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Subject: Re: ATM-ST
References: <199712250200.CAA29509@fsg1249.cray.com>
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Jeff Young wrote:

>
> Hi Robert,
> We were discussing the ATM-ST document and we came away wondering
> about using LANE as a base. I was tasked with discussing with you what
> your insights are for that choice.

Jeff,

I looked at three choices for ATM-ST: AAL5, LANE, and CLIP. Some of the criteria included:

1. Can't be an ATM only solution (i.e. requiring all communicating parties to be on an ATM only network. That approach hasn't worked for ATM in general and is not the way ATM is typically deployed.
2. Must offer a high-performance solution. Otherwise, what's the point? This means that the network adapter must handle the performance critical tasks: credit accounting, direct DMA to/from buffers, etc.
3. Must address issues of network configuration, address resolution, naming, etc.

Here's a summary of the options:

AAL5: For the basic protocol in an ATM-only environment, this is clearly the best fit: data and control channels between all participating entities can be mapped onto ATM VC's. AAL5 provides the required data integrity with the CRC. ATM hardware is already designed around dispatching on a per-VC basis.

But, does not address interoperability. No real support for naming, addressing, etc. That is, no one uses ATM signalling and ATM addresses except to support higher level network protocols. This would all have to be re-invented for ST. Who is going to invest in this for a niche protocol?

LANE: HIPPI-ST looks like ST over an IEEE 802 network. Ethernet-ST will look like ST over an IEEE 802 network. Since LANE makes an ATM network look like an 802 network, ATM-ST should fit in just fine. Issues of discovery, broadcast, address resolution, configuration, .. are all standardized, implemented, and deployed. Furthermore, bridging to "legacy" networks is supported. Today, mixed ATM/ethernet/token-ring networks are in production use. When HIPPI-ST arrives, bridging to these networks will most likely follow the same model. The ATM adapter will have to look at the LLC/SNAP header to distinguish ST packets (as opposed to looking at ATM VC number for AAL5), but since the adapter has to process the ST protocol header in any case, this doesn't seem like such a burden.

Multiple virtual LAN's can be configured (and are in practice), so ST traffic will have it's own set of VC's. This will mostly help reduce software complexity.

LANE v1 has only a single VC between entities, but this has been changed in v2 (approved, will be deployed by the time ST comes out). While LANE looks and sounds like a kludge, in fact, the performance critical operations have no real overhead.

CLIP: It's pretty clear that one could implement ST over IP and someone will. At that point, it will run on CLIP. This should be standardized, then, as ST over IP rather than ST over ATM/CLIP. This clearly handles the internetworking requirement and the issues of naming, config, address resolution, etc.

What about a high performance implementation? Right now, there is a single VC per IP address. The network adapter would have to process IP headers, sending some to the conventional driver for processing by the IP layer, processing some locally (those with ST as the upper level protocol). You can't tolerate IP fragmentation unless you are going to do IP reassembly on the adapter, so MTU's are going to be limited. What about duplicate and missing packets? What does ST over IP offer that TCP doesn't?

The connection to other networks is going to be through a router for (CL)IP. The question is: on the non-ATM side of the network, what is ST going to run over? One answer is IP. For an ethernet and low performance, this is ok (I'm assuming that the ethernet adapters are not going to implement ST. They are just going to dump frames to buffers and notify the drivers). What if the other side is giga-ethernet or HIPPI-6400? IP doesn't make sense. So, we would have to convert between 802 style packets and IP packets. Now, in one port of the router comes an IP packet. The router forwards it to another port. But now that output port has to decide what to do with the packet. Some IP packets may very well need to be sent along as IP packets. Others (according to what criteria?) are to be de-encapsulated/re-assembled?! and sent as HIPPI-6400 messages with only a LLC/SNAP/ST header. I think I'd rather just build a bridge between network types of the same "sort" (IEEE 802) than figure this out.

The ATM community is moving to LANE/MPOA (which uses LANE as the underlying network) and away from CLIP. Besides inertia, the motivations are virtual LAN's and support for all protocols that run on 802 networks rather than only protocols that run on IP. Of course, IP runs on LANE's all the time and without performance penalties (IP appealing to an ethernet driver or IP appealing to a LANE driver is not so much different and is not, in any case, the big part of the end-to-end path).

> Why not CLIP? (It is the IETF standard.) Do we see this would be
> used in the LAN or WAN?

ATM-ST has a few advantages:

1. Hardware (adapters, switches) and software at moderate speeds (155-622) deployed now. This advantage will fade over the coming years for the LAN case with giga-ethernet's arrival.
2. A wide-area solution: I can actually lease a high-speed SONET line and hook it up to my ATM switch and blast data from a HIPPI-6400 compute cluster to remote systems, for example. ST is great for this: the bandwidth-latency product may turn out to be about the same between WAN ATM and LAN HIPPI-6400.
3. A more reliable network than legacy LAN's (we'll see for giga-ether). Without a basically reliable network, might as well use TCP.

With regards to CLIP being an IETF standard: I personally believe that an IETF standard is "worth more" than ATM Forum standard, all things being equal. And, I believe that the world, in general, is moving to IP rather than 802. This being said, I don't think all things are equal here: ST is targeted at reliable, switched LAN's. I approached the ATM-ST proposal from this point of view and from how best to exploit ATM advantages.

-- robert

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> Thanks,
> Jeff