

TSG Radio Access Network WG1#9

Dresden, Germany

November 30 - Dec 3, 1999

TSGRAN1#9(99)i99

Agenda

Source:

GBT

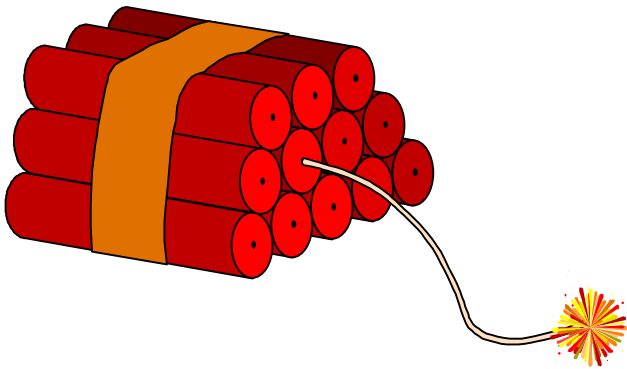
Subject:

Advantage and Disadvantage of Channel Assignment

Contribution for

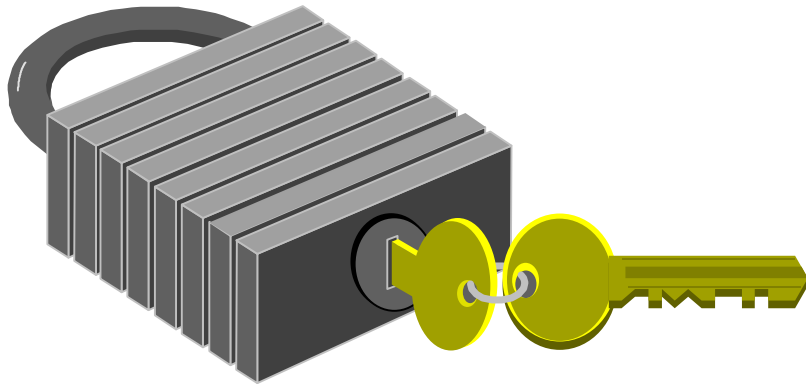
Approval

Disadvantages of Channel Assignment



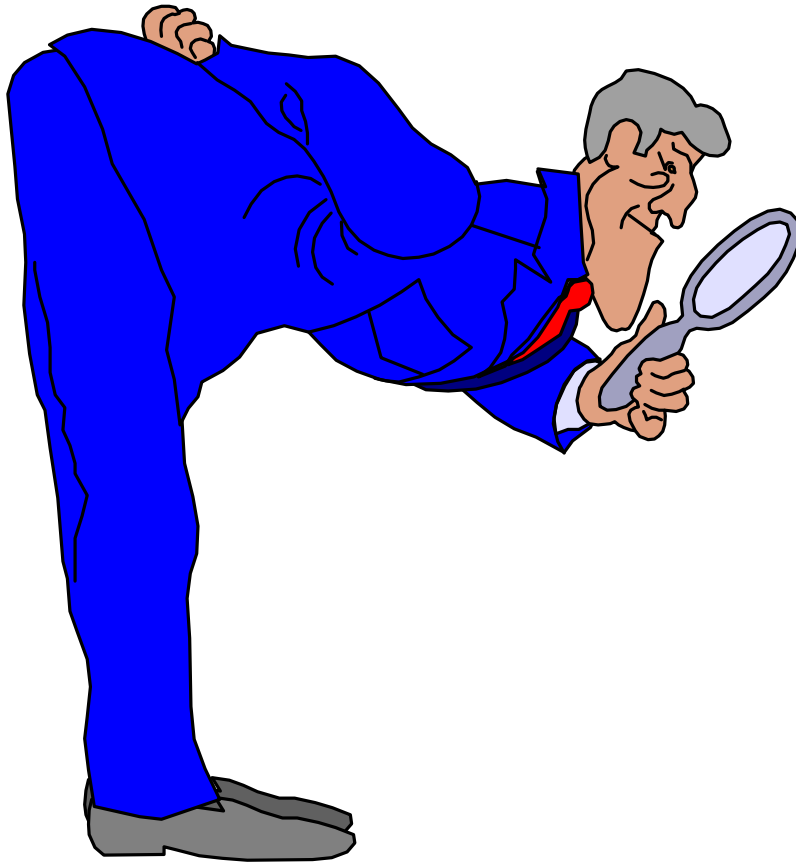
- CA has no relevance to a single CPCH case. It serves no function in a single CPCH case.
- Negligible throughput performance gain (~1%)
- No support for multiple data rates unless Data Rate Status Broadcast is used
- Excessive preamble interference, more UE power consumption
- Added Complexity with no gain

Advantages of Channel Assignment



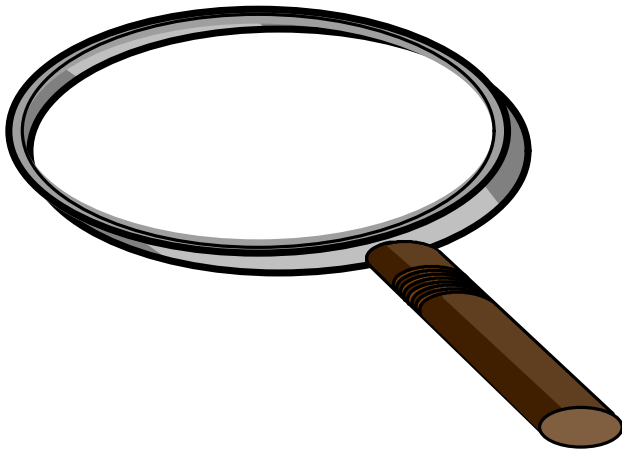
- When high data capacity cell required by service provider, then flexible assignment provides some saving in signature usage. This is the result of enhanced collision detection.
- No higher order Collision Resolution capability is achieved with current CA schemes, but it is possible.

Comments on the CA simulation analysis



- Poisson Arrival Assumption
- Lack of Multiple Data Rate Capability
- Lack of BO due to Collision in the CA formula
- It shows similar performance between perfect CA and perfect monitoring (1% difference due to enhanced collision detection capability)
- wrong Back-Off assumptions

1. Poisson Arrival Assumption



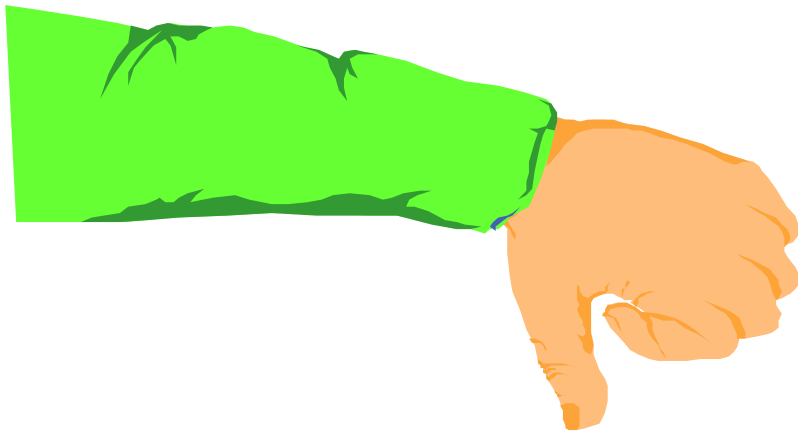
- Packets do not arrive in clusters in Poisson model
- When the packets arrive in cluster, then there is a possibility of piggybacking increasing the packet length changing the delay-throughput behavior.

2. Lack of Multiple Data Rate Capability



- Supporting multiple data rate requires Data Rate Status Broadcast
- This makes the CA scheme similar to Basic Scheme with monitoring.
- This is to avoid BO due to wrong data rate selection.
- This will also remedy the excessive preamble interference problem.

3. Lack of BO due to Collision in the CA delay formulation



- There is close to 30% collision at peak throughput. This will contribute to worse delay performance. This is not included in the CA Delay formula

4. Similar performance for CPCH with “Perfect CA” and “Perfect monitoring”



- Almost 1% difference in throughput performance.
- Impact of excessive preamble interference is not included in perfect CA case.
- Impact of back off due to wrong data rate selection (simulation is for 16 CPCH @64 kbps) is not incorporated.
- Impact of back-off due to collision is not added.

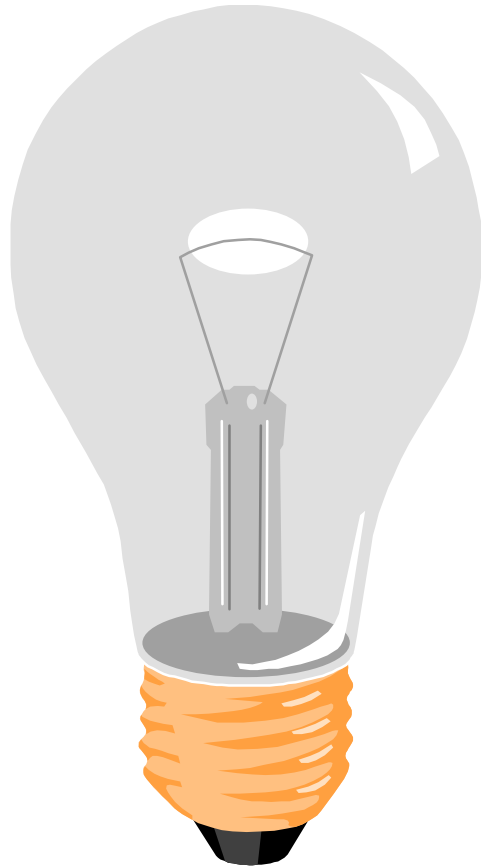
5. Wrong Back-Off Assumptions

exponential back-off vs. random or fixed



- GBT's R299D02
- TBOC1 all-busy: Random 1-16 frames
- TBOC2 channel-busy: fixed 0-15 access slots
- TBOC3 Bo-No-AICH: fixed 1-16 frames
- TBOC4 collision: Random 10-100 frames

What is the main reason the throughput is 75-80% if undetected collision is $\sim 2\%$?



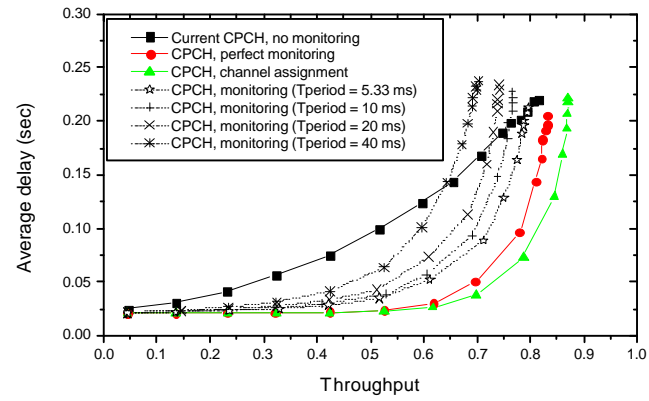
- There is a 8% contribution due to delay in monitoring (10 ms case)
- Gaps in the channel usage due to non-arrival of Users.
- This contributes to loss in $\sim 10\%$ efficiency that can be picked up with second order Collision Resolution capability.

Aiming for the Maximum throughput squeezing the last 10%

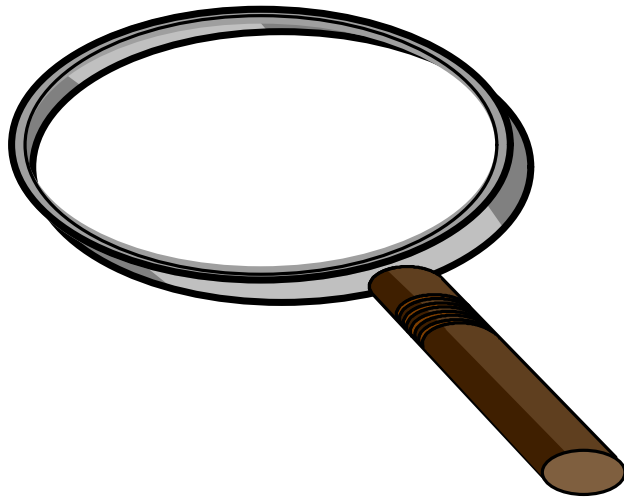


- Second level Collision Resolution capability by enhancing the basic CPCH scheme.
- Transmit the second CD2 in the same access a lot to allocate the available resource to the defeated Mobile.
- Double CR scheme to squeeze the last 10% of the throughput

Samsung simulation results: Throughput performance

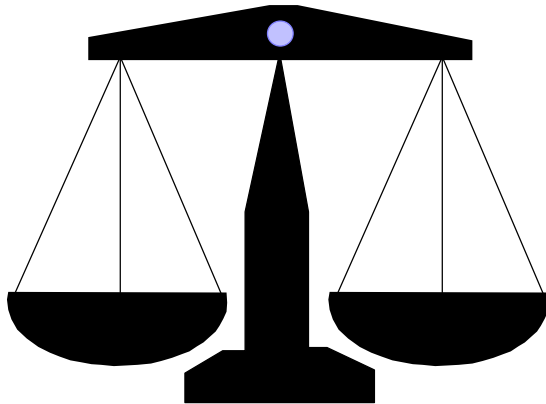


Further comments on Samsung's results



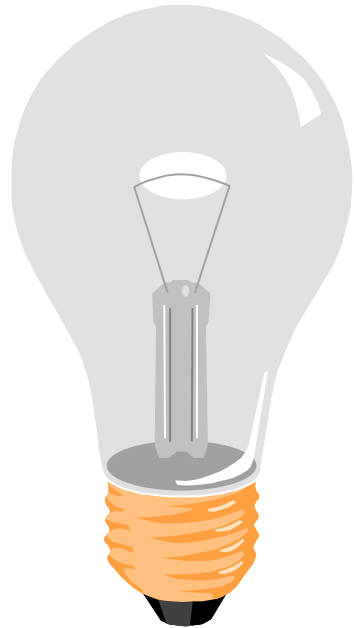
- The results show that the 5.33 ms period performs best and is near-optimum as compared to perfect monitoring.
- Furthermore, it is interesting to note the behaviour of the “current CPCH” which seems to be getting better than all other cases.
- The CA case is still “suspect” and under question as it does not reflect the realistic assumptions.

Monitoring CA versus DSMA-CD



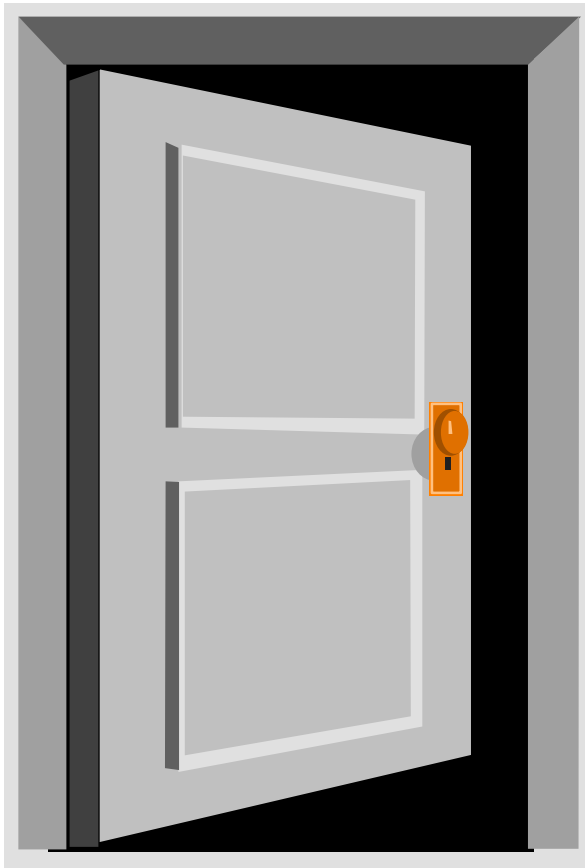
- Currently proposed CA scheme [7 data rates] shall perform slightly worse than DSMA-CD with less than 7 CPCH channels
- Less monitoring cycle means less power consumption, slightly better throughput/delay performance.
- Monitoring CA will lead to more preamble transmission and more UE power consumption
- Monitoring CA provides some flexibility in assignment
- Channel monitoring provides highest level of information to UE. The UE receives PV values per CPCH. This leads to least UE power consumption.

Monitoring CA versus DSMA-CD



- Invalidation of use of PVs per CPCH with CA. With the current scheme and the monitoring method, the preamble interference is minimized [in conjunction with use of PVs].
- More preamble transmission and knocking on the door by the UE in the case of CA leads to more UE power consumption.
- Use of CA is useless in case of single CPCH case.
- The use of CA, in case of multiple CA and a single rate will lead to excessive tries by UEs since there is no PV mechanism here and there is no knowledge of congestion level, UEs simply hit the shore and generate excessive interference with preambles.

Conclusion and the way forward



- Insure backward compatibility with CA. Provide CA support in the WG1/WG2 specification
- Consider CA schemes for Release 2000 to evaluate the realistic gains by various schemes and use of real packet models not Poisson Arrival.
- Consider the new 2 CR scheme that could perhaps realize the potential of the higher order Collision Resolution.