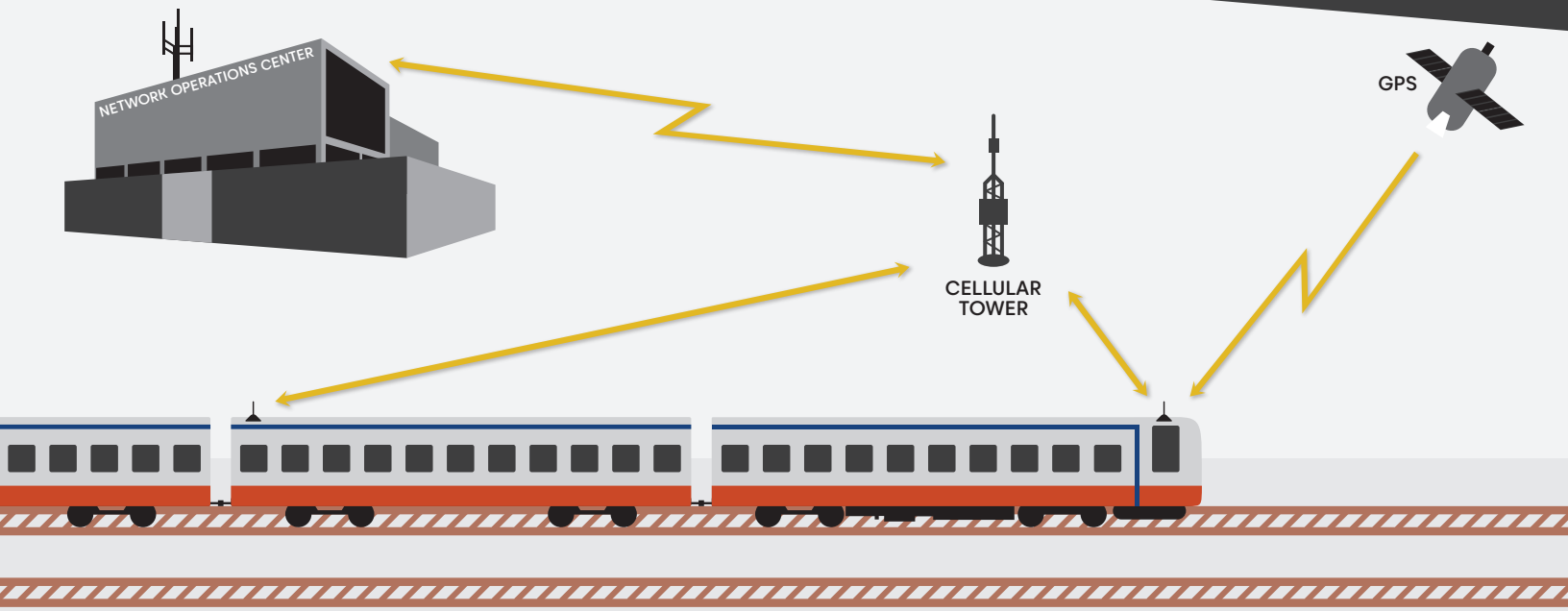

VMS

VEHICLE MANAGEMENT SYSTEM

Vehicle Management System is a flexible solution for non-vital vehicle tracking. The base VMS communicates GPS locations over a cellular network with intelligent health monitoring and remote system upgrade capability thus minimizes the need for physical access to the hardware. Our black box solution for vehicle-to-control center communication can be expanded by Chicago Systems & Signals or any other contractor while also allowing authorities to utilize any Linux-based hardware product. VMS establishes a platform to build upon, customize, and easily integrate into future improvements.

FEATURES

GPS FEATURES

- 1 Second GPS Refresh
- GPS Auto Enabling and Self-verification
- GPRMC verification prior to location transmission
- Transmits Cellular IP Address, Latitude, Longitude, Speed, Compass Heading

COMMUNICATION NETWORK

- Cellular connection established on powering on
- Private APN configurable
- Self-monitoring with connection health checks and automatic recovery.
- Configurable Communication Protocol selection
- Configurable Destination and Port

VISUAL HEALTH STATUS

- LED Indication of Communication Health

REMOTE SYSTEM MAINTENANCE & UPGRADING

- Boot Message reporting current System Version
- Rotating logs of system state and errors for long-term remote troubleshooting
- Support for simplifying mass updates

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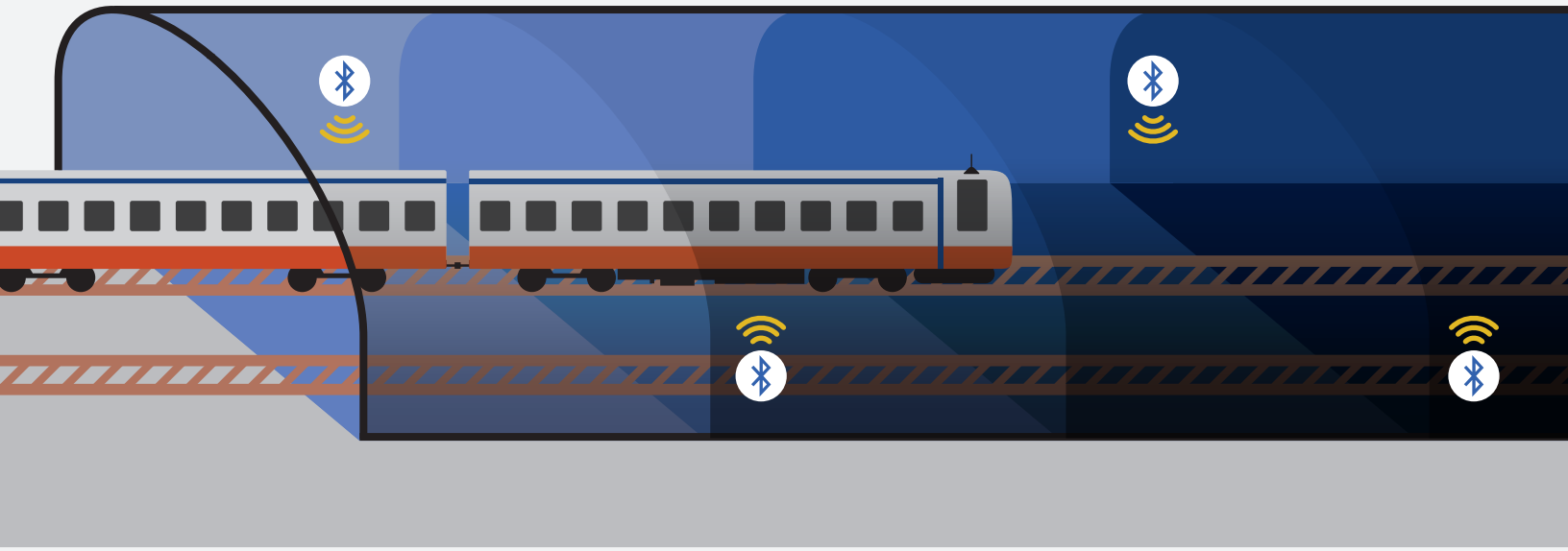
VMS VEHICLE MANAGEMENT SYSTEM



ADDITIONAL FEATURE

BLUETOOTH BEACON TRAIN TRACKING

Bluetooth Beacon Tracking solves the issue of losing satellite GPS monitoring when underground or within any dark territory. This feature allows for Bluetooth beacons to be mapped and vehicle progression movement monitored as the vehicle comes into range of the beacons. The beacon progression tracking can also be leveraged when other dark territory tracking solutions (such as: Automatic Vehicle Identifier (AVI) checkpoint loops and long track circuits) are available but more continuous movement monitoring is preferred.

FEATURES

COMMUNICATION DETAIL

- Communicates Eddystone UID message format
- Limit Bluetooth activity by filtering for low energy devices
- Limit Security Concern by setting to be not discoverable and not pairable
- Beacon Tracking Automatic on/off based on status of the preferred GPS signal
- Message updates based on beacon progression
- Message updates once a second when reporting the same beacon

AUTOMATIC DETECTION OF TURN-BACK

CONFIGURABLE ITEMS

- Table of beacon Instance ID's and their associated GPS location
- Eddystone Namespace
- Turn-back Detection Timeout

VMS VEHICLE MANAGEMENT SYSTEM

ADDITIONAL FEATURE

RECEIVING OFFICE COMMUNICATION

Support for two-way communication by receiving office information and commands via the cellular connection. VMS can use the office information to make automatic adjustments to correct the GPS location of the operational head of the multi-vehicle consist. VMS will automatically detect vehicle turn-backs based on heading to correctly offset the GPS to the front or back until the next office message is received.
Added remote maintenance features and support of various audible alert tones via an optional add-on direct serial wired speaker.

FEATURES

COMMUNICATION DETAIL

- Message to initiate various configurable audible tones including the tone type, repeat count and delay pause.
- Message to provide vehicle specific information on the antenna offset from to the front and rear of a multi-vehicle paired consist based off of its current heading.
- Message to support maintenance features for rebooting and upgrading.

AUTOMATIC DETECTION OF TURN-BACK

CONFIGURABLE ITEMS

- Enable/Disable Two-way communication
- UDP port for communication
- Enable/Disable Antenna Offset support
- Vehicle information timeout value
- Enable/Disable Audible alert support
- Serial port for audio tone

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