CHOReOS - Large Scale Choreographies for the FI
foundations and prospects

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Template v6

What is CHOReOS ?

Choreography-centric SOA for Services & Things

▶ **Main goal**: sustaining **decentralized** service **choreographies**

▶ **Specific context**: Future Internet (FI), Ultra Large Scale (ULS)

　▶ **Focus on *Internet of Services* and *Internet of Things***

▶ **Abstract**: It revisits choreography-centric SOAs by introducing a **dynamic development process** and **middleware** for coordination of services through choreographies
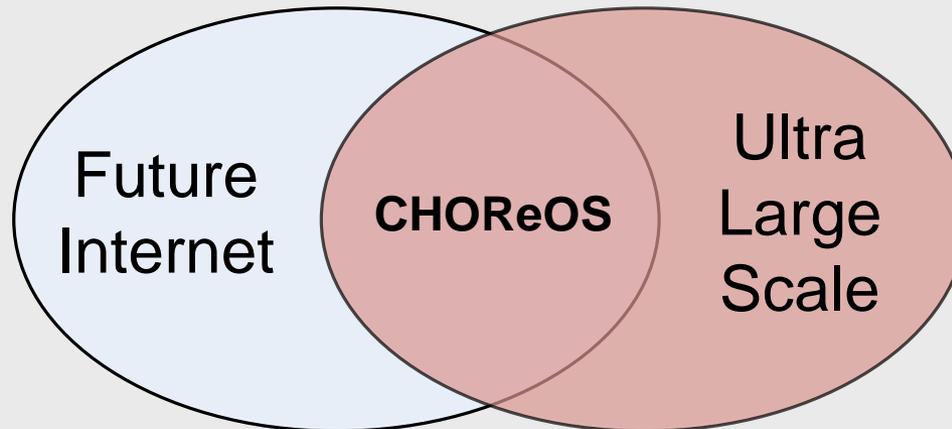
CHOReOS at a glance

Duration:

▶ **October 2010 – September 2013**

Consortium of 15 partners:

▶ **7 industrials**
▶ **8 academics**

Total budget:

▶ **8.665.785 €**

European programme:

▶ **Call FP7-ICT-2009-5**

   ▶ **Grant n°257178**

Further information:

▶ **http://www.choreos.eu**

Consortium

7 industrials
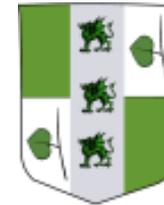
8 academics

Outline

1. Orchestration vs. Choreography
2. Foundations: first year achievements
    1. Initial architectural style for choreographies
    2. Dynamic development model
    3. Middleware specification
    4. IDRE specification
3. Use cases
4. OW2 impact
    1. Community building
    2. OW2 'Future Internet' initiative
    3. Synergies
5. Prospects

Outline

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Orchestration vs. Choreography

Orchestration:

▶ **Local / centralized** perspective

▶ *"Each player in the orchestra strictly follows instructions from the conductor"*

▶ **SOA**: Refers to a **business process**, with a specific (business) goal

Choreography:

▶ **Global / distributed** perspective

▶ *"Dancers dance following a global scenario, without a single point of control"*

▶ **SOA**: describes a **protocol** for peer-to-peer interactions

Choreographies help deal with FI *"…ities"*

Scalability

▶ **… in the number of users, service instances, composed services, …**

Heterogeneity

▶ **… in the diversity of service types, technologies, …**

Mobility

▶ **… leading to mobile and volatile services…**

Awareness & adapability

▶ **… overcoming the volatility of services…**

Outline

Initial architectural style for choreographies

"The software architecture of a system is the set of structures needed to reason about the system, which comprise software elements, relations among them, and properties of both" (Wikipedia)

Define an architectural style for CHOReOgraphies

▸ **Identify key architectural abstractions for choreographies in the FI → Revisits the SOA style to face FI challenges**

  ▸ **Web-based services at large (WS* & Rest, B & T) → Paradigm independent <u>definition of "services"</u>**

  ▸ **Highly heterogeneous interaction paradigms (C/S, P/S, T/S, …) → <u>CHOReOS Multi-Paradigm Connectors</u> to sustain interoperability**

  ▸ **Choreography-based composition of services → CHOReOS Coordination Protocol relying on a specific <u>Distributed Coordination Algorithm</u>**

    → Synthesis of decentralized choreographers aka <u>Coordination Delegates</u>
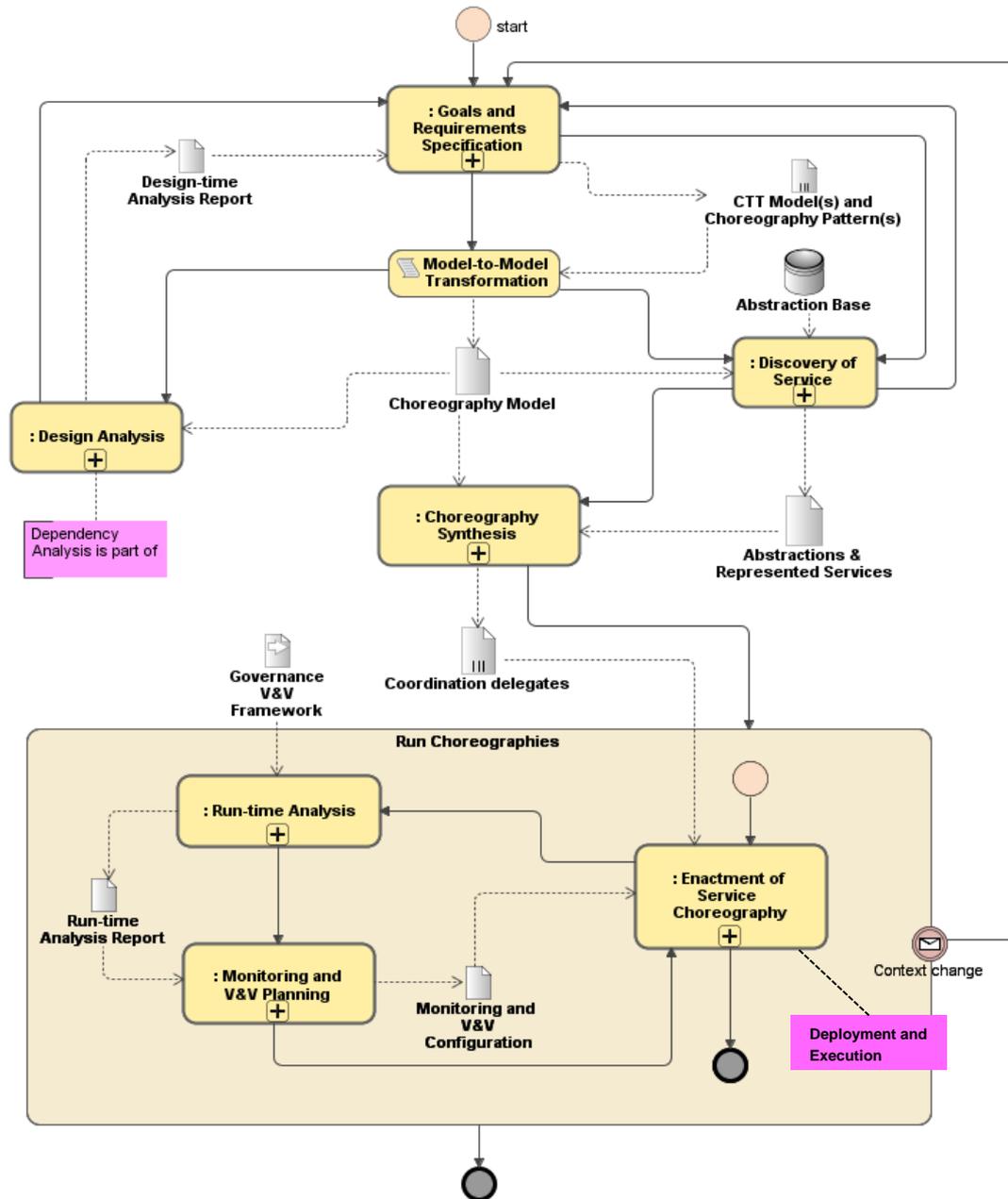
Dynamic development model

Abstract description of the CHOReOS software development process

Common activities, but structured in a CHOReOS-specific way

Technology-independent characterization of the "strategy" to be used during the choreography life cycle

First-level development process model as BPMN2 process Diagram

Middleware specification

A service-oriented middleware to enable the development and execution of scalable choreographies by facilitating

- **service discovery**
- **service access**
- **composition of services**
- **deployment in the cloud**

…while sustaining scalability, interoperability, mobility, awareness & adaptability!

Specification defines multiple key "components":

- **XSD: eXtensible and scalable Service Discovery**
- **XSA: eXtensible and scalable Service Access,**
  - based on an extensible Service Bus (XSB); with two concrete implementations: DSB and LSB.
- **XSC: eXtensible Service Composition,**
  - which enacts compositions of FI Business and Thing-based services
- **Cloud & Grid facilities, to support the middleware and the choreographies that are built on it**

IDRE specification

The CHOReOS Integrated Dev. & Runtime Environment (IDRE)

Formally grounded abstractions and models

Dynamic choreography-centric development process

Integrated Development and Runtime Environment

Service governance, verification, and validation

Service-oriented middleware
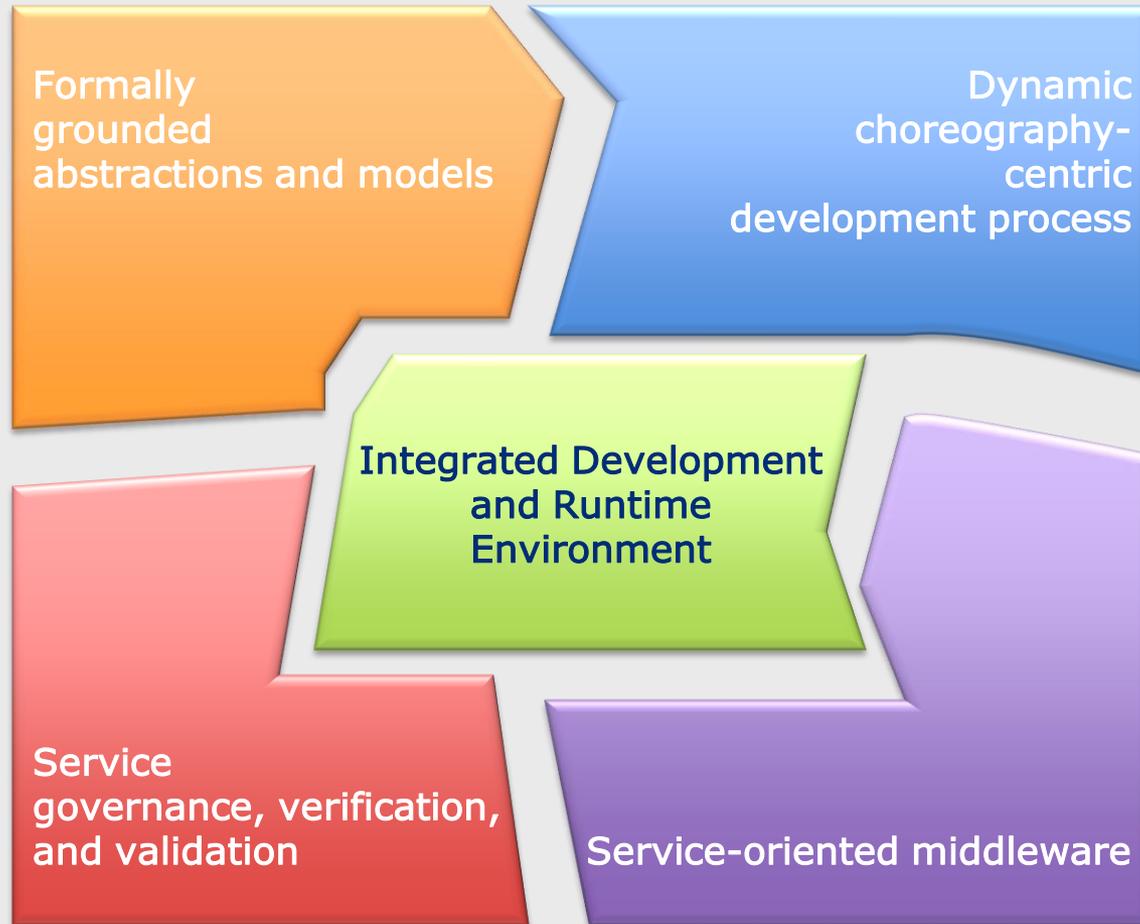
IDRE specification

IDRE is all about…

▶ **Defining integration requirements**

  ▶ **Development, design, enactment, governance and monitoring requirements for a choreography**

▶ **Defining the overall Architecture**

  ▶ **Identifying the integration Dependencies**
  ▶ **Defining the integration Plan**

▶ **Implementing the test bed**

▶ **Releasing integrated CHOReOS software**

  ▶ **Packaging and delivering software prototypes**
  ▶ **Providing developer and user manuals**

Outline

Use cases

3 use-cases, context relevant to CHOReOS

▶ **Passenger-friendly Airport**
  ▸ **Context:** air transportation / service to passengers
  ▸ **Goal:** improvements in <u>services provided to passengers</u>
  ▸ **Scenario particularly suited to illustrate FI/<u>scalability</u> aspects**
    ▪ Average of 180.000 passengers per day at an Airport like CDG
    ▪ Number that varies greatly depending on the airport, time of the day, season, etc.
  ▸ **CHOReOS innovation highlights**
    ▪ To enable dynamic rebinding and replacement of services
    ▪ To rely on choreographies for coordination

Image: photostock/FreeDigitalPhotos.net

At home ➡ **Inside airport** ➡ **In plane**

▶ **Mobile-enabled coordination of people**
▶ **DynaRoute**

Outline

Why Community Building?

The goal: extend project value, sustainability
- ▶ **Enable the pursuit of the development activity beyond the official duration and the budget scope of the project.**

The approach: foster a business <u>ecosystem</u>
- ▶ *'An economic community supported by a foundation of interacting organizations and individuals'*

The method: leverage an ecosystem <u>platform</u>
- ▶ **Infrastructure services: technical resources**
- ▶ **Governance services: decision making rules**
- ▶ **Marketing services: branding & communication**

A three-stage process

Technical Stage ▶ Open Source Stage ▶ Ecosystem Stage

Technical stage
- ▶ **Define deliverables structure for community sharing**
- ▶ **Select open source licenses**

Open source stage
- ▶ **Move project to an open source community**
- ▶ **Endorse (inside the project) open source governance**

Ecosystem stage
- ▶ **Open to, attract third-party stakeholders**
- ▶ **Develop business/market outreach**

Technical stage: open sourcing the IDRE

Why OSS ?

Facilitates deployment of complex technologies

- **Helps combine multiple technologies and know-how from independent providers**
- **Makes multi-tier cooperation easier by enhancing trust and reducing coordination costs**

Lower barriers to access

- **Legal barriers: open source licences enable sharing**
- **Economic barriers: no monetary entry cost**

IDRE code structure

- **Modular project structure to facilitate third party contributions**

Chosen licenses

- **IDRE development modules**
  - **Eclipse Public Licence (EPL)**
  - **Affero General Public License (AGPL)**
- **IDRE runtime modules :** Lesser General Public License (LGPL)
- **Documentation:** Creative Commons License

OSS stage: Leveraging the OW2 Community

An established open source community

- **One of 4 global independent and open communities**
- **Community highly driven by European interests**

Ramping up the open source community

- **Leverage current OW2 Members within CHOReOS**
- **Attract contributors with open source tactics**
- **Enhance CHOReOS profile (as a mature project) within OW2**
- **Advertise the OSS strategy on the CHOReOS website**
- **Leverage social networks: Twitter, LinkedIn, Facebook**

Ecosystem stage: Future Internet Initiative

"(…) joint efforts by OW2 Members to develop technical integration between projects and business synergies in order to address specific market needs"

Leverage OW2 business ecosystem mechanism

▶ **Initiative led by CHOReOS**
  ▶ **Grouping of scope-bound projects, CHOReOS is the first in this initiative**
  ▶ **Inria and OW2 to lead the initiative**
  ▶ **Promote solutions not just packages**

▶ **Open up the initiative to non-OW2 members**
  ▶ **Lower barriers to participation**

▶ **Market the Future Internet initiative**
  ▶ **Identify initial deployment as Future Internet initiative achievement**
  ▶ **Connect with other FP7 projects**

Synergies

Identifying synergies with existing projects

▶ **Orchestra**
  ▸ "…solution to handle long-running, Service Oriented Processes"

▶ **JORAM**
  ▸ "…distributed MOM… designed with an OSGi based services architecture to provide a dynamically adaptable messaging server"

▶ **Fractal**
  ▸ "…a modular, extensible and programming language agnostic component model that can be used to design, implement, deploy and reconfigure systems and applications"

▶ **SOFA**
  ▸ "…used for dynamic reconfiguration of component architecture and for accessing components under the SOA concepts"

Outline

Prospects (Y2)

1st integration of CHOReOS platform:

▶ **Refined CHOReOS architectural style and conceptual model**

  ▶ Feedback loop from the development of IDRE

▶ **Instantiation of the CHOReOS dynamic development model**

  ▶ Stability and interdependencies analysis to support adaptable choreographies

▶ **1st Middleware implementations**

▶ **1st Governance and V&V tools and infrastructure**

Use cases design

Training kits

Community Building Prospects

Technical stage Y2 outlook:

- ▸ **Improve website content, SEO; Grow social network usage in consortium**
- ▸ **Confirm IDRE structure**
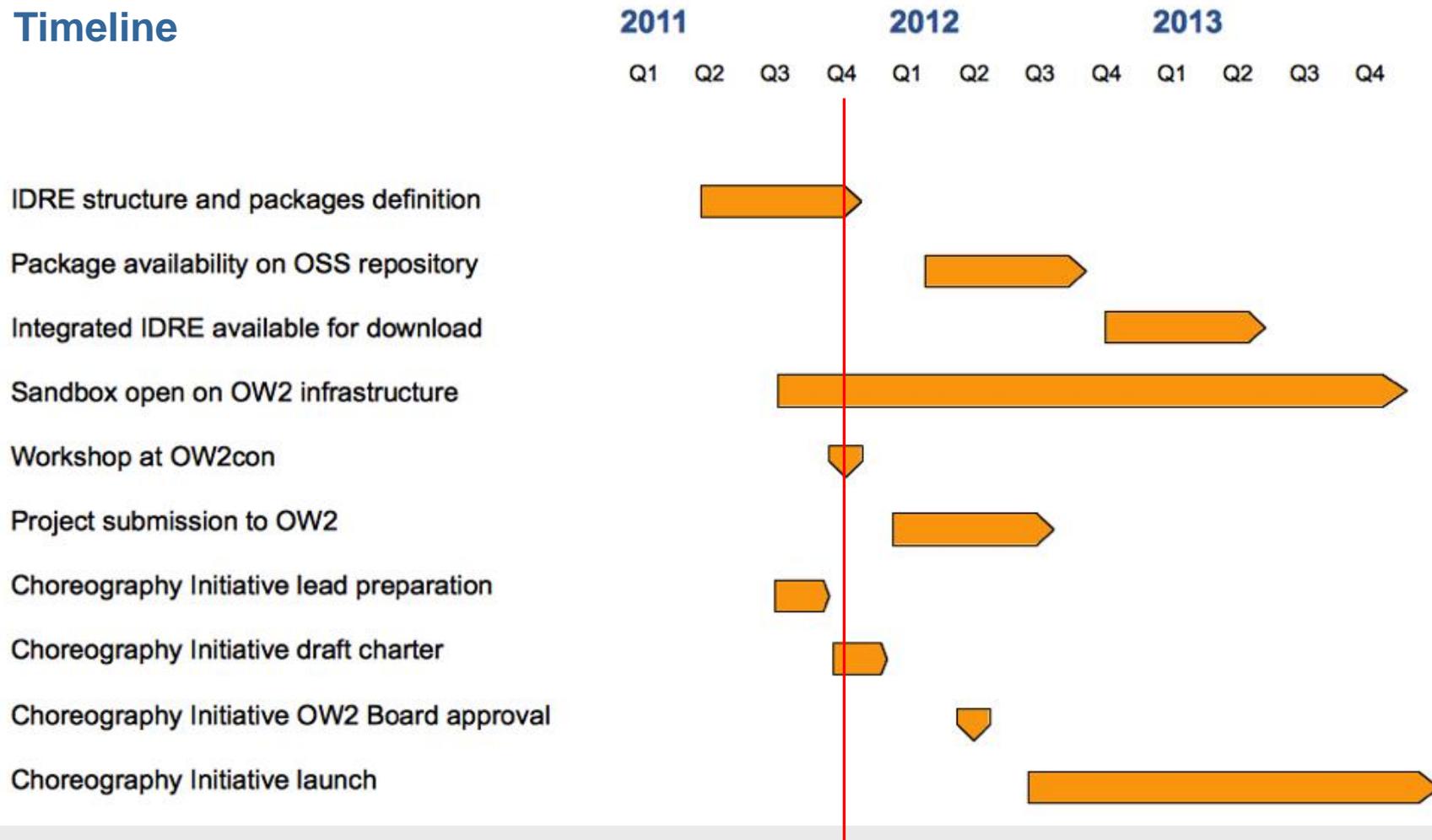
Open source stage Y2 outlook:

- ▸ **Set-up IDRE project on OW2 forge**
- ▸ **Promote software in events (exhibitions, conferences)**
- ▸ **Y3 preview:**
  - ▸ **IDRE available for download**
  - ▸ **Fast track project to "Mature" status**

Ecosystem stage Y2 outlook:

- ▸ **Launch CHOReOS-led 'Future Internet' initiative**
- ▸ **Promote initiative along with IDRE OW2 Project**

Community Building Prospects

Timeline

	2011				2012				2013			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

IDRE structure and packages definition

Package availability on OSS repository

Integrated IDRE available for download

Sandbox open on OW2 infrastructure

Workshop at OW2con

Project submission to OW2

Choreography Initiative lead preparation

Choreography Initiative draft charter

Choreography Initiative OW2 Board approval

Choreography Initiative launch

Contact

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