

Your Blueprint for Digital  
Transformation, starting with  
IBM Z and **IBM IMS**



Betty Patterson Bucci, IBM Distinguished Engineer

July 17, 2018

Virtual IMS User Group Meeting



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# The Why



**How  
much  
do you  
know  
about  
your  
house?**

- Was anything added on? Remodeled?
- Was the work up-to-code and inspected?
- How current is the electrical?
- Do you have excess AMPs (for the next remodel)?
- What about your HVAC? Are you losing money because someone decided not to insulate?
- Who built the house originally?
- Who did the additions, and when?
- Do you have all of the blueprints?
- Do you have documentation of all of the data points that drove each decision?
- Do the data points make each decision look rational?

***Unlikely***





# Digital Transformation

# KPMG CIO Survey 2017

## 4,498 Executives

“Technology Leaders are telling us that change has reached **unprecedented levels**,” and that “increasingly it is coming from unexpected corners.”

“The political, business and economic environment is becoming **more unpredictable**”

64%

Enterprise Architecture is one of 3 skills deemed to be **the most scarce**, and the fastest growing [gap]

34%

**Fewer than half** of organizations reported having an “enterprise-wide digital strategy”

41%

# The biggest impediment to digital success?

Resistance to change - 43%



Lack of Budget - 25%



# Digital Transformation is your response to the **ongoing disruptions** facing industry markets

## Banking and Financial Services

Expanding # of non-traditional competitors driving disruption: Non-Bank entrants, New Payment Models, New Lending Models, New Depositories

## Government

- Adoption of mobile devices
- Geopolitical instability & terrorism
- Increased proliferation of social media platforms & mobile devices
- Government Transparency

## Insurers

- Usage-based Insurance:
- Pay-as-you-drive
  - Pay-how-you-drive
  - *Manage-how-you-drive*

## Automotive

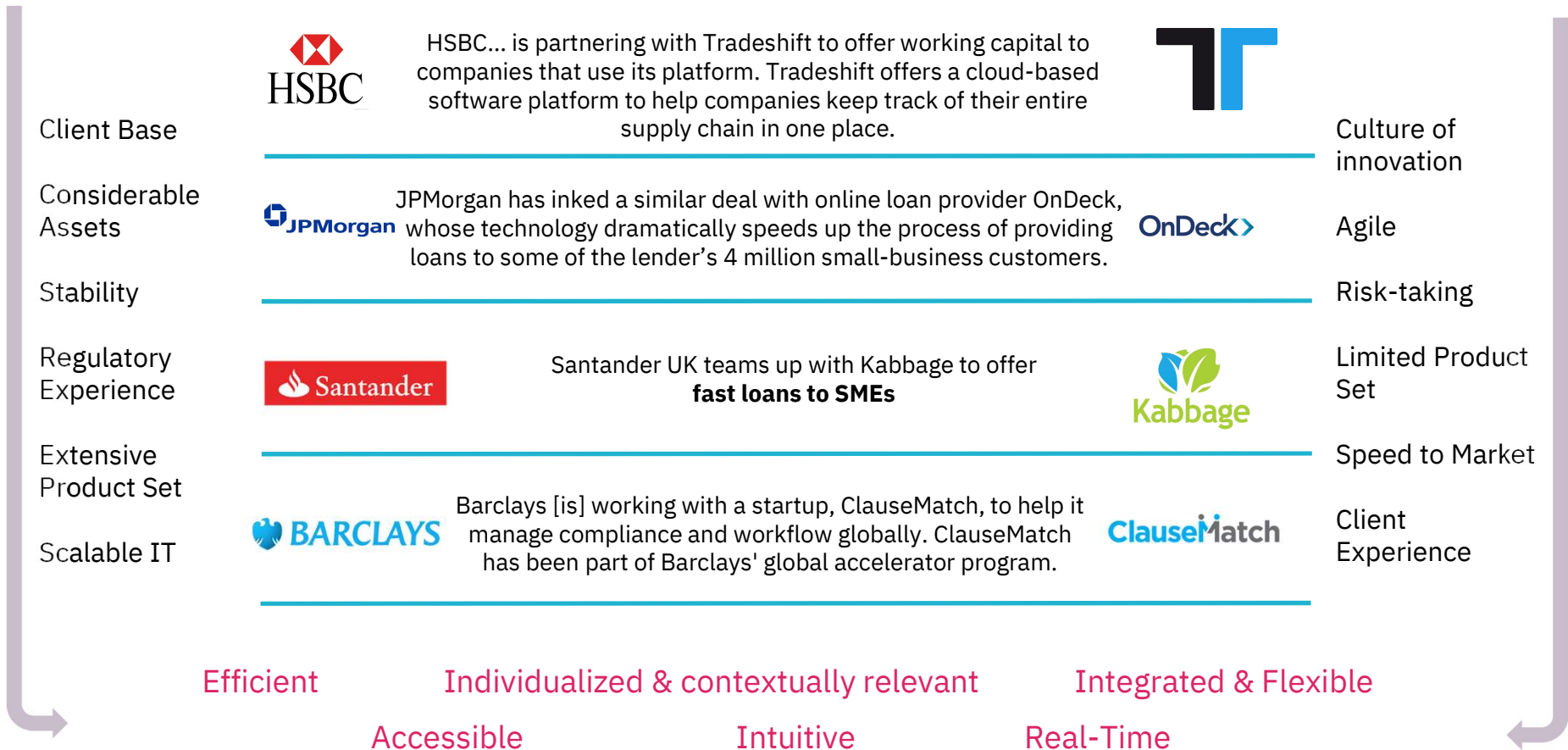
Telematics is disrupting the Automotive Industry with Self-Driving Automobiles, Vehicle Data, Traffic/Accident/Weather data

## Retailers

- Change in Retail Store's Role: Inspiration, purchase point, pickup point, return locations
- 20% of sales and shipments to be picked up at retail store
- Stores within Stores
- Seasonal Pop-Up Stores



# Strategic Partnerships create new opportunity



# Digital Transformation responsibilities by Persona



**LOB Owner**



**Enterprise Architect**



**Application Architect**



**Operations**

**System Programmer  
DBA**

## Expose

API Enable APPS & Data



## Evolve

Automate & Transform



## Optimize

Predict & Respond



<p>Improve efficiency, reduce costs and extend reach of assets through an open and connected environment</p>	<p>Have a vibrant and engaged developer community that can rapidly respond to business requests</p>	<p>Achieve the highest levels of confidence and agility to meet business goals and prevent interruption of services</p>
<p>Define an API channel for business critical assets</p>	<p>Govern APIs to maximize security and reuse</p> <p>Leverage best fit language for transformation</p>	<p>Transform monolithic applications into granular services</p>
<p>Empower developers with open &amp; modern development environment</p> <p>Discover &amp; create APIs w/ zero to minimal changes to assets</p>	<p>Automate delivery pipeline</p> <p>Embrace early test integration (shift left)</p>	<p>Optimize development with advanced analytics</p>
<p>Monitor APIs</p> <p>Have a current view of the application ecosystem</p>	<p>Have performance visibility from device to backend</p>	<p>Predict and automatically respond to service interruption</p>
<p><b>Run &amp; Maintain</b></p> <p>Have a current view of resources and leverage the latest compilers and subsystems to reduce costs and maximize performance</p>		<p><b>Be Efficient</b></p>

A digital server room with blue and green lighting and binary code. The scene is a perspective view of a server aisle. The floor is dark blue with a grid pattern. The walls are lined with server racks. The lighting is a mix of blue and green, with some yellow highlights. In the background, there are vertical lines of light and a faint binary code pattern. The overall atmosphere is futuristic and high-tech.

“After several years of relentless hardware and software innovation, the **mainframe** is at an inflection point from being a supporting platform of transaction revenue to becoming a **source of revenue growth and innovation.**”

# The Mainframe has a vital role in the digital economy

Mainframes process

**30 billion** business transactions per day

Mainframes enable

**\$6 trillion** in card payments annually

**80 percent** of the world's corporate data resides or originates on mainframes

**91 percent** of CIOs said new customer-facing apps are accessing the mainframe



How digital transformation can impact your bottom line

\$200 million  
*in additional revenue per year*

*Infrastructure costs reduced by*  
**\$18 million**

300%

*return on investment over 5 years*



27%

*lower mainframe licensing costs*

# The How

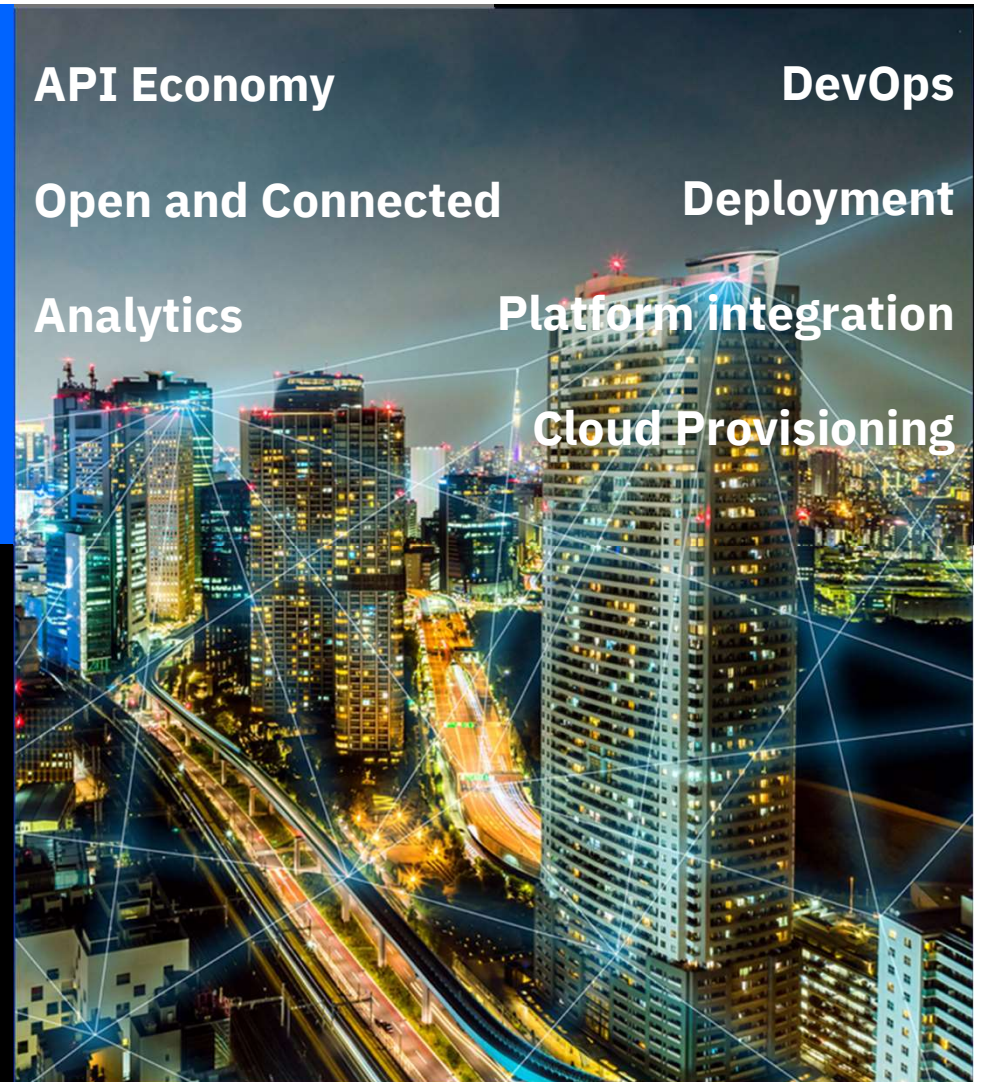
# Digital Transformation is multi-layered and complex

3 new archetypes

Reinventors

Practitioners

Aspirationals







# Digital Transformation



# Digital Reinvention™

Based on **Institute  
for Business Value**  
survey

**12,854**  
2017 Global

C-suite Study  
respondents

IBM IMS / © 2018 IBM Corporation

27%

## Reinventors

- Exceptionally well aligned strategy, IT, and Operations
- Confident in capacity to transform and manage disruption
- Collaborate and extract value from ecosystems
- Leverage data to uncover and create compelling customer experiences
- Culture of experimentation, co-creation and design thinking

37%

## Practitioners

- Capabilities don't yet fully match ambitions
- Ambitions to catch-up and/or disrupt through innovation
- Strategy execution needs better alignment across IT and operations
- Many are building or planning to launch platform business model
- Understand the value of data and experimentation but culturally not there yet

36%

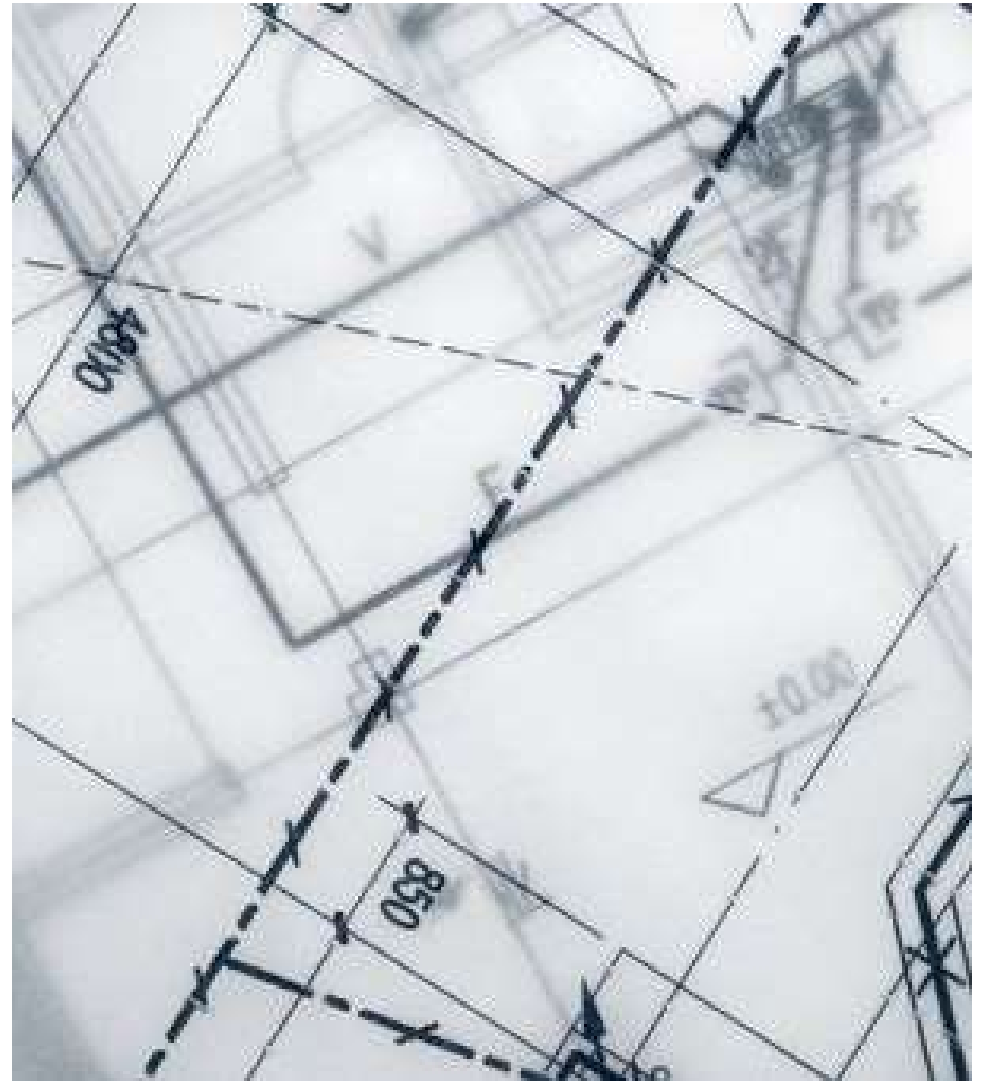
## Aspirationalists

- Most are challenged to get the right vision, strategy and execution capabilities in place
- Few have or will pursue new business models or innovation
- Many are focused on protective strategies
- Indicate digital skills gaps are a significant concern
- Few reveal a culture of experimentation, co-creation

# Digital Transformation

# API Economy

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# Capitalize on the business opportunities created by the API Economy

## Your business assets

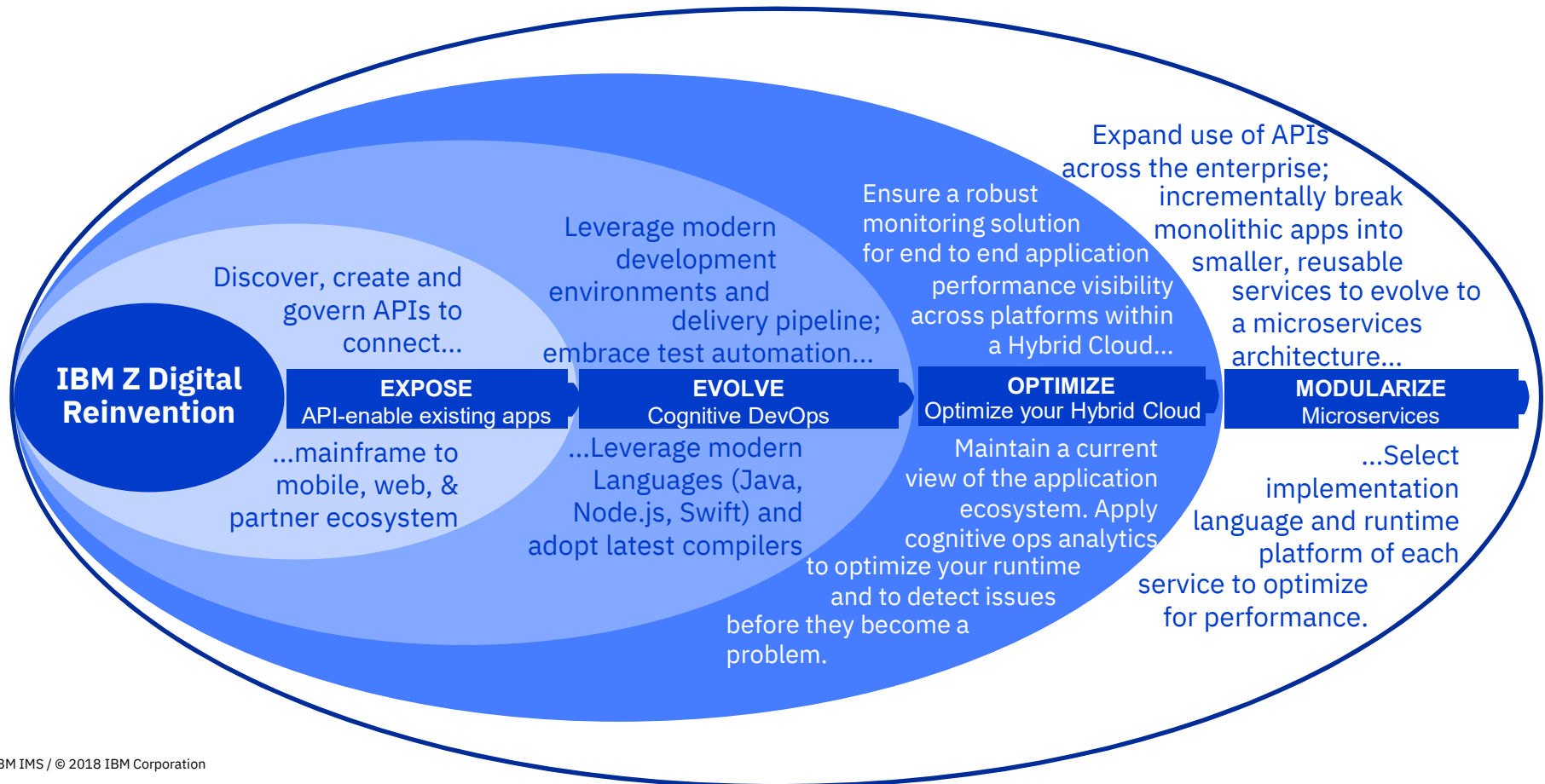
*(data, function or  
computing  
resources) can be  
represented as  
digital products*

## Co-value creation

*occurs using third  
party APIs, developers,  
partners, hobbyists or  
IT departments, all of  
whom consume,  
compose and produce  
APIs and apps*

*Apps as strategic applications  
emerge. Apps and APIs are used to  
re-imagine the client experience, creating new  
or enhanced business processes that leverage  
mobility, cloud, analytics, and social  
platforms*

# IBM Z Digital Transformation Maturity Model



## From APIs to Microservices

**API enable**  
transactions,  
programs  
and stored  
procedures

Break  
monolithic  
applications  
into  
**microservices**

Extract  
**business**  
**rules** into a  
decision  
management  
tool

Write new  
function as  
**microservices**  
in Java, Swift,  
node.js

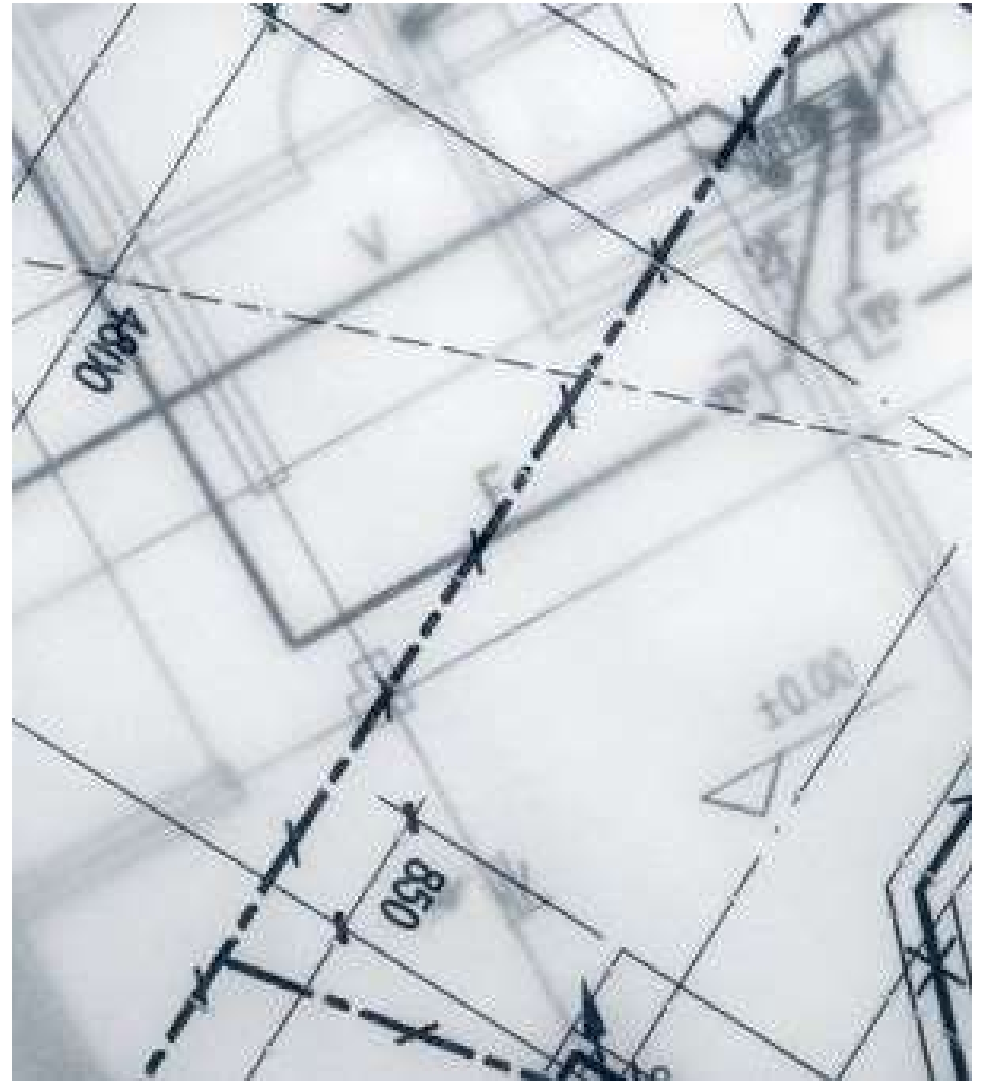
The language  
and platform is  
based on the  
needs of each  
microservice.

**Adopt DevOps for faster  
delivery and responsiveness**

# Digital Transformation

# DevOps

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**You don't  
buy  
DevOps,  
you do  
DevOps**

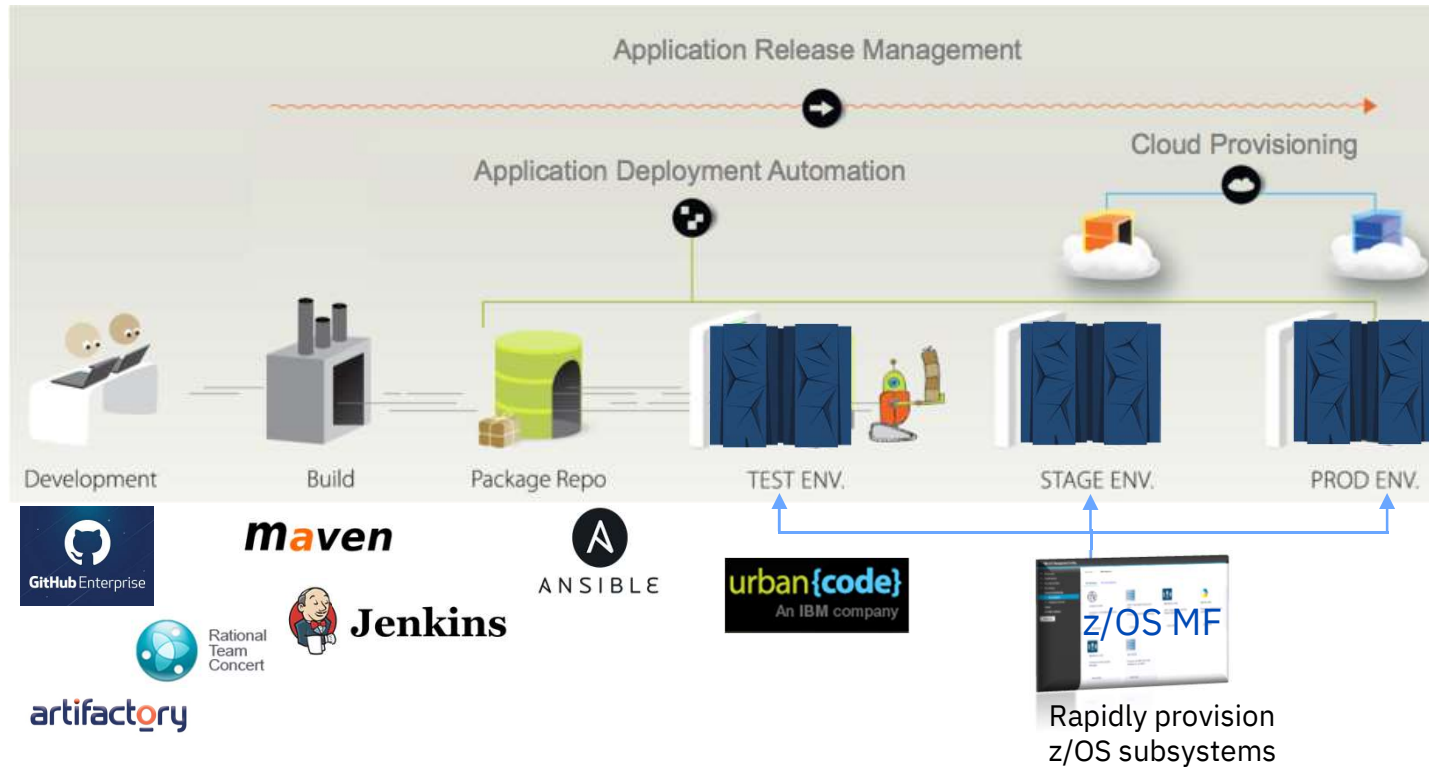
IBM IMS / © 2018 IBM Corporation

**It's an approach, a mindset – a combination of culture, process and technology (including infrastructure, tools and services)**

**It's about transforming application development and delivery in order to accelerate digital transformation.**

**DevOps is done in steps, gaining value at each stage.**

# Integrated DevOps with IBM Z



# How can Swagger help with DevOps?



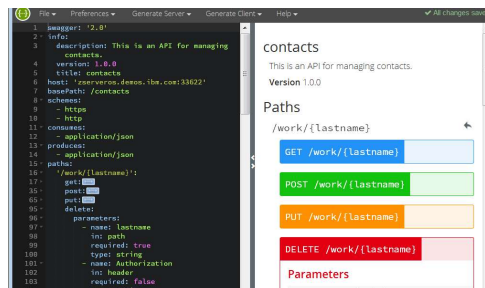
More than just an API description framework...

There are number of Open Source tools available to aid consumption:

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## 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 creates stub code to consume APIs from various languages.



# DevOps for the Enterprise + An Open Ecosystem

Increasing your agility to deliver for digital transformation

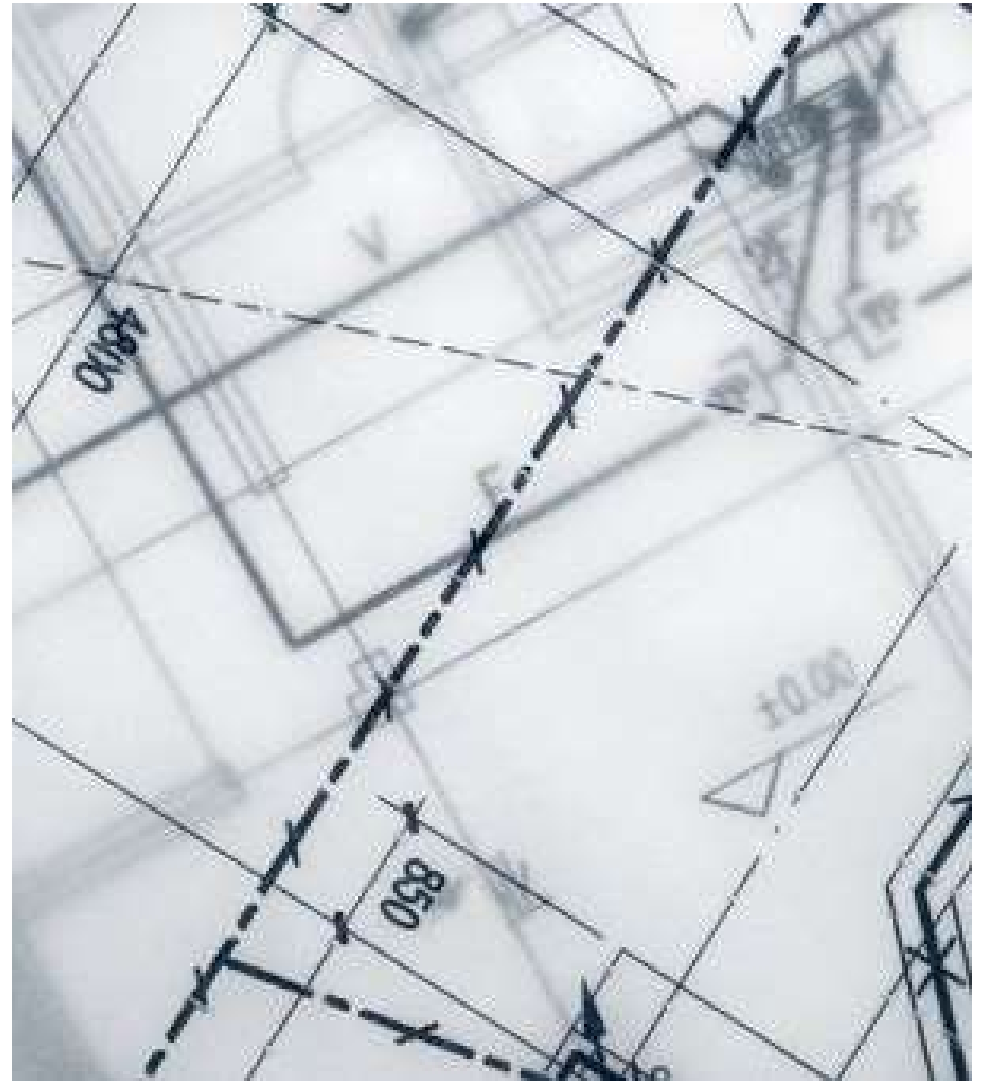
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Distributions	Virtualization	Languages	Runtimes	Management	Database	Analytics
 Supported by Canonical   Community Versions    	  LPAR DPM  	          	   OpenJDK  	  ANSIBLE     urban{code}	        Db2 	    

# Digital Transformation

# Open and Connected

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# The Connected Mainframe Delivers



- The Connected Mainframe is a platform that is **integration ready both** within and outside the mainframe with **Java, Linux, Web and API enablement**
- Integrate the mainframe with the rest of the datacenter infrastructure and IT processes with **Hybrid Cloud, DevOps** and **API/Mobile usage**



Additional revenue per year  
**\$200M**



Higher application developer productivity on mainframe  
**15%**



Infrastructure cost reduction

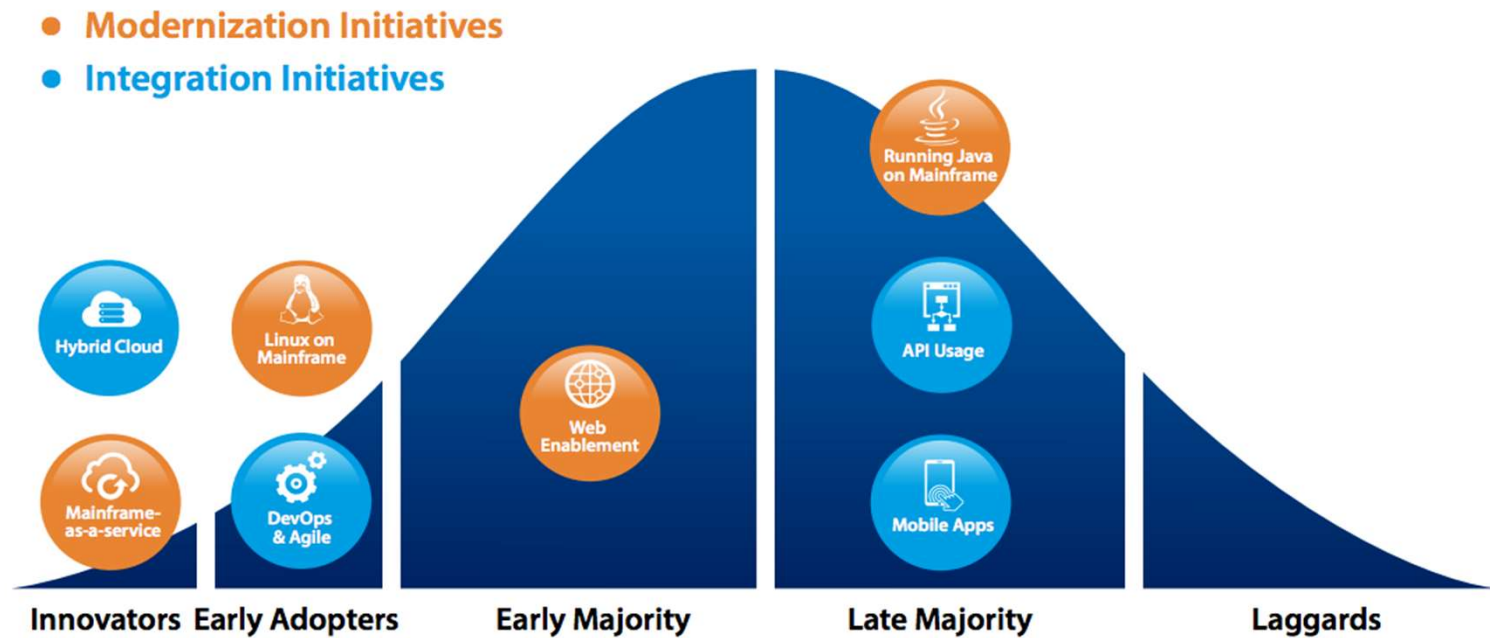
**\$18M**  
**32%**



IT staff productivity  
**\$8M**  
**14%**



# Where are you on the Connected Mainframe continuum?



# The What



# Digital Transformation Responsibilities by Persona



# Expose: API Enable APPS & Data



**LOB Owner**

Improve efficiency, reduce costs and extend reach of assets through an open and connected environment



**Enterprise Architect**

Define an API channel for business critical assets

- IBM Application Discovery and Delivery Intelligence
- IBM Application Delivery Foundation for z Systems
- IBM z/OS Connect Enterprise Edition



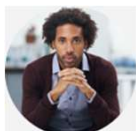
**Application Architect**

Empower developers with open & modern development environment

- IBM Application Discovery and Delivery Intelligence
- IBM Application Delivery Foundation for z Systems
- IBM Explorer for z/OS

Discover & create APIs w/ zero to minimal changes to assets

- IBM Application Discovery and Delivery Intelligence
- IBM Application Delivery Foundation for z Systems
- IBM z/OS Connect Enterprise Edition



**Operations**

Monitor APIs

Have a current view of the application ecosystem

- IBM Service Management Suite for z/OS
- Specialty Tools

**System Programmer DBA**

## Run & Maintain

Have a current view of resources and leverage the latest compilers and subsystems to reduce costs and maximize performance

## Be Efficient

- Omegamon
- IBM Compilers
- IBM Automatic Binary Optimizer for z/OS

# Evolve: Automate & Transform



**LOB Owner**



**Enterprise Architect**



**Application Architect**



**Operations**

**System Programmer DBA**

Have a vibrant and engaged developer community that can rapidly respond to business requests

Govern APIs to maximize security and reuse  
Leverage best fit language for transformation

Automate delivery pipeline

Embrace early test integration (shift left)

Have performance visibility from device to backend

**Run & Maintain**  
Have a current view of resources and leverage the latest compilers and subsystems to reduce costs and maximize performance

**Be Efficient**

- IBM Rational Team Concert
- IBM UrbanCode Deploy
- Open Source Options
- IBM Dependency Based Build Beta
- IBM Application Discovery and Deliver Intelligence
- IBM z Systems Development and Test Environment

- IBM API Connect

- Java, Node.js, Swift

- IBM z Systems Development and Test Environment
- XATester
- IBM Rational Test Workbench
- IBM Rational Test Virtualization Server
- IBM Application Discovery and Deliver Intelligence

- IBM Z Application Performance Management Connect

- Omegamon
- IBM Compilers
- IBM Automatic Binary Optimizer for z/OS



**LOB Owner**



**Enterprise Architect**



**Application Architect**



**Operations**

**System Programmer  
DBA**

## Optimize: Predict & Respond

Achieve the highest levels of confidence and agility to meet business goals and prevent interruption of services

Transform monolithic applications into granular services

- IBM Application Discovery and Delivery Intelligence
- IBM Application Delivery Foundation for z Systems
- IBM z/OS Connect Enterprise Edition

Optimize development with advanced analytics

- IBM Application Discovery and Delivery Intelligence

Predict and automatically respond to service interruption

- IBM Common Data Provider
- IBM Operational Analytics for Z
- Splunk
- zAware

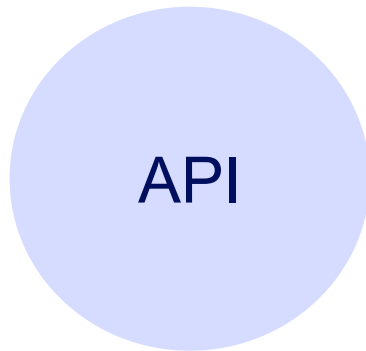
## Run & Maintain

Have a current view of resources and leverage the latest compilers and subsystems to reduce costs and maximize performance

## Be Efficient

- Omegamon
- IBM Compilers
- IBM Automatic Binary Optimizer for z/OS

# Common IMS Transformation Patterns



IMS assets as  
API



Rapid IMS provisioning  
and Integrated DevOps



Application  
Agility with Java in IMS



Open IMS data access  
with JDBC and SQL

Make your **IMS assets** more **open and modern** in the API economy

**Ease integration** within or outside your company with **minimal mainframe skills**

**Low development cost** with minimal to no programming required

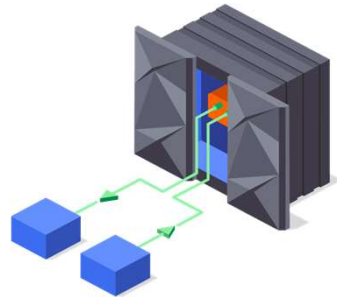
*Top 3 reasons for transforming IMS with **API***



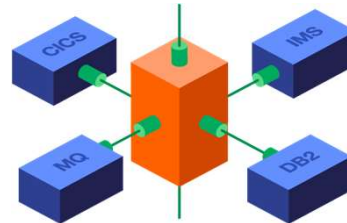
# IBM z/OS Connect Enterprise Edition

## Truly RESTful APIs to and from your mainframe

for building microservices and succeeding in the API economy



**APIs to and from the mainframe**



**Comprehensive subsystem support**



**Point-and-click API creation**



Call external APIs from your mainframe applications, or expose those applications as easily consumable RESTful APIs with OpenAPI descriptions - with simple integration into enterprise API management solutions.

Learn more: [ibm.biz/zosconnectdc](https://ibm.biz/zosconnectdc)

Try for yourself: [ibm.biz/ibmztrial](https://ibm.biz/ibmztrial)

## z/OS Connect Enterprise Edition

---

Create Open API (Swagger) defined RESTful APIs to z Systems

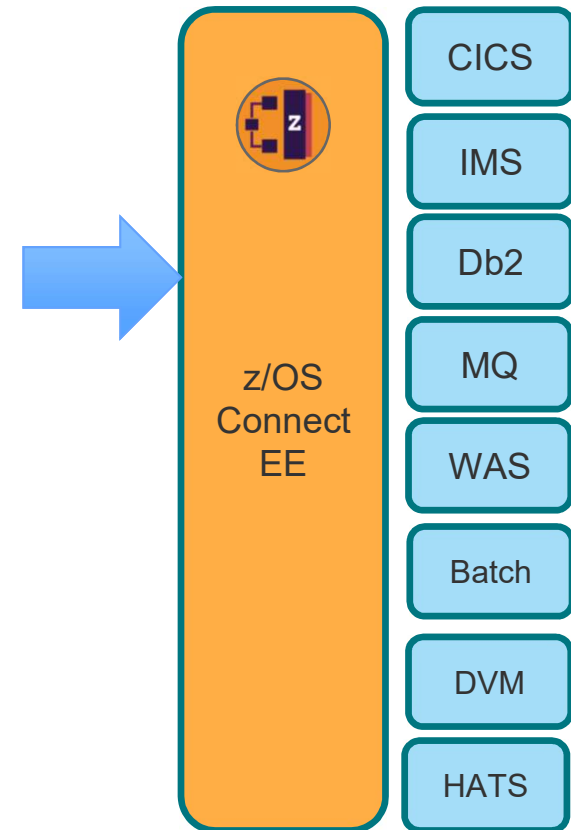
“Fully REST” enable major z/OS Subsystems

- z/OS appears as any other REST Provider
- Support of all REST verbs
- With sophisticated mapping of true RESTful APIs to existing mainframe services and data

Call out REST API from z/OS application

No Backend Application Changes

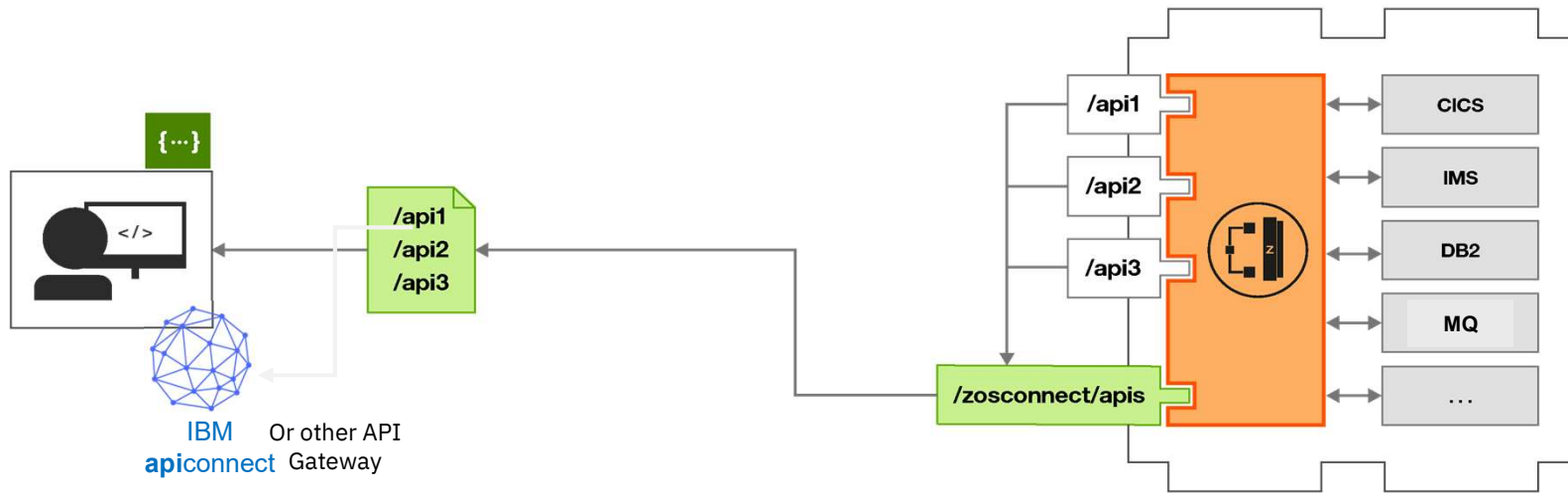
No Coding Required (Tool Driven)





# Describe your z/OS assets as Open API

Mainframe assets described and discoverable as Open APIs, just like any other APIs.  
No mainframe skills to use mainframe apps as APIs.  
Expose IMS and z/OS assets as RESTful APIs without writing any code.

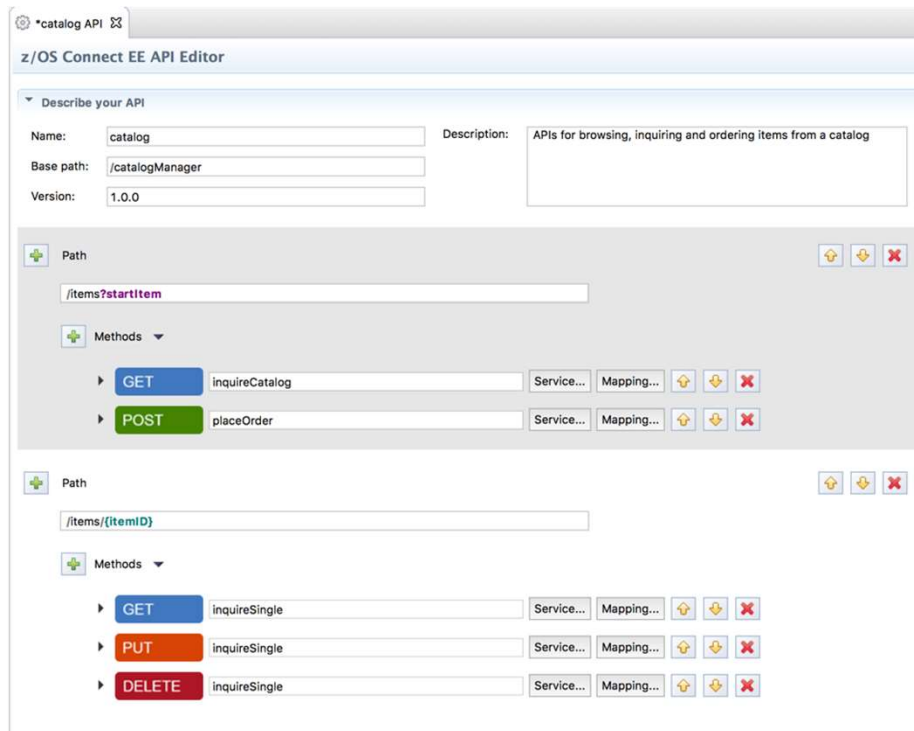


URIs of Open APIs docs can be consumed by API management products such as Apigee or IBM API Connect.

The inclusion of OpenAPI Spec 2.0 support in z/OS Connect EE V2.0 makes exchange of API information standardized, which provides compatibility with a wider set of devices and functions

# API toolkit – Easy creation of API for your z/OS Assets

## API definition



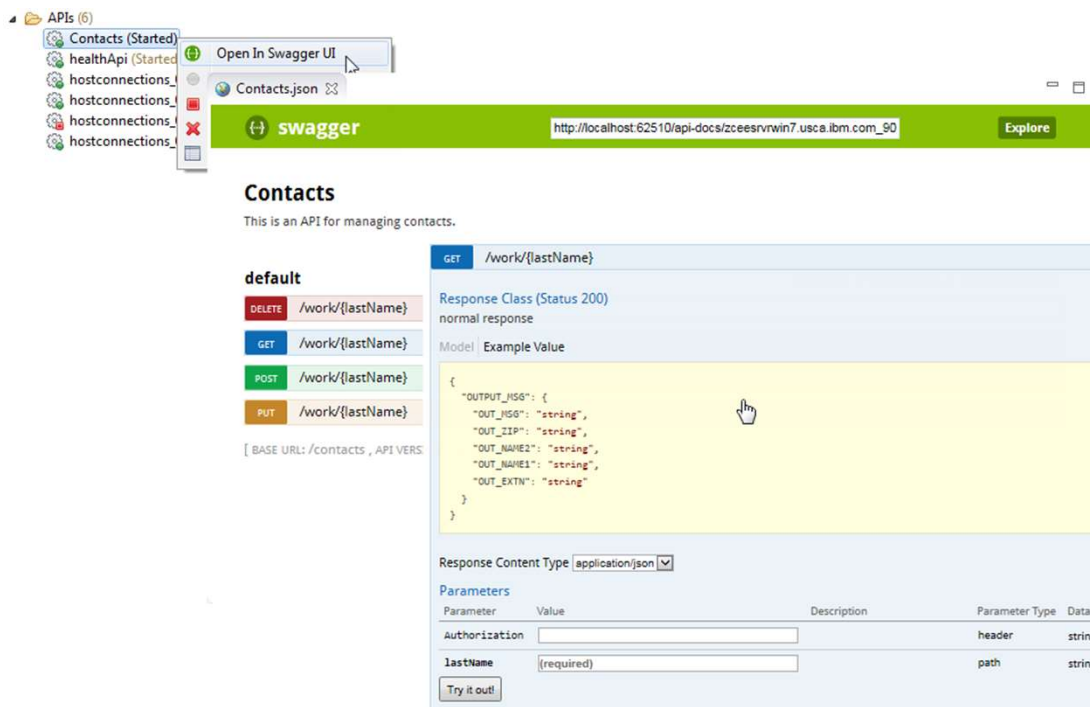
The **API toolkit** is designed to encourage RESTful API design.

Once you define your API, you can map backend services to each request.

Your services are represented by `.sar` files, which you import into the API toolkit.

# API toolkit

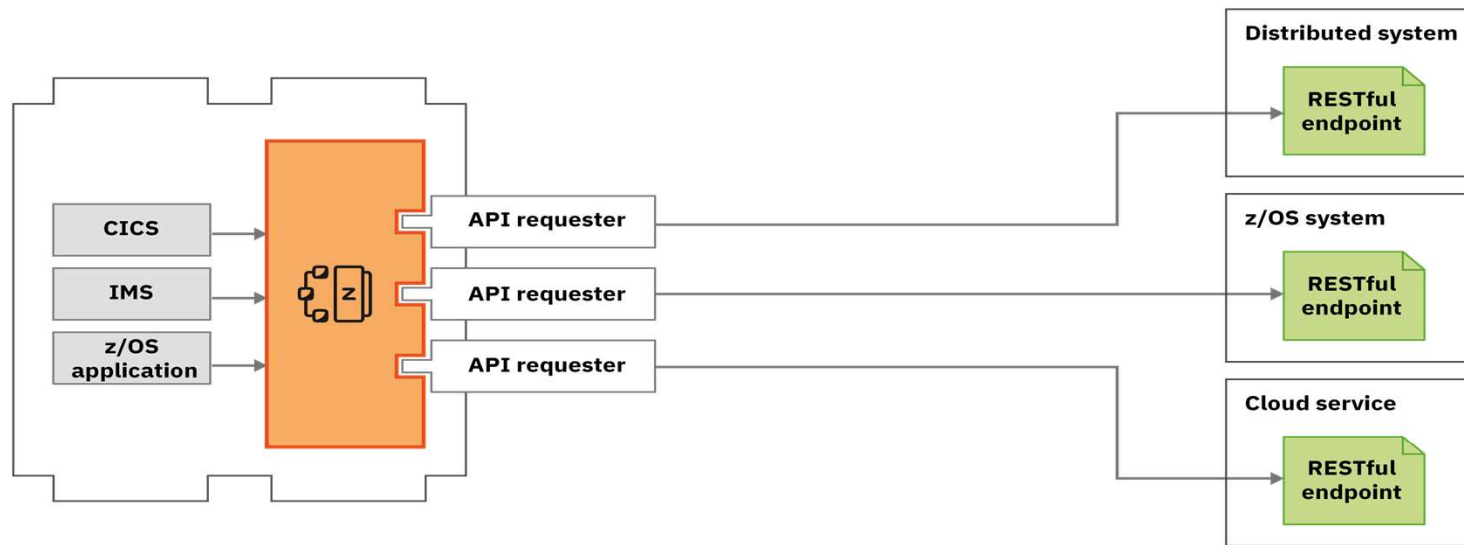
## Testing with Swagger UI



Test your deployed APIs directly with **Swagger UI** inside the editor.

No need to export the Swagger doc to a separate tool.

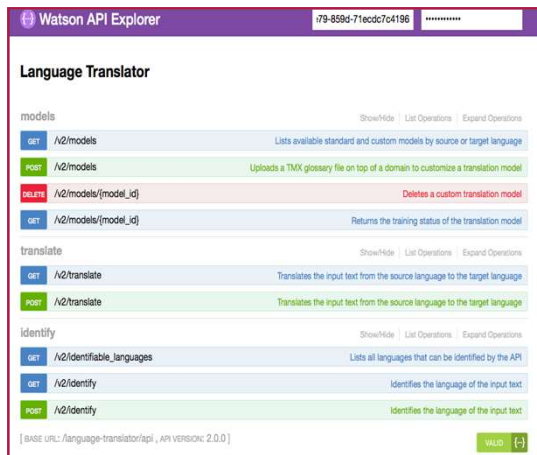
# IMS and z/OS assets to call external APIs with API requester



# API requester code generation for z applications

*z developer does not need to write complex code to parse JSON messages nor to handle HTTP calls*

## API Description via Open API Doc



The screenshot shows the Watson API Explorer interface for the Language Translator API. It lists several endpoints under three categories: 'models', 'translate', and 'identify'. Each endpoint is shown with its HTTP method (GET, POST, DELETE) and a brief description of its function. A purple arrow labeled 'Generate' points from this interface towards the right, indicating the process of generating code from the API description.

Generate  
Command-line  
Build toolkit

Request and Response  
copybooks

API info  
copybook

Configuration file (ARA)

## IMS / BATCH / COBOL / PLI app

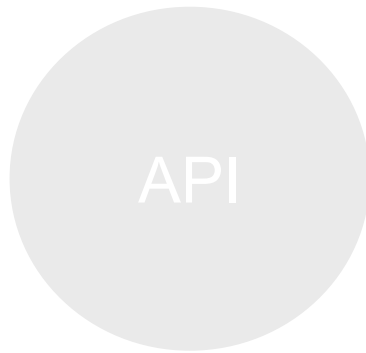
```
*Request and Response data structure
01 REQUEST
   COPY API00Q01
01 RESPONSE
   COPY API00P01
01 API-INFO
   COPY API00I01
77 COMM-STUB-PGM-NAME PIC X(8)VALUE 'BAQCSTUB'

*Set request data
MOVE input-value TO REQUEST-DATA
SET BAQ-REQUEST-PTR TO ADDRESS OF REQUEST
SET BAQ-RESPONSE-PTR TO ADDRESS OF RESPONSE

* One simple call to invoke API
Call COMM-STUB-PGM-NAME
using API-INFO ...
   BAQ-REQUEST-PTR ...
   BAQ-RESPONSE-PTR ...

* Display response data
DISPLAY "Output: " RESPONSE-DATA
```

# Common IMS Transformation Patterns



IMS assets as  
API



Rapid IMS provisioning  
and Integrated DevOps



Application  
Agility with Java in IMS



Open IMS data access  
with JDBC and SQL

**Skills** are easy to find for Java and tools

Make your **IMS applications** more **maintainable** and **cost-effective**

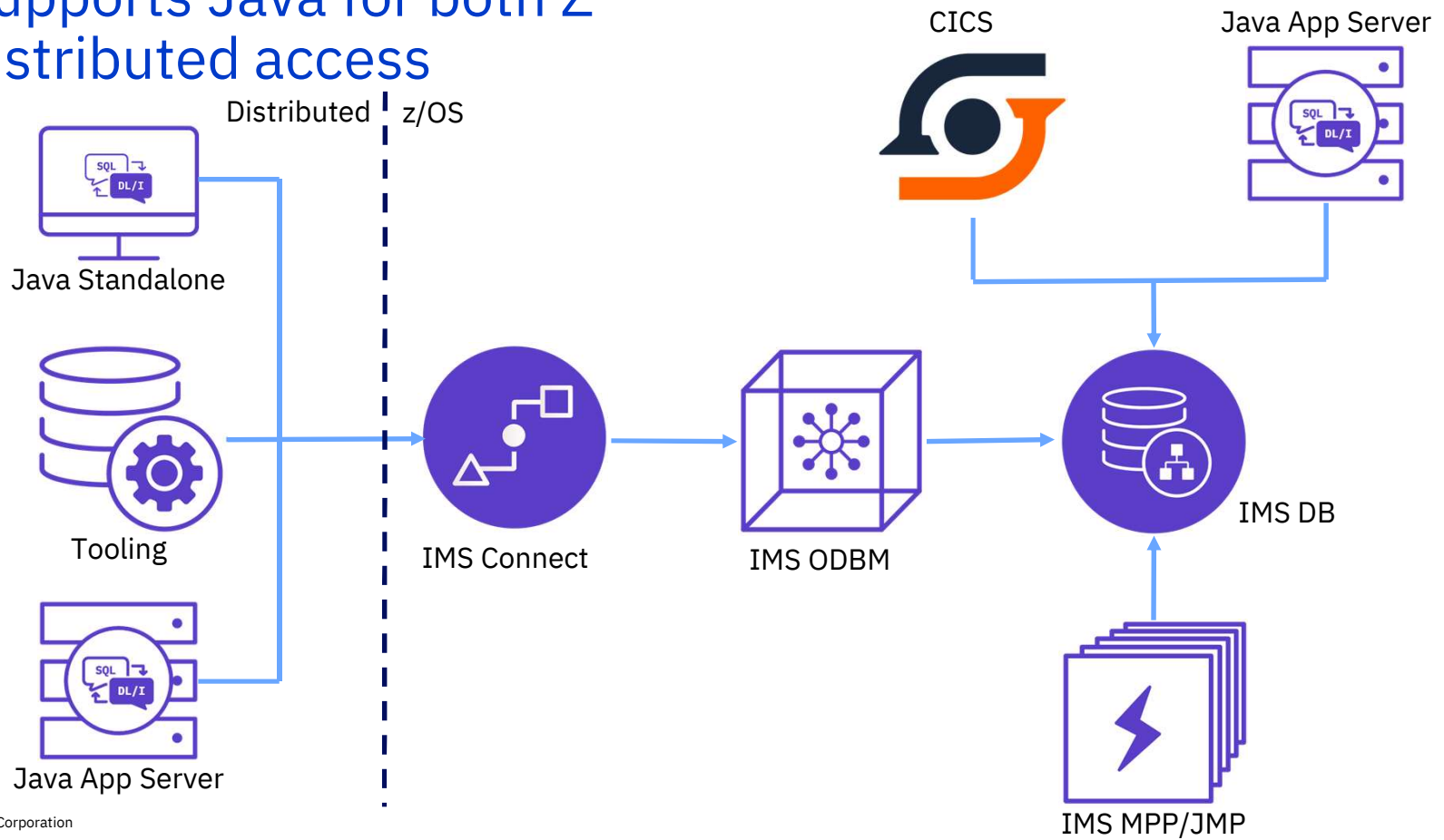
**DevOps ready** for continuous integration with most enterprise DevOps pipeline

## *Top 3 reasons of transforming IMS with **Java***



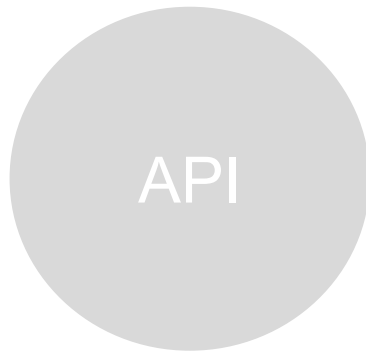
Java on IMS

# IMS supports Java for both Z and distributed access





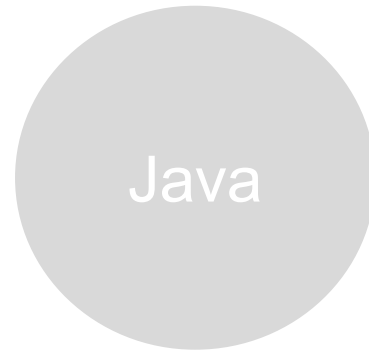
# Common IMS Transformation Patterns



IMS assets as  
API



Rapid IMS provisioning  
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Application  
Agility with Java in IMS



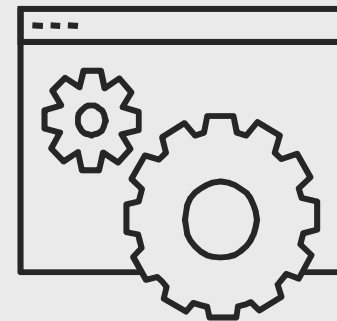
Open IMS data access  
with JDBC and SQL

**Continuous delivery and integration** DevOps with mainframe assets

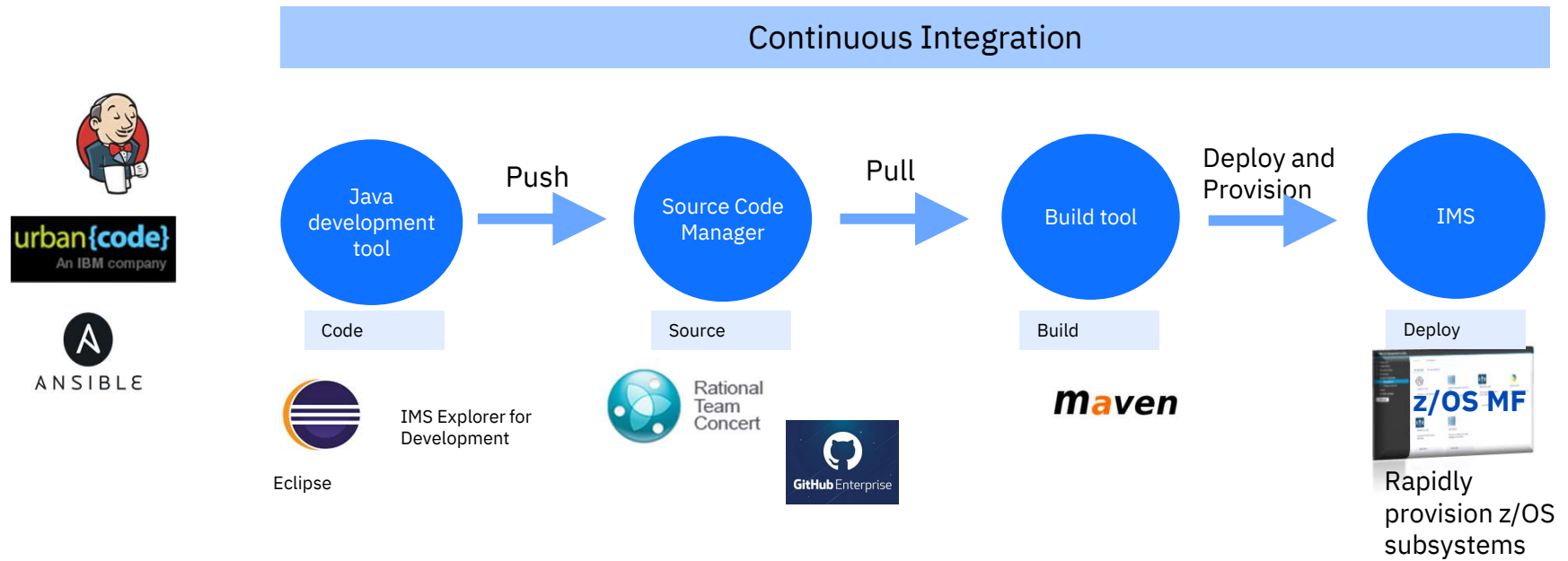
Enable **Cloud-like provisioning** and configuration with IMS

**Self-service** application development and deployment with no mainframe skills

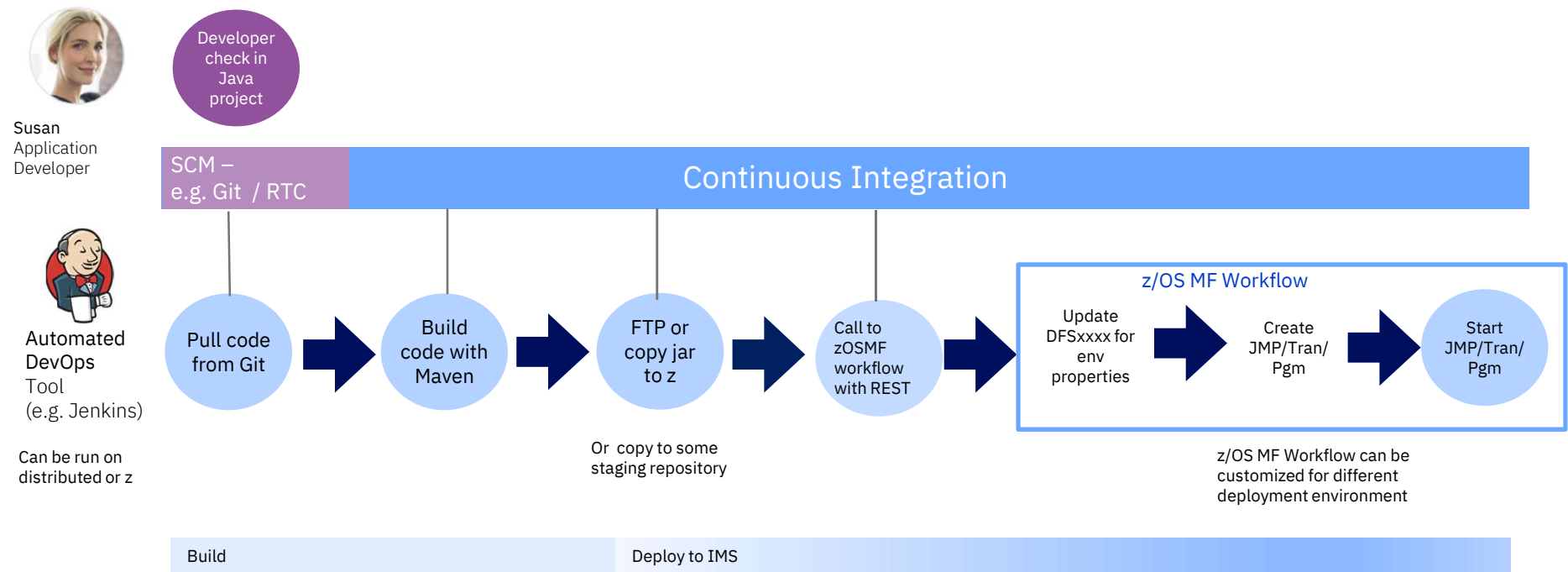
## *Top 3 reasons of transforming IMS with **DevOps***



# Sample Java DevOps Pipeline



# Sample Jenkins Pipeline to deploy a Java application in IMS



Make your **IMS data more accessible**

**Instant data access** with reduced latency and elimination of ETL

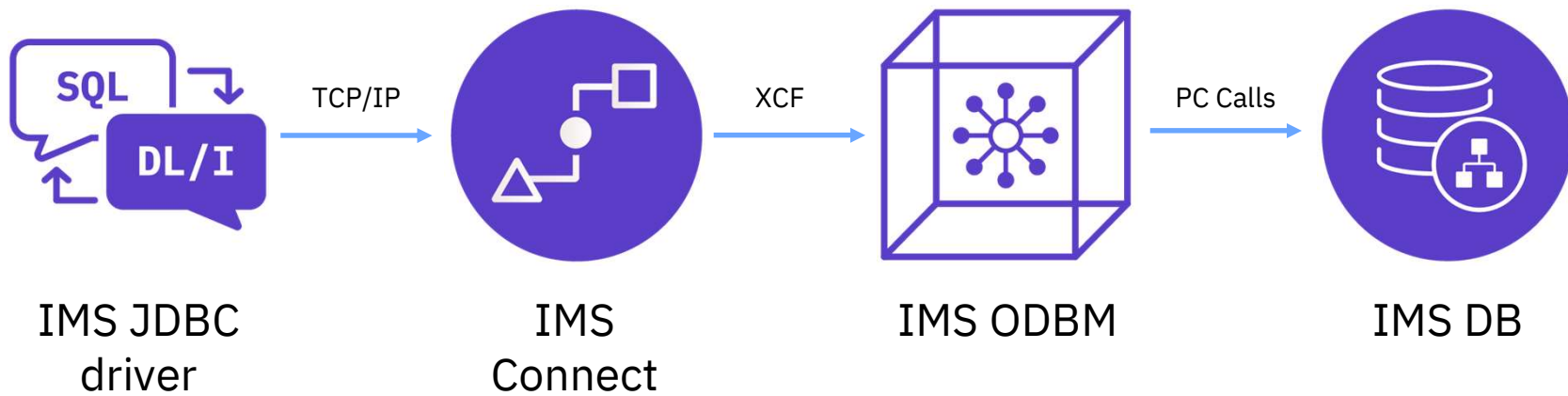
Abundant **Java and SQL Skills** and tools

## *Top 3 reasons for transforming IMS with **Open Database***



## The Open Database architecture

The following pieces are needed for distributed access: IMS Universal JDBC driver, IMS Connect, ODBM, SCI and IMS



# Solution adoption kits

- [API solution kit \(http://ibm.biz/IMS\\_API\\_Economy\\_Kit\)](http://ibm.biz/IMS_API_Economy_Kit)
- [Java solution kit \(http://ibm.biz/JavaIMSKit\)](http://ibm.biz/JavaIMSKit)
- [Open access solution adoption kit \(http://ibm.biz/BdZWUT\)](http://ibm.biz/BdZWUT)
- Interactive exploration models

## API economy solution implementation process flow



# IMS Open Access samples

[Open access solution adoption kit](https://www.ibm.com/support/knowledgecenter/SSEPH2_15.1.0/com.ibm.ims15.doc.sk/ims_openaccovr.htm) (with use case, documentation and sample code)

The screenshot shows the IBM Knowledge Center page for the 'Open access solution adoption kit'. The page title is 'Open access solution adoption kit'. The breadcrumb navigation is 'Home > IMS 15.1.0 > IMS solution adoption kits'. The page content includes a search bar and a table of contents. The table of contents lists the following items:

- + IBM IMS 15 documentation
- **IMS solution adoption kits**
  - Key concepts
  - **Open access solution adoption kit**
    - + Accessing IMS data using .NET applications
    - + Accessing IMS data using Java applications
  - + Java in IMS solution adoption kit
  - + API economy solution adoption kit
  - + Release planning for IMS
  - + Installing IMS
  - + IMS administration
  - + Programming for IMS
  - + Troubleshooting for IMS
  - + IMS reference information
  - IMS glossary

The main content area contains the following text:

Historically, IMS data residing on IBM z Systems was only accessible by COBOL and PL/I applications on the mainframe. With the open access solution, you can now access IMS database from outside the IBM z Systems platform. Accessing IMS data outside of the IBM z Systems platform is called *open access*.

→ **Accessing IMS data using .NET applications**  
If you have .NET applications outside of IMS that need access to the data, whether it is for querying or analytics or any purpose, the open access kit can guide you to make that happen.

→ **Accessing IMS data using Java applications**  
If you have Java applications outside of IMS that need access to the data, whether it is for querying or analytics or any purpose, the open access kit can guide you to make that happen.

**Related information:**  
Getting started with open access

Feedback

[https://www.ibm.com/support/knowledgecenter/SSEPH2\\_15.1.0/com.ibm.ims15.doc.sk/ims\\_openaccovr.htm](https://www.ibm.com/support/knowledgecenter/SSEPH2_15.1.0/com.ibm.ims15.doc.sk/ims_openaccovr.htm)

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## IMS Sample GitHub

The screenshot shows the 'IBM IMS on GitHub' page. The page title is 'IBM IMS on GitHub'. The page content includes a welcome message and a grid of application samples.

Welcome to IMS on GitHub. Here you will find sample code and tutorials for your IMS application development and deployment needs.

**Application samples**

- ims-java-jmp**: A sample Java app that runs in an IMS dependent region
- ims-java-cobol**: A sample Java app that inter-operates with COBOL in an IMS dependent region (Coming soon)
- ims-java-jee-tm**: A Java EE app that accesses an IMS transaction
- ims-java-jee-db**: A Java EE app that accesses an IMS database using JDBC and Open database
- ims-zcee-api-provider**: A tutorial on creating a REST API that accesses an IMS transaction
- ims-zcee-api-requester**: A tutorial on enabling an IMS application to call out to a REST API

<https://developer.ibm.com/zsystems/ims/ims-github/>

<https://github.com/imsdev>





# IBM Z Trial Program

- Try the latest IBM z capabilities today
- No charge, on-demand environment
- No set up, no install
- Hands-on tutorials



# Get your IBM Z trial environment

## Selected examples of available trials



### z/OS Connect Enterprise Edition

Create efficient and scalable RESTful APIs for mobile and cloud applications securely from your business critical applications residing on the mainframe.



### Information Management System (IMS)

The most secure, highest performing and lowest cost hierarchical database management software for online transaction processing (OLTP).



### Application Discovery & Delivery Intelligence

Application discovery tools are part of the software lifecycle management process; use them to leverage your time-tested code and to transform and support digital and hybrid cloud transformation.



### OMEGAMON for JVM Monitoring

IBM OMEGAMON for JVM on z/OS provides resource level monitoring of all Java Virtual Machines on z/OS enabling visibility and insight into Java performance across subsystems.

To see the full list of available trials:

<https://www.ibm.com/it-infrastructure/z/resources/trial>

**Because we  
love what you  
build with what  
we build**

A word cloud featuring various terms related to IBM z Systems and cloud computing. The central text is "THANK YOU" in large, bold, orange letters. Surrounding it are other terms in black and blue, including "z Systems", "Hybrid Cloud", "IMS", "Database", "Automation", "APIs", "Workload management", "Mobile", "DevOps", "Insurance", "Systems management", "Industries", "Java", "Banking", "Availability", "Scalability", "Security", "Open", and "Analytics".

Mobile  
DevOps  
Insurance  
Systems management  
Industries  
Analytics  
APIs  
Workload management  
Automation  
z Systems  
THANK YOU  
Java  
Hybrid Cloud  
Banking  
Scalability  
Security  
IMS  
Database  
Open

## Reading Resources

- [Breathing new life into crucial infrastructure](#)
- [KPMG CIO Survey 2017](#)
- [Paper “The Business Value of the Connected Mainframe for Digital Transformation”](#)
- [Economist article](#)
- [Deutsche Bank whitepaper](#)
- [Java solution kit](#)
- [API solution kit](#)
- [Open Access solution kit](#)

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