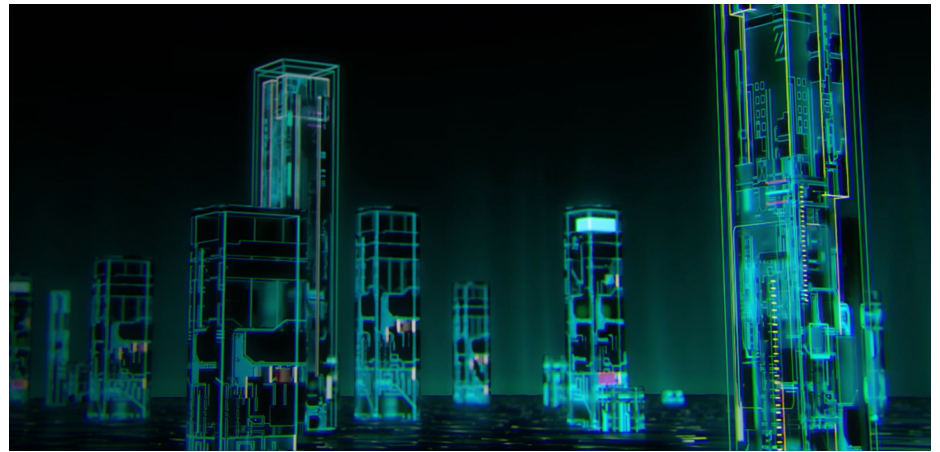




# HPE SERVICE DIRECTOR

Zero-touch Orchestration for physical and virtualized environments



## EVERYTHING IS A SERVICE

As the Digital Transformation is reshaping the Communications, Media, and Entertainment landscape, the dynamicity and agility required in a world where “Everything is a Service” introduces operational challenges to the Digital Service Provider:

- Existing OSS/BSS systems are not coping with the agility of bringing new services to the market
- Increased Scalability requirements necessitates an optimization of operations for hybrid and virtualized environments
- Zero-touch automation is required for coping with complexity and dynamicity in a multi-domain, multi-technology environment
- Digital Service offerings necessitates a seamless orchestration of Connectivity, Compute, Application functions, and Virtualized Network Functions

HPE Service Director is the solution for zero-touch orchestration across physical and virtualized network environments optimizing the operational process across Connectivity, Compute, Application functions, and Virtualized Network Functions.

HPE Service Director provides an intent-based solution that models services, its components, the relationships, and policies to orchestrate the business processes and the complete service lifecycle across hybrid environments.

## HPE SERVICE DIRECTOR FEATURE SUMMARY

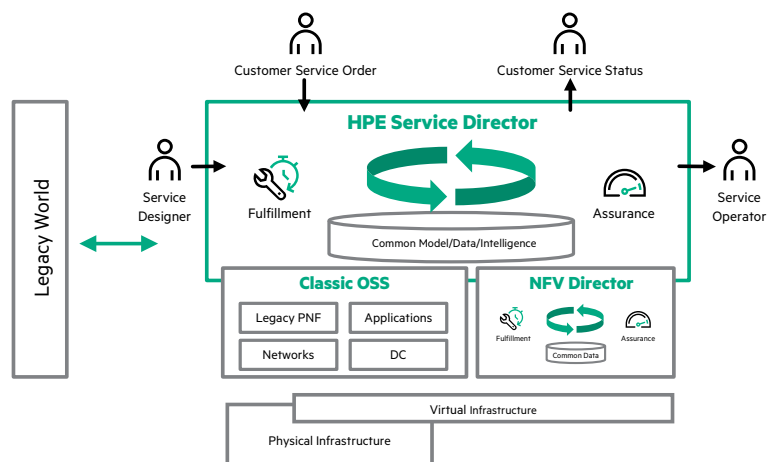
<b>Service Orchestration</b>	<ul style="list-style-type: none"> <li>• Intent-based modeling of Services, its Components, Relationships, and Policies for dynamic orchestration of services taking always the current network environment into account</li> <li>• One Common Catalog model allowing Unified Operations across Provisioning and Closed-Loop</li> <li>• Orchestrates End-to-End Services across physical and hybrid environments</li> <li>• Supports both simple and composite/nested service instantiation</li> <li>• Supports complete Service Lifecycle Management operations</li> <li>• Provides Runtime Service Catalog</li> <li>• Supports Cross Domain Orchestration</li> <li>• Supports Orchestration of Shared Services</li> <li>• Provides log information in machine readable format</li> <li>• Provides a unified REST API for Catalog Management, Service- and Order Management, and Closed-Loop for integration with OSS and BSS landscape</li> <li>• Act as “Orchestrator of Orchestrators” to orchestrate multiple domain orchestrators</li> </ul>
<b>Zero-touch Provisioning</b>	<ul style="list-style-type: none"> <li>• For every Service Request, the declarative Model Engine computes impacted service components across complete model and creates the runbook at runtime</li> <li>• Supports Bulk Operations on large number of services</li> <li>• Supports transactional model (based on MTOSI), retries and roll-back</li> <li>• Supports integration of manual tasks</li> <li>• Supports timed triggers</li> <li>• Supports plug-in Adapter Framework including OpenAPI, REST, YANG, SOAP, CLI for south-bound integration with hybrid networks</li> </ul>
<b>Closed-Loop</b>	<ul style="list-style-type: none"> <li>• One model drives zero-touch provisioning and fully automated healing actions to close the loop</li> <li>• The declarative model describes the Service Health Monitoring Indicators and the dependencies of service components required for Service Impact Analysis</li> <li>• The core engine of HPE Service Director configures the required monitoring components in the network and sets up a collection layer based on KAFKA for receiving qualified Service events, leveraging existing Assurance ecosystems</li> <li>• Supports SNMP</li> <li>• Provides GUI for impact analysis and operator controlled testing and healing action execution (“Open-Loop”)</li> </ul>
<b>Service Order Management</b>	<ul style="list-style-type: none"> <li>• Provides TMF641 Service Ordering REST API</li> <li>• Provides order management model as jump-start</li> <li>• Supports modeling of manual tasks</li> <li>• Supports long waits</li> <li>• Supports Jeopardy Management</li> </ul>
<b>User Interface</b>	<ul style="list-style-type: none"> <li>• Browser-based User Interface complying with accessibility standards (WCAG 2.1)</li> <li>• Single pane-of-glass to manage complete service lifecycle</li> <li>• Tree view and tabular view to browse complete Service Instance Inventory</li> <li>• Dashboard Views with drill-down functionality</li> <li>• Supports SSO based on SAML</li> <li>• Supports personalization and allows customer adaptations and extensions</li> </ul>
<b>Secure, Reliable, and Resilient solution</b>	<ul style="list-style-type: none"> <li>• Microservices based platform architecture</li> <li>• All components are state-less and support container deployment using Docker, Kubernetes, and Helm Charts</li> <li>• Secured interfaces and APIs—supports https with TLS 1.2</li> <li>• Role-based Access Control for tenants and accounts on UI level as well as API level</li> <li>• All API actions are logged in Service Order Registry</li> <li>• Supports Load-balancing</li> <li>• Supports self-monitoring and High Availability</li> <li>• Supports Geo-redundancy architecture across multiple sites separated by large geographical</li> </ul>



## SERVICE DIRECTOR OVERVIEW

HPE Service Director is a zero-touch orchestration solution for orchestrating services across multi-domains and hybrid environments. It is completely intent-model driven and covers the complete service lifecycle combining Fulfillment and Assurance to provide fully automated Closed-Loop capabilities. It provides fully documented Open REST APIs for interaction with the OSS and BSS landscape. The browser-based GUI gives Operations the ability to manage the complete lifecycle of Services, including Dashboard Views and drill-down functionalities for troubleshooting.

Service Director in addition provides a Service Order Management (SOM) capability, leveraging intent-based modelling for Order Management, combining the intelligence of its internal descriptive engine for massive parallel order executions in addition with manual interactions, long transactions, retry, and roll-back abilities.



**FIGURE 1.** HPE Service Director End-to-End Orchestration for hybrid environments

## SERVICE DIRECTOR—KEY FEATURES

### Zero-touch provisioning

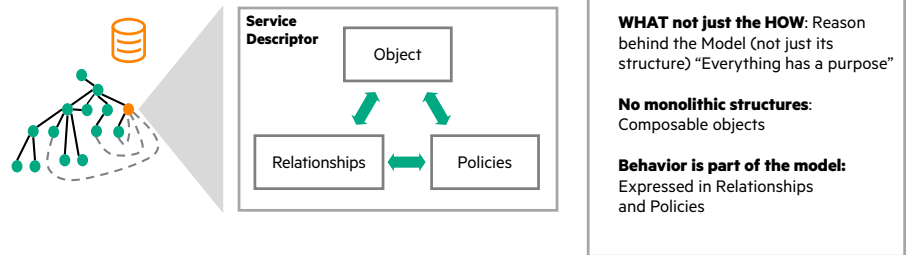
HPE Service Director is built around an intelligent engine, the Dynamic Descriptor Engine. It orchestrates end-to-end services using intent-based service catalogs and driven by incoming service lifecycle requests (create, modify, tear-down). The engine dynamically derives the impacted components and generates an infrastructure specific run-book on the fly, taken the current service instances and network environment into account. Efficient execution of the run-book implements the required changes in the network to provide the requested services in the desired manner.

### Model-driven

Instead of coding specific flows and exception handling procedures, HPE Service Director is completely Model-driven, using an intent-based modeling notation called Dynamic Service Descriptors (based on HEAT Orchestration templates) to model the services, service components, its relationships and the required policies to ensure proper service stitching. Making use of multiple inheritance, the Model-driven approach of HPE Service Director allows to compose complex service models out of service building blocks, tremendously reducing time-to-market by re-using proven and flexible service components.



**Dynamic Service Descriptors**



**FIGURE 2.** Intent-based Models drive zero-touch operations

In order to capture the intent of a service instead of only defining its structure, incorporating policies and the relationship between services into the same model is key for driving the intelligent orchestration of services across dynamically changing network environments.

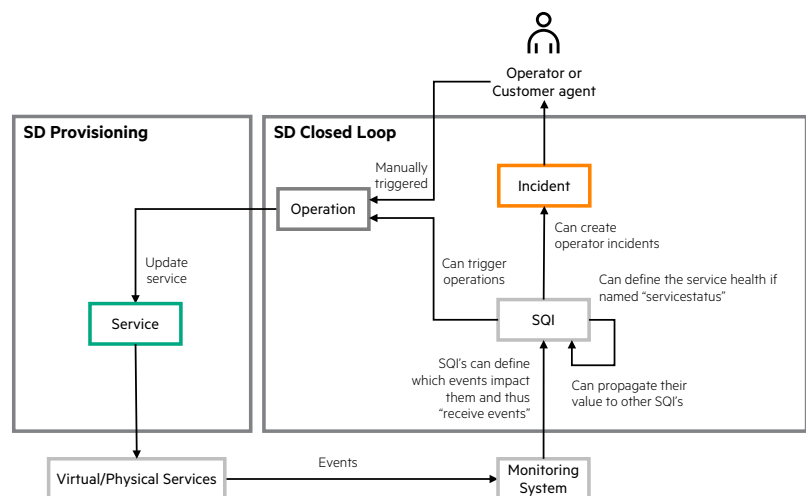
On top of typical policies based on relationships such as reference and containment, HPE Service director also supports more complex policies and containment policies also more complex policies where a certain function will be called during execution to retrieve a parameter value or policy decision on-the-fly. In addition, the Orchestrator also supports definition of placement policies or business policies as dedicated service objects to be executed in the overall orchestration flow.

**Fully automated Closed-Loop**

HPE Service Director leverages the same declarative model for setting up the service to also specify the required Service Health Indicators and dependencies for doing the Service Impact analysis.

The core engine will derive from the model the information necessary for configuring Service Health Monitors in the network leveraging the existing Assurance ecosystem.

In addition, the Closed-Loop provides a collection environment based on Kafka to collect qualified service events to calculate the service impact and decide on possible healing actions that get executed through the core engine as modifications to impacted service instances. It also allows to involve Operators to drive the healing cycle by deciding on which actions to take.



**FIGURE 3.** SD Closed-Loop Monitoring and Fast Recovery



**Service Order Management**

HPE Service Director provides as additional capability a complete Service Order Management solution. It adds the means for adding long transactions and manual tasks during the design phase, and the engine has been extended with means to execute Jeopardy Management for Orders in long wait states.

In order to ease the integration, HPE Service Director additionally offers a certified implementation of the TMF 641 Service Ordering REST API to allow third-party applications such as CRM solutions to use TMF 641 as the north-bound input to provide Order requests following the standard order lifecycle (create, modify, delete).

**Cloud-native application**

HPE Service Director architecture is based on stateless microservices allowing for distributed deployment of its components and independent scalability. The application also supports deployment in a container environment, e.g. using Docker. In addition, it supports Kubernetes and Helm charts for automatic deployment, scaling and management of the application.

**AGILITY IS KEY FOR DIGITAL SERVICES TRANSFORMATION**

HPE Service Director has been developed as a true fail-fast system. The onboarding and modeling process supports concurrent delivery. Well-defined roles enable efficient collaboration in agile teams. Immediate feedback significantly shortens the release cycles. New network functions can be rolled-out in weeks instead of months.

As the intent-based modeling approach allows to re-use service components already modeled and stored in the service catalog by composition, and in addition also introduces multiple inheritance in the model to leverage proven service components, this leads to fewer errors while eliminating unnecessary workflows with less exception handling to significantly reduce overall complexity leading to much faster time-to-market.

HPE Service Director also has a proven track record of successful integration into customers CI/CD chains driving increased agility on our customers side.

**TABLE 1.** Accelerate Service Innovation with HPE Service Director Intent-based modeling

Service automation process	Classic	HPE SD
Service onboarding	Months	Weeks
Dynamic service chain creation	Months	Hours
Instantiation of complex services covering multiple service building blocks	Weeks	Minutes
Service offer migration	>1 year	~ 2–3 months



## SOFTWARE PRE-REQUISITES

Software	Version
Operating system	Linux® RHEL 7.x Or CentOS 7.x
Database	EnterpriseDB PPAS 11.4 Or Oracle 12.2c/18c/19c
Java	OpenJDK 11.x or later, 64-bit
Kafka (for Closed-Loop)	2.2

HPE Service Director also uses following Open Source components which are not shipped as part of the product and need to be directly downloaded (details available in Install guide)

Software	Version
Apache CouchDB	2.3.x
Node.JS	12.x
Redis	5.x

## OPTIONAL SOFTWARE

The following software is not mandatory but recommended for operational readiness of HPE Service Director.

Software	Version
Elastic ELK	7.0.1
Kubernetes	1.17.x/1.18.x
Prometheus	2.2.1



## COMMUNICATIONS AND MEDIA SOLUTIONS, HEWLETT PACKARD ENTERPRISE

Communications and Media Solutions is the business unit at HPE that provides vertical solutions to the communications and media industry. With over 30 years of experience in the industry, we have over 50 solutions and over 1500 active contracts, with more than 300 telco customers in 160 countries. We provide software and services capabilities to enable your digital transformation, automate your operations, and help you grow your business with innovative cloud-native network solutions and digital, 5G-ready services.

### ABOUT HEWLETT PACKARD ENTERPRISE

Hewlett Packard Enterprise is the global edge-to-cloud platform-as-a-service company that helps organizations accelerate outcomes by unlocking value from all of their data, everywhere. Built on decades of reimagining the future and innovating to advance the way people live and work, HPE delivers unique, open and intelligent technology solutions, with a consistent experience across all clouds and edges, to help customers develop new business models, engage in new ways, and increase operational performance.

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