PBB-TE 1:1 Protection

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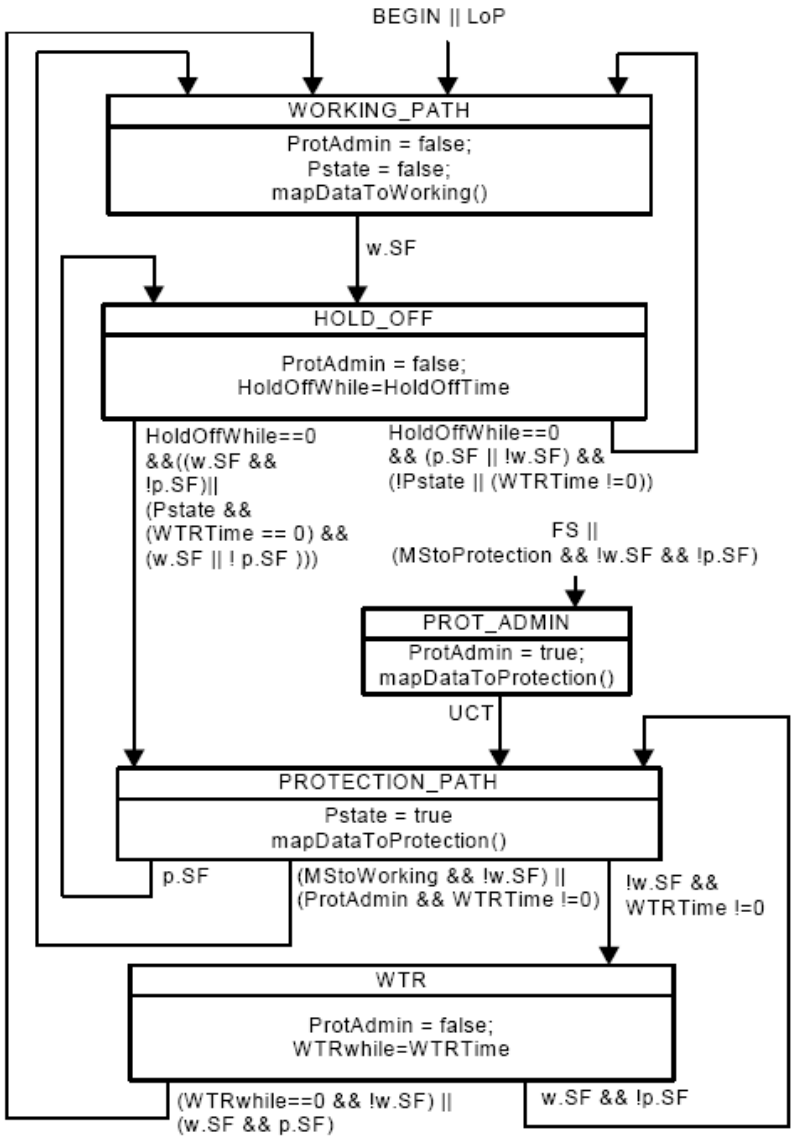
G.8031 Questions (Q9/15)

- **Hold-Off in Do Not Revert state**
  - Agreed that hold-off should apply in DNR
  - Proposed to use hold-off before asserting any SF
- **MS from Do Not Revert state**
  - Agreed that MS from DNR is needed
  - Add state or request (some prefer adding state)
  - Will update G.8031 in next revision

Q9/15 on PBB-TE Protection

- Discussion noted that IEEE will express PBB-TE protection state machine according to 802.1 practice
- Contributions proposing to extend the APS in Rec. G.8031 to support PBB-TE (IEEE 802.1Qay).
- Added a new study point to extend G.8031 to support PBB-TE protection switching.

Protection State Diagram



Complex predicates:

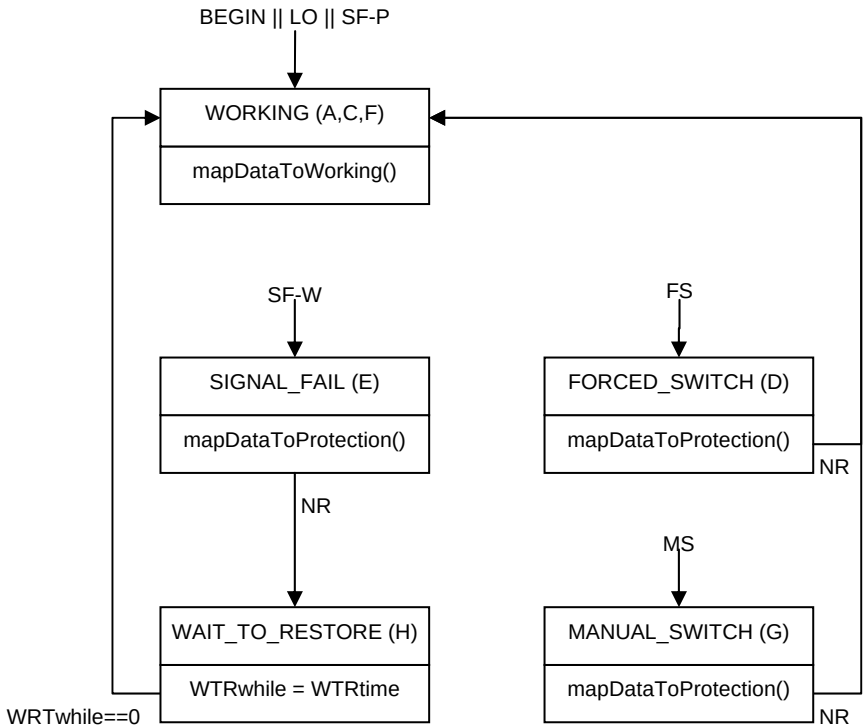
- attempt to capture request precedence in predicates
- state split between states and variables
- state variables used in predicates
- Revertive/Non-Revertive configuration captured in expression WTRTime != 0

Result is hard to analyze and compare with G.8031 behavior

Ways to Reduce Complexity

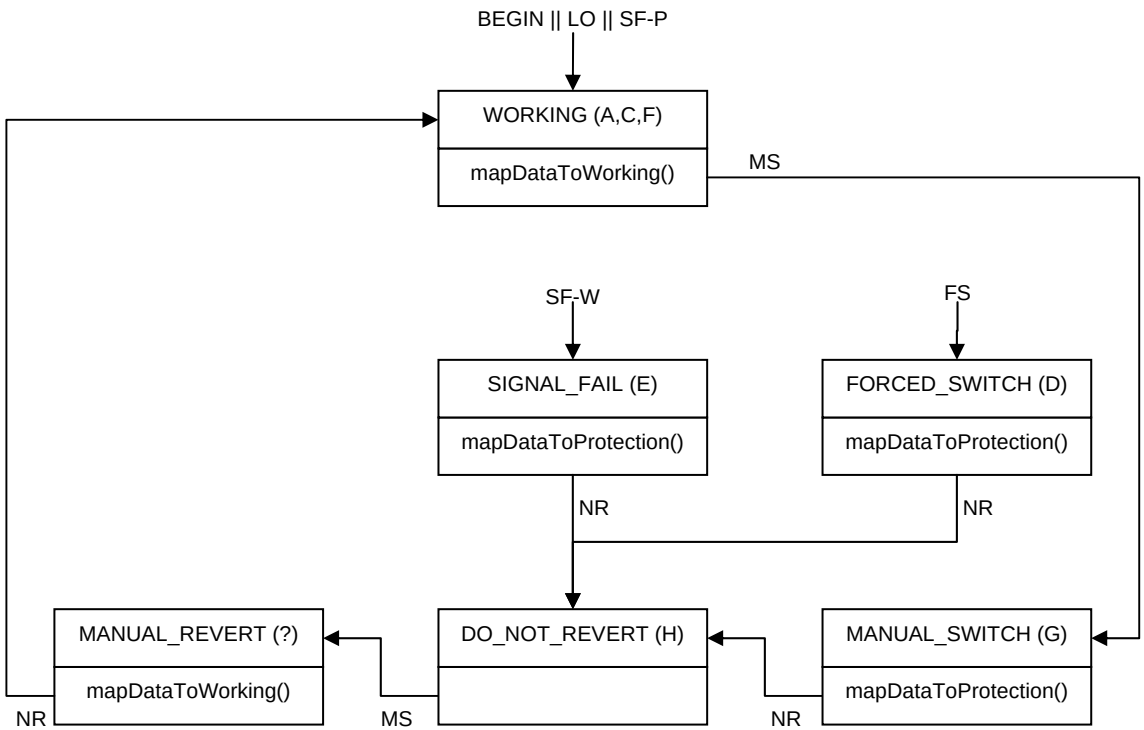
- Separate request precedence logic from state diagram
  - One input request to state machine (Rin)
- Eliminate state variables
- Separate diagrams for revertive and non-revertive cases
- Roughly match states to G.8031

Simplified State Diagram



protection state machine (revertive)

Simplified State Diagram

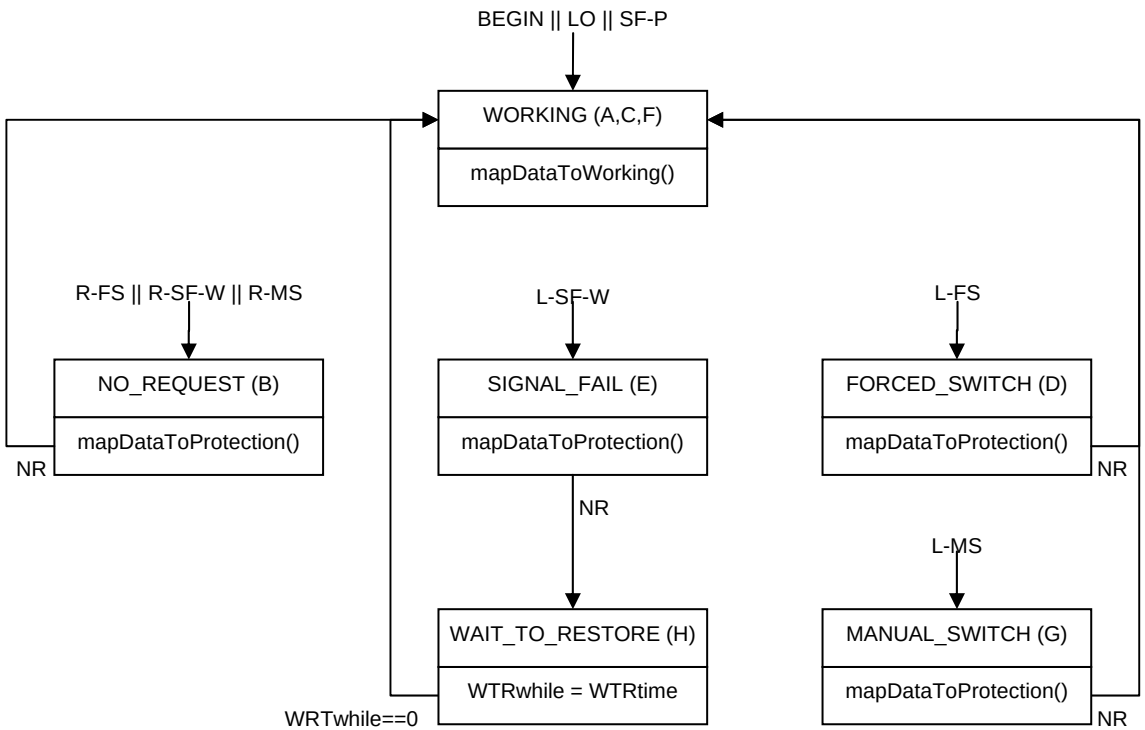


protection state machine (non-revertive)

State Machine Incomplete

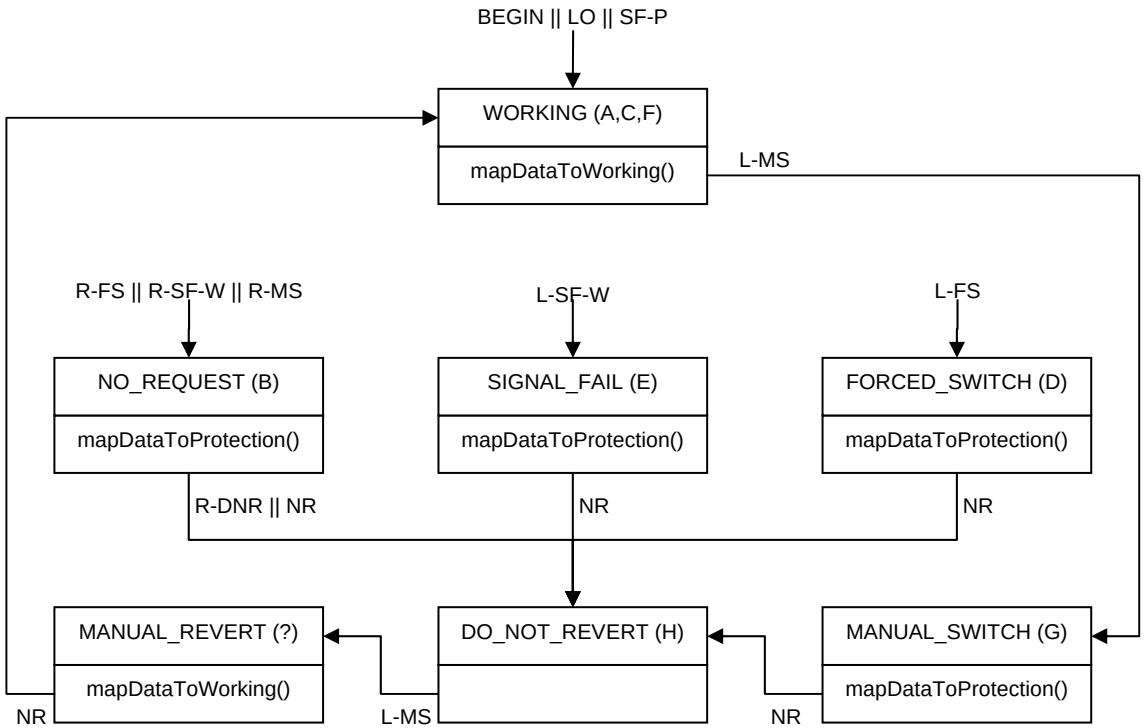
- Requirement that TESIs are bi-directional and symmetrically routed is not maintained by protection switching state machine
- Unnecessary reliance on external entity
- Specification can be completed by adding remote request/state input
- Completes specification and informs implementers of required coordination
- Management can provide remote input or APS protocol can be used – state machine remains the same

Protection w/ Remote Input



protection state machine (revertive)

Protection w/ Remote Input



protection state machine (non-revertive)

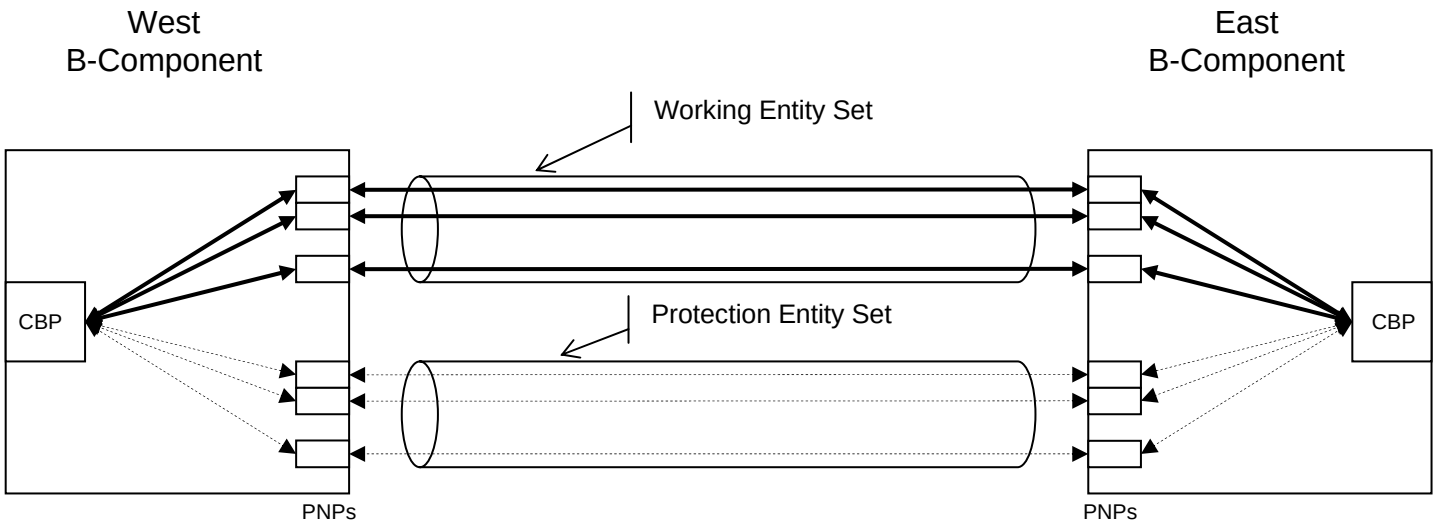
1:1 Protection w/ Load Sharing

- Some comments have suggested that load sharing departs from the 1:1 model
- There are models of protection with load sharing which preserve the 1:1 model
- Following the 1:1 model
  - Keeps the work within the scope of the PAR
  - Maintains the simplicity of the protection scheme
  - Enables one state machine to cover all cases

1:1 Protection

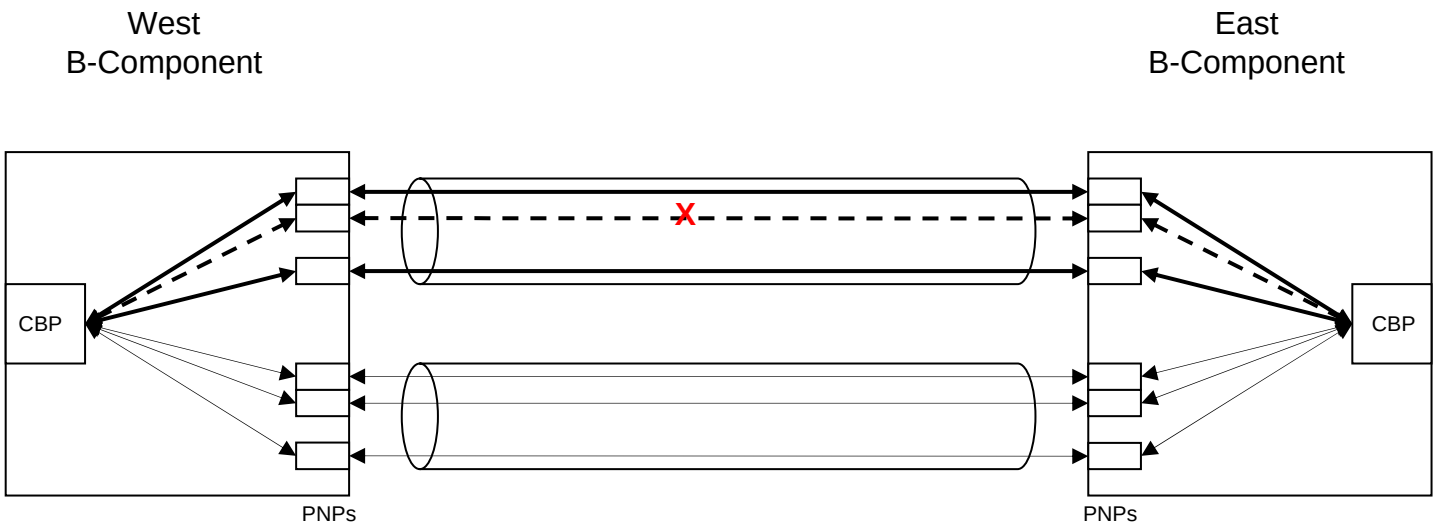
- State machine scope: protection group
- Request scope: TE service instance
  - FS & LO: unconditionally move traffic off of TESI
  - MS: move traffic off TESI, only if not needed for protection
  - SF: switch traffic to protection (TESI failed)
- Switching action scope: TE service instance
  - mapDataToWorking() and mapDataToProtection()
- Group protects all traffic in case of a single TESI failure
- Management model: various
  - Specification should provide only basic model
  - Simple and flexible
- BSI provisioning includes TESI to which it is assigned
  - With or without protection group

1:1 Protection w/ Load Sharing



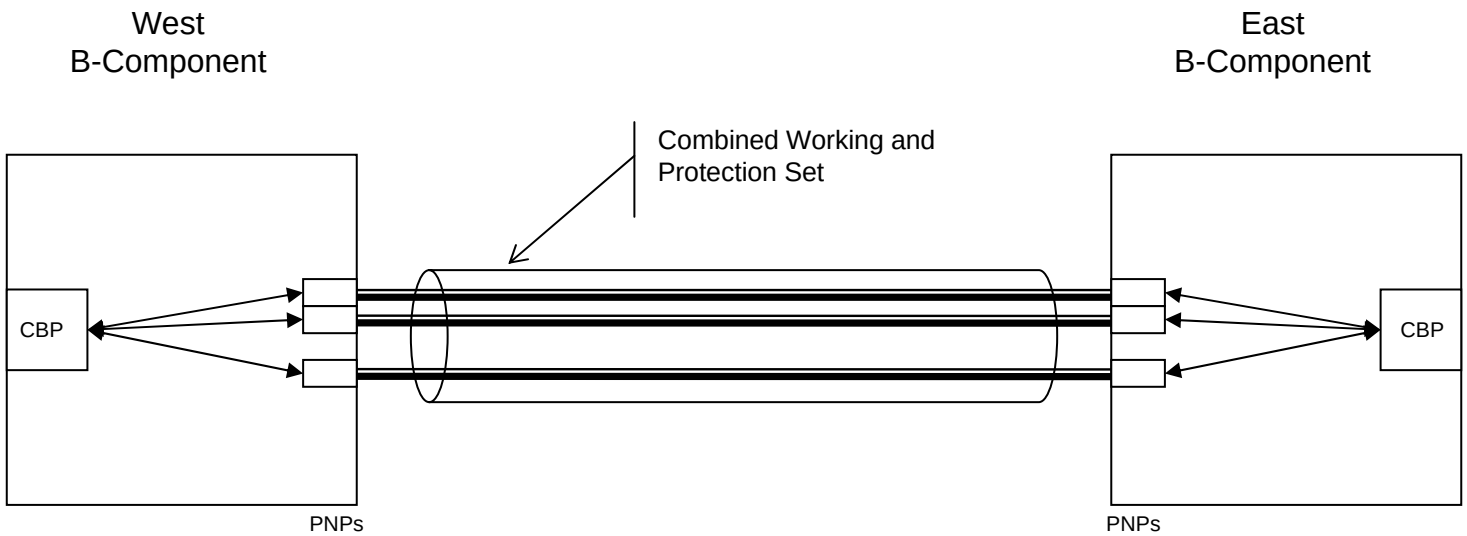
Working and Protection Sets

1:1 Protection w/ Load Sharing



Mapping Traffic to the Protection Entity

1:1 Protection w/ Load Sharing

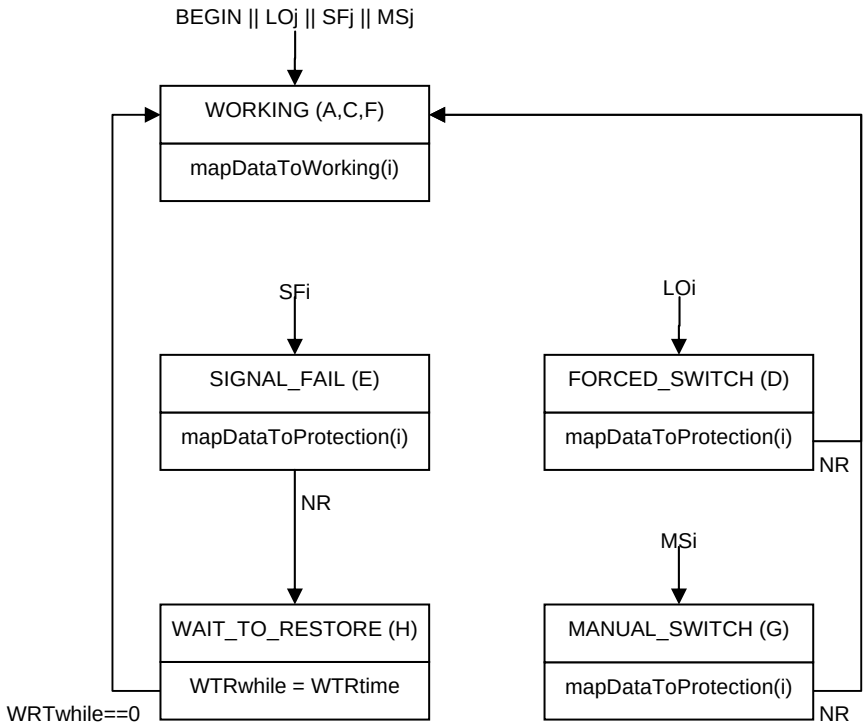


A Combined Protection Group

1:1 Protection w/ Load Sharing

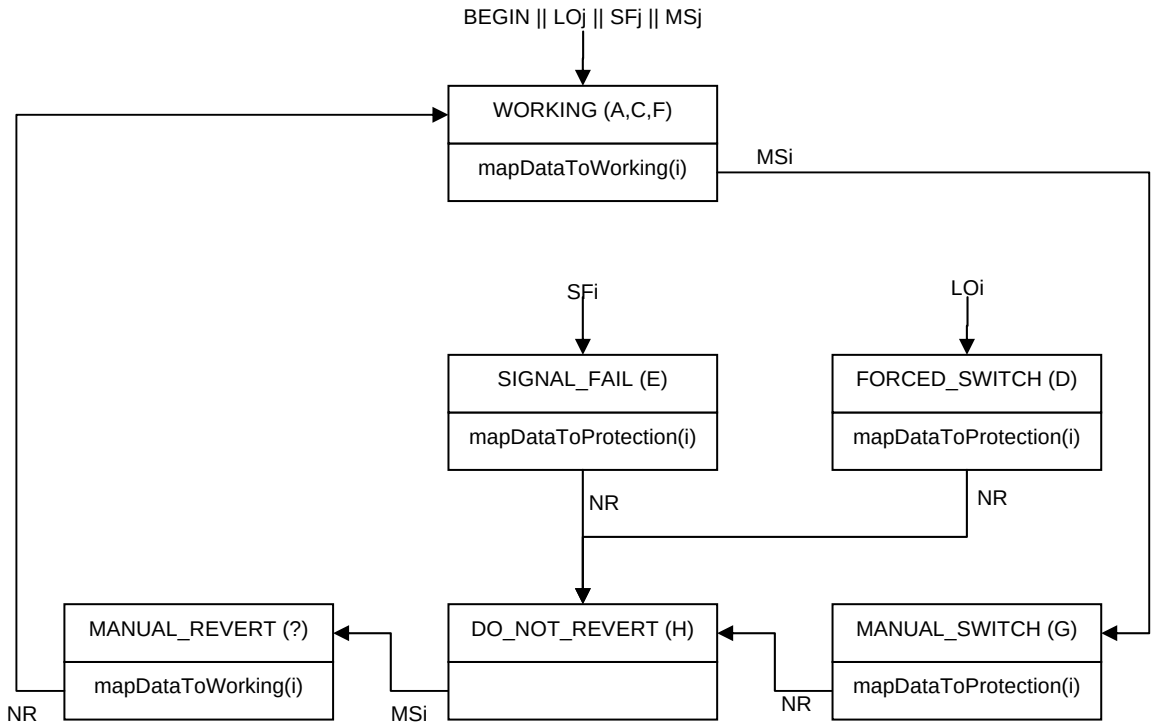
- Provisioning of BSI's protection TESI
- Bandwidth benefit of shared protection (N>2)
- Management benefits related to managing one protection group vs. managing many more TESIs and protection groups
- Same control model as original 1:1 protection
- Extensions work equally well for two or more TESIs in the protection group

Protection w/ Load Sharing



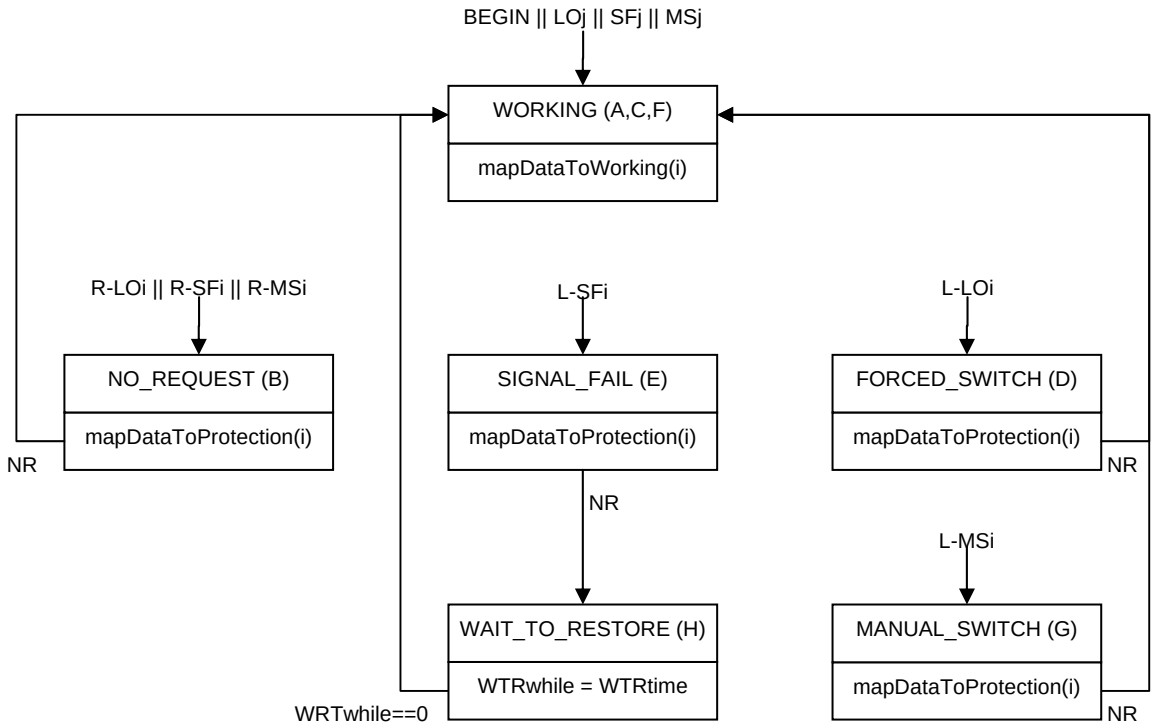
protection member state machine (revertive)

Protection w/ Load Sharing



protection member state machine (non-revertive)

Protection w/ Load Sharing



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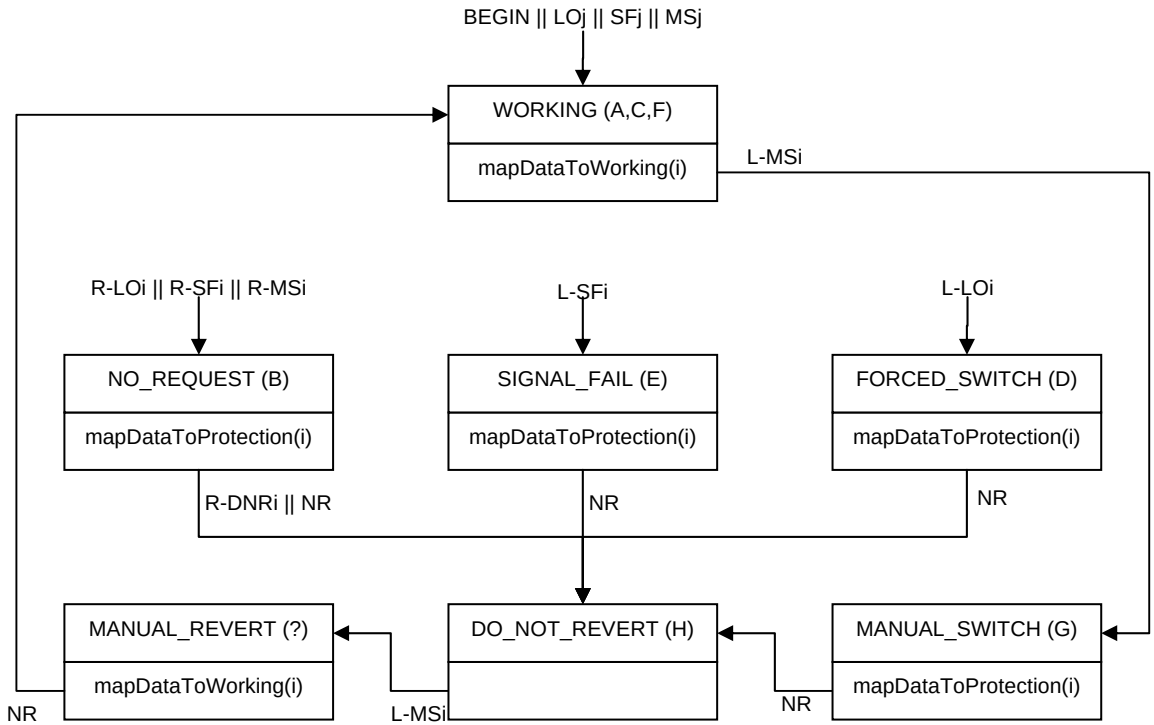

protection member state machine (non-revertive)