

# DYNAMIC<sup>®</sup> CV

CYBER-SECURE CONNECTED VEHICLE OPERATIONS AT THE INTERSECTION



## OVERVIEW

Dynamic CV is the connected vehicle (CV) module of Q-Free's cybersecurity-first Dynamic software, bringing secure CV operations to the intersection through encrypted and authenticated communications.

Dynamic CV executes complex connected vehicle application processing directly on the controller using an encrypted API, rather than via third-party software using insecure protocols, simplifying deployment. The software supports vendor-agnostic roadside units (RSU) through the RSU 4.1 header.

Designed to align with modern IT and infrastructure secure expectations, Dynamic CV supports advanced safety and mobility applications without reliance on a central system—while helping protect critical infrastructure against evolving cyber threats.

Applications include:

- Preempt/priority for emergency and transit vehicles
- Dilemma zone detection
- Red light runner detection
- Advanced pedestrian and bicycle service
- Suggested vehicle speed

## BENEFITS

- Securely exchange real-time signal and connected vehicle data
- Built-in encryption and authentication eliminating vulnerabilities tied to legacy protocols
- Real-time data processing with <100 ms latency
- Broadcast key signal data: SPaT, MAP, SSM, TIM
- Ingest key CV data: SRM, BSM, PSM
- Seamlessly upgrade software remotely or onsite without putting signals into flash
- Centralized user management with federated authentication
- Compatible with DSRC, CV2X, and cellular LTE communications
- Runs directly on ATC controllers — no additional hardware required



Meaningful  
cybersecurity



Encrypted and  
authenticated

## CONNECTED VEHICLES DATA & COMMUNICATIONS

### BROADCAST SIGNAL DATA

Transmit real-time intersection data to connected vehicles:

- Signal phase and timing (SPaT)
- Intersection geometry (MAP)
- Signal status messages (SSM)
- Traveler information messages (TIM)
- Time-to-green/red and suggested speed

### INGEST CONNECTED VEHICLE DATA

Set to receive and process real-time data, if desired:

- Signal request messages (SRM)
- Basic safety messages (BSM)
- Personal safety messages (PSM)
- Vehicle location, type, and intent

### COMMUNICATIONS

Dynamic CV uses industry-standard protocols:

- Communicates via a secure API to support NTCIP 1201, 1202, and 1211 functionality
- SNMP disabled by default but can be enabled for NTCIP compliance
- Creates, broadcasts, and ingests SAE J2735 messages
- Supports DSRC, CV2X, and cellular LTE communications
- Integrates with Q-Free's Kinetic Mobility for centralized authentication and user federation

## INTERSECTIONS OPERATIONS & DEPLOYMENT

### ADVANCED APPLICATIONS

Enable a wide range of safety and mobility applications directly at the intersection:

- Emergency vehicle preemption
- Transit signal priority (TSP)
- Freight priority
- Red light runner detection
- Dilemma zone protection
- Advanced pedestrian and bicycle service
- Queue and congestion response
- Suggested speed harmonization

These applications enhance safety, reduce delays, and support more efficient, sustainable transportation networks

### COMPATIBILITY

Build on a Linux-based ATC architecture and open standards, Dynamic CV runs directly on the controller—eliminating the need to additional edge hardware.

- Supports ATC 5.2b or later controllers
- Runs directly on ATC controllers through software activation—no additional hardware needed
- Simplifies deployment and reduces overall system cost

## SECURITY-FIRST APPROACH

Legacy systems rely on unencrypted communications, leaving critical infrastructure at risk.

Dynamic CV changes that—bringing added security to the core of connected vehicle operations.



### End-to-End Encryption

Secure communications using modern protocols (HTTPS, secure web sockets), replacing legacy SNMP-based approaches.



### Secure Remote Access

Web-based interface with encrypted access eliminates security risks tied to traditional remote logins.



### Access Control & User Management

Centralized authentication and user federation with Kinetic Mobility.