

IEEE CQR BREAK OUT SESSION ON
QUALITY OF EMERGING SERVICES

1998 Focus Area Session Chair	Masyuki Murata, Osaka University
1998 Focus Area Champion:	Bill Hoberg, Lucent Technologies
1998 Focus Area Editor:	Kelly Krick, Nortel Networks
1999 Focus Area Session Chair	Koichi Asatani, Kogakuin University
1999 Focus Area Champion:	Bill Hoberg, Lucent
1999 Focus Area Editor:	Amber Adams, Nortel Networks
2000 Focus Area Session Chair	Clayton Lockhart, AT&T
2000 Focus Area Champion:	Clayton Lockhart, AT&T
2000 Focus Area Editor:	Weider Yu, Lucent Technologies
<u>Participants</u>	

- [Definition](#)
- [Metrics](#)
- **World Class Performance**
- **Best Practices**
- **Best-in-Class Recognition**

Material from 1998 Workshop (5/5, Indian River Plantation Marriott Resort, Stuart, Florida):

I. DEFINITION

Quality of Emerging Services is based on the platforms and capabilities to deliver those services. As such a definition of the emerging services are required. Emerging services are those introduced within the last 5 years or significantly launched throughout the telecommunications networks within the last 5 years. (Internet qualifies as an emerging service.)

Internet & Multimedia

- Dial-up Access
- Dedicated Access
- IP Voice
 - IP Radio
 - IP Telephony

- Video
 - Broadcast
 - 2 way/Conferencing
- Multicasting Multimedia
- Multimedia on demand
- Information “Browsing”
- Virtual Private Network
- Email+
- Chat
- Electronic Bulletin Board
- Entertainment & Games
 - Multi-party games
- Web Publishing
- Web/Email Advertising
- Broker/Stocks
- Medical Services
- Virtual Reality
- Electronic Commerce
 - Electronic Cash (Banking)
 - Trusted 3rd Parties
 - Key Management
 - Digital Signature
 - Secure Sockets

Mobile Remote Communications/Wireless

- Satellite
 - Broadcast Video Distribution
 - Internet Access (Downlink)
 - Imarsat
 - LEO
 - Iridium
 - Global Star
- Cellular
 - Analog
 - Digital
 - TDMA
 - GSM
 - CDMA
- Global Positioning System (Location)
 - Intelligent Transportation System
- Paging w/ text or voice
- Internet Access
- Remote Sensing
- Wireless LANs
- Packet Data Transport
- Email
- Point to Multipoint Video

FAX
Global Network

Broadband

- Cell Relay
- Permanent Virtual Circuits
- Switched Virtual Circuits
- Multi-media Access Asymmetric
- Asymmetric
 - ADSL
 - Cable TV
 - Internet Access
 - Telephony
 - Video Broadcast
 - Digital Satellite
- Symmetric
 - Frame Relay
 - Switched Mega Data Service
 - ATM

Quality of Emerging Services is not based on plain old telephone service (POTS)

II. METRICS

Quality of Emerging Services can best be measured by establishing attributes of quality and refining those attributes into metric definitions. Below are listed the attributes from this workshop. Subsequent workshops need to focus on the definitions for these attributes. Once accomplished, the metrics could be collected and weighted and would be valuable to base decisions.

Attributes

Product/Service related attributes

- Performance
 - Error Free
 - Latency/Throughput
 - Availability
 - Speed
 - Response Time
 - Access Time
 - Good Quality
 - Accuracy
- Reliability
 - Availability

- Mean time to repair
- Delivery – Status/Confirmation
- Robustness
- Two Phase Commit (Transactions)
- Dependability
- Session Stability
- Scope of Measurement (Global vs. Local)

- Friendly / Usability
 - Congestion Friendly
 - User Friendly
 - Easy Service Portability
 - Adaptability
 - Expandability
 - Flexibility
 - Maintainability

- Security
 - Availability
 - Privacy**
 - Confidentiality
 - Integrity
 - Accountability

Business related attributes

- Effective Customer Support
 - Technical Support
 - Billing
 - Provisioning
 - Cessation

- Customer Business Fit
 - Cost Effective
 - Provides Value
 - Features & Functionality
 - Satisfies Customer Needs – On budget, Timely, and Fit for purpose
 - Effectiveness

- Differential Guarantee Service
 - Priority
 - Best Effort vs. Guarantee
 - Service Level Agreements (Variety and Measurements)

Material from 1999 Workshop (4/20, Rancho Bernardo Inn, San Diego California):

Wireless Service Quality can be defined as the condition by which we seek to maximize customer care, accessibility, and media & channel quality in a secure manner at a reasonable cost within the framework of existing technology.

Wireless Service Quality includes . . .

- Customer care
- Billing
- Customer service
- Accessibility
- Coverage capacity
- Call completion
- Seamless mobility
- Smooth handoff between cells
- No dropped calls
- Convenient service (anytime, anywhere)
- Privacy
- Confidential conversations
- Fraud protection
- Terminal / handset characteristics
- Durability
- Resilience
- User-friendliness
- Price differentiation
- Customer expectations of quality vary with price of service
- Media quality
- Fax / data quality
- Transmission reliability and clarity
- Network application quality
- Channel quality
- No delays
- Sound quality
- Noise-free / echo-free
- Signal quality

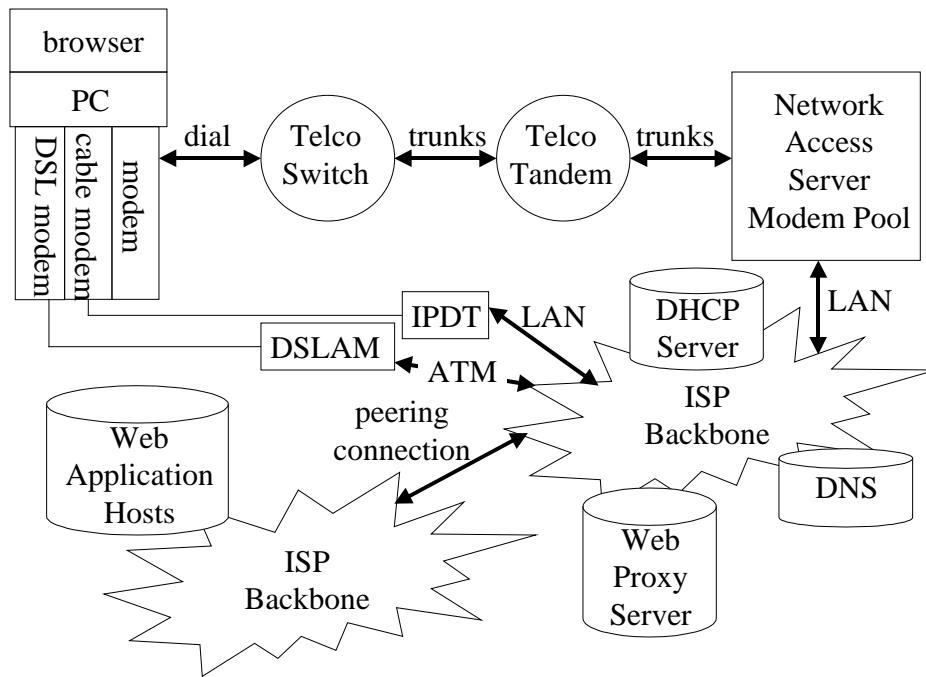
Wireless Service Quality does not include . . .

- Pricing
- Cost of service
- Availability of service features
- Caller ID
- Call waiting
- Provisioning
- Roaming
- Frequency
- Bandwidth

Material from 2000 Workshop (4/19, Creta Paradise Beach Resort, Chania, Island of Crete, Greece):

III. WORLD CLASS PERFORMANCE

To provide a quantification of world-class performance, the working group decided to focus on “Access to Internet-based Web Information” as a sample emerging service. Access includes not only dial access via modem, but also dedicated access via Digital Subscriber Line, Private Line or Cable Modem. During the course of the discussion a reference connection model was created (shown below), metrics for the end-to-end user experience were itemized, and a number of performance bottleneck and failure points were listed in the reference connection.



Typical Reference Connection(s) for Access to Web Application Services

Some definitions:

DHCP: Dynamic Host Configuration Protocol

ISP: Internet Service Provider

DNS: Domain Name Service

DSLAM: Digital Subscriber Line Access Multiplexer
IPDT: IP Data Terminal
ATM: Asynchronous Transfer Mode
LAN: Local Area Network

It was noted that the end user experience could suffer degradation for a number of reasons due to the complexity of the (minimal) reference architecture above. The end user experience was categorized by the standard DPM attribute categories of **Accessibility**, **Continuity** and **Fulfillment**. A transaction is considered to be an interactive Web session from the beginning of the implied connect (via browser launch or dialer launch) to a graceful termination by the user. The metrics for this service were chosen to be:

Accessibility:

- 1) No connect (blocking): A successful connect state refers to the ability to view a home page (assumed to non-graphics or Java intensive) after the browser has been launched.
- 2) Location mis-routing: Mis-routing refers to either getting the wrong dial access number (in the case of dial-up) or the wrong URL.
- 3) Connect time: Connect time refers to the time passed to achieve a successful connect state.

Continuity:

- 1) Drop-out rate: Drop-out refers to a phenomenon of not being able to connect to any, non-locally cached URL, which could be for any number of reasons.
- 2) No response from site: No response from a site refers to the inability of the browser to receive HTML from a URL which was valid from the last time the user connected to that URL.

Fulfillment:

- 1) Throughput rate: Throughput is the steady state rate, with protocol overhead, of an HTTP or FTP session, relative to the raw bit rate of the transmission access medium.

It was noted that various elements of the architecture could cause the end-user perceived quality degradations. In particular:

- 1) Poor loop quality
- 2) No circuit conditions in the POTS network
- 3) Transmission line coding mismatches
- 4) Use of DCME / satellite transmission techniques
- 5) Modem exhaust
- 6) Modem ring no answer conditions
- 7) Bad modem
- 8) ISP IP backbone congestion or outage
- 9) DNS congestion or outage
- 10) HTTP proxy / caching server congestion or outage
- 11) Peering link / exchange point congestion or outage
- 12) Web hosting server congestion or outage

World-class performance parameters were suggested in the DPM categories above.

Accessibility:

- 1) No connect (blocking): No more than 0.1% of no connect (Only one in 1000 times of dial access is blocked; 99.9 % of successful connect)
- 2) Location mis-routing: No more than 0.1% of location mis-routing (Only one in 1000 times of dial access is location mis-routing; 99.9% of correct location mis-routing)
- 3) Connect time: No more than 15 seconds 90% of the time for dial access
No more than 8 seconds 95% of the time for dedicated access

Continuity:

- 1) Drop-out rate: No more than 0.1% of drop-out for any length transaction
- 2) No response from site: No more than 1% of no response from site

Fulfillment:

- 1) Throughput rate: Achieve at least 90% utilization of access medium bandwidth

PARTICIPANTS

The 1998 working group participants consisted of the following industry professionals.

Name	Company
Chen, Chi-Ming	AT&T
Doran, Marvin	Nortel
Ekholdt, Roald	Norwegian PTA
Friedmann, John	AT&T
Fujita, Yasuyuki	Osaka University
Harrison, John	BT
Hasegawa, Go	Osaka University
Hoberg, William	Lucent
Krick, Kelly	Nortel
Luckenbaugh, Gary	Lockheed Martin
Mase, Kenichi	NTT
Murata, Masayuki	Osaka University
Pennington, William	DSC
Zamanali, Jalal	Lucent

The 1999 working group participants consisted of the following industry professionals.

NAME	TITLE	COMPANY	STATE/ COUNTRY
Adams, Amber	Metrics Analyst	Nortel Networks	Texas, U.S.A.
Ahmed, Hanan	System Engineer	Ericsson Research	Quebec, Canada

Asatani, Koichi	Professor	Kogakuin University	Tokyo, Japan
Dang-Tran, Quan	Manager Network Services	Nokia Telecommun.	Texas, U.S.A.
Hoberg, William	Dist. Mem. Tech. Staff	Lucent Technologies	Illinois, U.S.A.
Krick, Kelly	Director Operations	Nortel Networks	New Jersey, U.S.A.
Mahmoud, Esmat	Sr. Tech. Staff Mem.	AT & T	New Jersey, U.S.A.
Parkinson, David		British Telephone	Suffok, England
Rauscher, Karl	Technical Manager	Lucent Technologies	Illinois, U.S.A.
Stavroulakis, Peter	Director	Telecomm. Systems Institute	Greece
Yamazaki, Yoshiharu	Quality Manager of Mobile Com.	NTT DoCoMo	Japan
Yu, Weider	Dist. Mem. Tech. Staff	Lucent Technologies	Illinois, U.S.A.
Zamanali, Jalal	Mem. Tech. Staff	Lucent Technologies	Illinois, U.S.A.

The 2000 working group participants consisted of the following industry professionals.

Name			Company	Country
Pamela	J	Aduskevich	AT&T	USA
Chi-Ming		Chen	AT&T	USA
Anastasios	A.	Economides	University of Macedonia	Greece
Hossein		Eslambolchi	AT&T	USA
Russell	M.	Johnson	Bookham Technology Ltd	Netherlands
John		Koulouris	OTE	Greece
Kelly	J.	Krick	Nortel Networks	USA
Clayton	M.	Lockhart	AT&T	USA
Esmat		Mahmoud	AT&T	USA
Spilios	E.	Makris	Telcordia Technologies	USA
Marcello	B.	Melgara	CSELT	Italy
Clyde		Miller	Nortel Networks	USA
E.	N.	Protonotarios	National Technical University of Athens	Greece
Barbara	T.	Reagor	Telcordia Technologies	USA
Weider	D.	Yu	Lucent Technologies	USA