Implementing 2022-7
Over a Single Network

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BFE

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IP SHOWCASE THEATRE AT IBC – SEPT. 14-18, 2018

What is ST 2022-7?

- A SMPTE standard that defines a method to receive multiple versions of an RTP stream for seamless failover.

- Originally defined for ST 2022-6 ("SDI over IP")
- Currently being revised for generic RTP-Streams (in DP-ballot)

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How is it done?

The receiver …

- … receives two or more streams of packets with identical RTP headers and payloads
- … aligns the streams internally. If a packet is missing from one stream, the receiver replaces it with an identical packet from one of the other streams and still produce a complete output stream.

What about the other headers?

2022-7 …

- … only cares about RTP
  - The packets could be completely identical
  - Or they could have different addresses, ports etc.

Don't care*   Must be identical

Ethernet Header	IP Header	UDP Header	RTP Header	RTP Payload
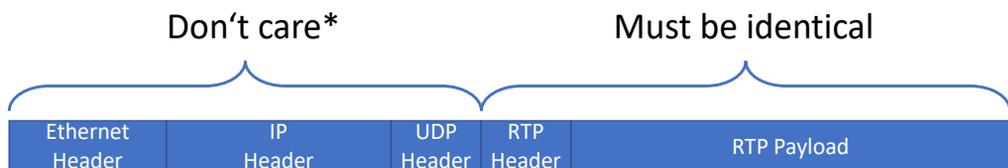
* As long as the packets make it to the receiver

Why do we want to do this?

We want to secure the transmission against outages and packet loss. These may be

- planned or unplanned (software upgrade or equipment failure)
- caused by one (or more) several components: switch, cable, port/SFP

- To achieve effective protection, the paths that the streams take must not share any component. They must be "disjoint".
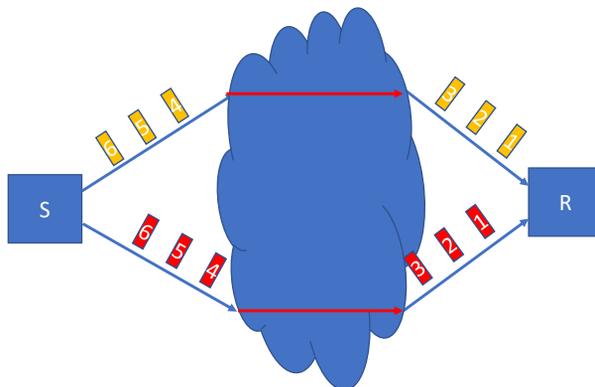
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How do we achieve disjoint paths?

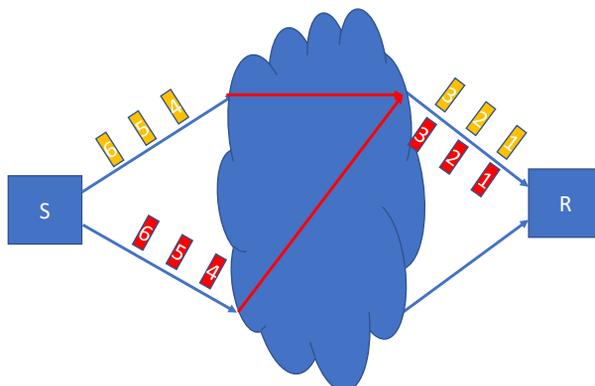First idea: use two disjoint networks. The paths are forced to be disjoint by the topology.

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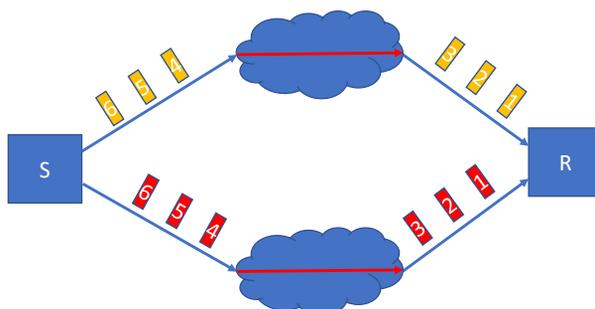
How do we achieve disjoint paths?

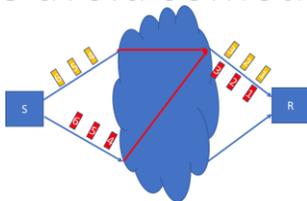Alternative idea: use a single network.

How can we avoid something like this?

How can we avoid something like this?

- Somewhere in your network there must be a system that computes the paths through the network. This could be the switches themselves or an SDN controller.
- Use a path computing system that has the ability to find and use disjoint paths through the network for the streams that you require it for.

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Why not use the first idea?

Because it has some limitations:

- Limited support for devices capable of only one connection ("single-homed").
- Limited interoperability with standard network protocols
  - Needs a workaround for PTP
  - How do you connect to your other IP networks (without creating a bridge between the two networks)?
- Less resilient, more hardware needed.

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Why would we have single-homed devices?

- There are devices that don't support ST 2022-7 (yet)

- For some devices, two physical connections might not be feasible (e.g. Microphones)

- You might want to limit the use of ST 2022-7 to the most important signals for cost reasons.

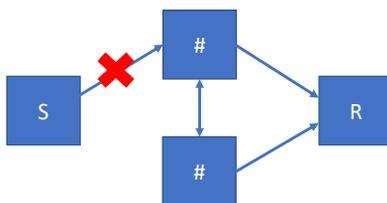11

What are the issues with single-homed devices?

- If the single connection fails, the device is not able to send or receive streams and there is not much you can do about it except fixing it.

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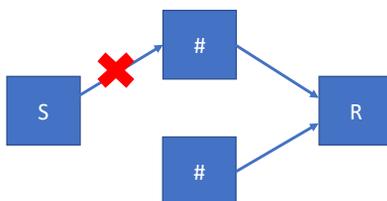
How does a single network help?

- It doesn't.

- But having more than one device might.

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What are the issues with single-homed devices?

- If you have several identical single-homed devices you might not be able to distribute them across the networks (so that you retain 50% of the capacity in case one network fails), because devices on different networks don't see each other.
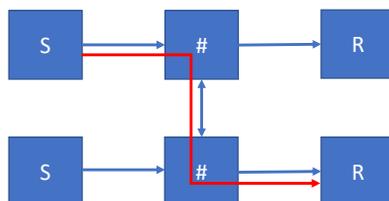

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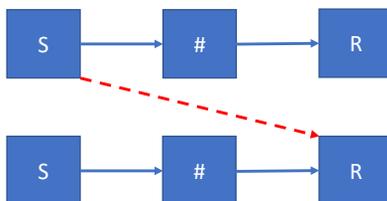
How does a single network help?

- All senders can stream to all receivers and if one switch fails, you still have 50% of your senders and receivers.

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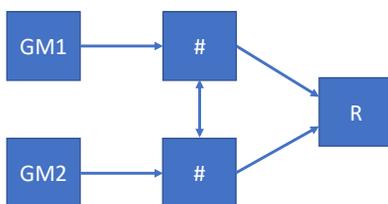**IP SHOWCASE THEATRE**

What are the issues with PTP?

- Grandmasters don't see each other and cannot decide which one should be active.
  (There are workarounds, which either create a "bridge" between the networks or offload the decision which GM to use to the end device)
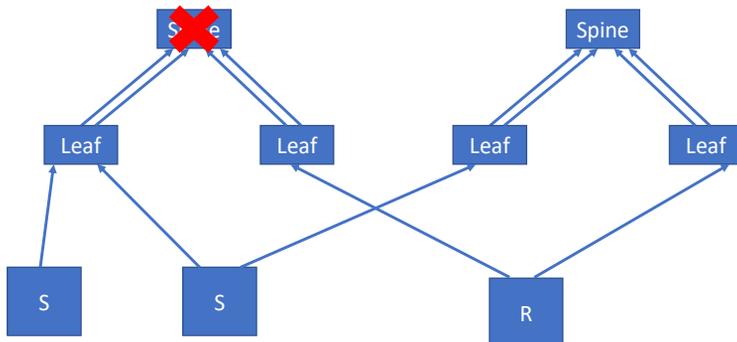

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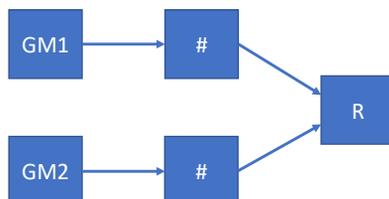
How does a single network help?

- Grandmasters see each other and can decide which one should be active. No workarounds needed.

GM1 → # → R

GM2 → #

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Why are separate networks less resilient?

Spine (X)   Spine

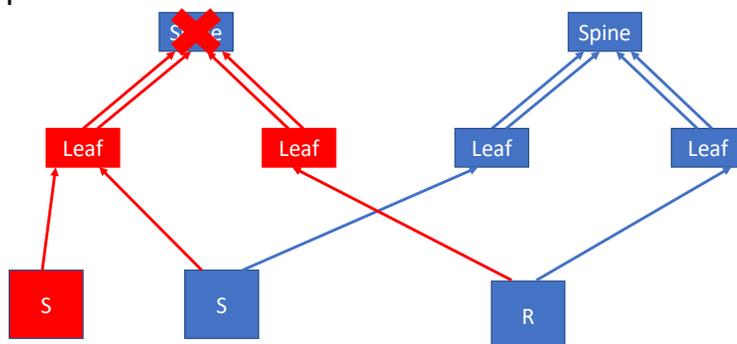Leaf   Leaf   Leaf   Leaf

S   S   R

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Why are separate networks less resilient?

- If a spine fails all redundancy is lost and all single-homed devices on that spine are disconnected.
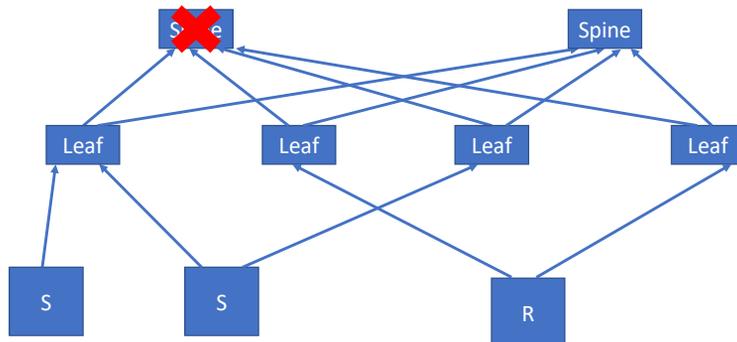
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How does a single network help?

- If a spine fails the only the bandwidth is reduced. Single-homed devices can still access the network.

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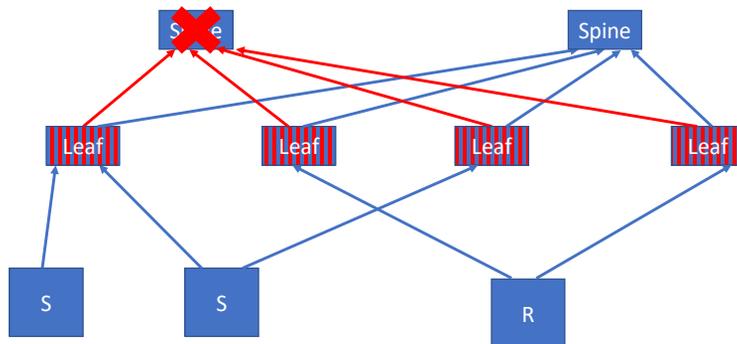## How does a single network help?

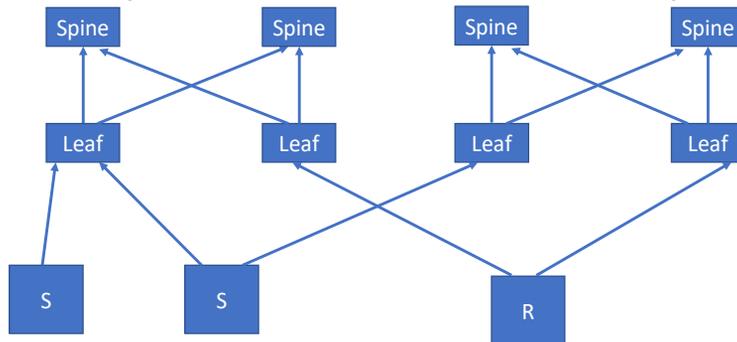- If a spine fails the only the bandwidth is reduced. Single-homed devices can still access the network.

Why do separate networks need more hardware?

- You have to scale spines symmetrically (n+n redundancy) if you want to make sure you have the full bandwidth for one path.
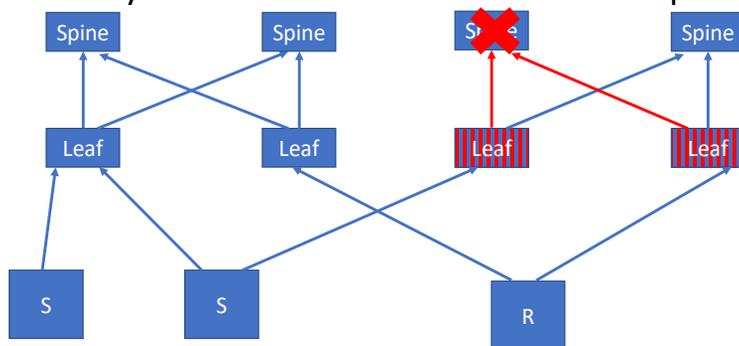
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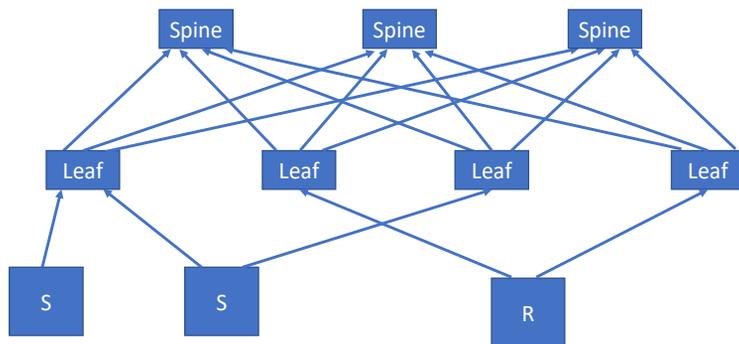

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How does a single network help?

- You can use n+1 redundancy to retain the full bandwidth in case of a single switch failure.

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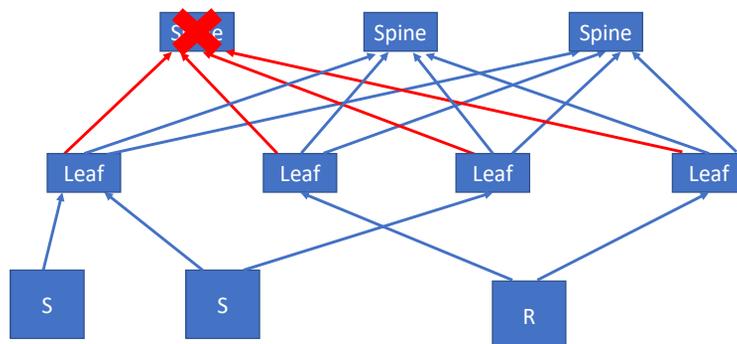
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- You can use n+1 redundancy to retain the full bandwidth in case of a single switch failure.

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Conclusion

Using a single redundant network provides better

- support for single-homed devices
- support for standard network protocols like PTP
- resiliency and efficiency

If you want to use ST 2022-7 in a single network you have to have a mechanism (e.g. an SDN controller) that is capable of routing your ST 2022-7 streams over disjoint paths.

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Thank You

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