Fragmentation

Dave Roberts
Advanced Micro Devices, Inc.

Assumption

- Propagation effects coupled with frame error-rate goals will suggest a maximum 802.11 MAC frame size of about 1/2 KB or so.

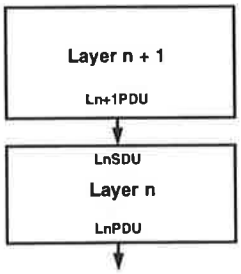
The Problems

- The optimum size frame may not meet the minimums necessary for typical network layer packets.
- A small frame size may cause problems when routing or bridging a larger frame from another network (e.g., Ethernet, token ring).

Definitions

- SDU vs. PDU
- Fragmentation
- Windowing

SDU vs. PDU



- SDU
  = what the layer accepts
- PDU
  = what the layer passes on

Fragmentation

- The breaking up of a layer n+1 PDU into multiple layer n PDUs.
- Implies that layer n has a max SDU size (= layer n+1 PDU size) > max PDU size

"Windowing"

- Giving medium access priority to subsequent frames of a frame group once the first frame has seized the medium.

Fragmentation vs. Windowing

- Fragmentation does not require windowing.
- Typically, windowing implies fragmention, however.
- This talk will not address windowing.

L3 PDU Required Maximums

- All L3 devices must be capable of handling frames this size or less
- AppleTalk - 600 bytes max ever
- IP - 576 bytes
- IPX - 576 bytes
- NetBIOS - ??

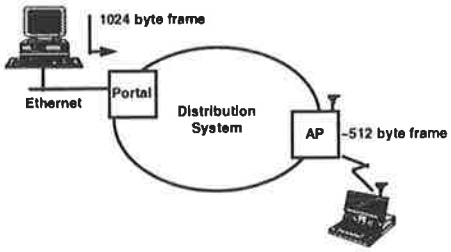
Possible Solutions

- Make 802.11 L2 PDU size >= 600 bytes
- Let each L3 deal independently
- Fragment in L2

Small L2 SDU Precedence

- ARCNET has 508 byte frames (extended version).
- In this case, each protocol handled it on its own.
- ARCTalk doesn't exist
- IPX developed a L2.5 fragmentation scheme
- NetBIOS ??
- IP fragments at L3

Routing/Bridging Problem



Possible Solutions

- Drop packet
- Fragment in L3
  - Solves routing problem
  - Doesn't solve bridging problem
- Fragment in L2

Routing/Bridging Precedence

- A token ring can generate a 4500 byte frame to an Ethernet.
- Appletalk - no problem (600 byte max)
- IPX - drops packet ("Well, don't do that.")
- NetBIOS - drops?
- IP - fragments at L3
- A bridge will not handle this solution at all.

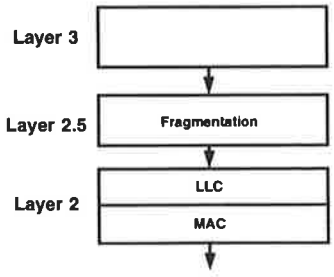
Observations

- These problems aren't new.
- They have been solved before.
- Bridging dissimilar LANs is always hazardous.
- L2 fragmentation could address both problems at the cost of 802.11 complexity.

How Complex?

- Fragmentation would require:
- Buffering in all stations - how much?
  - All fragments from all possible datagrams in progress
- Fragment ageing timers - how long?
- Recovery mechanism to deal with missing fragments
  - Interaction with sleeping and power managment?
- What max SDU size do we choose?
  - 1500?
  - 4500?
  - Larger?
  - Why?
  - If no fragmentation, SDU size = MAC frame size

A Layer 2.5 Approach



- This is basically what IPX does with ARCNET
- Layer 2.5 is basically the network driver code

Possible Layer 2.5 Implementations

- SNAP is layer 2.5
- Do something similar to SNAP or use SNAP
- Define a "fragmentation" LLC DSAP/SSAP or
- Define a SNAP "fragmentation" protocol ID

Layer 2.5 Benefits

- Isn't a burden where not needed
  - Appletalk has 600 byte max frames
  - IP already has fragmentation
- Can be implemented in drivers
  - No L3 vendor support required
- Could be used to solve the bridging problem in general

Recommendation

- Don't add the complexity to 802.11.
- Use the same solutions as before or
- Use a layer 2.5 approach (which does not fit 802 reference models).