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Develop your Cloud Native use cases at the Edge with K3s

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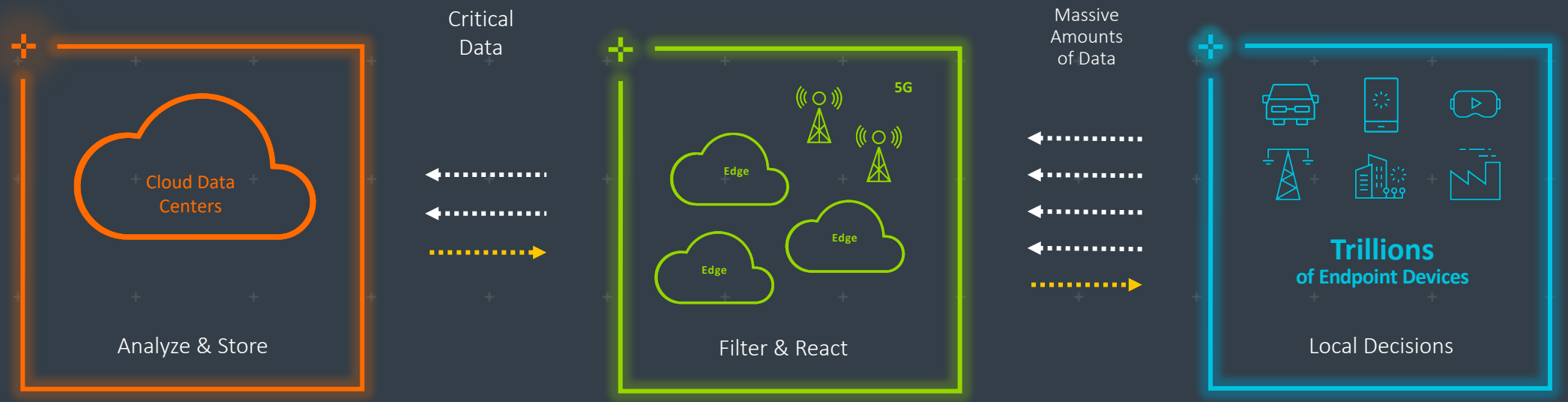
Agenda

- Introduction
- Evolution of Edge & Cloud Native Disruption
- Project Cassini - Arm’s Platform for the Edge
- Use Case #1 - CI/CD at the Edge with K3s and GitLab
- Use Case #2 - Smart Cities Demo
- Summary, Q&A

Data Consumption is Driving a New Internet Architecture



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Heterogenous Compute for Increasing Edge Demands

Faster general-purpose compute used to be good enough for all workloads…

…heterogenous, intelligent & optimized compute is the only way to keep up

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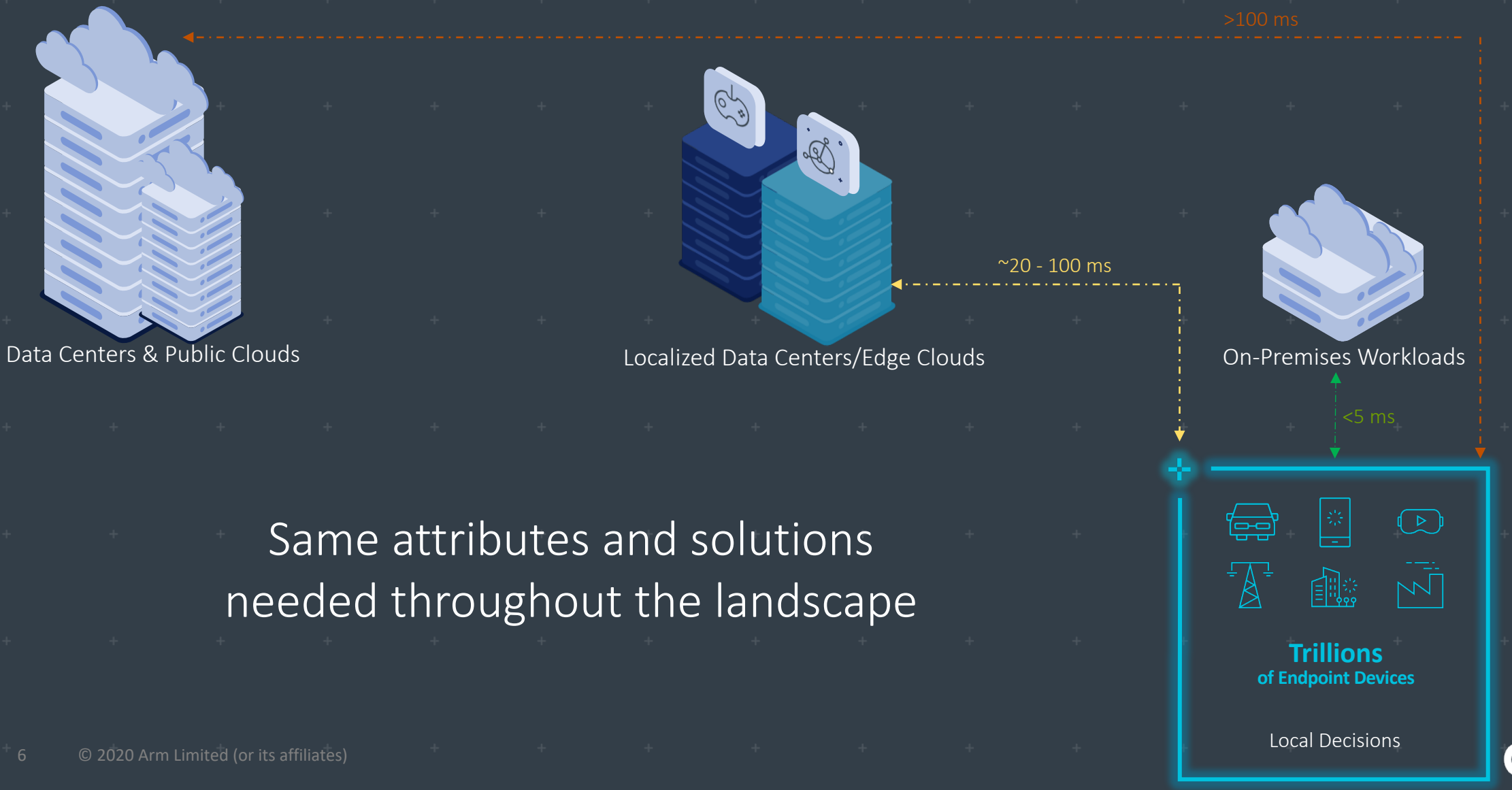
Spatial Latency and Resource Constraints Influences Edge



Same attributes and solutions
needed throughout the landscape

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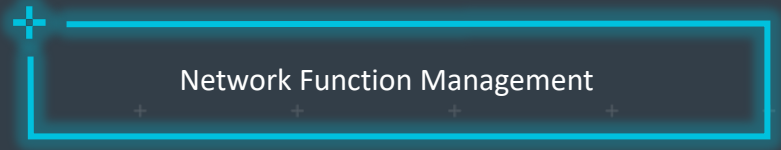
Evolution of the Edge

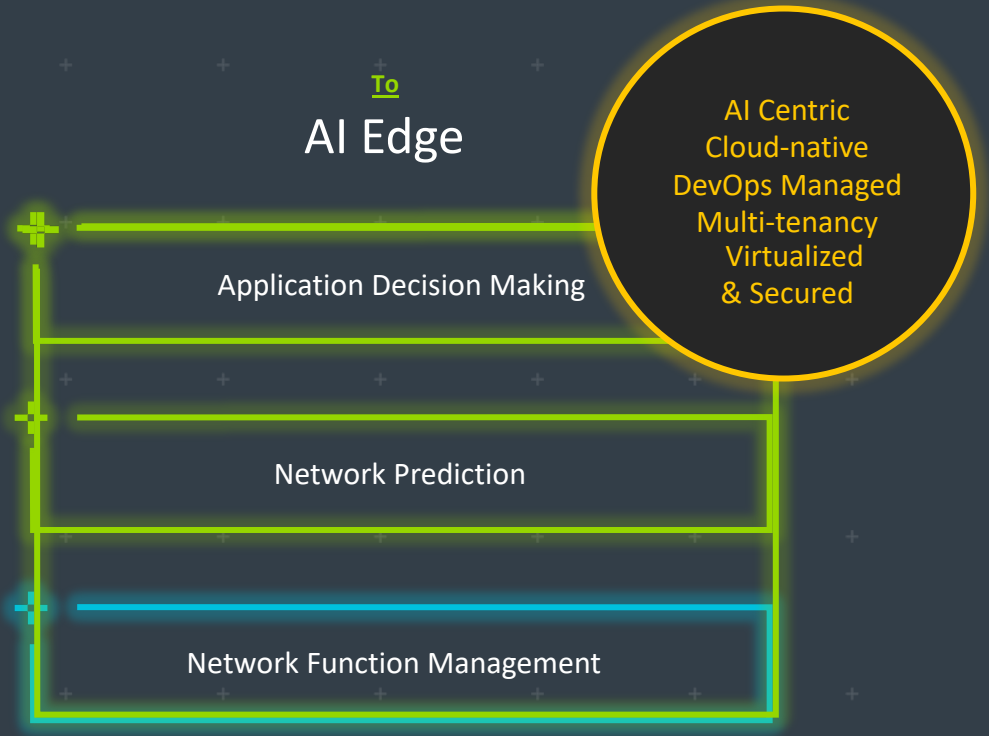
From

Network Bridge



To

AI Edge



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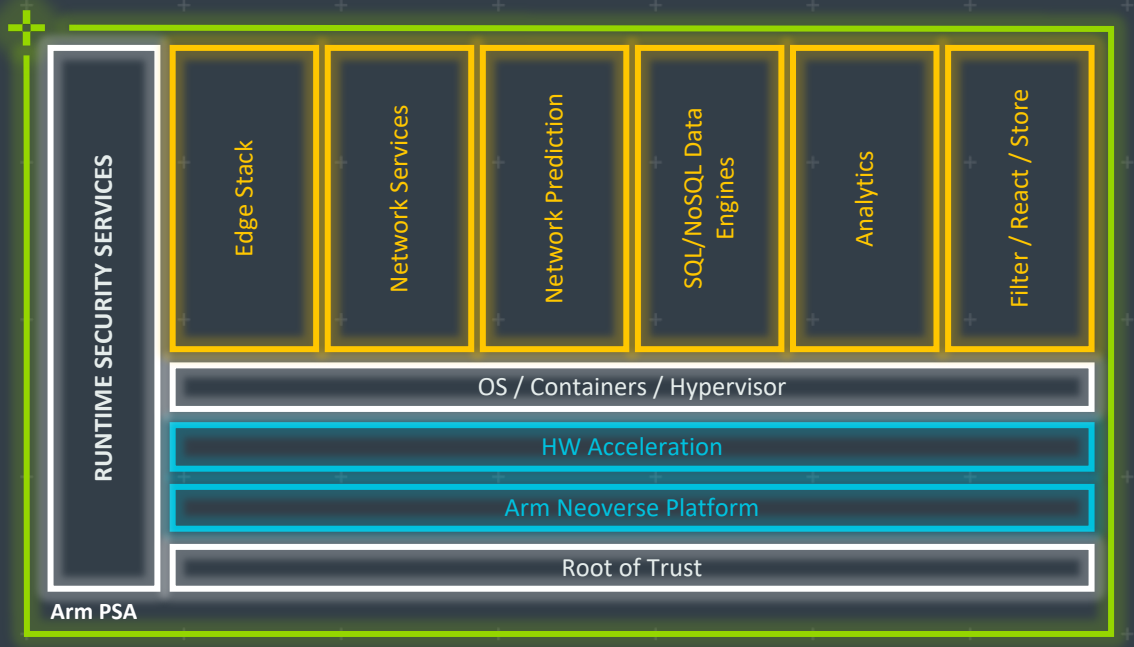
The AI Edge Technology Stack



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Project Cassini

Ensuring a cloud native experience across a diverse and secure edge ecosystem

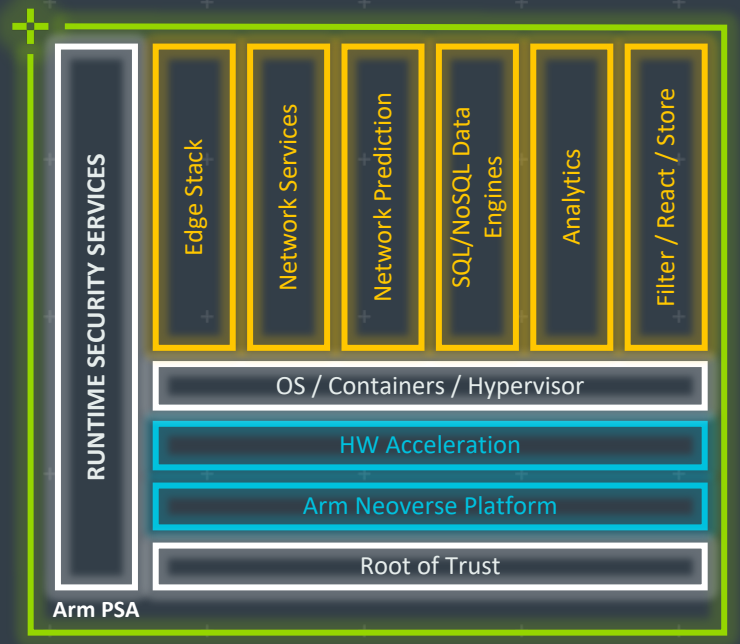
Platform standards & reference systems

+

Cloud native software stack

+

PSA extended for a secure infrastructure edge



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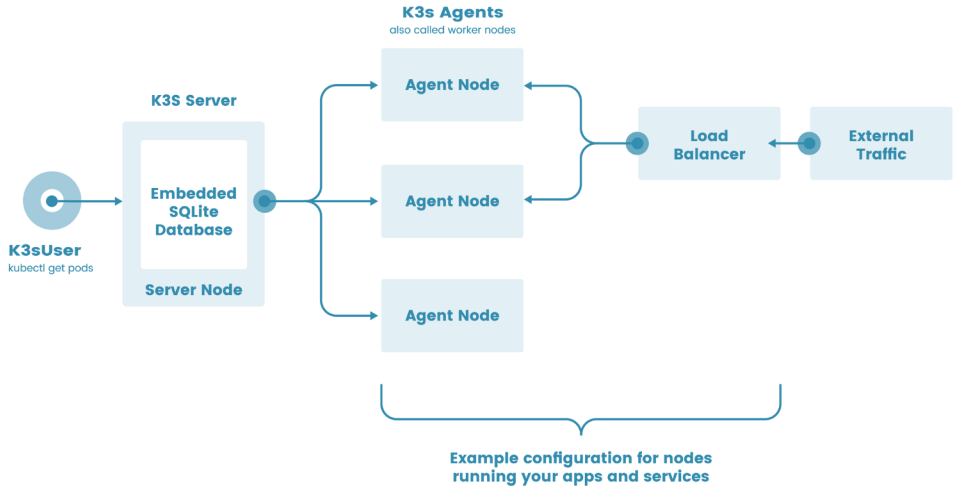
Developing Cloud Native Applications at the Edge on Arm with Rancher k3s and GitLab as CI/CD

Rancher K3s architecture and Gitlab CI/CD

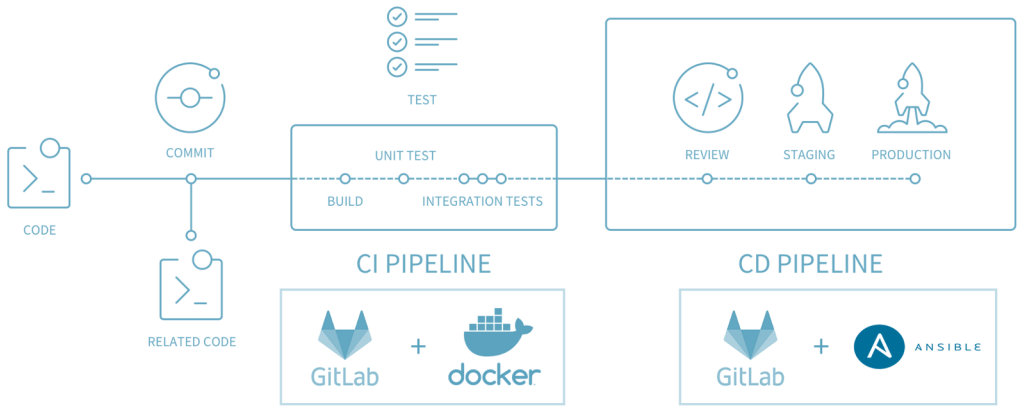
K3S

- Lightweight, production-grade Kubernetes distribution from Rancher
- Optimized for Arm Architecture
- DevOps tool for quick, reliable application deployments to resource-constrained environments like edge computing, CI and IoT use cases



GitLab

- Web based DevOps platform that provides a Git based repository
- CI/CD pipeline features & support for build and deploy native applications at the edge
- Support for GitLab Runners available on Arm



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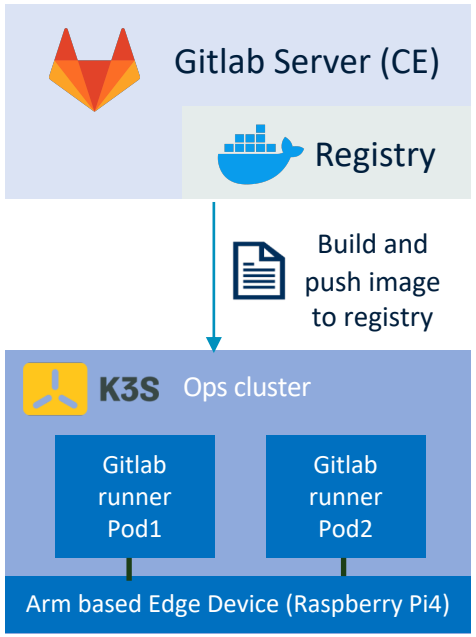
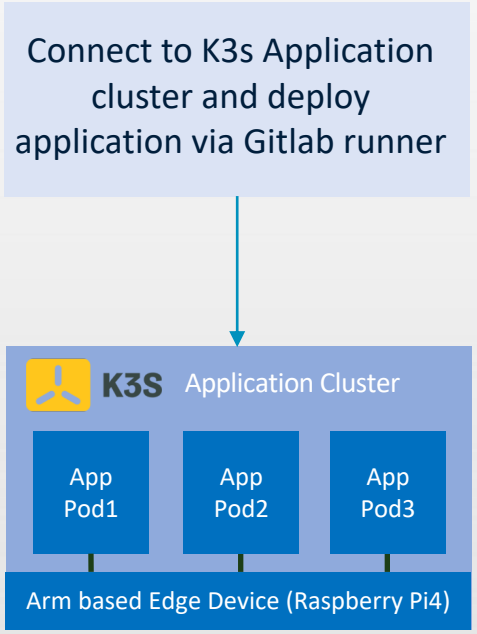
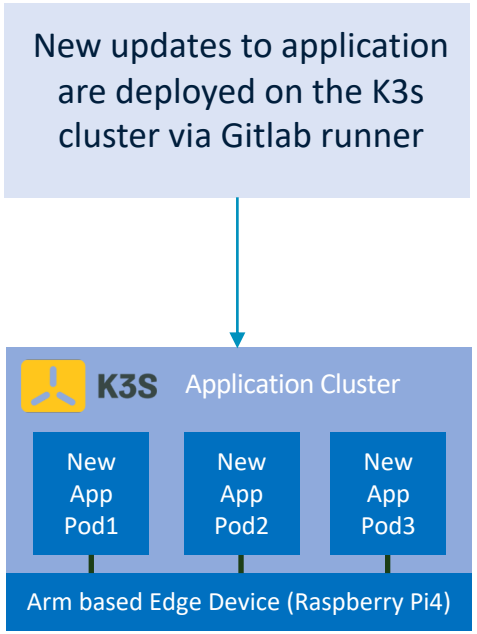
Demo: CI/CD with Rancher K3s and Gitlab at Edge







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Demo

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Smart Cities Demo

SMARTER

- Vision
  - The effective integration of physical, digital and human systems in the built environment to deliver **sustainable, prosperous and inclusive future** for its citizens
- Mission
  - Drive research in systems, security, and ML at the Edge through deployable reference designs satisfying smarter cities requirements from partners

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SMARTER - Use Cases

Smart Cities

Argonne Array of Things
Multiple AI@Edge Machine Learning & Sensor Applications at edge

Smart Agriculture

Texas A&M Well Water Monitoring and Control
Single application, but with actuation and LORA last-mile

Smart Rural

NSF Sage Project to monitor climate change & wildfires
Widely dispersed, low bw, multi-application sensors w/AI@Edge

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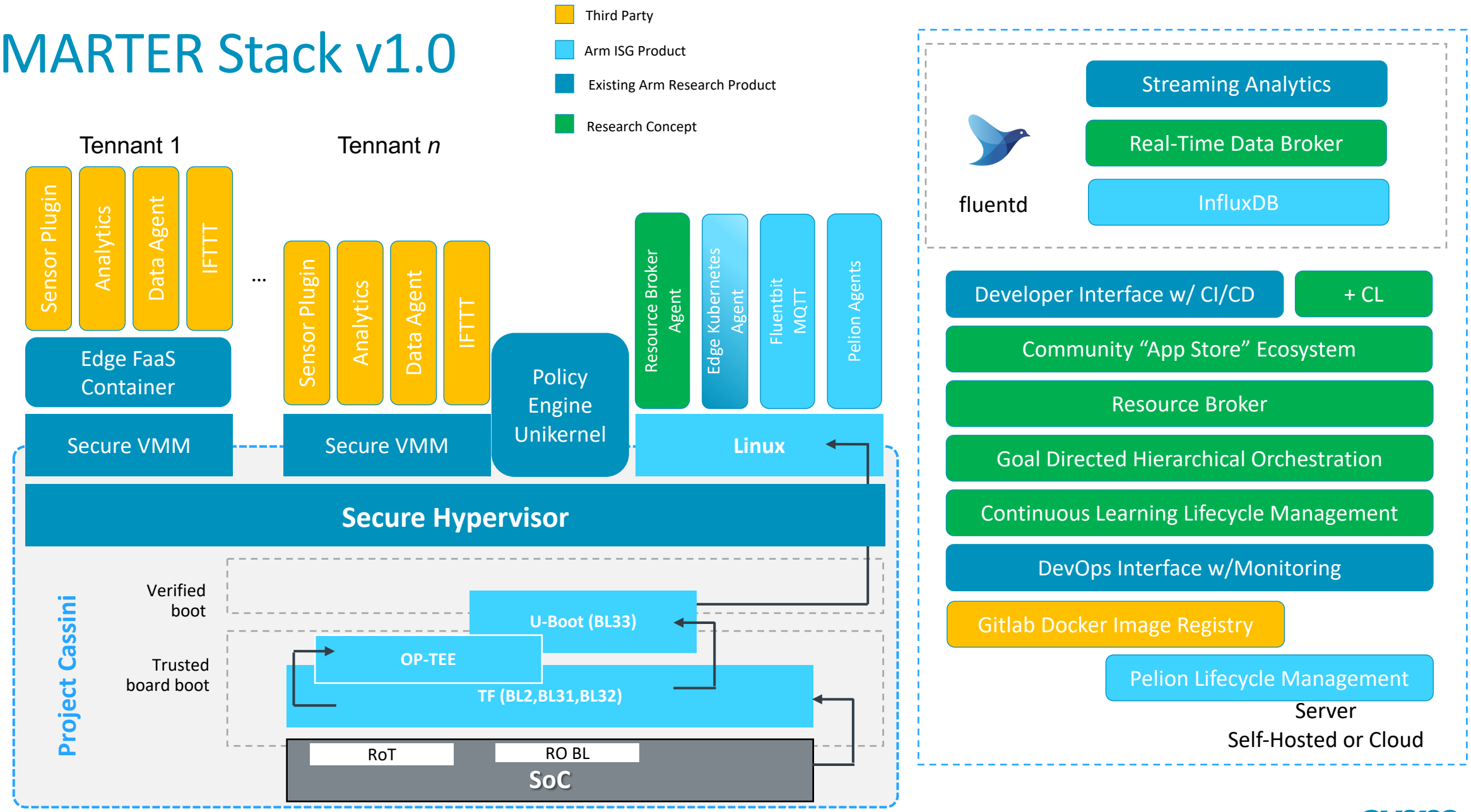
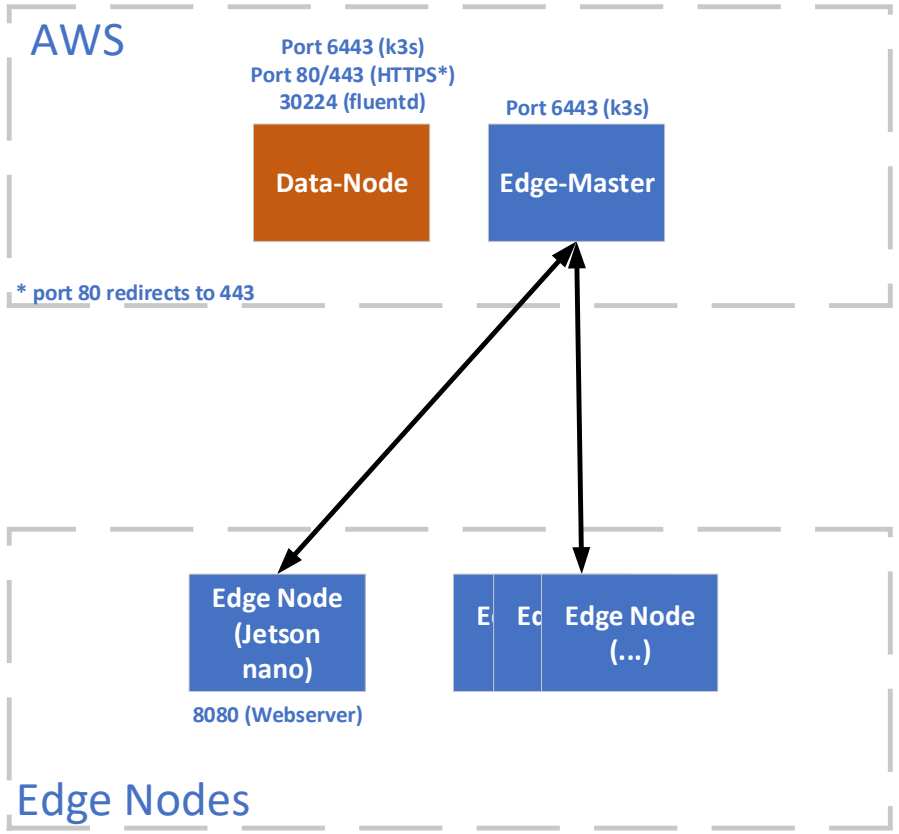
SMARTER Stack v1.0



Smart City Demo

Edge Node Management

- K3s cluster with worker nodes at the edge, and master node in the cloud.
- Edge-Master runs on m6g.
- Edge-Node is Nvidia Jetson Nano
  - Any platform can be used
- Edge-Nodes have a camera and mic.
  - Runs containerized inference engine that counts cars and people detected by the camera.
  - Runs containerized inference engine that classifies sounds in the vicinity of the edge node.
  - Can be extended with additional sensors and containers.
    - Thermal imaging, air/water quality, etc.



https://gitlab.com/arm-research/smarter/example

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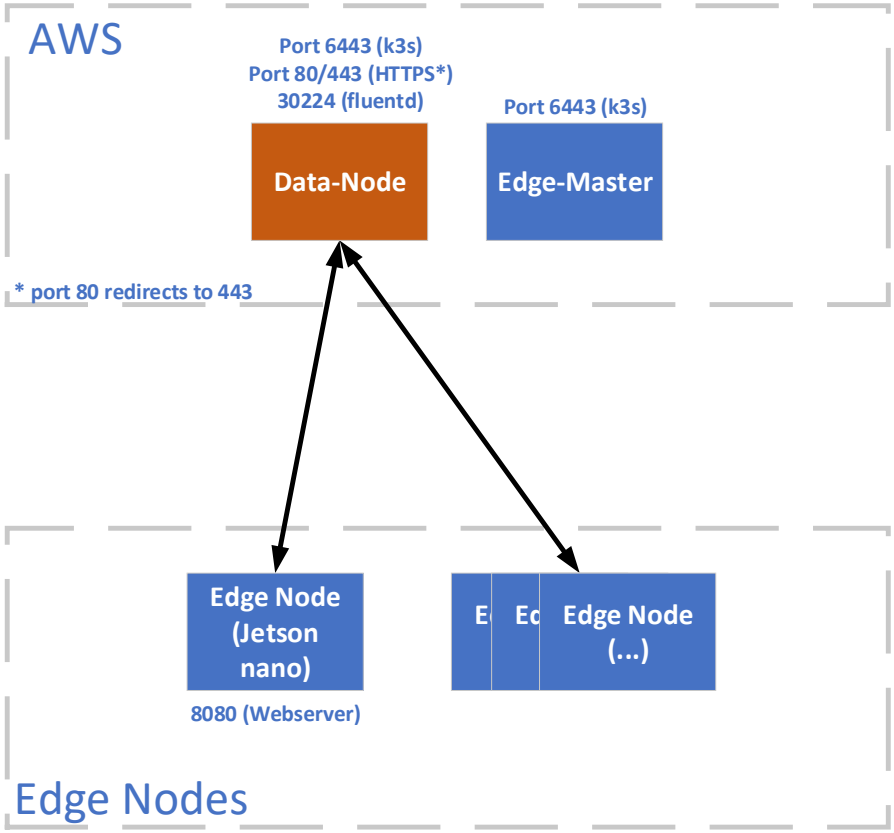
Smart City Demo

Data Aggregation

- Edge-Nodes send their image detection and sound classification data to a Data-Node in the cloud.
- Data-Node participates in a separate Data management cluster.
- Data-Node manages the data with various containerized tools.
  - Fluentbit, Influxdb, Elasticsearch, Kibana, Prometheus, and Grafana.



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Smart Cities Demo

Conclusion

CLOUD NATIVE COMPUTING FOUNDATION
PLATINUM MEMBER

Questions/POC/Collaboration – Contact Us

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Reading Material

- Rancher K3s Blog: https://rancher.com/blog/2019/why-k3s-is-the-future-of-k8s-at-the-edge/
- Whitepaper: https://info.rancher.com/accelerating-edge-computing-with-arm-and-k3s-lightweight-kubernetes
- Project Cassini Blog: https://community.arm.com/developer/ip-products/processors/b/processors-ip-blog/posts/taming-of-the-edge
- Arm SMARTER Blog: https://community.arm.com/developer/research/b/articles/posts/a-smarter-device-manager-for-kubernetes-on-the-edge

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Questions?

Thank You
Danke
Merci
谢谢
ありがとう
Gracias
Kiitos
감사합니다
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شكرًا
תודה