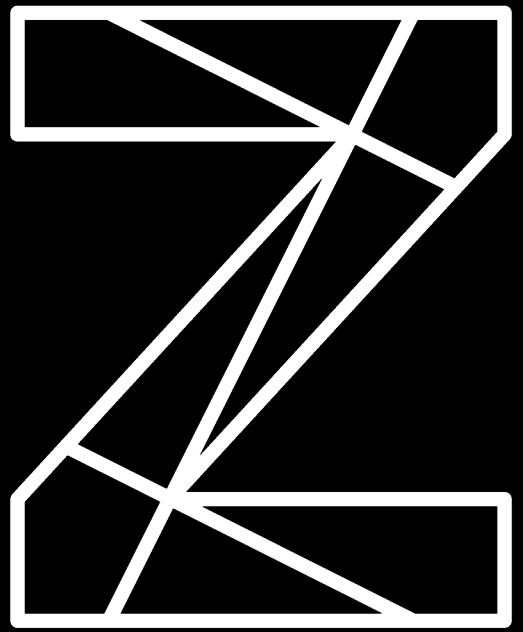
CICS Tools and Open Solutions

SS (Sang Soo) HAN
AP CICS Product Manager



Agenda

1. CICS Tools Update
2. Data Providers for CICS to dashboard solutions
3. Open Solutions with CICS

CICS Tools
Portfolio Overview

CICS VSAM Recovery for z/OS

Keep your systems functional in the event of a disaster by restoring data following either logical or physical damage

CICS VSAM Transparency for z/OS

Migrate VSAM data to Db2 simply and smoothly, without the need for rewrites

CICS Performance Analyzer for z/OS

Understand CICS performance, drive efficiencies, and plan for future workload growth

CICS Interdependency Analyzer for z/OS

Insight into CICS application relationships to make application changes with speed and confidence

CICS Configuration Manager for z/OS

Simply and safely manage complex CICS resource definition changes, with control and auditability

CICS Deployment Assistant for z/OS

Discover, visualize and manage CICS infrastructure to rapidly deploy new regions to meet demand

Updates

CICS Performance Analyzer:

- SupportPac CA10: Guidance on configuring Elastic to ingest CICS PA data

  RFE 166921: CICS PA Splunk App – Enqmgsum report
- RFE 139557: ‘Enhance CICS PA to process zOS Connect SMF data’

CICS Interdependency Analyzer:

- SupportPac CA1A: Provides RESTful APIs for CICS IA data
- RFE 127574: Show URIMAP name in CICS Command Flow

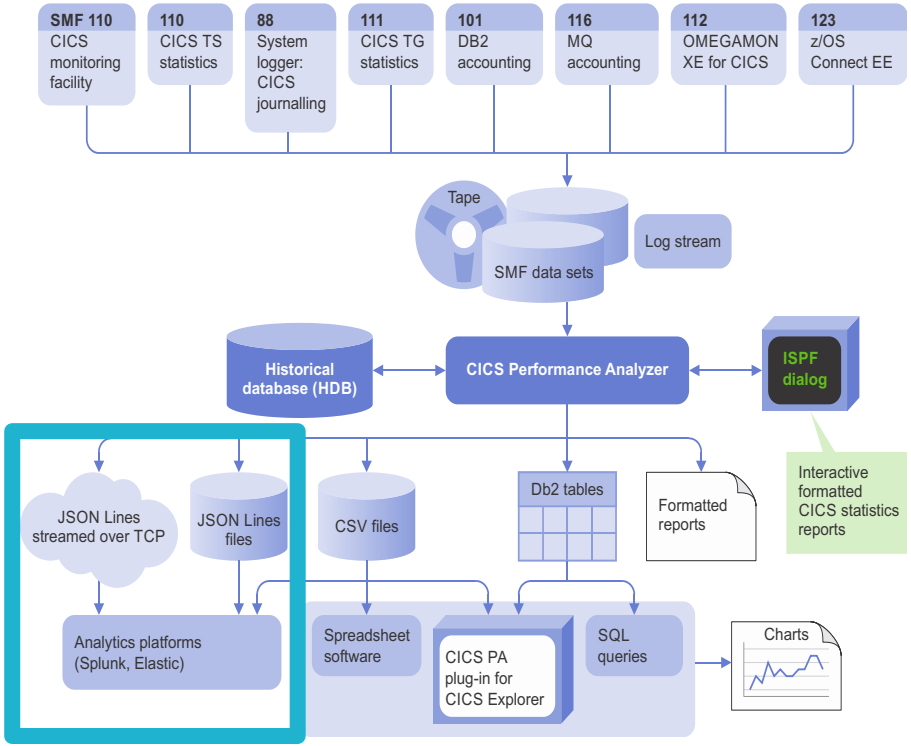
CICS Configuration Manager:

- RFE 143575: Provide a list of selectable Connection Names to determine the Server Connection details

CICS VSAM Recovery:

- RFE 15322: Add new fields into DWWJUP utility
- RFE 15327: CICS VR 4.2 Use of CLIST for generating forward recovery JCL
- APAR PH37907: improved log of logs scanning

IBM CICS Performance Analyzer for z/OS



- Update to SupportPac CA10 to provide guidance on how to configure the Elastic Stack to ingest CICS PA data (in addition to guidance on JSON Lines and Splunk)
- Find this here:
- https://www.ibm.com/support/pages/ca10-cics-performance-analyzer-zos-output-json-lines

IBM CICS Performance Analyzer for z/OS

Examples from the user documentation:

Configuring the Elastic Stack to use JSON Lines from CICS Performance Analyzer

Configuring the Elastic Stack to use JSON Lines from CICS Performance Analyzer involves three steps:

1. **Configuring Elasticsearch with an index template**
   to map all string values to the keyword data type
2. **Configuring Logstash**
   to ingest JSON Lines over TCP
3. **Creating an index pattern, or patterns, in Kibana**
   for data from CICS Performance Analyzer

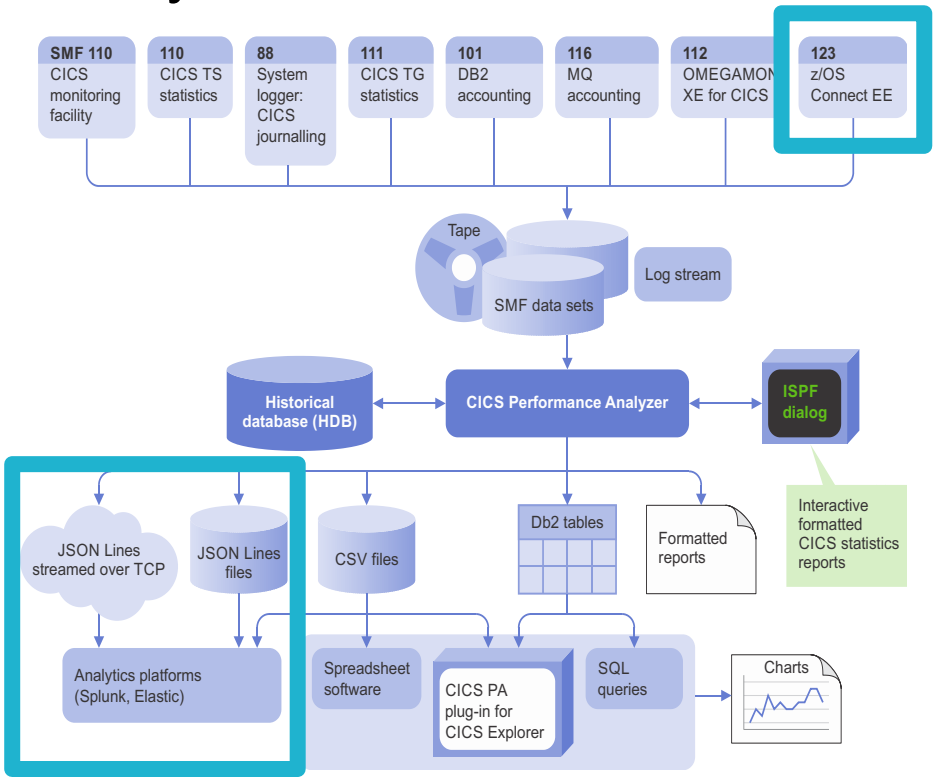
Running the Elastic Stack in a Docker container

If you have Docker, then you can use the following `docker run` command to start a container running the Elastic Stack (Elasticsearch, Logstash, and Kibana):

```
docker run -d -p 15601:5601 -p 19200:9200 -p 15046:5046 --name
elastic-740 sebp/elk:740
```

where `-p 15046:5046` defines the port mapping for the TCP port on which Logstash will be listening for JSON Lines from CICS Performance Analyzer.

IBM CICS Performance Analyzer for z/OS



- Update to CICS PA to enable reporting on SMF123 records for z/OS Connect EE:
- https://www.ibm.com/support/pages/apar/PH37264

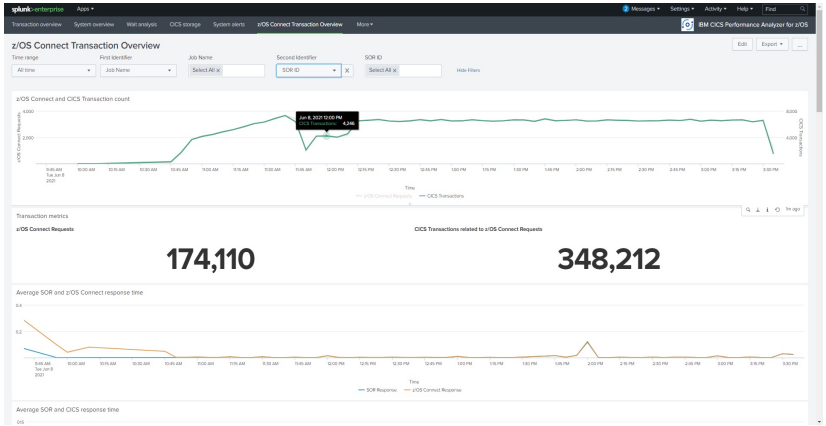
```
Shared System Definitions
New System
Command ===>
Specify the name and type of system.
System Name . . .
System Type . . .   1. CICS System
                    2. MVS Image
                    3. DB2 Subsystem
                    4. MQ Subsystem
                    5. System Logger
                    6. z/OS Connect
```

IBM CICS Performance Analyzer for z/OS

Examples of z/OS Connect EE Reports:

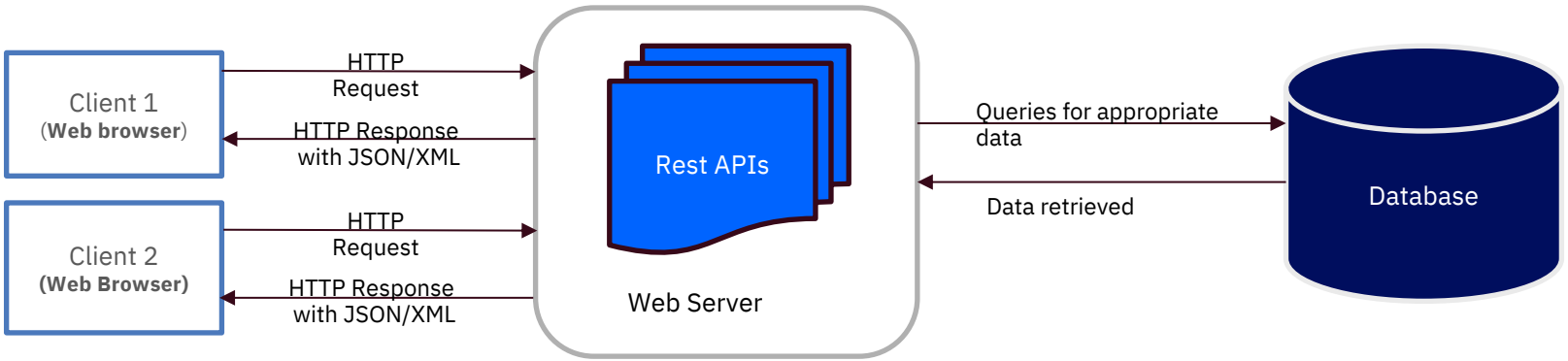
```
Jobname  : ZOSCONN   Jobid: STC15062  SID: MV22  SSI: ZCON  System: MV22     Sysplex: MV22      Date: 21/01/2021
User Name:                                                                   Mapped User Name:
API  Name: ec05                                                              API VRM: 1.0.0
Srv  Name: EC05service                                                       Srv VRM: 1.0.0
Client IP: 9.163.50.103
SOR Id   : GBIBMIYA.IY22TS55                                                 SP Name: CICS-1.0
SOR Res  : CSMI,EC05
Req Id   :          91  Req Type : API      Req Method: GET                  Req  Payload Len:       0
Resp Code: 200          Timed Out: N                                         Resp Payload Len:     264
Query String:

ZC Entry : 17:31:17.498741 SOR Sent : 17:31:17.500112 SOR Recv: 17:31:18.026770 ZC Exit  : 17:31:18.026999
ZC Resp  :         .528258 Sent Late:         .001370 SOR Resp:         .526659 Exit Late:         .000229 ZC Time:    .001600

APPLID   Tran Start    Dispatch User CPU  Suspend   TaskNo DispWait Disp1Dly RMI Elap JVM Elap   QR CPU   L8 CPU  CPUonCP  CPUonSP
         Time          Time     Time      Time             Time     Time     Time     Time     Time     Time     Time     Time
IY22TS55 CSMI 17:31:16  .000224  .000224  .526141    74576  .000030  .000004  .000000  .000000  .000202  .000000  .000224  .000000
IY3VZC13 CSMI 17:31:17  .001045  .000692  .000354      125  .000316  .000013  .000000  .000000  .000632  .000000  .000692  .000000
```

New z/OS Connect List report



z/OS Connect EE dashboards in the CICS Performance Analyzer Splunk app

REST APIs for IBM CICS Interdependency Analyzer for Z/OS

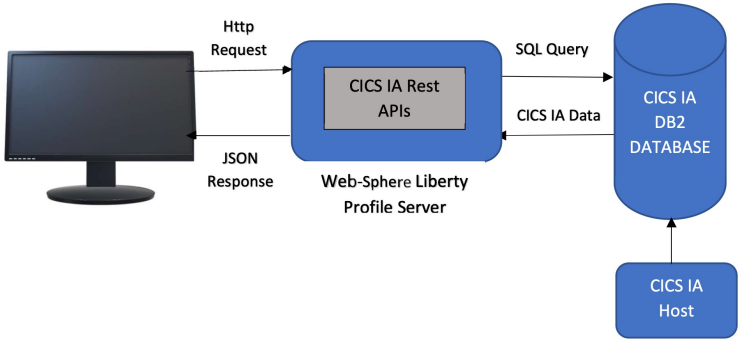


- REST APIs is an architectural style
- REST APIs are bundled as a Web Application and hosted on a Web Server
- Clients can fire HTTP requests which invokes the REST APIs
- REST API queries the DB for data, processes it, and sends HTTP response containing XML or JSON data.

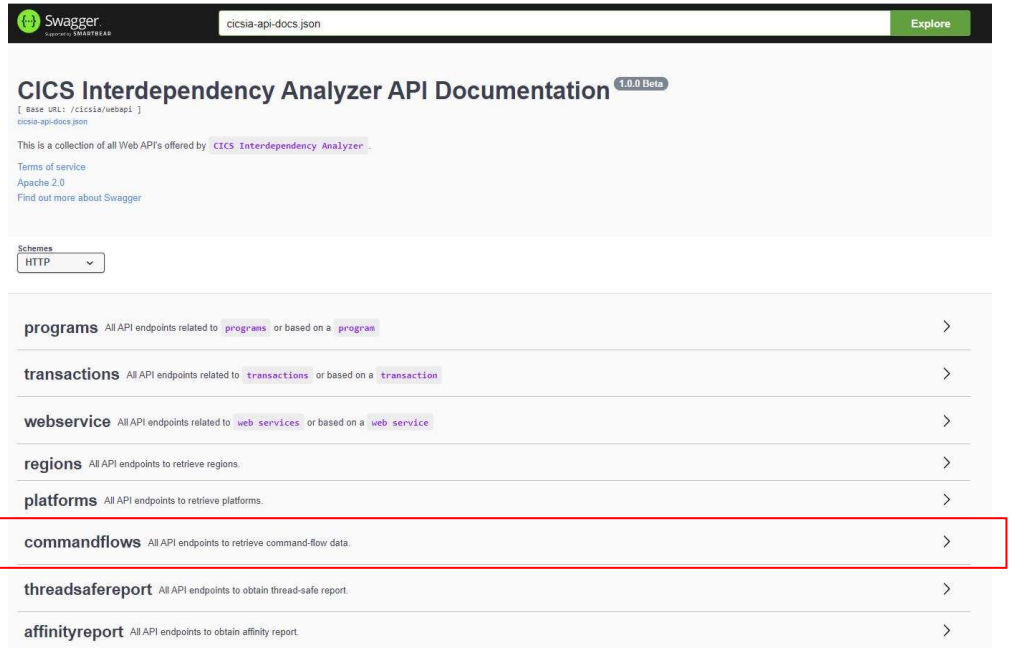
REST APIs for IBM CICS Interdependency Analyzer for Z/OS

CA1A: REST API for CICS Interdependency Analyzer for z/OS

https://www.ibm.com/support/pages/node/6378374



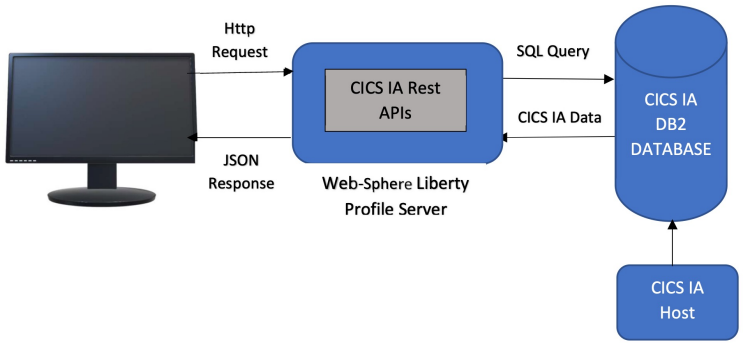
Component Diagram: Figure 1



The Advantages of REST APIs

CA1A: REST API for CICS Interdependency Analyzer for z/OS

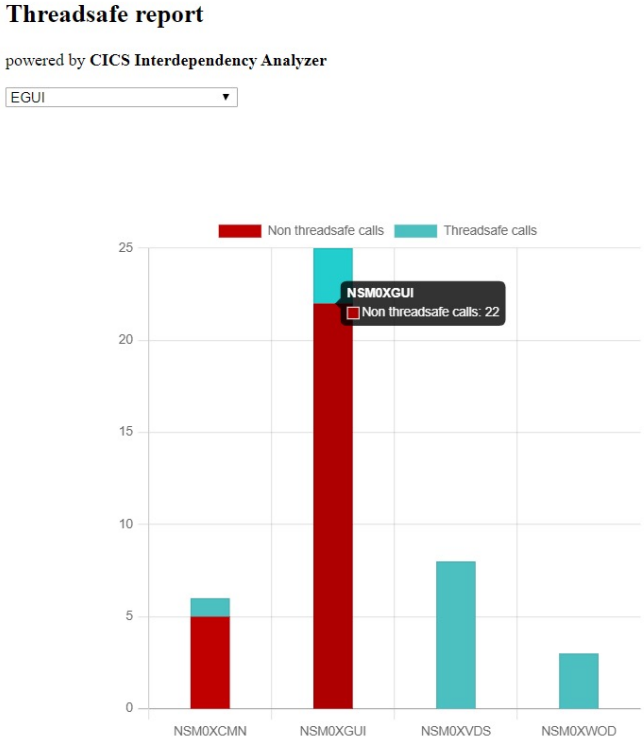
https://www.ibm.com/support/pages/node/6378374

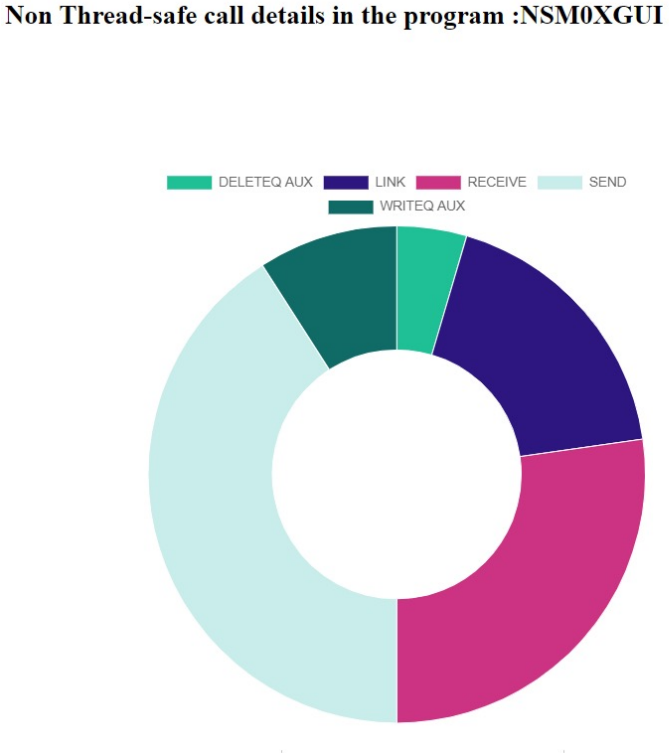


Component Diagram: Figure 1

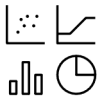
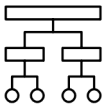
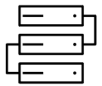
- Enables use of modern UI libraries for better visualization of data.
- REST API architecture enables loose coupling between UI and business logic.
- Enables easy integration with other tools.
- Generation of complex reports is possible by using modern reporting frameworks.
- Enables to create test cases for user applications based on data collected by CICS Interdependency Analyzer

REST APIs for CICS Interdependency Analyzer Sample UI – Threadsafe Report:





CICS Tools – Information

Creating/modernizing applications		CICS Interdependency Analyzer CICS Configuration Manager CICS VSAM Transparency
Monitoring existing applications		CICS Interdependency Analyzer CICS Performance Analyzer
Managing existing applications		CICS Configuration Manager CICS Interdependency Analyzer CICS Deployment Assistant
Troubleshooting		CICS Performance Analyzer CICS Interdependency Analyzer
Data recovery and replication		CICS VSAM Recovery

Links:

CICS Interdependency Analyzer
https://www.ibm.com/support/pages/ibm-cics-interdependency-analyzer-zos

CICS Configuration Manager
https://www.ibm.com/support/pages/ibm-cics-configuration-manager-zos

CICS VSAM Transparency
https://www.ibm.com/support/pages/ibm-cics-vsam-transparency-zos

CICS Performance Analyzer
https://www.ibm.com/support/pages/ibm-cics-performance-analyzer-zos

CICS Deployment Assistant
https://www.ibm.com/support/knowledgecenter/SSCLNZ/welcome.html

CICS VSAM Recovery
https://www.ibm.com/support/pages/ibm-cics-vsam-transparency-zos

Satish Tanna
Satish_tanna@uk.ibm.com

Nina Mirski-Fitton
nina.mirski-fitton@ibm.com

CICS Tools
Hints and Tips

CICS SMF data is too big to get a summary report in time. How can we handle this data quickly?
-> CICS PA has the EXTRACT function to divide the SMF data for each CICS region

Is there any option to get the CICS monitoring records for linked program or VSAM files?
-> Resource Class definition in CICS Monitoring

Is there any application API to get CICS monitoring records?
-> EXEC CICS COLLECT Statistics Monitor(DFHMNTDS) // DFHMNTDS : COBOL copybook for monitor

I don’t have DB2 for z/OS, but I want to store SMF data to a DB Tables, can I do it?
-> DB2 UDB is able to load the CICS SMF and Interdependency data and use CICS Explorer or REST API

Can I capture COBOL dynamic call trees in a transaction?
-> Command Flow function of CICS Interdependency Analyzer can capture COBOL dynamic call APIs with all other CICS, DB2, MQ APIs.

Data Provider Solutions to a dashboard

How to send the CICS SMF data or logs to an external dashboard system?

Real time? Or offline batch data sending?

IBM Common Data Provider

Omegamon Data Provider

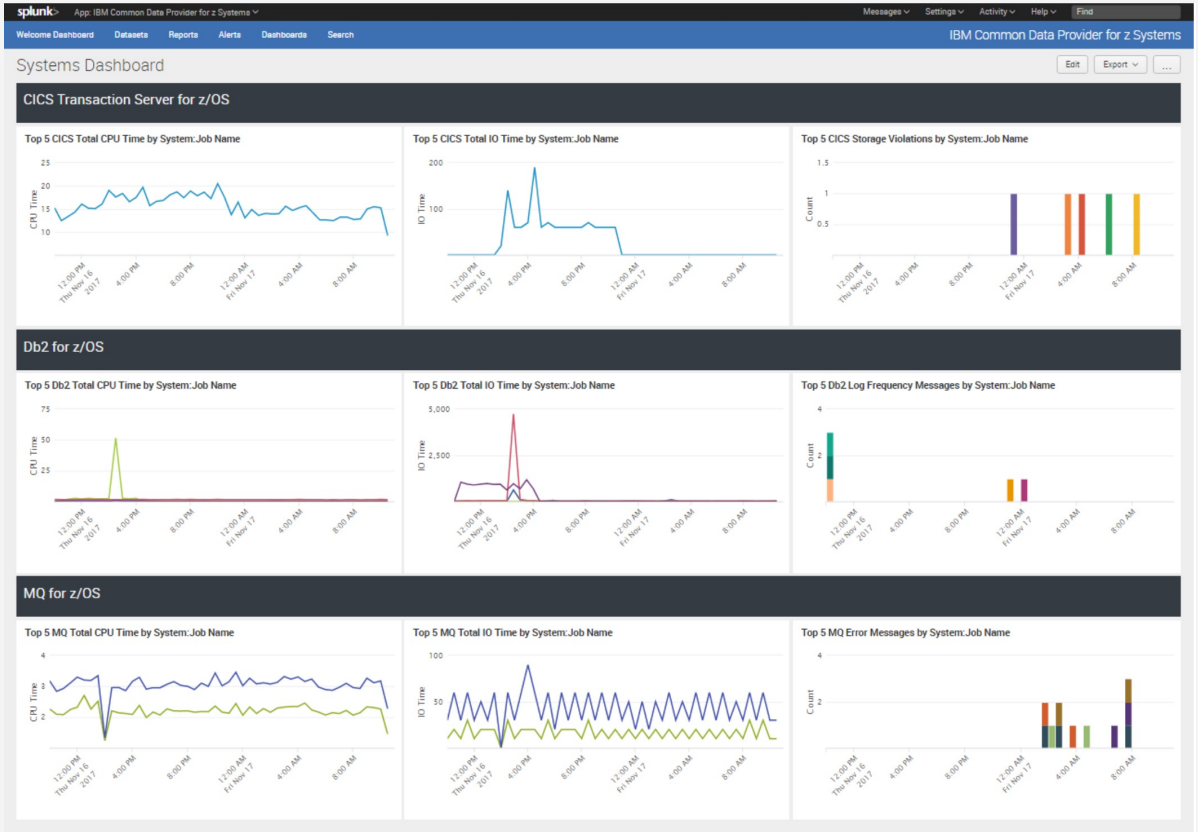
IBM Z Common Data Provider

* Pre-defined Splunk Dashboard

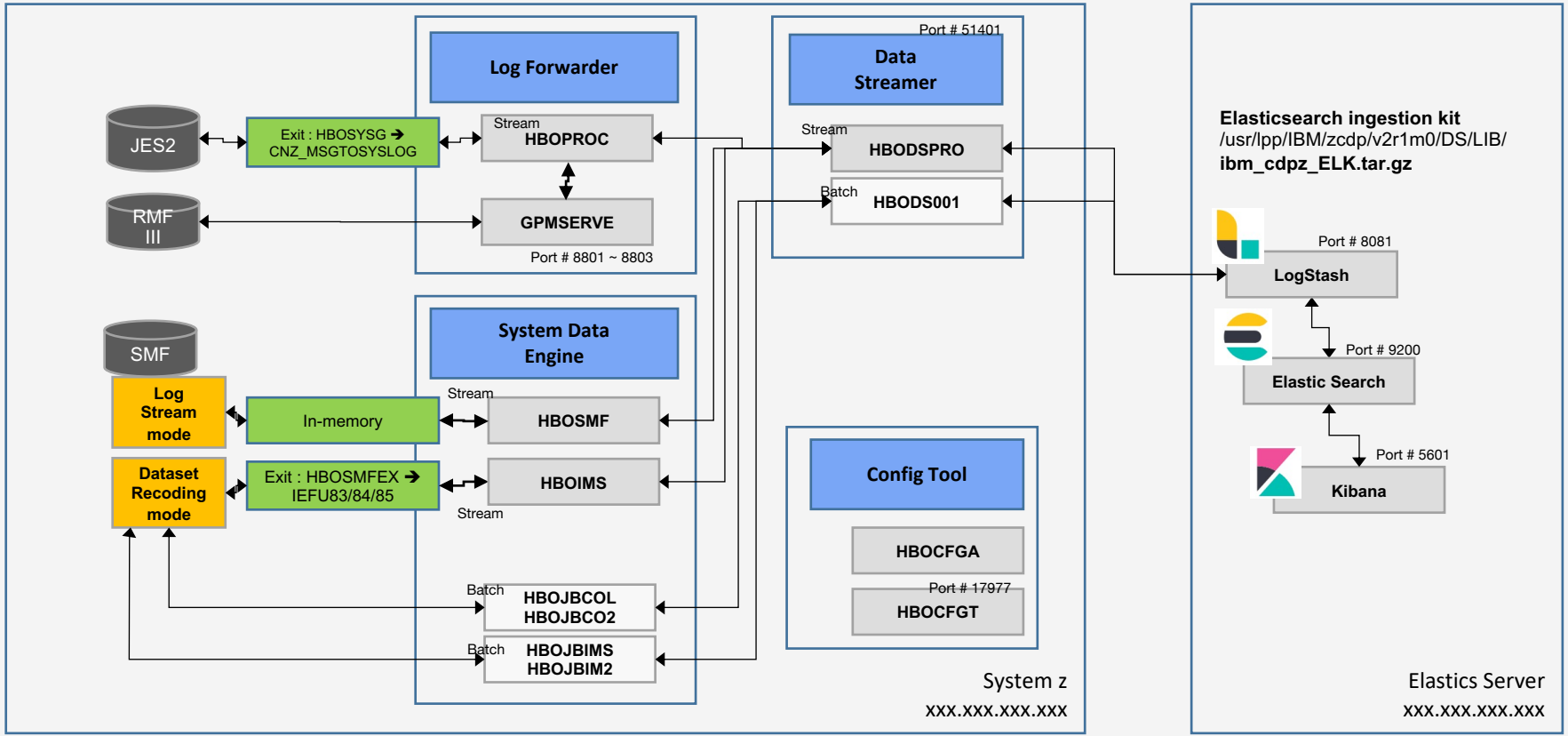
IBM® Z Common Data Provider provides the infrastructure for accessing IT operational data from z/OS® systems and streaming it to the analytics platform in a consumable format.

It is a single data provider for sources of both structured and unstructured data, and it can provide a near real-time data feed of z/OS operational data, like System Management Facilities (SMF) data and z/OS log data to your analytics platform.

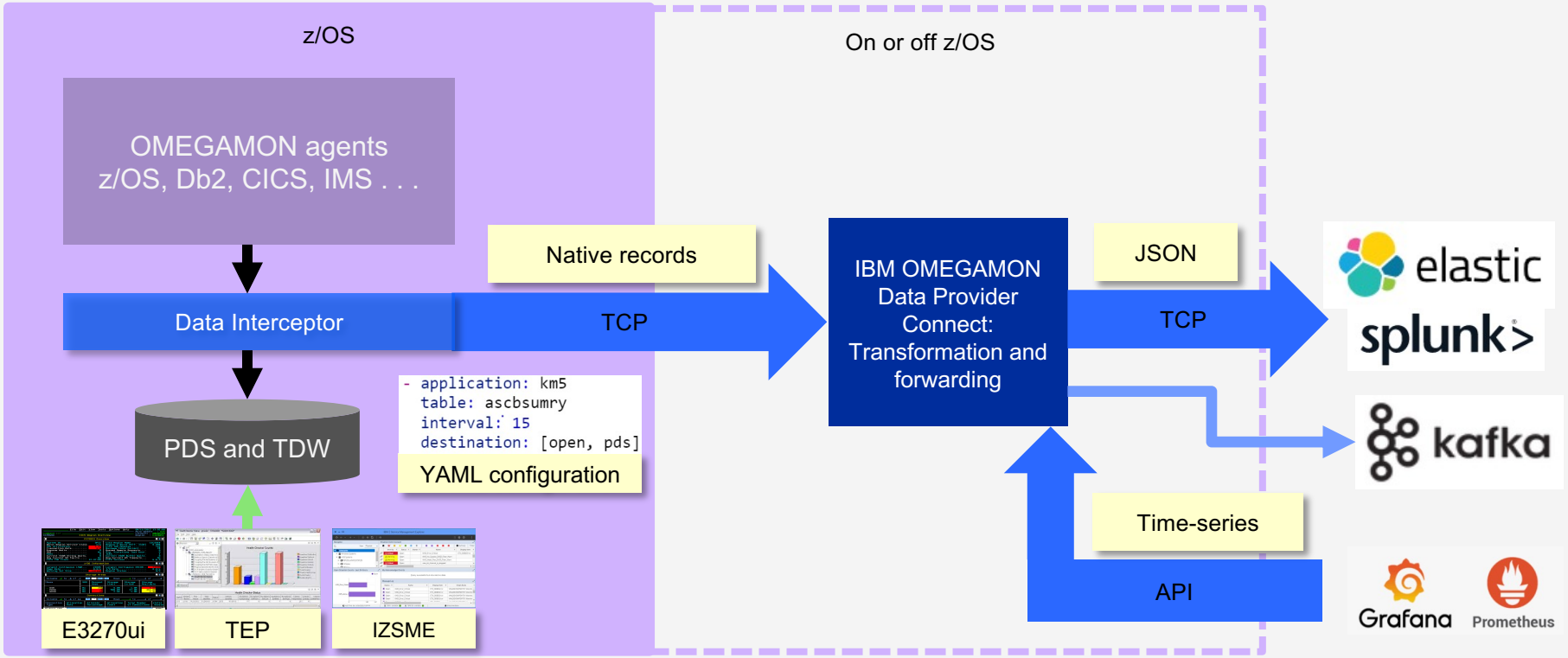
IBM Z Common Data Provider automatically monitors SMF data and z/OS log data, it can collect SMF data and z/OS log data, and forwards it to the configured destination.



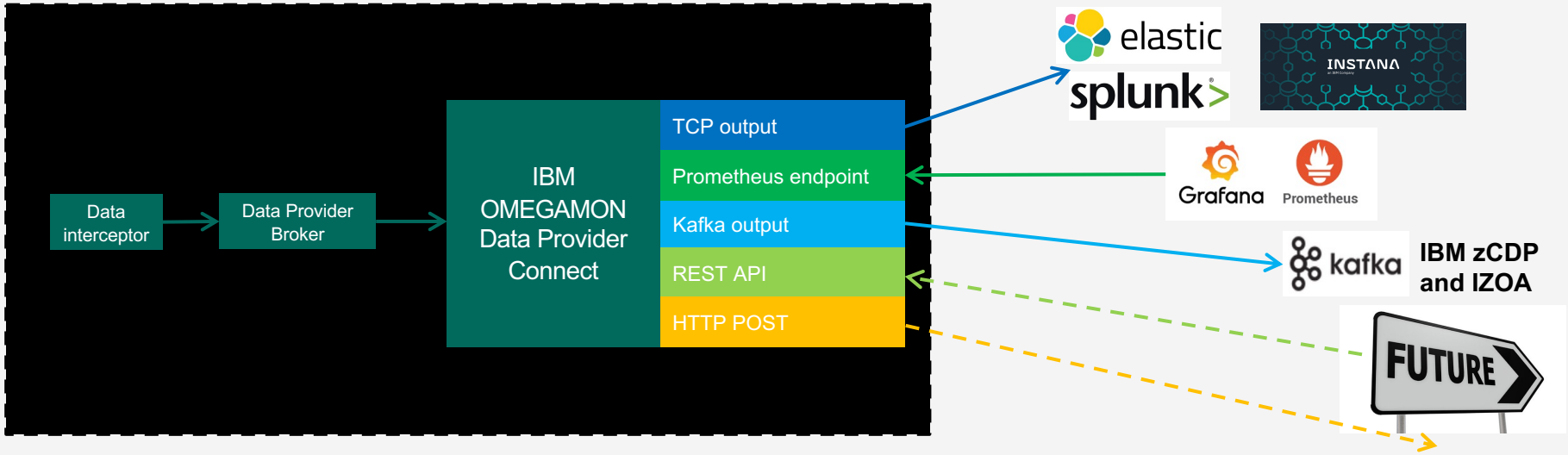
IBM Z Common Data Provider – Configuration



Omegamon Data Provider - Architecture overview



Omegamon Data Provider - Services



TCP output

```
target:
  hostname: elastic-host
  port: 5046
  ...
```

Kafka output

```
target:
  server: kafka-host:9092
  topic: omegamon-json
  ...
```

Prometheus endpoint

```
endpoint:
  url: /metrics
  ...
```

REST API endpoint

```
endpoint:
  url: /api
  ...
```

Elastic

Search Elastic

Dashboard / OMDS - WLM Extended Metrics

Full screen | Share | Clone | Edit

Search | Show dates | Refresh

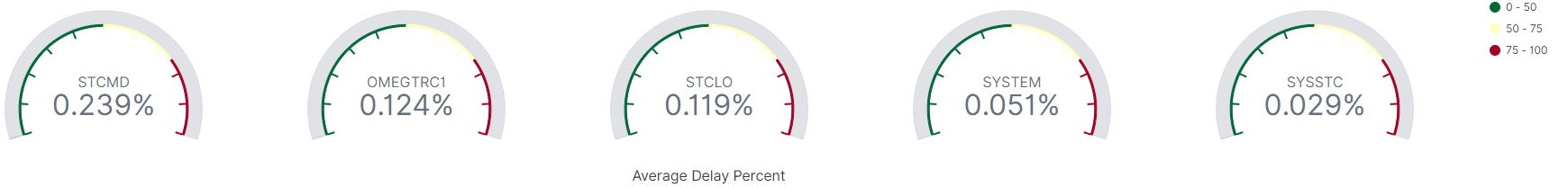
sysplexnam: RSPLEX0K | + Add filter

Proof-of-concept dashboard in Kibana showing **WLM Class Sysplex Metrics** attributes (table KM5WLMCLPX) from OMEGAMON for z/OS, 5.6

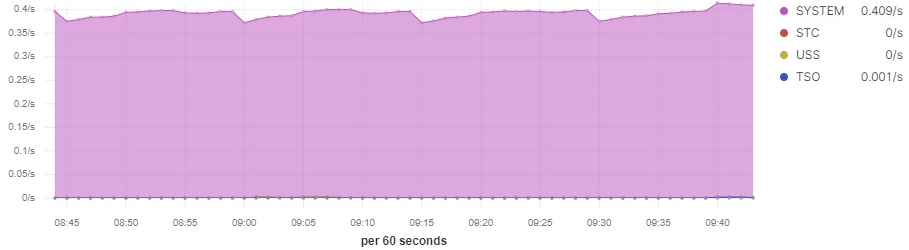
Controls

Sysplex: RSPLEX0K

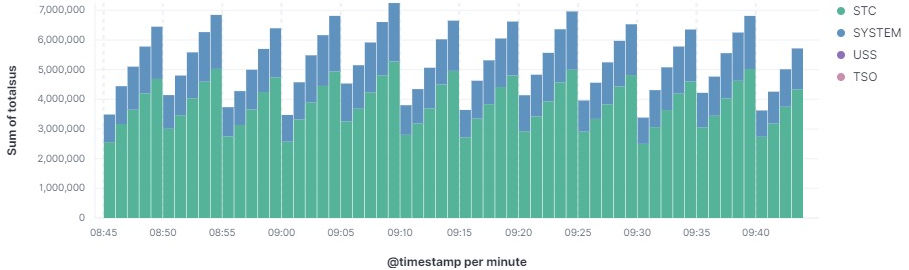
Top 5 Average Delay Percentage by Service Class



Average Transaction Rate by Workload



Total Service Unit by Workload



Total Delay Percentage by Class Name

Metrics Data Statistics

Sysplex	WORKLOAD	Class Name	Goal Type	Goal Importance	Count
RSPLEX0K	SYSTEM	SYSOTHER	8	0	60
RSPLEX0K	SYSTEM	SYSSTC	8	0	60

Grafana dashboard

Leveraging the metrics API to feed Prometheus

Omegamon Data Provider - Schedule

1. OMEGAMON Monitor for z/OS – GA November 2021
2. OMEGAMON for Db2 and CICS – Tentative Q1 2022
3. IMS, MQ, Networks, Storage, JVM – Tentative Q2 2022

Available for users who have :
IBM Z Monitoring Suite 1.2 and higher and IBM Z Service Management Suite V2.1 and higher

Omegamon Data Provider - Deliverables

Code

Premium function included in suites via FMID added to Integration Monitor 5.6.1

SMPE installable modification to OMEGAMON MONITOR for z/OS V5.6 to introduce OMEGAMON Data Provider

Beta might only have OM for z/OS and Integration Monitor to speed access

Beta for Dashboards available as SaaS to enable trial evaluation without code install

Dashboards

Sample Elastic dashboards can be delivered in the following ways:

- Docker image downloaded from Docker Hub – can optionally include sample data
- Separately, requiring the customer to install Elastic or use their own instance – on a GitHub repo or ZIP file

Proposal: Create Open Mainframe Community Project

Note: Same open data format can support Splunk. A doc update will follow. As per other Rocket/IBM performance tools.

Documentation

User's Guide PDF

Installation and customization

Instruction on using the dashboards – very minimal

Preparing Elastic and Splunk to receive data

Prometheus and Grafana

IBM Z Common Data Provider or Omegamon Data Provider?

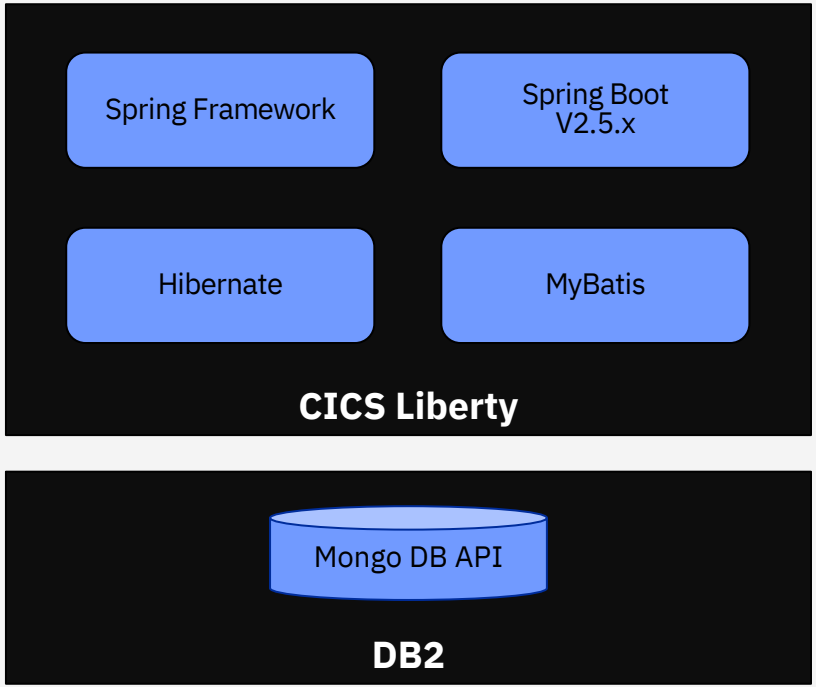
IBM Z Common Data Provider

- Broader and Complete supports for all type of M/F data
  SMF, RMF, Syslog, File and so on
- Day 1 support for Splunk and Log Stash / Grafana Dashboard

Omegamon Data Provider

- No cost to Current Omegamon Suite Users
  5698-B66 IBM Z Monitoring Suite 1.2(1)
  5698-014 IBM Z Service Management Suite V2.1.(1)
- If Omegamon data is enough for dashboard configuration

Open Solutions Experiences with CICS Liberty in Z



Spring Framework & Spring Boot Support in CICS Liberty

Spring Framework

- Core technologies: dependency injection, events, resources, validation, data binding, type conversion.
- Testing: mock objects, TestContext framework, Spring MVC Test, WebTestClient.
- Data Access: transactions, DAO support, JDBC, ORM, Marshalling XML.
- Spring MVC and Spring WebFlux web frameworks.
- Integration: remoting, JMS, JCA, JMX, email, tasks, scheduling, cache.
- **Integrated to CICS Liberty as a Dynamic Web Project**

Spring Boot

- Create stand-alone Spring applications
- Provide opinionated 'starter' dependencies to simplify your build configuration
- Automatically configure Spring and 3rd party libraries whenever possible
- Provide production-ready features such as metrics, health checks, and externalized configuration
- Absolutely no code generation and no requirement for XML configuration
- **Runs on CICS without modification**
- **Configure Spring Boot® applications for integration with CICS transactions and security, and to call the CICS API**

Aligning CICS resource status with Spring applications

Problem : Spring application could be unavailable even though your bundle and program are enabled.
Solution : An agent code to make a triggering once spring applications are ready and link to liberty is ready.

Spring installation Process	**Java Agent Code (by CICS Service)**
Install a bundle	
Bundle is enabled	
Program is installed and enabled for CICSProgram annotation	
The proxy program is registered in JNDI	==> Trigger to write a data to a TSQ with the program name
Spring application **context** is created	==> Trigger to write a data to a TSQ with the bundle name

You can check the final availability status with TSQs.

Data Access Frameworks

MyBatis

- MyBatis is a persistence framework with support for custom SQL, stored procedures and advanced mappings. MyBatis eliminates almost all of the JDBC code and manual setting of parameters and retrieval of results. MyBatis can use simple XML or Annotations for configuration and map primitives, Map interfaces and Java POJOs to database records.

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN"
        "http://mybatis.org/dtd/mybatis-3-mapper.dtd">
<mapper namespace="test.TestMapper">
            <select id="selectById" resultType="test.Test">
                        SELECT ID, PN FROM TEST.TESTTRXT WHERE ID = #{id}
            </select>
            <insert id="insert" parameterType="test.Test">
                        INSERT INTO TEST.TESTTRXT(PN) VALUES(#{pn})
            </insert>
</mapper>
```

Hibernate

Hibernate ORM enables developers to more easily write applications whose data outlives the application process. As an Object/Relational Mapping (ORM) framework, Hibernate is concerned with data persistence as it applies to relational databases (via JDBC).

- **Object / Relational Mapping**
- **JPA Provider**
- **Idiomatic Persistence**
- **High Performance**
- **Scalability**
- **Reliability**
- **Extensibility**

Data source definition for JTA or CICS UOW control

If you don't use JTA

dataSource	type	autocommit	autocommit default	Default commit behaviour
cicsts_dataSource	T2	false	false	commit CICS UOW
Liberty datasource	T2	false	false	rollback CICS UOW
Liberty dataSource	T4	true or false	true	commit database update

1. Liberty dataSource with Autoconfigure or manual

```
<feature>jdbc-4.2</feature>
<dataSource id="defaultCICSDataSource" jndiName="jdbc/jdbcDataSource" transactional="false">
                <jdbcDriver libraryRef="defaultCICSDb2Library"/>
                <properties.db2.jcc driverType="2"/>
                <connectionManager agedTimeout="0"/>
</dataSource>
<library id="defaultCICSDb2Library">
<fileset dir="/usr/lpp/db2v11/jdbc/classes" includes="db2jcc4.jar db2jcc_license_cisuz.jar"/>
<fileset dir="/usr/lpp/db2v11/jdbc/lib" includes="libdb2jcct2zos4_64.so"/>
</library>
```

2. cicsts_dataSource definition (Manual, not autoconfigure)

```
<feature>cicsts:jdbc-1.0</feature>
<cicsts_dataSource id="defaultCICSDataSource" jndiName="jdbc/CICSDataSource">
  <properties.db2.jcc currentSchema="DSN81110"/>
</cicsts_dataSource>

<cicsts_jdbcDriver libraryRef="defaultCICSDb2Library"/>
<library id="defaultCICSDb2Library">
<fileset dir="/usr/lpp/db2v11/jdbc/classes" includes="db2jcc4.jar db2jcc_license_cisuz.jar"/>
<fileset dir="/usr/lpp/db2v11/jdbc/lib" includes="libdb2jcct2zos4_64.so"/>
</library>
```

Liberty Data Source

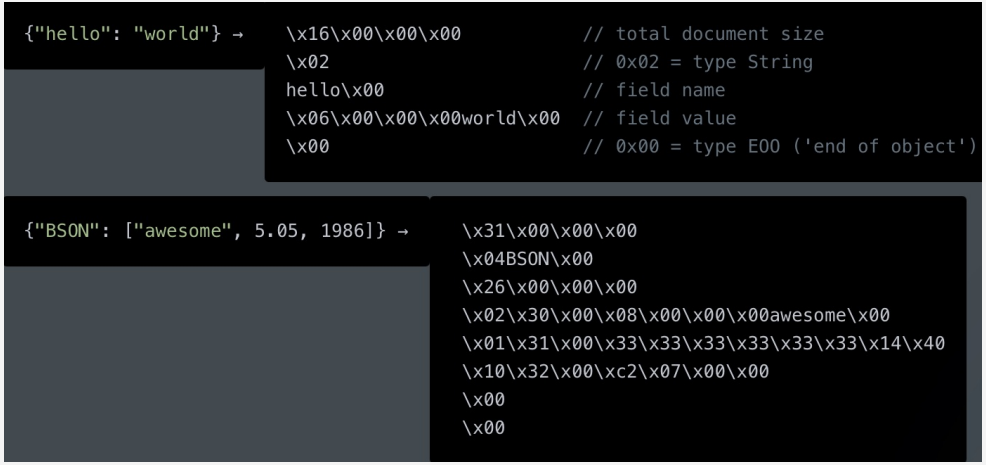
Recommend for pure Java entry point control SUOW for Java link to COBOL works. But syncpoint control in COBOL sub program will make an abend

CICS Data Source

COBOL to Java and Java to COBOL links are supported by SUOW but recommend JCICS Task control.

MongoDB API in DB2 - JSON2BSON and BSON2JSON

JSON



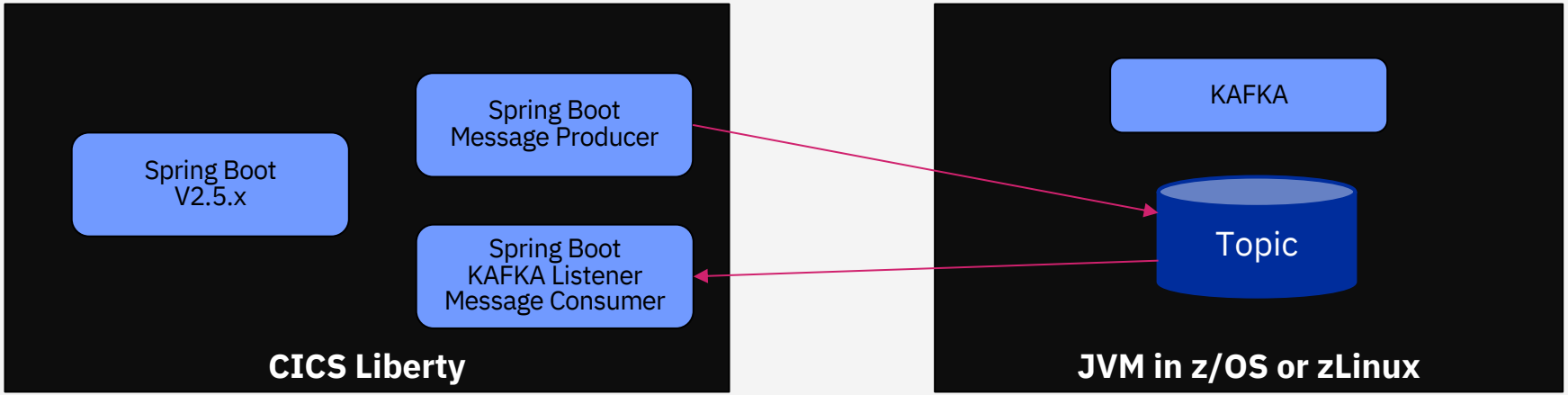
BSON (Binary JSON)

```
try (PreparedStatement preparedStatement =
  connection.prepareStatement("INSERT INTO TEST.TABLE
 (..., BSON_Field ) VALUES (..., SYSTOOLS.JSON2BSON(?))")) {

...       preparedStatement.setClob(10, new StringReader(json));

          preparedStatement.executeUpdate();
```

Java code to insert a JSON string to a BLOB column in DB2 by using the udf, **SYSTOOLS.JSON2BSON**.

How to configure a KAFKA server and connect to CICS Liberty?

Kafka is a stream-processing platform built by LinkedIn and currently developed under the umbrella of the Apache Software Foundation. Kafka aims to provide low-latency ingestion of large amounts of event data.



Fast, Light and Reliable
A Java solution

KAFKA server for z/OS

https://www.ibm.com/docs/en/z-logdata-analytics/5.1.0?topic=zos-installing-configuring-apache-kafka

- To run Apache Kafka on z/OS, your z/OS operating system must meet the following requirements:
  z/OS version 2.4 or later. With z/OS 2.4, the following fixes must be installed:
  - OA60306/UJ90013
  - OA60310/UJ05191
  - OA60316/UJ05214
  - PH32235/UI74844
- IBM® 64-bit SDK for z/OS Java™ Technology Edition V8 (product number 5655-DGH). It must be at the minimum service level of SR6 FP20 (8.0.6.20). It is recommended to use the latest service release. To find the latest service release or fix pack, see IBM SDK for z/OS, Java Technology Edition.
- Bash 4.3 or later. You can download Bash from the Rocket software website.
- Apache Kafka version 2.6.0 or later. You can download the Kafka binaries from the Apache Kafka download page.
- A dedicated zFS file system is recommended. The zFS data set needs to be in extended format so that it can be allocated or grow beyond four gigabytes (4 GB) in size.

Important: The Apache Kafka provided producer (`kafka-console-producer.sh`) and consumer (`kafka-console-consumer.sh`) console commands don't work under z/OS UNIX System Services. You can run these commands on a distributed platform but connect to the Kafka server running on z/OS to verify whether the Apache Kafka on z/OS is working correctly. You can also test with your own Java programs.

How can I help you?

AP CICS Services

- CICS Health Check
- CICS Application Tuning (COBOL & Java)
- CICSPlex Implementation
- CICS Java Implementation
- Open Solutions Support
- Dashboard Implementation Consulting

AP CICS Services Teaming

CICS Architect
Java Experts
CICS System Consultant

Contact SS,
AP CICS Product Manager
sshan@sg.ibm.com