

Using OpenTelemetry to Integrate the Mainframe Into Your Enterprise-Wide Observability Platform

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Abstract

In recent years there has been an increased focus on real-time observability of applications and the underlying infrastructure to deliver better insights around performance and increase business resiliency. As well as SMF record processing, there is now a demand for OpenTelemetry signal support from the mainframe to ensure complete end-to-end visibility across the enterprise. IBM has delivered new OpenTelemetry trace capabilities in the latest releases of z/OS and major subsystems together with opportunities to integrate this with metrics and log data.

This can pose a number of challenges for the mainframe operations team from deciding what data needs to be collected and shared, to capacity management of this operational data minimizing any potential impact to production workload performance and system resource consumption.

If you are on or beginning your journey with OpenTelemetry on IBM Z, this session will assist you by focusing on experiences integrating the mainframe as part of an enterprise-wide observability strategy, the key stakeholders involved, and the challenges to be addressed. In particular, we will focus on approaches to deliver OpenTelemetry signal data - traces, metrics and logs - to one or more observability platforms while managing the volumes of operational data effectively, helping your adoption of these latest technologies across the mainframe.

Let's start with the fundamentals..

What is observability?

What are we trying to achieve?

How does it impact the mainframe?

Observability: The Wikipedia definition

In software engineering, more specifically in distributed computing, observability is the ability to *collect data* about programs' execution, modules' internal states, and the communication among components.

To improve observability, software engineers use a wide range of logging and tracing techniques to gather telemetry information, and tools to analyze and use it.

Observability is foundational to site reliability engineering, as it is the *first step in triaging a service outage*. One of the goals of observability is to *minimize the amount of prior knowledge needed to debug an issue*.

Source: [Wikipedia - Observability \(software\)](#)

Observability: The CNCF definition

Observability is a *system property* that defines the degree to which the system can *generate actionable insights*.

It allows users to *understand* a system's state from these external outputs and take (corrective) action.

Source: [CNCF - Observability](#)

Observability: The IBM definition

Observability is the ability to *understand* the internal state or condition of a complex system based solely on knowledge of its external outputs, specifically its telemetry.

Observability provides deep visibility into modern, distributed tech stacks *for automated, real-time problem identification and resolution.*

Source: [IBM – What is observability?](#)

Observability = visibility and understanding

What did the user experience?

Which customers are impacted?

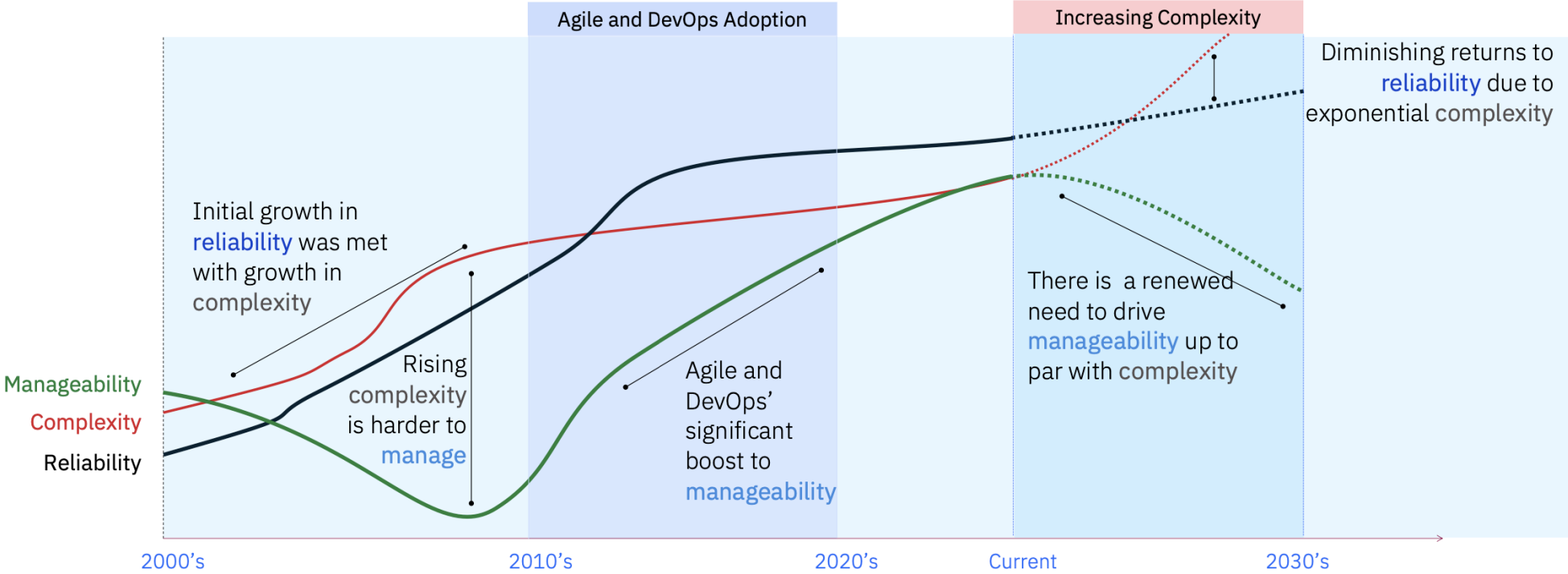
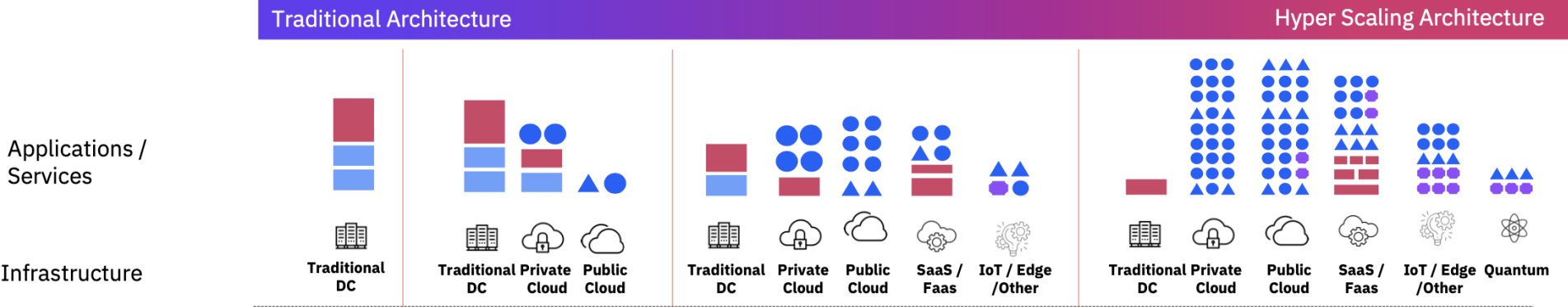
What is the business and revenue impact?

What systems, programs, or configuration was part of that experience?

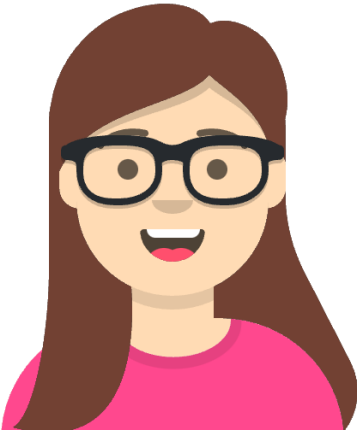
Where was that process running?

What else within the system could have contributed?

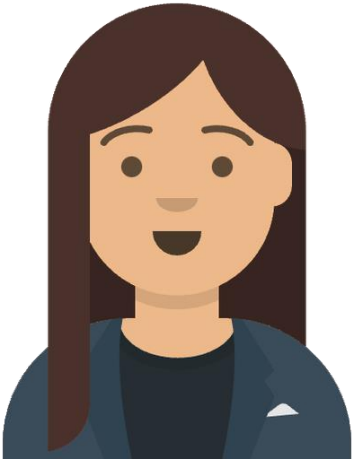
Why is observability needed?



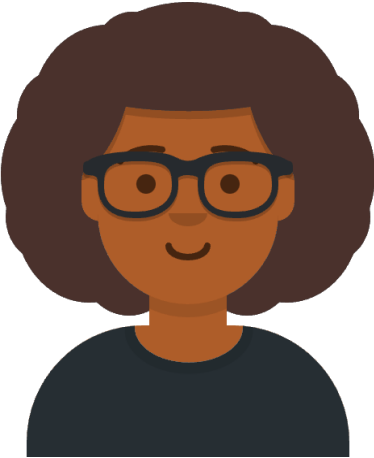
Observability is a team sport!



End User



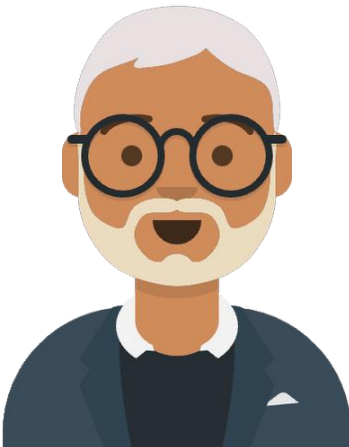
Site Reliability
Engineer



Early-tenure
Systems
Programmer



Application
Developer

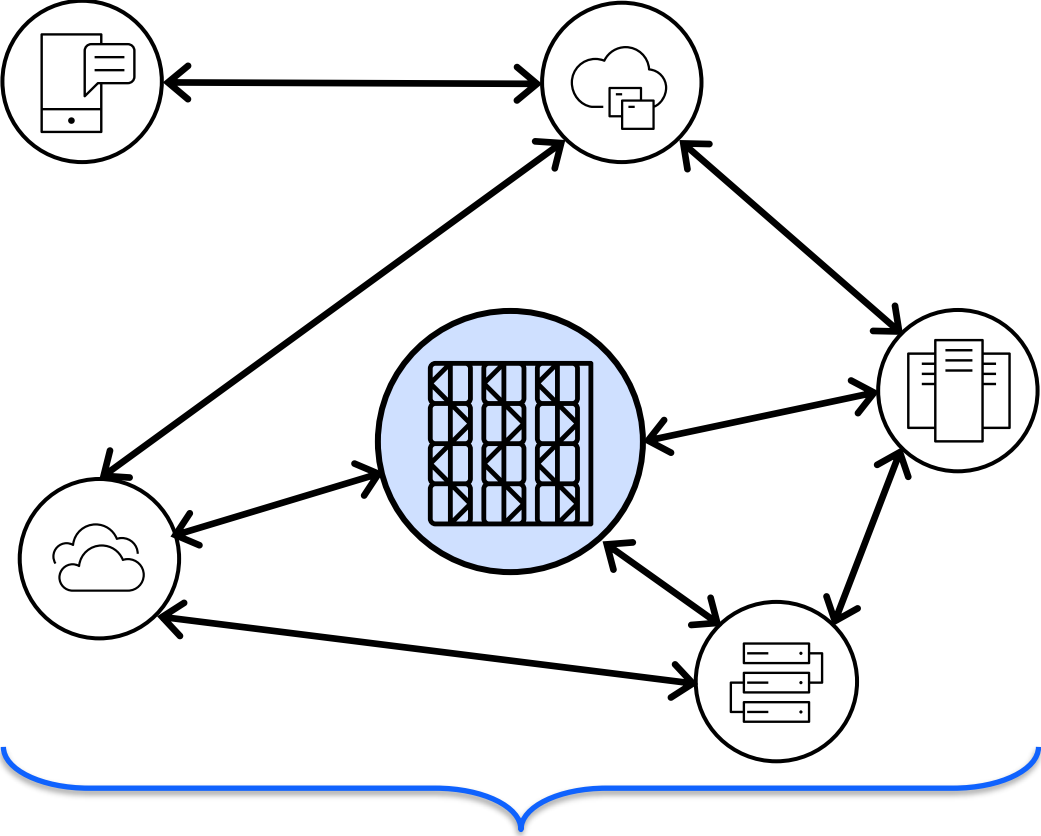


Senior
Systems
Programmer



Capacity
Planner

Observability and IBM Z



End-to-end observability for hybrid applications and underlying infrastructure

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

Yet the majority of organizations lack integration of IBM Z into their enterprise-wide observability strategy

Addressing enterprise observability inclusive of IBM Z is a top priority

91%

of IT executives agree that their organization promotes hybrid architectures with workloads distributed across cloud, mainframe, and edge assets¹

92%

of respondents say it is important to have a single dashboard to monitor operations across a hybrid environment, yet 85% find it difficult to do this²

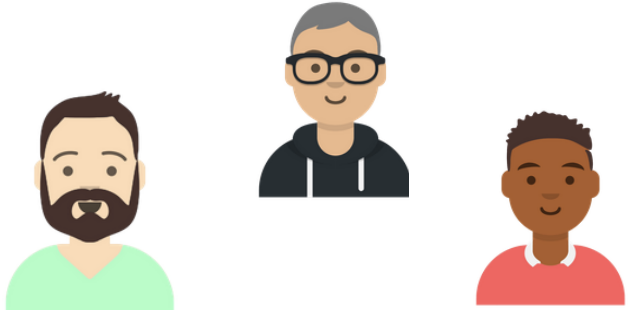
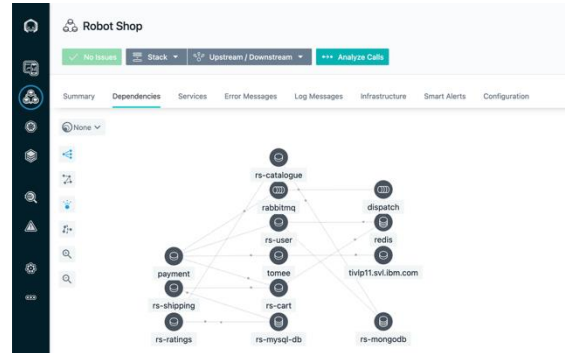
1. IBM: [Mainframes as mainstays of digital transformation](#)

2. Kyndryl: [Kyndryl's 2024 State of Mainframe Modernization Survey Report](#)

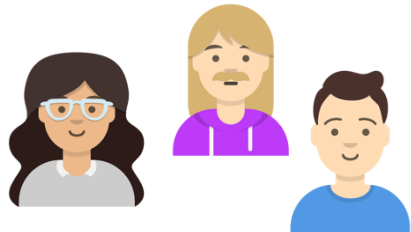
The challenges of Observability in a hybrid environment



Site Reliability Engineer



Mainframe SMEs



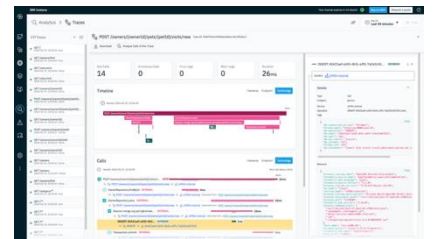
Application developers

Storage Overview

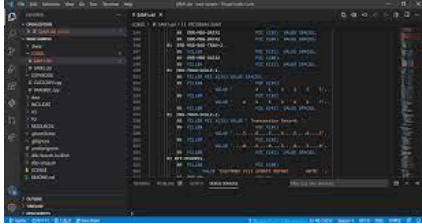
Group Name	Log Level	Group Size	Group Name	Free Space	Total Inodes	FS Type	Status
rs-catalogue-01	INFO	1000000	rs-catalogue-01	1000000	1000000	ext4	Healthy
rs-catalogue-02	INFO	1000000	rs-catalogue-02	1000000	1000000	ext4	Healthy
rs-catalogue-03	INFO	1000000	rs-catalogue-03	1000000	1000000	ext4	Healthy
rs-catalogue-04	INFO	1000000	rs-catalogue-04	1000000	1000000	ext4	Healthy
rs-catalogue-05	INFO	1000000	rs-catalogue-05	1000000	1000000	ext4	Healthy
rs-catalogue-06	INFO	1000000	rs-catalogue-06	1000000	1000000	ext4	Healthy
rs-catalogue-07	INFO	1000000	rs-catalogue-07	1000000	1000000	ext4	Healthy
rs-catalogue-08	INFO	1000000	rs-catalogue-08	1000000	1000000	ext4	Healthy
rs-catalogue-09	INFO	1000000	rs-catalogue-09	1000000	1000000	ext4	Healthy
rs-catalogue-10	INFO	1000000	rs-catalogue-10	1000000	1000000	ext4	Healthy

CPU Utilization Summary

Address Space	SAU10	CPU Percent	ICB Percent	SRB Percent	CPU Excluding Home SRU Time
BLH	0000	0.0	0.0	0.0	0.0
CLDHB8	0100	0.0	0.0	0.0	0.0
MSDWP	0140	0.0	0.0	0.0	0.0
XCFR8	0005	0.0	0.0	0.0	0.0
DEINSTR	0002	0.0	0.0	0.0	0.0
INDNAPL	0173	0.0	0.0	0.0	0.0
MDUW	01AC	0.0	0.0	0.0	0.0
DCIMSTR	010E	0.0	0.0	0.0	0.0
DDORIE	010C	0.0	0.0	0.0	0.0
WASITER	0001	0.0	0.0	0.0	0.0
RODTH	0002	0.0	0.0	0.0	0.0
RAPD	0002	0.0	0.0	0.0	0.0
TSPIC	0004	0.0	0.0	0.0	0.0
DUMSRV	0002	0.0	0.0	0.0	0.0
CRS	0002	0.0	0.0	0.0	0.0
SMSPDSE	0005	0.0	0.0	0.0	0.0
SHYDWP	0005	0.0	0.0	0.0	0.0
CONSOLE	000A	0.0	0.0	0.0	0.0
AMTSTR	000C	0.0	0.0	0.0	0.0
AMTADPSE	000C	0.0	0.0	0.0	0.0
DEWNA	000E	0.0	0.0	0.0	0.0



Non-Z IT operations

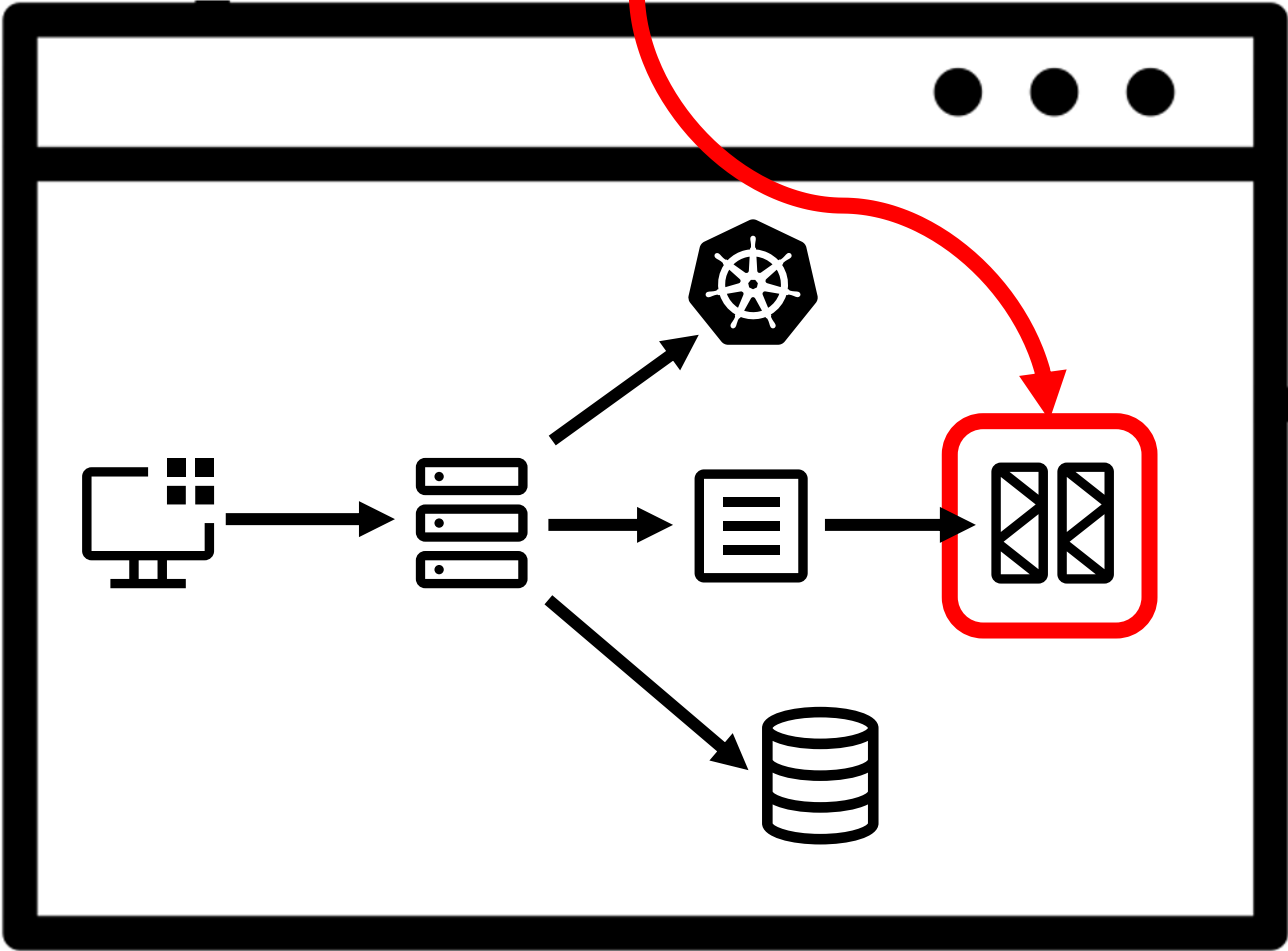


The absence of end-to-end observability...

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.**

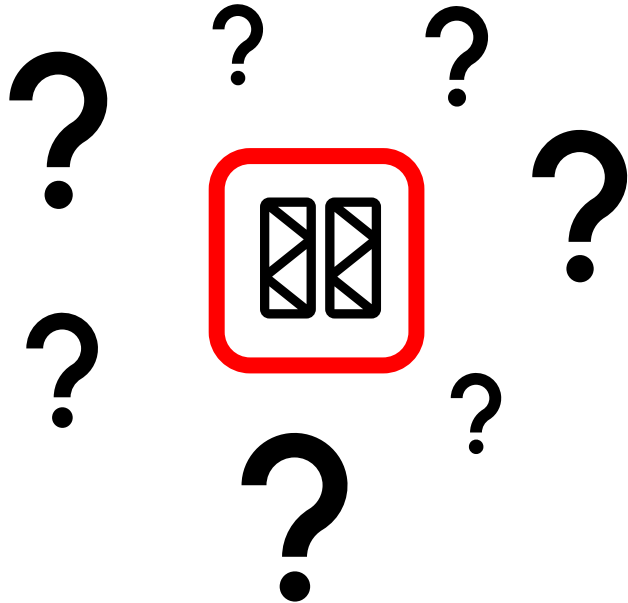


This single node represents the entire time the transaction spent on the “mainframe”! – Not good!



The absence of end-to-end observability

We need to address the problem fast...I'm not sure where the root cause of the issue is...lets convene the "war room" and everyone needs to join now!



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



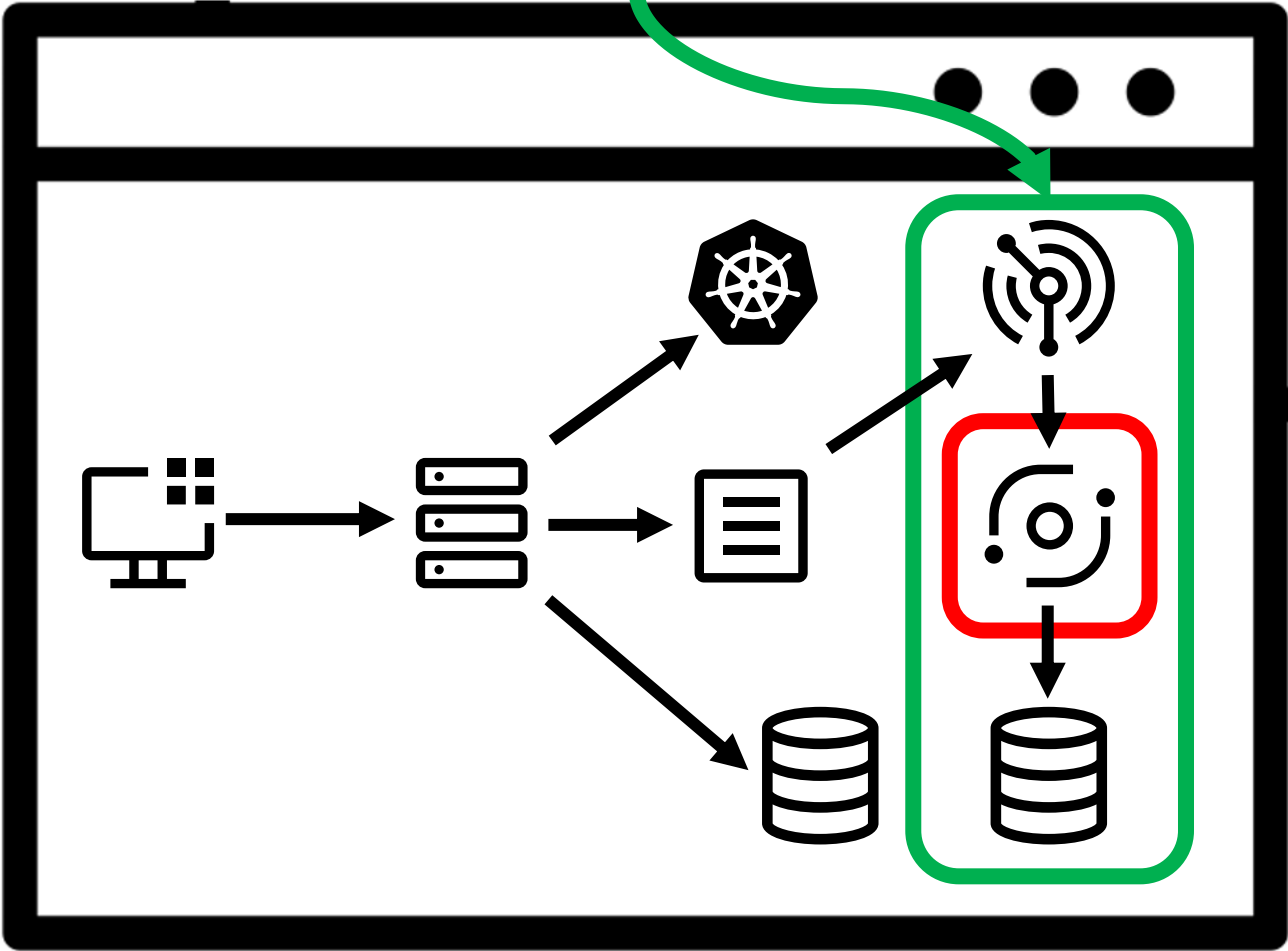
CICS SME

With 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 problem is within a CICS system. I'll reach out to our CICS expert right now to look closer**



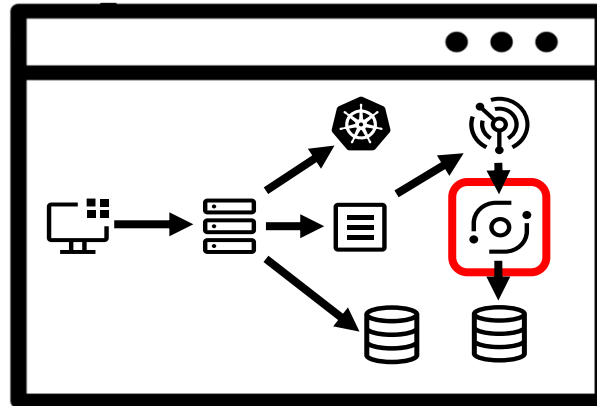
Now we can see this application called MQ on z/OS, CICS and Db2 on z/OS – complete end-to-end visibility



...faster engagement and time to resolve

It seems there is a slowdown coming from CICS. It appears to be stemming from *CICST11A* and task *56177* is associated.

Looking at details about the CICS region, I can see that the transaction rate on this region has dropped



Thanks for the heads up.

I'm going to investigate that CICS region, review the CICS task history, and take action immediately.



CICS SME

The emergence of hybrid application systems is pushing the need for standards around telemetry data

Blind spots in Observability weakens ability to manage and drives up time to resolve application problems

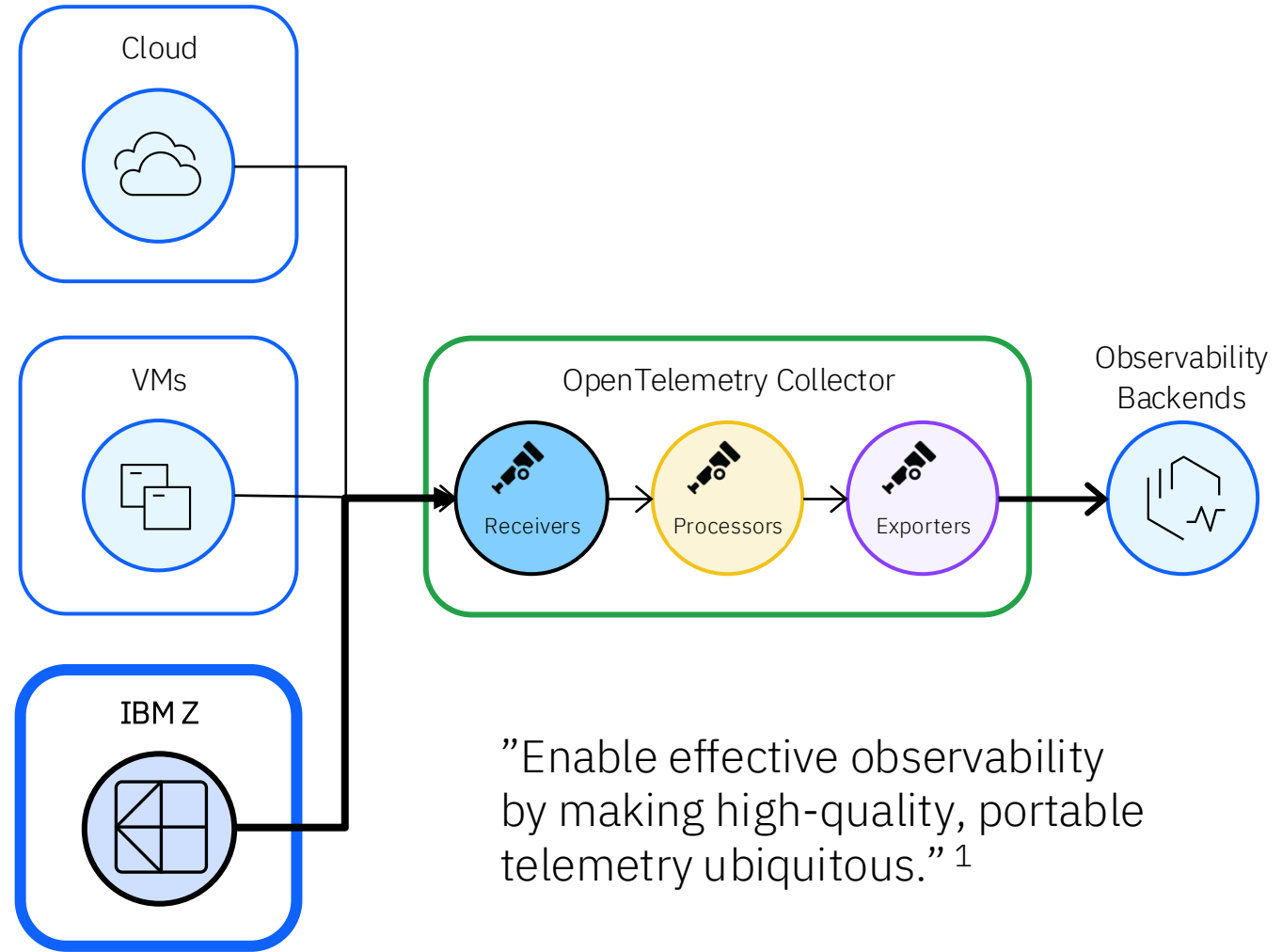
Is OpenTelemetry the solution?

What is OpenTelemetry?

OpenTelemetry is a vendor-agnostic observability framework that assists in generating, processing, and distributing telemetry data such as metrics, traces, and logs.

The mission of OpenTelemetry includes:

- Eliminate data fragmentation through a single standard that collects all required observability data
- Reduce (or eliminate) need for multiple data collection agents
- Promote interoperability through protocols like W3C to allow one standard that works with any platform



REFERENCE:

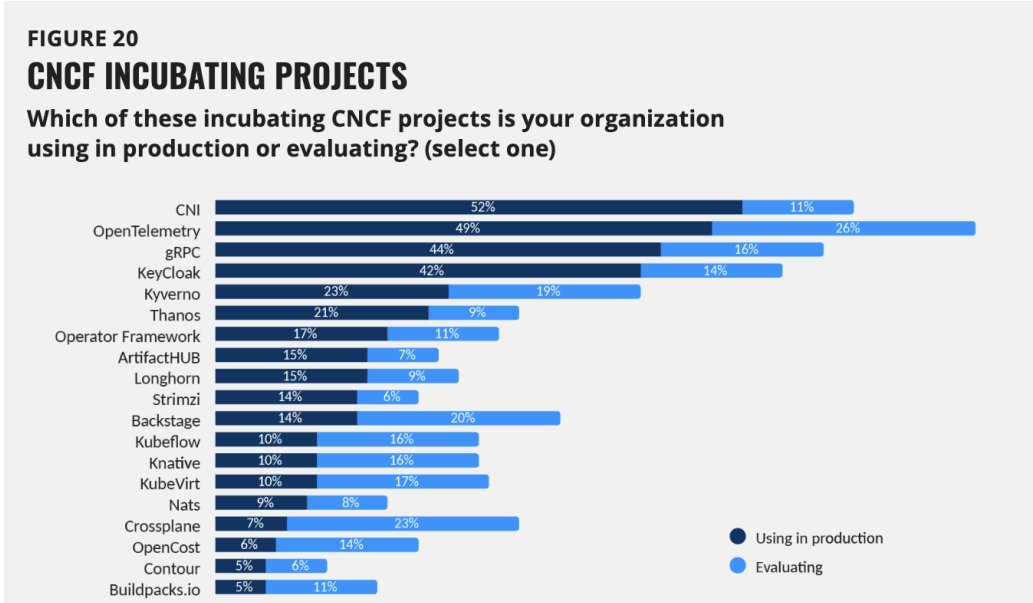
1 - <https://opentelemetry.io/community/mission/>

Are people adopting OpenTelemetry?

The 2025 CNCF Annual Cloud Native Survey indicated that 49% of respondents are using OpenTelemetry in production with a further 26% evaluating it¹

- 2024: 39% in production & 23% evaluating
- 2023: 32% in production & 29% evaluating

Continual adoption across observability vendors – both commercial and open source – with 100+ vendors claiming some level of support²



Ecosystem / Vendors

Vendors

Vendors who natively support OpenTelemetry

A non-exhaustive list of organizations offering solutions that consume OpenTelemetry natively via [OTLP](#), such as observability backends and observability pipelines.

Some organizations provide a [distribution](#) (of customized OpenTelemetry components), that provides additional capabilities or for improved ease of use.

Open Source (OSS) refers to a vendor who has an observability product that is [open source](#). The vendor may still have other products that are closed source, such as a SaaS offering that hosts an open source product for their customers.

Organization ¹	OSS	Commer- cial	Native OTLP	Learn more
Apache SkyWalking	Yes	No	Yes	skywalking.apache.org/...
Fluent Bit	Yes	No	Yes	docs.fluentbit.io/...
Jaeger	Yes	No	Yes	www.jaegertracing.io/...
OpenLIT	Yes	No	No	docs.openlit.io/...
Centreon	Yes	Yes	Yes	docs.centreon.com/...
ClickHouse	Yes	Yes	No	github.com/...
Elastic	Yes	Yes	Yes	www.elastic.co/...

REFERENCE:
 1 - <https://www.cncf.io/reports/the-cncf-annual-cloud-native-survey/>
 2 - <https://opentelemetry.io/ecosystem/vendors/>

Why is OpenTelemetry relevant for IBM Z?

Mainframe integration into enterprise observability

Enable end-to-end observability and eliminate the lack of visibility into the mainframe

Real time analysis and response

Businesses and complex hybrid application landscape require to respond to revenue-impacting issues in real time

OpenTelemetry-driven observability strategies

Enterprise observability strategies fully established around OpenTelemetry

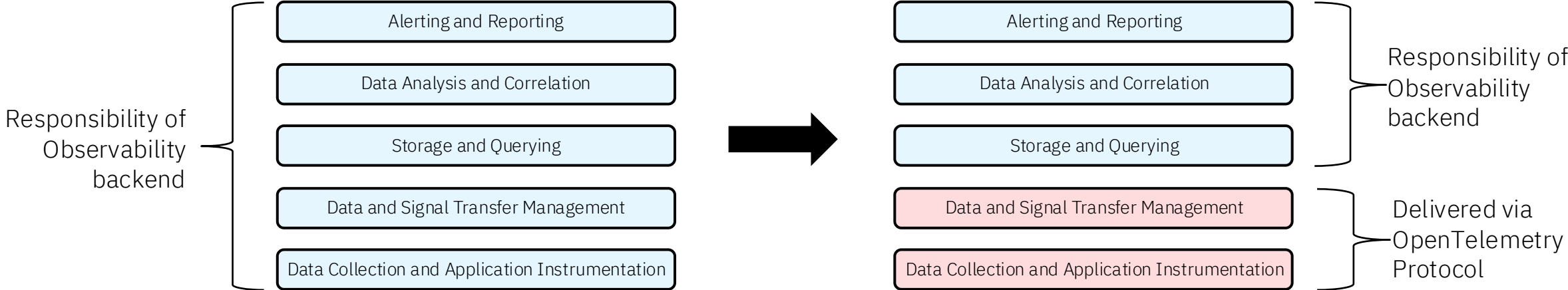
We are seeing interest from clients in Open Telemetry support

Telemetry data liberation

New applications and regulations require to make IBM Z telemetry data more easily accessible, usable and shareable across the enterprise

Desire to simplify the experience of collecting and consuming observability data across the platform.

The impact of OpenTelemetry




As more organizations adopt OpenTelemetry as their observability standard, the traditional value of commercial vendors (easier or comprehensive data collection) is potentially diminished.


Observability products must achieve differentiation through advanced analysis and correlation capabilities


Unified telemetry data layer with OpenTelemetry

 AI Ops

 Observability

 Telemetry Data

 Hybrid Cloud


 Service & Operations Management


 Observability Product#1


 Observability Product#2


 Observability Product#3



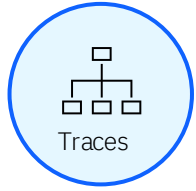
OpenTelemetry 

 Public Cloud

 Private Cloud

 IBM Z and LinuxONE

Signals: categories of telemetry



Traces

Traces allow to get visibility to the full “path” a request takes in an application.



Metrics

A metric is a measurement about a service, captured at runtime.



Logs

A log is a timestamped text record, either structured (recommended) or unstructured, with metadata.



Profiles

A Collection of stack traces containing an understanding of what code is responsible for resource consumption.

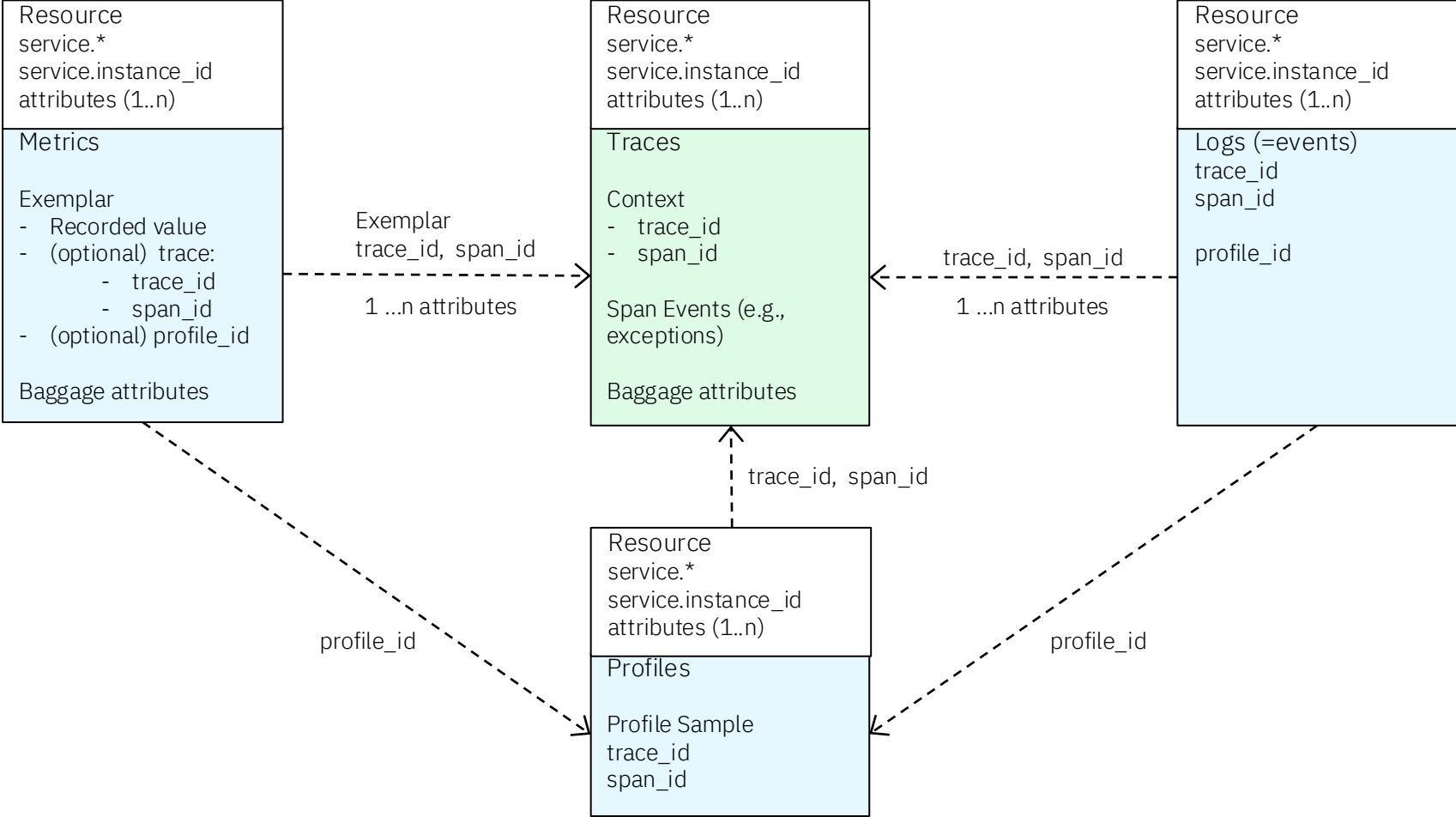
“To harness the true power of Observability, you need to treat these signals not as pillars, but as three strands that make up a braid”¹

REFERENCE:

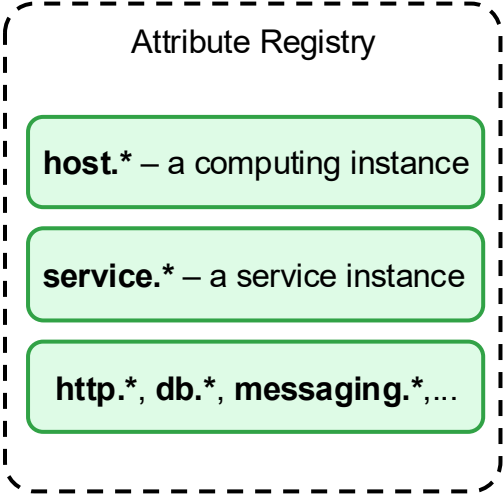
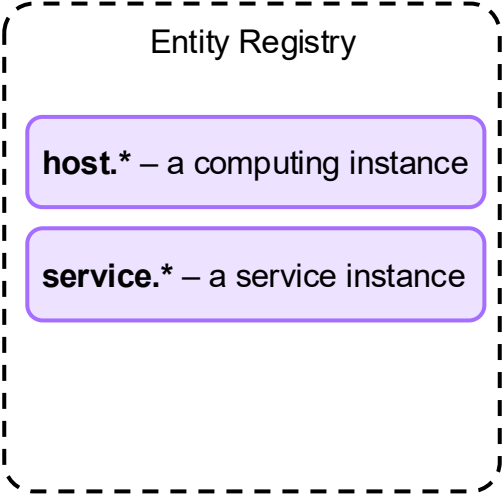
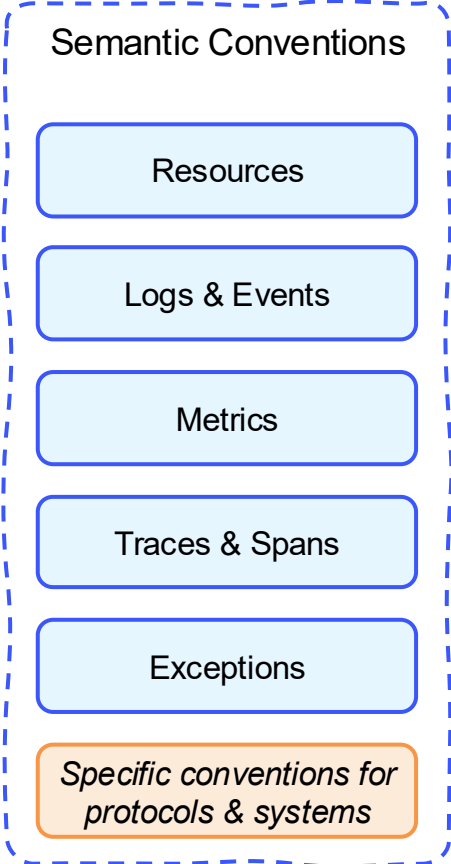
Signal Description - <https://opentelemetry.io/docs/concepts/signals/>

2 - <https://medium.com/womenintechology/storing-all-of-your-observability-signals-in-one-place-matters-36178cd0ce10>

Correlation between signals

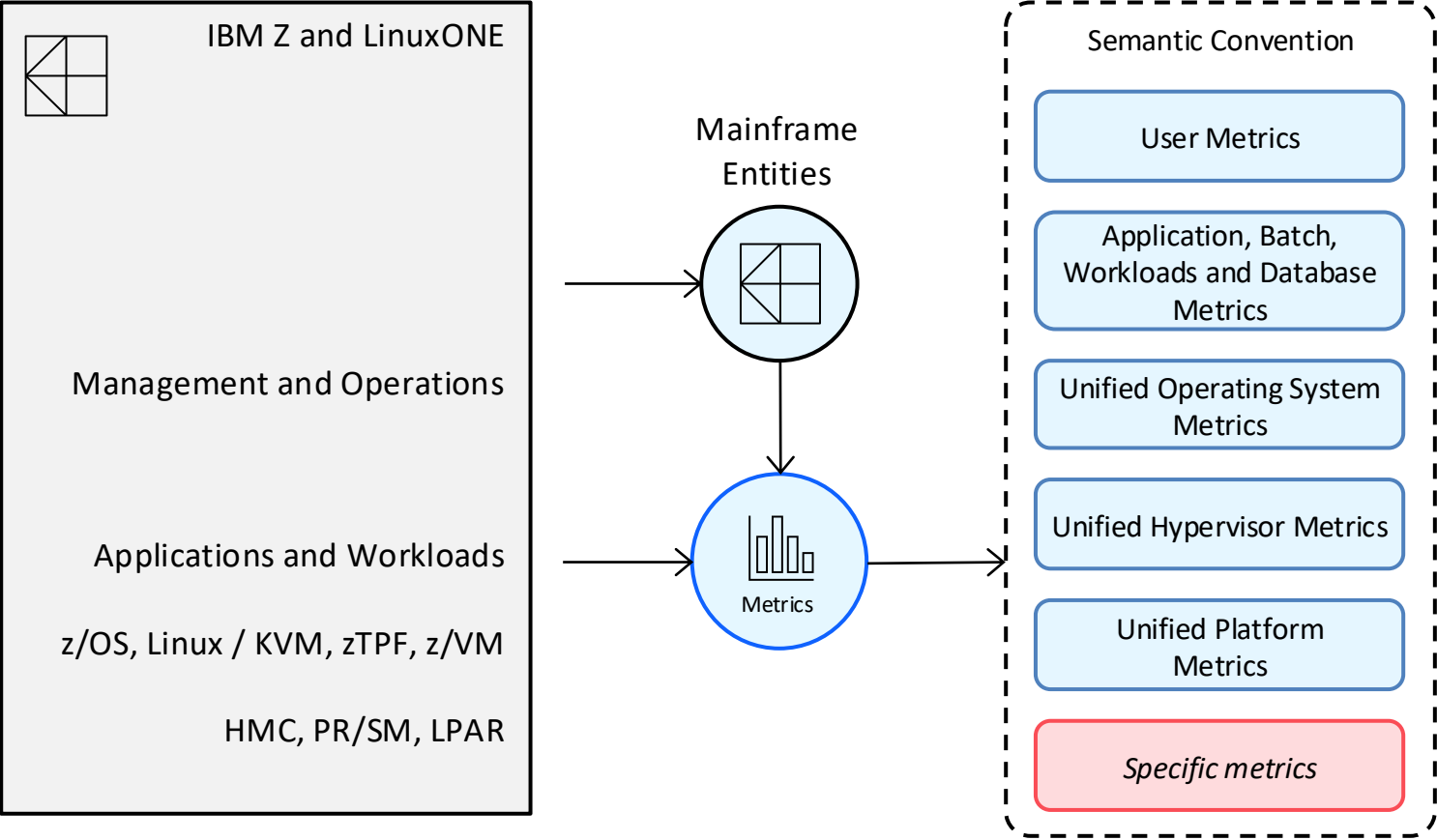


OpenTelemetry Semantic Conventions



```
model
├── {root-namespace}
│   ├── events.yaml
│   ├── metrics.yaml
│   ├── registry.yaml
│   ├── entities.yaml
│   └── spans.yaml
```

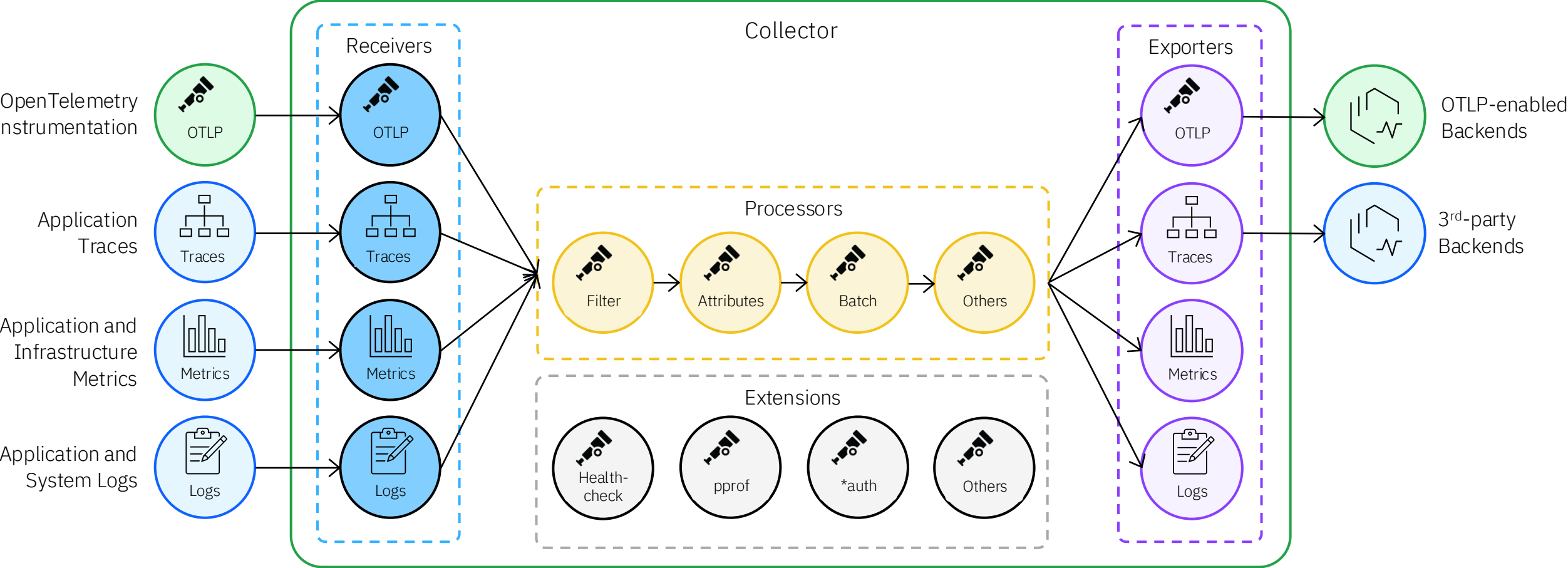
Semantic Conventions for IBM Z metrics



This requires a community-driven approach for success

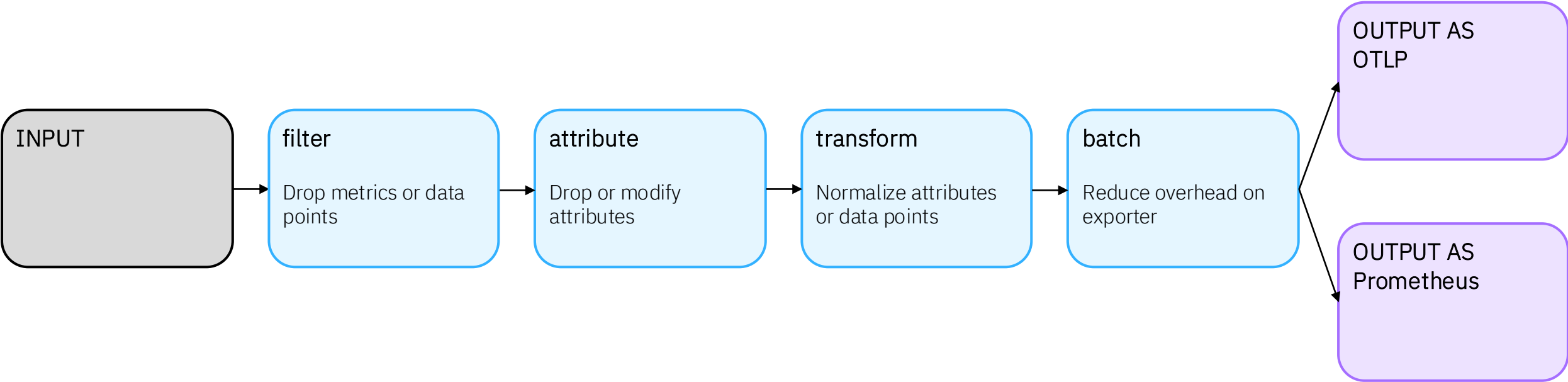
The OpenTelemetry for Mainframe SIG is focused on contributing Z specific semantics and attributes to support specific observability needs.

OpenTelemetry Collector



Source: [OpenTelemetry Collector](#)

Pipelines normalize telemetry data and reduce overhead



It is important to understand that OpenTelemetry is not a product.

Telemetry data can be consumed by many different observability backends, that will be responsible for the correlation, analysis, management and presentation

What is IBM doing to bring OpenTelemetry to IBM Z...

IBM's strategy for Observability on IBM Z and IBM LinuxONE: Adopting open, cross-platform observability standards

Objectives:



Enhance end-to-end observability by building on OpenTelemetry as core technology



Aid the simplification of the platform



Drive initiative across the IBM Z platform and IBM Z software



Facilitate OTLP telemetry export for all signal types using both native and agent-based instrumentation

Vision:

Ensure IBM Z is a first-class participant in enterprise-wide observability, supporting clients through the adoption and exploitation of standards like OpenTelemetry

A plan for OpenTelemetry across the Z pillars



z/OS

Agent led observability and metrics very mature on platform via SMF/RMF with syslog/joblog. Focus on enabling OpenTelemetry tracing to deliver end-to-end observability

Linux on Z

As Linux variant, OS and applications already support observability metrics. OpenTelemetry collector now available for Linux/s390x.

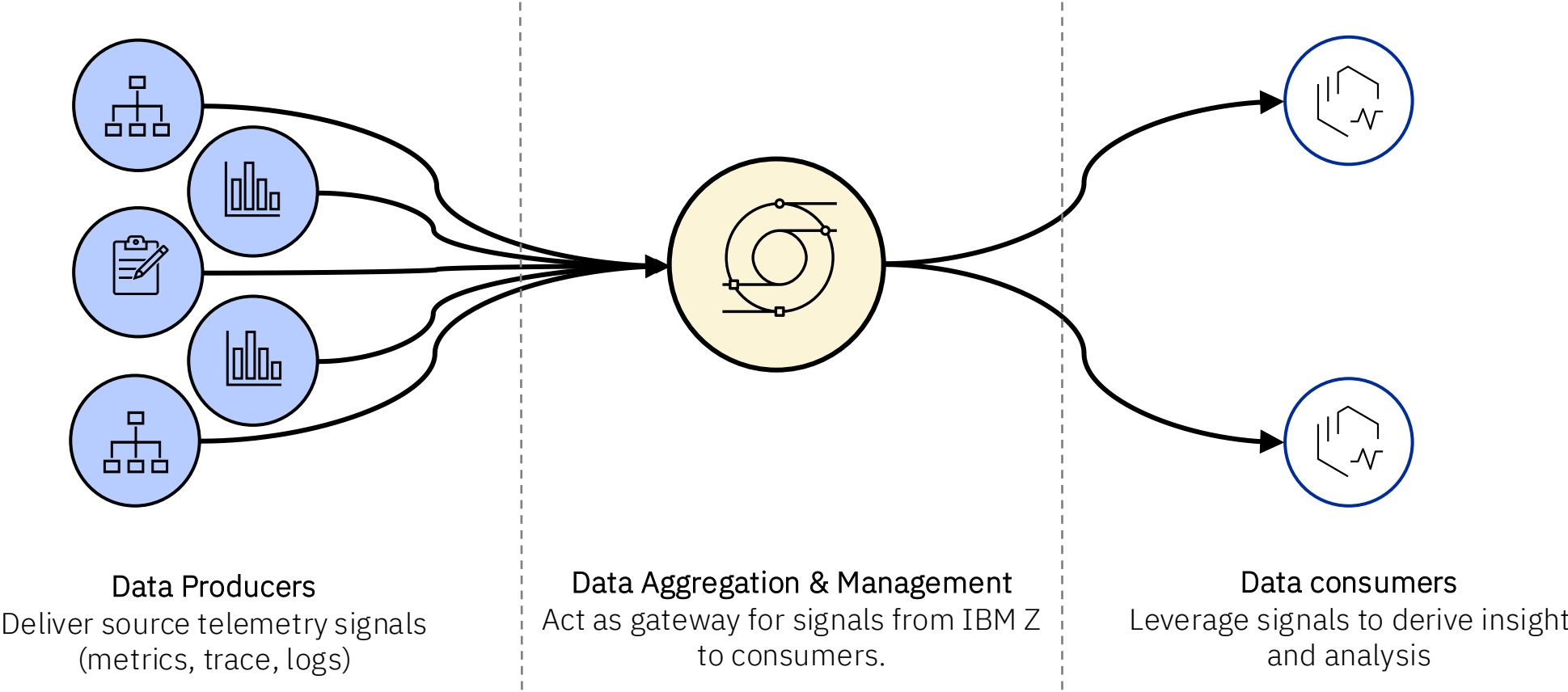
z/TPF

Support delivered for OpenTelemetry via enhancements to the tpfmtmc utility enabling trace and metric export

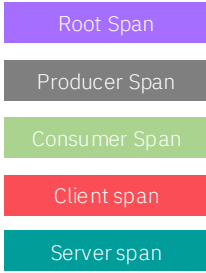
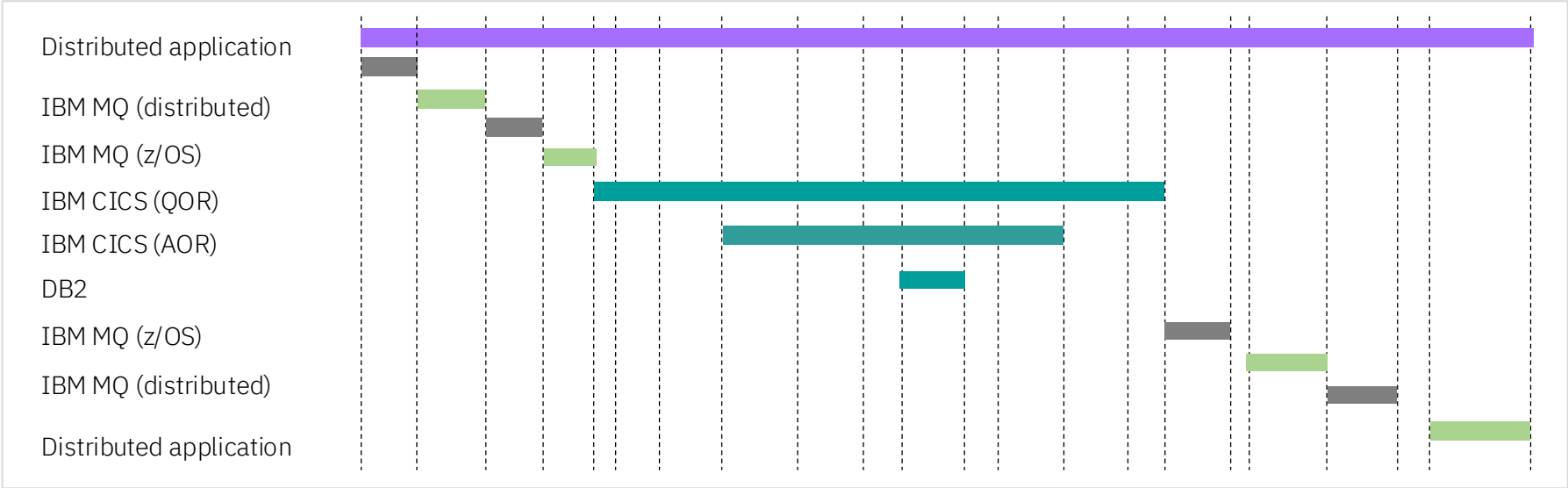
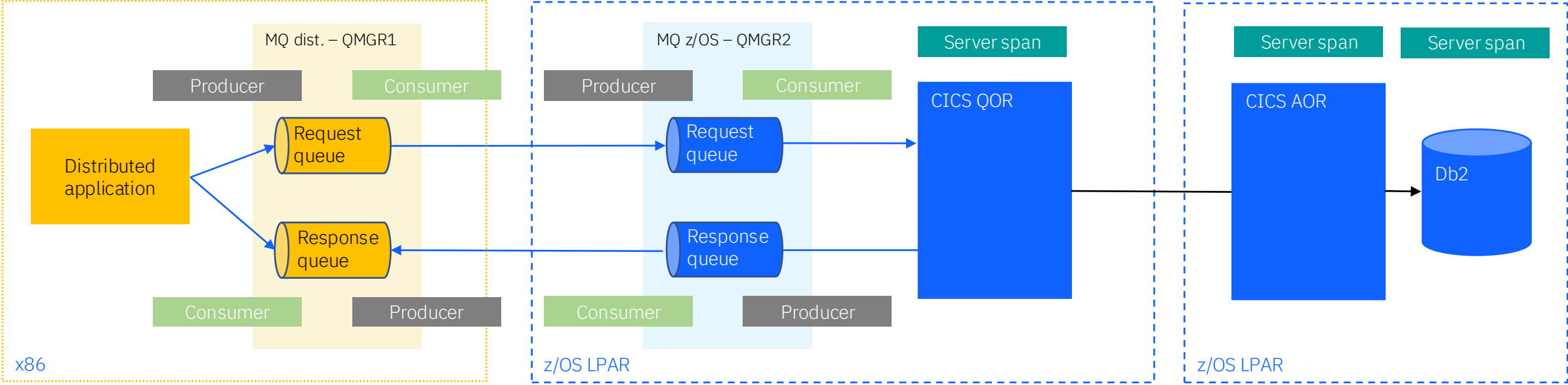
z/VM

Plans underway to deliver metrics support through OpenTelemetry formats.

Simplified adoption of OpenTelemetry on IBM Z from source to consumption

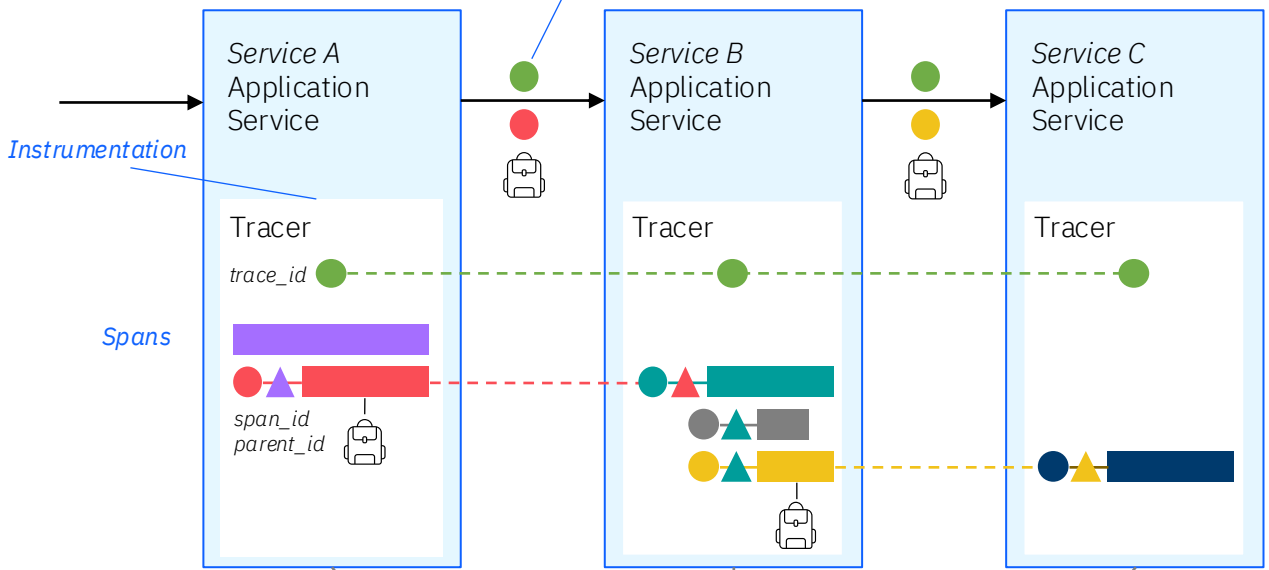


An example of Distributed Tracing

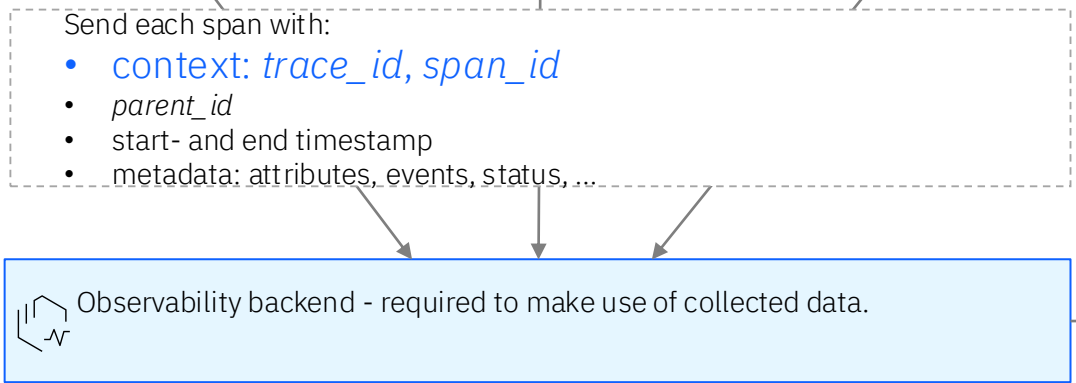


How Distributed Tracing works

(1) Context Propagation



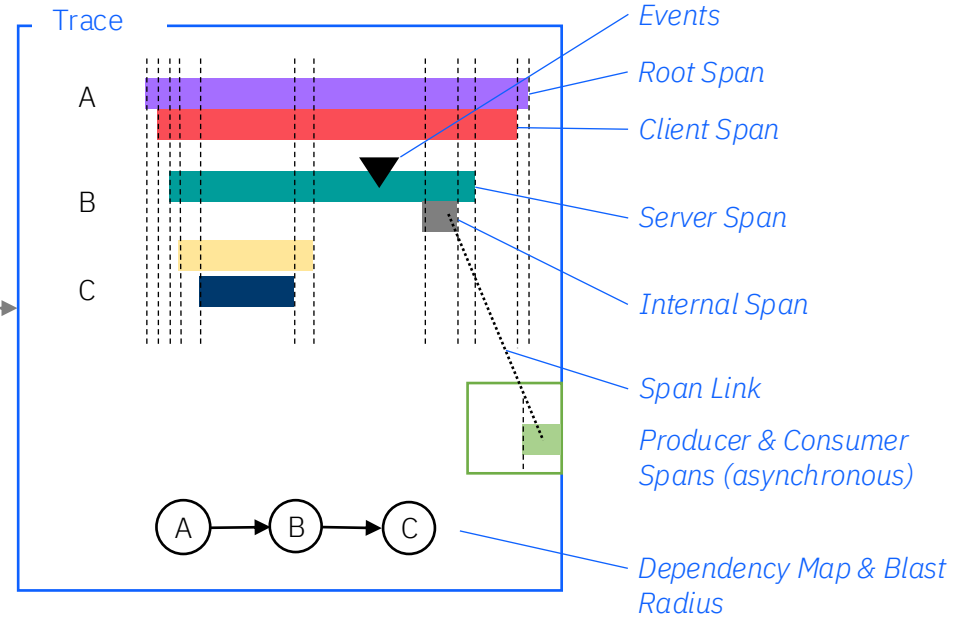
(2) Export of spans



Trace: single request and its path through a system of services

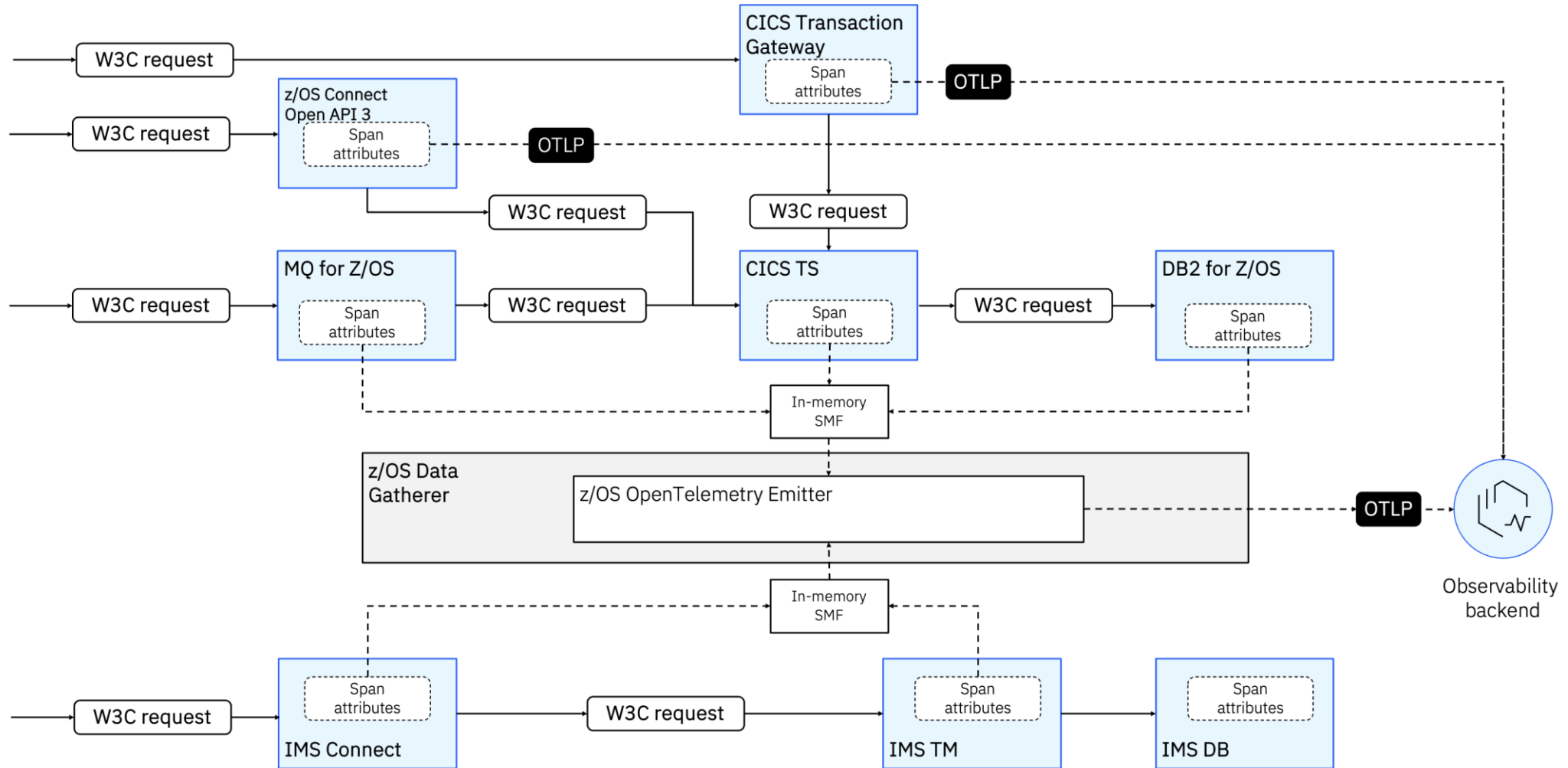
Span (timespan): represents a unit of work or operation

Tracers are part of the runtime and collect data.



Distributed Tracing for z/OS System Software

Available Now



Native Distributed Tracing – Initial Support

Required product releases and updates	IBM z/OS Data Gatherer PTF for z/OS OpenTelemetry Emitter on z/OS 3.1 and 3.2
	CICS Transaction Server for z/OS 6.3
	CICS Transaction Gateway 10.1 PTF
	IBM MQ for z/OS 9.4.3 and potentially 9.4.4. (additional functionality)
	z/OS Connect (OpenAPI 3) V3.0.96 (September 2025) and above
	Db2 V13 PTF
	IMS 15.6
	WebSphere Liberty – support already built-in with Telemetry MicroProfile and support of OpenTelemetry Java Agent

Deeper dives into native distributed tracing with OpenTelemetry this week

Tuesday

- 3:45pm – Enhanced IBM MQ Insights Through Observability and the Power of OpenTelemetry (Salon 17)

Thursday

- 10:30am - OpenTelemetry Tracing With CICS TS 6.3 (Salon 17)

Exposing metrics in OpenTelemetry

IBM Z Workload Scheduler

- Export metrics from master domain manager about job status and updates
 - Details: <https://www.ibm.com/docs/en/workload-automation/10.2.6?topic=scheduler-enabling-observability-opentelemetry>
 - Session: Tuesday 2:45pm - What's New in IBM Z Workload Scheduler V.10.2.x and Roadmap (Salon 21)

OMEGAMON

- Stream selected attributes to third-party consumers in various formats including OpenTelemetry
 - Details: <https://www.ibm.com/docs/en/odp/1.1.0?topic=introduction>
 - Session: Monday 3:45pm - Simplify Mainframe Operations with the Latest IBM Z OMEGAMON Enhancements (Salon 21)

More to come...

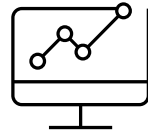
Introducing IBM Z Observability Connect

Formerly Z APM Connect

NEW



Demand for OpenTelemetry on IBM Z is growing, success is dependent simplicity of adoption



Observability platforms look to integrate trace, metrics and log signal types to provide end-to-end visibility



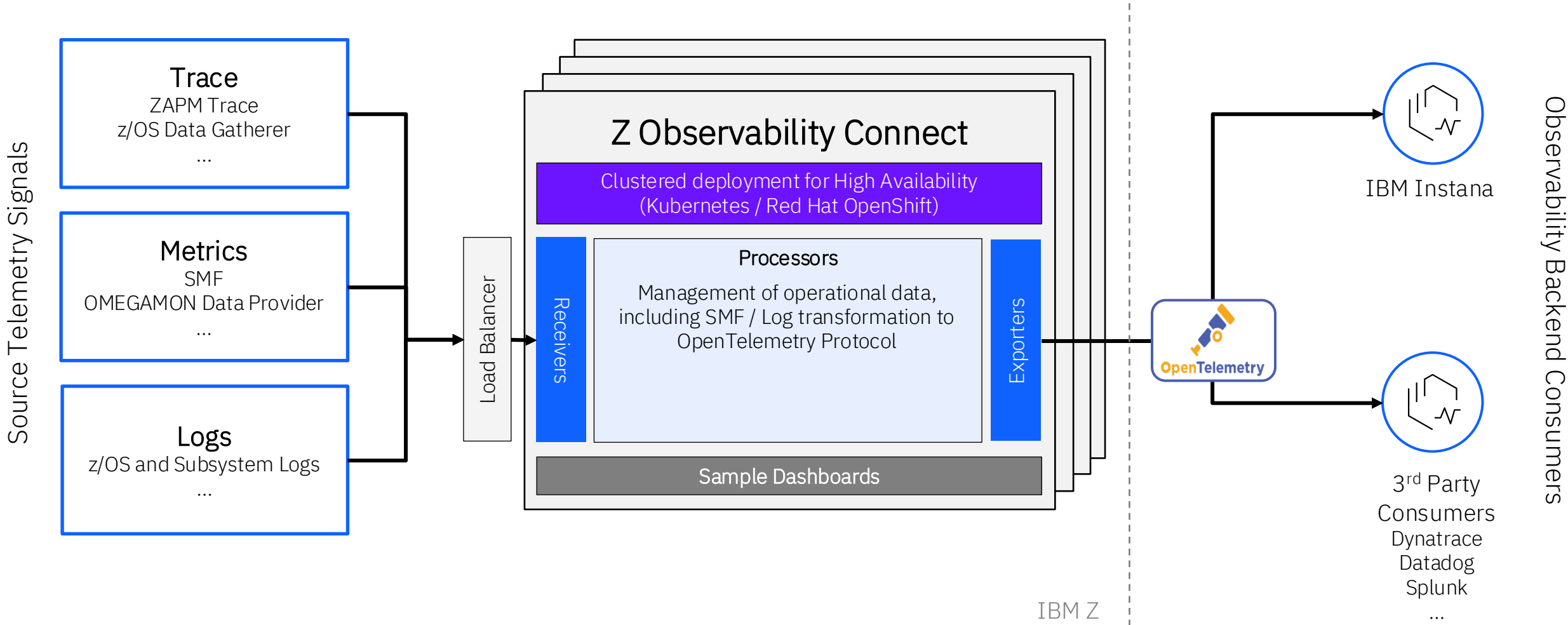
Clients are concerned about cost and management of enabling OpenTelemetry across critical z/OS resources

IBM Z Observability Connect is positioned to be the single data aggregator for mainframe operational data and deliver it to multiple consumers for observability of application and resources.

Announcement Details: [HERE](#)

Z Observability Connect V7.1

NEW



Expanding consumption of z/OS telemetry data

With OpenTelemetry support in Z Observability Connect, transaction flows together with metrics and log details can be surfaced within many different observability backend solutions that support OTLP ingestion

The presentation and analysis of the data will vary from solution to solution

All examples here are presenting trace data from z/OS using Z Observability Connect

The image displays a collage of six different observability tool interfaces, each with a green arrow pointing to it from a label on the left. The tools shown are:

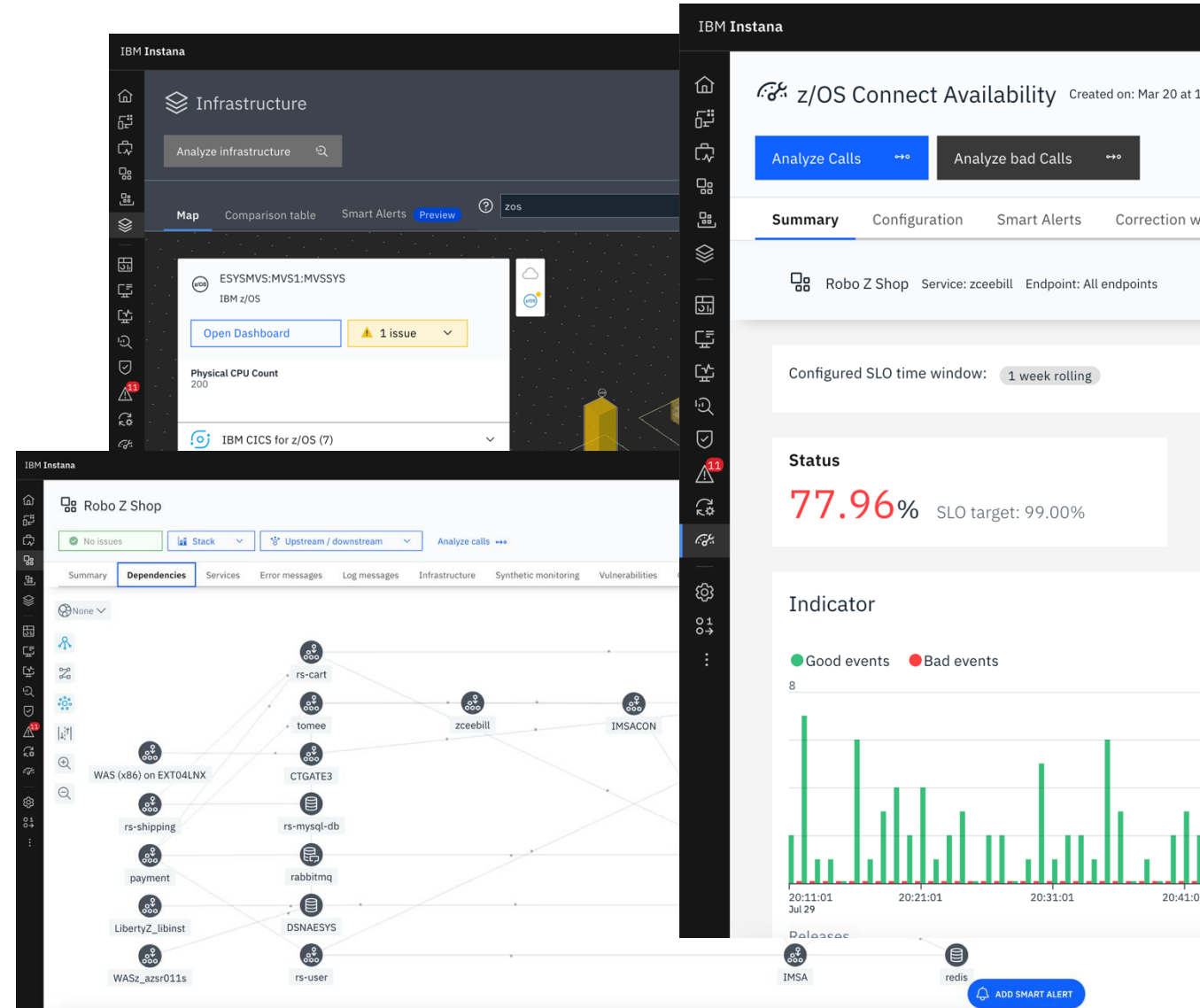
- Instana**: Shows a dashboard for 'Robo Z Shop' with an application map and various service nodes.
- AppDynamics**: Displays a 'DEMOAPPS' dashboard with an application flow map and transaction details.
- Grafana**: Shows a 'Tempo' trace viewer with a detailed view of a transaction and its spans.
- Jaeger**: Displays a 'Service & Operation' view for a specific transaction, showing its components and metrics.
- Splunk**: Shows an 'APM' dashboard with a table of services and their performance metrics, including latency and error rates.
- Dynatrace**: Displays a 'z/ceebill' dashboard with service maps and performance metrics over time.

Why Instana for enterprise-wide observability?

Not all observability platforms provide the same capabilities and out-of-the-box to deliver immediate value.

Key features from Instana include:

- Integrated IBM Z support
- 100% trace coverage to capture outlier performance issues
- **Ability to mix OpenTelemetry & Instana span data**
- Multiple perspectives (applications, infrastructure, website/mobile monitoring etc.)
- Define and manage Service Level Objectives
- Alerting with AI-based probable root cause analysis
- Integrated automation processes to take actions



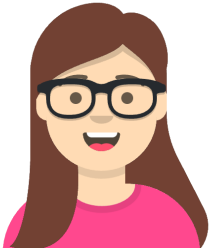
Application trace and infrastructure in context

OMEGAMON data within Instana

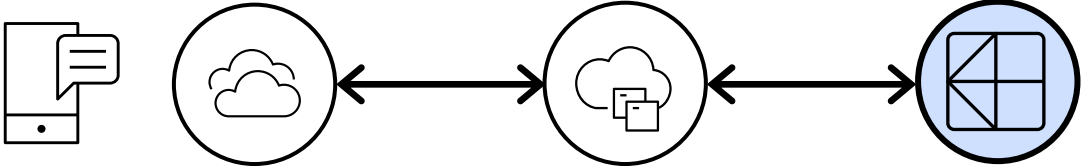
The image displays the IBM Instana monitoring interface, divided into three main sections:

- Dependencies (Top Left):** A dependency graph for 'Robo Z Shop' showing services like CTGATE2, rs-user, tomee, zceebill, IMSACON, IMSA, rs-mongodb, ims.db, DSNA, redis, dispatch, rs-catalogue, rs-cart, rabbitmq, rs-mysql-db, WASz_azsr011s, DSNAESYS, rs-shipping, LibertyZ_libinst, and EXT04LNX WAS.
- Calls (Top Right):** A list of 5 calls for 'Unspecified' (Trace ID: 35e12239282a27ff). The call details show a sequence: CICS563T (10,332ms) -> DBW2 (15ms) -> VSAM (<1ms). A red arrow points from the 'Calls' tab to the 'Calls' list.
- Infrastructure (Bottom):** A detailed view for 'JAO:CICS1AAA' showing various metrics and graphs:
 - Summary:** CPU Utilization (0), Storage Violations (0), Enqueue Waits (0), AIDS (0), ICES (6), SOS (N).
 - Transaction Rate:** A line graph showing a peak in transaction rate around 10:45:20.
 - Maximum Tasks Percent:** A line graph showing a spike in maximum tasks percent around 10:45:20.
 - Rates:** A line graph showing CPU Utilization, IO Rate, and Page Rate.
 - Performance:** A line graph showing Worst Region Performance Index and Queued Remote Requests.A red arrow points from the 'Infrastructure' section back to the 'Calls' list. A red box highlights the 'Infrastructure' dropdown menu in the call details, which is set to 'JAO:CICS1AAA'.

Observability and IBM Z



End User



Public Cloud

Private Cloud

IBM Z



End-to-end Observability for hybrid applications and underlying infrastructure



Site Reliability Engineer



Application Developer



Mainframe Subject Matter Expert

Ensuring the mainframe is at the center of an enterprise-wide observability strategy is essential for maintaining strategic application availability

Adoption of OpenTelemetry standard delivers insights in context enabling faster detection, isolation and resolution of operational issues

In summary

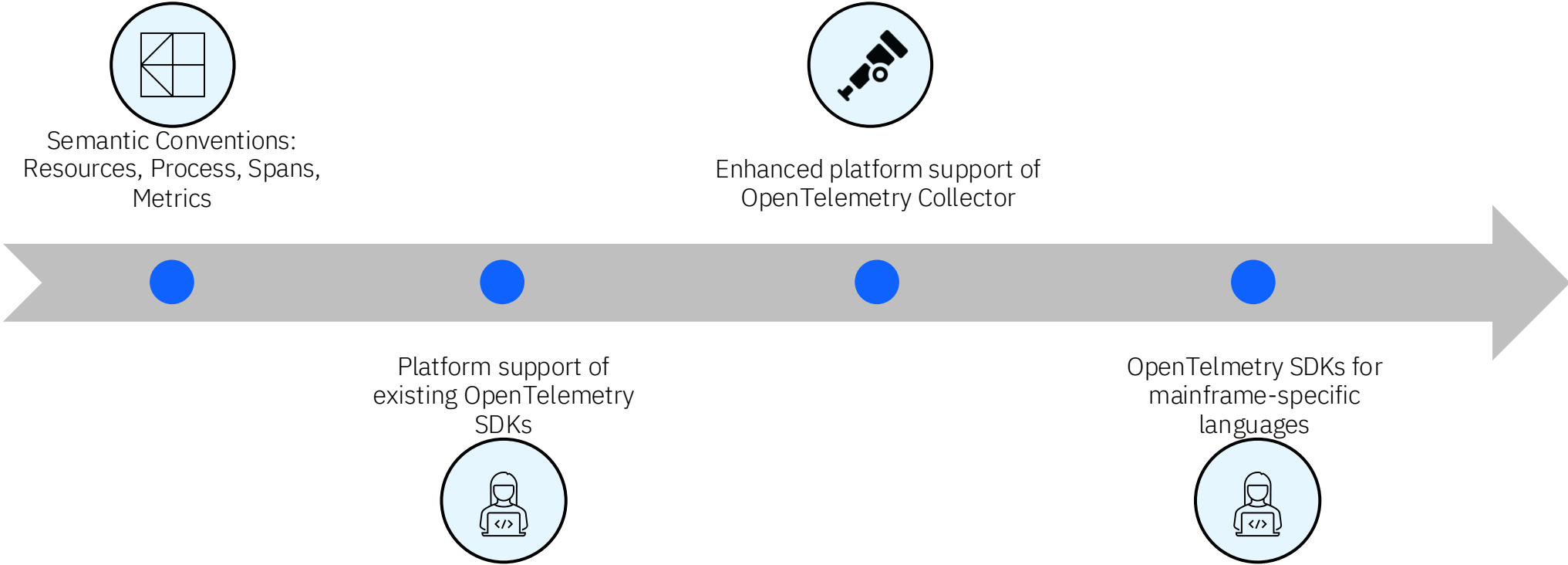
Observability is a critical discipline for modern IT operations to ensure that infrastructure supports the critical business application needs. These capabilities must be inclusive of essential enterprise platforms such as IBM Z in order to deliver **end-to-end insight from mobile to mainframe** to reduce time to isolate and resolve application problems

OpenTelemetry has emerged as a standard in the past 5 years to simplify the means of collecting and processing operational data from complex hybrid environments. However, observability backend remain critical for providing analysis and insight.

IBM Z Observability Connect has been enhanced to enable generation of and management of OpenTelemetry Protocol spans from z/OS subsystems to backend of choice. **IBM Instana** takes advantage of these capabilities and delivers high-value analysis, alerting and reporting on the data provided



Contribute to the OpenTelemetry on Mainframe SIG



Get approval from your organization to contribute to OpenTelemetry as a CNCF project (EasyCLA)

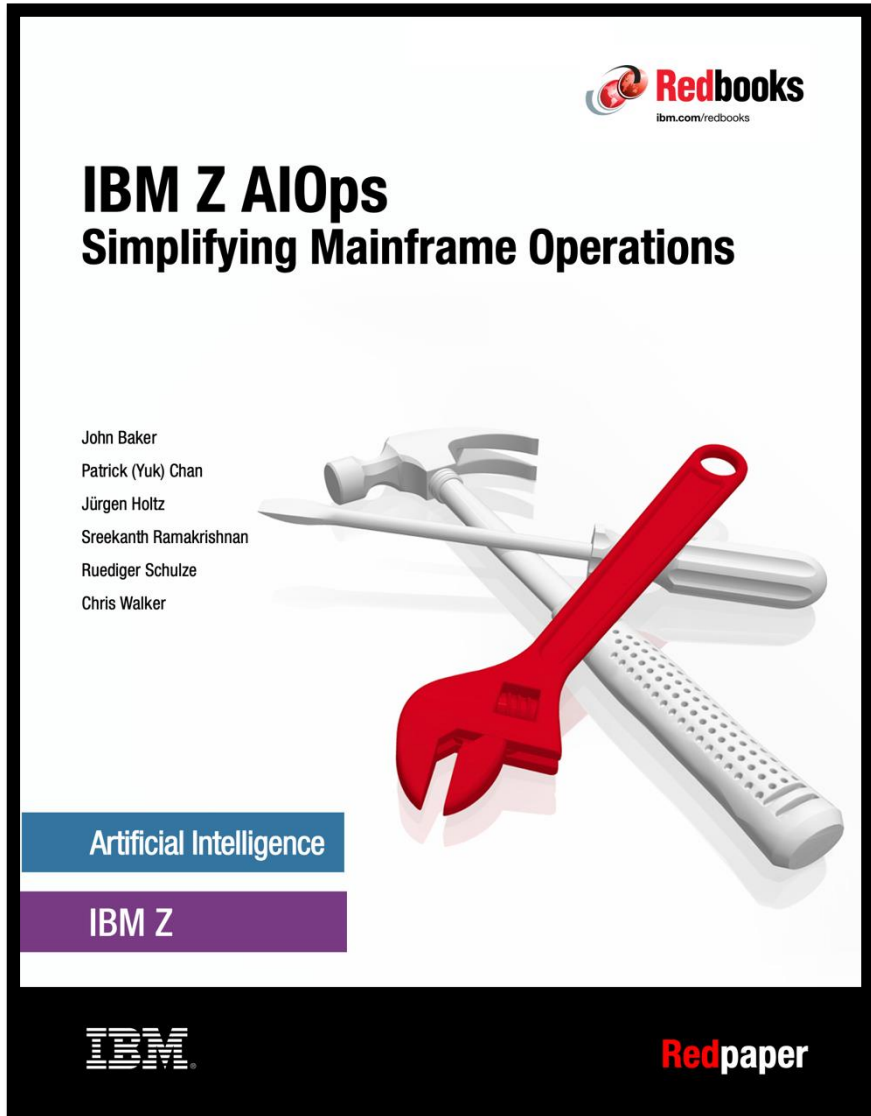
Join the SIG meeting on Wednesday, 1PM ET

- [Zoom meeting](#)
- [Meeting Notes](#)

Join the Slack: [#otel-mainframes](#)

We welcome long-time mainframers, returnees and those who are new to the platform and want to learn about mainframe technology.

New Redpaper



How can you simplify mainframe operations? To answer this question, this IBM Redbooks publication draws on Lean Thinking, which focuses on identifying waste and strain in any process.

By applying AI and machine learning technologies to mainframe operations, you can deliver improved efficiency and effectiveness.

Download your copy:

<https://ibm.biz/Redpaper-SMO-2025>



Observability and AIOps for IBM Z sessions at SHARE Orlando

Day	Time	Title	Featured Products
Monday	9:45 am	Data Center Automation - Z System Automation and Agentic AI	Z System Automation
	10:30 am	Using OpenTelemetry to Integrate the Mainframe Into Your Enterprise-Wide Observability Platform	Z Observability Connect, Instana
	1:15 pm	BYOD Lab: WXA4Z Agentic Hands-on Workshop	watsonx Assistant for Z
	1:15 pm	Intelligent Automation of a Hybrid Data Center With Next Generation of Z System Automation	Z System Automation
	2:30 pm	IBM Z NetView Technical Updates	Z NetView
	3:45 pm	Simplify Mainframe Operations with the Latest IBM Z OMEGAMON Enhancements	OMEGAMON
Tuesday	10:30 am	Stronger, Smarter Operations: How BPER Reinvented Data Resiliency Management with IZBR	Z Backup Resiliency
	2:30 pm	What's New in IBM Z Workload Scheduler V.10.2.x and Roadmap	Z Workload Scheduler
Wednesday	9:15 am	IBM Concert for Z, an AI-Powered Mainframe Resilience Platform: Solutions vs. Alerts	Concert for Z
	1:45 pm	BYOD Lab: AI Enabled Proactive Monitoring to Get the Most From Your System With IBM Concert for Z	Concert for Z
	2:30 pm	IBM Z Cyber Vault Explained - Soup to Nuts and Nose to Tail	Z Backup Resiliency
	3:45 pm	Using AI for Capacity Planning and Performance Management in Z	IntelliMagic
Thursday	10:30 am	IBM Z NetView Hints and Tips	Z NetView

Connect with IBM technical leaders and product management team:

Concert for Z	OMEGAMON	Z Observability Connect	NetView	Z System Automation	Z Workload Scheduler	IMS Tools
Domenico D'Alterio	Ash Mahay	Instana	Derrick Washington	Johannes Hausch	Domenico D'Alterio	Tracy Dean
Fabrizio Miatto		Chris Walker			Wolfgang Schaeberle	

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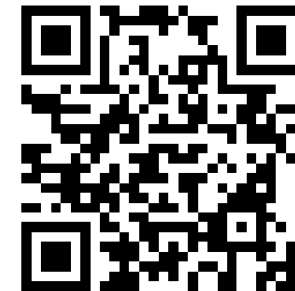
Find out more information using the QR code below.



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