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Priority Access analyses:

Analyses of Priority mechanism

By: Wim Diepstraten AT&T-GIS (NCR)

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Motion adopted in March:

Motion:

To add a "*Distributed Time Bounded*" service functionality to the Foundation MAC and to determine by the end of the May meeting whether one or both of the TBS's will remain in the standard.

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Time Bounded Alternative:

- **Foundation protocol defines optional PCF to support Time Bounded.**
  - **Limitation due to PCF overlap problems.**
  - **This limits larger installations.**
  - **Relevant for current and future frequency bands.**
    - » **high speed in 1.9 GHz PCS band.**
    - » **high speed in potential 5.2 GHz band (HIPERLAN).**
- **Alternative for reservation based "Time Bounded" Service needed.**
- **Solution: Distributed Time Bounded Service (DTBS) using priority access mechanism.**

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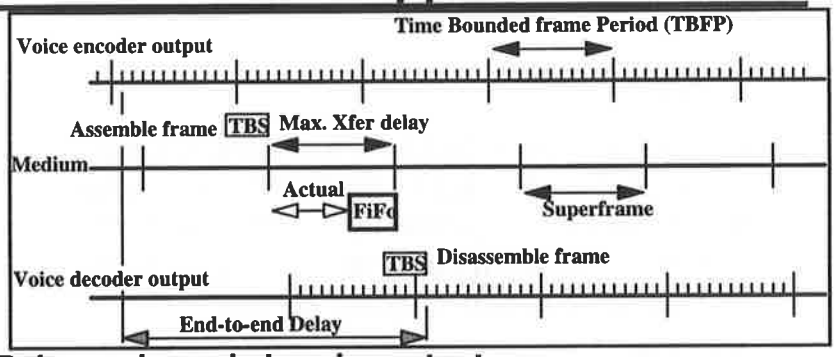
TBS voice Application:



Delay variance is less important.

- **Only variable transfer delay up to a given maximum is needed.**
- **Timing can be restored in the receiver using a FiFo.**

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Required Characteristics:

- No overlap limitations between the *Asynchronous* and *DTBS* service.
- Low transfer delay for all priority levels to support "Bursty" traffic.
- Low transfer delay probability distribution for High Priority traffic.
- Maximum delay limit for DTBS acceptable to support Voice applications.
  - 20-30 msec frame times should be acceptable.
  - longer delays acceptable for local connections.
- Low impact on *"Low Priority only"* delay and throughput characteristics.

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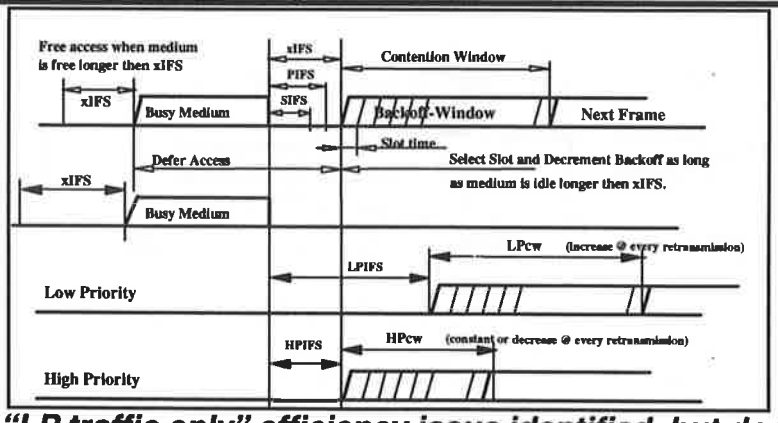
Priority in CSMA/CA:



"LP traffic only" efficiency issue identified, but does not show up significantly in the simulations.

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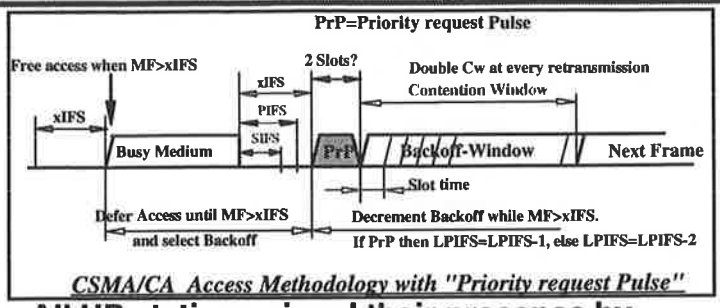
Offending Command = add
Error = nametype : typecheck
operator was expecting a different type of operand
Stack =
--nostringval--
0

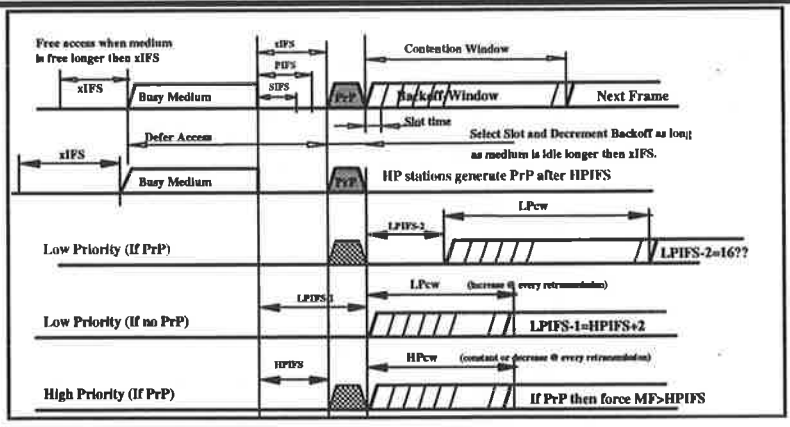
Alternative Priority scheme:



CSMA/CA Access Methodology with "Priority request Pulse"

- **All HP stations signal their precence by generating the "Priority request Pulse" (PrP).**
- **Use only a long LPIFS when High Priority traffic is there.**
  - **impoves delay and throughput performance.**

PrP based Priority scheme:

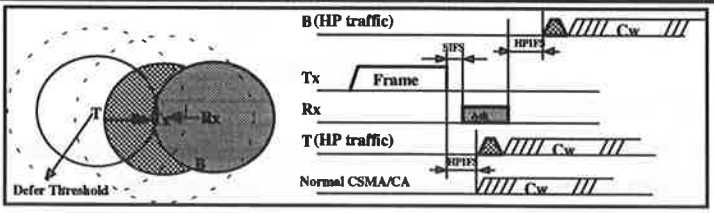


- **Lower "LP-only" delay, higher efficiency.**

Other PrP method issue's:

- PrP method requires synchronization between all stations.
  - To generate and recognise the PrP.
  - Receiver antenna slotting needs to be synchronized.
  - More sensitive to Rx-Tx turnaround times, and "CCA-off detection" implementations, so more critical PHY requirements.
- More complex access algorithm.
- If not all stations see "Data and Ack", then they generate and expect the PrP at different times, so impacting the priority scheme.

PrP may jam the Ack:



- PrP impact of the "Hidden node problem".
  - PrP may jam the Ack consistently.
  - Pure CSMA/CA has lower jam probability.
  - Solution: HPIFS should be > SIFS+Ack
- Also shows the unsynchronized PrP case.
  - Will cause leakage between priority levels.

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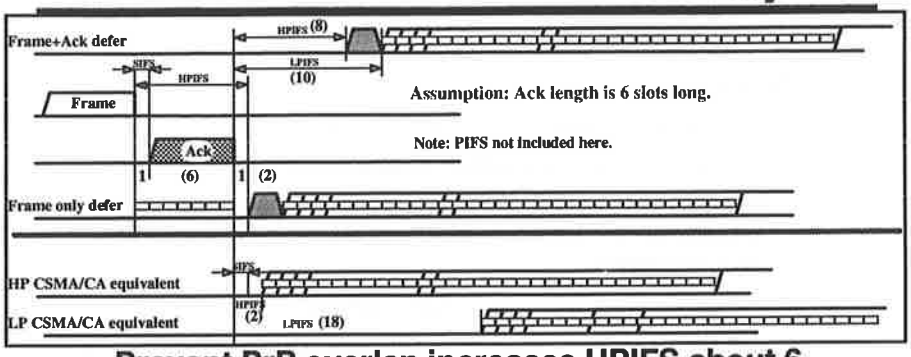
How to decrease Ack vulnerability:



- Prevent PrP overlap increases HPIFS about 6 slots, and decrease LPIFS with 8 (at 50% CW overlap).
- Short Ack is important.

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DTBS Conclusions:

- The standard should support DTBS based on DCF priority access, as already concluded in the March meeting.
- The implementation method is still to be decided, and two alternatives have been proposed.
- The PrP based method has different characteristics compared to the original doc 58 proposal.
- Solutions of the identified problems have been found, but need further specification and simulation work.

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Related issue's:

- Should we support one or both TBS methods in the draft standard.
  - Position: Only DTBS
- Should the priority mechanism be optional?
  - Position: No, the priority should be considered a fixed part of the non-optional DCF.
- Should DTBS be an optional or standard service?
  - Position: Optional
- What functions need further specification to support DTBS?
  - QoS I/F, "Time_to_Live" function, HP monitor.

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Additional DTBS functions:

- QoS based interface definition.
- "Time_to_Live" parameter maintenance.
- High Priority Load monitoring function.
- Issue:
  - Do we need to standardize Queue ordering functions, or is this an implementation issue.
    - » Position: Can be an implementation decision.

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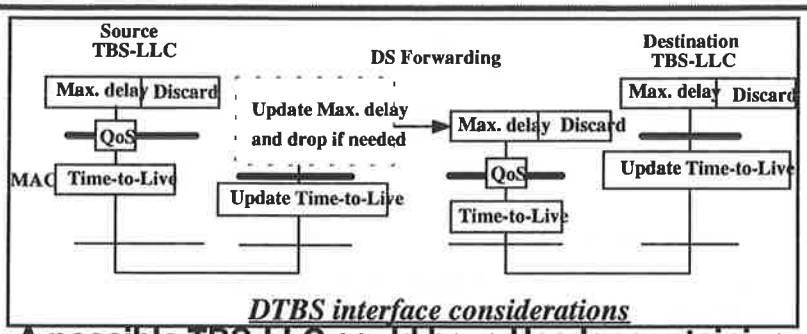
Possible DTBS I/F:



- A possible TBS-LLC could have Header containing:
  - Max. Delay parameter
  - Discard parameter (to allow drop of frame that experienced a too long delay, and allow recovery of timing in the receiver).

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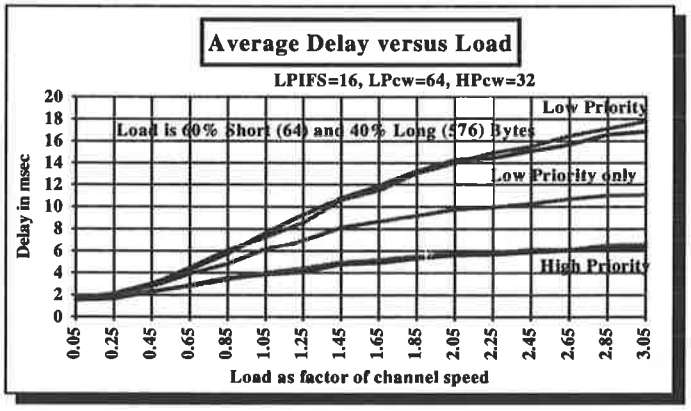
Average Delay performance:



Significant priority difference when load increases.

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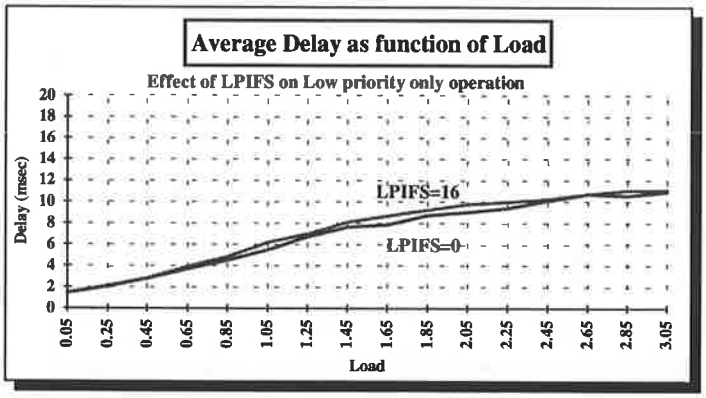
Low Priority only impact:



No difference at low Loads, minor impact during higher loads, showing lower Throughput.

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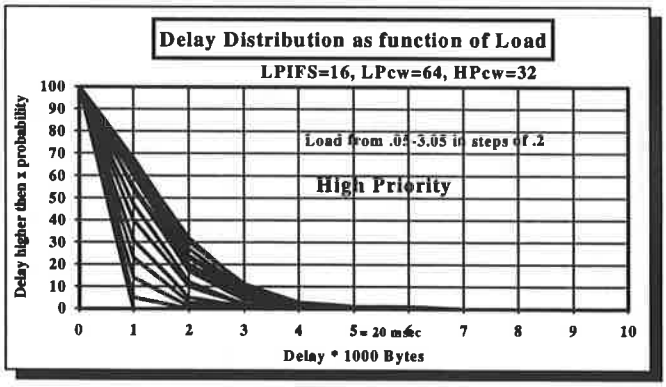
Delay Distribution:



- 20 msec max delay can be met even in high priority overload case.

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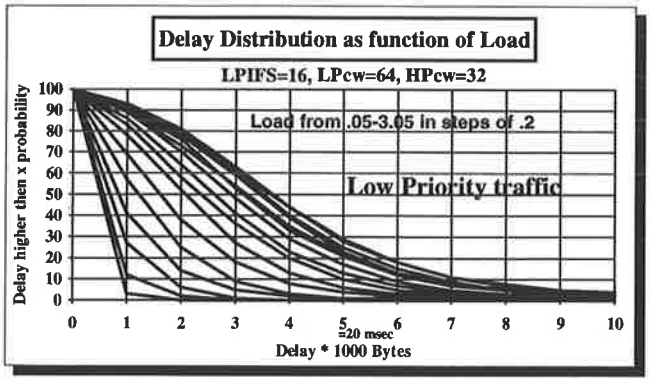
More Delay Distribution:



- **Both Low and High Priority traffic load increases in this simulation.**

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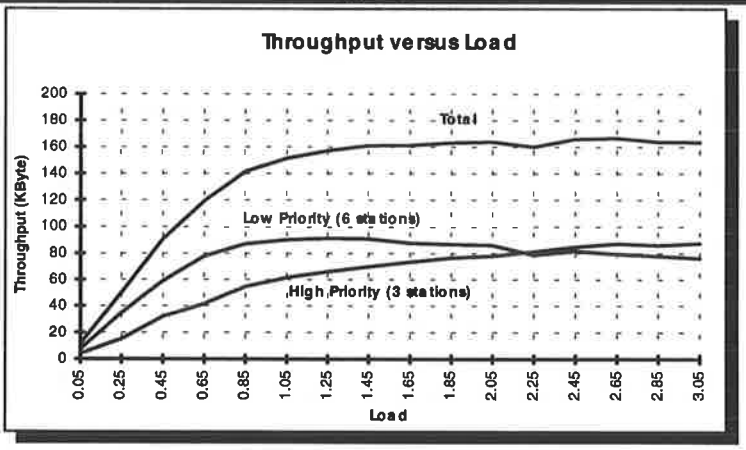
Throughput:



High priority traffic gets higher throughput.

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