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1394 PWG Meeting -- April 6-7, 1998

The list of attendees included:

Takashi Isoda	Canon
Shigeru Ueda	Canon
Osamu Hirata	Canon Business Machines
Lee Farrell	Canon Info Systems
Peter Johansson	Congruent Software
Greg LeClair*	Epson
Fumio Samitsu	Epson
Yoshinori Murakami	Epson
Tak Shiozaki	Epson
Fumio Nagasaka	Seiko Epson
Laurie Lasslo	Hewlett Packard
Greg Shue	Hewlett Packard
Alan Berkema	Hewlett Packard
Jon Lewis	Hewlett-Packard
Mark Dovi	Hewlett-Packard
Motoyasu Tsunoda	Hitachi Micro Systems
Peter Lee	Intel
Fred Leung	Intel
Yuuji Sasaki	Japan Computer Industry
Brian Nagy	Kodak
Jerry Thrasher	Lexmark
Don Wright	Lexmark
Randy Turner	Sharp
Bob Morford	SIS Microelectronics

* 1394 PWG Chairman

Administrivia --

Don Wright gave the next PWG meeting details:

* May 18-22
* Northern Virginia/Washington DC area
* Crystal City Marriott
* April 27 Reservation deadline

Greg LeClair presented the meeting goals and proposed agenda topics:

* Introductions
* FDS Status Update -- Meeting 4/20
* SBP-2 Model Discussion
* SHPT Presentation
* Current Profile
* E-mail/Telecon Issues
* LUNs
* Logins
* Terminology
* Scenarios
* New Business
* Total Host to Printer Solution

FDS Status Update --
The next meeting for IEEE 1212 will be held at Canon in Japan on April 20. Greg LeClair suggests that people examine the latest draft of the FDS proposal (now part of IEEE 1212) which has been posted on the 1394 PWG Website.

IP over 1394 --
Making progress faster than originally expected.
Interoperability demo was held at Cisco between Toshiba, Intel and Sony.
Showed 3 1394-capable PCs interworking. Windows- and Linux-based

machines were connected and used browser to access the Web. IP functionality on Unicast and Broadcast is working now. Planning to work out solution for Multicast in around two weeks. Expect final solution to be ready in August.

SBP-2 Model Discussion --
Since Last meeting, the group has held a teleconference about the Image Device profile, and Shimura-san of Canon has published a proposal for SHPT.

SHPT Presentation --
Isoda-san gave SHPT presentation slides. The SHPT proposal offers better efficiency over the Ordered model. Isoda-san explained that the other schemes considered either create redundant communication between the Initiator and Target, or impose latencies that reduce the efficient use of bus bandwidth. Also, the other schemes impose extra workload on both the Initiator and Target to re-schedule tasks.

The SHPT model introduces the concept of a "queuing model" that uses the SBP-2 unordered capability over a single Login. Both the Initiator and Target maintain two separate queues, one each for the Read and Write requests. This way, independent activity can occur for both Read and Write execution. By having this separation, there is no need for a Read transaction to wait for any Write transactions before it executes. Therefore, by eliminating these delays, the efficiency of the bus is improved.

A major point of the proposal is to have the Target be responsible for the re-ordering of the ORBs after an error recovery. By splitting the ORB list into the two separate queues, a more efficient recovery is possible.

To facilitate accurate error recovery, the Target must keep track of the sequence ids of each ORB being processed in both the Read and Write queue and the buffer offset of the last command processed. After an error occurs, the Initiator will re-build the ORB list. As the Target accepts the ORBs in the list, it will examine each sequence id of the ORBs and decide if it has already processed it completely. If it has, the target will return a buffer processed status without doing any execution. Otherwise, it will use the buffer offset pointer to find the location of last execution, and continue.

Question related to the SHPT command set: Will the SHPT proposal require a change to our implementation of SBP-2? In order to use a special command set, they will need to be included in our profile definition.

Because SHPT does not follow the standard unordered model, Greg Shue says that it will make the use of standardized drivers more difficult. Greg says that there are issues about how a task list gets updated. Alan is concerned that the Initiator needs to know about the queue lengths in the Target. He feels that this creates a "munging" of the layers.

Greg Shue raised several issues about SHPT:

* PSID/SSID fields are defined, but not explained how they're used.
* Partial completion notification has no value-added.
* It appears that a Function is mapped to a LUN.
* It is unnecessarily complex to require the Initiator to limit the number of ORBs on a list (based on the Target queue lengths)
* It is possible to handle the flow control by doing explicit completion notification.

Greg believes that many of the benefits raised by SHPT can be achieved and addressed through the use of an Ordered Model. He will explain this

idea in the future.

Greg gave his reactions to SHPT proposal:
+ Provides required functionality
* Flow control is explicit
* Device type definition => LUN is mapped to a Function
* Partially completed notification is redundant
- Several issues of Task Management interactions are missing and need to be addressed
- Use of PSID/SSID fields not addressed
- Uses vague area of SBP-2 specification; standard implementations may not support
- Limited potential savings:
a) completion notification is required for each command
b) might be able to avoid refetching entire Active Task List on Doorbell ring at the cost of:
coding new Task Management Model
testing new Task Management Model

Peter Johannson asked for more explanation of why Greg thinks SHPT is "not standard" and uses the vague area of "unordered command-set dependent" portion of the SBP-2 specification. Greg explained that the Target essentially ignores the "next ORB" pointers. After hearing Greg's explanation, Peter still did not think this is a problem.

Greg Shue then offered a proposal to get "best of both worlds" -- use the best of everything.
* Model the device as two message queues
* Use the Ordered task model
* Initiator only queues commands guaranteed to complete
* Explicit queue status (flow control) sent on each command completion within completion notification
* Unsolicited Data Available sent only when task list is empty
* Add sequence id to know where you can resume fetching contents

According to Greg, this approach would not create redundant traffic on the bus, because the command completion could be "piggy-backed" on the completion notification. Peter Johannson did not seem convinced. He believes that using the Ordered model will allow blocking.

Peter pointed out that a standard SBP-2 driver should not be re-ordering the ORB links. Implementations should be able to assume that this order will be maintained.

Peter said that a pending Read ORB could be removed from the list based on knowledge of the fetch agent.

Greg LeClair summarized the Desired Goal: Service with one LUN, non-blocking bi-directional communication with a single login.

Two alternatives now exist for the single login method: SHPT and using the Ordered model. Several individuals prefer that the depth of target queues should not need to be known by the Initiator. How can we modify the SHPT model to eliminate this knowledge?

Profile Document --
Greg Shue proposed that Alan Berkema be given the formal responsibility of being Editor of the Profile document. Discussion of this proposal was postponed until Brian Batchelder (the current Editor) is present.

Alan said that the next version should be updated to reflect whatever is decided on the "Ordered vs. Unordered" model.

Greg and Alan both believe that flow control (e.g. knowing the Target queue depths) is not necessary if we use the Unordered Model.

Extended reconnect: Greg Shue has submitted a proposal for extending the Transient Re-connect time-out period. He and Peter believe that the SBP-2 group will adopt his proposal. If it does get accepted, it will have an impact on the Profile document.

Randy Turner asked if there would really be a situation in which the Write queue will ever contain more than a single ORB at a time. He thinks that this condition might not actually occur-- based on his understanding of existing O/S behavior.

E-mail/Telecon Issues --
Greg LeClair started a discussion on the various issues that have been raised in recent e-mail and the last teleconferences. To illustrate some of the questions raised about LUNs, Logins, and Units, he drew a diagram.

How should we distinguish between Units and LUNs? People agree that the PCL Interpreter and Status can be combined into a single Unit. There was not agreement if they should also be combined into a single LUN.

Alan says that he is anxious to include the diagram content and clarifications in the next update of the Profile document.

Greg Shue identified some issues:

* How can we encode multiple PDLs?
* How do we identify the different types of services?
* Do we need to provide a mechanism to allow multiple logins (from the same Initiator) to the same type of service?

Although the above diagram has a LUN identified for SNMP, it was noted that this is only one choice of implementation method. It would also be possible to create a separate Unit Directory that has a function of SNMP. This observation led to the proposal of a "Login-less datagram" service as a beneficial feature. For example, it could be very useful for providing access to an SNMP service for status information. Could we identify a unique Unit Directory that offers a service for this capability? This might be a way to bypass the restriction of only having one login per service. However, after some discussion, people thought that this concept might have some drawbacks. For instance, Peter described that the suggested approach would be limited to 12 bytes of data transfer in one direction. The group agreed that this proposal needs further consideration and will be addressed via e-mail.

After the afternoon break, Greg LeClair asked the group if they were prepared to vote on choosing a method for the profile:

* Ordered
* Unordered without "flow control"
* Explicit "flow control" to avoid blocking (using either Ordered or Unordered)

[NOTE: The term "flow control" above does not imply negotiation. Later, the group decided that the term "policy" was more appropriate.]

Greg Shue wanted further clarification on the Unordered method without flow control before he feels ready to select one of the above methods. He wanted to review what happens when a pending Read needs to be "cleared" from the ORB list. It was suggested that a Read could be completed with zero bytes sent. Randy said this is not a good idea -- he feels that a zero length message should only be used when dealing with an error condition.

Instead of having the Initiator know the queue lengths within the Target, Peter suggests that the Initiator only needs to know the acceptable "delta" to identify the maximum number of pending Read or Write ORBs on the list. This "delta" value would somehow identify a limit on the number of items in the ORB list. However, Peter said that he would like to have a separate discussion of this concept so it could be worked out in more detail.

After some discussion, Greg Shue seemed satisfied that an Unordered model will require some kind of agreement on a policy that limits the number of ORBs that can be sent across to the Target. For SHPT, this policy would be implemented by knowing the queue lengths in the Target. For Peter's proposal, the "delta" value would be used.

Do we really need to use pending Reads on the ORB list? Randy says we don't need to have them. He also says that by eliminating pending Reads, unnecessary complexity can be eliminated. He claims the latency saved by having a pending Read is not significant. Others strongly disagreed.

In response to Randy's concern about "unnecessary complexity," someone asked if SHPT's method of communicating the queue depths was in fact very complex. Peter said that it should be very simple to convey the information in CSR or in a command following the Login. Can the queue depth values change across logins? Yes, theoretically this is possible, although in practice it probably will not happen.

Isoda-san gave an explanation of the SHPT error recovery process (using ORB sequence ids and buffer offsets.) Peter warned that the buffer contents might not be reliable in all cases after a bus reset. For certain situations, all the data might need to be re-transmitted.

Day 1 Meeting adjourned.

PWG-C --
Nagasaka-san reported that next PWG-C meeting is April 10 at Sony. This meeting will have a new board member elections. Shinoda-san announced two sub-working groups: Subgroup 1 is working on Direct Printing Protocol (DPP) and Subgroup 2 is working on AV/C. Subgroup 2 will issue a new proposal and submit for review. To attend the PWG-C meeting, contact Shinoda-san via e-mail at: shinoda@bsd.canon.co.jp

Review of Day 1 --
Alan summarized the major issues that had been discussed and still need to be resolved:

* Ordered vs. Unordered model
* Should we issue a "Hanging" ORB (Pending ORB) or not?
* Management Function as a separate Unit Directory or Login-less Management -- using a register or Management ORB

Alan also said that he would like to examine the expected schedule for making further progress and estimating when the group could complete its activity.

Ordered Model --
Greg Shue gave his views on using the Ordered Model instead of the Unordered Model.

* The Target reports status of Message queues as they exist in the Target on each command notification. Reporting status is similar to method used to report credit in 1284.4. Information is "piggy-backed" on message transaction.
* Command is simple transfer of data between Initiator and Target memory.
* Initiators only queue commands that are guaranteed to be completed.
* Target only needs to fetch one ORB at a time.

* Initiator could have option to skip notification for some ORBs (this can help performance.)

Greg believes that the Unordered Model approach is much simpler to test, and he feels that this may be a significant benefit. He claims this method will be much easier to predict the desired/expected behavior. He also believes that the target is simpler.

Peter Johansson argued that the testing might not be as easy as Greg believes, nor that the target is significantly simpler. Peter pointed out that both models only need to fetch one ORB at a time if it is desired.

Potential drawbacks of the proposal were also noted:
* must complete all pending ORBs before a new ORB could be processed (e.g. sending an asynchronous notification)
* Lack of extensibility

Sequence of communication:
Login
Config (specify max message size, queue length, initiator USTAT, ENABLE watchdog configuration)
Start
USTAT

Peter claimed that the target does not really need to communicate how much data is available. If you add the transfer length and underflow/overflow (error) flag in the completion status, the initiator can determine all necessary flow control.

Nagasaka-san asked Ueda-san if the Ordered model that Greg proposes reduces/eliminates the latency that SHPT claims to avoid. Ueda-san says he is not yet sure, and would like to review the proposal details more carefully before he knows.

Alan said that he believes both models require similar exchanges of information, but that the Unordered model offers more flexibility.

Voting Rules Revisited --
The clarification of "meeting attendance" was raised. Don Wright made a motion that we (re-)define "meeting attendance" qualification as "physically attending any part of any day of a meeting." The motion passed.

As a result, the updated voting rules and procedures are given below:
* An individual must be present at a meeting or participate via teleconference to vote.
* Votes are counted on an individual basis -- not as companies.
* Eligibility to vote is determined by physically attending two of the previous four meetings. Teleconference participation does not qualify as "attendance" for voting purposes. (It was suggested that eligibility requirements may be overruled by the chairman if he believes a company is unfairly "stacking" the vote.) "Meeting attendance" requires physical attendance of any part of any day of a meeting.
* With a simple majority vote, the group may confer voting rights to an individual that is not otherwise eligible to vote. This will be done on a "case-by-case" basis, and is intended to address those individuals that have made significant contributions to the group -- but have not attended the required amount of meetings.
* Simple majority votes are sufficient for approving procedural and other minor issues.
* Two-thirds majority votes are required for "major technical issues" -- as determined by the chairman prior to the discussion on the vote.

* A quorum is defined by having at least 50% of the eligible voters or 10 eligible voters present -- whichever is less.
* The chairman will declare quorum conditions have been met at the beginning of the meeting. The quorum remains in effect for the duration of the meeting -- regardless of whether any of the eligible voters leave early.
* It is the responsibility of the Secretary to maintain the list of eligible voters.

Unordered Model Vote --
Alan Berkema made a motion to adopt the Unordered execution model of SHPT as our direction of development and to use it as the basis for our continued work on the Imaging Device Communication Profile. Greg Shue seconded the motion.

The group also voted to confer voting rights to both Peter Johansson and Shigeru Ueda for this meeting.

During the discussion, it was noted that the Unordered model offers more flexibility and better performance over the Ordered model. Also, because SBP-2 penalizes idle devices with significant start-up latencies, the Unordered is preferable. There are more cases of the Ordered model being idle than the Unordered model.

The motion passed 11 yes votes, 1 no vote, and no abstentions.

Alan will include several of the SHPT proposal concepts in the next revision of the Profile document.

"Hanging" ORBs --
Peter suggested that the standard should not make any statement on whether or not a "Hanging" ORB may, can, or should be issued. It should be up to the implementation to use this method or not. The group agreed.

Management as Separate Unit Directory or "Login-less" Management --
It was suggested that some usage models be developed for helping to determine this issue. If anyone has any strong suggestions for this possible mechanism, they are encouraged to develop a proposal for submission.

Printing Usage Model --
Greg LeClair led the group in an effort to define a Printing Usage Model (single function.)

Greg noted that SBP-2 limits a single Initiator to one login to a given LUN. That is a restriction that we must deal with. Randy identified a requirement for multiple users (or applications) on a given device to use the same service. Is this a problem? Greg reminded the group to review the latest IEEE 1212 draft to determine if it addresses all the requirements of the PWG group.

The group started to review different configuration alternatives to determine if they were valid Usage models, but did not complete the process.

A suggestion:
If a single instance of a service is available, the Unit Directory should indicate if multiple instances are possible or not. However, Configuration ROM only needs to show LUN 0. To handle multiple instance assignments of LUN ids, the PWG driver could (should?) be responsible for multiple LUN identification.

Randy says that for a device that supports two or more services (such as a Printer supporting both LPR and IPP), he would like to have separate Unit Directories for each service. Peter mentioned that the IEEE 1212 standard is attempting to address something called "affinity"

relationships that indicate whether different services belong to the same device or not. These relationships would help to avoid the (possibly incorrect) interpretation that multiple physical printers exist.

Peter noted that it was inappropriate to expect the Secretary to capture the details of the technical considerations and discussions for the Minutes. He suggested that prior to the next meeting, someone should develop a detailed proposal for submission and review by the group.

The group voted to have Alan as the new Editor for the Profile document. He will add the details of the above discussions into the next revision.

Peter outlined some ROM entries to illustrate a sample hierarchy. He also stressed that we should participate in IEEE 1212 to ensure that the discovery method actually works for PWG 1394 requirements:

```
Command_Set_Specification_Id
      standards organization of your choice
Command_Set
      Digital Still Image (DSI)
Service
      <new ROM entry -- TBD>
            LPR
            TIPSI
            HPS
            IPP
            "Bass-o-matic"
            etc.
```

Greg LeClair volunteered to write up a more detailed explanation/proposal for the directory information contents. He will submit his write-up to Alan for inclusion in the next Profile document revision.

Meeting adjourned.