

Nearby One

for Cisco Tail-F Network Services Orchestrator (NSO)

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)

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 topologies 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.

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.

The **Nearby One for NSO solution** platform provides you with:

➤ **Software pack** that integrates northbound of NSO and enables:

- ✓ **nZTP** of edge nodes using a cloud-based OTT call-home service, including host agents
- ✓ **Service placement engine** that dynamically determines best location to run services based on real-time measured network conditions and considering end-to-end application SLAs
- ✓ **SLA manager** engine that enforces service and infrastructure SLAs based on Application, Operating System, Chassis
- ✓ **Visual service designer** to build Edge deployments (VNF and Applications) using a simplified drag-and-drop approach
- ✓ **Single pane of glass** to operate infrastructure (node lifecycle management), edge applications and NFVs.
- ✓ **UI to define automation logic** across Nearby Blocks without recompilation or code changes
- ✓ **Producer/Consumer normalized interfaces** for Nearby Blocks, enabling interoperability between applications and NFVs in an automated way
- ✓ **Operational information** of all managed components maintained in a time series database (alarms and summarized information exposed to NSO)
- ✓ **OpenID provider** to integrate OAuth as the natural way to enable the application ecosystem
- ✓ **Open:** powered by Prometheus, Grafana, NATS, and other open source technologies

➤ **NSO package** that provides automation mechanisms that extend NSO's service model to automate Nearby One services.

- ✓ **Turns NSO into an end-to-end orchestration** tool, closing the gap between the NFVO and the Edge domain orchestrator
- ✓ **Automates Nearby One service chain deployment** (Applications, NFVs) without the need for code development
- ✓ **Seamlessly integrates into NSO's CDB** to provide visibility on the configuration and operational status of edge components
- ✓ **Multi-tenancy across the entire stack**, isolating services between tenants and enabling sharing of resources on demand
- ✓ **Leverages NSO advanced mechanisms** (kickers, reactive re-deployments) to automate Nearby One services and connect them to the infrastructure status

➤ An **open catalog of Nearby One Blocks** that brings a new **ecosystem of Applications** (Video Analytics, Cloud Gaming, AR/VR, CDN) and **interfaces** (CSPs, **ETSI MEC**) into NSO. Blocks go beyond Network Element Drivers (NED) by including a set of NSO services that transform application specific YANG models into normalized interfaces for Nearby One, **enabling service chain development without coding or compiling packages**. Blocks are powered by Cisco Tail-F Conf-D to provide northbound NETCONF interfaces and by Cisco Elastic Services Controller (ESC) to manage cloud-level VIMs.

➤ **New Nearby One Blocks** can be either developed by Nearby Computing through its **professional services** offer or directly by customers using the development SDK (*available during 2021*)

Product Overview

Nearby One solution 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.

Nearby One is offered as a **standalone software** or as a **bundle** that is deployed on top of Cisco Tail-F Network Services Orchestrator.

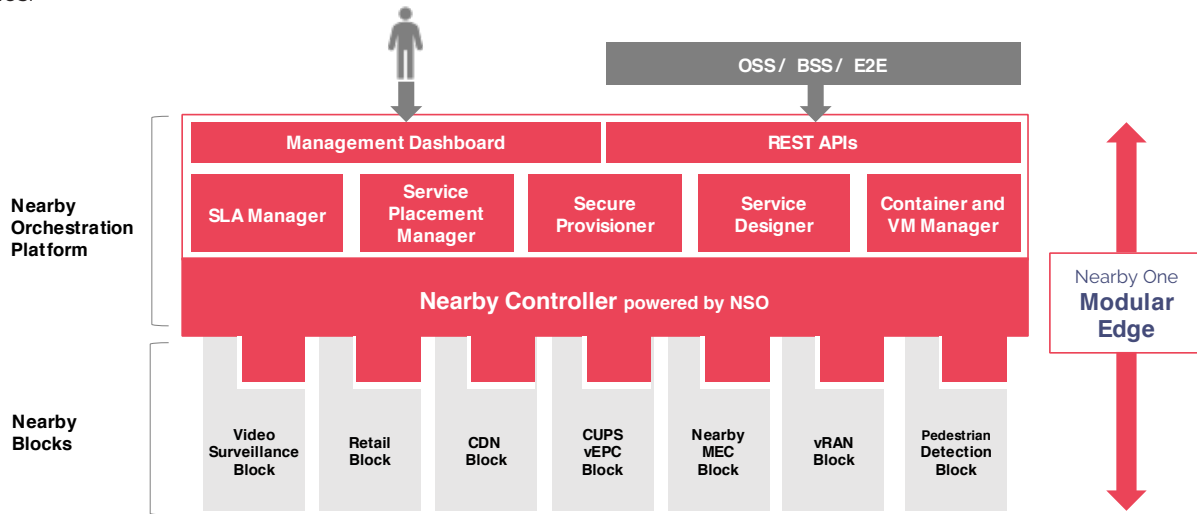
This document describes the NSO-powered version of the product.

Architecture Components

Architecture on two levels

The Nearby One solution is composed of two main elements:

- The Nearby Orchestration Platform is the main component of the solution, runs in a central location and is in charge of performing all tasks related to the orchestration of applications and infrastructure.
- The Nearby Blocks are distributed components that encapsulate logic and code for different application-specific functionalities.

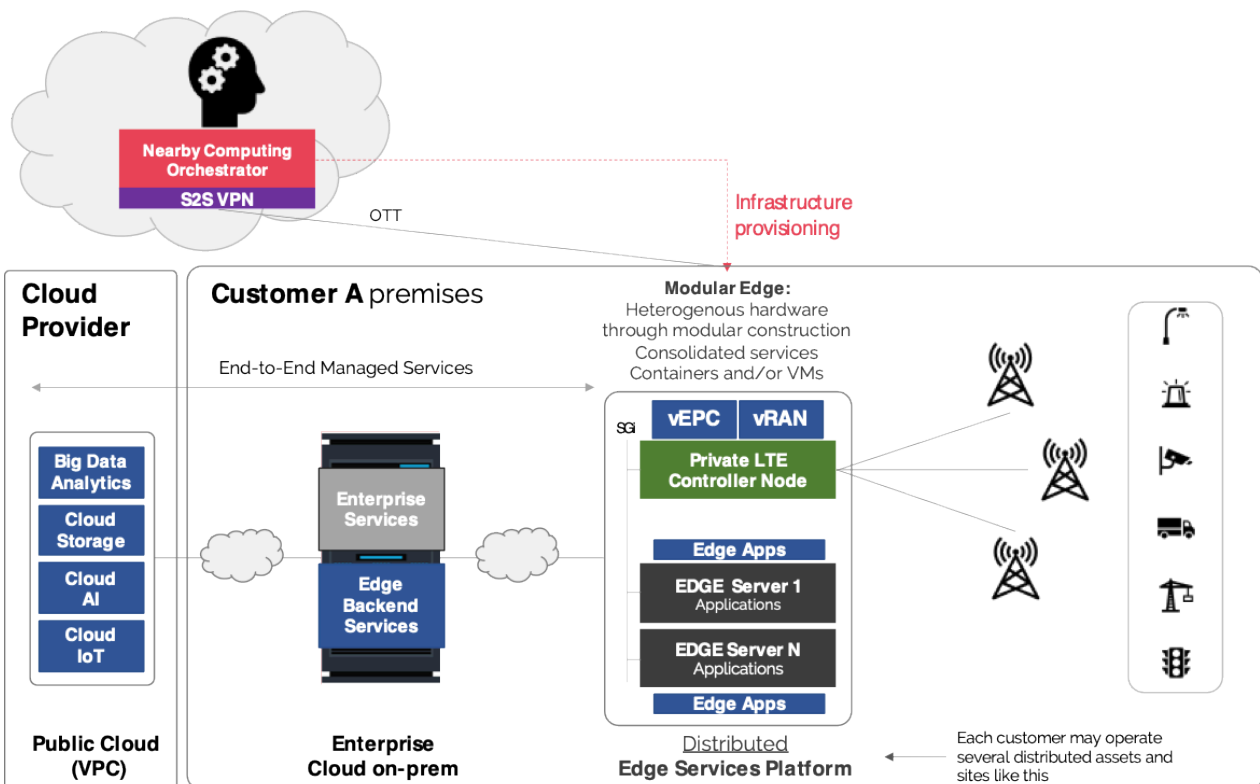


*Selection of Nearby Blocks provided only as example – each deployment

Multilayer Orchestration Engine

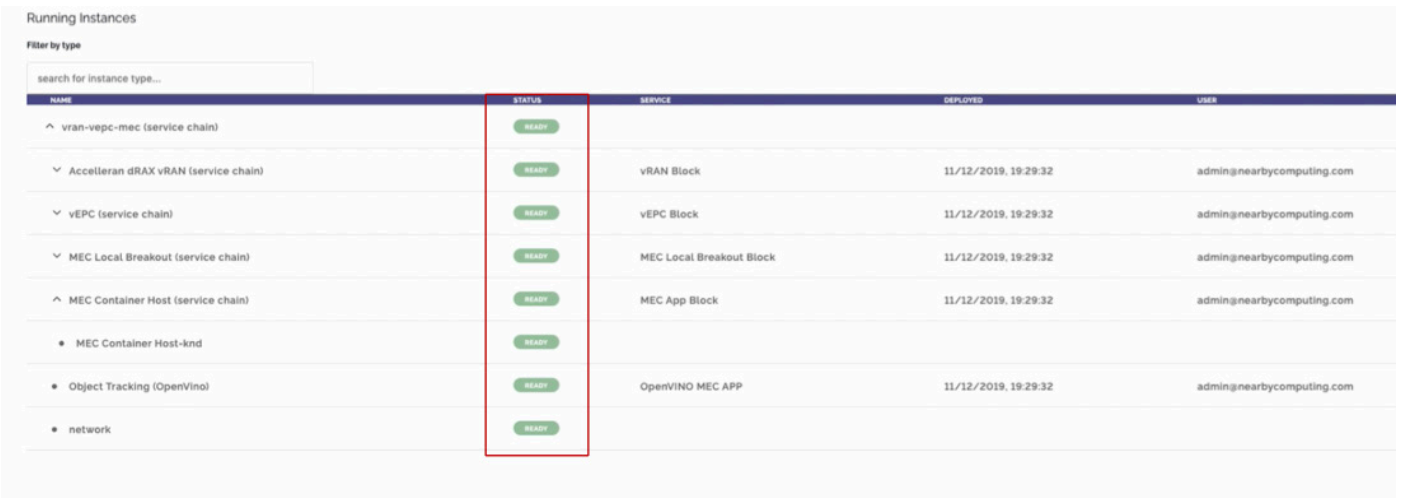
The power of Nearby One: Instantiating and managing multi-tier services, covering provision, deployment and life cycle management

Nearby One 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 Nearby One 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 the capabilities of Nearby One solution, customers and users can adapt the technology to the real-world situations faced in everyday operations.



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.



NAME	STATUS	SERVICE	DEPLOYED	USER
^ vran-vepc-mec (service chain)	READY			
^ Accelleran dRAX vRAN (service chain)	READY	vRAN Block	11/12/2019, 19:29:32	admin@nearbycomputing.com
^ vEPC (service chain)	READY	vEPC Block	11/12/2019, 19:29:32	admin@nearbycomputing.com
^ MEC Local Breakout (service chain)	READY	MEC Local Breakout Block	11/12/2019, 19:29:32	admin@nearbycomputing.com
^ MEC Container Host (service chain)	READY	MEC App Block	11/12/2019, 19:29:32	admin@nearbycomputing.com
• MEC Container Host-kind	READY			
• Object Tracking (OpenVino)	READY	OpenVINO MEC APP	11/12/2019, 19:29:32	admin@nearbycomputing.com
• network	READY			

Operational Control

All managed nodes and services are continuously monitored to assess the platform and the software performance of all components. Nearby One solution collects key performance metrics of the hardware components and aggregates them into a time series database where they can be processed and analyzed. Service KPIs are also collected at all times, and aggregated into the same time series database. Therefore, platform telemetry and service KPIs can be correlated to continuously understand the performance of the solution components and dynamically adjust resource allocation and service placement decisions. Customizable dashboards can be built on top of the operational data using Grafana, which is natively deployed as part of the Nearby Orchestration Platform.



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 Nearby One 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.

Nearby One combines relational and non-relational database technology to ensure speed, scalability and future adaptability to challenges. It continuously expands the scope of orchestration.

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.

Security management

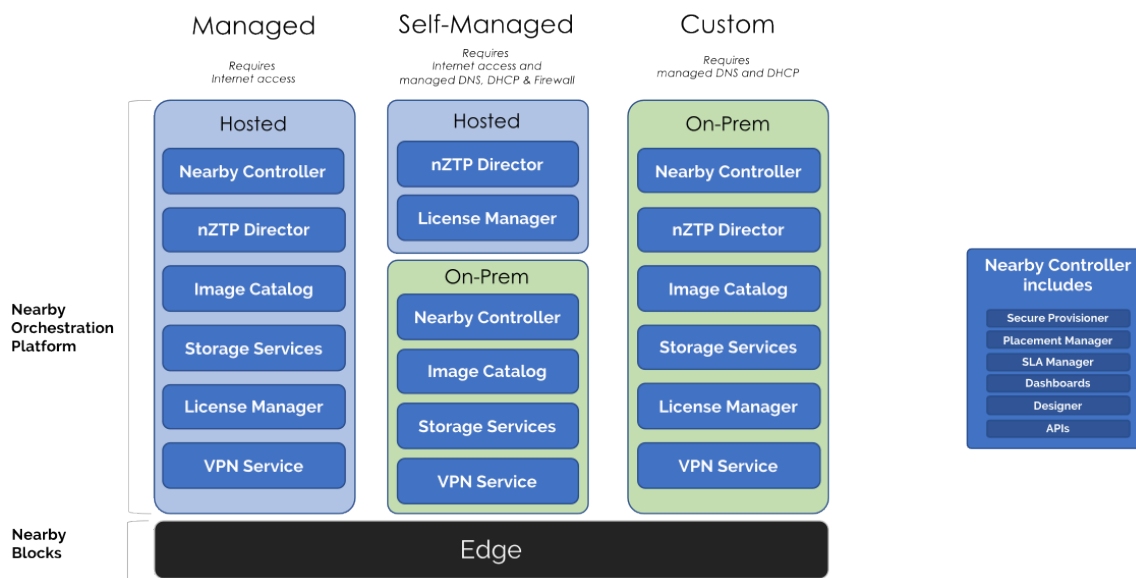
Nearby One offers solutions at the various levels of security related to identity, integrity and / or availability. It is a product that enables you to secure your service deployments as well as your equipment provision. This is achieved using the company's own integrated tools along with another layer of security services that are deployed in parallel to business services. They are mana-

ged 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

Nearby One deployment options

The Nearby One solution can be deployed as a pure cloud-managed service, where all components sit in a public or private cloud location; as a self-managed service where the customer hosts part of the key components on-premise and some node provisioning and service licensing components are hosted in the cloud; or as a fully on-premise deployment completely managed by the customer. With these approaches, Nearby One fits the needs of all types and sizes of customers.



Key Components

E2E Service Orchestrator

End-to-end orchestration is a quantum leap forward for conventional NFV or SD-WAN orchestration. Nearby One 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. Nearby One 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 Nearby One 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

Nearby One incorporates a monitoring console to show the status of systems and links for the entire managed network. The operator can build custom dashboards 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

Nearby Computing 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. Nearby Computing 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 Nearby One 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.
Ready for novel Intel acceleration technologies	Nearby One also covers Intel Edge architectures based on hardware accelerators allowing for 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	Nearby One 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	Nearby One 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, Nearby One 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.
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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...)	Nearby One 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	Nearby One 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	Nearby One is also available on a preboot iPXE HTTPS server for greater security. Nearby One 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.
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Networking configurations

Flat networks	The Nearby One extended orchestration system covers flat networks where all nodes are on the same plane.
Client/Server Managed VPN and S2S VPN	Nearby One can access managed nodes 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	Nearby One 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 Nearby One 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.

NearbyComputing, S.L.

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