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Oracle Communications Unified Inventory Management

Oracle Communications Unified Inventory Management (UIM) is an open, standards-based, cloud-native application that provides an intelligent inventory of communications services and resources – from 5G to Fiber – across physical and virtual network technologies.

Unified Inventory Management context within Oracle's Unified Inventory and Topology solution

UIM is a key component within Oracle's Unified Inventory and Topology solution, shown below. This solution provides holistic service, network and resource visibility across diverse network technologies, generations, and domains. Such accurate, real-time views support automated orchestration and assurance.
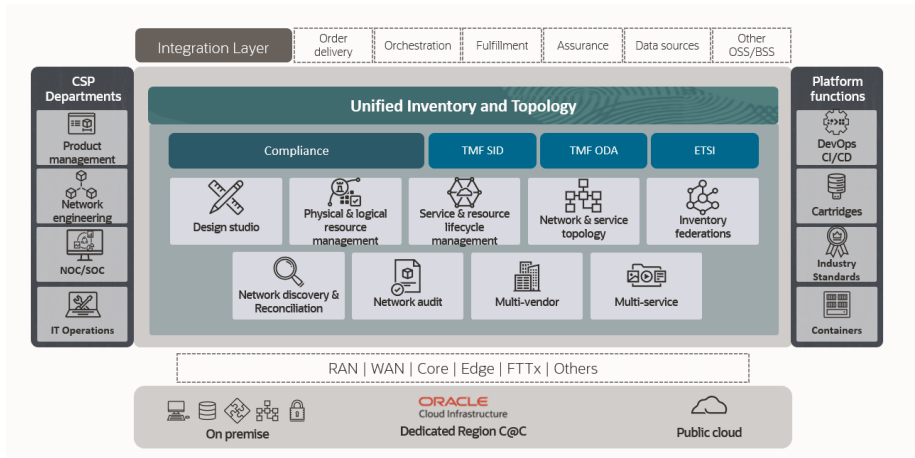

Image 1. UIM context within Oracle's Unified Inventory and Topology solution.

Introduction to UIM

UIM itself is an open, standards-based, cloud-native application that provides an intelligent inventory of communications services and resources. Its flexible, extensible architecture enables rapid design and delivery of customer-centric services and management of current and next-gen resources and technologies. UIM cost-effectively addresses wholesale and discrete inventory needs across the enterprise through its inventory federation framework and pre-built support for multiple service and technology domains. In short, UIM:

- Enables rapid introduction of current and next-generation services and technologies inc. 5G, Fiber, Carrier Ethernet, etc.

Key benefits

- Enables rapid introduction of current and next-generation services and technologies inc. 5G, Fiber, Carrier Ethernet, etc.

- Facilitates faster time to revenue through pre-built support for complex next-generation services and TMF certified Open APIs

- Enables rapid deployment with existing inventories through flexible inventory federation

- Is pre-integrated with complementary Oracle applications for faster solution deployment

- Supports both physical and virtualized resources and network services

- Simplifies IT deployment through use of common technologies with complementary Oracle applications

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UIM'S role within CSP processes

Through integration with other Oracle Communications applications and third-party systems, UIM drives and / or supports several vital CSP processes, including:

Service fulfillment and orchestration

- UIM enables the definition & lifecycle management of services, resources, and identifiers

- During the service fulfillment process, in tandem with Oracle Communications Order and Service Management (OSM) UIM automatically instantiates and tracks the customer facing services (CFSs) and creates the constituent resource facing services (RFSs) and resources during the service design and assign step

- UIM also integrates with service monitoring / service assurance components within the broader fulfillment and assurance solution to support closed loop operation that can dynamically adjust network inventory capacity or QoS to varying customer or traffic demand

Customer order capture

- UIM manages requests for service feasibility, service qualification and service reservations during the pre-order / order capture process (e.g., telephone number, VLAN IDs, etc.)

- UIM supports high volumes of queries, reservations, and assignment of resources (e.g., telephone numbers) to services

Network planning, network design and build

- UIM supports the definition, planning and readiness of network infrastructure – both physical and virtual – in conjunction with underlying network orchestrators and controllers where present

- UIM provides the system of record for the full lifecycle management of physical and logical network resources: "as-planned", "as-is", "as-was"

- UIM stays fully synchronized with the actual network configuration through discovery & reconciliation processes provided by Oracle Communications

Key features

- Modular inventory deployment approach enabling initial adoption for a specific and bounded business problem up to enterprise wide

- Flexibility inventory federation providing complete, unified inventory views and operations while complementing and leveraging existing inventory investments

- Customer-centric inventory with inherent, standard support for customers, products, services, and resources

- Accurate, consistent inventory information with pre-integrated discovery / reconciliation

- Integrated workflow capability for business interaction and engineering work orders

- Functionally mature, technically robust, scalable, and vendor agnostic inventory platform

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Network Integrity, service assurance integration as well as real-time network events

Network asset lifecycle management

- UIM may be integrated with asset registers in ERP financials to synchronize the status and location of capital-intensive physical network assets across their entire lifecycle

- This ensures an accurate financial picture is maintained for all physical network assets for accurate financial reporting

Product overview

UIM enables communications service providers (CSPs) and enterprises with large networks to:

- Model, manage and provide full lifecycle management of customer services and resources

- Support complex inventory-related business processes

- Provide real-time, unified views of customer services and resource inventory

- Replace existing inventory systems or work cooperatively with them
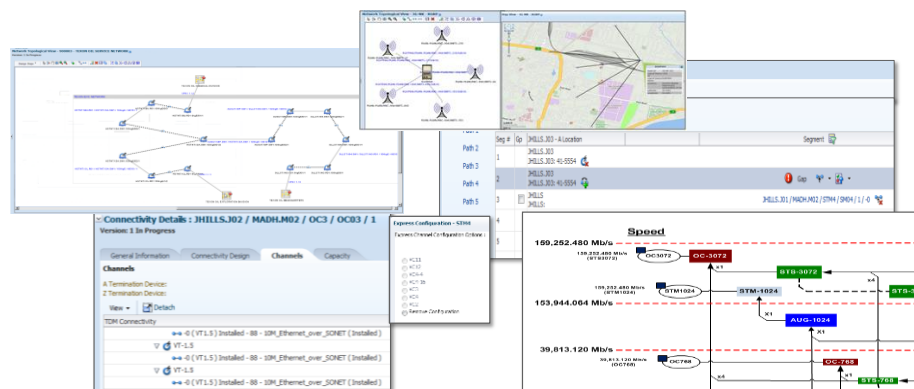
Image 1. UIM's graphical user interface

UIM's inventory management capabilities include:

- **Managing physical and logical resources.** UIM models and manages hardware resources such as racks, shelves, cards, ports, and connectors; and logical resources such as network addresses, media streams, and telephone numbers.

- **Managing connectivity.** Connectivity is the ability to transfer information to and from devices and locations. UIM models and manages connectivity by representing physical and logical resources, the connections between those resources, the capacity of the resources, and the locations of the resources.

- **Managing networks and topology.** Networks are modeled logically, by associating resources to network nodes and network capacity to the connectivity model. Topology features enable the design and management of networks graphically and by using maps.

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- **Managing services.** UIM provides and end-to-end view of fulfilled customer services. Services are configured with resources which can be updated over time.

- **Managing service and resource lifecycles.** UIM manages the lifecycles of resources and services as they are planned, placed in service, and retired. Different kinds of entities have different lifecycles corresponding to how they are used in the inventory.

- **Managing business processes.** UIM supports business processes by providing features for planning and resource management. For example, business interactions can be used to plan activities such as service fulfilment or equipment build-outs.

UIM ENTITY / FUNCTION	DESCRIPTION
Location	Model and interact with geocoding systems to provide strong location validation
Assets	Model and track virtually any type of physical and logical inventory including network addresses and telephone numbers
Connectivity	Model channelized SONET/SDH, and T/E/J-Carrier connectivity with a complete standards-based signal architecture to work cohesively with packet connectivity
Networks	Model virtually any type of network and track capacity when services are allocated to network resources
Services	Model virtually any type of service and assign services over available resource capacity
Network topology	Design and maintenance network connectivity in a graphical view rendered with maps at different view levels
Extensible Resource Lifecycle	Transition resources through various states and keep historical versions of changes to resources and services
Provide Business Planning	Plan equipment build outs by creating business interactions to track planned equipment resources and enable them at a later date
Reservations	Reserve resources for projects or customers for allocation at a later date

Table 1. An overview of the key UIM functions

Applying UIM to 5G networks

UIM supports 5G networks and services in two key ways:

- Designing and building the 5G network or 5G network slices to support specific network traffic

- Provisioning customer service bundles within a single customer order on potentially multiple 5G network slices

Designing and building 5G network slices

5G network slices enable multiple logical networks to be dynamically created on the same underlying infrastructure. The example below illustrates how UIM

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designs both 5G eMBB and 5G URLLC network slices across 4 cities. UIM models the RAN, transport & core networks as follows:

- Fully virtualized core network slice subnet – for the URLLC slice, the User Plane Function (UPF) is deployed in the network edge data centers

- The 5G RAN is partially virtualized (CU-CP and CU-UP as virtual functions and gNB-RRU and gNB-DU as physical functions)

- 4 edge network slice subnets for the 5G RAN & the UPF portion of the 5G Core

- The transport network slice subnet is designed using Carrier Ethernet ELAN as L2 VPN

This 5G URLLC network slice design is illustrated below.
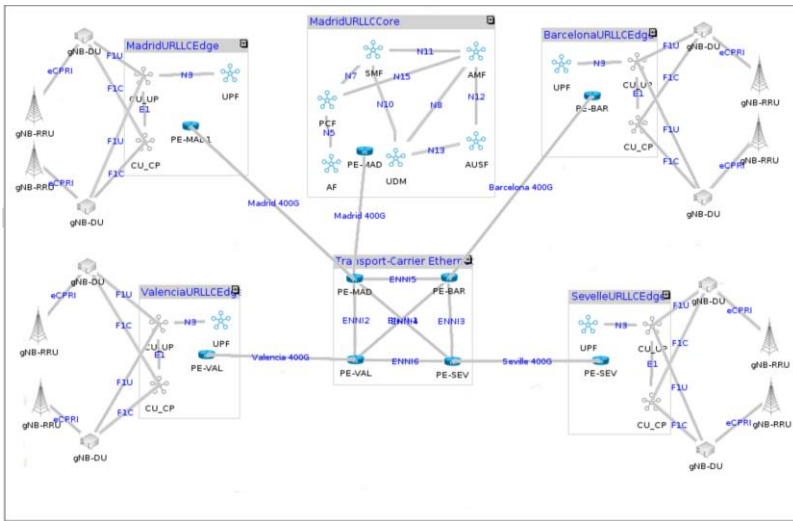
Image 2. Designing an end-to-end 5G RAN, transport & core 5G network in UIM.

The 5G network slices and subnets are instantiated through UIM integration with Open Source MANO for managing the lifecycle of the virtual network functions using the standard ETSI NFV-SOL005 interface. Each part of the network, physical or virtual, may be configured using different underlying tools – however UIM manages the lifecycle of the 5G network slices and network slice subnets.

Image 3. Managing network slices and slice subnets using UIM.

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Provisioning customer services on multiple 5G network slices

When customers order service bundles that include services on both the eMBB and ULLRC slices, UIM designs and assigns these services on the appropriate pre-provisioned 5G network slice. In this case, the 5G mobility service gets provisioned on the eMBB slice denoted by SD of 175002 / SST of 1 whereas the highly interactive virtual reality service gets provisioned on the URLLC slice denoted by SD of 175001 / SST of 2. The design for each of these services is depicted below.
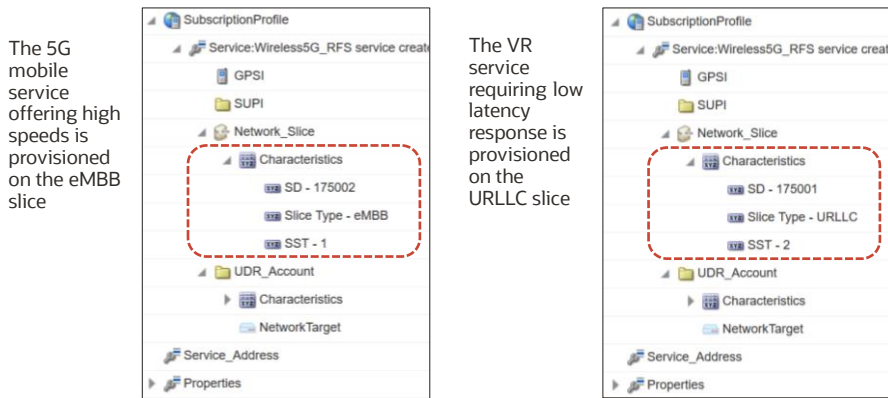
Image 4. UIM service design and assignment for different 5G services.

UIM functional architecture

UIM employs a highly modular architecture enabling both technical and commercial control of deployment footprints as illustrated below.
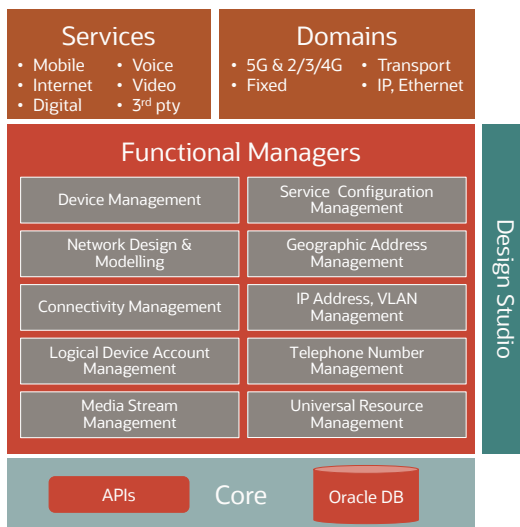
Image 5. UIM functional architecture.

The UIM application consists of:

- **A core platform** with design time modeling of complex inventory structures and behavioral rules through their complete lifecycle together with a technical service catalog to support service fulfillment of customer services. Design time configuration is enabled through Design Studio, the single, integrated design time environment across UIM and complementary Oracle

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applications. Design Studio offers best-practices graphical service and resource modeling of customer services and resources. The core platform also provides a set of Open APIs for solution integration.

- **A set of functional managers** that can be deployed individually or in sets to manage certain entity types such as telephone numbers, logical or physical resources within the network and IT infrastructure or to support service fulfillment through the technical service catalog.

- **Technology packs** that provide pre-configured support for specific domains of network and service technologies that include specifications, characteristics, rules, capacity models, etc., as typically used for the targeted domain. These optional Technology Packs may be extended in the field or custom ones developed on projects using Design Studio.

UIM Alignment with TMF SID

The information model in UIM is based directly on the industry-standard TM Forum's (TMF) Frameworx Shared Information Data (SID) model. This information model:

- Enables the representation of practically any communications inventory object – current and next generation

- Leverages significant and ongoing contributions and best practices from the industry into the TMF SID

- Uses a common language representation that greatly simplifies standards-based integration between systems reducing cost, time, and risk in integration

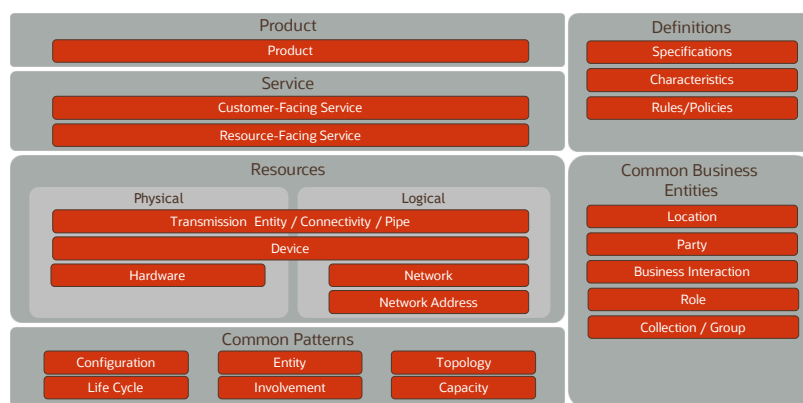The alignment between UIM's information model and TMF SID is portrayed below.

Image 6. UIM information model based on the TMF SID model.

UIM Alignment with TMF Open Digital Architecture and Open APIs

UIM supports the principles of the TMF Open Digital Architecture and supports / has certified several TMF Open APIs with the product including:

- TMF 633 Service Catalog API

- TMF 638 Service Inventory Management API

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- TMF 639 Resource Inventory Management API

Additional APIs are in the process of being supported and certified – including those for:

- TMF 645 Service Qualification API

- TMF 632 Party Management API

- TMF 673, 675, 674 Geographic Address, Location, Site APIs

UIM Cloud Native Deployment

The role of inventory is growing more important in the management of cloud-based networks and contemporary 5G and fiber-based services – both functionally and operationally.

UIM has been re-architected to be deployed using Container Images in a Kubernetes-orchestrated Cloud Native Environment to facilitate continuous integration, continuous delivery, and DevOps practices.
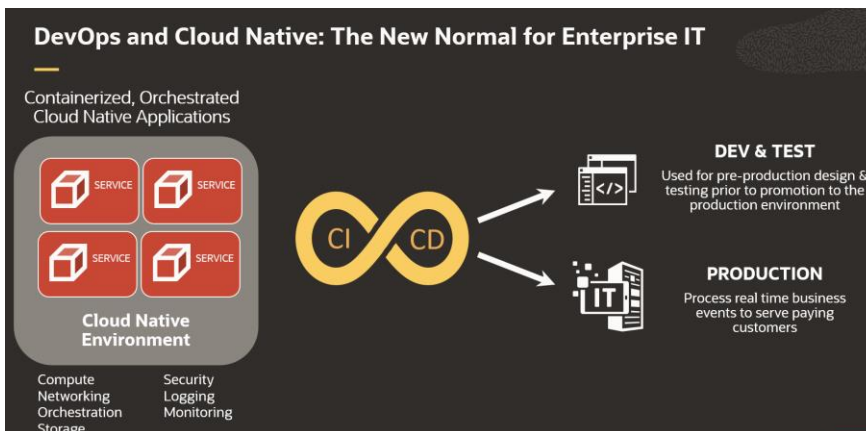

Image 7. Contemporary approach using DevOps and Cloud Native.

This enables

- The rapid and automated deployment and configuration of UIM on a Kubernetes cluster

- Simplified life cycle management of installation and deployment using Helm charts

- Ease of maintenance and management of services through an appealing dashboard for monitoring system health and resource utilization

- Near zero downtime

- Lower CAPEX and OPEX through hardware optimization and lower operational costs respectively

The UIM Cloud Native deployment option enables UIM to be deployed using container images (supporting Docker for Container Runtime) that are then orchestrated in a Kubernetes clustered environment. It supports a full DevOps implementation approach through a rapid, consistent & auditable installation & configuration process with configuration externalized in Helm scripts. It operates

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with near zero downtime and supports metrics reporting and monitoring using Prometheus and Grafana.

This deployment option takes advantage of Open Source Cloud Native tooling and achieves operational efficiency while maintaining full control of IT operations.

| Container runtime | Container orchestration | Microservices-based architecture | Packaging and deployment | Metrics and dashboard |

Image 8. Open-source tooling used with UIM Cloud Native

Strategic advantages of UIM

UIM's next-generation architecture and deployment flexibility offers several key advantages to service providers, including:

- Modular deployment approach: UIM is designed for modular deployment which enables initial adoption for a specific and bounded business problem often in proximity with incumbent inventory solutions. It may then be easily expanded to provide additional capabilities. For example, it may initially be deployed to manage logical resources, and then expand to manage customer services and associated physical resources.

- Flexibility with inventory federation: UIM provides a flexible inventory federation framework that complements and leverages existing inventory investments avoiding the need for an inventory migration or transformation program. This framework supports different implementation scenarios such as:

- Existing inventory systems manage the network connectivity for connection-oriented technologies and UIM integrates with them to holistically manage the services and connectivity – helping to rapidly introduce next-generation services by leveraging existing inventory investments

  - Oracle Communications MetaSolv Solution manages service configurations and federates to UIM as the resource repository of VLAN ID pools

  - Unified, convergent inventory: Increasingly convergent services must be delivered with inventory distributed across multiple sources with differing, non-standard data structures – UIM provides a unified view of inventory using a common, standard information model, without requiring the expense, time, and risk of inventory consolidation

- Customer-centric inventory: Next-generation services require customer-centric rather than network-centric views of inventory information – UIM fully enables a customer-centric view through inherent, standard support for customers, products, services, and resources

- Accurate, consistent inventory information: UIM provides trusted, consistent inventory information to key business processes that span engineering, IT,

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operations, and finance. Inventory accuracy is supported through UIM pre-integration with Oracle Communications Network Integrity product

- Integrated workflow capability for business interaction and engineering work orders: UIM supports a complete lifecycle and set of statuses for resources included in business interaction and engineering work orders

- Enhanced usability: UIM User Interface and functions are regularly enhanced, including support for ADF Framework, expanding trees, controlled user access, and more

- Functionally mature and technically robust: Stable platform with support for high availability, clusters, latest multi-vendor technology platforms, etc. all proven at scale

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