Eric Demers
VP of Engineering

Adreno GPU Compute

IWOCL 2015

QUALCOMM®
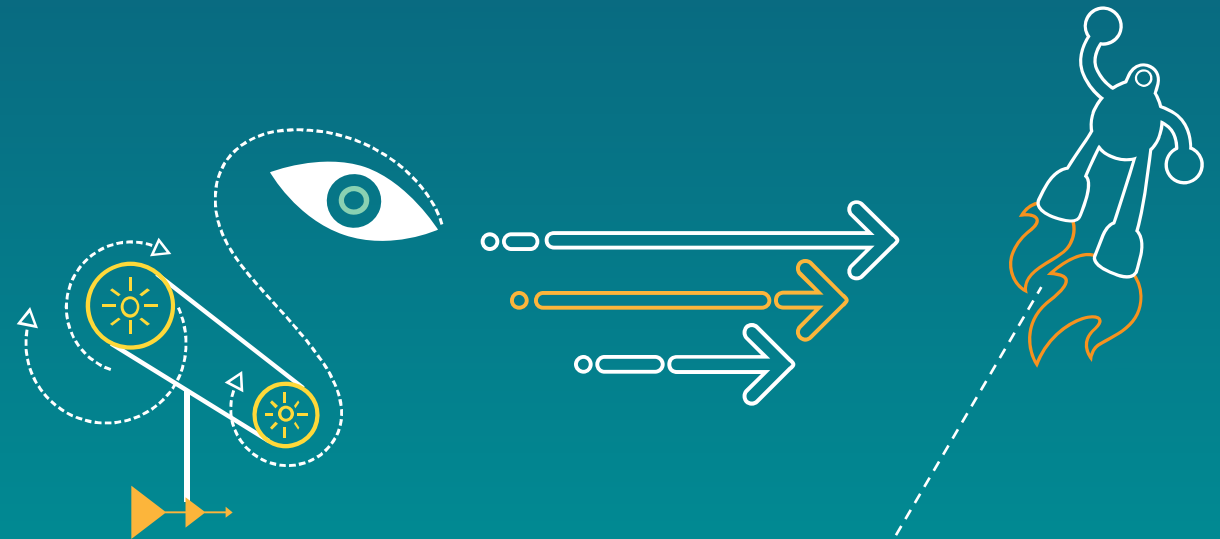
A Worldwide Leader in Mobile Technologies

QUALCOMM®

29	**Years of wireless innovation**
15+	**Billion chips shipped**
$3.4	**Billion in R&D in FY2013**
84,000+	**Patents**
$120	**Billion market cap**

Source: Qualcomm Technologies, Inc. data

SoCs with embedded GPUs Q3 2014

Q3'14
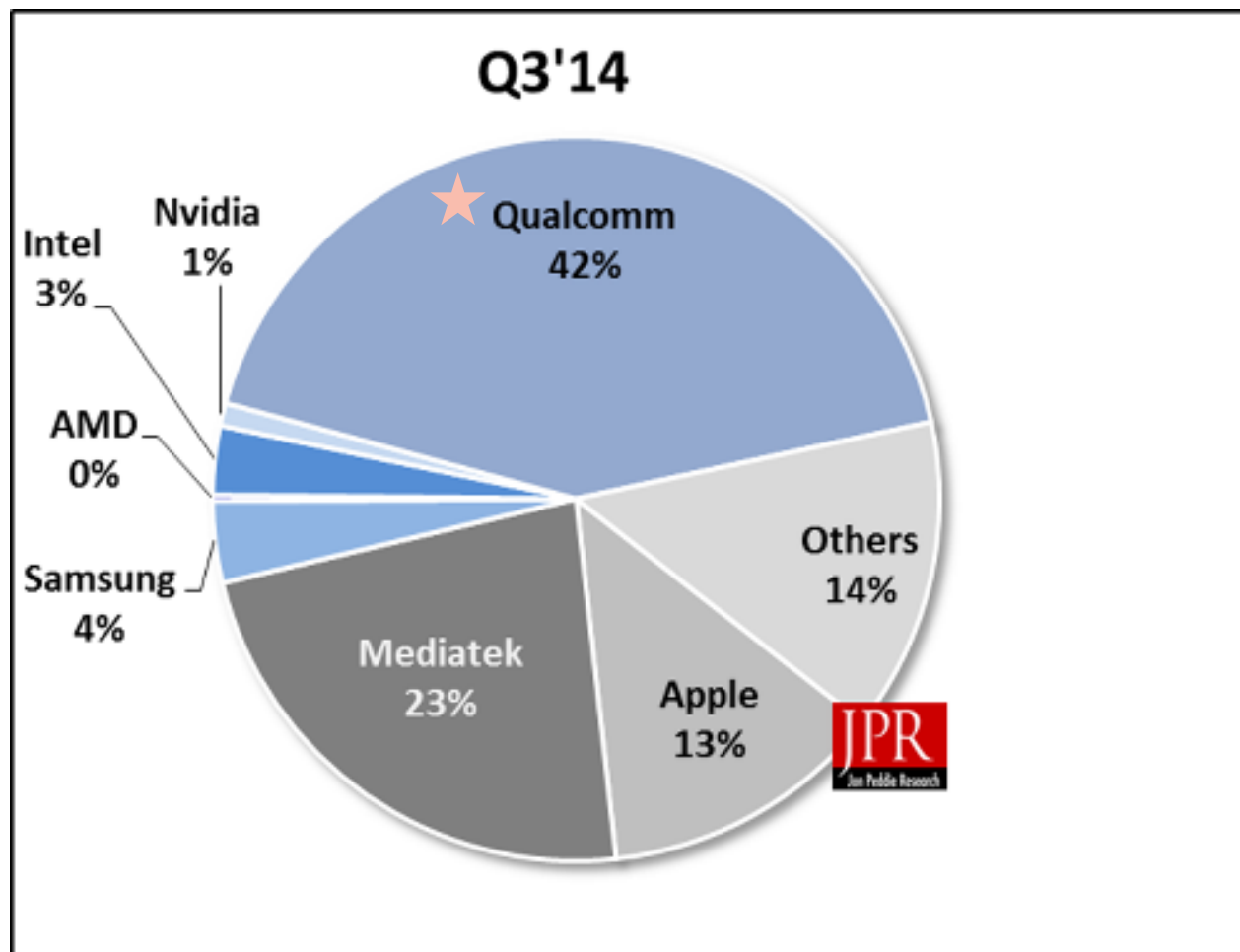
Supplier	Market Share
AMD	0.0%
Apple	13%
Intel	3%
MediaTek	23%
Nvidia	1%
Samsung	4%
QTI	42%
Others	14%
TOTAL	100.0%

3

Commercial Products with OpenCL Support

HTC Droid DNA
LG Optimus G
Motorola Moto X, Droid Mini
Sony Xperia ZL, Tablet Z
…

Samsung GALAXY S4
HTC One, One Max
LG G Pad, Optimus
Amazon Fire TV
…

HTC Desire
Motorola Moto E
LG Watch Urbane
…

Samsung GALAXY S5
HTC One(M8)**, Desire Eye**
LG G3
Sony Xperia Z2, Z3
…

Samsung GALAXY Tab S
LG G Pro 2
Sony Xperia Z1S
…

Samsung GALAXY Note 4, Edge
HTC One M, Desire 820
LG G Flex
Sony Xperia Z4 Tablet
….

2013

2014 - 2015

Snapdragon S4 Pro

Snapdragon 600

Snapdragon 400

Snapdragon 410

Snapdragon 800

Snapdragon 801

Snapdragon 805

Snapdragon 810

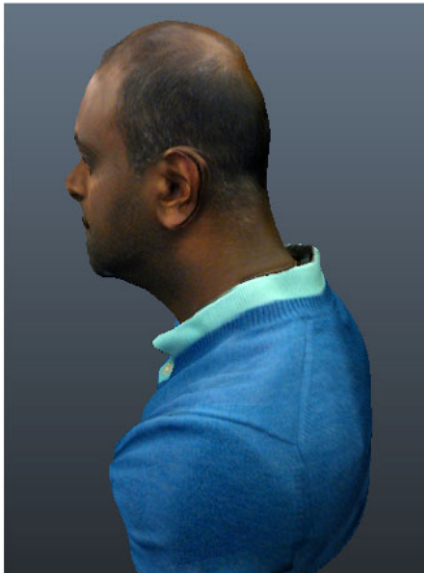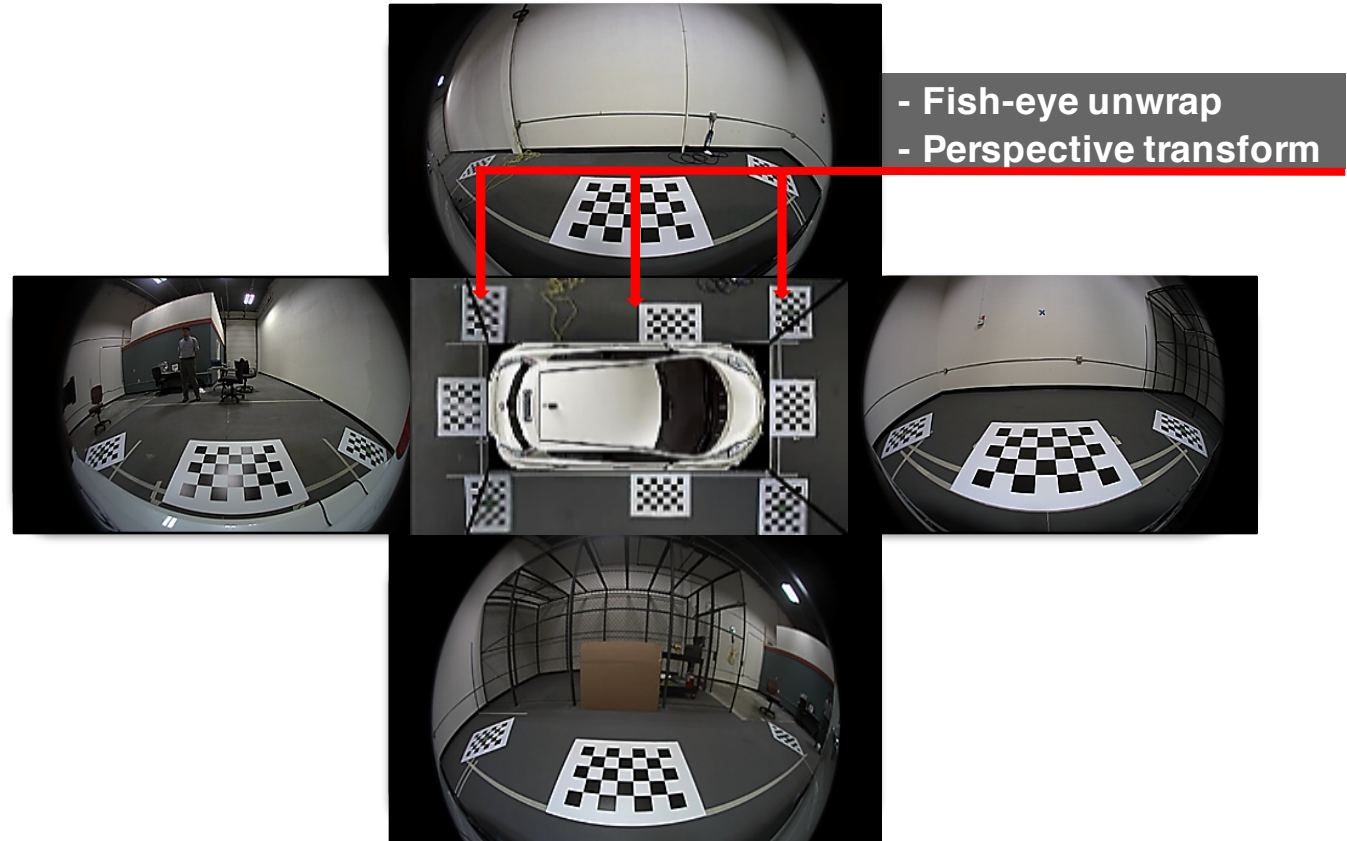**Snapdragon 615**

OpenCL 1.1 Embedded

OpenCL 1.2 Full

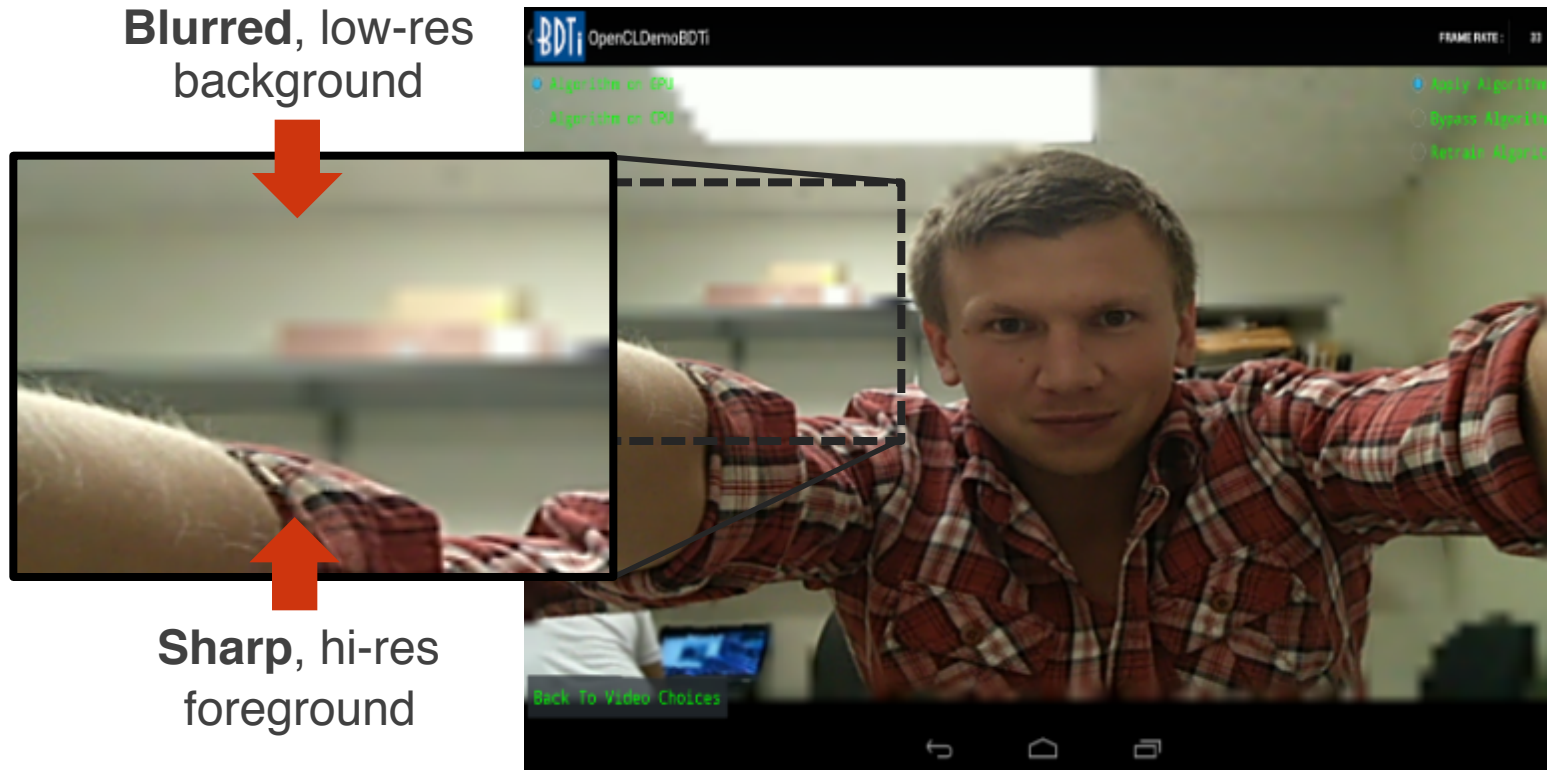# GPU Compute Accelerated Computer Vision

- **Accelerated FastCV**
  - OpenCL(GPU), DSP and NEON acceleration
- **Deep Convolutional Neural Networks**
- **High Quality 3D Scanning: Model and Texture Mapping**

- **360 Degree Bird-Eye View**
  - Demoed in CES 2015
  - 30 FPS on GPU

- Fish-eye unwrap
- Perspective transform

Real time Video Post-Processing Demo

Blurred, low-res background

Sharp, hi-res foreground

- ○ **Video conferencing**
  - – Hide details on background
  - – Video stream compression

- ○ **Not feasible without GPU Compute**
  - – 33 FPS on GPU Accelerated
  - – 17 FPS on 4-Core NEON CPU

- ○ The demo implements background subtraction using local-binary-pattern descriptors that are integrated with a custom refinement algorithm and contour filtering

- ○ Understanding CPU and GPU architecture and **device specific optimization techniques** is a key for getting to top performance levels and creating new user experiences with OpenCL

OpenCL Tools for Snapdragon

Qualcomm snapdragon

DEVELOP

OpenCL
Developer Guide

Advanced
OpenCL Tutorials

Find these in Adreno SDK on developer.qualcomm.com
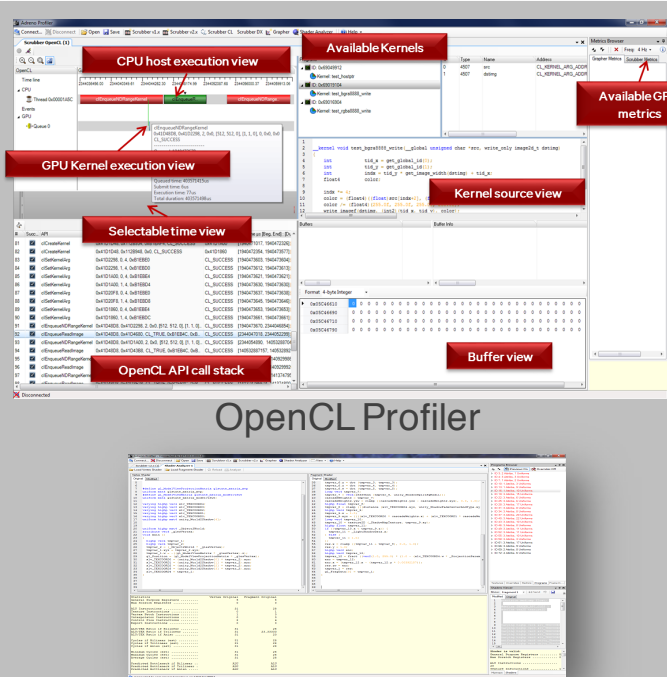
DEBUG

On-device OpenCL Debugger

Find this in Adreno SDK on developer.qualcomm.com

PROFILE / TUNE

Available Kernels

CPU host execution view

Available GPU metrics

GPU Kernel execution view

Kernel source view

Selectable time view

OpenCL API call stack

Buffer view

OpenCL Profiler

OpenCL Kernel Analyzer

Find these in Adreno Profiler on developer.qualcomm.com

OpenCL Product Differentiation

- **It's a perfect time to start differentiating your product with using GPU Compute on Snapdragon!**
  - Significant performance improvement and power reduction
  - New user experiences which are not feasible to implement without using GPU Compute
  - Set of all required profiling, debugging tools and development platforms is available to help you with *reducing time-to-market*
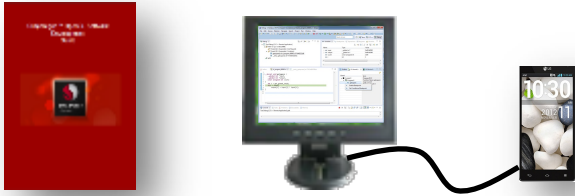
How to Start?

1.

✓ Order **Snapdragon development boards** on
   intrinsyc.com

2.

✓ Download our **SDK** and **Programming Guide**
   developer.qualcomm.com

3.

?

✓ Ask your questions regarding Adreno GPGPU, **tools and SDK** on
   https://developer.qualcomm.com/forums/qdevnet-forums/mobile-gaming-graphics-adreno

✓ For all other GPGPU related questions, e-mail to
   arthurn@qti.qualcomm.com

Thank you

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