

Claims of 6,425,035	<p>Maximum Strategy Inc. Gen5 S-SERIES XL System Guide Revision 1.01 (6/11/1996) - "SG" Graphical User Interface for MAXSTRAT Gen5/Gent-S Servers User's Guide 1.1 (1/6/1997) - "GUI"</p>
<p>1. A storage router for providing virtual local storage on remote storage devices to devices, comprising:</p>	<p>The GUI Guide ("GUI") expressly references the System Guide ("SG"), which is incorporated by reference: "1.1.3 Related Reference Material ... S-Series System Manual" [GUI 2]</p> <p>The Gen5 includes router functionality: "2.7.3 Network Routing Table A network routing table allows the GEN-5 controller to handle Ethernet connections across gateways to hosts on the other networks." [SG 2-18]</p> <p>Gen5 is a <i>storage router for providing virtual local storage</i>, because it is a storage server: "Gen5 is the product name of the MAXSTRAT Generation 5 Storage Servers." [GUI 2]</p> <p>The description of the Gen-5 XL architecture includes all the structural elements of Claim 1: See Figure 15 "GEN-5 XL Block Diagram" depicting CPU 1 (<i>supervisor unit</i>) with Memory (<i>buffer</i>), IFP 1 (<i>Fibre Channel controller</i>) coupled with High Speed Bus B (<i>Fibre Channel Transport Unit</i>), and DMC 1 (<i>SCSI bus controller</i>) coupled via an internal buffer with lines (<i>SCSI Transport Unit</i>) leading to disk drives. [SG 5-21]</p>
<p>a buffer providing memory work space for the storage router;</p>	<p>The Gen5 includes a <i>buffer providing memory work space for the storage router</i>: See Figure 15 "GEN-5 XL Block Diagram" depicting CPU 1 (<i>supervisor unit</i>) with Memory (<i>buffer</i>). [SG 5-21]</p> <p>"0x40 0x01 DRAM Parity Error" [SG B-11]</p> <p>"0x800 BUF: error code 0x1000 BUF: bit-mask; module parity error 0x2000 BUF: bit-mask; DMC error disconnect 0x00FF BUF: bit-mask; buffer state 0x0005 BUF: bit-mask; buffer full 0x0000 BUF: bit-mask; buffer empty" [SG B-14]</p>
<p>a first controller operable</p>	<p>The Gen5 includes a Host Interface Port (<i>First controller</i>)</p>

to connect to and interface with a **first transport medium**;

operable to connect to and interface with a First transport medium:

“Supported Ports
1 to 8 Host Interface Ports
SCSI-2 Logical Command Interface” [SG 1-4]

“The system software can be view as two major components. Each component is comprised of *its own dedicated embedded control processor(s)*.

Storage Server manages data control and transfer.

Device Module Controller Processors control and handle stacked link list transfer tasks to/from the storage devices.” [SG 1-5]

Gen5 includes attachable Interface Port Cards, which can be Fibre Channel (*First controller*) or SCSI:

“1.4 Controller Configuration

The GEN-5 XL Controller consists of:

- GEN-5 Rack Mountable Chassis (with fans)
- Device Module Controller (DMC) cards
- *Interface Port (IFP) cards*” [SG 1-7]

“The GEN-5 XL controller supports the following configurations:

...

- *Up to four IFP cards (multi-host configurations)*” [SG 1-8]

“The GEN-5 controller includes several different types of ports, each with varying capabilities:

- IFP

High speed data transfer to/from disk storage

- Ethernet

System management

- Com Ports

System management

UPS support

Physical Port	Logical Port Number	Mode
IFP #1	0x01 & 0x05	Command/Data
IFP #2	0x02 & 0x06	Command/Data
IFP #3	0x03 & 0x07	Command/Data
IFP #4	0x04 & 0x08	Command/Data
Com #1	0x09 (Service Console)	Command-only
Com #2	0x0A (UPS)	Reserved
Ethernet	0x0E (Service Console)	Command-only”

[SG 1-12]

“Each type of IFP requires host cabling between the IFP and the host interface. For specific interface cabling, see section on specific

	<p>interface type.” [SG 2-21]</p> <p>See Figure 5-2 depicting four IFP modules providing commands & responses to a Command Queue module. [SG 5-2]</p> <p>“Information available through the System Monitor screen; ... • Number and Type of installed Interface Ports” [GUI 70]</p> <p>The Gen5 Host Interface Ports can be <i>Fibre Channel</i>:</p> <p>“4.3.1 Interface Ports There are up to four physical interface ports on the XL model, two physical ports on the L model, and eight physical ports on the S-Series.” [GUI 73]</p> <p>“4.3.1.1 Interface The valid Interface types are: ... FCS (FC)” [GUI 73]</p> <p>See also: “(FC)” refers to “Fibre Channel-IP” for the Profile System companion MAXSTRAT product. [GUI 73]</p>
<p>a second controller operable to connect to and interface with a second transport medium; and</p>	<p>The Gen5 includes a <i>Second controller operable to connect to and interface with a Second transport medium</i>:</p> <p>“1.1.2 Definitions ... Module The hardware controller for a column of disks also referred to as Device Module Controller (DMC).” [SG 1-2]</p> <p>“The system software can be view as two major components. Each component is comprised of <i>its own dedicated embedded control processor(s)</i>. Storage Server manages data control and transfer. <i>Device Module Controller Processors control and handle stacked link list transfer tasks to/from the storage devices.</i>” [SG 1-5]</p> <p>“Data Drive SCSI-2 fast/wide differential If the disk drives are racked and shipped from Maximum Strategy Inc., they will be ready for use.” [SG 3-2]</p> <p>“3.3.4 Disk Drive Cabling Disk Drive cables include one cable for each disk channel string (see Figure 13).</p>

	<table border="1"> <tr> <td>INTERFACE</td> <td>CABLE</td> </tr> <tr> <td>SCSI-2 Fast/Wide/Differential</td> <td>68-conductor"</td> </tr> </table> <p>[SG 3-8]</p> <p>"Each module supports two independent SCSI-2 interfaces or two rows of devices within a facility." [SG 3-14]</p> <p>"APPENDIX A Supported Disk Drives Currently supported disk drives: ... data drive ... SCSI-2 wide/fast differential" [SG A-1]</p>	INTERFACE	CABLE	SCSI-2 Fast/Wide/Differential	68-conductor"
INTERFACE	CABLE				
SCSI-2 Fast/Wide/Differential	68-conductor"				
<p>a supervisor unit coupled to the first controller, the second controller and the buffer,</p>	<p>The Gen5 has a supervisor unit: "The system software can be view as two major components. Each component is comprised of its own dedicated embedded control processor(s). <i>Storage Server manages data control and transfer.</i> Device Module Controller Processors control and handle stacked link list transfer tasks to/from the storage devices." [SG 1-5]</p> <p>The Gen5 has two general-purpose CPUs: "2.13 Dual CPU Mode The monitoring capability on the GEN-5 XL controller lets each CPU monitor the other CPU and monitor the RAID subsystem." [SG 2-30]</p> <p>"Dual-CPU Mode Setup In a new system, the CPU in slot 1 will be configured as the Master, and the CPU in slot 3 will be configured as the Slave." [SG 2-30]</p> <p>The Gen5 <i>supervisor unit</i> could be a Motorola 68040 microprocessor: "4.3.2 Processor and IO Boards The CPU boards have the type (i.e. 68040) and operational status displayed. M68040 CPU-1 ... On the Gen5 system, the CPU running as the Master will have the CPU name in green. The Slave CPU will be in black, and disabled CPUs will have the text colored in gray." [GUI 74]</p>				
<p>the supervisor unit operable to map between devices connected to the first transport medium and the storage devices,</p>	<p>The Gen5 <i>maps between devices connected to the first transport medium and the storage devices</i>: "Each physical bank is numbered, starting at 1 (see Figure 1), and is <i>addressed logically by a unique Facility Address.</i>" [SG 1-8]</p> <p>The Gen5 maintains the mapping configuration in tables: "4.2 Important System Files ...</p>				

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System File	Description
/etc/fstab	Static file systems mounting table
/etc/mntab	Currently mounted file systems
/etc/hosts	Host name database"

[SG 4-1]

"The system administration and configuration management tools require the use of identifies to refer to storage entities on the disk array. These entities include the following:

- physical volumes
- physical partitions
- physical devices" [SG 4-3]

"Configuration Partitions

2) Use the shell vol command to clear then configure the partitions." [SG 4-7]

"vol - manipulate physical volumes

...

Description

vol is a utility used to manage physical volumes. vol accepts a number of commands which follow.

...

par

The par option is used to manipulate the partitions on a volume."

[SG 4-81 to 4-87]

"2.5.2.1 Create Command

Create allows the user to specify the makeup of a Partition.

A Partition is created from available space on a Physical Volume.

When a Volume is initially defined a default partition (p0) is

created consisting of all available space on the Volume, and set to

RAID level 5. When a user defined Partition (p1, p2, p3) is created,

the default partition is overlaid." [GUI 48]

to implement access controls for storage space on the storage devices and

Gen5 implements access control for storage space on the storage devices by limiting certain host's ability to see the data. For the Gen5, a facility is a partition on a disk or a set of disks, and the command to implement access control from hosts to facilities is the ifp command combined with the field for luns bitmask enable:

"ifp - display or modify the internal port configuration

...

Description

To configure the interface port parameters, select the port type followed by its valid parameters and values as listed above. The port types include:

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