Radio Television Slovenia: Success Story

Radio Television Slovenia (RTV SLO) is the major public broadcaster in Slovenia. RTV SLO currently operates three national TV channels, three national radio channels, two radio and TV programmes in the regional centres, radio and TV programmes for Slovene national minorities in the neighbouring countries, programmes for foreign audiences, teletext and an Internet and a mobile portal. The signal of the national radio and television programs is also provided via satellite.

RTV SLO's decision to move from traditional tape based production to tapeless file based digital HD production and to archive all file based digital HD production and as well archived material from the past posed a challenge on how to meet the vast capacity demands for archiving and at the same time provide immediate accessibility to all the content. Their existing storage solution was no longer able to meet their demand for capacity and performance. Therefore RTV SLO started to look for a new archiving solution in order to release their existing storage solution or only on-line file based video production and to find long-term file based storage solution that could meet all their requirements that were:

- High throughput was crucial as the solution had to meet the need of digitalizing and archiving the existing content and supporting the on-going needs for current production.
- Linear scalability in both capacity and performance as they are aware of the permanently growing volume of material.
- Predictable storage media development roadmap and tape format compatibility
- Responsiveness and automation meant the content should be accessible in a timely manner without any human intervention.
- Reliability of the solution was also a key feature as it is the source for editing and broadcasting production and therefore it needs to provide 24*7 uninterrupted operations.
- Redundant hardware design - no single point of failure.
- Standardized IT based and widely used archiving formats for future safety.
- Accessible trough standard protocols meaning no additional software need to be installed on end-users workstations.
- Intuitive administrative and end-user interface.

Based on the requirements Xenya in cooperation with our partners prepared a solution that would provide all the necessary functionality and won the tender despite admirable competition.

The solution was composed of the following elements:

- ***XenData X64* Edition Archive Series** software provides transparent access for the end user on one side and managing all the archiving functions on the other side
- **Qualstar XLS-8161100** LTO5 tape library provides an efficient and scalable solution for the tape storage
- **Infortrend ESDS S24F-R2840-4** for the intermediate disk storage

- **Supermicro servers** provide an ideal platform due to their high configurability options as well as their outstanding reliability

Archiving Architecture

The architecture of the solution consists of the robot tape library, intermediate storage volume and the data servers running the archival software. The solution is a hierarchical storage system where the users see a CIFS share (NAS) and are unaware of the actual location of the files. If the files are on the intermediate storage the user can use it immediately, if it is actually archived on tape the system automatically restores the file contents to the NAS and the user can access it. The system automatically archives files based on a predefined set of rules (e.g. not accessed for 48 hrs. etc.) and restores them on use. As the majority of the files are media files the transfer between the user and the system must be high/throughput so 10Gb Ethernet is used.

The system has been designed with scalability in mind so it can grow as the demands do. This is achieved by several methods:

- The library capacity can grow by adding additional tape and/or drive units. Qualstar libraries by rule support also new generations of drive technology via firmware update. The maximum planned capacity is for 9500 tape slots that will increase even more by switching to a new generation of tape technology (currently LTO5).
- The data servers scale horizontally meaning as the needs grow one can add additional server-storage pairs to the system and dedicate additional NAS volumes for increased throughput and capacity.

Special attention has to be put in the networking part between the users and the system as many concurrent users need to access the system without interruptions.

The building blocks of the solution

Robot Tape Library

Qualstar model XLS-8161100. The library uses LTO5 tape cartridges. System recognizes tape cartridges by scanning barcode label on a cartridge. The average time required for the XLS-8161100 to pick a cartridge from a storage slot and place it in a tape drive and to pick a cartridge from a tape drive and return it to a storage slot is 11 and 10 seconds respectively (the average times assume random locations for the tape drives and storage slots). The XLS-8161100 can accommodate up to 9639 cartridge slots, 16 tape drives which are installed in one to four drive bays and four I/O ports to facilitate the import and export of cartridges. Each I/O port includes a removable 10-cartridge magazine. The tape library and NAS server are linked together via 8 Gbit/s Fibre Channel connections. Resources in the XLS-8161100 can be subdivided into as many as eight independent user-configurable logical library partitions. Each partition is a subset of the available tape drives, cartridge slots and I/O ports and is controlled across its own host connection. A system controller within the library hosts the library management interface which can be accessed locally using the touch screen or remotely across a LAN. SNMP remote management is also supported over Ethernet. Library sends email and pager alerts to designated users when a XLS module or a field replaceable unit (FRU) fails. Library collects extensive statistics about the number of

reads of individual LTO tape media, the quality of read/write heads and data recording and sends a warning when a number of errors exceeds the predefined limit. During normal library operations tape drive cleaning is managed by the host software applications using cleaning cartridges installed in each logical library partition.

Data Server

NAS server for intermediate storage of archiving media files and management of data in the tape library is a Supermicro system with two Intel Xeon processors, 32 GB of memory, 1 Gbit/s Ethernet network interfaces and 10 Gbit/s Ethernet interfaces with LC multimode optical connectors. It is linked to the robot tape library via Qlogic QLE2564 FC interfaces. NAS server runs Microsoft Server 2008 Standard. Media files on NAS server are exported as a CIFS share to the LAN.

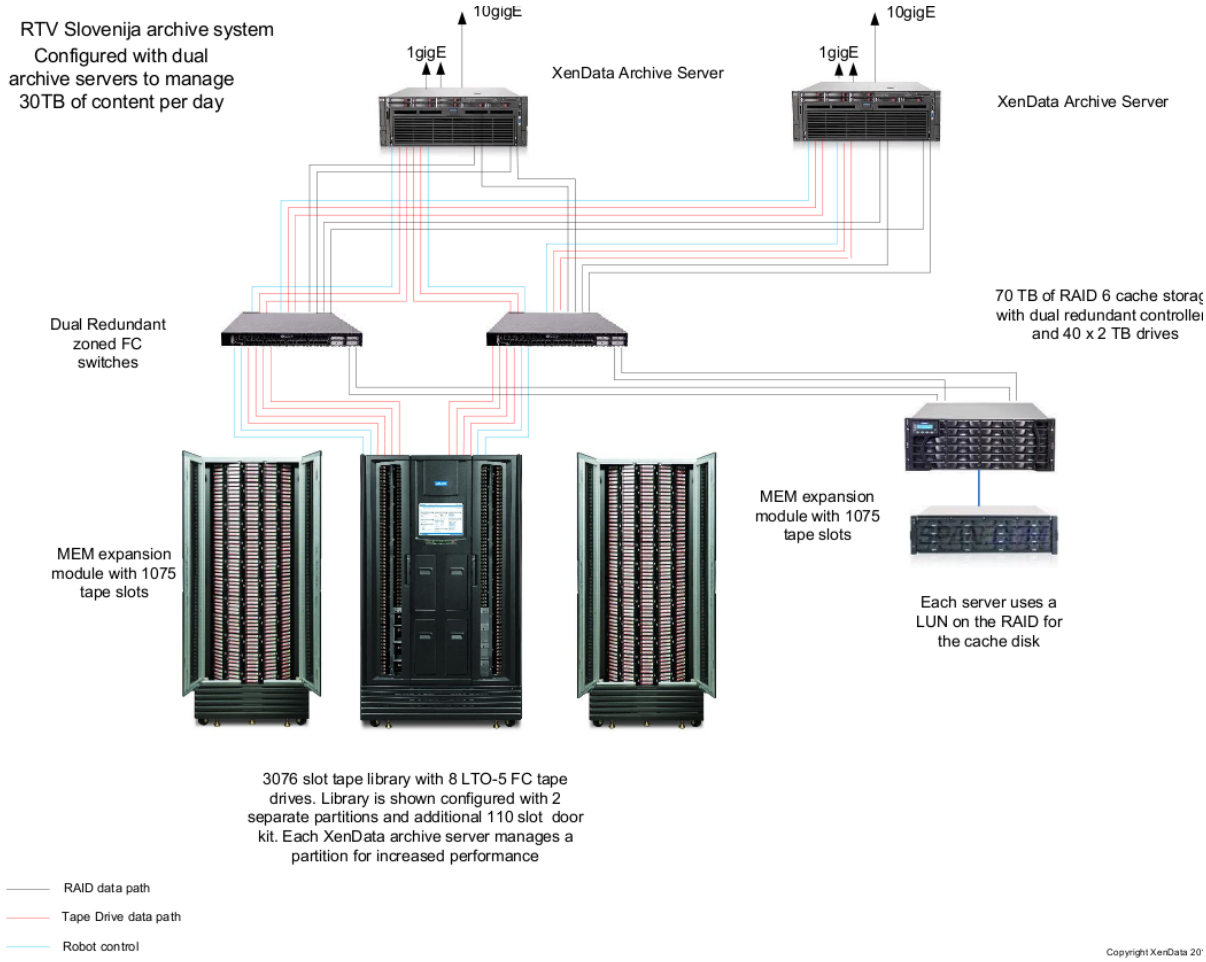
Intermediate Storage

Infortrend ESDS S24F-R2840-4 host storage system combining 8Gb/s FC host connectivity and 6Gb/s SAS drive support. There is 4 GB of cache memory per controller. Fault-tolerant hardware modules and high-availability hardware design prevent »single-point-of-failure«. Storage system is configured as RAID 6. ESDS S24F-R2840-4 can be expanded to 102 drives (up to five expansion enclosures (JBOD), 2 TB SAS drives supported). Write speed in RAID 6 configuration is over 1.3 TB/h (video or image files). ESDS S24F-R2840-4 can be managed locally or remotely via Telnet or with graphic web application over Ethernet. Various critical event notification methods include email, LAN broadcast, fax, SNMP traps, SMS, and MSN.

Archiving Software

XenData X64 Edition Archive Series software runs on a server running a 64-bit version of Windows 2003. It manages one or more data tape libraries and RAID to create a highly scalable digital archive. It manages the scheduling of the archiving tasks, the transparent restores, keeps a searchable catalogue of all files and tapes, provides a number of additional features like tape aggregation, duplication, etc.

Solution diagram



Files are archived by writing to the archive file system that is presented as a standard CIFS network share. Administrator defined policies determine where the files are stored: on RAID, data tape or both. Simply trying to access the desired file on the network share will restore it (unless already there) without the need of any additional software or API.

The archived files are written to tape using the standard POSIX tar format. This means that in addition to using XenData software files may be restored using a wide range of other operating systems. The software automatically generates replica data tape cartridges that may be exported from the library for off-site retention. Furthermore the tapes may be rapidly imported into a replica system. Additionally XenData software supports partial reading (reading only a portion) of large files for faster access to the desired content.

A software module is included which provides e-mail and on-screen alerts. These are tailored to the needs of archive system operators, system administrators and IT support personnel.

Conclusion

RTV SLO archiving system allows strong tape library capacity expansion, data server for intermediate storage of archiving files bandwidth growth, capability of extracting and replication of the parts of the archive, exporting data cartridges to other compatible tape libraries or standalone device.