

Technical Guideline Formulation

Day 2

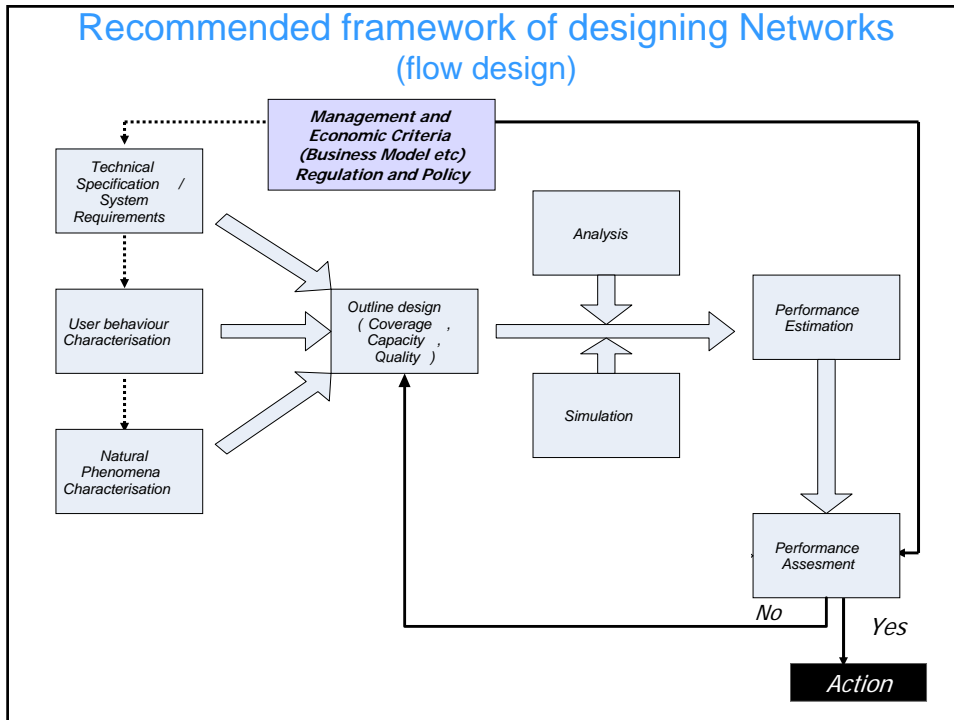
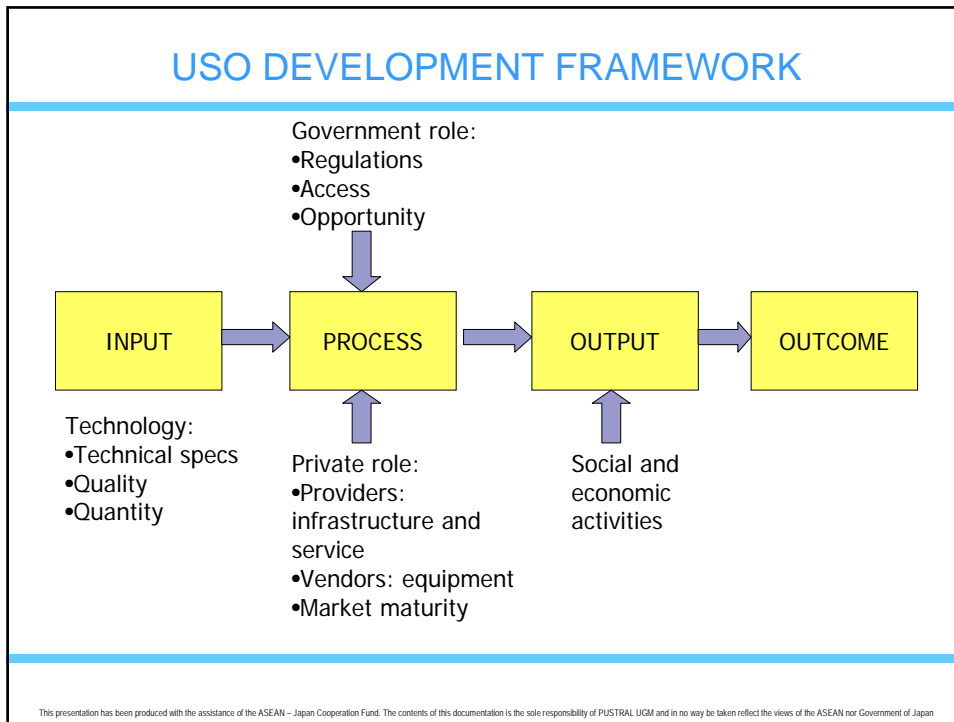
Moderated by Mr. Arif Wismadi

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Discussion

- USO Development Framework
- Recommended framework of System Design
 - Technical Specification /System Requirements
 - User behavior Characterization
 - Natural Phenomena
 - Outline design
 - Analysis/Simulation
 - Performance Estimation
 - Performance Assessment

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Recommended framework of designing Networks

Step 1	Management and Economic Criteria (Business Model) Policy and Regulation	
Step 2	Technical Specification /System Requirements	
	User behavior Characterization	
	Natural Phenomena Characteristics/Conditions	
Step 3	Outline Design	Capacity
		Coverage
		Quality
Step 4	Analysis/Simulation	
Step 6	Performance Estimation	
	Performance Assessment	

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Technical Specification /System Requirements

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Classification of wired telecommunication technologies

Wire						
Distance	Definition	Main Utilization	Fiber		Copper	
			Single Mode	Multi Mode	ISDN	DSL
Long	National Backbone Network	Backhaul	Speed: G, Tbps Loss: Low Coverage: Long Cost: High Capacity: High	NA	NA	NA
Middle	Interface between Backbone and Access line (Long distance)	20Km*~	Cost: High	NA	NA	NA
	Interface between Backbone and Access line (Short distance)	~20Km*	Cost: Very High	Cost: High	NA	NA
Short	Last One Mile	Access	Cost: Very High	Speed: High Interference: Low Cost: Mainly labor cost Capacity: Medium	Speed: 64Kbps x n No exchange network. Technology: declining, need to secure spectrum	Speed: several dozens of Mbps/ Max up to 10km Rural: bad quality only Several Mbps/ several km Max.

*20Km is defined here referring to current wired LAN technology and field trials reports. This document is the sole responsibility of PUSTRAL UGM and in no way be taken reflect the views of the ASEAN or Government of Japan. NA=Non applicable

Classification of Radio telecommunication technologies

Radio							
Distance	Definition	Main Usage	Microwave		Cellular	Wireless LAN	
			Satellite	Terrestrial	Mobile phone	WiFi	WiMAX
Long	National Backbone Network	Backhaul	Cost: High Speed: Low Transmission delay: High Usability: LOS	Usage: Mainstream trunk line used by telecom companies, Cost: High	NA	NA	Possible
Middle	Interface between Backbone and Access line (Long distance)	20Km*~	Cost: High Speed: Low Transmission delay: High Usability: LOS	Usage: Mainstream trunk line, Cost: High	NA	Interference: High Usability: LOS (Several km)	New technology : communication speed will automatically change depending on the environment Usability: NOLS Distance: Several dozen Km
	Interface between Backbone and Access line (Short distance)	~20Km*	Cost: High Speed: Low Transmission delay: High Usability: LOS	Usage: Mainstream trunk line, Cost: High	Coverage: expandable with cells.	Interference: High Usability: LOS with external antenna	New technology : equipment device is expensive Usability: NLOS Reflected wave: utilizable
Short	Last One Mile	Access	Cost: High Speed: Low Transmission delay: High Usability: LOS	Equipment device: High cost License: required	Dissemination rate: Phone call and SMS are high Speed: Low	Cost: Very low Diffusion rate: High (Cheap:: several meters)	New technology : equipment device : expensive and still unfamiliar, no terminal product available yet.

*20Km is defined here referring to current wireless LAN technology and field trials reports.

NA=Non applicable

Table of Comparison of technologies Characteristics

	Satellite (Satellite mobile phone)	Terrestrial	WiMAX	WiFi
Cost	High	High	Low but few in the market	Very low
Speed	fix Low	fix M,Gbps	Enables an automatic speed control in Mbps	Depend on Propagation
Delay	Propagation Distance (Distance Delay)	Depend on # of relay (Digital Delay)	Best Effort/QoS (Packet Delay)	Packet Delay
Radio Licensing (Depend on regulation authority)	required	required	Depend on indoor/outdoor, Band, WiMAX/WiFi	Depend on indoor/outdoor, Band, WiMAX/WiFi
Usibility	LOS	LOS	NLOS	LOS

LOS: line of sight; NLOS: non-line-of-sight; NA: Non applicable. The contents of this documentation is the sole responsibility of PUSTRAL UGM and in no way be taken reflect the views of the ASEAN nor Government of Japan

**Table of Comparison of technologies Characteristics
(Cont.)**

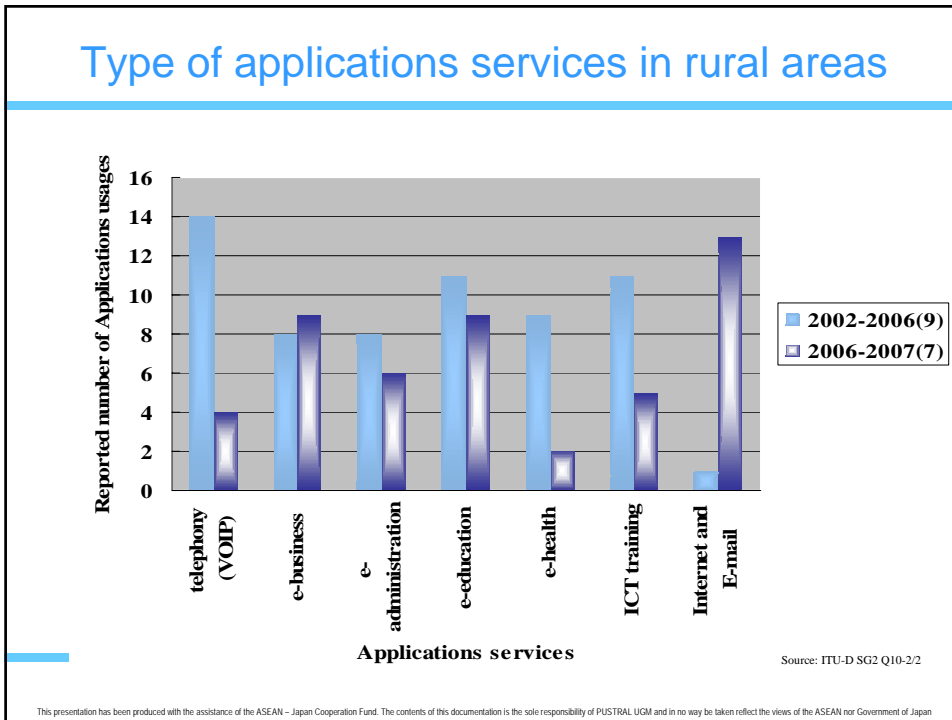
	Mobile phone	Fiber (Single)	Fiber (Multi)	Copper (ISDN)	Copper (DSL)
Cost	Low	High	High	Low	Low
Speed	Low	Fix G, Tbps	Fix High	64 Kbps xn	~10Mbps Outside line
Delay	Digital Delay	Few Digital Delay	Few Digital Delay	Digital Delay	Digital Delay
Licensing (Depend on each country's regulation authority)	registrati on	NA	NA	NA	NA
Usibility	NLOS	Anywhere	Near local office	Near Switching office	Near local office

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User behavior Characterization

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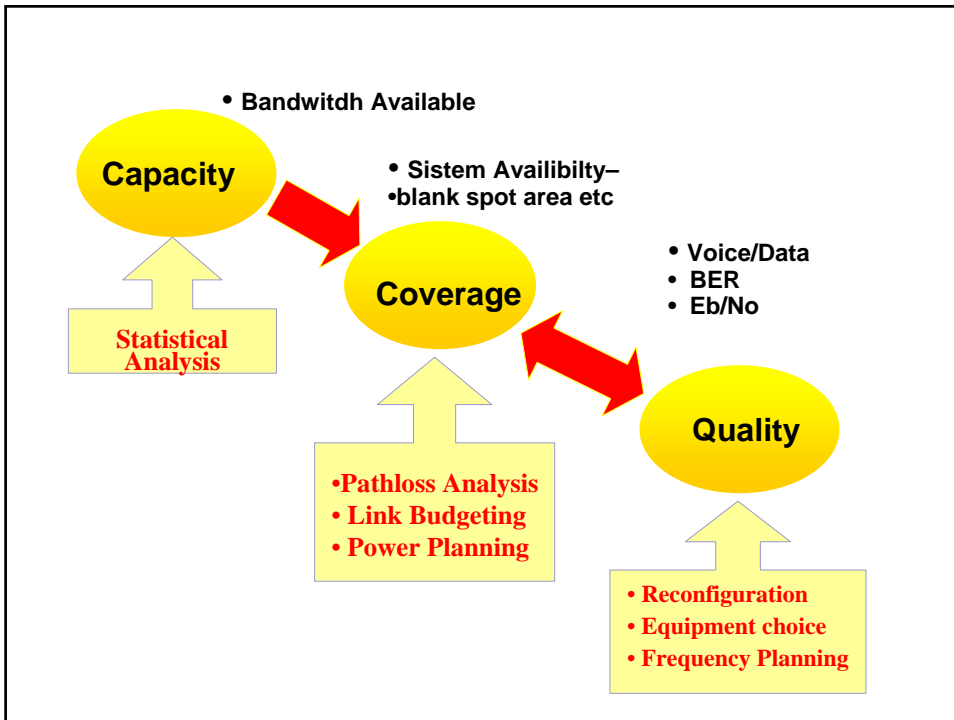


Service	Data Rate	Symmetry	Traffic ^a	Mobility	Inter-activity	Quality of Service	
						Real Time	BER ^b
Home Office Home Learning	2 Mb/s	yes	ABR/CBR /VBR	quasi- mobile	high	yes (CBR+VBR)	small
Internet-Services, Internet-Access	≤ 2 Mb/s ↓ ^c	no	ABR	quasi- mobile	low	no	medium
HDTV	20 Mb/s ↓	no	CBR	no	no	abs. delay	small
Video on Demand	6 Mb/s ↓	no	CBR	no	low	abs. delay	small
Audio on Demand	384 kb/s ↓	no	CBR	yes	low	abs. delay	medium
(Video-)Telephony	144 kb/s	yes	CBR	yes	high	yes	medium
Narrowband-Data	144 kb/s	yes	ABR	yes	low	no	medium
Teleshopping	4 Mb/s ↓, 144 kb/s ↑ ^d	no	ABR/CBR	quasi- mobile	low	abs. delay (CBR)	small
Interactive Entertainment (Games)	4 Mb/s	yes	VBR	?	high	yes	small
Video-Conference	n • 64 kb/s ... 2 Mb/s	yes	VBR/CBR	quasi- mobile	high	yes	small

a. ABR ... Available Bit Rate; CBR ... Constant Bit Rate; VBR ... Variable Bit Rate
 b. Bit Error Rate
 c. ↓ downstream (base station to terminal)
 d. ↑ upstream (terminal to base station)

Natural Phenomena

- Remote Area with mountainous area , VSAT technology
- Remote Village with flat contour, Wireless Access or hybrid
- High Rain/tropical weather, operate in VHF to C band frequency
- Remote Area with Forestry area with VSAT technology or hybrid



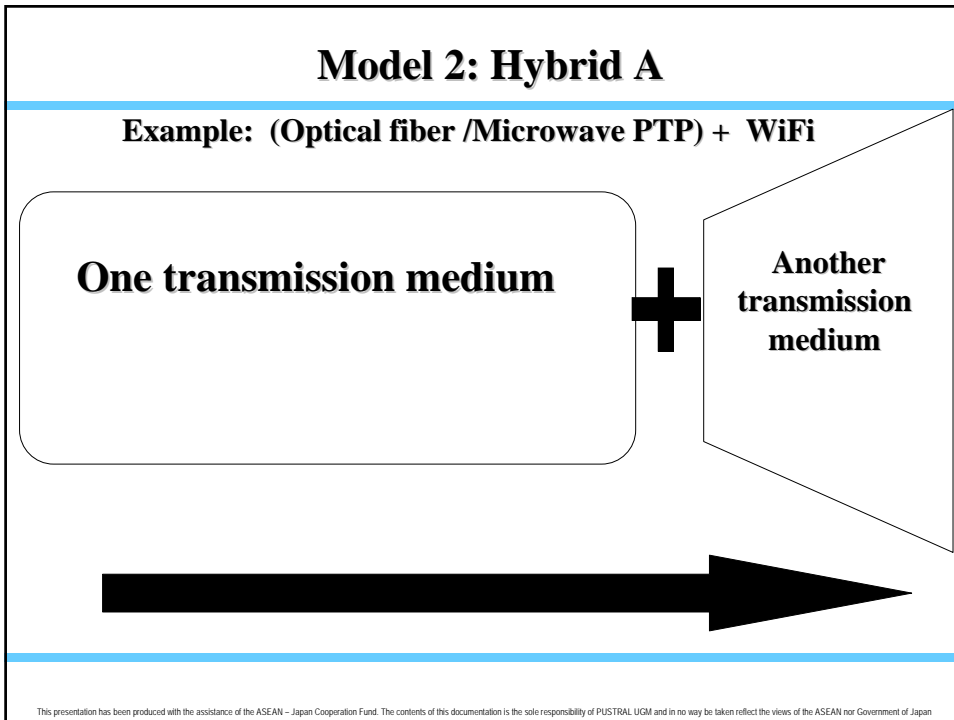
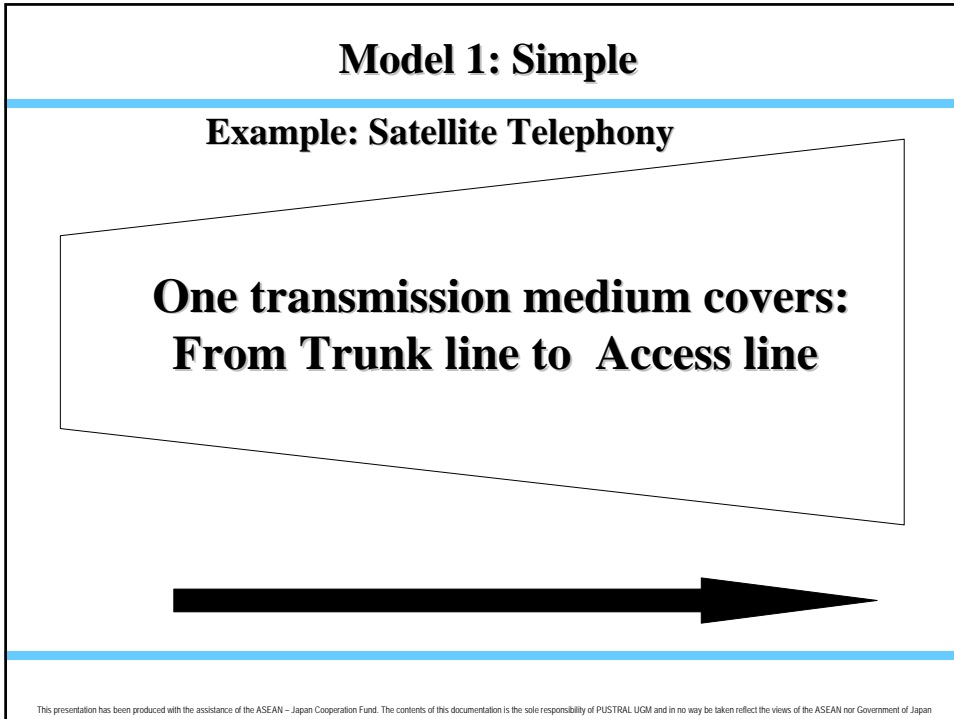


Type of Models

Model		Characteristics
Model 1	Simple	One transmission medium covers end to end
Model 2	Hybrid* A	Connecting Trunk line and Access line by using two different transmission medium
	Hybrid B	Rural areas where it is impossible to extend enough network, interface transmission placed between Backhaul and Access makes it more realistic.

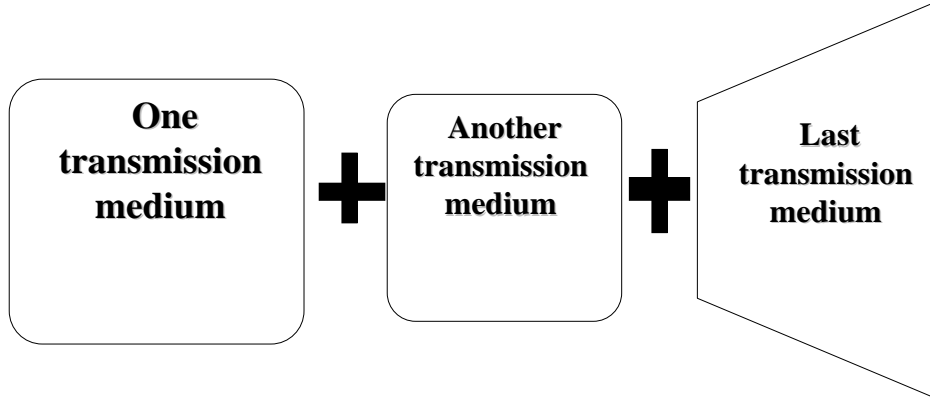
*Hybrid is defined as more than one transmission medium.

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Model 2 : Hybrid B

Example: Satellite+ WiFi + optical fiber



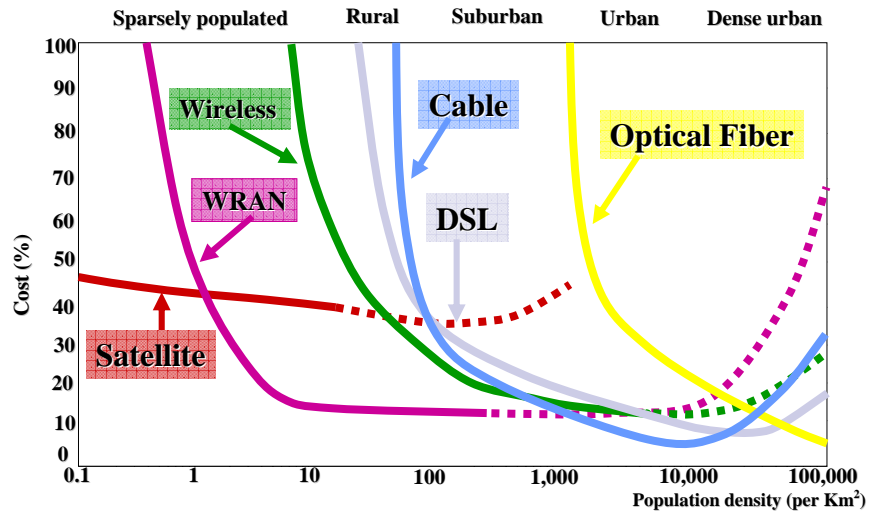
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Performance Estimation



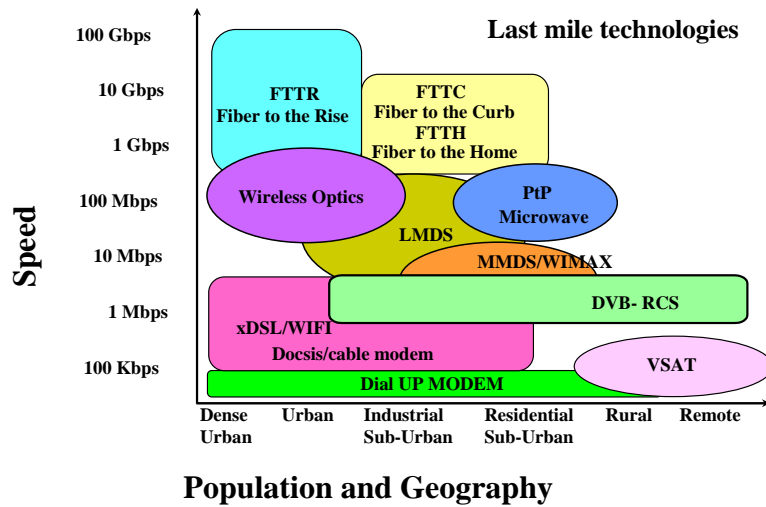
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A rough image of telecommunication infrastructure (Cost and Population Density)



Note: This table was prepared using the following sources: Gerald Chouinard, DEVELOPMENT OF THE NEW IEEE 802.22 WIRELESS REGIONAL AREA NETWORK (WRAN) STANDARD, ITU-D SG2Q10-2/2 DOC. Document 2/58-E Sept. 2006.

Speed, Population and Geography



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Power supply

- Power supply is the most crucial yet severe issue when dealing with telecommunication technologies for rural and remote areas.

Rural and remote areas where commercial power are not reached, power systems based on renewable energy resources such as wind power facilities, mini-hydroelectric power facilities, batteries and/or solar panel should be arranged.

- ICT facilities consistent with the capacity of power must be chosen.
- For more information see:
Output document of ITU-D SG2 Rapporteur's Group: "Analysis of case studies on successful practices in telecommunications for rural and remote areas." Available free of charge at: <http://www.itu.int/pub/D-STG-SG02.10.1-2006/en>

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Performance Assessment

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Broadband Connectivity (Commission of the European Communities)

- "Digital divide forum report: Broadband access and public support in under served areas"
(Dated 15.07.2005):
 - Download speeds between 144 kbps and 512 kbps have been the most common speeds rural users have subscribed to in the past two years (55-56% of users).

Source: http://ec.europa.eu/information_society/europe/i2010/docs/implementation/ddf_report_final.pdf (Retrieved 2007/08/30)

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Broadband Connectivity (India)

- In India, Broadband policy 2004 defines Broadband connectivity as an 'always-on' data connection that has the capability of the minimum download speed of 256 Kbps to an individual subscriber.

Source: ITU-D SG2 Q10-2/2 e-discussion web log at : <http://www.itu.int/ituweblogs/ITU-D-SG2-Q10/>

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Broadband Connectivity (ITU-D SG2 Q10-2/2)

- E-discussion group of ITU-D SG2 Q10-2/2 “Telecommunication for rural and remote areas” recommend to use 256Kbps* as broadband connectivity for rural and remote areas.
- This will not only allow access to internet, web-browsing, e-services for individual but also social or public usages such as medical consultation services, e-education services etc.

* Source: ITU-D SG2 Q10-2/2 e-discussion web log at : <http://www.itu.int/ituweblogs/ITU-D-SG2-Q10/>

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