

# Orange Leverages EMCO to Guide Autonomous Vehicles



## EMCO ENABLES SMOOTH TRANSITION OF AUTONOMOUS VEHICLE MANAGEMENT APPLICATIONS FROM ONE EDGE NETWORK CLUSTER TO ANOTHER

Orange is one of the world's leading telecommunications operators with sales of 42.5 billion euros in 2021 and 137,000 employees worldwide at 30 June 2022, including 76,000 employees in France. The Group has a total customer base of 282 million customers worldwide at 30 June 2022, including 236 million mobile customers and 24 million fixed broadband customers. The Group is present in 26 countries. Orange is also a leading provider of global IT and telecommunication services to multinational companies under the brand Orange Business Services.

As part of Orange's quest to build the network of the future (underpinned by 5G and 6G broadband cellular network technologies) the company runs into challenges at the network edge required to support next generation applications.

Specifically, Orange needed a way to orchestrate efficient migration of edge applications from one Kubernetes cluster to another with a high quality of service. An example use case where efficient migration is critical is support for autonomous vehicles.

An autonomous vehicle can, of course, operate without a driver – able to independently sense its environment and move around safely with little or no human input. However, it cannot operate without continuous guidance and control from applications that reside at the network edge – applications that manage route guidance, pickup/delivery logistics, and more.

If a vehicle stays within range of a single wireless tower, its edge network applications may possibly remain on a single Kubernetes cluster from start to finish of a given route. But as each vehicle roams an entire urban region and beyond, supporting applications are required to migrate from one region to another.

Extrapolate this need to hundreds or thousands of autonomous vehicles in real-time, and the complexity of the challenge becomes clear.

The compute capacity for each region must be right-sized for all 5G/6G network applications – not just those required for autonomous vehicles – in order for network infrastructure economics to generate an appropriate return on investment.

So rapid application teardown, reconfiguration, and re-instantiation onto a new cluster is required in order to maintain seamless communications with vehicles – and to fulfill edge network duties cost-effectively.

*"Leveraging Edge for network services offers new opportunities for Orange. Enabling, hence, new orchestration capabilities for network edge services is key. EMCO, thanks to its advanced orchestration capabilities, can help Orange to address edge networking challenges and accelerate its 5G and beyond network evolution",*

**ILHEM FAJJARI, RESEARCH PROJECT LEADER, ORANGE INNOVATION**



CHALLENGE

SOLUTION

Orange researched a number of open-source Kubernetes projects and was unable to find a solution to the problem – until it discovered the Edge Multi-Cluster Orchestrator (EMCO) project. EMCO is a software framework for intent-based deployment of cloud-native applications to a set of Kubernetes clusters, spanning enterprise data centers, multiple cloud service providers and numerous edge locations. Aimed at various verticals, including telecommunication service providers, it is designed to be flexible, modular and highly scalable. However, working through design specifics for its proof of concept, Orange recognized that while the application controllers were resident within EMCO's Distributed Applications Management stack were perfect for its cluster migration needs, key functions and features were missing or incomplete.

The development team was able to creatively fill these gaps by leveraging Temporal workflows. Temporal is an open-source platform that enables developers to easily write, run, and operate fault-tolerant applications at scale. Moving autonomous vehicle control apps from one cluster to another must be done virtually transparent to vehicle operations. In order to achieve this, workflows are required to confirm an application can be re-instantiated on the target cluster, ensure that the new application instance is ready to take traffic, redirect vehicle comms traffic to this new instance and, finally, delete the application instance in the source cluster – a background process that can take a number of seconds, depending on the size of the application. Combining the power of EMCO with Temporal workflows enabled Orange to move forward successfully with its proof of concept.

BENEFITS

With over a quarter of a billion customers spread over 26 countries, Orange must stay on the cutting edge of telecommunication, broadband and IT service employment that enables businesses and consumers to thrive and prosper.

Yet, even with formidable resources, Orange recognizes that in this fast-paced, hyper-competitive world, it too must leverage open source software to achieve its vision. EMCO is a prime example – enabling Orange to successfully address a key edge networking challenge that brings autonomous vehicle management one step closer to broad deployment.

*“Working with Orange, the EMCO community stood up an adjunct repository - the Ecosystem repository - which enables developers to sandbox use case-driven POCs such as the 5G relocation POC discussed herein. The repository provides an excellent proving ground for testing real-world solutions beyond core EMCO development - but still within the community - helping to prove out capabilities, find gaps, address software defects, and funnel new requirements into the EMCO framework.”*

**BOB MONKMAN, OPEN SOURCE STRATEGIST, INTEL CORPORATION**

