Building Distributed Applications using Microsoft Orleans

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LET’S BEGIN NOW!

INTRODUCTION!

- Cloud Architect @ HARMAN A SAMSUNG COMPANY
- Domain: Professional Audio, Video & Control
- Area of Expertise: Cloud, Distributed computing
- Area of Interest: AI/ML, Cloud and IoT
- Location: Bangalore, India
- Azure certified
- Member .NET foundation

AGENDA

01 Actor Model
Threading, Concurrency, Actors, Different APM frameworks

02 Microsoft Orleans
History, About, Use cases

03 Components of Orleans
Grains(Virtual Actors), Silo, Cluster

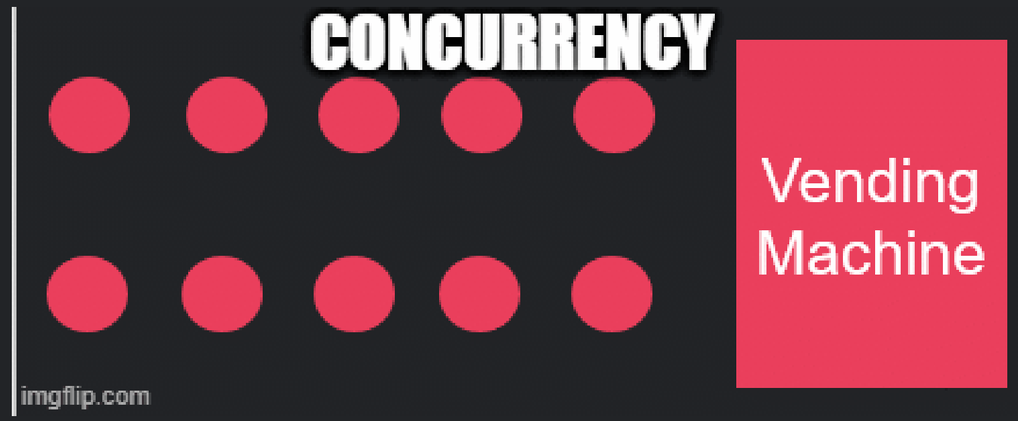
04 Deployment Models
In-process, Single or Multiple host, Cloud

05 Dashboard

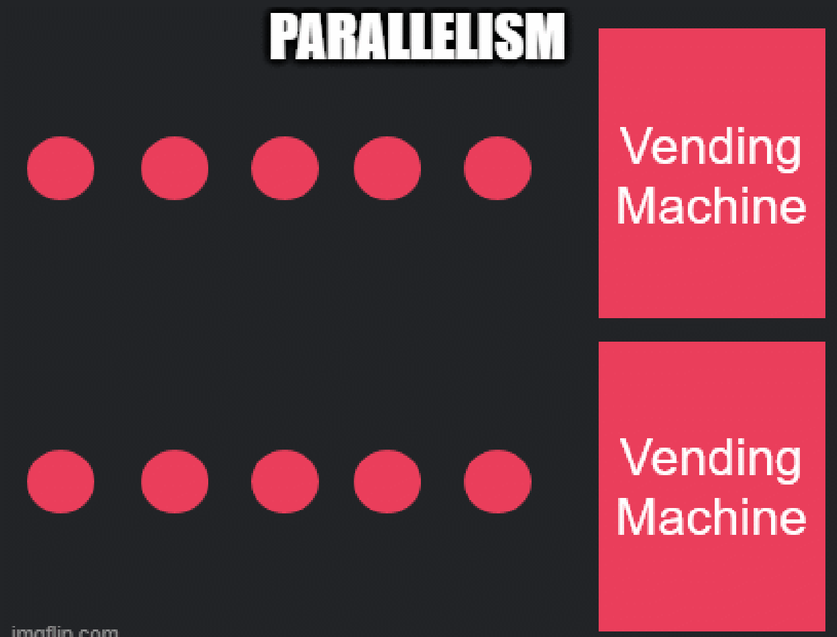
06 Demo

01 ACTOR MODEL

THREADING, CONCURRENCY AND PARALLELISM

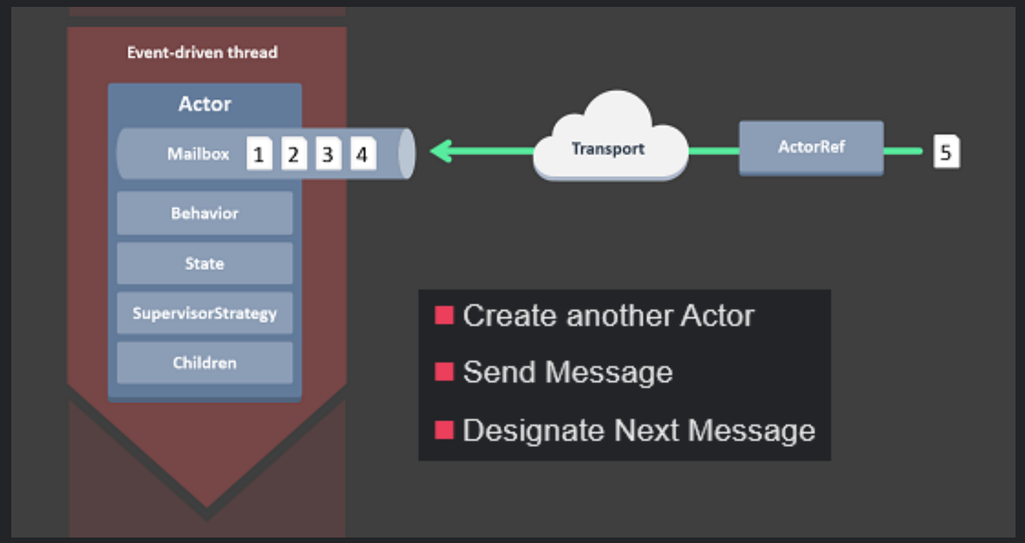


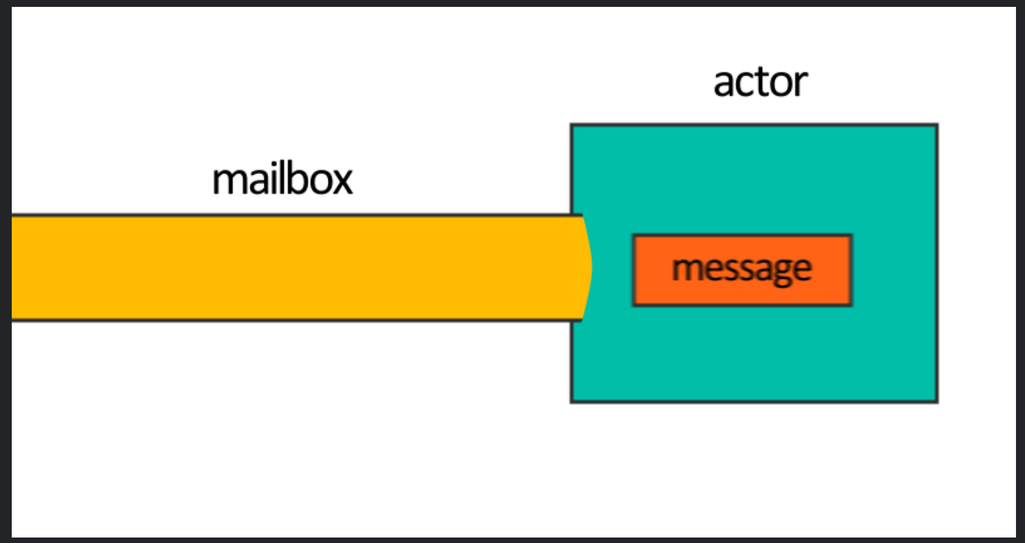
- Simultaneously, not parallel. (context switch)
- A logical distinction.
- Can be worked with single core



- Processor's power physically
- Multi-core

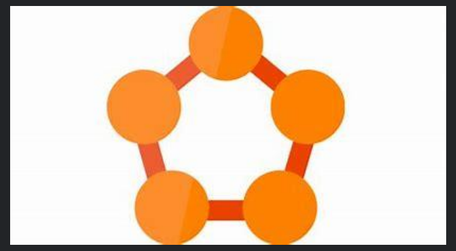
ACTOR MODEL





- Invented by Carl Hewitt in 1973
- An actor is a computer process with an address.
- It encapsulates state and behavior within it.
- Message passing and async communication
- Single thread execution

- Sequential message processing
- Location Transparency
- No data sharing.
- No locks, thread management and concurrency issues
- Easy to scale, highly performance and fault-tolerant.



ACTOR MODEL FRAMEWORK

02 MICROSOFT ORLEANS

GOALS

SIMPLE

Simple for developers, widely accessible programming model.

SCALABLE

Scalable, something that can be deployed to single or multiple node.

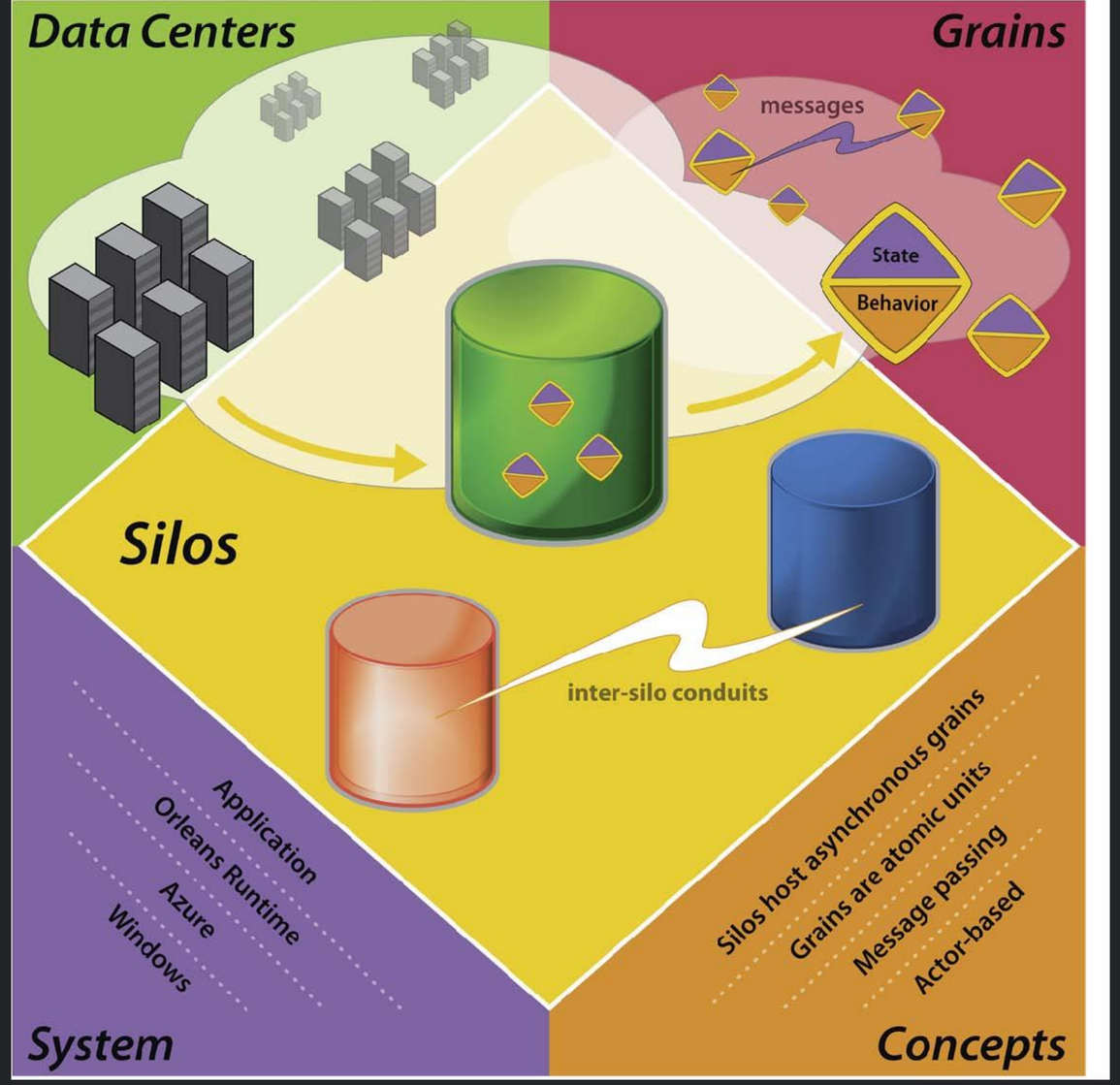
ABSTRACTED

Abstract the underlying intricacies of distributed computing/programming.

OVERVIEW

- Created by Microsoft Research
- Open Sourced in January 2015
- Built with Azure in mind
- Based on Virtual actor
- Used in Halo 4 and 5
- Used in various Azure services
- Support multiple deployment
- No Concurrency Issues

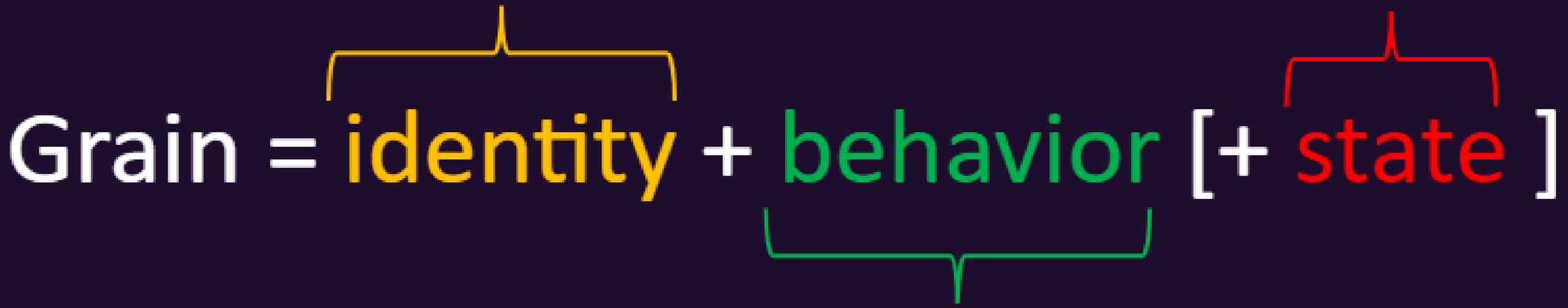
ORLEANS USE CASES



03 ORLEANS COMPONENTS

User/jack@email.com

In-memory
or persisted




```
class User : Grain, IUser
```

ACTOR

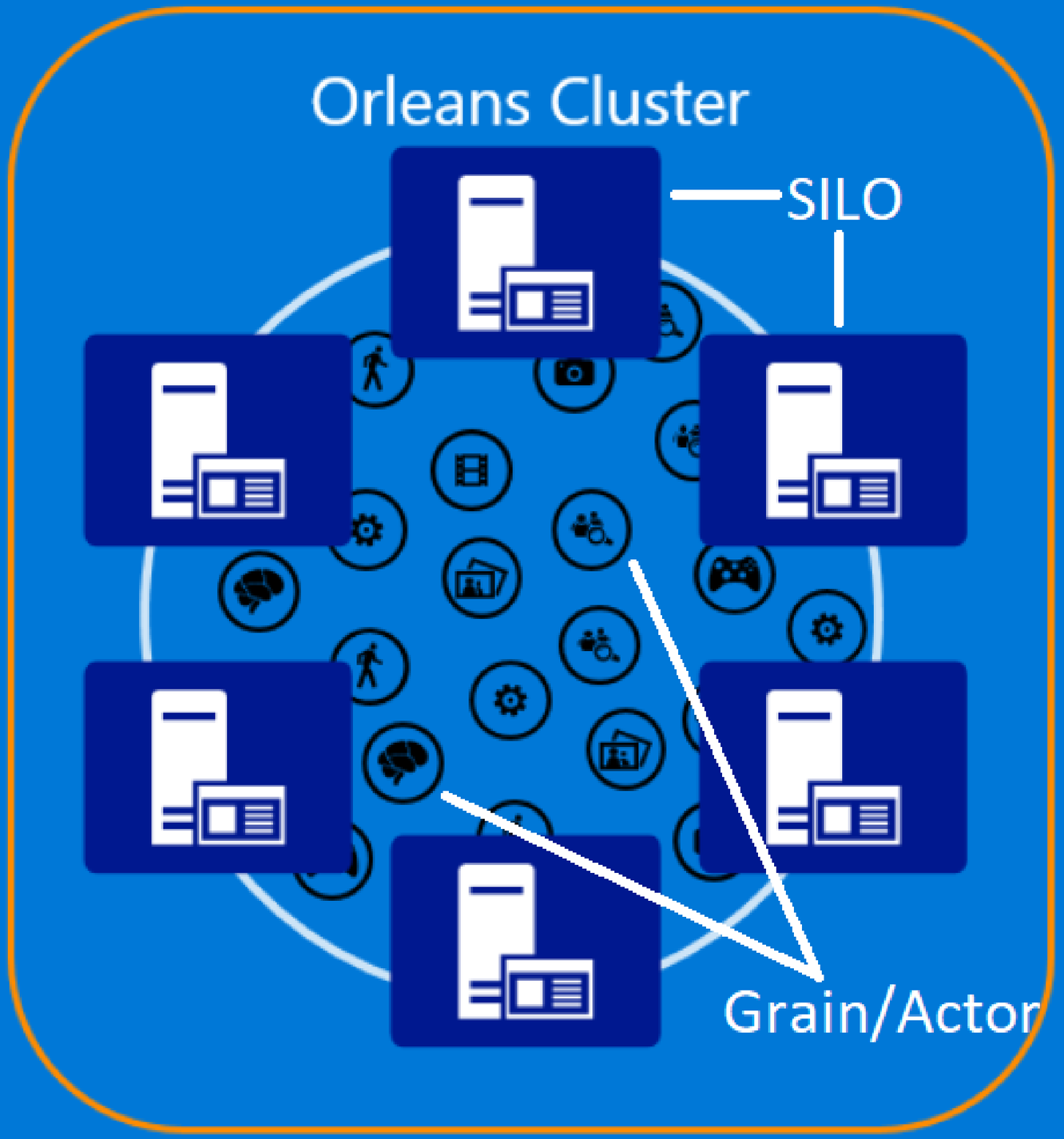
- Grains are implementations of Actors
- They have an identity
- Loosely Coupled(Backed by an Interface)
- Terminated to free compute resources

LIFECYCLE

- Activating
- Active
- Deactivating
- Persisted

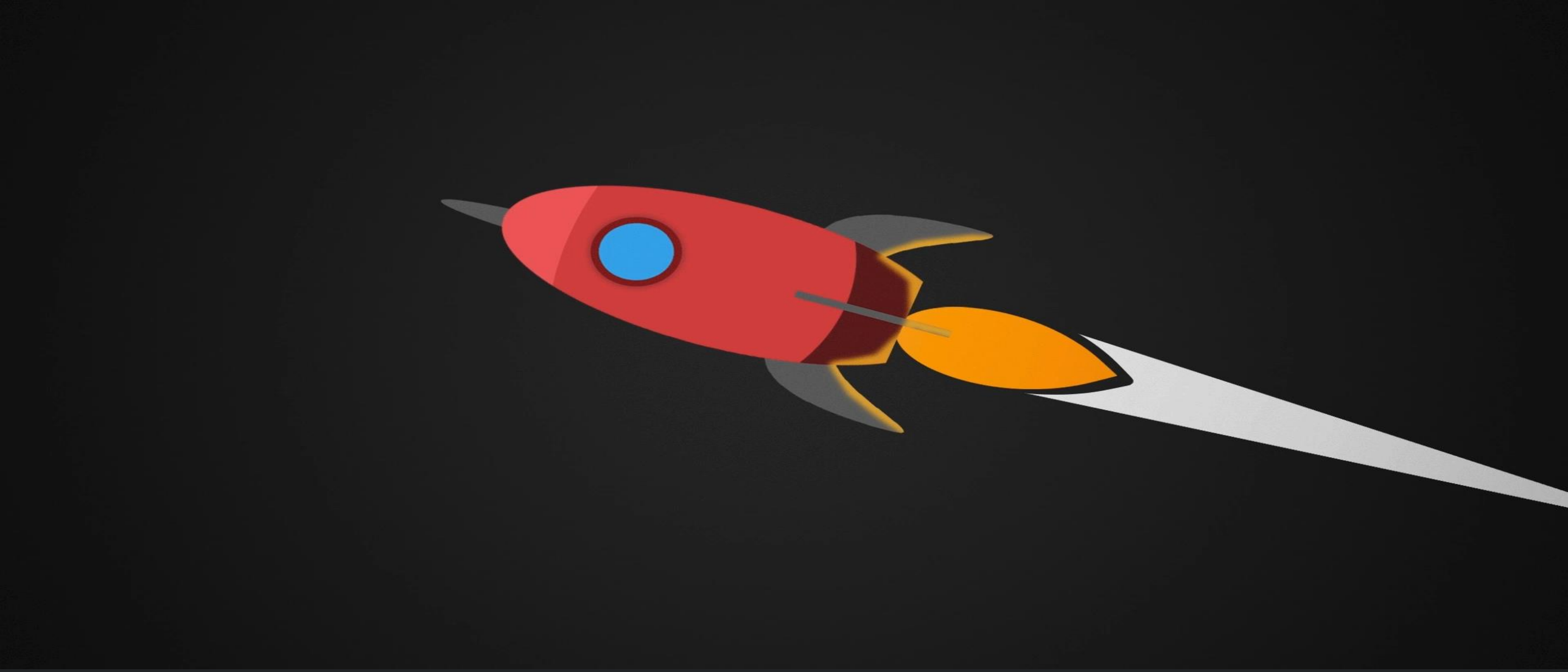
STORAGE

- It can be stored in memory(Volatile)
- Stored in DB for persistence



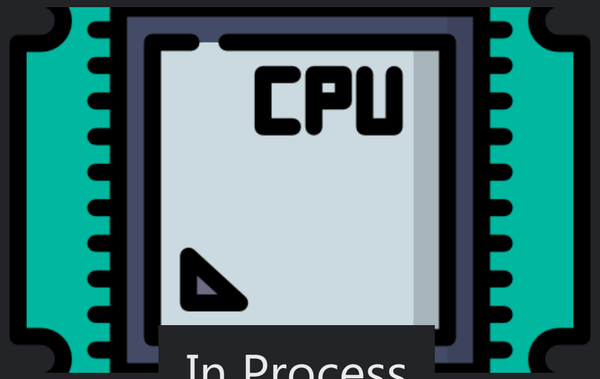
SILOS

- Its an host for a Grain
- Manages lifecycle of a Grain
- Generally have 1 silo per Node/Container/Machine
- A cluster is used for fault tolerance and Scalability



04 DEPLOYMENT

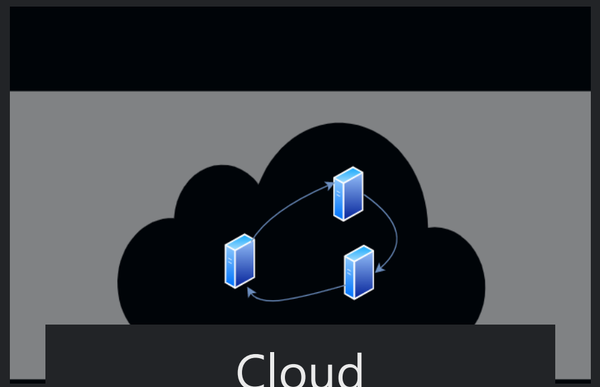
DEPLOYMENTS



In Process

Host

Cluster



Cloud

Kubernetes

05 DASHBOARD

v.2.2.5.0 Source

- Overview
- Grains
- Silos
- Reminders
- Log Stream

TOTAL ACTIVATIONS
471
More info

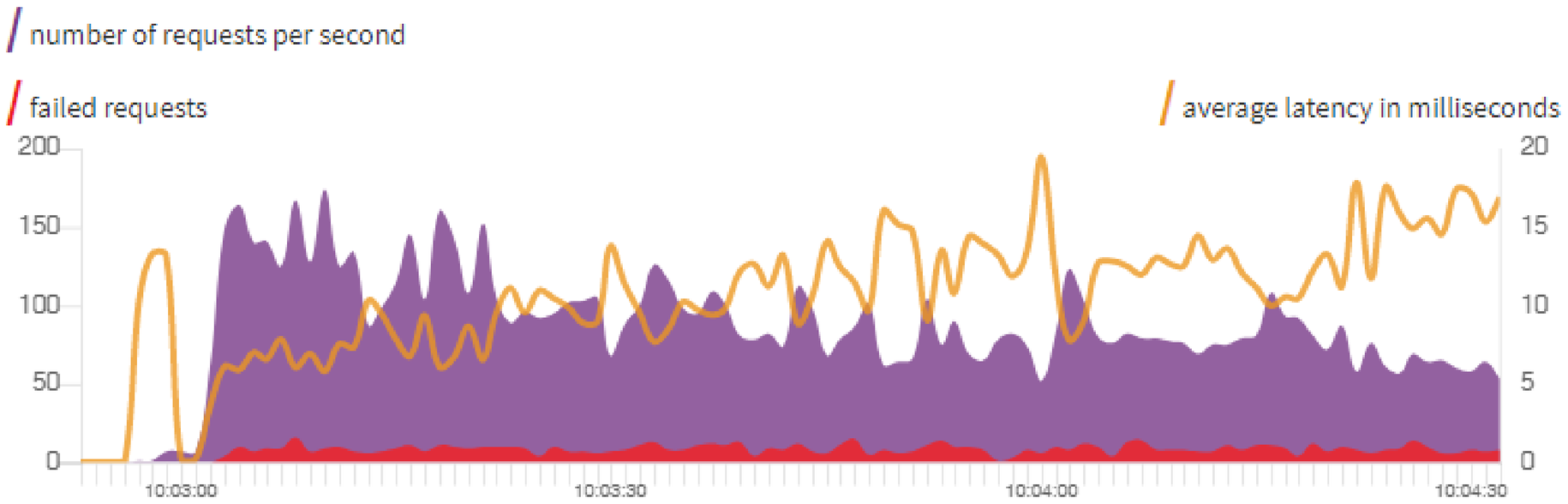
ACTIVE SILOS
1
More info

ERROR RATE
18.53%

REQ/SEC
41.88

AVERAGE RESPON...
20.60ms

Cluster Profiling



Methods with Most Calls

Methods with Most Exceptions

Methods with Highest Latency

06 DEMO

RESOURCES

- Getting Started https://dotnet.github.io/orleans/
- Samples: https://github.com/dotnet/orleans/tree/main/Samples
- Documentation: https://dotnet.github.io/orleans/docs/index.html
- Community Support : Github or Gitter (https://gitter.im/dotnet/Orleans)
- Slides and Source: https://github.com/praveenraghuvanshi/tech-sessions/tree/master/17052021-MS-Orleans-dotnet-cambridge

THANK YOU FOR WATCHING!

ANY QUESTIONS?

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