Multiple Concatenated Networks as an Application Example - The Move from Fixed Partitioning to Dynamic Allocation Principles

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Traditionally ... (1)
CCITT Approach

CCITT (and now ITU-T) recommended the allocation of transmission requirements to the

- originating National network
- International chain
- terminating National network

Traditionally ... (2) Subsequent National Approaches

National Administrations enforced the allocation of transmission requirements to the

- originating terminal
  or Private / Corporate network
- National PSTN
- terminating terminal
  or Private / Corporate network

Traditionally ... (3)
Example of Delay Allocation

Based on the "25 ms rule (M)" of G.131(Blue Book) many Administrations were running their intra-national telephone connections without insertion of echo cancellers (EC)

Typically delay allocation was done according to the following scheme:

- < 5 ms for originating private network
- < 15 ms for National PSTN
- < 5 ms for terminating private network

Traditionally ... (4)
Intellectual Basis

Allocation was based on experience. Values for each single parameter such as

- delay
- loss
- noise

No consideration of correlation and trade-off between these single parameters

Recently ... (1)
New Approach of the ITU-T

E-Model as given in G.107, with guidance on its application in G.108 and the subsequent definition of categories of end-to-end speech transmission quality in G.109

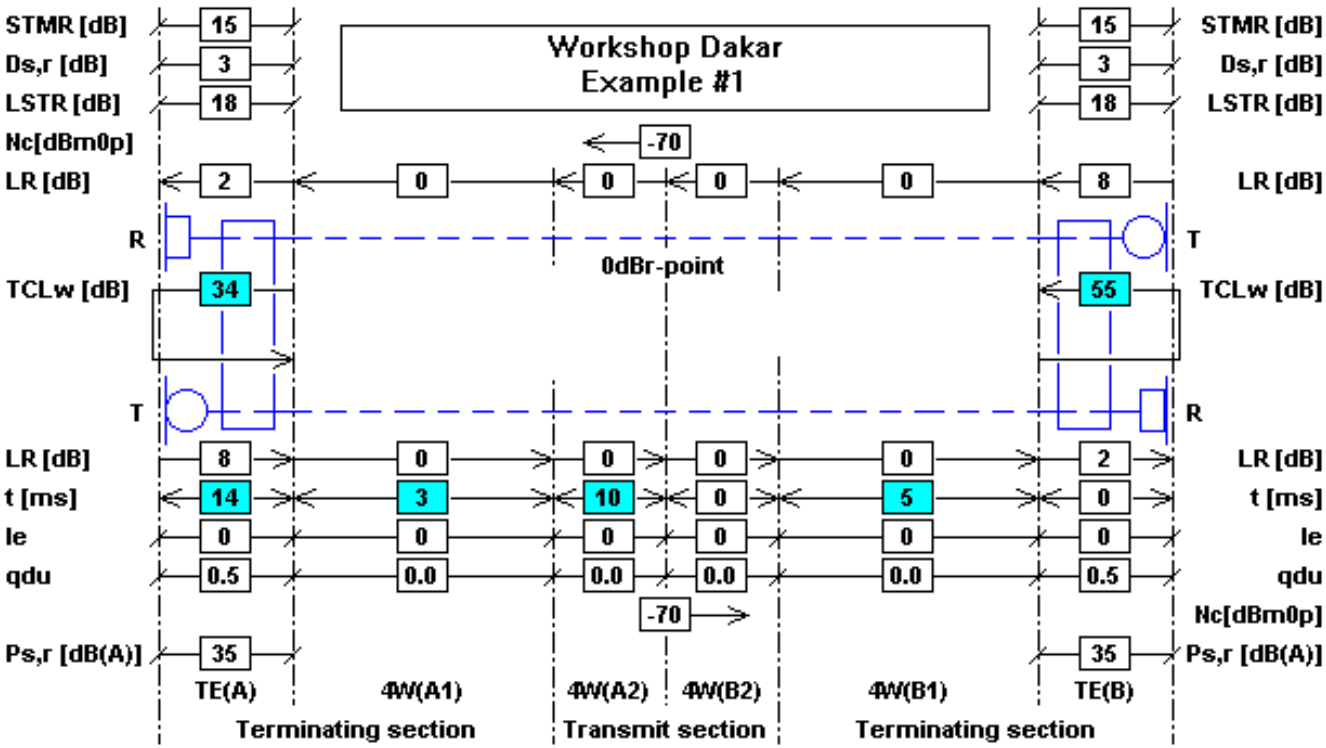
Calculated E-Model Rating R provides single value estimation of user perceived end-to-end speech transmission quality on the listening side

Recently ... (2)
New Approach of the ITU-T

Two examples are given in the following

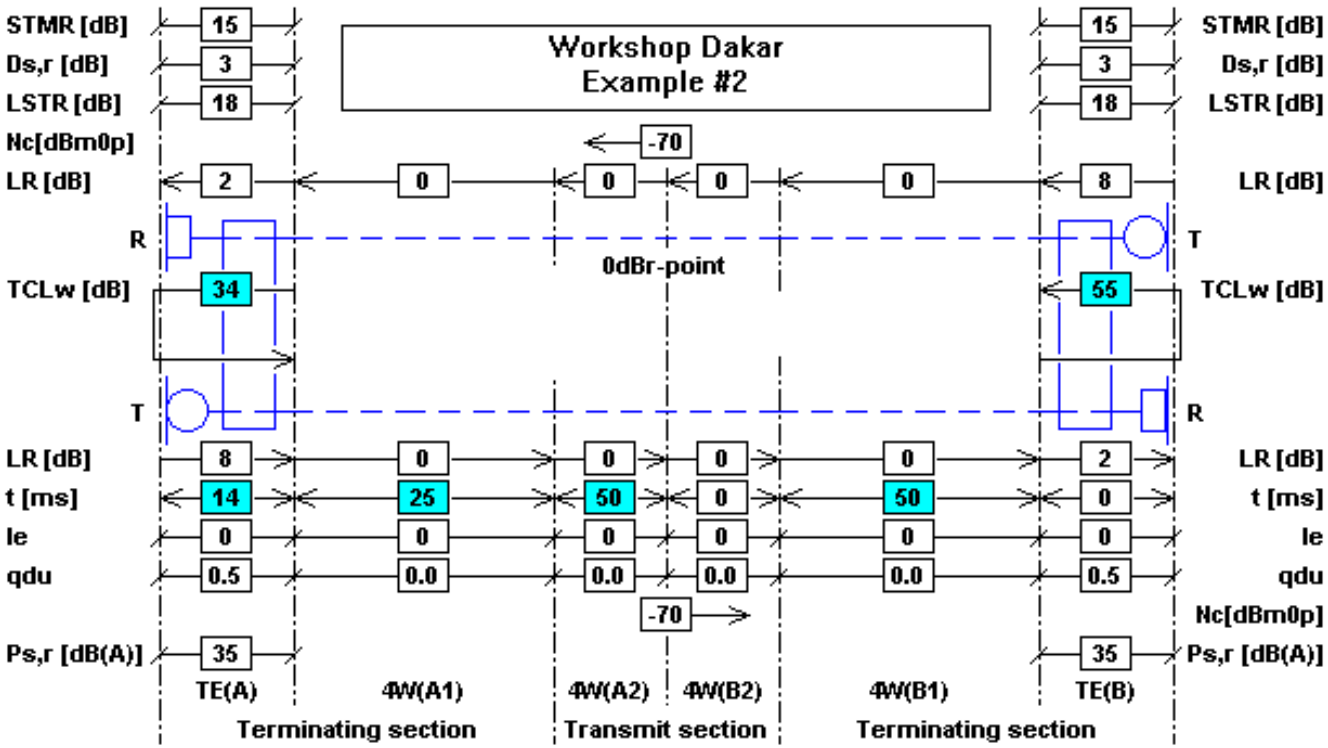
- with each a lower quality terminal on the left side and
- with each a higher quality terminal on the right side and
- with different concatenated networks in between

Recently ... (3)
Example #1



Impairment left Side						Impairment right side				
R	Itot	Is	Id	Ie		R	Itot	Is	Id	Ie
92.0	2.3	1.4	1.3	0.0		86.4	8.0	1.4	7.0	0.0

Recently ... (4)
Example #2



Impairment left Side						Impairment right side				
R	Itot	Is	Id	Ie		R	Itot	Is	Id	Ie
89.6	4.8	1.4	3.8	0.0		61.4	32.9	1.4	31.9	0.0

Recently ... (5)
Allocation questioned

Question: ?

- How to allocate end-to-end speech transmission quality to concatenated networks and terminals involved ?
- (who is guilty ?)

Answer: !

- Speech quality in terms of R can not be allocated to segments or to pieces of equipment in a connection

Recently ... (6)
Liberalization of TelCo Markets

Based on various regional initiatives, liberalization bills issued in many places have introduced significant changes

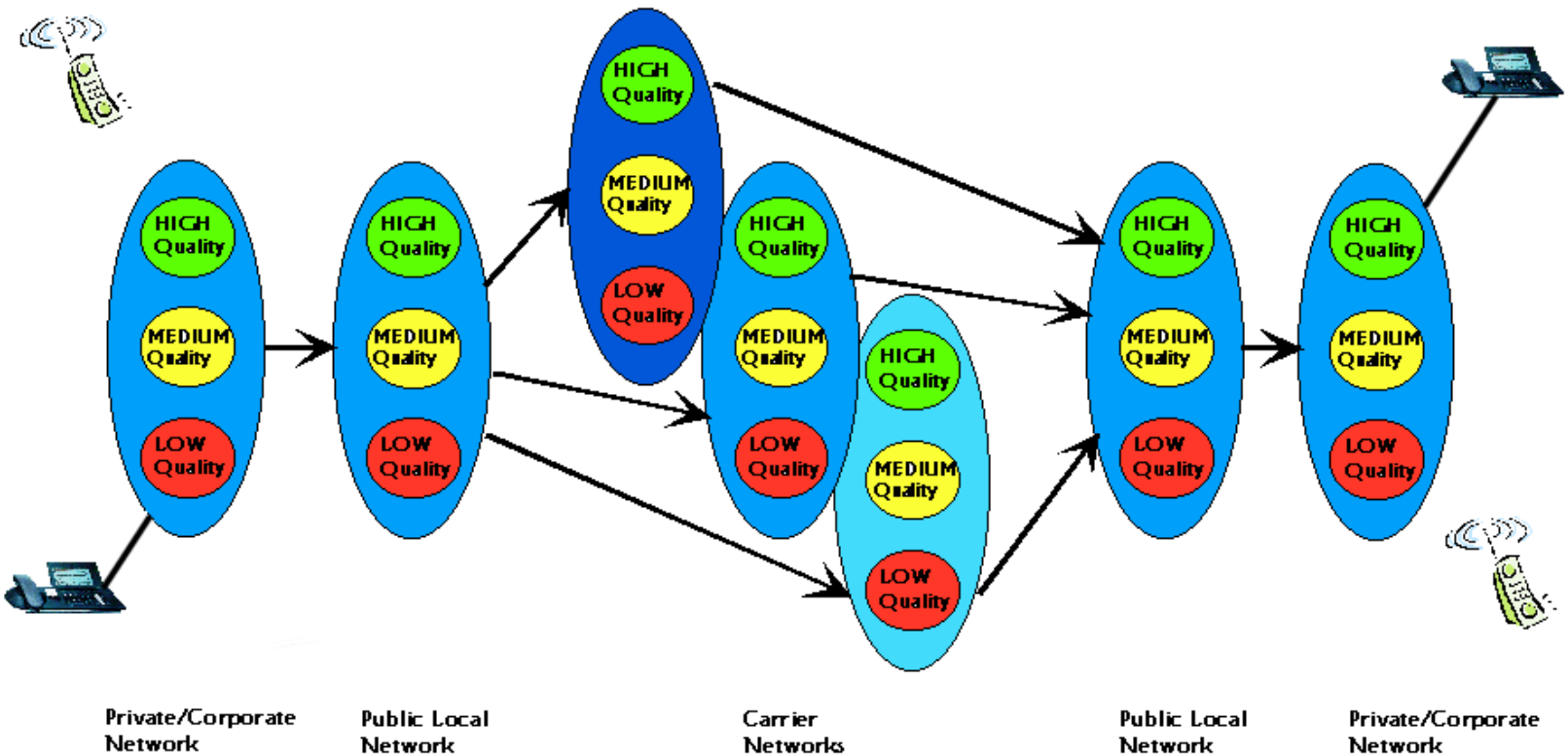
Customers have choice between

- various types of terminals
- different long distance carriers
- different local network operators

Enforcement of national transmission plans has been disabled, e.g. inside EU

Terminal approval has been abandoned

Recently ... (7)
Scenario of Choices



Currently ...
Challenges

Challenging situation caused by a combinatory effect of the following:

- Liberalization
- End-to-end modelling of speech quality
- Telephony service providers have to rely on doubtful market mechanisms
- Customers experience a worsening of speech quality in increasing number of cases

Still to do ... (1)
Complex Control or Simplification

In order to ensure reasonable end-to-end speech transmission quality various approaches are possible:

- Complex signalling infrastructure with all 19 input parameters of the E-Model and execution of real-time E-Model calculations all over the place
- or
- Introduction of simplifications or assumptions (not to say requirements)

Still to do ... (2)
Simplified Control Mechanisms

SS #7:

- delay counter
- satellite indicator
- echo control device indicator

ETSI ES 201 801 (2000-10):

- Transfer of performance parameters of connections on a per call basis; End-to-end speech transmission performance

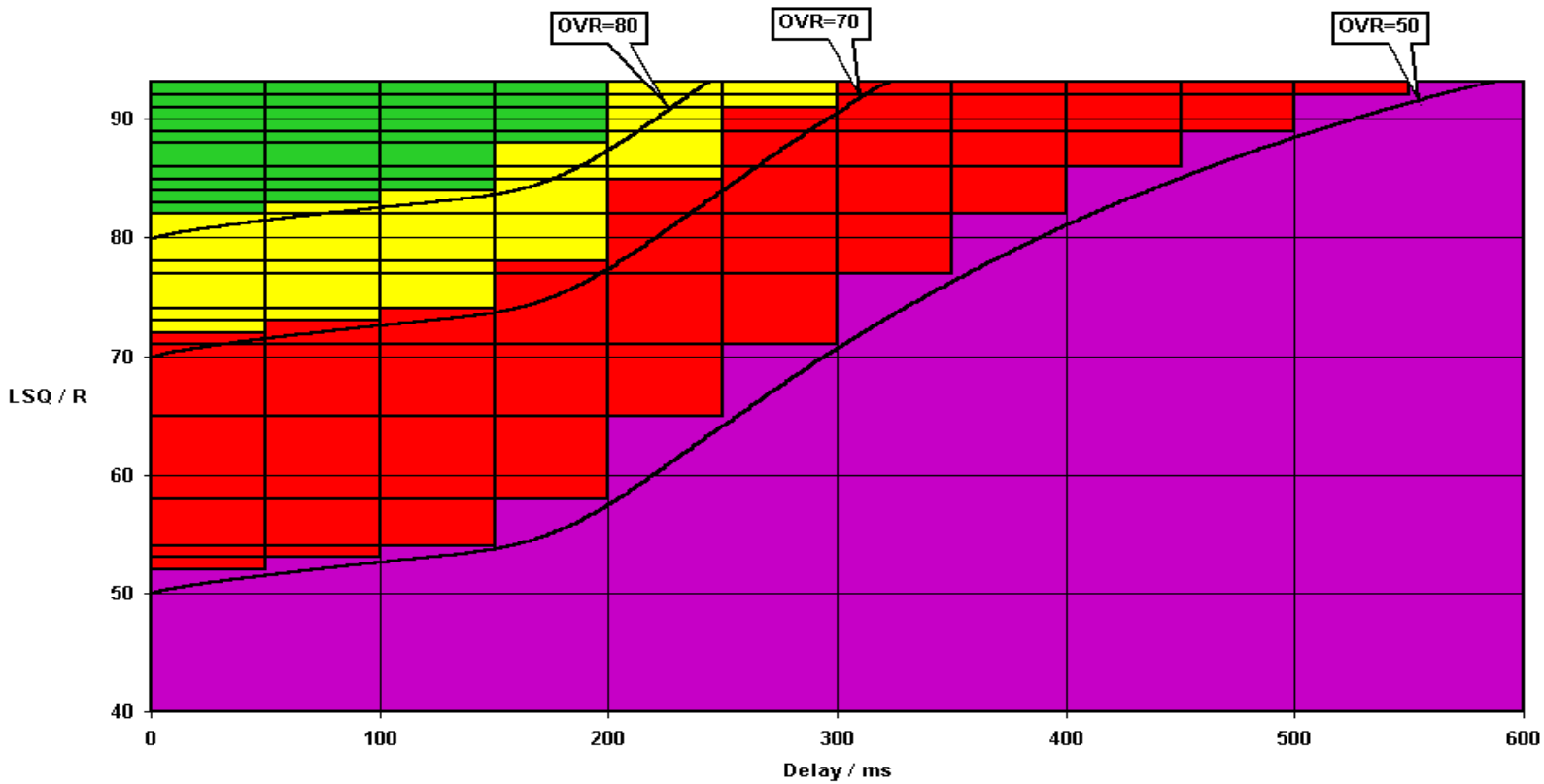
Several initiatives are underway in various standardization bodies

Still to do ... (3)
Simplified Control Mechanisms

ETSI Project TIPHON defines QoS classes as their term for speech quality description. This includes definition of signalling support and de-composition of the complex E-Model Rating R into:

- a set of parameters which are orthogonal to each other and for which some allocation principles may be valid
- remainder of parameters is assumed to have default (= good) values

Still to do ... (4)
Simplified Control Mechanisms



Still to do ... (5)
Simplified Control Mechanisms

Transformation of E-Model R = OVR into Delay and LSQ = (R - Ie) requirements.

Assumptions in order to facilitate this:

- perfect echo cancellation in place: TELR=65 dB and WEPL=110 dB
- for all terminal related parameters,
  E-Model default values are assumed

This challenge for IP terminals has been recognized by ANSI/EIA/TIA-810A which requires TCLw= 55 dB.

Any questions ?

Abbreviations

%GoB	Percentage Good or Better
%PoW	Percentage Poor or Worse
ANSI	American National Standards Institute
CN	Corporate Network
EC	Echo Canceller
EIA	Electronic Industries Alliance
ETSI	European Telecommunications Standardization
EU	European Union
Ie	Equipment Impairment Factor
IP	Internet Protocol
LSQ	Listener Speech Quality
MOS	Mean Opinion Score
OLR	Overall Loudness Rating
OVR	Overall Speech Quality Rating
PSTN	Public Switched Telephone Network
QoS	Quality of Service
R	E-Model Rating
TCLw	Terminal Coupling Loss (weighted)
TELR	Talker Echo Loudness Rating
TIA	Telecommunications Industry Association
TIPHON	Telecommunications & Internet Protocol Harmonization Over Networks
WEPL	Weighted Echo Path Loss

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