The Status of Radio in the Connected Car

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STRATEGY ANALYTICS

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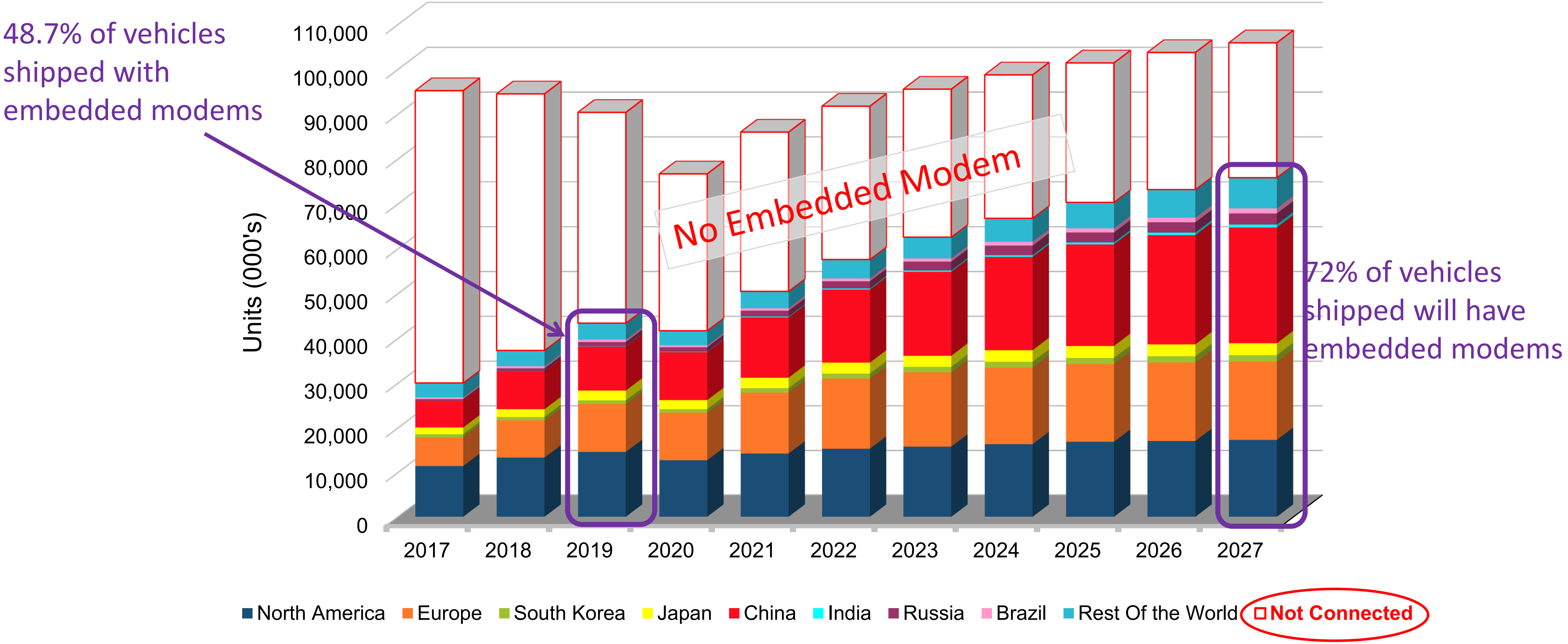
WHAT WE NEED TO KNOW

- State of automotive connectivity
- A battle over user experiences/interfaces
- Impact of Google, Android, Apple (Amazon? Alibaba? Baidu?)
- Emerging role of digital assistants
- Driver monitoring – potential game changer
- Audience measurement on steroids
- Car as browser

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

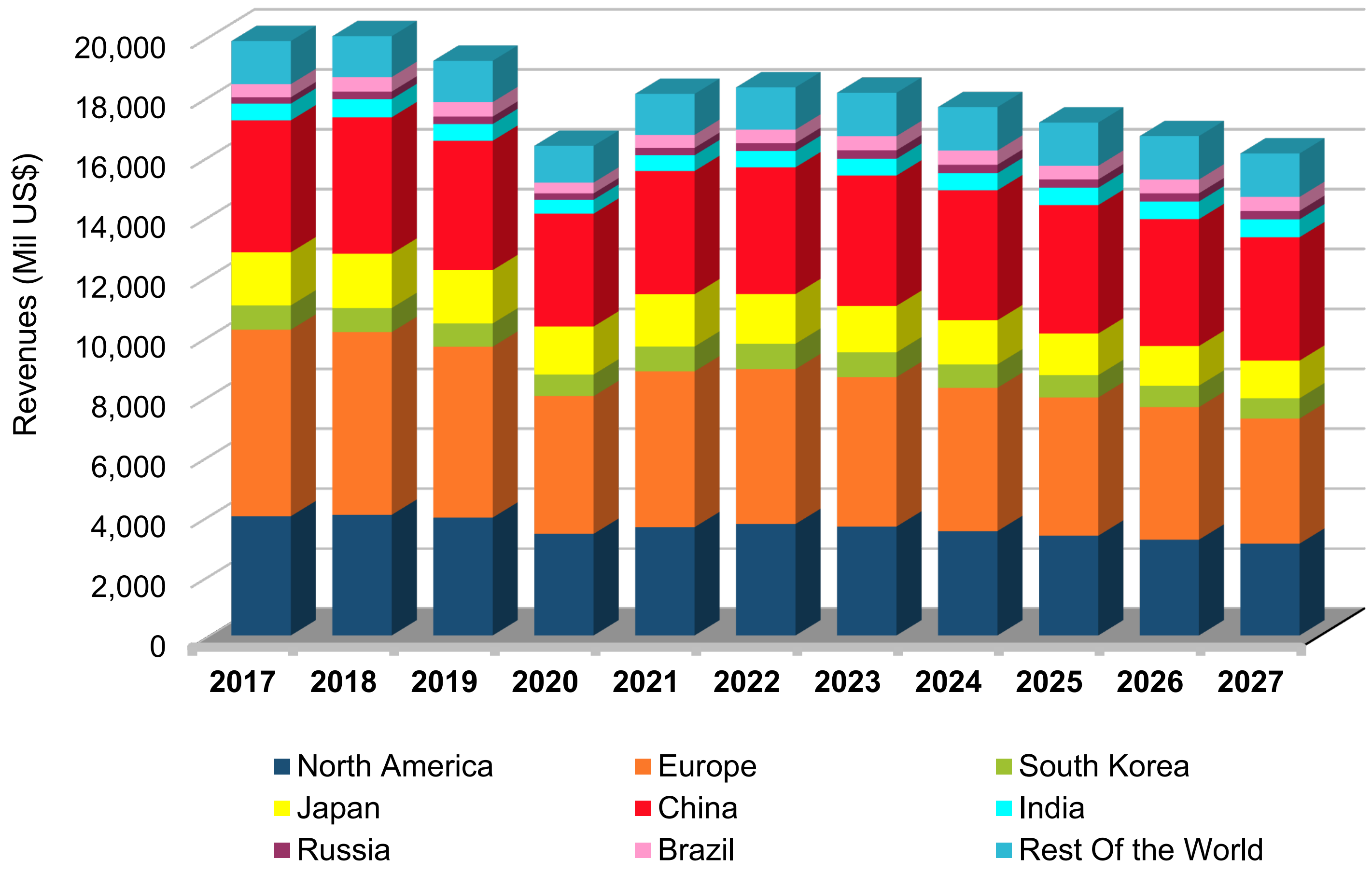
AUTOMOTIVE EMBEDDED MODEMS
GLOBAL ANNUAL SHIPMENTS



OEM HEADUNIT UNDER THREAT: GLOBAL REVENUE OPPORTUNITY

STRATEGY ANALYTICS

Headunit Supplier Revenue Opportunity 2019 vs. 2027: -16.1% (CAGR -2.2%)

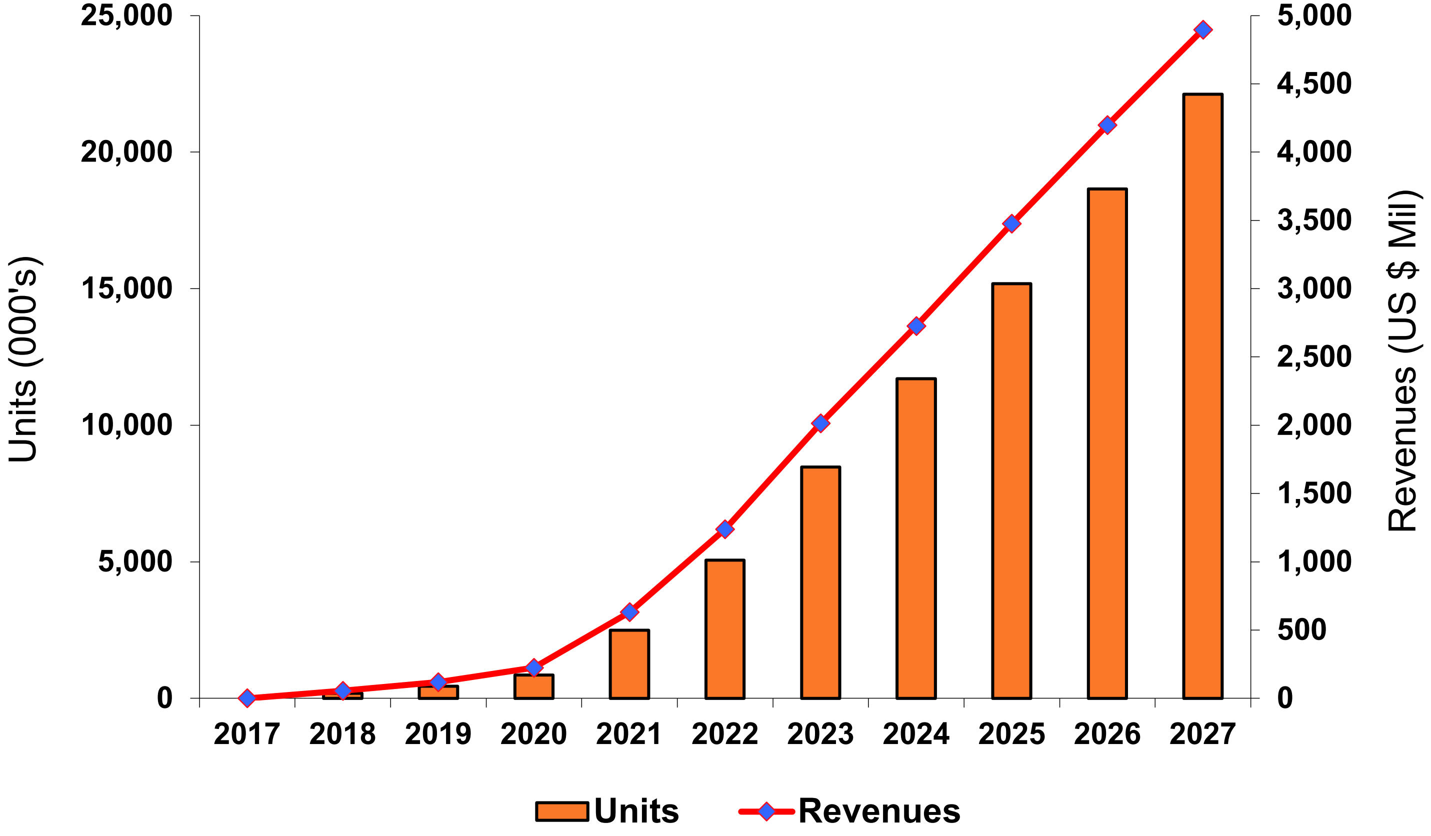


- China -4.6%: From $4.3 Billion in 2019 to $4.1 Billion in 2027 (CAGR -4.6%)
- North America -22.1%: From $4.0 Billion in 2019 to $3.2 Billion in 2027 (CAGR -3.1%)
- Europe -26.8%: From $5.7 Billion → $4.1 Billion (CAGR -3.8%)
- Japan -29.3%: From $1.78 Billion in 2019 → $1.25 Billion in 2027 (CAGR -4.2%)
- India +7.4%: $560 Mil in 2019 to $600 Million in 2027 (CAGR 0.9%)
- Brazil -3.3% : $485 Mil in 2019 to $470 Mil in 2027 (CAGR -0.4%)

Note: By 2021 the 'traditional' headunit market opportunity will be challenged by Cockpit Domain Controllers (CDC's). These systems integrate headunit, cluster and HUD functionality

COCKPIT DOMAIN CONTROLLER ECU: OEM GLOBAL SHIPMENTS
UNITS AND REVENUES

Cockpit Domain Controller (CDC) ECU Opportunity



- CDC Shipments 2019 vs. 2027:
  - 440,000 Units in 2019
  - 22.1 Million units in 2027
- CDC Revenues 2019 vs. 2027:
  - $120 Million in 2019
  - $4.9 Billion in 2027

Average Selling Price

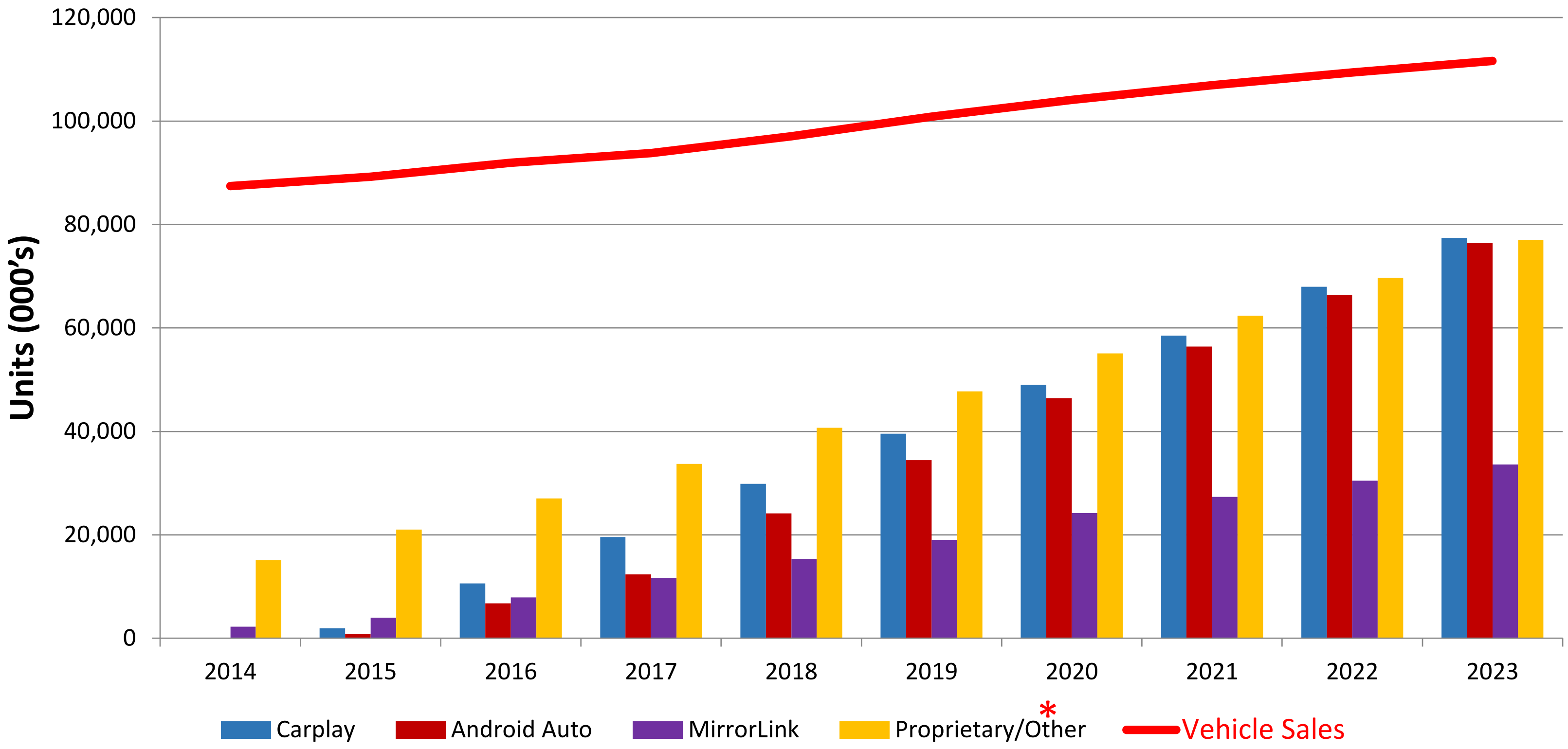
2019: $271/unit → 2027: $221/unit

Note: CDC's integrate the traditional headunit functions of audio, radio and connectivity with the ability to drive one or more clusters from a single ECU

Source: Infotainment & Telematics Service

BEING CONNECTED….
SMARTPHONE/GATEWAY CONNECTIONS

STRATEGY ANALYTICS



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

Consumer Interest is High 

…But…Limited Control of the IVI Environment! 

STRATEGY ANALYTICS

Hybrid Radio Solutions Multiplying

- **Audi hybrid radio – bespoke, in-house design – integrating broadcast and streaming**
- **Radioline – Broadcast + streaming on Android (Panasonic)**
- **Radioplayer – Streaming only – Polestar + Aptiv**
- **RadioDNS – enabling standards platform**
- **Gracenote, Music Story – Metadata providers**

STRATEGY ANALYTICS

COMPETITIVE LANDSCAPE – MUSIC & MEDIA IN THE CAR

Radioline

- **Android-based hybrid radio**
- **Global, scalable, multi-platform solution**
- **Multi-lingual voice commands**
- **Cross-platform integration**
- **Broadcast, streaming, podcasts**
- **Partnered with Panasonic**

COMPETITIVE LANDSCAPE – MUSIC & MEDIA IN THE CAR

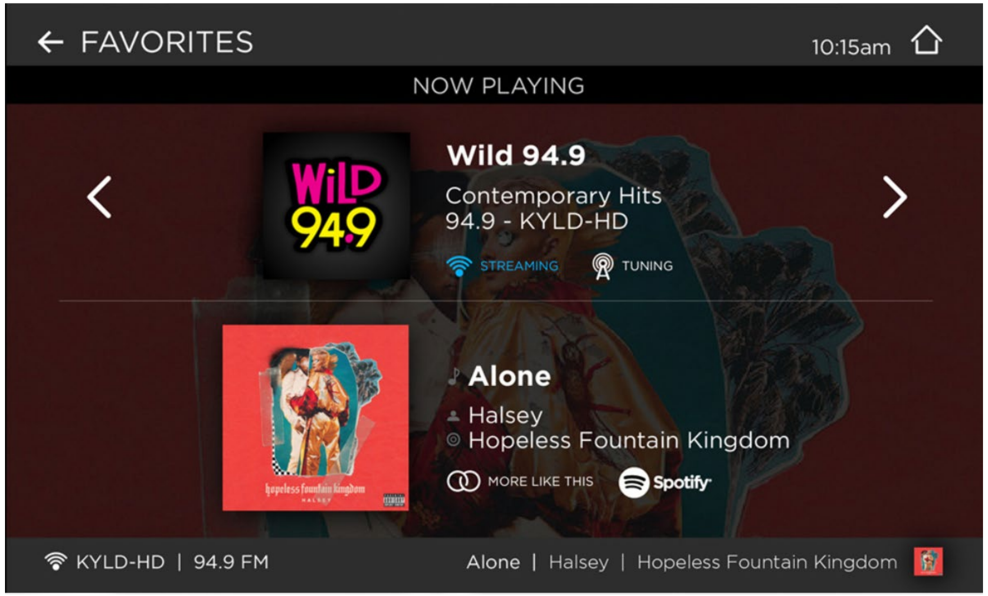
Radioplayer

- **Partnered with Audi**
- **Integrated with Polestar Streaming only**
- **Regional – 10 countries**
- **Ambitious: personalization, measurement, scale**

COMPETITIVE LANDSCAPE – MUSIC & MEDIA IN THE CAR

Gracenote

- **Global metadata platform**
- **History of successfully charging high license fees**
- **Refocusing on automotive industry**
- **Touting music ID, station ID, sports event info**
- **Targeting personalization, location relevance**
- **Broadcast and streaming solution**
- **Most direct competitor with Xperi**
- **Ownership by Nielsen something of a wild card – will they do measurement?**



DIGITAL ASSISTANTS & RADIO
MARKET TRENDS

Voice-based digital assistants are rapidly bringing limited types of AI to our cars and our homes – AND **access to streaming radio content**.

- 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

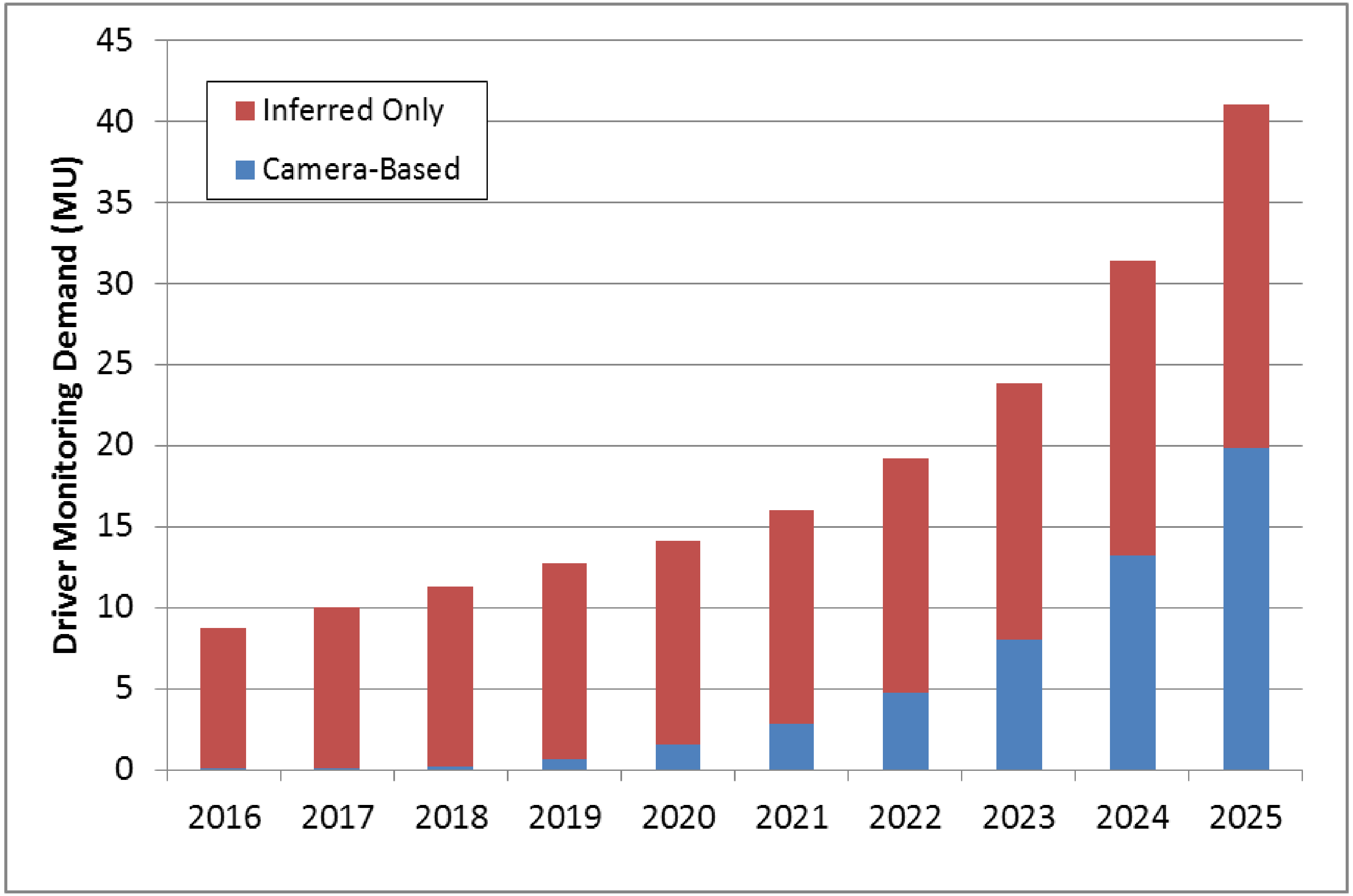
OEMS' INFOTAINMENT AI PARTNERSHIPS

OEM	Digital Assistant	Status
Audi	Alibaba's Tmall Genie, PIA	Tmall Genie – Launch TBD PIA – Concept demonstration
BMW/MINI	Amazon Alexa, BMW Intelligent Personal Assistant	Alexa – Launched (BMW Connected mobile app integration), launching in MINI cars, this year BMW Intelligent Personal Assistant – Used cloud services from Microsoft that underpin Cortana to develop this solution, i.e. Microsoft white label solution provider
Ford	Amazon Alexa	Launched
Honda	HANA, Honda Personal Assistant	Hana – demonstrated, developed via SoftBank partnership Honda Personal Assistant – developed via partnership with SoundHound
Hyundai	Amazon Alexa, Google Assistant, SoundHound's Houndify	Alexa and Google Assistant launched, Houndify launched in Hyundai Venue in India
Mercedes	Google Assistant, Amazon Alexa, Tmall Genie, SoundHound	Google Assistant, Amazon Alexa launched April 2017 SoundHound to launch
Nissan	Google Assistant	Google Assistant – part of Google Automotive Services, which Renault-Nissan-Mitsubishi Alliance has adopted.
PSA	SoundHound's Houndify	Launch was planned for 2020
SEAT	Amazon Alexa	Launched in 2017
Toyota/Lexus	Amazon Alexa, YUI	Alexa – Launched in 2018 YUI – concept demonstration
Volkswagen	Amazon Alexa	Planned, launch date not yet announced
Volvo	Amazon Alexa, Google Assistant, Siri, Alibaba's Tmall Genie	Alexa, Google Assistant, Siri, works with OnCall App Tmall Genie- launch date not yet announced

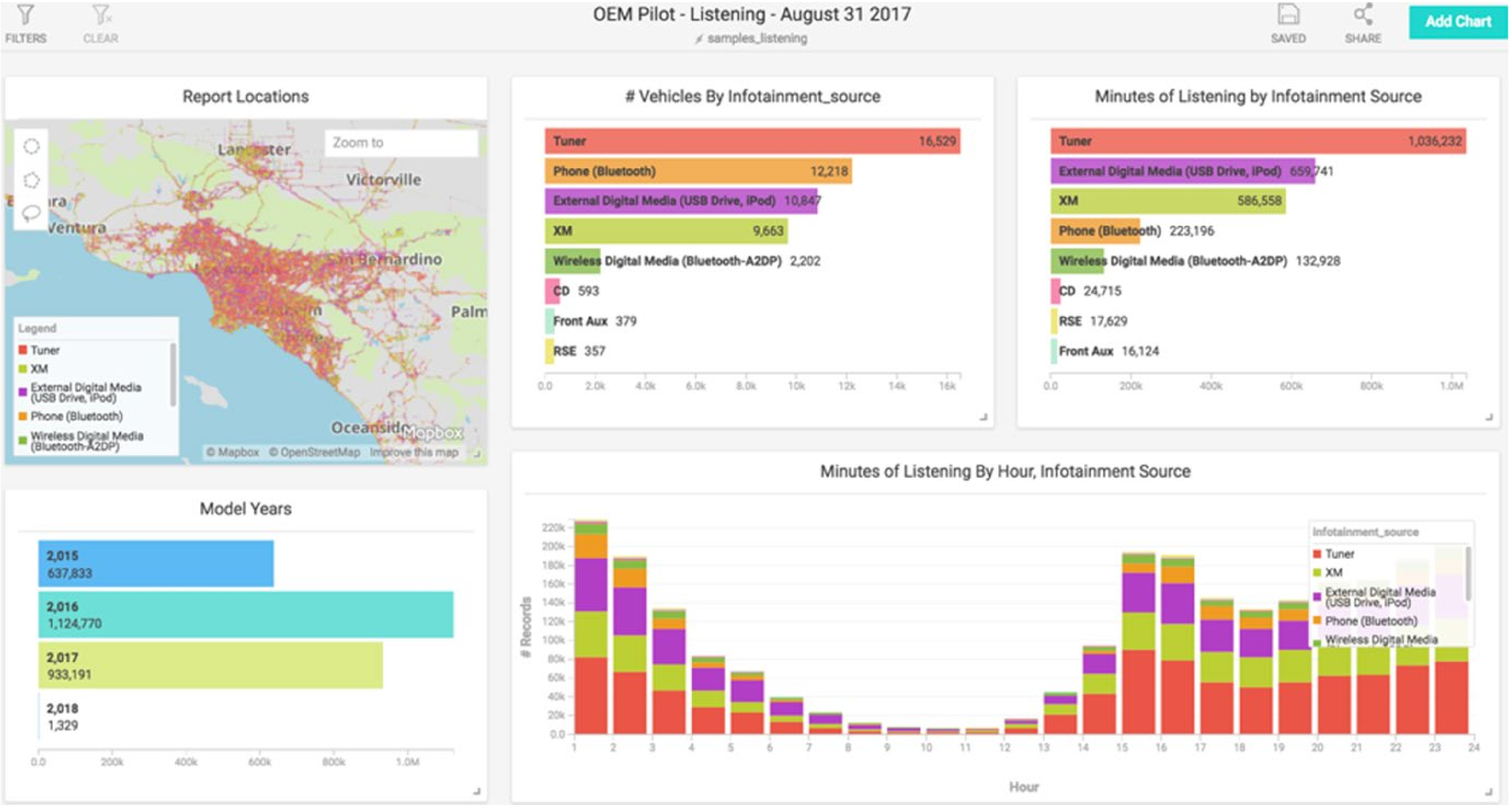

CoDriver for Driver Monitoring
JUNGO
CONNECTIVITY
Sensor:
Face detection
Alignment
Pose
Eyes open/openness
Gaze Tracking
Person ID, Age, Gender
Anti-spoofiness
Emotion
Multi-people
....
States:
Ready To Take Control
Distraction
Drowsiness
Head bob/drop
Distress
Eye Blink, Sleep
....

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

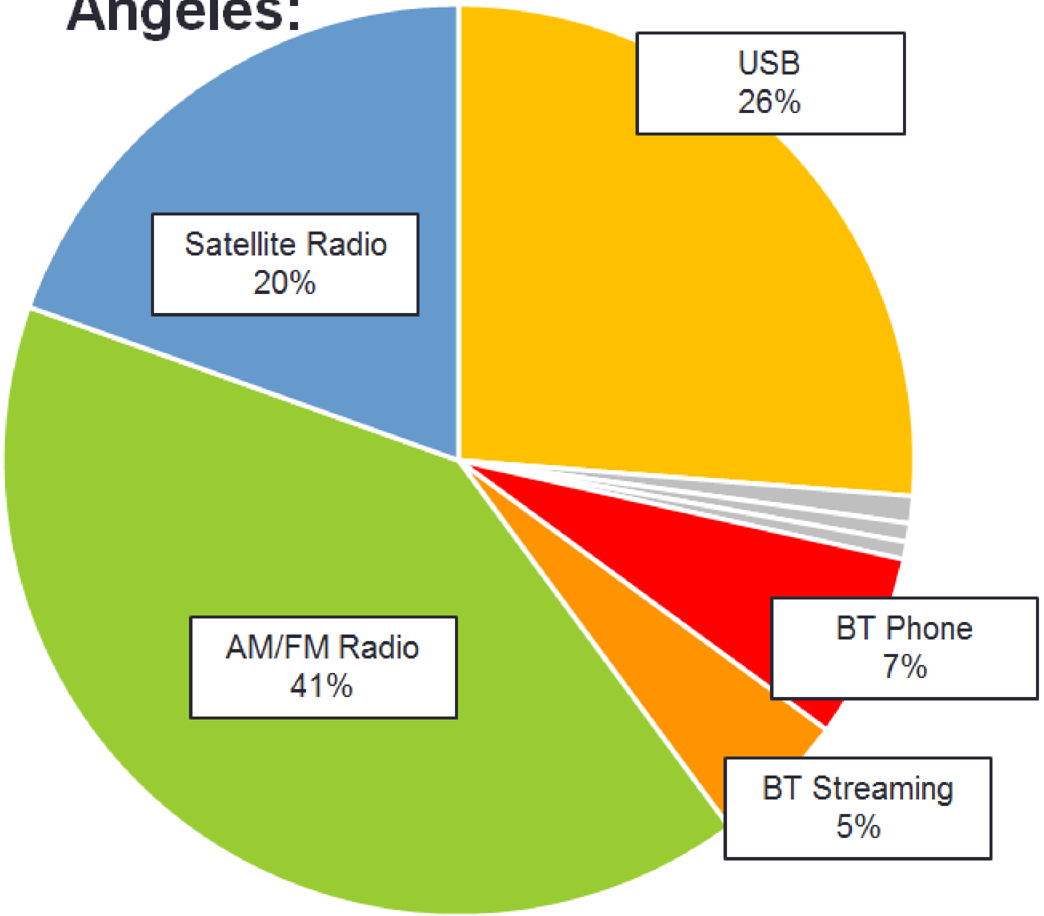


PEERING INTO THE BLACK HOLE OF IN-VEHICLE LISTENING

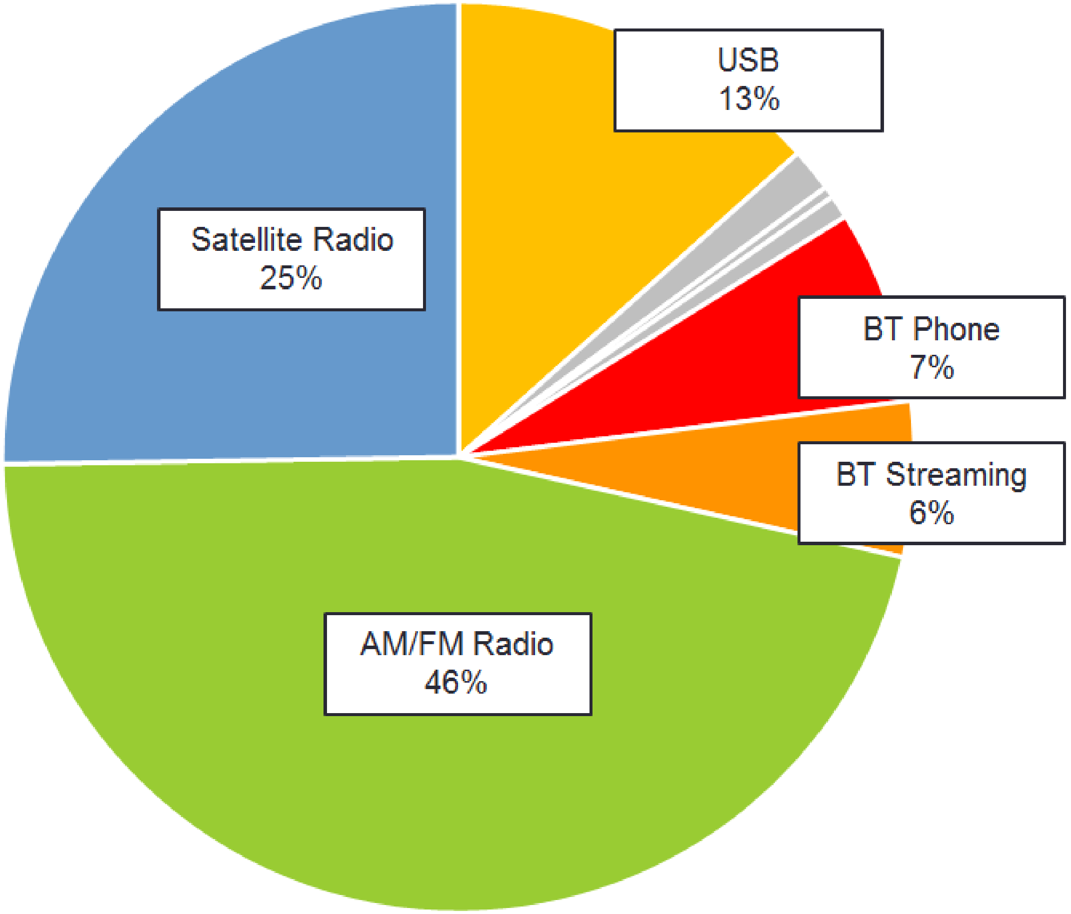


TUNERS HOLDING THEIR OWN IN THE U.S.

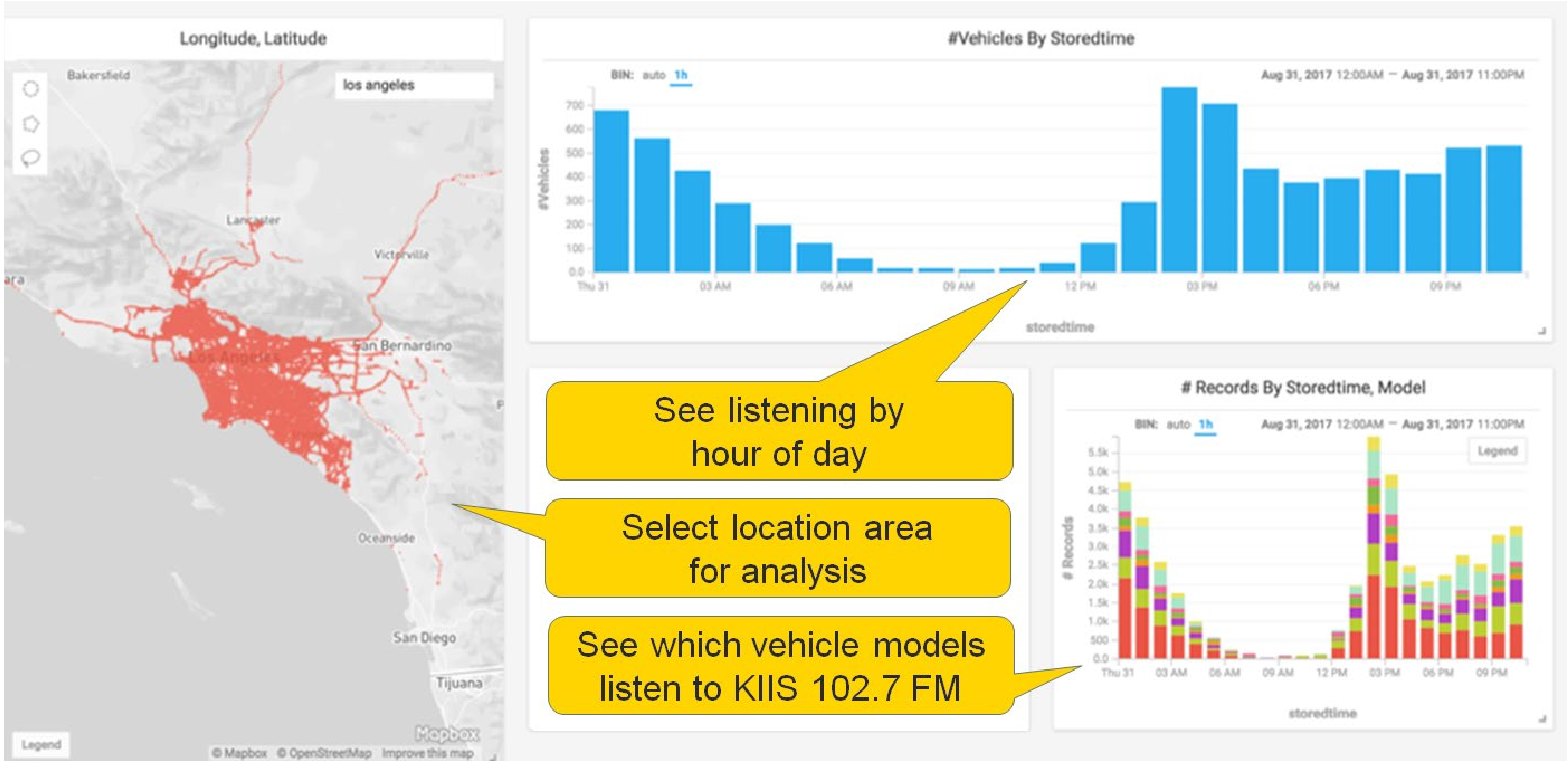
Los Angeles:



Chicago:



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



THE CAR IS A BROWSER

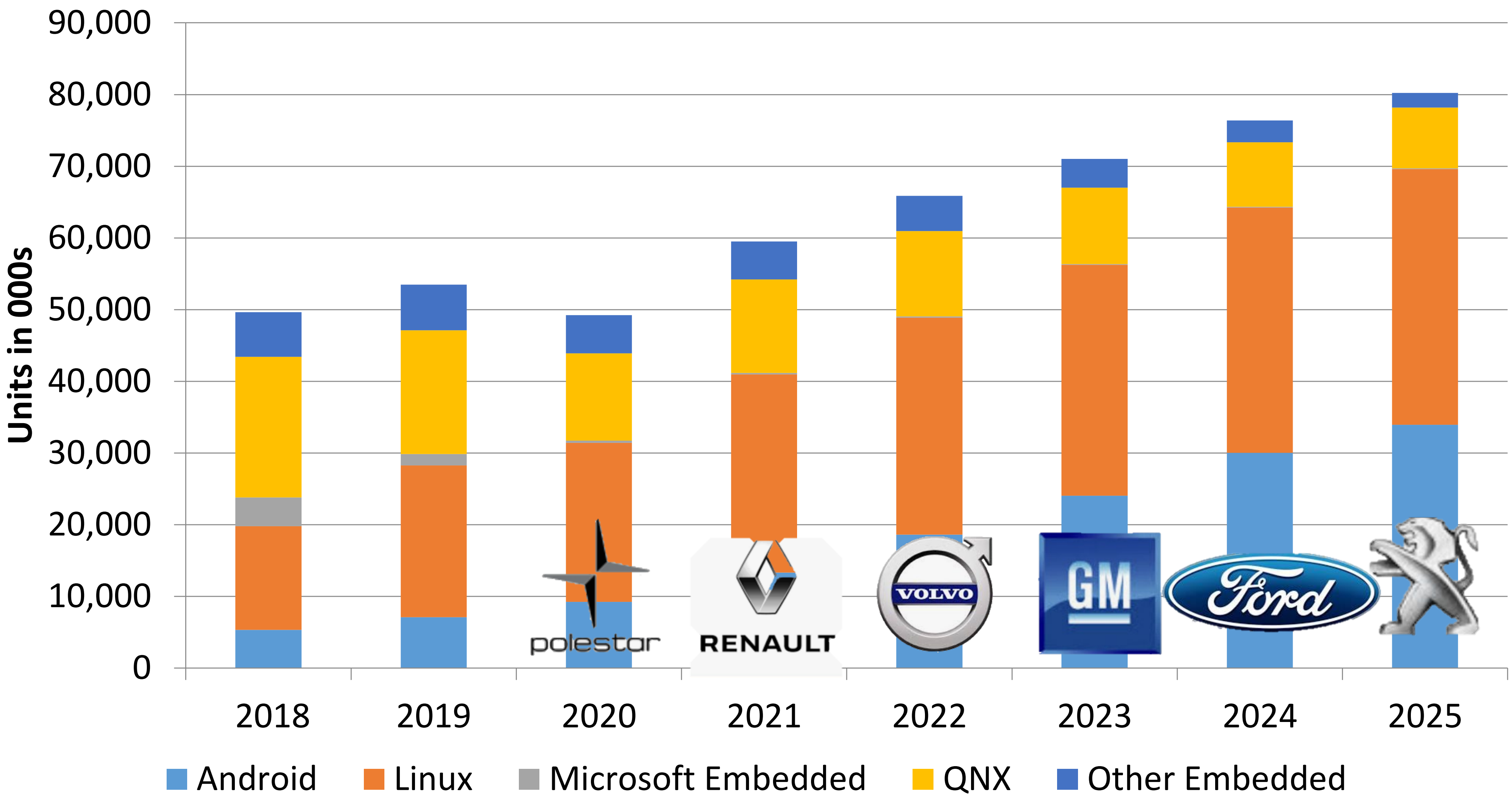
Intent

Attribution

Understanding the impact of Google and Android adoption

STRATEGY ANALYTICS

THE MARCH TOWARD ANDROID ADOPTION IN CARS



Android OS: 5.5M in 2018 to 33.9M by 2025

Linux (incl. AGL and other Linux-based OSes): 14.4M in 2018 to 35.6M by 2025

Microsoft Embedded: 4M in 2018 to 108,000 by 2025.

QNX: 19.6M in 2018 to 8.4M by 2025.

Other Embedded: 6.2M by 2018 to 2M by 2025.

EXECUTIVE SUMMARY

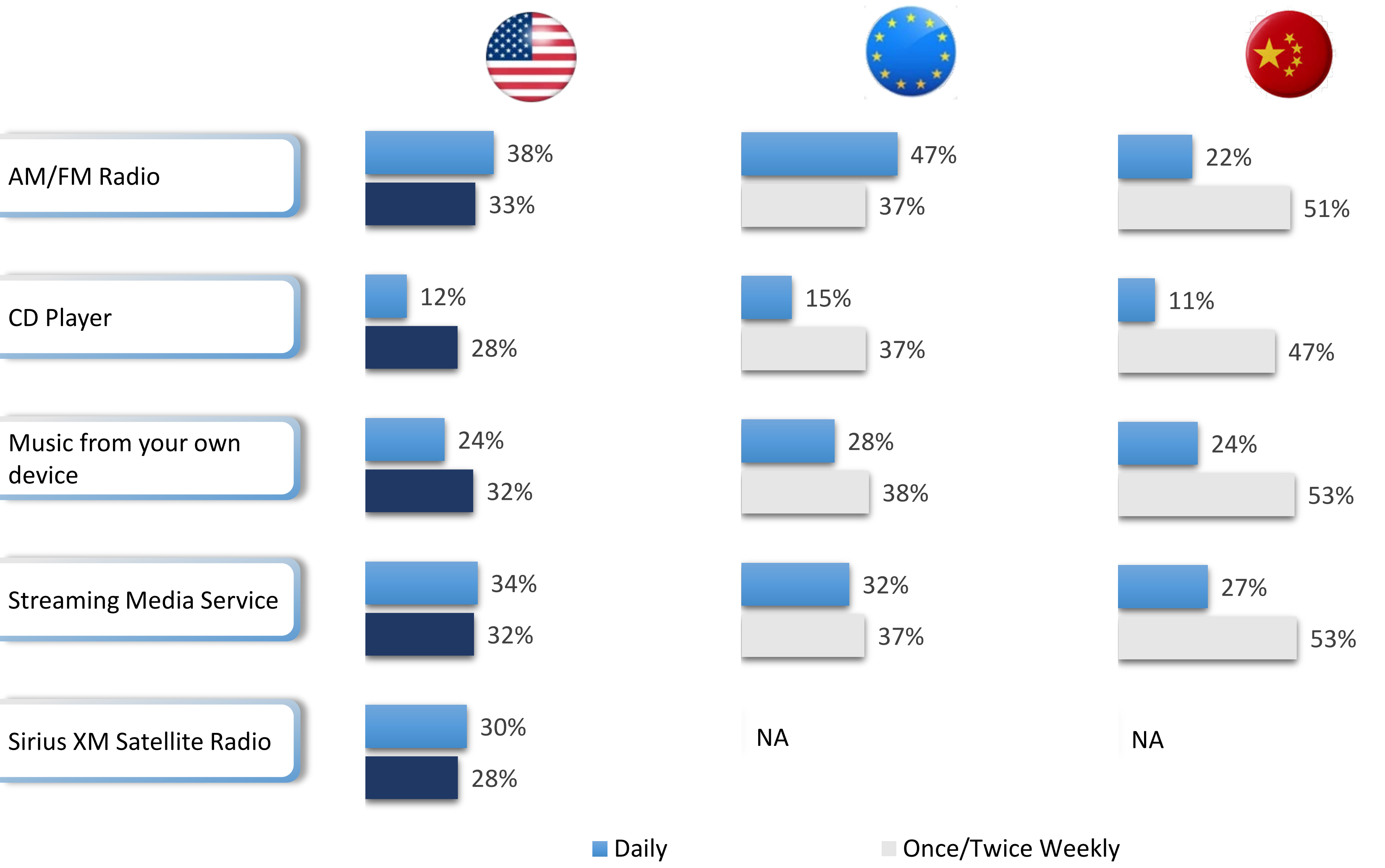
- **Strategy Analytics undertook a worldwide internet-based survey to investigate car owners' usage of, and interest in, audio infotainment sources in the car.**
  - A total of 4,705 car owners across the US, UK, France, Germany, Italy, and China were surveyed.
- **In terms of both usage and interest for in-car listening, AM/FM radio's dominance is now in danger.**
  - Streaming media has continued its steady year-over-year increase, both in terms of daily/weekly usage, and interest as a "must-have" for the next car purchase.
  - In China, streaming is now a clear #1 over AM/FM radio for usage and interest among car owners.
  - Increased adoption of streaming media has been accompanied by declines in usage and interest for AM/FM radio in all regions, including a steep decline in the US.
  - After a slight dip in 2019, interest in smartphone mirroring has rebounded in 2020.

INFOTAINMENT SOURCE USAGE

STREAMING USAGE PULLS CLEAR FROM RADIO IN CHINA, CLOSING FAST IN US

STRATEGY ANALYTICS

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



- At least 38% of car owners in Western markets use AM/FM radio in the car daily, with a further 33% using it once/twice weekly.
  - Just 22% of car owners in China use AM/FM radio in the car daily.
- At least 27% 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 satellite radio and streaming music are close competitors in the US.

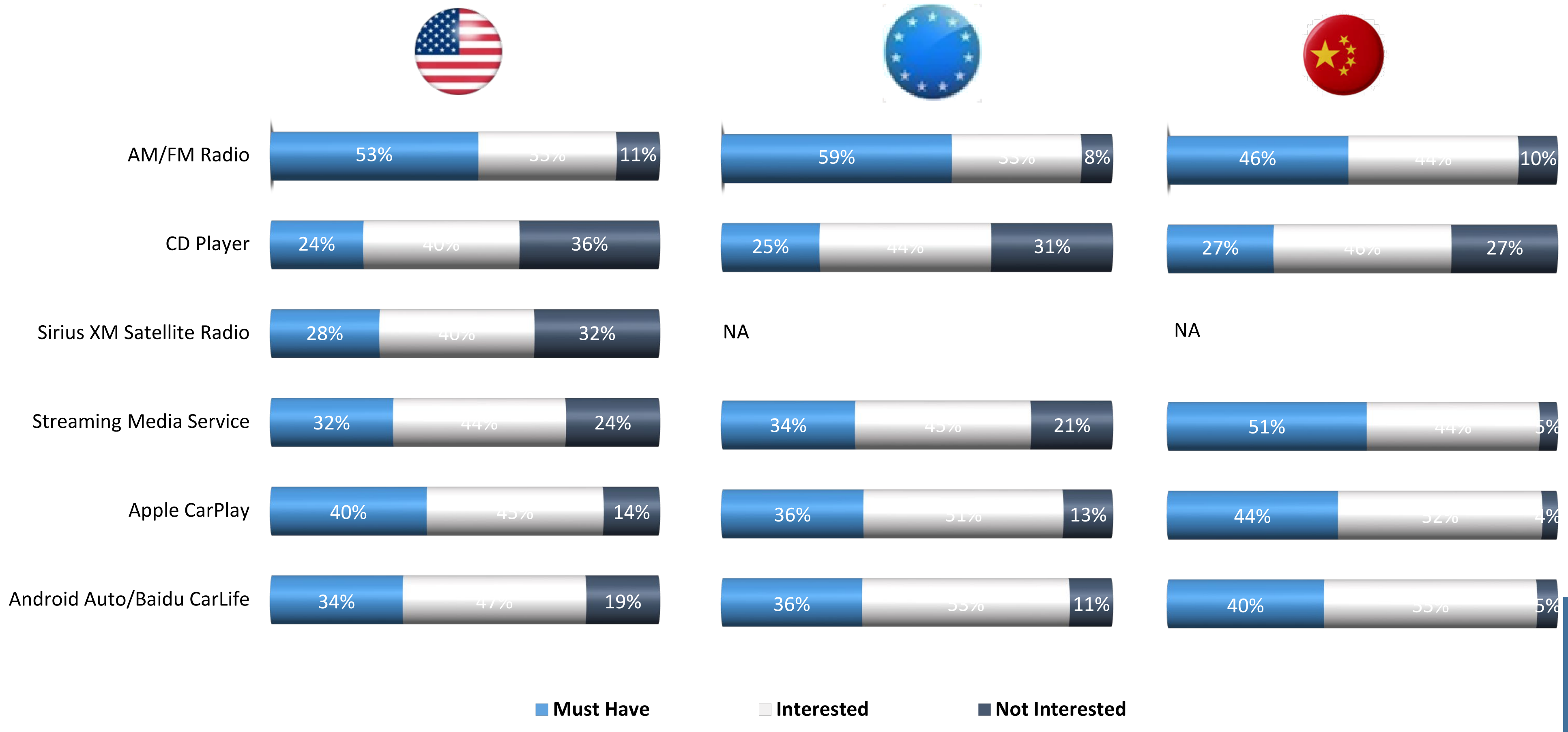
Base: US - 1513, Western Europe - 1661, China - 1531

INTEREST IN INFOTAINMENT SOURCES

THE "NON-RADIO" PICTURE FOR INFOTAINMENT REMAINS UNCLEAR

STRATEGY ANALYTICS

Q: "Must-have" features for next vehicle



- At least 53% of car owners in Western markets consider AM/FM radio to be a "must-have," while only 46% of car owners in China feel similarly about AM/FM radio.
- 51% of car owners in China consider streaming music to be a "must-have," compared to just 32-34% of those in Western markets.
- 34-44% of car owners in all markets consider any smartphone mirroring system to be a "must-have."

Insight: Continuing a trend noted in 2019, consumers still send mixed signals on their "must haves" beyond AM/FM radio. As such, flat UI (for easy access to all sources) remains important for the next model turn.

Base: (US/Western Europe/China) - AM/FM Radio, CD Player, Streaming Media Service (1513/1661/1531), Sirius XM Satellite Radio (1513/NA/NA), Apple CarPlay (913/609/453), Android Auto/Baidu CarLife (561/1024/1531)

INTEREST IN INFOTAINMENT SOURCES

SHARP DROP IN DEMAND FOR AM/FM IN THE US; REBOUNDS FOR ANDROID AUTO & CARPLAY

STRATEGY ANALYTICS

Q: "Must-have" features for next vehicle

Over time	AM/FM Radio	CD Player	Sirius XM Satellite Radio	Streaming Music Service / Streaming Media Service	Apple CarPlay	Android Auto
2020	53%	24%	28%	32%	40%	34%
2019	62%	23%	23%	26%	33%	23%
2018	61%	32%	28%	29%	32%	36%
2017	71%	41%	26%	22%	23%	30%
2016	77%	43%	25%	17%		
2015	72%	50%	29%	27%		
2014	79%	58%	28%	17%		

In the US, when exploring the percentages of car owners who consider a feature a "must-have," and how these numbers changed from 2019 to 2020…

- …AM/FM radio fell 9 percentage points.
- …streaming media rose 6 percentage points.
- …SiriusXM radio rose 5 percentage points.
- …Apple CarPlay rose 7 percentage points.
- …Android Auto rose 11 percentage points.

Insight: In the US, though usage of streaming music has passed usage owned brought-in media, fewer consumers consider streaming service access a "must-have" on the level of access to owned brought-in media. Furthermore, the exploding interest in CarPlay and Android Auto has levelled off and dropped (respectively) as penetration of those systems deepens and consumers become more aware of their benefits and limitations.

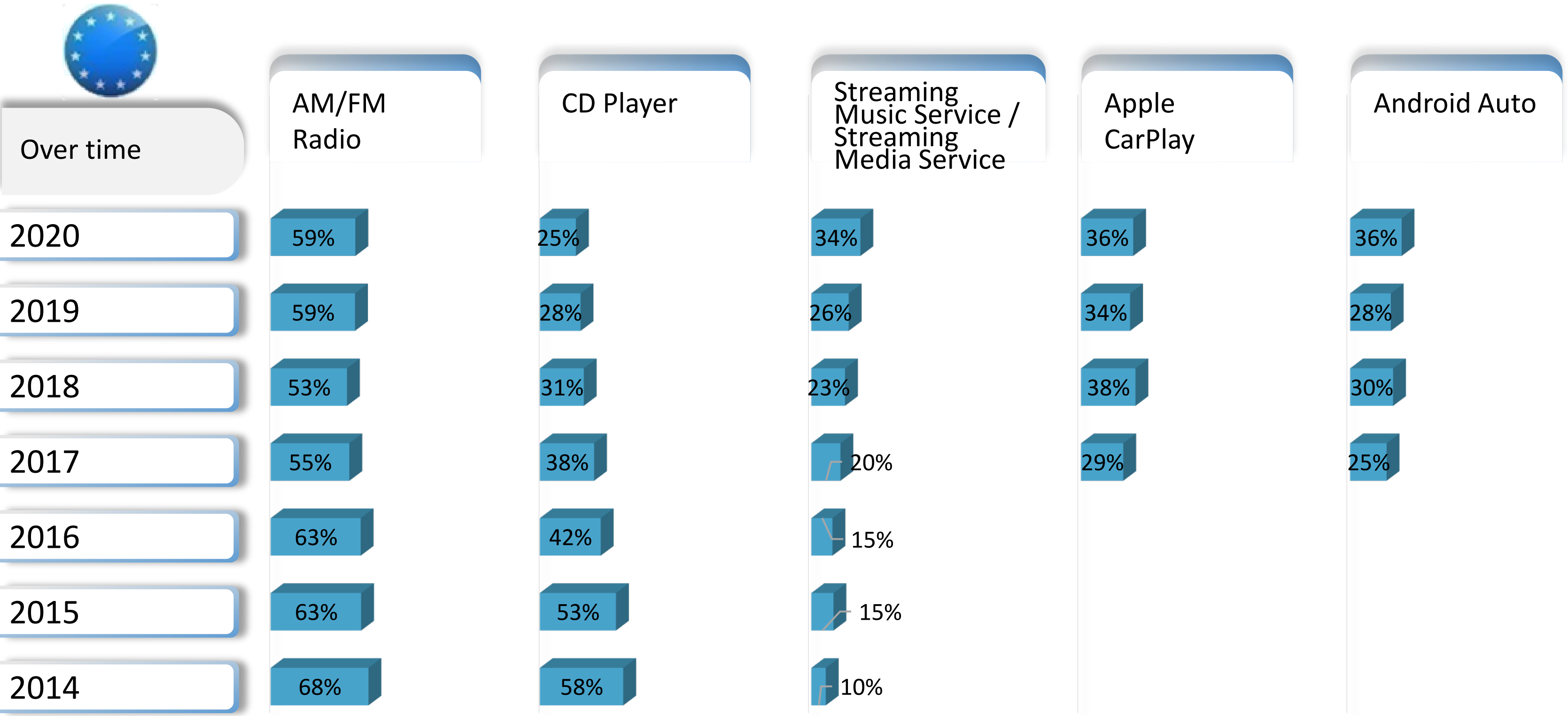
Base: US (2020/2019) - AM/FM Radio,CD Player, Satellite Radio/Sirius XM Satellite Radio, Streaming Music Service/Streaming Media Service (1513/1517), Apple CarPlay (913/895), Android Auto (561/554)

INTEREST IN INFOTAINMENT SOURCES

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

STRATEGY ANALYTICS

Q: "Must-have" features for next vehicle



In Western Europe, when exploring the percentages of car owners who consider a feature a "must-have," and how these numbers changed from 2019 to 2020…

- …AM/FM radio held steady.
- …streaming media rose 8 percentage points.
- …Apple CarPlay rose 2 percentage points.
- …Android Auto rose 8 percentage points.

Insight: In a trend that is identical to one observed in the US, radio is still king in Western Europe, but the percentage of car owners who consider streaming media a "must-have" is sharply increasing. This is likely helping power a rebound in interest for smartphone mirroring, especially Android Auto, which made notable gains in interest among European car owners.

Base: Western Europe (2020/2019) - AM/FM Radio, CD Player, Streaming Music Service/Streaming Media Service (1661/1721), Apple CarPlay (609/557), Android Auto (1024/1071)

INTEREST IN INFOTAINMENT SOURCES

AM/FM RADIO CONTINUES TO SLIDE IN CHINA

STRATEGY ANALYTICS

Q: "Must-have" features for next vehicle

Over time	AM/FM Radio	CD Player	Streaming Music Service / Streaming Media Service	Apple CarPlay	Baidu CarLife
2020	46%	27%	51%	44%	40%
2019	49%	29%	46%	37%	35%
2018	51%	32%	40%	39%	33%
2017	49%	32%	35%	36%	28%
2016	53%	41%	33%		
2015	55%	42%	34%		
2014	62%	51%	32%		

In China, when exploring the percentages of car owners who consider a feature a "must-have," and how these numbers changed from 2019 to 2020…

- …AM/FM radio fell 3 percentage points
- …streaming media rose 85percentage points.
- …Apple CarPlay rose 7 percentage points.

Insight: In China, interest in streaming music as a "must-have" for the next vehicle purchase has now overtaken AM/FM radio in importance. Interest in smartphone mirroring has resumed its rise, after levelling off in 2019. In the China market, flat UI is crucial for upcoming models, in order for users to access the streaming media and terrestrial radio sources they are clearly using in tandem.

Base: China (2020/2019) - AM/FM Radio, CD Player, Streaming Music Service/Streaming Media Service, Baidu CarLife (1531/1552), Apple CarPlay (453/405)

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 – audience measurement and attribution in the works**