ORACLE COMMUNICATIONS

# Enabling OSS Transformation with Data Federation

ORACLE WHITE PAPER | JANUARY 2016

ORACLE

## Disclaimer

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

## Table of Contents


The High Cost and Risk of Fragmented OSS Systems 2

Leverage Existing Investments for OSS Transformation 3

UIM Data Federation Reference Models 5

- Unify Service Fulfillment through Data Federation 6
  - Reference Model: UIM as Service Inventory 6
- Unify Service Fulfillment through Connectivity Co-operation 7
  - Reference Model: UIM as Service Inventory 7
- Extend Capabilities of Existing Service Fulfillment Solution 9
  - Reference Model: UIM as Resource Inventory 9

Data Federation Considerations 9

Conclusion 10

# Enabling OSS Transformation with Data Federation

Many Communications Service Providers (CSPs) are struggling with the business challenges resulting from inventory data spread across several stand-alone inventory silos that have grown from historical, business, and organizational reasons. The lack of unified view of inventory data directly impacts revenues and increases OPEX for a CSP. Yet, the cost of migrating from multiple legacy systems to a single next-gen inventory system is often so high that it does not make business sense to replace everything. This leaves the CSPs in a difficult situation where they are unable to scale up their business to meet growing market demand. CSPs need a flexible, holistic Inventory Management System that can 'federate' with their existing legacy systems and provide a unified inventory view that enables better business decision-making. CSPs realize this and are showing increased interest in Federation. Reports from various analysts like Analysys Mason, Gartner and Stratecast have emphasized the need for a federated environment where CSPs can get a unified and comprehensive view of their complete inventory.

Oracle Communications Unified Inventory Management (UIM) provides a framework that can federate and co-operate with multiple legacy inventory systems, providing a unified and comprehensive view of the inventory managed in those systems. It also allows CSPs to roll out next-gen services over their existing legacy network with reduced time-to-market and minimum investments. The UIM Data Federation Framework enables the CSPs to stay ahead of their competition by enabling them to deliver next-gen services to an expanded subscriber base with reduced CAPEX and OPEX.

## The High Cost and Risk of Fragmented OSS Systems

Most CSPs have complex OSS system architectures that have evolved over time. They were built by a variety of business groups such as IT departments and system integrators. Some of these systems have been designed to support an organizational alignment on a particular service, or have evolved through growth and acquisition. As a result, service and resource information is managed across disparate systems and databases. In this context, introducing new communications technologies, services, or even business processes is full of challenges and risks.

CPSs typically explore three paths to upgrading OSS systems:

- Enhancing legacy OSS applications to support new requirements
- Deploying new silo applications to address new requirements
- Replacing outdated OSS applications with modern systems designed to manage traditional and next-generation services and resources

The first path has high cost and risk associated with trying to adapt antiquated software to new purposes it wasn't designed for. Chances are that it won't meet the time-to-market requirements of today's CSP. The second path compounds the problem by introducing more disparate databases and fragmentation in the back office. Deploying a new OSS to manage traditional and next-generation requirements is an appropriate long-term solution, but this is a multi-year project due to the costs and risks associated with data migration and business process redefinition.

The economic reality of today's back office calls for approaches that enable CSPs to leverage their investments in legacy applications when appropriate while also introducing new offerings in a cooperative fashion. This is the best of both worlds, because it leverages existing investments while enabling controlled, orderly modernization of the OSS while also addressing faster time-to-market requirements.

## Leverage Existing Investments for OSS Transformation

Oracle Communications' strategy to address this problem is to support the cooperation of OSS systems with legacy systems through data federation. Data federation is usually a more viable and often necessary approach for OSS transformation projects when compared to wholesale system replacement approaches. Data federation enables disparate systems to cooperate in solving end-to-end business problems while presenting a common user experience. In a data federation arrangement, specific data access and data management tasks and processes are delegated transparently to legacy systems.

*CSPs have three choices for rolling out new service offerings in the back office— enhance legacy OSS applications to support new requirements, deploy new silo applications to address new requirements, or displace outdated OSS applications with a modern OSS designed to manage traditional and next-generation services and resources.*

Data federation is not a new concept. It has been used in business intelligence applications for some time. These applications have built-in features designed to pull data from disparate sources into common views for reporting and analysis.

Data federation in the business intelligence space, while not trivial, is more straightforward than data federation in the OSS space. Here, new challenges are introduced for bi-directional integrity, synchronization, and performance. These challenges arise from the need to support Online Transaction Processing (OLTP) involving federated data. In an OLTP environment, there is a need for real-time cooperation between systems where data can be referenced, shared, and synchronized.

The user experience should hide many of the complexities of this cooperation and present a common view. In many cases, users do not need to know that a business process involves multiple systems and databases.

UIM has been designed to enable data federation; it does not assume it is the only inventory system in the provider's environment. UIM enables a customer- and service-aware inventory that includes physical and logical views of network configurations and resources. UIM can represent subscribers, services, and resources in its database while cooperating with interdependent application data sources through data federation. UIM's modular architecture is based on contemporary Java technologies and open Service Oriented Architecture (SOA) standards.

*UIM's model is founded on the TM Forum Information Framework (SID). SID enables specialized deployments for niche services or full-scale inventory transformation projects. This flexible architecture enables data federation.*

Data federation with UIM delivers the following advantages over traditional system deployments:

- Improved time-to-market because of the reuse of existing systems and processes
- Transparency of underlying systems
- Ability of native systems to perform resource operations, such as queries
- Risk reduction because massive data migration is not required
- Data unification across multiple inventories

Using standard approaches and implementation models, CSPs can design styles of data federation that are appropriate for their specific business purposes to improve time-to-market for new services and technologies. In one common federation model, two inventory systems partition the data among themselves based on separating the service management function from resource management. For example, new resources can be managed in UIM while cooperating with legacy OSS applications managing traditional resources, all the while participating in a common service configuration.

As an example, consider the following data federation example of a CSP that needs to implement a new MPLS VPN services offering over a new MPLS core network that leverages existing access networks:

- Ethernet/SDH access networks are managed in an existing legacy application called 'SYS-A'
- ATM and Frame Relay access networks are managed in another legacy application called 'SYS-B', obtained as part of an acquisition
- The CSP plans to use UIM to manage enterprise MPLS VPN services and a new IP core network

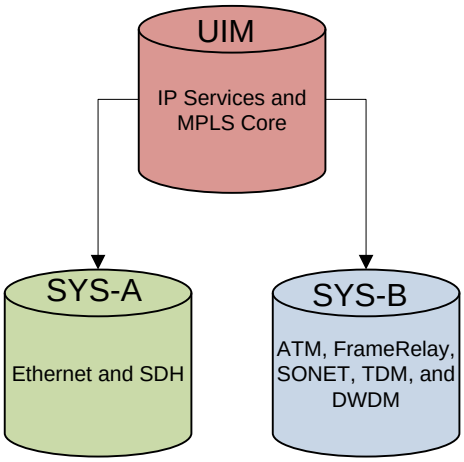



Figure 1 - System View of Inventory

Consider the following business conditions:

- Users are comfortable with the legacy systems SYS-A and SYS-B; business processes around these applications are understood.
- OSS interfaces are available to cooperate with the legacy applications.
- There is a clear need to address time-to-market demands for new service offerings.

Consider the following data migration challenges:

- Data integrity in the legacy systems may be mixed or insufficient, making a data migration very costly.
- Repositioning functionality from the legacy systems into a new system may present an unacceptable time delay.
- Disruptions to business processes, staffing, and ongoing business initiatives may make displacing the legacy systems undesirable.

Using a federated approach, new service configurations can be managed in the new strategic platform, UIM, which has a federated assignment view of resources from the legacy systems. While Layer 3 MPLS VPN can be configured and managed in UIM, there is a need for visibility and access into the ATM/Frame Relay and Ethernet access networks so access ports can be allocated and configured.

With federated access to SYS-A and SYS-B, UIM can cooperate with the legacy applications to accomplish access network port allocation and configuration. Traditional ATM/FR/Ethernet service configurations would continue to be

performed in the legacy applications using existing business processes, and would not be affected by the transparent overlay of the UIM service configuration model.

Figure 2 illustrates one example of data federation in this scenario.

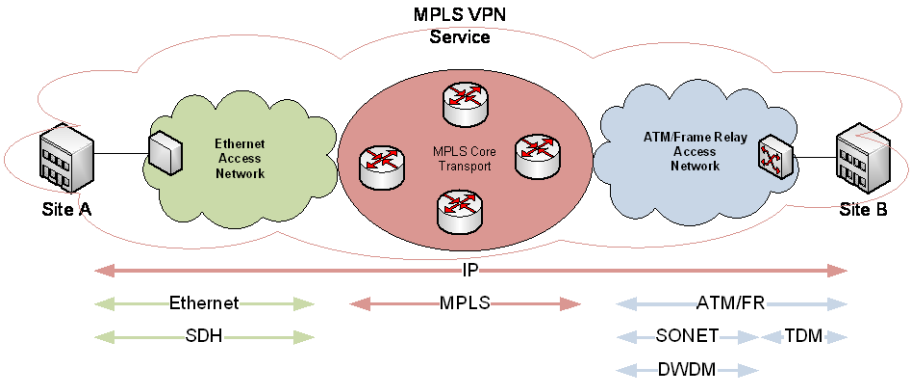



Figure 1 - Logical View of Inventory

## UIM Data Federation Reference Models

Oracle Communications is committed to providing tools and examples to enable data federation in your back office. With over 100 inventory customers, Oracle Communications has the industry knowledge and field experience required for complex OSS deployments.

*Oracle Communications Unified Inventory Management supports three reference models for enabling OSS transformation with data federation:*

- *Unify service fulfillment through data federation*
- *Unify service fulfillment through connectivity co-operation*
- *Extend capabilities of existing service fulfillment solution*

UIM supports a data federation and connectivity co-operation framework along with three reference models based on actual OSS deployments. These reference models, which use an Oracle Communications application to simulate a legacy federated system, are particularly valuable because each utilizes UIM in a completely different business scenario.

In the first reference model, UIM manages service configurations while Oracle Communications Internet Name and Address Management (INA Management) serves as a resource repository of IP addresses. In the second reference model, an External Inventory System manages the legacy SDH network while UIM manages the service configuration for next-gen carrier Ethernet Services. UIM and the External Inventory System communicate using the connectivity co-operation framework. In the third reference model, Oracle Communications MetaSolv Solution (MSS) manages service configurations and UIM is the resource repository of VLAN ID pools.

*Oracle Communications Unified Inventory Management has native IP Address Management support for both IPv4 and IPv6 but can still federate with External IP Address Management Systems to access its IP Addresses for use within the UIM service inventory.*

The following sections describe the three reference models in more detail. These reference models are fully documented in a technical white paper that you can download from My Oracle Support.

## Unify Service Fulfillment through Data Federation

Oracle Communications has implemented a reference model that unifies service fulfillment through data federation. This scenario illustrates implementing UIM for service modeling while continuing to manage certain resources in a legacy inventory application.

This reference model leverages UIM and INA Management to support a scenario of a CSP using UIM as a customer- and service-aware inventory to configure services and resources. In this scenario, UIM manages the services and their configurations, cooperating with INA Management to manage IP addresses. INA Management is used to represent a legacy resource management system.

### Reference Model: UIM as Service Inventory

In this reference model, UIM relies on an External IP Address Management System to supply the IP addresses in a federated manner so UIM can assign IP addresses to service configurations. UIM models services and other resources such as logical devices. In this example, we have used Oracle Communications INA Management as an External IP Address Management System that manages IP address subnets, domain pools, public address space, and private address space. Even though IP address management is delegated to INA Management, the UIM end user does not need to know that UIM is using a separate application for IP addresses.

UIM owns the service models that assign and unassign IP addresses. INA Management owns the resource models for IP addresses. UIM makes use of the sophisticated resource models in INA Management through data federation.

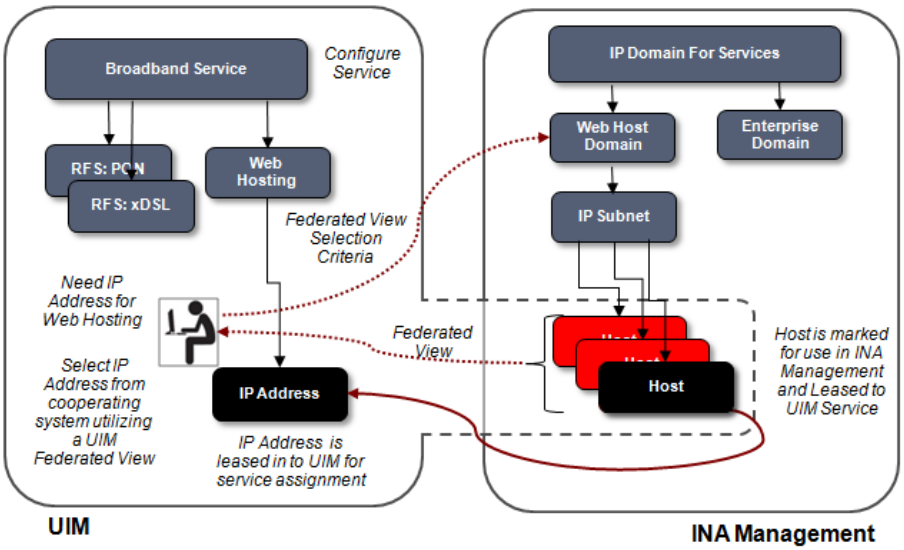



Figure 3 - UIM/INA Management Reference Model

Generally, data federation should be one-way and read-only. One-way data federation refers to requests that are initiated from UIM. Read-only data federation refers to a system that is federated but not updated.

These are guidelines rather than mandatory requirements. In some circumstances, you may need to deviate from them. For example, this scenario requires a simple request to update an IP address state from UIM to INA Management.

To avoid complexity, write operations should be limited. Write operations include requests to create, update, or delete IP addresses in INA Management. INA Management should not read or write to UIM. There should be a layered architecture in which UIM is a client of INA Management with UIM initiating communication.

## Unify Service Fulfillment through Connectivity Co-operation

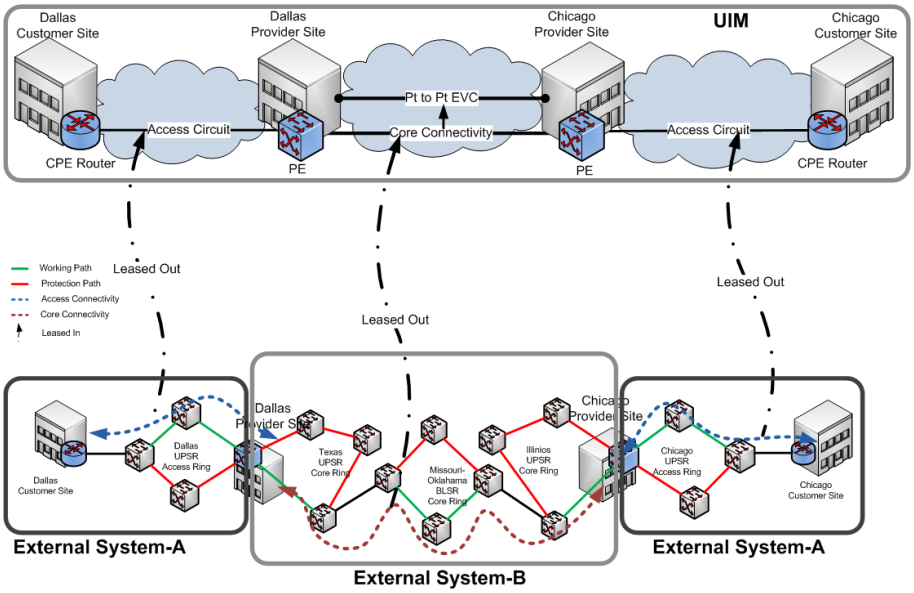
Oracle Communications has implemented a reference model that unifies service fulfillment through connectivity co-operation. This scenario illustrates implementing UIM for service fulfillment while using the network resources from an External System. In this approach, UIM manages the service inventory and the External System manages the network inventory. UIM offers connectivity co-operation capabilities that can be leveraged to provision next-gen services (such as Carrier Ethernet) over existing legacy networks (such as SONET / SDH).

*Data federation provides a unified view across disparate data sources to manage OSS transformation risk and cost.*

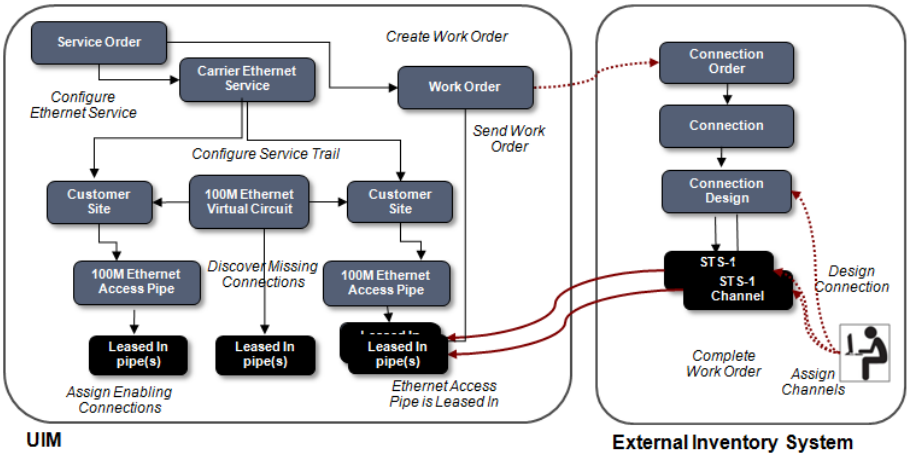
This approach is suitable for CSPs that already have a legacy inventory system that manages the network inventory for legacy transmission technologies such as TDM, SDH, and ATM. It is usually a huge task for a CSP to roll out next-gen services using the legacy inventory systems due to limitations in these systems. In such scenarios, UIM can be deployed along with the legacy inventory systems to leverage UIM's Service Fulfillment capabilities to quickly roll out the next-gen services over the existing network.

### Reference Model: UIM as Service Inventory

In this reference model, the UIM Metro Ethernet Tech-Pack is used to manage Service Inventory for Metro Ethernet E-Line and E-LAN Services while External Inventory System(s) manage the Network Inventory for SONET/SDH Networks.




To provision a Metro Ethernet E-Line or E-LAN service, the connectivity requests are sent to the External Inventory System using UIM's connectivity co-operation framework. The External Inventory System then allocates the capacity in the SDH network and creates the rider connectivity which is then "LEASED-IN" to UIM to enable the Access and Transport connectivity for the E-Line and E-LAN Service.




Connectivity requests are usually long-running transactions that may take some time to get completed. In some cases, a new card or device may need to be installed in the network to provide connectivity. Due to the nature of such requests, UIM uses an asynchronous mechanism to communicate to the External System so that UIM is not blocked waiting for the External System to respond. This approach also allows a user in the External System to manually perform Network Design and Assign to fulfill the connectivity request while UIM is doing Service Design and Assign.

### Extend Capabilities of Existing Service Fulfillment Solution

Oracle Communications has implemented a reference model that extends a service fulfillment solution through data federation. In this scenario, an existing system may not be able to manage all physical and logical resources for a CSP. This solution implements data federation with UIM and MSS.

#### Reference Model: UIM as Resource Inventory

In this model, MSS is responsible for service management and general resource management of MPLS VPNs and VPLS services. MSS currently uses a Product Service Request (PSR) to manage services, connections to manage VLANs, and Network Systems to manage networks. However, MSS does not fully support modeling resources such as VLAN ID and VLAN ID pools.

A VLAN ID pool has user definable set of assignable VLAN IDs, typically from 0-4095. Each VLAN ID must have an inventory state and be assignable from a pool. The VLAN ID pool may be unique by type of service and network.

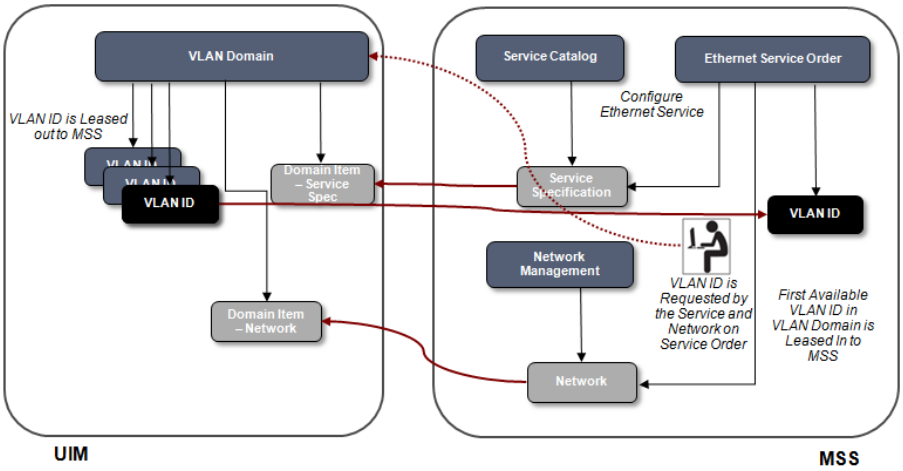



Figure 4 - MSS/UIM Reference Model

To overcome this limitation of MSS, this solution allows VLAN ID pools and VLAN IDs to be managed by UIM. MSS requests a VLAN ID and assigns it to PSR orders in MSS. MSS requests VLAN IDs by associated entities that are natively managed in MSS, such as network system and product catalog. These entities must be associated to the VLAN ID pool so that MSS may query by these associated entities. For UIM to associate these entities to VLAN ID pools, it must federate data from MSS to UIM to associate to the VLAN ID pools. This eliminates the need for dual entry of associative entities and allows UIM to have visibility into real-time data in MSS.

## Data Federation Considerations

Accessing data spread across multiple systems and applications poses several challenges.

*Oracle Communications Unified Inventory Management provides a framework to enable data federation and connectivity co-operation.*

Some of these are listed below with solutions that were identified from the above reference models.

Similar issues will need to be managed with most federation implementations. The reference implementations provided by Oracle Communications mitigate a lot of risks associated with federation. By taking advantage of these reference models, Oracle's experience can be leveraged to reduce risk in OSS transformation projects.

Several of these issues are described below.

**Harmonization of Data:** Data needed by all the systems must be kept up to date. Do you hold a reference locally and delegate to the other system? Do you replicate the data locally to perform the function and then update the other system? Do you replicate the data locally as read-only, and delegate writes to the other system?

> In the reference models, if UIM queries for federated data, the data is not replicated into UIM. Data is replicated only when it is associated with an entity in UIM such as a service configuration.

**User Experience:** How do you ensure seamless user experience for Inventory functions in business process for UIM?

> In the reference models, UIM provides the same user experience for federated entities as it does for entities within UIM. However, a specification entity is designated as federated when it is modeled in Oracle Communications Design Studio. For each federated specification entity, an "(E)" is appended to the specification entity name to denote that the entity is external. This naming convention enables a common user experience from a navigation point of view, while still making it possible to identify federated data.

**Data Models:** The systems that are federated are likely to have different data models and referential integrity requirements and capabilities. Transformation and business processes will need to be designed to ensure success.

> In the UIM/INA Management reference model, UIM can query from INA Management for a particular IP address. For an IP address to be assigned to a service in UIM, the IP address is set to a reserved state in INA Management. The reservation ensures referential integrity so that another application does not allocate the same IP address.

**Performance:** Retrieving and updating status values in a system that is federated can pose challenges with timeliness of information.

> Ensuring low network latency between UIM and the federated system alleviates such issues.

**Security:** Users will need security credentials in UIM as well as federated systems.

> Username and passwords are stored and obfuscated for each federated application.

**Granularity of Data:** Some systems represent the same data at different levels of granularity. For example, in one system, the City value of a subscriber address may be a free form text attribute, while in another system, address elements are stored as separate attributes. How should these be reconciled when data is being shared between the systems?

> In the reference models, the granularity of data is not an issue. UIM's federation approach supports the inclusion of rules that aggregates or parses data from the foreign system to transform it into its SID-based model.

## Conclusion

Oracle Communications is committed to its strategy of enabling business transformation through flexible deployment and product collaboration. Data federation gives a CSP more solution options for a unified inventory view that is

customer- and service-aware.  A CSP is able to manage risk and enable faster time-to-market by leveraging existing legacy inventories.  UIM delivers an industry-standard framework and provides reference models for enabling OSS transformation through data federation and connectivity co-operation using three different models.

ORACLE

**Oracle Corporation, World Headquarters**
500 Oracle Parkway
Redwood Shores, CA 94065, USA

**Worldwide Inquiries**
Phone: +1.650.506.7000
Fax: +1.650.506.7200

CONNECT WITH US

blogs.oracle.com/oracle

facebook.com/oracle

twitter.com/oracle

oracle.com

Integrated Cloud Applications & Platform Services



White Paper Title
January 2016
Author: [OPTIONAL]
Contributing Authors: [OPTIONAL]

Oracle is committed to developing practices and products that help protect the environment