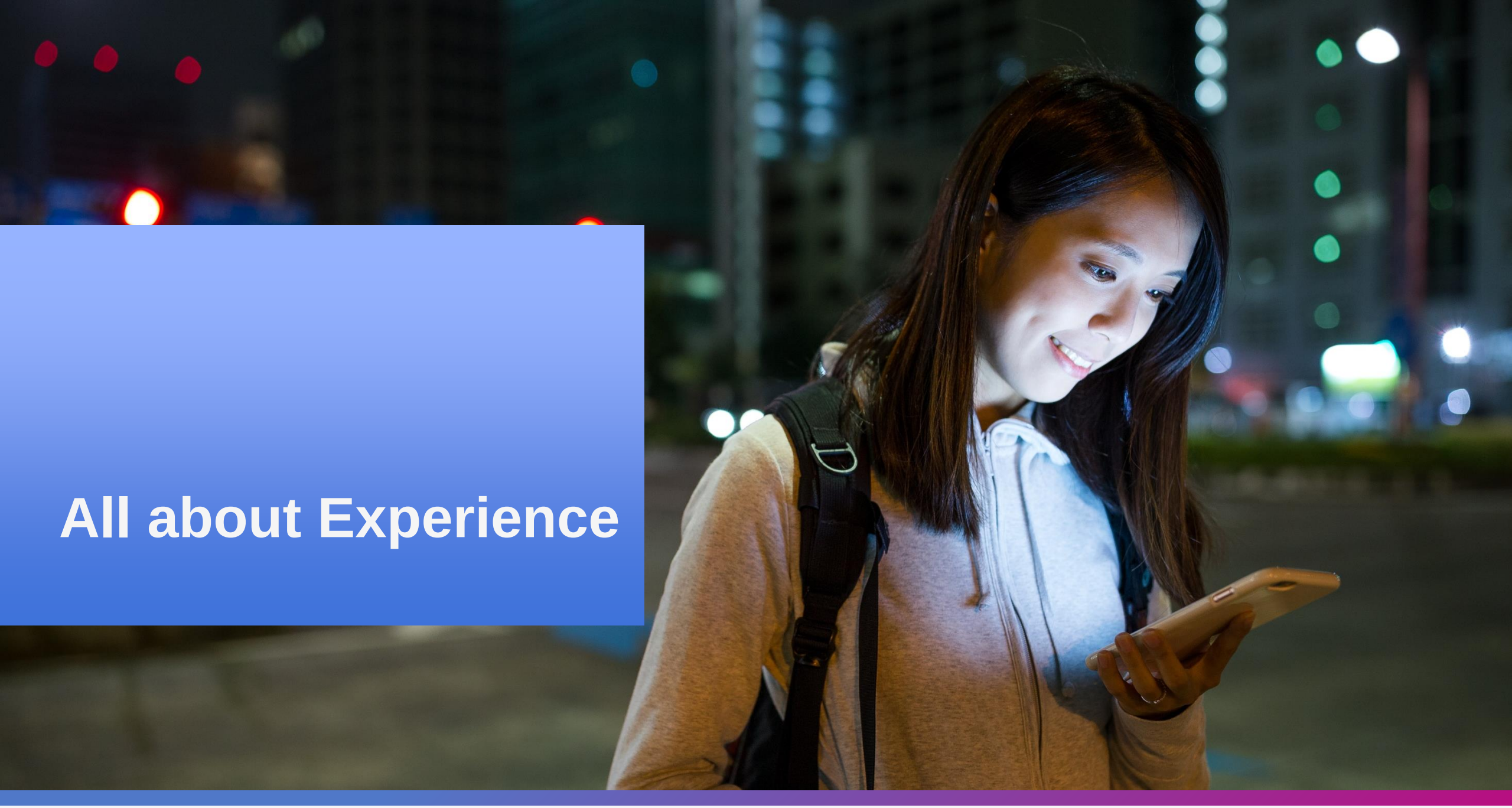
ACCELERATING HETEROGENEOUS SOC DESIGN

Chengdu

Zack Zheng, 11th June 2019



All about Experience

Enables Partners to lead the User Experience

Leading global provider of strategic Intellectual Property (IP) blocks for System-on-Chip (SoC) devices

Domain experts in graphics processing unit (GPU), artificial intelligence (AI) and connectivity

Our IP helps customers develop chips with highly differentiated features, enabling fast time to market & reducing risk

SoC devices using Imagination's IP devices are used in billions of devices worldwide

Customers includes top semiconductor players and OEMs such as Leading Smartphone companies and AP providers, enabling the development of many of the world's most iconic products

Cumulative partner chip shipment > 11 bn

The Imagination IP family

Imagination

The best solution for embedded graphics, vision, AI and communications

PowerVR GPU

Leading graphics IP cores for embedded devices

- XEP/XMP GPU
  - Focused Features
  - Fillrate & perf/mm2 focus
- XTP GPU
  - Feature rich
  - Performance/mW

PowerVR Vision & AI

Dedicated AI and Computer Vision IP Products

- PowerVR 3NX
  - Neural Network Accelerator
  - Performance/mm2
  - Performance/mW
- PowerVR ISP
  - Low area, high quality & highly power efficient
  - Multi camera capable ISP

Ensigma

Connectivity and broadcast communications

High performance, low power

- RF
  - Wi-Fi, Bluetooth
- Connectivity
  - Wi-Fi, Bluetooth
  - IEEE 802.15.4
  - GNSS
- Broadcast
  - TV, Digital Radio

Powers everything, everywhere

Mobile

Automotive

IoT

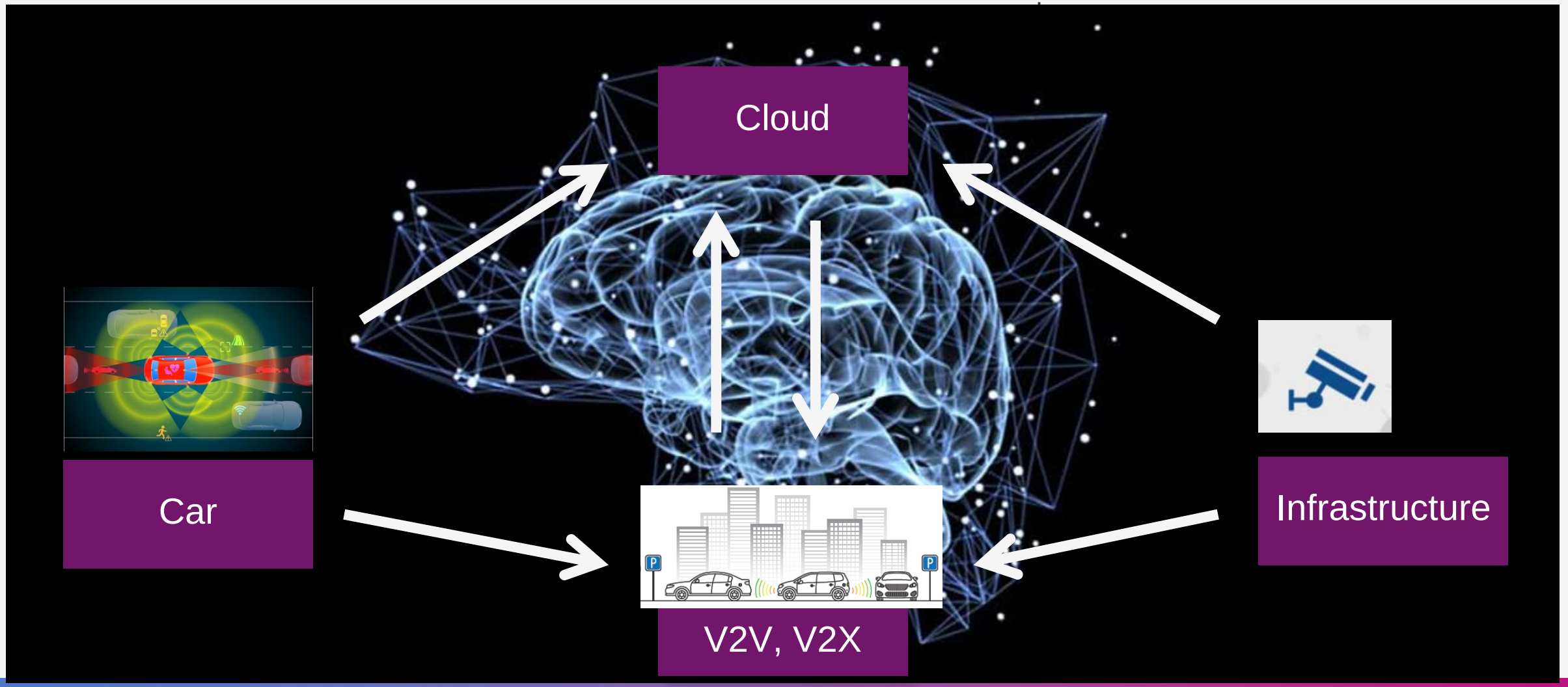
Consumer

Vision & AI

AR / VR

Device + Cloud + Urban infrastructure

Hybrid model



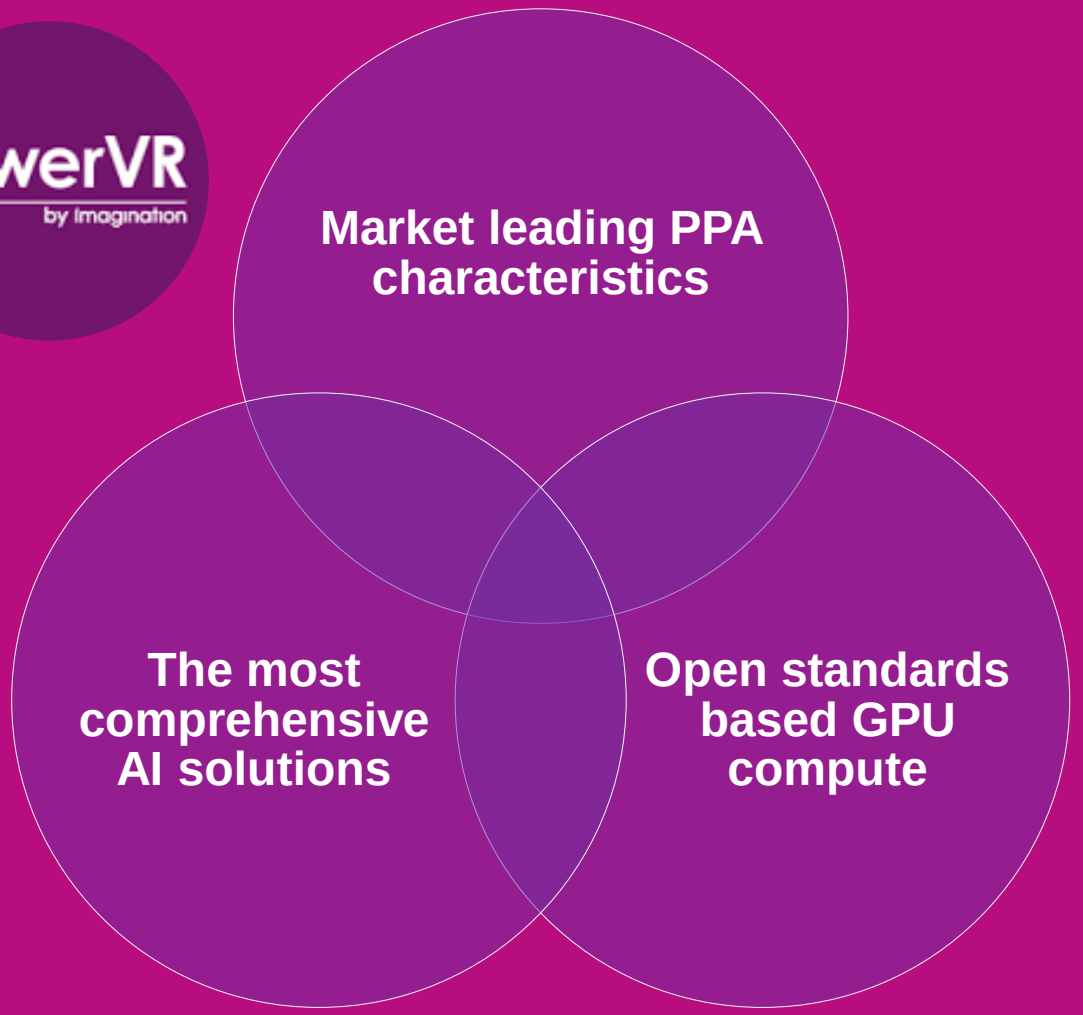
The PowerVR Pedigree

- An architecture based on patented advantages (TBDR)
- A heritage of high performance
- Unmatched team experience
- Deep relationships built on quality, technology and support

10
GENERATIONS OF GPU

25+
YEARS EXPERIENCE

6+
BILLION CORES SHIPPED



- Significant investment in R&D
- Thousands of fundamental GPU patents
- Granular, scalable & differentiated product
- Choose any PPA balance, we have the core
- 5+ years investment in AI

PowerVR Product Families

PowerVR GPU and Neural Network Accelerator IP Families

PowerVR

The best solution for embedded graphics, vision and AI

PowerVR GPU

Broad suite of products covering embedded graphics needs across several applications

PowerVR Vision and AI

Dedicated AI, Vision ISP and vision hardware

XE/XM GPU

Focused features
Fillrate/mm^2
Performance/mm^2

XT GPU

Feature rich
Performance/mW

GP-GPU

Compute focussed solution

3NX NNA

Hardware NN

Performance/mm^2
Performance/mW

Vision / ISP

Hardware

Performance/mm2
Performance/mW

PowerVR 8XE/8XEP in Silicon

Some examples of devices created by various OEMs

PowerVR GE8100

HTC Desire 12

Lenovo A5

Ulephone S9 Pro

Huawei Honor 7S

PowerVR GE8300

Renesas R-Car D3

Acer Iconia One 10 B3-A50

Lenovo Tab 7 Essential

Acer Iconia One 10 B3-A40

PowerVR GE8320

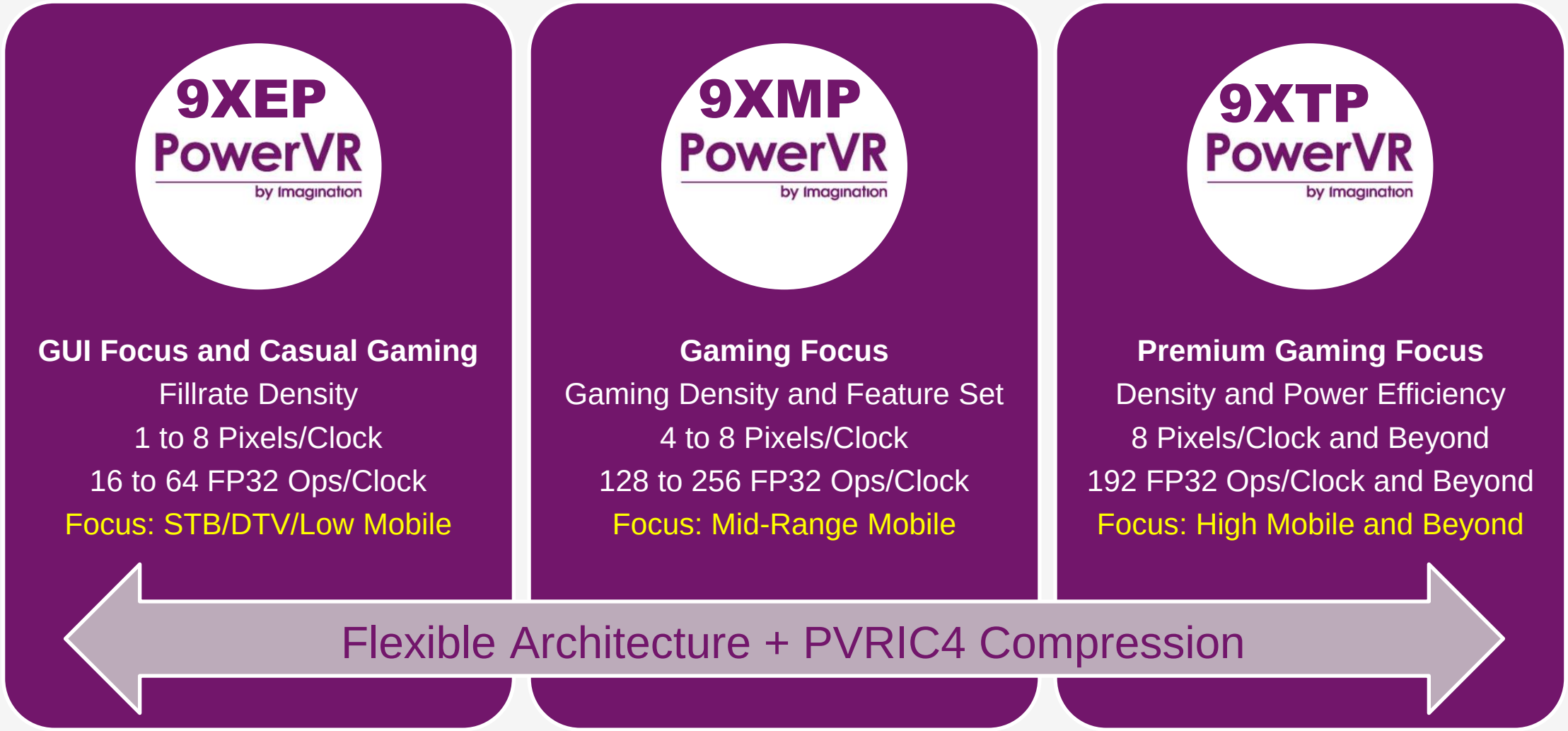
Vivo Y83

Xiaomi Redmi 6A

Alcatel 5V

Many more devices available and in development…

PowerVR GPU Solutions Overview



Other configurations possible – selected configurations highlighted


PowerVR 9XEP
PowerVR 9XMP
PowerVR 9XTP
PowerVR Circuit breaker Demo - Conceptual illustration, final performance/quality depends on system characteristics

Ray Tracing - Realistic Shadows

PowerVR Series3NX highlights

Wide core selection

- Five NNA new single cores
- 256 to 4,096 MACs/clk
- Up to 10 TOPS/s

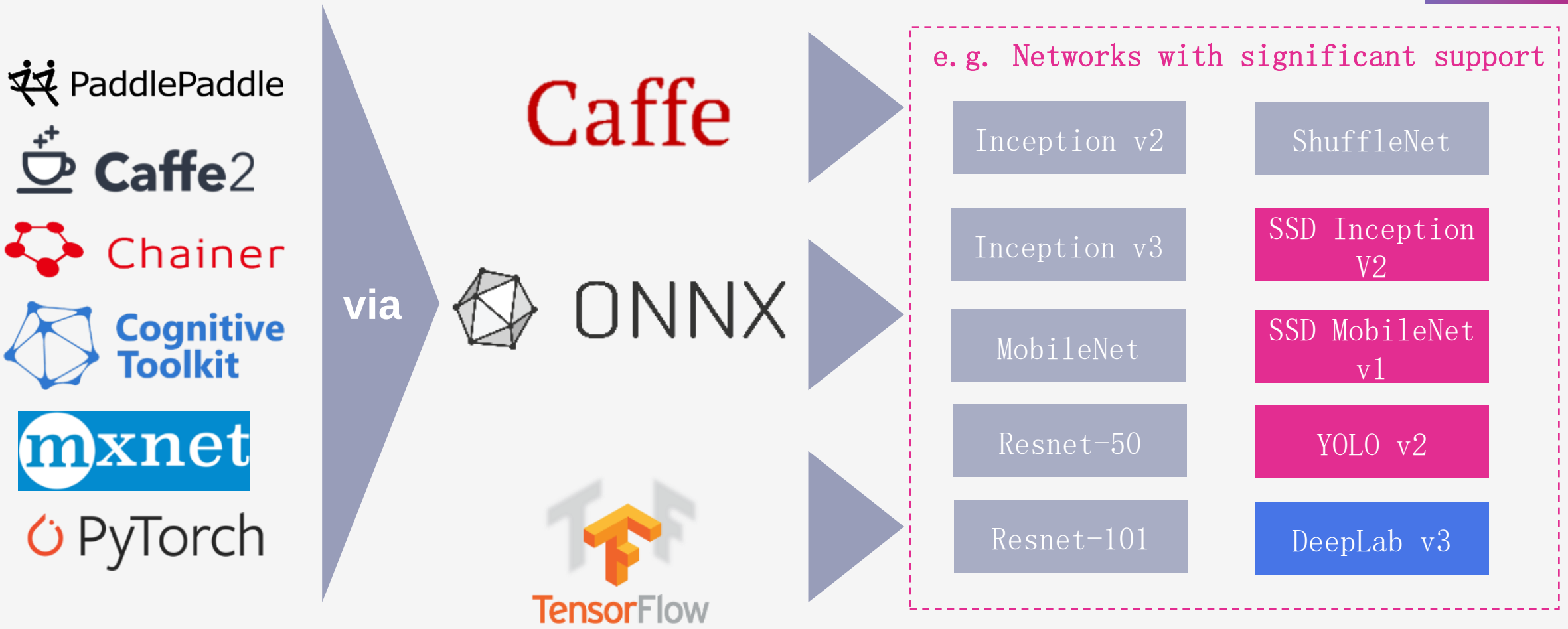
Improved PPA

- Up to 70% better inf/s
- Up to 40% better inf/s/mm^2
- Up to 35% lower bandwidth/mm^2

New Features

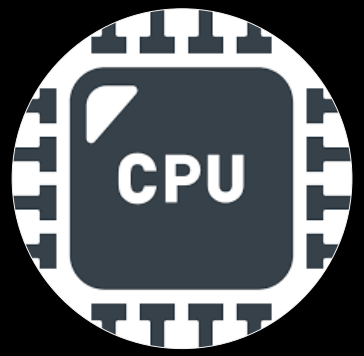
- Lossless weight compression
- Advanced Security enablement
- Programmable extensibility

Acceleration for popular Neural Networks



Smart AI

Why GPU and Neural Network Accelerators provide the optimum solution

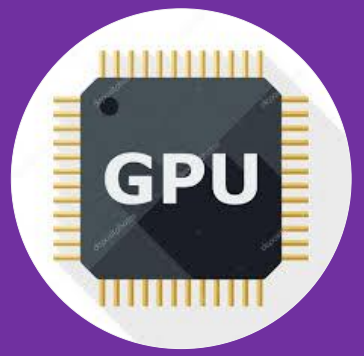


CPU

- Fully Flexible
- BUT inefficient and slow for high compute workloads

DSP

- Fully Flexible
- BUT hard to program – no standardisation, INT focussed

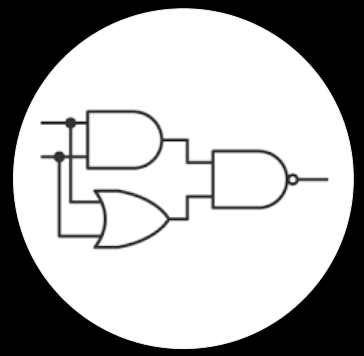


GPU

- Fully Flexible
- Standardised APIs for Compute, Float and INT support

Neural Network Accelerator

- Configurable
- Lowest power with domain specific flexibility



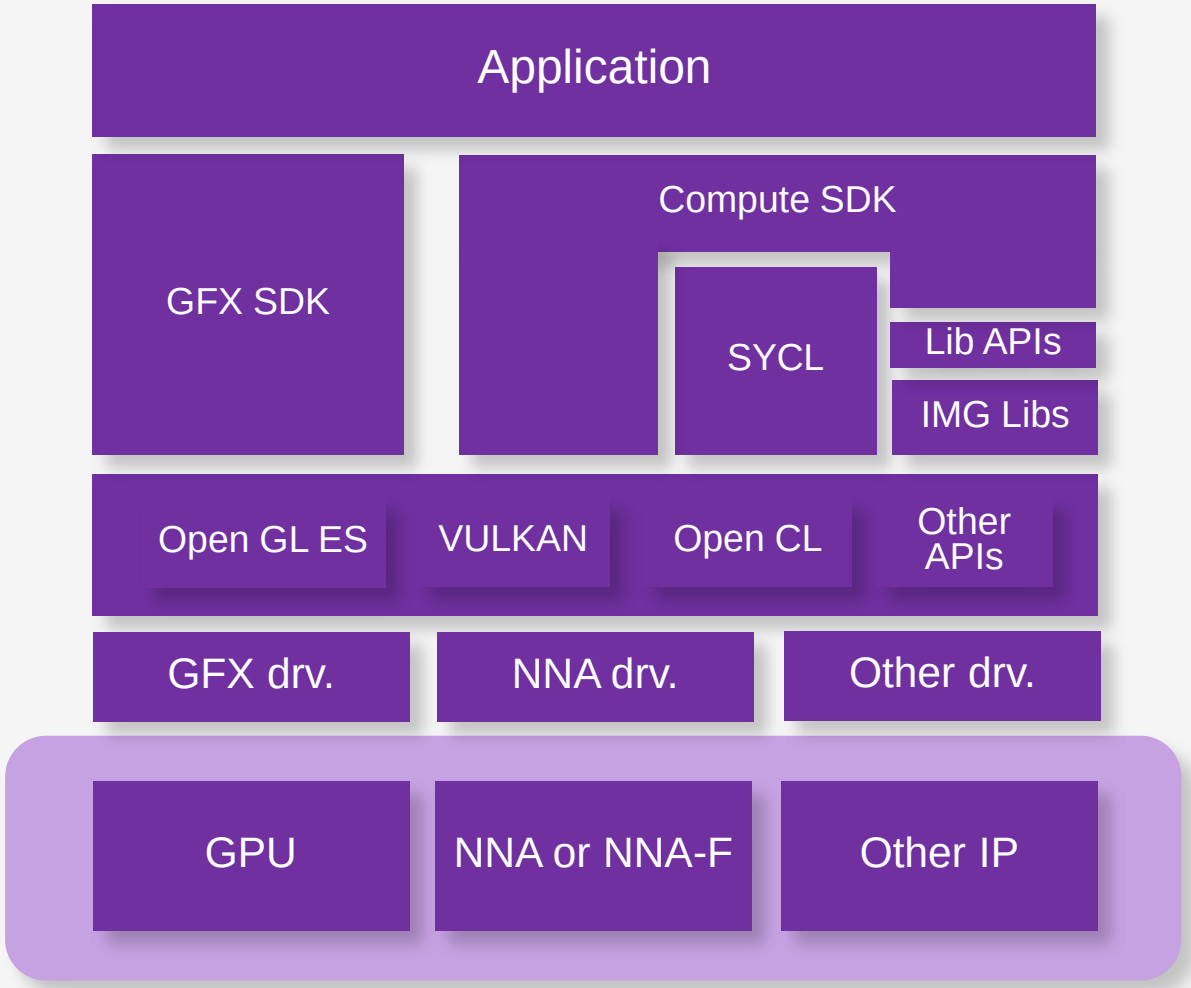
Fixed Function

- Single usage case
- Lowest power BUT zero flexibility

Best partners

Enabling Heterogeneous Computing

PowerVR Compute SDK



PowerVR Automotive IP Introduction

Delivering a complete IP product for automotive SoCs

A complete product for automotive systems, utilising PowerVR deep domain knowledge and experience in this sector

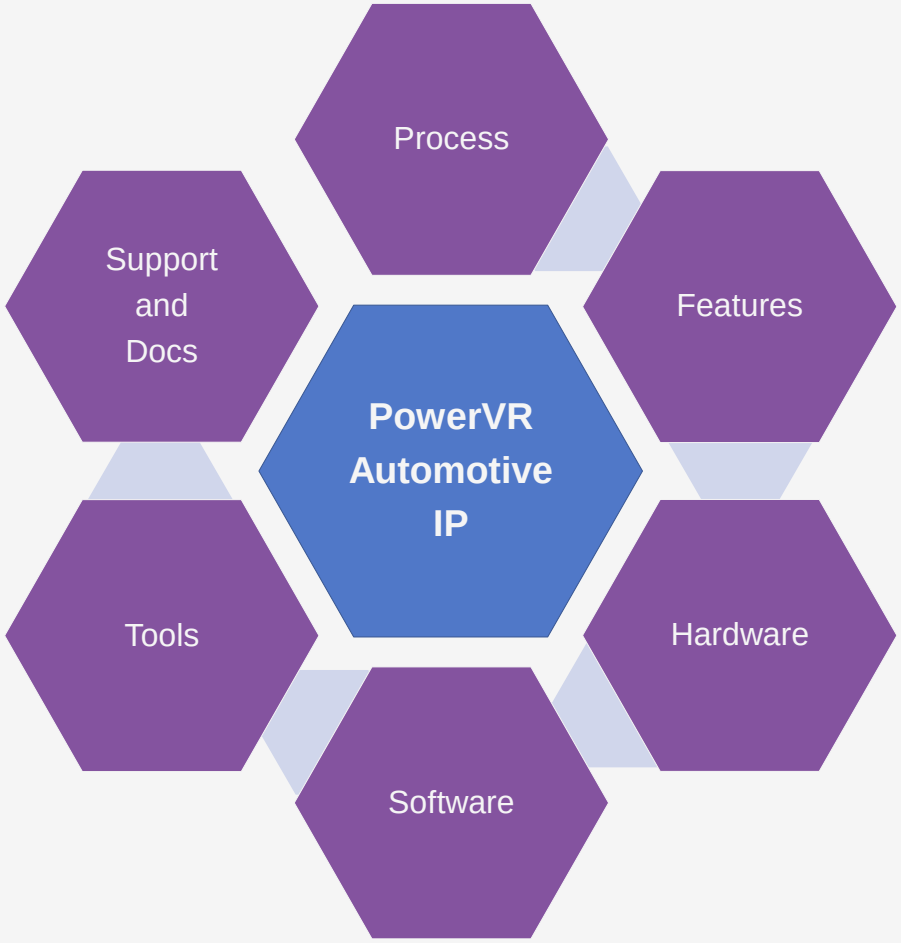
Solutions evolving from PowerVR long term leadership position in automotive GPU

Focus on delivering solutions to enable transition from informational to safety critical and ISO 26262 functionality

Built-in Automotive and Safety mechanisms

Advanced software support for automotive OS, hypervisor and safety critical (SC) software

PowerVR Automotive option pack for GPU & Neural Network Accelerator (NNA)



PowerVR History In Automotive

Enabling families of leading infotainment and ADAS solutions

Renesas (Licensee since 2004)

Multiple generations of PowerVR graphics cores

Number 1 Automotive application processor – 48% (2016)

R-Car Gen1 Family (2011)	Series5 SGX531 (E1), SGX540 (M1A & E2)
R-Car Gen2 Family (2013)	Series5XT SGX543MP2 (H1) & SGX544MP2 (M2)
	Series6 G6400 (H2)
R-Car Gen3 Family (2015-19)	Series6XT GX6250 (M3/L) & GX6650 (H3)
	Series7XE GE7800 (M3N)
	Series8XE GE8300 (E3 & D3)

Texas Instruments (Licensee since 2005)

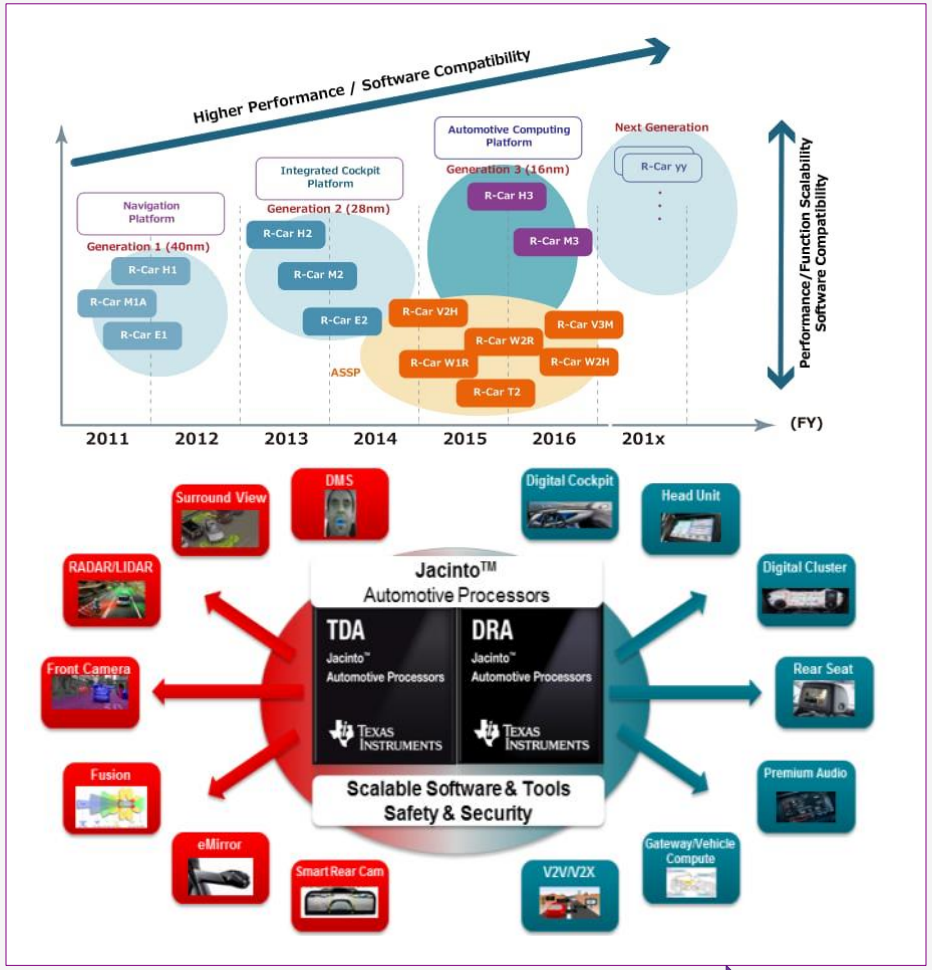
Licensing for mobile and automotive for over a decade

Automotive family TDRAxx (Jacinto) came out of mobile (OMAP) family

DRA5x, DRA6x and DRA7x (SGX543, SGX544MP2)

Socionext (Licensee since 2004)

MB86R2x	Series5 SGX531
SC1810 Miranda SoC	Series8XE GE8300



Multiple projects (with both existing & new customers) in advanced stages, multiple SoCs to be announced within this year

The Ensigma Edge

- Strong technology across a wide range of wireless standards
- A heritage of high performance broadcast IP
- Production proven RF expertise
- Customer momentum built on quality, success and support

5
GENERATIONS

19
YEARS OF IP

50+
MILLION CORES SHIPPED

High Performance Connectivity

Broadcast Solutions

Low Power Connectivity

- Exceptional team focused on delivery
- Broad portfolio across major standards
- End to end solution provider: RF to software stack

Ensigma communications IP

Scalable and flexible wireless communications solution

High Performance Connectivity

Broadcast Solutions

Low Power Connectivity

Our licensees and partners drive our business

Key Licensees

Alliance Partners

Software Ecosystem

Standards

OpenGL ES 1.1/2.0/3.2 – Available and Conformance Achieved

Vulkan 1.1 – Available and Conformance Achieved

Extensive involvement from Imagination in creation of new API

Performance benefits demonstrated, ecosystem support ongoing

OpenCL 1.2 Embedded Profile – Available and Conformance Ac

OpenCL 2.0 available on XT series

Framework

Android - RenderScript– Available and Conformance Achieved,

NN API launched – IMGDNN across NNA and GPU

OS Support – Linux, Android, Tizen, WebOS & Windows; RTOS

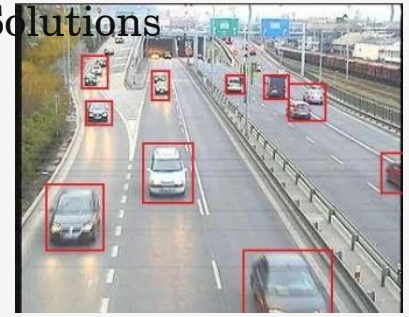
Hypervisor Support – INTEGRITY, Open Synergy, QNX, Fiasco, & Xen

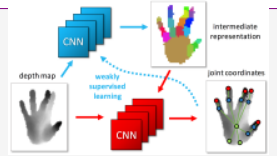
Driver Extensions

Driven by market and customer requirements, including VR extensions for GLES/Vulkan

Tools & App

Renesas Electronics and Codeplay Collaborate on OpenCL™ and SYCL™ for ADAS Solutions





Ecosystem events

China industry Alliance

Imagination Joins SiFive's DesignShare ecosystem

The 9th ISO 26262 IQPC conference is chaired by Imagination Technologies' Dave Higham

Our strategic value in China

China seeks to further develop its economy

Strategic rivals threatened by ‘hyper competition’

Imagination’s advantage

Imagination

Thank you

www.imgtec.com