

A photograph of two men on a staircase. The man on the left is a Black man in a dark blue jacket, smiling and looking at a tablet. The man on the right is a white man with glasses in a pink sweater, holding the tablet and pointing at the screen. They are both smiling and appear to be in a collaborative work environment. The background shows the metal railings of the staircase and a blurred ceiling.

Solution overview brochure

Gain service agility

HPE Service Director



Hewlett Packard
Enterprise

Benefit from HPE service modeling innovation to automate dynamic services orchestration from end-to-end and over hybrid physical and virtualized networks. Accelerate time to market and greatly reduce costs.

Revenues increase with service agility

Virtualization and cloudification are redefining the communications industry, enabling service agility, driving revenue through new services, and reducing time to market. Using these technologies, innovative communications service providers (CSPs) can create service marketplaces where users choose their offerings à la carte and deploy them instantly. This will bring together CSPs telecom and as-a-Service offerings, expanding into related industries. Competitive CSPs will:

- Shorten time to market for new services
- Make operations more flexible
- Implement network functions virtualization (NFV) for cost optimization

With Hewlett Packard Enterprise (HPE) Service Director, you can address these three business objectives. It's a single, extensible, and modular product that supports design principles including:

- A production system for dynamic services across physical network functions (PNFs) and virtual network functions (VNFs).
- Unified operations across fulfillment and assurance, enabling a closed loop.
- Functions configured through a single-service catalog. Services in the catalog are described in a service model, which combines data, relationships, and policies, reducing the need for coding.
- A common inventory between fulfillment and assurance ensures quality and accuracy.
- A single pane of glass user interface improves productivity by giving multiple stakeholders access to information—from operations to sales.

HPE Service Director architecture is built with preintegration in mind. New capabilities can be added with minimal additional configuration effort. This extensibility lets the platform grow with your needs.

HPE Service Director capabilities

HPE Service Director provides six fundamental capabilities along a single value chain as shown in Figure 1. The journey begins with agile service onboarding, a model-based design approach that enables dynamic construction of service models, its components, and relationships through service descriptors. The behavior is expressed as a set of policies that drive the business processes.

Dynamic service instantiation uses service declarations to rapidly perform service configurations and changes. Relationships of single declarations make up the full service graph. When the top service gets activated, all declared subordinated service elements have to be activated. Vice versa, if the top service of a single service elements gets deactivated, it will cause a deactivation of all related elements. This enables agility thanks to the full automation of dynamic changes: changing a single element (e.g. changing a network function type from physical to virtual) will automatically adapt the whole service graph, when needed.

The instantiated service model will automatically populate assurance, enabling service impact and root case analysis across PNF and VNF based services.

In case a service impact is detected, HPE Service Director can trigger service reconfiguration to resolve the problem: the change of a single service element, may cause adaptations in the whole service graph, enabled by the dynamic service instantiation as explained before.

Furthermore, open application program interfaces (APIs) provide flexible integration with the operational support system (OSS) ecosystem and legacy business processes. And the entire lifecycle is controlled through a role-based user experience for all stakeholders.

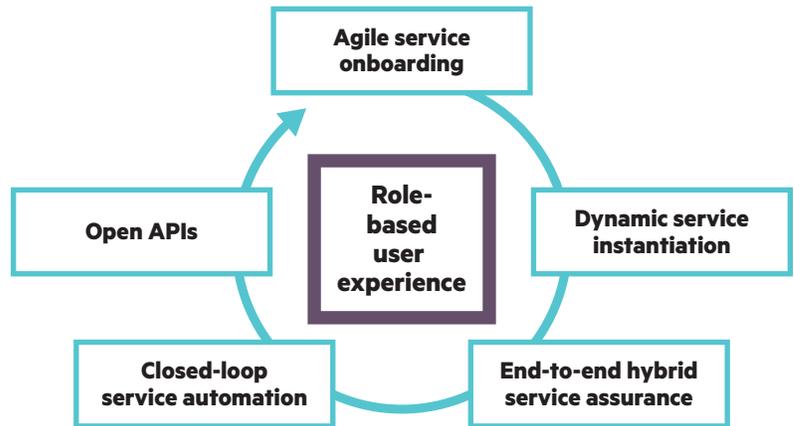


Figure 1: HPE Service Director capabilities

Single modeling language: dynamic service descriptors

HPE Service Director uses a new way to model and design services. This new dynamic service descriptor (DSD) approach replaces traditional workflow-driven orchestration, where service behavior is hardcoded into the workflows.

HPE Service Director uses a declarative language to describe the service—its relationships, behavior, and policies. The engine takes the service descriptors, retrieves the service’s current (as-is) state/configuration, and builds a run book at run time to achieve the desired state. As a result, a single service model can configure all HPE Service Director capabilities.

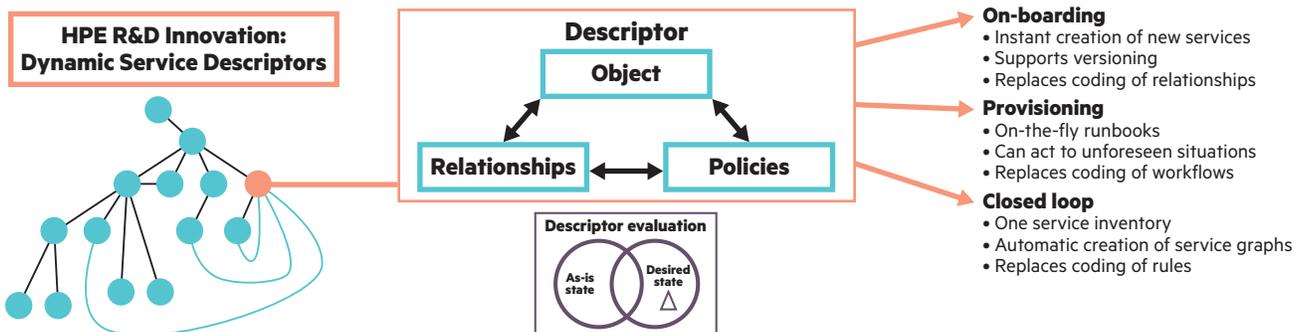


Figure 2: Dynamic Service Descriptors

The DSD language

Descriptors are written using an extension of the Heat Orchestration Template (HOT), originally developed by OpenStack. The HOT language is easy to read, building on YAML (human-readable data serialization language). As a result, DSDs can be maintained at a lower cost and without vendor lock-in, since there are no binaries. This leads to lower delivery costs and less implementation risks.

The entire behavior of an object can be described with a single descriptor. HPE Service Director is delivered with a use-case-specific generic model, which through multiple inheritances, is customized to the specific service or resource. For example, the L3 VPN model is applied to Cisco equipment.

Micro workflows

Once the engine identifies necessary changes to transform the model from the as-is state to the desired state (based on an MTOSI state model), it executes a list of micro workflows, as shown in Table 1. In this example, a running L2 service is moved from a physical customer edge (CE) router to a virtual one, resulting in a dynamically created list of micro workflows.

Table 1: Micro workflows example

LOG MESSAGE	MANAGED OBJECT	COMMENT
Deactivate Lan NS	NS	
Design Lan NS	NS	
Design vRouter (VNF)	VNF	
Design NFVI Box	NFVI Box	
Reserve NFVI Box	NFVI Box	
Provision NFVI Box	NFVI Box	Provision NFVI
Activate NFVI Box	NFVI Box	
Deactivate pBox	Phys Box	
Terminate pBox	Phys Box	
Remove pBox	Phys Box	De-provision Phys Box
Reserve vRouter (VNF)	VNF	
Reserve Lan NS	NS	
Activate vRouter (VNF)	VNF	Deploys VNF
Activate Lan NS (connect)	NS	

Micro workflows are used as an atomic layer, for example, to issue an individual command to network elements—while descriptors are used on a molecular layer to combine other descriptors or workflows.

The impact of DSD

Using the DSD approach has a profound impact. With it, service onboarding is faster, and the product manager can rebundle products while considering complex product behavior. This affects the number of jeopardies and delivery costs. Even complex reengineering processes—replacing network equipment at runtime—ares possible with minimal effort.

This policy-based approach has many advantages. For example, a service chain with 4 VNFs—vServices Router, vWAN Accelerator, vWAN Optimization, and a vSecurity Gateway—has 24 possible service chain permutations. A scripted approach would require 24 process scripts. In contrast, only four descriptors are required with the DSD approach. So, operational expenses are reduced.

DSDs are used to describe the service models for fulfillment and assurance. This unique ability is one reason for the strength of the HPE Service Director approach.

A move to an NFV OSS

The last two years show an important evolution in the way resources and services are managed and orchestrated.

Evolution of resource orchestration

Management of the NFV infrastructure is defined by the ETSI-MANO architecture. Over the last two years, NFV infrastructure has progressed from a single-use, single-site virtualized infrastructure manager (VIM) setup to virtual data centers (VDCs). These VDCs share the infrastructure between several tenants across multiple locations, providing the appropriate management capabilities.

Evolution of service orchestration

Two types of services can be identified, deployed on top of NFV: carrier network services and dynamic customer services.

Carrier network services have a stable footprint and low rate of change. Once set up, their configuration changes slowly. They need to be highly elastic—able to adapt to changing loads. So, scaling is very important. Typical examples of these carrier network services include vEPC, vIMS, or vCDN.

Dynamic customer services, conversely, are highly individual and often configured on a per-user basis. They change continuously and run over heterogeneous network infrastructures on PNF and VNF. Typical examples include virtualized customer premises equipment (vCPE), enterprise VPNs, or user services running on top of an SDN. As the individual user service is often deployed onto individual virtual machines (VMs), elasticity is less important.

Important factors to consider

For the foreseeable future, the network infrastructure will remain in a hybrid state: a mix of traditional networks (physical) and virtualized (NFV-enabled) infrastructures. The same challenges exist for the operations domain, where orchestration and traditional OSS systems will co-exist.

CSPs are moving away from mass rollouts to a “fast-fail” methodology, made popular by over-the-top (OTT) players. This methodology consists of rapid prototyping of alpha services, which then are run in beta trials with selected customer bases. Depending on failures and first feedback, the services are changed and adapted on the fly. Finally, if considered stable and profitable enough, they are brought into mass production. This new way of service design will be prevalent for dynamic services in particular. The classic OSS is not designed for this mode of operation, which is another reason why status quo is not feasible for CSPs.

HPE addresses challenges

The HPE NFV-OSS architecture covers all aspects of the evolution in resource and service orchestration as described above. This is summarized in Table 2.

Table 2: Resource and service orchestration

FUNCTION	PRODUCT	FEATURES
Resource orchestration	HPE NFV Director	Implements management of VDCs, NFV orchestration, and virtual network function manager (VNFM) functionality as defined by ETSI MANO standards. This includes closed-loop NFV assurance and fulfillment, for example, to automate elasticity.
Service orchestration	HPE Service Director	Provides end-to-end service management, configuring telecommunications services across PNF and VNF. Supports fast-fail methodology and a closed loop, for example, for automated service re-configuration to resolve problems.

In addition to the HPE OSS Orchestration products, the existing HPE OSS and Data Center Management portfolio manages physical resources today, with the HPE Unified OSS Console solution providing a common user interface across all components.

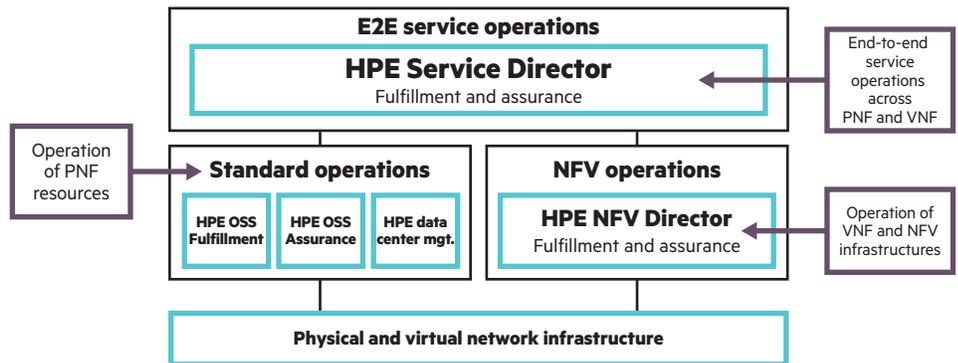


Figure 3: HPE OSS portfolio for hybrid operations

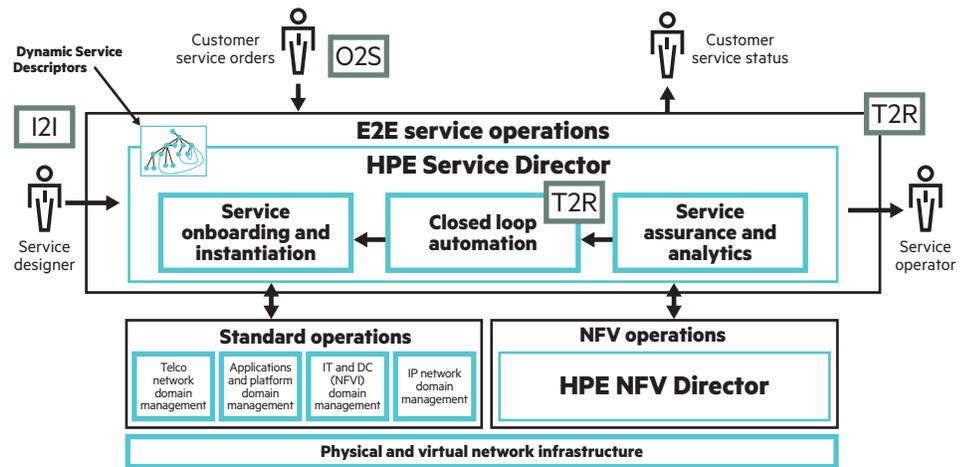


Figure 4: HPE Service Director architecture

HPE Service Director key processes

Four essential operations processes are supported by HPE Service Director as indicated in Figure 4:

The **Idea2Implementation (I2I)** process defines new services and on-boards them into the catalogs, ready for instantiation. The process comprises the definition and onboarding of services, using logical, virtual, and physical resources. While the service provider focuses on development of new services, network equipment vendors take care of the network functions themselves. So, a VNF description may be delivered with the VNF from the vendor, and used by HPE NFV Director, while the service description, using this VNF, will be defined by the service provider in HPE Service Director.

The **Plan2Provision (P2P)** process sets up resources that must exist before the first order comes in. This process is similar to the Operations Support & Readiness (OS&R) process grouping in the TM Forum eTOM standards. In particular, this involves the classic (PNF) and NFV infrastructures. For OS&R, this includes entire platforms, such as IP Multimedia Subsystem (IMS) and Evolved Packet Core (EPC). With NFV, such platforms become a kind of “Resource as a Service.” The process can be described with the Order2Service process (covered in the next paragraph), but is initiated by the provider, not by the customer.

The **Order2Service (O2S)** process receives orders to instantiate a new service. These can originate from a customer, such as a CPE, or internally, for example, an EPC or IMS. The process performs the decomposition or services, requests the creation of PNF and VNF from subordinated provisioning systems and NFVO, and configures the services on top of the PNF and VNFs. It also sets up monitoring, impact analysis, and correlation.

The **Trouble2Resolution (T2R)** process addresses problem detection and healing. Problem detection consists of collecting events and KPIs from subordinated systems and network functions, and performing service impact analysis due to automatic provisioning of the service graph into the assurance system. The operator is informed about the problem (“open loop”) or the service resolution is automated (“closed loop”) and triggers a healing process. In the simplest case, a scale-up or scale-out action resolves the problem through a request to HPE NFV Director, or a change of service parameters is triggered, which is automatically executed by the dynamic descriptor engine.

Service Director use cases

An HPE Service Director use case implements capabilities for a selected service domain, such as vCPE or mobile broadband. A use case consists of a core model (COTS) and an asset library. Use cases are defined by the following four components:

- HPE Service Director version, for example, HPE Service Director 1.0
- Core capability, such as “Provisioning” and “Closed loop”
- Use case core model version, which comes with a use case asset library kit
- A Service Director use case core model—delivered, supported, and maintained solely by HPE

Use case components

HPE Service Director is always sold in conjunction with a use case, which defines:

- The licensing agreement (License-To-Use)
- Use case core model including best practice prebuilt models of services and resources
- Other assets useful for customer-specific adaptation of Service Director, as summarized in the asset library

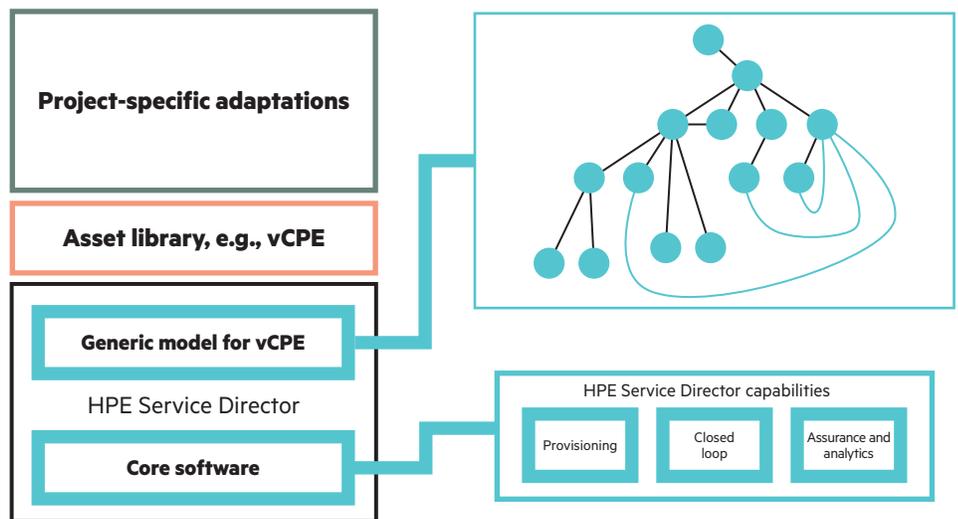


Figure 5: HPE Service Director use cases approach

Licensing model

HPE Service Director is licensed based on usage (capacity). Capacity parameters are use-case specific, for example, the number of service instances or subscribers. Service Director does not implement license enforcement.

Generic model

This is a use case-specific model based on Hewlett Packard Enterprise best practices and includes use case DSDs and documentation of the model. You can further customize it through inheritance. The model is versioned, letting you update the underlying platform without impacting running applications.

Asset library

The asset library provides assets for specific equipment, which you can adapt and extend. Asset library components are sold on top of the use case.

Use case extensions

Customization or specialization can only happen through inheritance of DSDs provided by HPE. These new DSDs can be modified, enhanced, or overwritten. The use case is designed for adaptation so you can customize parts of it to fit your needs. The use case includes a starter kit, letting you make adaptations, such as:

- Specific service offerings or extensions—cloud breakout, for example
- VNF integrations for provisioning or configuration, or specific for assurance, such as KPIs or auto-healing
- Specific network function integrations, for example, taking a generic firewall descriptor and extending it to the specific requirements of a vendor's system

Benefits of the use case approach

With a use case approach, you get:

- Capacity-based licensing model that fits your business case
- Faster time to market through significantly shortened delivery time
- Reduction of complexity by leveraging industry best practices
- Asset library that provides model assets for specific equipment that can be adapted or extended
- Platforms that can be extended with multiple use cases

A new way of delivery

The Service Director approach—DSD in particular—enables you to change the deployment model from a waterfall approach to SCRUM project delivery methodology.

This method develops the system in iterations called sprints. The team includes all stakeholders: product managers defining business requirements, network engineering, NFV engineering, orchestration, and business support systems teams. Regular meetings handle operational and technical issues. Sprint planning meetings and review meetings ensure progress within expectations.

The benefits of an agile delivery approach include:

- Concurrent delivery provides immediate feedback
- Collaboration through well-defined roles
- Four-week iterations for network function rollout
- Small, mixed teams composed of HPE and your stakeholders
- True configuration reduces development and testing efforts, decreasing IT dependency
- Implicit knowledge management by storing tacit know-how
- A true library approach through composition, reuse, and inheritance
- Fewer errors with reduced, unnecessary workflows; less coding leads to less exception handling
- Migration, or versioning, is built in and enables continuous integration/continuous delivery (CICD)

A leader in OSS

As the trusted partner for OSS transformation, Hewlett Packard Enterprise has many years of consulting experience to offer you. We gained our insights from small-to-large and complex OSS transformation projects from around the world. Our expertise includes industry-leading solutions, mature deployment methodologies, and highly experienced delivery teams.

HPE is an active member of the TM Forum, helping drive development and adoption of TM Forum Framework standards. We are equally active with the Information Technology Infrastructure Library (ITIL) and are the only technology vendor to author one of the five ITIL V3 core books. In addition, HPE authored the ITIL glossary and built the overarching process maps for the new library.

With this rich experience, HPE brings the best to our consulting and product development. An active participation in TM Forum, ITIL, and other bodies helps ensure HPE solutions are closely aligned with the industry's direction, so investments you make today will continue to pay off long into the future.

The HPE OSS solution is:

- Built on more than 25 years of deep and broad OSS experience
- Successful in more than 500 client deployments worldwide
- Backed by a portfolio of more than 300 field-proven best practices

Further, the HPE OSS solution:

- Integrates OSS capabilities from Hewlett Packard Enterprise and solution partners
- Gives you access to 10,000 HPE Services personnel available in more than 170 countries
- Enables fast deployment with minimal disruption to existing operations, together with HPE global delivery and integration teams
- Gives you the peace of mind that comes with local experts based near you who speak your language

And, we offer a variety of financing and operating approaches for OSS, depending on your individual needs.

HPE Services

HPE Communications & Media Solutions (CMS) Services offers a proven path to navigating your transformational journey:

- HPE Solution Consulting Services helps define business transformation and translate strategies into actionable solutions.
- HPE Solution Implementation Services offers a low-risk project lifecycle across design, development, customization, and network and system integration.
- HPE Solutions Management Services increases the operational efficiency of your existing solutions, including reactive, proactive, operational, and enhancement management services.
- HPE Outsourcing Services offers a variety of sourcing options—including IT and infrastructure outsourcing, application management, and business process outsourcing—designed to improve business agility while reducing your operational expenses.

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