Connect & Produce Anywhere

How we resource live events is changing

Mix of on-site and remote working

Functions will be accessed on-site, in-facility and remotely

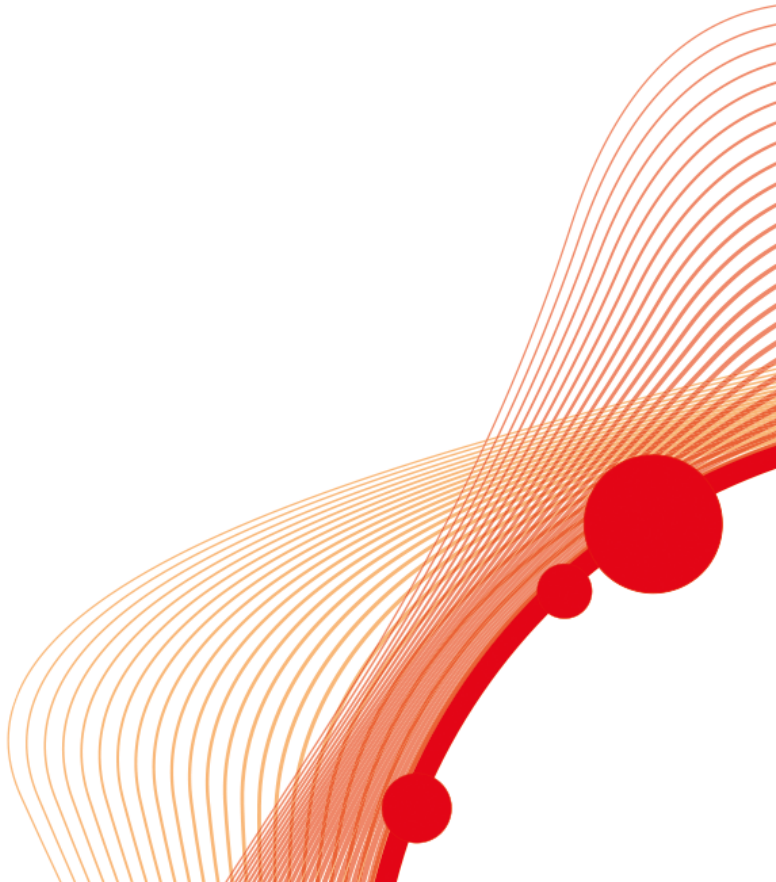
- Video, audio edit, graphics, monitoring...

Users are starting to expect this, and don't want to be concerned with the technical details

It's not just “do everything in the cloud”

Often providing those functions on-site, or at a broadcaster’s facility makes sense for operational or performance reasons

- We would like the choice
- Need to avoid use of different systems / technologies depending on what we choose
- Focus on software and how it can be deployed in different cases



Cloud
Highly scalable
Connectivity can vary significantly
Usually provided and managed by 3rd party
OpEx-heavy

On premises
High bandwidths available
Much production activity happens here
Can fit a lot of compute in a facility
Often self-provided and self-managed
CapEx-heavy

Edge
Sufficient compute and bandwidth on location for what matters
Can self-provide or use 3rd party
Cloud vendors increasingly offering edge products

Applications must run on any of these!

Connectivity	Bit rates	Formats
Broadcaster dedicated fibre	Many Gbps	UHD 50/60P, uncompressed or lightly compressed
Venue-supplied Internet	Hundreds of Mbps	HD 50/60P, compressed
5G / LEO	Tens of Mbps	HD 50/60P, compressed

- Very large pipes will be needed for the highest tier
- Where this is not feasible, we'll certainly need some resource to be local.
- And if we want to support different types of production we will need to think about all these tiers

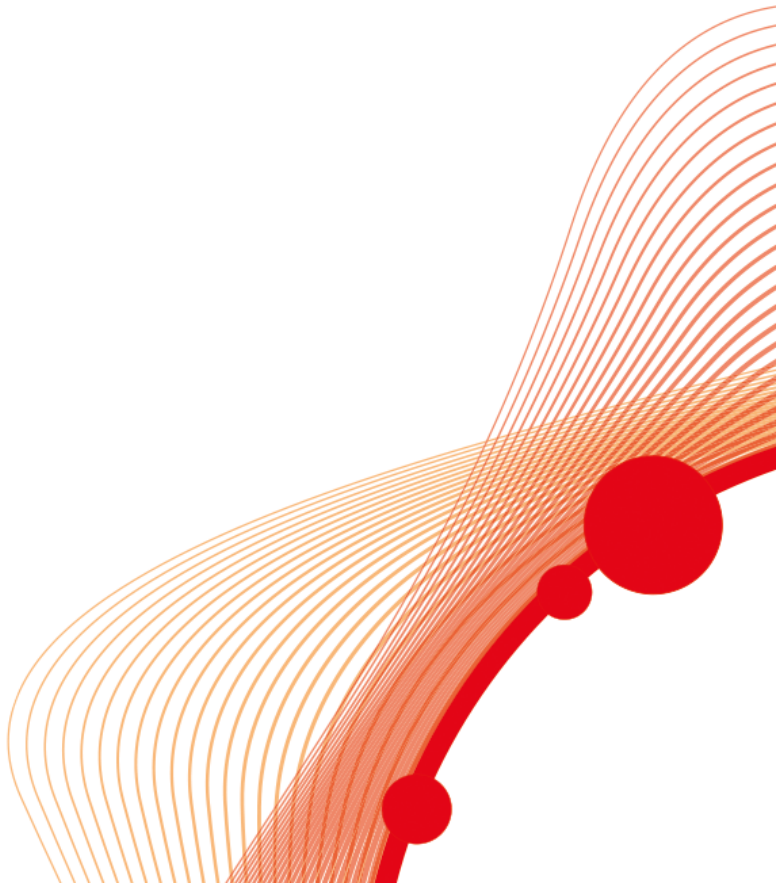
The challenge

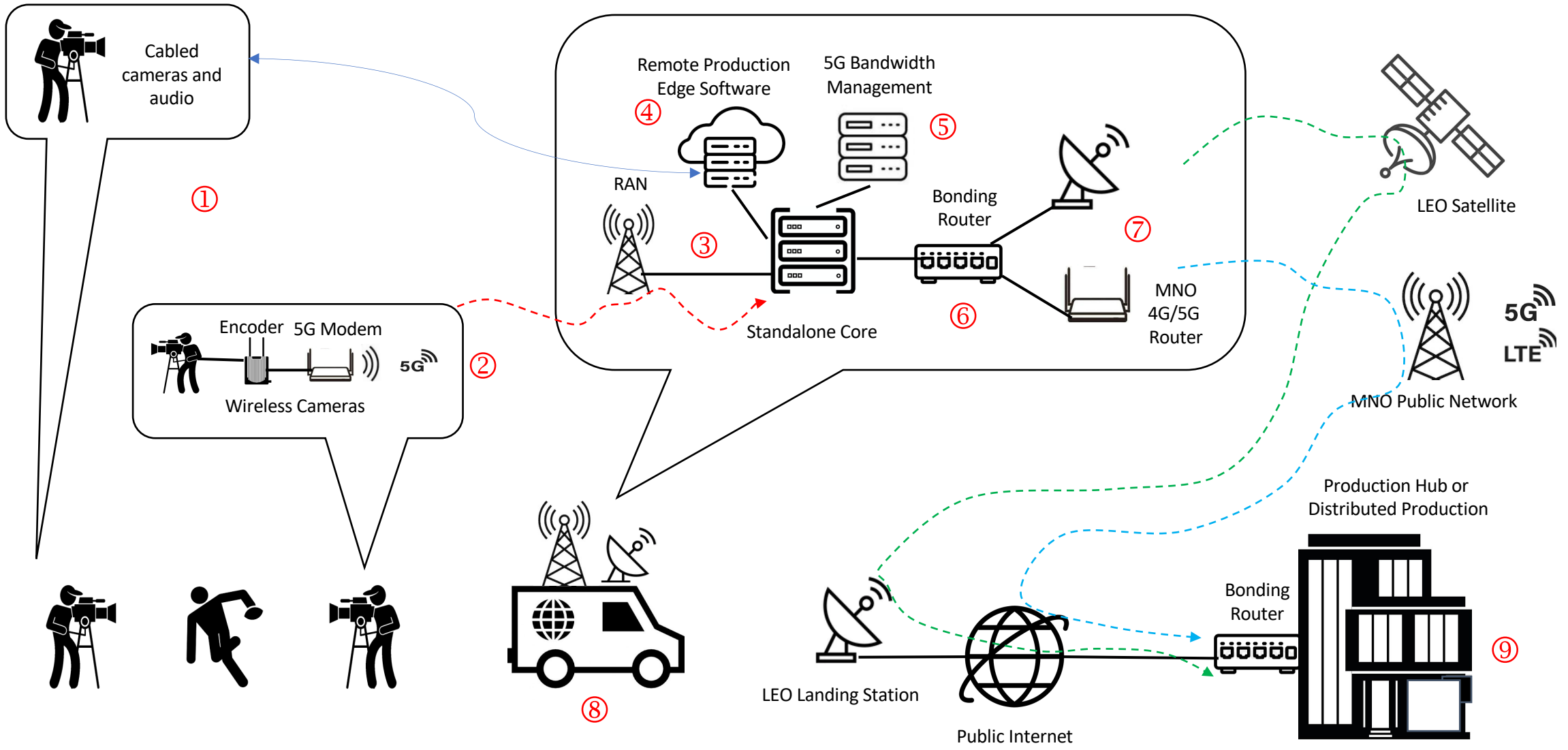
Dynamically move live production media processing stages between cloud and edge computing at the event.

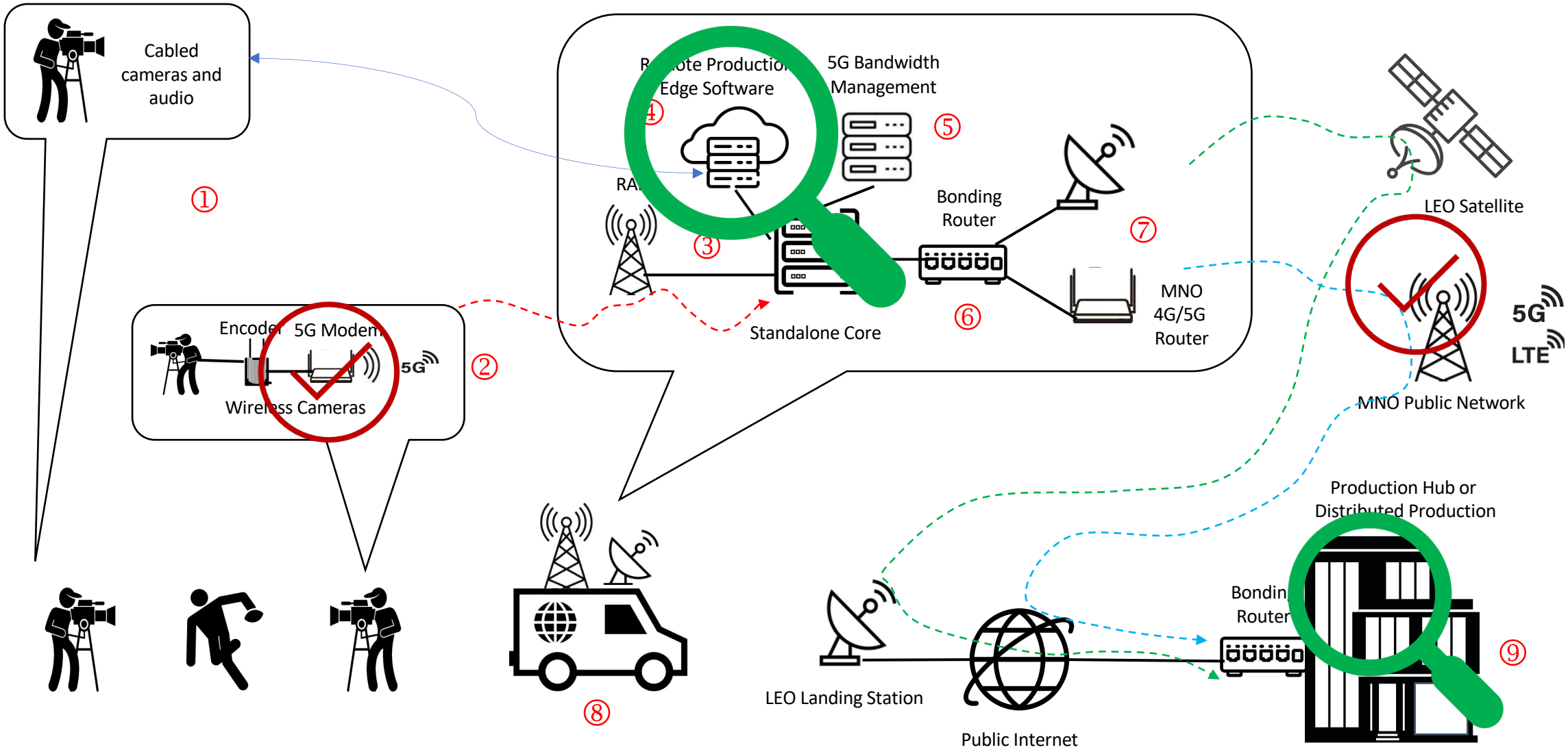
- Do this so that the operators don't notice!

Allow us to deploy software to the best location making the most efficient use of resources in a bandwidth constrained location.

- Do this so that production experience is not impacted by bandwidth




Cabled cameras and audio
①
Encoder
5G Modem
5G
Wireless Cameras
②
Remote Production Edge Software
④
5G Bandwidth Management
⑤
RAN
③
Standalone Core
Bonding Router
⑥
⑦
MNO 4G/5G Router
LEO Satellite
5G
LTE
MNO Public Network
⑧
LEO Landing Station
Public Internet
Production Hub or Distributed Production
Bonding Router
⑨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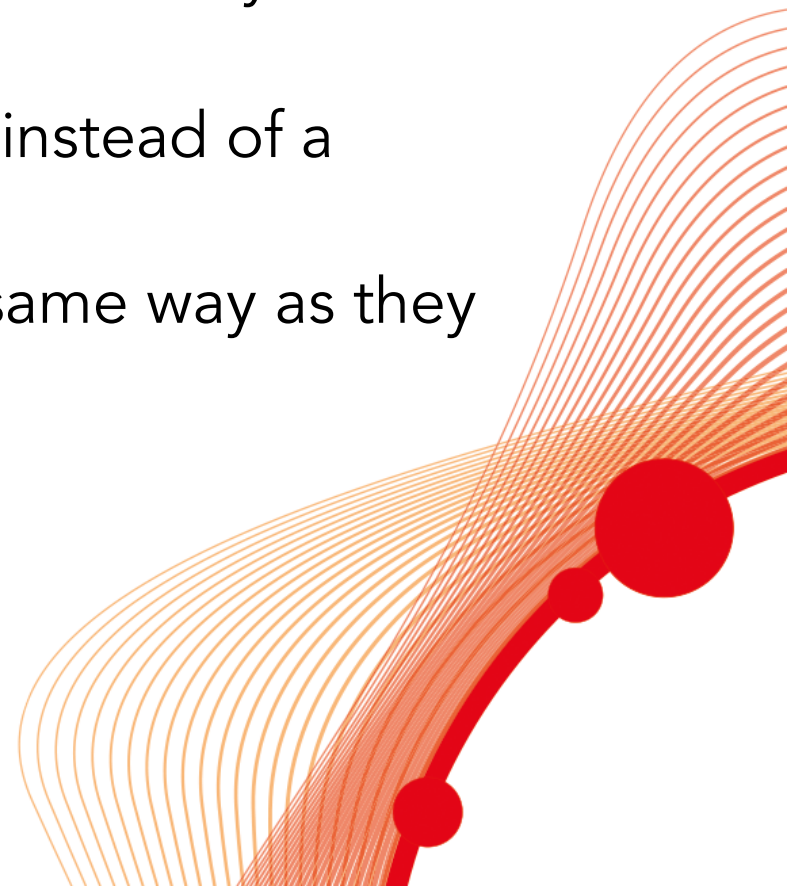
⑥
Standalone Core
LEO Satellite
5G
LTE
MNO Public Network
⑧
LEO Landing Station
Public Internet
Production Hub or Distributed Production
⑨

What we are exploring...

- How can we run live production software on different software platforms?
- Can we run them on servers at an event?
- What are the sustainability implications?
- What can be done now and what is expected for the future?

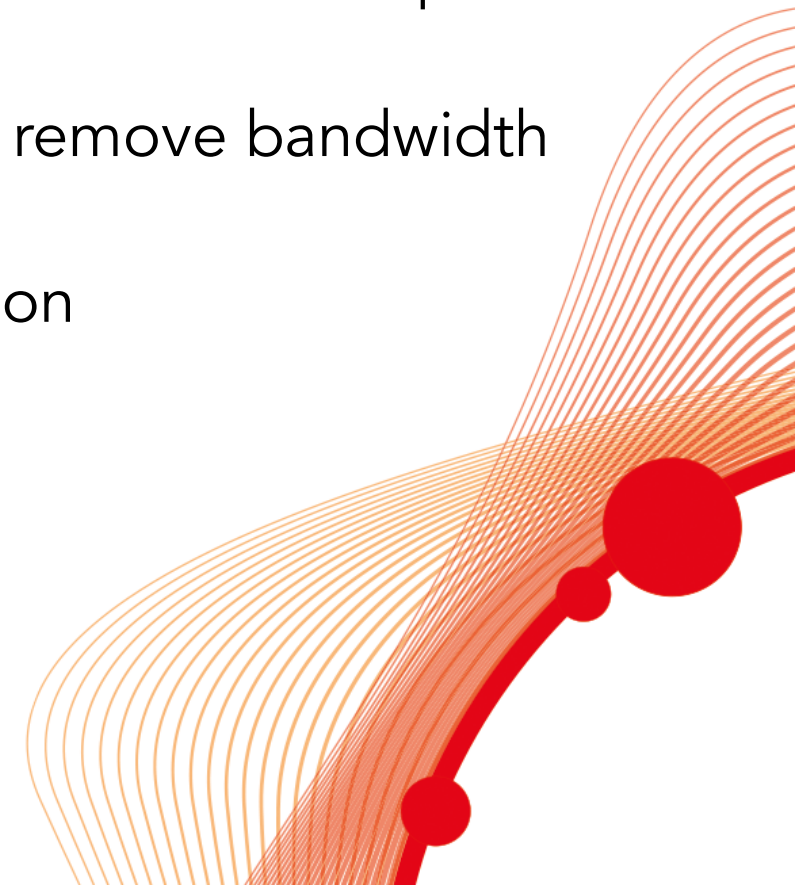
Edge First

- By deploying Edge compute can we reduce the connectivity required for ground to cloud solutions
- Edge could be deployed as a 'mobile data centre' instead of a scanner
- Option to run whatever services we require in the same way as they run in a cloud
- Enable low-latency local feeds as required



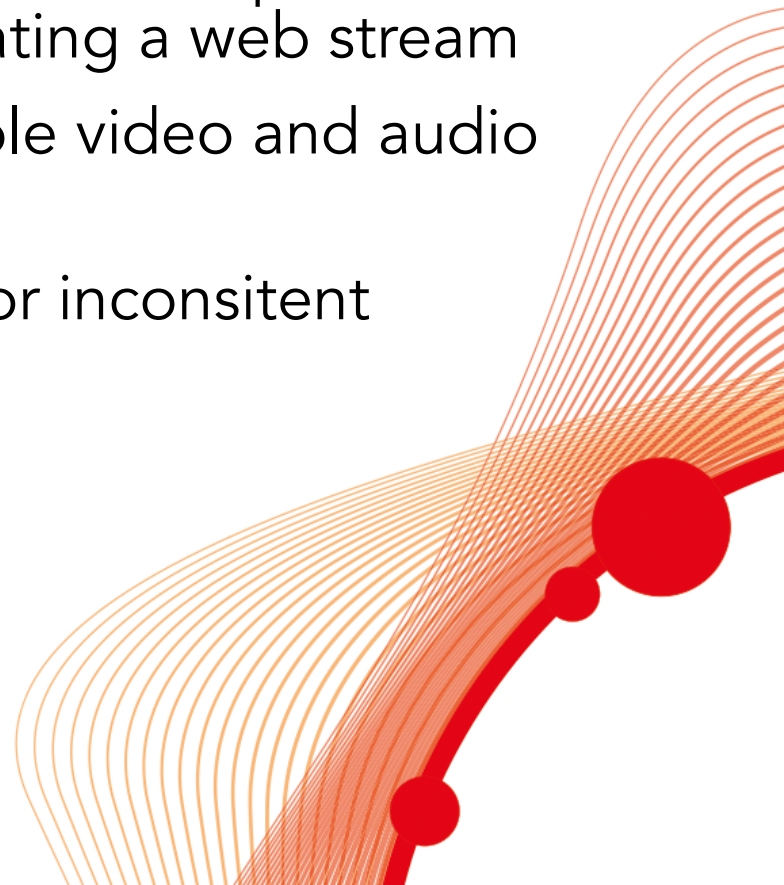
Constrained Bandwidth

- Venues don’t always have the connectivity required to send multiple feeds to the cloud
- Operational environment could be anywhere if we remove bandwidth constraints
- Connectivity is biggest blocker to remote production



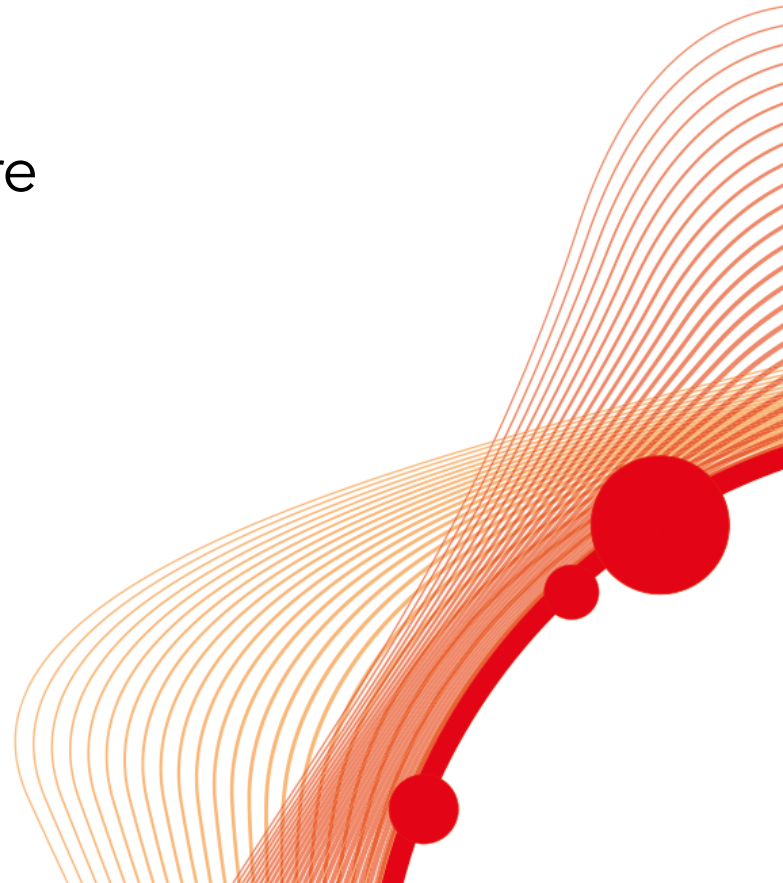
A note about latency

- It's not necessarily bad to have significant latency for some parts of the operation – a few seconds may be ok when generating a web stream
- But latency needs to be consistent between multiple video and audio sources so that mixing is viable
- And operational control can't be delayed by slow or inconsitent connectivity



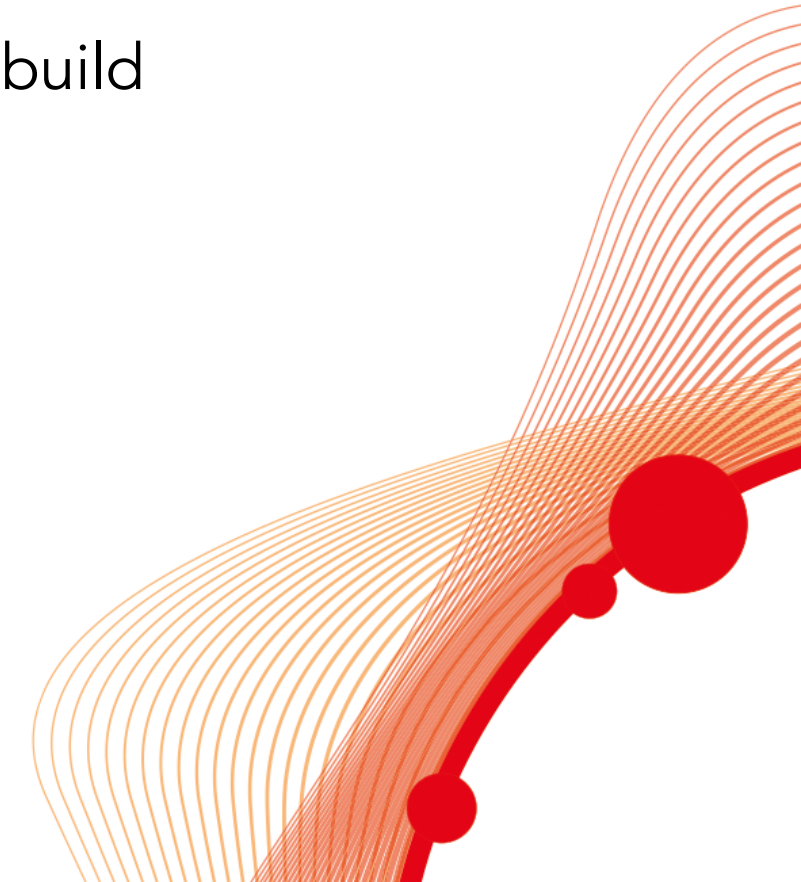
Work Anywhere

- Editorial choice on where operational staff are located
- On site, in office or at home
- Choice of tools dependant on licence not hardware



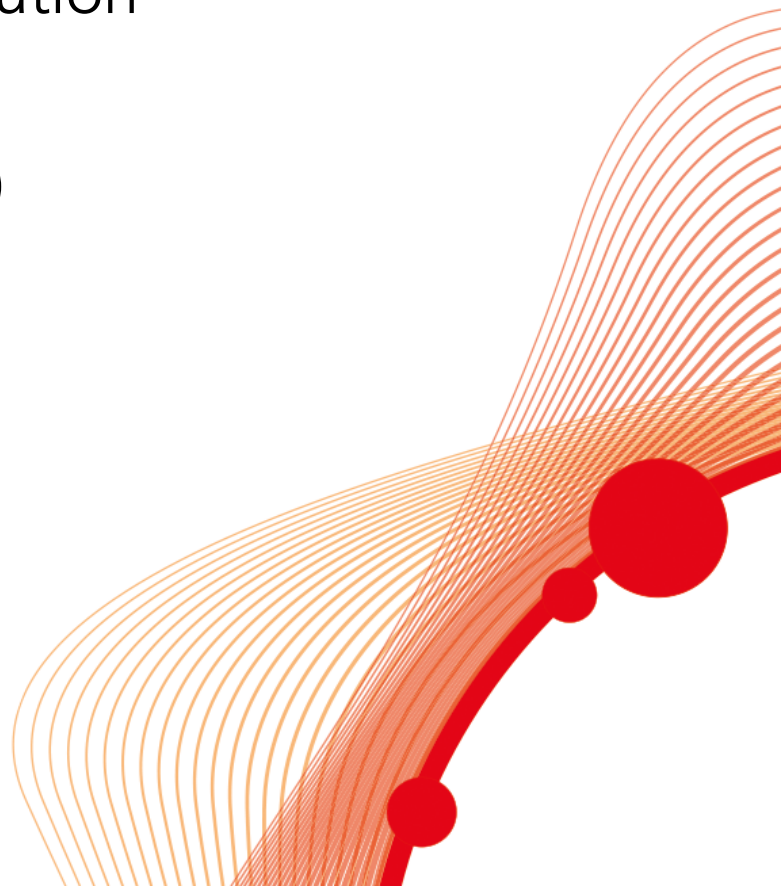
Sustainability

- Remote production can reduce our carbon impact
- Sunk carbon in hardware and multiple duplicated build
- Reuse and better sharing or resources
- Think about how we measure and track



Test environment at Techex, Bracknell, UK

- Vision and audio mix, graphics, playout and distribution streaming applications
- Deployed on local (edge) cloud servers (Dell/AMD)
- Azure Stack HCI and Google Distributed Cloud
- Local NDI sources – target mid/low tier production
- Access to cloud-based distribution
- View and monitor at IBC!

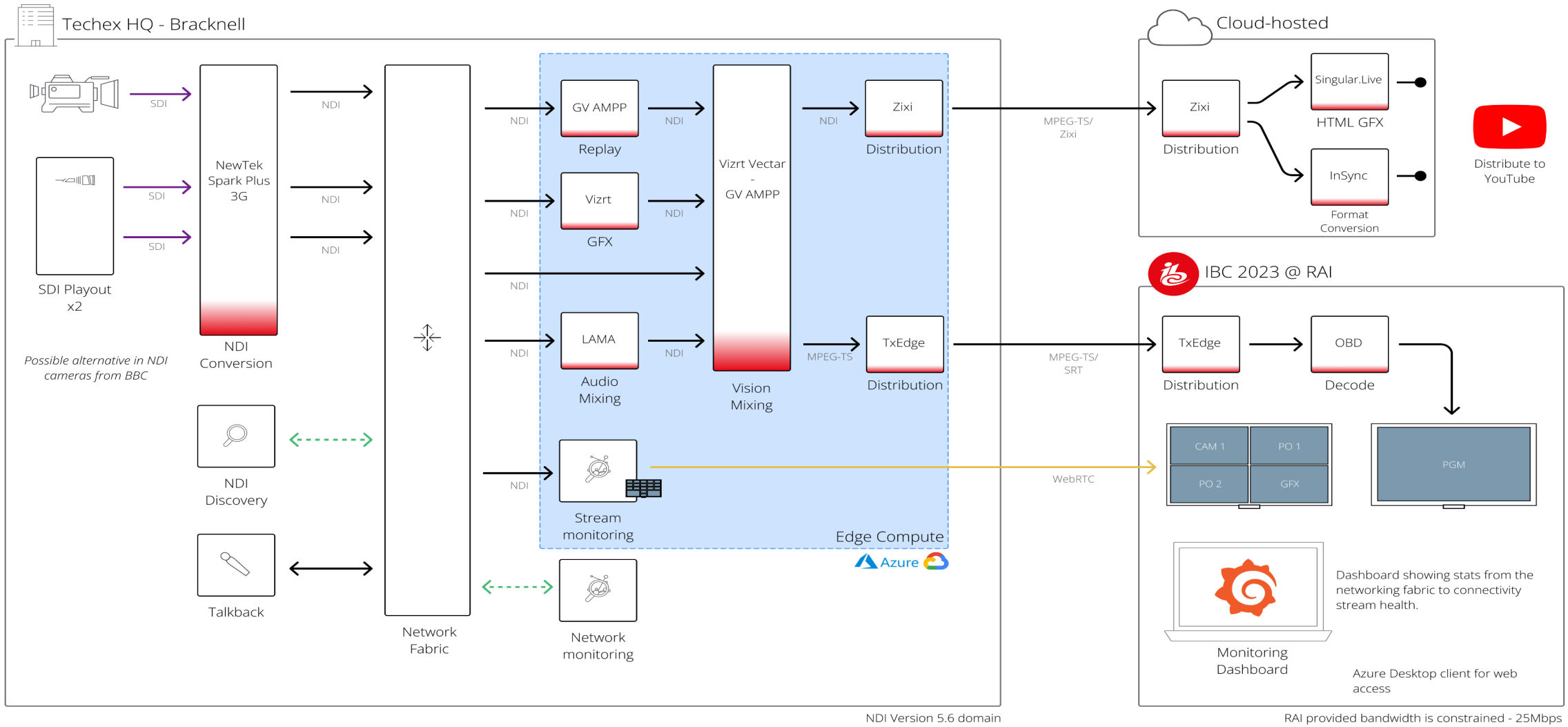


EDGE FIRST

CONSTRAINED BANDWIDTH

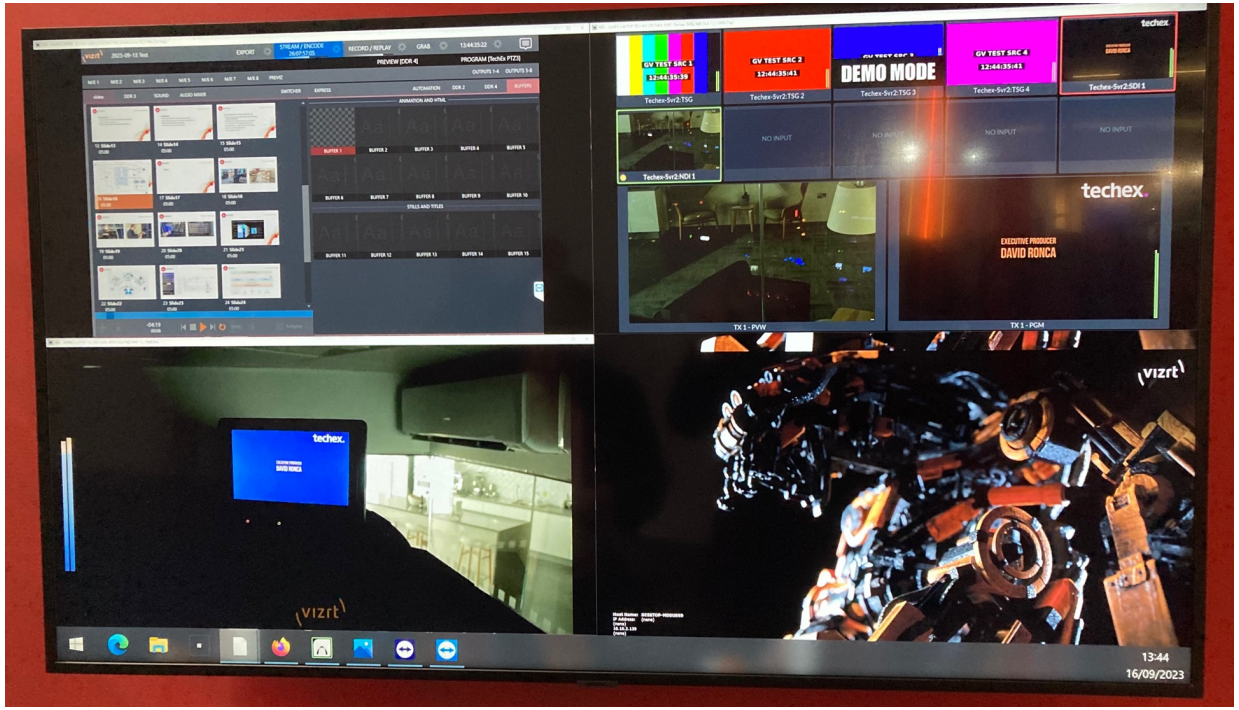
WORK ANYWHERE

SUSTAINABILITY



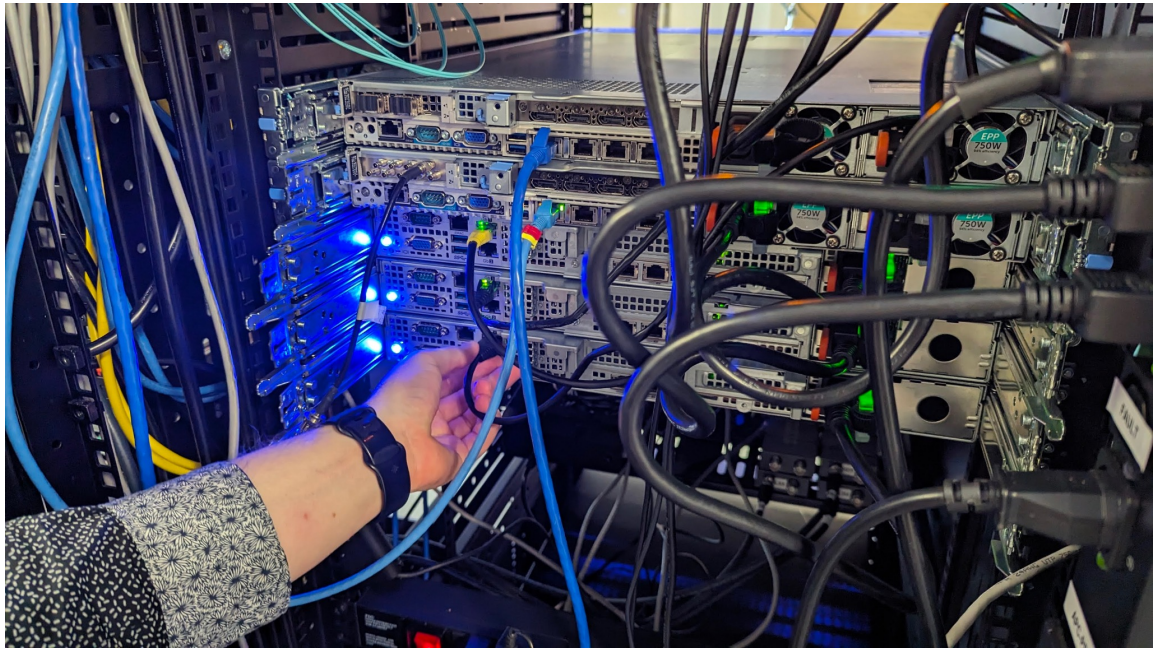
Connect & Produce Anywhere - IBC Workflow

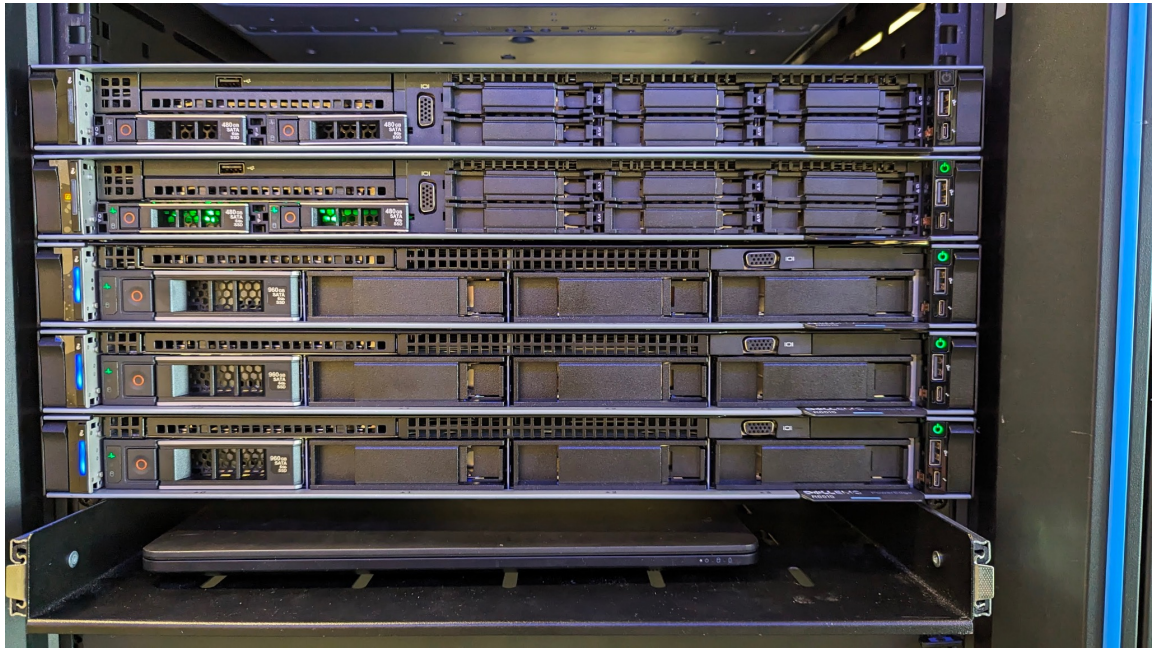

CONNECT & PRODUCE
ANYWHERE
Champions:
Participants:
BBC
BT
sky sports
vodafone
AMD
Microsoft
Google Cloud
techex.
OPEN
SINGULAR.LIVE
Grass Valley
INNER
ORANGE
BLUE
DEMO MODE

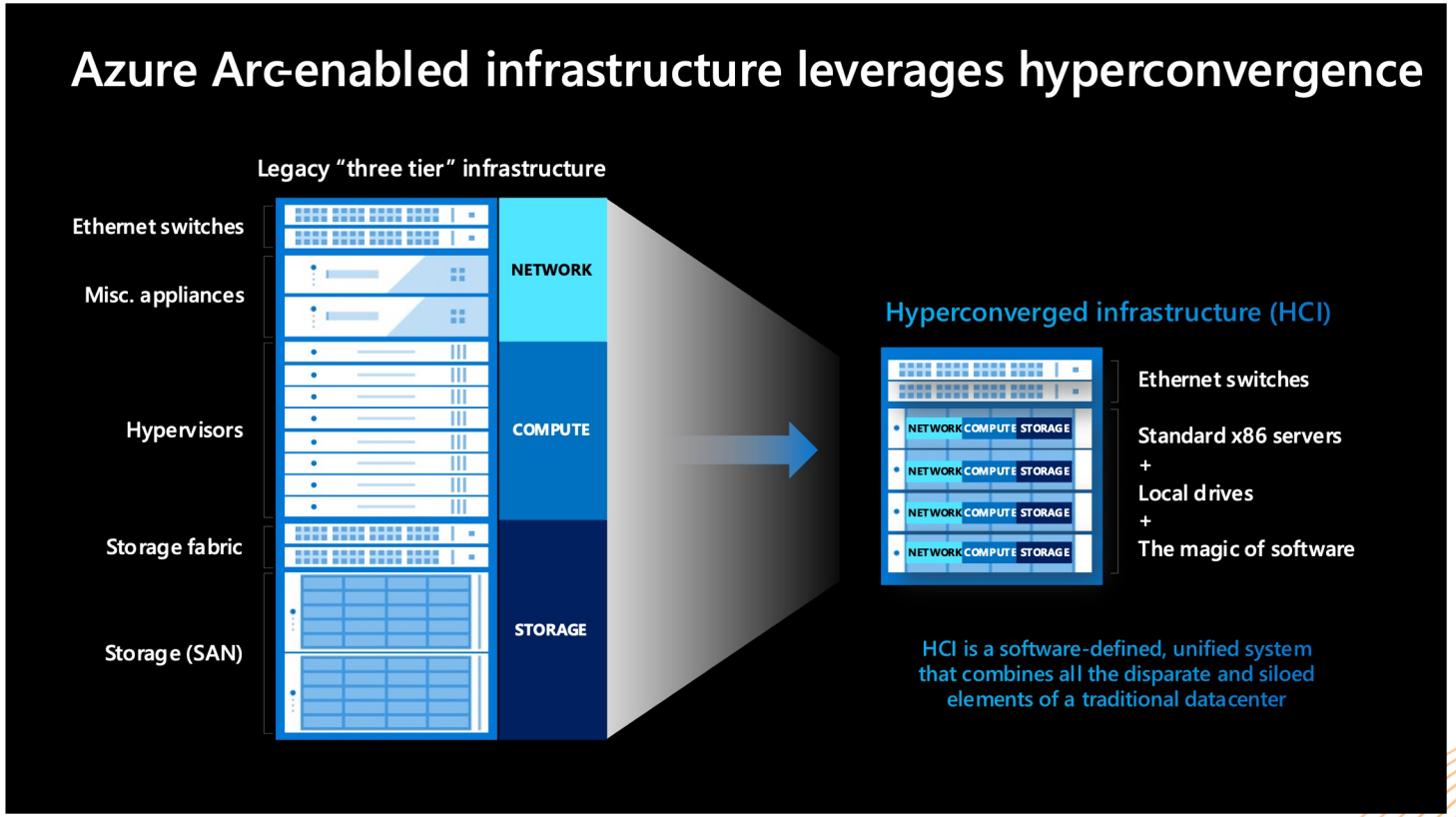

DEMO MODE
techex.
EXECUTIVE PRODUCER
DAVID RONCA
vizrt
13:44
16/09/2023

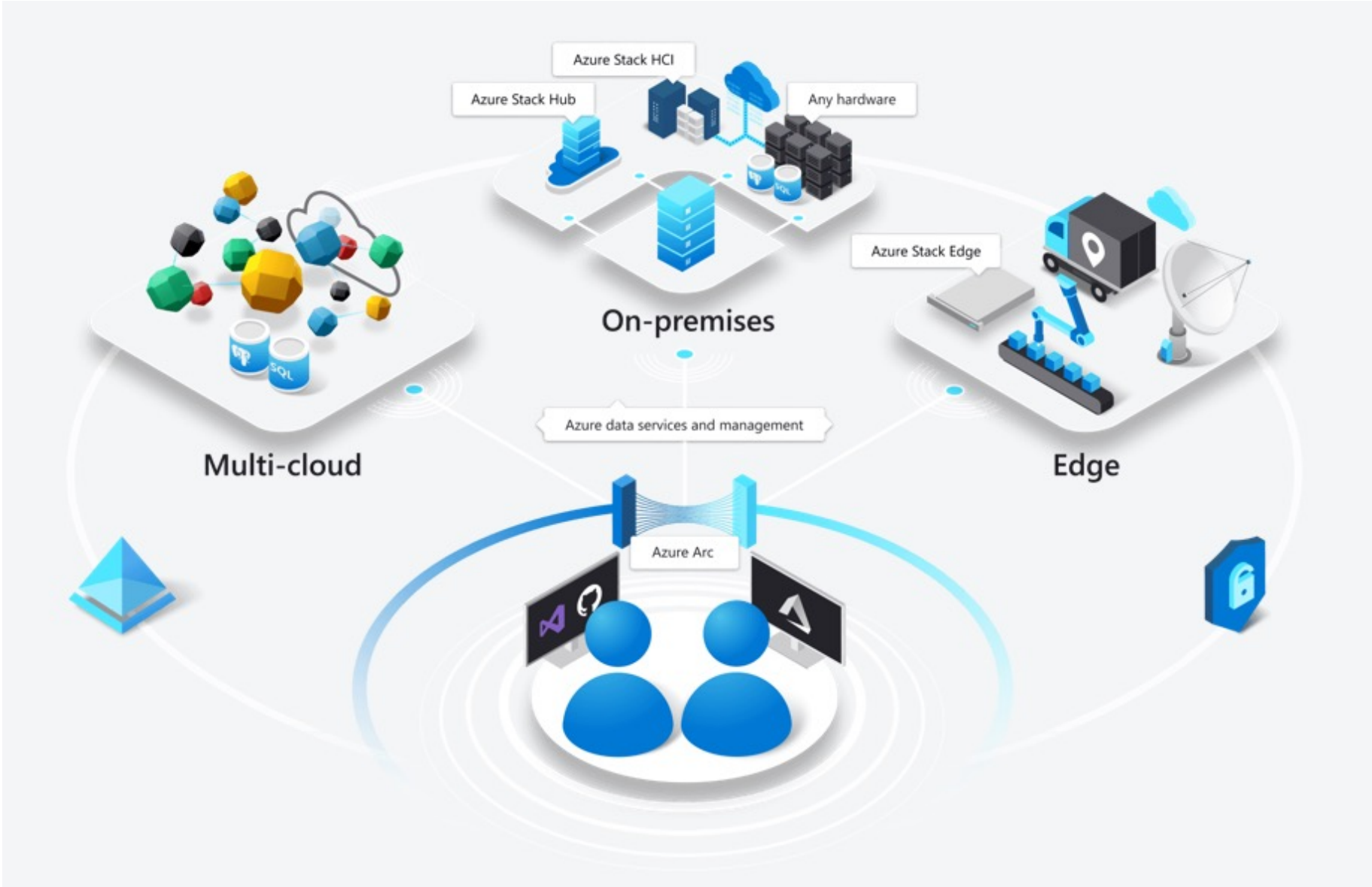

NewTek


CROWN
7






Azure Arc-enabled infrastructure leverages hyperconvergence
Legacy "three tier" infrastructure
Ethernet switches
Misc. appliances
Hypervisors
Storage fabric
Storage (SAN)
NETWORK
COMPUTE
STORAGE
Hyperconverged infrastructure (HCI)
NETWORK COMPUTE STORAGE
NETWORK COMPUTE STORAGE
NETWORK COMPUTE STORAGE
NETWORK COMPUTE STORAGE
Ethernet switches
Standard x86 servers
+
Local drives
+
The magic of software
HCI is a software-defined, unified system that combines all the disparate and siloed elements of a traditional datacenter


Azure Stack HCI
Azure Stack Hub
Any hardware
On-premises
Azure Stack Edge
Azure data services and management
Multi-cloud
Edge
Azure Arc


DELL EMC
Azure Stack HCI
DELL EMC
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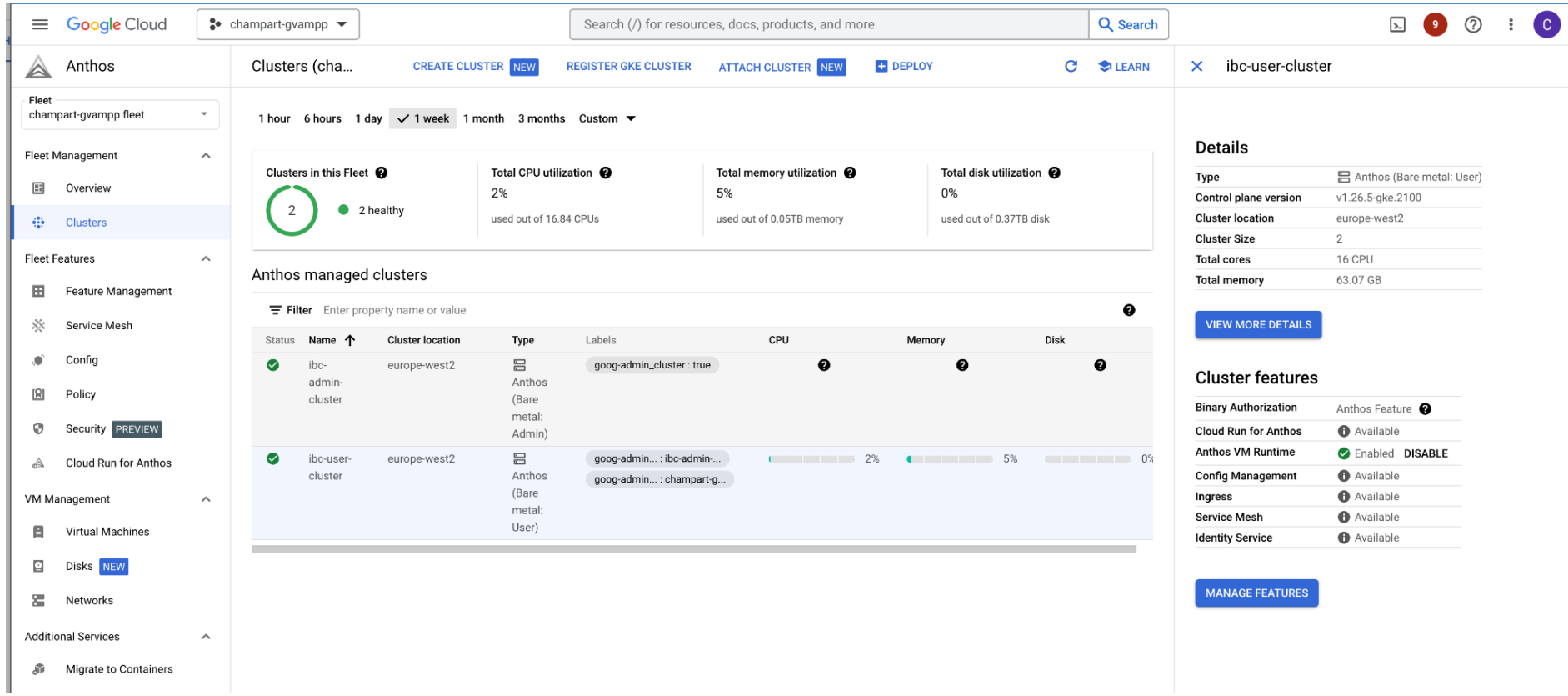
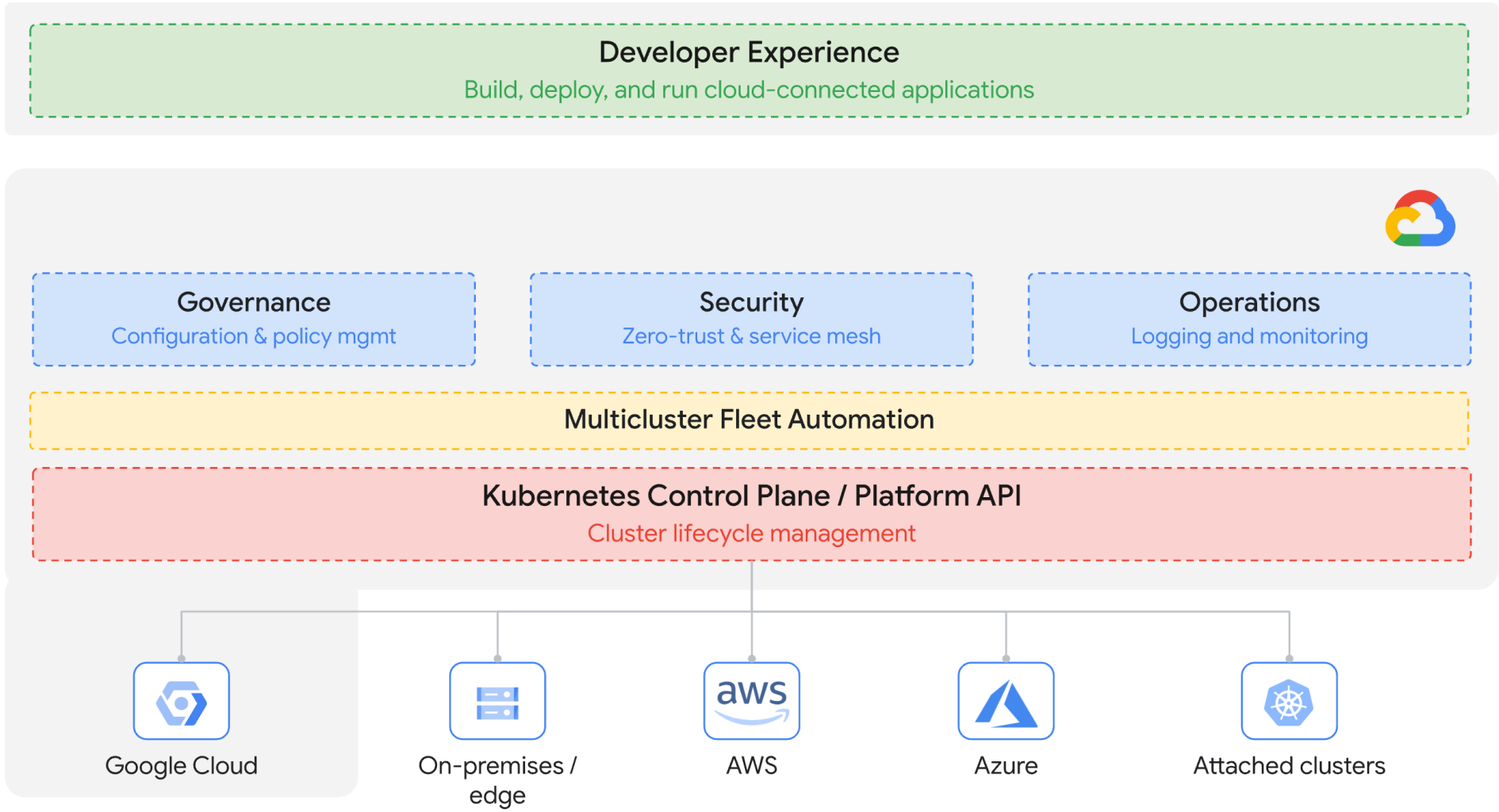
DELL EMC
Azure Stack HCI

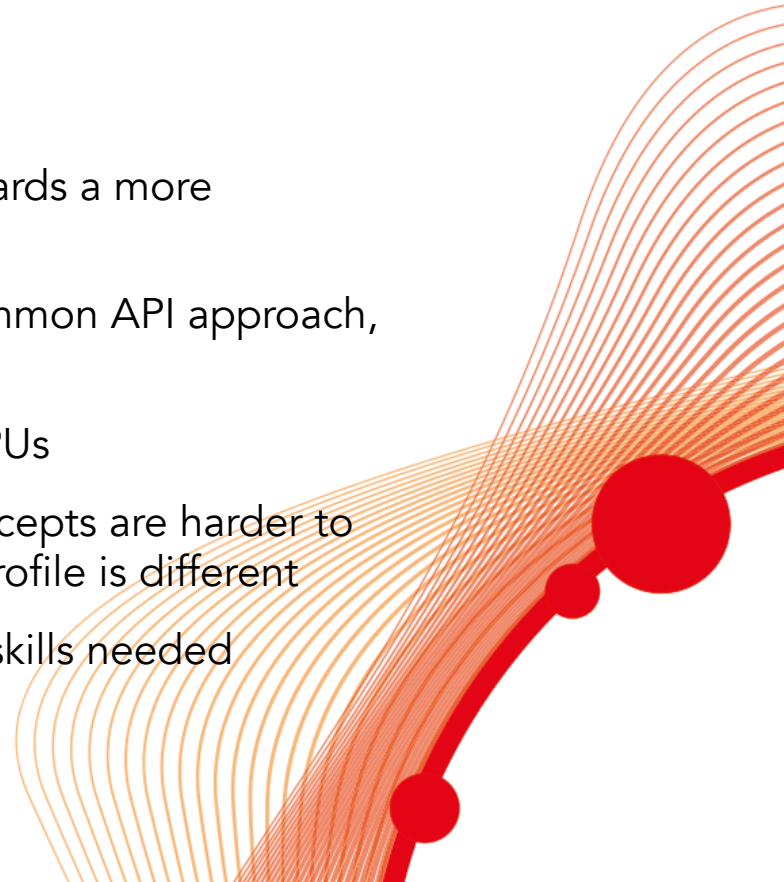

Google Cloud
champart-gvampp
Search (/) for resources, docs, products, and more
Search
Anthos
Fleet
champart-gvampp fleet
Fleet Management
Overview
Clusters
Fleet Features
Feature Management
Service Mesh
Config
Policy
Security PREVIEW
Cloud Run for Anthos
VM Management
Virtual Machines
Disks NEW
Networks
Additional Services
Migrate to Containers
Clusters (cha...
CREATE CLUSTER NEW
REGISTER GKE CLUSTER
ATTACH CLUSTER NEW
DEPLOY
LEARN
1 hour
6 hours
1 day
1 week
1 month
3 months
Custom
Clusters in this Fleet
2
2 healthy
Total CPU utilization
2%
used out of 16.84 CPUs
Total memory utilization
5%
used out of 0.05TB memory
Total disk utilization
0%
used out of 0.37TB disk
Anthos managed clusters
Filter
Enter property name or value
Status
Name
Cluster location
Type
Labels
CPU
Memory
Disk
ibc-admin-cluster
europe-west2
Anthos (Bare metal: Admin)
goog-admin_cluster : true
ibc-user-cluster
europe-west2
Anthos (Bare metal: User)
goog-admin... : ibc-admin-...
goog-admin... : champart-g...
2%
5%
0%
ibc-user-cluster
Details
Type
Anthos (Bare metal: User)
Control plane version
v1.26.5-gke.2100
Cluster location
europe-west2
Cluster Size
2
Total cores
16 CPU
Total memory
63.07 GB
VIEW MORE DETAILS
Cluster features
Binary Authorization
Anthos Feature
Cloud Run for Anthos
Available
Anthos VM Runtime
Enabled
DISABLE
Config Management
Available
Ingress
Available
Service Mesh
Available
Identity Service
Available
MANAGE FEATURES


Developer Experience
Build, deploy, and run cloud-connected applications
Governance
Configuration & policy mgmt
Security
Zero-trust & service mesh
Operations
Logging and monitoring
Multicluster Fleet Automation
Kubernetes Control Plane / Platform API
Cluster lifecycle management
aws
Google Cloud
On-premises / edge
AWS
Azure
Attached clusters


CONNECT & PRODUCE
ANYWHERE
Champions:
Participants:
BBC
BT
sky sports
vodafone
AMD
Microsoft
Google Cloud
techex.
OPEN
SINGULAR.LIVE
Grass Valley
INNER
ORANGE
BLUE
DEMO MODE

What we have learned so far

- Observability of the network is critical
- Mixed environments are a pain SDI needs careful consideration on how you handle it in a software native environment
- How we measure sustainability
- So far cloud deployments have been vendor specific, we need to move towards a more standardised container type deployment
- Open APIs and not all APIs are equal need to start the conversation to a common API approach, end user requirements are key,
- Building the stacks is non-trivial, especially with specialised features such GPUs
- It took longer than expected not because of supply or tech but logistics concepts are harder to resource than known deployments but drive more innovation because risk profile is different
- Startup procedures at an event need to be well understood... possible new skills needed
- How do we enable an app based infrastructure ?
- Routing and interop?

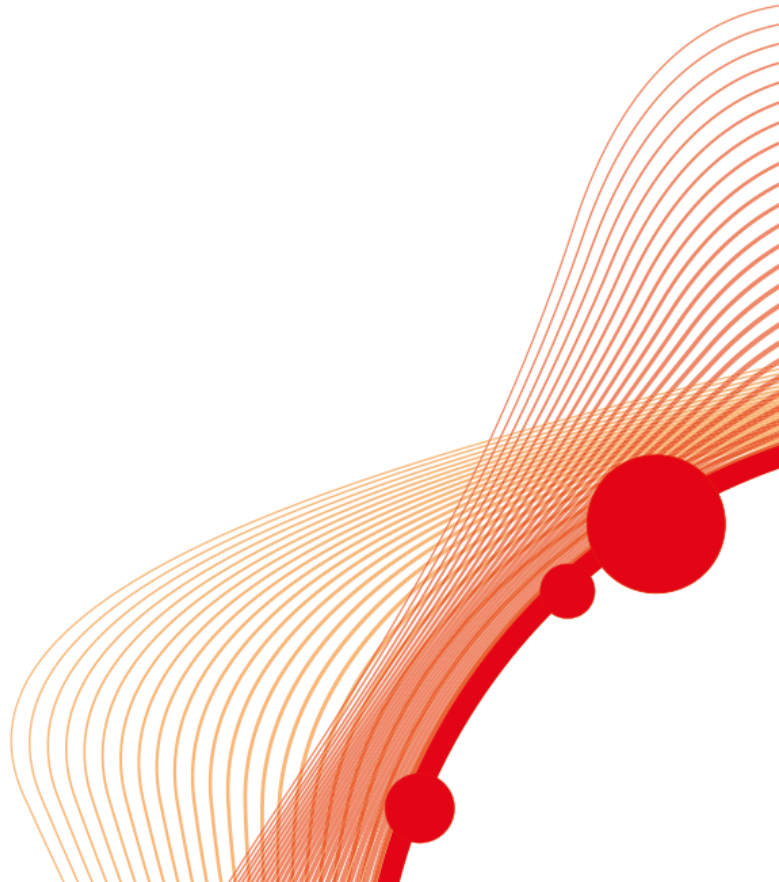


This is just the start

Test bed will be extended after IBC

- More and different applications
- More connectivity types (ST 2110, JPEG-XS, etc)
- Environmental monitoring
- Orchestration
- Business case and licence options

Incubator for further work and trials



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