13.1 Reliability, availability, and serviceability

Reliability, availability, and serviceability (RAS) are important concepts in the design of the IBM Spectrum Virtualize system. Hardware features, software features, design considerations, and operational guidelines all contribute to make the IBM Storwize V7000 system reliable.

Fault tolerance and high levels of availability are achieved by using the following methods:

- The Redundant Array of Independent Disks (RAID) capabilities of the underlying disks
- IBM Storwize V7000 nodes clustering using a *Compass* architecture
- Auto-restart of hung nodes
- Integrated Battery Backup Units (BBU) to provide memory protection if a site power failure occurs
- Host system failover capabilities using N-Port ID Virtualization (NPIV)

High levels of serviceability are available through the following methods:

- Cluster error logging
- Asynchronous error notification
- Automatic Dump capabilities to capture software detected issues
- Concurrent diagnostic procedures
- Directed Maintenance Procedures (DMP) with guided online replacement process
- Concurrent log analysis and memory dump data recovery tools
- Concurrent maintenance of IBM Storwize V7000 components
- Concurrent upgrade of IBM Storwize V7000 Spectrum Virtualize Software and firmware
- Concurrent addition or deletion of node canisters in the clustered system
- Automatic software version leveling when replacing a node
- Detailed status and error conditions that are displayed by LED indicators
- Error and event notification through Simple Network Management Protocol (SNMP), syslog, and email
- Optional Remote Support Assistant

The heart of IBM Storwize V7000 system is a pair of *node canisters*. These two canisters share the read and write data workload from the attached hosts and to the disk arrays. This section examines the RAS features of IBM Storwize V7000 system, monitoring, and troubleshooting.

Throughout this chapter, the term *IBM Storwize V7000* refers to both models of the product: IBM Storwize V7000 Gen2 and Gen2+.