∧ rmPrecommitted = {} \lambda msgs = \{\}
\lambda timeout = "off"
\lambda rmState = <<"working", "working">>
\lambda tmState = "init"  $\land \text{rmPrepared} = \{\}$ \lambda rmPrecommitted = \{\}
\lambda msgs = \{[type |-> "prepared", rm |-> 1]\}
\lambda timeout = "off" \lambda rmPrecommitted = \{\}
\lambda msgs = \{[type |-> "prepared", rm |-> 2]\}
\lambda timeout = "off" \lambda rmState = <<"prepared", "working">>
\lambda tmState = "init" \lambda rmState = <<"working", "prepared">>
\lambda tmState = "init"  $\land$  rmPrepared = {}  $\land \text{rmPrepared} = \{\}$ \lambda rmPrecommitted = \{\}
\lambda msgs = \{[type |-> "prepared", rm |-> 1]\}
\lambda timeout = "off" \lambda rmPrecommitted = \{\}
\lambda msgs = \{ [type |-> "prepared", rm |-> 2] \}
\lambda timeout = "off"  $\wedge$  timeout = "off" /\rmState = <<"prepared", "working">>
/\tmState = "init" \lambda rmState = <<"prepared", "prepared">>
\lambda tmState = "init" \lambda rmState = <<"working", "prepared">>
\lambda tmState = "init"  $\land$  rmPrepared =  $\{1\}$  $\land$  rmPrepared = {}  $\land$  rmPrepared = {2} \lambda rmPrecommitted = \{\}
\lambda msgs = \{ [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2] \}
\lambda timeout = "off" \lambda rmState = <<"prepared", "prepared">>
\lambda tmState = "init" \lambda rmState = <<"pre>prepared", "prepared">>>
\lambda tmState = "init"  $\land$  rmPrepared = {2}  $\land$  rmPrepared = {1}  $\land$  timeout = "off" \lambda rmState = <<"prepared", "prepared">> \lambda tmState = "init"  $\land$  rmPrepared =  $\{1, 2\}$  $\land rmPrecommitted = \{\}$  $\land$  msgs = { [type |-> "pre-commit"], \lambda rmState = <<"prepared", "prepared">> \lambda tmState = "init"  $\land$  rmPrepared =  $\{1, 2\}$ \( \text{rmPrecommitted} = \{ \} \\ \text{msgs} = \{ [type |-> "pre-commit"], \]  $\land$  rmPrecommitted = {}  $\land$  msgs = { [type |-> "pre-commit"], [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2], [type |-> "pre-committed", rm |-> 1] } [type |-> "prepared", rm |-> 1],  $\bar{\wedge}$  timeout = "off" \lambda rmState = <<"pre-committed", "prepared">> \lambda tmState = "init" \lambda rmState = <<"pre>prepared", "pre-committed">>
\lambda tmState = "init"  $\land$  rmPrepared =  $\{1, 2\}$  $\land$  rmPrepared =  $\{1, 2\}$ / rmPrecommitted = {}
// msgs = { [type |-> "pre-commit"],
 [type |-> "prepared", rm |-> 1],
 [type |-> "pre-committed", rm |-> 2],
 [type |-> "pre-committed", rm |-> 1],
 [type |-> "pre-committed", rm |-> 1],  $\land$  rmPrecommitted =  $\{2\}$  $\land$  rmPrecommitted = {1} \( \text{msgs} = \{ [type |-> "pre-commit"], \ [type |-> "prepared", rm |-> 1], \]  $\land$  msgs = { [type |-> "pre-commit"], [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2], [type |-> "pre-committed", rm |-> 2] } [type |-> "prepared", rm |-> 2], [type |-> "pre-committed", rm |-> 1] } [type |-> "pre-committed", rm |-> 2] }  $\dot{\wedge}$  timeout = "off"  $\Lambda$  timeout = "off"  $\bar{\Lambda}$  timeout = "off" \lambda rmState = <<"pre-committed", "prepared">> \lambda tmState = "init" \lambda rmState = <<"prepared", "pre-committed">> \lambda tmState = "init" ∧ rmState = <<"pre-committed", "pre-committed">> ↑ tmState = "init"  $\land$  rmPrepared =  $\{1, 2\}$  $\land$  rmPrepared = {1, 2}  $\land$  rmPrepared =  $\{1, 2\}$ / rmPrecommitted = {1}
/ msgs = { [type |-> "pre-commit"],
 [type |-> "prepared", rm |-> 1],
 [type |-> "pre-committed", rm |-> 2],
 [type |-> "pre-committed", rm |-> 1],
 [type |-> "pre-committed", rm |-> 1], \( \text{rmPrecommitted} = \{2\} \)
\( \text{msgs} = \{ \text{[type |-> "pre-commit"]}, \\ \text{[type |-> "prepared", rm |-> 1], \\ \text{[type |-> "pre-committed", rm |-> 2], \\ \text{[type |-> "pre-committed", rm |-> 1], \\ \text{[type |-> "pre-committed", rm |-> 1], \\ \text{[type |-> "pre-committed", rm |-> 2], \\ \text{[type |-> "pre-committed", [type |-> "pre-committed", rm |-> 2] } [type |-> "pre-committed", rm |-> 2] }  $\hat{\Lambda}$  timeout = "off"  $\bar{\Lambda}$  timeout = "off" \(\lambda\) rmState = <<"pre-committed", "pre-committed">> \(\lambda\) rmState = <<"pre-committed", "pre-committed">>  $\wedge$  tmState = "init"  $\wedge$  rmPrepared = {1, 2}  $\wedge$  tmState = "init"  $\wedge$  rmPrepared = {1, 2}  $\land$  rmPrecommitted =  $\{1, 2\}$  $\land$  msgs = { [type |-> "pre-commit"], [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2], [type  $\mid - \rangle$  "pre-committed", rm  $\mid - \rangle$  1], [type |-> "pre-committed", rm |-> 2] }  $\bar{\Lambda}$  timeout = "off" \lambda rmState = <<"pre-committed", "pre-committed">>
\lambda tmState = "init"  $\land$  rmPrepared =  $\{1, 2\}$  $\land$  rmPrecommitted =  $\{1, 2\}$  $\land$  msgs = { [type |-> "pre-commit"], [type  $\mid ->$  "commit"], [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2], [type |-> "pre-committed", rm |-> 1], [type  $\mid - \rangle$  "pre-committed", rm  $\mid - \rangle$  2] }  $\land$  timeout = "off"  $\land$  rmPrepared =  $\{1, 2\}$  $\land$  rmPrecommitted =  $\{1, 2\}$  $\land$  rmPrecommitted =  $\{1, 2\}$ \(\lambda\) msgs = \{ [type |-> "pre-commit"], [type |-> "commit"], \( \text{msgs} = \{ [type |-> "pre-commit"], [type |-> "commit"], \) [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2], [type |-> "pre-committed", rm |-> 1], [type |-> "pre-committed", rm |-> 2] } [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2], [type |-> "pre-committed", rm |-> 1],  $\Lambda$  timeout = "off" \lambda rmState = <<"pre-committed", "committed">> \lambda tmState = "committed" ∧ rmState = <<"committed", "pre-committed">> ∧ tmState = "committed"  $\land$  rmPrepared =  $\{1, 2\}$  $\land$  rmPrepared =  $\{1, 2\}$  $\land$  rmPrecommitted =  $\{1, 2\}$ \( \text{msgs} = \{ [type |-> "pre-commit"], [type |-> "commit"], [type |-> "prepared", rm |-> 1], [type |-> "prepared", rm |-> 2], [type |-> "pre-committed", rm |-> 1], [type |-> "pre-committed", rm |-> 2] }  $\Lambda$  timeout = "off" \(\lambda\) rmState = <<"committed", "committed">>

Next State Actions

TMPrecommit RMPrepare RMCommit TMCommit TMRcvPrepare TMRcvPrecommit