iSCSI connection state transitions

**Symbolic Names for States**
- S1: FREE
- S2: XPT_WAIT (illegal for target)
- S3: XPT_UP
- S4: LOGIN_SENT (initiator)/LOGIN_RCVD (target)
- S5: FAILED
- S6: EXITING
- S7: LOGGED_IN (full-feature phase)
- S8: LOGO_SENT (initiator)/LOGO_RCVD(target)
- S9: LOGGED_OUT
- S10: ASYNC_MSG_SENT (target)/ASYNC_MSG_RCVD(initiator)
- S11: LOGO_FAILED
- S12: XPT_CLEANUP
- S13: BUSY

**Note**: Transitions happening due to the same event and arriving into the same resultant state (from different starting states) share the same transition number, but are given different suffixes.
### iSCSI connection state transitions (contd.)

#### State Transition Table

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<thead>
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<th>FROM</th>
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**Note:** “-” stands for “undefined”.
iSCSI connection state transitions (contd.)

State transitions

- T1: Transport connect request was made (ex: TCP SYN sent). (initiator only)
- T2: Transport connection established. (initiator only)
- T3: Transport connection request timed out, or failed. (initiator only)
- T4: Transport connection established (target only).
- T5: iSCSI login was sent by the initiator (or was received for a target).
- T6: A login success was received/sent
- T7: A login redirection/initiator error/target error was received. (initiator only)
- T8: A login redirection/initiator error/target error was sent. (target only)
- T9-1, T9-2, T9-3, T9-4: Transport disconnect request was sent/indication received (ex: TCP FIN received/sent).
- T10: Both sides closed the transport connection.
- T11: Logout was sent by the initiator (or was received for a target).
- T12: Logout Response (success) was received by the initiator (or sent by the target)
- T13-1, T13-2: Async PDU with iSCSI event 2 received by the initiator (or sent by the target)
- T14: Logout was sent by the initiator (or was received for a target)
- T15: Async PDU with iSCSI event 2 received (initiator only)
- T16: Logout Response (failure) was received by the initiator (or sent by the target)
- T17: Transport disconnect request was sent/indication received (ex: TCP FIN received/sent).
- T18: Both sides closed the transport connection.
isci state diagrams

iSCSI connection state transitions (contd.)

State transitions (contd.)

• T19-1, T19-2, T19-3, T19-4: Transport connection deemed non-responsive by either end; or transport RESET received by either; or Async PDU with iSCSI event 3 (for this CID), or event 4 received by the initiator.

• T20-1, T20-2, T20-3: Unexpected transport disconnect indication received by either side.

• T21-1, T21-2, T21-3, T21-4: Transport connection deemed non-responsive by either end; or transport RESET received by either.
Whenever a connection state machine (say, CSM-R) enters the BUSY state (S13), it must go through the state transitions additionally described in the connection recovery state diagram either using a connection in the LOGGED_IN state with an explicit logout (let us call it CSM-E), or on a new transport connection in the FREE state with an implicit logout (let us call it CSM-I). This recovery state diagram hence is applicable only to the instance of the connection in recovery, i.e. CSM-R. In the case of an implicit logout for example, CSM-R reaches RECOVERY_DONE at the time CSM-I reaches LOGGED_IN. In the case of an explicit logout, CSM-R reaches RECOVERY_DONE when CSM-E receives a successful logout response while continuing to be in the LOGGED_IN state.

**Symbolic names for states in the connection recovery state diagram:**
- R1: BUSY (Same as S13)
- R2: IN_RECOVERY
- R3: RECOVERY_DONE (Same as S1)

**State transitions in the connection recovery state diagram**
- M1: Connection state timeout happened on either side.
- M2: An implicit/explicit logout was sent by the initiator (or received by the target)
  - In CSM-I case, a recovery login was sent by the initiator (or received by the target) in state S1.
  - In CSM-E case, a logout was sent by the initiator (or received by the target) in state S7.
- M3: Logout failure detected
  - CSM-I failed to reach S7, instead arrived into S1.
  - CSM-E either moved out of S7, or Logout timed out and/or aborted, or Logout Response (failure) received by the initiator (or sent by the target).
- M4: Successful implicit/explicit logout was performed.
  - CSM-I reached state S7.
  - CSM-E stayed in S7, and received Logout Response (success) by the initiator (or sent by the target).
If any one connection participating in a session is LOGGED_IN, the session state is LOGGED_IN. Else, it is ACTIVE. The first connection becoming LOGGED_IN and the last connection becoming not LOGGED_IN toggles the session state.

**Symbolic Names for States**
- Q1: FREE
- Q2: ACTIVE
- Q3: LOGGED_IN
- Q4: FAILED

**State transitions**
- N1: At least one transport connection was established for the session.
- N2: At least one transport connection reached the LOGGED_IN state.
- N3: Last LOGGED_IN connection had ceased to be LOGGED_IN.
- N4: Last participating transport connection was dropped.
- N5: Session failure (all connections reported BUSY, or recovery failed)
- N6: Session state timeout happened on either side.
- N7: Session recovery attempt with an implicit logout (i.e. login).