

MOTOTRBO™

Application Development Kit Overview



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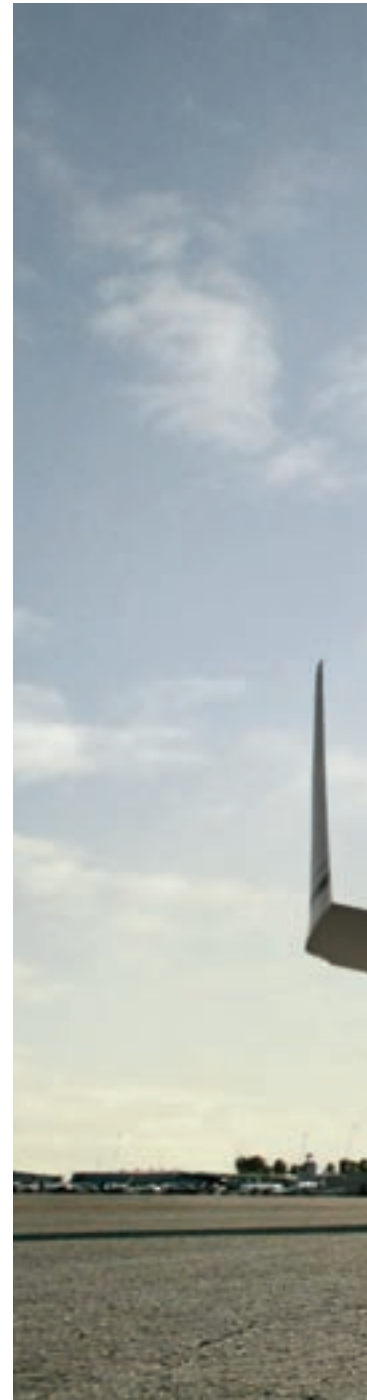
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1.0

What is MOTOTRBO?

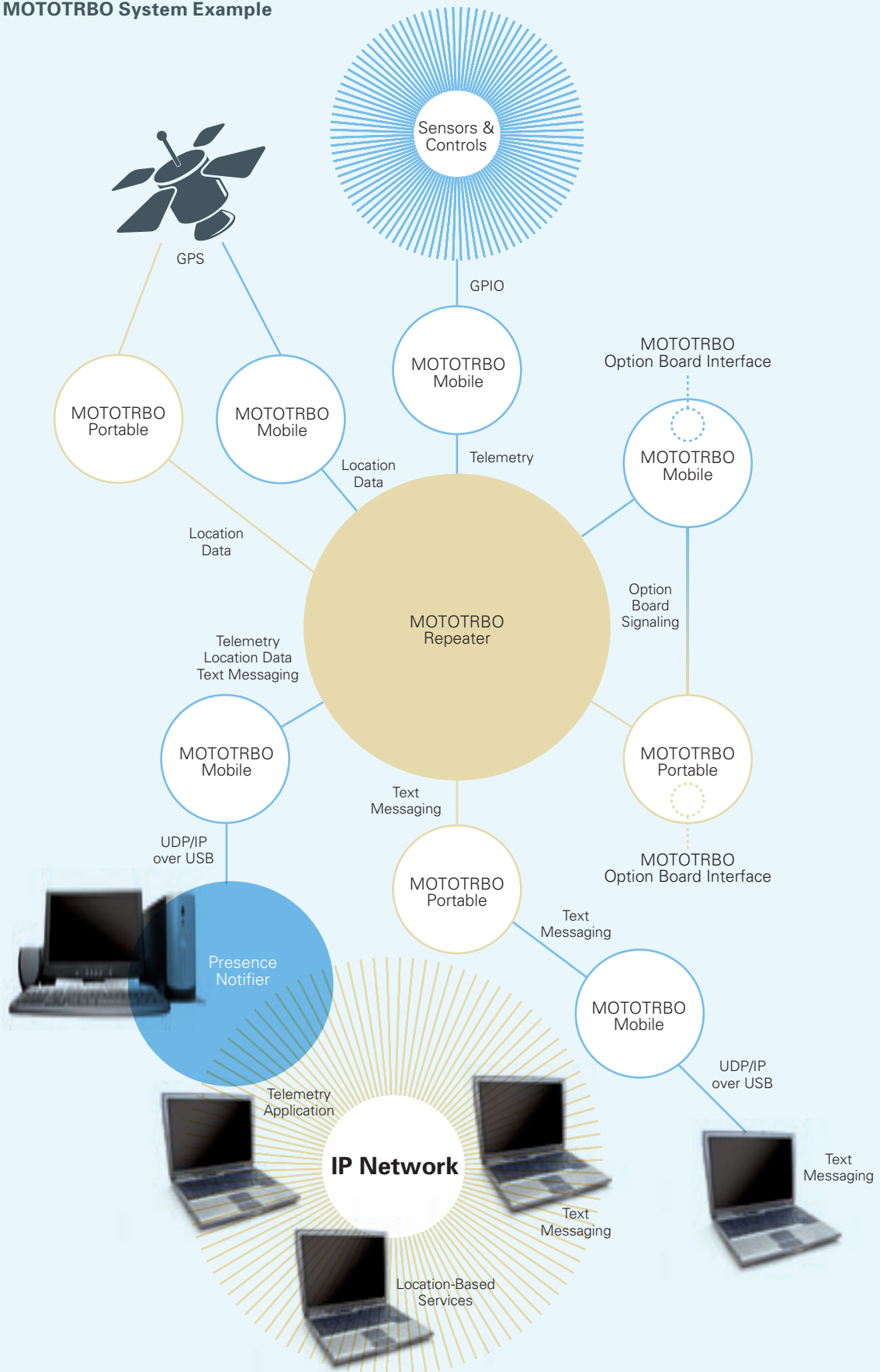
MOTOTRBO is Motorola's next generation of Professional Radio that is capable of analogue and digital two-way communications. In addition to the standard features available with Motorola's other analogue-based products, MOTOTRBO brings digital enhancement to the voice quality as well as an expanded feature set to this product tier.

While operating in digital mode, MOTOTRBO uses a two-slot Time Division Multiple Access (TDMA) air interface to transmit and receive digitised voice and air protocol control messages simultaneously. This leads to a higher quality of service (QoS) and a richer user experience with the product.

With the digital mode operation of the MOTOTRBO system, customers can expect end-to-end operation of advanced features and integrated applications such as text messaging, Location-Based Services (LBS), and telemetry as well as customised capabilities provided through an internal option board.

Section 1

Figure 1 - MOTOTRBO System Example



2.0

Extending the MOTOTRBO Product

Aside from the functionality embedded in the radio, the MOTOTRBO subscriber's capabilities can be extended through defined application programming interfaces for 3rd party developer use. The MOTOTRBO Application Development Kits (ADKs) offer an opportunity to customise a solution specifically to a customer's need.

The MOTOTRBO ADKs are comprised of protocol specifications and development guidelines that are intended as technical references for the external vendor. These ADKs not only include software specifications, but also include electrical and mechanical specifications, where applicable. Each interface's set of technical references also detail the

specific domain knowledge required to successfully implement a 3rd party application for the MOTOTRBO product.

There are four primary ADKs for developer use:

- MOTOTRBO Option Board ADK
- MOTOTRBO Telemetry ADK
- MOTOTRBO Location Data ADK
- MOTOTRBO Text Messaging ADK

Please refer to the individual ADK sections for more information on the interface. Refer also to the Appendix: ADK Document Map for more information on document components for each ADK.



Section 2

2.1

MOTOTRBO Option Board ADK

The MOTOTRBO portable and mobile radios provide a physical and logical interface to accommodate an internal option board with an onboard processor and embedded logic. This option board interface is the means by which an option board, executing its own software application, interoperates with the main board firmware to create the custom end-user solution.

The option board interface of the MOTOTRBO product uses the Extended Command and Management Protocol (XCMP) to establish a communication mechanism between the option board device and the radio. Through this protocol, the option board can request notification of ergonomic events such as button presses or signals (i.e. carrier detect, PL detect, etc.) in order to take further action to process a customised feature. The option board can also request the radio to execute certain actions such as display text or route audio in order to present a specific ergonomic experience to the user. In addition, the option board can activate or de-activate specific functionality, such as scan, the menu system, or an over-the-air data session, to execute the behavior of a new feature.

The option board interface uses a Synchronous Serial Interface (SSI) to transport the XCMP control and data messages within XCMP Network Layer (XNL) packets to and from the radio and its available services. The SSI is comprised of four logic lines: clock, sync, data in, and data out. The option board uses the SSI to transport logical and audio data to and from the radio. There are no dedicated analogue audio lines on the option board interface. Whether the MOTOTRBO radio is operating in analogue or digital mode, all audio is encoded into digital format and transported on the SSI bus.

The SSI bus is a multi-slotted Time Division Multiplexed (TDM) communication channel that is shared with other chips and devices contained within or attached to the Radio Host. A separate Option Board Sync (OBSync) logic signal is provided by the

main board so that the option board can send and receive data during its proper timeslot.

Through the MOTOTRBO™ Option Board interface, custom applications can be created to achieve a desired user operation while the MOTOTRBO™ radio is operating in either analog or digital mode. The extended functionality provided by an option board can be a basic ergonomic feature, such as a “Man-Down” lone worker application, or an advanced signal processing feature, such as a custom signaling system format.

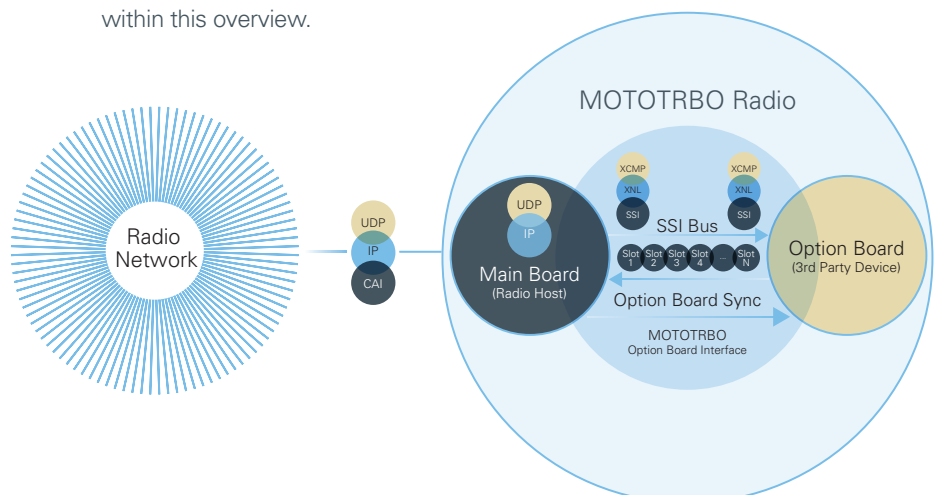
The MOTOTRBO™ Option Board interface also has the extended capability to communicate with other devices within the radio system. This includes Data Applications which are integrated into the Radio Network through a PC environment. These Data Applications communicate using User Datagram Protocol over Internet Protocol (UDP/IP) sent over the Common Air Interface (CAI) of the MOTOTRBO™ Radio. Interoperation with Data Applications is only available while MOTOTRBO™ is operating in digital mode.

For more information about the MOTOTRBO™ Option Board interface, please see the following references:

- MOTOTRBO™ Option Board ADK Guide
- MOTOTRBO™ Option Board PROIS Cross-reference
- MOTOTRBO™ XCMP / XNL Development Guide
- MOTOTRBO™ XCMP / XNL Development Specification

For more information about the other interfaces, please refer to the appropriate sections contained within this overview.

Figure 2 - MOTOTRBO Option Board Interface Architecture



2.2

MOTOTRBO Telemetry ADK

The MOTOTRBO product can be customised for telemetry operation by developing a PC-based application using the MOTOTRBO Telemetry interface. A Telemetry Services PC application interoperates with a MOTOTRBO radio via direct USB connection and can monitor or control the general purpose inputs and outputs (GPIOs) of a radio. Telemetry operation is available while the MOTOTRBO product is operating in digital mode only.

Telemetry operation is available on 3 GPIOs for the MOTOTRBO portable and on 5 GPIOs for the MOTOTRBO mobile. The status of telemetry events can be queried for inputs or outputs. The state transition of telemetry inputs can also be announced and shown on a display-capable MOTOTRBO radio.

Routing of telemetry information in the radio network is accomplished using UDP/IP. The destination of the telemetry data can be either to a Telemetry Services PC application or to another device such as an option board. The Telemetry interface can also broadcast telemetry status over-the-air to specific MOTOTRBO subscribers within the radio network.

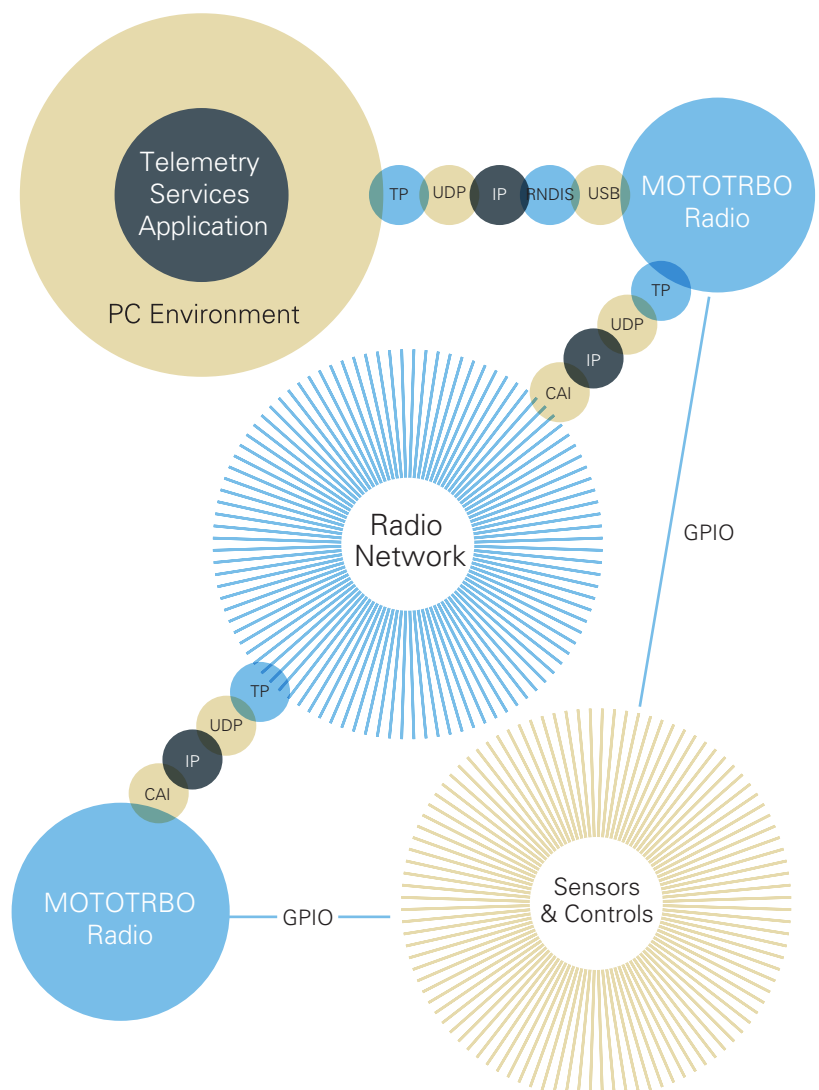
The Telemetry interface enables remote detection or activation of events through the MOTOTRBO system. An example of a telemetry-based solution is an irrigation system that is automatically activated based on average moisture level.

For more information about the MOTOTRBO Telemetry interface, please see the following references:

- MOTOTRBO Telemetry ADK Guide
- MOTOTRBO Telemetry Protocol Specification
- MOTOTRBO Data Services Overview

For more information about the other interfaces, please refer to the appropriate sections contained within this overview.

Figure 3 – MOTOTRBO Telemetry Interface Architecture



2.3

MOTOTRBO Location Data ADK

The MOTOTRBO product features optional embedded GPS capability for Location-Based Services (LBS) with the portable and mobile radio. The location function provides latitude, longitude, altitude, velocity, and heading data for the radio. A LBS PC application can also interoperate with the MOTOTRBO product to record a timestamp of reported location data for any specified radio. The Location Data interface is available while the MOTOTRBO product is operating in digital mode only.

Location status can be configured for periodic or on-request reporting during normal operation. During emergency operation, the MOTOTRBO radio can be configured for more frequent reporting of location data.

Architecture

Messages for requests and responses for location data are handled through the Location Request and Response Protocol (LRRP). LRRP is a location data reporting protocol that is optimised for use within the MOTOTRBO Radio Network. LRRP control and data messages are sent via the Radio Network within UDP/IP packets that are transported over the Common Air Interface (CAI). The LRRP messages are processed directly by the embedded GPS components inside the MOTOTRBO radio as well as within the LBS PC application. The Location Data interface can also interoperate with the MOTOTRBO Option Board interface to route location data directly to a custom option board device.

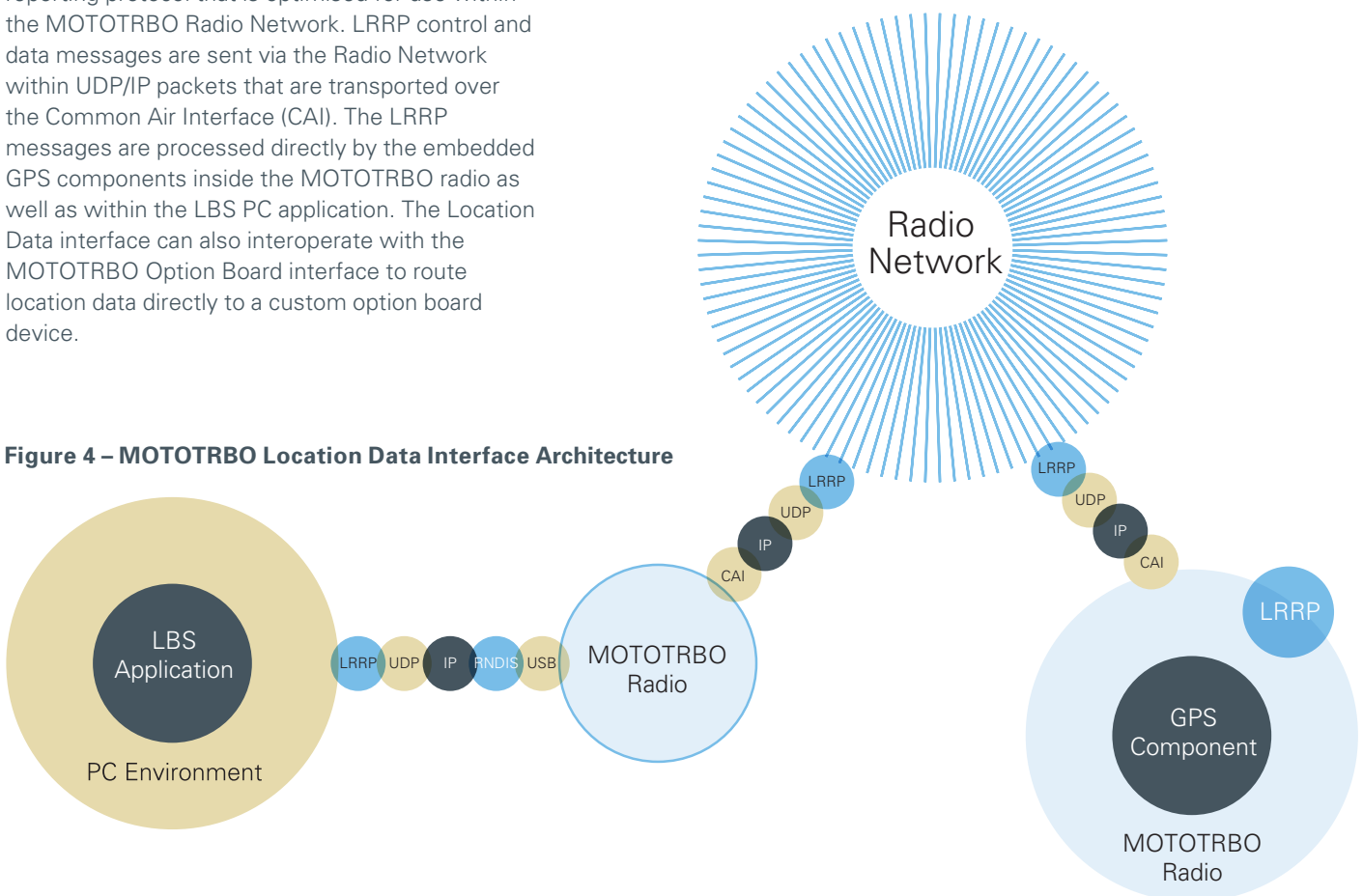
The Location Data interface facilitates asset tracking via location-based services. For example, a LBS application can provide an Automated Vehicle Location (AVL) capability to track the position of delivery trucks in the coverage area of the MOTOTRBO system.

For more information about the MOTOTRBO Location Data interface, please see the following references:

- MOTOTRBO Location Data ADK Guide
- MOTOTRBO Location Request and Response Protocol (LRRP) Specification
- Motorola Binary XML Encoding Specification
- MOTOTRBO Data Services Overview

For more information about the other interfaces, please refer to the appropriate sections contained within this overview.

Figure 4 – MOTOTRBO Location Data Interface Architecture



2.4

MOTOTRBO Text Messaging ADK

The MOTOTRBO product includes embedded text messaging capability for one-to-one or one-to-many device destinations. This capability can be extended to interoperate with a PC-based application to provide enhanced Text Messaging Services (TMS) using the Text Messaging interface of the MOTOTRBO radio. The TMS feature is available while the MOTOTRBO product is operating in digital mode only.

A text message containing up to 140 characters can be sent between a subscriber, talkgroup, subscriber with an attached PC (via USB), dispatcher client, or external network (i.e. the Internet). These messages can be pre-canned or composed along with a received message inbox for later viewing.

Interface Architecture

Text messages are routed within the Radio Network as UDP/IP packets transported over the MOTOTRBO Common Air Interface (CAI). The destination of text messages is determined by the target IP address and port number. This enables the routing of text messages to two logically different devices that are physically connected together (e.g. PC attached to MOTOTRBO radio via USB). In addition, the Text Message interface interoperates with the MOTOTRBO Option Board interface to route text messages directly to the option board for processing.

The Text Messaging Services interface provides alternate methods for sending and receiving text messages within the MOTOTRBO system. A

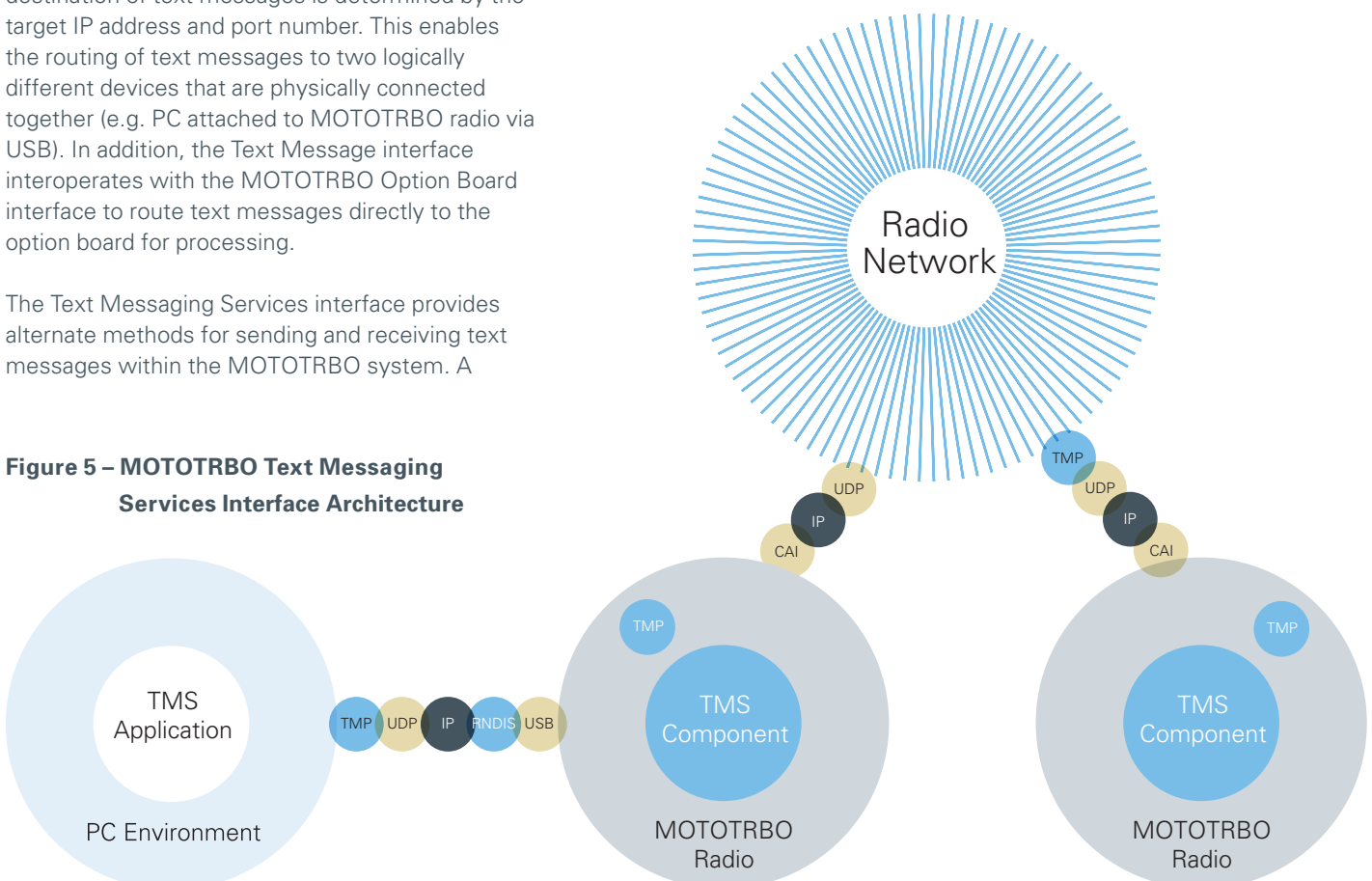
model implementation of this interface would be a PC-based dispatch messaging center. The messaging center contains a user interface for typing text messages to be sent to an individual radio or a group of radios as well as an output screen for displaying received messages.

For more information about the MOTOTRBO Text Messaging Services Interface, please see the following references:

- MOTOTRBO Text Messaging ADK Guide
- MOTOTRBO Text Messaging Protocol Specification
- MOTOTRBO Data Services Overview

For more information about the other interfaces, please refer to the appropriate sections contained within this overview.

Figure 5 – MOTOTRBO Text Messaging Services Interface Architecture



2.5

Presence Notifier

The Presence Notifier is used to notify a PC-based backend application, such as for telemetry, LBS, or text messaging, that a MOTOTRBO radio has powered on or off and has registered or de-registered with the system. This application allows for efficient bandwidth utilisation of the Radio Network – messaging only occurs between the backend application and those MOTOTRBO subscribers that are available and that the application is interested in. The Presence Notifier component is for use in digital mode only.

The MOTOTRBO radio contains an Automatic Registration Service (ARS) that sends a registration message to the Presence Notifier within the Radio Network. When the MOTOTRBO radio is powered down, a de-registration message is sent. The registration and de-registration messages are sent as UDP/IP packets that are transported over the CAI. The Presence Notifier ultimately receives the UDP/IP packets and processes them for the registration state of each MOTOTRBO radio.

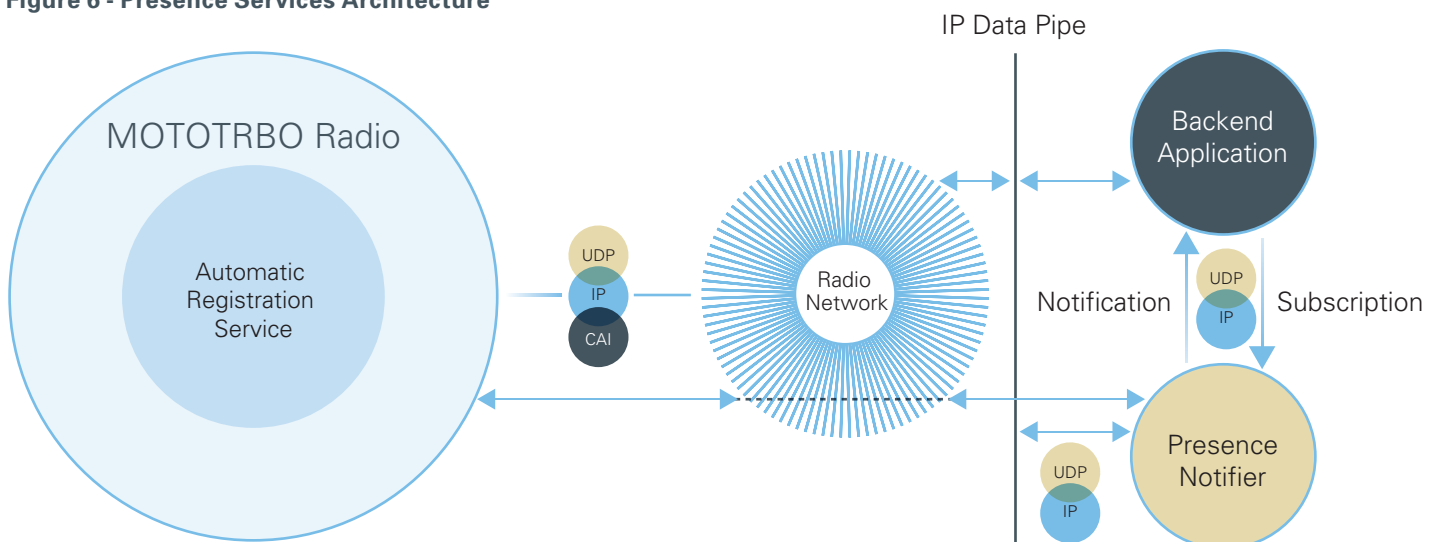
The Presence Notifier tracks the state of each MOTOTRBO radio on the Radio Network and reports each radio's state to each Backend Application. Each backend application must subscribe with the Presence Notifier in order to receive notifications of each MOTOTRBO radio of interest. Information between each Backend Application and the Presence Notifier is exchanged as UDP/IP packets.

For more information about the Presence Notifier, please see the following references:

- Presence Notifier Application User's Guide
- Presence Notifier-to-Watcher Interface Specification
- MOTOTRBO Data Services Overview

For more information about the other interfaces, please refer to the appropriate sections contained within this overview.

Figure 6 - Presence Services Architecture



2.6

Data Services

Aside from the data application capability of the MOTOTRBO product for telemetry, location, and text messaging, the MOTOTRBO radios can also be used as a generic UDP/IP “pipe” for the transport of data between multiple IP-capable devices. These devices, such as laptop or desktop PCs, must be attached to subscriber units operating within the Radio Network. The Data Services capability is available while the MOTOTRBO product is operating in digital mode only.

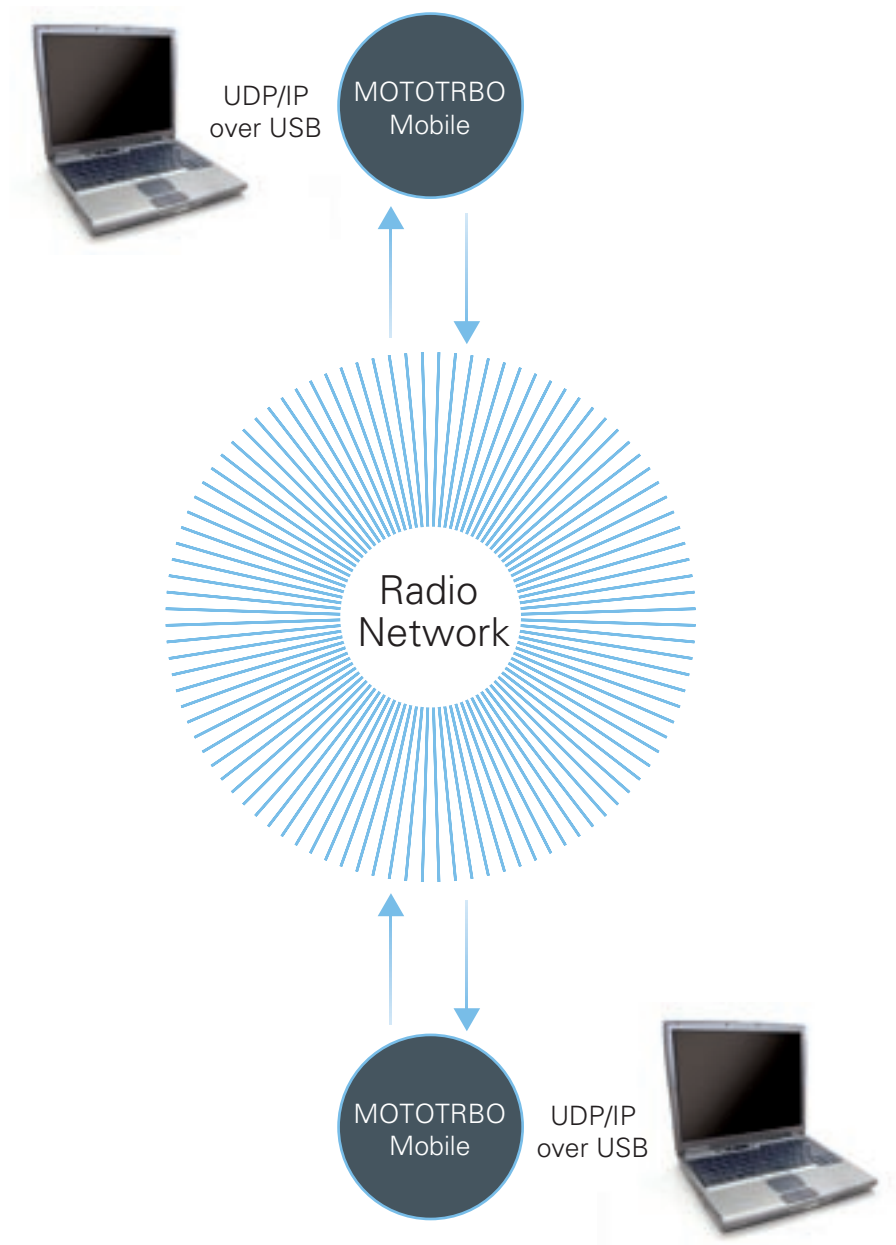
The attached PCs are mapped to an IP space that is separate from the MOTOTRBO radio IP address range. Therefore, data intended to the attached IP-capable device or the MOTOTRBO radio can be routed to the appropriate endpoint.

For more information about the Data Services capability, please see the following reference:

- MOTOTRBO Data Services Overview

For more information about the other interfaces, please refer to the appropriate sections contained in this overview.

Figure 7 – Data Services Architecture



3.0

Professional Radio Application Developer Programme

The Professional Radio Application Developer Program now includes MOTOTRBO and is comprised of three tiers of membership:

- Registered User
- Licensed Developer
- Application Partner / Application Provider

Each tier of membership brings greater accessibility to program information and development resources. Interested developers must be approved for Licensed Developer or Application Partner status in order to receive items such as:

- Application Development Kit (ADK) documentation
- Technical support, including developer forums and training
- Program affiliation media, including partner logo and application directory listing
- Motorola channel partner and customer information

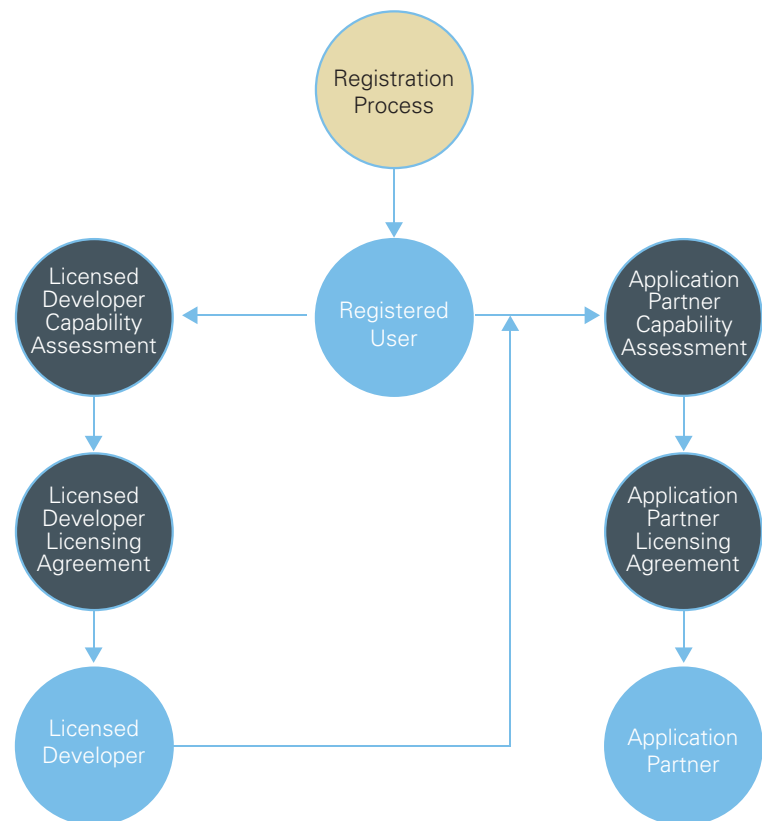
Registered Users have access to general information and resources only.

Developer Programme Membership Process Flow

The capability assessment is based on technical competency, commercial capability, and product portfolio. Characteristics that are considered include:

- Adequate commercial capability
- Expertise in two-way radio communications
- Expertise in hardware / software engineering development
- Adequate development and test environments
- Repeatable development and test processes
- Quality Assurance processes

Figure 8 – Professional Radio Application



4.0

Service & Support for Application Development

The MOTOTRBO Application Development Kits (ADKs) are only one component of the service and support for 3rd party developers. The Professional Radio Application Developer Programme for MOTOTRBO is staffed with full-time engineers whose primary responsibility is to support 3rd party application developers world-wide. Application developers have direct access to Motorola resources to assist in the development and certification of the 3rd party application.

This service and support includes, but is not limited to, the following items:

- Technical training on the use and capability of the developer interfaces on the MOTOTRBO radio
- Application notes and FAQs on relevant MOTOTRBO development topics
- Technical consultation service during the design and development phases of the 3rd party product
- Access to a MOTOTRBO system test environment with subscribers and infrastructure for 3rd party product verification (where supported by the local business region)

In order to ensure technical leadership and growth, the capabilities of the MOTOTRBO product and the developer interfaces will be continuously improved and enhanced for greater functionality and expansion. As a mechanism to support this process, Motorola will:

- Assist developers to define feature enhancements
- Document and submit change requests for prioritisation
- Track and oversee defect repair of application interfaces

Through this process, the MOTOTRBO product will be ensured to have:

- Clear, concise, and accurate developer documentation
- Full compliance with published specifications and guides for each application interface
- Compatibility audit with older release versions of published specifications

5.0

Further Information and Contact

For further information about MOTOTRBO and MOTODEV, please visit the following websites:

- Motorola MOTOTRBO:
<http://www.motorola.com/mototrbo>
- MOTODEV developer network – Professional Radio Application Developer Program:
<http://developer.motorola.com>

As an alternative, please contact your region's business development manager for further information on how to develop applications for the MOTOTRBO platform.

- Asia Pacific Region (APAC)
- Yit-Kai Lai (APACAPP@motorola.com)
- Europe, Middle East, and Africa (EMEA)
- Dietmar Kloss (EMEAAPP@motorola.com)
- Latin American Countries Region (LACR):
- Barbara Wakat (Barbara.Wakat@motorola.com)
- North America (NA)
- Dwain Lunau (NAGADP@motorola.com)



6.0

Appendix: ADK Document Map

Document	MOTOTRBO Option Board	MOTOTRBO Telemetry	MOTOTRBO Location Data	MOTOTRBO Text Messaging
MOTOTRBO ADK Overview	•	•	•	•
MOTOTRBO Option Board ADK Guide	•			
MOTOTRBO Option Board PROIS Cross-Reference	•			
MOTOTRBO XCMP / XNL Development Guide	•			
MOTOTRBO XCMP / XNL Development Specification	•			
MOTOTRBO Telemetry ADK Guide		•		
MOTOTRBO Telemetry Protocol Specification		•		
MOTOTRBO Location Data ADK Guide			•	
MOTOTRBO LRRP Specification			•	
Motorola Binary XML Encoding Specification			•	
MOTOTRBO Text Messaging ADK Guide				•
MOTOTRBO Text Messaging Protocol Specification				•
Presence Notifier Application User's Guide		•	•	•
Presence Notifier-to-Watcher Interface Specification		•	•	•
MOTOTRBO Data Services Overview		•	•	•
MOTOTRBO USB Configuration Guide	•	•	•	•



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