2.11 Over The Air Battery Management

When a battery fails and communication is lost, it impacts every aspect of an organization from serving customers to saving lives. But monitoring and maintaining the status of a large fleet of batteries can be time-consuming, inefficient and potentially overwhelming.

That is why the proprietary IMPRES™ Battery Fleet Management technology was created. It saves the guesswork, complexity and costs of managing hundreds even thousands of radio batteries and chargers wherever they're located, and makes it easier for users to do their work safely and successfully.

IMPRES Battery Fleet Management already supports collection of battery information each time an IMPRES battery is inserted into an IMPRES charger. And now IMPRES Battery Fleet Management supports automatic collection of battery information over the air while the radios are in use. This removes the need for wired network connections, Charger Interface Units, and remote clients at charger locations.

With IMPRES Battery Fleet Management, existing or customizable reports can be utilized to see the most relevant information. Data is stored in a database and can be exported to an Excel file or printed. IMPRES Battery Fleet Management software records and organizes a variety of data so the user can:

- Evaluate whether batteries are meeting their performance criteria
- Determine when batteries are nearing their end-of-life
- Eliminate unexpected downtime and work interruptions
- Avoid the expense of throwing batteries away prematurely
- Identify batteries that are missing, misplaced or inactive
- Identify radios that are not using IMPRES batteries
- Decide exactly when to buy new batteries
- Optimize charger utilization

NOTE: Over the air battery management focuses on managing the long term health of the batteries. It is not meant to acquire the current real-time energy levels of all radios within the system.

Automatic collection of battery information over the air is supported in the following system architectures:

- Direct Mode (including Dual Capacity)
- Single Site Repeater
- IP Site Connect
- Capacity Plus
- Linked Capacity Plus

Collection of battery information over the air is supported in the following radios when they are utilizing IMPRES batteries:

- DP2000, DP4000 Series

2.11.1 How Does It Work?

The Battery Fleet Management application (BMA) communicates with the radio system through an IP data gateway. The IP data gateway can be either the Motorola Network Interface Service (MNIS), which communicates via IP to the repeaters in the system, or a mobile radio configured as a control station.To support AES, the repeater codeplug must be configured with Enhanced Privacy type since the repeater does not encrypt or decrypt any AES payload. The Enhanced Privacy option allows the repeater to repeat the AES and Enhanced Privacy encrypted audio and data bursts. For proper functioning of the repeater in a system with AES encrypted transmissions, the repeater must be running on firmware version R02.08.00 or later.

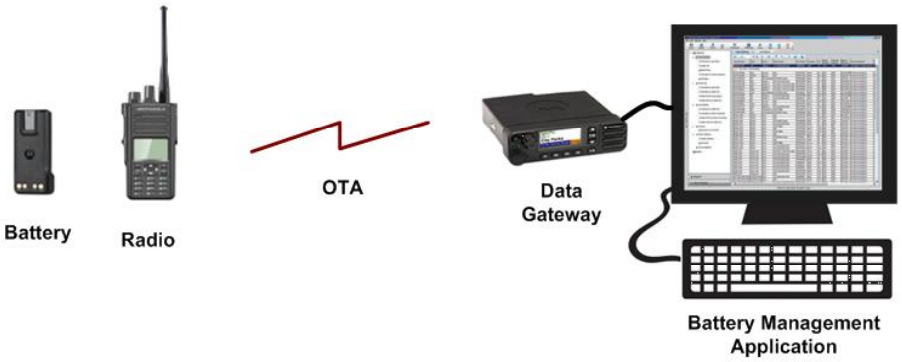

Figure 2-20 Battery Fleet Management Application (BMA) set up

The Battery Fleet Management application (BMA) starts empty. Within a few hours after a radio powers up, it registers its current battery over the air with the BMA. If the battery has never been registered with the BMA before, the BMA creates a new record for the battery and reads its battery data over the air. If the battery has been registered with the BMA before, the BMA checks the last time the battery's data was read. If it has not been recently read, the BMA reads the battery data over the air. If it has been recently read, no action is taken. Radios register their battery about once a day, and a battery's data is read once every few weeks.

2.11.2 How To Configure Automatic Over The Air Battery Data Collection

The radios must be programmed with the radio address of the IP data gateway the Battery Fleet Management application is utilizing, and over the air battery management must be enabled on the channel the IP data gateway is monitoring.

The Battery Management Server ID can be found in the network section of the radio CPS, under Services. Digital capable channels have a checkbox to enable Over-the-Air Battery Management. The radio only sends automatic battery registrations on channels that are enabled for over the air battery management.

Per standard data system configuration, the IP data gateway, either MNIS or a control station, must have a unique radio ID on the system. The IP data gateway utilized by the BMA must be configured for confirmed data calls, otherwise the success rate of the over the air battery management messaging will be noticeable low.

If there is a UDP port conflict on the PC, the IP data gateway, either MNIS or a control station, and the Battery Management Application can be configured with a different UDP Port. The setting can be found in the Network section of CPS for the control station, and the Configuration menu of the Battery Management Application.

Over the air battery management messaging does not revert, therefore the BMA's IP data gateways need not be monitoring revert channels.

Since the over the air messaging utilizes the MOTOTRBO IP data service, all pre-requisites and limitations of the standard IP data service apply to battery management.

2.11.3 System Level Optimizations

There are two timers that may require adjustments for optimal performance: the Battery Data Refresh Timer, and the Radio Hold Off Timer. The default values should be acceptable for most scenarios.

2.11.3.1 Battery Data Refresh Timer

The Battery Data Refresh Timer controls how frequently the battery data is read. Its default value is 21 days (i.e. 3 weeks). Battery data changes fairly slowly, therefore it unnecessary to read it over the air very often. The more often the battery data is read, the larger the load on the system. This is especially true if the system contains a very large number of radios. The Battery Data Refresh Timer can be found in the Preferences of the Battery Fleet Management application.

2.11.3.2 Radio Hold Off Timer

The Radio Hold Off Timer controls how long after power up does the radio wait before registering its current battery with the Battery Fleet Management application. Its default value is 2 hour. The radio waits for a random time between 30 minutes and the configured Radio Hold Off Timer.

If a system contains a very large number of radios, the Radio Hold Off Timer should be increased to minimize the over the air message collisions and congestion during shift changes or other scenarios where many radios power cycle within a short period of time. Because battery data is normally only read once every three weeks, delaying a battery registration a few hours after power up does not impact the long term automatic battery data collection process.

The Radio Hold Off Timer can be found in the Preferences of the Battery Fleet Management application. It can also be configured per radio within the Radio Information dialog. The Battery Fleet Management application informs the radio of the new Radio Hold Off Timer the next time it registers. The radio utilizes the new Radio Hold Off Timer starting after the next power cycle, which usually occurs the next day.

After CPS configuration, the radio registers within minutes after power up prior to its first successful registration with the Battery Fleet Management application.

2.11.3.3 Performing A Manual Battery Data Read

The automatic over the air battery data collection process should keep the battery data in the Battery Fleet Management application (BMA) up to date, within the duration Battery Data Refresh Timer.

If immediate battery data refresh is needed, the Battery Fleet Management application (BMA) allows the user to request a manual read of a radio and battery.

If the requested radio is not available (turned off, out of range, busy in a call, in a charger, etc.), the BMA marks the radio and battery to be read the next time either registers with the BMA. If the requested radio is available, but the attached battery does not match the requested battery, the BMA reads the attached battery and then marks the requested battery to be read the next time it is registered with the BMA.

NOTE: It is not recommended to perform rapid manual requests. The resulting data transfers may cause disruption to other services.

2.11.3.4 A Radio Utilizing A Battery In A Charger

When a radio is placed in a charger while powered on, its battery data cannot be collected over the air. The radio does not register an IMPRES battery while in the charger. The automatic collection process pauses, and then continues when removed from the charger. A radio does not respond to a manual battery data read request over the air while in a charger.

It is expected that a radio spends at least the duration of the Radio Hold Off Timer powered up and not in a charger per day. If a radio is always in a charger, a wired solution utilizing Charger Interface Unit is the best solution.

If a radio is powered up (i.e. turned on) while already in the charger, it will not recognize the IMPRES battery and registers as a non-IMPRES battery with the Battery Fleet Management application. When the radio is removed from the charger the first time after power up, the radio registers its battery as an IMPRES within the duration of the Radio Hold Off Timer.

2.11.4 Advanced System Deployments

There are generally two types of over the air battery management deployments for the IMPRES Battery Fleet Management application (BMA), those that connect to the radio system through an IP link via the Motorola Network Interface Service (MNIS), and those that connect to the radio system through the over the air link via control stations. It's important to note that the BMA sends IP data messages targeted towards the radios and is agnostic to the underlying radio system architecture.

2.11.4.1 MOTOTRBO Network Interface Service (MNIS) Deployments

The following parameters within the MNIS software must be set:

- Confirmed Layer 2 Data Enabled
- A radio ID that matches the Battery Management Server ID configured in the fielded radios.

The Battery Fleet Management Application itself does not require presence via the Device Discovery and Mobility Service (DDMS), but the MNIS does require DDMS in order to route the data to the appropriate channel and site. The Battery Fleet Management Application and MNIS must reside on the same PC. Radios in the field always send over the air battery management messages confirmed regardless of the radio's configuration.

2.11.4.1.1 Single Site

Over the air battery management is supported through MNIS to single site repeaters. MNIS can connect to 8 single site repeaters at a time. In order for MNIS to perform mobility, DDMS must be installed, and ARS must be enabled in the radios.

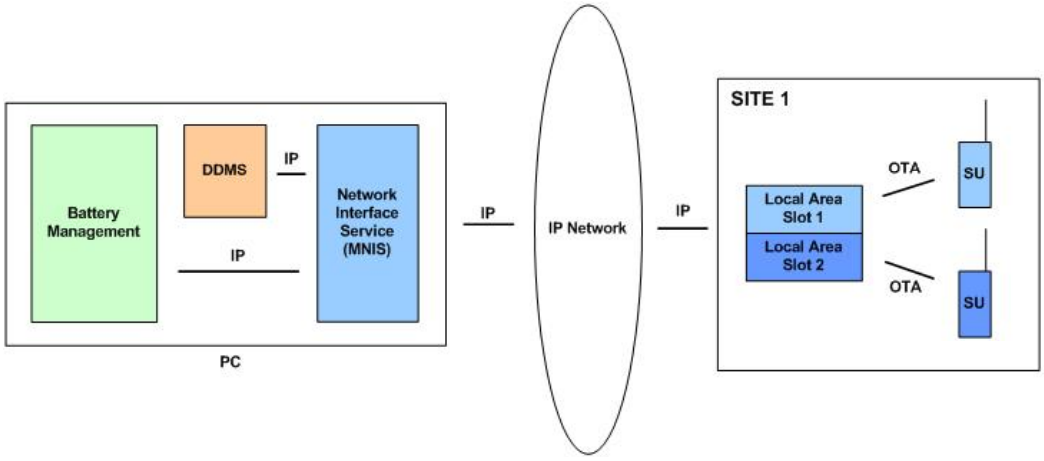

Figure 2-21 BMA Deployment in Single Site with MNIS

2.11.4.1.2 IP Site Connect

Over the air battery management is supported through MNIS to IP Site Connect systems. MNIS can connect to 8 IPSC systems at a time. Each system can have 15 sites. 8 systems can have 16 wide area channels. If utilizing local channels, one MNIS supports 32 wide and local channels overall. In order for MNIS to perform routing, DDMS must be installed, and ARS must be enabled in the radios.