Building a large OB-Truck using SMPTE ST 2110

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Agenda

- The Customer
- The Task
- The Decision
- The Challenge
- The Conclusion

The Customer

Österreichischer Rundfunk - ORF

- Public Broadcaster in Austria

- 8 million Viewers in Austria

- 4 TV Channels 24x7

- 9 Regional Channels

- 12 Radio Channels

The Task

Building a new OB-truck for sports, music and entertainment

- Cost-effective solution

- Some equipment needs to be reused

- Workflows for operators shouldn't change

- Needs to work with the existing infrastructure at ORF headquarters (which is still SDI-based)

- The design and technologies need to be scalable to serve as a blueprint for larger systems

- Use standard products, no custom development

The Decision

- Three different designs were evaluated:
  - Based on an SDI router
  - Based on a proprietary network technology
  - Based on IP

- Decision Criteria
  - Must be economically viable
  - Functionality
  - Must have a certain maturity
  - Gaining experience with new technology (for upcoming larger projects)
  - Flexibility (Ease of upgrade to UHD, ability to change/add functionality)

The Decision – **Go for IP!**

- Three different designs were evaluated:
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  - Based on a proprietary network technology
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- Decision Criteria
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The Challenges

You need SDI-IP-Converters

- Converters often include needed processing equipment

- As more and more devices add native IP interfaces, you will need less and less of Converters:
Between "Contract Award" and "Design Freeze", the number of converters was reduced by 1/3 due to changing to newer devices with native IP interfaces.

- A good broadcast control system can provide a seamless experience

The Challenges

Devices keep evolving rapidly!

- New IP-capable Boards

- New IP-capable Device Generations

- New Software Versions with new (required) features

- New Control Interfaces (NMOS!)

=> You have to freeze your design at some point!

The Challenges

Defining "Software defined Hardware" I

- Several vendors have developed FPGA-based flexible processing hardware that can change its internal structure based on the software loaded on the box and/or the configuration applied.

- There is a trade-off between flexibility and complexity of configuration.

- Because flexibility was one of the decision criteria, the device chosen has complex configuration options.

The Challenges

Defining "Software defined Hardware" II

- Essentially you have a "Subsystem in a Box" with router(s), frame synchronizers, de-/embedders, delays, color correction etc. which you have to design in itself.

- If you use a lot of these devices (37 in our case), you have to decide how many different designs you want/need to maintain.

The Challenges

Defining "Software defined Hardware" III

- We use 3 different designs:
  - Multiviewer
  - 18 in / 2 out
  - 10 in / 10 out
- Not all features (frame sync, delay, color correction) are used (and licensed) in every device

The Challenges

IP Address Management

- Currently a manual Task
- Requires a lot of management and configuration effort
- Needs to be automated for larger projects
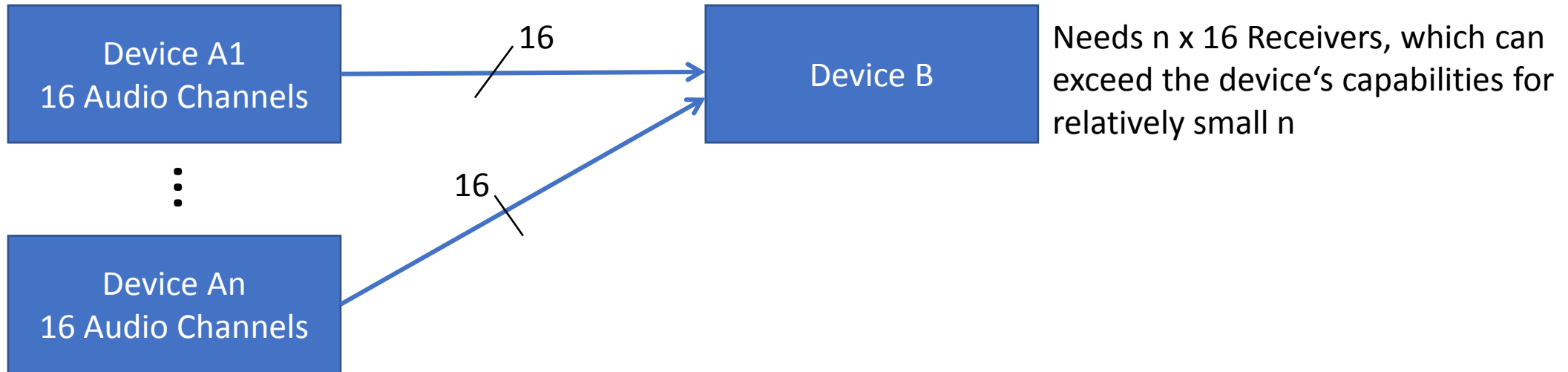 (ideally using DHCP and IS-05, see JT-NM TR-1001-1)

The Challenges

Audio Channel Management

- How many audio channels per stream?
    - =1: Many multicast streams
    - >8: exceeds ST 2110-30 Level A (minimum requirement for standard compliance)
- Balance limits of stream receivers vs. channels on devices
- Standard audio stream width was chosen to be 8 channels

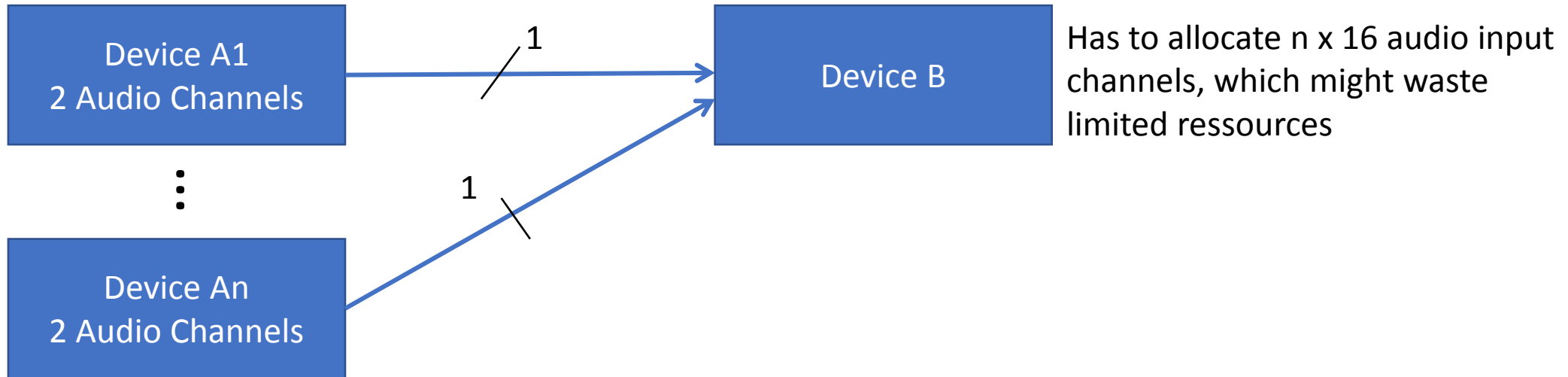# Stream Receivers vs. Audio Channels

16 audio channels per stream

Device A1
16 Audio Channels

1

⋮

Device An
16 Audio Channels

1

Device B

Needs n x 2 Receivers, making more efficient use of the receiver ressources

Stream Receivers vs. Audio Channels

16 audio channels per stream

Device A1
2 Audio Channels

⋮

Device An
2 Audio Channels

1

1

Device B

Has to allocate n x 16 audio input channels, which might waste limited ressources
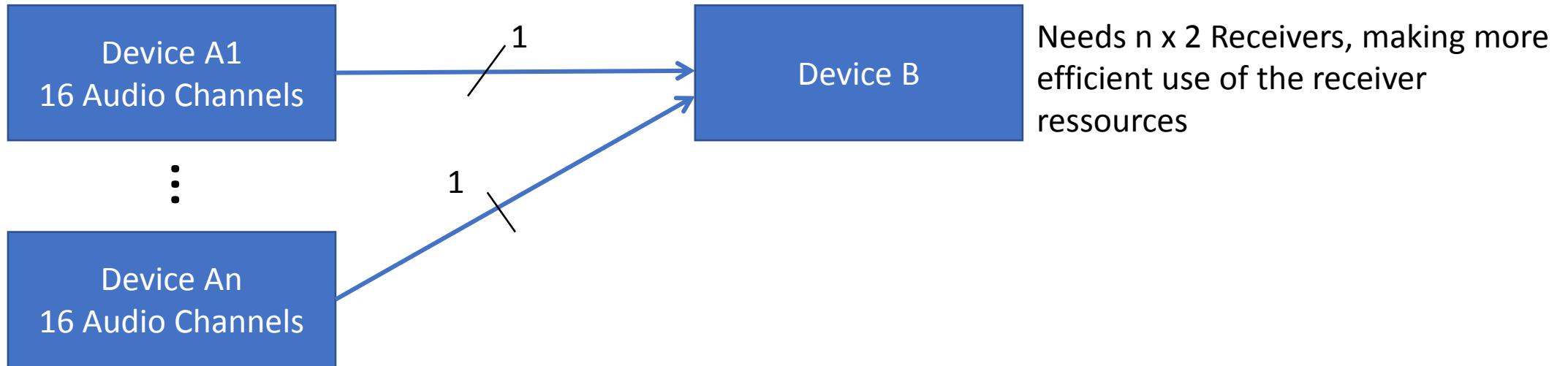
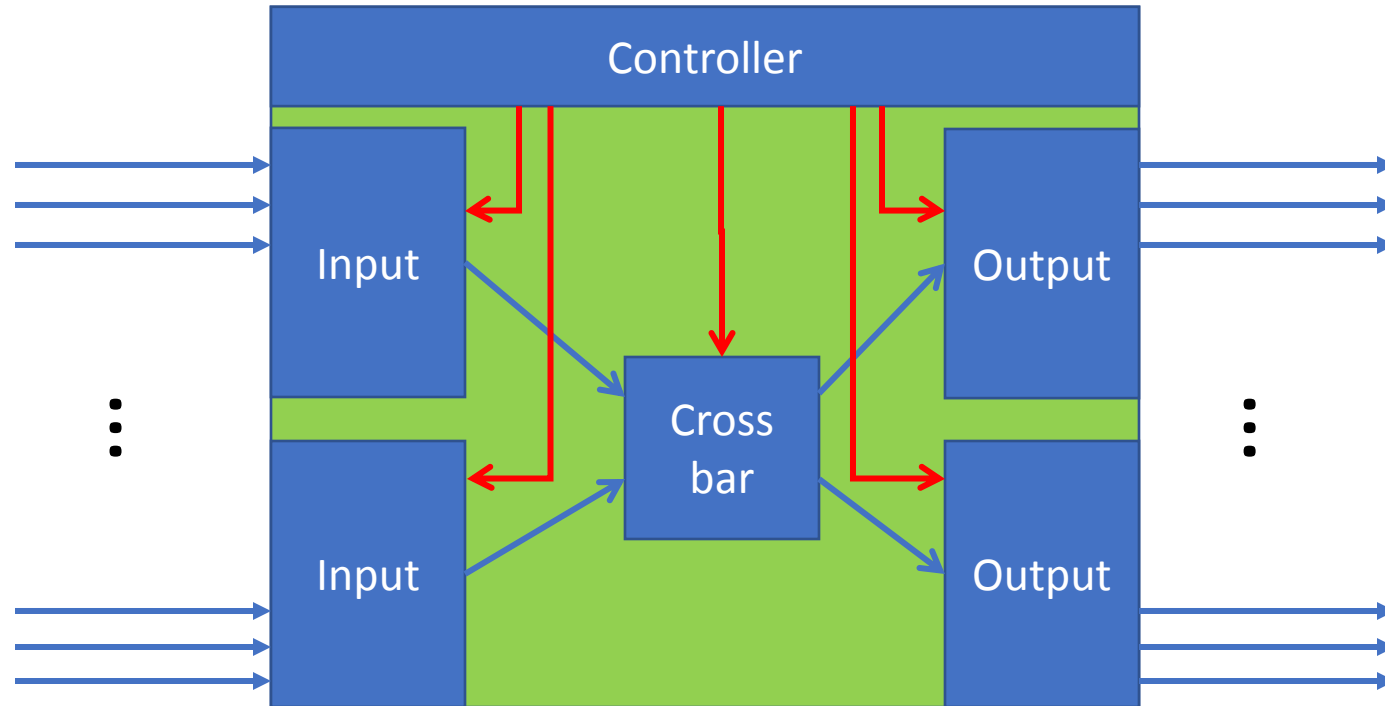# Stream Receivers vs. Audio Channels

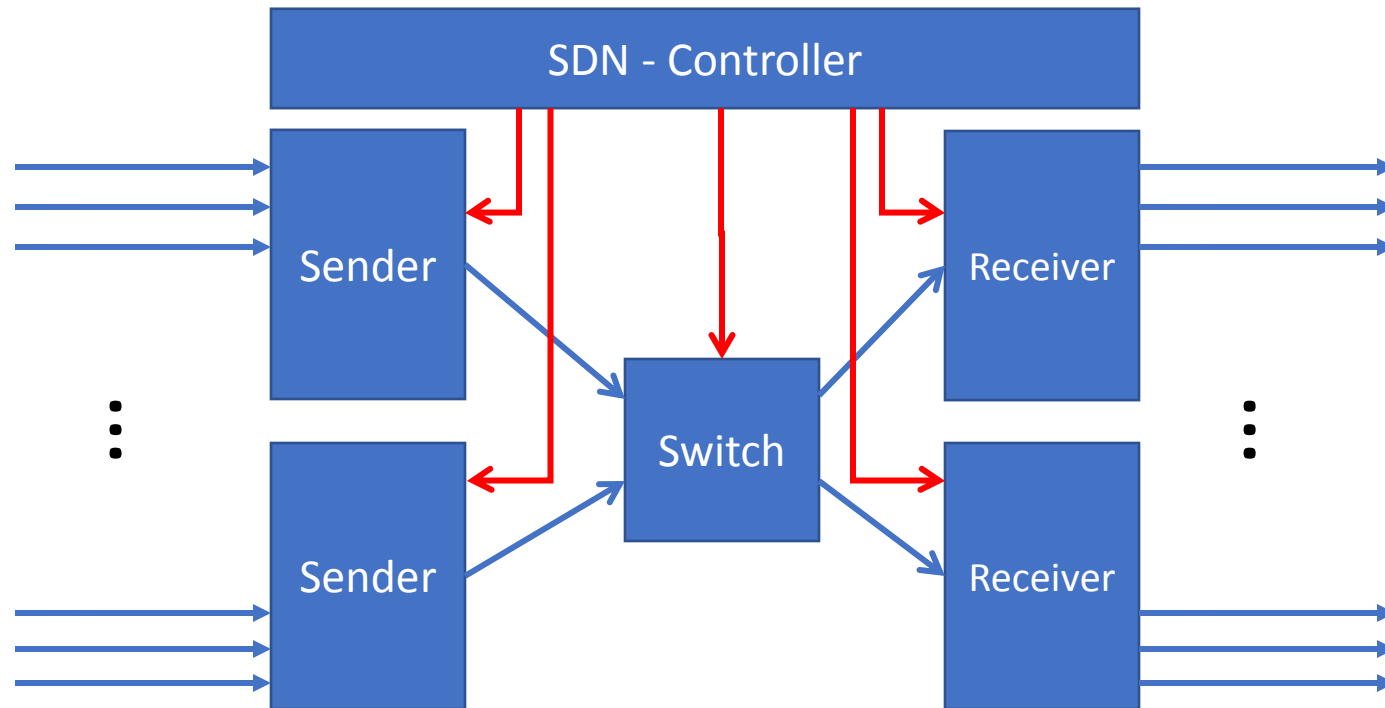8 audio channels per stream
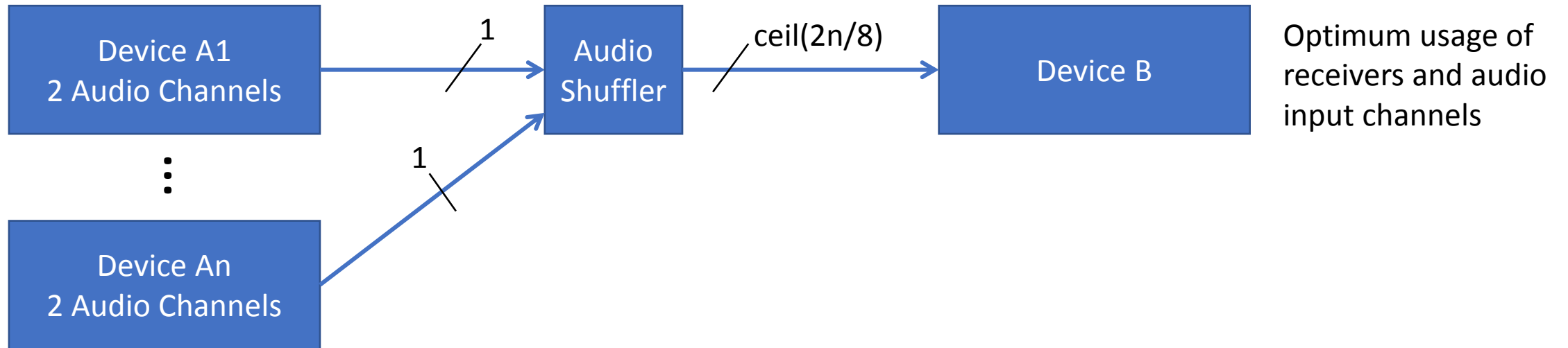
The Challenges

How to switch on and off

How to Switch on and off

How to Switch on and off

# How to Switch on and off

The Challenges

Training

- New topics

- Even some fundamentals are new

- There is a lot of uncertainty because people are unfamiliar with the technology.

- Troubleshooting procedures are different

The Challenges

Synchronization

- PTP requires more configuration effort than Blackburst
  - JT-NM TR-1001-1 addresses this to a certain extend through a central system resource

- Syncing PTP and Blackburst
  - Operation with external Blackburst is well defined (EG 2059-10), but there are devices that operate differently
  - Redundancy mechanisms for PTP and BB operate independently and might produce undesired results.
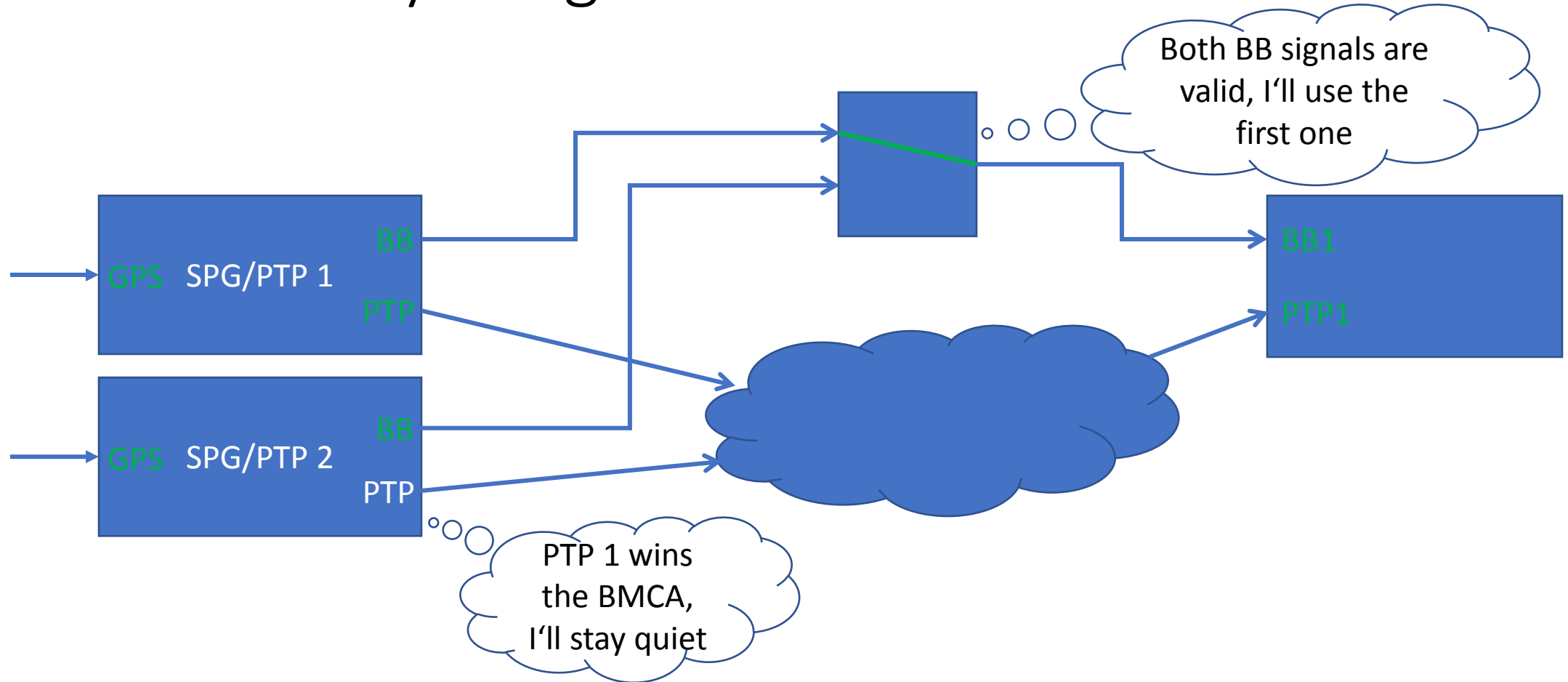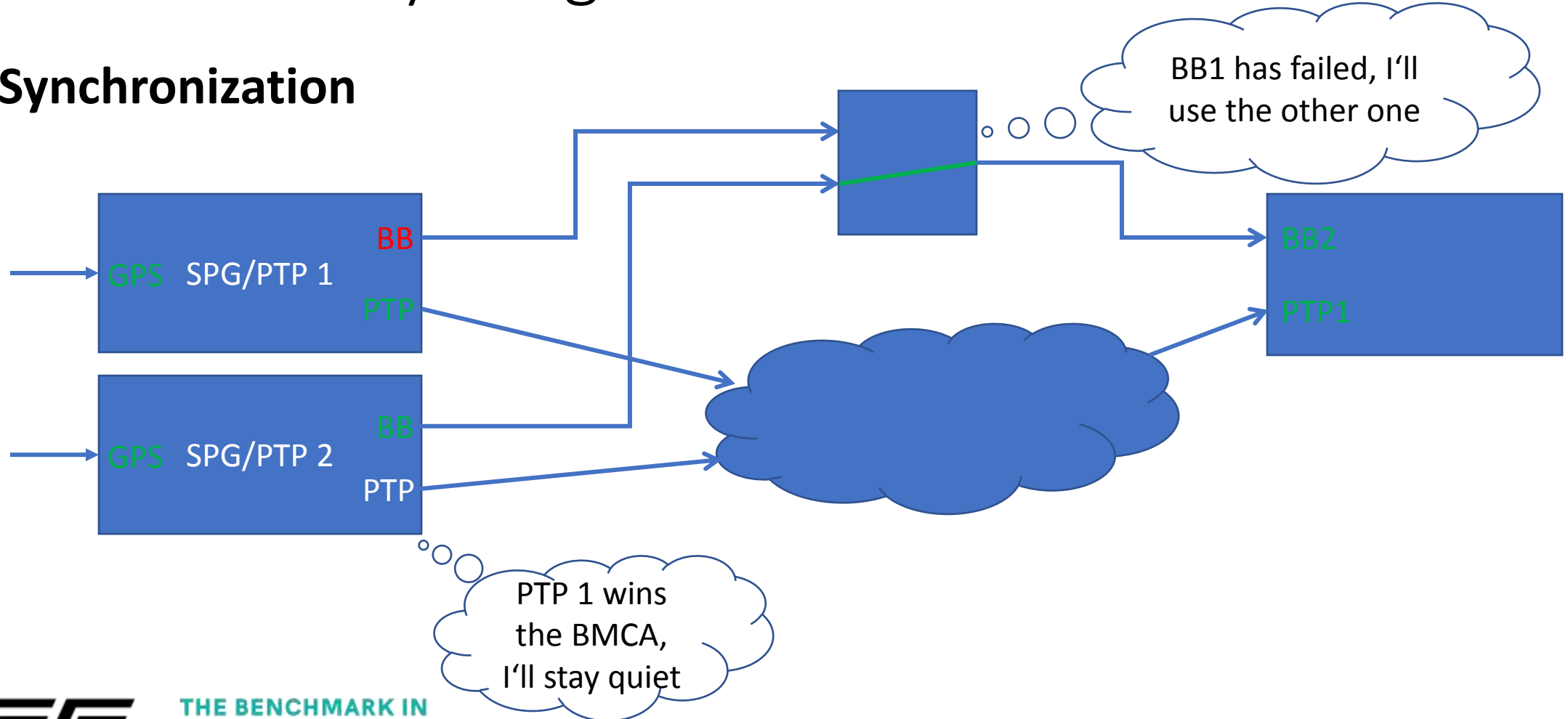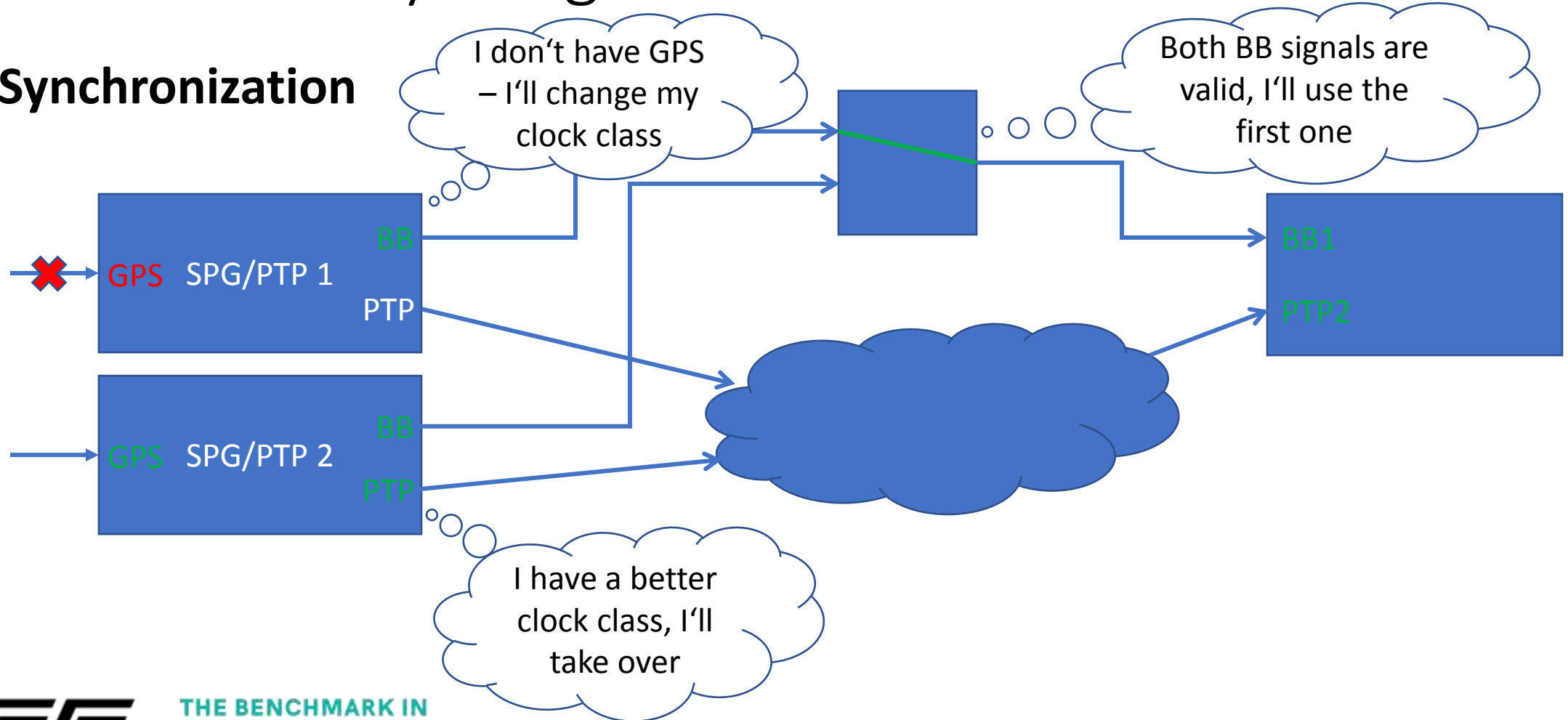
Syncing PTP and Blackburst

Syncing PTP and Blackburst

- Solution #1 (from vendor!): Buy two more SPGs and separate PTP generation from PTP to BB conversion (pair#2 will always generate the BB from the PTP GM)
(additional money and space required)

- Solution#2: Have an external control system manipulate PTP priority to follow BB change over unit.

The Conclusion

- We are in a transitional period

- IP based production systems are viable, however need careful design

- Adaption and some work arounds are still needed while technology matures

- It is essential to build knowledge of the new technology on all levels

Thank You

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