APPROVED MINUTES OF TRUNKING STUDY GROUP
IRVINE - 11 MARCH 1998

Prepared by:
Tony Jeffree

The meeting convened at 8:30 AM: Steve Haddock, Study Group Chair, opened the meeting with the introductions of participants. Tony Jeffree was appointed as recording secretary for the meeting.

SH: Presented the agenda for the meeting, starting with a re-cap of the addressing information for the Email reflector and website, and a summary of the Bellvue interim meeting (see minutes of that meeting). About 130 attendees; 8 presentations (on website), discussed objectives and drafted PAR and 5 criteria (on website). The major objectives voted and agreed were support of full duplex links of the same speed.

SH: Introduced a discussion of the PAR scope and purpose, and the 5 criteria.

Main points in discussion:

- Some discussion of the scope (support of 802.3 links) & whether it should be extended to other MACs (.5 in particular). Some feeling that it would be appropriate for other MAC groups to undertake thir own activity for those aspects of trunking that are MAC specific.
- Proposed addition to scope (from Bob Love): "It is an objective to allow this standard to be easily extendable to other 802 MACs so long as incorporation of extendibility features and functionality will not unduly delay developing and issuing this IEEE 802.3 link aggregation standard." This objective should be achievable with appropriate liaison.

Technical Motion that Bob's proposed text be inserted in the scope: *Proposed:* Paul Bottorff. *Second:* Tom Dineen. Voting: For 16, Against 53, Abstain 23. (*Motion Defeated*).

Technical Motion that Bob's proposed text be inserted in the objectives: *Proposed:* Andy Luque. *Second:* Tom Dineen. Voting: For 55, Against 21, Abstain 22. (*Motion Defeated*).

- SH took a straw poll of support for developing the standard. 94 participants from 54 companies indicated support for an interoperable standard for Link Aggregation.
- Changed "...achieving linearly scalable bandwidth..." to "...achieving incrementally scalable bandwidth..." in the 3rd of the 5 criteria. Other wordsmithing of this item to remove "network connections" & replace with "agregated links".
- 5th criteria: wordsmithing to indicate no new MAC or Phy technologies will be required, also to discuss both *availability* and *performance*, recognizing that these are distinct requirements addressed by the aggregation tecnology.
- Observation was made that availability characteristics in Link Aggregation are different from those provided by Bridges, as availability has a time component. Switching configurations in trunks is anticipated to converge much faster than in Bridges.

SH introduced the presentations. The list:

- Paul Bottorff (Bay) - Link Aggregation Reference Model.
- Paul Bottorff (Bay) - Adressing requirements.

- Paul Congdon (HP) - Objectives.
- Norm Finn (Cisco) - Distributor Requirements.
- Norm Finn (Cisco) - LA setup & maintenance.
- Mick Seaman (3Com) - Configuration objectives.
- Joris Wils (3Com) Verification protocol requirements.

Paul Bottorff: Link Aggregation Reference Model

Main points from discussion:

- It was observed that there may be a need to name the MACs being aggregated differently from the aggregated result, as both the individual MACs and the aggregate MAC provide a MAC service interface. The term used in the presentation was "Mux" for the entity that results from aggregating a number of links. Possibly useful terminology to be found around "physical MAC" vs. "logical MAC"...??
- Paul's view is that the Load balancer is outside the scope of the standard. It was observed that it is desirable to model it within the stack, even though it may not be standardised. Other presentations model this as a distributor function.

Paul Bottorff: Adressing requirements

Main points from discussion:

- The discussion concluded that there is a long discussion to be had with respect to what addresses are used in BPDUs, especially regarding the effects of re-configuration.
- Will need to do some work in 802.1 regarding the implications of addressing choices.

Paul Congdon: Objectives.

No significant points came from the floor discussion.

Norm Finn: Distributor Requirements

Main points from discussion:

- No one distribution algorithm works for all applications/configurations, hence the difficulty in standardising this. However, frame ordering must appear to be maintained as far as the MAC service user is concerned.

Norm Finn: LA setup & maintenance

Main points from discussion:

- Does Spanning Tree get held off until LA has occurred? Easiest model may be that Bridges connect to logical Ports (Muxes), which are not active until aggregation has taken place.
- Some distribution algorithms may need the use of a "flush" protocol (for example when re-configuration results in a flow being transmitted via a different link, the flush protocol allows the transmitting device to determine when all frames transmitted on the old link have been received).

Mick Seaman: Configuration objectives

Main points from discussion:

- Will need to look at Bridge operation in the context of link state changes in order to determine whether there will be any impact on 802.1 work.

Joris Wils: Verification protocol requirements

No significant points came from the floor discussion.

Meeting adjourned for lunch at 12:15; *re-convened* at 1:25.

Steve Haddock started off with a discussion of reference model, based on Paul B's model. Some minor changes were agreed; LLC -> MAC Client, and the LAC, AC and AD are combined to form a Link Aggregation Sublayer.

Motion (technical): Move to accept Bottorff reference model with the proposed edits:

- One layer entitled "Link Aggregation Sublayer".
- LLC - Logical Link Control changed to MAC Client.
- Remove AB - Load Balancer block.

Moved: Dineen

Second: Luque

For 59, Against 0, Abstain 4. *Motion Passes.*

It was also agreed to adopt the breakdown shown in Paul Congdon's architectural diagram to show the detail within the sublayer.

Steve Haddock then presented a series of Objectives for the Link Aggregation effort. These were wordsmithed and voted individually and in groups, as seemed appropriate. The summary below shows the agreed objectives resulting from the wordsmithing, and records the specific votes taken:

- LA Groups consist of Full Duplex link segments.
- LA Groups consist of link segments operating at the same speed.
- A physical link segment can be part of at most one LA Group at any one time.
- Frame collection at the receiver will not require reassembly or reordering of frames.

Motion (Technical) to accept objective #3 above ("A physical link segment can...").

Moved: Grow

Second: Quackenbush

For 54, Against 0, Abstain 9. *Motion Passes.*

A straw poll was taken as to whether the constraint on frame ordering should be that the order of frames received be preserved for a given priority on a single link. 30 in favour, 24 against. Following discussion, decided to not state any constraint on frame ordering.

Constraint #4 ("Frame collection at the receiver...") accepted without objection.

Objectives continued....

- Frame distribution will prevent duplication of frames, and will transmit associated frames that require ordering to be maintained on the same physical link.

(Note that the wording of this objective needs some polish, but the intent of the discussion was clear; i.e., that if a given flow requires ordering to be maintained, then the only way to achieve that is to ensure that all frames associated with that flow in a given direction are transmitted, in order, on a single link.)

Much discussion of the implications of this objective; in particular that it may permit violation of the MAC service as currently defined in ISO/IEC 15802-1. Concerns expressed that this would cause us to violate the 802 functional requirements. However, it was also observed that this appears to be a fundamental problem with the way the MAC service is expressed; maybe it is time to examine whether the MAC service needs to be changed.

May need to flag in the PAR that the 802 functional requirements may not be met with respect to frame ordering. This will be discussed when voting on the PAR takes place in 802.3 on Thursday, also at the Exec on Thursday night.

Motion to accept this objective (Technical):

Moved: Finn

Second: Congdon

For 56, Against 3, Abstain 3. *Motion Passes.*

- Each instance of the LA sublayer will be addressed with a single Individual MAC address.

There was some discussion of what the addressing requirement should be, and in particular, whether the objective should express any requirement on the addressing of each link. Agreed that this should not be done.

Motion to accept this objective (Technical):

Moved: Daines

Second: Finn

For 66, Against 0, Abstain 1. *Motion Passes.*

- The standard will define a protocol for configuration, initialization, verification, and maintenance of LA Groups.

This objective was accepted by acclamation.

Steve Haddock announced that the next Interim meeting is to be held on April 29 in New Hampshire. 49 peoplle indicated that they are probable attendees.

Approval of Seattle minutes - *accepted by acclamation.*

Steve Haddock gave an overview of membership & voting rights. Any atendee at a task force or study group meeting may vote, but votes in 802.3 meetings are for .3 voters only.

Meeting adjourned at 3:05pm.