# Towards a Telco-grade Orchestration for Cloud-native VNFs

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Despite the undeniable convergence of cloud and network, there are still key differences between IT and NFV (Network Function Virtualization) environments. Such fundamental differences impact the way the telco applications need to be managed. Indeed, NFV ecosystem requires novel management and orchestration techniques to achieve the required carrier grade performances.

In this context, micro services and containers are appealing candidates for implementing telco applications due to their small footprint and fast start times. The architecture of containers enables an efficient deployment of micro services. In fact, an application is deployed as a suite of small services where each one is running in its own container and communicating with lightweight mechanisms.

Several container management frameworks exist such as: i) Kubernetes, ii) Mesos, etc. However, all of them have been designed to suit IT applications. Consequently, they lack a number of mandatory features for the management and performance guarantee of telco applications. To deal with such limitations, these platforms need to be customized to close the gap with regard to NFV requirements. In this context, several features must be integrated to the aforementioned frameworks [1]:

- ***Multi-network interfaces****:* contrary to IT applications, telco workloads may require sophisticated network models to support the multi-homing with various QoS, as specified by ETSI MANO. Indeed, a VNF Component (VNFC) can be connected to different networks. The latter can belong to different planes: control, management and data. Also, they may be associated with different QoS requirements and different network isolation domains,
- ***Service function chaining****:* in a Cloud environment, IT applications are generally discrete workloads. With an NFV environment, telco applications must be configured together as a service through which traffic needs to be correctly steered. In this context, the support of multiple networks per micro service is a prerequisite for SFC and could allow a chain of containers to be managed through extra network interfaces.
- ***Data plane acceleration****:* existing container's network models are suitable for IT applications as they provide easy, reliable networking and generally good throughput. However, for telco applications, additional network properties are mandatory to ensure deterministic performances. Two complementary data plane acceleration techniques can be used: DPDK, SR-IOV,
- ***Enhanced platform awareness****:* Container management frameworks need to acquire a greater awareness of the underlying platform's capabilities. Such a feature will address issues related to resource abstraction which can negatively impact the performance of SLA critical telco applications. By doing so, telco workloads can benefit from the access to certain platform features to improve their performance or to increase the stability and the predictability of their behaviour. In this context, various compute related capacities can be cited: i) CPU pinning to avoid unpredictable latency and host CPU overcommit by dedicating CPUs to the telco containers, ii) NUMA awareness to improve the utilization of compute resources for telco containers that need to avoid cross NUMA node memory access, and iii) huge pages to accelerate the memory management by using larger page sizes,
- ***Multi-site support****:* With IT environment, applications are generally hosted in centralized datacentres. However, with NFV environment, some telco workloads must be distributed to the network edge in order to be nearer to the users, and hence minimize latency. Consequently, container management frameworks need to be extended to support the deployment and the management of telco applications across multiple datacentres, geographical locations and administrative domains while maintaining a unique control plane.

[1] https://www.youtube.com/watch?v=-nIYfh1BCAQ