



5. SAM-FS / QFS Nutzerkonferenz

25.05.-27.05.2011

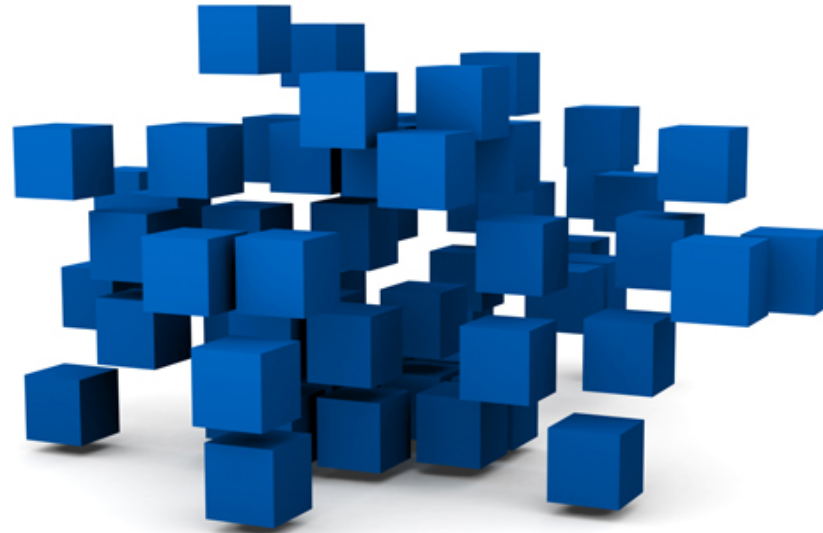
Hotel Radisson SAS Resort Schloss Fleesensee



HSM Tools..... die das Leben leichter machen

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Member of
SNIA Europe

- Update HMK, SAM-FS
- Anforderungen an ein Archiv
- SAM-Tools
 - SAM-NeT
 - SAM-WeB
 - Media Recycle / Refresh,
Auto Refresh (Selbstaufräumendes Filesystem)
 - Tape Sniffing
 - HSM Migration
 - Object Storage (CAS like)
 - Backup und Restore
 - Backup Cache
 - SAM-Watch

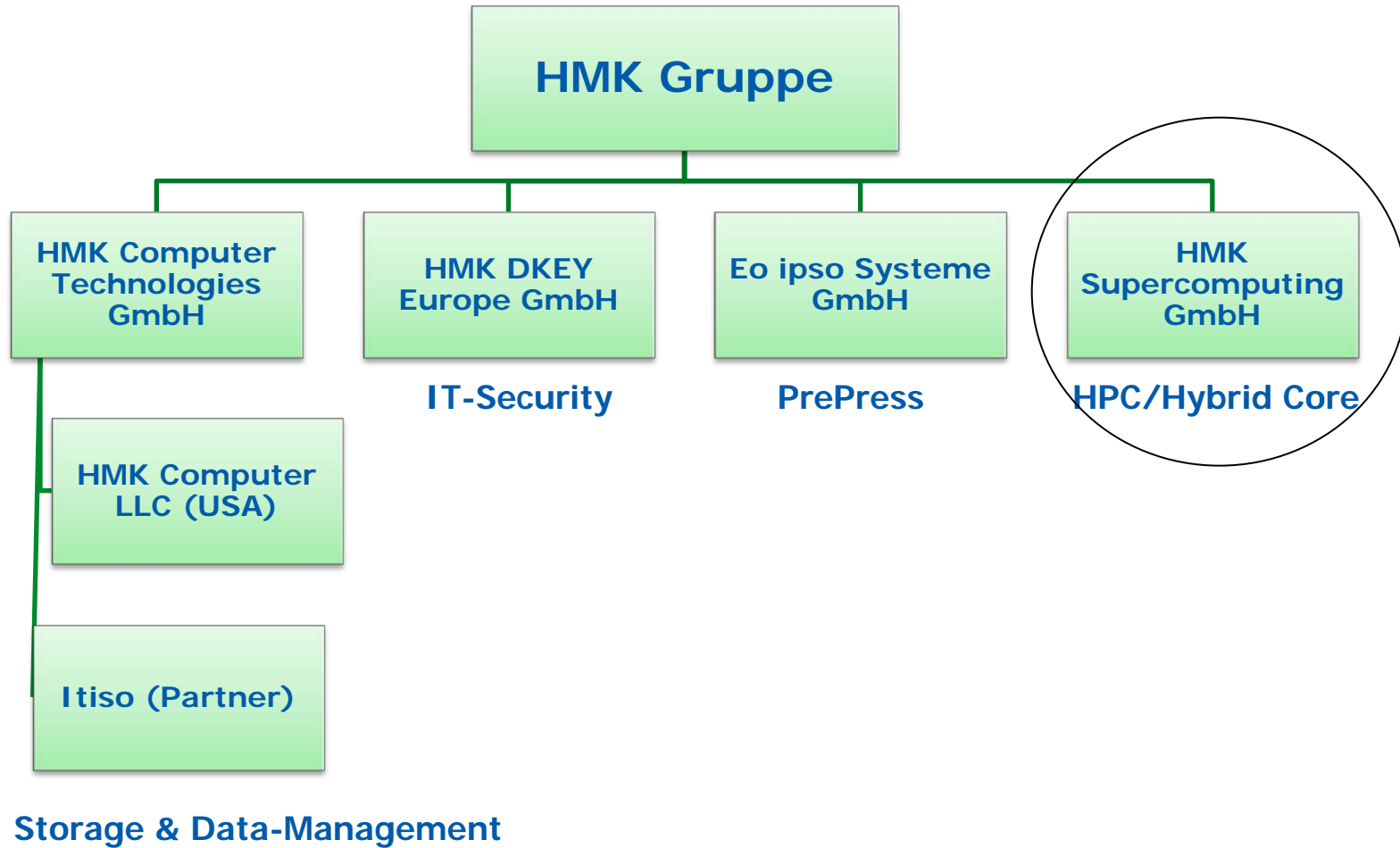




Designer for Architectures

- **Herstellerübergreifender** Lösungsanbieter für Enterprise Storage
- **Kostensenkungen** für unsere Kunden trotz wachsender Datenmengen
- Innovative Technologie für **Effizienzsteigerung**





HMK SAM-FS Benefits

- **ILM**
 - Managt Daten Lebenszyklus entsprechend ihrer Wertigkeit
 - Kontinuierliches Backup & Archiv
- **Disaster Recovery**
 - SCHNELLES RECOVERY (fast meta data rebuild)
 - Kann Backup ersetzen / verbessern
- **Höhere Produktivität -> Kosteneinsparungen**
 - Managt Daten über Storage Tiers via Policies
 - Migriert & konsolidiert Daten
 - Einfache Administration (WEB)

- **Bleibende Werte dauerhaft Bewahren**
 - Je moderner die Technologie, desto kürzer die Lebenszeit (Pergament, Mikrofich, digitale Daten)
 - Je moderner die Technologie, desto höher die Speicherdichte
- **Verfügbarkeit**
 - Infrastruktur lässt sich neu erschaffen
 - Inhalte nicht
- **Auffindbarkeit der Information**

HMK Archiv ist nicht gleich Archiv

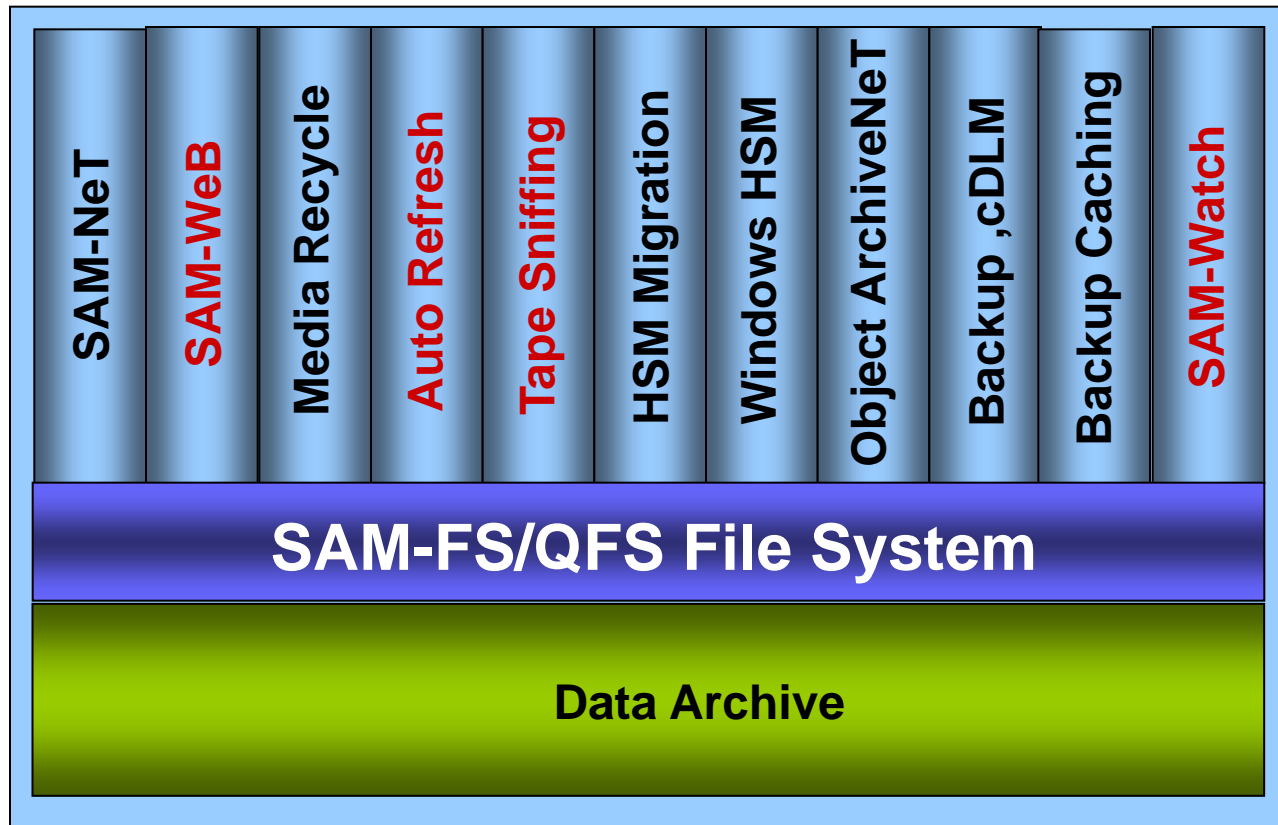
Compliance Archive vs. Kostengünstige Speicherung

- **Unveränderbarkeit der Daten**
 - Sicherheit des Datenbestandes
 - Skalierbarkeit der Lösung
- **Portierbarkeit der Daten**
- **Leichtes Wiederfinden**



Extend the Power of SAM-FS

HMK Tools & Services



SAM-FS & Windows

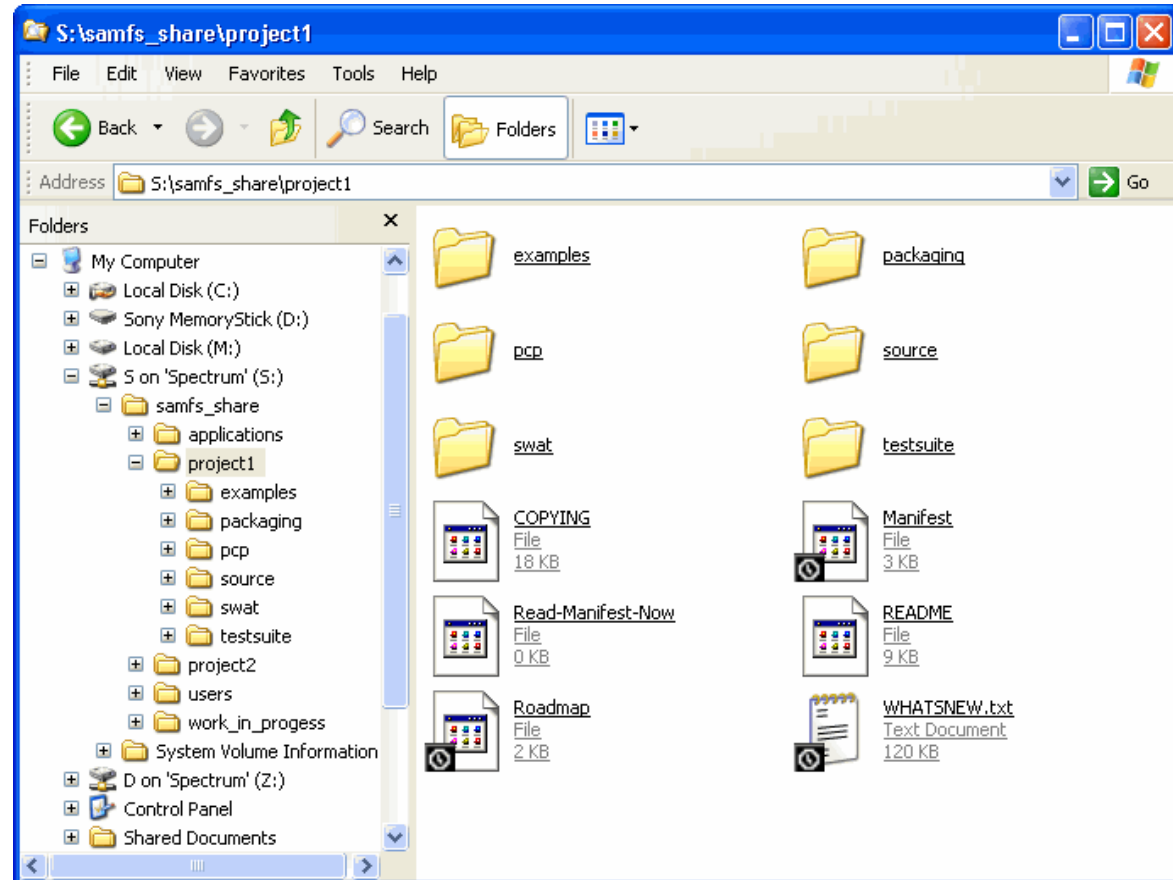
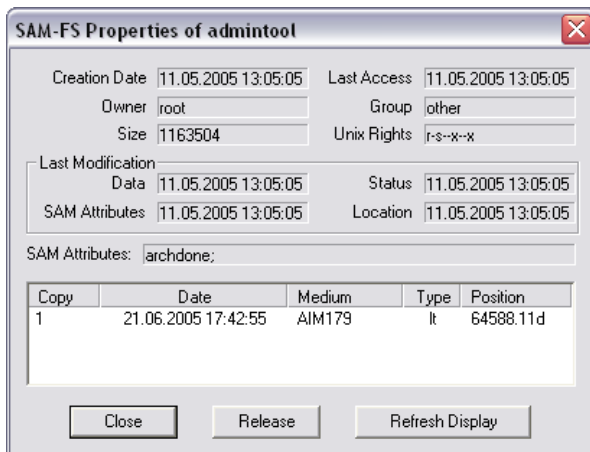
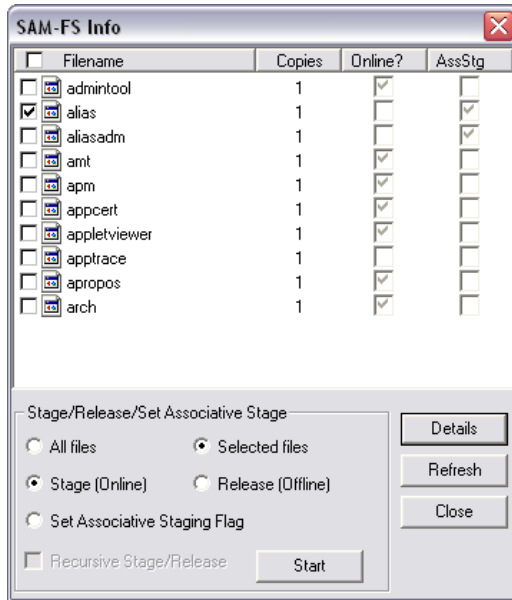
Windows Explorer Plug-In

- Icon Overlay for offline files in Windows Explorer
- Allows display of SAM-FS attributes (à la sls-D), stage & release of files & directories, etc.
- Multi-File & Multi-User functionality
 - **Führt Browsing des SAM-FS Filesystems via Samba weiter während Offline Files im Hintergrund gestaged werden**
 - **No Window freeze**
- Supports Async I/O
 - **Read-behind**
- API for own implementation available

Better Windows Integration

SAM-FS - Windows Integration

- Windows Explorer Plug-In
- Multi-File & Multi-User Functionality
- Supports Async I/O



- Are all files archived ?
 - Are all copies produced following the SLA?
 - Which files are not archived?
 - What files have been archived in a special time?
- Are there damaged copies / files?
 - On what archive media?
- What capacity is used for
 - „never release“?
 - „partial online“ ?
 - „never archive“ ?
- Which files are on archive media xyz?
- How many files have been archived in time range?

HMK SAM-Web (Browserbasierte Visualisierung)

- Samfsdump extractor (10 mio Files per min.)
- Optimized database
- WebGUI
 - FS – statistics
 - Intuitive queries
 - Fast answers
 - Results in
 - Lists
 - Summaries
 - Standard requests
 - predefined
 - Individual
- Monitoring interface
- Delete-functionality

The screenshot shows the HMK SAMweb Query Criteria interface in a browser window. The page title is "HMK SAMweb Query Criteria". The interface includes a search bar, a "Submit query" button, and a "Clear criteria" button. Below the search bar, there are several sections for defining query criteria:

- Directory:** A text input field.
- Filename pattern:** A text input field.
- VSM list:** A text input field.
- Media type:** A dropdown menu.

Below these fields, there are three sections for defining query criteria:

- SAM-FS Fileattributes:** A table with columns for Attributes, Query Criteria, and Yes/No.
- Date Attributes:** A table with columns for Attributes, Query Criteria, Date [from], Time [from], Date [to], and Time [to].
- Other Fileattributes:** A table with columns for Attributes, Query Criteria, Value [from], and to.

At the bottom, there is a section for **Copy Attributes** with columns for Copy 1, Copy 2, Copy 3, Copy 4, and Query Criteria. The interface also includes a "Submit query" button, an "OR query" button, and a "Clear criteria" button.



SAM-WeB Statistics

Filesystemstatistics at 20090602-00:53:21 on host: uqfs

Using samfsdump dated 20090602-00:35:00

Global max file size : 199.41 G

DAU-size: 64 KB

Total objects processed: 1630269

Class Report:

ClassRange	Total Files	%	Total Size	Average % Filesize	Total Online	%	Total Locked	%
(1): 0K - 4K	507705	32	555.19 M	0 1.12 K	30.93 G	0	10.31 M	0
(2): 4K - 8K	117927	7	682.58 M	0 5.93 K	7.16 G	0	0.00	0
(3): 8K - 16K	72613	5	809.14 M	0 11.41 K	4.39 G	0	448.00 K	0
(4): 16K - 32K	108422	7	2.37 G	0 22.94 K	6.45 G	0	256.00 K	0
(5): 32K - 64K	109850	7	4.78 G	0 45.66 K	6.67 G	0	64.00 K	0
(6): 64K - 128K	58267	4	5.15 G	0 92.71 K	57.56 M	0	128.00 K	0
(7): 128K - 256K	57409	4	10.18 G	0 185.98 K	2.25 M	0	0.00	0
.....								
(17): 128M - 256M	9738	1	1.68 T	1 180.75 M	2.76 G	0	1.08 G	0
(18): 256M - 512M	6227	0	2.18 T	1 367.71 M	2.11 G	0	1.27 G	0
(19): 512M - 1G	6316	0	4.50 T	1 746.61 M	14.02 G	0	7.58 G	0
(20): 1G - 2G	158187	10	291.53 T	91 1.89 G	782.48 G	12	159.38 G	2
(21): 2G - 4G	488	0	1.41 T	0 2.96 G	3.04 G	0	0.00	0
(22): 4G - 8G	265	0	1.47 T	0 5.67 G	4.16 G	0	0.00	0
(23): 8G - 16G	331	0	3.68 T	1 11.40 G	21.74 G	0	0.00	0
(24): 16G - 32G	135	0	2.80 T	1 21.22 G	113.03 G	2	0.00	0
(25): 32G - 64G	61	0	2.73 T	1 45.76 G	1.11 T	18	0.00	0
(26): 64G - 128G	15	0	1.41 T	0 96.39 G	0.00	0	0.00	0
(27): 128G - 256G	10	0	1.45 T	0 148.63 G	532.27 G	8	0.00	0
Totals	1573005		319.54 T	213.01 M	2.69 T	43	173.08 G	3

Total Files: 1573005
Total Zero Files: 5191
Total Dirs/Symlnk: 52067
Total size: 319.54 T
Average filesize: 213.01 M
Total size all copies: 638.77 T
Total online cap.: 6.26 T



SAM-WeB Statistics

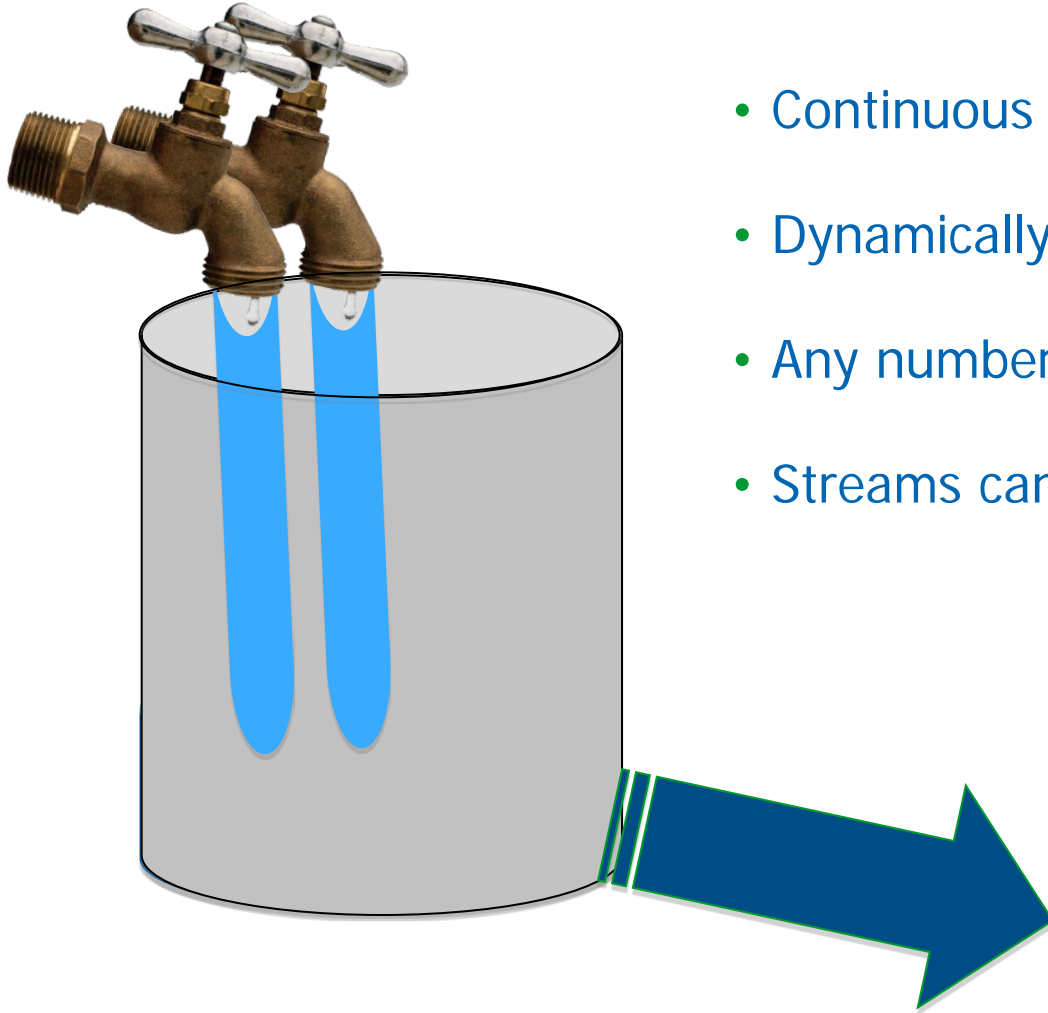
Timerange	Creation time			Modify time			Access time		
	within	files	volume %vol	files	volume %vol	files	volume %vol		
1d	10060	1.94T	0.2%	9978	2.06T	0.2%	36895	3.50T	0.4%
2d	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
1w	317061	8.13T	0.8%	89414	9.18T	1.0%	400772	10.76T	1.1%
1m	1308855	38.42T	4.0%	1133139	38.91T	4.0%	1578090	58.65T	6.1%
2m	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
3m	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
1y	3155221	348.35T	36.1%	3108671	345.45T	35.8%	4881256	388.02T	40.2%
2y	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
3y	0	0.00	0.0%	0	0.00	0.0%	0	0.00	0.0%
older	36486142	568.63T	58.9%	36936137	569.87T	59.0%	34380326	504.54T	52.3%

Total	41277339	965.47T	100.0%	41277339	965.47T	100.0%	41277339	965.47T	100.0%
=====									

Faster Administration and Monitoring

Media Refresh Toolkit

- Automatically recycles / copies data between media types (incl. diskarchive)
 - i.e. 9940 to T10K, LTO-3 to LTO-5, etc.
- Highly optimized media transcription with little or no impact on production
- Drastically shorter recycle / copy process (up to 15 times)
- Automatic load balancing and streaming of devices
 - **Dynamically adjust the usage of available drives and disk buffer area**
 - **Maximum throughput and performance**
- Concise control and status reports
- Also used for standard recycling (tape and disk)



- Continuous streaming
- Dynamically configurable
- Any number of streams
- Streams can be stopped & started for new



Media Refresh / Fast Recycle

Robot(s)	uqfs	Tapes	% active	Tapes available				Total	Fullest	Avg
		0%	tapes	%	free	pool	in use	total	TB	GB
S10400 li	56	5	5	0	215	1136	1348	629.9	1296.7	899.3
dkpools dk						3	3	287.1		
totals		56	5		0	215	1139	1351	917.0	
VSN pools:								Capacity		
apool				9				7.0T		
cp2pool				42				30.7T		
dkfpool				2				15.7T		
hpool				12				9.3T		
npool				152				112.9T		
Tapes and used volume per archiveset and copy:										
Archiveset				copy 1		copy 2		copy 3		copy 4
all				1 98.1G		0		0		0
darch2cp				537 286.9T		0		0		0
diskarchive_(unspecified)				3 287.1T		0		0		0
home				32 25.7T		31 24.3T		0		0
nbu_full				0		526 287.0T		0		0
unreserved				9 5.9T		0		0		0
Total				582 605.7T		557 311.4T		0 0.0		0 0.0
GrandTotal				1139 917.0T						

- 9 tapes will be relabeled
- Recycling of 5 tapes will be started
- Date: 2009/06/05 01:21

Migrate archive data over HW lifecycles

Selbstaufräumendes Filesystem

- File Virtualisierung, entkoppelt Files von Bandmedien über Diskarchiv
- Rumpf-Filesysteme für Metadaten, Archivierung ins Diskarchiv
- Stellt gelöschte Bereiche sofort zur Verfügung, reduziert das aktuell genutzte Volumen
- Alle Daten in Filesystemen sind online, alle Anwendungen laufen ohne Veränderung

Fast Disk Recycling

Regular checks of existing tapematerial

- Check tape consistency and integrity of blockcounts
- Check for read errors
- Procedures
 - Regular automatic checking
 - Checking on demand
 - Automatic recycling in case of errors
 - Automatic recycle / eject, if too many error
 - Keep results in a tape database, which combines information from the actual checks, the catalogs, the archive_audit summaries and the SEF logs

Trust your Tapes

SAM-HSM Migration Suite

- Automatic migration of data and media from other HSM systems to SAM-QFS (Migration 25-30 in progress)
 - **UniTree (EMC), Veritas HSM (Storage Migrator), DMF Data Migration Facility (SGI), Amass (ADIC), others possible**
- Migration principle
 - **Conversion of the Metadata, takes only a few hours**
 - **Production on new filesystem after one weekend (and than via SAM-QFS only)**
 - **Not necessary for parallel operation of old and new systems**
- Staging possible in two modes
 - **Random stage when users access files**
 - **„Bulk migration“ process in the background**
- Migration time $T_{[sec]} = \text{Volume}_{[MB]} / (\text{Speed}_{[MB/sec]} \times \text{Drives})$

„Top Down“

- Migrate metadata (few hours)
- After that the users work with the new system
- Old system not necessary anymore
- Two migration methods:
 - Fast „bulk“ migration for whole tapes (preferred)
 - Random recall for files, which are not yet migrated and instantly required

„Bottom Up“ (for small and medium data quantities)

- Snapshot and migration of the metadata
- Production stays on the old system
- Bulk migration of data from the snapshot
- Transition to production after final synchronization of metadata
- After that clean new HSM production without access to the old tapes

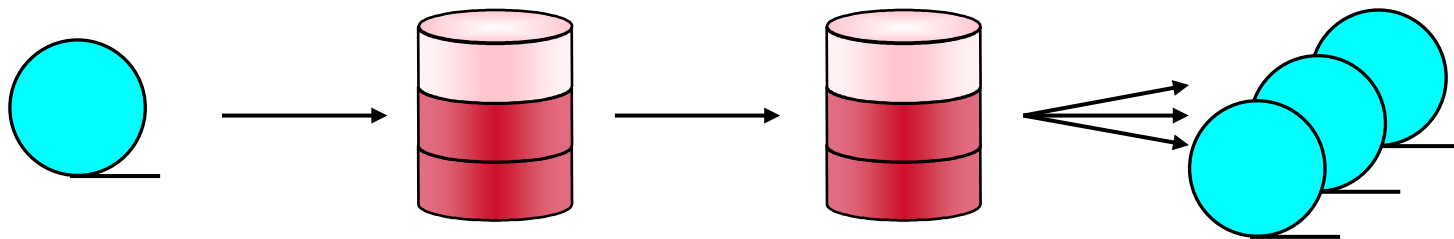
Complete migration with bulk and accompanying random recall (used in most cases)

- **Stepwise migration**
 - Migrate most important subsets right away
 - Migrate other subsets later (e.g. wait for the refresh for the next technology change)
 - Remainder not to be migrated (rare access, just before end of retention period etc.)
 - Always with accompanying random recall
- **Only random recall**

HMK Throughput Experiences

- **Bulk Migration**

- Generally running at device speed
- Continuous parallel operation
- Unpack faster than read
- E.g. 9940B can migrate ~ 2,6 TB per day (or 3,2 TB with 25% compression), LTO-4 ~ 8 TB per day
- Of course filesystem and peripherals have to provide enough performance and capacity



Read full tape to disk

Unpack files

Write multiple copies



Experiences in a big Project

- **German Meteorological site**
 - Metadata for 10 mio files ~ 8 hours to capture and build the filesystems
 - 850+TB HSM (here Amass) data incl. some copies
 - 711 TB net volume to migrate
 - Ca. 90 days to process ~ 11,000 tapes
 - Old system was never used. The verification was done with checksums, which had been taken from the old system before the start of the migration.
 - Max 10 TB per day (restriction see above)
 - Out of the total volume (711TB) only one 256k block of one file was not readable
 - With traditional method, for the 711 TB it would have taken 44 months plus the cost of parallel operation of both systems

HMK Throughput Experiences

Random Recall

- Migrating Convex based UniTree (UNC) access to the files thru SAM* was 32 times faster than UniTree itself (81 hours versus 2.5 hours for 10,000 files)
- Access to files in the latest release of Veritas Storage Migrator took about twice as long as SAM (Boeing: migration of 85 mio files)

Current project 2011

- 850+ TB
- 35 mio files
- Planned migration time 70-80 days

Migrate archive data over your sw lifecycle

ERS NTFS Migrator

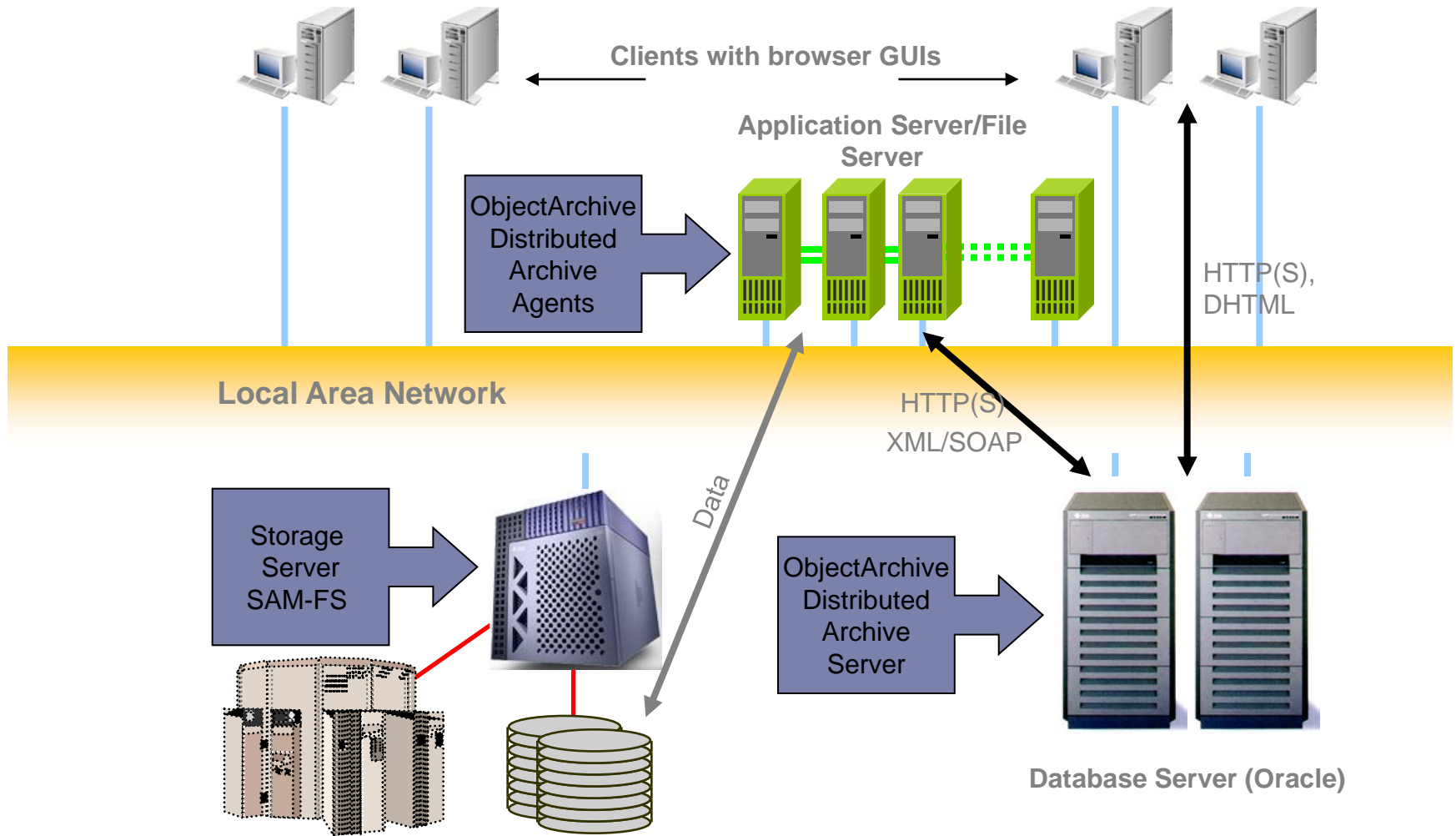
- ERS scanning engine determines migration candidates by age, size, user, access time, etc.
 - **Time/Schedule based (every night, etc.)**
 - **Event driven (file system full, etc.)**
- Copies file candidates from NTFS to SAM-FS
 - **Encapsulate extended Windows attributes, ACLs, etc.**
 - **SAM-FS makes multiple copies to Tape, other**
- Releases files from NTFS disk cache
 - **Leave file stub behind with copy information**
- Sets Offline Attribute
- Deletes files

Object ArchiveNeT

- Allows to store additional descriptive business information (i.e. easy to remember meta information, project name, etc.) together with the archived files in an object
 - Files are stored in containers (good for small files)
 - GUI to view content of containers (for Linux, Solaris, HP-UX, AIX, Irix, True64, Windows)
 - Groups files together by attaching meta information
 - Easy search for files and objects based on meta data
 - File name or directory name must not be known
 - Delete files/objects when expiration date is reached



OANET Architecture



Content Archiving



Backup- and Restore Tool for SAM-FS, cDLM:

Novartis FMI

Information Life Cycle Management

- Scheduled SAM-FS Snapshots capture Filesystem in the background content
- Client Server Architecture with Explorer-like GUI
 - **Clients for Solaris/W2k/WinXP/Linux/MacOS X**
- No external database required
 - **Optimized for cDLM**
 - **No administration required**
 - **Minimizes space requirements**
 - Each version is exactly one entry
 - **Maximum performance**
 - **Minimum overhead**
- Versioning

Why additional Backup?

HMK SAM-BackupCache

BMW

- Backup writes into SAM, not directly to Tape
 - Decouples tape devices from networks
 - **Allows 100% utilization of hardware = less required**
 - Simplified administration
 - On demand scalability and accelerated restores
 - Optimized media usage
 - Compatible with Veritas NetBackup, Legato NetWorker, others on request

- **Monitoring**
 - Controlling Script-Agents
 - Communication with monitoring tool, e.g. Nagios
- **Proactive Checks**
 - Status of filesystems, SAM devices and VSNs, process activities, performance, VSN pool filling grades, damaged copies and media, ...
- **Reports**
 - After reaching watermarks
 - Via e-mail, SMS, pager
- **Remote HMK service available**

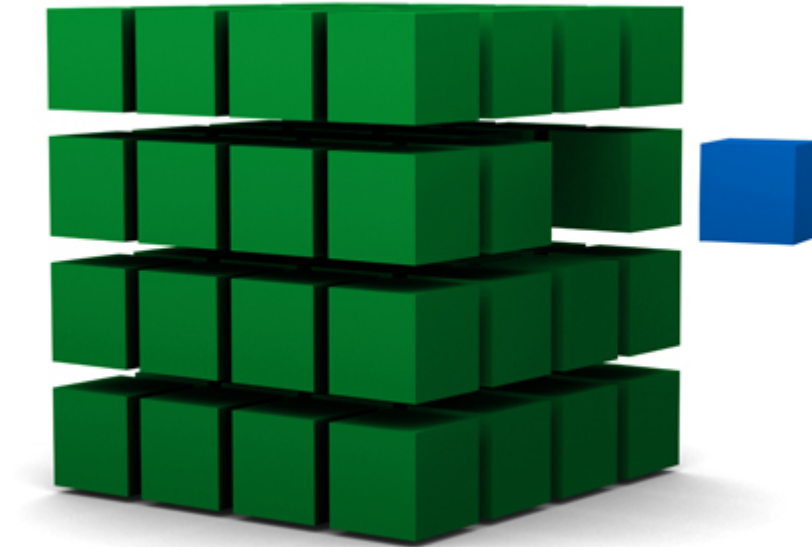
Automated Operation

- HSM ist (nur) HSM
 - Basis Policies
- Produktiv-Umgebungen erfordern oft mehr
 - Insbesondere auf dem Weg vom **HSM-Auslagern** zum **Compliance-Archiv**
- Tools sind getrieben durch Ihre Anforderungen



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We manage your data...



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