Date: 19 April 2006
To: T10 Technical Committee
From: Tim Symons
Subject: 06-098r3 SAS-2 Self-configuring devices

Revision Information

- Revision 0: Initial proposal
- Revision 1: Add text to clarify that self configuring devices configure attached non-self-configuring expander devices
    - Added text to allows that a discovery process may be initiated when a BROADCAST (CHANGE) is received on the subtractive port.
- Revision 2: Identify configuration topologies for reference of further discussion.
    - Added Domain Discovery
    - Added Neighbor discovery
- Revision 3: Removed unique behavior definitions for subtractive port. Added Full domain self discovery, and improved usage models

Text additions from r2 to r3 are shown in red.

Referenced Document

SAS-2 revision 3

Overview

During discussions about SAS zoning there have been many questions regarding the definition of self-configuring devices and how a management application client in either an HBA or another self-configuring device should operate during discovery. This proposal is for additional definition of self-configuring devices and their expected behavior. Additions are recommended to the SAS-2 specification.

Discovery methods reviewed are:

a) Single Master Domain discovery
b) Nearest Neighbor discovery
c) Full domain self discovery

Single Master Domain discovery is not preferred due to the requirement to elect a master and to disable all other self configuring devices, which has no previously defined mechanism.

Nearest Neighbor discovery is not preferred due to the effect of waiting for all neighbors to complete configuration prior to total discovery finalization.

Full domain self discovery requires all management application clients to uniquely discover the domain topology. This allows multiple management application clients to interoperate independently and resolve the topology without dependency on other application clients. This offers the greatest interoperability, and allows for future discovery optimizations to be implemented independently of pre-existing algorithms.

This version of the proposal defines a range of usage models to test implementation concepts

[Suggested new definition for SAS-2]

3.1 Definitions

3.1.a self-configuring expander devices: An expander device containing a management application client and SMP initiator port to perform the discover process to configure its own route table and the routing tables of attached non self-configuring expander devices.

[Start: Suggested addition to SAS-2 existing text (included in black), new additional text (included in blue) and changes between revisions shown in red]

4.1.5 Expander devices (edge expander devices and fan-out expander devices)

…. An expander device with expander phys with the table routing attribute that does not have a configurable route table shall be self-configuring, and shall contain a management application client and SMP initiator port to perform the discover process to configure its own expander route table and the routing tables of attached non self-configuring expander devices.

[End: Suggested addition to existing text shown in blue]

[Start of suggested additions]

4.7.5 Self-configuring expander devices

4.7.5.1 Self configuring operation

The management application client of a self-configuring expander device shall configure routing tables in the expander device (see 4.7.1) and all devices that are not self–configuring devices attached to the expander device.

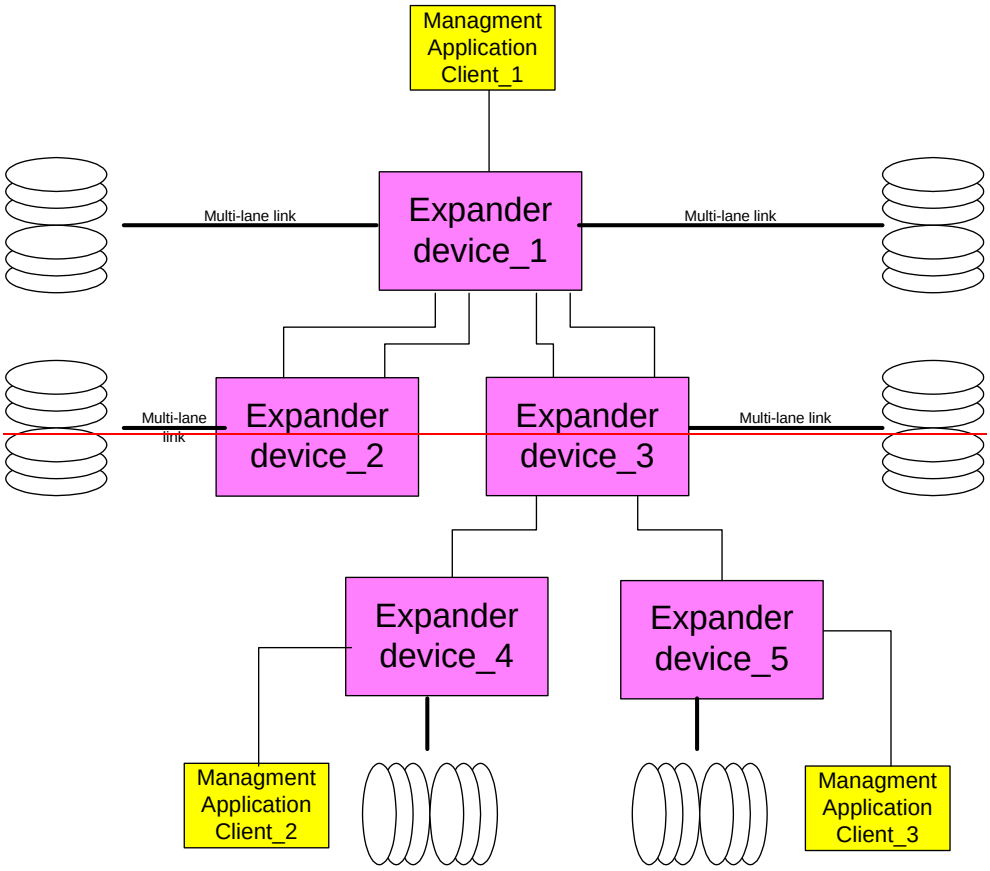
When a self-configuring expander device receives a phy initialization event or a BROADCAST (CHANGE) notification the self-configuring expander device shall start the discovery process for the phy that received the event and the device shall set its CONFIGURING bit to one. The BROADCAST (CHANGE) notification shall be issued on all other ports with zone access to the port that received the BROADCAST (CHANGE) notification. For a non-zoning expander device the notification shall be sent on all other ports.

[Start: References to Neighbor and Domain based discovery]

4.7.5.2 Discover topologies

~~4.7.5.2.1 Single master domain discovery~~

~~In a single master SAS topology, a configuration there shall be only one elected discovery device. All other device discovery processes shall be disabled and shall not discover devices in the topology. The elected discovery device shall discover all devices in the SAS domain and complete the route tables of all attached expander devices.~~

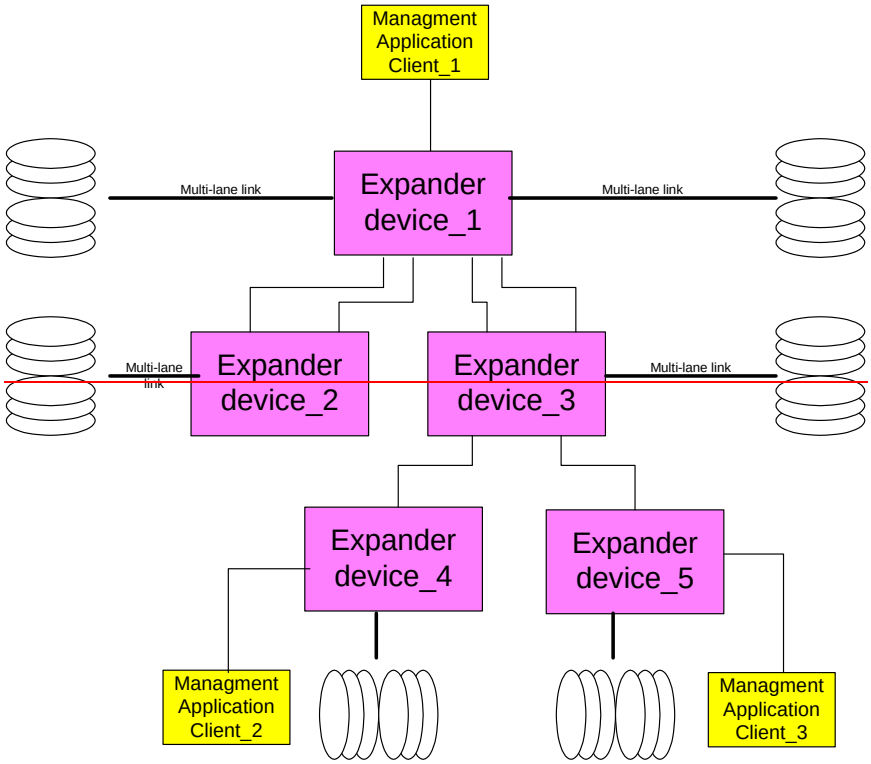


~~Figure 1 – Elected device discover all devices in the domain and configures all configurable expander device route tables~~

~~**4.7.5.2.1 Neighbor domain discovery**~~

~~All topologies described in SAS1.0 and SAS1.1 are neighbor domain discovery topologies. In a neighbor domain discovery, all devices that support a management application client (e.g. HBA and self-configuring expander devices) shall discover devices attached to their phys, and complete the route tables of configurable expander devices attached to the non-subtractive phys.~~

~~When a self-configuring expander device is included in the topology then the self-configuring device shall discover the topology attached to all of the non-subtractive ports and complete the route tables of configurable expander devices attached to the non-subtractive phys.~~



~~**Figure 2 – All HBA's discover all devices in the domain and configure all configurable expander route table entries.**~~

4.7.5.2.1 Full domain self discovery

Case 1 : All expanders are not self-configuring and one HBA

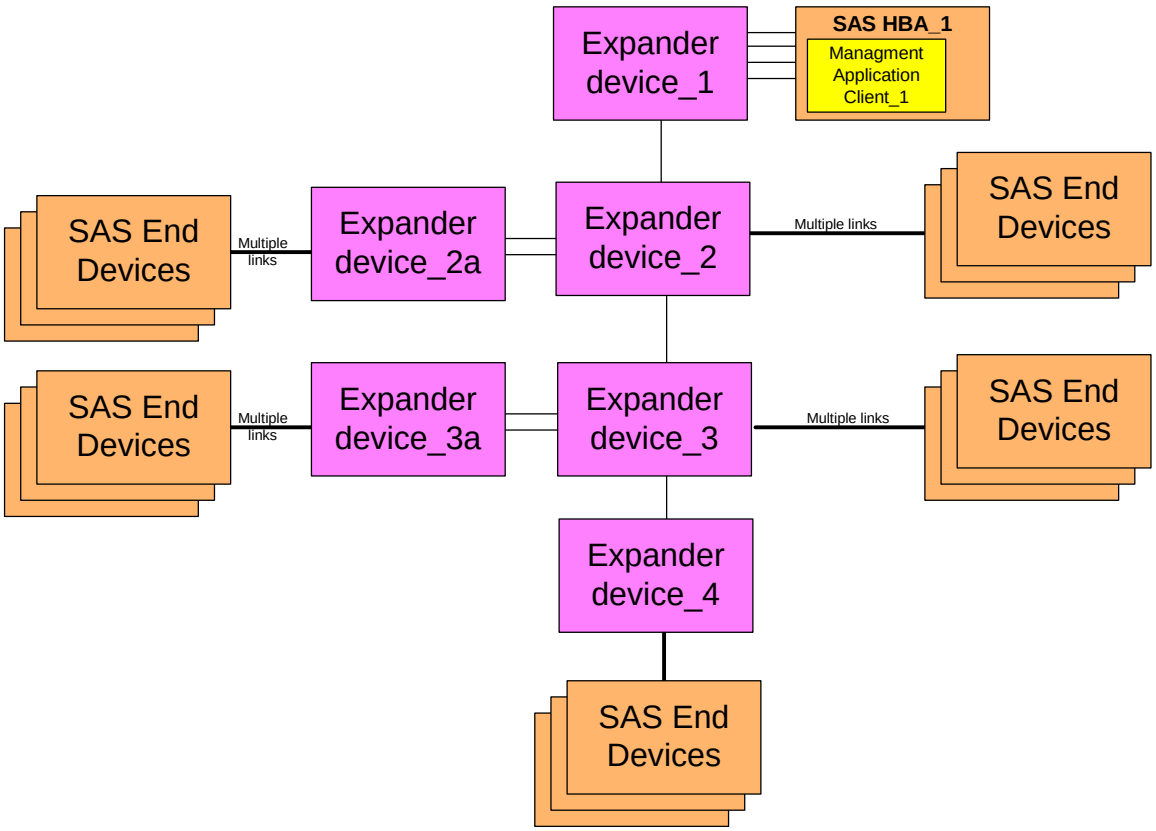


Figure 1 - Non Self configuring expanders, 1 HBA

SAS HBA_1 configures all expander route tables.

Case 2 : One self-configuring expander and one HBA

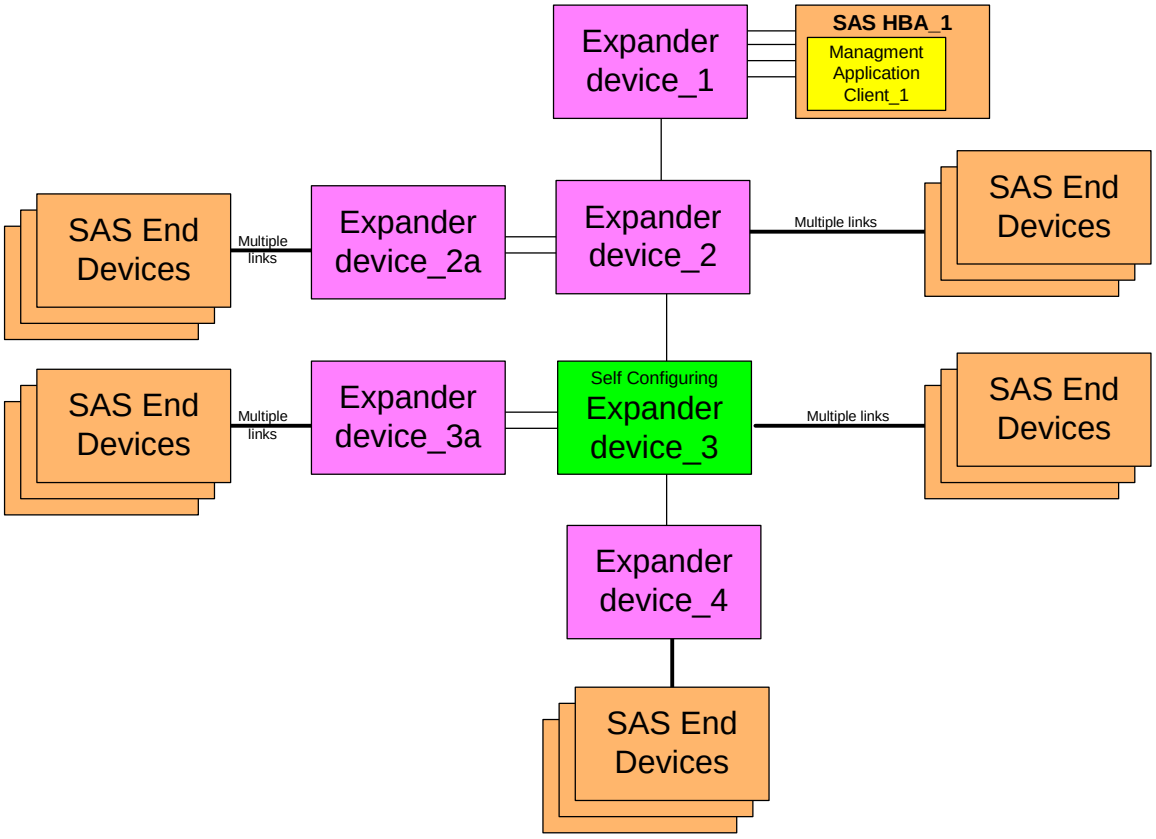


Figure 2 - One Self configuring expander, 1 HBA

HBA_1 configures : Expander_1
Expander_2
Expander_2a

HBA_1 configures : Expander_3
Expander_3a
Expander_4

Case 3 : One self-configuring expander and two HBAs

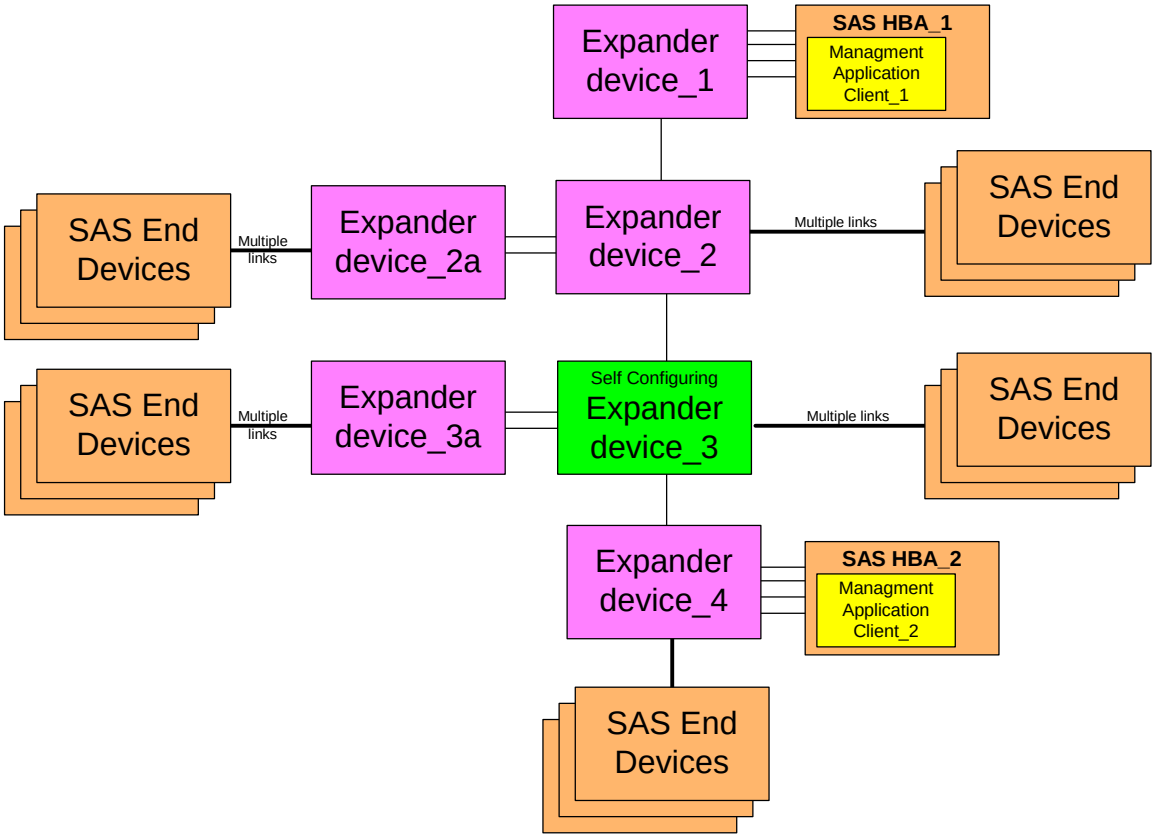


Figure 3 - One Self configuring expander, 2 HBAs

HBA_1 configures :	Expander_1 Expander_2 Expander_2a
HBA_2 configures :	Expander_4
Expander_3 configures :	Expander device_3 Expander device_3a

Case 4 : Two self-configuring expander and two HBAs

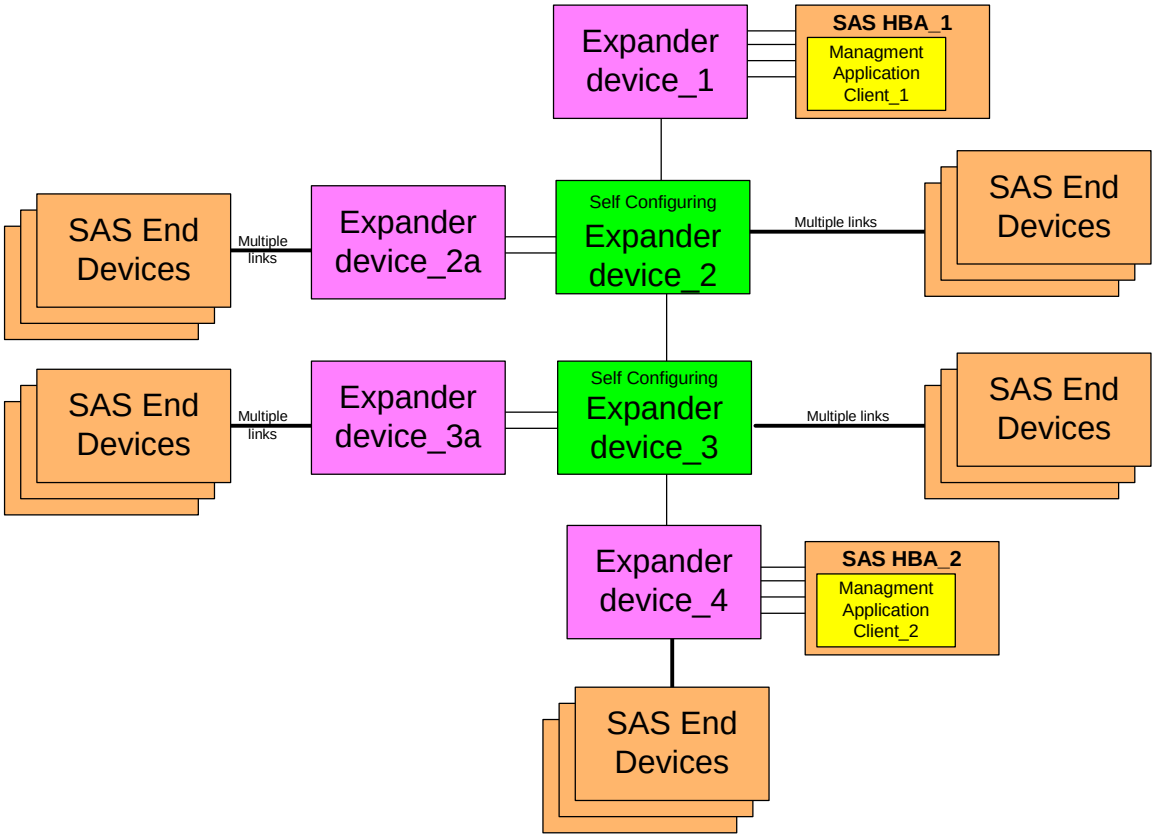


Figure 4 - One Self configuring expander, 2 HBAs

HBA_1 configures : Expander_1

HBA_2 configures : Expander_4

Expander_2 configures : Expander device_2
Expander device_2a

Expander_3 configures : Expander device_3
Expander device_3a

Case 5 : Two self-configuring expander and two HBAs

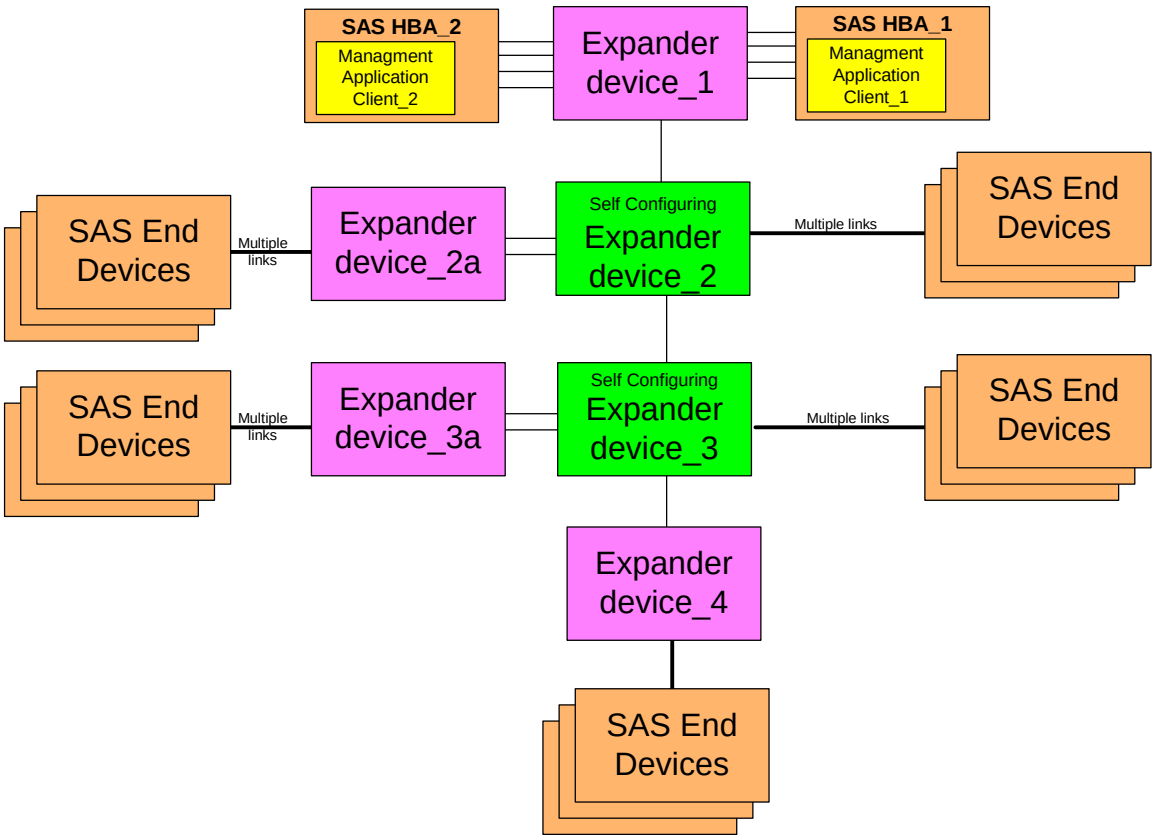


Figure 5 - One Self configuring expander, 2 HBAs

HBA_1 configures :	Expander_1
HBA_2 configures :	Expander_1
Expander_2 configures :	Expander device_2 Expander device_2a
Expander_3 configures :	Expander device_3 Expander device_3a Expander device_4