Connected Cars:
Who is Connecting and for What?

Roger C. Lanctot
Director, Automotive
Connected Mobility

STRATEGY ANALYTICS worlddab

WHAT WE NEED TO KNOW

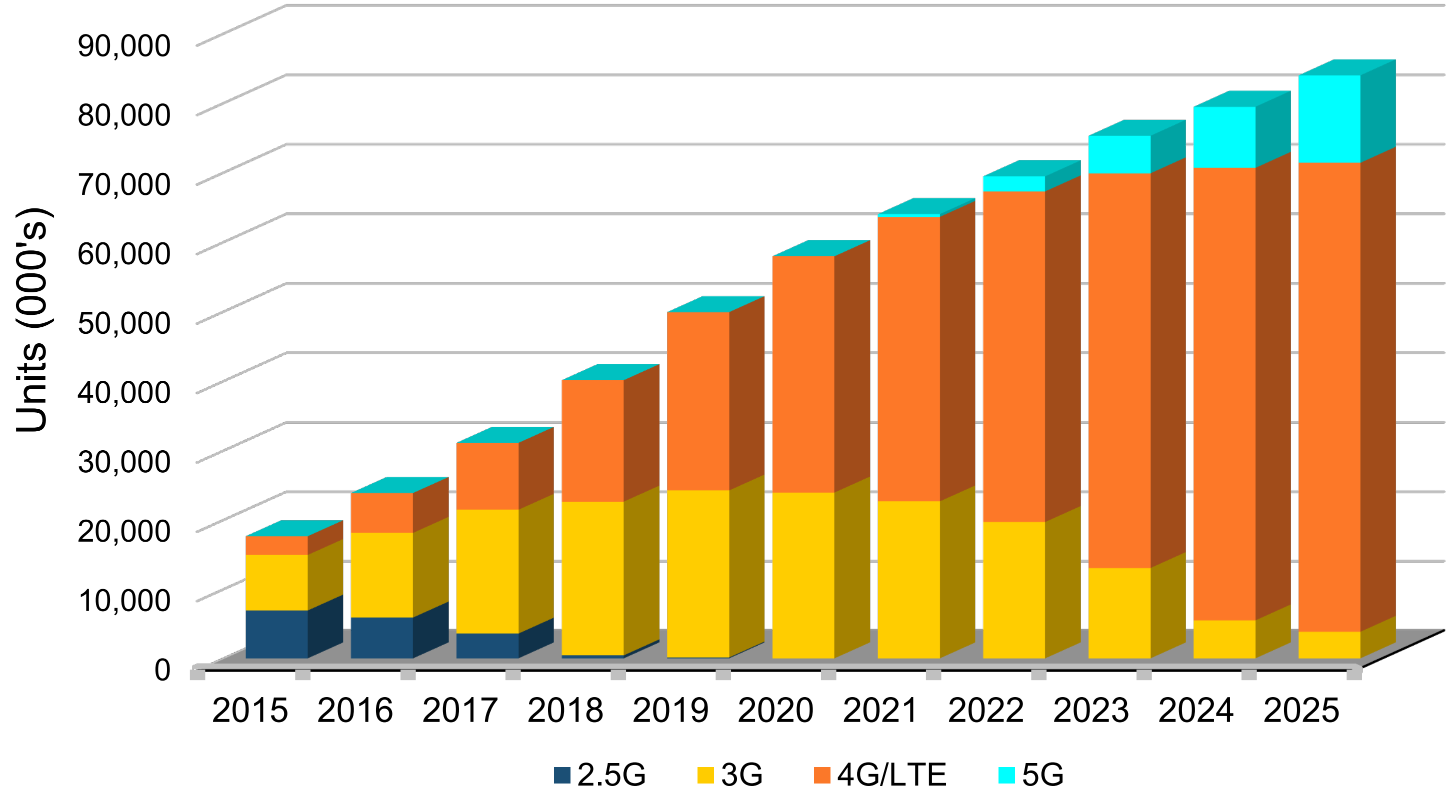
- State of automotive connectivity
- Value of automotive infotainment
- Impact of Google, Android, Apple (Amazon?)
- Emerging role of digital assistants
- Driver monitoring – potential game changer
- Audience measurement on steroids
- Car as browser

- **Latest Strategy Analytics European in-vehicle listening research**

OEM EMBEDDED TELEMATICS
CELLULAR MODEM SHIPMENTS – GLOBAL

STRATEGY ANALYTICS

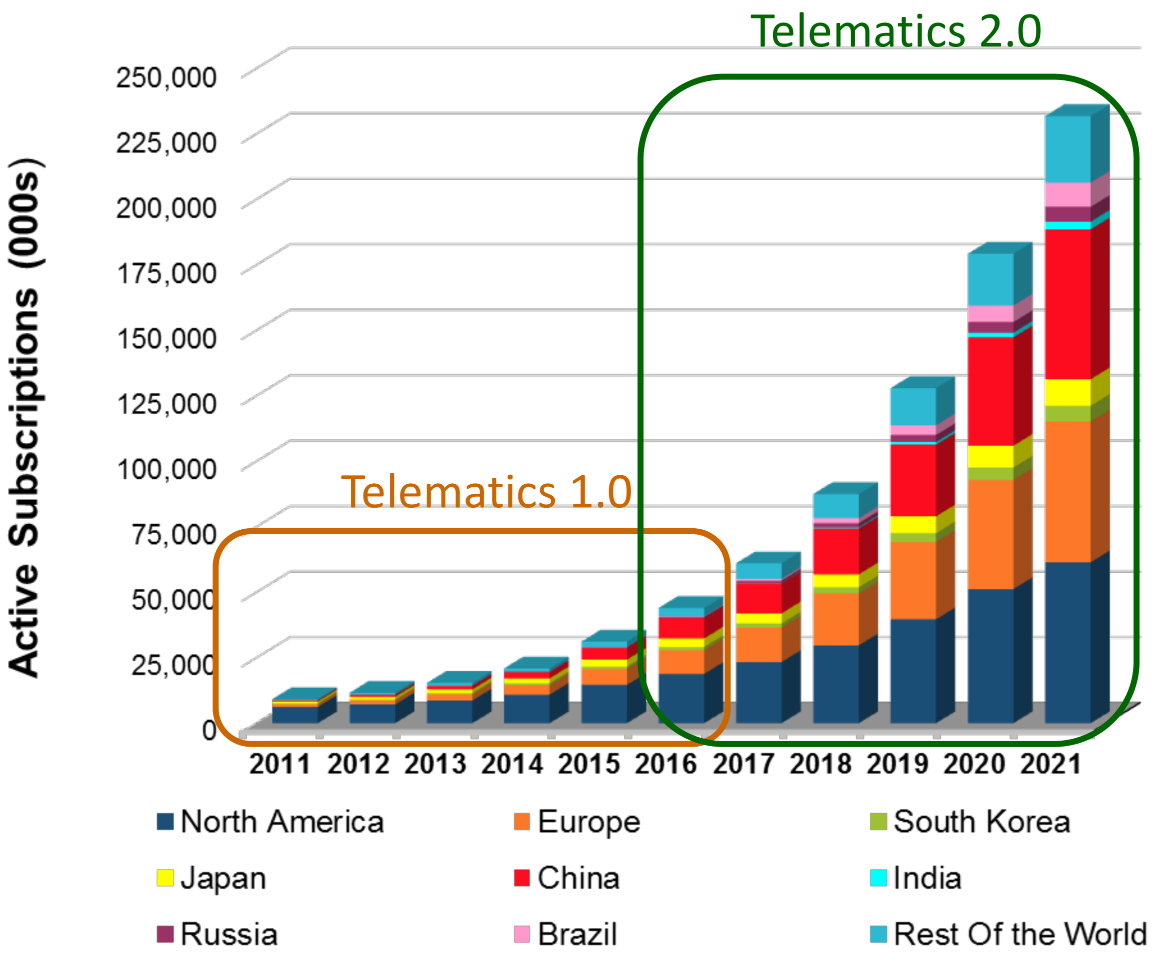
Telematics Forecast 2017 vs. 2025 (31 Mil. units → 84 Mil. units)



- 2.5G Network: 3.5 Mil units in 2017 to 0K units from 2020
- 3G Network: 18.8 Mil in 2017 units to 3.8 Mil units in 2025
- 4G/LTE Network: 9.6 Million units in 2017 to 67 Mil units in 2025
- 5G Network: 12.5 Million units in 2025

OEM EMBEDDED TELEMATICS
ACTIVE VEHICLE SUBSCRIPTIONS BY REGION

Global Active Subscriptions Will Exceed 250 Million by 2022



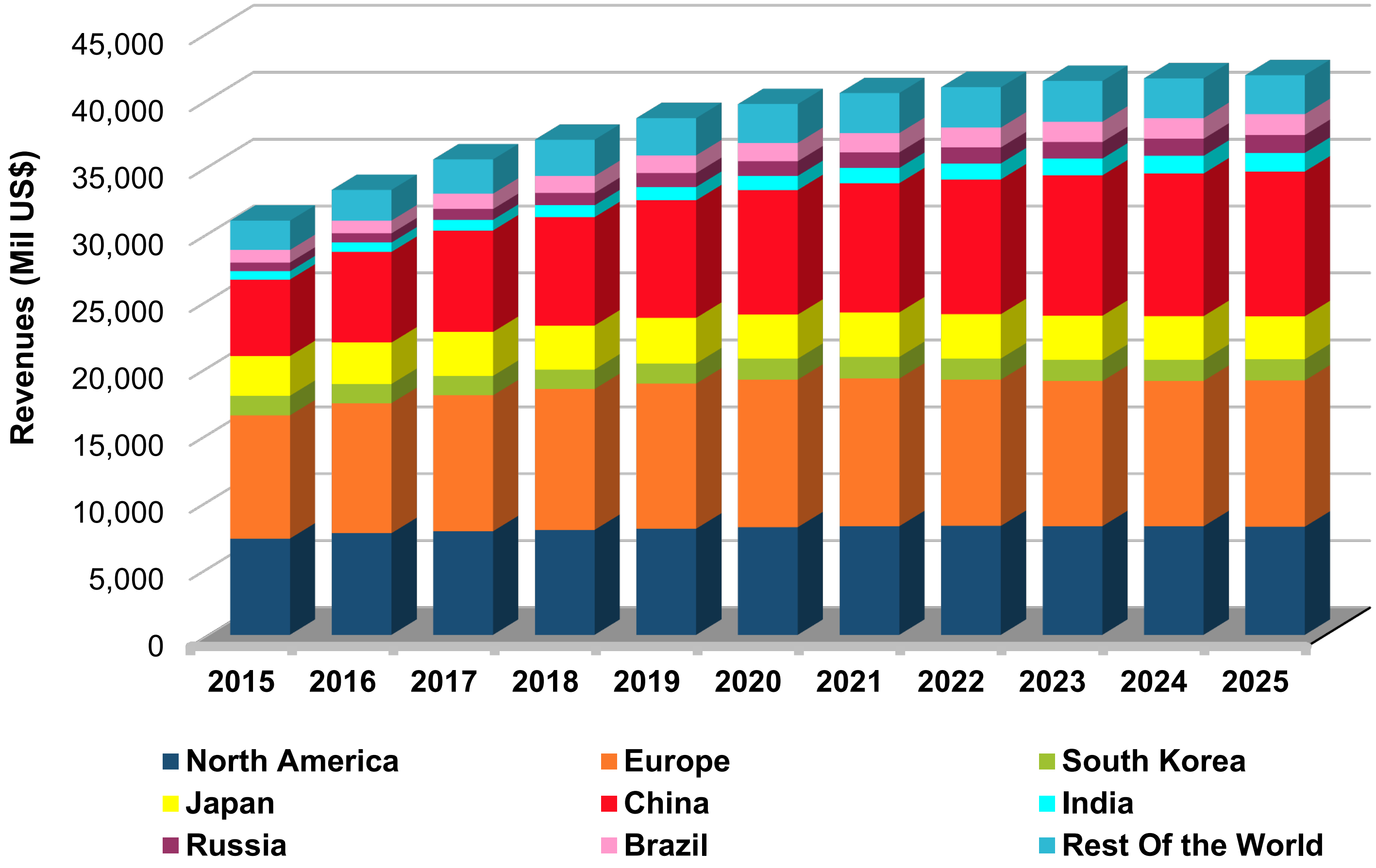
Leading Regions:

- North America: Market Driver - Single Market
- Europe: Market Driver – eCall
- China: Market Driver – Biggest Global Car market

OEM INFOTAINMENT:
REGIONAL SHIPMENT REVENUES

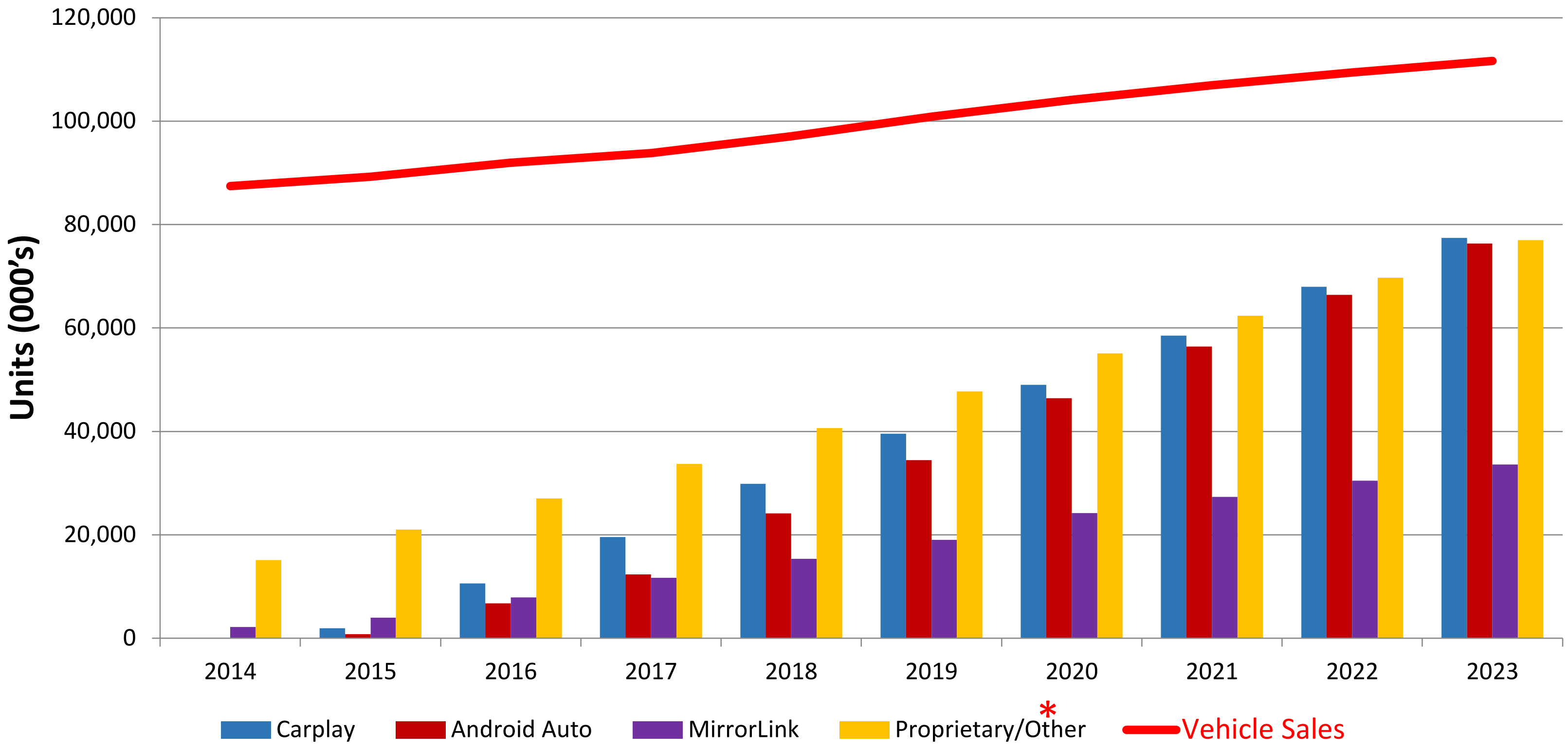
STRATEGY ANALYTICS

Tier 1 Revenue Growth: 2017 vs. 2025: +17.7% ($33.5 Bil. to $41.8 Bil.)



- China +42.6%: From $7.5 Billion in 2017 → $10.8 Billion in 2025 (CAGR 4.5%)
- North America +4.4%: From $7.7 Billion in 2017 → $8.1 Billion in 2025 (CAGR 0.5%)
- Europe +7.6%: From $10.1 Billion in 2017 → $10.9 Billion in 2025 (CAGR 0.9%)
- Japan -2.1%: From $3.28 Billion in 2017 → $3.21 Billion in 2025 (CAGR -0.3%)
- India: +75%: From $795 Million in 2017 to $1.4 Billion in 2025 (CAGR 7.3%)
- Brazil: +35.8%: From $1.1Billion in 2017 to $1.4 Billion in 2025 (CAGR 3.9%)

BEING CONNECTED….
SMARTPHONE/GATEWAY CONNECTIONS



* e.g. UVO, Entune, MyLink, etc.

Consumer Interest is High

…But…Limited Control of the IVI Environment!

CARPLAY, ANDROID AUTO UX'S

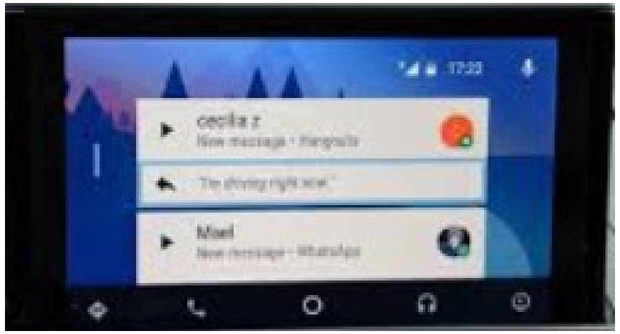
Old Apple CarPlay

New Apple CarPlay

Apple Reveals New IOS 13 CarPlay Look

SHARE ON: Facebook Twitter Google + Linked In Email

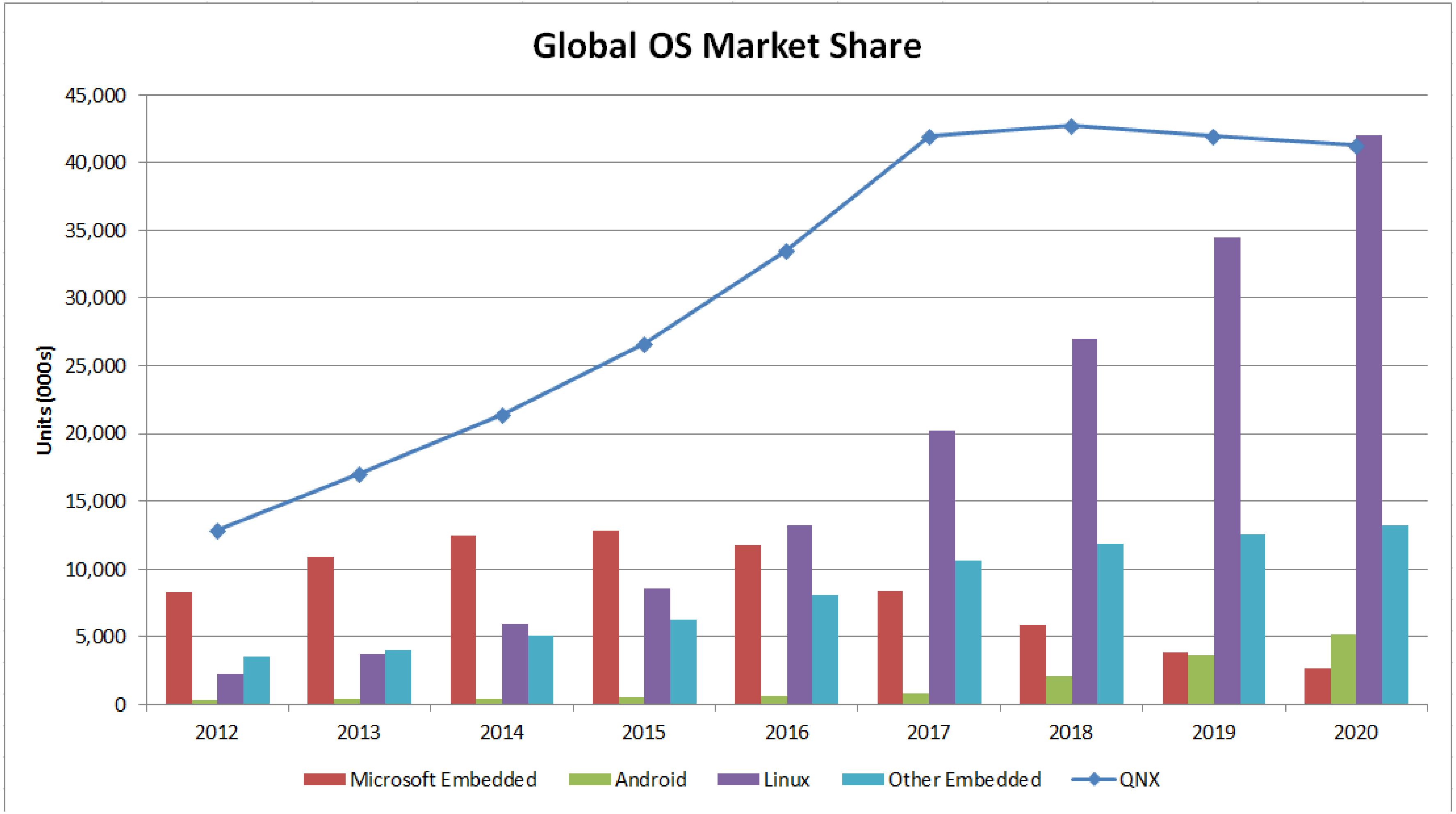
Old Android Auto



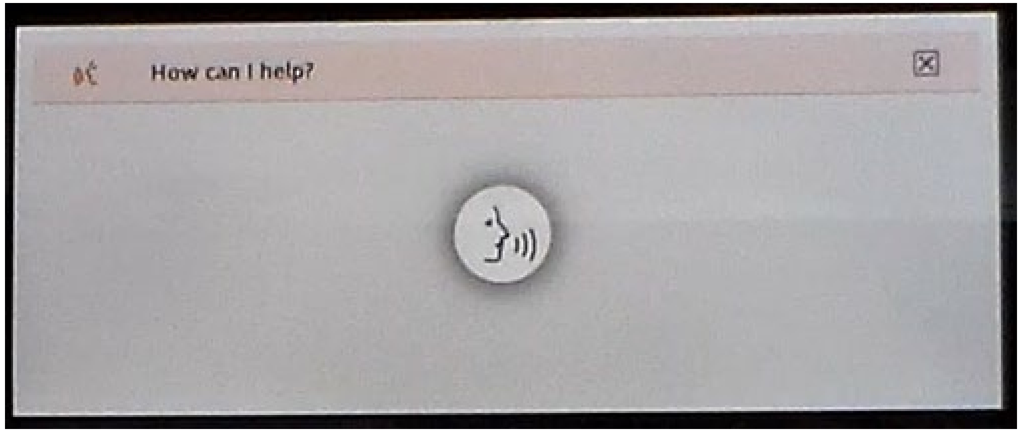
New Android Auto

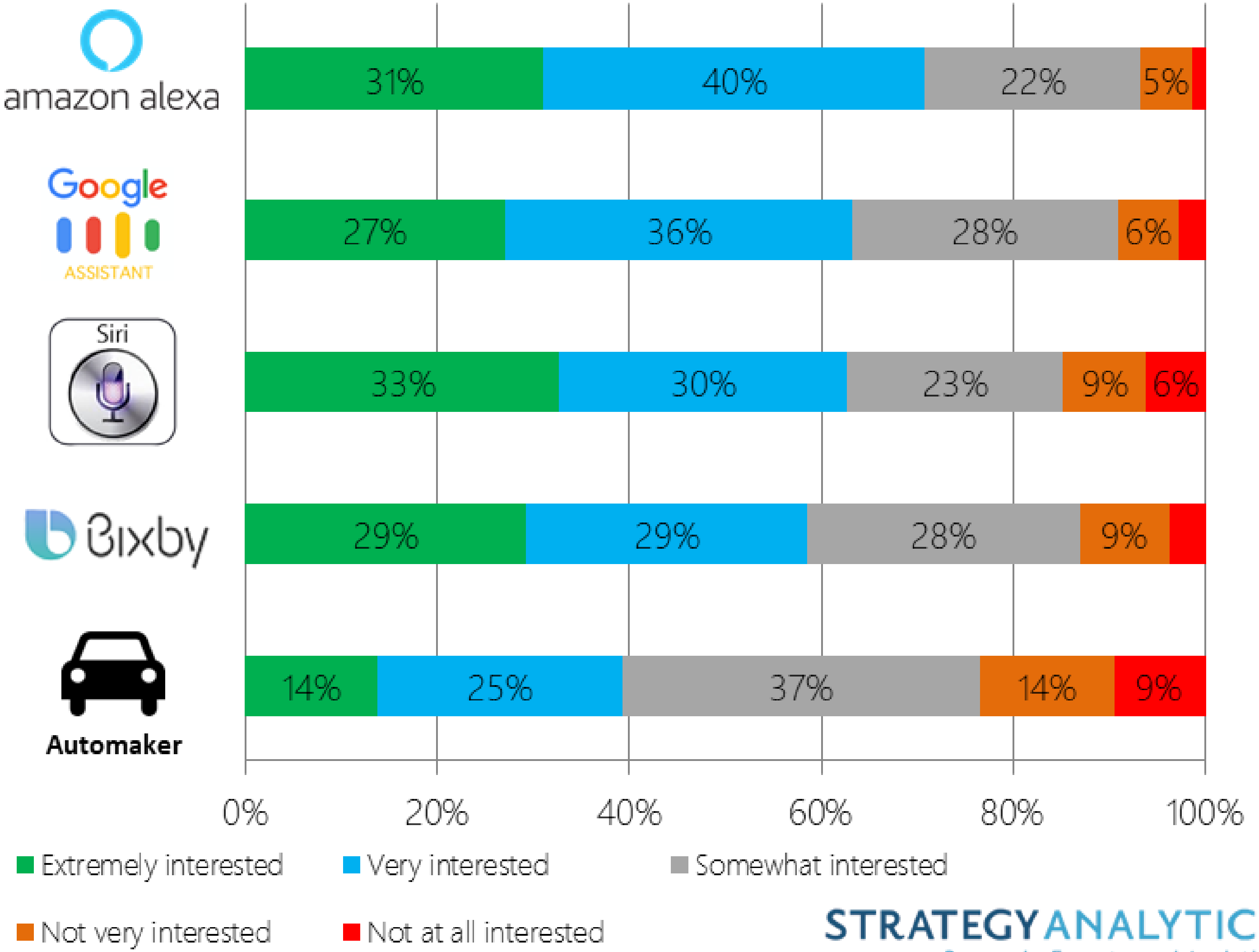
CHANGING OF THE OS GUARD – PEAK QNX

STRATEGY ANALYTICS



DIGITAL ASSISTANTS FOR THE CAR





STRATEGY ANALYTICS
Research, Experts, and Analytics

STRATEGY ANALYTICS

Voice-based digital assistants are rapidly bringing limited types of AI to our cars and our homes.

- Amazon Alexa-enabled devices, such as the Echo smart speaker (pictured at right) are selling in large volumes.
- Strategy Analytics' Smart Speaker service estimates that full-year (2017) shipments reached 32 million units in the U.S., France, Germany, and China.
- That figure is up more than 300% year-on-year.
- Google and Amazon accounted for 9 out of every 10 smart speakers sold during that period.

Source: Amazon

OEMS' INFOTAINMENT AI PARTNERSHIPS

STRATEGY ANALYTICS

OEM	Digital Assistant	Status
Audi	Alibaba's Tmall Genie, PIA	Tmall Genie – Launch TBD PIA – Concept demonstration
BMW/MINI	Amazon Alexa, Microsoft's Cortana, BMW Intelligent Personal Assistant	Alexa – Launched (BMW Connected mobile app integration), launching in MINI cars, this year Cortana – Demonstrated BMW Intelligent Personal Assistant – To launch March, 2019
Ford	Amazon Alexa	Launched
Honda	HANA, proprietary assistant developed in partnership with SoftBank	Concept demonstration
Hyundai	Amazon Alexa, Google Assistant	Both launched
Mercedes	Google Assistant, Amazon Alexa, Tmall Genie, SoundHound	Google Assistant, Amazon Alexa launched April 2017 SoundHound to launch
Nissan	Microsoft's Cortana	Planned, launch date not yet announced
PSA	SoundHound	Launch planned for 2020
SEAT	Amazon Alexa	Launched in select models in 2017, coming to more models this year
Toyota/Lexus	Amazon Alexa, YUI	Alexa coming to Entune 3.0 and Lexus Enform 2.0 App Suites this year YUI was a concept demonstration
Volkswagen	Amazon Alexa	Planned, launch date not yet announced
Volvo	Alibaba's Tmall Genie	Planned, launch date not yet announced

DIGITAL ASSISTANTS
CHALLENGES

- **Automakers must determine if and how users should manage multiple digital assistants accessible via the infotainment system**
  - Should users be able to choose a single assistant?
  - Should users be able to switch between assistants?
  - If switching is allowed, what HMI is used? Wake-up word? Via a menu accessible via touchscreen?

- **Automakers will need to communicate which digital assistants can control which in-vehicle systems**
  - Can Alexa, for example, control HVAC functions, or is that the role of a proprietary assistant?
  - Is there a seamless hand-off from one assistant to the other when the user makes a request that one assistant can't handle?
  - Are dealership salespeople trained to explain these features? If not, what does the OEM provide to new-car buyers to explain how these assistants work?

Source: Ford

What's really at stake?

CoDriver for Driver Monitoring

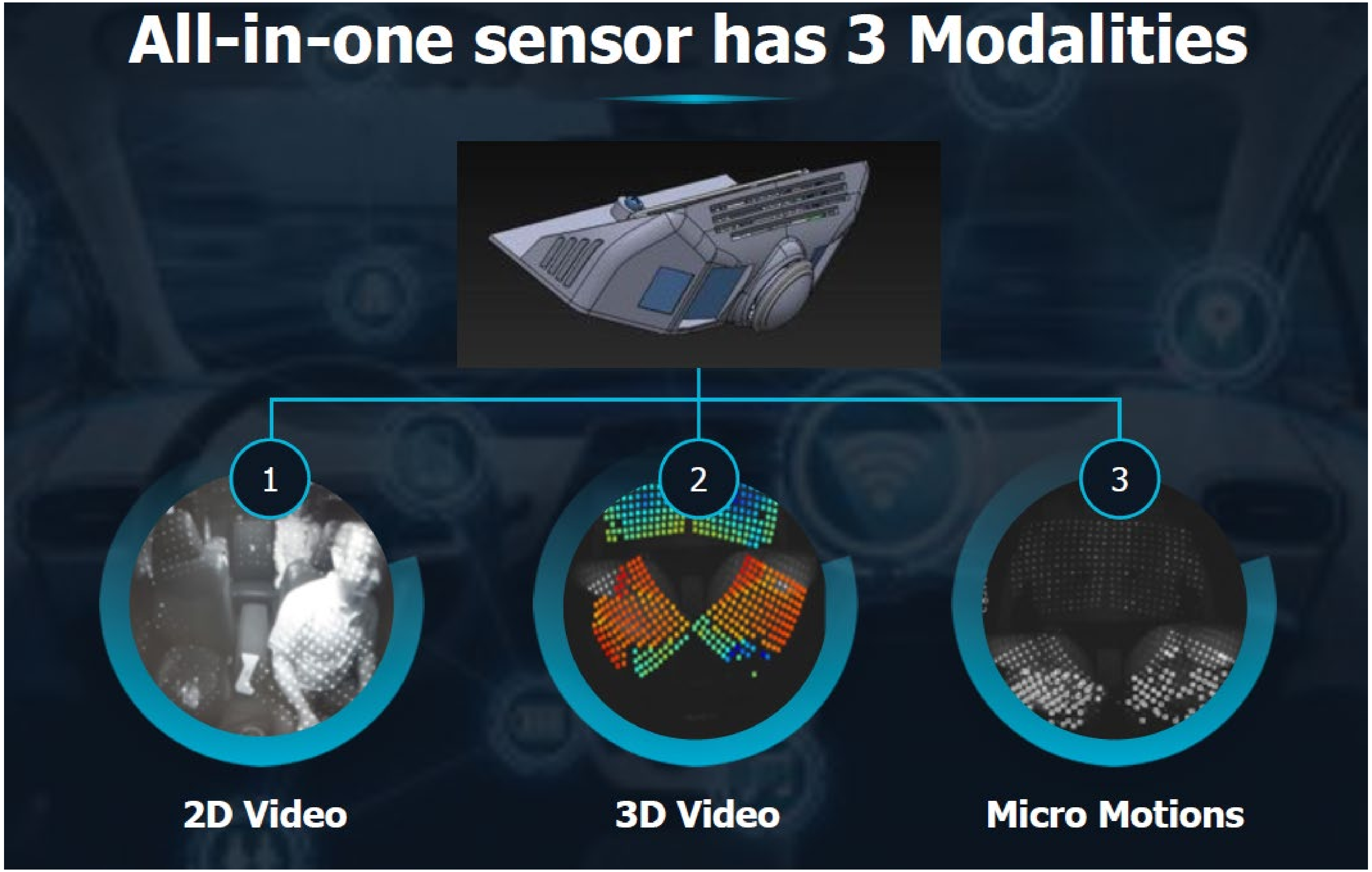
Sensor:

- Face detection
- Alignment
- Pose
- Eyes open/openness
- Gaze Tracking
- Person ID, Age, Gender
- Anti-spoofiness
- Emotion
- Multi-people
- ….

States:

- Ready To Take Control
- Distraction
- Drowsiness
- Head bob/drop
- Distress
- Eye Blink, Sleep
- ….

GUARDIAN OP-TECH



DRIVER MONITORING A US/EU FOCUS

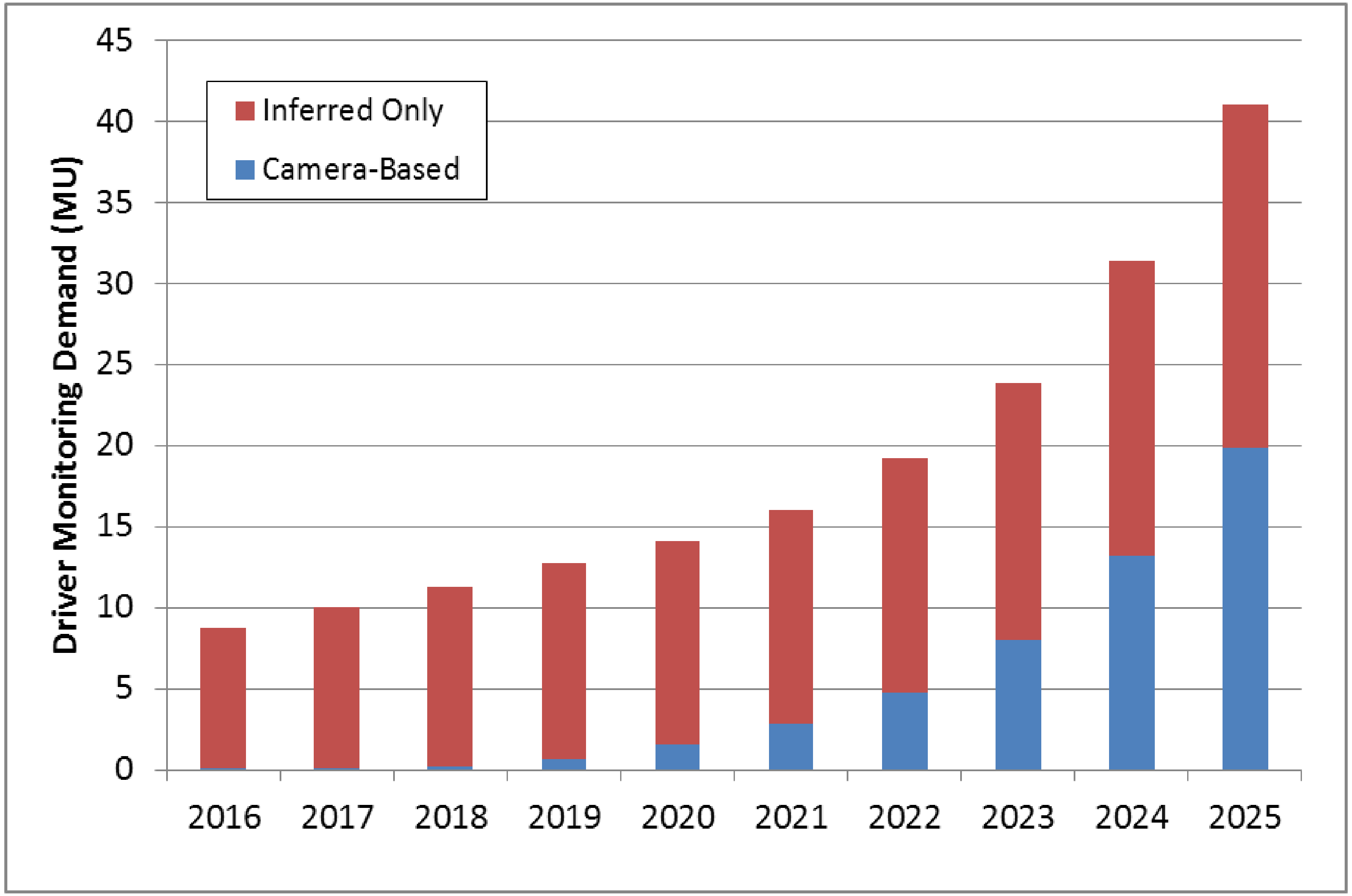
- Driver attention
- Driver identity
- Vehicle occupancy
- Driver/passenger physical characteristics – airbag deployment protocols
- “Forgotten baby”
- Mood detection
- Audience measurement?

DRIVER MONITORING @ CES

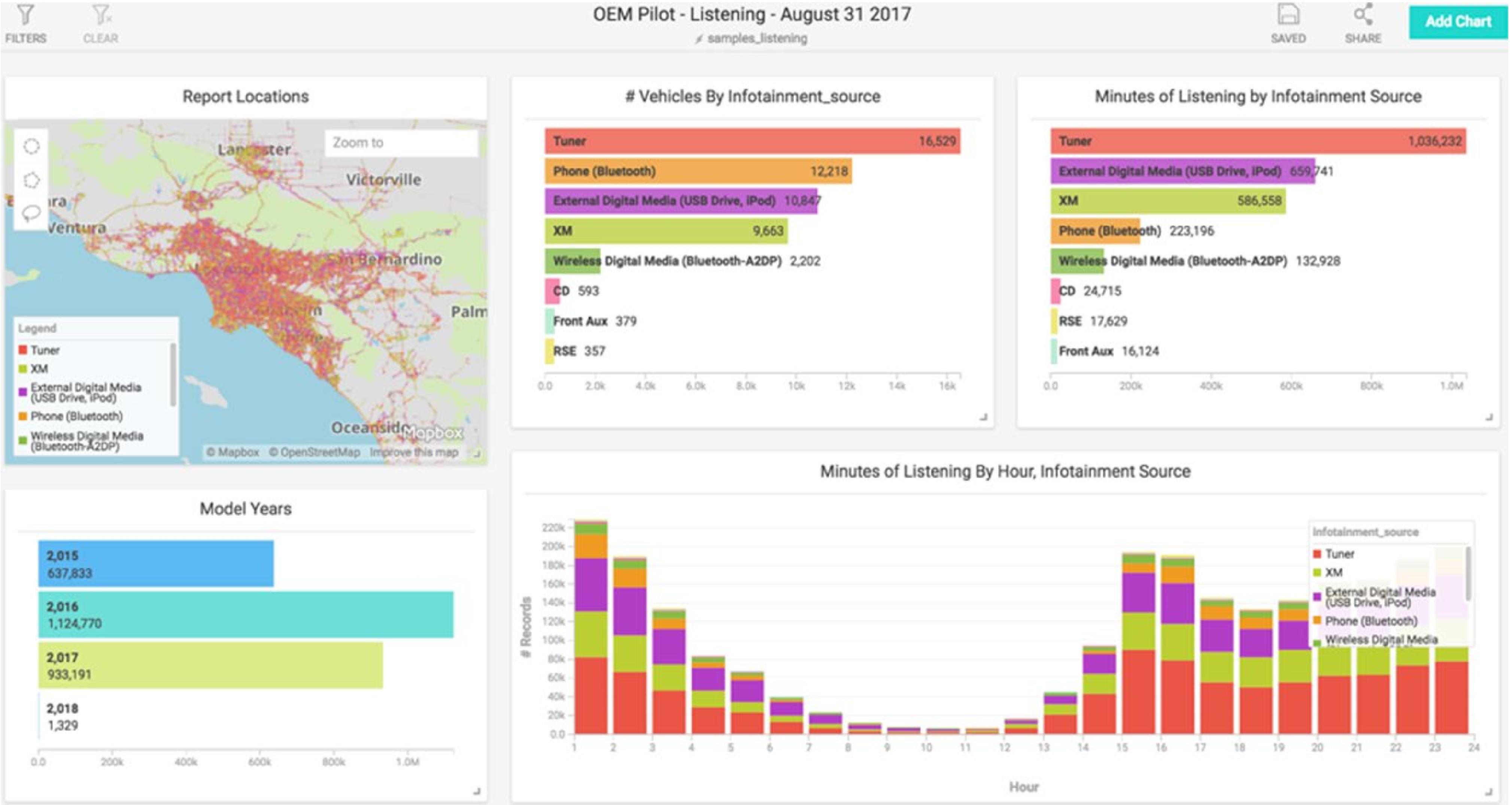
- Many, many solutions on display…
  - Core function remains **safety**
  - Range of additional functions ever-expanding:
    - Biometrics
    - Emotions (**Affectiva solutions** seen on many stands, e.g. Ambarella, Toyota Boshuku)
    - Head/gaze-tracking for e-mirror
  - Although in the short-term there are component opportunities in processing boxes for DMS, we believe in the med/long-term it will be **up-integrated into another module**, e.g. cockpit domain controller or ADAS domain controller

DRIVER MONITORING FORECAST

- Camera-based solutions forecast to deploy rapidly starting around now
- Legislative / NCAP interest in US and Europe
  - Europe NCAP for driver monitoring
  - US potential legislation for occupants left in hot vehicles



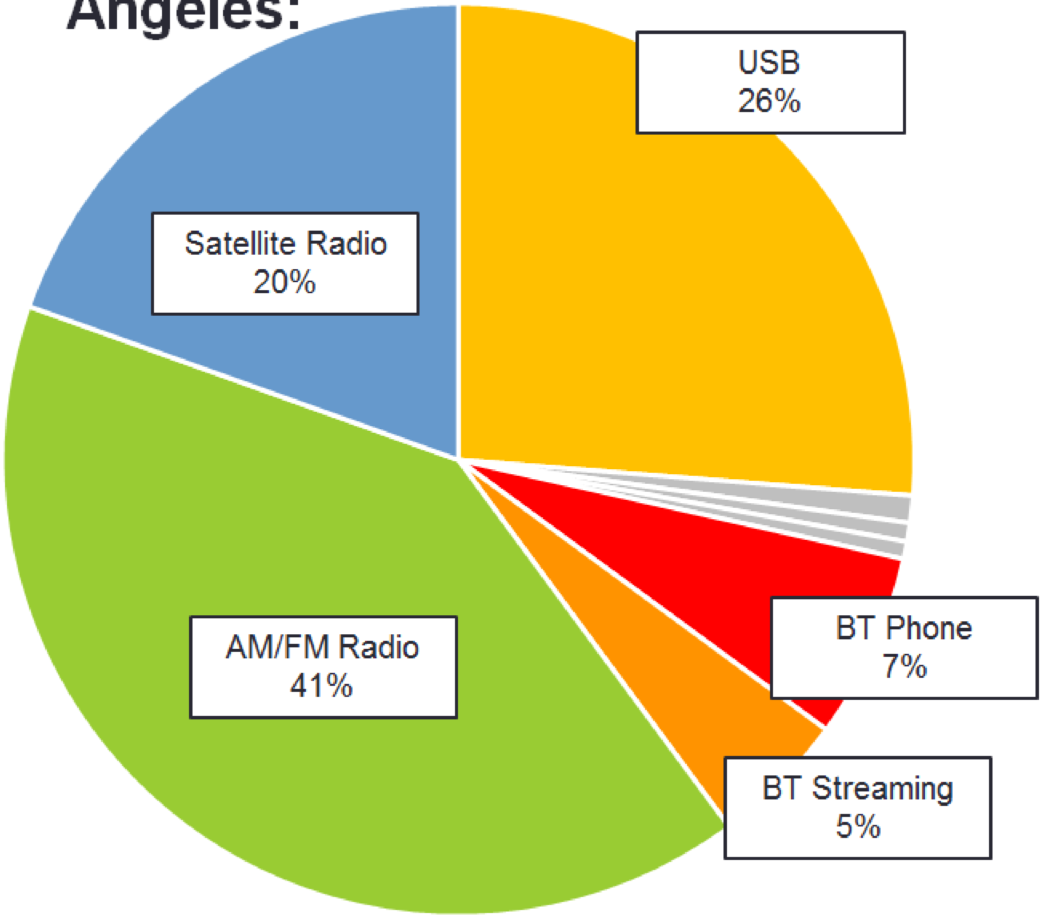
PEERING INTO THE BLACK HOLE OF IN-VEHICLE LISTENING



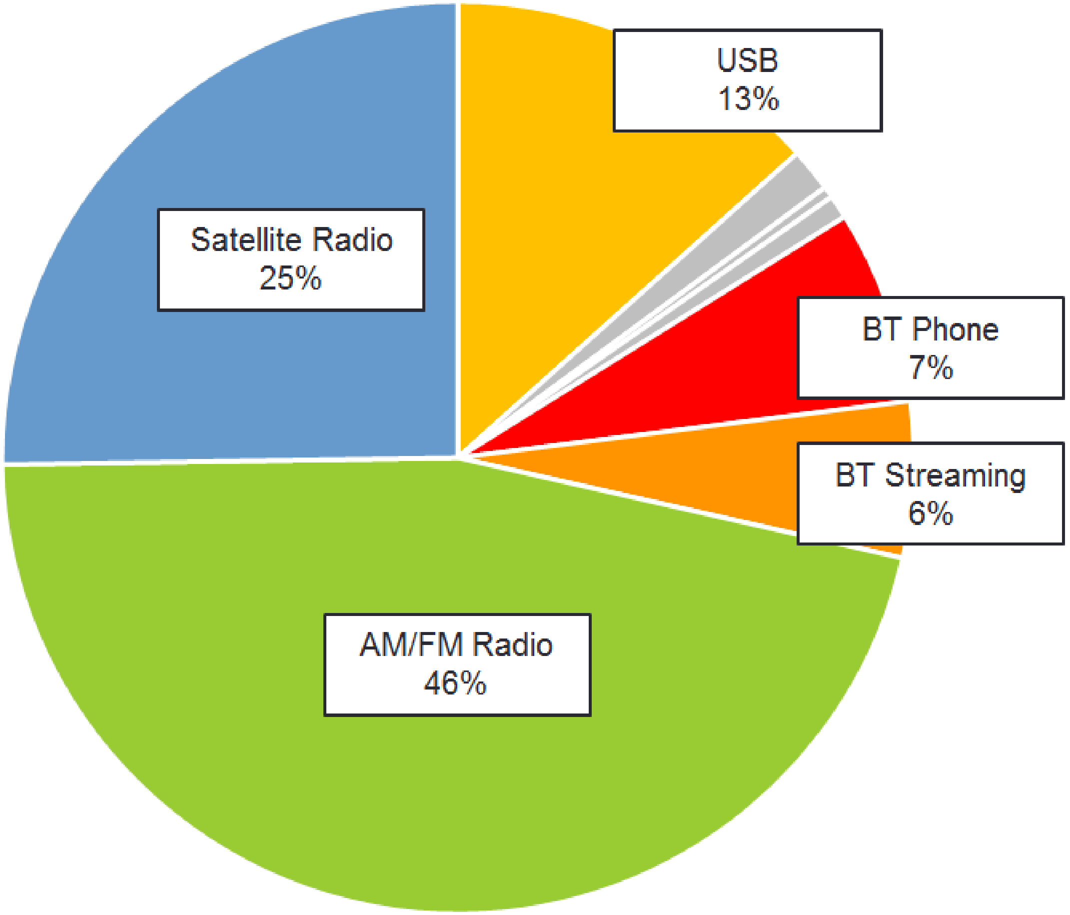
TUNERS HOLDING THEIR OWN IN THE U.S.

STRATEGY ANALYTICS

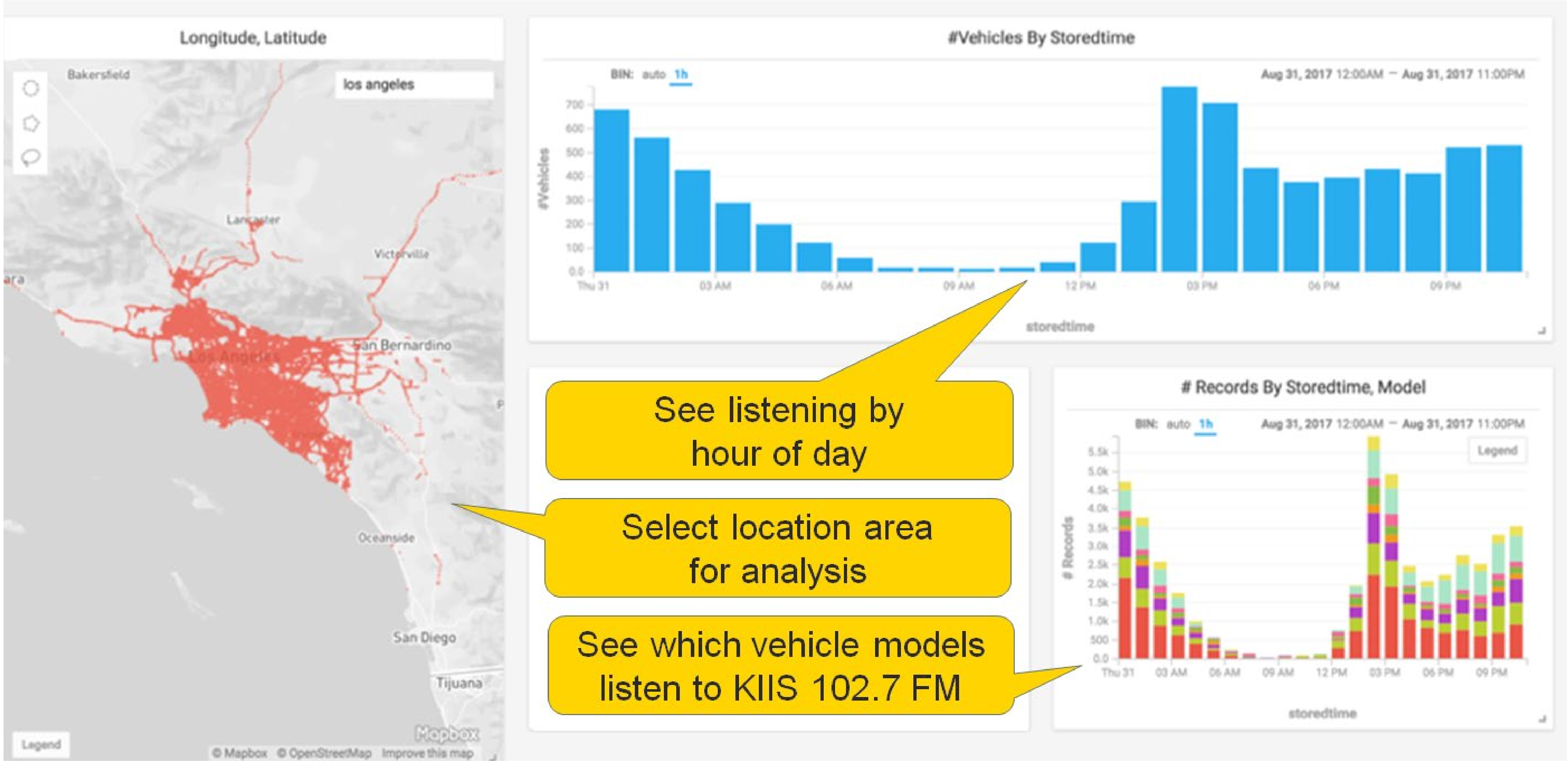
Los Angeles:



Chicago:



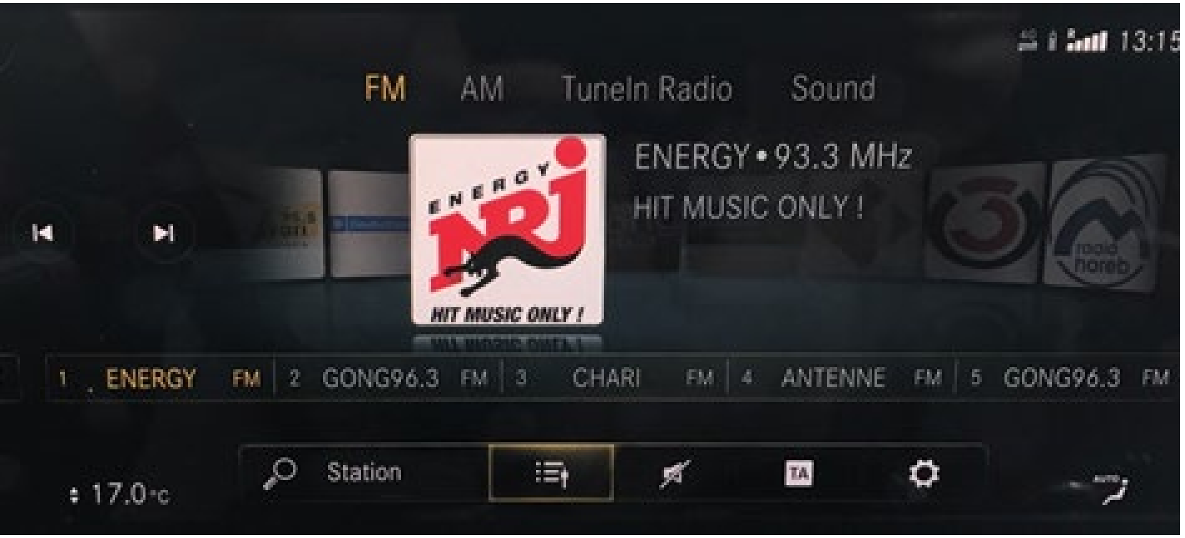
ANSWERING Q'S FOR CAR MAKERS, BROADCASTERS, ADV'RS



THE CAR IS A BROWSER

Intent

Attribution



2019 INFOTAINMENT REPORT: NEW ADVANCES FOR STREAMING

June 2019

Derek Viita

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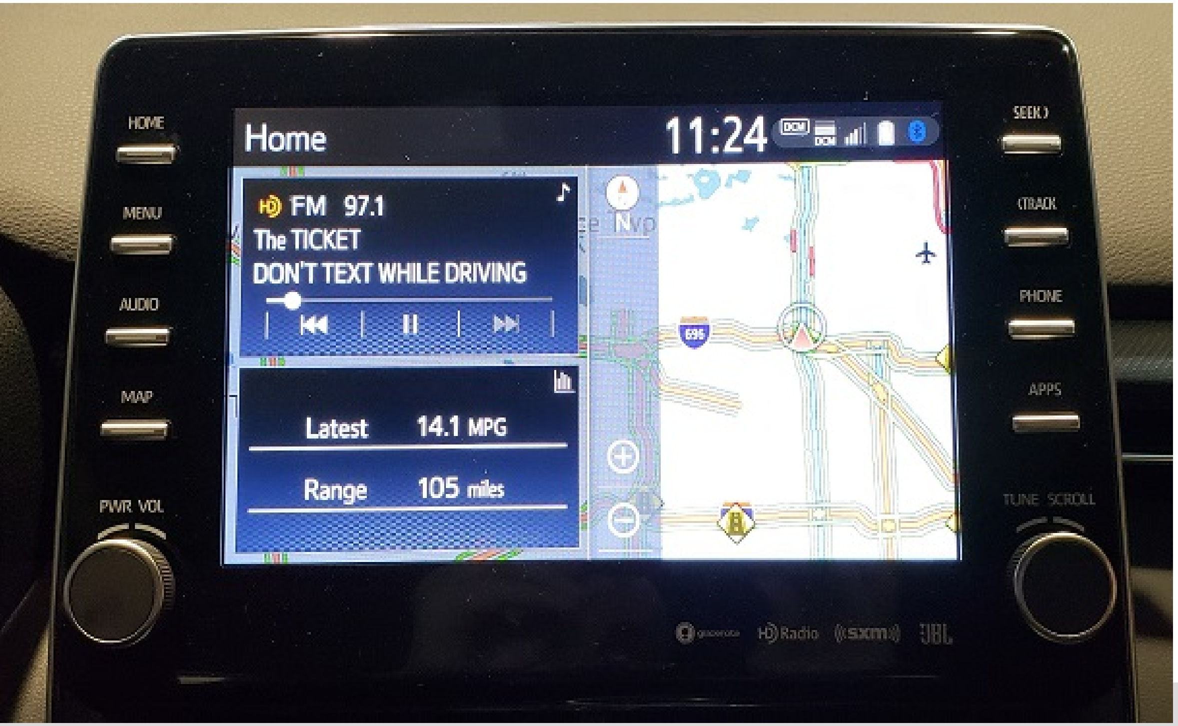
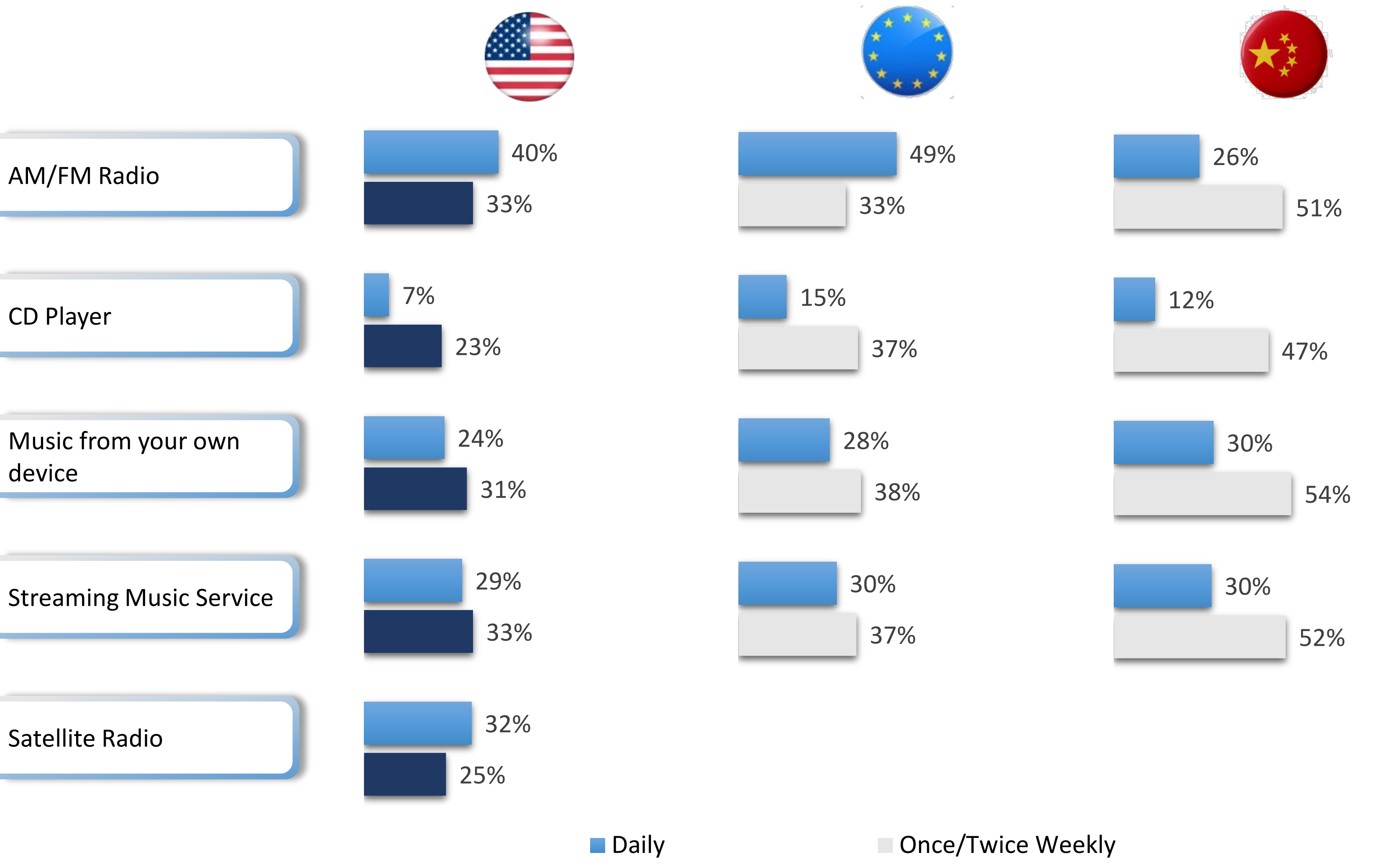
EXECUTIVE SUMMARY



- **Strategy Analytics undertook a worldwide internet-based survey to investigate car owners' usage of, and interest in, audio infotainment sources.**
  - A total of 4,790 car owners across the US, UK, France, Germany, Italy, and China were surveyed
- **As AM/FM radio usage declines, streaming radio appears to be the heir apparent to owned and brought-in media in the car**
  - Streaming media usage has surpassed that of AM/FM radio usage in China, and has made remarkable gains in Western markets.
  - In the US, an uptick in satellite radio usage was noted, especially among older demographics.

INFOTAINMENT SOURCE USAGE
STREAMING SOURCES SURPASS RADIO IN CHINA

Q: How often do you use each of the following features in your vehicle?



- At least 40% of car owners in Western markets use AM/FM radio in the car daily, with a further 33% using it once/twice weekly.
  - Just 26% of car owners in China use AM/FM radio in the car daily.
- At least 29% of car owners in each market use streaming music services in the car daily.
- At least 24% of car owners in each market listen to owned music from a portable device in a car daily.

Insight: In terms of daily in-car use, streaming music services and portable owned music have overtaken AM/FM radio in China. In Western markets, AM/FM radio is still the most-used in-car source, though in the US, satellite radio and streaming music are relatively close behind.

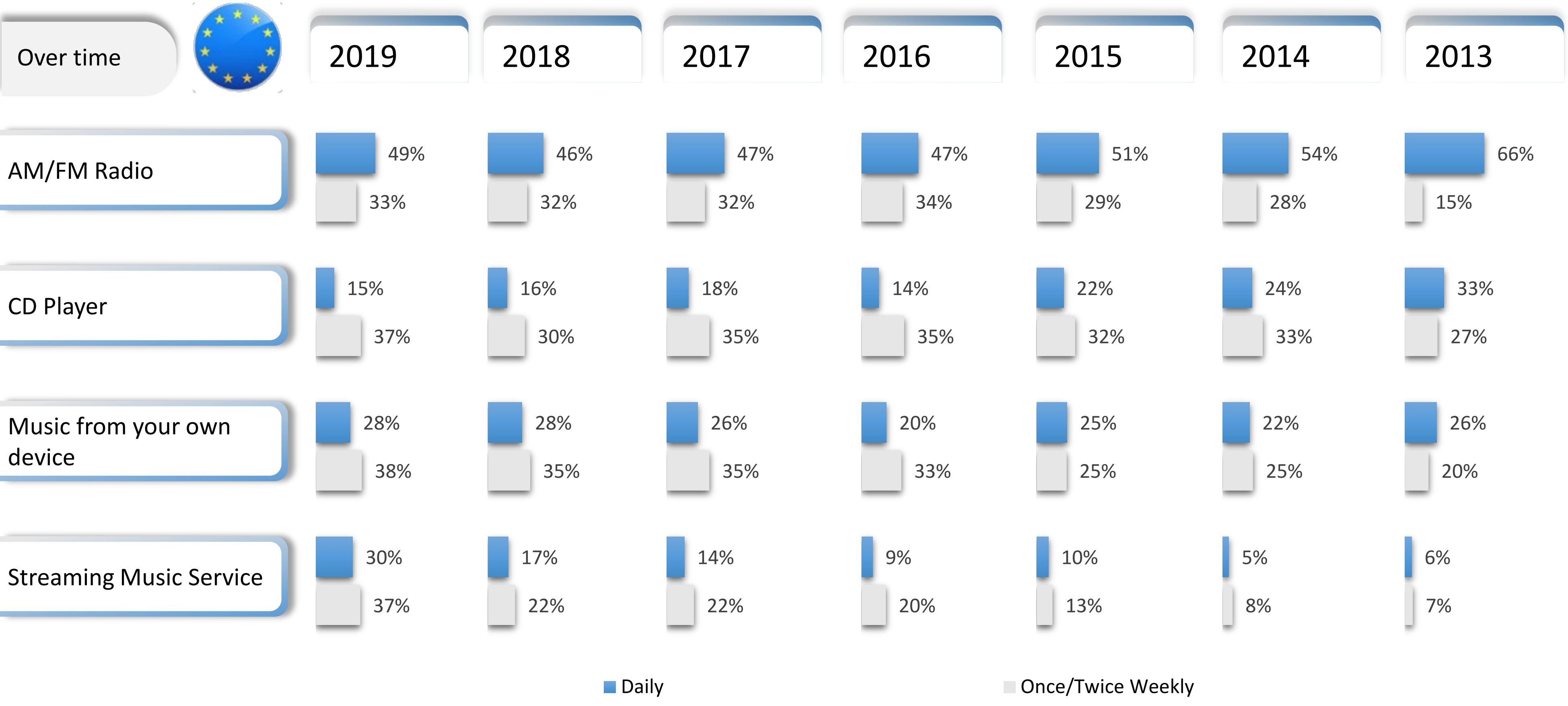
Base US: 1517, Western Europe: 1721, China: 1552

INFOTAINMENT SOURCE USAGE

STREAMING AND SATELLITE RADIO MAKE REMARKABLE GAINS IN US

STRATEGY ANALYTICS

Q: How often do you use each of the following features in your vehicle?



In Western Europe from 2018 to 2019...

- ...daily usage of AM/FM radio rose 3 percentage points.
- ...daily usage of streaming music in the car rose 13 percentage points, and weekly usage rose 15 percentage points.

Insight: AM/FM radio remains a daily in-car staple for much of Europe, but with such a marked increase in online media consumption, terrestrial providers will need to find new and novel ways to deliver content in the car.

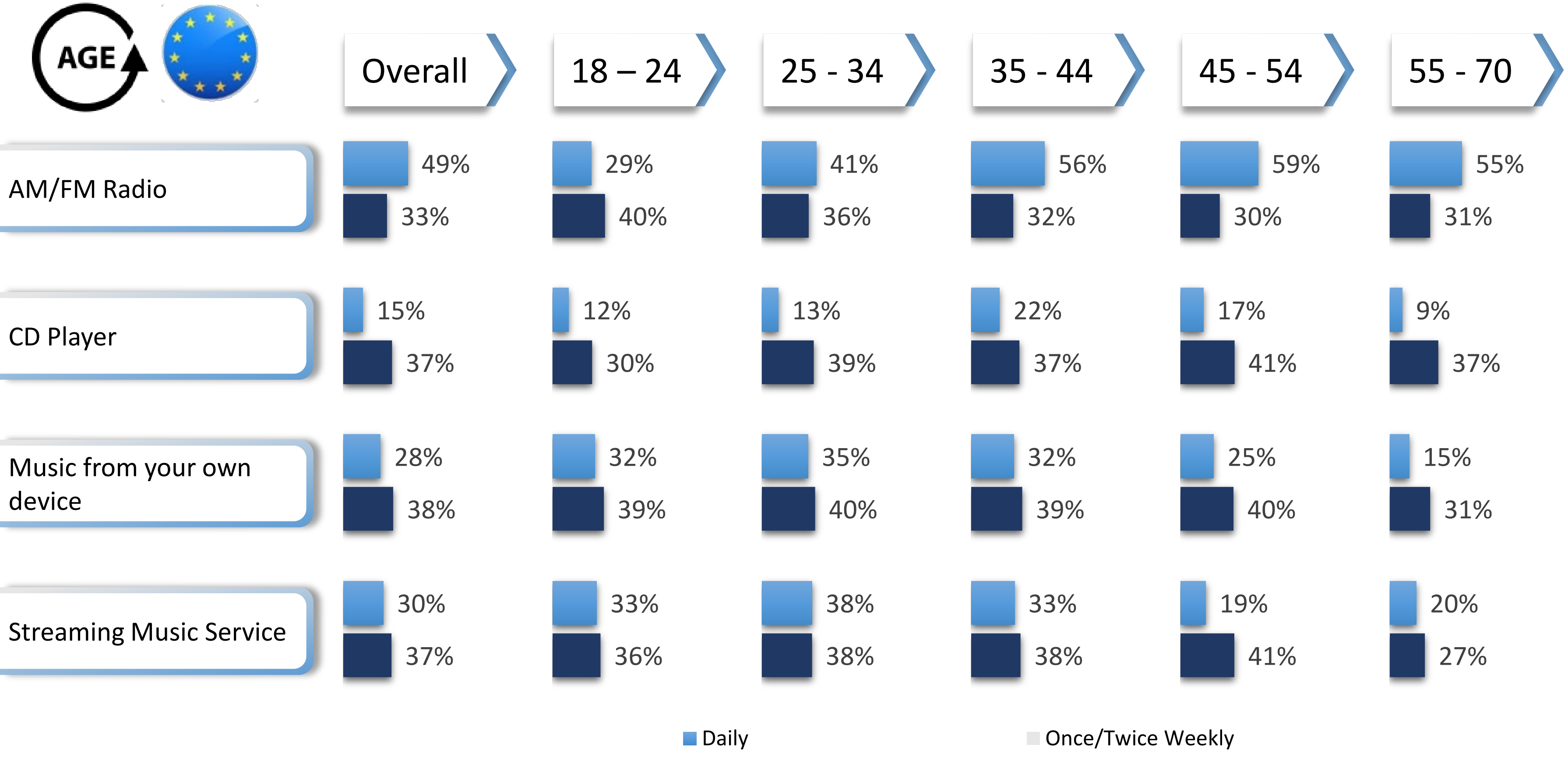
Base Western Europe: Overall (2019) – 1721

INFOTAINMENT SOURCE USAGE

STREAMING AND SATELLITE RADIO MAKE REMARKABLE GAINS IN US

STRATEGY ANALYTICS

Q: How often do you use each of the following features in your vehicle?



- Daily in-car usage of AM/FM radio is highest in the 45-54 age group (59%).
- Daily usage of streamed or owned music trends somewhat young, highest in the 25-34 age group (at least 35%) and lowest in the 55-70 age group (no more than 20%).
- Weekly CD player usage is still relatively robust in Europe, and daily usage is still somewhat high in middle age groups, peaking at 22% among those aged 35-44.

Insight: In Europe, the advance of streaming radio is powered by heavy daily usage among younger age groups, though this trend is not as strong as the one noted in the US.

Base Western Europe: Overall – 1721, 18-24 – 281, 25-34 – 357, 35-44 – 383, 45-54 – 345, 55-70 – 355

INFOTAINMENT SOURCE USAGE

STREAMING AND SATELLITE RADIO MAKE REMARKABLE GAINS IN US

STRATEGY ANALYTICS

Q: How often do you use each of the following features in your vehicle?

Tech Group		Overall	Early Adopter	Early Majority	Late Majority	Laggard
AM/FM Radio	Daily	49%	59%	49%	45%	33%
	Once/Twice Weekly	33%	33%	35%	32%	30%
CD Player	Daily	15%	27%	12%	8%	14%
	Once/Twice Weekly	37%	48%	35%	30%	35%
Music from your own device	Daily	28%	46%	26%	19%	12%
	Once/Twice Weekly	38%	43%	41%	29%	38%
Streaming Music Service	Daily	30%	49%	24%	18%	24%
	Once/Twice Weekly	37%	39%	39%	31%	29%

Daily   Once/Twice Weekly

- In Europe, Early Adopters are heavy "channel-flippers," reporting the highest daily usage of all infotainment sources. But the differences in daily usage between Early Adopters and other tech groups is most pronounced for digital media.
  - Daily usage of owned portable media is 46% for Early Adopters, and no more than 26% for all others.
  - Daily usage of streaming music is 49% for Early Adopters, and no more than 24% for all others.

Insight: As with US respondents, robust weekly usage among all tech adoption groups in Europe indicates that streaming media has appeal in all demographics.

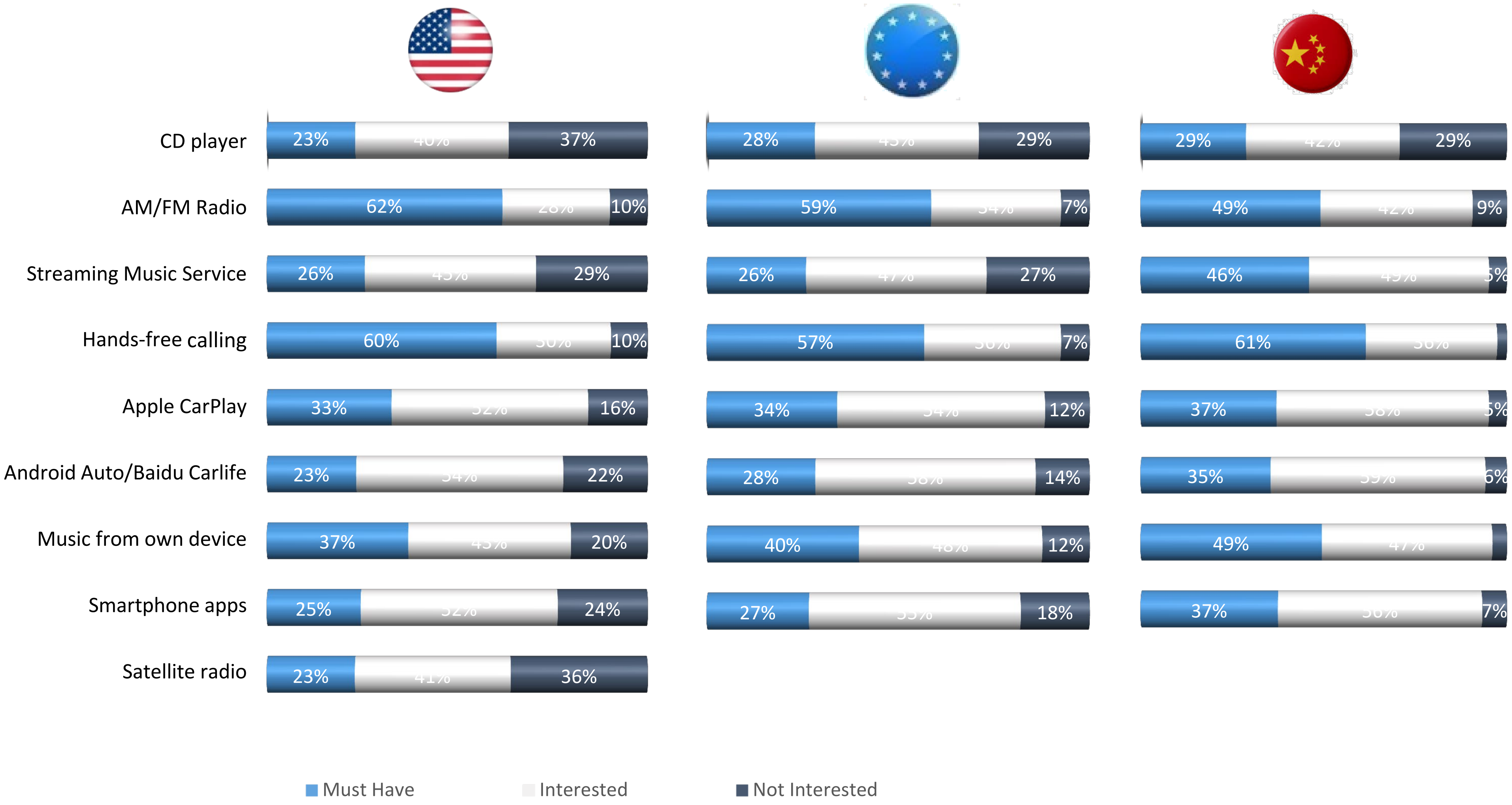
Base Western Europe: Overall – 1721, Early Adopter – 389, Early Majority – 687, Late Majority – 538, Laggard - 107

Note: Tech Group is based on selection of technology statement that best described them

INTEREST IN INFOTAINMENT SOURCES

STREAMING AND SATELLITE RADIO MAKE REMARKABLE GAINS IN US

Q: “Must-have” features for next vehicle



- At least 59% of car owners in Western markets consider AM/FM radio to be a “must-have,” while only 49% of car owners in China feel similarly about AM/FM radio.
- 46% of car owners in China consider streaming music to be a “must-have,” compared to just 26% of those in Western markets.
- 23-37% of car owners in all markets consider any smartphone mirroring system to be a “must-have”

Insight: In China, digital media has fully saturated into regular use in the car. Infotainment systems for China need to be accordingly designed for these use cases.

Base US: 1517, Western Europe: 1721, China: 1552

INTEREST IN INFOTAINMENT SOURCES

AM/FM STILL A MUST-HAVE; MIRRORING SYSTEM DESIRE HAS STABILIZED

STRATEGY ANALYTICS

Q: "Must-have" features for next vehicle

Over time	AM/FM Radio	CD Player	Music from Own Device	Smartphone Apps	Streaming Music Service	Hands Free Calling	Apple CarPlay	Android Auto
2019	59%	28%	40%	27%	26%	57%	34%	28%
2018	53%	31%	39%	41%	23%	57%	38%	30%
2017	55%	38%	38%	34%	20%		29%	25%
2016	63%	42%	42%	32%	15%			
2015	63%	53%	42%	30%	15%			
2014	68%	58%	44%	29%	10%			
2013	73%	56%	44%	30%	7%			

Insight: Radio is still king in Western Europe. For the other media sources: Though usage of streaming music services has passed usage owned brought-in media, car owners are sending mixed signals regarding what is a "must have" in the center stack. Flat UI (allowing easy access to all audio/media sources) will be more important than ever for the next model turn.

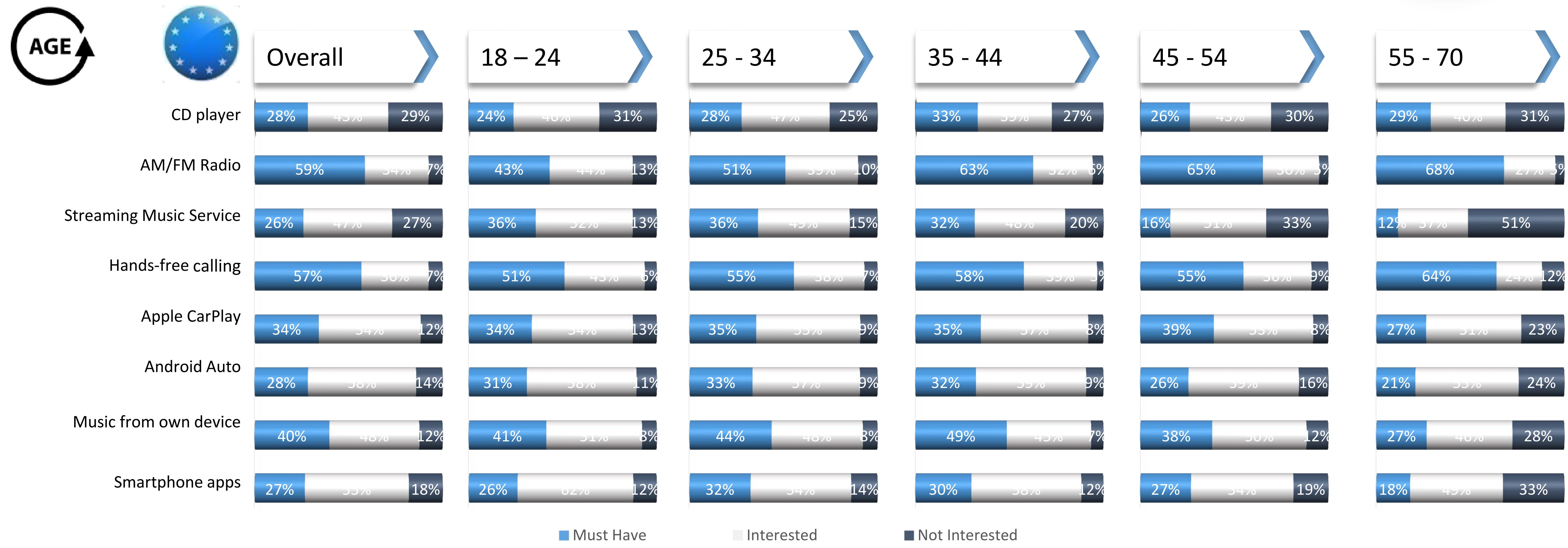
Base Western Europe (2019): CD Player, AM/FM Radio, Streaming Music Service, Hands-free calling, Music from own device, Smartphone App – 1721, Apple CarPlay – 557, Android Auto – 1071

INTEREST IN INFOTAINMENT SOURCES

AM/FM STILL A MUST-HAVE; MIRRORING SYSTEM DESIRE HAS STABILIZED

STRATEGY ANALYTICS

Q: Categorize each feature into one of these three categories for purchase of a new vehicle – Must have/Interested/Not interested

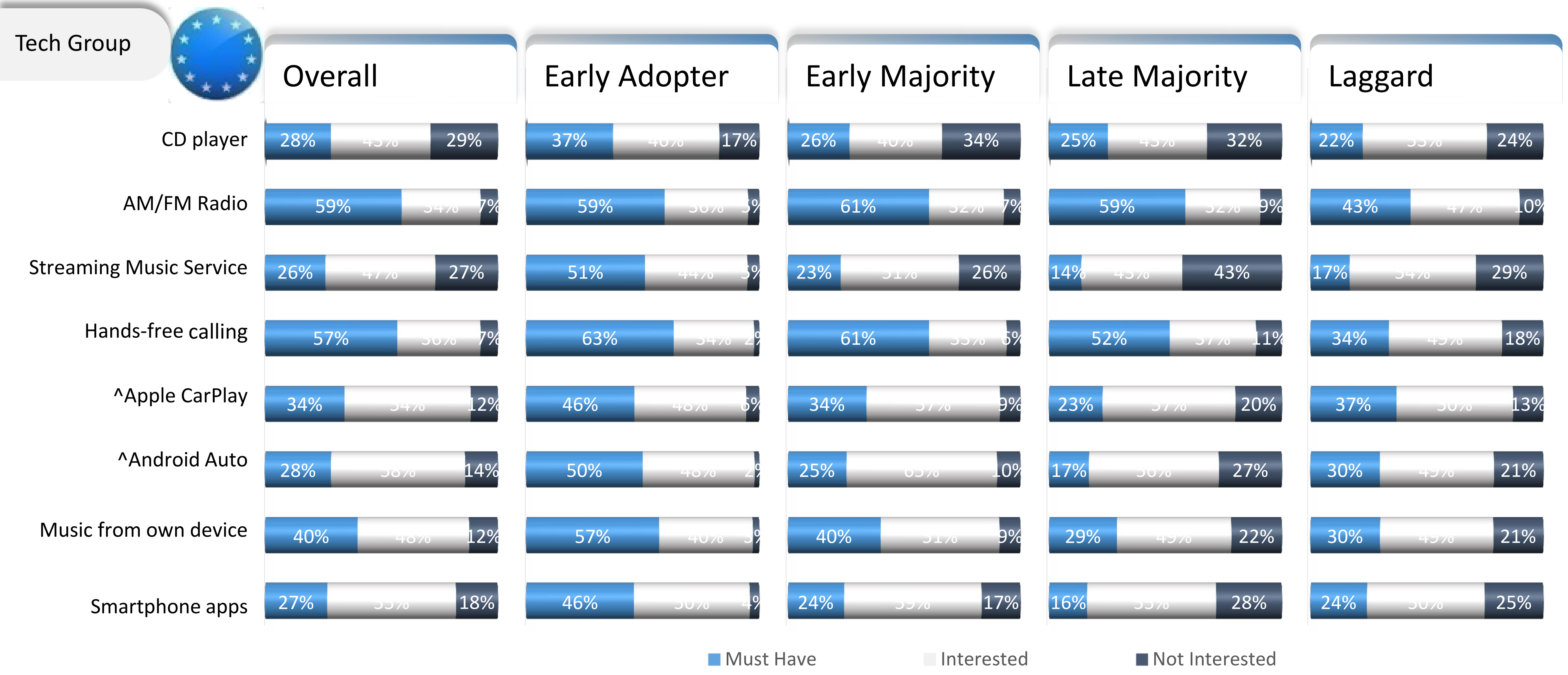


Base Western Europe: (Overall/18-24/25-34/35-44/45-54/55-70): CD Player, AM/FM Radio, Streaming Music Service, Hands-free calling, Music from own device, Smartphone App – (1721/281/357/383/345/355), Apple CarPlay – (557/134/141/112/87/83), Android Auto – (1071/139/203/261/242/226)

INTEREST IN INFOTAINMENT SOURCES
AM/FM STILL A MUST-HAVE; MIRRORING SYSTEM DESIRE HAS STABILIZED

STRATEGY ANALYTICS

Q: Categorize each feature into one of these three categories for purchase of a new vehicle – Must have/Interested/Not interested



Base Western Europe: (Overall/ Early Adopter/Early Majority/Late Majority/Laggard): CD Player, AM/FM Radio, Streaming Music Service, Hands-free calling, Music from own device, Smartphone App – (1721/389/687/538/107), Apple CarPlay – (557/142/204/165/46), Android Auto – (1071/236/456/332/47)

Note: Tech Group is based on selection of technology statement that best described them

CONCLUSIONS

- Infotainment systems in cars are big business
- Google wants a piece of the action
- Connectivity is all about customer retention
- Radio plays an essential role and remains dominant, though at risk
- We are on the cusp of realizing new audience measurement tools and tech

- **Digital radio technology is the tool that is leveling the field of play – new content – new user experiences – more content**