



U.S. DEPARTMENT OF
ENERGY

Office of Science

**BERKELEY
LAB**



ALS-U



ADVANCED LIGHT SOURCE



Exploring data acquisition options for distributed timing-synchronized FPGA-generated data

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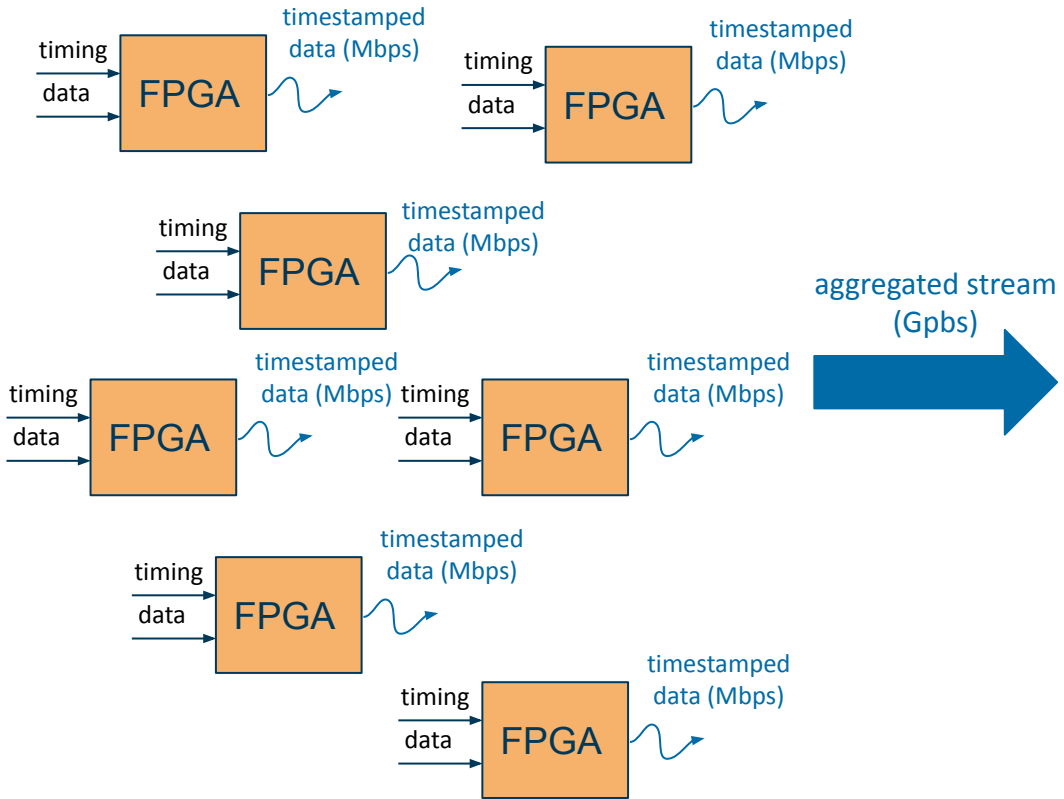
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Problem

Generate



Store

Large storage that we think we own (let's call it "the cloud"); in this case we kinda do, though...

Retrieval

User

human after working for 14 hours and hitting the "retrieve" button the same number of hours

User

human mistakenly trying to retrieve 100G samples, instead of 100k

User

unaware human using the lab's infrastructure to download a 8GB movie and being shutdown by IT (no retrieval for you; so let's just worry about the other users)

User

friendly, tech-savvy human, not-sleep deprived, starting to use the system and asking for just 16 samples (power of 2, because who knows?)

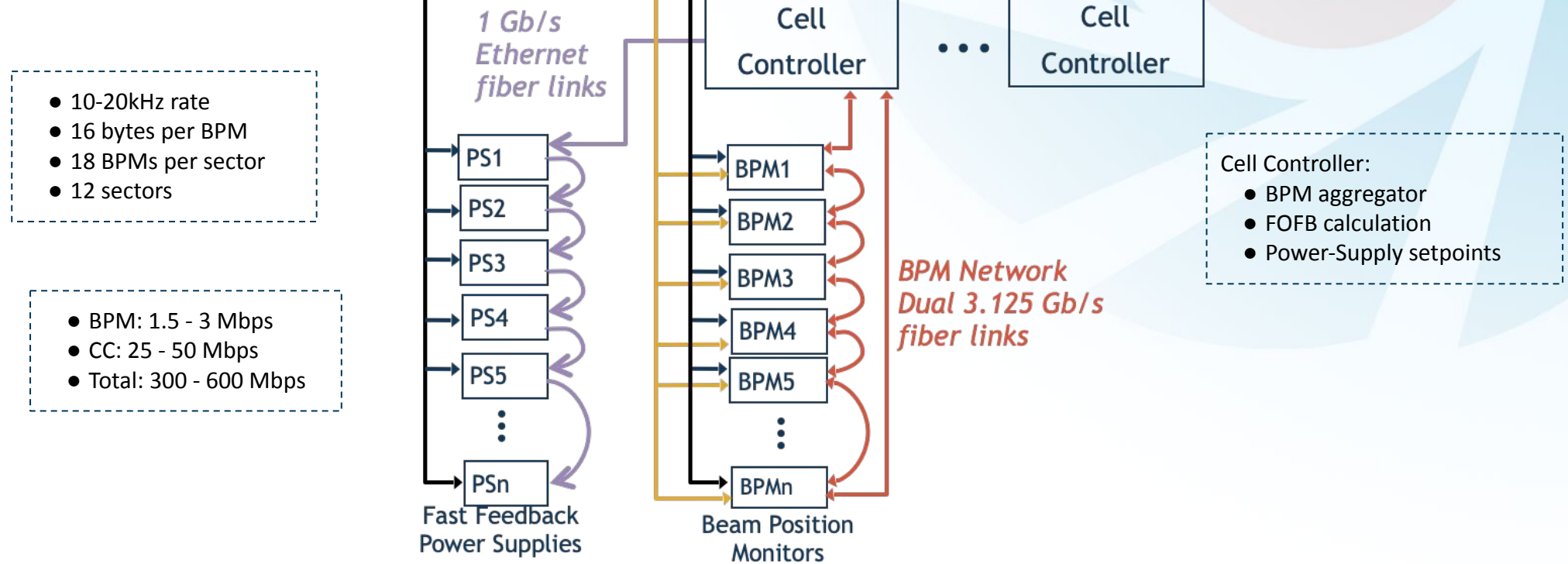
Concrete Use Case

ALS-U Storage Ring Sector (1 of 12)

MRF: Events / Timing Data (fiber fanouts)

Fast Orbit Feedback Network (Dual 3.125 Gb/s fiber links)

Ethernet - EPICS Channel Access



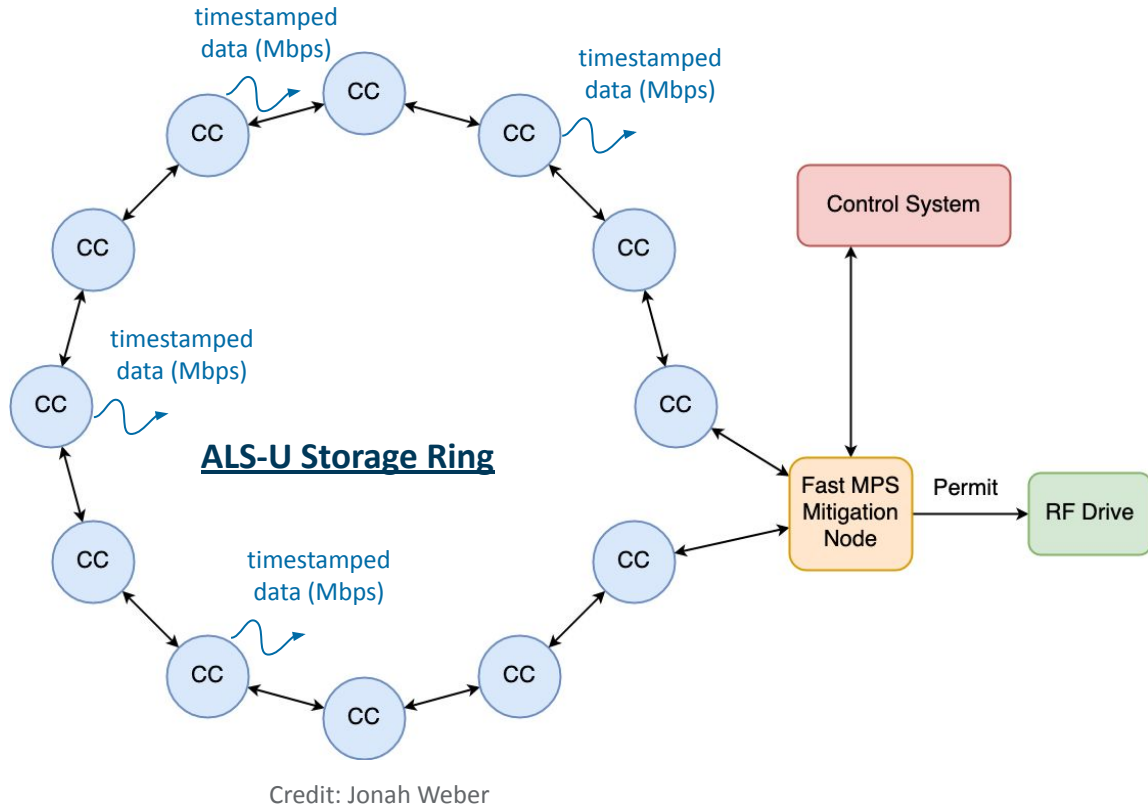
- 10-20kHz rate
- 16 bytes per BPM
- 18 BPMs per sector
- 12 sectors

- BPM: 1.5 - 3 Mbps
- CC: 25 - 50 Mbps
- Total: 300 - 600 Mbps

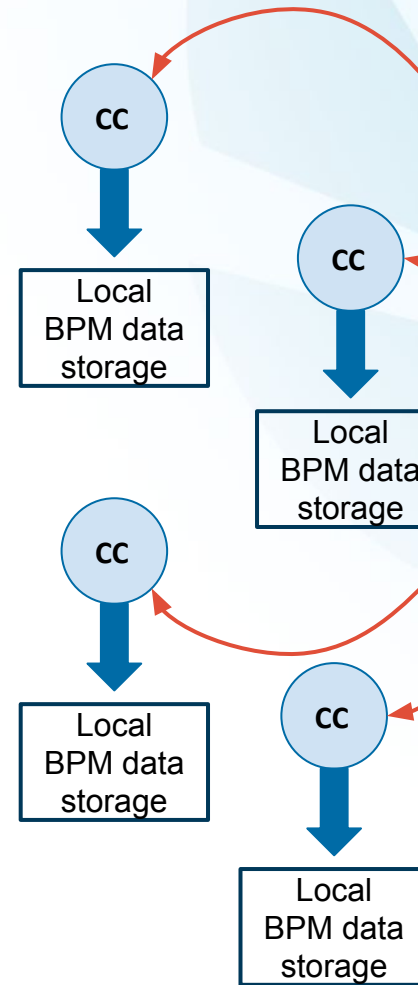
- Cell Controller:
- BPM aggregator
 - FOFB calculation
 - Power-Supply setpoints

Option #1: local/distributed storage

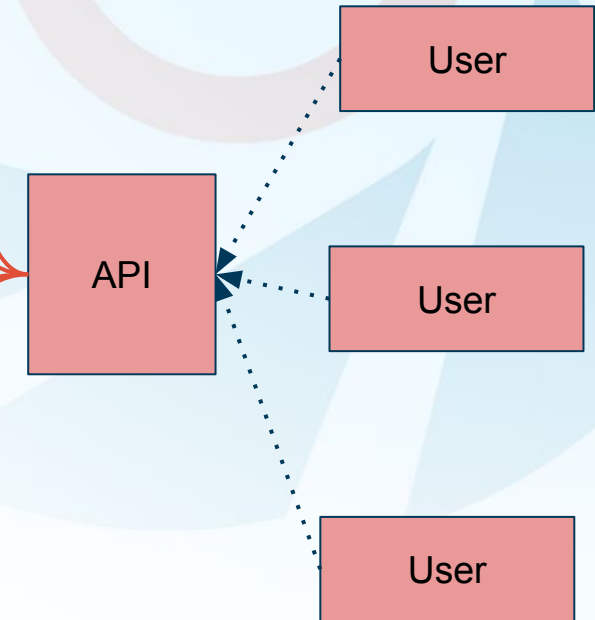
Generate



Store

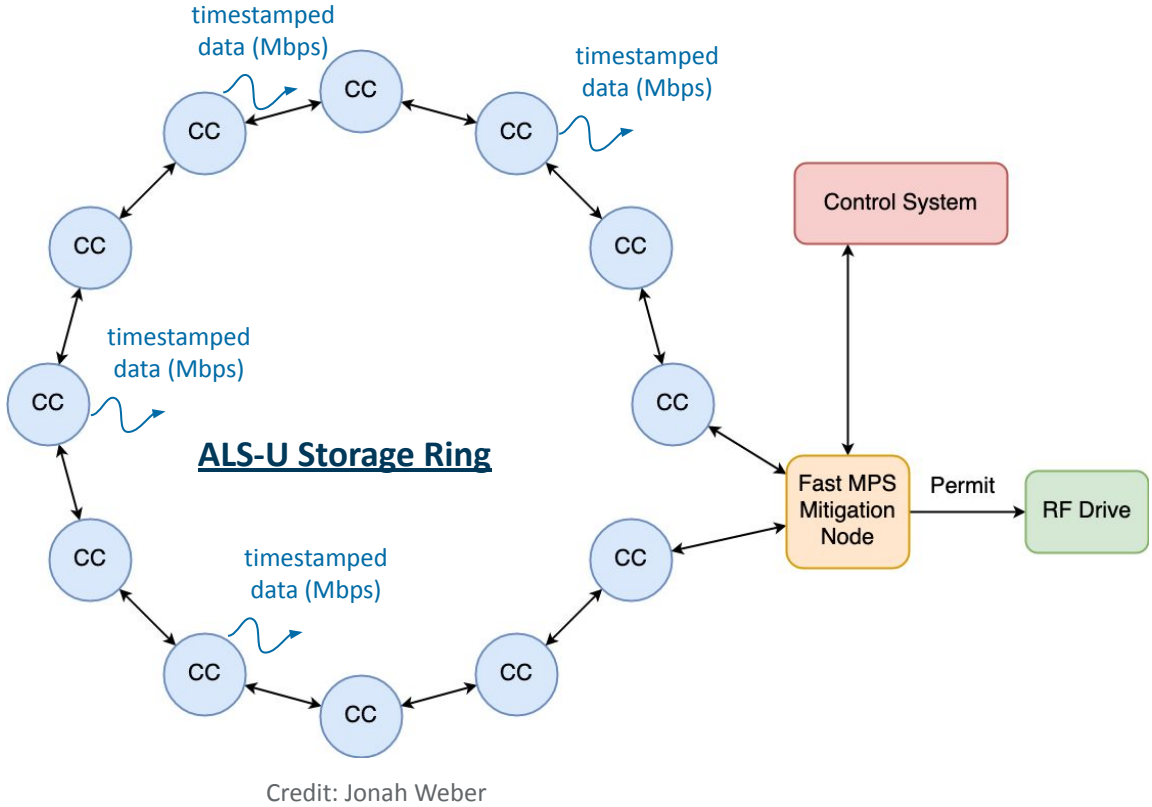


Retrieval



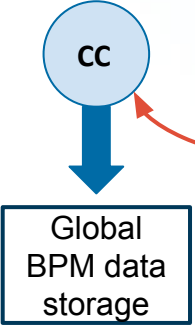
Option #2: local/single storage

Generate

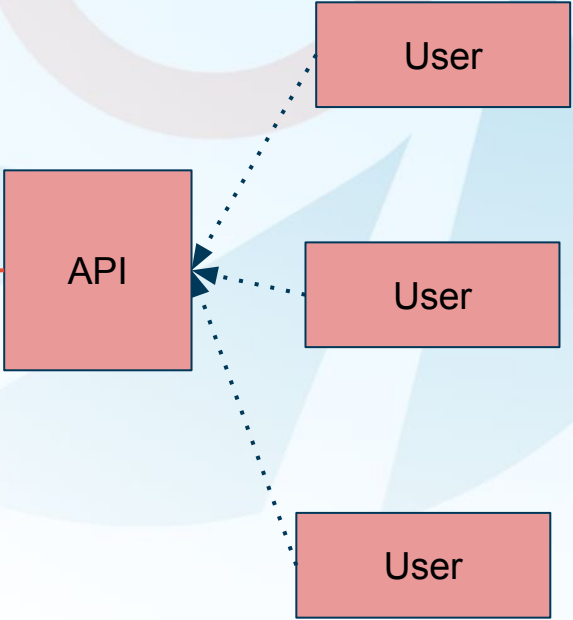


Store

All CC/Mtg will "eventually" have all BPM data from all sectors

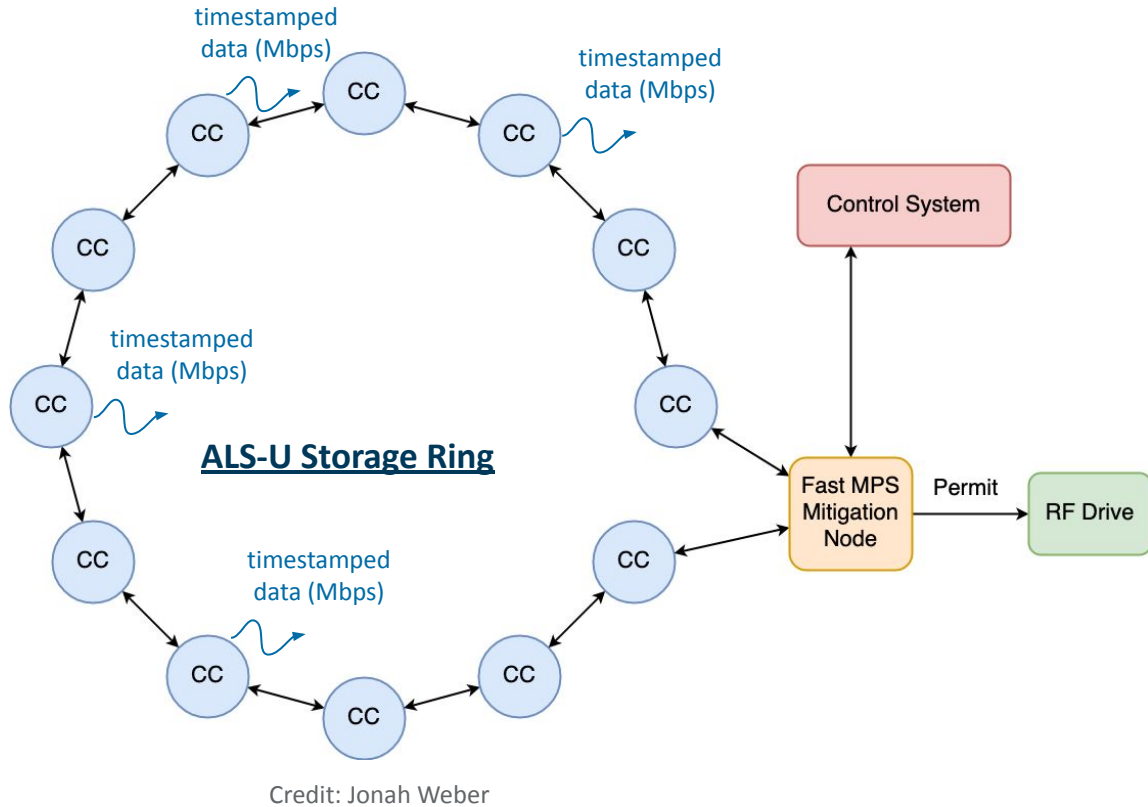


Retrieval

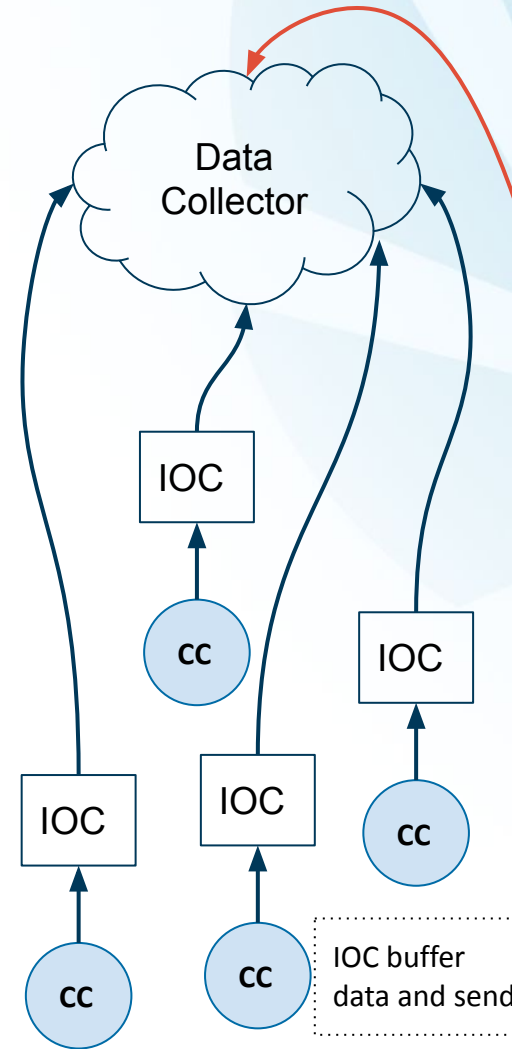


Option #3: Multiple CC IOC (pva) generating

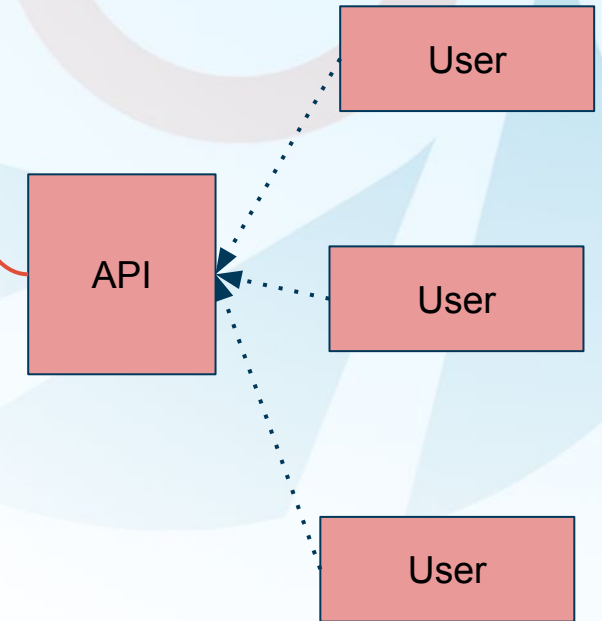
Generate



Store

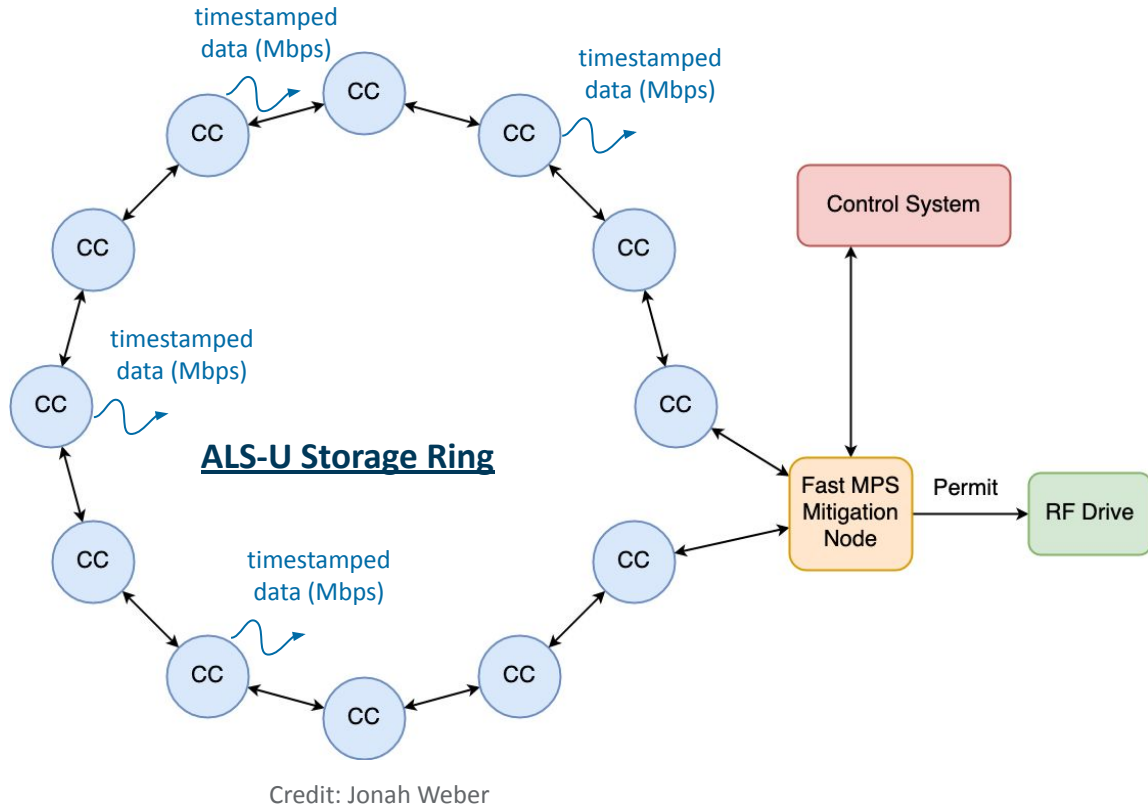


Retrieval



Option #4: Single CC IOC (pva) generating

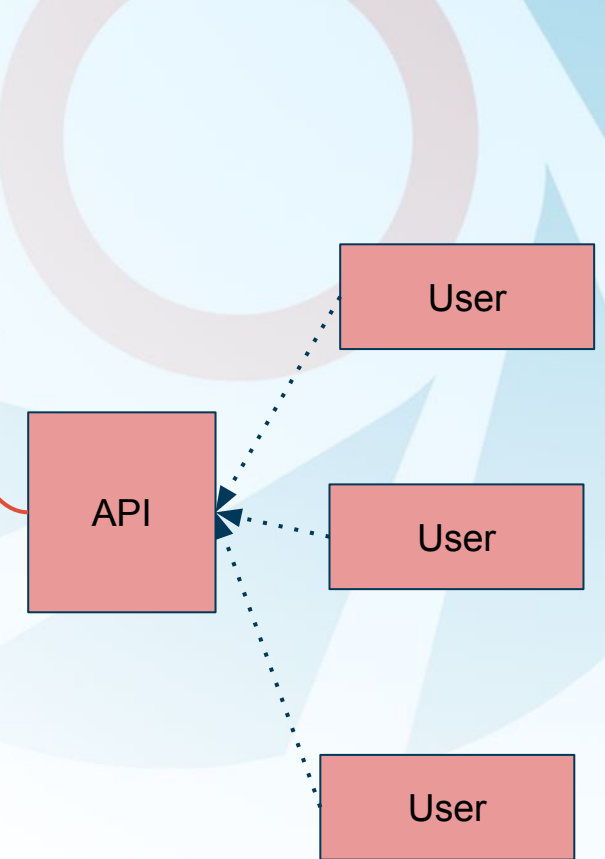
Generate



Store



Retrieval



Conclusion

- Any labs doing something like that?
- Any “standard” (EPICS 7, preferred) way of doing that?
 - Streaming EPICS data could enable us to leverage EPICS tools to consume/process data on-the-fly
- Should I try to use something from the community first, before writing my own?
- Anyone or somewhere where I can reach out to discuss this?