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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS
Quality of service and performance

End-user multimedia QoS categories

ITU-T Recommendation G.1010

ITU-T G-SERIES RECOMMENDATIONS

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For further details, please refer to the list of ITU-T Recommendations

Classification of performance requirements into end-user Quality of Service categories

Based on the target performance requirements identified in Appendix I, the various applications can be mapped onto axes of packet loss and one-way delay as shown in Figure 1. The size and shape of the boxes provide a general indication of the limit of delay and information loss tolerable for each application class.
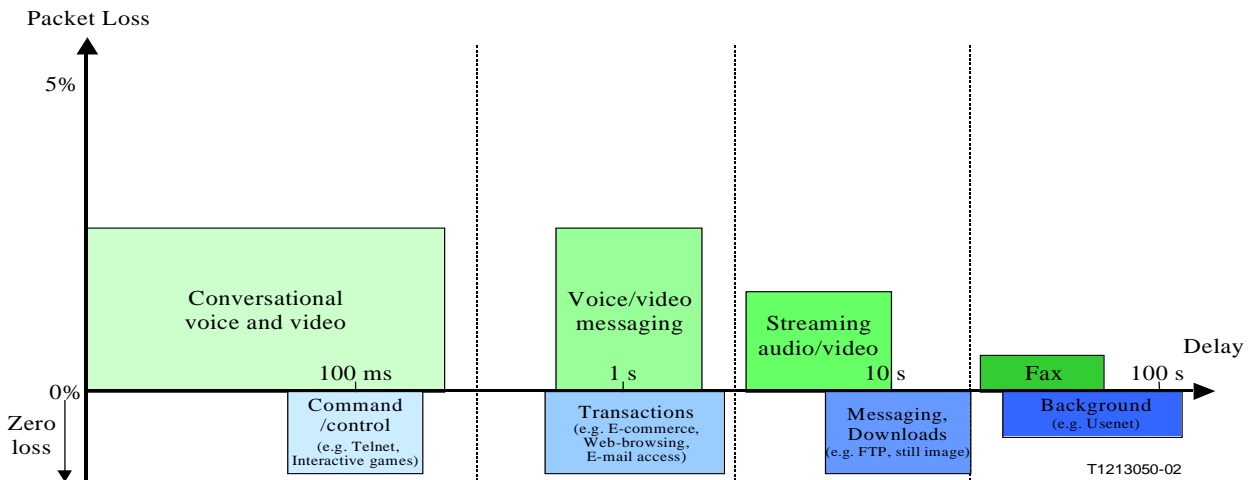

Figure 1/G.1010 – Mapping of user-centric QoS requirements

It can be seen that there are eight distinct groupings which encompass the range of applications identified. Within these eight groupings there is a primary segregation between applications that can tolerate some information loss and those that can not tolerate any information loss at all, and four general areas of delay tolerance.

This mapping can be formalised in Figure 2, to provide a recommended model for end-user QoS categories, where the four areas of delay are given names chosen to illustrate the type of user interaction involved. Of course, it is possible that each category could be subdivided into further categories to provide a range of quality levels for a specific service, as has been done for conversational voice in ETSI TS 101329-2 [4].
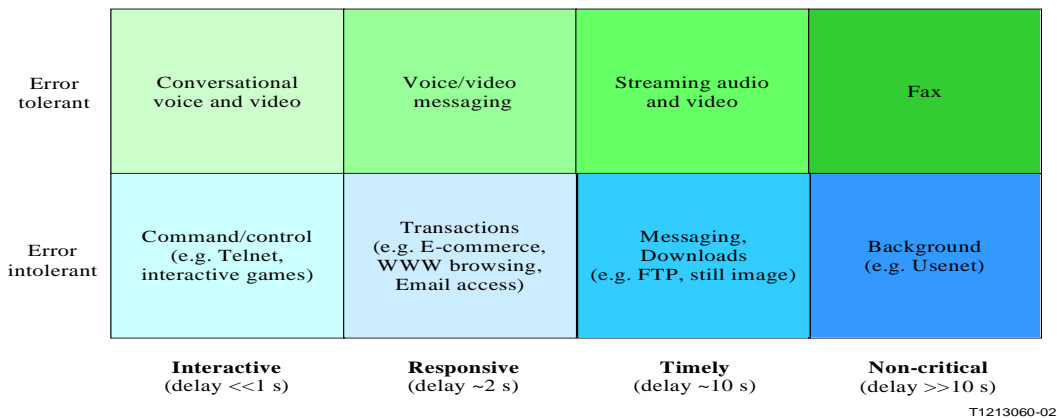

Figure 2/G.1010 – Model for user-centric QoS categories

Table I.1/G.1010 – Performance targets for audio and video applications

Medium	Application	Degree of symmetry	Typical data rates	Key performance parameters and target values			
				One-way delay	Delay variation	Information loss (Note 2)	Other
Audio	Conversational voice	Two-way	4-64 kbit/s	<150 ms preferred (Note 1) <400 ms limit (Note 1)	< 1 ms	< 3% packet loss ratio (PLR)	
Audio	Voice messaging	Primarily one-way	4-32 kbit/s	< 1 s for playback < 2 s for record	< 1 ms	< 3% PLR	
Audio	High quality streaming audio	Primarily one-way	16-128 kbit/s (Note 3)	< 10 s	<< 1 ms	< 1% PLR	
Video	Videophone	Two-way	16-384 kbit/s	< 150 ms preferred (Note 4) <400 ms limit		< 1% PLR	Lip-synch: < 80 ms
Video	One-way	One-way	16-384 kbit/s	< 10 s		< 1% PLR	
NOTE 1 – Assumes adequate echo control.							
NOTE 2 – Exact values depend on specific codec, but assumes use of a packet loss concealment algorithm to minimise effect of packet loss.							
NOTE 3 – Quality is very dependent on codec type and bit-rate.							
NOTE 4 – These values are to be considered as long-term target values which may not be met by current technology.							

Based on information in the Bibliography (Appendix II), Table I.2 provides an indication of suitable performance targets for data applications.

Table I.2/G.1010 – Performance targets for data applications

Medium	Application	Degree of symmetry	Typical amount of data	Key performance parameters and target values		
				One-way delay (Note)	**Delay variation**	**Information loss**
Data	Web-browsing – HTML	Primarily one-way	~10 KB	Preferred < 2 s /page Acceptable < 4 s /page	N.A.	Zero
Data	Bulk data transfer/retrieval	Primarily one-way	10 KB-10 MB	Preferred < 15 s Acceptable < 60 s	N.A.	Zero
Data	Transaction services – high priority e.g. e-commerce, ATM	Two-way	< 10 KB	Preferred < 2 s Acceptable < 4 s	N.A.	Zero
Data	Command/control	Two-way	~ 1 KB	< 250 ms	N.A.	Zero
Data	Still image	One-way	< 100 KB	Preferred < 15 s Acceptable < 60 s	N.A.	Zero
Data	Interactive games	Two-way	< 1 KB	< 200 ms	N.A.	Zero
Data	Telnet	Two-way (asymmetric)	< 1 KB	< 200 ms	N.A.	Zero
Data	E-mail (server access)	Primarily one-way	< 10 KB	Preferred < 2 s Acceptable < 4 s	N.A.	Zero
Data	E-mail (server to server transfer)	Primarily one-way	< 10 KB	Can be several minutes	N.A.	Zero
Data	Fax ("real-time")	Primarily one-way	~ 10 KB	< 30 s/page	N.A.	$<10^{-6}$ BER
Data	Fax (store & forward)	Primarily one-way	~ 10 KB	Can be several minutes	N.A.	$<10^{-6}$ BER
Data	Low priority transactions	Primarily one-way	< 10 KB	< 30 s	N.A.	Zero
Data	Usenet	Primarily one-way	Can be 1 MB or more	Can be several minutes	N.A.	Zero
NOTE – In some cases, it may be more appropriate to consider these values as response times.						