



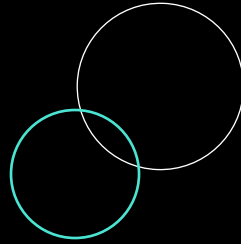
Nachhaltig skalierbare AV- Infrastruktur

Michael Rösch

Software-defined Broadcasting statt
Hardware-Overkill

Projektbedingungen

- ✓ Nachhaltigkeit
- ✓ Effizienz
- ✓ Skalierbarkeit



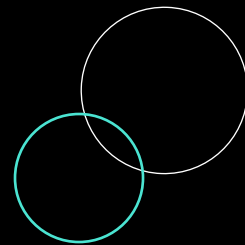
Das Projekt

- Der Kunde: Herstellende Industrie
- Neuer Geschäftszweig
- Neubau Campus mit Produktionsanlagen
- Viele Unbekannte (Nutzung, Randbedingungen)
- Technologiefirma: Lösung = Nachhaltig, Effizient, Skalierbar
- > „CampusTV“ und „Mission Control“



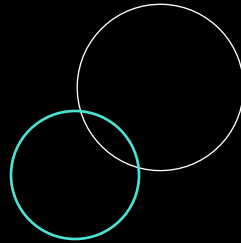
CampusTV

- Bespielung von Anzeigen mit Signalen auf dem Campus
- Live- und statische Quellen
- On prem / keine Cloud
- Große Anzahl an Quellen und Senken (70+)
- SW Applikationen als Quellen
- Genaue Zahl und Qualität unbekannt



Mission Control

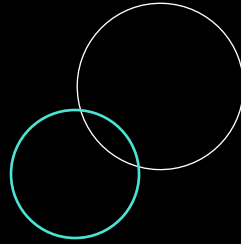
- Leitwarte zur Live-Überwachung
- Interoperabilität zu CampusTV
- Keine vorhandene Multimedia Infrastruktur
- Mission Critical mit Redundanzen
- Benutzerfreundlichkeit und Flexibilität



Hardware Hammer



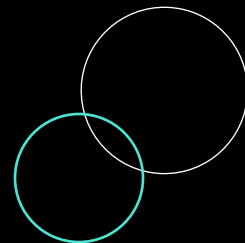
- 70 Client-PCs / Hardware-Decoder + separates Netzwerk
- VM Capturing?
- Orchestrierung von Quellen und Senken?
- Überwachung Quellen und Senken?
- Erweiterung bei Wachstum?
- Energieeffizienz?



Software als Rettung



- Software-defined = IP-Video Network
- Ein System für alle Anforderungen!
- Digital-Signage bis High-End-Visualisierung
- Intuitive Steuerung für fachfremdes Personal
- Anpassbar und Effizient



Technology Stack

- Quellen: VM, NDI, NDI-HX, UDP, ...
- Senken: Android, Three10X
- Processing: Sienna Processing Engine, Sienna Router
- Tech Stack: NDI, SRT, NVENC, HEVC, Dante, ...

Systemarchitektur



Sienna Engine & Router

Proc Amp
Proc Amp/Color
AES67 To NDI
AES67 Sender
PTV2 Reader
RTP Audio in with SDP
Audio Limiter
Audio Splitter 4Ch
Audio Splitter 8Ch
Stereo Splitter 4Ch
AEC
Audio Selector
Audio Input
Audio Output
Sync Delay
Bugs Audio Inserter
Distribution Amp
Audio Embedder
Audio Embedder Lite
Failover Switch
Frame Sync
Downstream Keyer
Picture In Picture
NDI Analyser
Up Down Converter
WebIRK
Audio DeEmbedder
Audio Delay
SAP Publisher
IP Stream Connect
NDI Distribution
NDI Source Connect
Signal Generator
UDP Streamer
RTSP Streamer
Loop Video Player
MultiViewer 2x2
YouTube Live
Facebook Live
Restream.io
RTMP Streamer
NDI Monitor
Waveform Monitor
SRT Transmitter
SRT Receiver
SRT Reflector
Dynamic DNS
Mumble Server
Graphic EQ
Rotate Image
Compressor
NDI to ReStream

MIB Recorder
EMB Module Support
Mumble Link
MIDI Interface
MultiViewer 4 Pro
MultiViewer 4 Pro UHD
MultiViewer 9 Pro
MultiViewer 9 Pro UHD
MultiViewer 10 Pro
MultiViewer 16 Pro
MultiViewer 17 Pro
MultiViewer 18 UHD
Source Multiplexer
Source Multiplexer Stereo
Mapping Mixer
Meterbridge
XDCMHD Recorder
AVC100 Recorder
NDI Recorder
ProRes Recorder
ProRes 4444 Recorder
Animation Recorder
Media Player
Profanity Delay
CG Engine
Media 2D Clock
Studio Clock
Text Ident
OB Vision Mixer
AI Mix
Alpha Embedder
Alpha Extractor
2D DVE
Metadata Engine
Virtual Camera Crew
Chroma Key
NDI Intercom Server
NDI Compliance Recd
UDP Compliance Recd
p5f to Interlaced
Interlaced to p5f
Prograde to Interlaced
Video Splitter 2x2
Video Splitter 3x3
Video Splitter 4x4
NDI to SRT
SRT to NDI
SiennaLink TX
SiennaLink RX
SiennaLink WB
Motion Detector

GPI over NDI
Audio Embedder 2
Failover Switch 2
Artnet-DMX
Multicast DA
HX2 DA
Timebase Corrector
Sense Destination
QRCode Detector
TimeLapse Strobe
NDI CC Decoder
CC Renderer
Vectorscope
Luma Waveform
RGB Parade
Histograms
CIE Scope
Audio Vectorscope
Contribution Manager
Portrait Fix
Logo Remover
DeInterlace
RTSP ReStreamer
HLSEngine
HLSEngine Easy
HLSEngRepack
Media 2D Clock
RTMP Target
TCP Relay
UDP Relay
RST Receive
RST Transmitter
Tailnet TX
Timeline RX
Tally Engine
Metadata Merger
Node RED Integration
Long Delay
IP Connect v2
IP Connect v4
MakropSF Decoder
Freeze Alarm
SyncBridges(m)
EBUR128 / CALMM Meter
EBUR128 / CALMM om
Sienna UNITE
Stream Link
IP Inserter
PTZ Joystick
ColorSpace
TS Encoder Pro
Alpha Tile

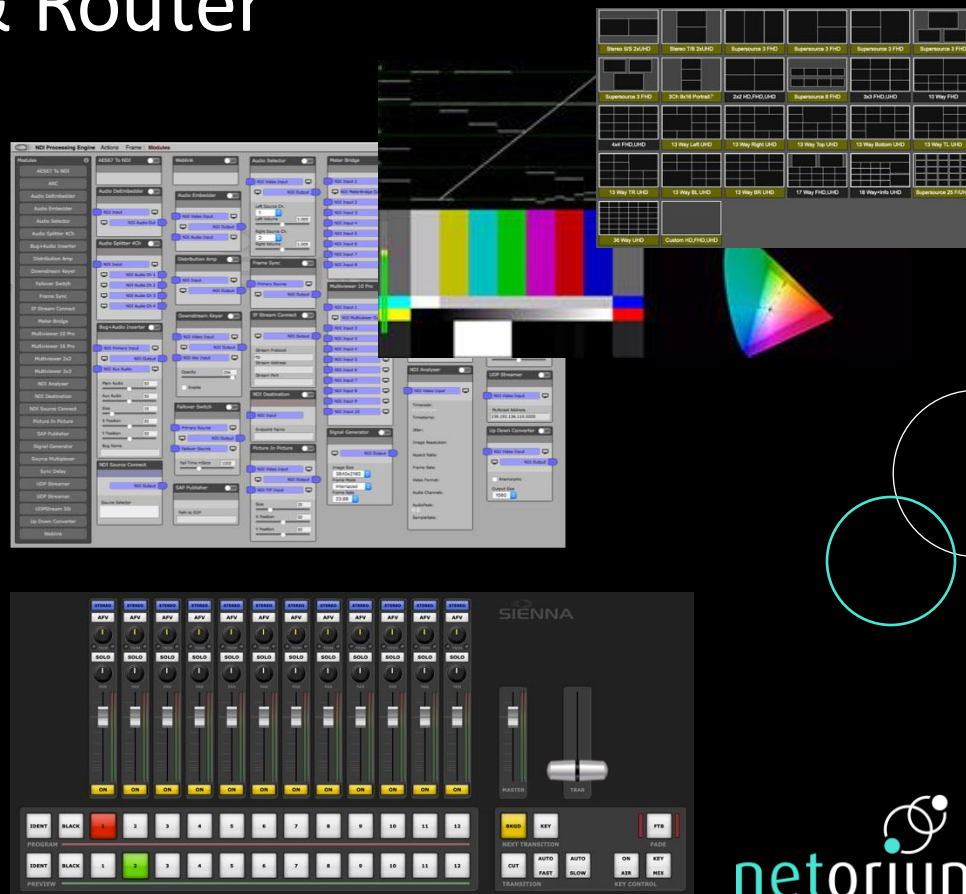
RTP Wrapper
Module Status
Audio Mixer 8Ch
Audio Mixer Pro
Icecast Server
Icecast Streamer
WAV Recorder
TC Window Burn
Up Down Convert Pro
Portrait Tile
Group Destination
Media Playlist
Surround Test Stream
YouTube Live SRT
Firewheel DA
Metrics Logging System
RD Module
AWS QD Integration
Jitter Scope
TS NDI SCTE35
SCTE35 ChangeOver
TS NDI SCTE104
SCTE35 Inserter
SCTE35 Trigger
TS Analyser
TS Analysis Visualiser
RTP Relays 2x2-7
RTP Combiner 2x2-7
NDI over SRT
DTMF Decoder
HLSEngine Multi
HLSEngine SDP
UDP Reflector
8K to UHD
Alarm Panel 2x2
Redundant Destination
Metadata Engine Pro
2D DVE Pro
TS Overlay
TS Proc Amp
PTV2 Server
IP Convert Quad
DVB Subsystem
TS Office Analyser
SyncFly(m)
NDI Connection Profiler
16Ch Audio PPM
SMPTE 12-10 IP Converter
NDI to SMPTE 12-10
Stream Repeater
TS Encoder Adv
MPFS Demux

NDI HXSD Distribution Amp.
Cue Player
MultiViewer 16 Advanced
SRT Monitor
MultiViewer 3
MultiViewer 2x1
Supersource 8
3D DVE
TS Metadata Toolkit
AES67 Sender Adv
64Ch RTP Audio over RST
64Ch RTP Audio over SRT
6/16Ch Multicast Player
NDI Analyser ADV
NDI to SDI
NDI to SDI Fill and Key
SDI to NDI
NDI Quad Node Gateway
NDI Matrix Controller
3D LUT
SynCheck Analyser
TS Encoder GPU
RTMP Encoder GRU
DNxHD Recorder DUO
CleanSwitch DA
Virtual VTR IP
Bendix SRT TX / RX
Unicast DA
IP Connect SRT
Audio Packetizer
Stream Normalizer
Unicast AD V
Fall Reset
Fill and Key Encoder
TS Transcoder
Audio Selector TS
AWS Kinesis Video
AWS Transcribe
AWS Transcribe Ticker
Enhance Video
Event Timer Engine
Fill / Key to MPFS
WebRTC Monitor
TS Remux
Dante Ready
Video Noise Filter
AI Audio Filter
Vision Mixer Advanced
Ingress Control IP
...

Sienna Engine & Router



- Source Registration
- IP-Resync
- Stream-Sync
- Failover
- Format Correction
- Audio-Video Operations
- Routing
- Preview
- Techn. Analysis
- MPEG-TS Encoding



Command Center VM

Client: Registration & Status

The screenshot displays the 'Client: Registration & Status' interface. At the top, there are tabs: Matrix, TVs, Netzwerk & Gebäude, TV-Steuerung, Logs, Benutzer, and Heartbeat. The 'Matrix' tab is selected, showing a red header with 'F5F6F7' and '34 Clients'. Below this, there are six panels, each representing a TV. Each panel shows the TV's IP, MAC, and a Sienna logo. The first panel is labeled 'ITTV' and shows a green status bar with a play button. The other five panels are labeled 'TV' and show a green status bar with a play button and a power button.

Video Server: Monitoring & Scheduling

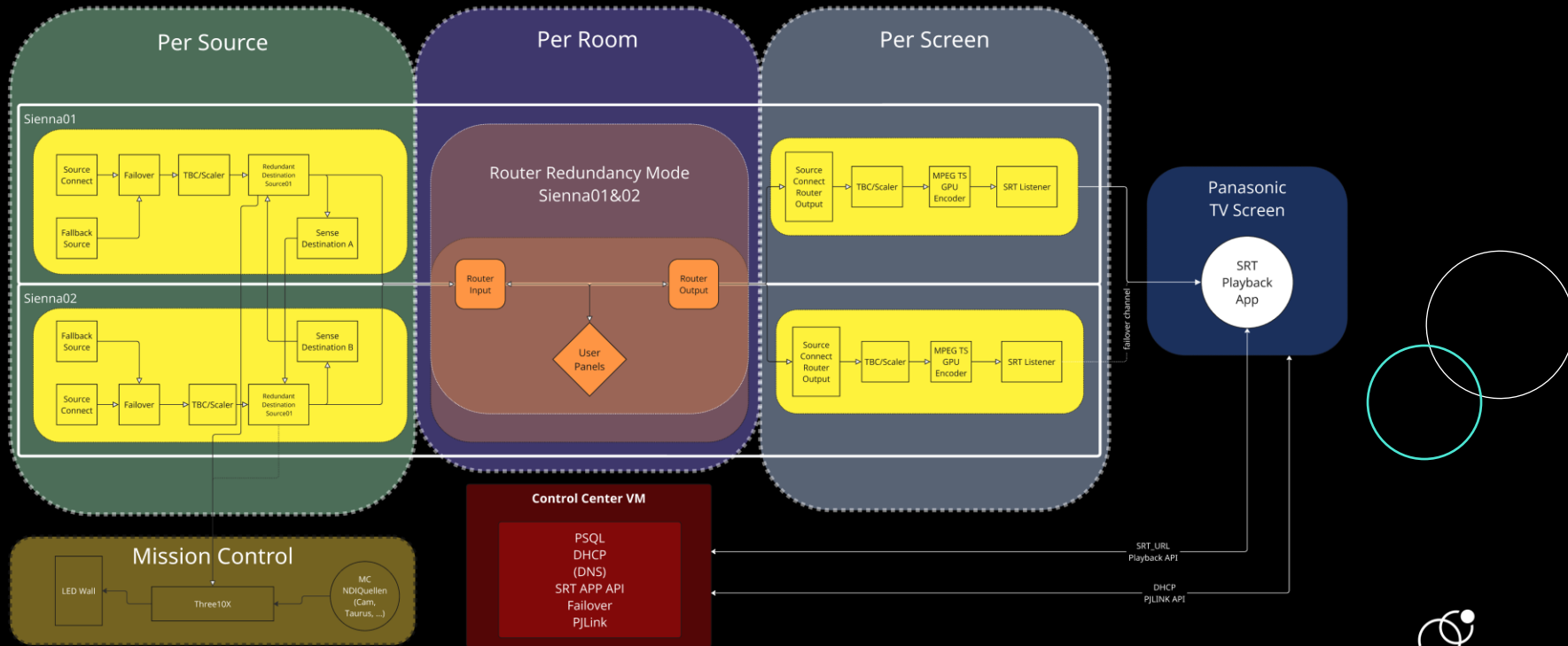
The screenshot displays the 'Video Server: Monitoring & Scheduling' interface. At the top, there are tabs: Matrix, TVs, Netzwerk & Gebäude, TV-Steuerung, Logs, Benutzer, and Heartbeat. The 'Heartbeat' tab is selected, showing a red header with 'Sienna Server Heartbeat-Monitoring'. Below this, there are controls for 'Heartbeat Service Modus' (An, Standby, Aus) and a status indicator 'Lauf'. A section titled 'Heartbeat Service Status' shows 'Überwachte Channels: 3'. Below this is a table titled 'Channel Status' with columns: Channel, Status, OS, Sienna Router, Letzte Prüfung, Fehler in Folge, Clients, and Aktionen. The table contains three rows of data. At the bottom, there is a section titled 'Aktive Failover-Prozesse' with the text 'Keine aktiven Failover-Prozesse' and a button 'Status aktualisieren'.

Channel	Status	OS	Sienna Router	Letzte Prüfung	Fehler in Folge	Clients	Aktionen
Verfügbar	Verfügbar	✓	✓	30.10.2025, 17:23:13	0	34	🔍 Prüfen ⚙️ Failover
Verfügbar	Verfügbar	✓	✓	30.10.2025, 17:23:13	0	0	🔍 Prüfen ⚙️ Failover
Verfügbar	Verfügbar	✓	✓	30.10.2025, 17:23:13	0	0	🔍 Prüfen ⚙️ Failover

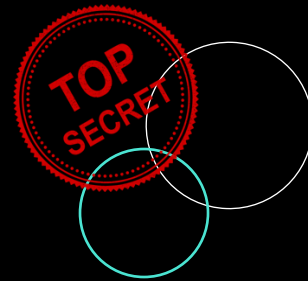
Screen Monitoring: Playback & Screen Power

The screenshot displays the 'Screen Monitoring: Playback & Screen Power' interface. It shows a table with columns: Hostname, MAC-Adresse, IP-Adresse, Player Status, Player Details, Channel wählen, Preview, and Aktionen. The first row is for 'ITTV'. The 'Player Status' column shows 'Wiedergabe' (Playback) and a button 'Status abfragen'. The 'Player Details' column shows 'Wiedergabe | srt://', '2377 kbps', '100%', '0ms', and '3MB'. The 'Channel wählen' column has a dropdown menu. The 'Preview' column shows a video player with a play button and a power button. The 'Aktionen' column has a button 'Bearbeiten'.

Failover

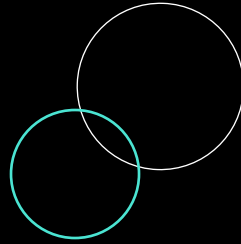


Use Case: 8K Mission Control

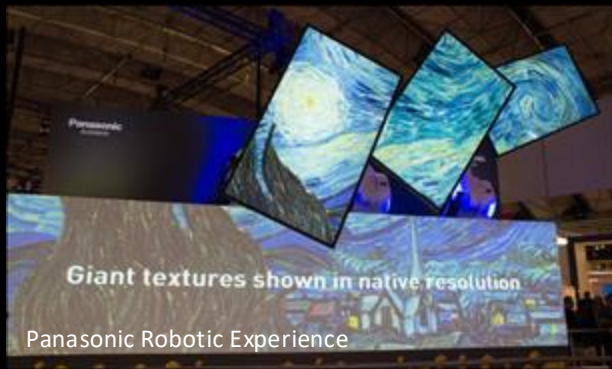


Use Case: 8K Mission Control

- Anwendung: Zentrale Überwachung und Steuerung Live-Vorgänge
- Remote Meetings und Events
- Integration: Nahtlose Verbindung mit den Quellen aus dem CampusTV
- Flexible Anordnung auf der großen LEDwall

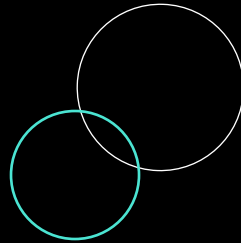


Use Case: 8K Mission Control



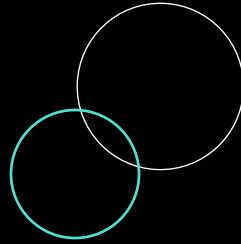
Three10X - Aufgaben

- Verwaltungsebene für Nutzer, Projekte, Assets
- Querverbindung zu CampusTV Quellen
- Room-Connector: Licht-, Ton- & Raumsteuerung
- Intuitive Bedienung: Eine Oberfläche, keine Schulung
- Pixel-Prozessor, X-Creator, X-Manager



Projektbedingungen

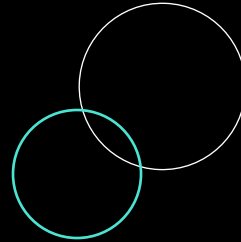
- ✓ Nachhaltigkeit
- ✓ Effizienz
- ✓ Skalierbarkeit



Mission Erfolgreich!



- ✓ Ein System, alle Formate: HD bis 8K aus derselben Infrastruktur
- ✓ Gleiche Hardware-Basis - unterschiedliche Anwendungen durch intelligente Software!
- ✓ Zukunftssicher: Neue Features via Software-Updates
- ✓ Vermeidung von lebenszeitbegrenzten Geräteinvests





Danke für die Aufmerksamkeit!

