TCG Storage Workgroup Status Update

SWG Update

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Agenda

- Introduction
- Learning Objectives
- Status Update
  - Various standards documents
- Upcoming plans
- Other sessions

Introduction

- We represent the TCG (Trusted Computing Group)
  - TCG Covers many things security
  - Trustedcomputinggroup.org
- Storage Work Group
  - Focuses on security features specific to storage devices and solutions
  - Data at rest security specifications (SSCs)
    - Security Subsystem Classes
    - Enterprise, Opal, Ruby, Pyrite
  - Storage Interface Interactions Specification (SIIS)
  - Feature sets, supplementals to SSCs
    - CNL, CNL SUM, Configurable PINs, Block SID, etc.

Learning Objectives

- Get an overview of the current activities w.r.t. standards
- Get a preview of upcoming standards activities
- Security trends in storage
- Help plan for your security features and capabilities
  - For your organization's products and solutions
- Welcome your participation and input

Core, SSC, and SIIS Specification

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1. Core and SSCs
    a. Enterprise SSC
    b. Opal 2.02
    c. Pyrite 2.0
    d. Ruby
    e. Key Per I/O
2. SIIS
    a. SIIS 1.10
    b. SIIS 1.11

Status of SSCs

- Core spec – Last updated in 2015
  - No outstanding items being tracked
- Enterprise – Last updated in 2015
  - No outstanding items being tracked
- Opal SSC – 2.02 – just completed public review
  - Main changes from previous version (2.01, released 2015)
  - Changes to LockOnReset, DoneOnReset
    - Allows for hardware reset, in addition to power cycle and programmatic resets
  - Changes – reporting estimated time for data removal mechanisms
    - GenKey, Revert, RevertSP
  - Manufactured-Inactive state is mandatory
  - Block SID support is mandatory
  - Various clean up and updates based on TC comments
- Ruby
  - Published in Jan, 2020
  - No outstanding items being tracked for this SSC
- Pyrite
  - Updated in May, 2020
  - No outstanding items being tracked for this SSC

Under Development

- Key Per I/O
  - Key insertion and management per I/O request
  - Specification under development
  - Please attend/listen to the Key Per I/O focused session for more details

SIIS Updates

- SIIS 1.10 – completed public review
  - Previous version SIIS 1.09 – released in Dec 2020
  - Main changes – touching upon various commands and details
    - A newly defined SIIS feature descriptor – main point is a flag to define write pointer behavior related to zoned namespace commands
    - NVMe MI – subsystem reset
    - NVMe Namespace Write Protection – if an NS is write protected, TCG methods will fail
    - NVMe Compare and Verify commands – will fail if the LBA range is readlocked
    - NVMe Copy command – will fail if the source is read locked and/or the destination is write locked
- SIIS 1.11
  - Some considerations (not final or plan of record)
    - NVDIMM-N
    - Sanitize and Format NVM clean up
    - Interactions with firmware update
    - Reservations
    - Other items as they are brought up

Features and Test

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1. Features
    a. Block SID Authentication
    b. CNL
    c. CNL App Notes
    d. CNL/LUN
    e. CNL and SUM
    f. Shadow MBR for Multiple Namespaces
    g. Configurable PIN Length
2. Test
    a. Test Cases
    b. Test Suite
    c. Certification

Block SID Authentication Updates

- Block SID Authentication v1.00 r1.00 was published in August 2015
- Block SID Authentication v1.01 r1.00 was published in Feb 2021
  - Added Locking SP Freeze Lock Support and State
  - Added new life cycle state called “Manufactured-Frozen”
  - Defined the interaction of Manufactured and Manufactured-Frozen states
- Allow the Locking SP to be frozen to prevent malicious software attack

Configurable Namespace Locking Feature Set Updates

- Configurable Namespace Locking (CNL) v1.00 r1.00 published in Feb 2019
  - Define the initial operation for the CNL, Assign and Deassign and Set methods
  - Define Namespace Global Range Locking Object and Namespace Non-Global Range Locking Object
- CNL Application Note v1.00 r1.00 published in Jan 2020
  - Show CNL examples and use cases
- Configurable Locking for NVMe Namespaces and SCSI LUNs v1.01 r1.00 recently published
  - Added Configurable Locking support for the SCSI LUNs in addition to the NVMe Namespaces
- Configurable Locking for NVMe Namespaces and SCSI LUNs v1.02 r1.xx under internal review
  - Added support for the Single User Mode (SUM) SUM_C and AssignToSUMRange

Configurable Locking for NVMe Namespaces and SCSI LUNs

- NVMe Namespaces
  - Assign/Deassign and Set methods

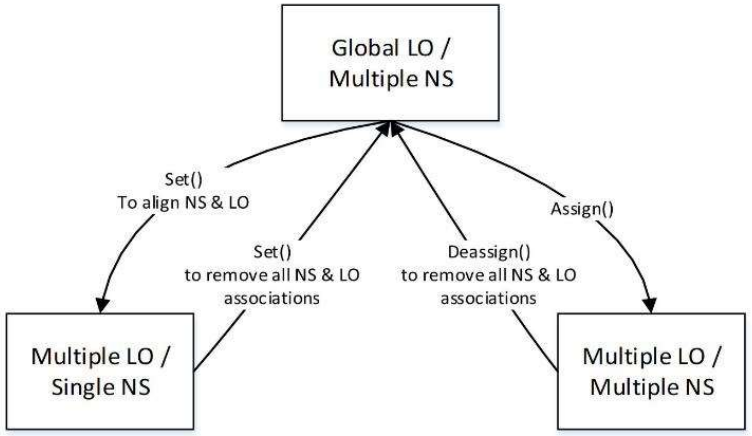


Figure 1 - Locking SP Modes (NVMe)

- SCSI LUNs
  - Assign/Deassign method

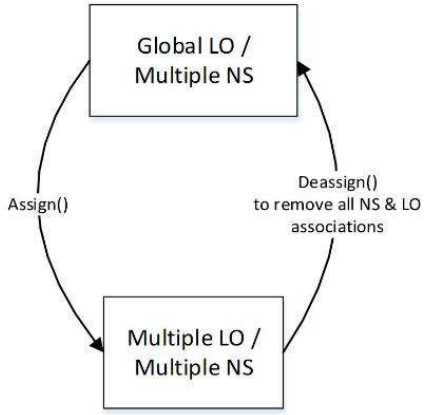


Figure 2 - Locking SP Modes (SCSI)

Configurable Locking Objects

- Global Range Locking object
  - Any namespace or LUN that is not associated with below
- Namespace Global Range Locking object
  - First Locking object to be associated with a Namespace/LUN
- Namespace Non-Global Range Locking object
  - Locking object associated with an LBA range within a namespace/LUN

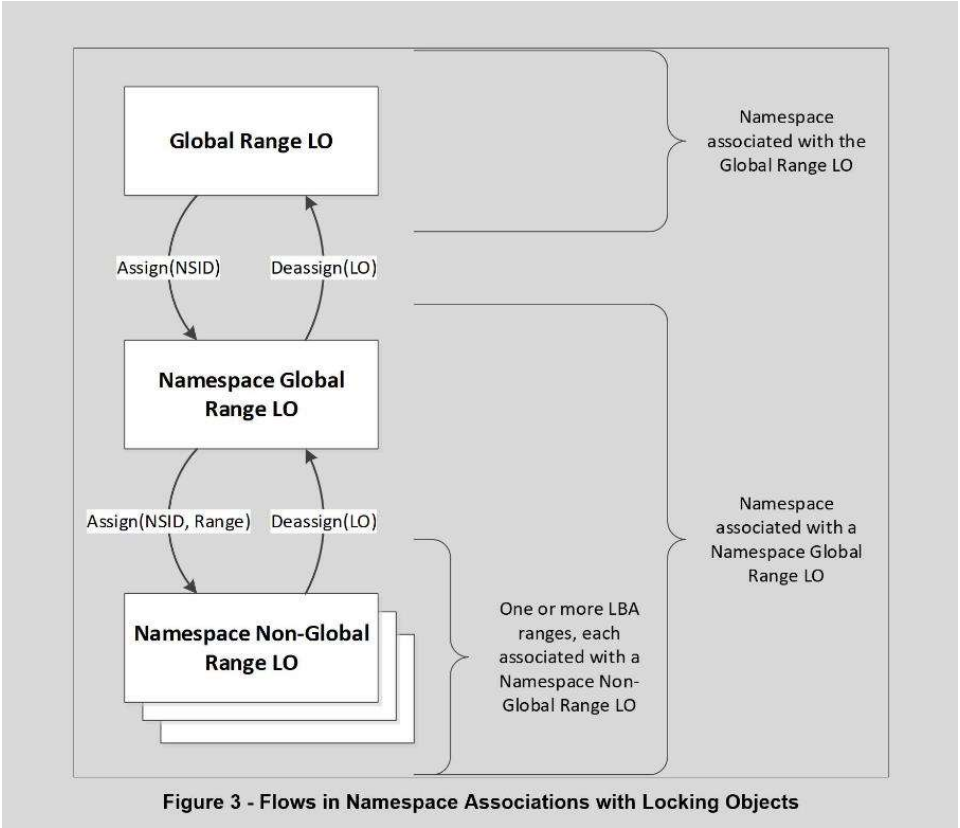
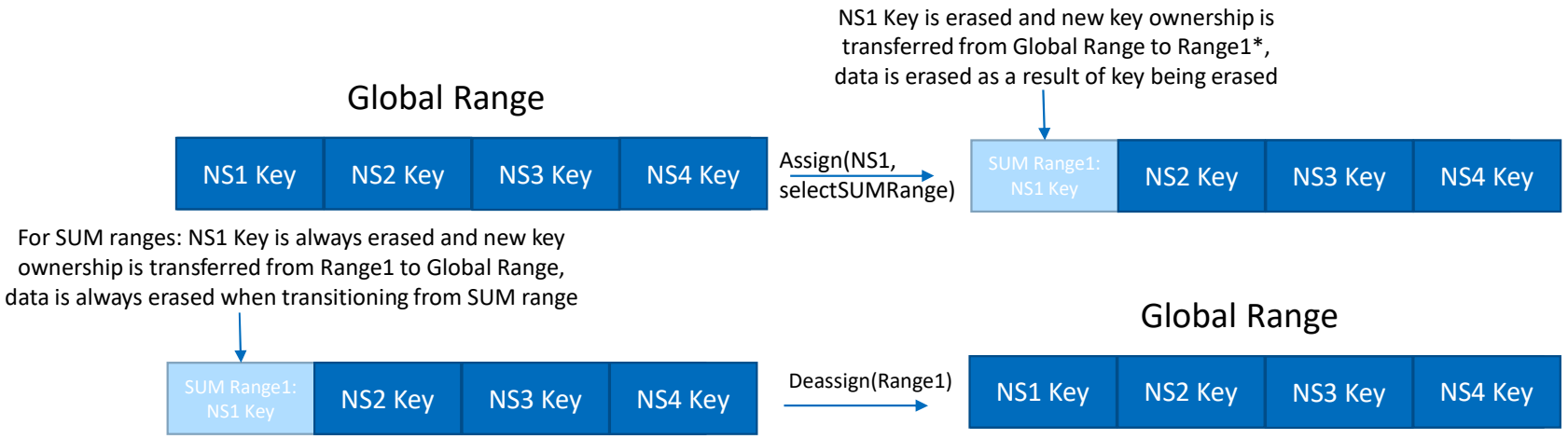


Figure 3 - Flows in Namespace Associations with Locking Objects

SUM & CNL Proposal in v1.02

- Add parameter to Assign to indicate caller wants to associate Namespace with an available SUM range
- Mandate:
  - Assign to SUM Range results in erase of data
  - Deassign from SUM Range results in erase of data
    - KeepNamespaceGlobalRangeKey = True results in failure of Deassign method



Shadow MBR for Multiple Namespace Updates

- Shadow MBR for Multiple Namspaces v1.00 r1.21 published on Oct 2020
- Defines rules for the MBRControl.NSID
  - Default value of MBRControl.NSID shall be 0x0000_0000 or 0xFFFF_FFFF, or existing namespace.
  - When MBRControl.NSID is equal to 0xFFFF_FFFF, the MBR and MBRControl tables in the Locking SP are shared by all namespaces and controllers within the NVM subsystem.
  - When MBRControl.NSID is equal to existing namespace, the MBR and MBRControl tables in the Locking SP are assigned to only the existing namespace; meaning MBR shadowing are applied to single namespace
- Rules of MBRControl.NSID
  - Set method for MBRControl.NSID of non-existing namespace except 0x0000_0000 shall fail
  - Support of Set method for MBRControl.NSID of 0xFFFF_FFFF is optional.
  - If MBRControl.NSID is equal to 0x0000_0000, Set method for MBRControl.Enable of TRUE shall fail
  - If MBRControl.Enable is equal to TRUE, Set method for MBRControl.NSID of non-existing Namespace including 0x0000_0000 shall fail

Other SWG Features Updates

- C_PIN Enhancements Feature (optional feature)
  - Configurable C_PIN TryLImit per Authority
  - Configurable C_PIN Persistence per Authority
  - Min and Max PIN length
- C_PIN Forced PIN Change (optional feature)
  - When enabled, requires the Authority PIN change before the authentication
  - Forced PIN change by allowing only Set method on the PIN column and Random method

Test and Certification Updates

- TCG Storage Workgroup Certification Program
  - TCG Storage Opal Family Test Cases Specification was published in April 2019
    - Test specification covers Opal family product such as Opal, Pyrite, and Ruby SSC
  - Certification Program version 2.0 was published in August 2020
    - Require completion of Compliance Test and Security Evaluation
    - Certification for TCG members
- Test Suites and Test Houses
  - Test Suites and Test Houses were approved in Nov 2020
    - Opal SSC Test Suite 4.0 is the approved Test Suite
    - ULINK is the approved Test House
- Storage Certified Products
  - The storage certified products were published on the TCG webpage

Other Sessions

- Please join the TCG SWG Key Per I/O presentation for the latest development status of the specification

