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1. About This Release

The development release described in this document includes firmware, OS drivers, tools, and host management software for the SmartRAID 3200 and SmartHBA 2200 solutions from Microchip.

1.1 Release Identification

The firmware, software, and driver versions for this release are shown in the following table.

Table 1-1. Release Summary

<table>
<thead>
<tr>
<th>Solutions release</th>
<th>3.1.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package release date</td>
<td>August 10, 2021</td>
</tr>
<tr>
<td>Firmware version</td>
<td>3.01.04.072</td>
</tr>
<tr>
<td>UEFI/Legacy BIOS</td>
<td>1.4.3.6/1.4.3.2</td>
</tr>
</tbody>
</table>

Driver versions

Windows Drivers:
- Windows 2019, 2016, Windows 10: 1010.6.0.1025

Linux SmartPQI:
- RHEL 7/8: 2.1.12-055
- SLES 12/15: 2.1.12-055
- Ubuntu 18/20/21: 2.1.12-055
- Oracle Linux 7/8: 2.1.12-055
- Citrix Xenserver 8: 2.1.12-055
- Debian 9/10: 2.1.12-055
- CentOS 7/8: 2.1.12-055

VMware:
- VMware ESX 6/7: 4150.0.119

FreeBSD/Solaris:
- FreeBSD 11/12/13: 4130.0.1008
- Solaris 11: 4120.0.1005

ARCCONF/maxView

| B24308 |

1.2 Files Included in this Release

This section details the files included in this release.

Table 1-2. Firmware Files

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Pre-Assembly Use</th>
<th>Post-Assembly Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>SmartFWx200.bin</td>
<td>Production-signed programmable NOR Flash File. Use to program NOR Flash for boards that are already running firmware.</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
### Table 1-3. Firmware Programming Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
<th>Executable</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCCONF</td>
<td>ARCCONF CLI Utility</td>
<td>ARCCONF BXXXXX.zip</td>
</tr>
<tr>
<td>maxView</td>
<td>maxView Utility</td>
<td>MAXVIEW XXX BXXXXX.zip</td>
</tr>
</tbody>
</table>

### Driver Files

### Table 1-4. Windows Drivers

<table>
<thead>
<tr>
<th>OS</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server 2019, 2016, Windows 10</td>
<td>x64</td>
</tr>
</tbody>
</table>

### Table 1-5. Linux Drivers

<table>
<thead>
<tr>
<th>OS</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHEL 8.4, 8.3, 8.2, 8.1, 7.9, 7.8, 7.7</td>
<td>x64</td>
</tr>
<tr>
<td>CentOS 8.3, 8.2, 8.1, 8.0, 7.9, 7.8, 7.7</td>
<td>x64</td>
</tr>
<tr>
<td>SLES 12 SP5, SP4</td>
<td>x64</td>
</tr>
<tr>
<td>SLES 15 SP3, SP2, SP1</td>
<td>x64</td>
</tr>
<tr>
<td>Ubuntu 20.04.2, 20.04.1, 20.04, 18.04.5, 18.04.4</td>
<td>x64</td>
</tr>
<tr>
<td>Ubuntu 21.04</td>
<td>x64</td>
</tr>
<tr>
<td>Oracle Linux 8.3, 8.2, 7.9, 7.8, UEK6U1 (5.4.17-2036)</td>
<td>x64</td>
</tr>
<tr>
<td>Oracle Linux 8.2 UEK R6</td>
<td>x64</td>
</tr>
<tr>
<td>Debian 10.5, 9.13</td>
<td>x64</td>
</tr>
<tr>
<td>Fedora 33 (inbox)</td>
<td>x64</td>
</tr>
<tr>
<td>XenServer 8.2</td>
<td>x64</td>
</tr>
</tbody>
</table>

### Table 1-6. FreeBSD, Solaris, and VMware Drivers

<table>
<thead>
<tr>
<th>OS</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESX6.5U3/U2</td>
<td>x64</td>
</tr>
<tr>
<td>ESX6.7U3/U2</td>
<td>x64</td>
</tr>
<tr>
<td>ESX7.0U2/U1</td>
<td>x64</td>
</tr>
<tr>
<td>FreeBSD 13, 12.2, 11.4</td>
<td>x64</td>
</tr>
<tr>
<td>Solaris 11.4</td>
<td>x64</td>
</tr>
</tbody>
</table>

### Host Management Software
<table>
<thead>
<tr>
<th>Description</th>
<th>OS</th>
<th>Executable</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCCONF Command Line Utility</td>
<td>Windows x64</td>
<td>See the arconf_B####.zip for the installation executables for the relevant OS.</td>
</tr>
<tr>
<td></td>
<td>Linux x64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VMware 6.5 and above</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XenServer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UEFI support</td>
<td></td>
</tr>
<tr>
<td>maxView Storage Manager</td>
<td>Windows x64</td>
<td>See the maxview_linux_B####.zip, maxview_win_B####.zip, and the maxview_vmware_B####.zip for the installation executables.</td>
</tr>
<tr>
<td></td>
<td>Linux x64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VMware 6.5 and above</td>
<td></td>
</tr>
<tr>
<td></td>
<td>XenServer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UEFI support</td>
<td></td>
</tr>
<tr>
<td>maxView vSphere Plugin</td>
<td>VMware 6.5 and above</td>
<td>See the maxview_vmware_B####.zip for the installation executables.</td>
</tr>
<tr>
<td>Boot USB (offline or pre-boot) for ARCCONF and maxView Storage Manager</td>
<td>Linux x64</td>
<td>See the maxview_offline_bootusb_B####.zip for the .iso file.</td>
</tr>
</tbody>
</table>
2. **What's New?**
This section shows what's new in this release.

2.1 **Features**
The following table lists the features supported for this release.

**Table 2-1. Features Summary**

<table>
<thead>
<tr>
<th>Features</th>
<th>Supported in this Release</th>
<th>Future Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>UEFI driver, boot support</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Legacy boot support</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Dynamic power management</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Driver support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Linux</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>VMware</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>FreeBSD</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Solaris</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>OS certification</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Flash support</td>
<td>ARCCONF utility</td>
<td>X</td>
</tr>
<tr>
<td>maxView tool support</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ARCCONF tool support</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MCTP BMC management</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4Kn support in RAID and HBA</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Controller-based encryption (CBE) support¹</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Out-of-band interface selection support of MCTP or PBSI</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>VPP Backplane support</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>PBSI support</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Configurable Expander SSU settings</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. Only available for encryption-enabled products.
2.2 Fixes and Enhancements
This section shows the fixes and enhancements for this release.

2.2.1 Firmware Fixes
This section shows the firmware fixes and enhancements for this release.

2.2.1.1 Fixes and Enhancements for Firmware Release 3.01.04.072
This release provides the following fixes and enhancements.

- Added board files for a "SmartRAID 3252-8I" board SKU.
- Improved performance of large sequential writes with DDR write cache enabled.
- Improved the serial log output for attached device inventory. Specifically, improved the information regarding NVMe device unique identifiers and separated/re-organized several groups of information to improve readability.
- Added support to report a unique SCSI ID for NVMe devices via Inquiry VPD 83h and new CISS style ReportPhysicalLUNs formats to support OS drivers in collecting this information.
- Added support for persistent logging across warm reset of the controller only.
- Added direct-cabling functionality for cables compatible with the 'auto-detect' logic.
- The "PMS (Performance Monitoring Statistics)" metrics API has been deprecated. Several performance-related metrics in the "M&P" API have also been deprecated; however, error-related counters are still being maintained.
- NVMe device PCIe identifiers are now reported via IdentifyPhysicalDevice command. This supports PLDM reporting as a part of adding SCSI unique identifiers for NVMe devices.
- Added support for firmware to report new OS driver device inventory command formats in support of future support for unique SCSI device information for NVMe devices and also added support to report a unique SCSI ID for NVMe devices via Inquiry VPD 83h and new CISS style ReportPhysicalLUNs formats to support OS drivers in collecting this information.
- Fixed an issue where background surface scan may not start if all the IOs to a volume use the SSD IOBypass.
  - Root cause: The consistency checking process waits for a volume to be written to before allowing a scan to start. This value was not updated when new SSD IOBypass data flows were added for fault-tolerant writes which can cause this checking to never start if the firmware IO path has never been used to write to the volume.
  - Fix: Modified the logic to indicate the first write has occurred if the SSD IOBypass is allowed to be used. The firmware has no way to monitor this IO path so must assume it has been used if it is allowed to be used.
  - Risk: Low
- Fixed an issue preventing hot-added drive discovery with an SGPIO backplane if that backplane segment initially had no drives installed at boot.
  - Root cause: The logic which decides to disable 'unused' PHYs incorrectly evaluated ports attached to an SGPIO backplane as not being associated with a backplane. Because SGPIO does not have a standardized out-of-band mechanism to detect hotplug, disabling the controller PHYs after initial discovery prevented future hotplugs from being detected.
  - Fix: For a direct-attach backplane, leave the controller PHYs enabled to support in-band hot-plug detection.
  - Risk: Low
- Fixed an issue where the reported link rate for NVMe drives is incorrectly reported when the desired port width is not the same as the actual port width linked up.
  - Root cause: The reporting from firmware was not granular enough to report the disparity. After that issue had been resolved, the firmware would try to disable 'unused' PHYs from the port group, but this would cause the entire port to be disabled.
  - Fix: Firmware logic was updated to report the discrete PHY link status/rates correctly. The firmware logic to disable 'unused' PHYs was also modified to not disable PHYs for an NVMe port in which at least one PHY is linked up.
  - Risk: Low
- Fixed an issue where the controller WWID is printed incorrectly during boot up to the UART/SOB log.
  - Root cause: A refactoring change to the general manufacturing format outputs was made alongside addition of support for a separate new format. This refactored code incorrectly treats the WWID as a...
QWORD field instead of a BYTE array which results in the output appearing to be endian swapped. The change only impacted this printing function—the WWID was otherwise properly used and reported elsewhere appropriately.

- **Fix:** Changed the logic back to printing the WWID value as a BYTE array.
- **Risk:** Low

- Fixed an issue where drives attached to a VPP backplane have incorrect bay numbers and are presented to the host incorrectly.
  - **Root cause:** The VPP discovery logic found a TWI device at address 0xAE but read all 0xFF’s from it. This resulted in behavior that set up the enclosure assuming a bad EEPROM, but this resulted in multiple customer experience issues.
  - **Fix:** The logic that follows having a bad EEPROM was adjusted to account for a responsive TWI target with no valid data. This case will now be treated more like a direct-cabled case without an enclosure.
  - **Risk:** Low

- Fixed an issue where nor flash corruption in the firmware version or checksum table results in uncorrectable corruption.
  - **Root cause:** The firmware version information was being corrected but not marked as such, and the checksum table was not being corrected. In both cases, the controller continues to report that it detected and did not repair the corruption.
  - **Fix:** Both of these cases are correctable if the redundant image is coherent, so logic was added to perform the correction as well as properly report that status.
  - **Risk:** Low

- Fixed an issue where the first cold boot after a firmware update reports redundant image corruption.
  - **Root cause:** DDR training results are stored in a redundant image section such that they can be referenced to speed up training during boot. On firmware update, these results are cleared to allow potentially new algorithms in the new firmware to establish new/better results. The RAID stack was incorrectly including this section in comparisons between the active and inactive image contents which was triggering a false image corruption message.
  - **Fix:** Do not include this section in the image comparison unless the stored results are already coherent.
  - **Risk:** Low

- Fixed an issue where SSD IOBypass is not re-enabled after a volume transformation has completed.
  - **Root cause:** After completing array transformation task for moving a logical volume to an existing array, if there is another volume present in the array in which the current volume was originally created, SSD IOBypass is not exercised on it. Array A contains two volumes U00, U01, and array B contains volume U02. When the transformation is queued for a U01 from array A to array B, SSD IOBypass will be disabled for all the volumes and drives in array A. When the firmware tries to update the SSD IOBypass for U00, it is in OK state and there is no other volume present in array A, so it will change the SSD IOBypass status for the volume U00 to enabled and enable the individual drive's SSD IOBypass. When the firmware tries to update the SSD SmarPath for the U01 volume, it will disable IOBypass for all the drives which are in the old and new config of U01, But will mark the SSD IOBypass status to disabled for the volume only for U01 and U02 which are part of the array B. This results in the SSD IOBypass of the drives that were part of the old volume being disabled but the volume itself has the status of SSD IOBypass as enabled. When the transformation is completed for the U01, firmware will try to update the SSD IOBypass config for all the volumes. When firmware tries to enable the SSD IOBypass for U00 volume since it is in already enabled state, it will not go and update the individual SSD IOBypass for the drives in the U00 volume (these drives SSD IOBypass will remain as disabled). Then firmware will enable the SSD IOBypass for the U01 and U02 and all the drives part of it. This results in SSD IOBypass for the drives in Array A will remain as disabled.
  - **Fix:** Before deciding whether SSD IOBypass needs to be enabled, look into the assigned drives in the logical volume and check if those drives are part of old config of any volumes under transformation.
  - **Risk:** Medium

- Fixed a potential 0x1ABD controller lockup when a SATA drive is being failed with IO outstanding and the drive fails to respond to Identify Device after reset.
  - **Root cause:** There is a possibility in firmware to queue an IO to a device at a time when it is being failed and this can lead to the IO being unrecoverable as the drive becomes unresponsive. Another device reset may have recovered the IO, however the firmware IO timeout logic explicitly excluded sending recovery task management to devices already marked failed.
Fix: In timeout handling, allow actions such as device reset against devices marked failed. Also added an active IO recovery step to the device failure routine to actively abort outstanding requests rather than waiting for the device (or SATL) to process its queues normally.

Risk: Low

Fixed an issue where firmware incorrectly reported “Online firmware Activation” as a supported feature set of this product.

Root cause: Firmware incorrectly advertised Online Firmware Activation functionality as supported. When host software observes these support bits and attempts to use the feature, it may encounter errors because it is not actually supported.

Fix: Modified the various feature reporting mechanisms to indicate this feature is not supported.

Risk: Low

Fixed a TLB exception lockup issue when multiple Out-of-Band MCTP requests were sent to the firmware at the same time.

Root cause: TLB Exception/NULL pointer exception occurs in the firmware when it receives asynchronous MCTP requests at the same time in a session when a previous MCTP request has not been processed fully. Due to this, the firmware gets into a timing sensitive situation where one of the threads in the firmware is setting up the packetized MCTP responses by accessing the OOB session memory buffer which was just freed up by another thread responsible for processing MCTP requests. This is because the firmware handles one MCTP request in a session in the synchronous manner, if it receives another request from the same session before completing the existing request, it deletes the old session context and starts processing the new request.

Fix: To gracefully handle this situation, the firmware will use spinlock while accessing the OOB session from different threads.

Risk: Low

Resolved a problem with reduced performance when the host is submitting large sequential IO streams at high queue depth.

Root cause: When requests are being coalesced and staged, this activity occurs in either the host IO ingress context (PARSE) or in the RAID mapping context (MAPPER). When PARSE is making decisions about when to stage data and staging resources are constrained, it was entering a busy-wait loop to allow completions to free resources and would check this loop every 10 ms (or 100 IO/s). In this particular workload, the steady-state of the system was causing the IO ingress to be completely gated on this loop which resulted in a very predictable and fixed amount of IO to occur.

Fix: The busy-wait loop timer was reduced to 100 µs (or 10k IO/s) which is more than sufficient to saturate the throughput of the controller.

Risk: Low

Fixed a problem where WRITE and READ fails on a RAID6 volume where it could have completed successfully on certain error recovery scenarios.

Root cause: In the below use cases, the firmware could have completed the IO operation successfully but since it does not allow the regeneration for RAID6 read requests failing with remappable errors.

i. Writing a single column with one drive returning re-mappable read error without valid URE in sense information and the URE sector cannot be found. When there was host read waiting on a continuously failing internal flush write requests, it resulted in OS driver initiating the LUN reset and waiting for its completion indefinitely. In another situation, when requests to flush to the disks were failing continuously during boot-time, firmware was not completing the preboot components’ requests on time, resulting in a 0x1E30 lockup since the maximum number of synchronous host requests were exhausted.

ii. Reading the data strip from failed drive with bad block (URE) on another drive in the same row.

iii. When the WRITE is mapped into a failed drive and bad block (URE) on another drive in the same row, the current implementation is propagating URE into P and Q drives, write is returned successful.

Fix: Allow the RAID6 code to regenerate data which completes the above scenarios. In third scenario, the bad block could also be cleared if the regenerated data is written successfully on the bad block (URE).

Risk: High
2.2.2 UEFI/Legacy BIOS Fixes
This section shows the UEFI/Legacy BIOS fixes and enhancements for this release.

2.2.2.1 Fixes and Enhancements for UEFI Build 1.4.3.6/Legacy BIOS Build 1.4.3.2
This release provides the following fixes and enhancements.

• Added an HII option in the port discovery protocol settings to support cable attached drives.
• Added support for Drive Last Failure reason status in the HII disk information menu.
• Fixed an issue where failed HBA drives are not shown in HII.
  – **Root cause**: Failed HBA devices are not displayed in HII and driver health messages.
  – **Fix**: Populate and provide available information on failed devices in HII and driver health messages.
  – **Exposure**: All previous versions.
  – **Risk**: Low
• Fixed an issue where the UEFI Self Certification Tests SCT fails for Component name2 protocol.
  – **Root cause**: GetControllerName of Component name2 protocol does not validate input language. SCT fails when incorrect language is provided as input.
  – **Fix**: Supported language validation added for GetControllerName of Component name2 protocol.
  – **Exposure**: All previous versions.
  – **Risk**: Low
• An error was observed while selecting the edit MaxCache logical drive option when the MaxCache logical drive was in degraded mode.
  – **Root cause**: Mismatch in possible options and set value for "Modify Cache Write policy".
  – **Fix**: Updated the config variable with proper values to avoid mismatch against possible options.
  – **Exposure**: All previous versions.
  – **Risk**: Low
• Fixed an issue where the port discovery protocol changes do not provide the status to inform users that a reboot is required.
  – **Root cause**: Port discovery protocol operation status only shows if it is success or failed.
  – **Fix**: Added reboot required message in final status of port discovery protocol settings.
  – **Exposure**: All previous versions.
  – **Risk**: Low
• Fixed an issue where Migrate Logical drive is displaying an error message for RAID 1(Triple) when trying to migrate strip size for the logical drive.
  – **Root cause**: Options eligibility did not consider already set with RAID1(TRIPLE) and RAID10(TRIPLE).
  – **Fix**: Populate options considering whether RAID1(TRIPLE) and RAID10(TRIPLE) are already set along with other possible options.
  – **Exposure**: All previous versions.
  – **Risk**: Low
• Fixed an issue where the UEFI ARCCONF CLI produces an error as an unrecognized command in the EFI shell.
  – **Root cause**: Incorrect header for sense feature page commands leading to wrong feature bit validation treating the ARCCONF CLI feature as not supported.
  – **Fix**: Corrected sense feature page command headers as per specification to obtain correct feature bits for ARCCONF CLI feature.
  – **Exposure**: All previous versions.
  – **Risk**: Low

2.2.3 Driver Fixes
This section shows the driver fixes and enhancements for this release.

2.2.3.1 Windows Driver Fixes
This section shows the Windows driver fixes and enhancements for this release.
2.2.3.1.1 Fixes and Enhancements for Windows Driver Build 1010.6.0.1025

This release provides the following fixes and enhancements.

- Fixed an issue where the OS would possibly fail to boot.
  - Root cause: Driver can fail to load because Writing Administrator Queue Configuration Function Register and then reading register without delay can give erroneous stale status.
  - Fix: Added a 1ms=1000us delay after writing Administrator Queue Configuration Function Register, but before polling begin polling status.
  - Risk: Low

- Fixed an issue where IOBypass multi-column requests incorrectly submitted.
  - Root cause: Driver was incorrectly assuming all 2 drive RAID 1 writes are single-column and incorrectly allowing request to be submitted via IOBypass, thus causing controller to fail the IOBypass request. The driver was not checking any write request transfers sizes to see if it was a multi-column write. Thus the request was incorrectly submitted via IOBypass.
  - Fix: Fixed driver logic to always check all request transfers sizes to see if they qualify as a Single-Column write and if not, reject the requests as candidates for IOBypass. The 1 MB Sequential Write to 2 drive - 128K strip RAID 1 volume is now rejected as a candidate for IOBypass and thus submitted via RAID path.
  - Risk: Low

2.2.3.2 Linux Driver Fixes

This section shows the Linux driver fixes and enhancements for this release.

2.2.3.2.1 Fixes and Enhancements for Linux Driver Build 2.1.12-055

This release provides the following fixes and enhancements.

- Fixed an issue where duplicate device nodes for Ultrium tape drive and medium changer are being created.
  - Root cause: The Ultrium tape drive is a multi-LUN SCSI target. It presents a LUN for the tape drive and a 2nd LUN for the medium changer. Our controller firmware lists both LUNs in the RPL results. As a result, the smartpqi driver exposes both devices to the OS. Then the OS does its normal device discovery via the SCSI REPORT LUNS command, which causes it to re-discover both devices a 2nd time, which results in the duplicate device nodes. This broken behavior was masked by an earlier smartpqi bug that caused the OS to skip its device discover for this type of device. This masking bug was fixed by a recent change to smartpqi to report more accurate information about SAS initiator port protocols and target port protocols.
  - Fix: When the OS re-discovers the two LUNs for the tape drive and medium changer, the driver recognizes that they have already been reported and blocks the OS from adding them a second time.
  - Risk: Low

- Fixed an issue where in some situations when the driver takes the controller offline, a kernel crash can occur.
  - Root cause: While taking controller offline, it is possible for the driver to fail IOs which have already been completed by the OS, causing a kernel crash.
  - Fix: If the device has been marked offline by the OS, do not fail IOs pertaining to that device because IOs may have been previously completed.
  - Risk: Low

- Fixed an issue where the OS boot could fail during logical volume rebuild.
  - Root cause: The driver was reading a controller register too soon after writing to that register.
  - Fix: Moved the delay in the register polling loop to the beginning of the loop to ensure there is always a delay between writing the register and reading it.
  - Risk: Low

- Fixed an issue with device removal using syfs.
  - Root cause: Defining slave_destroy causes SML to call into our slave_destroy to remove the device from SCSI table. Our slave_destroy is not complete.
  - Fix: Remove slave_destroy.
  - Risk: Low

- Fixed an issue where request_irq failed during system hibernation.
  - Root cause: The first argument irq in "request_irq" is not correct.
  - Fix: If the interrupt mode is being set to INTx, use PCI device's "irq" as first parameter to request_irq().
- **Risk:** Low
- **Fixed an issue where during system hibernation, driver frees all the irqs, disables MSix interrupts and requests legacy INTx interrupt. When driver invokes request_irq(), OS returns—EINVAL. For example, smartpqi 0000:b3:00:0: irq 191 init failed with error -22 genirq: Flags mismatch irq 34. 00000080 (SmartPQI) vs. 00000000 (i40e-0000:1a:00.0:misc).
  - **Root cause:** The first argument irq in request_irq is not correct
  - **Fix:** If the Interrupt mode is being set to INTx, use PCI device's irq as first parameter to request_irq().
  - **Risk:** Low

- **Root cause:** During boot-up, some OSes appear to hang when there are one or more disks undergoing sanitize. According to SCSI SBC4 specification section 4.11.2 Commands allowed during sanitize, some SCSI commands are permitted, but read/write operations are not. When the OS attempts to read the disk partition table a CHECK CONDITION ASC 0x04 ASCQ 0x1b is returned which causes the OS to retry the read until sanitize has completed. This can take hours.
  - **Fix:** Add in a Test Unit Ready to HBA disks and do not present them to the OS if 0x02/0x04/0x1b (sanitize in progress) is returned.
  - **Risk:** Low

- **Fixed an issue where during system hibernation, driver frees all the irqs, disables MSix interrupts and requests legacy INTx interrupt. When driver invokes request_irq(), OS returns—EINVAL. For example, smartpqi 0000:b3:00:0: irq 191 init failed with error -22 genirq: Flags mismatch irq 34. 00000080 (SmartPQI) vs. 00000000 (i40e-0000:1a:00.0:misc).
  - **Root cause:** The first argument irq in request_irq is not correct
  - **Fix:** If the Interrupt mode is being set to INTx, use PCI device's irq as first parameter to request_irq().
  - **Risk:** Low

- **Due to a change in the SCSI mid-layer, some Linux distributions may take a long time to come up if the system is rebooted while a hard disk(s) is being sanitized. This has been observed on RHEL 7.9/RHEL8.3 and SLES 15SP2.
  - **Root cause:** During boot-up, some OSes appear to hang when there are one or more disks undergoing sanitize. According to SCSI SBC4 specification section 4.11.2 Commands allowed during sanitize, some SCSI commands are permitted, but read/write operations are not. When the OS attempts to read the disk partition table a CHECK CONDITION ASC 0x04 ASCQ 0x1b is returned which causes the OS to retry the read until sanitize has completed. This can take hours.
  - **Fix:** Add in a Test Unit Ready to HBA disks and do not present them to the OS if 0x02/0x04/0x1b (sanitize in progress) is returned.
  - **Risk:** Low

- **Fixed an issue with request leakage, performance drop, and system crash.
  - **Root cause:** The issue happens in a max configuration where heavy I/O load is exercised with occasional LUN resets on the exposed devices. While failing queued IOs in the TMF path, there was a request leak and hence stale entries in request pool with reference count being non-zero. In the shutdown path, there is a BUG_ON to catch stuck I/O either in the firmware or in the driver. The unfreed stale request caused system crash. If the above situation keeps occurring then the I/O request pool keeps leaking and there could be a significant performance drop.
  - **Fix:** The driver now frees the leaked request properly in the TMF path while failing outstanding requests.
  - **Risk:** Low

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  - **Fix:** The driver now frees the leaked request properly in the TMF path while failing outstanding requests.
  - **Risk:** Low

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  - **Fix:** The driver now frees the leaked request properly in the TMF path while failing outstanding requests.
  - **Risk:** Low

- **Fixed an issue with SG element alignment only for tri-mode controllers.
  - **Root cause:** NVMe requires four byte alignment attribute in DMA engine settings.
  - **Fix:** For tri-mode controllers, use a customized dma engine with 4-byte DMA SG alignment parameter set.
  - **Risk:** Medium

- **Fixed an issue with SG element alignment only for tri-mode controllers.
  - **Root cause:** NVMe requires four byte alignment attribute in DMA engine settings.
  - **Fix:** For tri-mode controllers, use a customized dma engine with 4-byte DMA SG alignment parameter set.
  - **Risk:** Medium

- **Fixed an issue where OS boot may fail during logical volume rebuild.**

### 2.2.3 VMware Driver Fixes

This section shows the VMware driver fixes and enhancements for this release.

#### 2.2.3.1 Fixes and Enhancements for VMware Driver Build 4150.0.119

This release provides the following fixes and enhancements.

- Added support for the new extended formats in the data returned from the Report Physical LUNs command for controllers that support this feature. The new formats allow the reporting of 16-byte WWIDs.
- New IOBypass abort type TMF IU type required (0x20). Replaces old IU type for IOBypass aborts (0x16).
- Fixed an issue where PSOD was observed while running MBT tool.
  - **Root cause:** During attach(), driver saves private structure pointer for each adapter in a global array. Index to the array was never decremented during unload. This resulted in out of bound access of array and leads to PSOD.
  - **Fix:** Clear the private structure pointer during driver detach().
  - **Risk:** Medium
- Fixed an issue with SG element alignment only for tri-mode controllers.
  - **Root cause:** NVMe requires four byte alignment attribute in DMA engine settings.
  - **Fix:** For tri-mode controllers, use a customized dma engine with 4-byte DMA SG alignment parameter set.
  - **Risk:** Medium
- Fixed an issue where OS boot may fail during logical volume rebuild.
- **Root cause**: Driver reads a controller register too soon after writing the register during setup of admin queues in init process.
- **Fix**: Introduce a delay after creating the admin queue pair, before attempting to read the register again for status.
- **Risk**: Low

- Fixed an issue with task abort timeout for NVMe target.
  - **Root cause**: Current firmware posts IOBypass task abort TMF response for NVMe device in PQI_RESPONSE_IU_AIO_PATH_IO_SUCCESS IU and driver does not have a TMF response handler for that. TMF is then processed like a SCSI IO completion and the absence of SCSI command pointer in the TMF request structure results in logging a double completion.
  - **Fix**: Added success callback for IOBypass TMF.
  - **Risk**: Low

- Fixed an issue to avoid failing IOs for devices which are not online.
  - **Root cause**: While taking controller offline, it is possible for the driver to fail IOs which have already been completed by the OS, causing a kernel crash.
  - **Fix**: If the device has been marked offline by the OS, do not fail IOs pertaining to that device since IOs may have been previously completed.
  - **Risk**: Low

- Fixed an issue with an unsafe device quiesce process.
  - **Root cause**: An OS API for synchronizing and flushing interrupts was not being called.
  - **Fix**: Add call to the OS API for flushing any pending interrupts.
  - **Risk**: Low

- Fixed an issue with ESXi PSOD in Smartpqi TMF handler.
  - **Root cause**: During "virtual reset" TMF, driver iterates through IO structures and will issue aborts for all pending IOs. While framing an abort request, the driver uses the device structure pointer from the IO structure. If IO associated with the IO structure completes in parallel, the device structure pointer might reset to NULL, which will result in a page fault.
  - **Fix**: Use device structure pointer given by the OS TMF handler.
  - **Risk**: Low

- Fixed an issue with ESXi PSOD due to page fault.
  - **Root cause**: An inquiry command to one of the drives is timing out and the OS issues a TMF abort. During TMF completion, the driver will print the TMF status. Internally, this uses the driver private structure which was not set when framing the TMF request.
  - **Fix**: Set driver private structure pointer when framing TMF request.
  - **Risk**: Low

- Fixed an issue with ESXi PSOD due to Heartbeat NMI.
  - **Root cause**: Driver acquires a lock to get a slot on the inbound queue. All cores might end up in using the same inbound queue if the number of SCSI completion worlds are less than the number of cores. In most cases, the number of SCSI completion worlds are the same as number of sockets and most servers have 1 to 2 sockets. This might cause lock congestion as many threads will be trying to acquire the same lock. Driver uses a custom lock that does a tight busy wait if the lock is not available. This will cause the IO submission thread to hold the CPU core and the ESXi heartbeat thread might not get a chance to run for a long time. This will result in ESXi issuing an NMI and PSOD the server.
  - **Fix**: Use the spinlock in submission path.
  - **Risk**: High

- Fixed an issue where devices showed as RAID0 in display info.
  - **Root cause**: There is no check for physical devices or controllers before printing display info.
  - **Fix**: Modify the messaging so that it prints differently based on physical devices and controllers to identify them accordingly.
  - **Risk**: Low

- Fixed an issue where the system hangs during driver load.
  - **Root cause**: Driver uses an infinite timeout for sending internal commands related to event configuration during driver init stage.
• **Fix**: Added timeout for sending internal commands related to event configuration during driver init stage.
  
  • **Risk**: Low

  • **Fixed an issue with ESXi 7.0 u2 PSOD while booting.**
    
    **Root cause**: Smartpqi driver creates maximum of 64 outbound queues. Queues are created based on number of cores/scsi completion worlds and MSIX availability. At max, driver will create 64 queues and 64 handlers should be registered. Driver handler data array size was 63 instead of 64 and resulting in PSOD.
    
    **Fix**: Corrected the handler data array size.
    
    • **Risk**: Low

• **Fixed an issue with PSOD in build_scsi_cmd_raidbypass while toggling IOBypass.**
  
  **Root cause**: Device's raid map pointer is null for a short time while disabling the IOBypass.
  
  **Fix**: Check for NULL raid map and return PQI_STATUS_FAILURE if a null is found, redirecting the request to RAID path.
  
  • **Risk**: Low

• **Fixed an issue where abort messages would flood logs during device reset tests.**
  
  **Root cause**: All IO requests pending to a device will be aborted by an incoming device reset request. For devices capable of high queue depths, this could be tens or hundreds of individual abort requests, per device reset.
  
  **Fix**: Change logging level for this type of message from WARN to INFO, so that it is only printed when someone purposefully changes the driver's logging level to do debug or analysis.
  
  • **Risk**: Low

• **Fixed an issue with excessive logging during device resets.**
  
  **Root cause**: When resets are executing, incoming IO requests are blocked and returned with status DEVICE BUSY. A message is printed to warn that the device is undergoing a reset. When many device resets are occurring, such as during reset certification testing, this generates a large volume of logging activity and can cause logs to be frequently archived.
  
  **Fix**: Change this message to be logged only when logging level is specifically changed to a level at or above INFO (0x6). The messages were set to log at or above WARN (0x2), and driver logging level is NOTE (0x3) by default.
  
  • **Risk**: Low

• **Fixed an issue with PSOD during driver unload.**
  
  **Root cause**: Smartpqi driver maintains a linked list of hot-removed devices. Whenever a new device is present, driver checks whether that device is already present in the remove_device_list, and if it is present, driver moves that device from remove_device_list to actual device list. Entries in the remove_device_list will be reviewed in fixed time interval and list will be updated by removing device which has been in that list for more than 20 minutes (to handle vSAN hotplug test). During driver unload, driver checks for any devices present in the list and does the cleanup (free the device memory). PSOD stack trace indicates an invalid device memory freeing during this cleanup.
  
  **Fix**: Remove entry from the device list whenever the device memory is freed up.
  
  • **Risk**: Medium

• **Fixed an issue to remove erroneous status messages.**
  
  **Root cause**: Status message is reporting iu_type instead of status.
  
  **Fix**: Remove status field from messaging.
  
  • **Risk**: Low

• **Fixed an issue with PSOD when sending IOBypass Task Management Function.**
  
  **Root cause**: Code to use new IOBypass abort task IU referred to device pointer of abort request rather than dev pointer of request that is being aborted, to check for RAID type.
  
  **Fix**: Replace pointer with aborted request's dev pointer.
  
  • **Risk**: Low

• **Fixed an issue with Raid 10(Triple) messaging.**
  
  **Root cause**: Mistype.
  
  **Fix**: Fixed case and messaging.
  
  • **Risk**: Low
• Corrected queue depth setting for physical device.
  – Root cause: Driver gets the queue depth value from firmware for each target. If firmware does not give
    a valid queue depth value for a target, driver is sets queue depth to a default value (1014 for LD, 27 for
    PD). But for all physical devices, current driver resets the queue depth to maximum queue depth (1014)
    irrespective of whether firmware gave a valid QD or not.
  – Fix: Add proper check while setting the device queue depth.
  – Risk: Low
• Fixed an issue where the driver produces too much debug logging.
  – Root cause: Driver's default logging level was set very high during development phase, and was never
    readjusted for production use.
  – Fix: Change default log level back to normal default level, 3. Adjust logging level of some functions as
    needed.
  – Risk: Low
• Fixed an issue where logical disks are not exposed to OS.
  – Root cause: Controller and second logical disk have same Target and LUN numbers (T:0 L:1) with same
    bus number, creating inconsistent behaviour. Target and LUN number must be unique. PQI driver is not
    creating/registering individual bus ids for Logical and Physical volumes at driver initialization time.
  – Fix: Start logical device enumeration from T:L=0:1 and controller enumeration from T:L=0:0.
  – Risk: Medium
• Fixed an issue where IOBypass performance counters are too verbose.
  – Root cause: Messages were originally intended to be controlled via dynamic switch, so that they may be
    visible only when needed during performance analysis or debugging.
  – Fix: Print these messages only when a certain controller flag is changed from disabled to enabled. Add a
    module parameter to allow changing the state of the controller flag.
  – Risk: Low
• Fixed an issue with verbose logging from error handlers.
  – Root cause: Debug messages used in driver's error handling functions are being printed at “normal” system
    logging level.
  – Fix: Use recently-added controller flag and compile-time option to turn off the unwanted messaging.
  – Risk: Low
• Fixed an issue with PSOD while printing DMA memory tag.
  – Root cause: Driver uses tag (a string) to identify the DMA memory and it was maintained by using a char
    pointer. This tag is assigned while allocating the DMA memory. In some places, tag was defined as local
    char array and driver was maintaining pointer to that. During driver unload, when driver tries to print the tag,
    that resulted in page fault as tag memory was local to allocation function.
  – Fix: Maintain tag using char array instead of keeping tag address.
  – Risk: Low

2.2.3.4 FreeBSD/Solaris Driver Fixes
This section shows the FreeBSD/Solaris driver fixes and enhancements for this release.

2.2.3.4.1 Fixes and Enhancements for FreeBSD Driver Build 4130.0.1008
This release provides the following fixes and enhancements.

• Fixed an issue when drives are added/removed/offline, HBA devices, and controllers are displayed as a default
  RAID 0 value.
  – Root cause: There is no check for physical devices or controllers before printing display info.
  – Fix: Modify the messaging so that it prints differently based on physical devices and controllers to identify
    them accordingly.
  – Risk: Low
• Fixed an issue where uninitialized CCB structure causes undefined behavior when it is shared with the CAM
  layer.
  – Root cause: CCB is being used without clearing stack values.
  – Fix: Clear CCB before it is used.
2.2.3.4.2 Fixes and Enhancements for Solaris Driver Build 4120.0.1005
This release provides the following fixes and enhancements.

- Fixed an issue when drives are added/removed/offline, HBA devices, and controllers are displayed as a default RAID 0 value.
  - Root cause: There is no check for physical devices or controllers before printing display info.
  - Fix: Modify the messaging so that it prints differently based on physical devices and controllers to identify them accordingly.
  - Risk: Low

2.2.4 Management Software Fixes
This section shows the management software fixes and enhancements for this release.

2.2.4.1 maxView Storage Manager/ARCCONF Fixes
This section shows the maxView Storage Manager/ARCCONF fixes and enhancements for this release.

2.2.4.1.1 Fixes and Enhancements for maxView Storage Manager/ARCCONF Version 2.0.0 Build 24308
This release provides the following fixes and enhancements.

- RAID level name changed from 'RAID1 ADM' to 'RAID1 Triple' in maxView/ARCCONF.

- Support to add firmware event log buffer as part of "Savesupportarchive".

- Support for controller to report failed physical devices in the configuration.

- Fixed an issue where remote ARCCONF has OpenSSL security vulnerabilities.
  - Root cause: Remote ARCCONF uses older version of open source library OpenSSL which had security vulnerabilities.
  - Fix: Added changes to Remote ARCCONF by adding the latest version of OpenSSL library that had addressed the security vulnerabilities.
  - Risk: Low

- Fixed an issue where maxView does not display the configuration properly when a physical device has a model name with quotation marks ['"] in it.
  - Root cause: Having quotation marks ['"] in the physical device model name has corrupted the JSON format of the configuration making maxView unable to display it properly.
  - Fix: Added changes to JSON configuration creation to address characters such as ['.]
  - Risk: Low

- Fixed an issue in maxView to move the array using combination of unassigned and array member devices.
  - Root cause: maxView was listing only the unassigned physical device for move array operation using the same drive type
  - Fix: Added changes to list with all the unassigned physical devices along with array members for the move array operation.
  - Risk: Low

- Fixed an issue in maxView where move logical device option is disabled when trying to move from SATA to SATA SSD device type.
  - Root cause: Move logical device operation in maxView is blocked for non-SSD logical device to devices of type SSD.
  - Fix: Added changes to support both SSD and non-SSD devices during move logical device operation in maxView
  - Risk: Low
2.3 Limitations
This section shows the limitations for this release.

2.3.1 Firmware Limitations
This section shows the firmware limitations for this release.

2.3.1.1 Limitations for Firmware Release 3.01.04.072
This release includes the following limitations.
- This release includes support for B17A NAND devices. Firmware will actively prevent a firmware downgrade on a board with B17A NAND to firmware versions prior to v3.01.02.42 (SR 3.1.2 RC3).

2.3.2 UEFI/Legacy BIOS Limitations
This section shows the UEFI/Legacy BIOS limitations for this release.

2.3.2.1 Limitations for UEFI Build 1.4.3.6/Legacy BIOS Build 1.4.3.2
There are no known limitations for this release.

2.3.3 Driver Limitations
This section shows the driver limitations for this release.

2.3.3.1 Windows Driver Limitations
This section shows the Windows driver limitations for this release.

2.3.3.1.1 Limitations for Windows Driver Build 1010.6.0.1025
There are no known limitations for this release.

2.3.3.2 Linux Driver Limitations
This section shows the Linux driver limitations for this release.

2.3.3.2.1 Limitations for Linux Driver Build 2.1.12-055
This release includes the following limitations.
- On AMD/RHEL 7.9 systems, the system might panic due to a bug in the IOMMU module. For details, refer to https://lore.kernel.org/linux-iommu/20191018093830.GA26328@suse.de/t/
  - Workaround: Disable the IOMMU setting option in BIOS.
- Depending on hardware configurations, the smartpqi expose ld first parameter may not always work consistently.
  - Workaround: None
- Hibernating Linux system using “pm-hibernate” command causes system to hang.
  - Workaround: None

2.3.3.3 VMware Driver Limitations
This section shows VMware driver limitations for this release.

2.3.3.3.1 Limitations for VMware Driver Build 4150.0.119
There are no known limitations for this release.

2.3.3.4 FreeBSD/Solaris Driver Limitations
This section shows FreeBSD/Solaris driver limitations for this release.

2.3.3.4.1 Limitations for FreeBSD Driver Build 4130.0.1008
There are no known limitations for this release.

2.3.3.4.2 Limitations for Solaris Driver Build 4120.0.1005
There are no known limitations for this release.

2.3.4 Management Software Limitations
This section shows management software limitations for this release.
2.3.4.1 maxView Storage Manager/ARCCONF Limitations
This section shows the maxView Storage Manager/ARCCONF limitations for this release.

2.3.4.1.1 Limitations for maxView Storage Manager/ARCCONF Version 2.0.0 Build 24308
There are no known limitations for this release.
3. **Updating the Controller Firmware**
   This section describes how to update the controller firmware to the latest release.

3.1 **Updating Controllers to Latest Firmware**
   If running firmware is 3.01.00.006 or lower, please contact Adaptec Apps team at ask.adaptec.com.

3.1.1 **Upgrading to 3.01.04.072 Firmware**
   1. For controllers running 3.01.02.042 or higher firmware, flash with 3.01.04.072 version of firmware "SmartFWx200.bin" provided in this package using maxview or ARCCONF utility.
   2. Power cycle the server.
4. Revision History

Table 4-1. Revision History

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<th>Date</th>
<th>Description</th>
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<td>B</td>
<td>08/2021</td>
<td>Updated for SR 3.1.4 release.</td>
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<tr>
<td>A</td>
<td>06/2021</td>
<td>Document created.</td>
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