

NDI in the Master Control Room

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NDI In Master Control

- The NDI protocol was developed for production
 - Most of the use of NDI in the world is on production
 - Cameras, video mixers are the biggest users of NDI
- BUT
- We understand that it's perfect also in the Master Control Room
 - And I will try to share my experience



NDI

- NDI stands for Network Device Interface and is developed by NewTek (Today part of VIZRT)
- NewTek announced NDI in 2015, and the protocol was made available for public use early 2016
- NDI allows multiple video systems to identify and communicate with one another over IP.
- NDI is generationally lossless meaning that loss only occurs in the first generation of video and all subsequent re-compression steps in the NDI system are lossless.



NDI: network

- Use Standard network devices
- No special adapter or switch is needed.
- Can be used to any resolution up to 4K



Companies Supporting NDI

- NDI is supported by a wide range of manufacturers and developers of both hardware and software
- Here are a few of the major ones:
 - Etere
 - Adobe / Adobe Creative Cloud
 - JVC Professional
 - Panasonic
 - Evertz
 - LiveU
 - BirdDog

NDI Bandwidth

Video Format	Max Bandwidth
480i	20Mbps
720p	90Mbps
1080i	100Mbps
1080p	150Mbps
2160i	250Mbps
2160p	400Mbps

Common challenges





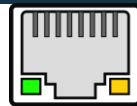
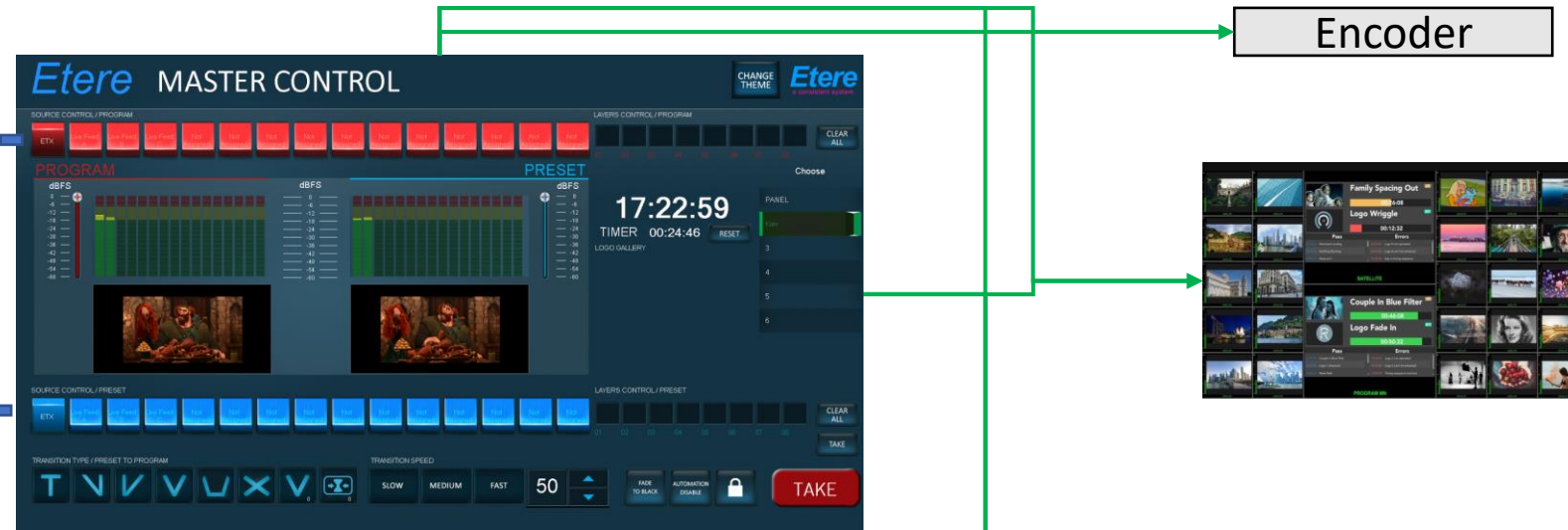
Challenge N.1 → Bandwidth

- Bandwidth use can explode if you send the same video to a lot of destinations (one HD is 100MB to 10 Destination is 1000GB)

NDI Bandwidth Problems

Program

Preset



100
200
300
400
500
600
700



Solution - Planning

- Avoid unnecessary connections
- Plan connection carefully
- Use Lowres option for signal monitoring
- Privilege 10GB networks even for HD signals

Challenge n2 Switch

Main Playout

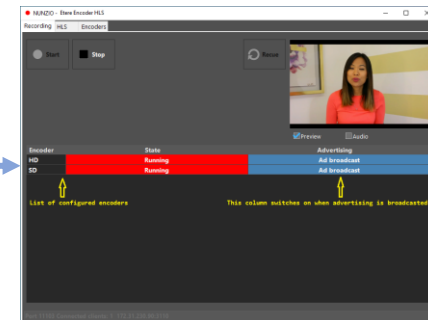


Backup Playout



Video Change Over

Live Encoder



Main/Backup NDI

Main Playout

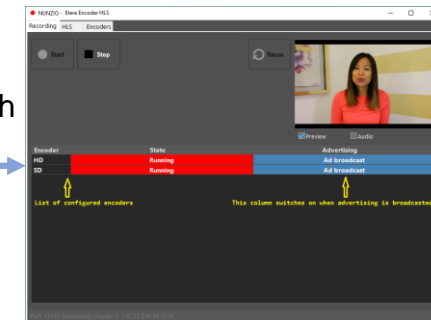


Main NDI Indicate the name of backup NDI

Backup Playout



Live Encoder



Receiver switch Automatically



Challenge n 3 Routing in NDI

- In NDI every video signal has a Name
- To connect the receiver must connect with that stream
- The receiver can interrogate to have the list of streams available
- Receiver can choose the to connect in Full resolution or in monitor mode



Stream
Name

Etere MASTER CONTROL

CHANGE THEME

Etere
a consistent system

SOURCE CONTROL / PROGRAM

ETX

Live Feed A

Live Feed B

Live Feed C

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

LAYERS CONTROL / PROGRAM

01

02

03

04

05

06

07

08

CLEAR ALL

PROGRAM

dBFS

0

-6

-12

-18

-24

-30

-36

-42

-48

-54

-60

dBFS

0

-6

-12

-18

-24

-30

-36

-42

-48

-54

-60

PRESET

dBFS

0

-6

-12

-18

-24

-30

-36

-42

-48

-54

-60

dBFS

0

-6

-12

-18

-24

-30

-36

-42

-48

-54

-60

17:22:59

TIMER 00:24:46

RESET

Choose

PANEL

Kley

3

4

5

6

LOGO GALLERY

3

4

5

6

SOURCE CONTROL / PRESET

ETX

Live Feed A

Live Feed B

Live Feed C

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

Not Assigned

LAYERS CONTROL / PRESET

01

02

03

04

05

06

07

08

CLEAR ALL

TRANSITION TYPE / PRESET TO PROGRAM

T

N

V

V

V

X

V

0

0

TRANSITION SPEED

SLOW

MEDIUM

FAST

50

FADE TO BLACK

AUTOMATION DISABLE

TAKE

Stream
Name

Case Study: Mondo TV





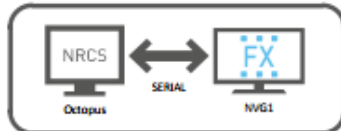
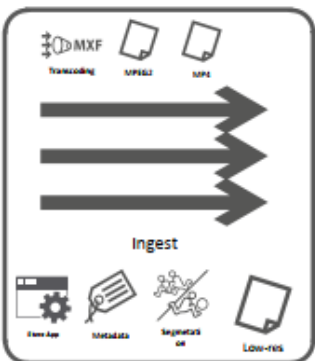
Case Study: Mondo TV

- Fully NDI based
- All incoming signals converted to NDI
- One of the world's largest solely NDI powered broadcasting systems



Case Study: Mondo TV

- A large scale broadcaster of Mondo TV
- Manages over 40 playout channels
- One All News channel
- 3 studios
- Multichannel ingest facility for incoming feeds
- Integrated editing via Adobe Premier
- Program archive and news archive
- Satellite and OTT output



VPK PRO



NDI

NDI

NDI

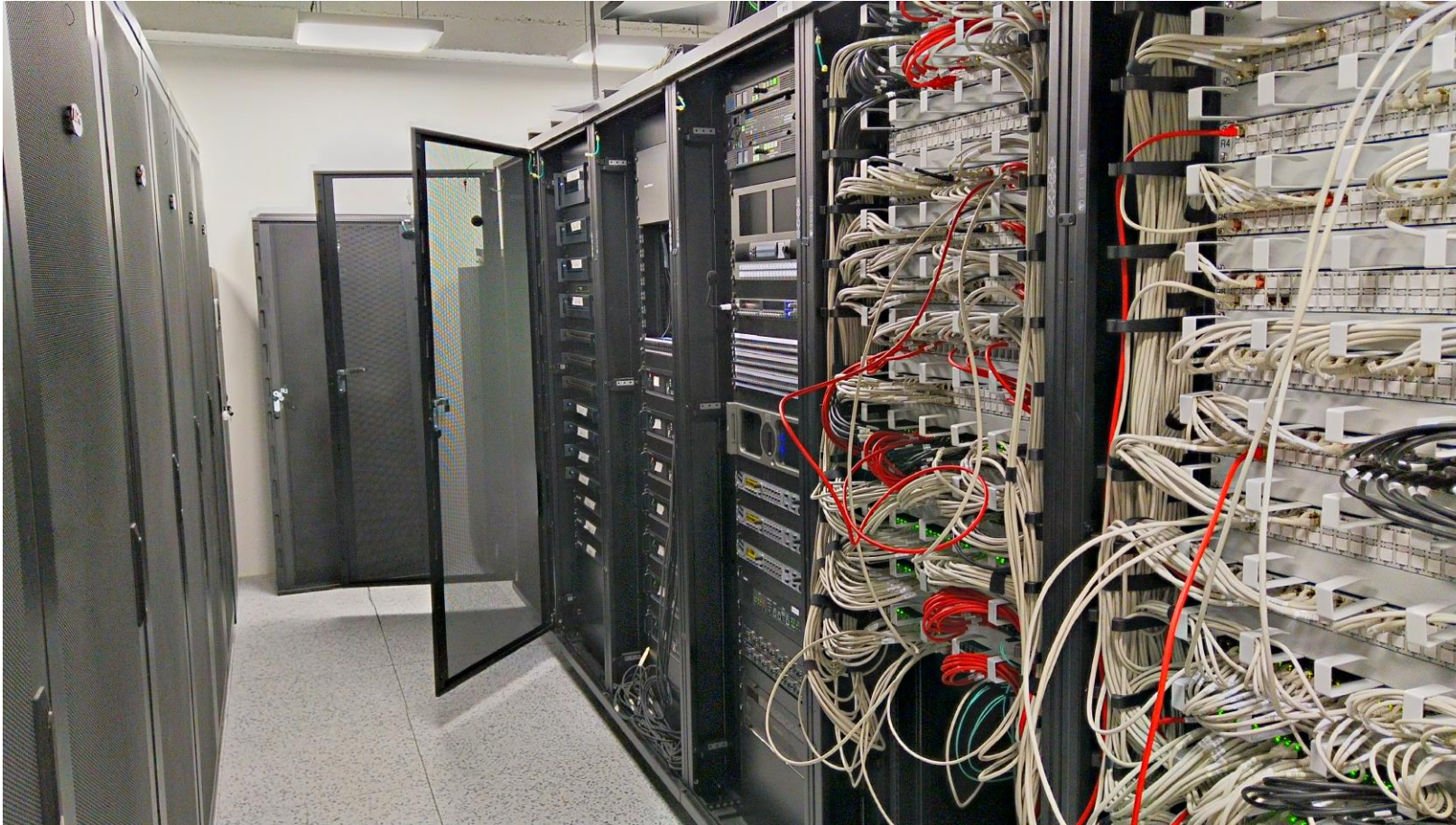
NDI

NDI

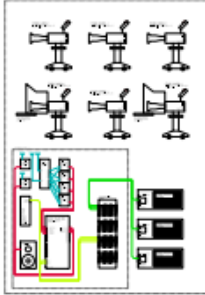
NEWS CHANNEL

SIMPLE CHANNEL

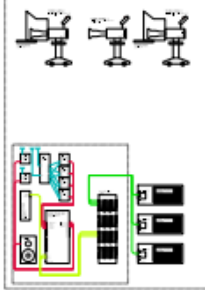
Case Study: Mondo TV



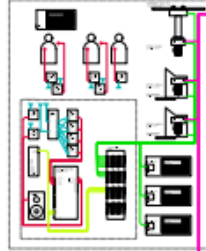
STUDIO 1



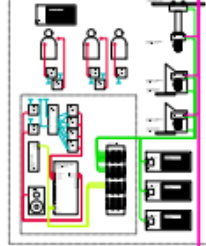
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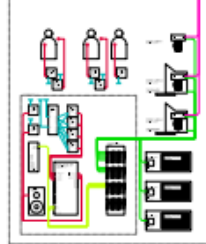
STUDIO 3



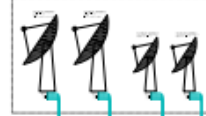
STUDIO 4



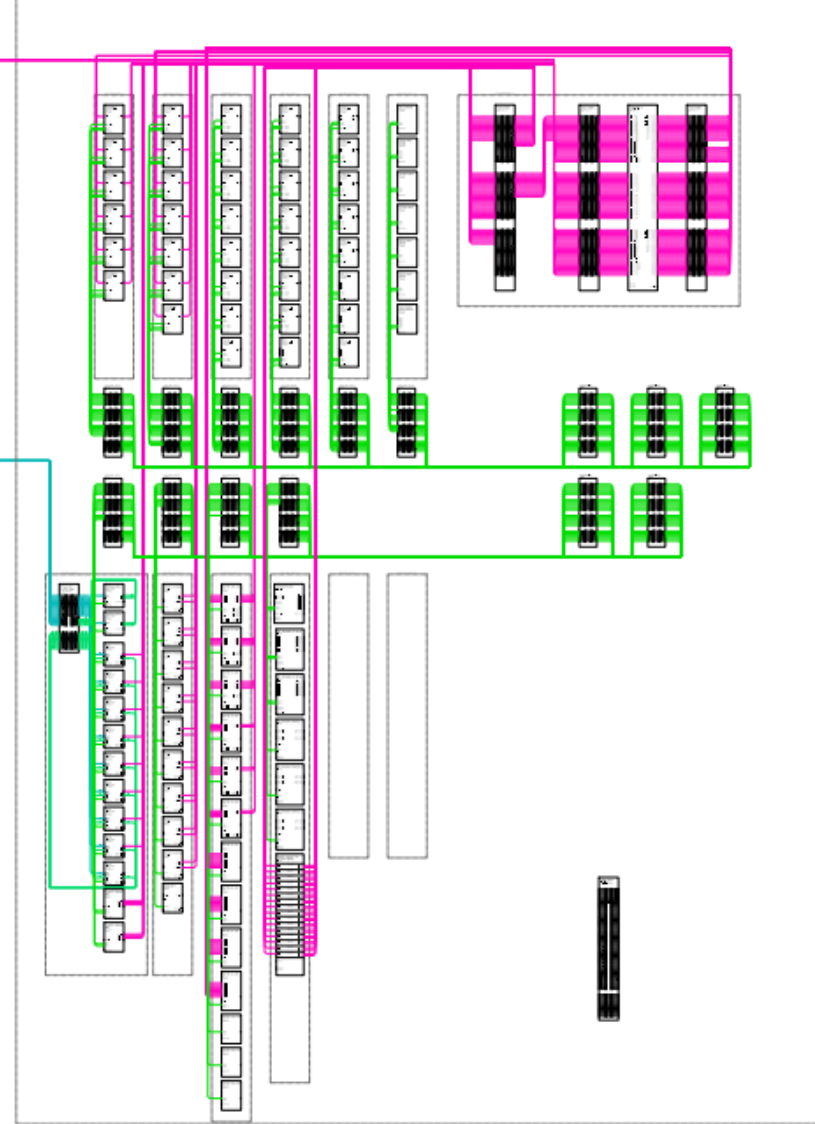
STUDIO 5



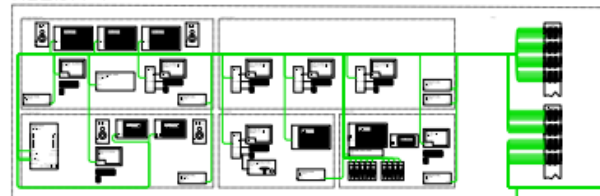
ROOFTOP



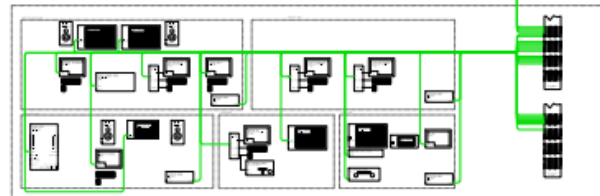
VTR POOL



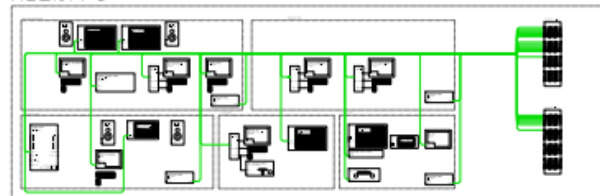
REZIJA 1



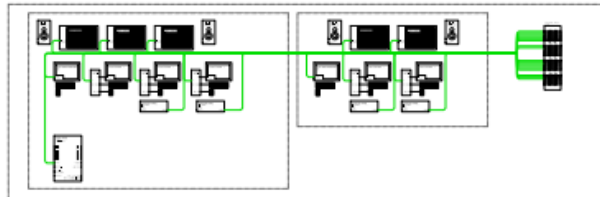
REZIJA 2



REZIJA 3



MCR



NLE PROMO



NLE NEWS/TV PRODUKCIJA



KOMENTIRNICE



Case Study: Mondo TV



Case Study: Mondo TV



NDI Video Monitoring

- Using native NDI monitor
- A Single station can control any video in the system without any additional cabling





Monitoring/Deliver

- To decrease the running bandwidth the delivery encoding is part of monitoring
- The software-based multiviewer provide both monitoring and encoding for the final delivery
- The advantage is a very compact and bandwidth efficient design
- For redundancy 2 multiviewer were used each one receive a redundant NDI signal

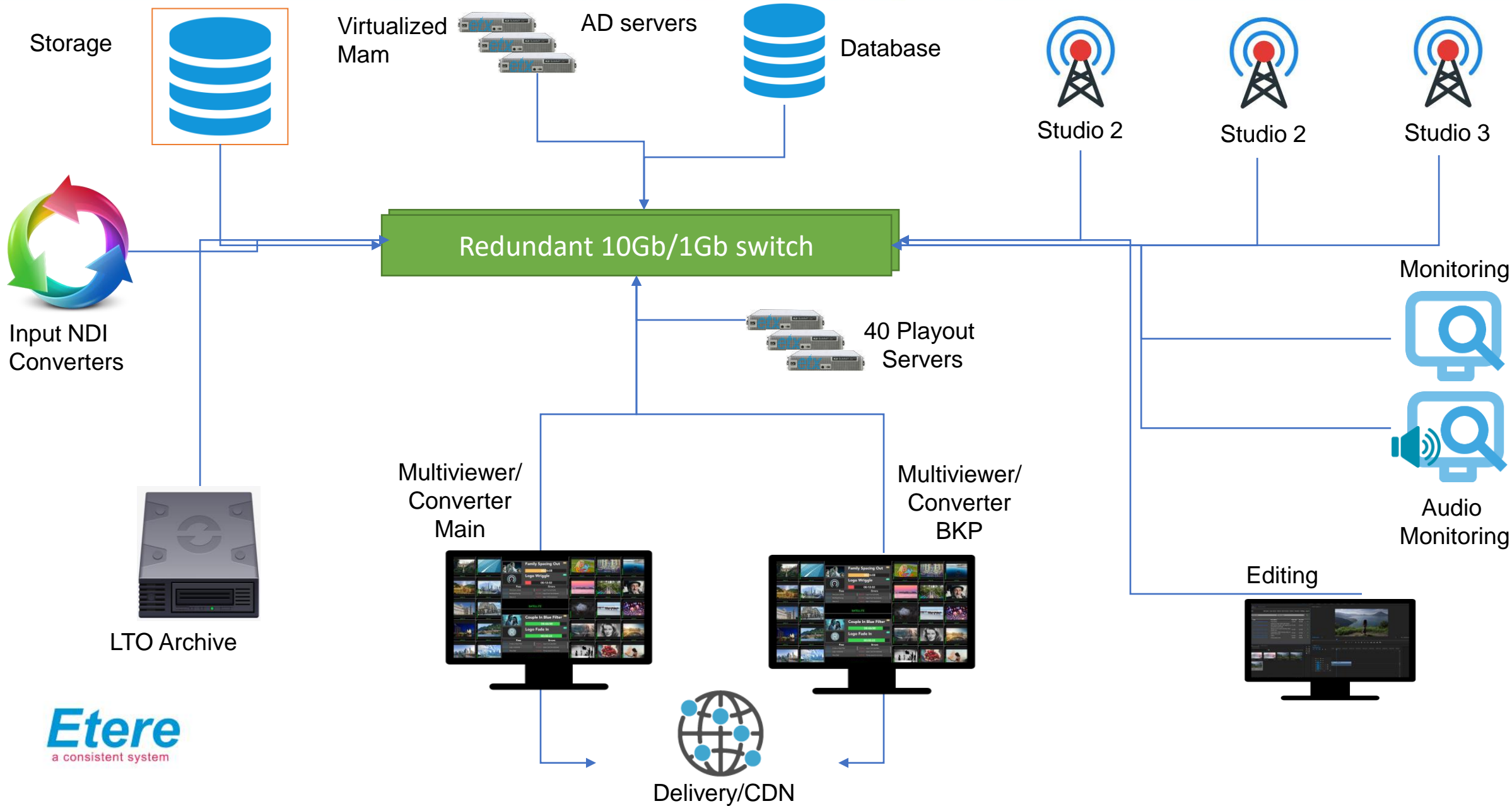
Multiviewer

Loudness Control

The Multiviewer interface displays a 4x6 grid of video feeds. The top two rows show various landscape and architectural shots, each labeled 'SATELLITE'. The bottom two rows show more diverse content, including a city skyline, a boat, and a person. The central area features two program windows. The top window, 'Family Spacing Out', has a duration of 00:26:08 and a 'Logo Wriggle' effect. The bottom window, 'Couple In Blue Filter', has a duration of 00:46:08 and a 'Logo Fade In' effect. Both windows show a 'Pass' status and a list of errors. The bottom window is labeled 'PROGRAM MN'.

Pass	Errors
22:18:26 Astronaut Landing	20:20:56 Logo 4 not uploaded
18:31:02 Earthling Running	20:19:02 Logo 4 can't be streamed
17:59:34 News at 6	19:40:34 Gap in timing sequence

Pass	Errors
15:18:26 Couple in Blue Filter	15:20:56 Logo 2 not uploaded
14:21:02 Logo 1 streamed	15:19:02 Logo 2 can't be streamed
13:40:34 News flash	13:40:34 Timing sequence incorrect



NDI Audio Monitoring

- This software panel allows easy audio monitor
- Similar to existing hardware audio monitor
- Smaller footprint than traditional systems
- Preview window for an easy management
- Immediate switch between signals





Small Problems Big problems

- When mondoTv was designed there were no NDI audio loudness processors
- To avoid an SDI or AES/EBU in/out the Loudness processor was integrated inside the playout system
- So every live and out were loudness normalized
- For a better audio design also the incoming files were normalized before playout if timing allows it



Mondo Tv summary

- Fully adapted NDI Master Control system
- Precise timing, seamless routing and monitoring
- Does not require any other IP protocols
- Greater cost savings
- Reliability
- Easy to expand/change

Thank You

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