Backbone Network Requirements

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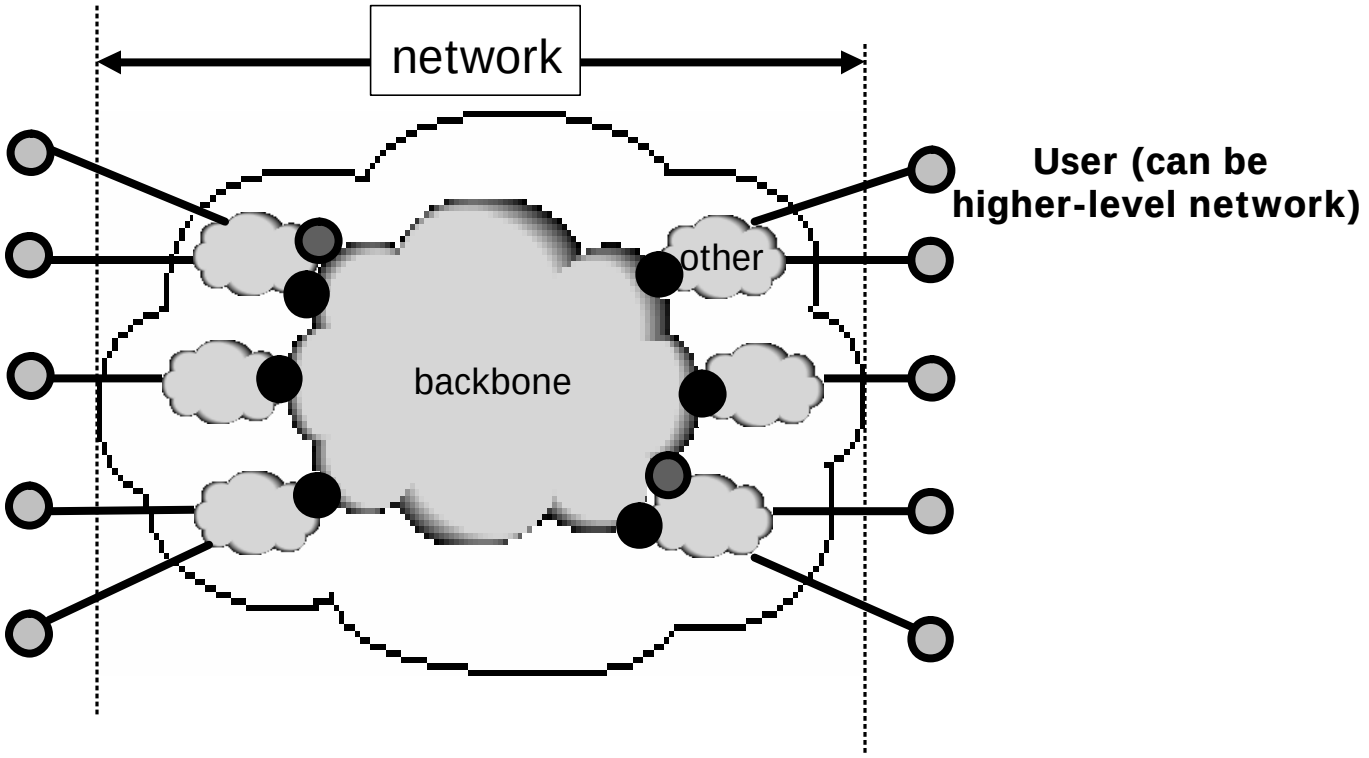
(supporting document for 802.1ah D1.2 Comments)

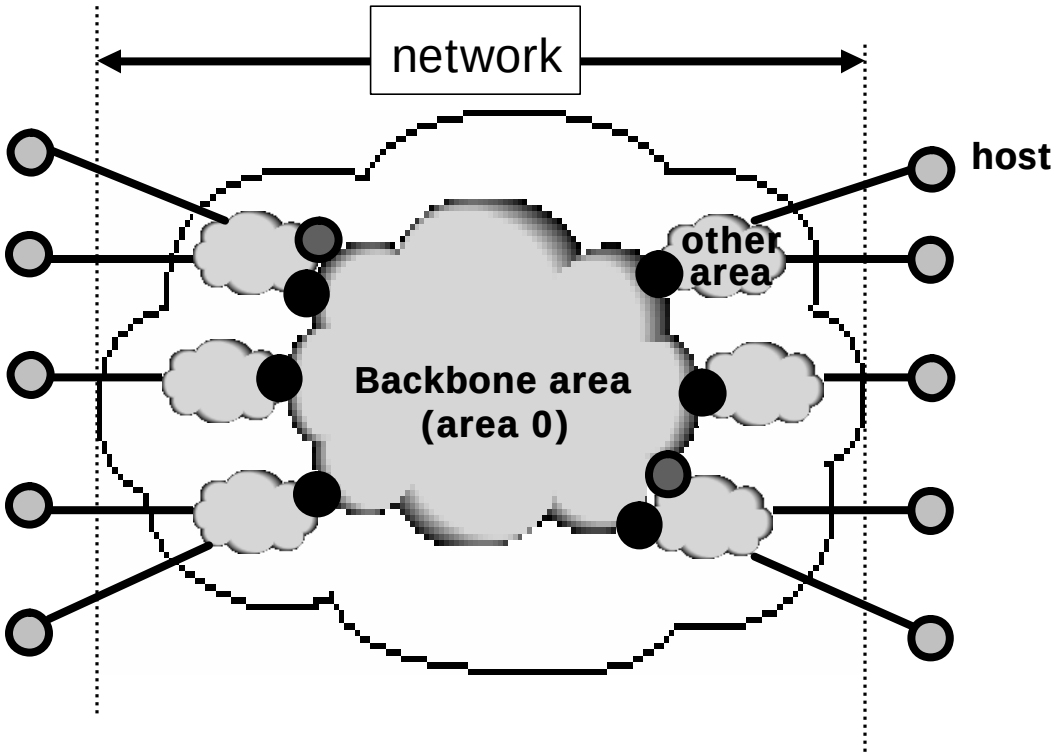
What is a Backbone?



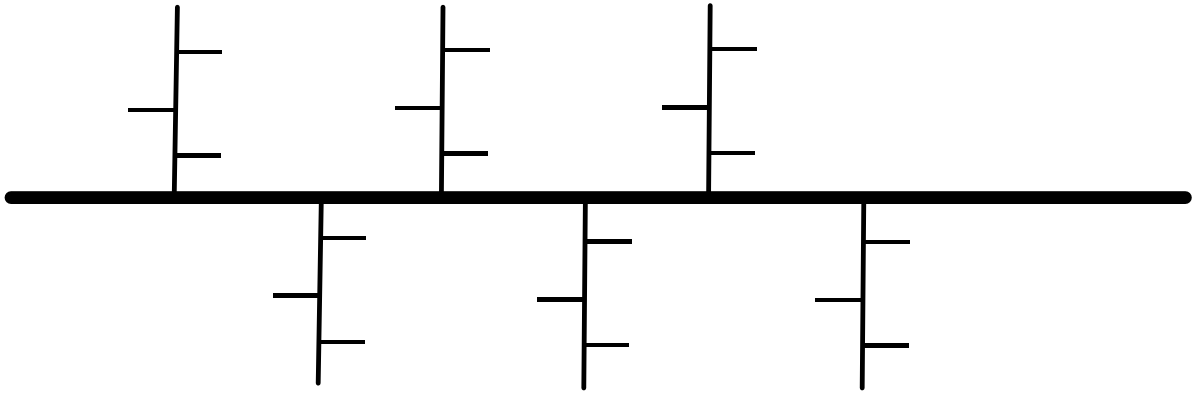
A “portion” of a network meeting the following two conditions:

1. **does not support directly attached users**
2. **provides transit for all traffic communicated between any two users attached to different “portions” of the network**

For example: OSPF Backbone Area



Why Designate a Backbone?



- **Scopes protocols – improves scaling**
  - Eg., each area with distinct spanning tree.
- **Backbone equipment faster / higher capacity**
  - Backbone designed for greater load.
- **Backbone sensitive to larger address space**
  - Sometimes supported in BB Edge to reduce burden on backbone core.

Two Operations Presenting Challenges for Backbone Bridges

- Identify FDB associated with VID in received frame. Challenging because:
  - 12-bit VID may be too small (~4K) to uniquely identify all the VLANs using the backbone.
  - 12-bit VID may even be too small to identify all the VLANs passing through an individual backbone bridge.
- Identify the FDB-entry, if any, associated with the DA in received frame. Challenging because:
  - The number of end-user MAC addresses may require a large FDB individual bridges in order to avoid unnecessary flooding.

More about the VID Problem

- Would be surprising to see this problem in a C-VLAN backbone since the number of C-VLANs is unlikely to exceed 4K.
- Straightforward solution to the problem in the S-VLAN environment is to simply increase the size of the SVID from 12-bits to, say, 28-bits.
  - This could have been done in 802.1ad.
  - In order to support the migration from 12-bit SVID to 28-bit SVID, an SVID mapping function can be provided between portions of the LAN using different SVID sizes.
    - It would be convenient, but not mandatory, to apply this function at the boundary of the backbone.
    - Since the 28-bit VID can be assigned to be globally unique within the provider domain, it might be called a GVID, and the function performing the mapping called the GMAP function.

But Then All Backbone Switches…..

- But then all backbone switches would need to switch on a 28-bit GVID.
- Yes, providers expect that backbone core switches will provide functions specific to the needs of the backbone.
- Providers do not expect to reuse vanilla provider switches as backbone core switches.

More about the FDB Size Problem

- It has not been demonstrated that an FDB size problem exists.
- The only architectural limitation on the size of the FDB is (roughly) the 48-bit size of the MAC address. It is unlikely that this limit would be a problem anytime in the near future.
- Providers expect that backbone bridges will be high capacity boxes supporting large numbers of FDB entries.
- Providers may not want to deploy a new architecture if a bridge with a bigger FDB solves the problem.

FDB Sizes Unlikely to Grow Explosively

- In today's provider networks (ie., Private-line or Frame Relay) it is unusual for the customer to access the network via anything other than a router.
- This means that the maximum number of FDB entries is the total number of customer sites served by a provider. This is a large number, but unlikely to exceed a reasonable FDB size.
- Further, why would a provider want to support a vast number of MAC addresses at a customer site without charging extra for the service? This requires resources from the provider.

But Maybe Someone Will Strain FDB Size

- There is no reason to disallow optional MAC-in-MAC encapsulation across a portion of the LAN (SVLAN or CVLAN).
- This function is entirely distinct from the requirement for GVID and the GMAP function described earlier.
- These functions should be described in distinct amendments to 802.1ad. The MAC encapsulation amendment would reference the GVID/GMAP amendment since it should handle traffic carrying GVID.

Conclusions

- MAC-in-MAC encapsulation and GVID/GMAP should be described in separate amendments.
  - Added benefit, specifying these amendments in distinct documents likely to simplify the description of each.
- The two amendments represent optional functions of bridges.
- The amendments are independent of each other except that MAC-in-MAC may reference GVID/GMAP.
- GVID/GMAP can be viewed as fixing a deficiency in the current 802.1ad (and providing a migration path).