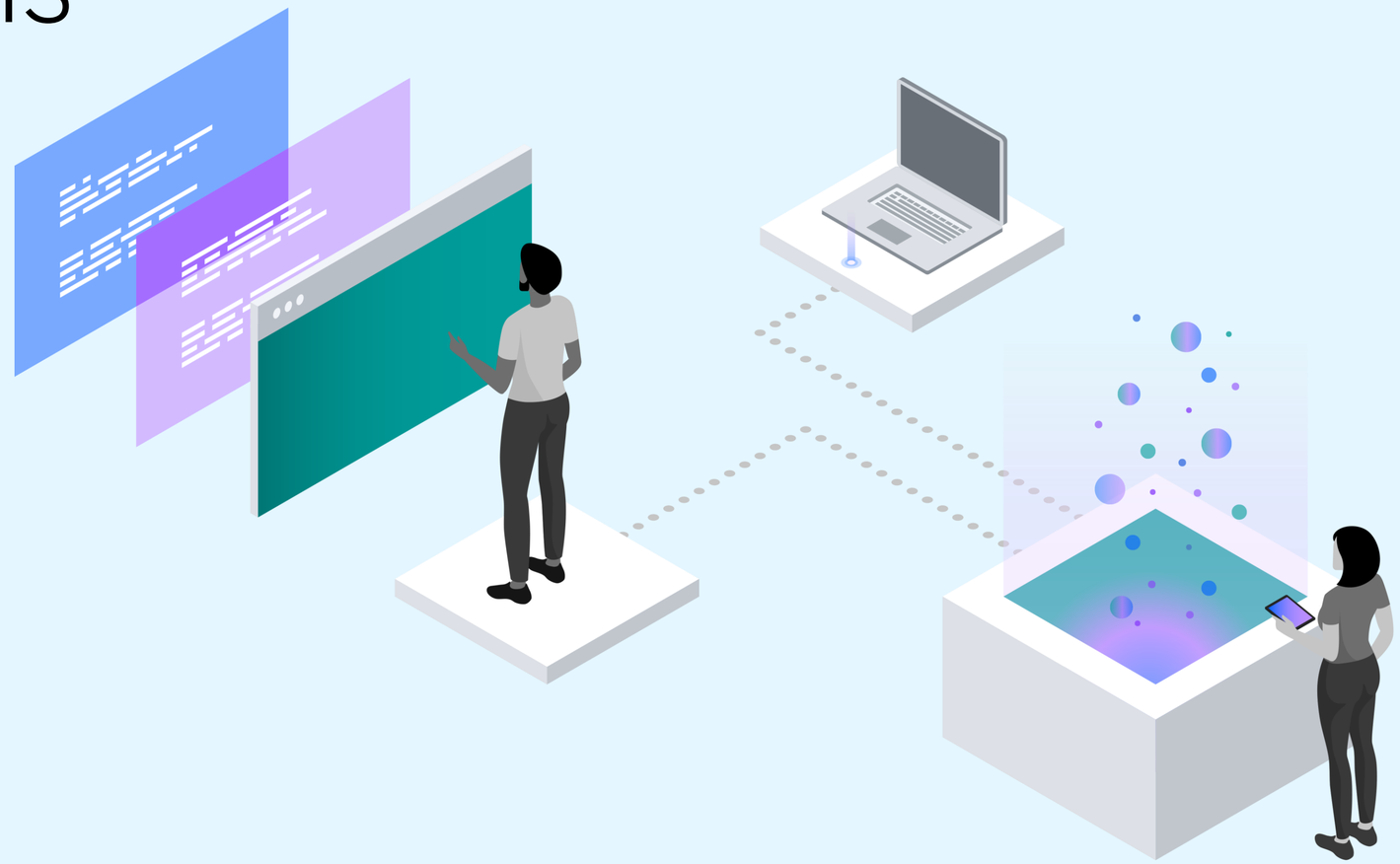
AIOps with IBM Z
Overview & Solutions



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garrett.lee.woodworth@ibm.com

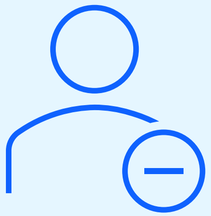
IT under pressure: Meeting greater customer demands with fewer skilled employees

1 sec

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

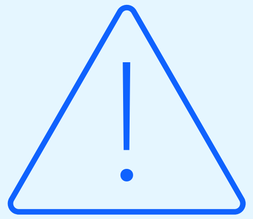
50%

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



$250K

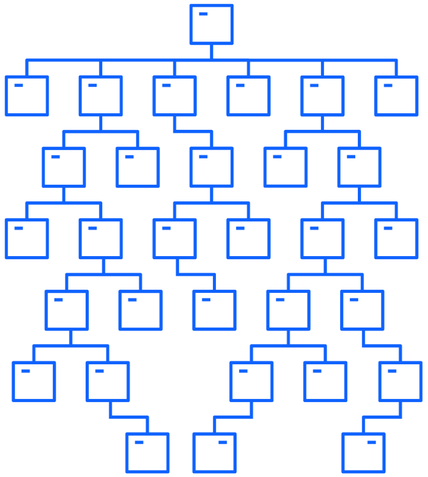
the average cost of an hour of downtime when a revenue generating production service is impacted



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

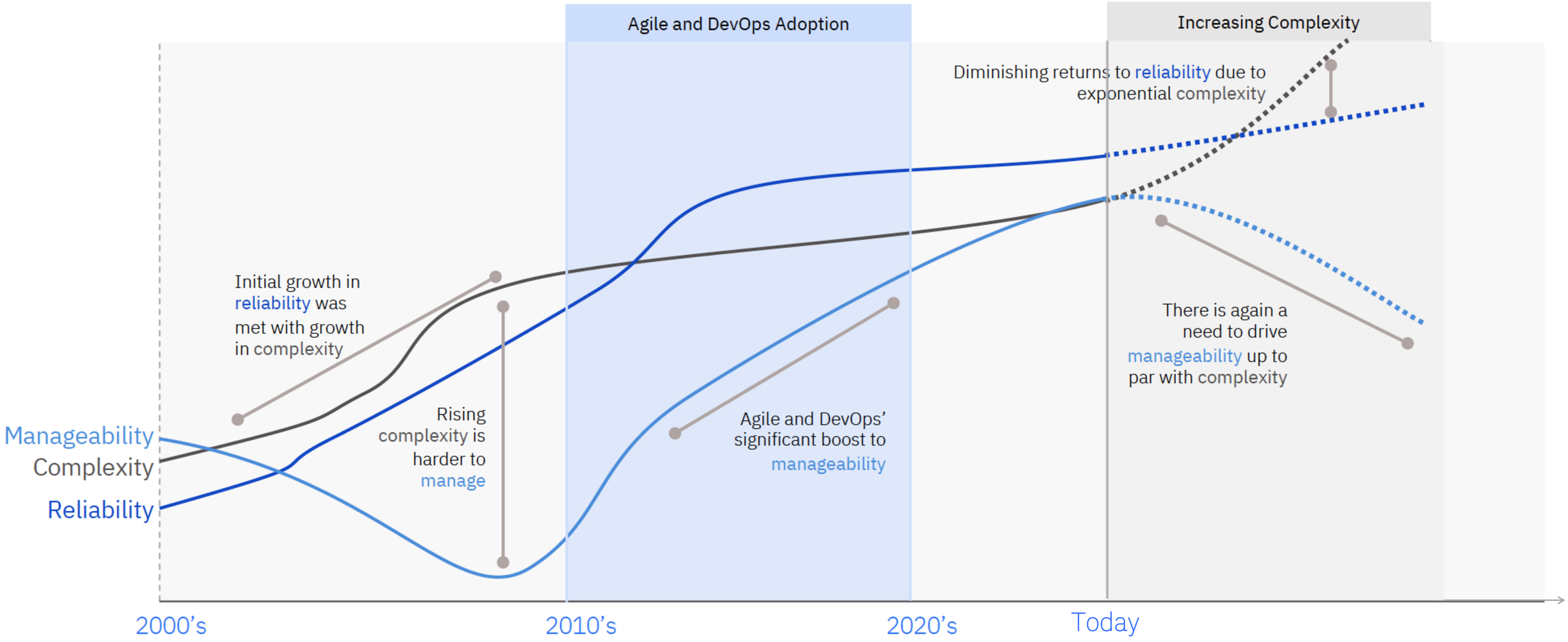


There's too much data for one person to handle

- 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

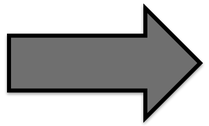
+ Cross-domain data ingestion and integration

+ 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.

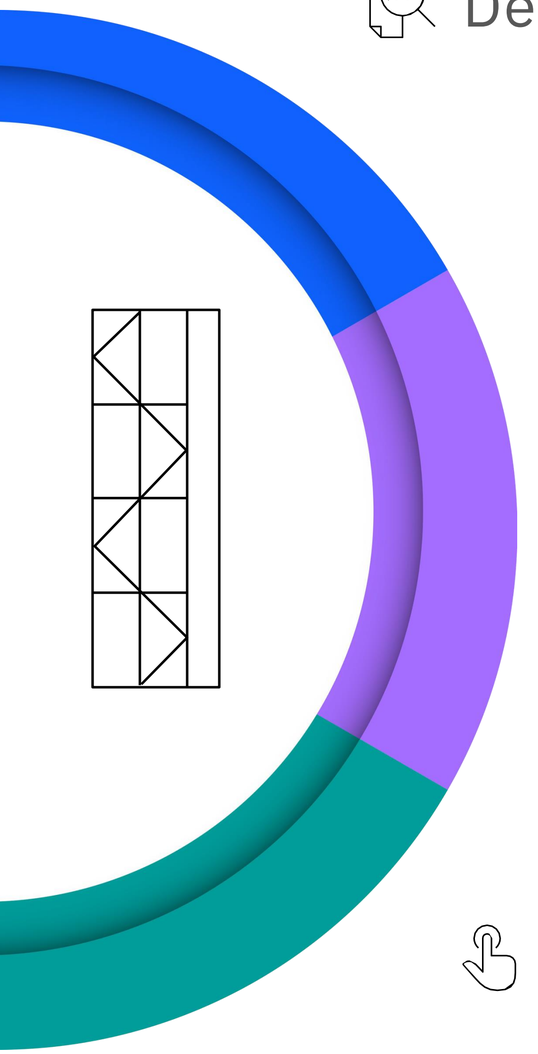
“Hybrid Cloud” AIOps – Broader scope

- 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.

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

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
INSTANA	SevOne	turbonomic an IBM Company	Cloud Pak for AIOps; IBM AIOps Insights

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

Application Owner

Site Reliability Engineers / IT Operations

Mainframe Subject Matter Experts

Ordered Received via Handheld

Order Received

Order Routing

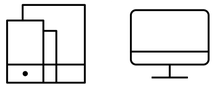
Create Sales Order

Check Availability

Pricing

Scheduling

Create Order



Mobile and Web Apps

Mobile & Web Devices

Sync DB

Sync API

Microservices

Public or private Cloud

Ingest API

Kafka

DB

Routing

Linux Services

Virtual Machines

IBM z/OS Connect

IBM MQ

IBM CICS

Order Processing

Order DB

Db2

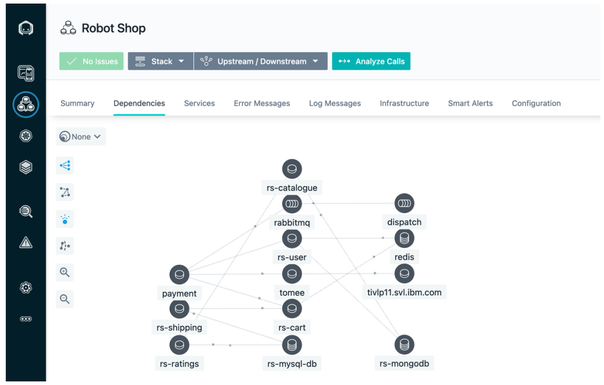
IBM Z

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

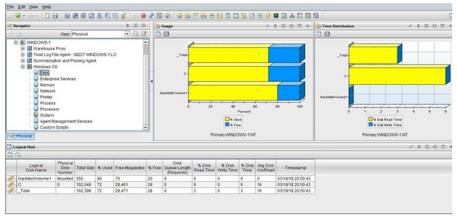
Yet the majority of IBM Z users lack integration of this key platform into their enterprise-wide observability strategy

The ongoing challenge of Enterprise Observability

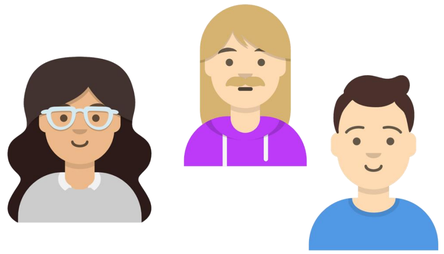
Application owner / SRE



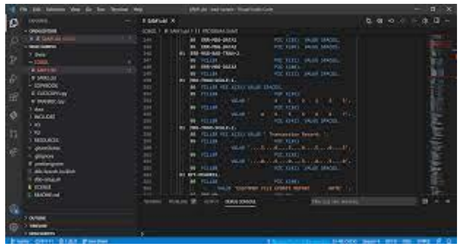
Mainframe Subject Matter Experts

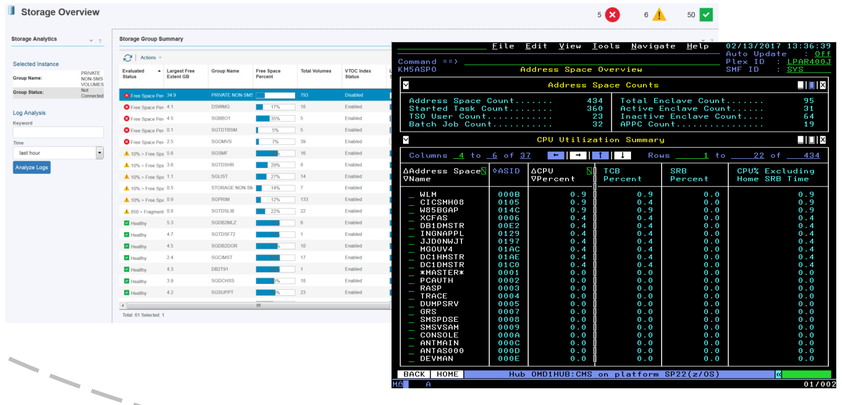


(Non-zSystems) IT operations



Application development

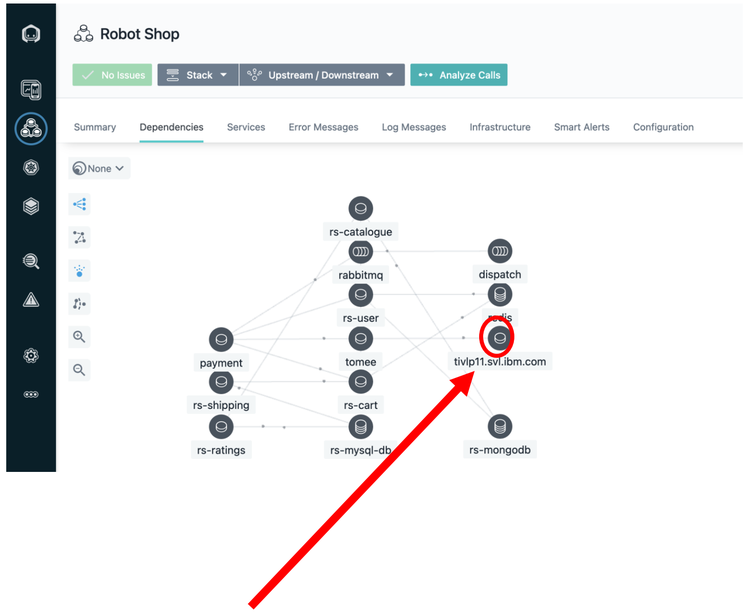




The absence of end-to-end observability…

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

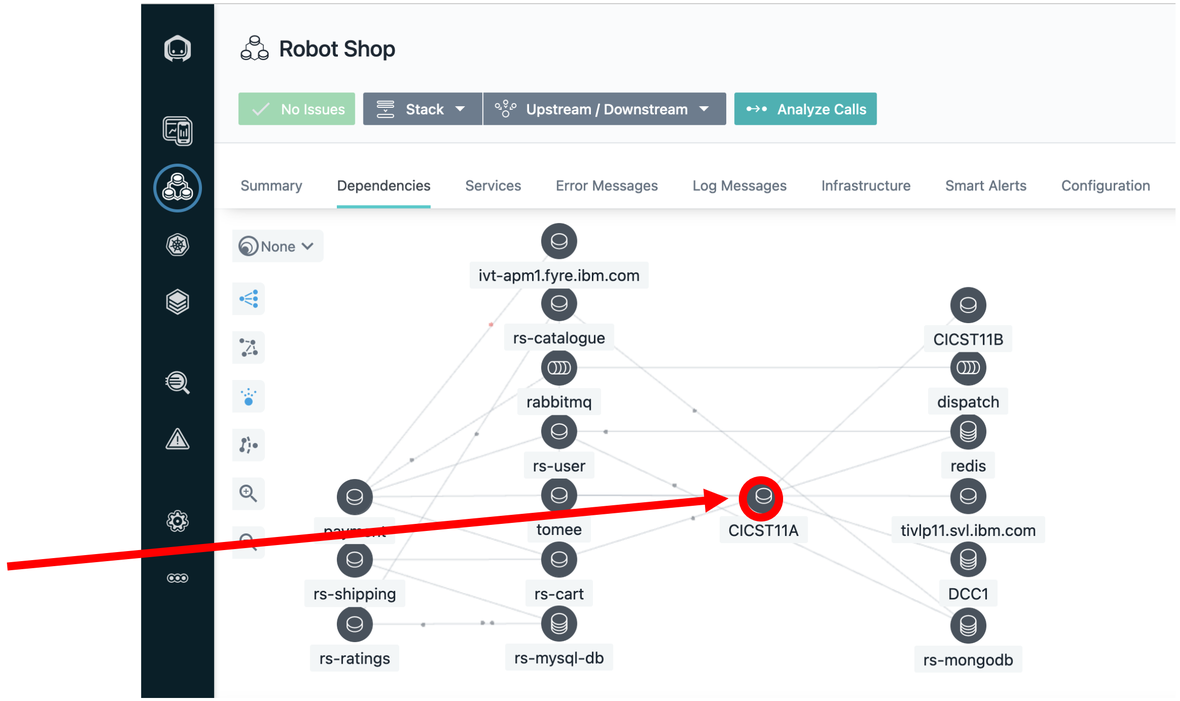
Uh-oh. One of our CICS regions is experiencing a slowdown. I'll fix it right now

CICS SME

Improved experience with enterprise observability

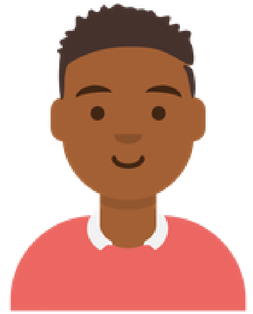
The response time of our principal customer-facing application has increased significantly over the past 30 minutes…**it seems there is a slowdown coming from CICS. It appears to be stemming from *CICST11A* and task *56177* is associated.**

Application Owner



Thanks for the heads up.

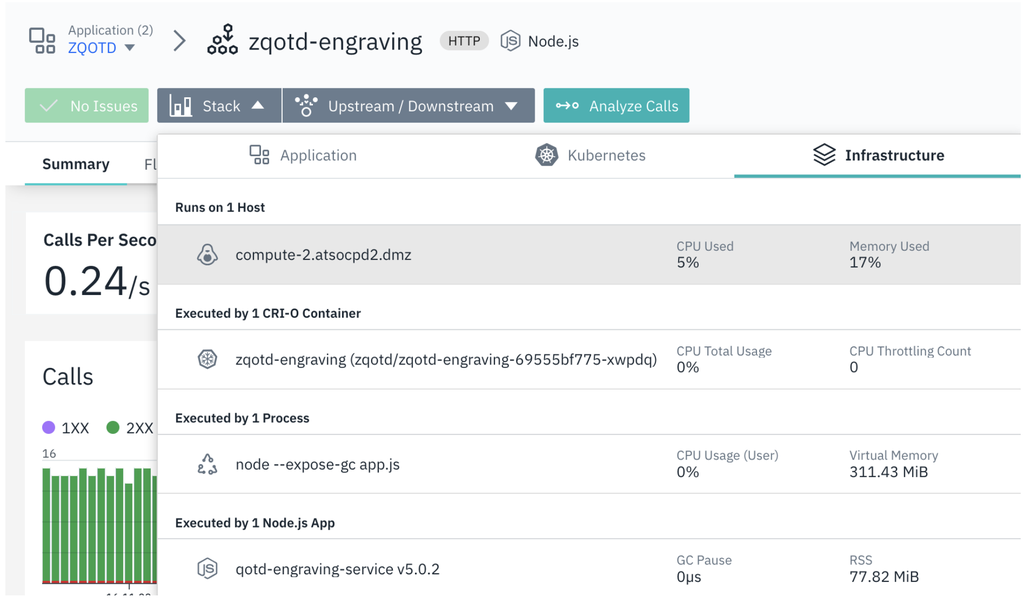
I’m going to look at that CICS region in OMEGAMON, review the CICS task history, and take action immediately.



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)

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

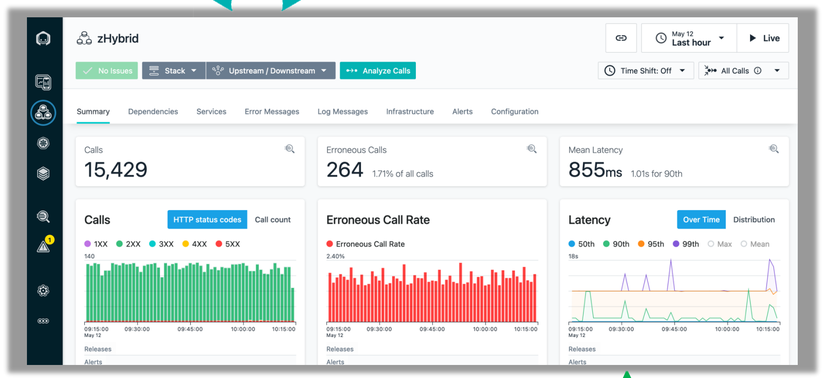
Db2 on z/OS via
- JDBC

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

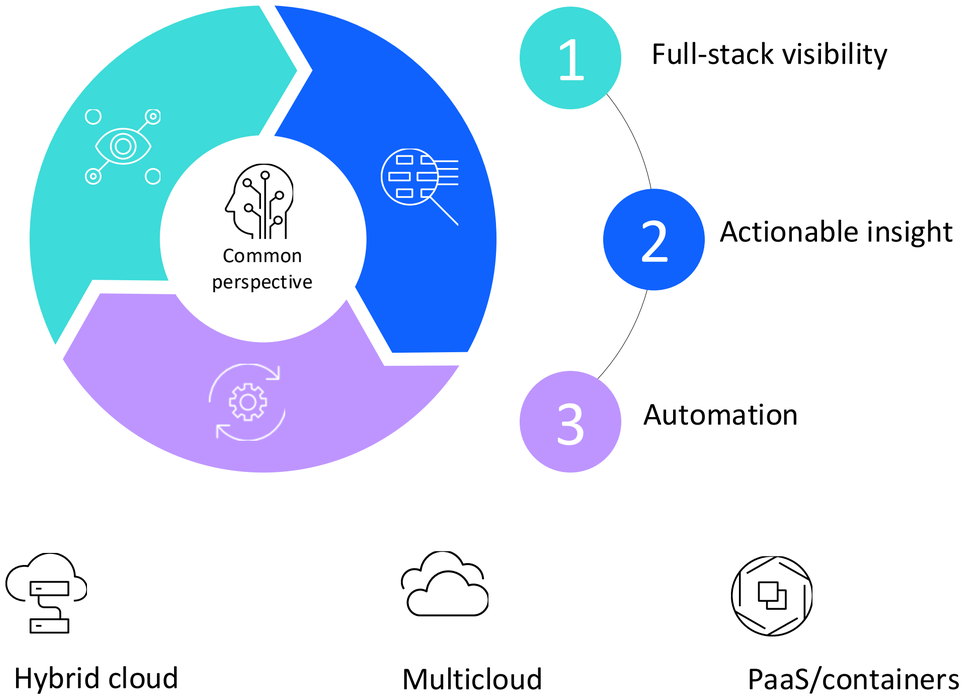
INSTANA



IBM Turbonomic Application Resource Management

IBM Turbonomic® Application Resource Management

Continuous application performance while safely reducing cloud costs



- Better customer experience
- Better application response times
- Faster time to market
- Increased IT productivity
- Reduced mean time to resolution

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 planni
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 planni
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*

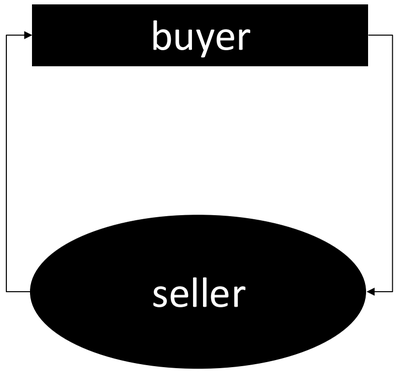
4

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

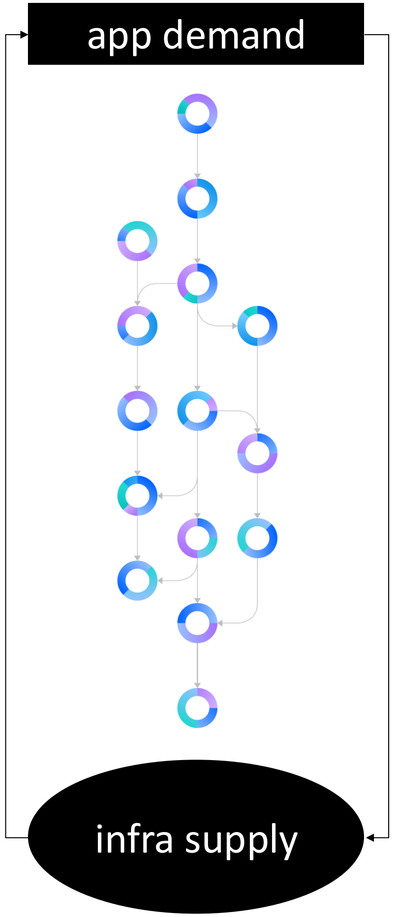
1. Abstraction

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

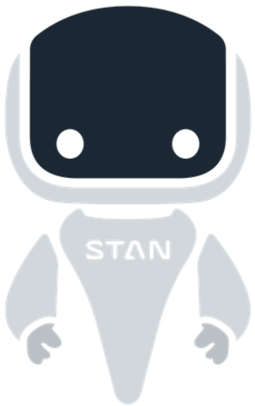
App-first, full-stack approach ensures actions are safe to automate. Clients operationalize automation by integrating actions into pipelines, processes, and workflows

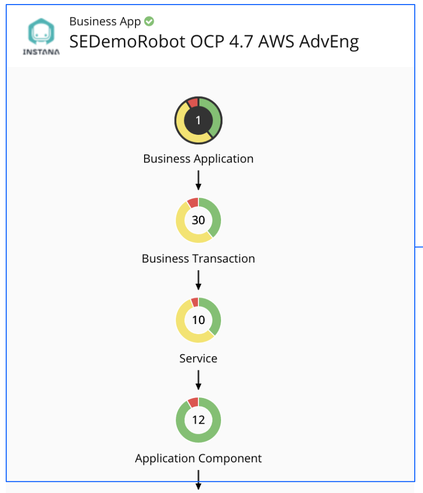
IBM **Instana** + IBM **Turbonomic**

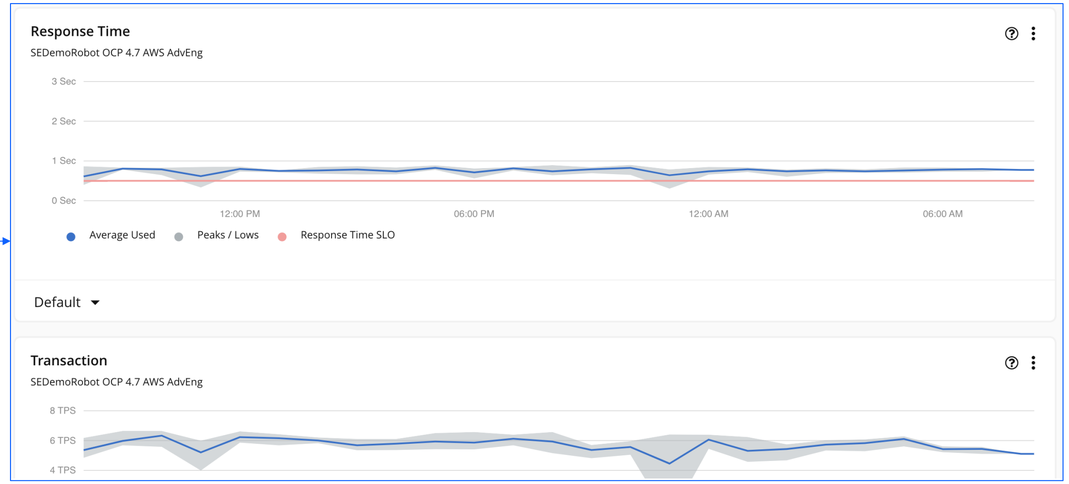
Powerful alone, better together

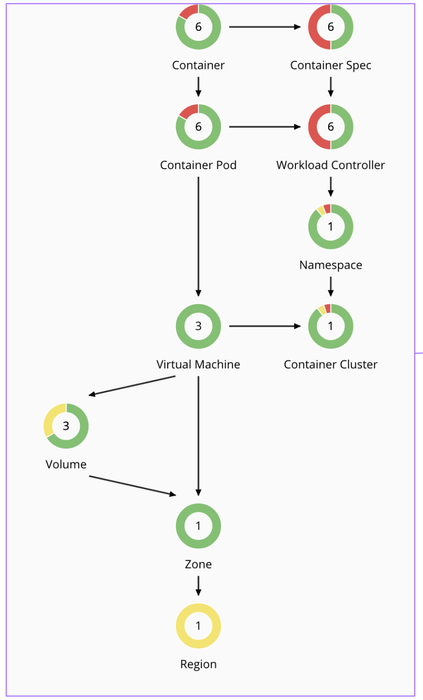
Only **Instana** provides real-time observability data with 1 second metric granularity

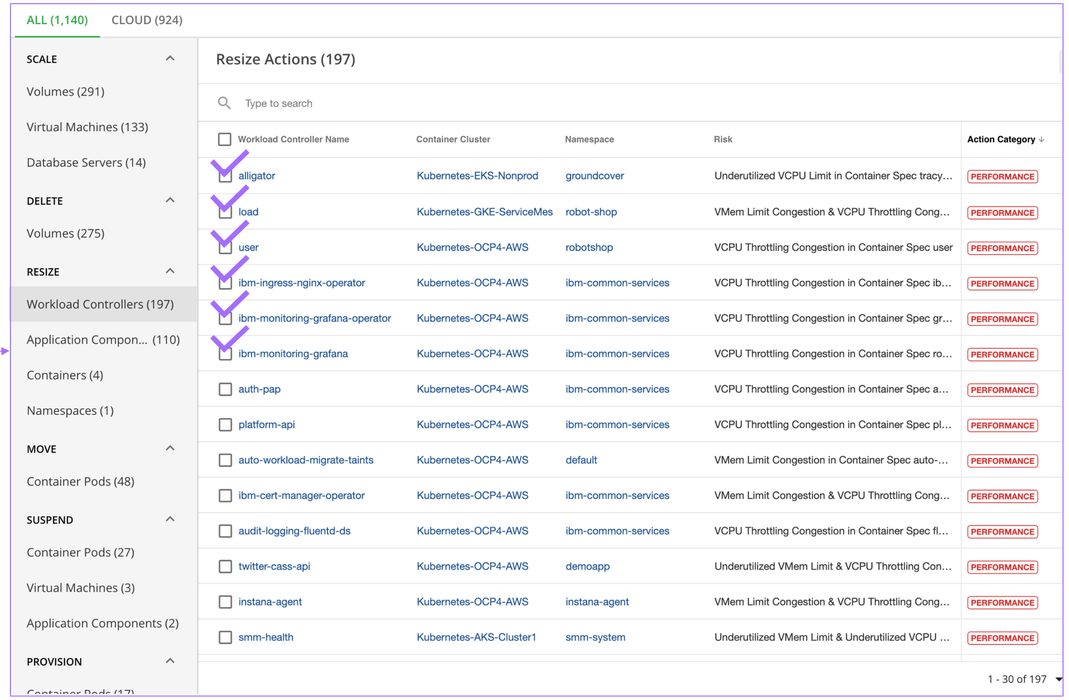
Only **Turbonomic** provides cost optimization you can operationalize and automate.











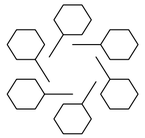
IBM Cloud Pak for AIOps

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

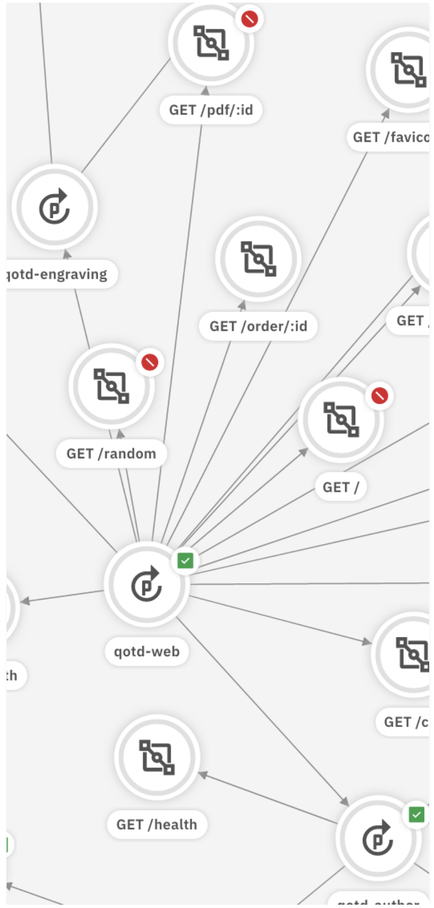
- CI/CD
- Logs
- Tickets

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

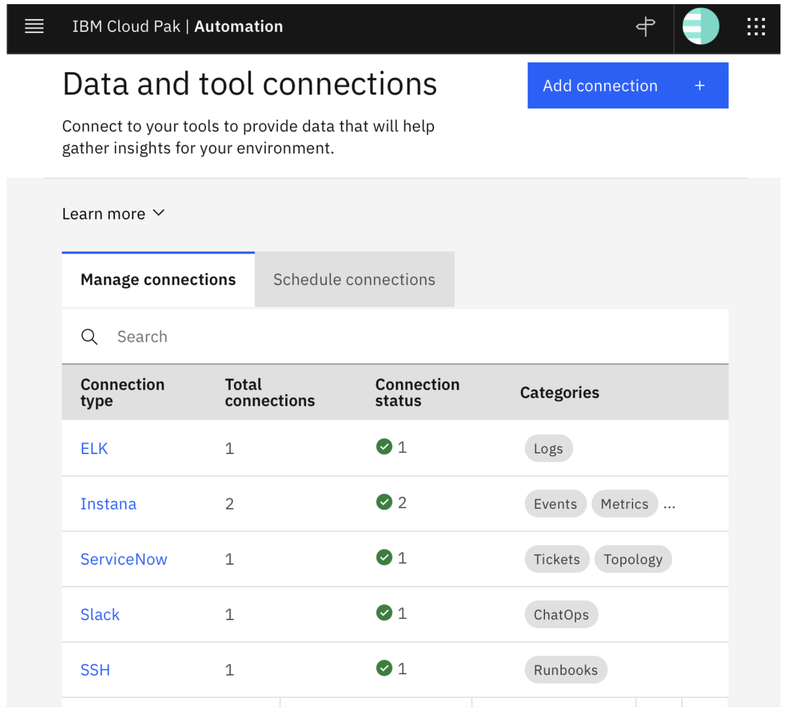
Take Actions

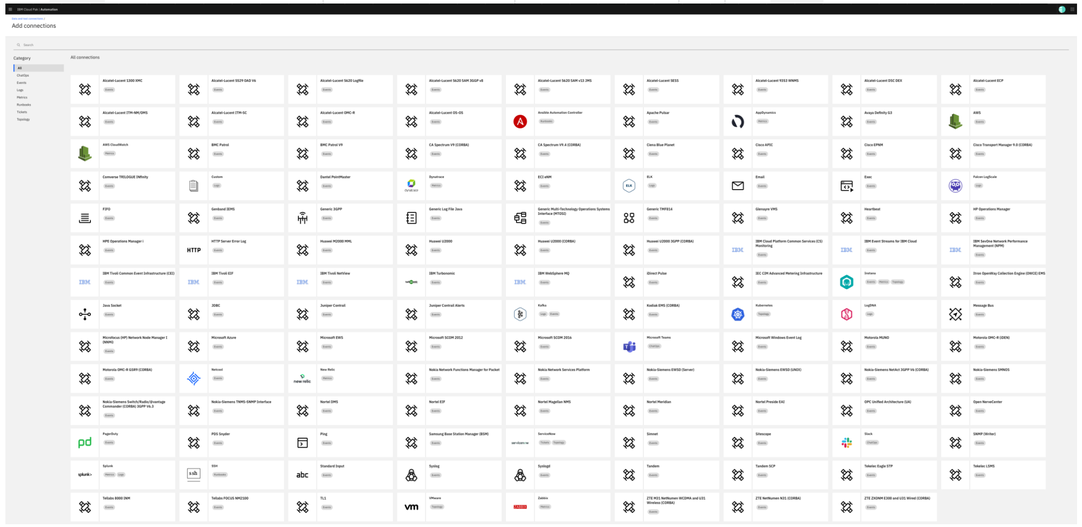
- Contextual side-launch
- Act Manually (with a click)
- Semi | Full Automation
- Pipelines & Workflows
- Explainability
- Collaboration Integration

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

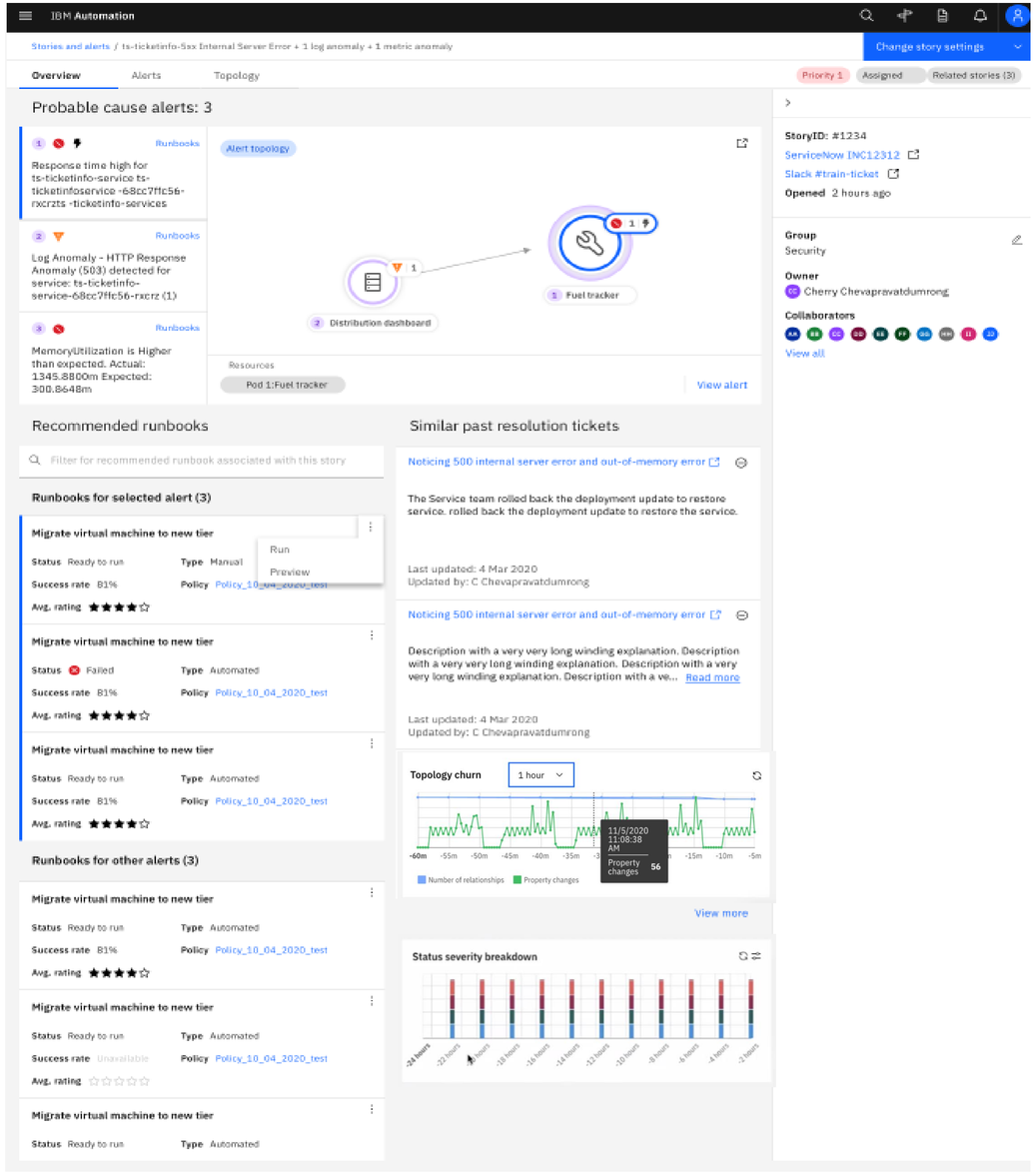
Easy configuration and management

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.



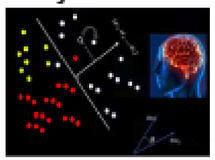
Access to ChatOps for team coordination and shortcuts to actions

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

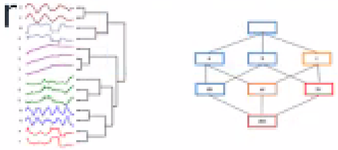


Detect anomalies from log messages
- Anomalous time period prediction
- Entity mentions in error logs
- Explanation & Pointer to log messages from anomalous time periods

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

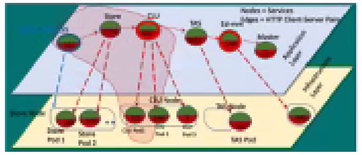


Group events, alerts, anomalies to reduce tickets
- Topological: Group events that are related and/or connected (e.g. “runs on”).
- Temporal: To automatically discover events that tend to co-occur
- Scope: Automatically group events based on scope
- Super-Group: Group of Groups

Event Seasonality

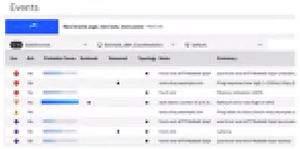
Automatically discovers events that occur with a regular pattern
- Identify chronic issues that may go un-detected
- Provide valuable insights into problem solving
- Continual learning over days, weeks, months, and years

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

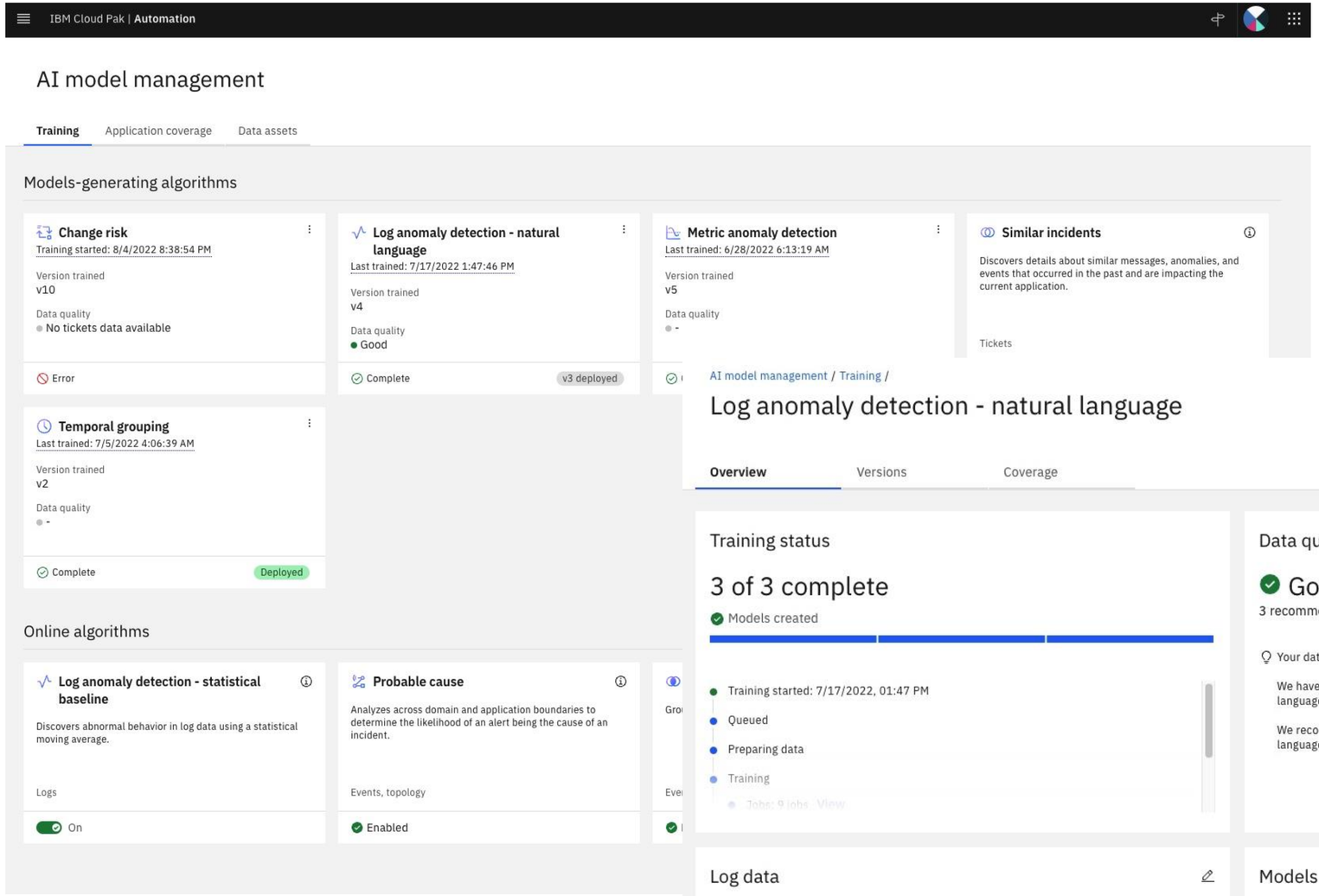
Incident Similarity

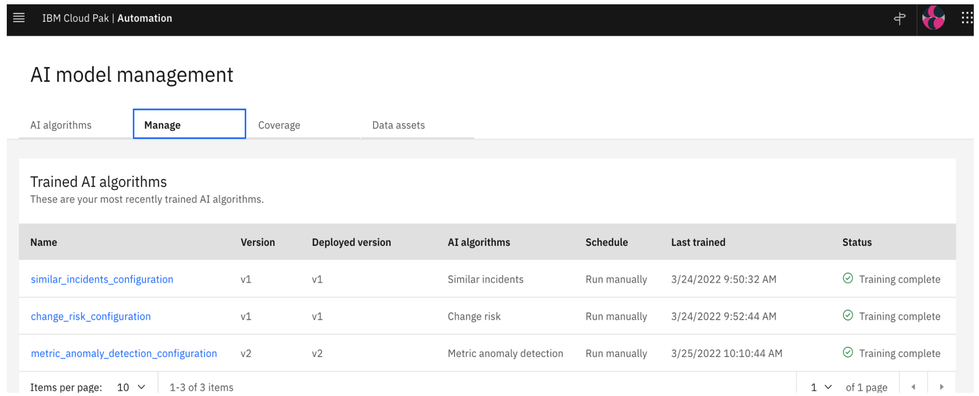
For a given problem description, find top k ranked similar incidents from the past. Helps understand the current issue and previous successful resolve actions. Consumes tickets and any data from the ticket progression to closure including human written investigation and resolution actions.
Uses Entity-Action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

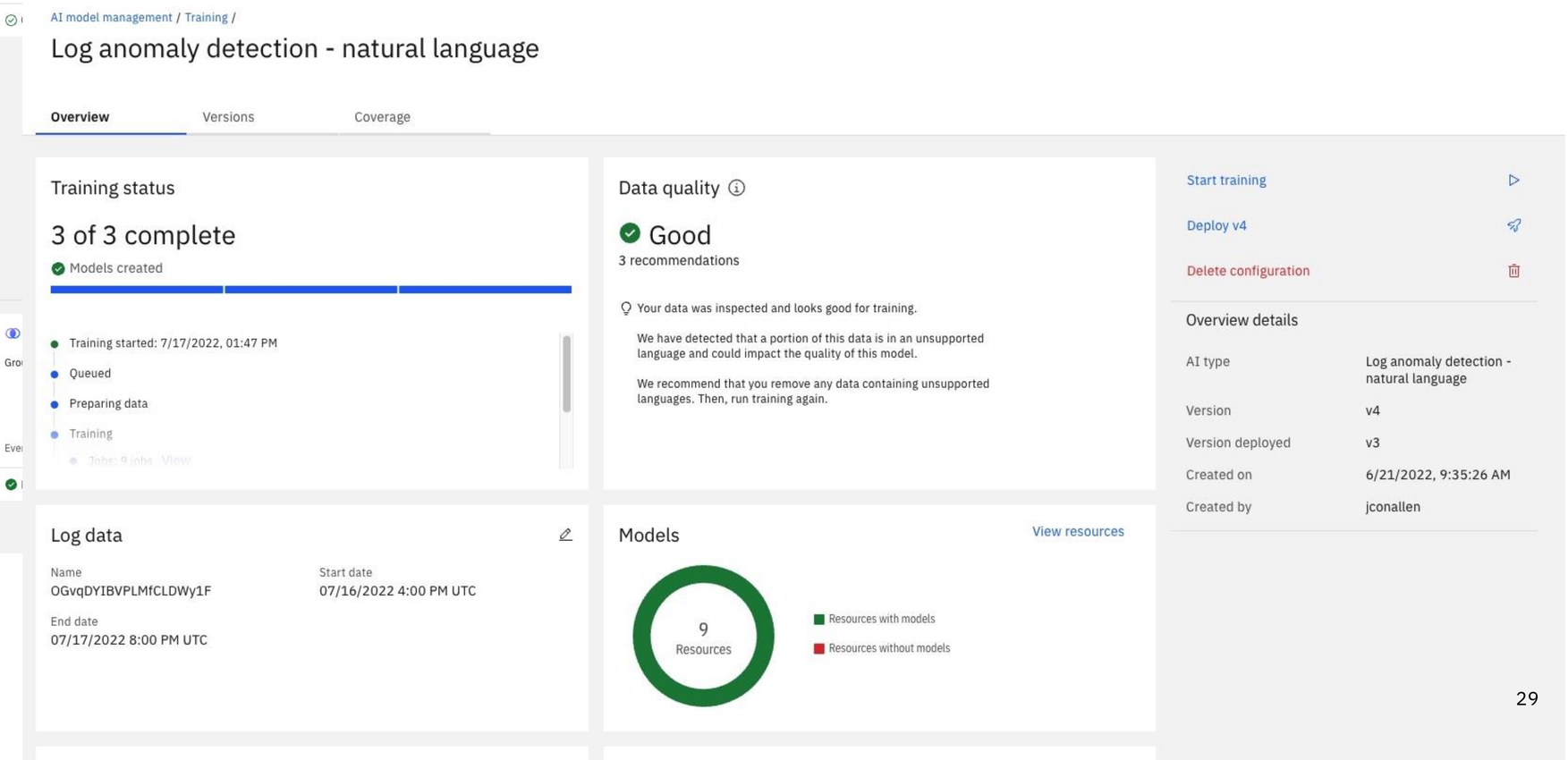
Change Risk Prediction

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

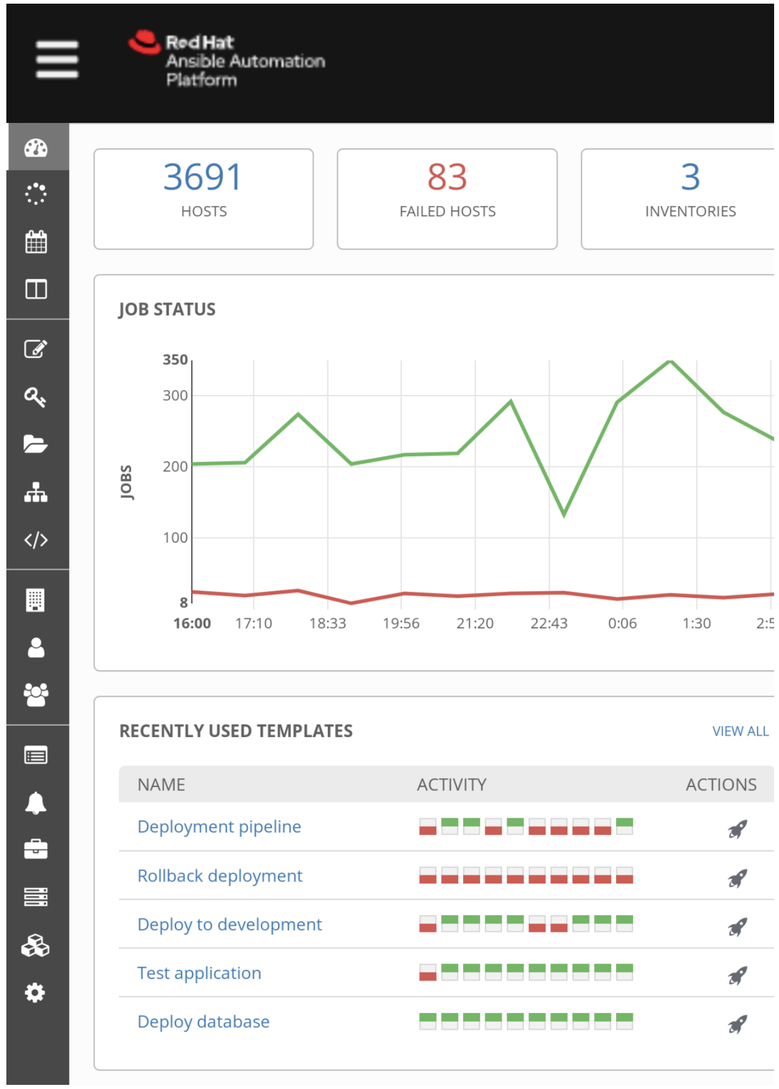






Ansible Automation Platform & Cloud Pak for AIOps

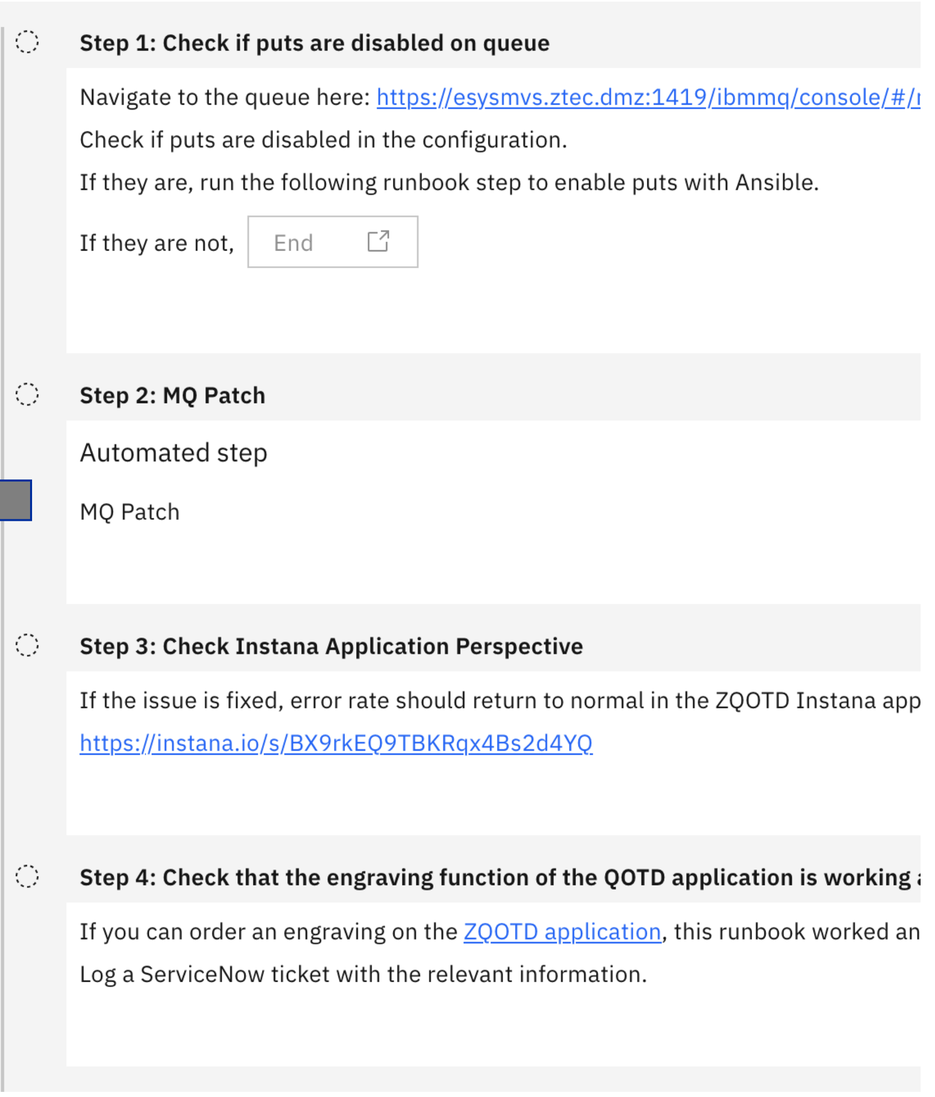
Accelerate IT Transformation & use of Automation. Improve Scalability and tolerance of Change.



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...



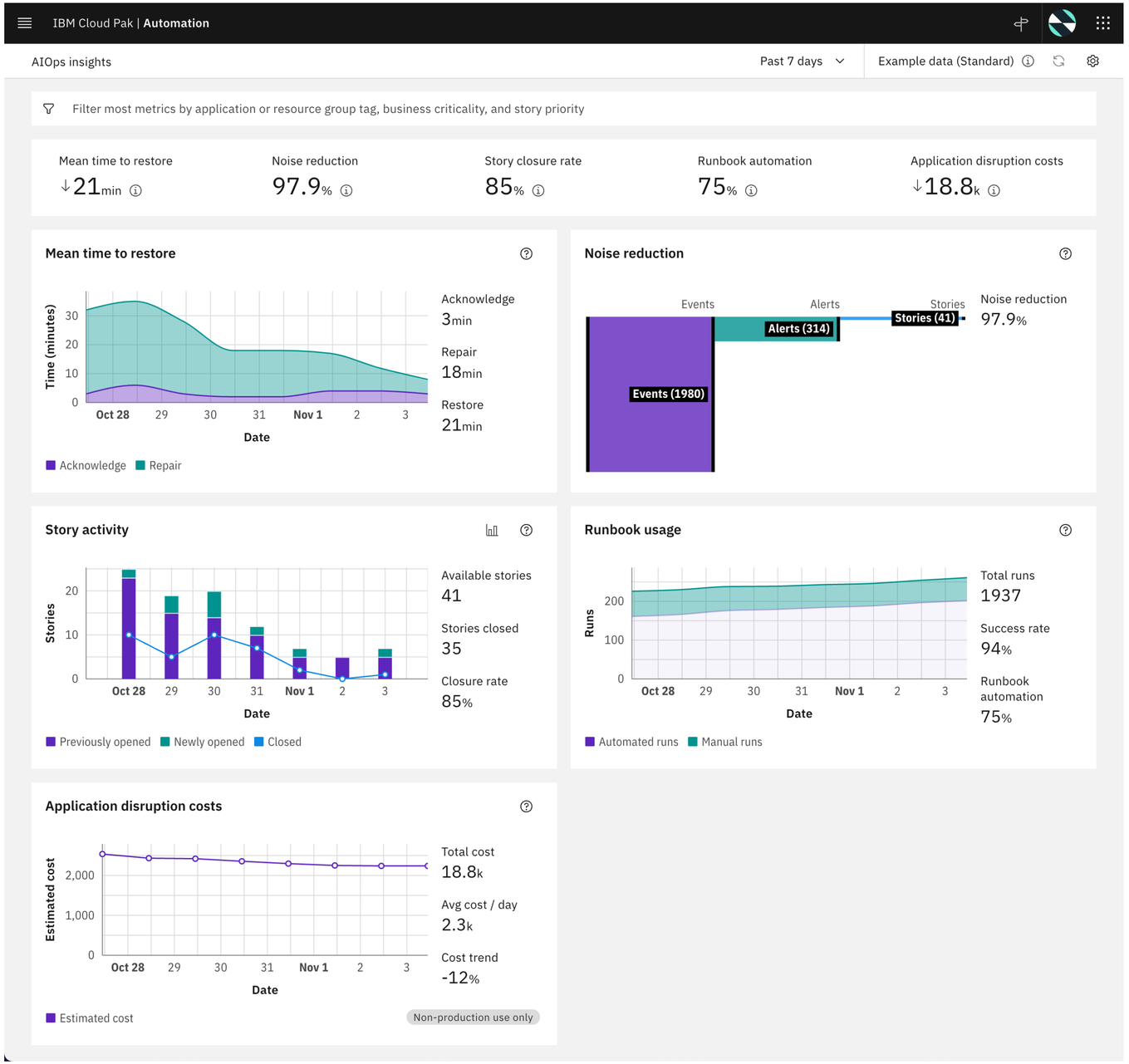
AIOps Insights Dashboard

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)



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
- **Join the IBM AIOps for IBM Z community** (Link)
- **Join the Instana community group** (Link)
- **Join the Turbonomic community group** (Link)

Thank you