STANDARDIZATION, INNOVATION AND BUSINESS MODELS

ETSI Symposium, Beijing, China
31 October 2007
Keys Concepts:
Balance, Flexibility, Inclusion
Key Concepts

Innovation
- Investment drives innovation
- Innovation creates new IP
- IP enables new products or technologies
- Sales create economic returns
- Reinvestment of returns in R&D sustains innovation

IPR protection
- IPR laws protect ability to earn economic returns from IP and recapture R&D expenses
- IPR laws are critical for new market entrants (SMEs)

Standards drive growth
- Help establish interoperability of competing products
- Simplifies development by defining a minimum set of common requirement
- Helps enables business opportunities
Standards Policies and Innovation
Standards Dynamics: Balance for All Businesses

Innovator / Tech Leader
- Develops or Acquires IP
- **Risk – Huge R&D Costs**

Implementer
- Implements Std in Product, Service
- **Risk - costs**

MARKET PLACE

Customer
- Product Choice
- **Risk - Sales Price**

Industry Driven Standards Organization
- Organize Stakeholders
- Foster adoption by consensus
- Balance all company interests
- FRAND Expectations
Innovation

IPR protection

Standards

Inclusive Policies

Trade Secrets
Patents
Innovation

Standards and Industry Specifications
Business Models and Pressures on Standards Policies
Business Model
Converting Innovation to Economic Value

INNOVATION

Growth Strategies
Value Proposition
Market Segments
Value Chain Structure
Revenue Model
Competitive Strategy
One Example of a Value Chain
Revenue Model Examples

• **Product driven**
  • Profits based on difference between manufacturing costs and sales price
  • Profits based on sale of replacement parts
  • Profits based on cosmetic concerns (product enhancement)
    • Defensive Licensing

• **Service Models**
  • Profits based on services offered to Consumer
  • Profits based on repair services
  • Profits based upon deployment/installation/maintenance services
    • FRANDz (free from monetary compensation)

• **R&D Models**
  • Profits based upon licensing intellectual property
    • FRAND

*Many large companies may practice combinations of the above*
Remember the Keys for Successful International Standards Organizations:
Balance, Flexibility and Inclusion of Companies
Qualcomm Business Model
Key Points

- **QCOM Standard Royalty Rate is < 5% of the wholesale sales price (after certain deductions, e.g. packing costs, shipping) of the phone.**
  - Unchanged since 1991, while QCOM patent portfolio incorporated in CDMA and WCDMA phones continue to grow
  - Individual GSM vendors have charged up to 15 percent on GSM phones
  - QCOM’s policy provides a stable/predictable model
- **LTE and UMB will not increase royalty rate above QC’s standard CDMA rate when incorporated into a CDMA device**
  - Multi-mode LTE/WCDMA and UMB/CDMA2000 device Royalty Rate is same as single mode WCDMA/CDMA2000 standard royalty rate
  - QCOM future proofs operators and vendors
- **QCOM aggregates R&D for vendors- 20% of revenues in 2006**
  - Many new vendors have entered the market using QCOMs solutions
    - These new vendors have to conduct far less of their own R&D
  - QCOM has lowered the barrier to entry for new vendors
  - QCOMs CDMA R&D has also been incorporated in WCDMA/HSPA
- **QCOM is committed to make 3G more affordable**
  - Two sub-$30 CDMA2000 handsets are available in India with Q chips
  - LG won “3G for All” competition with the GSM Association
    - The LG bid uses a QUALCOMM Chipset
QUALCOMM’s Standard Effective Royalty Rate is < 5% of the Wholesale Selling Price of a Complete CDMA/WCDMA Handset

- Standard Royalty Rate has remained unchanged since 1991
- Patents have increased from 37 in 1991 to 5,000+ in 2007*

*Cum US Patents filed

The Value of QUALCOMM’s Patent Portfolio Has Been Established By More than 140 Arms-Length Negotiated License Agreements
QUALCOMM Lowers Overall IP Cost – Enables Competition

Licensed Portfolio Has Grown Substantially While Average Royalty per Handset ($) Has Declined Significantly
GSM Has Flourished While Employing a Royalty Structure

- Vendors with substantial IPR negotiate cross-licenses
- Vendors with little or no IPR negotiate licenses

"This year foreign firms are demanding royalties for GSM licensing and the amount accounts for 15 percent of the product price," a source from Samsung Electronics said.

Source: An executive from Samsung Electronics, reported in the Korean Times, June 29, 2000

"Royalty fees make up to 29% of the costs of GSM handsets”

Director of the European public Telecommunications Network Operators’ association (ETNO)

Source: Eindhoven Center for Innovation Studies (ECIS) white paper dated Sept 2000

Source: ITSUG 1998
Cited in 3GMobile November 23, 2005
MultiMode OFDMA and CDMA: No Additional Royalty Rate Above Standard Single Mode CDMA Rate
QUALCOMM Future Proofs Operators and Vendors with OFDMA Solutions

- QUALCOMM will charge no additional royalty rate above QUALCOMM’s standard CDMA royalty rate for multi-mode OFDMA (LTE, UMB, WiMAX/WiBRO) products that also implement CDMA2000 or WCDMA, subject to other standard terms and conditions.
- QUALCOMM creates a stable predictable environment for operators and vendors.
- QUALCOMM has numerous essential patents for OFDMA:
  - Applies to UBM, LTE and WiMAX/WiBRO.
QUALCOMM Business Model: Technology and Value Chain Enabler
Aggressive Investment in a Complete Technology Roadmap
Cumulative R&D Expenditures Total More Than $7.2B to Date

QUALCOMM Yearly R&D Expenditures

Yearly R&D Expenditure
R&D as a Percentage of Revenue

Standard royalty rate has not changed during this time
## Additional Industry Advancements: Acquisitions & Expenditures

<table>
<thead>
<tr>
<th>Company</th>
<th>Description</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>SnapTrack</td>
<td>Position location &amp; E-911 services</td>
<td>$1.0B</td>
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<tr>
<td></td>
<td>Enables low cost position location services from mobile devices</td>
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<tr>
<td>Flarion</td>
<td>OFDMA</td>
<td>$805M</td>
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<td></td>
<td>Provides greater differentiation, enables hybrid CDMA/OFDMA path</td>
<td></td>
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<tr>
<td>MediaFLO USA*</td>
<td>Nationwide mobile multicast network</td>
<td>$800M</td>
</tr>
<tr>
<td></td>
<td>Lower cost video and multimedia content to large audiences</td>
<td></td>
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<tr>
<td>Iridigm</td>
<td>Always-On, low-power display screens</td>
<td>$186M</td>
</tr>
<tr>
<td></td>
<td>Sunlight viewable, extended battery life</td>
<td></td>
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<tr>
<td>Elata</td>
<td>Unified multimedia content delivery platform</td>
<td>$57M</td>
</tr>
<tr>
<td></td>
<td>Standardized user experience, lower cost, faster introduction of new content</td>
<td></td>
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<tr>
<td>Berkana Wireless</td>
<td>RF CMOS integrated circuits</td>
<td>$56M</td>
</tr>
<tr>
<td></td>
<td>Increased integration, lower cost, faster time-to-market</td>
<td></td>
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<tr>
<td>Trigenix</td>
<td>User Interface customization</td>
<td>$36M</td>
</tr>
<tr>
<td></td>
<td>Lower cost, faster time-to-market</td>
<td></td>
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<tr>
<td>TechSoft</td>
<td>Application software for 3G devices</td>
<td>$35M**</td>
</tr>
<tr>
<td></td>
<td>Reduce time to market and lower development costs for 3G devices</td>
<td></td>
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<tr>
<td>Spike</td>
<td>90nm wafer technology</td>
<td>$20M</td>
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<td></td>
<td>Lower cost, reduced geometry allows for smaller form factors</td>
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*Expected to require approximately $800M in funding over the next 4 to 5 years, some of which may be provided by third parties (as of November 2004 guidance).

** Combined investment with TechFaith Wireless Communication Technology Limited (TechFaith).
**Partial List of Common Fundamental CDMA Techniques:**

- Orthogonal Code Channelization
- Power Control UL & DL
- Soft & Soften Handoff
- Downlink Paging
- Scrambling

- Rake Receivers
- Rate Detection
- Random Access
- Channel Structure UL & DL
- Downlink Reference Channel

* cdmaOne was the first commercial standard to use the fundamental CDMA techniques

** Standard completion date.

Images: www.khulsey.co

Common CDMA techniques continue to be evolved and shared in EV-DO & HSPA
WCDMA Standard Continues to Evolve as QUALCOMM Continues to Contribute Actively in 3GPP

A Standard is a living document that continues to evolve …

<table>
<thead>
<tr>
<th>WCDMA</th>
<th>HSPA</th>
<th>HSUPA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common to cdmaOne</strong></td>
<td><strong>Beyond cdmaOne</strong></td>
<td><strong>HSDPA</strong></td>
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<tr>
<td>Direct Sequence spread spectrum</td>
<td>Variable Length Orthogonal Codes</td>
<td>High-Speed DL channelization structure</td>
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<tr>
<td>Orthogonal channelization codes</td>
<td>UL Complex Spreading</td>
<td>Fast and adaptive modulation and coding</td>
</tr>
<tr>
<td>Random Access</td>
<td>Fast DL Power Control</td>
<td>Fast and adaptive packet data scheduling</td>
</tr>
<tr>
<td>Fast UL power control</td>
<td>Data Rate Config. Channels</td>
<td>Fast hybrid ARQ</td>
</tr>
<tr>
<td>Rake Receivers</td>
<td>Dual-Event DL Paging</td>
<td>Fast DL rate control</td>
</tr>
<tr>
<td>Soft and Softer handoff</td>
<td>UL Channel Structure</td>
<td>Incremental redundancy feedback in DL</td>
</tr>
<tr>
<td>Single frequency re-use</td>
<td>Reservation Mode Random Access</td>
<td>Closed loop UL power control</td>
</tr>
<tr>
<td>DL Slotted Paging</td>
<td>Parallel Turbo Codes</td>
<td>Short TTI etc.</td>
</tr>
<tr>
<td>Blind Rate Detection</td>
<td>Coherent UL Detection</td>
<td><strong>HSUPA</strong></td>
</tr>
<tr>
<td>DL Channel Structure etc.</td>
<td>Continuous UL Operation etc.</td>
<td>Fast UL Rate Control based on UL loading of all active sets</td>
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<tr>
<td></td>
<td></td>
<td>Fast DL Power Control based on received UL power control bit stream</td>
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<td></td>
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<td>Enhanced Transport Format Combination Selection</td>
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<td></td>
<td>Fast Hybrid ARQ in UL</td>
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<td>Short TTI etc.</td>
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QUALCOMM Enables
More Affordable 3G
QUALCOMM Continues to Drive Down the Cost of 3G

India’s Reliance is currently offering sub-$40 CDMA2000 phones ... and one sub $30 phone!

**Sub-$30!**

ZTE Classic 201 (C160)
- CDMA2000
- SMS
- B & W with color film
- Polyphonic ring tone
- Games
- Targeting young professionals

**$30+**

TCL Classic 401
- CDMA2000
- Multiple recipients SMS
- B & W with color film
- Polyphonic ring tone
- World clock
- Conference calling
CDMA2000 Provides a Wide Selection of Affordable Devices

*Competition and economies of scales continue to drive down prices*

Sub-US$30

Sub-US$40

Sub-US$50

**LEGEND:** Color Screen Handsets

**Notes:**
1. Mobile devices shown are sold in India at an ex-factory wholesale cost below US$50.
2. Only devices shipped in volumes above 10,000 units are shown.
QUALCOMM and LG Expand the Availability of WCDMA

GSMA selects LG handset for “3G for All”

“We congratulate QUALCOMM on the outcome of the '3G for All' selection process. QUALCOMM has provided enthusiastic support for the GSMA's goals for the program, as well as significant efforts on behalf of their vendor partners, such as LG.”

- Rob Conway, CEO of the GSM Association

3G for All program background:
- Program to bring 3G multimedia services and Internet access to the mass-market worldwide
- Builds on GSMA EMH program
- 12 leading mobile operators across 6 continents and representing 620 million subscribers voted on winning handset
- LG KU250 chosen as winner, priced at ~30% less than entry-level WCDMA handsets
  - 15mm thin, video telephony, 1.3 MP camera, MP3, Bluetooth, removable memory, Internet access
  - Uses QUALCOMM UMTS chipset
- Expected to provide LG economies of scale in manufacturing, logistics and marketing
Lowering the Cost of CDMA2000 Handsets

Note: CDMA2000 Phones Sold per Calendar Quarter; lowest end represents complete phones sold in quantities of approx 150,000 units or higher
Note: Data derived from licensee reports. Does not include modules.

Source: QUALCOMM Incorporated
Lowering the Cost of WCDMA (UMTS) Handsets

Note: WCDMA Phones Sold per Calendar Quarter; lowest end represents complete phones sold in quantities of approx 50,000 units or higher
Note: Data derived from licensee reports. Does not include modules.

Source: QUALCOMM Incorporated
Thank you!