Annex D

(Normative)

FCP Device Discovery Procedure

D.1 FCP Device Discovery Procedure

This annex defines a set of behaviors that allow for the efficient discovery of resources (e.g., logical units) being made available to an initiator FCP_Port by a target FCP_Port. Since the responsibility of enabling this efficient discovery process resides with both the initiator FCP_Port and target FCP_Port, this annex specifies behaviors for both.

D.1.1 initiator FCP_Port discovery of Fabric-attached target FCP_Ports

The following procedure shall be used by initiator FCP_Ports for discovering and authenticating ~~FCP devices~~ target FCP_Ports in a Fabric switch environment. This discovery process only applies to initiator FCP_Ports that have completed the Link Initialization protocol, are in the Active State (see FC-FS-2) and have not yet performed Fabric Login (see FC-LS). This discovery process is not intended to be used following a Fabric event such as the reception of an Registered State Change Notification (RSCN). The discovery process that shall be followed after the reception of an RSCN is specified in D.2. The FCP device discovery procedure also applies to NL_Ports attached to an FL_Port that provides the Name Server capability described in FC-GS-6. The Node_Name and Port_Name are Name_Identifiers that are Worldwide_Names, assuring that they are uniquely identifiable. Logical units are also assigned a Worldwide_Name that may be examined using the INQUIRY command with the EVPD bit set to one and the PAGE CODE set to 83h (i.e., the Device Identification VPD page) (see SPC-4).

~~Depending on the specific configuration and the management requirements, any step other than step 2 and step 3 may be omitted and may be performed using actions outside this standard or the referenced standards.~~

initiator FCP_Port login process:

1) Perform Fabric Login (see FC-LS);
2) Login with the Name Server;
3) Register information with Name Server;
   a) FC-4 TYPEs object (see 7.2); ~~and~~
   b) FC-4 Features object (see 7.3);
   c) Discovery Type (see FC-GS-6);
   d) Symbolic Port Name (see FC-GS-6); and
   e) Symbolic Node Name (see FC-GS-6);
4) Register for State Change Notification with the Fabric Controller (see FC-LS);

initiator FCP_Port Discovery of available target FCP_Ports:

5) Issue a GID_FF query to the Name Server with the Domain_ID Scope and Area_ID Scope fields set to zero, the FC-4 Feature bits field set to 01h, and the TYPE Code field set to 08h. This query obtains a list of the Port Identifiers of devices that support the FCP protocol and FCP target function (see FC-GS-6);

initiator FCP_Port logical unit discovery:

6) For each Port Identifier ~~returned in the accept CT_IU for the GID_FF, perform login and Process Login,~~ discovered via the Name Server:
   a) perform Port Login; and
   b) perform authentication if required (see FC-SP).
7) For each target FCP_Port that accepted the PLOGI ELS and (if required) performed authentication successfully (see FC-SP), perform Process Login, with the Enhanced Discovery bit set to one (see 6.2).

Editor's Note: Authentication in this context, at least in the past, is specified in D.3 and D.4. Is your intent to introduce FC-SP authentication? **Yes, in step 6b I make reference to authentication. I've reworded it slightly, see if it makes more sense now.**

NOTE: An initiator FCP_Port may be configured by means not defined in this standard to not set the Enhanced Discovery bit. An example of when this would need to be done is when an in-band management application needs to access a previously unconfigured target FCP_Port.

8) If the PRLI ELS succeeds, issue an INQUIRY command to LUN 0 to identify the type of target (see 6.2 and SPC-4). If the PRLI ELS is rejected with a reason code "Unable to perform command requested" (i.e., 09h) and reason code explanation "No resources assigned" (i.e., 52h), then the initiator FCP_Port shall transmit a LOGO ELS to the target FCP_Port (see FC-GS-6);
9) If the INQUIRY command succeeds, issue a REPORT LUNS command to LUN 0 to obtain a list of the logical units accessible through the target FCP_Port (see SPC-4);
10) Issue an INQUIRY command for each reported LUN to determine the type of peripheral device and supported command set for the logical unit (see SPC-4); and
11) Issue an INQUIRY command with the EVPD bit set to one and the PAGE CODE set to 83h for each reported LUN to obtain the logical unit's Worldwide_Name. This allows higher level applications to identify possible redundant paths to a logical unit (see SPC-4).

D.1.2 Initiator discovery of loop-attached target FCP_Ports

The following procedure may be used by initiator FCP_Ports for discovering and authenticating FCP devices in a loop environment where no fabric switch is attached to the loop.

The following steps are all optional. Depending on the specific configuration and the management requirements, any step may be omitted and any step may be performed using actions outside this standard or the referenced standards.

1) Obtain a map of the loop or poll all possible addresses if a loop map is not available to identify devices that are present on the loop (see FC-AL-2);
2) For each loop ID found in step 1, perform login and Process Login, and if the device is determined to be an FCP target, issue an INQUIRY command to LUN 0 (see 6.2 and SPC-4);
3) If the INQUIRY command succeeds, issue a REPORT LUNS command to LUN 0 to obtain a list of the logical units accessible through the target FCP_Port (see SPC-4); and
4) Issue an INQUIRY command with the EVPD bit set to one and the PAGE CODE set to the Device Identification VPD page for each reported LUN to obtain the logical unit's Worldwide_Name. This allows higher level programs to identify possible redundant paths to a logical unit (see SPC-4).

D.1.3 Target FCP_Port discovery of Fabric-attached initiator FCP_Ports

The following procedure shall be used by target FCP_Ports for discovering and authenticating initiator FCP_Ports in a Fabric switch environment. This discovery process only applies to target FCP_Ports that have completed the Link Initialization protocol, are in the Active State (see FC-FS-2) and have not yet performed

Fabric Login (see FC-LS). This discovery process is not intended to be used following a Fabric event such as the reception of an Registered State Change Notification (RSCN). The discovery process that shall be followed after the reception of an RSCN is specified in D.2. The FCP device discovery procedure also applies to NL_Ports attached to an FL_Port that provides the Name Server capability described in FC-GS-6. The Node_Name and Port_Name are Name_Identifiers that are Worldwide_Names, assuring that they are uniquely identifiable. Logical units are also assigned a Worldwide_Name that may be examined using the INQUIRY command with the EVPD bit set to one and the PAGE CODE set to 83h (i.e., the Device Identification VPD page) (see SPC-4).

Target FCP_Port Login process:

1) Perform Fabric Login (see FC-LS);
2) Login with the Name Server;
3) Register information with Name Server;
   a) FC-4 TYPEs object (see 7.2);
   b) FC-4 Features object (see 7.3);
   c) Discovery Type (see FC-GS-6);
   d) Symbolic Port Name (see FC-GS-6); and
   e) Symbolic Node Name (see FC-GS-6).
4) Register for State Change Notification with the Fabric Controller (see FC-LS);

Target FCP_Port Discovery of available initiator FCP_Ports:

5) Issue a GID_FF query to the Name Server with the Domain_ID Scope and Area_ID Scope fields set to zero, the FC-4 Feature bits field set to 00h, and the TYPE Code field set to 08h. This query obtains a list of the Port Identifiers of devices that support the FCP protocol and FCP initiator function (see FC-GS-6);

Editor's Note: Why does a target FCP_Port need to discover available initiator FCP_Ports? **For error recovery and potentially for managment applications.**

Target FCP_Port process initiator FCP_Port LUN Discovery commands:

6) Process Port Login requests and transmit an accept if resources are available;
7) Perform authentication if required (see FC-SP); and
8) Process PRLI requests as follows:
   a) If the Enhanced Discovery bit in the PRLI request is set to one (see 6.2) and the target contains LUNs that are available for the initiator FCP_Port, the target FCP_Port shall transmit a PRLI accept; or
   b) If the Enhanced Discovery bit in the PRLI request is set to one (see 6.2) and the target does not contain logical units that are available for the initiator FCP_Port, then the target FCP_Port shall reject the PRLI request with a reason code "Unable to perform command requested" (i.e., 09h) and reason code explanation "No resources assigned" (i.e., 52h) (see FC-GS-6); or
   c) If the Enhanced Discovery bit in the PRLI request is not set to one (see 6.2), then the target FCP_Port shall transmit a PRLI accept if it has resources available to do so;
9) If the PRLI is accepted, the target FCP_Port shall process and respond to SCSI_FCP commands as defined in SPC-4.

D.2 RSCN Discovery

After RSCN is received, initiator and target FCP_Ports shall:

1) Perform one of the following actions depending upon the format of the RSCN:

a) Port Address format RSCN containing one Port ID in affected port ID List. - Transmit one Get Port Name (GPN_ID) Request CT_IU as defined in FC-GS-6 to the Name Server specifying the address identifier of the affected port ID in the RSCN; or
b) Port Address format RSCN containing more than one affected port ID's. - Transmit Get Port Name (GPN_FF) Request CT_IU as defined in FC-GS-6 to perform initial discovery of available addresse identifiers. The FC-4 Type shall be SCSI (08h) and the FC-4 Feature shall be target (00h). The Domain ID scope and Area ID scope bits shall both be set to zero; or
c) Domain Format RSCN - Transmit GPN_FF as defined in FC-GS-6 to perform initial discovery of available addresse identifiers. The FC-4 Type shall be SCSI (08h) and the FC-4 Feature shall be target (00h). The Domain ID scope shall be equal to the value of the Domain in the RSCN and Area ID scope bits shall be set to zero.

2) Depending upon the type of FCP_Port, perform either the:
   a) initiator FCP_Port Discovery of target FCP_Ports after RSCN reception; or
   b) target FCP_Port Discovery of initiator FCP_Ports after RSCN reception process.

D.2.1 initiator FCP_Port Discovery of target FCP_Ports after RSCN reception.

How an initiator FCP_Port performs discovery after an RSCN is received depends upon:

a) the initiator FCP_Ports current login state with each target; and
b) if authentication as defined in FC-SP will be performed between the two N_Ports.

The following set of conditions define how an initiator FCP_Port shall discover target FCP_Ports. In general, the initiator FCP_Port will either be discovering a previously unknown target FCP_Port referred to as a New target FCP_Port, or a previously known target FCP_Port referred to as an Existing target FCP_Port.

New target FCP_Port – The initiator FCP_Port discovers via the Name Server:

a) a previously unknown target WWPN;
b) a target WWPN the initiator FCP_Port does not have an active login with;
c) a previously known target WWPN that is associated with a 24 bit address that is different from the address identifier previously associated with that target WWPN;
d) a previously known target WWPN and the initiator FCP_Port received a logout from the target; or
e) a previously known target FCP_Port WWPN and the and the RSCN contains an Event Qualifier of "CHANGED PORT ATTRIBUTE" (see FC-LS)

For all of the cases above, the initiator FCP_Port shall perform the initiator FCP_Port logical unit discovery process.

Existing target FCP_Port – The initiator FCP_Port discovers via the Name Server:

a) a target FCP_Port the initiator FCP_Port has an active login with (need more text here). The initiator FCP_Port shall not perform discovery as defined in the New target FCP_Port section of a target FCP_Port for which an existing Login exists;
b) a target FCP_Port the initiator FCP_Port has an active login with (?) and the address identifier of the target FCP_Port was present in the payload of the RSCN. The initiator FCP_Port shall transmit ADISC to the target FCP_Port. If the response to ADISC is LOGO, perform the initiator FCP_Port LUN Discovery process;
c) a target FCP_Port the initiator FCP_Port has a current login session with (?) and that target FCP_Port is no longer present in the Name Server. The initiator FCP_Port shall wait R_A_TOV. If the Port

ID/WWPN combination is not rediscovered within R_A_TOV, the initiator FCP_Port shall consider itself logged out of the target FCP_Port and terminate all open exchanges with the target FCP_Port no longer listed in the Name Server; or

d) a target FCP_Port returns a LOGO ELS sequence or an LS_RJT ELS sequence with the reason code set to “Unable to perform command requested” and the reason code explanation set to “N_Port Login required”, perform the initiator FCP_Port logical unit discovery process.

D.2.2 Target FCP_Port Discovery of initiator FCP_Ports after RSCN reception.

The following actions will be taken depending upon the contents of the Name Server response:

a) New initiator found - do nothing;
b) Existing initiator found - do nothing;
c) Existing initiator found, was in the affected N_Port list - do nothing; or
d) Existing initiator found, now logged out of the fabric - Logout.

D.3 Fabric and Device Authentication

The following mechanisms are used by any Fibre Channel device to verify its relationship with other devices attached to the fabric. Such verification may be required after initialization or other temporary fabric disturbances. The following steps are all optional. Depending on the specific configuration and the management requirements, any step may be omitted by any of the attached devices and any step may be performed using actions outside this standard or the referenced standards.

1) N_Ports or NL_Ports retain the Fabric Port Name and Fabric Name of the Fabric from the information exchanged during fabric login and associate that information with the Loop Fabric Address of that Fabric. This information is retained by the N_Port or NL_Port for as long as the login with the Fabric is active (see FC-LS);
2) All N_Ports and NL_Ports, including initiator FCP_Ports and target FCP_Ports, validate the current fabric login following every Loop Initialization by comparing the Loop Fabric Address, Fabric Port Name, and Fabric Name received during fabric login with those reported by the FAN ELS performed during the initialization. If all three identifiers reported by the FAN do not match the values reported during fabric login, a configuration change has occurred and an explicit logout is performed and all open Exchanges are terminated (see 4.10 and FC-DA);
3) N_Ports and NL_Ports retain the Node Name and Port Name of the other port from each PLOGI ELS and associate that information with the Address Identifier of that port. This information is retained for as long as the PLOGI ELS with the other port is active (see FC-LS); and
4) initiator FCP_Ports and target FCP_Ports validate N_Port and NL_Port logins following every Loop Initialization by comparing the Port Name, Node Name, and Address Identifier received during the PLOGI ELS with those reported by the Name Server (see FC-GS-6) or the ADISC ELS/LS_ACC (see FC-LS) that follows loop initialization. If all three identifiers reported by the Name Server or ADISC ELS/LS_ACC do not match the values reported during PLOGI ELS, a configuration change has occurred and a logout is performed and all open Exchanges with that initiator FCP_Port or target FCP_Port are terminated (see 4.10 and FC-DA).

D.4 Logical unit authentication

A logical unit’s identity is optionally verified and monitored by performing an INQUIRY command with the EVPD bit set to one and the PAGE CODE set to the Device Identification VPD page to obtain the logical unit’s Worldwide_Name. The same Worldwide_Name is presented by a logical unit regardless of the port by which it is accessed and the value of the LUN field used to access it.

D.5 Target FCP_Port internal configuration change

If the internal configuration of a target FCP_Port changes and this change either does or could potentially change the response to a report LUNs command, the target FCP_Port shall transmit an RSCN to the Fabric controller. The RSCN shall contain the targets 24 bit address as well as the Event Qualifier of "CHANGED PORT ATTRIBUTE" (see FC-LS)