The bridge to possible

Media Streaming Mesh

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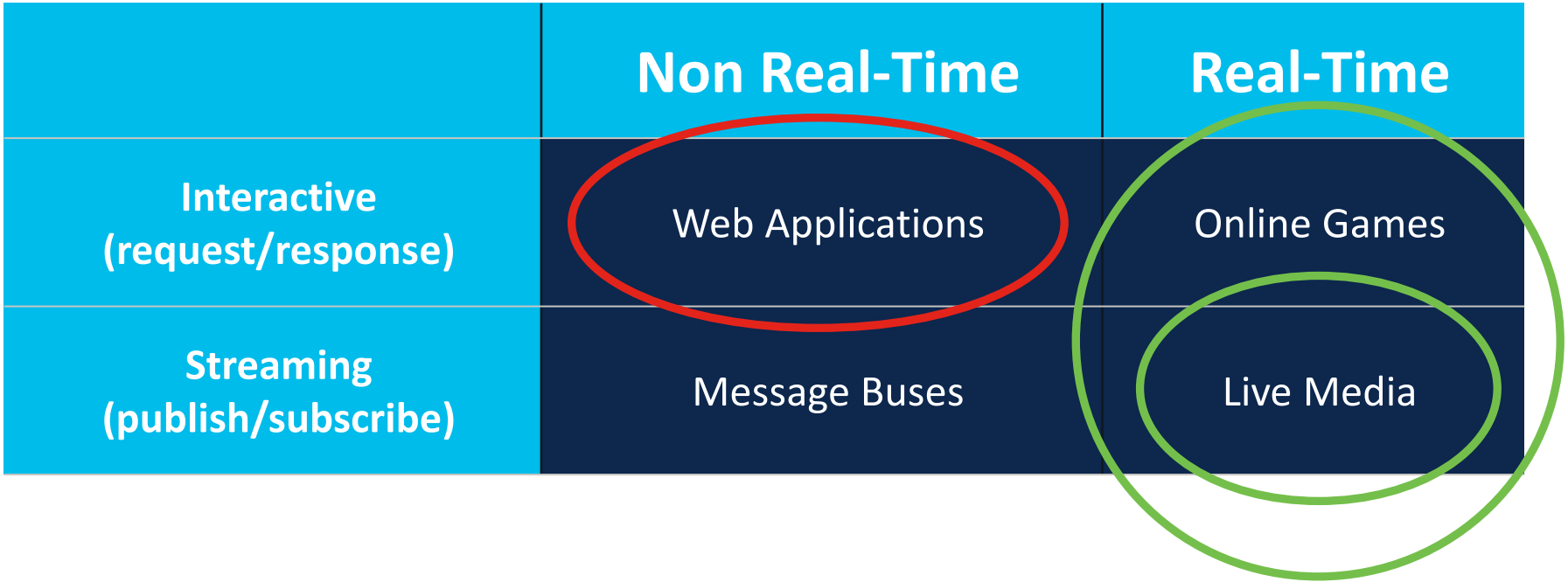
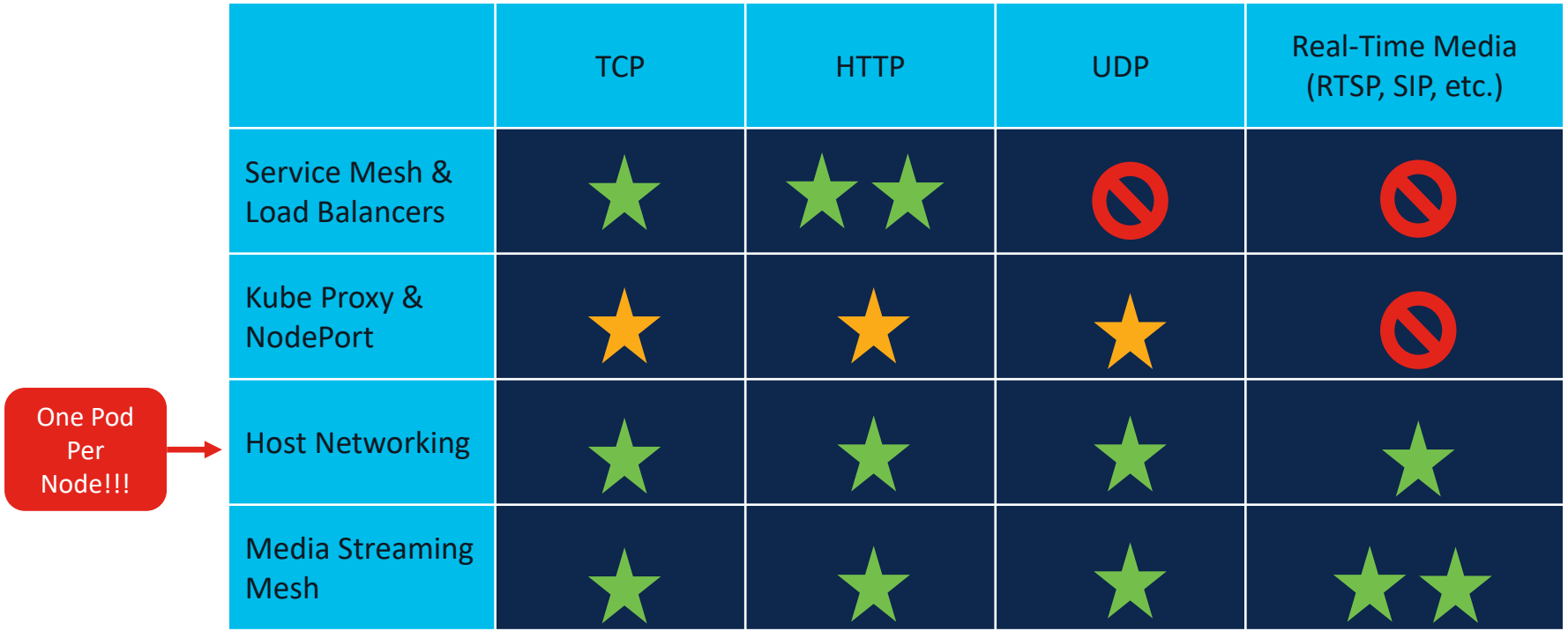
A (fuzzy) Application Taxonomy



Kubernetes Media Connectivity Options



Benefits of Media Streaming Mesh

Observability

Media Streaming Mesh monitors jitter and packet loss across the mesh, enabling DevOps teams to quickly locate and resolve connectivity issues.

Security

Media Streaming Mesh authenticates traffic senders using SPIFFE/SPIRE and can encrypt traffic using SRTP. Proxies reduce attack surface and ensure protocol conformance.

Low-Latency

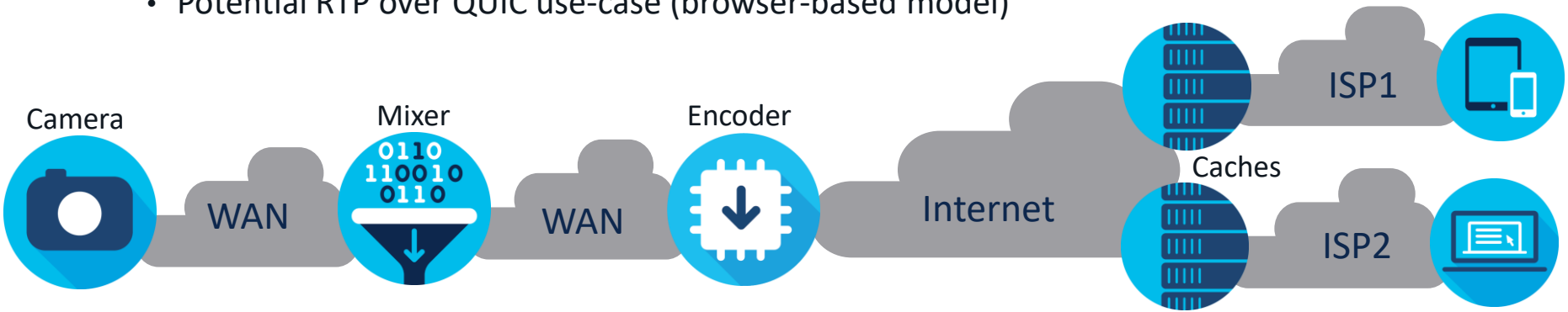
The Media Streaming Mesh RTP data plane proxy adds minimal latency, in contrast
to web proxies that terminate
TCP connections at each hop.

Deployability

Lightweight per-node data plane proxy, and per-cluster control plane proxy ensures a much lower footprint than per-pod web proxies, making it suitable for deployment at the edge.

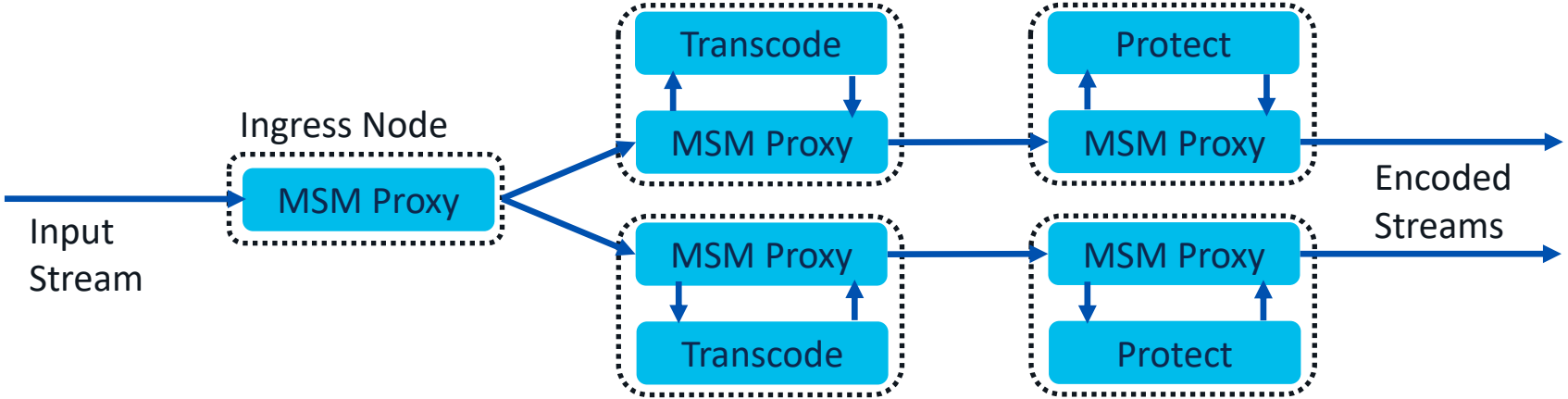
Live Video Use-Cases for Media Streaming Mesh

1. Contribution video (camera to studio and in-studio mixing)
   - Longer-term goal perhaps as cameras/mixers are dedicated hardware platforms
2. Interconnection of cloud-based encoders
   - Most likely an intra-cluster Kubernetes use-case
3. Distributing live streams from encoders to caches
   - Proxies handle fan out, and can add FEC, send dual streams over dual paths etc.
4. Streaming RTP to clients
   - Potential RTP over QUIC use-case (browser-based model)



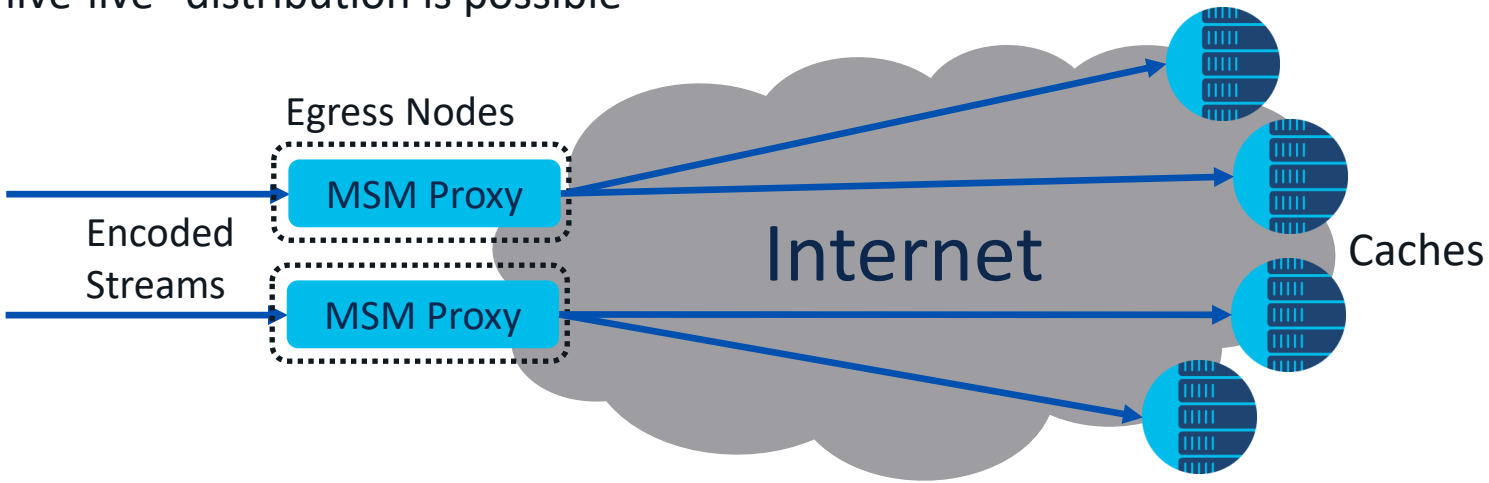
Interconnection of Cloud-Based Encoders

- We assume that for one input stream we may wish to:
  - Create multiple lower resolution / bitrate streams
  - Add content protection
- Deployment model is a single K8S cluster for multiple input streams
  - The same cluster can be used for distribution towards caches



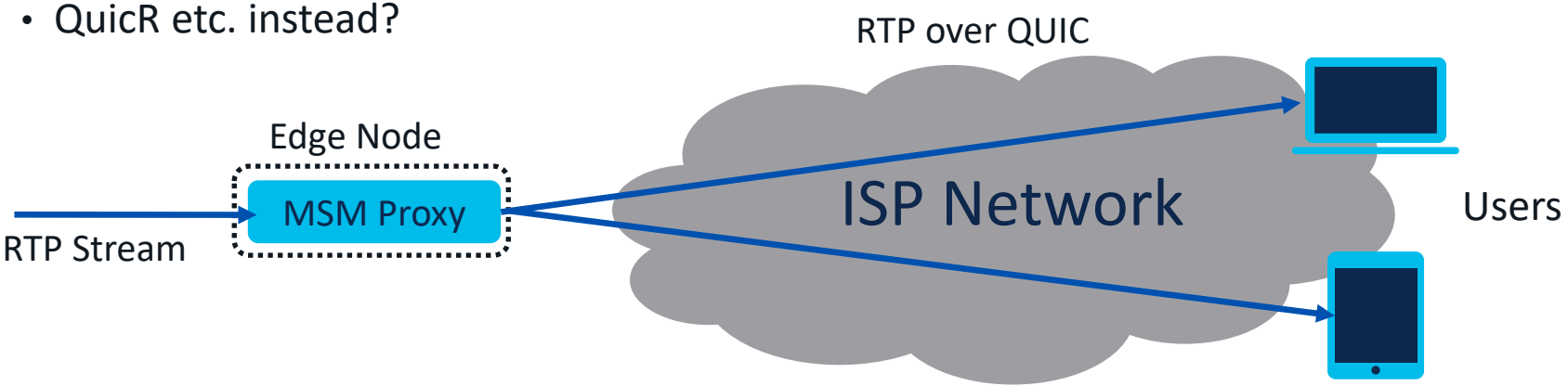
Distributing Live Streams from Encoders to Caches

- Egress node has one or more MSM proxies and can ”pull” any stream
- MSM proxy can replicate towards multiple caches
  - Can add FEC to streams from egress nodes towards caches
  - Caches could also use MSM at ingress to remove FEC etc.
  - ”live-live” distribution is possible



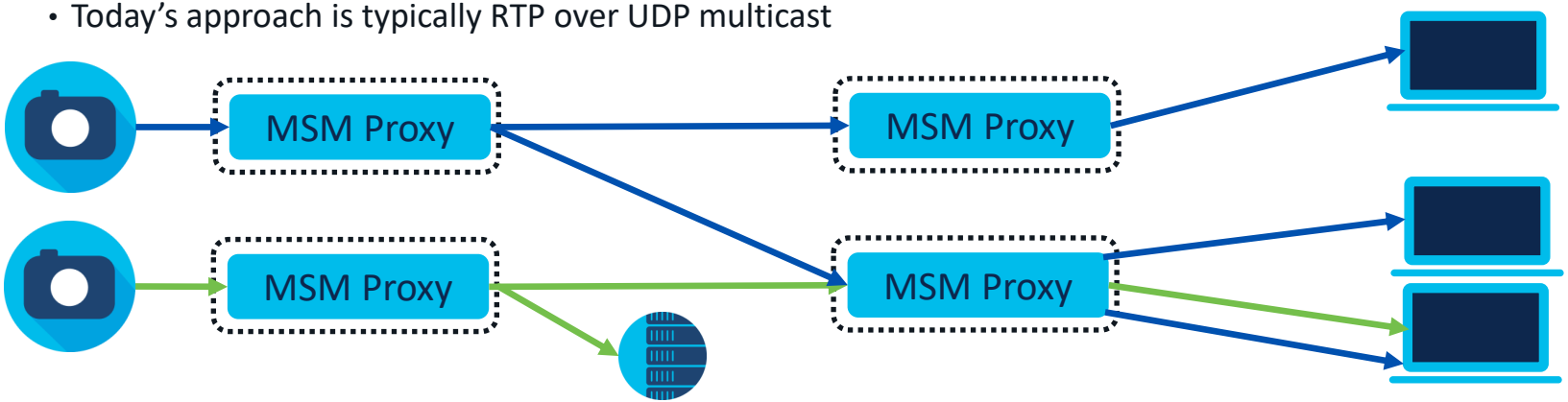
Streaming RTP over QUIC to Clients

- Edge proxy translates from RTP (over UDP) to RTP over QUIC
- Can use FEC, Live-Live etc. to optimise delivery to edge node
- Fan-out from proxy to multiple users
- Filter-based architecture enables plugging in congestion control algorithms
- Modified control plane required (negotiate flow IDs, not pairs of UDP ports)
- QuicR etc. instead?

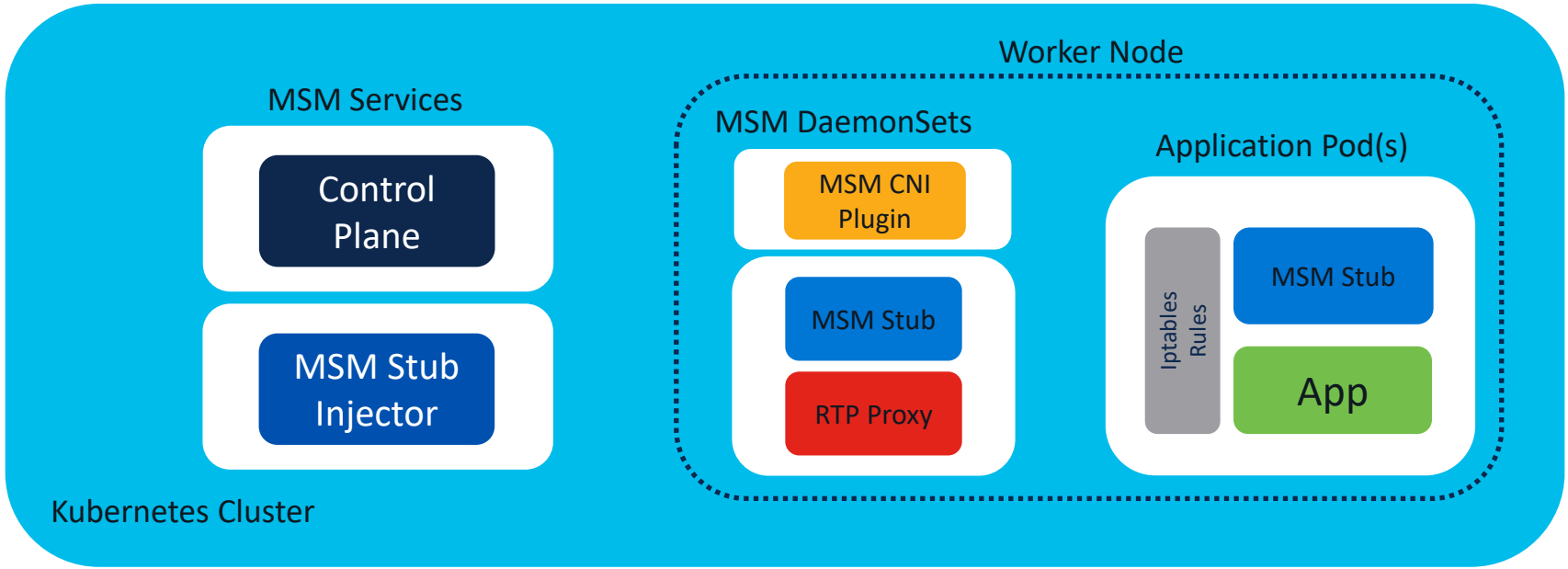


Video Monitoring Use-Cases for MSM

- Large number of cameras
  - Few per site in many small sites (e.g. retail)
  - Large numbers in a few big sites (airports, factories, casinos etc.)
- Multiple viewers – probably remote from the camera locations
  - There may be local ML apps too
- One or more proxies per camera site and a proxy at each viewer site
  - Today's approach is typically RTP over UDP multicast



MSM Software Architecture



Call to Action

- Media Streaming Mesh enables real-time media applications to be first-class citizens in today's cloud native world
- MSM is a work in progress and is in open-source
  - https://www.mediastreamingmesh.io
  - https://www.github.com/media-streaming-mesh
- Please collaborate with us to make it a success!