high rates of customer dissatisfaction. In addition, drivers have few to no options for interacting with their car remotely and obtaining valuable information such as location, alerts, battery charge status, and mileage to the next service. There are no industry standards, and therefore no end-to-end solutions for remotely collecting telemetry data. The different stakeholders in the connected car value chain do not work together to integrate all involved systems and build flexible and scalable solutions. Because of this, open source community-driven efforts are beginning to appear.

The VMware IoT agent running on the head unit can collect customizable sets of data (metrics) and report them to back-end systems over secure channels in real time. Because the head unit acts as gateway, metrics from ECUs and sensor data are obtained over the various car communication bus systems (such as CAN, FlexRay, and MOST) and securely stored in the agent's local database. Remote collection of these metrics occurs over a secure channel established on one of following wireless networks:

- Cellular network through embedded SIM card (in head unit or dedicated ECU)
- Cellular network by way of the driver's smart phone
- WiFi network (home network or public hot spots)

Metrics are stored and inventoried in the back end and can be used for further processing. Combined with VMware vCloud® Air™ hybrid cloud, this system easily scales with growing demands. This is so historical metrics from millions of cars can be collected, stored, and processed simultaneously and securely at optimal cost. VMware™ vRealize Operations Manager™ self-learning tools, predictive analytics, and smart alerts, enable proactive identification and possible remediation of emerging issues.

Use Cases

- Preventive diagnostics
- Dealership services
- Adaptive insurance services
- Reporting campaigns for early defect detection
- Service notifications
- ECU issue notifications
- Burglar alarm
- Car localization
- Notifications of oil and tire pressure loss and low battery conditions

Key Takeaway 2: The VMWare IoT agent running on the head unit can collect telemetry data and transmit it over a secure channel to a scalable back end.

3.2 Over-the-Air Data and Content Provisioning

The ability to push data and content over-the-air to cars creates a new road for innovative value-added services and features in the connected car world.

3.2.1 Firmware Upgrades

Similar to smartphones and tablets, the head unit's firmware requires upgrades to enable new functionality and adapt to customer's expectations. Why should a driver be required to drive to a dealership for maintenance if he can get the latest head unit features over-the-air? The AirWatch product provisioning feature allows pushing a software upgrade to the head unit in a few clicks from the AirWatch console. A "product" is a set of files, actions, conditions, assignments, deployment options and dependencies allowing the provisioning of software packages to a car. Specific subsets of cars can be targeted through flexible assignment rules, for example "all model *x* cars in made for the German market