

Making Sense of “The API* Economy”

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IT Thought Leader, Consultant
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* Application Programming Interface

LEVEL

Snapshot of My Activities

✓ *IT Analysis, Research, Services and Writing*



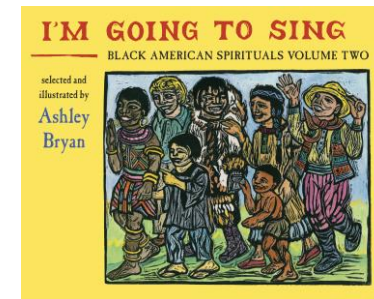
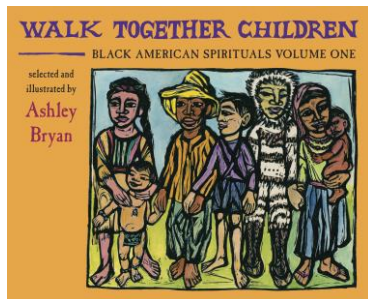
PathPoint Software, Inc.

IBMSystems
MEDIA

MSP TechMedia



✓ *Book Publishing*



✓ *Artisan Food & Buy Local in NC*



✓ *Incubator Farm & Support NC Farmers*



INTRODUCTION TO THE API ECONOMY

Topics

- *Gartner Vision*
- *Delivering value, growth and change*
- *Classifications*
- *Examples*
- *Small data programs and microservices*

Gartner API Vision (at 20K Feet)

According to Gartner*, the API economy is an **enabler** for turning a business or organization into a **platform**. How is this possible?

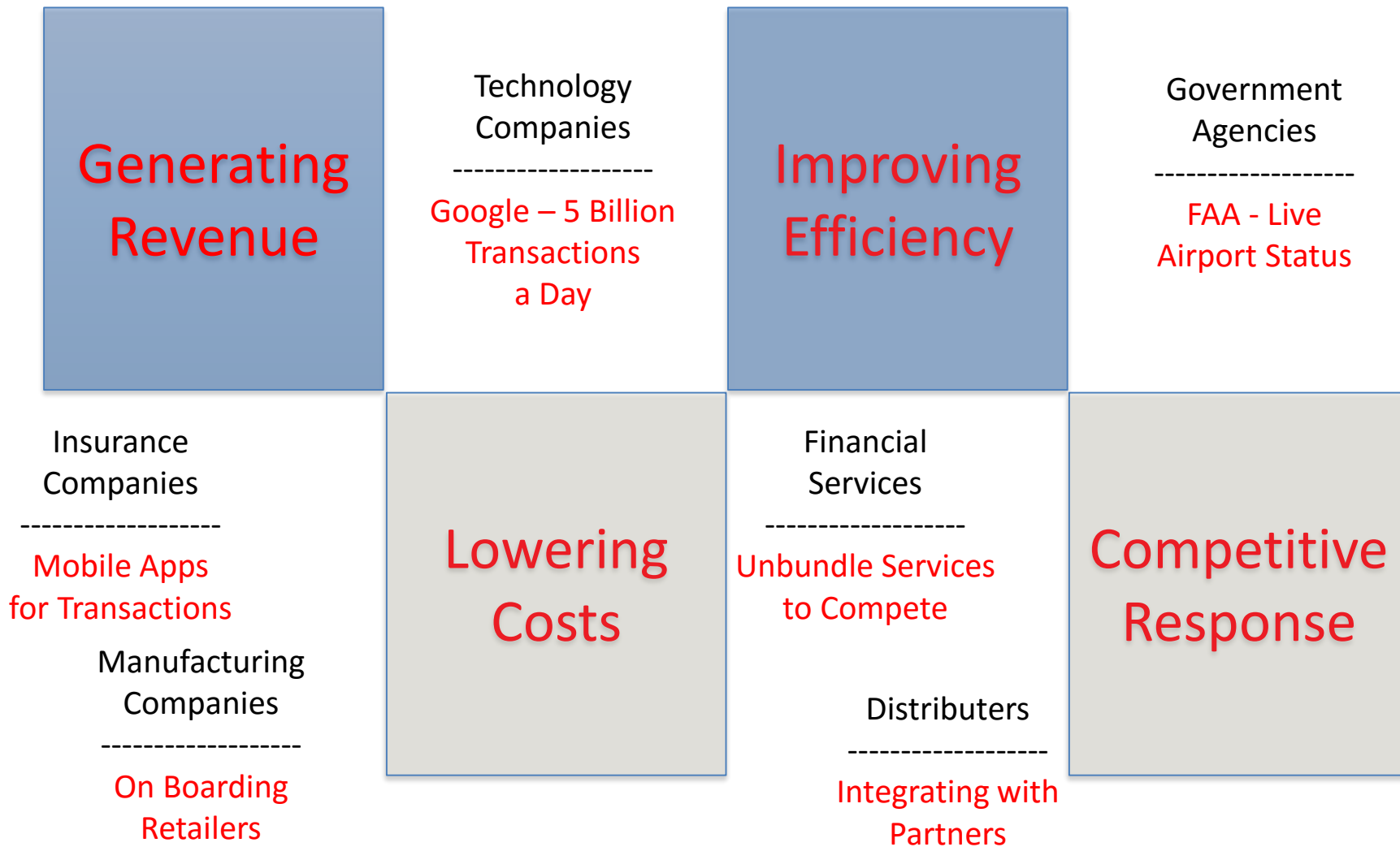
The API economy is a **set of business models and channels** based on secure access of functionality and exchange of data.

In new ways, APIs make it simpler to **integrate and connect people**, places, systems, data, things and algorithms.

Can also be used to--

Create new user experiences	Enable transactions and algorithms
Share data and information	Leverage third-party algorithms
Authenticate people and things	Create new product/services and business models

How companies and organizations deliver value leveraging emerging technology like APIs



Sources:

[API Economy](#) by Collins & Sisk.

[Intro to APIs in Government](#), [API Use for the Insurance Industry](#) by Glickenhause.

[Welcome To The API Economy](#), Forbes Magazine.

Classification of APIs by Type

O-APIs (Dawn of Operating Systems)

Category	Description	Example APIs
A-type	Access Methods	Queued Sequential Access Method
P-type	Performance	Application Response Measurement

N-APIs (Dawn of WWW)

Category	Description	Example APIs
D-type	Data access	Local Government, Climate, Ecosystems, Agriculture, Ocean, ...
\$-type	Accept online and mobile payments	PayPal Payments & Square online and in-person payments
M-type (Dawn of Cloud Computing)	Application program in the form of a microservice	Created from a variety of API Management tools; a new kind of application running on top of the legacy applications; non-disruptive

Search the Largest API Directory on the Web

Programmable Web

Search Over 17,189 APIs SEARCH APIS

D-type <https://www.programmableweb.com/category/agriculture/apis?category=19986&deadpool=1>

Filter APIs

Agriculture x Include Deprecated APIs

API Name	Description	Category	Submitted
OIPA: Openaid IATI	OIPA extracts all published IATI XML files from the IATI Registry and stores them in a PostgreSQL database, that you can access using a RESTful API.	Data-as-a-Service	09.03.2012
tropicalfruitandveg	The tropicalfruitandveg.com API provides a simple way to integrate information on tropicalfruitandveg.com. This REST API is available in XML, JSON and HTML and returns description, health, soil,...	Food	03.13.2017
Parrot Flower Power User	This API provides access to user data using the Flower Power Cloud and returns, Get profile and Obtain version info. The Parrot Pot is a smart flowerpot that helps your plants with a self-watering...	Internet of Things	11.15.2016

The home of the U.S. Government's open data

Here you will find data, tools, and resources to conduct research, develop web and mobile applications, design data visualizations, and [more](#).

D-type

GET STARTED

SEARCH OVER 165,976 DATASETS

Manufacturing & Trade Inventories & Sales



BROWSE TOPICS



Agriculture



Climate



Consumer



Ecosystems



Education



Energy



Finance



Health



Local Government



Manufacturing



Maritime



Ocean



Public Safety



Science & Research

HIGHLIGHTS

By the numbers: port statistics for some of the largest U.S. ports

As intermodal connectors for domestic and international freight, our nation's ports serve a critical role in numerous supply chains and the national economy. In recognition of this importance, the *Fixing America's Surface Transportation* (FAST) Act (P.L. 114-94; Dec. 4, 2015; 129 Stat. 1312) established a Port Performance Freight Statistics Program within the U.S. Department of Transportation: Bureau of Transportation Statistics. The first annual Port Performance Freight Statistics Program report provides descriptive statistics for a group of ports for year 2016, including the top 25 ports in terms of total tonnage, twenty-foot equivalent units (TEUs), and dry bulk tonnage. The report is available to download at https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/PPFS_Annual_Report.pdf

The 2016 Port Performance report used multiple sources, including public datasets featured on Data.Gov. One foundational dataset used in the report is the total commercial tonnage carried on waterways published by the U.S. Army Corps of Engineers - Waterborne Commerce Statistics Center.

Link to dataset: <https://catalog.data.gov/dataset/total-tonnage-foreign-and-domestic-of-commodities-carried-on-commercial-waterways>.

climate



Order by:

Relevance

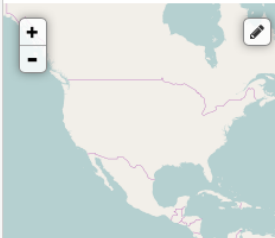
Datasets ordered by Relevance

You are searching in the list of datasets. Show results in entire Data.gov site.

Filter by location

Clear

Enter location...

Map tiles & Data by [OpenStreetMap](#), under [CC BY SA](#)

Topics



Clear All

Local Government (578)

Climate (562)

Ecosystems (122)

Agriculture (88)

Ocean (39)

Show More Topics

Topic Categories



Clear All

Arctic (201)

Water (112)

Ecosystem Vulnerabi... (101)

Arctic Weather and ... (97)

Human Health (94)

Show More Topic Categories

9,560 datasets found for "climate"

Climate Divisions [12 recent views](#)

U.S. Geological Survey, Department of the Interior National Climatic Data Center. climate

[ZIP](#) [ZIP](#) [Export](#) [TAR](#) [Export](#)

Climate Divisions

University of Idaho — This is a coverage of climate

[ZIP](#) [ZIP](#) [Export](#) [TAR](#) [HTML](#)

Climate Reconstructions

National Oceanic and Atmospheric Administration Paleoclimatology Program archives reconstruction paleoclimate proxies, in addition to the Program

[XML](#) [XML](#) [KMZ](#) [KMZ](#) [HTML](#) [HTML](#) 3 more in dataset

Downscaled Climate Model Climate Toolbox

University of Idaho — Geoprocessing services that produce raster data products from downscaled climate data. The current tools operate on ArcGIS 10.0. The tools are currently being...

[ZIP](#)

Mexico City Daily Climate Data

University of California San Diego — 1961-2010

[HTML](#)

Mirador - Climate Variability and Change

National Aeronautics and Space Administration — Earth Science data access made simple. NASA's role in climate variability study is centered around providing the global scale observational data sets on oceans and...

[HTML](#)

637 datasets found

Fruit and Vegetable Prices [326 recent views](#)

Department of Agriculture — How much do fruits and vegetables cost? ERS estimated average prices for 153 commonly consumed fresh and processed fruits and vegetables.

[XLS](#)

Collection 1 meter Digital Elevation Models (DEMs) - USGS National Map 3DEP Downloadable Data Collection [246 recent views](#)

U.S. Geological Survey, Department of the Interior — This is a tiled collection of the 3D Elevation Program (3DEP) and is one meter resolution. Data in this layer represent a bare earth surface. The 3DEP data holdings...

[WAF](#) [IMG](#) [Esri REST](#) [WMS](#) [HTML](#) [HTML](#) 1 more in dataset

Federal

Federal

University

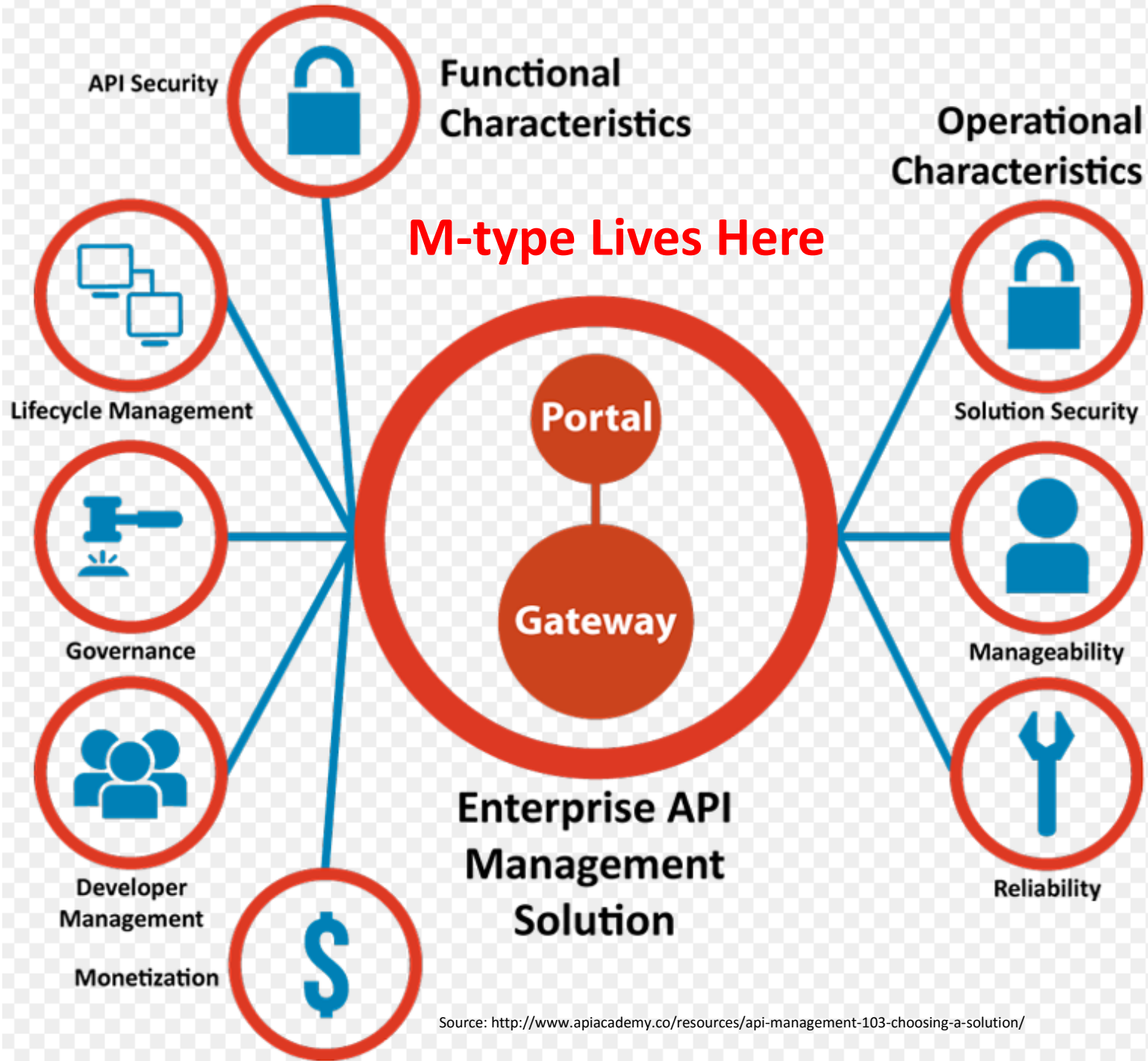
University

Federal

M-type is a N-API that Evolved Since the Dawn of Cloud Computing

API application programs are starting to be called microservices. Five things to know--

1. Created in an Integrated Development Environment (IDE)
2. Provide a connection between the legacy world (systems of record) and the new world of engagement (mobile)
3. Surrounded by support software and tools like management console, security, analytics & logging that are used for governance
4. You build then deploy, manage, HA, back up, etc.
5. API products have a lot of elements like a gateway, server, designer console, and are deployed in the cloud or on-premises



APIs and Microservices

Two views—

1. **An Architectural Style** -- Through adoption of the microservices architectural style, companies use many very small modules, communicating using lightweight protocols, that combine to provide a service. They are part of an application like order processing, supporting a business area like add a new customer, for a specific scenario like verify customer address. The microservices can be used in multiple scenarios.
2. **A Kind of Program** -- Many API Management software suppliers are providing an IDE and other key components like a management console and analytics, in support of the creation of small data applications they call microservices. These data applications can be used stand-alone or combined into applications by making important data and processes available in new ways without disrupting the system of record.

SURVEY OF API MANAGEMENT PRODUCTS

Topics

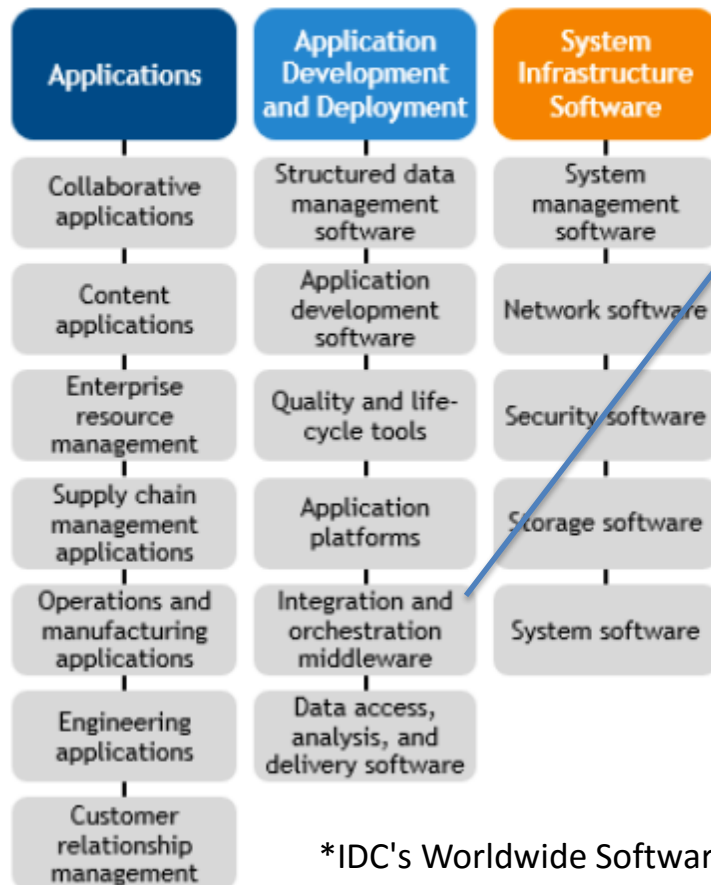
- *IDC Taxonomy*
- *Forrester and Gartner*

Where does API software fit into the IDC taxonomy?

IDC'S WORLDWIDE SOFTWARE TAXONOMY

FIGURE 1

Software Primary Market Segments



Integration and Orchestration Middleware

1. Business-to-Business Middleware
 - B2B Gateway Middleware
 - B2B Networks and B2B Managed Services
2. Integration Middleware
 - **API Management Software**
 - Enterprise Service Bus Middleware
 - Connectivity Middleware
3. Event-Driven Middleware
 - Business Activity Monitoring
 - Complex Event Processing Middleware
 - Message-Oriented Middleware
4. Managed File Transfer Software

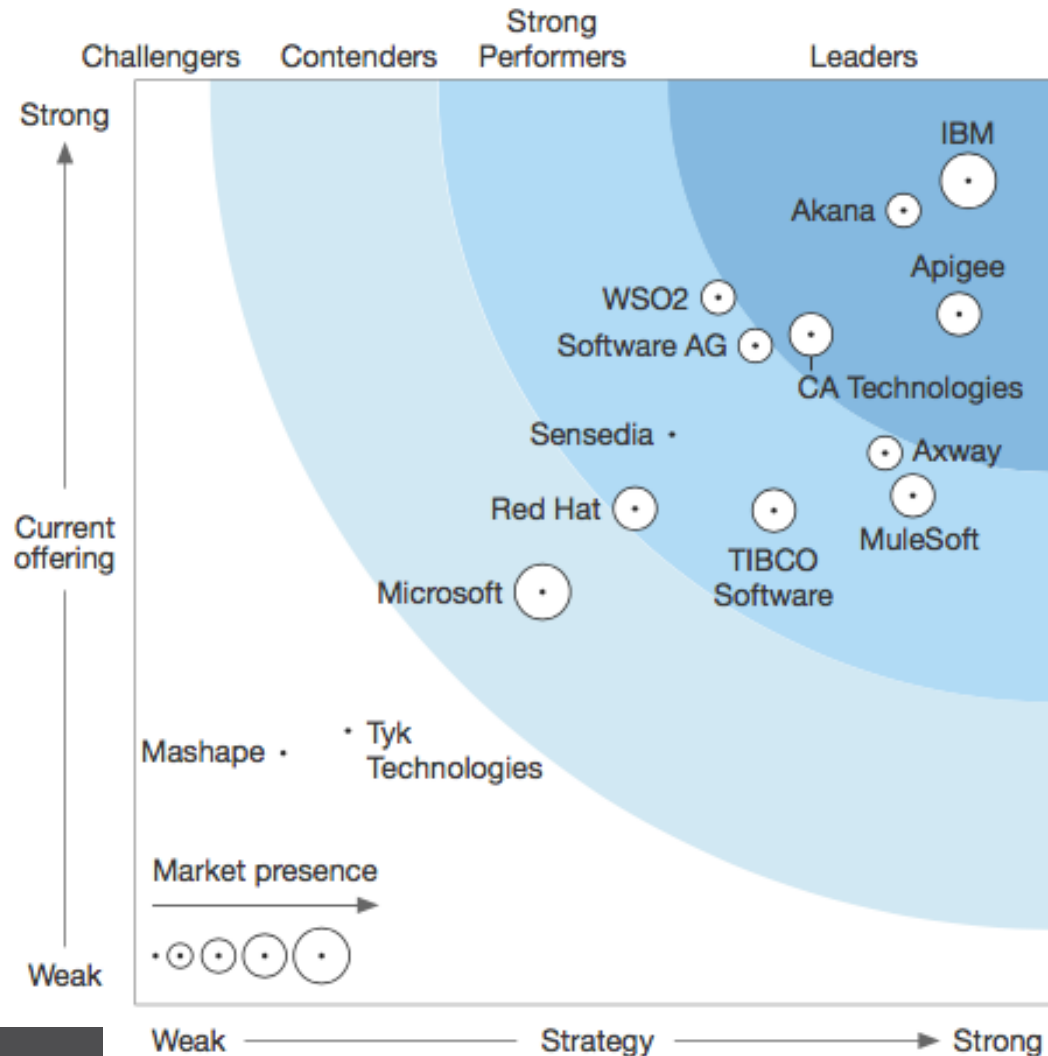
*IDC's Worldwide Software Taxonomy, 2016
Henry D. Morris, July 2016, IDC #US41572216

Here is the Latest Forrester Wave on API Software

What API companies/products are reviewed by Forrester?

Forrester has a different list compared to IDC with 8 different companies/products.

IDC and Forrester combine to 15 total companies/products.



The Forrester Wave™: API Management Solutions, Q4 2016

The 14 Providers That Matter Most And How They Stack Up

by Randy Hefner
November 14, 2016

Here is the Gartner Magic Quadrant

What API companies/products are reviewed by Gartner?

Gartner has a somewhat different list with 6 different companies/products as compared with IDC and Forrester.

IDC, Forrester and Gartner combine to 21 total companies/products.

Magic Quadrant for Full Life Cycle API Management

Published: 27 October 2016 ID: G00277632

Analyst(s): Paolo Malinverno, Mark O'Neill



Source: Gartner (October 2016)

API Management Leaders, Visionaries & Strong Performers

Company/Product	IDC ¹	Forrester ²	Gartner ³
Akana	R	Leader	V
Apigee	R	Leader	Leader
Axway	R	S	Leader
CA Technologies	R	Leader	Leader
IBM	R	Leader	Leader
Mulesoft	R	S	Leader
Red Hat (3scale)		S	Leader
TIBCO Mashery	R	S	Leader

IDC¹: Representative vendor Forrester²: Leader, Strong Performer, Contenders & Challengers Gartner³: Leader, Visionary, Niche players & Challengers

HOW THE API MANAGEMENT SYSTEMS ARE ORGANIZED AND REPRESENTED

Topics

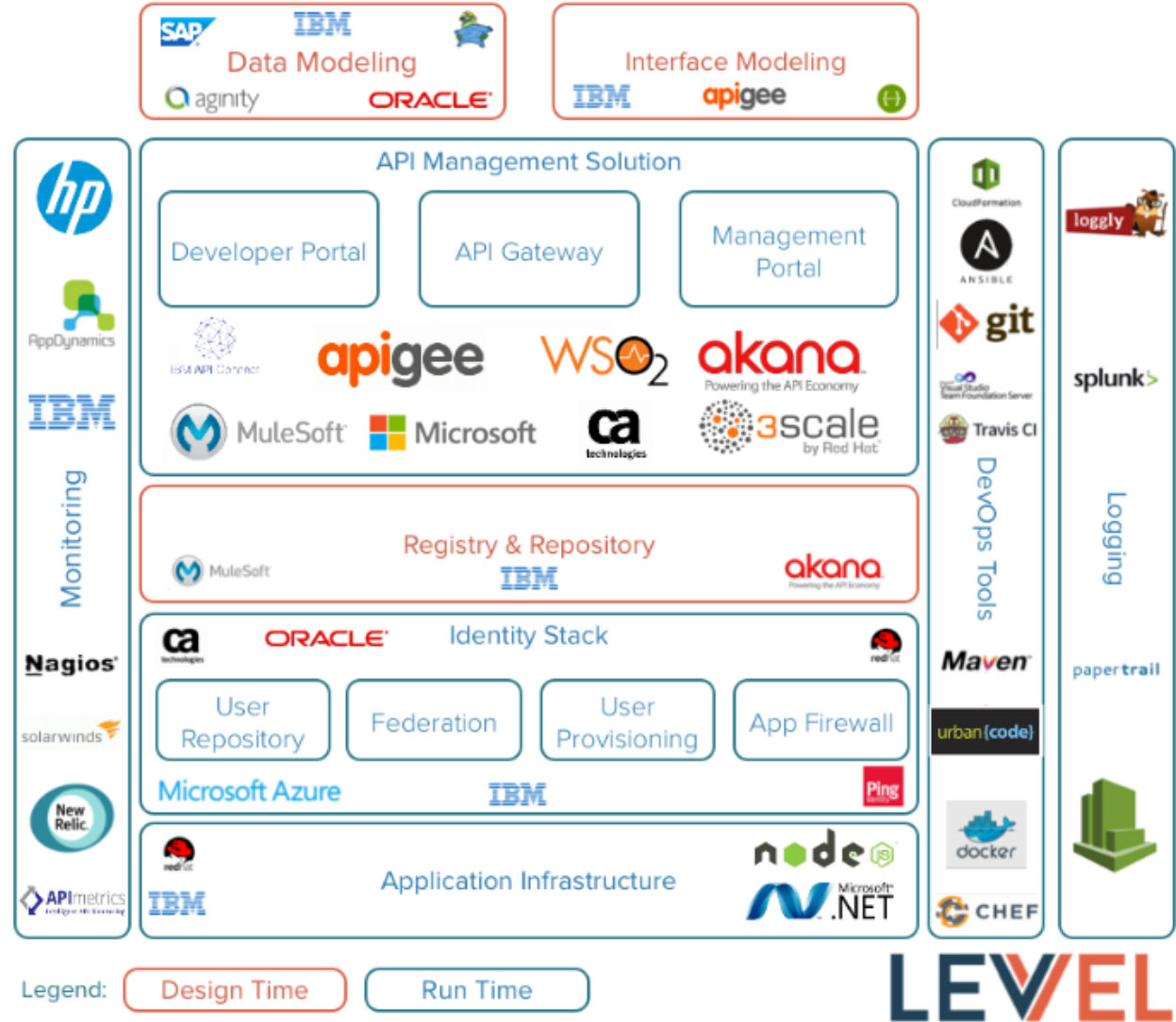
- *The Full Stack View*
- *The Fiorano API Management View*
- *Four Component Views*

The Tools of API Management — The Full Stack

BLOG post showing the features of many API products.

1. Design Time—Data Modeling, Interface Modeling and Registry & Repository

2. Run Time--API Management Solution, Identity Stack, Monitoring, DevOps Tools, Logging, and Application Infrastructure



Robert Broeckelmann, Principal Consultant at Level, LLC

see: <https://www.linkedin.com/pulse/tools-api-management-full-stack-robert-broeckelmann?trk=v-feed> Published on February 6, 2017



Build your Community



Mobile Strategies



Socialize



Monetize Digital Assets



Internet of Things



Enter New Markets Quickly



Websites



New Channels and Devices



API Economy



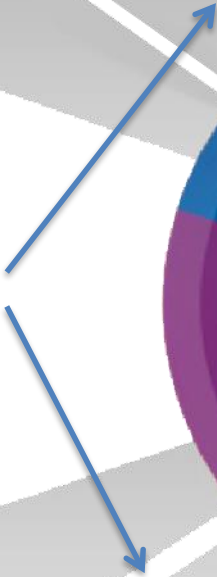
Partners



Connected Vehicles

Unlock your Business Capabilities

A View of the Role of APIs



Leverage Existing Enterprise Assets

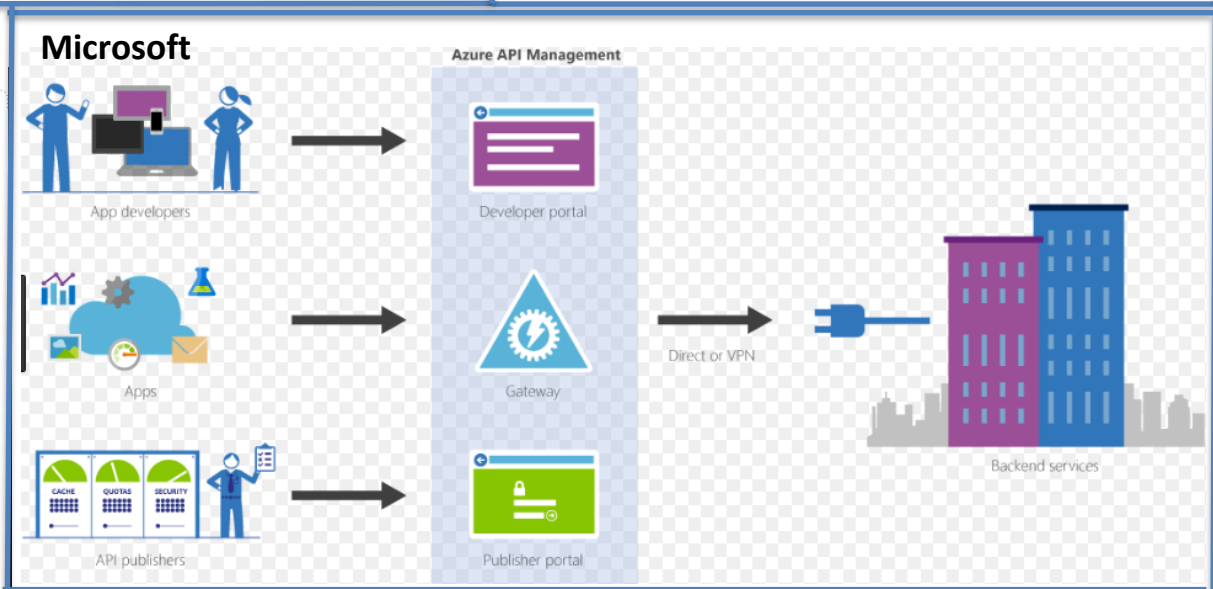
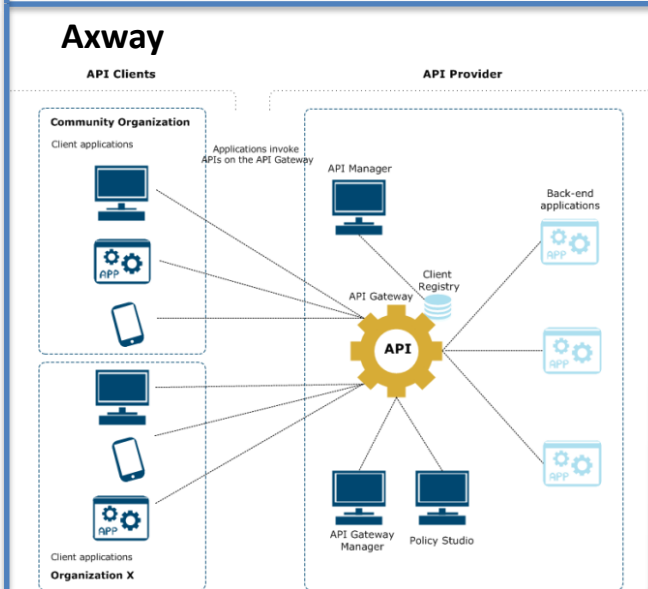
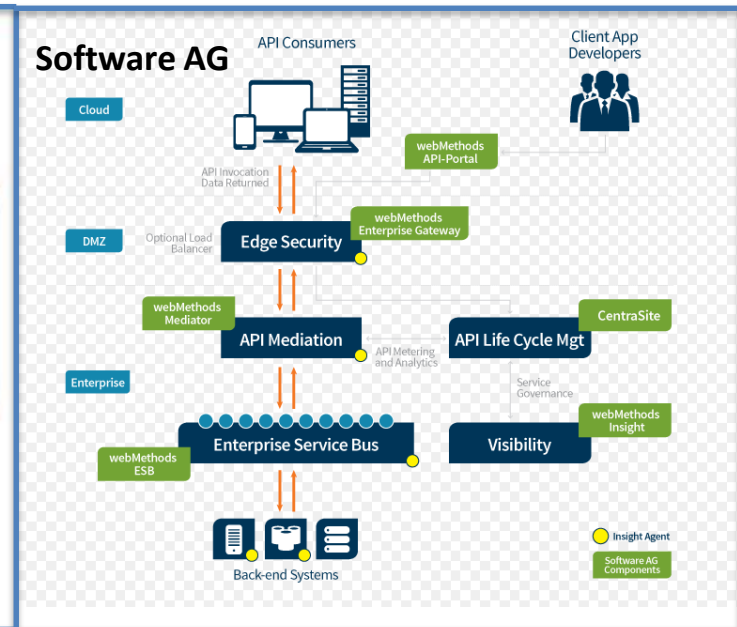
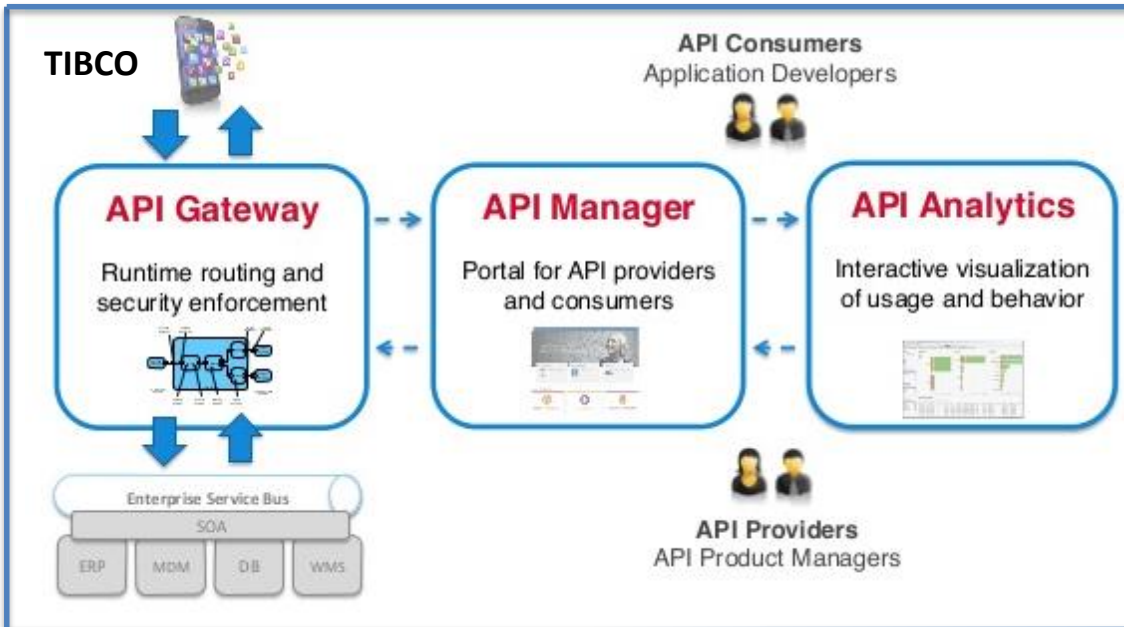
Enterprise Service Bus
ESB

Existing Systems

Host of Adapters

Cloud Integration

Four Components Views -- API Management Products



ROLE OF OPEN SOURCE AND OPEN STANDARDS

Topics

- *Open Source Tools*
- *Standards*
- *Styles*

Open Source Tools, Standards and Styles Used with API Management Software

Language

Java - a general-purpose computer programming language that is concurrent, class-based, object-oriented

Others – PHP, Python, Ruby, .NET / C#, Perl, ColdFusion, Node / JavaScript, & ActionScript

Architectural Style

Web Service - Standardized way of integrating web-based applications using XML, SOAP and other open standards

REST Service - Representational State Transfer (REST) is an architectural style for networked services that are lightweight, maintainable and scalable that uses HTTP requests to GET, PUT, POST and DELETE data. **SOAP** is compared to REST but SOAP is a protocol not a style.

Development Environment

Eclipse - Open source IDE

Support

Apache Log4j - A reliable, fast and flexible logging framework written in Java

Trail File - An XML representation of in/out screens

oAuth - Open protocol to allow secure authorization for REST APIs, web, mobile and desktop applications

EhCache - Widely used open source Java distributed cache engine

Angular - Open source development platform for web applications

Freemarker - Open source, Java-based template engine

Templates- A structured format, created by Freemarker, into which data is entered when generating entities

Example of template use →



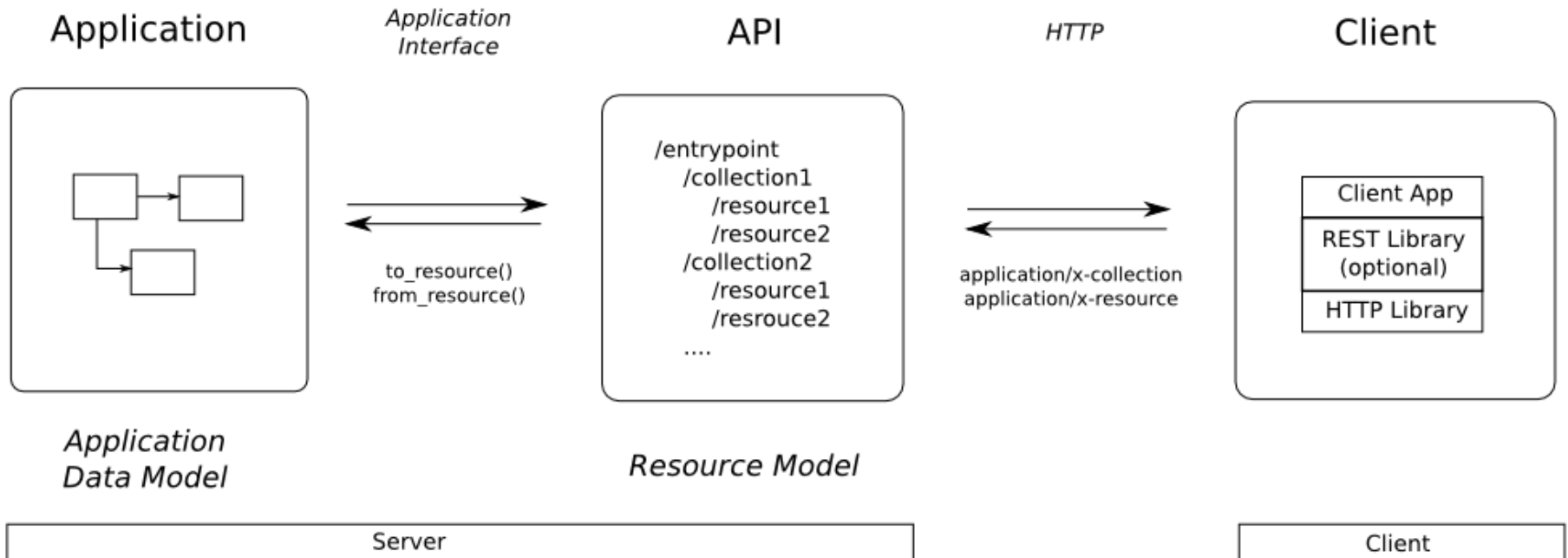
Document

IMPORTANCE OF RESTFUL WEB SERVICES AND OTHER INTERNET TECHNOLOGIES

Topic

- *REST and JSON*
- *SOAP*

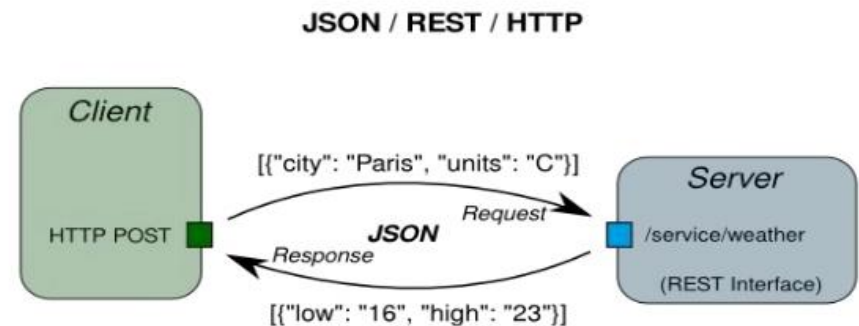
RESTful API is an Architectural Style



Source: <http://www.hongkiat.com/blog/rest-restful-api-dev/>

JSON

- Javascript Object Notation (JSON)
- JSON is lightweight computer data interchange format.
- JSON is based on a subset of Javascript programming language.
- Using of XML format.



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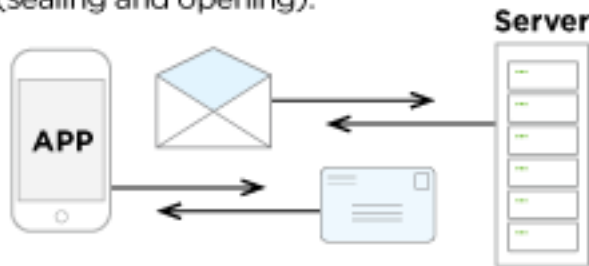
Source; <https://www.slideshare.net/materaj/web-architecture-mechanism-and-threats>

SOAP is Compared to REST

SOAP vs. REST APIs

SOAP is like using an envelope

Extra overhead, more bandwidth required, more work on both ends (sealing and opening).



REST is like a postcard

Lighterweight, can be cached, easier to update.

Upwork

1. SOAP is a protocol. REST is an architectural style.
2. REST APIs access a resource for data (a URI); SOAP APIs perform an operation.
3. REST permits many different data formats including plain text, HTML, XML, and JSON, which is a great fit for data and yields more browser compatibility; SOAP only uses XML.
4. Security is handled differently.
5. SOAP requires more bandwidth; REST requires fewer resources (depending on the API).
6. SOAP has Atomicity, Consistency, Isolation, Durability (ACID) is a set of properties of database transactions.
7. Here is a thoughtful comparison.



Document

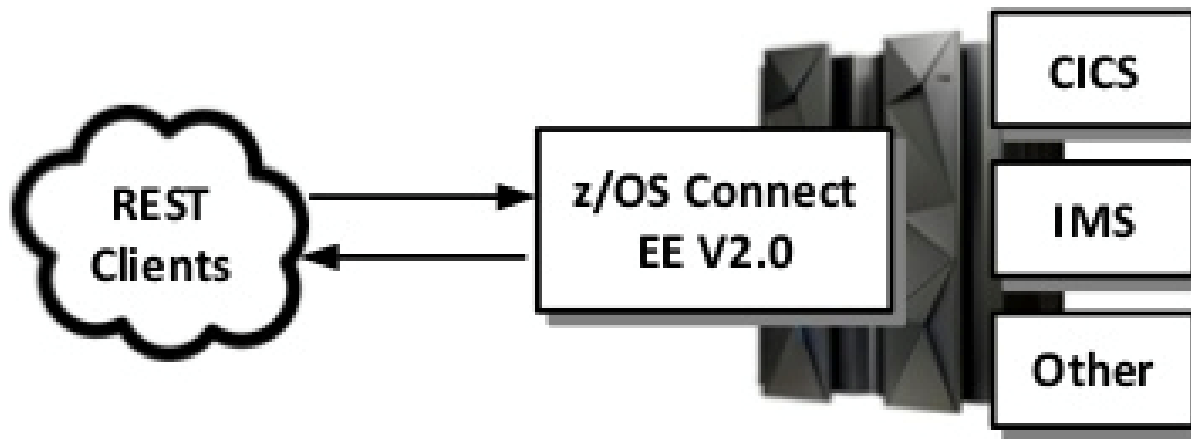
SPECIAL FOCUS ON API WITH ENTERPRISE COMPUTING

Topic

- *z/OS Connect Gateway*
- *CICS Example*

RESTful APIs on a mainframe with z/OS Connect EE

z/OS Connect Enterprise Edition V2.0 provides a way to host RESTful APIs on z/OS and provide access to the valuable business data that resides there. It provides a focal point for managing and controlling RESTful calls coming into mainframe environment:



Transforms applications written in one architectural style to a different one.

=> In 2015, IBM announced z/OS Connect Enterprise Edition, a strategic API gateway into z/OS.

=> This gateway is a configurable, high throughput interface into CICS, IMS, DB2 and WebSphere Application Server.

=> This product made APIs that could utilize data from CICS and IMS applications while requiring no changes to the application's underlying COBOL or PL/1 code.

Want to see how they do it? This is for CICS.

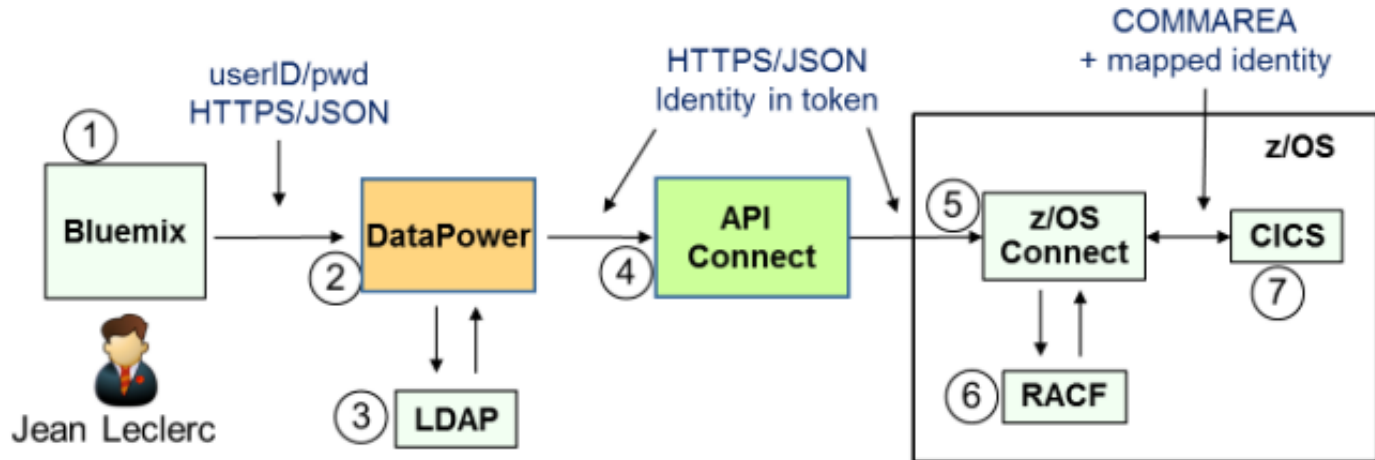
You will need to spend a few minutes and look at this step-by-step example using the hyperlinked text. Put PowerPoint in full-screen mode and the link will work.

"There are [4 stages to creating an API](#) using z/OS Connect:

1. Generate bindings for your application – Using a supplied piece of JCL generate the bindings (data definitions like a commarea copybook) that will allow z/OS Connect to call your CICS application. This generates a Service Archive File (SAR file).
2. Import SAR file into the tooling – This allows the tooling to display the fields that are part of your application interface.
3. Map the API – Define the Uniform Resource Identifiers (URIs) that make up your API, you can then map fields from the URIs to the fields within the application interface.
4. Deploy – Once your API is ready you need to deploy it. The z/OS Connect EE tooling has the ability to deploy your API directly to CICS. This is done through a service in the runtime that is listening on the same HTTP port that your API will be executed from.

CICS is easier to API than IMS. The next chart is a security example using CICS.

Security Design Involves userid/password, identity in tokens, and RACF



1. The user logs into the Bluemix application using a “distributed” identity and a password. The user credentials are sent with the API request in an HTTP authorization header over a secure connection to DataPower.
2. DataPower performs a number of security functions:
 - ✓ Acts as Secure Gateway Client for Bluemix connectivity
 - ✓ Protects the system against malicious attack
 - ✓ Authenticates the user and forwards the distributed user ID in an LTPA (“Lightweight Third Party Authentication”) token to API Connect
3. LDAP is used as the user registry for distributed users and groups.
4. API Connect checks the Bluemix application client ID and forwards the request to z/OS Connect EE.
5. z/OS Connect EE performs a number of security functions:
 - ✓ Validates the user credentials (LTPA token)
 - ✓ Calls RACF to map the distributed ID to a RACF user ID
 - ✓ Calls RACF to check that the user is authorized to invoke the API
 - ✓ Audits the request to record who invoked the API
 - ✓ Propagates the mapped RACF user ID to CICS
6. RACF is used for the mainframe user registry, mapping distributed IDs to RACF user IDs and for authorizing API calls.
7. CICS performs further authorization checks to make sure that the mapped RACF user ID is authorized to access CICS resources.

Questions?

- Contact Info
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- Writing
 - Magazine articles
 - <http://www.ibmssystemsmag.com/authors/Joseph-Gulla/>
 - BLOG
 - <http://www.ibmssystemsmag.com/Blogs/IT-Trendz/>
 - Destination z
 - <http://www.destinationz.org/Search.aspx?searchtext=%22joseph+gulla%22&searchmode=anyword>

ADDITIONAL MATERIALS

Topic

- *APIs are driving growth and change*
- *Classification by consumer*
- *DATA.GOV Applications*
- *IDC list of API Management Products*

APIs are driving growth and change

“APIs are a key growth driver for hundreds of companies across a wide range of industry sectors. It’s not just for Silicon Valley visionaries anymore.”

- Eric Savitz, Forbes Magazine

“APIs have been elevated from a development technique to a business model driver and boardroom consideration.”

- API economy (Tech Trends 2015), Deloitte

“Data.gov doesn’t just catalog raw data, it also includes APIs from across government. You can browse the current catalog for APIs, but expect this listing to grow as agencies include more of their APIs.”

- DATA.GOV




Classification of APIs by Consumer

	Public - External	Private – Internal	Protected - B2B
Consumer	Open to any developer	Used within the enterprise	Enterprise to enterprise
Focus	End user	Employees	Business to business
Driver	Data availability	Cost savings and productivity	Efficiency, productivity and cost reduction
Example	Facebook => post to newsfeed	Common I/O RESTful APIs to shared data	Shared inventory APIs for supplier reorder

Filtered by Agency: ✕ Department of Health and Human Services



Dynamic Proportional Reporting Ratio (PRR) for a Drug-Event Combination



Elder Care Finder



eRecall



Healthy Hive



LactMed




Medicaid Long Term Care Guide



Proportional Reporting Ratio (PRR) for a Drug



USDA FoodKeeper



Zoc Doc

Open government data powers software applications that help people make informed decisions – from choosing financial aid options for college to finding the safest consumer products and vehicles. Below are just a few examples of government, community, and business tools that: **use open government data** from the United States; are accessible, vetted, and available; and are, for the majority, free and do not require registration to use.

What API Management Software does IDC list in the Software Taxonomy Report?

API Management Software

API management software and cloud services support the secure and scalable publishing and management of application programming interfaces. This software helps API publishers design, monitor, manage, and update APIs and scale access to the services that connect to the APIs.

Representative vendors and products include the following:

- Apigee Enterprise API Management
- Axway API Management
- CA Layer7
- IBM API Management
- Intel Mashery
- MuleSoft API Manager
- SOA Software (now known as Akana) API Management
- TIBCO API Exchange



Taxonomy

IDC's Worldwide Software Taxonomy, 2016

API Management is a label for both API generators, API managers and those who do both.