PINNACLE ACTUARIAL RESOURCES, INC. *The Firm of Choice*

evogi Evolving Intelligent Insurance

# Overcoming the Challenges of Implementing an Effective Usage Based Insurance Program

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# Introduction

# Defining Telematics

- Telematics – The combination of telecommunications and computing. Data communications between systems and devices.

- As used in auto insurance, telematics based products relate to offerings by companies that utilize an onboard electronic device that captures information and relays it to the company for purposes of applying the product, be it pricing or other product related services.

# Types of Telematics Data

- **Usage:** Measures of vehicle usage – typically mileage.
- **Behavior:** Measures of vehicle behavior on the road – when, where and how a vehicle is driven.
- **Geospatial:** Measures of conditions of and surrounding the vehicle.

# Strategy

# Assessing the Strategic Options

- Time to Market
  - Innovator
  - Peer
  - Follower
- Utilization of Telematics
  - Risk segmentation
  - Internal tool
  - Value-added services

# The Innovators

- Risk Segmentation
  - Telematics Based Mileage Discount Programs




  - Beyond Mileage Discount



# The Innovators

- Value-Added Services




# The Innovators – Waiting in the Weeds









# Considerations

# Regulatory Environment

## Gaining Traction

- Progressive has implemented successfully in 39 states
- State Farm and Allstate both gained approval to implement in Illinois

## Battles Ahead

- California – State Farm and Automobile Club of Southern California succeeded only in capturing mileage information through telematics devices
- Location remains an issue

# Legal – Progressive Patents

Progressive Insurance is the owner of the following patents:

- USP 6,064,970 – “Motor vehicle monitoring system for determining a cost of insurance”
- USP 7,124,088 - “Apparatus for internet on-line insurance policy service”
- USP 7,877,269 - “Method and apparatus for internet on-line insurance policy service”

# Legal – Patent Litigation

Progressive Casualty Ins. Co. v. Safeco, et al., Civil Action No. 1:10-cv-1370 (ND Ohio).

- Filed on June 18, 2010
- Asserts that Safeco and Liberty Mutual infringe USP 6,094,970
- Proceeding stayed pending reexamination of the „970 patent on Nov. 12, 2010

Progressive Casualty Ins. Co. v. Allstate, et. al., Civil Action No. 1:11-cv-82 (ND Ohio).

- Filed on January 12, 2011
- Asserts that all defendants infringe USP 7,124,088 and 7,877,269
- Asserts that Allstate infringes USP 6,064,970
- Proceeding stayed regarding the „970 patent on June 28, 2011
- Proceeding stayed regarding the „088 and „269 patents on August 2, 2011

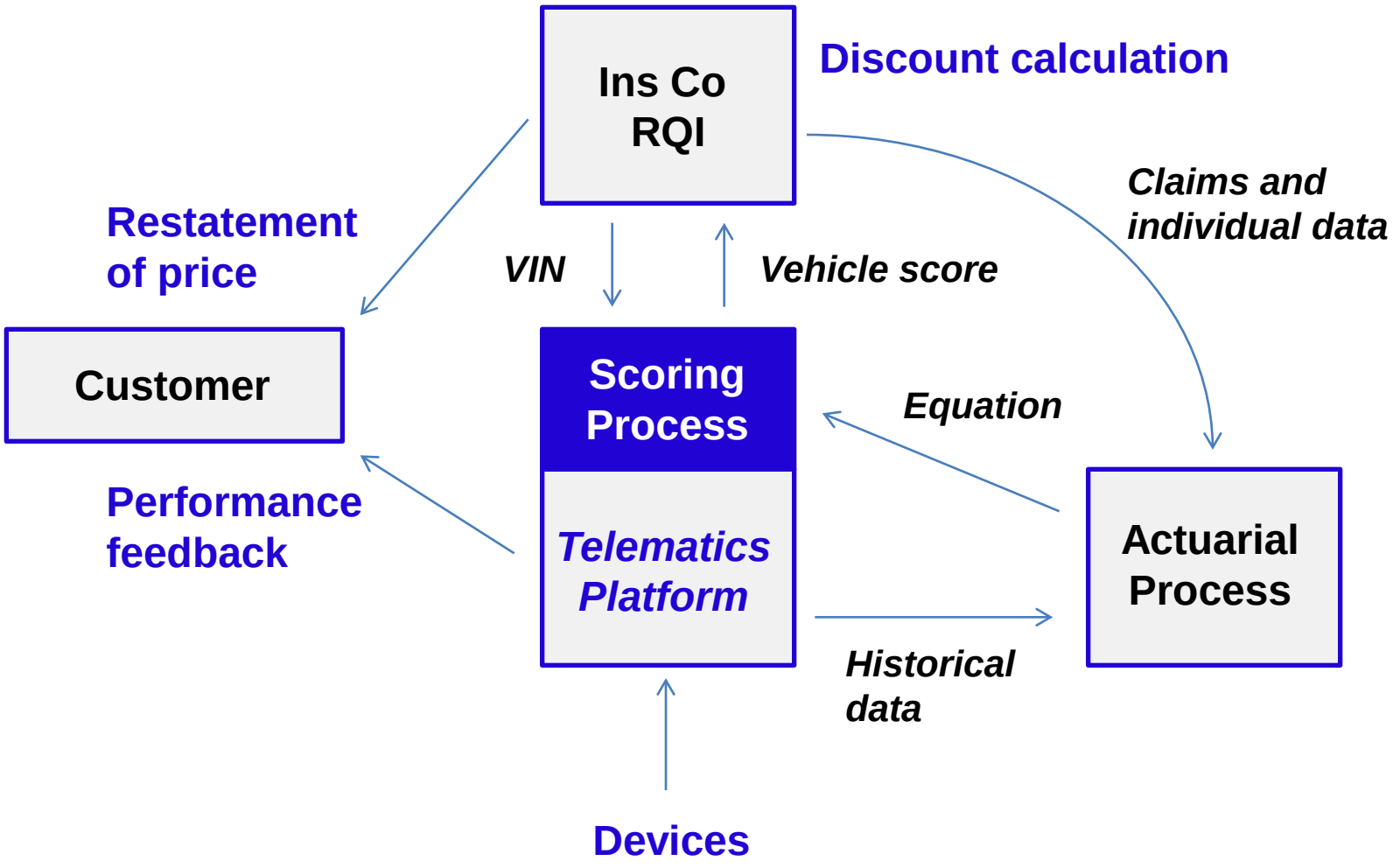
# Implementation

| | Usage Based Insurance (UBI) | Behavior Based Insurance (BBI) | Geospatial Insurance |
|---|---|---|---|
| **Time to market** | 9 – 12 months | 3 – 5 years | 5 – 7 years |
| **Cost** | lowest | moderate | highest |
| **Pricing accuracy** | good | better | best |
| **Pricing adequacy** | good | better | best |
| **LLAE reduction** | good | better | best |
| **Leakage reduction** | good | better | best |
| **Probability of IP lawsuit** | low | high | high |
| **Driver performance improvement potential** | low | medium | high |
| **System complexity systems** | low | medium | high |
| **Implementation complexity** | low | medium | high |

***Results vary based on insurance company capability, business processing systems capability, state filing requirements, and depth of implementation***

# Data and Analytics

# Navigating the Telematic Maze



# Data Needs

- Basic Usage Data
  - Miles Driven
- Behavioral Data
  - Time of Day
  - Acceleration/deceleration
  - Speed
  - Location*
- Geospatial Data
  - Operating State of Vehicle
  - Weather
  - Road Type
  - Traffic

# Data – Current Implementations

- Progressive
  - Time of Day
  - Vehicle Speed
  - Device Connect
  - Disconnect Time
- Allstate
  - Time of Day
  - Mileage
  - Hard Braking
  - Rapid Acceleration
  - Speed
- State Farm
  - Miles Driven
  - Acceleration
  - Braking
  - Turns (Right/Left)
  - Time of Day
  - Speeds 80+ mph

# Data – Common Theme

- Time of Day
- Mileage
- Speed
- Acceleration/Deceleration

# Data – Sources

- Company Employees
  - Employees
  - Extended Network
- Policyholders
- Data Pooling Arrangements

# Data and Analytics

- Data Volume
  - Over a thirty day period, a single vehicle may produce
    - An average of 80 trips
    - Over 50,000 distinct records

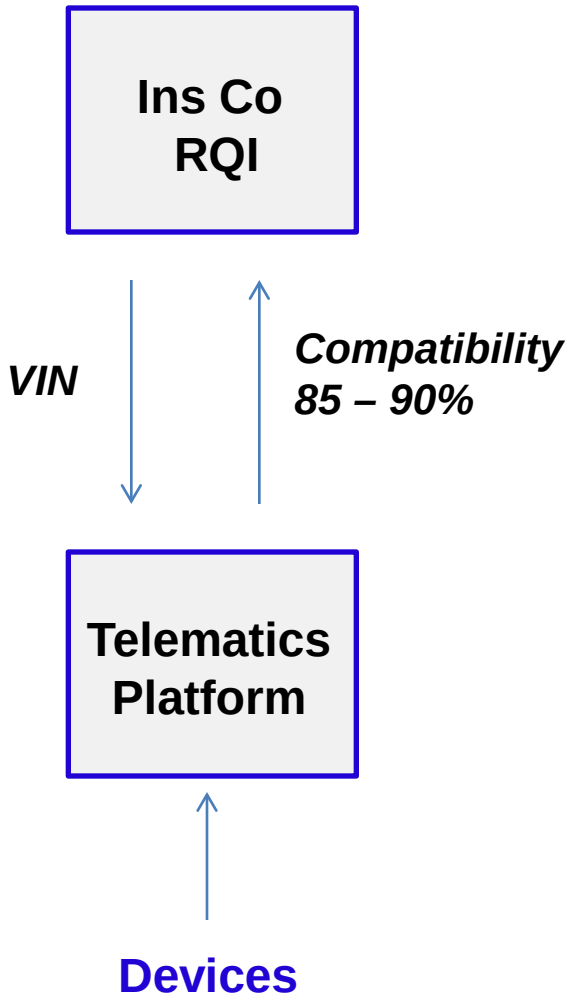
- When comparing behavior between vehicles
  - Variability in
    - Number of trips taken
    - Time on the road
    - Miles driven
    - …

# Data and Analytics

- Types of summarization
  - Cumulation
    - 31.6 hours
    - 924.5 miles driven
    - 172 trips
  - Statistics
    - 29.3 miles per hour
    - 11.0 minutes per trip
    - 5.4 miles per trip
  - Flags/Percentages
    - 20.88% time over 45 mph
    - No incidents over 80 mph

# Technology

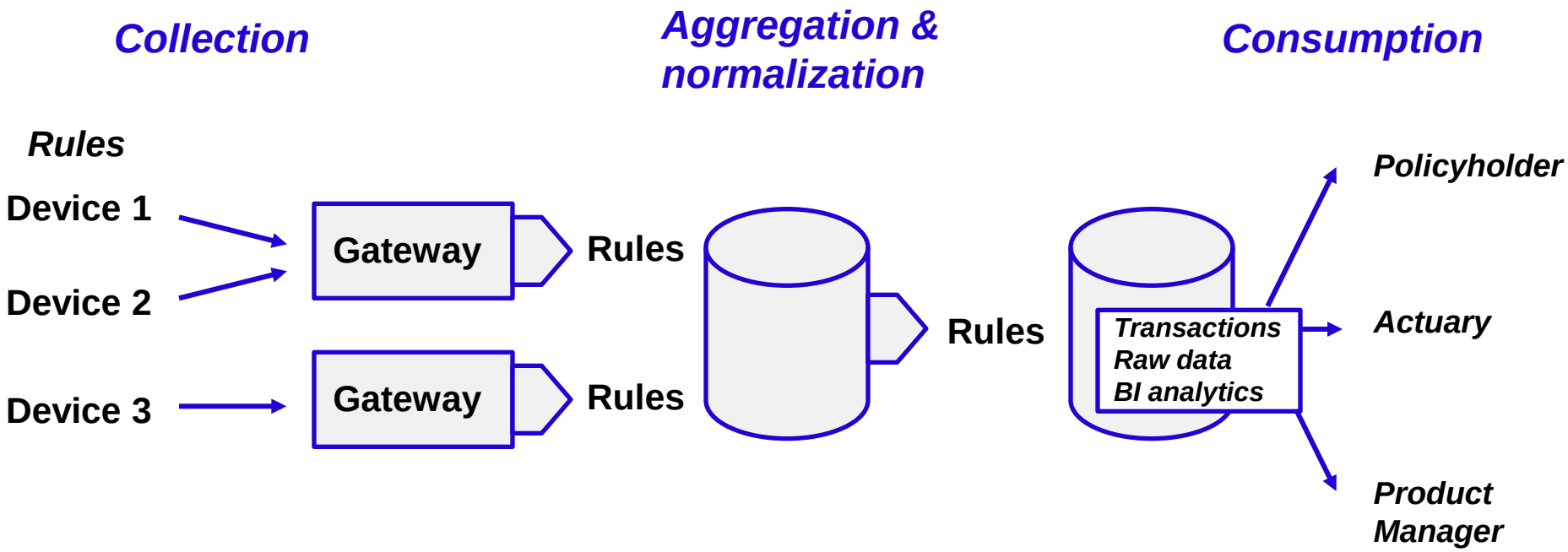
# Quoting – Getting Devices in Cars




***Topography***

- 1996 or newer
- Special issues, i.e., hybrids
- 9 different OBDII protocols
  - data element support, e.g., VIN verify
- Device compatibility with product
  - real-time support, e.g., teen tracking
  - swerving and cornering , e.g., BBI

# Telematics Platform



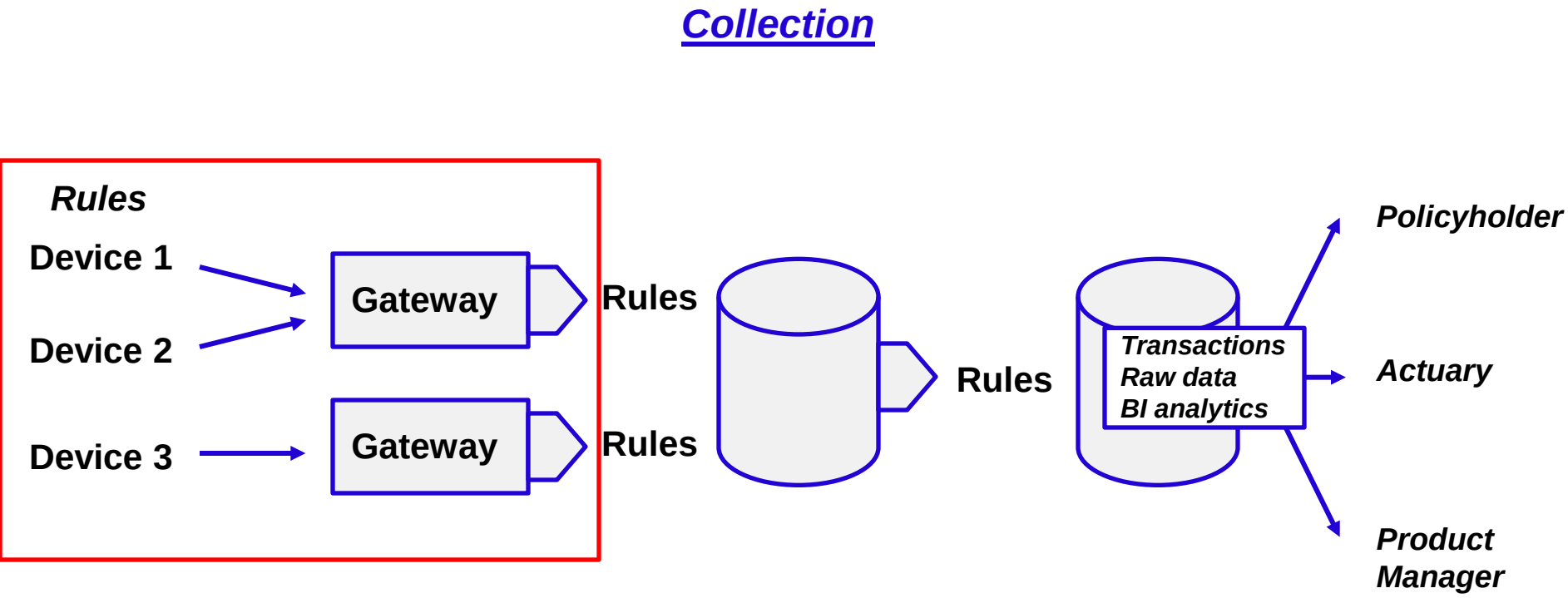

**Business Objectives**

- Operational reports: QOS, functioning, etc.
- Product segment and pricing analysis
- DOI filing support
- Policyholder alerts and reports

**Process Objectives**

- Stable: without frequent failure
- Reliable: same result with same event
- Flexible
- Useful: right data
- Right cost: affordable

# Data Collection



# Data – Hard Braking

**How do you recognize a hard brake?**

***Device 1***

a. Source: GPS speed sampled at 10 Hz
b. Source: OBDII speed sampled at 1 Hz

***Device 2***

Accelerometer sampled at 200 Hz (equation running on the device; velocity vector needs to be normalized)

***One or more event triggers on device***

***Device 3***

Raw data transferred from GPS /OBD/Accelerometer to gateway and rules engine decides

***Granular braking data***

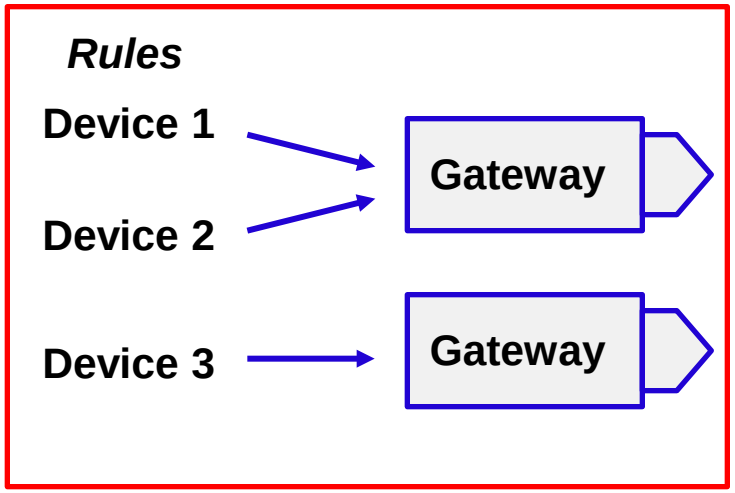
# Data – Hard Braking

**What is a hard brake?**

| Calculated change in speed | Measured force | Probable event |
|---|---|---|
| - 88 mph per second | 4g | likely accident |
| - 11 mph per second | .5g | very hard brake |
| - 7 mph per second | .32g | hard brake |

**70 – 63 mph in 1 second is a hard brake**

# Data Collection Summary




**Description of Activity**

**Inputs and outputs**

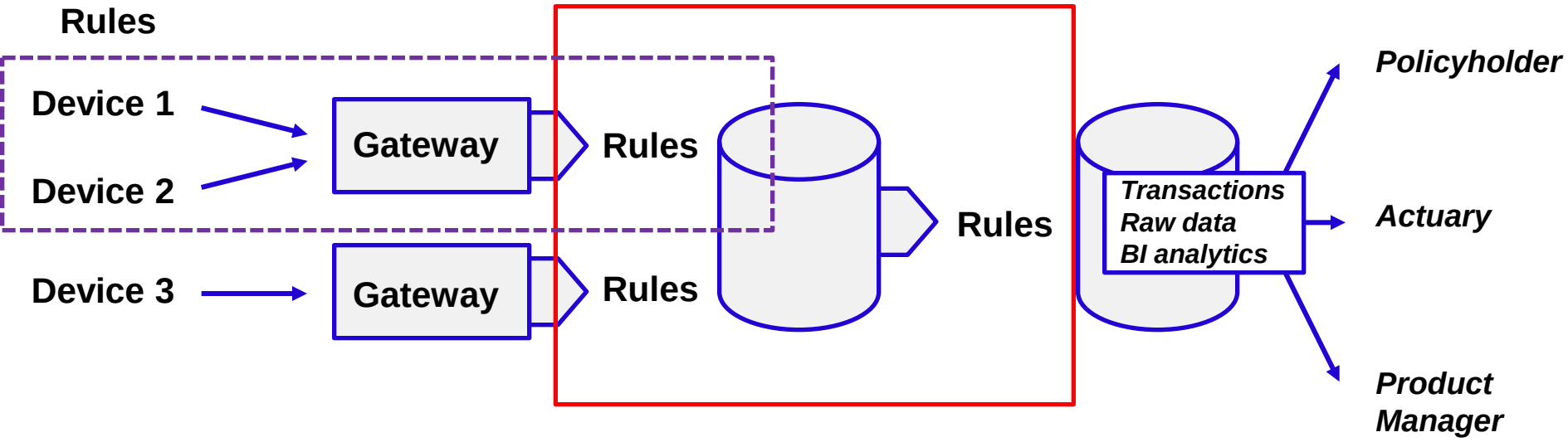
- Device differences
- Install orientation
- Acceleration equation (X, Y, Z axis)
  - Braking example

**Key Concepts**

- Acceleration and force
- Sampling versus transmission
- Accelerometer
- Threshold (events under threshold not recorded)
- Car protocols
- Device Car matchup
- TCP/IP v UDP transmission and timing

# Data Aggregation & Normalization

***Aggregation & normalization***



# Data – Hard Braking

**Does the quality of my braking data vary?**

| | | |
|---|---|---|
| ***Device 1*** | a. Source: GPS<br>b. Source: OBDII | HDOP .7 excellent<br>8 flag as suspect<br>20 discard |
| ***Device 2*** | Accelerometer | Velocity vector accuracy:<br>± 5% for 90% of vehicles<br>± 20% for remaining |
| ***Device 3*** | Raw data transfer | Both above |

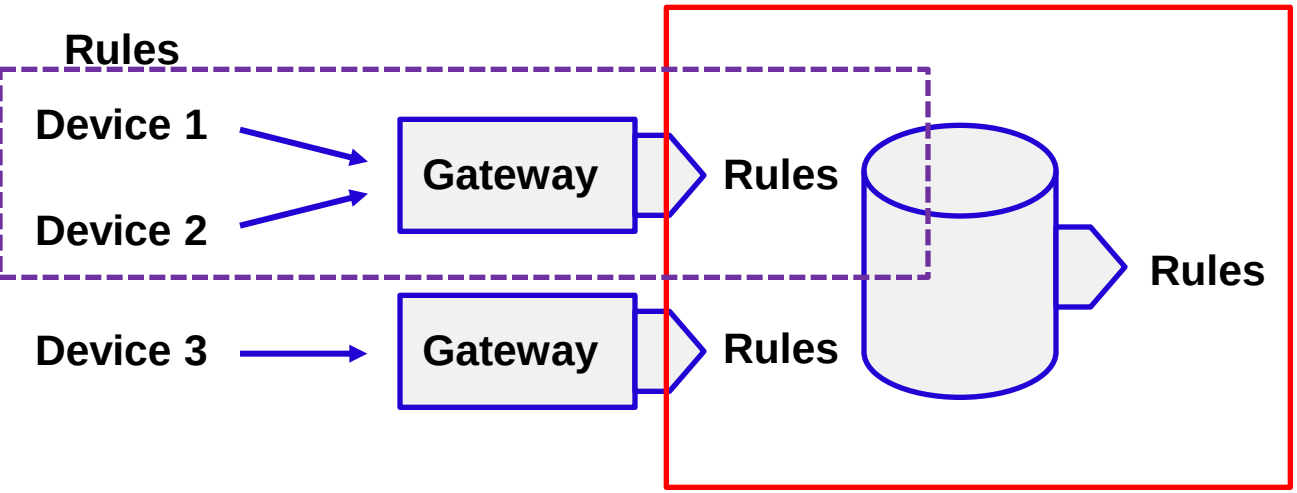
*Also for all*…device self check

# Data – Hard Braking

**What are typical process quality measures?**

- HDOP – horizontal dilution of precision
- Signal strength - number of satellites fixed
  - o Higher the number the greater the quality
  - o Minimal 3
  - o No upper limit
- Device self-check – issues during sampling
  - o High temp, humidity, vibration

# Data Aggregation & Normalization Summary




**Description of Activity**

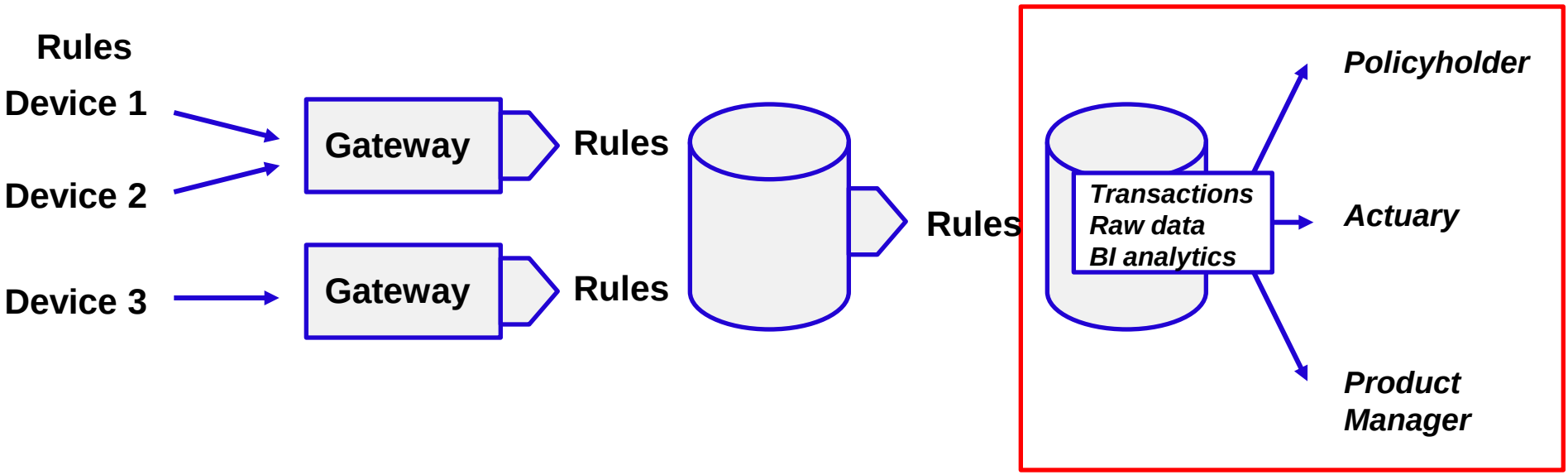
**Inputs and outputs**

- QOS
- Compensation/normalization among devices
  - Braking example

**Key Concepts**

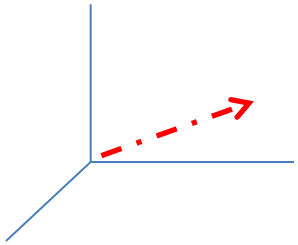
- Real-time requirement of data transmission
- HDOP
- Rules - aggregation
- Rules - normalization

# Data Consumption



# Data – Hard Braking

**What problem are we trying to solve?** ***Customer Alert***

| | |
|---|---|
| ***Device 1: GPS or OBDII*** | Simple calculation - threshold exceeded<br>Stored on device<br>Event may or may not be real-time<br>• Real-time versus memory page transactions |
| ***Device 2: Accelerometer***<br>  | Complex calculation - threshold exceeded<br>Stored on device<br>Device variances create differences in results<br>• Accelerometer vendor<br>• Complex calculation to normalize velocity vector<br>• Complex calculation to measure event<br>Event may or may not be real-time<br>• Real-time versus memory page transactions |
| ***Device 3: Raw Data*** | Three options: GPS, OBDII or Accelerometer data<br>Stream of data stored, not real-time<br>Calculation on host |

# Data – Hard Braking

**Who needs the data and for what? And, what are the business rules?**

| | |
|---|---|
| BBI product element | Number of hard brakes per trip (incidents relative to thresholds)<br>*Example* - 5 hard brakes, 2 very hard brakes, 0 possible accidents |
| Claims FNOL feature | Extreme hard brake event with time stamp and latitude & longitude |
| Actuarial analysis | Second-by-second data with hard brake with time stamp and latitude longitude AND added road type, weather, school zone, posted speed limit, actual speed limit for every brake event |

Device design and rules dictates the type and amount of data collected. A brake event support different needs depending upon set-up.

# Data Consumption Summary

**Description of Activity**

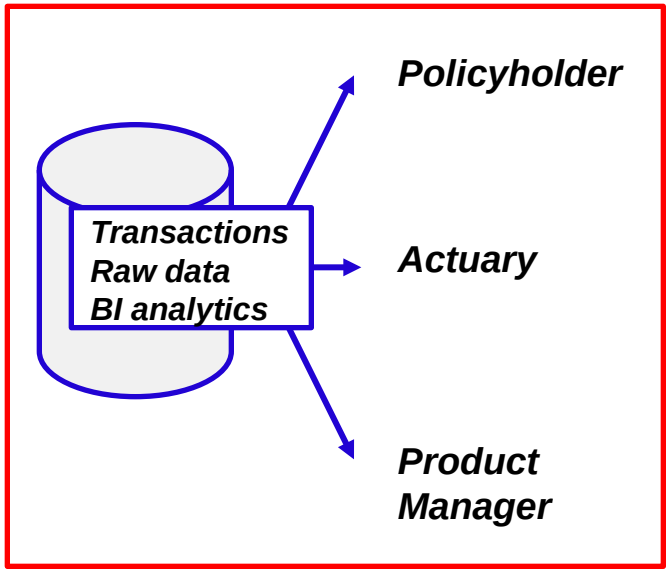
Policyholder: real time alerts, driving reports
Actuary: accumulated data
Product Manager: business performance, QOS

**Inputs and outputs**

Device differences
Braking example

**Key Concepts**

Data structure
Sampling versus transmitting
Real-time versus analytical



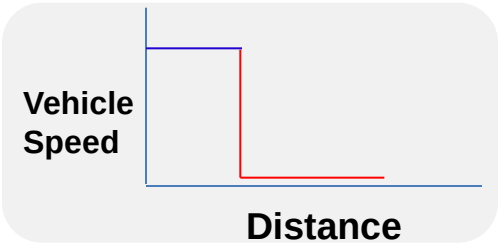
# Data – Hard Braking

***A simple case…***

Facts: a vehicle approaches an intersection at 55 mph. on a rainy day. The driver sees crossing vehicle and locks brakes. Car slides 40 feet and hits obstructing car.

Is the data used for calculating hard brake correct?

| | |
|---|---|
| GPS | Braking event identified |
| OBDII | Wheels locked, speed zero |
| Accelerometer | Braking event identified |


# Appendix – Device Considerations

# Evogi EVG3000
# OBD II Dongle Device

## Specifications and Features

### Key Functionality

**Available sources of OBD data***
Vehicle ID (VIN)
Current odometer reading
Current speed
Engine RPMs
Battery voltage
Engine coolant temperature
Accelerator pedal position
Brake pedal position
Various Diagnostic Trouble Codes (DTCs) with filtering capability
Malfunction Indicator Lamp (MIL) codes

**Possible Future (optional) sources of OBDII Data***
Integration with vehicle's OEM security system
Integration with vehicle's OEM keyless entry and remote start functions
Tire pressure
Oil life
Airbag status
Seatbelt indication
Fuel level
***Subject to vehicle and device compatibility***
***Vehicle must support OBDII and supported protocols, and provide specified data from the vehicles CANbus when polled by the device.***

**Accelerometer**
The device may be configured to generate inertial wake-up/free-fall interrupt signals when a programmable acceleration threshold is crossed at least in one of the three axis. Thresholds are programmable Over-The-Air and may be set between 2g and 8g.

**Programmable Event Triggers based on Accelerometer**
Acceleration / Deceleration based on MEMS data
Cornering
Impact detection based on MEMS data (not to be used as true 'crash detection')
Pre and Post "impact detection" log of all available vehicle and device data based on MEMS Data (configurable time pre and post impact sense)

**Standard Firmware Functions**
Programmable event processing
Remote device management
Over the Air firmware and configuration update support for both Application and OBD processors
UDP and SMS communication support
Internal logging of up to 10,000 events
Automatic detection and configuration of OBD-II port
Ignition Sense

**OBDII Event reporting capabilities***
Vehicle ID (VIN)
Current odometer reading
Current speed
Engine RPMs
Battery voltage
Engine coolant temperature
Accelerator pedal position
Brake pedal position
Various Diagnostic Trouble Codes (DTCs) with filtering capability

# Evogi EVG3000 OBD II Dongle Device

***Functinality cont'd***

**Programmable Event Triggers, based on GPS data**
Location, Speed, Heading, Time of day
Acceleration / Deceleration based on GPS data
Virtual Odometer
Trip Information:
Engine IDLE, Distance, Duration
Trip Duration between multiple speed settings
Trip Distance traveled at selected speed settings
Tow mode
Direction Change
High Speed

**Programmable Event Triggers, based on OBD data.***
High/Low limit threshold
Engine running status
Acceleration / Deceleration based on Speed from vehicle sensor
Trip Information:
Engine IDLE, Distance, based on vehicle sensors
Trip Duration above multiple speed and RPM thresholds
Trip Distance above selected speed and RPM thresholds
High Speed from vehicle sensor

**Possible Future (optional) reporting capabilities, based on OBD data***
Integration with vehicle's OEM security system
Integration with vehicle's OEM keyless entry and remote start functions
Tire pressure
Oil life
Airbag status
Seatbelt indication
Fuel level
Average MPG
Acceleration / Deceleration based on OBD data from in-vehicle sensors
Additional custom codes
Simplified route trace logging – up to 100,000 points

## Standard Hardware Features

**General Specifications**
Communications Modes GPRS packet data and SMS
Location Technology 50 Channel GPS
Internal antennas for Cellular and GPS antennas
Operating Temperature -30°C to +75°C
Mounting: J1962 OBDII port connector

**Electrical Specifications**
Operating Voltage
9 ~ 18 startup range
7 ~ 20V running range
Source: 12V battery line on OBDII connector
Power Consumption
3mA deep sleep, GPS off, OBD dormant (with wake up OBD activity)
10mA in idle standby with SMS messaging available, GPS off, OBD dormant
20mA in idle standby with GPRS messaging available, GPS off, OBD dormant
150mA active tracking, GSM on, GPS on, OBD active

**Location Specifications**
Internal GPS receiver module (uBlox NEO-6x)
50 Channel GPS (with SBAS, DGPS)
Accuracy 2.0 meters CEP (with SBAS)
Tracking Sensitivity -160dBm

**GSM Specifications**
Data Support: SMS, GPRS (UDP)
Cellular: FCC-Parts22,24, PTCRB
GPRS: up to Class 10
Quad Band (850/900/1800/1900 MHz
Output Power:
850 (class 4) 2 W
900 (Class 4) 2W
1800 (Class 1) 1W
1900 (Class 1) 1W

# Evogi EVG3000 OBD II Dongle Device

***Hardware Features, cont'd***

**I/O**

1 Serial Interface (5 Pin)
4MB serial FLASH memory for storage of event log data
Store up to 10,000 events
Simplified route trace logging up to 100,000 points
Processors
Separate STM32 processor for application processing
Separate ARM-class processor for OBD-II interface control
Accelerometer
MEMS motion sensor and 3 Axis Accelerometer
± 2g/± 8g dynamically selectable full-scale
Capable of measuring accelerations with an output data rate of 100 Hz or 400 Hz
Extended Operating temperature range from -40°C to +85°C
+10000g high shock survivability

**Status LED's**

COMM = Orange
GPS = Green
OBD = Red

**OBD-II Protocol Support**

J1850 PWM
J1850 VPW
ISO-9141-2
ISO-14230 KPW2000
ISO-15765 CAN

**Mechanicals**

Dimensions: 1.8in x 1.5in x 1.0in
Weight: 90 Grams

**Certifications:**

Fully certified (FCC/IC/CE, PTCRB, AT&T and T-Mobile)

# Evogi EVG3000 OBD II Dongle Device

## Data Sampling Rates

| Data Sampling Rates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Data type | Firmware Conditions | Vehicle Data Port | GPS Chipset | Accelerometer | Message Storage capacity | Utica National Requirement | Meets Specification | Exceeds Specification |
| GPS Data | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Timestamp | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Latitude | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Longitude | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Heading | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Speed (from GPS) | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Acceleration (from GPS Speed) | 50 ms | N/A | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| Braking (from GPS Speed) | 50 ms | N/A | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| GPS Positional Quality (HDOP) | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| GPS Quality (number of Satellites used to obtain fix) | 50 ms | N/A | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Virtual Odometer (Calculated from GPS) | 50 ms | N/A | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| IDLE (Calculated from GPS Speed) | 50 ms | N/A | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| Vehicle Data Port: OBDII Data | 50 ms | 50 ms | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| Speed from Vehicle Speed Sensor (VSS) | 50 ms | 50 ms | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| Acceleration (Calculated from VSS) | 50 ms | 50 ms | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Braking (Calculated from VSS) | 50 ms | 50 ms | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Cornering (Calculated from VSS) | 50 ms | 50 ms | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Swerving (Speed from VSS) | 50 ms | 50 ms | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Impact (Speed from VSS) | 50 ms | 50 ms | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| Vehicle RPM | 50 ms | 50 ms | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| VIN | 50 ms | 50 ms | 200 ms | 50 ms | 10,000 | GPS data gathered per second | Yes | √ |
| MIL | 50 ms | 50 ms | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| Fuel | 50 ms | 50 ms | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |
| Odometer (vehicle) | 50 ms | 50 ms | 200 ms | N/A | 10,000 | GPS data gathered per second | Yes | √ |

# Evogi EVG3000 OBD II Dongle Device

## Data Transfer Rates

| *Device Data Transfer Rate* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Device** | **Modem Class** | **Uplink Speed** | **Downlink Speed** | **Timeout** | **Wireless Network Latency range** | **Utica National Requirement** | **Meets Specification** | **Exceeds Specification** |
| EVG3000 Dongle 32Bit | GPRS Class 10 | 43kbs | 56kbs | 15 Seconds | >1 Second, ≥8 Seconds | Not Specified | Yes | √ |
| EVG3000 Dongle with OBDII support 32Bit | GPRS Class 10 | 43kbs | 56kbs | 15 Seconds | >1 Second, ≥8 Seconds | Not Specified | Yes | √ |
| EVG500 Dongle 8Bit | GPRS Class 10 | 43kbs | 18kbs | 15 Seconds | >1 Second, ≥8 Seconds | Not Specified | Yes | √ |
| EVG2600 Blackbox 32Bit | GPRS Class 10 | 43kbs | 18kbs | 15 Seconds | >1 Second, ≥8 Seconds | Not Specified | Yes | √ |
| EVG4200 Blackbox 32Bit with Jbus interface | GPRS Class 12 | 43kbs | 18kbs | 15 Seconds | >1 Second, ≥8 Seconds | Not Specified | Yes | √ |

- **Device Certifications**
  Fully certified (FCC/IC/CE, PTCRB, AT&T and T-Mobile)
- **Data transmission components (GPRS, GSM, SMS, USB, etc.)**
  The EVG3000 supports GSM/GPRS & SMS data transmission, and is compliant with parts 22 and 24 of the FCC Rules.
  The EVG3000 offers quad-band (850/900/1800/1900 MHz) capabilities to support networks worldwide.
- **Certification of device by wireless carriers**
  The Evogi devices and system supports GSM/GPRS & SMS data transmission, and is compliant with part 15 of the FCC Rules.
  Certified for use on AT&T and T-Mobile networks.

# Evogi EVG3000 OBD II Dongle Device

## Application Reporting

| Application Reporting | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Driver Feedback** | **Map View** | **Historical View** | **Alert Notification** | **Geofence** | **Administration** | **Utica National Requirement** | **Meets Specification** | **Exceeds Specification** |
| Trip Data | Locations | √ | E-Mail | Range | Behavior | Not Specified | Yes | √ |
| Fuel Consumption | N/A | √ | E-Mail | N/A | Behavior | Not Specified | Yes | √ |
| Trip Start Timestamp | Local Time Zone 12hr | √ | N/A | N/A | Behavior | Not Specified | Yes | √ |
| Trip End Timestamp | Local Time Zone 12hr | √ | N/A | N/A | Behavior | Not Specified | Yes | √ |
| VIN | Popup | √ | E-Mail | N/A | Exception | Not Specified | Yes | √ |
| Malfunction Indicator Lamp (MIL) Status | Popup | √ | E-Mail | N/A | Behavior & Exception | Not Specified | Yes | √ |
| Distance traveled during trip | Popup | √ | E-Mail | Range | Behavior | Not Specified | Yes | √ |
| Average Speed | Popup | √ | N/A | N/A | Behavior | Not Specified | Yes | √ |
| Maximum Speed | Popup | √ | E-Mail | Speed Zone | Behavior | Not Specified | Yes | √ |
| Trip Positional Quality | Exception | √ | N/A | N/A | Exception | Not Specified | Yes | √ |

# Evogi EVG3000 OBD II Dongle Device

## Conditional Reporting

| Conditional Reporting | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Event** | **Message type** | **CANbus** | **Data** | **Calculation Speed** | **Message Frequency** | **Utica National Requirement** | **Meets Specification** | **Exceeds Specification** |
| Trip Data | Event | Polled | Reported | 50 ms | on condition | Not Specified | Yes | √ |
| Fuel Consumption | Event | Polled | Accumulated | 50 ms | on condition | Not Specified | Yes | √ |
| Trip Start Timestamp | Event | N/A | Reported | 50 ms | on condition | Not Specified | Yes | √ |
| Trip End Timestamp | Event | N/A | Reported | 50 ms | on condition | Not Specified | Yes | √ |
| VIN | Event | Polled | Reported | 50 ms | on condition | Not Specified | Yes | √ |
| Malfunction Indicator Lamp (MIL) Status | Event | Polled | Reported | 50 ms | on condition | Not Specified | Yes | √ |
| Distance traveled during trip | Event | Polled | Accumulated | 50 ms | on condition | Not Specified | Yes | √ |
| Average Speed | Event | Polled | Accumulated | 50 ms | on condition | Not Specified | Yes | √ |
| Maximum Speed | Event | Polled | Accumulated | 50 ms | on condition | Not Specified | Yes | √ |
| Trip Positional Quality | Event | N/A | Reported | 50 ms | on condition | Not Specified | Yes | √ |

# Evogi EVG3000 OBD II Dongle Device

## Wireless Reporting

| Wireless Network Connectivity (device message types) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Device Message | Preferred Message Type | Configurable | 1 Second | 30 Seconds | 60 Seconds | Once per Trip | Utica National Requirement | Meets Specification | Exceeds Specification |
| GPS Data accumulated per second | Long | √ | Long | Long | Long | N/A | GPS Data gathered per second | Yes | √ |
| Trip Data (Calculated) | Long | √ | Long | Long | Long | Long | Evogi Proposed, Not Specified | Yes | √ |
| Trip Data (Accumulated) basic | Short | √ | Short | Short | N/A | N/A | Trip Data Gathered Per Second | Yes | √ |
| Trip Data (Accumulated) advanced | Long | √ | Long | Long | Long | Long | Trip Data Gathered Per Second | Yes | √ |
| Conditional Event Data reported per occurrence | Short | √ | Short | Short | Short | Short | Evogi Proposed, Not Specified | Yes | √ |
| Electronic Data Recording | Long | √ | Long | Long | Long | N/A | Evogi Proposed, Not Specified | Yes | √ |

**Message Types**

Evogi supports 2 standard message types which vary in length, and are annotated by “Long” and “Short”.
The minimum message size is 55bytes, and the maximum message size is 865 bytes.
The short message type supports a min of 55 bytes up to a maximum 108bytes.
The long message type supports a minimum of 108 bytes up to a maximum of 865 bytes.
The Short message contains basic, yet substantial, information related to GPS positional quality while the long message type contains additional information related to GPS positional quality.
The two message types may be configured simultaneously on a device to report different data sets at variable frequencies.

**Firmware remotely updatable**

The Evogi Group has standardized on firmware transmission upgrades over potentially expensive hardware replacements. The firmware upgrades and modifications can be transmitted on an as-needed basis for firmware updates. Additionally, reporting parameter settings may also be updated remotely “over the air”. This is achieved via the device maintenance portal.

**How does the device handle variable GPS data quality?**

The Evogi devices measures GPS signal quality and reports the HDOP and number of satellite fixes with each event message. The device uses this capability in a variety of ways based upon a sophisticated firmware platform. Special event types may be triggered and reported to record GPS signal quality changes over time. These event types are monitored in our device management platform to ensure quality of service. The Evogi devices does not collect or calibrate OBD port speeds.

The device generally transmits data on a two-minute time interval. When trigger events occur, the device will transmit at shorter interval time periods. The device can be programmed to transmit at any time interval programmed.

# Evogi EVG3000 OBD II Dongle Device

## Device Messaging

| Wireless Network Connectivity (device message types) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Device Message | Message type | Configurable | 1 Second | 30 Seconds | 60 Seconds | Once per Trip | Utica National Requirement | Meets Specification | Exceeds Specification |
| GPS Data accumulated per second | Long | √ | 108 bytes | 450 bytes | 865 bytes max | N/A | GPS Data gathered per second | Yes | √ |
| Trip Data (Calculated) | Long | √ | 865 bytes max | 865 bytes max | 865 bytes max | 865 bytes max | Evogi Proposed, Not Specified | Yes | √ |
| Trip Data (Accumulated) | Short | √ | 108 bytes | 108 bytes | N/A | N/A | Trip Data Gathered Per Second | Yes | √ |
| Trip Data (Accumulated) | Long | √ | 865 bytes max | 865 bytes max | 865 bytes max | 865 bytes max | Trip Data Gathered Per Second | Yes | √ |
| Conditional Event Data per occurrence | Short | √ | 108 bytes | 108 bytes | 108 bytes | 108 bytes | Evogi Proposed, Not Specified | Yes | √ |
| Electronic Data Recording | Long | √ | 865 bytes max | 865 bytes max | 865 bytes max | N/A | Evogi Proposed, Not Specified | Yes | √ |

***Device Messaging***

Managing data transmission and associated cellular data plans is quite complex; Evogi has extensive expertise and knowledge in this area and has developed a number of proprietary algorithms to manage this process. If GPRS/GSM signal is not present the device will store the event message in a log file in non-volatile memory, which has a capacity of 10,000 events. The device will automatically report log files upon presence of GPRS/GSM signal coverage.

The size of a data packet per event report is:

1. Proprietary
2. Configurable.
   - o This varies by the number of parameter settings and the time at which data is delivered. For example, when configured to report in real time as events are triggered, the message size (data packet) will be smaller than if the device collects event data over time and transmits all the information at the ignition off event.
   - o Data transmission volumes can be tabulated as event triggers are added or removed from the reporting structure (data packet sizes increment in very amounts, as “bits & bytes”, depending on the trigger configuration.)
   - o Average message size is generally configured at 100bytes.

Evogi handles server balancing based on customer needs, transmission rates and data demand. The devices support reporting to up to three additional IP addresses and ports.

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