

Experiential Case Study



**The Story of Illuminarium with UBEX
AV Solutions**



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1

Building Meaningful Relationships with Industry Professionals

Highlights from a recent user interview about the technical background of Illuminarium.

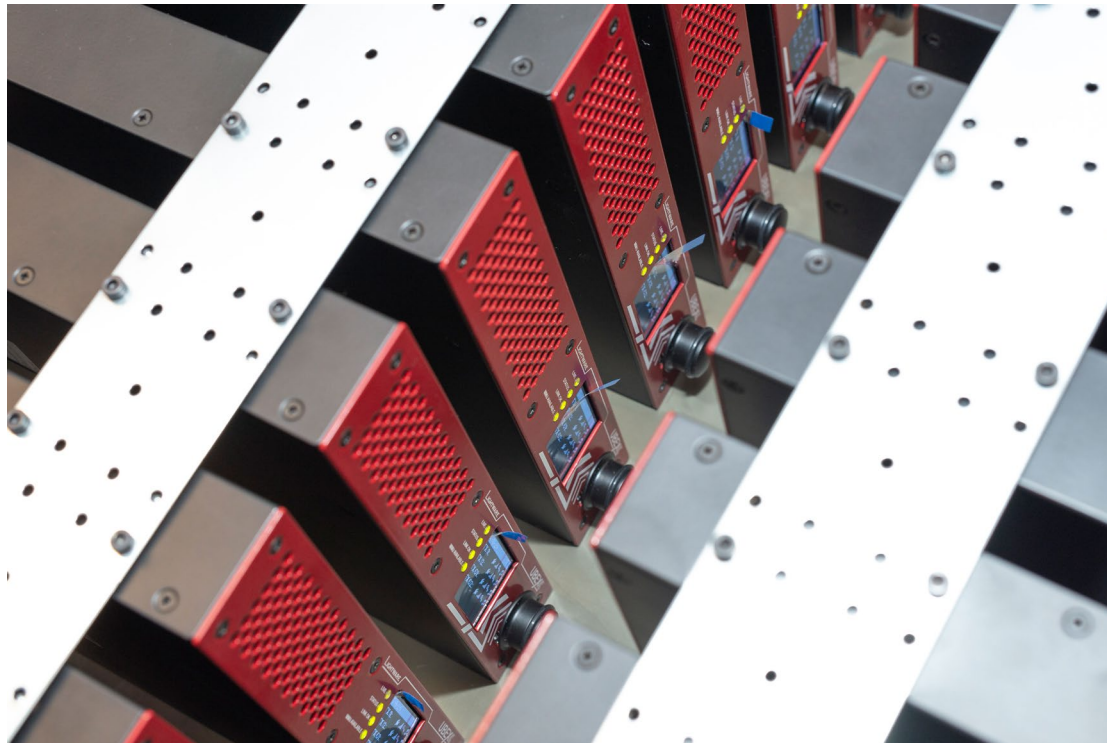
- ▶ [THE VOICE OF THE CUSTOMER](#)
- ▶ [BEHIND ILLUSIONS](#)

1.1. The Voice of the Customer

- What is the WOW-factor of UBEX, that made it appealing for the customer?

”Ferrari colours :) OK, seriously no loss, network based, integrates with media servers, and it's fiber of course.”

That was a part of the answer for a question on the user interview in May of 2021.



Testing of the Illuminarium UBEX system at Lightware Visual Engineering HQ in October 2020

Beyond that it's funny the conversation is well perceived the good mood between the Customer and the CEO. Why has it happened? Because both halves found their calculations in this business. The fact itself that the customer is willing to give us an interview after the completed and closed investment is showing that it's not a simple buyer-seller contract.

1.2. Behind Illusions

Illuminarium creates a realistic alternative reality and the visitors can be in a dream while awake. Behind the illusions, there is the latest video-projection technology with super high pixel resolutions. It's more than thousands of projectors, giant walls and sound systems. Behind the technology there are millions of hours of competent work from hundreds of scenario designers, AV engineers and technicians who finally created this world.



Technicians adjusting the projection areas in May 2021

Now let me show what is the Illuminarium really. The following chapter gives answers to all of your questions.

2

About Illuminarium

What is Illuminarium? Let us show it through a story by the creators themselves, including photos and videos of the project.

- ▶ [WHAT IS ILLUMINARIUM?](#)
- ▶ [PRESS VIDEOS](#)
- ▶ [WHAT'S THE FUTURE?](#)

2.1. What is Illuminarium?



Illuminarium Experiences is creating the next generation of immersive entertainment through groundbreaking technology. Created by worldwide leaders in cinematic and interactive content, architectural and theatrical design, and venue operations, Illuminarium Experiences enables visitors to experience recreated worlds. Actual filmed content is used to showcase real-world, authentic sights and scenes, presented in custom-designed venues called "Illuminariums."

Illuminariums are programmable, immersive theaters that surround visitors in a sensory space of sight, sound and scale unlike any other – providing access to the most amazing but typically out-of-reach places, people and experiences. They deliver one-of-a-kind sensory experiences, from exhilarating natural wonders to enriching cultural moments. Illuminariums are brought to life by 4K laser projectors, audio beams, in-floor haptics and realistic aromas, which work in combination to create a fully immersive experience.



"Illuminarium was designed as a place that can transport guests to anywhere," said Brian Allen, executive vice president of technology and content for Illuminarium Experiences. "The concept behind Illuminarium is a digitally delivered, immersive attraction. It enables people to walk into a space and they're immediately transported into another world, environment or country."

"From a technical standpoint, it requires us to deliver the highest-quality audio and video. Every layer of our technology contributes to the experience that we are trying to create. Our content is incredibly realistic and, because of that, we have to integrate technology that doesn't look like a projector and a screen but the African Serengeti. We have to look closely at the little details – like color spaces and the light output – to create an immersive experience."



Illuminarium combines techniques used in traditional motion-picture production and virtual reality so visitors can experience real-world adventures, created from filmed content (like a safari), as well as authentic, recreated worlds (like the planet Mars) without wearable hardware.

Illuminarium venues are highly scaled, programmable technological marvels that bring the immersive experience to a new level. Illuminarium's "Wild: A Safari Experience," debuting in July, will be the first experience. It is designed to take visitors to Botswana, Kenya, Tanzania and South Africa, giving viewers an opportunity to get up close with elephants and lions. In early 2022, Illuminarium Experiences will update the 30,000-square-foot venue in Atlanta to create a spacewalk, which will give visitors the chance to feel like they're setting foot on the moon.



"We create different rendering engines for each show," Allen continued. "It was important that we integrated a flexible solution, like UBEX, that enables us to utilize existing technology as we create new shows. UBEX allows direct connectivity to different inputs and components, which provides us with unparalleled flexibility across the massive facility."

Visitors are surrounded by an enormous canvas, with state-of-the-art laser projection, rich spatial beamforming audio (where natural and musical scores change with the listener's location), in-floor haptics, scents, and additional interactive technologies. Because the immersive design pushes the boundaries of modern technology, often to the breaking point, it was important for Illuminarium Experiences to keep the show running, no matter what.



"The show must always go on in our business," noted Allen. "It was essential for us to have a solution that would quickly failover. If a media server goes down, the system is designed to have another server take that place and automatically route the video to the correct designation."

Photos and description via www.illuminarium.com.

2.2. Press Videos



Clicking on the picture leads to a Youtube video



Clicking on the picture leads to www.fox5atlanta.com

2.3. What's the Future?

The first Illuminarium show has been opened successfully in Atlanta at 1st of July 2021. But the first one doesn't mean the last one as well, of course. Illuminarium has plans to open locations in Las Vegas in January and in Miami in the fall of 2022. Other future sites are being considered in New York, Chicago, Toronto, Montreal, Los Angeles, and Austin.



Illuminarium Experiences in Atlanta, Georgia

AV solutions of Illuminarium will be provided by UBEX in case of all future locations. The next chapter guides you on the road to UBEX and helps to clear out why it is chosen finally.

Video about the Grand Opening in Atlanta



Clicking on the picture leads to www.fox5atlanta.com

3

The Road to UBEX

Why AV over IP? Why UBEX, after all? What were the unique points supporting this solution? How they've found the network switch and was it the only one which could works here?

- ▶ ALL OF THE PIXELS THE FARTHER WAY
- ▶ NEEDS A GREAT NETWORK SWITCH
- ▶ NEEDS EVERYTHING FOR THE SYSTEM
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- ▶ THE FINAL SYSTEM DESIGN
- ▶ TESTING OUT THE ENTIRE SYSTEM

3.1. All of the Pixels the Farther Way

Illuminarium uses image projection to create an alternative reality inside a building. Like a live theater, the scenery must be dynamic and the technology behind this system must support it seamlessly. The show stage in Illuminarium is huge, so the distances that the AV extensions have to bridge are also huge. Reliably and accurately. Lightware and AV over IP technology were not the only candidate in this project:

- Tried out SDVoE - Didn't work, because compression added to the video stream. Pixel-perfect transmission needed!
- Tried out copper solutions with SDI infrastructure - Didn't work either, because it's too complex and brings very large matrix switchers.

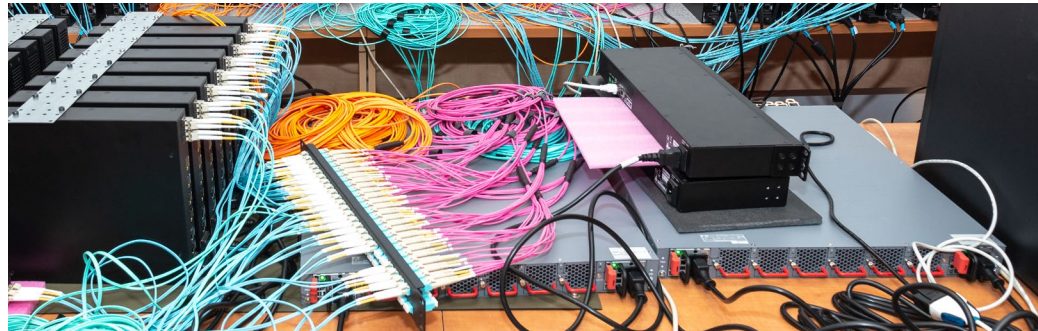
Pixel-perfect transmission across large distances is offered by the AV over IP technology powered by optical fiber infrastructure. So, the solution is given but which manufacturer will implement it? There are numerous AV manufacturers offering AV over IP solutions.

After the showrunners of Illuminarium came across UBEX, it became clear that the project's preferences and requirements can be satisfied by an UBEX matrix, but there was a long way to go until the real shipping.

3.2. Needs a Great Network Switch

Configuration Planning

If the UBEX matrix is the body, then the network switch is the heart of this system. It is the centerpiece in the middle of the whole AV network so it's crucial choosing the most suitable one. In case of Illuminarium there is not only one perfect switch but let's not run so far ahead.



Two of the four chosen network switches during the configuration setup

Due to the countless video streams which are required to be transmitted Lightware calculated with big number of endpoints (it came to 112 by the end). So engineers and system designers thought about more than one switch from the beginning. The final solution has been the 'leaf-and-spine' network topology with a 1 spine and 3 leaves configuration.

Finding the Right Switch

One of the biggest challenge was choosing the most suitable network switch. Lightware got a free hand in this matter and we were glad that people of Illuminarium trusted our professional competence. Honestly, 10 managed network switch models from 3 different switch vendors in uncountable combination have been tested finally. During the selection process we continuously kept negotiating the technical guys of Illuminarium.

Ten managed network switch models from three different switch manufacturers have been tested finally. During the selection process we continuously kept negotiating with the technical teams of Illuminarium. The chosen switch has been the Juniper QFX5120-32C in the aforementioned 1 spine and 3 leaves configuration (meaning four devices altogether)..



The Juniper QFX5120-32C built with 32x 100G QSFP28 and 2x 10G SFP+ port slots

Reserves for the Future

One of the aspect was at selecting of the network switch that it has to be free spare ports because:

- Illuminarium may want to expand the AV system in the future
- Free ports need to be available anytime in case of any technical fault

The network infrastructure was designed to make available an expansion even with more network switches.

3.3. Needs Everything for the System

We had network switches and an AV matrix system by UBEX at that time. Technical teams of Illuminarium notified us they trust Lightware to choose the correct peripherals like fiber optical cables, SFP+ transceiver modules, patch panels, 100G QSFP28 AOC (active optical cables), 40G SFP28 to 4x 10G SFP+ breakout AOC, etc. In summary, they needed everything without compromise for the complete AV system.



SFP+ transceiver modules, optical cables and SFP+ AOC during the system test

Lightware ordered all components and tested the whole infrastructure before shipping. See some photos about it in the [Testing Out the Entire System](#) section.

3.4. The Try-out Mini-Matrix

Lightware sent a light-sized UBEX matrix to Illuminarium for testing the AV system. The package contained 6 endpoints, an MMU, a network switch and the required network equipment. The mini-matrix was suitable for following purposes:

- any new settings of adjusted firmwares could be tested on the field
- network data monitoring could be tried out on a smaller system at first
- if any AV or network equipment is gone, technicians have spare parts to swap it immediately

Lightware configured and tested all parts of the mini-matrix before sending.

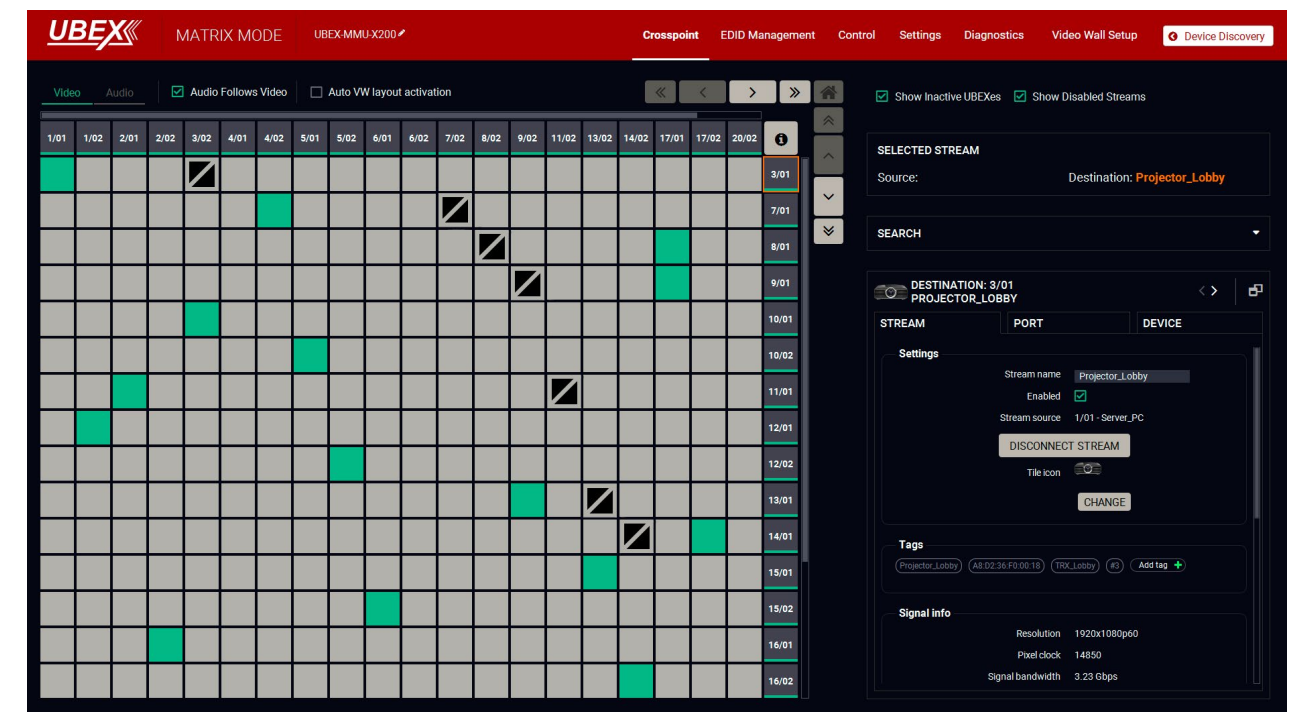
3.5. Personalized Matrix with Personalized Firmware

Illuminarium and Lightware were continuously in touch during the system designing stage and the device selection process. The result has been a personalized AV matrix, but it's just the hardware.

Illuminarium had some special needs so we implemented the requested changes to the firmware of the endpoint and the Matrix Management Unit (MMU), and either in the control software (LDC).

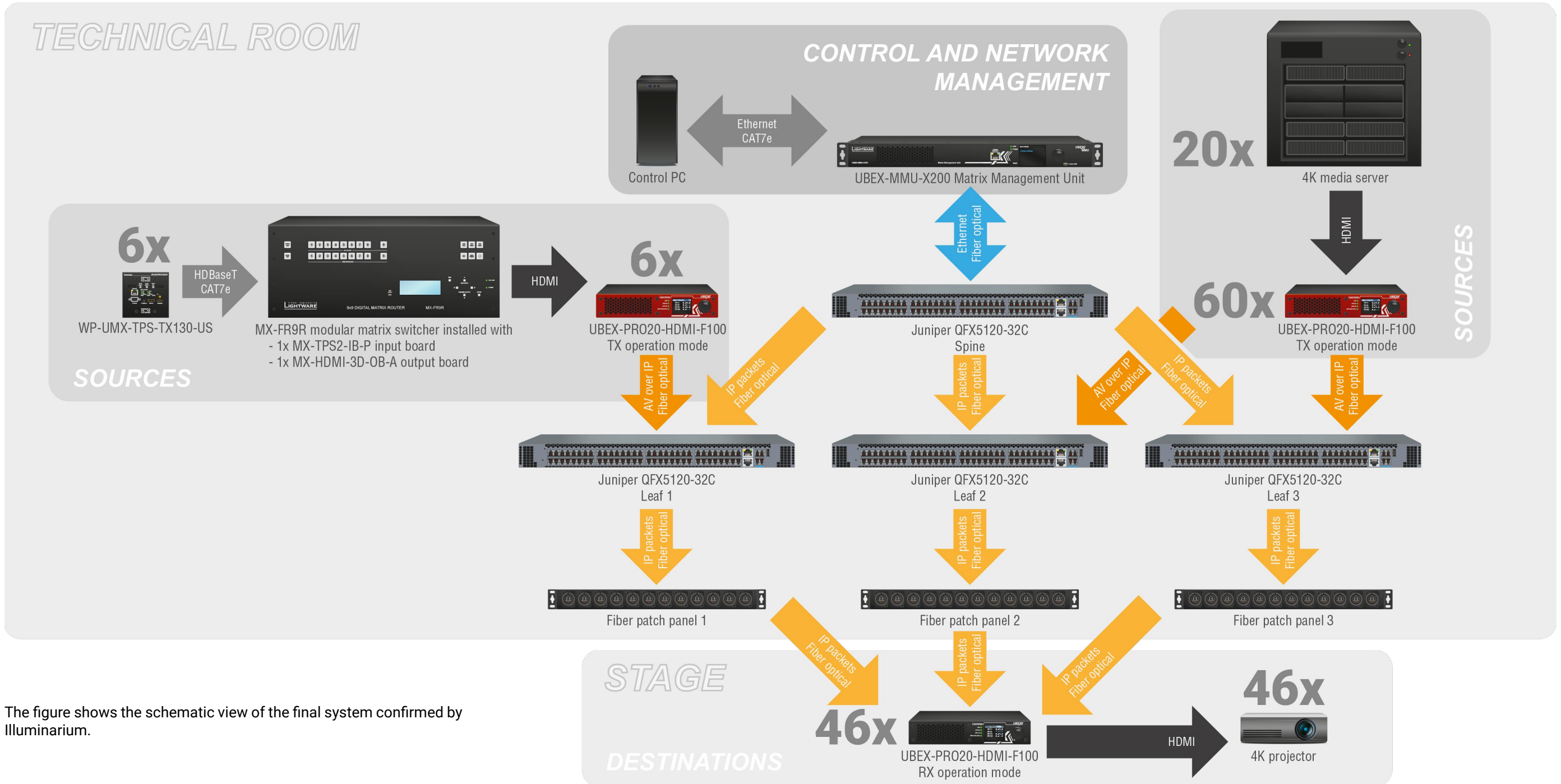
Lightware gave feedback continuously to the network switch vendor and some developer changes and fine-tuning were implemented to the firmware of the switch as well. A few example from the list of changes:

- special resolution support for the inbuilt scaler of the endpoint device
- new factory EDIDs are added for some special resolution support
- more different methods of the firmware update are implemented to the endpoints and MMU either



Lightware Device Controller (LDC) software showing the crosspoint grid view for a UBEX Matrix

3.6. The Final System Design



The figure shows the schematic view of the final system confirmed by Illuminarium.

3.7. Testing Out the Entire System

What Have We Done

The risk that system will work or not on its place was reduced to near-zero. How did we achieve this? Lightware undertook to build up, configure and test the whole UBEX AV matrix including the network switches, all cables, patch panels and transceiver modules. Beyond the normal testing procedure the test cases tried to cover all possible scenarios that could happen at Illuminarium. Few examples:

- Variated network switch configuration for the possible modular usage
- Changing the operation mode (transmitter, receiver or transceiver) of the endpoint device and check the matrix could follow the changes
- Using hundreds of different video resolutions for transmission
- 24/7 operation during the testing procedure
- Continuous temperature monitoring avoids the possible heating issues
- Numerous ways to 'stress-test' our seamless stream switching feature
- Used the "kill switch" that powered off the whole system immediately and after turned on again to demonstrate the show goes on as if nothing had happened

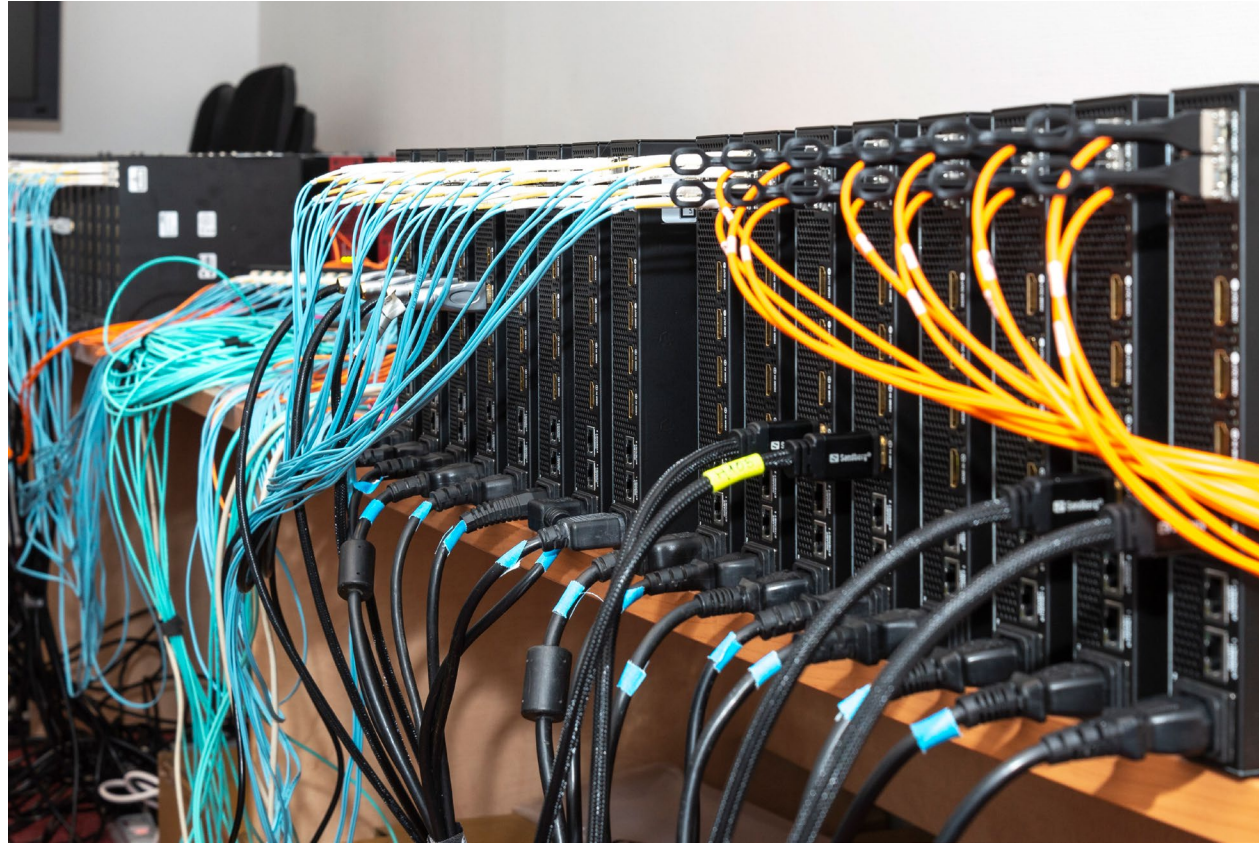
Picture Gallery



More than a bundle of colorful cables - it's a living video matrix



112 endpoint devices altogether



Endpoint devices before the HDMI cabling



The last photo before shipping - the job is done.