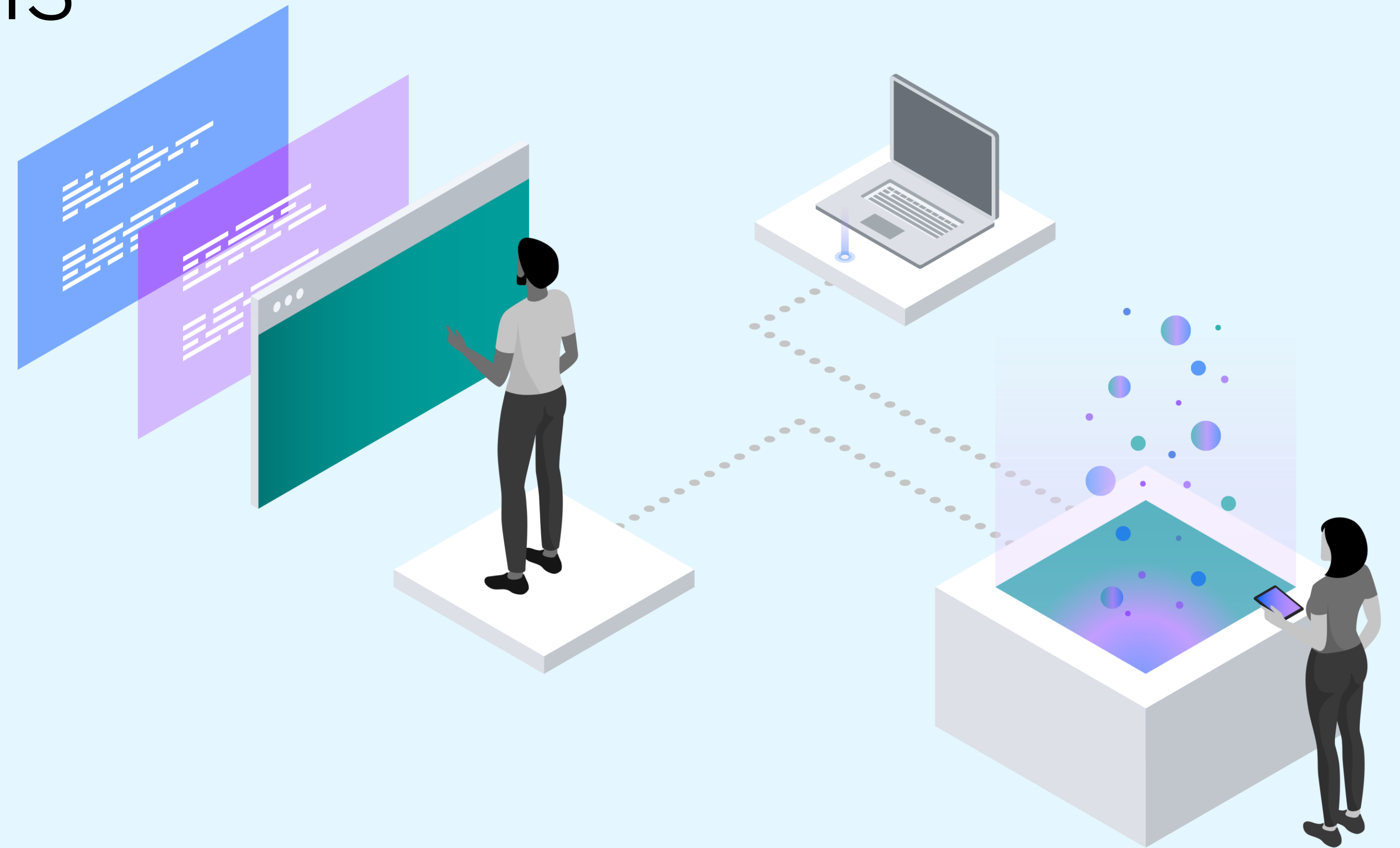


# AIOps with IBM Z

## Overview & Solutions



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

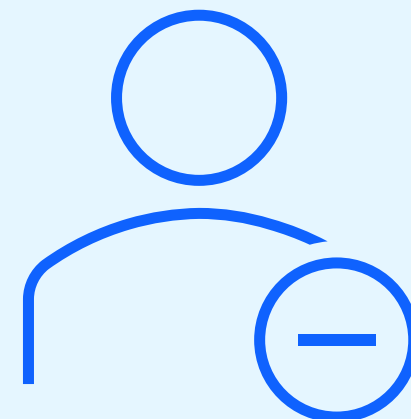
## 1 sec

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

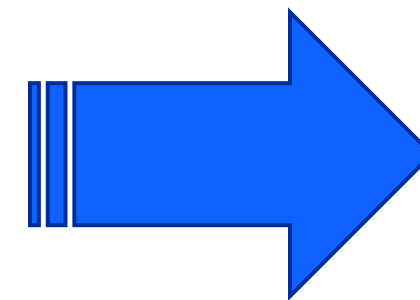
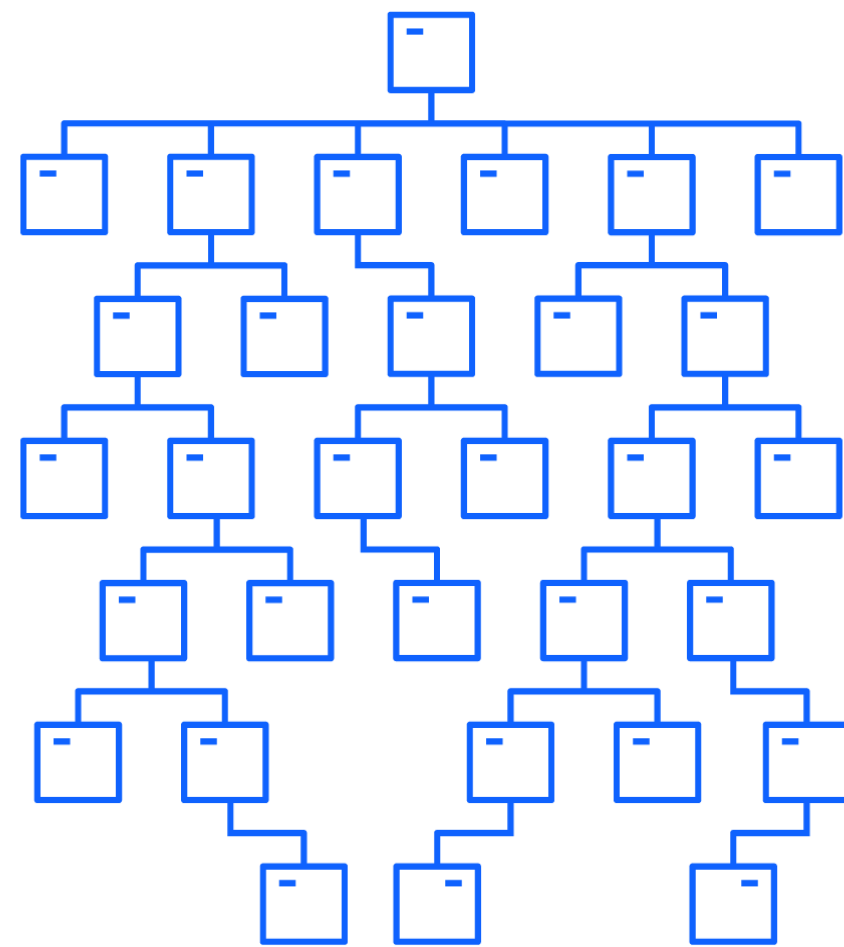
the average cost of an hour of downtime when a revenue generating production service is impacted



# 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

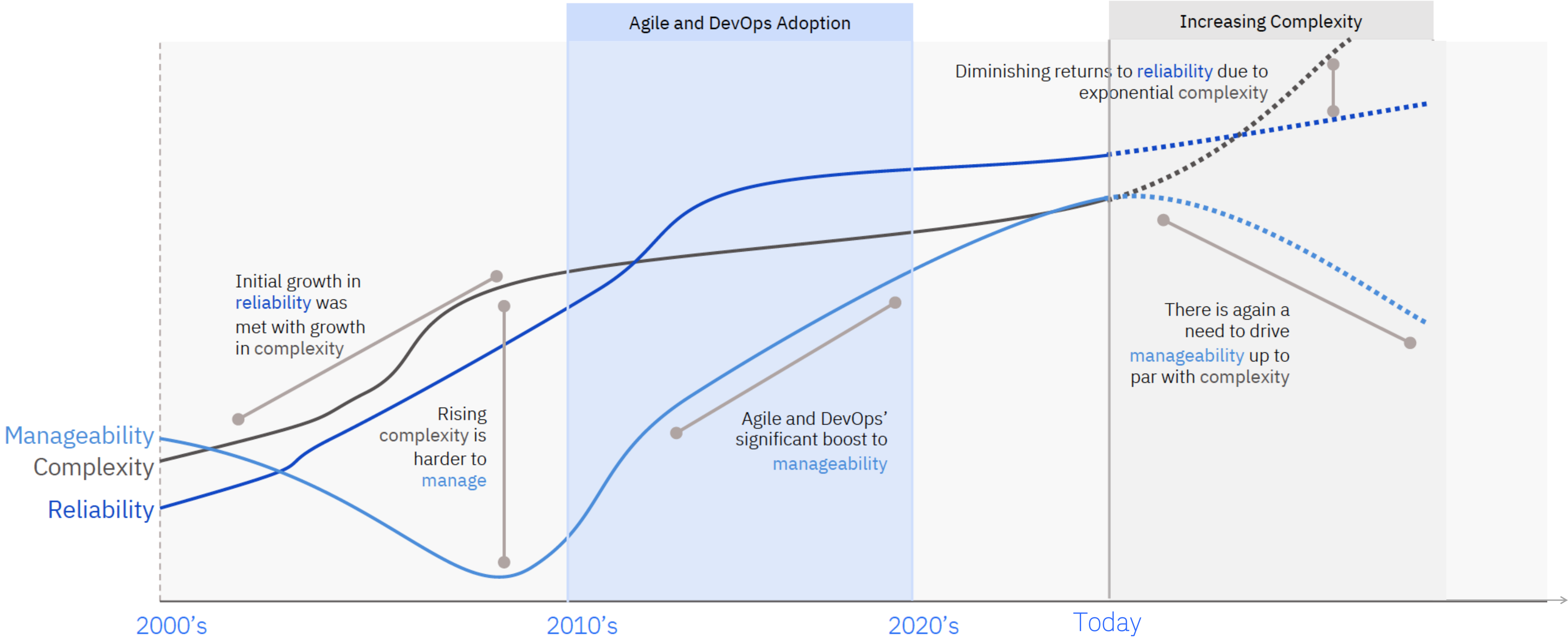


*There's **too much data** for one person to handle*

- 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

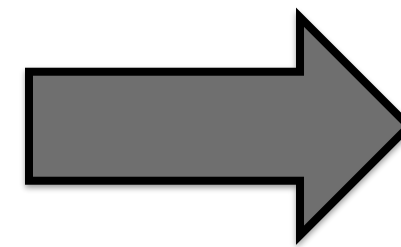
# The capabilities of an AIOps Platform



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



# 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.

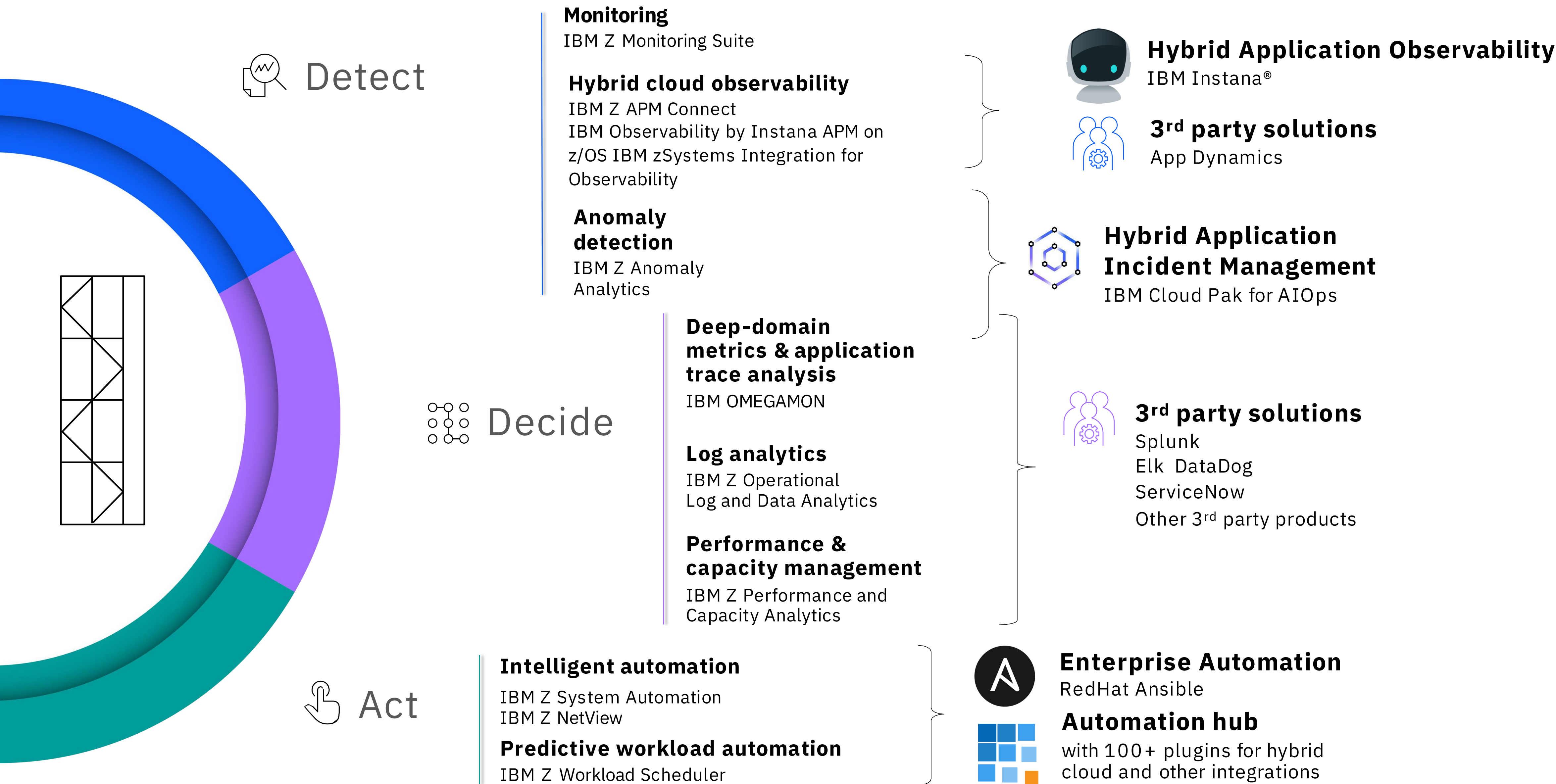
## “Hybrid Cloud” AIOps – Broader scope

- 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.

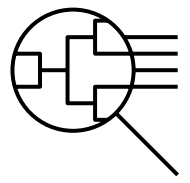
# Better together – Hybrid Cloud Integrations



# IT Automation with IBM

The most complete and integrated set of modular automation technologies

Application  
Monitoring



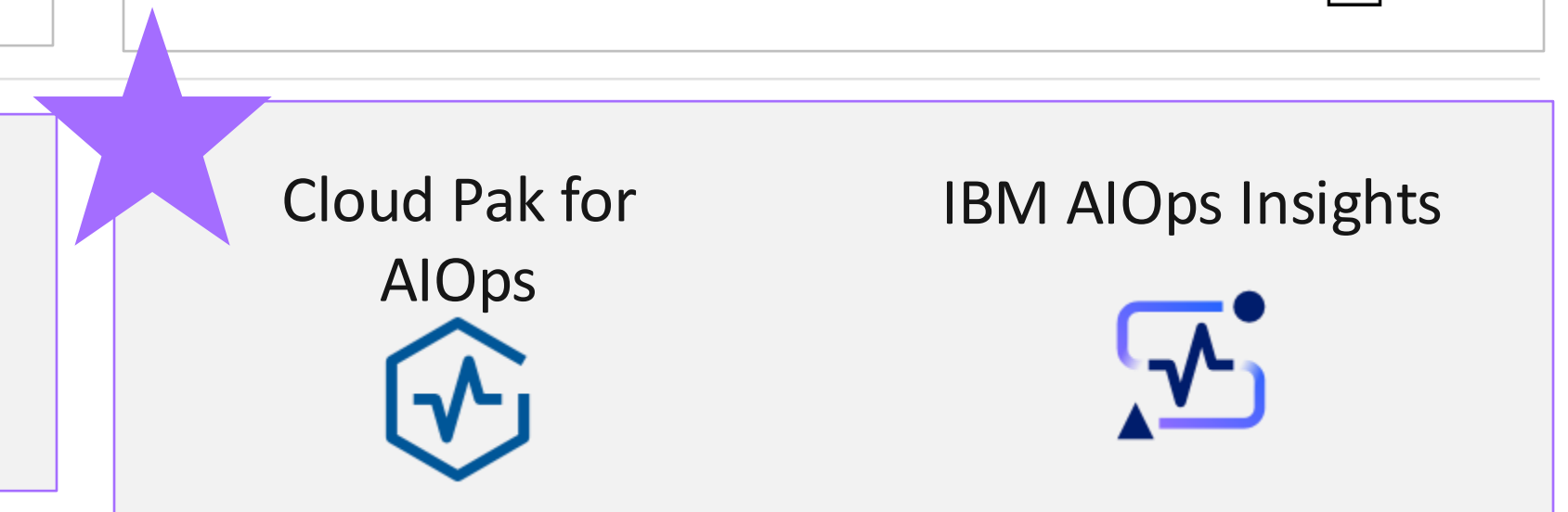
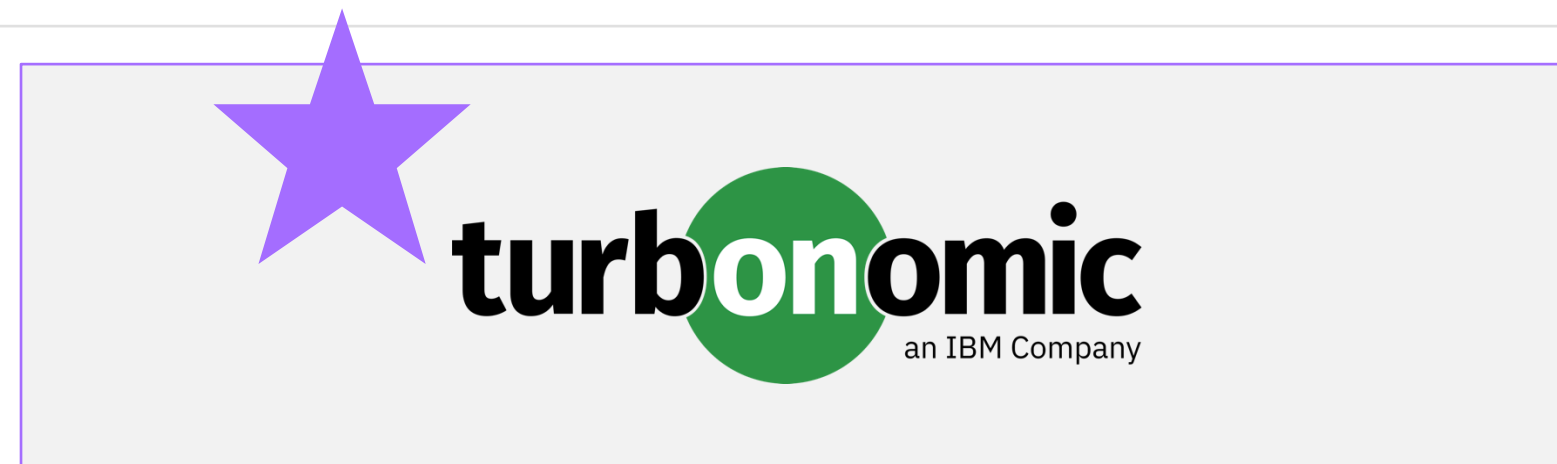
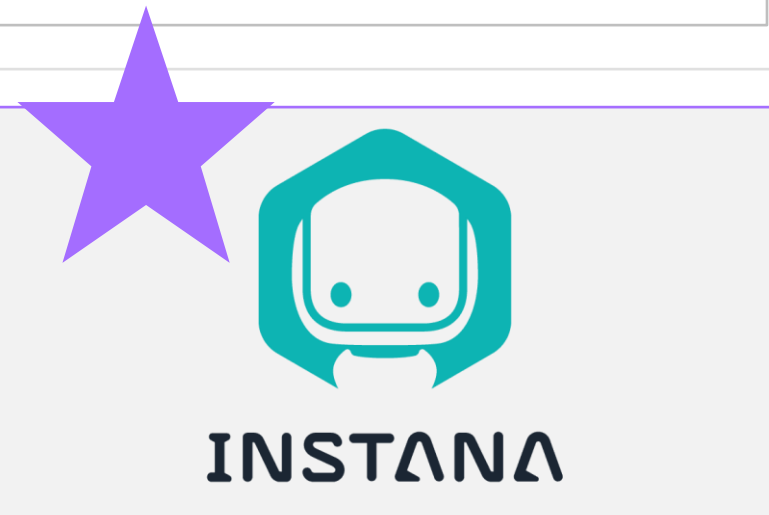
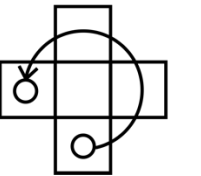
Network  
Performance  
Management



Cost-effective Resource Management



Proactive Incident Resolution



Enterprise Observability

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

Automated Operations

Dynamically and continuously assure cost effective application performance and resource utilization

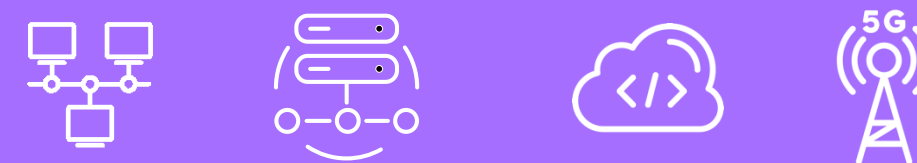
Incident Management

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

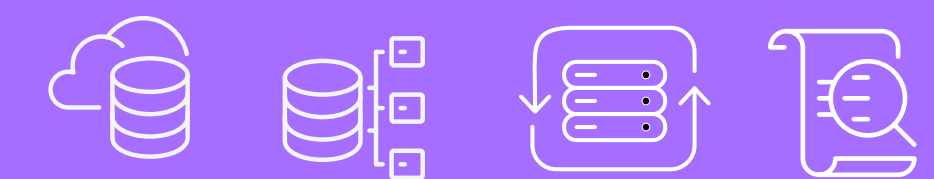
Integrated AI-powered IT Operations



Platforms



Hybrid Multicloud Networks

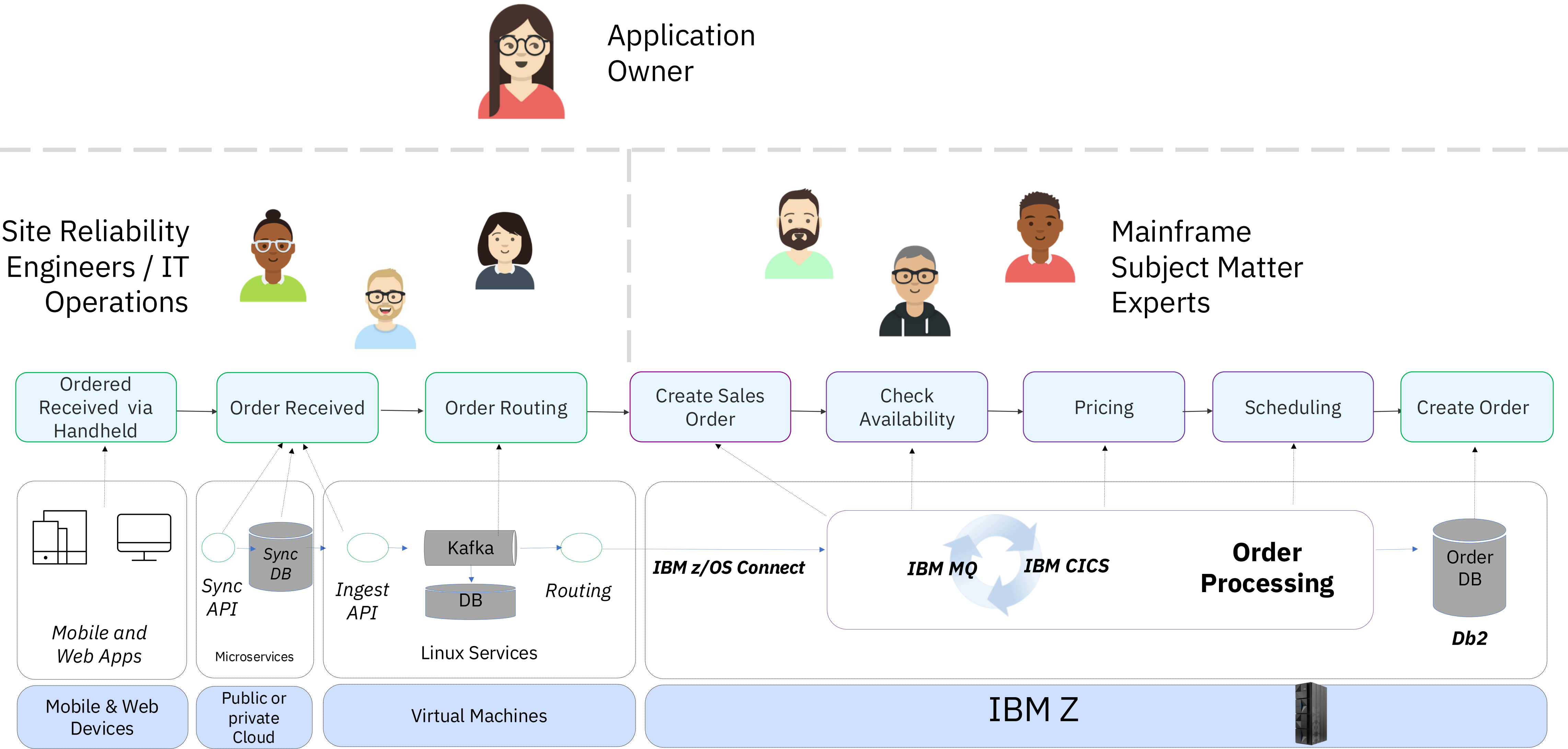


Data & Operations



# IBM Observability by Instana

# The challenge of enterprise observability



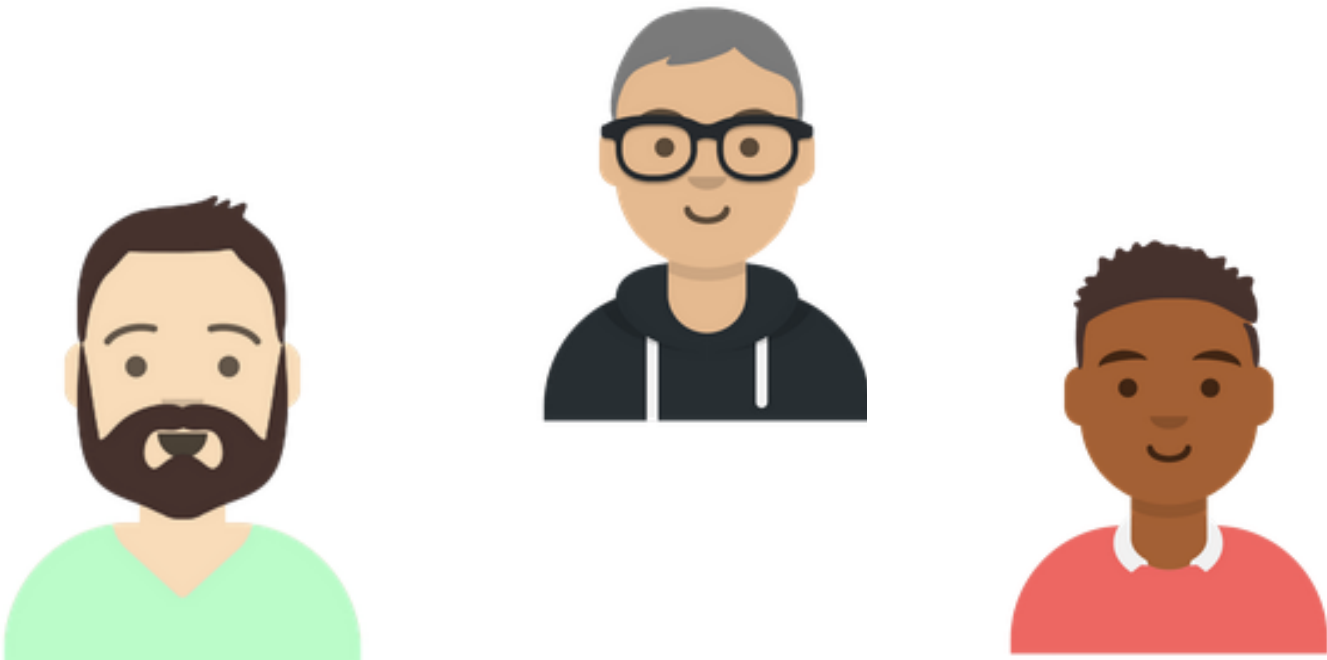
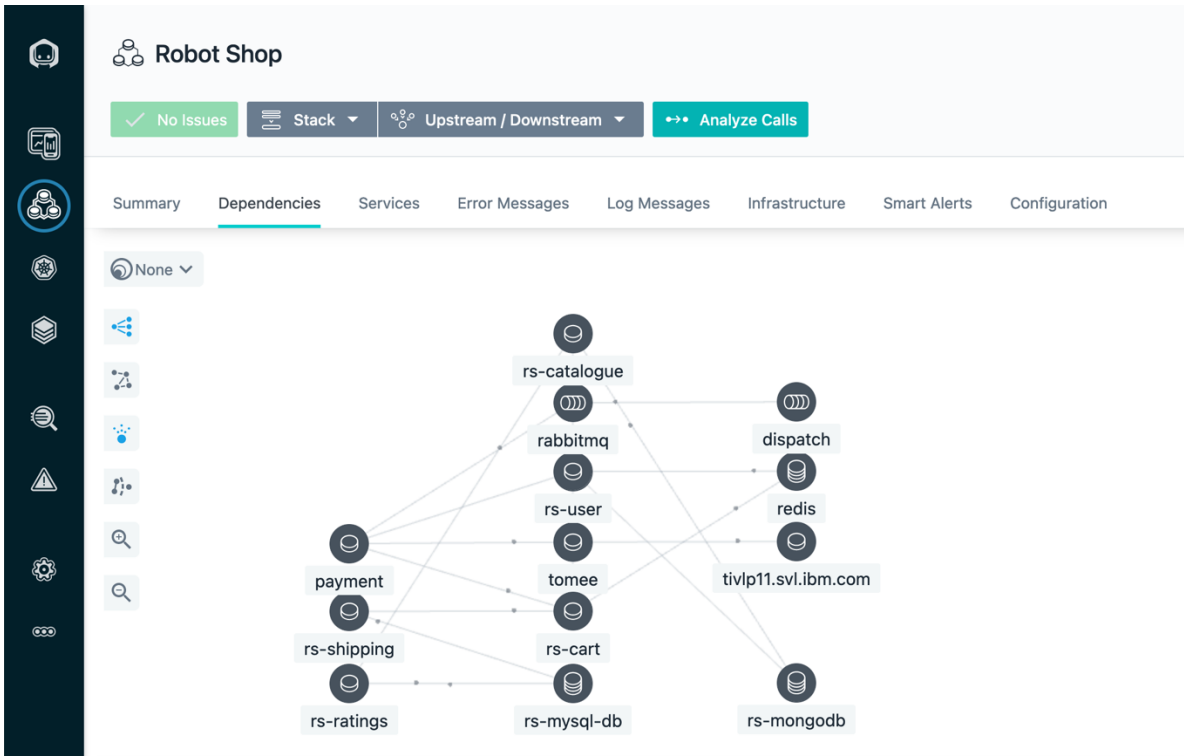
The mainframe is essential to the successful operations and business workflows of major enterprises...

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

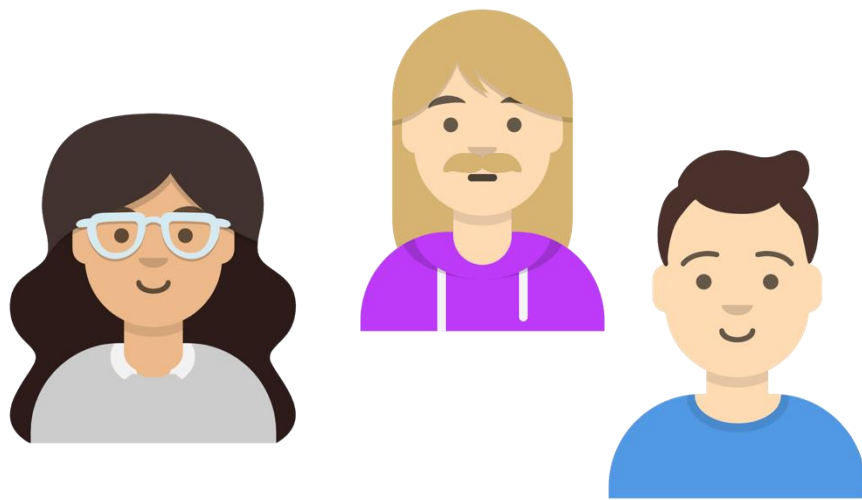
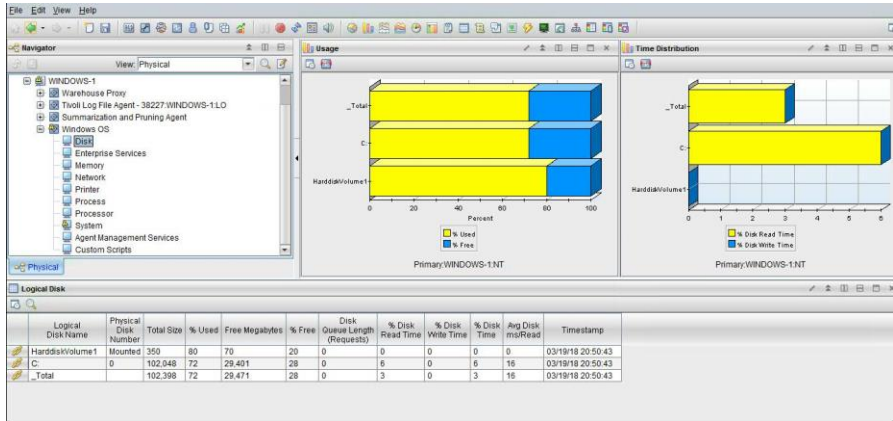
# The ongoing challenge of Enterprise Observability



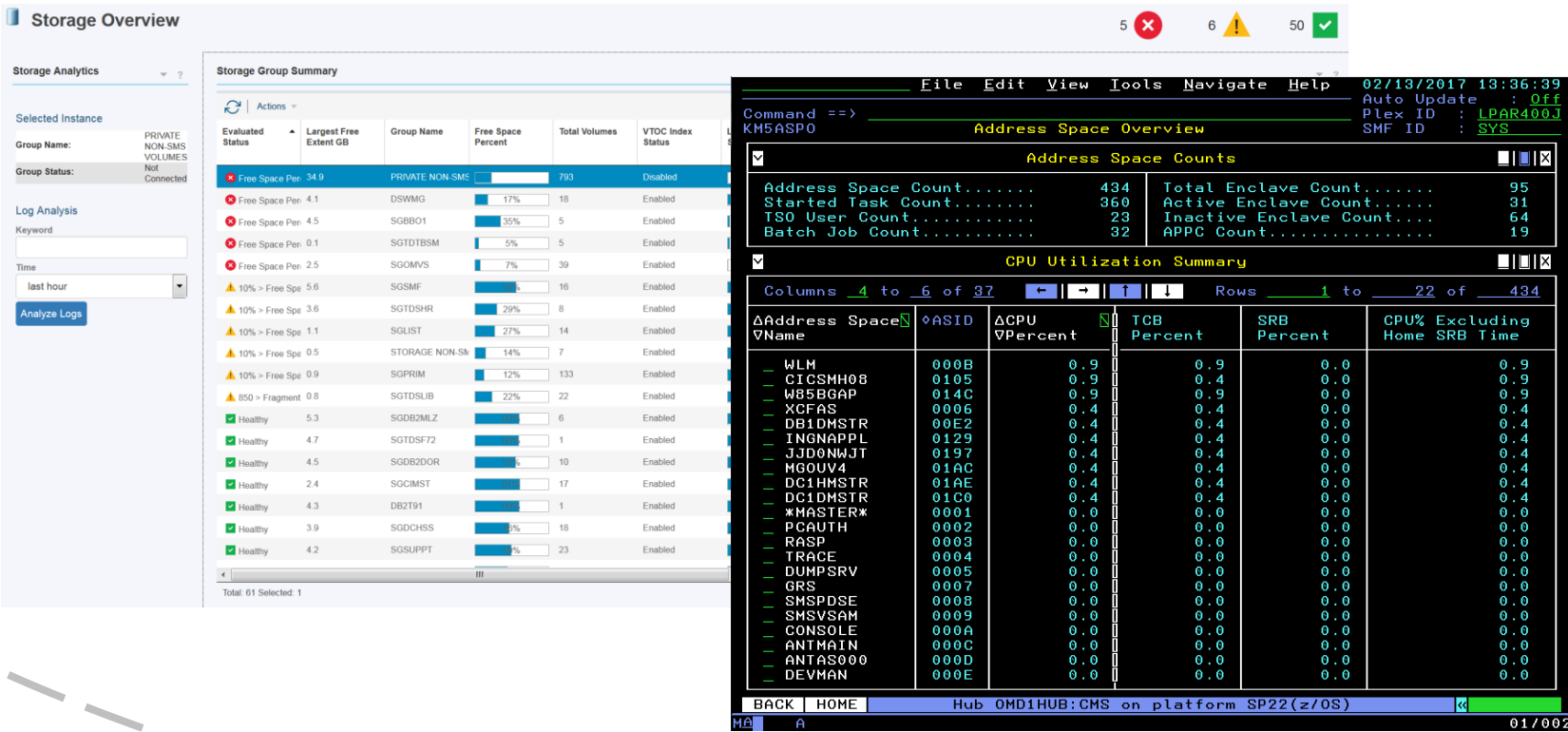
Application owner / SRE



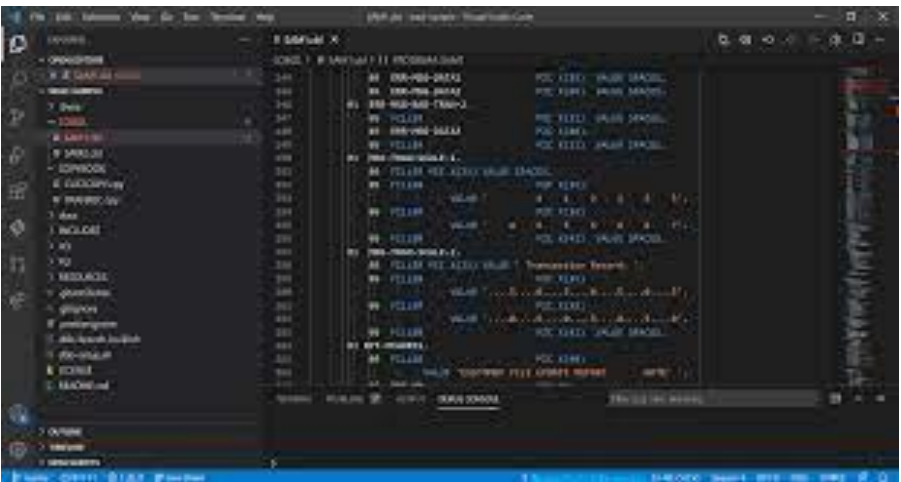
Mainframe Subject Matter Experts



Application development



(Non-zSystems) IT operations

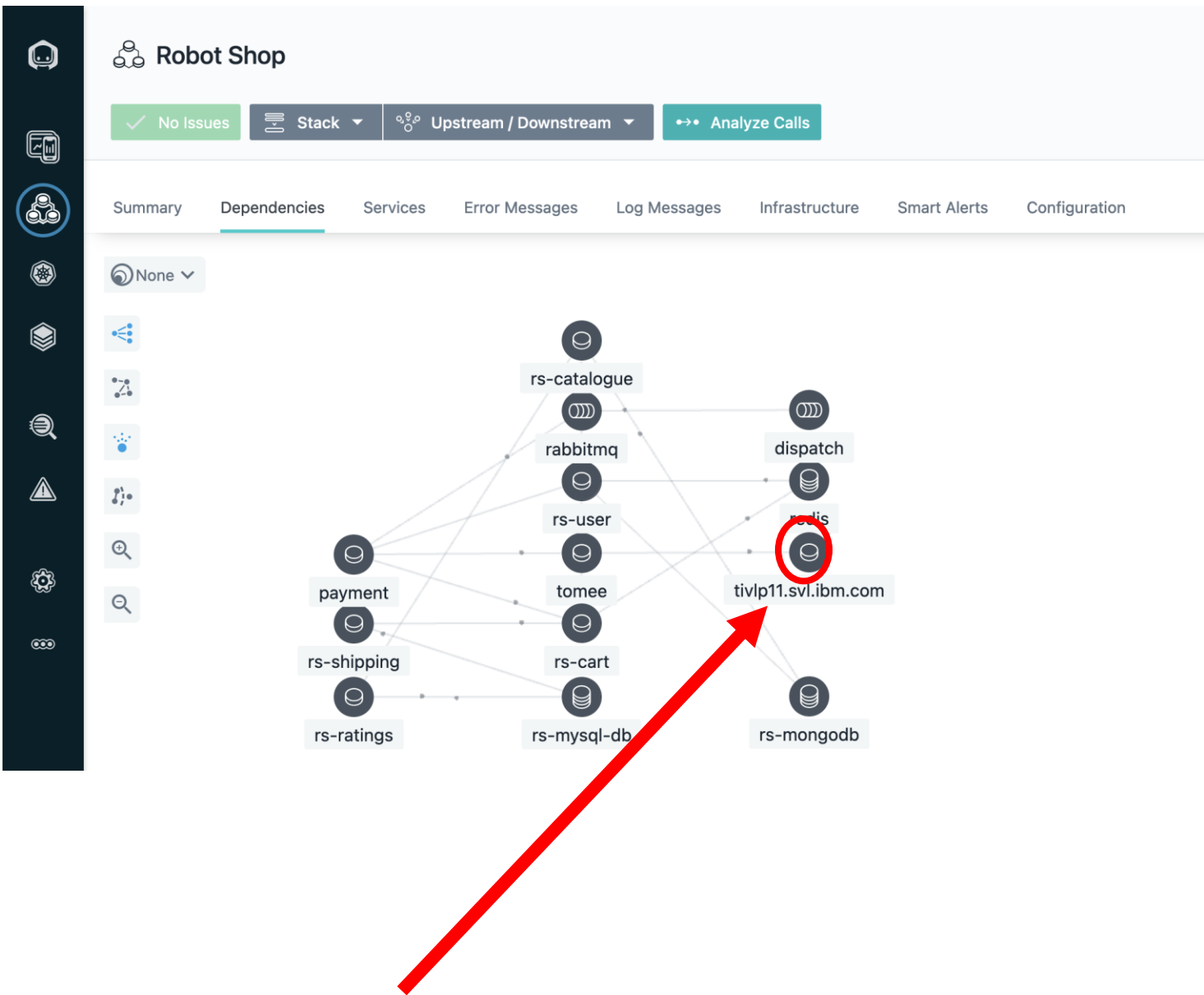


# The absence of end-to-end observability...

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 SME

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



IMS SME

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



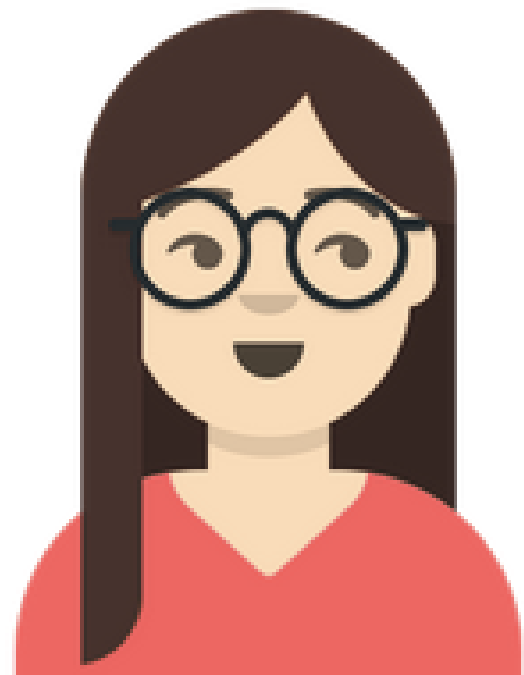
CICS SME

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



# Improved experience with enterprise observability

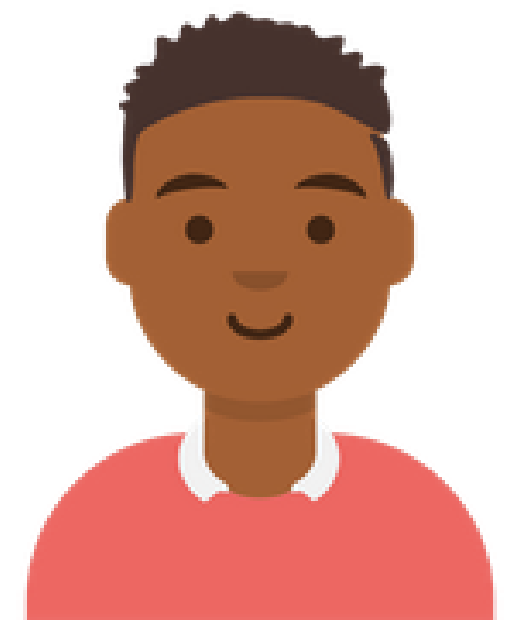
The response time of our principal customer-facing application has increased significantly over the past 30 minutes...**it seems there is a slowdown coming from CICS. It appears to be stemming from *CICST11A* and task *56177* is associated.**



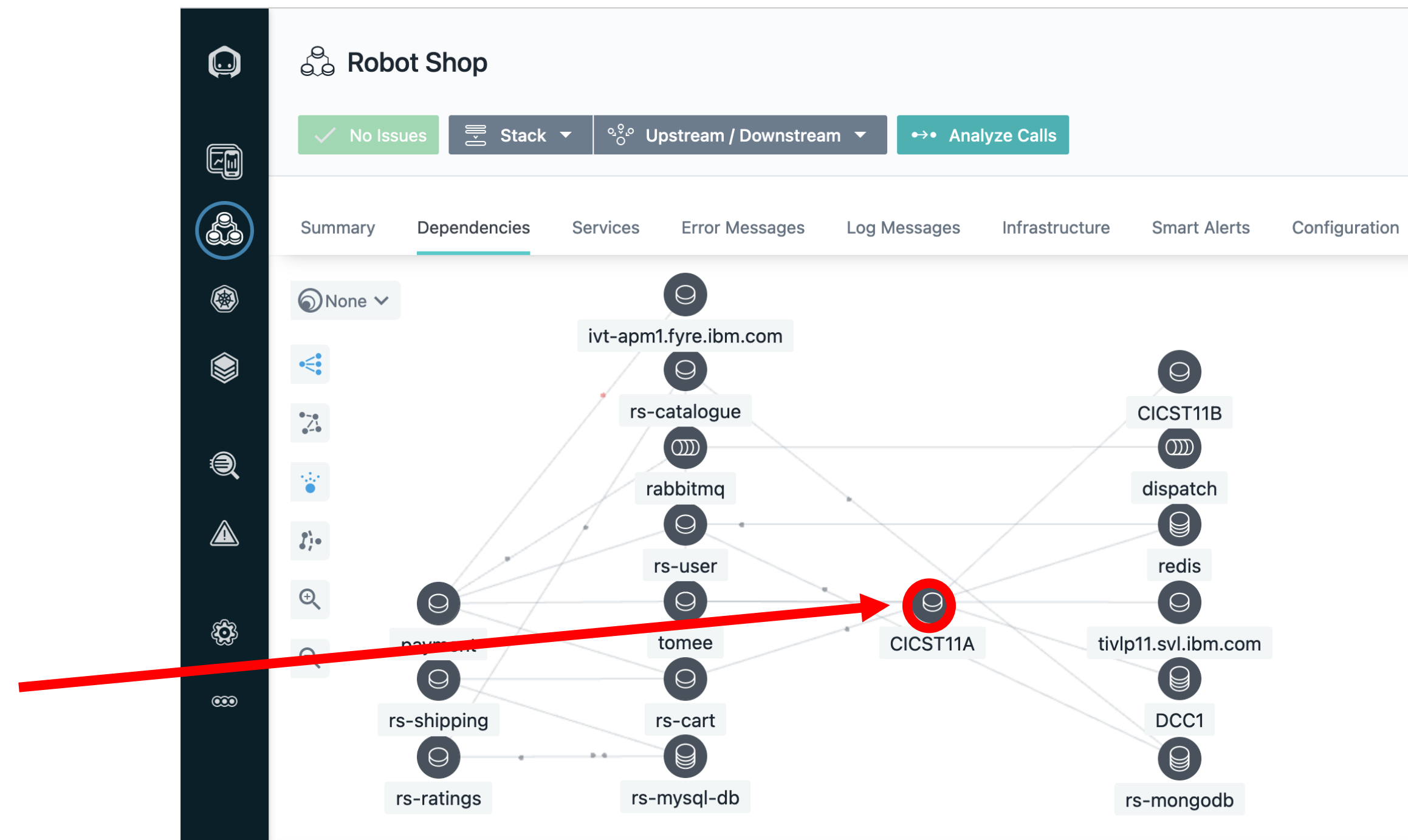
# Application Owner

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.

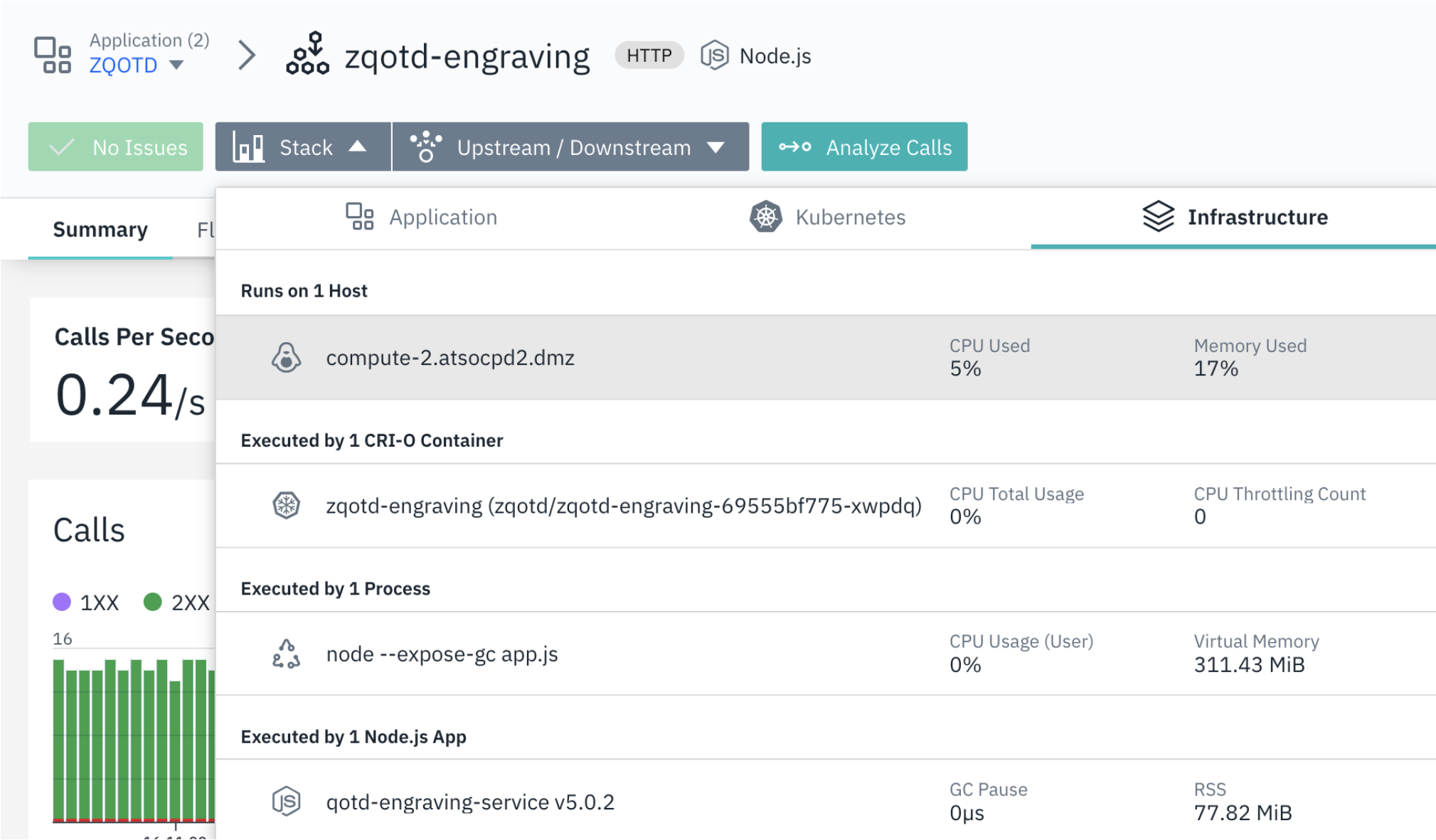


# CICS SME



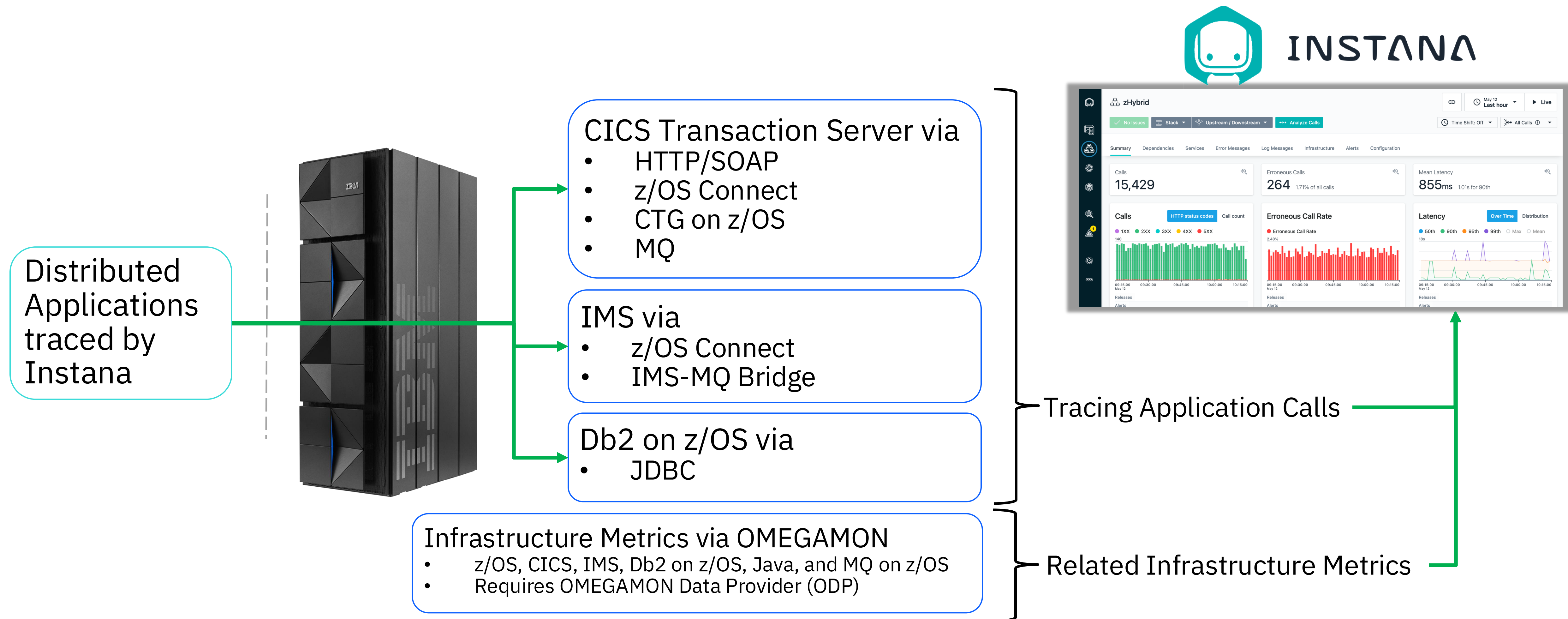
# Collect accurate data in context

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

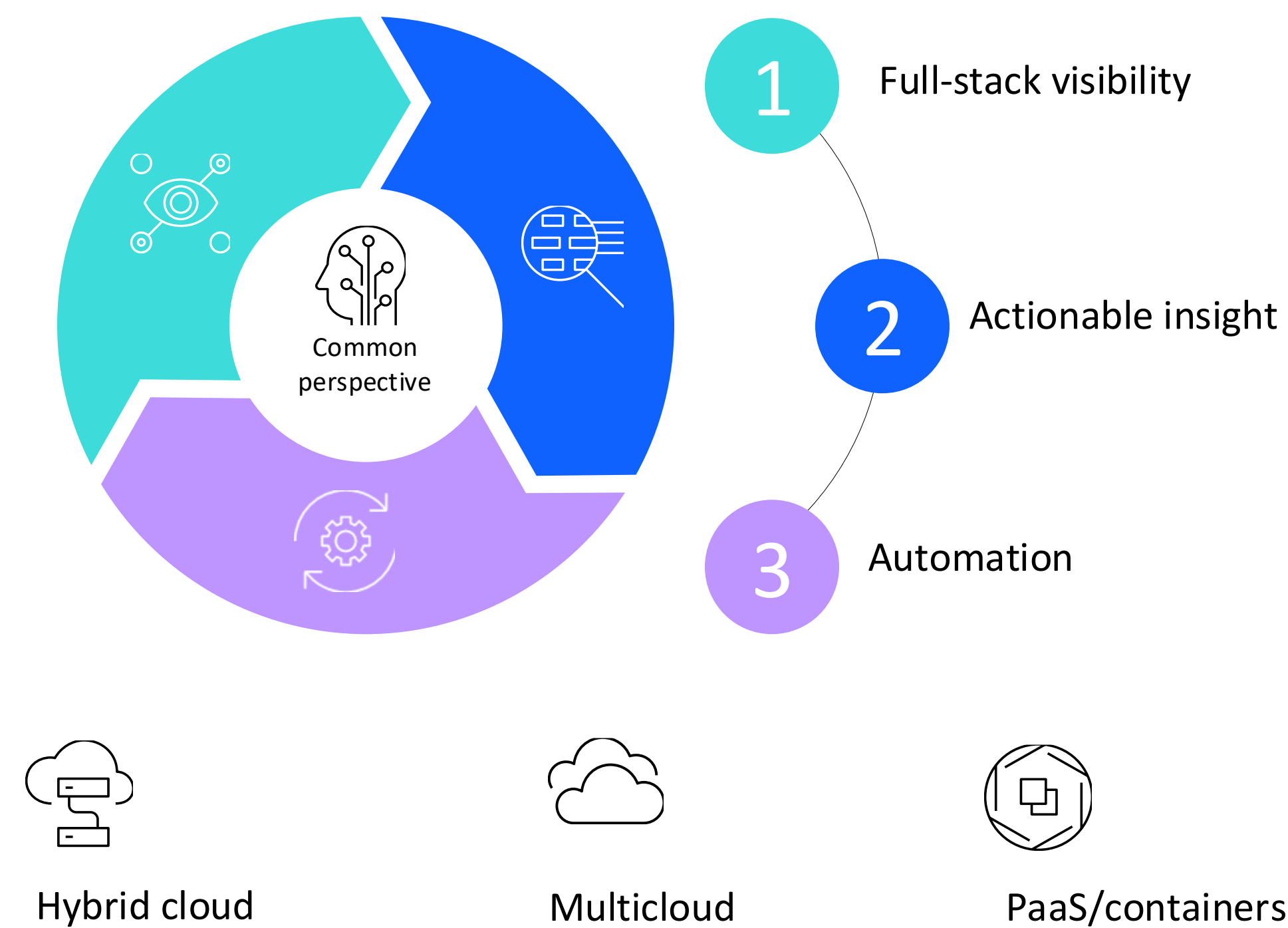
- Designed to observe hybrid applications that start on distributed systems and call into z/OS transactions
- Instana tracing isolates the location of the problem and provides data about the likely cause
- Integration with OMEGAMON shows correlated metrics related to the problem in Instana (Optional)



# IBM Turbonomic Application Resource Management

# IBM Turbonomic® Application Resource Management

Continuous application performance while safely reducing cloud costs





# IBM Turbonomic

---

Software (not people) continuously makes complex resourcing decisions to ensure all applications get exactly what they need to perform.

## Public cloud optimization

- VM rightsizing
- Storage volume configuration
- Database configuration
- Maximize RI coverage
- Optimize RI purchasing

[Learn more](#)

## Kubernetes optimization

- Container rightsizing
- Pod moves
- Cluster scaling
- SLO-driven scaling
- Container platform planning

[Learn more](#)



## Data center optimization

- Continuous compute placement
- VM rightsizing
- continuous storage placement
- Superclusters
- Initial placement

[Learn more](#)

## Sustainable IT

- Container rightsizing
- Pod moves
- Cluster scaling
- SLO-driven scaling
- Container platform planning

[Learn more](#)



# What actions can Turbonomic recommend and automate?

1. Vertically scale workloads  
(uses more historical data than other autoscalers like OCP VPA)
2. Horizontally scale workloads (to meet SLO)
3. Provision or suspend cluster nodes  
(recommend only on s390x)
4. Move pods to different nodes  
(unique to Turbonomic)

[More details](#)

1

Modify CPU requests and limits, equivalent to:

```
oc set resources deployment foo \  
--limits=cpu=200m,memory=512Mi \  
--requests=cpu=100m,memory=256Mi
```

2

Increase or decrease number of pods, equivalent to:

```
oc scale deployment foo \  
--current-replicas=1 \  
--replicas=2
```

3

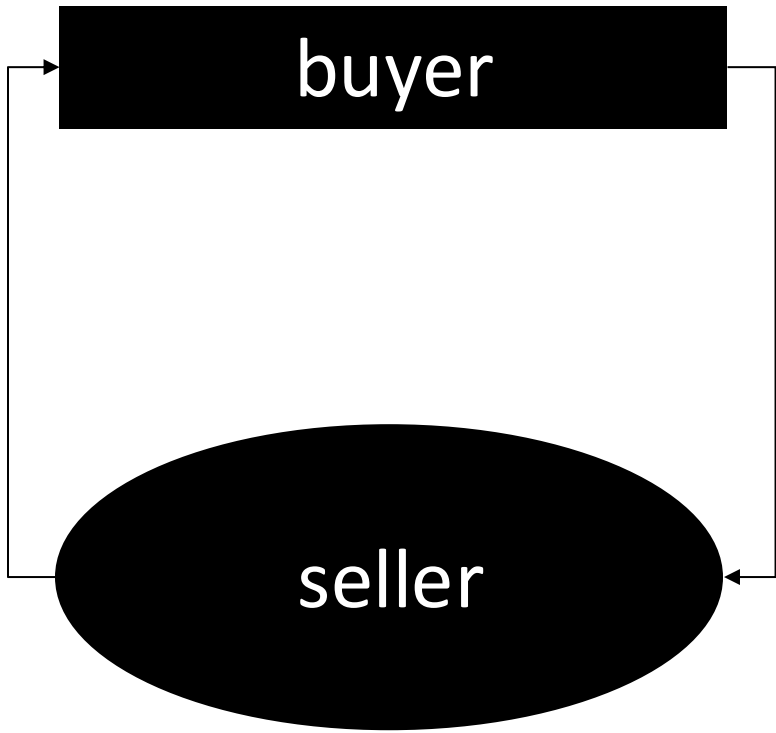
Cannot *automatically* scale nodes on s390x –  
however you can manually scale when *recommended*

4

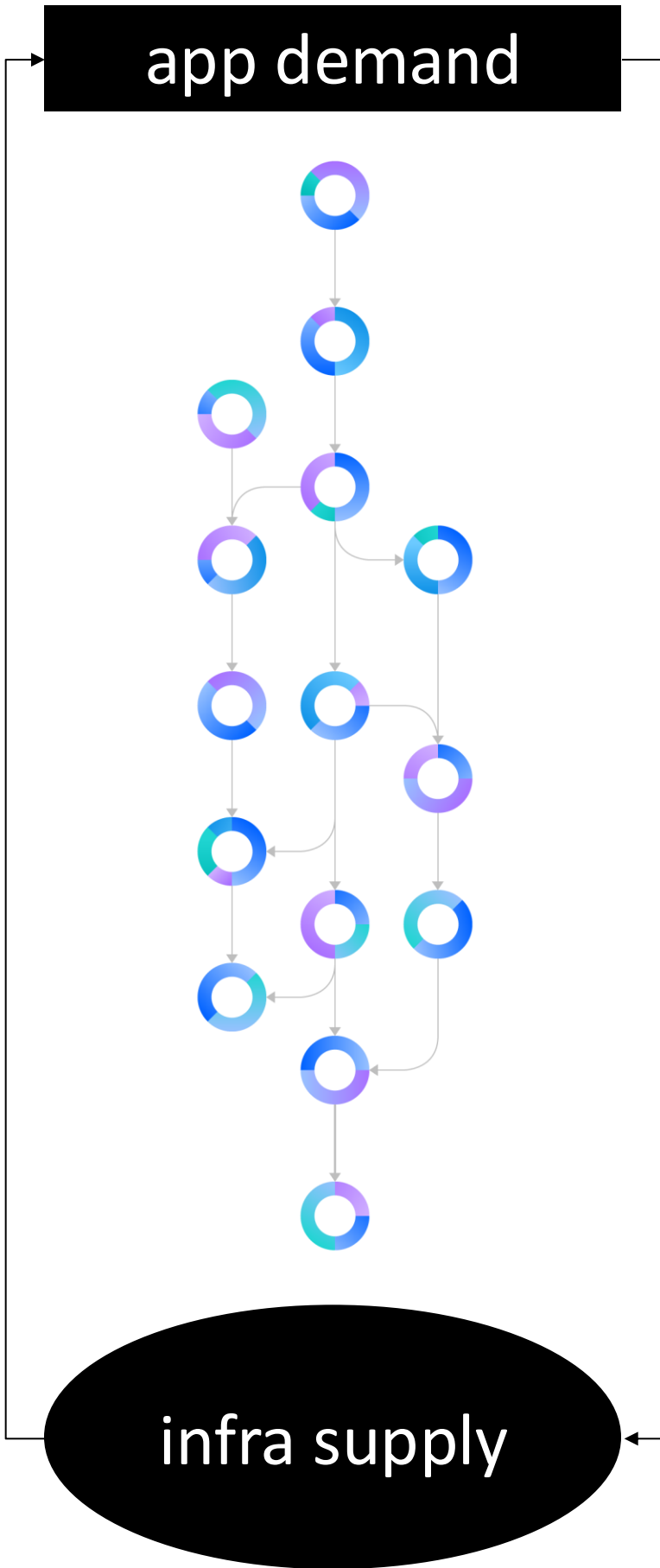
Spin up new pod on target node -> ensure it is up and running and passes health checks -> delete original pod

IBM Turbonomic  
automates resource  
decision-making

1. Abstraction  
Entities in the environment are  
abstracted as buyers or sellers of  
application resources (compute,  
storage, network).



2. Analytics  
Environment / the application stack  
is modeled as a market and the  
principles of supply, demand, and  
price are applied to match app  
demand to infrastructure supply.



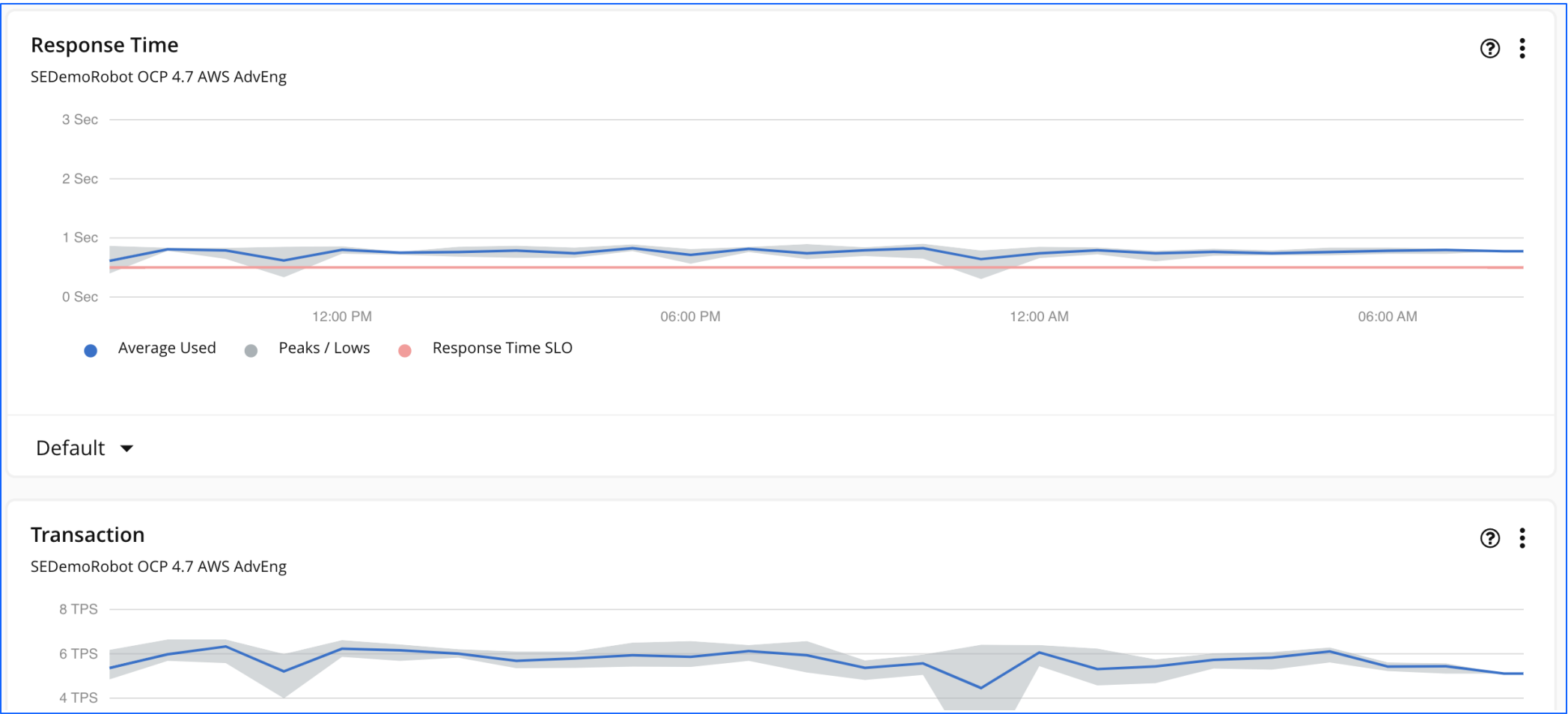
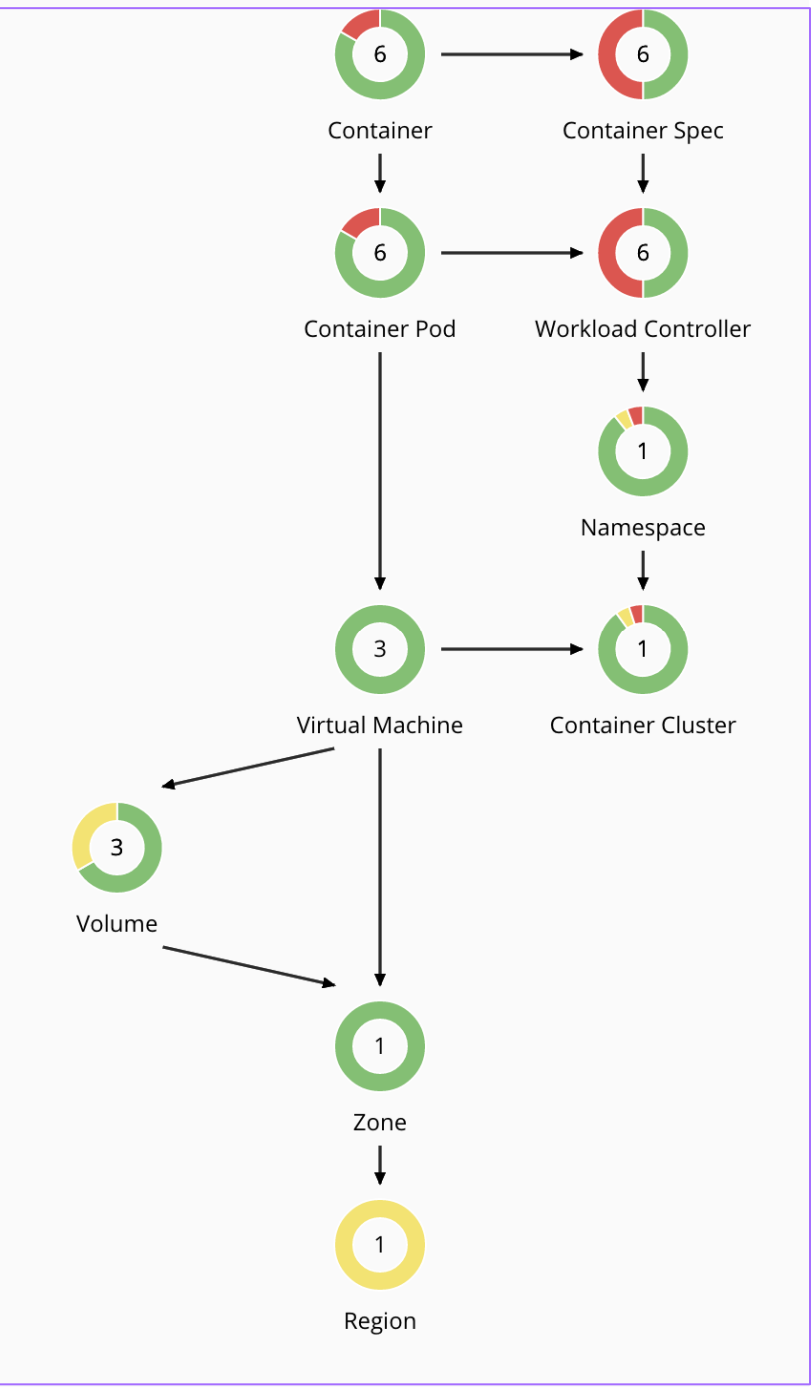
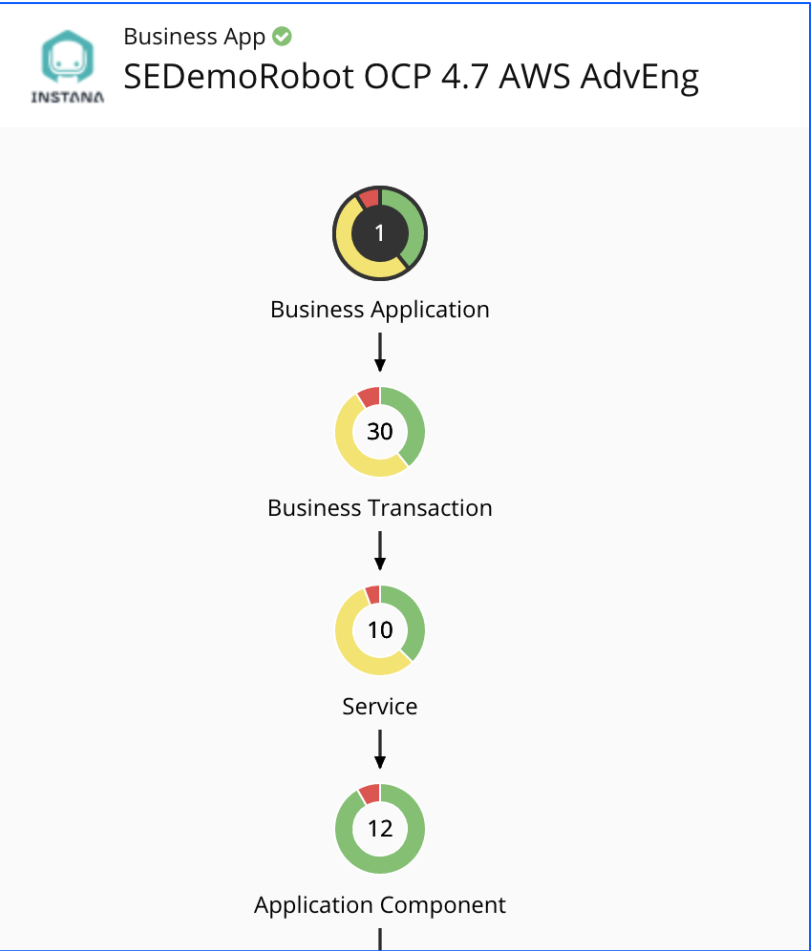
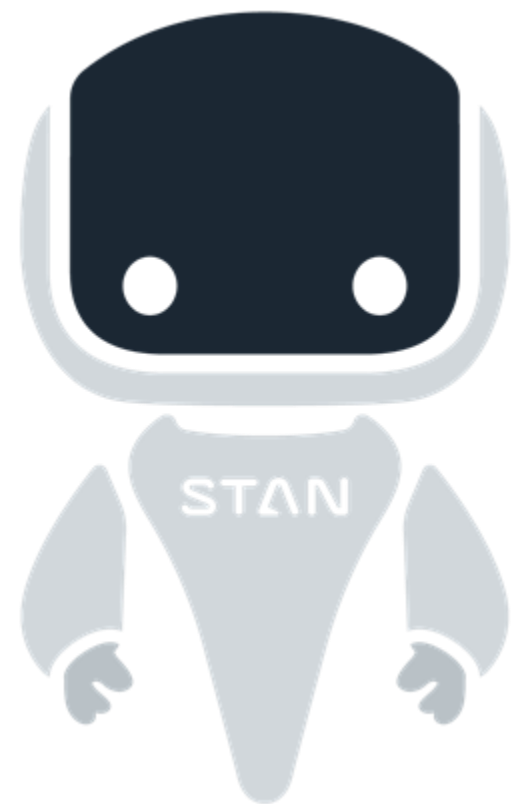
3. Automation  
App-first, full-stack approach  
ensures actions are safe to  
automate. Clients operationalize  
automation by integrating actions  
into pipelines, processes, and  
workflows

# IBM Instana + IBM Turbonomic

Powerful alone,  
better together

Only **Instana** provides  
real-time observability  
data with 1 second  
metric granularity

Only **Turbonomic**  
provides cost  
optimization you can  
operationalize and  
automate.



ALL (1,140) CLOUD (924)

SCALE	DELETE	RESIZE	MOVE	SUSPEND	PROVISION
Volumes (291)					
Virtual Machines (133)					
Database Servers (14)					
Volumes (275)					
Workload Controllers (197)					
Application Compon... (110)					
Containers (4)					
Namespaces (1)					
Container Pods (48)					
Container Pods (27)					
Virtual Machines (3)					
Application Components (2)					
Container Pods (17)					

### Resize Actions (197)

Type to search

	Workload Controller Name	Container Cluster	Namespace	Risk	Action Category
<input checked="" type="checkbox"/>	alligator	Kubernetes-EKS-Nonprod	groundcover	Underutilized VCPU Limit in Container Spec trac...	PERFORMANCE
<input checked="" type="checkbox"/>	load	Kubernetes-GKE-ServiceMes	robot-shop	VMem Limit Congestion & VCPU Throttling Cong...	PERFORMANCE
<input checked="" type="checkbox"/>	user	Kubernetes-OCP4-AWS	robotshop	VCPU Throttling Congestion in Container Spec user	PERFORMANCE
<input checked="" type="checkbox"/>	ibm-ingress-nginx-operator	Kubernetes-OCP4-AWS	ibm-common-services	VCPU Throttling Congestion in Container Spec ib...	PERFORMANCE
<input checked="" type="checkbox"/>	ibm-monitoring-grafana-operator	Kubernetes-OCP4-AWS	ibm-common-services	VCPU Throttling Congestion in Container Spec gr...	PERFORMANCE
<input checked="" type="checkbox"/>	ibm-monitoring-grafana	Kubernetes-OCP4-AWS	ibm-common-services	VCPU Throttling Congestion in Container Spec ro...	PERFORMANCE
<input type="checkbox"/>	auth-pap	Kubernetes-OCP4-AWS	ibm-common-services	VCPU Throttling Congestion in Container Spec a...	PERFORMANCE
<input type="checkbox"/>	platform-api	Kubernetes-OCP4-AWS	ibm-common-services	VCPU Throttling Congestion in Container Spec pl...	PERFORMANCE
<input type="checkbox"/>	auto-workload-migrate-taints	Kubernetes-OCP4-AWS	default	VMem Limit Congestion in Container Spec auto...	PERFORMANCE
<input type="checkbox"/>	ibm-cert-manager-operator	Kubernetes-OCP4-AWS	ibm-common-services	VMem Limit Congestion & VCPU Throttling Cong...	PERFORMANCE
<input type="checkbox"/>	audit-logging-fluentd-ds	Kubernetes-OCP4-AWS	ibm-common-services	VCPU Throttling Congestion in Container Spec fl...	PERFORMANCE
<input type="checkbox"/>	twitter-cass-api	Kubernetes-OCP4-AWS	demoapp	Underutilized VMem Limit & VCPU Throttling Con...	PERFORMANCE
<input type="checkbox"/>	instana-agent	Kubernetes-OCP4-AWS	instana-agent	VMem Limit Congestion & VCPU Throttling Cong...	PERFORMANCE
<input type="checkbox"/>	smm-health	Kubernetes-AKS-Cluster1	smm-system	Underutilized VMem Limit & Underutilized VCPU ...	PERFORMANCE

1 - 30 of 197

# IBM Cloud Pak for AIOps



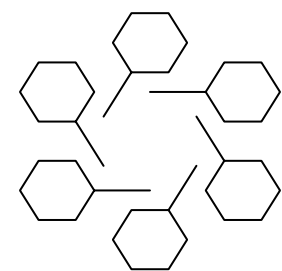
# IBM Cloud Pak for AIOps

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



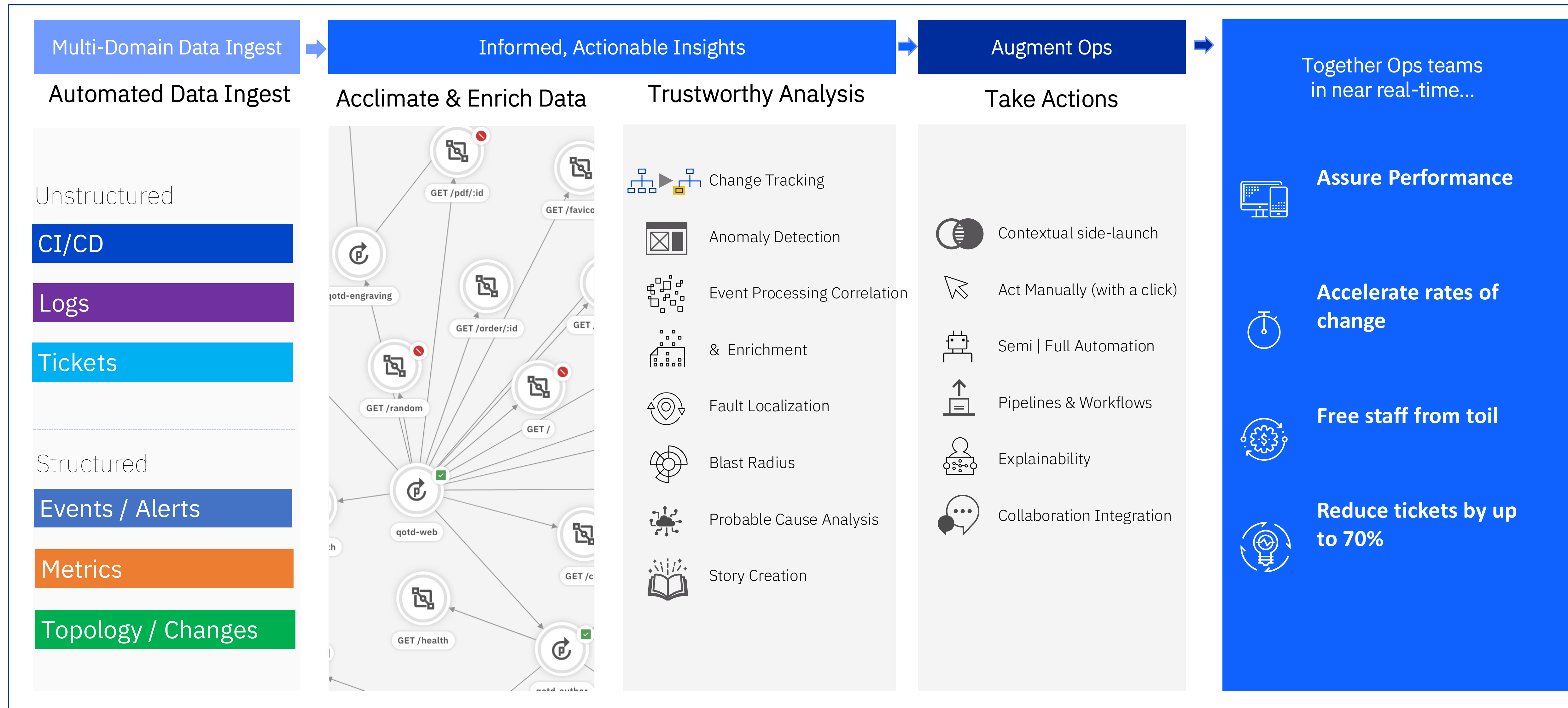
Create runbooks to automate recurring remediations

ChatOps and prescriptive next best actions

Centralize policies across cloud and VM environments



# Comprehensive AIOps approach to Real Business Outcomes



# Environment and Tooling Data Connectors

IBM Cloud Pak | Automation

Data and tool connections

Add connection +

Connect to your tools to provide data that will help gather insights for your environment.

Learn more

Manage connections

Schedule connections

Search

Connection type	Total connections	Connection status	Categories
ELK	1	1	Logs
Instana	2	2	Events Metrics ...
ServiceNow	1	1	Tickets Topology
Slack	1	1	ChatOps
SSH	1	1	Runbooks

Add connections

Category

All connections

Alcatel-Lucent 1300 SMC	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4	Alcatel-Lucent 1520 SMC V4
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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**

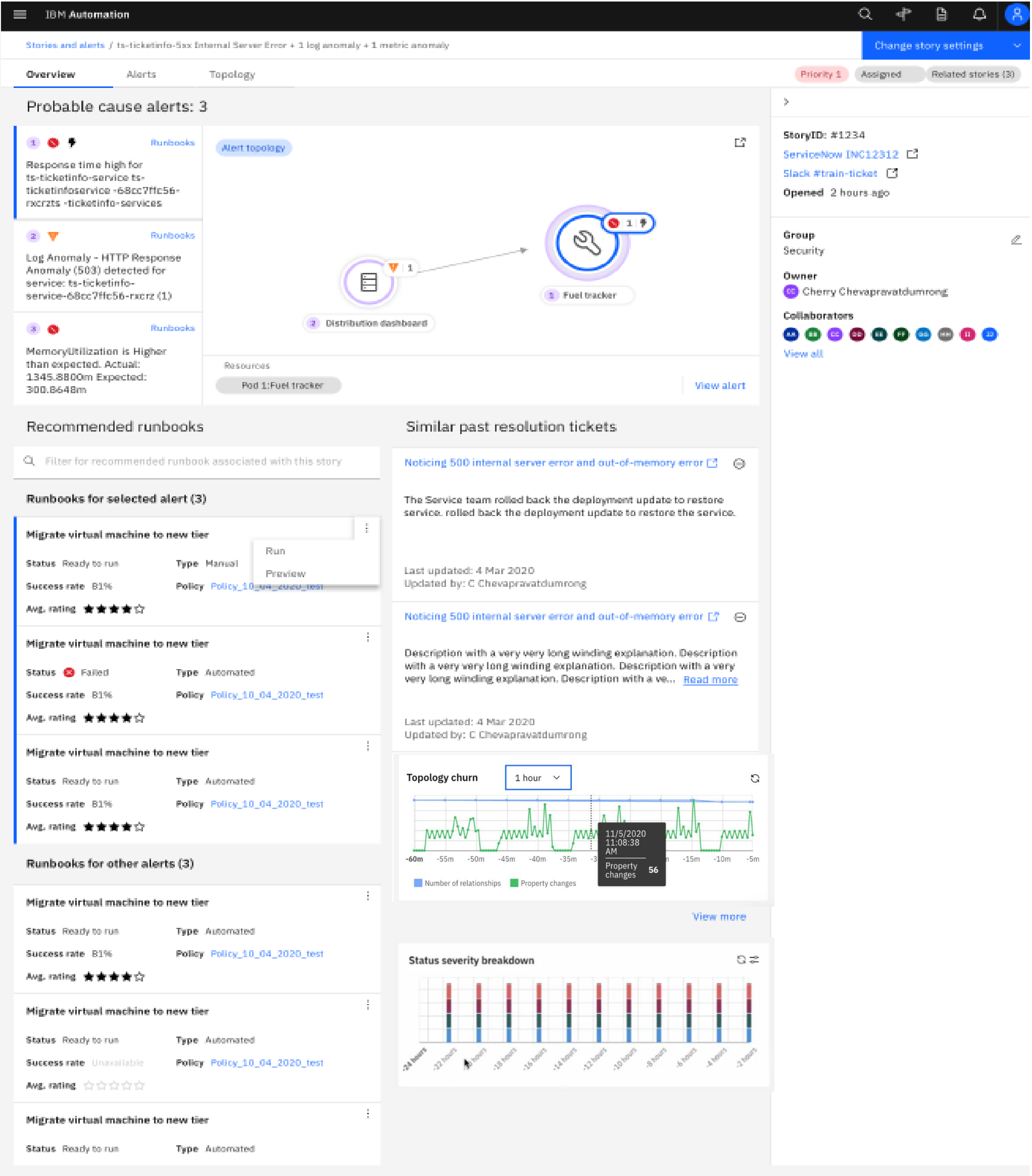
Easy configuration and management

# 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

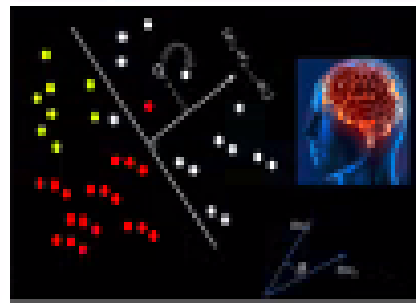
Similar incident tickets, to inform operators of rapid resolution steps as well as tracking recurring types of incidents.





# AI Analytics in Cloud Pak for AIOps

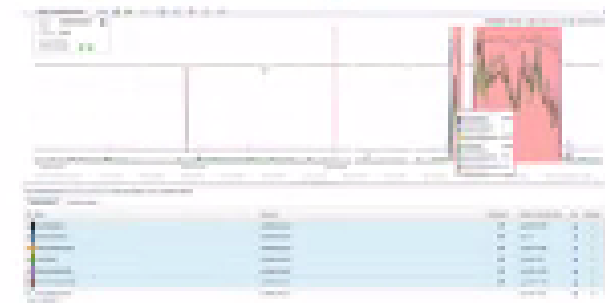
## Log Anomaly Detection



Detect anomalies from log messages

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

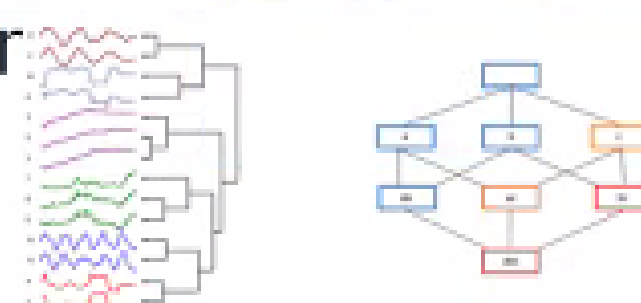
## Metric Anomaly Detection



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

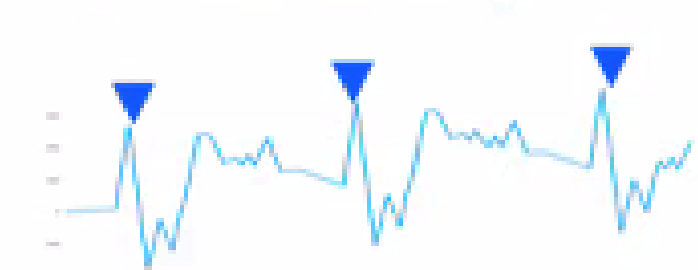
## Event Grouping with Entity Linkir



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

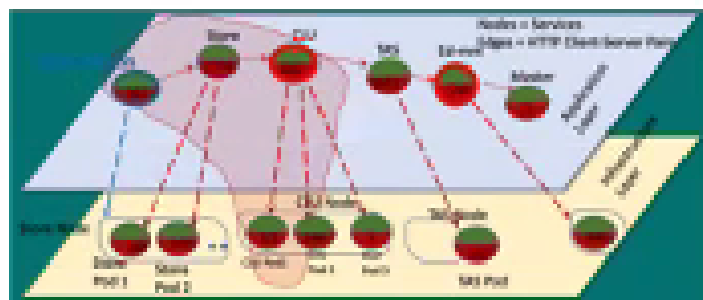
## Event Seasonality



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

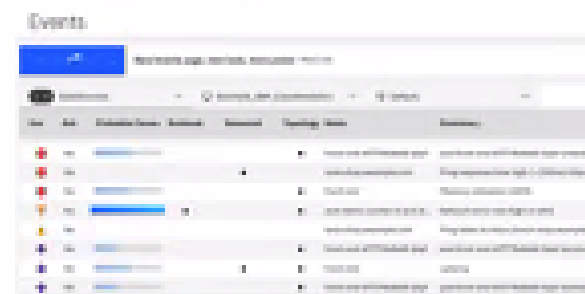
## Fault Localization & Blast radius



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.

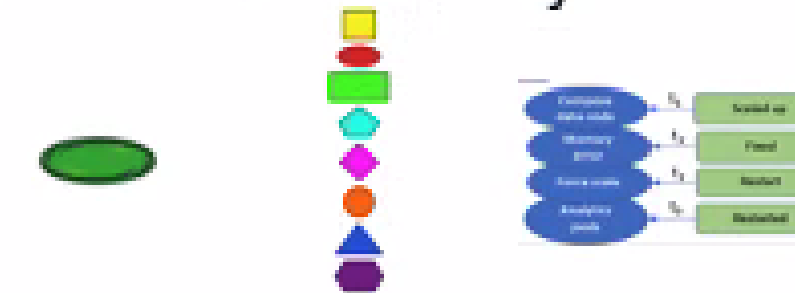
## Probable Cause



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



## AI model management

TrainingApplication coverageData assets

### Models-generating algorithms

**Change risk**

Training started: 8/4/2022 8:38:54 PM

Version trained  
v10

Data quality  
No tickets data available

Error

**Log anomaly detection - natural language**

Last trained: 7/17/2022 1:47:46 PM

Version trained  
v4

Data quality  
Good

Completev3 deployed

**Metric anomaly detection**

Last trained: 6/28/2022 6:13:19 AM

Version trained  
v5

Data quality  
-

AI model management / Training /

**Similar incidents**

Discovers details about similar messages, anomalies, and events that occurred in the past and are impacting the current application.

Tickets

**Temporal grouping**

Last trained: 7/5/2022 4:06:39 AM

Version trained  
v2

Data quality  
-

CompleteDeployed

### Online algorithms

**Log anomaly detection - statistical baseline**

Discovers abnormal behavior in log data using a statistical moving average.

Logs

On

**Probable cause**

Analyzes across domain and application boundaries to determine the likelihood of an alert being the cause of an incident.

Events, topology

Enabled

## Log anomaly detection - natural language

OverviewVersionsCoverage

Training status

3 of 3 complete

Models created

Training started: 7/17/2022, 01:47 PM

Queued

Preparing data

Training

Jobs: 9 jobsView

Data quality

Good

3 recommendations

Your data was inspected and looks good for training.

We have detected that a portion of this data is in an unsupported language and could impact the quality of this model.

We recommend that you remove any data containing unsupported languages. Then, run training again.

Log data

Name  
OGvqDYIBVPLMfCLDWy1F

Start date  
07/16/2022 4:00 PM UTC

End date  
07/17/2022 8:00 PM UTC

Models

9 Resources

Resources with models

Resources without models

## AI model management

AI algorithmsManageCoverageData assets

Trained AI algorithms

These are your most recently trained AI algorithms.

Name	Version	Deployed version	AI algorithms	Schedule	Last trained	Status
<a href="#">similar_incidents_configuration</a>	v1	v1	Similar incidents	Run manually	3/24/2022 9:50:32 AM	Training complete
<a href="#">change_risk_configuration</a>	v1	v1	Change risk	Run manually	3/24/2022 9:52:44 AM	Training complete
<a href="#">metric_anomaly_detection_configuration</a>	v2	v2	Metric anomaly detection	Run manually	3/25/2022 10:10:44 AM	Training complete

Items per page: 101-3 of 3 items

Start training

Deploy v4

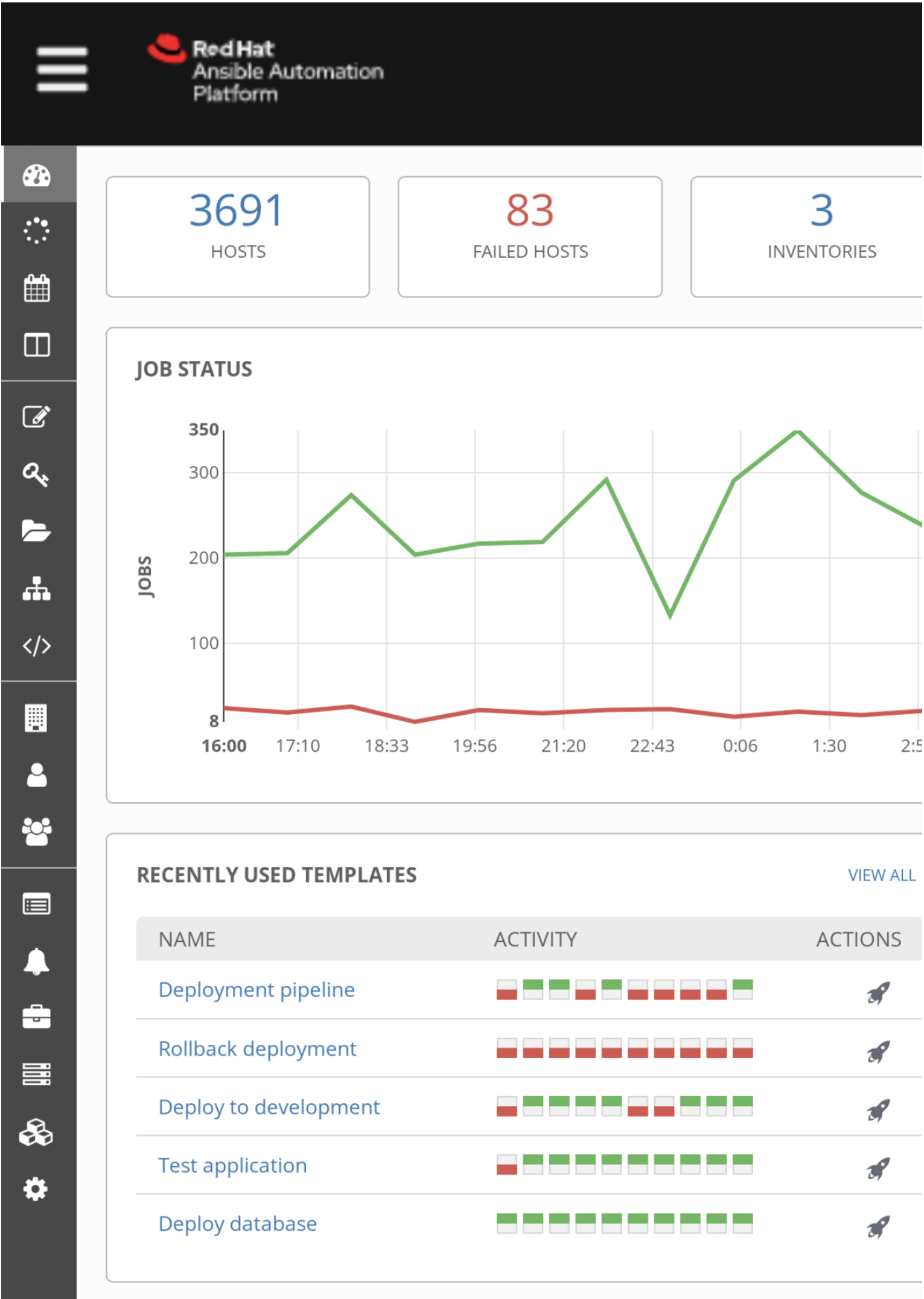
Delete configuration

Overview details	
AI type	Log anomaly detection - natural language
Version	v4
Version deployed	v3
Created on	6/21/2022, 9:35:26 AM
Created by	jconallen

# 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...

- Step 1: Check if puts are disabled on queue**  
Navigate to the queue here: <https://esysmvs.ztec.dmz:1419/ibmmq/console/#/1>  
Check if puts are disabled in the configuration.  
If they are, run the following runbook step to enable puts with Ansible.  
If they are not, End
- Step 2: MQ Patch**  
Automated step  
MQ Patch
- Step 3: Check Instana Application Perspective**  
If the issue is fixed, error rate should return to normal in the ZQOTD Instana app  
<https://instana.io/s/BX9rkEQ9TBKRqx4Bs2d4YQ>
- Step 4: Check that the engraving function of the QOTD application is working**  
If you can order an engraving on the [ZQOTD application](#), this runbook worked and  
Log a ServiceNow ticket with the relevant information.

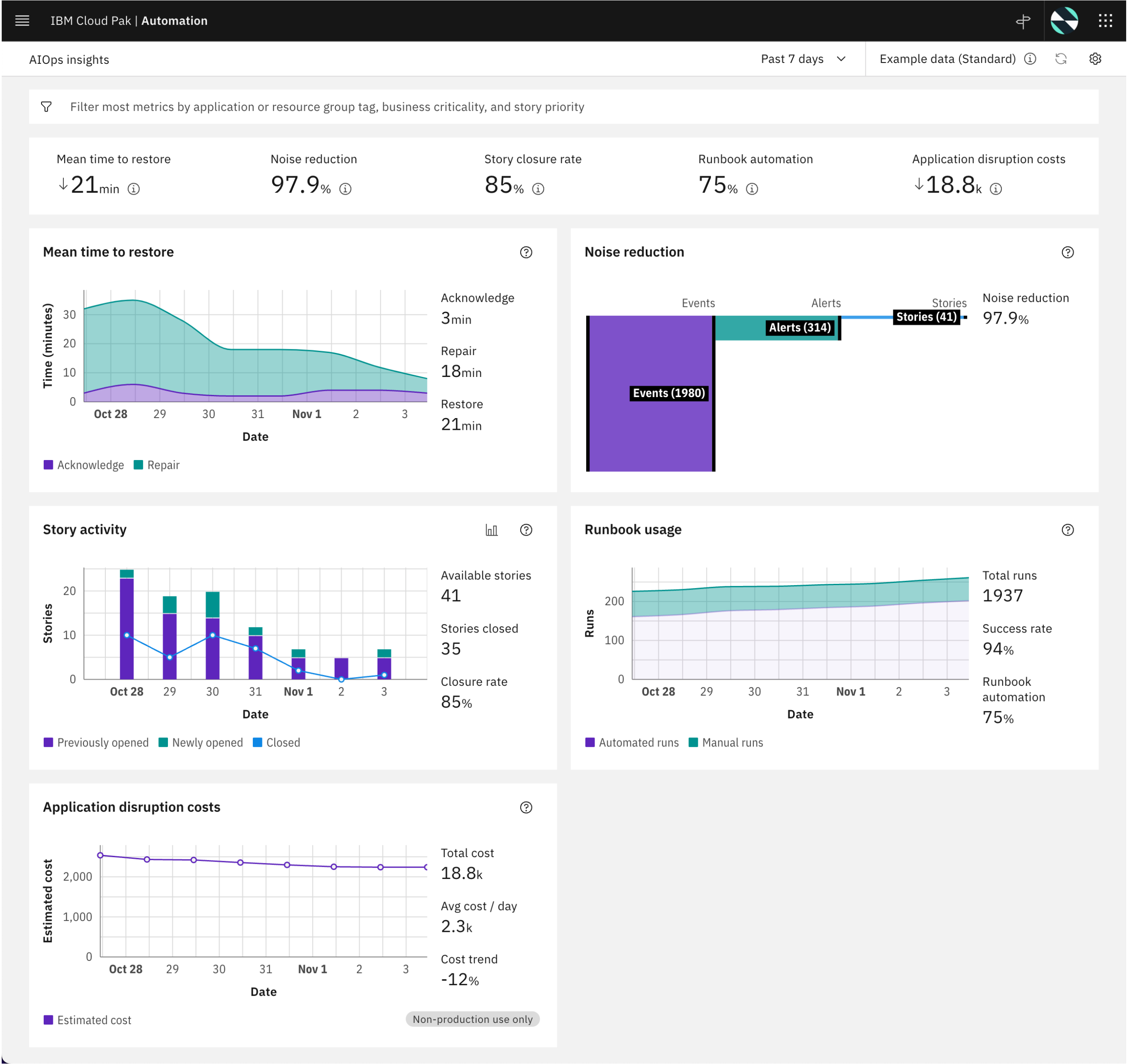
# AIOps Insights Dashboard

## 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)





## More information

### – Want to learn more?

- Excellent technical introduction video series on Instana- eight videos, each close to an hour in length: <https://community.ibm.com/community/user/viewdocument/intana-technical-training-series?CommunityKey=8d661410-d1fb-4067-ab9a-019475fc541e&tab=librarydocuments>
- Short YouTube product tour on Turbonomic- about a half hour: <https://www.youtube.com/playlist?list=PLy1IfoLMgdeZcC6sYKwVz0YLUz3Gdztye>
- Dozens of Cloud Pak for AIOps videos of varying lengths: [https://www.youtube.com/playlist?list=PL\\_4RxtD-BL5t8kaHEq9ef8piEAycxdhWd](https://www.youtube.com/playlist?list=PL_4RxtD-BL5t8kaHEq9ef8piEAycxdhWd)

– Join the IBM AIOps for IBM Z community ([Link](#))

– Join the Instana community group ([Link](#))

– Join the Turbonomic community group ([Link](#))

# Thank you

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