The Car.tv Era

How Mobile Edge Computing Will Transform
the Entire In-Vehicle Infotainment Ecosystem

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Executive Summary: Mobile Edge Computing Enables the Car.tv Era

Passengers in cars are a captive audience. Mobile edge computing (MEC) creates powerful opportunities for content providers to captivate them with entertainment, news and information that's live, on demand and highly relevant based on their location.

In the process, MEC gives advertisers new ways to reach those passengers, including when they're literally in the right place at the right time to make a purchase. Taxi companies, private and municipal bus fleets, limousine providers and ride-sharing aggregators all can leverage MEC to create new revenue streams and market differentiators. And starting today with 4G, mobile operators can use MEC to enable—and thus monetize—all of these new opportunities. Once these types of partnerships are in place, this new "car.tv" ecosystem can become a $100 million annual market opportunity.

MEC also makes it easier for content providers, advertisers and mobile operators to deliver entertainment, news and ads in the format that consumers prefer: video, including HD, 4K and augmented/virtual reality (AR/VR). That's because MEC moves content, compute and other resources to the network edge to enable faster performance, freeing consumers from buffering and other frustrations that prevent them from viewing shows, ads and other video content.

MEC is an Immediate Opportunity, Not One that Requires 5G

Most consumers are not only familiar with the concept of in-vehicle infotainment—they expect it. For example, many taxis have rear-seat displays running video ads and news summaries. The Cadillac CT6 sedan has an optional rear-seat infotainment system with 10-inch displays. SiriusXM is an example of how some content providers have spent the past decade working with auto OEMs to make their hardware optional or standard equipment. This installed base sets consumer expectations about the entertainment they can get in vehicles they own or rent.

The arrival of 4G has steadily expanded this in-vehicle infotainment ecosystem in terms of companies, business models and revenue opportunities. One way is by providing the bandwidth necessary to provide a good user experience with live and on-demand video. Many tablets and other aftermarket video devices also have embedded 4G, enabling fleet owners to add those to their vehicles so they can get revenue from advertisers, content providers and other companies that want to reach their passengers. These video devices also create powerful market-differentiation opportunities. For example, taxi and limousine companies could market a cable-style selection of TV channels as a way to attract passengers who otherwise might choose a ride-sharing aggregator such as Ola, Lyft or Uber. This selection could be particularly appealing to passengers with a long ride, such as 45 minutes to the airport due to distance and traffic.

Starting in 2019, many mobile operators worldwide have begun deploying 5G networks. This technology will provide the high bandwidth, low latency and other technological capabilities necessary to provide passengers with a wide variety of infotainment and advertising. However, it will take several years for 5G networks to achieve 4G's coverage, and for 5G hardware to become common in infotainment systems from automotive OEMs and aftermarket providers. Figure 1 compares 4G (LTE) with 5G in terms of global adoption through 2025.
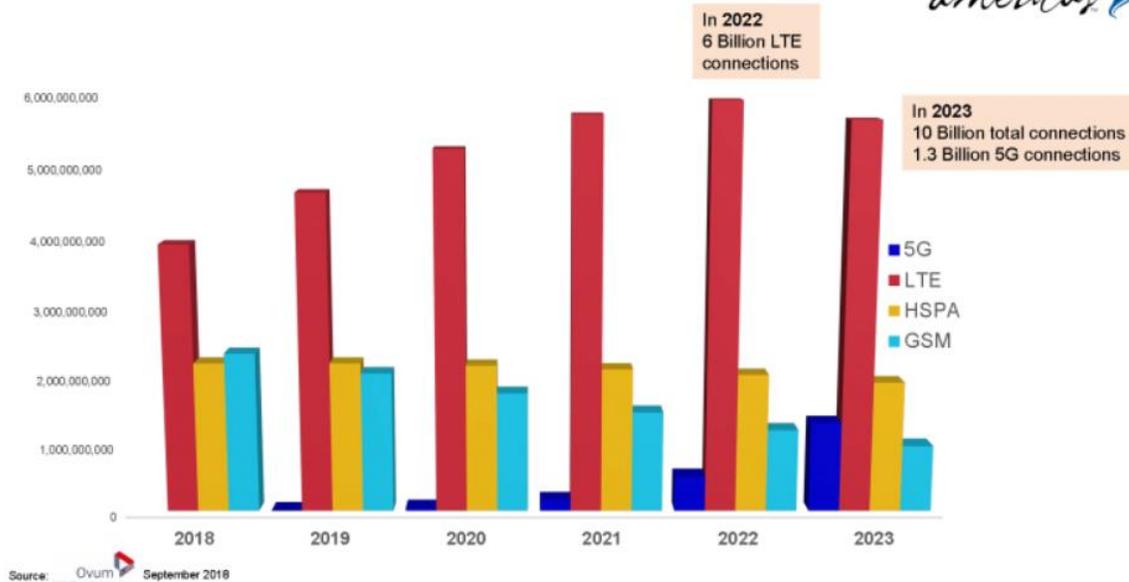
Figure 1: By 2023, 4G will still have nearly eight times more users worldwide than 5G.

Figure 1 highlights why mobile operators, content providers, advertisers and fleet owners can't afford to wait for 5G networks and devices to be widely available to capitalize on the car.tv opportunity. Those that do risk losing market share and mind share to rivals that act now.

For mobile operators, that means implementing MEC now in their 4G networks. Although 5G requires MEC, MEC doesn't require 5G. Operators can quickly and inexpensively deploy MEC as a seamless overlay on 4G and continue to use that same platform for their 5G networks. This plug-and-play architecture also enables fast deployments. For instance, in any given location such overlay platforms (and solutions) can take less than an hour of integration and commissioning.

MEC shifts content, compute and other resources to the mobile network edge to enable better performance—the kind that customers notice, such as immediate stream starts, no tiling and no resolution drops. This directly benefits the entire in-vehicle infotainment ecosystem and its customers in several ways, including:

- MEC enables the storage of video content at cell sites, including the street-level and indoor small cells that are both increasingly common in 4G and the norm for 5G. As a result, MEC this content now can be delivered faster than if it had to be served from the operator's core network. These benefits apply to all types of video content, including movies and other programming from providers such as Amazon Prime, Hulu and Netflix, as well as video advertising.

- MEC's ultra-low latency is key for ensuring that bandwidth-intensive formats such as 4K/UHD can be served up before the vehicle has driven out of the target area, such as the immediate vicinity of an advertiser's retail location.

- Although many automotive OEMs and their fleet customers, such as taxi companies, have installed video devices for passenger infotainment, they have zero control over the viewing experience. As a result, passengers often are frustrated by buffering and other common problems. But by leveraging MEC, those companies now can ensure a superior user experience, which reflects favorably on their brands when consumers are choosing a vehicle to buy or lease or a service to take them to the airport.

- MEC technology resides entirely in the mobile network. As a result, MEC enables high quality of experience regardless of whether the video device is built into the vehicle or aftermarket, and regardless of whether its chipset is 4G or 5G. This network-based design also enables those devices to begin leveraging MEC as soon as the operator deploys the technology, instead of requiring vehicle owners to first upgrade their video devices to 5G models. As a result, content providers and advertisers immediately have a large installed base to target. If a fleet owner isn't currently a customer of the operator offering MEC-based services, switching requires only a quick SIM card swap instead of replacing devices.

- MEC enables mobile operators to serve as publishers of advertising, including in-vehicle video commercials. As a result, operators no longer have to be marginalized as "dumb pipes" and instead can capture a major share of [the forecast $215 billion global mobile advertising market in 2021](#). Meanwhile, instead of relying on middlemen such as ad exchanges and ad networks, brands and their agencies can now work directly with mobile operators to reach vehicle passengers. This change eliminates the cost and complexity of the current mobile advertising market, including the unwieldy mix of location technologies. For a deeper dive into how MEC transforms the mobile advertising market, including the car.tv segment, see Edge AdTech – Why, What, How.

MEC Enables New Business Models and Revenue Streams

MEC will transform the entire connected vehicle ecosystem, including the parts focused on infotainment. This broad, deep impact benefits infotainment because mobile operators, automotive OEMs and other companies will have a big business incentive to leverage MEC for a wide variety of applications. For example, MEC enables the low latency that's crucial for enabling safe autonomous and semi-autonomous vehicles, as well as [vehicle-to-vehicle and vehicle-to-infrastructure (V2X) communications](#) for accident avoidance.

Partnerships are increasingly common in both infotainment and the rest of the connected vehicle ecosystem. One example is [Ford's SYNC](#), whose partners include Amazon and Microsoft. Following are some potential examples that MEC can enable:

- Mobile operators can provide subscriber identity module (SIM) cards in bulk to partners such as content providers, automotive OEMs and aftermarket infotainment device vendors.

- Infotainment device vendors can partner with content providers to provide fleet owners with turnkey packages of hardware, content and other services.

- Advertisers and/or their agencies can partner with content providers, infotainment device vendors, mobile operators or even fleet owners to deliver hyperlocal ads based on each vehicle's precise location and the type of content that a passenger is viewing. For example, a taxi passenger in Manhattan who chooses to watch MSNBC might receive a commercial for a new play when the cab is in or near the Theater District. Or a passenger in Chicago watching ESPN might receive a commercial for Cubs tickets.

In these and other relationships, there are significant opportunities for revenue sharing. For example, the taxi company might receive a royalty when a passenger purchases tickets to a Broadway show.

Example Business Model: Ride-Sharing Aggregators

There are 750,000 Uber drivers in the United States as of December 2017.[1] At present, there seems to be no cab aggregator offering in-cab entertainment. The next phase of the product will be to provide this product to all cars in the market. In 2018, there were roughly 276.1 million vehicles in the United States.[2]

The cab aggregator industry has grown exponentially. Assuming a market penetration in Uber 10% of Ubers drivers, this product will be serving 75,000 drivers. Also, assuming a base of 450 rides per month (15 rides per day) per cab with 5% of the riders paying for the premium experience in the first year and 10% paying for the riders paying for the premium experience in the third year.[3] This leads to 20.25 million rides in the first year and 40.50 million in the third. In addition, a strategy can be put in place that can be executed to capture large market share in a short period of time.

Using the previous assumptions, providing a user a premium experience for an extra 50 cents, this extra service could provide an extra $10.125 million in the first year and $20.25 million in the third to be split amongst the partners. The five players can split the service equally, creating an extra $2.025 million in the first year and $4.05 million in the third for each party.

Taking a more expensive approach, if we assume the premium experience costs an extra $2.50, this extra service could provide an extra $50.625 million in the first year and $101.25 million in the third. The five players can split the service equally, creating an extra $10.125 million in the first year and $20.25 million in the third for each party. Figures 2, 3 and 4 provide more details about these revenue opportunities.

General Statistics		Charges			Penetration	
Ubers in the US	750000	Charge 1	$	0.50	Year 1	0.05
Market Share	0.1	Charge 2	$	1.00	Year 2	0.075
Premium Ubers	75000	Charge 3	$	1.50	Year 3	0.1
Rides Per Day	15	Charge 4	$	2.00		
Rides Per Month	450	Charge 5	$	2.50		
Months	12					
Rides Per Year	5400					

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[1] https://money.cnn.com/2017/12/18/technology/uber-drivers-180-days-of-change/index.html

[2] https://www.google.com/search?q=how+many+cars+are+in+the+us+2018&rlz=1C1CHBF_enUS757US757&oq=how+many+cars+are+in+the+us&aqs=chrome.1.69i57j0l5.6775j0j4&sourceid=chrome&ie=UTF-8

[3] Assuming a growth of 2.5% growth per year starting at 5% in year 1.

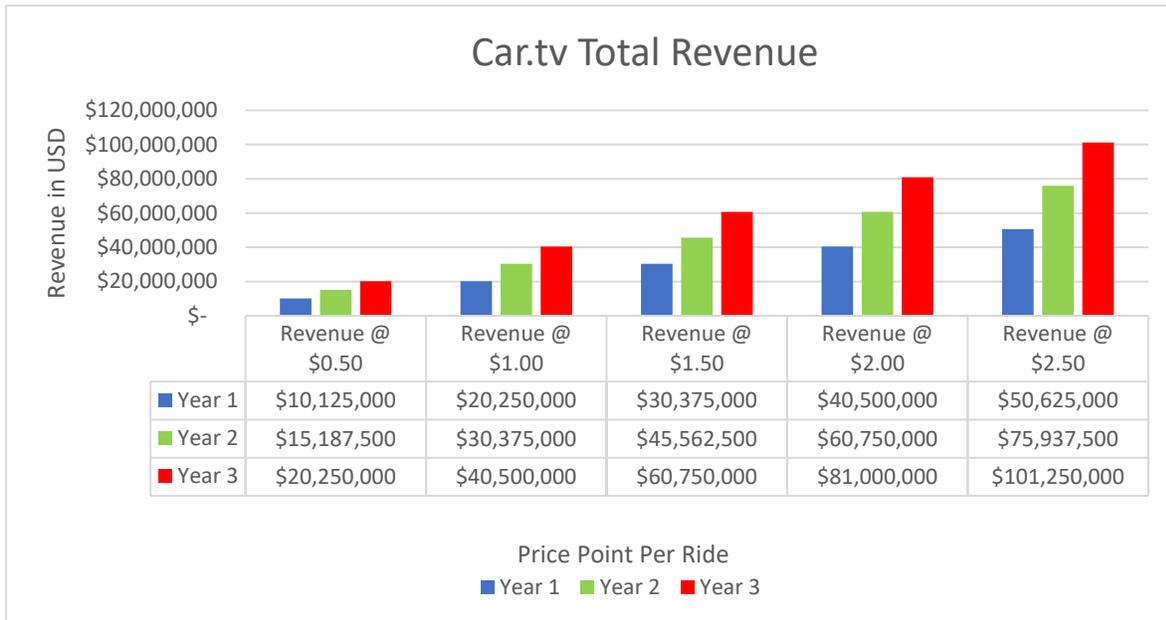**Figure 2 – General statistics, charges per ride and penetration by year.**

Car.tv Total Revenue

	Revenue @ $0.50	Revenue @ $1.00	Revenue @ $1.50	Revenue @ $2.00	Revenue @ $2.50
Year 1	$10,125,000	$20,250,000	$30,375,000	$40,500,000	$50,625,000
Year 2	$15,187,500	$30,375,000	$45,562,500	$60,750,000	$75,937,500
Year 3	$20,250,000	$40,500,000	$60,750,000	$81,000,000	$101,250,000

Price Point Per Ride

■ Year 1 ■ Year 2 ■ Year 3

Figure 3 – Total Revenue Opportunity

Car.tv Revenue Per Partner

	Revenue @ $0.50	Revenue @ $1.00	Revenue @ $1.50	Revenue @ $2.00	Revenue @ $2.50
Year 1	$2,025,000	$4,050,000	$6,075,000	$8,100,000	$10,125,000
Year 2	$3,037,500	$6,075,000	$9,112,500	$12,150,000	$15,187,500
Year 3	$4,050,000	$8,100,000	$12,150,000	$16,200,000	$20,250,000

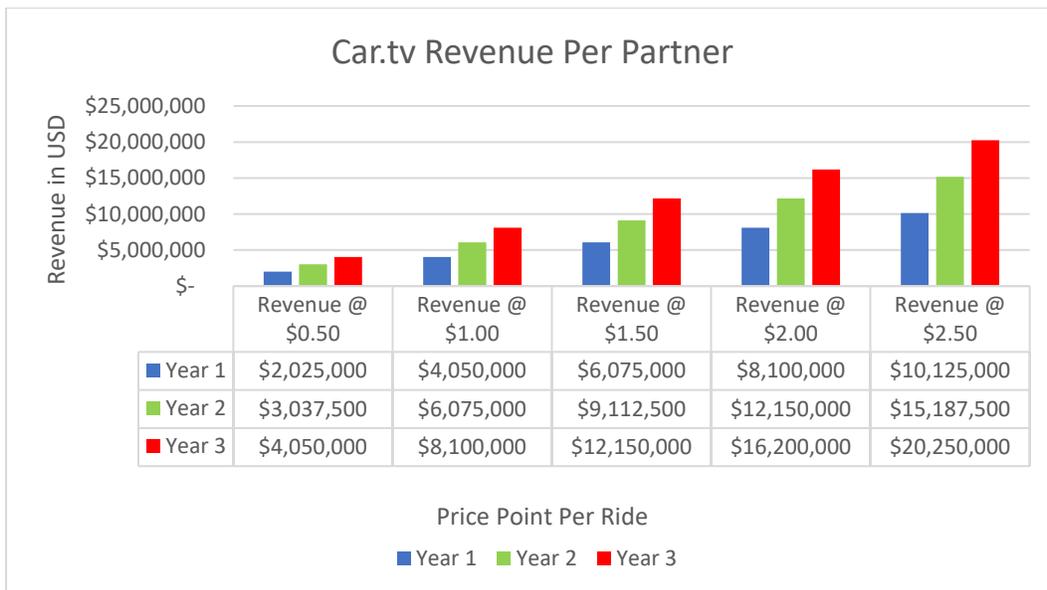Price Point Per Ride

■ Year 1 ■ Year 2 ■ Year 3

Figure 4 – Revenue per partner (five partners)

This is not the only potential business model. Other options include a subscription-based model or pay-per-show/movie-based model. With 276.1 million cars (including cabs) in the United States,[4] no matter the market penetration and share, this presents a very lucrative opportunity.

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[4] https://www.google.com/search?q=how+many+cars+are+in+the+us+2018&rlz=1C1CHBF_enUS757US757&oq=how+many+cars+are+in+the+us&aqs=chrome.1.69i57j0l5.6775j0j4&sourceid=chrome&ie=UTF-8

Conclusion: Car.tv isn't the Future. It's Now.

MEC is a fundamental part of the 5G architecture, but mobile operators can—and increasingly are—deploying it as an overlay on their 4G networks. This gives them a head start in capturing mind share and market share for MEC-enabled services, including in-vehicle infotainment.

As the number of MEC-enabled 4G networks grows, so do the revenue and market-differentiation opportunities for content providers, advertisers, fleet owners and ride-sharing aggregators. Those that don't act quickly risk losing their share of the $100 million annual car.tv market opportunity.