Automotive OTA

FUNDAMENTAL TECHNOLOGY FOR AN AUTONOMOUS DRIVING FUTURE

Remember when... Phones only made calls?

Now, with a connection to the internet, phones are so much smarter

Email

Social Media

News

Alarm

Games

Maps & Traffic

Music

Weather
A similar trend is happening in automotive

Before 1996 your car couldn’t connect to anything over-the-air.

1996
OnStar is the first connected vehicle service program.

2001
First hands-free BlueTooth car kit with speech recognition.

2010
First over-the-air updates for single-ECU navigation and infotainment systems.

2015
First over-the-air (OTA) updates for multi-ECU highly critical vehicle components. Driver centric features like ADAS and V2X are introduced.

Road to autonomous vehicles...

Software is at the center of innovation

Software technology for connected vehicles is transforming the automotive landscape, and software advancements will lead to new opportunities and innovations we are just now beginning to realize.

These advancements come with a massive increase in the amount of code, and will require updates similar to what we’ve come to expect with our smartphones, PCs, and other consumer electronics.

Today’s luxury sedan has more lines of code than...

<table>
<thead>
<tr>
<th></th>
<th>Lines of Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fighter Jet</td>
<td>22 Million</td>
</tr>
<tr>
<td>Particle Collider</td>
<td>50 Million</td>
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<tr>
<td>Luxury Sedan</td>
<td>100 Million</td>
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Autonomous vehicles will have much more

<table>
<thead>
<tr>
<th></th>
<th>Lines of Code</th>
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<tr>
<td>Autonomous Car</td>
<td>300 Million</td>
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Vehicle recalls are increasing

As more software is built into vehicles, the number of vehicle software recalls will continue to grow year-over-year. These software recalls will cost automakers billions of dollars a year globally.

Percent of US software related recalls

- **2014**: 6%*  
- **2015**: 27%*

US software recall repair estimate

- **2014**: $34 million**  
- **2015**: $164 million**

Nearly 5x increase

*NHTSA Automotive Recall Database  
**Inquiry Estimates Based On Automotive Software Recalls vs. Vehicle Production

OTA software updates are beneficial

The current recall process involves automakers sending letters to consumers who then drive to dealerships for manual software updates. With OTA software updates, this process can be automated from the cloud, and consumers can remotely receive updates faster and with far less hassle.

Faster Recall Compliance  
Reduced Recall Expense  
Improved Cybersecurity Response
The other side of the coin: OTA data management

Connected cars with OTA can not only receive software updates - they can transmit data to the cloud for analytics. This will increasingly allow automakers to understand and manage the vehicle’s operations and performance, as well as deliver new services leading to enhanced consumer experiences and brand loyalty.

Issue: OTA will get more complex

Automotive OTA software update and data management is growing more complex as automaker requirements transition from single ECUs like head units to multiple ECUs for highly critical vehicle systems and components controlling engines, powertrains, and other vital functions.

OTA is fundamental for autonomous

24/7 software updates and data management will be mandatory to keep autonomous vehicle software optimized and allow a continual flow of information about vehicle health, location, condition, direction, and communications with other cars, traffic signals, and even people in our increasingly connected world.