The CHOReOS objective is to sustain decentralized service choreographies in the Future Internet. It revisits the concept of choreography-centric service-oriented systems to introduce a dynamic development process and associated methods, tools, and middleware – referred to as CHOReOS Integrated Development and Runtime Environment (IDRE) – for the software systems that implement and coordinate the services in the Ultra Large Scale Future Internet.

**Motivation**

The Future Internet concept magnifies the required shift for Internet technologies, which should support the continuously growing scale of the converging networking world together with new generations of services made available to and brought by the broad mass of end users.

Specifically, the Future Internet introduces the following critical challenges in the context of service-oriented software development:

- Ultra large scale (ULS) on multiple dimensions such as number of services to be coordinated, wide distribution, high heterogeneity of the networked systems, high dynamics of the networked environment, and very high load
- Evolution of service-oriented software development from a mostly static to a dynamic user-centric process.

CHOReOS addresses these challenges by devising a dynamic development process, and associated methods, tools and middleware, to sustain the composition of services in the Future Internet.

**Technical Solution**

The core objective of CHOReOS is to leverage existing SOA standards, while making choreography development a fully dynamic, scalable and domain-expert centric process.
CHOReOS will implement a framework for scalable choreography development, specifically enabling the development of decentralized, compositional, adaptable, QoS-aware choreographies by domain-experts.

The key components of CHOReOS are:

- Formally grounded abstractions and models for the Future Internet of Services – CHOReOS will elaborate reference software architecture for the target choreography-based software systems, introducing abstractions for services, interaction protocols, and coordination (choreography patterns).
- Dynamic choreography-centric development process and supporting environment for the Future Internet – CHOReOS will define a model-driven process and tools enabling rigorous and systematized development, as well as requirements specifications and choreography modelling by domain experts (as opposed to IT professionals). Furthermore, they will enable synthesis of concrete adaptable, QoS-aware choreographies out of the ultra-large service base.
- Service-oriented middleware for the Future Internet – CHOReOS will implement service middleware support, effectively enabling the deployment of adaptable, QoS-aware choreographies in the ULS Future Internet. It will integrate and further evolve the latest research advances in the area of Grid and Cloud computing, Enterprise Service Bus, and pervasive computing.
- Governance and V&V for the Future Internet – CHOReOS will define concepts of governance of services and choreographies and will develop mechanisms for Verification and Validation (V&V) of adaptable, QoS-aware choreographies in the context of the ULS Future Internet. Such mechanisms will be conceived to apply model-based techniques and to extend V&V activities to run-time.

**Dissemination and Exploitation**

The artefacts produced by CHOReOS will be integrated and published as open source software via the OW2 consortium, which will help to spread the results to a wide community and enable further evolution of the CHOReOS IDRE and its specific components after the end of the CHOReOS project.

CHOReOS will also influence the evolution of existing service-related standards defined by OMG (UML, SoaML, BPMN).

Last but not least, CHOReOS innovations will be presented in major academic and industrial conferences, and its scientific and technological results will be published in conference proceedings and journals.

**From R&D to Real World Applications**

CHOReOS will be supported by the development of industrial case studies using the CHOReOS IDRE to demonstrate the added value of CHOReOS through measuring the quality of the developed systems, from both technical and socio-technical standpoints:

- The “Passenger-friendly airport” use case illustrates the use of choreographies in two contexts: a rather static but complex coordination among Air Traffic Control authorities, Airports and Airlines; and a larger and more evolving coordination among numerous airport partners including ordinary passengers.
- The “Mobile-enabled coordination of people” use case implements interaction among smartphone users who share information, which requires ULS and QoS-aware systems in terms of concurrent users, which illustrates dynamically composed choreography.
- The “Coordination of large-scale brainstormings” use case aims at creating and maintaining communities of trustable customers as well as participative workforce. Large scale choreographies play a key role to tackle this issue where several levels of behind-the-scenes coordination tasks must be performed to filter information provided by different groups of users, properly dispatch it to other groups, aggregate different information sources, etc. Such information can become a new subject of discussion for other groups, leading to a continuous circulation and therefore fostering of the overall discussion. This process may last days or weeks and is monitored and customized on-the-fly by moderators.
- The “DynaRoute” use case copes with choreographed services towards the management of a fleet of taxis in a large city such as Thessaloniki, Greece. It shows the interactions among travelers, transportation companies, and other businesses to assist citizens when travelling and utilizing location-based services. This use case will be the occasion of a real-life demonstration.