Cerence Technology Showcase

September 24, 2020

AI for a World in Motion

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Today's Agenda

- Using AI to Humanize Your Car, Prateek Kathpal, CTO
- Building Blocks of Conversational AI, Dr. Udo Haiber, SVP R&D
- Multimodality Components in Interactive AI, Dr. Christophe Couvreur, VP Products
- Assembling Blocks into Modularized Turnkey Solutions, George Liu, Senior Director, Products
- Bringing Tech Together for New Applications, Dr. Nils Lenke, VP Applications
- Creating Enduring Experiences, Adam Emfield, Senior Manager, UX
- Fireside Chat: Role of AI in Future Connected Vehicles,
  Charan Lota, Chief Engineer, Connected Technologies, Toyota North America
- Innovation in Action, Richard Mack, CMO

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Using AI to Humanize Your Car

Prateek Kathpal| Chief Technology Officer

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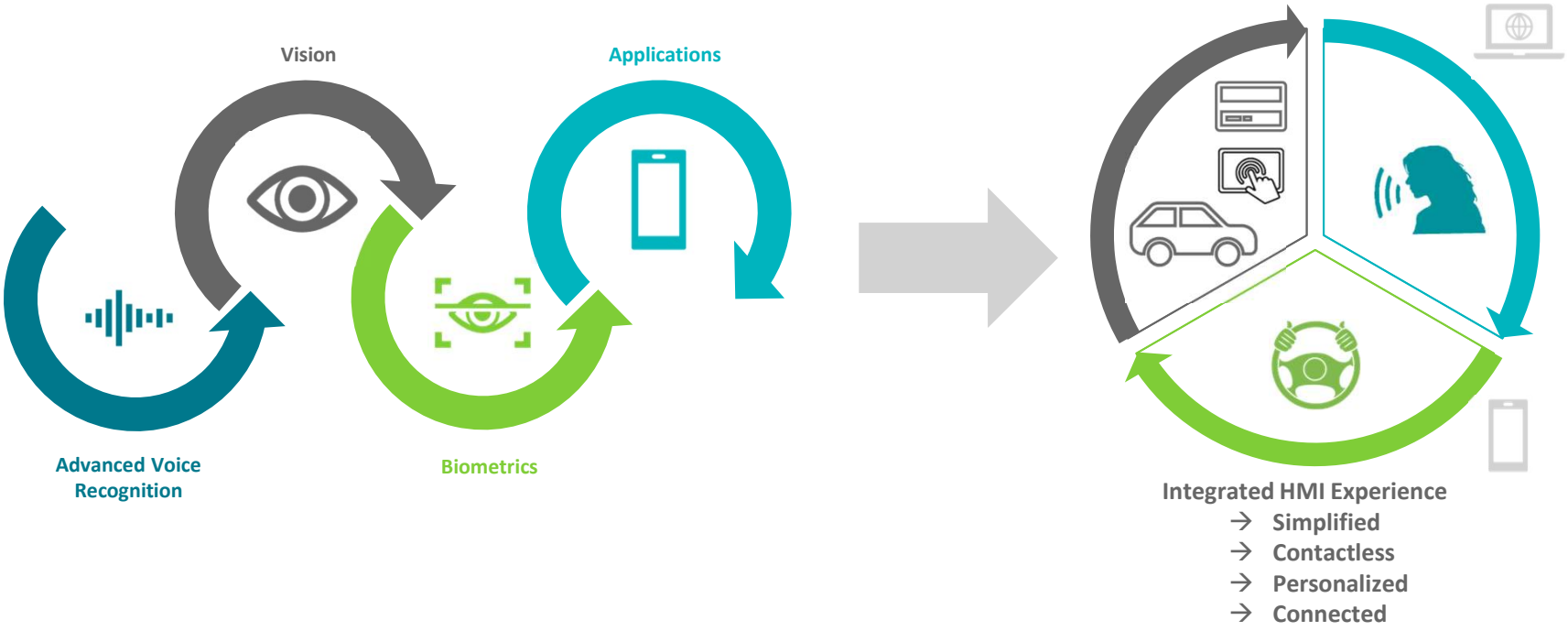
Powering a New Heart and Soul of the Car

Complete In-Car Experience



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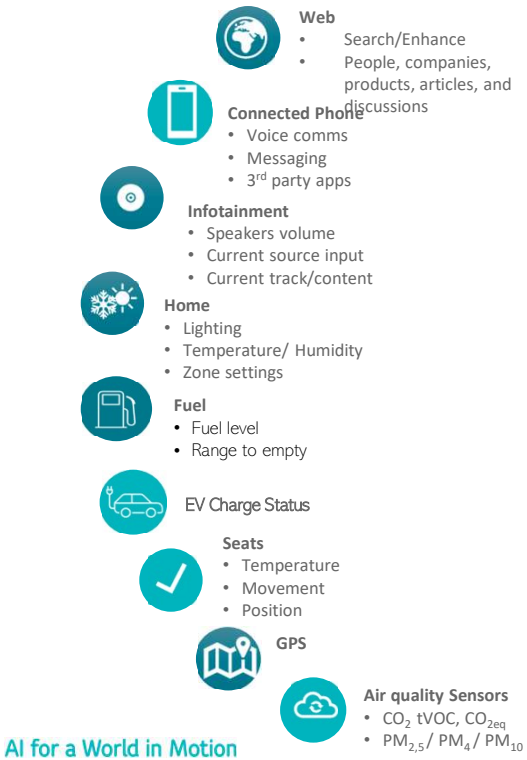
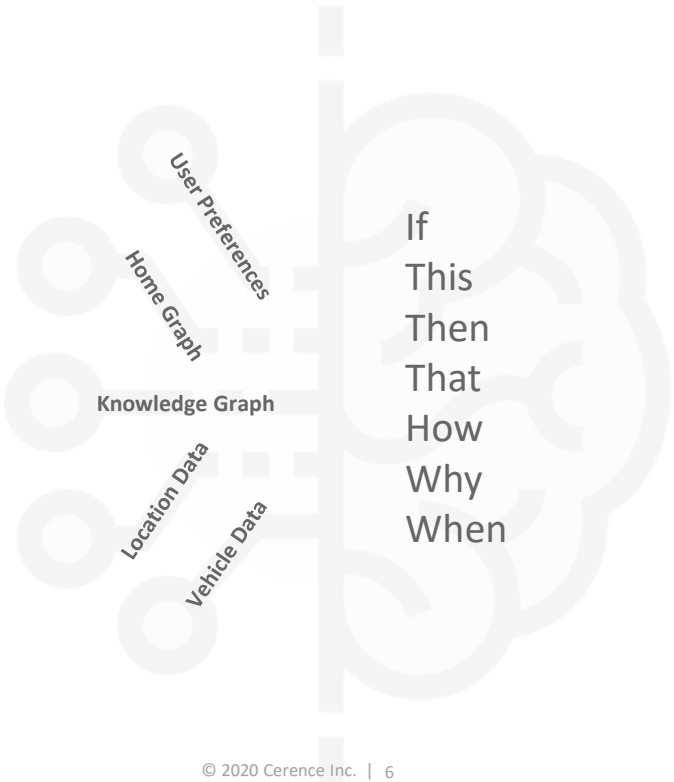
Cerence – AI-Powered Connected Driving Companion

Connected Inputs



AI for a World in Motion

Deep Learning with Preferences & Decisions



Driver Interactions with AI Companion

- Voice interaction
- Text-to-speech
- Handwriting & Swype
- Gaze tracking
- Gesture recognition
- Emotion detection

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Innovations with the cloud

Create one digital identity inside and outside the car

Digital Twin of Vehicle

Deliver personalized experience

AI for a World in Motion

Building the Connected Car of the Future

Extend your personal life seamlessly into the car

"Search for that outfit on the billboard and WhatsApp the link to John"

"Call into my Zoom conference call"

"Order flowers on my Prime account. Send them to my mother for Mother's Day"

"Can you find the cheapest covered parking close to my destination that accepts credit cards?"

"Which parking lots at the airport have availability?"

"What can you tell me about that restaurant? The Avenue is highly rated, has a kid-friendly menu and an open table at 6:45 pm. Would you like to make an OpenTable reservation for 4?"

"Your Nest door lock is unlocked. Would you like me to lock the front door?"

"Put $30 on pump #4."

"I found a critical problem with your airbag. Do you want to arrange a service appointment for today?"

"You have an early meeting tomorrow. Would you like to recharge the car tonight?"

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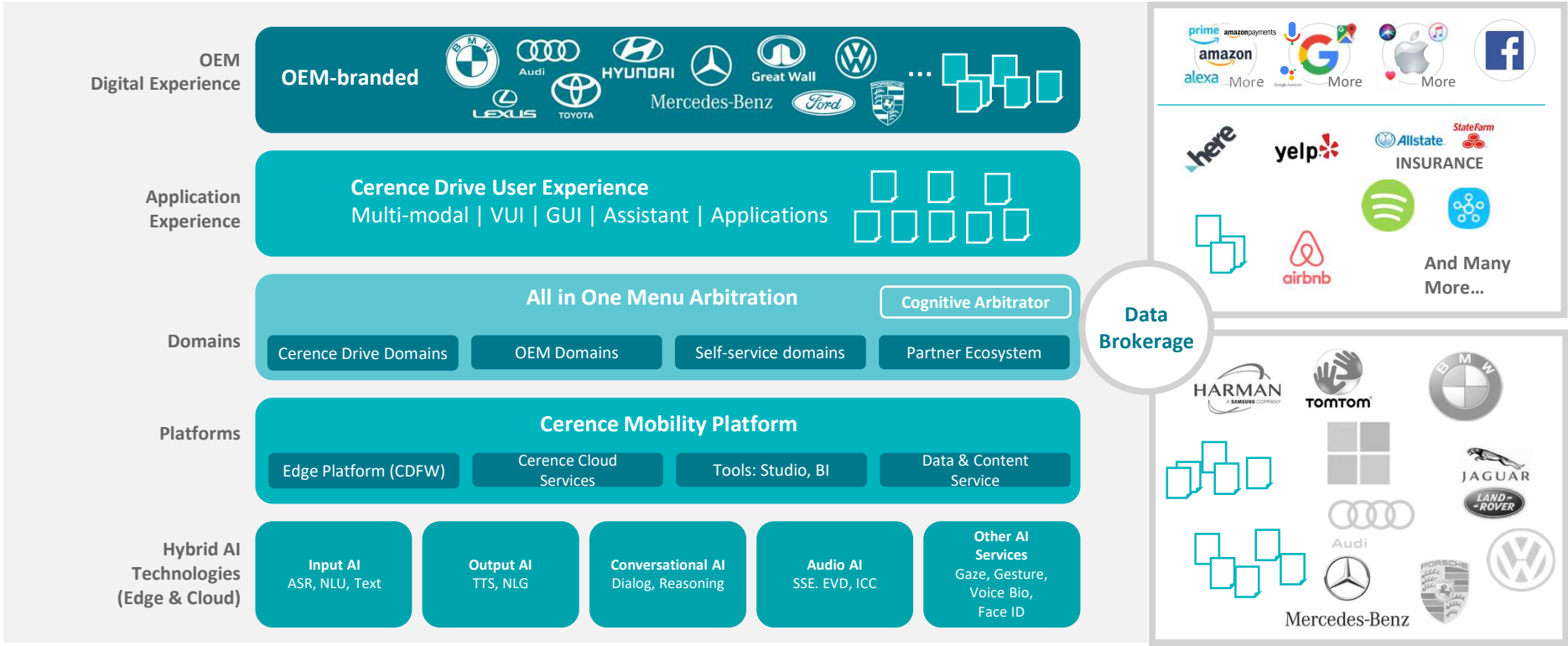
Core Foundation | Cerence Hybrid AI



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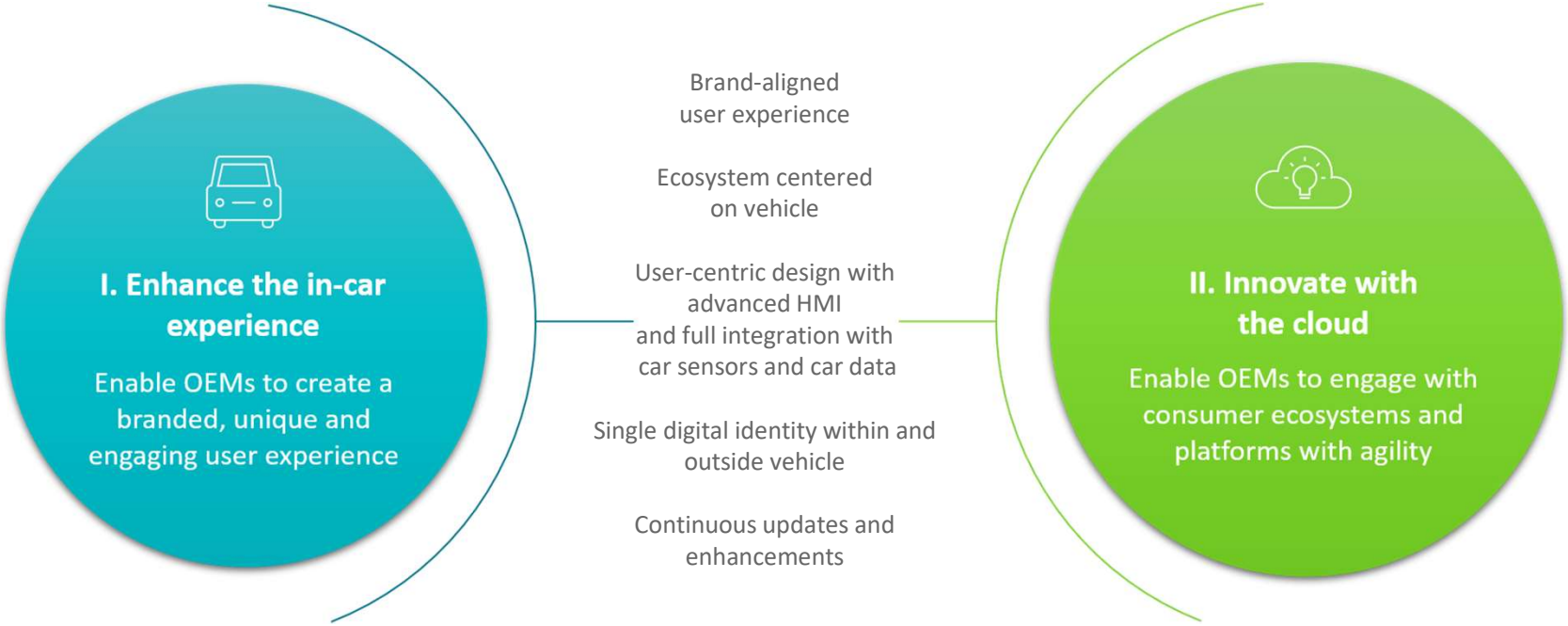
Our Roadmap – Aligned with Trends and Needs



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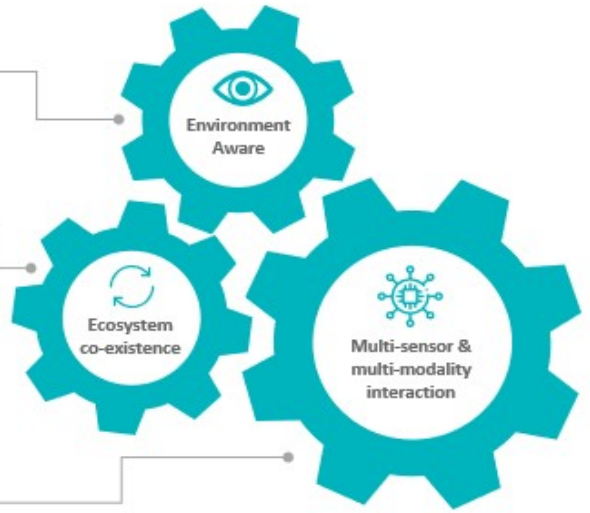
Building the Next-Generation Interactive AI

Intelligent car data and simplified experience

Smart Cities / Car2X information
External microphones
Cabin monitoring
Non-speech audio recognition
Autonomous driving use cases (L3/L4)
Adaptive persona

3rd party VA arbitration
Dev. eco system support
Outbound conversational agent
Monetization

Multiple microphones
Camera, Gaze, Gesture, in –car sensors
AR support
Sensor fusion & AI summarization
Multi-modal and multi-passenger games
Self-adapting assistant



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The Building Blocks of Conversational AI

Dr. Udo Haiber | Senior Vice President, Research and Development

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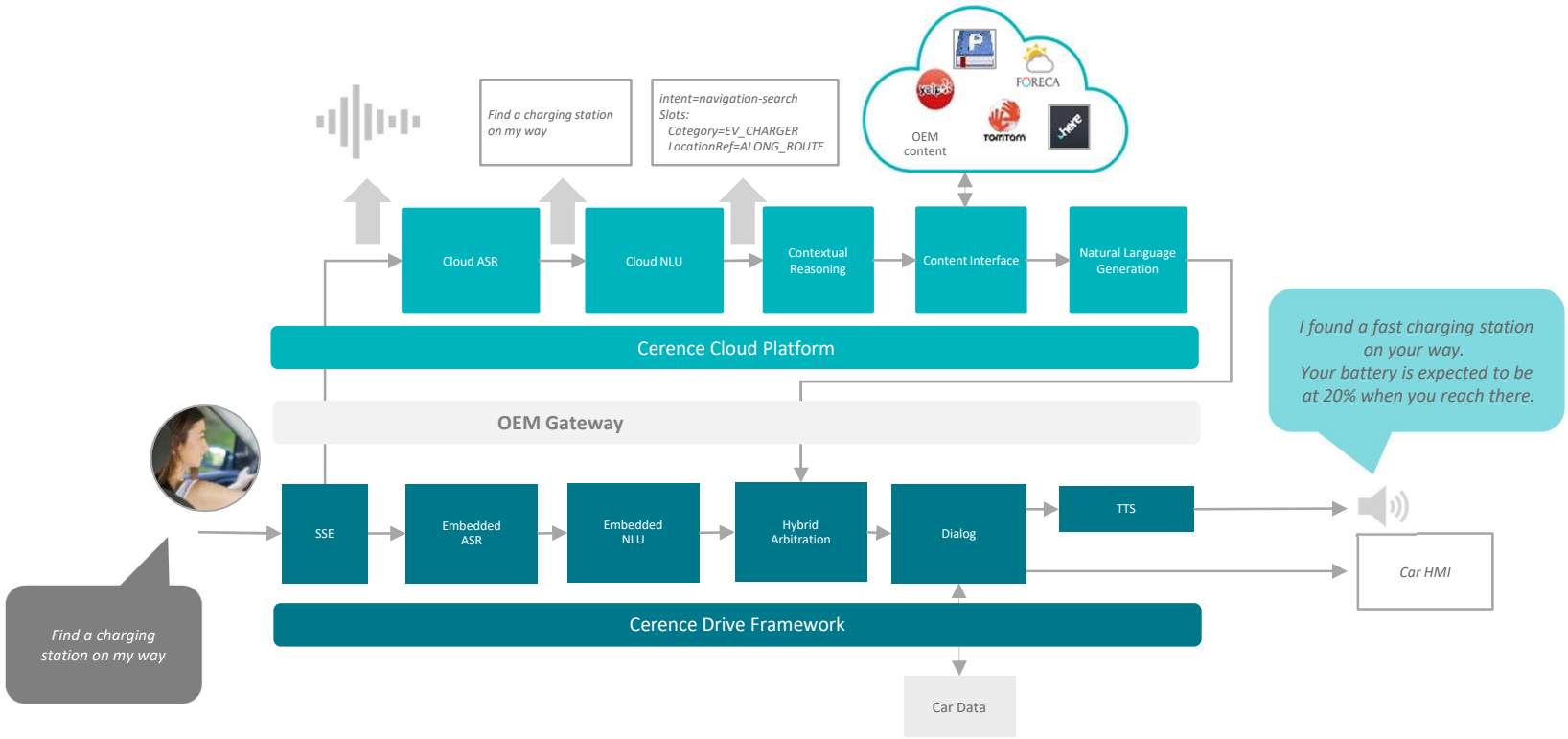
Hybrid Technologies | Used on the Edge and in the Cloud



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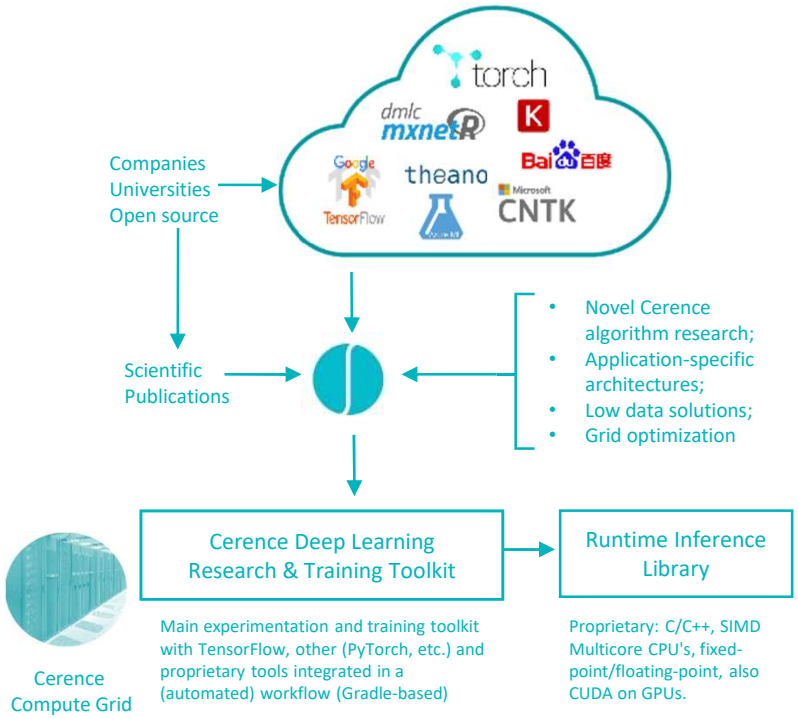
All Cerence Engines Powered by Deep Learning

Engines	ML Techniques
Speech Signal Enhancement (SSE)	• Feed-forward DNN and Gated Recurrent Units (GRU) for noise reduction.
Automatic Speech Recognition (ASR)	• Feed-forward DNN (FF-DNN) for speech detection • Linearly-Augmented DNN (LA-DNN) and Long Short-Term Memory RNN for acoustic modelling and language modelling • Multi-Task and Transfer Learning for cross-language training
Natural Language Understanding (NLU)	• Word Embedding (WE) and Sequence-to-sequence (seq2seq) Transformer for intent classification, mention extraction, and question answering • Gazetteers, literal annotators and Corrective Training for quick adaptations. • Pre-training and Transfer Learning.
Text-to-Speech (TTS)	• Bidirectional LSTM (BLSTM) for prosody prediction and unit selection • WE, Convolutional Neural Networks (CNN), BLSTM, Seq2seq Transformer in structured combinations for linguistic analysis • Seq2seq, WaveRNN and others for neural wave synthesis • Generative End-to-End Neural Synthesis (GEEnE) for cloud TTS, combining the above with Transformers and GRU-based NWS • Structured learning and Transfer Learning



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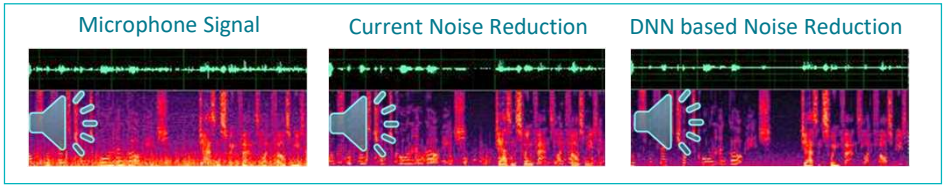
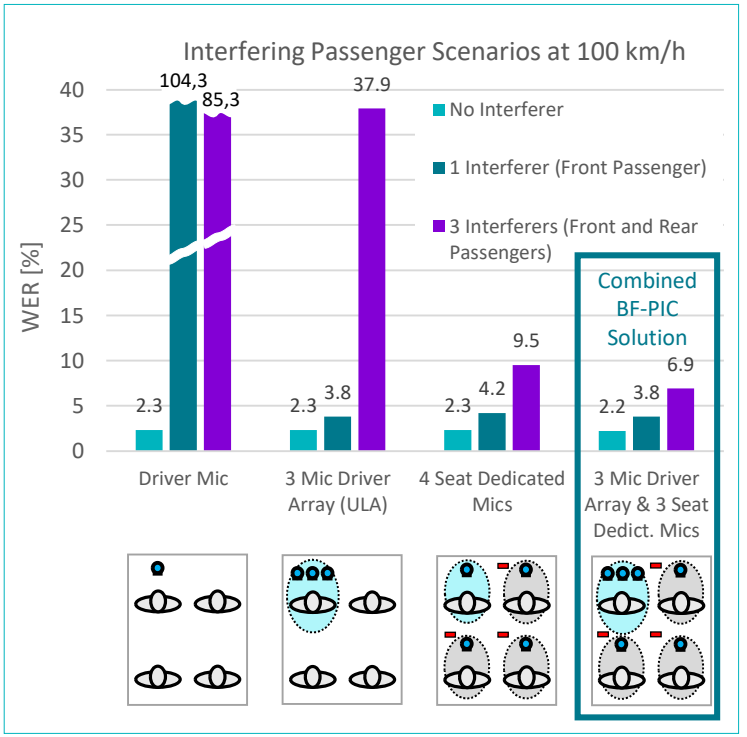
Audio AI | Ahead to Drive Innovation in Automotive

- High quality noise reduction suppresses driving noises while preserving the naturalness of the desired speech signal;
- Multi-zone processing with quick and simple speaker identification
- Passenger interference cancelation that blocks out background noise as well as voices from others in the car (speech recognition from all seats and telephony)
- In-car communication with improves speech quality and intelligibility of in-vehicle conversations
- 360° far-talk recognition with speaker localization
- Transforming experience towards autonomous driving use cases e.g. Emergency Vehicle Detection





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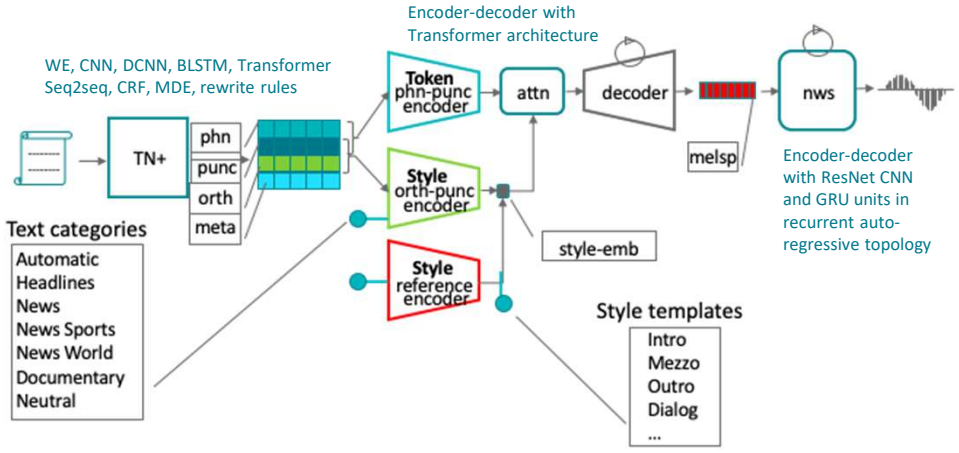
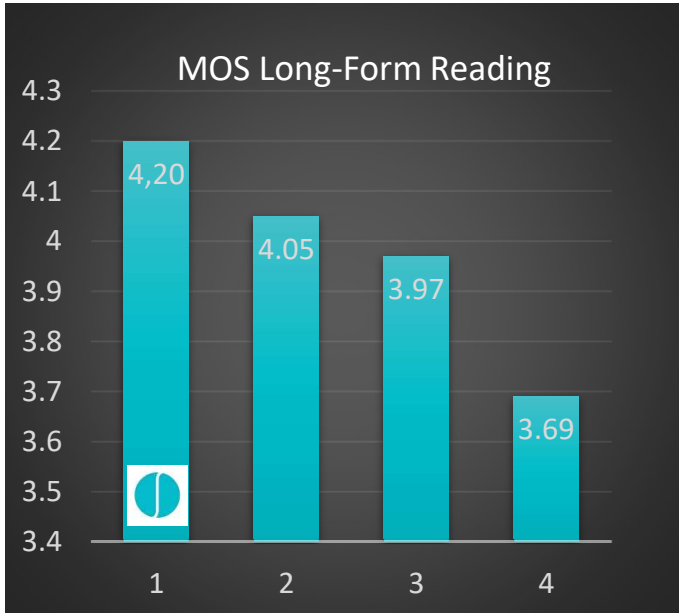
Text-to-Speech | Superior Technology Beats Giants



Generative End-to-End NEural TTS – application specific architecture;
example of combining several DNN methods in a full end-to-end system.



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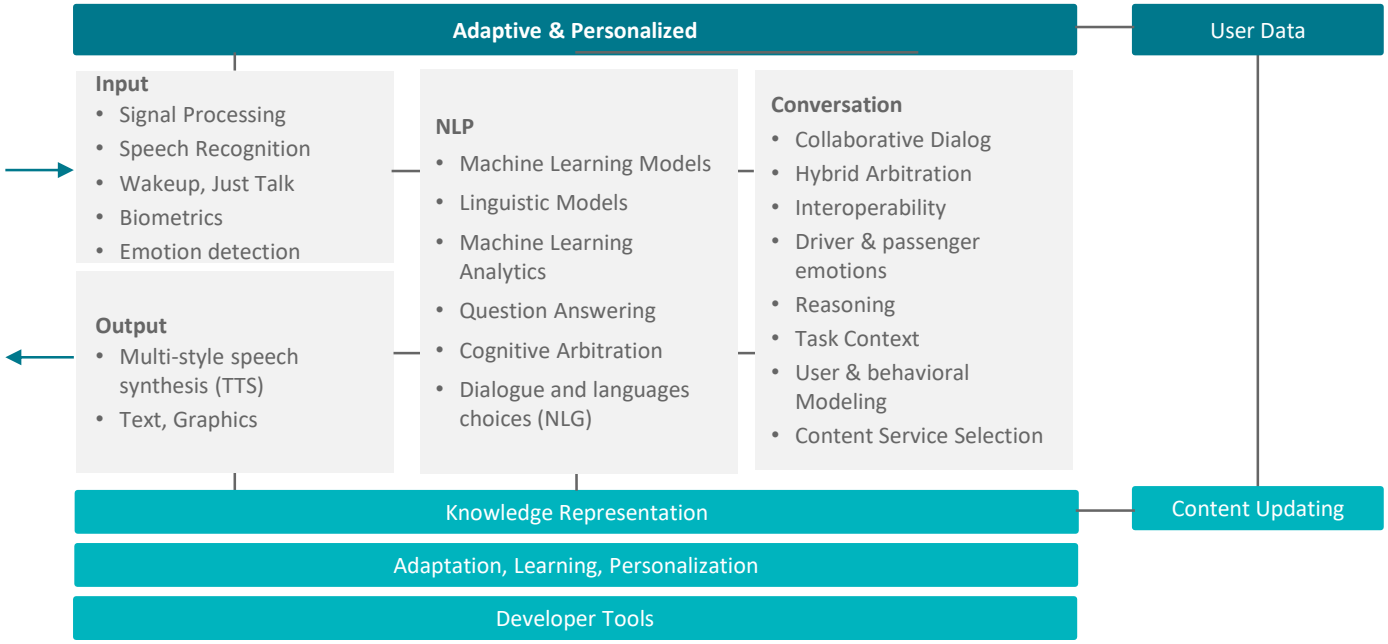
Mastering It All | Cerence Conversational AI Platform



Emotional AI

(1) Detecting emotions

- Emotion detection from 'tone' of voice
- Sensor fusion with other modalities (camera)

(2) Reacting to emotions

- Driver & passenger emotions
- Behavioral model
- Desired emotion state

(3) Expressing emotions

- Dialogue and languages choices (NLG)
- Multi-style speech synthesis (TTS)
- Other modalities (e.g. lightning)

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Multi-Modality Components in Interactive AI

Dr. Christophe Couvreur | Vice President Product

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Cerence Reader

Virtual newscaster

Decide on speaking style based on the input (neutral, headlines, news, sport, world news, documentary)

Generate naturally flowing speech with human articulation

More Than Words

The Washington Post
September 23, 2020 at 12:45 p.m. GMT+2
Johnson & Johnson begins late-stage trials on a single-shot coronavirus vaccine. The experimental vaccine being developed by pharmaceutical giant Johnson & Johnson is the fourth vaccine to enter the large Phase 3 trials that will determine whether they are effective and safe. Three other vaccine candidates have a head start, with U.S. trials that began earlier in the summer, but the vaccine being developed by Janssen Pharmaceutical Companies, a division of J&J, has several advantages that could make it logistically easier to administer and distribute if it is proved safe and effective.

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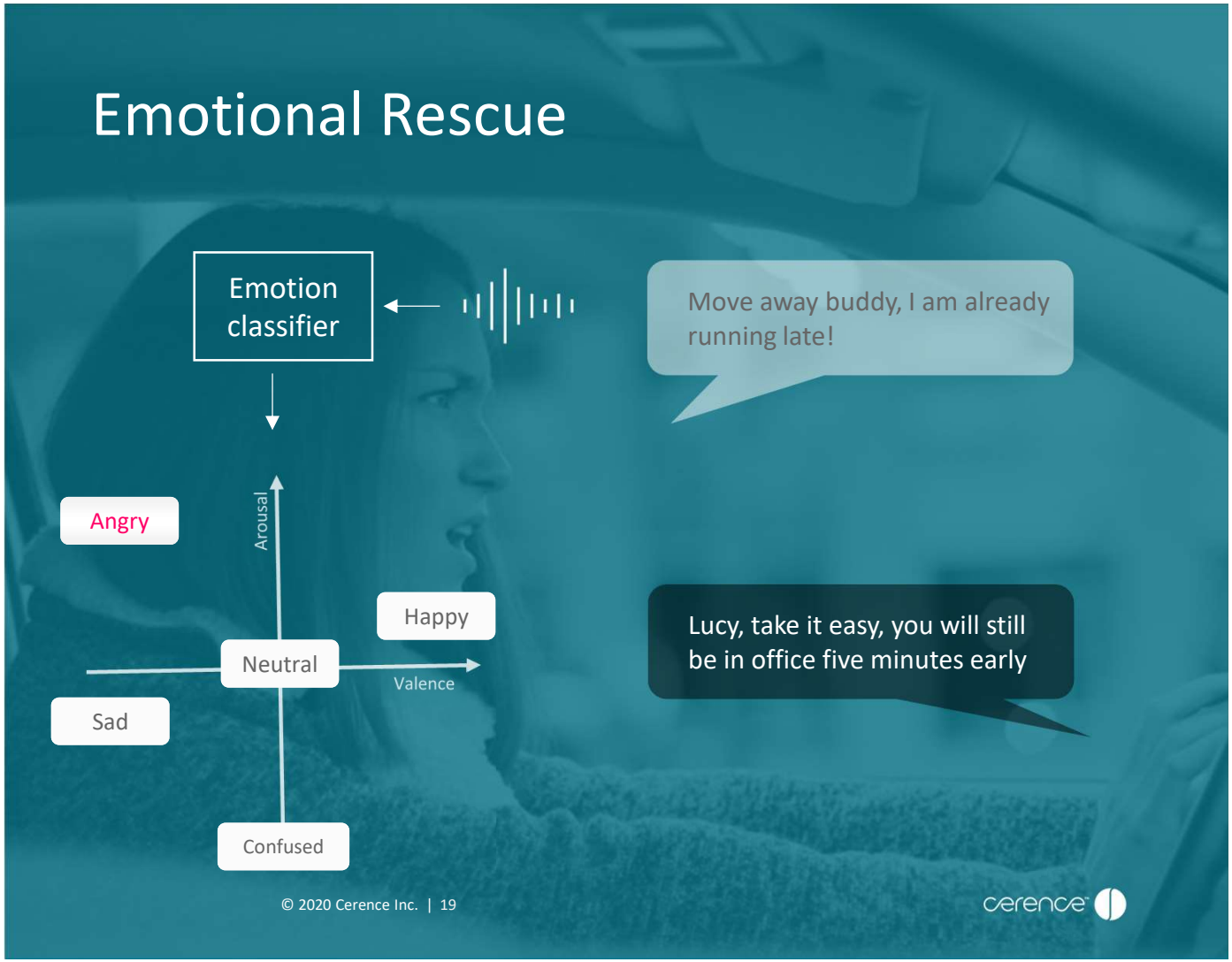
Humanizing Interaction

Detecting emotions based on audio signature

Reacting to emotions



AI for a World in Motion

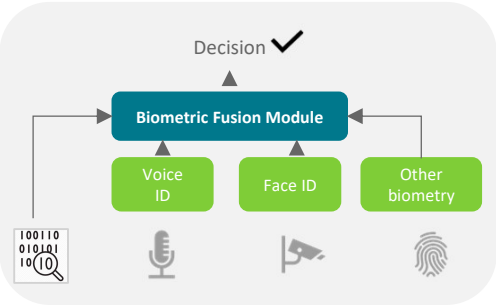
Biometrics

Multi-sensor identification

Voice ID

Face ID

Fusion engine



AI for a World in Motion

Only You

Classification

Classify a speaker by language, age or gender

- Easy UI Language switch
- Gender/age-specific UI
- Enables parental control

Identification

- Identify one speaker out of many known ones
- Activation of personal profile, e.g. load favorite radio stations
- Mirror & seat adjustments

Authentication

- Verify speaker's identity against the stored one
- Secure online transactions access to sensitive data, e.g. email account
- App login, e.g Facebook

Security Features

Synthetic Speech Detection
Special designed detector to prevent synthetic speech attacks

Playback Detection
Detects and prevents any recording playback to the system

Liveness Detection
Prevents system break-ins by prompting an arbitrary phrase to the user

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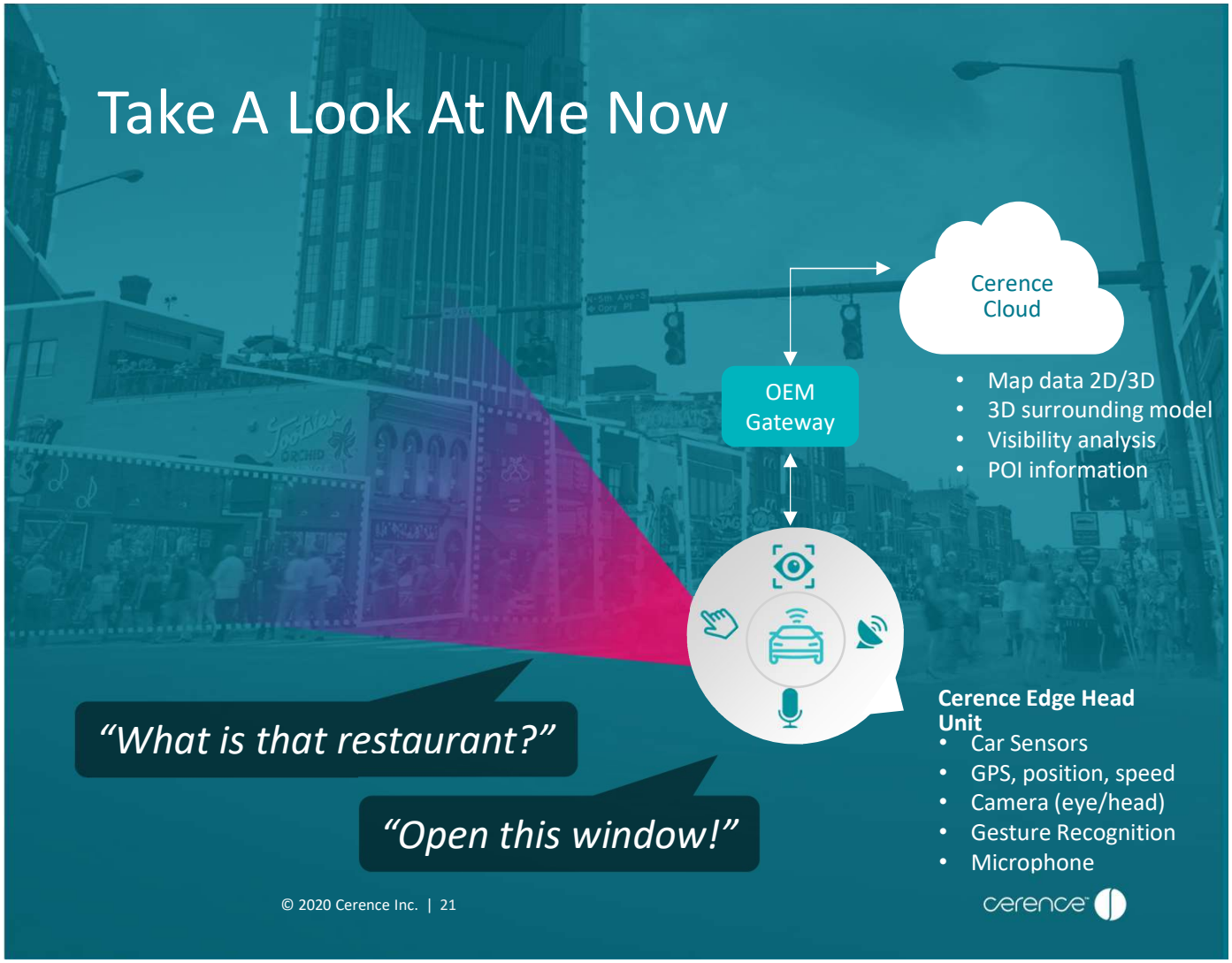
Cerence Look

Interact with the inside and the outside of the car

Bring gaze, voice and gestures together



Cerence EVD

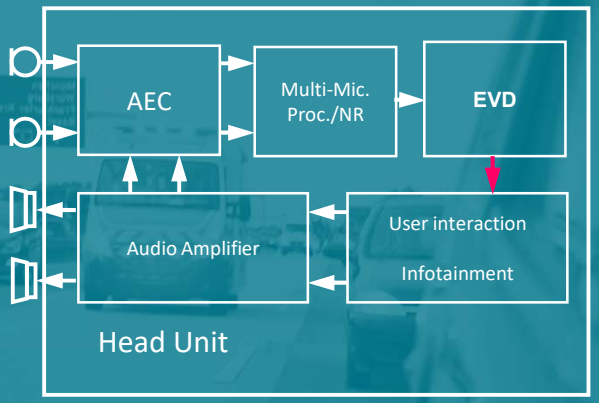
Emergency Vehicle Detection

In autonomous vehicles or to alert drivers

AI for a World in Motion

Song To The Siren

- Detects sirens using interior or exterior microphones of the car
- Even if the radio is playing
- World-wide variety of sirens



- Siren localization
- Expanding beyond siren sounds

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Assembling Blocks into Modularized Turnkey Solutions

George Liu| Senior Director, Products

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Modularized Turnkey Address Auto and Mobility Solutions Pain Points

Time to market

Technical delivery cannot keep up with fast demands from market

Fragmented Services or one-stop-shopping

Managing multiple-party integrations and operation are nightmare

Bucket of mobile applications controlled by solution vendors (e.g. tech giants)

Out-of-the-box and customization

Plenty internet-eco services but hardly focus on automotive user-centric

Data Monetization, one-time to long-tail

Underutilize the business value

How to build a data-driven business

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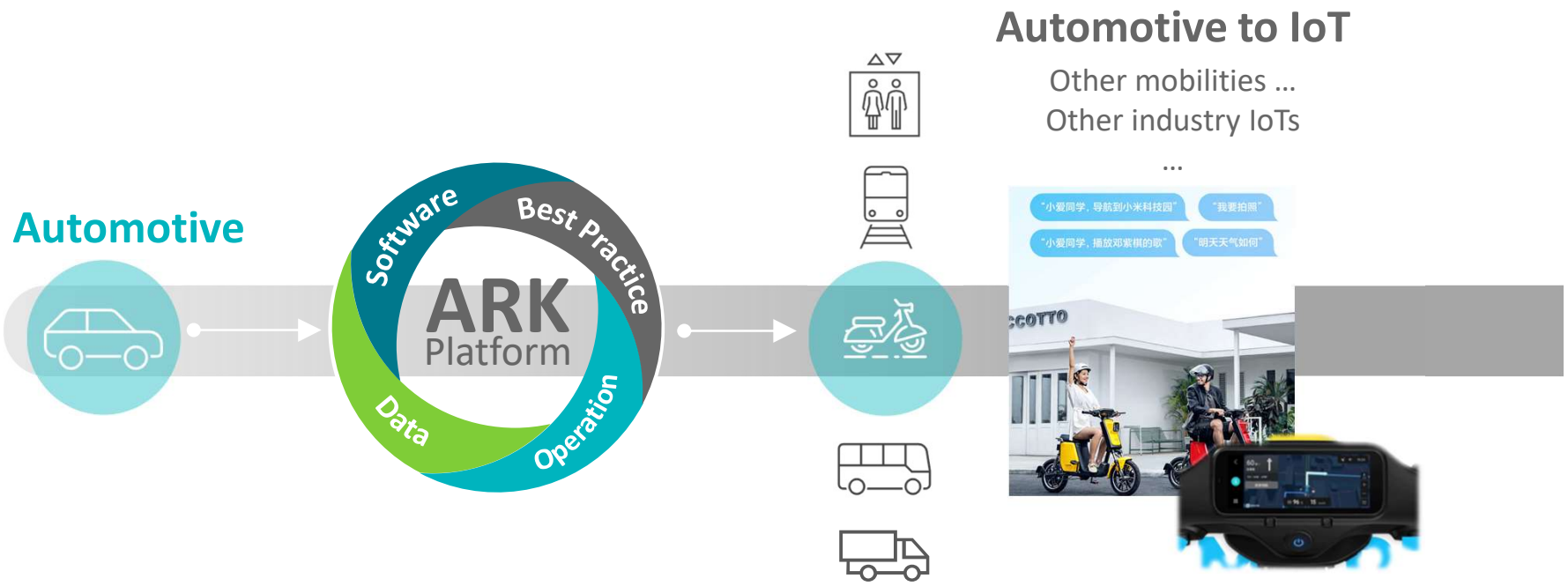
AI Reference Kit(ARK) enables faster AI adaption in new markets



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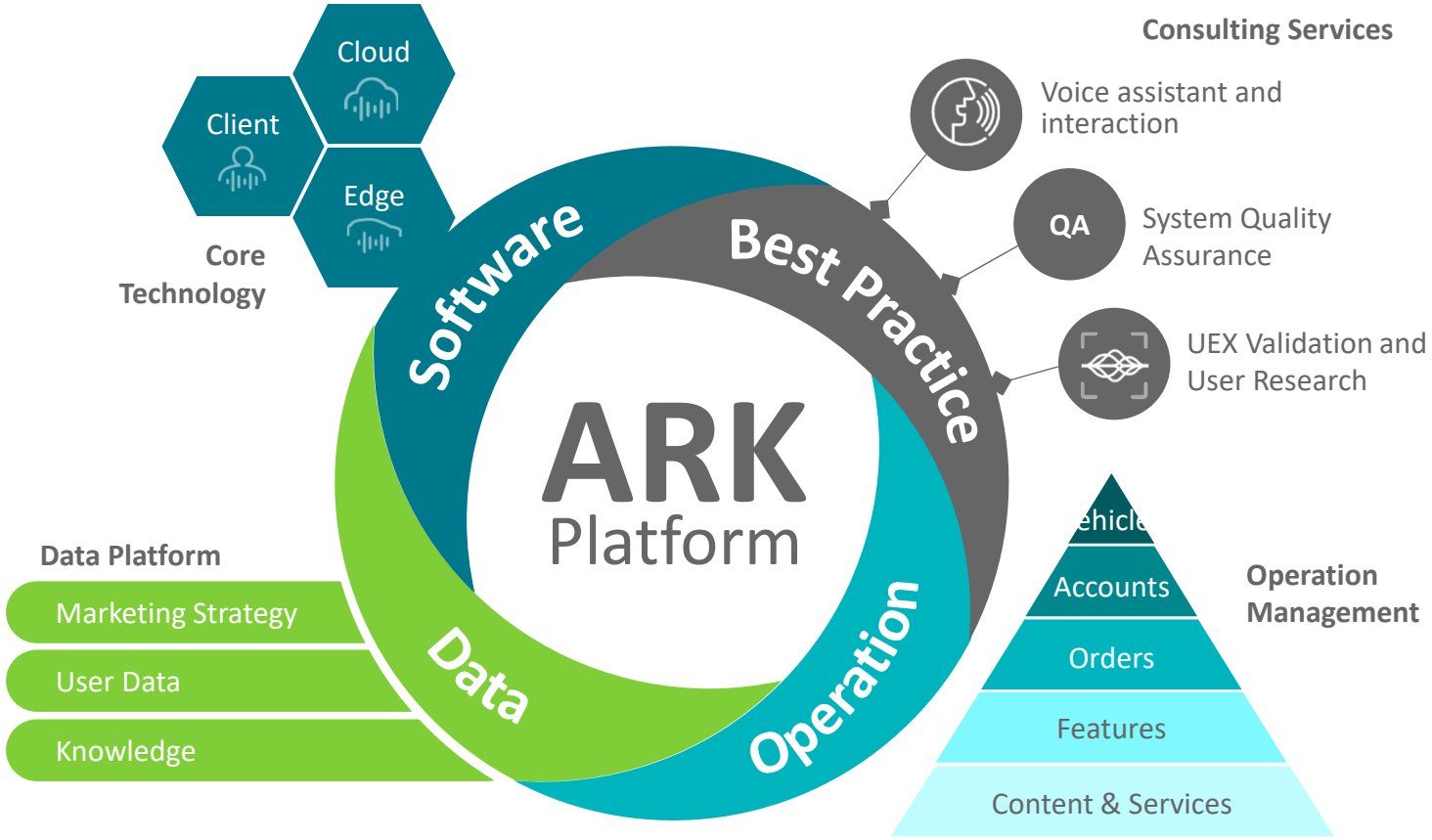
ARK is our Modularized Turnkey Solution Platform



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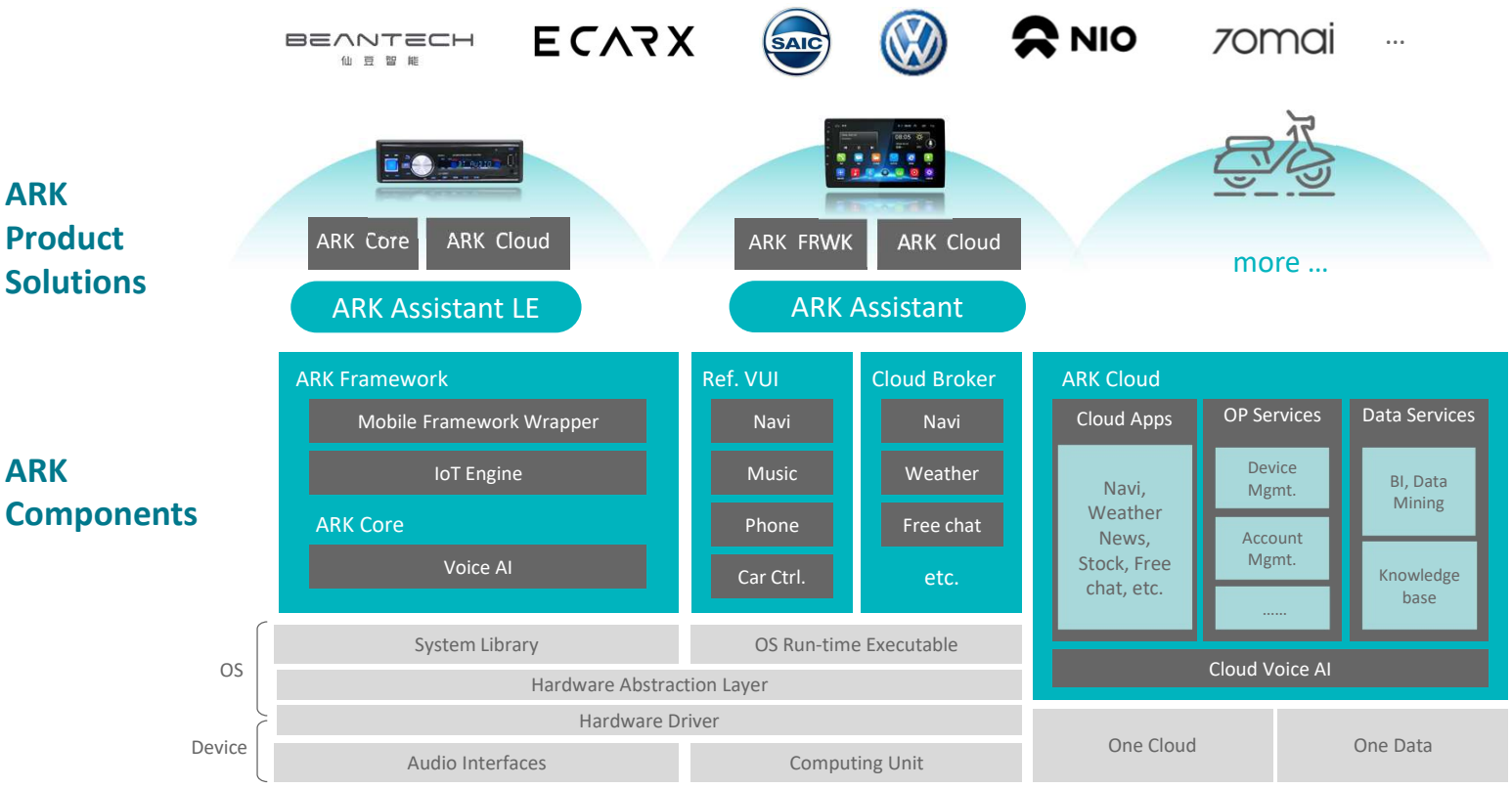
ARK Powered Leading Brands in China



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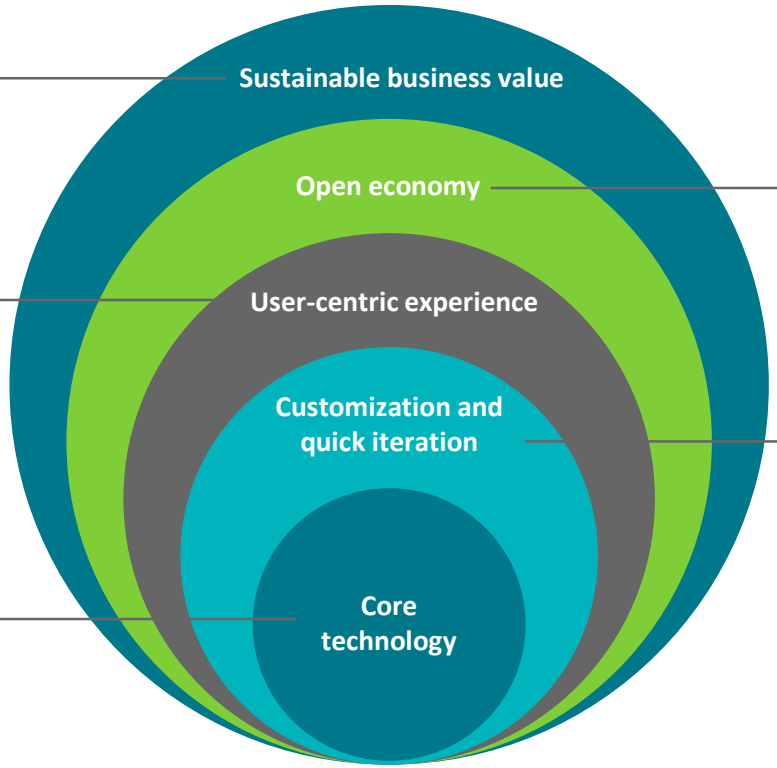
ARK Empowers Our Customers to Build the Solutions

Considering the post-sale scenario and taking advantage of customer data, enable the sustainable profit along product full life cycle

GUI, VUI, dialogues are well-designed with a large number of project experiences

Industry-leading conversational A.I. stack



Open to cooperate with main-stream content providers, software and hardware, easy to integrate with applications as demand

Easy to perform self-customization, less dependency to native engines, quick iteration to improve product performance

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Bringing Technology Together for New Applications

Dr. Nils Lenke| VP and GM, Cerence Applications

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The Yin & Yang of Successful Apps

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Cerence Car Life

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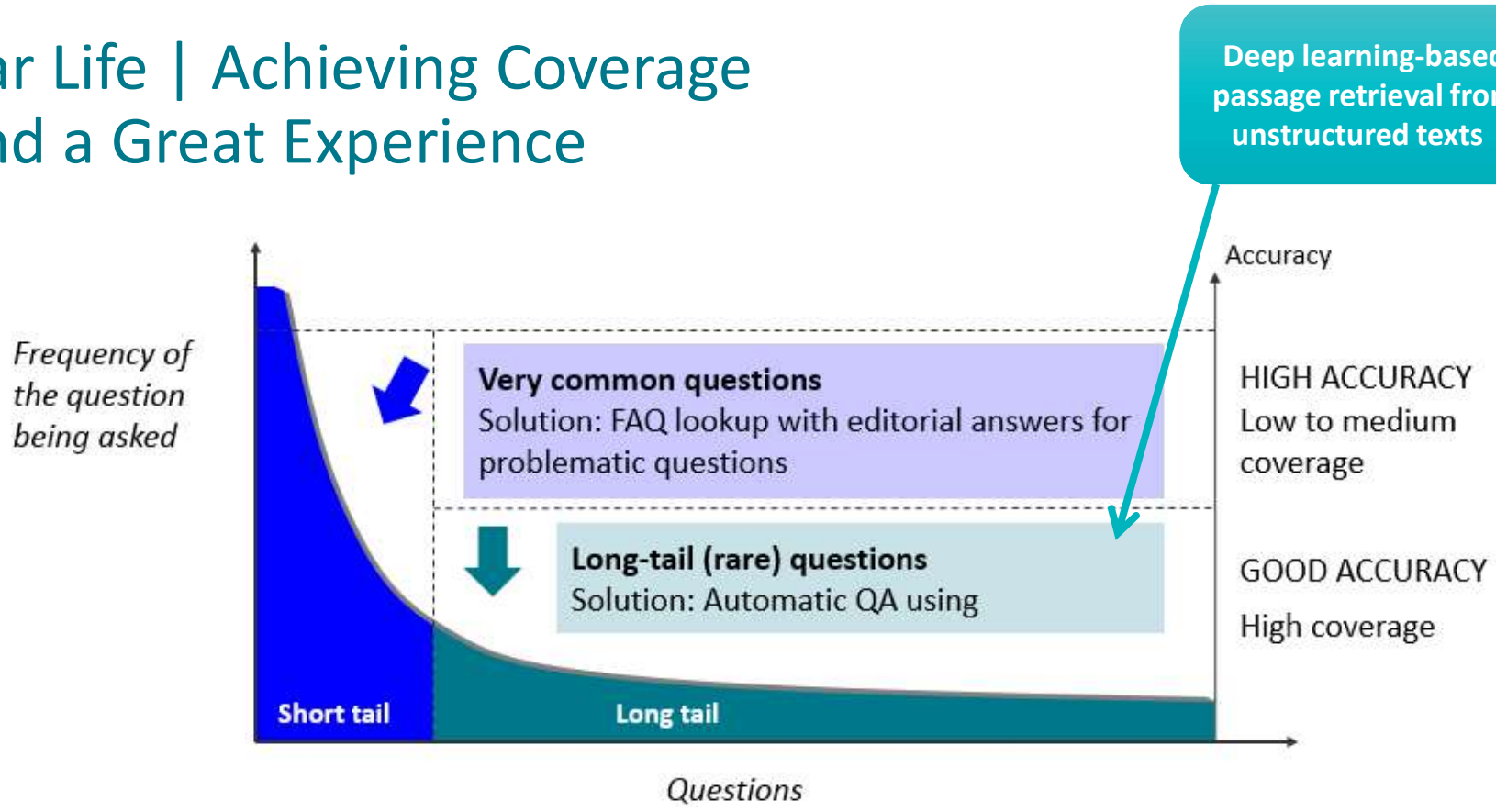
Car Life | Achieving Coverage and a Great Experience



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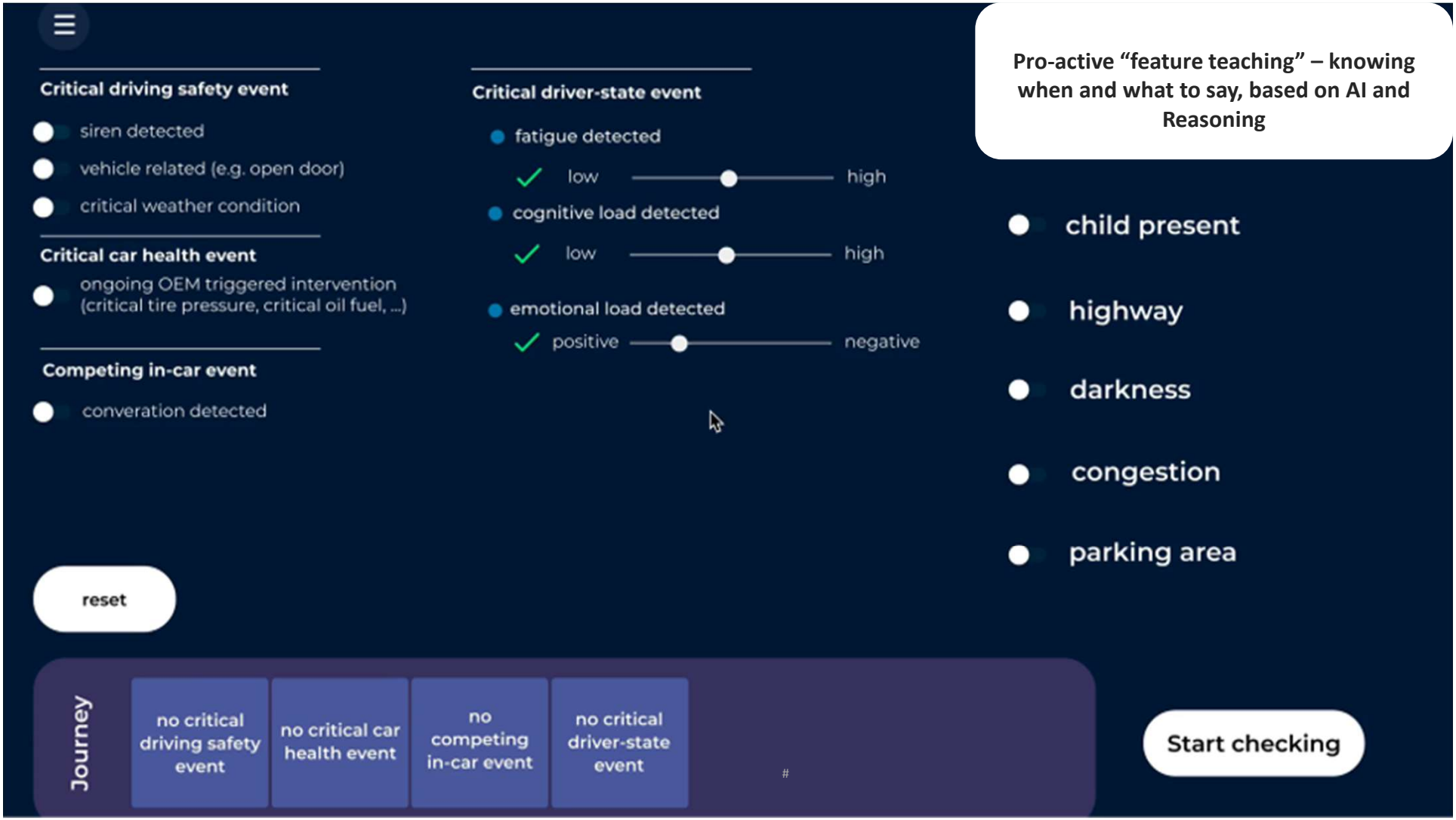
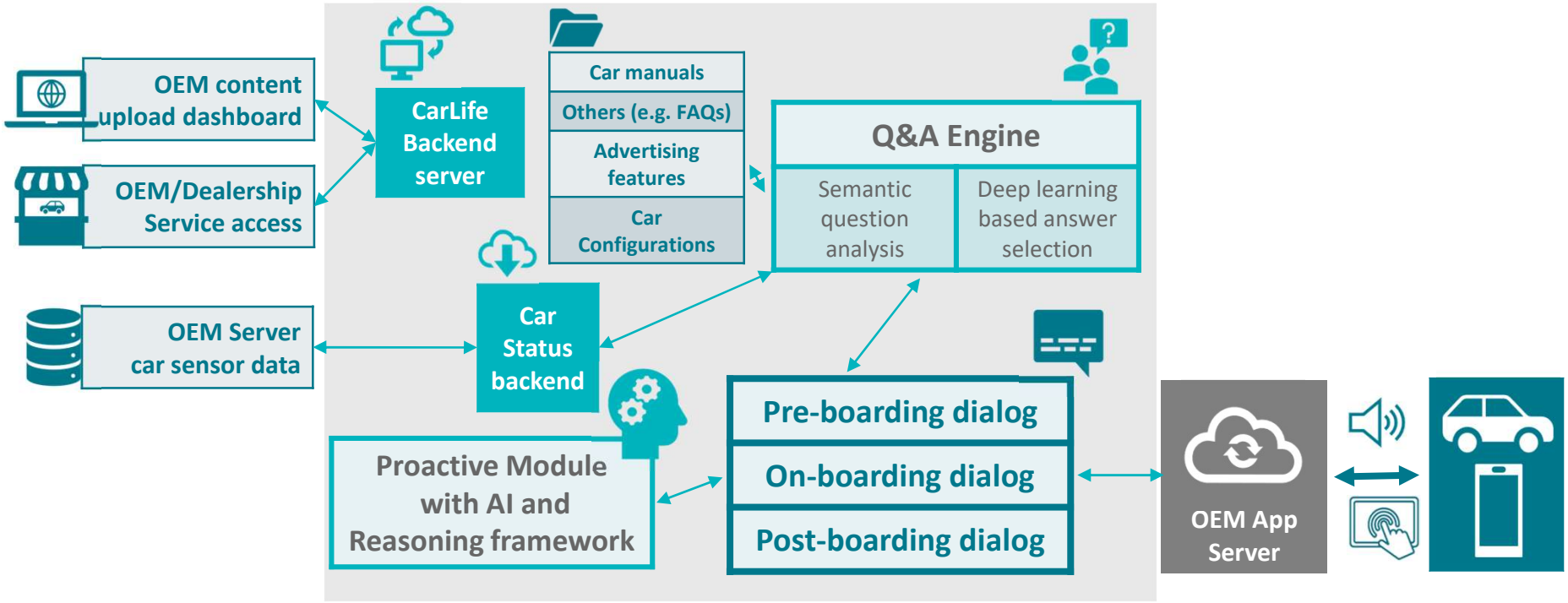

Critical driving safety event
siren detected
vehicle related (e.g. open door)
critical weather condition
Critical car health event
ongoing OEM triggered intervention (critical tire pressure, critical oil fuel, ...)
Competing in-car event
converation detected
Critical driver-state event
fatigue detected
low
high
cognitive load detected
low
high
emotional load detected
positive
negative
Pro-active "feature teaching" – knowing when and what to say, based on AI and Reasoning
child present
highway
darkness
congestion
parking area
reset
Journey
no critical driving safety event
no critical car health event
no competing in-car event
no critical driver-state event
Start checking

Car Life | Architecture Overview



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Cerence Pay

Authentication

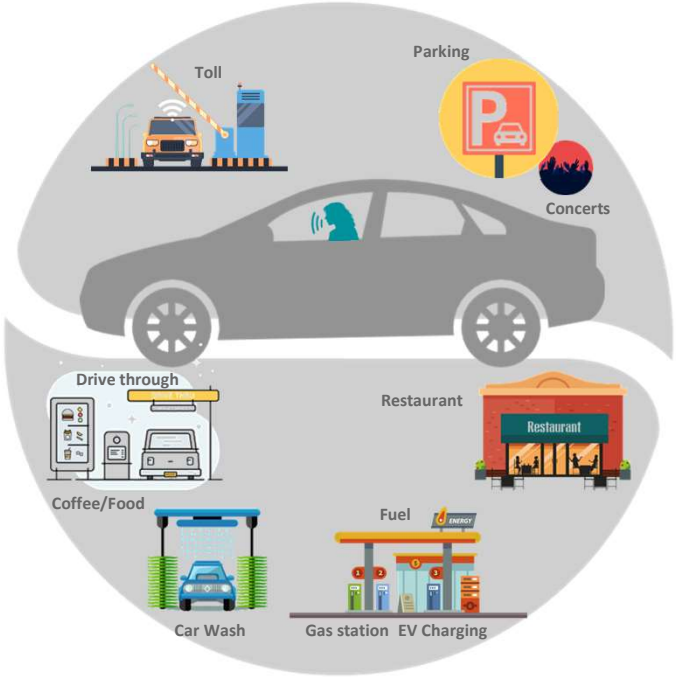
- Voice Biometry
- Facial Biometry

Integration

- Integration with head-unit and OEM companion App (push messages)

Embedded/Hybrid

- Embedded & cloud architecture for safe credential storage and linking



- Simplified payment experience via speech
- In-car commerce with extended partnerships

Innovation

- Pro-Active "Nudging" from existing domains (Navi etc.)

Agreements

- Service provider agreements with stakeholders

Experience

- UX expertise and insights into which use cases work, and how, where
- Speech/NLU/dialog domain(s) for the selected use cases

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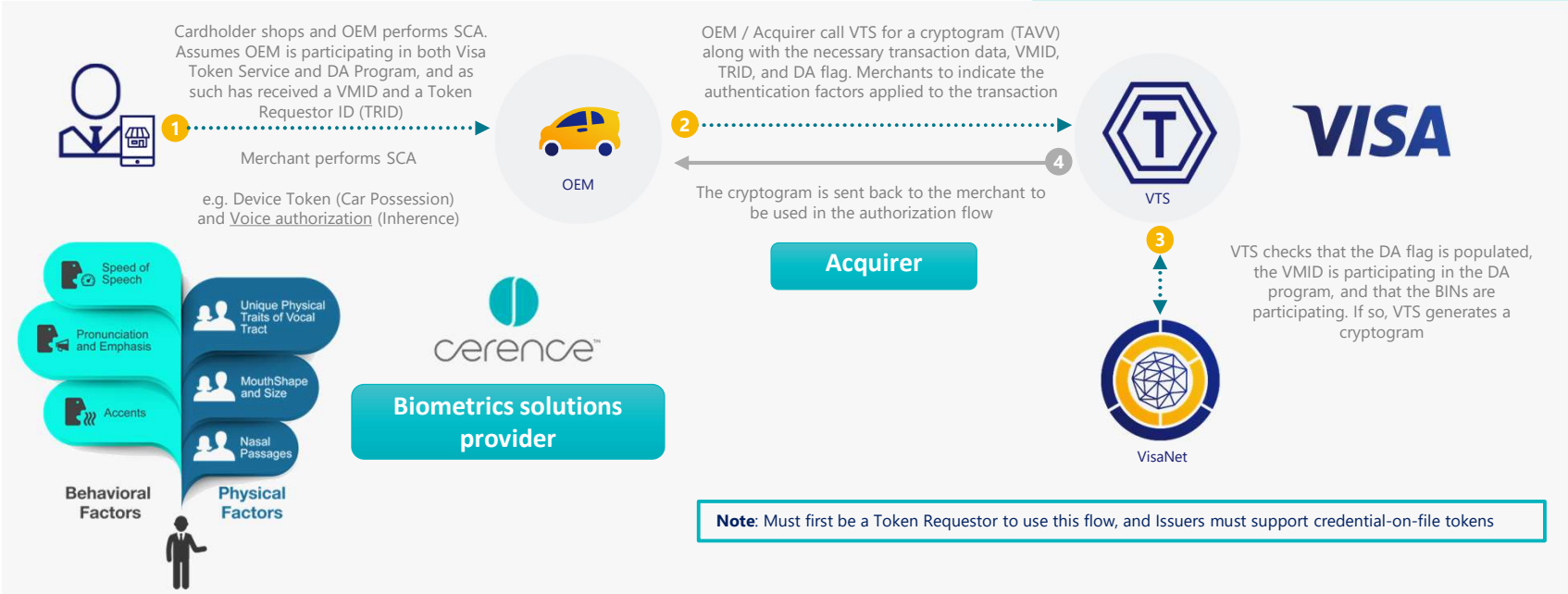
Cerence Pay
Delegated Authentication with Visa

The EU's *Revised Payment Services Directive* (PSD2) mandates *Strong Customer Authentication* (SCA) by 12/2020



Disclaimer: Programs, concepts and details under continuing development by Visa. Any Visa features, functionality, implementation, branding, and schedules may be amended, updated or canceled at Visa's discretion. The timing of widespread availability of programs and functionality is also subject to a number of factors outside Visa's control. In addition, certain features may not be available in all countries. Participation in programs and services are subject to Visa's terms and conditions in program participation agreements and associated documentation; issuer participation, acquirer participation and/or approval or sponsorship of merchant enrollment may be required.

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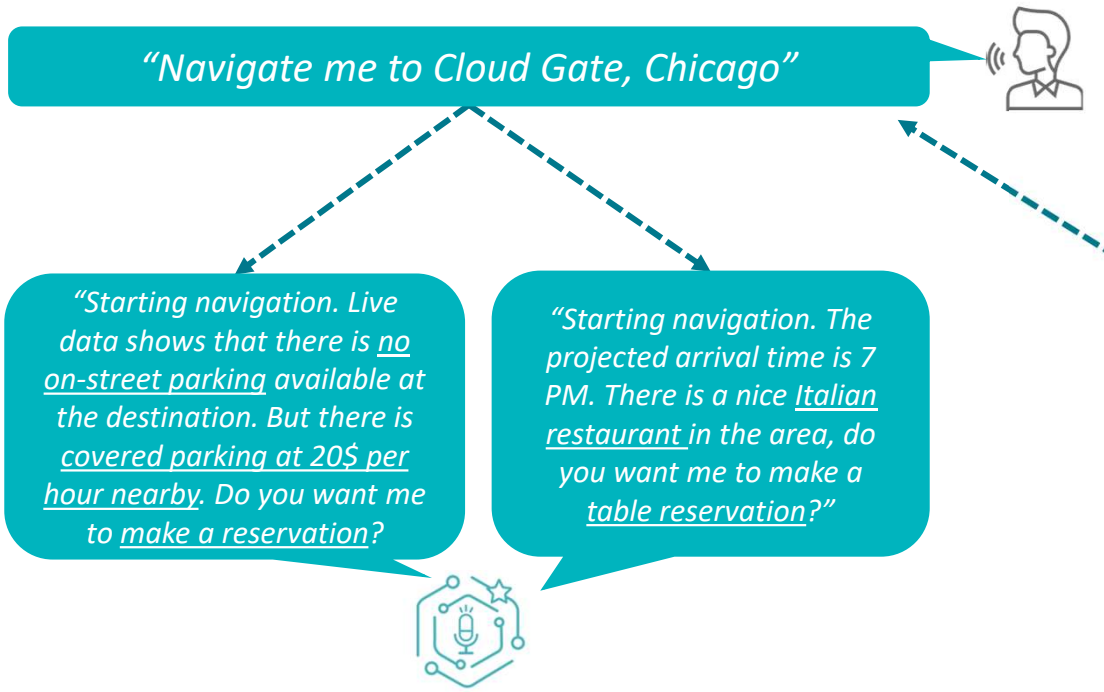
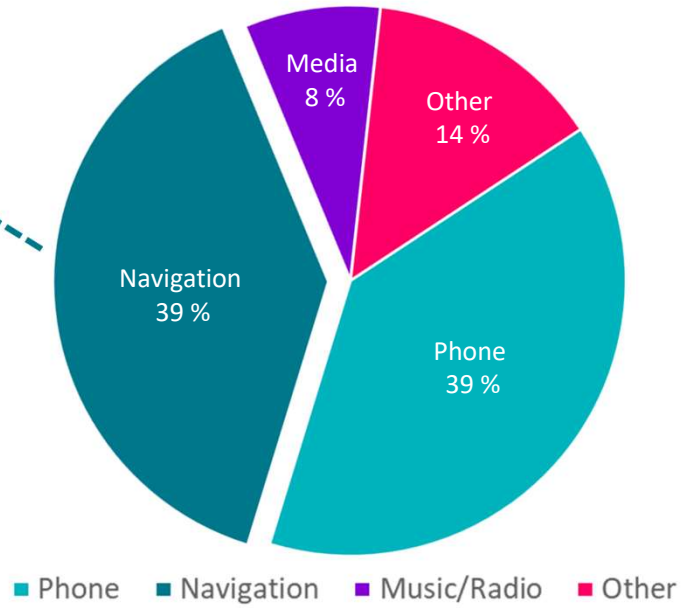
Cerence Pay | Proactive suggestions

Don’t wait for your customers to discover



Typical voice request as of today



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Creating Enduring User Experiences

Adam Emfield| Senior Manager, UX and UI

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What Does Artificial Intelligence Mean to the *User*?

"It learns about me"

"It can make use of huge amounts of data"

"It can make complicated decisions on my behalf"

"It can solve problems that people can't on their own"

"It knows what I want or need before I know"

"It knows me better than I know myself"

"I don't know. It's really, really complicated…."

Embrace Complexity to Create Simple, yet Elegant Experiences

- Old way:
  Bolt technology together
- New way:
  Put user experience (UX) first
- Cerence way:
  Bring art and science together

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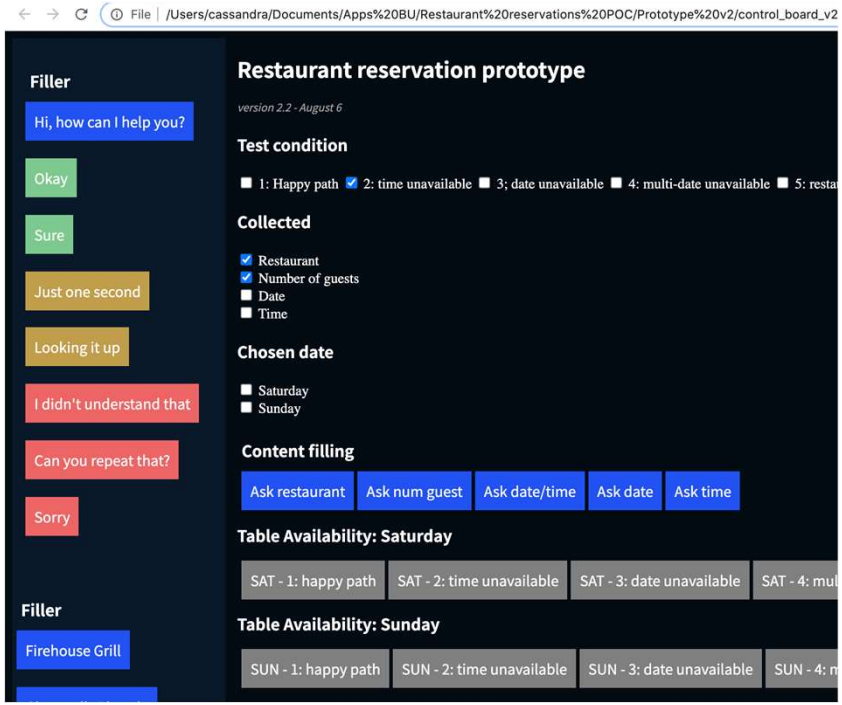
Prototyping User Responses and Reactions

- Before we build a product, we test the concept with real end-users
- Wizard of Oz (WOZ) method used to simulate dialog
- Participants were not made aware they were interacting with a ‘faked’ system



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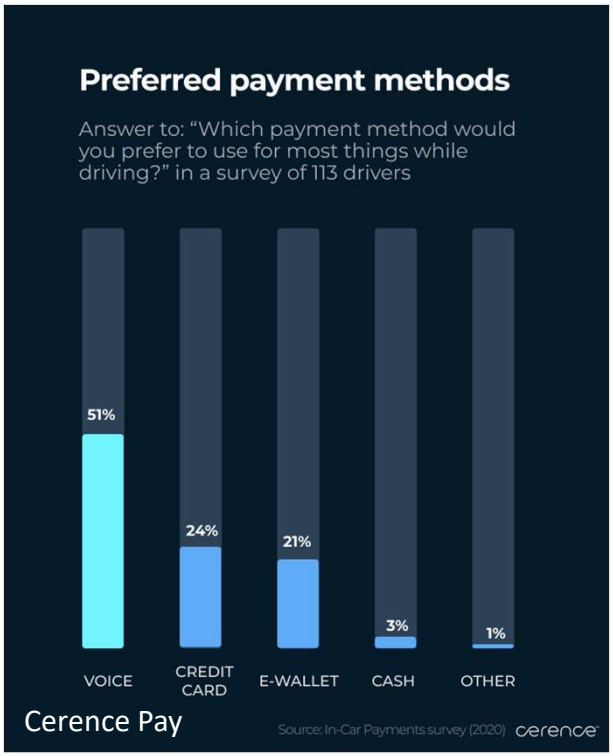
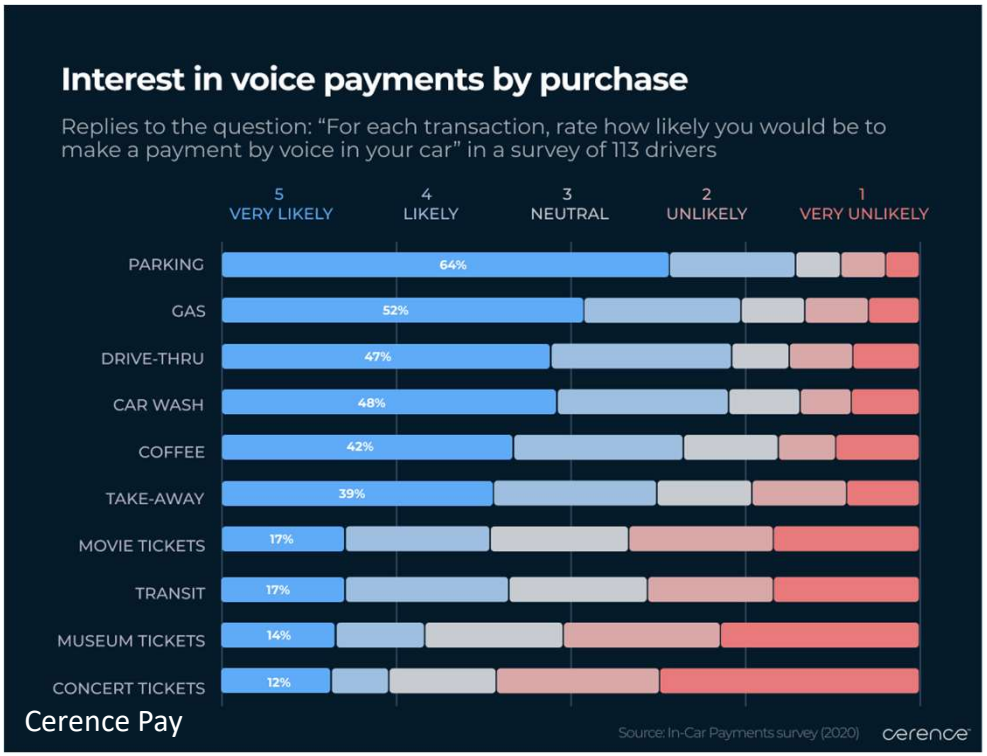
Product Design Led with Research, Surveys and Usability Studies



Cerence Pay



Cerence Pay

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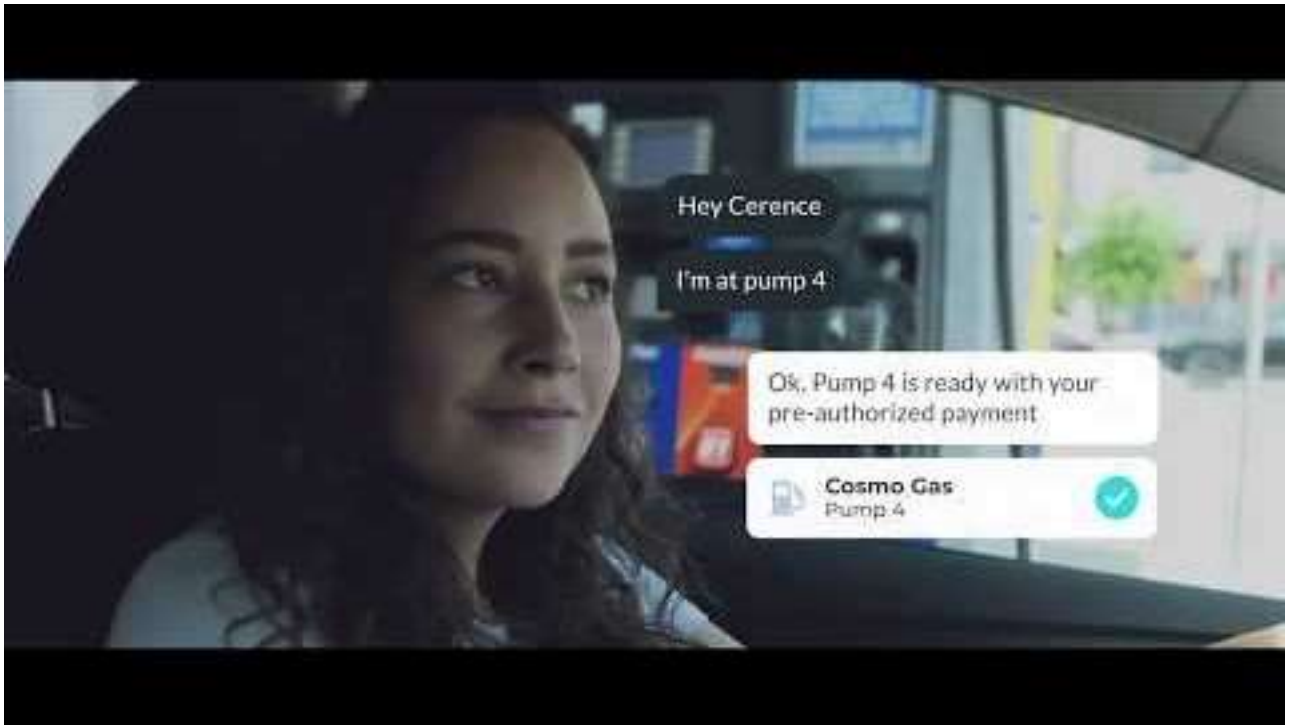

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Fireside Chat:
Role of AI in Future Connected Vehicles

Charan Lota | Chief Engineer, Connected Technologies, Toyota NA
with Prateek Kathpal, Cerence CTO

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Innovation in Action

Richard Mack | Chief Marketing and Communications Officer

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MBUX: The New Mercedes-Benz User Experience

Processing power for the ultimate digital car

Large 12.8" media display with 1.888 x 1728 pixels (optional)

Memory bandwith
41,790 MB/s

Augmented Reality
head-up display

Natural voice interaccion in 27 languages

16 GB RAM

50% more processing power compared to previous system

27 fewer hard keys compared to previous dashboard

Over-the-air updates

GPU with 691 gigaflops

320 GB SSD

"Breaking completely new ground in terms of the system's performance, capacity to learn, design and customization."

CEO Ola Källenius

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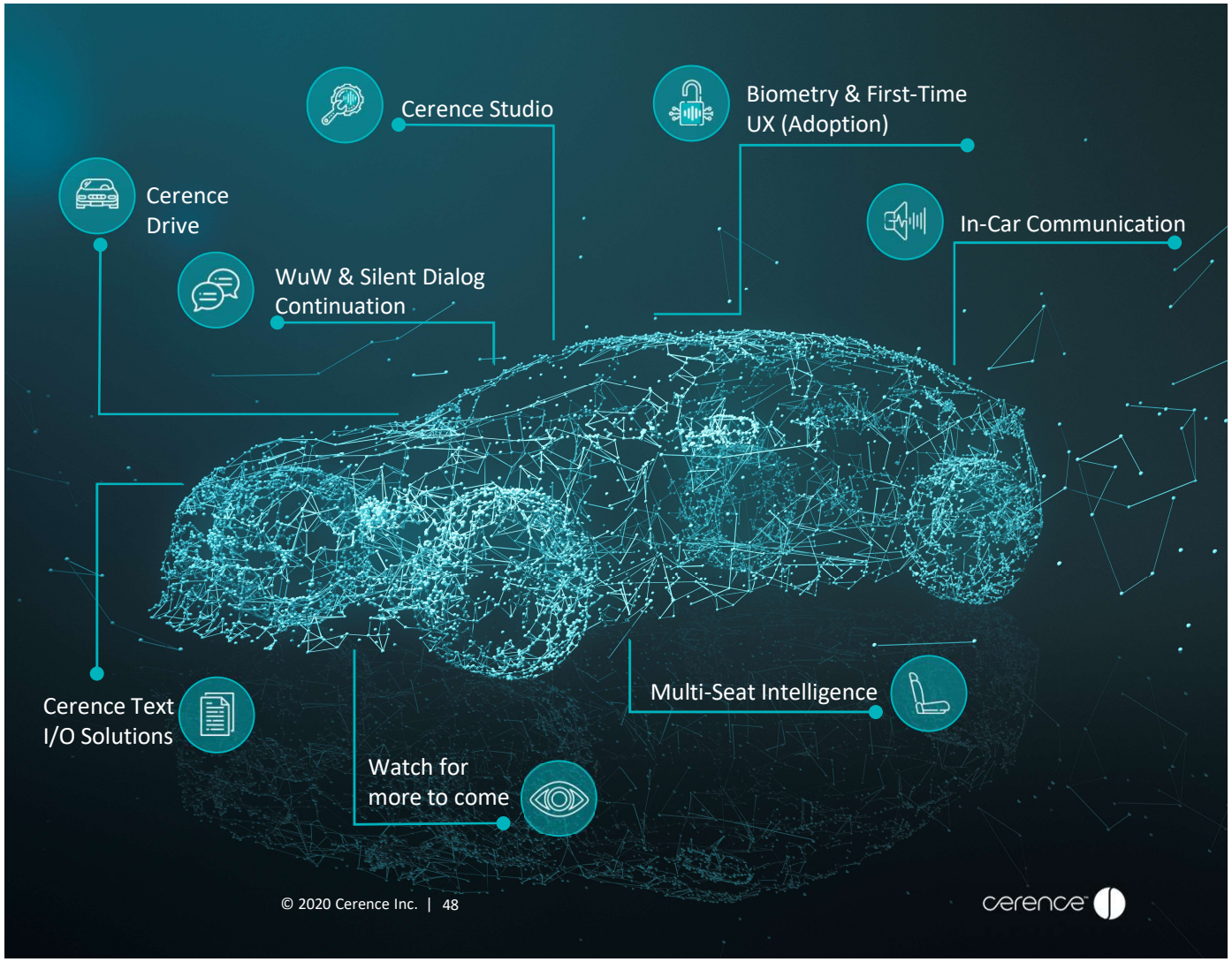
Cerence Products that Make MBUX Possible



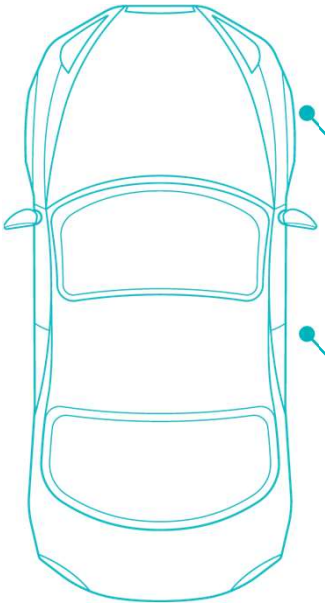
AI for a World in Motion

Feat of Significant Accomplishment and Value

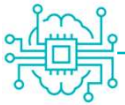
300+ Developers worldwide partnered with the Daimler counterparts

Supported semantics in the dialogs. Embedded dialog with 870+ intents and 575+ slots 2000+

Tuning and testing across Germany, US, China, Canada, Italy, Korea, and Belgium



Multi-cloud support in US and EU provides worldwide coverage and OTA updates



Integrated with hundreds of sensors and functions

Available for global audience with 27 supported languages

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“Any sufficiently advanced technology is indistinguishable from magic.”

Arthur C. Clarke

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Earning Rave Reviews and Accolades

" Like Tesla, only better!"
Autobild

"MBUX: Revolution for the Mercedes cockpit"
Automobil Industrie

"The smartest S-Class ever"
Auto Motor Sport

"A whole new level of driving"
TOUCH IT

"MBUX rich content is mind boggling"
MotorTrend

"Watch as we show how hey Mercedes voice assistant gives your car attitude"
Car Driver

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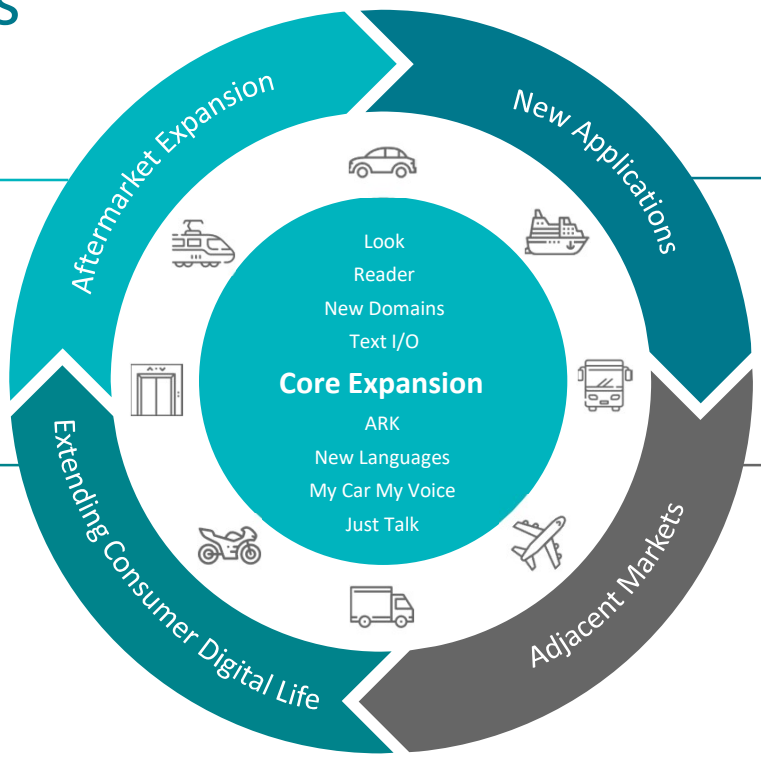
Innovation Creates Growth Opportunities in New and Existing Markets

Aftermarket Expansion

Extending Consumer Digital Life

Cerence Cognitive Arbitrator



New Applications

Cerence Pay
Cerence Car Life

Adjacent Markets

Two Wheelers
Cruise
Fleets
Trains
Public Transit
Elevators

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Thank you!

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