Modem Evolution

CTIA Special Session
May 8, 2012

Modem Leadership Across Multiple Devices
Delivering Fast, Reliable, Seamless Voice and Data Performance

Mobile   **Computing**   **Internet of Everything**   **Networking**
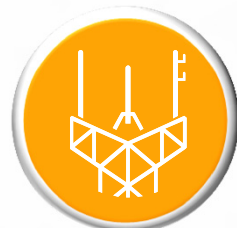
Gobi™ 3G, 4G, and 4G LTE Multimode Modems

Qualcomm Modems Are Highly Integrated

Built Smarter to Work Smarter

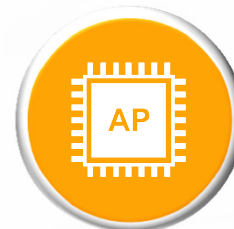

Power Optimization
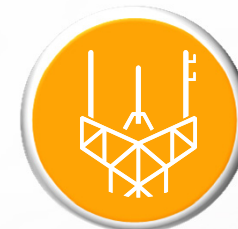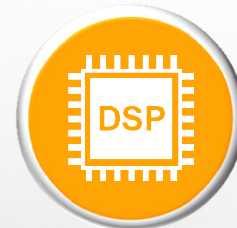
Broadcast

Multimode 3G/4G

OS Support

GPS

Voice

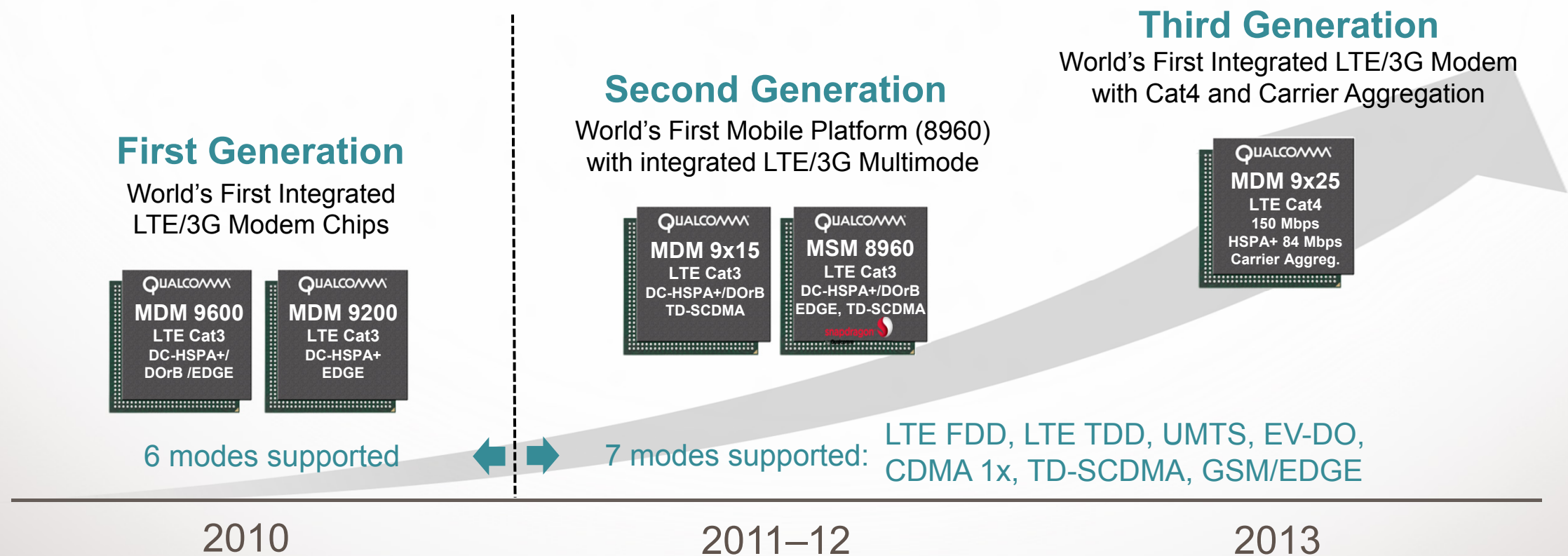**Soft Access Point**

Advanced Receivers

RF Multiband

DSP

Connectivity

Simplified APIs

Leading in LTE Technology Development
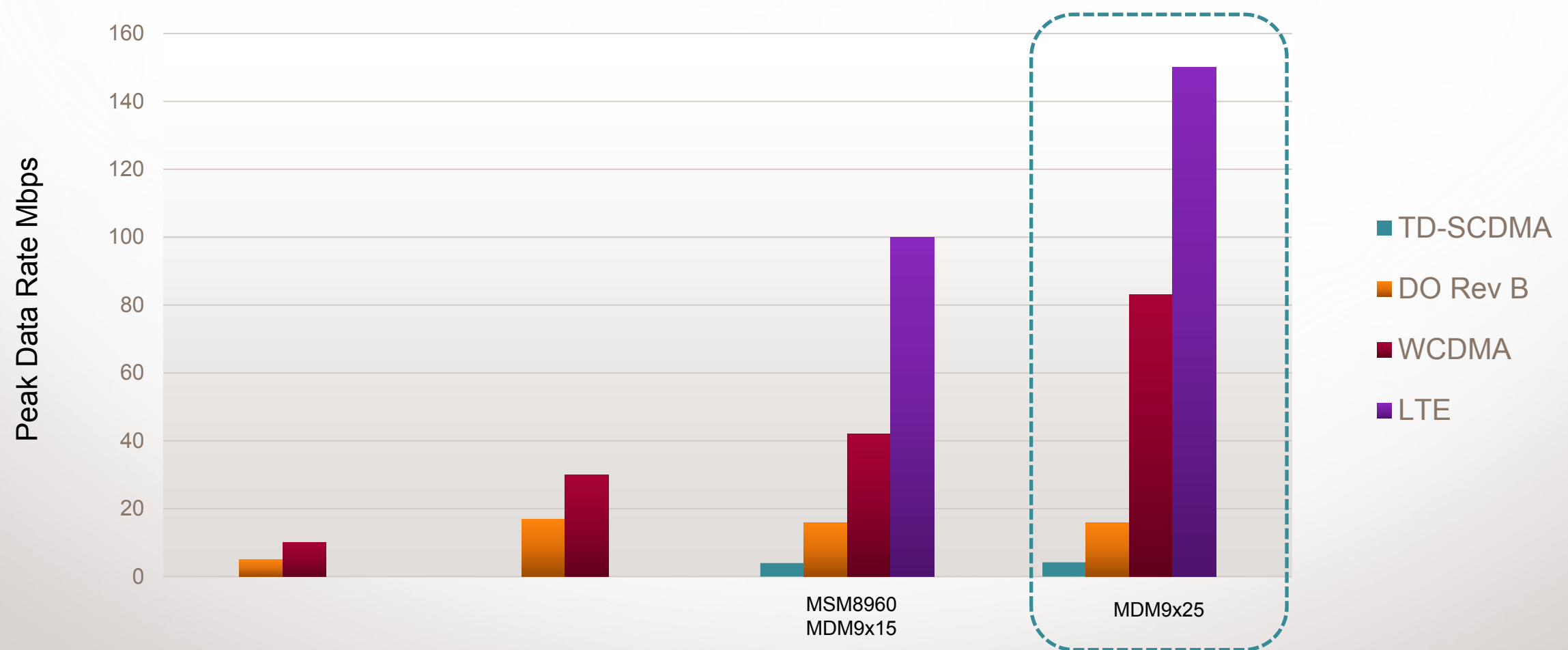## Already on Third Generation of LTE

Third Generation
World's First Integrated LTE/3G Modem
with Cat4 and Carrier Aggregation

Second Generation
World's First Mobile Platform (8960)
with integrated LTE/3G Multimode

First Generation
World's First Integrated
LTE/3G Modem Chips

QUALCOMM
MDM 9x25
LTE Cat4
150 Mbps
HSPA+ 84 Mbps
Carrier Aggreg.

QUALCOMM
MDM 9x15
LTE Cat3
DC-HSPA+/DOrB
TD-SCDMA

QUALCOMM
MSM 8960
LTE Cat3
DC-HSPA+/DOrB
EDGE, TD-SCDMA

QUALCOMM
MDM 9600
LTE Cat3
DC-HSPA+/
DOrB /EDGE

QUALCOMM
MDM 9200
LTE Cat3
DC-HSPA+
EDGE

6 modes supported

7 modes supported:

LTE FDD, LTE TDD, UMTS, EV-DO,
CDMA 1x, TD-SCDMA, GSM/EDGE

2010

2011–12

2013

All Multimode, All Bands, Performance Evolution

4

Integrated Multimode Modem Leadership

Qualcomm Modems Support Combination of Highest Data Speeds

Peak Data Rate Mbps

Legend:
- ■ TD-SCDMA
- ■ DO Rev B
- ■ WCDMA
- ■ LTE

Categories: MSM8960 MDM9x15, MDM9x25

Note: LTE example is FDD mode. TDD peak data rates also supported. Source: Qualcomm
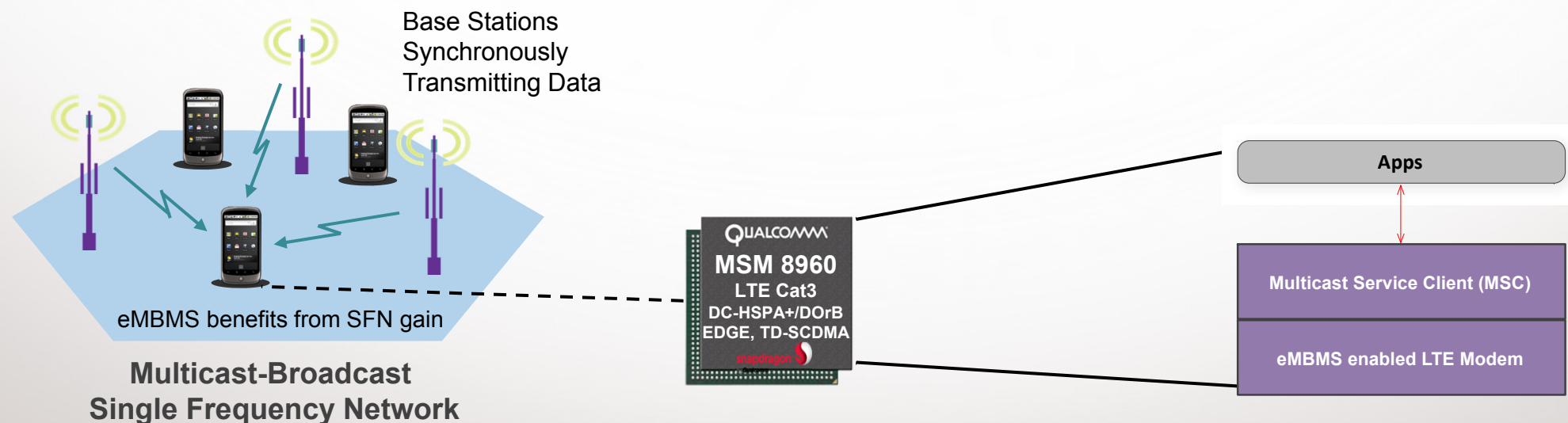
Qualcomm Supporting LTE Multimode Activities Globally

Support for Over 40 RF Bands Required

China
- UMTS/CDMA2100
- CDMA850
- CDMA450
- TD-SCDMA1900
- TD-SCDMA2000
- TD-LTE2300
- TD-LTE2600 (B38)

Europe
- UMTS2100
- UMTS900
- CDMA450
- LTE1800
- UMTS1800
- UMTS2600
- LTE800
- LTE2600-FDD
- TD-LTE2100 (B34)

Japan
- CDMA/UMTS850
- UMTS/CDMA2100
- UMTS1700
- UMTS/LTE1500 (B11)
- LTE1500 (B21)
- LTE850
- LTE900
- TD-LTE2600 (Bxx)

North America
- UMTS/CDMA AWS
- UMTS/CDMA1900
- UMTS/CDMA850
- Extended AWS
- LTE700
- TD-LTE2600 (B41)
- MSS 1500 (L-Band)
- MSS2100 (S-Band)

South Korea
- UMTS850
- LTE850
- UMTS2100
- CDMA1700

South America
- UMTS2100
- UMTS1800
- UMTS1900
- UMTS850

India
- CDMA850
- UMTS2100
- UMTS900
- TD-LTE2300

Australia
- UMTS2100
- UMTS850
- UMTS900
- LTE2600

eMBMS Overview

evolved Multimedia Broadcast Multicast Service

- Specified in 3GPP Rel-9, enhancements planned in Rel-10 and beyond

- Efficient "one-to-many" LTE broadcast solution (unlimited number of users)

- Reduces delivery costs and offloads content from unicast

- Flexible capacity sharing between unicast and broadcast

- Fully integrated with LTE infrastructure & Qualcomm UE chipsets

Base Stations Synchronously Transmitting Data

eMBMS benefits from SFN gain

**Multicast-Broadcast
Single Frequency Network**

QUALCOMM
MSM 8960
LTE Cat3
DC-HSPA+/DOrB
EDGE, TD-SCDMA

Apps

Multicast Service Client (MSC)

eMBMS enabled LTE Modem

LTE Multicast/Broadcast—Opportunities and Benefits
Drive ARPU and Reduce Cost

Deliver Live Events

- Live sporting events
- Breaking news
- "Must-see" live events
- Venuecasting

Distribute eMedia

- Catch-up TV
- Print media delivery
- Digital signage
- Targeted advertising
- eLearning
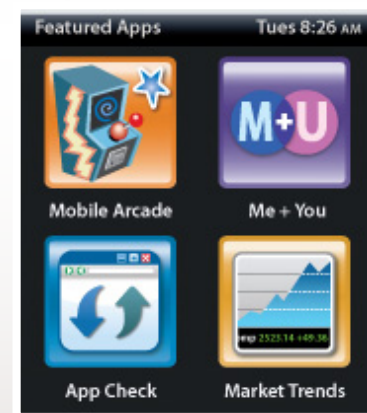
Offload Data

- Firmware Over the Air (FOTA)
- Featured applications
- Popular application updates
- Live tickers
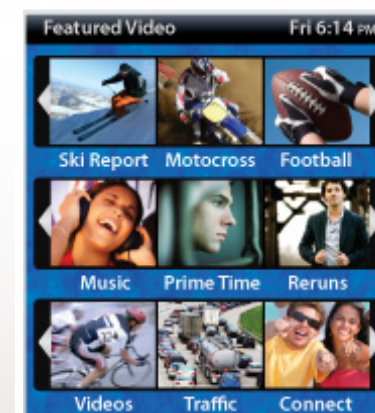
Manage Congestion

- Breaking news triggered media content
- Top YouTube video clips
- Machine-to-machine

* for illustrative purposes only

LTE Advanced: Carrier Aggregation
Key to Enabling Maximum Cat 4 Data Rates for Most Operators

- 3GPP Release 10 feature

- Enables higher peak, average user rates

- Combines fragmented LTE spectrum

- 150 Mbps data rates without contiguous 20 MHz

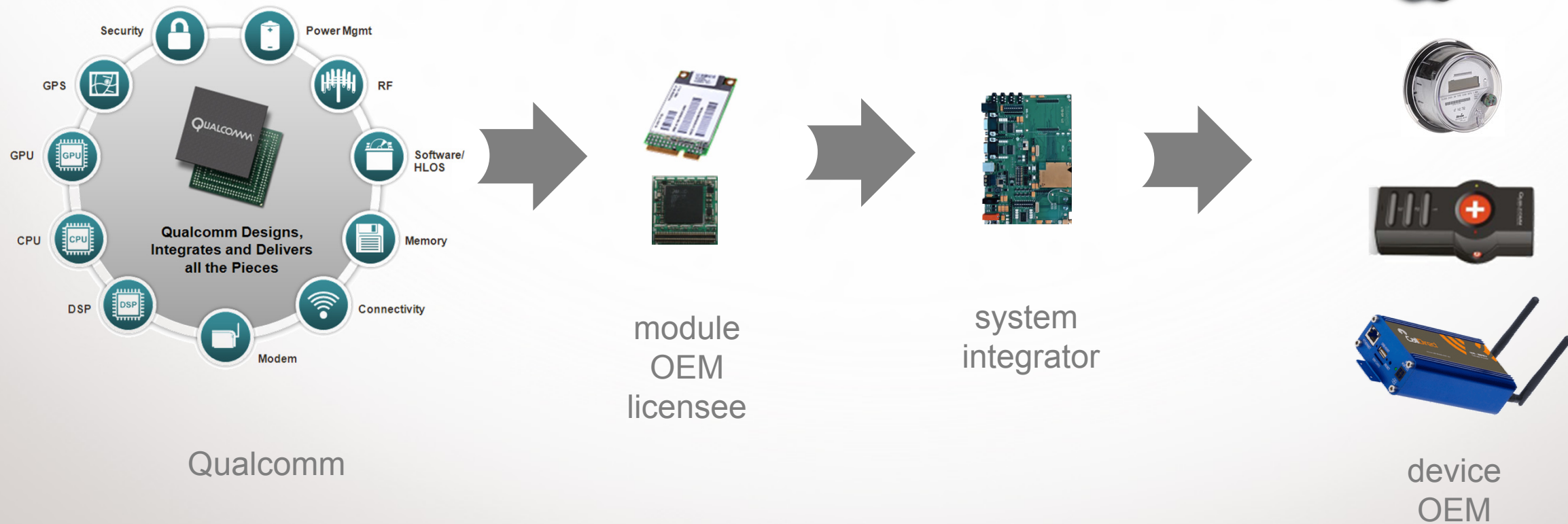- Over 20 combinations considered in 3GPP

- Lead chipset:

QUALCOMM

MDM 9x25
LTE Cat4
150 Mbps
HSPA+ 84 Mbps
Carrier Aggreg.

Downlink (Interband)

10 MHz + 10 MHz

Band X   Band Y

Uplink

10 MHz

Band X

DL LTE Carrier

DL LTE Carrier

UL LTE Carrier

Aggregated Data Pipe

Internet of Everything/M2M

Cloud

Automotive,
Transportation
& Logistics

Smart
Energy,
Security

3G/LTE

Industrial
Automation,
Enterprise
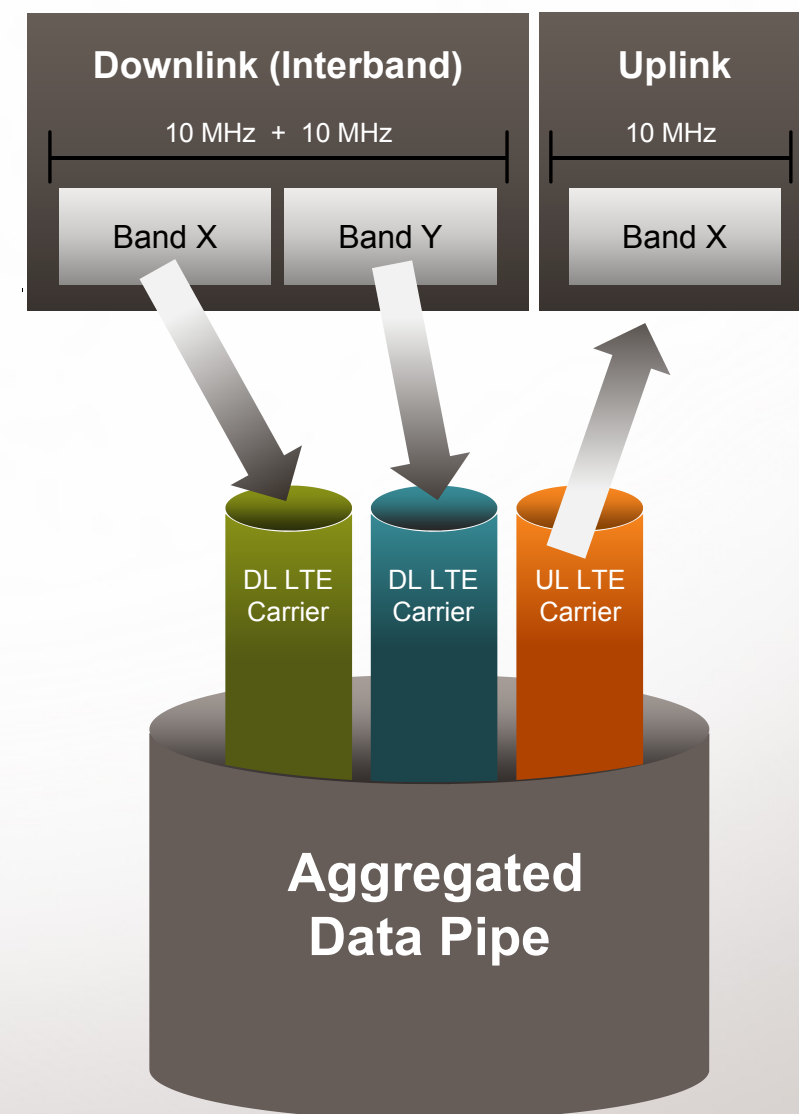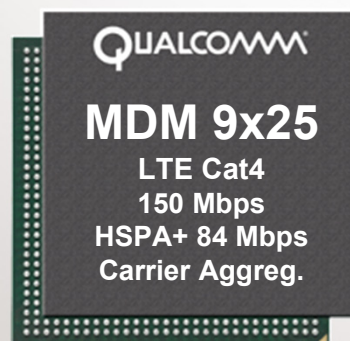
Consumer
& Other M2M

Key Enablers	Cloud Services	Affordable Processing and WAN	Managed Connectivity
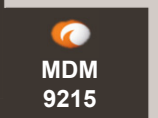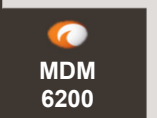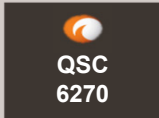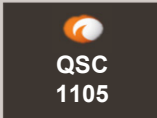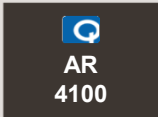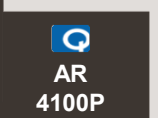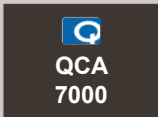
Role of Qualcomm in the M2M value chain

Qualcomm

module
OEM
licensee

system
integrator

device
OEM

Qualcomm's Internet of Everything (IoE) Roadmap

4G Multimode	**MSM 8960** — ▪ Dual core ▪ LTE, HSPA+, GSM/GPRS ▪ EV-DO Rev. 0/A/B, 1X-RTT	**MDM 9615** **MDM 9215** — ▪ LTE, HSPA+, GSM/GPRS ▪ EV-DO Rev. 0/A/B, 1X-RTT (9615)
3G Multimode	**MDM 6600** **MDM 6200** — ▪ HSPA, GSM/GPRS ▪ EV-DO Rev. 0/A/B, 1X-RTT (6600)	
3G HSDPA, 1X-RTT	**QSC 6270** — ▪ HSDPA, GSM/GPRS	**QSC 1105** — ▪ GSM/GPRS ▪ 1X-RTT
Connectivity Wireless LAN	**AR 4100** **AR 4100P** — ▪ 802.11n ▪ Low energy ▪ Single stream ▪ Integrated TCP/IP IPv4/IPv6 (4100P)	
Connectivity HomePlug Green PHY Power Line Communication (PLC)	**QCA 7000** — ▪ HomePlug Green PHY ▪ Low power	

Snapdragon   Gobi   Qualcomm Atheros

M2MSearch.com

- Web resource with database of ~100 modules enabled by Qualcomm

- Over a dozen of module OEM suppliers

- Searchable by chipset model, modem technology, operator certification and other attributes

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Qualcomm: Industry-Leading Modem Supplier

Only complete multimode modem solution with integrated 4G LTE/3G

#1 supplier of 3G modems worldwide

#1 in integrated multimode LTE+3G modems

Source: iSource, Q2 2011, QCT. 14