Reliable Fault Tolerant Storage Connectivity
R&S Virtual Storage Access (VSA)

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ROHDE&SCHWARZ

General Overview Rohde & Schwarz

History	Type of Enterprise	Globale Presence	Net Revenue	Employees	Success
▪ Established 1933 in Munich, Germany	Independent family owned company	▪ In over 70 countries, approx. 60 subsidiaries	2,09 Mrd. € (GJ 16/17)	11.000 worldwide	A leading international supplier in all of its fields of business

Business fields

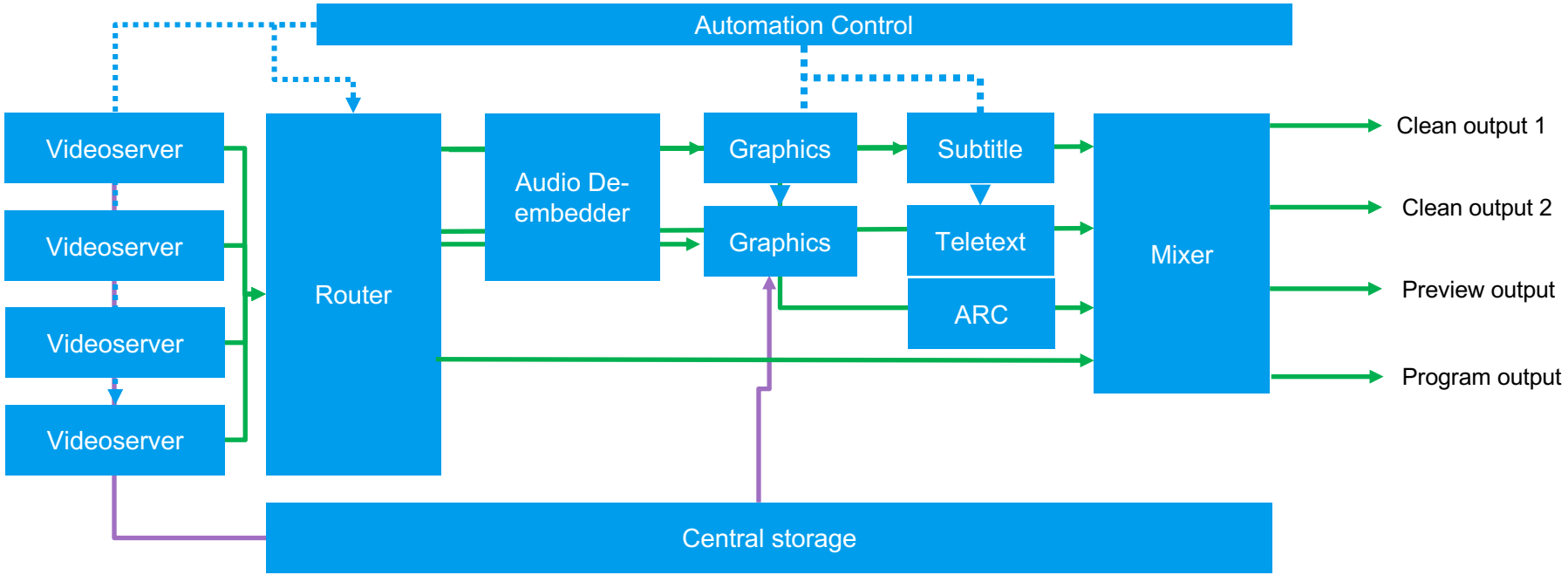
Test and Measurement	Broadcast and Media	Secure Communications	Cybersecurity	Radiomonitoring & Radiolocation
T&M instruments and systems for ▪ Wireless communications ▪ General purpose electronics ▪ Aerospace & defense applications	**Broadcast, T&M and studio equipment** for ▪ Network operators ▪ Broadcasters ▪ Studios ▪ Film industry ▪ Manufacturers of entertainment equipment	**Communications systems** for ▪ Air traffic control ▪ Armed forces **Encryption technology** for ▪ Armed forces ▪ Government authorities ▪ Critical infrastructures	**IT security products** for ▪ Economy ▪ Authorities	**Radiomonitoring equipment** for ▪ Regulatory authorities ▪ Homeland and external security ▪ Network operators **Radar intelligence systems**

Service

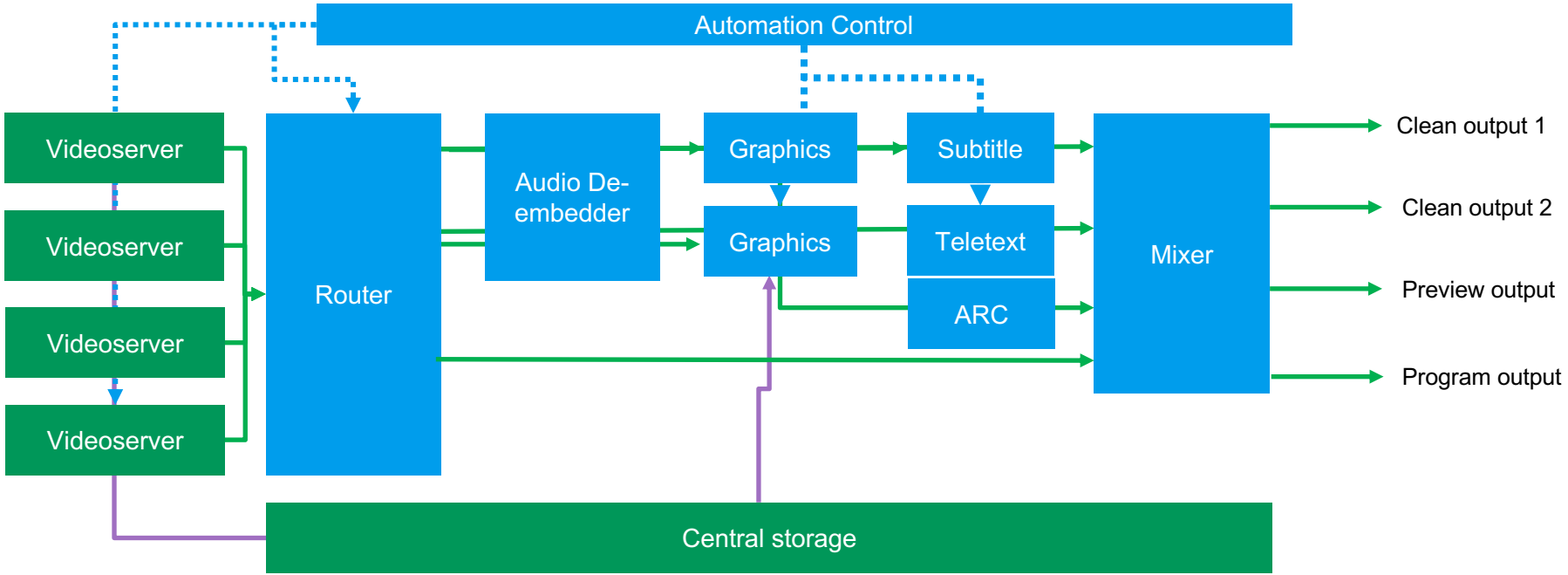
QPS 200

Master Control Chain within a TV facility

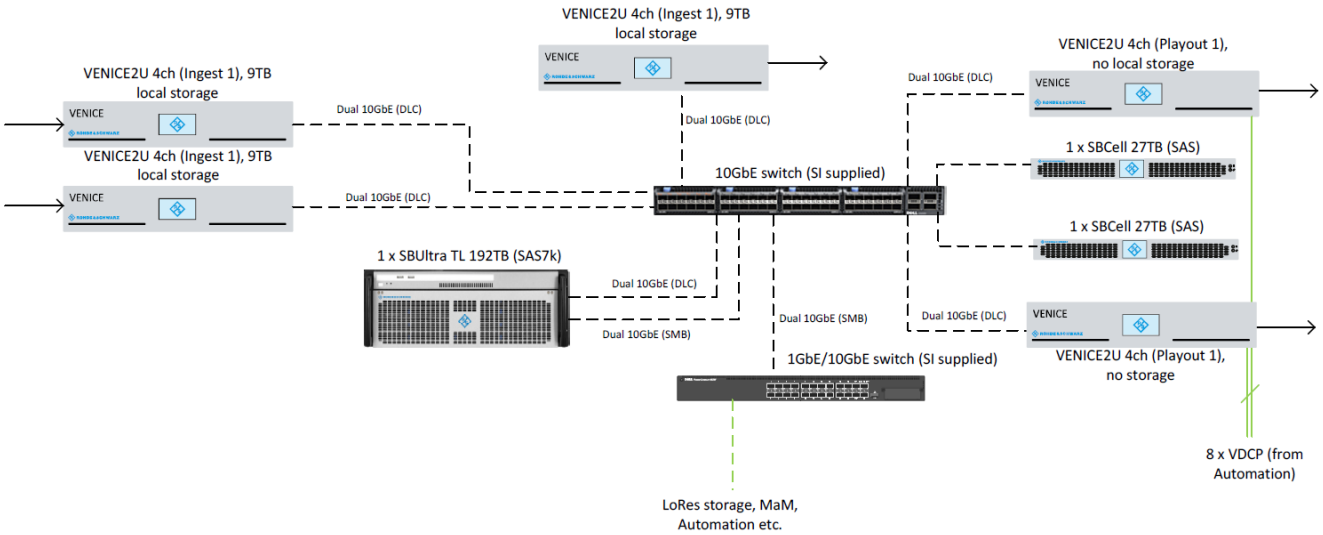
Master Control Chain within a TV facility



Master Control Chain within a TV facility R&S Components

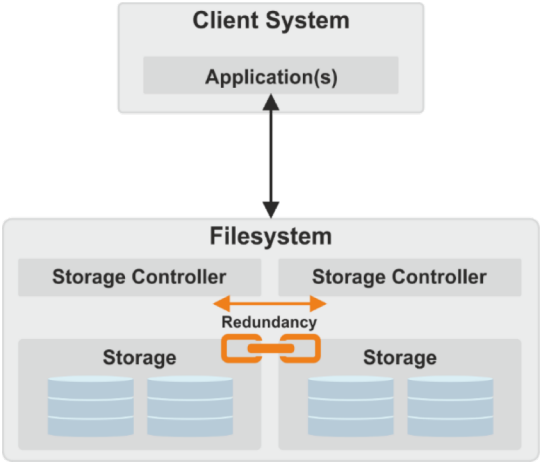


Application Channel Playout



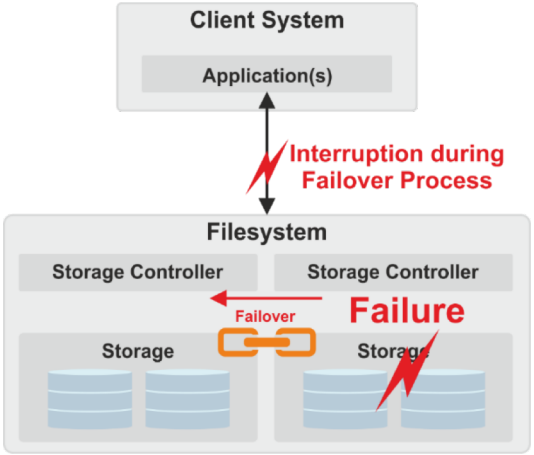
Typical Storage Redundancy

- Standard High-Availability Storage Configuration
  - Data Replication (by single file system)
  - Controller Redundancy
  - Hardware Failover Design



Typical Storage Redundancy

- Failure Scenarios
  - Failover takes time



Conceptual Issues arise from the Application itself

- Automation controls the Video Servers via Video Disk Control Protocol (VDCP)
  - Serial Communication
  - Conforms to the OSI Reference Model 1978
  - Is only aware of the next clip in the cue
  - Modern Socket Based Protocols behave similar

→If next Clip is as shorter than Failover Time result will be **Black On Air**

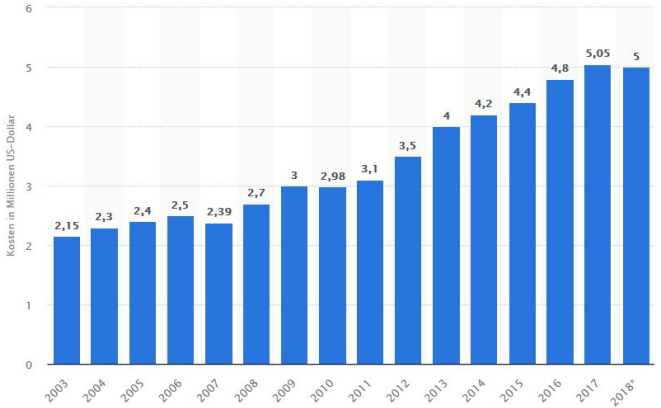
→Buffering is not a solution since Clips may be shorter than Failover Time

Black on Air

- Why are Black Frames on Air a Problem?
  - We don't like it!
  - It is expensive!
    - Advertising Private Broadcast (Germany) after 8pm
      - 30 seconds about **60.000**€
      - **2000**€/s
    - Advertising Sunday Afternoon Formula1 Race
      - 30 seconds about **150.000**€
      - **5000**€/s
    - Costs German Crime Movie (Tatort)
      - **17.000**€/min.

Black on Air

- Very Expensive!
  - Advertising during Super-Bowl Final (USA)
    - 30 seconds **5.000.000** US$
    - **166667**$/s
    - **5556**$/frame (1/30s, 33ms)
    - Costs Increasing



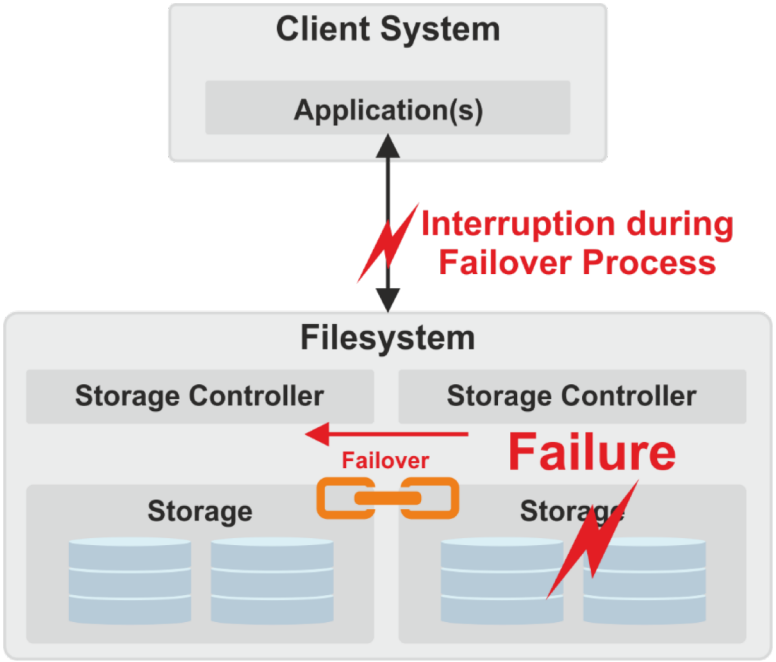
High Availability for Broadcast Environments - VSA

Requirements

- Non-disruptive data access during a failover event (seamless failover)
- Guaranteed bandwidth during any failure event
- Guaranteed max. latencies during any failure event
- Guaranteed performance in degraded mode

Standard storage solutions can provide mechanisms for High Availability configurations to cover failures **but they do not guarantee seamless data availability during a failover event!**

Standard High Available Storage Solutions - Failover



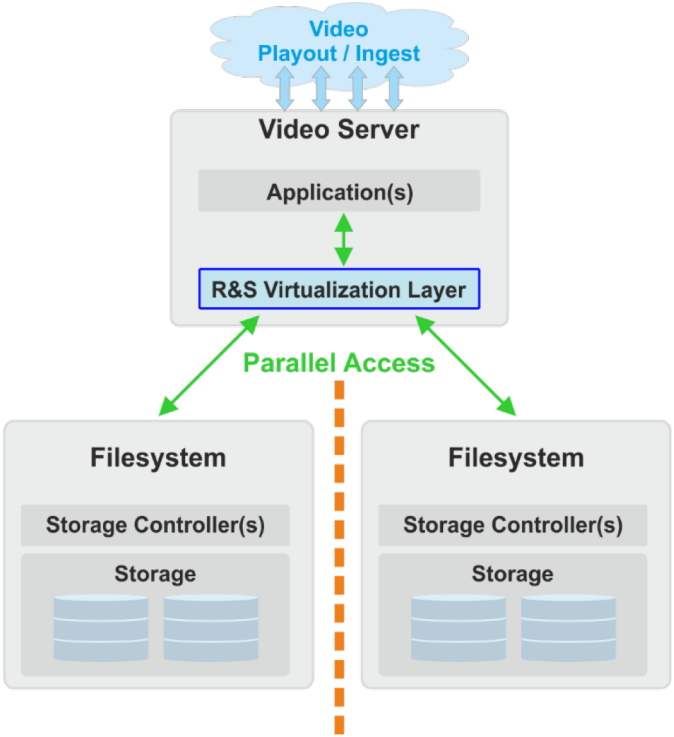
Blocking of all IO operations during failover process !

Failure Scenarios:

Controller: fail over to the second controller
takes ~30-60 seconds

Storage: exp. failed replication
takes ~8-30 seconds

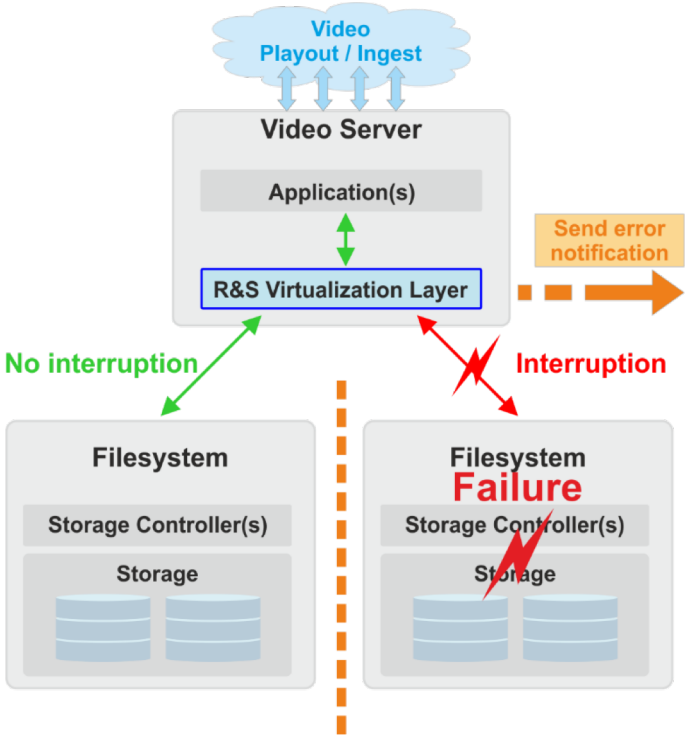
R&S Virtualization Layer



Storage Virtualization Layer

- Software component providing a virtualized storage access
- Usable with any application (standard file IO → no modification necessary)
- Non-Blocking Parallel File Replication
- Independent Storage Configuration

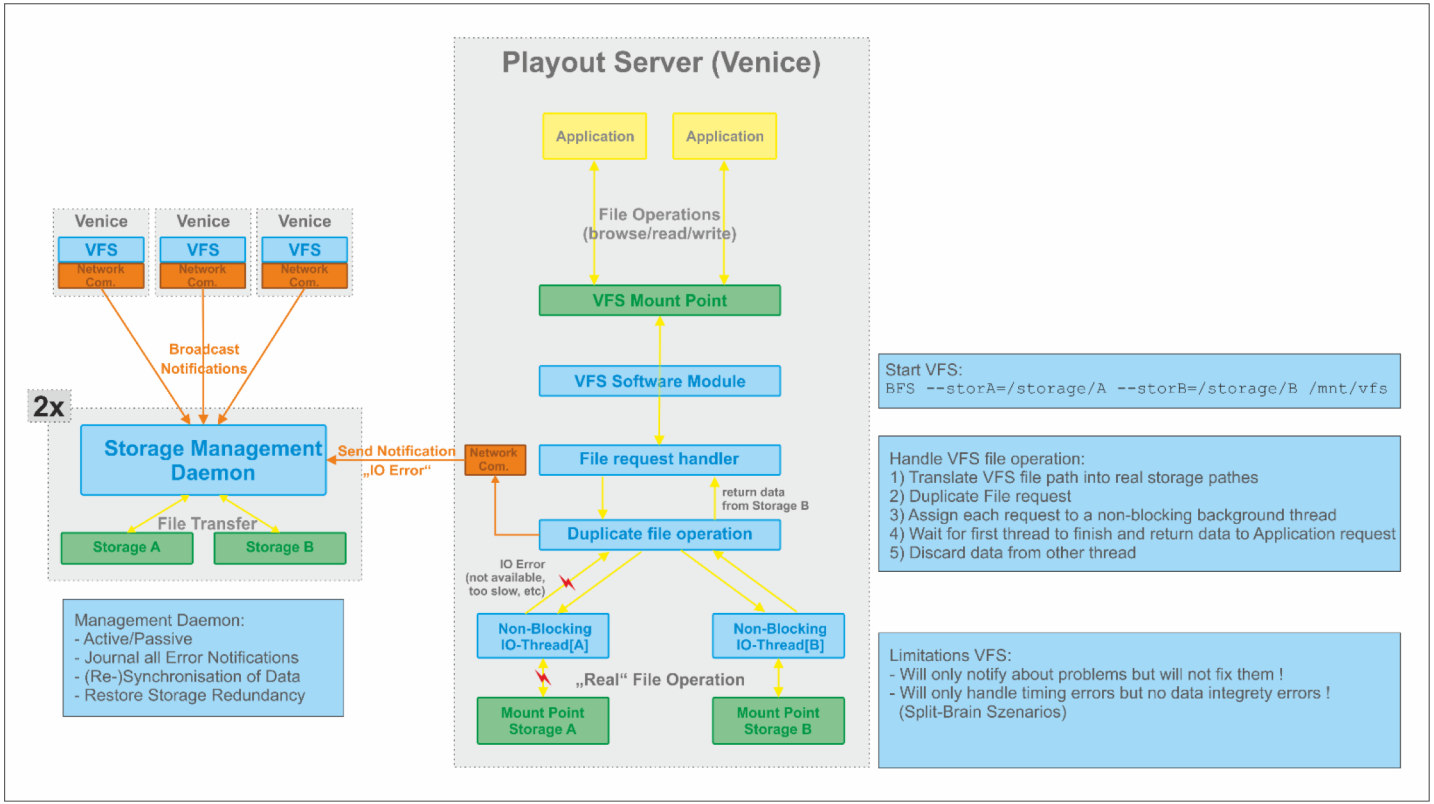
R&S Virtualization Layer - Handling of Storage Failures



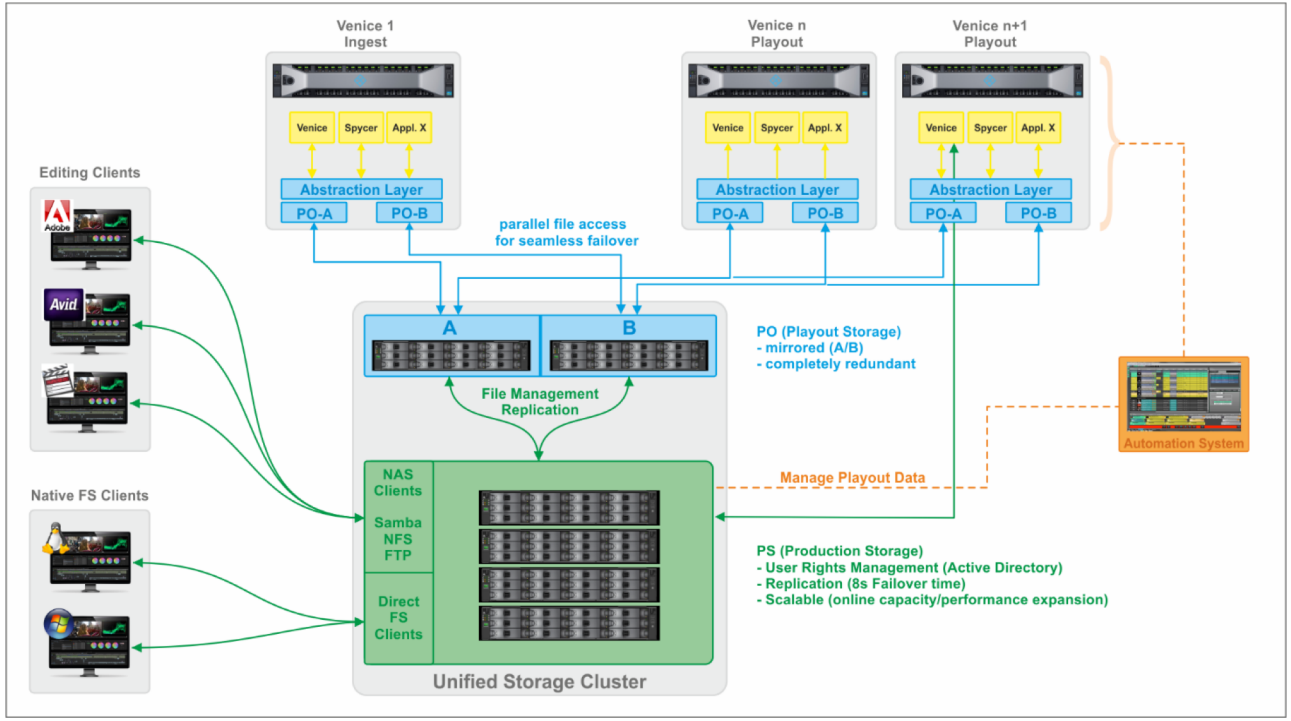
Errors and long latencies from one storage side got covered by the virtualization layer

- No interruption of running video transfers
- guaranteed response times
- completely parallel execution of all file system operations
- No failover process necessary
- Errors are forwarded to a central management service for later re-synchronization

R&S Virtualization Layer - Handling of Storage Failures



Example Configuration for Playout



Thank you …