Cell-based Architecture

An Emerging Architecture Pattern for Agile Integration

Asanka Abeysinghe

Vice President, Architecture - CTO Office

WSO2, Inc

Motivation

Centralized & Layered

picture credit: https://www.flickr.com/photos/kaktuslampa/

Not enough support for Agility

Brownfield > Greenfield

Is
there a middle
ground?

Legacy, monolithic

Microservices, sprawl

picture credit: https://www.apstra.com/home/landscape-of-meadow-field-with-the-changing-environment-2/

Reference Implementations

picture credit: https://www.marinersmuseum.org/

Underutilization of the Technology

picture credit: http://unlocked.footlocker.com/

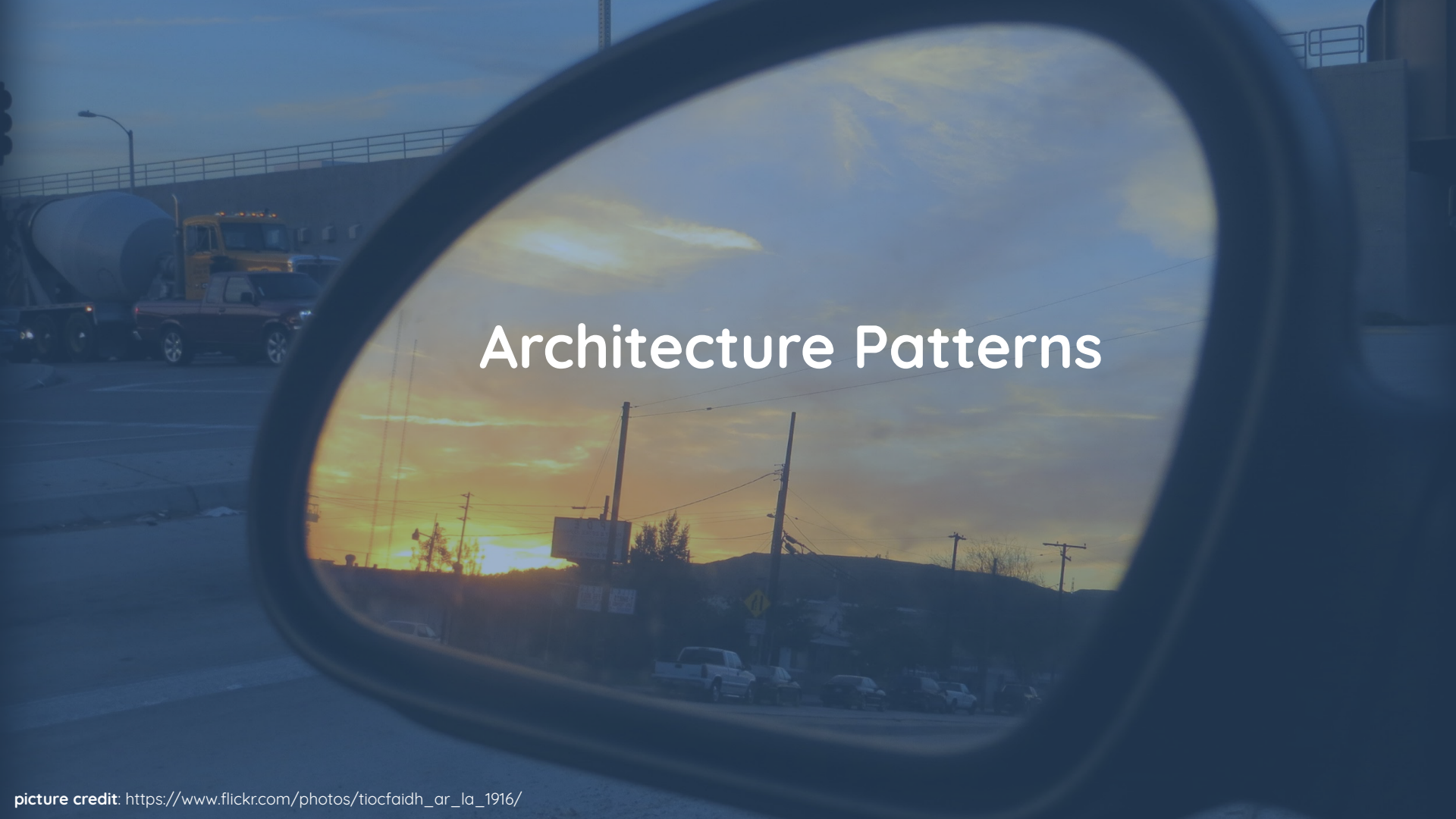
Gap: architecture | development | deployment

picture credit: https://www.flickr.com/photos/28994379@N02/

Dependency management

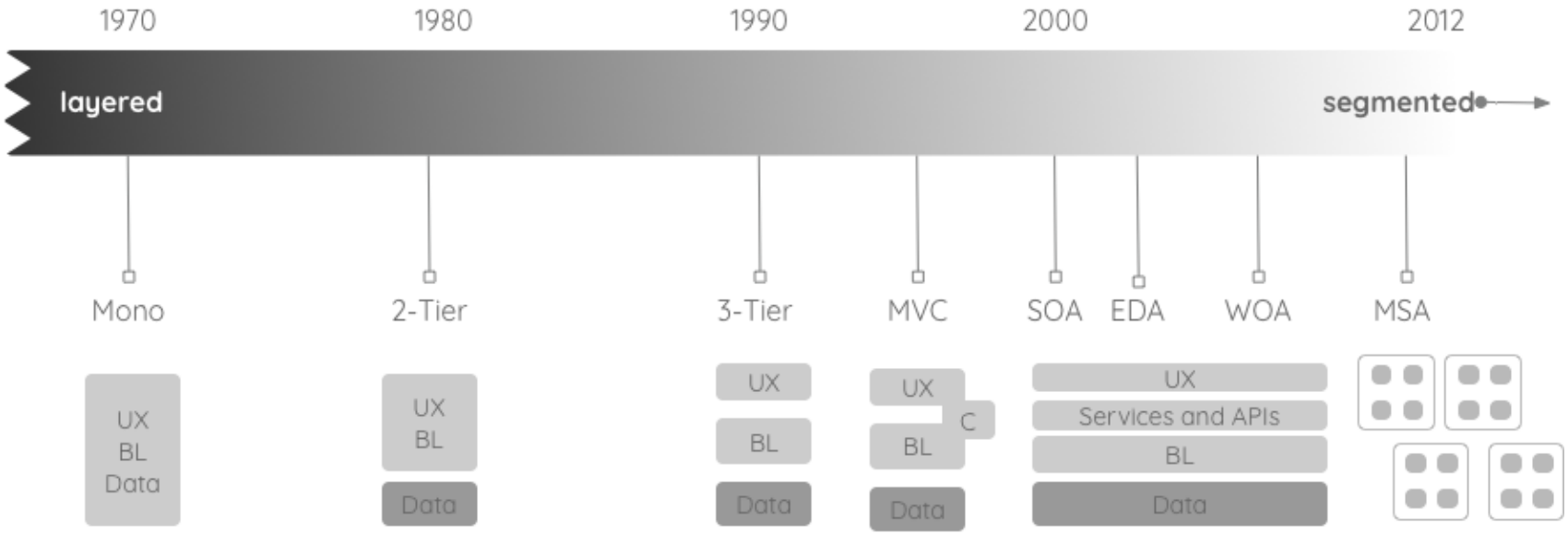
picture credit: https://www.solarpowerworldonline.com/2017/07/georgia-contractor-sells-farmers-solar-tough-market/

Architecture Patterns

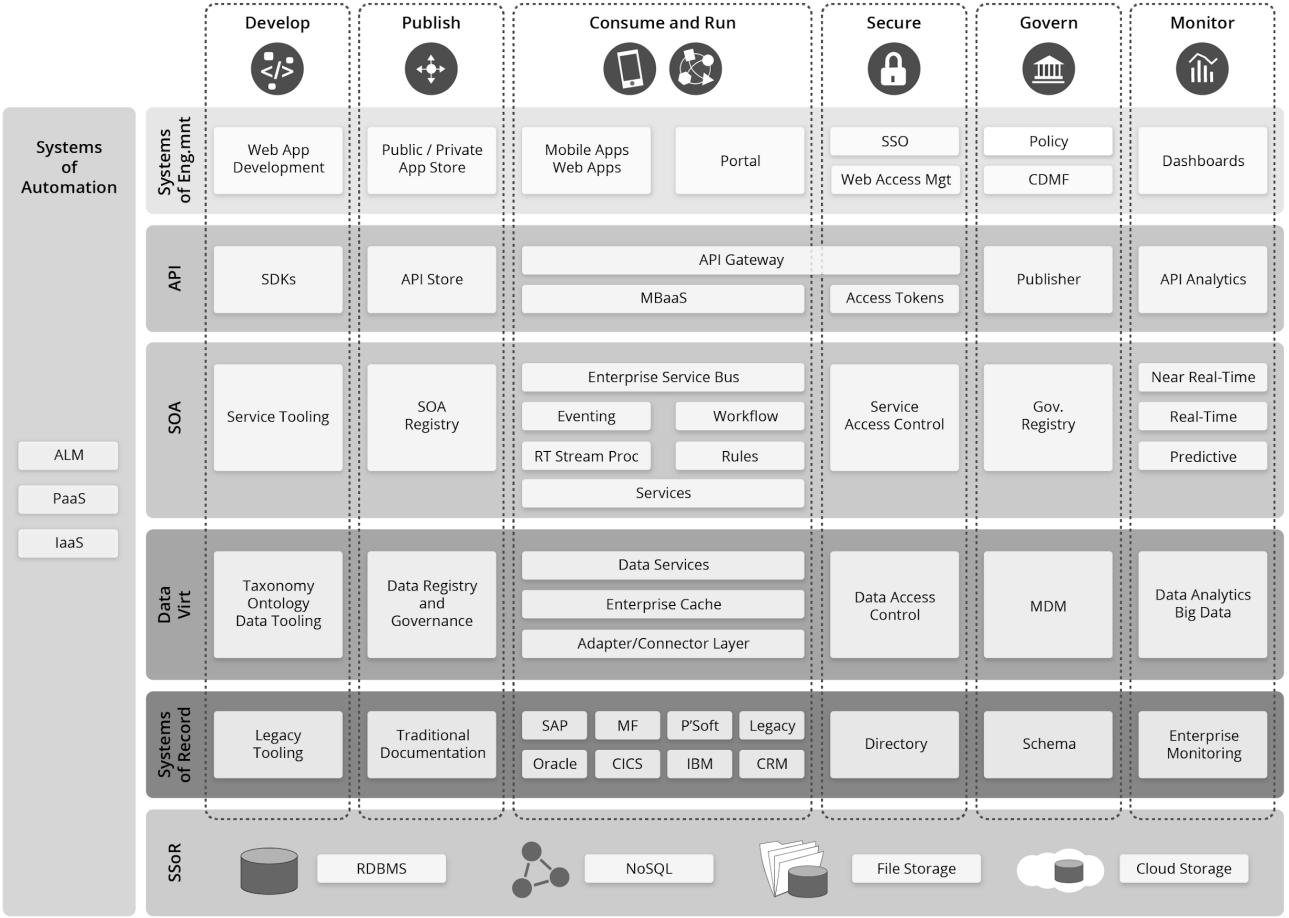


picture credit: https://www.flickr.com/photos/tiocfaidh_ar_la_1916/

Timeline


1970
1980
1990
2000
2012
layered
segmented
Mono
2-Tier
3-Tier
MVC
SOA
EDA
WOA
MSA
UX
BL
Data
UX
BL
Data
UX
BL
Data
UX
C
BL
Data
UX
Services and APIs
BL
Data

Background: Layered Architecture



A platform with an agile team

- 100 APIs, 60 message flows, 80 services, n DBs
- Multi-tenanted, 3 active tenants
- First release after 3 years

picture credit: https://www.flickr.com/photos/23119666@N03/

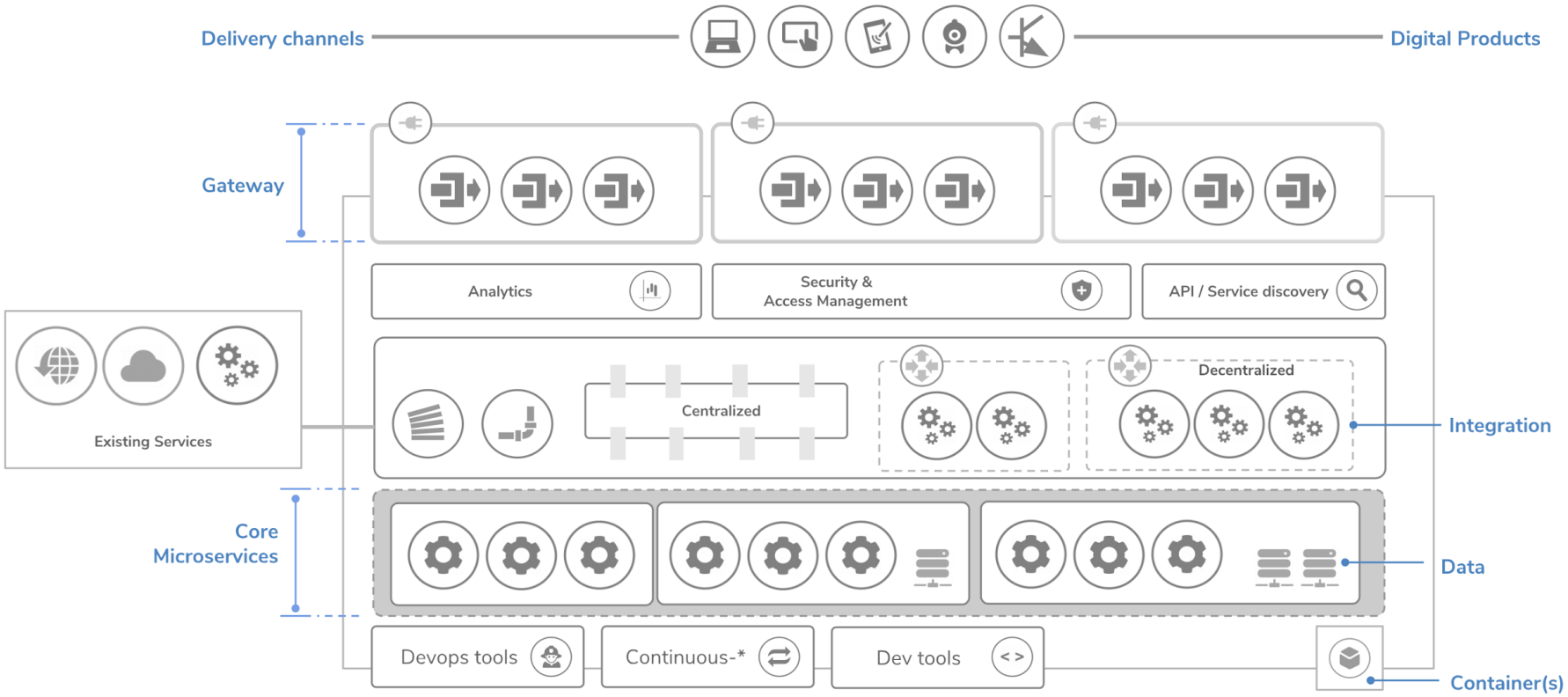
Rise of Microservices

picture credit: https://www.flickr.com/photos/imcountingufoz/

Pragmatic Microservices

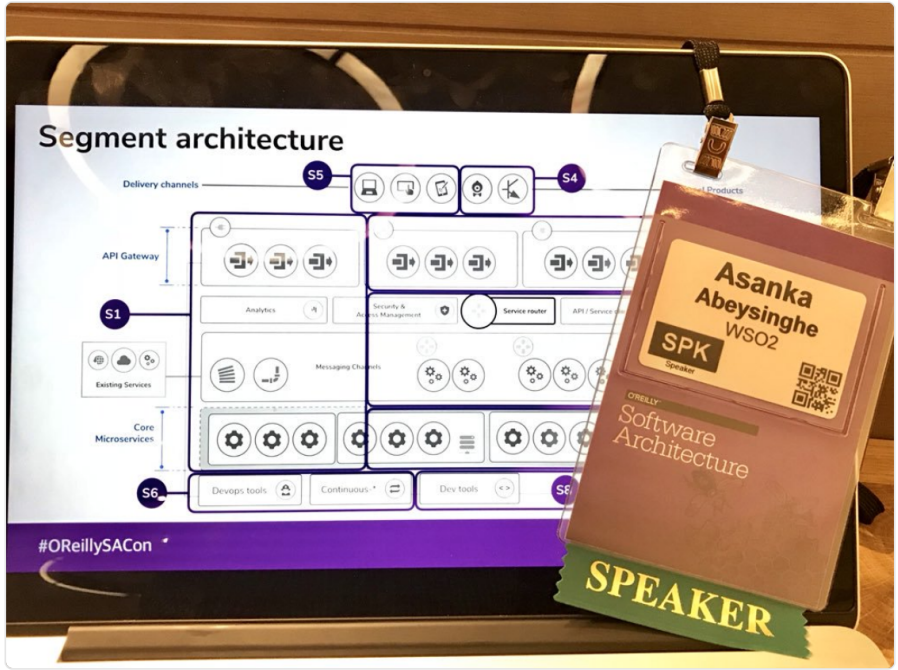
- Netflix: APIs
- Uber: Edge Gateway
- eBay: API Facade
- Gartner: Mini Services

Background: Layered Architecture with MSA



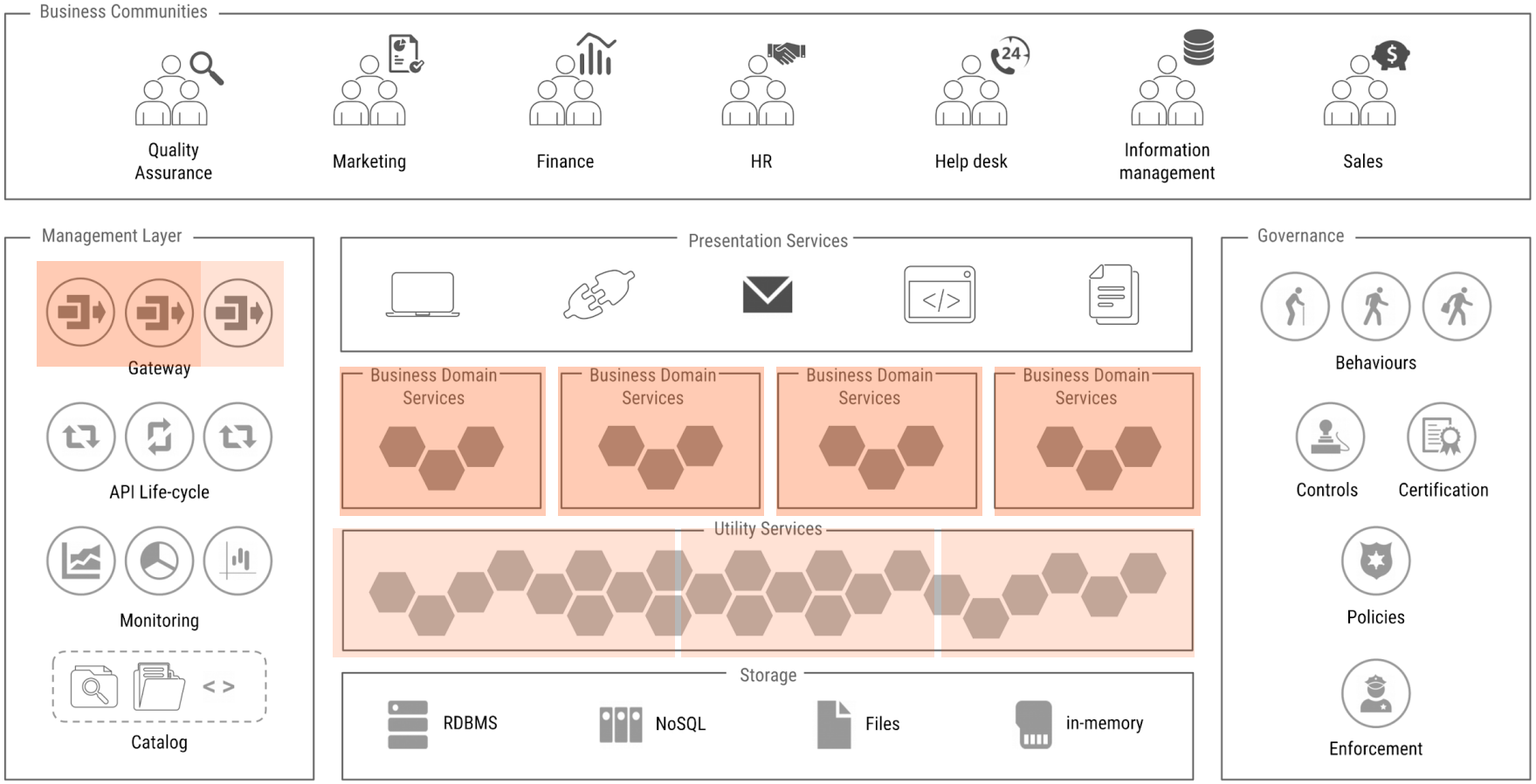
Asanka Abeysinghe
@asankama

Meet me at the Blenheim Room @OReillySACon to discuss #Iterativearchitecture #OReillySACon



7:14 AM - 16 Oct 2017 from Hilton London Metropole Hotel

Background: Segmented Architecture



Making of……

picture credit: https://commons.wikimedia.org/wiki/User:Frank_Schulenburg CC BY 3.0

picture credit: https://clutchpoints.com/phil-jackson-talks-about-the-kobe-bryant-michael-jordan-comparison/

picture credit: https://sportzwiki.com/football/sir-alex-ferguson-reveals-best-player-managed-man-united/

2014

2018

Google

reference architecture

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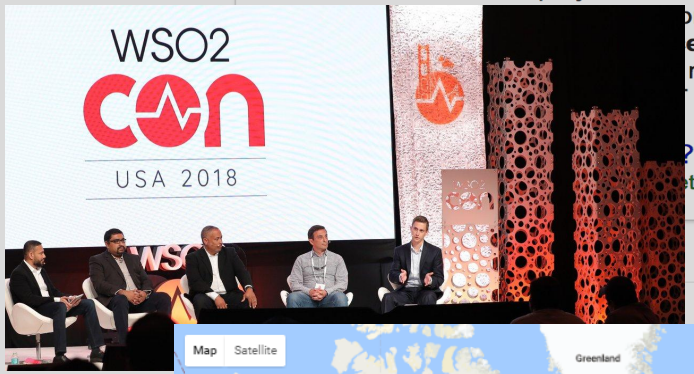
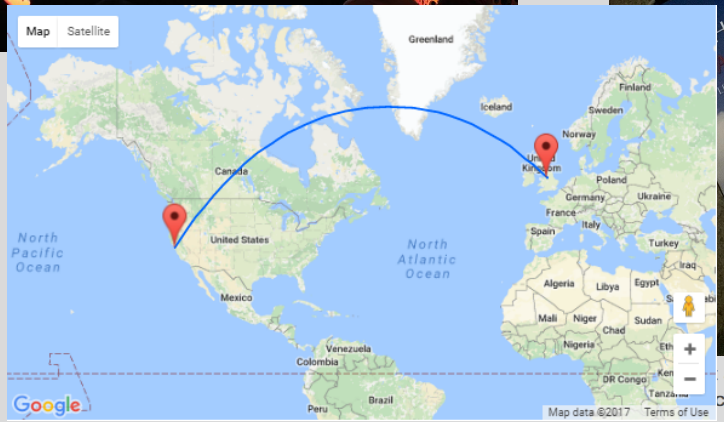
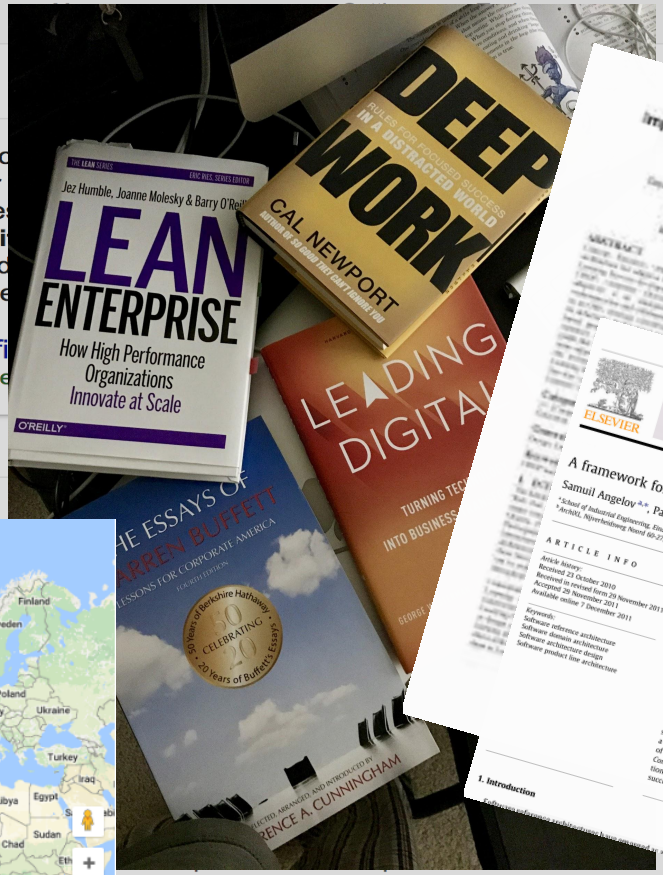
About 522,000,000 results (0.42 seconds)

A **reference architecture** is a document c
documents to which a project manager or
practices
e archi
method
service
? - Defi
t.com/de







Implementing the CIDP Reference Architecture: The CIDP Learning Object Editor

ELSEVIER

Information and Software Technology

A framework for analysis and design of software reference architectures

Samuil Angelov, Paul Grefen, Danny Greefhorst

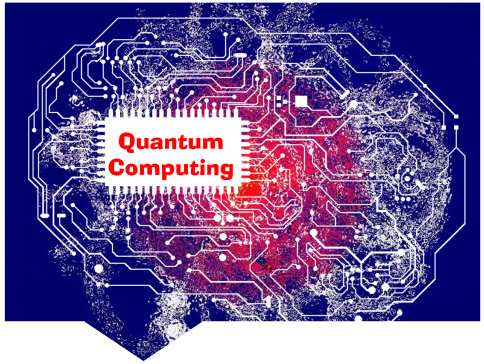
ARTICLE INFO

ABSTRACT

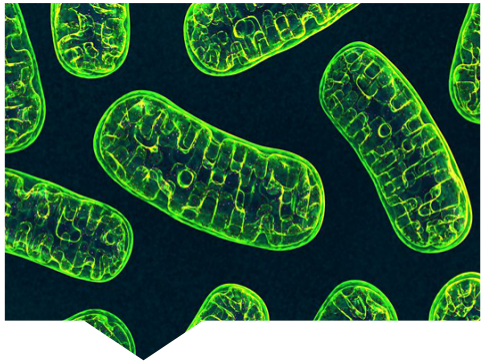
1. Introduction

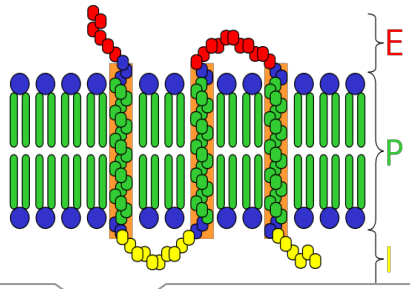
also provides a common vocabulary with
commonality.

Building the Concept



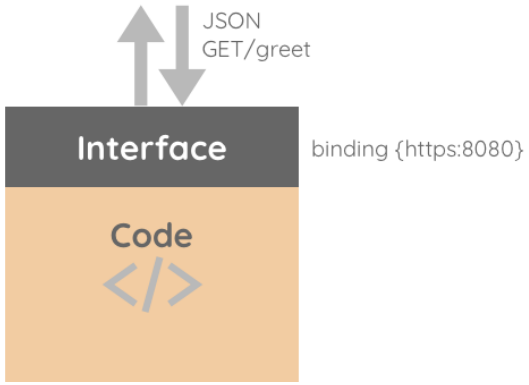
kubernetes





Service: Technical definition

A **code** exposes through an **interface** that describes a collection of operations that are **network accessible** using a standardized messaging protocol.

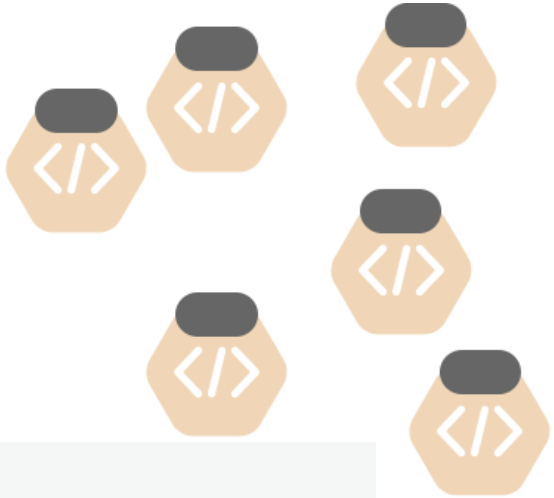



```
public class PersonApi {

    @Path("/greet")
    @GET
    @Consumes(MediaType.APPLICATION_JSON)
    @Produces(MediaType.APPLICATION_JSON)
     public JSONObject sayHello() {
       try {
          return new JSONObject().put("greeting", "Hello worl
       } catch (JSONException e) {
          return null;
       }

     }

}
```

Microservice: Technical definition

A microservice must have a **single purpose** and be loosely coupled in design and deployed independently of other microservices.

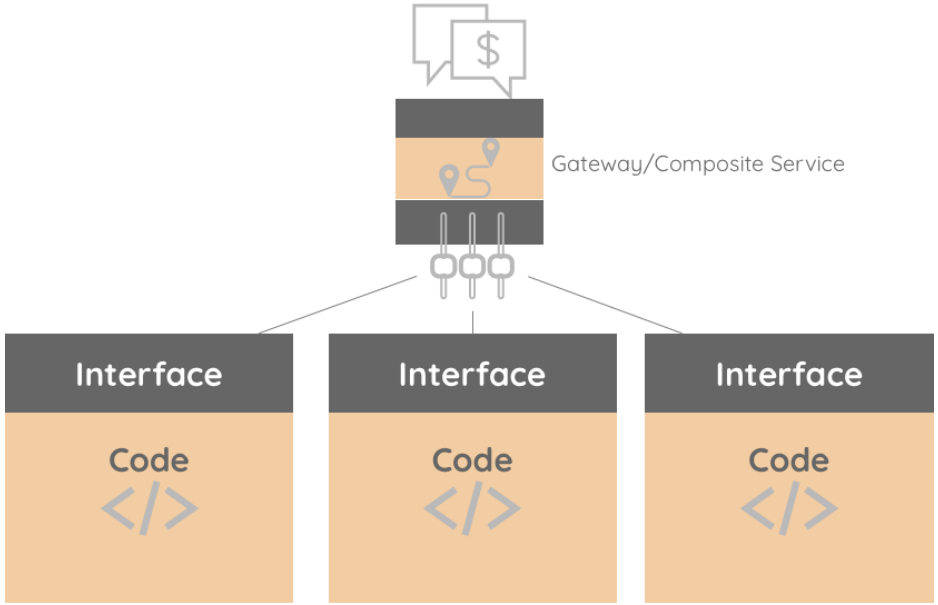
"Micro" is a concept of **scope** rather than **size**.



```
import ballerina/http;
import ballerina/log;

service<http:Service> hello bind { port: 9090 } {



    sayHello(endpoint caller, http:Request req) {
        http:Response res = new;


        res.setPayload("Hello, World!");


        caller->respond(res) but { error e => log:printError(
                                "Error sending response", err = e) };
    }
}
```

Service: Business definition

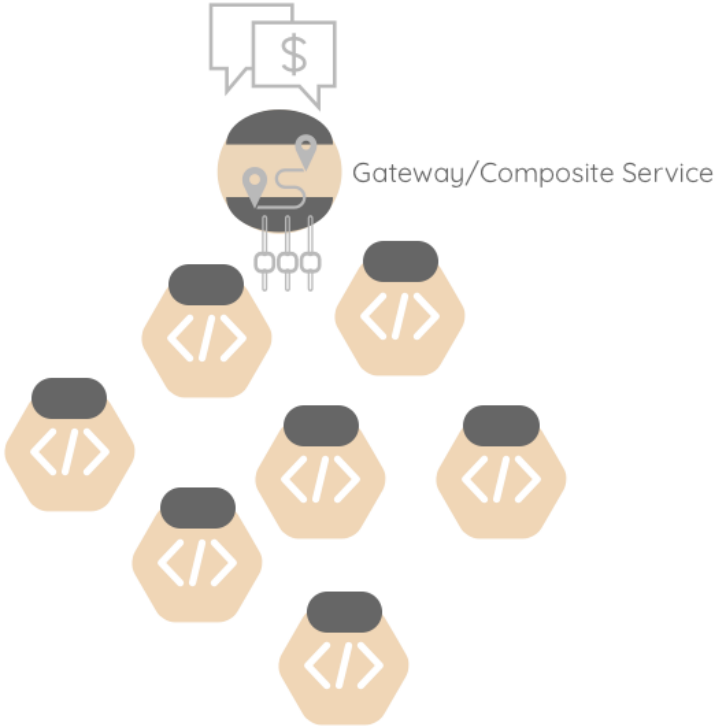
Software components that can be spontaneously discovered, **combined**, and **recombined** to provide a solution to a **business problem**.



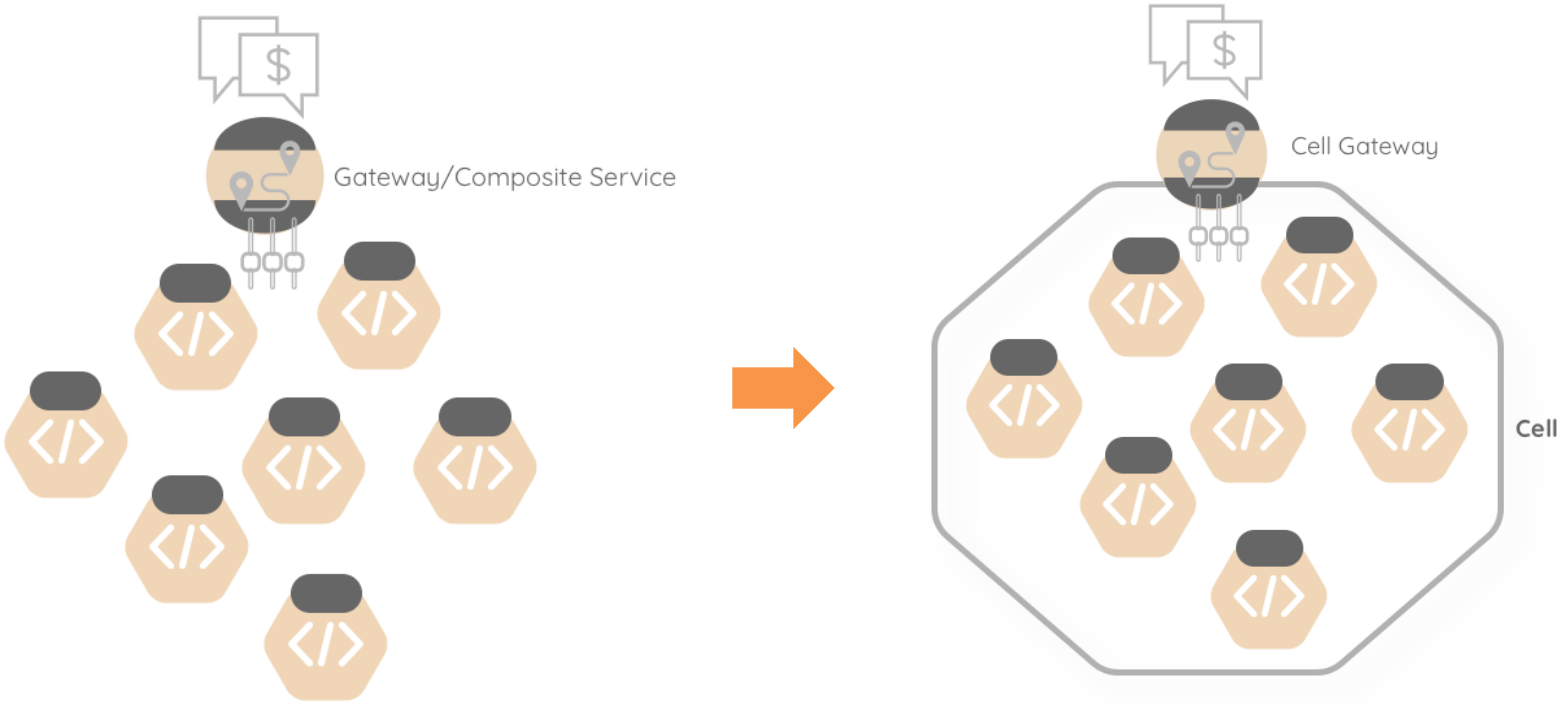
Microservice: Business definition

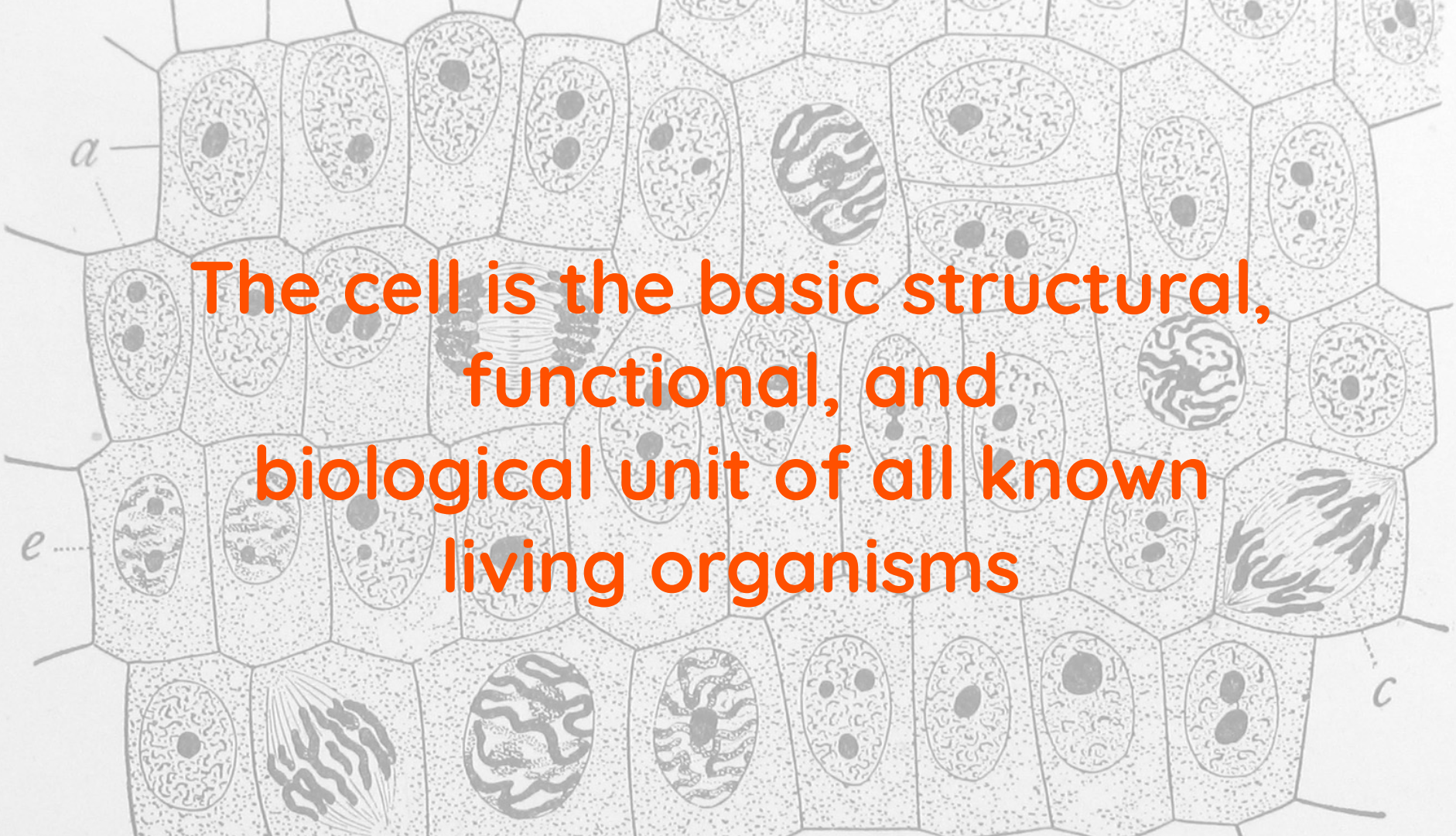
Microservices is an approach to application development in which a large application is built as a suite of **modular components** or services.

These services are built around **business capabilities**.



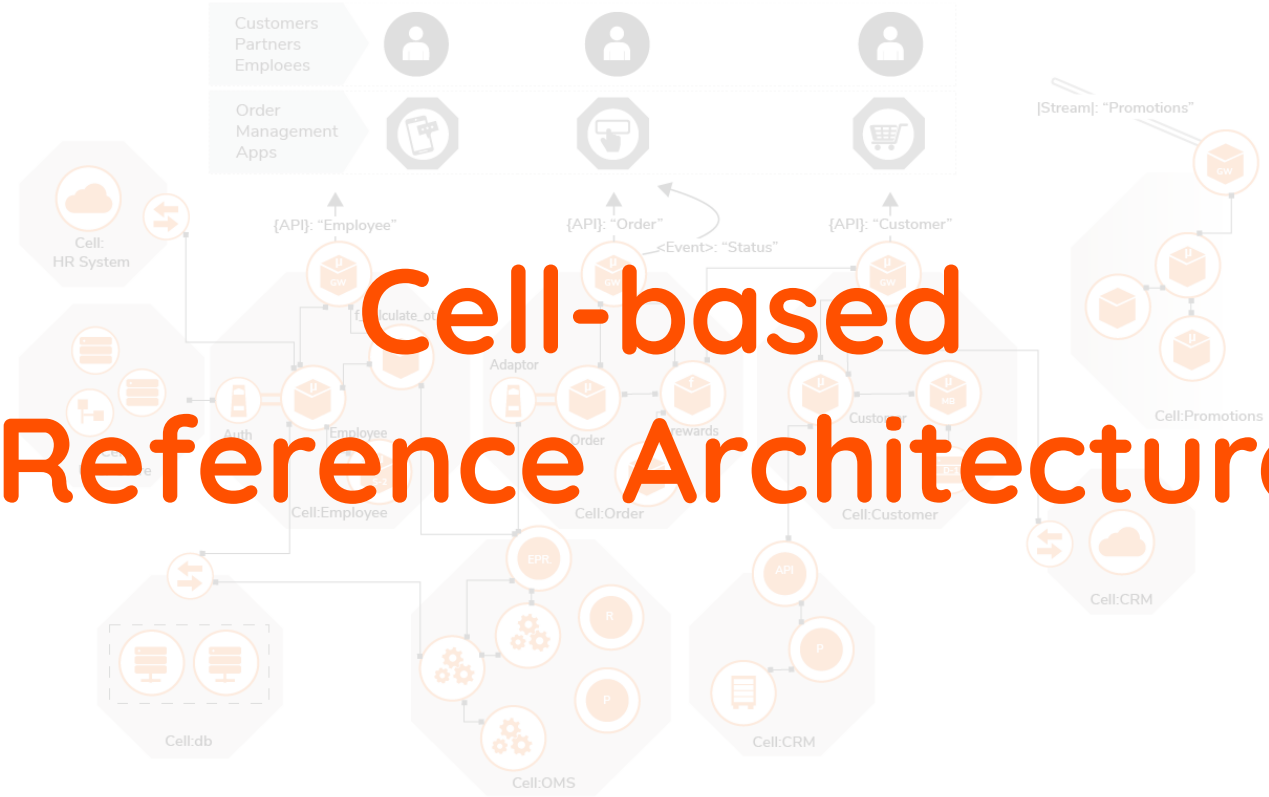
Group of Microservices





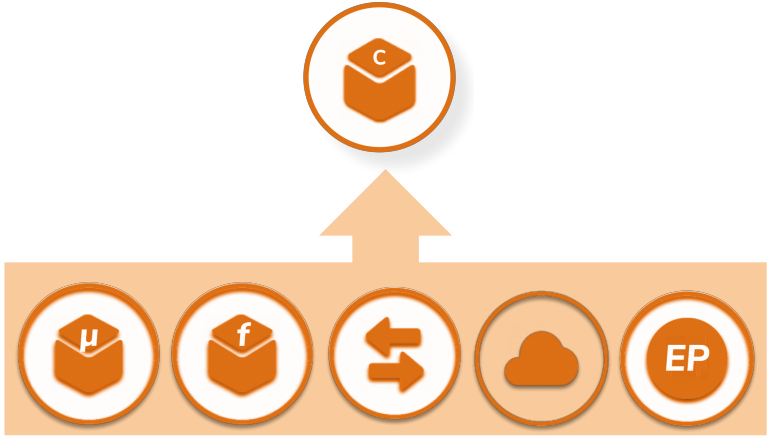
The cell is the basic structural, functional, and biological unit of all known living organisms

Cell-based Reference Architecture



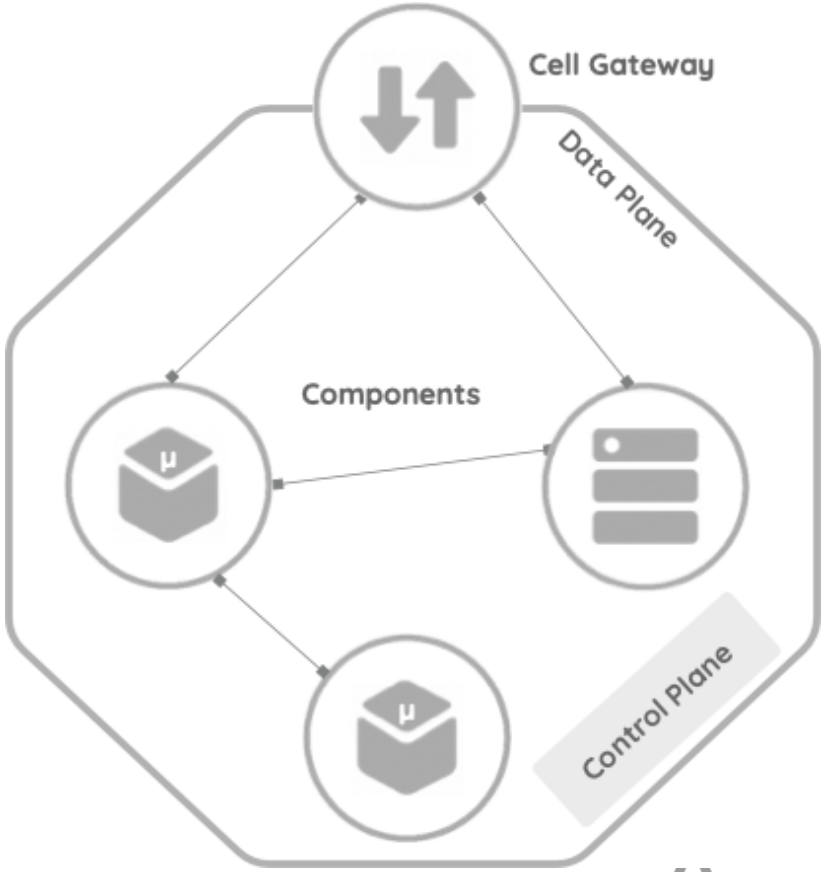
Component: Atomic Units

A **component** represents a process or business logic running in a container, serverless environment, or an existing runtime. A component is designed based on a specific scope, which can be independently run and reused at the runtime.



Cell: Units of Enterprise Architecture

A **cell** is a collection of components, grouped from design and implementation into deployment. A cell is independently deployable, manageable, and observable.

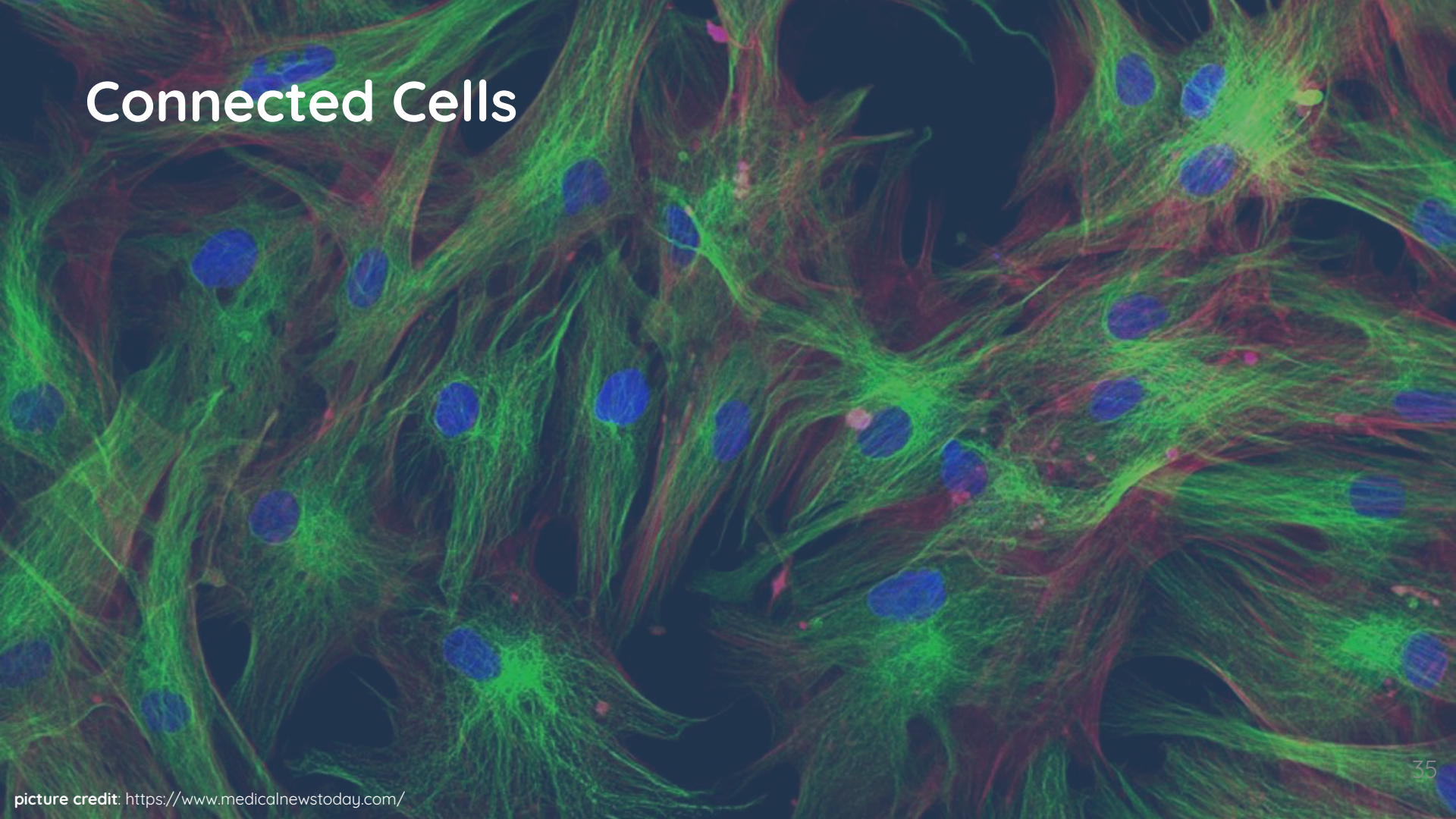


Cell:Component

1:M

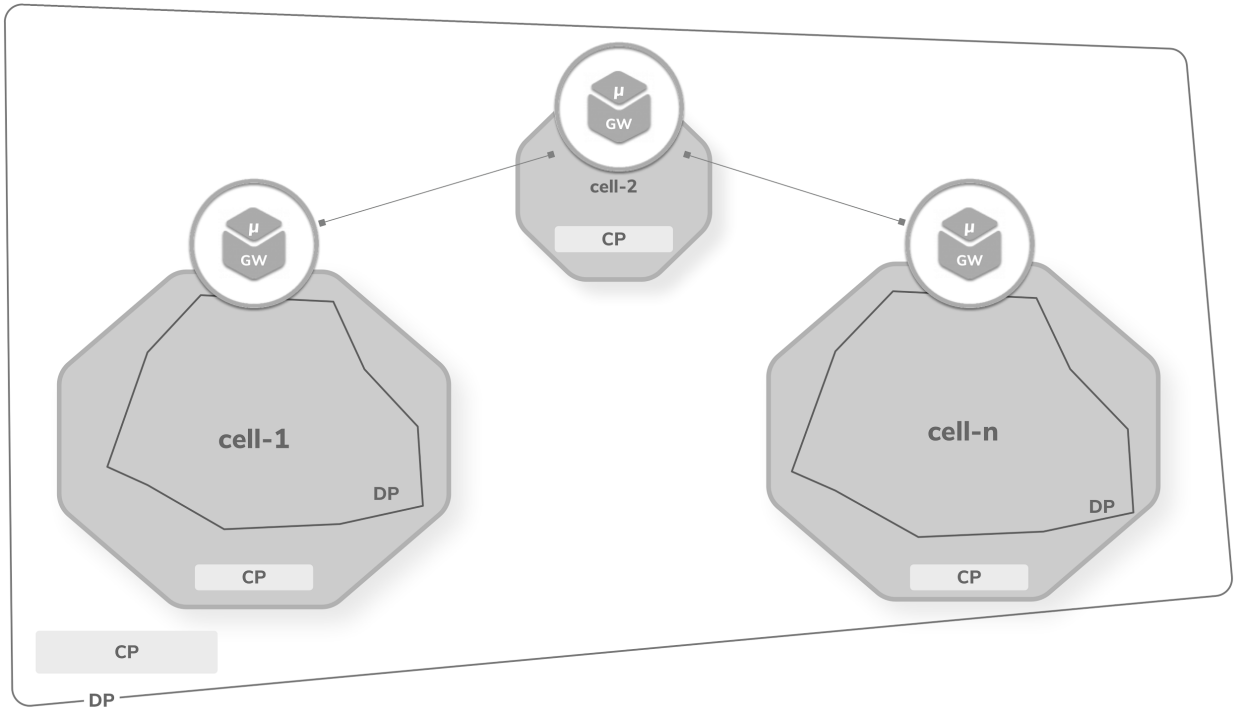
1:1

Connected Cells



picture credit: https://www.medicalnewstoday.com/

Inter and Intra Cell communication



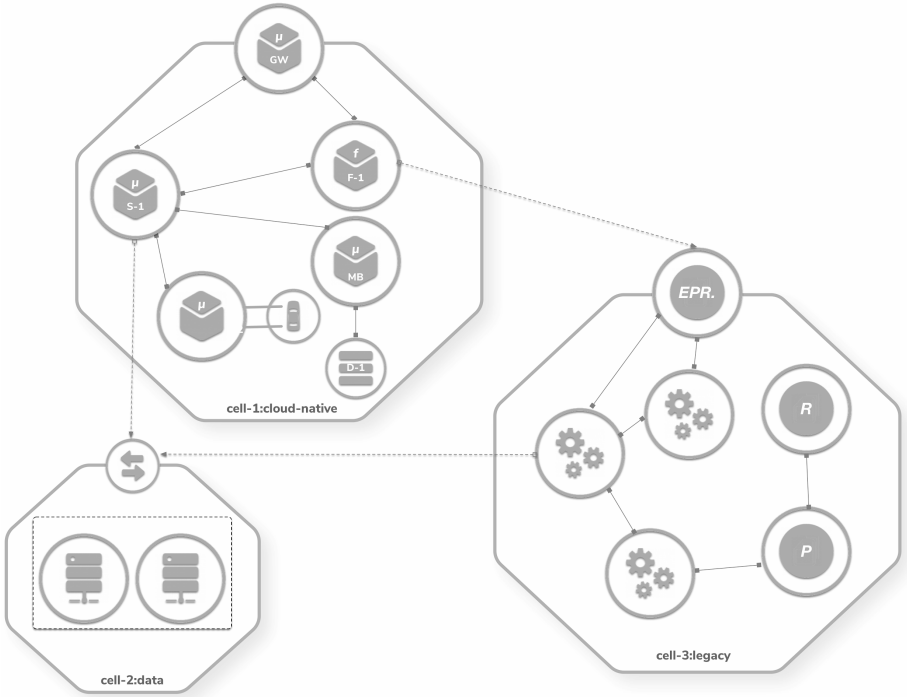
Connected Cells

Cell gateway (ingress)

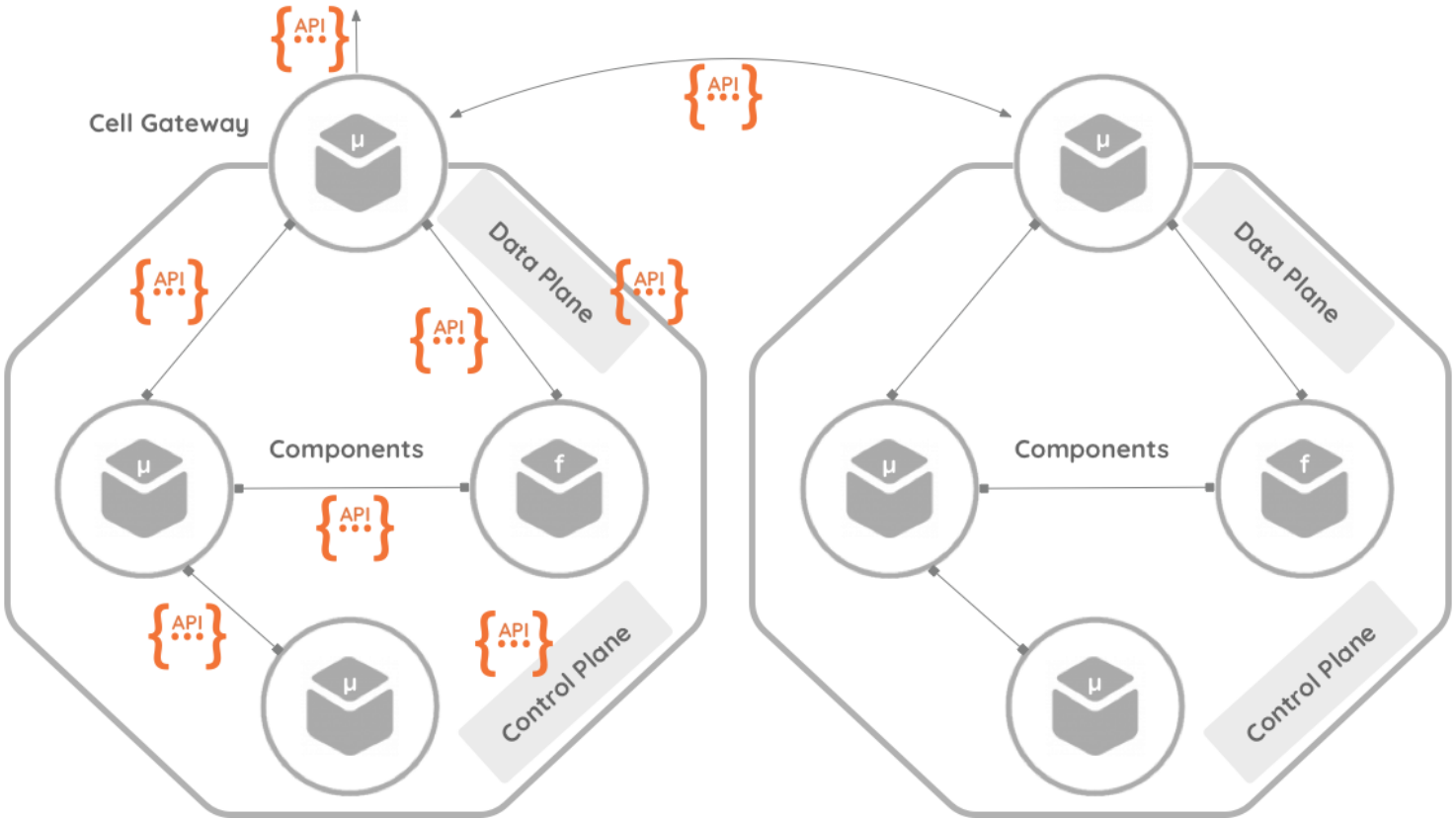
Sidecar (egress)

Adaptor (egress)

Ambassador (egress)



API-centric Architecture



Gateway Pattern

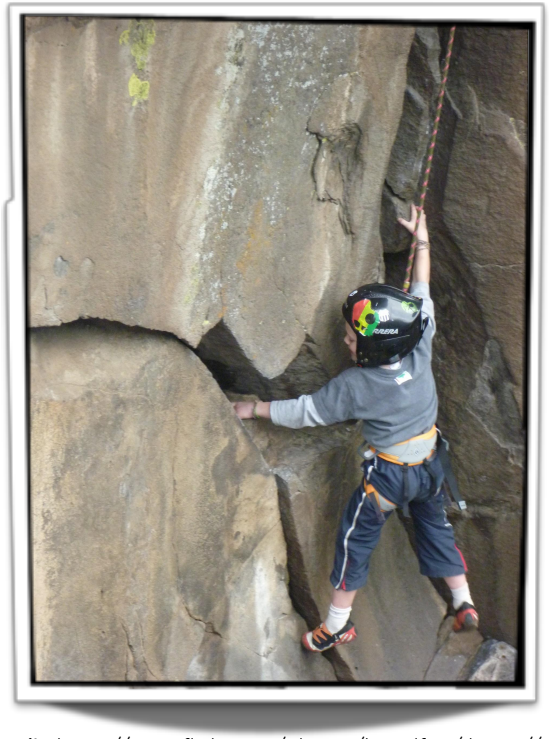
picture credit: https://www.flickr.com/photos/ell-r-brown/

Automated Governance (Re)-enables Flow

Automated governance is made of three things:

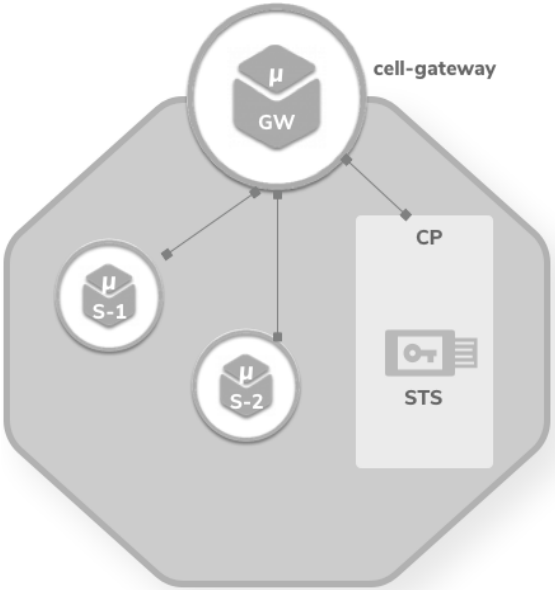
- A source of truth:
  - Policy store/registry
- Enforcement of the policy
  - Gateway or plugin attempting to keep the desired state
- Observability
  - How close to the desired state are we?

Security of Cells

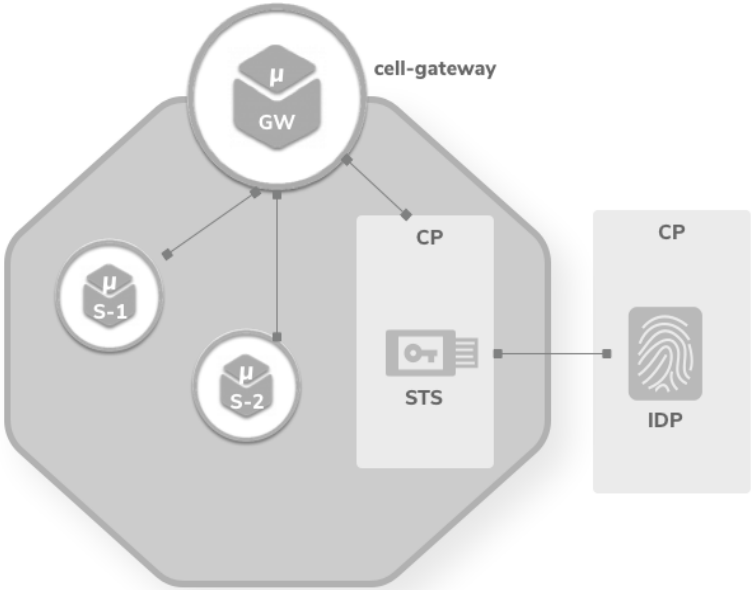


picture credit: https://www.flickr.com/photos/laurelfan/ https://www.flickr.com/photos/sahdblunders/

Security of Cells

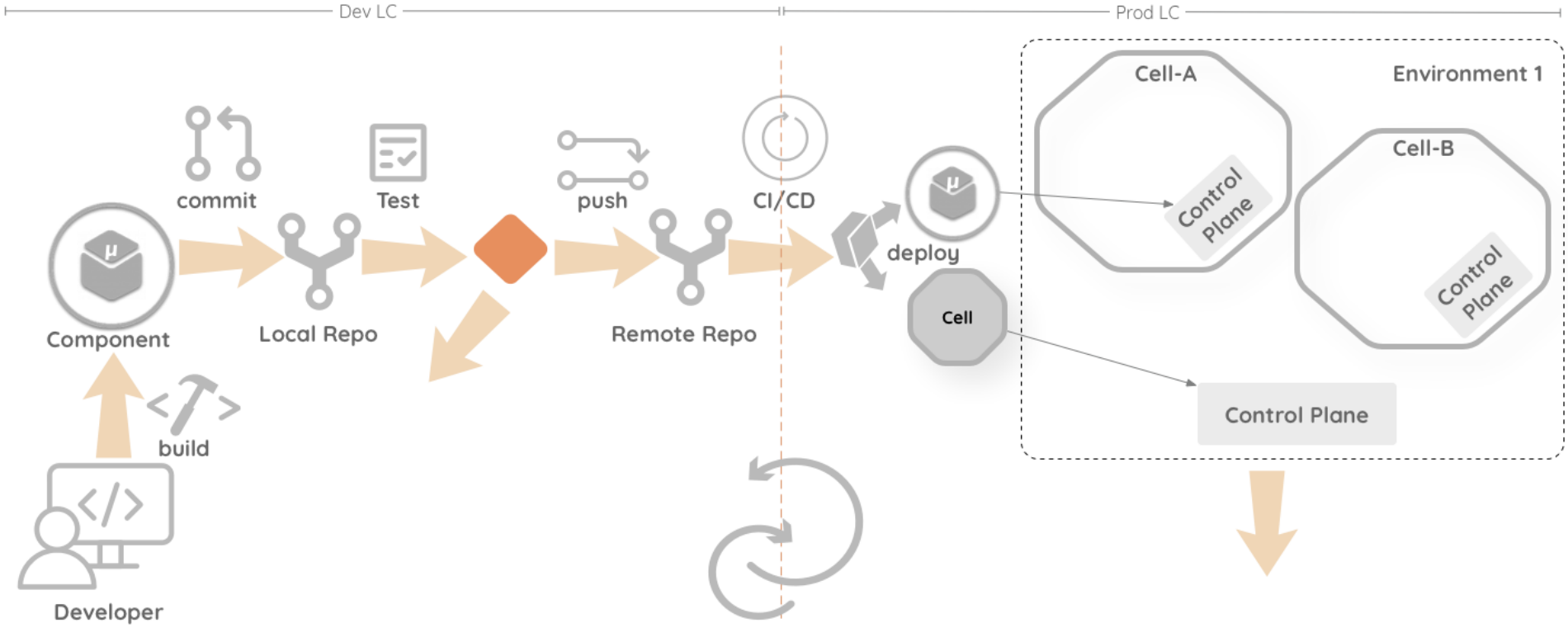


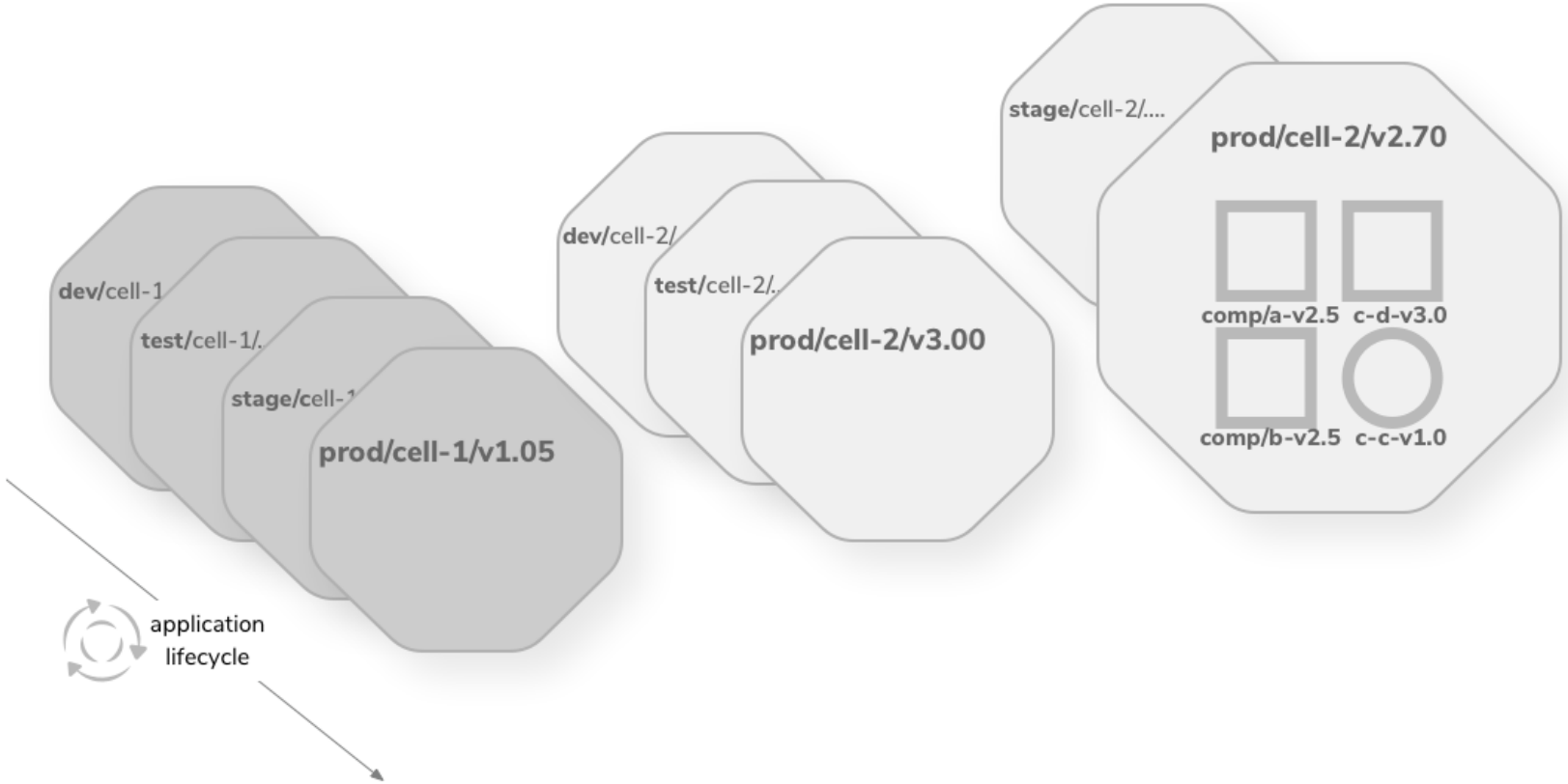
pattern-1



pattern-2

Developer Experience (DX) of a Cell


Dev LC
Prod LC
commit
Test
push
CI/CD
Component
Local Repo
Remote Repo
deploy
Cell
Cell-A
Environment 1
Cell-B
Control Plane
Control Plane
Control Plane
build
Developer


dev/cell-1
test/cell-1/.
stage/cell-1
prod/cell-1/v1.05
dev/cell-2/
test/cell-2/.
prod/cell-2/v3.00
stage/cell-2/....
prod/cell-2/v2.70
comp/a-v2.5
c-d-v3.0
comp/b-v2.5
c-c-v1.0
application
lifecycle

Structured Agility

Versioned Components

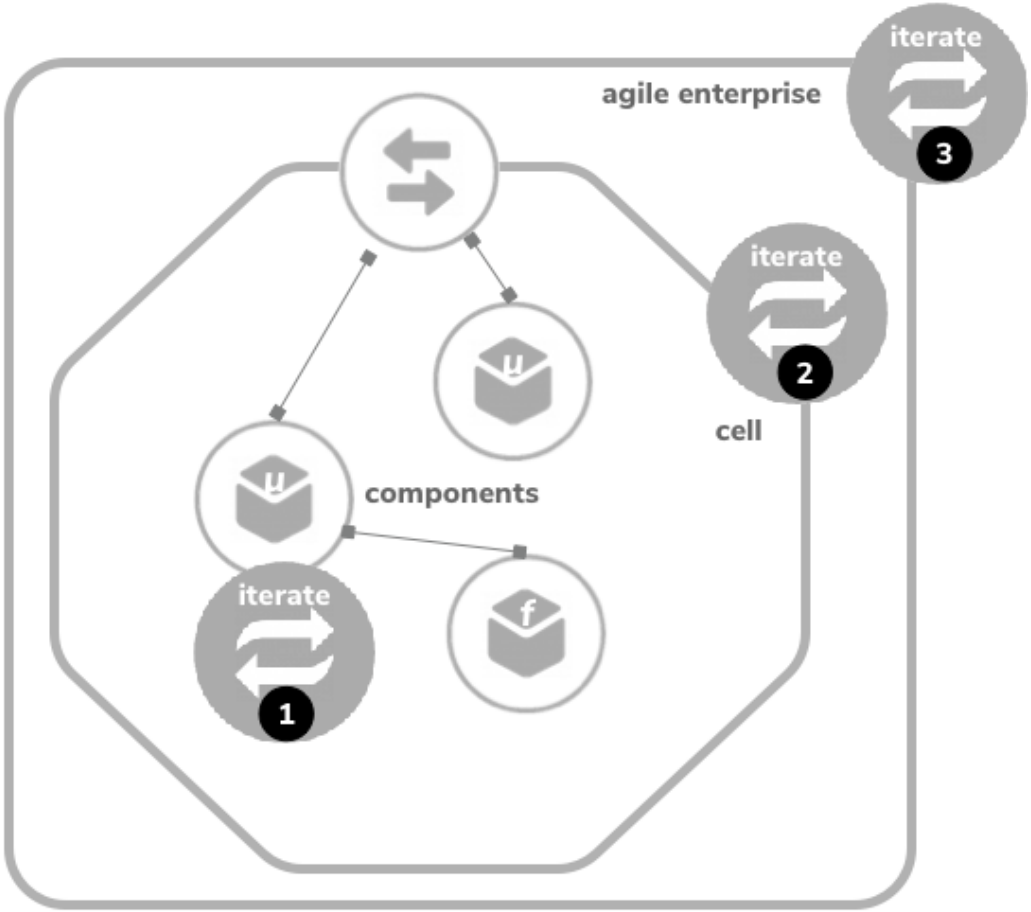
Versioned Cells

Dependency managed

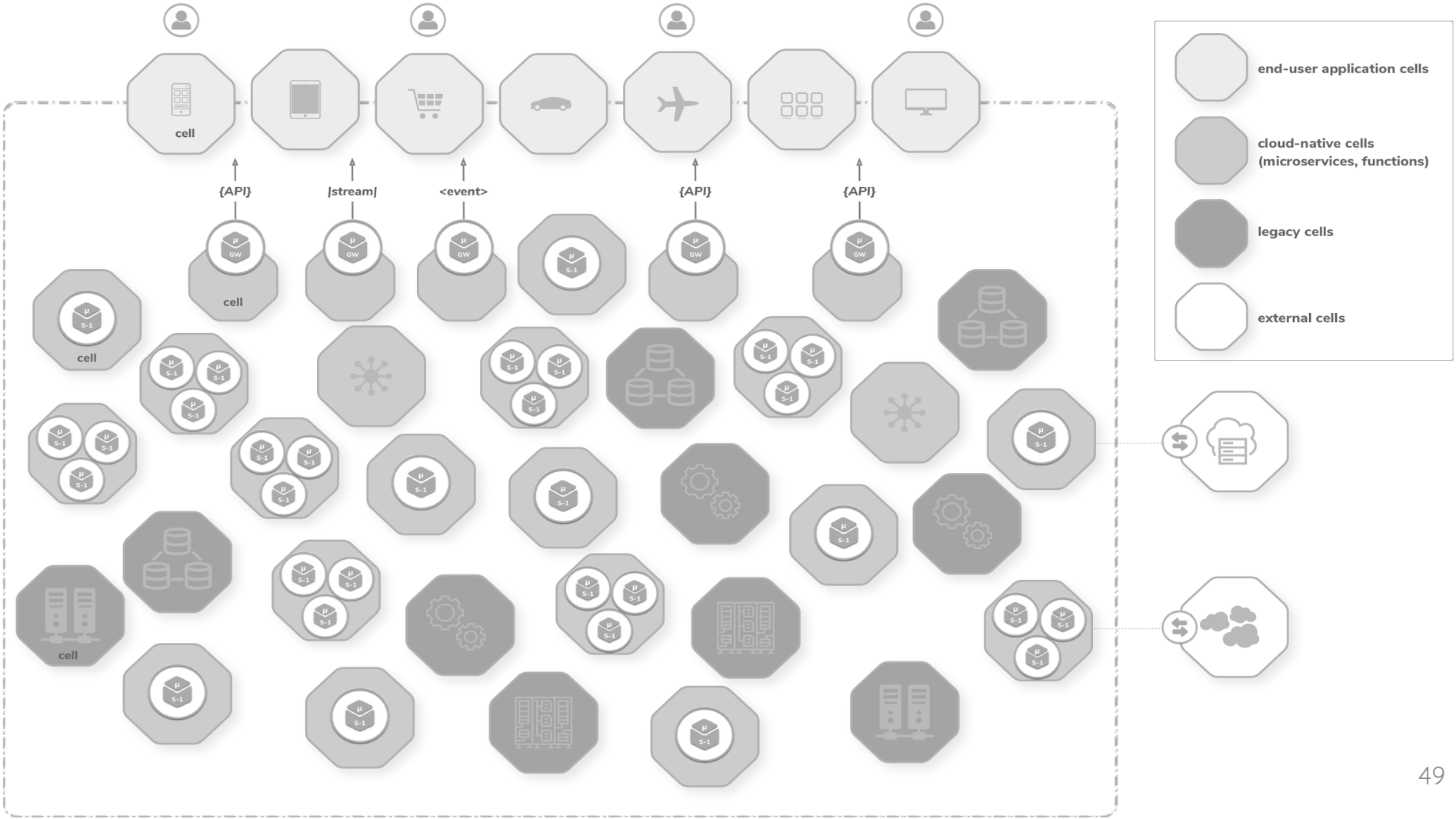
Autowired

Reusable

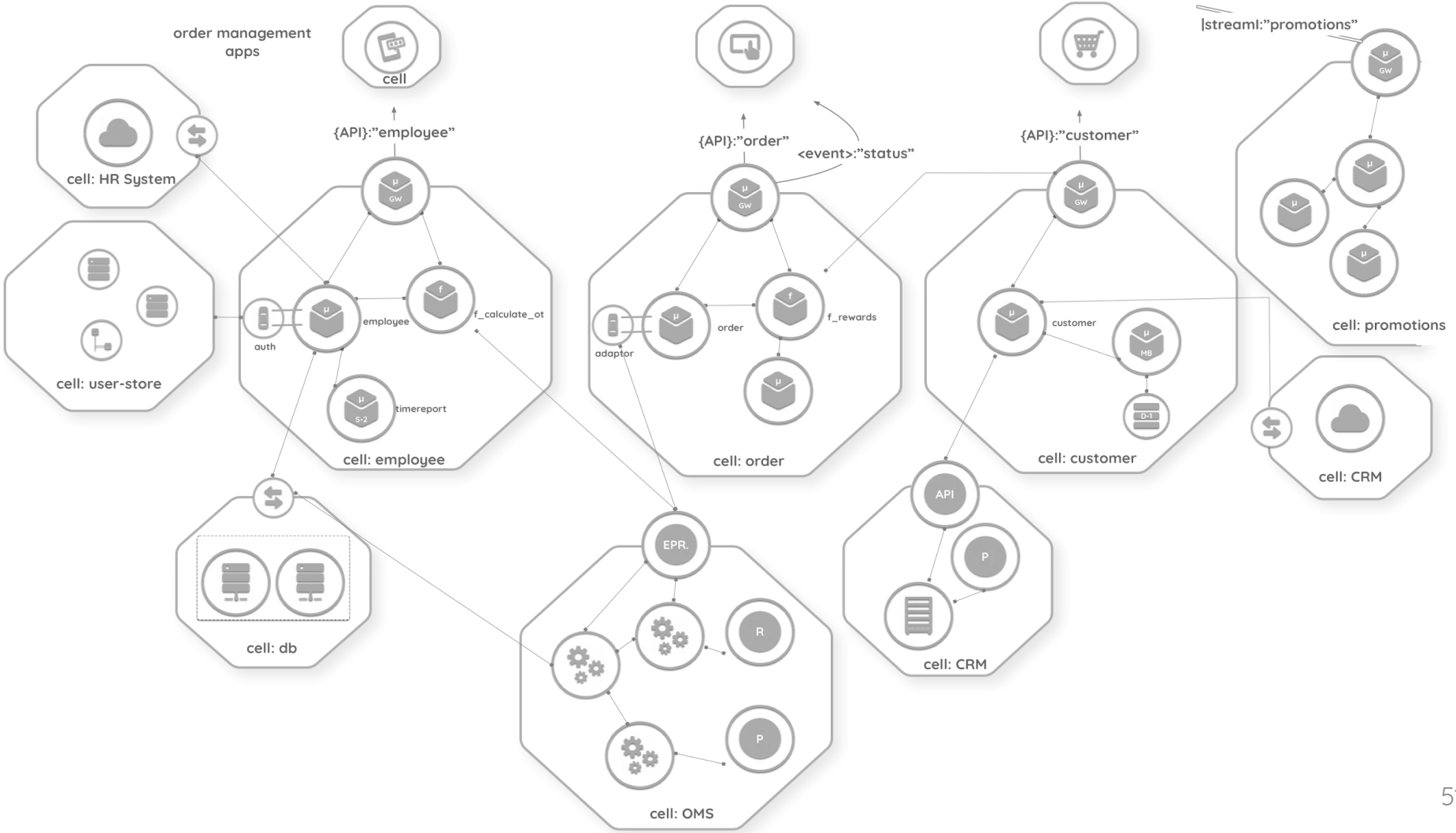
MSA & CNA compliant



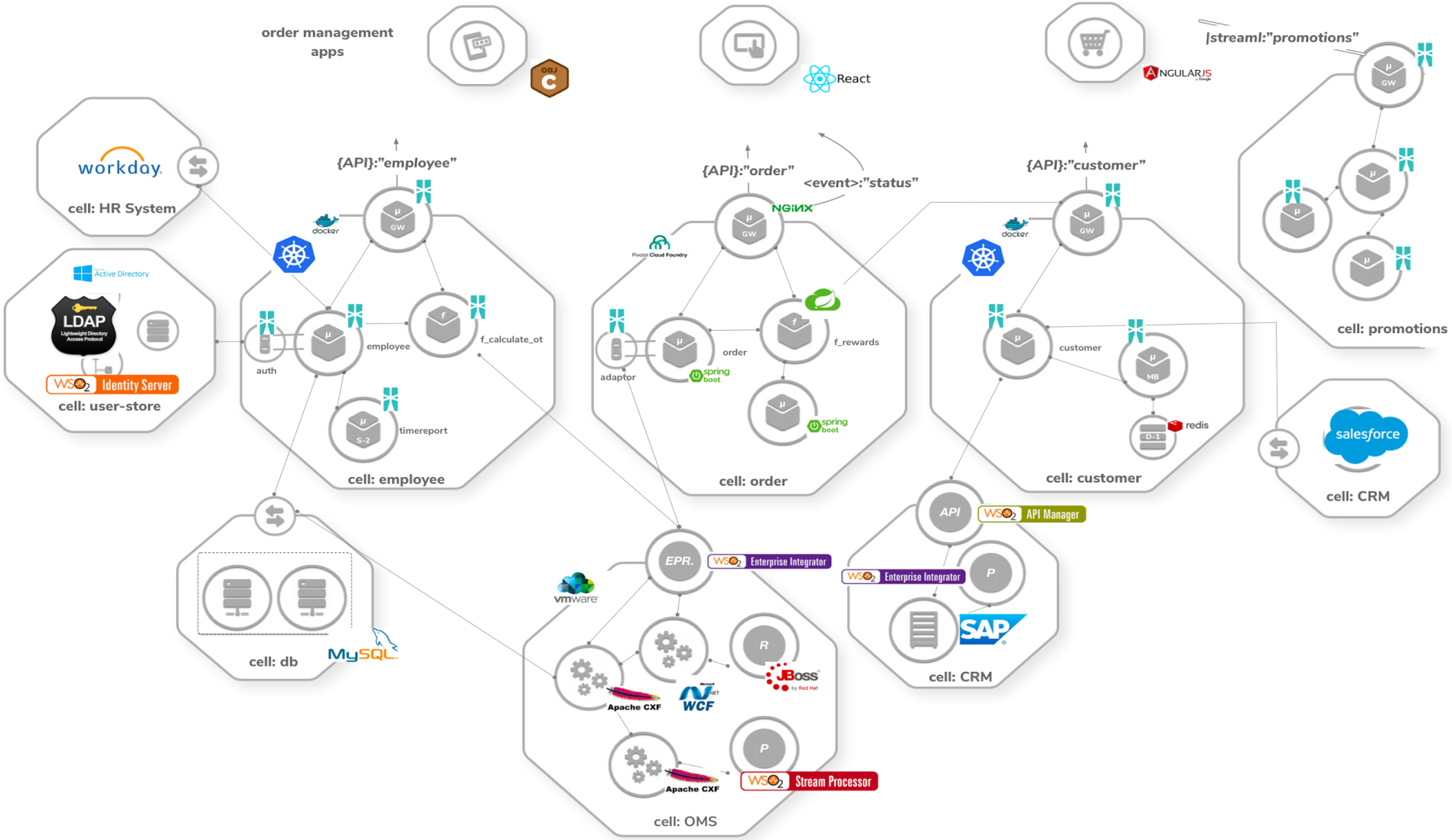
Cell-based Enterprise Architecture


cell
{API}
|stream|
<event>
{API}
{API}
GW
S-1
end-user application cells
cloud-native cells
(microservices, functions)
legacy cells
external cells

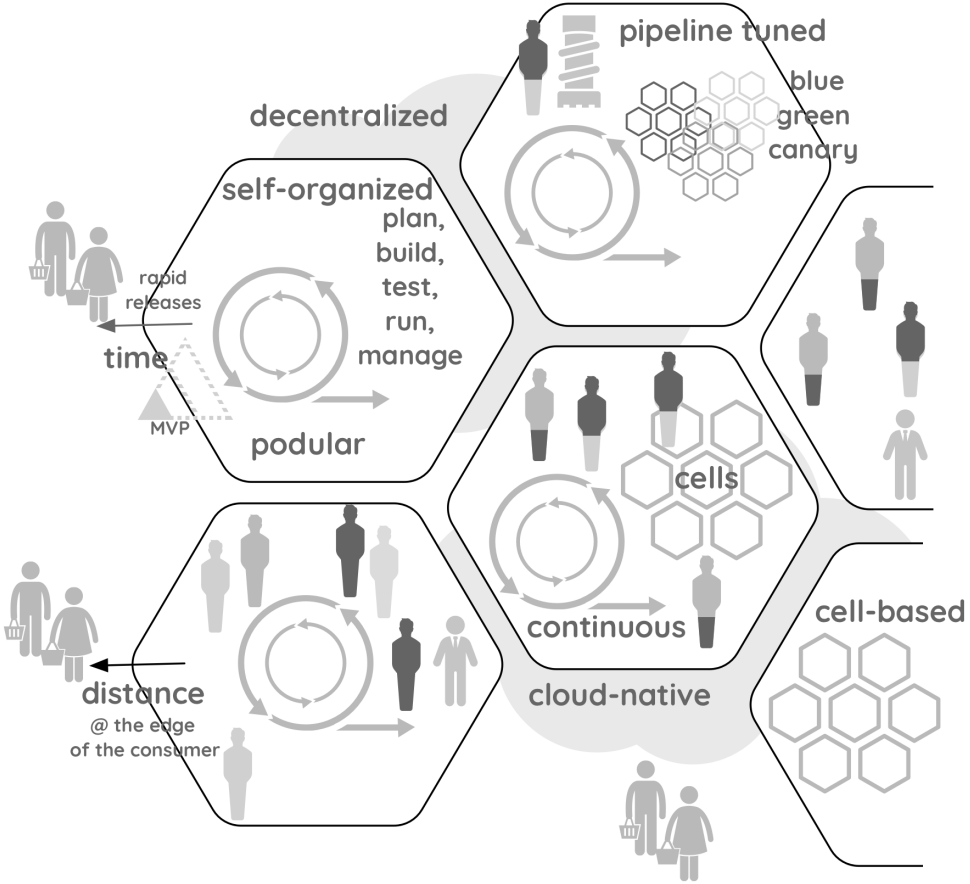
Reference Implementation L0


order management apps
cell
cell: HR System
{API}:"employee"
{API}:"order"
<event>:"status"
{API}:"customer"
|streaml:"promotions"
GW
cell: user-store
auth
employee
f_calculate_ot
S-2
timereport
cell: employee
adaptor
order
f_rewards
cell: order
customer
MB
D-1
cell: customer
cell: promotions
cell: CRM
cell: db
EPR.
R
P
cell: OMS
API
P
cell: CRM

Reference Implementation L1

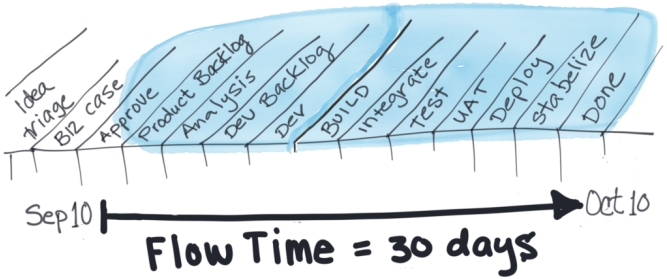

order management apps
React
ANGULARJS
|streaml:"promotions"
workday
cell: HR System
{API}:"employee"
{API}:"order"
<event>:"status"
{API}:"customer"
Active Directory
LDAP
WSO2 Identity Server
cell: user-store
docker
GW
auth
employee
f_calculate_ot
timereport
cell: employee
NGINX
Pivotal Cloud Foundry
adaptor
order
f_rewards
spring boot
cell: order
customer
MB
redis
D-1
cell: customer
cell: promotions
salesforce
cell: CRM
cell: db
MySQL
EPR.
WSO2 Enterprise Integrator
vmware
Apache CXF
WCF
JBoss
WSO2 Stream Processor
cell: OMS
API
WSO2 API Manager
SAP
cell: CRM

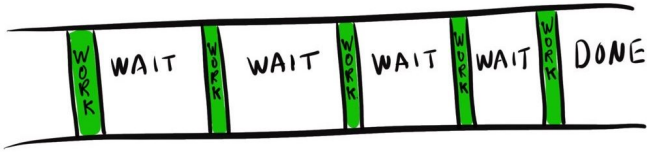
Cells and Podular Organizations



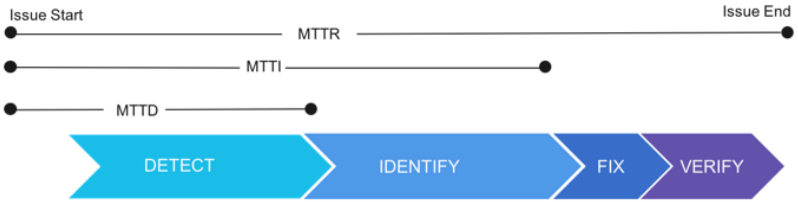
Measure the success

picture credit: https://www.marketingdonut.co.uk/direct-marketing/running-a-direct-mail-campaign/getting-the-measure-of-your-marketing





$$\frac{\text{WORK}}{\text{WAIT} + \text{WORK}} (100\%) = \text{FLOW EFFICIENCY}$$

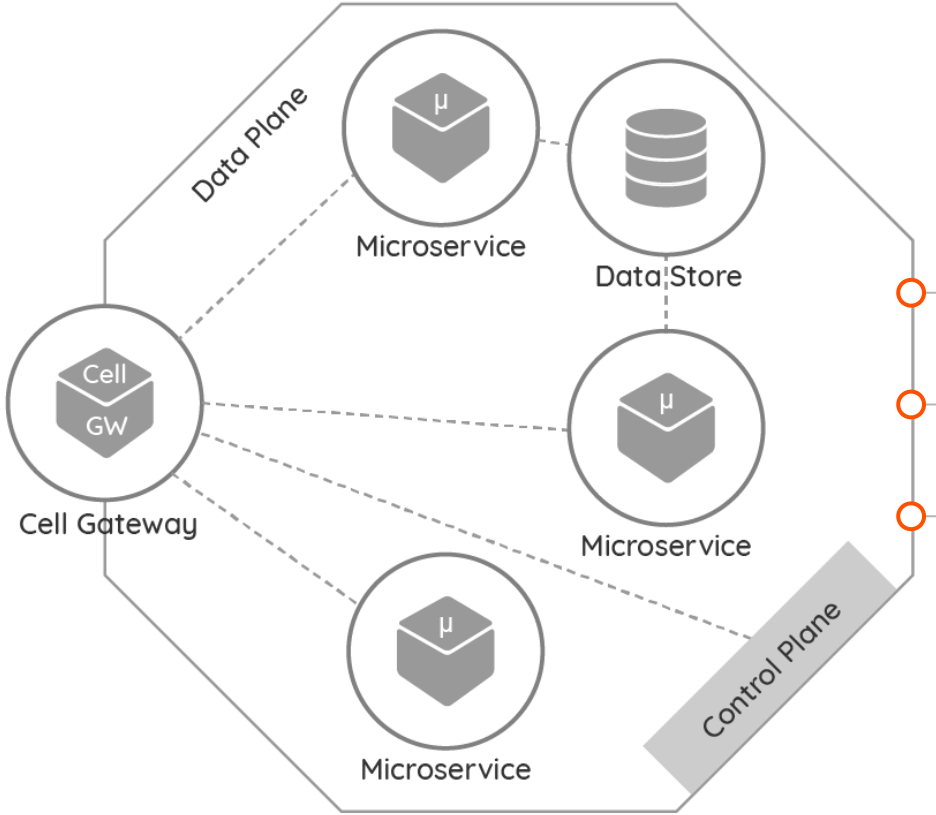


Mean Time to Repair

https://www.tasktop.com/blog/5-best-metrics-youve-never-met/

https://dzone.com/articles/reducing-mttr

Summary: Cell-based Reference Architecture



- Self-contained
- Deployable as a unit
- Independently elastic
- Data plane and control plane

From Theory to Practice

picture credit: https://www.flickr.com/photos/vasile23/

Just a (steady) start

WSO2

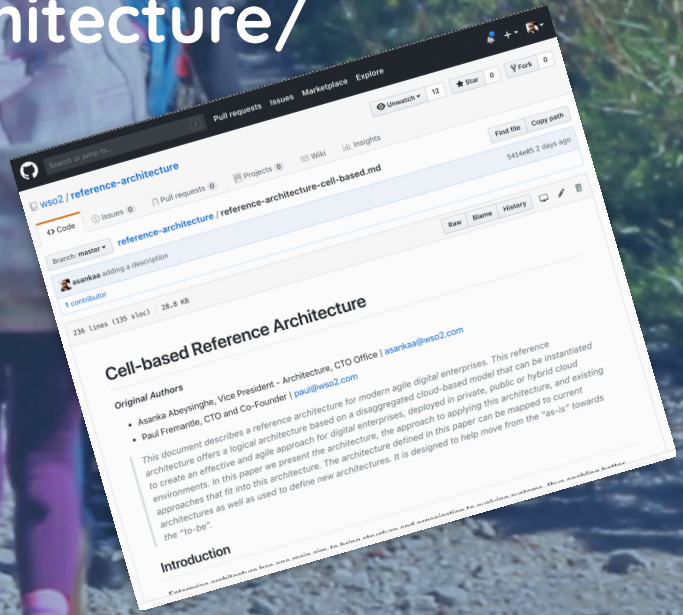
Reference Architecture for Agility, Version-0.9

Asanka Abeysinghe, Vice President - Architecture, CTO Office | asankaa@wso2.com
Paul Fremantle, CTO and Co-Founder | paul@wso2.com

This document describes a reference architecture for modern agile digital enterprises. This reference architecture offers a logical architecture based on a disaggregated cloud-based model that can be instantiated to create an effective and agile approach for digital enterprises, deployed in private, public or hybrid cloud environments. In this paper we present the architecture, the approach to applying this architecture, and existing approaches that fit into this architecture. The architecture defined in this paper can be mapped to current architectures as well as used to define new architectures. It is designed to help move from the "as-is" towards the "to-be".

July 2018

https://wso2.com/architecture/



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Branch: master | reference-architecture / reference-architecture-cell-based.md

Find file | Copy path

asankaa adding a description | 5414e85 2 days ago

1 contributor

236 Lines (135 sloc) | 28.8 KB

Raw | Blame | History

Cell-based Reference Architecture

Original Authors

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This document describes a reference architecture for modern agile digital enterprises. This reference architecture offers a logical architecture based on a disaggregated cloud-based model that can be instantiated to create an effective and agile approach for digital enterprises, deployed in private, public or hybrid cloud environments. In this paper we present the architecture, the approach to applying this architecture, and existing approaches that fit into this architecture. The architecture defined in this paper can be mapped to current architectures as well as used to define new architectures. It is designed to help move from the "as-is" towards the "to-be".

Introduction

https://github.com/wso2/reference-architecture

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THANK YOU

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