# Leveraging Edge and Cloud for Visual Intelligence Solutions

Salil Raje
Senior Vice President,
Software and IP Products Group
Xilinx

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# Agenda

- EV architectural trends
- Challenges of hybrid architectures
- What's needed


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# EV Architectural Trends

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## Driver Assistance Example

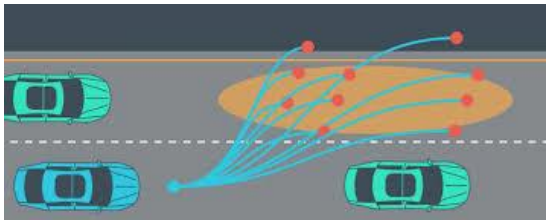
Power budget: 5W

Cost budget: $10-$40

Sensor input

Deep learning based perception

Path planning



Automatic braking

Latency < 100 ms



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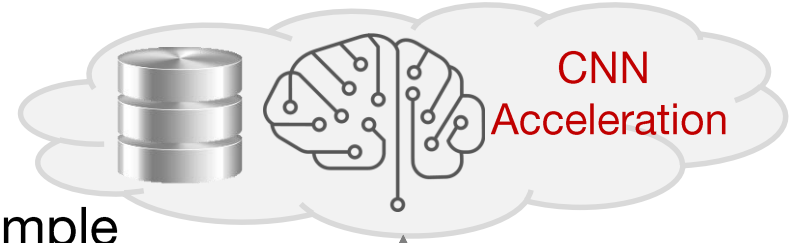
# EV in the Cloud: High Computational Performance/Watt




Medical Imaging Example

GB's of 3D image data

VPN

MRI Center 1

MRI Center 2

MRI Center 3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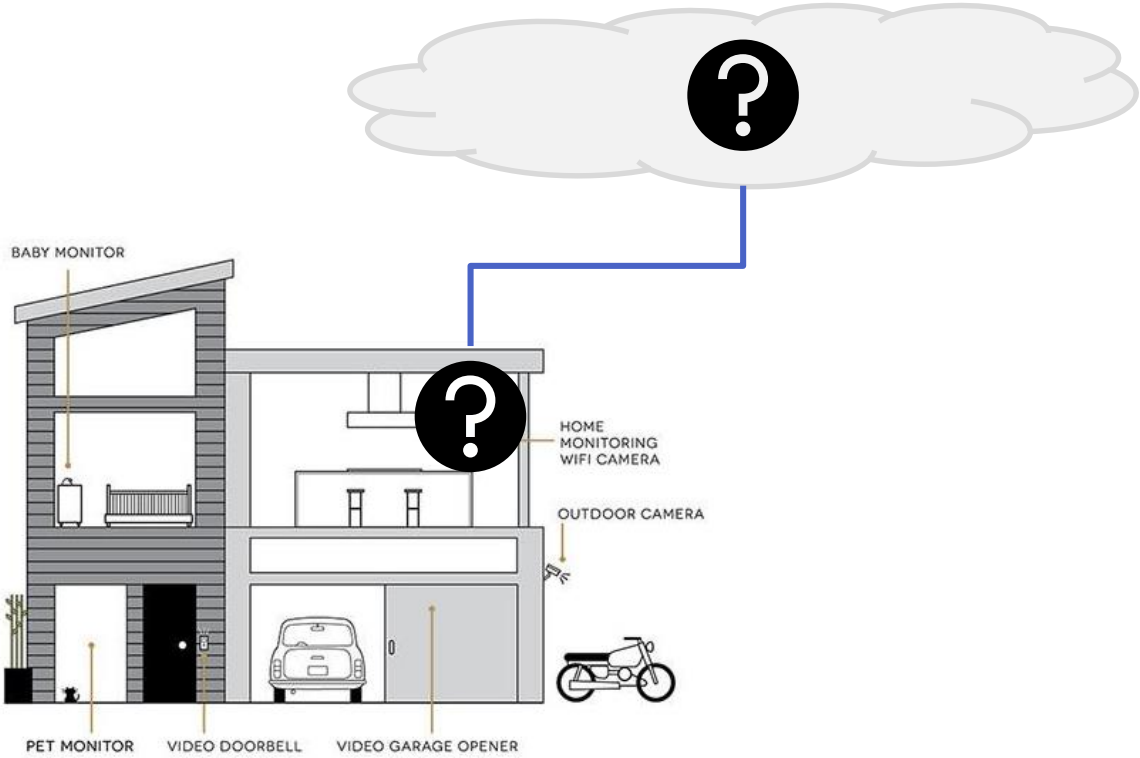
# EV Home Security Use Case





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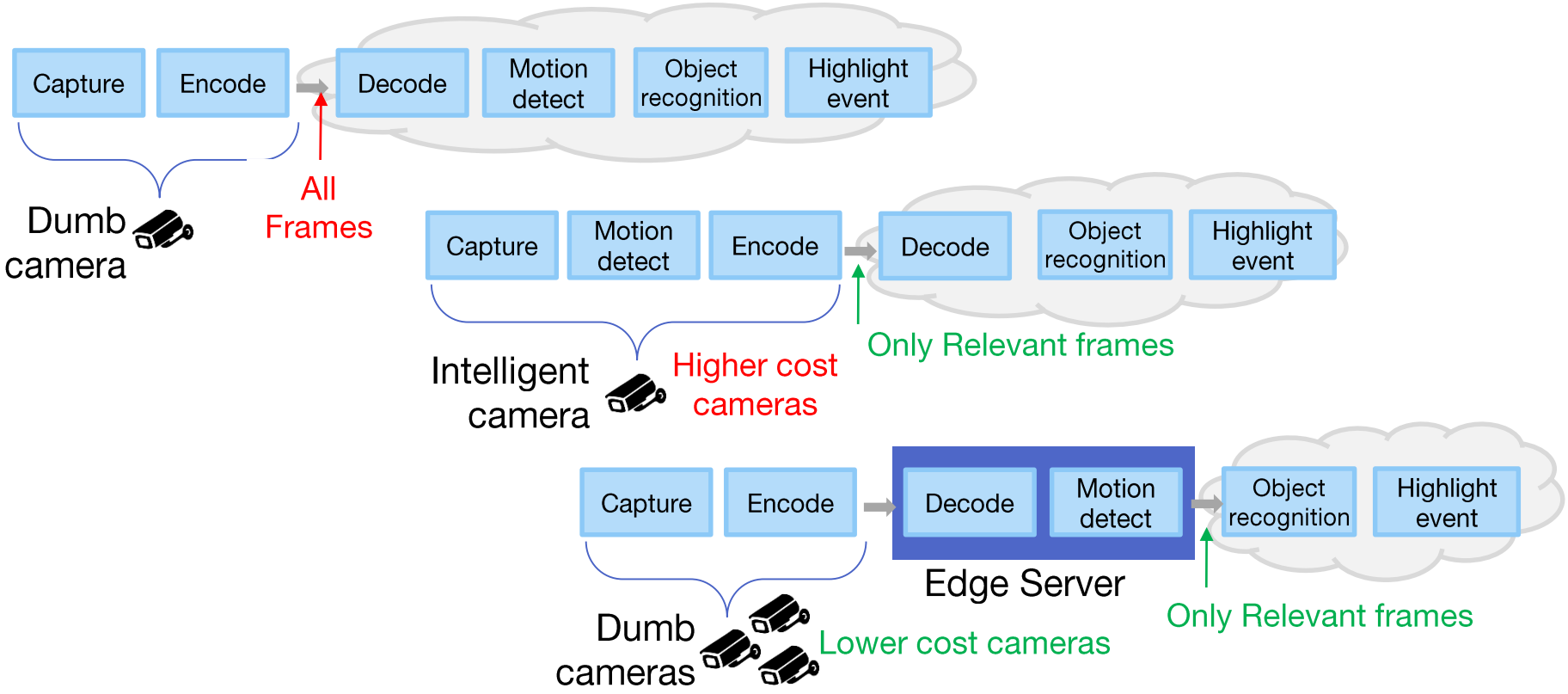
# EV Hybrid Architectures for Home Security





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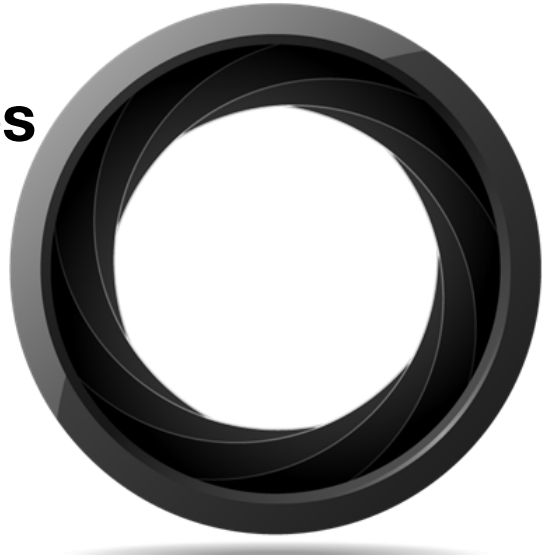
# Challenges of Hybrid Cloud Architectures

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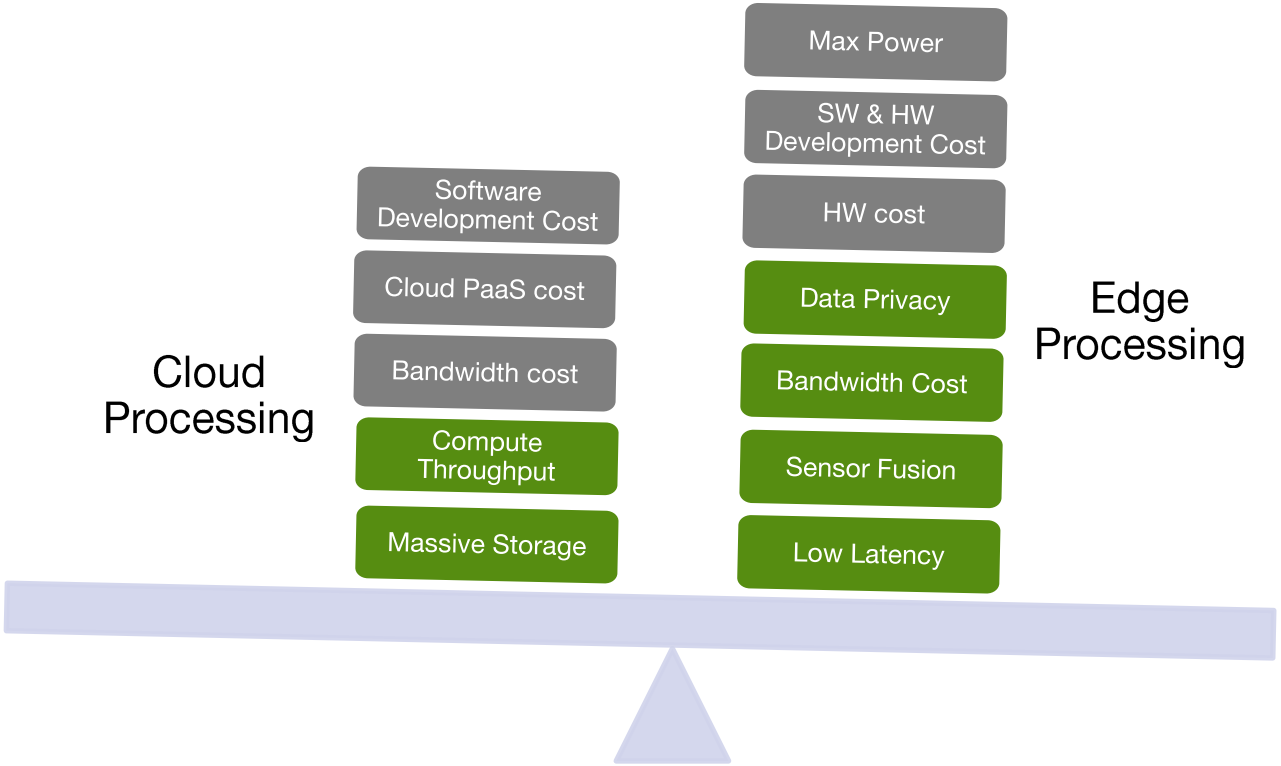
# System Partitioning Factors





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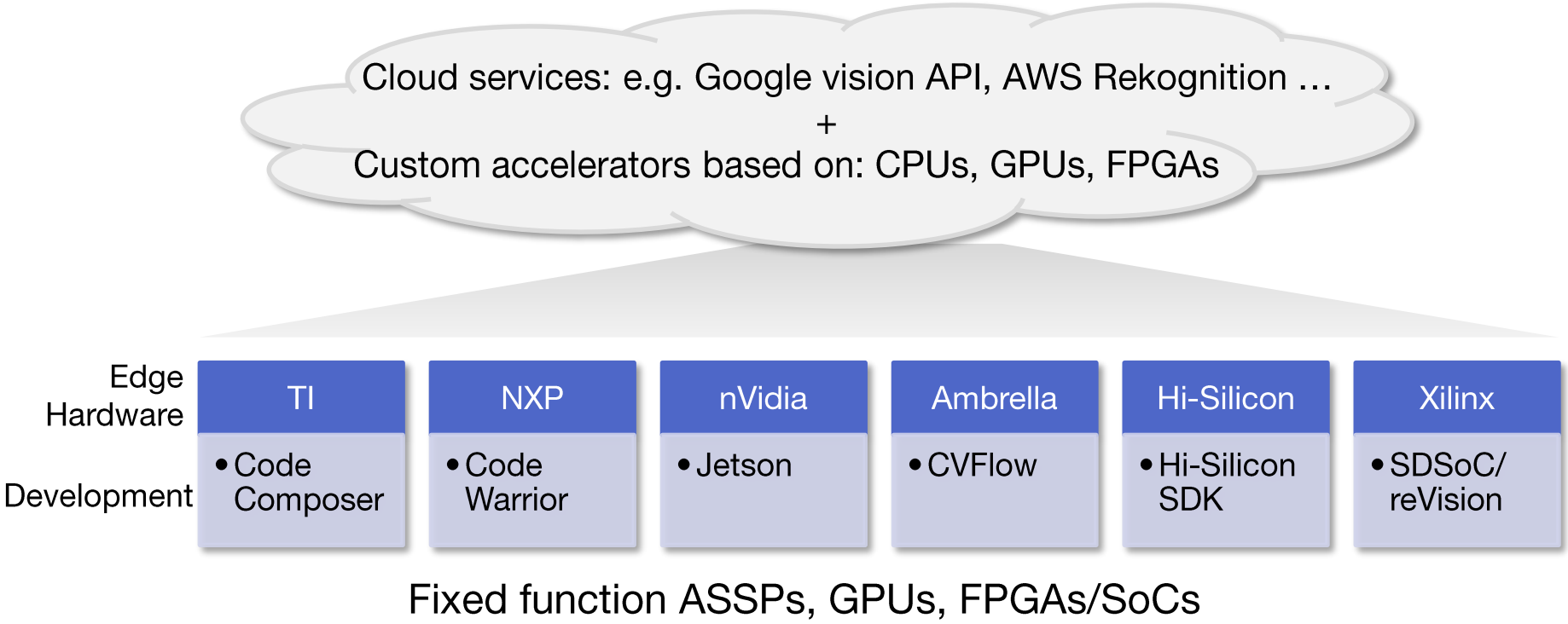
# Diverse Architectures with Multiple SW Stacks





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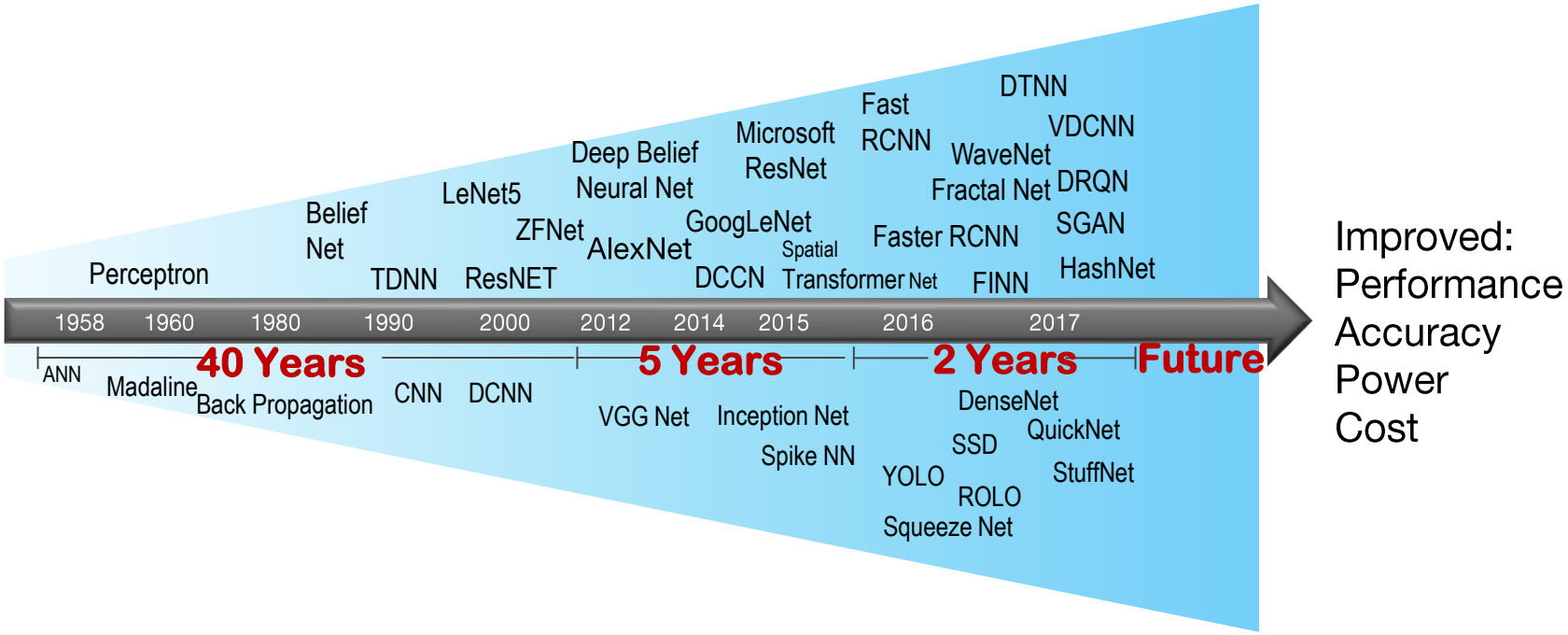
# Rate of Neural Network Algorithmic Innovation





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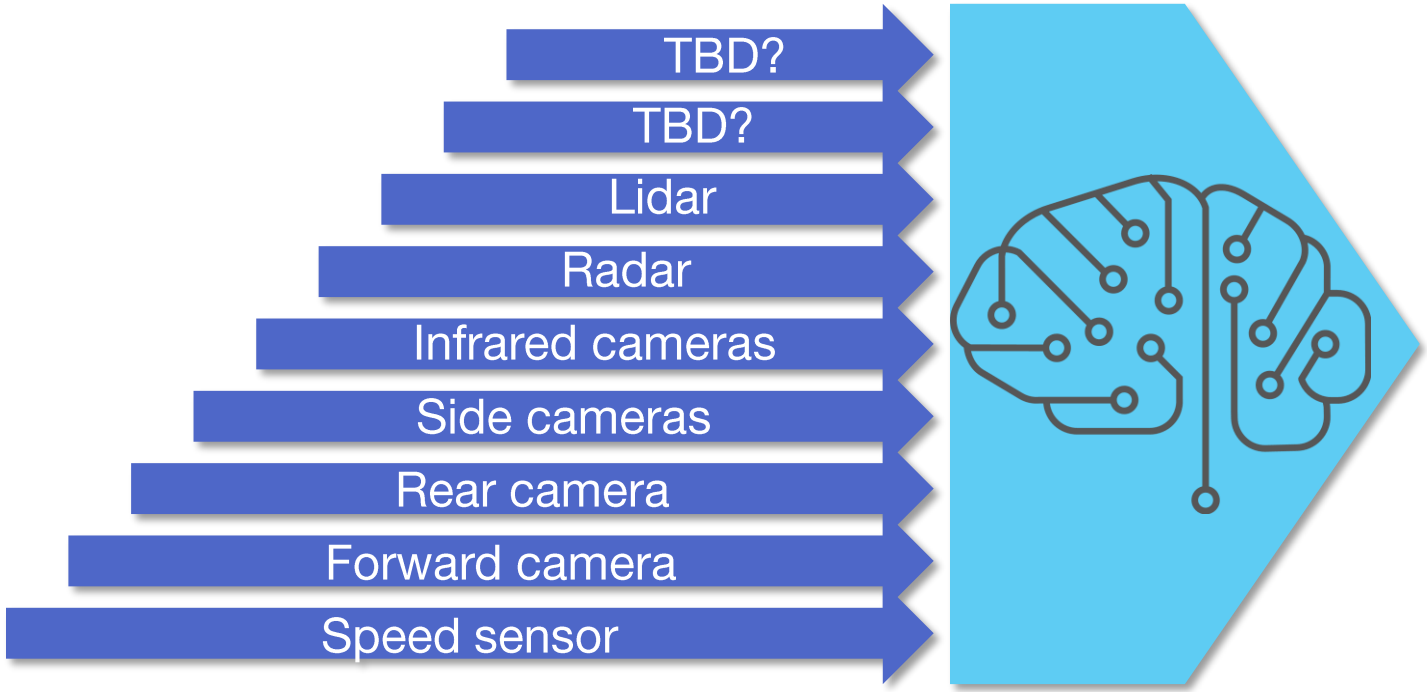
# Rapid Evolution of Sensor Fusion





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# What's Needed

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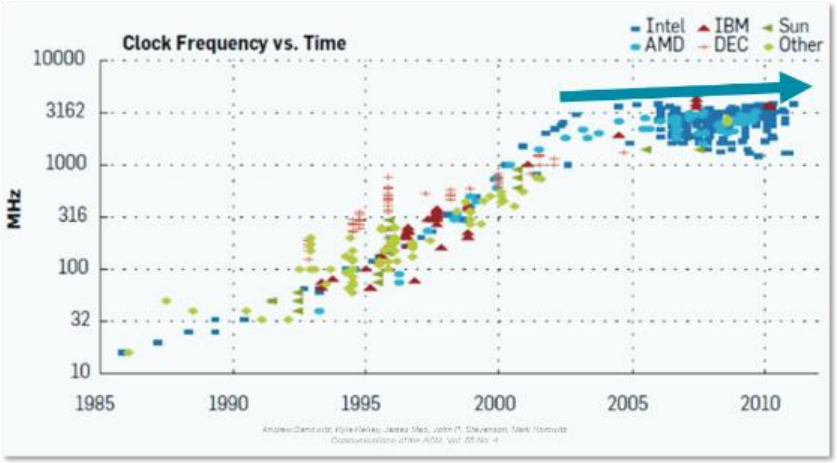
# Need Workload Specific Accelerators

- Processor frequency scaling ended in 2005
- Multicore architecture scaling has flattened



- Workloads require higher performance, lower latency
  - Cloud: Transcoding, analytics, AI…
  - Edge: EV, analytics, AI…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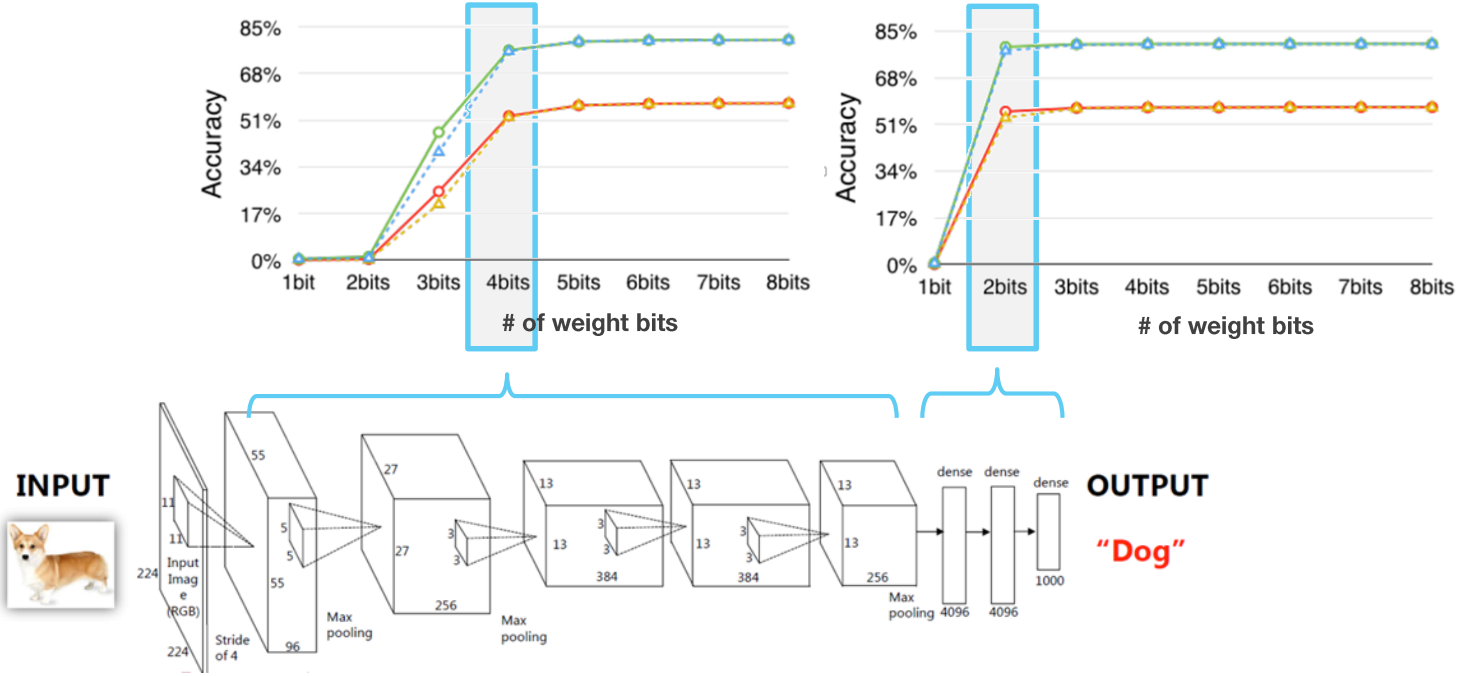
# Need Variable Precision Inferencing




Citation: https://arxiv.org/pdf/1510.00149.pdf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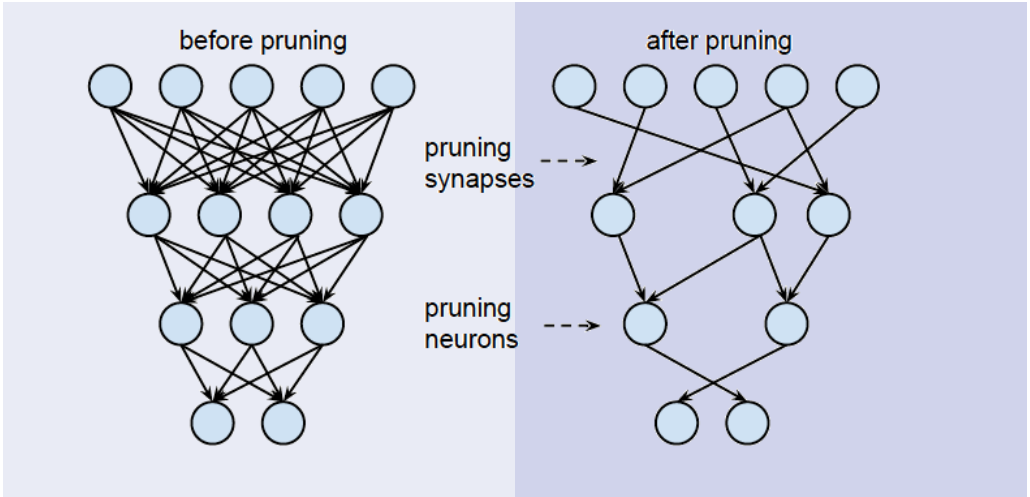
# Need CNN Pruning & Compression for Best Performance




| | | |
|---|---|---|
| Area | 100% | 15% |
| Error rate | 11.2% | 11.52% |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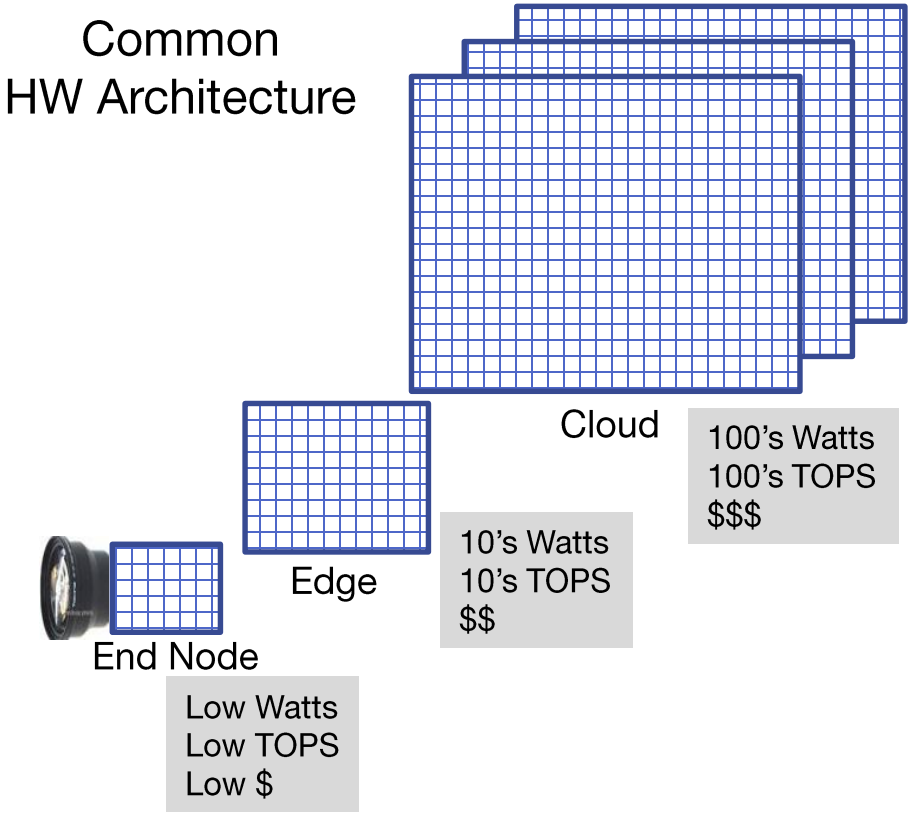
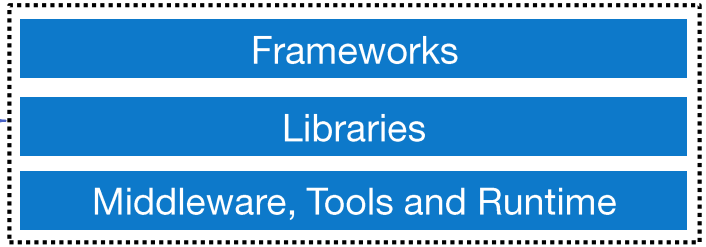
# Need Scalable HW/Unified Software Architecture




Common SW Stack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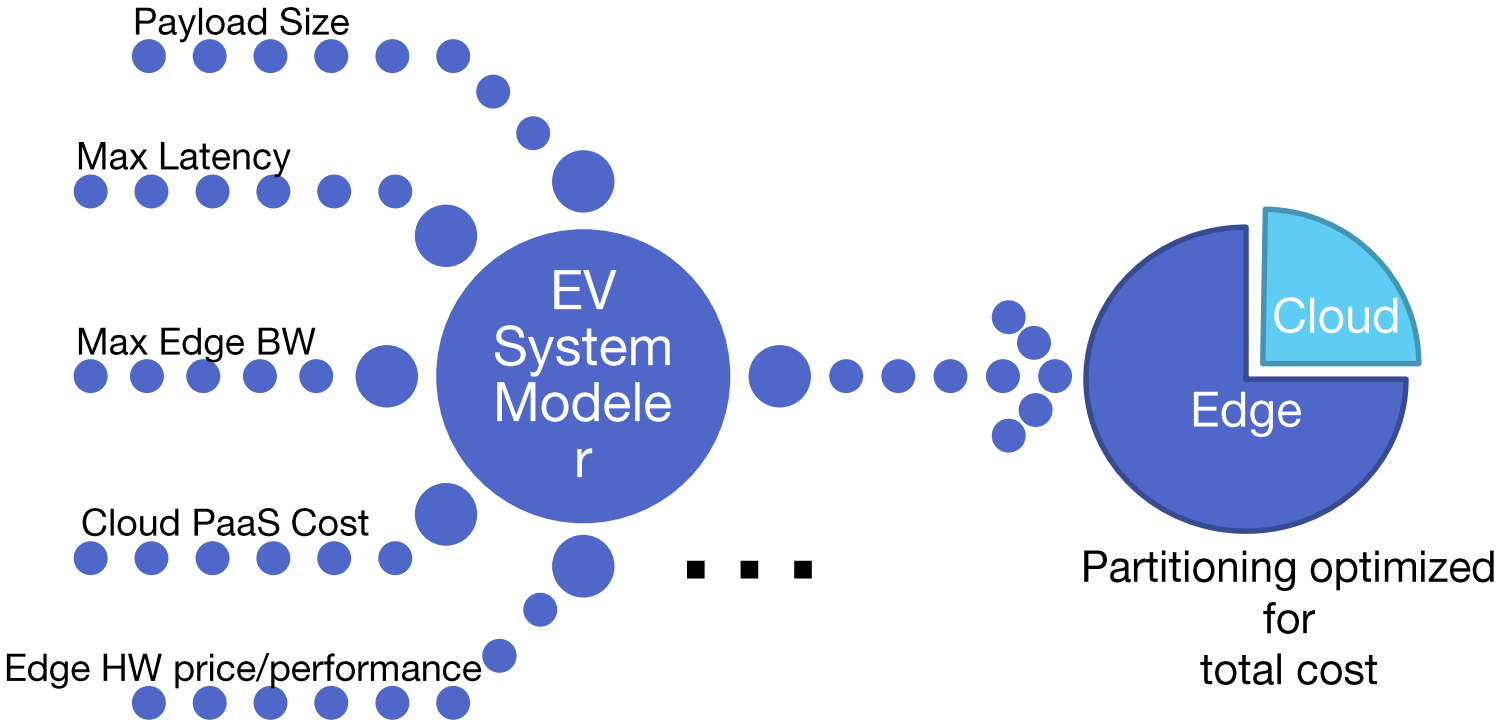
# Need Better System Modeling Tools





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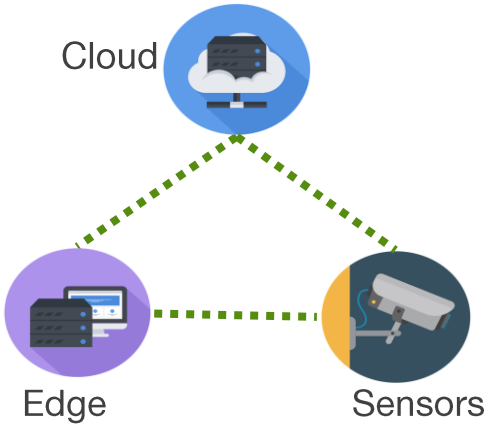
# Summary

- Increasing trend towards hybrid cloud architectures for EV applications
- Scalable, adaptable HW architecture and unified SW are a must
- Industry standard frameworks and libraries will accelerate growth





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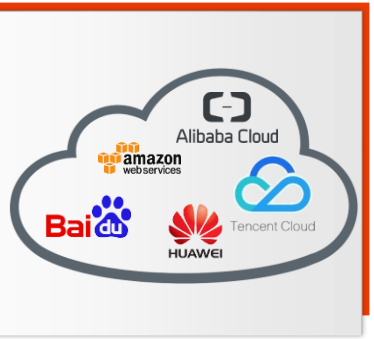
# About Xilinx and EV

| | FPGAs and SoCs | Production Boards | FPGA as a Service (FaaS) | EV Development Stack |
|---|---|---|---|---|
| Xilinx Offerings | | |   | reVISION Stack |

Examples of EV Applications

- >80 ADAS Models
- >80 ProAV & Broadcast
- >60 Smart Camera
- >50 Industrial Vision
- >10 Medical Diagnostic
- >5 VR/AR
- >5 Drone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# Xilinx EV Resources

- **Visit Xilinx on-line**
  - Platinum area of EVA website:
    **www.embedded-vision.com/platinum-members/xilinx**
  - EV Zone of our website
    www.**xilinx.com/products/design-tools/embedded-vision-zone**


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# Thank You