Accredited Standards Committee
X3, Information Processing Systems*

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Subject: X3S3.3 Multicast Workshop Meeting Minutes
7 - 8 April 1993, Arlington, Virginia (Draft)

X3S3.3 Multicast Workshop
7 - 8 April 1993, Arlington, Virginia

X3S3.3 held an ad hoc meeting regarding the multicast subject. The meeting was hosted by BBN. Document registration is shown in Attachment 1. Attendance List is shown in Attachment 2.

Mr. Chapin opened the meeting in the Wednesday morning. He requested the group to try to focus on the subject to allow the flow of this meeting to continue to the next X3S3.3 Orlando meeting in 20 - 22 April 1993. Hsi-ming Lee agreed to take the meeting minutes.

Mr. Moulton pointed out that the document SC6 N7897, Japanese comments on Multicast work, is an important document to be considered. As mentioned in the paper, Japan will oppose any work in Multicast to progress until all questions raised in the paper are satisfactorily resolved.

Mr. Chapin stated that the task group, in the past, has been talking about some specific mechanisms for doing connectionless in the network layer, modifying routing protocols and CLNP, etc. Parallel activities are to find out what is the model of multicast. The group had the problem what is the architecture of multicast semantics. Another question is what exactly needs to be standardized.

Mr. Chapin indicated that the purpose of this meeting was to sufficiently develop a solid semantics of multicast, not to get sidetracked to terminology's and other semantics. He also indicated that we would not spend a lot of time to discuss the Network Layer amendments for connectionless multicast, instead, trying to spend time as much as possible on the conceptual model of what the multicast overall.

Mr. John Day put together a set of documents of the architectural model of the multicast. Mr. Day presented **A3, "Patterns in Network Architecture".** Mr. Day went through the fundamental concepts of data communications: **The transfer of data among a set of users, identified by addresses, with a given quality of service.** All communication goes through three major phases: Enrollment/DeEnrollment, Allocation/DeAllocation, and Data Transfer. In the pairwise case, enrollment/DeEnrollment phase was so implicit and people tends to forget about it.

It is worth to note that:

Multicast DISTRIBUTION is a function of RELAYING layers.

Error control layers only provide multicast policies for error and flow control.

A **reliable** multicast transport: **Data transfer is multicast**, but **the control mechanisms are unicast with policies to accommodate the multicast semantics.** This is the most strict statement for a 100% reliable transport. If there is any relaxation, it is quite possible to impose a weaker policy. The question raised by Mr. Marlow and Andersen is that how this affects the mechanism. [See A3 for details.]

Outstanding issues up to this point [11:30am, Wednesday]:

1. **Causal of ordering**
   transport layer will not preclude its user to do this.

2. **Distinguishing one to many and many to many (if any)**
   One to many is a per instance case and many to many then have the ordering problem.

[Day] When you go to joint a group: From the point of view of the guy joining the group, it looks just like a pairwise case. [Chapin] In practice, it looks like very different. [Moulton] We have too much baggage in 8072. [Day] How about edging 8072 toward the direction. [Day] At any point you draw a service boundary, the only difference is back to "The transfer of data among a set of users, identified by address, with a set of quality of service."

[Day] We get to the characterization of multicast communications.

[Marlow] It is worth to discuss from the London output picture in [**4L57**]. [Chapin] It is still dealing with "packages" (i.e., profiles). [Lee] It was the first trial of categorizing different proposals.

[Day] Back to the document A1, slide "The Diversity of Multipeer" which shows:

<u>Population Characteristics</u>
static/dynamic population
centralized/decentralized
known/unknown population

Communication Discipline
send only/send receive

Transmission Characteristics
confirmed/non-confirmed
reliable/unreliable
ordering: local, causal, total

Based on Mr. Day's presentation in A3, the group started the discussion of mechanisms and policies. A table was put on the board:

Enrollment	Allocation	Data Transfer
Group Definition[1]	(Alloc. Mechanism)	Lost and Duplication PDU detection
	Local Binding	(Mechanism)
Group Management		Ack
		Ack/Nack
	Two-way	
	Quorum	(Policy)
	All	All must ack
		Given subset
Access Control		Quorum
	Three-way	None
	Quorum	
	All	Flow Control
		(Policy)
Instance bindings to GC	(DeAlloc. Mechanism)	Rigid (everyone keeps up)
	Abrupt	Drop slow
	Graceful	Average
		Quorum
		None
		(Mechanism)
		Pacing
		Credit
		Sequencing[3]
		Distribution
		(Mechanism)
		Flooding
		Exploders
		Spanning Tress
		Native[2]
		Data Corruption
		(Mechanism)
		FEC
		Error Detecting Codes
		(Policy)
		Choice of Code
		How much to check

Delimiting
(Mechanism)
Internal[5]
External[5]

Context Selection	Context Selection
isotropic	isotropic[4]
anisotropic	anisotropic

Ordering[3]
Native
Causal[6]
Total

Scope Control

Group Characteristics
Static/Dynamic
Known/Unknown
Centralized (1--> N)/decentralized (N-->N)

NOTE 1 – When discussing the Enrollment phase characteristics, Mr. Moulton pointed the group to the document A1.

NOTE 2 – "Native" means utilizing the underlying multicast services which includes intrinsic multicast/broadcast media.

NOTE 3 – Sequencing: Numbering the data. Ordering: The order to send the data.

NOTE 4 – **isotropic**: The context in which each participant in the group conversation is uniform, i.e., everybody has the same policies.

NOTE 5 – **External delimiting:** framing is external. **Internal delimiting:** link field is internal.

NOTE 6 – **Causal:** All receivers see the data in the same order.

[Issue] Type and Instance need to distinguished for the multipeer communication. The OSI Basic Reference Model doesn't help at this point. It is necessary to clarify the **Type and Instance** for the multipeer case.

[Wednesday 1:30pm] After the lunch break, the meeting re-convened at 1:30pm. [Moulton] Add "Instance Binding to GC" to the Enrollment phase. For this, you need to have GC-ID and SRC-REF to identify the particular instance of the group conversation. [Day] Essentially, you are building multicast control mechanism on top of unicast communications. [Chapin] It is confusion of where it is in the "space". [Day] Let's go to the "Data Transfer Phase" discussion.

Issue: AGI? It appears to J. Day that AGI is done by Enrollment and Management; and QoS is done by mechanisms in the data transfer phase. Mr.

Andersen said that AGI is not part of the enrollment, it is a QoS parameter. [Andersen] AGI is a set of specific rules which allow you to make a decision whether you have a connection. AGI is a criteria for transitioning from allocation phase to the data transfer phase. [Day] The point is how to distinguish the difference between AGI and QoS. [Moulton] In my view of the world, if you make the assumption at the enrollment phase, something happens such as enormous amount of information. Someone wish to join, it needs to know this set of information. [Andersen] AGI is the requirement for how a group conversion could be started. [Andersen] This should also belong to the 1 by N and N by N discussion.

[Day] "Join" means "you have establish the context of a shared state". For example, Ed Taylor has joint the group but he is not part of this "connection".

[John Day] An analog of the three phases:

Enrollment	It has been assumed that X3S3.3 and its friends is the environment of this meeting. When meeting announcement has been sent out by Mr. Chapin. The essential elements are: setting of a group of a specific type; a set of ground rules; understanding of the share state. The criteria has been set at this phase. [Note: It is **incorrect** to call X3S3.3 membership is the enrollment and the call of this meeting is allocation.]
Allocation	People come to the meeting. **Starts with a Connect.request by each member joining the group.**
Data Transfer	Everyone talks. **This phase is entered when AGI criteria satisfied, e.g., having the quorum.**

[Steve] One makes "connection request" the rest make "connection confirm".

[Day] Everyone in the group makes "connection request". Steve's model cannot degeneralized to the pairwised situation.

[Moulton] Group conversation is an instance.

[3:30pm (Wednesday) Break]

After the break, Mr. Chapin asked the group whether we have the common understanding of the chart before we make any selections out of the chart.

N --> 1 category was discussed. The group agreed that N--> 1 may be useful, but it is not **multicast**.

[Moulton] This chart is good enough to describe protocols but not services. [Chapin] A taxonomy document will be helpful for the future meeting. Mr. John Day took the responsibility.

[Marlow] Is that possible to use this chart to generate the connectionless multicast. [Day & Moulton] It is certainly possible. Are you looking at the Network layer or the Transport layer. It falls into the distinguishing of error control layer and relaying layer. [Chapin] We did decide to go through this process for the purpose of how to extract a set of characteristics which can be used for describing any proposals.

Issue: Where is Scope Control? [Chapin] put is under the Data Transfer phase. Allowing all the fancy mechanisms in the enrollment and allocation. But at the lower level, still allowing to control the scope of communications. [Day] **The scope control is recognized as for those people who wish to multicast in irresponsible ways.** [Andersen] Are we going to deal with multipeer service specifications?

[Chapin] It will be very useful for those people who have proposals to describe their proposals based on this chart. We may find out that it is relatively easy to progress in the future. The chart up to this point is the first attempt. Certainly, items can be added after examine against specific proposals.

[Thursday 9:30am]

[Lee] I have an item for discussion or at least for a start: What are important QoS parameters for multicast services? At least for the Transport Service?

[Irey] What are the differences between 1--> N, N-->N, N-->M, etc.

[Day] We want to go through those proposals for a start. X.6, HSTP, TP-5, CLTP MC extension, CLNP MC extension, TP-4 MC extension.

Mr. Andersen presented A7. First, he presented how HSTP works and then go through the check list.

The table in Attachment 3 shows the check list of all proposals.

An example of using printers was brought up by Mr. Marlow. Mr. Burg had some further comments. The discussion was cut off. This is considered as not part of the multicast discussion.

[Marlow] In CLTP, group is defined by the receivers. There is no restriction implied to who can be the sender(s).

[Thursday 1:00pm]

Enrollment Discussion: Fred Burg had some disagreement between this meeting and X3S3.3 as a whole. The mailing of the meeting notice. [Moulton] Share state information would be the key. What do you get the shared information? CR (analogy of meeting notice.) [Andersen] How about approach it step by step. Worry about the joining of conversation when the conversation starts at first; worry about those late joining later. [Moulton] The group has no meaning in terms of conversation. Group membership is totally different topic. [Andersen] You are adding access control beyond the group membership. [Day] Unclear part is still where is the cut point of Enrollment and Allocation.

[Moulton] part of the problem, to me you have groups and you have group members. The membership is very dynamic. The group conversation which has nothing to do with the group membership. You can join a group conversation assuming you are a group member. When you make a break of the fact of joining the group conversation and joining the group membership. **This is a very distinctive difference.** [Andersen] The word **join** has different meanings on these two cases. [Doug] There is no substance of joining a group. The real substance is joining the conversation. [Dave] Some of the discussion is probably meaningful for some of the multicast proposals we have today. Any of this makes a lot of sense. [Day] Yes or No.

[Day] The discussion we had yesterday. What was the process of enrollment and what was the process of allocation. Coming to this meeting was used as an analogy. The process was described as first send out the meeting announcement. There was an enrollment phase of X3S3.3 membership and sending out the meeting announcement. There was a separate process of setting up the connection of getting this meeting going. Steve's view is that sending the meeting announcement is actually the "connect/allocate". Day's view is not. Allocation is to create a specific instance of the shared state for the conversation. [Andersen] The instance of the group conversation begins at the attempt of setting up the meeting. [Day & Moulton] I don't think so. [Moulton] Your paradigm falls down. You start getting into the problem where for example the person who sends out the meeting notice has no relationship with the group. [Andersen] Access control problem. [Moulton] No, it is not. sending out the meeting notice has nothing to do with setting up the meeting. The model should be able to do with finding out the meeting. In my model is maintaining the directory. Someone calls Lyman for the meeting announcement. [Andersen] The beginning of shared state starts when the announcement sent out. [Wheeler] We had the same problem. One of them is how many call request you can have for one group conversation? [Day] Steve, do you mean enrollment creates the shared state somewhere in the system or in the participants? [Andersen] In the directory. [Day] In the system (OSIE). The allocation phase creates the shared state among the participants. [Andersen] The connection request starts the "allocation" phase. [Day] Let me try to draw the **conclusion: The enrollment phase creates the shared state in the OSIE (that will permit the allocate). The allocation phase establishes the shared state amongst the participants based on information established during enrollment of a specific instance of the group conversation for that group.** [Moulton] The establishment of the shared state information which is necessary for the group conversation.

CONCLUSION of the discussion:

The enrollment phase creates the shared state in the OSIE (that will permit the allocate).

The allocation phase establishes the shared state amongst the participants based on information established during enrollment of a specific instance of the group conversation for that group.

[Day] I don't want to use the term "connect" as oppose to "allocate". Connection request is actually requesting for the resources to be allocated for the communication. [Day] How do you do the address binding. You lay down the specification, but you have not instantiate the specification.

[Next topic]

Definition of 1-->N, N-->N, and M-->N.

[Day] Is it O.K. if the sender is not a member of the group? [Marlow] Yes. [Andersen] The question is that whether the sender have to be a member of the group? [Day] The three plans of London output may be an over simplification. [Moulton] There is no concept of 1-->N, N-->N, or M-->N, when there no attempt to identify the difference according to the source. When you have to know who the sender is, then it's important. [Doug] Not care or not to identify? [Doug] The instance of a group conversation in the connectionless case is that ONE shot of the PDU sending. [Moulton] *The lifetime of the shared state is longer than the group conversation is the idea of this kind of conversation.*

[Day] The reason of 1-->N and N-->N, 1-->N could use some simplified(?) or specific mechanisms as oppose to N-->N may not be able to use such. The question should be what is this categorization **for**.

[Moulton] The sending of data is "connectionless". The binding of group address is conversation.

[Marlow] **The phone book has to be printed before you read it.**

Can we focused the 1-N, N-N on the connectivities.

[On the board]

Receiver defined

Sender defined

1-->N

N-->N

[PM break]

QoS topic:

Those wonderful parameters are nice. Given the mechanisms and policies in the protocol. **All those work in SC21 is bogus until someone tell us what parameters will affect mechanisms/policies. The key is whether you can use it or not.**

Ordering (QoS) would be a good QoS to start with. 1-->N gives the total ordering. N-->N, you can select. CL provides no ordering. Ordering is a discrete spectrum. There are mechanisms can provide certain ordering QoS. [Day] There is another point aline:

"No order" means whatever the order it arrives will be delivered to the user. (e.g.., the protocol machine will not impose any mechanism in this regard.)

"In order" means those data may be delivered even there are gaps. (e.g., the protocol may be discard those out of order data.)

Sequencing: A separate mechanism for the sequencing (see John's paper). John found that many assumptions about linking things are not necessary.

Sequencing only applies to local ordering. Either no sequence, monotonic increasing with minimum gaps. [Day] I can have causal order and sequencing with gaps as a legal thing. I am guaranteeing all the receivers see things in the same order (but not necessary in the same thing.)

Throughput (QoS) is a good pass through parameter. Changing policies on flow control affects throughput. By specifying a specific throughput, you can not imply what mechanism can be used.

Reliabilities (QoS) Ack policies do not affect reliabilities. Any policies being imposed on top of Ack and Ack/Nack, are purely optimization.

Nack only mechanism is the only one affect the reliability. If there is a "point" or a "segment" in the reliability spectrum which can be provided by a Nack only mechanism. would we like to consider it?

"Error free seconds: ones you are not transmitting anything."

Error Rate (QoS) is connected to links. About error control of packet error rate at the transport layer, it is a Boolean factor. Ack is the mechanism, when you ack and if you ack is the policy.

Latency (QoS) or Jitter (QoS) control: This is the property of the subnetwork, not a parameter we can adjust in the transport layer. Maybe some lower layers? Subnetwork. Can you make a decision tree of what kind of subnetwork to use? Yes.

Observability and **actively manipulatability** is a criterion for selecting useful QoS for a particular protocol of a particular layer.

AGI: Active Group Integrity

In pairwise, we had a rug called QoS.

In multicast, we have AGI, Management as rugs.

[3:50pm, Thursday] The "raw" minutes up to this point was printed out for the group to review. [The meeting was adjourned at 4:10pm]

Attachment 1

Temporary Document Registration

A1 NOTES on Multicast Architecture (Moulton)

A2 SC6N7897, Japanese Comments on Document SC6 N7608, Issues Surrounding the Specifications of Enhanced Communications and Facilities (ECFF) (Japan)

A3 Patterns in Network Architecture (Day)

A4 Guidelines for the Specification of LFMs (Day)

A5 Unicast Sequencing Mechanism Specification (Day)

A6 Error Control Mechanism LFM Specifications (Day)

A7 HST Multipeer (Andersen)

Attachment 2

Attendance List

Name	Affiliation	Wed	Thur
Lyman Chapin	BBN	W	
James Moulton	ONS	W	Th
Dave Marlow	DoD	W	Th
Samir Saad	AT&T	W	Th
Colin Amor	Intelsat	W	Th
Kevin Thompson	MITRE	W	Th
John L. Wheeler	Wintergreen Info. Services	W	Th
Hsi-ming Lee	COMSAT	W	Th
Robert Rice	ARINC	W	Th
Margaret Loper	IST	W	Th
John Day	BBN	W	Th
Phil Irey	DoD/NSWC	W	Th
Steven C. Andersen	PARAMAX	W	Th
Doug Montgomery	NIST	W	
Fred Burg	AT&T	W	Th
Steve Van Trees	FAA		Th
Al Kerecman	DoD/Army CECOM		Th

	HSTP	X.6	TP-5	TP-4 MC	CLTP MC	CLNP MC
Enrollment						
Group Definition					x	x
Group Management		x				
Access Control						x?
Instance binding to GC			x	x		
Population Characteristics						
Static/Dynamic	x	x	D	x	D	D
Known/Unknown		x	x	K	U	U
Centralized/Decentralized	x		D	C	MxN	MxN
Allocation						
(allocation mechanism)						
Local Binding	x		x		x	x
Two-way	x		x			
Quorum			x			
All			x			
Three-way				x		
Quorum				x		
All				x		
Non-Blocking Establishment	x			n/a	n/a	n/a
Quorum enforcing		x	x			
(DeAlloc. Mechanism)					n/a	n/a
Abrupt	x		x	x		
Graceful						
Context Selection					n/a	n/a
isotropic	x	?		x		
anisotropic			x			
Priority	x	x			svc	svc
Data Transfer						
Communication Discipline						
Send only	x					
Send/Receive		x	x	x	x	x
Transmission Characteristics						
Confirmed/Non-Confirmed			c	c	nc	nc
Reliable/Unreliable			r/u	r	u	u
ordering: local, causal, total			l	c	n/a	n/a
Lost and Duplication PDU detection						
(Mechanism)						
Ack	x		x	x		
Ack/Nack						
None		x	x		x	x
(Policy)					none	none
All must ack			x	x		
Given subset						
Quorum						
Flow Control			x		none	none
(Policy)						
Rigid (everyone keeps up)			x	x		
Drop slow		x		x		
Average						

Quorum						
None		x				
(Mechanism)						
Pacing	x					
Credit	x		x	x		
Sequencing	x	x	x	x	n/a	n/a
Local	x	x	x	x		
Causal		x				
Global						
Distribution		n/a				
(Mechanism)						
Flooding						x
Exploders						x
Spanning Trees						x
Native	x		x	x	x	x
Data Corruption		n/a	none			
(Mechanism)						
FEC						
Error Detecting Codes	x			x	x	x
(Policy)						
Choice of Code						
How much to check	x			x	x	x
Delimiting						
Internal	x		x	x	x	x
External	x					
Context Selection					n/a	n/a
isotropic	x			x		
anisotropic			x			
Ordering					n/a	n/a
Local	x		x			
Causal				x		
Total						
Scope Control		x	no	no	no	x
Out of Flow	x		no		no	no
Expedited Data			no	x	no	no
Prioritizing Data	x		no	no	svc	svc

[NOTE from the minutes taker: This table needs careful examination from the originator of each proposal.]