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4Motion®

System Manual

Release 2.5M2
April 2010
P/N 215637

Document History

Topic	Description	Date Issued
Preliminary Release for Early Field Trials	New System Manual	January 2008
Preliminary Release for Beta		May 2008
Release for GA		July 2008
SDR Section 1.3.1.3	Removed	August 2008
Template	Changed	September 2008
Power Feeder Section 1.3.4	Supported in release 2.5	December 2008
7 MHz Channel Bandwidth Table 1-4, relevant sections in Chapter 4.	Supported in release 2.5	December 2008
Installing 4x2 ODU Section 2.1.4	Updated (including new installation options)	December 2008
Installation recommendation Section 2.3.9.1	Recommendation on installing AUs in a 3-sector configuration	December 2008
Trap Manager Section 2.1.5	Modified instructions for initial configuration	December 2008
Operation and Administration Using the CLI Chapter 4	Updated to reflect NPU SW Version 2_5_1_8	December 2008
Rate Limiting for the NPU Section 3.3.7.2	Rate limits are configurable only by the vendor.	May 2009
Configuring ACLs Section 3.3.10	Updated default ACLs.	May 2009
Configuring Performance Data Collection Section 3.3.13	Added support for new counters groups, updated names.	May 2009
Configuring the Power Control Required C/N Level Parameters Section 3.8.6.2.2	Updated Defaults for cqi, cdma, qam64-1by2, qam64-2by3, qam64-3by4, qam64-5by6.	May 2009
Managing the BS Keep-Alive Functionality Section 3.8.26	Updated commands' syntax.	May 2009
Managing the BS Idle Mode Parameters Section 3.8.28	New feature	May 2009

Topic	Description	Date Issued
Managing BS Services Section 3.8.4	Added new parameters: paging-cycle, paging-offset, lm-traffic-idle-period, dl-def-rate. Updated range and default value for max-subburst.	May 2009
Managing Ranging Parameters Section 3.8.23	The following tables were removed from operator CLI: Bandwidth Request, Handover Ranging, Initial Ranging, Periodic Ranging, Timing Correction. contbased-rsrvtimeout was removed from Ranging General table.	May 2009
Airframe General Parameters Sections 3.8.16.2.1, 3.8.16.3.1, 3.8.16.5.1	Updated parameters: Removed: enable-ul-scrotation. Added: auto-diversity, auto-rx-enable. Corrected name: ul-duration.	May 2009
Airframe Cyclic Delay Parameters Section 3.8.16.2.4	Updated descriptions.	May 2009
Airframe Linear Delay Parameters Previously Section 4.8.16.2.5	Updated descriptions.	May 2009
Airframe Mapping Parameters Previously Section 4.8.16.2.6	Updated descriptions.	May 2009
Airframe Receive Parameters Previously Section 4.8.16.2.7	Updated descriptions.	May 2009
Airframe Downlink Diversity Parameters Section 3.8.16.2.3	Changed value range and default for the mimo parameter.	May 2009
Airframe MIMO Parameters Sections 3.8.16.2.8, 3.8.16.3.5, 3.8.16.5.8	New Airframe parameters table.	May 2009
Neighbor BS General Parameters Sections 3.8.13.2.1, 3.8.13.3.1, 3.8.13.7.1	Updated parameters: Removed: restartcount ucd-configchangecount and dcd-configchangecount must be set to 0. Added: paging-grp-id, nbr-strt-rng-codes. Updated range and description: preamble-idx	May 2009

Topic	Description	Date Issued
Service Mapping Rule R1 Profile Parameters Sections 3.8.5.2.3, 3.8.5.6.3	Removed: sdu-length, sdu-size. All possible values of datadeliverytype are supported (including rTVR and nRTVR). Updated descriptions of cir, mir, latency. Updated range for cir, mir.	May 2009
Service Mapping Rule R6 Profile Parameters Section 3.8.5.2.4,	Updated range for cir, mir.	May 2009
Feedback Allocation Parameters Section 3.8.7	Removed: pr-cdma, ert-poll-enable. Default value of ir-cdma changed from 20 to 2. Updated description of max-cqi.	May 2009
Trigger Setup Parameters Section 3.8.10	Removed: hysteresismargin, timetotrigger Updated description of avgduration-rssi.	May 2009
Neighbor BS Trigger Setup Parameters Sections 3.8.13.2.3, 3.8.13.3.3, 3.8.13.7.3	Removed: hysteresismargin, timetotrigger	May 2009
Rate Adaptation Parameters (was previously Section 4.8.20)	All Rate Adaptation parameters were removed.	May 2009
Scan Negotiation Parameters Section 3.8.11	Removed: all parameters except enable-modify.	May 2009
Handover Negotiation at SBS (was previously 4.8.12)	All Handover Negotiation at SBS parameters were removed.	May 2009
UCD Parameters (was previously 4.8.15)	All UCD parameters were removed.	May 2009
DCD Parameters (was previously 4.8.16)	All DCD parameters were removed.	May 2009
Authentication Relay Parameters Section 3.8.18	Removed: nonauth-macctrlratethrshld, nonauth-pduratethrshld Updated the default value of maxeaproundsthrshld to 100. Updated the default value of suspendedeapprocthrshld to 10000. Updated the description. Updated the default value of activemsthrshld to 1024.	May 2009

Topic	Description	Date Issued
Handover Control Parameters Section 3.8.23	All configurable (read-write) parameters were removed. A new read-only parameter added: CINRReuse.	May 2009
BS Management Alarm Thresholds (was previously 4.8.26)	All BS Management Alarm Thresholds parameters were removed.	May 2009
BS Alarm Threshold Parameters Section 3.8.24	Removed: dl-droppedpackets, unalloc-slots, dl-retransmissions, ul-retransmissions, dl-subburstdrop, ul-subburstdrop. Updated description, range and default for ul-mednoise, ul-99prcntnoise. Added: Be-exc-dl-drop-thr, rt-exc-dl-drop-thr, nrt-exc-dl-drop-thr, ugs-exc-dl-drop-thr, ert-exc-dl-drop-thr.	May 2009
Managing the Site General Information Section 3.3.15.7	Added section on displaying the site general information. Address parameter value was changed to up to 70 characters. Removed: AsnName, Region.	May 2009
Managing the Unique Identifier Section 3.3.15.8	Added section on displaying the site ID.	May 2009
Displaying the Vendor Identifier Section 3.3.15.9	New feature.	May 2009
AU Connectivity Parameters Sections 3.5.2.3, 3.5.3.3, 3.5.6.3	Added new parameters: service-ip, service-mask, service-next-hop. Updatated possible values of bearervlanid and the read-only InternalManagementVLANID parameters.	May 2009
Configuring Physical and IP Interfaces Section 3.3.2	AU Fast Ethernet interfaces are not configurable.	May 2009

Topic	Description	Date Issued
AAA Client Configuration Section 3.3.11.13.1	Updated with new parameters/commands and additional changes related to support of multiple AAA clients and AAA Redundancy. In addition: Removed the auth-port and acct-port parameters. Added command for configuring the format of the Calling Station ID MAC Address. Added configuration rules for primary-serveraddr and alternate-serveraddr. Updated default and presence requirement for primary-serveraddr. Updated default and presence requirement for rad-sharedsecret. Updated description, default, possible values and presence requirement for src-intf. Added comment: If the bearer interface IP address is being modified after aaa-client configuration, you must re-configure the src-intf parameter to "bearer" so that the aaa-client will attach itself to the new bearer interface IP address.	May 2009
Global RADIUS Parameters Configuration Section 3.3.11.13.2	Added: alrmAaaSwitchoverRetryFailThrshld	May 2009
PIU HW Version Section 3.3.15.1.2	Updated parameter's possible values.	May 2009
Displaying the Current Status of Shelf Components Section 3.10.1.2	Added description of displayed details.	May 2009
Service Group Section 3.3.11.14.1	srvc-grp (grp-alias) possible values changed to 1-30 characters,	May 2009
Service Profile Section 3.3.11.15.3.1	profile-name possible values changed to 1-30 characters,	May 2009
Classification Rules Section 3.3.11.15.4.1	clsf-rule <rulename> possible values changed to 1-30 characters,	May 2009
PHS Rules Section 3.3.11.16.1	phs-rule <rulename> possible values changed to 1-30 characters,	May 2009

Topic	Description	Date Issued
Bearer Plane QoS Marking Rules Section 3.3.11.11.1	qos-alias possible values changed to 1-30 characters, media-type possible values changed to 1-30 characters,	May 2009
Log File Name Section 3.3.12.1.5	file-name possible values changed to 1-50 characters,	May 2009
AU Maintenance VLAN ID Section 3.3.3	New feature	May 2009
AU Connectivity Parameters Sections 3.5.2.3, 3.5.3.3, 3.5.6.3	Added service interface parameters.	May 2009
Neighbor BS Triggers/Specific BS Triggers Sections 3.8.13.2.4, 3.8.13.7.5, 3.8.13.4	Added new table: Neighbor BS Specific BS Triggers. Updated-added details on deleting Neighbor BS Triggers.	May 2009
Power Control Target Noise and Interference Level Parameters Sections 3.8.6.2.1, 3.8.6.3.1, 3.8.6.5.1	Added: power-control-correction-factor.	May 2009
Managing Power Control Levels and Policies Section 3.8.6	The following tables were removed: Open Loop Correction Policy, Open Loop Correction Range, Closed Loop - Unstable MS, Closed Loop - MS in Network Entry, Closed Loop Correction Range.	May 2009
GPS Position Parameters Section 3.3.15.2.4	Added possible values details to Latitude and Longitude.	May 2009
GPS General Configuration Parameters Sections 3.3.15.2.2, 3.3.15.2.7	Removed: AdaptorRequired	May 2009
GPS Clock Mode Was previously in sections 4.3.15.2.5, 4.3.15.2.11	Removed	May 2009

Topic	Description	Date Issued
AU Properties Sections 3.5.2.1, 3.5.3.1, 3.5.6.1	Updated possible values for required-type. Removed: required-ports, required-bandwidth (and the corresponding InstalledPorts and InstalledBandwidth). Updated options for port-3 power and port-4-power parameters (removed the NA option).	May 2009
Sector Parameters Section 3.9.1	heading is not mandatory when creating a new sector. The default value is 0.	May 2009
Antennas Section 3.7	heading is not mandatory when creating a new antenna. Limitation related to antenna heading vs. sector heading was removed). Removed: gain, altitude, beamwidth, electrical-azymuth-adjustment. Added: antenna-product-id.	May 2009
BS Bearer Interface Parameters Section 3.8.17	Added: bearer-vlan. Updated possible values for linkusage-hardthrshld.	May 2009
Managing MSs for Specific MS Advanced Mode Data Collection Section 3.8.27	New feature.	May 2009
Handover Negotiation at TBS Parameter Section 3.8.12.1	The default value of defaultactiontime was changed to 9.	May 2009
Power Control Maximum EIRP Section 3.8.6.2.2	The default value for maxeirp was changed to -99.	May 2009
Neighbor Advertisement Parameters Section 3.8.8	Removed: mininterval-normalload, mininterval-highload.	May 2009
IGMP Parameters Section 3.3.11.2	Configurable only by the vendor.	May 2009
MIP Foreign Agent Parameters Section 3.3.11.3	Configurable only by the vendor.	May 2009
Proxy-MIP Client Parameters Section 3.3.11.4	Configurable only by the vendor.	May 2009
ASN Interface Parameters Section 3.3.11.5	Configurable only by the vendor. Updated display format.	May 2009
Authenticator Function Parameters Section 3.3.11.6	Configurable only by the vendor. Updated display format.	May 2009

Topic	Description	Date Issued
Data Path Function Parameters Section 3.3.11.7	Configurable only by the vendor. Updated display format.	May 2009
Context Function Parameters Section 3.3.11.8	Configurable only by the vendor. Updated display format.	May 2009
MS State Change Parameters Section 3.3.11.9	Configurable only by the vendor. Updated display format.	May 2009
Connectivity Service Network (CSN) Parameters Section 3.3.11.10	Configurable only by the vendor. Updated display format.	May 2009
Enabling/Disabling VLAN Service Interface Section 3.3.11.14.3	Added default (disable).	May 2009
Service Flows Sections 3.3.11.15.3.3, 3.3.11.15.3.5	Removed: ulSfQosSduSize, dlSfQosSduSize. Updated syntax of commands for better support of commands auto-completion. ul-unsol-intrvl not applicable for RTVR data delivery type. ulqos-trafficpriority and dlqos-trafficpriority not applicable for UGS. Updated range for ulqos-maxsustainedrate, dlqos-maxsustainedrate, ul-rsrv-rate-min, dl-rsrv-rate-min.	May 2009
Monitoring Software Components Section 3.10.2	Removed details on counters-full and updated information is provided in the Performance Management document.	May 2009
Displaying Statistics for Physical and IP Interfaces Section 3.10.3	Removed details on counters-full and updated information is provided in the Performance Management document.	May 2009
System Log Files Sections 3.3.12.1.5, 3.10.4	Corrected directory name to tftpboot/management/system_logs (added s at the end)	May 2009
Policy Framework Section 3.3.11.17	New feature	May 2009
Power Feeders Configuration Section 3.3.15.3	pfAuSlotNoDestination, pfAuPortNoDestination are optional.	May 2009
DHCP Server/Proxy Parameters Sections 3.3.11.14.4.2, 3.3.11.14.4.3.	Added: Second DNS support (dnssrvr-addr2)	May 2009

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Dry Contact Input Alarms Sections 3.3.15.4, 3.3.15.6	Added alarmPolarity	May 2009
Displaying the Active Clear Timer and Event Rate Limit Section 3.3.14.2.6	New command	May 2009
ODUs Sections 1.3.3, 2.1.3, 3.6.1.1, 3.6.1.2, 3.6.1.6, 3.6.2. Tables 1-3, 1-7, 1-11, 1-21.	Added new ODUs: ODU-HP-2.3-WCS, ODU-2340-2400-000N-36-1X1-N-0, ODU-2480-2690-000N-38-4X2-N-0. Removed: 2x1 ODUs. Updated the list of ODU types in CLI (including types that are not available yet).	May 2009
ODU General Parameters Sections 3.6.1.2, 3.6.1.3, 3.6.1.6.	Removed: heater-existence	May 2009
Antennas Table 1-35, Table 1-38	Added antennas: ANT.2.3-2.7GHz, D/S,65°,16±0.5dBi, ANT.3.5GHz, D/S,65°,16±0.5dBi	May 2009
Airframe Uplink Feedback Zone Parameters Section 3.8.16.2.4	Updated limitation for subchannels.	May 2009
Service Mapping Rule R6 Profile Parameters Section 3.8.5.2.4	Updated range for mediaflowtype.	May 2009
Configuring General Service Mapping Rule Parameters Section 3.8.5.2.1	Updated description of the srvc parameter.	May 2009
Performance Data Collection Section 3.3.13, Table 3-5	Updated syntax of commands for better support of commands auto-completion.	May 2009
Configuring Common Parameters of a Service Group Section 3.3.11.14.2	Updated syntax of commands for better support of commands auto-completion. Updated description of dhcp-ownaddr.	May 2009
Enabling/Disabling VLAN Service Interface Section 3.3.11.14.3	Updated syntax of commands for better support of commands auto-completion.	May 2009
Configuring the DHCP Server/Proxy/Relay Section 3.3.11.14.4	Updated syntax of commands for better support of commands auto-completion.	May 2009

Topic	Description	Date Issued
IP-IP Service Interface Parameters Sections 3.3.11.12.2.1, 3.3.11.12.3.1	Updated syntax of commands for better support of commands auto-completion.	May 2009
Displaying Configuration Information for the Service Interface Section 3.3.11.12.6	Updated	May 2009
VLAN Service Interface Parameters Sections 3.3.11.12.2.2, 3.3.11.12.3.2	Updated syntax of commands for better support of commands auto-completion. Updated possible values and description for vlan-id. Added mask for dflt-gw-ip.	May 2009
QinQ Service Interface Parameters Section 3.3.11.12.2.3	Updated syntax of commands for better support of commands auto-completion. Updated possible values and description for vlan-id.	May 2009
ASN-GW Keep-Alive Parameters Section 3.3.11.17	Updated syntax of commands for better support of commands auto-completion.	May 2009
Configuring Power Feeders Section 3.3.15.3.1	Updated syntax of commands for better support of commands auto-completion.	May 2009
RF Frequency Section 3.8.14	Updated possible values.	May 2009
General Neighbor BS Parameters Section 3.8.13.2.1	Updated possible values.	May 2009
Bearer Interface IP Address Section 3.3.2.3.3	Addedd comment: After changing the bearer IP address, save configuration and reboot to apply changed IP address on ASN and CSN interfaces.	May 2009
IP Connectivity Mode Section 3.3.1.1	Added comment: You must save the configuration for a change in connectivity mode to take effect after next reset.	May 2009
Next Boot Mode Section 3.3.4.1	Added comment: You must save the configuration for a change in boot mode to take effect after next reset.	May 2009
Restoring the Factory Default Configuration With Connectivity Section 3.3.5.4.7	New feature.	May 2009
displaying Failures in Configuration Restore Operations Section 3.3.5.4.8	New feature.	May 2009

Topic	Description	Date Issued
Privilege Levels Sections 3.1.5.5, 3.1.6	The highest privilege level available for users is 10.	May 2009
DGW Profile Sections 3.3.11.15.3.1, 3.3.11.15.3.3.1	Added a note (parameters related to DGW profile are not applicable in current release).	May 2009
Power Feeders Requirements Section 2.3.3.3	Required only in configurations with 6 AUs where each AU is connected to 4 2.x GHz or 3.5 GHz 1x1 ODUs.	May 2009
Configuring the Properties of the Physical Interface Section 3.3.2.1.2	Physical interfaces can be configured when the interface is enabled.	May 2009
Managing AUs Section 3.5	Up to 6 AUs may be active (removed limitation on number of AUs that can provide services).	May 2009
Managing BSs Section 3.8	Removed the requirement to explicitely configure at least one parameter in tables with no mandatory parameters.	May 2009
Apply command Table 3-30, Sections 3.8.6, 3.8.20, 3.8.23.	Apply command not required for Power Control Levels and Policies, Control Traffic QoS Marking Rules and Ranging parameters, unless none of the BS General parameters was configured.	May 2009
BS Geneal Parameters Section 3.8.3	Added ul-def-rate, dl-def-rate.	May 2009
Commissioning-NPU Local Connectivity-External Management Interface Section 2.1.3.3	No need to shut-down external interface before configuring IP parameters.	May 2009
Commissioning-Completing the Site Configuration Using AlvariSTAR-Equipment Configuration-AU Section 2.2.4.1	Updated (only supported Type is AU 4x4 Modem, Ports and Bandwidth parameters were removed).	May 2009
Commissioning-Completing the Site Configuration Using AlvariSTAR-Equipment-Antenna Section 2.2.4.3	Updated: Added Antenna Product Type, Number of Ports applicable only if Antenna Product Type is set to Empty, Heading is not mandatory.	May 2009

Topic	Description	Date Issued
Commissioning-Completing the Site Configuration Using AlvariSTAR-BS Configuration Section 2.2.6	Removed the requirement for clicking Apply on Radio Advanced screen and Connectivity Advanced screen.	May 2009
Commissioning-Completing the Site Configuration Using AlvariSTAR-ASNGW Configuration	It is not mandartory to define AAA client (the default client can be used).	May 2009
Creating a Sector Association Entry Section 3.9.2.1	Updated association rules (relation between antenna-type, auto-diversity and auto-rx-enable parameters.	May 2009
Changes in Site Configuration Section 2.1.3.4	Reset is required only for a change in Connectivity Mode.	June 2009
Accessing the CLI from a Remote Terminal Section 3.1.2.2	No need to disable/enable the interface when configuring an IP Address.	June 2009
Adding/Modifying Users Section 3.1.6.1.1	Updated the command's syntax.	June 2009
Displaying the IP connectivity Mode Section 3.3.1.2	Updated display format.	June 2009
Managing VLAN Translation Section 3.3.2.1.3	Updated ranges. VLAN Translation entry can be created also when VLAN Translation is disabled.	June 2009
Configuring IP Interfaces Section 3.3.2.3	VLAN ID of Local Management Interface is configurable. It is not necessary to shut down an IP interface for configuring its parameters.	June 2009
Configuring a QoS Classification Rule Section 3.3.8.2.2	IP address of local-management can also be used as host source IP address.	June 2009
Configuring Static Routes Section 3.3.9	Added a note regarding automatically added/deleted kernel routes.	June 2009
Configuring ACLs in the Standard Mode Section 3.3.10.1.2	Removed paragraph on Standard ACL 1 which was previously available by default.	June 2009
Configuring Permit/Deny Rules from/to a Specific Protocol and Source/Destination IP Addresses Section 3.3.10.1.3.1	Any IANS value can be configured for the protocol-type parameter, including IP, OSPF and PIM.	June 2009

Topic	Description	Date Issued
Attaching/De-attaching ACLs to/from an Interface Section 3.3.10.3	Removed paragraph on Standard ACL 1 which was previously available by default.	June 2009
Enabling the Interface Configuration Mode Section 3.3.10.3.1	By default, all traffic destined towards the AUs is denied and all traffic towards the NPU is permitted.	June 2009
Deleting Next-hop IP Address-Network ID Mappings Section 3.3.11.1.2	nw-id parameter is optional.	June 2009
Managing the Authenticator Function Section 3.3.11.6	Updated descriptions for eapTimerTransfer and eapCounterTransferMax.	June 2009
Managing the Data Path Function Section 3.3.11.7	Updated descriptions of dpTimerInitPathRegReq, dpCounterInitPathRegReqMax, dpTimerMsDeregReq, dpCounterMsDeregReqMax, dpTimerPathRegReq, dpCounterPathRegReqMax, dpTimerPathRegRsp, dpCounterPathRegRspMax.	June 2009
Managing the Context Function Section 3.3.11.8	Updated descriptions of all parameters.	June 2009
Managing the MS State Change Functionality Section 3.3.11.9	Updated descriptions of msscfnTimerMsscRsp, msscfnCounterMsscRspMax, msscfnTimerMsscDrctvReq, msscfnCounterMsscDrctvReqMax.	June 2009
Configuring Bearer Plane QoS Marking Rules Section 3.3.11.11	Corrected value: Up to a maximum of 20 Bearer Plane QoS Marking Rules can be defined.	June 2009
Deleting Bearer Plane QoS Marking Rules Section 3.3.11.11.5	"int_default" and "ext_default" Bearer Plane QoS Marking Rules cannot be deleted.	June 2009
Enabling the Service Interface Configuration Mode\Creating a Service Interface Section 3.3.11.12.1	Updated the value of the Service Interface alias parameter (1-30 characters).	June 2009
Configuring Parameters for IP-IP Service Interface Section 3.3.11.12.2.1	srcaddr is mandatory. The only allowed value is the Bearer IP Address. dstaddr is mandatory. Updated description of dstaddr.	June 2009

Topic	Description	Date Issued
Configuring Parameters for VLAN Service Interface Section 3.3.11.12.2.2	vlan-id and dflt-gw-ip are mandatory.	June 2009
Configuring Parameters for QinQ Service Interface Section 3.3.11.12.2.3	vlan-id is mandatory.	June 2009
Configuring the AAA Client Functionality Section 3.3.11.13	rad-CallingStationId parameter added to AAA Client parameters config command (instead of *config aaaserverMACFormat* command added in a previous version of this release).	June 2009
Restoring Operation with the Primary Server Section 3.3.11.13.1.2	Updated command syntax and description.	June 2009
Deleting the AAA Client Section 3.3.11.13.1.4	“default” client cannot be deleted.	June 2009
Configuring DHCP Server Parameters Section 3.3.11.14.4.2.1	No need to delete service group for updating pool-minaddr & pool-maxaddr values. Corrected range for lease-interval (24-4294967295). Added rules for pool-minaddr & pool-maxaddr. Added rules for renew-interval.	June 2009
Deleting a Service Group Section 3.3.11.14.9	To delete a VLAN type service group, first execute the "no vlan-enable" command.	June 2009
Configuring Parameters for the Policy Framework Previousely Section 4.3.11.17.2	aaa-alias must be the alias of an active AAA client.	June 2009
Managing the ASN-GW Keep-Alive Functionality Section 3.3.11.17	Updated description of the feature.	June 2009
Configuring ASN-GW Keep-Alive Parameters Section 3.3.11.17.1	Added error condition. Updated range and default for rtx-time.	June 2009
Configuring BS Keep-Alive Parameters Section 3.8.26.1	Added error condition.	June 2009
Configuring the SNMP Manager Section 3.3.14.1	Clarified that each SNMP Manager entry is uniquely identified by the pair of values for the Read Community and Write Community.	June 2009

Topic	Description	Date Issued
Configuring the Trap Manager Section 3.3.14.2	Added note: A route to forward traps to a configured Trap Manager IP address must exist.	June 2009
Displaying the Trap Rate Limit Section 3.3.14.2.5	Updated description.	June 2009
Configuring the Date and Time Section 3.3.15.2.3	Corrected the presence of UTC to Optional.	June 2009
Configuring Power Feeders Section 3.3.15.3.1	Added note on error condition.	June 2009
Displaying the Unique Identifier for the 4Motion Shelf Section 3.3.15.8.2	Corrected command's syntax.	June 2009
Displaying the Vendor Identifier Section 3.3.15.9	Updated description.	June 2009
Displaying Location Information for the 4Motion Shelf	This section (previously Section 4.10.1.4) was removed (described in Section 3.3.15.7.2).	June 2009
Displaying the Unique Identifier for the 4Motion Shelf	This section (previously Section 4.10.1.5) was removed (described in Section 3.3.15.8.2).	June 2009
Enabling the Port Monitoring Session Section 3.11.2.1	Updated command's syntax.	June 2009
Disabling a Port Monitoring Session Section 3.11.2.1	Updated command's syntax. Updated description	June 2009
Upgrading the NPU: Step 2: Triggering Software Download Section B.2.1.2	Added error condition (available memory).	June 2009
Upgrading the AU Step 3: Creating the AU-to-Image Mapping Section B.3.1.3	Removed error condition (regarding mapping the AU to an image that is not residing in the AU flash).	June 2009
Displaying the Card Types Installed in Shelf Slots 1 - 9 Section 3.10.1.1	New	June 2009
ODU Names Table 1-7,	ODU-2340-2400-000N-36-1X1-N changed to ODU-HP-2.3b	June 2009
Configuring Bearer Plane QoS Marking Rules Section 3.3.11.11	Updated description of the feature.	June 2009

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Deleting Source Addresses Section 3.3.11.15.4.5.5	Updated command syntax.	June 2009
Deleting Destination Addresses Section 3.3.11.15.4.6.5	Updated command syntax.	June 2009
Enabling the Source Address Configuration Mode\ Creating a New Source Address Section 3.3.11.15.4.5.1	Added Privilege Level definition.	June 2009
Displaying the Status of the Manual Backup Procedure Section 3.3.5.4.2	Updated Privilege Level (10)	June 2009
Displaying the Automatic Backup Time Section 3.3.5.4.4	Added to manual.	June 2009
Displaying Failures in Configuration Restore Operations Section 3.3.5.4.8	Updated Privilege Level (10)	June 2009
Displaying the Currently Stored Backup Configuration Files Section 3.3.5.4.9	Updated Privilege Level (10)	June 2009
Displaying Configuration Information for SNMP Managers Section 3.3.14.1.3	Updated Privilege Level (10)	June 2009
Displaying Configuration Information for Trap Managers Section 3.3.14.2.4	Updated Privilege Level (10)	June 2009
Displaying Status Information for HARQ Maximum Retransmissions Parameter (was previously section 4.8.30)	Removed.	June 2009
Configuring Power Control Target Noise and Interference Level Parameters Section 3.8.6.2.1	Updated default value of pusc to -127.	June 2009
Specifying Configuration Parameters for the L3 Classification Rule Section 3.3.11.15.4.2	Added consistency and configuration rules for iptos-low and iptos-high.	June 2009
Enabling the Source Port Configuration Mode\ Creating a New Source Port Section 3.3.11.15.4.7.1	Added consistency rules for start-port and end-port.	June 2009

Topic	Description	Date Issued
Enabling the Destination Port Configuration Mode\ Creating a New Destination Port Section 3.3.11.15.4.8.1	Added consistency rules for start-port and end-port.	June 2009
Enabling Protocol Lists Section 3.3.11.15.4.4.2	Added consistency rules-impact of enabling destination port range	June 2009
Enabling the Destination Port Range Section 3.3.11.15.4.8.2	Added consistency rules-impact on parameters of IP protocol lists	June 2009
Enabling the Destination Port Range Section 3.3.11.15.4.7.2	Added consistency rules-impact on parameters of IP protocol lists	June 2009
Configuring the Position Section 3.3.15.2.4	Updated ranges for longitude and latitude.	June 2009
Managing Handover Negotiation at SBS Parameters Section 3.8.12	The previously removed section was brought back with one new parameter to support the Blackout Period feature.	June 2009
Configuring the AAA Client Functionality Section 3.3.11.13	Removed all commands and parameters associated with AAA server redundancy. Only a single client (default) is supported.	June 2009
Configuring the Output Parameters for Bearer Plane QoS Marking Rules Section 3.3.11.11.2	Added a note-for VLAN Service Interface only VLAN Priority marking is relevant.	June 2009
Managing Secure Shell (SSH) Parameters Section 3.1.7	New section	June 2009
Using Miscellaneous Commands Section 3.1.5.4	Update description of exit command.	June 2009
Managing the Session Section 3.1.8	New section	June 2009

Topic	Description	Date Issued
Managing Service Groups Section 3.3.11.14	Added explanations on the different service group types. Added new type (VPWS-Mapped). Added acctInterimTmr parameter and updated range/default for acct parameter in IP Service Group configuration. Updated description for ms-loop. Changed structure/headings and added new sections for configuring VPWS service groups. Updated description of dhcp-ownaddr.	June 2009
Configuring Antenna Parameters Section 3.7.2	Updated value range for latitude and longitude, updated default for latitude.	June 2009
Macro Outdoor BTS Sections 1.2.1, 1.3, 1.3.2 (new), 1.5.5, 1.5.6, 1.5.8, 1.5.9.7 (new), 1.5.9.8 (new), 1.5.9.9 (new), 2.4 (new). 3.1.1 (new)	New product line	June 2009
Configuring the Site General Information for the 4Motion Shelf Section 3.3.15.7.1	Removed ProductType (not configurable)	June 2009
Displaying the Site General Information Parameters Section 3.3.15.7.2	Product Type has several options.	June 2009
Replacing a PIU Section 2.3.10.4	Updated procedure	June 2009
Output Alarms Section 3.3.15.5.1	Corrected explanation of N.C. and N.O. terms.	June 2009
Displaying the Currently Stored Backup Configuration Files Section 3.3.5.4.9	Added description of the file's name format.	June 2009
Restoring the Configuration Defined in the Backup Configuration File Section 3.3.5.4.5	Added description of the file's name format.	June 2009
Downloading a Configuration File/Vendor Startup File from an External Server Section 3.3.5.2	Updated section, added info related to Vendor Startup file and file name format.	June 2009

Topic	Description	Date Issued
Displaying the Status of the last File Download Operations Section 3.3.5.3	New section	June 2009
Configuring Service Parameters Section 3.8.4.2	Updated range for paging-cycle, paging-offset and lm-traffic-idle-period.	August 2008
4x2 ODU Installation Guidelines Section 2.1.4.2	Updated	August 2008
Configuring R6 Profile Parameters Section 3.8.5.2.4	Updated value range for cir and mir parameters.	August 2008
Configuring R1 Profile Parameters Section 3.8.5.2.3	Updated value range for cir and mir parameters.	August 2008
Specifying Service Flow Configuration Parameters Section 3.3.11.15.3.3.2	Updated value range for ulqos-maxsustainedrate, dlqos-maxsustainedrate, ul-rsrv-rate-min, dl-rsrv-rate-min.	August 2008
Configuring Airframe MIMO Parameters Section 3.8.16.2.8	Updated default value of bcast-msgzone-loc.	August 2008
Managing the Policy Framework (was previously section 4.3.11.17)	Removed	August 2008
Managing Handover Negotiation at SBS (was previously 4.8.12)	Removed	August 2008
Configuring Alarm Threshold Parameters Section 3.8.24.1	Updated value range and defaul for ul-mednoise and ul-99prcntnoise.	August 2008
Managing Service Interfaces Section 3.3.11.12	Updated general description. Removed QinQ Service Interface.	August 2008
Default login ID Section 3.1	Changed from root to admin, with privilege level 10.	August 2008
Configuring Service Flows Section 3.3.11.15.3.3	Only IPv4CS service flows can be configured in the device.	August 2008
Configuring ACLs Section 3.3.10	Added details of modified ACL 1.	August 2008
Configuring ODU Port Parameters Section 3.6.2.2	Added warning - do not disable ODU ports	August 2008
Configuring Airframe General Parameters Section 3.8.16.2.1	auto-diversity and auto-rx-enable are forced to true (setting to false will be ignored).	August 2008

Topic	Description	Date Issued
Configuring Airframe Cyclic Delay Parameters Section 3.8.16.2.4	Updated dependencies. The values are set by internal logic.	August 2008
Configuring Airframe Linear Delay Parameters Previously Section 4.8.16.2.5	Updated dependencies. The values are set by vendor file.	August 2008
Configuring Airframe Mapping Parameters Previously Section 4.8.16.2.6	Updated dependencies. The values are set by internal logic.	August 2008
Configuring Airframe Receive Parameters Previously Section 4.8.16.2.7	The values are set by internal logic.	August 2008
Configuring Antenna Parameters Section 3.7.2	Updated possible values and default for antenna-product-id.	August 2008
Configuring Airframe Uplink Feedback Zone Parameters Section 3.8.16.2.4	Value of subchannels is set internally according to bandwidth.	August 2008
Configuring Airframe Downlink Data Zone Parameters Section 3.8.16.2.5	Value of subchannels is set internally according to bandwidth.	August 2008
Configuring Airframe Uplink Data Zone Parameters Section 3.8.16.2.6	Value of subchannels-number is set internally according to bandwidth. startallocation is hard-coded (value=0).	August 2008
Configuring Airframe MIMO Parameters Section 3.8.16.2.8	bcast-msgzone-loc is hard coded (set to nonSTCzoneOnly).	August 2008
Configuring Ranging Parameters Section 3.8.23.2	Updated valid values for start-of-rng-codes.	August 2008
Managing BS Feedback Allocation Parameters Section 3.8.7	Updated valid values for ir-cdma. The value for max-cqi is set by vendor file. Updated default value according to bandwidth.	August 2008
Configuring Power Control Target Noise and Interference Level Parameters Section 3.8.6.2.1	cqi-ack-ranging cannot be modified.	August 2008
Configuring the Power Control Maximum EIRP Section 3.8.6.2.2	maxeirp cannot be modified.	August 2008

Topic	Description	Date Issued
Configuring the Power Control Required C/N Level Parameters Section 3.8.6.2.2	All parameters cannot be modified.	August 2008
Configuring Service Parameters Section 3.8.4.2	max-subburst is not relevant. trgt-err-rate cannot be modified.	August 2008
Configuring the Unique Identifier for the 4Motion Shelf Section 3.3.15.8.1	A change in site identifier will take effect after reset. Special procedure needed when changing the site identifier of a device managed by AlvariSTAR.	August 2008
Managing the IP Connectivity Mode Section 3.3.1	Added AU maintenance IP domain. Added note on VLAN operation mode of the ports (tagged/untagged).	August 2008
Configuring Physical and IP Interfaces Section 3.3.2	Added AU maintenace IP domain.	August 2008
Configuring Parameters for VLAN Service Interface Section 3.3.11.12.2.2	A Service Interface VLAN ID shall not conflict also with AU Maintenance VLAN.	August 2008
Configuring BS Keep-Alive Parameters Section 3.8.26.1	Updated default values of tx-cnt and rtx-time.	August 2008
Managing Scheduler Parameters Section 3.8.29	New fearure	August 2008
Configuring AU Connectivity Section 3.5.2.3	Updated description of service-ip.	August 2008
Chapter 2 - Installation	Updated instruction for installing 4x2 ODUs Updated instructions for installing GPS Receiver. Added Macro Outdoor BTS instalation instructiond	August 2008
ODUs Tables 1-3, 1-6 (new), 1-7, 1-11, 1-12 (new), 1-16 (new), Section 3.6.1.1 (added note, removed tables of currently available ODUs)	Updated ODUs	August 2008

Topic	Description	Date Issued
Radio Standards Section 1.5.7	Added FCC part 25	August 2008
Managing Service Interfaces Section 3.3.11.12	QinQ Service Interface is supported (for special needs)	August 2008
Configuring Service Profiles Section 3.3.11.15.3	VLAN CS Service Flows can be configured for the Default Service Profile	August 2008
1x1 ODU LEDs Table 2-3	ETH connector is functional	August 2008
Configuring General Neighbor BS Parameters Section 3.8.13.2.1	Updated range for frequency	August 2008
Configuring the RF Frequency Parameter Section 3.8.14.1	Updated range for frequency	August 2008
Configuring Bearer Traffic QoS Marking Rule Parameters Section 3.8.20.2	Updated range for srvcflow-datadeliverytype.	August 2008
Configuring/Modifying the VLAN ID for an IP Interface Section 3.3.2.3.5	Added note that after changing the bearer interface VLAN ID the bearervlanid of all AUs must be changed to the same value.	August 2008
Restoring the Factory Default Configuration Section 3.3.5.4.6	Added note-reset required.	August 2008
Restoring the Factory Default Configuration With Connectivity Section 3.3.5.4.7	Added note-reset required.	August 2008
Deleting Service Flows Section 3.3.11.15.3.3.7	Corrected range for flow-id	August 2008
Configuring ASN-GW Keep-Alive Parameters Section 3.3.11.17.1	Corrected command syntax	August 2008
Configuring Logging Section 3.3.12	Added note: Logging configuration reverts to default after NPU reset.	August 2008
Managing the BS Idle Mode Parameters Section 3.8.28	Updated description of the feature.	August 2008
IF Cables Tables 2-1, 2-2	Limitations/Max Length for 3.5 GHz units are the same as for other ODUs	August 2008

Topic	Description	Date Issued
Commissioning Section 2.1	No need to configure ACL	August 2008
Configuring Airftame Parameters Section 3.8.16.2	Removed sections related to Cyclic Delay Parameters, Linear Delay Parameters, Mapping Parameters and Receive Parameters. In General Parameters, auto-diversity and auto-rx-enable were removed. Added notes regarding parameters that are not relevant (ignored) in Uplink Feedback Zone Parameters, Downlink Data Zone Parameters, Uplink Data Zone Parameters, MIMO Parameters.	August 2008
Restoring Default Values for Airframe Parameters Section 3.8.16.3	Removed sections related to Cyclic Delay Parameters, Linear Delay Parameters, Mapping Parameters, Receive Parameters and Uplink Data Zone Parameters. In General Parameters, auto-diversity and auto-rx-enable were removed. Added a note that the command for restoring the default values for Uplink Data Zone parameters is not applicable for the current release. Added notes regarding parameters that are not relevant (ignored) in MIMO Parameters.	August 2008
Displaying Configuration Information for Airftame Parameters Section 3.8.16.5	Removed sections related to Cyclic Delay Parameters, Linear Delay Parameters, Mapping Parameters and Receive Parameters.	August 2008
Managing BS Feedback Allocation Parameters Section 3.8.7	Added a note related to max-cqi parameter that cannot be modified.	August 2008
Configuring Power Control Target Noise and Interference Level Parameters Section 3.8.6.2.1	Added a note related to cqi-ack-ranging parameter that cannot be modified.	August 2008
Restoring the Default Values of Power Control Target Noise and Interference Level Parameters Section 3.8.6.3.1	Added a note related to cqi-ack-ranging parameter that cannot be restored to default value.	August 2008

Topic	Description	Date Issued
Managing Power Control Levels Section 3.8.6	Removed sections related to configuring or restoring the default value of Maximum EIRxP. Added a note that this command is not applicable for the current release. Updated the description for displaying configuration values of the parameter. Added a note regarding nilevels cqi-ack-ranging parameter that cannot be modified. Required C/N Levels are configurable. Updated default value for Required C/N Levels: ack, cqi, cdma.	August 2008
Configuring BS Service Parameters Section 3.8.4.2	Added a note regarding parameters that are not relevant or cannot be modified.	August 2008
Restoring Default Values for BS Service Parameters Section 3.8.4.3	Added a note regarding parameters that are not relevant or cannot be modified.	August 2008
Managing AUs Section 3.5	Removed sections related to configuring, restoring default values and displaying configured values of reserved parameters. Added a not that these commands are not applicable for current release.	September 2009
Configuring ODUs Section 3.6.1	Removed sections related to configuring, restoring default values and displaying configured values of reserved parameters. Added a not that these commands are not applicable for current release.	September 2009
Managing BS Reserved Parameters Section 3.8.25	Removed sections related to configuring, restoring default values and displaying configured values of reserved parameters. Added a not that these commands are not applicable for current release.	September 2009
Managing the IGMP Functionality Section 3.3.11.2	Removed details, added a note that relevant show commands are not applicable since the feature is not supported in the current release.	September 2009
Managing the MIP-Foreign Agent Functionality Section 3.3.11.3	Removed details, added a note that relevant show command is not applicable since the feature is not supported in the current release.	September 2009
Managing the Proxy-MIP Client Functionality Section 3.3.11.4	Removed details, added a note that relevant show command is not applicable since the feature is not supported in the current release.	September 2009

Topic	Description	Date Issued
Configuring the 4Motion Shelf Section 3.3.15	Updated descriptions of components.	September 2009
Configuring Bearer Plane QoS Marking Rules Section 3.3.11.11	Updated general description	September 2009
Configuring Power Control Target Noise and Interference Level Parameters Section 3.8.6.2.1	Updated range for pusc.	September 2009
AUs Section 3.1.1.6	Changed the mapping of the Macro Outdoor BTS AUs to Slot	January 2010
Sun Guard Installation Section 2.1.4.7	Updated: 4x2 ODUs and also NAU, DAU, and SAU units of the Macro Outdoor BTS may come with a sun-guard pre-installed	January 2010
Chapter 2 - Installation	Removed from the manual. Refer to the detailed Installation Manual	April 2010
Macro Outdoor Units Section 1.3.2, Section 3.5	New unit types with 2-channels AUs.	April 2010
2x2 ODUs Sections 1.3.3, 1.5.3.2.2, 1.5.3.3.2, 1.5.3.5.2	New ODU types	April 2010

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Radio Frequency Interference Statement

The Base Transceiver Station (BTS) equipment has been tested and found to comply with the limits for a class A digital device, pursuant to ETSI EN 301 489-1 rules and Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in commercial, business and industrial environments. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at the user's own expense.

FCC Radiation Hazard Warning

To comply with FCC RF exposure requirements in Section 1.1307 and 2.1091 of FCC Rules, the antenna used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 2 meter from all persons.

R&TTE Compliance Statement

This equipment complies with the appropriate essential requirements of Article 3 of the R&TTE Directive 1999/5/EC.

Safety Considerations - General

For the following safety considerations, "Instrument" means the BreezeMAX units' components and their cables.

Grounding

BTS chassis, Power Feeders and Outdoor Units are required to be bonded to protective grounding using the bonding stud or screw provided with each unit.

Safety Considerations - DC Powered Equipment (BTS & Power Feeder)

CAUTION	ATTENTION
Risk of electric shock and energy hazard.Disconnecting one Power Interface Unit (PIU) disconnects only one PIU module. To isolate the BTS completely, disconnect both PIUs	Risque de décharge électrique et d'electrocution. La déconnection d'un seul module d'alimentation (PIU) n'isole pas complètement la Station de Base. Pour cela, il faut impérativement débrancher les deux modules d'alimentation (PIU).

Restricted Access Area: The DC powered equipment should only be installed in a Restricted Access Area.

Installation Codes: The equipment must be installed according to the latest edition of the country national electrical codes. For North America, equipment must be installed in accordance with the US National Electrical Code and the Canadian Electrical Code.

Overcurrent Protection: A readily accessible Listed branch circuit overcurrent protective device, rated 60A for the BTS or 20A for the Power Feeder, must be incorporated in the building wiring.

CAUTION: This equipment is designed to permit connection between the earthed conductor of the DC supply circuit and the grounding conductor at the equipment. See installation instructions.

- The equipment must be connected directly to the DC Supply System grounding electrode conductor.
- All equipment in the immediate vicinity must be grounded in the same way, and not be grounded elsewhere.
- The DC supply system is to be local, i.e. within the same premises as the equipment.
- There shall be no disconnect device between the grounded circuit conductor of the DC source (return) and the point of connection of the grounding electrode conductor.

Lithium Battery

The battery on the NPU card is not intended for replacement.

Caution

To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

Line Voltage

Before connecting this instrument to the power line, make sure that the voltage of the power source matches the requirements of the instrument.

Radio

The instrument transmits radio energy during normal operation. To avoid possible harmful exposure to this energy, do not stand or work for extended periods of time in front of its antenna. The long-term characteristics or the possible physiological effects of radio frequency electromagnetic fields have not been yet fully investigated.

Outdoor Units and Antennas Installation and Grounding

Ensure that outdoor units, antennas and supporting structures are properly installed to eliminate any physical hazard to either people or property. Make sure that the installation of the outdoor unit, antenna and cables is performed in accordance with all relevant national and local building and safety codes. Even where grounding is not mandatory according to applicable regulation and national codes, it is highly recommended to ensure that the outdoor unit and the antenna mast (when using external antenna) are grounded and suitable lightning protection devices are used so as to provide protection against voltage surges and static charges. In any event, Alvarion is not liable for any injury, damage or

regulation violations associated with or caused by installation, grounding or lightning protection.

Disposal of Electronic and Electrical Waste

Disposal of Electronic and Electrical Waste

Pursuant to the WEEE EU Directive electronic and electrical waste must not be disposed of with unsorted waste. Please contact your local recycling authority for disposal of this product.

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damage and/or bodily harm and/or void the user's authority to operate the equipment and/or revoke the warranty provided by such manufacturer.

About This Manual

This manual describes the 4Motion solution, and details how to install, operate and manage the BTS system components.

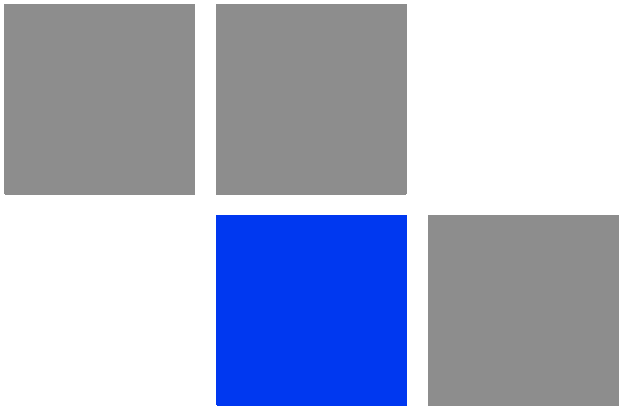
This manual is intended for technicians responsible for installing, setting and operating the 4Motion BTS equipment, and for system administrators responsible for managing the system.

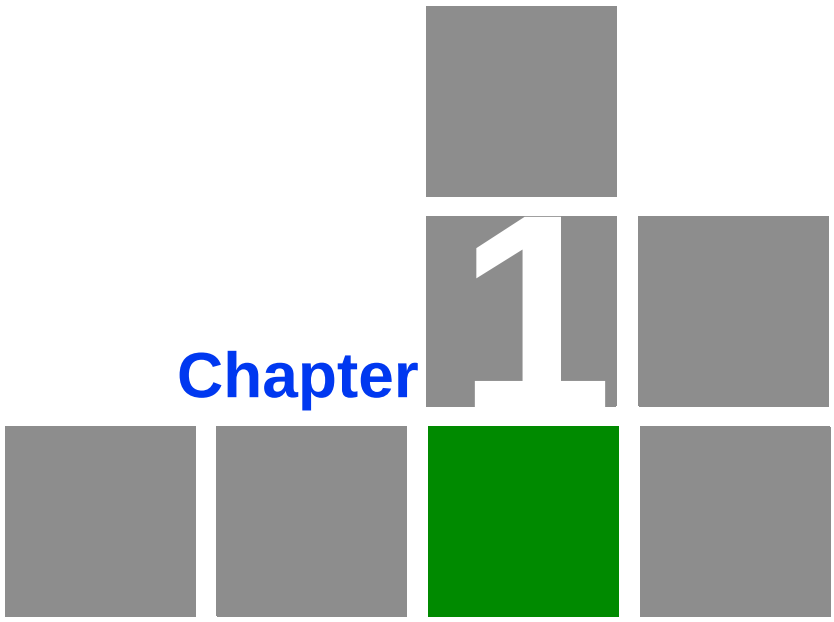
This manual contains the following chapters and appendices:

- **Chapter 1 - System description:** Describes the 4Motion BTS and its components.
- **Chapter 2 - Installation:** Describes how to install the BTS components.
- **Chapter 3 - Commissioning:** Describes how to configure basic parameters and validate units' operation.
- **Chapter 4 - Operation and Administration Using the CLI:** Describes how to use the Command Line Interface (CLI) for configuring parameters, checking system status and monitoring performance.
- **Appendix A - Antenna Configurations: Describes** the proposed antenna configurations that support the different available diversity scenarios.
- **Appendix B - Software Upgrade:** Describes how to load new software files using TFTP, and how to switch to a new software version in 4Motion units.
- **Glossary:** A listing of commonly used terms.

Contents

Chapter 1 - System Description





Chapter 1

System Description

In This Chapter:

1.1 About WiMAX

Emanating from the broadband world and using all-IP architecture, mobile WiMAX is the leading technology for implementing personal broadband services. With huge market potential and affordable deployment costs, mobile WiMAX is on the verge of a major breakthrough. No other technology offers a full set of chargeable and differentiated voice, data, and premium video services in a variety of wireless fashions - fixed, portable and mobile - that increase revenue and reduce subscriber churn.

WiMAX technology is the solution for many types of high-bandwidth applications at the same time across long distances and will enable service carriers to converge the all-IP-based network for triple-play services data, voice, and video.

WiMAX with its QoS support, longer reach, and high data capacity is positioned for fixed broadband access applications in rural areas, particularly when distance is too large for DSL and cable, as well as in urban/suburban areas of developing countries. Among applications for residential are high speed Internet, Voice Over IP telephony and streaming video/online gaming with additional applications for enterprise such as Video conferencing, Video surveillance and secured Virtual Private Network (with need for high security). WiMAX technology allows covering applications with media content requesting more bandwidth.

WiMAX allows portable and mobile access applications, with incorporation in notebook computers and PDAs, allowing for urban areas and cities to become “metro zones” for portable and mobile outdoor broadband wireless access. As such WiMAX is the natural complement to 3G networks by offering higher bandwidth and to Wi-Fi networks by offering broadband connectivity in larger areas.

The WiMAX Forum is an organization of leading operators and communications component and equipment companies. The WiMAX Forum’s charter is to promote and certify the compatibility and interoperability of broadband wireless access equipment that conforms to the Institute for Electrical and Electronics Engineers (IEEE) 802.16 and ETSI HiperMAN standards. The ultimate goal of the WiMAX Forum is to accelerate the introduction of cost-effective broadband wireless access services into the marketplace. Standards-based, interoperable solutions enable economies of scale that, in turn, drive price and performance levels unachievable by proprietary approaches, making WiMAX Forum Certified products.

1.2 4Motion Solution

1.2.1 4Motion Solution Highlights

Leveraging its extensive experience in Broadband Wireless Access (BWA) systems, leading technology and current favorable economics for broadband and mobile services, Alvarion's 4Motion mobile WiMAX solution represents the next evolution in communications.

With 4Motion, Alvarion offers a diversified range of products and services for all operators. Integrating the most advanced and adaptive radio management and control technologies, 4Motion optimizes usage of the operator's spectrum and network resources. At the same time, the solution supports the most stringent quality of service (QoS) requirements for next-generation applications such as video and gaming.

As a mobile solution, 4Motion network can be efficiently integrated with existing networks, including 3G, DSL, satellite, and cable, to provide multiple service applications.

4Motion enables operators and their customers to address the following consumer and enterprise market segments:

- “Best effort" fixed broadband access (DSL equivalent)
- Portable broadband access
- "Personal broadband" (handheld) access
- Mobile broadband (including full handover and roaming support)

4Motion supports the following services:

- IP-based and Ethernet-based services (e.g. VoIP, video streaming, gaming)
- QoS and application-based prioritization and de-prioritization

4Motion is designed as an end-to-end solution based on the following elements:

- BTS (Base Transceiver Station) equipment with an optional localized access service network gateway (ASN-GW):
  - » Indoor modular Macro BTS.
  - » All-outdoor modular Macro BTS.
- Optional centralized, fully integrated ASN-GW, which may be offered as a part of an end-to-end solution that includes third-party partners' equipment
- AAA servers provided by either Alvarion or its leading WiMAX partners
- AlvariSTAR Element management system supporting NMS and OSS systems
- Customer premises equipment and handsets

Figure 1-1 illustrates the entire service provider environment and 4Motion solution elements within the radio access network, core network and subscriber environment.

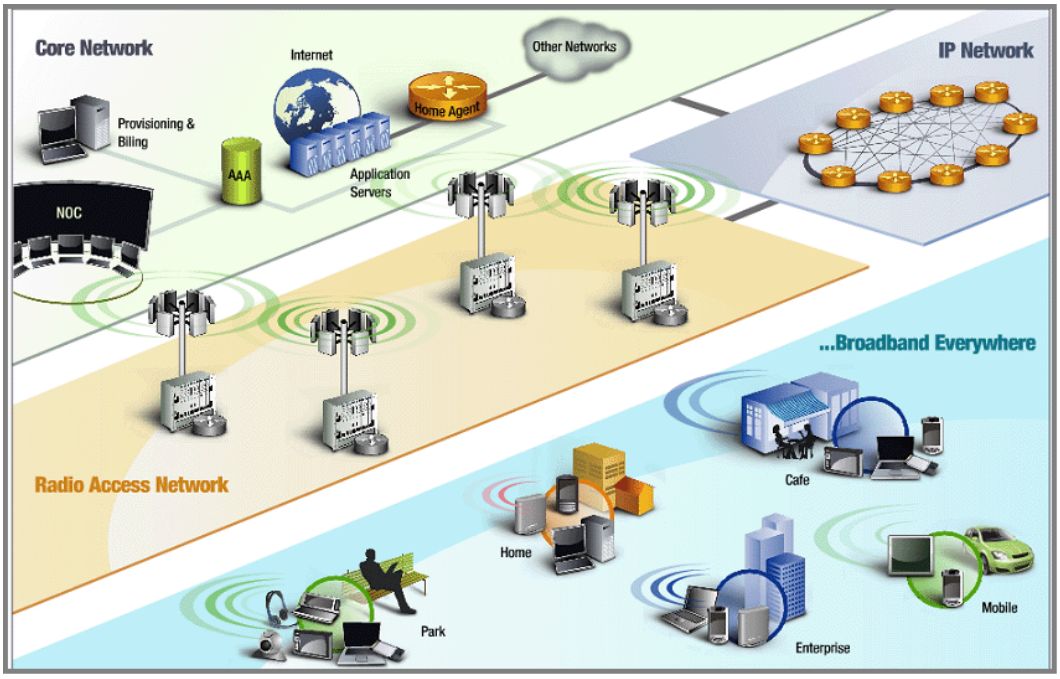


Figure 1-1: 4Motion Solution Elements

Alvarion believes that compliance with standard-driven open architecture protects the infrastructure investment, and opens the system to a variety of fully interoperable end-user devices. As such, 4Motion is designed with open

architecture and interfaces according to the WiMAX Forum networking working group (NWG) profile C, which supports openness and enables flat as well as hierarchical topologies. In addition, by keeping the radio resource management functionality in the Base Transceiver Station only, Profile C delivers a faster, optimized handover mechanism.

1.2.2 WiMAX Network Reference Model

Figure 1-2 and Figure 1-3 show the basic mobile WiMAX network architecture, with a single ASN-GW and with multiple ASN-GWs, as defined by the WiMAX Forum NWG.

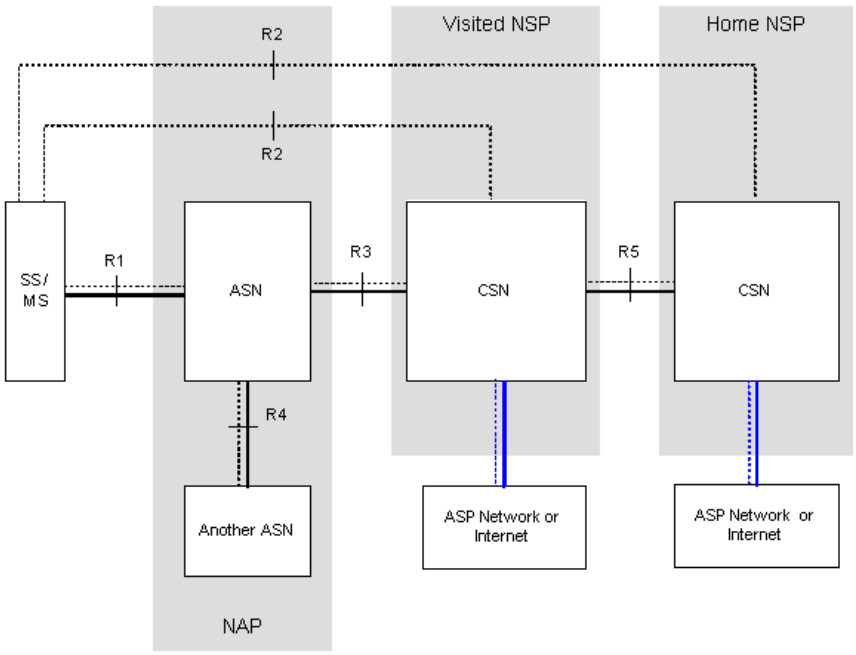


Figure 1-2: Mobile WiMAX Network Reference Model

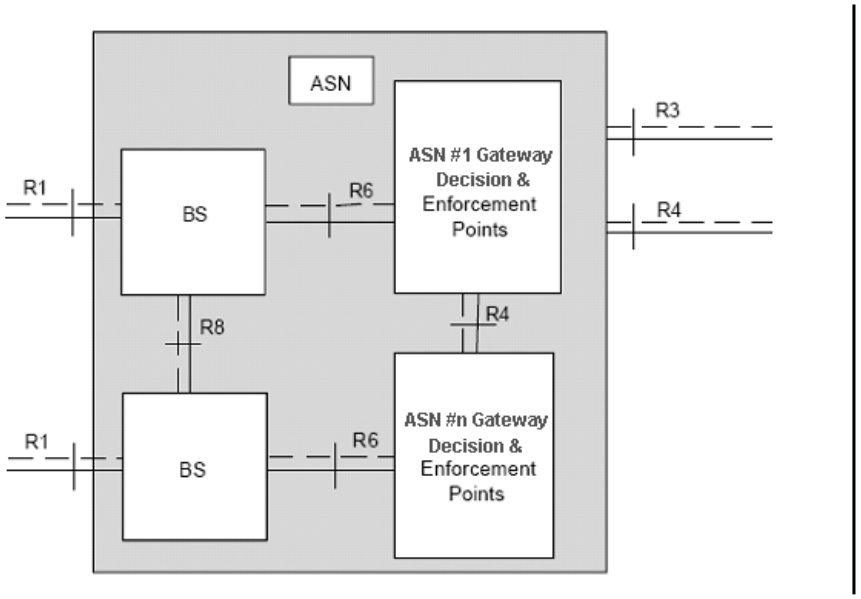


Figure 1-3: ASN Reference Model containing Multiple ASN-GWs

The various components and entities involved in the networking architecture are:

1.2.2.1 Access Service Network (ASN)

An ASN is defined as a complete set of network functions needed to provide radio access to a WiMAX subscriber. The ASN provides the following mandatory functions:

- WiMAX Layer-2 (L2) connectivity with WiMAX mobile station (MS)
- Transfer of AAA messages to the WiMAX subscriber's home network service provider (H-NSP) for authentication, authorization and session accounting for subscriber sessions
- Network discovery and selection of the WiMAX subscriber's preferred NSP
- Relay functionality for establishing Layer-3 (L3) connectivity with a WiMAX MS (i.e. IP address allocation)
- Radio resource management
- ASN-CSN tunneling
- ASN anchored mobility

An ASN is comprised of network elements such as one or more base transceiver stations and one or more ASN gateways. An ASN may be shared by more than one connectivity service network (CSN).

1.2.2.2 Connectivity Service Network (CSN)

A CSN is defined as a set of network functions that provide IP connectivity services to WiMAX subscribers. A CSN may offer the following functions:

- MS IP address and endpoint parameter allocation for user sessions
- Internet access
- AAA proxy or server
- Policy and admission control based on user subscription profiles
- ASN-CSN tunneling support
- WiMAX subscriber billing and inter-operator settlement
- WiMAX services such as location-based services, connectivity for peer-to-peer services, provisioning, authorization and/or connectivity to IP multimedia services, and facilities to support lawful intercept services such as those compliant with Communications Assistance Law Enforcement Act (CALEA) procedures

A CSN is comprised of network elements such as routers, proxy/servers, user databases, and inter-working gateway devices.

1.2.2.3 Network Access Provider (NAP)

An NAP is a business entity that provides WiMAX radio access infrastructure to one or more WiMAX network service providers (NSPs). A NAP implements this infrastructure using one or more ASNs.

1.2.2.4 Network Service Provider (NSP)

An NSP is a business entity that provides IP connectivity and WiMAX services to WiMAX subscribers compliant with the established service level agreement. The NSP concept is an extension of the Internet service provider (ISP) concept, providing network services beyond Internet access. To provide these services, an NSP establishes contractual agreements with one or more NAPs. An NSP may also establish roaming agreements with other NSPs and contractual agreements with

third-party application providers (e.g. ASP, ISP) for the delivery of WiMAX services to subscribers. From a WiMAX subscriber standpoint, an NSP may be classified as a home or visited NSP.

1.2.2.5 Base Station (BS)

The WiMAX BS is an entity that implements the WiMAX MAC and PHY in compliance with the IEEE 802.16e standard. A BS operates on one frequency assignment, and incorporates scheduler functions for uplink and downlink resources.

The basic functionality of the BS includes:

- IEEE 802.16e OFDMA PHY/MAC entity
- R6 and R8 functionality according to NWG definitions
- Extensible Authentication Protocol (EAP) relay
- Control message authentication
- User traffic authentication and encryption
- Handover management
- QoS service flow management entity

1.2.2.6 ASN Gateway (ASN-GW)

The ASN-GW is a network entity that acts as a gateway between the ASN and CSN. The ASN functions hosted in an ASN-GW may be viewed as consisting of two groups - the decision point (DP) and enforcement point (EP). The EP includes bearer plane functions, and the DP includes non-bearer plane functions.

The basic DP functionality of the ASN-GW includes:

- Implementation of EAP Authenticator and AAA client
- Termination of RADIUS protocol against the selected CSN AAA server (home or visited AAA server) for MS authentication and per-MS policy profile retrieval
- Storage of the MS policy profile
- Generation of authentication key material

- QoS service flow authorization entity
- AAA accounting client

The basic EP functionality of the ASN-GW includes:

- Classification of downlink data into generic routing encapsulation (GRE) tunnels
- Packet header suppression functionality
- DHCP functionality
- Handover functionality

The WIMAX Forum NWG has adopted two different approaches for ASN architecture - centralized and distributed: In the centralized approach there is at least one central ASN-GW, and the NPU operates in transparent mode, as shown in Figure 1-4.

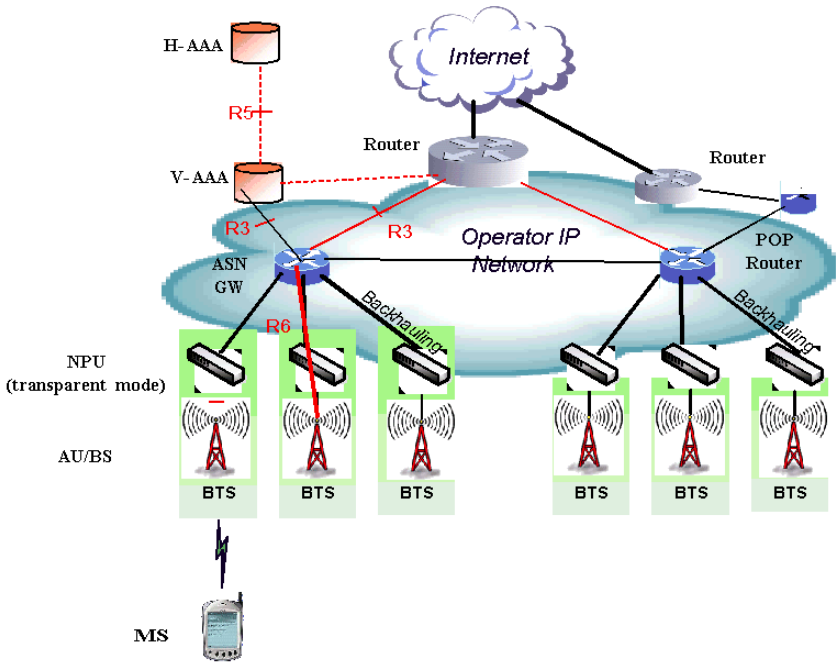


Figure 1-4: Centralized Network Reference Model

In the distributed approach, the NPU operates in ASN-GW mode, as shown in Figure 1-5.

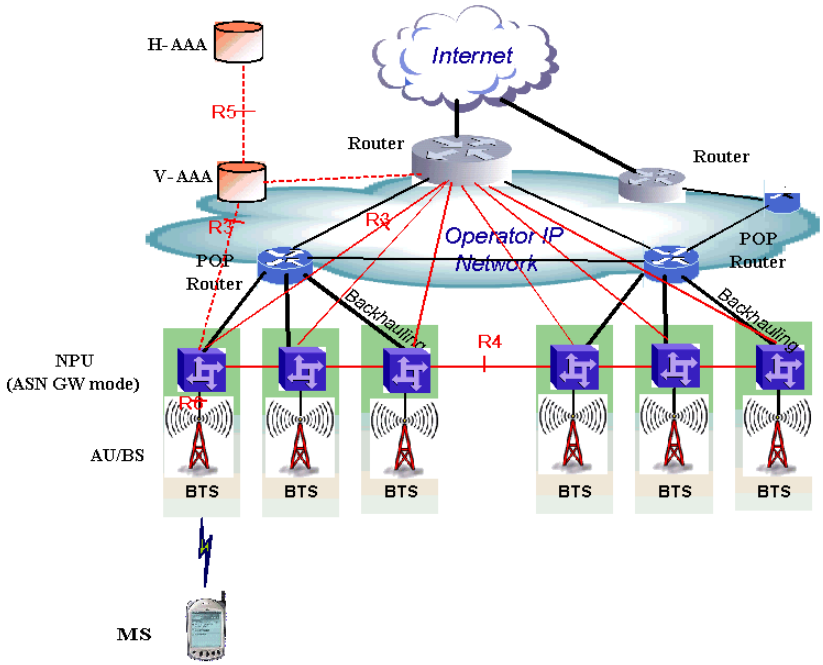


Figure 1-5: Distributed Network Reference Model

Alvarion believes in providing operators with the flexibility to select the mobile WiMAX network topology that best suits their needs and existing network architecture. Therefore, 4Motion is designed to support both distributed and centralized topology approaches according to WiMAX Forum NWG profile C.

1.2.2.7 Reference Points

- **Reference point R1** consists of the protocols and procedures between the MS and ASN as per the air-interface (PHY and MAC) specifications (IEEE 802.16e).

- **Reference point R2** consists of protocols and procedures between the MS and CSN associated with authentication, services authorization and IP host configuration management. This reference point is logical in that it does not reflect a direct protocol interface between the MS and CSN. The authentication part of reference point R2 runs between the MS and CSN operated by the home NSP, however, the ASN and CSN operated by the visited NSP may partially process the aforementioned procedures and mechanisms. Reference point R2 might support IP host configuration management running between the MS and CSN (operated by either the home NSP or visited NSP).

- **Reference point R3** consists of the set of control plane protocols between the ASN and CSN to support AAA, policy enforcement and mobility management capabilities. It also encompasses the bearer plane methods (e.g. tunneling) to transfer user data between the ASN and CSN.

- **Reference point R4** consists of the set of control and bearer plane protocols originating/terminating in various functional entities of an ASN that coordinate MS mobility between ASNs and ASN-GWs. R4 is the only interoperable reference point between similar or heterogeneous ASNs.

- **Reference point R5** consists of the set of control plane and bearer plane protocols for internetworking between the CSN operated by the home NSP and that operated by a visited NSP.

- **Reference point R6** consists of the set of control and bearer plane protocols for communication between the BS and ASN-GW. The bearer plane consists of an intra-ASN data path between the BS and ASN gateway. The control plane includes protocols for data path establishment, modification and release control in accordance with the MS mobility events.

- **Reference point R8** consists of the set of control plane message flows and optional bearer plane data flows between the base stations to ensure a fast and seamless handover. The bearer plane consists of protocols that allow data transfer between base stations involved in the handover of a certain MS.

It is important to note that all reference points are logical and do not necessarily imply a physical or even direct connection. For instance, the R4 reference point between ASN-GWs might be implemented across the NAP internal transport IP network, in which case R4 traffic might traverse several routers from the source to the destination ASN-GW.

1.3 The Base Transceiver Station

The 4Motion solution features a multi-carrier, high-power Base Transceiver Station (BTS). Designed for high availability and redundancy, it utilizes a central networking and management architecture, and a range of diversity schemes.

The BTS main features include:

- R1 support - 802.16e interface handling (e.g. PHY, MAC, CS, Scheduler, ARQ) and processes such as handover, power control and network entry
- R6 support - communication with ASN-GW
- EAP proxy in ASN-GW mode
- Handover triggering for mobility tunnel establishment - R6 (GRE tunnel)
- Local QoS PEP for traffic via air interface (or SFM) and admission control
- Hand-Over (HO) control function
- Radio resource management agent
- Key generation (TEK, KEK) and traffic encryption

The 4Motion Base Transceiver Station equipment includes:

- The indoor modular Macro BTS.
- The all-outdoor modular Macro BTS.
- Outdoor Radio Units.
- GPS Receiver
- Power-Feeder (optional for the indoor Macro BTS).

1.3.1 The Indoor Macro BTS

1.3.1.1 The BreezeMAX Shelf

The BreezeMAX shelf is an indoor -48 VDC powered 8U cPCI PICMG 2.x standard shelf prepared for installation in a 19" or 21" (ETSI) rack. This chassis has a total of nine double-Euro (6U high) slots and six single-Euro (3U high) slots. All the modules are hot swappable, and high availability can be provided through multiple redundancy schemes.

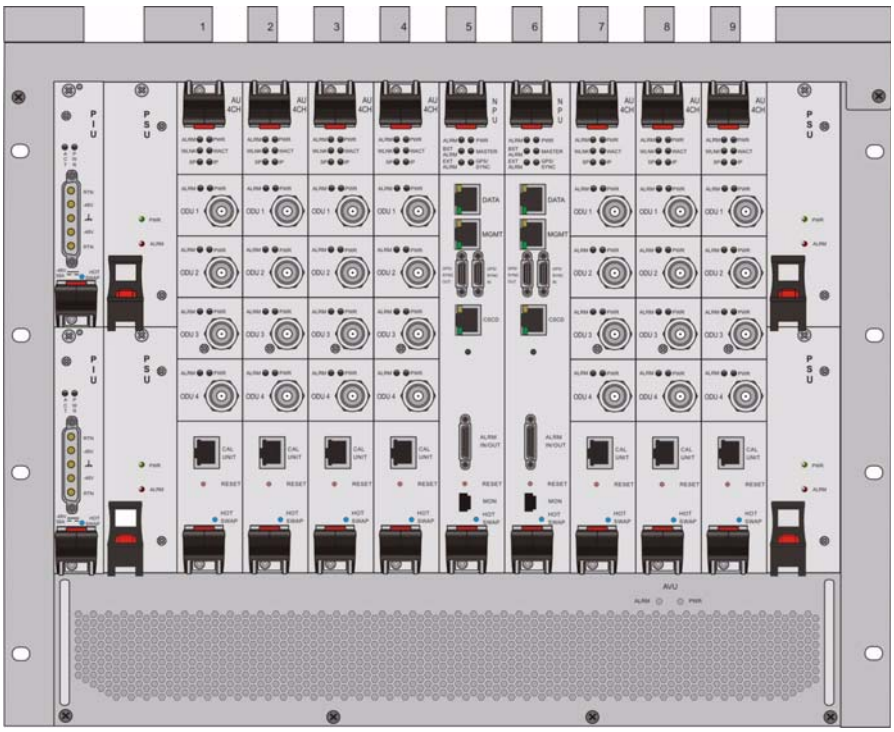


Figure 1-6: BreezeMAX Shelf (with all modules installed)

The shelf modules are:

Table 1-1: BreezeMAX Shelf Modules

Module	Description
PIU	3U high power interface unit, 1+1 redundancy, -48VDC, protection, filters
PSU	3U high power supply unit, up to 3+1 redundancy
NPU	6U high network processing unit with optional ASN-GW functionality, hardware ready for 1+1 redundancy (NPU redundancy is not supported in the current release), 1000/100 Base-T main network interface, 1000/100 Base-T cascade interface and 100/10 Base-T out-of-band management interface

Table 1-1: BreezeMAX Shelf Modules

Module	Description
AU	6U high access unit, 4-channel, 802.16e MAC-modem-baseband IF card
AVU	2U high air ventilation unit, 9+1 redundancy fans with alarm control

The six single-Euro slots are intended for one or two redundant Power Interface Units (PIUs) and up to four redundant Power Supply Units (PSUs). One of the double Euro slots (Slot 5) is dedicated to the NPU module, with interfaces for network backhaul, in-band and out-of-band (OOB) management connections. Another double-Euro slot (Slot 6) is reserved for an optional redundant NPU (the shelf is HW-ready for NPU redundancy). The remaining seven double-Euro slots (1-4, 7-9) are dedicated for Access Unit (AU) modules, thereby enabling various network topologies with up to 6 simultaneously operational AUs, and future redundancy configurations. In addition, the shelf contains an Air Ventilation Unit (AVU).

1.3.1.2 NPU

The Network Processing Unit is the controller of the Base Transceiver Station. Serving as the central processing unit that manages the BTS components, the NPU aggregates traffic to/from the AU modules, and transfers it to/from the IP backbone through a dedicated Gigabit/Fast Ethernet interface. In addition, the NPU can be operated in ASN-GW mode, in which case it also implements ASN-GW functionality.

When operating in ASN-GW mode, the NPU implements the R3 reference point toward the CSN, R4 reference point toward other ASN-GWs, and R6 reference point toward AU/BSs. The R8 reference point traffic is transparently relayed between AU/BSs (intra- or inter-BTS).

When operating in transparent mode, the NPU transparently relays R6 and R8 reference-point traffic between AU/BSs (intra- or inter-BTS).

The BreezeMAX shelf is hardware-ready for 1+1 NPU card redundancy.

The NPU main functions, when operating in transparent mode, are:

- Aggregate backbone Ethernet connectivity for user and control traffic
- Aggregate backbone Ethernet connectivity for management traffic (in-band or out-of-band)
- Connection to a cascaded shelf (future feature)

- L2 switch forwarding capabilities
- Internal and external traffic VLAN encapsulation
- QoS marking
- Overall operation, control and shelf management, including AU diagnostics and control, PSU monitoring, AVU management and redundancy support
- Local and remote extensive management support via CLI (Telnet, SSH) and SNMP, including software download, fault and performance management
- Alarm management, including external alarm inputs and activation of external devices
- Synchronization, including GPS receiver interface, clock and IF reference generation and distribution to the shelf modules, and holdover handling
- Security functionalities such as rate limiting and access control lists

When operating in ASN-GW mode, the following additional ASN-GW functions are supported:

- EAP authenticator
- RADIUS AAA client
- AAA accounting client
- MS policy profile storage
- QoS service flow authorization
- Classification of downlink data into service flows
- Packet header suppression functionality
- Multiple service provider support (multihost) for improved security and wholesale model
- DHCP functionality - internal server, DHCP proxy, DHCP relay (with Option 82 support)

- Handover functionality
- GRE encapsulation/decapsulation
- IP-in-IP encapsulation/decapsulation
- Transparent VLAN (single tag) and QinQ (dual tag) encapsulation
- Fragmentation/reassembly
- R4/R6/R3 interfaces implementation
- Keep-alive signaling towards the relevant BSs and other ASN-GWs for enhanced management of service availability

When several shelves are collocated, the NPU cascade interface can be used for shelf interconnection. In this architecture, the NPU that is directly connected to the backhaul implements a layer-2 connection toward the NPUs in the cascaded shelves. Bearer, control and management traffic is sent over the cascade connection. Synchronization and GPS backup power are sent toward the NPUs in the cascaded shelves through the GPS/SYNC ports.

GPS synchronization cascading will be implemented in a future release.

1.3.1.3 AU

The Access Unit module performs the WiMAX/IEEE 802.16e BS function according to the NWG Profile C definitions via digital signal processors (DSPs) and field-programmable gate array (FPGA) technology. The AU module is designed to support high-traffic throughput and enable diversity, MIMO and AAS, thereby extending capacity and range.

The AU implements the following functionality:

- 802.16e multi-channel OFDMA PHY
- Up to four-channel support (Tx/Rx)
- Diversity and future AAS
- Flexible channel bandwidth - up to 20 MHz
- Flexible FFT size - up to 2048 points

- Wide variety of reuse patterns
- Advanced channel coding (CTC)
- HARQ
- Rate adaptation
- High-performance CDMA detector
- IF interface to RF ODU
- MAC-PHY interface
- Link management (network entry, basic capabilities negotiation, authentication and registration, connection management)
- Fragmentation/ reassembly
- QoS PEP for air interface traffic
- QoS DSCP marking
- Scheduling - connections quota computation for all data delivery types
- Frame/burst building
- Power save
- Handover management
- Power control
- R1/R6/R8 functionality
- Data path mapping between R6 (GRE) and 802.16e interfaces
- Traffic authentication and encryption
- Authentication relay
- Security key receiver

- Context client/server
- ID to IP address resolution for ASN entities
- IP and Ethernet convergence sublayers
- Keep-alive signaling towards the relevant ASN-GWs for enhanced management of service availability

The AU design is based on Alvarion's programmable, off-the-shelf, cutting-edge components, in order to provide a future-proof solution with excellent cost and performance.

The AU card interfaces with the NPU card for R6/R8 functionality, as well as control, synchronization and management between the NPU and AU.

The AU implements four receive and transmit channels, each of them is HW-ready for up to 20 MHz bandwidth.

1.3.1.4 PIU

The single-Euro Power Interface Unit module serves as the interface between the DC power source and both the PSU modules and external ODU radio transceivers.

The PIU filters and stabilizes the input power, and protects the system from power problems such as over-voltage, surge pulses, reverse polarity connection, and short circuits. It filters high-frequency interference (radiated emissions) and low-frequency interference (conducted emissions) at the external power source. Each shelf contains two slots for optional 1+1 PIU redundancy. One PIU is sufficient to support a fully populated shelf, and two modules provide redundant power feeding (i.e. from two input sources), while avoiding current flow between the two input sources.

1.3.1.5 PSU

The single-Euro Power Supply Unit module is a -48 VDC power supply unit that generates low-voltage DC output to comply with PICMG 2.x standard requirements. Each shelf can contain up to four PSU modules supporting N+1 redundancy configuration scheme.

Table 1-2 displays the number of PSU modules (excluding redundant units) required for various Base Station configurations without NPU redundancy (one NPU):

Table 1-2: PSU Requirements, Configurations with one NPU (excluding PSU redundancy)

Number of AUs	Minimum Required Number of PSUs
1 - 4	2
5 - 6	3

1.3.1.6 AVU

The 2U-high AVU includes a 1U-high integral chamber for inlet airflow and a 1U-high fan tray with an internal alarm module. To support high availability, the fan tray includes 10 brushless fans (9 fans are sufficient for cooling a fully-loaded shelf). Fan failure is indicated by both the front panel LEDs and a trap sent to the management system. To further support high availability, the chassis may operate without the hot-swappable fan tray for up to 10 minutes until the AVU is replaced.

1.3.2 The Macro Outdoor BTS

The Macro Outdoor BTS is a modular scalable and reliable all-outdoor platform enabling extended and flexible installation capabilities while sustaining all the features and capabilities of the 4Motion solution.

The All-Outdoor Macro BTS portfolio includes the following system elements:

- NAU (Network Access Unit): A full-size enclosure containing NPU and AU cards.
- DAU (Dual Access Unit): A full-size enclosure containing two AU cards.
- SAU (Single Access Unit): A half-size enclosure containing one AU card.

The full-size enclosure is similar to the enclosure of the 4x2 ODUs (see Section 1.3.3), supporting flexible mounting options for system components, including back-to-back and side-by-side mounting. The units are available with either full (4-channels) AUs or with 2-channels AUs.

The modular architecture and different unit types enable building a variety of configurations using up to six AUs with either 2 or 4 channels, addressing a pay-as-you-grow deployment. The functionality is the same as described for the NPU (see Section 1.3.1.2) and AU (see Section 1.3.1.3) cards of the Indoor Macro BTS, with a few minor exceptions.

1.3.3 ODU

The outdoor unit (ODU) is a high-power, multi-carrier radio unit that connects to one or more external antennas. It is designed to provide high system gain and interference robustness utilizing high transmit power and low noise figure. It is HW-ready for supporting a bandwidth of up to 20 MHz, enabling future options such as increased capacity through the use of a multiplexer or wider frequency channels.

The following ODU port configurations will be available:

- 1x1(1Rx by 1 Tx): One receive port, one transmit port (one Tx/Rx interface)
- 2x2 (2Rx by 2Tx): Two receive ports, two transmit ports (two Tx/Rx interfaces)
- 4x2 (4Rx by 2Tx): Four receive ports, two transmit ports (two Tx/Rx interfaces, two Rx only interfaces)

The wide range of ODU types will enable efficient utilization of various second and fourth order transmit and receive diversity schemes.

The following table provides details on the currently available ODUs following the WiMAX Forum's definitions:

Table 1-3: ODU Types

Band (GHz)	ODU Frequency Range (MHz)	ODU Port Configuration	ODU Bandwidth (MHz)	ODU Max Tx Power (dBm)
2.0	2020-2220	1Rx by 1Tx	Up to 10	36
2.3	2300-2360	1Rx by 1Tx	Up to 10	36
	2340-2400	1Rx by 1Tx	Up to 10	36
	2305 - 2317, 2348 - 2360 (includes WCS filter)	1Rx by 1Tx	Up to 10	36
	2300-2400	2Rx by 2Tx	Up to 30	38

Table 1-3: ODU Types

Band (GHz)	ODU Frequency Range (MHz)	ODU Port Configuration	ODU Bandwidth (MHz)	ODU Max Tx Power (dBm)
2.5	2496-2602 (band A)	1Rx by 1Tx	Up to 10	36
	2590-2690 (band B)	1Rx by 1Tx	Up to 10	36
	2485-2690	2Rx by 2TX	Up to 30	38 (37 in the 2485-2495 GHz band)
	2496-2602 (band A)	4Rx by 2Tx	Up to 20	38
	2590-2690 (band B)	4Rx by 2Tx	Up to 20	38
	2485-2690	4Rx by 2Tx	Up to 20	38 (37 in the 2485-2695 GHz band)
	2560-2570	4Rx by 2Tx	Up to 10	37
3.3	3300-3355	1Rx by 1 Tx	Up to 14	32
3.5	3400-3455	1Rx by 1Tx	Up to 14	34
	3445-3500	1Rx by 1Tx	Up to 14	34
	3500-3555	1Rx by 1Tx	Up to 14	34
	3545-3600	1Rx by 1Tx	Up to 14	34
	3400-3600	2Rx by 2Tx	Up to 30	37
	3400-3600	4Rx by 2Tx	Up to 20	37
3.6	3600-3800	4Rx by 2Tx	Up to 20	36

1.3.4 Power Feeder

The PIU of the indoor Macro BTS can support a maximum current of 58 A (@-40.5 VDC). In certain installations with a relatively high number of ODUs this current may not be sufficient to power the shelf and all the ODUs. In such installations the ODU Power Feeder is used as an additional power source providing power (-48 VDC) to ODUs. It transfers transparently all signals between the AU and the ODU, while injecting DC power received from an external source. Each ODU Power Feeder unit can serve up to four ODUs. Up to three ODU Power Feeder units can be installed in a 1U high Power Feeder panel.

1.3.5 Antenna

In the 4Motion architecture, the antenna is approached as an independent element. This provides the operator with the flexibility to select the antennas source according to its supplier policy. To ensure the availability of antennas that

complement the 4Motion solution, Alvarion works closely with several antenna suppliers to ensure availability of antennas that comply with its requirements.

In cases where the operator prefers other antenna vendors, Alvarion can provide a recommended antenna specification based on the required antennas types.

For more information on recommended antenna configurations and required antennas refer to “Antenna Configurations” on page 681.

1.3.6 GPS

GPS is used to synchronize the air link frames of Intra-site and Inter-site located Base Transceiver Stations to ensure that in all Base Stations the air frame will start at the same time, and that all Base Stations will switch from transmit (downlink) to receive (uplink) at the same time. This synchronization is necessary to prevent Intra-site and Inter-site interference and Base stations saturation (assuming that all Base Stations are operating with the same frame size and with the same DL/UL ratio).

In order for the system to be synchronized, the GPS have to first acquire at least 4 satellites. After that the GPS reception can be reduced to 1 satellite.If no satellite is received the BTS will go to holdover state where internal clock is provided to synchronize the BTS.

1.3.6.1 Outdoor GPS Receiver

The all-outdoor GPS Receiver is a pole mountable GPS receiver and antenna in a single environmentally protected enclosure. The GPS Receiver is powered by a 12 VDC power source, supplied to it by the NPU. The RS-422 interface allows installation at distances up to 100m.

1.4 Element Management Systems

The end-to-end IP-based architecture of the system enables full management of all components, using standard management tools. An SNMP agent in the NPU implements proprietary MIBs for remote setting of operational modes and parameters of the Base Transceiver Station equipment. Security features incorporated in the equipment restrict the access for management purposes.

Alvarion offers the following management tool:

1.4.1 AlvariSTAR

AlvariSTAR is a comprehensive carrier-class Element Management System (EMS) for Alvarion's Broadband Wireless Access systems. AlvariSTAR is designed for today's most advanced Network Operation Centers (NOCs), providing the network Operation, Administration and Maintenance (OA&M) staff and managers with all the network surveillance, monitoring and configuration and service provisioning capabilities required to effectively manage the network while keeping the resources and expenses at a minimum.

AlvariSTAR offers the network's OA&M staff with a unified, scalable and distributable management system. Utilizing distributed client-server architecture, the user is provided with a robust, scalable and fully redundant management system in which all single points of failure can be avoided.

AlvariSTAR provides the following management functionality:

- Device Discovery
- Device Inventory
- Topology
- Fault Management
- Configuration Management
- Service Management
- Data Collection
- Performance Monitoring

- Device embedded software upgrade
- BTS duplication and template-based configuration modification of multiple BTS simultaneously.
- Security Management
- Event Forwarding to other Network Management Systems.

1.5 Specifications

1.5.1 Modem & Radio

Table 1-4: General Modem & Radio Specifications

Item	Description
Operation Mode	TDD
Channel Bandwidth	■ 5 MHz ■ 7 MHz ■ 10 MHz
Central Frequency Resolution	0.125 MHz (actual configurable frequencies depend on the local radio regulations and allocated spectrum)
Modulation	OFDM modulation, 1024/512 FFT points; QPSK, QAM16, QAM64
Access Method	OFDMA
FEC	Convolutional Turbo Coding: 1/2, 2/3, 3/4, 5/6

1.5.2 Sensitivity

Table 1-5: Sensitivity, AWGN @ PER=1%

Modulation & Coding	Sensitivity (dBm), 5 MHz Bandwidth	Sensitivity (dBm), 7 MHz Bandwidth	Sensitivity (dBm), 10 MHz Bandwidth
QPSK 1/2	-97.3	-95.8	-94.2
QPSK 3/4	-94.9	-93.4	-91.8
16QAM 1/2	-92.2	-90.7	-89.1
16QAM 3/4	-88.3	-86.8	-85.2
64QAM1/2	-86.8	-85.3	-83.7
64QAM2/3	-83.0	-81.5	-79.9
64QAM3/4	-82.2	-80.7	-79.1
64QAM5/6	-81.0	-79.5	-77.9

1.5.3 ODUs

1.5.3.1 2.0 GHz Band

Table 1-6: 2.0 GHz Band 1x1 ODU Specifications

Item	Description
Frequency Band	ODU-2020-2220-000N-36-1x1-N-0: 2020-2220 MHz
Ports Configuration	1x1 (1Rx, 1Tx)
Bandwidth Support	Up to 10 MHz
Maximum Tx Power)	36 dBm
Tx Power Control Range	6 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.6 dB typical, 6.0 dB maximum
Dimension	329 x 157 x 169 mm
Weight	6.1 Kg
Connectors	ANT: N-Type jack, 50 Ohm, lightning protected IF: TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 89W maximum, 75W typical Receive - 15W maximum, 9W typical

1.5.3.2 2.3 GHz Band

1.5.3.2.1 2.3 GHz Band 1x1 ODUs

Table 1-7: 2.3 GHz Band 1x1 ODUs Specifications

Item	Description
Frequency Band	ODU-HP-2.3: 2300-2360 MHz ODU-HP-2.3-WCS: 2305 - 2317, 2348 - 2360 MHz (incliudes WCS filter) ODU-HP-2.3b: 2340-2400 MHz
Ports Configuration	1x1 (1Rx, 1Tx)
Bandwidth Support	Up to 10 MHz, 5 & 10 MHz SAW filters
Maximum Tx Power)	36 dBm
Tx Power Control Range	6 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.6 dB typical, 6.0 dB maximum
Dimension	ODU-HP-2.3-WCS: 329 x 157 x 209 mm Other ODUs: 329 x 157 x 169 mm
Weight	ODU-HP-2.3-WCS: 8.6 Kg Other ODUs: 6.1 Kg
Connectors	ANT: N-Type jack, 50 Ohm, lightning protected IF: TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 89W maximum, 75W typical Receive - 15W maximum, 9W typical

1.5.3.2.2 2.3 GHz Band 2x2 ODU

Table 1-8: 2.3 GHz Band 2x2 ODU Specifications

Item	Description
Frequency Band	ODU-2300-2400-000N-38-2X2-N-0: 2300-2400 MHz*
Ports Configuration	2x2 (2Rx, 2Tx)
Bandwidth Support	Up to 30 MHz
Beam Forming Support	Yes
Maximum Tx Power)	38 dBm*
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	420 x 340 x 270 mm
Weight	15 Kg
Connectors	ANT: 2 x N-Type jack, 50 Ohm, lightning protected IF: 2 x TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 200W maximum Receive - 40W maximum

* With the optional external WCS filter, the frequency range is 2305-2315, 2350-2360 MHz, and Tx power is reduced by 1 dB.

1.5.3.3 2.5 GHz Band

1.5.3.3.1 2.5 GHz Band 1x1 ODUs

Table 1-9: 2.5 GHz Band 1x1 ODUs Specifications

Item	Description
Frequency Band	ODU-HP-2.5A: 2496-2602 MHz (Band A) ODU-HP-2.5B: 2590-2690 MHz (Band B)
Ports Configuration	1x1 (1Rx, 1Tx)
Bandwidth Support	Up to 10 MHz
Maximum Tx Power)	36 dBm
Tx Power Control Range	6 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.6 dB typical, 6.0 dB maximum
Dimension	329 x 157 x 209 mm
Weight	6.1 Kg
Connectors	ANT: N-Type jack, 50 Ohm, lightning protected IF: TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 89W maximum, 75W typical Receive - 15W maximum, 9W typical

1.5.3.3.2 2.5 GHz Band 2x2 ODUs

Table 1-10: 2.5 GHz Band 2x2 ODUs Specifications

Item	Description
Frequency Band	ODU-2485-2690-000N-38-2X2-N-0: 2485-2690 MHz
Ports Configuration	2x2 (2Rx, 2Tx)
Bandwidth Support	Up to 30 MHz
Beam Forming Support	Yes
Maximum Tx Power)	38 dBm (37 dBm in the 2485-2495 MHz range)
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	420 x 340 x 270 mm
Weight	15 Kg
Connectors	ANT: 2 x N-Type jack, 50 Ohm, lightning protected IF: 2 x TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 200W maximum Receive - 40W maximum

1.5.3.3.3 2.5 GHz Band 4x2 ODUs

Table 1-11: 2.5 GHz Band 4x2 ODUs Specifications

Item	Description
Frequency Band	ODU-2496-2602-000N-38-4x2-N-0: 2496-2602 MHz (Band A) ODU-2590-2690-000N-38-4x2-N-0: 2590-2690 MHz (Band B) ODU-2485-2690-000N-38-4X2-N-0: 2485-2690 MHz ODU-2560-2570-000N-37-4X2-N-0: 2560-2570 MHz
Ports Configuration	4x2 (4Rx, 2Tx)
Bandwidth Support	Up to 20 MHz
Maximum Tx Power)	38 dBm For ODU-2485-2690-000N-38-4X2-N-0: 37 dBm in the 2485-2495 MHz range. For ODU-2560-2570-000N-37-4X2-N-0: 37 dBm.
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	420 x 340 x 270 mm
Weight	15 Kg
Connectors	ANT: 4 x N-Type jack, 50 Ohm, lightning protected IF: 4 x TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 284W maximuml Receive - 70W maximum

1.5.3.4 3.3 GHz Band

Table 1-12: 3.3 GHz Band 1x1 ODU Specifications

Item	Description
Frequency Band	ODU-3300-3355-000N-32-1x1-N-0: 3300-3355 MHz
Ports Configuration	1x1 (1Rx, 1Tx)
Bandwidth Support	Up to 14 MHz
Maximum Tx Power	32 dBm
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	329 x 157 x 169 mm
Weight	6.1 Kg
Connectors	ANT: N-Type jack, 50 Ohm, lightning protected IF: TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 90W maximum, 62W typical Receive - 20W maximum, 14W typical

1.5.3.5 3.5 GHz Band

1.5.3.5.1 3.5 GHz Band 1x1 ODUs

Table 1-13: 3.5 GHz Band 1x1 ODUs Specifications

Item	Description
Frequency Band	ODU-HP-TDD-3.4a: 3400-3455 MHz ODU-HP-TDD-3.4b: 3445-3500 MHz ODU-HP-TDD-3.5a: 3500-3555 MHz ODU-HP-TDD-3.5b: 3545-3600 MHz
Ports Configuration	1x1 (1Rx, 1Tx)
Bandwidth Support	Up to 14 MHz
Maximum Tx Power	34 dBm
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	329 x 157 x 169 mm
Weight	6.1 Kg
Connectors	ANT: N-Type jack, 50 Ohm, lightning protected IF: TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 90W maximum, 62W typical Receive - 20W maximum, 14W typical

1.5.3.5.2 3.5 GHz Band 2x2 ODUs

Table 1-14: 3.5 GHz Band 2x2 ODUs Specifications

Item	Description
Frequency Band	ODU-3400-3600-000N-37-2x2-N-0: 3400-3600 MHz
Ports Configuration	2x2 (2Rx, 2Tx)
Bandwidth Support	Up to 30 MHz
Beam Forming Support	Yes
Maximum Tx Power)	37 dBm
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	420 x 340 x 270 mm
Weight	15 Kg
Connectors	ANT: 2 x N-Type jack, 50 Ohm, lightning protected IF: 2 x TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 200W maximum Receive - 240W maximum

1.5.3.5.3 3.5 GHz Band 4x2 ODUs

Table 1-15: 3.5 GHz Band 4x2 ODUs Specifications

Item	Description
Frequency Band	ODU-3400-3600-000N-37-4x2-N-0: 3400-3600 MHz
Ports Configuration	4x2 (4Rx, 2Tx)
Bandwidth Support	Up to 20 MHz
Maximum Tx Power)	37 dBm
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	420 x 340 x 270 mm
Weight	15 Kg
Connectors	ANT: 4 x N-Type jack, 50 Ohm, lightning protected IF: 4 x TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 216W maximuml Receive - 24W maximum

1.5.3.6 3.6 GHz Band

Table 1-16: 3.6 GHz Band 4x2 ODU Specifications

Item	Description
Frequency Band	ODU-3600-3800-000N-36-4x2-N-0: 3600-3800 MHz
Ports Configuration	4x2 (4Rx, 2Tx)
Bandwidth Support	Up to 20 MHz
Maximum Tx Power)	36 dBm
Tx Power Control Range	10 dB, in 1 dB steps
Tx Power Accuracy	+/- 1 dB
Maximum Input Power @ antenna port	-60 dBm before saturation, -8 dBm before damage
Noise Figure	4.5 dB typical, 5.5 dB maximum
Dimension	420 x 340 x 270 mm
Weight	15 Kg
Connectors	ANT: 4 x N-Type jack, 50 Ohm, lightning protected IF: 4 x TNC jack, 50 Ohm, lightning protected
Power Source	-40.5 to -60 VDC over the IF cable
Power Consunption	Transmit - 216W maximuml Receive - 24W maximum

1.5.4 AU - ODU Communication

Table 1-17: AU - ODU Communication

Item	Description
IF Frequency	■ Tx: 240 MHz ■ Rx: 140 MHz
Ref Synchronization Frequency	64 MHz
Bi-Directional Control Frequency	14 MHz
IF cable Impedance	50 Ohm
Maximum IF cable Attenuation	10 dB @ 240 MHz 7.5 dB @ 140 MHz 8 dB @ 64 MHz
Minimum IF cable Shielding Effectiveness	90 dB in the 10-300 MHz band
Maximum IF cable Return Loss	20 dB in the 10-300 MHz band
Maximum IF cable DC Resistance	1x1 ODUs, 2.x GHz 4x2 ODUs: 1.5 Ohm 3.x GHz 4x2 ODUs: 1 Ohm

1.5.5 Data Communication (Ethernet Interfaces)

Table 1-18: Data Communication (Ethernet Interfaces)

Item		Description
Standard Compliance		IEEE 802.3 CSMA/CD
Speed	NPU Data Port	10/100/1000 Mbps, Full Duplex with Auto Negotiation
	NPU Management Port	10/100 Mbps, Half/Full Duplex with Auto Negotiation
	NPU Cascade Port (not applicable for NAU)	100/1000 Mbps, Full Duplex with Auto Negotiation
	AU Calibration Port(not applicable for Macto Oudoor BTS components, not used in current release)	10/100 Mbps, Half/Full Duplex with Auto Negotiation

1.5.6 Configuration and Management

Table 1-19: Configuration and Management

Item	Description
Out Of Band (OOB) Management	■ Telnet via Management port ■ SSH via Management port ■ SNMP via Management port ■ Telnet via Cascade port (not applicable for NAU) ■ SSH via Cascade port (not applicable for NAU) ■ SNMP via Cascade port (not applicable for NAU) ■ Monitor port (serial interface)
In Band (IB) Management via Data Port	■ SNMP ■ Telnet ■ SSH
SNMP Agents	SNMP ver 2 client MIB II (RFC 1213), Private MIBs
Software Upgrade	Using TFTP
Configuration Upload/Download	Using TFTP

1.5.7 Standards Compliance, General

Table 1-20: Standards Compliance, General

Type	Standard
EMC	■ ETSI EN 301 489-1/4 ■ FCC Part 15
Safety	■ EN60950-1 ■ UL 60950-1
Environmental	ETS 300 019: ■ Part 2-1 T 1.2 & part 2-2 T 2.3 for indoor & outdoor ■ Part 2-3 T 3.2 for indoor ■ Part 2-4 T 4.1E for outdoor
Radio	■ ETSI EN 302 326 ■ ETSI EN 302 544 ■ FCC part 15, part 27, part 25

1.5.8 Environmental

Table 1-21: Environmental Specifications

Type	Unit	Details
Operating Temperature	Outdoor units	AU-ODU-HP-2.3-WCS: -52°C to 55°C All other ODUs and Macro Outdoor BTS units: -40°C to 55°C Outdoor GPS Receiver: -40°C to 85°C
	Indoor equipment	0°C to 40°C
Operating Humidity	Outdoor units	8%-100%, weather protected
	Indoor equipment	5%-95% non condensing

1.5.9 Mechanical and Electrical

1U = 44.45 mm (1.75”).

1HP = 5.08 mm (0.2”)

1.5.9.1 BreezeMAX Shelf

Table 1-22: BreezeMAX Shelf, Mechanical & Electrical Specifications

Item	Description
Dimensions	8U ETSI type shelf, 8U x 43.2 x 24 cm
Weight	6.9 Kg (excluding AVU)

1.5.9.2 AVU

Table 1-23: AVU, Mechanical & Electrical Specifications

Item	Description
Dimensions	2U x 84HP x 16 cm
Weight	1.5 Kg
Power Condumption	40W maximum, 23W typical

1.5.9.3 PIU

Table 1-24: PIU, Mechanical & Electrical Specifications

Item	Description
Dimensions	3U x 5HP x 16 cm
Weight	0.45 Kg
Power Source	-40.5 to -60 VDC
Power Dissipation	35W maximum (active PIU)
Maximum Supplied Current	58A
-48V Connector	5 pin/40A D-Type plug

1.5.9.4 PSU

Table 1-25: PSU, Mechanical & Electrical Specifications

Item	Description
Dimensions	3U x 5HP x 16 cm
Weight	0.7 Kg
Power Output	300W maximum output power Efficiency: 80% minimum

1.5.9.5 NPU

Table 1-26: NPU, Mechanical & Electrical Specifications

Item		Description
Dimensions		6U x 7HP x 16 cm
Weight		0.7 Kg
Power Consumption		68W maximum, 61W typical
Connectors	DATA	100/1000Base-T (RJ-45) with 2 embedded LEDs
	MGMT	10/100Base-T (RJ-45) with 2 embedded LEDs
	GPS/SYNC IN	15-pin micro D-Type jack
	GPS/SYNC OUT	15-pin micro D-Type jack
	CSCD	100/1000Base-T (RJ-45) with 2 embedded LEDs
	ALRM IN/OUT	25-pin micro D-Type jack
	MON	3-pin low profile jack

1.5.9.6 AU

Table 1-27: AU, Mechanical & Electrical Specifications

Item		Description
Dimensions		6U x 7HP x 16 cm
Weight		0.6 Kg
Power Consumption		74W maximum, 66W typical
Connectors	ODU1 - ODU4	4 x TNC jack, lightning protected
	CAL UNIT	10/100Base-T (RJ-45) with 2 embedded LEDs

1.5.9.7 NAU

Table 1-28: NAU, Mechanical & Electrical Specifications

Item		Description
Dimensions		420 x 340 x 280 mm
Weight		15 Kg
Power Source		-40.5 to -60 VDC
Power Consumption		140W maximum
NPU Connectors	DATA	RJ-45, lightning protected
	MNG	RJ-45, lightning protected
	GPS	RJ-45, lightning protected
	ETH (x5)	5 x RJ-45, lightning protected
	SYNC (x3)	3 x RJ-45, lightning protected
AU Connectors	POWER	SAMTEC Mini Fit 6 pins
	IF1-IF4	4 x TNC jack, lightning protected
	SYNC	-
	ETH	RJ-45, lightning protected (not used)
	MON	RJ-45, lightning protected

1.5.9.8 SAU

Table 1-29: SAU, Mechanical & Electrical Specifications

Item		Description
Dimensions		420 x 340 x 140 mm
Weight		7.5 Kg
Power Source		-40.5 to -60 VDC
Power Consumption		75W maximum
Connectors	POWER	SAMTEC Mini Fit 6 pins
	IF1-IF4	4 x TNC jack, lightning protected
	SYNC	RJ-45, lightning protected
	ETH	RJ-45, lightning protected
	MON	Not used

1.5.9.9 DAU

Table 1-30: DAU, Mechanical & Electrical Specifications

Item		Description
Dimensions		420 x 340 x 280 mm
Weight		15 Kg
Power Source		-40.5 to -60 VDC
Power Consumption		150W maximum
Master* AU Connectors	POWER	SAMTEC Mini Fit 6 pins
	IF1-IF4	4 x TNC jack, lightning protected
	SYNC	RJ-45, lightning protected
	ETH	RJ-45, lightning protected
	MON	Not used
Slave* AU Connectors	POWER	SAMTEC Mini Fit 6 pins
	IF1-IF4	4 x TNC jack, lightning protected
	SYNC	Not used
	ETH	RJ-45, lightning protected
	MON	Not used

* Master AU is with a SYNC connector (in the Slave AU there is no SYNC connector)

1.5.9.10 GPS Receiver

Table 1-31: GPS Receiver, Mechanical & Electrical Specifications

Item	Description
Dimensions	Tubular enclosure, 15.5 D x 12.7 H cm
Weight	0.363 Kg
Power Source	12 VDC from the NPU
Power Consumption	6W maximum
Connector	12-pin round plug

1.5.9.11 ODU Power Feeder

Table 1-32: ODU Power Feeder, Mechanical & Electrical Specifications

Item		Description
Dimensions		15.7 x 14.6 x 3.17 cm
Weight		0.6 Kg
Power Source		-40.5 to -60 VDC
Power Dissipation		2W per channel
Connectors	ODU 1 - ODU 4	4 x TNC jack, lightning protected
	IDU 1 - IDU 4	4 x TNC jack, lightning protected
	Power	3 pin/20A D-Type plug

1.5.10 Antennas

1.5.10.1 2.x GHz Antennas

Table 1-33: BS-RET-DP-ANT 2.3-2.7 Specifications

Item	Description
Frequency Band (MHz)	2300-2700
Number of Elements	2
Polarization	Linear, +/-45°
Gain (dB)	17.3 @ 2.4 GHz 18 @ 2.6 GHz
Azimuth Beamwidth (degrees)	65
Elevation Beamwidth (degrees)	6.5
Elevation Side Lobe Level (dB)	<-18
Maximum Power (W)	250
Cross-polarization Discrimination (dB)	>15
Front-to-Back Ratio (dB)	>30
Electrical Downtilt Range (degrees)	0-10
Remote Electrical Downtilt Support	Internal motor, AISG version 2 compliant
Isolation Between Ports (dB)	>30
Return Loss (dB)	>15
RF Interface Impedance (Ohm)	50
RF Connectors	2 x N-Type jack
RET Connector	8-pin IEC 60130-9
Dimensions (mm)	1060 x 126 x 69
Weight (Kg)	6
Wind Load (Kg)	0.24 @ 160 km/h
Maximum Wind Velocity (km/h)	200

Table 1-34: BS-RET-DDP-ANT 2.3-2.7 Specifications

Item	Description
Frequency Band (MHz)	2300-2700
Number of Elements	4
Polarization	Linear, 2 x +/-45°
Gain (dB)	17.3 @ 2.4 GHz 18 @ 2.6 GHz
Azimuth Beamwidth (degrees)	65
Elevation Beamwidth (degrees)	6.5
Elevation Side Lobe Level (dB)	<-18
Maximum Power (W)	250
Cross-polarization Discrimination (dB)	>15
Front-to-Back Ratio (dB)	>30
Electrical Downtilt Range (degrees)	0-10
Remote Electrical Downtilt Support	Internal motor, AISG version 2 compliant
Isolation Between Ports (dB)	>30
Return Loss (dB)	>15
RF Interface Impedance (Ohm)	50
RF Connectors	4 x N-Type jack
RET Connector	8-pin IEC 60130-9
Dimensions (mm)	1070 x 300 x 110
Weight (Kg)	13
Wind Load (Kg)	0.48 @ 160 km/h
Maximum Wind Velocity (km/h)	200

Table 1-35: ANT.2.3-2.7GHz, D/S,65°,16±0.5dBi Specifications

Item	Description
Frequency Band (MHz)	2300-2700
Number of Elements	2
Polarization	Linear, +/-45°
Gain (dB)	16 +/- 0.5
Azimuth Beamwidth (degrees)	65 +/-5
Elevation Beamwidth (degrees)	8 +/-2
Elevation Side Lobe Level (dB)	<-18
Maximum Power (W)	50
Cross-polarization Discrimination (dB)	-15
Front-to-Back Ratio (dB)	>28
Isolation Between Ports (dB)	>25
RF Interface Impedance (Ohm)	50
RF Connectors	2 x N-Type jacks
Mechanical Downtilt Range (degrees)	0-15
Dimensions (mm)	711 x 171 x 90
Weight (Kg)	2.6
Maximum Wind Velocity (km/h)	Survival: 200 Operation: 160
Regulatory Compliance	ETSI EN 302 326-3 V1.2.1 class CS RoHS Compliance

1.5.10.2 3.5 GHz Antennas

Table 1-36: BS-RET-DP-ANT 3.3-3.8 Specifications

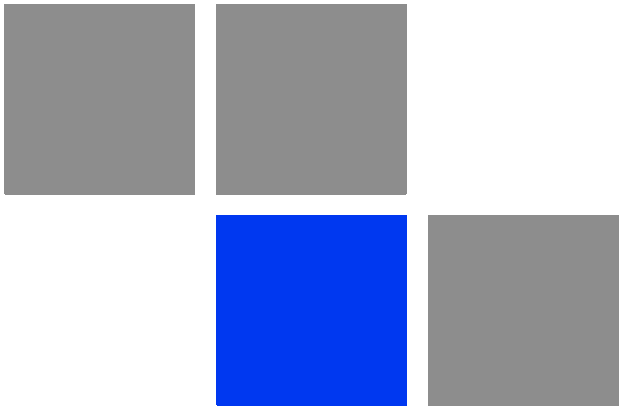
Item	Description
Frequency Band (MHz)	3300-3800
Number of Elements	2
Polarization	Linear, +/-45°
Gain (dB)	18
Azimuth Beamwidth (degrees)	65
Elevation Beamwidth (degrees)	6.5
Elevation Side Lobe Level (dB)	<-18
Maximum Power (W)	200
Cross-polarization Discrimination (dB)	>15
Front-to-Back Ratio (dB)	>30
Electrical Downtilt Range (degrees)	0-10
Remote Electrical Downtilt Support	Internal motor, AISG version 2 compliant
Isolation Between Ports (dB)	>30
Return Loss (dB)	>15
RF Interface Impedance (Ohm)	50
RF Connectors	2 x N-Type jack
RET Connector	8-pin IEC 60130-9
Dimensions (mm)	760 x 126 x 69
Weight (Kg)	4.5
Wind Load (Kg)	0.17@ 160 km/h
Maximum Wind Velocity (km/h)	200

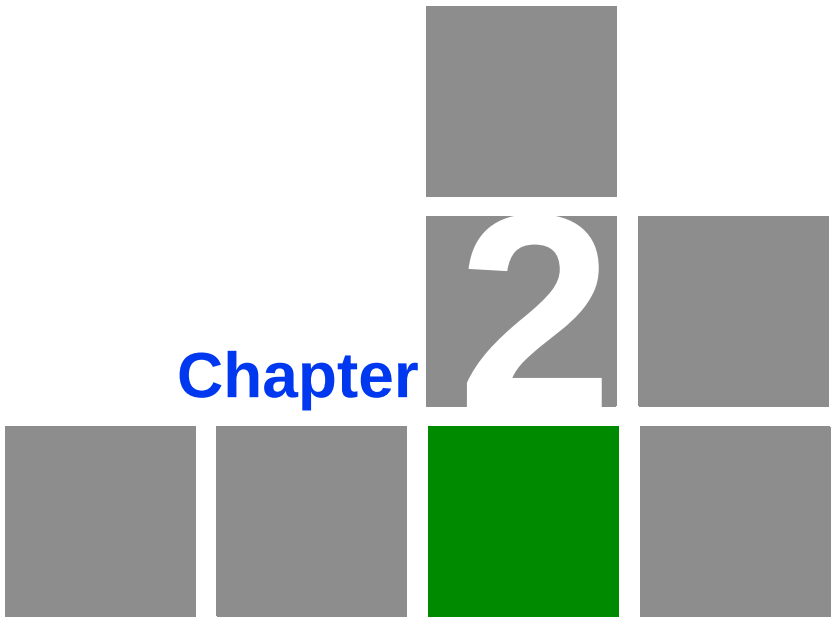
Table 1-37: BS-RET-DDP-ANT 3.3-3.8 Specifications

Item	Description
Frequency Band (MHz)	3300-3800
Number of Elements	4
Polarization	Linear, 2 x +/-45°
Gain (dB)	18
Azimuth Beamwidth (degrees)	65
Elevation Beamwidth (degrees)	6.5
Elevation Side Lobe Level (dB)	<-18
Maximum Power (W)	200
Cross-polarization Discrimination (dB)	>15
Front-to-Back Ratio (dB)	>30
Electrical Downtilt Range (degrees)	0-10
Remote Electrical Downtilt Support	Internal motor, AISG version 2 compliant
Isolation Between Ports (dB)	>30
Return Loss (dB)	>15
RF Interface Impedance (Ohm)	50
RF Connectors	4 x N-Type jack
RET Connector	8-pin IEC 60130-9
Dimensions (mm)	750 x 300 x 110
Weight (Kg)	10.5
Wind Load (Kg)	0.34 @ 160 km/h
Maximum Wind Velocity (km/h)	200

Table 1-38: ANT.3.5GHz, D/S,65°,16±0.5dBi Specifications

Item	Description
Frequency Band (MHz)	3300-3800
Number of Elements	2
Polarization	Linear, +/-45°
Gain (dB)	16 +/- 0.5
Azimuth Beamwidth (degrees)	65 +/-5
Elevation Beamwidth (degrees)	6 +/-1
Elevation Side Lobe Level (dB)	<-14
Maximum Power (W)	50
Cross-polarization Discrimination (dB)	-15
Front-to-Back Ratio (dB)	>25
Isolation Between Ports (dB)	>25
RF Interface Impedance (Ohm)	50
RF Connectors	2 x N-Type jacks
Mechanical Downtilt Range (degrees)	0-15
Dimensions (mm)	711 x 171 x 90
Weight (Kg)	2.6
Maximum Wind Velocity (km/h)	Survival: 200 Operation: 160
Regulatory Compliance	RoHS Compliance





Chapter 2

Commissioning

In This Chapter:

2.1 Initial NPU Configuration

2.1.1 Introduction

After completing the installation process, as described in the preceding chapter, some basic NPU parameters must be configured locally using the CLI via the MON port of the NPU.

Refer to “Using the Command Line Interface for Management” on page 68 for information on how to access the CLI either via the MON port or via Telnet and how to use it.

The following sections describe the minimum mandatory configuration actions required to allow remote configuration of the site and to enable discovery by the EMS system:

1 ”NPU Local Connectivity”

2 ”Site Connectivity”

3 ”Static Route Definition”

4 ”SNMP Manager Definition”

5 ”Mapping the AU Software Version”

6 ”Site ID Definition”

7 ”Saving the Configuration”

2.1.2 NPU Local Connectivity

Refer to “Accessing the CLI from a Local Terminal” on page 70 for details on connecting locally to the NPU.

Clear existing site configuration (must be executed for "used” NPUs). Restore to factory default and reboot using the following command:

npu# restore-factory-default

The system will reset automatically.

2.1.3 Site Connectivity

2.1.3.1 Connectivity Mode

The connectivity mode determines how traffic is to be routed between the NPU and the BSs, AAA server and external Management System servers.

The default connectivity mode is In-Band (IB) via the Data port. Alternatively, the NPU can be managed Out-Of-Band (OOB) via the dedicated Management port.

To view the current and configured connectivity mode, use the command:
npu# show connectivity mode

To change the connectivity mode to Out-Of-Band, use the command:
npu(config)# connectivity mode outband (for details refer to "Configuring the IP Connectivity Mode" on page 100).

2.1.3.2 VLANs Translation (Outband Connectivity Mode)

When using In-Band connectivity via the Data port, the default VLAN ID for management packets is 12. The default VLAN ID for data packets is 11. If different VLAN IDs are used in the backbone, the VLANs should be translated accordingly. To enable VLAN translation and configure the required VLANs translation, run the following commands (the examples are for backhaul Data VLAN ID 30 and Management VLAN ID 31):

1. Enable the Data port configuration mode (for details refer to "Enabling the Interface configuration mode" on page 104):
   npu(config)# interface gigabitethernet 0/10
2. Enable VLAN translation (for details refer to "Enabling/Disabling VLAN Translation" on page 111): *npu(config-if)# vlan mapping enable*
3. Translate data VLAN 11 to the backhaul data VLAN 30 (for details refer to "Creating a VLAN Translation Entry" on page 111):
   npu(config-if)# vlan mapping 11 30
4. Translate management VLAN 12 to the backhaul management VLAN 31:
   npu(config-if)# vlan mapping 12 31
5. Exit the interface configuration mode: *npu(config-if)# exit*
6. To view the VLAN mapping parameters, run the command:
   npu# show interface gigabitethernet 0/10 vlan mapping

2.1.3.3 External Management Interface

To configure the necessary parameters of the External Management interface used for connectivity with the EMS system, run the following commands:

1. Enable the External Management interface configuration mode (for details refer to "Enabling the Interface configuration mode" on page 104):
   npu(config)# interface external-mgmt
   (there is no need to shut down the interface for configuring its parameters)

2 Configure the IP address (x.x.x.x) and subnet mask (y.y.y.y). For details refer to "Assigning an IP address to an interface" on page 121:
npu(config-if)# ip address x.x.x.x y.y.y.y

3 Configure the MTU of the interface to 1500 bytes: *npu(config-if)# mtu 1500*

4 Exit the interface configuration mode: *npu(config-if)# exit*

5 Exit the configuration mode: *npu(config)# exit*

2.1.3.4 Save and Apply Changes in Site Connectivity Configuration

1 Save the configuration: *npu# write* (otherwise, after the next time reset you will lose the configuration changes).

2 If you changed the Connectivity Mode, reset the system to apply the changes: *npu# reset*

2.1.4 Static Route Definition

Static Route must be configured whenever the EMS server and the NPU are on different subnets. For more details refer to "Adding a Static Route" on page 168.

Run the following command: *npu(config)# "ip route 0.0.0.0 0.0.0.0 x.x.x.x"*
(x.x.x.x is the next hop IP address, 0.0.0.0 0.0.0.0 define the IP address and mask as "any destination". Depending on your backhaul network, you may define different IP address and mask to allow only specific destinations).

2.1.5 SNMP Manager Definition

To define the communities to be used by the SNMP manager, run the command: *npu(config)# snmp-mgr ReadCommunity public ReadWriteCommunity private*.
For more details refer to "Adding an SNMP Manager" on page 371.

For proper operation of the manager you should configure also the Trap Manager parameters and enable sending traps to the defined Trap Manager (this can also be done later via the management system):

1 *npu(config)# trap-mgr ip-source x.x.x.x port 162 TrapCommunity public*
(x.x.x.x is the IP address of the EMS server). For more details refer to "Adding/Modifying a Trap Manager entry" on page 374

2 *npu(config)# trap-mgr enable ip-source x.x.x.x*

Note that if the management system is behind a NAT router, the NAT Outside IP address (the IP of the router's interface connected in the direction of the managed device LAN) must be defined in the device as a Trap Manager, with traps sending enabled. In the NAT router, Port Forwarding (NAT Traversal) must be configured

for UDP and TCP ports 161 and 162 from Outside IP (connected to the managed device's LAN) to Inside IP (connected to the management system's LAN).

2.1.6 Mapping the AU Software Version

To define the software version to be used by all AUs run the command: *npu(config)# map au default <image name>*, where image name is the required AU software version (to view the AU software versions available in the NPU run the command *npu# show au image repository*).

2.1.7 Site ID Definition

To define the site ID (Site Number): *npu(config)# site identifier x*
(x is the unique site identifier, a number in the range from 1 to 999999)

For more details refer to "Configuring the Unique Identifier for the 4Motion Shelf" on page 410.

2.1.8 Saving the Configuration

To save the configuration run the command: *npu# write* (otherwise, after the next time reset you will lose the configuration changes).

2.2 Completing the Site Configuration Using AlvariSTAR

2.2.1 Introduction

After completion of the initial configuration you should be able to manage the new Site using AlvariSTAR and continue configuring (at least) all mandatory parameters to enable the necessary services.

For details on how to use AlvariSTAR for managing 4Motion sites refer to the AlvariSTAR and 4Motion Device Manager User Manuals.

Verify that the Site is included in the list of devices that can be managed by AlvariSTAR. It can be added to the list of managed devices either through the Equipment Manager (by creating a New managed device) or through the Managed Network window (by inclusion in a range to be discovered and activation of the Network Scan Task from the Task Manager).

To complete the minimal configuration, open the Site's Device Manager from the Equipment Manager and perform the following configuration steps:

1 "Site Configuration" on page 59

2 "Connectivity Configuration (optional)" on page 59

3 "Equipment Configuration" on page 59

4 "ASNGW Configuration" on page 61 (only for Distributed ASNGW topology)

5 "BS Configuration" on page 63

6 "Site Sector Configuration" on page 64

7 "Apply All Changes" on page 65

NOTE

The following sections list the minimum actions that must be performed for completing basic configuration of the Site. Additional parameters may also be configured in order to complete the entire configuration of the Site.

After configuring the mandatory parameters in each screen, click on the Apply button. Click Apply even if you did not change any of the screen's default parameters.

In some of the screens in the following sections there are no mandatory parameters but still you must click on the Apply button to activate the default values.

2.2.2 Site Configuration

2.2.2.1 General Tab

ASN Topology - the default is Distributed ASNGW.

If you change it to Centralized ASNGW click Apply for the device to accept the change.

2.2.3 Connectivity Configuration (optional)

2.2.3.1 IP Interface Screen

Configure the IP address of the Bearer interface:

8 Change the IP and/or any other parameter value, except VLAN ID.

9 Click on Apply to accept the changes.

2.2.3.2 IP Routing Screen

The IP Routing screen is used to define the static routes for traffic originating from the NPU.

The static route for management traffic was already configured (see “Static Route Definition” on page 56).

If necessary (depending on your specific backhaul network) you may configure additional static route(s) for Bearer Traffic and/or Control Traffic. If additional static routes were defined (or if you made any changes in the already configured static route), click on the Apply button.

2.2.4 Equipment Configuration

2.2.4.1 AU

AU entities must be created for all installed AUs (you may create an AU entity also for AUs that are not installed yet).

To create a new AU entity:

1 Right click on the AU lnode in the Navigation Pane and select Create. The New AU definition window will open. You can also double-click on an empty slot in the Site Equipment View Page to open the New AU window for the selected slot.

2 In the New AU definition window, define the following:

» AU number (AU Slot)

» Type (in current release only AU 4x4 Modem is applicable)

3 Click Apply.

4 Repeat the process for all required AU entities.

2.2.4.2 ODU

ODU entities must be created for all installed ODUs (you may create an ODU entity also for ODUs that are not installed yet).

To create a new ODU entity:

1 Right click on the ODU node in the Navigation Pane and select Create. The New ODU definition window will open.

2 In the New ODU definition window, define the following:

» ODU number

» ODU Type

3 Click Apply.

4 In the ODU General screen of the applicable ODU, in the Ports Configuration section, configure the Tx Power for the relevant Tx/Rx port(s) . Click on the Apply button for the device the accept the configuration.

5 Repeat the process for all required ODU entities.

2.2.4.3 Antenna

Antenna entities must be created for all installed and connected antennas (you may create an Antenna entity also for antennas that are not installed/connected yet).

To create a new Antenna entity:

1 In the Antenna screen, click on the Add New Antenna button.

2 In the Antenna Parameters section, define Antenna Product Type

3 Click Apply.

4 Repeat the process for all required Antenna entities.

2.2.4.4 GPS

The default GPS Type is Trimble. If there is no GPS, the value should be changed to None.

Click Apply for the device to accept the change.

2.2.5 ASNGW Configuration

NOTE

ASNGW screens are available only for Distributed ASNGW topology (see also "Site Configuration" on page 59.

2.2.5.1 AAA Screen

1 Configure the following mandatory parameters:

- Primary Server IP Address
- RADIUS Shared Secret
- ASNGW NAS ID

2 Click Apply for the device to accept the configuration.

2.2.5.2 Service Screen

2.2.5.2.1 Service Interface Tab

At least one Service Interface for data must be defined. If a dedicated management station for CPEs is being used, a suitable Service Interface for management must also be defined.

1 Click on the Add Service Interface button and configure the following mandatory parameters:

- Service Interface Name
- Type
- Tunnel Destination IP (IP-in-IP Service Interface)
- Service VLAN ID (VLAN Service Interface)
- Default Gateway IP Address (VLAN Service Interface)

2 Click Apply for the device to accept the configuration.

2.2.5.2.2 Service Groups Tab

At least one Service Group associated with a defined Service Interface for data must be defined. If a dedicated management station for CPEs is being used, a suitable Service Group associated with the defined Service Interface for management must also be defined.

1 Click on the Add Service Group button and configure at least the following mandatory parameters:

- Name
- Type
- Service Interface Name
- DHCP Function Mode
- DHCP Own IP Address
- External DHCP Server IP Address (Relay mode)
- IP Address Pool From (Server mode)
- IP Address Pool To (Server mode)
- Subnet Mask (Server mode)
- DNS Server IP Address (Proxy mode)

2 Click Apply for the device to accept the configuration.

2.2.5.3 SFA Screen -Classification Rules Tab

Create the necessary Classification Rule(s) according to the relevant type of traffic, and click Apply.

2.2.5.4 Service Profiles

At least one Service Profile must be defined and associated with an already defined Service Group.

1 Right-click on the Service Profile node and select **Create**. The New Service Profile window is displayed.

2 Define the Name of the New Service Profile and click Apply.

3 The new Service Profile added to the list of available Service Profiles in the navigation tree. Select it to continue the configuration process.

4 Click Add in the Service Flow area.

5 Configure the applicable general parameters of the Service Flow.

6 Configure the applicable QoS parameters of Service Flow for UL and DL (for Data deleivery type=BE it will be Maximum Sustained Traffic Rate and Traffic Priority)

7 Associate this Service Flow with previously created Classification Rule(s).

8 Change the Profile Status to Enable

9 Click Apply for the device to accept the configuration.

2.2.6 BS Configuration

2.2.6.1 Creating a New BS Entity

To create a new BS entity:

1 Right click on the BS level entry in the Navigation Pane. The New BS definition window will open.

2 In the New BS definition window, define the following:

- BS ID LSB
- Operator ID

3 Click Apply.

4 Complete the BS configuration as described in the following sections.

2.2.6.2 Radio

2.2.6.2.1 Basic Screen

2.2.6.2.1.1 General Tab

1 Configure the following mandatory parameters:

- Name
- Bandwidth
- Center Frequency

2 Click Apply for the device to accept the configuration.

3 You will be prompted to properly configure some additional parameters.

4 Click Apply for the device to accept the configuration.

5 Select the Radio Advanced screen and click Apply to complete the configuration.

2.2.6.3 Connectivity

2.2.6.3.1 Basic Screen - Bearer Tab

1 Configure the following mandatory parameters:

- » IP Address
- » IP Subnet Mask
- » Default Gateway

2 Click Apply for the device to accept the configuration.

2.2.6.3.2 Basic Screen - Authentication Tab

1 Configure the mandatory Default Authenticator IP Address parameter.

2 Click Apply for the device to accept the configuration.

2.2.7 Site Sector Configuration

To create a new Site Sector entity:

1 Right click on the Site Sector level entry in the Navigation Pane. The New Site Sector definition window will open.

2 In the New Site Sector definition window, define the Site Sector Number

3 Click Apply.

4 At least one Site Sector Association must be defined for each Site Sector. Click on the Add Sector Association button and configure all the parameters in the applicable line of the Sector site Association table:

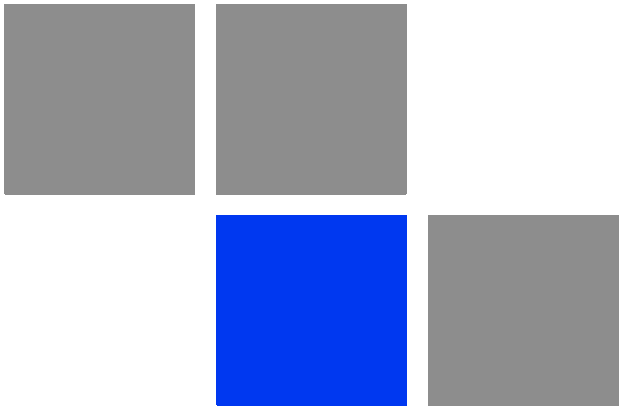
- BS ID LSB
- AU Slot Number
- AU Port Number
- ODU Number
- ODU Port Number
- Antenna Number
- Antenna Port Number

5 Click Apply for the device to accept the configuration.

2.2.8 Apply All Changes

If you changed any of the parameters that are applied only after reset of the NPU such as ASN Topology or Configured GPS Type (indicated by a pop-up message after applying the change), you must reset the NPU (in the NPU screen select the Reset option in the Shutdown Operation parameter). This will cause also automatic reset of all AUs

To fully apply all the Site Sector configuration changes, reset all the relevant AUs (in the Control tab of each applicable AU screen select the Reset option in the Shutdown Operation parameter). It is not necessary to reset each of the AUs if you reset the NPU.



Chapter 3

Operation and Administration Using the CLI

In This Chapter:

3.1 Using the Command Line Interface for Management

All 4Motion system components are managed via the NPU module. The AU is not accessed directly: any configuration change or status enquiry is sent to the NPU that communicates with other system components.

The following system management options are available:

- Accessing the Command Line Interface (CLI) locally via the MON port
- Using Telnet/Secure Shell (SSH) to access the CLI

The CLI is a configuration and management tool that you can use to configure and operate the 4Motion system, either locally or remotely, via Telnet/SSH. The following are some administrative procedures to be executed using the CLI:

- Specifying the boot mode to be used at the next system reset
- Selecting the connectivity mode
- Shutting down/resetting 4Motion
- Configuring and operating 4Motion
- Monitoring hardware and software components
- Executing debug procedures
- Executing software upgrade procedures

This section provides information about:

- "Accessing the CLI" on page 70
- "Command Modes" on page 73
- "Interpreting the Command Syntax" on page 74
- "Using the CLI" on page 75

- "Managing Users and Privileges" on page 78
- "Managing Secure Shell (SSH) Parameters" on page 87
- "Managing the Session" on page 89

3.1.1 Managing the Macro Outdoor BTS

The following section describe the CLI when using it to manage the Indoor Macro BTS equipment. The same CLI is used also to manage the Macro Outdoor BTS equipment, with the following changes:

3.1.1.1 CSCD Port and Local Management

There is no CSCD port in the Macro Outdoor BTS. Local Management may be supported only on the Management port (in in-band or unified connectivity mode). It should be noted that local management will be blocked if connectivity mode is set to out-of-band.

3.1.1.2 Management Port

In the Macro Outdoor BTS the management port is marked MNG, while in the Indoor BTS it is marked MGMT. All references to MGMT port are applicable to the MNG port of the Macro Outdoor BTS.

3.1.1.3 AVU, PIU and PSU

AVU and its Fans, PIUs and PSUs do not exist in the Macro Outdoor BTS. These shelf components cannot be manage and the status of all the following is indicated as existing and healthy:

- 2 PIUs
- 4 PSUs
- AVU
- 10 AVU Fans

3.1.1.4 Alarm In/Out Connectors and Dry-Contacts Management

Alarm In-Out connectors do not exist in the Macro Outdoor BTS. All commands related to dry-contact in/out are not applicable.

3.1.1.5 Power Feeder

Power Feeders are not applicable for the Macro Outdoor BTS

3.1.1.6 AUs

Up to a maximum of six AUs can be supported in the Macro Outdoor BTS. The following table details the mapping of Macro Outdoor BTS AUs to Slot numbers:

Table 3-1: Mapping of Macro Outdoor BTS AUs to Slot #

AU	Slot #
AU of NAU	7
SAU	1
Master AU of DAU 1	3 (This is the AU with the Sync connector)
Slave AU of DAU 1	2
Master AU of DAU 2	9 (This is the AU with the Sync connector)
Slave AU of DAU 2	8

3.1.1.7 ODUs and Antennas

Up to a maximum of 28 ODUs and 28 Antennas can be defined for the Macro Outdoor BTS.

3.1.2 Accessing the CLI

You can access the CLI, locally, via an ANSI ASCII terminal or PC that is connected via the DATA port of the NPU. You can also use Telnet/SSH to remotely access the CLI.

This section describes the procedures for:

- "Accessing the CLI from a Local Terminal" on page 70
- "Accessing the CLI From a Remote Terminal" on page 71

3.1.2.1 Accessing the CLI from a Local Terminal

To access the CLI via the MON connector:

1 Use the MON cable to connect the MON connector of the NPU to the COM port of your ASCII ANSI terminal or PC. The COM port connector of the Monitor cable is a 3-pin to 9-pin D-type plug.

2 Run a terminal emulation program, such as HyperTerminal™.

3 Set the communication parameters listed in the following table:

Table 3-2: COM Port Configuration

Parameter	Value
Baud rate	115200
Data bits	8
Stop bits	1
Parity	None
Flow control	Xon/Xoff
Port	Connected COM port

4 The login prompt is displayed. (Press Enter if the login prompt is not displayed.) Enter your login ID and password to log in to the CLI.

NOTE

The default login ID and password are:
Login ID: admin
Password: admin123

After you provide your login information, the following command prompt is displayed:

npu#

This is the global command mode. For more information about different command modes, refer to Section 3.1.3.

3.1.2.2 Accessing the CLI From a Remote Terminal

The procedure for accessing the CLI from a remote terminal differs with respect to the IP connectivity mode. The Ethernet port and IP interface you are required to configure for enabling remote connectivity is different for each connectivity mode. For more information about connectivity modes, and Ethernet ports and IP interface used for operating the 4Motion system, refer “Managing the IP Connectivity Mode” on page 98.

To access the CLI from a remote terminal, execute the following procedure:

IMPORTANT

The in-band connectivity mode is the default connectivity mode; the DATA port and external-management VLAN are the default Etherent port and IP interface that are configured for the in-band connectivity mode. The following procedure can be used for accessing the CLI when the in-band connectivity mode is selected. This procedure is identical for all other connectivity modes. However, the Ethernet port, VLAN, and IP interface to be configured will differ for the out-of-band and unified connectivity modes, as listed in Table 3-9.

1. Assign an IP address to the external-management interface. For this, execute the following procedure. (Refer Table 3-9 for more information about the IP interface to be configured for the connectivity mode you have selected).

   a. Run the following command to enable the interface connectivity mode for the external-management interface:

      ```
      npu(config)# interface external-mgmt
      ```

   b. Run the following command to assign an IP address to this interface:

      ```
      npu(config-if)# ip address <ip-address> <subnet-mask>
      ```

2. Connect the Ethernet cable to the DATA connector on the front panel of the NPU. (Refer Table 3-9 for more information about the Ethernet port to be used for the connectivity mode you have selected).

3. To enable exchange of packets, create IP-level connectivity between the remote machine and the external-management interface.

4. From the remote terminal, execute the following command to use Telnet/SSH to access the IP address of the external-management interface:

   telnet <ip address of external-management interface>

   ssh <ip address of external-management interface>

   Refer to “Managing Secure Shell (SSH) Parameters” on page 87 for details on managing SSH parameter.

5. At the prompt, enter your login ID and password.

NOTE

The default login ID and password are:
Login ID: admin
Password: admin123

After you provide your login information, the following command prompt is displayed:

npu#

This is the global command mode. For more information about different command modes, refer to Section 3.1.3.

3.1.3 Command Modes

The CLI provides a number of command modes, some of which are listed in the following table for executing different types of commands:

Table 3-3: CLI Command Modes

Mode	Used for...	Command Prompt
Global configuration mode	Executing all configuration commands	**npu(config)#**
Global command mode	Executing all other commands such as show and delete commands	**npu#**
Interface configuration mode	Executing all commands for configuring physical and IP interfaces.	**npu(config-if)#**
Standard/extended ACL mode	Executing commands for configuring standard and extended ACLs	**npu(config-std-nacl)#** **npu(config-ext-nacl)#**

The following table lists the commands to be executed for entering/exiting a particular command mode:

Table 3-4: Commands to Enter/Exit a Command Mode

To...	Run the Command...	The Command Mode is Now...
Enter the global configuration mode	**npu# config terminal**	**npu(config)#**

Table 3-4: Commands to Enter/Exit a Command Mode

Enter the interface configuration mode	**npu(config)# interface** {<interface-type> <interface-id> |**internal-mgmt** |**external-mgmt** | **bearer** | **local-mgmt** | **npu-host** | **all-au**}	**npu(config-if)#**
Exit the configuration mode and enter the global command mode.	**npu(config)# end** **npu (config-if)# end**	**npu#** **npu#**
Exit the current configuration mode by one level	**npu (config-if)# exit**	**npu(config)#**

3.1.4 Interpreting the Command Syntax

The following table lists the conventions used in the command syntax for all 4Motion commands:

Table 3-5: Conventions Used in the 4Motion Command Syntax

Convention	Description	Example
{}	Indicates that the parameters enclosed in these brackets are mandatory, and only one of these parameters should be specified.	**npu(config)# limit** {**cpu** | **memory**} ([**softlimit** <limit>] [**hardlimit** <limit>]) This command is used for specifying the soft and hard limits for memory and CPU utilization. The cpu/memory parameters are enclosed within {} brackets, indicating that their presence is mandatory, and that only one of these parameters is required.
()	Indicates that one or all parameters enclosed within these brackets are optional. However, the presence of at least one parameter is required to successfully execute this command.	**npu(config)# limit** {**cpu** | **memory**} ([**softlimit** <limit>] [**hardlimit** <limit>]) This command is used for specifying the soft and hard limits for memory and CPU utilization. The softlimit and hardlimit parameters are enclosed within () brackets, indicating that you are required to specify the value of at least one of these parameters to successfully execute this command.

Table 3-5: Conventions Used in the 4Motion Command Syntax

[ ]	Indicates that the parameter enclosed within these brackets is optional.	**npu(config)# reboot from shadow** [<shadow image name>] This command is used to reboot the system with the shadow image. The shadow image name parameter is enclosed with the [ ] brackets, indicating that it is optional. If you do not specify the value of this parameter, the system automatically boots up with the last downloaded shadow image.
< >	Indicates that the parameter is mandatory and requires a user-defined value (and not a discrete value).	**npu(config)# load to shadow** <shadow image name> This command is used to load the system with a particular shadow image. It is mandatory to specify a value for the shadow image name parameter; otherwise an error is raised by the system. The value of this parameter is not a discrete value; you are required to specify a value for this parameter.
|	Indicates the OR conditional operator that is used between two or more parameters. The presence of this parameter indicates that only one of the parameters separated by the I conditional parameter should be specified in the command.	**npu(config)# pm-group enable npu** {**BckhlPort** | **MgmtPort** | **CascPort** | **AuPortTable** | **IntMgmtIf** | **ExtMgmtIf** | **LclMgmtIf** | **BearerIf** | **Sfa** | **DatapathFn** | **AaaClient** | **Authenticator** | **ContextFn** | **ProxyDhcp** | **RelayDhcp** | **ServerDhcp** | **MsStateChangeFn**} This command is used to specify the group for which performance data collection and storage is to be enabled. The | conditional operator indicates that only one parameter should be specified.

NOTE

In this document, all discrete values are specified in boldface, and all user-defined values are not bold.

3.1.5 Using the CLI

To help you use the CLI, this section provides information about:

■ "Using Control Characters" on page 76

3.1.5.1 Using Control Characters

Control characters refer to special characters that you can use to recall or modify previously-executed commands. The following table lists the control characters to be used for executing commands on the CLI:

Table 3-6: Control Characters for Using the CLI

Press	To...
Up/Down arrow keys	Scroll the previously executed CLI commands. Press Enter if you want to select and execute a particular command.
Right/Left arrow keys	Navigate to the right/left of the selected character in a command.
Home key	Navigate to the first character of a command.
End key	Navigate to the last character of a command.
Backspace key	Delete the characters of a command.
TAB key	Prompt the CLI to complete the command for which you have specified a token command. Remember that the CLI that is the nearest match to the token command that you have specified is displayed.
? key	View the list of commands available in the current mode. If you press ? after a command, a list of parameters available for that command is displayed.

3.1.5.2 Using the CLI Help

The CLI provides help that you can access while using the CLI. Execute the following command to obtain help for a specific command:

```
help ["<text>"]
```

Specify the command name as the parameter to view help for this command. For example, to obtain help for the **`show resource limits`** command, run the following command:

```
npu# help “show resource limits”
```

The help for the **`show resource limits`** command is displayed.

If you do not provide the command name as the parameter, all commands that can be executed in the current command mode are displayed.

3.1.5.3 Using the History Feature

The history feature of the CLI maintains a sequential list of all previously executed commands. The following table lists the commands that you can run to access, edit or execute a command from the command history list:

Table 3-7: Commands for Using the History Feature

Run the command...	To...
show history	Obtain a list of previously executed commands.
!!	Execute the last command displayed in the list of previously executed commands.
!<n>	Execute the nth command in the list of previously-executed commands.
!<string>	Execute the most recent command in the CLI history that starts with the string entered as the value for the `string` parameter.

3.1.5.4 Using Miscellaneous Commands

The following table lists other miscellaneous commands that you can execute in any mode while using the CLI:

Table 3-8: Miscellaneous Commands

Enter the command...	To...
`exit`	Exit the current configuration mode. In global command mode this command will cause termination of the session.
`clear screen`	Clear the screen.

3.1.5.5 Privilege Levels

All commands that can be executed using the CLI are assigned privilege levels between 0 and 10, where 0 is the lowest, and 10 is the highest. In addition, each user is assigned a privilege level; the user can access only those commands for which the privilege level is the same or lower than the user's privilege level.

The default user, admin, is assigned privilege level 10. However, if you are logging in as admin, you can execute certain additional commands for managing users and enabling passwords for privilege levels. For more information about managing users and privileges, refer to Section 3.1.6.

3.1.6 Managing Users and Privileges

To enable multi-level access to the CLI, you can create and manage multiple users, and assign privilege levels for each user. The privilege level determines whether a user is authorized to execute a particular command. The privilege level is pre-configured for each command, and can be between 0 and 10, where 0 is the lowest and 10 is the highest. The user can execute all commands for which the privilege level is equal to or lower than the default privilege level assigned to the user.

IMPORTANT

By default, the privilege level of users logging in with admin privileges is 10. However, the admin user can execute some additional commands for adding users and enabling passwords for different privilege levels.

You can also configure passwords for each privilege level. Users with lower privilege levels can enter this password to enable higher privilege levels.

This section describes the commands for:

3.1.6.1 Managing Users

You can add/modify/delete one or more users for accessing the CLI either through a local or remote terminal.

IMPORTANT

Only users who have logged in as admin can add/modify/delete users.

This section describes the commands for:

- "Adding/Modifying Users" on page 79
- "Deleting a User" on page 80

3.1.6.1.1 Adding/Modifying Users

IMPORTANT

Only users who have logged in as admin can execute this task.

To add/modify a user, and assign a username, password, and privilege level, run the following command:

```
npu(config)# username <user-name> password <passwd> privilege <0-10>
```

IMPORTANT

An error may occur if:

- You are not logged in as the admin.
- The username or password that you have specified is more than 20 characters.
- The privilege level that you have specified is not within the range, 0-10.

Command Syntax	`npu(config)# username <user-name> password <passwd> privilege <0-10>`
Privilege Level	10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
username <user-name>	Indicates the user name of the user to be added.	Mandatory	N/A	String (up to 20 characters and case-sensitive)
password <passwd>	Indicates the password to be assigned to the user to be added.	Optional	password	String (up to 20 characters and case-sensitive)
privilege <0-10>	Indicates the privilege level to be assigned to a user. The user will be permitted to execute all commands for which the privilege level is equal to or lower than the value of this parameter.	Mandatory	N/A	0-10

Command Modes Global configuration mode

3.1.6.1.2 Deleting a User

IMPORTANT

Only users who have logged in as admin can execute this task.

To delete a user, run the following command:

```
npu(config)# no user <username>
```

IMPORTANT

An error may occur if:

- You are not logged in as admin user.
- The username that you have specified does not exist. Remember that user names are case-sensitive.
- You are trying to delete an active user or the admin user.

Command Syntax

```
npu(config)# no user <username>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
username <name>	Indicates the username of the user to be deleted.	Mandatory	N/A	String (upto 20 characters and case-sensitive)

Command Modes

Global configuration mode

3.1.6.2 Managing Privileges

To enable users to execute commands that require a higher privilege level (than their currently configured default level), you can configure a password for each privilege level. Other users can then use the password you have specified to enable a higher privilege level.

IMPORTANT

Only users who have logged in as admin can assign or delete passwords for any privilege level.

This section describes the commands for:

- "Assigning a Password for a Privilege Level" on page 81
- "Deleting a Password for a Privilege Level" on page 82

3.1.6.2.1 Assigning a Password for a Privilege Level

IMPORTANT

Only users who have logged in as admin can execute this command.

To assign a password for a privilege level, run the following command:

```
npu(config)# enable password  [Level <0-10>] <password>
```

IMPORTANT

After you execute this command, any user can use this password to enable the (higher) privilege level for which you have configured the password. For more information about using passwords for enabling higher privilege levels, refer Section 3.1.6.3.

IMPORTANT

An error may occur if:

- You are trying to configure a password for a privilege level that is higher than your default privilege level.
- The password that you have specified is more than 20 characters.
- The privilege level that you have specified is not within the range, 0-10.

Command Syntax

```
npu(config)# enable password  [Level <0-10>] <password>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`[Level <0-10>]`	Indicates the privilege level for which a password is to be enabled.	Optional	10	0-10
`<password>`	Denotes the password to be assigned for the current privilege level.	Mandatory	N/A	String (up to 20 characters and case-sensitive)

Command Modes

Global configuration mode

3.1.6.2.2 Deleting a Password for a Privilege Level

IMPORTANT

Only users who have logged in as admin can execute this command.

To delete a password for a privilege level, run the following command:

```
npu(config)# no enable password [Level <0-10>]
```

IMPORTANT

An error may occur if:

- The privilege level that you have specified is not within the range, 0-10.
- You are trying to delete a password for a privilege level that is higher than your default privilege level.

Command Syntax

```
npu(config)# no enable password [Level <0-10>]
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
[Level <0-10>]	Indicates the privilege level for which a password is to be disabled.	Optional	10	0-10

Command Syntax

Global configuration mode

3.1.6.3 Enabling/Disabling Higher Privilege Levels

You can execute commands that require higher privilege levels. If the admin user has configured a password for that level, you can use that password to enable higher privilege levels.

For example, if your privilege level is 1, you can provide the password configured for privilege level 10 to execute all commands that require privilege level 10.

This section describes the commands for:

- "Enabling a Higher Privilege Level" on page 84
- "Returning to the Default Privilege Level" on page 85

3.1.6.3.1 Enabling a Higher Privilege Level

To enable a higher privilege level:

1. Log in to the CLI.
2. Run the following command to specify the privilege level and password:

   ```
   npu(config)# enable [Level <0-10>]
   ```

3. At the password prompt, specify the password configured for the privilege level that you have specified.

If you specify the correct password, you are logged in to the CLI with the privilege level that you had specified. You can now execute all commands that require the current privilege level.

NOTE

You can display your current privilege level, using the following command:
`npu# show privilege`

You can, at any time, return to your default privilege level. For details, refer Section 3.1.6.3.2.

NOTE

An error may occur if:

- You have specified an incorrect password. Remember that all passwords are case-sensitive.
- No password is not configured for the privilege level you are trying to access.

Command Syntax	`npu(config)# enable [Level <0-10>]`
Privilege Level	10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`[Level <0-10>]`	Indicates the privilege level you want to enable.	Mandatory	N/A	0-10

Command Modes Global configuration mode

3.1.6.3.2 Returning to the Default Privilege Level

Run the following command to disable the current privilege level, and return to your default privilege level:

```
npu(config)# disable [Level <0-10>]
```

After you run this command, you automatically return to your default privilege level. You can display your current privilege level, using the following command:

```
npu# show privilege
```

Command Syntax

```
npu(config)# disable [Level <0-10>]
```

Privilege Level 1

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`[Level <0-10>]`	Indicates the privilege level you want to disable.	Mandatory	N/A	0-10

Command Modes Global command mode

3.1.6.4 Displaying Active Users

To display all active users, run the following command:

```
npu# show users
```

Command Syntax	**npu# show users**
Privilege Level	1
Display Format	Line User Peer Address 0 con <user name> <value>
Command Syntax	Global command mode

3.1.6.5 Displaying All Users

To display all users, run the following command:

npu# listuser

Command Syntax	**npu# listuser**
Privilege Level	1
Display Format	User Mode User 1 <value> User 2 <value> User 3 <value>
Command Syntax	Global command mode

3.1.6.6 Displaying the Privilege Level

To display your current privilege level, run the following command:

npu# show privilege

Command Syntax	**npu# show privilege**
Privilege Level	1
Display Format	Current privilege level is <value>
Command Syntax	Global command mode

3.1.7 Managing Secure Shell (SSH) Parameters

The SSH parameters define the parameters used for establishing remote secure access to the device using SSH protocol rather than the plaintext-based insecure Telnet protocol.

This section includes:

3.1.7.1 Configuring SSH Parameters

To configure SSH parameters, run the following command:

npu(config)# ip ssh {version compatibility | cipher ([des-cbc] [3des-cbc]) **| auth** ([hmac-md5] [hmac-sha1]) **}**

Command Syntax	**npu(config)# ip ssh {version compatibility | cipher ([des-cbc] [3des-cbc]) | auth ([hmac-md5] [hmac-sha1]) }**
Privilege Level	10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`version compatibility`	The SSH version that can be used: The default is SSH version 2. The command **npu(config)# ip ssh version compatibility** enables compatibility with both SSH version 1 and SSH version 2.	Optional	SSH2	version compatibility
`cipher ([des-cbc] [3des-cbc])`	The encryption algorithm used by the SSH protocol: DES-CCBC or 3DES-CBC.	Optional	des-cbc	■ des-cbc ■ 3des-cbc
`auth ([hmac-md5] [hmac-sha1])`	The authentication mechanism used by the SSH protocol: HMAC-MD5 or HMAC-SHA1.	OPtional	hmac-sha1	■ hmac-md5 ■ hmac-sha1

Command Modes Global configuration mode

3.1.7.2 Restoring the Default Values of SSH Parameters

To restore the default value of one or more SSH parameters, run the following command:

`npu(config)# no ip ssh {version compatibility | cipher ([des-cbc] [3des-cbc]) | auth ([hmac-md5] [hmac-sha1]) }.`

To restore the default values of all SSH parameters run the following command:

`npu(config)# no ip ssh`

Command Syntax **`npu(config)# no ip ssh {version compatibility | cipher ([des-cbc] [3des-cbc]) | auth ([hmac-md5] [hmac-sha1]) }`**

Privilege Level 10

Command Modes Global configuration mode

3.1.7.3 Displaying the SSH Parameters

To display the current configuration of the SSH parameters, run the following command:

npu# show ip ssh

Command Syntax	**npu# show ip ssh**
Privilege Level	1
Display Format	Version : <value> Cipher Algorithm : <value> Authentication : <value>
Command Modes	Global command mode

3.1.8 Managing the Session

This section includes:

- "Locking the Session" on page 89
- "Managing the Session Timeout" on page 90

3.1.8.1 Locking the Session

To lock the session, run the following command:

npu# lock

This will prevent unauthorized persons from using the CLI without terminationg the session. The following message will be displayed:

CLI console locked

Enter Password to unlock the console:

```
To resume the session, you must enter the password used for
initiating it.
```

Command Syntax	**npu# lock**
Privilege Level	10
Command Modes	Global command mode

3.1.8.2 Managing the Session Timeout

The session timeout parameter defines the maximum allowed inactivity time after which the session will be terminated automatically. The default timeout is 1800 seconds. You can define a different value for the current Telnet/SSH session. You can also change the timeout value for the MON port sessions, that will apply also to future sessions via the MON port.

This section includes:

3.1.8.2.1 Enabling the Line Configuration Mode

To enable the line configuration mode, run the following command:

npu(config)# line {console | vty}

IMPORTANT

An error will occure if you select console when using Telnet/SSH or vice versa. In this case the following error message will be displayed:

Cannot configure for other terminals

After enabling the line configuration mode you can execute any of the following tasks:

- "Configuring the Session Timeout" on page 91
- "Restoring the Default Value of the Session Timeout" on page 92

Command Syntax

```
npu(config)# line {console | vty}
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`console | vty`	The terminal running the session to be managed: Select console if you are connected via the MON port. Select vty if you are connected via Telnet/SSH.	Mandatory	N/A	■ console ■ vty

Command Modes

Global configuration mode

3.1.8.2.2 Configuring the Session Timeout

To configure the session timeout, run the following command:

```
npu(config-line)# exec-timeout <integer (1-18000)>
```

IMPORTANT

For Telnet/SSH sessions, the modified timeout is applicable only for the current session. Whenever you start a new session the default timeout (1800 seconds) will apply.

Command Syntax

```
npu(config-line)# exec-timeout <integer (1-18000)>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`<integer (1-18000)>`	The session timeout, in seconds.	Mandatory	N/A	1-18000 (seconds)

Command Modes Line configuration mode

3.1.8.2.3 Restoring the Default Value of the Session Timeout

To restore the default value of 1800 seconds for the current session timeout, run the following command:

```
npu(config-line)# no exec-timeout
```

Command Syntax `npu(config-line)# no exec-timeout`

Privilege Level 10

Command Modes Line configuration mode

3.1.8.2.4 Displaying a Session Timeout

To display the current configuration of a session timeout, run the following command:

```
npu# show line {console | vty <line>}
```

Command Syntax `npu# show line {console | vty <line>}`

Privilege Level 1

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`console | vty <line>`	The session for which the timeout should be displayed: console: a session via the MON port (even if there is currently no active session via the MON port). vty #: An active Telnet/SSH session number #. To view currently active sessions refer to Section 3.1.6.4.	Mandatory	N/A	■ console ■ vty #, where # is the number of a currently active Telnet/SSH session.

Display Format

```
Current Session Timeout (in secs) = <value>
```

Command Modes

Global command mode

3.2 Shutting Down/Resetting the System

This section describes the commands for:

3.2.1 Shutting Down the System

You can, at any time, use the CLI to shut down the 4Motion system. When you execute the `shutdown` command, the system and all its processes are gracefully shut down. It is also possible that the system may initiate self shutdown if an internal error has occurred.

IMPORTANT

Before shutting down the system, it is recommended that you:

- Save the configuration file. The last saved configuration is used for rebooting the system. For more information about saving the current configuration, refer to Section 3.3.5.1.
- Periodically make a backup of log and trace files on the NPU flash if you have configured logs and traces to be written to file. This file does not store log and trace messages after the system is reset or shut down. For details, refer to Section 3.3.12.1.5.

To shut down the 4Motion system, run the following command:

```
npu# npu shutdown
```

A few seconds after you run this command, the system is shut down.

NOTECAUTION

The system does not display any warning or request for verification; it immediately shuts down after you execute this command. To start up the NPU (after shut down), either switch off and then switch on the -48V power supply, or disconnect and then reconnect the PIU power cable.

Command Syntax	`npu# npu shutdown`
Privilege Level	`10`

Command Modes	Global command mode

3.2.2 Managing System Reset

System reset refers to a complete shutdown and reboot of the 4Motion system. You can use the CLI to manually reset the system. It is also possible that the system may be reset because of an internal or external error, or after the NPU is upgraded.

After the system is reset and boots up, you can use the CLI to retrieve the reason for the last system reset. For more information about using the CLI to display the reason for system reset, refer to "Displaying the Reason for the Last System Reset" on page 96.

3.2.2.1 Resetting the system

IMPORTANT

Before resetting the system, it is recommended that you:

- Save the configuration file. For more information about saving the current configuration, refer to Section 3.3.5.1.
- Periodically make a backup of log and trace files on the NPU flash if you have configured logs and traces to be written to file. This file does not store log and trace messages after the system is reset or shut down. For details, refer to Section 3.3.12.1.5.

To reset the system, run the following command:

```
npu(config)# reset
```

A few seconds after you run this command, the 4Motion system is shut down, and then boots up with the last saved configuration.

Command Syntax	`npu(config)# reset`
Privilege Level	`10`
Command Modes	Global configuration mode

3.2.2.2 Displaying the Reason for the Last System Reset

The 4Motion system may be reset because of any of the following reasons.

- NPU upgrade
- Health failure (an internal module does not respond to the periodic health messages sent by the system)
- Internal error:
  - A system module did not initialize correctly
  - The software image to be used for rebooting the system is invalid or inaccessible.
- System initialization failure after last reboot
- User-initiated system reset
- Generic (unknown error)

To display the reason for the last system reset, run the following command:

```
npu# show reset reason
```

After you run this command, the reason for the last system reset is displayed.

Command Syntax	`npu# show reset reason`
Privilege Level	`1`
Display Format	`Reset reason : <Reason For Last Reset>`
Command Modes	Global command mode

3.3 NPU Configuration

After installing, commissioning, and powering up 4Motion, you can use the CLI to configure 4Motion and make it completely operational in the network.

Configuration information is stored in a configuration file that resides in the NPU flash. When you power up 4Motion for the first time after installation, the system boots up using the factory default configuration. You can then use the CLI to modify these configuration parameters.

NOTE

For more information about accessing the CLI from a local terminal or remotely via Telnet/SSH, refer to, Section 3.1.2.

This section provides information about the following configuration-specific tasks:

- "Managing the IP Connectivity Mode" on page 98
- "Configuring Physical and IP Interfaces" on page 101
- "Managing the AU Maintenance VLAN ID" on page 130
- "Managing the NPU Boot Mode" on page 131
- "Managing the 4Motion Configuration File" on page 134
- "Batch-processing of CLI Commands" on page 145
- "Configuring the CPU" on page 146
- "Configuring QoS Marking Rules" on page 152
- "Configuring Static Routes" on page 167
- "Configuring ACLs" on page 171
- "Configuring the ASN-GW Functionality" on page 204
- "Configuring Logging" on page 342
- "Configuring Performance Data Collection" on page 358

- "Configuring the SNMP/Trap Manager" on page 370
- "Configuring the 4Motion Shelf" on page 379

3.3.1 Managing the IP Connectivity Mode

The following are the various types of traffic originating or terminating from/to the NPU:

- Subscriber data flows
- ASN/CSN control messages
- Network Management System (NMS) traffic (external management traffic)
- Local management traffic
- Internal management traffic
- AU maintenance traffic

4Motion has defined separate IP domains for each traffic type:

- Bearer IP domain: Enables connectivity between ASN-GW, Base Station (BS), AAA server and the Home Agent (HA) for managing transport for subscriber data and the ASN/CSN control traffic.
- NMS IP domain (external management IP domain): Defines the connectivity between NMS agent of the NPU and external NMS server.
- Local management IP domain: Defines the connectivity between the NMS agent of NPU and IP-based local craft terminal.
- Internal management IP domain: Enables connectivity between the NPU NMS agent and management agents for the AU cards.
- Subscriber IP domain: NPU supports subscriber IP domain through multiple VLAN service interfaces.
- AU maintenance IP domain: Defines the connectivity between the service interface of the AU and an external server.

To enable separation of the bearer IP and NMS IP domains, the following (user-configurable) connectivity modes are defined:

- Out-of-band connectivity mode: In this connectivity mode, the bearer and external NMS IP domains are separated at the Ethernet interface. The DATA port and bearer VLAN is used for the bearer IP domain, and the MGMT port and external-management VLAN is used for external NMS connectivity.

- In-band connectivity mode: In this connectivity mode, the VLAN is used to differentiate between the bearer and external NMS IP domains on the DATA port. The bearer VLAN is used for the bearer IP domain and the external-management VLAN is used for the external NMS IP domain. The MGMT port is assigned to the local-management VLAN in this connectivity mode.

- Unified connectivity mode: In this connectivity mode, the bearer IP domain and external NMS IP domain are unified. That is, the same IP address and VLAN are used to connect to the NMS server, AAA server, HA, and BS. (The MGMT port is assigned to the local-management VLAN in this connectivity mode.

IMPORTANT

For all connectivity modes, the CSCD and MGMT ports operate in VLAN-transparent bridging mode (untagged access mode). The assigned VLANs are used only for internal communication.

For all connectivity modes, the DATA port operates in VLAN-aware bridging mode (tagged-trung mode).

For more information about the VLANs that are configured for 4Motion, refer the section, “Configuring Physical and IP Interfaces” on page 101.

IMPORTANT

In addition to the bearer IP domain, local-mangement IP domain, and external-management IP domain, each NPU has an internal NMS IP domain. The internal NMS IP domain is used for separating the IP domain for management traffic between the BS and NPU card.

In addition, the DATA port is assigned also to AU maintenance VLAN. AU maintenance IP domain is used for separating the IP domain for maintenance (upload of maintenance reports) traffic between the AUs’ service interfaces and external server.

The following table lists the physical interface and VLAN configuration of bearer, local-management, and external-management IP domains with respect to the connectivity mode:

Table 3-9: Ethernet and IP Domain VLAN-to-Connectivity Mode Configuration

Connectivity Mode	Bearer IP Domain	External-Management IP Domain	Local-management IP Domain
Out-of-band	■ DATA port ■ Bearer VLAN	■ MGMT port ■ External-management VLAN	■ CSCD port ■ Local-management VLAN
In-band	■ DATA port ■ Bearer VLAN	■ DATA port ■ External-management VLAN	■ CSCD and MGMT ports ■ Local-management VLAN
Unified	■ DATA port ■ Bearer VLAN	■ DATA port ■ Bearer VLAN	■ CSCD and MGMT ports ■ Local-management VLAN

This section describes the commands for:

■ "Configuring the IP Connectivity Mode" on page 100

■ "Displaying the IP connectivity Mode" on page 101

3.3.1.1 Configuring the IP Connectivity Mode

To configure the IP connectivity mode, run the following command:

```
npu(config)# connectivity mode {inband | outband | unified}
```

In-band is the default connectivity mode. You can display the currently configured connectivity mode. For details, refer Section 3.3.1.2.

IMPORTANT

You must save the configuration (run the command npu# write) for a change in connectivity mode to take effect after next reset.

Command Syntax	`npu(config)# connectivity mode {inband | outband | unified}`
Privilege Level	`10`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`{inband | outband | unified}`	Indicates the connectivity mode to be configured.	Mandatory	inband	■ inband ■ outband ■ unified

Command Modes Global configuration mode

3.3.1.2 Displaying the IP connectivity Mode

To display the IP connectivity mode, run the following command:

```
npu# show connectivity mode
```

Command Syntax

```
npu# show connectivity mode
```

Privilege Level

```
1
```

Display Format

```
Current connectivity mode : <value> Next Boot connectivity mode : <value>
```

Command Modes Global command mode

3.3.2 Configuring Physical and IP Interfaces

The following Ethernet interfaces are provided on the front panel of the NPU for enabling connectivity with external entities:

- DATA port: A Gigabit Ethernet interface that connects the NPU with the operator network.
- CSCD port: A Gigabit Ethernet interface that provides a dedicated Ethernet connectivity to the local management NMS Server, or supports concatenation

of two or more 4Motion chassis. (Concatenation is not supported in the current release.)

- MGMT port: A Fast Ethernet interface that provides a dedicated Ethernet interface for external EMS server connectivity. In some configurations the MGMT port is used for connecting the local NMS server (IP-based craft terminal).

You can configure the speed, duplex, and MTU for these interfaces. For the DATA port, you can also configure VLAN translation (mapping).

Based on the connectivity mode, 4Motion initializes the following pre-configured IP interfaces:

- Local-management: Used for enabling connectivity with the local NMS server that is connected via the MGMT port when 4Motion is operating in the in-band connectivity mode; or via CSCD port when 4Motion is operating in the out-of-band connectivity mode. The IP address used for the local-management interface is intended for "back-to-back" connection between NPU and Local NMS Server.

- Internal-management: Used for enabling the NMS connectivity between the AU and NPU. This interface is used internally by 4Motion and is not reachable from user-visible ports. The IP address and VLAN identifier used for the internal-management interface are not user-configurable.

- External-management: Used for enabling connectivity with the NMS server that is connected via the DATA port when 4Motion is operating in the in-band connectivity mode, or via MGMT port when 4Motion is operating in the out-of-band connectivity mode.

- Bearer: Used for enabling bearer IP domain connectivity. When the Unified connectivity mode is selected, the NMS server is also connected using bearer interface.

In addition, AU maintenance interfaces enabling the AU maintenance IP domain connectivity for maintenance traffic between the AUs service interfaces and an external server. For more details refer to Section 3.3.3.

You can configure the IP address and MTU for bearer, external-management and local-management interfaces. You can also modify the VLAN ID for bearer and external-management interfaces. The following table lists the default VLAN IDs assigned to pre-configured IP interfaces.

Table 3-10: Default VLAN IDs

Interface	Default VLAN ID
Local-management	9
Internal-management	10 (non-configurable)
Bearer	11
External-management	12
AU Maintenance	14

In addition to the physical and IP interfaces, 4Motion defines the following virtual interfaces. These interfaces are used only for applying Access Control Lists (ACLs) for filtering traffic destined towards the NPU or AUs.

- NPU
- All AUs

This section describes the commands for:

- "Configuring Physical Interfaces" on page 103
- "Managing the External Ether Type" on page 117
- "Configuring IP interfaces" on page 118
- "Configuring Virtual Interfaces" on page 126
- "Displaying Status and Configuration Information for Physical, IP, and Virtual Interfaces" on page 127

3.3.2.1 Configuring Physical Interfaces

The NPU contains three Ethernet interfaces on the front panel: one Fast Ethernet interface (MGMT port) and two Gigabit Ethernet interfaces (DATA and CSCD ports). Each of these interfaces is a member of one or more VLANs. The following table lists the physical interfaces, and their type, port numbers and member VLANs:

Table 3-11: Ethernet Interfaces - Types, Port Numbers, and Member VLANs

Interface Type	Physical Interfaces	Port Number	Member VLANs
Fast Ethernet	MGMT	0/8	■ Local-management (in the in-band or unified connectivity modes) ■ External-management (only in the out-of-band connectivity mode)
Gigabit Ethernet	CSCD	0/9	■ Local-management
	DATA	0/10	■ Bearer· ■ External-management (only in-band connectivity mode) ■ Multiple Service VLAN ■ AU maintenance

To configure a physical interface:

1 Enable the interface configuration mode (refer Section 3.3.2.3.1).

2 You can now enable any of the following tasks:

» Modify the physical properties of an interface (refer Section 3.3.2.1.2).

» Manage VLAN translation (refer Section 3.3.2.1.3).

3 Terminate the interface configuration mode (refer Section 3.3.2.3.7).

You can, at any time, display VLAN membership information (refer Section 3.3.2.1.5), and VLAN translation entries for the DATA port (refer Section 3.3.2.1.7).

3.3.2.1.1 Enabling the Interface configuration mode

To configure a physical interface, run the following command to enable the interface configuration mode.

```
npu(config)# interface {<interface-type> <interface-id>
|internal-mgmt |external-mgmt | bearer | local-mgmt | npu-host |
all-au}
```

Table 3-12: Parameters for Configuring the Interface Configuration Mode (Ethernet Interfaces)

Interface	Parameter	Example
Fast Ethernet	<interface-type> <interface-id>	**npu(config)# interface fastethernet 0/8**
Gigabit Ethernet	<interface-type> <interface-id>	**npu(config)# interface gigabitethernet 0/9** **npu(config)# interface gigabitethernet 0/10**

IMPORTANT

To enable the interface configuration mode for physical interfaces, specify values for the `interface-type` and `interface-id` parameters only. The `internal-mgmt`, `external-mgmt`, `bearer`, `local-mgmt` parameters are used for enabling the interface configuration mode for IP interfaces; the `npu-host` and `all-au` parameters are used for enabling the interface configuration mode for virtual interfaces. For more information about configuring IP interfaces, refer to Section 3.3.2.3; refer to Section 3.3.2.4 for configuring virtual interfaces.

IMPORTANT

An error may occur if the interface type and ID that you have specified is in an invalid format or does not exist. Refer to the syntax description for more information about the correct format for specifying the interface type and name.

After enabling the interface configuration mode, you can:

- Modify the physical properties of an interface (refer to Section 3.3.2.1.2)
- Manage VLAN translation (refer to Section 3.3.2.1.3)

Command Syntax **npu(config)# interface** {<interface-type> <interface-id> |**internal-mgmt** |**external-mgmt** | **bearer** | **local-mgmt** | **npu-host** | **all-au**}

Privilege Level **10**

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<interface-type>	Indicates the type of physical interface (Gigabit Ethernet or Fast Ethernet) for which the configuration mode is to be enabled.	Mandatory	N/A	■ fastethernet ■ gigabitethernet
<interface-id>	Indicates the port number of the physical interface for which the configuration mode is to be enabled.	Mandatory	N/A	Fast Ethernet: ■ 0/8 Gigabit Ethernet: ■ 0/9 ■ 0/10

Command Modes

Global configuration mode

3.3.2.1.2 Configuring the Properties of the Physical Interface

After you enable the interface configuration mode, you can configure the following properties for this interface:

- Auto-negotiation mode
- Duplex (full/half) mode
- Port speed
- MTU

This section describes the commands to be used for:

- “Shutting down the interface” on page 107
- “Defining the auto-negotiation mode” on page 107
- “Specifying the Duplex Status” on page 108
- “Specifying the port speed” on page 109

“Configuring the MTU for physical interfaces” on page 109

NOTE

There is no need to shut down the interface for configuring its parameters.

3.3.2.1.2.1 Shutting down the interface

Run the following command to shut down this physical interface:

```
npu(config-if)# shutdown
```

IMPORTANT

Beware from shutting down the interface you use for accessing the device.

Run the following command to enable this physical interface:

```
npu(config-if)# no shutdown
```

Command Syntax	`npu(config-if)# shutdown` `npu(config-if)# no shutdown`
Privilege Level	`10`
Command Modes	Interface configuration mode

3.3.2.1.2.2 Defining the auto-negotiation mode

The auto-negotiation feature enables the system to automatically negotiate the port speed and the duplex (half or full) status with the link partner. If you disable auto-negotiation, you are required to manually configure the port speed and duplex status.

IMPORTANT

By default, auto-negotiation is enabled.

Run the following command to enable the auto-negotiation mode:

```
npu(config-if)# auto-negotiate
```

Enter the following command if you want to disable the auto-negotiation mode:

```
npu(config-if)# no auto-negotiate
```

After you disable auto-negotiation, you can manually configure the port speed and duplex status. For details, refer to Section 3.3.2.1.2.3 and Section 3.3.2.1.2.4

Command Syntax	**npu(config-if)# auto-negotiate** **npu(config-if)# no auto-negotiate**
Privilege Level	**10**
Command Modes	Interface configuration mode

3.3.2.1.2.3 Specifying the Duplex Status

The duplex status for an interface can be either full-duplex or half duplex. If you have disabled the auto-negotiation feature, specify whether data transmission should be half or full duplex.

IMPORTANT

By default, full-duplex is enabled if auto-negotiation is disabled.

Run the following command to configure the full duplex mode for this interface:

npu(config-if)# full-duplex

Run the following command to configure the half duplex mode for this interface:

npu(config-if)# half-duplex

IMPORTANT

An error may occur if you run this command when Auto-negotiation is enabled.

Command Syntax	**npu(config-if)# full-duplex** **npu(config-if)# half-duplex**
Privilege Level	**10**
Command Modes	Interface configuration mode

3.3.2.1.2.4 Specifying the port speed

If you have disabled the auto-negotiation feature, you can run the following command configure the port speed to be used for this physical interface.

```
npu(config-if)# speed {10 | 100 | 1000}
```

By default, the port speed for the Fast Ethernet interfaces is 100 Mbps, and for the Gigabit Ethernet interfaces is 1000 Mbps.

IMPORTANT

An error may occur if you run this command when:

- Auto-negotiation is enabled.
- The interface does not support the specified speed.

Command Syntax

```
npu(config-if)# speed {10 | 100 | 1000}
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
{10 | 100 | 1000}	Indicates the speed, in Mbps, to be configured for this physical interface. A value of 1000 is not applicable for Fast Ethernet interfaces.	Mandatory	N/A	■ 10 ■ 100 ■ 1000

Command Modes

Interface configuration mode

3.3.2.1.2.5 Configuring the MTU for physical interfaces

You can configure the MTU for the physical interface. If the port receives packets that are larger than the configured MTU, packets are dropped.

Run the following command to configure the MTU of the physical interface:

```
npu(config-if)# mtu <frame-size(1518-9000)>
```

Command Syntax

```
npu(config-if)# mtu <frame-size(1518-9000)>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<frame-size(1518-9000)>	Indicates the MTU (in bytes) to be configured for the physical interface. For the DATA interface the range is from 1518 to 9000. For all other interfaces the following values are supported by the hardware: 1518, 1522, 1526, 1536, 1552, 1664, 2048, 9022.	mandatory	For the DATA interface the default is 1664. For all other physical interfaces the default is 1522.	1518-9000 for the DATA interface. 1518, 1522, 1526, 1536, 1552, 1664, 2048, 9022 for all other interfaces.

Command Modes

Interface configuration mode

3.3.2.1.3 Managing VLAN Translation

4Motion supports translation of the VLAN ID for packets received and transmitted on the DATA port to a configured VLAN ID. Before starting VLAN translation, first enable VLAN translation, and then create one or more VLAN translation entries.

This section describes the commands for:

- "Enabling/Disabling VLAN Translation" on page 111
- "Creating a VLAN Translation Entry" on page 111
- "Deleting a VLAN Translation Entry" on page 113

3.3.2.1.3.1 Enabling/Disabling VLAN Translation

By default, VLAN translation is disabled. Run the following command to enable/disable VLAN translation on the DATA (gigabitethernet 0/10) interface:

```
npu(config-if)# vlan mapping {enable|disable}
```

IMPORTANT

An error may occur when you run this command:

- For an interface other than the DATA port (0/10).

Command Syntax

```
npu(config-if)# vlan mapping {enable|disable}
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
{enable|disable}	Indicates whether VLAN translation should be enabled or disabled for this interface.	Mandatory	disable	■ enable ■ disable

Command Modes

Interface configuration mode

3.3.2.1.3.2 Creating a VLAN Translation Entry

A VLAN translation entry contains a mapping between the original and translated VLANs. To create a VLAN translation entry, run the following command:

```
npu(config-if)# vlan mapping <integer(9|11-100|110-4094)>
<integer(9|11-100|110-4094)>
```

Specify the original VLAN ID and the translated VLAN ID.

IMPORTANT

An error may occur if:

- The original and/or translated VLAN ID that you have specified is not within the allowed range.
- The translated VLAN ID that you have specified is already a member VLAN for this port.
- You are trying to create a VLAN translation entry for a VLAN that is not a member of DATA port.
- A VLAN translation mapping already exists for the original VLAN IDs that you have specified.

Command Syntax

```
npu(config-if)# vlan mapping <integer(9|11-100|110-4094)>
<integer(9|11-100|110-4094)>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`<integer(9|11-100|110-4094)>`	The first VLAN ID Indicates the VLAN ID of the VLAN for which VLAN translation is required. Legitimate values include: ■ The Bearer VLAN ID (default 11). ■ The External Management VLAN ID (default 12) - only in In-Band Connectivity Mode.	Mandatory	N/A	9, 11-100, 110-4094
`<integer(9|11-100|110-4094)>`	Indicates the translated VLAN ID that is being mapped to the original VLAN ID.	Mandatory	N/A	9, 11-100, 110-4094

Command Modes

Interface configuration mode

3.3.2.1.3.3 Deleting a VLAN Translation Entry

To delete an existing VLAN translation entry, run the following command:

```
npu(config-if)# no vlan mapping {all | <integer(9|11-100|110-4094)>
<integer(9|11-100|110-4094)>}
```

Specify `all` if you want to delete all the VLAN translation mapping entries. Specify the VLAN identifiers of the translation entry if you want to delete a specific VLAN entry.

IMPORTANT

An error may occur if:

- The VLAN ID or mapping that you have specified is not within the allowed range or it does not exist.
- You are trying to delete a VLAN translation entry for a VLAN that is not a member of this physical interface.

Command Syntax

```
npu(config-if)# no vlan mapping {all | <integer(9|11-100|110-4094)>
<integer(9|11-100|110-4094)>}
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
{all | <integer(9|11-100|110-4094)> <integer(9|11-100|110-4094)>}	Indicates the VLAN translation entry to be deleted.	Mandatory	N/A	■ all: Indicates that all VLAN translation entries are to be deleted. ■ <integer(9|11-100|110-4094)> <integer(9|11-100|110-4094)>: Indicates the original and translated VLAN IDs for the translation entry to be deleted.

Command Modes	Global command mode

3.3.2.1.4 Terminating the Interface Configuration Mode

To terminate the interface configuration mode, run the following command:

```
npu(config-if)# exit
```

Command Syntax	`npu(config-if)# exit`
Privilege Level	10
Command Modes	Interface configuration mode

3.3.2.1.5 Displaying VLAN Membership Information

Run the following command to display Ethernet interfaces that are members of a particular or all VLAN:

```
npu# show vlan [id <vlan-id(11-4094)>]
```

Do not specify the VLAN ID if you want to view membership information for all VLANs.

Command Syntax	`npu# show vlan [id <vlan-id(11-4094)>]`
Privilege Level	`1`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`[id <vlan-id(11-4094)>]`	Indicates the VLAN ID for which membership information is to be displayed. Do not specify any value for this parameter if you want to view VLAN membership information for all VLANs.	Mandatory	N/A	11-4096

Display Format

```
Vlan            Name             Ports
 ----            ----             -----
<VLAN ID    <>VLAN Name>      <member ports>
<VLAN ID    <>VLAN Name>      <member ports>
```

Command Modes

Global command mode

3.3.2.1.6 Displaying VLAN Configuration Information for Physical Interfaces

To display the configuration information for a VLAN that is bound to a particular physical interface, run the following command:

`npu# show vlan port config [port <interface-type> <interface-id>]`

Do not specify the port number and type if you want to display configuration information for all physical interfaces.

IMPORTANT

An error may occur if you specify an interface type or ID that does not exist.

Command Syntax

`npu# show vlan port config [port <interface-type> <interface-id>]`

Privilege Level

`1`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<interface-type>	Indicates the type of physical interface for which VLAN membership information is to be displayed.	Optional	N/A	■ fastethernet ■ gigabitethernet
<interface-id>	Indicates the ID of the physical interface for which VLAN membership information is to be displayed.	Optional	N/A	Fast Ethernet: ■ 0/8 Gigabit Ethernet: ■ 0/9 ■ 0/10

Display Format

```
Vlan Port configuration table
----------------------------------------
Port                                    <port number>
 Port Vlan ID                           : <value>
 Port Acceptable Frame Type             : <value>
 Port Ingress Filtering                 : <Enabled/Disabled>
```

Command Modes

Global command mode

3.3.2.1.7 Displaying the VLAN Translation Entries

Run the following command to display VLAN translation entries for a Gigabit Ethernet interface:

npu# show interface gigabitethernet <interface-id> **vlan mapping**

IMPORTANT

An error may occur if you specify an interface ID that does not exist.

Command Syntax **npu# show interface gigabitethernet** <interface-id> **vlan mapping**

Privilege Level **1**

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<interface-id>	Indicates the identifier of the Gigabit Ethernet interface for which VLAN translation entries are to be displayed. In current release VLAN Mapping is supported only on the DATA port (interface-id 0/10).	Mandatory	N/A	■ 0/10

Command Modes Global command mode

3.3.2.2 Managing the External Ether Type

The External Ether Type parameter defines the EtherType in outer VLAN header of uplink Q-in-Q traffic. The External Ether Type parameter is not applicable the device operates in Transparent (Centralized ASN Topology) mode.

This section includes:

■ "Configuring the External Ether type"

■ "Displaying the Ether Type"

3.3.2.2.1 Configuring the External Ether type

To configure the Ether Type run the following command:

npu(config)# config npuEtherType {8100 | 88A8 | 9100 | 9200}

Command Syntax **npu(config)# config npuEtherType** {8100 | 88A8 | 9100 | 9200}

Privilege Level `10`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
{8100 | 88A8 | 9100 | 9200}	Indicates the type of Ether Type.	Mandatoryl	88A8	■ 8100 ■ 88A8 ■ 9100 ■ 9200

Command Modes Global configuration mode

3.3.2.2.2 Displaying the Ether Type

Run the following command to display the current Ether Type value:

```
npu# show npuetherType
```

Command Syntax `npu# show npuetherType`

Privilege Level `1`

Display Format `Ethertype: <value>`

Command Modes Global command mode

3.3.2.3 Configuring IP interfaces

The following IP interfaces are pre-configured in the system:

- Local-management

- Internal-management
- External-management
- Bearer

IMPORTANT

You cannot modify the IP address and VLAN identifier for the internal-management interface.

To configure an IP interface:

1. Enable the interface configuration mode (refer Section 3.3.2.3.1).
2. You can now:
   - » Shut down/Enable the Interface (refer to Section 3.3.2.3.2).
   - » Assign an IP address to an interface (refer to Section 3.3.2.3.3).
   - » Remove an IP address associated with an interface (refer to Section 3.3.2.3.4).
   - » Modify the VLAN ID (refer to Section 3.3.2.3.5).
3. Modify the MTU (refer to Section 3.3.2.3.6).
4. Terminate the interface configuration mode (refer to Section 3.3.2.3.7).

You can, at any time, display configuration information for an IP interface (refer to Section 3.3.2.3.8).

NOTE

There is no need to shut down the interface for configuring its parameters.

3.3.2.3.1 Enabling the Interface Configuration Mode

To configure an IP interface, run the following command to enable the interface configuration mode:

```
npu(config)# interface {<interface-type> <interface-id>
|internal-mgmt |external-mgmt | bearer | local-mgmt | npu-host |
all-au}
```

The following table lists the IP interfaces that each parameter represents:

Table 3-13: Parameters for Configuring the Interface Configuration Mode (IP Interfaces

IP Interface	Parameter	Example
Internal-management	`internal-mgmt`	**`npu(config)# interface internal-mgmt`**
External-management	`external-mgmt`	**`npu(config)# interface external-mgmt`**
Bearer	`bearer`	**`npu(config)# interface bearer`**
Local-management	`local-mgmt`	**`npu(config)# interface local-mgmt`**

IMPORTANT

To enable the interface configuration mode for IP interfaces, specify values for the for `internal-mgmt`, `external-mgmt`, `bearer`, `local-mgmt` only. The `interface-type` and `interface-id` parameters are used for enabling the interface configuration mode for physical interfaces; the `npu-host` and `all-au` parameters are used for enabling the interface configuration mode for virtual interfaces. For more information about configuring physical interfaces, refer Section 3.3.2.1; refer Section 3.3.2.4 for configuring virtual interfaces.

After enabling the interface configuration mode for this interface, you can:

- Shut down/Enable the Interface (refer to Section 3.3.2.3.2)
- Assign an IP address to an interface (refer Section 3.3.2.3.3).
- Remove an IP address associated with an interface (refer Section 3.3.2.3.4).
- Modify the VLAN ID (refer Section 3.3.2.3.5).
- Modify the MTU (refer to Section 3.3.2.3.6).

Command Syntax

`npu(config)# interface` {<interface-type> <interface-id> |**`internal-mgmt`** |**`external-mgmt`** | **`bearer`** | **`local-mgmt`** | **`npu-host`** | **`all-au`**}

Privilege Level

`10`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
internal-mgmt |external-mgmt | bearer | local-mgmt	Indicates the IP interface for which the configuration mode is to be enabled.	Mandatory	N/A	■ internal-mgmt ■ external-mgmt ■ bearer ■ local-mgmt

Command Modes Global configuration mode

3.3.2.3.2 Shutting down/Enabling an IP Interface

To shut-down an IP interface, run the following command:

```
npu(config-if)# shutdown
```

Run the following command to enable the interface:

```
npu(config-if)# no shutdown
```

Command Syntax

```
npu(config-if)# shutdown
npu(config-if)# no shutdown
```

Privilege Level **10**

Command Modes Interface configuration mode

3.3.2.3.3 Assigning an IP address to an interface

Run the following command to assign an IP address and subnet mask for an IP interface:

```
npu(config-if)# ip address <ip-address> <subnet-mask>
```

IMPORTANT

You can configure the IP address and subnet mask for only the external-management, local-management, and bearer interfaces.

The bearer interface IP address is used also in other interfaces such as the ASN and CSN interfaces. If you change the bearer interface IP address, you must save the configuration (run the command npu# write) and reboot the NPU to apply changed IP address on ASN and CSN interfaces.

For example, run the following command to assign the IP address, 172.10.1.0, and subnet mask, 255.255.255.0 to the external-management interface:

```
npu (config-if)# ip address 172.10.1.0 255.255.255.0
```

IMPORTANT

An error may occur if:

- The IP address you have specified is already configured for another interface.
- You are trying to assign an IP address for an interface for which IP address configuration is not permitted. This error is caused only for the internal-management interface (the pre-configured IP address for this interface is 10.0.0.254).

Command Syntax

```
npu(config-if)# ip address <ip-address> <subnet-mask>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<ip-address>	Indicates the IP address to be assigned to this IP interface. The defaults are: External Management: 192.168.1.1 Beare: 172.16.0.1 Local Management: 172.31.0.1	Mandatory	Depends on interface type.	Valid IP address

	<subnet-mask>	Indicates the subnet mask to be assigned to this IP interface.	Mandatory	255.255.255.0	Valid subnet mask

Command Modes Interface configuration mode

3.3.2.3.4 Removing an IP Address from an Interface

To remove an IP address from an interface, run the following command:

```
npu(config-if)# no ip address
```

Command Syntax `npu(config-if)# no ip address`

Privilege Level `10`

Command Modes Interface configuration mode

3.3.2.3.5 Configuring/Modifying the VLAN ID for an IP Interface

IMPORTANT

You can modify the VLAN ID for only the bearer, local-management and external-management interfaces.

If you change the VLAN ID of the bearer interface, you must change the bearervlanid of all AUs (see "Configuring AU Connectivity" on page 418) to the same value.

Run the following command to modify the VLAN ID for this interface:

```
npu(config-if)# if_vlan <vlanid(9 | 11-100 | 110-4094)>
```

NOTE

Refer Table 3-10 for the default VLAN IDs assigned to the bearer, local-management and external-management interfaces.

IMPORTANT

An error may occur if:

- The VLAN ID you have specified is not within the specified range, or is in use by another interface. Refer the syntax description for the VLAN ID range.
- The VLAN ID is already used as a translated VLAN or a VLAN translation entry already exists for this VLAN.
- You are trying to run this command for the internal-management interface. You can modify the VLAN ID for only the external-management, local-management or bearer interfaces.

Command Syntax

```
npu(config-if)# if_vlan <vlanid(9 | 11-100 | 110-4094)>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`<vlanid(9 | 11-100 | 110-4094)`	Indicates the VLAN ID to be assigned to this interface. **Note**: The VLAN IDs, 1-8, 10, 101-109 are reserved.	Mandatory	N/A	9 11-100 110-4094

Command Modes

Interface Configuration mode

3.3.2.3.6 Configuring the MTU for IP Interfaces

You can configure the MTU for the IP interface. Received packets that are larger than the configured MTU will be dropped.

Run the following command to configure the MTU of the IP interface:

```
npu(config-if)# mtu <frame-size(68-1500)>
```

Command Syntax

```
npu(config-if)# mtu <frame-size(68-1500)>
```

Privilege Level `10`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`<frame-size(68-1500)>`	Indicates the MTU (in bytes) to be configured for the IP interface.	mandatory	1500	68-1500

Command Modes Interface configuration mode

3.3.2.3.7 Terminating the Interface Configuration Mode

To terminate the interface configuration mode, run the following command:

```
npu(config-if)# exit
```

Command Syntax `npu(config-if)# exit`

Privilege Level 10

Command Modes Interface configuration mode

3.3.2.3.8 Displaying IP Interface Status and Configuration Information

To display the status and configuration information for an IP interface, run the following command:

```
npu# show ip interface [{internal-mgmt | external-mgmt | bearer | local-mgmt}]
```

Do not specify the interface if you want to view configuration information for all IP interfaces.

IMPORTANT

An error may occur if the IP interface does not exist for the configured connectivity and boot mode.

Command Syntax

```
npu# show ip interface [{internal-mgmt | external-mgmt | bearer |
local-mgmt}]
```

Privilege Level

1

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
{**internal-mgmt** | **external-mgmt** | **bearer** | **local-mgmt**}	Indicates the interface for which configuration information is to be displayed. Do not specify any value for this parameter if you want to view configuration information for all IP interfaces.	Optional	N/A	■ internal-mgmt ■ external-mgmt ■ bearer ■ local-mgmt

Display Format

```
<Interface Name> is <up/down>
Internet Address is <value>
Broadcast Address  <value>
```

Command Modes

Global command mode

3.3.2.4 Configuring Virtual Interfaces

In addition to physical and IP interfaces, 4Motion defines the following virtual interfaces. All ACLs configured for filtering traffic destined towards the NPU or AUs, are attached to either of these interfaces.

- NPU-host: Used for configuring ACLs to filter traffic destined towards the NPU.
- All-AU: Used for configuring ACLs to filter traffic destined towards the AUs in the 4Motion shelf.

For more information about attaching ACLs to the NPU or all-AUs, refer the section, “Attaching/De-attaching ACLs to/from an Interface” on page 199.

3.3.2.5 Displaying Status and Configuration Information for Physical, IP, and Virtual Interfaces

To display the status and configuration information for physical, IP and/or virtual interfaces, run the following command:

npu# show interfaces [{[<interface-type> <interface-id>] | **internal-mgmt** | **external-mgmt** | **bearer** | **local-mgmt** | **npu-host** | **all-au**}]

To display the configuration information for all interfaces, do not specify a value for any parameter.

The following table lists parameters to be specified with respect to the type of interface for which configuration information is to be displayed:

Table 3-14: Parameters for Displaying Configuration Information for Physical, IP, and Virtual Interfaces

Interface	Parameters	Example
All Interfaces	None	**npu# show interfaces**
Physical Interfaces	**Fast Ethernet:** <interface-type> <interface-id>	**npu# show interfaces fastethernet 0/8**
	Gigabit Ethernet <interface-type> <interface-id>	**npu# show interfaces gigabitethernet 0/9** **npu# show interfaces gigabitethernet 0/10**
IP Interfaces	internal-mgmt	**npu# show interfaces internal-mgmt**
	external-mgmt	**npu# show interfaces external-mgmt**
	bearer	**npu# show interfaces bearer**
	local-mgmt	**npu# show interfaces local-mgmt**
Virtual Interfaces	npu-host	**npu# show interfaces npu-host**
	all-au	**npu# show interfaces all-au**

IMPORTANT

An error may occur if:

- The interface type or ID that you have specified does not exist.
- The IP interface does not exist for the configured connectivity and boot mode.

Command Syntax

```
npu# show interfaces [{[<interface-type> <interface-id>] | internal-mgmt
| external-mgmt | bearer | local-mgmt | npu-host | all-au}]
```

Privilege Level

1

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`[{[<interface-type> <interface-id>] | internal-mgmt | external-mgmt | bearer | local-mgmt | npu-host | all-au}]`	Indicates the type of interface (physical, IP, or virtual) for which configuration information is to be displayed. Do not specify any value for this parameter if you want to display configuration information for all physical, IP, and virtual interfaces.	Optional	N/A	Refer[a] Table 3-14

a.

Display Format (Physical Interfaces)	<Port Number> <up/down>, line protocol is <up/down> (connected) MTU <value >bytes, <Full/half> duplex, <value> Mbps, Auto-Negotiation Octets : <value> Unicast Packets : <value> Broadcast Packets : <value> Multicast Packets : <value> Discarded Packets : <value> Error Packets : <value> Unknown Packets : <value> Octets : <value> Unicast Packets : <value> Broadcast Packets : <value> Multicast Packets : <value> Discarded Packets : <value> Error Packets : <value>
Display Format (IP Interfaces)	<IP Interface Name> <up/down>, MTU <value> bytes, <value> InBytes, <value> InUnicast Packets <value> InDiscarded Packets <value> InError Packets <value> OutBytes, <value> OutUnicast Packets
Display Format (Virtual Interfaces)	<Virtual Interface Name> interface Acls attached <No. of attached ACLs>
Command Modes	Global command mode

3.3.3 Managing the AU Maintenance VLAN ID

The service interface of the AU is used for uploading maintenance reports to an external server. Most of the service interface parameters except the VLAN ID are configured separately for each AU (see Section 3.5.2.3). The AU maintenance VLAN ID is the VLAN ID used by all au service interfaces.

This section describes the commands to be used for:

- "Configuring the AU Maintenance VLAN ID" on page 130
- "Displaying the AU Maintenance VLAN ID" on page 131

3.3.3.1 Configuring the AU Maintenance VLAN ID

To configure the AU maintenance VLAN ID, run the following command:

npu(config)# config AuMaintenanceVlanId <integer (9, 11-100, 110-4094)>

IMPORTANT

An error may occur if the VLAN ID you have specified is not within the specified range, or is in use by another interface. Refer the syntax description for the VLAN ID range.

Command Syntax

npu(config)# config AuMaintenanceVlanId <integer (1-9, 11-100, 110-4094)>

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<integer (1-9, 11-100, 110-4094)>	The au maintenance VLAN ID used by all au service interfaces.	Mandatory	14	1-9, 11-100, 110-4094.

Command Modes

Global configuration mode

3.3.3.2 Displaying the AU Maintenance VLAN ID

To display the current value configured for the au maintenance VLAN ID, run the following command:

```
npu# show aumaintenanceVlanId
```

Command Syntax	`npu# show aumaintenanceVlanId`
Privilege Level	`1`
Display Format	`aumaintenanceVlanId <value>`
Command Modes	Global command mode

3.3.4 Managing the NPU Boot Mode

The NPU boot mode refers to the mode of operation to be used for operating the NPU. You can configure the NPU to be operated in any of the following boot modes:

- ASN-GW mode: In this mode, the NPU implements ASN-GW functionalities, that is, it implements R3 Reference Point (RP) towards the CSN, R4 reference point toward other ASN-GWs, and R6 reference point toward AU/BSs. The R8 reference point traffic is transparently relayed between AU/BSs (intra- or inter-shelf). The ASN-GW mode operates:
  - » With HA support, that is, the NPU implements Mobile IP services (MIP) Not supported in the current release.
  - » Without HA support, that is, the NPU does not implement MIP services

IMPORTANT

The ASN-GW mode without HA support is the default boot mode that is used when the NPU boots up for the first time.

- Transparent mode: In this mode, the NPU transparently relays R6 and R8 reference-point traffic between AU/BSs (intra- or inter-shelf).

This section describes the commands to be used for:

- "Configuring the Next Boot Mode" on page 132
- "Displaying the Current and Next Boot Mode Information" on page 133

3.3.4.1 Configuring the Next Boot Mode

The next boot mode refers to the boot mode that should be used for booting up the NPU the next time it is shut down or reset. The default boot mode is the ASN-GW mode without HA support.

The following are the possible boot modes for operating the NPU:

- ASN-GW mode without HA support (does not implement MIP services)
- Transparent mode

NOTE

To view the NPU current and next boot mode, refer to "Displaying the Current and Next Boot Mode Information" on page 133.

To configure the next boot mode, run the following command:

```
npu(config)# nextbootmode {asngwStatic | transparent}
```

IMPORTANT

It is recommended that you run this command to specify the boot mode to be used after the next NPU reset. If you do not specify the next boot mode, the NPU boots up using the last configured boot mode. You must save the configuration (run the command npu# write) for a change in boot mode to take effect after next reset.

Command Syntax	`npu(config)# nextbootmode {asngwStatic | transparent}`
Privilege Level	`10`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`{asngwStatic | transparent}`	Indicates the mode that is to be used for rebooting the NPU.	Mandatory	asngwStatic	■ asngwStatic: Indicates that the ASN-GW boot mode without HA support. That is, the system will not implement MIP services. This is the default mode of operation. ■ transparent: Indicates transparent boot mode.

Command Modes Global configuration mode

3.3.4.2 Displaying the Current and Next Boot Mode Information

To display the current and next boot modes, run the following command:

`npu# show bootmode`

Command Syntax **`npu# show bootmode`**

Privilege Level **`1`**

Display Format

```
current bootmode : <Current Boot Mode>
next bootmode    :   <Configured Next Boot Mode>
```

Command Modes	Global command mode

3.3.5 Managing the 4Motion Configuration File

4Motion configuration parameters are stored in a default configuration file that resides in the NPU flash. When you start 4Motion for the first time after installation, the system boots up with the factory default configuration. After the system boots up, you can use the CLI to modify the values of parameters (for which default values exist), and specify values for the remaining parameters.

IMPORTANT

You can, at any time, restore factory default configuration parameters. If you have not saved configuration since the first time the system was started (after installation), the system boots up with the factory default parameters at the next system reset.

You can also download the configuration file from an external TFTP server, and use the configuration parameters in this file to boot up the 4Motion system. In addition, you can batch-process commands.

IMPORTANT

It is recommended that you periodically save changes to configuration. (The saved configuration is written to a file that resides in the NPU flash.) If you have modified any configuration parameters at runtime, it is recommended that you save configuration before resetting/shutting down 4Motion. Unsaved configuration is lost after system reset or shut down.

It is recommended that you make periodic backups of the configuration file. You can either manually make a backup of this file or configure the system to automatically make a daily backup. You can, at any time, restore the configuration specified in the backup file or the factory default configuration.

This section describes the commands for:

- "Saving the Current Configuration" on page 135
- "Downloading a Configuration File/Vendor Startup File from an External Server" on page 135
- "Displaying the Status of the last File Download Operations" on page 137
- "Making a Backup/Restoring the Configuration File" on page 138

3.3.5.1 Saving the Current Configuration

When you reset the 4Motion system, it always boots up using the last saved configuration. If you are starting 4Motion for the first time after installation and commissioning, it boots up using the factory default configuration. Thereafter, any changes to configuration (made at runtime using the CLI) should be saved; all unsaved changes are lost after system reset.

IMPORTANT

You can, at any time, revert to the factory default configuration. For more information about restoring factory default configuration, refer to Section 3.3.5.4.6. If you do not save configuration after first time start up of 4Motion, it boots up with the factory default configuration the next time the system is reset.

Run the following command to save the current configuration:

```
npu# write
```

The next time you reset the system, it boots up with the last saved configuration.

IMPORTANT

It is recommended that you save the current configuration before shutting down or resetting the system. The last saved configuration is used during system startup. Unsaved configuration is lost after system reset/shutdown. For more information about shutting down/resetting the system, refer to Section 3.2.

Command Syntax	`npu# write`
Privilege Level	`10`
Command Mode	Global command mode

3.3.5.2 Downloading a Configuration File/Vendor Startup File from an External Server

IMPORTANT

Before downloading a file from an external server, you are required to configure the IP interfaces, external-management, bearer, and local-management. For more information about configuring IP interfaces, refer the section, “Configuring Static Routes” on page 167.

You can download a file from an external server, and use this file for booting up 4Motion. After downloading this file, reset the system. The system boots up with the downloaded configuration.

In addition to the regular Operator configuration file (typically a backup file previously uploaded from either the same or another BTS), this command can also be used to download a Vendor Startup file supplied by the vendor that contains parameters that can be configured only by the vendor.

The default name of the Vendor Startup file is vendor_startup.xml.gz.

IMPORTANT

As soon as the system boots up with the downloaded configuration, the downloaded configuration file is deleted from the NPU flash. The system continues to operate using the downloaded configuration until the next system reset. After the system is reset, it boots up using the last saved configuration. To ensure that the downloaded configuration is used to boot up the system after reset, save the downloaded configuration using the following command:

```
npu# write
```

For more information about saving configuration, refer to Section 3.3.5.1.

Run the following command to download the configuration/vendor file from an external server:

```
npu# configfile download tftp://<ip-address>/<filename>
```

Reset 4Motion after you run this command. The system boots up with the downloaded configuration. To reset the system, run the following command:

```
npu(config)# reset
```

For more information about resetting 4Motion, refer to Section 3.2.2.1.

NOTE

An error may occur if:

- The file to be downloaded is not present in the appropriate path on the TFTP server.
- The file name that you have provided is in an invalid format. (The file to be downloaded should be a compressed xml file with the xml.*gz* extension.)

Command Syntax

```
npu# configfile download tftp://<ip-address>/<filename>
```

Privilege Level `10`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`<ip-address>`	Indicates the IP address of the TFTP server.	Mandatory	N/A	Valid IP address
`<filename>`	Indicates the name of the configuration file to be downloaded using the TFTP server. The file to be downloaded should be a compressed xml file in the format is <name>.xml.gz.	Mandatory	N/A	<filename>xml. .gz

Command Modes Global command mode

3.3.5.3 Displaying the Status of the last File Download Operations

To display the status of the last file download operations, run the following command:

```
npu# show file-download-status
```

Command Syntax `npu# show file-download-status`

Privilege Level `10`

Display Format

```
The status of File Download operation for Operator file is :: <status>
The status of File Download operation for Vendor file is :: <status>
```

Command Modes Global command mode

3.3.5.4 Making a Backup/Restoring the Configuration File

You can make a backup of the current system configuration. You can either manually make a backup or configure the system to automatically make a daily backup of the current configuration. You can, at any time, restore configuration from the backup configuration file or revert to the factory default configuration.

NOTE

The system makes a backup (automatic daily backups or manual backup) of the current configuration. The backup files are stored in the path, tftpboot\management\configuration. The naming convention used for the backup configuration files is, **YYYYMMDDHHMM.cfg.gz**.

You can display the three most recent backup configuration files residing in the NPU flash. For details, refer to Section 3.3.5.4.9.

This section describes the commands for:

3.3.5.4.1 Making a Manual Backup of the Current Configuration

To manually make a backup of the current configuration, run the following command:

```
npu# manual-backup
```

You can, at any time, view the status of the manual backup procedure. For details, refer to Section 3.3.5.4.2.

IMPORTANT

To enable the system to automatically make a backup of the current configuration, everyday, refer to Section 3.3.5.4.3.

Command Syntax

```
npu# manual-backup
```

Command Modes

Global command mode

3.3.5.4.2 Displaying the Status of the Manual Backup Procedure

To display the current status of the manual backup procedure, run the following command:

```
npu# show manual-backup-status
```

Command Syntax

```
npu# show manual-backup-status
```

Privilege Level

```
10
```

Display Format

```
The Status of the File Backup operation is: <status-value>
```

Where `<status value>` may be any of the following:

- Generating (1)
- Copying (2)
- Compressing (3)
- Compression Failure (4)
- Copying Failed (5)
- Completed (6)

Command Modes

Global command mode

3.3.5.4.3 Making Automatic Backups of the Current Configuration

You can enable the system to automatically make daily backups of the current configuration at a specific time. (You can also manually make a backup of the configuration. For details, refer to Section 3.3.5.4.1.)

NOTE

By default, the system makes a daily backup of the current configuration, at 00:00 hours.

To enable the system to make automatic backups of the current configuration, run the following command:

npu(config)# auto-backup-time <hh:mm>

Specify the time in the 24-hour format. The system will automatically make a backup of the current configuration, everyday, at the time that you have specified.

IMPORTANT

You can restore the configuration from any of the backup configuration files residing in the NPU flash. For details refer to Section 3.3.5.4.5.

Command Syntax

npu(config)# auto-backup-time <hh:mm>

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<hh:mm>	Indicates the time at which the system should automatically create a backup of the current configuration, everyday.	Mandatory	00:00	HH:MM (Enter the time in the 24-hour format)

Command Modes

Global configuration mode

3.3.5.4.4 Displaying the Automatic Backup Time

To display the current time configured for the automatic backup procedure, run the following command:

```
npu# show auto-backup-time
```

Command Syntax	`npu# show auto-backup-time`
Privilege Level	`10`
Display Format	`Automatic Backup time is  :: <value> hrs`
Command Modes	Global command mode

3.3.5.4.5 Restoring the Configuration Defined in the Backup Configuration File

You can, at any time, restore configuration from the backup configuration file. (To display a list of currently stored backup files, refer to Section 3.3.5.4.9.) Run the following command to specify the backup file to be restored:

```
npu# restore-from-local-backup <filename>
```

IMPORTANT

After executing this command, reset the system to restore configuration from the backup configuration file. For more information about resetting the system, refer to Section 3.2.2.1.

IMPORTANT

If you have stored the backup file on an external server, you can download the backup file from the external server, and reset the system to apply the configuration defined in the downloaded file. For details about downloading the configuration file from an external server, refer Section 3.3.5.2.

Command Syntax	`npu# restore-from-local-backup <filename>`
Privilege Level	`10`

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`<filename>`	Indicates the name of the backup configuration file to be used for restoring configuration. The format of the backup configuration file name iz YYYYMMDDHHMM.xml.gz, where YYYYMMDDHHMM indicates the creation date and time of the zipped XML configuration file.	Mandatory	N/A	Valid file name

Command Modes Global command mode

3.3.5.4.6 Restoring the Factory Default Configuration

You can, at any time, run the following command to restore factory default configuration:

```
npu# restore-factory-default
```

IMPORTANT

After executing this command, reset the system to apply the configuration change. For more information about resetting the system, refer to Section 3.2.2.1.

Command Syntax `npu# restore-factory-default`

Privilege Level `10`

Command Modes Global command mode

3.3.5.4.7 Restoring the Factory Default Configuration With Connectivity

You can, at any time, run the following command to restore factory default configuration without changing any of the parameters required for maintaining management connectivity to the unit:

```
npu# restore-factory-default-with-connectivity
```

IMPORTANT

After executing this command, reset the system to apply the configuration change. For more information about resetting the system, refer to Section 3.2.2.1.

The parameters that are maintained without any change include:

- Physical interfaces (MGMT, CSCD, DATA) configurations
- IP interfaces (local-management, external-management, bearer) configurations
- IP route configurations
- SNMP Managers configurations
- Trap Managers configurations
- AU software mapping
- Site ID

Command Syntax	`npu# restore-factory-default-with-connectivity`
Privilege Level	`10`
Command Modes	Global command mode

3.3.5.4.8 Displaying Failures in Configuration Restore Operations

When some configurations cannot be applied during NPU configuration restore process, the NPU will not reset. Instead, the NPU will report the “Configurations

Applied Successfully with few exceptions" message. You can then view the failed CLIs using the following command:

npu# show apply fail details

According to the failures details you can perform the necessary corrective actions. The intent to have this feature is to address scenarios when migration tool can not determine consistency checks/rules between parameters/tables.

Command Syntax	**npu# show apply fail details**
Privilege Level	**10**
Command Modes	Global command mode

3.3.5.4.9 Displaying the Currently Stored Backup Configuration Files

To display a list of backup configuration files that are currently residing on the NPU flash, run the following command:

npu# show backup-configuration-files

The three most recent backup configuration files are displayed.

The format of the backup configuration file name is YYYYMMDDHHMM.xml.gz, where YYYYMMDDHHMM indicates the creation date and time of the zipped XML configuration file.

Command Syntax	**npu# show backup-configuration-files**
Privilege Level	**10**
Display Format	1.<file name>.gz 2. <file name>.gz 3. <file name>.gz

Command Modes	Global command mode

3.3.6 Batch-processing of CLI Commands

You can use the CLI to batch-process commands to be executed for configuring and monitoring 4Motion.

IMPORTANT

Before initiating batch-processing of commands, remember that:

- If an error occurs while executing any command, the batch-processing operation is aborted; all subsequent commands are not executed.
- If you want to execute a command that requires system reset, specify the save configuration and system reset commands at the end of the batch file. (For more details about saving configuration and resetting the system, refer to "Saving the Current Configuration" on page 135 and "Resetting the system" on page 95.

To batch-process CLI commands:

1. Ensure that the text file comprising the commands to be batch processed is present on the TFTP server to be used for downloading the batch file.
2. Run the following command to download the text file and initiate batch-processing of commands specified in this file:

```
npu# batch-run tftp://<ip-address>/<file name>
```

After you execute this command, the file is downloaded from the TFTP server, and the commands in the file are executed sequentially. After batch-processing of all commands in this file is complete, the downloaded file is deleted from the 4Motion system.

The following is a sample text file that contains a list of commands to be batch-processed:

```
config terminal
nextbootmode asngwStatic
limit cpu softlimit 80 hardlimit 85
bearerqos rule_1 0 3 5 data 1
config outer-dscp 3 vlan-priority 4 qos enable
exit
write
reset
```

Command Syntax

npu# batch-run tftp://<ip-address>/<file name>

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<ip-address>	Indicates the IP address of the TFTP server to be used for batch-processing commands to be used for configuring and monitoring 4Motion.	Mandatory	N/A	Valid IP address
<file name>	Indicates the configuration file to be used for batch-processing the CLI commands. Always suffix the file name with .txt.	Mandatory	N/A	<filename>.txt

Command Modes

Global configuration mode

3.3.7 Configuring the CPU

To ensure optimal utilization of the NPU resources, you are required to configure the thresholds for the CPU and memory utilization for the NPU. In addition, to

protect the from hostile applications, the type and rate of traffic destined towards the NPU is limited by default.

This section describes the commands to be executed for:

- “Configuring CPU and Memory Utilization Thresholds for the NPU” on page 147
- “Rate Limiting for the NPU” on page 149

3.3.7.1 Configuring CPU and Memory Utilization Thresholds for the NPU

This section describes the commands for:

- “Specifying Thresholds for CPU and Memory Utilization for the NPU” on page 147
- “Displaying CPU and Memory Utilization Limits for the NPU” on page 148

3.3.7.1.1 Specifying Thresholds for CPU and Memory Utilization for the NPU

You can use the CLI to configure the thresholds (soft and hard limits) for CPU and memory utilization for the NPU. When the soft or hard limit for either CPU or memory utilization is reached, an alarm is raised.

NOTE

To display the current thresholds that are configured for CPU and memory utilization for the NPU, refer to Section 3.3.7.1.2.

To configure the thresholds (soft and hard limits) for CPU and memory utilization for the NPU, run the following command:

```
npu(config)# limit {cpu | memory} ([softlimit <limit>] [hardlimit <limit>])
```

For example, run the following command if you want to configure the soft and hard limits for CPU utilization to be 78 and 85 percent, respectively.

```
npu(config)# limit cpu softlimit 80 hardlimit 85
```

NOTE

An error may occur if the value of the `softlimit` parameter is higher than the `hardlimit` parameter.

Command Syntax

```
npu(config)# limit {cpu | memory} ([softlimit <integer (1-99>] [hardlimit <integer (1-99>])
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`{cpu | memory}`	Indicates whether the threshold is to be specified for CPU or memory utilization.	Mandatory	N/A	cpu/ memory
`[softlimit <integer (1-99>]`	Indicates the soft limit, as a percentage, for CPU/memory utilization. When this limit is reached, the system raises a Minor or Major alarm.	Optional	70 (for CPU and memory utilization)	1-99
`[hardlimit <integer (1-99>])`	Indicates the hard limit, as a percentage, for CPU/memory utilization. When this limit is reached, the system raises a Critical alarm. The value of this parameter should always be greater than the `softlimit` parameter.	Optional	90 (for CPU and memory utilization)	1-99

Command Modes

Global configuration mode

3.3.7.1.2 Displaying CPU and Memory Utilization Limits for the NPU

To display the configured CPU and memory utilization limits for the NPU, run the following command:

```
npu# show resource limits
```

NOTE

To configure the CPU and memory utilization limits for the NPU, refer to Section 3.3.7.1.2.

Command Syntax	`npu# show resource limits`
Privilege Level	`1`

Display Format	`Resource softlimit hardlimit`
	`CPU <limit> <limit>`
	`Memory <limit> <limit>`

Command Modes	Global configuration mode

3.3.7.2 Rate Limiting for the NPU

The rate limiting feature enables limiting the type and rate of traffic destined towards the NPU. This feature is used to protect the NPU from hostile applications or Denial of Service (DoS) attacks because packets that exceed an allowed rate are dropped and not queued to the NPU.

The default rate limits that are preconfigured in the device provide all the functionality necessary for proper operation of the system.

You can at any time:

- Enable or disable rate limiting (refer to Section 3.3.7.2.1).
- Display configuration information for the rate limiting feature (refer to Section 3.3.7.2.2).

3.3.7.2.1 Enabling/Disabling the Rate Limiting for the NPU

You can disable or enable the rate limiting feature for the NPU. When this feature is disabled, rate-limiting for all applications is in the "not-in-service" state. When you enable this feature, the last saved configuration parameters for all applications (pre-defined, user-defined, and all others) is used.

By default, this feature is enabled for the NPU.

NOTECAUTION

When you disable rate limiting for the entire system, it is disabled for all applications, pre-defined, user-defined, and all others, and any application can use 100% of the NPU's capacity, thereby making it vulnerable to attack from hostile applications.

To enable/disable the rate limiting feature, run the following command:

```
npu(config)# set cpu rate-limit {enable | disable}
```

Command Syntax

```
npu(config)# set cpu rate-limit {enable | disable}
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
{enable | disable}	Indicates whether this feature should be enabled or disabled for the NPU.	Mandatory	N/A	■ enable ■ disable

Command Modes

Global configuration mode

3.3.7.2.2 Displaying the Rate Limiting Configuration Information for an Application

To display rate limiting parameters that are configured for specific or all user-defined and pre-defined applications, run the following command:

```
npu# show rate-limit config {ftp | telnet | tftp | ssh | icmp | snmp
| R4-R6 | igmp | eap | arp | all-others | <user-defined-app> | all}
```

IMPORTANT

An error may occur if you want to run this command to display configuration information for an application for which rate limiting is disabled.

Command Syntax

```
npu# show rate-limit config {ftp | telnet | tftp | ssh | icmp | snmp |
R4-R6 | igmp | eap | arp | all-others | <user-defined-app> | all}
```

Privilege Level 1

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`{ftp | telnet | tftp | ssh | icmp | snmp | R4-R6 | igmp | eap | arp | <user-defined-app> | all}`	Indicates the application for which rate limiting is to be displayed.	Optional	N/A	■ ftp ■ telnet ■ tftp ■ ssh ■ icmp ■ snmp ■ R4-R6 ■ igmp ■ eap ■ arp ■ user-defined-app: Refers to user-defined applications for which rate limiting is to be displayed. ■ all

Display Format

```
CPU Rate Limiting Status : Enabled

PRE-DEFINED RATELIMIT CONFIGURATION:

-----------------------------------

Application   DestPort      Rate(Kbps)    Status

<Application>  <Port Number>  <Configured Rate> <Current Status>

<Application>  <Port Number>  <Configured Rate> <Current Status>

<Application>  <Port Number>  <Configured Rate> <Current Status>


USER-DEFINED RATELIMIT CONFIGURATION:

Application  Srcport    Dstport     Proto       SrcIPAddr   DstIPAddr
L2type    Rate

<Application> <Port Number> <Port Number>  <Protocol>    IP address> <IP
Address>   <value>    <Configured Rate>
```

Command Modes

Global command mode

3.3.8 Configuring QoS Marking Rules

QoS marking rules refer to the classification of traffic originating from the NPU into different flows. You can then apply DiffServ Code Points (DSCP) and/or 802.1p priority bits for appropriate QoS handling of each flow.

The NPU generates the following types of traffic:

- R4/R6 control traffic
- R3 control traffic such as RADIUS or MIP
- Management traffic

To define QoS marking for traffic generated by NPU, you are required to configure:

- Class-maps: Define the DSCP and/or VLAN priority bits to be applied for signaling and management traffic originating from the NPU.
- QoS classification rules: Classify packets into flows, based on the IP address of the host interface, transport protocol, and the source port number of the application traffic. A class-map can be associated with each flow to define

separate DSCP and/or VLAN priority bits for QoS handling of each flow. Extended ACL 199 is used for configuring QoS classification rules and associating each rule with a class-map.

IMPORTANT

By default, QoS marking rules are disabled. You are required to enable a QoS marking rule before it is applied on host originating traffic matching the QoS classification rules.

To configure QoS marking rules:

1. Create one or more class-maps (refer to Section 3.3.8.1)
2. Use extended ACL 199 to configure QoS classification rules, and apply the appropriate class-map for each classifcation rule (refer to Section 3.3.8.2).
3. Enable the QoS marking rule to classify packets based on the QoS classifcation criteria, and apply the apprpriate class-map (refer to Section 3.3.8.3)

You can, at any time, display configuration information for a particular class-map (refer to Section 3.3.8.1.6).

3.3.8.1 Managing Class-maps

A class-map refers to the DSCP and/or 802.1p VLAN priority bits to be applied on host-originating traffic that match the criteria defined by the applicable QoS classification rules. Each class-map is assigned a class-identifier, which you can use to reference a class-map (while associating it with the QoS classification rule).

To configure a class-map:

1. Enable the QoS class-map configuration mode (refer to Section 3.3.8.1.1)
2. You can now:
   - Configure the 802.1p VLAN priority and/or DSCP for this class-map (refer to Section 3.3.8.1.2).
   - Delete the 802.1p VLAN priority and/or DSCP for this QoS class-map (refer to Section 3.3.8.1.3).
   - Terminate the QoS class-map configuration mode (refer to Section 3.3.8.1.4).

You can, at any time, delete an existing class-map (refer to Section 3.3.8.1.5) or view the configuration information for an existing class-map (refer to Section 3.3.8.1.6).

3.3.8.1.1 Enabling the QoS Class-map Configuration Mode/ Creating a New Class Map

To specify the 802.1p VLAN priority and/or DSCP values for a class-map, first enable the QoS class-map configuration mode. Run the following command to enable the QoS class-map configuration mode. You can use this command to create a new QoS class-map

```
npu(config)# class-map <class-map-number(1-65535)>
```

If you run the above command to create a new QoS class-map, the configuration mode for this QoS class-map is automatically enabled.

By default, class-maps 1-8 are pre-configured. Refer to Table 3-15 for details on these class-maps and the QoS classification rules to which they are associated.

IMPORTANT

If you want to modify the 802.1p VLAN priority and/or DSCP values for a class-map that is already associated with a QoS classification rule, first disable the QoS classification rule. For more information about disabling QoS classification rules, refer to Section 3.3.8.3.

NOTE

The QoS class-map number is used to reference the QoS class-map that you want to associate with a QoS classification rule, which defines the classification rule to be applied for host-originating traffic. For more information about creating QoS classification rules, refer Section 3.3.8.2.

After you enable the QoS class-map configuration mode, you can:

- Configure the 802.1p VLAN priority and/or DSCP for this class-map (refer to Section 3.3.8.1.2).
- Delete the 802.1p VLAN priority and/or DSCP for this QoS class-map (refer to Section 3.3.8.1.3).
- Terminate the QoS class-map configuration mode (refer to Section 3.3.8.1.4).

IMPORTANT

An error may occur if:

- You specify a class-map number that is not within the range, 1- 65535.
- The class-map configuration mode for the class-map you have specified is already enabled.

Command Syntax

```
npu(config)# class-map <class-map-number(1-65535)>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<class-map-number(1-65535)>	Indicates the identifier of the QoS class-map for which the QoS class-map configuration mode is to be enabled.	Mandatory	N/A	1-65535

Command Modes

Global configuration mode

3.3.8.1.2 Specifying 802.1p VLAN priority and/or DSCP for a Class-map

IMPORTANT

If you are modifying the 802.1p VLAN priority and/or DSCP for a class-map that is associated with a QoS classification rule, first disable the QoS classification rules for that ACL. For details, refer to Section 3.3.8.3.

After enabling the QoS class-map configuration mode, you can configure one or both of the following values for this QoS class-map:

- DSCP value in the IPv4 packet header to indicate a desired service.
- 802.1p VLAN priority in the MAC header of the packet.

Run the following command to configure the 802.1p VLAN priority and/or DSCP:

```
npu(config-cmap)# set {[cos <new-cos(0-7)>] [ip dscp
<new-dscp(0-63)>]}
```

Command Syntax

```
npu(config-cmap)# set {[cos <new-cos(0-7)>] [ip dscp <new-dscp(0-63)>]}
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
[**cos** <new-cos(0-7)>]	Indicates the 802.1p VLAN priority value to be applied for this class-map.	Optional	N/A	0-7 where 0 is the lowest and 7 is the highest
[**ip dscp** <new-dscp(0-63)>]	Indicates the DSCP value to be applied for this class-map.	Optional	N/A	0-63

Command Modes

Class-map configuration mode

3.3.8.1.3 Deleting 802.1p and/or DSCP Values from a Class-map

IMPORTANT

If you are deleting the 802.1p VLAN priority and/or DSCP for a class-map that is associated with a QoS classification rule, first disable the QoS classification rules for that ACL. For details, refer to Section 3.3.8.3.

Run the following command to delete the 802.1p VLAN priority and/or DSCP for this class-map.

```
npu(config-cmap)# no {[cos <new-cos(0-7)>] [ip dscp
<new-dscp(0-63)>]}
```

IMPORTANT

An error may occur if the 802.1p or DSCP that you have specified do not exist for this class-map.

Command Syntax

```
npu(config-cmap)# no {[cos <new-cos(0-7)>] [ip dscp <new-dscp(0-63)>]}
```

Privilege Level **10**

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
`[cos <new-cos(0-7)>]`	Indicates the 802.1p VLAN priority to be deleted for this class-map.	Optional	N/A	0-7
`[ip dscp <new-dscp(0-63)>]`	Indicates the DSCP to be deleted for this class-map.	Optional	N/A	0-63

Command Modes QoS class-map configuration mode

3.3.8.1.4 Terminating the QoS Class-map Configuration Mode

To terminate the QoS class-map configuration mode, run the following command:

```
npu(config-cmap)# exit
```

Command Syntax **`npu(config-cmap)# exit`**

Privilege Level 10

Command Modes QoS class-map configuration mode

3.3.8.1.5 Deleting a QoS Class-map

Run the following command to delete an existing QoS class-map:

```
npu(config)# no class-map <class-map-number(1-65535)>
```

IMPORTANT

An error may occur if you specify a class-map number that does not exist or is not within the range, 1-65535.

Command Syntax

```
npu(config)# no class-map <class-map-number(1-65535)>
```

Privilege Level

10

Syntax Description

Parameter	Description	Presence	Default Value	Possible Values
<class-map-number(1-65535)>	Indicates the identifier of the QoS class-map number to be deleted.	Mandatory	N/A	1-65535

Command Modes

Global configuration mode

3.3.8.1.6 Displaying Configuration Information for a Class-map

Run the following command to view the configuration information for a class-map:

```
npu# show class-map [<class-map-num(1-65535)>]
```

Specify the class-map number if you want to view configuration information for a specific class-map. If you do not specify the class-map number, configuration information for all class-maps is displayed.

IMPORTANT

An error may occur if you specify a class-map number that does not exist or is not within the range, 1-65535.

Command Syntax

```
npu# show class-map [<class-map-num(1-65535)>]
```

Privilege Level

1