Providing VoIP Services over UMTS-HSDPA with Frame Aggregation

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Evaluate metric: User Outage
Given a delay budget $D$, maximum tolerable packet loss $q$,

Outage if $\text{Prob}(\text{packet-delay} > D) > q$
High Speed Downlink Packet Access

• Targeted for high data rate wireless data service up to 2Mbps

• New features (Node B – UE)
  – Link Adaptation
  – Hybrid ARQ
  – Packet Scheduler
    • Utilizing multi-user diversity
    • Large delay variations

• Can it support VoIP??
  – difficult to analyze
  – simulation
Packet Trace of a VoIP Session

Channel Fading And Scheduling Delay

Fading Matters
Impact of Frame Aggregation

Tradeoff aggregation delay for better bandwidth utilization
Impact of Admission Control

Performance Bottleneck

Allowing appropriate coverage holes helps overall performance
Impact of CDM Capability

TDM – Multi-user diversity
CDM – QoS provision

50User Deployed, 1&4 Frame Aggregation, min G=5dB, CDM=1&2

Proportion of Users with Packet loss > 2%

Delay Budget (ms)

CDM is important
Impact of Receiver Diversity

Reduce deep fading
Overall System Performance

The delay required subject to 5% of user outage
Conclusions

- VoIP capacity is quite sensitive to delay budget
- Without limitation on rate profile, frame aggregation does not help in lightly loaded systems
- Bottleneck at low geometry users (could use fast cell site selection to help)
- Receive diversity helps tremendously.