



JS7 JobScheduler Architecture

Cluster Architecture:

High Availability



- System Architecture
 - System Architecture

- Cluster Architecture
 - Cluster High Level Architecture
 - Cluster Characteristics

- Cluster Operation
 - Controller Cluster Operation
 - Controller Cluster of Two Nodes
 - Controller Cluster of Three Nodes
 - Controller Cluster of Four Nodes
 - Director Agent Cluster Operation

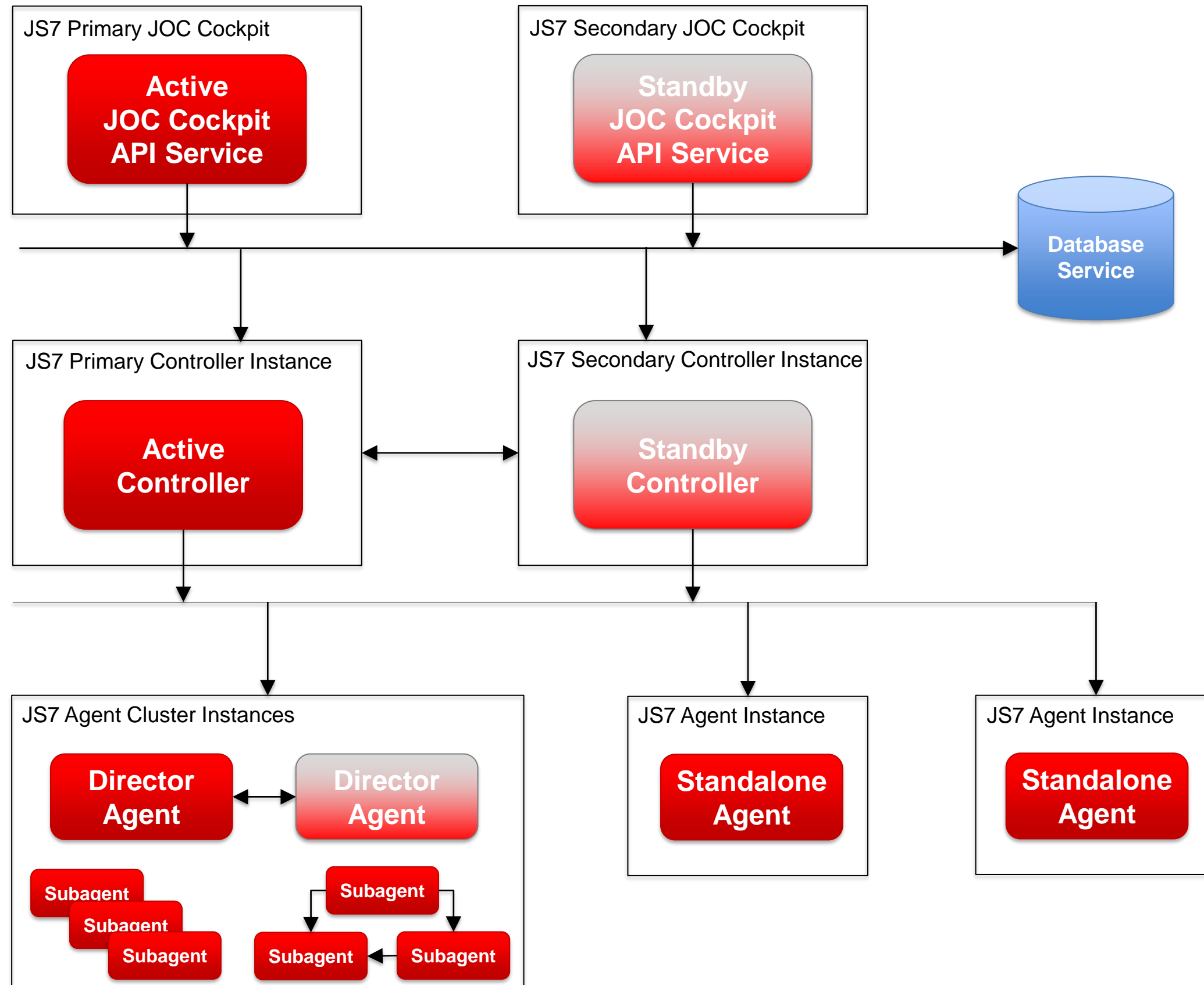
- Site Redundancy
 - Redundancy of Two Active/DR Sites
 - Redundancy of Three Active Sites

JOC Cockpit

- JOC Cockpit is operated as a passive cluster or standalone and serves the User Interface and REST API Service
- Makes use of a database for persistence and for restart capabilities

Controller / Agents

- Controller is operated as an active-passive cluster or standalone instance to orchestrate Agents
- Agents receive workflow configurations from a Controller, start workflows autonomously and report back execution results
- Director Agents are operated as an active-passive cluster
- Subagents are operated from active-active or active-passive clusters
- Standalone Agents are operated without cluster



JOC Cockpit Cluster

- Passive Cluster: database used for synchronization
- Acts as a Cluster Watch for Controller Cluster

Controller Cluster

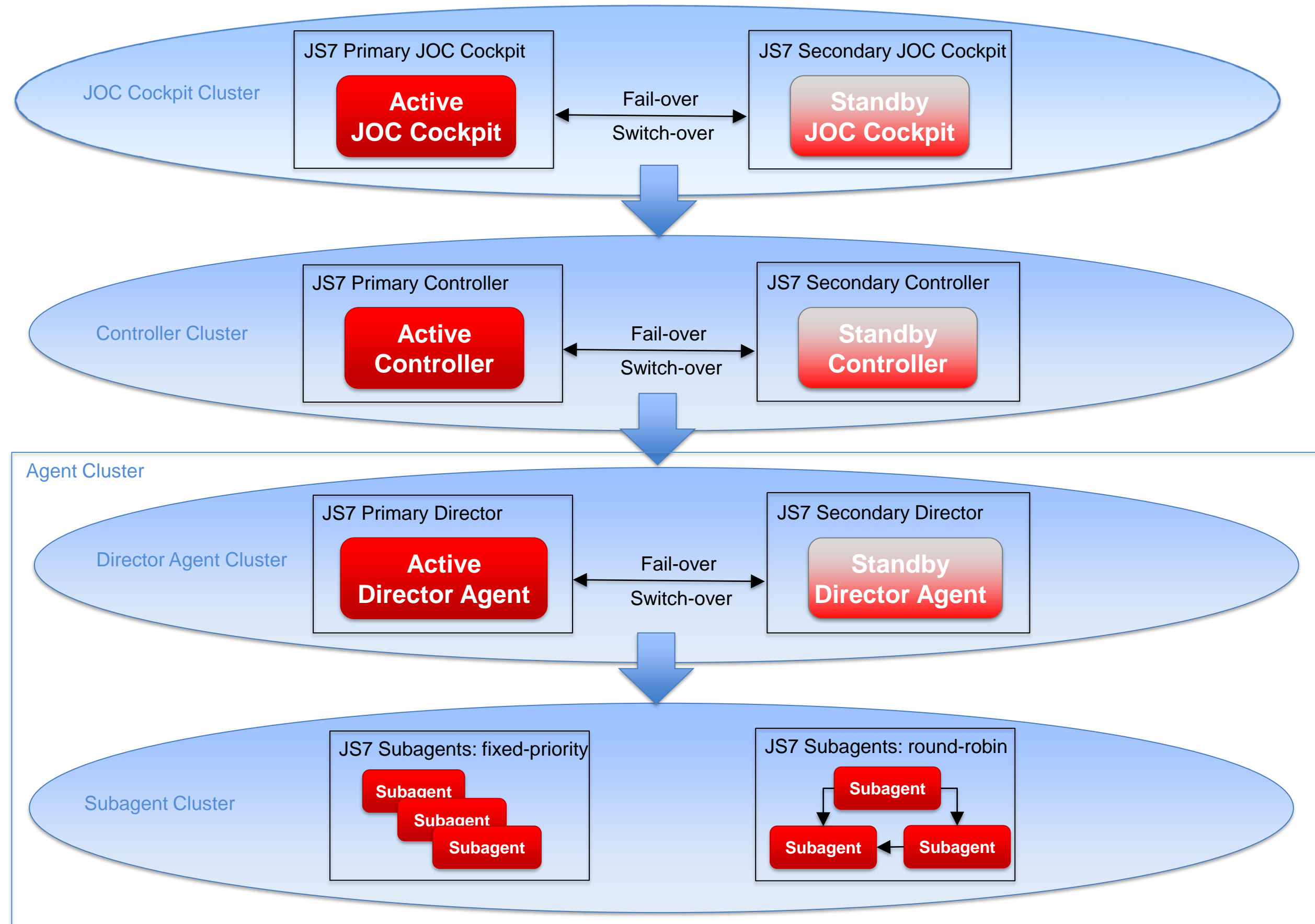
- Passive Cluster: manages and orchestrates any number of Agent Clusters
- Acts as a Cluster Watch for Director Agent Cluster

Director Agent Cluster

- Passive Cluster: manages and orchestrates any number of Subagents
- Acts as single point of control for Subagents

Subagent Cluster

- Passive Cluster: performs fixed-priority scheduling with any Subagents
- Active Cluster: performs round-robin scheduling with Subagents



JOC Cockpit Cluster

- JOC Cockpit instances are operated for an active-passive cluster of an arbitrary number of nodes that are synchronized by the database.
- Fail-over occurs when the Active JOC Cockpit is down. One of the Standby JOC Cockpit instances will become active.
- For switch-over users select the Standby JOC Cockpit instance that should become active.

Controller Cluster

- The Controller implements a witness-based cluster. JOC Cockpit takes the role of the witness, aka Cluster Watch. When JOC Cockpit instances fail-over or switch-over, the Cluster Watch will fail-over or switch-over.
- Controller instances are operated for an active-passive cluster of two nodes.
- For fail-over the Active Cluster Watch and Standby Controller instance must agree.
- For switch-over the Active Cluster Watch and both Active & Standby Controller instances must agree.

Director Agent Cluster

- The Director Agent implements a witness-based cluster. The Controller takes the role of the witness, aka Cluster Watch. When Controller instances fail-over or switch-over, the Cluster Watch will fail-over or switch-over.
- For fail-over the Active Cluster Watch and Standby Director Agent instances must agree.
- For switch-over the Active Cluster Watch and both Active & Standby Director Agent instances must agree.

Subagent Cluster

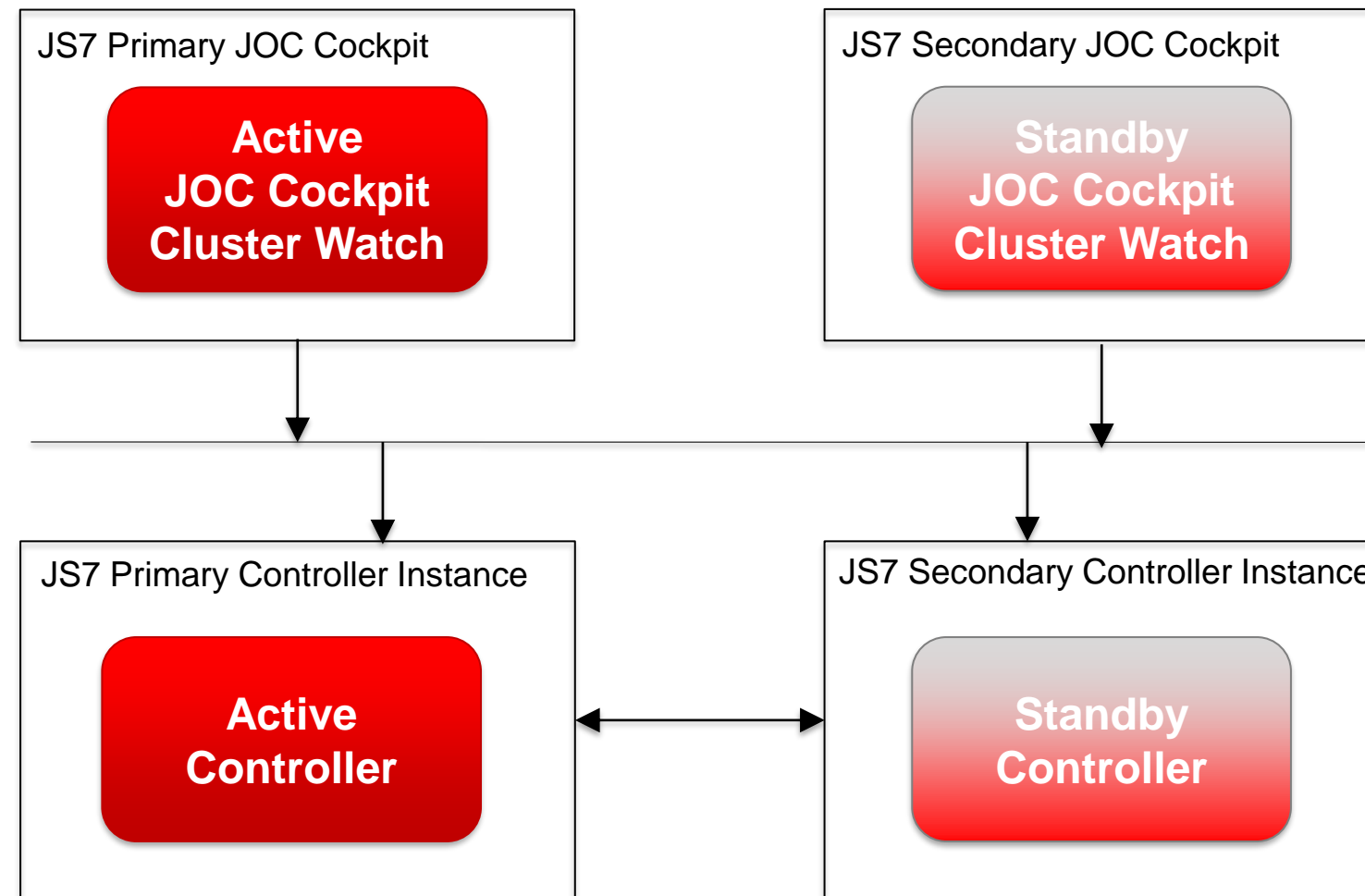
- Director Agents implement logical clusters for active-passive and active-active operation with any number of Subagents.
- Any number of Subagent Clusters can be specified reusing the same Subagents in different Subagent Clusters.
- For fail-over operations the Active Director Agent will select the next available Subagent in the Subagent Cluster.

Roles

- The Active JOC Cockpit takes the role of the Cluster Watch
- Active and Standby Controller instances can switch roles if in sync of journal replication
- Fail-over requires the Cluster Watch to be witness to loss of the Active Controller instance

Operations

- Fail-over is the automated operation when the Active Cluster Watch and Standby Controller agree to switch the active role to the Standby Controller instance
 - Prerequisite no. 1: The Active Cluster Watch is witness to loss of the Active Controller instance
 - Prerequisite no. 2: The Standby Controller instance is in sync (coupled) with the Active Controller instance for journal replication
- Switch-over is the user's operation to switch the active role to the Standby Controller instance provided that the Standby Controller is in sync of journal replication

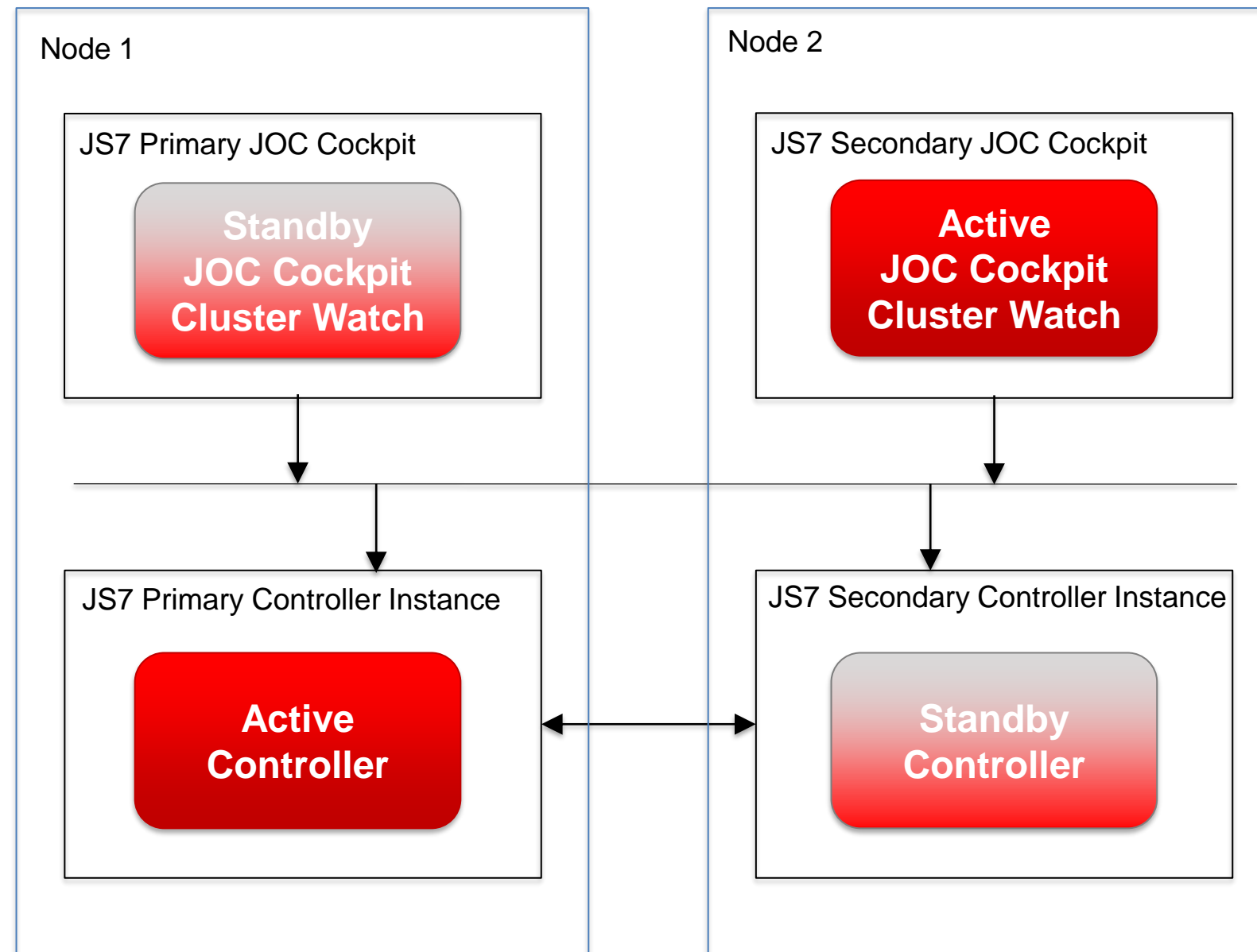


Disaster Scenarios

- If Node 1 fails, Standby Cluster Watch and Active Controller will fail, Active Cluster Watch and Standby Controller will agree on fail-over
- If Node 2 fails, scheduling will continue, Standby Cluster Watch will become active

Restart Capabilities

- In all scenarios after loss of one node scheduling will continue
- After loss of one node restart capabilities are lost

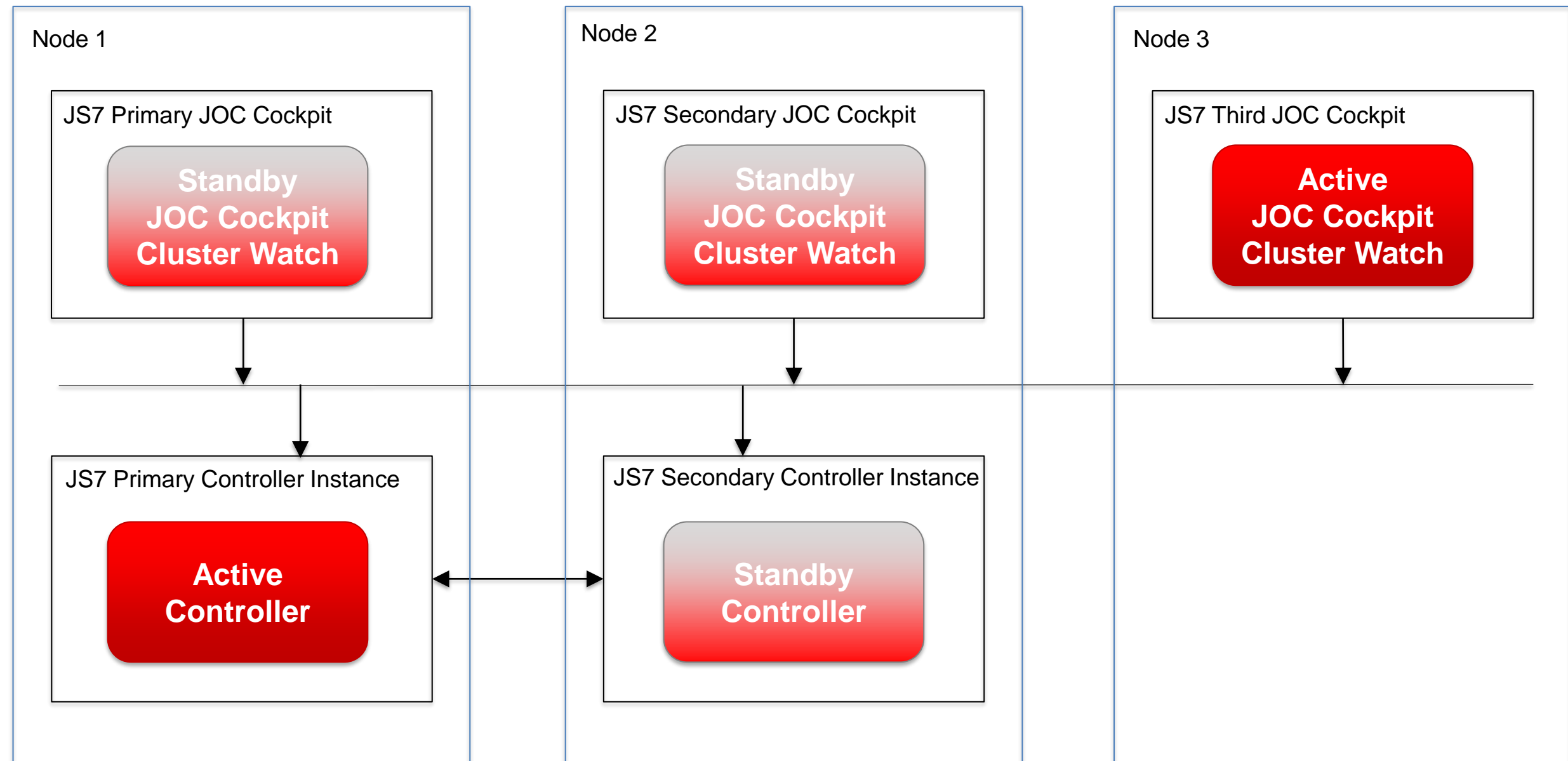


Disaster Scenarios

- If Node 1 fails, Active Cluster Watch and Standby Controller will agree on fail-over
- If Node 2 fails, scheduling will continue without fail-over
- If Node 3 fails, scheduling will continue, Active Cluster Watch will fail-over to Node 1 or 2

Restart Capabilities

- In all scenarios after loss of one node scheduling will continue
- After loss of one node restart capabilities are lost, except for loss of Node 3

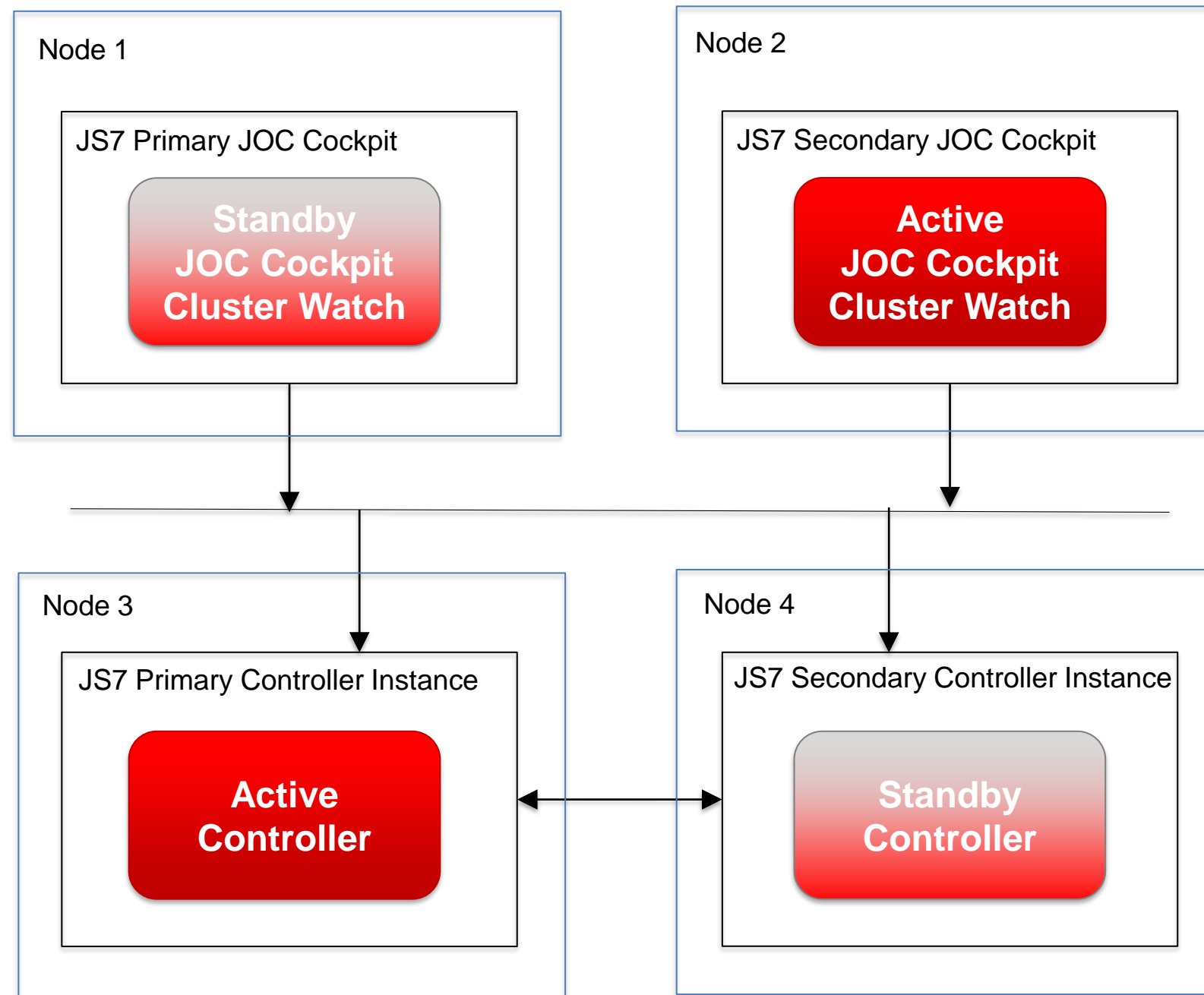


Disaster Scenarios

- If Node 1 fails, scheduling will continue without fail-over
- If Node 2 fails, Active Cluster Watch fails, scheduling will continue without fail-over
- If Node 3 fails, Active Controller fails, Active Cluster Watch and Standby Controller will agree on fail-over
- If Node 4 fails, scheduling continues

Restart Capabilities

- In all scenarios after loss of one node scheduling will continue
- After loss of Node 1 & 2, 1 & 4 or 2 & 3 scheduling will continue
- After loss of Node 3 & 4 scheduling will stop

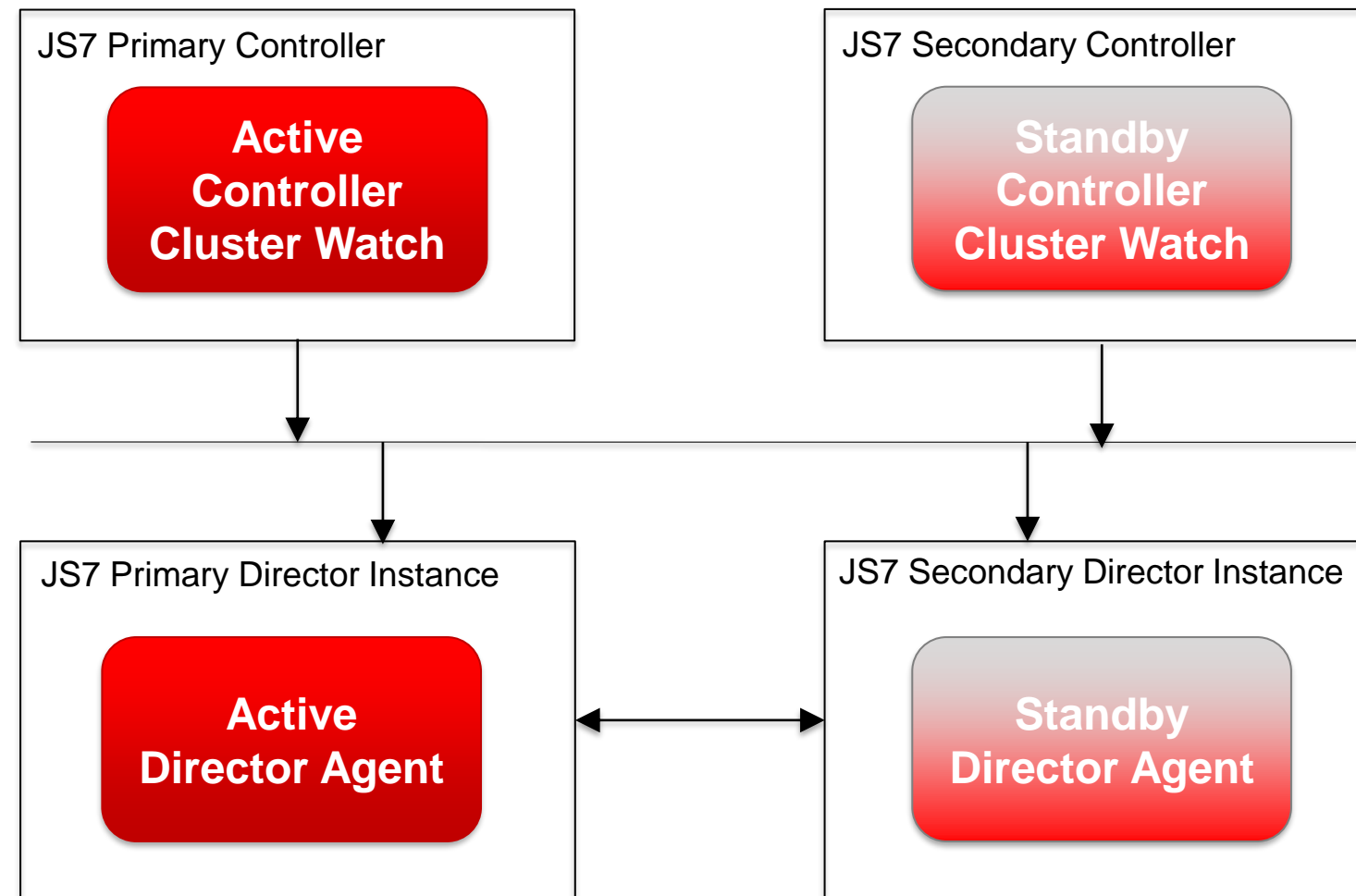


Roles

- The Active Controller takes the role of the Cluster Watch
- Active and Standby Director Agent instances can switch roles if in sync of journal replication
- Fail-over requires the Cluster Watch to be witness to loss of the Active Director Agent

Operations

- Fail-over is the automated operation when the Active Cluster Watch and Standby Director Agent agree to switch the active role to the Standby Director Agent:
 - Prerequisite no. 1: The Active Cluster Watch is witness to loss of the Active Director Agent
 - Prerequisite no. 2: The Standby Director Agent is in sync (coupled) with the Active Director Agent for journal replication
- Switch-over is the user's operation to switch the active role to the Standby Director Agent instance provided that the Standby Director Agent is in sync of journal replication



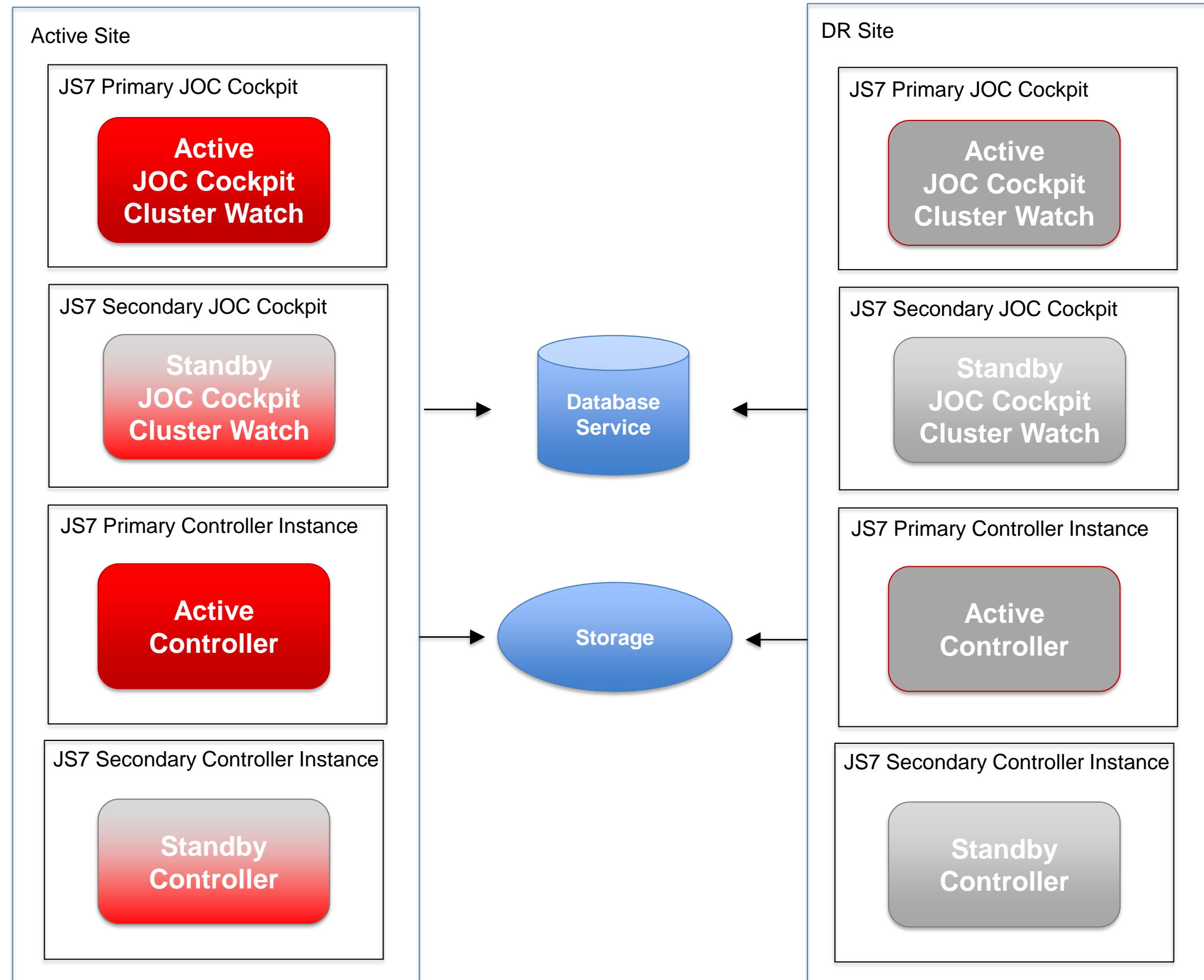
Further Scenarios using 2 Nodes, 3 Nodes or 4 Nodes apply similarly as indicated for the Controller Cluster

Disaster Scenarios

- Failure of a single node is managed by clustering within the Active Site
- Failure of more nodes suggests switching-over to the DR Site
- JS7 products in the Active Site are active/standby
- JS7 products in the DR site are not started (cold standby)

Operations

- Switch-over between Sites is initiated by the user
- Switch-over includes that storage and database are available for the DR Site
- Hostnames (alias names) and endpoints are the same in Active Site and DR Site

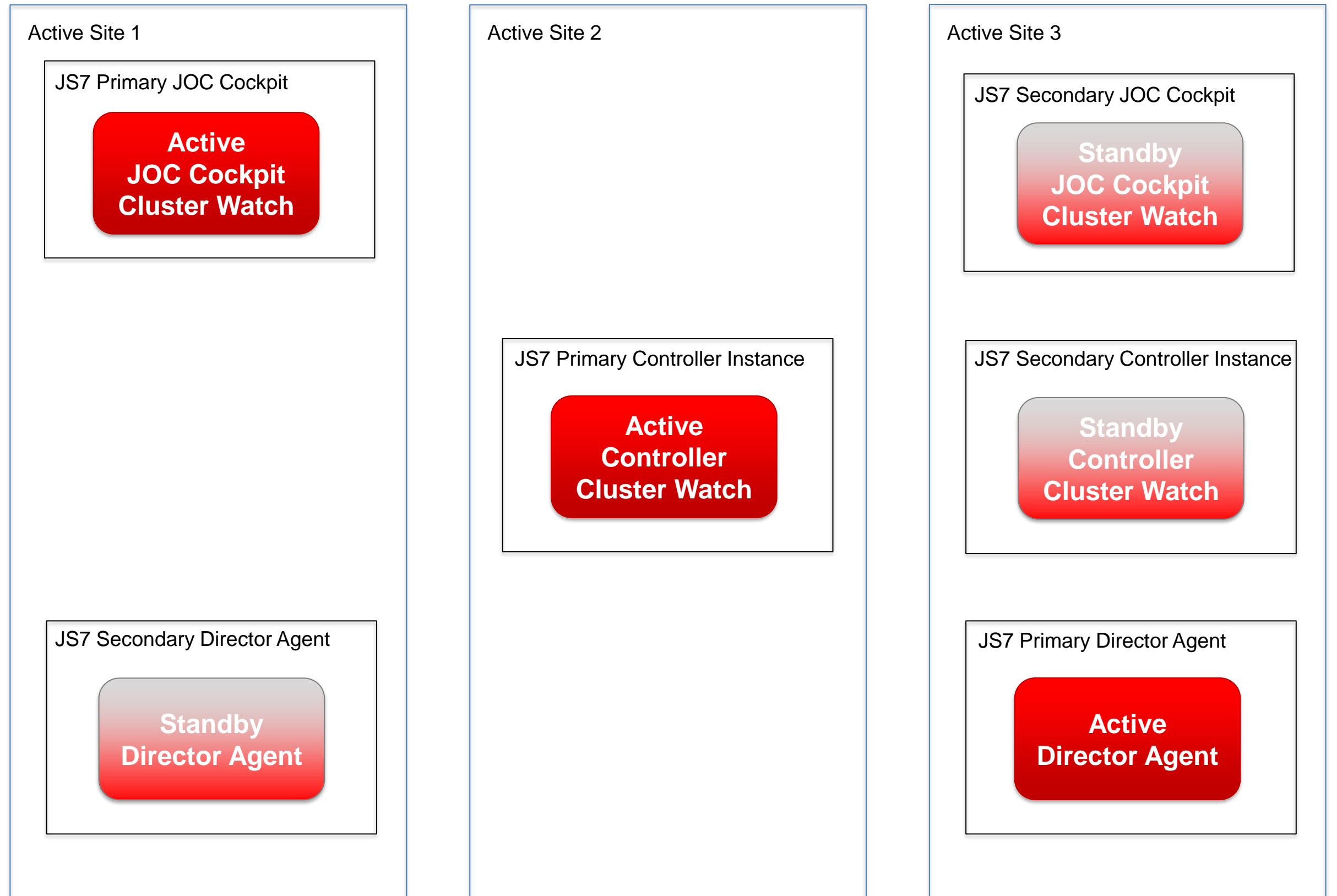


Disaster Scenarios

- If Site 1 fails, Active JOC Cockpit / Cluster Watch will fail-over to Site 3
- If Site 2 fails, Active JOC Cockpit / Cluster Watch and Standby Controller will agree on fail-over
- If Site 3 fails, Active Controller / Cluster Watch and Standby Director Agent will agree on fail-over

Restart Capabilities

- After loss of Site 1 scheduling will continue. If subsequently Site 2 is lost, scheduling will continue after fail-over
- After loss of Site 2 and subsequently Site 1, scheduling will continue
- After loss of Site 3 and subsequently Site 2, scheduling will continue
- After loss of Site 1 and 3 scheduling will stop





Questions?
Comments?
Feedback?

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