Implementing 2022-7 Over a Single Network

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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)
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

* 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”.

How do we achieve disjoint paths?

First idea: use two disjoint networks. The paths are forced to be disjoint by the topology.
How do we achieve disjoint paths?

Alternative idea: use a single network.

How can we avoid something like this?
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- 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.

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.
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.

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.
How does a single network help?

- It doesn’t.

- But having more than one device might.

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.
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.

![Diagram showing network connections](image)

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)

![Diagram showing PTP issues](image)
How does a single network help?

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

Why are separate networks less resilient?
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• If a spine fails all redundancy is lost and all single-homed devices on that spine are disconnected.

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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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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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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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.
Thank You

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