devops HEROES

Creare applicazioni REALI con Microsoft Orleans

Sponsor & Org

UNIVERSITÀ DEGLI STUDI DI PARMA

engage LABS

innprojekt

iSolutions

DRILLING PERGEMINE CONTRACTOR

daniela malvisi COMMUNICATION

LIME ware

getlatestversion.it

Anatomia di un'applicazione REALE

- Microservizi
- Swagger & OpenAPI client generator
- Layered architecture
- Serve una cache
- Mini database per microservizio
  - Diversi database da gestire
  - ORM
  - Migration
- Dashboard per monitoring
- Gestione delle transazioni aka Sagas
- Una manciata di job non manca mai
- Message bus
- Ci serve un DevOp per il deploy
- Oppure Event sourcing (ma qui è tutta un'altra cosa... serve altro)

Dipendenze di un'applicazione REALE

Microservizi

Project Tye

Open API Specification

NGINX

Swagger

OpenAPITools/**openapi-generator**

OpenAPI Generator allows generation of API client libraries (SDK generation), server stubs, documentation and configuration automatically given an OpenAPI Spec...

Dashboard

Transazioni

OpenSleigh

Message bus

RabbitMQ

MASS TRANSIT

Scheduler

QUARTZ

Hangfire

An easy way to perform background processing in .NET and .NET Core applications. No Windows Service or separate process required.

Backed by persistent storage. Open and free for commercial use.

DBs

mongoDB

FluentMigrator

Microsoft SQL Server

PostgreSQL

EVENT STORE

Caching

redis

NCache™

Librerie

MediatR

MiniProfiler/**dotnet**

A simple but effective mini-profiler for ASP.NET (and Core) websites

MiniProfiler !

automapper

Dipendenze di u

Microservizi

Project Tye

Open
Specific

NGINX

Swag

OpenAPITools/**openapi-generator**

OpenAPI Generator allows generation of API client libraries (SDK generation), server stubs, documentation and configuration automatically given an OpenAPI Spec...

age bus

bbitMQ

Caching

redis

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DBs

goDB

FluentMigrator

Microsoft SQL Server

PostgreSQL

EVENT STORE

Milan Jovanović @mjovanovic... · 9h

Here are 13 excellent libraries I use in my Microservices:

1. EF Core
2. Dapper
3. MediatR
4. Refit
5. Polly
6. Scrutor
7. MassTransit
8. FluentValidation
9. Hangfire
10. Testcontainers
11. FluentAssertions
12. NetArchTest.Rules
13. StackExchange.Redis

18 57 353 28,8K


Marty, torniamo nel 2010

2010

2010

La regina Elisabetta...

2010

15 Aprile

Eyjafjallajokull inizia a eruttare

2010

11 Giugno 2010

L'Italia campione del mondo in carica affronta il Paraguay nella prima partita del girone.

2010

28 Novembre 2010

Esplode il caso Wikileaks

2010

Novembre 2010

Si comincia a parlare di Orleans

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Orleans: A Framework for Cloud Computing

Sergey Bykov, Alan Geller, Gabriel Kliot, Jim Larus, Ravi Pandya, Jorgen Thelin
MSR-TR-2010-159 | November 2010
Superseded by SOCC '12 publication. Please read and cite that publication.

Download BibTex

Client + cloud computing is a disruptive, new computing platform, combining diverse client devices – PCs, smartphones, sensors, and single-function and embedded devices – with the unlimited, on-demand computation and data storage offered by cloud computing services such as Amazon's AWS or Microsoft's Windows Azure. As with every advance in computing, programming is a fundamental challenge as client + cloud computing combines many difficult aspects of software development.

Orleans is a software framework for building client + cloud applications. Orleans encourages use of simple concurrency patterns that are easy to understand and implement correctly, building on an actor-like model with declarative specification of persistence, replication, and consistency and using lightweight transactions to support the development of reliable and scalable client + cloud software.

View Publication

Groups

Systems Research Group - Redmond

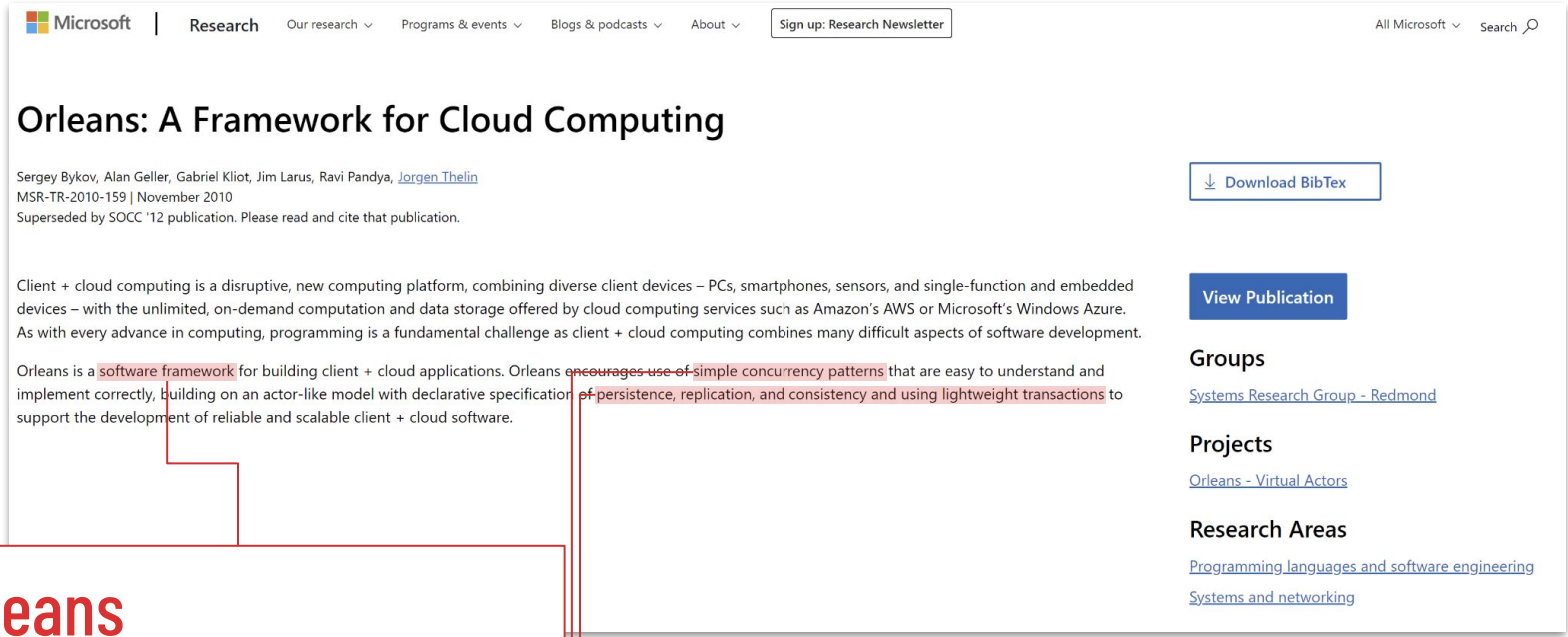
Projects

Orleans - Virtual Actors

Research Areas

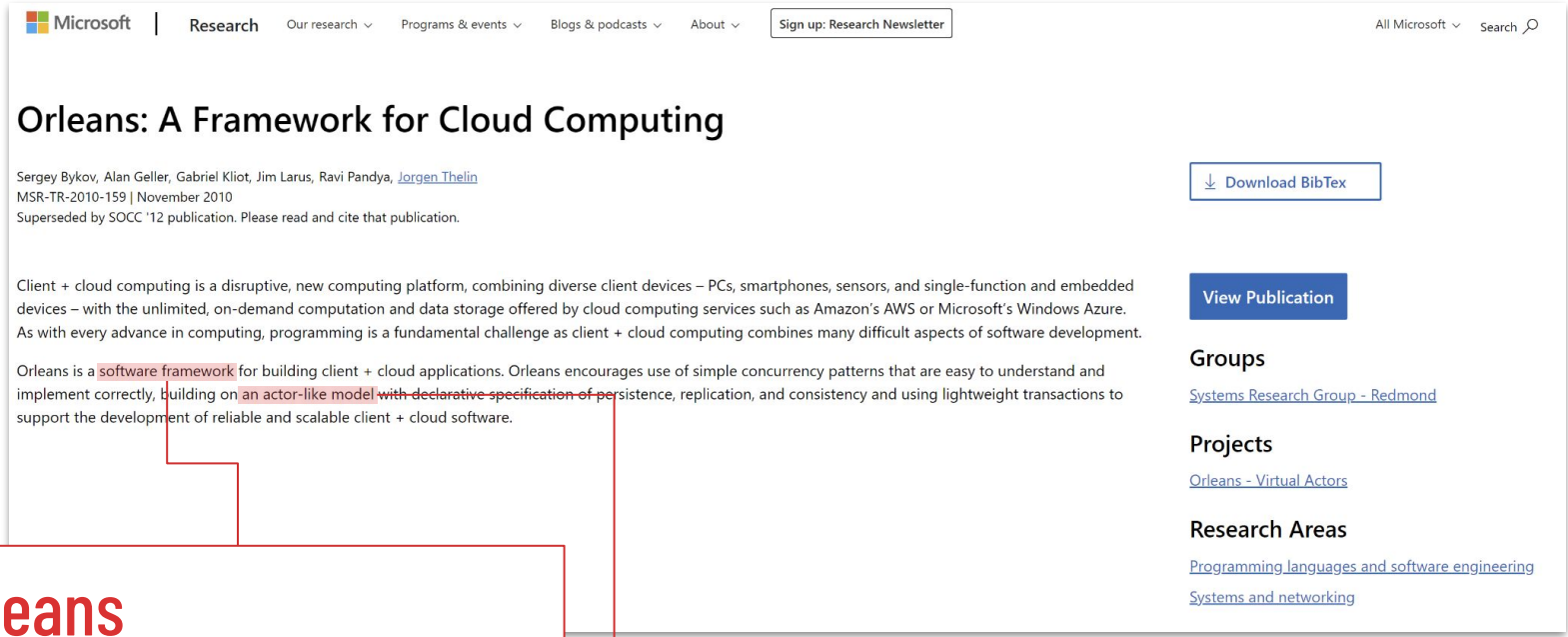
Programming languages and software engineering

Systems and networking



Orleans

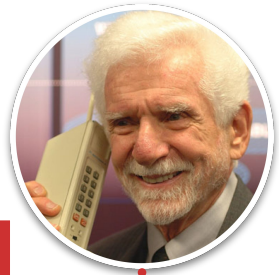
A Framework for Cloud Computing



Orleans

A Framework for Cloud Computing


Marty, serve andare più indietro: nel 1973

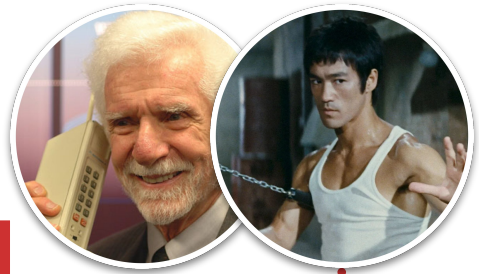


1973

2010

3 Aprile 1973

Prima telefonata da un cellulare portatile

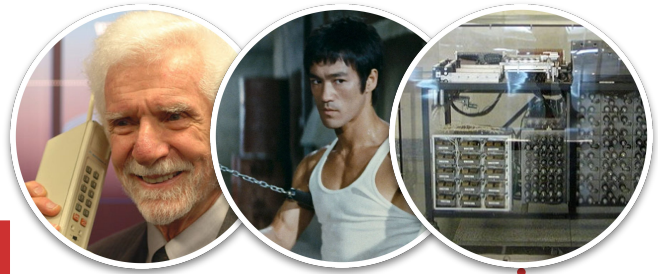


1973

2010

26 Luglio

Bruce Lee entra nel mito: esce nelle sale il film I tre dell'Operazione Drago

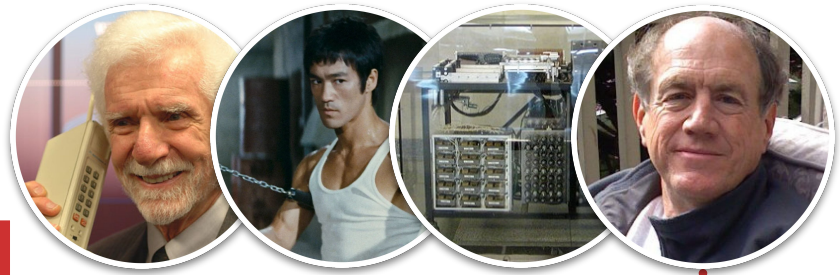


1973

2010

19 Ottobre

Riconosciuto l'inventore del computer elettronico



1973

2010

In un giorno non preciso del 1973

Carl Hewitt inventa l'actor model

https://www.youtube.com/watch?v=7erJ1DV_Tlo&ab_channel=jasonofthel33t

Carl Hewitt ci dice che un attore...

E' l'**unità fondamentale** di calcolo, e...

- **processa** i dati che riceve
- **persiste** ciò che dev'essere salvato (lo stato)
- **comunica** tramite messaggi

Da solo non serve a niente, ma diventa interessante all'interno di un **sistema**

Processa un messaggio alla volta

- risolve i problemi di **concorrenza**
- semplifica il **debug**

Actor Model - Definizione

> The **actor model** in computer science is a mathematical model of concurrent computation that treats actor as the universal primitive of concurrent computation.
>
> In response to a message it receives, an actor can: make local decisions, create more actors, send more messages, and determine how to respond to the next message received.
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> Actors may modify their own private state, but can only affect each other indirectly through messaging (removing the need for lock-based synchronization).

Fonte: https://en.wikipedia.org/wiki/Actor_model

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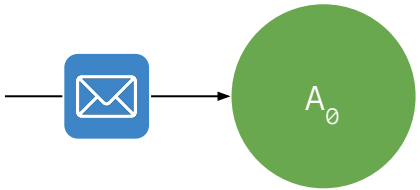
Everything is an Actor!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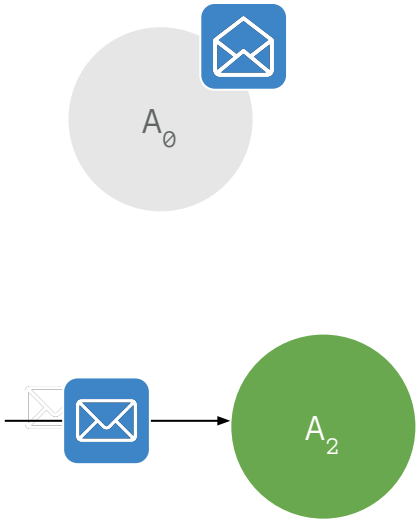
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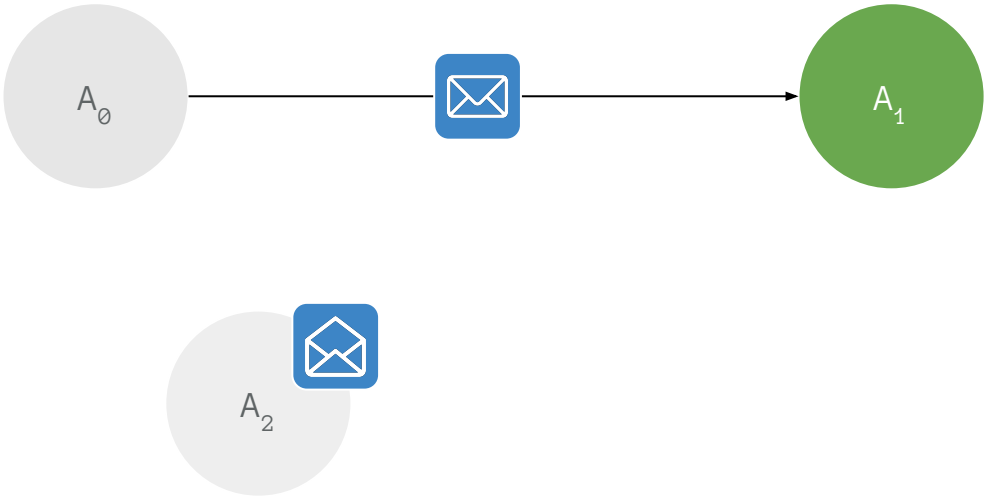
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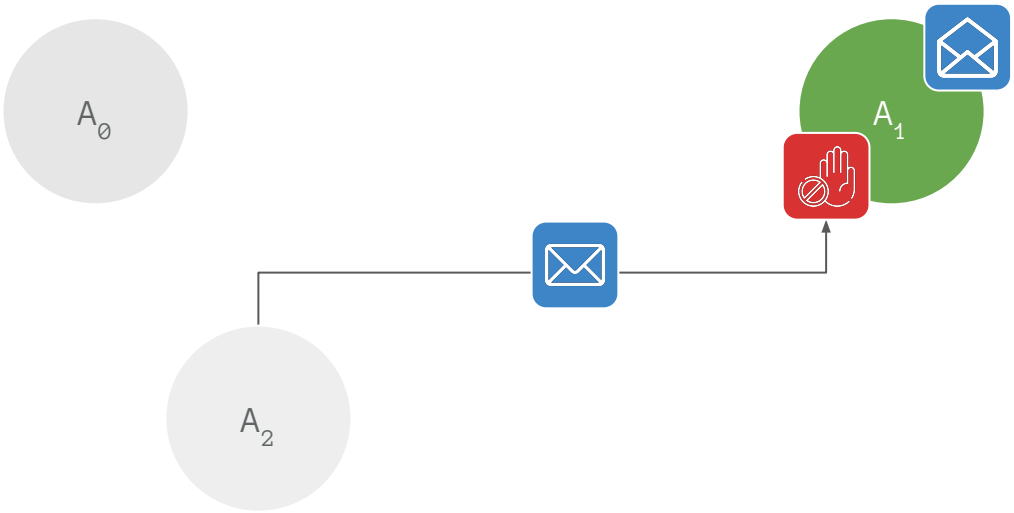
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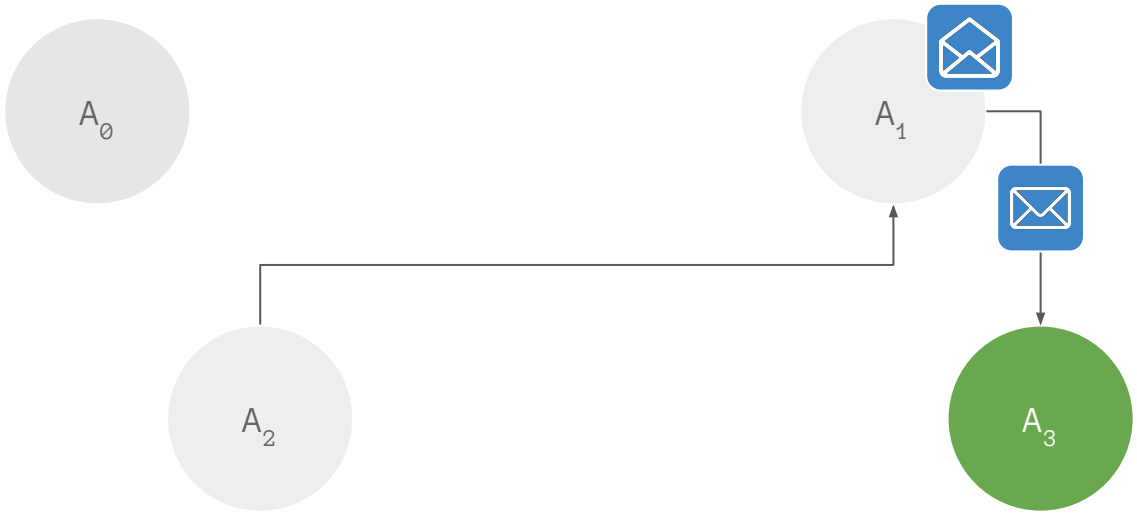
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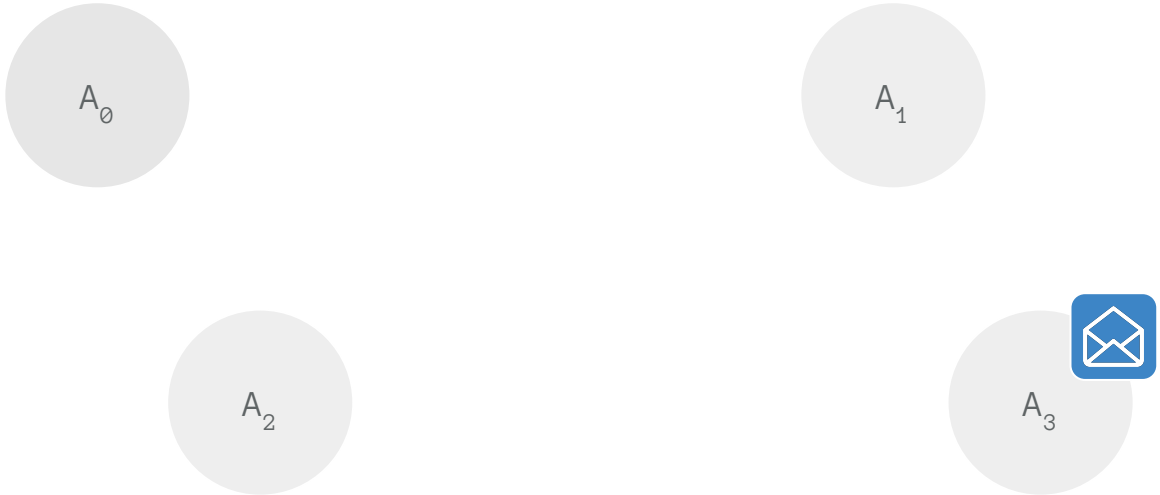
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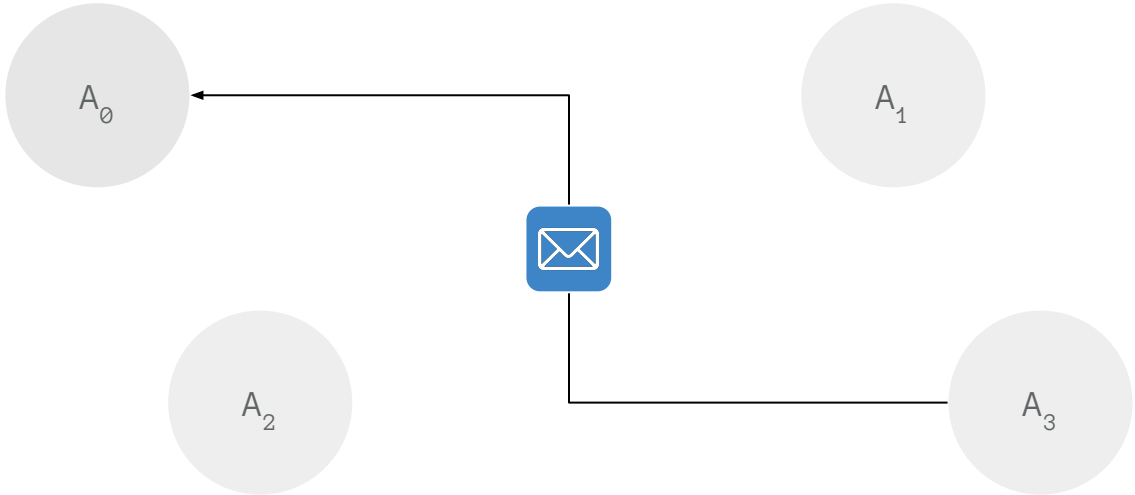
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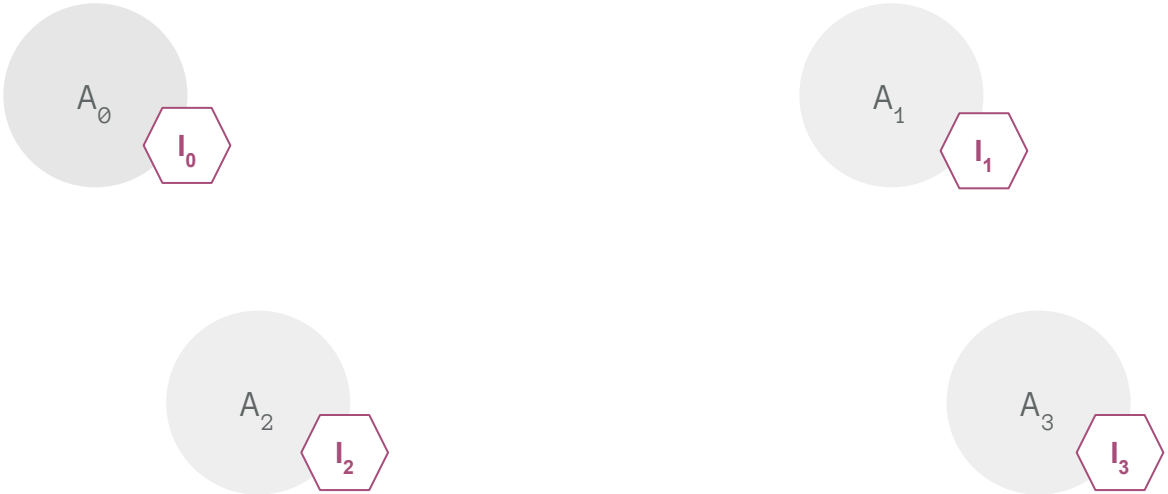
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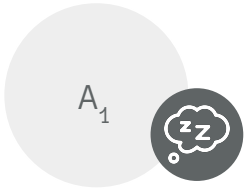
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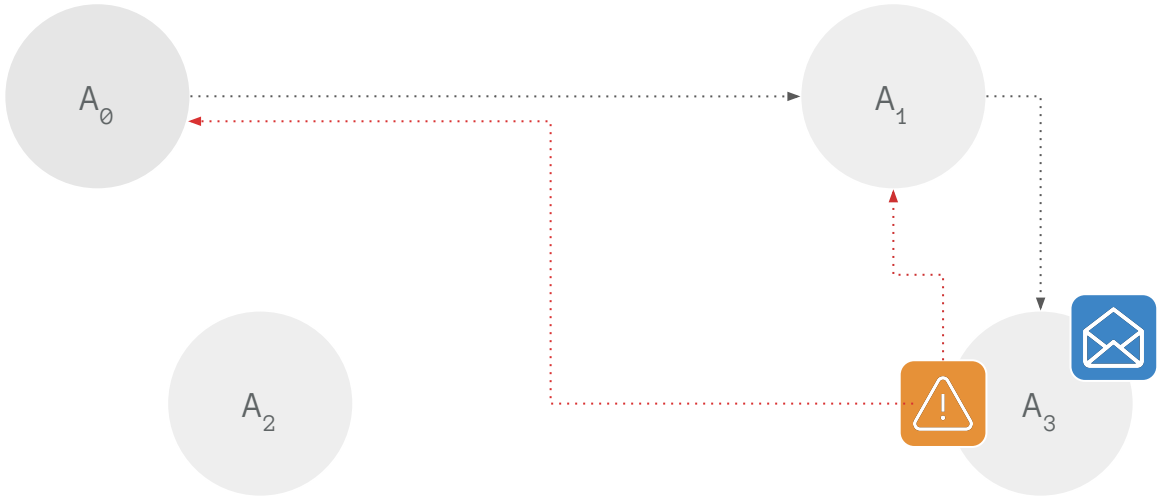
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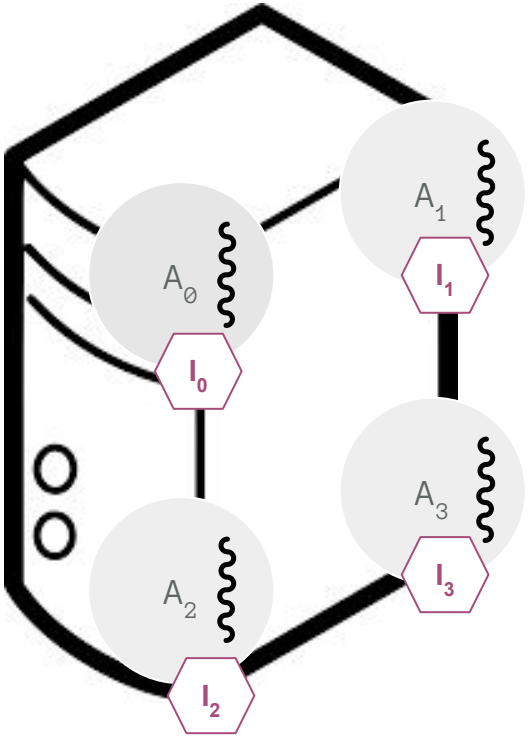
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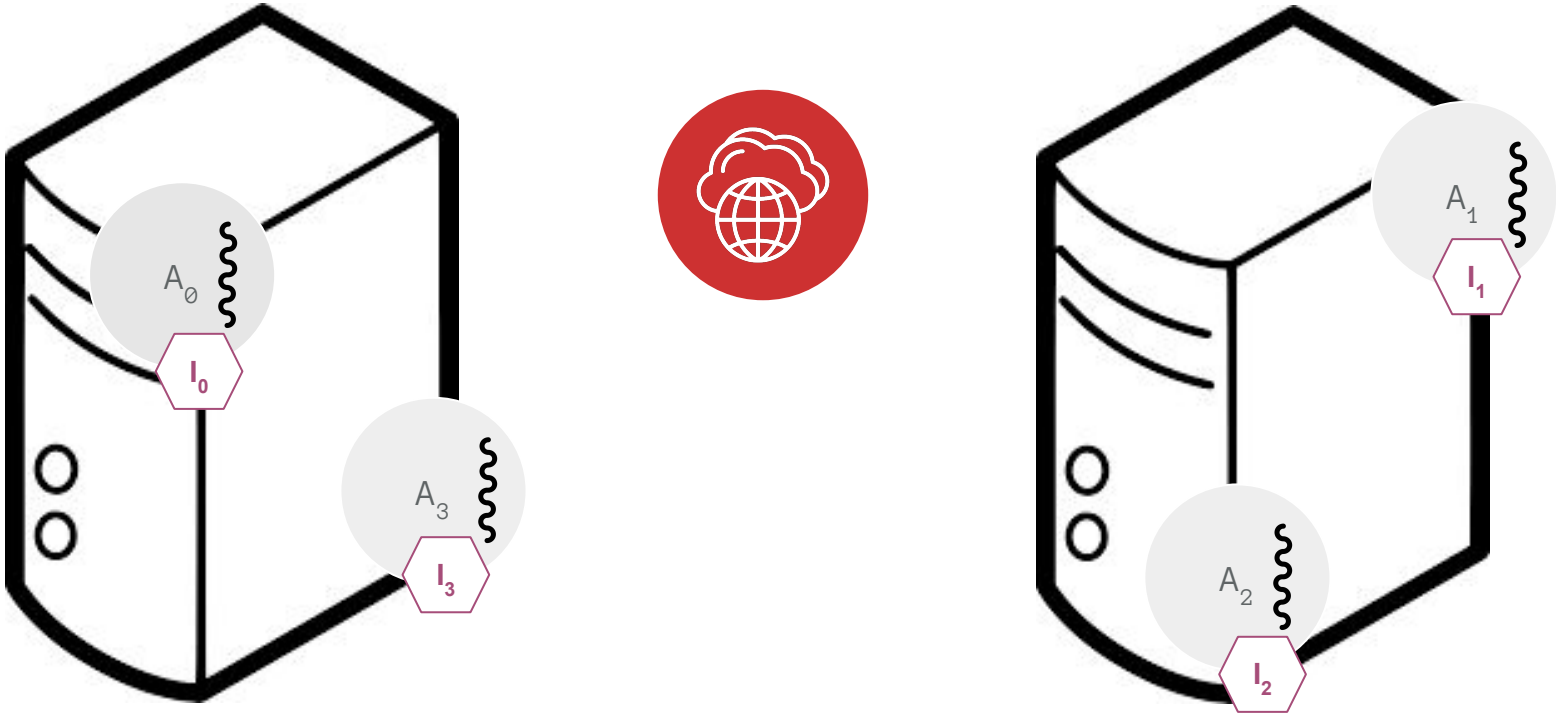
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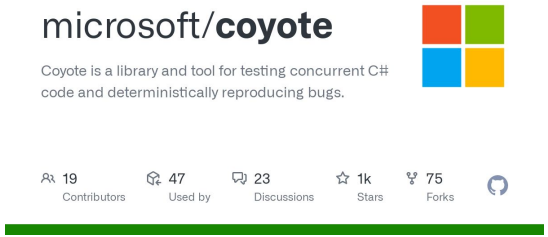
Actor Model... per gli altri

Actor Model... nel mondo .net



Orleans timeline

2009

Inizio 2009
Avvio del progetto

Fine 2011
Orleans viene utilizzato per la realizzazione di servizi internamente a Microsoft

Novembre 2012
Rilascio di Halo 4

Novembre 2012
Rilascio di una prima preview ad utenti esterni

Marzo 2014
Pubblicazione del paper "Orleans: Distributed Virtual Actors for Programmability and Scalability"

Aprile 2014
Rilascio preview pubblica su CodePlex

Gennaio 2015
Codice open source pushato su GitHub

Febbraio 2015
Rilascio v 1.0.0

Marzo 2018
Rilascio v 2.0.0

Ottobre 2019
Rilascio v 3.0.0

Luglio 2022
Rilascio v 7.0.0

2023

Luglio 2023
Rilascio v 7.2.1

Microsoft Orleans viene utilizzato da

Diversi servizi di **Microsoft Azure**

Xbox

Skype

Halo

PLAYFAB

PlayFab

Gears of War

GRAINS

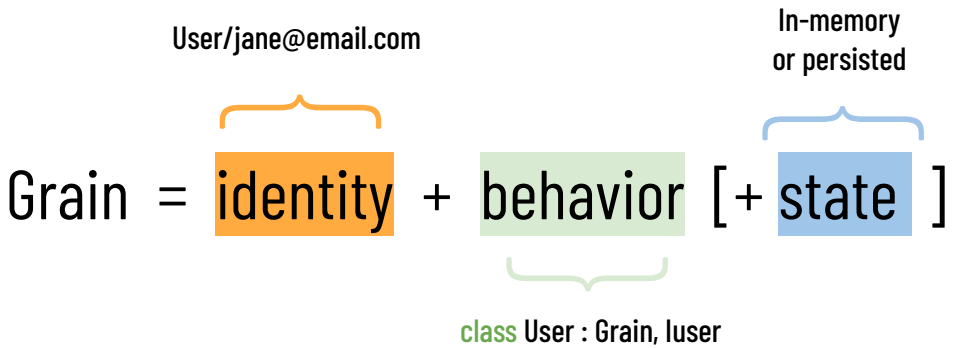
In analogia con i granelli di grano, sono **oggetti piccoli** e solitamente **abbondanti**

Microsoft Orleans - Grains

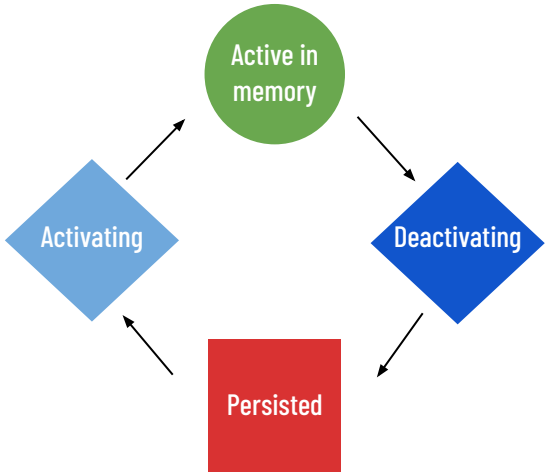
- E' una **classe**, che eredita da **Grain** ed implementa un'interfaccia **IGrainWith...Key**
- Ciascun *grain* ha una **chiave**

  → *Long, GUID, String, GUID + String, Long + string*

- Per una data **identity** e **tipologia** *di grain*, viene attivata una **singola istanza**



Microsoft Orleans - Grains - Lifecycle



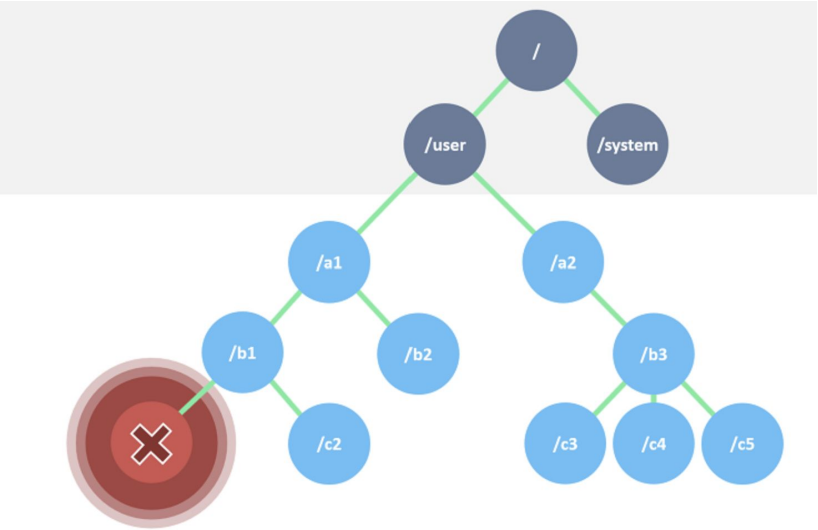
- Entità logiche che **esistono sempre**
- L'applicazione non crea/distrugge i grains
- L'Attivazione dell'istanza del *grain* avviene **quando serve**

  → *Attivazione non esplicita, ma legata alla ricezione di un messaggio*

- Il **GC** del runtime di Orleans si occupa di **disattivare** i *grains* che **non ricevono messaggi**
- Ogni *grain* processa **un messaggio alla volta** (*turn-based concurrency*)

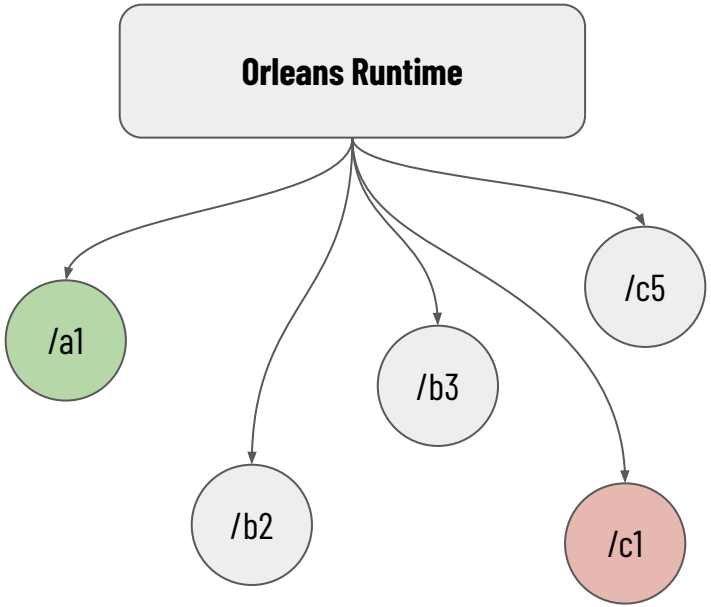
Microsoft Orleans - Grains - Virtual Actors

Sistema ad attori **tradizionale**



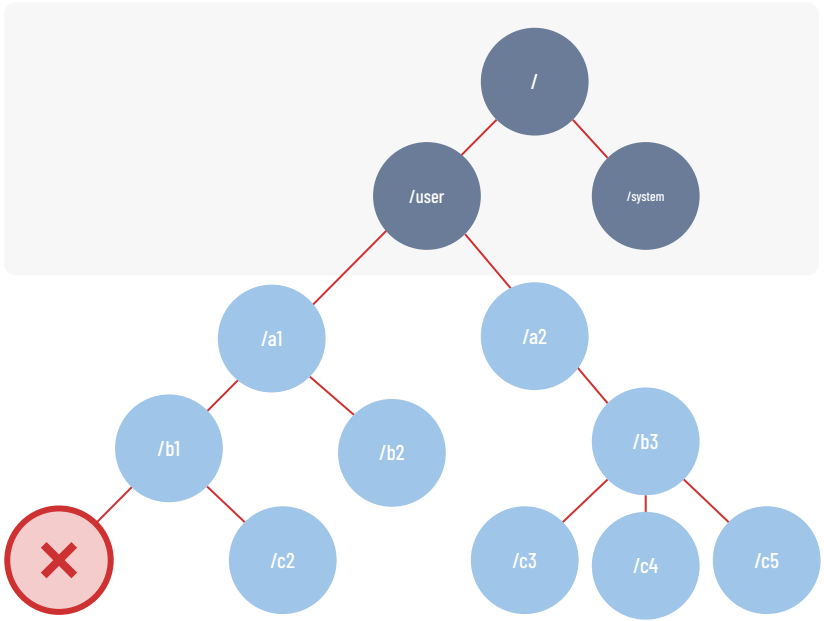
https://getakka.net/articles/concepts/supervision.html

Microsoft **Orleans**

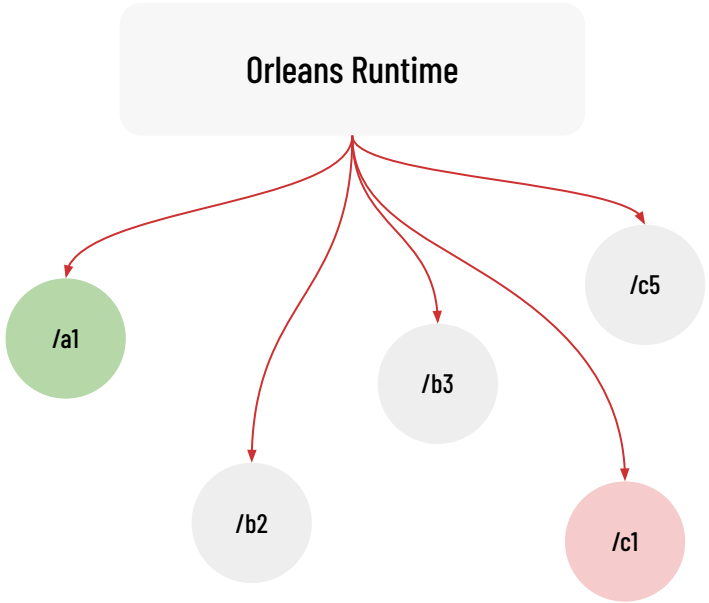


Microsoft Orleans - Grains are *Virtual* Actors

Sistema ad attori **tradizionale**



Microsoft **Orleans**



GRAINS

Sono le **strutture che contengono i granelli** di grano

SILOS

Microsoft Orleans - Silos

- I *silos* sono il **runtime** che gestisce i *grains*
- Può essere hostato in un Windows Service, in una Console Application
  - → *On-premise, in Docker container, nel cloud*
- Tipicamente si ha **un silo per macchina**
- I silo richiedono l'apertura di 2 porte TCP
  - → *30.000 per comunicazioni silo-to-silo*
  - → *11.111 per comunicazioni client-to-silo*
- Un *silo* **non espone** direttamente delle **API**

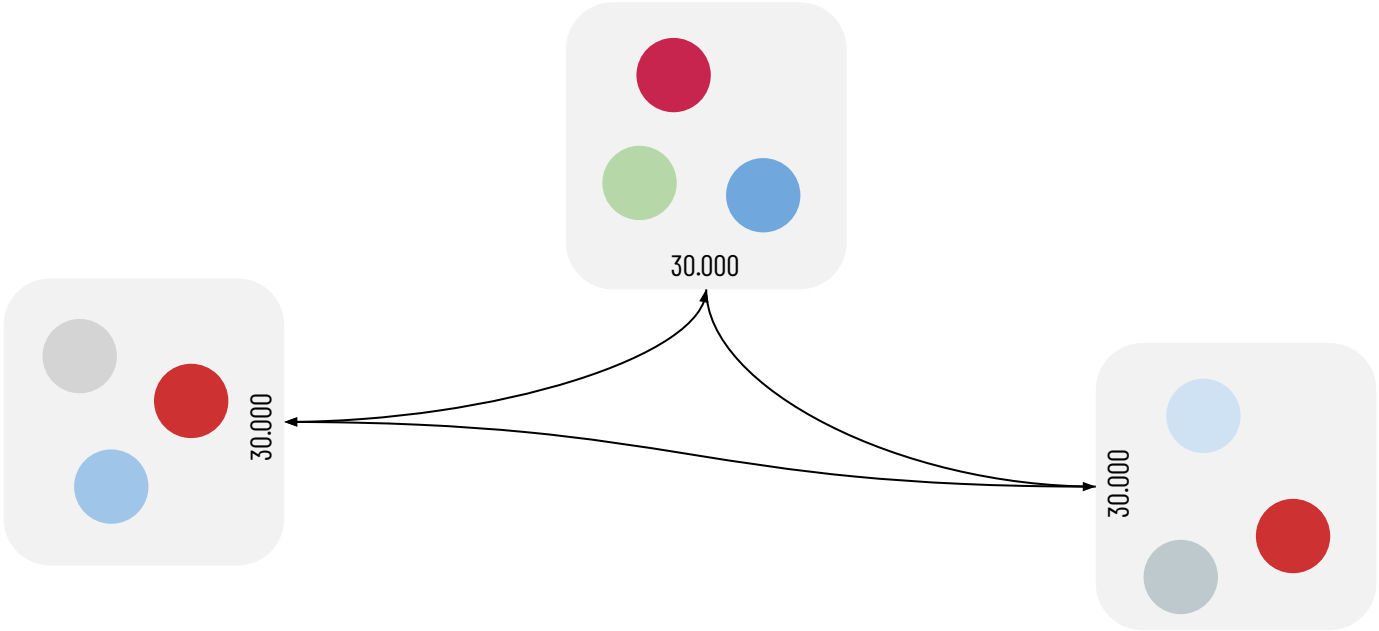
Un insieme di silo che **cooperano** e realizzano un sistema

CLUSTER

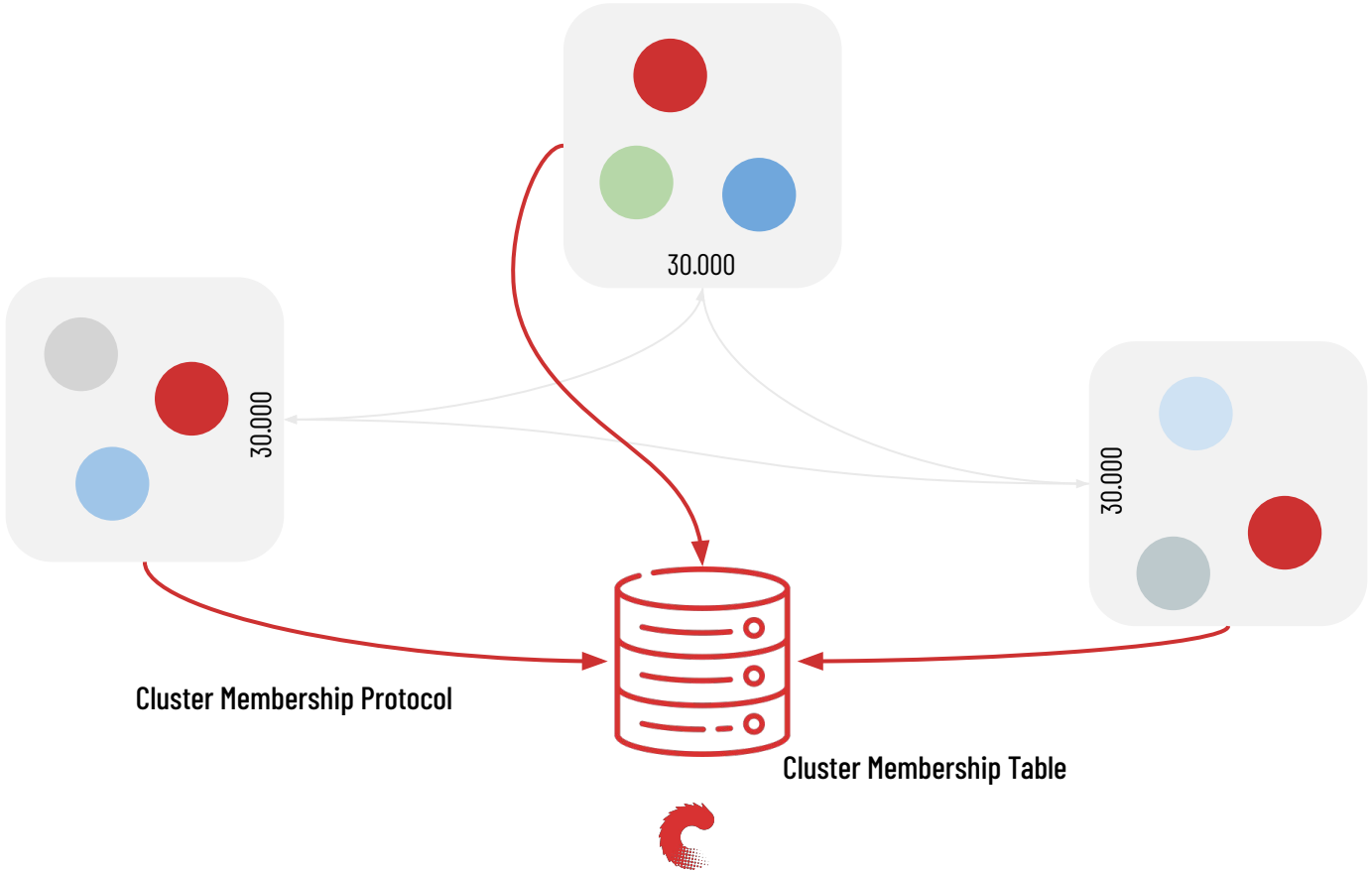
SILOS

GRAINS

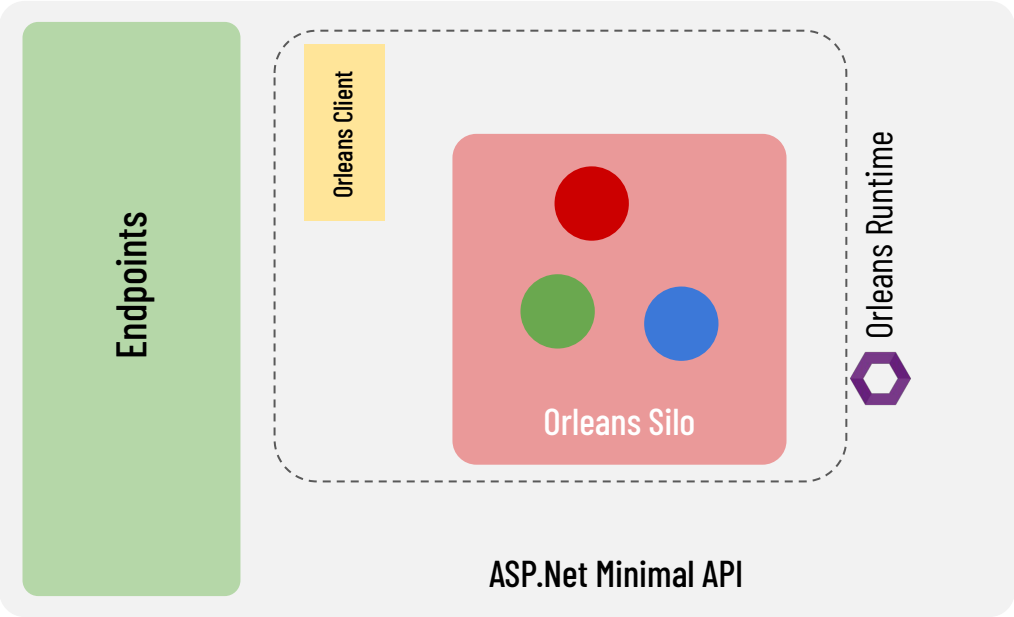
Microsoft Orleans - Cluster



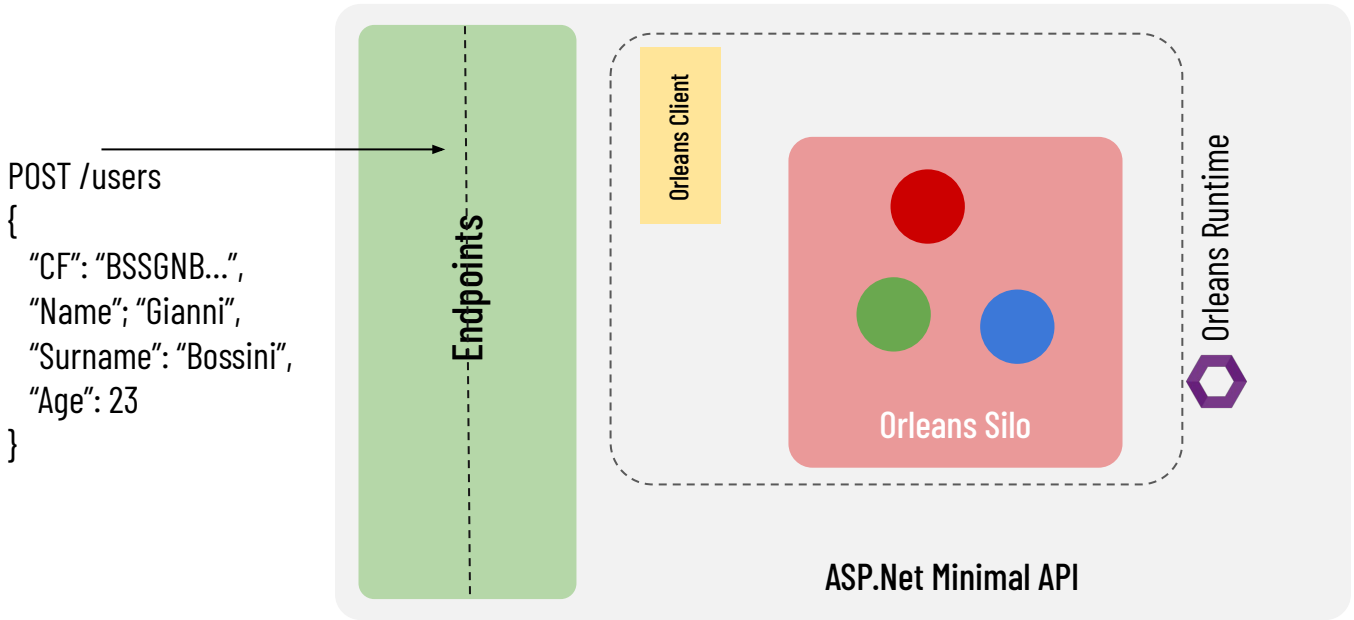
Microsoft Orleans - Cluster



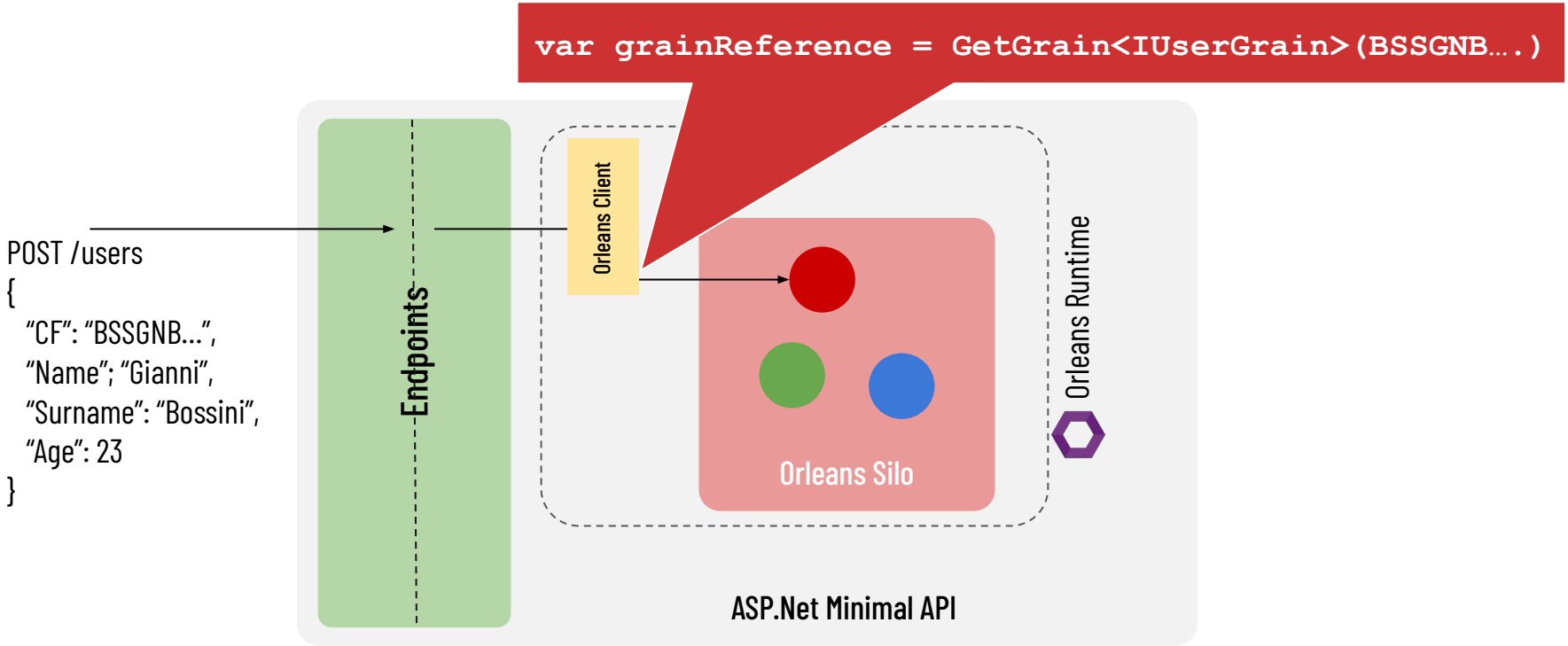
Microsoft Orleans - Hosting - CO-HOSTED CLIENTS



Microsoft Orleans - Hosting - CO-HOSTED CLIENTS

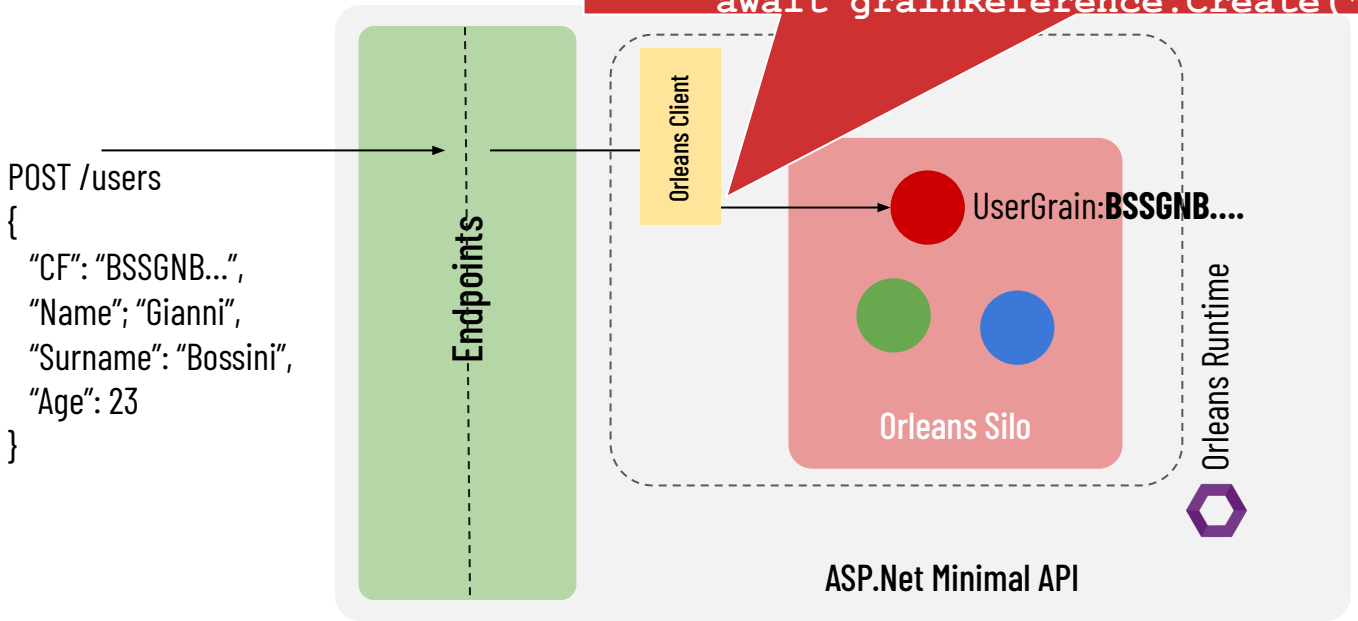


Microsoft Orleans - Hosting - CO-HOSTED CLIENTS

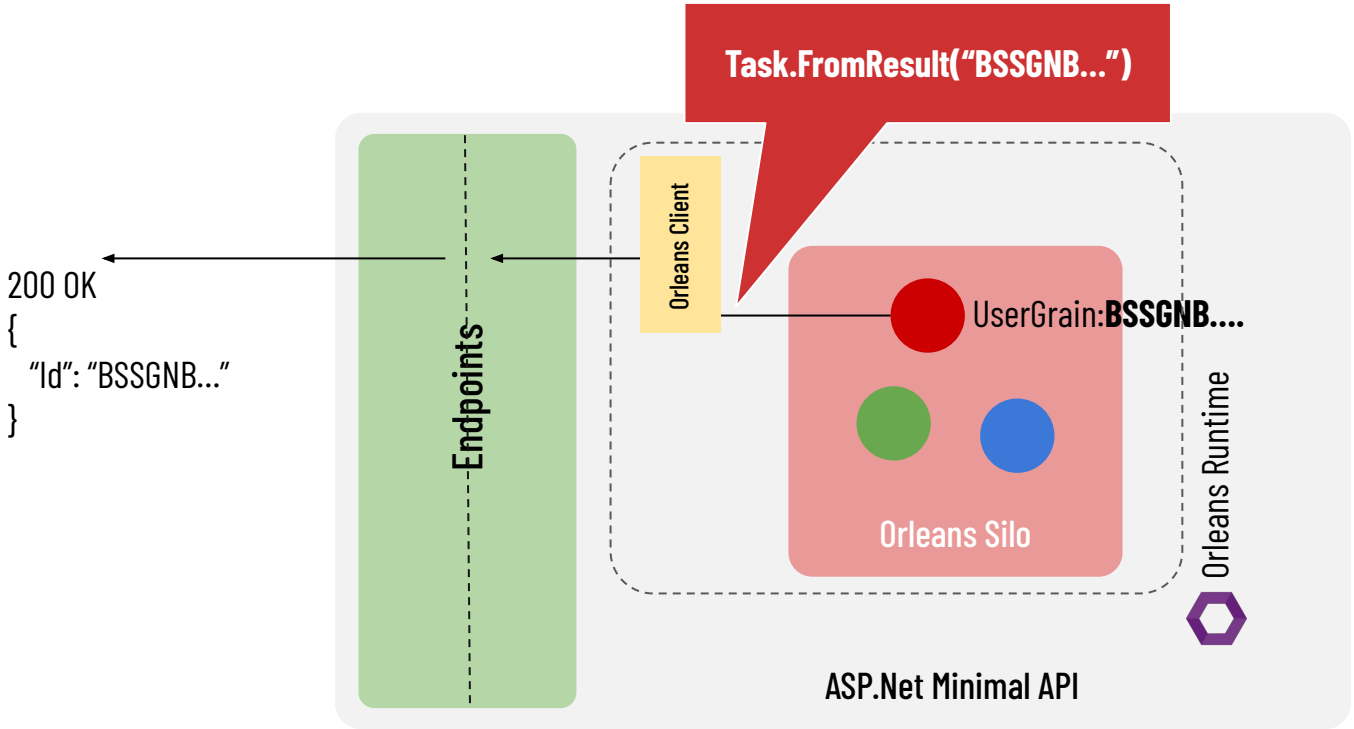


Microsoft Orleans - Hosting - CO-HOSTED CLIENTS

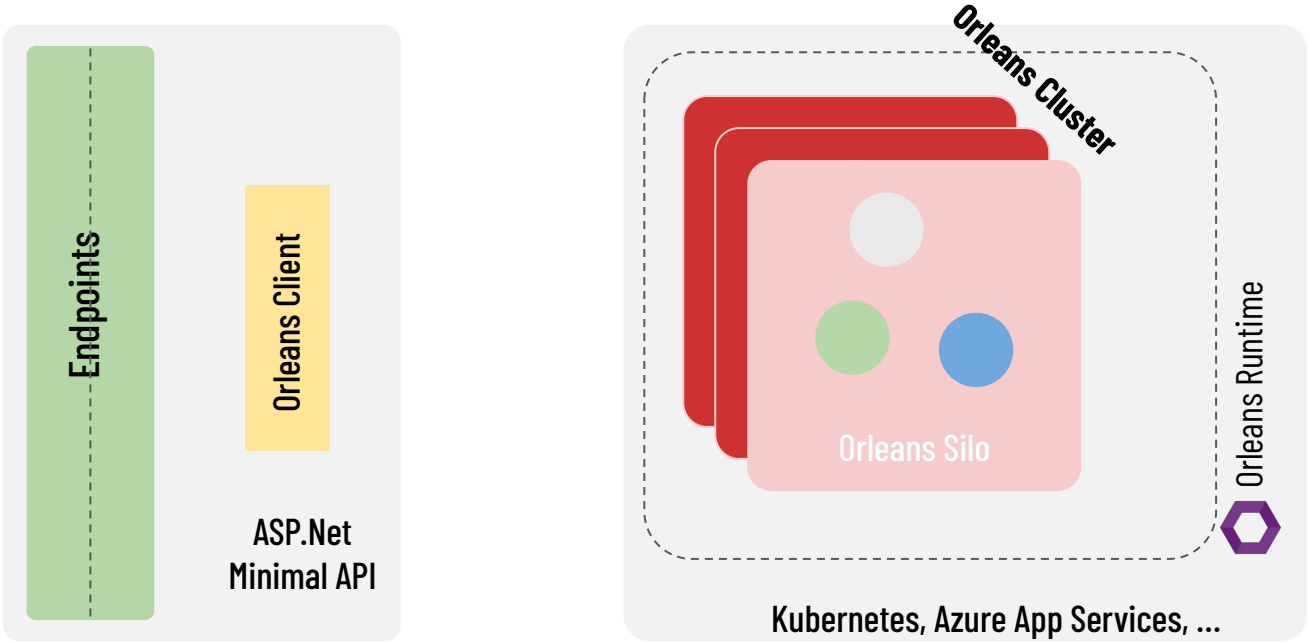
```
var grainReference =
GetGrain<IUserGrain>(BSSGNB….)
await grainReference.Create(“Gianni”, …);
```



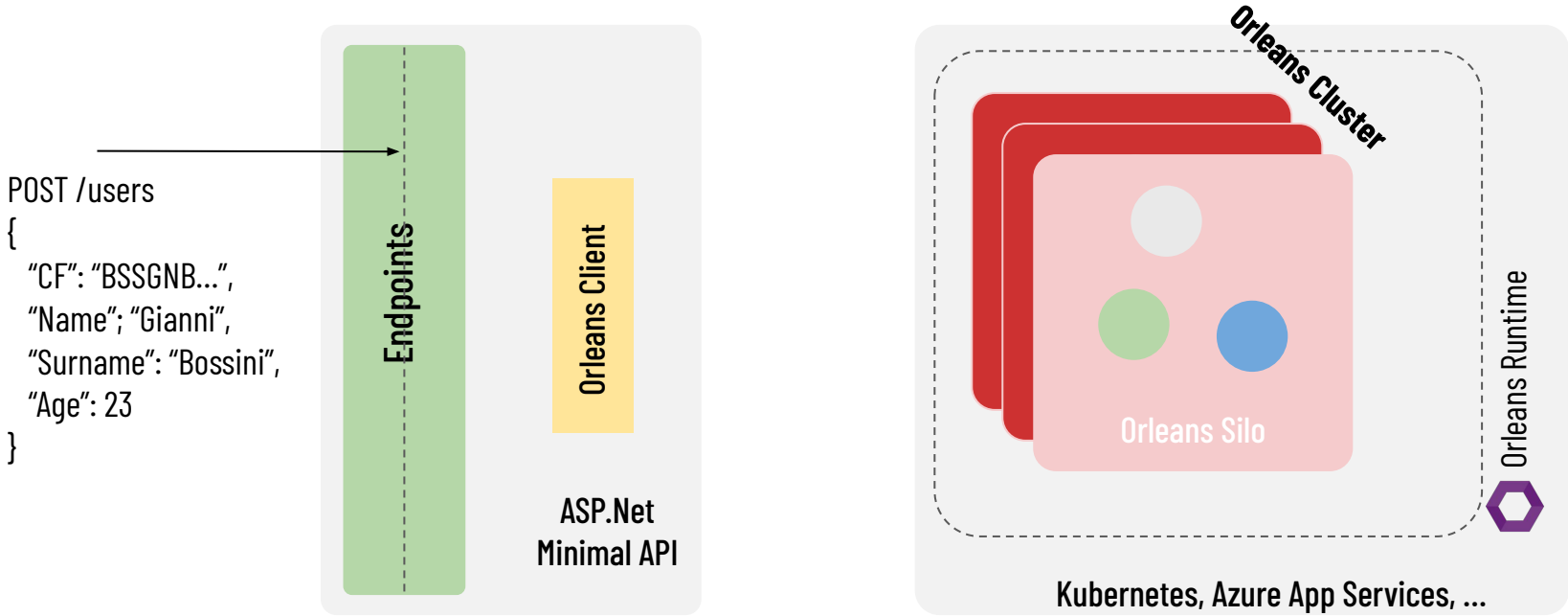
Microsoft Orleans - Hosting - CO-HOSTED CLIENTS



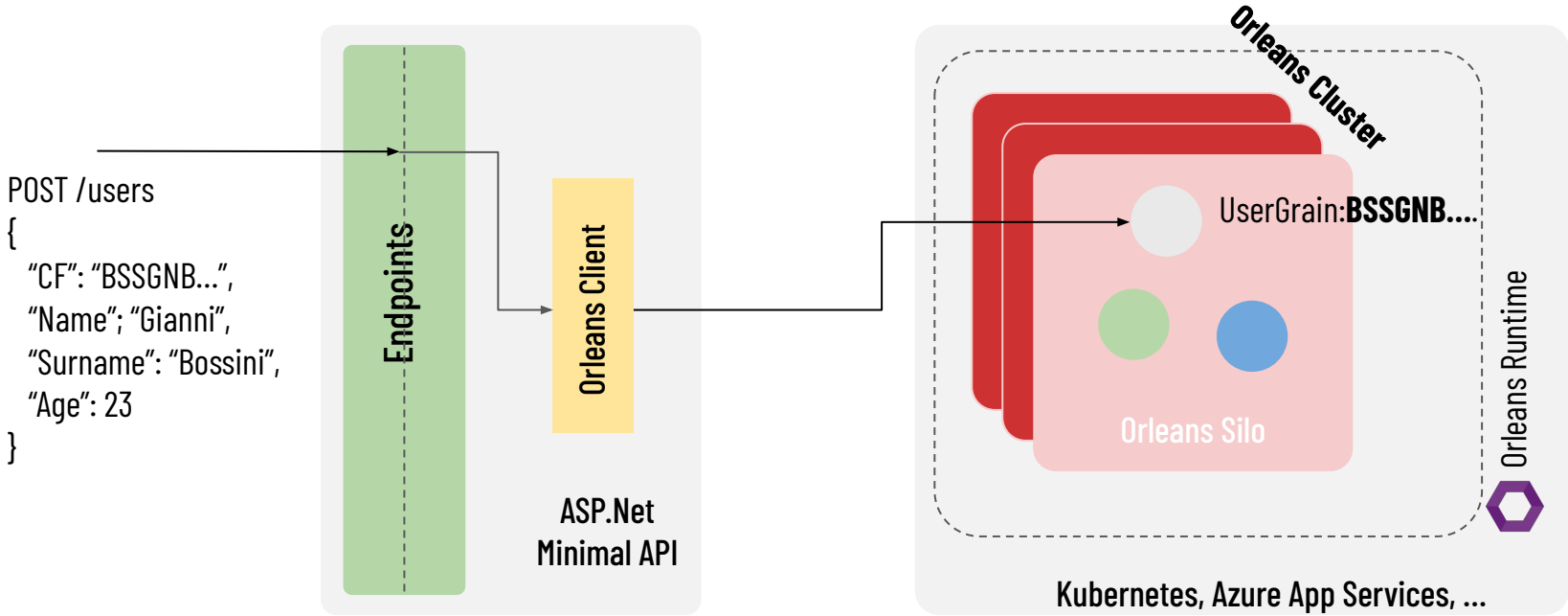
Microsoft Orleans - Hosting - EXTERNAL CLIENTS



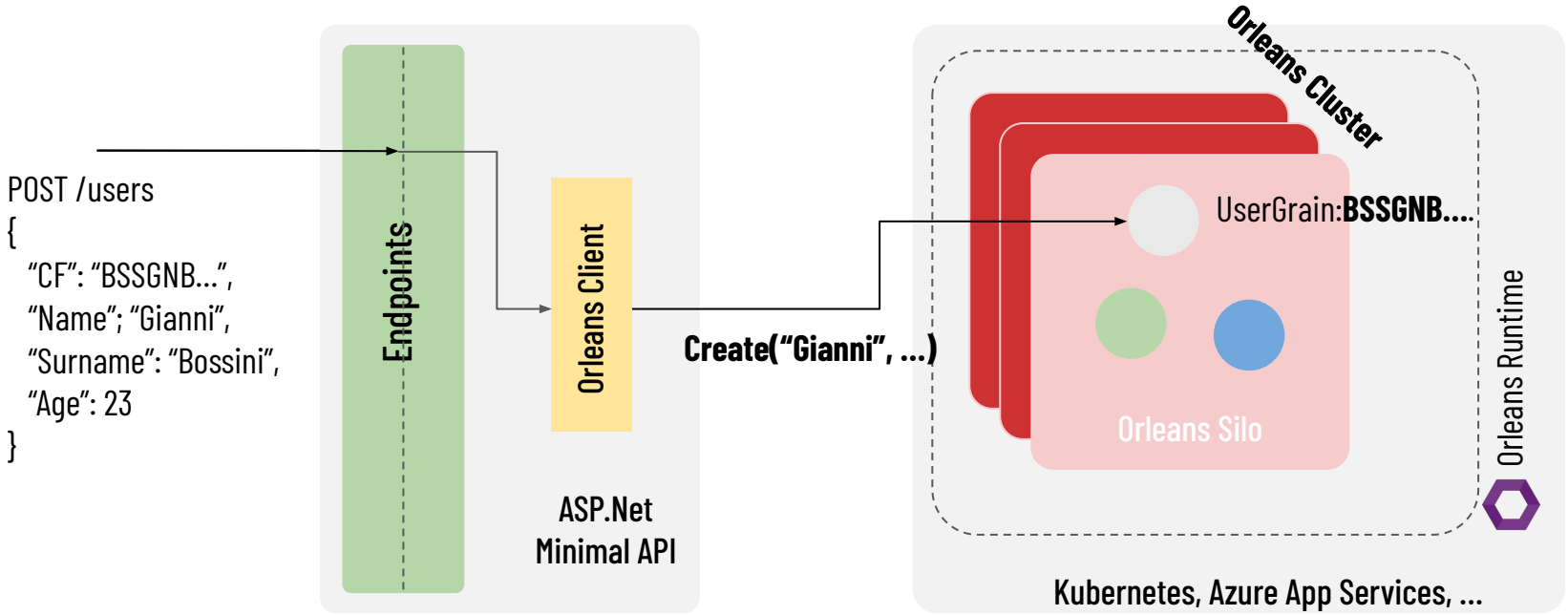
Microsoft Orleans - Hosting - EXTERNAL CLIENTS



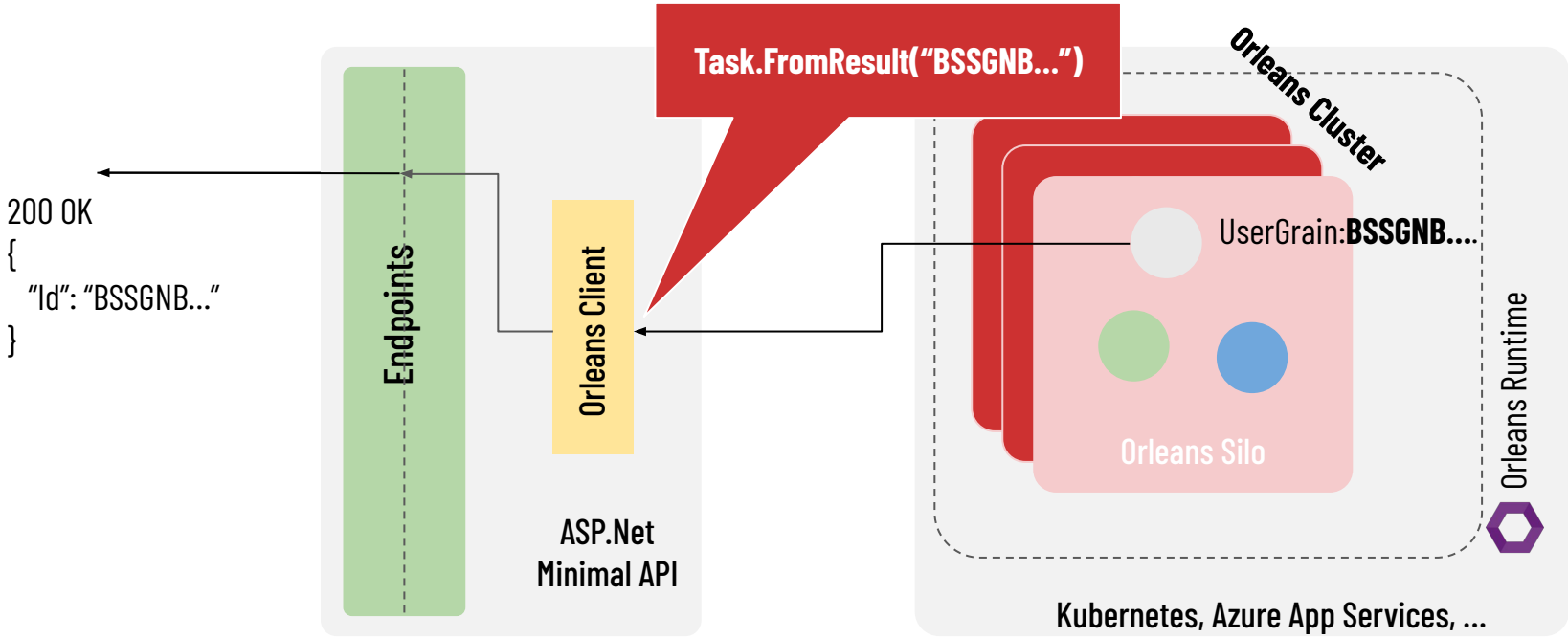
Microsoft Orleans - Hosting - EXTERNAL CLIENTS



Microsoft Orleans - Hosting - EXTERNAL CLIENTS



Microsoft Orleans - Hosting - EXTERNAL CLIENTS



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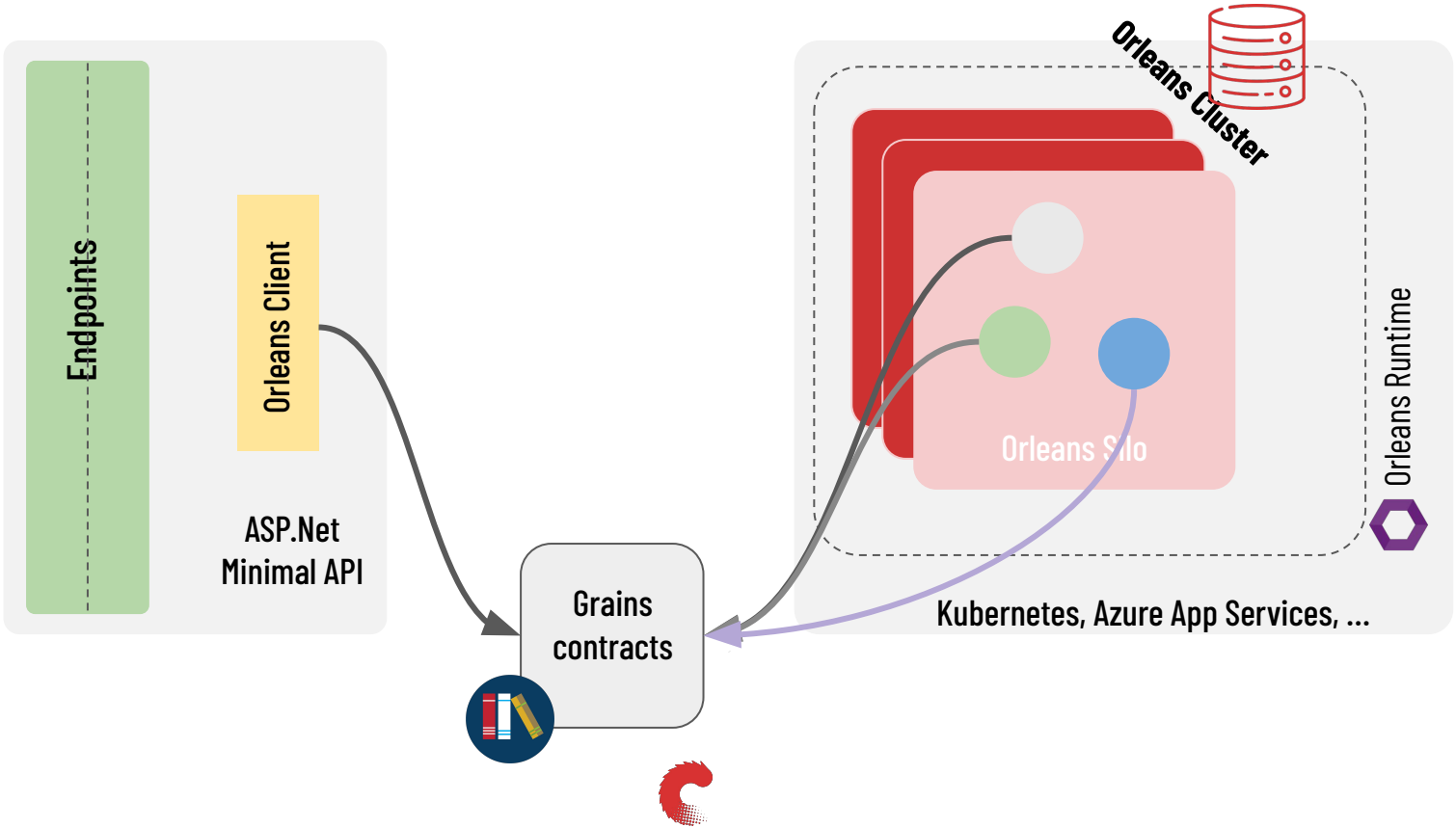

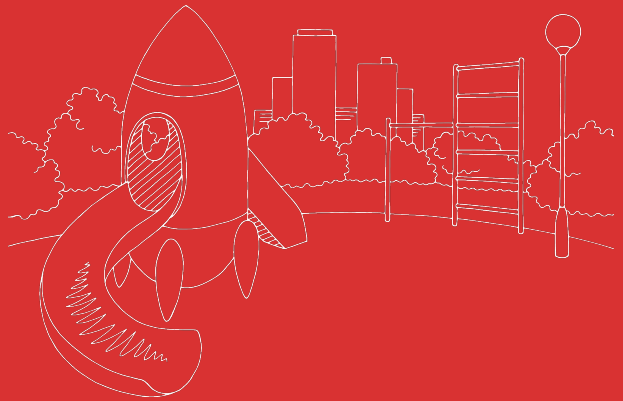

DEMO - UrlShortener

- Grain e test
- Ottimizzazioni
- Dashboard e osservabilità
- Stateless workers, Timers e Reminders
- Filtri
- Observer
- Persistenza
- Road to producion
- From Co-hosted to External clients

Microsoft Orleans aka Distributed .NET

- Da applicazioni on-premise fino a complessi sistemi distribuiti
  - senza cambiare l'approccio OOP
- Applicazioni scalabili e affidabili

→ *Scala da un singolo server locale a centinaia a migliaia di applicazioni distribuite e a disponibilità elevata nel cloud*

→ *"Potrebbe supportare la creazione di un attore per ogni abitante della Terra"*

Addio dipendenze, benvenuto Orleans

Considerazioni

SDK **maturo**
Community attiva
Tante **features complesse**
senza librerie esterne

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Applicazioni **cloud-native complesse**, scalabili e distribuite richiedendo **basso effort** per uno sviluppatore .net

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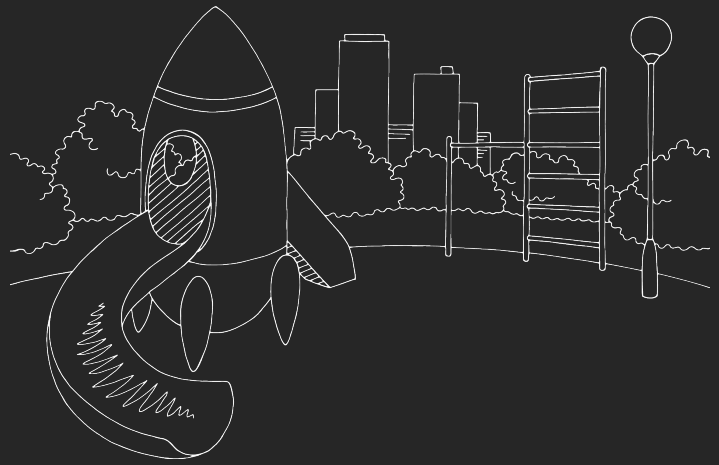
Monolite **modulare** composta da **nanoservizi** che comunicano tramite messaggi

Indexing aka **Actor-Oriented Database** per dominare il mondo



https://github.com/GianniBortoloBossini/
innova2023-creare-applicazioni-reali-con-ms-orleans

Materiale - Articoli

- Microsoft Orleans documentation
  https://learn.microsoft.com/en-us/dotnet/orleans/
- Intro to Virtual Actors by Microsoft Orleans
  https://bogdan-dina03.medium.com/intro-to-virtual-actors-by-microsoft-orleans-6ae3264f138d
- Actor model
  https://codedocs.org/what-is/actor-model
- Russ Hammett's blog
  https://blog.kritner.com/categories/programming/microsoft-orleans/
- Introduction to Project Orleans
  https://ideasof.andersaberg.com/development/Introduction-To-Orleans
- Indexing in an Actor-Oriented Database
  https://www.cidrdb.org/cidr2017/papers/p29-bernstein-cidr17.pdf

Materiale - Video & Corsi

- Hewitt, Meijer and Szyperski: The Actor Model (everything you wanted to know...)
  https://www.youtube.com/watch?v=7erJ1DV_Tlo&ab_channel=jasonofthel33t
- On .NET Live - Conway's Law, Microservices and Modular Monoliths with Microsoft Orleans
  https://techcommunity.microsoft.com/t5/net-events/on-net-live-conway-s-law-microservices-and-modular-monoliths/ev-p/3790218
- Architetture Distribuite – Microsoft Orleans e RabbitMQ
  https://dev.marche.it/eventi/2023/07/12/architetture-distribuite-microsoft-orleans-e-rabbitmq-ancona-12-luglio-2023/
- Introduction to Actor-based Development with Project Orleans - Chris Klug - NDC Oslo 2023
  https://youtu.be/-NdkAW_NAb8?si=39SWluceoV1qUc7g
- [Course] Introduction to Microsoft Orleans [2014]
  https://www.pluralsight.com/courses/microsoft-orleans-introduction
- [Course] Complete Microsoft Orleans .NET: From Zero to Hero [2019]
  https://www.udemy.com/course/complete-orleans-net-from-zero-to-hero/
- [Course] Actor Model Workshop [2023]
  https://www.avanscoperta.it/it/training/actor-model-workshop/

Per altri articoli nerd (e non solo)
https://blog.codiceplastico.com

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