ITU Regional Seminar

Belgrade, Serbia and Montenegro, 20-24 June 2005

Session 3.3

Network planning at different time scales, long, medium and short term

Network planning at different time scales:

- **Long term network planning (Target network)**

  Target network planning as bases for preparing of comprehensive master plans - master plans are usually based on long term assessments.

- **Medium term network planning**

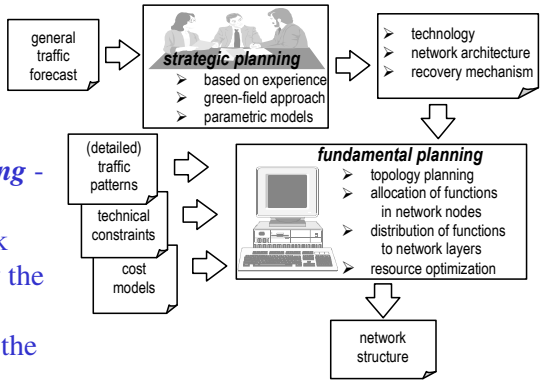
  To identify intermediate steps from present to target network.

- **Short term network planning**

  Short-term plans can be made up on regional or local bases.

Long-term planning

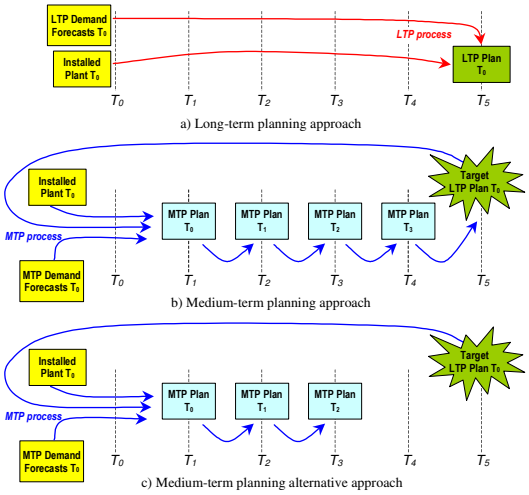
- ***strategic planning*** - defines the technology and architecture to be used in the network through the comparison of different options (generally based on a green-field approach)



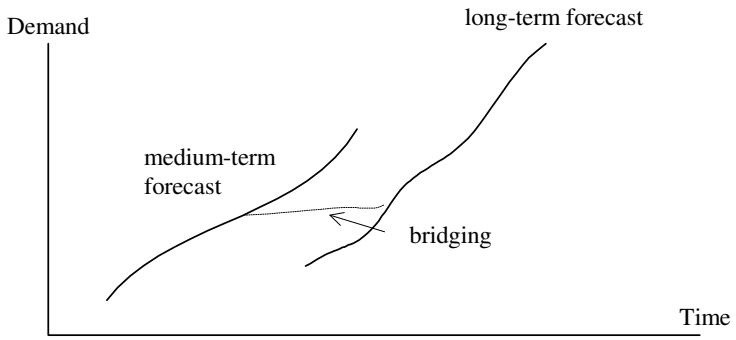
- ***fundamental planning*** - uses as input the technology and network architecture selected by the strategic planning and defines the structure of the network

Medium-Term Planning

Objective is the capacity upgrading of the network nodes and links following the long-term deployment strategies



Demand forecasting as bases for network planning



Network planning at different time scales

Long-term planning - to define and dimension the network parts which are characterised by a long lifetime and large investments for their deployment

Medium-term planning - should emphasise the behaviour and the relationships among the sets of entities (nodes, links, subnetworks) and the list of planning actions and procedures which are involved when planning a network to guarantee the convergence towards the established long term plans.

Short Term Planning - determines the routes and the telecommunications systems that support a demand

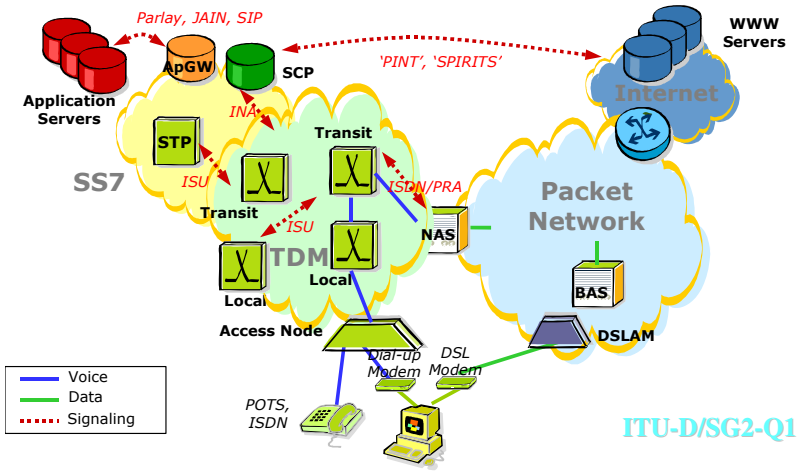
Network planning at different time scales as seen in the evolution steps to NGN

- In respect to strategies for introduction of new equipment and coexisting of present and future technology
- In respect to potential new customers and services

Strategies for introduction of the new equipment

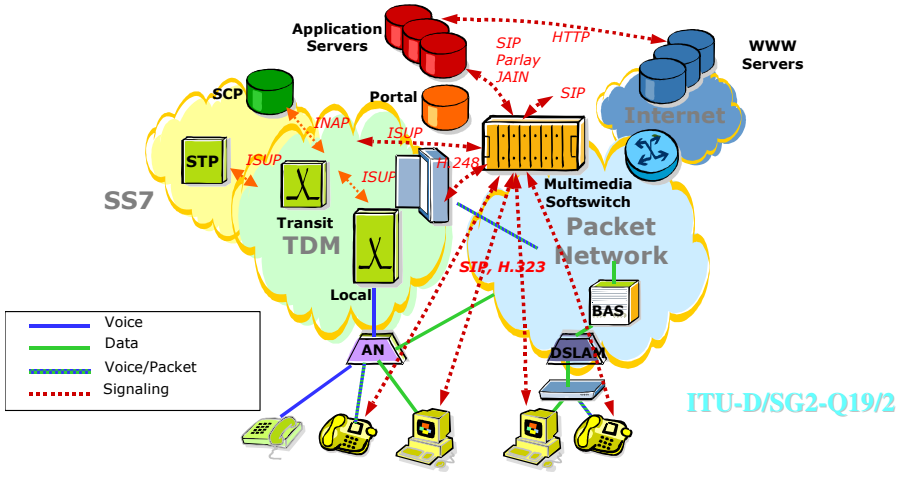
- **Consolidation:**
  Optimize the installed PSTN to reduce capital (CAPEX) and operational expenses (OPEX). Consolidation can be combined with a selection of future-safe products to prepare migration to NGN
- **Expansion:**
  Keep the existing PSTN infrastructure and services, but introduce an overlay NGN (based on broadband access) for addressing new customers and introducing new services (e.g., multimedia).
- **Replacement:**
  Replace PSTN components (at their end-of-life) with equivalent NGN components.

Evolution steps to NGN



Early Introduction of Broadband Access

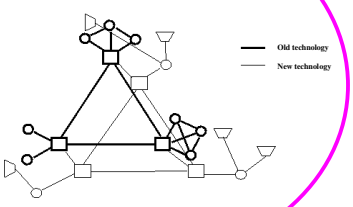
Next Generation Network NGN

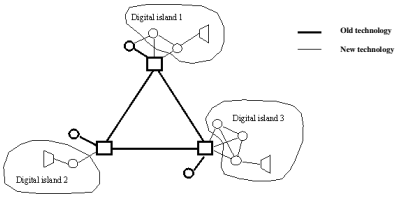


Multimedia Services and New User/Network Interaction

Strategies for coexisting of the present and future technology

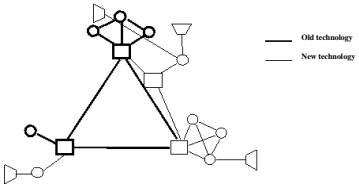
Overlay strategy





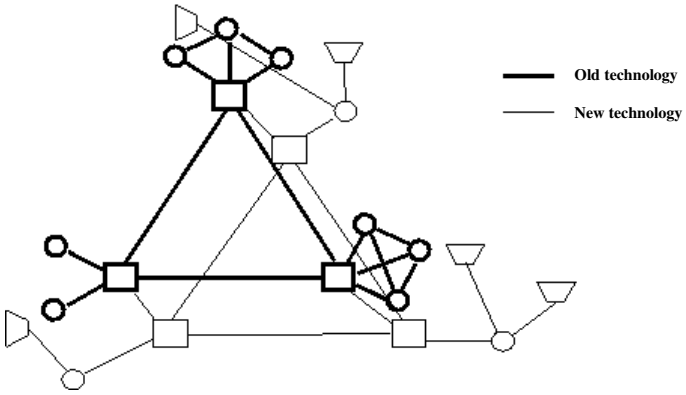
Island strategy

Pragmatic strategy



Strategies for coexisting of the present and future technology

Overlay strategy



Strategies for coexisting of the present and future technology

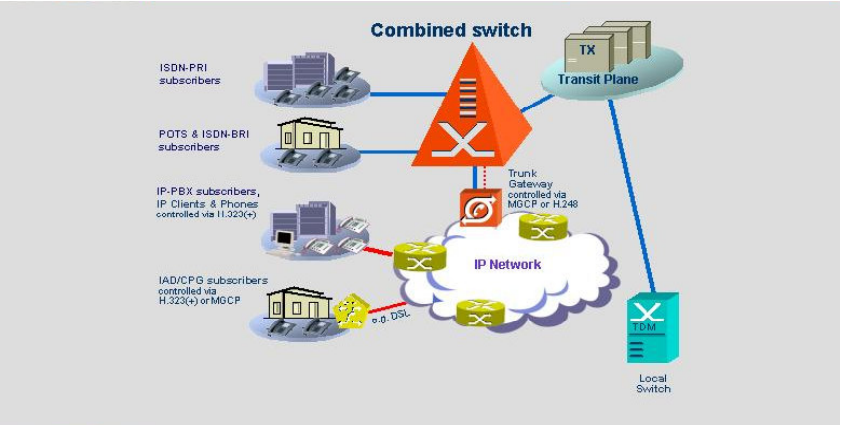
Overlay strategy

Deployment of overlay NGN access network

- Residential gateways RGW and access gateways AGW are being deployed in the areas served by existing TDM equipment for new and business subscribers to meet their demands on new state-of-the-art services
- Overlay NGN access network with Class 5 softswitches is created.
- Gradually, this network is expanded till the total replacement of the existing TDM equipment

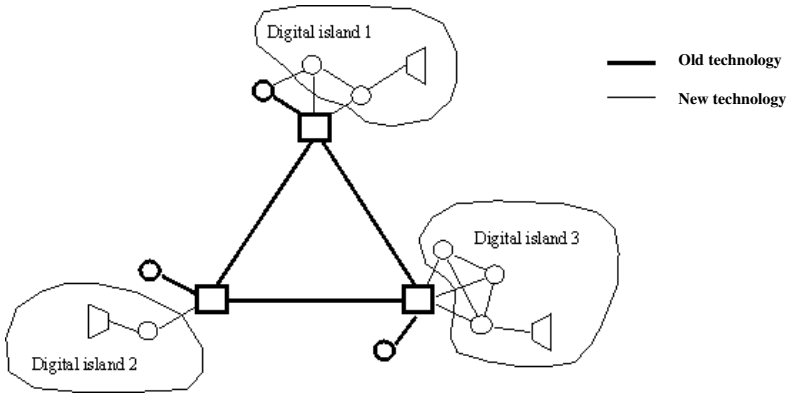
Strategies for coexisting of the present and future technology

Overlay strategy



Strategies for coexisting of the present and future technology

Island strategy



Strategies for coexisting of the present and future technology

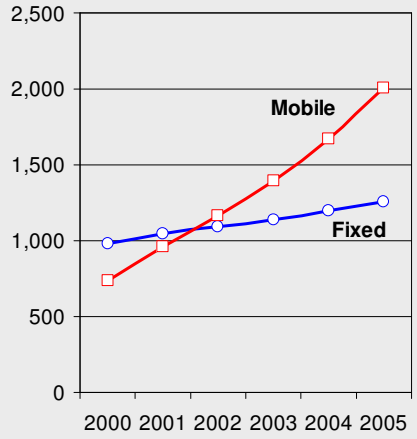
Island strategy

Deployment of NGN islands in the access network

- PSTN exchanges are replaced with AGW and residential gateways RGW situated at the customer site
- NGN class 5 islands are formed in the TDM network, connected via MAN
- Trunk gateways TGW are used for interconnection with PSTN

Worldwide fixed and mobile subscribers

Worldwide fixed-line and mobile telephone subscribers, millions



Source: TMG, Inc. (2004 estimate and 2005 forecast).

- Mobile passed fixed in 2002 globally; since then the gap has grown
- Today almost every country has more mobile than fixed line subscribers

Telecommunications Management Group, Inc.

Fixed network users potential

Highly developed countries (close to saturation):

Country	Population (in thousands)	Teledensity [%]	Average house-hold size	Teledensity per house-hold [%]	Percent of residential lines
Australia	19,157	53,86	2,64	101,2	75,0
Canada	30,750	63,45	2,65	98,2	63,9
France	58,892	56,89	2,46	94,0	69,2
Germany	82,260	65,08	2,16	95,5	77,0
Italy	57,298	48,07	2,71	96,9	79,2
Japan	126,919	55,83	2,70	116,8	75,8
New Zealand	3,831	44,81	2,91	103,0	78,5
Republic of Korea	47,300	48,86	3,04	105,5	74,1
Spain	40,600	50,62	3,25	100,8	83,5
Sweden	8,881	68,20	2,22	98,7	67,9
Switzerland	7,204	74,42	2,39	99,6	60,0
United Kingdom	59,766	59,086	2,38	93,0	71,0
United States of America	275,130	64,58	2,58	94,1	67,6

- *teledensity per house-hold about 100%*
- *ratio residential to business from 2 / 1 to 3 / 1*

Simple method to evaluate fixed subscribers potential :

Assumptions:

- **Teledensity per household in the highly developed countries**
  - around 100% (one connection per household)
- **Ratio residential to business subscribers**
  - in the range 2 to 1 - 3 to 1 , possibly depending on the strength of the economy

Note: Average household size in the highly developed countries
- between 2 and 3

Simple method:

- Fixed network subscribers potential is **number of** households **increased by** 1/3 for high potential economies or by 1/4 for others

Application of the simple method for evaluating fixed network users potential :

Bulgaria :

2,9 Million households (2,7 HH size) - potential of 3,9 Million fixed subscribers (50 % teledensity) – 38,0 % teledensity now*

China :

347 Million households (3,7 HH size) – potential of 462 Million fixed subscribers (36 % teledensity) – 16,7 % teledensity now *

South Africa :

10,2 Million households (4,5 HH size) – potential of 13,6 Million fixed subscribers (30 % teledensity) – 11,0 % teledensity now *

Russia:

52 Million households (2,8 HH size) – potential of 78 Million fixed subscribers (53 % teledensity) – 24,2 % teledensity now *

** Available WTID data*

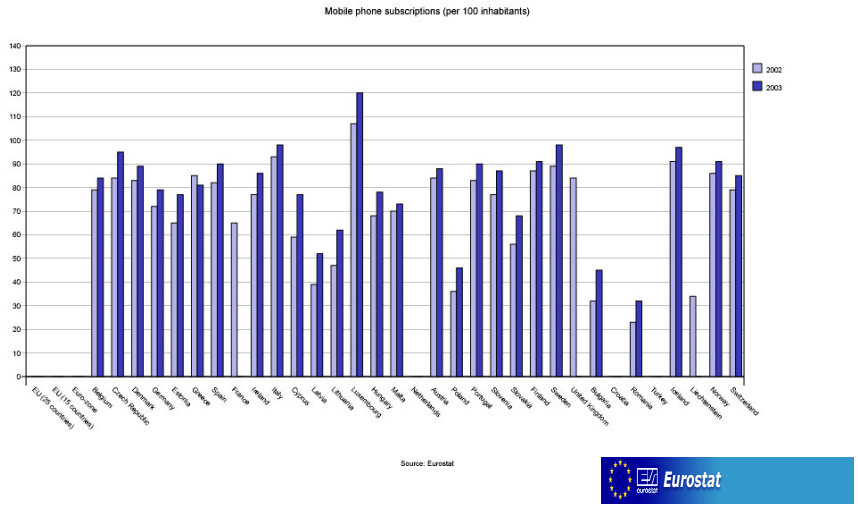
Cellular mobile network users potential

Highly developed countries:

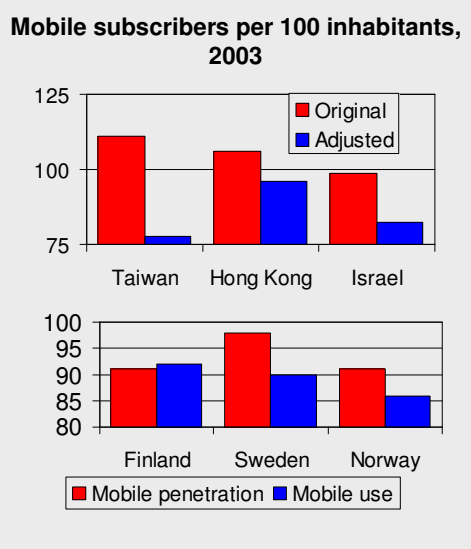
Country	Population (in thousands)	Population below 6 [%]	Population above 80 [%]	Cellular mobile Teledensity [%]
Australia	19,662	-	-	71,9
Canada	31,414	-	-	41,7
France	59,637	-	-	69,60
Germany	82,537	-	-	78,5
Italy	56,464	4,5	4,0	101,8
Japan	127,440	-	-	68,0
New Zealand	3,939	-	-	64,8
Republic of Korea	47,600	-	-	69,4
Spain	40,683	4,6	3,8	91,6
Sweden	8,943	5,1	5,0	88,9
Switzerland	7,281	-	-	84,3
United Kingdom	59,088	-	-	84,1
United States	288,370	-	-	54,3

• teledensity above 90%, related to population brake down

Mobile subscribers - EU



Mobile subscribers



Important to be precise about subscribers in countries already exceeding 100 %

- Taiwan: **20-30%** have 2nd SIM card
- Hong Kong: **24%** of prepaid non-active
- Israel: ~ **20%** double counted (due to churn and "liberal" counting policies) or non-resident subscribers

Age ranges for mobile use:

- Finland: **15-74**
- Sweden: **16-75**
- Norway: **9-79**

Source: TMG, Inc. adapted from national regulatory & national statistical agencies.

Simple method to evaluate cellular mobile network users potential :

Assumptions:

- **Cellular mobile Teledensity in the highly developed countries**
  - **in a range 40% to 90% (one case above 100%)**
- **Individual usage of the network obviously related to the population volume**
- **Possible correlation with population brake down by age**
  - **e.g. All above 6 and below 80 are users**

Simple method:

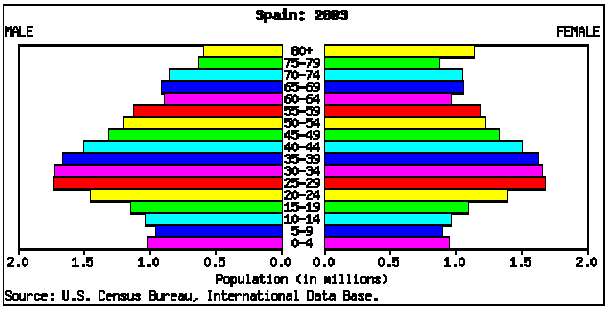
- Cellular mobile network users potential is **related to** population brake down by age **excluding only** unable/unwilling to use telecommunications, e.g. age below 6 and above 80

Cellular mobile network users potential

Case of Spain :

Cellular mobile teledensity from ITU database - **91.6 %**

Correlation with population - brake down by age



4,6 % of population below **6**

3,8 % of population above **80**

- ***user potential of about 91,6 % expected***

Impact of Cellular mobile on Fixed network - Fixed and Cellular mobile network growth

Network growth (compound annual growth rate in %)	New telephone lines added 1997-2002	New mobile subscribers added 1997-2002
Low Income	12,5	76,5
Lower Middle Income	14,4	67,6
Upper Middle Income	4,4	57,4
High Income	1,2	29,9
Africa	6,0	74,9
Americas	2,3	28,7
Asia	11,8	43,3
Europe	2,6	46,3
Oceania	0,4	24,3
WORLD	5,3	40,2

World telecommunication/ ICT indicators ITU Database

CAGR is computed by the formula:

$[(Pv / P0)^{(1/n)}]-1$

Pv = Present value

P0 = Beginning value

n = Number of periods

Impact of Cellular mobile on Fixed network

Case of Italy:

1,4 % CAGR for fixed network ,

35,2 % CAGR for mobile network for **1997-2002**

Year **1997**: fixed network teledensity **44,79 %** ,
residential lines **76,5 %**
cellular mobile teledensity **20.46 %**

Year **2003**: fixed network teledensity **48,40 %** ,
residential lines **79,2 % (2001)**
cellular mobile teledensity **101.76 %**

User behaviour and usage trends

Findings of the United Nations :

- **all growth in population will concentrate in urban areas, no growth in rural areas**
- **most of the growth will concentrate in urban areas of less developed regions**

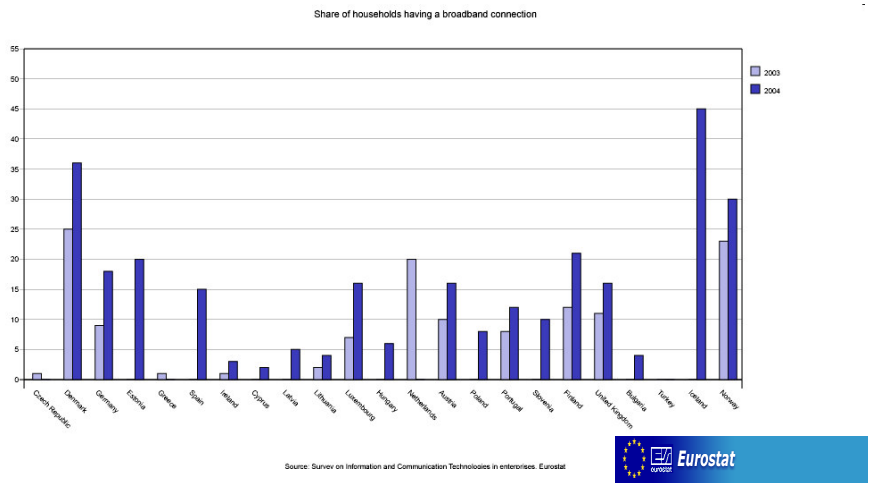
Users will concentrate in urban areas, as urban areas put higher pressure on the individual to "do what the others do" and from technical point it is easier to connect people in urban areas

Teledensity statistics for largest cities

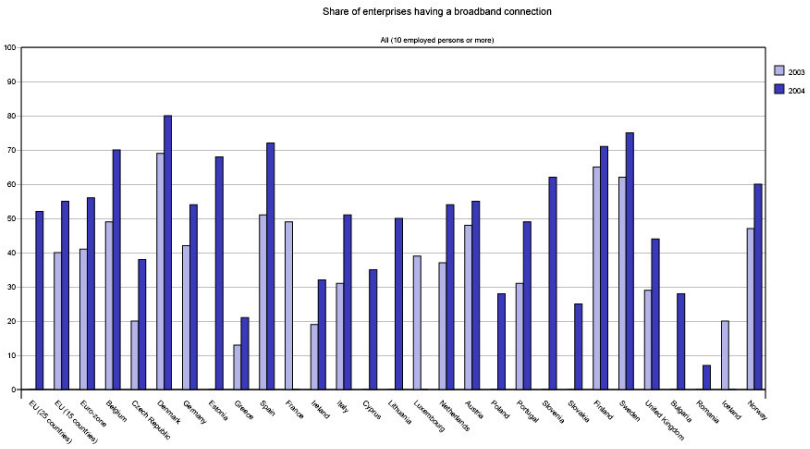
	Population as % of total	Large city teledensity [%]	Rest of country teledensity [%]	Overall teledensity [%]	
Low Income	6,0	9,26	2,15	2,54	1 : 4,3
Lower Middle Income	5,8	24,84	7,30	8,77	1 : 3,4
Upper Middle Income	16,1	30,77	21,10	22,94	1 : 1,5
High Income	10,8	57,49	54,83	55,21	1 : 1,05
Africa	12	6,42	1,39	1,99	
Americas	13,6	34,8	21,72	11,39	
Asia	4,8	25,97	6,94	7,84	
Europe	10,9	48,24	30,19	31,98	
Oceania	17,8	45,97	36,77	38,38	
WORLD	7,7	17,4	25,25	9,20	

ITU WTID 2002

Broadband connection – households(EU)



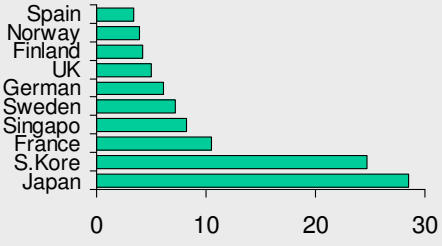
Broadband connection – enterprises(EU)



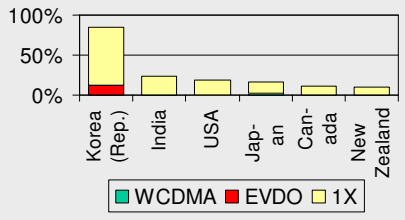
Source: Survey on Information and Communication Technologies in enterprises. Eurostat

Connected to exchange with support of xDSL-technology, cable network upgraded for Internet, or other broadband technologies.

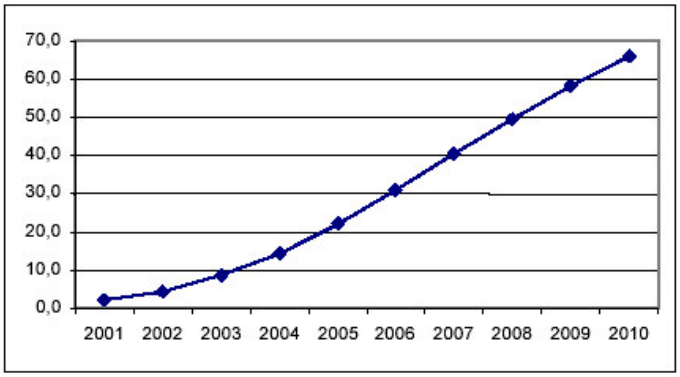
Broadband Mobile subscribers



http://reports.tmgtelecom.com/ssmi



Broadband connection – evolution



Broadband penetration *forecasts for the residential market - EU*

Millennium Development Goals - trends 1990-2003

	Telephone lines and cellular subscribers per 100 population		Personal computers in use per 100 population		Internet users per 100 population	
	1990	2003	1990	2003	1990	2003
World	10	41	2	**10**	<1	**11**
Developed regions	38	125	9	**45**	<1	**45**
Developing regions	2	25	<1	**3**	0	**5**

Source: World Telecommunication Indicators Database