

Review of FC-SCM to allow for use in an FCoE environment

Item 1:

Text from FC-SCM:

4.1 Interoperability environments

This technical report defines an environment in which a compliant device adheres to a set of behaviors that allow a management tool to simply manage **the SAN** of which this device is a component, as shown in figure 1. The SAN consists of one or more hosts (e.g., servers), **one or more switches**, and one or more storage devices. The management tool may reside on one of the hosts or in one of the switches. This technical report presumes that changes in the SAN configuration are performed by a single management tool. If multiple management tools are operating concurrently in a single SAN, coordination of their activities is outside the scope of this technical report.

Observation:

Definition of a SAN – Not in FC-SCM, could we assume that a SAN may include

Definition of a Switch – Not in FC-SCM, in FC-SW-5

3.1.80 Switch: 1. A Fabric Element conforming to this Standard. 2. A member of the Fabric collective.

3.1.33 Fabric Element: The smallest unit of a Fabric that meets the definition of a Fabric. From the point of view of an attached Nx_Port, a Fabric consisting of multiple Fabric Elements is indistinguishable from a Fabric consisting of a single Fabric Element.

3.1.31 Fabric: As defined in FC-FS-3 an entity that interconnects various Nx_Ports attached to it, and is capable of routing frames using only the D_ID information in an FC-2 frame header.

Concern:

An FCoE FCF is not included in the definition of a Fabric...

Proposed resolution:

Not an issue, none required.

Item 2:

Text from FC-SCM:

(Clause 6.3.2) State IN1: Link Init. Link Initialization, as defined by the Link Initialization protocol clause in FC FS-3, executes while in this state with one exception; initiator FCP_Ports do not support Arbitrated Loop and do not attempt Loop initialization as outlined in FC-AL-2.

During Link Initialization, an initiator FCP_Port shall not complete link initialization until it is capable of completing the Login and Registration process. An initiator FCP_Port that repeatedly performs the Link Initialization protocol to the Active state may be placed in the Fenced state by the Switch that the port is attached to. Refer to transition to P0 in 7.3.

Concern:

FCoE initiators use the FCoE Initialization Protocol (FIP) and not Link Initialization as defined in FC-FS-3.

Proposed resolution:

Change all of State IN1 as follows:

State IN1: Pre-FLOGI Init. The initiator FCP_Port shall;

- a) Perform Link Initialization, as defined by the Link Initialization protocol clause in FC FS-3, with one exception; initiator FCP_Ports do not support Arbitrated Loop and do not attempt Loop initialization as outlined in FC-AL-2; or
- b) Perform ENode/FCF Discovery if required, as defined in FC-BB-5.

Item 3:

Concern:

The State machine diagram (Figure 2) for initiator FCP_Ports contains the following State label:

"IN1: Link Init
*Attempt FCFS-
2 Link
Initialization"

Proposed resolution:

Change the state label as follows:

"IN1: Pre-FLOGI Init
*Condition the
interface
for FLOGI"

Item 4:

Text from FC-SCM:

Transition All:IN1. If an Initialization event occurs as defined in FC-FS-3, then the initiator FCP_Port shall transition to state IN1.

Concern:

Initiator FCP_Ports that utilize FCoE will not experience Initialization events as defined in FC-FS-3.

Proposed resolution:

Change transition All:IN1 as follows:

Transition All:IN1. The initiator FCP_Port shall transition to state IN1 when:

- a) an Initialization event occurs, as defined in FC-FS-3;
- b) upon detecting that its physical layer is not operational as defined in FC-BB-5; or
- c) upon detecting a non-local fault as defined in FC-BB-5 (e.g. unsolicited multicast Discovery Advertisements are not received within $2.5 * FKA_ADV_PERIOD$)

Item 5:

Text from FC-SCM:

Transition IN1:IN1. If the Link initialization protocol as defined in FC-FS-3 was not successful within R_T_TOV . The initiator FCP_Port shall remain in State IN1 and retry the Link Initialization protocol.

Concern:

Initiator FCP_Ports that utilize FCoE do not perform Link Initialization as defined in FC-FS-3 and therefore it cannot fail.

Proposed resolution:

Not an issue, no change required.

Item 6:**Text from FC-SCM:**

Transition IN1:IN2. If link Initialization has been completed and the initiator FCP_Port has reached the Active state as defined in FC-FS-3, then the initiator FCP_Port shall transition to state IN2.

Concern:

Initiator FCP_Ports that utilize FCoE do not perform Link Initialization as defined in FC-FS-3 and therefore it cannot be successful.

Proposed resolution:

Change transition IN1:IN2 as follows:

Transition IN1:IN2. The initiator FCP_Port shall transition to state IN2 when:

- a) Link initialization protocol, as defined in FC-FS-3, has been completed; or
- b) ENode/FCF Discovery, as defined in FC-BB-5, has discovered at least one FCF.

Item 7:**Text from FC-SCM:**

State IN2: FLOGI/FDISC. Fabric Login as defined in FC-LS-2 shall be performed. The Name Server Session Begin (NSSB) bit (i.e., Word 1 bit 26 of the Common Service Parameters) shall be set to one. In addition to what is defined in FC-LS-2, the following additional requirements shall apply:

- a) A FLOGI ELS Request shall be transmitted within E_D_TOV of the initiator FCP_Port reaching the Active state;
- b) If an LS_ACC was received in response to the FLOGI ELS Request and an additional N_Port_ID is required, then the initiator FCP_Port shall transmit an FDISC ELS Request. Each Fabric Login requested by FDISC shall set the NSSB bit to one; and
- c) If the FLOGI ELS Request was completed by other than LS_ACC, refer to annex A.

Concern:

Initiator FCP_Ports that utilize FCoE do not perform Fabric Login as defined in FC-LS-2 and therefore it cannot be performed.

Proposed resolution:

Not an issue, no change required.

Item 8:**Text from FC-SCM:**

Transition IN2:IN2. If the FLOGI ELS Request was completed by other than LS_ACC, then the initiator FCP_Port shall follow the procedure defined in annex A and shall remain in State IN2.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 9:

Text from FC-SCM:

Transition IN2:IN3. If the initiator FCP_Port set the security bit to one in the FLOGI ELS Request and the FLOGI LS_ACC also has the security bit set to one, then the initiator FCP_Port shall transition to state IN3.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 10:

Text from FC-SCM:

Transition IN2:IN4. If the initiator FCP_Port did not set the security bit to one in the FLOGI ELS Request and the security bit is not set to one FLOGI LS_ACC, then the initiator FCP_Port shall transition to state IN4.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 11:

Text from FC-SCM:

Transition IN2:IN13. If the initiator FCP_Port does not set the security bit to one in the FLOGI ELS Request and the Fabric returns an FLOGI LS_RJT as defined in FC-SP-2 because the Fabric requires authentication, then the initiator FCP_Port shall transition to state IN13.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 12:

Text from FC-SCM:

Transition IN2:IN14. If the Name Server Session Begin bit (see FC-LS-2) was not set in the FLOGI LS_ACC, then the initiator FCP_Port shall transition to state IN14.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 13:

Text from FC-SCM:

7 Requirements for Fabrics

Concern:

Does the term fabric implicitly mean Fibre Channel?

Proposed resolution:

Not an issue, no change required.

Item 14:

Text from FC-SCM:

Clause 7.1

b) support the Name Server Session Begin (NSSB) bit (i.e., Word 1 bit 26 of the Common Service Parameters) in the FLOGI ELS Request as defined in FC-LS-2;

Concern:

FIP FLOGI Request is not mentioned.

Proposed resolution:

Not an issue, no change required.

Item 15:

Concern:

The Switch state machine diagram (Figure 3) contains the following State label:

“P1: Link Init
*Attempt FCFS-
2 Link
Initialization”

Proposed resolution:

Change the state label as follows:

“P1: Pre-FLOGI Init
*Condition interface
for FLOGI”

Item 16:

Text from FC-SCM:

State P0: Fencing invoked due to error. A Switch port is in this state if the attached initiator FCP_Port or target FCP_Port performs an action that reduces the performance of the Switch. The switch may hold the attached initiator FCP_Port or target FCP_Port in State P0 for an indefinite amount of time. This action may require user intervention to resolve. In this state the Switch port shall retain the current value of the NCDD internal state machine variable and:

- a) transmit the Offline Sequence (OLS); or
- b) disable the transmitter of the optic that the FCP_Port is connected to on the FC Switch.

Concern:

OLS cannot be transmitted by an Ethernet port that is connected to a CNA. Also, disrupting LAN Traffic due to an FCoE protocol issue is not ideal.

Proposed resolution:

Rewrite State P0 as follows:

State P0: Fencing invoked due to error. A FC Switch PF_Port (see FC-FS-3) or FCF VF_Port (see FC-BB-5) may be in this state if the attached initiator FCP_Port or target FCP_Port performs an action that reduces the performance of the Switch. The switch may hold the attached initiator FCP_Port or target FCP_Port in State P0 for an indefinite amount of time. This action may require user intervention to resolve. In this state the FC Switch PF_Port or FCF VF_Port shall retain the current value of the NCDD internal state machine variable and;

- a) transmit the Offline Sequence (OLS);
- b) disable the transmitter for the PF_Port that the FCP_Port is connected to; or
- c) discard FIP FLOGI Requests from a particular ENode MAC.

Item 17:

Text from FC-SCM:

State P1: Link Init. The Link Initialization Protocol as defined in FC-FS-3 is performed with one exception, a switch port may transition an attached port to State P0 for reasons defined in Transition All:P0.

During Link Initialization, Switch ports shall only exit the OL1 state as defined in FC-FS and attempt to achieve the Active state when the switch port is capable of servicing Login and Registration requests.

Concern:

The text does not include what to do in an FCoE environment.

Proposed resolution:

State P1: Pre-FLOGI Init. Perform:

- a) Link Initialization, as defined by the Link Initialization protocol clause in FC FS-3, with one exception; Arbitrated Loop is not supported and Loop initialization as outlined in FC-AL-2 is not supported; or

- b) Transmit at least one FIP Advertisement as defined in FC-BB-5.

During Link Initialization, [FC Switch PF_Ports](#) shall only exit the OL1 state as defined in FC-FS and attempt to achieve the Active state when the switch port is capable of servicing Login and Registration requests. [The FCoE Controller of a VF_Port capable FCF-MAC shall only transmit FIP Advertisements when the FCF is capable of servicing Login and Registration requests.](#)

Item 18:

Text from FC-SCM:

Transition P1:P1. If the Link Initialization protocol was not successful within R_T_TOV, then the switch port shall remain in State P1.

Concern:

FCF VF_Ports do not perform Link Initialization as defined in FC-FS-3 and therefore it cannot fail.

Proposed resolution:

Not an issue, no change required.

Item 19:

Text from FC-SCM:

Transition P1:P2. If the switch port has reached the Active state as defined in FC-FS-3 and a FLOGI ELS Request is received, then the switch port shall transition to State P2.

Concern:

FCF VF_Ports do not perform Link Initialization as defined in FC-FS-3 and therefore it cannot be successful in an FCoE environment.

Proposed resolution:

Change transition P1:P2 as follows:

Transition P1:P2. The FC Switch PF_Port or FCF VF_Port shall transition to state IN2 when:

- a) the FC Switch PF_Port has reached the Active state as defined in FC-FS-3; or
- b) the FCoE Controller has transmitted at least one FIP Advertisement as defined in FC-BB-5.

Item 20:

Text from FC-SCM:

Transition P1:P10. If the switch port has reached the Active state and an Exchange Link Parameters (ELP) SW_ILS Request is received (see FC-SW-5), then the switch port shall transition to State P10. If E_D_TOV has elapsed since the switch port reached the Active state and neither an FLOGI ELS Request nor ELP SW_ILS Request has been received, then the switch port shall transition to State P10 and if the switch port is capable of becoming an E_Port, then the switch port shall transmit an ELP SW_ILS Request.

Concern:

FCF VF_Ports do not reach the active state and other text is not be applicable to FCoE.

Proposed resolution:

Transition P1:P10. If the FC Switch PF_Port has reached the Active state and an Exchange Link Parameters (ELP) SW_ILS Request is received (see FC-SW-5), then the switch port shall transition to State P10. If E_D_TOV has elapsed since the switch port reached the Active state and neither an FLOGI ELS Request nor ELP SW_ILS Request has been received, then the switch port shall transition to State P10 and if the switch port is capable of becoming an E_Port, then the switch port shall transmit an ELP SW_ILS Request.

Item 21:**Concern:**

In State P2 as well as transitions P2:P3, P2:P4 and P2:P5 instances of FLOGI ELS Request do not include support for FIP FLOGI Requests.

Proposed resolution:

Not an issue, no change required.

Item 22:**Text from FC-SCM:**

Transition P15:P1. If:

- a) a Loss of Signal condition or Loss of Synchronization condition as defined in FC-FS-3 has occurred; or
- b) a change to the authentication configuration of the SCM Switch has been made and the SCM Switch initiated the Link Initialization process as defined in FC-FS-3,

then the switch port shall transition to state P1.

Concern:

P15:P1 does not cover the FCF VF_Port case.

Proposed resolution:

None required. VN_Ports will continuously be retrying FIP and these requests can be discarded by the switch as defined in state P0. When the authentication configuration is modified, FCF VF_Ports can stop discarding the FIP FLOGI Requests. May require manual intervention.

Item 23:**Text from FC-SCM:**

Clause 8.1

- a) set the Name Server Session Begin bit in the FLOGI (see FC-LS-2);

Concern:

FCoE needs FIP FLOGI as defined in FC-BB-5 to be added.

Proposed resolution:

Not an issue, no change required.

Item 24:

Concern:

The Target FCP_Port state machine diagram (Figure 4) contains the following State label:

“T1: Link Init
*Attempt FCFS-2
Link
Initialization”

Proposed resolution:

Change the state label as follows:

“T1: Pre-FLOGI Init
*Condition interface
for FLOGI”

Item 25:

Text from FC-SCM:

(Clause 8.3.2) State T1: Link Init. The target FCP_Port shall de-instantiate the following state machines:

- a) PLOGI/PRLI state machine;
- b) RSCN state machine; and
- c) Target internal change state machine.

Link Initialization, as defined by the Link Initialization protocol clause in FC FS-2, executes while in this state with one exception; target FCP_Ports do not support Arbitrated Loop and do not attempt Loop initialization as outlined in FC-AL-2.

A compliant target FCP_Port shall not complete link initialization until it is capable of completing the Login and Registration process.

NOTE 12 - A target FCP_Port that repeatedly performs the Link Initialization protocol to the Active state may be placed in the Fenced state by the Switch that the port is attached to. Refer to transitioning to P0 in clause 7.

Concern:

FCoE targets use the FCoE Initialization Protocol (FIP) and not Link Initialization as defined in FC-FS-3.

Proposed resolution:

Change all of State T1 as follows:

State T1: Pre-FLOGI Init. The target FCP_Port shall:

1. de-instantiate the following state machines:
 - a) PLOGI/PRLI state machine;
 - b) RSCN state machine; and
 - c) Target internal change state machine.
2. Perform either:
 - a) Link Initialization, as defined by the Link Initialization protocol clause in FC FS-3, with one exception; target FCP_Ports do not support Arbitrated Loop and do not attempt Loop initialization as outlined in FC-AL-2; or
 - b) ENode/FCFdiscovery if necessary as defined in FC-BB-5.

Item 26:

Text from FC-SCM:

Transition All:T1. If an Initialization event occurs as defined in FC-FS-3, then the target FCP_Port shall transition to state T1.

Concern:

Target FCP_Ports that utilize FCoE will not experience Initialization events as defined in FC-FS-3.

Proposed resolution:

Transition All:T1. The target FCP_Port shall transition to state T1 when:

- a) an Initialization event occurs, as defined in FC-FS-3;
- b) upon detecting that its physical layer is not operational as defined in FC-BB-5; or
- c) upon detecting a non-local fault as defined in FC-BB-5 (e.g. unsolicited multicast Discovery Advertisements are not received within $2.5 * FKA_ADV_PERIOD$)

Item 27:

Text from FC-SCM:

Transition T1:T1. If the Link initialization protocol as defined in FC-FS-3 was not successful within R_T_TOV, then the target FCP_Port shall remain in State T1 and retry the Link Initialization protocol.

Concern:

Target FCP_Ports that utilize FCoE do not perform Link Initialization as defined in FC-FS-3 and therefore it cannot fail.

Proposed resolution:

Change transition T1:T1 as follows:

Transition T1:T1. The target FCP_Port shall transition to state T1 when:

- a) Link initialization protocol, as defined in FC-FS-3, was not successful within R_T_TOV; or
- b) The FCoE Initialization Protocol, as defined in FC-BB-5, was not successful.

Item 28:

Text from FC-SCM:

Transition T1:T2. If Link Initialization has been completed and the target FCP_Port has reached the Active state as defined in FC-FS-3, then the target FCP_Port shall transition to state T2.

Concern:

Target FCP_Ports that utilize FCoE do not perform Link Initialization as defined in FC-FS-3 and therefore it cannot be successful.

Proposed resolution:

Change transition T1:T2 as follows:

Transition T1:T2. The target FCP_Port shall, transition to state T2 when:

- a) Link initialization protocol, as defined in FC-FS-3, has been completed; or
- b) ENode/FCF Discovery, as defined in FC-BB-5, discovered at least one FCF.

Item 29:

Text from FC-SCM:

State T2: FLOGI/FDISC. Fabric Login as defined in FC-LS-2 shall be performed. The Name Server Session Begin (NSSB) bit (i.e., Word 1 bit 26 of the Common Service Parameters) shall be set to one. In addition to what is defined in FC-LS-2, the following additional requirements apply:

- a) a FLOGI ELS Request shall be transmitted within E_D_TOV of the target FCP_Port reaching the Active state;
- b) If an LS_ACC was received in response to the FLOGI ELS Request and one or more additional N_Port_IDs are required, then the target FCP_Port shall transmit an FDISC ELS Request with the NSSB bit (i.e., Word 1 bit 26 of the Common Service Parameters) set to one; and
- c) if the FLOGI ELS Request was completed by other than LS_ACC, then refer to annex A.

Concern:

Target FCP_Ports that utilize FCoE do not perform Fabric Login as defined in FC-LS-2 and therefore it cannot be performed.

Proposed resolution:

Not an issue, no change required.

Item 30:

Text from FC-SCM:

Transition T2:T2. If the FLOGI ELS Request was completed by other than LS_ACC, then the target FCP_Port shall follow the procedure defined in annex A and transition to state T2.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 31:

Text from FC-SCM:

Transition T2:T3. If the target FCP_Port set the security bit to one in the FLOGI ELS Request and the FLOGI LS_ACC has the security bit set to one, then the target FCP_Port shall transition to state T3.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 32:

Text from FC-SCM:

Transition T2:T4. If the target FCP_Port did not set the security bit to one in the FLOGI ELS Request and the security bit is not set to one the FLOGI LS_ACC, then the target FCP_Port shall transition to state T4.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 33:**Text from FC-SCM:**

Transition T2:T10. If the target FCP_Port does not set the security bit to one in the FLOGI ELS Request and the Fabric returns an FLOGI LS_RJT as defined in FC-SP because the Fabric requires authentication, then the target FCP_Port shall transition to state T10.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 34:**Text from FC-SCM:**

Transition T2:T11. If the Name Server Session Started (NSSS) bit (i.e., Word 1 bit 26 of the Common Service Parameters) was set to zero in the FLOGI LS_ACC, then the target FCP_Port shall transition to state T11.

Concern:

Need to include support for FIP FLOGI Requests and FIP FLOGI LS_ACC.

Proposed resolution:

Not an issue, no change required.

Item 35:**Text from FC-SCM:**

Transition T10:T1. If:

- a) the switch port has detected the Loss of Signal condition or Loss of Synchronization condition as defined in FC-FS-3, then the switch port shall transition to state T1; or
- b) A change to the authentication configuration of the Switch has been made, then if the initiator or target FCP_Port is a PN_Port, the switch port shall initiate the Link Initialization process as defined in FC-FS-3 and transition to state T1.

Concern:

Instances of switch should be replaced with Target FCP_Port and this will also need to be updated to support FCoE.

Proposed resolution:

Not an issue, no change required.

Item 36:**Text from FC-SCM:****A.2.1 LS_RJT or Reject CT_IU**

If the response to an ELS or CT_IU Request is not LS_ACC and the reason code is not retryable as defined in A.2.3, the initiator or target FCP_Port shall not retransmit the ELS or CT_IU Request until:

- a) In the case of a non-retryable reject of an FLOGI ELS, the device has performed Link Initialization; or
- b) In all other cases an RSCN is received.

Concern:

The text does not indicate what to do in an FCoE Environment.

Proposed resolution:

Change text as follows:

A.2.1 LS_RJT or Reject CT_IU

If the response to an ELS or CT_IU Request is not LS_ACC and the reason code is not retryable as defined in A.2.3, if the initiator or target FCP_Port is a PN_Port, then it shall not retransmit the ELS or CT_IU Request until:

- a) In the case of a non-retryable reject of an FLOGI ELS, the device has performed Link Initialization;
- b) In all other cases an RSCN is received.

Item 37:**Concern:**

Add to T10:T2 find a way to escape from auth fail for an FCoE device. This will also need to be done for IN13:IN2.

<SEE PROPOSED RESOLUTION BELOW>

Narrow the scope of item B in #35 to ensure that FCoE devices are excluded, see text in #36.

<COMPLETED by ES, SEE ITEM B IN #35>

Proposed resolution:

Change the following transitions to the following:

Transition IN13:IN2. The initiator FCP_Port may transition to state IN2 to attempt authentication. The initiator FCP_Port shall not attempt to authenticate more than once per R_A_TOV.

Transition T10:T2. The target FCP_Port may transition to state T2 to attempt authentication. The target FCP_Port shall not attempt to authenticate more than once per R_A_TOV.