To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 24 May 2006
Subject: 06-260r0 SAS-2 zone management use cases

Revision history
Revision 0 (24 May 2006) First revision

Related documents
sas2r04 - Serial Attached SCSI - 2 (SAS-2) revision 4

Overview
This explores some of the possible use cases for zone management.

Figure 1 shows a zone manager attached (via sideband means) to all expanders in the ZPSDS. This requires no SMP functions for zone configuration. Zoning expanders on the boundaries need to power on with their boundary phys' ZONE PARTICIPATING bits set to zero and ZONE GROUP fields set to 0 (or other appropriate default zone groups) until the zone manager can attend to them. The phys inside the ZPSDS can power on with ZONE PARTICIPATING bits set to one and ZONE GROUP fields set to 1.
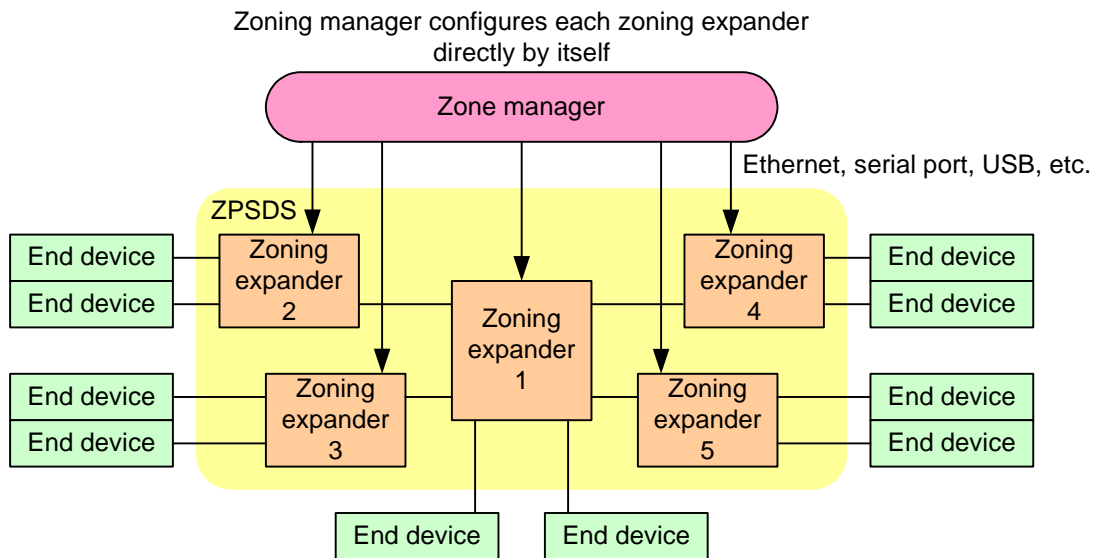

Figure 1 — Zone manager attached to all expanders in the ZPSDS

Figure 2 shows a zone manager attached (via sideband means) to one expander in the ZPSDS. This requires that the SMP initiator port in zoning expander 1 be used to send SMP configuration functions to the other expanders.
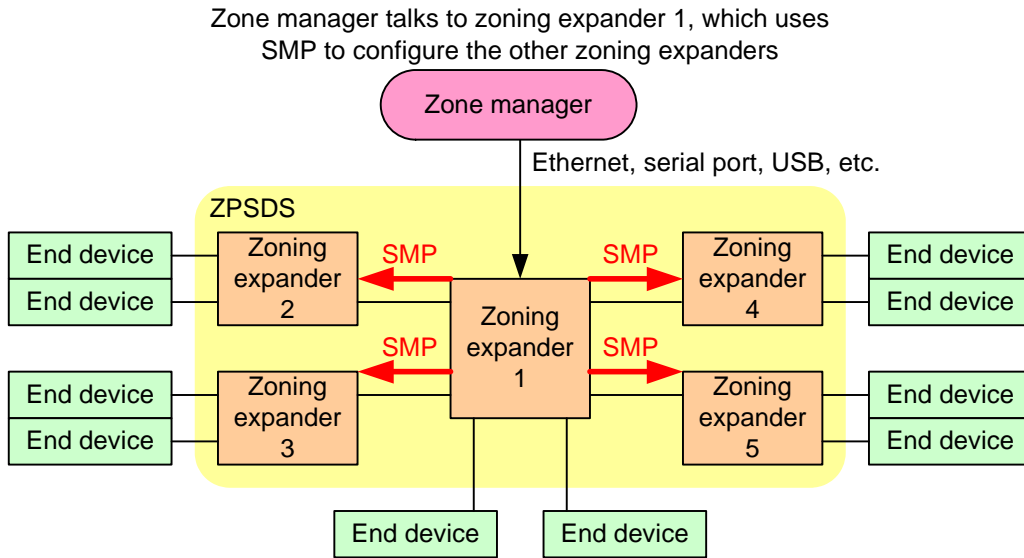
Zone manager talks to zoning expander 1, which uses
SMP to configure the other zoning expanders

Zone manager

Ethernet, serial port, USB, etc.

ZPSDS

| End device | Zoning expander 2 | SMP | SMP | Zoning expander 4 | End device |

| End device | | | | | End device |

Zoning expander 1

SMP   SMP

| End device | Zoning expander 3 | | Zoning expander 5 | End device |

| End device | | | End device |

End device   End device

Figure 2 — Zoning manager attached to one expander in the ZPSDS

Figure 3 shows a zone manager attached (or part of) an end device. This requires the end device be in a ZG which has access to ZG 2 (this must be understood by all the expanders at power on). That end device can configure all the zoning expanders.
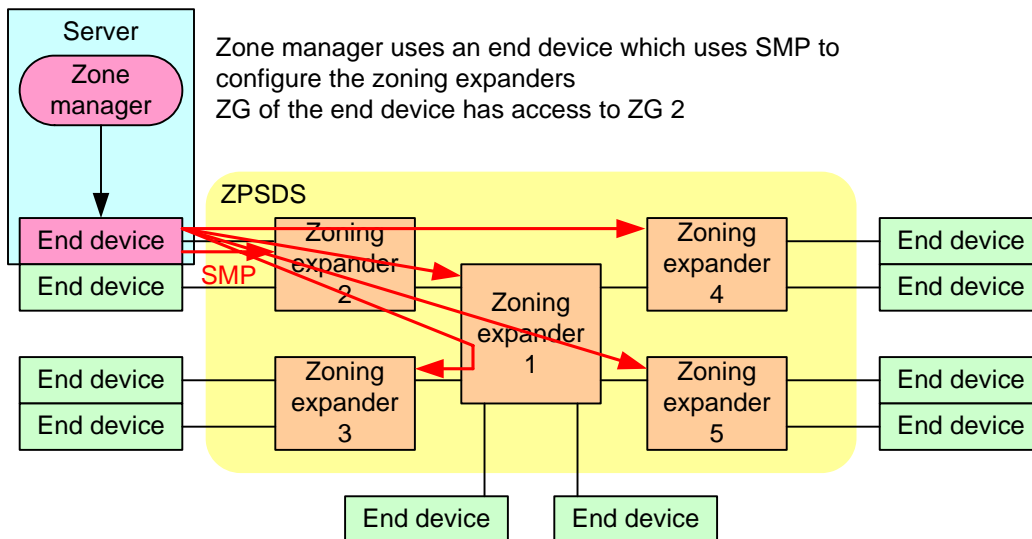
Server

Zone manager

Zone manager uses an end device which uses SMP to
configure the zoning expanders
ZG of the end device has access to ZG 2

ZPSDS

End device

| | Zoning expander 2 | | Zoning expander 4 | End device |

| End device | SMP | | | End device |

Zoning expander 1

| End device | Zoning expander 3 | | Zoning expander 5 | End device |

| End device | | | End device |

End device   End device

Figure 3 — Zone manager attached to end device

Figure 4 shows extending a ZPSDS to include additional expanders.The zone manager could be attached to the end device as shown, or attached to one or more of the expanders in the original ZPSDS. This scenario requires a standard SMP configuration function to enable zoning in an expander that has it disabled. This function should not be allowed from any source (see password discussions below).

Zone manager uses an end device which uses SMP to configure the zoning expanders
ZG of the end device has access to ZG 2
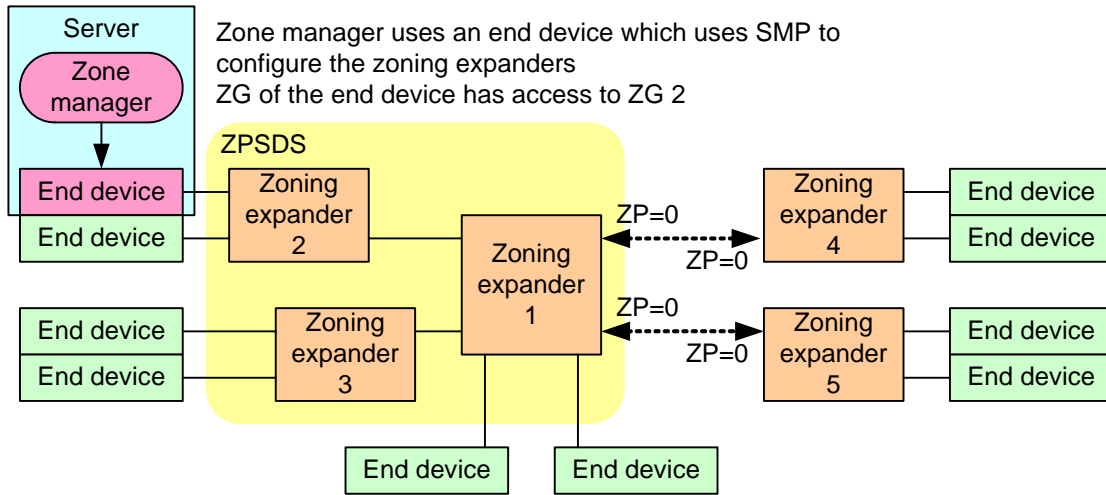
When expanders 4 and 5 are added, start them in a default zone group with limited access (this might be two steps; start in ZG 0, then upgrade to a ZG that has access to the zone manager). The zone manager probes what's been added and displays the topology to the user (SMP accesses to the expanders, possibly SSP/STP accesses to the end devices). If the user chooses, then configure and enable zoning in expanders 4 and 5, extending the ZPSDS.
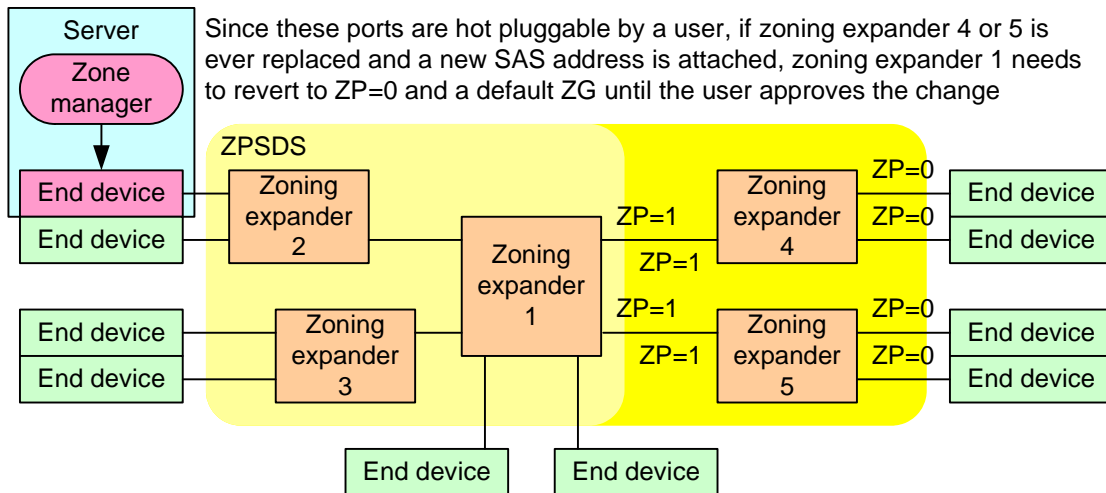
Since these ports are hot pluggable by a user, if zoning expander 4 or 5 is ever replaced and a new SAS address is attached, zoning expander 1 needs to revert to ZP=0 and a default ZG until the user approves the change

Figure 4 — Extending ZPSDS

Figure 5 shows joining two ZPSDSes. There is no reason to mandate that there only be one ZPSDS in a SAS domain - it will be easy for a user to do and doesn't necessarily break anything, so should be allowed. By default, the expanders in the right ZPSDS will ignore zone configuration requests from the left. The zone manager must send a password (or provide some other proof of permission) to zoning expander 4 and 5 so they will allow changes.
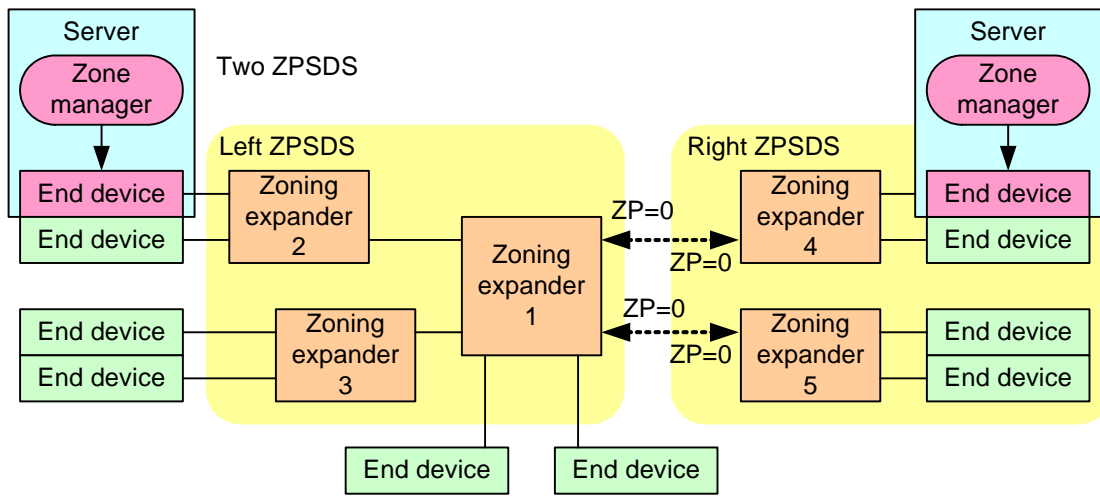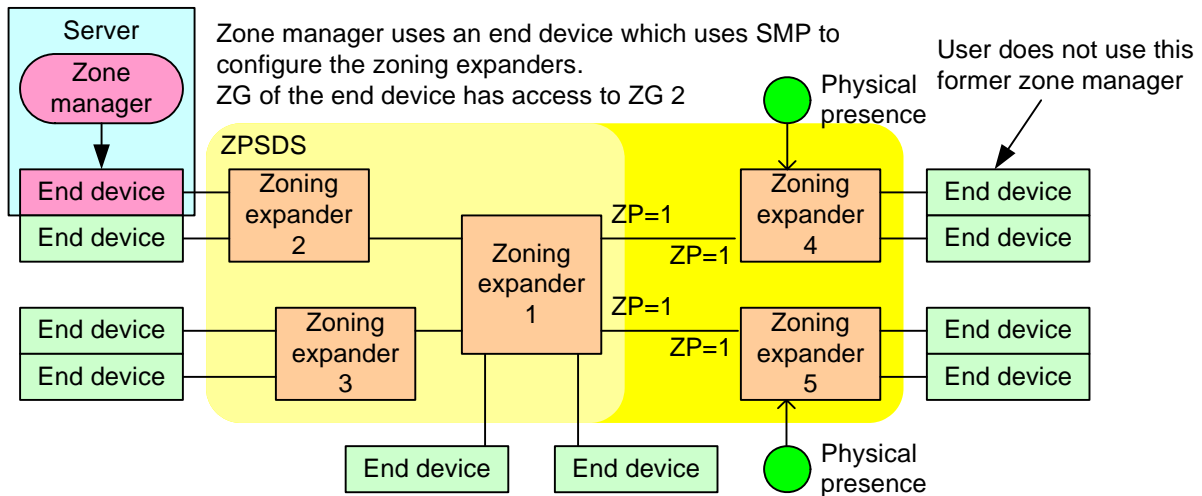

Figure 5 — Joining two ZPSDS

If a password is used, it might be important to transport the password in encrypted format. This requires the zone manager and expanders each include or have access to random number generators. A Diffie-Hellman exchange like that proposed for delivery of tape drive data encryption keys using the SECURITY PROTOCOL IN/OUT commands (see 06-225) would be suitable. A public/private key certificate-based exchange could be used, requiring the expander to have a digital certificate. In this case, the user trusts the ZPSDS in which the zone manager sits and can verify that expanders 4 and 5 are the ones just attached, but zoning expanders 4 and 5 do not trust the user since they don't know what environment they are in.

Another approach relies on physical presence detection. If the user presses a button (or performs some equivalent operation) that is detected by expander 4 and expander 5, then zoning configuration is allowed. This physical presence indication might allow configuration from any or certain ports for a short time period, allow configuration from certain ports at any time, or clear out all zoning settings and allow configuration from certain ports (so it now appears like a plain expander and falls into the "extending the ZPSDS" scenario described earlier).

Figure 6 shows an expander claiming to be inside a ZPSDS when it really is not. As long as expander 1 (which really is in the ZPSDS) has ZONE PARTICIPATING bit set to zero on its output phys, the zone manager doesn't honor the ZONE PARTICIPATING bits that are set to one on expanders 4 and 5.
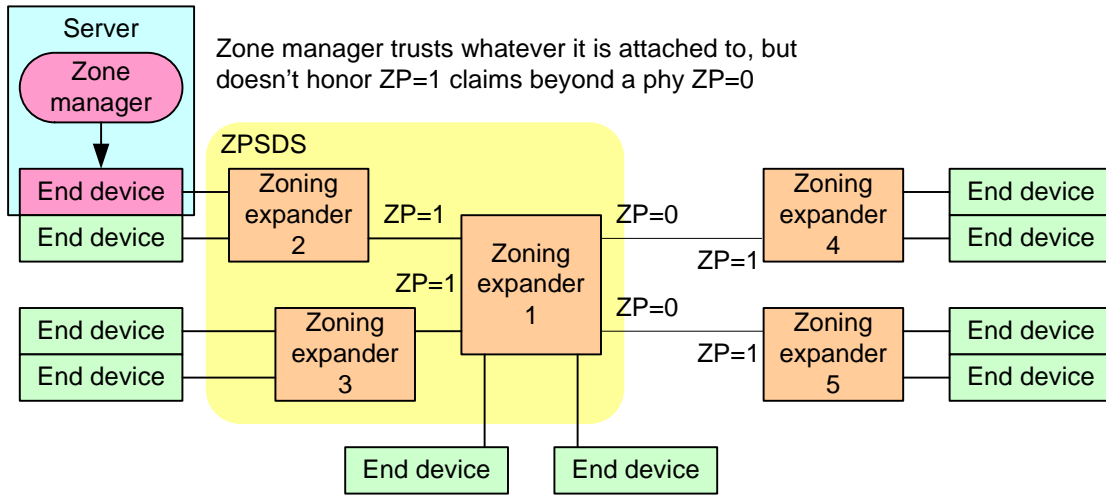
Figure 6 — Expander outside ZPSDS is not trusted