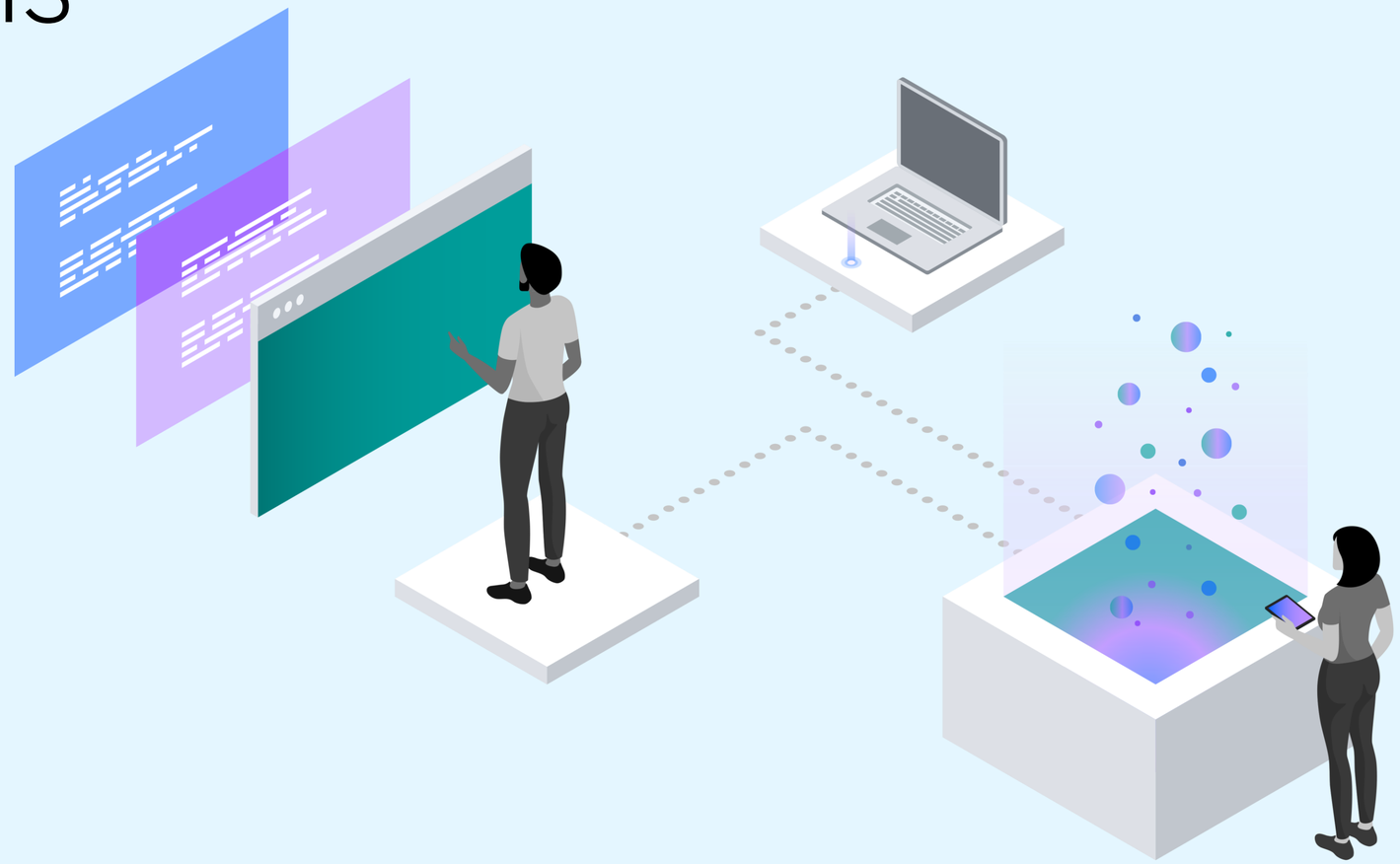
AIOps with IBM Z
Overview & Solutions



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IBM

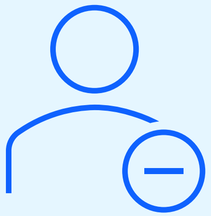
IT under pressure: Meeting greater customer demands with fewer skilled employees

1 sec

of latency causes a 7% reduction in customer conversion and a 16% reduction in customer satisfaction

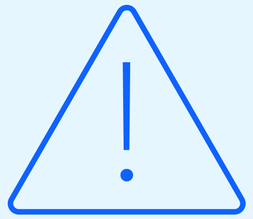
50%

of all employees need to upskill or reskill by 2025 for responsibilities arising from automation and new technologies



$250K

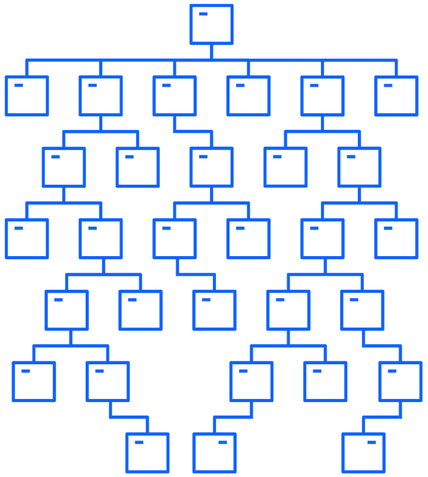
the average cost of an hour of downtime when a revenue generating production service is impacted



Current Landscape: Management Complexity

76% of companies use 2 or more public clouds

Organizations are using an average of over 1,000 applications across multiple clouds

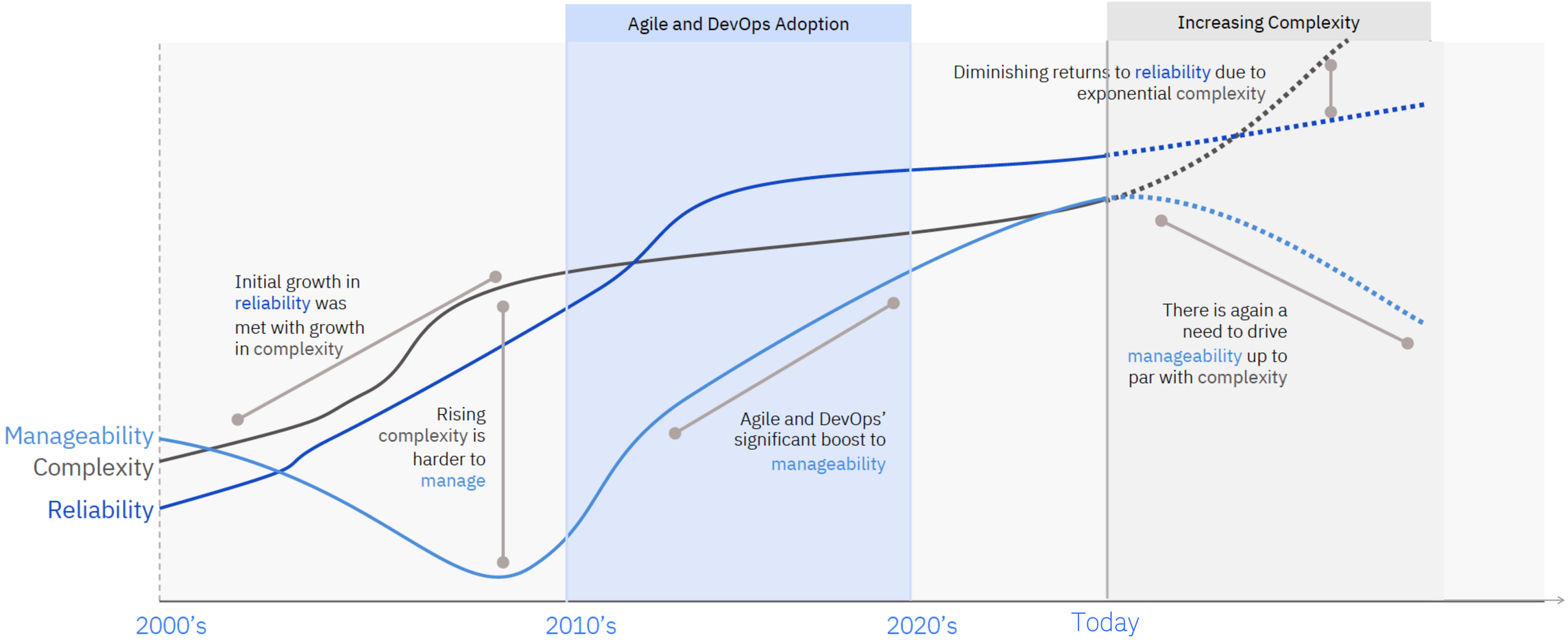


There's too much data for one person to handle

- Businesses need real-time visibility into their infrastructure and application estates to leverage actionable insights to automate and enhance overall IT operations
- Current break-fix, reactive approaches to IT management simply cannot scale
- Adopting piecemeal software solutions results in inconsistencies and inefficiencies, undermining integrated workflows and automations and reducing visibility

Why AIOps?

Modernization Accelerates Complexity



Example Technology Adoption

- Legacy, Monolith Apps
- Enterprise Apps
- Web Applications
- Mobile
- IoT
- Hyperscaler Cloud
- 5G, Edge
- Distributed Cloud
- AI Training & Inferencing
- NTN
- Quantum

The capabilities of an AIOps Platform

Gartner defines an AIOps Platform as **using machine learning to conglomerate insight, toward intelligent, AI powered Correlation & Automation solutions** in the following areas:

AIOps Capabilities

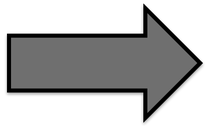
+ Cross-domain data ingestion and integration

+ Topology generation

+ Event correlation and analytics

+ Incident and pattern recognition

+ Augmented remediation



Business Outcomes

+ Consolidate tools, teams and domains to work together and share understanding

+ See your entire IT estate and understand how incidents originate and propagate

+ Remove the toil of manual investigations, saving time and expanding operations capacity

+ Save time on repetitive fixes or deployments and empower operations to tackle complex problems

Source: Gartner

AIOps - Two IBM Z perspectives

“ZAIOps” – z/OS scope

- Encompasses z/OS monitoring & management solutions including the OMEGAMON suite, IBM Z Anomaly Analytics, IBM Z Operational Log and Data Analytics, IBM Z System Automation, and more.

“Hybrid Cloud” AIOps – Broader scope

- Encompasses solutions that support Linux on IBM Z, distributed platforms, containers, public clouds, and more.
- Solutions include Instana, Turbonomic, IBM Cloud Pak for AIOps, SevOne, Apptio, and more.

These are not mutually-exclusive perspectives.

They work hand-in-hand to break down silos and bring IBM Z and z/OS into broader AIOps environments.

Observability & AIOps

Application & Infrastructure Monitoring

Proactive Incident Resolution

INSTANA

Cloud Pak for AIOps

Enterprise Observability

Enhance visibility and comprehension with full stack scalable application, infrastructure and network health and performance monitoring

Incident Management

Automate and manage end-to-end IT and network operations at scale with efficiency and resiliency

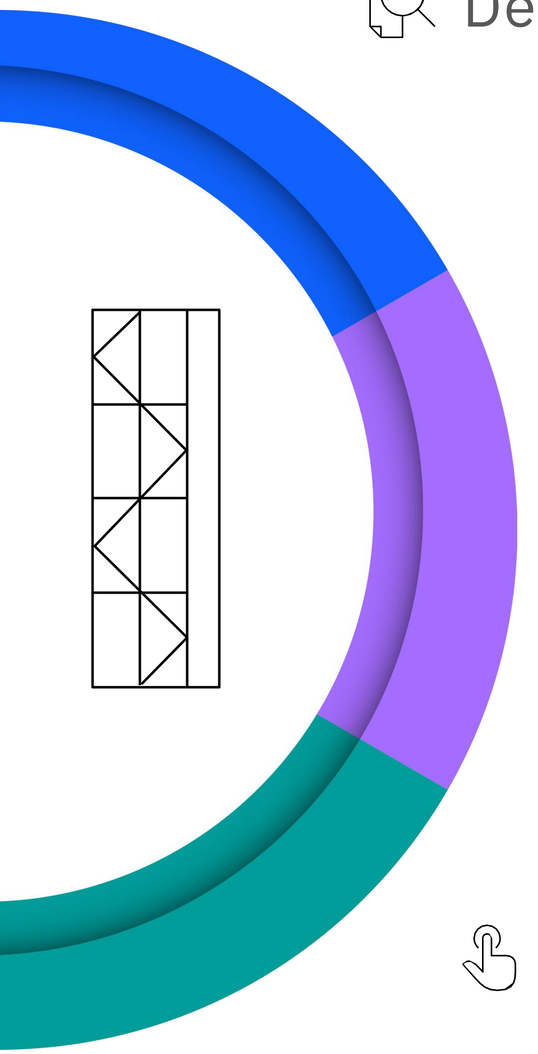
Integrated AI-powered IT Operations

Platforms

Hybrid Multicloud Networks

Data & Operations

Better together – Hybrid Cloud Integrations



Detect

Monitoring
IBM Z Monitoring Suite

Hybrid cloud observability
IBM Z APM Connect
IBM Observability by Instana APM on z/OS IBM zSystems Integration for Observability

Anomaly detection
IBM Z Anomaly Analytics

Hybrid Application Observability
IBM Instana®

3rd party solutions
App Dynamics

Hybrid Application Incident Management
IBM Cloud Pak for AIOps

Decide

Deep-domain metrics & application trace analysis
IBM OMEGAMON

Log analytics
IBM Z Operational Log and Data Analytics

Performance & capacity management
IBM Z Performance and Capacity Analytics

3rd party solutions
Splunk
Elk DataDog
ServiceNow
Other 3rd party products

Act

Intelligent automation
IBM Z System Automation
IBM Z NetView

Predictive workload automation
IBM Z Workload Scheduler

Enterprise Automation
RedHat Ansible

Automation hub
with 100+ plugins for hybrid cloud and other integrations

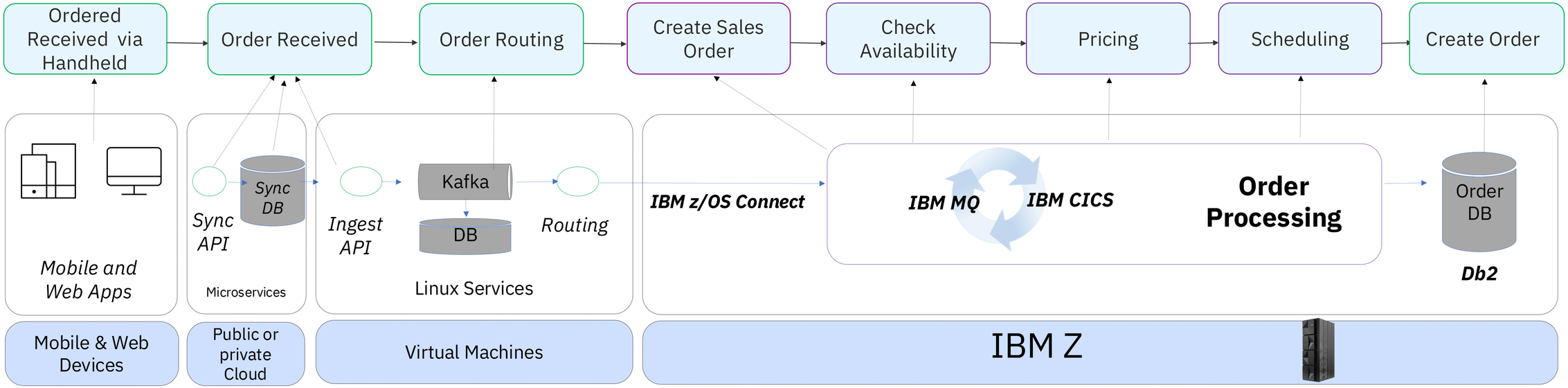
IBM Observability by Instana

The challenge of enterprise observability

Application Owner

Site Reliability Engineers / IT Operations

Mainframe Subject Matter Experts

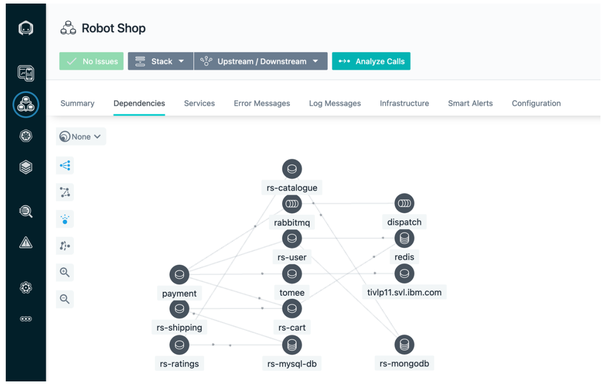


The mainframe is essential to the successful operations and business workflows of major enterprises…

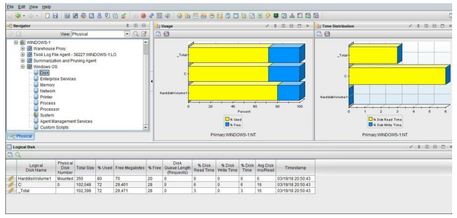
Yet the majority of IBM Z users lack integration of this key platform into their enterprise-wide observability strategy

The ongoing challenge of Enterprise Observability

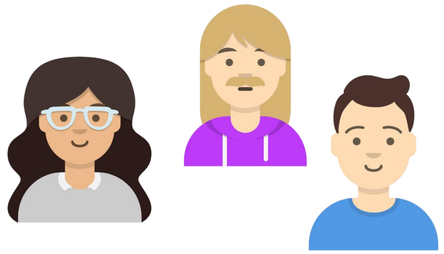
Application owner / SRE



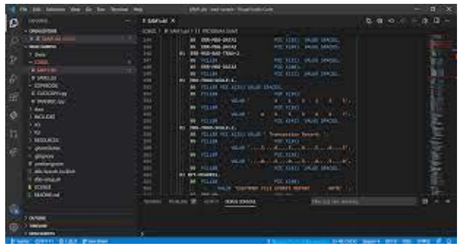
Mainframe Subject Matter Experts

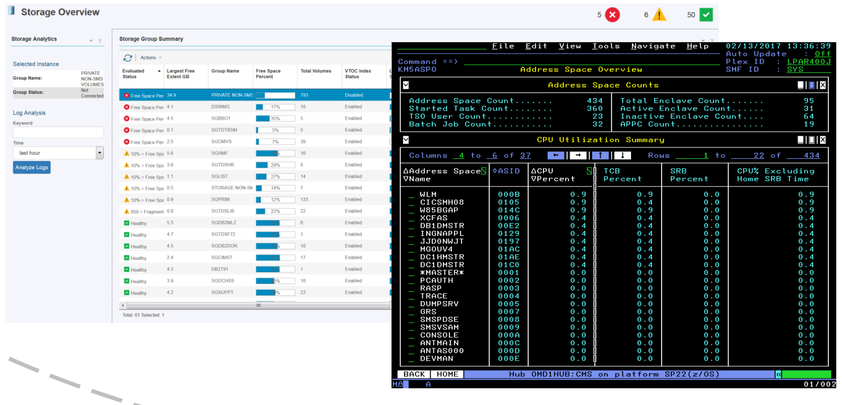


(Non-zSystems) IT operations



Application development

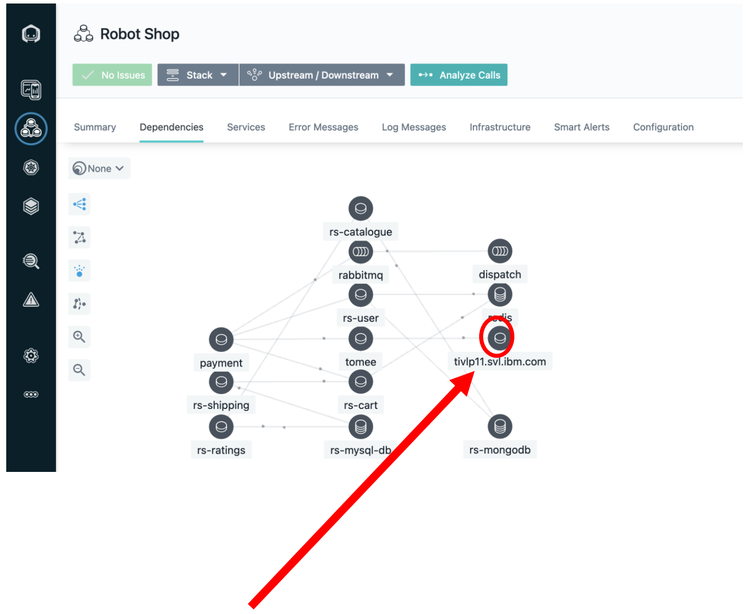




The absence of end-to-end observability…

The response time of our principal customer-facing application has increased significantly over the past 30 minutes…**it looks like the mainframe is where the slowdown is occurring, but I can't see any details.**

Application Owner



MQ is looking good according to my dashboards. Not our problem. Have you spoken to the IMS team?

MQ SME

No problems with IMS. I don't think IMS is part of this application.

IMS SME

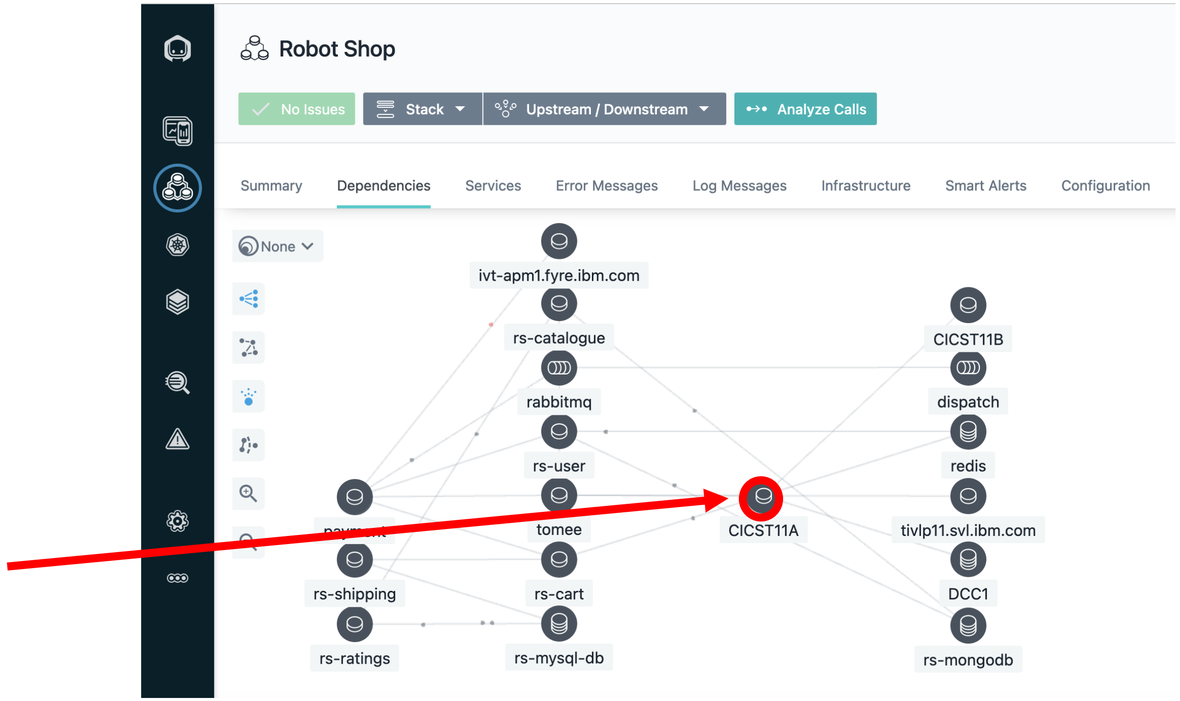
Uh-oh. One of our CICS regions is experiencing a slowdown. I'll fix it right now

CICS SME

Improved experience with enterprise observability

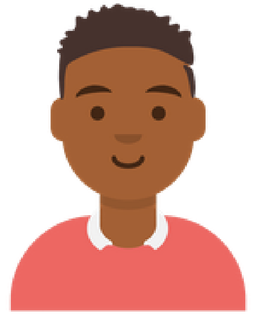
The response time of our principal customer-facing application has increased significantly over the past 30 minutes…**it seems there is a slowdown coming from CICS. It appears to be stemming from *CICST11A* and task *56177* is associated.**

Application Owner



Thanks for the heads up.

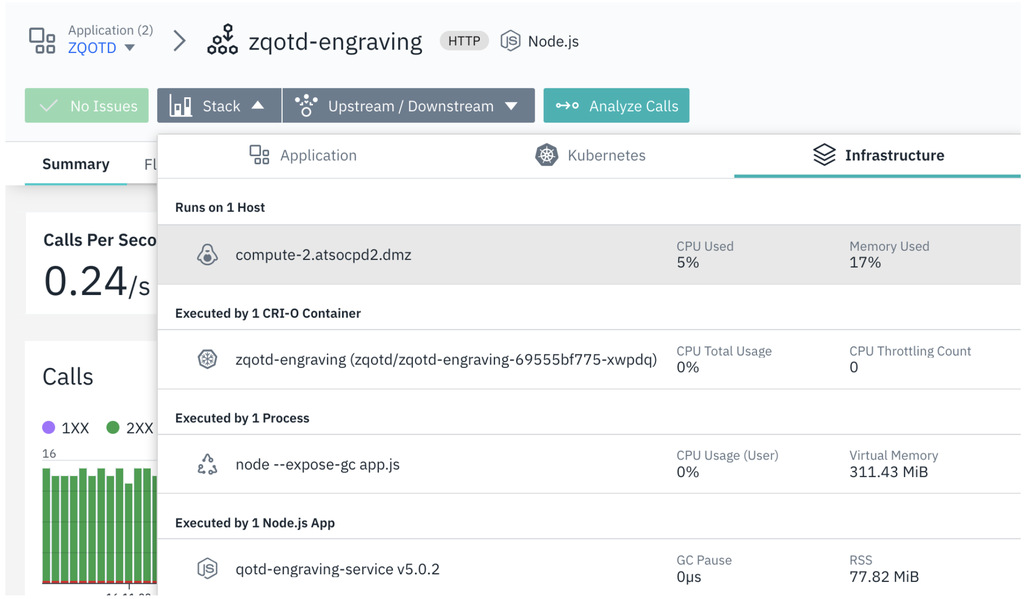
I’m going to look at that CICS region in OMEGAMON, review the CICS task history, and take action immediately.



CICS SME

Collect accurate data in context

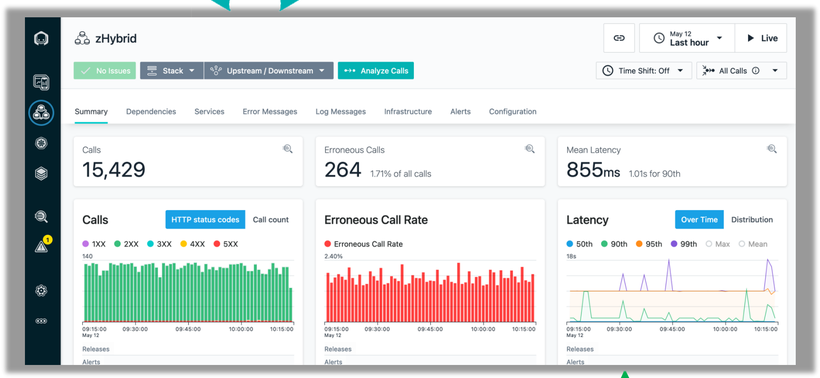
Real-time detection and mapping of all interdependencies reduces risk and decreases MTTR (Mean Time to Restore) by ensuring that you're always looking at accurate information.



Instana Capabilities on z/OS

- Designed to observe hybrid applications that start on distributed systems and call into z/OS transactions
- Instana tracing isolates the location of the problem and provides data about the likely cause
- Integration with OMEGAMON shows correlated metrics related to the problem in Instana (Optional)

INSTANA



Distributed Applications traced by Instana

CICS Transaction Server via
- HTTP/SOAP
- z/OS Connect
- CTG on z/OS
- MQ

IMS via
- z/OS Connect
- IMS-MQ Bridge

Db2 on z/OS via
- JDBC

Tracing Application Calls

Infrastructure Metrics via OMEGAMON
- z/OS, CICS, IMS, Db2 on z/OS, Java, and MQ on z/OS
- Requires OMEGAMON Data Provider (ODP)

Related Infrastructure Metrics

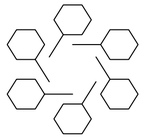
IBM Cloud Pak for AIOps

IBM Cloud Pak for AIOps

Proactive problem determination, remediation and avoidance

Proactive incident resolution using AI to eliminate unnecessary down time

Cross Domain Data Ingestion



Events, metrics, alerts, topology, CMDB

Tickets, defects, CI/CD events

On-Prem, Cloud, SaaS, VM's and containers, systems, apps, network

Event Correlation

Correlate across all relevant data sources

Detect hidden anomalies, group based on patterns

Find deviations in performance metrics

Proactive Incident Management

Prioritize incidents based on business criticality

Dynamically update application topologies

Recommend fixes based on analysis of past tickets

Runbook Automation

Create runbooks to automate recurring remediations

ChatOps and prescriptive next best actions

Centralize policies across cloud and VM environments

Comprehensive AIOps approach to Real Business Outcomes

Multi-Domain Data Ingest

Automated Data Ingest

Unstructured

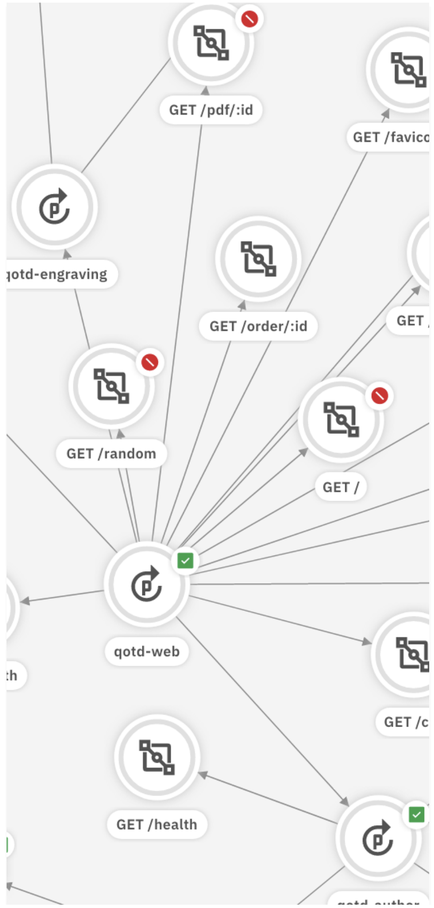
- CI/CD
- Logs
- Tickets

Structured

- Events / Alerts
- Metrics
- Topology / Changes

Informed, Actionable Insights

Acclimate & Enrich Data



Trustworthy Analysis

- Change Tracking
- Anomaly Detection
- Event Processing Correlation
- & Enrichment
- Fault Localization
- Blast Radius
- Probable Cause Analysis
- Story Creation

Augment Ops

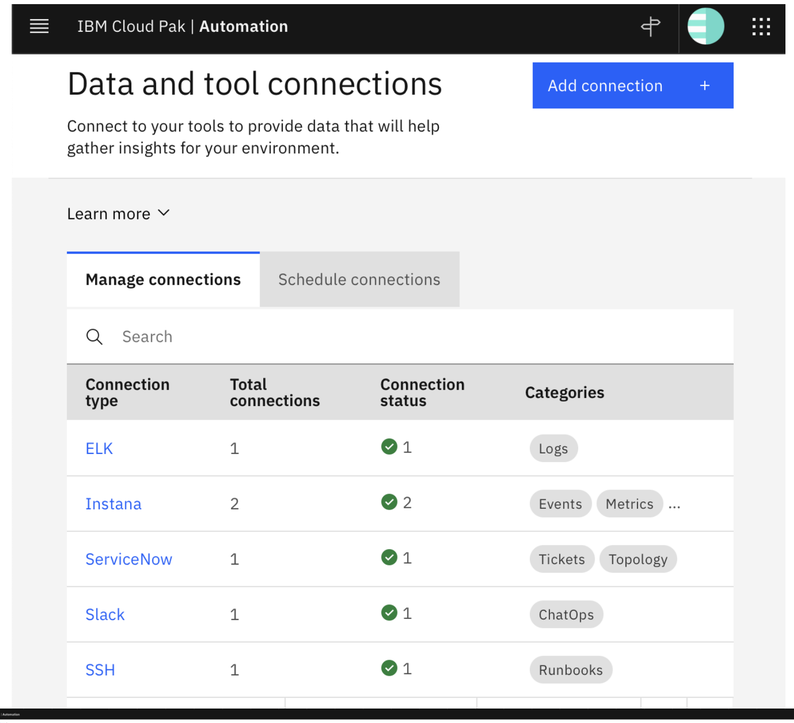
Take Actions

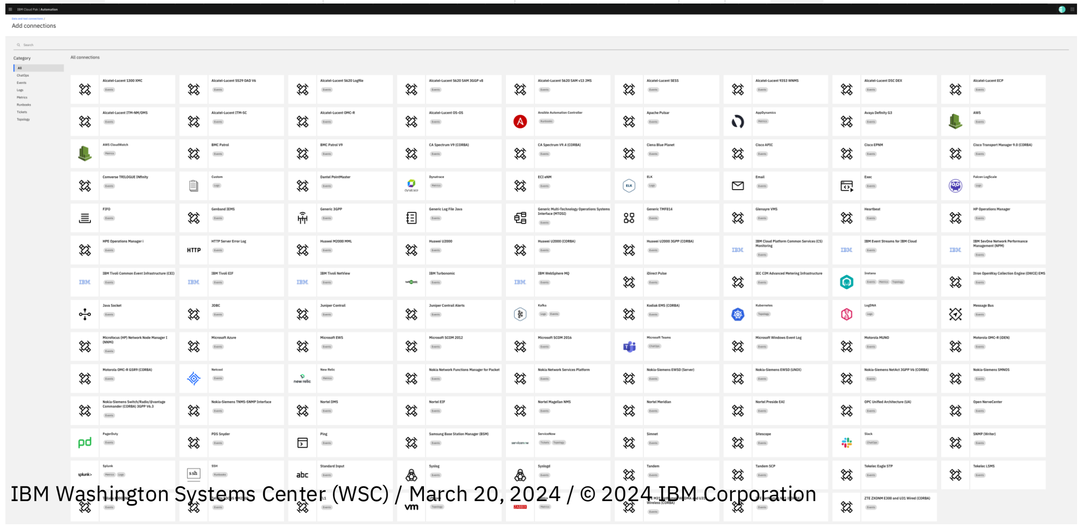
- Contextual side-launch
- Act Manually (with a click)
- Semi | Full Automation
- Pipelines & Workflows
- Explainability
- Collaboration Integration

Together Ops teams in near real-time...

- **Assure Performance**
- **Accelerate rates of change**
- **Free staff from toil**
- **Reduce tickets by up to 70%**

Environment and Tooling Data Connectors





Over 160 industry standard connectors out-of-the-box

Ingest Events & Alerts, Metrics, Topology and Logs from across your estate and tooling

Create your own custom connectors using generic connectors and SDKs

Leverage your existing Netcool Probes

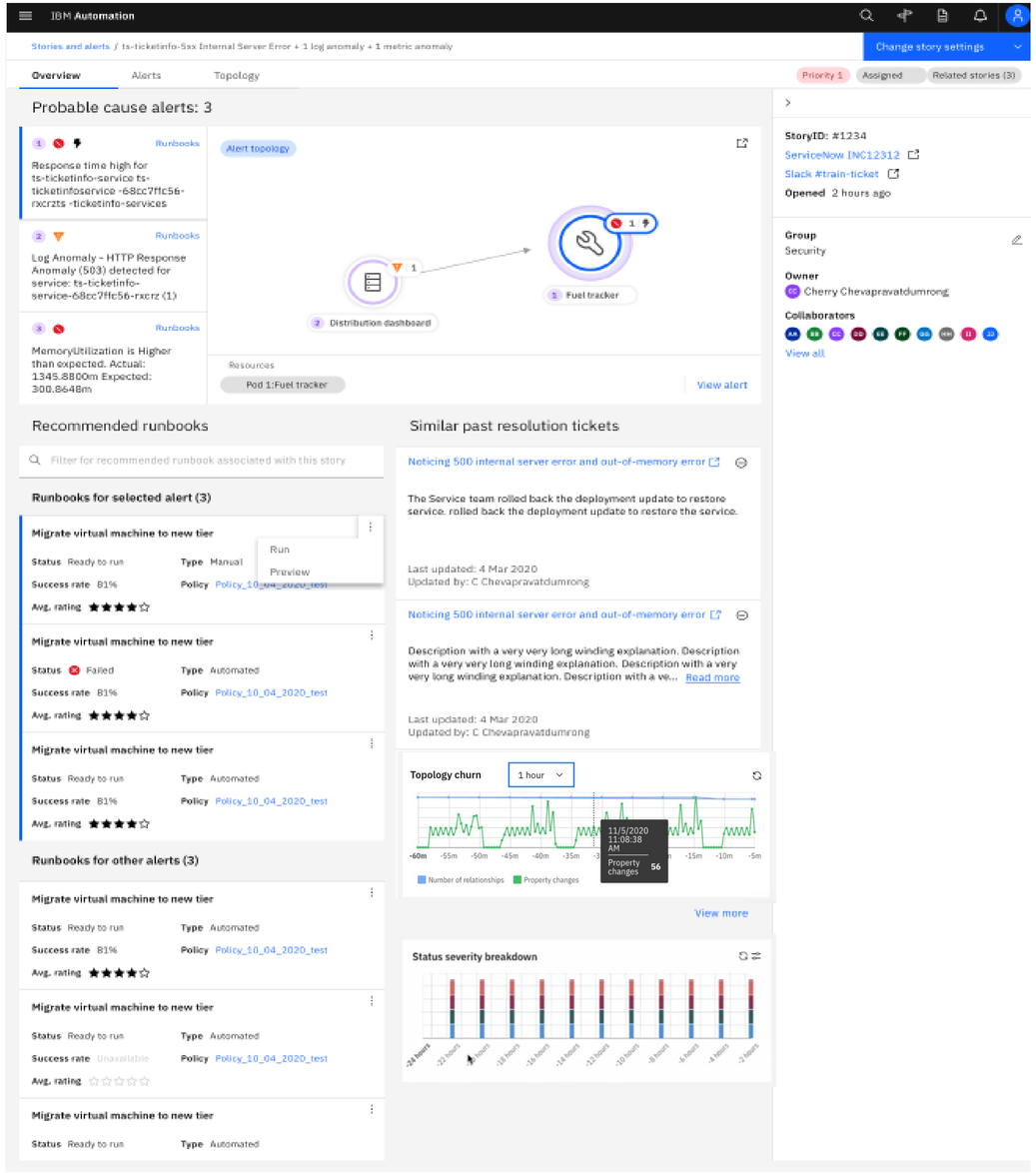
Easy configuration and management

AIOps Incident View

Probable Cause alerts are prominently displayed and ordered by likelihood, with additional details only one click away.

Topology view of affected and associated resources, and historical change tracking to quickly pinpoint the source of an incident and its impact

Recommended runbooks based on incident context and user feedback.



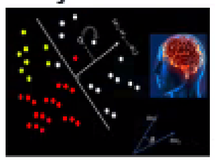
Access to ChatOps for team coordination and shortcuts to actions

Direct link to ServiceNow ticket or other ITSM systems

Similar incident tickets, to inform operators of rapid resolution steps as well as tracking recurring types of incidents.

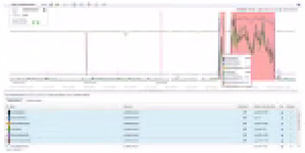
AI Analytics in Cloud Pak for AIOps

Log Anomaly Detection



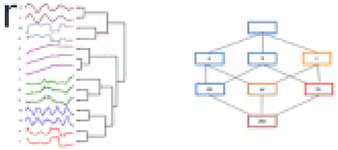
Detect anomalies from log messages
- Anomalous time period prediction
- Entity mentions in error logs
- Explanation & Pointer to log messages from anomalous time periods

Metric Anomaly Detection



Detect anomalies from time series metrics
- Deviation from normal operating range
- Change from variable to flat
- High & low range changes
- Exceed previous range
- Exceed normal range variance

Event Grouping with Entity Linkir

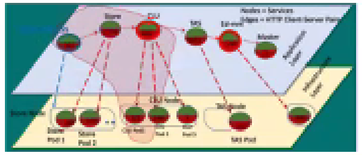


Group events, alerts, anomalies to reduce tickets
- Topological: Group events that are related and/or connected (e.g. “runs on”).
- Temporal: To automatically discover events that tend to co-occur
- Scope: Automatically group events based on scope
- Super-Group: Group of Groups

Event Seasonality

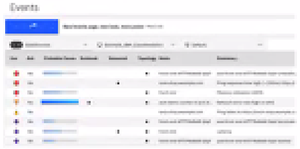
Automatically discovers events that occur with a regular pattern
- Identify chronic issues that may go un-detected
- Provide valuable insights into problem solving
- Continual learning over days, weeks, months, and years

Fault Localization & Blast radius



Derive full scope of components using vertex-weighted topology graph traversal and a Reasoning engine to understand the meaning of the topology relationships
- Blast-radius via directional dependency analysis of the related components that interact with the localised source of the issue.

Probable Cause



Derive probable fault component using vertex-weighted topology graph traversal and a Reasoning engine to understand the meaning of the topology relationships
- Probable Cause localisation to the most likely source of an issue within the application topology

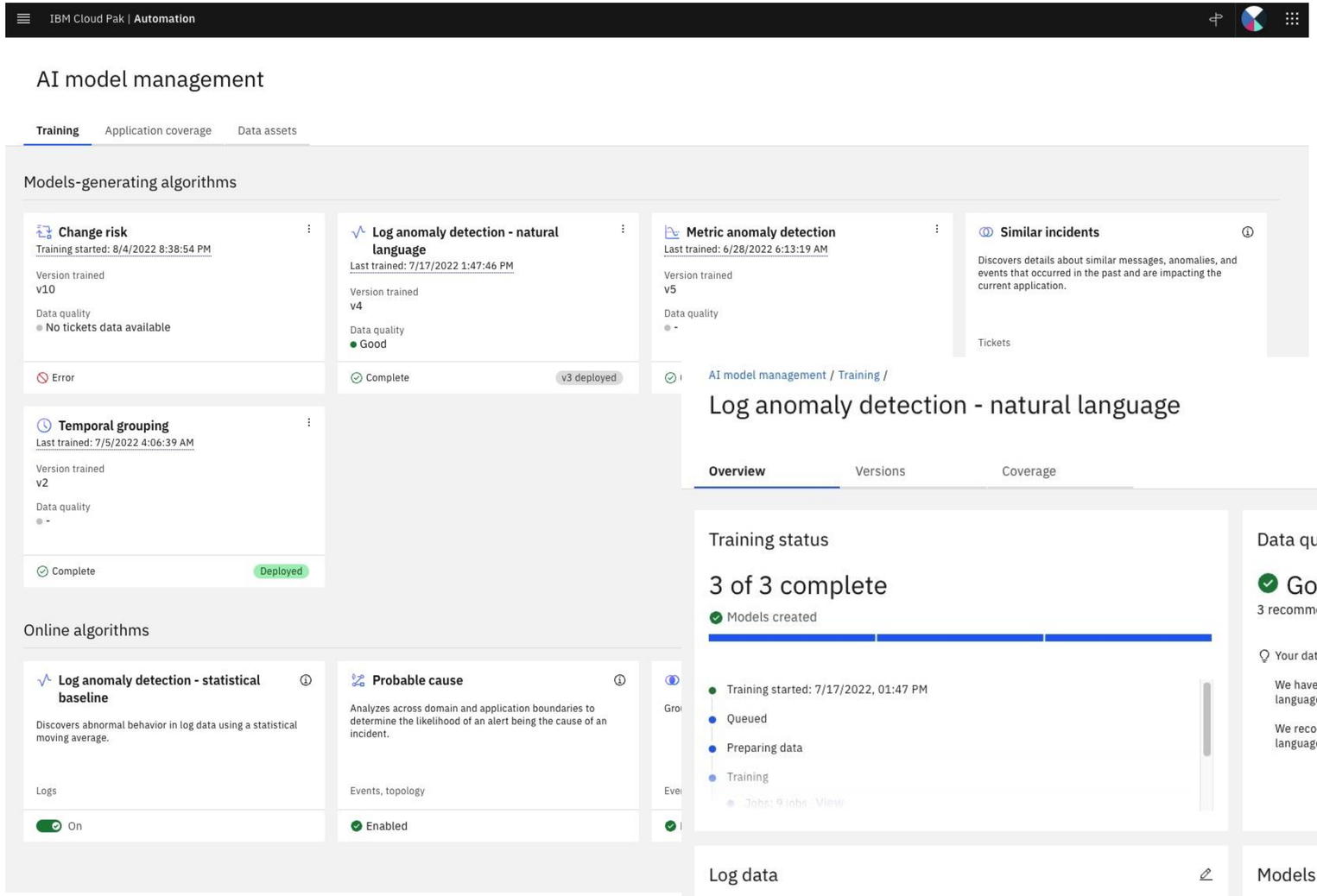
Incident Similarity

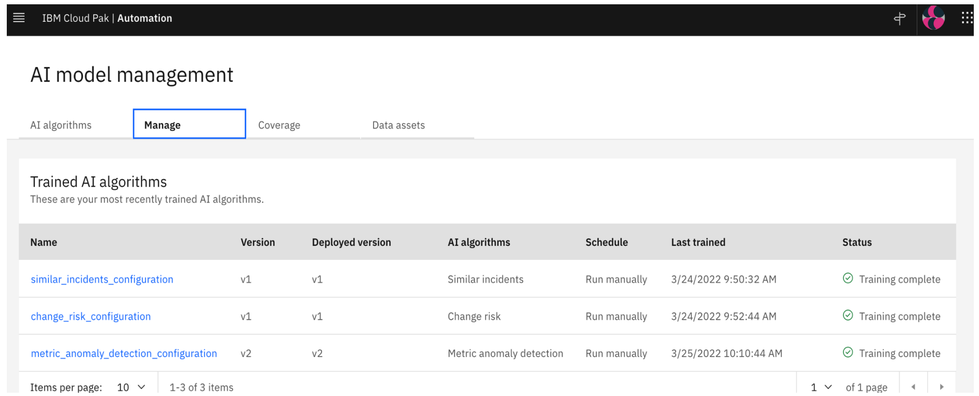
For a given problem description, find top k ranked similar incidents from the past. Helps understand the current issue and previous successful resolve actions. Consumes tickets and any data from the ticket progression to closure including human written investigation and resolution actions.
Uses Entity-Action extraction and Action sequence mining to understand tickets and summarize what was done.

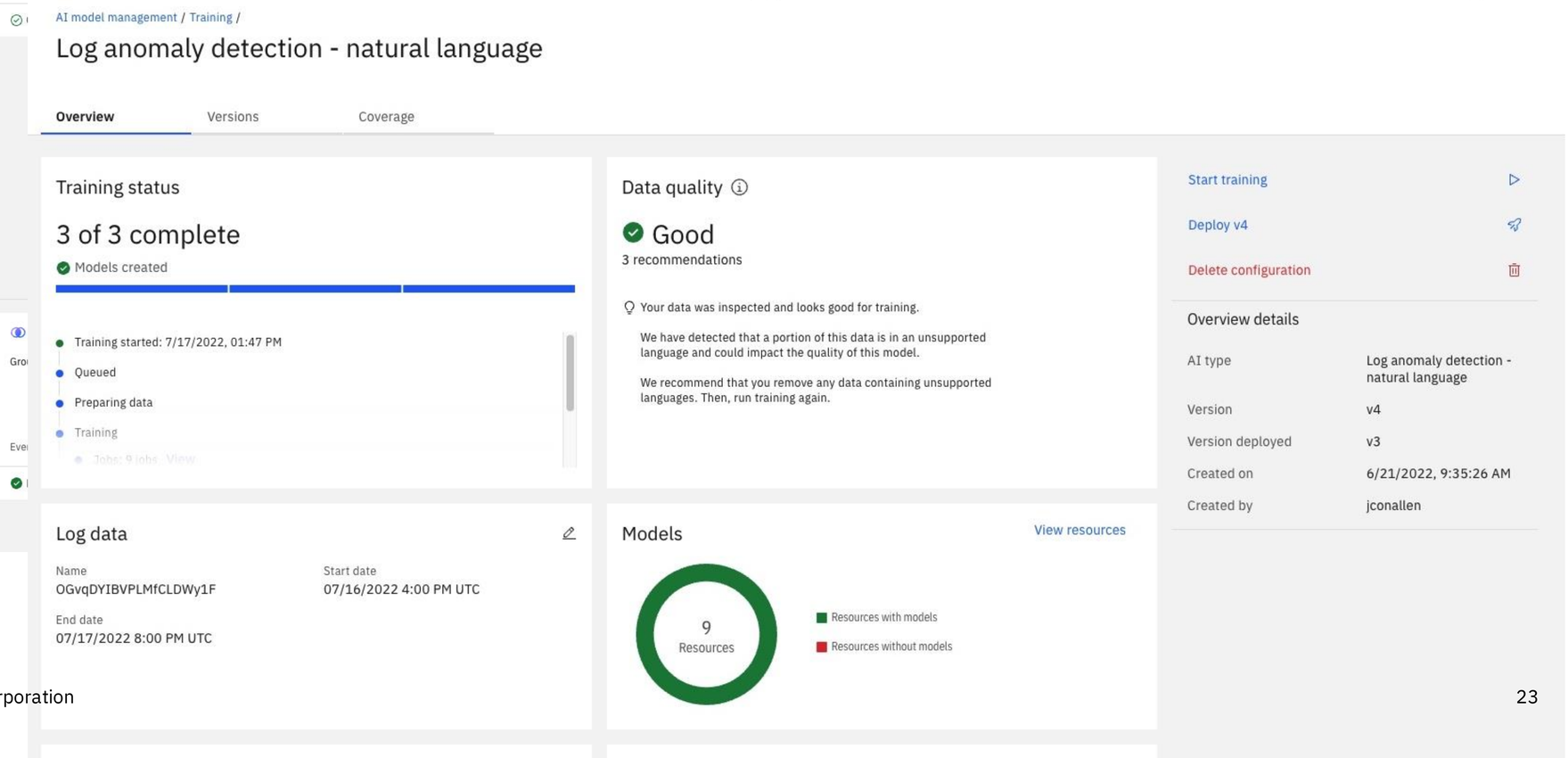
Change Risk Prediction

Assess the risk for each proposed change based on issues caused by historical changes.
- Harvest and analyse the change ticket history to identify changes that implicitly failed when applied.
- Identify changes that resulted in subsequent issues if they rolled out

AI Management

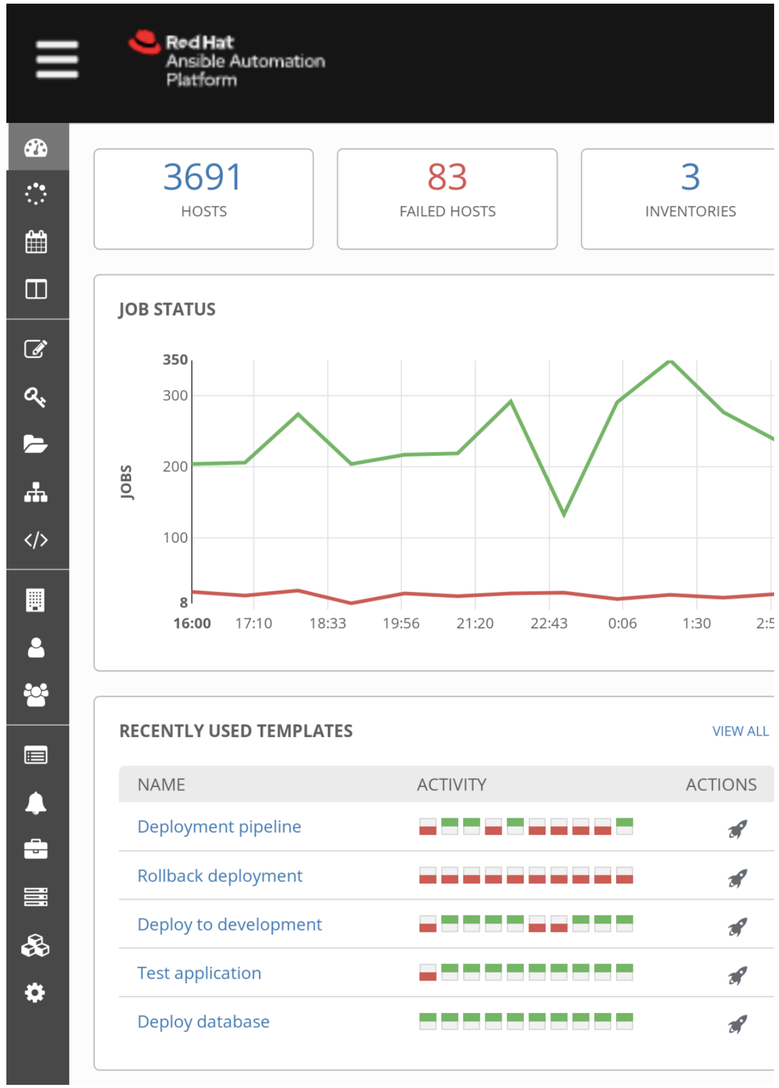






Ansible Automation Platform & Cloud Pak for AIOps

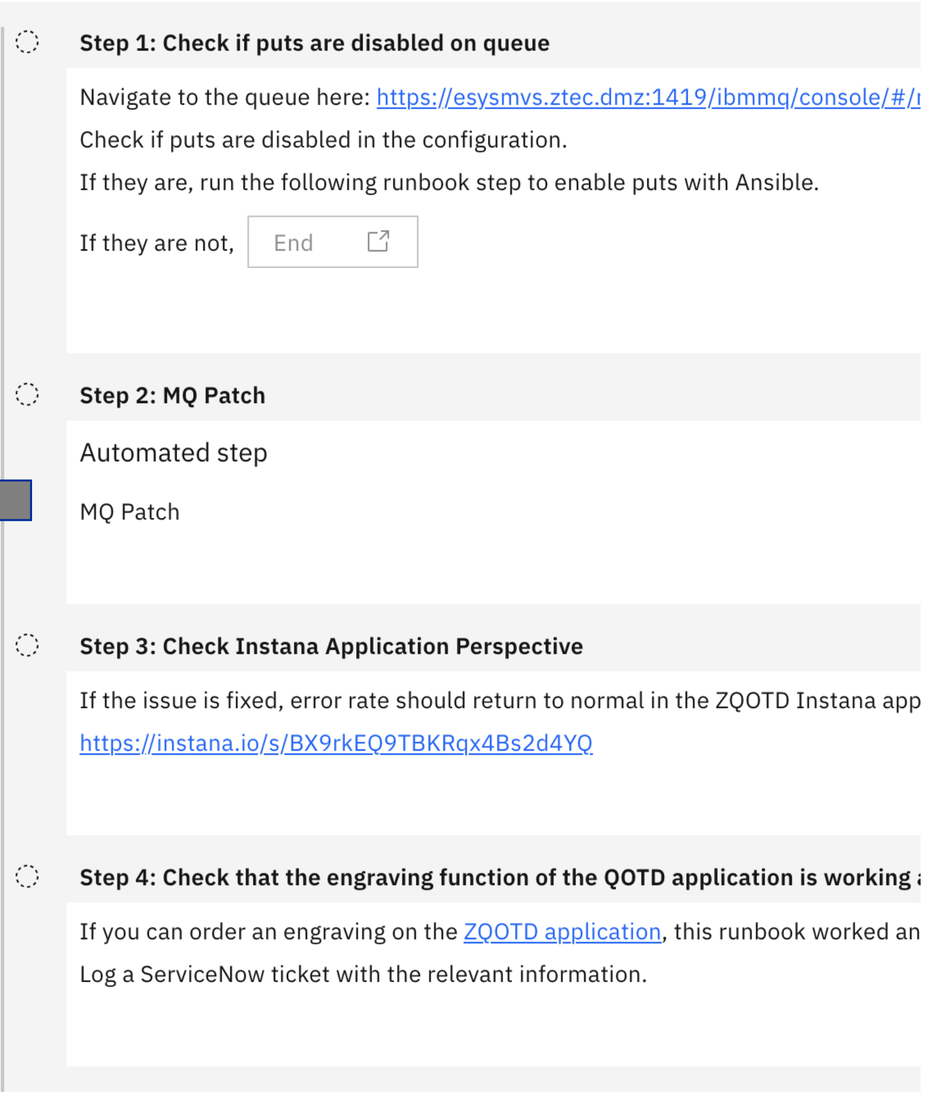
Accelerate IT Transformation & use of Automation. Improve Scalability and tolerance of Change.



Direct Integration
Register & Invoke Job and Workflow Templates into actions

Provenance of Automation
Track actions when & where they occur

...this action occurred on *these* elements...



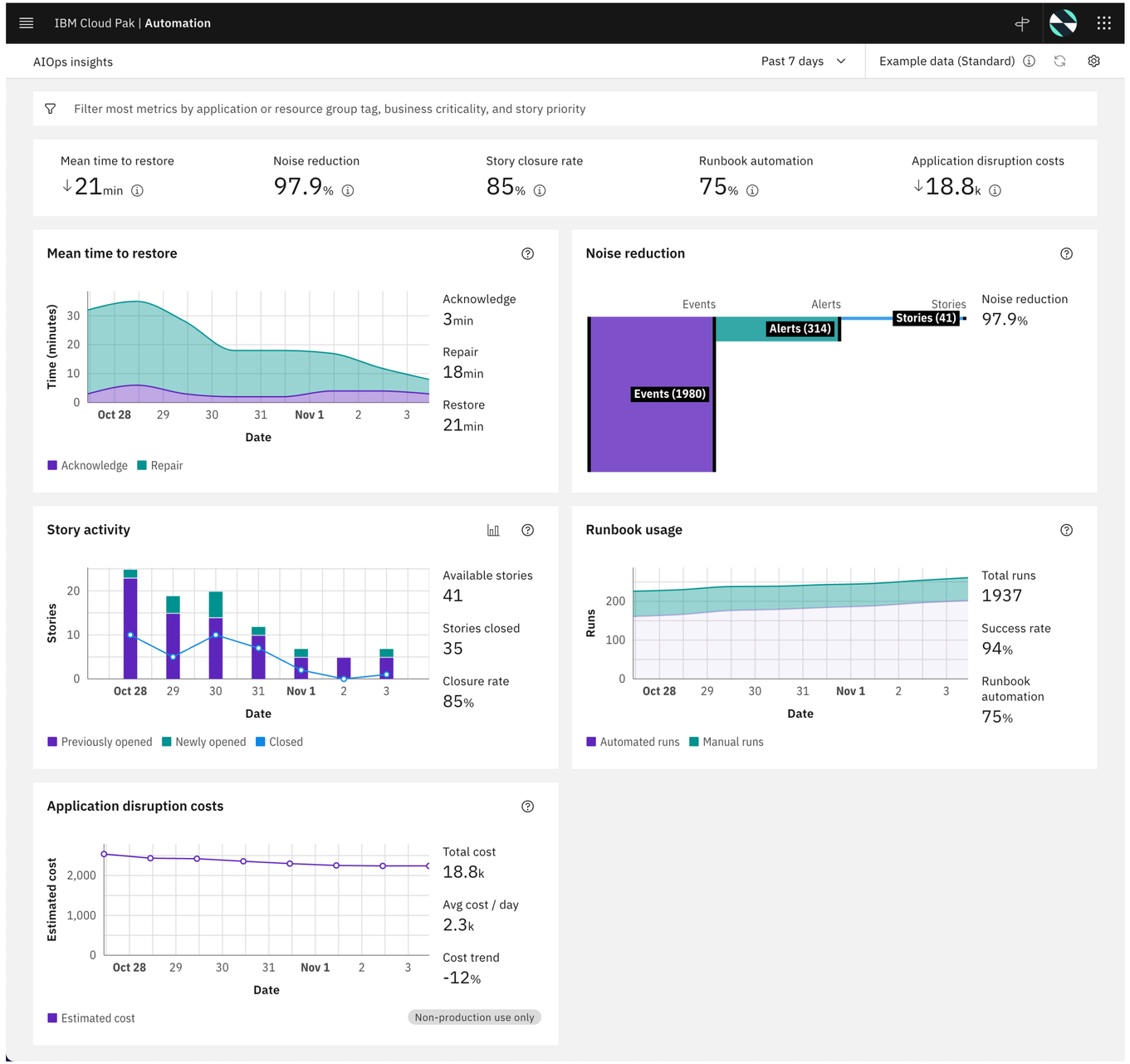
AIOps Insights Dashboard

Understanding Operations Performance

Track KPI’s and automation utilization to ensure operations teams are benefiting from AIOps and identify new opportunities for automation.

Observe trends and understand application and service performance over time.

Analyze cost impacts of outages, and savings realized with AIOps (Tech Preview)

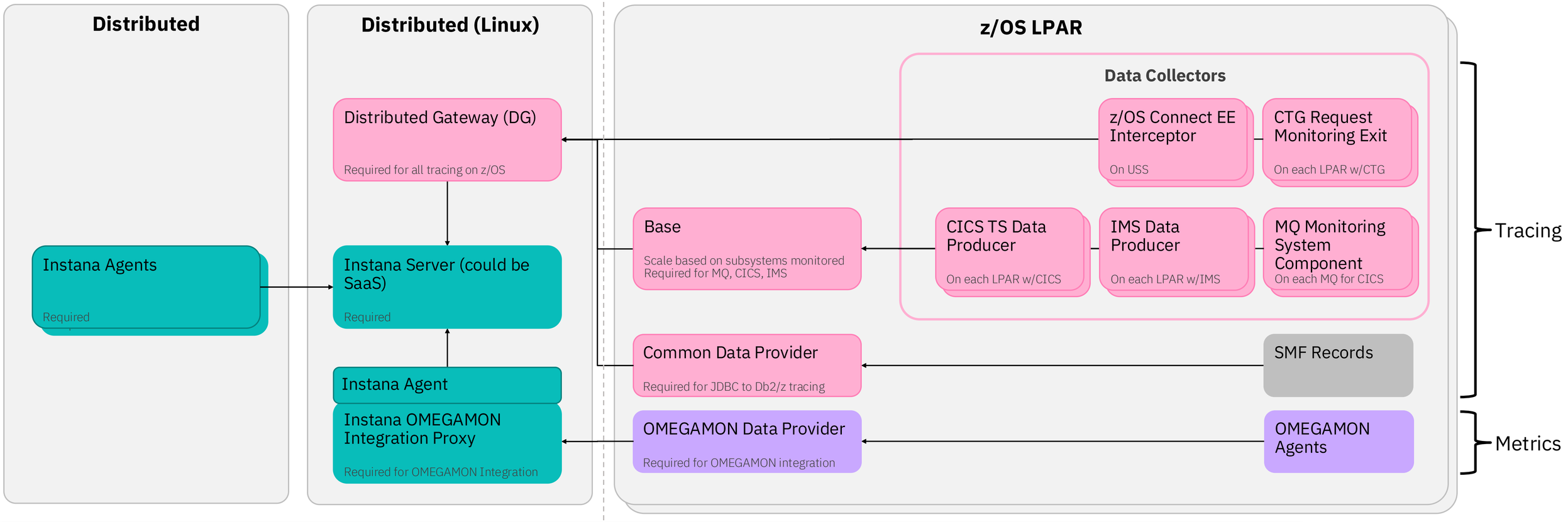


Next steps/more information

- **Want to learn more?**
  - Reach out to me for a live demo or deep-dive presentation (matt.mondics@ibm.com)
- **Interested in a POC of CP4AIOps running on the IBM Z platform?**
  - Reach out to me
- **Join the IBM AIOps for IBM Z community** (Link)

Thank you

Basic architecture for ingesting z/OS telemetry into Instana



What's in the Box?

The Instana on z/OS PID includes the following components:

- Instana self-hosted server
- "Z APM Connect" components
  - Distributed Gateway
  - Base
  - Data Collectors
- Common Data Provider
- Instana on z/OS prerequisites

For OMEGAMON integration, the following additional components are required:

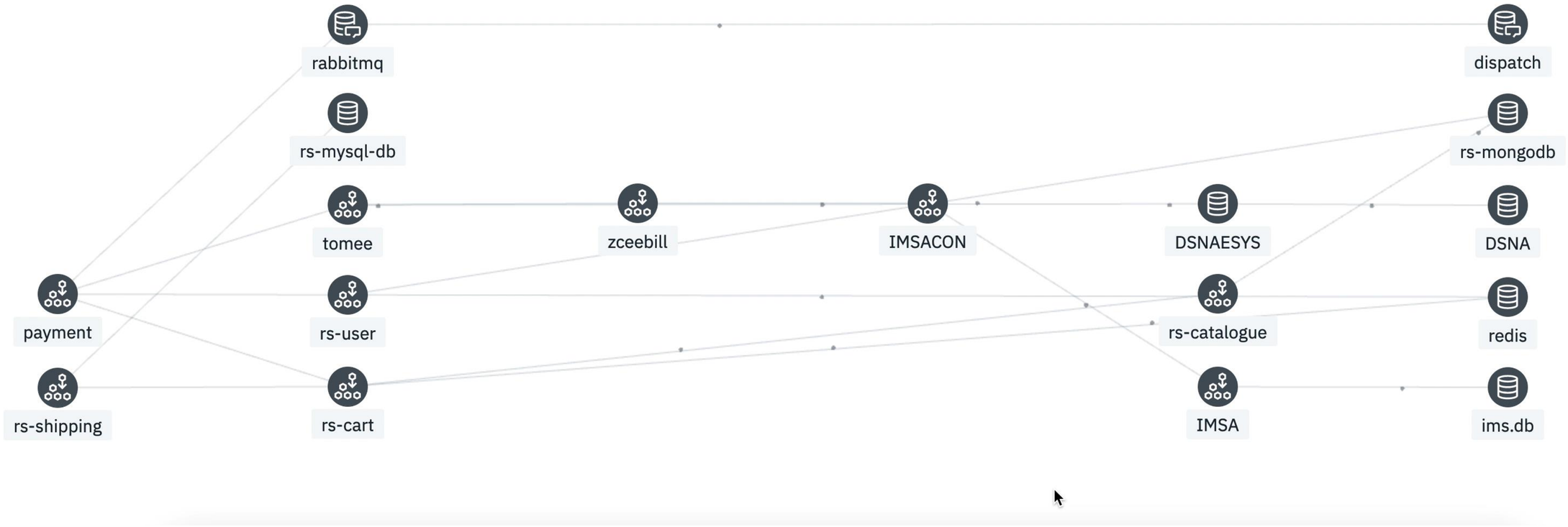
- OMEGAMON agents
- OMEGAMON Data Provider
- Instana Integration Proxy

} NOT provided by Instana on z/OS

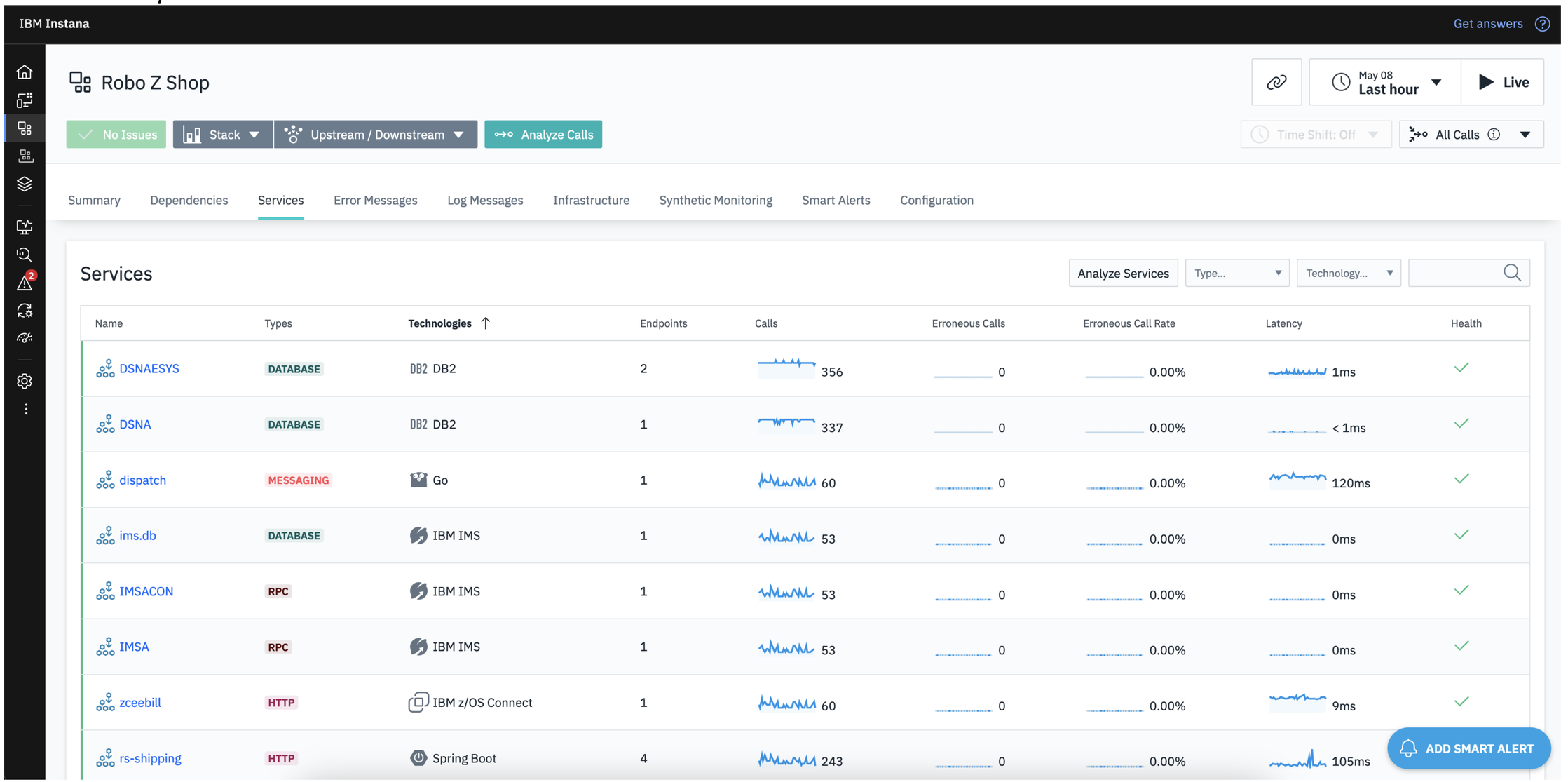
Delivered with:

- Instana on z/OS
- Instana
- OMEGAMON
- Existing

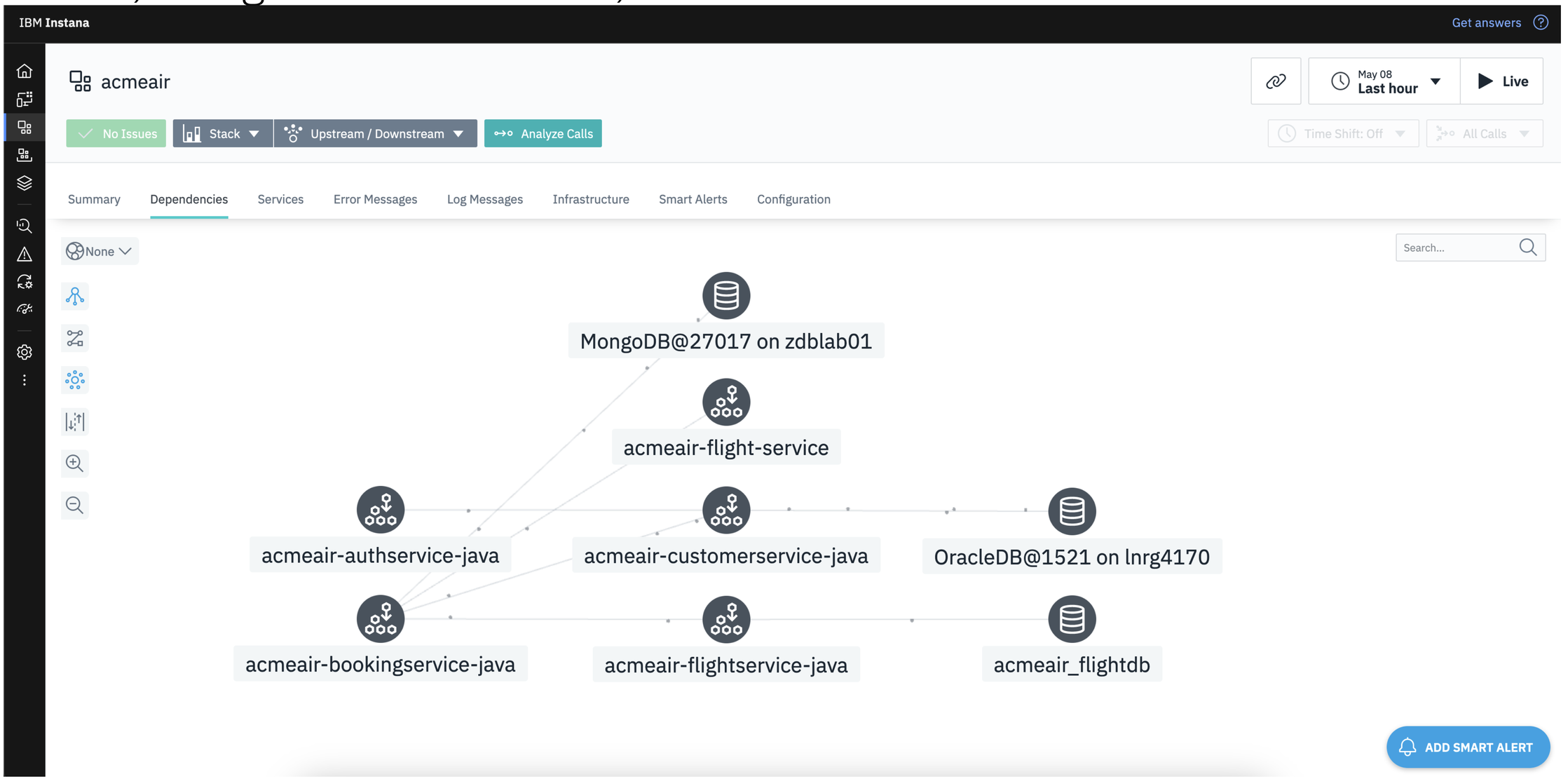
Monitor your: End-to-end application with distributed (x86) Linux services & z/OS



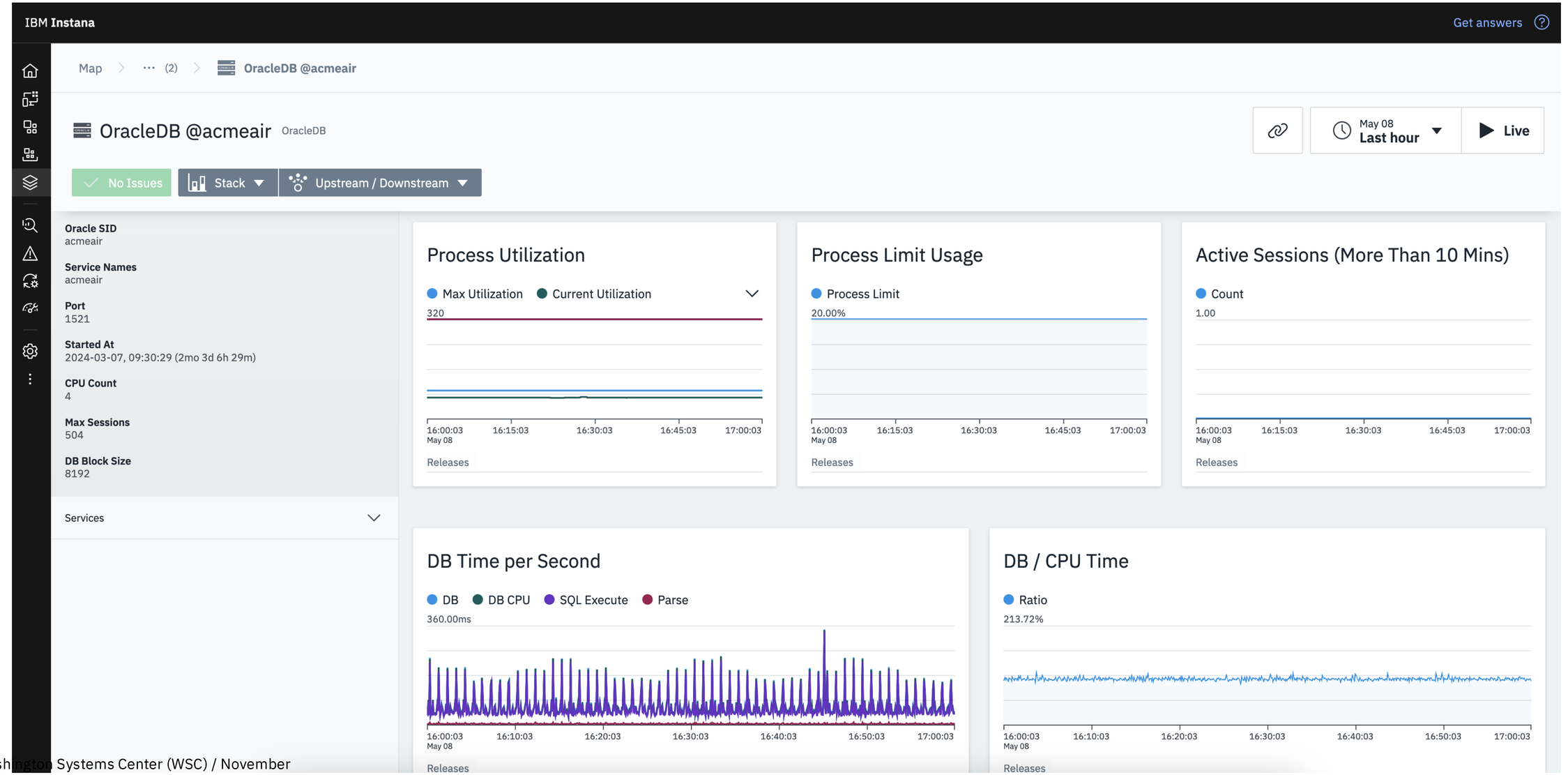
Monitor your: End-to-end application with distributed (x86) Linux services & z/OS



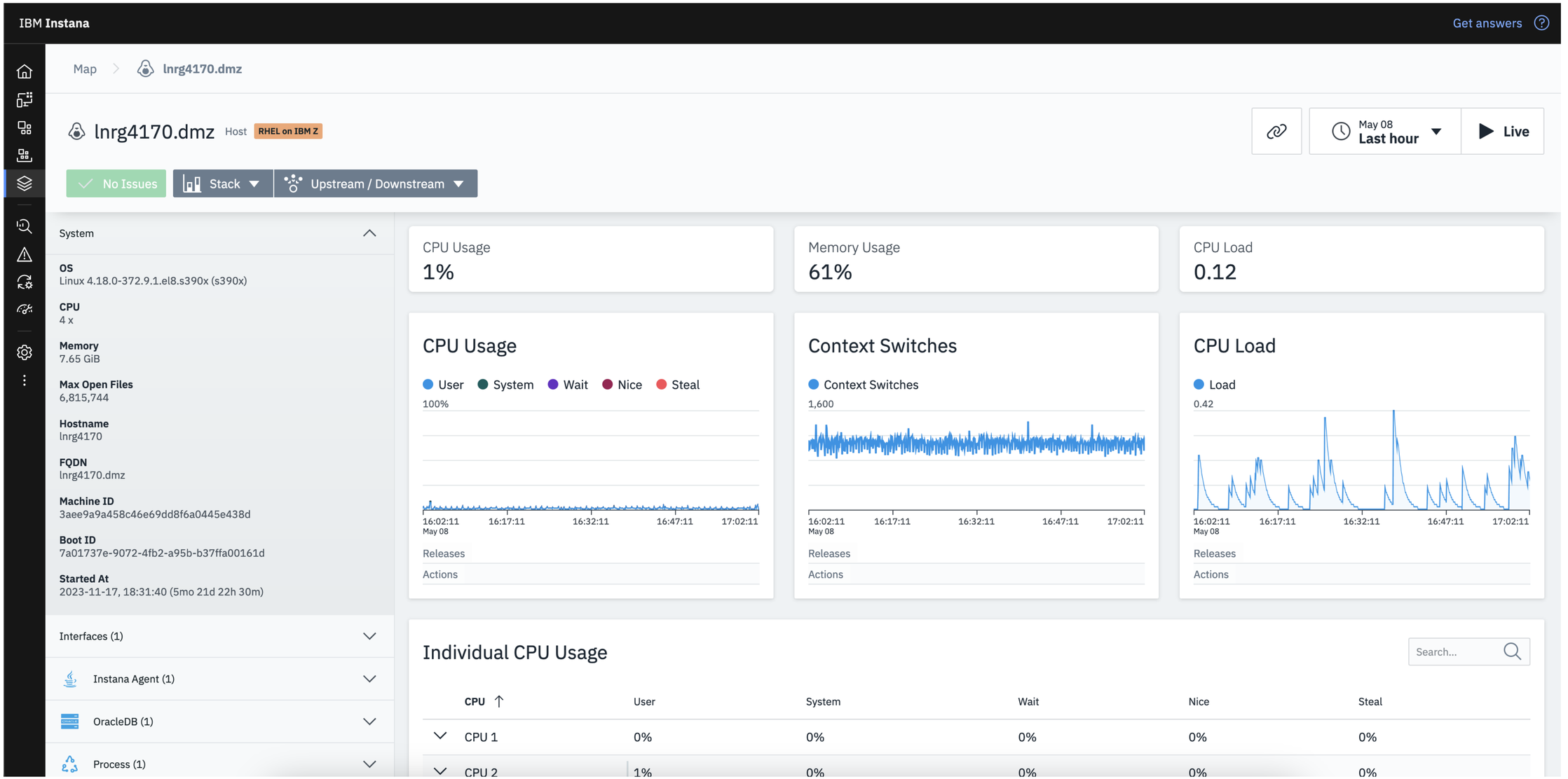
Monitor your: End-to-end application with OpenShift on IBM Z containers, MongoDB on LinuxONE, and OracleDB on LinuxONE



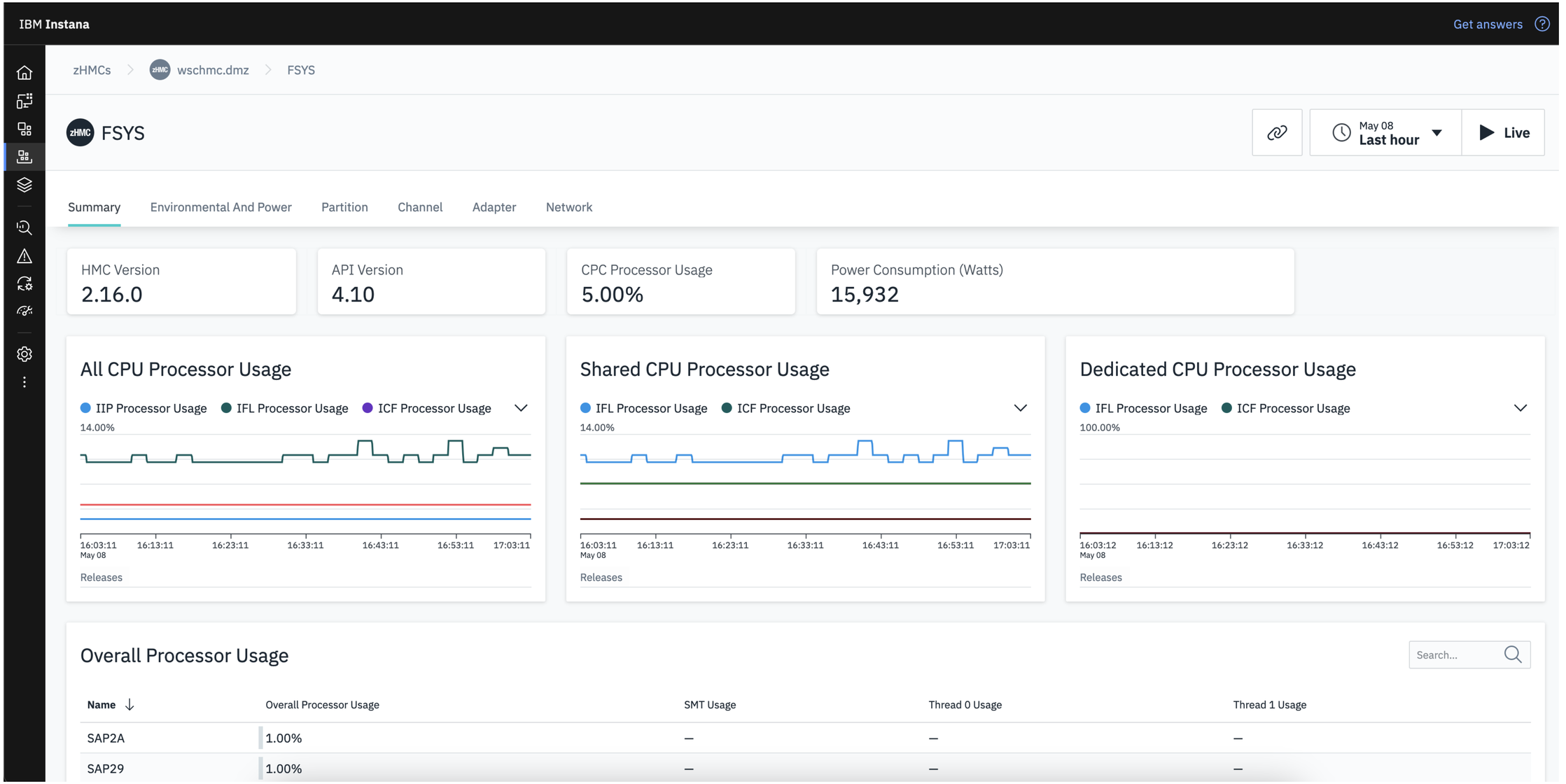
Monitor your: OracleDB



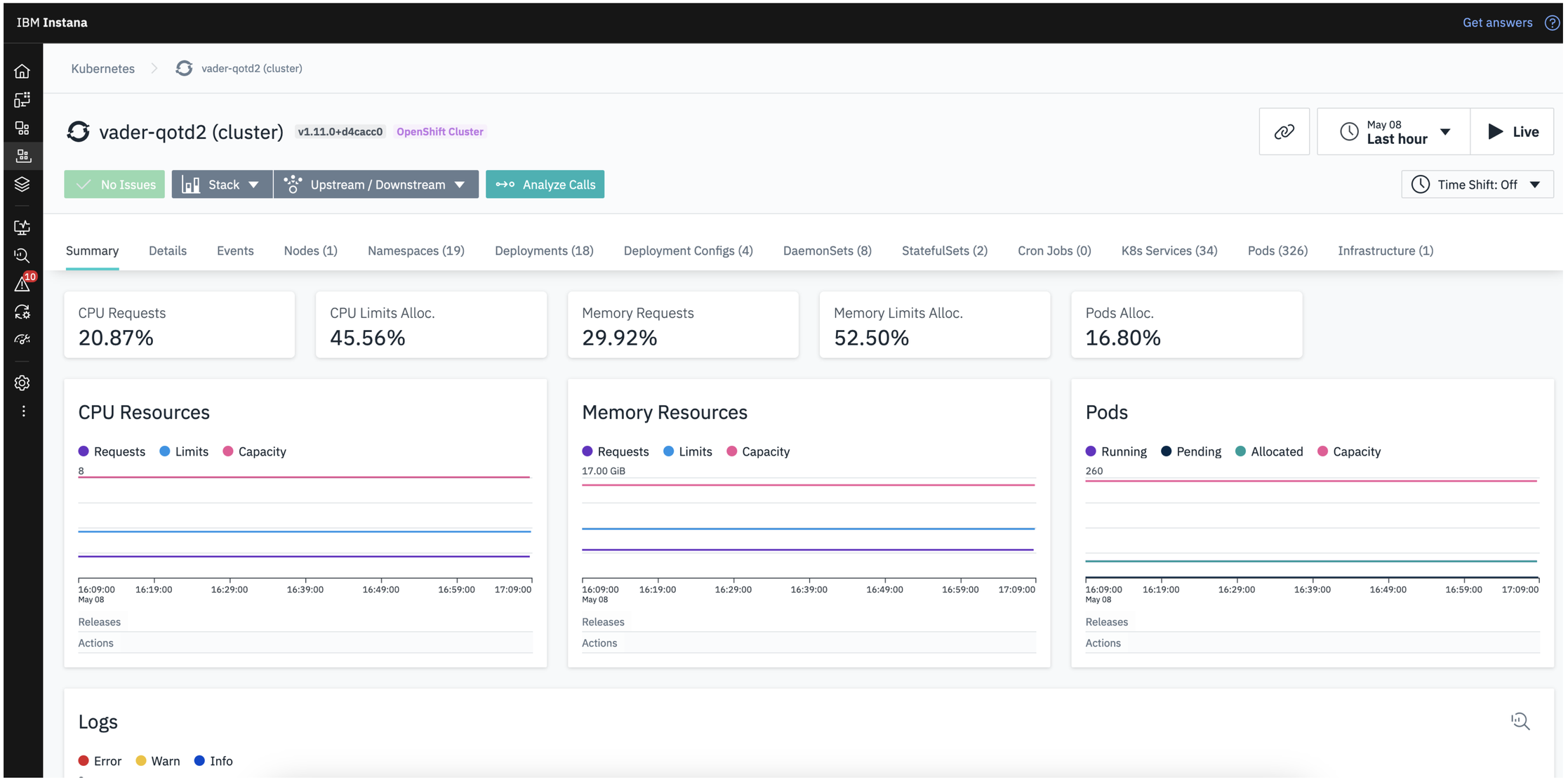
Monitor your: Linux on IBM Z/LinuxONE virtual machine



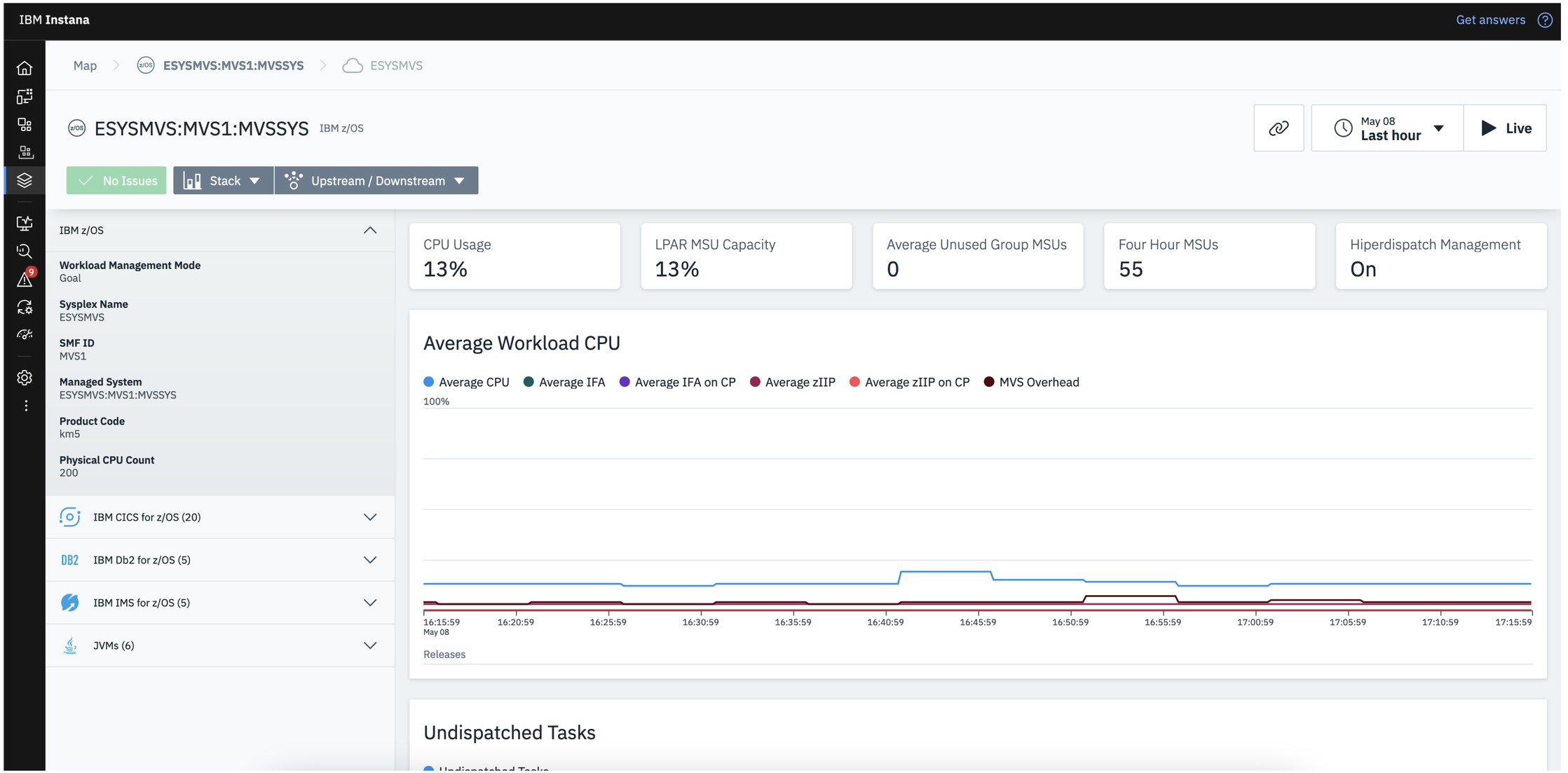
Monitor your: IBM Z Hardware (from HMC API)



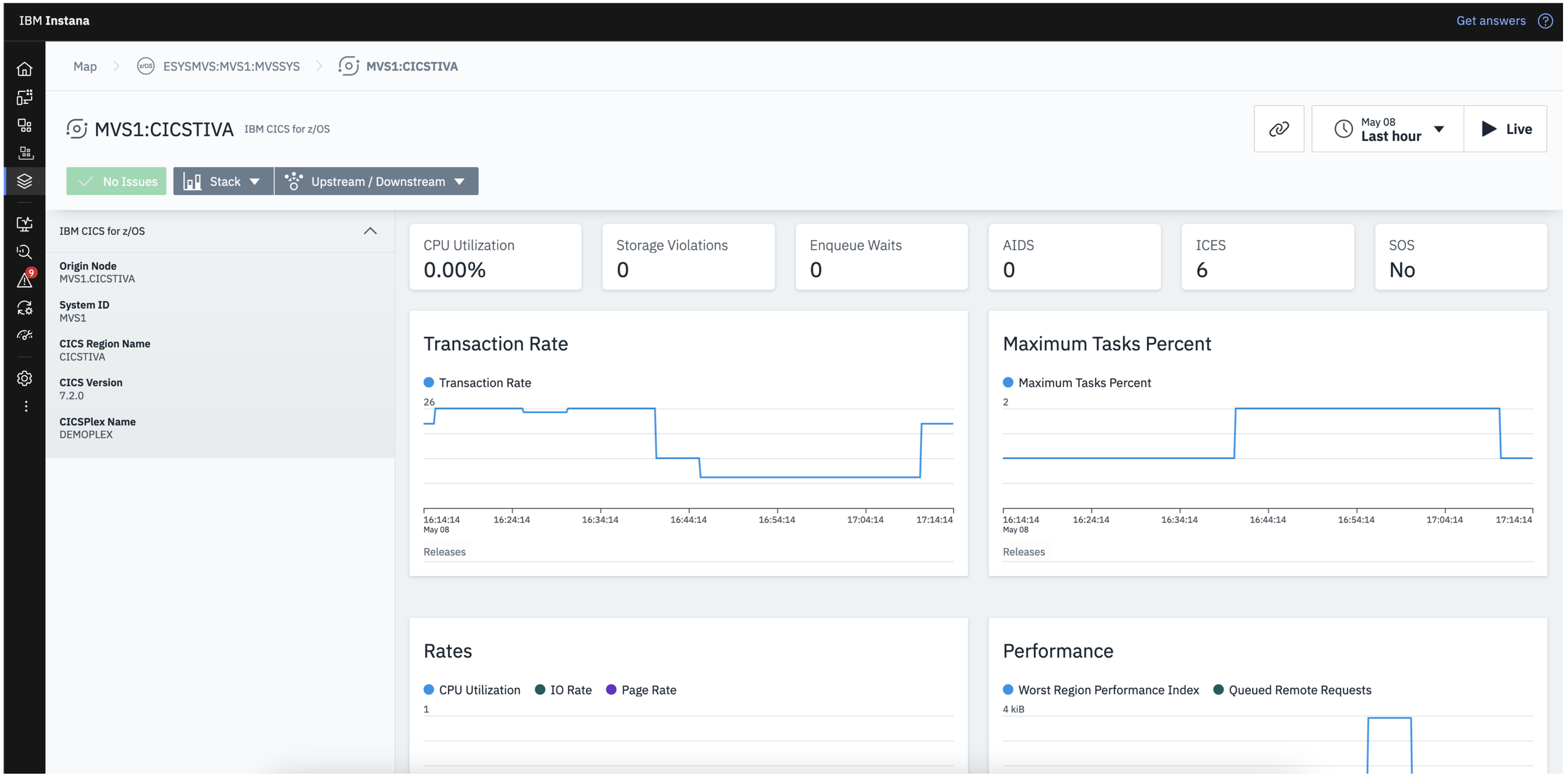
Monitor your: OpenShift cluster



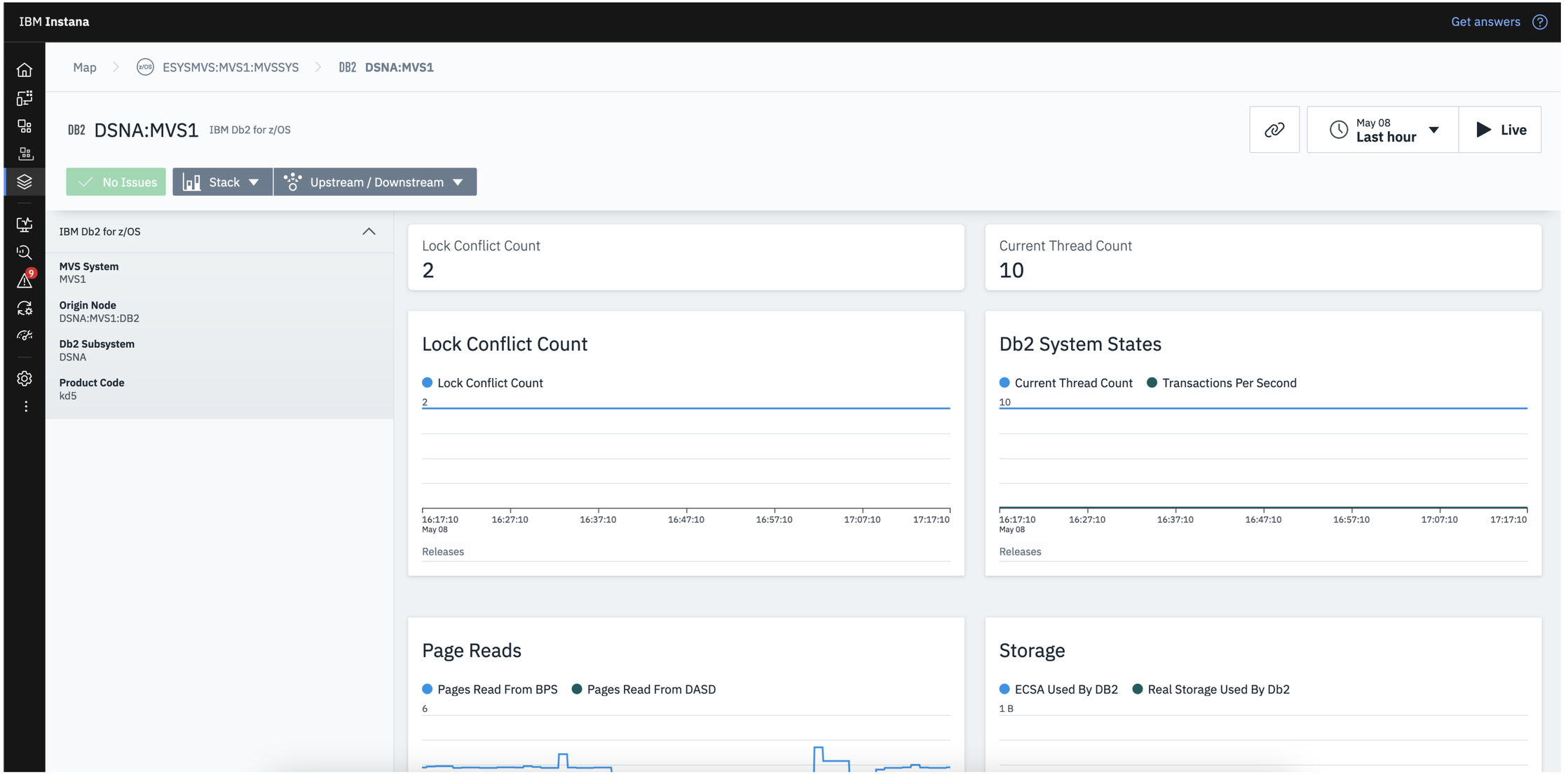
Monitor your: z/OS LPAR (via OMEGAMON)



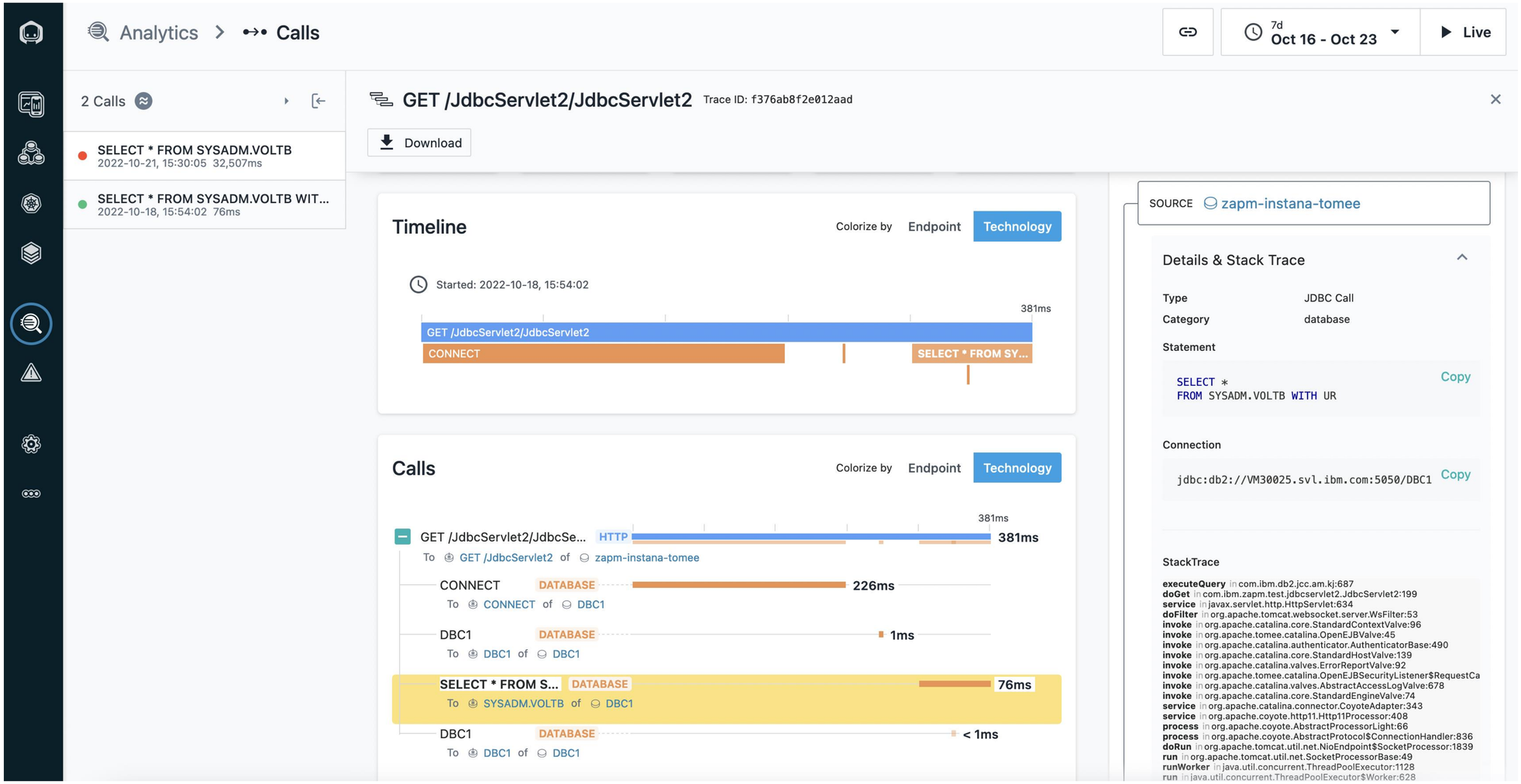
Monitor your: CICS region (via OMEGAMON)



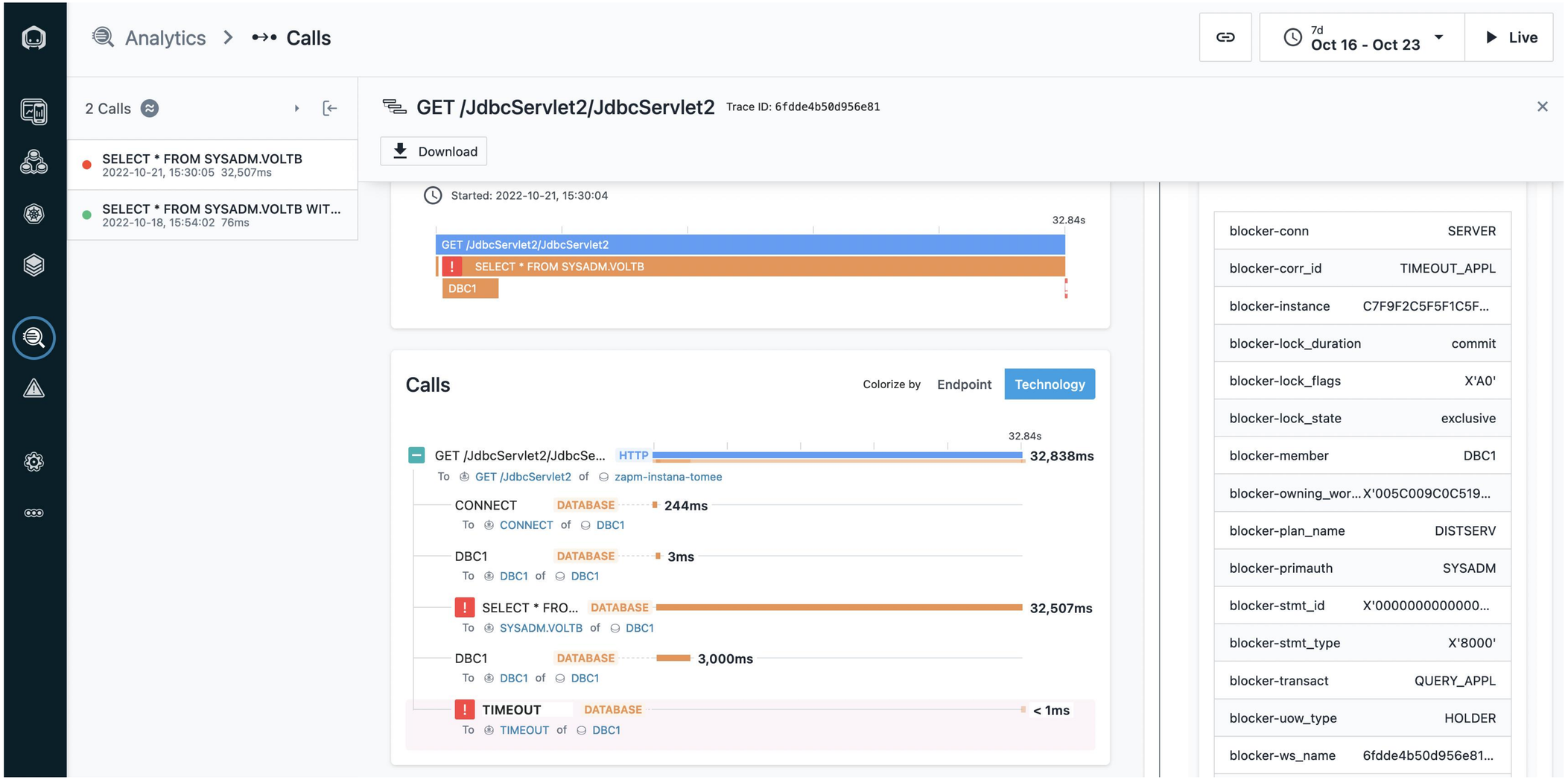
Monitor your: Db2 on z/OS database (via OMEGAMON)



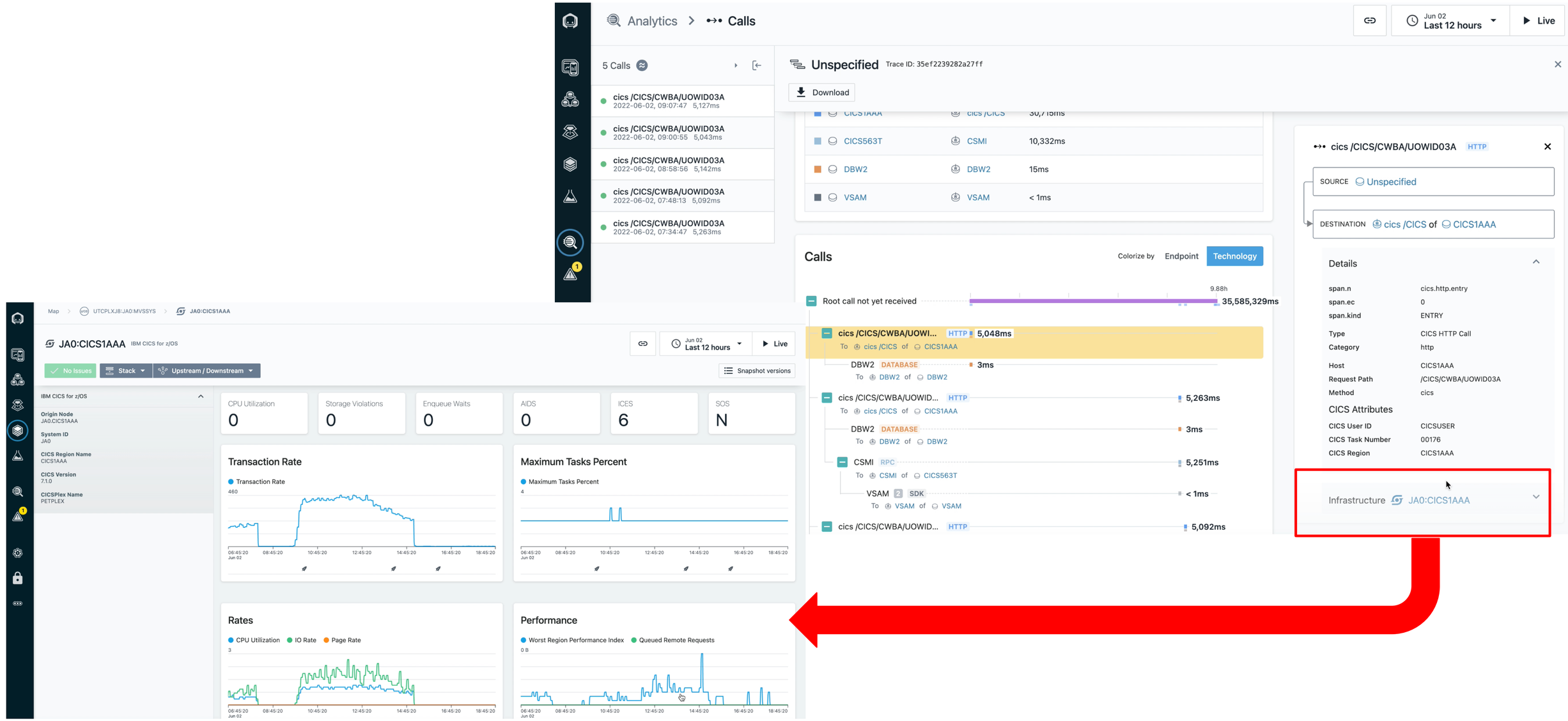
Example tracing into Db2 on z/OS



Example timeout delay in Db2 on z/OS



Link from transaction trace to infrastructure



When there are issues, integrate with your existing platforms to notify the team or remediate the problem

Custom Dashboards

Events and Metrics

Alerting Integrations

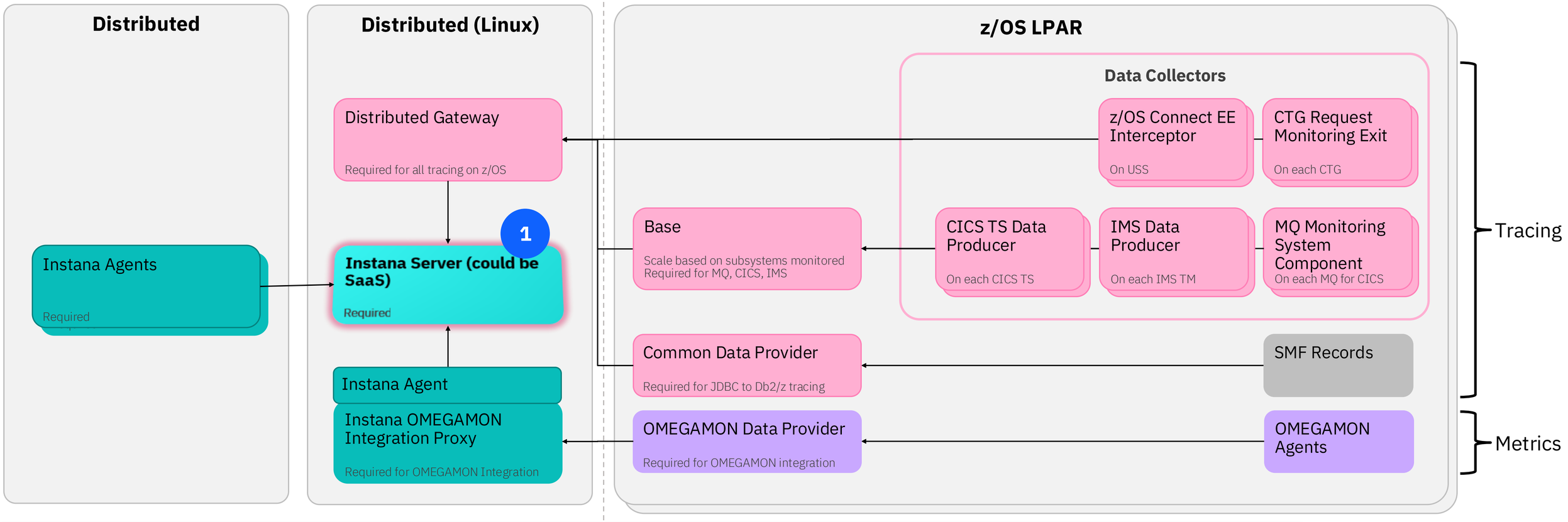
Google Chat

Email

Webhooks

Logging Integrations

Instana Server



What is it?

- The backend server that consumes all telemetry data from all sources, including z/OS
- Stitches together tracing spans received from host agents on distributed platforms with related spans and metrics from z/OS for a cohesive end-to-end view

Is it Required? Where is it deployed?

Required: Yes, for all Instana on z/OS deployments

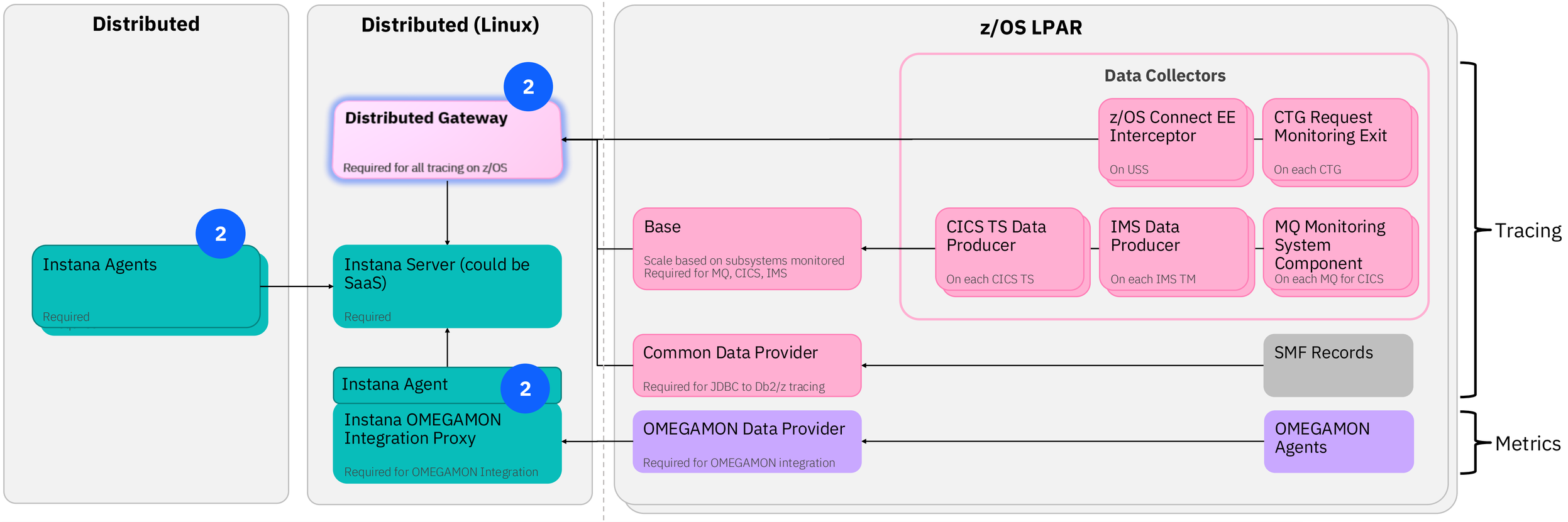
Deployment:

- SaaS based tenant/units are available to collect telemetry
- Can also be deployed for self-hosted scenarios on Linux (x86)
- [deployment of Instana self-hosted to zLinux is expected later in 2023]
- Installing the Instana backend

Delivered with:

- Instana on z/OS
- Instana
- OMEGAMON
- Existing

Distributed Gateway



What is it?

- Bridge between the tracing components and the Instana Server
- Receives trace data from tracing components
- Formats the data into proper Instana tracing “spans”
- Sends spans to the Instana backend

Is it Required? Where is it deployed?

Required: Yes, for all Instana on z/OS deployments

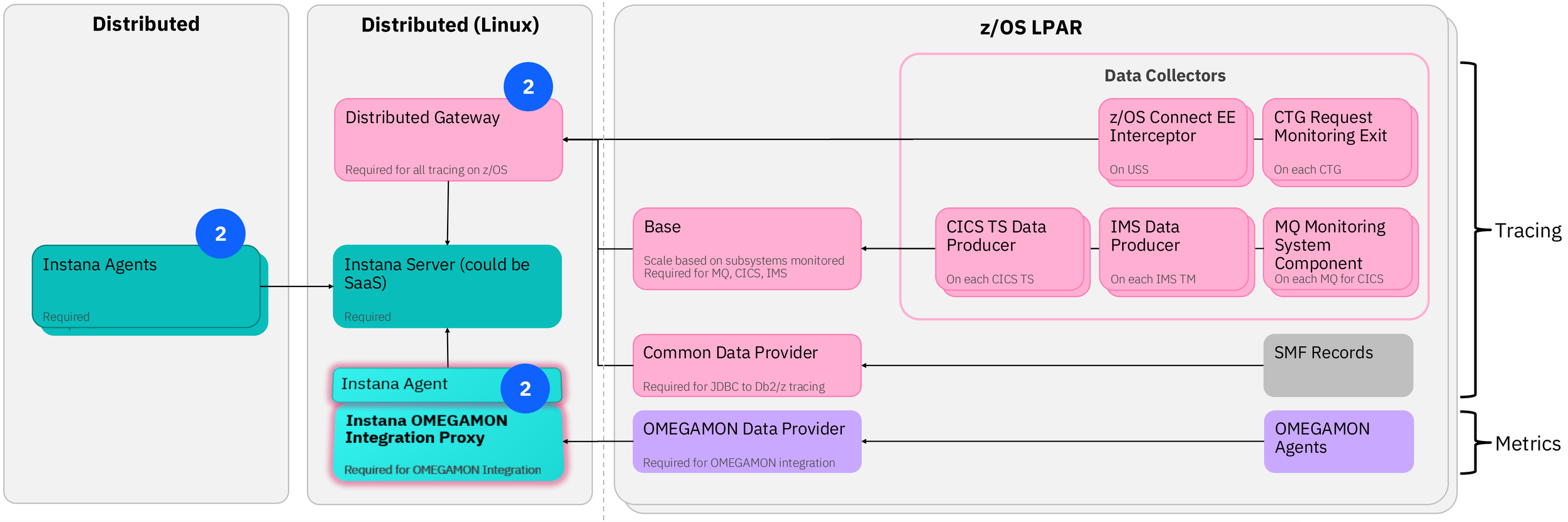
Deployment:

- On a Linux server – this offloads processing from z/OS
- Recommend a Kubernetes based deployment (like OpenShift) for scalability
- Distributed Gateway installation prerequisites
- Deploying the Distributed Gateway

Delivered with:

- Instana on z/OS
- Instana
- OMEGAMON
- Existing

OMEGAMON Integration Proxy



What is it?

- Collects metric data from the OMEGAMON Data Provider
- Transforms it into a format that Instana can consume
- Sends metrics to a sensor in an Instana host agent named: *com.instana.plugin.ibmapmproxy*
- The Instana host agent then sends the payloads to the Instana server where entities are created and metrics saved.

Is it Required? Where is it deployed?

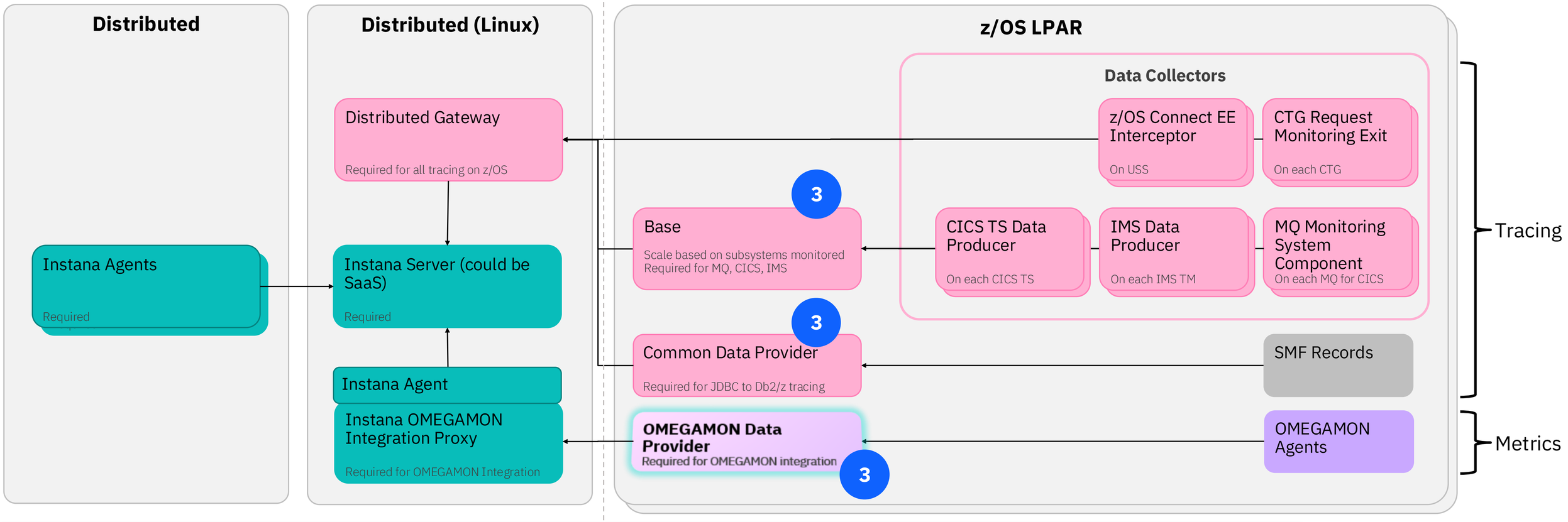
Required: Only if planning to integrate OMEGAMON metrics within Instana. OMEGAMON is not a pre-req for transaction tracing.

Deployment:

- The proxy is downloaded from Instana's GitHub repository (https://github.com/instana/ibm-monitoring-integration) and is deployed into a Kubernetes or OpenShift cluster
- OMEGAMON Integration Proxy Prerequisites
- Integrating with OMEGAMON

Delivered with:
- Instana on z/OS
- Instana
- OMEGAMON
- Existing

OMEGAMON Data Provider



What is it?

- Streams selected metrics for key z/OS subsystems that OMEGAMON is collecting – selected to compliment Instana's transacting tracing
- Metrics are streamed simultaneous to OMEGAMON and Instana's Server

Is it Required? Where is it deployed?

Required: Only if planning to integrate OMEGAMON metrics within Instana. OMEGAMON is not a pre-req for transaction tracing.

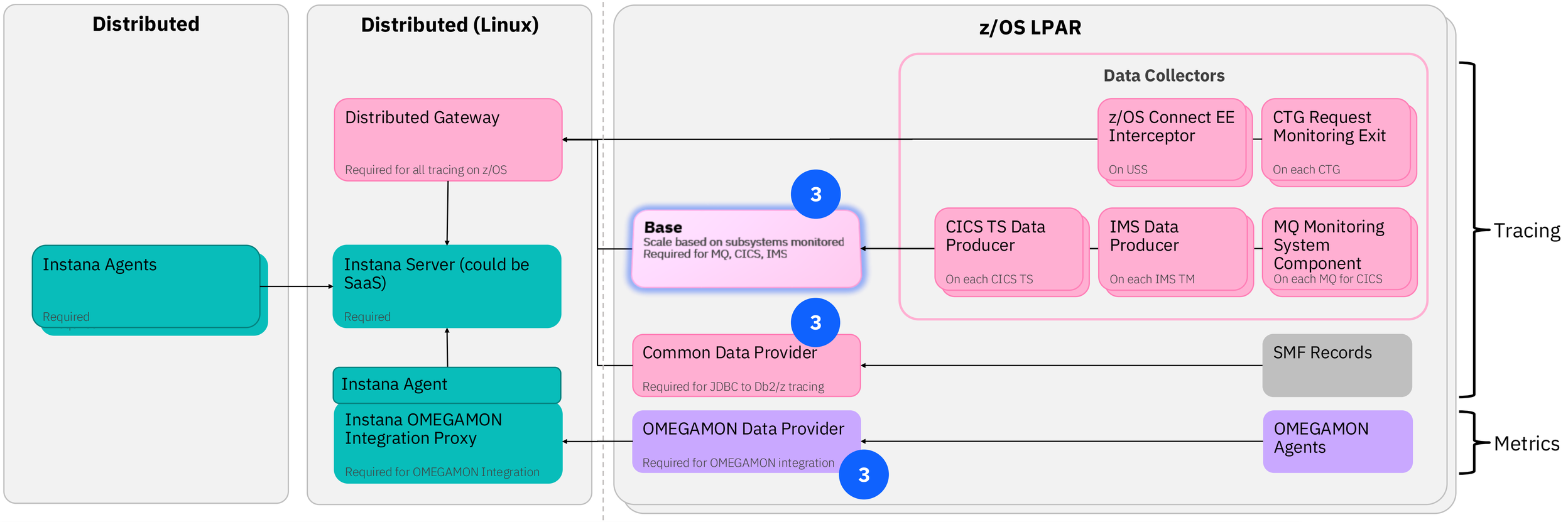
Deployment:

- Each LPAR to get data from OMEGAMON agents running on that LPAR
- A YAML file related to OMEGAMON's Data Connect Process specifies which attributes will be streamed to Instana
- OMEGAMON Data Provider Prerequisites
- Integrating Instana with OMEGAMON Data Provider

Delivered with:

- Instana on z/OS
- Instana
- OMEGAMON
- Existing

Base



What is it?

- Receives trace data from potentially high-volume subsystems like CICS, IMS, and MQ
- Internal architecture made up of “couriers” – number of couriers can be increased to handle more volume
- Is a z/OS “Started Task”

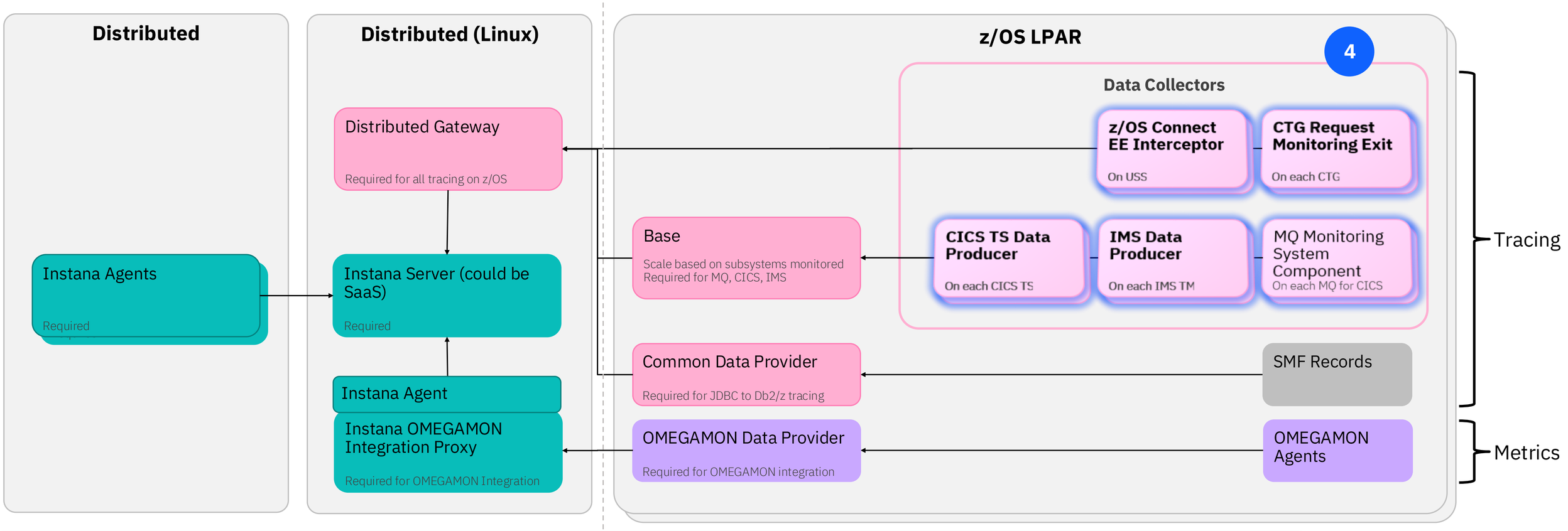
Is it Required? Where is it deployed?

Required:
- Yes – when tracing CICS, IMS or MQ
- No – when tracing distributed calls via JDBC into Db2 on z/OS

Deployment:
- To each LPAR where a CICS or IMS Data Collector is being used
- For high volume environments, multiple Bases may be started
- Instana on z/OS Base prerequisites
- Installing Instana on z/OS Base

Delivered with:
- Instana on z/OS
- Instana
- OMEGAMON
- Existing

Data Collectors



What is it?

- Data Collectors gather trace data for all calls through the various z/OS subsystems supported
- Minimal data is captured for each call
- Data is sent to the DG for processing into Instana Spans

Is it Required? Where is it deployed?

Required:

- Yes – when tracing calls into CICS, IMS, or MQ via z/OS Connect or CTG
- No – when tracing distributed calls via JDBC into Db2 on z/OS

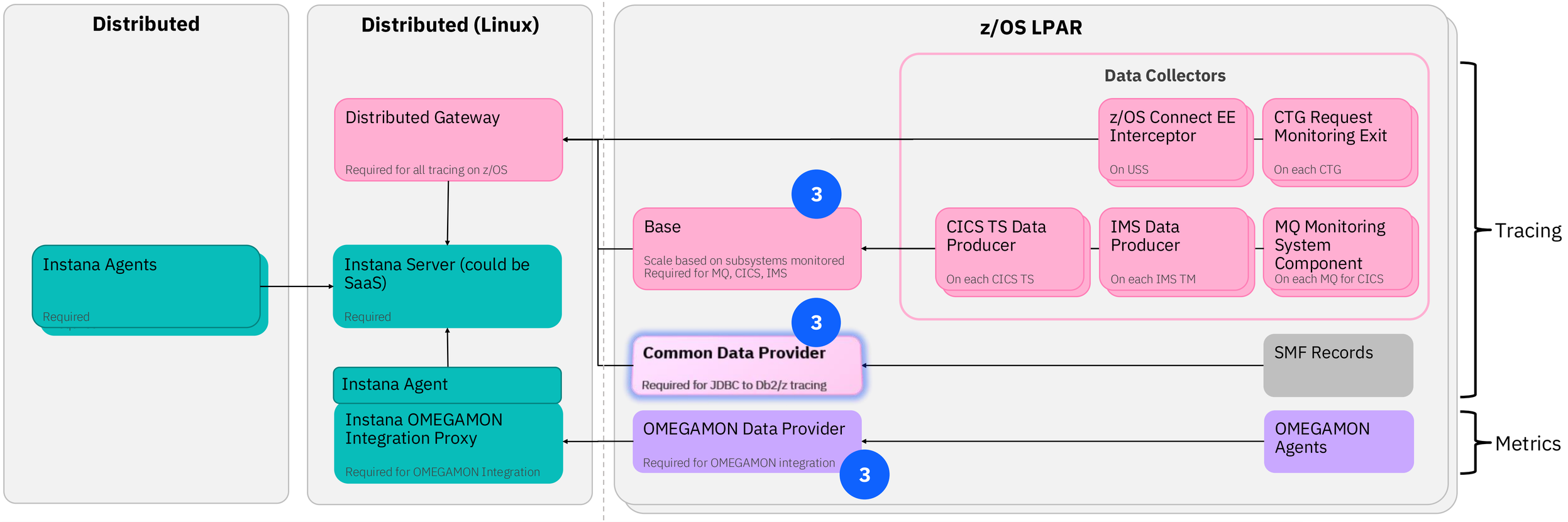
Deployment:

- In z/OS LPAR's, into the subsystems being observed
- One data collector will be deployed to each environment
- Prereqs: CICS; IMS; z/OS Connect; CTG 1; CTG 2
- Install: CICS; IMS; MQ; z/OS Connect; CTG

Delivered with:

- Instana on z/OS
- Instana
- OMEGAMON
- Existing

Common Data Provider



What is it?

- Accesses operational data from z/OS systems stored in SMF
  - SMF records have Instana's trace context for filtering
- Collects, formats and filters transaction data related to JDBC requests to Db2 on z/OS
  - Performance metrics for SQL calls
  - Db2 timeouts and Db2 deadlocks
- Sends the filtered SMF data to the Distributed Gateway

Is it Required? Where is it deployed?

Required: Only when tracing distributed calls via JDBC into Db2 on z/OS

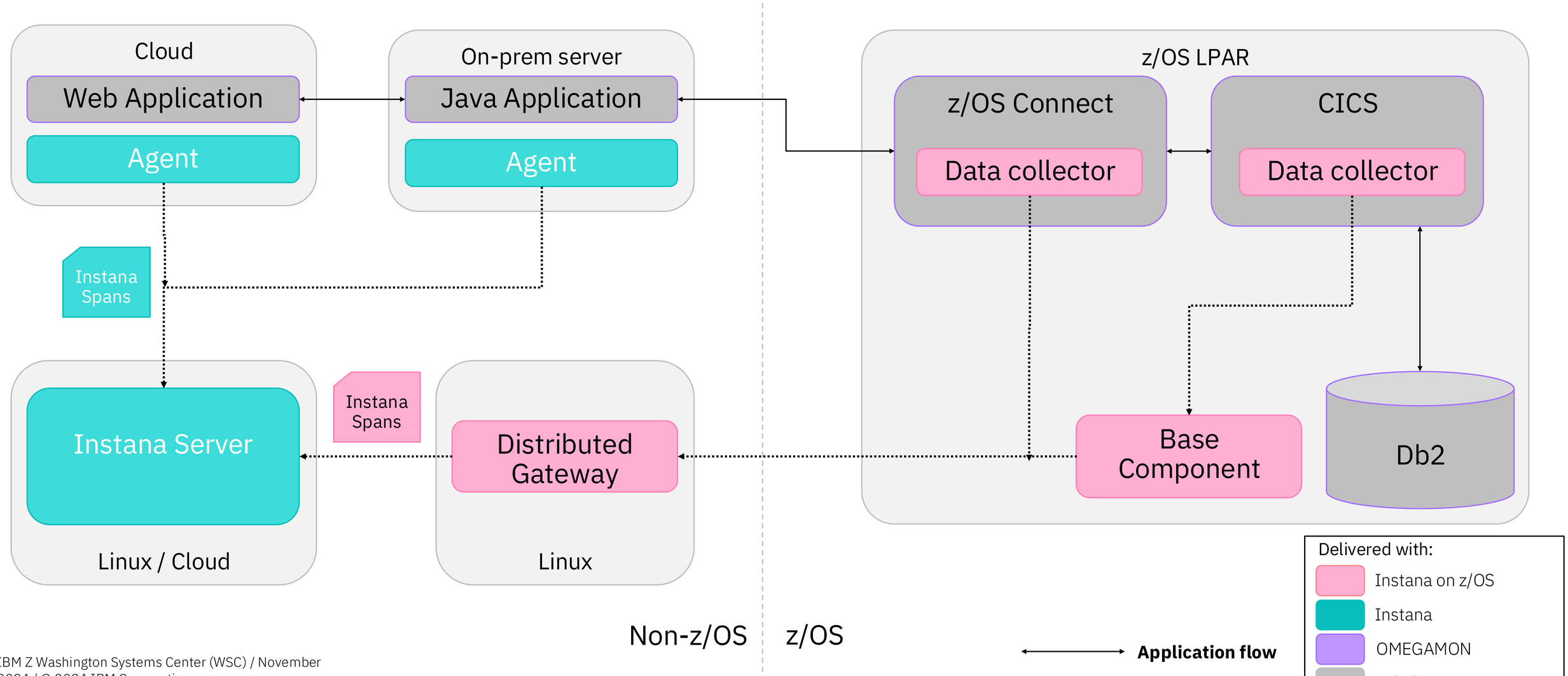
Deployment:

- In each LPAR where SMF 101/102 records will be needed to help provide details on Db2 on z/OS traces
- Already deployed CDP may be leveraged
- Common Data Provider prerequisites
- Deploying Common Data Provider
- APAR/PTF requirements; Db2 for z/OS prerequisite

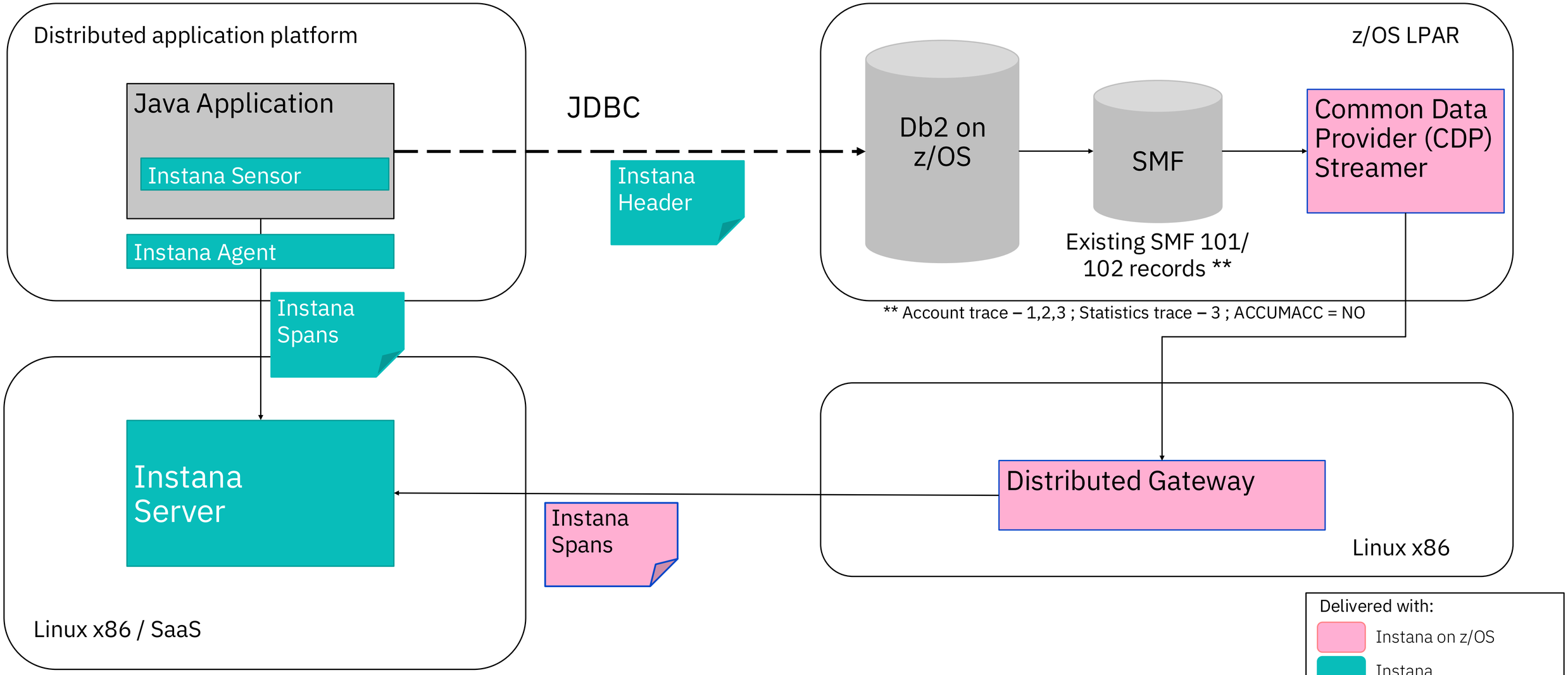
Delivered with:

- Instana on z/OS
- Instana
- OMEGAMON
- Existing

Example Instana on z/OS flow for tracing



Flow for Db2 on z/OS via JDBC tracing



Instana + OMEGAMON flow

Delivered with:
- Instana on z/OS
- Instana
- OMEGAMON
- Existing

Non-z/OS

z/OS

A YAML file is deployed here to define what attributes are to be gathered from OMEGAMON

Instana Host Agent

Proxy Sensor

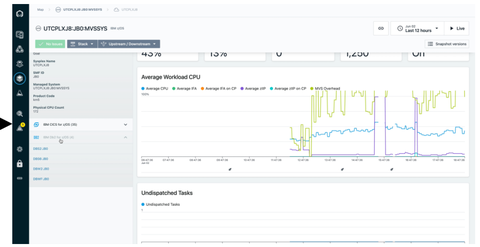
Instana Integration Proxy

OMEGAMON Data Provider (ODP)

OMEGAMON PDS

The Proxy Sensor in the Instana host agent sends the OMEGAMON data to the Instana server where it is processed for display in the Instana UI.

Instana Server (SaaS or on-prem)



OMEGAMON
OMEGAMON
OMEGAMON Agents

LPAR 1

OMEGAMON
OMEGAMON
OMEGAMON Agents

LPAR n