



## **Installing and coordinating a WAN-based grid storage system**

### **Introduction**

In order to most effectively store data, many factors must be considered. These include security, management, disaster recovery and availability. A grid-based storage system provides these benefits while also allowing for the use of untapped network and computer resources within the corporate LAN and WAN.

Grid-based systems use intelligent agents to coordinate and manage storage. This is in sharp contrast to open standards which try to manage heterogeneous storage providers via an outside toolset. This moves the system intelligence into the storage itself which provides for better management, the ability for the system to more quickly recognize and correct problems and the lack of a need for external applications for certain types of hardware or storage.

The key to the success of any grid-based system is communication between the agents. This paper will focus on how to implement a specific grid-solution, SANware, such that a company can use both resources on its LAN and WAN to effectively secure and store its data. We will also compare the system to another application which use similar methods to achieve information delivery and system discovery.

### **Architectural Considerations**

In order to effectively implement any grid-based storage system, all computers on both sides of any WAN connection must be able to converse. However, it is never known by a single agent which other agents are active at a given time. In order to effectively determine which agents are active and help to reduce network traffic, traffic controllers are used. These traffic controllers act to disseminate information to their nodes such that all communications do not have to be made with every agent for every communication. However, when an agent is first joining the grid or a traffic controller is being located on the grid, the discovering agent has no prior knowledge of the grid and its agents. For this reason multi-cast or broadcast messages must be used for these initial communications. Once the agent has completed discovery the following communications can be made using directed packets or datagrams.

In the case of SANware, ports 20014 and 20015 for both UDP and TCP must be routed between the 2 subnets. Also, UDP broadcast via these ports between the selected subnets must be enabled. Firewall considerations include the node\_svr.exe file having access to the network and the ports mentioned previously. The Admintool2.exe file must also have network access and Internet access in order to maintain its license.

In the case of a Cisco-based trading system for the delivery of Reuters information, the specified port was set for UDP Flooding by using the "ip broadcast-address" command. Using this command, all UDP broadcasts are routed to the broadcast address specified.

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The architecture also used tree spanning to allow for a morphing of the broadcast address while maintaining the source address.

### **Implementation**

In order to effectively implement a many-to-many communication architecture with no required central communicator, broadcast messaging must be implemented. Broadcasts to initiate communication allow for the necessary communication for distributed systems and avoid the necessity for prior knowledge of the agent network before initiating communication. SANware follows this methodology by using UDP broadcasts to handle node discovery and allows for computers on different subnets to effectively communicate without prior knowledge of each other. Once communication is established using the UDP broadcasts, further communication can be directed using both UDP and TCP protocols.

The trading system was a receive-only and hence didn't need the 2-way UDP communication required by a grid-based architecture. However, the same commands used to implement a one-way broadcast can be used to implement a 2-way broadcast. ACLs can be used to ensure security once the broadcasts are enabled.

Implementation is accomplished by installing the grid agent software in one subnet and instituting the basic node/supernode configuration. Once this is accomplished, the routers between the subnets must be opened for the necessary ports and be set to allow for UDP broadcast both to and from the different subnets. Installing a node in the 2<sup>nd</sup> subnet is now required. Once the node is installed, start the Admin Tool and ensure that one of the Supernodes on the 1<sup>st</sup> subnet is accessible. Once administrative communication has been successfully established, the remaining computers on the 2<sup>nd</sup> subnet can have the agent software installed. Finally, initiate the Admin Tool on either the 1<sup>st</sup> or 2<sup>nd</sup> subnet and add the newly installed computers to SANware making sure to set their location differently than the computers comprising the 1<sup>st</sup> subnet. Using the location overlay will ensure that data is stored completely on each subnet, though still not on any one computer within the subnet.

### **Effect**

Once implemented in this fashion, a grid storage solution will provide a number of benefits:

1. Data will be automatically stored and available in both subnets independent of the accessibility of either subnet.
2. Data is inherently secure due to the grid implementation.
3. The computers used for the grid implementation are monitored by the agents.
4. Computers will be used more fully as the grid architecture provides for optimal computer and network usage.

A grid implementation also provides for management via any computer on the grid whether or not that computer is an active grid participant as there is no central management console in a true grid.