



Education

# **SMI-S: Building the Case for a Standard**

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## ➤ SMI-S: Building the Case for a Standard

- ◆ This tutorial describes how the SMI-S standard benefits four primary players in storage management solutions – end users, vendors of storage products, application (such as SRM) vendors, and integrators. Standards-based solutions help end-users avoid vendor lock-in, provide choices in storage management applications, and eliminating the cost of vendor-specific agent infrastructures. Vendors of storage products benefit by gaining application support with little or no vendor-specific development costs. Application vendors and integrators benefit by gaining storage support with little or no vendor-specific development costs. This tutorial also looks at innovative solutions that can exploit a standards-based infrastructure such as SMI-S – for example, Management Frameworks.
- ◆ This tutorial also talks about the past and future evolution of SMI-S; how the standard started by providing basic storage networking management tasks, adding more functionality and increasing the scope to meet the requirements of end-users and storage vendors, and plans for the future.

# Overview

- Qualities of a “good” standard?
  - ◆ Examples of good and not-so-good standards
- How this applies to SMI-S
  - ◆ How SMI-S measures up to these qualities
  - ◆ How SMI-S stakeholders benefit from the standard
  - ◆ How the evolution of SMI-S increases the benefits



**Check out SNIA Tutorial:  
Solving Business-Oriented  
Goals with SMI-S**

# What makes a “good” standard?

- Vendor Neutral
- Well documented
- Sustained, democratic governance
- Completeness, with room for extensibility
- Conformance tests
- No more complex than necessary
- Improves efficiency for stakeholders
- Provides a platform for innovation

# Example of a “good” standard: Intermodal Containerized Shipping

- Created in 1956, has revolutionized shipping
  - ◆ Improved logistics and reduced costs
- Standard sized containers: 20’, 40’ and 45’
- Transportable on ship, rail, truck, etc.
- Arbitrary contents, including modular offices and hospitals
- Standard size helps to optimize design for warehouses, ships, terminal ports, handlers, etc



# Example of a sub-optimal standard: Master Boot Record disk partitions

- De facto standard – allows various PC platforms to coexist as different partitions of disk
- Essential functionality for x86 system bootstrap
- No written specification, no owning organization
  - ◆ Occasional collisions when different stakeholders decide to use same value or area for different purposes
- Limited long-term view
  - ◆ Every couple years, some other limit (32 meg limit, 2 gig limit, 8 gig limit, cylinder related limits, ...) surfaces
  - ◆ In general, tough to use newer disks with older motherboards
  - ◆ Complete dead end at 32-bit block address limit (2 TB)
- Well-designed replacement (GPT) tied to languishing BIOS replacement (EFI)
  - ◆ Over-complexity hampering acceptance

# Informal and Formal standards

## ➤ 'De Facto' Standards

- ◆ Informal – defined by one vendor or organization without standards credibility
- ◆ Often created to solve a short-term problem without necessarily looking at long-term issues
- ◆ Tend to provide limited interoperability
- ◆ Tend to reduce competition

## ➤ 'De Jure' Standards

- ◆ Created/recognized by an authorized body
- ◆ Intended to increase competition and interoperability



# Standards Lifecycle

- Standards that “stick” often start as de facto (informal), then mature into de jure (official) standards
- Initial work serves as prototype – helps work out the kinks
- Stakeholders recognize that industry-wide and open participation strengthens the standard
- Also recognize a need for an organization to oversee evolution of the standard

# Example: Secure Socket Layer

- The “S” (security) in HTTPS
- Originally developed by Netscape for e-commerce,
  - ◆ Publicly shared specification, but not a ‘de jure’ standard
  - ◆ Developed quickly, became obligatory for e-commerce
- At the time, difficult to imagine an internet without Netscape, but some folks wanted more rigor
- Took SSL to IETF to become a de jure standard (RFC)
  - ◆ Renamed as Transport Layer Security (TLS)
  - ◆ Improved documentation
  - ◆ Governance
  - ◆ Vendor Neutral
  - ◆ Innovation – SSL/TLS now integrated into many solutions

# How SMI-S Measures up

- Look at the characteristics of a good standard (completeness, conformance tests, well documented, ...) and see how SMI-S supports the goal
- In particular, look at the benefits to key stakeholders
  - ◆ Storage vendors
  - ◆ Application (e.g., SRM) developers
  - ◆ Integrators
  - ◆ End users

# Vendor Neutral

- SMI-S published as an ANSI (US) and ISO (international) available to any vendor
- SMI-S developed in SNIA Technical Working Groups (TWGs)
  - ◆ TWGs open to any SNIA member
- Conformance tests open to any vendor

# SMI-S Documentation

- Each release first developed as a SNIA specification, selected releases submitted to ANSI, then ISO
- Documentation workload shared by volunteer authors supported by TWGs
- Managing this scope of documentation (SMI-S 1.1 has 1474 pages) has been challenging
  - ◆ Learning from ANSI, ISO, and peers (T10, T11)
  - ◆ SMI-S 1.2 broken into 9 separate books (aligned with topics/TWGs)
  - ◆ Content Author Guide for style, tool usage
  - ◆ Professional editors pull together the entire collection, help with standardization tasks



Building a case for a standard...

# SMI-S Documentation

- With each release, documentation improves
  - ◆ Authors learn more about writing standards
    - › Reading ISO style guide, incorporating suggestions
  - ◆ Addressing comments from ANSI/ISO reviewers
  - ◆ SNIA Review process improving
  - ◆ More reliance on professional editor to clean-up text and formatting
  - ◆ Tool improvements – portion of each profile generated from machine-readable XML files
    - › Verifies that programmable names are valid
    - › Same files used by CTP – help eliminate inadvertant off-by-one differences between spec and tests

# SMI-S Governance

- SNIA defines policies for TWGs and technical architectures (like SMI-S)
  - ◆ IP Policy
  - ◆ Vendor Neutrality
- SMI Technical Steering Group (TSG) oversees SMI TWGs
- Storage Management Initiative (SMI) formed 2006
  - ◆ Formed as SNIA “initiative”
  - ◆ Subsumed SMF and other SMI-S related non-technical entities
  - ◆ SMI Governing Board (and committees)
    - › Schedules, budget, marketing, run plugfests

# SMI-S Completeness, extensibility

- Early versions focused on basics (discovery, minimal provisioning) of commonly deployed SAN devices
  - ◆ Initial goals defined in ‘functionality ladder’ from Bluefin
  - ◆ All documented in SMI-S 1.0
- Later versions filling in gaps
  - ◆ Advanced and newer functionality (e.g., Thin Provisioning)
  - ◆ Optimization (e.g., bulk retrieval of common info from arrays)
  - ◆ Additional devices (e.g., Host Hardware RAID controllers)



# SMI-S Extensibility

- CIM Common Information Model has served well in allowing us to add more devices, functionality
- SMI paving the way for vendor extensions
  - ◆ External to the standard, but format common with standard profiles
  - ◆ Created by vendors, then shared
  - ◆ Serve as incubators for new spec functionality
  - ◆ SMI-S 1.4.0 draft contains rules for keeping extensions compatible with existing profiles

# SMI-S Conformance Tests

- CTP tests created for SMI-S 1.0 and extended with each follow-on release
  - ◆ Infrastructure tests
    - > Independent of storage
    - > Tests interoperability of the transport
  - ◆ Read-only test of information
    - > Are mandatory elements provided?
    - > Formatted as expected?
  - ◆ Active management tests
    - > E.g., Create LUNs or Zones

# Conformance Tests

- Over 500 SMI-S provider and client products have been tested through the Conformance Testing Program (CTP) for SMI-S 1.0/1.1
- CTP provider test development for SMI-S 1.2 wrapping up
  - ◆ Vendor testing starting
  - ◆ Large investment in updates to help “raise the bar” in CTP testing

# No more complex than necessary

- **Cross-references are the mantra for standards like SMI-S**
  - ◆ Build on and refer to other standards rather than re-inventing
  - ◆ SMI-S builds on standards from T10 (SCSI) T11 (FC), T10 (ATA), IETF (iSCSI, networking, security), DMTF (management), and other organizations
    - 39 standards referenced in SMI-S 1.2 Architecture book – these are standards with global relevance to SMI-S
    - Individual books reference other standards
- **The result is that the bulk of SMI-S is about storage management**

# SMI relationship to other standards

## ➤ Peer relationships

- ◆ SMI-S defines management standards for devices with datapath standards defined elsewhere (SCSI, FC, ...)
- ◆ SMI-S emphasizes use of names standardized elsewhere
  - Help end users correlate info from SMI-S and non-SMI-S applications

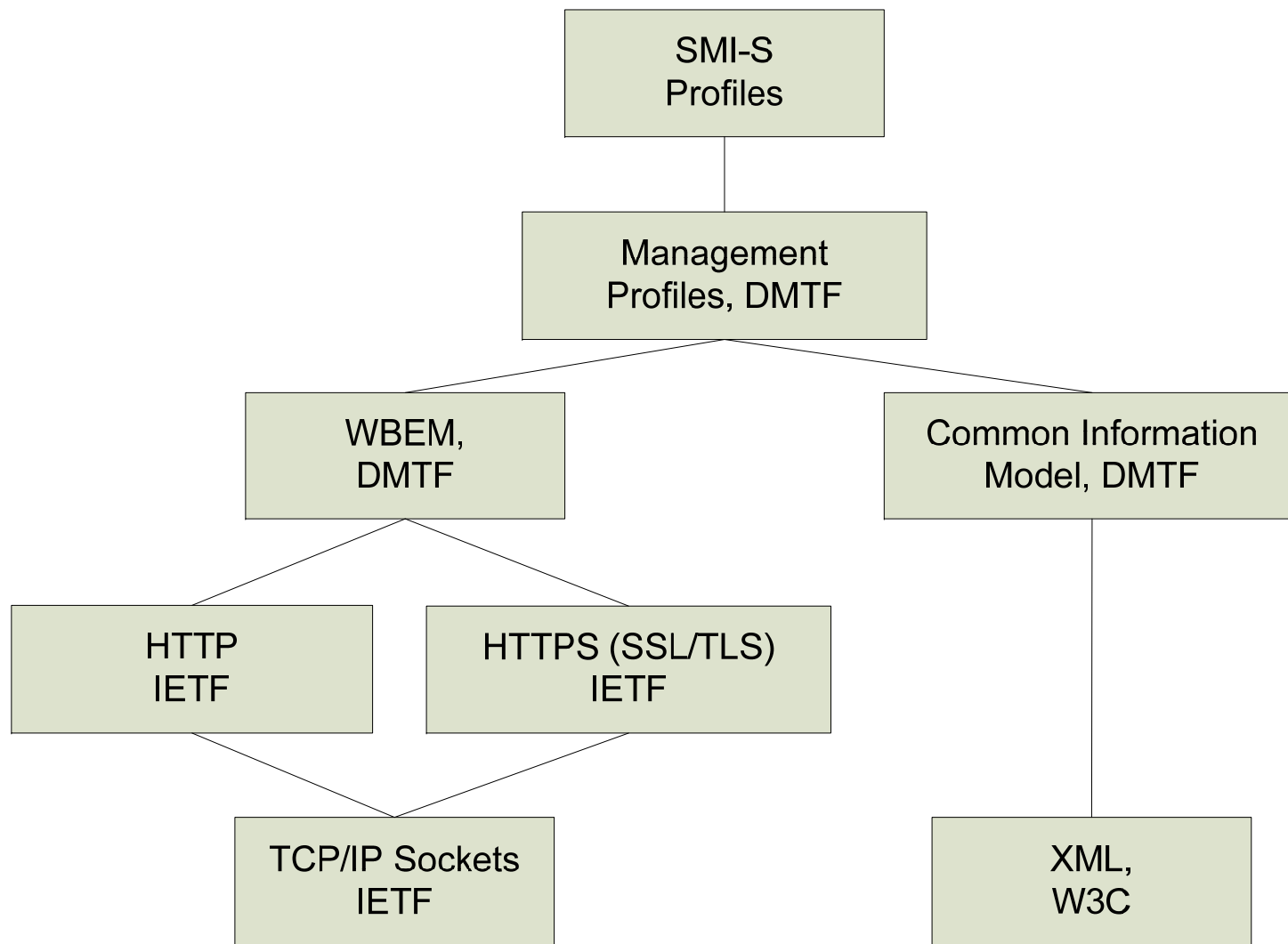
## ➤ Layering - building on standards

- ◆ SMI-S builds on network-facing management standards from DMTF
  - SMI-S focuses on storage
  - SMI-S indirectly builds on network standards from IETF, XML from W3C
  - See next slide
- ◆ SMI-S defines some profiles based on standard APIs (e.g., HBA API)

## ➤ Filling Gaps

- ◆ SMI-S utilizes standards (e.g., SLP) to cover functionality not addressed elsewhere

# SMI-S Building on other standards



# Managing Complexity

- Early SMI-S focused on storage functionality incorporated in the standard
- Recent activities focused on production-readiness
  - ◆ How to install multiple-vendor SMI-S solutions
  - ◆ Trying to avoid adding additional complexity to SMI-S
  - ◆ Finding other vehicles
    - › Provider portal
    - › Best practices papers

# SMI-S efficiency for stakeholders

## ➤ SMI-S benefits to storage vendors

- ◆ Encourages development of third-party storage management applications
  - Offer customers multiple applications
- ◆ Minimize need to develop or maintain in-house management infrastructure

## ➤ SMI-S benefits to application vendors

- ◆ Single infrastructure/transport common to multiple vendors and device types



# SMI-S efficiency for stakeholders

## ➤ SMI-S benefits to integrators

- ◆ Common management platform for many vendors and devices
  - Minimize investment in multiple, proprietary infrastructures
- ◆ Tools, trouble-shooting techniques, ... common to multiple vendors and products

## ➤ SMI-S benefits to end users

- ◆ Minimize vendor lock-in
- ◆ Share benefits to integrators
- ◆ Platform for innovation – future products

# SMI-S: platform for innovation

- SMI-S developed with a goal of enabling innovation
  - ◆ Imagine other standards layered over SMI-S
    - › For example, SNIA Management Frameworks
  - ◆ Exploit commonality across profiles
    - › SMI-S Common Recipes show how an application might compose a SAN-wide topology using results from many SMI-S profiles
  
- Potential for Automation
  - ◆ Recovery when events are reported
  - ◆ Preventative maintenance
    - › Monitor capacity growth and expand a LUN off-hours

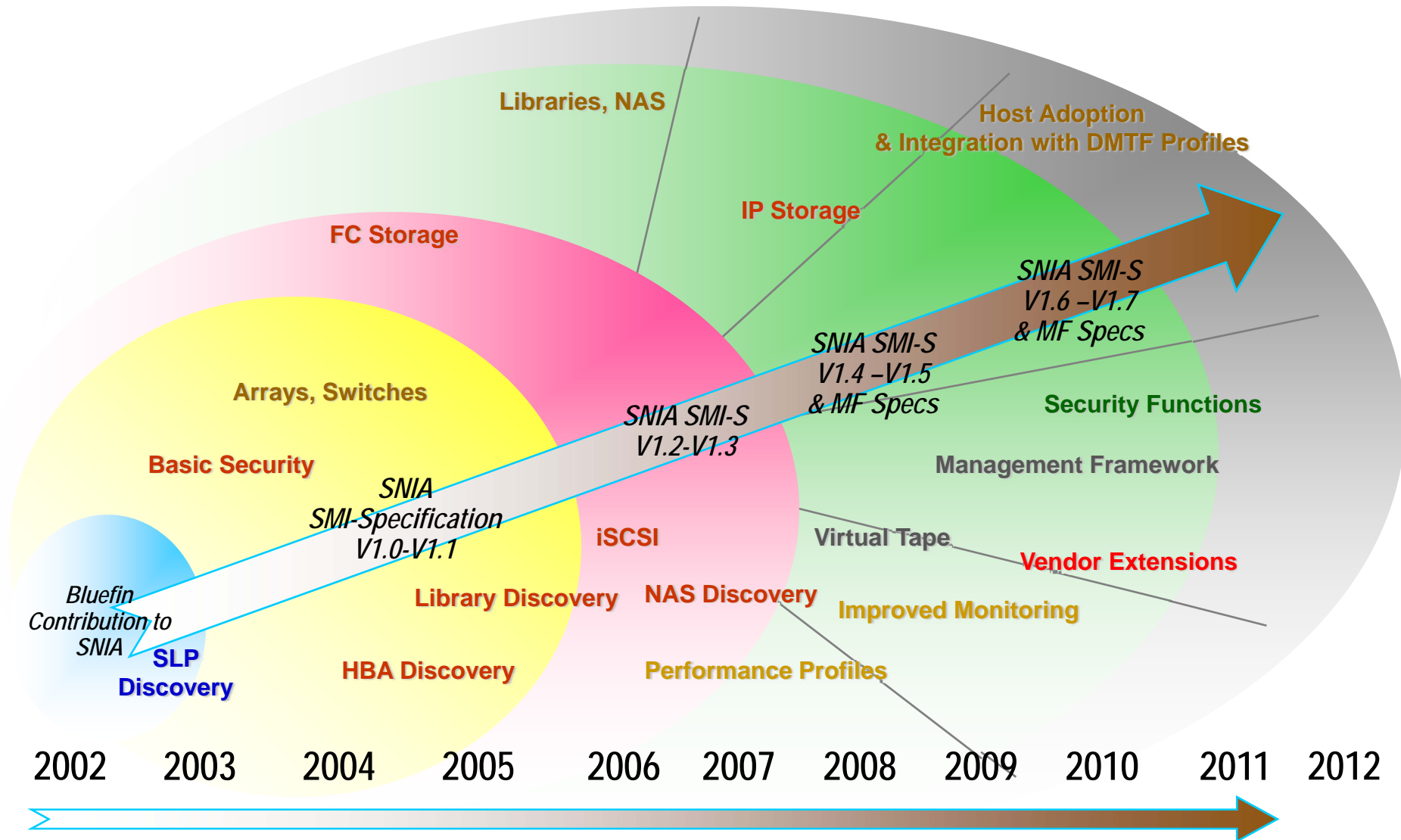
# SMI-S Roadmap

## ➤ Where are we now

- ◆ SMI-S 1.1.1 in ANSI and ISO standardization processes
- ◆ SMI-S 1.2 completed early 2008 – released as SNIA Architecture but not being submitted to ANSI/ISO
- ◆ SMI-S 1.3
  - › CTP testing in progress
- ◆ SMI-S 1.4 and Management Frameworks
  - › Content being developed

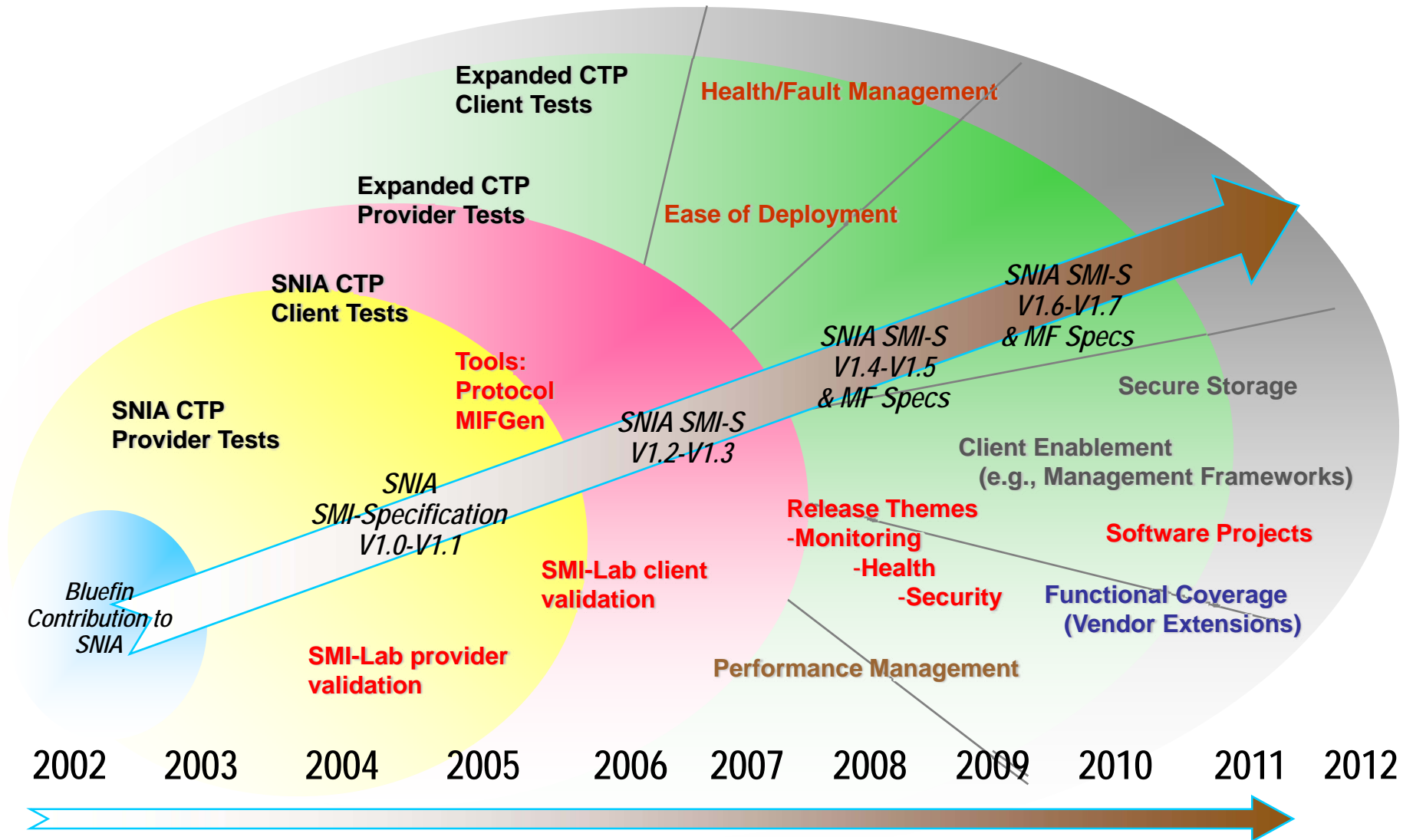
## ➤ The following slides show the SMI-S roadmap past and planned future

# Technical Roadmap



# Storage Management Initiative

Ecosystem Road Map – The journey continues



- Please send any questions or comments on this presentation to SNIA: [trackvirtualization@snia.org](mailto:trackvirtualization@snia.org)

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