

Demo of exposing an IMS pgm and DB through REST API with z/OS Connect EE

Aymeric Affouard aymeric.affouard@fr.ibm.com

IBM

November 2019

Session **HB** – Wellington B



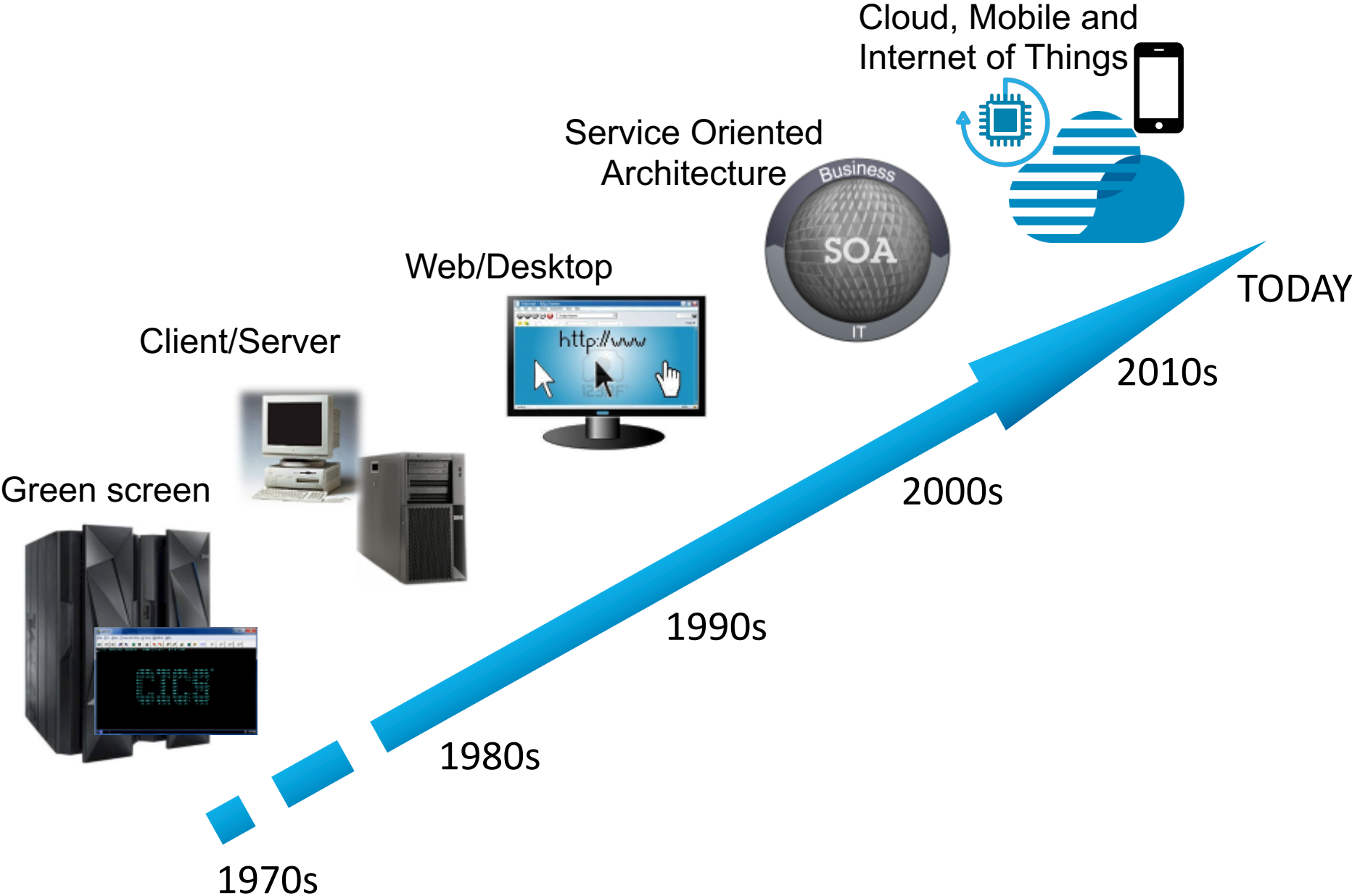
Contents



- What are REST APIs?
- What is z/OS Connect EE?
- Service and API creation using the API Toolkit
- Demo time: IMS program
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Evolution of integration with core systems



Today APIs are being built on REST and JSON

HTTP **verbs** are used to suggest the action against the resource

GET
POST
PUT
DELETE

The “path” narrows the request to a “resource” (ex: “accounts”) on a target system

Query-parameter can be used to provide specific values for the action against the resource

http://

Standard HTTP host and (optionally) port designation

Path-parameters link to the resource

<https://maps.googleapis.com/maps/api/geocode/json?latlng=43.6144322,3.9071322>

```
{
  "results" : [
    {
      "address_components" : [
        {
          "long_name" : "729-819",
          "short_name" : "729-819",
          "types" : [ "street_number" ]
        },
        {
          "long_name" : "Rue de la Vieille Poste",
          "short_name" : "Rue de la Vieille Poste",
          "types" : [ "route" ]
        },
        {
          "long_name" : "Montpellier",
          "short_name" : "Montpellier",
          "types" : [ "locality", "political" ]
        }
      ]
    }
  ]
}
```

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Query-parameter can be used to provide specific values for the action against the resource

`http://<host>:<port>/<path>/<parameter>?name=value&name=value`

Standard HTTP host and (optionally) port designation

Path-parameters link to the resource

GET `https://mybank.com/myBank/accounts/{accountId}`

Response

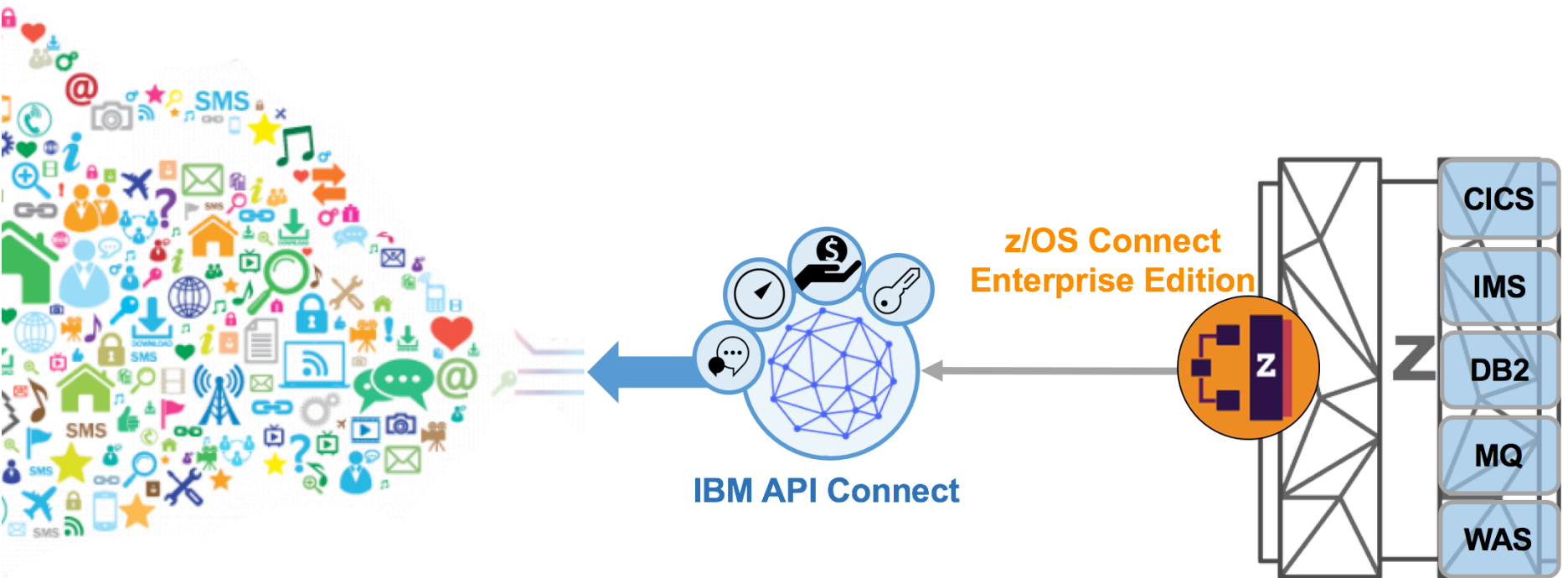
```
{
  "operation": "Balance Inquiry",
  "balance":{
    "date": "9/27/2016",
    "amount": 1267.28,
    "accountName": "Mr or Mrs Smith"
  }
}
```

What is z/OS Connect EE?



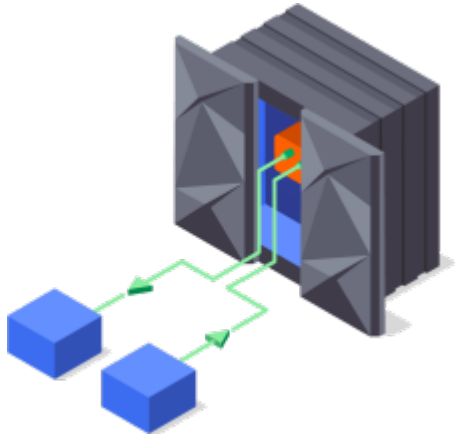
What is z/OS Connect EE?

z/OS Connect EE is IBM's strategic solution for creating and deploying natural REST APIs for z/OS assets in a unified manner across different subsystems with integrated security and scalability

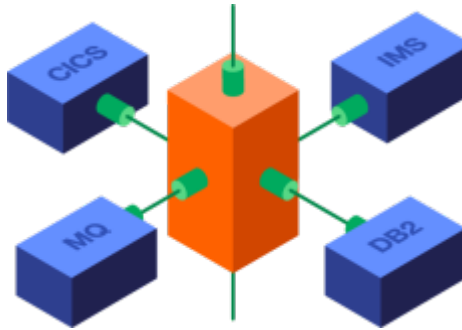


z/OS Connect EE is normally deployed with an API management solution which supports the entire API lifecycle from creation, security and management

z/OS Connect EE V3



APIs to and **from** the mainframe



Comprehensive subsystem support and **unified** tooling



Point-and-click API creation

- Create services and APIs using a common **API Toolkit**
- Call external APIs from your mainframe applications with the **API requester** support
- Simple integration into enterprise API management solutions

Why use Swagger?

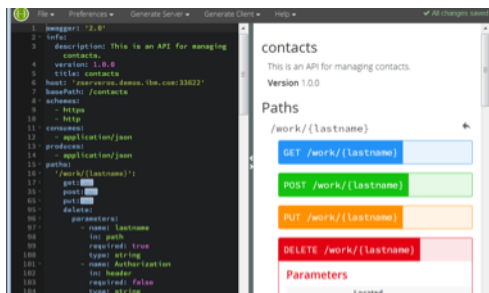
It is more than just an API framework



There are a number of tools available to aid consumption

Write Swagger

Swagger Editor allows API developers to design their swagger documents.



Read Swagger

Swagger UI allows API consumers to easily browse and try APIs based on Swagger Doc.

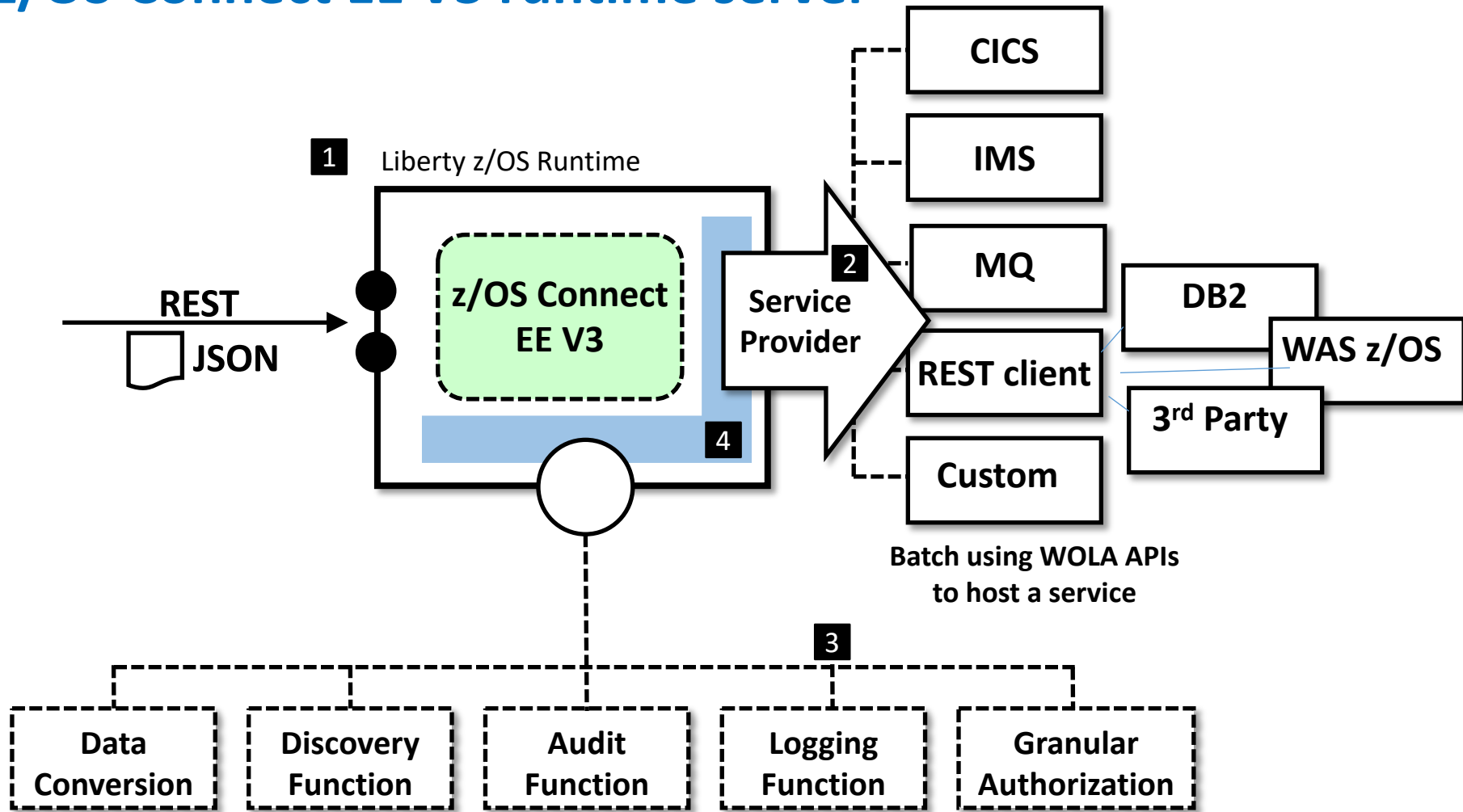


Consume Swagger

Swagger Codegen create stub code to consume APIs from various languages



z/OS Connect EE V3 runtime server

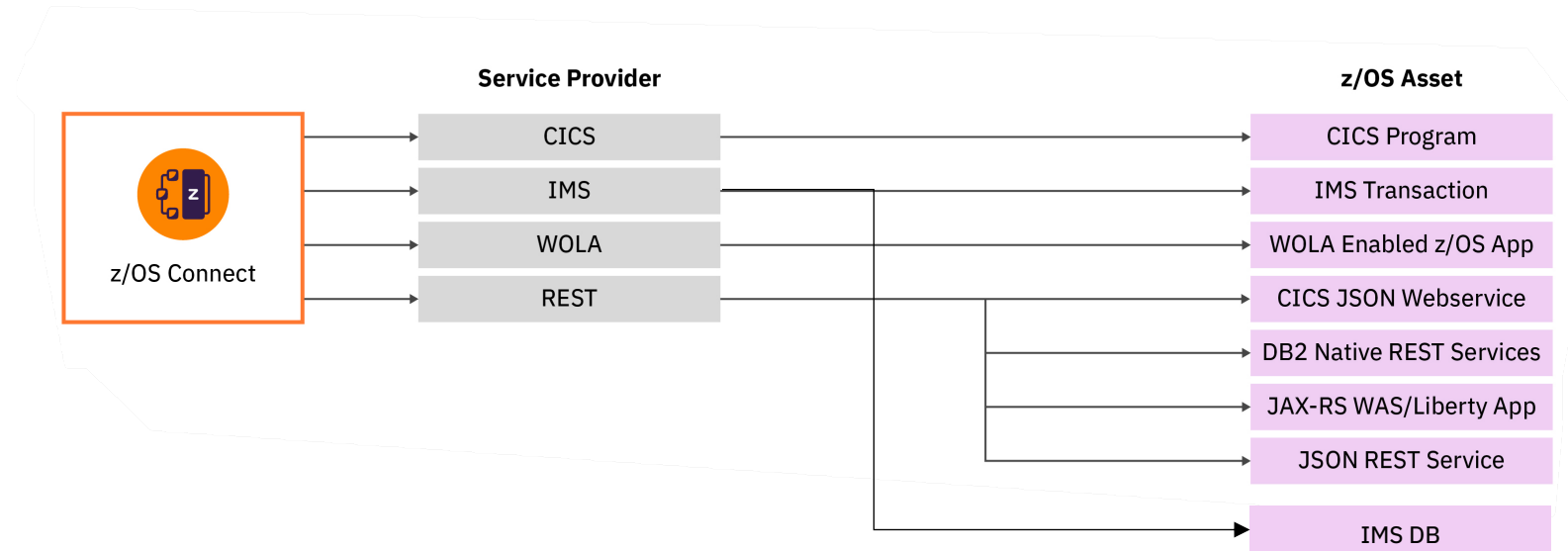


1. **Liberty** is provided as a runtime.
2. Backend connectivity is provided with "service provider" code.

3. "Interceptors" and provide function that is called for each request that arrives.
4. Both the "service provider" and "interceptor" interfaces are **extensible**.

What assets can z/OS Connect EE map to?

And which service provider should I use?



The core **service providers** included with z/OS Connect EE provide API access to a wide range of z/OS assets.

What is difference between Service & API ?

The API is the interface you expose to API requestors

GET
POST
PUT
DELETE



GET `http://<host>:<port>/api_path?parm=value&parm=value`



Service

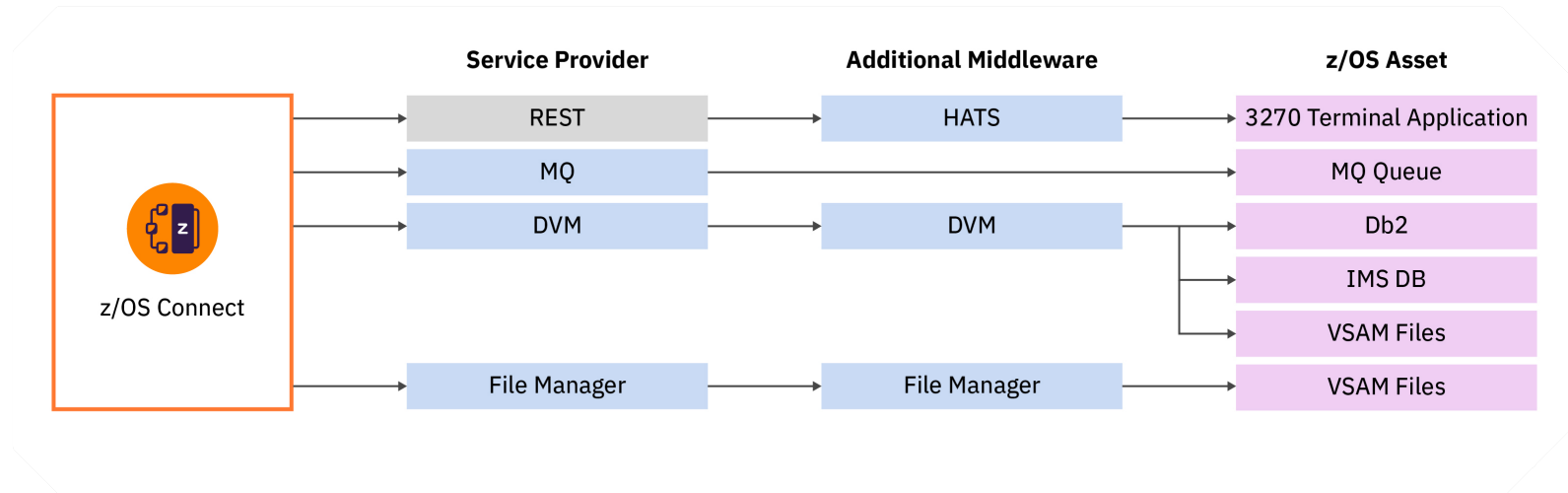


POST `http://<host>:<port>/zosConnect/services/service_name?action=invoke`

Request Body Schema
Response Body Schema

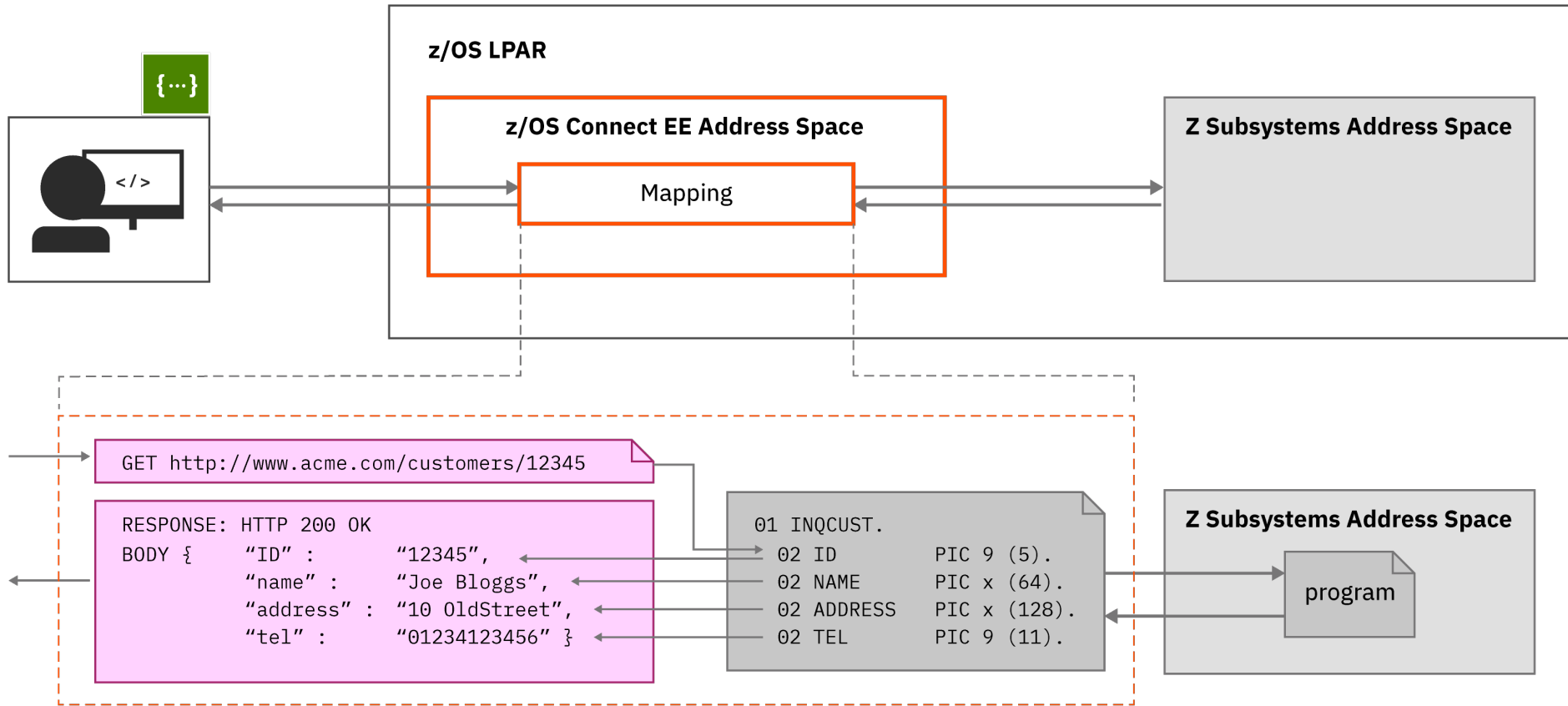
z/OS Connect EE 3rd party integrations

Additional value from the ecosystem



z/OS Connect EE is **pluggable** and **extensible** allowing 3rd Party Service Providers to expand the list of z/OS assets you can expose as APIs

Data mapping



A key role of z/OS Connect is to map REST/JSON messages into a message format that the target z/OS application understands, and to specify the use of HTTP verbs, path, query and header parameters.

Service projects and service creation

1 Import data structure

Import

Import Input or Output Message Data Structures

Import COBOL or PL/I data structures (from copybooks or includes) or full programs.

Import from: Local file system

File type: COBOL data structures only

Source folder: C:\ZCEE V3 demo

Data structure file: DFHXCP1.cpy Browse...

Import the data structure, define the service interface and configure the service

2 Redact fields, rename fields, and add descriptions to fields to make the service more consumable for an API developer

| Data structure | Fields | Include | Interface rename | Def |
|----------------|-------------------------------------|-------------------------------------|---------------------|-----|
| COMMAREA | | | | |
| DFHXCP1 | CA_REQUEST_ID | <input checked="" type="checkbox"/> | requestID | |
| | CA_RETURN_CODE | <input checked="" type="checkbox"/> | returnCode | |
| | CA_RESPONSE_MESSAGE | <input checked="" type="checkbox"/> | responseMessage | |
| | CA_REQUEST_SPECIFIC (Redefined) | <input type="checkbox"/> | CA_REQUEST_SPECIFIC | |
| | CA_INQUIRE_REQUEST redefines CA_REQ | <input type="checkbox"/> | CA_INQUIRE_REQUEST | |
| | CA_INQUIRE_SINGLE redefines CA_REQ | <input checked="" type="checkbox"/> | inquireSingle | |
| | CA_ITEM_REF_REQ | <input checked="" type="checkbox"/> | itemRefReq | |
| | FILL_0 | <input type="checkbox"/> | FILL_0 | |
| | FILL_1 | <input type="checkbox"/> | FILL_1 | |

Configuration

Required Configuration

Enter the required configuration for this service.

Coded character set identifier (CCSID): 37

Connection reference: CICSMOB1

Optional Configuration

Enter the optional configuration for this service.

Transaction ID: MZIS

Transaction ID usage: EIB_AND_MIRROR

3 Specify connection reference and transaction id for service.

z/OS Connect EE V3
API Toolkit

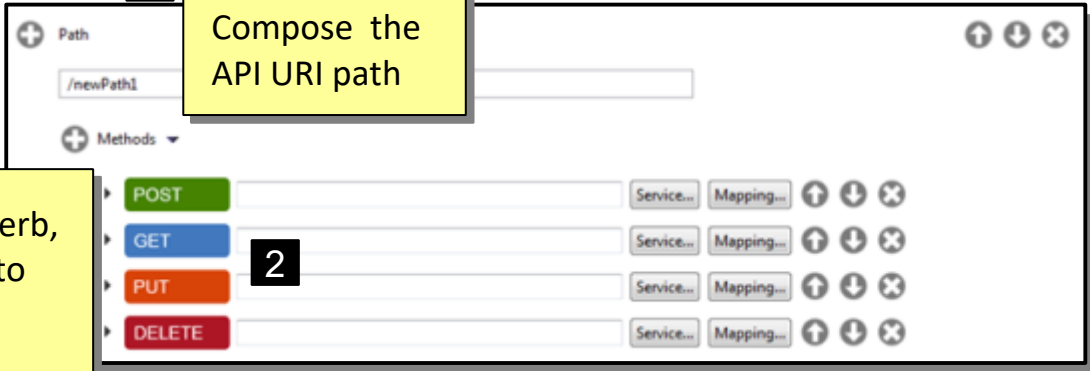


IBM Explorer for z/OS
Aqua V3.1

API projects and API creation

1

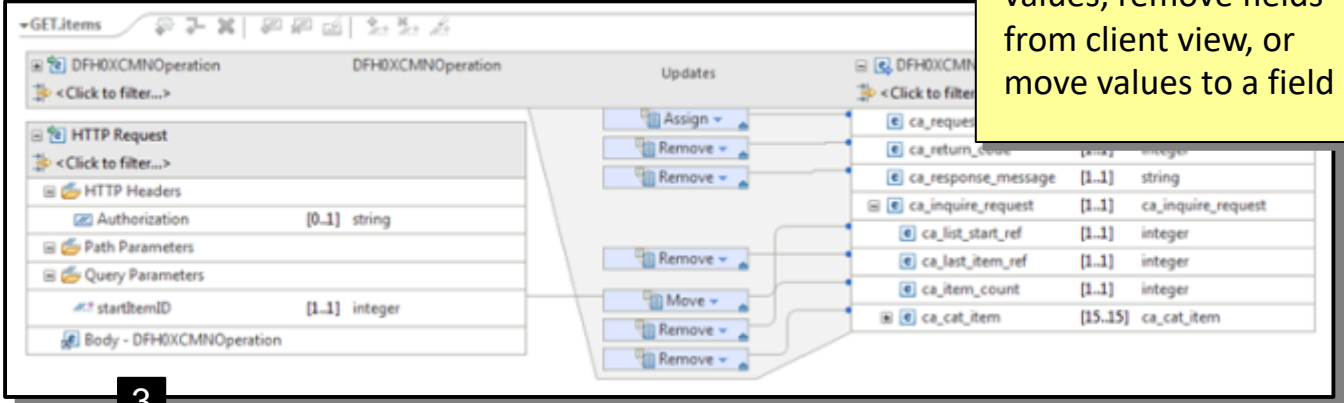
Compose the API URI path



Select the HTTP verb, and map the call to the underlying service

2

Use the "Mapping" function to assign static values, remove fields from client view, or move values to a field



3

z/OS Connect EE V3
API Toolkit



IBM Explorer for z/OS
Aqua V3.1

Define the URI path, http verbs and JSON mappings for the API

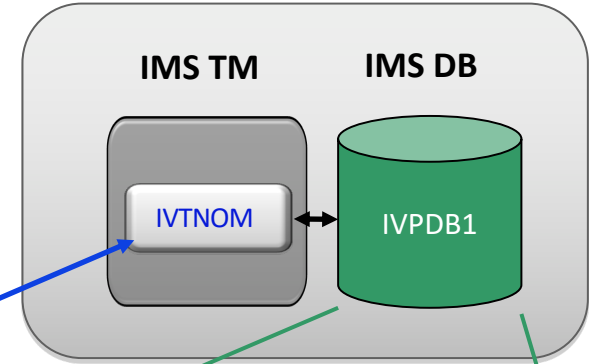
Demo time IMS program



Overview of the Phone Book Sample



Five functions of the IVTNOM transaction are:
add, display, update, delete, show50



HIDAM Database

ADD
Add a contact

DISPLAY
List a contact

UPDATE
Update a contact

DELETE
Delete a contact

SHOW50
Display 50 contacts

IVTNOM

| Status | Result1 | LNAME | FNAME | PHONE | ZIP |
|--------|---------|-----------|-----------|------------|---------|
| 3 | | AFFOUARD | AYMERIC | 012334 | 34000 |
| 4 | | ASSOU | YAO | 0123344556 | 75012 |
| 5 | | BOUEDO | MARIE T | 0123456 | 75000 |
| 6 | | BOURNE | JASON | 8888 | 750000 |
| 7 | | BRUNEEL | ISABELLE | 7916 | 94000 |
| 8 | | CAMERON | | | |
| 9 | | CARL | FARKAS | 7440 | 75012 |
| 10 | | CHARLET | KYLE | 1234567891 | CA12345 |
| 11 | | CLIENT | FRED | 123 | 11111 |
| 12 | | CLIENT2 | FRED | 123 | 11111 |
| 13 | | COUGHTRIE | ALISON | 9-111-1111 | SO534SR |
| 14 | | FABRIZIO | GERANZANI | 3357693747 | 00144 |
| 15 | | FUNG | HALEY | 123123123 | CA4678 |
| 16 | | GAMBLIN | RICHARD | 4563-6789 | SOUTH |
| 17 | | GERMAIN | KEVIN | 67890 | 92800 |
| 18 | | GOLOUBEV | PHILIPPE | 12345 | 75012 |
| 19 | | HILLARY | CLINTON | 1234 | 93123 |
| 20 | | HITE | KEVIN | 12344 | 2341234 |
| 21 | | LAST1 | FIRST1 | 8-111-1111 | D01/R01 |

PhoneBook API with IMS

```
{
  "OUTPUT_MSG": {
    "OUT_MSG": "ENTRY WAS DISPLAYED",
    "OUT_ZIP": "34000",
    "OUT_NAME2": "AYMERIC",
    "OUT_NAME1": "AFFOUARD",
    "OUT_SEGNO": "0001",
    "OUT_CMD": "DISPLAY",
    "OUT_EXTN": "0123344555"
  }
}
```

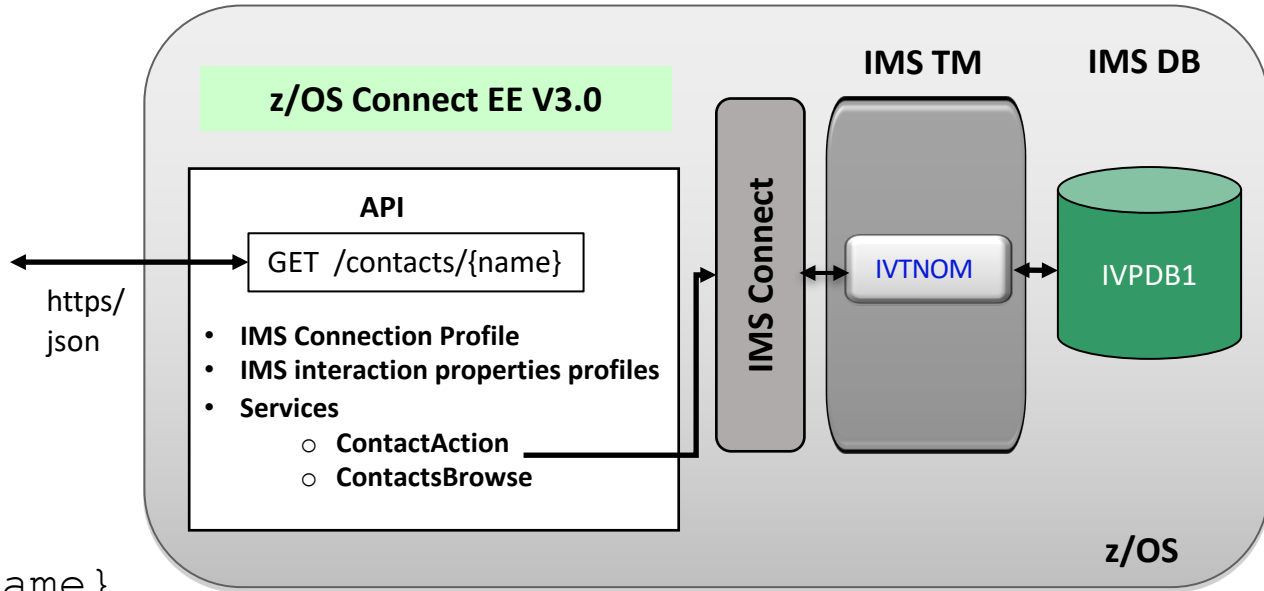
Sample API response

- GET** /contacts/{name}
- PUT** /contacts/{name}
- DELETE** /contacts/{name}
- POST** /contacts
- GET** /contacts?after

↑
HTTP Verb conveys the method against the resources; i.e., POST is for create order, GET is for retrieving information about items in the catalog

URI conveys the resource to be acted upon; i.e., item reference

**The JSON body carries the specific data for the action (verb) against the resource (URI)
 No JSON in a GET request**



PhoneBook API – with one service

Only 4 functions of the 5 ones: add, display, update, delete. We miss show50.

The screenshot shows the z/OS Connect EE API Editor interface. On the left is the Project Explorer showing a project structure for 'API-PhoneBook' and 'API-PhoneBookUsing1Service'. The main editor area is titled 'Describe your API' and contains the following configuration:

- Name:** phonebook
- Description:** API for the PhoneBook IMS Transaction IVTNOM
- Base path:** /phonebook
- Version:** 1.0.0

Below the configuration, there are two API endpoint definitions, both highlighted with a red border:

- Endpoint 1:** Path: /contacts/{name}
 - Methods: GET, PUT, DELETE
 - Each method is associated with a 'ContactAction' service and a 'Mapping...' button.
- Endpoint 2:** Path: /contacts?after
 - Method: POST
 - Associated with a 'ContactAction' service and a 'Mapping...' button.

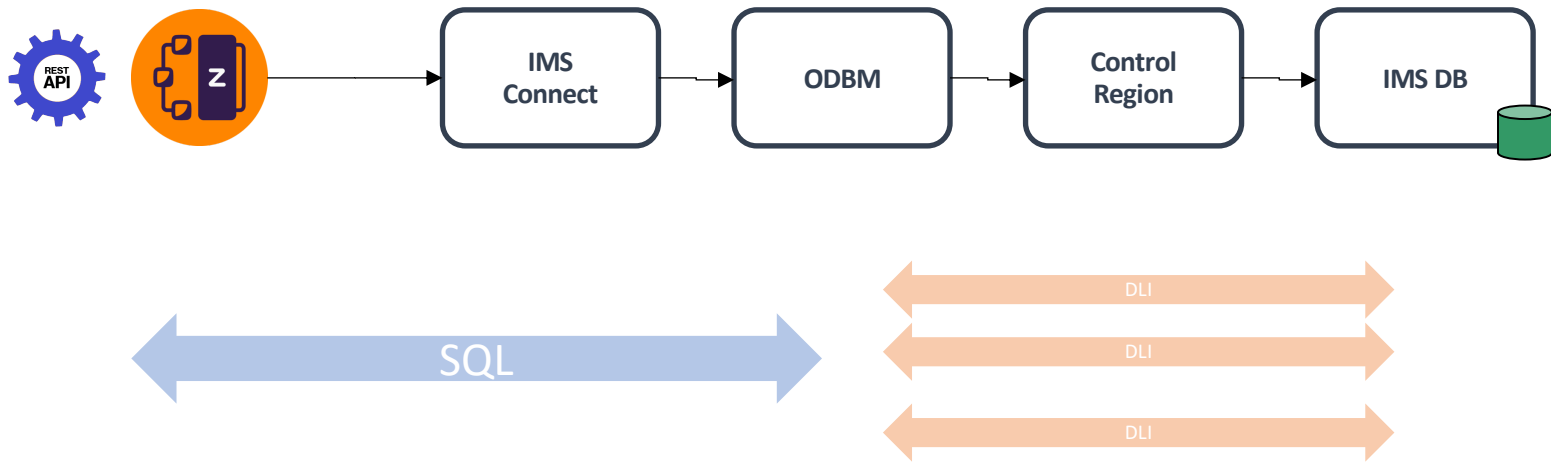
At the bottom left, the 'z/OS Connect EE Servers' panel shows a list of servers:

- MOPZCEL Blue 51043 (9.212.143.123:51043)
- MOPZCEP Blue 50743 (9.212.143.123:50743)
- MOPZCET Blue 52943 (9.212.143.123:52943)

Demo time IMS database



How will this work with IMS DB



SQL Command: `SELECT DEPARTMENT_NUMBER, DEPARTMENT_NAME, EMPLOYEE_NAME, FUNCTION, CONTRACT_TYPE, ANNUAL_SALARY, VARIABLE_PART, PAYMENT_MONTH FROM PERSONNEL_COST_DATABASE.DEPARTMENT JOIN PERSONNEL_COST_DATABASE.EMPLOYEE ON DEPARTMENT_NUMBER = DEPARTMENT_DEPARTMENT_NUMBER WHERE EMPLOYEE_NUMBER = ?`

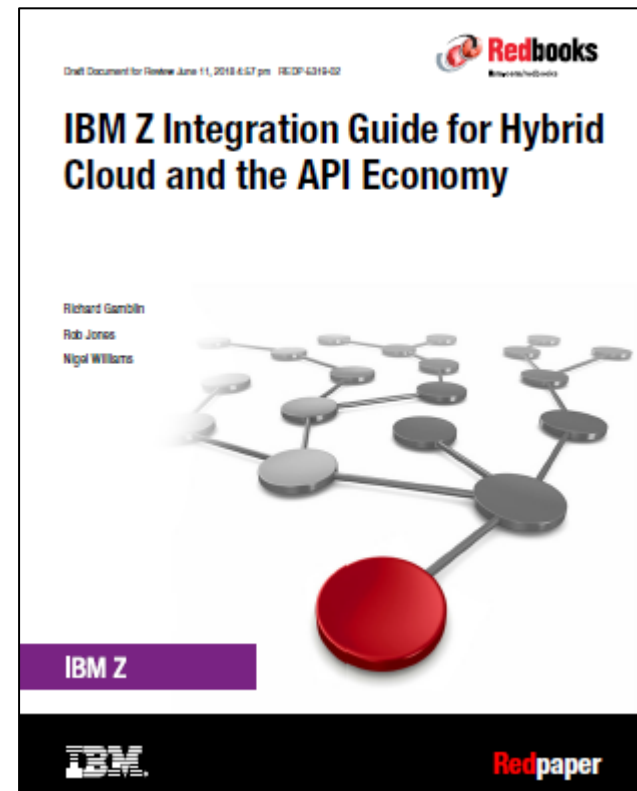


More information



Redpaper

- Architecture options for service and API enablement
- Hybrid integration reference architecture for IBM Z
- IBM integration solutions
 - z/OS Connect EE
 - IBM App Connect Enterprise
 - IBM API Connect
 - IBM DataPower Gateway
- Real world scenarios



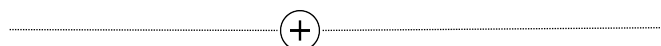
Draft published of 3rd Edition June 2018

z/OS Connect EE V3 Resources

Downloads

↓ z/OS Connect EE open beta runtime

ibm.biz/zosconnect-open-beta



↓ z/OS Connect EE workstation tooling

ibm.biz/zosconnect-tooling-download

Explore the docs

ⓘ z/OS Connect EE Knowledge Center

ibm.biz/zosconnect-kc

ⓘ z/OS Connect EE Developer Center

ibm.biz/zosconnectdc

ⓘ z/OS Connect EE Articles and blogs

<https://developer.ibm.com/mainframe/docs/>

Where to get help

🌐 dW Answers

ibm.biz/zosconnect-dw-answers

🌐 z/OS Connect EE open beta forum

ibm.biz/zcee-beta-forum

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- This session is **HB**



1. What is your conference registration number?

✦ This is the three digit number on the bottom of your delegate badge

2. Was the length of this presentation correct?

✦ 1 to 4 = "Too Short" 5 = "OK" 6-9 = "Too Long"

1 2 3 4 5 6 7 8 9

3. Did this presentation meet your requirements?

✦ 1 to 4 = "No" 5 = "OK" 6-9 = "Yes"

1 2 3 4 5 6 7 8 9

4. Was the session content what you expected?

✦ 1 to 4 = "No" 5 = "OK" 6-9 = "Yes"

1 2 3 4 5 6 7 8 9