IP Office™ Platform 11.0

IP Office Platform Security Guidelines

Issue 03g - (Wednesday, October 28, 2020)

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Chapter 1. Overview

1. Overview

The following document is a practical guide to planning, checks and configuration changes required to help secure the IP Office solution. All IP Office existing and new installations, regardless of usage, must be assessed with the following sections and immediate action taken where indicated.

Implementing these recommendations will substantially reduce the risk of compromise from security threats such as Denial of Service, Toll Fraud and theft of data.

This document does not provide an analysis of security-related topics, define security policy or discuss theory – it also cannot guarantee security. This document does however aim to provide useful and understandable information that can be used by installation, service and support personnel as well as customers to help harden IP Office against attacks.

1.1 Disclaimer

Avaya has used reasonable commercial efforts to ensure that the information provided here under is accurate at this date. Avaya may change any underlying processes, architecture, product, description or any other information described or contained in this document. Avaya disclaims any intention or obligation to update or revise the document, whether as a result of new information, future events or otherwise. This document is provided "as is," and Avaya does not provide any warranty of any kind, express or implied.

1.2 Purpose

This document provides guidelines for implementing and maintaining IP Office Platform security. It contains an overview of security policy and describes the security tools available to an IP Office Platform solution.

1.3 Intended Audience

This document is intended for installation, administration, service and support personnel who required knowledge of the available IP Office security tools and information on how to implement an IP Office security policy.

1.4 Information classifications and NDA requirements

Avaya provides security-related information according to the following information classifications:

Classification	Description
Avaya Restricted	This classification is for extremely sensitive business information, intended strictly for use within Avaya. Unauthorized disclosure of this information can have a severe adverse impact on Avaya and the customers, the Business Partners, and the suppliers of Avaya.
Avaya Confidential	This classification applies to less sensitive business information intended for use within Avaya. Unauthorized disclosure of this information can have significant adverse impact on Avaya, and the customers, the Business Partners, and the suppliers of Avaya. Information that can be private for some people is included in this classification.
Avaya Proprietary	This classification applies to all other information that does not clearly fit into the above two classifications, and is considered sensitive only outside of Avaya. While disclosure might not have a serious adverse impact on Avaya, and the customers, Business Partners, and suppliers of Avaya, this information belongs to Avaya, and unauthorized disclosure is against Avaya policy.
Public	This classification applies to information explicitly approved by Avaya management as non-sensitive information available for external release.

As this document is generally available, the information herein is considered Public. This document contains references to additional information sources which may disclose both confidential and proprietary information and require a non□disclosure agreement (NDA) with Avaya.

1.5 Applicability

The following information is applicable to IP Office IP500 V2, IP Office Server Edition, IP Office applications and endpoints for release 9.1, 10.0, 10.1 and 11.0.

IP Office Technical Bulletin 169 covers releases 9.0 and prior, and can be found at: https://ipofficekb.avaya.com/businesspartner/ipoffice/mergedProjects/bulletins/techbulls/tb169.pdf.

The following areas are not covered in this document:

- Physical security measures
- Non-Avaya component security
- Security policy definition
- Regulatory compliance

1.6 Responsibility for IP Office Security

Avaya is responsible for designing and testing all Avaya products for security. When Avaya sells a product as a hardware/software package, the design and testing process of the Avaya product also includes the testing of the operating system.

The customer is responsible for the appropriate security configurations of data networks. The customer is also responsible for using and configuring the security features on IP Office systems, gateways, applications and telephones.

1.7 Responsibility for Security Updates

When security-related applications or operating software updates become available, Avaya tests the updates if applicable before making them available to customers. In some cases, Avaya modifies the updated software before making updated software available to customers.

Avaya notifies customers of the availability of security updates through Security Advisories. Customers can subscribe to receive notification about Security Advisories by email. For more information, see Avaya Product Security Support.

When IP Office software security updates become available, the customer can install the updates or employ an installer from the customer services support group to install the updates. When Avaya installs the updates, the installer is responsible for following best security practices for server access, file transfers, and data backup and restore.

1.8 Apple iOS 13/macOS 10.15 Changes

With the release of the iOS 13 and macOS 10.15 (Catalina) operating systems, Apple have changed the criteria for security certificates that those operating systems will accept. See Avaya product support notice PSN005435u and Apple support notice HT210176 for more details.

The enhanced criteria are:

- TLS server certificates and issuing CAs using RSA keys must use key sizes greater than or equal to 2048 bits. Certificates using RSA key sizes smaller than 2048 bits are no longer trusted for TLS.
- TLS server certificates and issuing CAs must use a hash algorithm from the SHA-2 family in the signature algorithm. SHA-1 signed certificates are no longer trusted for TLS.
- TLS server certificates must present the DNS name of the server in the **Subject Alternative Name** extension of the certificate. DNS names in the **CommonName** of a certificate are no longer trusted.
- In addition, for TLS server certificates issued after the 1st July 2019, as indicated in certificate's ***NotBefore*** field:
  - The certificate must contain an ***ExtendedKeyUsage*** (EKU) extension containing the *id-kp-serverAuth OID*.
  - The certificate must have a validity period of 825 days or fewer, as set by the ***NotBefore*** and ***NotAfter*** fields of the certificate.

IP Office Certificate Compatibility

For system's using IP Office generated certificates, the following releases generated certificates that comply with the requirements above:

- **IP Office Release 10.1 Systems:** 10.1 SP6 (10.1.0.6) and higher.
- **IP Office Release 11.0 Systems:** 11.0 FP4 SP1 (11.0.4.1) and higher.

1.9 Android 10 (Q) Security Changes

With the release of the Android 10 operating systems, Google have changed the criteria for security certificates that the operating system will accept. See Avaya product support notice PSN005435u for more details.

- TLS server certificates and issuing CAs must not use the SHA-1 or SHA-2 CBC signature hash algorithms.

IP Office Certificate Compatibility

For system's using IP Office generated certificates, the following releases generated certificates that comply with the requirements above:

- **IP Office Release 10.1 Systems:** 10.1 SP6 (10.1.0.6) and higher.
- **IP Office Release 11.0 Systems:** 11.0 FP4 SP1 (11.0.4.1) and higher.

1.10 Document Changes since Last Issue

Updates for IP Office Release 11.0:

- Avaya Equinox, J100 Series, K100 Series (Vantage) clients added
- TLS minimum version controls
- CLI based CSR support for Linux servers
- Phone wildcard certificate support clarification
- Updated Avaya Product Security Support process
- Notes regarding security changes for iOS, macOS and Android support.

Chapter 2.
IP Office Security Fundamentals

2. IP Office Security Fundamentals

All telephony, management, data, services and interfaces offered by the IP Office solution have security features to help prevent security threats such as:

- Unauthorized access or modification of data
- Theft of data
- Denial of Service (DoS) attacks
- Viruses and Worms
- Web-based attacks such as Cross-Site Scripting and Cross-Site Forgery
- Detect of attempted attacks

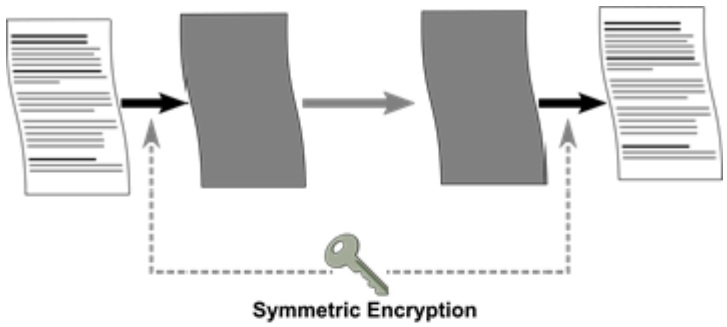
The following table lists methods and techniques used to help counter security threats:

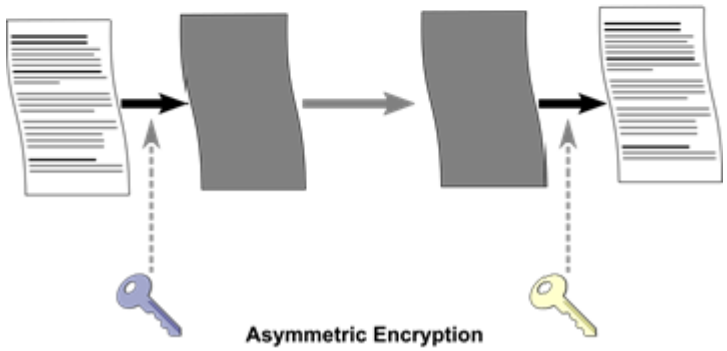
Mechanism	Usage	IP Office Examples
Identification and Authentication	Identification is the ability to uniquely identify a user, system or application of a system or an application that is running in the system. Authentication is the ability to prove that an entity is genuinely who they claim to be.	Telephony and Service User accounts Message authentication X509 digital certificates
Authorization	Authorization protects resources by limiting access only to authorized users, systems or applications.	Telephony and Service User accounts' access controls
Auditing	Auditing is the process of recording and checking events to detect whether any unexpected activity or attempt has taken place.	Audit trail System Status Application Alarms Syslog reports
Confidentiality	Confidentiality keeps sensitive information private, protecting from unauthorized disclosure.	TLS/SRTP encryption Security database encryption
Data integrity	Data integrity detects whether there has been unauthorized modification of data.	TLS/SRTP Message authentication

2.1 Encryption

Encryption ensures that all data stored on a system or sent by one system to another cannot be 'read' by anyone else. There are two main types of encryption

- Symmetric encryption is the application of a mathematical process at the originating end, and a reverse process at the receiving end. The process at each end use the same 'key' to encrypt and decrypt the data.
- Asymmetric encryption uses different keys for encryption and decryption. A common usage is a certificate authority's private and public key. See Certificates and Trust 32 for more information.





Most message data encryption is symmetric. The data sent may be optionally encrypted using a number of well-known algorithms:

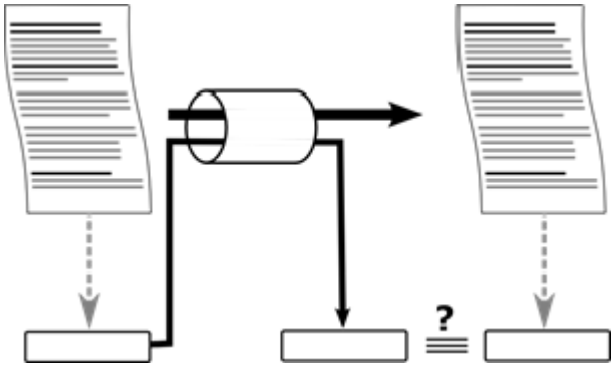
Algorithm	Effective key size (bits)	Use
DES-40	40	Not supported – insufficient strength
DES-56	56	Not supported – insufficient strength
3DES	112 (AKA two key DES)	Not supported – insufficient strength
3DES	168 (AKA three key DES)	'Low' security.
RC4-128	128	'Low' security.
AES-128	128	'Medium' security.
AES-256	256	'Strong' security.

In general the larger the key size, the more secure the encryption. However smaller key sizes usually incur less processing.

IP Office supports encryption using the Transport Layer Security (TLS v1.0, v1.1, and v1.2), Secure Shell (SSH v2), Secure RTP (SRTP) and IPsec protocols.

2.1.1 Message Authentication

Message authentication ensures that all data sent by either the system or Manager cannot be tempered with (or substituted) by anyone else without detection. This involves the originator of the data producing a signature (termed a hash) of the data sent, and sending that as well. The receiver gets the data and the signature, and checks both match.



Any data sent may be optionally authenticated using a number of well-known and cryptographically secure algorithms:

Algorithm	Effective hash size (bits)	Use
MD5	128	Not supported – insufficient strength
SHA-1	160	'Low/Medium' security for message authentication. • SHA-1 is not supported for TLS certificates by iOS13, macOS 10.15 and Android 10.
SHA-2	224, 245, 384, 512	'Strong' security

In general the larger the hash size, the more secure the signature. However smaller hash sizes usually incur less processing. IP Office supports message authentication using Transport Layer Security (TLS v1.0, v1.1, and v1.2), Secure Shell (SSH v2), Secure RTP (SRTP) and IPsec protocols.

2.1.2 Security Database

A security database is located on the IP Office which controls all local access, plus remote access to other IP Office components. These security settings have initial default values, can be modified by IP Office Manager or Web Manager, and cover the following areas:

- Administrative accounts
- An inviolate security administration account
- Users' password and account policy
- Trust Store (Trusted Certificate Store)
- Identity certificates
- Received certificate checks
- Service interface security controls
- Legacy interface controls

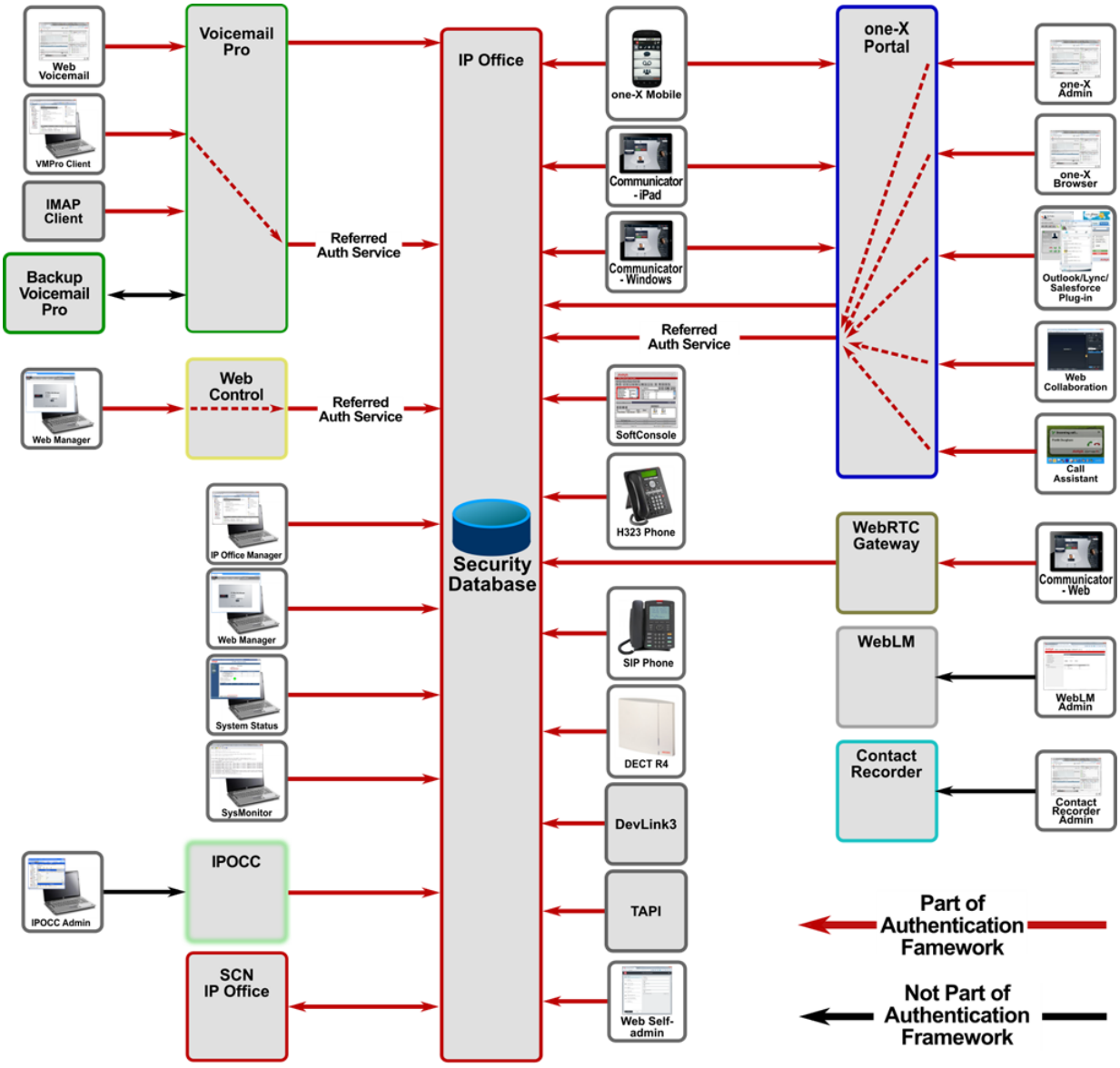
The security settings are separate to the IP Office configuration, always secured and cannot be saved or edited offline.

In addition to the IP Office security settings, one-X Portal for IP Office, Voicemail Pro, Contact Recorder, WebLM and Web Control have local administrative accounts used under fall-back conditions, see User Accounts and Rights of Access 18.

2.2 Authentication and Authorization Framework

IP Office has its own Authentication and Authorization (AA) framework, and requests to IP Office services are routed through the AA framework. The AA framework prevents unauthenticated, unauthorized access to IP Office services and data.

The following diagram shows the service interfaces covered by this framework:



Authentication and Authorization Framework

Linux one-X Portal, Linux Voicemail Pro and Web Control refer any administrative login to IP Office via an authentication/authorization web service. Windows one-X Portal and VMPro do not participate

There are some legacy interfaces which do not pass through the AA framework:

- TFTP user lists and directories
- TFTP file transfer
- SNMP (Note no SET operations supported)

These are disabled by default but can be enabled within an environment secured by other means.

2.3 Linux Platform Security

A number of IP Office products run on the Linux operating system. Avaya uses the open source Linux operating system as a secure foundation for communications.

The open source foundation is beneficial because of the following reasons:

- Security experts worldwide review the source code for defects or vulnerabilities.
- Avaya works diligently to monitor both the enhancements and improvements created by the Linux community and to carefully review the changes before incorporating them into Avaya products.
- Linux based Avaya servers help protect against many DoS attacks such as SYN floods, ping floods, malformed packets, oversized packets, and sequence number spoofing, among others.

Avaya has modified or hardened the Linux operating system in the following ways to minimize vulnerabilities and to improve security:

- **Minimal installation:** All unnecessary RPMs are removed. In addition to making the software file images smaller and more manageable, the operating system is more secure because attackers cannot compromise RPMs that are not present.
- **Least privilege:** All IP Office applications run as non-root. The root SSH access is disabled.
- **Ports:** Unnecessary IP ports closed.
- **Linux OS:** Security-Enhanced Linux (SELinux) is enabled, which provides increase security using kernel-level mechanisms that reduce the threat of compromise and limits potential damage from malicious or flawed applications.
- **Firewall protection:** The Linux-based products of Avaya use the IPTables firewall that protects the system against various network-based attacks.
- **Enhanced Access Security Gateway (EASG) support:** EASG is a certificate based authentication system that replaces passwords for technical support accounts.
- **Drive partition protection:** Processes that can write significant quantities of data to the hard drive such as the backup/restore HTTPS server and Voicemail Pro have quotas assigned to ensure disk space is not exhausted by malicious or unintentional actions.

Third-party security and management packages/tools

Several anti-virus and other security packages for Linux are available, however Avaya does not support the use of such software on the IP Office product as it has a level of natural immunity and the packages can severely impact performance.

For more information see the document "*Anti-Virus Policy Statement for Avaya Products Running on the Linux OS*" which can be found at https://downloads.avaya.com/css/appmanager/css/P8Secure/documents/100156571.

2.4 IP Office Services

All IP Office administrative and maintenance service interfaces are controlled by the security database for availability and security level. These services include:

Service	Usage
Configuration	IP Office Manager and Server Edition Manager configuration access
Security Administration	IP Office Manager and Server Edition Manager security settings (database) access
System Status Interface	System Status Application (SSA) access
Enhanced TSPI	one-X Portal CTI access
HTTP	Phone and IP Office Manager file access, Voicemail Pro, IP Office Line, SysMonitor (secure)
Web Services	Web Manager and SMGR
External	Services external to the IP Office application.

Each service has a configurable Service Security Level:

Service Security Level	Usage
Disabled	The service and corresponding TCP ports are inactive
Unsecure Only	This option allows only unsecured access to the service. The service's secure TCP port, if any, is disabled. This or Disabled are the only options supported for the Enhanced TSPI service
Unsecure + Secure	This option allows both unsecured and secure (Low) access.
Secure, Low	This option allows secure access to that service using TLS, and demands weaker (for example 3DES) encryption and authentication or higher. The service's unsecured TCP port is disabled.
Secure, Medium	This option allows secure access to that service using TLS, and demands moderate (for example AES-128) encryption and authentication or higher. The service's unsecured TCP port is disabled.
Secure, High	This option allows secure access to that service using TLS and demands stronger (for example AES-256) encryption and authentication, or higher. In addition, a certificate is required from the client (for Mutual Authentication). See Certificate Check Controls 43 for tests made on the received certificate. If no certificate is received from the client, the connection is rejected. The service's unsecured TCP port is disabled.

Other service interfaces are controlled for activity.

2.5 Default Security Settings

Defaults values for IP Office security settings are loaded on first start-up and on reset. They have a level of security and include enforced password changes for accounts.

Note: IP Office release 9.0 and earlier require additional changes from default to make them more secure.

It is possible to reset the IP Office security settings via a management interface, IP500 V2 serial port or power-on reset buttons; for this reason it is important to make the IP Office installation physically secure.

For information about IP Office Administrative user defaults see Default Administrative Users and Rights Groups 20.
For information about certificate defaults see Initial Certificate Settings 37.

The following default security settings are applied to the various IP Office service interfaces.

Interface	Default Setting	Default Security?	Notes
Configuration	Secure, Medium	✓	IP Office Manager configuration access
Security Administration	Secure, Medium	✓	IP Office Manager security settings access
System Status Interface	Secure, Medium	✓	SSA access
Enhanced TSPI	Unsecure Only	✗	one-X Portal CTI access
HTTP	Unsecure + Secure	✗	Phone and IP Office Manager file access, Voicemail Pro, IP Office Line, SysMonitor (secure)
Web Services	Secure, Medium	✓	Web Manager and SMGR
TFTP Server	Active (IP500 V2) Inactive (Linux)	✗	Allows access for Manager upgrade and UDP whois discovery
TFTP Directory Read	Inactive	n/a	DECT R4 system directory
TFTP Voicemail	Inactive	n/a	Used for Voicemail Pro R9.0 and prior
Program Code	Active (IP500 V2) Inactive (Linux)	✗	Manager upgrade access
Devlink	Inactive	n/a	DevLink and SysMonitor UDP/TCP access
Devlink3	Active	✓	DevLink3 access.
TAPI	Inactive	n/a	1st and 3rd party TAPI interfaces only.
HTTP Directory Read	Active	✗	one-X Portal directory access, external directory feature
HTTP Directory Write	Active	✗	one-X Portal directory access

The local security settings for one-X Portal, Voicemail Pro, IPOCC and Contact Recorder may be reset using the Linux console CLI and root access.

Chapter 3.

User Accounts and Rights of Access

3. User Accounts and Rights of Access

There are two main types of user accounts in the IP Office solution.

- A telephony user is called an IP Office User.
- An administrative user is called a Service User.

IP Office users are defined in the main configuration settings. Service users are defined in the security settings.

A special type of Service User is the Security Administrator, with permanent access to all security settings. An IP Office system can have no Service or IP Office users configured, but the Security Administrator cannot be removed or disabled.

In order to provide a central authentication database for the Authentication and Authorization (AA) framework a secure web service is provided by IP Office to other applications. Linux one-X Portal, Voicemail Pro and Web Management use this service to 'Refer' administrative logins to the database.

3.1 Service Users

Access to system settings is controlled by Service Users and Rights Groups stored in the control unit's security settings. These are stored separately from the system's configuration settings. All actions involving communications between Manager and the system require a service user name and password. That service user must be a member of a Rights Group with permissions to perform the required action.

Security Administrator:

The security administrator can access the system's security settings and the account cannot be removed or disabled.

In addition a further security setting can force this account to have exclusive security rights, preventing another Service Users from security settings access.

Service Users:

Each service user has a name, a password and is a member of one or more Rights Groups. The accounts may be in one of a number of states, including enabled, disabled, locked out and enforced password change.

IP Office supports a maximum of 64 Service Users.

Rights Groups:

The Rights Groups to which a service user belongs determine what actions they can perform. It can be thought of as a role, but has much more flexibility. Actions available to Rights Groups include configuration, security actions and maintenance actions. Where a service user has been configured as a member of more than one Rights Group, they combine the functions available in the separate Rights Groups

IP Office supports a maximum of 32 Rights Groups.

Application Roles:

In addition to rights of IP Office service access, Rights Groups can also contain 'Roles' for IP Office Manager and Web Manager; the settings of these roles determine what rights of access the Service User has within that application. It allows more granularity of access control within that application than the basic service access rights. For example the IP Office configuration service has two basic rights of access: Read All and Write All. However the Manager Operator roles can further constrain what can be written, viewed or edited.

Example Rights Assignment:

In the example illustrated above:

- Service user X can read and write the configuration. However they can only edit Operator settings and can only make changes that can be merged.
- Service user Y can read and write the configuration, edit all settings and make changes that require reboots or merges. They can also access the Voicemail Pro settings.
- Service user Z can read and write the configuration, edit all settings and make changes that require reboots. They can also access the security and the Voicemail Pro settings.
- The Security Administrator account can only access the security settings.

3.1.1 Changing Administrative Users, Rights Groups and Authentication

IP Office Manager and Web Manager allow modification of Service Users and Rights Groups. Prior to any change, the following should be considered:

- A Server Edition or multi-site IP500 V2 deployment should have consistent Service Users and Rights Groups. IP Office Manager and Web Manager have synchronisation tools to assist.
- For All Linux servers, enable Referred Authentication to allow IP Office application to use the local IP Office
- All changes should follow security best practices such as password policy and minimal rights of access.

3.1.2 Default Administrative Users and Rights Groups

The following **Security Administrator** account is present on first start-up and security settings reset:

Name	Default Account Status	Usage	Rights Group Membership	Notes
security	Enabled, Force password change	This is the default security administration account. Has all rights to all security management and maintenance services	Implied all security rights	Cannot be removed or disabled

The following **Service User** accounts are present on first start-up and security settings reset:

Account Name	Default Account Status	Usage	Rights Group Membership	Notes
Administrator	Enabled, Force password change	This is the default account used for system configuration using the IP Office and Web Manager applications, including one-X Portal/Voicemail Pro administration. Has all rights to all management and maintenance services including security settings.	Administrator, System Status, Business Partner	Should not be removed or disabled Should not be renamed
EnhTcpaService	Enabled	This account is used for one-X Portal for IP Office connections to the system.	TCPA Group	Although not enforced, the password should be change as soon as possible in both IP Office and one-X Portal Enable only when one-X Portal deployed
IPDECTService	Disabled	This account is used for DECT R4 system provisioning	IPDECT Group	Enable only when DECT R4 deployed and provisioning mode active
BranchAdmin	Disabled	This account is used for System Manager (SMGR) access in a branch deployment	SMGR Admin	Enable only when SMGR deployed; will be enabled when the Initial Configuration Utility (ICU) run and SMGR administration selected. Must not be renamed
BusinessPartner	Disabled	Similar access rights to Administrator and can be used as a separate account for Business Partners	Business Partner	Should be removed/disabled unless required
Maintainer	Disabled	Maintenance account without edit configuration or security access. Can be used for Manager (read-only), Web Manager (read-only), System Status Application (SSA), Backup/Restore, System Monitor, Upgrade	Maintainer	Should be removed/disabled unless required

The following **Rights Groups** are present on first start-up and security settings reset:

Group Name	Usage	Rights Group Users	Notes
Administrator Group	Allows full access to the IP Office Manager application to configure the system. No security or maintenance access	Administrator	All IP Office Manager operations are permitted Can use embedded file manager
Manager Group	Allows limited access to the IP Office Manager application to configure the system.	–	All IP Office Manager operations permitted except: - Delete Short Code - View LAN2 Settings Can use embedded file manager
Operator Group	Allows limited access to the IP Office Manager application to configure the system.	–	All IP Office Manager operations permitted except: - New object creations - View LAN2 Settings - Delete Directory - Delete Incoming Call Route Cannot use embedded file manager
System Status Group	Allows limited access to the SSA and Sys Monitor applications.	Administrator	Sys Monitor access right only checked when using service users with Sys Monitor
TCPA Group	This group is used by the one-X Portal for IP Office application.	EnhTcpaService	
IPDECT Group	This group is used by the DECT R4 master base station to extract DECT settings from IP Office.	IPDECTService	
SMGR Admin	This group is used by SMGR to configure IP Office.	BranchAdmin	Do not change the access rights
Security Admin	Allows access to security settings only	–	
Backup Admin	Allows access to all backup and restore services only, including one-X Portal	–	
Upgrade Admin	Allows access to the upgrade service	–	Allows upgrade of both IP Office applications and operating system
System Admin	Allows configuration of IP Office, one-X Portal and Voicemail Pro	–	
Maint Admin	Allows configuration of IP Office, one-X Portal and Voicemail Pro along with backup, restore and upgrade	–	Typically used for maintenance personnel
Business Partner	Full access to all configuration, security and maintenance services.	Administrator, BusinessPartner	
Customer Admin	Web Management , one-X Portal and Voicemail Pro administration	–	No IP Office manager access
Maintainer	Allows configuration view only, along with SSA, Sys Monitor backup, restore and upgrade	–	Typically used for maintenance personnel with no need for configuration changes

The following **Rights Group** assignments are present on first start-up and security settings reset:

Service	Rights Group > Access Right V	Administrator Group	Manager Group	Operator Group	System Status Group	TCPA Group	IPDECT Group	SMGR Admin
Configuration	Read all configuration	✓	✓	✓				
	Write all configuration	✓	✓	✓				
	Merge configuration	✓	✓	✓				
	Default configuration	✓	✓	✓				
	Reboot/Shutdown immediately	✓	✓	✓				
	Reboot when free	✓	✓	✓				
	Reboot at time of day	✓	✓	✓				
Security Admin	Read all security settings							
	Write all security settings							
	Reset all security settings							
	Write own service user password							
System Status	System Status Access				✓			
	Read all configuration				✓			
	System Control				✓			
	Sys Monitor				✓			
Telephony APIs	Enhanced TSPI Access					✓		
	DevLink 3							
	Location API							
HTTP	DECT R4 Provisioning						✓	
Web Services	Security Read All							✓
	Security Write All							✓
	Security Write Own Password							✓
	Config Read All							✓
	Config Write All							✓
	Backup							✓
	Restore							✓
	Upgrade							✓
External	Voicemail Pro Basic							
	Voicemail Pro Standard							
	Voicemail Pro Administrator							✓
	one-X Portal Administrator							
	one-X Portal Super User							

Service	Rights Group > Access Right V	Administrator Group	Manager Group	Operator Group	System Status Group	TCPA Group	IPDECT Group	SMGR Admin
	Web Control Administrator							
	Web Control Security							
	WebRTC Administrator							

3.2 Security Settings on Upgrade

When the IP Office system is upgraded and new rights groups or services added, existing users will only be granted the new rights if the Service Users' accounts are at default. This prevents unexpected changes of rights on upgrade. If access to these new rights or services are required, they must be added manually after the upgrade process has been completed.

Chapter 4.
Password and PIN Management

4. Password and PIN Management

In general, password and PIN resistance to Guessing (attacks using default passwords, dictionary words, or brute force) and Cracking (attacks that attempt to match the login calculation without needing to know the actual password) can be greatly improved by 'strong' passwords and a password change policy.

A strong password is typically one that:

- Is long (e.g. at least 8 characters)
- Complex (e.g. contains upper, lower and numeric characters)
- Does not contain sequences or repeated characters
- Is not easily guessable. Guessable passwords include:
  - Password same as account name or extension number (or reversed)
  - Dictionary words
  - Dictionary words with number substitution
  - Backwards words
  - Personal or corporate information
  - Date of birth
  - Default passwords

A strong PIN/Login Code is typically one that:

- Is long; a 13 digit PIN is similar in strength to an 8 character case-sensitive password
- Does not contain sequences or repeated digits
- Does not contain keypad sequences (for example 2580)
- Is not easily guessable. Guessable PINs include:
  - PIN same as extension number (or reversed)
  - Personal or corporate information
  - Date, prevalent when 4, 6 or 8 digit minimum length is enforced
  - Default login codes

Password and PIN strength and management is not covered in detail here, but many publications exist including:

- NIST Special Publication (SP) 800-118, Guide to Enterprise Password Management (Draft): ttp://csrc.nist.gov/publications/drafts/800-118/draft-sp800-118.pdf
- Centre for the Protection of National Infrastructure (CPNI), PROTECTING SYSTEMS AND DATA, PASSWORD ADVICE http://www.cpni.gov.uk/documents/publications/2012/2012029-password_advice.pdf
- US-CERT Security Tip (ST04-002), Choosing and Protecting Passwords: https://www.us-cert.gov/ncas/tips/ST04-002

4.1 Password and PIN Policy

On a new installation of IP Office, when you ignite a Linux server or first login to Manager or Web Manager, you are required change the three system account passwords: Administrator, Security Administrator and system password.

Both Service and IP Office User password policy is configured in the **Security Settings | General** tab of IP Office Manager. The policy settings include:

- Service user minimum name and password length
- Service user minimum password complexity
- Number of consecutive failure attempts and the subsequent action; nothing, log, temporary disable, permanent disable
- Ensure no previous passwords are reused
- Enforced password change – both immediate and periodic
- Idle account timeout
- Separate set of IP Office User policy settings to allow differentiation

PINs are used on IP Office for telephony user login (Login Code), VoIP extension registration (Phone Password) and voice mailbox access (Voicemail Login Code). The policy is configured using **System | Voicemail | Voicemail Code Complexity** and **System | Telephony | Login Code Complexity**:

- Minimum login code & extension registration length
- Minimum login code & extension registration complexity
- Minimum voicemail code length
- Minimum voicemail code complexity

4.1.1 Administrative User Passwords

There are various accounts used for administrative, maintenance and machine/service access. The following tables cover those interfaces, their password attributes, and where the account settings are located:

Login Interface	Account Settings	Notes
• **Manager** • **Server Edition Manager** • **Web Manager** • **System Status (SSA)** • **Web Control** • **Voicemail Pro client** • **SysMonitor***	Service User name and password. Various rights of access Password: 1-31 Unicode characters	Change using Manager in security settings mode or Web Security Manager Security settings for Service User password policy apply Temporary or permanent lock out upon number of consecutive failed attempts. Current lockout status can be viewed in Manager under Security | Service Users | Service User Details *SysMonitor will use this account when the **Security | System | Unsecured Interfaces | Use Service User Credentials** is active
• **Manager upgrade**	System password Password: 1-31 ASCII printable characters	Change using Manager in security settings mode
• **SysMonitor*** • **DevLink**	Sysmon password Password: 1-31 ASCII 0-9, a-z, A-Z characters	Change using Manager in security settings mode *SysMonitor will use this password when the **Security | System | Unsecured Interfaces | Use Service User Credentials** is inactive
• **Voicemail Pro client**	Three admin roles: - Administrator - Standard - Basic Password: 5-31 ASCII printable characters except \ / : * ? < > | , ;.	Change using VMPro client, Voicemail Pro Administrators tab Used for Windows Voicemail Pro at all times Used for Linux Voicemail Pro as a fall-back account when IP Office Referred Authentication is not available
• **Contact Recorder**	Two admin roles: - System Admin - Restricted Admin Password: 1-99 Unicode characters except space	Change using Contact Recorder web admin page, system tab
• **one-X Portal admin**	Two admin roles: - Administrator - Backup/restore Password: 1-31 Unicode characters	Change using one-X Portal admin web page, **Configuration | Users** panel Used for Windows one-X Portal at all times Used for Linux one-X Portal as a fall-back when IP Office Referred Authentication is not available
• **Linux Secure Shell (SSH)**	One admin role: 'Administrator' Password: 1-31 ASCII printable characters	Change using Web Control login screen Can only change password
• **Linux Console interface (CLI)**	Two admin roles: - Administrator - root Password: 1-31 ASCII printable characters	Change using Web Control login screen Change using Web Control, **Settings | System** tab Can only change passwords
• **VMPro <> IP Office service interface**	VMPro password Password: 1-31 ASCII printable characters	Change using Manager in security settings mode Change using VMPro client, **System Preferences | General** tab When zero length (default), IP Office will use the system password
• **one-X Portal <> IP Office service interface**	Service User name and password Password: 1-31 Unicode characters	Change using Manager in security settings mode or Web Security Manager.

Login Interface	Account Settings	Notes
		Change using one-X Portal admin web page, **Configuration | Providers | Default-CSTA-Provider | Edit** panel
• **TAPI Link Pro (3rd party TAPI)**	System password Password: 1-31 ASCII printable characters	Change using Manager in security settings mode TAPI Link Lite is covered in IP Office Users' Passwords and Login Codes[30].
• **DECT R4 Provisioning**	Service User name and password Password: 1-31 Unicode characters	Change using Manager in security settings mode Change using base station web admin interface
• **DevLink3 API** • **Location API** • **Service Monitoring API** • **Web Management SDK API**	Service User name and password Password: 1-31 Unicode characters	Change using Manager in security settings mode

4.1.2 IP Office Users' Passwords and Login Codes

The following table indicates which IP Office components use what password, voicemail PIN or login code when logging in to the various interfaces.

Password is defined by the configuration field **User | User | Password** and typically used during application login.

Voicemail code is defined by the configuration field **User | Voicemail | Voicemail Code** and used for mailbox login.

Login code is defined by the configuration field **User | Telephony | Supervisor Settings | Login Code** and used for phone login. A new field in release 9.0+ allows VoIP phone login against the extension, not user record: **Extension | Extn | Phone Password**.

All passwords and login codes can be changed in IP Office and Web Manager.

Login Interface	Account Setting	Notes
• **SoftConsole** • **one-X Portal browser** • **one-X Mobile Preferred** • **Communicator Windows/iPad** • **IP Office Video Softphone** • **Outlook plugin, Call Assistant** • **Salesforce & Lync plugin** • **TAPI Link Lite (1st party TAPI)** • **RAS (dial in) Users** • **Web Self-Administration** • **Web Collaboration conference owner** • **Integrated Contact Reporter Agent/Supervisor** • **IP Office Web Client**	• Name: **User	User	Name** • Password: **User	User	Password** • Attributes: 0-31 ASCII 0-9, a-z, A-Z characters	Security settings for IP Office user password policy apply TAPI Link Pro and DevLink are covered in Administrative User Passwords 28. Temporary or permanent lock out upon number of consecutive failed attempts.
• **Voicemail Pro mailbox** • **Embedded Voicemail mailbox**	• User extension: **User	User	Extension** • Voicemail Code: **User	Voicemail	Voicemail Code** • Attributes: 0-15 ASCII digits	Voicemail settings for password/PIN policy apply: **System	Voicemail	Voicemail Code Complexity**. User's voicemail code input not required if accessing voicemail from a trusted extension.
• **IP Office User phone login**	• User extension: **User	User	Extension** • Login Code: **User	Telephony	Supervisor Settings	Login Code** • Attributes: 0-31 ASCII digits	System settings for password/PIN policy apply: **System	Telephony	Login Code Complexity**. Temporary lock out upon number of consecutive failed attempts.
• **H323 Phone registration** • **SIP Phone registration**	• Phone extension: **Extension	Extn	Base Extension** • Login Code: **User	Telephony	Supervisor Settings	Login Code** • Attributes: 0-31 ASCII digits	System settings for password/PIN policy apply: **System	Telephony	Login Code Complexity**. Temporary lock out upon number of consecutive failed attempts For R9.0+, H323 **Extension	Extn	Phone Password** field is used if set. Current lockout status can be viewed and reset in SSA under **System	VoIP Security	Blacklisted Extensions** and **Blacklisted Addresses**.

Chapter 5.
Certificates and Trust

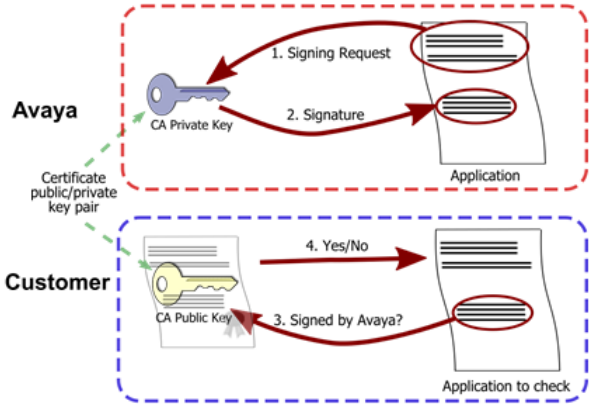
5. Certificates and Trust

Digital certificates are used within the IP Office solution for a number of purposes:

- Signing firmware, applications and Java applets to assure their origin.
- Identifying IP Office to other systems, applications and users.
- Verifying the identity of other systems, applications and users.
- Setting up Transport Layer Security (TLS) links, including HTTPS and SIP.
- Incorporating IP Office into a wider trust domain.

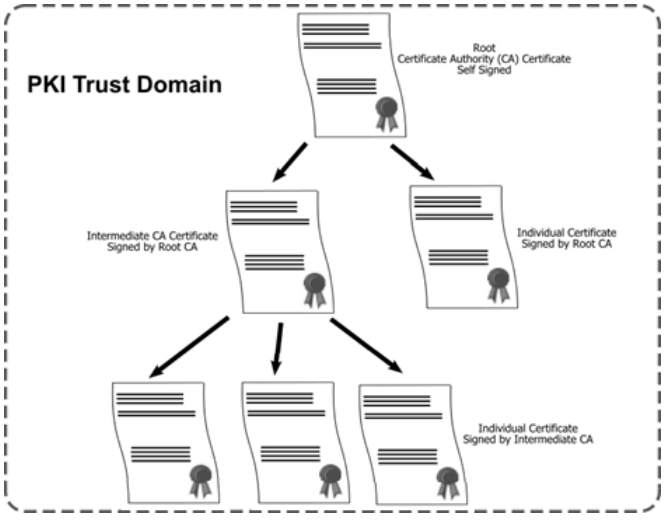
Digital certificates are defined by the X509v3 format and have become the de facto standard for most security operations that involve identity verification. The identity of individuals, systems and applications can be asserted by a certificate with a 'public' key and its corresponding 'private' key. The public key is part of the certificate, along with other identity information and other digital security data.

For example, Avaya signs its applications with its private key and makes the corresponding certificate public. Anyone wishing to check the application can take the certificate and use the public key to unlock the signature and verify:



One point from the above example is that the private key must remain private; anyone with access to the key can masquerade as Avaya.

To ensure greater trust, a trusted party can sign the public key and the information about its owner. A trusted party that issues digital certificates is called a certification authority (CA), similar to a governmental agency that issues drivers' licenses. A CA can be an external certification service provider or a government, or the CA can belong to the same organization as the entities it serves. CAs can also issue certificates to other subordinate CAs, which creates a tree-like certificate trust called a Public-Key Infrastructure (PKI):



5.1 Certificate Terminology

Throughout this document the following terms and definitions will be used in the context of certificates:

- **Certificate:** A digital certificate containing identity information, a public key and other digital security data conforming to the X.509 v3 standard.
- **Certificate Authority (CA):** An entity that can issue identity certificates signed by another certificate.
- **Root CA Certificate:** A 'self-signed' certificate (i.e. A certificate that has been signed by itself) representing the certificate authority's root of the certificate hierarchy whose private key can be used for signing other certificates. Most operating systems and browsers ship with many root CA Certificates from public authorities that are trusted by default.
- **Intermediate CA Certificate:** A certificate which has been created by signed by a CA for the purpose of signing other certificates.
- **Identity Certificate:** A certificate used to represent an entity's identity. To be used as an identity certificate the associated private key must also be present.
- **Trusted Certificate:** A certificate that is trusted by an entity.
- **Trust Store (Trusted Certificate Store/TCS):** A store of trusted certificates.
- **Trusted Root/Trust Anchor:** The top level certificate that is trusted by an entity.
- **Certificate Chain:** A list of certificates, starting with the Identity Certificate followed by one or more CA certificates (usually the last one being Root CA certificate) where each certificate in the chain is signed by the subsequent certificate.
- **Trust domain:** A single PKI trust structure, e.g. an 'island of authority'.
- **Server Authentication:** The checking of a server's certificate by a client.
- **Mutual Authentication:** The checking of a client's certificate by a server.
- **Certificate Identity Verification:** The source of the certificate (IP address, URL, etc.) is checked against the contents of the certificate's Name and Subject Alternative Name fields.
- **Single Domain Certificate:** A certificate created for a single server with just one name field/domain (i.e. one identity).
- **Multi Domain Certificate (AKA 'Multi-SAN' or 'Unified Communications' certificate):** A certificate created for a single server with many domains/identities, each identity is one name entry.
- **Wildcard Certificate:** A certificate created for a multiple servers or a single server with many domains/identities. The name entry is of the form '*.example.com'. Wildcard certificates carry additional security risks and limitations. See Certificate Name Content 41.

5.1.1 Components of a Certificate

Certificates are made up of a number of fields some mandatory and some optional:

- **Version:** usually V3 – indicating X.509 v3 format
- **Serial Number:** A unique number used to uniquely identify the certificate. There is no requirement that the number is actually serialised, just that it's unique.
- **Subject (AKA Issued to):** The entity (person, system etc.) identified by the certificate. This is divided into a number of sub fields: Common Name (CN), Organisation Unit (OU), email, etc. Typically the CN is referred to as the 'Name' of the certificate.
- **Subject Alternative Name:** Alternative names by which the entity can be identified. These entries are often tested to assure the recipient the source of the certificate. For example the IP Address of the remote server should match one of the names in this field.
- **Issuer (AKA Issued by):** The CA entity that verified the information and issued the certificate. This is also divided into a number of sub fields like Subject.
- **Valid From:** The UTC time/date the certificate is first valid from.
- **Valid To:** The expiration time/date.
- **Key Usage:** Purpose for which the public key can be used (e.g. certificate signing, encryption, etc.).
- **Signature Algorithm:** The cryptographic algorithm used to create the signature.
- **Signature:** The signature data to verify that it came from the issuer. Encrypted with the issuer's private key, can be decrypted with the issuer's public key found in the issuer's certificate.
- **Public Key Algorithm:** The public key type (e.g. RSA, DSA etc.).
- **Public Key:** The public key.

There are other fields that may be present, see RFC 5280 for more information.

5.1.2 Certificate Security

The size of the public key and the thumbprint algorithm used determine in part how resistant the certificate is to being compromised. Many government bodies now determine that certificates with MD5 and SHA-1 thumbprint algorithms, or public keys of less than 2048 bits are not secure.

For TLS certificates, iOS13, macOS 10.15 and Android 10 require SHA-2 certificates.

5.1.3 Certificate Checks

When a certificate is received with a view to verifying identity, a number of tests and checks can be carried out:

- The certificate is assessed for basic validity such as integrity, start/end date, usage information, strength of public key, etc.
- The subject of the received certificate and any alternative names are verified against the source of the certificate; for example the IP address or the domain name. This is termed 'Certificate Identity Verification'.
- The Issuer is extracted and the Trusted Certificate Store (TCS) searched for a certificate that matches. When found the received certificate's signature is checked using the public key of the trusted certificate. This is repeated until a trusted Root CA certificate is found.
- If revocation information present in the Root CA certificate, the received certificate is checked with the CA to see if it has been revoked (i.e. certificate has be cancelled or withdrawn by the authority).

Due to the variety of implementations, certificate content, configurable setting and heritage, many systems and applications differ greatly in their application of such tests.

5.1.4 Certificates and the Transport Layer Security (TLS) Protocol

Certificates are used by TLS in a number of ways:

- Exchanging the keys used for the symmetric encryption at the beginning of the session.
- Verifying the identity of the TLS server
- Verifying the identity of the TLS client

Due to the way TLS works, the server must always have a certificate else the TLS session cannot start, and that certificate is always presented to the client. In order to obtain the client's certificate, the server must explicitly request it.

Typically the identity verification of both client and server is configurable, along with the exact set of checks carried out on the received certificate(s). Without such checks TLS can be susceptible to man-in-the-middle attacks.

The IP Office platform supports TLS v1.0, v1.1 and v1.2. All TLS interfaces start with TLS v1.2 but can allow negotiation down to v1.1 or v1.0 for compatibility. There are IP Office, Voicemail Pro, Web Manager and one-X Portal admin settings for 'Minimum TLS version' that enforce v1.2. Note that some Avaya clients do not support v1.2 at present. See Appendix F – IP Office VoIP Endpoint Security 106.

5.1.5 Certificate File Naming and Format

Like so many other aspects of certificates, there are various options and standards (both formal and informal) associated with certificate files.

There are four main encodings/internal formats for certificate files. Note these are encodings, not file naming conventions:

- **DER:** Distinguished Encoding Rules (DER) format, which is a binary format used to represent a certificate. Typically used to describe just one certificate, and cannot include a private key.
- **PEM:** Privacy Enhanced Mail (PEM) is a Base 64 (i.e. ASCII text) encoding of DER, one certificate is enclosed between '-----BEGIN CERTIFICATE-----' and '-----END CERTIFICATE-----' statements. Can contain a private key enclosed between '-----BEGIN PRIVATE KEY -----' and '-----END BEGIN PRIVATE KEY -----' statements. More than one certificate can be included.
  PEM be identified by viewing the file in a text editor.
  This is an unsecure format and not recommended for private key use unless it is protected with a password.
- **PKCS#12:** Public Key Cryptography Standard (PKCS) #12. A secure, binary format, encrypted with a password. Typically used to describe one certificate, and its associated private key, but can also include other certificates such as the signing certificate(s).
  This is the recommended format for private key use.
- **PKCS#7:** A Base 64 (i.e. ASCII text) encoding defined by RFC 2315, one or more certificates are enclosed between '––BEGIN PKCS––' & '––END PKCS7––' statements. It can contain only Certificates & Chain certificates but not the private key. Can be identified by viewing the file in a text editor.

There are many common filename extensions in use:

- **.CRT** – Can be DER or PEM. Typical extension used by Unix/Android systems' public certificates files in DER format.
- **.CER** – Can be DER or PEM. Typical extension used by Microsoft/Java systems' public certificates files in PEM format.
- **.PEM** – Should only be PEM encoded
- **.DER** – Should only be DER encoded
- **.p12** – Should only be in PKCS#12 format. Typical extension used by Unix/Android systems' identity certificates/private key pair files. Same format as .pfx hence can be simply renamed.
- **.pfx** – Should only be in PKCS#12 format. Typical extension used by Microsoft systems' identity certificates/private key pair files. Same format as .p12 hence can be simply renamed.
- **.pb7** – Should only be in RFC 2315 format. Typical extension used by Microsoft and Java systems for certificate chains.

3rd party tools such as OpenSSL and the Windows Management Console Certificate snap-in can be used to convert between the various formats, care should be taken not to expose any private key. See Converting Certificate Files 119 for information on OpenSSL format conversion.

5.2 IP Office Certificate Support

The IP Office platform supports certificates in a number of ways, most of which are configurable via the security settings:

- An identity certificate for each system and their local applications, including an optional separate identity certificate for management and telephony interfaces.
- Unique identity certificate self-generated by all systems when required.
- Identity certificate can be administered via IP Office Manager or Web Manager, or obtained automatically using the Simple Certificate Enrollment Protocol (SCEP) or PKCS#10 (IP Office Linux only).
- DER and PEM for certificate file import/export, and PKCS#12 for certificate/private key pair import/export.
- A Certificate Authority on the Primary and Linux Linux Application Server including Subject Alternative Name support.
- The certificate processing can support 1024, 2048 and 4096 bit public RSA keys, and SHA-1, SHA-256, SHA-224 and SHA-512 hashes. For TLS certificates; iOS13, macOS 10.15 and Android 10 do not support SHA-1 certificates.
- A Trusted Certificate Store (TCS) of 64 entries minimum.
- Configurable default TCS content, restored on security settings reset.
- Individual per-service controls to enforce mutual certificate authentication where the client's certificate is requested and tested.
- Separate management and telephony received certificate check levels that provide increasingly rigorous tests. This includes a 'high' setting that tests not only the trust chain but also the presence of the received certificate in the TCS.
- Intermediate CA certificate support, both for the CAs and the identity certificate chain offered by IP Office and its applications.
- Errors, alarms and warnings to help identify certificate issues.

Currently IP Office certificate support does not include the following:

- Linux Applications (including one-X Portal, Voicemail Pro and Contact Recorder) cannot be configured for mutual authentication. i.e. they cannot check any received certificate against the TCS.
  - SIP clients' certificates are not requested.
- The received certificate tests of IP Office do not include revocation checks such as OCSP or CRLs.
- The received certificate tests of IP Office do not include assuring the source of the certificate using Subject Alternative Name entries. i.e. Certificate identity verification.
- No support for DSA or EC-DSA public key certificates, or RSA public keys above 4096 bits. It is recommended to use RSA public keys of 2048 bits.
  - The IP500 V2 servers does not support the manual generation of a Certificate Signing Request (CSR) where the private key is retained within the server. Either a web form based request or a 3rd party tool to create a CSR can be used. See Certificate Signing Requests 112 for more information on how to generate a CSR for IP Office.

5.2.1 Interface Certificate Support

Certificates are supported on all IP Office TLS and SSH interfaces including HTTPS, whether client or server.

- **Note:** SSLv2 and SSLv3 are not supported by IP Office.

For information about basic TLS functionality see Certificates and the Transport Layer Security (TLS) 35.

There are a number of IP Office settings that affect certificate operation

The table in IP Office Interface Certificate Support 103 lists all TLS links in the IP Office platform solution and their security capabilities including certificate support.

The table in IP Office VoIP Endpoint Security 106 lists VoIP clients in the IP Office platform solution and their security capabilities.

5.2.2 Initial Certificate Settings

5.2.2.1 IP500 V2 Initial Certificate Settings

IP500 V2 will always create a unique self-signed CA certificate upon initial start-up and on security settings reset. It will contain the certificate fields listed below.

This certificate can be used for PKI operations in a limited manner; it has some security value, but is not part of a wider PKI and hence not trusted by anything else unless this certificate is installed in the relevant TCS.

Certificate Field	Contents	Notes
Version	V3	Always X.509 V3 format
Serial Number	Large random number	Ensures serial number unique Not more than 20 bytes
Subject (Issued To)	CN = ipoffice-nnnnnnnnnn.avaya.com O = Avaya Inc OU = GCS L = Basking Ridge S = New Jersey C = US E = support@avaya.com	Where: - nnnnnnnnnn is the LAN 1 mac address, e.g. ipoffice-00e00705918e.avaya.com
Subject Alternative Name(s)	1: DNS Name=ipoffice-nnnnnnnnnn.avaya.com 2: IP Address=a.b.c.d 3: IP Address=e.f.g.h	Where: - nnnnnnnnnn is the LAN 1 mac address - a.b.c.d is the LAN 1 IP address at the time of certificate creation - e.f.g.h is the LAN 2 IP address at the time of certificate creation
Issuer (Issued by)	CN = ipoffice-nnnnnnnnnn.avaya.com O = Avaya Inc OU = GCS L = Basking Ridge S = New Jersey C = US E = support@avaya.com	Same content as Subject: Self-signed certificate
Valid From	DD/MM/YY HH:MM:SS	Will reflect the UTC time/date minus 24 hours when the certificate was created. If the real time clock was corrupt/not set, the time will be fixed to 00:00:00 1st January of the year the software was released.
Valid To	Valid From plus 7 years	
Key Usage	keyAgreement keyEncipherment digitalSignature, nonRepudiation, dataEncipherment keyCertSign	Marked non-critical The certificate can be used for the set of IP Office certificate operations
Extended Key Usage	id-kp-serverAuth id-kp-clientAuth	Marked non-critical The certificate can be used for the set of IP Office certificate operations
Basic Constraints	cA: true pathLenConstraint: 0	Marked critical The certificate can be used in isolation as a CA, no other certificates may be signed by this one
Signature Algorithm	sha256RSA	
Signature	Signature data	
Public Key Algorithm	RSA	

Certificate Field	Contents	Notes
Public Key	Size 2048 bits	

Note

1. The correct LAN 1 and LAN 2 address should be set during initial installation and the identity certificate manually regenerated.

5.2.2.2 Linux Servers Pre-Ignition Initial Certificate Settings

The UCM and default Server Edition distributions before ignition has completed do not have a unique certificate. In order to connect a browser to ignite, this certificate requires to be temporarily accepted. It should never be stored permanently. It is self-signed and contains a subject and issuer of *'ipoffice-default.avaya.com'*.

Once ignition has completed, it is replaced by the relevant identity certificate according to the resultant server type.

5.2.2.3 Server Edition Primary/Linux Application Server Initial Certificate Settings

The Primary and Linux Application Server have an inbuilt certificate authority. During the ignition process the installer can chose to keep the default CA root certificate used for signing, or import another as a public/private key pair. This imported certificate can either be a root CA or an intermediate CA.

If the internal CA is retained, it has the contents listed below.

Certificate Field	Contents	Notes
Version	V3	Always X.509 V3 format
Serial Number	Large random number	Ensures serial number unique Not more than 20 bytes
Subject (Issued To)	CN = ipoffice-root-SubjectName.avaya.com O = Avaya Inc OU = GCS L = Basking Ridge S = New Jersey C = US E = support@avaya.com	Where: - SubjectName is the hostname configured during ignition. See Note 1.
Subject Alternative Name(s)	1: DNS Name= ipoffice-root-hostname.avaya.com	A copy of the Subject CN
Issuer (Issued by)	CN = ipoffice-root-hostname.avaya.com O = Avaya Inc OU = GCS L = Basking Ridge S = New Jersey C = US E = support@avaya.com	Same content as Subject: Self-signed certificate
Valid From	DD/MM/YY HH:MM:SS	Will reflect the UTC time/date minus 24 hours when the certificate was created. If the real time clock was corrupt/not set, the time will be fixed to 00:00:00 1st January of the year the software was released.
Valid To	Valid From plus 10 years	
Key Usage	digitalSignature keyCertSign cRLSign off-line cRLSign	Marked non-critical The certificate can be used for the set of IP Office certificate operations
Extended Key Usage		Not present
Basic Constraints	cA: true pathLenConstraint: 1	Marked critical The CA certificate may sign further identity or intermediate CA certificates
Subject Key Identifier	Key Identifier	This value is placed in the Authority Key Identifier of any signed certificates
Signature Algorithm	sha256RSA	

Certificate Field	Contents	Notes
Signature	Signature data	
Public Key Algorithm	RSA	
Public Key	Size 2048 bits	

Note 1: The field SubjectName is set according to the following process:

- If Web Manager | Platform View | Settings | System | Network | Host Name set to something other than:
  - localhost
  - localhost.localdomain
  - the installer default (mac address)
  Use the Hostname field.
- If Hostname not used, use a DNS resolution of LAN1 if not then LAN2.
- If Hostname not used and no successful DNS resolution, use the default name of 'Eth0 mac' e.g. 'ipoffice-root-00e007057307.avaya.com'
- The correct hostname should be set during ignition, if not the root CA certificate will need to be regenerated.

Also as part of ignition, an identity certificate is created signed by the internal CA with the properties listed below.

Certificate Field	Contents	Notes
Version	V3	Always X.509 V3 format
Serial Number	Large random number	Ensures serial number unique Not more than 20 bytes
Subject (Issued To)	CN = SubjectName O = Avaya Inc OU = GCS L = Basking Ridge S = New Jersey C = US E = support@avaya.com	Where: - SubjectName is the hostname configured or detected. See Note 1.
Subject Alternative Name(s)	1: DNS Name= SubjectName 2: IP Address=a.b.c.d 3: IP Address=e.f.g.h	Where: - DN is the hostname configured during ignition - a.b.c.d is the LAN 1 IP address at the time of certificate creation - e.f.g.h is the LAN 2 IP address at the time of certificate creation (if present) See Note 2.
Issuer (Issued by)	CA certificate subject fields	Certificate signed by the internal CA
Valid From	DD/MM/YY HH:MM:SS	Will reflect the UTC time/date minus 24 hours when the certificate was created. If the real time clock was corrupt/not set, the time will be fixed to 00:00:00 1st January of the year the software was released.
Valid To	Valid From plus 7 years	
Key Usage	keyAgreement keyEncipherment digitalSignature, nonRepudiation, dataEncipherment	Marked non-critical The certificate can be used for the set of IP Office certificate operations
Extended Key Usage	id-kp-serverAuth id-kp-clientAuth	Marked non-critical The certificate can be used for the set of IP Office certificate operations
Basic Constraints	subjectType: endEntity pathLenConstraint: 0	Marked critical Indicates Identity certificate
Authority Key Identifier	Key Identifier	Matches the Subject Key Identifier field of the CA certificate
Signature Algorithm	sha256RSA	
Signature	Signature data	
Public Key Algorithm	RSA	

Certificate Field	Contents	Notes
Public Key	Size 2048 bits	

Note 1: The field SubjectName is set according to the following process:

- If Web Manager | Platform View | Settings | System | Network | Host Name is set to something other than:
  - localhost
  - localhost.localdomain
  - the installer default (mac address)
  Use the Hostname field.
- If Hostname not used, use a DNS resolution of LAN1 if not then LAN2.
- If Hostname not used and no successful DNS resolution, use the default name of 'Eth0 mac' e.g. 'ipoffice-server-00e007057307.avaya.com'
- The correct hostname should be set during ignition, if not the identity certificate will need to be regenerated. This is done automatically if the Web Manager | Platform View | Settings | General | Certificates | Renew automatically setting is active (default).

Note 2:

- The correct LAN 1 and LAN 2 address should be set during ignition, if not the identity certificate will need to be regenerated.
- Identity certificate regeneration is done automatically if the Web Manager | Platform View | Settings | General | Certificates | Renew automatically setting is active (default).

5.2.2.4 Server Edition Secondary/Linux Expansion Initial Certificate Settings

The Secondary Server and Linux Expansion do not have an inbuilt certificate authority. The ignition process creates a unique self-signed identity certificate with the properties listed below.

This identity certificate has limited value and should be replaced by one generated by the Primary Server or other external CA.

Certificate Field	Contents	Notes
Version	V3	Always X.509 V3 format
Serial Number	Large random number	Ensures serial number unique Not more than 20 bytes
Subject (Issued To)	CN = SubjectName O = Avaya Inc OU = GCS L = Basking Ridge S = New Jersey C = US E = support@avaya.com	Where: - SubjectName is the hostname configured or detected. See Note 1.
Subject Alternative Name(s)		None
Issuer (Issued by)	CN = SubjectName O = Avaya Inc OU = GCS L = Basking Ridge S = New Jersey C = US E = support@avaya.com	Same content as Subject: Self-signed certificate
Valid From	DD/MM/YY HH:MM:SS	Will reflect the UTC time/date minus 24 hours when the certificate was created. If the real time clock was corrupt/not set, the time will be fixed to 00:00:00 1st January of the year the software was released.
Valid To	Valid From plus 7 years	
Key Usage		None
Extended Key Usage		None
Basic Constraints		None
Signature Algorithm	sha256RSA	
Signature	Signature data	

Certificate Field	Contents	Notes
Public Key Algorithm	RSA	
Public Key	Size 2048 bits	

5.2.3 Certificate Name Content

The certificate fields **Subject Name** (Common Name field) and **Subject Alternative Name** have particular significance to IP Office and its various clients.

Although IP Office does not process the Subject Alternative Name (SAN) field itself, specific content is required for SIP endpoints and other clients, typically as verification of the certificate's source. See IP Office VoIP Endpoint Security 106 for more Avaya client information.

When requesting or creating identity certificates for IP Office systems, all connected systems that process the received IP Office certificate should be reviewed for their Name and SAN requirements. This should also include any possible future systems connected within the lifetime of the certificate. If in doubt, all possible name entries should be included.

Typical considerations include:

- **Example: *example.com***
  The system's Domain Name (DN) for the Subject Name. If there is no relevant domain name, a meaningful and unique text name for the system should be used as this field can be displayed to users. The Name field should never be empty.
- **Example: *DNS:example.com***
  The system's Domain Name (DN) as one SAN entry in DNS format. This should always be present if any other SAN entries are required. This entry is typically used by web browsers and other clients when accessing IP Office using DNS resolution. When used by SIP endpoints, starting in IP Office release 10.0, this entry typically should have the value configured in Manager | LANx | VoIP | SIP Registrar | SIP Registrar FQDN.
- **Example: *DNS:ipoffice.example.com***
  Any other domain name or FQDN of the system as one SAN entry in DNS format. This entry is typically used when the system can be accessed using 'split' DNS.
- **Example: *DNS:sip.example.com***
  Any SIP domains in use as one SAN entry for each SIP domain, in DNS format. This is typically the value configured in Manager | LANx | VoIP | SIP Registrar | SIP Registrar FQDN. This entry is typically used by SIP endpoints, such as the H175, which verifies the server certificate against the SIP Domain it is registering to.
- **Example: *URI:sip:sip.example.com***
  Any SIP domains in use as one SAN entry for each SIP domain, in URI format. This is typically the value configured in Manager | LANx | VoIP | SIP Registrar | SIP Registrar FQDN. This entry is typically used by SIP endpoints when accessing IP Office using DNS resolution.
- **Example: *IP:192.168.42.1***
  The IP Address of LAN 1 as one SAN entry in IP format. This entry is typically used by web browsers and other clients when accessing IP Office using the LAN 1 IP Address. IP Address fields are not supported by many public Certificate Authorities. See the notes below.
- **Example: *IP:192.168.43.1***
  The IP Address of LAN 2 as one SAN entry in IP format. This entry is typically used by web browsers and other clients when accessing IP Office using the LAN 2 IP Address. IP Address fields are not supported by many public Certificate Authorities. See the notes below.
- **Example: *IP:203.0.113.30***
  Any NAT or public IP Address as one SAN entry in IP format. This entry is typically used by 9608, 9611, 9621 and 9641 H.323 phones in Cloud or Remote Worker deployments, web browsers and other clients when accessing IP Office using the external/public direct IP Address. Note that this entry is not added by default to identity certificates generated by the IP Office Primary Server CA. This entry is needed if phones or other clients are configured to connect to the IP Office's public IP address and not it's FQDN. IP Address fields are not supported by many public Certificate Authorities. See the notes below.
- **Example: *URI:sip:203.0.113.30***
  Any SIP IP Address in use as one SAN entry for each SIP domain, in URI format. This entry is used by the Avaya E129 SIP endpoint when accessing IP Office using an IP Address.

Notes:

- Many public Certificate Authorities do not support IP address and private domains. DNS and public domains should be used for all clients if a public CA is to be used. Not using IP address can compromise the administration of 9600 and other endpoints. 1100/1200 series phones do not support FQDNs and hence cannot be used with certificates provided by public Certificate Authorities.
- For details on wild cards, see Using Wildcards 43.

IP500 V2 and Server Edition Primary/Application server support the creation of certificates with up to 8 SAN fields with the following options:

- DNS – used for hostname or FQDN
- URL – used for URLs and URIs
- IP – IP Address in v4 format
- Email – email address

These SAN fields can also be used for Certificate Signing Requests via SCEP.

See Initial Certificate Settings 37 for the default Name SAN fields added on initial certificate creation.

For many straightforward deployments only a single FQDN as the subject name is required, such as one-X Portal and Voicemail Pro on Windows, UCM or Linux Application Server where DNS always resolves itself to the same FQDN.

Other deployments where the identity of the system differs depending upon access (e.g. LAN or WAN) or the use of SIP or H323 endpoints with secure signalling, SANs will typically be required.

5.2.3.1 Using Wildcards

Under certain circumstances, the use of 'wildcard' names might be considered. A wildcard name field contains an asterisk in the name (e.g. '*.example.com') and covers all sub-domains. IP Office can support both Subject name and SAN wildcard fields, but these carry additional security risks and limitations and hence are not recommended. See the notes below.

Wildcard certificates are not supported by Avaya SIP clients such as Equinox, Vantage and J100 Series phones.

Notes:

- Wildcard certificates (or certificates with wildcard name fields) carry the following additional risks:
  - Security: If one server or sub-domain is compromised, all sub-domains may be compromised.
  - Security: If used for more than one server, private key may become exposed.
  - Management: If the wildcard certificate needs to be revoked, all sub-domains will need a new certificate.
  - Compatibility: Wildcard certificates may not work with all server-client configurations.
  - Protection: Wildcard Certificates are not protected by CA extended validation or warranty.
  - Security: They must not be used to secure more than one IP Office server in a deployment; each server must have a unique identity certificate.

5.2.4 Certificate Check Controls

There are three levels of received certificate checks performed by IP Office on supported interfaces; these apply to any certificate received from any remote TLS client or server.

- **Low:** Only the received certificate is checked for validity (in date) and strength (public key >=1024 bits). This has no value in determining trust.
- **Medium:** The received certificate is checked for validity (in date) and strength (public key >=1024 bits), then the TCS is searched for a complete trust chain to a root CA. This is typical of the way browsers check certificates. Note that these tests do not include Certificate Identity Checks using the Name and Subject Alternative Name fields.
- **High:** This will not only perform Low and Medium checks, it will also check the public key >= 2048 bits, and that a copy of the received certificate is in the store. This allows a far smaller trust domain to be implemented where only individual certificates are accepted. This is a form of 'certificate pinning' and overcomes one of the limitations of the standard tree structure of PKI; every certificate issued by the root CA is always trusted.

See "*Administering Avaya IP Office™ Platform with Manager*" for a detailed list of checks performed.

The extended 'High' trust checks are activated with the settings:

- **Manager Security | System | Certificates | Received Certificate Checks (Telephony)** = ***High***
  Applies to all certificates received on the SIP-TLS interfaces
- **Manager Security | System | Certificates | Received Certificate Checks (Management)** = ***High***
  Applies to all certificates received on the Management TLS and HTTPS interfaces.
- **Manager Configuration | Line | Line | Security** = ***High***
  Applies to certificates received on that IP Office WebSocket Line, regardless of the management received certificate checks (WebSocket Lines use the IP Office HTTP/S server).

Mutual Authentication

Where IP Office acts as a TLS/HTTPS server, certain security settings activate a certificate request from the client. If no certificate is received the IP Office will reject the connection. If one is received, certificate checks will be applied. This is the main mechanism used to enforce trust checks by IP Office.

- **Note:** At present, IP Office never requests certificates from SIP or H323 endpoints connecting via TLS.

Mutual authentication is activated with the settings:

- **Manager Security | Services | Configuration | Service Security Level** = ***High***
  Applies to IP Office Manager configuration settings and Configuration Web Service (XO) DevConnect interfaces on port 50805.
- **Manager Security | Services | Security Administration | Service Security Level** = ***High***
  Applies to IP Office Manager security settings on port 50809.
- **Manager Security | Services | HTTP | Service Security Level** = ***High***
  Applies to HTTPS clients connecting to port 443 & 411, typically H323 phones, DECT R4, IP Office lines, Voicemail Pro, SysMonitor, etc.

- **Manager Security | Services | Web Services | Service Security Level** = ***High***
  Applies to Web Manager interface on port 8443.
- **Manager Security | System | Certificates | Received Certificate Checks (Telephony)** = ***Low***, ***Medium*** or ***High***
  Applies to SIP and SM Lines on port 5061.
- **Manager Configuration | Line | Line | Security** = ***High***
  Applies to IP Office WebSocket Server Lines on port 443. This is separate to the **Security | Services | HTTP | Service Security Leve**l control.

See IP Office Interface Certificate Support 103 for more information.

5.2.5 Certificate Distribution

This section covers the processes of certificate distribution.

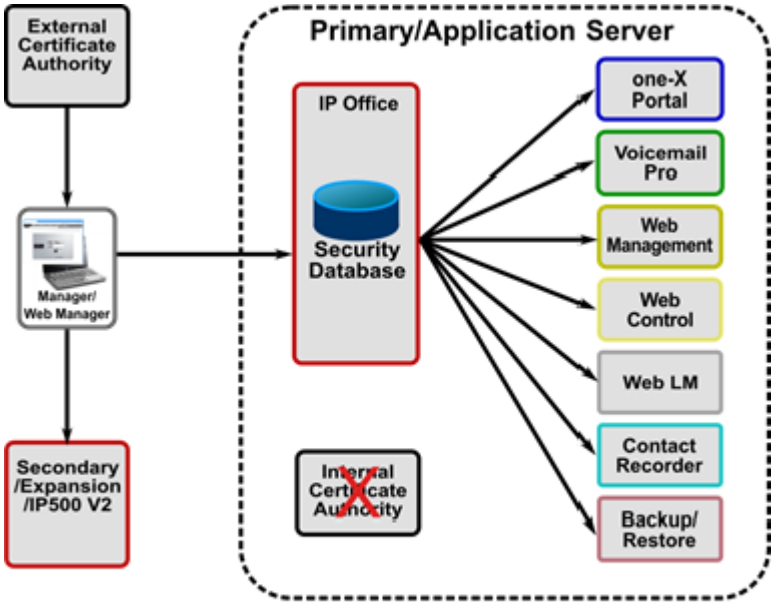
5.2.5.1 Identity Certificate Distribution

IP Office supports three main mechanisms to distribute identity certificates, the selection of which will depend upon the trust policy chosen. One unique identity certificate is required for each IP Office – two if a separate telephony trust domain is required.

Manual from an External CA

A Manual certificate Signing request (CSR) is created and sent to an external CA who verified the contents and creates an identity certificate signed by the CA.

Once the identity certificate/private key is obtained, Manager or Web Manager can be used to administer it on IP Office:



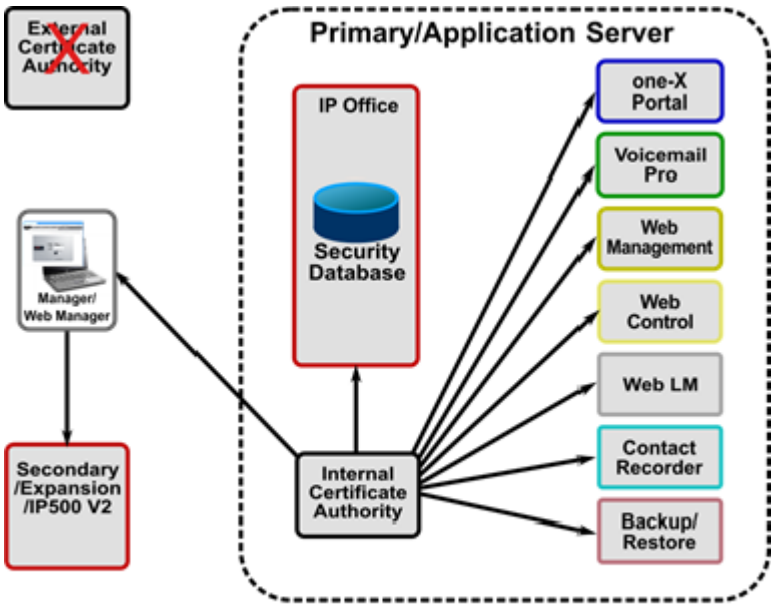
Certificate Distribution - External Certificate Authority

For more information on creation of a PKI based on an External CA, see Implementing IP Office PKI 51.

For more information on external Certificate Authorities, see Certificates from External Certificate Authorities 54.

Manual from the Primary or Linux Application Server

The internal certificate authority can be used to create a set of unique identity certificates in the secure PKCS#12 file format. The PKCS#12 file also includes the CA certificate.
These identity certificates can be utilized for any entity including IP Office, phones, Manager PCs etc. Once the identity certificate/private key file is saved to the local PC, Manager or Web Manager can be used to administer it on IP Office



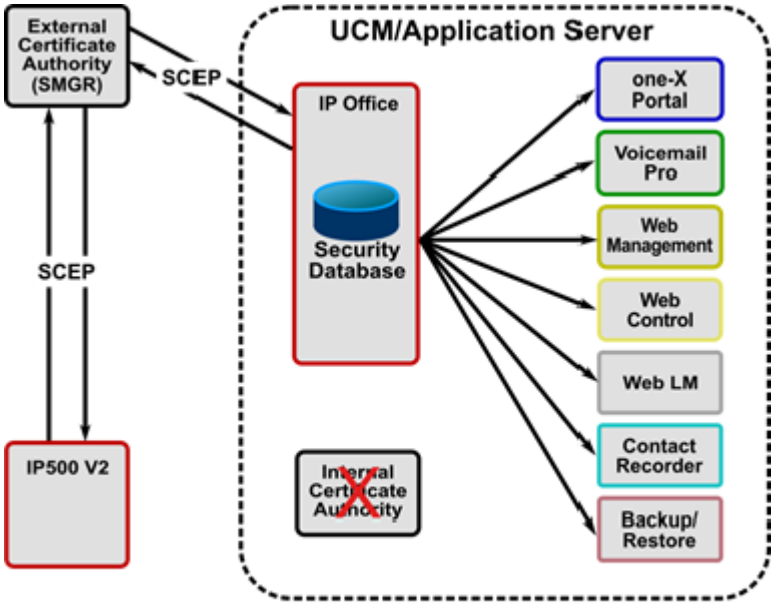
Certificate Distribution - Internal Certificate Authority

For more information on creation of a PKI based on an internal CA, see Implementing IP Office PKI 51.

Automatic using Simple Certificate Enrolment Protocol (SCEP)

Each IP Office is configured with the location of the SCEP server along with a password. The IP Office will periodically perform a CSR until it obtains its identity certificate. The private key is kept internally. The SCEP server must be administered to accept the signing request and issue the correct certificate.

As part of the enrolment process the CA certificate used to sign the SCEP request is placed into the TCS after which the IP Office will trust any other certificate signed by that CA. This is the mechanism used in IP Office branch deployments with System Manager (SMGR).



Certificate Distribution - Simple Certificate Enrollment Prototcol

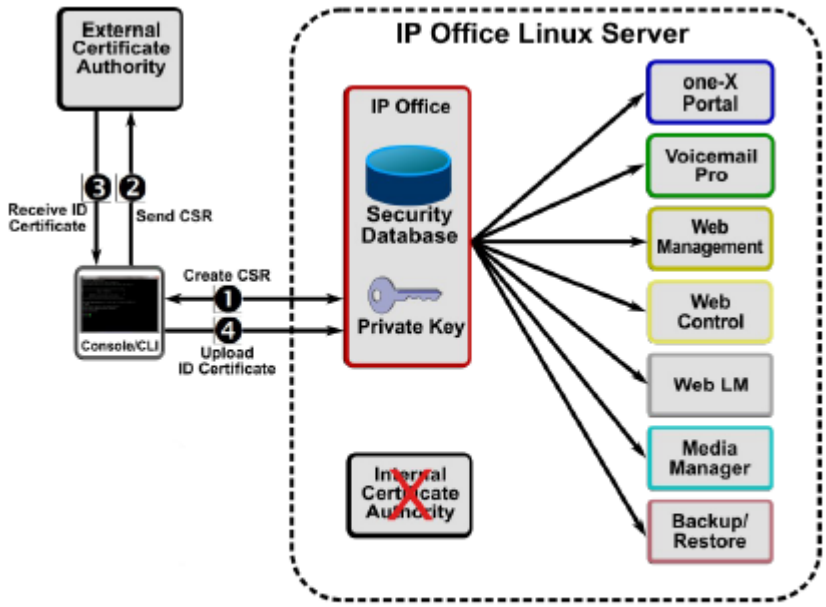
In all cases (External CA, Internal CA, SCEP), when a new identity certificate is received by IP Office, all relevant interfaces/applications are updated.

For more information on creation of a PKI based on SCEP, see Implementing IP Office PKI 51.

Manual Using a PKCS#10 CSR

A PKCS#10 certificate Signing request (CSR) is created on the IP Office Linux server via the command line interface (CLI). The private key is retained within the server. The CSR is sent to an external CA who verifies the contents and creates an identity certificate signed by the CA.

Once the identity certificate is returned the CLI is used to combine with private key and distributed with the server.



Certificate Distribution - External Certificate Authority, PKCS#10

For more information on creation of a PKI based on an External CA, see Implementing IP Office PKI 51.

For more information on external Certificate Authorities, see Certificates from External Certificate Authorities 54.

5.2.5.2 Root CA Certificate Distribution

If the trust policy selected uses a well-known public CA (such as Verisign™), their root certificates are typically already installed in the relevant operating systems and browsers. However, IP Office does not have well-known public CA certificates in its TCS – these can be downloaded from the CA's web site and manually administered via Manager or Web Manager for each IP Office.

For more information on Root CA Certificate distribution, see Implementing IP Office PKI 51.

5.2.5.3 Intermediate CA Certificate Distribution

If the trust implementation additionally uses Intermediate CA certificate(s), the IP Office certificate chaining feature can be activated and the Intermediate CA(s) needs to be added to the TCS. This ID certificate chain is propagated to all local TLS interfaces.
This will remove the need to administer Intermediate CA certificates in the various clients' trusted certificate stores.

For more information on Intermediate CA Certificate distribution, see Implementing IP Office PKI 51.

5.2.6 Determining Trust Policy

With today's secure communication requirements, it is not possible to ignore the use of certificates to implement trust relationships, even if the identified needs are minimal. A trust policy must be selected and implemented before exposing IP Office services. This section provides some information to assist in the determination of such a policy; however it cannot provide definitive guidance or include outside factors.

Note: IP Office branch deployments have a specialized environment and requirements. See the documents:

- **Deploying Avaya IP Office™ Platform as an Enterprise Branch with Avaya Aura® Session Manager**
  Document number 18-603853, https://downloads.avaya.com/css/P8/documents/101004861
- **Administering Centralized Users for an IP Office™ Platform Enterprise Branch**
  Document number 15-604263, https://downloads.avaya.com/css/P8/documents/101004857
- **Avaya IP Office™ Platform in a Branch Environment Reference Configuration**
  Document number 15-604253, https://downloads.avaya.com/css/P8/documents/101004855

When considering a trust policy for IP Office, the following questions can be considered:

- What international, national, corporate or other trust requirements exist?
- Is there an existing trust/PKI infrastructure that IP Office should be part of?
- Are IP Office services being exposed on public interfaces?
- Are IP Office platform components deployed on unsecure platforms or environments?
- Are IP Office clients/endpoints deployed on unsecure platforms or environments?
- What are the trust requirements for 3rd party systems that connect to IP Office?
- Is the ability to trust IP Office without administering certificates on clients/endpoints significant?
- Is there a need for a separate management and telephony trust domain?
- Which interfaces and services need to use trust checks and which do not?
- Does trust need to be one-way (e.g. client checks sever), or both-way (e.g. client and server check each other)?
- Is there a need to provide the extended trust checks of IP Office where all clients' certificates must be present in the TCS? This is useful when the PKI tree trust structure is insufficient.
- How many ID certificates are required? At least one unique certificate per IP Office server, two if a separate telephony trust domain is needed.
- How are certificates to be obtained, distributed and recovered?
- What certificate renewal and distribution methods should be supported?
- Is the CA able to provide the correct certificate content? For example Subject Alternative Name content

This list is by no means exhaustive, for further information see Assessing IP Office Security Requirements 67.

5.2.7 IP Office PKI Trust Approaches

There are five main approaches that can be used with the IP Office Platform:

1. PKI Trust domain based on the Primary or Linux Application Server internal root CA.
2. PKI Trust domain based on the Primary or Linux Application Server internal Intermediate CA.
3. PKI Trust domain based on an external Certificate Authority.
4. PKI Trust domain based on an external Certificate Authority via SCEP.
5. No PKI trust domain.

Approach 1: PKI Trust Domain based on Primary or Linux Application Server root CA

This option allows identity certificates to be generated using the root CA certificate of the server.

Relative advantages include:

- Cost over a commercial CA.
- Control of the CA is internal.
- Certificate content format compatible with other Avaya components.
- The certificate policy is flexible and not subject to commercial considerations.
- The trust relationships do not extend outside of the deployment – i.e. it remains a private domain.

Relative disadvantages include:

- The root CA certificate is untrusted by 3rd parties and other IP Office components and therefore needs to be distributed.
- The certificate creation and distribution process is manual.

Approach 2: PKI Trust domain based on Primary or Linux Application Server Intermediate CA

This option allows identity certificates to be generated on the Primary or Linux Application Server using an intermediate CA certificate obtained from an external Certificate Authority.

Potential advantages for intermediate CA certificate on the Primary/Linux Application Server:

- Generated ID certificates are part of a wider trust
- Control of the CA is internal.
- ID certificate content format compatible with other Avaya components.
- ID certificates with private domains and address ranges IP addresses can be created
- The root CA certificate is (typically) trusted by 3rd parties and therefore does not need to be distributed.

Potential disadvantages include:

- Cost - if using a commercial provider. Signing certificates are typically more expensive.
- The certificate policy is subject to commercial considerations.
- Many public certificate authorities will not issue intermediate CA certificates for private domains or IP address ranges.
- The root CA certificate is untrusted by IP Office components and therefore needs to be distributed.
- The certificate creation and distribution process is manual.
- All clients need to support certificate chains in the TLS exchange; if not the intermediate CA certificate needs to be distributed.

Approach 3: PKI Trust Domain Based on an External Certificate Authority

This option allows identity certificates to be obtained direct from an external Certificate Authority using a manual process.

Potential advantages for identity certificates from an external CA:

- Useful for small deployments when no Primary or Linux Application Server exists – for example a Windows server running one-X Portal or Voicemail Pro.
- Generated ID certificates are part of wider trust domain.
- The root CA certificate is (typically) trusted by 3rd parties and therefore does not need to be distributed.

Potential disadvantages include:

- Public certificate authorities will not issue certificates for private domains or IP address ranges.
- Cost - if using a commercial provider.
- Control of the CA is external.
- The certificate policy is subject to commercial considerations.ID certificate content format may not be compatible with Avaya components.
- The root CA certificate is untrusted by IP Office components and therefore needs to be distributed.
- The certificate creation and distribution process is manual.

Approach 4: PKI Trust Domain Based on an External Certificate Authority via SCEP

This option allows identity certificates to be obtained direct from an external Certificate Authority using an automated process.

Potential advantages for identity certificates obtained using SCEP:

- Generated ID certificates are part of a wider trust domain.
- ID certificate content format compatible with Avaya components.
- The root CA certificate is (typically) trusted by 3rd parties and therefore does not need to be distributed.
- The root CA certificate is always trusted by IP Office components and therefore does not need to be distributed.
- The certificate creation and distribution process is automated, supporting many systems efficiently.

Potential disadvantages include:

- Compatibility with SECP servers is currently limited to EJBCA – the CA present on Avaya Aura System Manager (SMGR).
- Public certificate authorities will not issue certificates for private domains or address ranges.
- Cost - if using a commercial provider.
- Control of the CA is external.
- The certificate policy is subject to commercial considerations.

Approach 5: No Trust Domain

This can only be considered used where a single IP500 V2 or Primary Server has no external/public interfaces and is completely within a secure/closed environment.

Installation/Creation is achieved by retaining the default identity certificate.

No trust relationships are active, no certificates are checked.

PKI Maintenance will consist of renewing the identity certificate by deleting the existing using IP Office Manager or Web Manager; this will create a new certificate for the next 7 years. Any existing browser exceptions will need to be re-asserted.

5.2.8 Selecting IP Office PKI

Existing customer security policy may already define the necessary approach. Where this has not yet been defined, an assessment of requirements should help identify the appropriate option. The following guidance may be helpful:

- A deployment with external interfaces and many external clients would suggest an external, public Certificate Authority (Approach 3).
- A deployment with no external interfaces, or few external clients would suggest an internal Certificate Authority (Approach 1).
- A deployment that requires IP Addresses or private domain names in the certificate fields cannot use a public Certificate Authority, therefore Approach 1 may be suitable.
- A deployment that offers any service to the public should use an external, public Certificate Authority (Approach 3).
- A branch deployment with System Manager will typically use SCEP (Approach 4)

Although five approaches are outlined above, a mix may be appropriate; for example external, public CA for public facing servers, internal CA for all others. A hybrid approach cannot be used when VoIP endpoint resilience is active; the root CA for both home and backup server must be the same.

5.2.9 Implementing IP Office PKI

Once the trust policy has been determined, the implementation process will depend on the option selected:

Approach 1: PKI Trust Domain based on Primary or Linux Application Server root CA

1. The Primary Server CA should be used for Server Edition deployments. The Linux Application Server for non-Server Edition deployments. The same CA must be used for all systems in a deployment.
2. Enable the setting **Platform View | Settings | General | Certificates | Identity Certificates | Renew automatically** on the Primary/Linux Application Server.
3. For every device (server, IP 500V2 etc.) use the CA to create a unique ID certificate for each with the correct name content and save to a local directory. The name fields of the certificate are important for correct interoperation with clients; see Certificate Name Content 41 for more information. See Using the IP Office Certificate Authority 109.
4. Save the root CA certificate in both PEM and DER formats to a local directory using the Web Manager setting **Platform View | Settings | General | Certificates | CA Certificate | Download (PEM-Encoded)** and **Download (DER-Encoded)**.
5. Use Web Manager or IP Office Manager to save the CA certificate in each TCS.
6. Use Web Manager or IP Office Manager to save the ID certificate on the relevant IP Office server. See Update Certificates 70.
7. If SIP or H.323 phones are using HTTPS for provisioning or TLS for signalling, the IP Office root CA certificate must be present on each phone. See VoIP Security 60.
8. Distribute the root CA certificate to all clients and browsers. The mechanisms vary and some require PEM format, some require DER. See the relevant client and browser documentation.
9. Verify that the correct ID certificate has been applied on each device using a browser or other diagnostic tool.
10. Enable certificate checking in the IP Office security settings and IP Office lines.
11. Verify using SE Manager that all IP Office systems are online with no alarms.
12. Enable secure connections for clients.
13. Verify each client can connect successfully.
14. Ensure all ID certificate files are stored securely.
15. Once all checks have been carried out, a configuration backup should be taken.

Approach 2: PKI Trust Domain based on Primary or Linux Application Server Intermediate CA

1. The Primary Server CA should be used for Server Edition deployments. The Linux Application Server for non-Server Edition deployments. The same CA must be used for all systems in a deployment.
2. Select an appropriate Certificate Authority that can fulfil the trust and certificate requirement of the deployment. For more information on external public authorities, see Certificates from External Certificate Authorities 54.

3. Request an Intermediate CA certificate/private key pair from a trusted Certificate Authority in PCKS#12 format. An intermediate CA certificate differs in content to a root CA or a device identity certificate. For more information on external public authorities, see Certificates from External Certificate Authorities 54.
4. Download the root CA certificate (and any further intermediate CA certificates) from the Certificate Authority in PEM and DER format to a local directory.
5. Install Intermediate CA certificate the on the Primary or Linux Application Server. This can either be done during ignition, or post ignition via the Web Manager setting **Platform View | Settings | General | Certificates | CA Certificate | Import**.
6. For every device (server, IP 500V2 etc.) use the CA to create a unique ID certificate for each with the correct name content and save to a local directory. The name fields of the certificate are important for correct interoperation with clients; see Certificate Name Content 41 for more information. See Using the IP Office Certificate Authority 109.
7. Save the intermediate CA certificate in both PEM and DER formats to a local directory using the Web Manager setting **Platform View | Settings | General | Certificates | CA Certificate | Download (PEM-Encoded)** and **Download (DER-Encoded)**.
8. Use Web Manager or IP Office Manager to:
   - Save both the root and intermediate CA certificate in the TCS, then
   - Activate the certificate chaining feature Offer ID Certificate Chain.
9. Use Web Manager or IP Office Manager to save the ID certificate on the relevant IP Office server. See Update Certificates 70.
10. Distribution of the root CA certificate to phones, clients and browsers is as per PKI Trust Domain based on Primary or Linux Application Server root CA section above.
11. Verification and enabling steps are as per PKI Trust Domain based on Primary or Linux Application Server root CA section above, with the note that many external CAs provide online verification tools.
12. Once all checks have been carried out, a configuration backup should be taken.

Approach 3: PKI Trust Domain based on an External Certificate Authority

1. The CA on the Primary or Linux Application Server is not used.
2. Enable the setting **Platform | Settings | General | Certificates | Identity Certificates | Renew automatically**.
3. Select an appropriate Certificate Authority that can fulfil the trust and certificate requirement of the deployment. For more information on external public authorities, see Certificates from External Certificate Authorities 54.
4. For every device (server, IP 500V2 etc.) request the CA to create a unique ID certificate for each with the correct name content and save to a local directory. The name fields of the certificate are important for correct interoperation with clients; see Certificate Name Content 41 for more information. For more information on external public authorities, see Certificates from External Certificate Authorities 54.
5. For IP500 V2 devices, an external form based CSR must be used. For IP Office Linux devices a PKCS#10 CSR can be created using the CLI. For more information on the CSR process, see Certificate Signing Requests 112.
6. Download the root and any intermediate CA certificate from the Certificate Authority in PEM and DER format to a local directory.
7. Use Web Manager or IP Office Manager to:
   - Save both the root and intermediate CA certificate in the TCS, then
   - Activate the certificate chaining feature Offer ID Certificate Chain.
8. Use Web Manager or IP Office Manager to save the ID certificate on the relevant IP Office server. See Update Certificates 70.
9. Distribution of the root CA certificate to phones, clients and browsers is as per PKI Trust Domain based on Primary or Linux Application Server root CA section above.
10. Verification and enabling steps are as per PKI Trust Domain based on Primary or Linux Application Server root CA section above, with the note that many external CAs provide online verification tools.
11. Once all checks have been carried out, a configuration backup should be taken.

Approach 4: PKI Trust Domain based on an External Certificate Authority via SCEP

1. The CA on the Primary or Linux Application Server is not used; disable the setting **Platform View | Settings | General | Certificates | Identity Certificates | Renew automatically**.

2. Select an appropriate Certificate Authority that can fulfil the trust and certificate requirement of the deployment, including a SCEP service based on EJBCA.
3. The steps required to enable SCEP operation are covered in the IP Office Branch documentation.

5.2.10 Certificates from External Certificate Authorities

An external Certificate Authority (CA) provides a way of obtaining identity certificates that are trusted by 3rd parties. These CA providers typically perform the following functions:

- Validates the certificate requestor's identity and ownership of the domain
- Issues certificates
- Maintains certificate status information
- Updates Certificate Revocation Lists

Most commercial CAs are part of one or more industry organisations such as:

- The Certificate Authority Security Council. https://casecurity.org/
- The CA/Browser Forum. https://cabforum.org/

Both have online resources that can assist in selecting and using a CA. In addition there are other web resources from the CA providers themselves.

5.2.10.1 Selecting a Certificate Authority

Note: An external Certificate Authority cannot issue certificates with name content that cannot be externally verified. This includes any local domain names and private IP addresses. If local domain names or private IP addresses are required, the CA of the Primary or Linux Application Server should be used.

Select a Certificate Authority that can fulfil the trust and certificate requirement of the deployment. Selection criteria are outside of this document but should include for IP Office deployments:

- Is the Certificate Authority trusted?
- Can the Certificate Authority provide RSA 2048 bit + SHA-256 identity certificates for web servers? Code signing and other certificate type are not used by IP Office.
- Does the Certificate Authority support a secure web form based Certificate Signing Request (CSR)? If not, external tools are required to provide the CA with a text-based CSR. See Certificate Signing Requests 112 for more information about creating such text-based CSRs.
- Can the Certificate Authority provide identity certificates in PKCS#12 format? If not, external tools are required to convert the identity certificate to the correct format for import into IP Office.
  - See Certificate File Naming and Format 35 for more information on certificate file formats.
  - See Creating a CSR using IP Office Linux Command Line 118.
- If required, can the Certificate Authority provide multi-domain (AKA 'Multi-SAN' or 'Unified Communications') certificates?
- If required, can the Certificate Authority provide a signing CA certificate? The option would be required for Approach 2: PKI Trust domain based on Primary or Linux Application Server Intermediate CA above.
- Will the root CA already be in the client browsers and operating systems? Are all client browsers and operating systems covered?
- Are intermediate signing certificates used? This can increase deployment complexity if intermediates are used.
- Are the signing certificates provided in both PEM and DER format? See Certificate File Naming and Format 35 for more information on certificate file formats.
- What notification/assurance level is required? Providers typically offer a number of levels under various names:
  - Basic, AKA 'Domain Validation' – only the domain name is validated, not the company itself. Browsers should not raise an error/warning, but no company information is shown. This level is not recommended for IP Office interfaces where verification of company identity is important.
  - Intermediate, AKA 'Organization Validation' – the domain and company are validated. Browsers should not raise an error/warning, company information is shown.
  - Enhanced, AKA 'Extended Validation' – the domain and company are validated in detail. Browsers should display a green verified background and company information is displayed. Due to their security concerns, Wildcard certificates are not allowed for 'Extended Validation'.
- How long are the identity and signing certificates valid for? Shorter periods increase the maintenance overhead.

- Can a free trial certificate be obtained to verify correct operation? IP Office has been tested successfully with a number of providers' certificates but due to quantity of providers, assurance cannot be given that all providers' certificates can be supported successfully.
- Are test and other support utilities provided?

5.2.10.2 Obtaining Identity Certificates

Once a provider has been selected, the certificate requirements need to be identified:

- The name fields of the certificate are vital for correct interoperation with clients; see Certificate Name Content 41 for more information.
- The certificate should be RSA2048 bit, with SHA-256 signature algorithm
- The quantity and duration
- The assurance level
- Whether single domain or multi-domain
- The certificate should be for a web server and not a signing certificate

Once requirements identified, a Certificate Signing Request (CSR) is made to the CA. This can use a number of methods:

- Form based, using the CA's web site or downloaded utilities: The private key and the certificate are created by the CA and sent/downloaded by the customer.
- Text based, using the OpenSSL package: The private key is created by OpenSSL and kept on the PC. The certificate is created by the CA and OpenSSL used to join the two parts together in a PKCS#12 file.
- Text based, using Microsoft windows tools: The private key is created by Microsoft OS tools and kept on the PC. The certificate is created by the CA and Microsoft OS tools used to join the two parts together in a PKCS#12 file.
- Automated via SECP: The private key is created by IP Office, kept on the system. The certificate is created by the CA and IP Office joins the two parts together.
- Web form based, using a 3rd party site. This is not recommended.

Currently IP Office Linux and IP500 V2 servers do not support the generation of a CSR where the private key is retained within the IP Office server. This means if the CA does not support form-based CSR, the OpenSSL or Microsoft windows tools methods of Certificate Signing Requests 112 must be used.

Once a CSR is submitted to the CA, they will review the application and if successful issue the identity certificate along with the signing certificate(s). The required format of IP Office identity certificates is PKCS#12. The required formats for the signing certificates are PEM and DER. See Certificate File Naming and Format 35.

If the file formats are not as required by IP Office utilities can be used to convert; these can be provided by the CA or 3rd party tools can be used. Examples of conversion using 3rd party tools are contained in Certificate Signing Requests 112.

5.2.11 Certificate Maintenance

Regardless of the certificate/trust structure used, all certificates expire and may under exceptional circumstances be compromised. It addition due to identity certificate naming requirements, update may be necessary due to hostname or IP address change. The certificate policy should include provision for replacement/update of CA and individual certificates, both trusted and identity.

If left at default, IP Office's identity certificates will expire seven years after installation and the root CA certificate in ten. For certificates obtained from an external authority it can be a little as 12 months.

For identity certificates derived from a CA, replacement is relatively straight forward as the CA (and hence the basic trust relationship) is unchanged: Obtain the relevant replacement before expiry with the same content and replace. If the root or intermediate CA requires changing, the process can be more extensive depending on whether the associated public/private key pair also changes. The IP Office internal CA on the Primary will optionally retain the public/private key pair if the CA certificate is recreated via Web Management (the **Renew existing** option).

If the root CA public/private key pair is changed, all identity certificates need to be renewed and should be done well before CA expiry. The new CA should be installed in the relevant trust stores alongside the old; this allows a transition period during which all identity certificates can be replaced.

Administrative logins to Manager and Web Manager will display an identity certificate expiry warning, along with the number of days remaining. IP Office release 10.0 and onwards will raise an alarm – a daily system event in SSA, SNMP, syslog, email – whenever any certificate is within 6o days of expiry.

Renewing an IP500 V2/Secondary/Expansion Server ID Certificate

If the default self-signed certificate or SCEP is being used, deleting the current or restarting the system will force another to be generated/obtained. When creating the new certificate the Common Name and Subject Alternative Name files can be specified in the Manager security settings – if not the default values will be used. For Server Edition all processes will restart, for IP500 V2 the transition will be smooth.

If the ID certificate has been obtained from an external CA, a replacement can be administered using IP Office Manager or Web Manager.

Renewing a Primary/Linux Application Server Edition ID Certificate

If the ID certificate has been created by the internal CA, the setting Web Management Platform | **Settings | General | Certificates | Renew automatically** determines whether the creation and application is automatic due to expiry or change hostname or IP Address. If not automatic, **Generate and Apply** can be used.

If the ID certificate has been obtained from an external CA, a replacement can be administered using IP Office Manager or Web Manager.

Renewing a Primary/Linux Application Server CA Certificate

A new one can be created using Web Management Platform View | Settings | General | CA Certificate | Create new. This command must be used with caution as it will create a completely new root CA certificate – it will also require new ID certificates for all entities, and CA certificate distribution to all devices. To keep all existing ID certificates Renew existing should be selected; this will create a new certificate with the same content and public/private keys, but a different serial number and start/end date. Only this new root CA requires distribution, in-date existing ID certificates signed by the previous CA will still be valid. Care must be taken not to abuse the convenience of this feature as the longer the public/private keys are unchanged, the greater the risk of compromise.

See Using the IP Office Certificate Authority 109.

Recovering an ID, CA or TCS Certificate

All certificates are part of the security settings backup/restore process. To recover an ID certificate, the latest backup set should be restored. For Server Edition, all processes will restart.

Troubleshooting

The certificates exchanged by any IP Office interface can be displayed using 3rd party tools like Wireshark. The IP Office identity certificate can also be displayed in Manager, Web Manager and browsers.

Failure of received certificate checks by IP Office result in an alarm event which contains the cause. These alarms also include certificate check failures as reported by the far end via TLS Alert messages. IP Office Manager and browsers also report certificate checks failures.

If an HTTP/TLS interface appears to have certificate issues it may be possible to temporarily disable certificate checking or enable an unsecure version of that interface.

The IP Office Manager security settings interface to IP Office should always be accessible; IP Office will always ensure it has an identity certificate (creating a self-signed one if the previous is deleted or corrupted), and Manager can be configured to accept any certificate. See Securing IP Office Manager 78.

It has been found on rare occasions that low-end routers when performing Network Address Translation (NAT) will modify IP addresses within the certificate name fields, rendering them corrupt. Changing the firewall/router is the best solution, but a temporary workaround may be to remove any IP address entries subject to NAT.

Chapter 6.
VoIP Security

6. VoIP Security

VoIP security provides means by which two endpoints can engage in more secure communications. There are a number of approaches that can be used:

- **Use Encapsulated Routes**
  Ensure that VoIP calls between different sites use connections that are routed via paths that provide additional security encapsulation. VPN and other IP transport security is briefly discussed in Limiting IP Network Exposure 83, however the relative merits for each media security approach is outside the scope of this document.
  - Use a Virtual Private Network (VPN) implemented using IPsec or another VPN technology such as SSL VPN.
  - Use other IP transports with security support such as Multi-Protocol Label Switching (MPLS).
- **Apply additional security to the call signalling and media:**
  The two aspects of any VoIP call, the call signalling and the call media (audio and or video) can each separately be made more secure using the following methods:
  - **Secure Real-time Transport Protocol (SRTP)**
    SRTP can be applied to the call media. SRTP is discussed in this chapter.
  - **Datagram Transport Layer Security (DTLS)**
    The options and requirements of TLS/DTLS are covered in the Certificates and Trust 32.

This section of the document looks primarily at the options and effects of SRTP implementation.

SRTP supports RTP media protection on a point to point basis providing confidentiality, message authentication and replay protection. SRTP also supports authentication and replay protection for the RTP Control Protocol (RTCP). Note that RTCP is not used as the signaling channel for VoIP calls, but contains Quality of Service (QoS) information.

The confidentiality (implemented by symmetric key encryption) and authentication (implemented by Hashed Message Authentication Code, HMAC) are optional and independent of each other.

SRTP encryption relies upon dynamically generated secure keys to be sent to the far endpoint. This cannot be achieved via the SRTP protocol so an alternative secure mechanism is required, typically via the associated signaling channel, for example SIP-TLS for SIP and 'Annex H' for H.323.

As SRTP is point to point, all individual links involved in the VoIP call – including key exchange/signaling – must be secure for the call to be secure end to end.

6.1 IP Office Platform Media Security

IP Office support both SRTP and IPsec for VoIP media security. IP Office's IPsec feature can be utilised, but it is not recommended as it limited to the IP500 V2 platform and uses a legacy key exchange mechanism (IKEv1).

VoIP media security using SRTP is supported on IP Office in Standard Edition, Server Edition, Select and hosted, without the need for extra licensing, for the connections:

- IP Office Line
- SIP Line
- SM Line
- Avaya H.323 extensions: 9608, 9611, 9621, 9641
- Avaya SIP extensions: 9608, 9611, 9621 and 9641 (in centralized branch deployments), 11xx, 12xx, B179, E129, H175, J100 Series, K100 Series (Vantage), Scopia XT series
- Avaya Communicator for iPad and Windows
- one-X Mobile Preferred for iOS and Android
- 3rd Party SIP extensions that support SRTP

The following configurable SRTP options are supported by IP Office:

SRTP feature	Options	Support	Default	Notes
SRTP Operation	Disabled	✓	✓	All SRTP settings are per system with a per line and per extension override
	On: Best Effort	✓		
	On: Enforce	✓		
RTP Encryption	Off	✓		
	On: AES128-CTR	✓	✓	
	On: AES128-F8	✗		
RTP Authentication	Off	✓		RTP Authentication should not be disabled
	On: SHA-1/32	✓		
	On: SHA-1/80	✓	✓	SHA-1/80 provides stronger authentication for a small bandwidth increase
RTCP Encryption	Off	✓	✓	
	On: AES128-CTR	✓		Some Avaya and 3rd party endpoints do not support encrypted RTCP
	On: AES128-F8	✗		
RTCP Authentication	On: SHA-1/32	✓		RTCP Authentication always active
	On: SHA-1/80	✓	✓	SHA-1/80 provides stronger authentication for a small bandwidth increase

IP Office supports a per-system SRTP set of controls, with a per-line and extension override, including encryption and authentication settings. By default SRTP operation is disabled, however upgrades of IP Office branch systems from previous releases using the SM line and SRTP will maintain their settings.

The SRTP operation control is the setting Media Security and has the following values:

- **Disabled** – SRTP is not available
- **Enforce** – RTP is not available on that call leg.
  - **Note:** This doesn't enforce end to end SRTP, only SRTP on the call leg configured as Enforce.
- **Best Effort** – always offer both SRTP and RTP and given a choice, choose SRTP.

Where SIP soft clients connect to IP Office in simultaneous-registration mode (i.e. another device is registered for the same user), they do not have a per-extension override of media security settings. IP Office will handle calls of these devices according to its system-level Media Security settings

Each leg of a call is regarded independently by IP Office for SRTP control; the appropriate SRTP Line or Extension setting will determine the support by each leg. Conferencing or recording of calls with SRTP legs by IP Office will retain SRTP wherever possible.

In order to provide complete call security, the SRTP key exchange also requires to be secured, see VoIP Signalling Security 62.

6.2 VoIP Signalling Security

Securing the signalling of VoIP links is necessary when SRTP is enabled and is a security measure in itself: It should be enabled when the SIP registrar or H323 Gatekeeper is exposed on a public interface, with the other unsecure options disabled.

The security mechanism is dependent upon the type of link:

Link Type	Key Security Mechanism	Notes
IP Office Line	WebSocket HTTPS	Only the IP Office Line with WebSocket transport and Security setting of Medium or High should be used.
SIP Line	SIP-TLS	Additional line configuration is required to enable SIP-TLS. Also supports the SIPS URI scheme
SM Line	SIP-TLS	Additional line configuration is required to enable SIP-TLS Also supports the SIPS URI scheme
Avaya H.323 extensions	H.323-TLS	Supported from R10.0. Additional configuration is required to enable H.323-TLS.
	H.323-Annex H	No additional configuration required This does not secure the complete H.323 signalling channel, just the registration, key exchange and dialled digits.
Avaya SIP extensions	SIP-TLS	Additional SIP registrar configuration is required to enable SIP-TLS

For SIP extensions, the relevant LAN's SIP registrar layer 4 protocol setting should be configured to enable the TLS protocol. SIP-TLS requires the administration of certificates; see Certificates and Trust 32.

For SIP or SM lines, the Line's transport setting should be configured to use the TLS protocol and certificate checks enabled. A further consideration is the use of the SIPS URI scheme as defined by RFC 3261 and RFC 5630. Enabling the SIPS URI Type setting will cause all sessions originated from the trunk to use SIPS, indicating the requirement for secure SIP links for the call. The system setting System | VoIP Security | Strict SIPS when active, causes IP Office to reject any call to a SIP or SM Line that is not configured for SIP-TLS and the SIPS URI Scheme. When not set, IP Office permits the 'downgrading' of a SIP-TLS call to an unsecure SIP call.

Care should be taken when using SIPS URI scheme and Strict SIPS, as support by both Avaya clients and ITSPs is varied which could result in failed calls. This is of high importance for emergency call planning.

Current SIPS support of Avaya clients is covered in IP Office VoIP Endpoint Security 106.

See Secure Provisioning of 9609, 9611, 9621 and 9641 H.323 121 phones for information on 9608, 9611, 9621 and 9641 H323 secure phone provisioning.

For further details, see the relevant client documentation.

6.3 Endpoint Provisioning Security

When either media or signalling security is used, settings are required on the endpoints themselves. Some remote endpoint provisioning is supported directly by IP Office and can be more securely conveyed via HTTPS rather than the default HTTP.

Endpoint support of secure remote provisioning is covered in IP Office VoIP Endpoint Security 106.

Where remote endpoint provisioning is not supported by an endpoint, settings local to the device are used.

For further details, see the relevant client documentation.

6.4 SRTP Performance & Capacity

SRTP is more processing intensive than RTP to the extent that the concurrent call capacity of an IP500 V2 is reduced by 66% and Linux servers by 50%. See the Capacity Planning section in "*Deploying IP Office Server Edition Solution*". These reductions only occur when the media stream terminates or originates on IP Office. For this reason it is important to use direct media wherever possible.

SRTP direct media will occur when both external endpoints SRTP capabilities match, if they do not, IP Office will terminate both streams and convert. This will reduce the concurrent SRTP call capacity by two. This in turn places great importance on the various SRTP configuration settings within both IP Office and the various endpoints.

The following IP Office recommendations should be followed as a starting point, and only varied if necessary:

- RTP encryption and authentication should be kept on; some endpoints will not negotiate at all if either is off.
- RTP encryption/authentications setting should be AES-128/CTR plus SHA-1/80.
- RTCP encryption should be kept off; some systems (including Avaya Communication Manager) do not support RTCP encryption.
- All SIP extensions where possible should be configured for best effort (capability negotiation or 'cap-neg'); this allows the IP Office settings to dictate SRTP behaviour.
    - **Note:** When Auto generated configuration files that IP Office provides to 11xx/12xx and B179 device types always indicates to the phones to do best effort, when the IP Office SRTP configuration is Best Effort or Enforce.
- Ensure consistency between the system and per-extension SRTP settings for SIP soft clients that connect to IP Office in simultaneous-registration mode (Avaya Communicator and one-X Mobile).
- All direct media settings on.
- Default codec selections which should ensure the mandatory G711 codec is always available.

Another performance consideration is the extra bandwidth incurred when SRTP is active; authentication adds 4 or 10 bytes to each packet for both RTP and RTCP. Given a 20ms sample period, active SRTP uses the following approximate IP bandwidth for a single call:

Codec	No SRTP	+RTCP auth	+RTP/RTCP auth	Notes
G.711	84 kbps	SHA1/80: 85 kbps SHA1/32: 84.5 kbps	SHA1/80: 86 kbps SHA1/32: 85 kbps	2.4% increase 1.2% increase
G.729	25 kbps	SHA1/80: 26 kbps SHA1/32: 25.5 kbps	SHA1/80: 27 kbps SHA1/32: 26 kbps	8% increase 4% increase
G.722	84 kbps	SHA1/80: 85 kbps SHA1/32: 84.5 kbps	SHA1/80: 86 kbps SHA1/32: 85 kbps	2.4% increase 1.2% increase

6.5 Secure Call Indications

There are no direct indications on phone displays that signal the call is secure. If assurance is required, Media Security should be set to Enforce and Strict SIPS activated.

The call leg SRTP status can be displayed by System Status Application and SysMonitor, see SRTP Troubleshooting 102.

6.6 VoIP Security Planning Considerations

Secure media and signalling must be considered whenever VoIP endpoints or IP Office VoIP interfaces transit or are potentially accessible by untrusted networks, including the Internet.

Prior to deploying secure media or signalling using IP Office, the following should be reviewed:

- The IP Office SRTP feature supports media security natively without license or IP infrastructure requirements, but can add extra interoperation complexity with various endpoints.
- Signalling security must be considered whenever SRTP is contemplated. Signalling security can be considered on its own as a security improvement mechanism.
- Secure phone provisioning must be considered whenever media or signalling security is contemplated.
- When VoIP endpoint resilience is active with secure signalling or provisioning, the root CA certificate for both home and backup server must be the same.
- SRTP will reduce the concurrent call capacity of IP Office systems, therefore direct media should be used whenever possible. It may also reduce the capacity and performance of other connected systems.
- The exact SRTP support of each endpoint type should be assessed to determine how best to achieve security, direct media and other performance criteria.
- IP Office default SRTP settings should be retained wherever possible and only varied under exceptional circumstance.
- IP Office branch deployments have a specialized environment and requirements. See:
  - Deploying Avaya IP Office™ Platform as an Enterprise Branch with Avaya Aura® Session Manager, Document number 18-603853, https://downloads.avaya.com/css/P8/documents/101004861
  - Administering Centralized Users for an IP Office™ Platform Enterprise Branch, Document number 15-604263, https://downloads.avaya.com/css/P8/documents/101004857
  - Avaya IP Office™ Platform in a Branch Environment Reference Configuration, Document number 15-604253, https://downloads.avaya.com/css/P8/documents/101004855

Chapter 7.

Securing the IP Office Platform Solution

7. Securing the IP Office Platform Solution

IP Office can be made a very secure product, however only a certain number of features are active by default or on upgrade from previous releases. This is in order to ease the initial installation but will not help protect the system without following the suggestions listed in this document, other Avaya security publications and the relevant IP Office installation/Administration manuals. It is therefore necessary to check and implement the configuration options listed here.

Additional setting may be necessary to further secure the individual deployment. Avaya is presenting this information for guidance only; the customer is responsible for ensuring their system is secure.

7.1 General Guidelines

The recommended process for improving the security of IP Office is to; Assess the requirements, Implement changes as needed, then to Monitor the system and Respond in a timely manner to any detected threat.

All guidelines and steps should be followed regardless of the actual IP Office deployment.

Assess:

- Review existing installations
- Plan new deployments
- Identify security risks and requirements

Implement:

- Change security defaults
- Remove unnecessary accounts
- Disable unused services/interfaces
- Enforce password policy
- Update Identity Certificates and PKI
- Secure users and extensions
- Secure trunks/lines
- Secure voice media
- Prevent unwanted Calls
- Secure voicemail and one-X Portal
- Limit IP network exposure
- Secure management applications & configuration data
- Secure servers
- Activate reporting/monitoring
- Checks and tests

Monitor:

- Monitor alarms and logs
- Detect other unusual activity
- Review Avaya Security advisories
- Review Avaya IP Office Software updates and technical bulletins
- Monitor telephony provider communication
- Periodic security reassessment

Respond:

- Investigate and react to any incident
- Report to appropriate organizations
- Ensure the latest software updates/service packs are installed

7.2 Assessing IP Office Security Requirements

It is vital that a security risk assessment is carried out on all IP Office installations, both initial (prior to deployment or for existing deployments if one has not yet been carried out), and periodically after initial assessment to review any change.

A primary differentiator of security risk for IP Office is whether the system is potentially accessible from external or unsecured networks or individuals, especially the Internet.

This document does not cover security assessments in any detail; however there are many resources available that cover this process, including for example:

- **US National Institute of Standards and Technology (NIST) Special Publication (SP) 800-30, Risk Management Guide for Information Technology System**
  http://dx.doi.org/10.6028/NIST.SP.800-30r1
- **UK British Standards Institute (BSI) ISO/IEC 27001, Self-assessment questionnaire**
  http://www.bsigroup.co.uk/en-GB/iso-27001-information-security/ISO-27001-for-SMEs/
- The SANS Institute also provides a wide range of security-related information, including risk assessments and audits:
  http://www.sans.org/reading-room

7.3 Security Administration

The security settings are stored on the system and are separate from the system's configuration settings. To change a system's security settings, Manager must first be switched to security mode by selecting **File | Advanced | Security Settings** from the menu bar.

Security settings can only be loaded directly from a system. These settings cannot be saved as a file on the local PC, nor do they appear as a temporary file at any time. By default Manager and the system will always attempt to use a secured link for configuration and security settings exchanges.

7.4 Change Security Defaults

All default passwords must be changed to a unique and 'strong' password. See Password and PIN Management 26 for more information on password strength.

In IP Office Manager **Security Settings | General** tab:

1. For Security Administrator account:
   a. Change **Password** to a 'strong' password of 8 or more characters.
   b. Set **Minimum Password Complexity** to ***high***.
2. Change service user account '**Administrator**' password to a 'strong' password of 8 or more characters.
3. If required, add a customer administration account (again with strong password) with the minimum rights of access. The account status **Force New Password** should be set. This will enforce a password change at the next login (i.e. during customer/ engineering Installation).
4. Change the System, VM Pro and Monitor passwords to 'strong' passwords of 8 or more characters.

7.5 Remove Unnecessary Accounts

All unnecessary administration and IP Office user accounts should be removed or disabled to reduce the likelihood of forgotten default accounts being used for unauthorized access. Any remaining accounts must have their passwords changed. See User Accounts and Rights of Access 18 for more information on the differing account types and locations.

1. In IP Office Manager | **Security Settings | Service User** tab, remove all unnecessary service user accounts; only retain accounts that are essential. The service user may be deleted or the account status set to Disabled.
2. For all remaining active Service User accounts, change password to a strong one of 8 or more characters. If using Server Edition, see Securing Server Edition Servers 85 for alternative Service User administration using Web Manager
3. In **Configuration | Users**: Delete any RAS telephony user accounts (for example 'RemoteManager') that are not required. For any that are required, change the password to a strong one of 8 or more characters.

7.6 Disable Unused Services/Interfaces

All interfaces and services not required must be disabled. Additionally, consider enabling interfaces and services only when required.

1. In IP Office Manager **Security Settings | System | Unsecured Interfaces** tab: Uncheck all Application controls and enable only the minimum according to the following table:

Application Control	Affected Application	Notes
TFTP Server	IP Office Manager Upgrade Phone Manager DECT R4* Legacy Voicemail Pro UDP whois** Network Viewer	Disables all TFTP access, including TFTP Directory Read, TFTP Voicemail and Program Code. * When inactive, DECT will continue operating but without the system directory feature. ** TCP whois discovery should be used in Manager.
TFTP Directory Read	Phone Manager DECT R4* TAPI Install**	Also used for legacy applications: IP DECT*, Analog DECT, Conferencing Centre, CRM, MMM * When inactive, DECT will continue operating but without the system directory feature ** TAPI installation will generate a warning, but it can be ignored Also controlled by the general TFTP Server setting above.
TFTP Voicemail	Legacy Voicemail Pro	Enable only when Voicemail Pro R9.0 and prior used Not applicable to embedded voicemail Also controlled by the general TFTP Server setting above.
Program Code	IP Office Manager Upgrade	Used for upgrades from IP Office Manager, must be disabled when not required Also controlled by the general TFTP Server setting above.
DevLink	DevLink System Monitor*	Must be disabled when not required * When inactive, SysMonitor can still use the HTTP/S access method.
TAPI	TAPI Link Lite (1st party TAPI) TAPI Link Pro (3rd party TAPI) Avaya Contact Center Select IP Office Contact Center	Enable only when TAPI required; note that TAPI driver installation will fail if the TAPI interface is not active. This setting will affect the IPOCC and ACCS CTI Link; when inactive, any IPOCC and ACCS sessions will require TLS and a trusted certificate from IPOCC/ACCS. This setting will not affect the one-X Portal CTI Link.
HTTP Directory Read	one-X Portal* IP Office Centralised Directory	Enable only when one-X Portal or IP Office Centralized Directory used * When inactive, one-X Portal will continue operating but without the personal directory feature.
HTTP Directory Write	one-X Portal*	Enable only when one-X Portal deployed * When inactive, one-X Portal will continue operating but without the personal directory update feature.

7.7 Ensure Minimum Rights of Access

Restrict Service Users' rights of access to the minimum necessary. See User Accounts and Rights of Access 18 for more information on the differing access levels.

1. In IP Office Manager | **Security Settings | Rights Groups**, remove all unnecessary access rights; only retain rights that are essential.
2. In IP Office Manager | **Security Settings | Service Users | Rights Group Membership**, remove all unnecessary rights group membership.
3. If necessary, create new rights groups with minimum access.
4. Rights groups that are defined but not assigned to any Service User do not present a security risk.
5. In IP Office Manager **Security Settings | Services** tab: Enable only the minimum services at the recommended **Service Security Level** according to the following table:

Service Name	Application	Service Security Level	Notes
Configuration	Manager, Configuration Web Service (DevConnect)	Secure, Medium	Should always be enabled
Security Administration	Manager	Secure, Medium	Should always be enabled
System Status Interface	SSA	Secure, Medium	Disable if SSA not present
Enhanced TSPI	one-X Portal	Unsecure Only	Disable if one-X Portal not present
HTTP	H323 Phones (HTTP or HTTPS) Embedded File Manager (HTTP), IP Office Softphone (HTTP or HTTPS) SysMonitor (HTTP or HTTPS) VMPro (HTTPS) IP Office Line (HTTP or HTTPS)		Controls the IP Office HTTP server. Disable if not required, else if just HTTPS required, set to Secure, Medium. If HTTP must be enabled, set the System | System | Avaya HTTP Client Only setting active. This will reject all non-Avaya clients.
Web Services	Web Manager	Secure, Medium	Disable if Web Management or System Manager (SMGR) not used
External	Voicemail Pro, one-X Portal, Web Control, WebRTC	n/a	Not a true service interface

6. In IP Office Manager Configuration | System | System tab, check the File Writer IP Address setting. This specifies the IP address allowed to write files to the IP Office (IP500 V2 and Linux) using HTTP and TFTP protocols. It should be set to 0.0.0.0 (disabled) and set only when files need to be transferred.

7.8 Enforce a Password Policy

Change the security settings to enforce minimum password complexity, disable service users temporarily and IP Office users permanently on bad logins.

If a Service user fails to login 3 times within 10 minutes, the account will be locked for 60 seconds. If an IP Office user fails to login 5 times within 10 minutes, account will be locked permanently and the administrator will be required to unlock the account using Manager.

NOTE: This recommended IP Office User password policy must always be enforced if the system is potentially accessible from unsecured networks including the Internet; for example when SIP trunks or VoIP remote worker/extensions are supported.

In IP Office Manager Security **Settings |General** tab:

1. **Set Service User Details:**
   - **Minimum Name Length** to 6.
   - **Minimum Password Length** to 8.
   - **Password Reject Action** to '***Log and Temporary Disable***'.
   - **Minimum Password Complexity** to '***Medium***'.
   - **Previous Password Limit (Entries)** to 4.
2. **Set IP Office User Details:**
   - **Password Enforcement** to on.
   - **Minimum Password Length** to 8.
   - **Minimum Password Complexity** to 'Medium'.
   - **Password Reject Limit** to 5.
   - **Password Reject Action** to '***Log and Disable Account***'.

- **Note:** The IP Office user password policy only applies to the password field, not the voicemail or user login code. See Password and PIN Management 26 for more information.

7.9 Update Certificates

1. It is essential to understand the information and recommendations of Certificates and Trust 32 to determine the certificate and trust requirements of the system prior to installation.
2. If required, administer a new platform identity certificate:
   - The new identity certificate should be in a 'p12' or 'pfx' file.
   - Ideally, all certificates used to sign the new identity certificate should be in the same file.
   - If the signing certificates are in separate files, use Manager Security | System | Certificates | Trusted Certificate Store | Add to upload each one.
   - Activate the Manager setting Security | System | Certificates | Identity Certificate | Offer ID Certificate Chain.
   - Use Manager Security | System | Certificates | Identity Certificate | Set to upload the identity certificate file.
   - The identity certificate will be automatically propagated to all TLS/HTTPS interfaces of the server, any signing certificates will be placed in the Trusted Certificate Store (TCS).
   - If a separate telephony identity certificate is required, it should be administered using Manager security settings.
3. The default certificates trusted by IP Office should be removed if not required. This is achieved by placing a copy of the certificate in the ***system/primary/certificates/tcs/delete*** directory using the Manager or Web Manager's File Manager.
   Any default certificates to be trusted by IP Office should be added to the ***system/primary/certificates/tcs/add*** directory. See Default Trusted Certificates 98 for more information and how to create the certificate files.
4. If there is a change to the server's LAN IP address, SIP domain or FQDN, the Identity certificate will require regeneration. An IP500 V2, UCM, Secondary or Linux Expansion Server will always require manual regeneration. A Primary or Linux Application Server will be automatic if the **Web Manager | Platform | Settings | General | Certificates | Renew automatically** setting is active (default).

5. After ensuring that all other IP Office components' identity certificates are correctly configured, set the received certificate check levels appropriately using the Manager settings **Security | System | Certificates | Received Certificate Checks (Management)** and **Security | System | Certificates | Received Certificate Checks (Telephony)**.

7.10 Securing Telephony Users & Extensions

Users and extensions should be configured to restrict access to necessary features, default login codes changed and auto-create disabled.

1. All unused Users should be deleted – except NoUser.
2. The following auto-create settings must be disabled when not required:
   - **LAN1 | VoIP | H323 Gatekeeper | Auto-create Extn**
   - **LAN1 | VoIP | H323 Gatekeeper | Auto-create User**
   - **LAN1 | VoIP | SIP Registrar | Auto-create Extn/User**
   - **LAN2 | VoIP | H323 Gatekeeper | Auto-create Extn**
   - **LAN2 | VoIP | H323 Gatekeeper | Auto-create User**
   - **LAN2 | VoIP | SIP Registrar | Auto-create Extn/User**
   - **Line | IP DECT | Gateway | Auto-Create Extension**
   - **Line | IP DECT | Gateway | Auto-Create User**
3. If any auto-create feature is used to assist installation, the settings must be deactivated as soon as possible.
   Note that from 9.1, these settings will automatically be deactivated 24 hours after being set to avoid inadvertent exposure.
4. If no H.323 extensions are supported, the **LAN1/LAN2 | VoIP | H323 Gatekeeper Enable** must be set disabled. If H.323 extensions are supported, only the relevant LAN's gatekeeper should be enabled.
5. If no H.323 remote workers are supported, the **LAN1/LAN2 | VoIP | H323 Gatekeeper | H323 Remote Extn Enable** must be set disabled. If H.323 remote workers are supported, only the relevant LAN's Remote Extn should be enabled.
6. If no SIP extensions are supported, the **LAN1/LAN2 | VoIP | SIP Registrar Enable** must be set disabled. If SIP extensions are supported, only the relevant LAN's registrar should be enabled.
7. If no SIP remote workers are supported, the **LAN1/LAN2 | VoIP | SIP Registrar | SIP Remote Extn Enable** must be set disabled. If SIP remote workers are supported, only the relevant LAN's SIP Remote Extn should be enabled.
8. Enforce a Login Code (PIN) policy for all users and extensions by setting **System | Telephony | Login Code Complexity | Minimum length** to the minimum acceptable length, and activating Complexity tests. For more information on PIN and Login Code security see Password and PIN Management 26.
9. All VoIP (SIP, H323, DECT) users' **User |Telephony | Supervisor Settings | Login Code** or **Extension | Extn | Phone Password** must be set.
10. If any SIP registrar or H323 gatekeeper is exposed directly or indirectly to an unsecure network, even via an SBC, the additional steps of Hardening for Remote Worker Operation 73 must be followed.
11. All SIP extensions' **Extn | Force Authorisation** setting must be enabled.
12. All auto-created VoIP users must have their **User | Telephony | Supervisor Settings | Login Code** changed from the default. All auto-created non-VoIP (Digital, Analog) users should have their name and extension changed from the default.
13. Each user should have only the necessary **User | User | Profile** features enabled, all others disabled.
14. Each user should have only the minimum necessary **User | Web Self-Administration** interface features enabled, all others disabled. Web Self-Administration is a new feature form R9.1 and disabled by default. Each tab of the Web Self-Administration page may be controlled for view and edit on a per-user basis:

Tab	User Setting
Profile	User
Voicemail	Voicemail
Do Not Disturb	DND
Mobility	Mobility
Forwarding	Forwarding
Personal Directory	Personal Directory
Button Programming	Button Programming
Download	none (always available)

15. For IP Office release 8.1 and prior, disable all **User | Phone Manager Options** unless required. This can be achieved via the application of User Rights (User Rights | Phone Manager).
16. If different from the system-wide setting, change the **Extn | VoIP | Media Security** setting. See VoIP Security 60.

17. If the VoIP extension is to be configured for secure media (SRTP) or operates in an unsecure environment, any settings file supplied by IP Office should be conveyed via HTTPS not HTTP. This will additionally require certificate administration; see Certificates and Trust 32.

7.11 Hardening for Remote Worker Operation

Whenever SIP or H323 remote worker operation is supported, or if any SIP registrar or H323 gatekeeper is exposed directly or indirectly to an unsecure network even via an SBC, extra considerations are required to ensure that the external access does not compromise IP Office security.

- **Important:**
  IP Office must only be connected externally via a properly configured Firewall. It must never be connected directly.

1. The RTP port range on the LAN interface must be set to no more than 50750. If more RTP ports are required, the minimum value may be changed.
   - **LAN1/LAN2 | VoIP | Port Number Range | Maximum**
   - **LAN1/LAN2 | VoIP | Port Number Range (NAT) | Maximum**
2. Any exposed SIP Registrar or H323 Gatekeeper should have the TLS option enforced and any unsecure options disabled. See VoIP Security 60. To reduce the overhead of security and certificate management, one LAN's registrar can be used for the external interface, the other LAN for internal extensions.
3. The SIP registrar ports should be changed from the default 5060/5061
4. Any settings file supplied by IP Office must be conveyed via HTTPS not HTTP. This will additionally require certificate administration; see Certificates and Trust 32.
5. SRTP for media security should be considered, see VoIP Security 60.
6. If any H323 Gatekeeper is exposed directly or indirectly to an unsecure network, all H323 remote worker's **Extension | Extn | Phone Password** must be set. The code must not be a sequence, repeated digits, or same as the extension number. It must not be less than 9 digits, preferably 13 digits. For R8.1 and prior, the setting **User |Telephony | Supervisor Settings | Login Code** can be used.
7. Each H323 remote worker extension's **Extension | VoIP | IP Address** should be set to the public IP Address of the phone.
   - **Note:** This cannot be used if more than one phone is behind the same firewall/NAT, or the remote IP address changes.
8. If any SIP registrar is exposed directly or indirectly to an unsecure network, ALL SIP extensions must have default users who's Login Codes are not less than 9 digits, preferably 13 digits.
9. If any SIP registrar is exposed, ALL SIP extension's **Extension | VoIP | IP Address** should be set to the IP Address of the phone.
   - Note: The SIP extension must have a static IP address.
10. The steps of Securing Telephony Users & Extensions 72 must be followed.
11. The steps of Preventing Unwanted Calls 75 must be followed.
12. A Session Border Controller (SBC) must be considered for enhanced SIP remote worker security – the Avaya SBC for Enterprise (ABSCE) is a solution specifically tailored for IP Office SIP remote workers and SIP trunks. For more information see "*Configuring the Avaya Session Border Controller for IP Office Remote Workers*" in "*Administering Avaya IP Office Platform ™ with Manager*".
    - **Note:**
      If an SBC or SIP Application Level Gateway (ALG) is deployed, some of the IP Office security measures must be moved from the IP Office to the SBC/ALG; the IP Office source IP address blacklisting should be disabled with the No User Source Number 'B_DISABLE_SIP_IPADDR'. The SBC/ALG black/white listing must be activated to compensate.

7.12 Securing Trunks/Lines

SIP trunking and off-switch or trunks-to-trunk forwards/transfers should be disabled when not required, and a Session Border Controller (SBC) used for enhanced SIP security. Links between IP Office systems can be optionally secured.

1. If using SIP trunks, IP Office must be connected externally via a properly configured Firewall; see Limiting IP Network Exposure 83 for more information. IP Office must never be connected directly.
2. Unless SIP trunks are configured for a particular LAN interface, the **LAN1/LAN2 | VoIP | SIP Trunk Enable** setting must be disabled.
3. Many IP Office customers rely on the Services Providers to provide a secure SIP trunk environment. For a stronger security posture, implementation of the Avaya Session Border Controller for Enterprise (Avaya SBCE) is recommended as a best practice. Avaya SBCE also provides Advanced Services such as Secure Remote Worker and Encryption Service supporting VPN-less access to IP Office for SIP endpoints outside the enterprise firewall. The Avaya SBC for Enterprise is a solution specifically tailored for IP Office. For more information see: http://www.avaya.com/usa/product/avaya-session-border-controller-for-enterprise.
   - **Note:**
     If an SBC or SIP Application Level Gateway (ALG) is deployed, some of the IP Office security measures must be moved from the IP Office to the SBC/ALG; the IP Office source IP address blacklisting should be disabled with the No User Source Number 'B_DISABLE_SIP_IPADDR'. The SBC/ALG black/white listing must be activated to compensate.
4. Off-switch forwards/transfers should be disabled on a per-system or per-user basis, with the system setting taking precedence over the user.
   - Per-user setting is: **User | Telephony | Supervisor Settings | Inhibit Off-Switch Forward/Transfer**. This can also be set via User Rights.
   - System-wide setting is: **System | Telephony | Telephony | Inhibit Off-Switch Forward/Transfer**.
5. Analog trunks-to-trunk forwards/transfers should be disabled on a per-line basis unless required, using **Line | Analog Options| Analog Trunk to Trunk Connection**.
6. Other changes to restrict calls are contained in Preventing Unwanted Calls 75.
7. IP Office Lines (AKA SCN trunks) may be secured using the **Line | Line | Transport Type** of ***WebSocket Client/Server***, and a **Line | Line | Security setting** of ***Medium*** or ***High***.
   - One IP Office system must be the WebSocket client, the other the server. The Primary and Secondary should always be the WebSocket server.
   - For the ***High*** setting, certificate configuration is required; see Certificates and Trust 32 for more information.
8. For Server Edition deployments, secure IP Office Lines should always be used.

7.13 Secure Voice Media

In an unsecure environment with no other VoIP security, IP Office's VoIP media security should be enabled.

- **Note:** Enabling VoIP media security will reduce the platform concurrent call capacity considerably. It will also require SIP call signalling security.

For more information, see VoIP Security 60. This should be reviewed prior to enabling any IP Office VoIP media security.

7.14 Preventing Unwanted Calls

The following recommendations cannot be precise due to the wide variation of national, international and customer dial plans, however they can be adapted as required for specific deployments.

- **Note:** It is strongly recommended that all IP Office deployments be protected from unwanted calls regardless of the perceived risk.

Toll fraud, dial-through attacks or general unwanted incoming or outgoing calls can be mitigated in IP Office by:

- Call barring
- Authorization Codes
- Call logging and monitoring
- Phone Lock
- Auto Logout
- Out of hours barring
- Blocking off-switch and trunk-to-trunk transfers
- Removing mobile call control
- Ensuring Emergency Numbers are defined
- Correct error handling in Voicemail Pro call flows.

7.14.1 Call Barring

The normal way of call barring is to have a default outgoing route and then lock down undesired numbers. When locking down un-desired numbers it is important to take in to account IP Office dialling rules and add an N after any dial string you are trying to block.

For example to block calls to Premium rate numbers (1900-xxx-xxxxx US or 09… UK):

	US	UK
Telephone Number	1900N	09N or 909N
Feature	Barred	Barred

It is important to ensure that the Telephone Number is followed by an N so that it matches even when dialled en-bloc (or redial).

Many countries have prefixes that may be dialled before normal PSTN numbers, for example to force Caller ID presentation, (*67(US)/141(UK) to Withhold Caller ID, *82(US)/1470(UK) to present Caller ID) it is important to include versions of all barred short codes including these prefixes or just bar any call attempts using these prefixes.

7.14.2 User Based Barring

There are several potential methods for achieving different routing/barring rules for Users.

One effective method that minimizes the per-user config, and can be part of user rights templates, centralizes the routing/barring config, and maintains features like secondary dial tone, is to create copies of the "50:Main" ARS for the different access levels required.

As 50:Main is the default it makes sense for that to be the one that is used for most users, or on sites with specific concerns about security the most restricted.

For this example we will define two alternate ARS entries for Local & Long Distance, and Unrestricted, by copying the default Main then restrict Main to be local only. All the ARS tables must route Emergency Calls.

The new Short Codes in the Main ARS will be:

Code	Telephone Number	Feature	Line Group ID
11	911	Dial Emergency	0
911	911	Dial Emergency	0
0N;	0N	Barred	0
1N;	1N	Barred	0
XN;	N	Dial 3K1	0
XXXXXXXXXXN	N	Dial 3K1	0
*67N		Barred	0
*82N		Barred	0

The 0N; and 1N; codes have been changed to barred and barred codes added for *67 and *82. Note the addition of the N to ensure a match for redial, etc. Short codes can be added for areas where 7 digit local dialing is still available if required, also it might be useful to create Short Codes to trap local Area Codes that have been dialed with a leading 1, also Freephone dialing.

The Local & Long Distance Short codes will be:

Code	Telephone Number	Feature	Line Group ID
11	911	Dial Emergency	0
911	911	Dial Emergency	0
0N;	0N	Barred	0
1XXXN;	1N	Dial 3K1	0
XN;	N	Dial 3K1	0
XXXXXXXXXXN	N	Dial 3K1	0
1900N		Barred	0
*67N		Barred	0
*82N		Barred	0

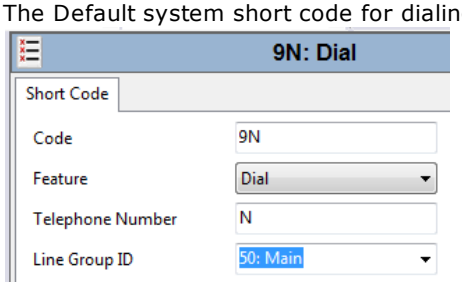
This will allow all calls starting '1' except Premium Rate (1-900 numbers), the 1N; Short Code is modified to 1XXXN; to avoid people pausing during dialing matching a simple "1N;" short code. The barring for *67 and *82 is repeated.

The Unrestricted ARS short codes will be:

Code	Telephone Number	Feature	Line Group ID
11	911	Dial Emergency	0
911	911	Dial Emergency	0
N;	N	Dial 3K1	0

This is totally un-restricted, in real operation it is unlikely that there will be totally un-restricted out-dialing.

The Default system short code for dialing is Unchanged:



Add specific User Short Codes for users who are allowed greater dialling privileges, similar to the default system Short code but pointing to the appropriate ARS entry. This can be done via User Rights Templates.

For more information on ARS operation, see the field descriptions for the Manager ARS tab in Administering Avaya IP Office ™ Platform with Manager.

7.14.3 Protecting Phones

In some environments one of the risks is not from the normal Users of the phones but people who have physical access to the phone but you don't want them to use phones. There are several mechanisms that can be used to protect the phones when the normal users are away from their desks:

- **Phone Lock**
  Phones can be locked using the Lock feature on the phone Features menu. Locking the phone also locks the Features menu. The 1400, 9500, and 9600 series phones have an option to specify a timer where the phone will automatically lock itself after a specified period of inactivity.
- **Short codes**
  The "Outgoing Call Bar On" short code prevents the phone being used to make outgoing calls - Internal and Emergency calls are allowed. "Outgoing Call Bar Off" with the user's login code unlocks the phone
- **Logging out/Hot Desking**
  Users can log out of the phone - which will leave the phone with the special 'NoUser' account associated with it. This NoUser is Outgoing Call Barred. Users must have a login code to be able to log out of their default phone (the phone with their extension number).
- **Auto Logout**
  The **Extension | Telephony | Supervisor Settings | Login Idle Period** can be used to force a User to be logged out if their phone is idle for a period of time.
- **Out of Hours Call Routing**
  A time profile can be associated to an ARS so that when the time Profile is inactive a different ARS is used for routing calls - for our example above we will set the extra ARS tables to point to Main out of hours so that only Local and Emergency Calls can be made.
- **Trusted Voicemail Source**
  Where a phone is in an un-controlled area it is also advisable to remove the default Trusted Source Number for Voicemail access, so that all IP Office Voicemail access requires entering the Voicemail access code, even from the User's home extension.

7.14.4 Making Calls from Protected Phones

Once phones have outbound dialing locked down it often becomes necessary to provide occasional exceptions. Since release 5.0 it has been possible for a privileged User (Receptionist for example) to transfer secondary dial tone to a restricted user to allow them to make a call that they would not otherwise be able to make.

A more versatile solution is to use Authorization Codes. Authorization Codes permit a user with a Code to go to a restricted phone and make a call with their privileges without the necessity of Hot Desking for the call. This is sometimes called "Roaming Class of Service" on other systems. For information see the field descriptions for the Manager Authorization Codes tab in *Administering Avaya IP Office ™ Platform with Manager*.

Note that Emergency Calls are always permitted, hence the need to ensure Emergency Dialing has been correctly defined.

7.14.5 Forwarding Protection

When a user has forwarding active, any call routing, including barring for calls to that user, will be applied. If a user cannot make long distance call, and attempts to forward to a long distance number, the call will fail. As call routing/barring can vary by time of day it is not possible to block the attempt to configure long distance as the forwarding target.

Use the setting **System | Telephony | Telephony | Inhibit Off-Switch Forward/Transfer** to inhibit all off-switch forwarding and transfers. When enabled, this takes precedence over all user settings.

This setting can also be set per user using **User | Telephony | Supervisor Settings | Inhibit Off-Switch Forward/Transfer**.

7.14.6 Remote Forwarding Controls

By default IP Office and the IP Office Voicemail applications do not provide any mechanisms for remote modification of User Forwarding settings. However, Mobile Call Control can be enabled to give access. For information, see "Mobile Call Control" in Administering Avaya IP Office ™ Platform with Manager.

There is also a Voicemail Pro **Personal Options Menu** option that can be added to a custom call flow to allow users to remotely change their forwarding and other settings.

Before enabling either of these options the warnings in the manuals must be considered and a judgment made to decide if the benefit is worth the risk of unauthorized access.

7.14.7 SMDR Reporting of Barred Calls

To enable the detection of unauthorized call attempts, the string 'SMDR' can be included in the telephone field of the Barred short code. When included, an SMDR report will be generated with the relevant field indicating the calling party, call destination etc. The call will be zero duration, zero ring time, with the word 'Barred' in the 2nd party info field.

7.14.8 Error Handling in Voicemail Pro Call Flows

All call flows that can make internal or external calls, transfers or other potential call operations must ensure only the expected call destinations from valid users are allowed. All possible invalid operations should be detected and prevented by the use of call flow logic.

7.15 Configuration and Other Sensitive Data

IP Office security settings are automatically encrypted and locked to the individual IP Office and cannot be exported, but configuration and other data for IP Office, Voicemail Pro and one-X Portal contain some unencrypted information that may pose a security threat or privacy issue.

- Any backup data store (for example a file server used for backup/restore, copies of SD Cards) must be secured from unauthorised access
- Any backup/restore mechanism itself should be secure; IP Office, Voicemail Pro and one-X Portal support secure backup/restore options such as HTTPS and SFTP
- Access to call recordings which are held as files on the Voicemail Pro or Contact Recorder server should be controlled
- Offline and exported configuration files, SysMonitor logs and Linux server logs should be controlled using, for example, encryption with password protection. This should include any configuration or other sensitive data sent outside of the organisation.

7.16 Securing IP Office Applications

7.16.1 Securing IP Office Manager

1. Apply the following configuration settings on the Manager **File | Preferences | Security** tab to ensures more secure IP Office communications and help keep configuration data away from unauthorized users:

Configuration	Parameter Setting
Request Login on Save	Enabled
Close Configuration/Security Settings After Send	Enabled
Save Configuration File After Load	Disabled
Backup Files on Send	Disabled
Enable Application Idle Timer (5 minutes)	Enabled
Secure Communications	Enabled

2. The **Manager Certificate Check** on the **File | Preferences | Security** tab should be set according to the security policy. It should be set to ***None*** only for recovery purposes.
3. For more information see Certificates and Trust 32 and Windows Certificate Management 99.

4. If mutual certificate authentication is required (i.e. the IP Office Configuration or Security Administration service will request a certificate from Manager) the **File | Preferences | Security | Certificate** offered to IP Office needs to be set with an identity certificate. See Windows Certificate Management 99. If Current User is selected, it will only apply the current Windows user. If Local Machine is selected, it will be used for all Windows users of that PC.
5. To prevent other administrators from modifying the **File | Preferences | Security** tab settings, ensure those Service Users do not have the rights to edit security settings, or have the Administrator Manager Operator Role.
6. In IP Office Manager's **File | Preferences | Directories** tab, change the **Working Directory (.cfg Files)** to be different to the **Binary Directory (.bin Files)**. If the two directory settings are the same, it potentially allows remote TFTP/HTTP file access to the folder containing copies of configuration files.
7. Ensure all offline configuration files, exported files or other configuration data are controlled.

7.16.2 Securing Web Manager/Web Control

Web Manger and the Linux Web Control Panel are browser-based online management tools that always use HTTPS communication.

1. Any browser used for web-based management should have the CA certificate/ID certificate of the IP Office installed in the relevant trusted certificate store. It is possible in some browsers to provide temporary or permanent exceptions, but this should be avoided. For more information about certificates and browser support, see Certificates and Trust 32.
2. Ensure all offline configuration files, exported files or other configuration data are controlled.

7.16.3 Securing Web Licence Manager

Web Licence Manager (WebLM) administrative account are separate to IP Office and logins to WebLM are not integrated into the IP Office AA framework.

WebLM administration is browser-based and always uses HTTPS communication.

1. Change the password of the default account as soon as possible.
2. All passwords must be 'strong' and of 8 or more characters (See Password and PIN Management 26).
3. For subsequent password management, go to the WebLM 'Manage Users' page. Any unused administrator accounts must be deleted.
   - Note: WebLM does not support referred authentication; local user accounts are used at all times.
4. Any browser used for web-based management should have the CA certificate/ID certificate of the IP Office installed in the relevant trusted certificate store. It is possible in some browsers to provide temporary or permanent exceptions, but this should be avoided. For more information about certificates and browser support, see Certificates and Trust 32.
5. If the application is not used, it should be disabled using the Web Control Settings | System | Services | Automatic Start setting.

7.16.4 Securing System Status Application

SSA will always attempt to connect to the IP Office using the secure TLS service first if the login page setting **Secure Connection** is selected. However if the TLS connection attempt fails, it will offer the user the option to connect over the unsecure connection.

1. To prevent the use of the unsecure connection, the Manager security setting **Services | System Status Interface | Service Security Level** should be set to ***Secure, Low*** or ***Secure, Medium***.
   - **Note:** The use of SSA with the TLS connection will limit the status monitoring capacity, particularly on the IP500 V2 platform. If high SSA events or call rates are anticipated, the unsecure connection should be used with alternative security arrangements.
2. There is no checking of the IP Office certificate by SSA when the TLS connection is used hence no certificate configuration is possible on SSA.
3. If not required by support personnel using SSA, the rights: **Rights Groups | System Status | Read all configuration** and **Rights Groups | System Status | System control** should be removed from the Service User account.
4. Any snapshot file saved by SSA may be read by any other SSA instance without authorization. This file can include configuration and other sensitive information and therefore access to the file must be controlled.

7.16.5 Securing Sys Monitor

SysMonitor has a number of connection methods: Two legacy (UDP and TCP), and two contemporary (HTTP and HTTPS). Only the HTTPS method is fully secure, but has the highest processing overhead. UDP has the least.

IP Office support of the various SysMonitor connection methods is controlled by the security settings as follows:

HTTP Service Security Level	HTTP	HTTPS	UDP	TCP
Disabled	Disabled	Disabled	n/a	n/a
Unsecure Only	Enabled	Disabled	n/a	n/a
Unsecure + Secure	Enabled	Enabled	n/a	n/a
Secure Low	Disabled	Enabled	n/a	n/a
Secure Medium	Disabled	Enabled	n/a	n/a
Secure High	Disabled	Enabled	n/a	n/a

Unsecured Interfaces | DevLink	HTTP	HTTPS	UDP	TCP
Disabled	Disabled	Enabled	Disabled	Disabled
Enabled	Enabled	Enabled	Enabled	Enabled

1. A Service User account should be used rather than the legacy Monitor Password, the Manager security using the setting **System | Unsecured Interfaces | Use Service User Credentials**. For default accounts that can use SysMonitor in this way refer to Default Administrative Users and Rights Groups 20.
2. The legacy UDP and TCP connection methods should be disabled via the Manager security setting **System | Unsecured Interfaces | DevLink**.
   - **Note:** If the legacy connection methods are not disabled, the password exchange between SysMonitor and IPOffice is unsecure.
3. Select the correct connection methods in the SysMonitor File | Select Unit tab. If HTTPS is used, an identity certificate (certificate plus private key) is requested. This is used by SysMonitor to identify itself.
   For more information about certificates and PKI, see Certificates and Trust 32.
4. To ensure only HTTPS is used, the Manager security setting **Services | HTTP | Service Security Level** should be set to disable HTTP.
   - **Note:** The IP Office HTTP service is used by many components including H323 phones, IP Office lines, SoftConsole, Voicemail Pro and one-X Portal.
5. Any log files saved by SysMonitor may be read by any other SysMonitor instance without authorization. This file can include configuration and other sensitive information and therefore access to these files must be controlled.

7.16.6 Securing Voicemail Pro

1. Using the Voicemail Pro client, the password for the default administration account 'Administrator' must be changed to a 'strong' password of 8 or more characters. Any unused accounts must be deleted.
   - **Note:** For Voicemail Pro R9.0 and higher on Server Edition, UCM and Linux Application Server, all authentication is referred to the 'local' IP Office – the default administration account is only used under failure conditions. For UCM and Linux Application Server, the local IP Office is a management instance running on the server itself.
     See User Accounts and Rights of Access 18 for more information.
2. Using the Voicemail Pro client, configure the password used to access the IP Office in **Administration | Preferences | General | Voicemail Password**. This password must match the password entered in the Manager setting **Security | System | Unsecured Interfaces | Voicemail Password**. The password should be 'strong' and 8 or more characters.
3. The IP Office configuration setting **System | Voicemail | Voicemail IP Address** must not be left at 255.255.255.255, but set to the IP Address of the Voicemail Pro server.
4. Only users and groups that are entitled to use voicemail should have their mail box activated. All others should be disabled using the Voicemail Pro client disable mailbox feature.
   - **Note:** Disabling the mailbox will also disable IMAP, MAPI, email and Web Voicemail integrations for that user
5. All mailboxes must be protected by password/Voicemail Code access, except when connecting from trusted extensions (by the use of the **User | Source Numbers** field). The recommended minimum is 4 digits for internal use, 9 when the mailbox can be accessed externally.

6. The mailbox password/Voicemail Code policy should be enforced by setting the voicemail Default Telephony Interface to Intuity in the Voicemail Pro client, and minimum PIN Length to 4 or 9 using the Manager setting **System | Voicemail | Voicemail Code Complexity**.
   - **Note:** If IP Office voicemail TUI is used, the users are not forced to set a new password/Voicemail Code on initial mailbox access.
7. To prevent Toll fraud via the outdialling feature, it can be disabled on the IP Office Configuration **System | Voicemail** tab in IP Office Manager. Where Outcalling is required, the call barring steps of Preventing Unwanted Calls 75 must be used.
8. To prevent Toll fraud via call flows, all call flows must have adequate protection against dialling unauthorized numbers.
   Where external calling is required, the call barring steps of Preventing Unwanted Calls 75 must be used.
9. Where a phone is in an un-controlled area the default Trusted Source Number for Voicemail access should be removed, so that all IP Office Voicemail access requires entering the Voicemail access code, even from the User's home extension.
10. Disable all unused services such as SMTP and MAPI.
11. If the SMTP send feature is used, authentication should be used. TLS is always enforced.
12. If the IMAP4 server feature is used, TLS should be used.
13. If the host server operating system is Microsoft Windows, consult the relevant Microsoft OS security guidelines, which can be found at https://technet.microsoft.com/en-us/library/windows-server-security.aspx. More general information can be found at https://technet.microsoft.com/en-us/security/default.aspx
14. If the application is not used, it should be disabled using the Web Control Settings | System | Services | Automatic Start setting.

7.16.7 Securing Embedded Voicemail

1. Only users and groups that are entitled to use voicemail should have their mailbox activated.
2. All mailboxes must be protected by password/Voicemail Code access, except when connecting from trusted extensions (by the use of the **User | Source Numbers** field). The recommended minimum is 4 digits for internal use, 9 when the mailbox can be accessed externally.
3. The mailbox password/Voicemail Code policy should be enforced by setting the **System | Voicemail | Voicemail Mode** to ***Intuity Mode***, and minimum PIN Length to 4 or 9 using the Manager setting **System | Voicemail | Voicemail Code Complexity**.
   - **Note:** If IP Office voicemail TUI is used, the users are not forced to set a new password/Voicemail Code on initial mailbox access.
4. Where a phone is in an un-controlled area the default Trusted Source Number for Voicemail access should be removed, so that all IP Office Voicemail access requires entering the Voicemail access code, even from the User's home extension.

7.16.8 Securing one-X Portal for IP Office

1. Log in to the default one-X Portal Administrator account and change the password to a strong password of 8 or more characters.
   - Note: This account is used by one-X Portal if the IP Office authentication service is not available, see User Accounts and Rights of Access 18 for more information.
2. For subsequent password management, go to the one-X Portal **Configuration | Users** page. Any unused administrator accounts must be deleted.
3. On the one-X Portal administration page, navigate to **Configuration | Providers | CSTA-Provider | Edit** and configure the password used to access IP Office. The password must match the password configured for the IP Office Manager user ID EnhTcpaService.
4. If one-X Portal clients are to be used externally, follow Hardening for Remote Worker Operation 73.
5. If external one-X Portal clients are configured to support VoIP calls, follow Limiting IP Network Exposure 83.
6. one-X Portal offers both an HTTP (8080 + 8069) and HTTPS (8443/9443 + 8063) interface for web clients. HTTPS must be used for external access. The HTTP ports can be disabled using the setting **Security | Protocol | Secure Connection (HTTPS)**.
7. To administer an Identity Certificate for the HTTPS interfaces:
   - On Linux-based one-X Portal servers see Update Certificates 70.

- On Windows-based servers, use the one-X Portal administration web page and import the PKCS#12 format certificate file using the setting **Configuration | Certificate | Import**. Note this certificate is specific to the one-X Portal HTTPS interfaces and not part of the Windows OS certificate store and must include all intermediate certificates.

8. Log in to the default Superuser backup and restore account and change the password to a strong password of 8 or more characters. For subsequent password management, go to the one-X Portal AFA page **Configuration | Edit** page.
9. If the host server operating system is Microsoft Windows, consult the relevant Microsoft OS security guidelines, which can be found at https://technet.microsoft.com/en-us/library/windows-server-security.aspx. More general information can be found at https://technet.microsoft.com/en-us/security/default.aspx
10. If the application is not used, it should be disabled using the **Web Control Settings | System | Services | Automatic Start** setting.

7.16.9 Securing WebRTC Gateway

1. If the application is not used, it should be disabled using the Web Control Settings | System | Services | Automatic Start setting.

7.16.10 Securing Media Manager

1. If the application is not used, it should be disabled using the Web Control Settings | System | Services | Automatic Start setting.
2. If SMTP emails are used for alarms and events select the Secured Connection option using the Web Manager setting Applications | Media Manager | Configuration.

7.16.11 Securing Avaya Contact Center Applications

1. Whenever IP Office Contact Centre (IPOCC) and Avaya Contact Center Select (ACCS) are deployed with IP Office, the CTI link between IP Office and the application should be secured according to Securing CTI Interfaces 75.
2. Please refer to the relevant application documentation for all other security aspects:
   - Avaya IP Office Contact Center Feature Description
   - Avaya Contact Center Select Solution Description

7.17 Securing CTI Interfaces

1. If not required, disable TAPI Link Lite/Pro (1st /3rd party TAPI) as per Disable Unused Services/Interfaces 68.
2. To secure the link between ACCS or IPOCC and IP Office, the setting IP Office Manager | **Security Settings | System | Unsecured Interfaces | TAPI** should be disabled. This will enable TLS and request a trusted certificate from IPOCC/ACCS.
3. Administer IPOCC/ACCS with an identity certificate. See the relevant IPOCC/ACCS documentation.
4. Administer the IP Office Trusted Certificate Store (TCS) with the root CA certificate of the IPOCC/ACCS.

7.18 Limiting IP Network Exposure

It is vital to control the IP network access of IP Office to reduce the exposure to attack. Network security integration is outside the scope of this document; however the following section covers some items that must be reviewed as part of network security hardening.

If using any level of external IP access, IP Office must **only** be connected via a properly configured Firewall or other network security mechanism (e.g. VPN, MPLS). It must **never** be connected directly.

If no external IP access is required, IP Office must be isolated using a firewall or other mechanism.

Using Manager, the IP Office IP Route table should be inspected for any gateway routes that may have been unintentionally acquired via DHCP. These should be deleted if not required and the DCHP settings modified to prevent reoccurrence.

Firewall

Any Firewall used must be selected, deployed, tested and managed by competent personnel to meet the needs of the IP Office deployment.

The NIST Special Publication (SP) 800-41, Guidelines on Firewalls and Firewall Policy: http://csrc.nist.gov/publications/nistpubs/800-41-Rev1/sp800-41-rev1.pdf provides background information, including other helpful resources.

Only the absolute minimum of Firewall ports and protocols should be opened for use with IP Office. For example set only the port direction and protocol needed.

The relevant IP Office port matrix for each release must be used. A link to the port matrix document is located on the Avaya Product Security page at https://support.avaya.com/security.

Firewall guidelines:

- If a remote IP address is static – an ITSP SIP trunk for example – the source address should be configured to constrain the access further.
- IP Office unsecure ports/protocols should never be exposed to the Internet.
- If using a stateful Firewall, H.323 and SIP inspection should be turned off as this will interfere with IP Office operation.

Session Border Controller

The Avaya SBCE is recommended to be located behind the Enterprise firewall, and serves as a security and demarcation device between the IP-PBX and the Carrier facility. Avaya also supports an implementation of the Avaya SBCE parallel to the firewall, although it is better as recommended for best practices security to put it behind the firewall as part of a layered defence strategy. The Avaya SBCE performs NAT traversal, securely anchors signalling and media, and can normalize SIP protocol implementation differences between carrier and Enterprise SIP implementations.

Remote Maintenance Access

Both System Status Application and SysMonitor access to IP Office can be secured, and events/alarms sent to syslog servers (including the IP Office Primary Server) using the TLS protocol.

IP Office SNMP should not be used without additional security measures such as Virtual Private Network (VPN).

All IP Office systems supports secure and high integrity SSLVPN connectivity, and Avaya offers IP Office Support Services (IPOSS) based on this technology. For more information, see Deploying IP Office ™ Platform SSL VPN Services.

For IP Office deployment in an enterprise or branch environment, Avaya's Secure Access Link (SAL) gateway can be utilised.

7.19 Secure Maintenance Interfaces

Events and alarms can be securely sent to syslog servers (including the IP Office Primary Server) using the TLS protocol. This can be enabled using the Manager setting **System | System Events | Alarms | Syslog | Protocol**.

Both System Status Application and SysMonitor access to IP Office can be secured. See Securing System Status Application 79 and Securing Sys Monitor 80.

SNMP should not be used as this is not secure.

- **Note:** Enabling security on these interfaces will increase the software processing of the IP Office and will be unsuitable for instances where high traffic is expected. In this instance local monitoring via unsecured interfaces or external secure solution are required. See Limiting IP Network Exposure 83.

Unsecure modems should not be left connected to the serial or analogue ports.

7.20 Restricting Physical Access

Any unauthorized physical access to the system could present attackers with an opportunity to reset the configuration and security settings, modify BIOS, access the unsecure serial port, install or modify software via the SD Card or other mechanisms.

It is essential to secure physical access to the IP Office platform; mechanisms of controlling such access outside the scope of this document.

7.21 Securing Server Edition Servers

1. It is important to understand the information and recommendations of Certificates and Trust 32 to determine the certificate and trust requirements of the server as options are offered during the initial ignition process.
2. The ignition process will enforce a change to the Administrator and security passwords, it also updates the fall back accounts for one-X Portal, Voicemail Pro and Web Control (the local Linux administration web interface).
3. All security administrator account passwords of all other systems in the Server Edition solution need to be the same. This can be done using IP Office Manager **Security | General | General** to change individual settings.
4. All Service User account credentials used for central management of all systems need to be the same. This can be done using Web Manager Security Manager **Service Users | Synchronize Service User and System Password**.
5. Apply a password policy to the Web Control application using Web Manager Platform **Settings | System | Password Rules Settings**.
6. Enable the setting Web Manager Platform **Settings | System | Authentication | Enable referred authentication**. This will refer all Web Control logins to the local IP Office. The local Linux Administrator account credentials are only used under failure conditions.
7. Disable the HTTP backup/restore server using Web Manager setting **Platform View | Settings | System | HTTP Server**. From R9.1, an HTTPS backup/restore server is always active for this purpose.
8. Enable the internal server firewall to apply DoS and DDos attack filters using Web Manager setting **Platform View | Settings | System | Firewall Settings | Activate**.
   - Note: The firewall support on Server Edition does not replace the need for an external firewall. For further information see Limiting IP Network Exposure 83.
9. Disable any unused unsecure TCP or UDP ports using Web Manager setting **Platform View | Settings | System | Firewall Settings | Enable TCP/UDP Ports**. This will apply filtering to all LAN 1 and LAN 2 traffic, regardless of source or destination.
10. If the ingress ports utilized by all IP Office operations conform to the following table, the setting **Platform View | Settings | System | Firewall Settings | Enable Filter** can be activated:

Protocol	Ports
TCP	22, 25, 37, 143, 389, 411, 443, 445, 514, 993, 1433, 1434, 1718:1720, 4097, 4560, 5060:5061, 5222, 5269, 5443, 5800:5899, 6514, 7070:7071, 7443, 8005, 8063, 8084, 8087, 8135, 8411, 8444, 8666, 8443, 8805, 9092, 9094, 9095, 9443, 9444, 9888, 32768:65280
UDP	37, 53, 67, 68, 123, 161, 162, 389, 500, 514, 520, 1024:65535

    For more information on IP Office port/protocol usage, see the relevant IP Office port matrix which can be found at https://support.avaya.com/security.
11. If not required, disable the syslog receiver on the **Primary Settings | General** tab.
12. If not required, remove the syslog client on the Secondary and each Expansion System using the Manager setting **System | System Events | Alarms | Destination Syslog**.
    - **Note:** Removing the syslog destination will stop audit trail and security events being sent to the Primary Server.
13. If not required, disable the Enhanced Access Security Gateway (EASG) support using the Web Manager setting **Platform View | Settings | EASG Settings | Status**.
14. If required, administer a new server identity certificate using Web Manager:
    a. The new identity certificate should be in a 'p12' or 'pfx' file.
    b. Set Platform | Settings | General | Certificates | Renew automatically active.
    c. Ideally, all certificates used to sign the new identity certificate should be in the same file.
    d. If the signing certificates are in separate files, use Security Manager | Certificates | +Add Certificate to upload each one.
    e. Set Security Manager | Certificates | Edit | Offer ID Certificate Chain active.
    f. Use Security Manager | Certificates | Edit | Set to upload the identity certificate file.
    g. The identity certificate will be automatically propagated to all TLS/HTTPS interfaces of the server, any signing certificates will be placed in the Trusted Certificate Store (TCS).
    - For more information see Certificates and Trust on page 33 32.

15. Follow Securing the IP Office Platform Solution 66.
    a. If Voicemail Pro is installed, follow Securing Voicemail Pro 80.
    b. If one-X Portal is installed, follow Securing one-X Portal 81.
    c. Any applications not used should be disabled using the Web Control **Settings | System | Services | Automatic Start** setting. Note that IP Office and Management Services should never be disabled.
16. Do not activate the server's Intelligent Platform Management Interface (IPMI) – this effectively grants physical access to the server.

7.22 Securing Linux Application Server/UCM

The Linux Application Server and Unified Communications Module (UCM) run a 'Management' IP Office instance. A management IP Office is a single installation of selected IP Office features running on Linux with management and maintenance services enabled. All telephony functions are disabled and no licensing is required.

1. It is important to understand the information and recommendations of Certificates and Trust 32 to determine the certificate and trust requirements of the server as options are offered during the initial ignition process.
2. The ignition process will enforce a change to the Administrator and security passwords, it also updates the fall back accounts for one-X Portal, Voicemail Pro and Web Control (the local Linux administration web interface).
3. Apply a password policy to the Web Control application using **Settings | System | Password Rules Settings**.
4. Enable the setting **Settings | System | Authentication | Enable referred authentication**. This will refer all Web Control logins to the management IP Office. The local Linux Administrator account credentials are only used under failure conditions.
5. Use IP Office Manager to load the security settings of the IP Office Shell Server that co-resides on the Linux Application Server/UCM at the same IP address.
   - **Note:** This is not the UCM host IP500 V2 address.
6. Follow Securing the IP Office Platform Solution 66.
7. Disable the HTTP backup/restore server using **Settings | System | HTTP Server**. From R9.1, an HTTPS backup/restore server is always active for this purpose.
8. Disable any unused unsecure ports/protocols using **Settings | System | Firewall Settings**. This will apply filtering to all LAN 1 and LAN 2 traffic, regardless of source or destination.
   - **Note:** The firewall support on the Linux Application Server do not replace the needs for an external firewall. For further information see Limiting IP Network Exposure 83.
9. If not required, disable the Enhanced Access Security Gateway (EASG) support using the Web Manager setting **Platform View | Settings | EASG Settings | Status**.
10. If required, administer a new server identity certificate on the IP Office Shell Server using the IP Office Manager **System | Certificates | Identity Certificate | Set**; this identity certificate will be automatically propagated to all TLS/HTTPS interfaces of the server. Alternatively if the system is an Linux Application Server, the Web Control **Settings | General | Certificates | Identity Certificates** settings can be used. For more information see Certificates and Trust 32.
11. If required, administer a new server identity certificate on the IP Office Shell Server using the IP Office Manager **System | Certificates | Identity Certificate | Set**; this identity certificate will be automatically propagated to all TLS/HTTPS interfaces of the server. For more information see Certificates and Trust 32.
12. If Voicemail Pro is installed, follow Securing Voicemail Pro 80.
13. If one-X Portal is installed, follow Securing one-X Portal 81.
14. Do not activate the server's Intelligent Platform Management Interface (IPMI) – this effectively grants physical access to the server.

Chapter 8.

Monitoring the IP Office Platform

8. Monitoring the IP Office Platform

Constant and consistent monitoring ensures any threats can be identified early and reacted to. In addition to threat monitoring, existing installations should be reviewed for changes in security requirements that may be caused by customer needs, technology, or regulation.

- Activate all necessary reporting. See Activating Reporting 93.
- Monitor all alarms and logs, especially for repeated failed logins or other evidence of attack
- Detect other unusual activity, for example:
- New VoIP extensions
    - Forwarding set
    - Phones dialling unexpectedly
    - Unable to make outgoing calls
    - Unusual call destinations
    - Unusual call volumes or time of day/week
    - High phone bill
    - Unable to login to phones or applications
    - Unable to use voicemail
    - The string 'Barred' in SMDR reports
    - The syslog tag of 'IPTables-Rejected' in Linux server syslog events.
- Review Avaya Security advisories
- Review Avaya IP Office application notes, technical bulletins and tips
- Ensure the latest IP Office service packs are applied
- Monitor telephony provider communications
- Conduct periodic security reassessment

8.1 Checks and Tests

Thorough checks and tests should be carried out to ensure the deployment is secure and no previous attacks have compromised the system:

- Note: Care must be taken not to inadvertently expose sensitive data as a by-product of testing activities.
- Check LAN1/LAN2 do not have public IP addresses i.e. directly accessible from the internet.
- Check the IP Office for unsecure internet or inbound IP access by identifying the public IP address of the Firewall (e.g. by using http://whatismyipaddress.com), then attempting access to the IP Office ports defined by the Port Matrix document. The following table contains some example ports that should be tested.

Note: This port list is not exhaustive and can vary from release to release. A link to the port matrix document is located on the Avaya Product Security page at https://support.avaya.com/security.

Port	Protocol	Use	Possible test Tool	Notes
22	TCP	SSH	SSH, Nmap or other port scanner	Linux servers only
69	UDP	TFTP	Nmap or other port scanner	A TFTP RRQ of 'nasystem/who_is' can be used
80	TCP	HTTP	Browser, Nmap or other port scanner	http://[IP Address] can be used
143	TCP	IMAP	Nmap or other port scanner	Voicemail Pro only
161	UDP	SNMP	SNMP test tool, Nmap or other port scanner	
411	TCP	HTTP	Nmap or other port scanner	
443	TCP	HTTPS	Browser, Nmap or other port scanner	https://[IP Address] can be used
993	TCP	IMAP-TLS	Nmap or other port scanner	Voicemail Pro only
1300	TCP	H323-TLS	Nmap or other port scanner	
1720	TCP	H323	Nmap or other port scanner	
5060	UDP	SIP	Nmap or other port scanner	
5061	TCP	SIP	Nmap or other port scanner	
5443	TCP	HTTPS	Nmap or other port scanner	Linux servers only
7070	TCP	HTTPS	Browser, Nmap or other port scanner	Linux servers only https://[IP Address]:7070 can be used
7071	TCP	HTTPS	Browser, Nmap or other port scanner	Linux servers only https://[IP Address]:7071 can be used
8000	TCP	HTTP	Nmap or other port scanner	Linux servers only
8069	TCP	HTTP	Nmap or other port scanner	one-X Portal only
8080	TCP	HTTP	Browser, Nmap or other port scanner	https://[IP Address]:8080/onexportal-admin.html can be used
8086	TCP	HTTP	Nmap or other port scanner	one-X Portal only
8411	TCP	HTTPS	Nmap or other port scanner	
8443	TCP	HTTPS	Nmap or other port scanner	
9443	TCP	HTTPS	Nmap or other port scanner	one-X Portal only
50791	TCP		VMPro Client, Nmap or other port scanner	
50792	UDP		Nmap or other port scanner	
50793	TCP		Nmap or other port scanner	IP500 V2 only
50794	UDP + TCP	SysMonitor	SysMonitor, Nmap or other port scanner	
50796	TCP	TLS	Nmap or other port scanner	
50804	TCP		IP Office Manager, Nmap or other port scanner	
50805	TCP	TLS	IP Office Manager, Nmap or other port scanner	
50808	TCP		SSA, Nmap or other port scanner	
50809	TCP	TLS	SSA, Nmap or other port scanner	

Port	Protocol	Use	Possible test Tool	Notes
50812	TCP		IP Office Manager, Nmap or other port scanner	
50813	TCP	TLS	IP Office Manager, Nmap or other port scanner	
50814	TCP		Nmap or other port scanner	

If access is successful, it can indicate a misconfigured Firewall or other network protection system.

- Attempt to log into the servers using the set of default administrator accounts and passwords in the following table.
  - Note: Default accounts from previous releases are not removed on upgrade.

Default Account Name	Domain	Possible test Tool	Notes
security **Administrator** **Manager** **Operator** **BusinessPartner** **Maintainer** **IPDECTService** **SMGRB5800Admin** **BranchAdmin**	IP Office	Web Manager IP Office Manager	All servers, including IP500 V2 and UCM
Administrator	Voicemail Pro	VMPro client	Voicemail Pro only
Administrator	one-X Portal	Browser	one-X Portal only
Administrator	Web Control	Browser	Linux servers only
root	Linux	Console interface	Linux servers only

If access is successful, the account credentials should be changed or the account removed. See Remove unnecessary accounts 67 for more information on account removal

- Use IP Office Manager to load the configuration and review all errors and warnings with particular reference to passwords. None should be present.
- Check for unexpected Extensions and Users
- Check all users' settings for unusual forwarding destinations
- Ensure All SIP Extensions' **Extension | Extn | Force Authorisation** setting has not been disabled.
- Check the special IP Office user 'NoUser' **Source Number** field; any unexpected entries should be clarified with support personnel. NoUser source numbers are sometimes used to enable specific features or behaviour.
- Check that the padlock symbol is displayed on the bottom right of the screen, indicating a secure connection to IP Office.
- Use IP Office Manager to load the security settings and review all warnings; none should be present.
- Again, check that the padlock symbol is displayed on the bottom right of the screen, indicating a secure connection to IP Office.
- Log on to one-X Portal administration page, if a warning is displayed 'Change Administrator Default Password' the administrator account is at default.
- For R9.0+, if login to Web Control, one-X Portal or Voicemail pro fails unexpectedly, check the IP Office security settings for the account being used; it must have a rights group assigned which contains the correct 'External' rights.
- Check successful and failed logins produce the expected reports and results.
- Test the call barring, emergency calls, authorisation codes, Voicemail Pro outcalling and call flows. Testing of Emergency Calls must be arranged in advance with the PCSP/Emergency Services to avoid prejudicing genuine emergency response.
- Review Firewall, SBC and call logger reporting.

8.2 Activating Reporting

To ensure timely indication of any untoward activities on any component, various reporting mechanisms should be enabled. It is important to ensure that the reporting mechanisms themselves are reliable and secure.

IP Office

The following events and logging features are available for IP Office.

- System events for failed logins, blacklisted IP Addresses, and SSL/TLS failures, potentially indicating attempts to gain unauthorized access to the system. Available as syslog, SMTP (email), SNMP traps and displayable in SSA. For more information see:
  - "Service Alarms" in Using Avaya IP Office™ Platform System Status Application.
  - The description of the **System | System Events** tab in Administering Avaya IP Office™ Platform with Manager.
  - The file 'IP_Office_Alarms_N_N_N.xlsx' contained on the IP Office Admin DVD.
- Audit trail of administrative logins, their source and result. Available as syslog events, also displayable in SSA and Manager. NOTE that user/phone based changes are not currently captured. For more information see:
  - "Control Unit Audit" in Using Avaya IP Office™ Platform System Status Application.
  - **File | Advanced | Audit Trail** in Administering Avaya IP Office™ Platform with Manager.
- Detailed audit trail of all administrative changes, including security settings. Available as syslog events only.
- For Server Edition, all events are active and send via syslog to the Primary Server.
- Reports of all calls available as Station Message Detail Reporting (SMDR) message that can be sent to 3rd party call loggers. For information, see the SMDR section in Administering Avaya IP Office™ Platform with Manager

Voicemail Pro

The following events and logging features are available for Voicemail Pro server:

- Audit trail of administrative logins. Available as syslog events only. For more information see: "Voicemail Pro Syslog" in Administering Avaya IP Office™ Platform Voicemail Pro. By default for Server Edition, all events are active and send via syslog to the Primary.
- Voicemail box login failures are reported via the IP Office failed login alarms, see above.

Contact Recorder

Audit trail details of administrative logins are available as syslog events and are displayed on the web administration page. For information, see **System | Audit Trail** in Administering Avaya IP Office Platform Contact Recorder.

one-X Portal

The following events and logging features are available for one-X Portal server:

- Audit trail of administrative logins. Available as syslog events only. By default for Server Edition, all events are active and send via syslog to the Primary.
- one-X client login failures are reported via the IP Office failed login alarms, see the IP Office section above.

Linux-based Servers

Server Edition, Linux Application Server and UCM servers generate security and audit logs via syslog, either saved internally or sent to a remote server.

- To enable the Linux OS security and audit logging, the following settings must be enabled on the **Web Control | Settings | General** tab.
  - Authentication and authorization privileges
  - Information stored by the Linux audit daemon (auditd)
  - Apache web server access_log and error_log
- By default for Server Edition, all events are active and send via syslog to the Primary where they can be stored, viewed and forwarded to external syslog servers. For more information see **Logs | Syslog Event Viewer** and **Settings | General | Syslog** in the Web Control application.

Other Components

- Firewall intrusion detection and reporting should be activated.
- SBC intrusion detection and reporting should be activated.

- Call logger unusual call activity detection and reporting should be activated.

Avaya Security Advisories and IP Office Updates

1. Register for Avaya Security Advisory notifications by using the E-Notification subscription procedures. See Avaya Product Security Support 96.
2. Register for IP Office Knowledgebase news, which includes updates on technical bulletins, application notes and technical tips using the options available at: https://ipofficekb.avaya.com.

8.3 Response to Incidents

Containment, eradication and recovery is the recommended process to follow if a security incident has been detected:

- Attacked/compromised systems should be isolated or otherwise protected as soon as possible.
- Avaya customers with information regarding any discovered security problems with Avaya products should create a Service Request using the Self Service link on https://support.avaya.com, or by contacting the Customer Support phone number under the Maintenance Support link (1-800-242-2121 for US domestic customers). Non-Avaya customers wishing to report a security finding with Avaya products should send this information to securityalerts@avaya.com. See Avaya Product Security Support 96 for further information.
- Avaya provides a document to assist customers with security requests, see https://downloads.avaya.com/css/P8/documents/100161515.
- If the attack is IP based, it may be possible to trace the source IP address to the ISP it's registered to and report it. In addition the IP address or subnet can be blocked by the firewall.
- A general guide to incident handling is provided by NIST Special Publication (SP) 800-61, Computer Security Incident Handling Guide. http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-61r2.pdf.

Chapter 9. Appendices

9. Appendices

9.1 Appendix A - Avaya Product Security Support

The Avaya Product Security Support Team (PSST) performs the following functions:

- Manages Avaya product vulnerabilities and threats.
- Maintains information posted at http://support.avaya.com/security.
- Performs security testing and auditing of the core products of Avaya.
- Resolves security-related field problems in support of Avaya Global Services.
- Manages the security at the securityalerts@avaya.com mailbox.

As a result, the PSST actively monitors security issues related to the following topics:

- Avaya products
- Products that are incorporated into Avaya products
- General data networking and telecommunications, as identified by government agencies

Before contacting Avaya on a security matter, please consult the Product Security Support Flow, which can be found at https://downloads.avaya.com/css/P8/documents/100161515. There is a link this document on the Avaya security support site at http://support.avaya.com/security.

When a security vulnerability is identified, the PSST determines susceptibility of Avaya products to those vulnerabilities and follows a process according to the Avaya's Product Security Vulnerability Response Policy defined at https://downloads.avaya.com/css/P8/documents/100045520. Depending on the category of risk, the PSST creates an Avaya Security Advisory to notify customers of the vulnerability.

9.1.1 Accessing Avaya Security Advisories

Avaya Security Advisories are posted on the Security Support web site at http://support.avaya.com/security. Customers can register at Avaya Support web site to receive email notifications of Avaya security advisories.

9.2 Appendix B - Default Trusted Certificates

The following certificates are trusted by IP Office and are present on initial default and security settings reset (IP Office Release 10.1 and higher):

DigiCertICA.cer:

```
-----BEGIN CERTIFICATE-----
MIIElDCCA3ygAwIBAgIQAf2j627KdciIQ4tyS8+8kTANBgkqhkiG9w0BAQsFADBh
MQswCQYDVQQGEwJVUzEVMBMGA1UEChMMRGlnaUNlcnQgSW5jMRkwFwYDVQQLExB3
d3cuZGlnaWNlcnQuY29tMSAwHgYDVQQDExdEaWdpQ2VydCBHbG9iYWwgUm9vdCBD
QTAeFw0xMzAzMDgxMjAwMDBaFw0yMzAzMDgxMjAwMDBaME0xCzAJBgNVBAYTAlVT
MRUwEwYDVQQKEwxEaWdpQ2VydCBJbmMxJzAlBgNVBAMTHkRpZ2lDZXJ0IFNIQTIg
U2VjdXJlIFNlcnZlciBDQTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEB
ANyuWJBNwcQwFZA1W248ghX1LFy949v/cUP6ZCWA1O4Yok3wZtAKc24RmDYXZK83
nf36QYSvx6+M/hpzTc8zl5CilodTgyu5pnVILR1WN3vaMTIa16yrBvSqXUu3R0bd
KpPDkC55gIDvEwRqFDu1m5K+wgdlTvza/P96rtxcflUxDOg5B6TXvi/TC2rSsd9f
/ld0Uzs1gN2ujkSYs58O09rg1/RrKatEp0tYhG2SS4HD2nOLEpdIkARFdRrdNzGX
kujNVA075ME/OV4uuPNcfhCOhkEAjUVmR7ChZc6gqikJTvOX6+guqw9ypzAO+sf0
/RR3w6RbKFfCs/mC/bdFWJsCAwEAAaOCAVowggFWMBIGA1UdEwEB/wQIMAYBAf8C
AQAwDgYDVR0PAQH/BAQDAgGGMDQGCCsGAQUFBwEBBCgwJjAkBggrBgEFBQcwAYYY
aHR0cDovL29jc3AuZGlnaWNlcnQuY29tMHsGA1UdHwR0MHIwN6A1oDOGMWh0dHA6
Ly9jcmwzLmRpZ2ljZXJ0LmNvbS9EaWdpQ2VydEdsb2JhbFJvb3RDQS5jcmwwN6A1
oDOGMWh0dHA6Ly9jcmw0LmRpZ2ljZXJ0LmNvbS9EaWdpQ2VydEdsb2JhbFJvb3RD
QS5jcmwwPQYDVR0gBDYwNDAyBgRVHSAAMCowKAYIKwYBBQUHAgEWHGh0dHBzOi8v
d3d3LmRpZ2ljZXJ0LmNvbS9DUFMwHQYDVR0OBBYEFA+AYRyCMWHVLyjnjUY4tCzh
xtniMB8GA1UdIwQYMBaAFAPeUDVW0Uy7ZvCj4hsbw5eyPdFVMA0GCSqGSIb3DQEB
CwUAA4IBAQAjPt9L0jFCpbZ+QlwaRMxp0Wi0XUvgBCFsS+JtzLHgl4+mUwnNqipl
5TlPHoOlblyYoiQm5vuh7ZPHLgLGTUq/sELfeNqzqPlt/yGFUzZgTHbO7Djc1lGA
8MXW5dRNJ2Srm8c+cftIl7gzbckTB+6WohsYFfZcTEDts8Ls/3HB40f/1LkAtDdC
2iDJ6m6K7hQGrn2iWZiIqBtvLfTyyRRfJs8sjX7tN8Cp1Tm5gr8ZDOo0rwAhaPit
c+LJMto4JQtV05od8GiG7S5BNO98pVAdvzr508EIDObtHopYJeS4d60tbvVS3bR0
j6tJLp07kzQoH3jOlOrHvdPJbRzeXDLz
-----END CERTIFICATE-----
```

GDigiCertRoot.cer:

```
-----BEGIN CERTIFICATE-----
MIIDrzCCApegAwIBAgIQCDvgVpBCRrGhdWrJWZHHSjANBgkqhkiG9w0BAQUFADBh
MQswCQYDVQQGEwJVUzEVMBMGA1UEChMMRGlnaUNlcnQgSW5jMRkwFwYDVQQLExB3
d3cuZGlnaWNlcnQuY29tMSAwHgYDVQQDExdEaWdpQ2VydCBHbG9iYWwgUm9vdCBD
QTAeFw0wNjExMTAwMDAwMDBaFw0zMTExMTAwMDAwMDBaMGExCzAJBgNVBAYTAlVT
MRUwEwYDVQQKEwxEaWdpQ2VydCBJbmMxGTAXBgNVBAsTEHd3dy5kaWdpY2VydC5j
b20xIDAeBgNVBAMTF0RpZ2lDZXJ0IEdsb2JhbCBSb290IENBMIIBIjANBgkqhkiG
9w0BAQEFAAOCAQ8AMIIBCgKCAQEA4jvhEXLeqKTTo1eqUKKPC3eQyaKl7hLOllsB
CSDMAZOnTjC3U/dDxGkAV53ijSLdhwZAAIEJzs4bg7/fzTtxRuLWZscFs3YnFo97
nh6Vfe63SKMI2tavegw5BmV/Sl0fvBf4q77uKNd0f3p4mVmFaG5cIzJLv07A6Fpt
43C/dxC//AH2hdmoRBBYMql1GNXRor5H4idq9Joz+EkIYIvUX7Q6hL+hqkpMfT7P
T19sdl6gSzeRntwi5m3OFBqOasv+zbMUZBfHWymeMr/y7vrTC0LUq7dBMtoM1O/4
gdW7jVg/tRvoSSiicNoxBN33shbyTApOB6jtSj1etX+jkMOvJwIDAQABo2MwYTAO
BgNVHQ8BAf8EBAMCAYYwDwYDVR0TAQH/BAUwAwEB/zAdBgNVHQ4EFgQUA95QNVbR
TLtm8KPiGxvDl7I90VUwHwYDVR0jBBgwFoAUA95QNVbRTLtm8KPiGxvDl7I90VUw
DQYJKoZIhvcNAQEFBQADggEBAMucN6pIExIK+t1EnE9SsPTfrgT1eXkIoyQY/Esr
hMAtudXH/vTBH1jLuG2cenTnmCmrEbXjcKChzUyImZOMkXDiqw8cvpOp/2PV5Adg
06O/nVsJ8dWO41P0jmP6P6fbtGbfYmbW0W5BjfIttep3Sp+dWOIrWcBAI+0tKIJF
PnlUkiaY4IBIqDfv8NZ5YBberOgOzW6sRBc4L0na4UU+Krk2U886UAb3LujEV0ls
YSEY1QSteDwsOoBrp+uvFRTp2InBuThs4pFsiv9kuXclVzDAGySj4dzp30d8tbQk
CAUw7C29C79Fv1C5qfPrmAESrciIxpg0X40KPMbp1ZWVbd4=
-----END CERTIFICATE-----
```

To remove that default trust a file can be used with, use the IP Office Trusted Certificate Store delete feature:

- Create a text file with an extension '.pem', open and copy the above PEM data including the 'BEGIN CERTIFICATE' and 'END CERTIFICATE' lines. The line termination can be Windows or Linux.
- One .pem, file per certificate
- Using the IP Office or Web Manager File Manager feature, copy the file to the ***system/primary/certificates/tcs/delete*** directory
- Restart IP Office

To add a default trusted certificate, the above steps can be followed, but copy the file to the ***system/primary/certificates/tcs/add*** directory

The default certificate feature also supports the binary DER format; see Certificates and Trust 32 for more information on certificate file formats.

9.3 Appendix C - Windows Certificate Management

The certificate store used by a number of Avaya applications to save and retrieve X509 certificates is the default one provided by the Windows operating system. The Windows certificate store is relevant to the many applications running on Windows that uses certificates for security, either TLS or HTTPS, including:

- IP Office Manager
- Avaya Communicator
- Google Chrome Browser
- Safari Browser
- Microsoft Internet Explorer
- Microsoft IIS (used by Windows Voicemail Pro)

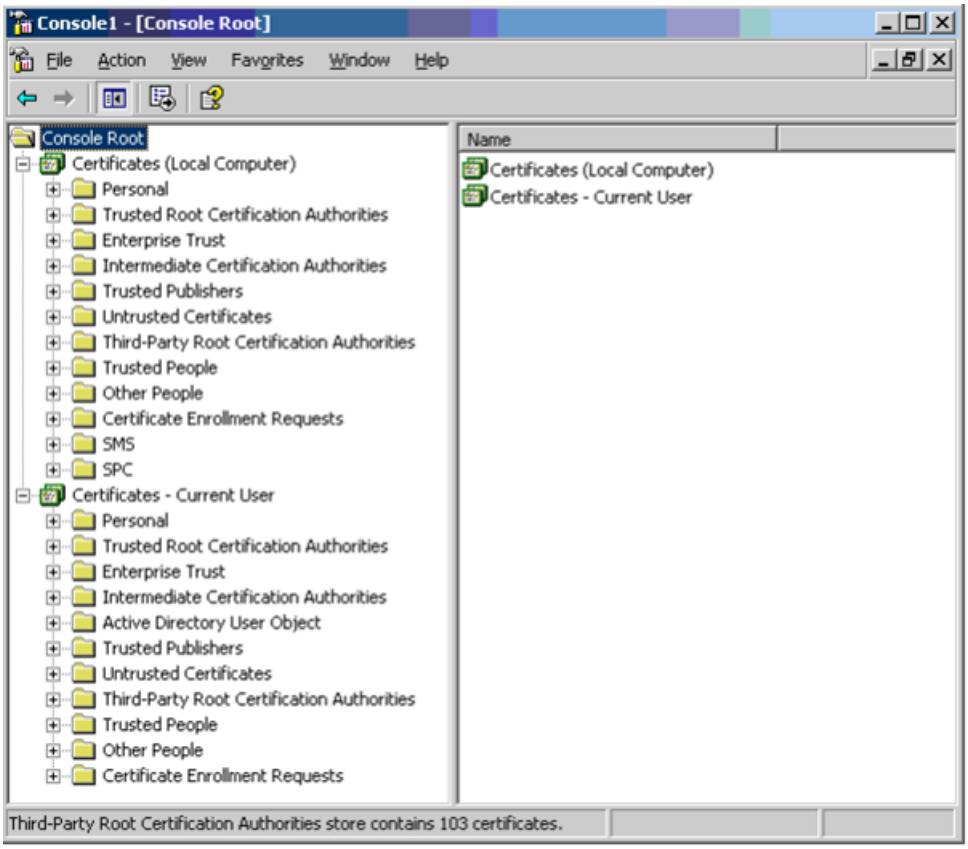
There are some applications that currently do not use the Windows certificate store:

- IP Office SoftConsole – uses a local certificate file
- Firefox Browser – uses its own internal certificate store
- Java Runtime environment 1.6, 1.7 and 1.8 – uses its own internal certificate store
- one-X Portal for Windows server – uses a local certificate file

- **Warning:**
  Avaya accepts no responsibility for changes made by users to the Windows operating system. Users are responsible for ensuring that they have read all relevant documentation and are sufficiently trained for the task being performed.

9.3.1 Windows Certificate Store Organization

By default, certificates are stored in the following structure:



Each of the sub folders has differing usage. The Certificates - Current User area changes with the currently logged-in windows user. The Certificate (Local Computer) area does not change with the currently logged-in windows user.

IP Office Manager and other Windows applications only access some of the certificate sub folders:

Certificates (Local Computer) Folder	Usage
Personal | Certificates	Folder searched by Manager and some Web Browsers 1st for a certificate to send to the IP Office when requested. Certificate matched by the subject name contained in File | Preferences | Security | Certificate offered to the system. Folder accessed whenever 'Local Machine certificate store' used for Security Settings. Folder searched by Manager for matching certificate when certificate received from the system, and File |Preferences | Security | Manager Certificate Checks = Medium or High.
Trusted Root Certification Authorities | Certificates	Folder searched by Manager for matching root CA certificate when non-self-signed certificate received from IP Office, and File | Preferences | Security | Manager Certificate Checks = Medium or High. Folder searched by some browsers and other applications for matching root CA certificate when a certificate received from IP Office.

Certificates - Current User Folder	Usage
Personal | Certificates	Folder searched by Manager 2nd for a certificate to send to the IP Office when requested. Certificate matched by the subject name contained in File | Preferences | Security | Certificate offered to the system. Folder accessed whenever 'Current User certificate store' used for Security Settings. Folder searched by Manager for matching certificate when certificate received from IP Office, and File | Preferences | Security | Manager Certificate Checks = Medium or High.
Trusted Root Certification Authorities | Certificates	Folder searched by Manager for matching parent certificates when non-self-signed certificate received from the system, and File | Preferences | Security | Manager Certificate Checks = Medium or High. This folder is not used by non-Microsoft applications such as Chrome or Safari browsers – the corresponding Local Computer folder is used.
Other People | Certificates	Folder searched by Manager for matching parent certificates when non-self-signed certificate received from the system, and File | Preferences | Security | Manager Certificate Checks = Medium or High. This folder is not used by non-Microsoft applications such as Chrome or Safari browsers – the corresponding Local Computer folder is used.

9.3.2 Certificate Store Import

In order to use certificates – either for security settings or Manager operation – they must be present in the windows certificate store. Certificates may be placed in the store by the Certificate Import Wizard. The Certificate Import Wizard can be used whenever a certificate is viewed. In order for Manager to subsequently access this certificate the Place all certificate in the following store option must be selected:

- If the imported certificate is to trust the IP Office, the Trusted Root Certification Authorities folder should be used, and the certificate imported should be the root CA certificate.
- If the certificate is to subsequently identify the Manager, the Personal folder should be used, and the associated private key saved as well.

9.3.3 Certificate Store Export

Any certificate required outside of the Windows PC must be first saved in the Certificate store then exported. If the certificate is to be used for identity checking (i.e. to check the far entity of a link) the certificate alone is sufficient, and should be saved in PEM or DER format.

If the certificate is to be used for identification (i.e. to identify the near end of a link) the certificate and private key is required, and should be saved in PKCS#12 format, along with a 'strong' password to access the resultant .pfx file.

9.3.4 Certificates Console

The Windows Certificates Console is a Microsoft Management Console (MMC) snap-in that can be used to manage the Windows certificate store including viewing, importing and exporting.

For more information on the Certificates Console, see:
http://social.technet.microsoft.com/wiki/contents/articles/2167.how-to-use-the-certificates-console.aspx

9.4 Appendix D - SRTP Troubleshooting

This section provides notes for SRTP troubleshooting.

9.4.1 Troubleshooting Tools

System Status Application

- Active Calls displays whether call is secure, direct media or relayed, whether SRTP is done by VCM or CPU on IP500 V2. Linux servers always use CPU.

SysMonitor

- For capturing SRTP traces, set filters to default trace options plus:
  - **SIP | Sip + Verbose**
  - **Media | Media Events |Media handlers**
  - **Media | VoIP Events | VoIP + Verbose**
  - **Media | VoIP Events | Primitive + Verbose**
- During calls, in **Status | [S]RTP Sessions** window, column secure describes whether SRTP is used in that call and whether it is done by VCM or CPU on IP500 V2. Use **Show SRTP** button to display further details on SRTP sessions.

9.4.2 Troubleshooting Tips

First step in troubleshooting is to check whether the system and all participating devices are correctly configured. Some endpoints need to be registered using TLS to have SRTP available.

- Ensure that the system is using the default settings for advanced options. If that is not the case, check that it is intentional.
- If SIP devices are used and Best Effort is configured, check with SSA/SysMonitor how SRTP is negotiated and whether the device supports cap neg (can be checked by placing a call to device with both SRTP and RTP and then checking whether it responds with SRTP or RTP – if it is SRTP, cap neg is supported). If not, override device media security settings and configure ***Enforce*** or ***Disabled***, as appropriate.
- IP Office lines with Best Effort configured and both crypto suites are enabled can result in large call initiation messages on IP Office lines, ~ 5000 bytes. If the link is slow and/or the call rate is high it can have a negative impact. Consider using only one crypto suite or the lines' **VoIP Settings | Media Security** setting to ***Enforce*** or ***Disabled***.
- Some phones do not support RTCP (SRTCP); verify operation with SRTCP disabled.

9.5 Appendix E - IP Office Interface Certificate Support

The following table provides an overview of certificate support for the IP Office Platform IP interfaces.

- **Note:** The relevant endpoint or server documentation should be consulted as supported features may vary with release.

For a full list of ports, see the relevant IP Office port matrix which can be found at https://support.avaya.com/security.

Link	Protocol	Cert Support	ID Cert Offered[1]	Cert Trust Checks[2]	Cert check Control[3]	Notes
IP Office						
SIP Line	SIP-TLS	✓	Tel	Bi	✓	
SM Line	SIP-TLS	✓	Tel	Bi	✓	
SIP Extension	SIP-TLS	✓	Tel	Cli	✗	See IP Office VoIP Endpoint Security 106 for more details.
H323 Extension – signalling	H323-TLS	✓	Man	Cli	n/a	TLS option from R10.0 onwards See IP Office VoIP Endpoint Security 106 for more details.
H323 Extension – provisioning	HTTPS	✓	Man	Bi	✓	See IP Office VoIP Endpoint Security 106 for more details.
DECT R4 Provisioning	HTTPS	✓	Man	Bi	✓	See IP Office VoIP Endpoint Security 106 for more details.
D100 Provisioning	HTTP	✗	n/a	n/a	n/a	
IP Office Line	HTTPS	✓	Man	Bi	✓	WebSocket
IP Office Manager - Security	TLS	✓	Man	Bi	✓	Manager and SE Manager
IP Office Manager - Configuration	TLS	✓	Man	Bi	✓	Manager and SE Manager
SoftConsole	HTTPS	✓	Man	IPO	✓	WebSocket
SSA	TLS	✓	Man	IPO	✗	
Web Manager (single)	HTTPS	✓	Man	Bi	✓	Web Manager single instance management over port 8443
Web Manager (solution)	HTTPS	✓	Man	Cli	✗	Web Manager Server Edition management over port 7070
System Directory	HTTPS	✓	Man	Bi	✓	Central external directory feature
one-X Portal CTI	TCP	✗	n/a	n/a	n/a	
IPOCC CTI	TLS	✓	Man	Srv	✓	IP Office is the server
ACCS CTI	TLS	✓	Man	Srv	✓	IP Office is the server
one-X Portal Directory	HTTPS	✓	Man	Srv	✓	IP Office is the server
Voicemail Pro	HTTPS	✓	Man	Srv	✓	IP Office is the server
Backup/Restore client	HTTPS	✓	Man	Cli	✓	
SysMonitor	HTTPS	✓	Man	Srv	✓	IP Office is the server
Voicemail Pro						
one-X Portal status	TCP	✗	n/a	n/a	n/a	Message Status
one-X Portal VM play	HTTPS	✓	Man	✗	✗	
Exchange WS client	HTTPS	✓	Man	Srv	n/a	
SFTP Client	SSHv2	✓				Exporting voicemail and recording data
one-X Portal						
one-XP Browser/ Call Assistant	HTTPS	✓	Man[4]	Cli	✗	

Link	Protocol	Cert Support	ID Cert Offered[1]	Cert Trust Checks[2]	Cert check Control[3]	Notes
Outlook, SalesForce, Lync Plugin	HTTPS	✓	Man[4]	Cli	✗	
one-X Mobile Android	HTTPS	✓	Man[4]	Cli	✗	See IP Office VoIP Endpoint Security 106 for more details.
one-X Mobile iOS	XMPP-TLS	✓	Man[4]	Cli	✗	See IP Office VoIP Endpoint Security 106 for more details.
Communicator Windows	HTTPS	✓	Man[4]	Cli	✗	See IP Office VoIP Endpoint Security 106 for more details.
Communicator iOS	XMPP-TLS	✓	Man[4]	Cli	✗	See IP Office VoIP Endpoint Security 106 for more details.
Linux Server						
Backup/Restore server	HTTPS	✓	Man	Cli	✗	
Web Control	HTTPS	✓	Man	Cli	✗	
SSH Server	SSHv2	✓				
SFTP Server	SSHv2	✓				
WebLM Server						
Web Admin	HTTPS	✓	Man	Cli	✗	WebLM is the server
Contact Recorder						
Web Admin	HTTPS	✓	Man	Cli	✗	Contact Recorder is the server

Notes:

1. Type of ID certificate presented:
   - **Tel** – Telephony or Management (configurable).
   - **Man** – Management certificate.
2. Support and direction of certificate trust checks:
   - **Bi** – Mutual certificate checks can be enabled.
   - **Svr** – Only the server can check certificates.
   - **Cli** – Only the client can check certificates.
3. The color indicates the grouping for the certificate check controls on the IP Office server component:

Color	Control	Notes
✓	Manager Security: **System | Certificates | Received Certificate Checks (Telephony)**	Any setting other than None will request a client certificate See Certificate Check Controls 43 for further information.
✓	Manager Security: **System | Services | HTTP | Service Security Level** Manager Security: **System | Certificates | Received Certificate Checks (Management)**	See Certificate Check Controls 43 for further information.
✓	Manager Configuration: **Line | Line | Security**	The HTTP service security level setting is applied first. This allows the general HTTPS server to have cert checks disabled, but still retain check for IP Office lines
✓	Manager Security: **System | Services | Security Administration | Service Security Level** Manager Security: **System | Certificates | Received Certificate Checks (Management)**	See Certificate Check Controls 43 for further information.
✓	Manager Security: **System | Services | Configuration | Service Security Level** Manager Security: **System | Certificates | Received Certificate Checks (Management)**	See Certificate Check Controls 43 for further information.
✓	Manager Security: **System | Services | Web Services | Service Security Level** Manager Security: **System | Certificates | Received Certificate Checks (Management)**	See Certificate Check Controls 43 for further information.

Color	Control	Notes
✓	Manager Security: **System | Certificates | Received Certificate Checks (Management)**	IP Office HTTP clients will check the server certificate against the TCS for a setting of Medium or High See Certificate Check Controls 43 for further information.
✓	Manager Security: **System | Unsecured Interfaces | TAPI = unchecked**	IP Office will check the ACCS or IPOCC server certificate against the TCS as per a setting of Medium See Certificate Check Controls 43 for further information.

4. one-X Portal for Windows uses a separately administered ID certificate

9.6 Appendix F - IP Office VoIP Endpoint Security

The following table provides an overview of the various security aspects of Avaya endpoints with respect to IP Office.

- Note: The relevant endpoint or server documentation should be consulted as supported features may vary with release.

IP Office VoIP Endpoint	Secure Media	Secure Signalling[13]	Secure Remote Settings[1]	IP Office Auto-gen Settings	SIPS Support	Validate Server Cert?	Offer ID Cert?[7]	IP Office Subject Alt Name Required?[8]
Avaya H.323 Endpoint								
9608, 9611, 9621 and 9641	✓	✓ or partial[2]	✓	✓[10]	n/a	✓	✓	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1 IP.2: IP address of IP Office LAN2 IP.3: Public IP Address if remote.[14]
Other 9600 Phones	✗	✗	✓	✓	n/a	✓	✓	✗
1600 Series	✗	✗	✗	✓	n/a	✓	✓	✗
DECT R4	✗	✗	✓	✓	n/a	✓	✓	✗
IP Office[3]	✓	✓	✓	n/a	n/a	✓	✓	✗
Voicemail Pro[4]	✗	✗	✓	n/a	n/a	✗	✗	✗
Avaya SIP Endpoint								
9608, 9611, 9621, 9641[5]	✓	✓	✓	✗	✓	✓	✓	✗
1100/1200 Series[9]	✓[11]	✓	✓	✓	✗	✓	✓	IP.1: IP address of IP Office LAN1 IP.2: IP address of IP Office LAN2 IP.3: Public IP Address if remote
B179	✓[11]	✓	✓	✓	✓	✓	✓	✗
E129	✓	✓	✓	✓	✓	✓	✓	DNS.1: FQDN of IP Office DNS.2: IP address of IP Office if the phone is configured to connect to SIP server using IP address instead of FQDN[14] SIP URI: IP address of IP Office
J129	✓	✓	✓	✓	✓	✓	✓	IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP Address if remote[14] URI.1:'sip':SIP FQDN[14]
J139, J169, J179	✓	✓	✓	✓	✓	✓	✓	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP Address if remote[14] URI.1:'sip':SIP FQDN[14]
	✓	✓	✓	✓	✓	✓	✓	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP Address if remote[14] URI.1:'sip':SIP FQDN[14]
H175	✓[11]	✓	✓	✓[10]	✓	✓	✓	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP Address if remote.[14]
E159	✗	✗	✗	✓	✗	✗	✗	✗
E169	✗	✗	✗	✓	✗	✗	✗	✗
Scopia XT series	✓	✓	n/a	✗	✓[6]	✓	✓	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP address if remote.[14]

IP Office VoIP Endpoint	Secure Media	Secure Signalling[13]	Secure Remote Settings[1]	IP Office Auto-gen Settings	SIPS Support	Validate Server Cert?	Offer ID Cert?[7]	IP Office Subject Alt Name Required?[8]
Communicator iPad[12]	✓	✓	n/a	✗	✓[6]	✓	✗	✗
Communicator Windows[12]	✓	✓	n/a	✗	✓[6]	✓	✗	✗
one-X Mobile iOS	✓	✓	n/a	✗	✓[6]	✓	✗	✗
one-X Mobile Android	✓	✓	n/a	✗	✗	✓	✗	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP address of IP Office if remote[14]
D100 SIP DECT	✗	✗	✗	✓	✗	✗	✗	✗
Equinox	✓	✓	✓	✓	✓	✓	✓	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP address if remote.[14]
IP Office Web Client	✓	✓	n/a	✗	n/a	✓	✗	DNS.1: FQDN of IP Office IP.1: IP address of IP Office LAN1[14] IP.2: IP address of IP Office LAN2[14] IP.3: Public IP address if remote.[14]

Notes:

1. Ability for the phone to remotely download settings and configuration in a secure manner, typically via HTTPS.
2. When H323-TLS is not used, signalling is not fully secured, but registration, SRTP Key exchange and dialled digits are.
3. IP Office line with WebSocket and security active.
4. Link between Voicemail Pro and its host IP Office. For Server Edition and UCM this is an internal link.
5. 9608, 9611, 9621 and 9641 SIP phones only supported as Centralized Users in a branch deployment.
6. SIPS always active when Secure Signalling selected.
7. IP Office does not request certificates from SIP clients for the SIP-TLS session at present. It may request a certificate for any HTTPS transfer according to the **Mutual Authentication** setting; see See Certificate Check Controls 43 for further information..
8. This column indicates whether the client requires Subject Alternative Name support within the received identity certificate from IP Office.
   Typically if DNS is used, the VoIP Endpoint only requires the FQDN of the IP Office in the SAN and no IP Address. IP Addresses and private domain names are not supported by public Certificate Authorities.
9. 1100/1200 Series and J129 phones do not support FQDNs and hence cannot be used with certificates provided by public Certificate Authorities.
10. The IP Office root CA certificate can be provisioned to the phone automatically by IP Office using the auto-generated settings file. See the Endpoint Configuration chapter of Deploying OnAvaya™ and Powered by Avaya IP Office and IP Office Contact Center For Business Partners for more information.
11. Direct media is disabled when SRTP is enabled.
12. Client does not fully support TLSv1.2; when one-X Portal admin setting 'TLS v1.2 clients only' is active, Communicator for Windows will not connect, Communicator for iPad will operate, but without XMPP presence.
13. When VoIP endpoint resilience is active with secure signalling or secure provisioning, the root CA certificate for both home and backup server must be the same.
14. Certificate IP Address entries required only if configured to connect to signalling server using IP address. Unless a private, closed deployment utilising the Primary CA, IP addresses are not recommended.
15. Phone does not support secure RTCP (SRTCP).

16. 16. If IP address entries have to be used for the device with Public CAs which cannot have IP address name entries, some phone settings files can be enhanced to use the FQDN_IP_MAP entry. This maps IP Address entries to FQDNs. See the relevant phone documentation for support of this feature. If the IP Office Auto-gen Settings file feature is used, the FQDN_IP_MAP entry can be added to a '46xxspecials.txt' file at the same path where the phone binaries can be found. For example, to map IP Addresses to FQDN for 9608, 9611, 9621 and 9641 phones only:

```
IF $MODEL4 SEQ 9608 GOTO 96X1SETTINGS
IF $MODEL4 SEQ 9611 GOTO 96X1SETTINGS
IF $MODEL4 SEQ 9621 GOTO 96X1SETTINGS
IF $MODEL4 SEQ 9641 GOTO 96X1SETTINGS
GOTO END
# 96X1SETTINGS
SET FQDN_IP_MAP "ipo1.ca.avaya.com=10.136.100.70,ipo12.ca.avaya.com=10.136.100.74"
# END
```

9.7 Appendix G - Using the IP Office Certificate Authority

The Certificate Authority (CA) feature of the Linux Application Server and Server Edition Primary can be used to:

- Generate an identity certificate for the server itself.
- Generate identity certificates for other devices including IP Office systems, phones and servers.
- Import a new signing certificate.
- Refresh the existing signing certificate.

The CA feature can be accessed via Web Manager **Platform View | Settings | Certificates | Identity Certificates**.

9.7.1 Generating the CA Server's Own Identity Certificate

By default, the Primary or Linux Applications Servers' own identity certificate is automatically created and signed by the internal CA. It is also automatically re-generated if the LAN1 IP Address, LAN2 IP Address or hostname is changed. This is controlled by the Web Management setting **Platform View | Settings | Certificates | Identity Certificates | Renew automatically**.

To manually create an identity certificate for the CA server:

1. Uncheck the setting **Platform View | Settings | Certificates | Identity Certificates | Create certificate for a different machine**.
2. Enter a unique subject name if the default offered is not acceptable. See Certificate Name Content 41 for more information.
3. Enter the subject alternative names if the default offered is not acceptable. See Certificate Name Content 41 for more information.
   It is recommended that a full set of subject alternative names are supplied to ensure compatibility with various Avaya clients and endpoints:

   DNS:<FQDN of server>, IP:<LAN1 IP address>, IP:<LAN2 IP address>, IP:<Public IP address>, DNS:<SIP domain>, URI:sip:<SIP domain>, URI: <LAN1 IP address>, URI: <LAN2 IP address>

   For example:

   ```
   DNS:example.com, IP:192.168.0.45, IP:192.168.1.45, IP:203.0.113.30, DNS:example.sip.com, URI:sip:example.sip.com, URI:192.168.0.45, URI:192.168.1.45, URI:sip:192.168.0.45
   ```

4. Enter the number of days the certificate will be valid for. The start date/time will be the current UTC time of the server. The end date/time will be start time + number of days. Identity certificates should not be valid for more than three years (1095 days). The longer the period, the greater the risk of certificate compromise.
5. Enter the Public Key Algorithm. This should be RSA-2048.
6. Enter the Secure Hash Algorithm. This should be SHA-256.
7. Check the settings and then click **Generate and Apply**. This will cause the server to generate and apply the new certificate to all interfaces during which service loss will occur.

9.7.2 Generating Identity Certificates for Other Devices

To manually create an identity certificate for another device:

1. Check the setting **Platform View | Settings | Certificates | Identity Certificates | Create certificate for a different machine**.
2. Enter the Machine IP. This is used to create the file name, but not the certificate itself; an IPv4 address of that device should be entered.
3. Enter the Password; this is used to secure the identity certificate file and must conform to the complexity requirements.
4. Enter a unique subject name for the device. See Certificate Name Content 41 for more information.
5. Enter any subject alternative names. See Certificate Name Content 41 for more information.
6. Enter the number of days the certificate will be valid for. The start date/time will be the current UTC time of the server. The end date/time will be start time + number of days. Identity certificates should not be valid for more than three years (1095 days). The longer the period, the greater the risk of certificate compromise.
7. Enter the Public Key Algorithm. This should be RSA-2048 for all IP Office devices. RSA-1024 should only be used for legacy systems that cannot support RSA-2048.
8. Enter the Secure Hash Algorithm. This should be SHA-256 for all IP Office devices. SHA-1 should only be used for legacy systems that cannot support SHA-256.
9. Check the settings and then click Generate. This will cause the server to generate a PKCS#12 file containing the identity certificate, private key and signing certificate. The file is secured by the password entered and will be requested every time the file is opened.
10. A popup will prompt to save the file. Save the file to the local machine. Once the popup is close, the file will be deleted on the CA server.
11. The PKCS#12 file can now be imported into the IP Office deployment. See Update Certificates 70 and Implementing IP Office PKI 51 for more information.
    - For one-X Portal Windows this is achieved via the one-X Portal admin web page.
    - For VMPro Windows the file is imported into IIS.
    - For IP Office and Linux servers use Web Manager.

9.7.3 Exporting the Signing Certificate

If the signing certificate is a root CA certificate, it will need to be exported in both PEM and DER formats for later import into various clients and servers in order to trust any identity certificate created by this CA. This does not export the private key, just the certificate.

To export the CA certificate in PEM format:

1. Select **Platform View | Settings | Certificates | CA Certificates | Download (PEM –encoded)**.
2. A popup will prompt to save the file which is named '***root-ca.pem***'. Save the file to the local machine for later distribution.

To export the CA certificate in DER format:

1. Select **Platform View | Settings | Certificates | CA Certificates | Download (DER–encoded)**.
2. A popup will prompt to save the file which is named '***root-ca.crt***'. Save the file to the local machine for later distribution.

9.7.4 Renewing/Replacing the Signing Certificate

To create a new signing certificate:

1. Select **Platform View | Settings | General | CA Certificate | Create new**.
2. This will create a completely new root CA certificate and will also require new ID certificates for all entities. The previous signing certificate will be deleted.

To keep all existing ID certificates but refresh the signing certificate:

Care must be taken not to abuse the convenience of this feature as the longer the public/private keys are unchanged, the greater the risk of compromise.

1. Select **Platform View | Settings | General | CA Certificate | Renew existing**.
2. This will create a new certificate with the same content and public/private keys, but a different serial number and start/end date.
3. Only this new root CA requires distribution, in-date existing ID certificates signed by the previous CA will still be valid.

To replace the existing signing certificate:

1. Select **Platform View | Settings | General | CA Certificate | Import**.
2. The format must be PKCS#12.
3. This will replace the signing certificate and may require new ID certificates for all entities

To back-up the signing certificate:

1. Select **Platform View | Settings | General | CA Certificate | Export**.
2. A password is requested to secure the PKCS#12 file
3. A popup will prompt to save the file which is named '***root-ca-p12***'. Save the file to the local machine and add a '***.p12***' extension.

To restore the signing certificate:

1. Select **Platform View | Settings | General | CA Certificate | Import**.

9.8 Appendix H - Certificate Signing Requests

One of the following methods can be used to obtain identity certificates based on a text-based Certificate Signing Request (CSR) to an external Certificate Authority (CA). In all cases the server used will retain the private key and therefore must be secured.

- Microsoft Management Console (MMC) Certificates Snap-in 113
- OpenSSL Package 116
- IP Office Linux server's command line (CLI) 118

For Microsoft Windows-based IP Office application servers for one-X Portal or Voicemail Pro, the Microsoft method is recommended and the server itself can be used to create the CSR and process the received certificate.

For the Linux Application server or Server Edition either method can be used, but the OpenSSL package of the IP Office server itself must not; another PC should create the CSR and process the received certificate.

This section contains procedures for using each method. There are procedures for converting certificate files.

9.8.1 Creating a CSR using Microsoft MMC Certificates Snap-in

Use the following processes.

9.8.1.1 Create the CSR

1. If the selected CA provides instructions or utilities to generate CSRs using Microsoft tools, those can be used in preference to the following steps providing the correct format and content result. Any question on format or content should be clarified with the CA.
2. The following step cover use of the Microsoft Management Console Certificates Snap-in to generate a CSR and process the signed identity certificate. The identity certificate will reside in the Local Machine Personal certificate store and will not active on any machine interface by default.
3. All steps must be carefully followed to avoid errors.
4. Further information on the snap-in and certificate operations can be found at: https://technet.microsoft.com/en-us/library/cc771157.aspx
5. Ensure all naming information has been identified (Common name, Alternate subject names, organization details etc.)
6. You must be logged in and run the console session as administrator.
7. To open the Microsoft Management Console (MMC):
   a. Click **Start**.
   b. In the Search box, type ***mmc***.
   c. Click **mmc.exe**.
8. Click **File > Add/Remove Snap-in**.
9. Click **Certificates > Add > OK**.
10. Select **Computer Account** and click **Next**.
11. Select **Local Computer** and click **Finish** then **OK**.
12. Expand **Certificates (Local Computer)**.
13. Right-click **Personal**, then click **Select All Tasks > Advanced Operations > Create Custom Request**.
14. Click **Next**.
15. Select **Proceed without enrolment policy** and click **Next**.
16. Select **(No Template) Legacy Key**.
17. Select **PKCS #10** and click **Next**.
18. In the Certificate Information section, click arrow button next to **Details** and click **Properties**.
19. On the **General** tab, type the domain name of the certificate in the **Friendly Name** field.
20. On the **Subject** tab, in the **Subject Name** field, enter the information below, clicking **Add** after entering each type:

Type	Value	Notes
Country	Country Name (2 letter code)	The Country Name is a 2 letter code defined by https://www.iso.org/obp/ui/#home; select Country codes, and click search e.g. US
State	State or Province name	Should not be abbreviated
Locality	Locality name	e.g. City
Organization	Organization name	e.g. Company Name
Organization Unit	Section/Department name	e.g. IT
Common Name	FQDN of server	e.g. www.example.com
Email	Contact email address	e.g. contact@example.com

21. Any entries not required (for example Organizational Unit Name) or not requested by the CA should not be added.
22. If the CSR is for a multi-domain/SAN certificate, in the Alternative Name field, enter the information below, clicking **Add** after entering each type:

Type	Value	Notes
DNS	DNS SAN entry	The first Alternative Name field should be DNS with the same value as the Common Name. e.g. www.example.com e.g. example.com
IP address (v4)	IP SAN entry	e.g. 192.168.0.42 e.g. 192.168.0.44
URL	URI SAN entry	e.g. sip:example.com e.g. 192.168.0.42

23. On the Extension tab, select **Key usage**.
24. Select **Non repudiation**, **Digital signature**, **Key encipherment**, **Data encipherment**, clicking **Add** after entering each option.
25. Unselect **Make these key usages critical**.
26. On the Extension tab, select **Extended Key Usage**.
27. Select **Server Authentication**, **Client Authentication**, clicking **Add** after entering each option.
28. Unselect **Make the Extended Key Usage critical**.
29. On the **Private Key** tab, select **Cryptographic Service Provider**, select **Microsoft Strong Cryptographic Provider (Encryption)** only.
30. On the Private Key tab, select **Key type**, select **Exchange**.
31. On the Private Key tab, select **Key options > Key size**, and set the value to ***2048***.
32. Select **Make Private Key Exportable**. Note: This step is important.
33. If presented, select **Select Hash Algorithm**, select **Hash Algorithm** and set the value to ***sha256***.
34. Review all entries; check the **Key options > Key size**, is still set to the value to ***2048***.
35. Click **OK** then **Next**.
36. Enter the filename (e.g. yourdomain) and location to save the CSR to. Ensure **Base 64** is selected. Click **Finish**.
37. Open the CSR file yourdomain.req in a text editor and copy all of the text, including the start and end lines.
38. Go to the CA and follow instruction to paste the full CSR into the SSL enrolment form of the CA. If requested, the server software used to generate the CSR can be specified as Microsoft, or Microsoft IIS 7. If requested, SHA-256 should be selected for the hash algorithm. SHA-1 should not be used.

9.8.1.2 Download and Import the Signed Identity Certificate

1. After approval and generation, receive/download the certificate files from the CA. There should be two or more files:
   - The signed identity certificate which needs to be in PKCS#7/P7B or PEM format
   - Zero, one or more intermediate certificates in PEM format
2. The root certificate should be downloaded in PEM and DER format and put aside for later distribution to IP Office systems.
3. Copy all to the original CSR directory.
4. See Certificate File Naming and Format 35 for more information on certificate file formats.
5. On the same server the certificate request was created on, open the MMC Certificates snap-in for the Local Computer account.
6. Expand **Certificates (Local Computer)**.
7. Right-click **Personal**, then click **Select All Tasks > Import**.
8. Click **Next**.
9. Browse and select the signed identity certificate received from the CA, then click Open.
10. Ensure that these options are always selected:
    - **Mark the Private Key Exportable**
    - **Import all Extended Properties**
    - **Import all Certificates in the Chain**

11. Click **Next**.
12. Select **Place all certificates in the following store**. Under **Certificate Store**, make sure **Personal** is selected. and click **Next**.
13. Complete the Certificate Import Wizard and click **Finish**.
14. Check there is a key icon on the new certificate, if not the private key is not present.
15. Repeat the import process to import the intermediate certificate file(s); there will be no key icon with these new certificates. Again these must go into the Personal certificate store.
16. Select the identity certificate and click **Open**, select **Details** and verify the content are as expected. Select **Certification Path** and verify all the certificates are present to the root certificate.

9.8.1.3 Export the Signed Identity Certificate

1. The identity certificate and its private key, root and intermediate certificate(s) are now stored in the Local Machine Personal certificate store. These can now be exported in an appropriate format for IP Office.
2. On the same server the certificate request was created on, open the MMC Certificates snap-in for the Local Computer account.
3. Expand **Certificates (Local Computer)**.
4. Right-click the identity certificate (the one with the key icon), then click **Select All Tasks > Export**, click **Next**.
5. Select **Yes, export the private key**, click **Next**.
6. Select: **Personal Information Exchange - PKCS #12 (.PFX)**, **Export all Extended Properties**, and **Include all Certificates in the certification path if possible** .
7. When prompted, a strong password should be used to secure the file. This password will be requested when later importing into IP Office.
8. Click **Next**.
9. Enter a filename (e.g. yourdomain) and then click **Next**, then **Finish**. The ID certificate file `yourdomain.pfx` should be renamed `yourdomain.p12`.
10. The PKCS#12 file `yourdomain.p12` now has the identity certificate, private key and all intermediate certificates.
11. `yourdomain.p12` can now be imported into the IP Office deployment; for one-X Portal Windows this is achieved via the one-X Portal admin web page. For VMPro Windows the file is imported into IIS. For IP Office and Linux servers use IP Office or Web Manager. See the relevant documentation and Implementing IP Office PKI 51 for more information.
12. The yourdomain.p12, root and intermediate certificate files should be retained and used for recovery purposes.
    - **Note:** A password will always be required to open the PKCS#12 file.

9.8.2 Creating a CSR using the OpenSSL Package

Use the following processes.

9.8.2.1 Create the CSR

1. OpenSSL package is a third-party product and Avaya cannot provide assurance or warranty of purpose in any form.
2. OpenSSL is available for both Microsoft windows and Linux machines. See https://www.openssl.org/. The following has been tested on Windows 64-bit OpenSSL version 1.0.2d.
3. All steps must be carefully followed to avoid errors.
4. If the selected CA provides instructions or utilities for the use of OpenSSL, those should be used in preference to the following steps. Any question on format or content should be clarified with the CA.
5. Ensure all naming information has been identified (Common name, Alternate subject names, organization details etc.)
6. You must be logged in and run the console session as administrator.
7. Create a directory for the CSR and key and change to it.
8. Create a text file openssl.cfg with the following content, ensure no additional line breaks:

```
[req]
distinguished_name = req_distinguished_name
req_extensions = v3_req
prompt = no
[req_distinguished_name]
countryName = Country Name (2 letter code)
stateOrProvinceName = State or Province Name (not abbreviated)
localityName = Locality Name (e.g. City)
organizationName = Organization Name (e.g. Company)
organizationalUnitName = Organizational Unit Name (e.g. Section/Department)
commonName = Common Name (e.g. www.example.com)
emailAddress = Email Address (e.g. contact@example.com)
[v3_req]
keyUsage = nonRepudiation, digitalSignature, keyEncipherment, dataEncipherment
extendedKeyUsage = serverAuth, clientAuth
subjectAltName = @alt_names
[alt_names]
DNS.1 = www.example.com
DNS.2 = example.com
IP.1 = 203.0.113.30
IP.2 = 203.0.113.40
URI.1 = sip:example.com
URI.2 = 203.0.113.30
URI.3 = sip: 203.0.113.30
```

9. The items in red must be replaced with the information specific to the CSR. Ensure that the information requested by the CA is supplied accurately.
10. The Country Name is a 2 letter code defined by https://www.iso.org/obp/ui/#home; select Country codes, and click Search.
11. Any entries not required (for example Organizational Unit Name) or not requested by the CA can be removed by removing the whole line.
12. If the certificate is for a single domain, remove all lines from `subjectAltName = @alt_names` and onwards.
13. If the certificate is for multiple domains, the first alt_name entry should be DNS.1 and the same as the Common Name (e.g. www.example.com).
14. Create the CSR and private key using the command line, ensuring no line breaks. The items in red should be replaced with the domain name of the device.

```
openssl req -new -out example.csr -newkey rsa:2048 -sha256 -keyout example.key -config
openssl.cfg
```

15. When requested ('Enter PEM pass phrase'), a strong password for the private key file should be entered. This will be requested later when combining the signed certificate.
16. Verify the CSR with the command line: `openssl req -text -noout -verify -in example.csr`

17. Check the output is as expected.
18. Open the CSR file example.csr in a text editor and copy all of the text
19. Go to the CA and follow instructions to paste the full CSR into the SSL enrolment form of the CA. If requested, the server software used to generate the CSR is OpenSSL, or 'Other'. If requested, SHA-256 should be selected for the hash algorithm. SHA-1 should not be selected.
20. Keep the example.key file for later use. Note a password will always be required to open the key file.

9.8.2.2 Download and Combine the Signed Identity Certificate

1. After approval and generation, receive/download the certificate files from the CA. There should be two or more files:
   - The signed identity certificate which needs to be in PEM format
   - Zero, one or more intermediate certificates which need to be in PEM format
2. If there are download options, selecting 'Other' or 'Apache' should provide the correct format.
3. Copy all to the original CSR directory. Rename the identity certificate to the domain name with a .crt extension.
4. The root certificate should be downloaded in PEM and DER format and put aside for later distribution to IP Office systems.
5. If there is more than one intermediate certificate file: In the original CSR directory , combine all the intermediate certificate files into one file using the single command line:

   ```
   cat intermediate1.crt intermediate2.crt intermediate3.crt > intermediates.crt
   ```

6. In the original CSR directory , join the files into a single PKCS#12 file along with the intermediate certificate file using the single command line:

   ```
   openssl pkcs12 -export -in example.crt -certfile intermediates.crt -inkey example.key -
   out example.p12
   ```

7. When prompted ('Enter pass phrase for example.key '), the password used to secure the private key file when creating the CSR should be entered.
8. When prompted ('Enter Export Password '), a strong password should be used to secure the output PKCS#12 file. This password will be requested when later importing into IP Office.
9. Review the PKCS#12 with the command line: `openssl pkcs12 -info -in example.p12`
10. The identity certificate, private key and all intermediates should be present.
11. The ID certificate file example.p12 and intermediates.crt can now be imported into the IP Office deployment. See the relevant documentation and Implementing IP Office PKI 51 for more information.
    - For one-X Portal Windows this is achieved via the one-X Portal admin web page.
    - For VMPro Windows the file is imported into IIS.
    - For IP Office and Linux servers use IP Office or Web Manager.
12. The example.key, example.p12, root and intermediate certificate files should be retained and used for recovery purposes.
    - **Note:** A password will always be required to open the PKCS#12 and key file.

9.8.3 Creating a CSR using the Linux Server Command Line

Use the following processes.

9.8.3.1 Create the CSR

All steps must be carefully followed to avoid errors.

1. Log in on the IPOL machine through the SSH service as Administrator, enter the certificates menu under the admin tab
2. Here the user can begin to create the CSR filling the SN and SAN parameters.
3. With the help of the csr_subjectName command the user can/should specify the following parameters: Country/State/Locality/Organization/OrganizationUnit/CommonName/Email as defined in the CSR parameters table above at the subject name fields.
4. Any entries not required (for example Organizational Unit Name) or not requested by the CA should not be added.
5. If the CSR is for a multi-domain/SAN certificate, the user has the possibility to add entries in the SAN fields with the help of the csr_subjectAltName (add) command. The valid values are DNS (DNS SAN entry), IP (IPv4 SAN entry), URI (URI SAN entry). We can specify multiple values for every entry, numbering them as per ex: DNS.1=test1csr.com, DNS.2=test2csr.com.
6. When all the parameters of the CSR have been filled the user should check the CSR generation configuration with the help of the csr_view_parameters command. The command will display the current configuration for the CSR. The user should see something similar on the console display:

```
[ req ]
distinguished_name = req_distinguished_name
req_extensions = v3_req
prompt = no
[ req_distinguished_name ]
C=US
ST=Tennessee
L=Nashville
O=CSRsTest
OU=CSRsTestDep
CN=testcsr.com
emailAddress=admin@testcsr.com
[ v3_req ]
basicConstraints = CA:FALSE
keyUsage = digitalSignature, nonRepudiation, keyAgreement, dataEncipherment, keyEncipherment
subjectAltName = @alt_names
subjectKeyIdentifier = hash
[ alt_names ]
DNS.1=testcsr.com
IP.1=192.168.42.1
URI.1=sip:testcsr.com
```

7. The user should then issue the generate_csr command which will generate the CSR, it will store the private key of the CSR in a location only accessible by root and it will display the generated CSR in the console.
8. The user should copy the from the console the generated CSR (that is view as text starting with the -----BEGIN CERTIFICATE REQUEST----- string and it ends with the -----END CERTIFICATE REQUEST----- string.
9. The CSR can be pasted in a text file and can be signed at a public CA or a private one resulting in a signed certificate based on a CSR generated on the IPOL machine.

9.8.3.2 Download and Combine the Signed Identity Certificate

1. After approval and generation, receive/download the certificate file(s) from the CA.
2. The user can import a signed certificate in CLI under the admin/certificates menu with the help of the **import_certid** command. This command does not need any arguments. After invokation the CLI awaits the input of a signed certificate beginning with the string -----BEGIN CERTIFICATE----- and ending with the string -----END CERTIFICATE-----. The certificate should be in pem format (text).
3. If the certificate is valid (the certificate text is valid and also the certificate Is based on a CSR generated on the same ipol machine) the ipol machine will import the certificate into ipoffice application.
4. Upon successful operation an Operation Successful will be reported to the user.

5. The user will be able to read and set the certificate distribution flag through the **read_distribution_flag** and **set_distribution_flag** (on/off) so the certificate will remain the default one only for the ipoffice application (distribution flag off) or it will be distributed for all the applications on the machine (distribution flag on).

9.8.4 Converting Certificate Files

The intermediate.crt file can be in PEM or DER format; it is PEM format if viewable using a text editor.

If other formats are required OpenSSL can be used:

To convert PEM to DER:

```
openssl x509 -outform der -in intermediate.crt -out intermediate.der
```

To convert DER to PEM:

```
openssl x509 -inform der -in intermediate.crt -out intermediate.pem
```

To convert PKCS#7 to PEM:

```
openssl pkcs7 -print_certs -in certificate.pb7 -out certificate.pem
```

To convert PKCS#7 and private key to PKCS#12:

```
openssl pkcs7 -print_certs -in certificate.pb7 -out certificate.pem
openssl pkcs12 -export -in certificate.pem -inkey privateKey.key -certificate.pfx -
certfile CAcert.cer
```

You will be asked for an encryption key for the resultant PKCS#12 file.

To convert PEM certificate and private key to PKCS#12:

```
openssl pkcs12 -export -in certificate.pem -inkey privateKey.pem -
certificate.pfx
```

You will be asked for an encryption key for the resultant PKCS#12 file. You may also be asked for the private key password.

See Certificate File Naming and Format 35 for more information.

9.9 Appendix I - Secure Provisioning of 9608, 9611, 9621 and 9641 H.323 Phones

You can configure endpoints with or without staging. The staging process is the most secure.

In the less secure alternative without staging, the phone does not authenticate the server with the initial HTTPS connection. If the initial phone connection to HTTPS is hijacked to an attacker's file server, the fraudulent file server can become trusted by the phone.

In deployments with stronger security requirements where this risk is not acceptable, the phones must be staged in a controlled environment.

9.9.1 Recommended Staging Process

Prepare the file server at the staging center. It can be an IP Office acting as the file server, and possibly also as the DHCP server, or it can be another HTTP file server. The following few steps list the files that have to be placed on the staging file server:

1. Put the phones upgrade file and firmware files on the staging file server.
2. Put the certificate of the root CA that signed the cloud IP Office identity certificate (or the root CA that signed the top intermediate CA in the certificate chain of the IP Office identity certificate) on the staging file server.
3. Edit the phones settings file per customer to contain the following settings, and put it on the staging file server:
4. **NVTLSSRVR**, **NVHTTPSRVR** and **NVMCIPADD** - all three settings should specify the DNS name (FQDN) of the cloud IP Office instance. This FQDN will be resolved by DNS to the public IP address of the cloud IP Office instance. Note that the cloud IP Office instance for each customer will have a different FQDN and public IP address, hence the settings file has to be edited for staging phones for each customer.
5. As an alternative to the above, the HTTPS Sever IP Address, HTTP Sever IP Address and Call Server IP Address can be manually configured on each phone using the CRAFT UI. But since programming phones manually via CRAFT UI can be very time consuming, the preferred method is setting the parameters using the staging settings file per the bullet above.
6. **SET TRUSTCERTS** <filename of root CA certificate>
7. **SET TLSSRVRVERIFYID 1** - This is a new parameter in the 9608, 9611, 9621 and 9641 H.323 phone R6.5. When set to 1, the phone will verify the server identity in TLS connections, which is recommended for security. The phone will verify that the DNS name of the TLS server (as set in **NVTLSSRVR**) matches the Common Name or subjectAltName in the server certificate.
8. Connect the phone to the staging center network, and provide it with the staging file server IP address, from DHCP or from the phone UI.
9. The phone will contact the staging file server via HTTP and will download the upgrade and settings files, the trusted root CA certificate, and the firmware files if needed.
10. After staging, the phone is shipped to customer site.
11. The phone is connected to the LAN at the customer site and powered up.
12. The phone contacts the cloud IP Office via HTTPS over TLS, using the NVTLSSRVR IP address it previously got from the staging settings file, and using port 411 (phone's default value of TLSPORT). The port 411 has to be open in the cloud firewall and in the IP Office. An authenticated TLS connection will be established, as the phone will verify the identity certificate (or identity certificate chain) that the cloud IP Office offers in the TLS connection, by checking it against the trusted root CA cert that the phone got during staging.
13. The phone will get the 96x1Hupgrade.txt file and the auto-generated 46xxsettings.txt file from the cloud IP Office through the HTTPS/TLS connection. The phone will also get the language files from the cloud IP Office through HTTPS.
14. The auto-generated 46xxsettings.txt will specify **HTTPPORT 8411**. The port number 8411 has to be open in the cloud firewall, whereas port 80 will probably be closed.
15. This is based on an enhancement on the IP Office. Port 8411 is hard-coded on the Linux IP Office and is open for restricted HTTP access allowing only Avaya IP phones to get only firmware files.
16. IP Office includes the setting **HTTPPORT 8411** in the auto-generated 46xxsettings.txt file sent to a phone if and only if the request for the settings file came in HTTPS (not HTTP) and IP Office determines that the phone is connecting from the Internet. IP Office makes this determination if the source IP address of the request is not an RFC 1918 private address and not in the customer's private network as can optionally be specified in **NUSN "PRIVATE_ADDR"**.
17. If new phone firmware is available on the cloud IP Office, as indicated in the upgrade file, the phone will get it from the cloud IP Office via HTTP on port 8411 as specified by the HTTPPORT in the auto-generated 46xxsettings.txt.
18. Ensure during initial provisioning the impact of a large number of sets performing firmware downloads.

9.9.2 Automated Process

1. Make sure that the Root CA certificate, which was used to sign the IP Office identity certificate, is installed in the IP Office Trusted Certificate Store
2. If the trust policy selected for the IP Office uses a well-known public CA, download the PEM-encoded root CA certificate from the CA's web site and install it in the IP Office Trusted Certificate Store using IP Office Manager Security Mode **System | Certificates | Trusted Certificate Store | Add**.
3. If the trust policy selected for the IP Office uses its own internal CA, then the root CA certificate will already be in the IP Office Trusted Certificate Store.
4. Make sure that the IP Office identity certificate includes a Subject Alternative Name field containing the public IP address of the IP Office.
5. This is needed for the phones to be able to verify the server identity, when the phones are configured to connect to the IP Office's public IP address. It is not needed when the phones are configured through staging to connect to the IP Office's FQDN.
6. If IP Office is using an identity certificate generated by its own internal CA, then you need to generate a new identity certificate with the public IP address in Subject Alternative Name. Caution: Re-generate only the identity certificate and do not unnecessarily re-generate the root CA certificate, which can be disruptive (see below).
7. Configure in each phone the following parameters through the phone's CRAFT menu: HTTPS Sever IP Address, HTTP Sever IP Address and Call Server IP Address. All three parameters have to be set to the IP address of the IP Office.
8. The phone is restarted, whereby it contact the IP Office and automatically obtains and installs the Root CA certificate of the IP Office.

9.10 Appendix J - Application/Client Security Dependencies

The following tables provide an overview of IP Office components and their dependencies on various IP Office security settings.

Applications

IP Office Component	Interface Controls	Login Account	IP Office Certificate Use	Other Controls	Notes
IP Office Manager	IP Office Service: - Configuration (secure) - Security Administration (secure) Legacy Interface: - Program Code	Service User	Yes: - Management		Program Code used for Manager upgrade of IP500 V2 only
Web Management	IP Office Service: - Web Services	Service User	Yes: - Management		
Web Control	IP Office Service: - External	Service User	Yes: - Management		
Voicemail Pro	IP Office Service: - HTTP (secure)	Voicemail password	Yes: - Management		
one-X Portal	IP Office Service: - EnhTSPI Legacy Interface: - HTTP directory read - HTTP directory write	Service User	No		
SSA	IP Office Service: - System Status	Service User	Yes: - Management		
SoftConsole	IP Office Service: - HTTP	IP Office User	Yes: - Management		

IP Office Component	Interface Controls	Login Account	IP Office Certificate Use	Other Controls	Notes
SysMonitor	IP Office Service: - HTTP Legacy Interface: - DevLink	Service User or Monitor password	Yes: - Management	SysMonitor will use a service user when the **Security | System | Unsecured Interfaces | Use Service User Credentials** is active	
TAPI	Legacy Interface: - TAPI	System password	No		TAPI installer requires IP Office TAPI service enabled
DevLink	Legacy Interface: - DevLink	Monitor password	No		DevLink installer requires IP Office DevLink service enabled (?)
Contact Recorder	None	Internal to Contact Recorder		Disable service in Web Control	
WebRTC Client	IP Office Service: - External	Service User			See WebRTC client below
DECT R4 Master base station	IP Office Service: - HTTP (secure) Legacy Interface: - TFTP directory read	Service User	Yes: - Management		See DECT R4 extension below
ACCS		Internal to ACCS			See ACCS documentation
IPOCC		Internal to IPOCC			See IPOCC documentation
WebLM	Disable service	Internal to WebLM			See WebLM documentation

Lines

IP Office Component	Interface Controls	Login Account	IP Office Certificate Use	Other Controls	Notes
IP Office Line	IP Office Service: - HTTP	IP Office Line password	Yes: - Management		
SIP Line	Remove SIP line	SIP Line	Yes: - Management - Telephony		
Analogue/Digital	Remove line	No	No		Analogue/ Digital lines cannot be removed

UC Clients

IP Office Component	Interface Controls	Login Account	IP Office Certificate Use	Other Controls	Notes
Avaya Communicator	one-X Portal Service	IP Office User	Yes: - Management	HTTPS only can be enabled by the setting Protocol | Secure Connection (HTTPS)	
one-X Mobile	one-X Portal Service	IP Office User	Yes: - Management		HTTPS only can be enabled

IP Office Component	Interface Controls	Login Account	IP Office Certificate Use	Other Controls	Notes
one-XP Browser/ Call Assistant	one-X Portal Service	IP Office User	Yes: - Management		HTTPS only can be enabled
Outlook, SalesForce, Lync Plugin	one-X Portal Service	IP Office User	Yes: - Management		HTTPS only can be enabled
Web Collaboration	one-X Portal Service	IP Office User	Yes: - Management		HTTPS only can be enabled
WebRTC	WebRTC service SIP Registrar	IP Office User	Yes: - Management		

Extension

IP Office Component	Interface Controls	Login Account	IP Office Certificate Use	Other Controls	Notes
DECT R4	IP DECT Line	IP Office User, SARI/ PARK	No	Auto-create DECT extension	
H.323	H323 Registrar	IP Office User Or Extension password	Yes: - Management	Auto-create H323 extension	TLS only can be enabled
SIP	SIP Registrar	IP Office User	Yes: - Management	Auto-create SIP extension	
Analogue/Digital	No	IP Office User	No		Analogue/ Digital extensions cannot be removed

Chapter 10.
Document History

10. Document History

Date	Issue	Change Summary
29th March 2018	**03a**	Update for IP Office R11.0: • SHA-384 no longer supported. • SHA-224 now supported.
15th May 2018	**03b**	• Alignment with CID168370 V12 updates. • Correction of version numbers (02>03 range).
13th September 2018	**03c**	• Minor typo corrections.
23rd January 2019	**03d**	• Remove 96x0/96x1 references.
20th November 2019	**03e**	• Notes for changes for iOS 13/macOS 10.15 support[7]. • Notes for changes for Android 10 support[8].
6th January 2020	**03f**	• Update IP Office Knowledgebase site links.
28th October 2020	**03g**	Remove obsolete external link.

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