



Building Cloud Native Applications with Ballerina and Choreo



February, 2024

WSO₂
Code
Challenge

Win a
Tesla Cybertruck!
(or \$100,000)



DEVELOP AND DEPLOY

Use any language, any IDE, and GitHub to develop your app and run it in Choreo for free.

FRONTEND AND BACKEND

Your app needs both a frontend as well as backend APIs.

DEPLOY TO PRODUCTION

Promote your app to the Choreo production [environment](#).

MAXIMIZE YOUR CHANCES OF WINNING

Boost your odds by enhancing your app with the following additions:

- Use a connection to integrate the backend API to the frontend
- More components*:
 - Databases
 - Manual or scheduled jobs
 - Multiple [projects](#)
 - [Internal and external APIs](#)
- Use [Asgardeo](#) for app authentication
- Use [Ballerina](#) to implement backend logic or APIs

The more you do, the greater your chances of winning the Cybertruck or \$100,000!

Each Addition = 1 Additional Entry

* Up to the free tier limit

Learn more:
<https://choreo.dev/cybertruck>

Our Team



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What you will learn....

- Understand Cloud Native Application development
- Build a Cloud Native Application using Ballerina
 - Develop a backend API
- Deploy an application in the cloud using Choreo
 - Deploy a backend API
 - Deploy a frontend web application

Our mission

Help our customers

**Create awesome digital experiences
quickly, easily, and securely**

by simplifying complex technology to the point where they can:

JUST ADD DEVELOPERS.



800+ Employees
45% Engineering

Colombo, Dubai, Mumbai, Munich,
London, Santa Clara, Austin, São Paulo,
Sydney



18+ Years
In the
Industry



700+ Customers
Across 90 Countries
and 6 Continents



Rapidly Growing
Over 30% YoY
Growth in ARR

Why is it important? - I asked from ChatGPT !



You

What is cloud native application development and why its important for a undergrad to know?

< 2 / 2 >



ChatGPT

Cloud-native application development is a modern approach to designing, building, and running applications that fully exploit the advantages of cloud computing. It is characterized by the use of microservices architectures, containerization, dynamic orchestration, and continuous integration/continuous delivery (CI/CD) pipelines. This methodology enables applications to be highly scalable, flexible, and resilient, making them well-suited to the dynamic environments of the cloud.

Key Components of Cloud-Native Development:

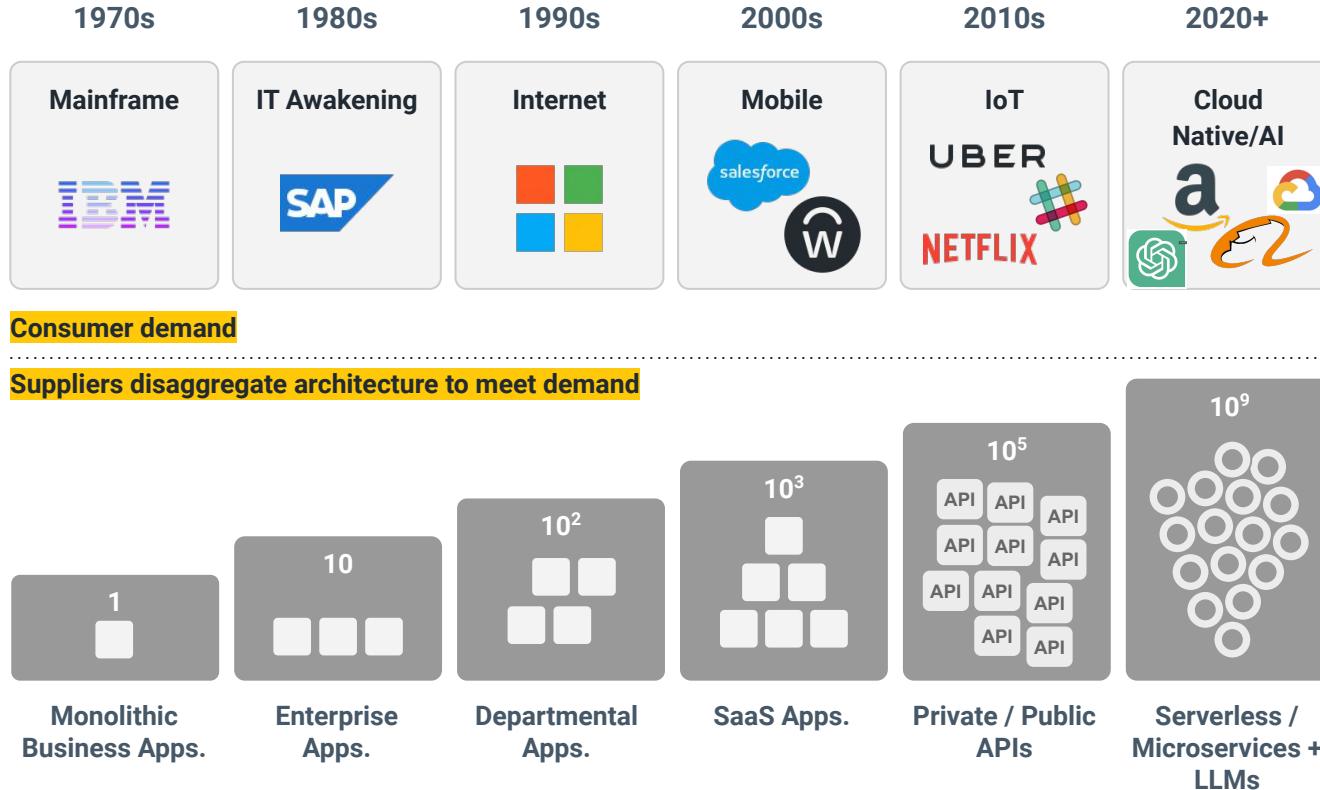
- Microservices:** Instead of building a single, monolithic application, developers break down the application into smaller, independent services that communicate over a network. This allows for easier updates, scaling, and maintenance of individual components.
- Containers:** Containers package up code and all its dependencies so the application runs quickly and reliably from one computing environment to another. Docker and Kubernetes are popular technologies in this space.
- Dynamic Orchestration:** Tools like Kubernetes automate the deployment, scaling, and management of containerized applications, enabling efficient use of resources and high availability.
- DevOps and CI/CD:** Cloud-native development embraces DevOps principles and practices, including continuous integration and continuous delivery, to automate the software delivery process and enable rapid, reliable software releases.

Importance for Undergraduates:

Understanding cloud-native application development is crucial for undergraduates for several reasons:

- Industry Relevance:** The industry is rapidly adopting cloud-native technologies for their flexibility, efficiency, and scalability. Knowledge in this area makes graduates more attractive to employers in a wide range of industries.
- Innovation and Agility:** Cloud-native development practices support faster iteration, innovation, and the ability to respond to market demands. This aligns with the dynamic nature of technology and business today.
- Technical Proficiency:** Learning about microservices, containerization, orchestration, and CI/CD pipelines provides a strong foundation in modern software engineering practices. It prepares students for the technical challenges they will face in their careers.
- Future-Proofing:** As cloud computing continues to evolve, having a solid understanding of cloud-native principles ensures that graduates can adapt to new technologies and methodologies in the future.

Development has exponentially grown more complicated



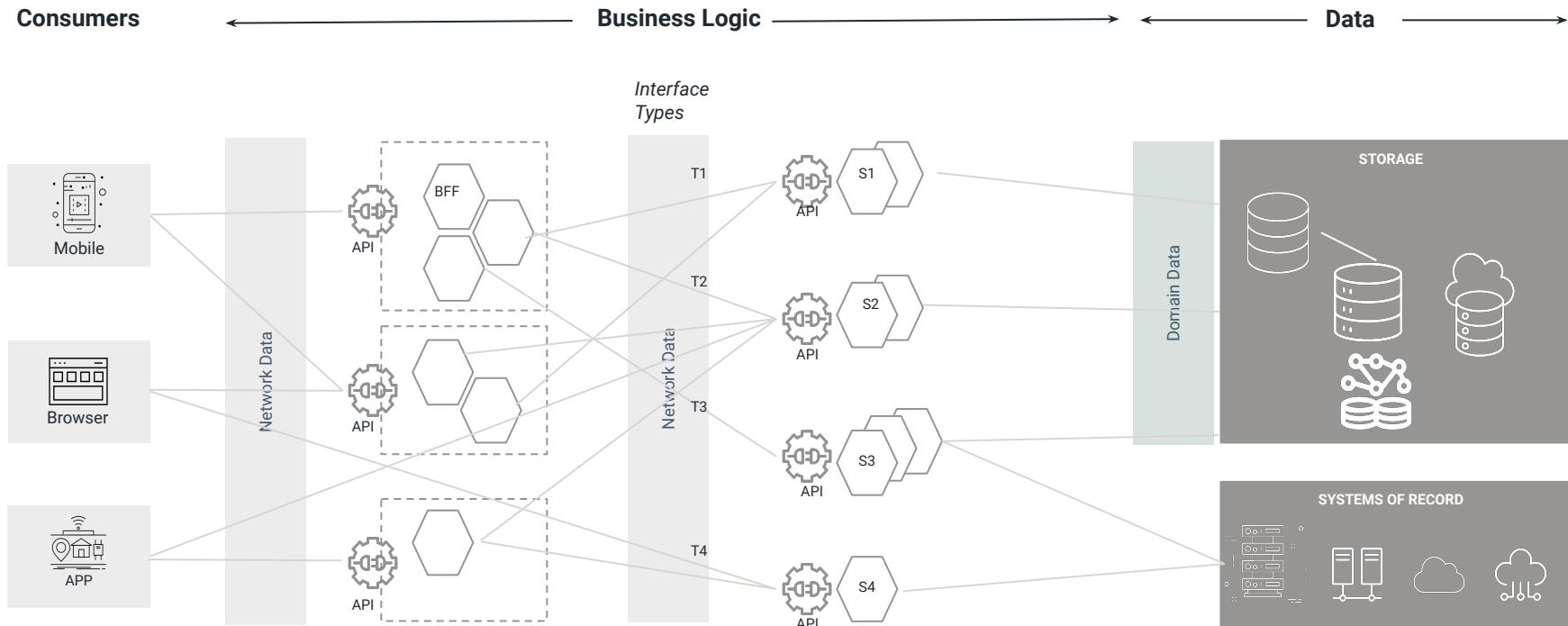
What is Cloud Native?

“Cloud-native architecture and technologies are an approach to designing, constructing, and operating workloads that are built in the cloud and take full advantage of the cloud computing model.”

Source: <https://learn.microsoft.com/en-us/dotnet/architecture/cloud-native/definition>

<https://wso2.com/choreo/resources/building-a-cloud-native-twelve-factor-app-on-choreo-just-write-the-code/>

Cross Section of a Cloud Native Application

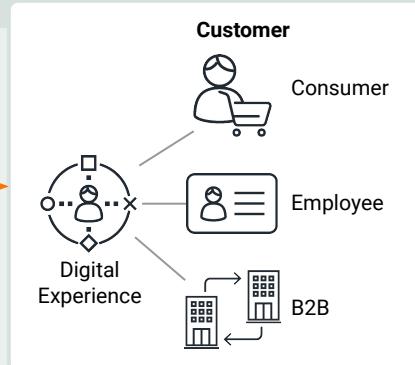


Manufacturing software in the cloud native era is very hard



You write code. You want to get it to the hands of the customer ASAP.

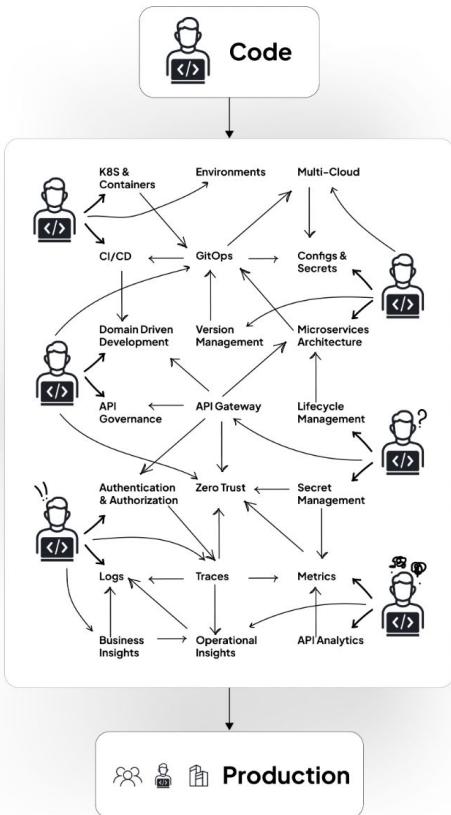
- Runtime architecture, CICD, DevOps, Environments, SecOps, Configuration Management, Version management, Testing, Observability, Analytics, SRE,
- Code writing also needs access to reuse
- DevOps goes to Canary etc.
- Self Service and policy-driven
- Zero Trust environment



Only the digital natives have software manufacturing down to a science; all others are struggling.

How we are going to solve it (with Choreo + Ballerina)

Without Choreo



With Choreo



Use case

“The Luxury Hotel wants to build a reservation system for the public website”

Room Search: Users can find rooms by entering check-in and check-out dates and can apply filters based on the guest count.

Room Reservation: With requires entering personal details (full name, contact number, email)

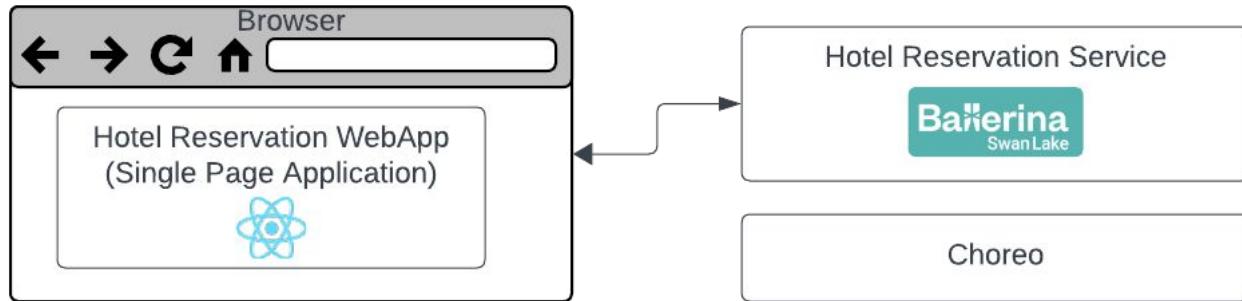
Update Reservations: Users can change their booking dates

Cancel Reservations: Offers an easy option for users to cancel their bookings at any time.

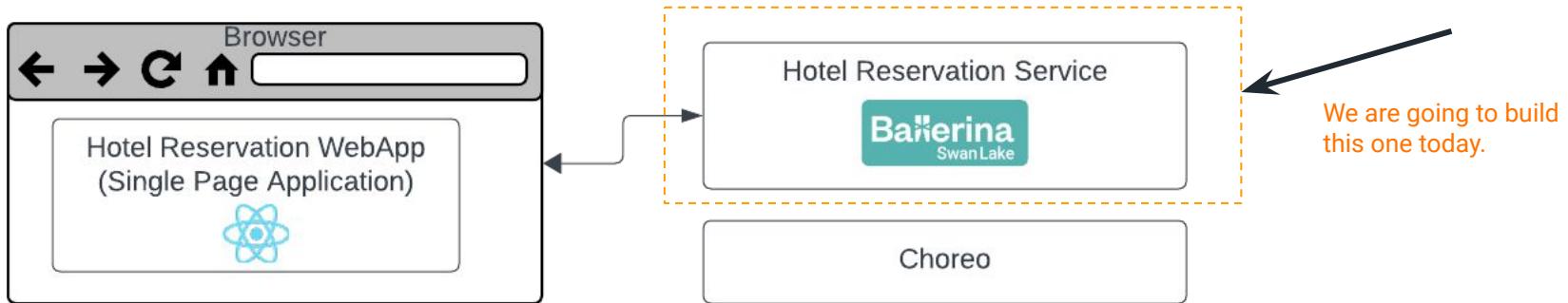
Please refer to the instructions guide for more details.

<https://github.com/ballerina-guides/hotel-reservation-demo>

What we are going to build today...



What we are going to build today...



Ballerina

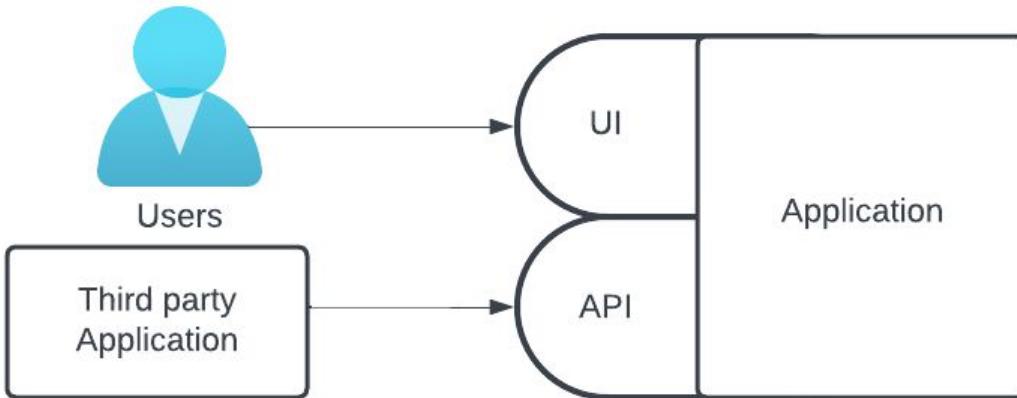
A complex network of white lines on a teal background, forming a web-like structure that radiates from a central point towards the edges of the frame.

Open source, cloud-native programming language optimized for integration

<https://ballerina.io/>

What is an API?

“An API is a network-enabled function that allows different software systems to interact and exchange data over a network.”



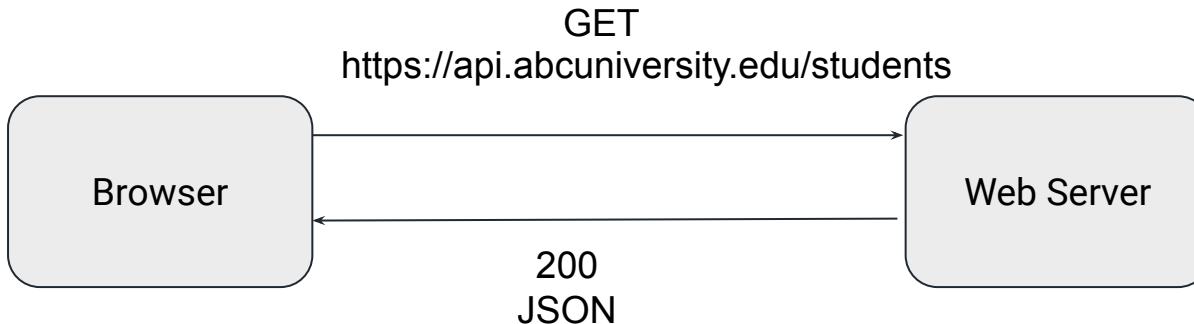
CORBA, DCOM, RPC (.Net Remoting and Java RMI), SOAP, REST, GraphQL, gRPC

What is HTTP?



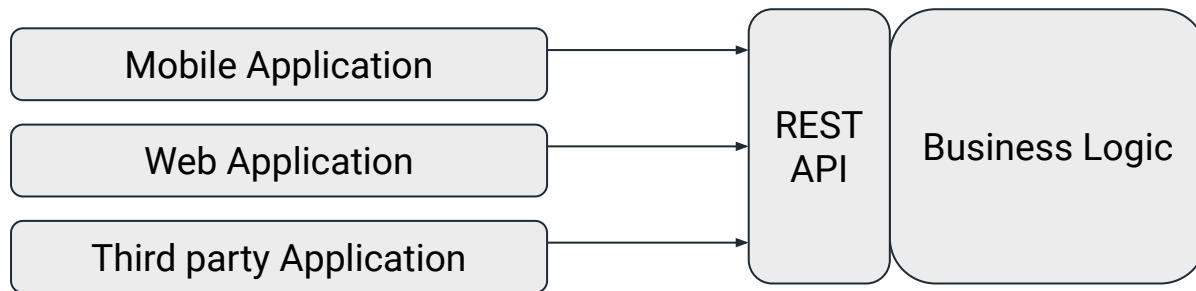
What is a REST Service?

A REST API uses HTTP to enable interaction between systems on the internet through standard operations like GET and POST.

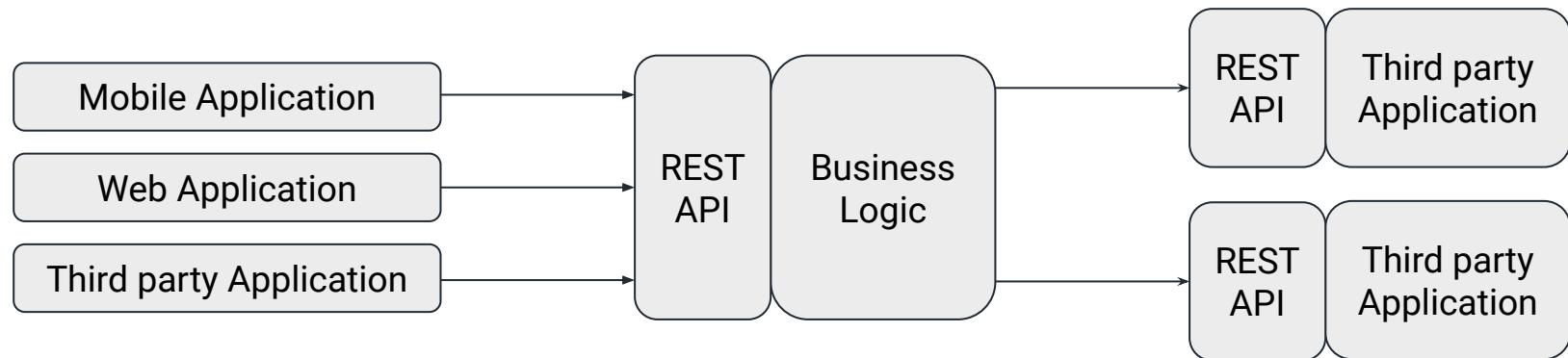


- C - Create - POST
- R - Read - GET
- U - Update - PUT
- D - Delete - DELETE

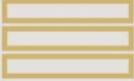
What is a REST Service?



What is a REST Service?



Evolution of Application Architecture

	Development Process	Application Architecture	Deployment & Packaging	Application Infrastructure
~ 1980	Waterfall 	Monolithic 	Physical Server 	Datacenter 
~ 1990	Agile 	N-Tier 	Virtual Servers 	Hosted 
~ 2010	DevOps 	Microservices 	Containers 	Cloud 

<https://www.oracle.com/cloud/cloud-native/what-is-cloud-native/>

INTEGRATION PRODUCTS & TECHNOLOGIES

ESB, BPM, EAI

NOT CLOUD-NATIVE

GENERAL-PURPOSE LANGUAGES & FRAMEWORKS

Java - SpringBoot,
Micronaut,
VertX, Quarkus

NodeJS - Express, VueJS

Python - Flask, FastAPI

WRONG ABSTRACTIONS

INTEGRATION
PRODUCTS &
TECHNOLOGIES

ESB, BPM, EAI

NOT CLOUD-NATIVE

Ballerina

Swan Lake

The
Integration
Language

GENERAL-PURPOSE
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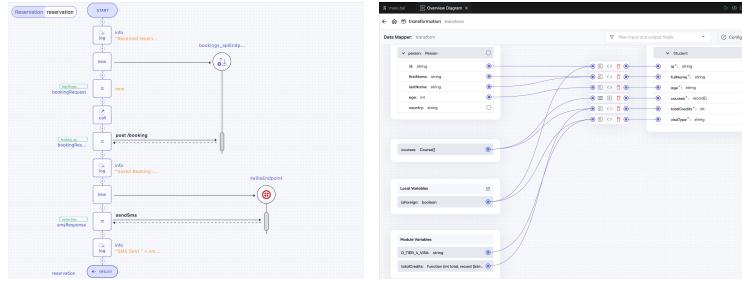
NodeJS - Express, VueJS

Python - Flask, FastAPI

WRONG ABSTRACTIONS

Ballerina is a full platform

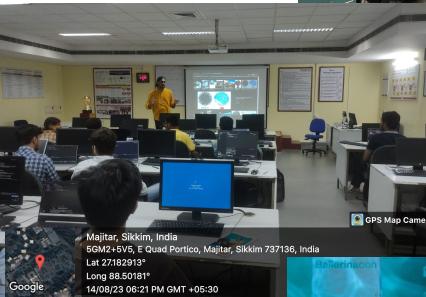
- VSCode plugin
 - Source and graphical editing
 - Debugging
- Tools for working with OpenAPI, GraphQL schemas, gRPC schemas, EDI
- Generate API Documentation & test framework
- Ballerina library includes network protocols, data formats, and connectors.
- Ballerina Central (<https://central.ballerina.io/>)
 - Module sharing platform



Student engagement community

- Ballerina is an open source project (<https://github.com/ballerina-platform/ballerina-lang/>)
- Seeking open source contributors
 - Ballerina is available for hacktoberfest
 - Have good first issues for external contributors
- Research Collaborations to explore new tech applications offering students the opportunity to engage in high-impact research projects.

<https://ballerina.io/community/>



Training Material

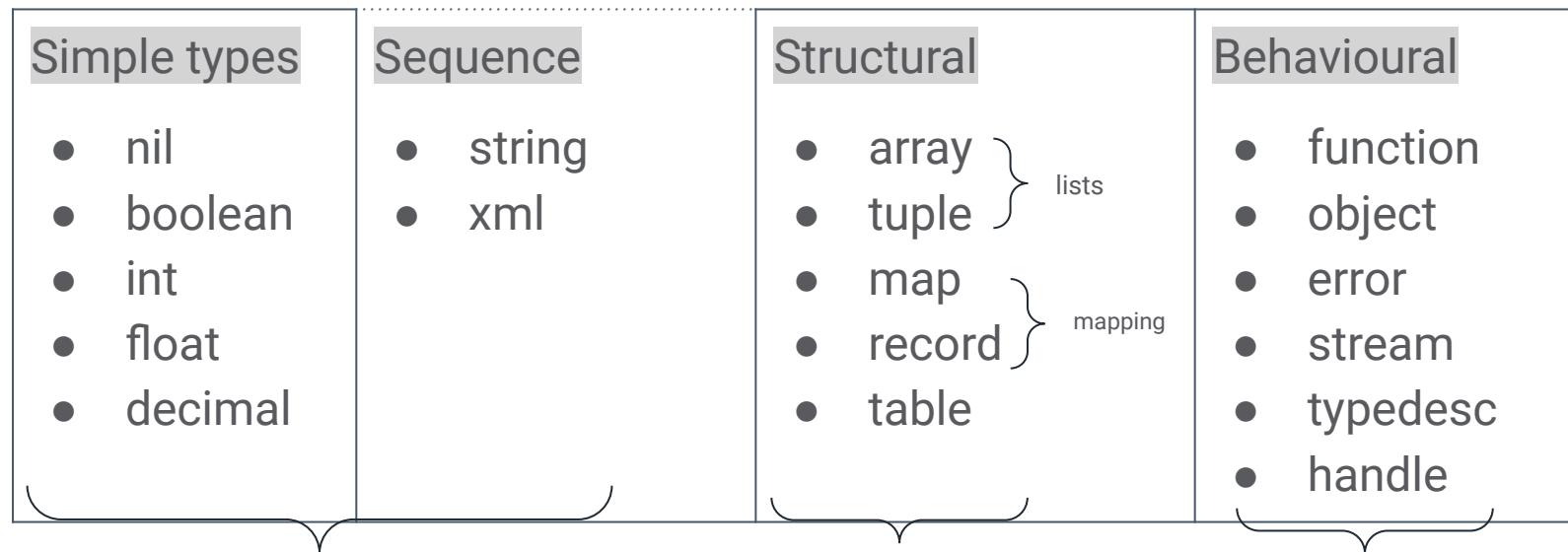
<https://github.com/ballerina-guides/hotel-reservation-demo>



Develop a Backend Service Using Ballerina



Ballerina Basic Types



Plain data

Plain data only if
their members are
plain data

Not Plain data

anydata - Type of Plain data

any - any value except for error

Code to cloud support in Ballerina

```
import ballerina/http;

service / on new http:Listener(9090) {

    // This function responds with `string` value `Hello, World!` to HTTP GET requests.
    resource function get greeting() returns string {
        return "Hello, World!";
    }
}
```

```
$ bal build --cloud=k8s
Compiling source
    ballerina/helloworld:0.1.0
```

```
Generating executable
```

```
Generating artifacts...
```

```
@kubernetes:Service          - complete 1/1
@kubernetes:Deployment        - complete 1/1
@kubernetes:HPA               - complete 1/1
@kubernetes:Docker            - complete 2/2
```

```
Execute the below command to deploy the Kubernetes artifacts:
kubectl apply -f /Volumes/data/ballerina/code/testBalProject/target/kubernetes/helloworld
```

```
Execute the below command to access service via NodePort:
kubectl expose deployment helloworld-deployment --type=NodePort --name=helloworld-svc-local
```

```
target/bin/helloworld.jar
```

- Greatly simplifies the experience of developing and deploying Ballerina code in the cloud.
- Supports generating the deployment artifacts for the Docker, K8s, Azure functions.
- Use Cloud.toml to change the generated artifact values.



Join the Ballerina Community



Discord : <https://discord.gg/ballerinalang>



SO : <https://stackoverflow.com/questions/tagged/ballerina>



Twitter : <https://twitter.com/ballerinalang>



GitHub : <https://github.com/ballerina-platform>



Youtube : <https://github.com/ballerina-platform>



LinkedIn : <https://www.linkedin.com/showcase/ballerinalang>

Deploying an application in the cloud using Choreo

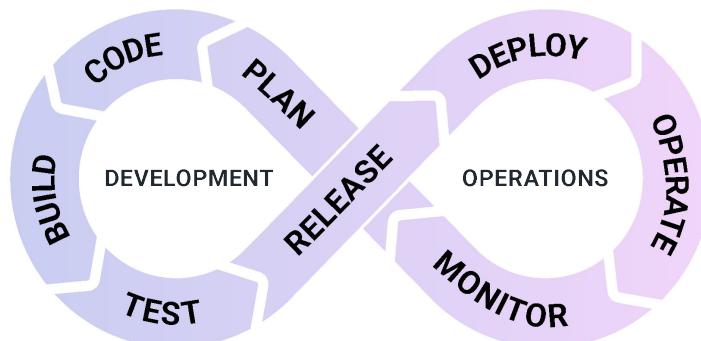


What is Choreo?



<https://choreo.dev/>

Choreo is a platform designed to accelerate the creation of digital experiences. With Choreo you can build, deploy, monitor, and manage your cloud native applications while increasing developer productivity and enabling you to focus on innovation.



Discord : <https://discord.com/invite/wso2>

Twitter <https://twitter.com/ChoreoDev>

Docs <https://wso2.com/choreo/docs/>

Everything You Need to Build Apps in the Cloud

Host SaaS products

Host web apps

Host APIs

Host jobs

User authentication

Authorization management

Secure configuration
management

Cloud native

Multi-environment deployment

Multi-cloud deployment

Zero trust deployment

Scalable deployment

Laptop deployment

Kubernetes deployment

Highly available deployment

CICD

Multi-version development

VSCode plugin

GitHub and BitBucket
integration

Unit and integration testing

Manage multiple projects and
components

Team management

AI augmented engineering

Cell-based architecture



Thanks!



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