Xilinx in Automotive

Willard Tu, senior director, automotive

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Agenda

Background on Xilinx's automotive business

Today's News: Xilinx and Daimler

What's Next: Xilinx's powerful, new ACAP architecture

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About Xilinx

Pioneer and leader in field-programmable gate arrays (FPGA) and programmable system-on-a-chip (SoC) devices

- **High-performance, highly scalable programmable silicon with distinct benefits**
  - Handles extremely complex computing tasks
  - Allows creation of custom applications and can be reprogrammed as design evolves
  - Programmable SoC lines integrate powerful CPUs: software, hardware and I/O programmability in a single chip
  - Is driving innovation in many industries including aerospace/defense, ASIC prototyping, audio, automotive, broadcast and AV, consumer electronics, data center, medical, wired and wireless communications and more

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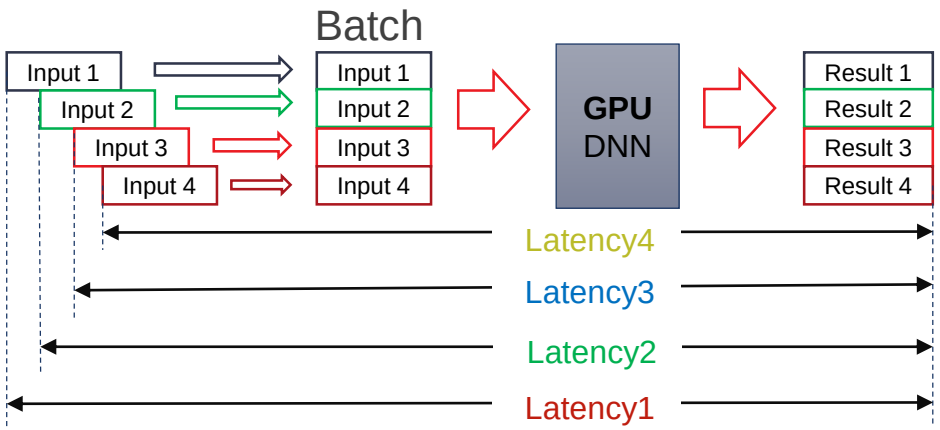
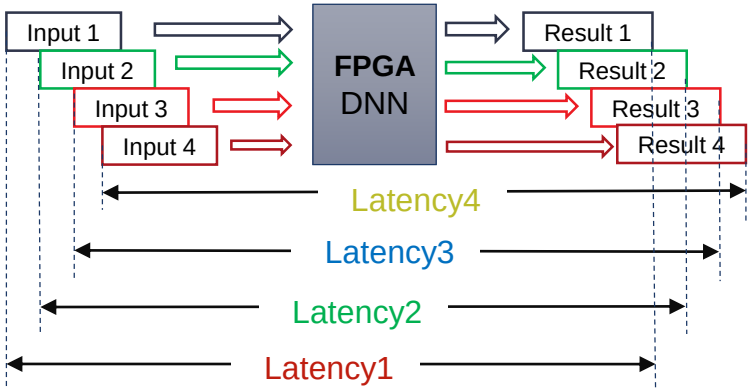
FPGA Benefits: Low Latency, High Throughput





- Inference with batches
  - >> Require parallel batch of data for SIMD
  - >> High batch => high latency, higher throughput
  - >> Lower compute efficiency at low batch
- "Batch-less" inference
  - – Low and deterministic latency
  - – High throughput regardless of batch size
  - – Consistent compute efficiency

Customers, from edge to Cloud, require low latency inference (batch=1)

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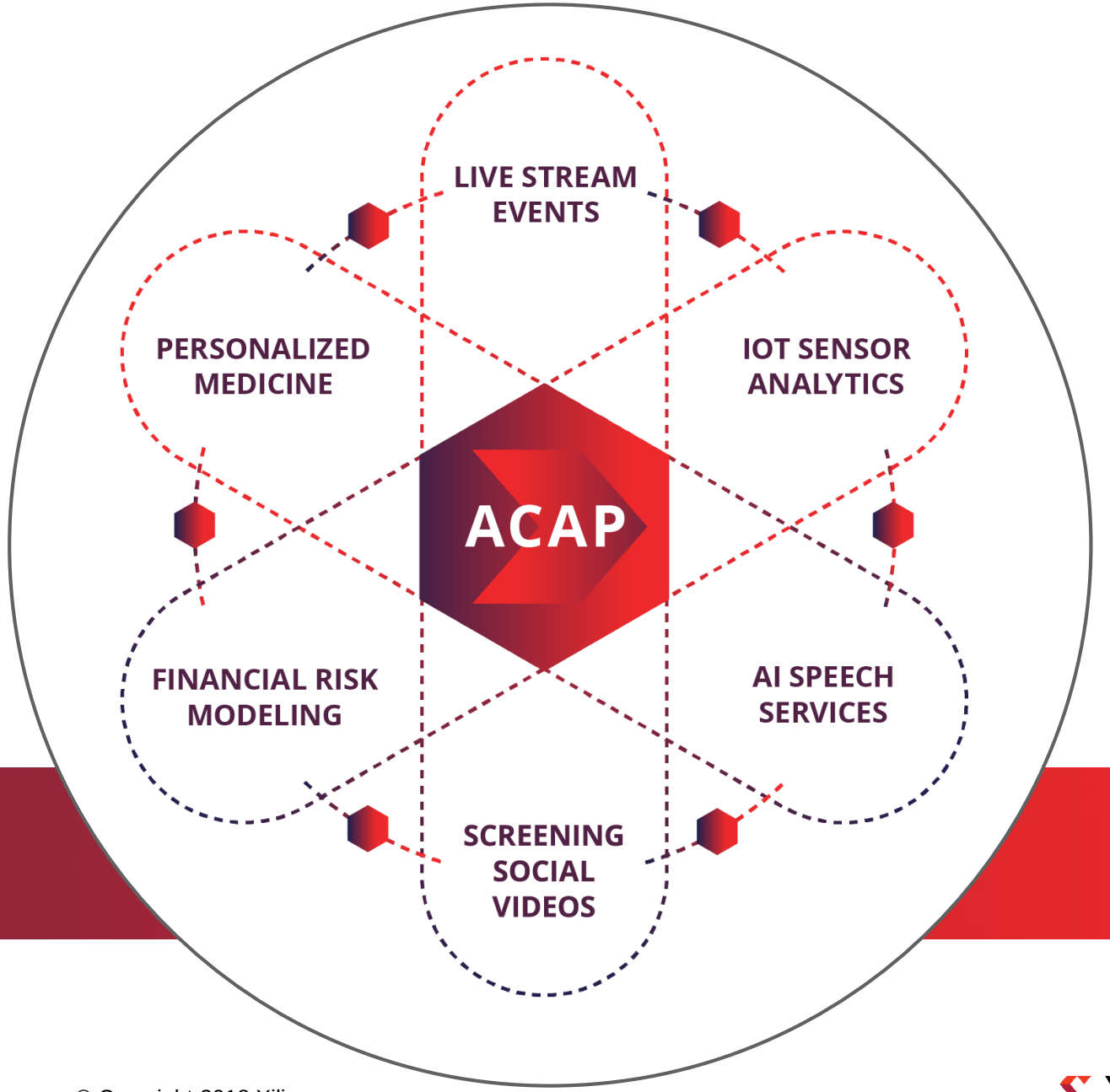
What's Next: ACAP

Next-generation technology announced earlier this year—adaptive compute acceleration platform (ACAP)—will exceed traditional CPUs and GPUs in performance



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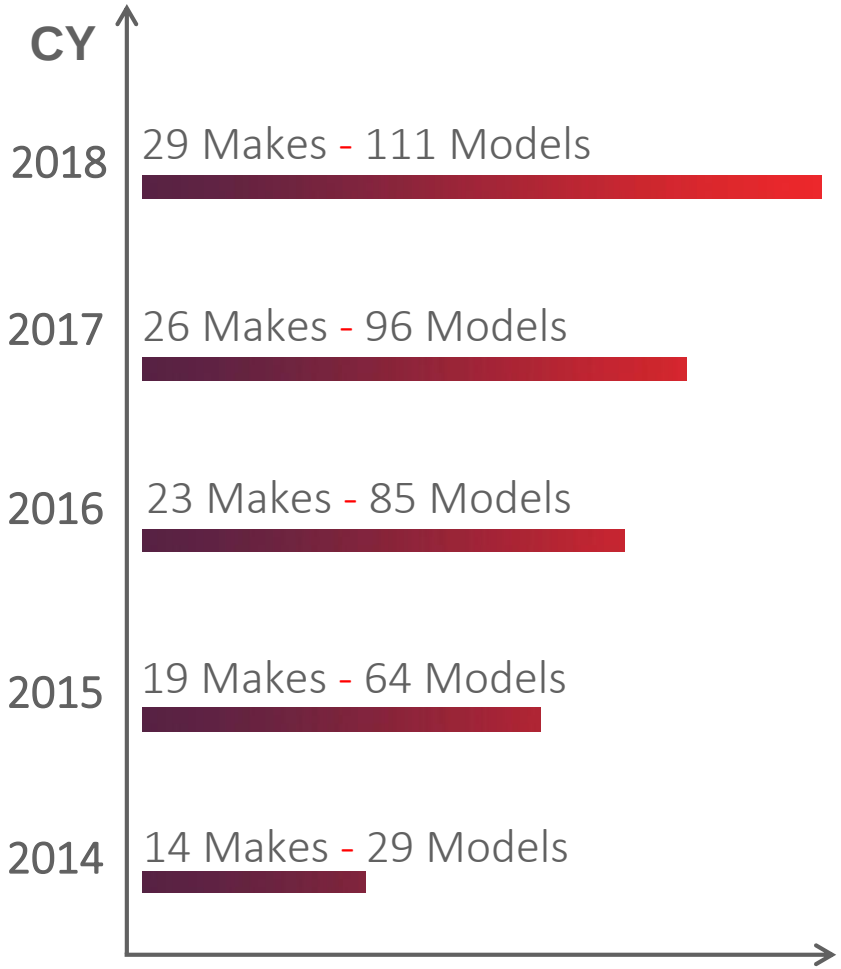
Xilinx's Steady Growth in Automotive



Tier 1 Suppliers

BOSCH, veoneer, Continental, Nidec, MAGNA, GENTEX, Panasonic, HARMAN, Pioneer, LG, HYUNDAI MOBIS, DENSO, Valeo, HITACHI, FURUKAWA ELECTRIC GROUP, MITSUBISHI

OEMs

Audi, BMW, Ford, SUBARU, LEXUS, Mercedes-Benz, Volkswagen, Geely, TOYOTA, Jeep, mazda, SEAT, CHRYSLER, VOLVO, Chevrolet, ŠKODA, ACURA, BYD, INFINITI, SAIC 上汽集团 SAIC MOTOR, ISUZU, Cadillac, NISSAN, LAND ROVER, DAIHATSU, HONDA, MASERATI, KING LONG 金龙客车, HYUNDAI

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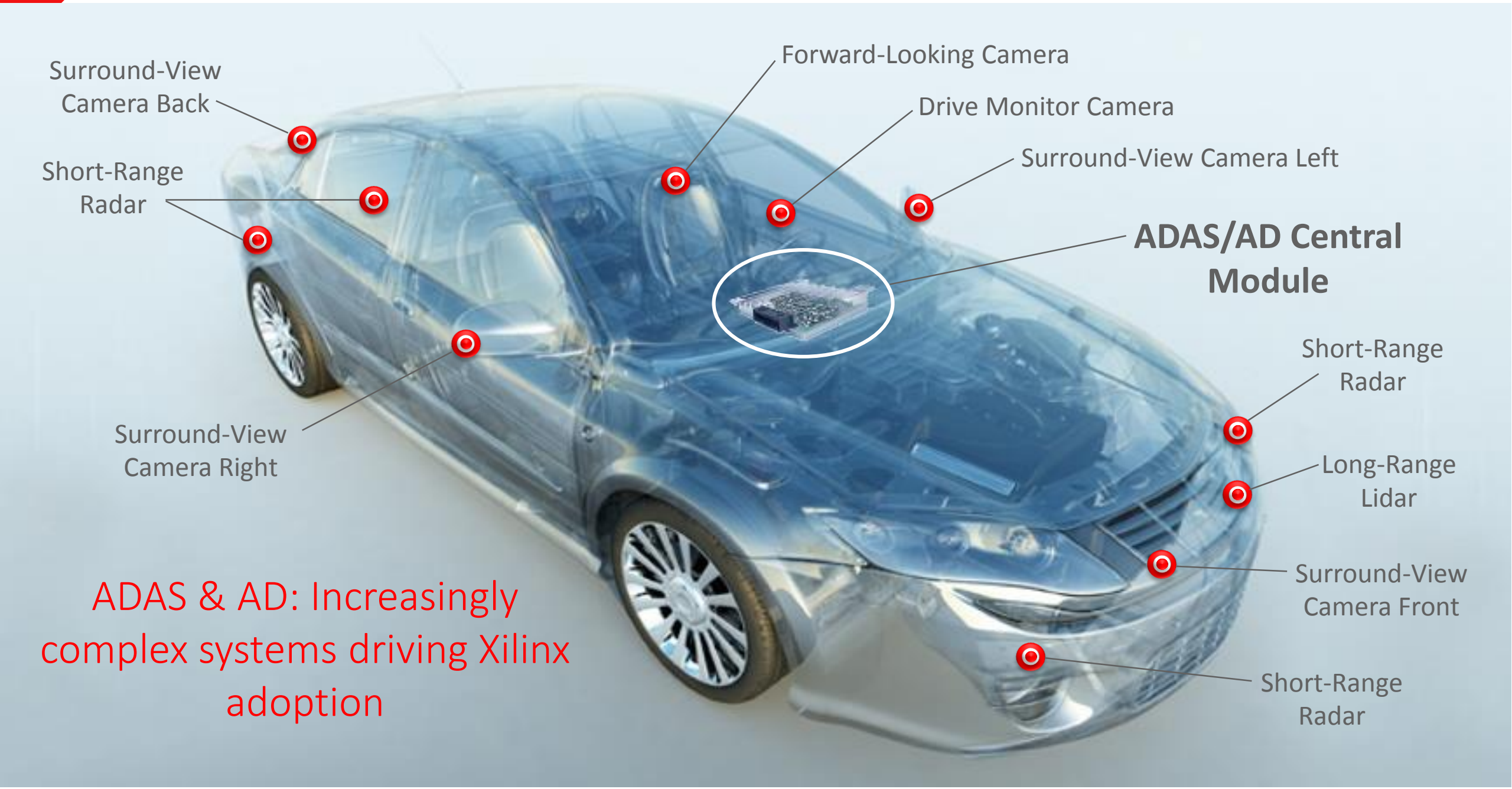

ADAS & AD: Increasingly complex systems driving Xilinx adoption

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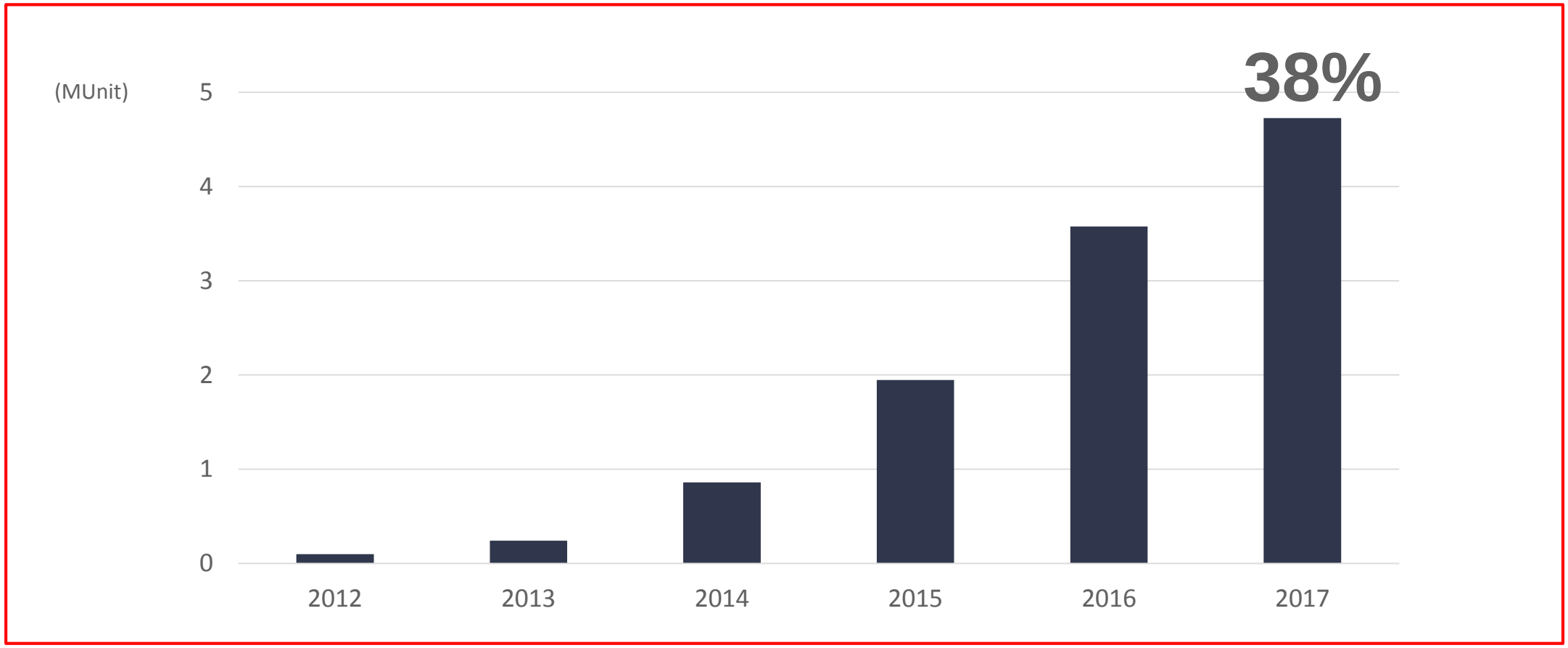
Front Camera Units/Shipments and Share



IHS Markit | TAM: IHS Markit 2017 | Xilinx SOM: shipment from **Four** Tier1s based in Japan and EU

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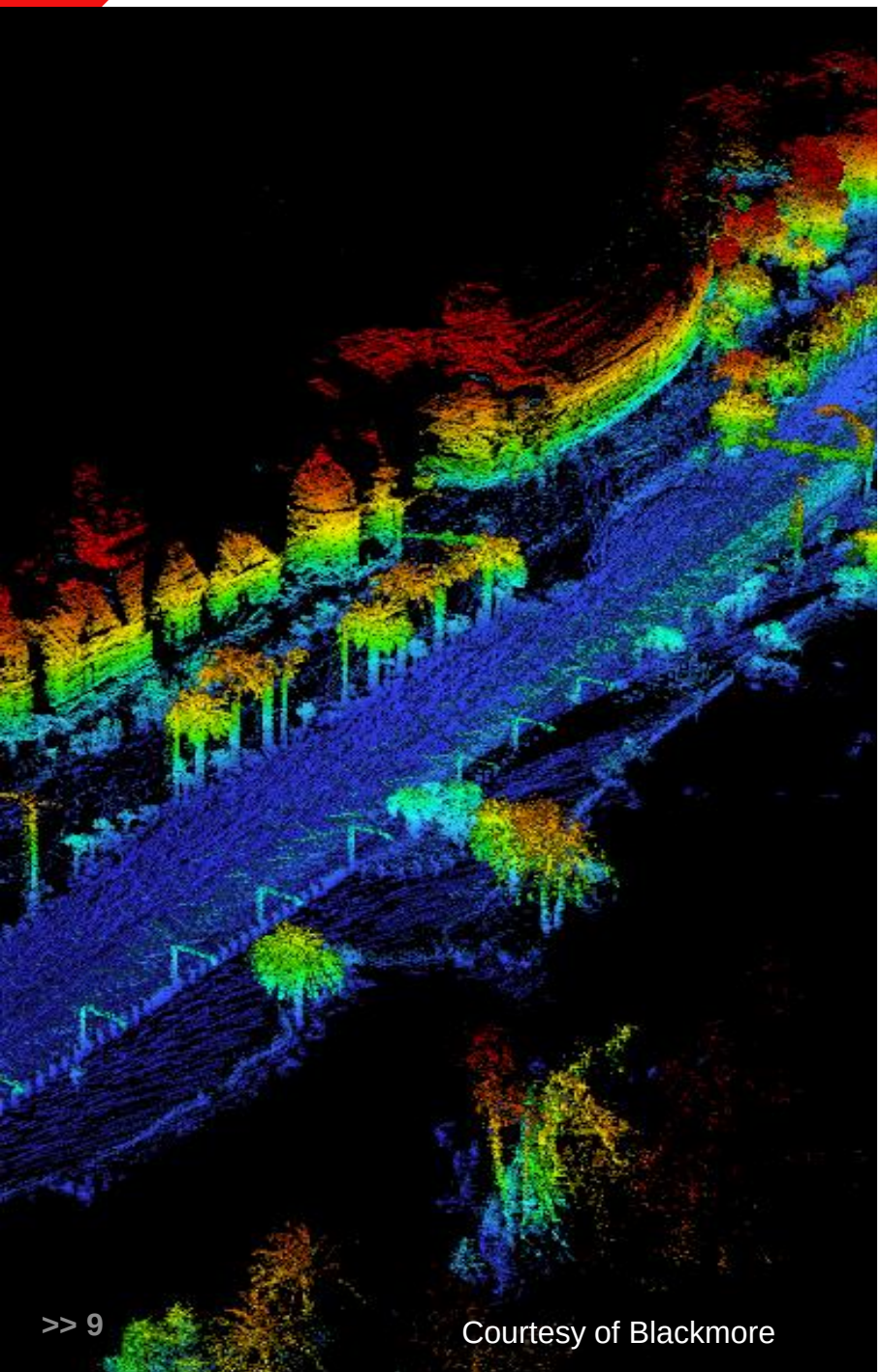

Courtesy of Blackmore

At the Forefront of Emerging Lidar Sensors

- Estimated market share >90%
  - Several major Tier 1s
  - Most start-ups
- Suitable for all Lidar technologies

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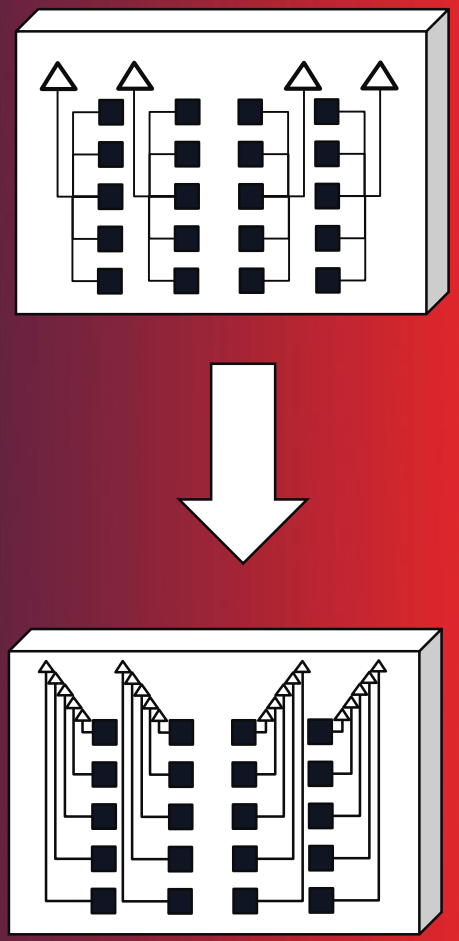
What's next: 4D Imaging Radar Complexity Demands Xilinx Power

4D Radar refers to an RF sensor that determines an object's location in Range (1), Azimuth (2) and Elevation (3), and the object's Relative Range Rate (4)

Most of today's automotive radar locate objects in range and azimuth only

- These radars combine column elements of planar array antenna



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What's next: 4D Imaging Radar Complexity Demands Xilinx Power (continued)

Adding the elevation location measurement can result in a dramatic increase in the number of receive channels and corresponding processing performance

- Each antenna element is associated with its own independent feed/channel
- This leads to the opportunity for digital beam forming in the processor

Therefore, 4D radar demands extensive use of simultaneous processing pipelines, which can be realized in Xilinx Programmable Logic fabric

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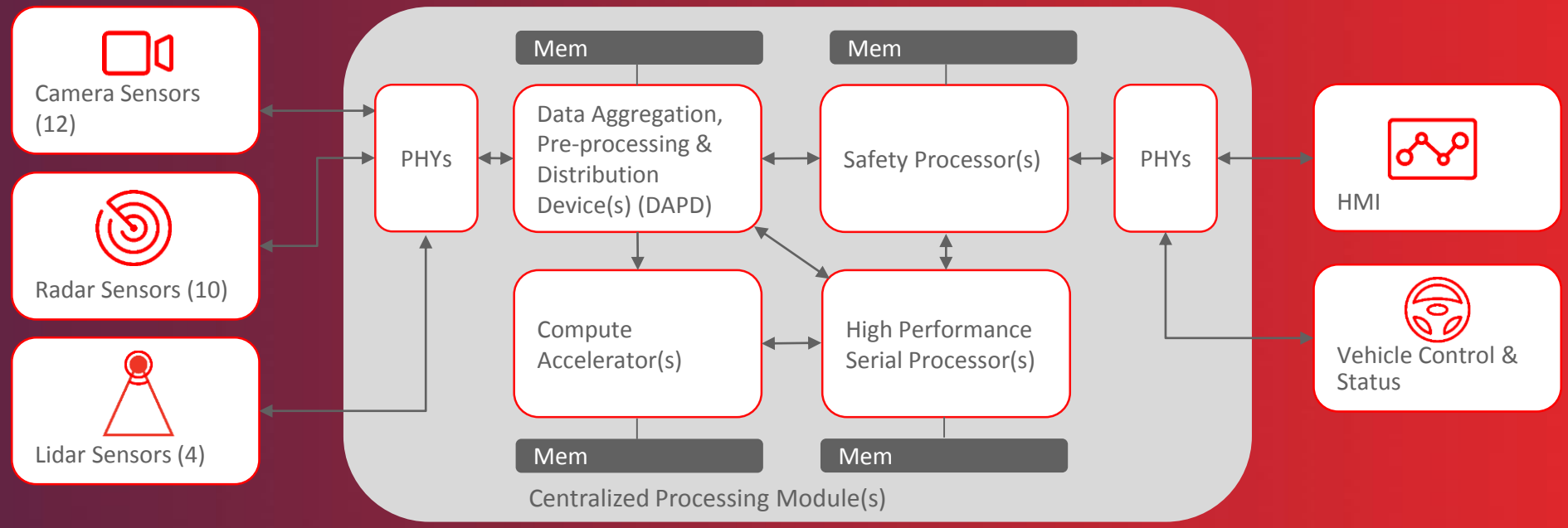
Why Xilinx for Autonomous Driving



- Front-end of an emerging application space = instability of designs
- 100x more complex than ADAS
- OEMs want to own & differentiate
- Scalability

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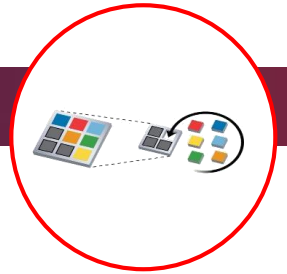
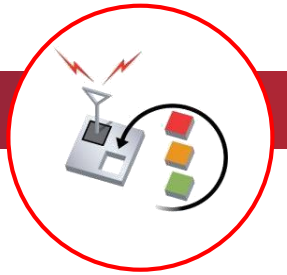
Achieving More with Less



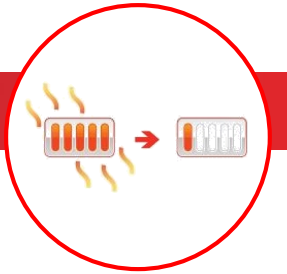
Dynamic Function eXchange (DFX)

- Using the same device for mutually exclusive functions
- Time-multiplexing hardware requires smaller device
- System cost and size reduction with fewer devices



OTA Silicon

- Over-the-air update to enable upgradability for software AND hardware
- Add new features or update mission critical functions, e.g. security algorithms



Thermal Dissipation Reduction

- Use smaller or/and fewer devices
- Swap out power-hungry tasks
- Optimized performance/watt

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Today's News: Daimler Selects Xilinx for AI-based Auto Applications

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"Xilinx is providing technology that will enable us to deliver very low latency and power-efficient solutions for vehicles that must operate in thermally constrained environments. We have been very impressed by Xilinx's heritage and selected the company as a trusted partner for our future products."

~ Georges Massing, Director User Interaction & Software, Daimler AG

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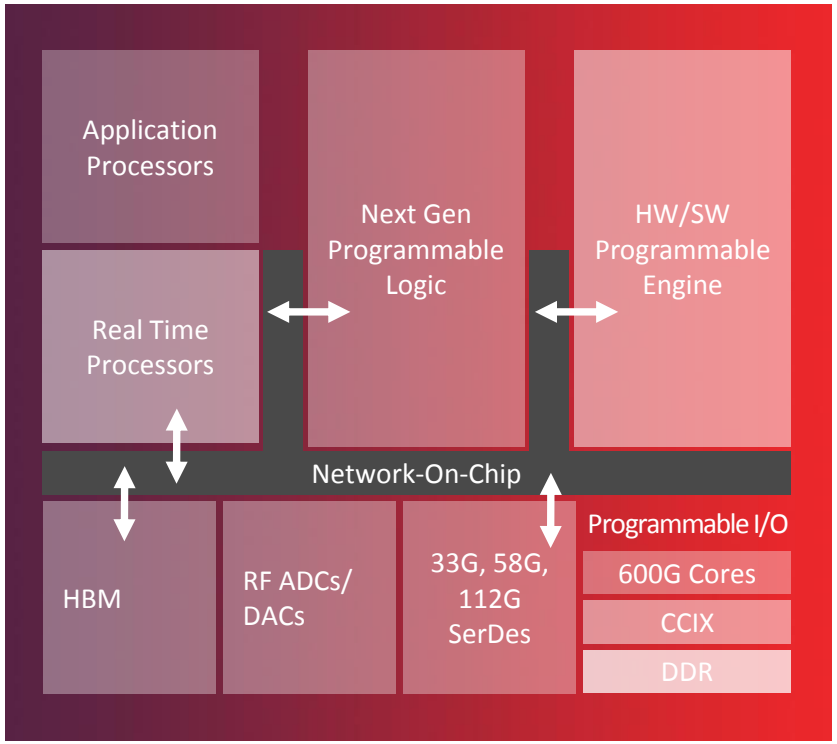
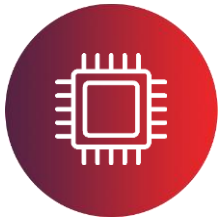
What's Next: Xilinx ACAP

Announced in March, new device category

- Enables workload-specific acceleration
- Hardware/software-programmable engines, IP subsystems and a network-on-chip, highly integrated programmable I/O





Will power cameras up to 8MP and enable systems up to Level 3, handling urban and highway scenarios

Benefits include higher bandwidth channels; high-performance/low power consumption; high performance/low power CNN Processing for environment Cognition; expected to advance functional safety

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The Road Ahead
Building the
Adaptable Intelligent World

Adaptable.
Intelligent.

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