Mobile Broadband for Rural and Remote Areas
The CDMA450 Solution

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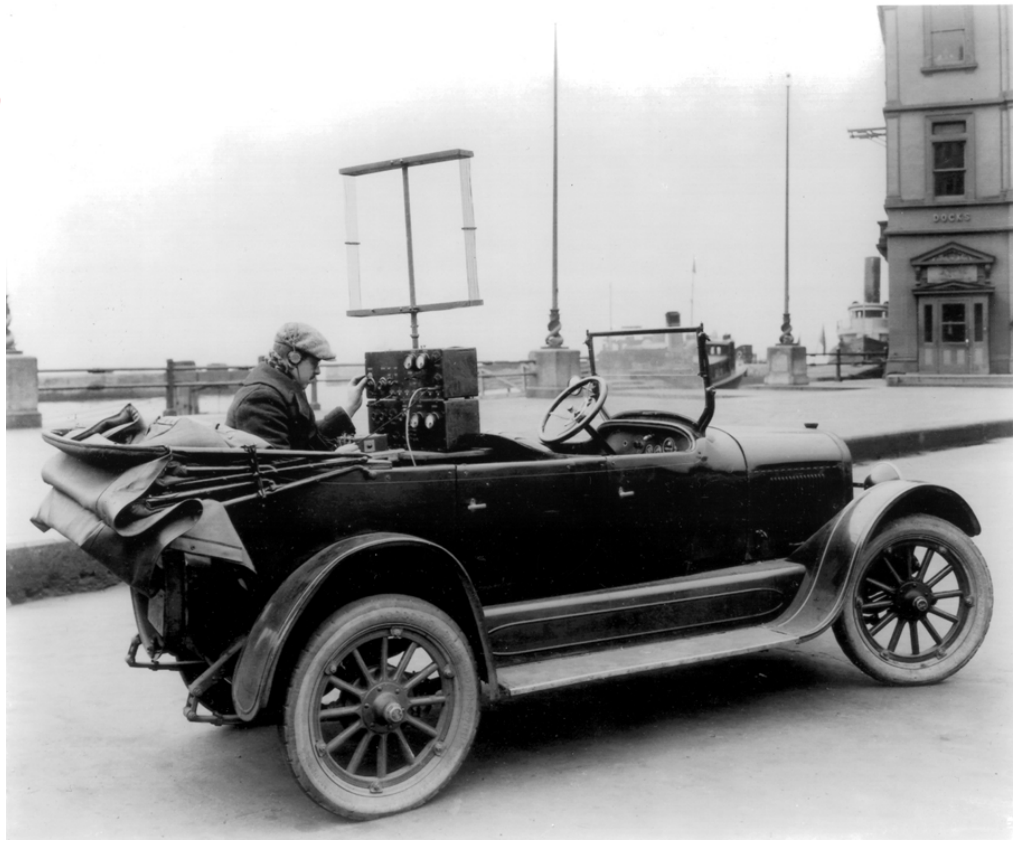
Lucent Technologies
Bell Labs Innovations

Presentation Outline

1. **Wireless technology evolution:**
   - 3G Today & standards evolution
2. **Comparative benefits of CDMA450**
   - Coverage
   - Voice capacity
   - Data throughput
   - Latency
   - Key Benefits
3. **Lucent's CDMA450 solution**
   - N. Architecture
   - CDMA450 products
   - Evolution to IMS
4. **Business Modeling**
5. **Summary**

History of Wireless Innovations

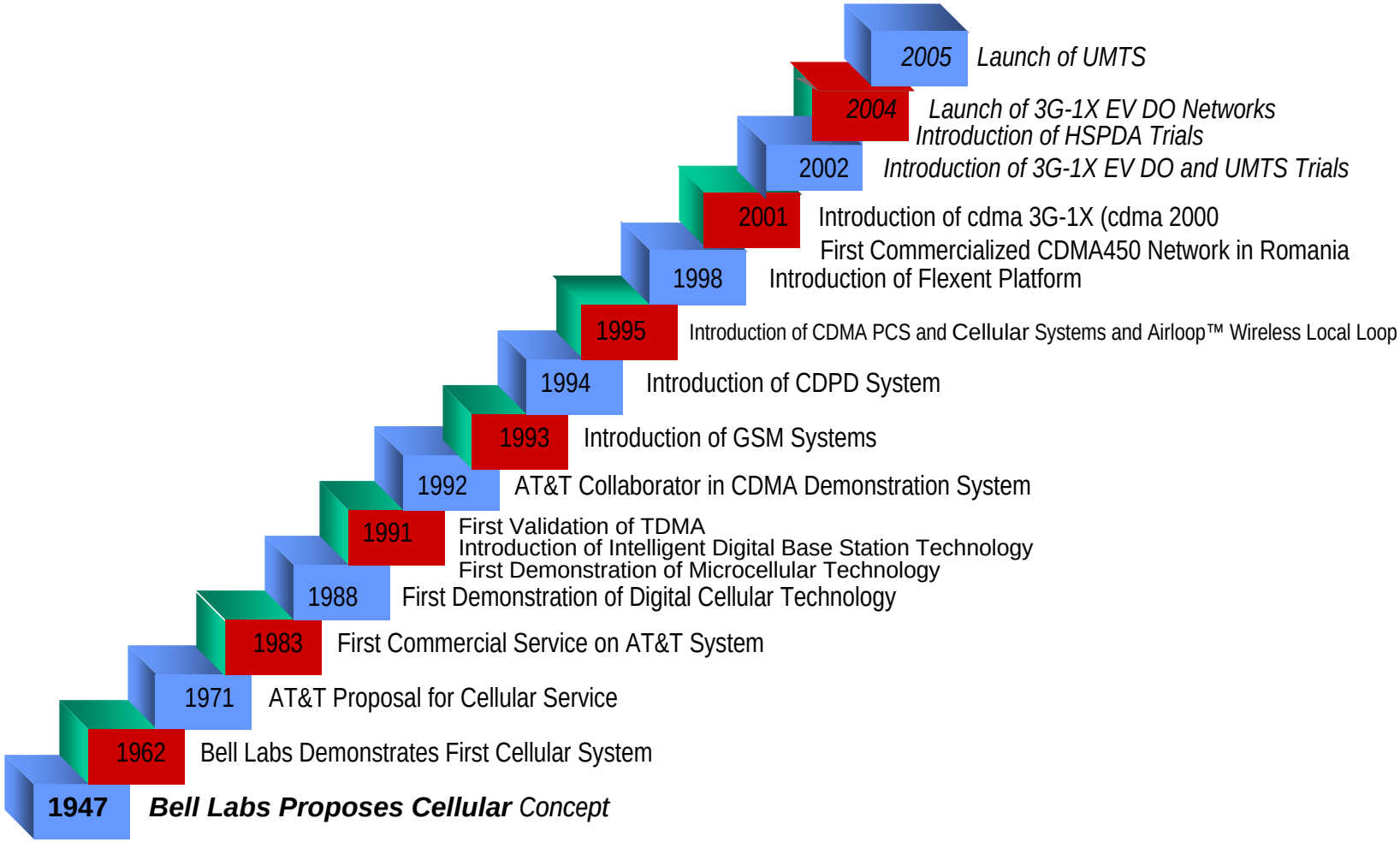
- **1891 John J. Carty - an early AT&T engineer *"A system of telephony without wires seems one of the interesting possibilities … the ether will transmit speech"***
- **Carty is regarded as the founder of the scientific tradition that led to the formation of Bell Laboratories.**
- **1924: AT&T supplied mobile communications to NYC police cars.**
- **1947 the concept of Cellular networks was invented in Bell Labs**



First Mobile Radio Telephone

History of Wireless in Lucent

Technology



Mass Market Data Services

1G
Analog voice,
L. speed data

2G
voice,
M. speed data

3G
Voice, VOIP
H. Speed packet

4G
3G+interactive
video,
push to view

System Impact

- **Data centric**
- **Lower cost**
- **Increase data rate**
- **Decrease latency**
- **Improve uplink**

Current Commercial Status of IMT-2000 Operators

CDMA is the dominant platform for IMT-2000 : CDMA2000® and WCDM

CDMA2000:
- Operators–1X: 91
- 1X-EVDO: 18

WCDMA: 68

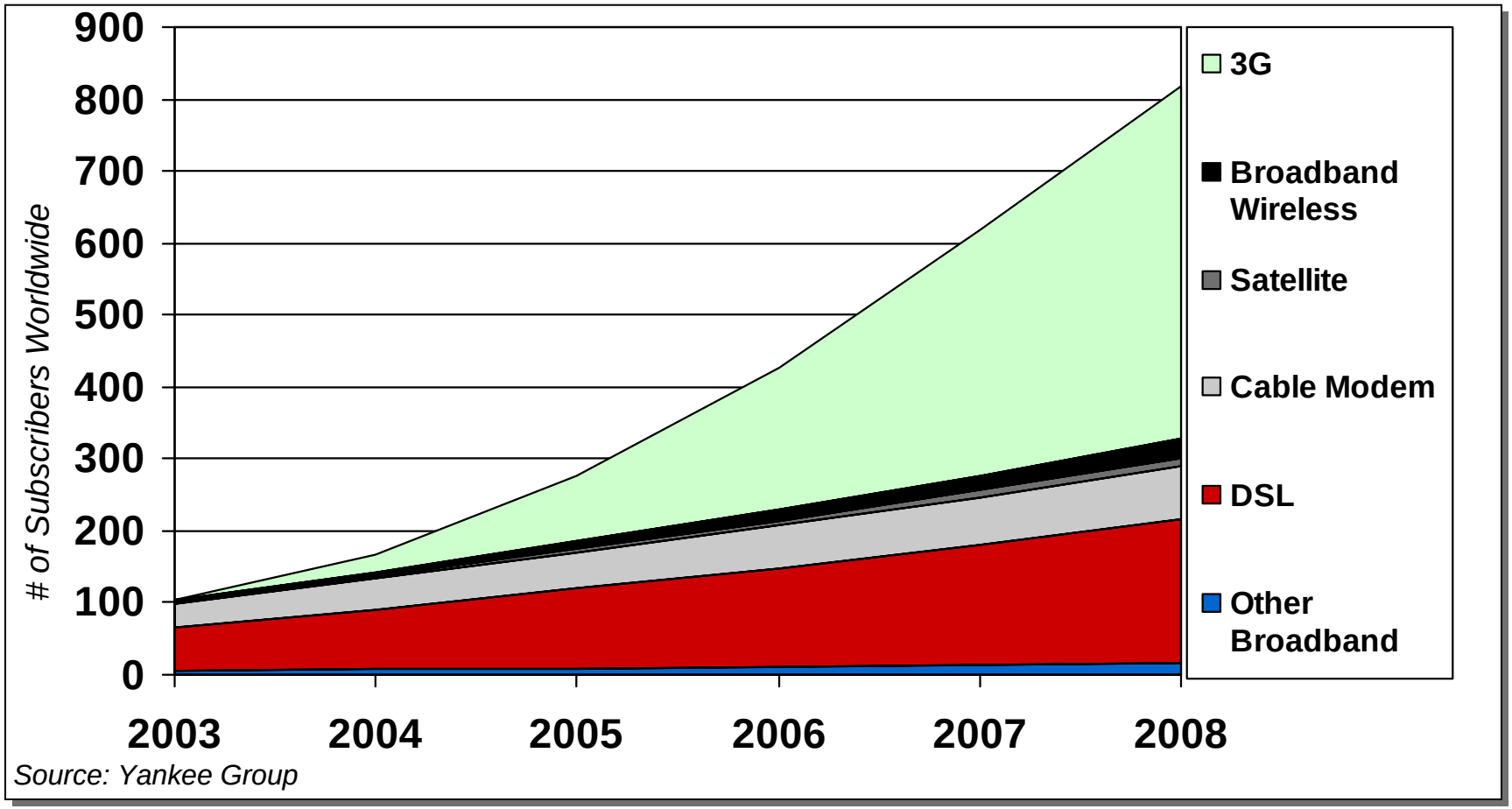
Source: 3GToday at www.3gtoday.com as of July 31, 2005

159 Operators in 71 Countries

196 million reported* 3G CDMA subscribers

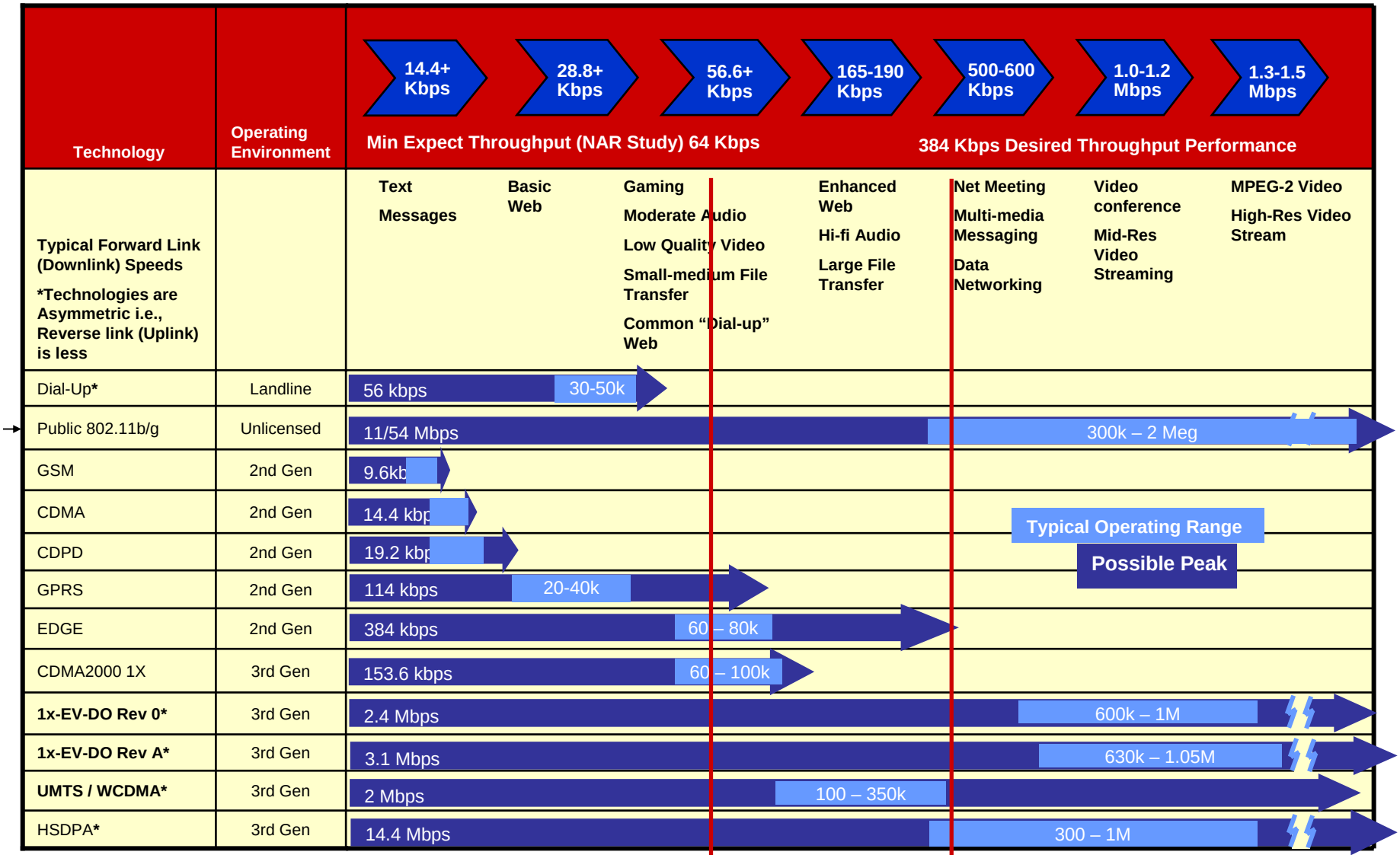
660 Devices, 56 Vendors

This Will Lead to a Redefinition of the Market for Broadband Subscribers…



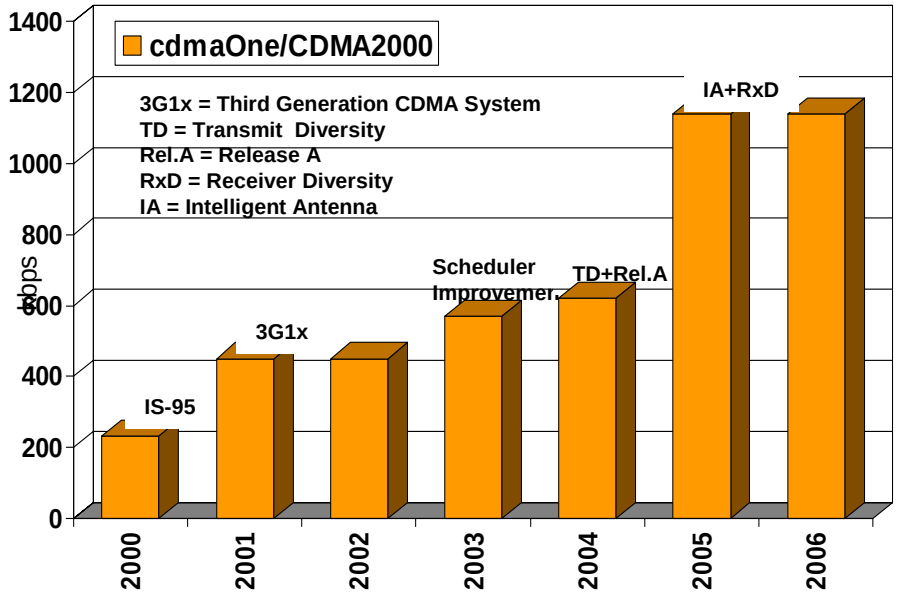
By 2008, end users will begin to access their chosen blended lifestyle services across these technologies, moving toward seamless converged access

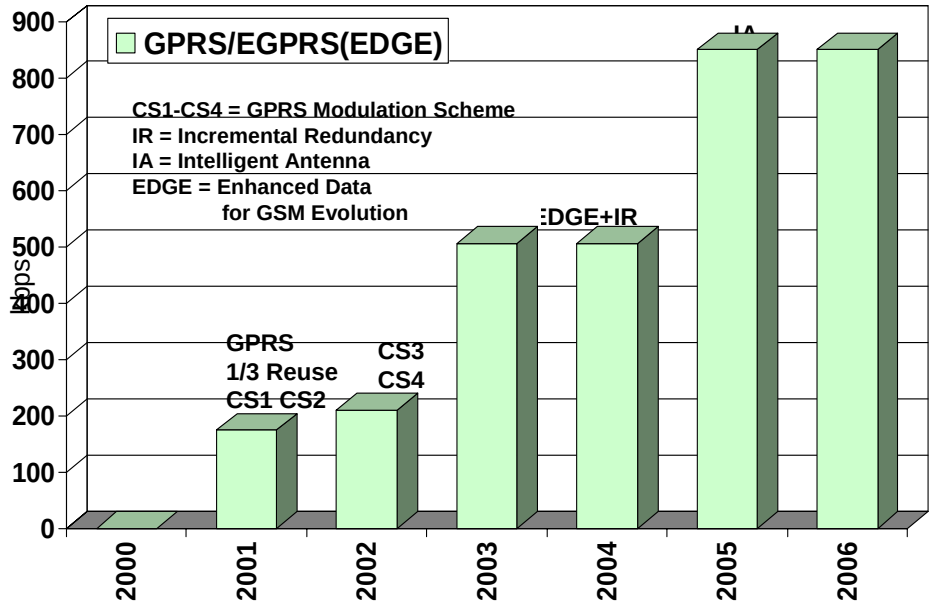
Comparison of Peak and Typical Forward Link (Downlink) Data Rates

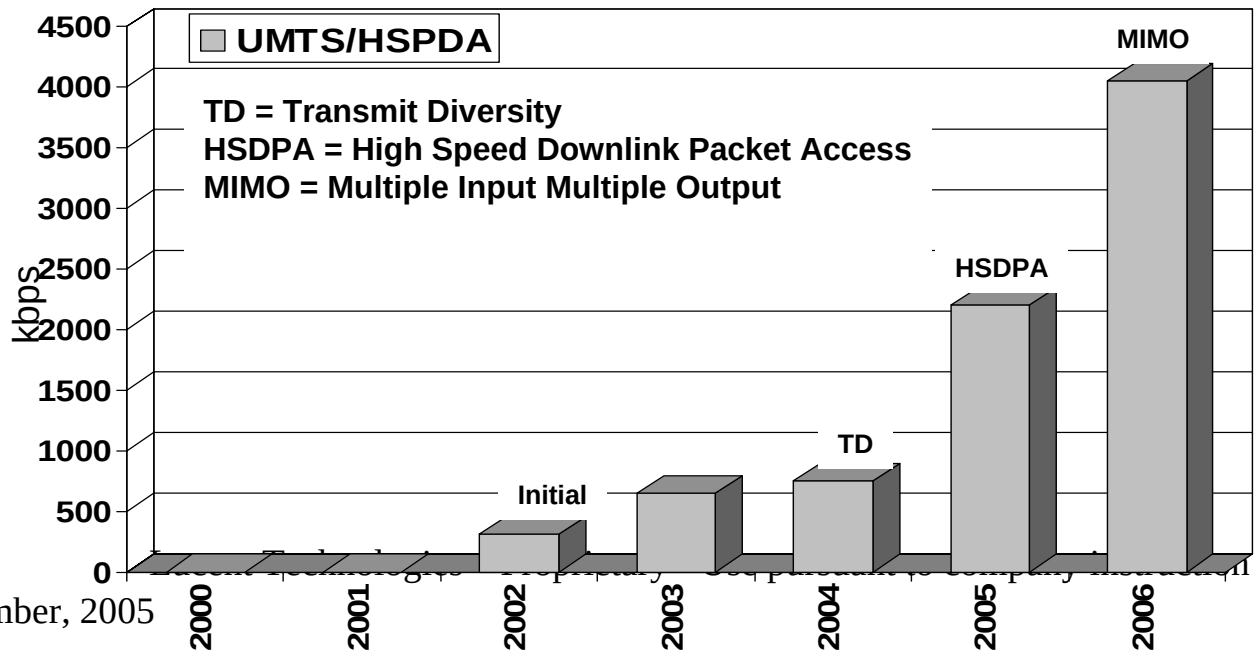


Source: Industry reports & Lucent Analysis

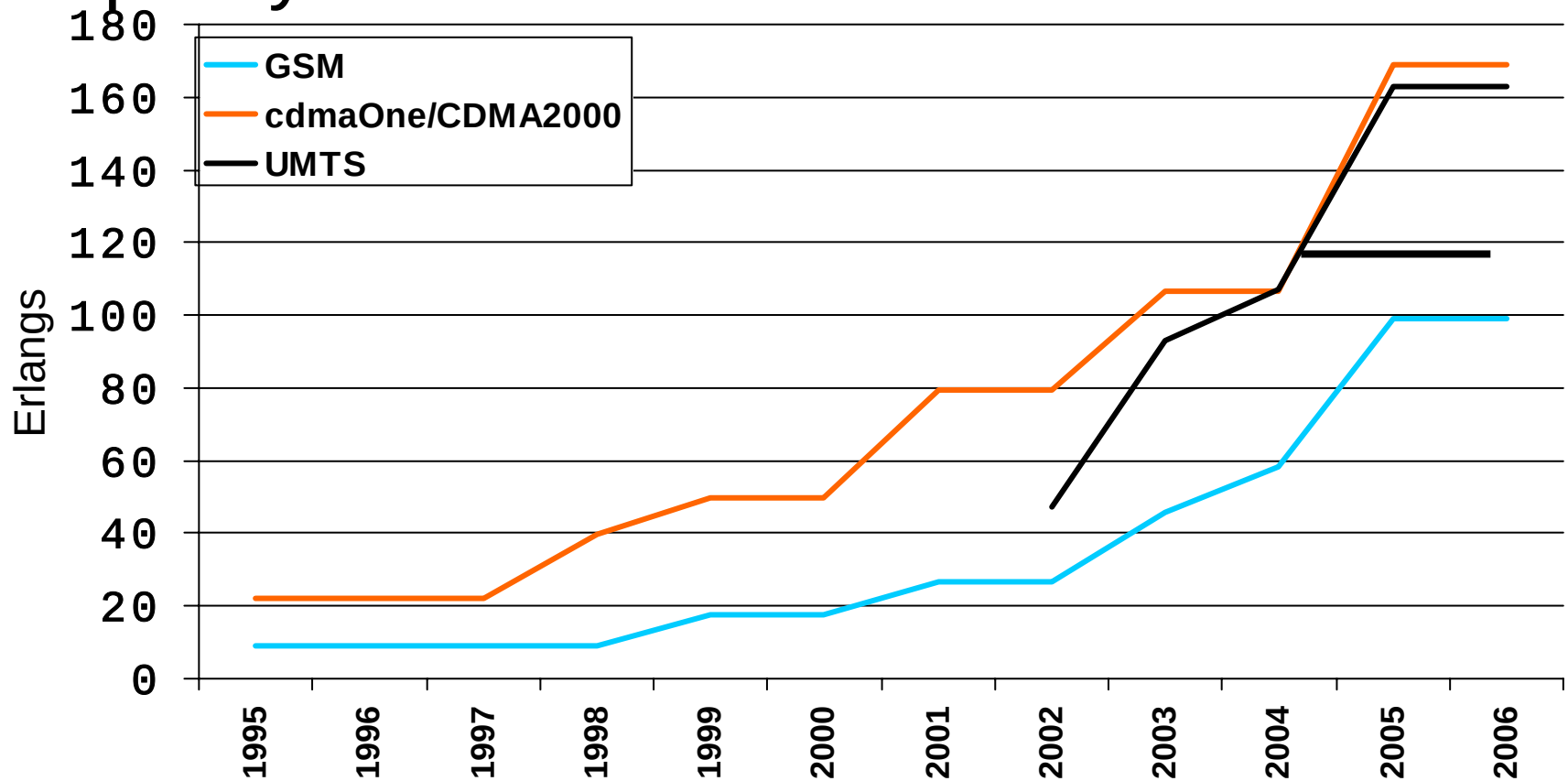
Average throughput in 5 MHz (per sector per carrier)







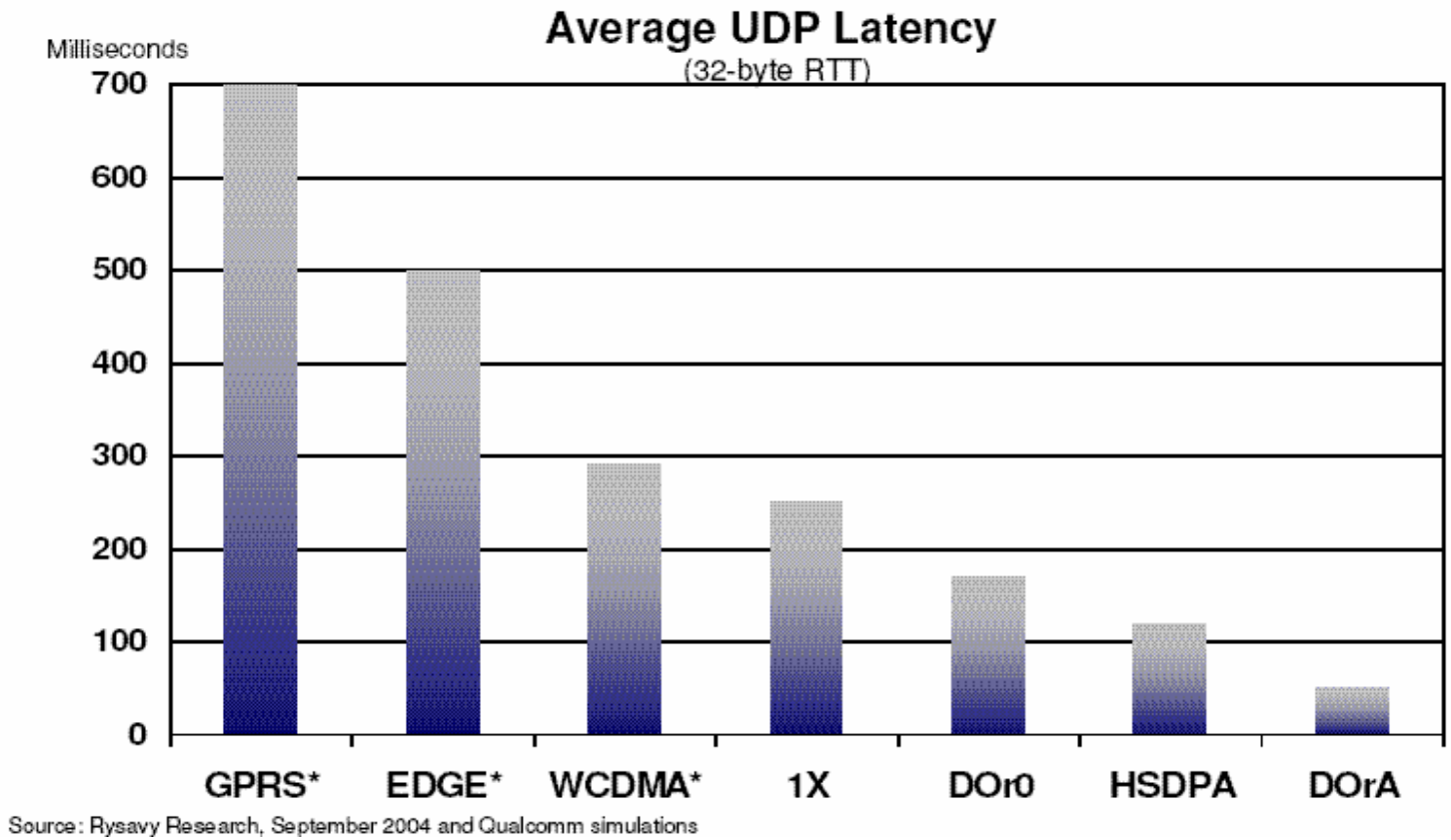
Technology comparison, Erlang Capacity in 5 MHz



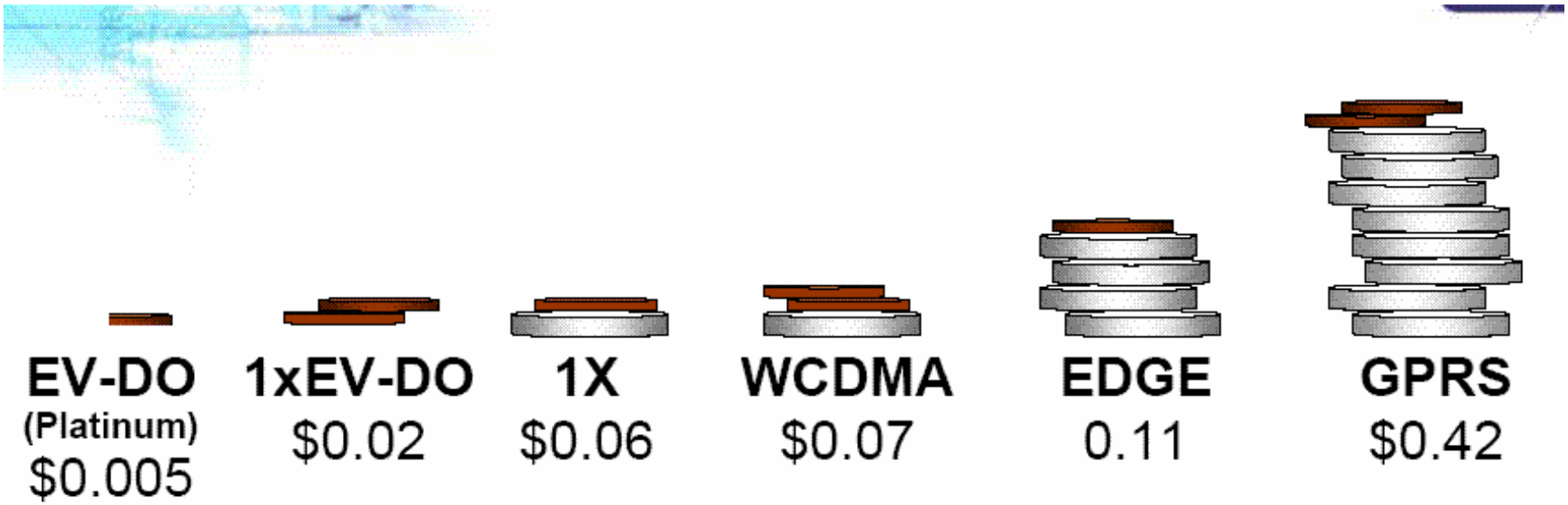
Year/Technologies	1995	1996	97	98	99	00	01	02	03	04	05	06
GSM	9	9	9	9	17.5	17.5	26.4	26.4	45.9	58.2	99	99
UMTS								47.5	93	107	163	163
CDMA2000	22.2	22.2	22.2	39.6	49.8	49.8	79.2	79.2	106.5	106.5	168.9	168.9

Wireless Systems Latency Comparison

Low latency will enable wireless systems carry delay-sensitive Applications such as voice, interactive gaming, TV video…



Cost per Megabyte Comparison



Spectral efficiency affects cost

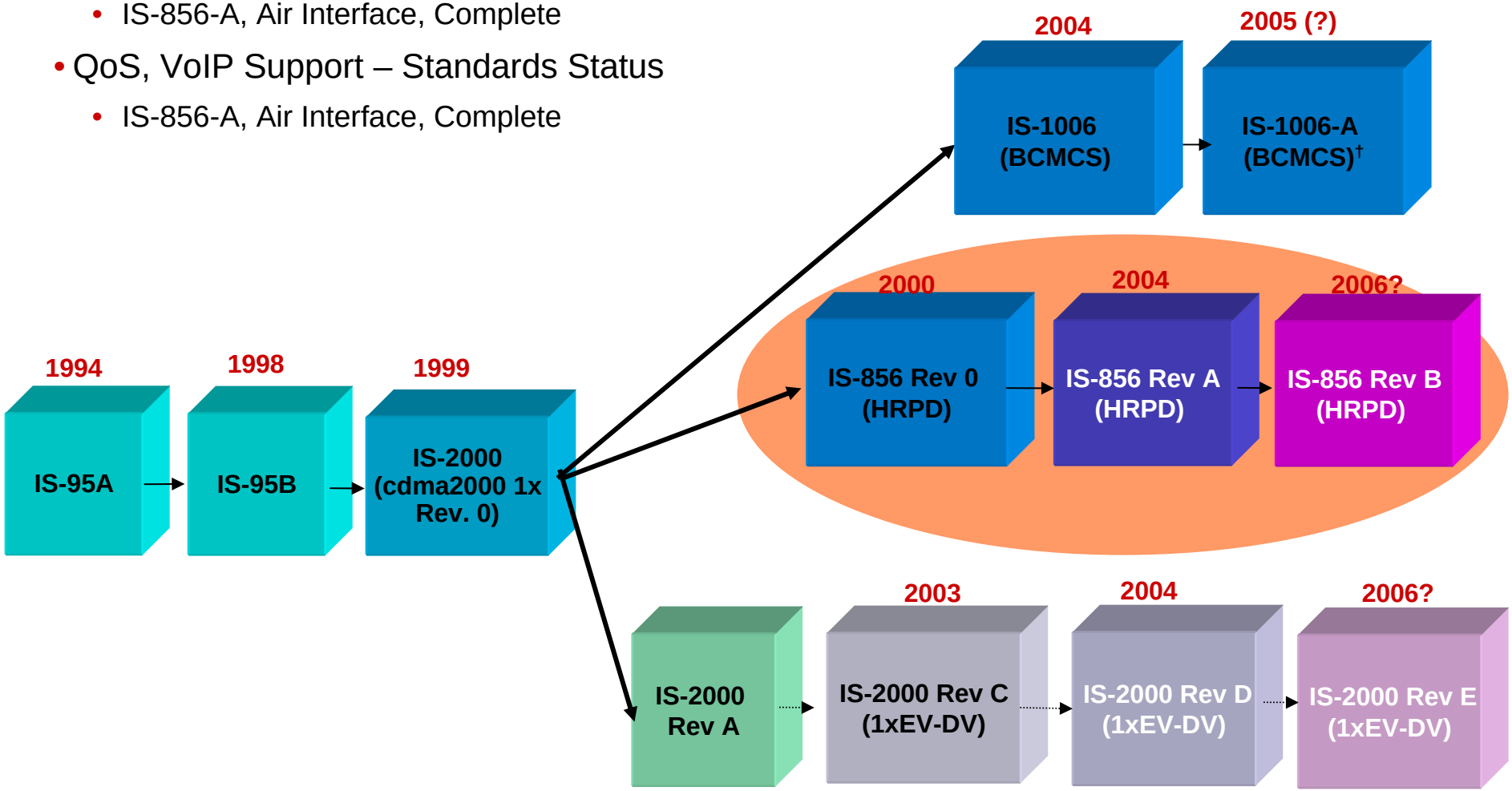
Cost = "Greenfield" Network Operations Expenses + Depreciation on Capital

Operators Prefer Mobile Broadband Technologies that are Affordable & Evolutionary

Source: The Economics of Wireless Data, http://www.qualcomm.com/main/whitepapers/WirelessMobileData.pdf

CDMA2000 Standards Technology Evolution

- 1xEV-DO Rev A - Standards Status
  - IS-856-A, Air Interface, Complete
- QoS, VoIP Support – Standards Status
  - IS-856-A, Air Interface, Complete



CDMA2000 1x – Key Benefits

CDMA2000 Key Benefits (1/3)

Technology – Low Risk.

- CDMA2000 is a superior technology that provides:
  - Third Generation Compliant according to ITU IMT-2000 standards
  - Mature, stable and proven technology, commercialized in 2000
  - Compatible with 2G/3G services, applications and interoperability
  - High Capacity, Economical Technology
    - *Average Cost per MB 2¢ and voice per Minute 0.01¢
  - High Speed Data - Peak Rate 2.4MB,
  - Excellent Voice quality, better or comparable to landline
  - Smooth evolution to future CDMA2000 releases, investment protection.
    - Forward and Backward compatible, infrastructure and handsets/devices
  - Many choices of spectrum,
    - 450Mhz, 800Mhz, 1800Mhz, 1900Mhz and 2.1Ghz

CDMA2000 Key Benefits cont (2/3).

Services and Applications.

- All GSM supplementary and telemetry services are supported including SMS, MMS, and roaming.
- High speed data service at peak rate of 2.4 Mbps can be laid over existing CDMA2000 1x sharing infra and BTS equipment
- Due to CDMA low cost structure; Existing Operator static Services and Applications can evolve into Dynamic rich content multi-media applications.
  - Existing MMS and java applications work with CDMA2000
  - Also allowing new and innovative services applications to be deployed today to further enhance Operator differentiation.
- Operator can use CDMA2000 capacity and speed advantage for offensive or defensive strategies, example;
  - Enables Operator to compete much more aggressively on price.

CDMA2000 Key Benefits cont. (3/3)

Handset and Devices

- More than 650 devices are available on the market with colour displays, cameras and GPS capabilities.
- CDMA2000 handsets and devices are mature, proven and stable.
- CDMA2000 handsets are completely programmable by Operator.
  - Providing complete control to Operator on User Interface and Over The Air activation and downloading.
- Single Mode, Quad/Tri/Dual band handset for roaming between CDMA spectrum available
- Much cheaper then EDGE and UMTS with lot more choices available today.
- Small form factor, long battery life and attractive looking – come in many styles and models addressing all market segments.
  - PCMCIA type for laptops
  - Fixed Wireless terminals
  - Embedded industrial devices

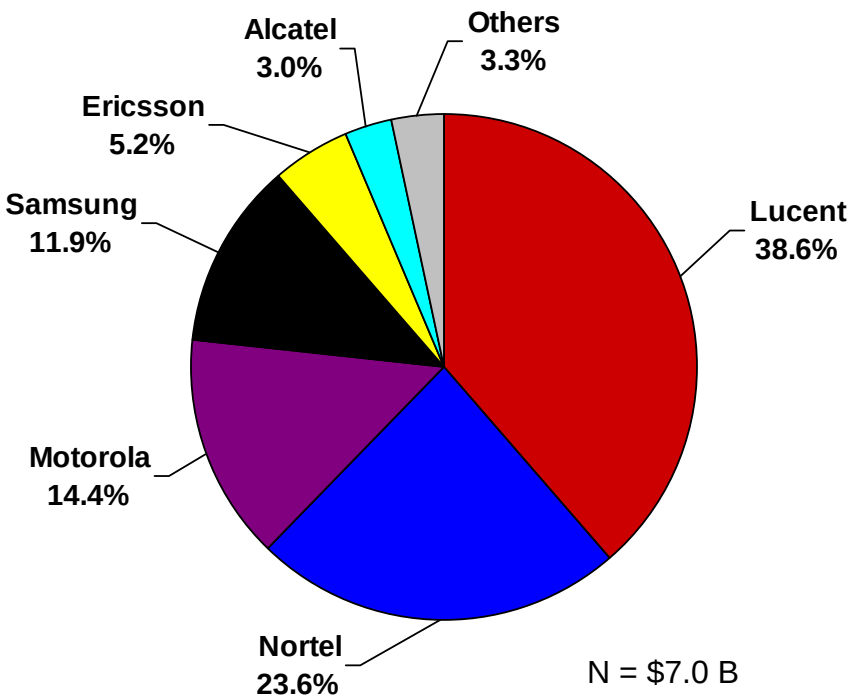
Lucent's CDMA Value Proposition

- **Unrivalled Global Market Leader in Spread Spectrum CDMA Technology**
  - Most Experienced CDMA Vendor
  - First to Support CDMA; First in North America with CDMA2000 1X
  - Extensive Contributions to Standards
  - Extensive Intellectual Property
- **Lucent …. A CDMA Leader**
  - Lucent Has Deployed Over 148,000 CDMA Base Stations (1995 to october 2005
  - Lucent has deployed Over 98,000 3G CDMA Base Stations (october 2005)
  - Lucent is No. 1 with over 42% Global CDMA subscribers share (Jan 2005**)**
  - Over 70 customers in 22 ccountires
    - Customers Includes: Verizon Wireless, Sprint PCS, Telecom NZ , Telcel, KTF, China Unicom, Reliance India, Tata India, Telecard Paksitan

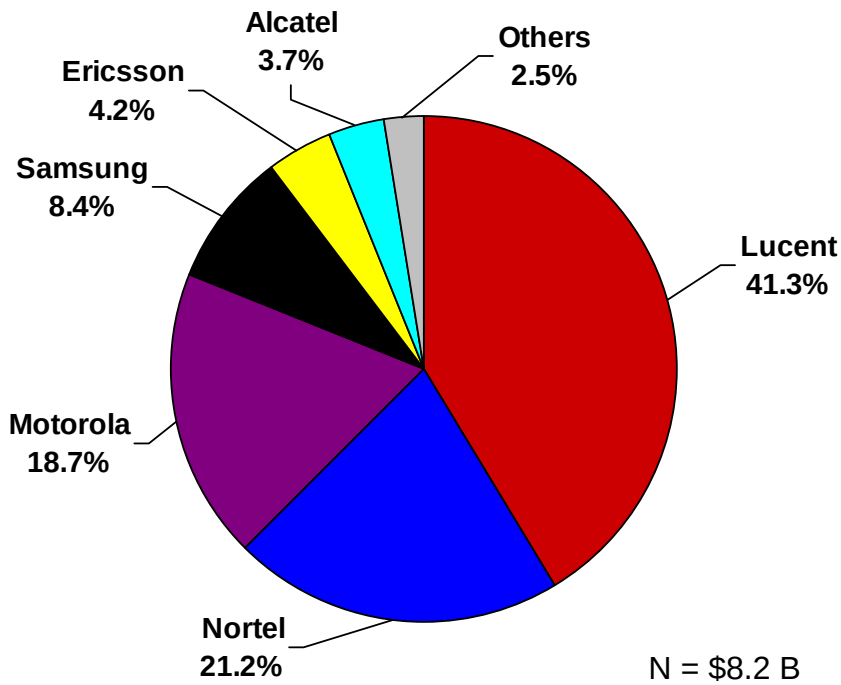
Over 98,000 of 148,000 Deployed Base Stations Are Equipped with CDMA2000 1X Technology Today

CDMA Wireless Revenue Share

4 Qtrs Ending 2Q03



4 Qtrs Ending 2Q04



Source: Dell'Oro, 2Q 2004

Lucent continues to maintain #1 position

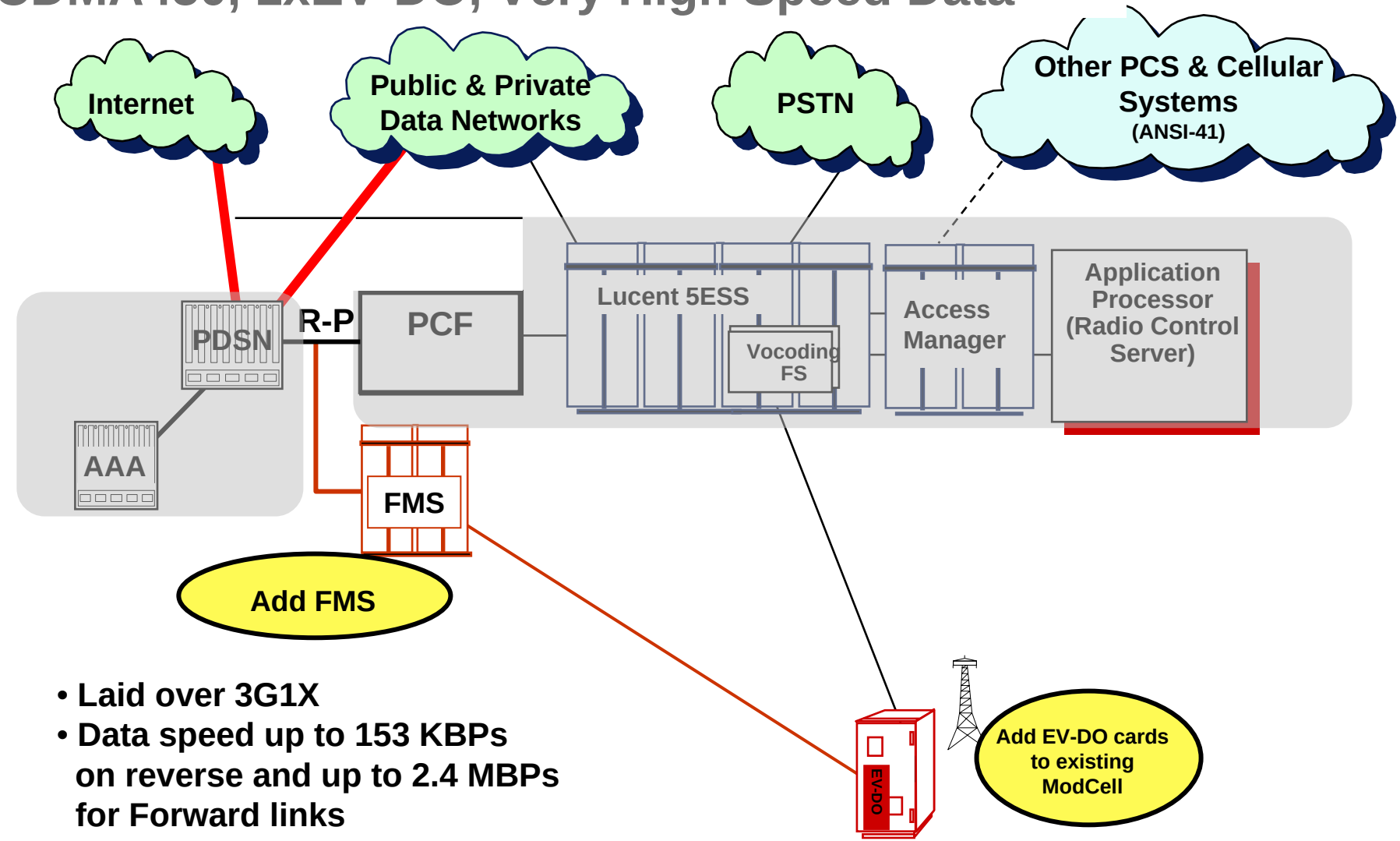
CDMA450 – Theoretical Cell Sizes

CDMA450 provides larger cell sizes when compared to cell sizes in other bands.

Frequency (MHz)	Cell Radius (Km)	Cell Area $(Km)^2$	Normalized Cell Count
450	48.9	7521	1
850	29.4	2712	2.8
1900	13.3	553	13.6
2500	10	312	24.1

NOTE: The above 'theoretical' cell sizes may not be able to achieve in certain morphologies and are based on simplistic assumptions.

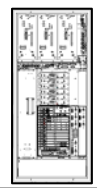
CDMA450, 1xEV-DO, Very High Speed Data



- **Laid over 3G1X**
- **Data speed up to 153 KBPs on reverse and up to 2.4 MBPs for Forward links**
- **Future evolution to EV-DV, i.e.**

Flexent™ ModularCell

Flexent CDMA450 BTS Products

	Modcell 2.0	Compact 3.0	Modcell ES	Modcell 4.0 Compact
Footprint	910x1010x1800mm (36x40x72in)	600x600x1200mm (24x24x50in)	600x600x1800mm (24x24x72in)	650X600X1200 (31X24X50)
Weight (kg) For maximum capacity	410	260	300	260
Sectors	1-3	1-3	1-3	1-3
Carriers	1-2 (w/ growth to 3)	1	1-3	1-3
1xEV-DO	Yes	No	Yes	Yes
T1/E1	12	4	12	12
Illustration				

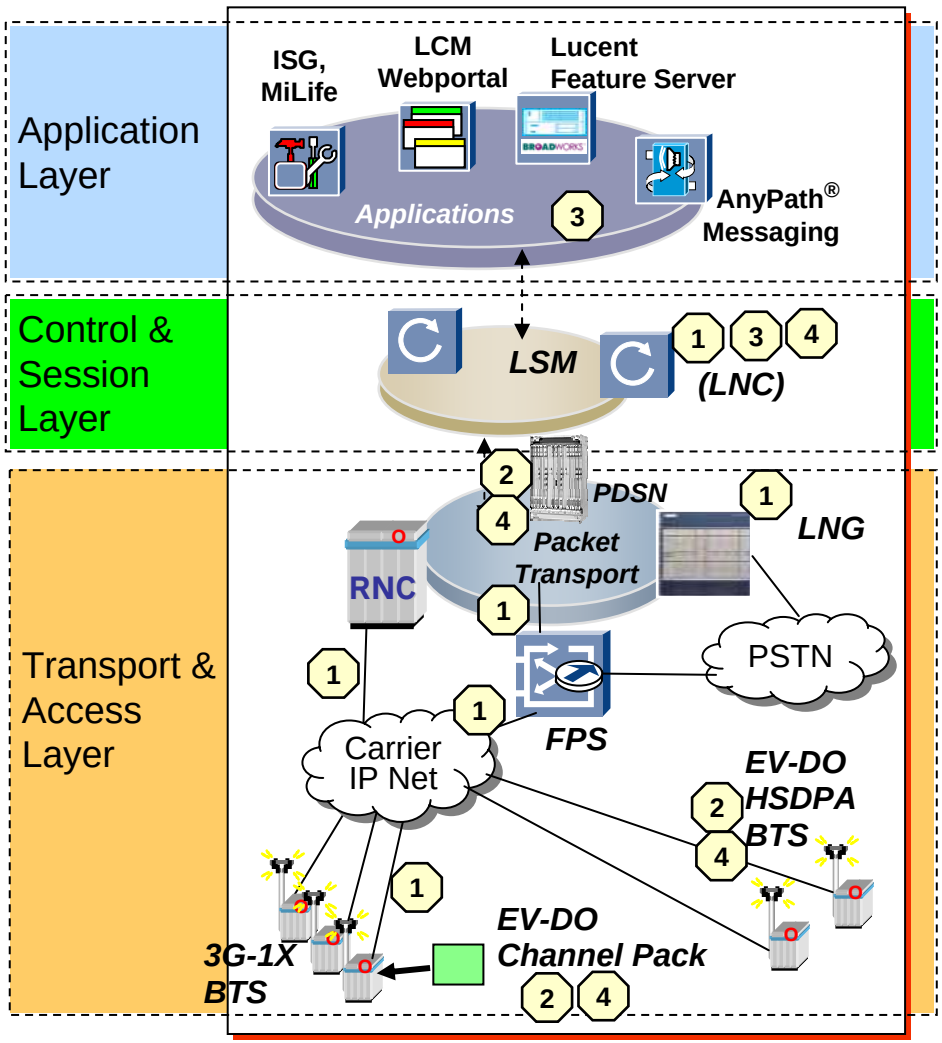
“Footprint” Key to 4G

3G

4G

CDMA2000	UMTS W-CDMA
EV-DO 802.11/16 Interop.	HSDPA 802.11/16 Interop
Revision A EV-DO	HSDPA-EUDCH
SoftSwitch/MG	SoftSwitch/MG
VoIP/QoS/MPLS	VoIP/QoS/MPLS
BLAST/MIMO	BLAST/MIMO
Base Station Routers	Base Station Routers

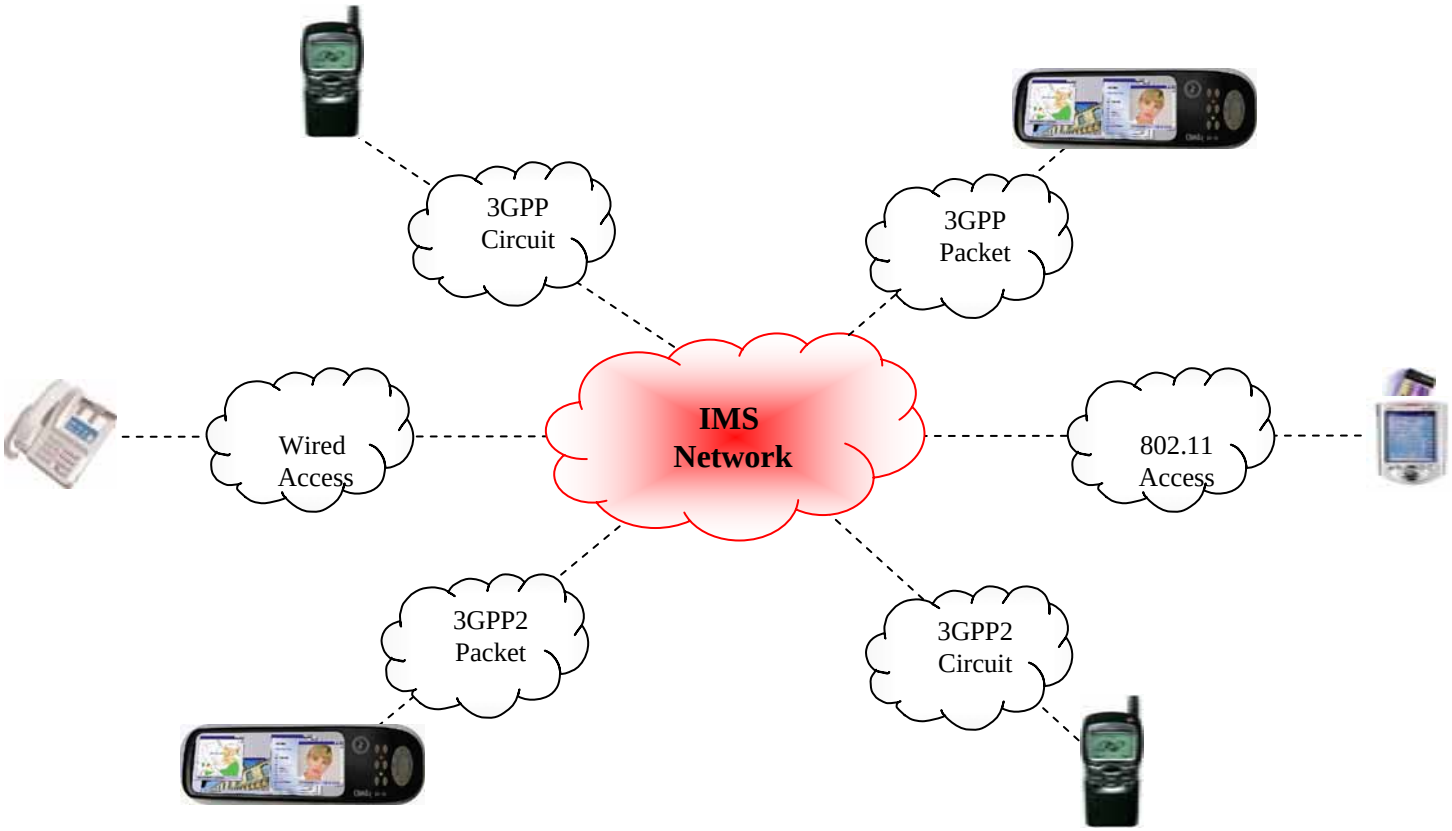
Accelerate™ Flexent® CDMA Evolution to IMS



Packetize the Core Network

1. **Packetize the Core Network**
   - Packet Tandem/Gateway
   - IP backhaul
   - TrFO/RTO on FPS
2. **High Speed Data – enterprise & mass market**
   - Data transfer speeds comparable to DSL, cable
   - Bring the office experience to road warrior
   - Cost effective alternative to DSL, cable in remote situation
3. **IMS for new services**
   - Access independent network – same services anywhere
   - Centralized servers speed deployment and provide common user experience
   - Multimedia services to end users
4. **Voice over IP (VoIP)**
   - Capacity greater than circuit voice
   - Voice integrated with Operatorer media in new services
   - Common infrastructure, lower cost

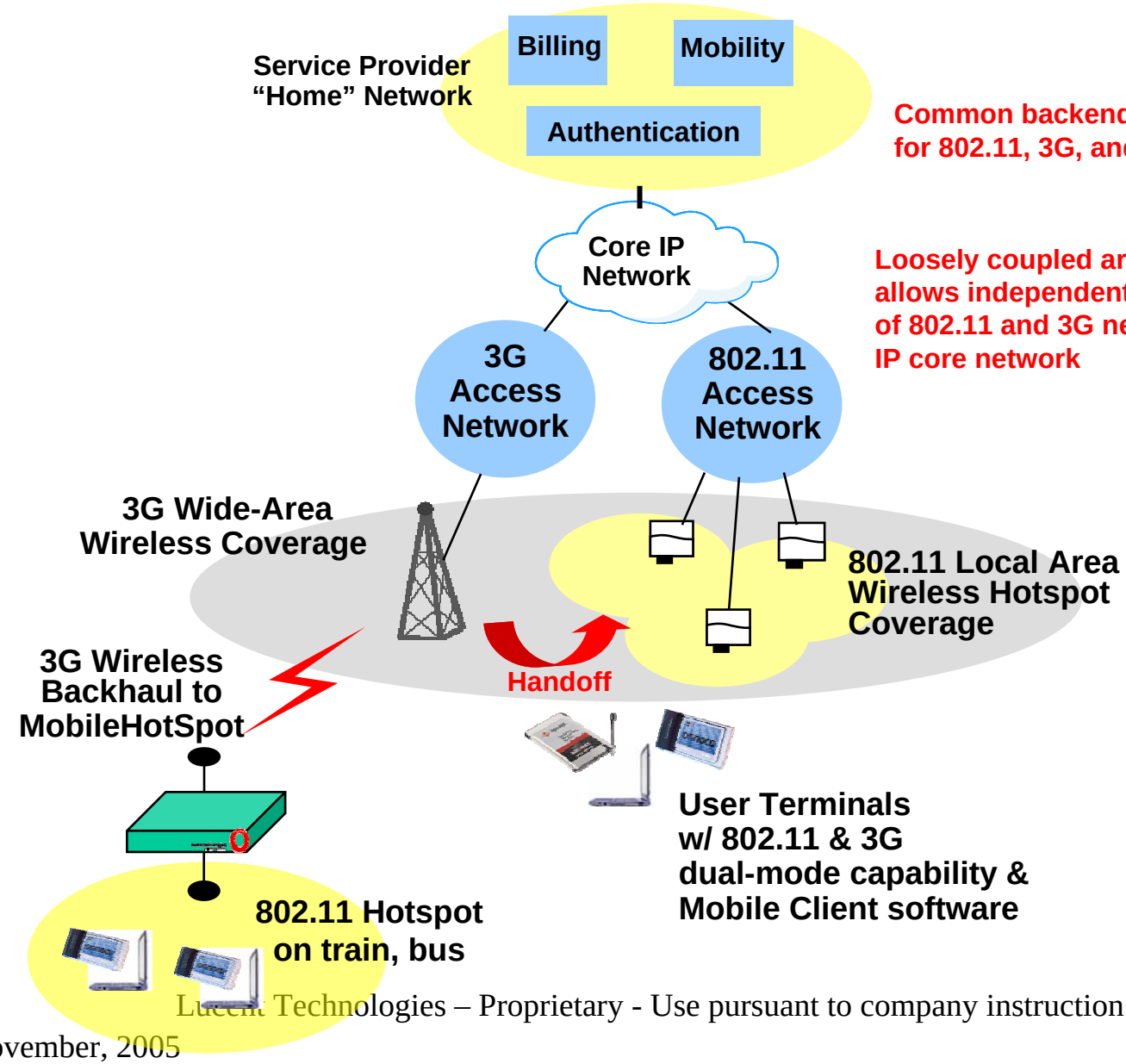
Access Independent IMS Network



Convergence!

Nice but still horribly complicated

Network of networks



CDMA2000 Devices

Voice Centric

- Mono tone

Messaging

- Camera
- MMS
- 100K pixel

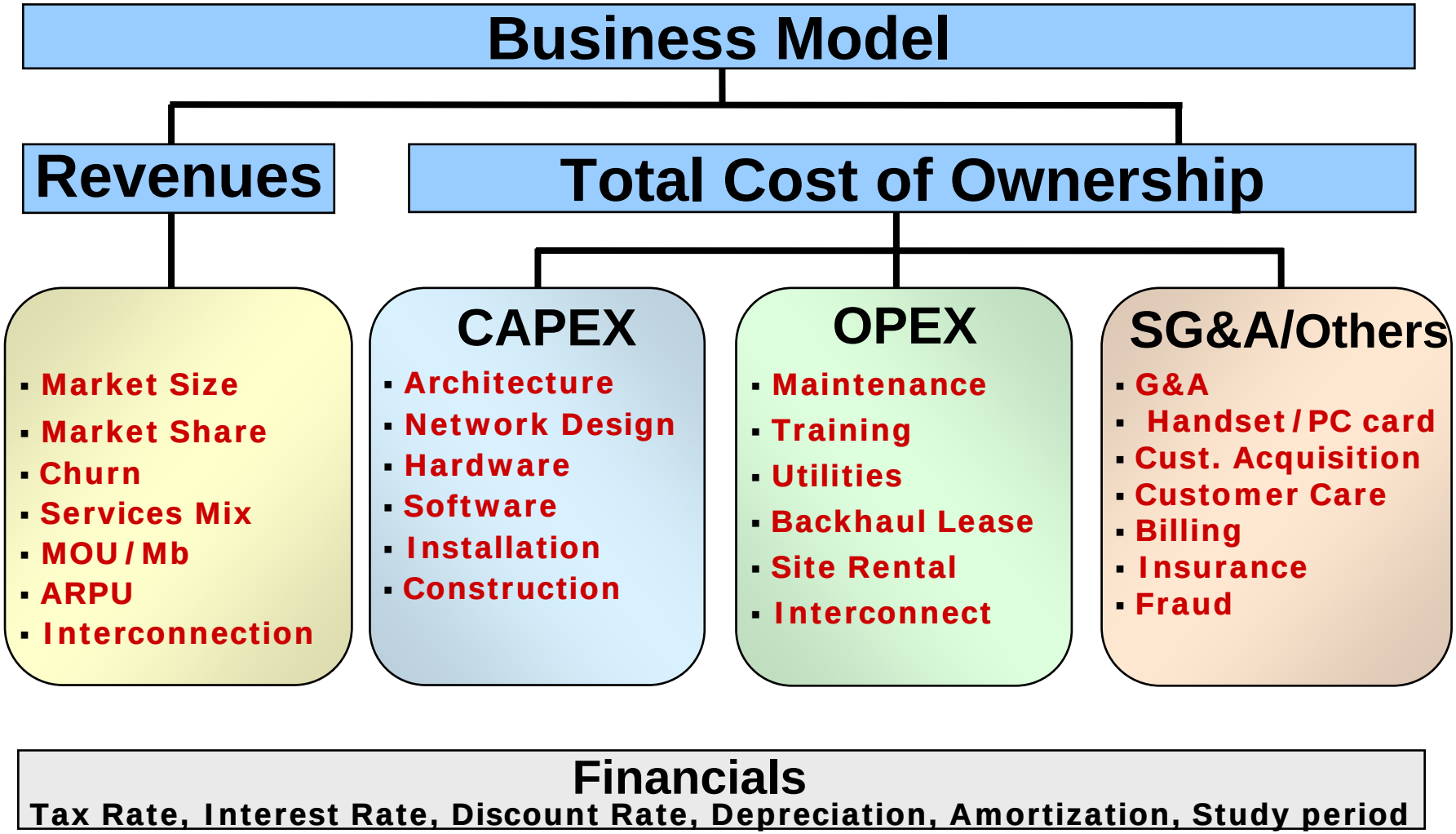
Interactive Multimedia

- Camcorder
- VoD/MOD
- Games phone
- 100K pixel

Digital Convergence

- Video telephone
- Digital TV
- WiFi
- Smartphone
- 300K-mega pixel CCD
- Voice recognition

Business Modeling Framework



Advanced Business Modeling

Technical

- Network Specifications
- Operational Data
- Traffic Models
- Engineering Rules

Economic

- Subscriber Forecast
- Ground Rules & Constraints
- Product Information
- Competitive Environment

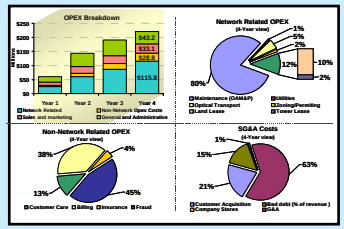
Inputs

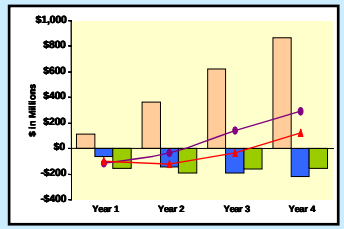
-- Analysis --

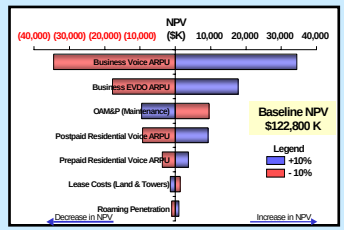
- Traffic Data Analysis
- Network Growth Configuration
- Multi-year Product Mix
- Total Cost of Ownership
- Revenue Modeling
- End User Segmentation
- Financial Modeling and Analysis

Outputs

-- Results --

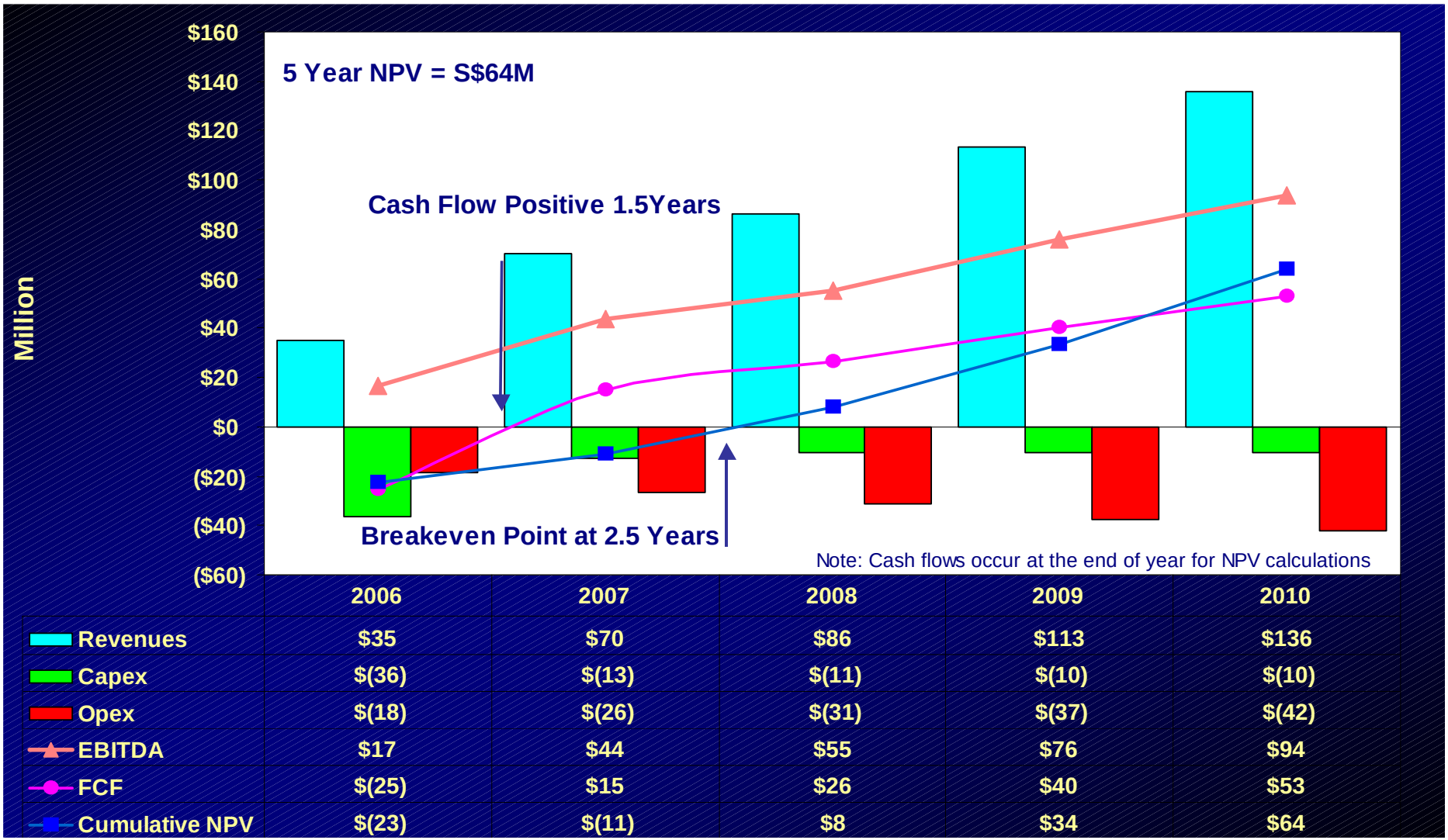






Cash flow
Break-even points
Total Revenue
Total Cost of Ownership
Sensitivity Analysis

Business Case Results



	2006	2007	2008	2009	2010
Revenues	$35	$70	$86	$113	$136
Capex	$(36)	$(13)	$(11)	$(10)	$(10)
Opex	$(18)	$(26)	$(31)	$(37)	$(42)
EBITDA	$17	$44	$55	$76	$94
FCF	$(25)	$15	$26	$40	$53
Cumulative NPV	$(23)	$(11)	$8	$34	$64

Summary

Lucent Technologies
Bell Labs Innovations

- **CDMA2000 1x is Mature, stable and proven technology**
- **Lucent is a CDMA leader #1 with over 148,000 BTS deployed worldwide**
- **CDMA2000 1x can offer wireless broadband services with mobile environment up to 153 Kbps and up to peak of 2.4 Mbps with an over-laid EV-DO**
- **CDMA2000 1x provides the capacity, coverage and quality needed for urban and rural applications plus future proof Compatible with future developments and evolution path to VOIP, IMS…**
- **CDMA450 is widely used for WLL applications which allows operators to:**
  - **supplement cable network in urban areas and**
  - **provide quickly and cost effectively Telephone service to needy rural areas**
  - **More suppliers keep entering the CDMA450 market**
- **In addition to 450 MHZ, CDMA 1x can be deployed on many different frequency bands. e.g. 850, 1900, 700 MHZ……..**

Thank you

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