

# CONNECTED CARS DELIVER CONVENIENCE ALONG WITH SECURITY RISKS

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High-speed wireless networks have made possible the Connected Car, a vehicle that is as connected to the internet as a smartphone. As with the phone, this connectivity creates a plethora of opportunities for service providers to meet the needs of drivers, allowing them to stream media, check stock quotes, and even shop for merchandise from their vehicles. But, it also creates many new challenges, as companies want to satisfy consumers while keeping drivers safe. This article will address: Connected car as an archetype of mobile and ubiquitous computing; Experiences enabled by constant connectivity, including consumerism and streaming media; Security risks to vehicles that are connected to the internet.

The future of cars is coming quickly, and it's connected to the internet. Over three-quarters of Americans routinely carry a device that continually connects them to the global network. This connection enables conveniences that were unimaginable a decade ago, like the ability to buy movie tickets, make restaurant reservations and check in with every friend in a one mile radius, all while walking down the street.

Or perhaps, while being transported down the street in a self-driving car. OK, self-driving cars are not quite mainstream yet, despite much progress by companies such as Lyft and Uber. Still, the rest of the previous scenario (and much more) is already reality — made possible by advances in smartphone technologies and LTE network connectivity.

## The Era of the Connected Car

In its broadest sense, the connected car is a prime example of how the Internet of Things (IoT) is changing the way we create new products. A core principle of IoT is adding technologies like data storage, computational capability and network connectivity to products that traditionally have not been built with them in mind. Products like cars. At the end of the 20th century, a car might have been equipped with between one and five computers, meaning pieces of hardware containing microprocessors. Today, even the barest-bones economy cars have at least 10 such devices in them; most luxury vehicles have more than 100.

Modern autos — essentially computers on wheels — fit the very definition of mobile computing, or “mobicom.” Mobicom involves combining mobile communications, mobile hardware and mobile software to create rich user experiences — experiences that differ greatly from those had when sitting at a desk with a monitor and keyboard. Mobicom delivers these rich experiences by embracing portability, connectivity, interactivity and individuality.

While mobicom brings technology to users while they are on the move, ubiquitous computing or “ubicom” delivers the availability of computing resources anywhere, any time. And unlike desktop computing, ubicom can happen using any device. Ubicomp interfaces essentially become invisible to their users who don't need to think about the microprocessors that power them. Anti-lock braking systems are a

good example. They require sensors on the wheels and computing power to evaluate the results before braking power is applied yet the majority of users don't consider any of this, mindlessly pressing the brake pedal in a learned reaction repeated thousands of times.

So, while the idea of computing in cars has been around for decades, it's only recently that always-there connectivity has been explored as a way to expand the experience of traveling in what can be considered an advanced computing platform. Commerce will be a huge driver of this connected car surge as manufacturers rush to embrace these new opportunities. That's great news for user experience (UX) designers as the need for their expertise is increasing exponentially.

The industry stemming from satisfying commuters with connected commerce is estimated to be \$230 billion dollar and growing, according to *PYMNTS Digital Drive*.

### **Always-There Connectivity**

Always-there connectivity gives rise to some very obvious use cases grown from existing in-vehicle infotainment (IVI) technology already present in many (if not most) new vehicles. Say you like a song playing on your satellite radio. What if you could just press a button on the touchscreen to purchase it? Or how about this: you're getting thirsty during your long commute. Wouldn't it be convenient if your IVI could display coffee shops between your present location and your destination — and then place an order for your favorite beverage so it's ready and paid for when you arrive for pick up?

Of course, the ability to make in-vehicle purchases matters little if you crash while placing that order. Distracted driving is already a huge problem, claiming thousands of lives on the highways every year. Fortunately, the same connectivity that enables these new distractions will also provide many new ways — for instance, highly accurate voice assistants — to mitigate their impact on driving.

Voice assistants in vehicles have been around for years, but a recent study by the Nielsen Norman Group has shown the current usability of these systems to be rather poor. Simple commands tend to work, but beyond that the systems often get it wrong. This leads to user mistrust and frustration, which can actually increase driver

distraction. That's one reason consumers have been slower to adopt this tech than the companies that develop it would like.

### **Natural Language Understanding**

But there's a fix. It comes in the form of in-vehicle connectivity that allows access to cloud-computing platforms like Alexa and Google, which are more capable of the natural language understanding (NLU) that users are starting to expect. NLU allows voice assistants to be far more accurate and therefore useful. But the technology, just now maturing into something commercially beneficial, has been a challenging problem for the industry for years. Beyond the inherent difficulty of the problem of recognizing and translating human speech accurately, doing it in a moving vehicle adds a veritable battleground of background noises for the algorithms to contend with. Open windows, heavy rain, air conditioning and general road vibration compete to overwhelm simple NLU systems.

Fortunately, experts in artificial intelligence, linguistics and machine learning have come together to create solutions. In the connected car, the full power of the cloud can be brought to bear to clean up the noise and allow these advanced NLU assistants work to the level they do in a (relatively) quiet kitchen. The







result? You're able to tell your auto voice assistant to purchase that song without taking your hands off the wheel.

#### V2X Communication

A key concept to the connected car is V2X communication, which stands for 'Vehicle-to-Everything' and encompasses passing information to any equipment, devices or systems that might have an impact on the vehicle. In practice, this focuses on Vehicle-to-Infrastructure (V2I) and Vehicle-to-Vehicle (V2V) communication. V2I refers to the wireless bi-directional communication between the vehicle and stationary equipment along the roadways, which can provide dynamic updates such as traffic alerts and emergency information, along with static information such as lane markers and stop signs. Similarly, V2V focuses on the dynamic transfer of information between vehicles through a form of ad hoc networking.

Together, V2X communication and ubiquitous cloud computing form the core of the connected car experience, and will eventually lead us to fully autonomous vehicles. If the driver isn't actually driving, the "distracted driver problem" effectively goes away. This could have the net impact of reducing traffic-related accidents by 90 percent, saving thousands of lives and billions of dollars every year. Now that hour a day you used to spend driving to and from work can be used more productively for other things.

In an autonomous vehicle, the experience design shifts from supporting the task of driving to supporting the new activities allowed by free time during travel. The IVI system begins to take on more aspects of In-Flight Entertainment (IFE) systems, supporting rich media like movies and games. Commuting time can now be spent in a moving office space, getting caught up on the day's email or conducting meetings using all the same capabilities that are available on the desktop.

#### Security is a Major Concern

Like with all IoT devices, security is a concern and adding connectivity to a car opens up as many possible security risks as it does added convenience. A frightening example from 2015 still resonates. Two cybersecurity specialists showed how they could take remote control of a Jeep Cherokee and control the wipers, climate systems, media player and other systems as the driver sat helplessly. They stopped short of interfering with the steering and brakes — they were just trying to prove a point, not cause harm — but they could have. The ramifications of that are chilling.

Many IoT devices are challenging to secure, simply because they don't have the necessary computing power to implement some necessary encryption schemes, or even to self-update to implement security patches over their lifetime. Connected cars will require innovations in security thought to provide robust protection from remote systems manipulation, theft of driver data and billing information, and other breaches. Fortunately, automakers are working tirelessly to ensure these protections are available.

The sheer amount of technology in connected cars offers consumers more choices than ever for spending their money. As consumers demand rich experiences in their vehicles to leverage this connectivity, manufacturers rush to deliver. Though the design and security challenges are vast, creating a future where accidents on the highways are rare and travel becomes something to enjoy rather than endure is very much worth building.



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