



Current Analysis Webinar

4G Silicon - Stakes Rise: The Competitive Landscape Intensifies

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September 28-29, 2010: Mobile Device Silicon

■ 4G Silicon = LTE/WiMAX Silicon

■ Section I: 4G Silicon Trends and Development

- Defining the 4G Silicon Market
- Carrier/Customer Perspectives
- LTE/WiMAX Silicon Challenges
- Market Size and Direction

■ Section II: 4G Silicon Competitive Landscape

- LTE/WiMAX Silicon Competitive Drivers
- LTE/WiMAX Silicon Vendor Comparisons
- LTE/WiMAX Solution/Application Factors

== Benefits from Carriers Perspective

- Meets customer demand for HS BWA incrementally delivered. 100 Mbps downlink and 50 Mbps uplink services with low latency < 10ms.
 - BB Wireless Access = Wireline Broadband
 - BW increments of 1.4,3,5,10, 20 MHz
- Spectral Efficiencies
 - Frequency allocations and channels all BW utilized
 - Creates additional level of complexity
- Seamless connection to legacy networks running GSM, CDMA, WCDMA through LTE/3G multimode devices.
 - Voice Traffic offload to run on existing facilities
- SON support (Self Optimizing & Self Organizing) Network
- LTE services are being deployed at a very high rate and on a global basis.
 - 64 LTE operator announced programs in 31 countries
 - 130 operators committed to support 4G roaming
 - Industry Verticals: Energy and Defense

4G Silicon Webinar: World Wide Carrier LTE Deployments

■ North America

- Aircell
- AT&T
- Century Tel
- Connect
- Cox
- Metro PCS
- T-Mobile
- Verizon
- Bell Canada
- Rogers
- Telus

■ MEA

- STC
- Zain
- Vodacom
- Call C
- Etislar

■ Europe

- 3,
- DNA
- Elisa
- EMT
- KPN
- Mobilkom
- MTS
- Orange
- SRF
- Svyazinvest
- T-Mobile
- Tele2
- Telcom Italia
- Telenor
- **TeliSonera**
- TMN
- Vivacell-MTS
- Vodaphone

■ South America

- ViVo Brazil

■ Asia-Pacific

- China Telecom
- China Mobile
- CSL Limited
- Ghunghwa Telcom
- eMobile
- Hutchison 3
- KDDI
- KT
- LG Telecom
- M1
- NTT
- PCCW
- Piltel
- Singtel
- Starhub
- SmarTone
- Softbank
- SK Telecom
- Telecom NZ
- Telstra

4G Silicon Webinar: American Carrier WiMAX/LTE Deployments

--= Verizon

- 4G LTE Network
- By end of 2010 launched in 30 metro's, 100 million potential subscribers
- USB Based Service Data Only in 2010
- Smartphones and Tablets 2011
- No Fullscale Global Roaming

--= AT&T

- 4G LTE Late 2011
- Finishing HSPA+ Rollout

--= Sprint

- WiMAX Network

--= Metro PCS

- LTE Trials September, Las Vegas, Nevada

--= Clearwire

- FDD & TDD LTE trials August, 2.5GHz Band runs to early 2011

== LTE Channel Bandwidths and Frequency Allocations

EARFCN	Industry Name	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Uplink	Downlink	Duplex Mode	Region
1	2100 MHz							1920-1980 MHz	2110-2170 MHz	FDD	Europe/ASIA/Japan
2	1900 MHz							1850-1910 MHz	1930-1990 MHz	FDD	North & South America
3	1800 MHz							1710-1785 MHz	1805-1880 MHz	FDD	Japan
4	1.7/2.1 GHz							1710-1755 MHz	2110-2155 MHz	FDD	North & South America
5	UMTS850							824-849 MHz	869-894 MHz	FDD	North & South America
6	UMTS800							830-840 MHz	875-885 MHz	FDD	Japan
7	2.5 GHz							2500-2570 MHz	2620-2690 MHz	FDD	Europe/ASIA/Japan
8	EGSM900							880-915 MHz	925-960 MHz	FDD	Europe/South America
9	UMTS 1700							1749.9-1784.9 MHz	1844.9-1879.9 MHz	FDD	Japan
10								1710-1770 MHz	2110-2170 MHz	FDD	
11								1427.9-1452.9 MHz	1475.9-1500.9	FDD	
12								698-716 MHz	728-746 MHz	FDD	
13								777-798 MHz	746-756 MHz	FDD	
14								788-798 MHz	758-768 MHz	FDD	
...											
17								704-716 MHz	734-746 MHz	FDD	
33	1900 MHz							1900-1920 MHz		TDD	
34								2110-2025 MHz		TDD	
35								1850-1910 MHz		TDD	
36								1930-1990 MHz		TDD	
37								1910-1930 MHz		TDD	
38	2.6 GHz							2570-2620 MHz		TDD	
39								1880-1920 MHz		TDD	
40	2.3-2.4 GHz							2300-2400 Hz		TDD	

- Initial Deployments in 2010 are typically:**
 - TDD (cheaper to implement same frequency band for TX & RX)
 - Data Only
 - USB Dongle
 - No initial roaming or restricted roaming
 - Restricted Bandwidths
- 2011 LTE Network Deployments**
 - Smartphone and Tablet support
 - Roaming
 - Carriers Choice (BW allocations)
- 2010- 2012 Carrier Deployments**
 - APAC & NA
- 2012-2013 Carrier Deployments**
 - China Mobile and China Telecom TDD-LTE

== Sustained Trends

- Integrated/Discrete Architecture Debate
- CPU Geometry Evolution: 90nm/65nm/45nm/32nm/2xnm
- SDR Innovation
- Evolution of Mobile Devices Category (cell, smart, super)
- Portfolio/Application Range Stretching
- Patents and R&D

== More Recent Trends

- Mobile O/S Fragmentation
- Multimode Flexibility
- SoC Integration will Take More Forms
- Application Intelligence
- 3rd Party Developers More Important
- Smartphone to Superphone?

== 4G Challenges

- 3G Revenue Models
- Support of Bands w/in 4G Spectrum
- Power Conservation still TBD
- Carrier Strategies Remain Unproven
- WiMAX Over Hype Lessons Learned

== 4G Trends/Solutions

- Multimode Flexibility
- SDR Approach Needed for Multimode
- Avoid Hard-wire Constraints
- 4G Can Solve 3G Capacity Constraints
- Power Conservation May Need Short-term Custom Option

== Mobile Internet Outpaces Desktop Internet Adoption

- Morgan Stanley

== Global Mobile Data Growth

- Exponential growth 2X year-over-year
- > 500 Petabytes/month, 2011
 - Cisco Visual Networking Index

== Merger & Acquisition Activity

- Intel buys Infineon \$1.4 Billion
- Qualcomm Wins Spectrum in India

== WiMAX Silicon Vendors are Adding LTE support

- WiMAX & LTE chipsets, Beceem & Sequans
- 3G/LTE chip sets Qualcomm, Fujitsu

== Forecast that 50 Million Consumer devices will be using LTE technology by 2012

== Global LTE Handset Market 150 Million Units by 2013

- Strategy Analytics

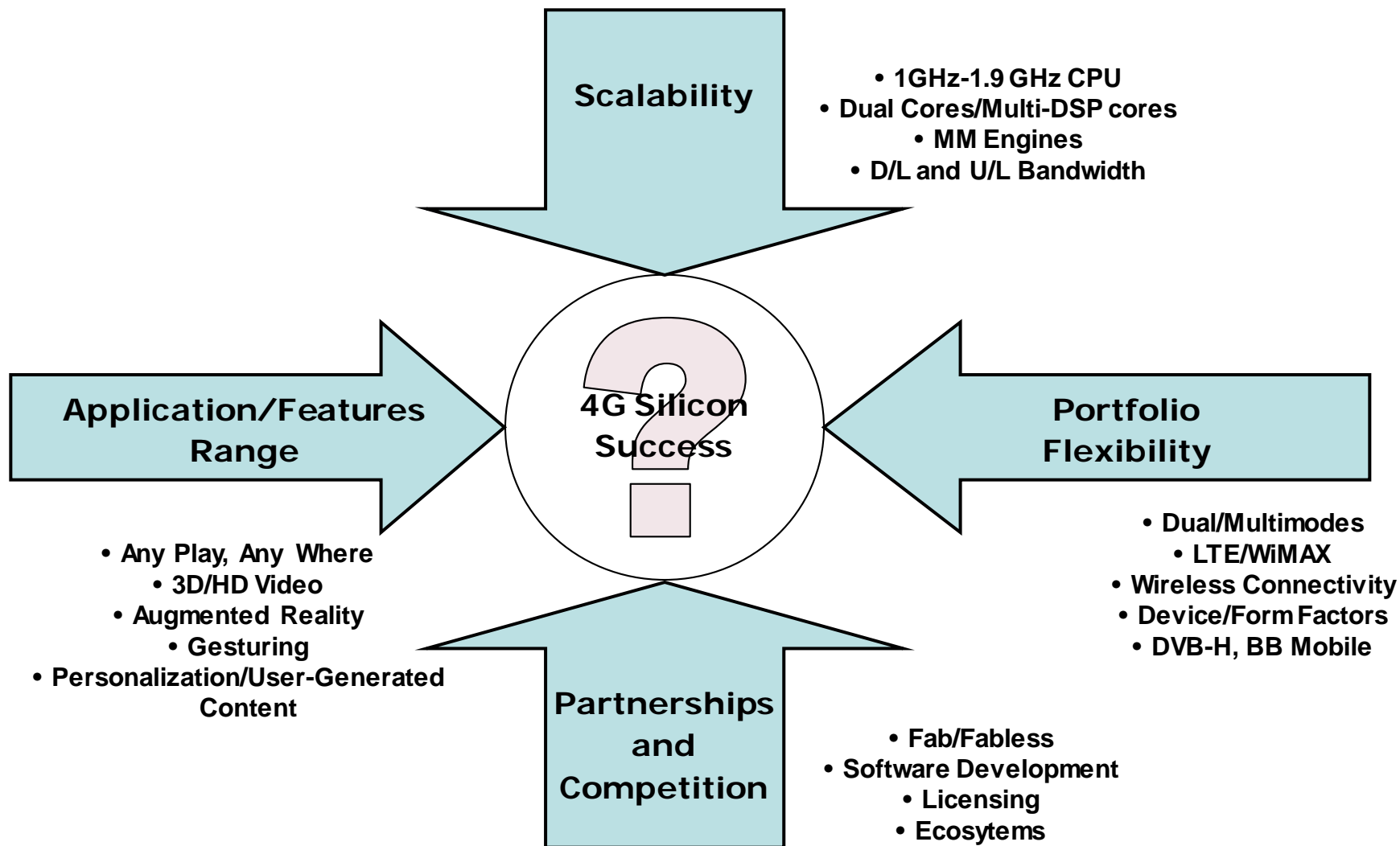


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Section II: 4G Silicon Competitive Landscape

4G Silicon Webinar: Major Drivers Shaping Evolution



Application Processor Platform Trends

Characteristics . . .

- Multicore

- 1 GHz+
- Near Constant 300 mW power budget (per core)
- New Generation MP with expanding capabilities

- 2x nm geometry

- Integrated GPU with diversified feature support

- More multimedia engines

- Integrated and dedicated
- Isolation of applications and secure payments

■ Mobile Device Trends

■ Characteristics . . .

■ Personal Computing Platform

- Console gaming quality graphics
- Navigation Tool w/ Augmented Reality
- Advanced Video Features
- Enhanced Web Interaction (HTML5/FP10)

■ Advancing Capabilities




- Broadband DL/UL Speeds
- Improved Battery Charge Metrics

■ Diversification of form factors

■ Scale as Important as Ever

4G Silicon Webinar: LTE Silicon Competitive Landscape




Ratings Key

	Positive
	Neutral
	Negative

Vendor	LTE/WiMAX Chipset	LTE Bands	Portfolio Range	LTE Chip Traction	Marketing	Overall 4G Solution
Qualcomm	MDM9xxx/ MDM8xxx	10MHz+/ Unpaired	3G/LTE Chip	Multi-Eval	1 st 3G/LTE Chip	3G/LTE Inside Track
Wavesat	Odyssey 9010	14 TDD/FDD Bands; 4 Rel. 8 BWs	WiMAX/9 th Gen	6 LTE IOTs /25+ Carriers	Strategy Clear	Diverse Options
ST- Ericsson	M700	Flexible	All BWs Supported	Sagem; Ericsson	Effective; TD-LTE	More Wins Needed
Samsung	Kalmia	4 Min.; Metro PCS	Diverse	Early LTE Wins	Device/Chip Clash	High-Profile Wins
Beceem	BCS500/BCSi500	TDD/FDD	WiMAX-to- LTE; WiMAX/LTE	Further Out	Clear but IPO	WiMAX/LTE Combos Need Proof
Sequans	SQN3010	Only Bands 38/40	Proven WiMAX	ALU; Huawei; MOT	Evolving	LTE Diversity Needed
Intel/ Infineon/ Comsys	Smarti LU; ComMAX	Six 3G/LTE	Intel Execution	Nokia	TBD	Close Infineon Merger
Altair	FourGee 3100/6200	Entire 700MHz- 2.7GHz	WiMAX Exit = Limits	IPWireless; ZTE	SDR O2P Compelling	More Traction Needed

4G Silicon Webinar: Major Supplier Competitive Landscape




Ratings Key

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	Neutral
	Negative

Vendor	Smartphone/Tablet Platform	CPU/GPU Scalability	Portfolio Range	Wireless Connectivity	Marketing	Overall MDS Solution
Qualcomm	Snapdragon	Competitive	Most Diverse	Diverse	Somewhat Unfocused	Threatening
TI	OMAP 4	Threatening	Baseband Exit	WiLink 7.0	Strategy Clear	Threatening
ST-Ericsson	U8500	Solid	Very Competitive	Bluetooth	Effective	Threatening
Samsung	Hummingbird	Competitive	4G Wins	Partners/Gap	Device/Chip Clash	High-Profile Wins
Broadcom	BCM2820	Competitive	4G Concerns	Robust	Clear Messaging	Prove App. Processor
Marvell	ARMADA	Niche-dependent	Flexible Platforms	GPS/Others Gap	New Video Features	New Wins Needed
Intel	Atom: Handset Apps TBD	Competitive (but not handsets)	Competitive	Partners/Gap	Influencer	New Opps.
MediaTek	MT6000: Nascent/Low-end Smartphones	Competitive; More Cohesion Though	4G Applications = New Challenges	Emerging Threat	Limited	Asia-Pac Threat

4G Silicon Webinar: Application Platform Competitive Landscape

Ratings Key

	Positive
	Neutral
	Negative

Vendor	Application Platform	Dual CPU Clock Speed	GPU Metrics	Differentiator	Marketing	Overall App Solution
Qualcomm	Snapdragon	MSM8x60 = 1.2GHz; QSD8672 = 1.5 GHz	Competitive in 2D/3D	Asynch Processing	20 Unique OEMs	Market Leader
TI	OMAP 4	1 GHz	Top 2D; Trails 3D (28 M Triangles per sec)	Cortex-A9	Strategy Clear	MOT Droid
ST-Ericsson	U8500	1.2 GHz	Trails (28M Triangles per sec)	Camera but More Needed	Effective	Wins Needed
Samsung	Hummingbird/S5P C110	1 GHz	90 M Triangles Per sec	AMOLED	iPhone; Galaxy S	High-Profile Wins
Marvell	Armada 628	1.5 GHz	200 M Triangles Per Sec	Triple Core; 1080p HD	Savvy	New Wins Needed
Intel	Atom/Z6xx	1.5 GHz – Smartphones; 1.9 GHz – Tablets	Unknown	Netbook; Device Continuum	32nm = Smartphone	Jury Still Out

== Video Near-Term Trends/Solutions

- Support of More Video Codecs
- Projector Capabilities
- 1080p 30/60 fps Decoders
- Auto/Quality Enhancements
- Video Processing Advances
- Flash Player 10.1 Support
- Multi-display Options

== Video Long-Term Trends/Solutions

- Enhanced Sensors
- 720p HD Video Capture
- 1080p encoders
- Image Searches
- Video Intelligence

== 2011

- Microaccess Points/Phone-based WiFi
- 32nm for smartphones/tablets
- ARM Cortex-A9
- Dual Core LTE Smartphones
- Up to 20M Tablets Shipped
- Femtocell Gains Momentum

== 2012

- 1x Advanced/DO Advanced/HSPA+/LTE Advanced Modems
- 2xnm geometry
- ARM Cortex-A15
- LTE Surpasses WiMAX
- Smartphone shipments up 50% of All Handsets



Current Analysis Webinar: Thank You

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