MOBILE BROADBAND QUALITY OF SERVICE EXPERIENCE

Dialog Telekom Plc

29th April 2009

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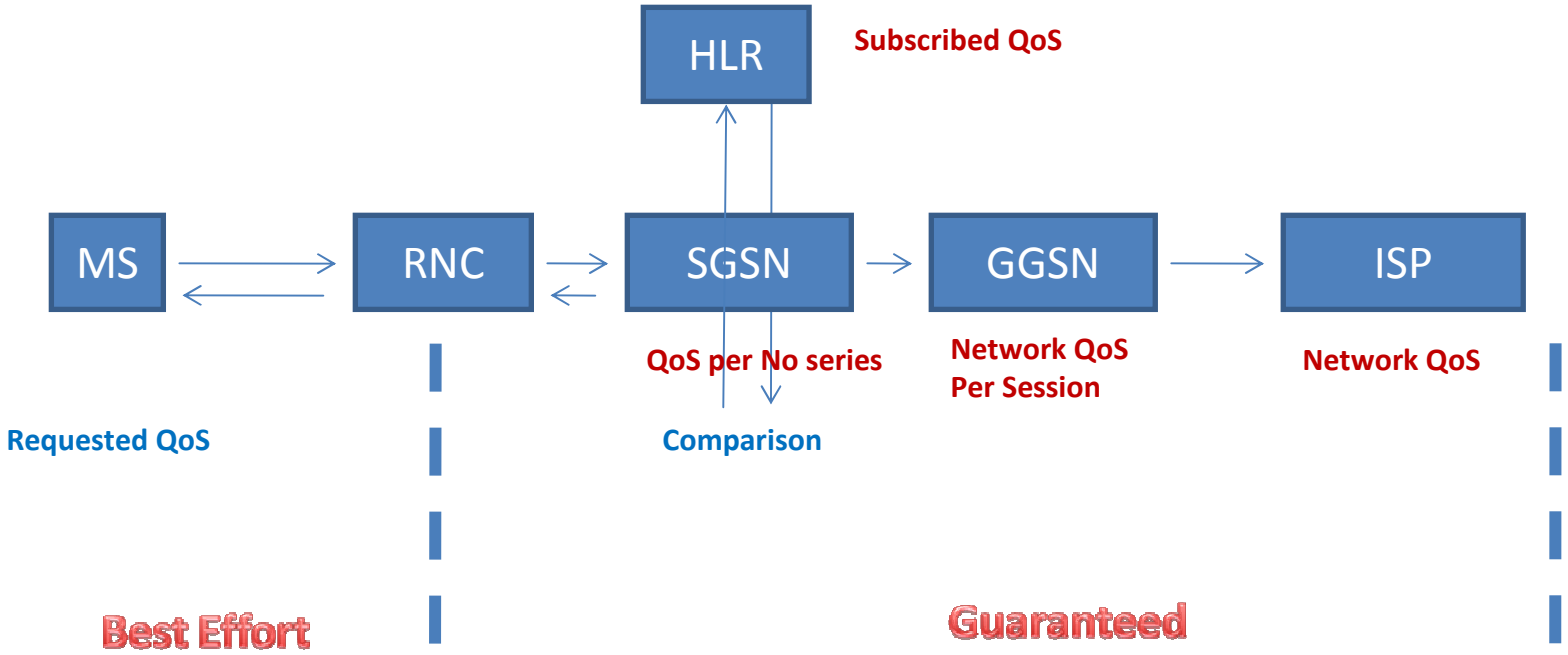
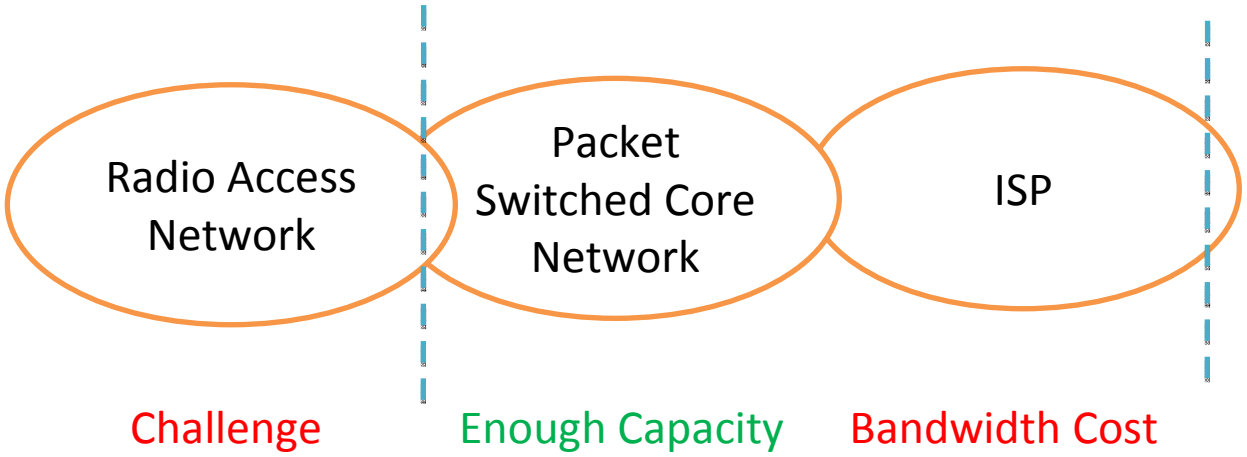
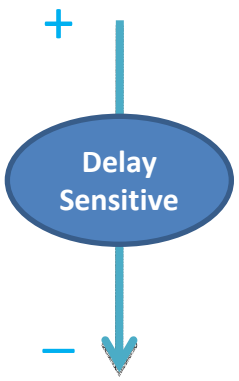
End to end QoS Delivery



End to end QoS Delivery & Issues





QoS Classes

- Conversational (voice)
- Streaming (video streaming)
- Interactive (web browsing)
- Background (email)

Future Of Mobile Broadband Provisioning - Billable QoS idea

- Dialog already introduced its FUP packages
- Service aware billing platforms

  > **Service Providers can offer specialized paid services** that allow subscribers to choose special traffic treatment, such as blocking or prioritizing packets from specific applications

  - Save Network Resources & eliminate BW abuse
  - Subscriber-focused business

  > **Subscribers can choose to give priority to applications** with greater sensitivity to the timing and reliability of packet delivery (such as video on demand), ensuring fewer delays and dropped packets resulting in billable QoS.
- Operator readiness
- Customer awareness

Win – Win for Operator & Subscriber!

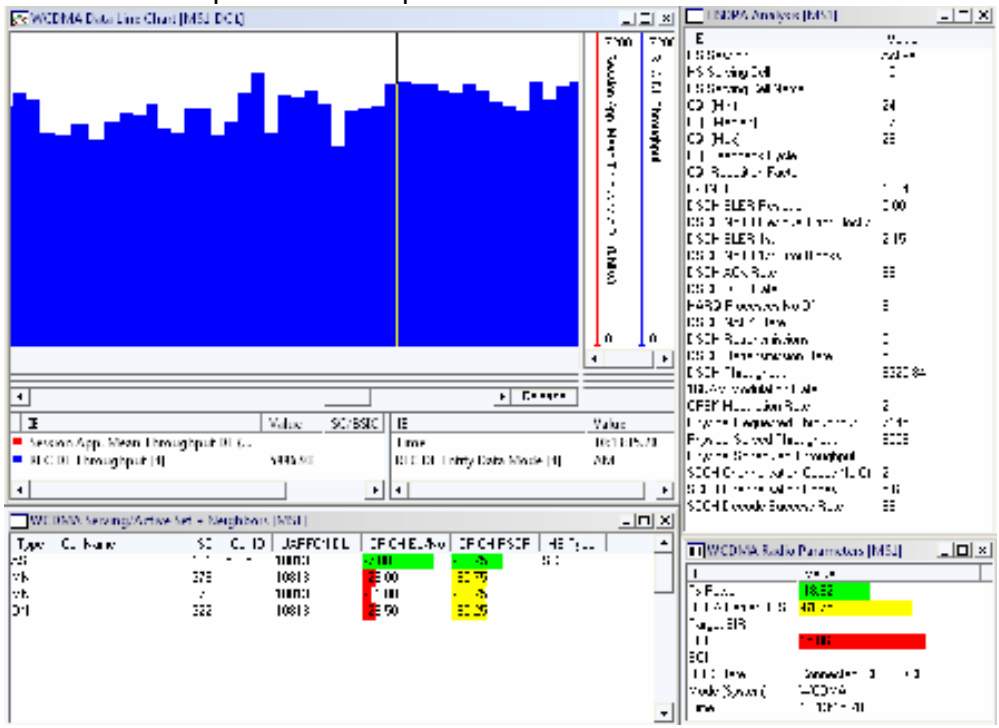
Radio Network – Biggest Challenge to delivering QoS to end users

Limiting factors

- Shadowing
- Multipath fading
- Interference
- Path loss
- Power limitations
- Cell breathing in CDMA technologies

Due to above limitations realized throughputs are always much lower than the theoretically specified

Practical example of a 7.2Mbps cell



Accessibility and Retainability are equally important as Throughput and Latency

Always it is a trade off between higher QoS and system capacity !!

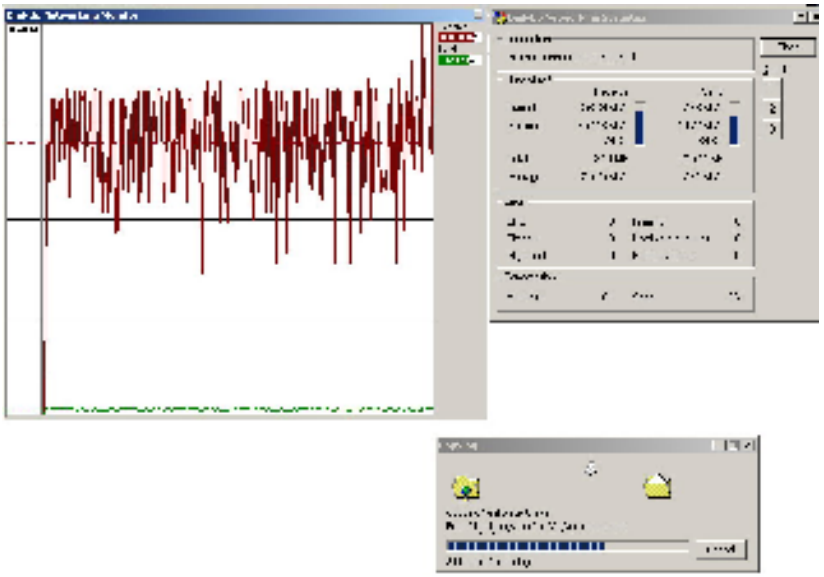
QoS Evolution in UTRAN and Dialog Experience

	R99	R4/5	R6	R7	R8
DL(Mbps)	.4(FDD)	3.6/7.2/14.4	14.4	28.8 (HSPA+)	42 (HSPA+) 173 (LTE)
UL(Mbps)	.4	.4	5.76	11.5	11.5(HSPA+), 58 (LTE)
Round trip time(ms) - target	Less than300	Less than 100	Less than 50		LTE-Less than30ms

Dialog Network has evolved now to R7 compliant with **21Mbps/5.76Mbps**

Initial 3G network (R 99) – 2005

Location – Union place, Colombo 02



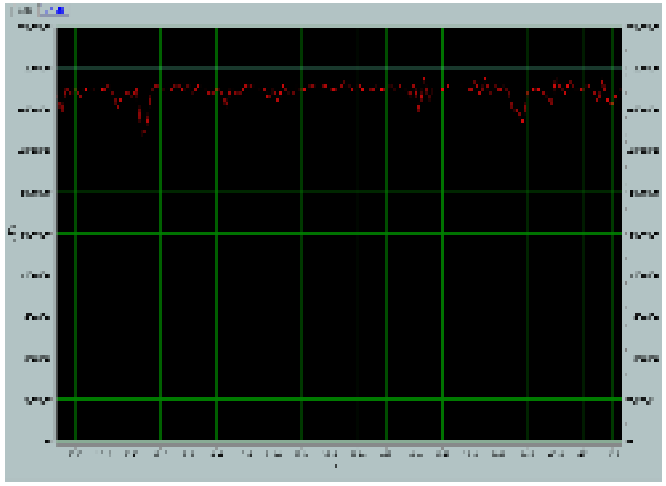
Average data rate = 315kbps

Latency = 250ms

Release 4/5 Experience

HSDPA 7.2 network – 2007

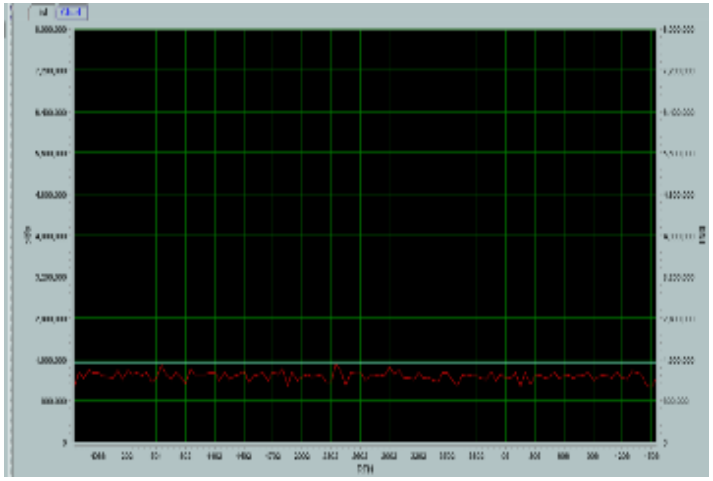
Location – Thorana Junction



Average data rate = 6.9Mbps Latency = 95ms

HSUPA 1.9 network – 2007

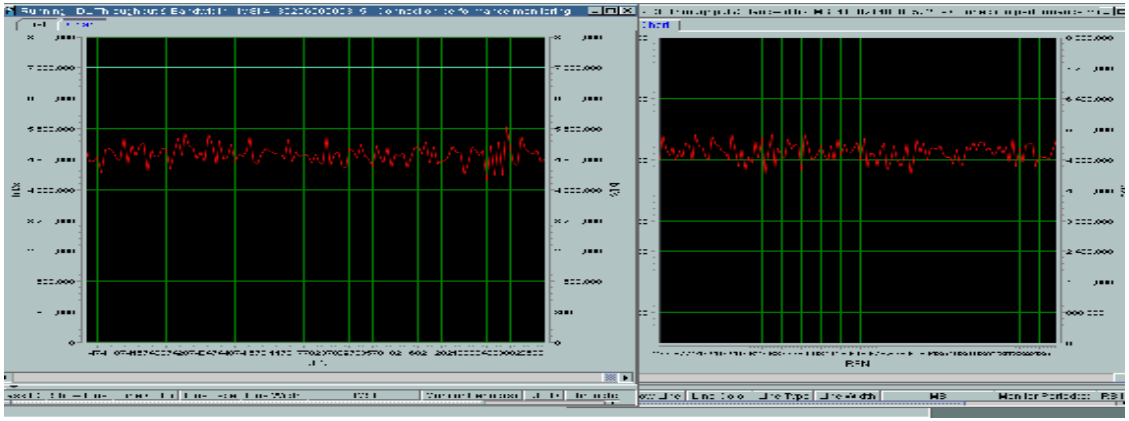
Location – Thorana Junction



Average data rate = 1.22Mbps

HSPA 14.4 network – 2007

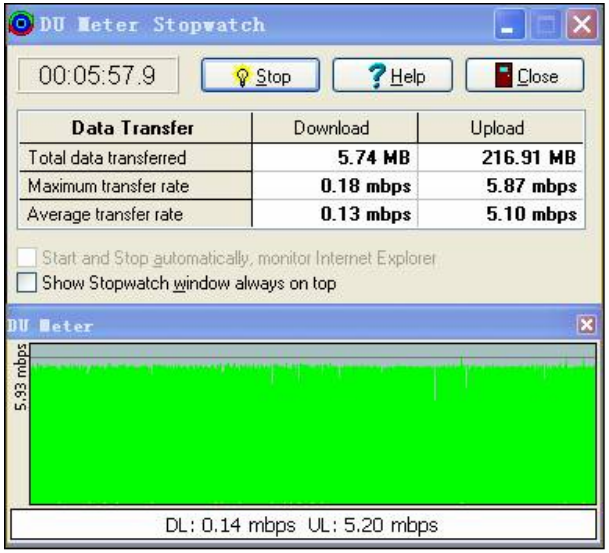
Location – Kollonnawa



Average data rate = 13.13Mbps Latency = 95ms

HSPA 14.4/5.76 network (R6)– 2008

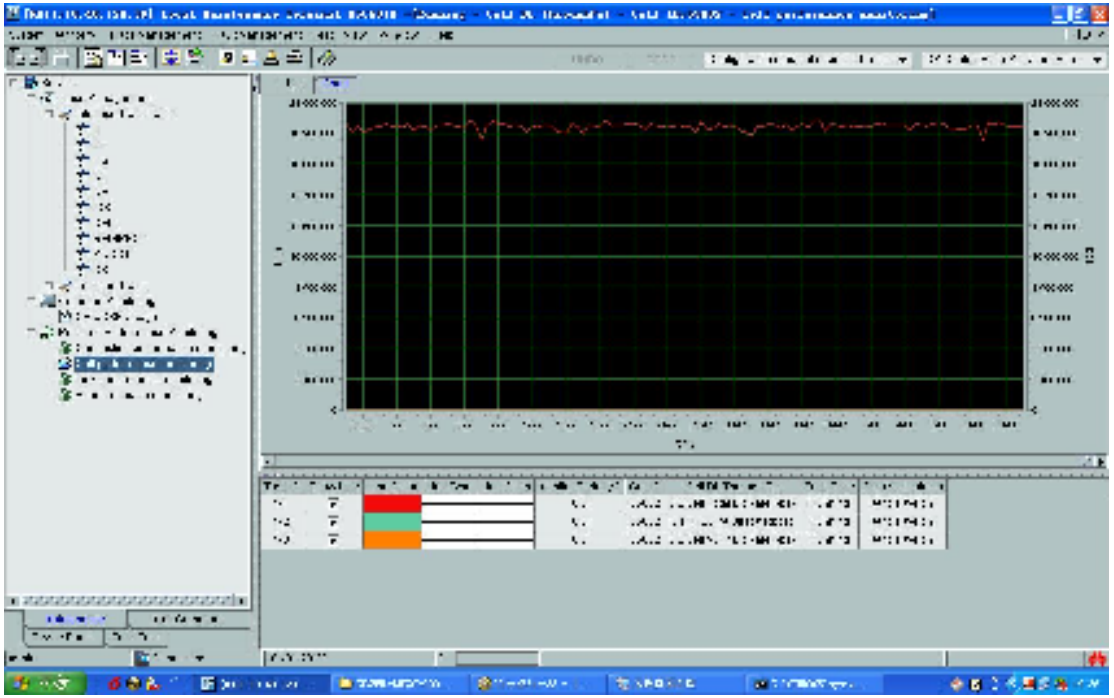
Location – Arena (Dialog Future world)



Average UL speed = 5.2Mbps

HSPA 21Mbps network (R7) – 2009

Location –Arena (Dialog Future world)



Average data rate = 19.2Mbps

Latency = 57ms

Other Practical limitations in delivering higher QoS through radio network

Limiting factors	Dependency	How to overcome
Cell breathing	Cell plan and the number of users	Better cell plan and increased number of sites
Maximum number of user per cell	Vendor dependant	procuring & installing more licenses
Channel Elements	vendor dependant implementation	More licenses and hardware
Backhauling	Transmission network	More investment
TX power	Cell plan and availability of hardware	More sites
other licensed features	vendor dependant	procuring & installing more licenses & hardware

Ultimately it comes down to economics

Equipment suppliers are increasingly moving from telecom vendors to software vendors, thus leveraging on the license mechanisms for telecom features

3G/HSPA Data market in Sri Lanka is still maturing both geographically and in different market segments

This poses a great challenge to provide system coverage and capacity to accommodate the highest QoS

For operators its is a balancing act between Investment, Returns and Quality of Service !

THANK YOU