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Interoperability: The Freedom of Using Open Source to Accelerate Innovation

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Agenda

- Why Open Source
- The Red Hat Approach
- Technologies enabling Interoperability
- Business Value of Red Hat Integration





The EU Open Source
Policy Summit 2021

Friday, February 5 2021

Final Results

European Commission

Open Source Study

(SMART 2019/0011)



OSS Investment in the EU:

the Member State Level

- More than **3 million employees** involved in computer programming in the EU
- In 2018, more than **260,000 contributors to GitHub**,
i.e. on EU average **8.7%** of employees in computer programming
- Average personnel investment of all contributors based on full time equivalents of more than **€14 Billion** in 2018
- In 2018, more than **30 million GitHub commits** representing an effort of more than **16,000 FTEs** based on the Constructive Cost Model
- **Almost €1 Billion** invested on personnel cost in the EU in 2018

Quantification of Economic Benefit Based on the European Growth Model

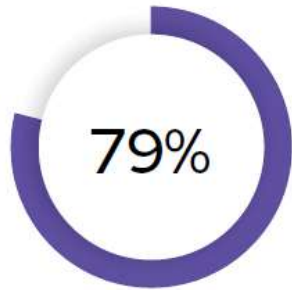
- Elasticity of 0.04, i.e. the **10% increase of commits** from 2017 to 2018 contributed to GitHub is **contributing 0.4% of the GDP** in the EU
- In 2018, 0.4% of the total GDP of €15,900 Billion in the EU is a contribution of more than **€63 billion** per year
- A **10% increase in the number of contributors** would increase the EU GDP by 0.6%, i.e. **€95 billion** per year
- In summary, the EU economy is significantly benefiting from the global poll of OSS
- In the future, if the EU can increase both of them marginally, an additional GDP of **>€100 billion** per year in the EU could be possible.

Summary of Results Concerning Impacts of OSS

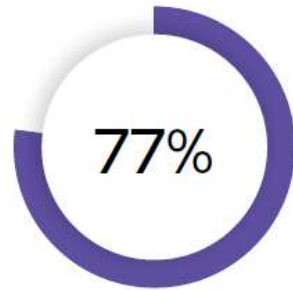
- **Significant investment** by EU countries & EU located companies into Open Source of **€1 billion in 2018** at minimum, only for labor costs
- **Significant contribution of OSS to GDP** of the EU, i.e. an increase of 10% would generate an **additional €100 billion in EU GDP per year** in the future
- Significant contribution of OSS to foundation of start-ups, i.e. an increase of 10% would generate around **1,000 additional ICT start-ups per year**
- **Savings in Total Cost of Ownership in the public sector**, but more important, the **avoidance of vendor lock-in** and **contributing to digital autonomy**
- **Further benefits** of Open Source mainly **related to openness, including standards**, and **independence** and **labor cost savings**, but less to additional revenue

Open Source – The Benefits Are Broad & Strategic

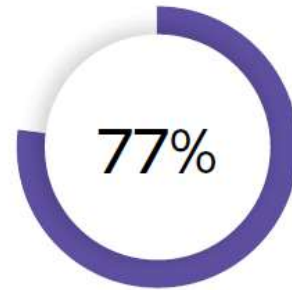
Advantages of enterprise open source



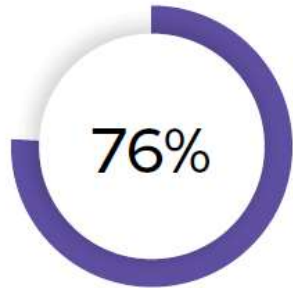
Provides flexibility to customize solutions to meet company's needs



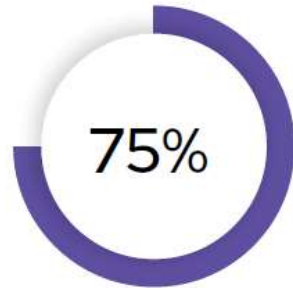
Ensures my organization has access to the latest innovations



Has been instrumental in my organization's ability to take advantage of hybrid cloud architectures



Simplifies the process of adopting a hybrid cloud infrastructure



Is a key part of my organization's security strategy

This year's top benefits?
Better Security
&
Higher Quality Software

Top benefits of using enterprise open source

1

Better security

32%

2

Higher quality software

32%

3

Ability to safely leverage open source tech

28%

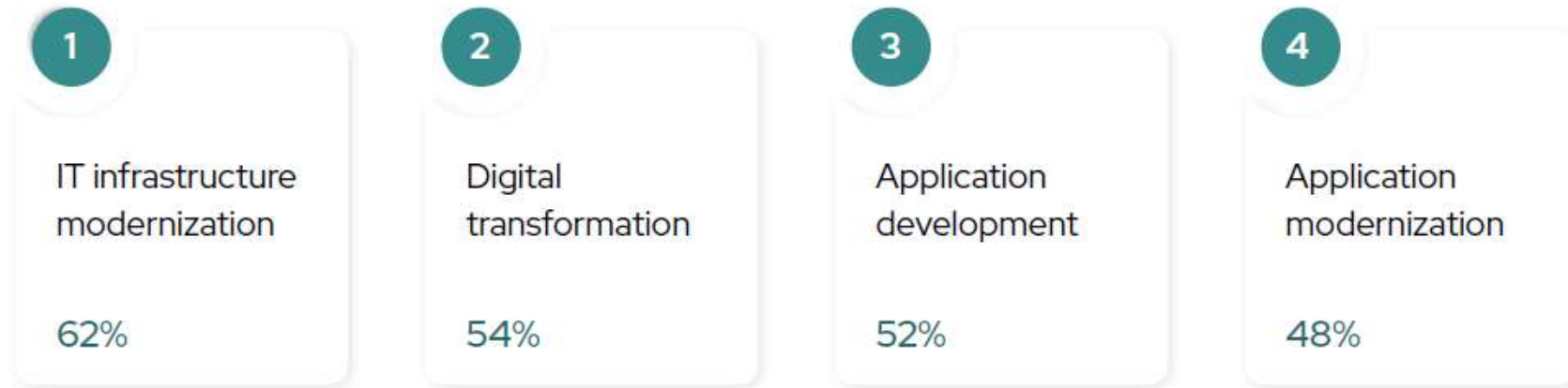
4

Designed to work in cloud, cloud-native tech

26%

How Are Organizations Using Enterprise Open Source?

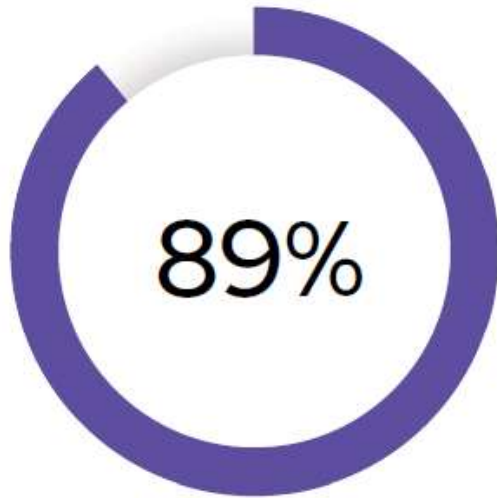
Top uses for enterprise open source



EMEA

IT infrastructure modernization	59%
Application development	55%
Digital transformation & Application integration	49%
Application modernization	47%

Security Is A Major Benefit of Enterprise Open Source



of IT leaders believe enterprise open source is as secure or more secure than proprietary software.

(APAC = 89%, EMEA = 90%, LATAM = 87%, U.S. = 90%)

EMEA

Can use well-tested open source code for our in-house applications—**53%**

Security patches are well-documented—**51%**

Vendors make vulnerability patches available promptly—**49%**

More people have had their eyes on the code—**46%**

My team can audit the code—**43%**

But what makes enterprise open source such a benefit with respect to security?

The top benefit is that the “**team can use well-tested open source code for our in-house applications.**” This reflects the increasingly widespread use of open source code for internal applications.

Red Hat

At Red Hat we make Open Source Software
consumable for Enterprise Customers by
preserving the advantages of Open Source and
eliminating the disadvantages of Open Source
through our Subscription Business Model

in·ter·op·er·a·bil·i·ty

/,ɪn(t)ər,äp(ə)rə'bilədē/

noun

the ability of computer systems or software **to exchange and make use of information.**

"interoperability between devices made by different manufacturers"

the ability of military **equipment or groups to operate in conjunction with each other.**

"staff believe interoperability between forces is crucial to effectiveness"



Interoperability

It Become to be a common challenge



Updated January 21, 2022

Joint All-Domain Command and Control (JADC2)

What Is JADC2?

Joint All-Domain Command and Control (JADC2) is the Department of Defense's (DOD's) concept to connect sensors from all of the military services—Air Force, Army, Marine Corps, Navy, and Space Force—into a single network. Traditionally, each of the military services developed its own tactical network that was incompatible with those of other services (i.e., Army networks were unable to interface with Navy or Air Force networks). DOD officials have argued that future conflicts may require decisions to be made within hours, minutes, or potentially seconds compared with the current multiday process to analyze the operating environment and issue commands. They have also stated that the Department's existing command and control architecture is insufficient to meet the demands of the National Defense Strategy (NDS). Congress may be interested in the concept because it is being used to develop many high-profile procurement programs.

algorithms to identify targets, then recommending the optimal weapon—both kinetic and nonkinetic (e.g., cyber or electronic weapons)—to engage the target.

Some analysts take a more skeptical approach to JADC2. They raise questions about its technical maturity and affordability, and whether it is even possible to field a network that can securely and reliably connect sensors to shooters and support command and control in a lethal, electronic warfare-rich environment. Analysts also ask who would have decisionmaking authority across domains, given that, traditionally, command authorities are delegated in each domain rather than from an overall campaign perspective. Some also question how much a human will be needed for JADC2 to make decisions in real time, and whether it is appropriate to reduce the amount of human involvement in military-related decisions.

Why Change Current C2 Structures?

**Media & speeches**[Media centre](#)[Press releases](#)**[BIS management speeches](#)**[Basel Committee speeches](#)[Central bankers' speeches](#)[BIS photo gallery](#)

Interoperability in payments: for the old and the new?

Speech by [Agustín Carstens](#), General Manager of the BIS, Singapore Fintech Festival, 8 November 2021

**BIS speech** | 08 November 2021by [Agustín Carstens](#)

It is my great pleasure to speak to you today¹. I would like to thank the organisers of the Singapore Fintech Festival and the Monetary Authority of Singapore for their kind invitation to be virtually present.

Singapore is the home of one of the BIS Innovation Hub's five global centres. It is also a pioneer in cross-border payments. In April 2021, Singapore linked its PayNow service to Thailand's PromptPay, allowing users to make payments across borders with just a mobile phone number. This is a great achievement. Many challenges had to be overcome – and it is these challenges that I would like to discuss today.

Interoperability in Healthcare

To better understand the basics of interoperability and health information exchange, we'll walk you through several key elements.

In This Guide

[What is Interoperability?](#)

[Interoperability Standards](#)

[The Interoperability Ecosystem](#)

[Uses of Information Exchange](#)

[Workflow Considerations and Guidelines](#)



[Public Policy and Government Efforts](#)

What is Interoperability?

It is the ability of different information systems, devices and applications (systems) to access, exchange, integrate and cooperatively use data in a coordinated manner, within and across organizational, regional and national boundaries, to provide timely and seamless portability of information and optimize the health of individuals and populations globally.

Health data exchange architectures, application interfaces and standards enable data to be accessed and shared appropriately and securely across the complete spectrum of care, within all applicable settings and with relevant stakeholders, including the individual.

Fast Healthcare Interoperability Resources



[Home](#) [Getting Started](#) [Documentation](#) [Resource Types](#) [Profiles](#) [Extensions](#) [Operations](#) [Terminologies](#)

Home

This page is part of the FHIR Specification (v4.3.0: R4B - STU). This is the current published version. For a full list of available versions, see the [Directory of published versions](#).


0 Welcome to FHIR®

FHIR is a standard for health care data exchange, published by HL7®. This is Release R4B - see the [explanation about R4B](#).






First time here?
See the [executive summary](#), the [developer's introduction](#), [clinical introduction](#), or [architect's introduction](#), and then the [FHIR overview / roadmap & Timelines](#). See also the [open license](#) (and don't miss the full [Table of Contents](#) and the [Community Credits](#) or you can [search this specification](#)).

See also the [Known Issues](#) that are not yet addressed.


Level 1 Basic framework on which the specification is built

 Foundation	Base Documentation, XML, JSON, Data Types, Extensions
---	---

Level 2 Supporting implementation and binding to external specifications

 Implementer Support Downloads, Version Mgmt, Use Cases, Testing	 Security & Privacy Security, Consent, Provenance, AuditEvent	 Conformance StructureDefinition, CapabilityStatement, ImplementationGuide, Profiling	 Terminology CodeSystem, ValueSet, ConceptMap, Terminology Svc	 Exchange REST API + Search Documents Messaging Services Databases
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Level 3 Linking to real world concepts in the healthcare system

 Administration	Patient, Practitioner, CareTeam, Device, Organization, Location, Healthcare Service
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Level 4 Record-keeping and Data Exchange for the healthcare process

Four Levels of Interoperability

Source : <https://www.himss.org/resources/interoperability-healthcare>

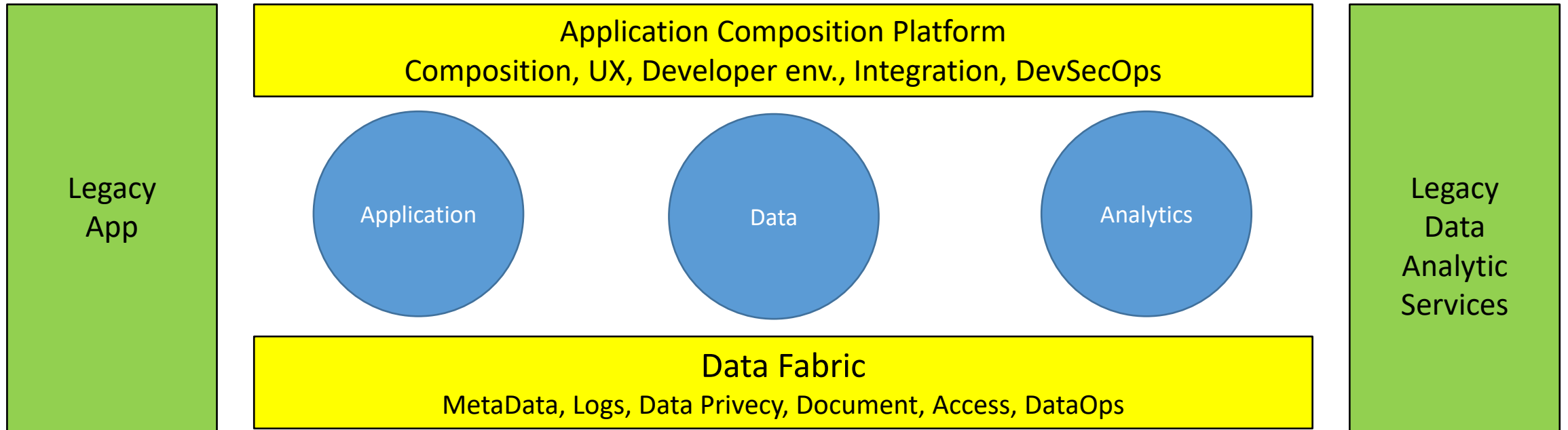
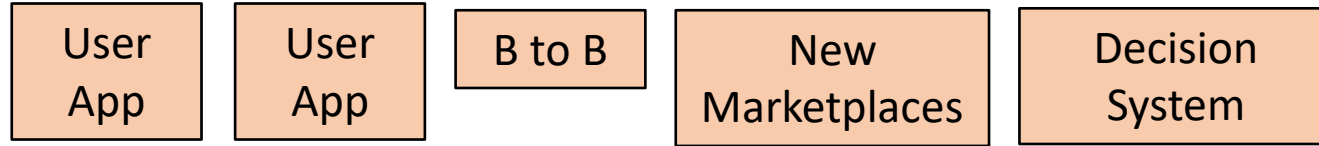
- **Foundational (Level 1):** Establishes the inter-connectivity requirements needed for one system or application to securely communicate data to and receive data from another
- **Structural (Level 2):** Defines the format, syntax and organization of data exchange including at the data field level for interpretation
- **Semantic (Level 3):** Provides for common underlying models and codification of the data including the use of data elements with standardized definitions from publicly available value sets and coding vocabularies, providing shared understanding and meaning to the user
- **Organizational (Level 4):** Includes governance, policy, social, legal and organizational considerations to facilitate the secure, seamless and timely communication and use of data both within and between organizations, entities and individuals. These components enable shared consent, trust and integrated end-user processes and workflows

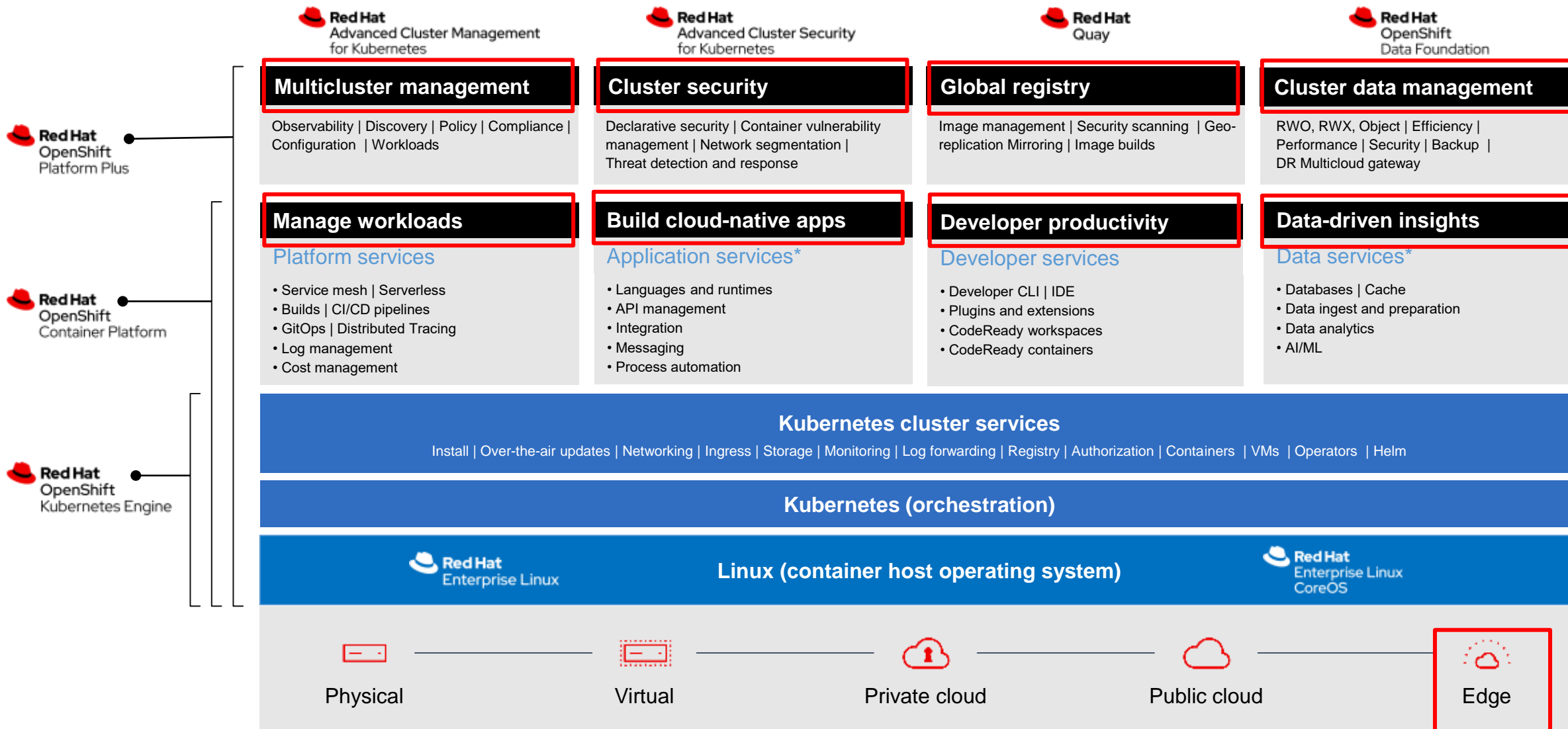
The Red Hat Approach and Products

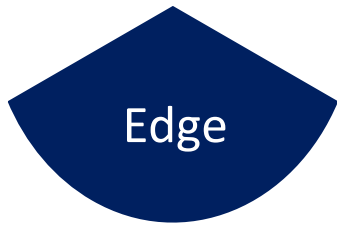
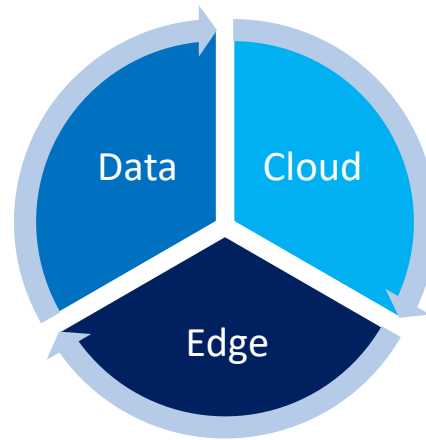
The new normal – composable IT (Gartner)

Application leaders responsible for strategy should:

- Develop an application strategy that is **modular**, **composable** and **resilient** by using the Gartner Reference Model for Composable Enterprise Applications to define the organization's packaged business capabilities (PBCs).
- Empower the **business stakeholders** to participate directly in the **development of applications** by directing teams to model applications as compositions of separately packaged business capabilities and deploying democratized platform tools.
- Enable the **unified use of data management, analytics and application** capabilities by designing data, analytics and application functionality as intercomposable PBCs.







<https://www.youtube.com/watch?v=h5S49yYvhsQ>



<https://www.youtube.com/watch?v=M8kANf8Xphg>

6 Time more users access to Data Driven decision systems

More than 200 DevOps activities to improve application at the Battlefield

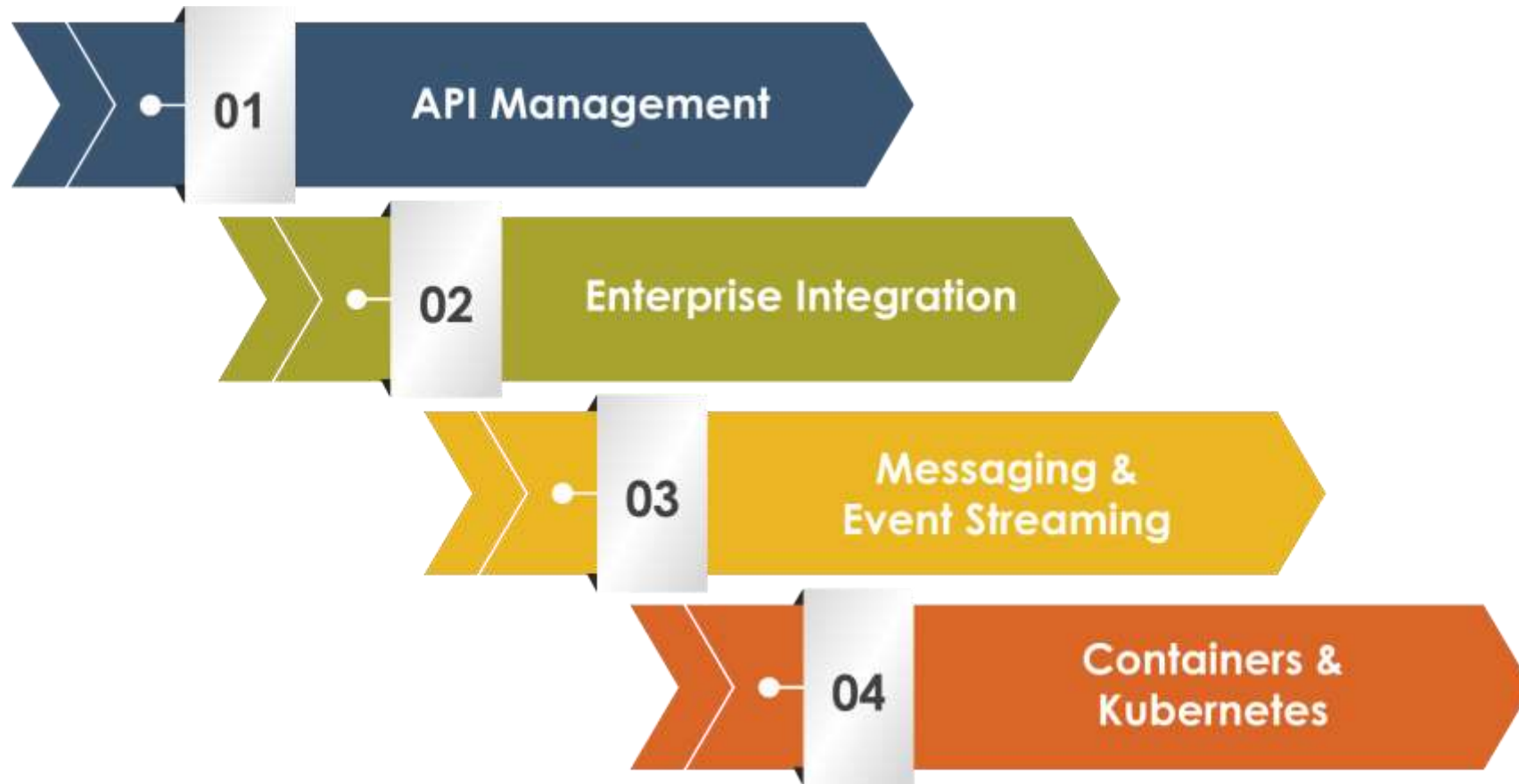


Interoperability Enablers for Public Organizations

- Openness (without exposing sensitive info)
- Interoperability-by-design
- Security-by-design
- Flexibility in hosting
- Scalability
- Governance & Management



Technologies enabling & advancing Interoperability



API Management

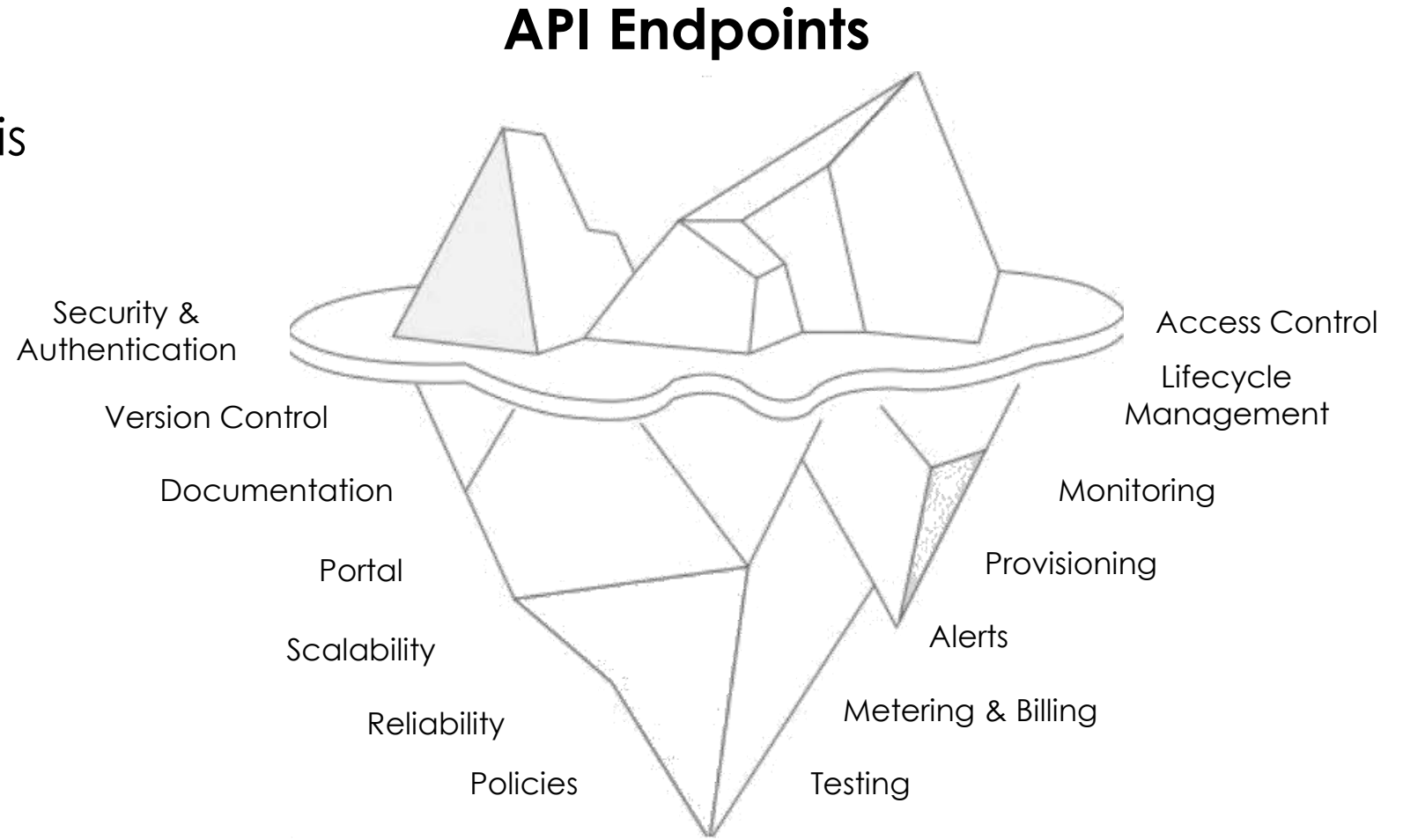
Why APIs?

- Decouple interfaces from business logic
- Apply security policies
- Measure and track incoming requests
- Throttle excessive traffic
- Monetize offered services

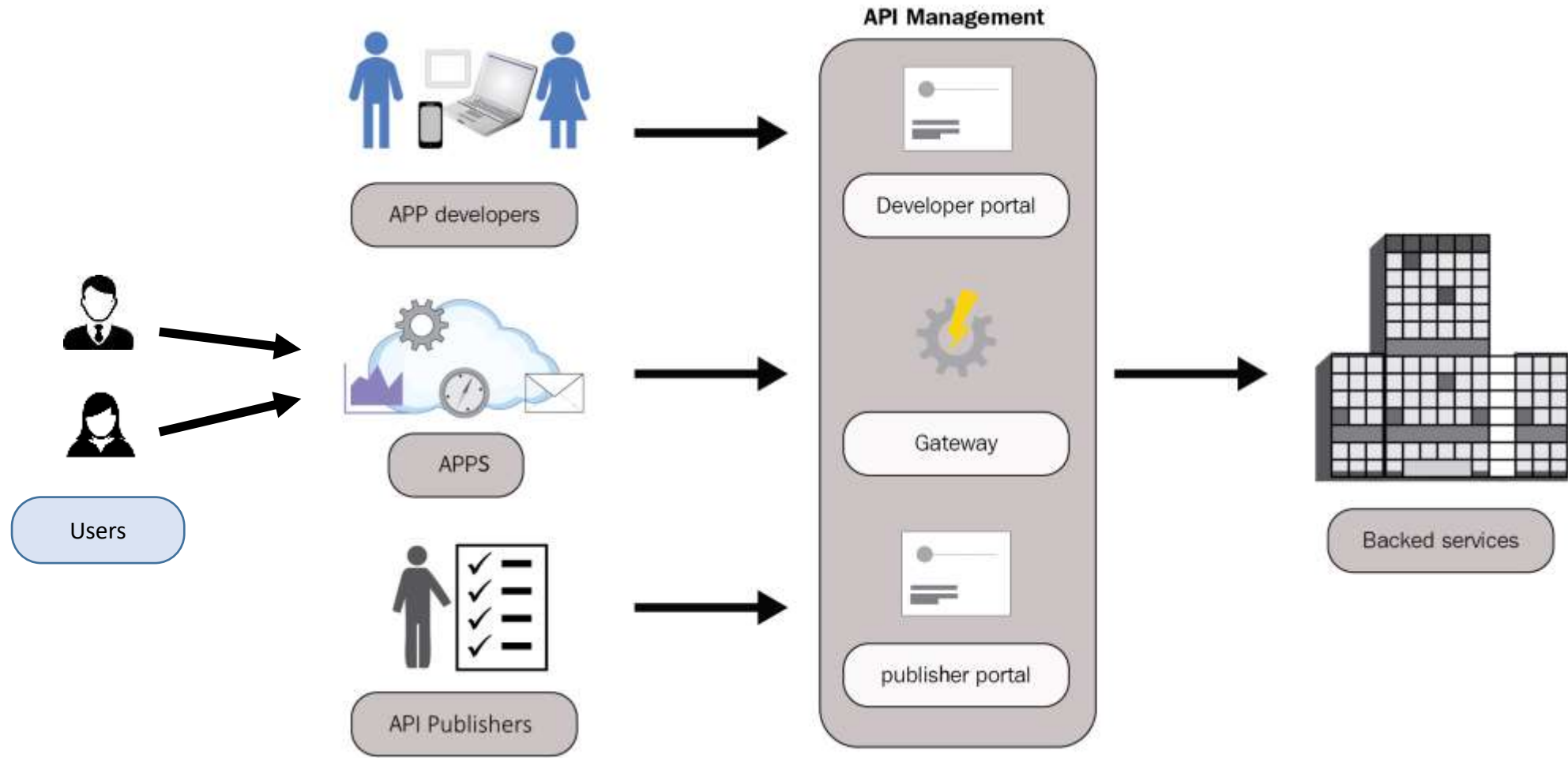


Taking Control of APIs

Creating & exposing APIs is just the start!



API Management Building Blocks



Enterprise Integration

Why do we need it?

- Glue together disparate systems
- Avoid reinventing the wheel
- Apply standard set of integration practices
- Employ a common, lightweight interoperability layer

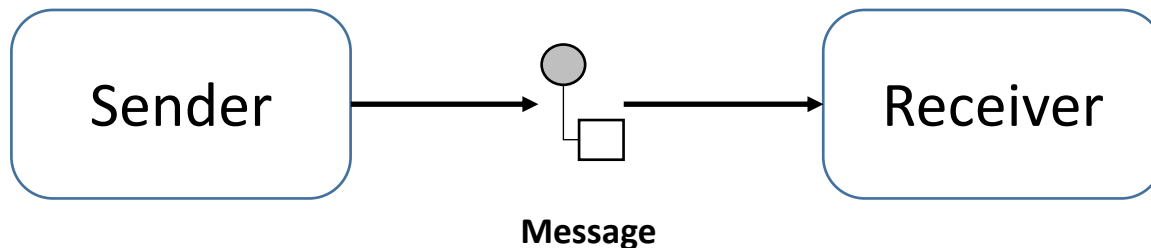


About Integration Services

What is an Integration Service?

But you may have:

- many senders and many receivers
- multiple protocols (ftp, http, jms, etc.)
- many complex rules

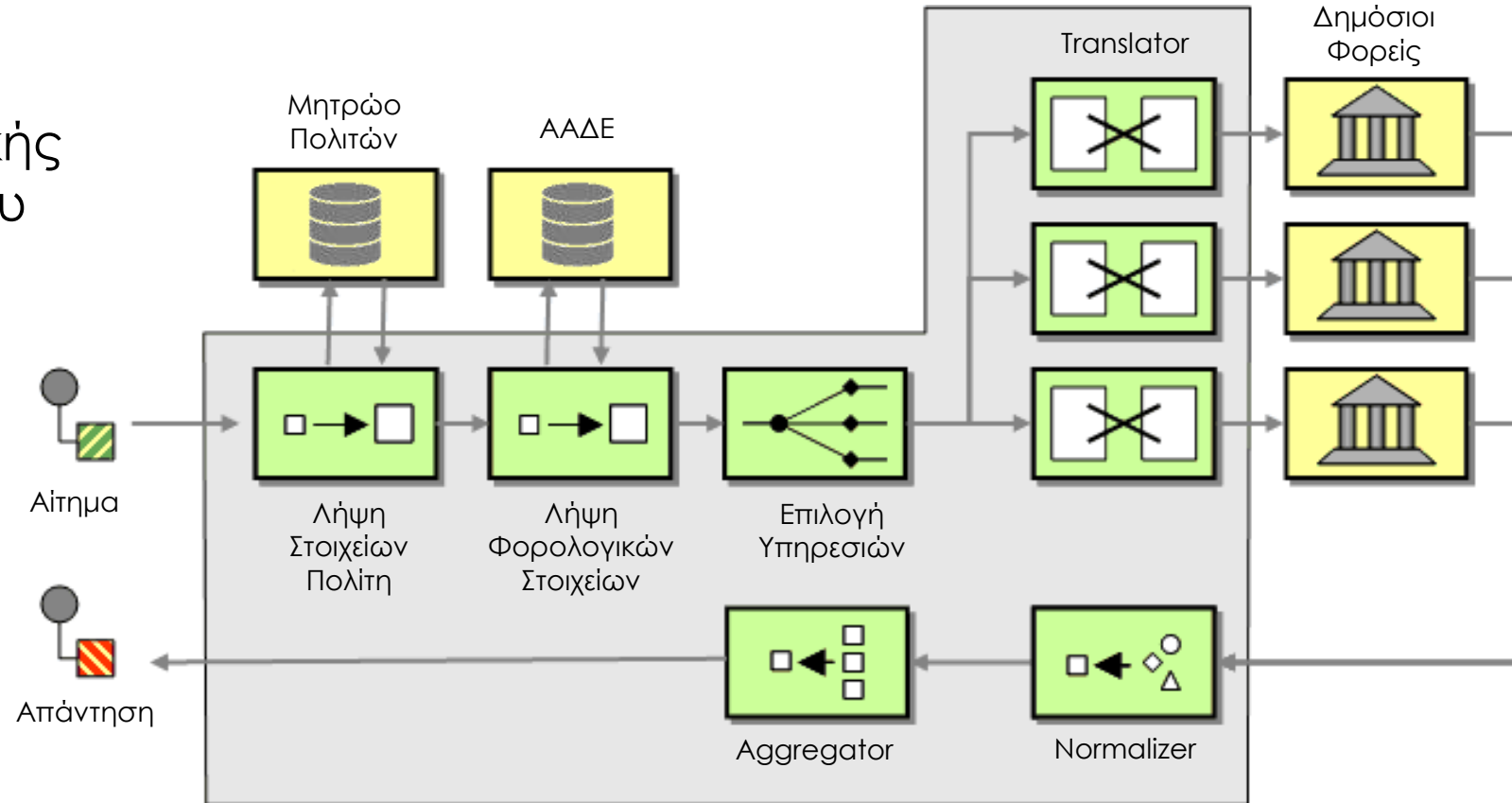


So you need to:

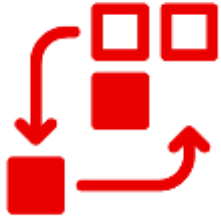
- **translate** between protocols
- **glue** components together
- define routes: **what goes where**
- **filter** some things in some cases

Example of an Integration Service

Εμφάνιση Εργασιακής
Κατάστασης Ατόμου

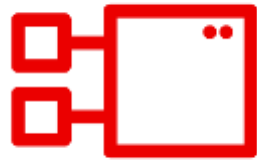


Enterprise Integration – Key Requirements



Patterns

Solve integration problem by applying best practices out of the box



Adaptors

Ability to interact with databases, message queues, file systems, APIs, etc.



Lightweight

Fast execution, based on a cloud-native runtime



Data Formats

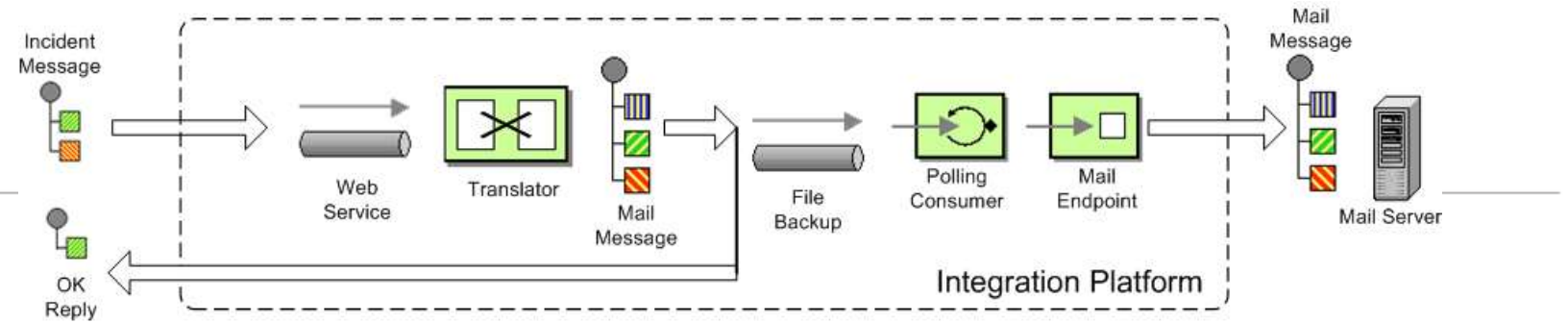
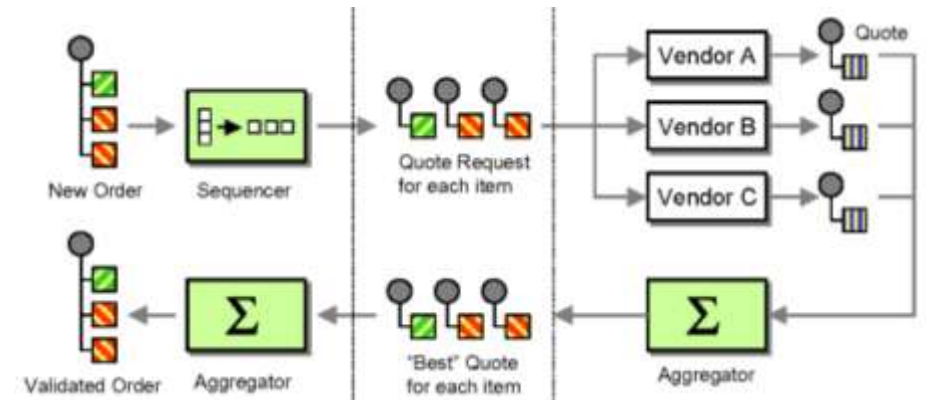
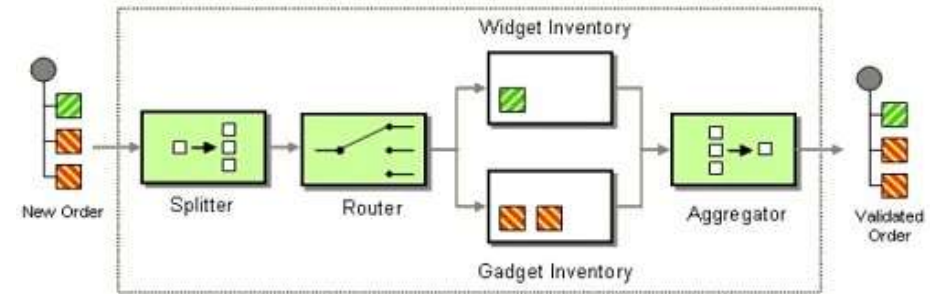
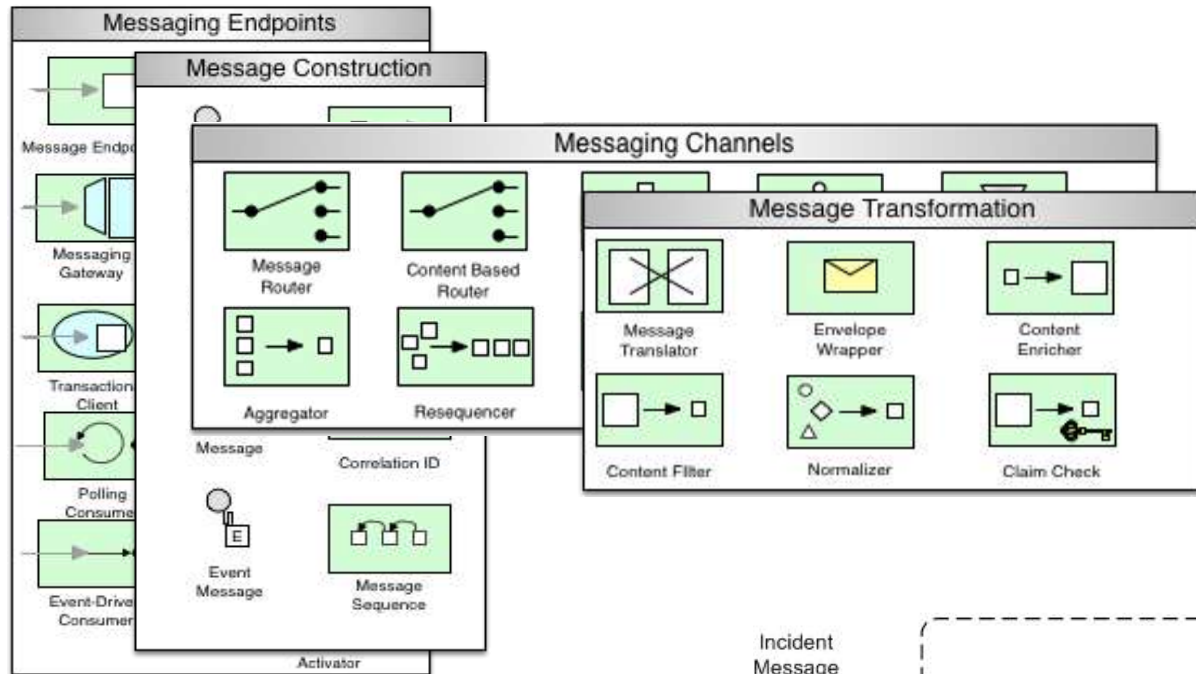
Translate messages in multiple formats, and industry standard formats

Apache Camel



APACHE
Camel

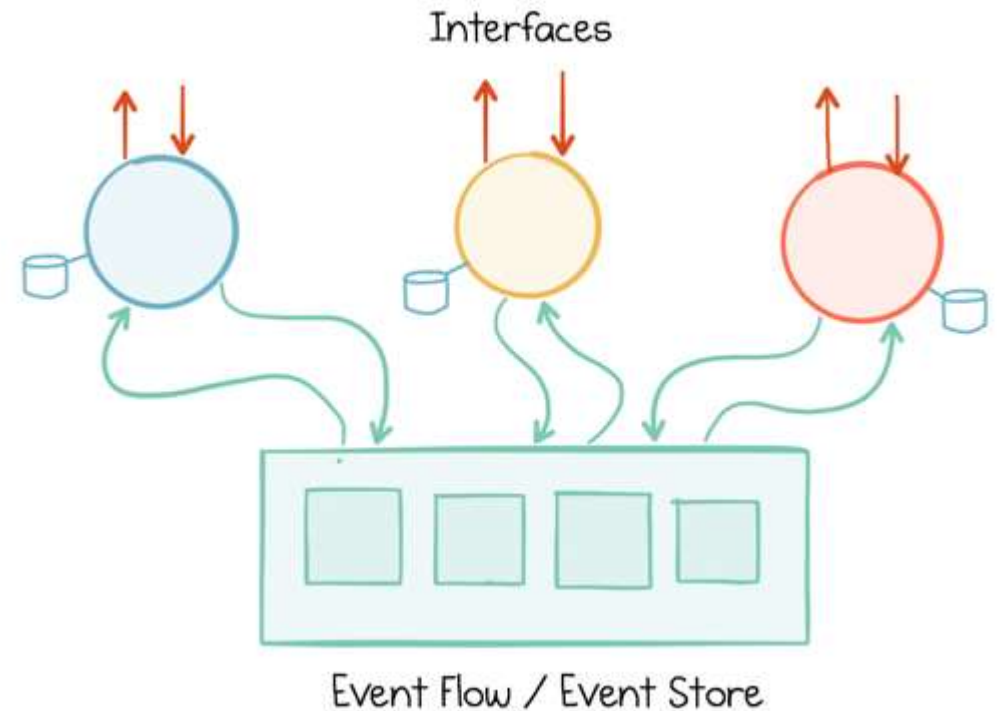
The “Swiss knife” of integration



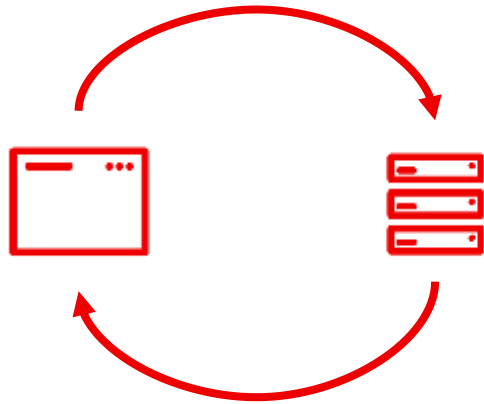
Messaging & Event Streaming

Why do we need it?

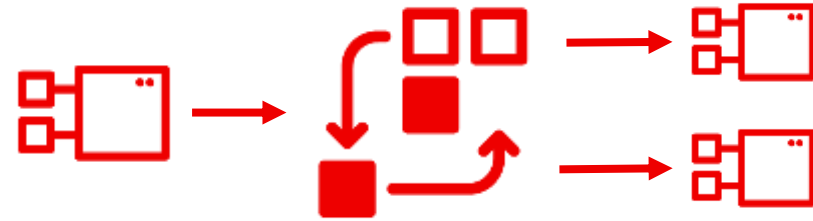
- Decoupling between production & consumption of data
- Publish – subscribe capabilities
- Handling of streaming data feeds



Request-reply vs Event-Driven

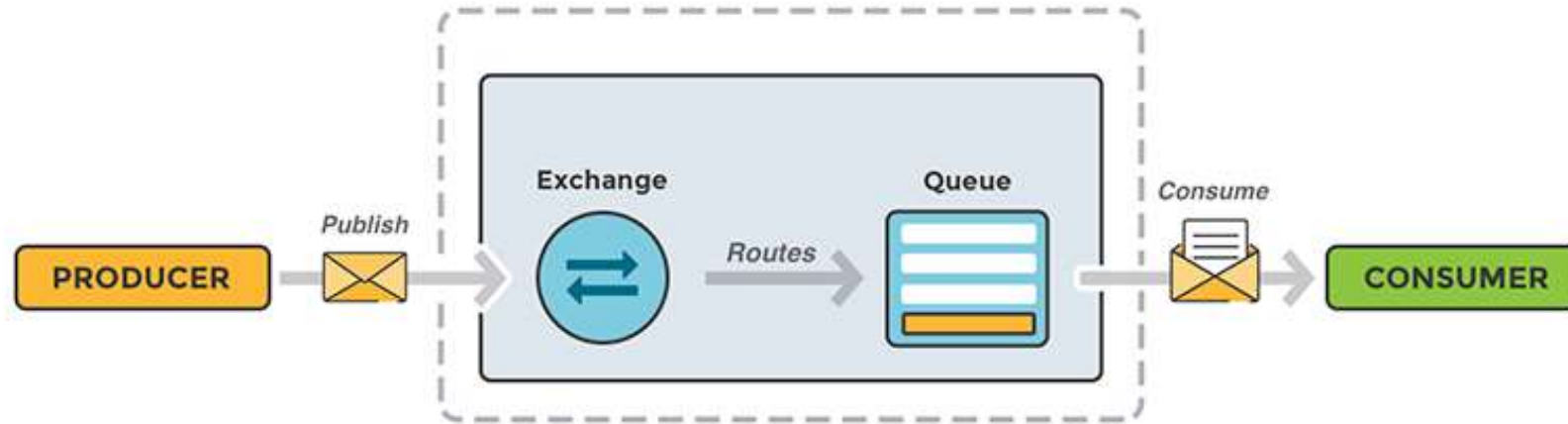


Synchronous & ephemeral
Low composability
Simplified model
Low tolerance to failure
Best practices evolved as REST



Asynchronous and persistent
Decoupled
Highly composable
Complex model
High tolerance to failure

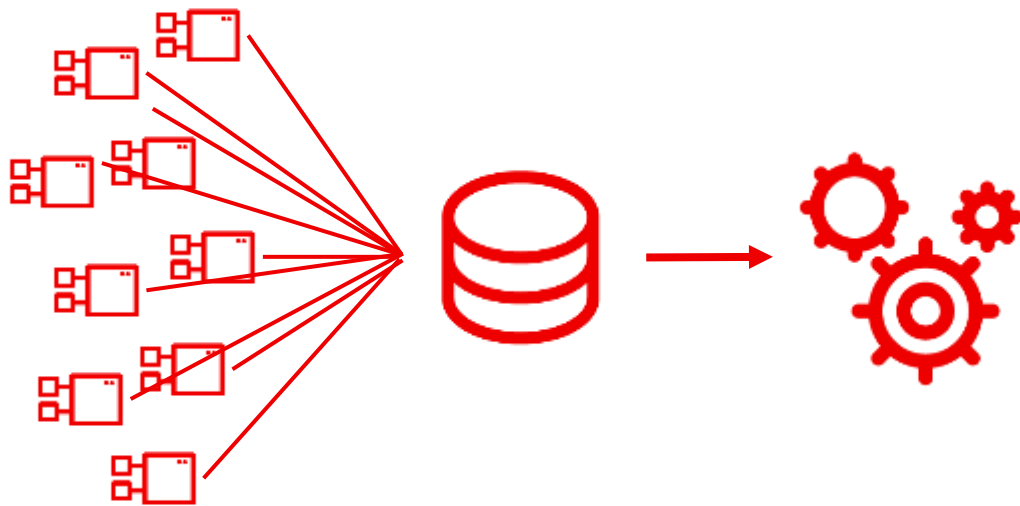
Message-based Integration



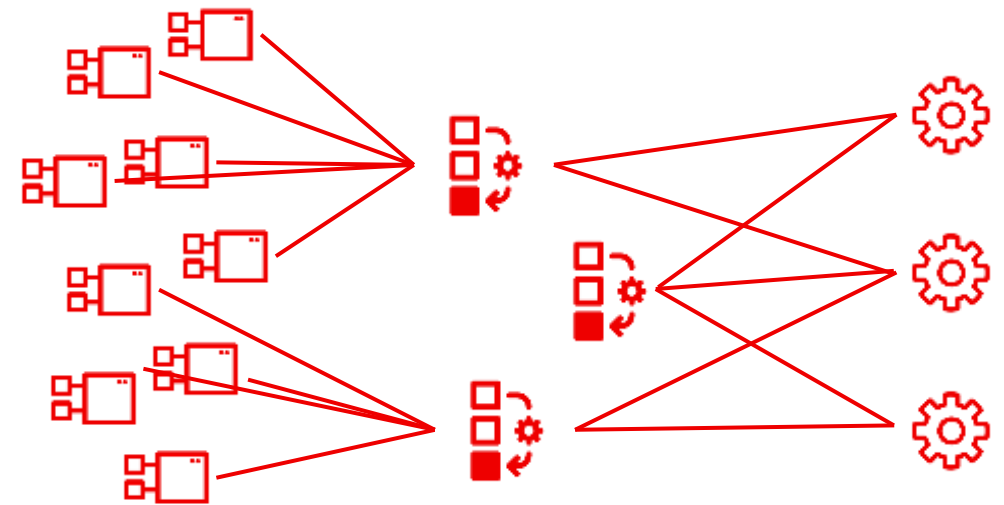
- Point-to-point for direct communication
- Publish – subscribe model for decoupling of senders and receivers

Stream-based Data Processing

Goal: Massive data processing from replayable streams



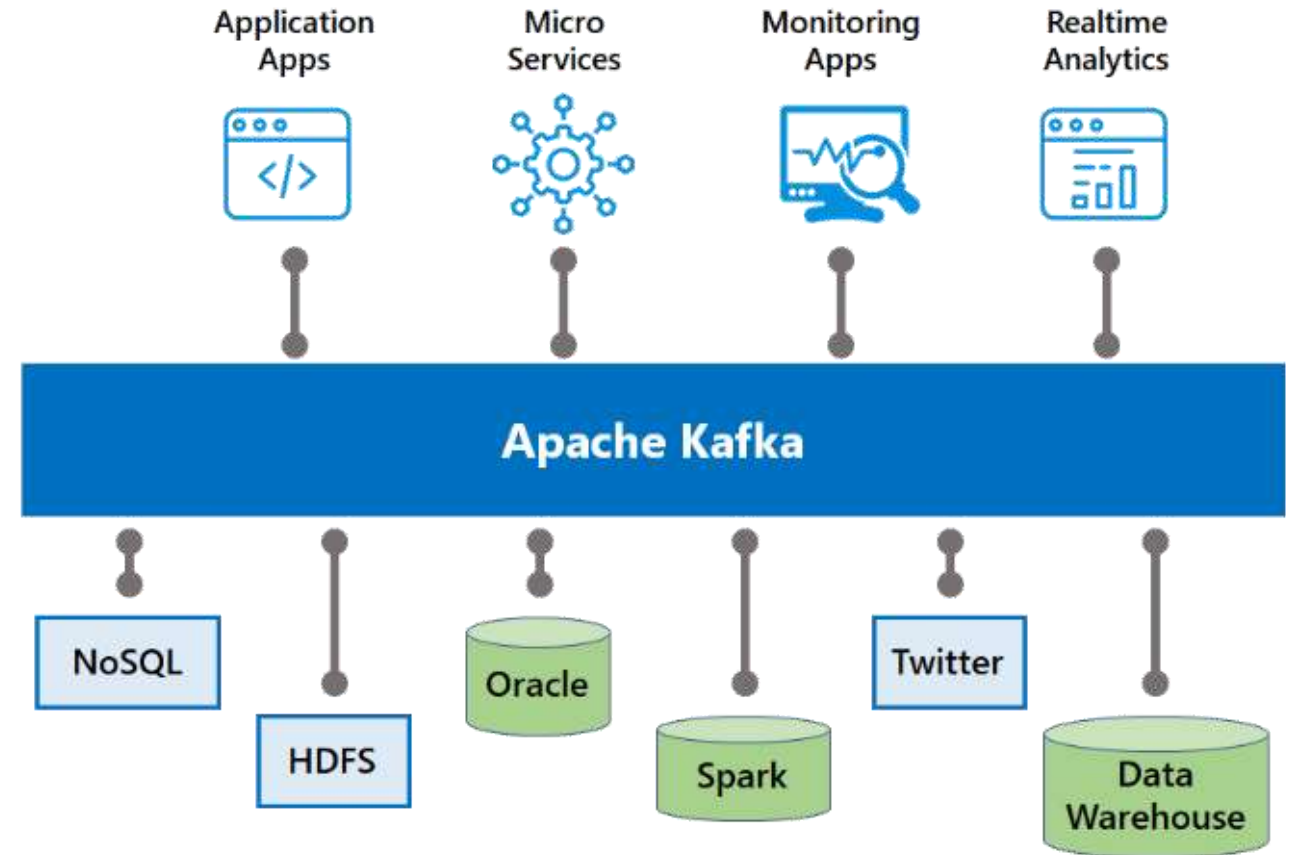
- DBs not well suited for event-based streaming
- Ingestion capability is limited
- Multiple consumers competing for receiving events



- Event-streaming platforms are a much better fit
- Ingestion capability is unlimited
- Multiple consumers are served in parallel

Event Streaming with Apache Kafka

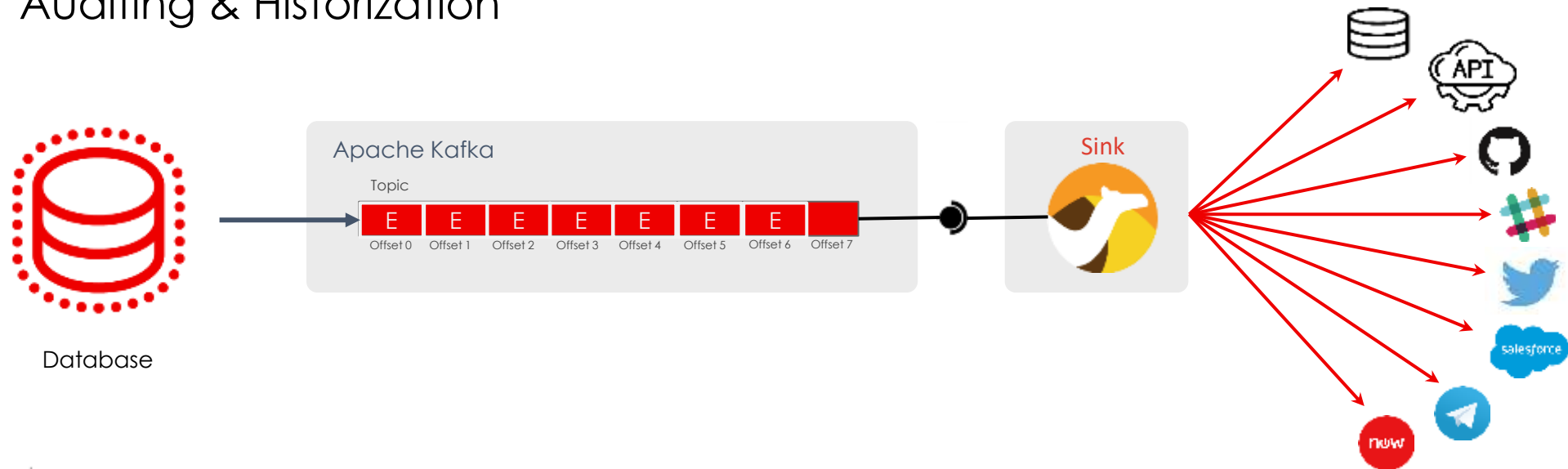
- Real-time publish-subscribe messaging system
- Very low overhead, can process millions of messages per second
- Used by most organizations for handling streams of incoming data
- Can act as the basis for implementing the *National Data Corridor*



Data Replication with Apache Kafka

Use Cases for Data Replication (“Change Data Capture”)

- Exchange data between databases of independent systems
- Feeding data into Analytics Systems & Data Lakes
- Auditing & Historization



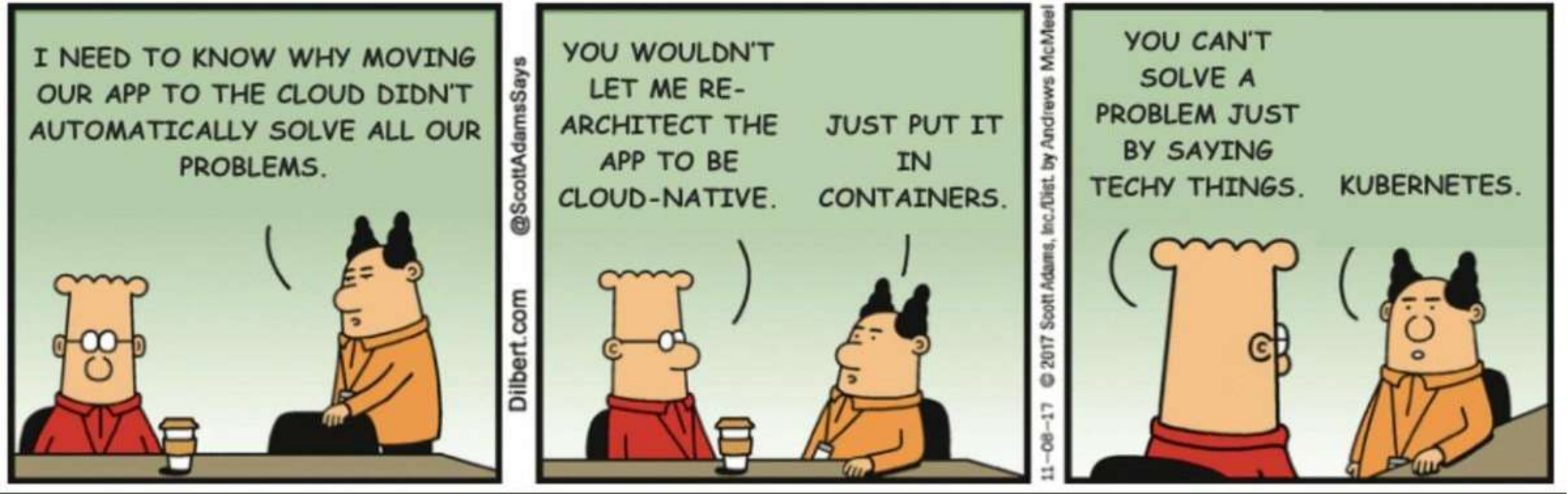
Containers & Kubernetes

What do we need to improve?

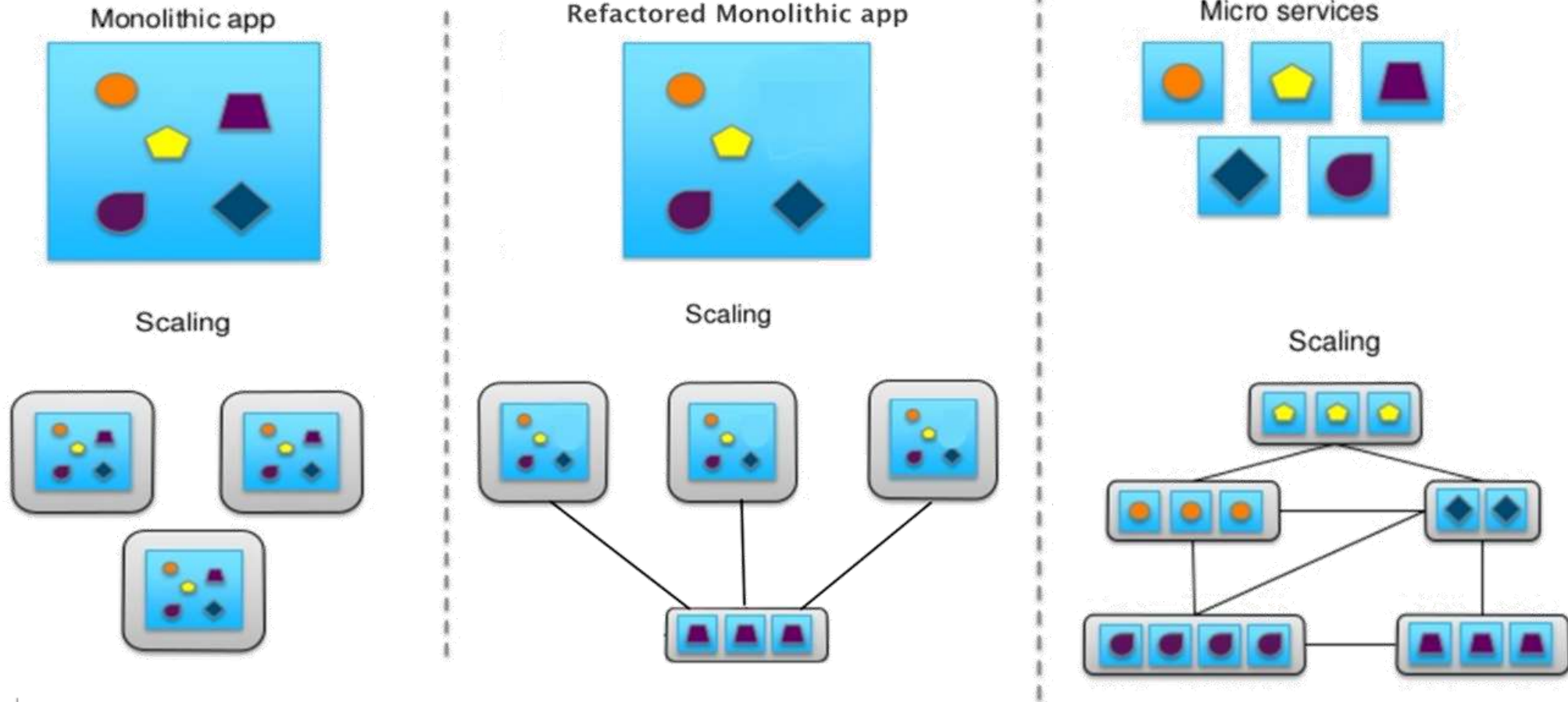
- Easily deploy on-prem or in the cloud
- Minimize downtime
- Scalability of services
- Speed up deployment of new versions
- Visibility into issues and bottlenecks



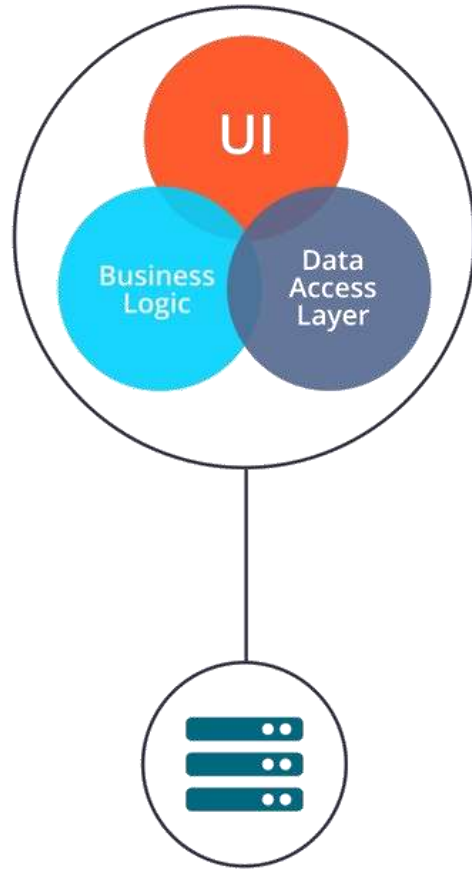
Cloud Native Apps & Containers...



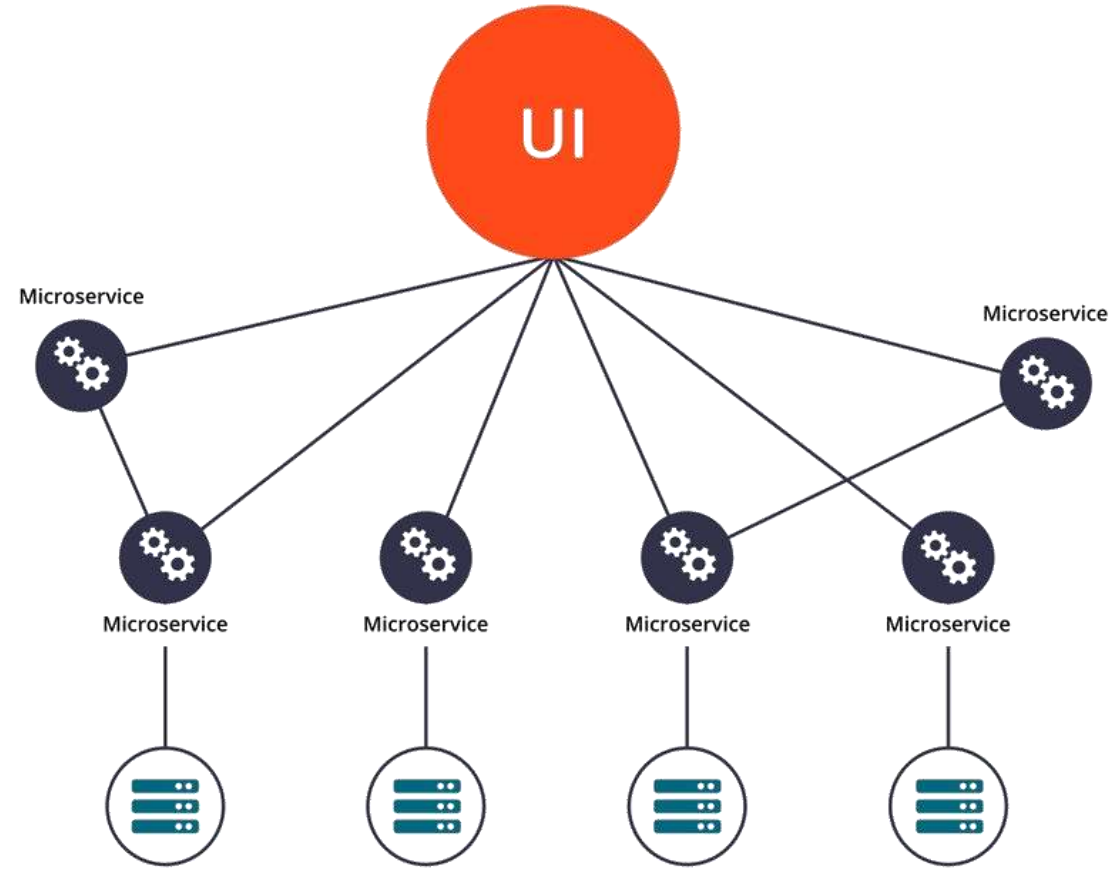
Scaling of Applications



Breaking down applications into smaller units

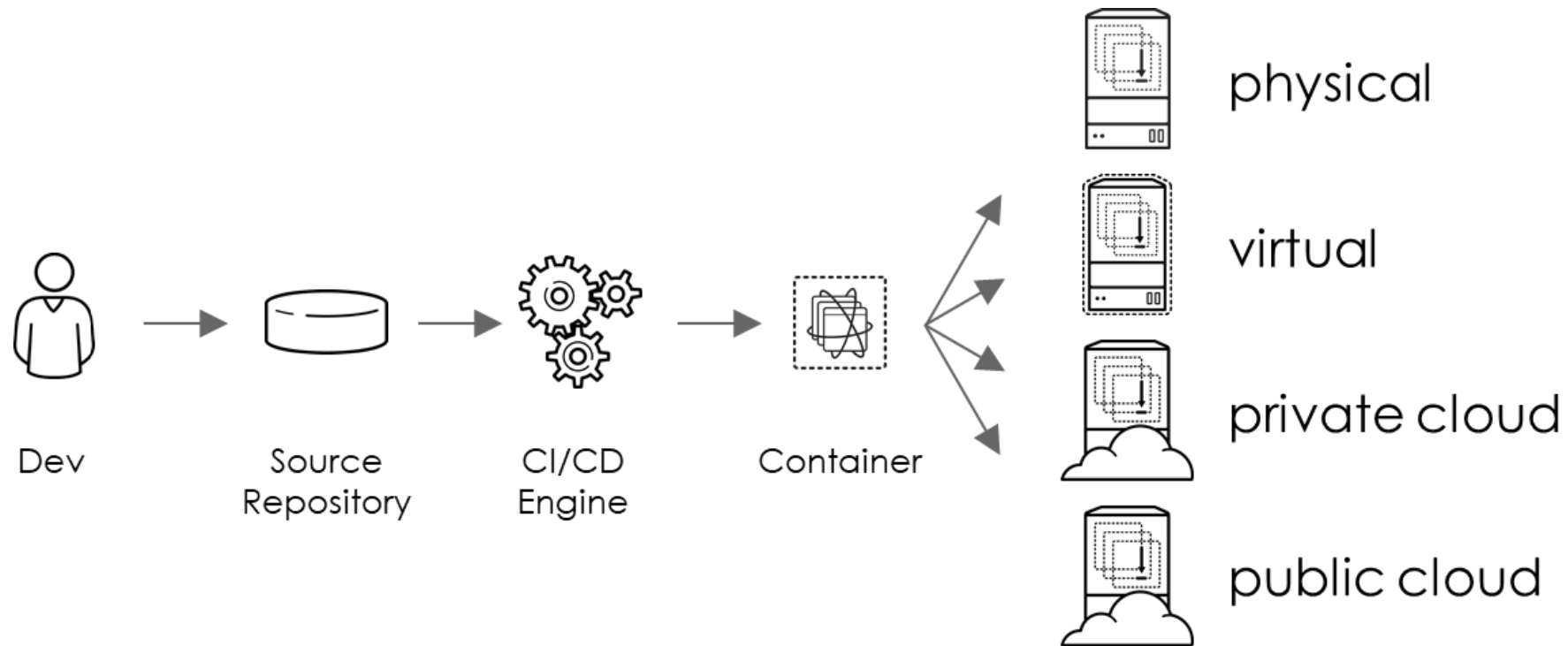


Monolithic Architecture

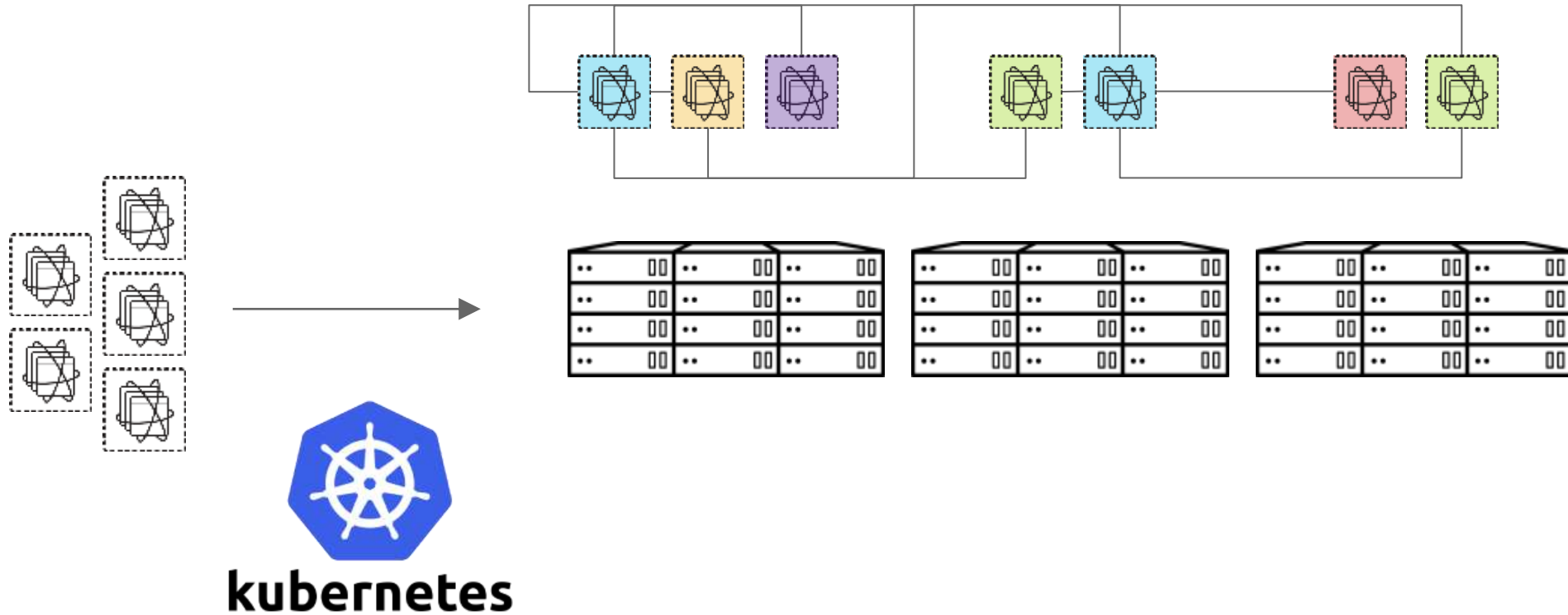


Microservice Architecture

Employing Container Technology



The Need for a Container Platform



Kubernetes Container Platform

- High Availability & Load balancing
- Self healing
- Auto-scaling on a per-service basis
- Integrated logging & monitoring
- Distributed tracing
- Flexibility to deploy anywhere
- Increased efficiency in utilization of h/w resources
- Advanced network and application security



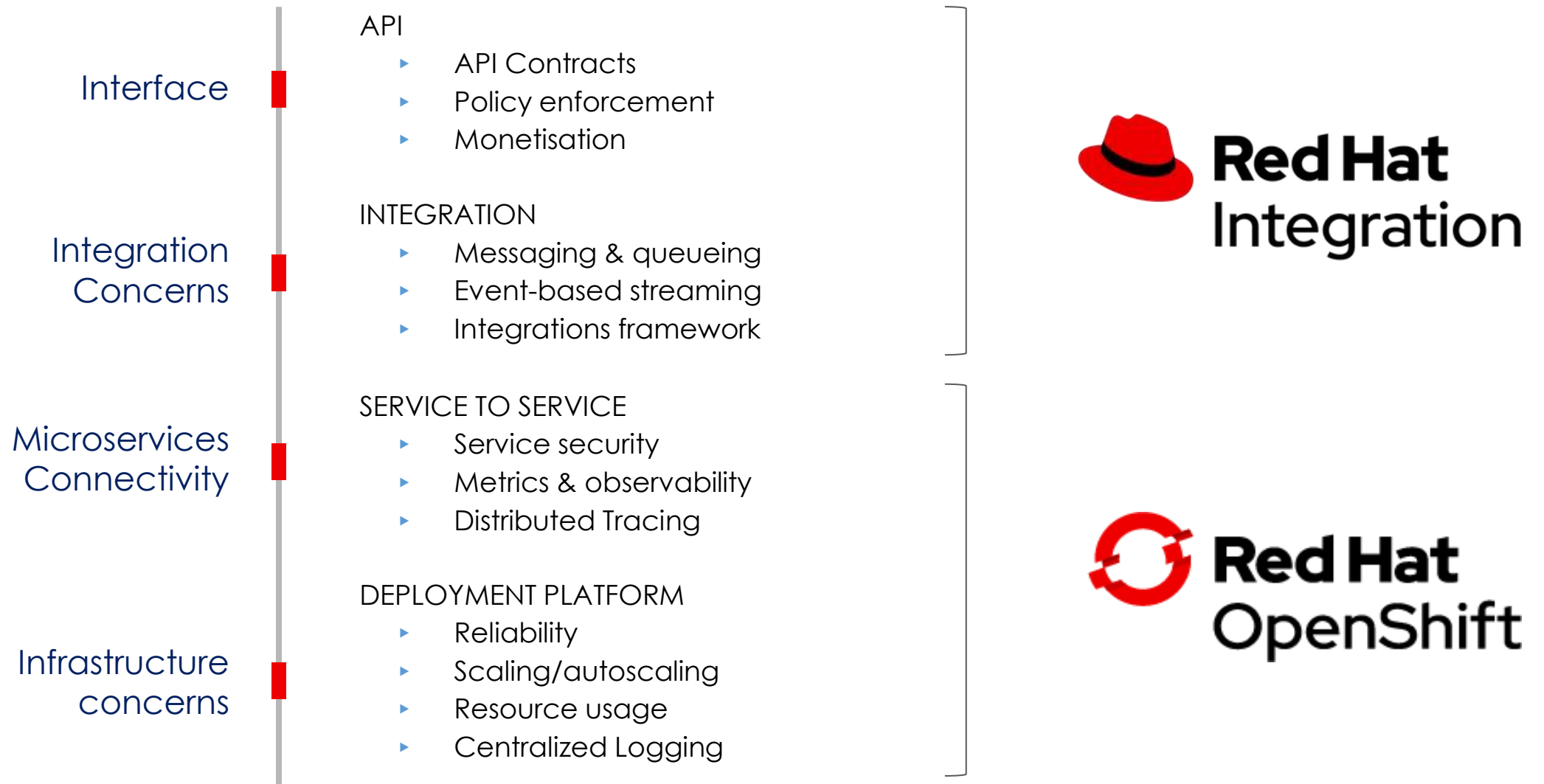
Red Hat Middleware: A holistic approach to Interoperability



Red Hat Middleware: A holistic approach to Interoperability

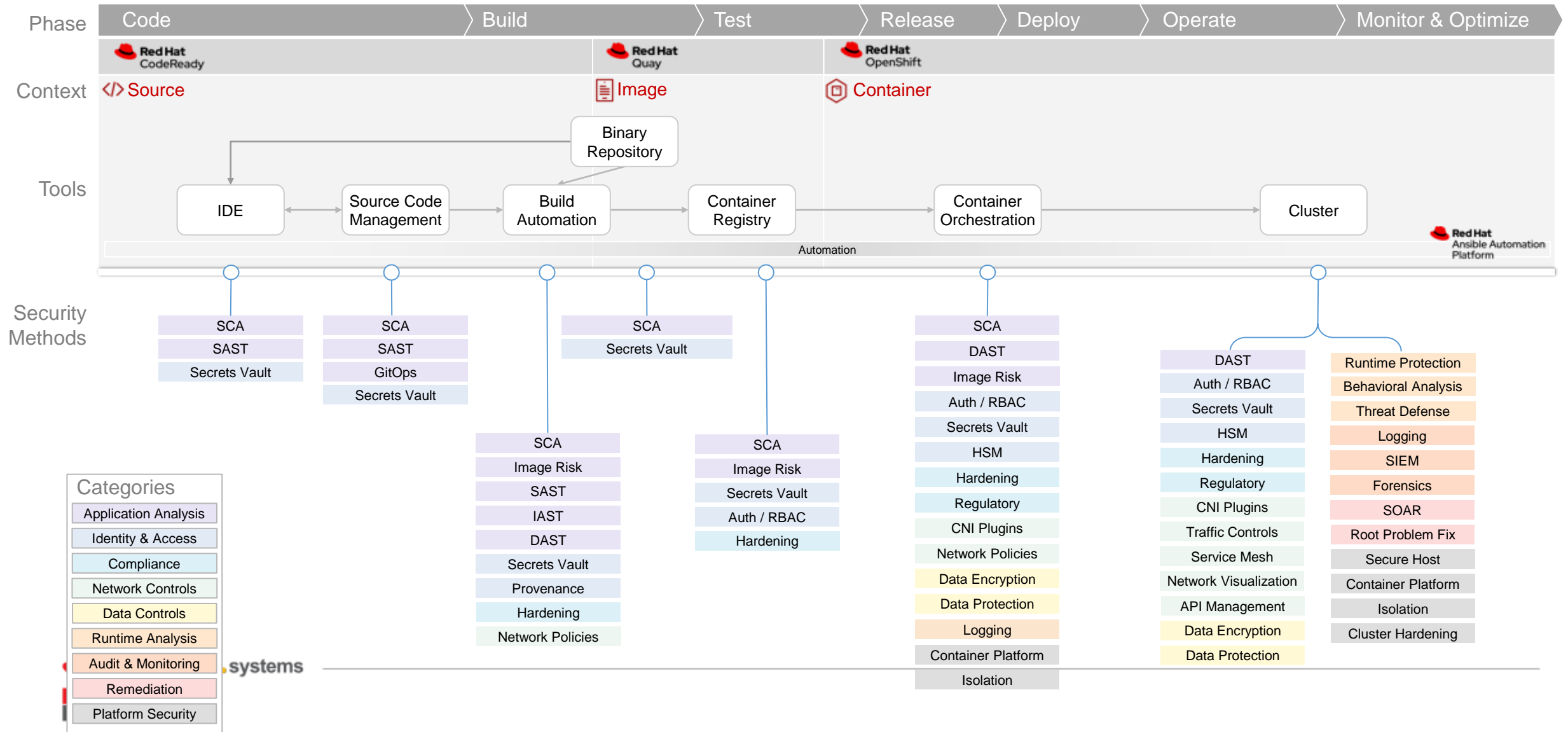


Red Hat Middleware: A holistic approach to Interoperability

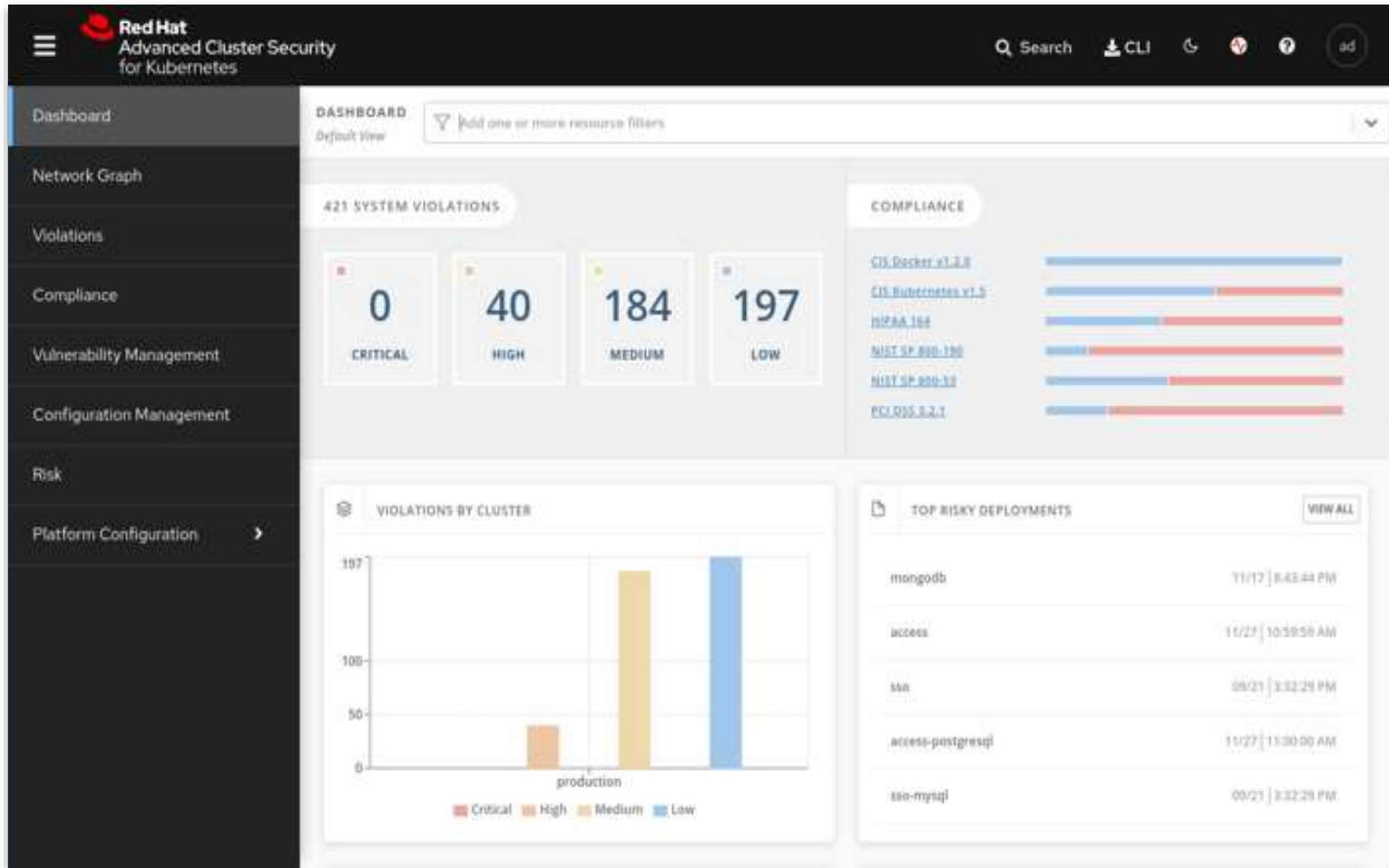


Security of Multi-Cloud

DevSecOps Methods & Technologies Framework



Single View on Security



Access the dashboard from the published Route using admin credentials generated during installation.

Oauth2 integration with OpenShift is not implemented at the current date.

Dashboard will provide an overview of overall systems violations, compliance statistics and top risky deployments across all managed clusters.

On the left side, the dashboard menu provides quick access to all features and configs.

An aerial photograph of a complex highway interchange with multiple lanes and ramps. The image is overlaid with a semi-transparent blue gradient. In the center, the text 'Thank you!' is written in a large, white, sans-serif font.

Thank you!