

SAS PAIRED SUBTRACTIVE ROUTING**CROSS-REFERENCE TO RELATED APPLICATIONS**

The present application claims the benefit under 35 U.S.C. §119(e) of U.S. Provisional Application Ser. No. 61/191,037, filed Sep. 5, 2008, which is incorporated herein by reference. The present application is related to copending applications “COMBINING MULTIPLE SAS EXPANDERS TO PROVIDE SINGLE SAS EXPANDER FUNCTIONALITY” U.S. Patent Publication No. 2010/00664085; Express Mail No. EM 260723514 US), filed on the same date as the present application by inventors Stephen B. Johnson, Timothy E. Hoglund, and Louis H. Odenwald, Jr.; “METHOD FOR PROVIDING PATH FAILOVER FOR MULTIPLE SAS EXPANDERS OPERATING AS A SINGLE SAS EXPANDER” U.S. Patent Publication No. 2010/0064086; Express Mail No. EM 260723491 US), filed on the same date as the present application by inventors Christopher McCarty and Stephen B. Johnson; and “SPECIFYING LANES FOR SAS WIDE PORT CONNECTIONS” U.S. Patent Publication No. 2010/0064084; Express Mail No. EM 260723505 US), filed on the same date as the present application by inventors Stephen B. Johnson and Christopher McCarty. All of these applications are incorporated herein by reference.

TECHNICAL FIELD

The present disclosure generally relates to the field of Serial Attached SCSI, and more particularly to a system, method, and product for performing paired subtractive routing while combining multiple SAS expanders to provide single SAS expander functionality.

BACKGROUND

Serial Attached SCSI (SAS) is a term referring to various technologies designed to implement data transfer between computer devices. The SAS protocol is a serial successor to the parallel Small Computer System Interface. In the SAS protocol, all SAS devices are either an initiator device, a target device, or an expander device. Initiator devices are devices that begin an SAS data transfer, while target devices are the devices to which initiator devices transfer data. Together, initiator devices and target devices are known as end devices.

SAS expanders are devices that facilitate data transfer between multiple initiator devices and multiple target devices. The SAS protocol utilizes a point-to-point bus topology. Therefore, if an initiator device is required to connect to multiple target devices, a direct connection must be made between the initiator device and each individual target device in order to facilitate each individual data transfer between the initiator device and each individual target device. SAS expanders manage the connections and data transfer between multiple initiator devices and multiple target devices. SAS expanders may contain SAS devices.

SUMMARY

A system, may include, but is not limited to: means for assigning an input port to a SAS expander device; means for assigning an output port to the SAS expander device; means for defining the output port and the input port to be paired with each other as a primary subtractive port; means for programming only a SAS initiator address in the route table of the SAS

expander; means for sending a OPEN command out the output port upon receiving an OPEN command into the input port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device; and means for sending a OPEN command out the input port upon receiving an OPEN command into the output port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device.

A method for performing paired subtractive routing in a Serial Attached Small Computer System Interface (SAS) cascaded topology may include, but is not limited to: assigning an input port to a SAS expander device; assigning an output port to the SAS expander device; defining the output port and the input port to be paired with each other as a primary subtractive port; programming only a SAS initiator address in the route table of the SAS expander; sending an OPEN command out the output port upon receiving the OPEN command into the input port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device; and sending an OPEN command out the input port upon receiving the OPEN command into the output port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device.

A computer-readable medium may have computer-executable instructions for performing a method for performing paired subtractive routing in a Serial Attached Small Computer System Interface (SAS) cascaded topology, the method including, but not limited to: assigning an input port to a SAS expander device; assigning an output port to the SAS expander device; defining the output port and the input port to be paired with each other as a primary subtractive port; programming only a SAS initiator address in the route table of the SAS expander; sending an OPEN command out the output port upon receiving the OPEN command into the input port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device; and sending an OPEN command out the input port upon receiving the OPEN command into the output port if the DEST of the OPEN command is not a direct attached device of the SAS expander device and the DEST is not in the route table of the SAS expander device.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not necessarily restrictive of the present disclosure. The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate subject matter of the disclosure. Together, the descriptions and the drawings serve to explain the principles of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The numerous advantages of the disclosure may be better understood by those skilled in the art by reference to the accompanying figures in which:

FIG. 1 is a block diagram illustrating a SAS topology illustrating a single, cohesive SAS expander;

FIGS. 2A through 2E are block diagrams illustrating various configurations of a single, cohesive SAS expander;

FIG. 3 is block diagram illustrating a blade center switch configuration of a single, cohesive SAS expander;