ITU Seminar

Warsaw, Poland , 6-10 October 2003

Session 2.3

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.

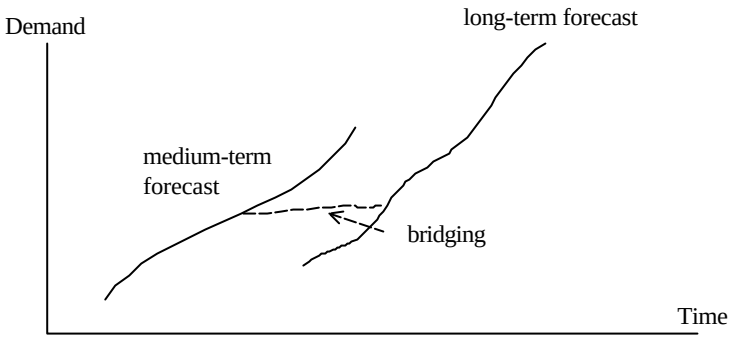
- **Medium term network planning**

  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.

Demand forecasting as bases for network planning



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

- In respect to strategies for introduction of the new equipment
- In respect to strategies for coexisting of the present and future technology

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).

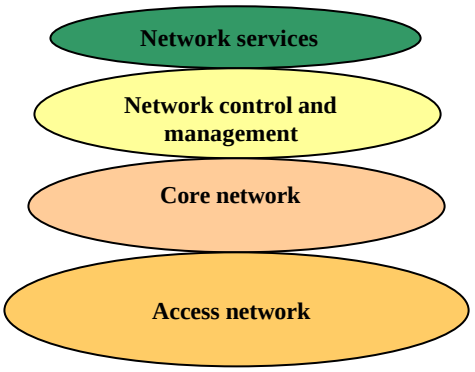
- **Replacement:**
  Replace PSTN components (at their end-of-life) with equivalent NGN components.

Evolving Network Architectures : Next Generation Network NGN

A next generation network (NGN) is essentially characterized by packet-based transport layer for voice and data and separation of control and transport functions

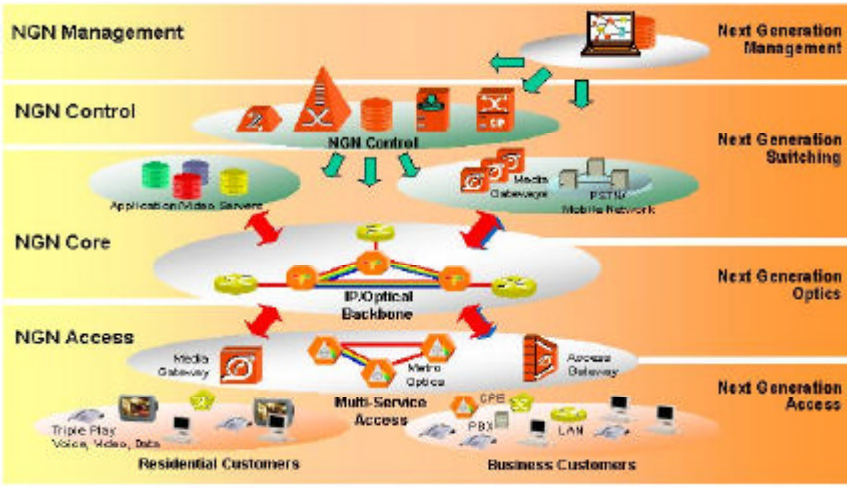
- all application data is carried in packets/cells
- broadband technology in the access
- QoS capable multiservice networks in the edge network
- optical networking in the core network
- open distributed control architecture replaces the classical "monolithic" switch
- distributed intelligent layer that separates control logic from transport
- open platforms for creation, provisioning and delivery of intelligent/enhanced services

Evolving Network Architectures : Next Generation Network NGN



NGN architecture generalized in four layers

Evolving Network Architectures : Next Generation Network NGN



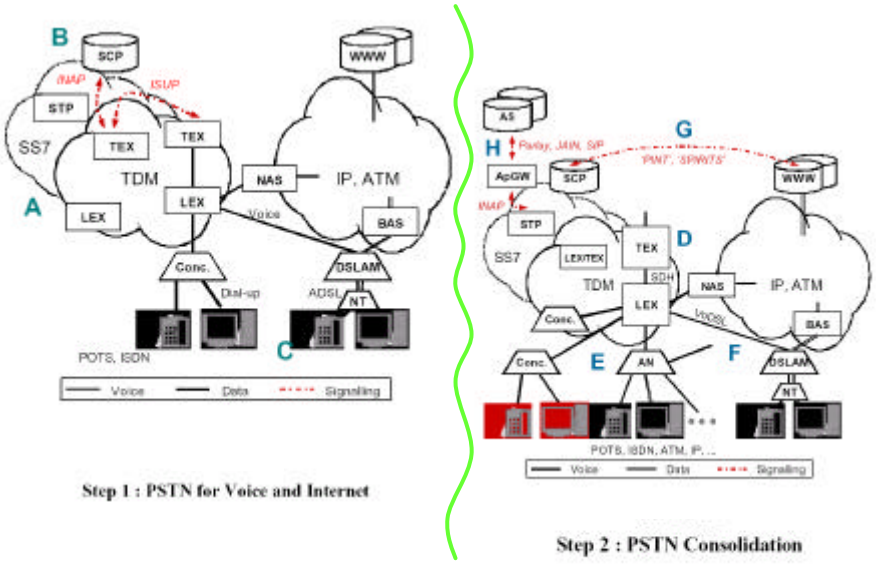
Evolving Network Architectures :

Next Generation Network NGN

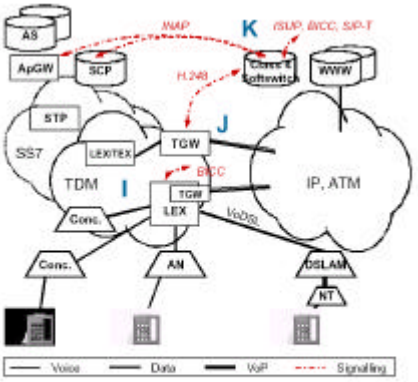
Strategies for migrating TDM/PSTN towards NGN

Evolution steps to NGN

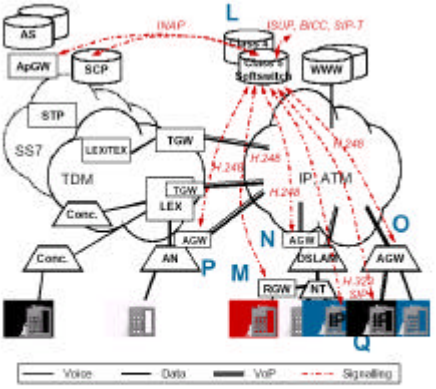
Evolution steps to NGN



Evolution steps to NGN

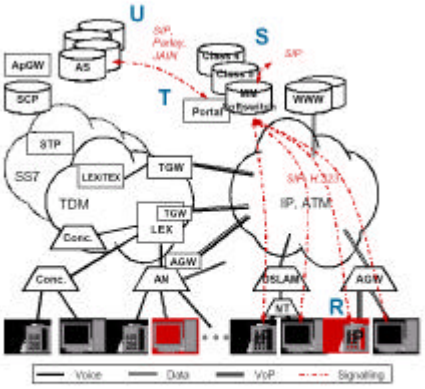


Step 3: Voice over Packet for Trunking

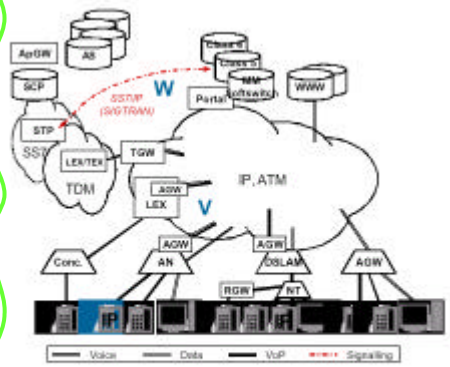


Step 4: Voice over Packets in access and CPE

Evolution steps to NGN



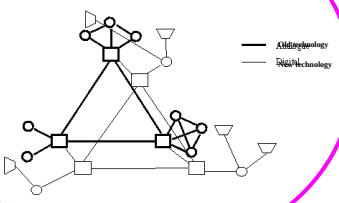
Step 5 : Multimedia

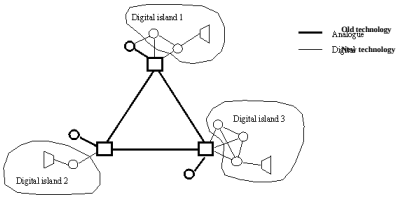


Step 6 : The full NGN

Strategies for coexisting of the present and future technology

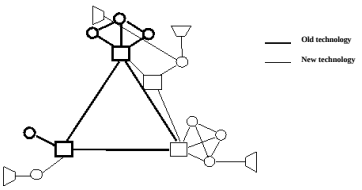
Overlay strategy





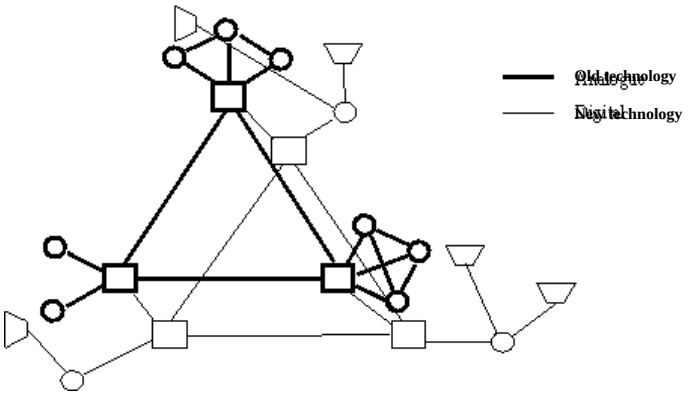
Island strategy

Pragmatic strategy



Strategies for coexisting of the present and future technology

Overlay strategy



Strategies for coexisting of the present and future technology

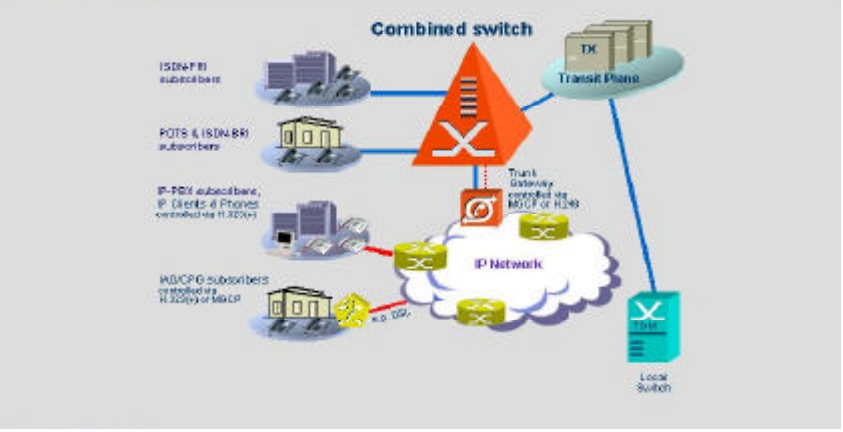
Overlay strategy

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

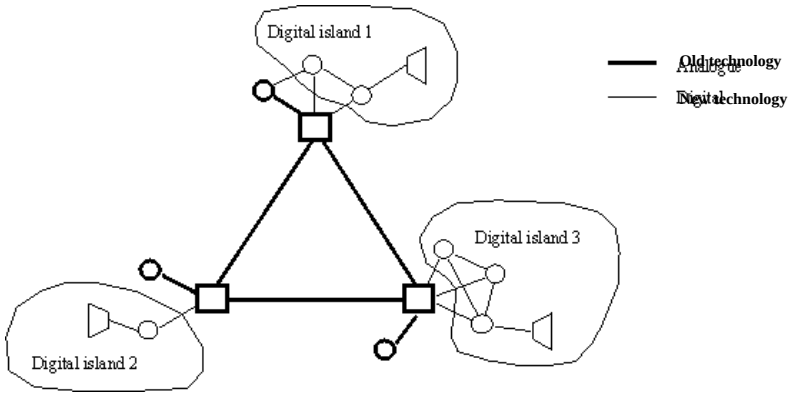
Strategies for coexisting of the present and future technology

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

Users/Subscribers potential

Findings of the United Nations that:

- 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

can be related to the ***Internet*** like this:

- users (and traffic) 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 (higher density, no long access lines)
- as industrial areas are already covered very well with Internet users the growth of the less developed regions is the real add-on

Subscribers potential

Internet -

In sum: the general trend of the world-wide population - both in growth and in distribution - supports the dissemination of the Internet

Mobile -

The number of mobile users shows a high dynamic behaviour; many forecasts/expectations had to be corrected always after a few months

Today In some countries the figures for mobile phones have now surpassed those for fixed lines; reason lies in the fact that a family has one fixed access but more than one member of the family has a mobile phone

Subscribers potential

Based on statistics for population, average house-hold size, average teledensity, residential teledensity and teledensity per house-hold.

Reference to Cellular mobile teledensity and impact on fixed network.

Ratio residential to business subscribers.

Subscribers potential

New telephone lines added 2000-2001 : 0,3 %

Highly developed countries:

Country	Population (in thousands)	Teledensity [%]	Average house-hold size	Teledensity per house-hold [%]	Residential lines [%]
Australia	19,157	52,46	2,64	101,2	73,0
Canada	30,750	67,65	2,65	98,2	63,4
France	58,892	57,93	2,46	94,0	74,0
Germany	82,260	61,85	2,16	95,5	77,0
Italy	57,298	47,39	2,71	96,9	67,1
Japan	126,919	58,58	2,70	116,8	73,3
New Zealand	3,831	49,99	2,91	103,0	70,8
Republic of Korea	47,300	46,37	3,04	105,5	74,6
Spain	40,600	42,12	3,25	100,8	74,5
Sweden	8,881	60,20	2,22	98,7	65,3
Switzerland	7,204	72,67	2,02	99,6	68,0
United Kingdom	59,766	58,86	2,38	93,0	70,1
United States of America	275,130	69,97	2,58	94,1	65,8

- *ratio residential to business 3 to 1*
- *teledensity per house-hold 100%*

Germany : 50,7 Million (61,6%)

Subscribers potential :

Central and East European and CIS countries :

Country	Population(x1000)	Teledensity	Household size	Household Teledensity
Albania	3,910	3.91	3,99	14.2
Armenia	3,520	15.15	4,17	57.0
Azerbaijan	7,734	10.36	5,34	49.1
Belarus	10,236	26.88	3,32	74.8
Bosnia	3,972	10.20		
Bulgaria	8,225	35.04	2,83	84.6
Croatia	4,473	36.49	3,16	85.8
Czech Republic	10,244	37.79	2,67	71.9
Estonia	1,439	26.22	2,22	65.0
Hungary	10,197	37.25	2,72	87.7
Kazakhstan	16,223	11.31	4,50	45.2
Kyrgyzstan	4,990	7.71	4,40	27.5
Latvia	2,424	30.21	2,58	62.8
Lithuania	3,699	32.11	2,74	74.1
Macedonia	2,024	25.49	3,61	81.4
Moldova	4,280	13.22	3,25	37.5
Poland	38,765	28.24	2,95	63.9
Rumania	22,327	17.46	3,06	47.2
Russia	146,934	21.83	2,83	48.7
Slovak Republic	5,405	31.42	2,80	63.4
Slovenia	1,986	28.62	2,96	90.9
Tajikistan	6,127	3.57	5,85	16.5
Turkmenistan	4,459	9.17	4,67	34.2
Ukraine	50,456	20.65	3,09	52.7
Uzbekistan	24,655	6.71	5,50	30.7
Yugoslavia	10,640	22.61	3,09	61.9

Subscribers potential :

Average household size of Central and East European and CIS countries – from 2,2 to 5,8

For highly developed countries - from 2,0 to 3,2

Calculated subscriber potential for some Central and East European and CIS countries :

- **Bulgaria : 3,86Million(47 %)potential teledensity**
- **Hungary : 4,99 Million (49 %) potential teledensity**
- **Russia : 64 Million (43 %) potential teledensity**
- **Uzbekistan: 5,96 Million (24 %) potential teledensity**

Information technology :

Density statistics for Information technology :

	Internet hosts per 10000 inhabitants	Internet users per 10000 inhabitants	PCs per 100 inhabitants
Low Income	**0,98**	**62,21**	**0,59**
Lower Middle Income	**4,32**	**264,94**	**2,45**
Upper Middle Income	**78,69**	**992,66**	**8,24**
High Income	**1 484,20**	**3 992,87**	**37,31**
Africa	**3,38**	**84,89**	**1,06**
Americas	**1 332,97**	**2 164,28**	**26,57**
Asia	**28,73**	**433,97**	**2,18**
Europe	**191,47**	**1 804,54**	**17,94**
Oceania	**885,26**	**2 771,59**	**39,91**
WORLD	**232,66**	**820,81**	**7,74**

} CIS m

} CEE m

Information technology :

Central and East European and CIS countries :

Country	TotalPopulation (M)	Internet Users (10'000)	PCs (100)
Armenia	3,79	142,05	0,79
Azerbaijan	7,78	32,13	..
Moldova	4,39	136,67	1,59
Tajikistan	6,13	5,22	..
Ukraine	50,30	119,29	1,83
Uzbekistan	25,26	59,39	..
Albania	3,97	25,19	0,76
White Russia	10,25	411,87	..
Bosnia	4,07	110,65	..
Bulgaria	8,11	746,27	4,43
Kazakhstan	16,09	61,64	..
Latvia	2,35	723,10	15,31
Lithuania	3,68	679,16	7,06
Rumania	22,39	446,63	3,57
Russia	146,76	293,00	4,97
Macedonia	2,04	342,47	..
Turkmenistan	4,84	16,55	..
Yugoslavia	10,68	561,80	2,34
Croatia	4,66	558,91	8,59
Czech Republic	10,27	1 302,66	12,14
Estonia	1,43	3 004,59	17,48
Hungary	9,97	1 484,01	10,03
Pola nd	38,63	983,72	8,54
Slovak Republic	5,40	1 203,26	14,81

High Income:

3 993

Technology - % digital:

Central and East European and CIS countries :

Country	Main lines (thousands)	Density	Digital (%)	Residential (%)
Armenia	529,3	13,97	20,9	90,3
Azerbaijan	865,5	11,13	30,4	88,7
Moldova	676,1	15,40	34,0	86,5
Tajikistan	223,0	3,63	7,5	79,0
Ukraine	10 669,6	21,21	7,9	82,4
Uzbekistan	1 663,0	6,58	33,8	84,2
Albania	197,5	4,97	78,9	91,0
White Russia	2 857,9	27,88	35,8	83,7
Bosnia	450,1	11,07	41,6	83,2
Bulgaria	2 913,9	35,94	12,0	88,2
Kazakhstan	1 834,2	11,31	29,3	88,8
Latvia	724,8	30,83	52,2	81,7
Lithuania	1 151,7	31,29	46,5	84,2
Rumania	4 094,0	18,28	54,8	88,2
Russia	35 700,0	24,33	27,1	79,0
Macedonia	538,5	26,35	71,2	88,5
Turkmenistan	387,6	8,02	20,4	80,3
Yugoslavia	2 443,9	22,88	53,0	88,5
Croatia	1 700,0	36,52	76,0	82,6
Czech Republic	3 846,0	37,43	85,7	68,8
Estonia	503,6	35,21	71,2	80,1
Hungary	3 730,0	37,40	85,8	86,6
Poland	11 400,0	29,51	77,6	76,7
Slovak Republic	1 556,3	28,80	70,0	74,2

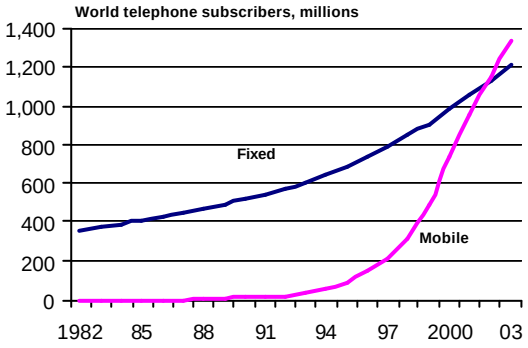
Telecom Indicators for CEE and CIS countries :

- **Subscribers potential-**
  very high for many of the countries
- **Information technology -**
  below 10 % for most countries -
  about 40 % for high income countries
- **Still plenty of analogue equipment mostly in rural areas -**
  from only 7 % to 85 % digital

Teledensity statistics for highly developed countries – influence of mobile

Country	Population (in thousands)	Teledensity [%]	Residential Teledensity [%]	Average house-hold size	Teledensity per house-hold [%]	Cellular mobile Teledensity [%]
Australia	19,157	52,46	73,0	2,64	101,2	44,69
Canada	30,750	67,65	63,4	2,65	98,2	28,46
France	58,892	57,93	74,0	2,46	94,0	49,33
Germany	82,260	61,05	77,0	2,16	95,5	58,60
Italy	57,298	47,39	67,1	2,71	96,9	73,73
Japan	126,919	58,58	73,9	2,70	116,8	52,62
New Zealand	3,831	49,99	70,8	2,91	103,0	56,33
Republic of Korea	47,300	46,37	74,6	3,04	105,5	26,82
Spain	40,600	42,12	74,5	3,25	100,8	60,93
Sweden	8,881	68,20	65,3	2,22	98,7	71,72
Switzerland	7,204	72,67	68,0	2,02	99,6	64,39
United Kingdom	59,766	58,86	70,1	2,38	93,0	72,70
United States of America	275,130	69,97	65,8	2,58	94,1	39,79

Teledensity statistics for highly developed countries - mobile



Impact of Cellular mobile on residential teledensity:
Case of Italy:
Year 1997: average teledensity **44,68 %** , residential teledensity **76,5 %**
Year 2000: average teledensity **47,39 %** , residential teledensity **67,1 %**

Statistics for Network growth

Compound annual growth rate in %

	New telephone lines added 2000-2001	New mobile subscribers added 2000-2001
Low Income	**8,3**	**72,4**
Lower Middle Income	**17,2**	**70,5**
Upper Middle Income	**7,4**	**27,8**
High Income	**0,3**	**14,8**
Africa	**7,6**	**51,0**
Americas	**2,1**	**21,2**
Asia	**12,4**	**38,4**
Europe	**2,4**	**20,0**
Oceania	**0,2**	**26,7**
WORLD	**6,0**	**26,7**

South East Europe Company	Traffic per user [mErl]	Percentage of users
Urban	**15**	**15**
City Suburban	**12**	**22**
Suburban (country)	**9**	**45**
Rural	**7**	**18**
Average	**9,3**	**100**

Data for avarage traffic per user

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
Lower Middle Income	5,8	**24,84**	**7,30**	8,77
Upper Middle Income	16,1	**30,77**	**21,10**	22,94
High Income	10,8	**57,49**	**54,83**	55,21
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

CONCLUSION

There is still considerable potential of telecom subscribers in the world, concentrated primarily in the developing countries and after all in the LDCs

Planning in the developing countries for a long period will primarily have to solve problems of huge network expansion, so long-term (target) network planning will be essential task