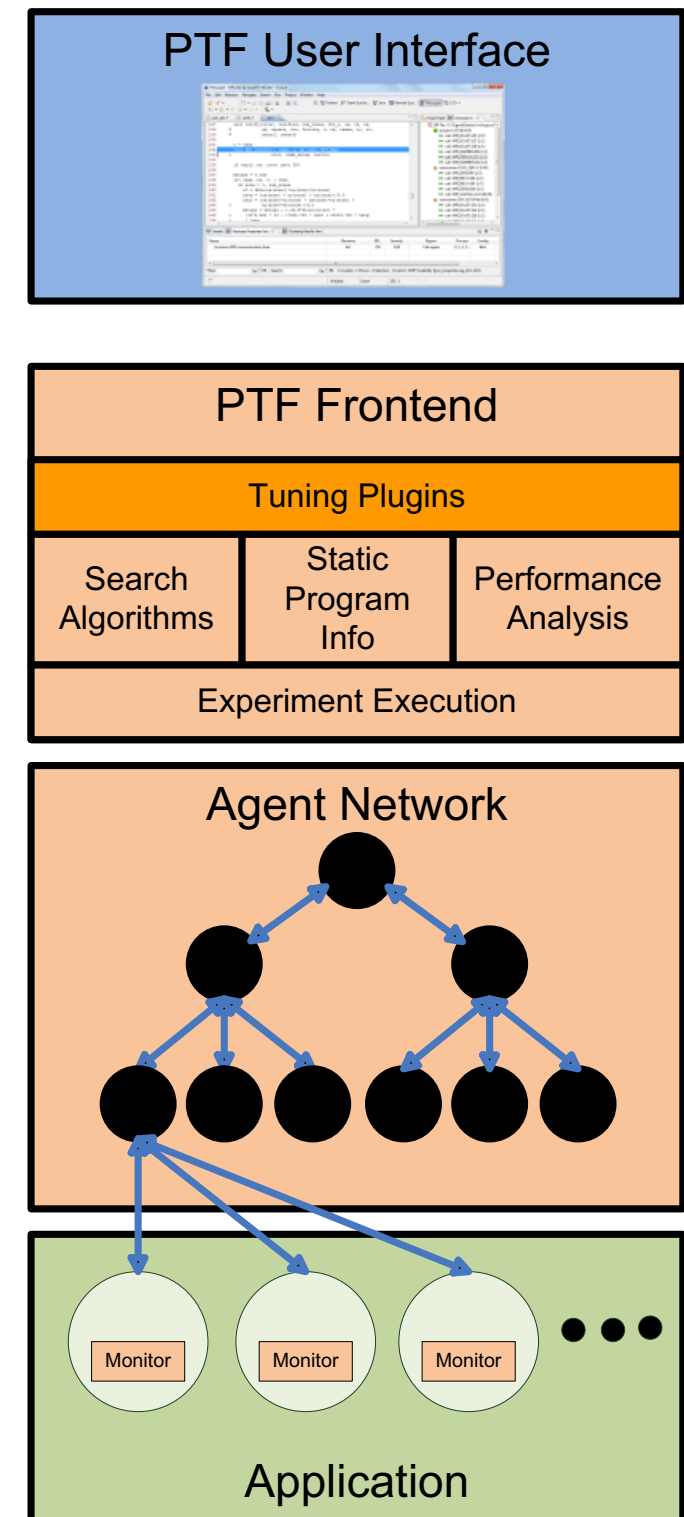


Managing the Cloud Edge Continuum: The Serverless IoT Framework

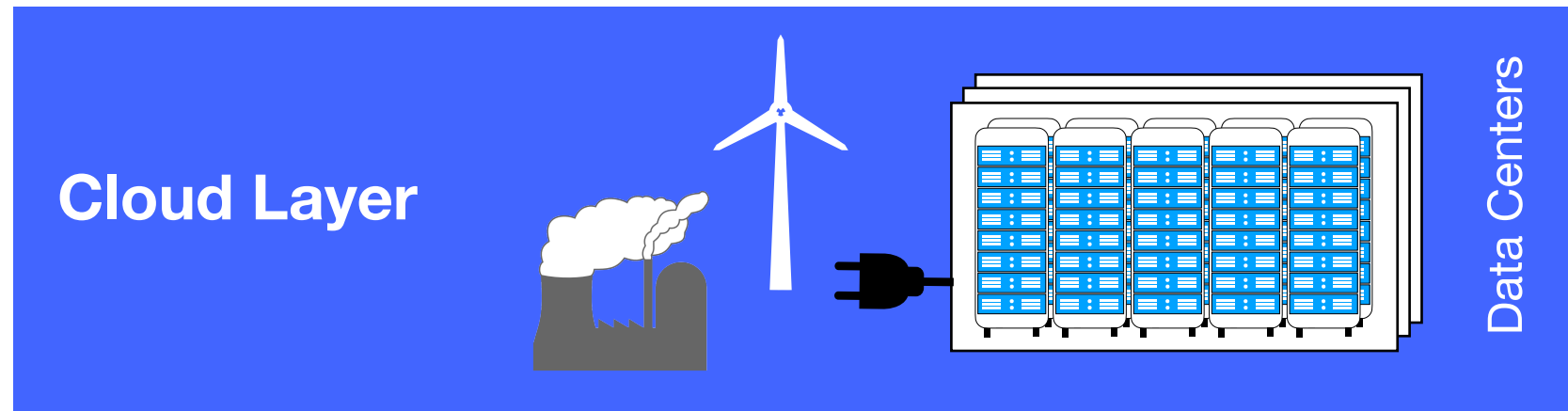
Michael Gerndt
Technische Universität München

Journey from HPC to Embedded

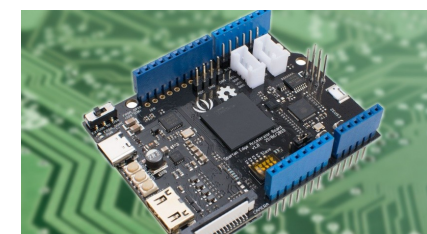
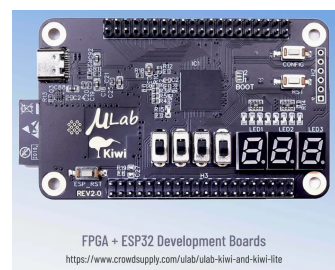
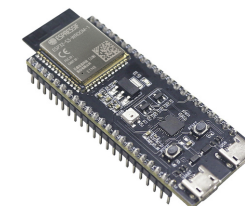
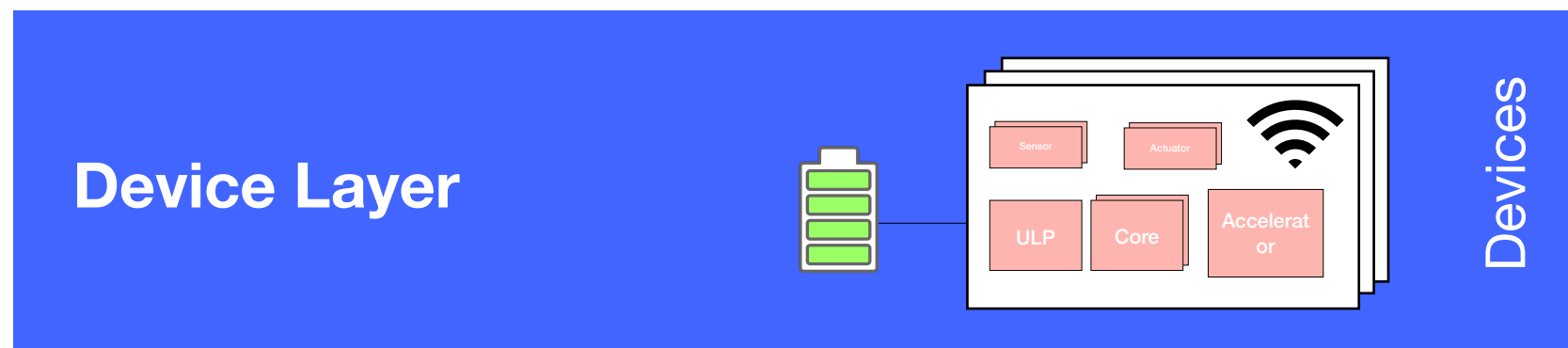
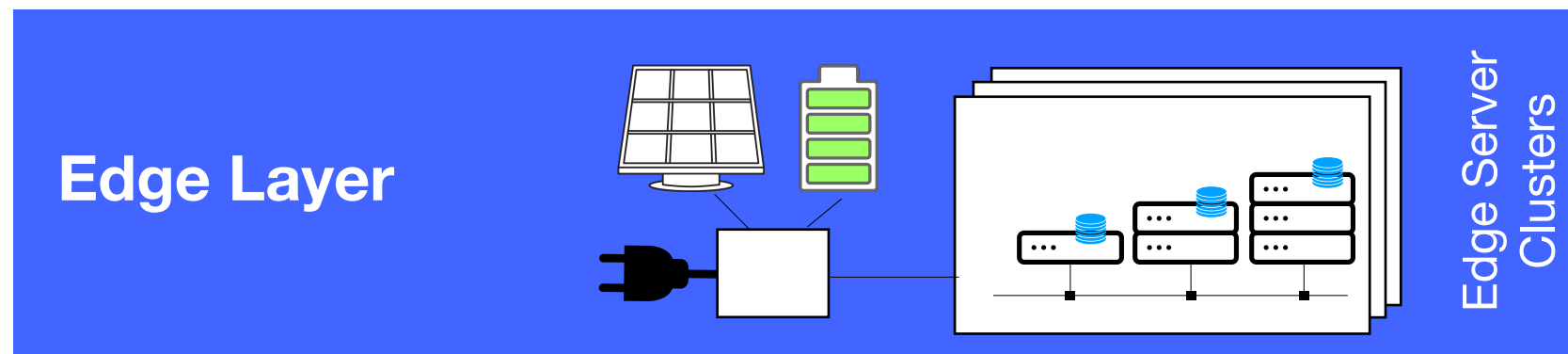
- Distributed Shared Memory and OPAL
- Periscope
 - Paradyn
 - iPSC tools at TUM
- Periscope Tuning Framework
- Malleable MPI applications: iMPI
- Predictive Autoscaling for the Cloud
- AIOPS: Root Cause Analysis, Failure Prediction
- Function Delivery Network: FaaS on Heterogeneous Systems
- Elastic Workflows in Automotive
- FedLess: Federated Learning on FaaS
- Cloud Edge Continuum for IoT



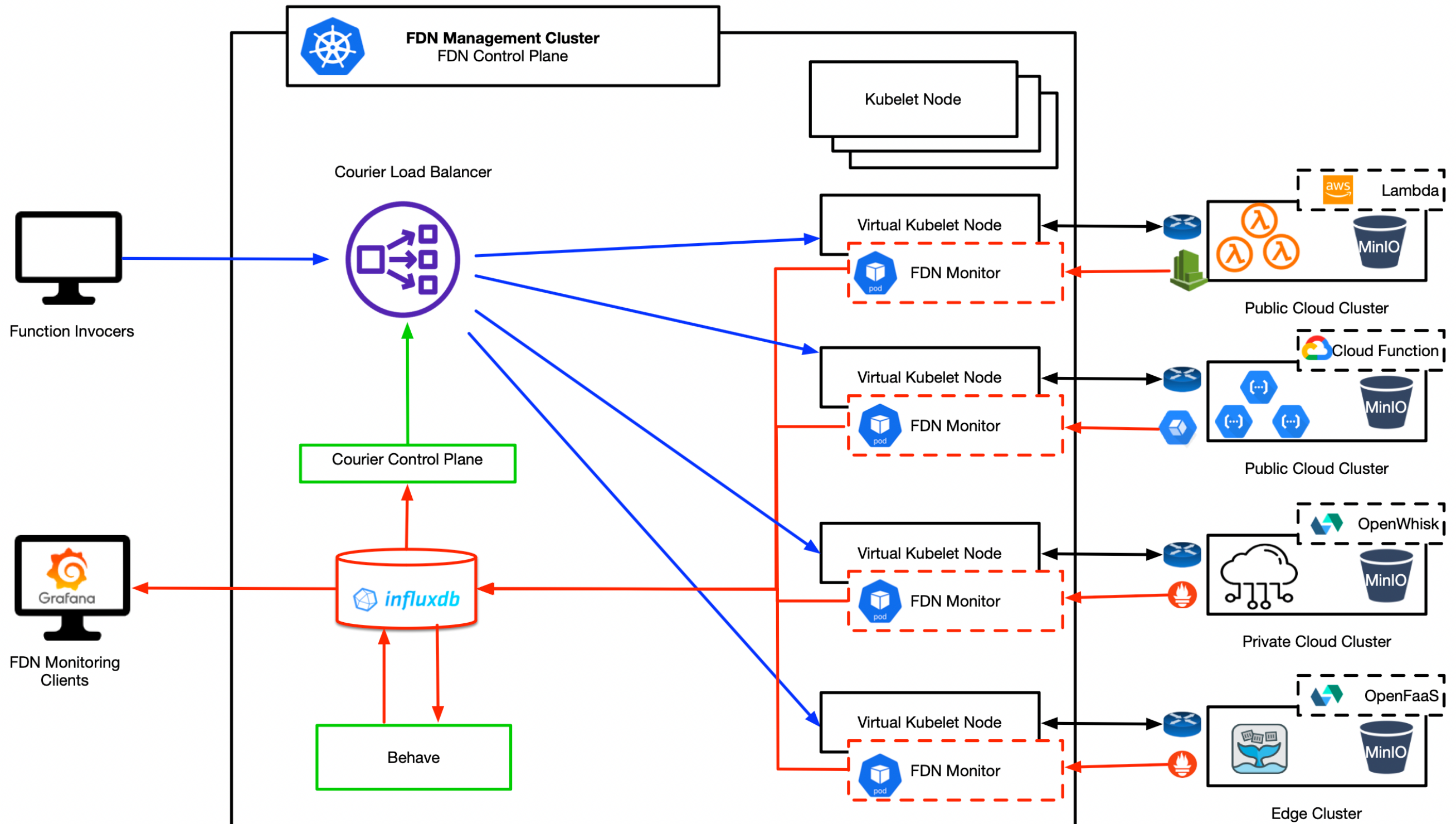
Cloud Edge Continuum



Privacy Barrier



Function Delivery Network (FDN)



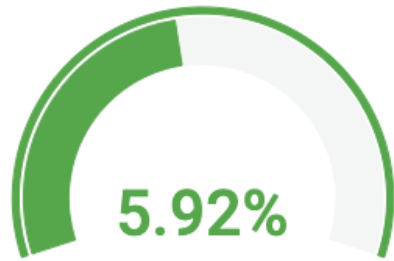
FDN Monitoring: Infrastructure Dashboard

FDN / FDN Infrastructure Usage Dashboard

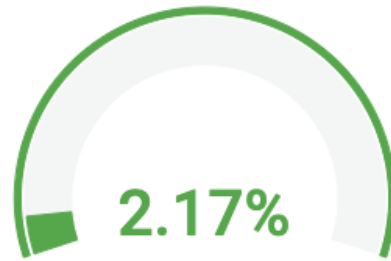
cluster_name All function_name All

High level of Clusters

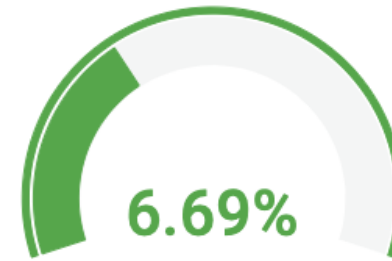
CPU Usage (edge-1)



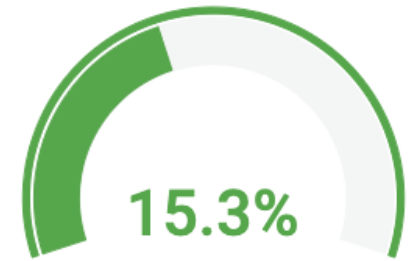
CPU Usage (edge-2)



CPU Usage (lrz-cloud-1)

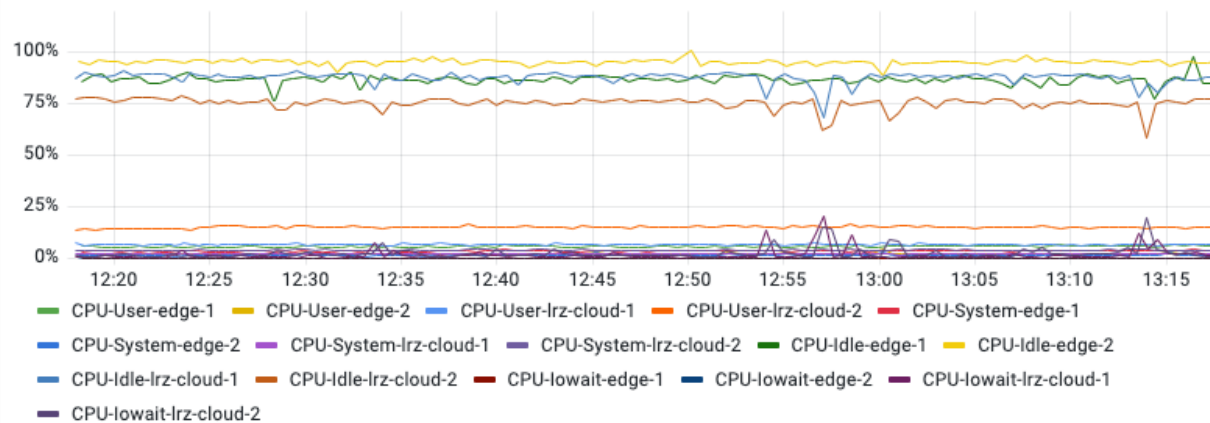


CPU Usage (lrz-cloud-2)

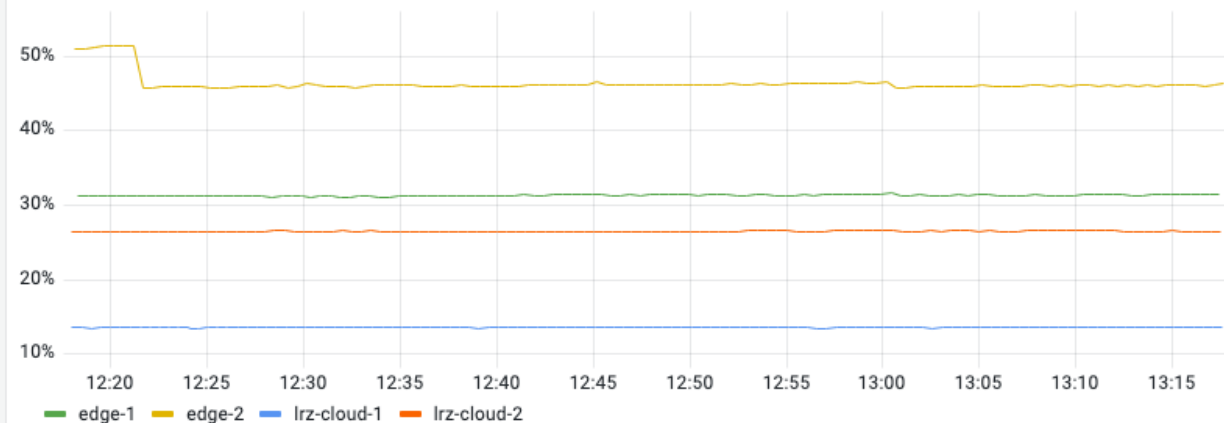


System Usage

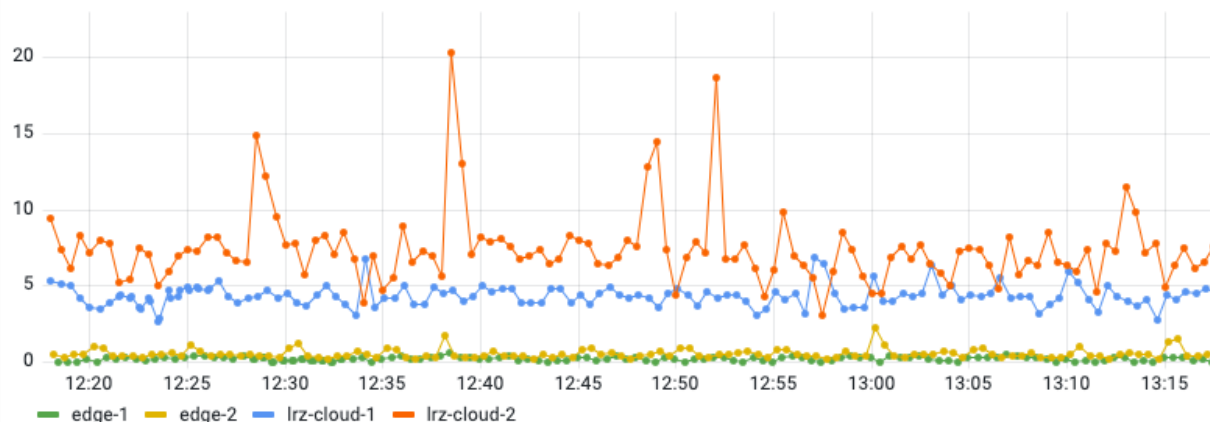
CPU-User Usage



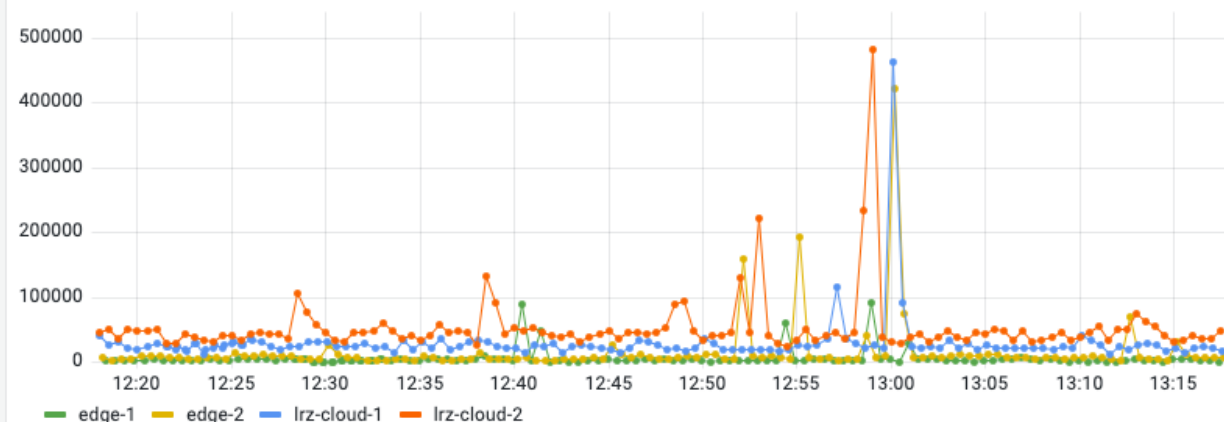
MemoryUsage



Disk. Write IOPS



Disk. Write Bytes



FDN Monitoring: Function Dashboard



FDN / FDN Functions Usage Dashboard



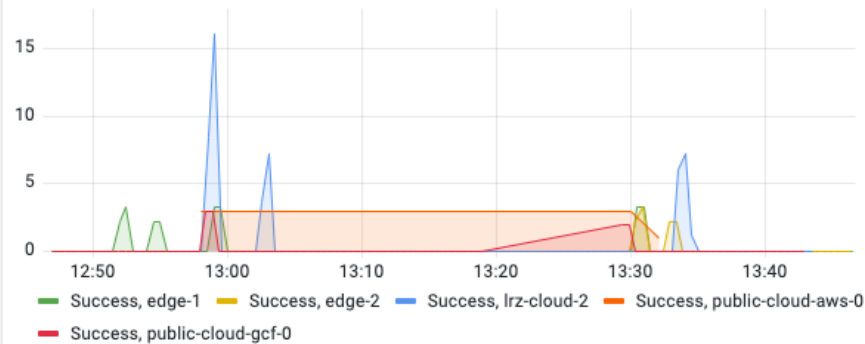
cluster_name All function_name gzipcompression



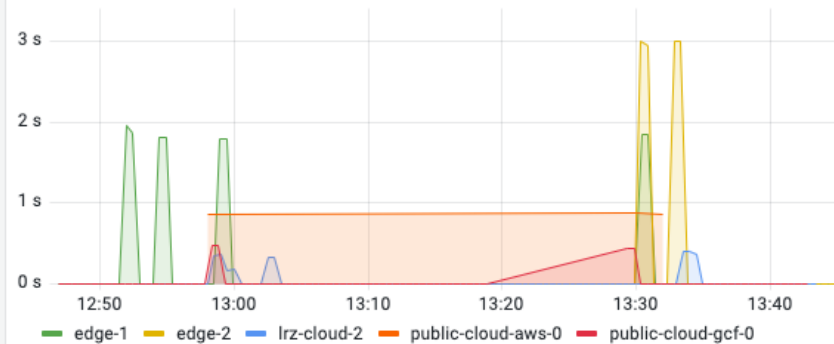
gzipcompression



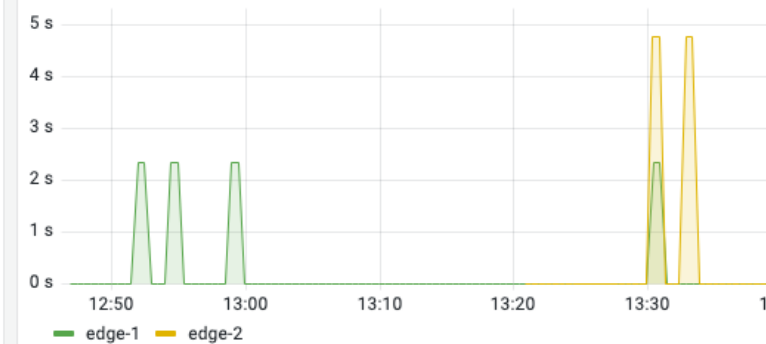
Invocations (gzipcompression)



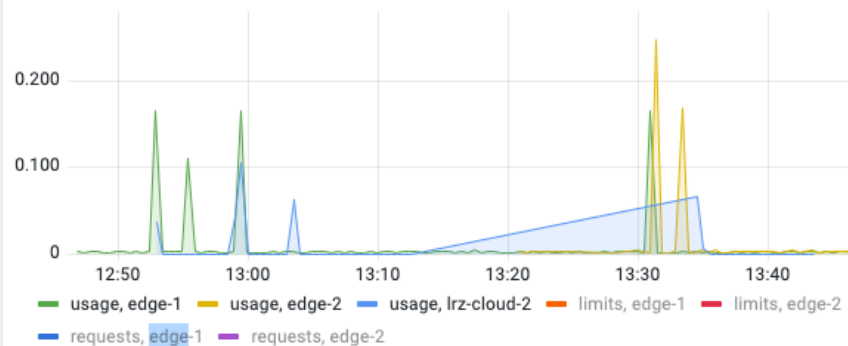
Average Execution Time (gzipcompression)



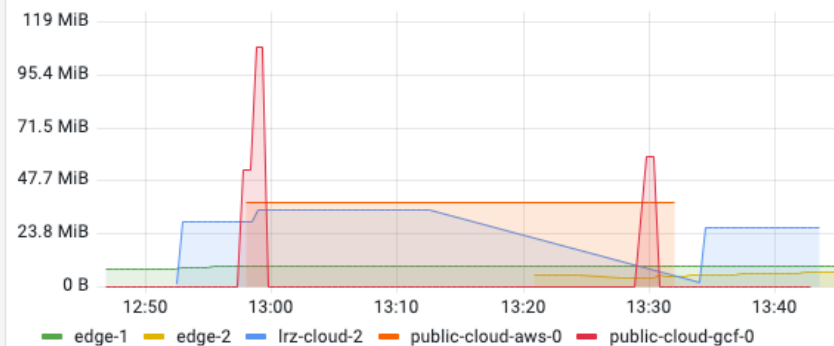
P90 Execution Time (gzipcompression)



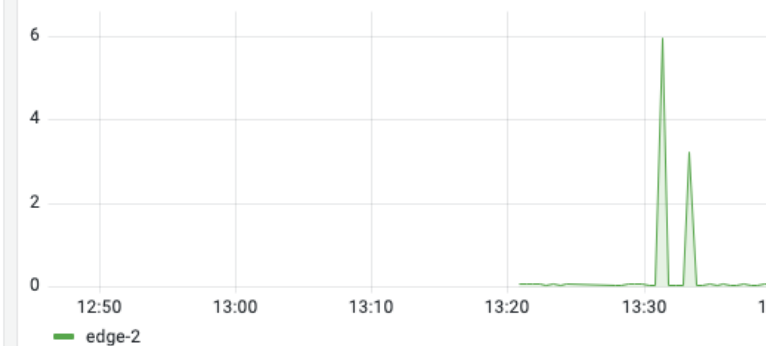
CPU Cores Sum Across Cluster (gzipcompression)



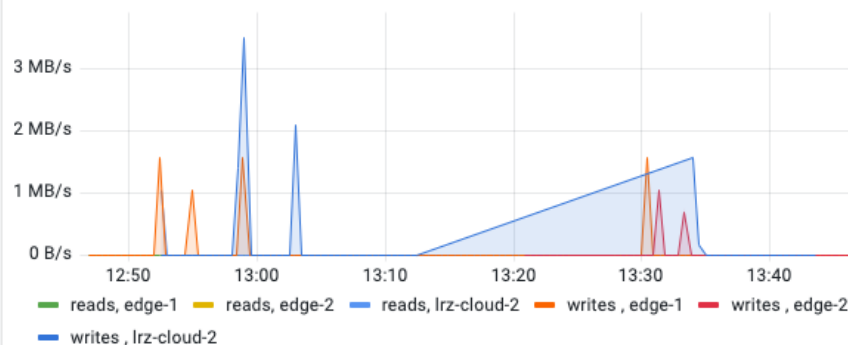
Memory Usage Sum Across Cluster (gzipcompression)



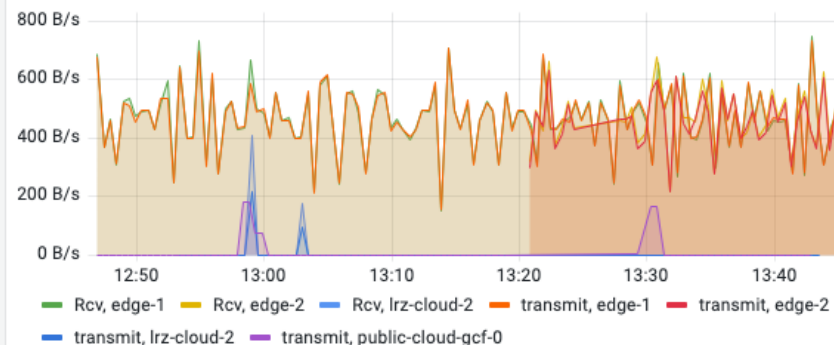
Power Usage Sum Across Cluster (gzipcompression)



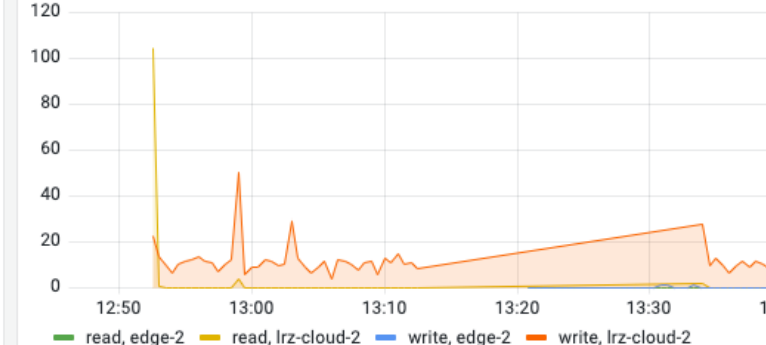
ThroughPut Across Cluster (gzipcompression)



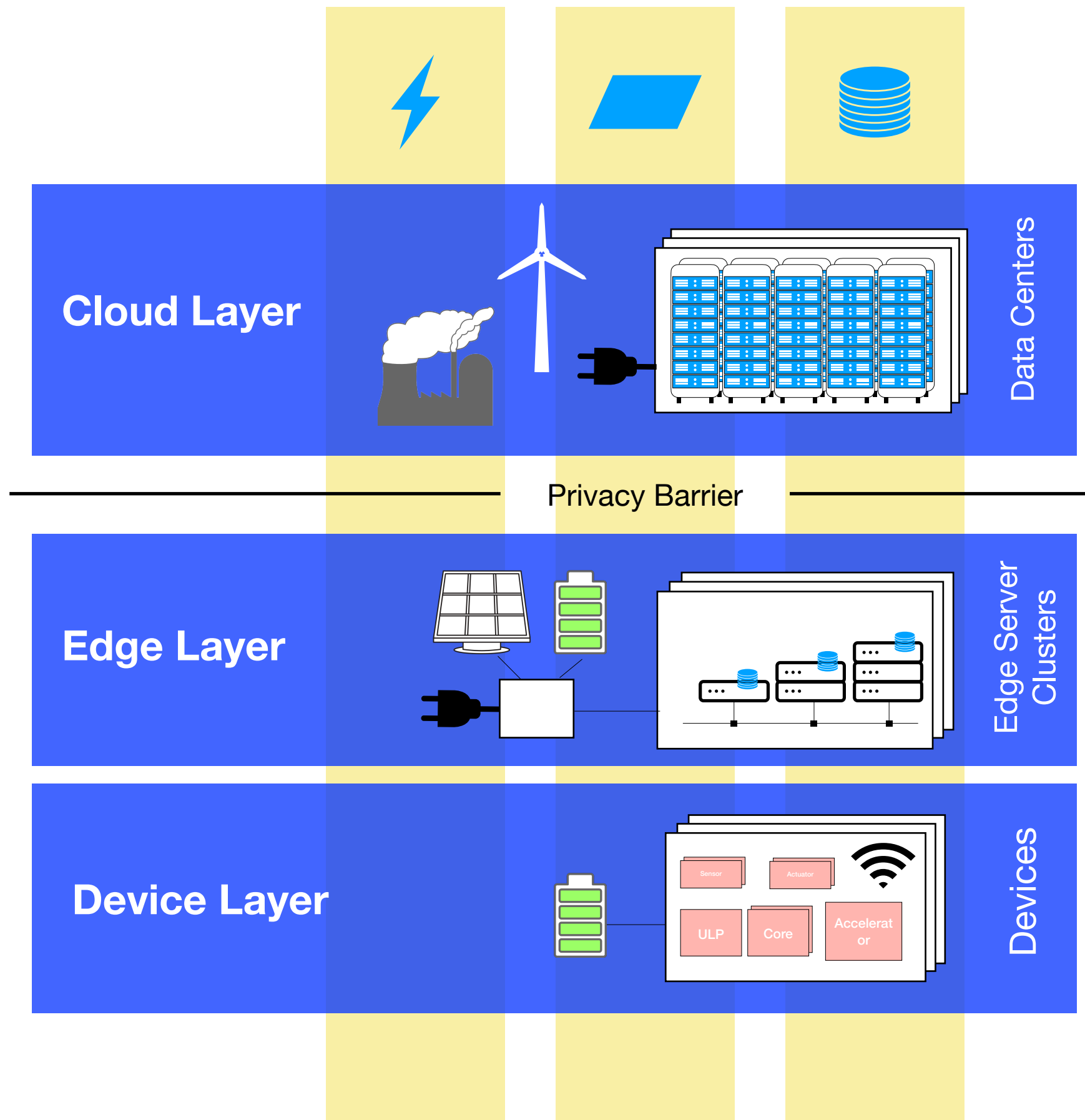
Network Recv Bandwidth Across Cluster (gzipcompression)



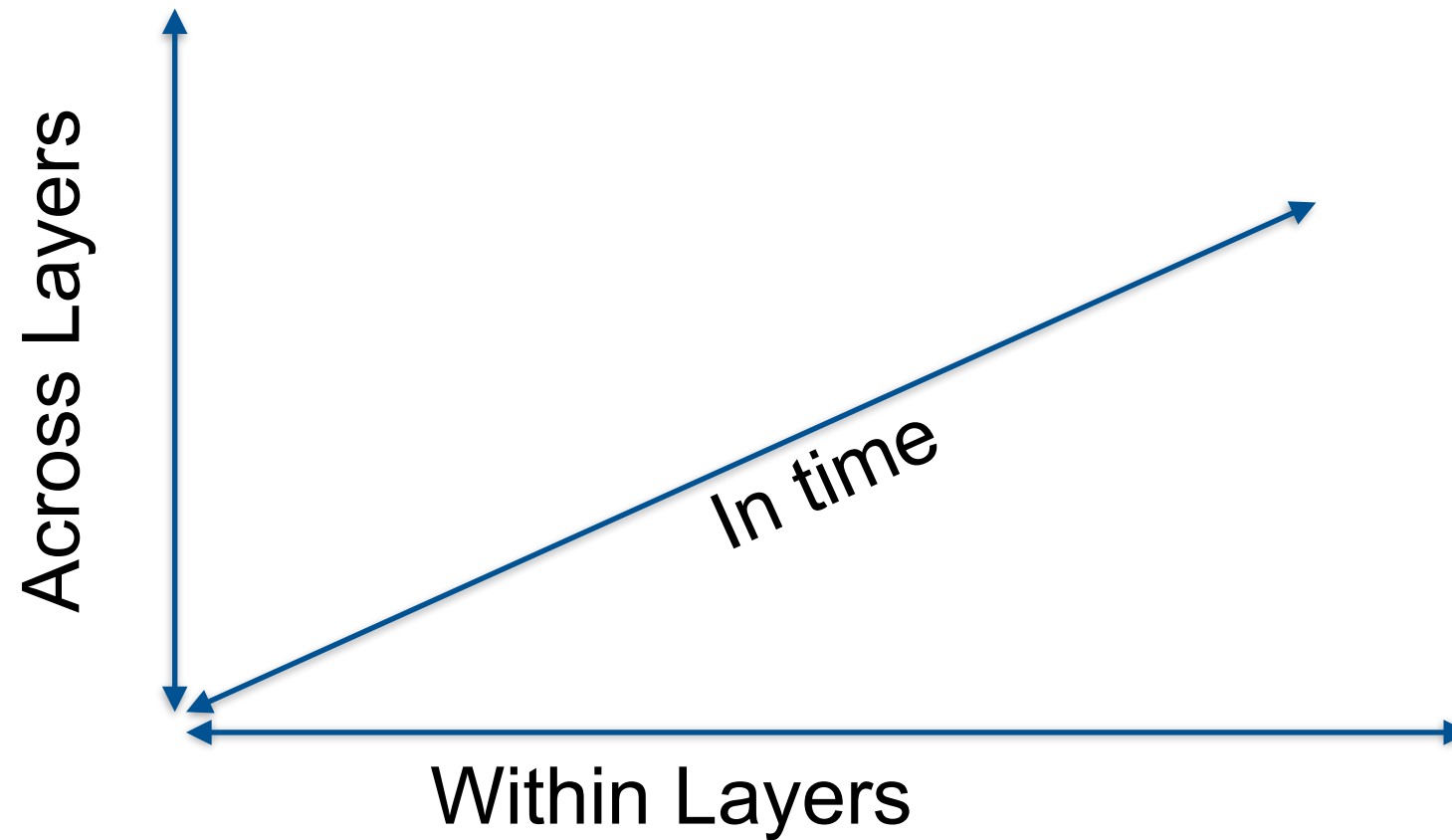
IOPS Across Cluster (gzipcompression)



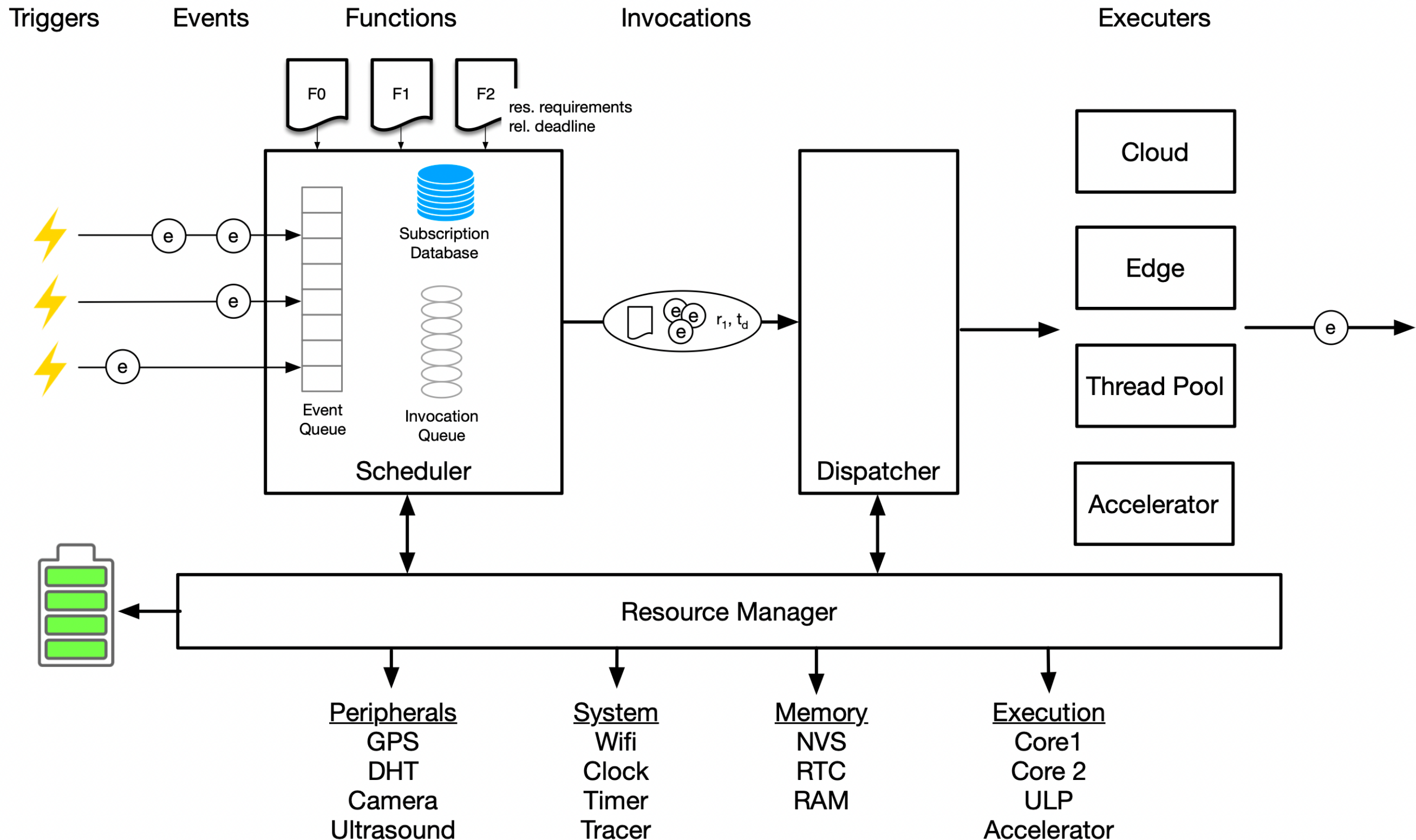
Extend Serverless Computing for IoT



Edge Optimizations

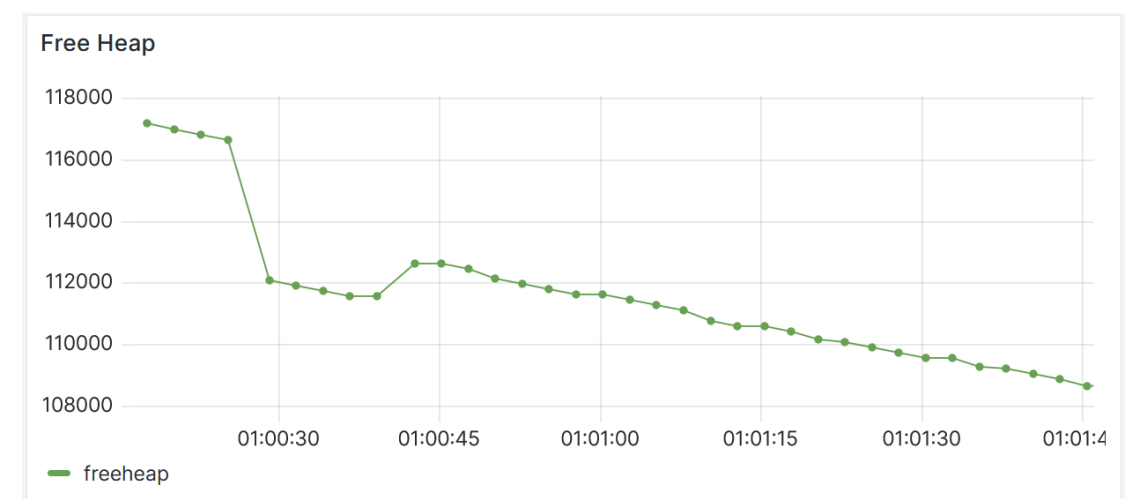
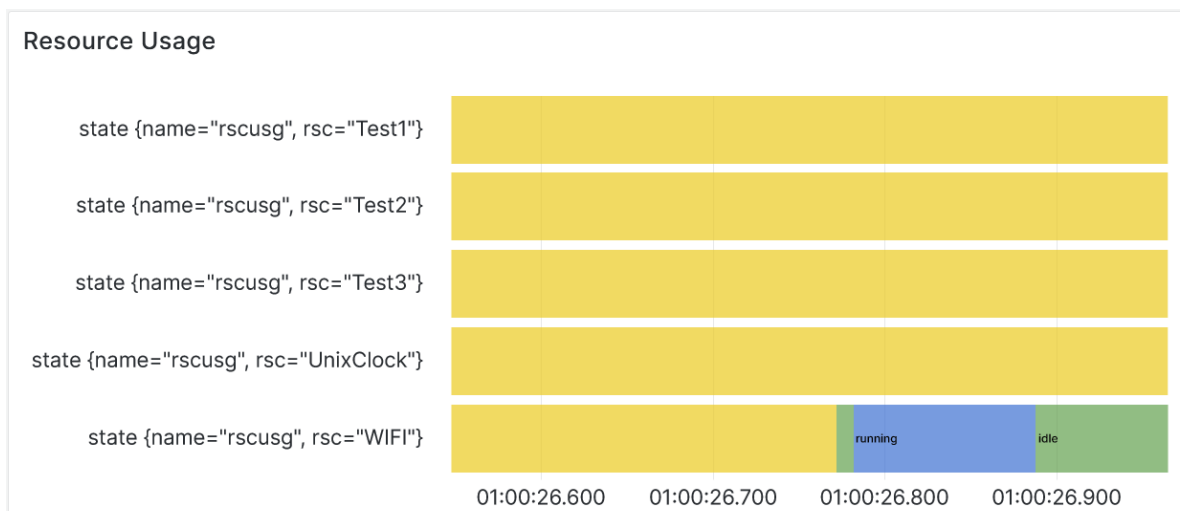
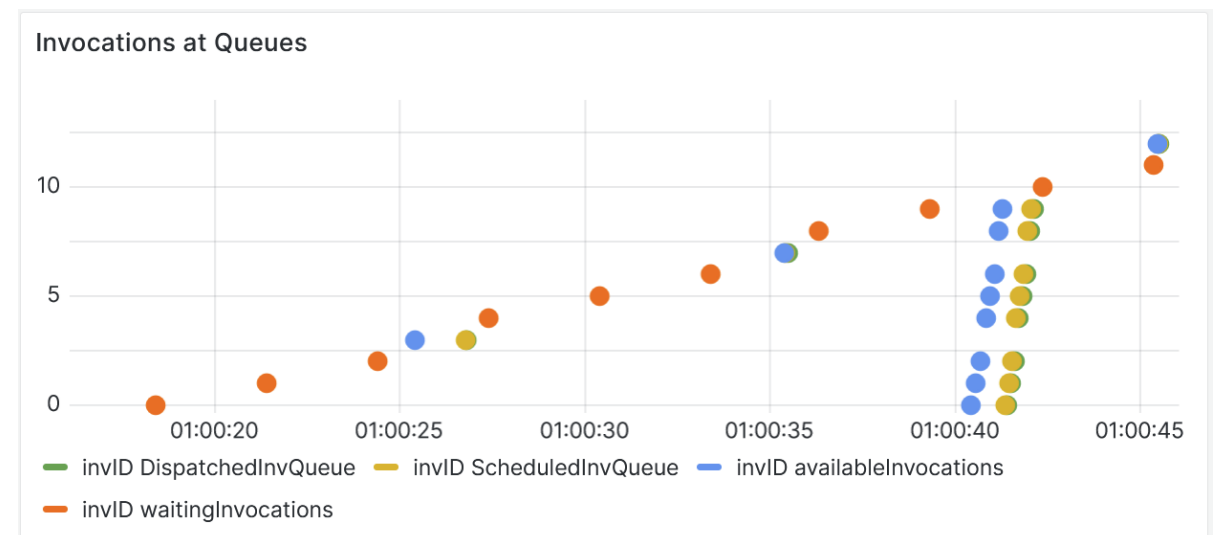
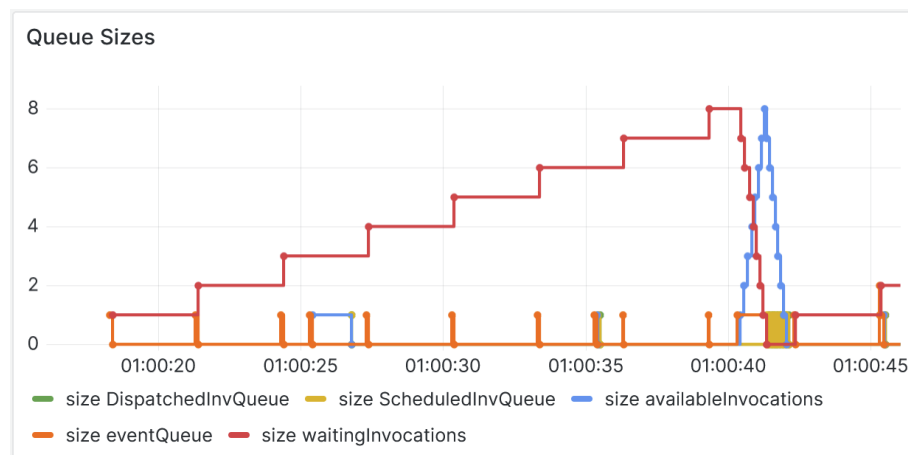
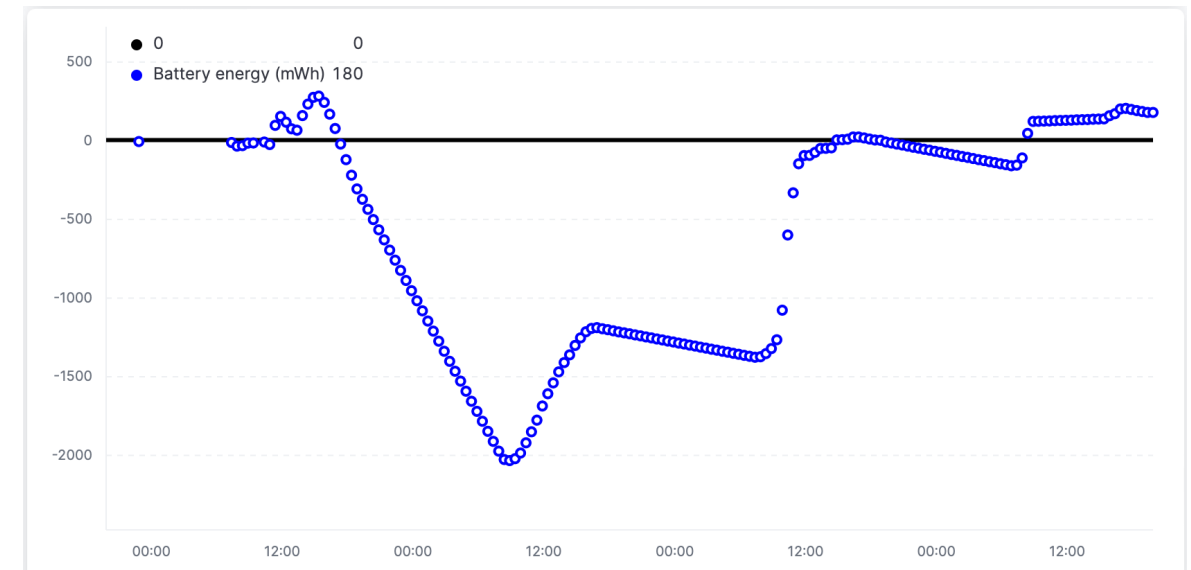


SIF on Edge Devices

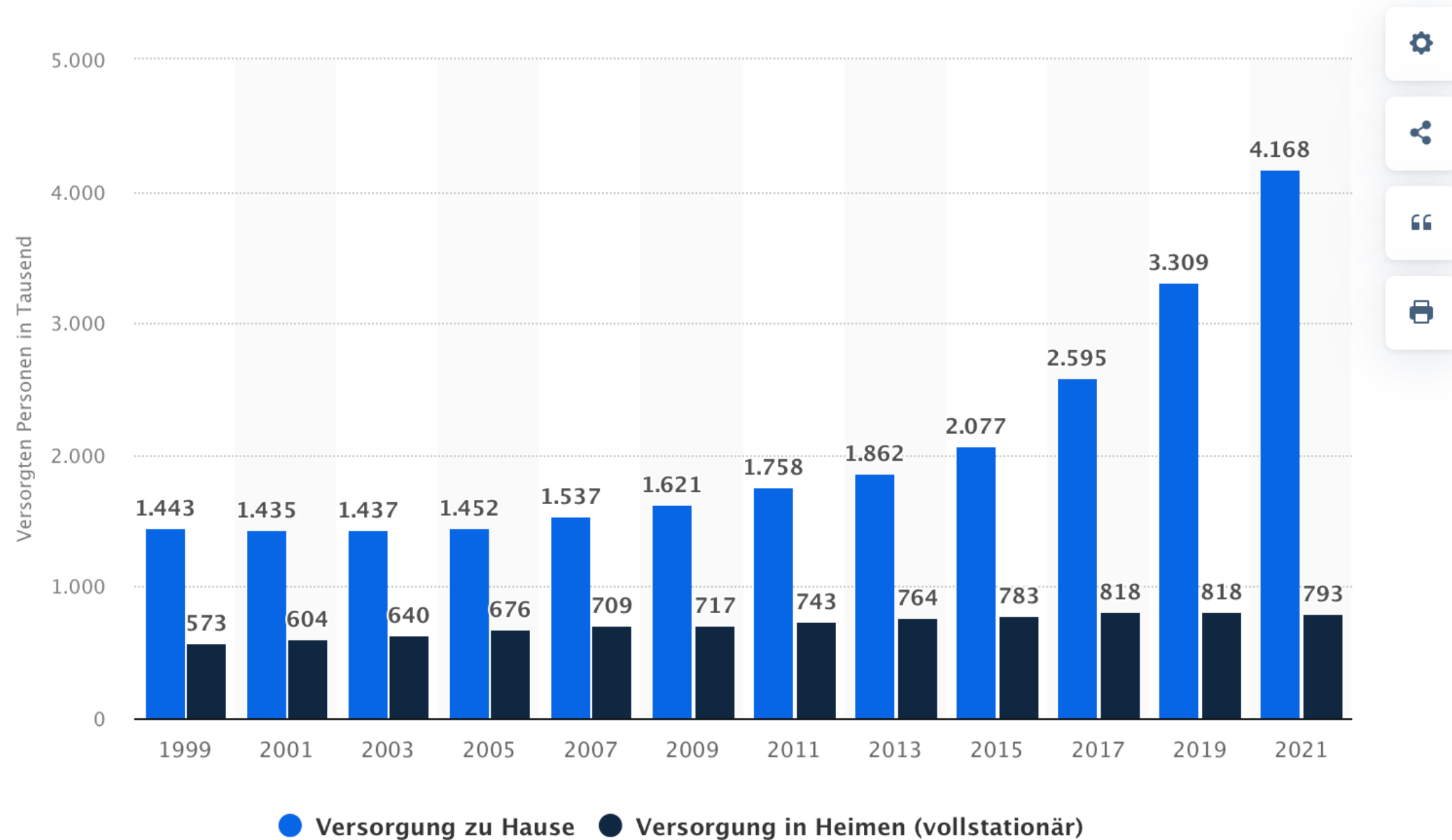


SIF Achievements on Edge Devices

- Automatic Deep Sleep
- Function offloading to the edge
- Automatic duty cycle control for battery lifetime guarantees
- SIF Tracing
 - Hardware trace buffer
 - Protobuf binary trace format



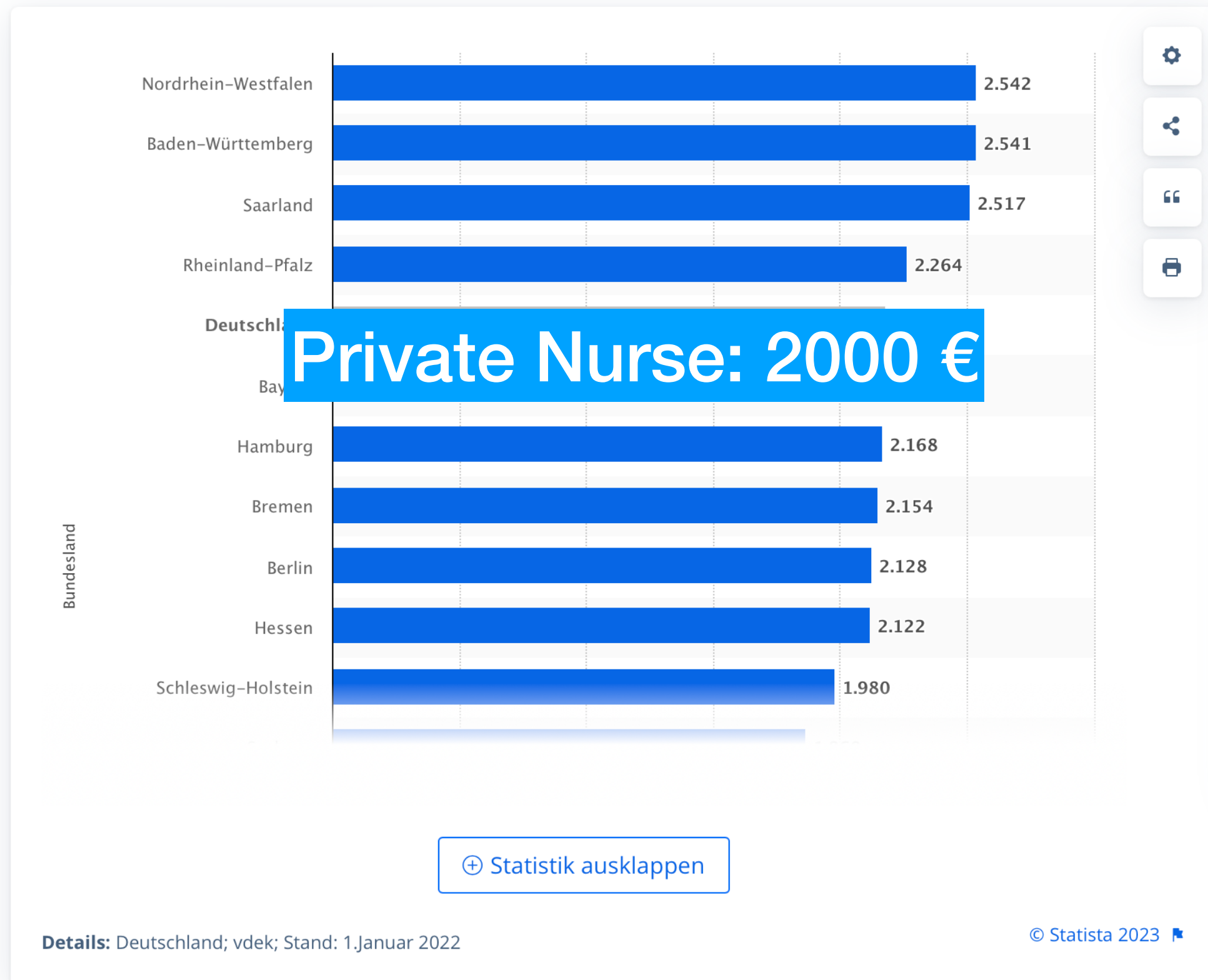
Use Case: Senior Homecare



Details: Deutschland; 1999 bis 2021

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Costs of Nursing Home



Master Lab on IoT for Senior Homecare

