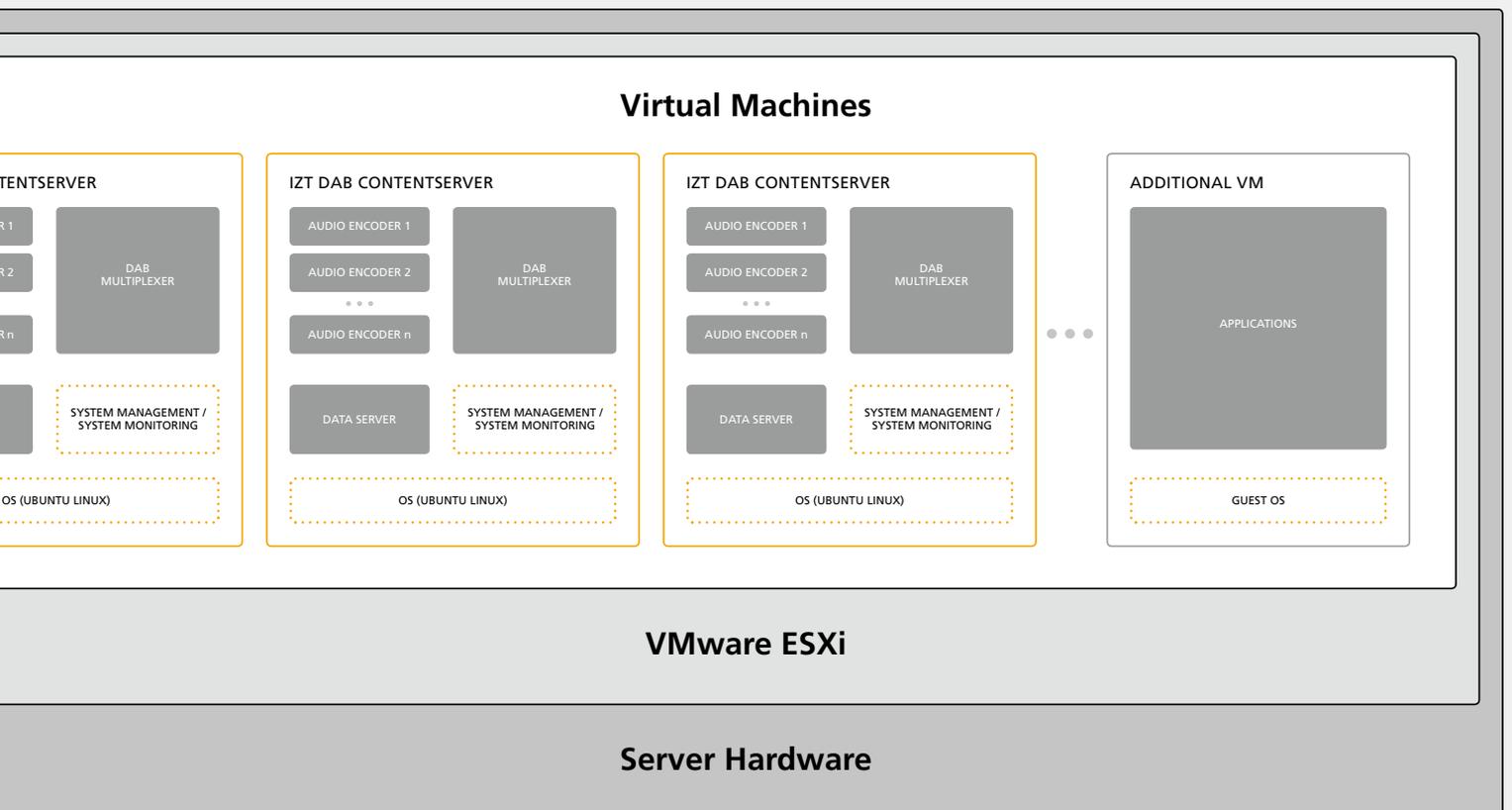


IZT DAB ContentServer

Virtualizing DAB Head-ends



- DAB Multiplexer Systems in IT Data Centers
- VMware ESXi as hypervisor
- Reliable operation and monitoring



Virtualizing DAB Head-ends

The DAB ContentServer technology is pioneer in moving broadcast equipment from dedicated hardware devices to IT infrastructure. While the broadcast industry shows an increasing demand to migrate technical processes of production and distribution to standard IT servers, the IZT DAB ContentServer brings all prerequisites to be operated in virtual machines.

WHY VIRTUAL?

Broadcast infrastructures have become more and more IT-centric. Broadcasters and service providers benefit from harmonized infrastructure and connectivity – including flexibility regarding physical locations. An ongoing trend in the industry is virtualization, i.e. functionality is handled not by dedicated devices but by software applications being operated as a virtual machine on standard server hardware. Virtualization in a functional meaning makes it possible to operate and combine software applications on generic IT hardware platforms.

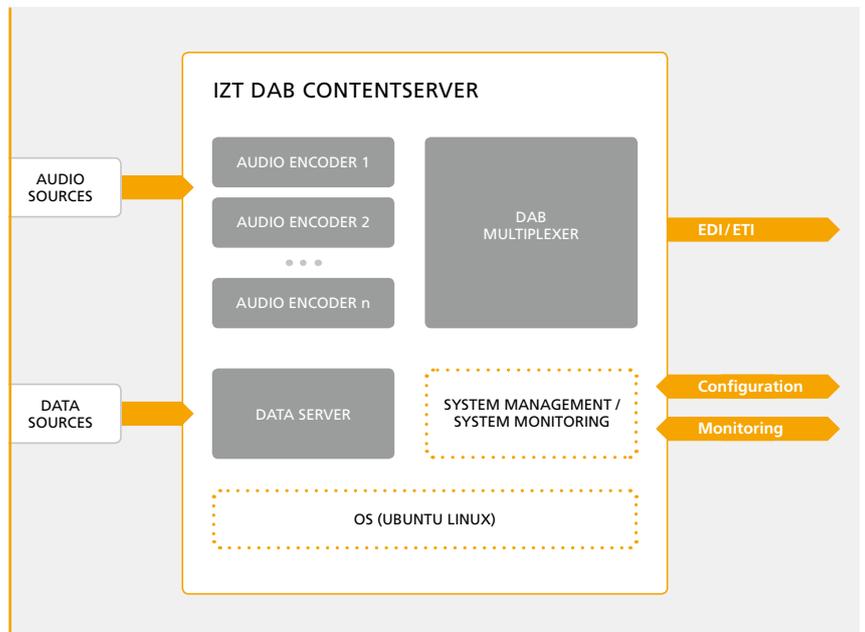


FIGURE 2: VERSATILE FUNCTIONALITY COMBINED: AUDIO ENCODING, DATA SERVICE HANDLING AND MULTIPLEXING



FIGURE 1: THE IZT DAB CONTENTSERVER IS OPERATED ON STANDARD SERVER HARDWARE

Traditional DAB head-ends were built using several dedicated devices for different purposes. In contrast, the ContentServer technology incorporates the functionalities of audio encoding, data service handling and multiplexing in one entity – including all configuration and monitoring capabilities. The software system is installed on a standard IT server, saving rack-space and energy costs as well as making it straightforward to replace defective or obsolescent hardware. There have been good reasons to operate each DAB ContentServer on dedicated server hardware, including:

- Well-known and -tested, controlled hardware environment
- Direct control over network interfaces and their performance with regard to accurate timing
- Hardware monitoring through the user interface including SNMP traps and other report features
- Uncomplicated trouble-shooting

While the ContentServer itself already incorporates all essential elements of a DAB head-end in one system, using virtual machines makes it possible to operate multiple instances of the ContentServer in one hardware. In consequence, virtualization can provide additional benefits:

- Cost savings (rack space, power consumption)
- Consistent, standardized infrastructure and connectivity to transport content
- Operate DAB head-end in centralized IT data centers
- Maintenance takes advantage of harmonized hardware
- Flexible restructuring of processes and applications and flexible reaction to hardware failures

In result, virtualization can help optimizing the infrastructure for DAB encoding and multiplexing. However, these processes require a permanent consumption of CPU, memory and network performance. Therefore, the gain in sharing capacities with other applications to facilitate peak demand is limited.

SETTING UP A VIRTUALIZED DAB HEAD-END

IZT recommends using VMware ESXi as hypervisor. Each service or ensemble multiplexer requires a separate ContentServer instance. The ContentServer software system includes and integrates an operating system (Linux Ubuntu-based) which makes the installation as virtual machine straight-forward. Additional virtual machines can be installed, for example a web server or Windows system including the IZT DAB MultimediaPlayer and other software to analyze the EDI output streams of the ContentServer instances.

Running multiple Virtual Machines (VMs) on a single hardware requires careful considerations regarding the performance and network traffic – especially with respect to timing.

Operation and monitoring

IZT provides accordingly configured server hardware suiting the specific needs of a customer or consults customers in selecting and configuring their own hardware. Intensive talks with the IT department of the operator are advisable to ensure a stable and reliable integration of the system into the overall infrastructure.

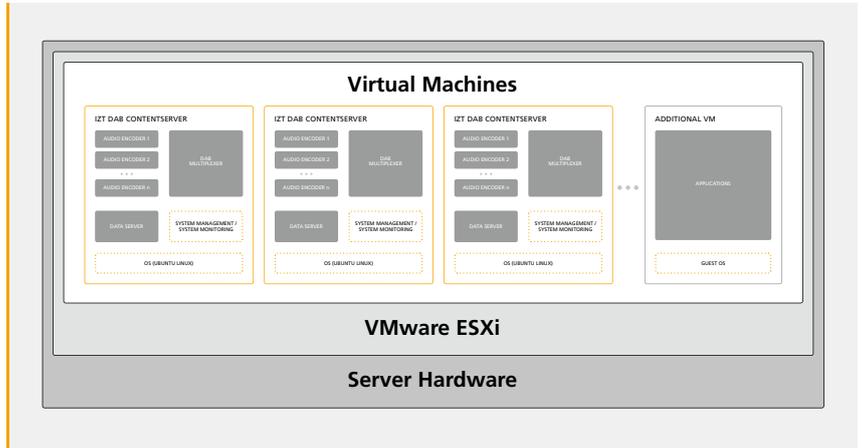


FIGURE 3: VIRTUALIZATION OF MULTIPLE DAB CONTENTSERVER INSTANCES UNDER VMWARE ESXI

VMware ESXi allows setting up the VMs and lets the operator configure physical and virtual network interfaces via a web interface. Each ContentServer instance of the setup can be accessed via its primary IP address. In addition, it is possible to use additional interfaces and VLANs, e.g. for EDI streams, Audio over IP or for different service providers.

The ContentServer and VMware ESXi support SNMP, making it possible to monitor the host system, the virtualization and the multiplexer instances being operated as virtual machines.

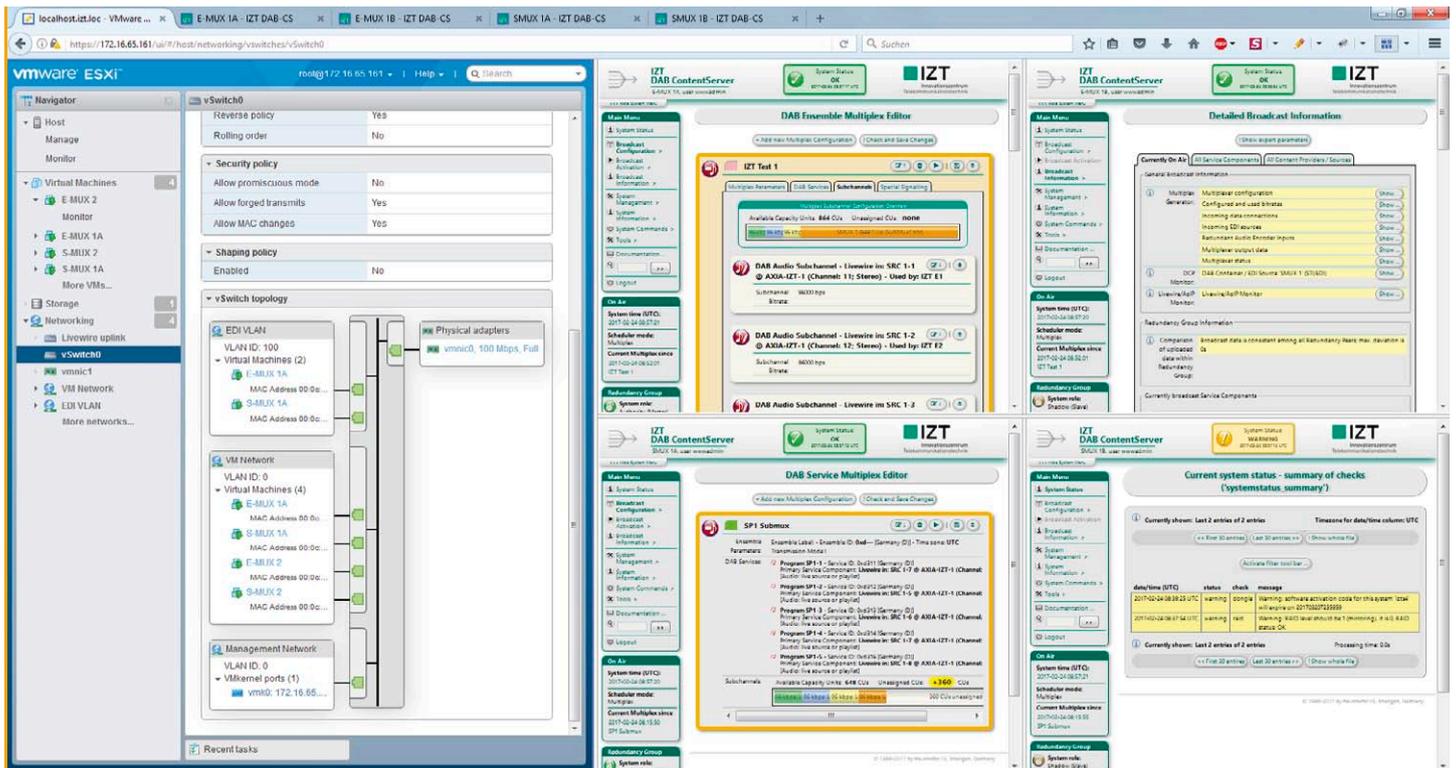


FIGURE 4: CONFIGURATION AND MONITORING IS POSSIBLE WITH A STANDARD WEB BROWSER FOR EACH MULTIPLEXER INSTANCE AS WELL AS FOR THE HYPERVISOR

Network load

It is important to regard the data rates of streams between virtual machines as well as streams over the physical network interfaces from and to the virtual machines' host. The following kinds of data streams have to be considered:

- Outgoing EDI/ETI streams to the transmitter network or redundancy switches
- EDI/STI-C and EDI/STI-D streams between service and ensemble multiplexers (virtual and/or external)
- Incoming and outgoing streams to maintain and monitor a redundancy group of multiplexers (external)
- Encoded audio streams for cross-redundancy between redundant multiplexers (external)
- Audio over IP for audio contribution to the multiplexer, e.g. Livewire, AES67, RTP etc. (external)
- Incoming data from service providers for PAD/data services
- Monitoring and control

It is useful to define separate VLANs and/or network interfaces, e.g. for different kinds of data streams or for different origins.

Timing and synchronization

It is essential to ensure synchronization of incoming and outgoing streams such as the incoming audio sources, feeds from service multiplexers and outgoing EDI streams. The ContentServer instances need to be synchronized to NTP.

While virtualization adds another element to the overall system which needs to be controlled with respect to synchronization, VMware ESXi provides adequate mechanisms to synchronize the host system as well as the virtual machines. IZT will carefully consider the complete synchronization scheme together with the customer.

Internal tools of the DAB ContentServer make it possible to monitor the timing of incoming and outgoing packets as well as buffers and will alert the operator in case of issues, e.g. via SNMP.



FIGURE 5: IT IS ESSENTIAL TO MONITOR AND CONTROL THE NETWORK LOAD AND TO ENSURE ACCURATE SYNCHRONIZATION



FIGURE 6: THE DCP MONITOR OF THE DAB CONTENTSERVER ALLOWS MONITORING OF INCOMING AND OUTGOING STREAMS



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