SNIA eXtensible Access Method (XAM)

Value Proposition & Architecture Overview

David Martin, October 2008

SNIA

XAM Initiative

Agenda

- XAM Introduction & Value Proposition

- SNIA XAM Initiative Status

- SNIA XAM v1.0 Architecture

- Application vendor engagement process
  for implementing the XAM SDK

XAM Introduction

eXtensible Access Method (XAM) API - An Application
Programming Interface (API) standard between applications and
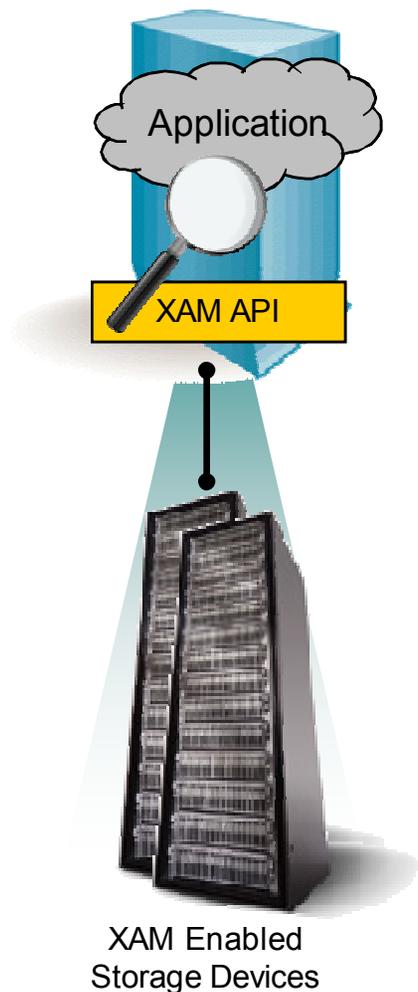retention-managed storage devices

- The XAM API specification defines a consistent interface and set of
  capabilities between the application and XAM-compliant storage devices
- XAM also defines the structure of the XAM object stored on the storage
  devices

The XAM Software Development Kit (SDK)

- Provides the XAM API specification and a set of development tools (libraries,
  documentation, and sample code) that allows applications to communicate
  with a XAM-compliant Storage Systems

  The SNIA is advancing the XAM Specification through the SNIA Architecture
  and ANSI / ISO standard process

XAM Introduction

Application

XAM API

XAM Enabled
Storage Devices

The XAM API specification defines the programming interface and services that enable applications to store, retrieve, search, and manage XAM objects on XAM-enabled storage devices

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Note – this slide best viewed in slide presentation mode

XAM Value Proposition

- **XAM provides choice and flexibility**
  - Choice between storage devices and applications, flexibility to change vendors or use storage devices from multiple vendors

- **XAM reduces costs**
  - Reduces application porting, testing, and support costs, and improves quality & time to market

- **XAM metadata is the foundation for extended e-Discovery & analytics capabilities**
  - Rich XAM metadata & search capabilities are the basis for advanced e-discovery, contextual search, semantic search, and other types of advanced language analysis
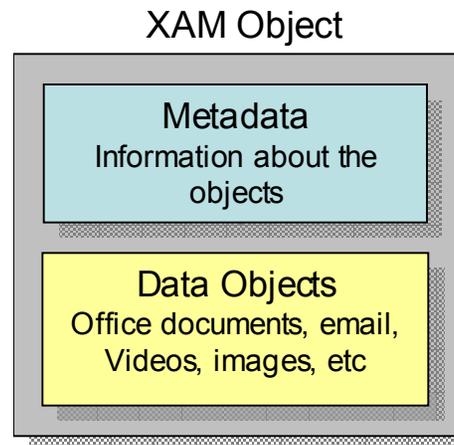
XAM Services

- The XAM API Specification includes
  - Standard API and consistent set of services for retention managed storage devices

XAM Interface Services

Store/Retrieve	Search	Manage	Access Control	Import/Export

  - General structure definition of the XAM object being managed

XAM Object

Metadata
Information about the objects

Data Objects
Office documents, email, Videos, images, etc

The Importance of Metadata
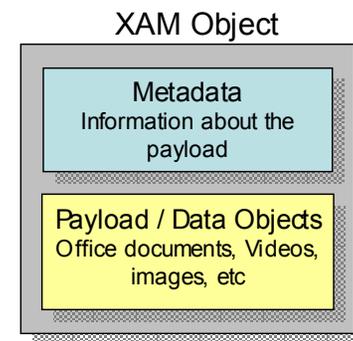## Avoiding the Digital Landfill

◆ **What if there were NO LABELS on these products??**

◆ **Without metadata, SAN, NAS, & CAS storage are just digital landfills for corporate data**

- Difficult or impossible to locate a specific piece of information from the millions or billions of objects
- No information sharing between applications
- Expensive to store and manage

XAM makes your data useful and improves your business outcomes

XAM Metadata

- A XAM object is like a can of food In a supermarket
  - The **contents** of the can is the **XAM payload / data object**
  - The **label** on the can that provides information about the product is the **XAM metadata**
  - A XAM object contains both metadata and payload
  - Multiple sets of metadata and payloads can be combined inside a single XAM object

- The can label contains critical information about the contents of the can

XAM Object

Metadata
Information about the payload

Payload / Data Objects
Office documents, Videos, images, etc

Can Label	XAM Metadata field
UPC code	XAM identifier
Expiration date	Retention period of XAM object
Product Brand	Application that created XAM Object
Nutritional Information	Standard classification information
Other key information specific to the product	Unique (application specific) metadata

File System Data

XAM objects

Data objects without metadata are like cans without labels

XAM Enables Compliance & Retention Management

Regulatory Compliance

- XAM supports tamper proof storage
- XAM enables data authenticity
- Regulatory retention information (retention, disposition) is embedded inside XAM objects

Retention Management

- Removes the IT management effort & cost overhead of managing retention of objects
- Reduces regulatory risk of keeping information too long… or not long enough

"All large corporations must have a strategy for dealing with reactive discovery now and a long term plan for dealing with proactive information management…"

Debra Logan
Gartner
October 2007

XAM & Information Authenticity

XAM Object

Metadata Information about the payload
Payload / Data Objects Office documents, Videos, images, etc

◆ **XAM ensures information authenticity**

- XAM atomically embeds metadata with content in the XAM object structure,
- Metadata & payload fields in the XAM object can be designated "static"
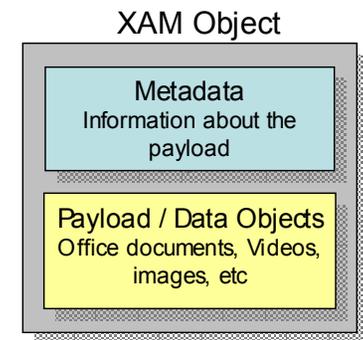
◆ **Legal, compliance, and governance environments require data authenticity**

◆ **XAM is the only storage specification/protocol that sufficiently addresses the information authenticity issue**

Authenticity: *A property of information, including its content (the data) and metadata, that <u>identifies</u> that it is currently what it was originally and <u>verifies</u> that it has not changed over time.* (Source: SNIA DMF, NARA, Society of American Archivists)
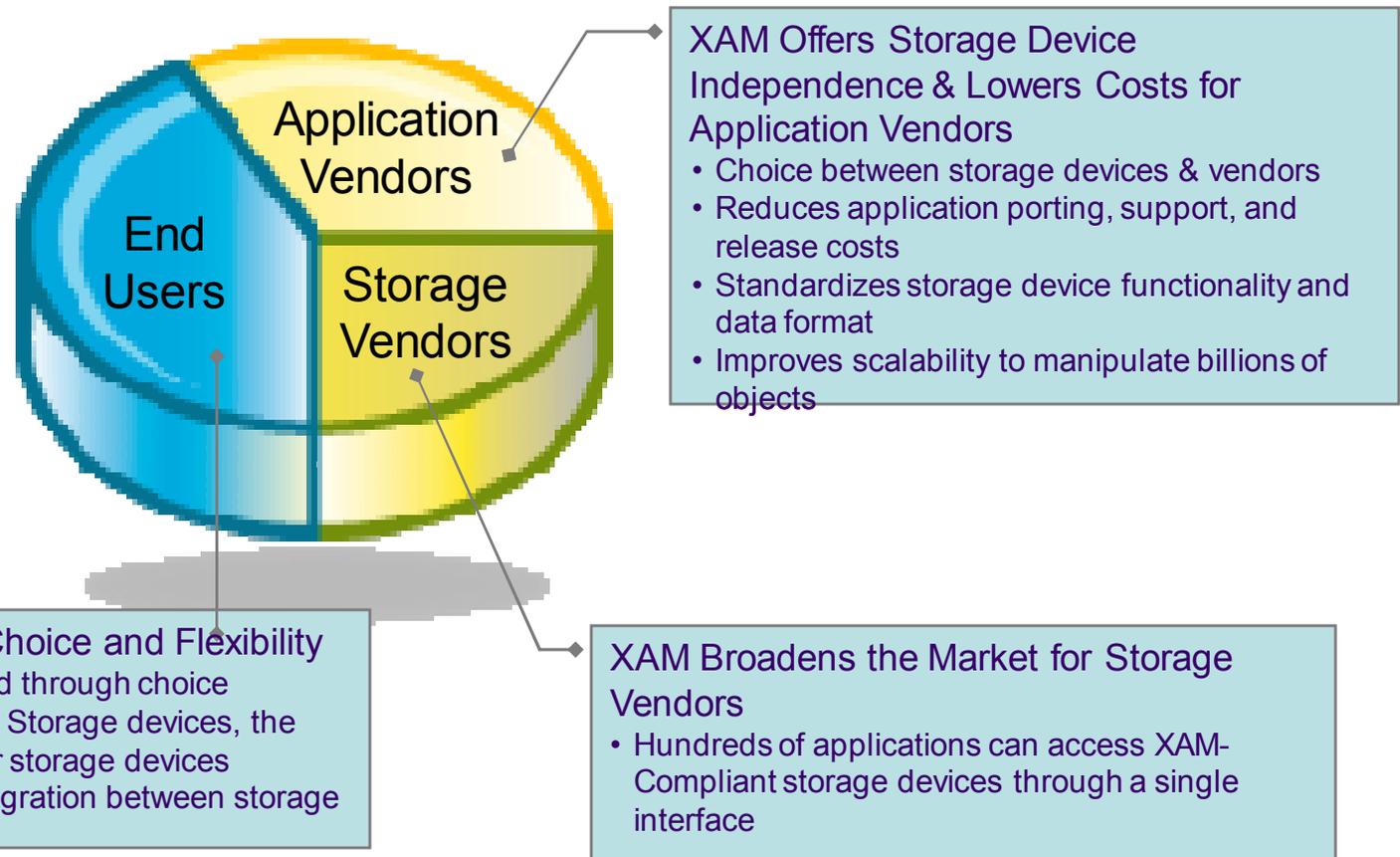
XAM Value Proposition for End Users

➤ XAM provides choice of application vendors and storage vendors

➤ XAM reduces IT costs by automating retention management

➤ XAM improves flexibility by providing the ability to use multiple storage devices concurrently

➤ XAM supports easy migration of data between storage devices

➤ XAM Provides faster access to advanced application features

➤ XAM enables extended search and e-Discovery functionality

Nutritional Facts		
Serving Size 1/2 cup (130g)		
Servings per container about 3		
Amount per serving		
Calories 130		Fat Cal 5
		% Daily Value
Total Fat 0.5g		0%
Saturated Fat 0g		0%
Cholesterol 0mg		0%
Sodium 260mg		11%
Total Carbohydrates 22g		7%
Dietary Fiber 5g		22%
Sugars 0g		
Protein 10g		20%
Vitamin A 0%	Y	Vitamin C 0%
Calcium 4%	Y	Iron 10%

* Percent Daily Values are based on a 2,000 calorie diet

Make sure you require XAM support in your storage and Application RFP's!! 11

XAM is a Win-Win for Vendors AND Customers

Application Vendors

End Users

Storage Vendors

XAM Offers Storage Device Independence & Lowers Costs for Application Vendors
- Choice between storage devices & vendors
- Reduces application porting, support, and release costs
- Standardizes storage device functionality and data format
- Improves scalability to manipulate billions of objects

XAM Offers End Users Choice and Flexibility
- End users are empowered through choice between applications and Storage devices, the ability to use multi-vendor storage devices concurrently, and easy migration between storage devices

XAM Broadens the Market for Storage Vendors
- Hundreds of applications can access XAM-Compliant storage devices through a single interface

XAM at SNW 2007
XAM makes this possible!

Information independence for applications and storage

Commercially Available Applications — Custom Application

Records & Documents | DiskXtender | DB Archiving software | Photo Editor

XAM Interface

HP IAP | EMC Centera | Sun SD 5800

XSET Browser | XAM Query Tool

Examples of the Power of XAM: Vendor Donated Tools
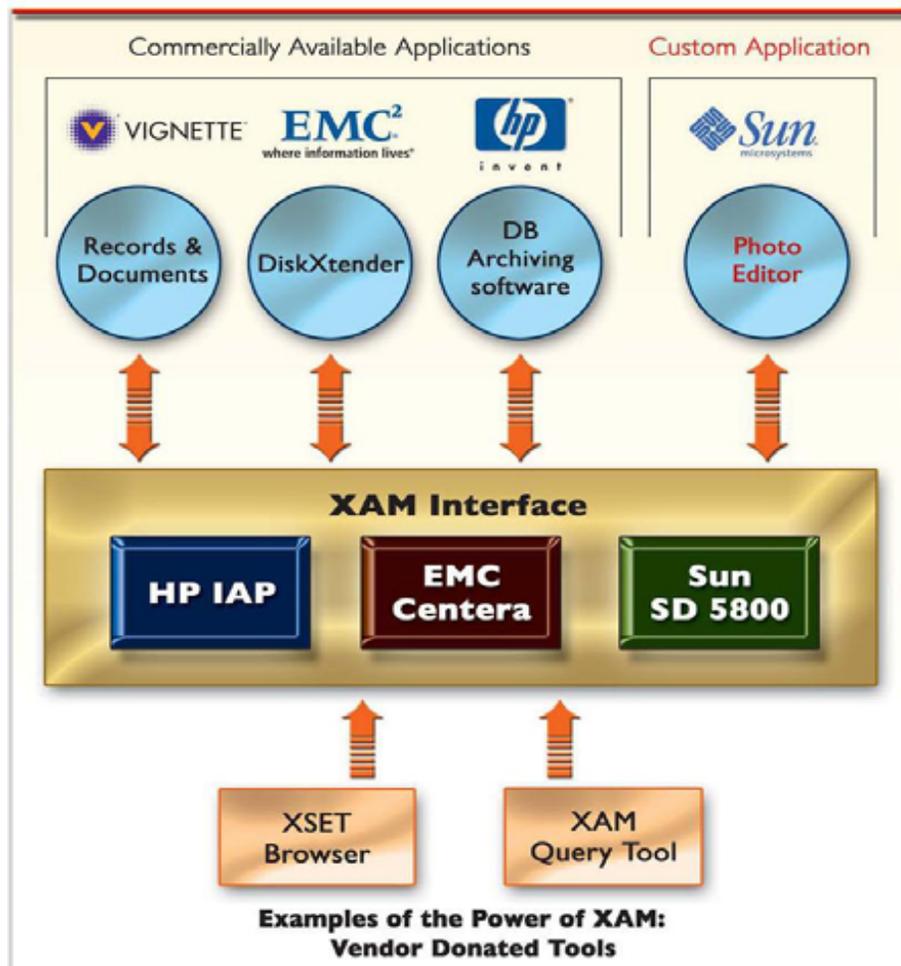
SNW Solutions Center

First Multi-Vendor demonstration based on XAM

See a flash video of the demonstration at
www.snia.org/xam

XAM Availability & Status

◆ **XAM API Specification v1.0 released and available**

  ◦ Available at http://www.snia.org/xam

◆ **XAM Software Development Kit (SDK) v1.0 is available in draft form**

  ◦ Pre-release available now at http://www.snia.org/xam

  ◦ Final XAM SDK v1.0 scheduled to be released early CYQ4 2008

◆ **Q3 2008 – XAM API v1.0 Specification submitted to standards bodies**

  ◦ ANSI first, followed by international (ISO)

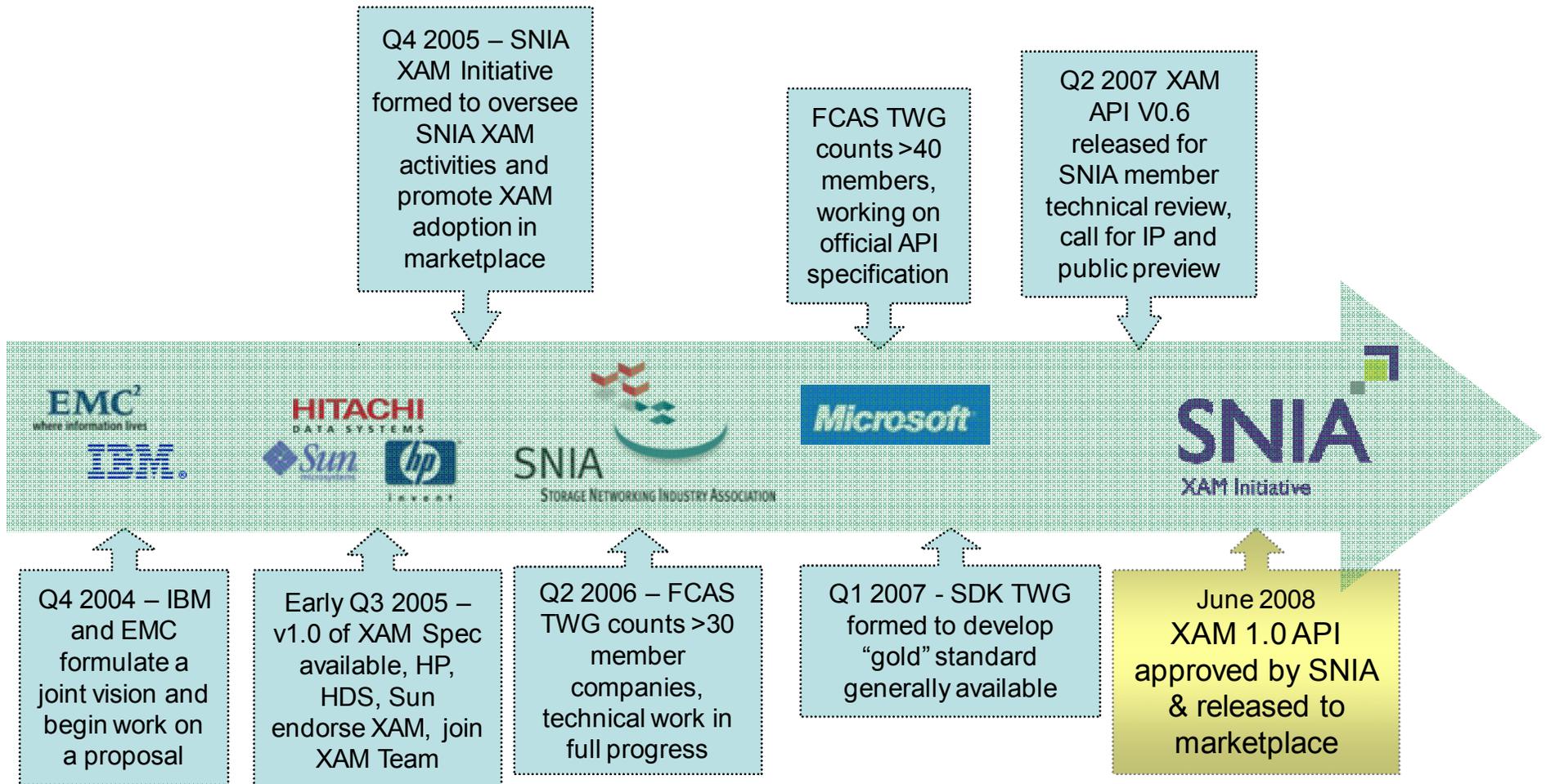 ◦ Standardization process expected to take 6-9 months

SNIA & XAM

Your partners and competitors are already participating

Don't be left out!

- **The SNIA XAM Initiative** is chartered to drive adoption of XAM specification, and ensure that the specification fulfills market needs for a fixed content data management interface standard

- **The SNIA Fixed Content Aware Storage Technical Work Group (FCAS TWG)** is the a center of technical activities related to new application-level interfaces for storage of static data (fixed content) and associated metadata

- **The SNIA Software Development Kit Technical Working Group (XAM SDK TWG)** is chartered to develop SNIA Software which implements current and future versions of the XAM Specification(s)

SNIA
Driving XAM to Standardization

SNIA

Advancing storage & information technology

Q4 2005 – SNIA XAM Initiative formed to oversee SNIA XAM activities and promote XAM adoption in marketplace

FCAS TWG counts >40 members, working on official API specification

Q2 2007 XAM API V0.6 released for SNIA member technical review, call for IP and public preview

Q4 2004 – IBM and EMC formulate a joint vision and begin work on a proposal

Early Q3 2005 – v1.0 of XAM Spec available, HP, HDS, Sun endorse XAM, join XAM Team

Q2 2006 – FCAS TWG counts >30 member companies, technical work in full progress

Q1 2007 - SDK TWG formed to develop "gold" standard generally available

June 2008 XAM 1.0 API approved by SNIA & released to marketplace

EMC² where information lives
IBM
HITACHI DATA SYSTEMS
Sun
hp invent
SNIA STORAGE NETWORKING INDUSTRY ASSOCIATION
Microsoft
SNIA XAM Initiative

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XAM API Services

- **Store / Retrieval Interface**
  - Metadata & streams storage via XSet abstraction
  - Create, read, update, delete data
- **Search / Query Interface**
  - Based on SQL "Select" statement
  - Supports query of metadata (mandatory) and content (optional)
- **Security Interface**
  - Role-based access control (RBAC)
  - ACL permissions on objects
- **Management Services Interface**
  - Retention
  - Litigation hold
  - Storage management services (specific to storage device)

Query / Discovery Examples

Query & Discovery

- Structured metadata query allows SQL-like flexibility in examining typed fields such as numbers and dates
- Unstructured stream query allows vendor extensibility for full-content search, with annotated information type

Application examples:

- "Find all records for patient X after 4/7/2006"

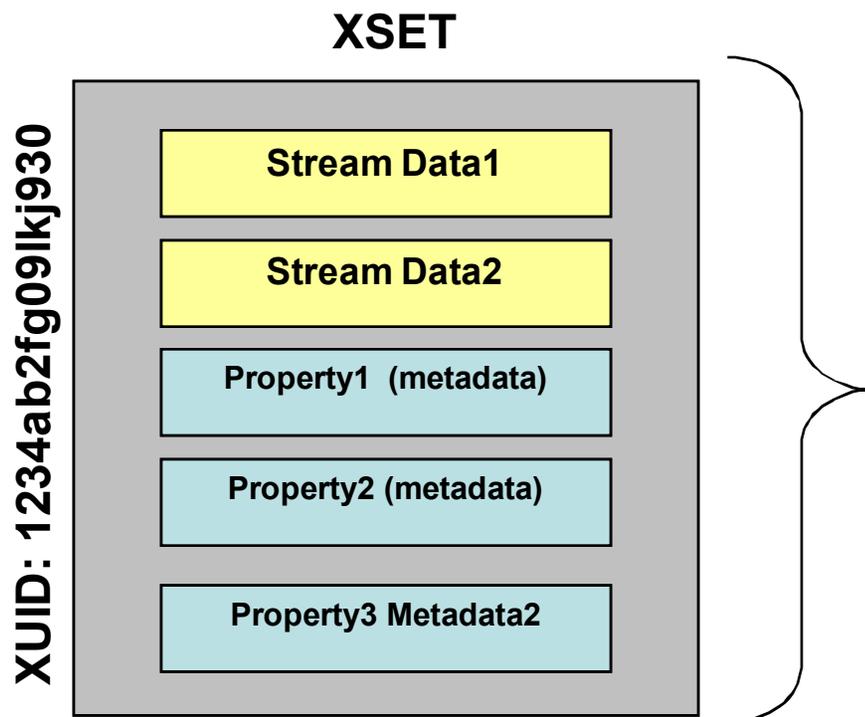- "Create thumbnails of all JPEG files written by application X larger than 300K"

Query example:

- **SELECT WHERE "org.nema.medical.patient_name"='X' and "org.nema.medical.record_date">date('2006-04-06')**

XAM Architecture

Application

Xam Library
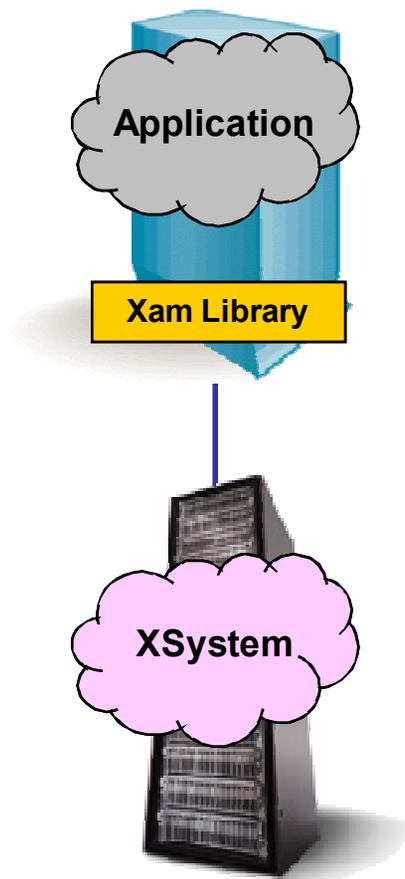
XSystem

- An application uses the the XAM Library (xam.dll) to 'connect' to a specified XSystem
  - An single application may connect to multiple XSystems simultaneously
  - Multiple applications may connect to a single XSystem simultaneously

- An XSystem is not identical to a vendor's "storage box", but a logical abstraction which should be viewed as 'bag of storage'.

- The application may be required to authenticate at the time the connection to an XSystem is established.

- The application uses XAM Library to store/retrieve "content objects" to/from the XSystem.

- These "content objects" are bundles of data and metadata, and are called XSets.

XSET Concept

XSET

XUID: 1234ab2fg09lkj930

Stream Data1
Stream Data2
Property1 (metadata)
Property2 (metadata)
Property3 Metadata2

The technical term for a "XAM object" is an "XSet"

XSets contain "Streams" and "Properties" that are collectively called "Fields"

A property (metadata) is a simple type (i.e. integer, float, string)

Streams are "just" a sequence of bytes. Streams can be typed or un- typed
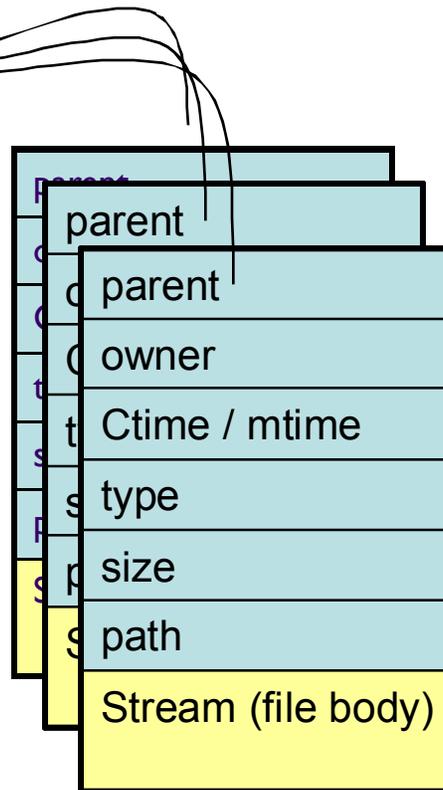
Each Field has a name, type, & size

XSET Mapping Examples
Example Mapping Data Types to XSets

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Email

Subject:
From:
To:
Date
email body
Attachment 1
Attachment 2
MAPI blob
Retention

File (Directory)

path
owner
ctime
parent

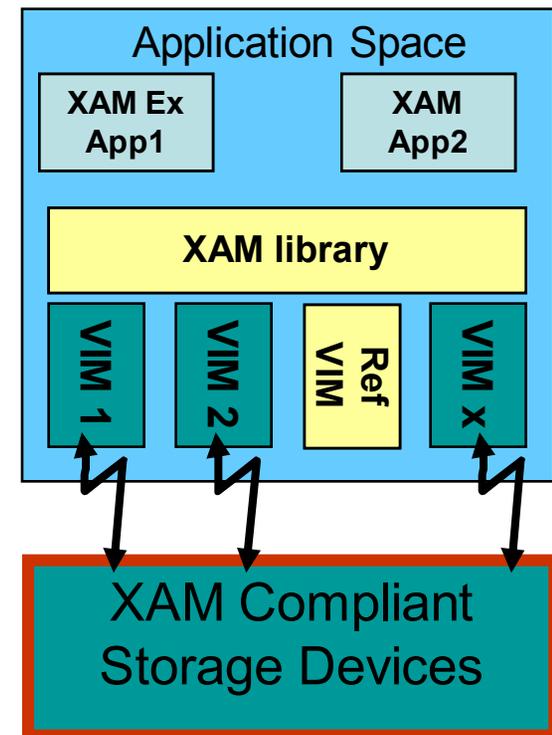| |
|---|
| parent |
| owner |
| Ctime / mtime |
| type |
| size |
| path |
| Stream (file body) |

Call Data Record

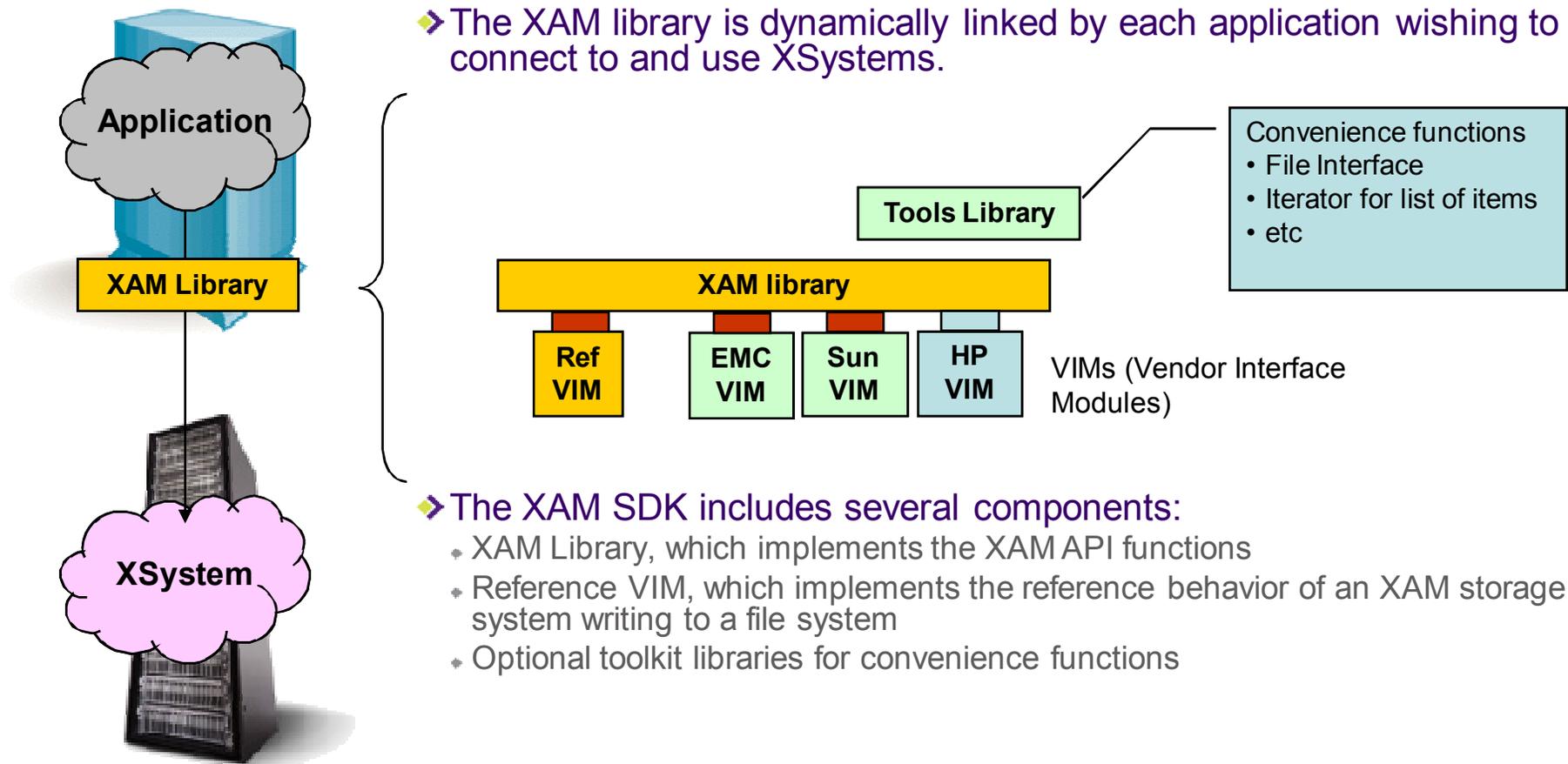| |
|---|
| Call Origin |
| Call Destination |
| Date/Time |
| Duration |
| Network Type |

Note: These are example mappings only. While it is desirable that industry verticals define standard data formats for for common object types, XAM v1.0 does not currently provide mapping templates.

XAM Software Development Kit

- ◆ XAM API standardized by SNIA
- ◆ XAM SDK includes the XAM API and development tools
  - ✦ Gated Source (Requires membership in SNIA SDK TWG)
  - ✦ Governed independently of any vendor
- ◆ VIM: Vendor Interface Module
  - ✦ Connects the SDK to a particular storage device through the VIM Interface
  - ✦ Reference VIM – Standard file system interface supplied in XAM SDK
  - ✦ Device VIMs are provided by storage device vendor
- ◆ XAM SDK Includes
  - ✦ Reference VIM
  - ✦ Best Practices
  - ✦ Toolkit
  - ✦ Sample Application(s)

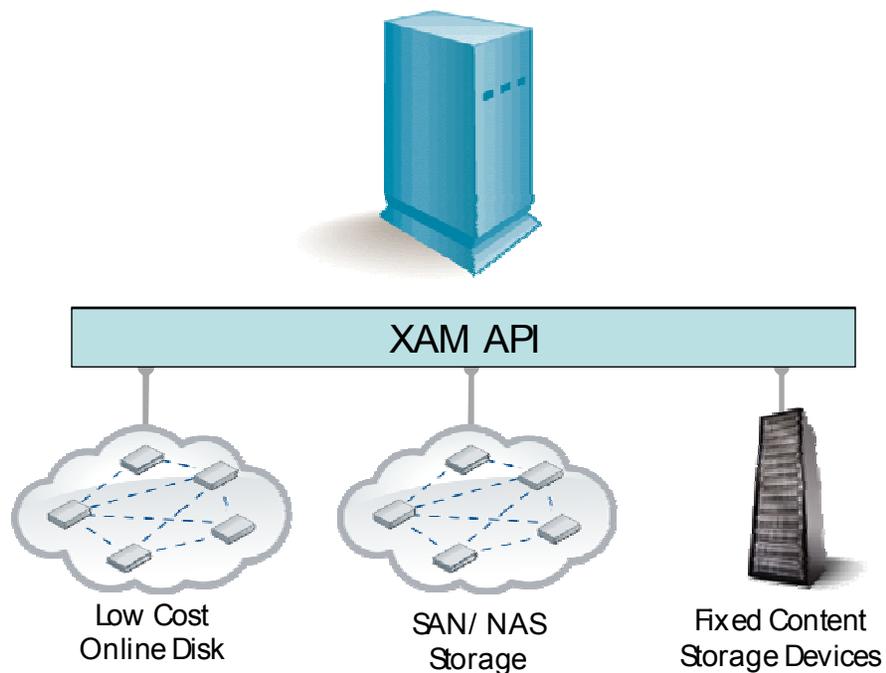### Application Space

XAM Ex App1		XAM App2

XAM library

VIM 1	VIM 2	Ref VIM	VIM x

XAM Compliant Storage Devices

- SNIA Supplied
- Storage Vendor Supplied
- SNIA, Application, or Storage Vendor

XAM Software Development Kit

Application

XAM Library

XSystem

◆➤ The XAM library is dynamically linked by each application wishing to connect to and use XSystems.

Tools Library

XAM library

| Ref VIM | EMC VIM | Sun VIM | HP VIM |

VIMs (Vendor Interface Modules)

Convenience functions
• File Interface
• Iterator for list of items
• etc

◆➤ The XAM SDK includes several components:
- XAM Library, which implements the XAM API functions
- Reference VIM, which implements the reference behavior of an XAM storage system writing to a file system
- Optional toolkit libraries for convenience functions

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XAM Directions
Some ideas under consideration

XAM API

Low Cost
Online Disk

SAN / NAS
Storage

Fixed Content
Storage Devices

- **Extend XAM to Primary Storage**
  - XAM online storage devices (SAN / NAS / DAS)
  - XAM does not require non-tamperable storage devices

- **XAM "Classes of Storage"**
  - XAM is single interface into multiple classes of storage
  - Different classes have different capabilities or quality of service
  - XAM objects can "migrate" between classes of storage

XAM Plugfests

- Held at SNIA lab at Colorado Springs, CO where XAM compliant storage devices & latest XAM VIMs are maintained
- Applications can test with the latest versions of all Storage vendor equipment and libraries
- Application vendors can attend a scheduled Plugfest or connect on remotely over VPN
- Scheduled 2-3 times per year (tbd), ad-hoc as necessary
- Available to SNIA members only

Access to XAM SDK Components

Public Access Component	Access
XAM API Spec	Public access
XAM Library	Public access
Vendor Implementation Module (VIM)	Storage Vendor
SDK Development & Debug tools	Public access
Best Practices guide	Public access

SNIA Component	Notes	Access
XAM Contribution	Steering of specification & implementation	SNIA Membership
XAM Certification/Seal	Not currently available	SNIA Membership
Plugfest & SNIA XAM Lab	Colorado Springs, CO	SNIA Membership
Pre-release versions of XAM SDK	Early versions of SDK releases	SNIA Membership

Preliminary Information - XAM SDK component access details are still being defined

For more Information

- http://www.snia.org/xam

- http://www.snia.org/publicreview

- Power of XAM Brochure

- Other XAM materials
  - Storage Vendor Interfaces to XAM "developers playpen"
  - Technical Tutorials
  - White Paper
  - Storage Developers Conference Video
  - XAM Flash
  - Why and How to Join the XAM Revolution

XAM at SNW Fall 2008

- **XAM Hands On Labs**
  - San Antonio 4 in the HOL Area Tuesday & Wednesday
  - 3 - 2hr sessions between 9am-5PM each day

- **XAM at TechEdge**
  - Visit XAM TechEdge Booth
  - EXPO hours

- **SNIA XAM Deep Dive for Developers Special Session**
  - Fort Worth 7, Wednesday & Thursday
  - 8am-10AM, 10AM-12noon sessions both days
  - 2PM-4PM session Wednesday

- **Attend 3 activities & get a gift!**

Please pick up a XAM Activities Summary card at the door

Questions?

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XAM Initiative