TSG RAN WG 1#9 **TSGR1#9(99)j35**
Dresden, Germany
November 30-December 3, 1999

Agenda item: **AH14**
Source: **Golden Bridge Technology**
Title: **Critique of the Uplink Gating method proposal**
Document for: **Discussion and approval**

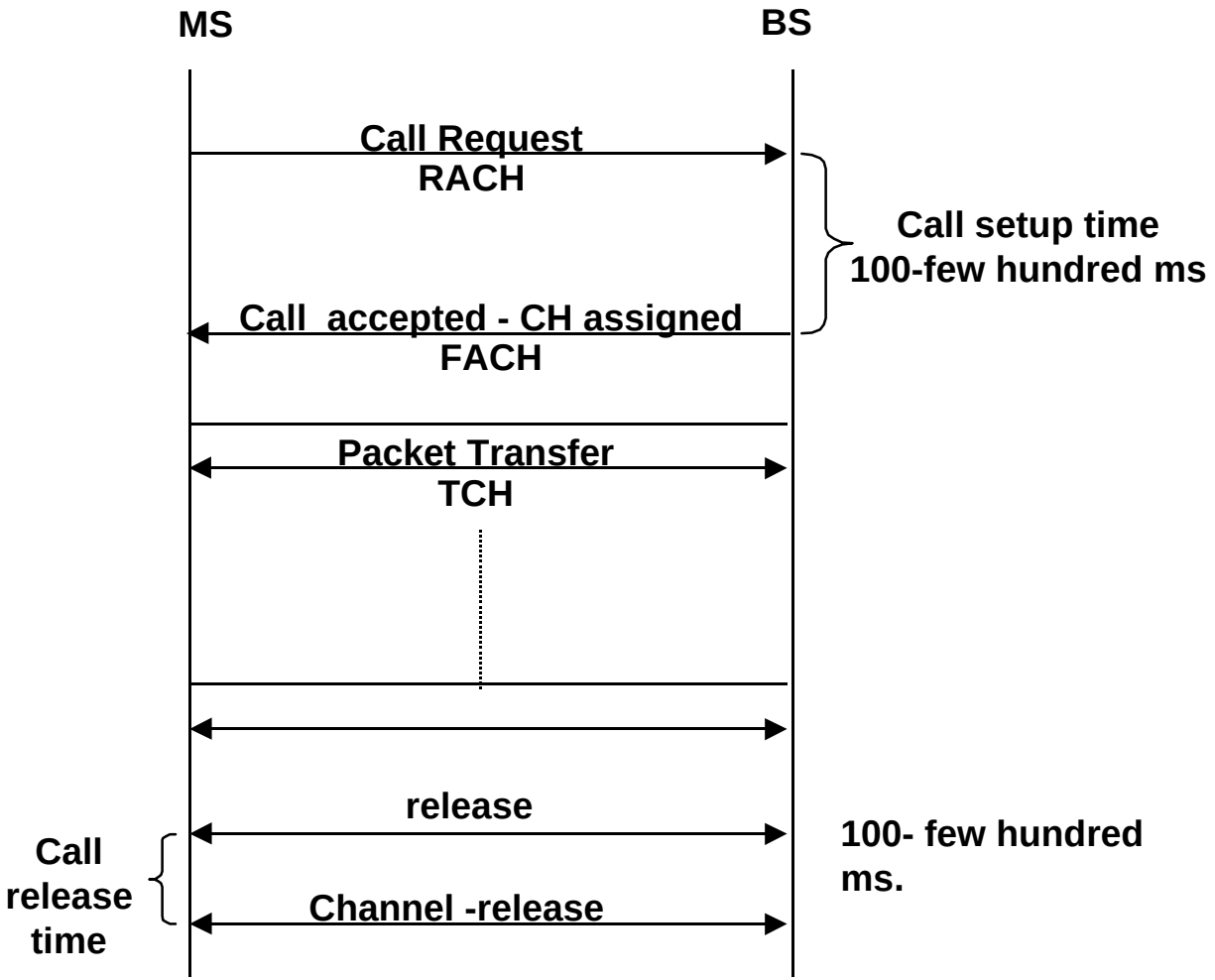
Conclusion: Gating method does not provide any gain in terms of UE power consumption or reduction of uplink interference as compared to Stop and Resumption control.

Last Updated: November 15, 1999

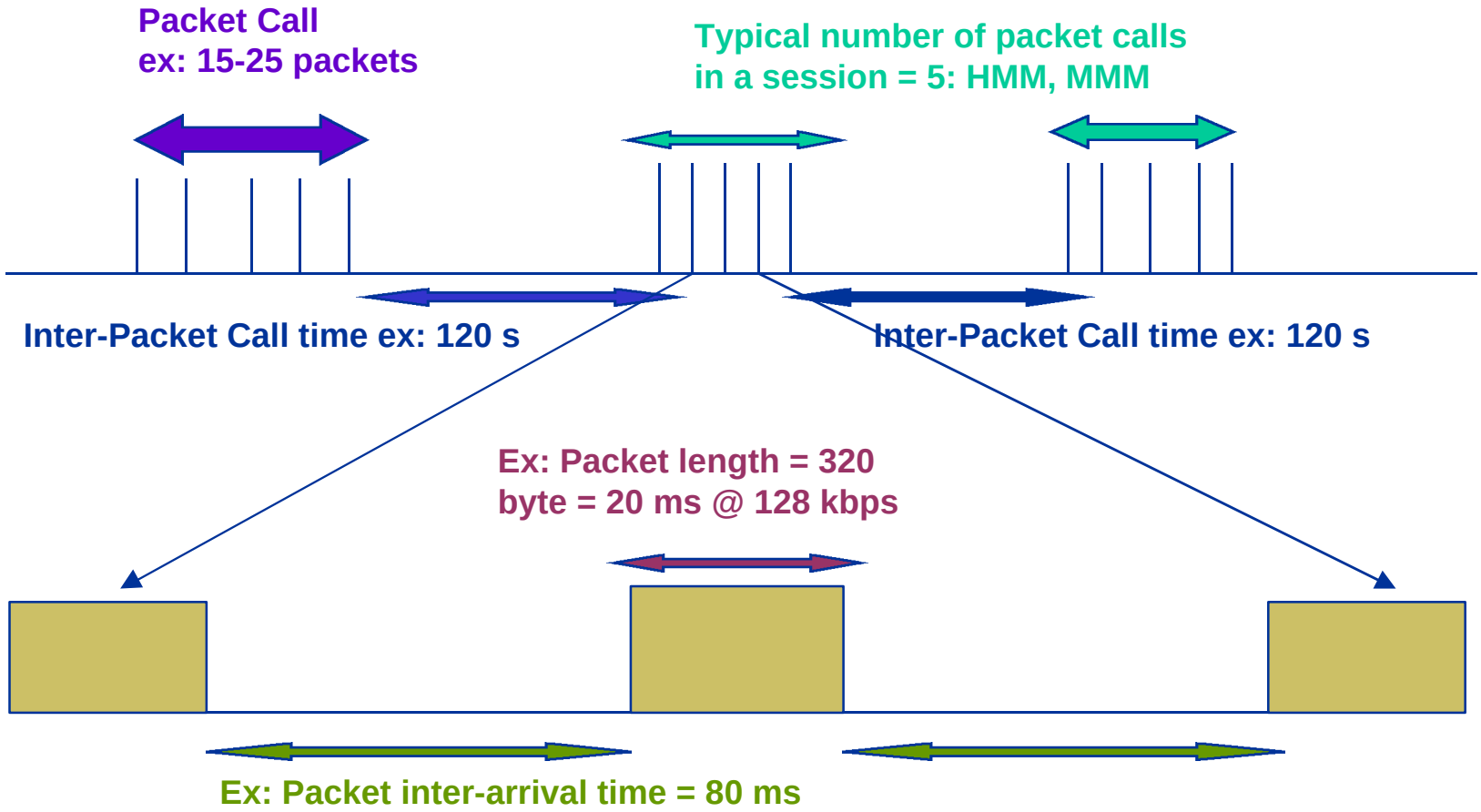
Golden Bridge Technology, Inc.

Costs of the Uplink Gating method

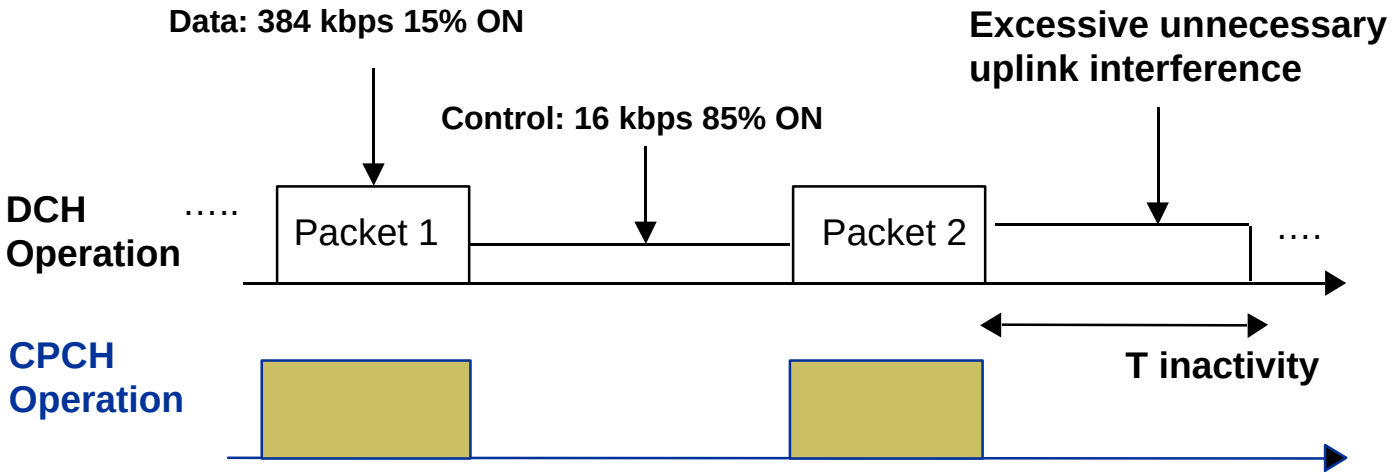
DCH/DCH: Circuit Mode of operation



Packet Train Model

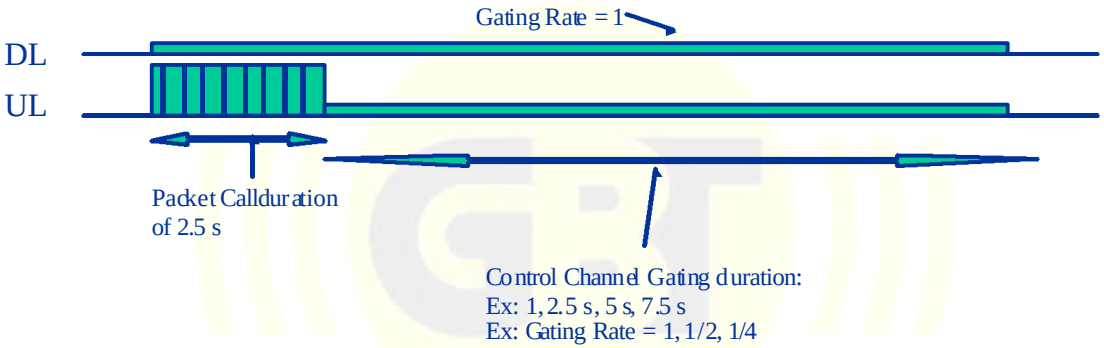


Problems with DCH in Packet Transmission



- **When Compared to CPCH, DCH Control Channel**
  - **Wastes 24% of Spectrum Capacity**
  - **Wastes 24% of handset power consumption in Talk mode**
  - **Requires 5-10 times more channel resources in the Base Node**
  - **Wastes 12.4 % more downlink capacity**

DCH Gating Method COSTs excessive



- Assume 20% duty cycle during packet call, 30 simultaneous packet calls for DCH operation, packet call duraion = 2.5 s
- TO = Control Channel Release Time-Out = 1, 2.5, 5, 7.5 s
- GR = Gating Rate
- $UL_{cap\text{-}req} = N_{pkt\text{-}call} \times (1\text{-duty cycle}) \times f_{dpcch}$

  $+ (TO/pkt\text{-}call\text{-}dur) \times N_{pkt\text{-}call} \times f_{dpcch} \times GR$

Examples of Downlink and Uplink Capacity wastage with DCH optimization methods such as Gating and Stop and Resumption Control:

- TO = 2.5 s, GR = 1/2, 60 parallel active sessions, 30 parallel packet calls:
- UL $_{\text{cap-req}}$ = 30%, DL $_{\text{cap-req}}$ = 15% (Gating method)
- TO = 1s, GR = 1, 42 parallel sessions, 30 parallel packet calls:
- UL $_{\text{cap-req}}$ = 28%, DL $_{\text{cap-req}}$ = 14% (Stop and Resumption control)

Conclusion: Both methods lead to excessive interference in DL and UL

CPCH vs. DCH: Power & UL Capacity

CPCH uses 24% less power in communication mode CPCH offers 24% more UL Capacity

- **Assume 15% duty cycle for DCH operation @ 384 kbps**
- **DCH operates @ 16 kbps when OFF**
- **Average DCH rate per user = 384 kbps x .15 + 16 kbps x .85 = 71.2 kbps**
- **Average CPCH data rate per user = 384 kbps x .15 = 57.6 kbps**
- **Clustered nature of the packet arrivals leads to 24% more interference and therefore 24% less capacity in case of DCH**
- **This also leads to 24% less UE power consumption in communication mode**

CPCH vs. DCH: Downlink Capacity

DCH Costs a minimum of 11.2% of Downlink Capacity to support Uplink Packet Transfer While CPCH Costs only 2.6% of the Downlink Capacity

- **Assume 30 parallel packet calls for DCH operation at all times**
- **30 x 8 kbps = 240 kbps Control Channels required in downlink to support the uplink transfer. [11.2% of the packet capacity]**
- **With CPCH 7 x 8 kbps = 56 kbps is required to support the uplink transfer in the downlink direction. [2.6% of packet capacity]**

CONCLUSION

- **Gating method does not provide any gain as compared to the Stop and Resumption method in the uplink and downlink direction.**

- **GBT recommends removal of the Uplink gating method from Release 99.**