New Telecommunication Technologies Bridging the Digital Divide

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Golden Gate Bridge, San Francisco
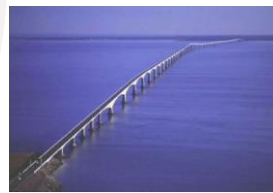
Confederation Bridge, PEI-NB, Canada

Abstract

End users are eager for the latest services and capabilities. Leading edge users are often the most lucrative for the operator on an individual basis, but the infrastructure to support their desires may be difficult to justify. Operators are faced with ongoing decisions on upgrading or replacing deployed infrastructure as new Releases or Generations are standardized and products become available. The latest technologies offer increased capacity and capability as well as reduced cost. It is important to remember that local market needs is an essential input to determining what an operator should do.

1

Outline

- Introduction
- What users demand
- Challenges operators face
- What holds us back?
- Taking advantage
- Summary and Conclusions
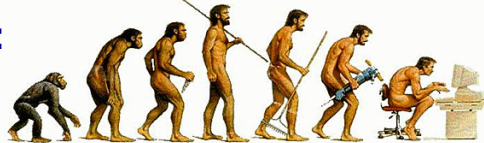
Introduction

- Society is evolving, with technology both driven by societal needs and a driver of societal directions
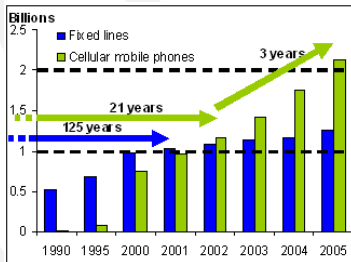 - Light heartedly:

  - Or more seriously:

NOT VETTED BY CNN

Behind the Barricade in Bangkok 24 April 2010
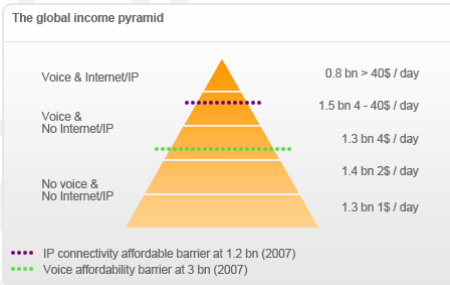CNN iReport (unvetted)
www.ireport.com/docs/DOC-436175

Introduction

- Telecommunications is becoming available everywhere, but is not always affordable:
  - 80% of the world's population is covered by GSM but <40% can afford it*

Billions
■ Fixed lines
■ Cellular mobile phones

ITU/UNCTAD, World Information Society Report, and ITU World Telecommunication Indicators Database

~4.3B subscribers today: www.gsmworld.com/

The global income pyramid

Voice & Internet/IP	0.8 bn > 40$ / day
Voice & No Internet/IP	1.5 bn 4 - 40$ / day
	1.3 bn 4$ / day
No voice & No Internet/IP	1.4 bn 2$ / day
	1.3 bn 1$ / day

•••• IP connectivity affordable barrier at 1.2 bn (2007)
•••• Voice affordability barrier at 3 bn (2007)

* and above figure are from the Nokia Siemens Networks web site: www.nokiasiemensnetworks.com/global/AboutUs/Corporate+responsibility/bringing-connectivity/Internet-for-the-next-billion.htm?languagecode=en

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5

Usage Patterns Are Changing I

- Convergence, mobility and personalization
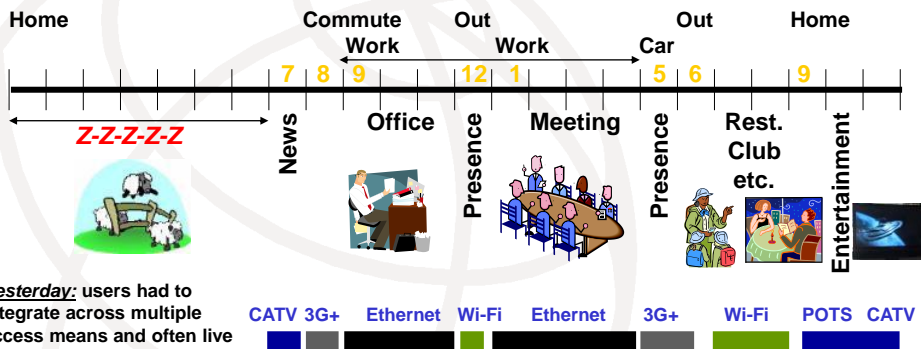
Home | Commute Work | Out Work | Out Car | Home

7 8 9 | 12 1 | 5 6 | 9

Z-Z-Z-Z-Z | News | Office | Presence | Meeting | Presence | Rest. Club etc. | Entertainment

Yesterday: users had to integrate across multiple access means and often live with device discontinuities

CATV 3G+ | Ethernet Wi-Fi | Ethernet | 3G+ | Wi-Fi | POTS CATV

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6

3

Usage Patterns Are Changing II

- Convergence, mobility and personalization
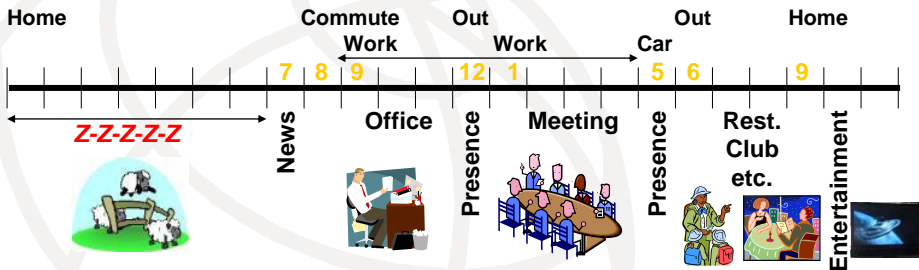
| Home | | Commute Work | Out Work | | Out Car | Home |

7 8 9   12 1   5 6   9

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Yesterday: **users had to integrate across multiple access means and often live with device discontinuities**

CATV 3G+ Ethernet Wi-Fi Ethernet 3G+ Wi-Fi POTS CATV
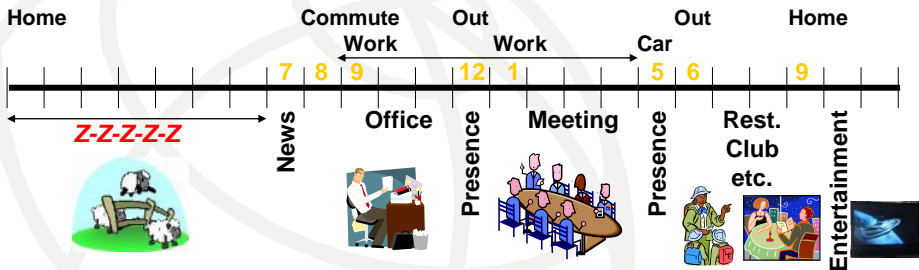
Tomorrow: **users enjoy seamless broadband communications services across multiple interoperable devices**

Continuous broadband integrated wireline and wireless technologies

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Usage Patterns Are Changing III

- Convergence, mobility and personalization

| Home | | Commute Work | Out Work | | Out Car | Home |

7 8 9   12 1   5 6   9

Z-Z-Z-Z-Z

News | Office | Presence | Meeting | Presence | Rest. Club etc. | Entertainment

Today: **users can avail themselves of some services that do some integration across multiple access means and device discontinuities**

CATV 3G+ Ethernet Wi-Fi Ethernet 3G+ Wi-Fi POTS CATV

Example: Apple's mobileMe™ synchronizes email, calendar, contacts, photo and video galleries, plus provides on line storage and iPhone location capabilities

Continuous broadband integrated wireline and wireless technologies

Usage Patterns Are Changing

What Users Demand

- Always on and available
  - People are used to interacting with those close by, miss doing so when apart
  - Telecoms bridges this gap but adds other benefits, especially being able to contact others instantly instead of spending a lot of time getting to where the other people are before being able to do so
  - Result: today most people can't do without their mobile phone

What Users Demand

- Anytime, anywhere, ...
  - we've just covered that
- ... and in any form
  - Not just voice but data, too (the Internet!)
  - When people talk face to face, they don't just exchange the sounds of their voices, but also their facial expressions and body language
  - The more telecoms can deliver the "in person" experience, the more effective it will be, hence ...

What Users Demand

- Voice and multimedia
  - Multimedia is now about adding images, initially still and monochrome, now colour and motion
  - Humans have five senses and we are now only exploiting two of them
    - 3GPP SA1 is starting to explore haptics www.3gpp.org/ftp/tsg_sa/TSG_SA/TSGS_47/Docs/SP-100196.zip
  - Today's science fiction is tomorrow's science fact

What Users Demand

- Self service, intuitive
  - Minimum administrative process
  - Should not require an engineering degree to set up and use
- Simple for the end user
  - Pick it up, turn it on: it works
  - UE HMI is obvious and simple to use
    - Challenge: fewer buttons vs. interface complexity
- Secure, trusted, reliable
  - Without a lot of user intervention

What Users Demand

- Always on
- Anytime, anywhere and in any form
- Voice and multimedia
- Self service, intuitive
- Simple for the end user
- Secure, trusted and reliable

Challenges Operators Face

- **User demands**
- **Is the existing infrastructure up to the job?**
- **Changing landscape**
- **Constant innovation**
- **Regulatory requirements and constraints**

What leaps are needed to meet the challenges?

Is the existing infrastructure up to the job?

- Demand for new data services saw the voice network adapted for data calls (modems)
  - Major shift in average holding time
  - But calls still full time physical (analog) or virtual (TDM): inefficient, limited to number of connections (trunks) available, could be "busy" but not actually carrying payload
- Evolution of data networks and realization of value of voice traffic saw data networks adapted for voice (VoIP)
- Evolution of core network to packet switching enables a major change in the types of services that can be provided
  - Short calls with small amounts of data handled efficiently
  - Long calls with bursty traffic handled efficiently
  - Voice traffic is bidirectional but tends to be half duplex hence can be more efficiently handled as data (VoIP)
  - Long calls with large amounts of data can be handled at least as efficiently as dedicated lines, and generally more so
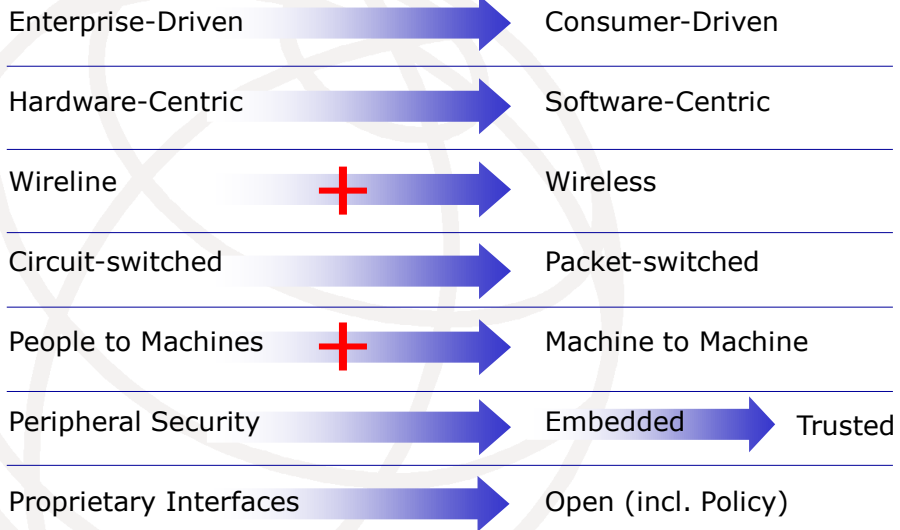
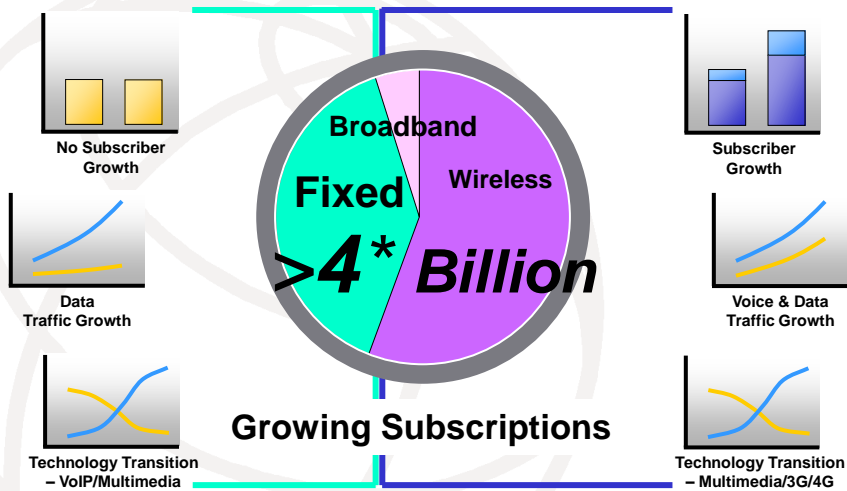*Leapfrog from circuit-switching to packet switching*

Landscape is changing

Enterprise-Driven	→	Consumer-Driven
Hardware-Centric	→	Software-Centric
Wireline	+ →	Wireless
Circuit-switched	→	Packet-switched
People to Machines	+ →	Machine to Machine
Peripheral Security	→	Embedded → Trusted
Proprietary Interfaces	→	Open (incl. Policy)

Telecom Market Trends

No Subscriber Growth

Data Traffic Growth

Technology Transition – VoIP/Multimedia

Broadband

Fixed

Wireless

>4* Billion

Growing Subscriptions

Subscriber Growth
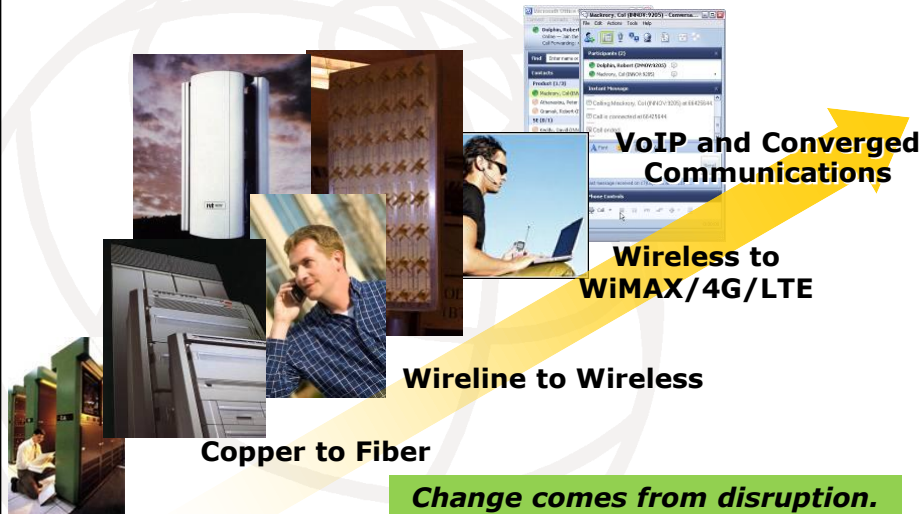
Voice & Data Traffic Growth

Technology Transition – Multimedia/3G/4G

* ~4.3B subscribers today:
www.gsmworld.com/

Telecommunications Industry: Constant Innovation

VoIP and Converged Communications

Wireless to WiMAX/4G/LTE

Wireline to Wireless

Copper to Fiber

Analog to Digital

Change comes from disruption. And disruption is constant!

Regulatory Requirements and Constraints

- Universal access requirements
  - Costs and subsidies
  - Applies equally to all?
- Competition
  - Incumbents, "green field," virtual operators
- Regulation basis
  - Technology (changes rapidly), or
  - Services (changes slowly)
- Regulators and technology convergence
  - How to regulate VoIP vs. traditional circuit-switched analog/TDM systems?
  - How to cope with convergence across voice, data and broadcast?

Need to leap past old models and ways of doing things.

What Holds Us Back?

- Legacy infrastructure
  - What is the current state of what we have in place? Is it old and obsolete and not up to the demands? Is it getting too expensive to operate for the revenue it earns? Have we just installed it and it seems to be obsolete already? And the latest technology seems to be so much better!

What Holds Us Back?

- Finances
  - Money does not grow on trees!
  - Telecoms requires significant up front investment

- Market uncertainty
  - Is the demand there? Users need to live within their means so telecoms services have to be profitable at price points that users can afford. (Ref: chart 5)
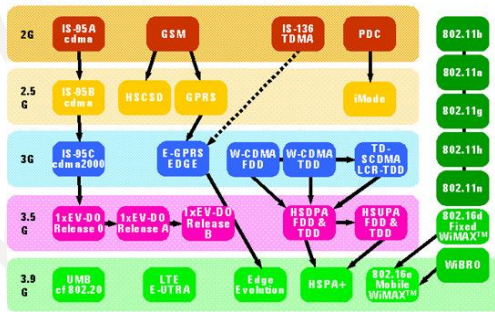
What Holds Us Back?

- Technology uncertainty
  - Core network: circuit-switched, TDM, all-IP?
  - Fixed access networks: Cu, xDSL, fibre?
  - Radio access: 2G, 3G, 3.14159G (πG ☺), 4G?

Digital wireless evolution 1990 - 2010

www.agilent.com/about/newsroom/tmnews
/background/2008/01oct2008_fieldfox

Taking Advantage

- No need to take the same path as our predecessors!
 - But we're still doing it!

Manila, 2007
www.ericmackonline.com/ICA/blogs/emonline.ns
f/dx/would-you-like-dsl-or-cable-internet-with-
that

Etching of Overhead Telephone and Telegraph
Wires in Broadway, 1890
Book of Old New York
Henry Collins Brown 1913

Taking Advantage

- No need to separate mobile from fixed networks from data form broadcast
  - Services are becoming independent of access
  - Broadcast is more about frequency band allocations than about content when content is available anytime, anywhere and on any access
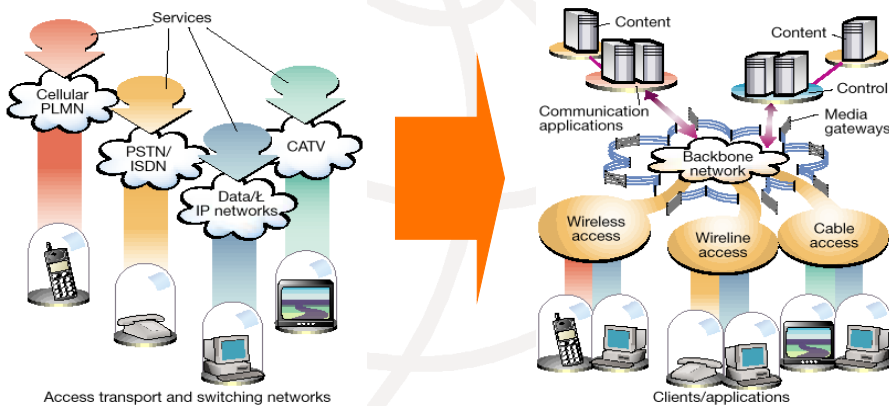

Access transport and switching networks
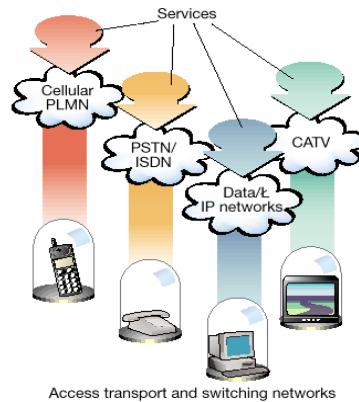
Taking Advantage

- Technology enables combining what used to be separate ...

Access transport and switching networks   Clients/applications
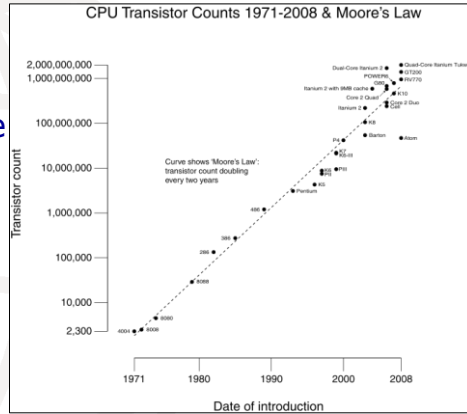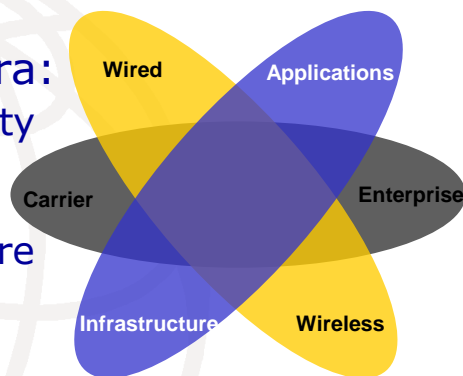
Taking Advantage

- It is much less expensive to install and manage a common infrastructure
- Moore's Law means that both UE and core network infrastructure capabilities have increased greatly while costs have declined significantly

CPU Transistor Counts 1971-2008 & Moore's Law

Curve shows 'Moore's Law': transistor count doubling every two years

http://en.wikipedia.org/wiki/Moore%27s_law

Megatrends

- Mega trends are defining a new era:
  - Hyper-connectivity
  - Network-aware applications and applications-aware networks
  - True Broadband
- Technology is all about enabling users to do what they want to do

Wired
Applications
Carrier
Enterprise
Infrastructure
Wireless

Taking Advantage

- **Mobile access and Next Generation Networks has been the leading edge of telecom standards work for some time now**
  - "Megatrends" are the key drivers
  - There is sufficient experience and maturity to enable adoption with confidence
  - NGNs are a bridge to the Digital Divide

NGN Benefits

- NGN: forward looking technologies, lower costs, greater flexibility, can meet user demands now and in the future
- NGNs will:
  - promote fair competition
  - encourage investment
  - meet regulatory requirements
  - provide open access to networks ...
- ... while:
  - ensuring universal access to services
  - promoting equality of opportunity to users
  - promoting cultural and linguistic diversity
  - recognizing need for global cooperation

But it's more than just technology …

NSN - Connectivity Scorecard

Connectivity is the key enabler of the information flow that defines modern economies. It is integral to economic productivity in advanced economies, and to the transformation of the economies of many Asian and African countries. However, investing in the infrastructure of ICT is no longer enough to ensure that people and communities are as connected as they could be. We want to identify the lost potential.

In 2008, Nokia Siemens Networks published findings from a connectivity research study carried out across 25 countries. The study, which analyzes not only a nation's ICT infrastructure but how well it is being used, ranks each nation's performance on a Connectivity Scorecard.

Designed by Leonard Waverman, Fellow at the London Business School and Dean of Haskayne School of Business at the University of Calgary, the Scorecard investigates how 'usefully connected' countries around the world really are. The Scorecard assesses performance against approximately 30 indicators of connectivity – including broadband, fixed-line, mobile and computing technologies – that contribute to a country's social and economic prosperity. Measures of positive ICT deployment include workforce IT skills, literacy, the use of enterprise software, women's access to ICT.

The results reveal that even the most advanced economies, and even the 'best connected' countries (such as the United States and Sweden), are failing to fulfil their ICT potential. This means poor access to public services and reduced availability of education, as well as hundreds of billions of dollars in lost potential revenue for business.

Efficiency and resource driven economies	Connectivity score		
Malaysia	7.07	Tunisia	3.50
Turkey	6.71	China	3.19
Chile	6.59	Philippines	3.17
South Africa	5.76	Egypt	3.02
Mexico	5.39	Sri Lanka	2.87
Russia	5.37	Vietnam	2.75
Argentina	5.14	India	1.88
Brazil	5.12	Indonesia	1.87
Colombia	4.08	Kenya	1.75
Botswana	3.98	Bangladesh	1.60
Thailand	3.75	Pakistan	1.54
Iran	3.62	Nigeria	1.30
Ukraine	3.60		

Innovation driven economies	Connectivity score		
United States	7.71	Hong Kong SAR	5.33
Sweden	7.47	France	5.22
Denmark	7.18	New Zealand	4.85
Netherlands	6.75	Belgium	4.65
Norway	6.51	Korea	4.17
United Kingdom	6.44	Italy	3.99
Canada	6.15	Czech Republic	3.71
Australia	6.14	Spain	3.49
Singapore	5.99	Portugal	3.02
Japan	5.87	Hungary	2.72
Finland	5.82	Greece	2.62
Ireland	5.70	Poland	2.49
Germany	5.37		

www.nokiasiemensnetworks.com/about-us/corporate-responsibility/bringing-connectivity/connectivity-scorecard

Chişinău, Moldova; 4-6 May 2010

31

Summary and Conclusions

- **People want to communicate**
  - The next billion users will be primarily mobile
  - Mobile Internet access will be the new norm
- **Major changes have taken place in both technology and markets**
  - Every network is in transition
  - Wealth of experience to draw on and apply
- **Use the new technologies to bridge the Digital Divide**
- **Remember the human element: users need to learn how to use the technology**

Chişinău, Moldova; 4-6 May 2010

32

Thank you!

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