



Driving Better Mobile Experiences

A Holistic Approach to Hardware & Software



LIAT BEN-ZUR

Sr. Director, Software Strategy & Business Development

@LiatBenZur



Snapdragon System Spans Hardware, Software, Services, and Ecosystem Tools

ECOSYSTEM SUPPORT

Developer Hardware

Developer Software Tools

Developer Ecosystem Events and Community

Carrier-Friendly Services

ADVANCED SOFTWARE TECHNOLOGY

Entertainment

Connectivity

Camera

Web

Computer Vision

Augmented Reality

AllJoyn™

BROAD SUPPORT FOR HLOS



bada

BlackBerry

brew mp



Windows



Windows Phone

LEADING HARDWARE



CPUs



GPUs



3G/4G MODEMS



MEMORY



DSPs



VIDEO/AUDIO



LOCATION AND SENSORS



WiFi BT FM



POWER MGMT



RF

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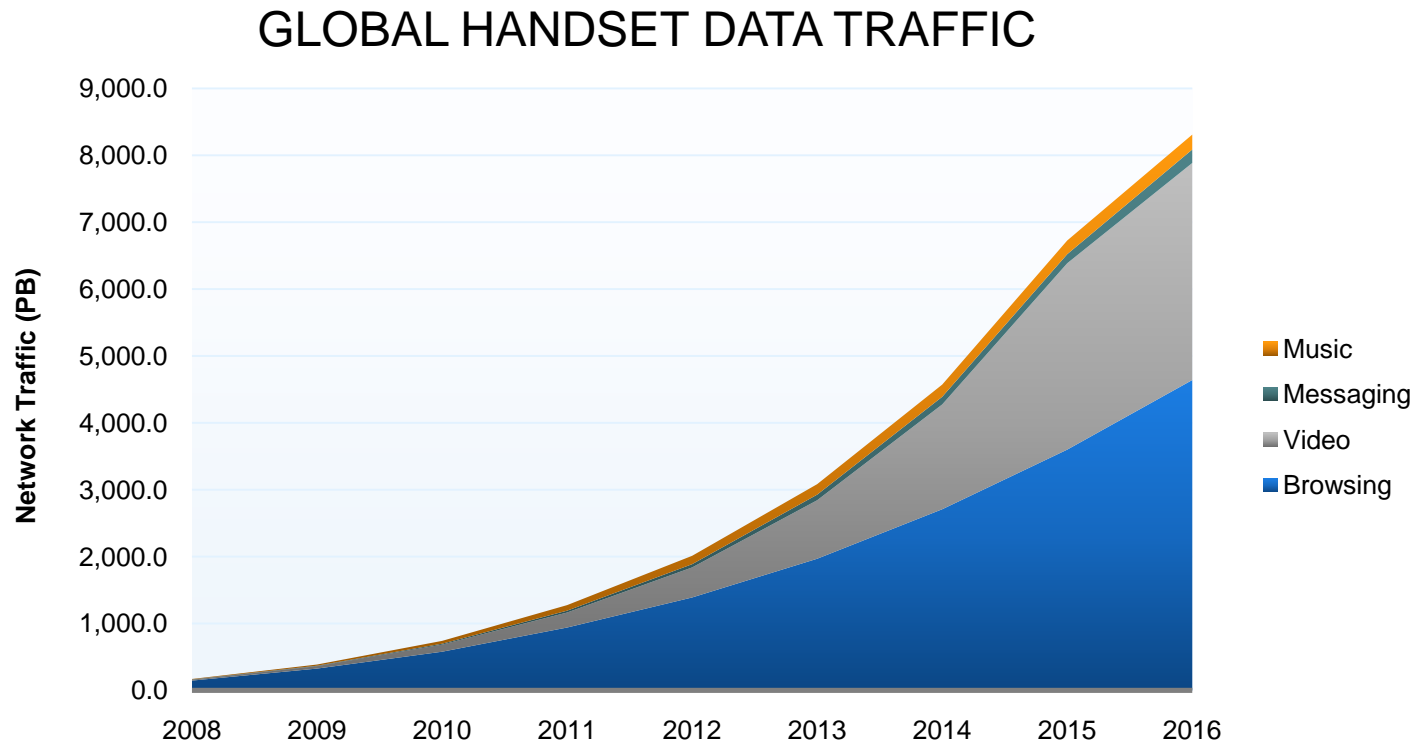


POWER MGMT



RF

Growth of Smartphones is Challenging Networks



- Ever growing number of Smartphones driving increased data loads
- Thousands of “chatty” apps running background updates, push, status, etc. driving signaling load

Growth of Smartphones is Challenging Networks

- Real need for intelligent system selection and effective use of Wi-Fi offload
- Real need to efficiently manage data applications
- Real need to improve performance reduce power consumption



OEMS AND CARRIERS WANT MORE INTELLIGENT PHONES
THAT ARE MORE NETWORK AND CONSUMER FRIENDLY

Qualcomm's Intelligent Connectivity Engine

PROVIDING REAL SOLUTIONS TO REAL PROBLEMS

WHAT

- Better Wi-Fi Experience
- Reduced Wi-Fi failures
- Longer Battery Life
- Reduced signaling traffic
- Reduced data traffic
- More carrier control of data offloading



HOW

- Real time, dynamic Wi-Fi Throughput & Quality Estimation
- Advanced 3G vs. Wi-Fi System Selection
- Intelligent aggregation of background app data requests (Network Socket Request Manager)
- Carrier Profiles with OMA-DM OTA provisioning

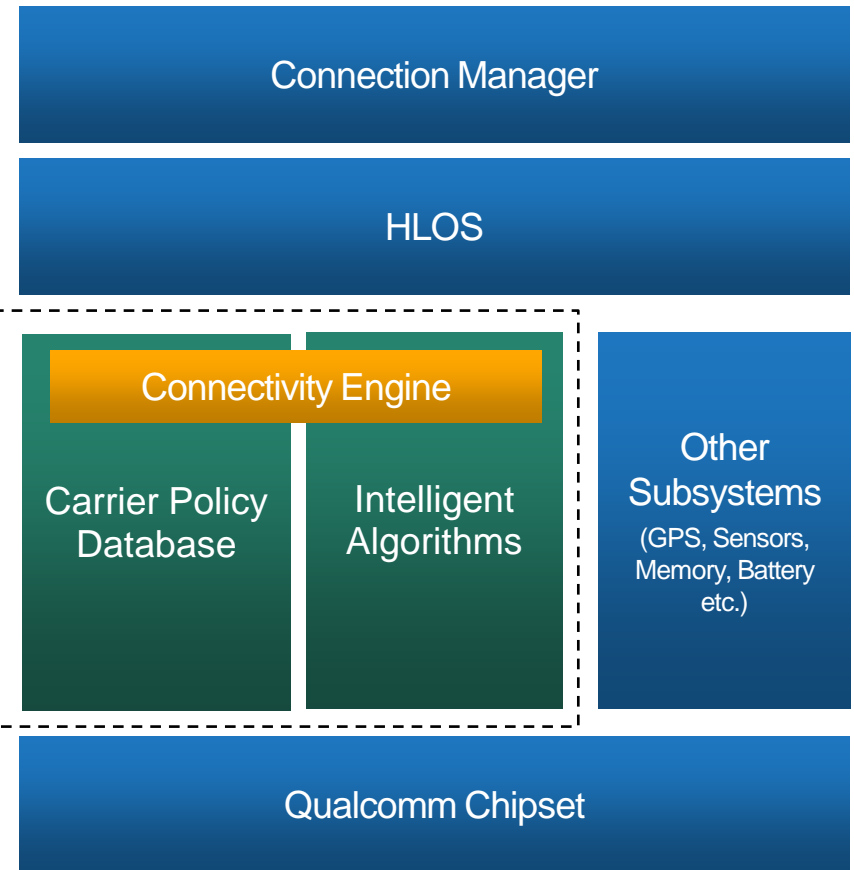


Qualcomm's Intelligent Connectivity Engine

PROVIDING REAL SOLUTIONS TO REAL PROBLEMS

Intelligent Algorithms that manage all aspects of device connectivity

- Run below the HLOS
- Policy based radio management
- Intelligent network selection
- Tight coupling with other subsystems



CONNECTIVITY ENGINE IS NOT A CONNECTION
MANAGER APPLICATION

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WiFi BT FM



POWER
MGMT



RF

Accelerating and Enabling a Better Web Experience

PAGE
DOWNLOAD



USER
SNAPPINESS



MULTIMEDIA
STREAMING



POWER
OPTIMIZATION



ENHANCED
CAPABILITIES



Browser Performance Optimizations



21%

FASTER
AVERAGE
PAGE
DOWNLOAD¹

70%

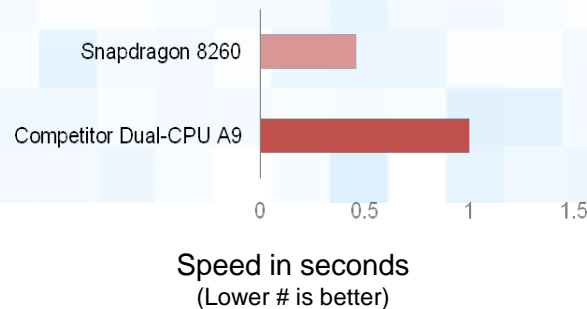
FASTER AVERAGE
ON V8
BENCHMARK¹

30%

FASTER
AVERAGE
PAGE RELOAD¹

46%

FASTER AVERAGE
DOWNLOAD²



Source: Tests performed by Qualcomm Innovation Center, Inc.

¹Tested with 26 sites on both UMTS and Wi-Fi networks on 1.2Ghz Qualcomm MDP8660 between optimized and stock Android 2.3.

²Tested with 30 sites on Wi-Fi and consistent environment on Android 2.3 using HTC Sensation and production OEM device with Dual-CPU A9.

Browser Performance Optimizations

71FPS

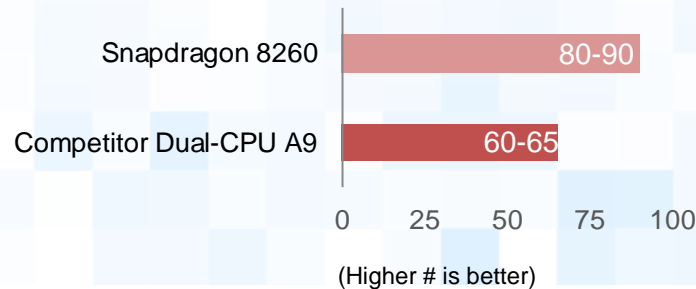
SMOOTH AS GLASS
SCROLL, PAN, ZOOM¹

> 30%

FASTER
HTML <CANVAS>
JS GAMEBENCH
SPRITES RENDERED²

7%

AVERAGE POWER
IMPROVEMENT
WHEN BROWSING¹



Source: Tests performed by Qualcomm Innovation Center, Inc.

¹Tested with 26 sites on both UMTS and Wi-Fi networks on 1.2Ghz Qualcomm MDP8660 between optimized and stock Android 2.3.

²Tested with 30 sites on Wi-Fi and consistent environment on Android 2.3 using HTC Sensation and production OEM device with Dual-CPU A9.

Enabling Rich Web App Device APIs

Location



- Single location
- Interval location
- Proximity alert

Sensors



- Pitch
- Direction
- Speed

Camera



- Zoom
- Filter effects
- Image recognition

Audio



- Capture
- Pitch
- Rate

Augmented Reality



- Image targets
- Frame markers

Proximity P2P



- Discovery
- Secure connections

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AND
SENSORS



WiFi BT FM



POWER
MGMT



RF

Computer Vision: Fast CV Accelerates These Use-Cases on Mobile Devices

Augmented Reality



Gestures



Face Recognition



Text Recognition



Depth Mapping

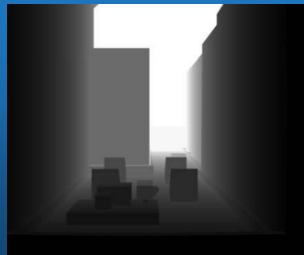


Image Stabilization



What is Augmented Reality (AR)?



REAL WORLD
VIEW

Live camera view

FASHION | WEST

Rating (52)
★★★★★
.2 miles

Ristorante
Italian Cuisine

Rating (134)
★★★★★
.8 miles

VIRTUAL
CONTENT

Information about
points of interest

Content
placement
inaccurate due to
compass error

GPS and
Compass-based
Augmented Reality
Experience

Good for rough location
of items outside
our field of view



Augmented Reality Use Case Scenario



REAL WORLD
VIEW

Live camera view



VIRTUAL
CONTENT

Vision-based AR recognizes objects in field of view and aligns graphics tightly to target object

Vision-based
Augmented Reality
Experience

Enables a more
immersive and
interactive experience



The core LAN technologies are already ubiquitous and in all our phones (Bluetooth, Wi-Fi)

But... Can your phone find me?

Why Can't All Smartphones Discover and Connect in this Conference Room?



Can you share the music or pictures currently on your phone with me? Why not?

Peer-to-Peer (P2P) is Complicated

P2P FRICTION DEVELOPERS FACE TODAY



What Is AllJoyn?

OPEN SOURCE FRAMEWORK TO ENABLE AD HOC, PROXIMITY-BASED, P2P NETWORKING



AllJoyn unleashes a whole new set of user experiences that span across mobile, tablets, PCs, TVs, and more by abstracting all the complexity of P2P networking from developers

What AllJoyn is Not...

Radio
Technology

Hardware
Based

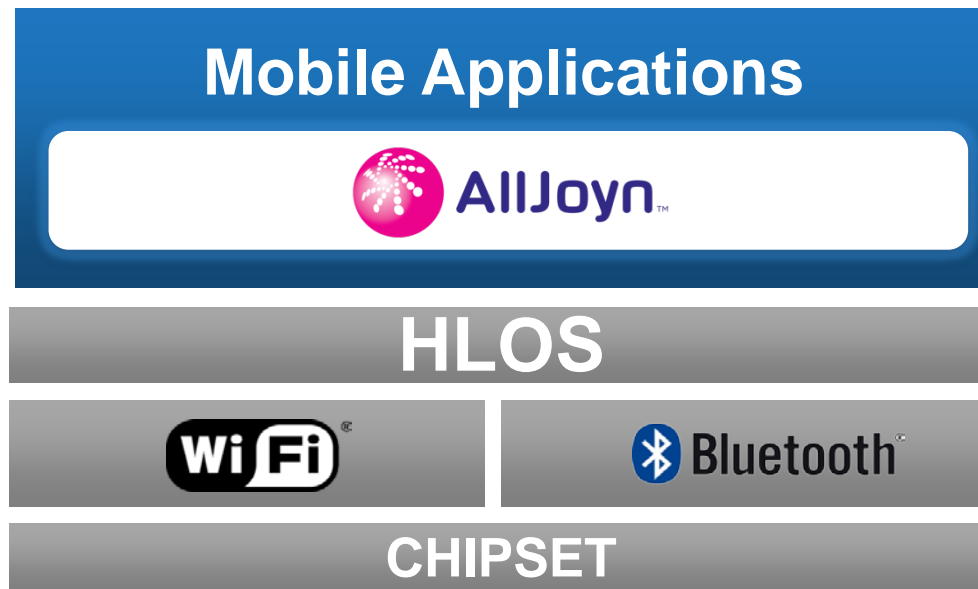
OS
Dependent

Transport
Dependent

Wireless
Protocol

The AllJoyn P2P Framework

MAKES PROXIMITY P2P EASY



Tablets



Mobiles



Televisions



Laptop/PC

www.Alljoyn.org

Free. Open Source
Apache 2.0

**P2P apps made up
of 2 parts:**

(1) the App, (2) AllJoyn Daemon

Application Layer Discovery.
What Services Are Running
on Nearby Devices That Are
Reachable

Proximal P2P Has Huge Untapped Potential

WWW.ALLJOYN.ORG

Entertainment Experiences



Low Latency, Head-to-Head
Multi-Player Gaming

Multiscreen Experiences



Smartphone and Tablet as
Companion to Television

Collaborative Experiences



Seamless Discovery, Chat,
and Interaction with People
Nearby

AllJoyn is an open source project for mobile software being driven out of Qualcomm Innovation Center, Inc (QulC), a subsidiary of Qualcomm Incorporated that focuses on open source development

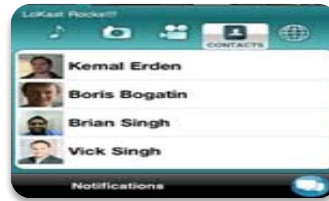
AllJoyn Ushers in New and Exciting User Experiences for Mobile, Tablets, & TVs



Race games
add head-2-
head
competition



Office apps add
p2p sync and
interact across
devices



Social
networking
apps easily
discover who is
nearby



Imaging apps
seamlessly
discover who to
send pictures to



Developers
easily build
phone apps
that can work
with TV

Great Opportunity to help OEMs & Developers
Differentiate with New, Custom Experiences

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WiFi BT FM



POWER MGMT



RF

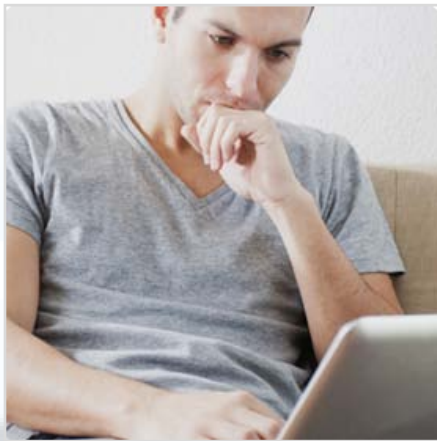
Snapdragon Developer Program: Delivering Experiences

PRELOAD APP OPPORTUNITIES FOR OEM CONSUMER CAMPAIGNS

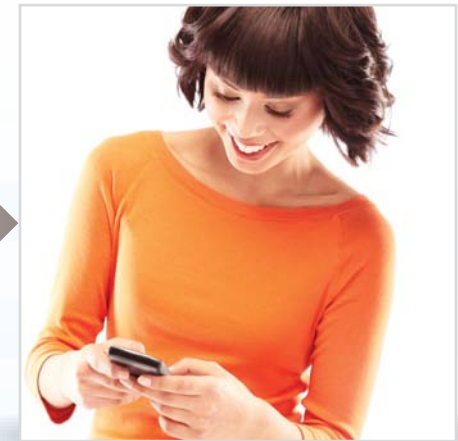
Enable developers
to build and optimize
differentiated
user experiences
for Snapdragon
enabled devices



Introduce developers
to our OEM and carrier
customers for preload
and other collaboration
opportunities



Developers Are
Creating the Next
Generation User
Experiences



We Deliver Enhanced Experiences...

Communications

Tango
Be there

ooVoo

bambuser
Live from your mobile!



YagattaTalk



Video and Premium Content (Security)

NETFLIX

DIVX

SanDisk

sling
MEDIA

LiveCast

splashtop

GAIKAI

Audio

WAVES

DOLBY

SRS

Peer-to-Peer



LoKast

ZOMBIE LANE

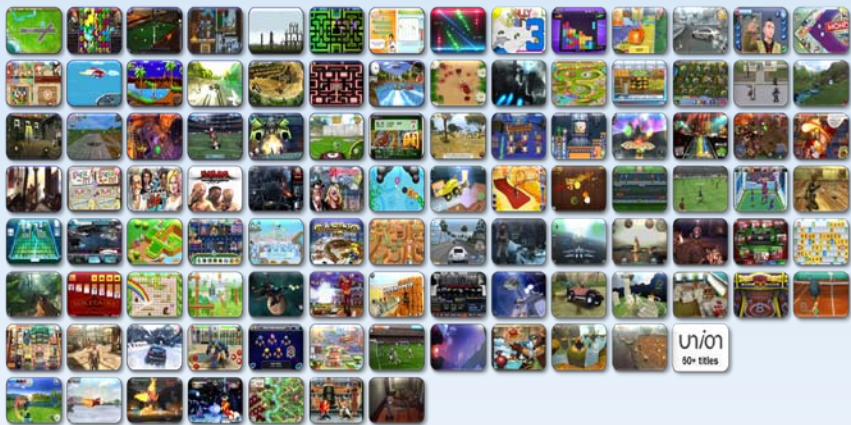
TOWER BLOXX
Deluxe

3D ROLLERCOASTER RUSH
JURASSIC



...And Compelling Games

Snapdragon Game Demos Optimized and Enhanced Games for Pre-Install Opportunities



Snapdragon Exclusive Games for Royalty-Free Pre-Install



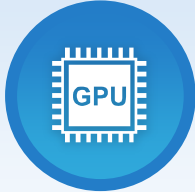







gaming.qualcomm.com

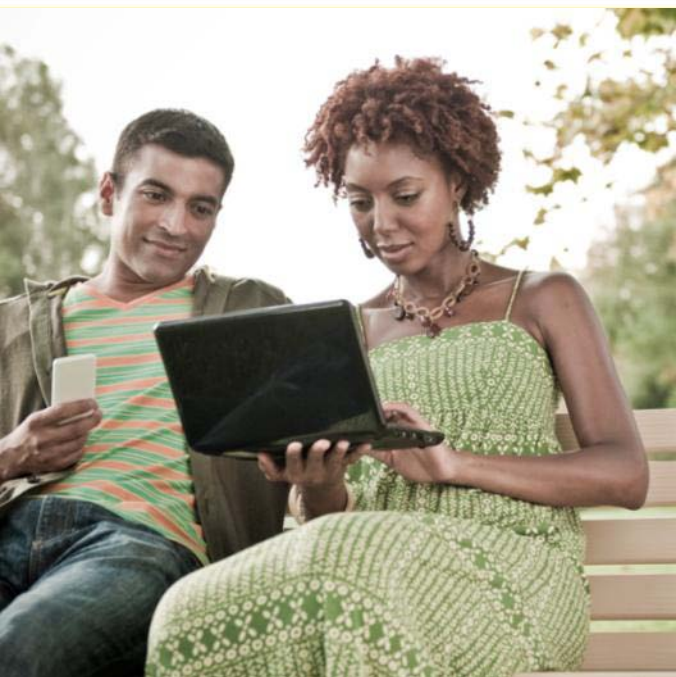
Optimized Apps That Take Advantage of Snapdragon

GREAT FOR PROMOTIONAL CAMPAIGNS TO SELL MORE DEVICES!

- We work with developers to offer leading edge experiences
- Leveraging advanced capabilities in the chip

Video Optimization	Content Protection	Graphics	Power
			
Facial Processing	Camera	Peer-to-Peer	Multi-Mic and Audio
			





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> Thank You

For more information on Qualcomm, visit us at:
www.qualcomm.com
www.qualcomm.com/blog



Americas Summit

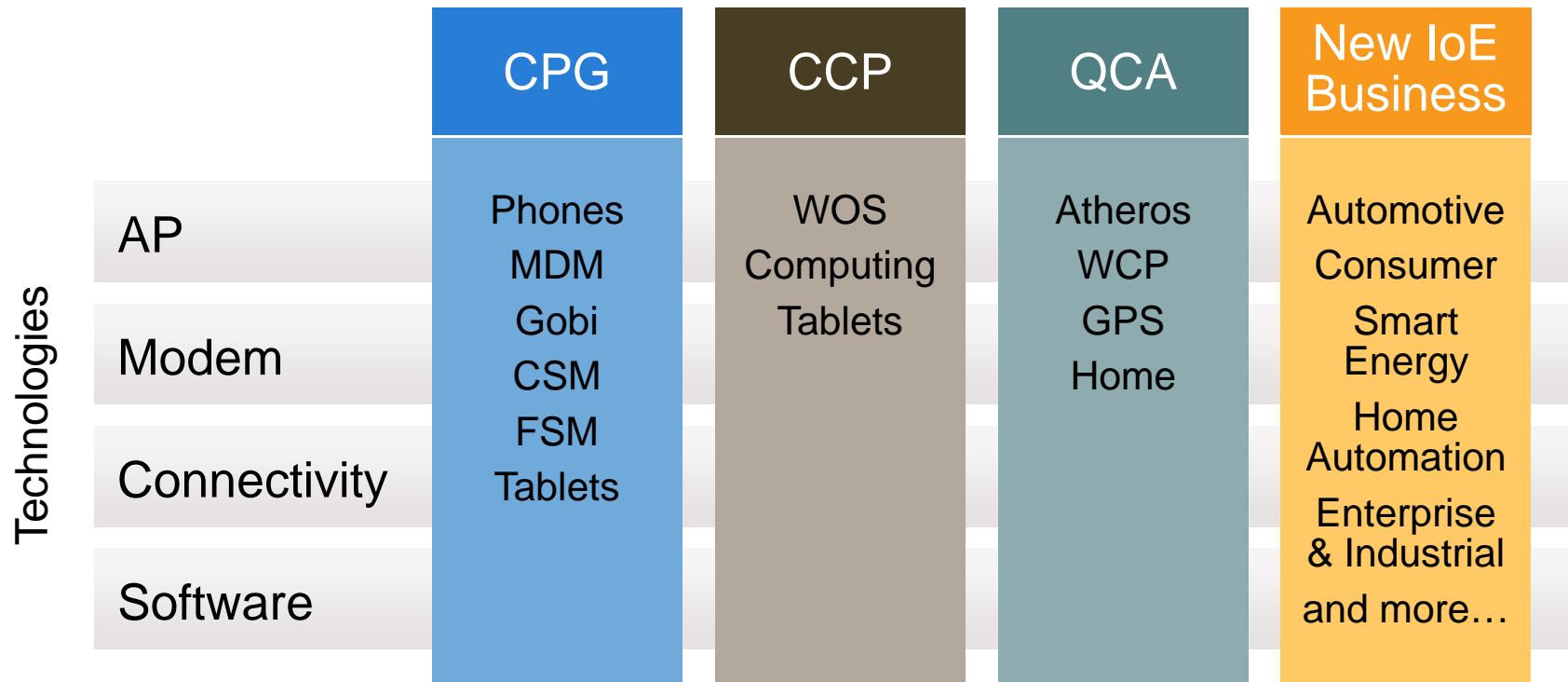
San Diego, December 1, 2011

KANWALINDER SINGH
SENIOR VICE PRESIDENT, QCT NEW MARKETS



Dedicated Focus for IoE

QCT PRODUCT CATEGORIES



IoE Segments



Consumer Devices

With WWAN Connectivity

- Person, Pet Tracking
- Health, Medical
- eReaders, Frames, Gaming consoles



Smart Energy and Home Automation

With WWAN Connectivity

- Smart Energy, Utilities
- Security, Surveillance
- Automation & Control
- Appliances
- Routers, Gateways



Automotive, Transportation & Logistics

With WWAN Connectivity

- Telematics, Emergency
- Fleet Management
- Insurance, Tracking
- Infotainment Head Unit

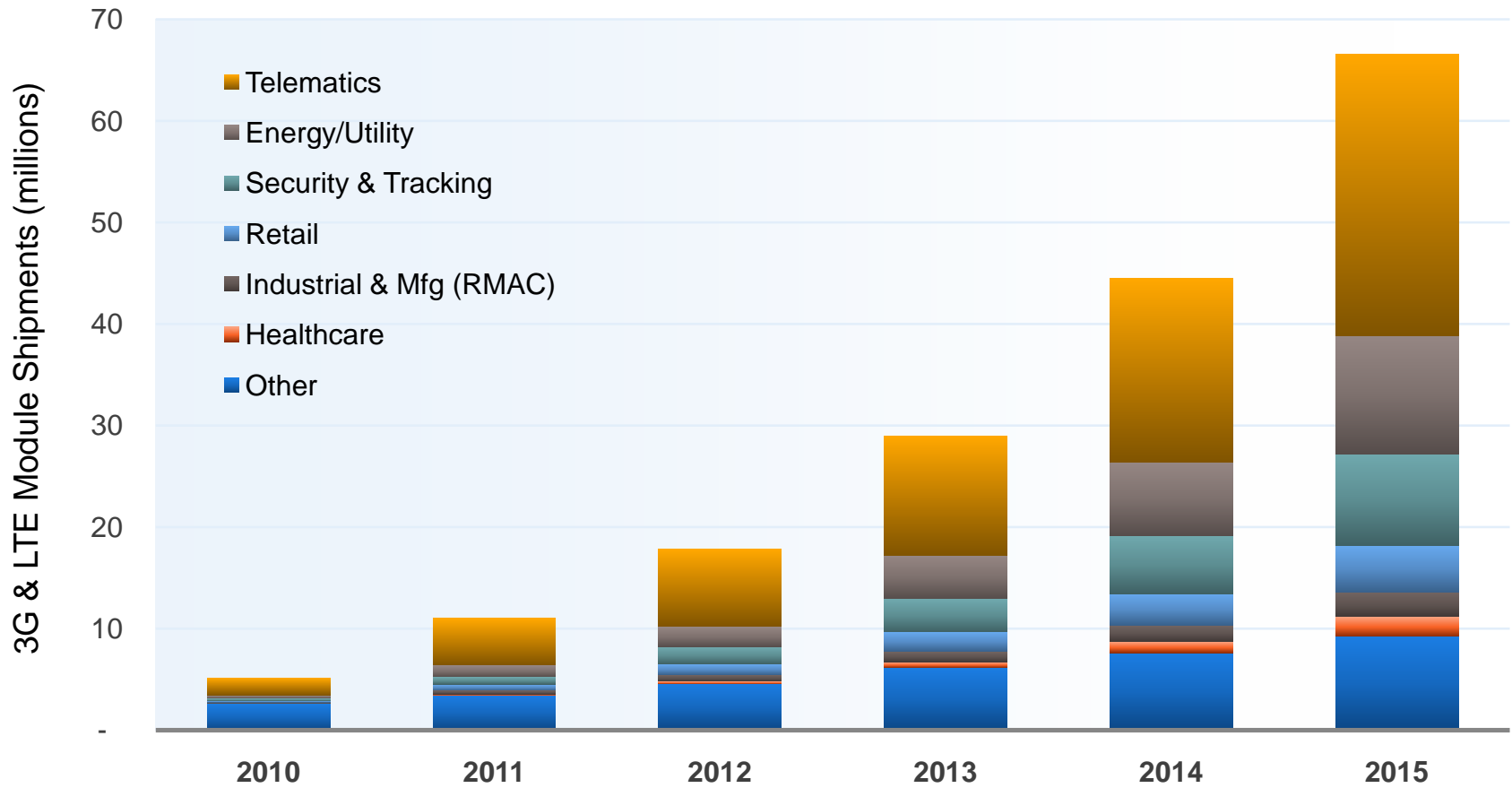


Enterprise, Industrial

With WWAN Connectivity












- ATM, Vending
- POS, Digital Signage
- Enterprise Tracking
- Hand Held Terminals
- Retail Kiosks, PoS
- Intelligent Digital Signage

Strong Projected Growth for IoE Segments



Source: Average of ABI Research (Sep 2011) and IMS Research (Jan. 2011) forecasts
Note: Excludes connected CE devices; "Other" includes non-vertical specific gateways

Chipset Mapping to Segmentation

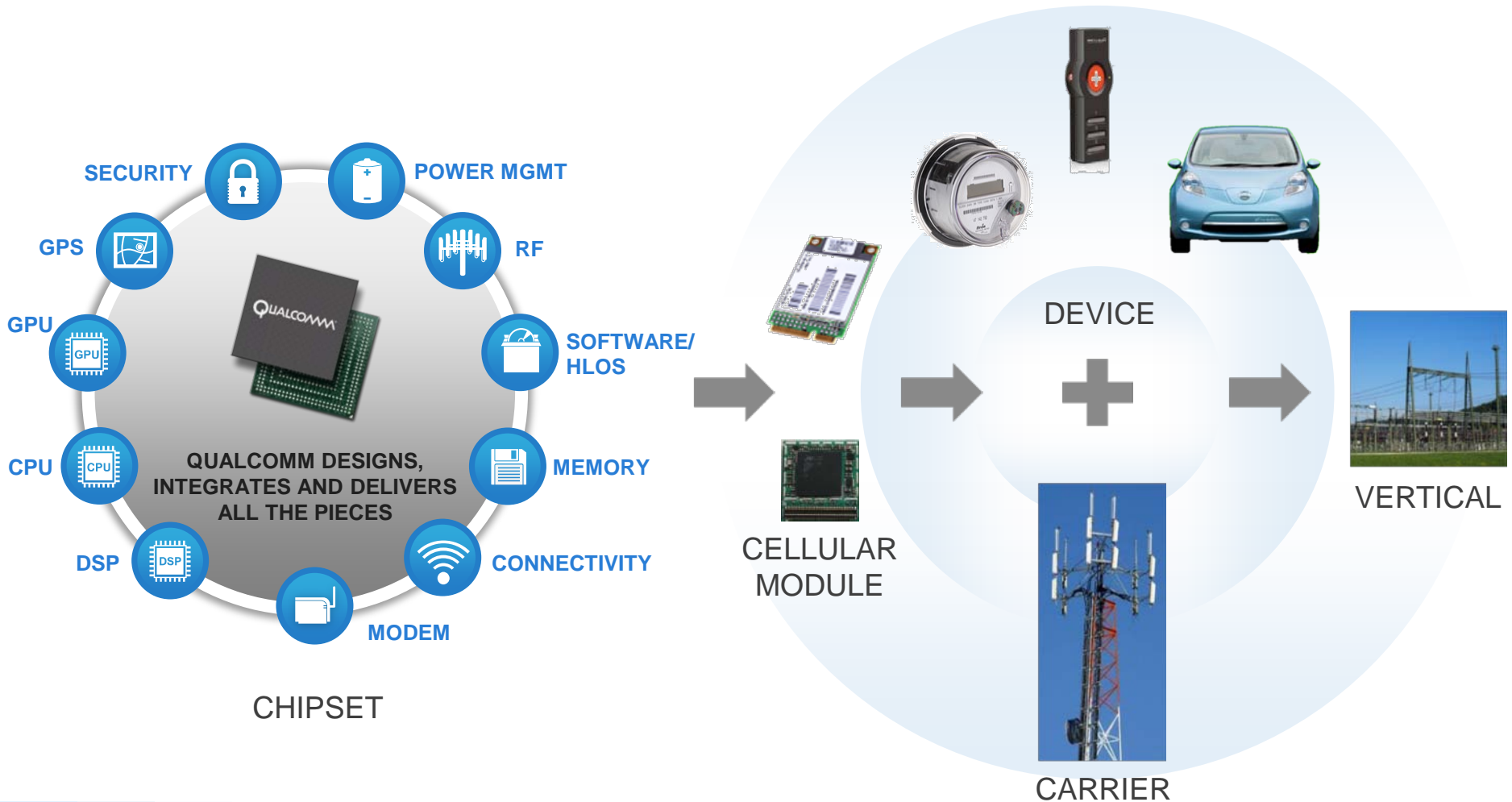
4G	 CONNECTED CAR	 HOME ENERGY GATEWAY	 DIGITAL SIGNAGE
3G Multi Mode	 FLEET MANAGEMENT	 POINT OF SALE	 KIOSK
3G 1x, DO UMTS	 TELEMATICS	 SECURITY	 INSURANCE
		 SMART METER	 COMMUNICATION NODE



Increasing Processing Power
operating on many platforms



Qualcomm Provides Technology Innovation and Leadership to the Value Chain



The In-Car Experience is Transforming



NAVIGATION
SERVICES



SAFETY AND
SECURITY



APPLICATION
DOWNLOADS



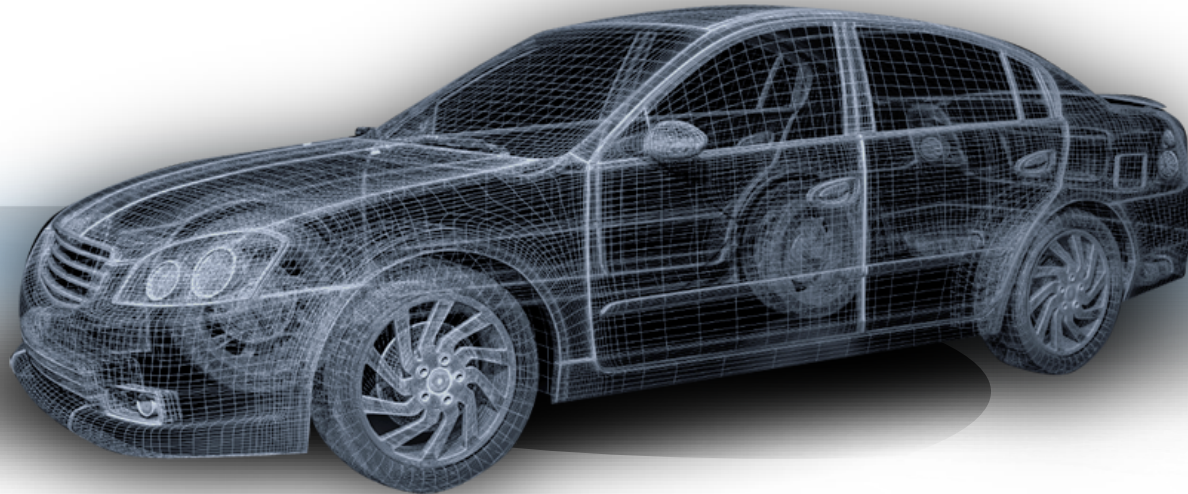
CONTENT
STREAMING



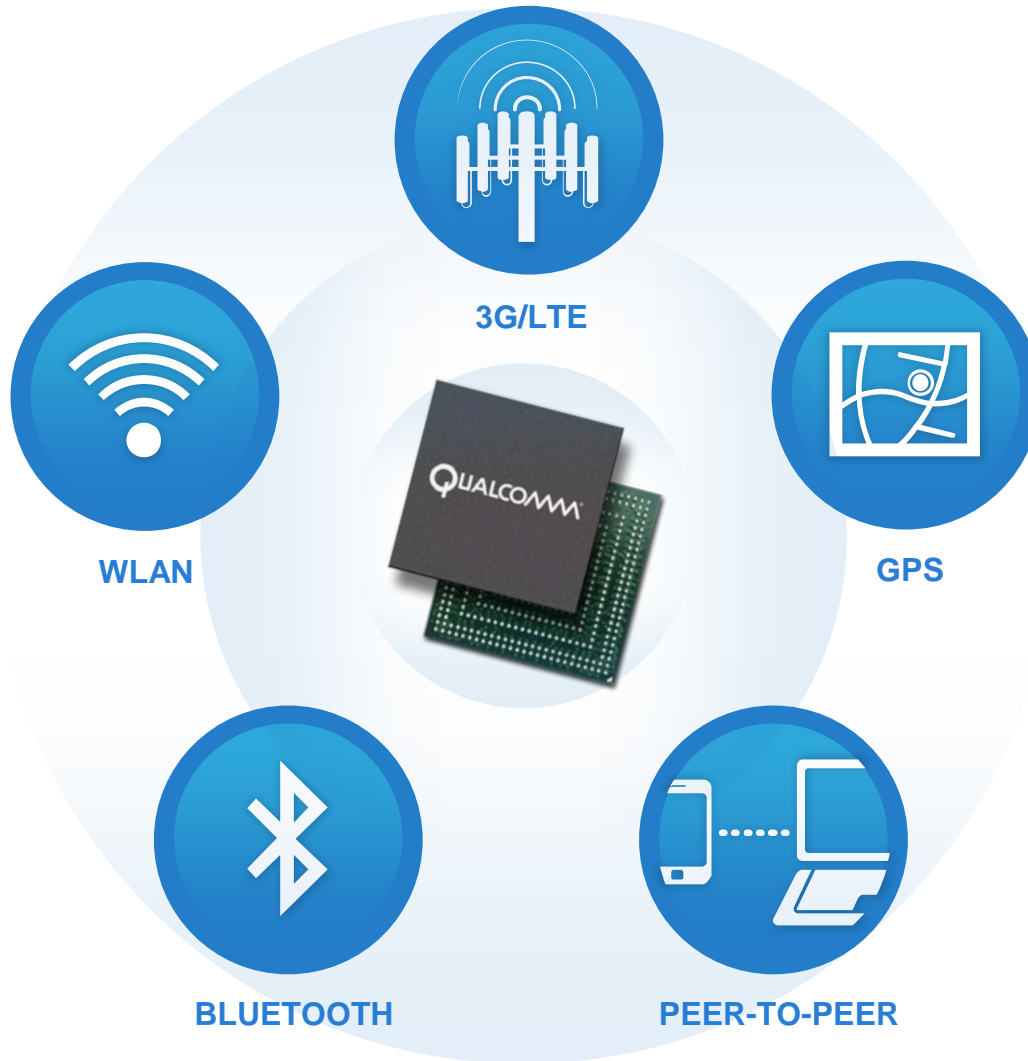
MOBILE
HOTSPOT



REAR-SEAT
ENTERTAINMENT



Qualcomm Technologies in the Connected Car



New Drivers for Automotive Connectivity



Infotainment

Traffic information for in-car navigation system augmentation

Internet radio services

Web access

Off-board navigation services (e.g. Google maps)



Telematics

Vehicle diagnostics for maintenance

Roadside assistance and concierge services

Automatic crash response and stolen vehicle recovery assistance



PAYD Insurance and Road Use

Road pricing, traffic management

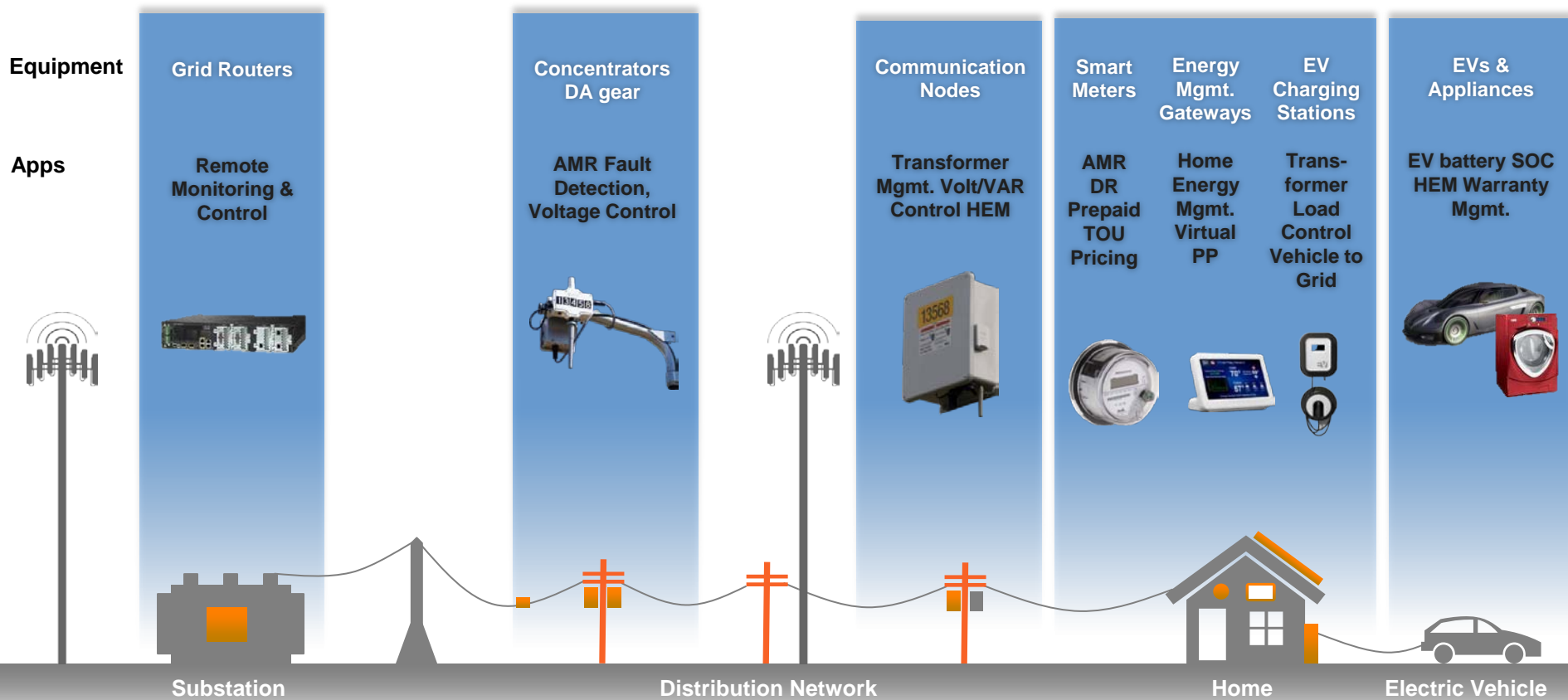
Driver behavior based rates

AUTOMOTIVE TIES INTO SMART ENERGY

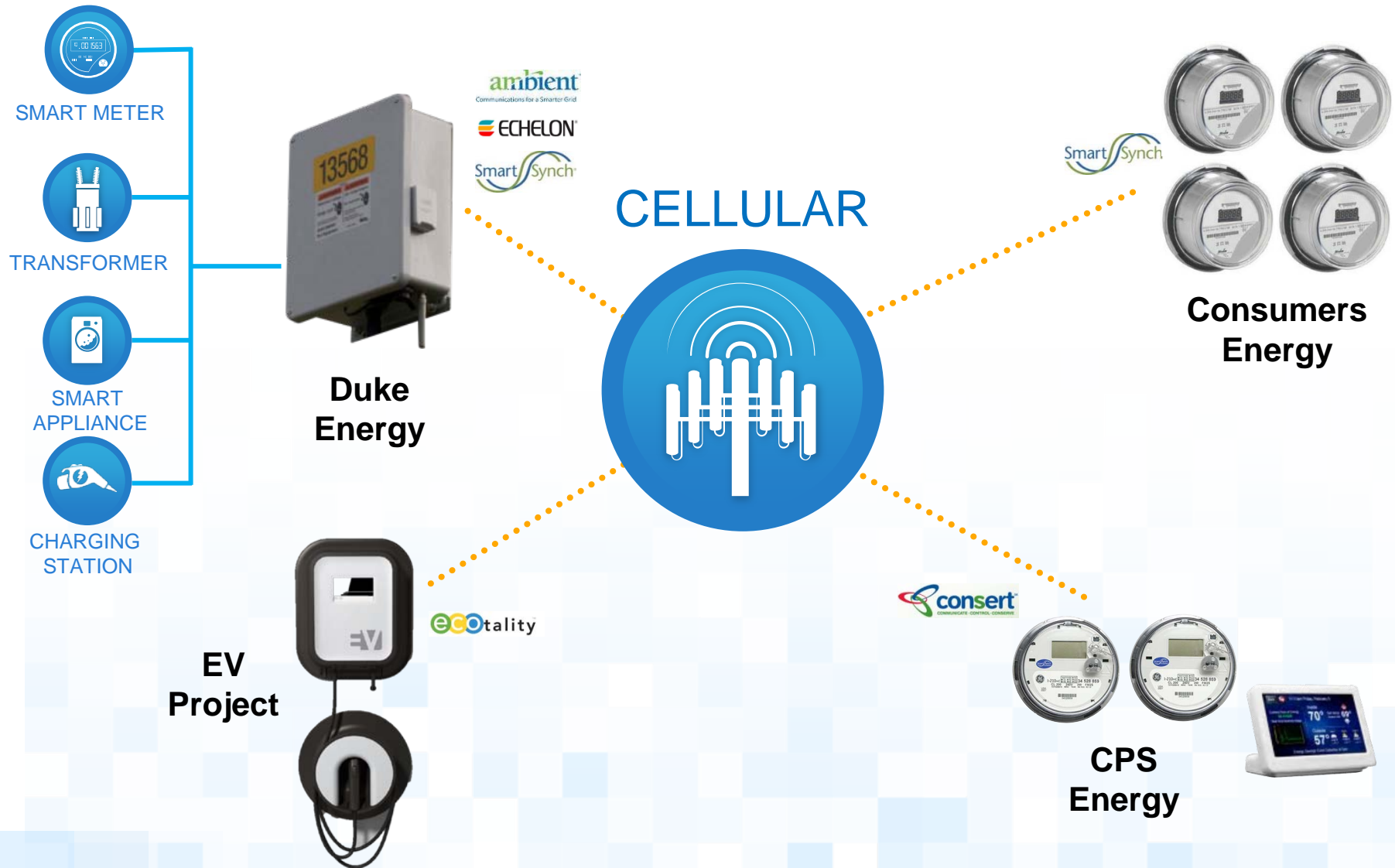


How Qualcomm Addresses Smart Energy

- 3G provides superior performance, reliability, security & scale
- QC connectivity solution portfolio addresses a broad range of smart energy applications both inside and outside the home



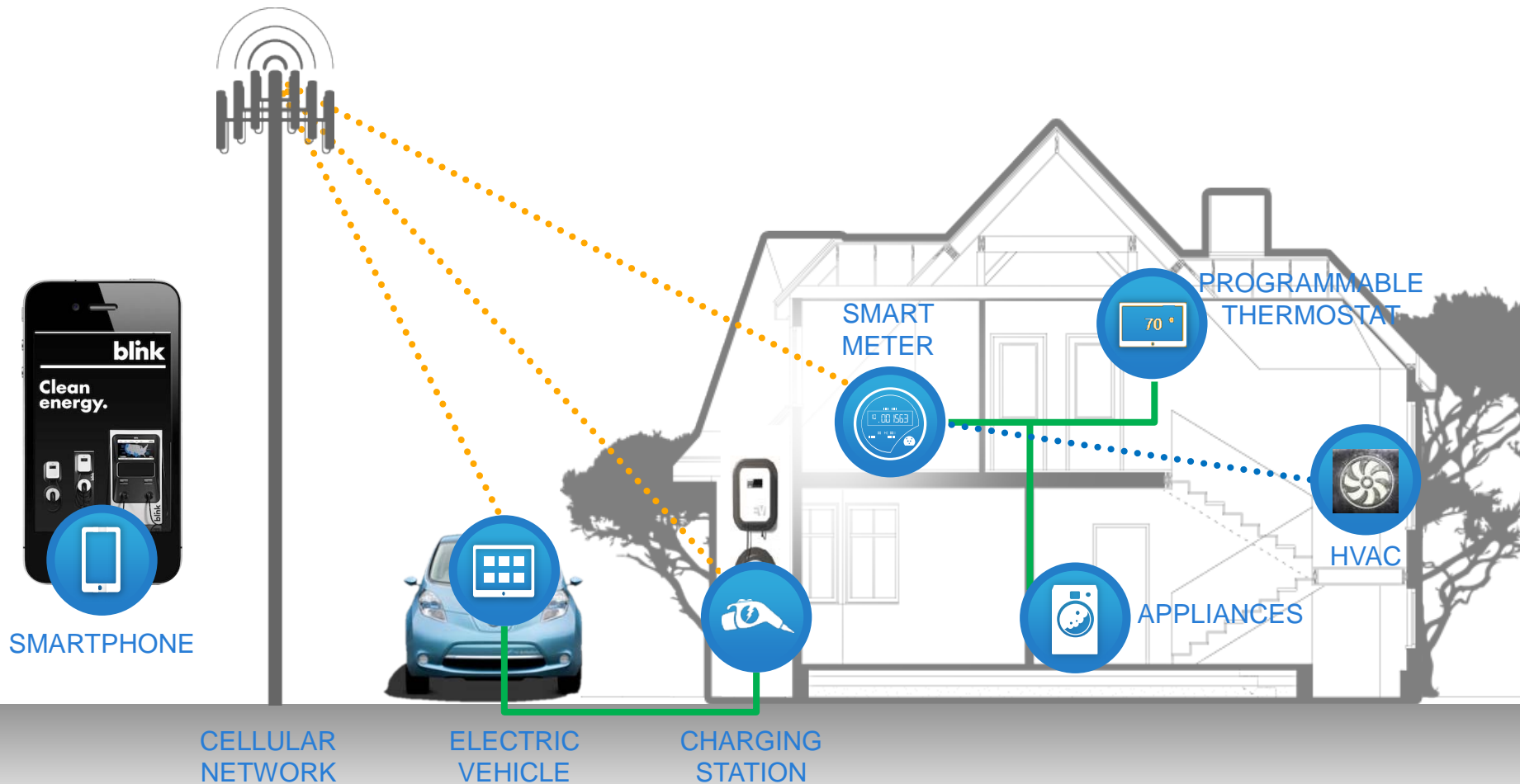
New Smart Energy Contracts Are Going Cellular



Smart Energy in the Home

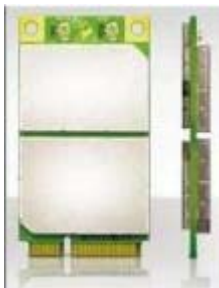
- Cellular
- Wi-Fi
- HomePlug Green PHY
- Enabled by Qualcomm

INTERNET OF EVERYTHING TODAY ENABLES INTELLIGENT CONTROL OF ENERGY USAGE



Qualcomm's Strong Cellular Ecosystem Helps Engage the Various New IoE Opportunities

- Online searchable database of Qualcomm-enabled M2M modules
- Contains 85+ modules from 13 commercial OEMs
- Includes specs and module vendor contact details
- www.m2msearch.com



Connectorized



Surface Mount

M2M Module Search
Quickly search Qualcomm-enabled Machine-to-Machine cellular module solutions.

These offerings are enabled by a healthy ecosystem of top-tier commercial suppliers for integration of mobile technology in various fields such as smart grid, automotive, tracking, home security, vending, digital signage, and others

Device Search

Select from the following options to search the device database. Press and hold the Ctrl button to select multiple items. [View all](#)

Company View All AM Telecom AnyDATA Cinterion Wireless	Modem Technology View All 1X-RTT EDGE EVDO rev.0	Voice Support View All Yes No Not Specified
Gobi API View All No Yes Not Specified	GPS Capabilities View All Not Specified Assisted Standalone	Operator Certifications View All Not Specified AT&T Sprint
Chipset Model View All Qualcomm (part N/A) Qualcomm MDM6085 Qualcomm MDM6200	Mounting View All Connectorized (PCIe, ribbon, plug) Surface Mount (LGA, BGA, LCC, etc) Not Specified	SEARCH FOR DEVICE ➔



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www.qualcomm.com/blog



Qualcomm Driving Innovation in Wireless

Matt Grob

EVP & Chief Technology Officer



Innovating to Drive the Future of Wireless



INVESTING FOR THE FUTURE

>\$17.6B
CUMULATIVE TOTAL
R&D INVESTMENTS
2005–2010

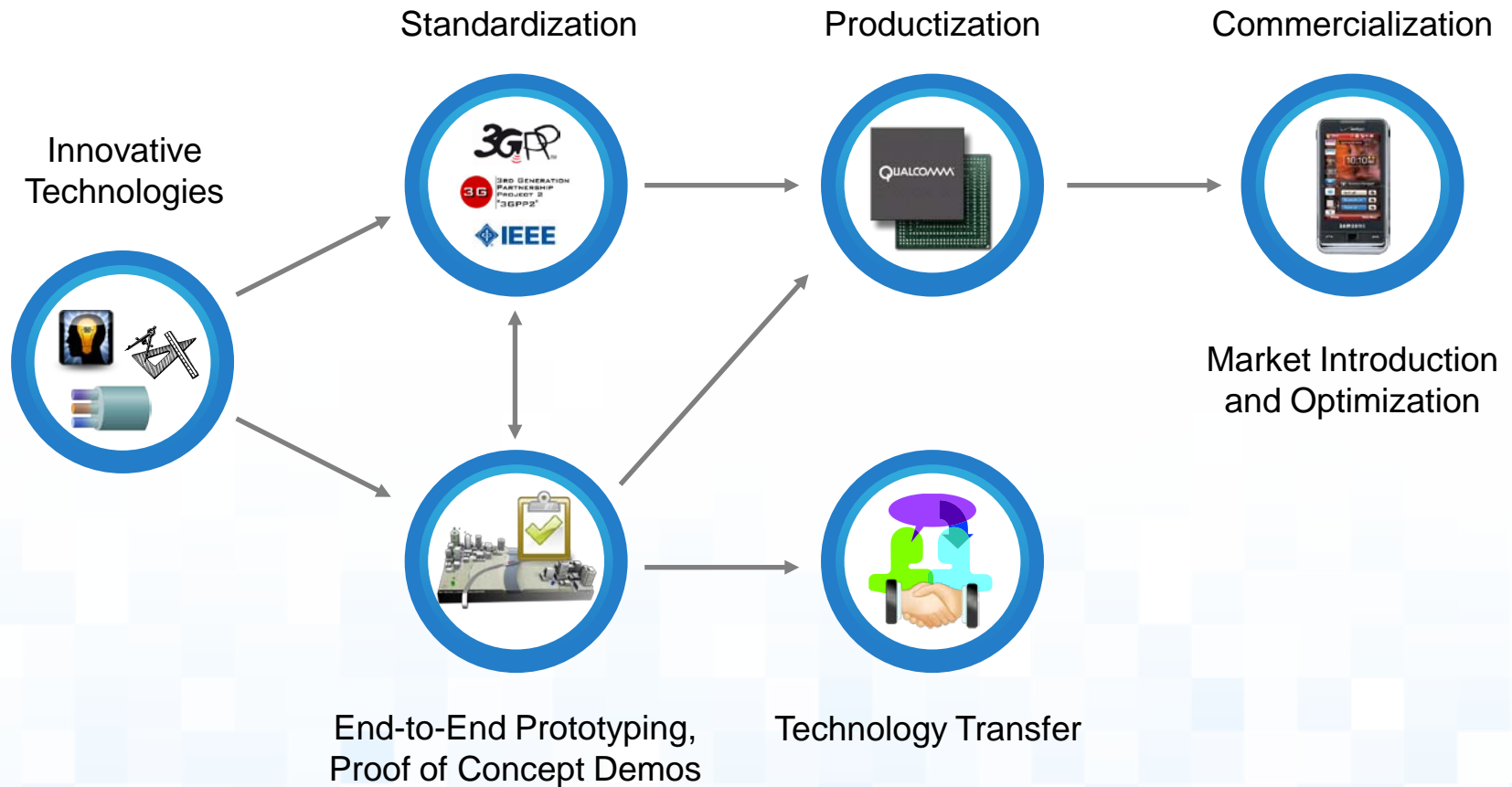
GLOBAL R&D PRESENCE

9 R&D
LOCATIONS

THE RIGHT PEOPLE

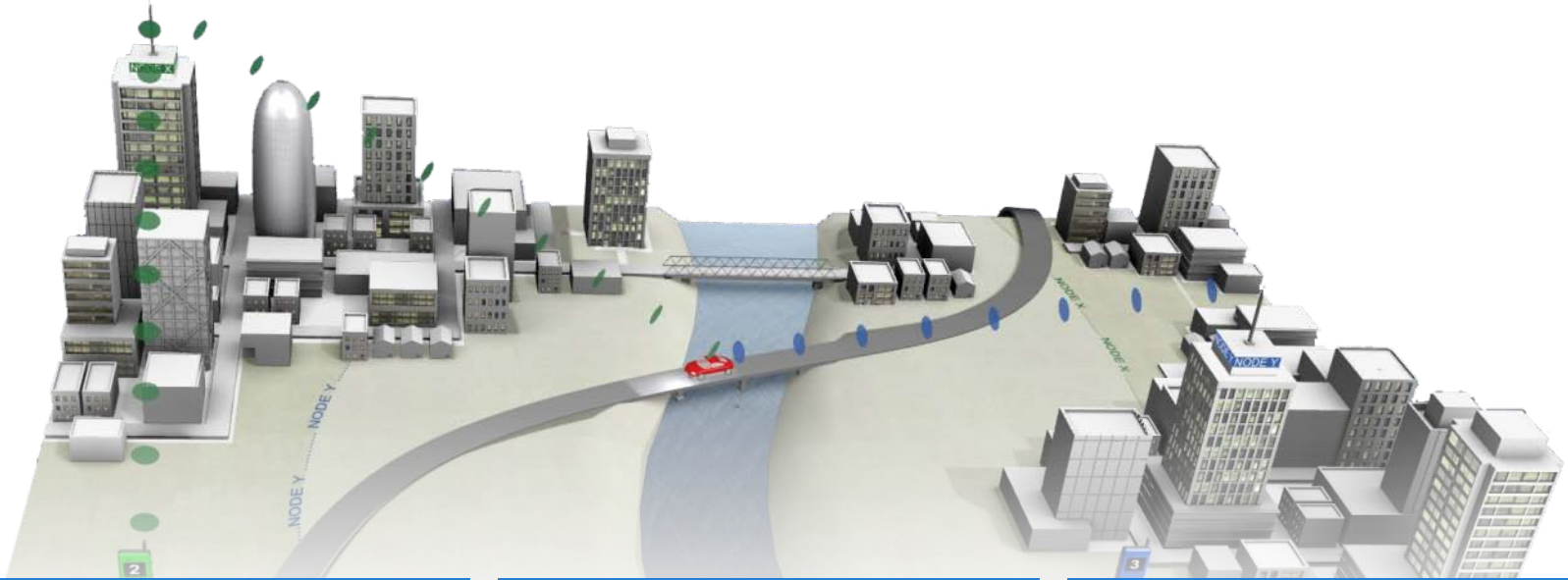
30% OF ENGINEERS
WITH PhDs
40% WITH MASTERS

Innovation Across Entire Wireless Value Chain



HOLISTIC APPROACH FOR EXCELLENT OVERALL SYSTEM PERFORMANCE

Success of DC-HSPA+



STANDARDS LEADERSHIP

- Major 3GPP contributor
- Recognized expertise

INDUSTRY-FIRST DEMOS

- MWC 2008: dual-carrier
- MWC 2009: dual-carrier 42 Mbps

INDUSTRY-FIRST CHIPSETS



Launched
February 2009



Launched
August 2010

49 COMMERCIAL, 41 COMMITMENTS

Enabling New Mobile Experiences

Connecting Everything

Supporting More Users,
at More Places,
with More Capacity

Evolve 3G/4G/WiFi

Small Cells/HetNets

Peer to Peer

Intelligent Connectivity



Mobile Computing Everywhere

Leveraging Computing
Power and Sensors to Enable
New User Experiences

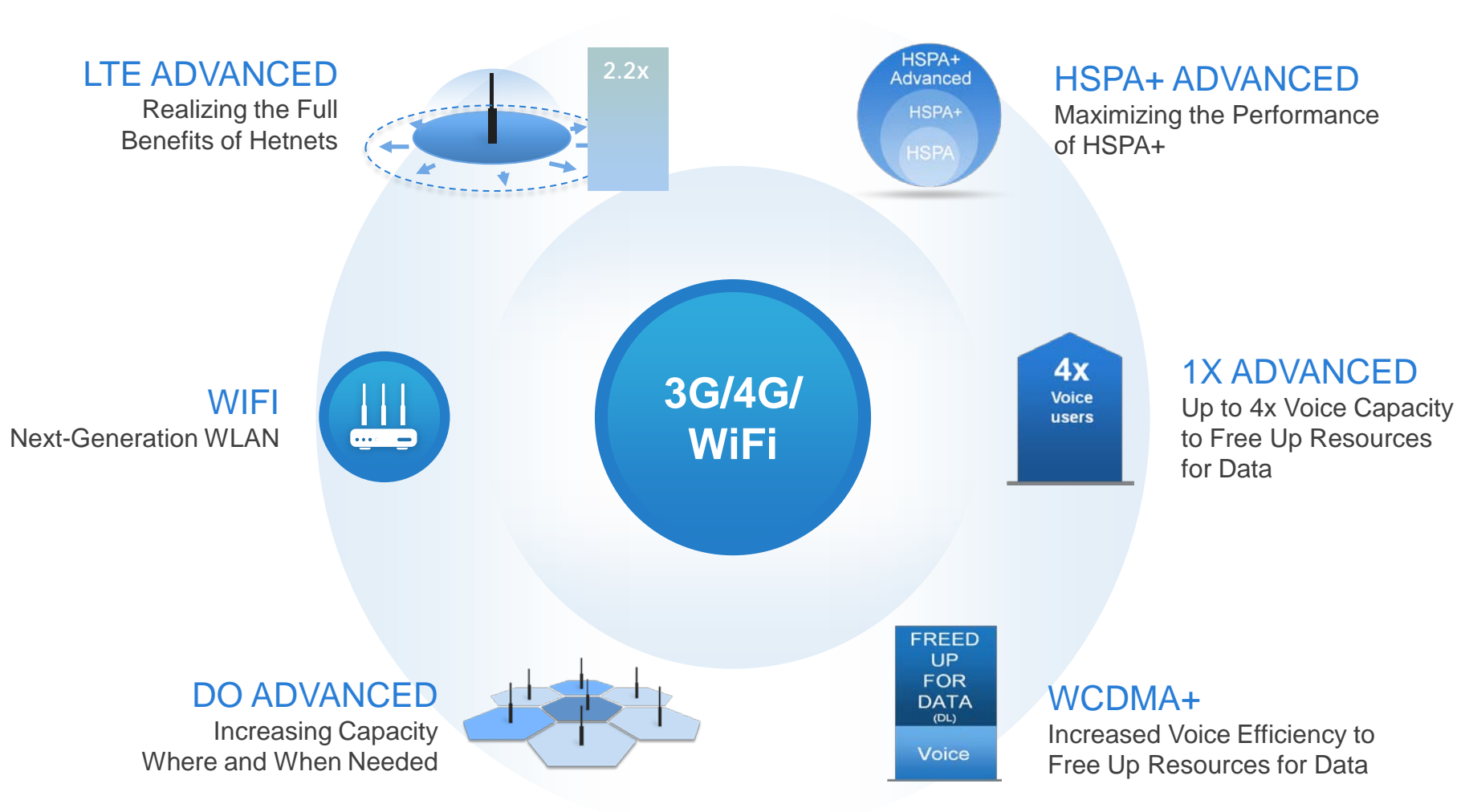
Context Awareness

Computer Vision

Indoor Location

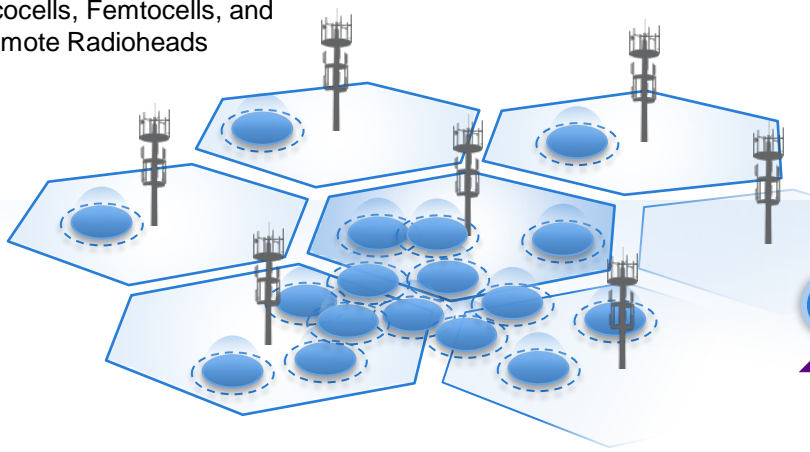
Improving Web Experience

Continuously Improving Wireless Performance



The Next Leap in Performance: Small Cells

Adding Small Cells Like
Picocells, Femtocells, and
Remote Radioheads



OPTIMIZATIONS MAKES THE LEAP
EVEN BIGGER—SMART HETNETS

LTE ADVANCED
HSPA+ ADVANCED
DO ADVANCED

SMALL CELLS
Bring Network Closer to User

**BETTER
TECHNIQUES**
Higher Order MIMO,
Smart Networks

MORE SPECTRUM
New Bands/Refarming

**How Do We
Get More
Capacity?**

Radio Link Approaching Theoretical Limit

Note: Other improvements, such as higher order modulation will also help, but 64QAM is already commonly used.
Other options are to use the available capacity better and reduce, e.g., power or signaling overhead to get more usable capacity.

UltraSON™ Enables Expanding Role of Small Cells



Initially: Indoor Femto Hot Spots

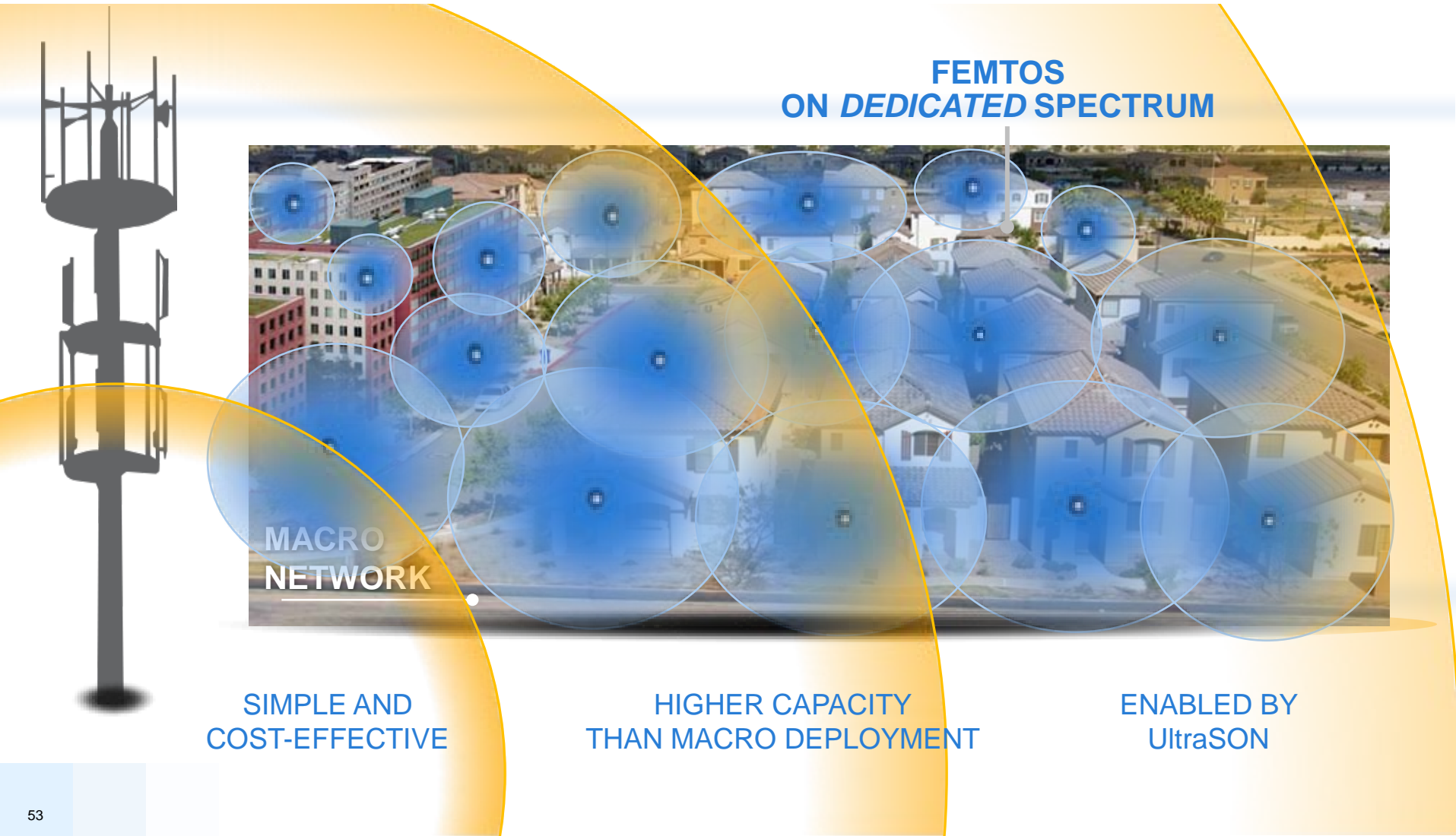
- Unplanned
- Restricted
- User's broadband connection

Next: Denser Indoor and Outdoor Deployments

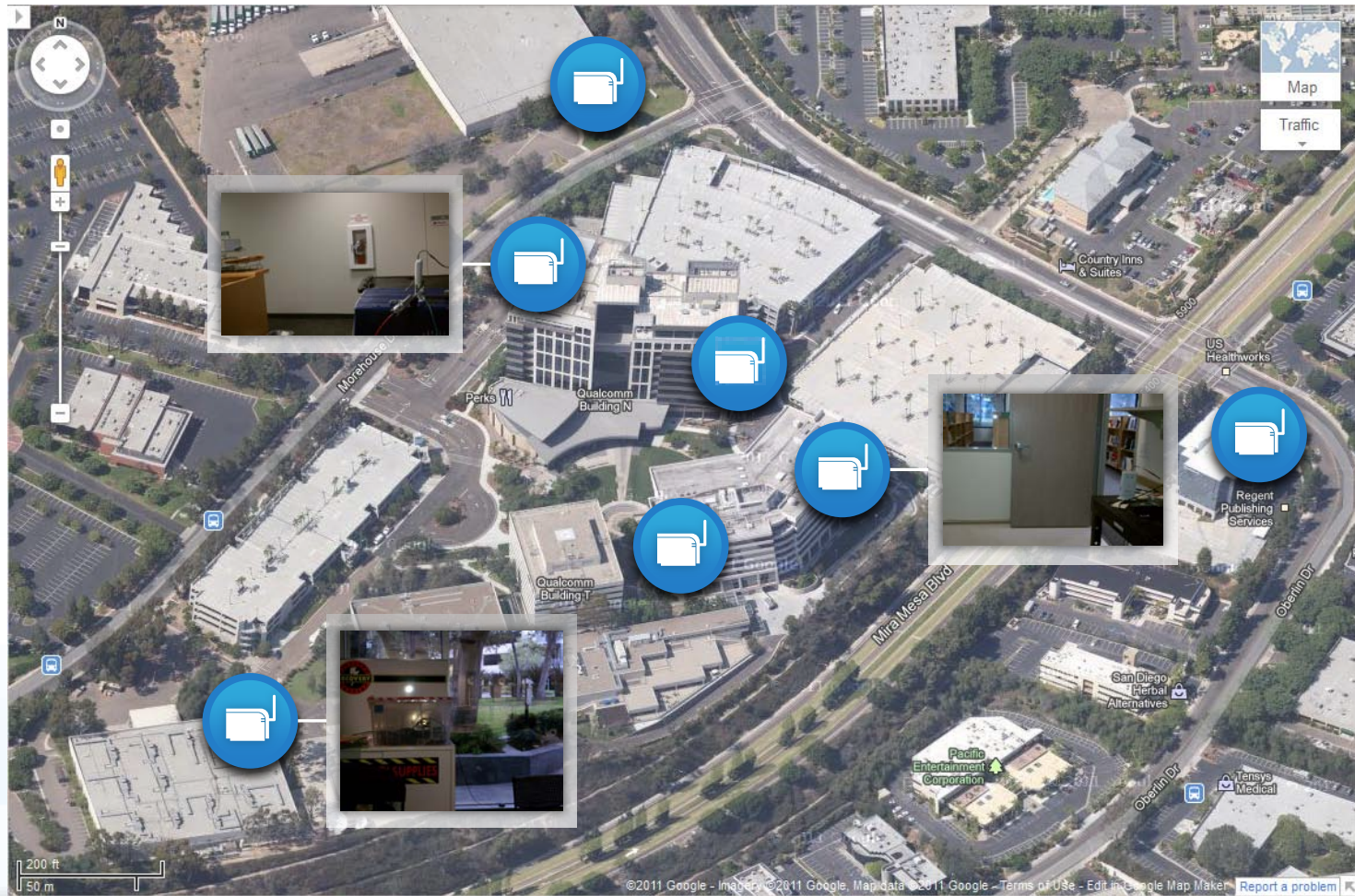
- Open
- Seamless handoff
- Interference coordination

New Femto-based Deployment Model

OPEN-ACCESS INDOOR FEMTOS PROVIDING OUTDOOR COVERAGE



Femto OTA Test Network



Intelligent Connectivity



CONNECTION
BASED ON:

- Coverage
- Data speed
- Internet connectivity
- Type of app
- Operator policies
- Per link decision

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Supporting More Users,
at More Places,
with More Capacity

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Small Cells/HetNets

Peer to Peer

Intelligent Connectivity



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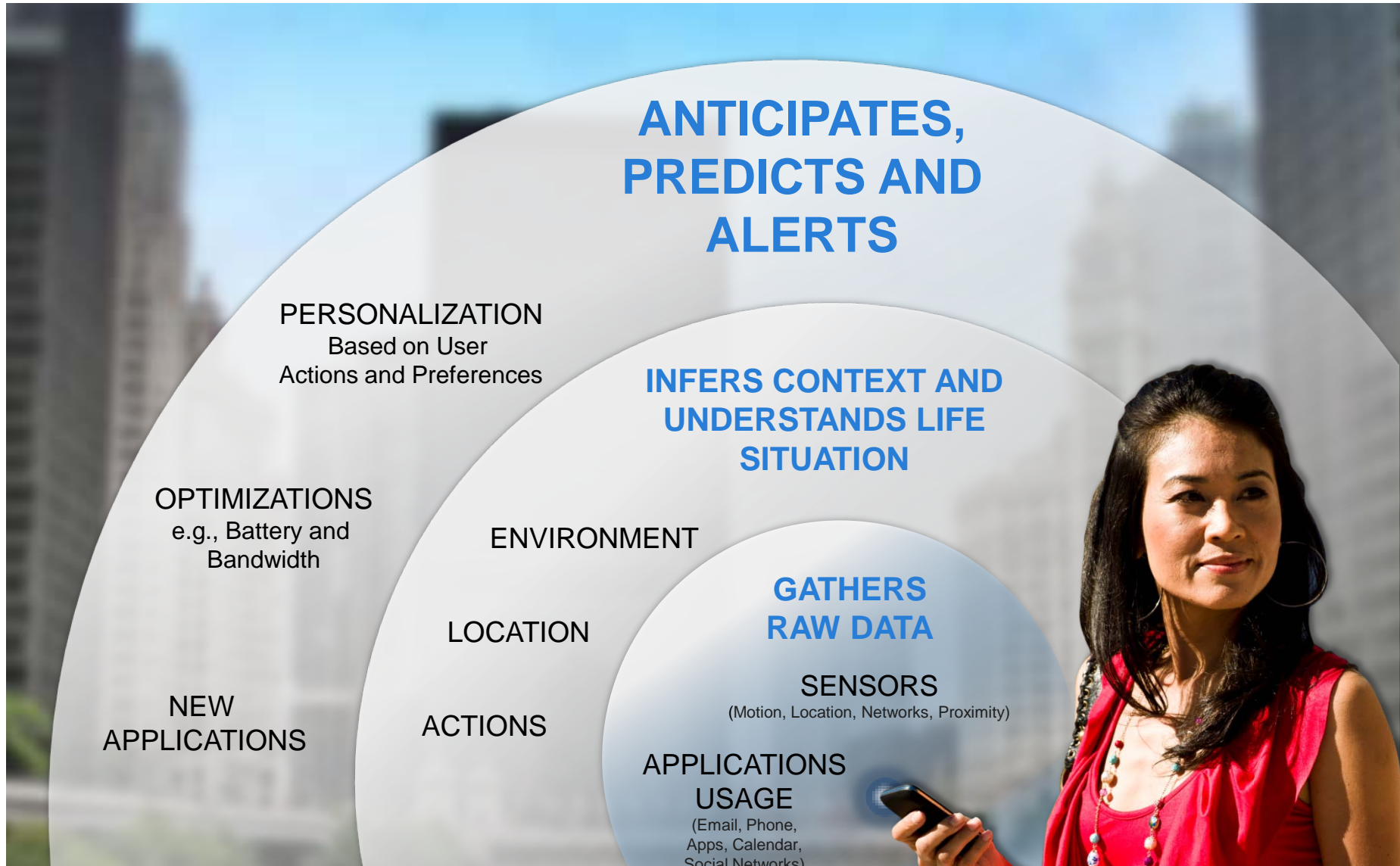
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Computer Vision

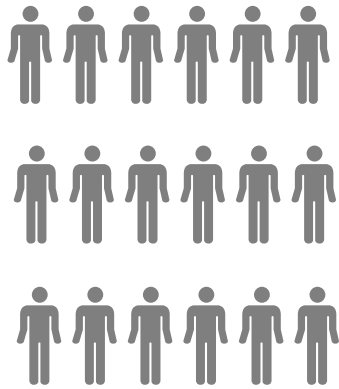
Indoor Location

Improving Web Experience

Context Awareness Enables New User Experiences



Augmented Reality - Market Traction



16,000+
REGISTERED
DEVELOPERS FROM
130 COUNTRIES



400+
MODELS OF
SMARTPHONES AND
TABLETS



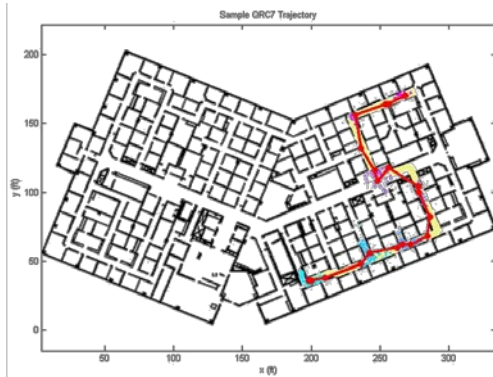
150+
APPS AVAILABLE ON
ANDROID AND iOS



2011 Future Mobile Entertainment Award
for Mobile Augmented Reality



Accurate Indoor Positioning



High Accuracy (<5m)

- Leverages existing WLAN AP and infrastructure

Integrated into Qualcomm Chipsets

- Highly efficient mobile based solution

Scalable Across Commercial Venues

- Airport, train stations, malls, museums, hospitals, sports venues etc.

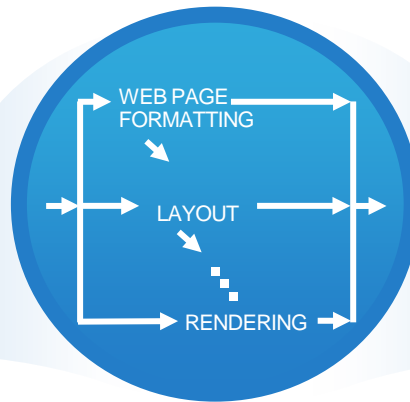
Web Browser Acceleration

EXPLOITING CONCURRENCY FOR HTML AND JAVASCRIPT

MOBILE COMPUTING
INCREASINGLY MULTI-CORE



Multi-Core CPU/GPU, DSPs,
and Hardware Accelerators



DEVELOPING FOR
SNAPDRAGON SOC

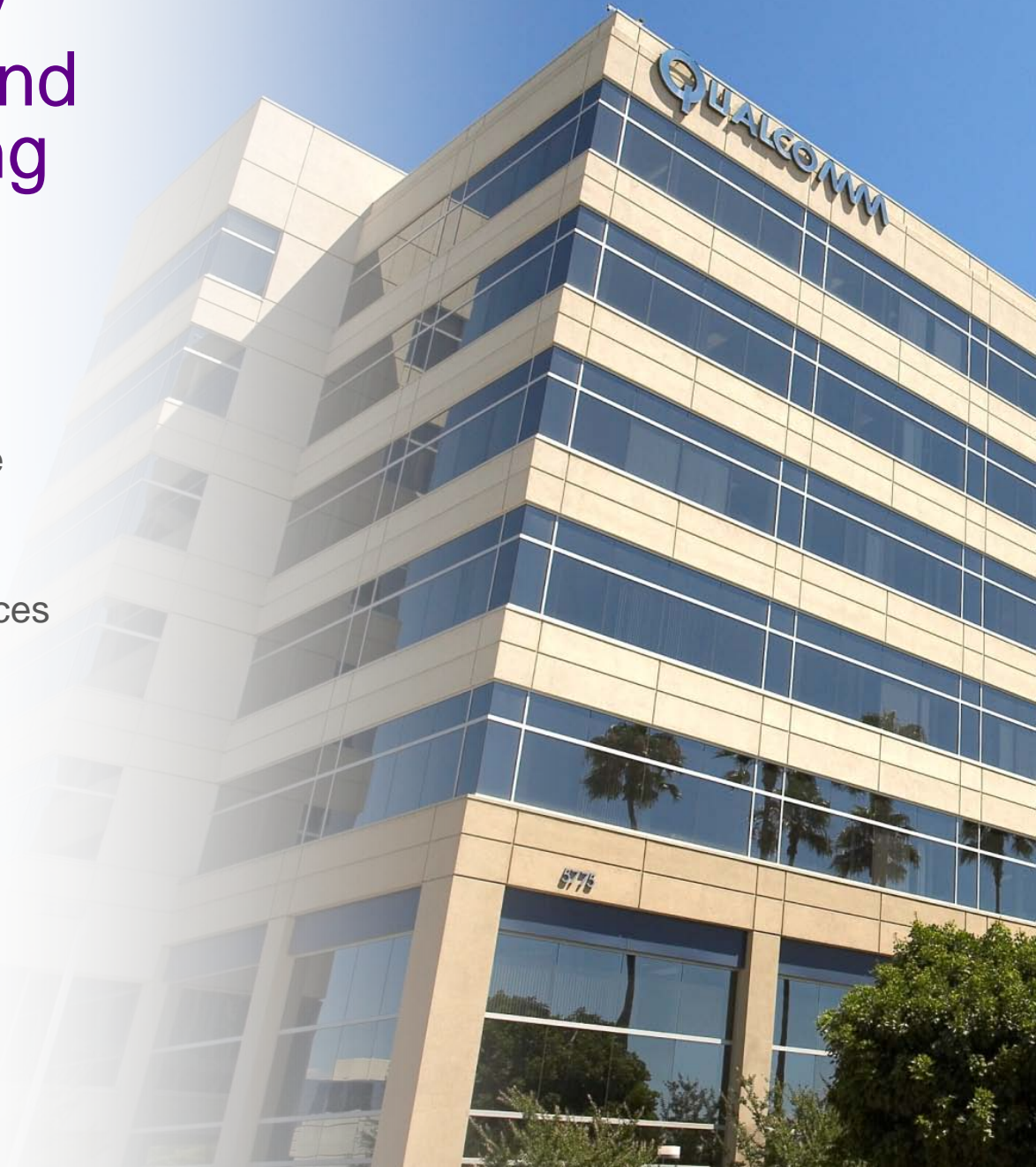


- Concurrently use all CPU cores
- Designed to exploit Adreno GPU, Hexagon DSP, and other hardware accelerators

SIGNIFICANTLY FASTER BROWSING EXPERIENCE

Leading the Way in Connectivity and Mobile Computing

- Strong track record of leadership in connectivity and mobile computing
- Broad R&D initiatives to drive innovation in wireless
- Well positioned to bring next generations of user experiences





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