

Out-Of-Band Recovery Mechanism for I/O modules

Patent pending

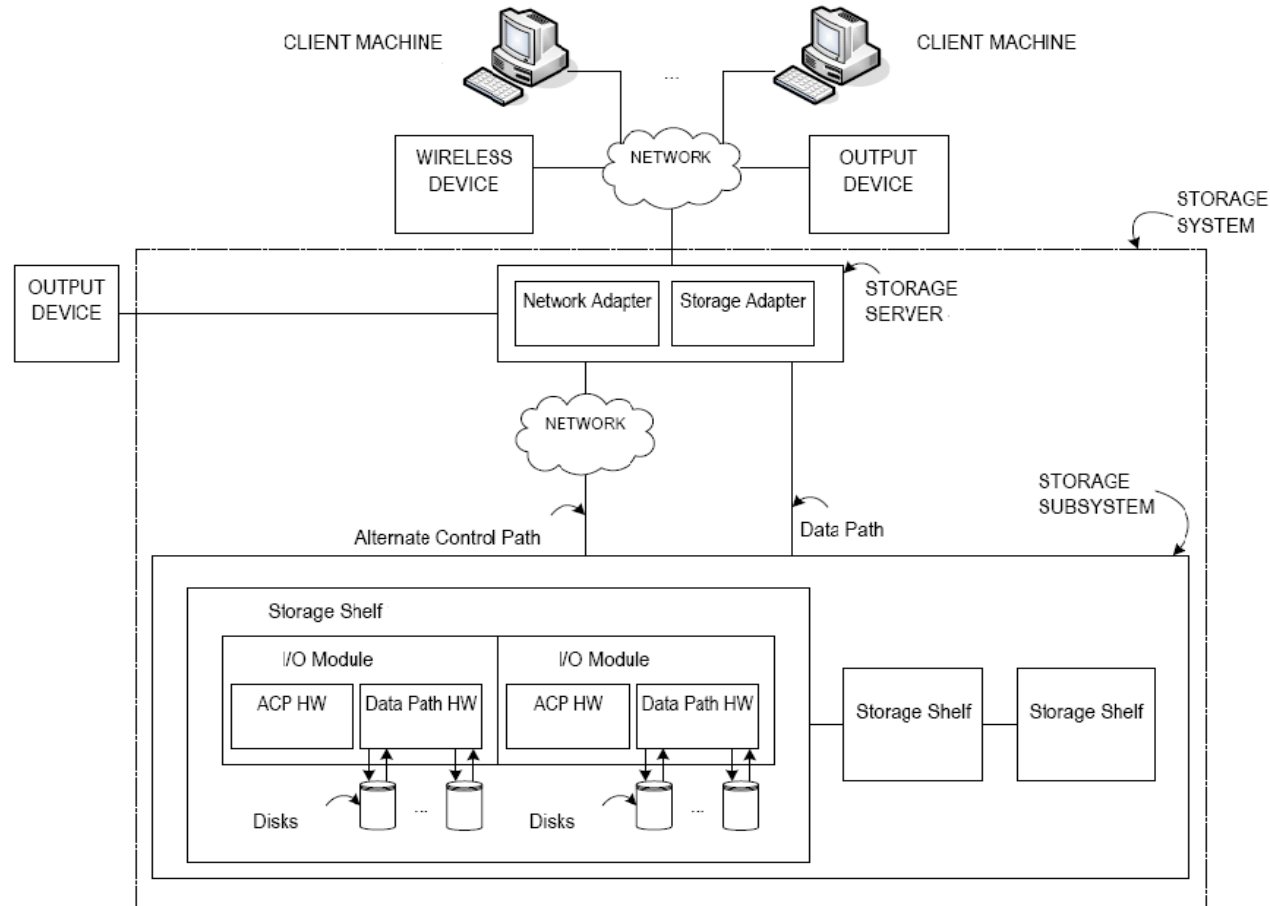
Mayank Saxena (NetApp)

- ❑ Recovering I/O modules in storage system, improve resiliency using alternate control path.
- ❑ Hardware failure in various network-based storage; NAS, SAN etc.
- ❑ Modular storage system built by adding multiple disk shelf and cabling them together.
- ❑ Client initiated I/O from storage server to I/O module in disk shelf.
- ❑ Non-responsive I/O module can result time-outs etc.
- ❑ Software watchdog don't kick-in.

What's ACP?

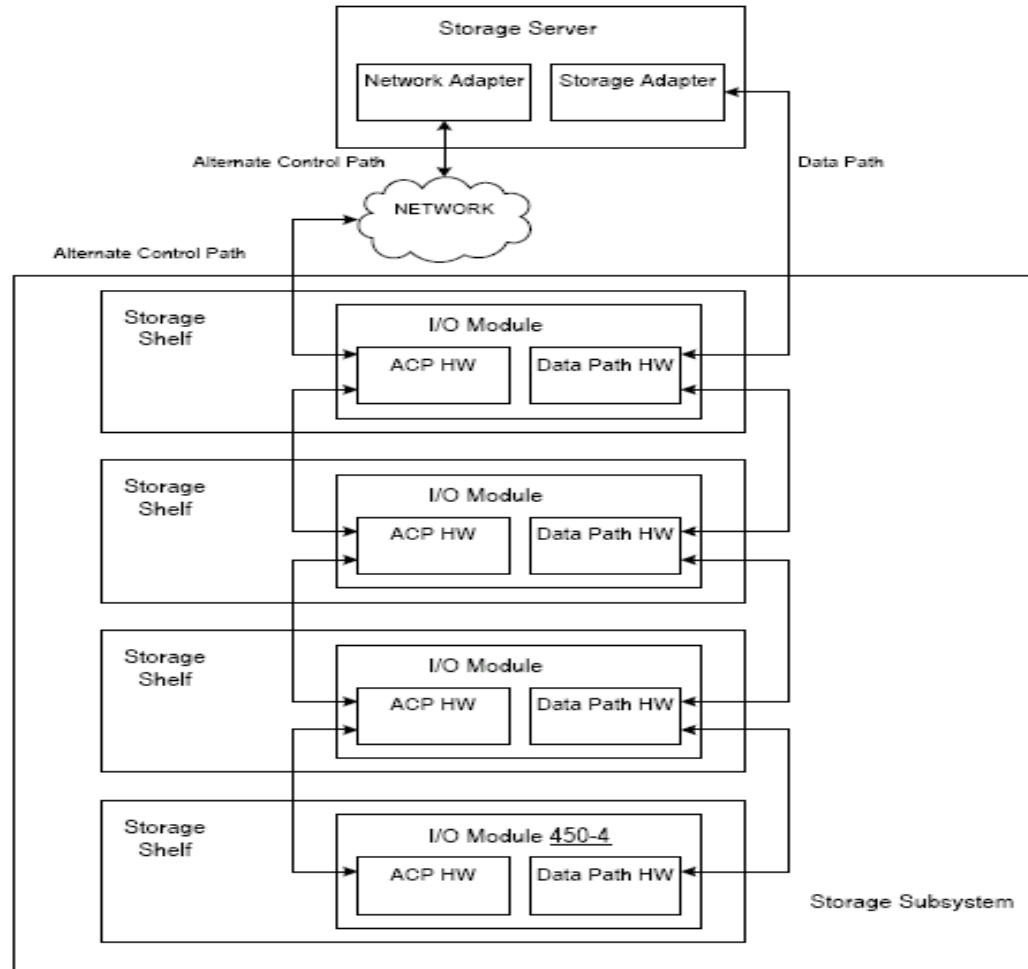
- ❑ Storage server with network adapter coupled to I/O module creating alternate control path to I/O module.
- ❑ Storage server detects non-responsiveness to data command and automatically changes I/O module using ACP to recover I/O module.
- ❑ If I/O module still non-responsive then heavier control command, such as power-cycle, to recover.
- ❑ Once module is back in service, data collected for further analysis using ACP.

Aah! ... how exactly?



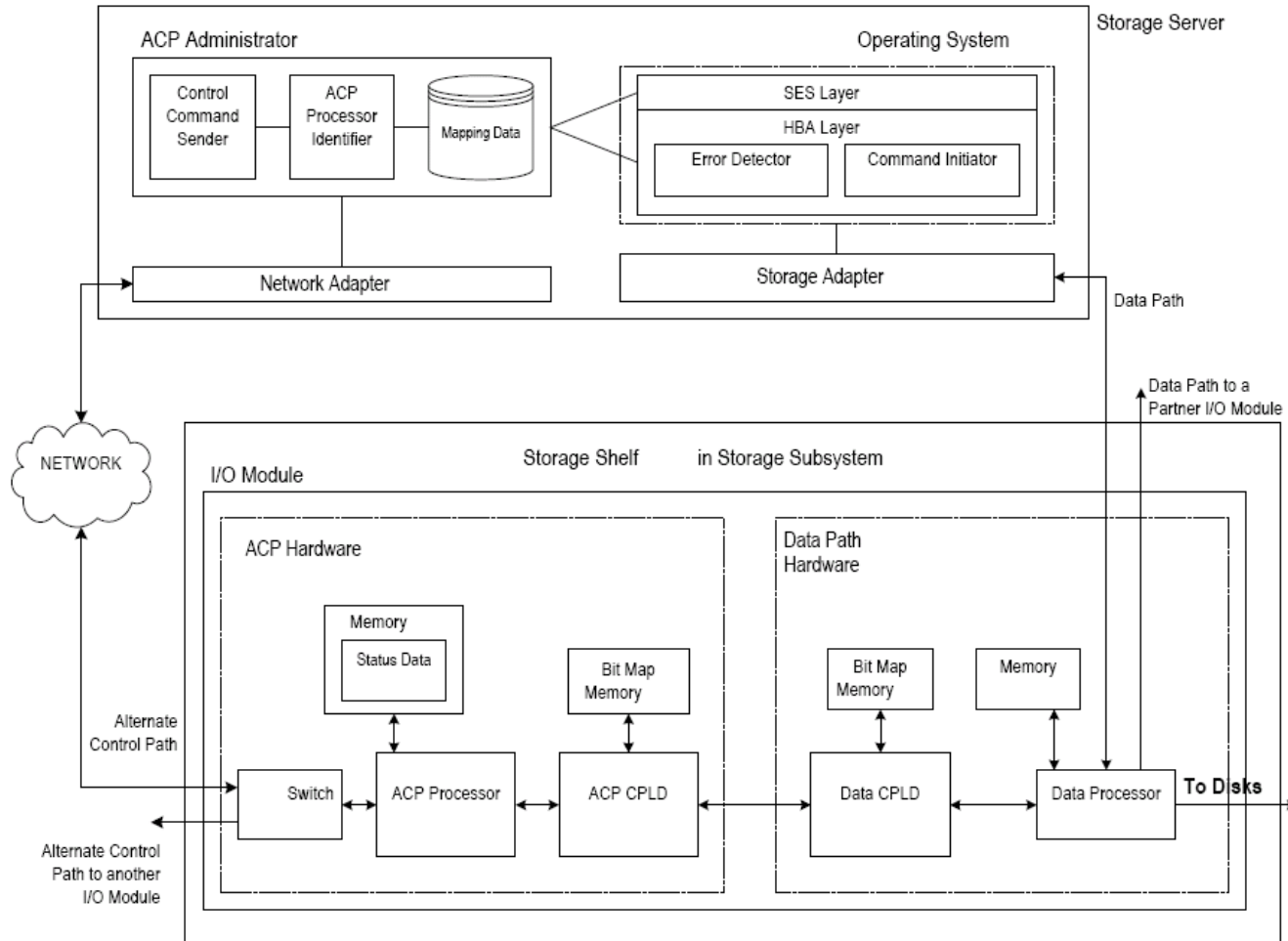
ACP in Network Storage System

ACP in storage system



ACP's System Level View

How's the river flow?



ACP's Ecosystem

Some more...

- ❑ Also provide way to do I/O module logs, voltage data, core dump data, and in-band SAS information.
- ❑ Resetting I/O module, power cycle I/O module, power cycle disk shelf.
- ❑ Push model of enclosure service.
- ❑ Reduces NTF I/O modules.
- ❑ Transparent to administrator.
- ❑ Pro-active recovery.

Thanks!

(Email: mayanks@netapp.com)