NBYCOMP
NearbyComputing

NearbyOrchestrator

End-to-end Cross-Platform Edge-Cloud Orchestration

Product Overview

NearbyOrchestrator has been specifically designed for projects that require complete orchestration and life-cycle management of distributed systems and applications. These characteristics are imperative for IoT, 5G or private LTE deployments which include both edge and cloud computing as well as a wide range of compute devices and software-defined technologies. Conventional orchestrators usually do not provide this level of global end-to-end solution.

NearbyOrchestrator complies with ETSI NFV MANO, ETSI MEC and IEEE 1934-2018 (OFA) (Fog Computing reference architecture), allowing you to deploy combined services based on all three architectures.

Product description

The Edge effect…
Edge computing architectures have already proven their practical benefits by allowing network managers to:
• deploy and manage computationally intensive and low latency applications, especially voice and video analytics
• perform most operations linked to IoT networks, standardize data, run automation and download from the cloud
• dynamically manage backhaul bandwidth through adaptive deployment of edge resources based on demand (in LTE networks)
• create bridges between tenants in multi-tenant environments, breaking the silos to enable high value cross-applications, such as industrial safety or energy efficiency, which have required huge investment in integration services until now

Edge is exponential
However, as is typically the case in edge computing scenarios, managing the lifecycle of nearly three orders of magnitude more devices than a cloud deployment with a wide range of typologies means increased complexity. In addition, devices are geographically dispersed and are no longer controlled by system administrators because they are located at the site of operation. More devices, more topologies, more locations, more complexity… all imply more cost.

Edge, only economical
NearbyOrchestrator makes edge easy and efficient which in turn helps you to control your OpEx. Projects that were once considered cost prohibitive are now affordable thanks to our smart orchestration technology.

End-to-end Edge
Users set up end-to-end value-add services (VAS) via a simple and intuitive User Portal. These services are implemented via models in our abstraction layer where they can be deployed on their own or combined into complex service chains.

Moreover, these services may be integrated into an invoicing system like a BSS, for eventual pricing as required.

The NearbyOrchestrator platform provides you with:
• an orchestration tool for SDN network services
• infrastructure, Platform and Software as a service (IaaS/PaaS/SaaS) that is edge-ready or for private or public cloud locations
• an applications deployment environment in virtual containers or VMs
• deployment capacities for Functions as a Service (FaaS).
• an integrated engine for bare-metal system provisioning with over-the-air (OTA) upgrade capacity
• a Simplified Service Builder, i.e. an easy-to-use environment for defining service chains that may be deployed separately or combined for value-added or business services
• a real-time monitoring display service status and use of services in their respective layers
• an SLA manager, able to automatically react to any event and maintain SLA by re-configuring the network architecture as needed.
• in addition to all of this, the ability to meet the requirements for identity, end-to-end security, licensing control, integrated invoicing and CMMS that you would expect to find in an enterprise solution

NearbyComputing is the solution for communications network operators and businesses that need to manage networks from remote locations, including mobility systems such as transport or vehicle fleets.

Architecture Components

Dashboard

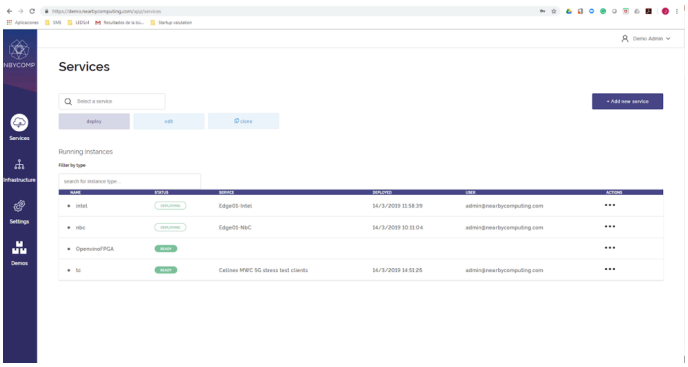
Our portal provides a user-friendly environment for creating E2E services that includes setting parameters and controlling deployment as well as monitoring operational status and operating performance in real time and over a given period of time.

Users can transparently and intuitively control execution of process on a set of links to the network, distributed systems and applications. Our environment offers users and groups complete control of access with a high degree of granularity, so that administrators can decide with total flexibility which features each user can access.

API Engine

Creating high-level E2E services requires the generation of a service-level API that can be individually activated in each instantiation. These individual services are generated in each layer in a secure environment depending on the parameters that have been set by the administrator.

The API engine is based on GraphQL technology which provides decisive power and versatility when generating an abstraction layer. It also decouples the formulation of high level business services from the control of low-level processes.



MOE·: Multilayer Orchestration Engine

NearbyComputing enables higher levels of added orchestration that multiply each of the basic component's capabilities. It enables an expanded level of orchestration that places elements,\ which usually fall outside the specifications of the standards covered on the same level of control. The power of NearbyComputing lies in instantiating and managing multi-tier services covering a range of needs in the provision, deployment and life cycle of a complex service, and in orchestrating the functionalities of the network, as well as the availability of systems and applications. This approach is particularly powerful in hybrid environments and complex configurations with multiple coordinated applications. Thanks to NearbyComputing's capabilities, customers and users can adapt the technology to the real-world situations faced in everyday operations.

Service-to-Devices Registry and Database

One of the keys to orchestration in large-scale environments is in the permanent mapping between the state of the (abstract) services and the reality of configuring all devices involved in order to run these services. This component in NearbyComputing has been specifically designed to ensure scalability, as well as to provide a simplified and transparent provisioning and onboarding of users in extraordinarily broad conditions.

NearbyComputing combines relational (MySQL) and non-relational (Couchbase) database technology to ensure speed, scalability and future adaptability to challenges. It continuously expands the scope of orchestration.

Security management

NearbyComputing offers solutions at the various levels of security related to identity, integrity and / or availability. It is a product that enables you to secure your service deployments as well as your equipment provision. This is achieved using the company's own integrated tools along with another layer of security services that are deployed in parallel to business services. They are managed using monitoring and tracking tools for security events and can perform such specific and useful functions as block access to USB ports on machines in uncontrolled environments.

Deployment Models

Architecture on two levels

NearbyOrchestrator consists of the following components:

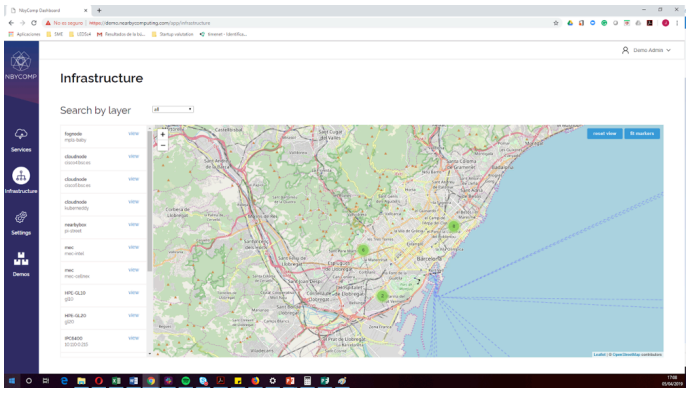
• NearbyControlPlane is the service administration center. It consists of a backend where the data resides, and the processes for the deployment and removal of services. It also has a frontend for management and monitoring that provides the status of services and nodes and allows the systems and services with advanced capabilities of service assurance to operate.

• NearbyBlocks is a small framework in each one of the orchestrated devices. Each NearbyBlock ensures operability and manages the instructions that are sent from NearbyControlPlane so that the instructions are applied. This framework also incorporates an intermediate level of control logic that allows offline operation, as well as continuous monitoring of system status as reported to the NearbyControlPlane

NearbyControlPlane deployment environments

• On-site
• Cloud CPE (Customer Premises Equipment)
• Commercial clouds: AWS, Microsoft Azure, Google Cloud Platform
• SaaS

Each environment has the same set of functionalities.



Key Components

E2E Service Orchestrator

End-to-end orchestration is a quantum leap forward for conventional NFV or SD-WAN orchestration. NearbyComputing pushes the boundaries of orchestration to automate comprehensive service provision procedures. Our reactive orchestration engine supports advanced and abstract rules that will allow you to dynamically deploy your resources where and when they are needed.

Service Creator&Manager. High availability

A graphic management interface allows you to register instances of services on the selected nodes. The operator need only provide configuration parameters to deploy the service

components. The system can monitor node status; if a node is unavailable, the system can automatically restore the service to other active nodes with available resources.

Complex Service Processing
A service is an entity with a logical sense, whatever it may be, in the field of network or systems management. Services increase efficiency in human and computing resource management in order to achieve scale and to secure procedures at controlled costs. NearbyComputing incorporates tools that allow the user to define complex services that can link an indeterminate or adaptive number of actions according to multivariate algorithms rules.

Multi-tenant Access
One key of the key design goals of NearbyComputing is to achieve a complete multi-tenant environment. Our technology guarantees being able to transparently use all the physical resources among different corporate users. Each one of the tenants can perform their deployments in a secure environment with the guarantee of auditing. In addition, the system provides gateways to exchange data and events to be able to generate concerted actions between tenants in cases that are defined as part of the orchestration of services.

Monitoring Center
NearbyControlPlane incorporates a monitoring console to show the status of systems and links for the entire managed network. The operator can build his/her own dashboard using different graphic solutions (e.g. map, network diagram, etc), prioritizing the aspects that are most relevant to their use case. At the same time, the operator can create alarm and notification systems, access logs to retrieve system event information and generally supervise each node or device in the entire network with a great deal of granularity.

Administration Manager
NearbyComputing is for organizations of any size that have a vast number of users with a wide range of roles and functions. It can be configured with complete granularity. The management environment enables the user to manage every aspect of the active license from billing scheme to accounting services, historical access and use notifications, API activations or connectors for third-party applications.

Features and Benefits

Orchestration by abstract service models	
Model-driven	Service creation is based on business rules that are specific to the application or the use case. The orchestrator dynamically reacts to the needs of the data plane.
Service chains	The services consist of low-level service templates that can be combined to form higher level use cases that can be further combined and adapt to fit business operations rules.
Data bus for coordination between tenants.	While each "tenant" application is located in its own secure environment with a service guarantee, the system has a bus or queue data to generate interactions between these applications. This way the usual limitations caused by the vertical silos are resolved and the implementation of 100% edge computing solutions is facilitated.

Multi-tenant environment	
Differentiated roles	Each tenant has its architecture of customized roles, and a single user may have different roles in each tenant environment.
RBAC	Role-Based Access Control allows you to specify permissions for individuals and groups.
AAA	All user actions are secure and follow Oauth2 approval processes, identifying and authenticating the user and ensuring that the he/she has sufficient authorization level. These processes are subject to strict traceability and accountability rules for adhering to invoicing service rules and Quality of Service (QoS) policies.

Multivendor CPE	
White Boxes	In IoT, it is common to install industrial rugged PCs for aggressive environments. NearbyComputing treats these PCs transparently and like any other node.
Vendor Agnostic	There is no dependency between the solution and the hardware that you want to integrate either at the system or the network level.
Cross-Platform	Services created using NearbyComputing can be deployed to different architecture environments, without the need to distinguish between: public cloud, datacenter, network edge, on-premise edge or IoT driver. They are all defined and managed in the same way.

Adapted to Intel RackScale Design Architectures	NearbyComputing also covers Intel Rack-Scale Design architecture based on disaggregated components. It is one of the most versatile and compact solutions for hardware available in relation to its power. It is particularly able in environments with variable demand for resources, such as video analytics at the end (edge) of the network.
OTT and non-OTT orchestration	NearbyComputing allows you to create services that work Over-The-Top, at the highest layer of network configuration without being limited by network characteristics. At the same time, depending on the deployment environment, you can also include the orchestration of network devices. This can be done through services that configure the OSI Layers 2, 3 and 4, and even operate SDN drivers.
IT asset management	NearbyControlPlane enables a search for, location and continuous follow-up of the configuration data for all computers and nodes that make up the orchestrated network. It also provides an API interface for automated data insertion in third-party asset management systems.

nZTP and automated device onboarding	
near Zero-Touch Provisioning	For mass deployments of computers in large-scale environments, NearbyComputing enables self-registration of equipment without having an installed operating system. The orchestrator fully configures this equipment automatically. This is a particularly useful function for shipped units which can renew their Over-The-Air (OTA) systems architecture without the need to return to the workshop.
Automated onboarding of newly registered devices	Once the registered devices have been provisioned, they are configured at the OS level and at the level of the applications for each tenant. This is so that they can start to operate at data level without the need for an on-site technician.
Complete integration with orchestration runtimes (Kubernetes, OpenStack, Cloud platforms...)	NearbyOrchestrator offers full integration with the most common application deployment environments. Any decision on which of them actually use will depend on the high-level services description and parameterization. In that way, the systems administrator benefits from an orchestration stack that entirely decouples the data plane from the control plane.
Support for PXE over LAN	NearbyControlPlane includes a PXE (Preboot Execution Environment) redirection service over LAN, over which PXE clients can directly obtain a system image and run it.
Extended iPXE over HTTPS	NearbyControlPlane is also available on a preboot iPXE HTTPS server for greater security. NearbyComputing offers this extended functionality which automates remote system provisioning and application deployment into a single procedure.

Topologies	
Hierarchical deployments	Our hierarchical deployment functionality increases scalability by allowing you to tailor your deployment to the exact topology of your use case. This also ensures greater security in the effective implementation of deployments because the operations do not depend on a single Master node.

Networking configurations	
Flat networks	The NearbyComputing extended orchestration system covers flat networks where all nodes are on the same plane.
Client/Server Managed VPN and S2S VPN	NearbyControlPlane can access nodes with the NearbyBlocks agent via a Virtual Private Network connection. Moreover, the orchestrator can configure the parameters of the connection, allowing users to overcome intermediate barriers such as firewalls, proxies, etc. Finally, the orchestrator allows users to connect to remote nodes via site-to-site VPN.
Integration with cloud provider VPCs	NearbyComputing covers the transparent orchestration of Virtual Private Clouds housed within Public Cloud Services

Support and Other Add-on Services

NearbyComputing provides the professional services required to implement an orchestration solution that is tailored to fit your needs. We will evaluate your current infrastructure in order to define, develop, test and deploy automated processes and services to fully satisfy your requirements. Additionally, our trainers will provide a solid foundation for users and managers so that your company can get the most out of your solution. Finally, NearbyComputing offers support and maintenance throughout the product lifecycle.

Orders and Request for Information

NearbyComputing offers a variety of software product licenses and solutions that allow you flexibility in selecting the products that make the most business sense for your company.

For on-prem products, customers may choose between installing NearbyComputing on available hardware or purchase products that have been pre-installed and pre-configured on top tier qualified hardware that is delivered with support and maintenance.

For more information, visit our website: www.nearbycomputing.com.

About NearbyComputing

NearbyComputing SL is a spin-off of the Barcelona Supercomputing Center - National Center for Supercomputing, and the Universitat Politècnica de Catalunya. We are focused on the development and implementation of advanced management solutions for computing systems in complex environments.

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