Oracle® Communications User Data Repository

Network Impact Report

Release 12.1

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Oracle Communications User Data Repository Network Impact Report, Release 12.1

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1 Introduction

1.1 Purpose/Scope

Purpose of this Feature Guide document is to highlight the changes of the product that may have impact on the customer network operations, and should be considered by the customer during planning for this release.

The scope of this document is limited to the changes between User Data Repository 10.2 and User Data Repository 12.1

1.2 Disclaimers

This document summarizes Release User Data Repository 12.1 new and enhancement features as compared to User Data Repository 10.2, and the operations impacts of these features, at a high level. The Feature Requirements (FRS) documents remain the defining source for the expected behavior of these features.

Note that feature implementations may change slightly during product test.

1.3 Glossary

This section lists terms and acronyms specific to this document.

Table 1: Acronyms

Acronym/Term	Definition
ACID	Atomicity, Consistency, Isolation, Durability
COMCOL	Communications Core Object Library
NOAMP	Network Operations, Administration, Maintenance and Provisioning
PM&C	Platform Management and Control
PNR	Push Notification Request, when in the context of an Sh message
PNA	Push Notification Answer, when in the context of an Sh message
PUA	Profile Update Answer, when in the context of an Sh message
PUR	Profile Update Request, when in the context of an Sh message
RAR	Re-Auth Request, when in the context of a Gx message
REST	Representational State Transfer
SEC	Subscriber Entity Configuration
SNA	Subscribe Notification Answer, when in the context of an Sh message
SNR	Subscribe Notification Request, when in the context of an Sh message
SOAM	System Operation, Administration, and Maintenance
SOAP	Simple Object Access Protocol
SPR	Subscriber Profile Repository
UDA	User Data Answer, when in the context of an Sh message sent from User Data Repository to PCRF
UDR	User Data Request, when in the context of an Sh message sent from PCRF to User Data Repository

Table 2: Terminologies

Acronym/Term	Definition
Affinity (and anti-affinity) rules	Affinity rules are setting that establish the relationship between a virtual maching (VM) and its host. An affinity rule indicates that VMs can co-exist on the same host. An anti-affinity rule indicates that VMs cannot co-exist on the same host.
Auto-Enrollment	The ability for the SPR to create a Subscriber profile for an unrecognized subscriber identity, based on a pre-determined message received on one of the provisioning or traffic interfaces. The identity contained in the received message is used to create a default profile in the database.
Basic Pool	Refers to the existing quota pooling capabilities Basic pools support up to 25 members.
Diameter Sh TPS	The number of Diameter transactions per second that are supported on the Sh signaling interface. A transaction is comprised of one Diameter Sh message received plus one message sent plus all of the processing required within the User Data Repository system to handle the request
Enterprise Pool	A new type of pool is introduced. The pool supports the sharing of pool quota across 1500 members.
Exhaustion	Exhaustion occurs when reports indicate that usage of a metered unit has equaled or exceeded the specified quota limit. If a recurring Quota is exhausted, typically the subscriber's sessions are subjected to more restrictive policies until the end of the Plan period or Billing Cycle.
Expiration	Expiration occurs when a periodic Quota reaches the end of the Plan period or Billing Cycle, or when a one-time quota reaches its established End Time or the close of its Validity period (NOTE that the time-based expiration of a Quota is quite different from the exhaustion of a Quota restricting the active session Time of a subscriber's usage.). A periodic Quota is typically Reset at expiration.
Opaque Data	A data type that is incompletely defined in an interface, so that its values can only be manipulated by calling subroutines that have access to the missing information. The concrete representation of the type is hidden from its users.
Pass	A Pass is a one-time override which temporarily replaces or augments the subscriber's default Plan or service, if any. While a Pass is in effect, it may modify the QoS controls, charging parameters, or other configurable rules associated with a subscriber's service. A Pass may: • be valid for a restricted interval • start when provisioned, or at a specific time, or upon occurrence of a triggering event within its validity interval • end at a specific time, or after given duration once activated, or upon a particular event • apply continuously, or only during certain time periods, or only under certain conditions (e.g. when roaming) • apply to the subscriber's overall usage, or be more limited (e.g. applying only to specific applications, flows, traffic types, or pre-defined rules) Passes are common options for pre-paid subscribers, who frequently have limited or no data access via their basic Plan, and may purchase Passes to gain access to such services. They can also be used to allow Casual Use plans for pre- or post-paid subscribers to purchase services on an occasional basis which they would not otherwise subscribe for on an ongoing basis.
Geo-redundant	A node at a geo-diverse location which can assume the processing load for another node(s)
Plan	A subscriber's Plan is the description of their basic, recurring service. Frequently, the Tier and/or Entitlement fields of the subscriber's Profile data may be used to indicate or derive the Plan type. Plans include enforceable policy characteristics (QoS and Charging parameters and PCC rules) computed automatically or through policy rules. A Plan may have associated Quota controls (see Basic Quota), which in turn may be subject to modification or over-ride through Passes, Top-ups, and Roll-overs (see below).
Pool Network	Refers to the network of User Data Repository s across which a quota pool can span.

Provisioning TPS	Provisioning transactions per second, which is comprised of one provisioning message received plus one message sent plus all of the processing required within the User Data Repository system to handle the transaction.
Quota	A Quota specifies restrictions on the amount of data Volume, active session Time, or service-specific Events that a subscriber can consume. A single Quota may express limits on any combination of Volume, Time, or Events. Quotas may be associated with a time period during which activity is measured.
Roll-over	Roll-over is a mechanism by which usage which was not consumed during one Quota period may be applied as a credit in a future period. Roll-over may apply to Basic Quotas associated with a subscriber's Plan, or may affect Passes or (more usually) Top-ups purchased by the subscriber. Roll-overs may be limited as to the amount that can be credited to the future period, or by capping the total amount of (basic and rolled-over) credit that may be available in a given period. They may also have limitations regarding the number of cycles that credits may be rolled into. In other words, Roll-over rules modify the process of resetting a recurring Quota.
Transparent Data	A data type whose representation is visible to the users.
Threshold	A Threshold is a soft limit at which usage must be reported during the monitoring of a Quota, usually lower than the full limit associated with the Quota. Typically, service parameters are not adjusted when a Threshold is reached, but other actions may be taken, such as notifying the user of their current usage.
Top-up	A Top-up is a modifier which takes effect only upon exhaustion of Basic Quota associated with a subscriber's Plan or default service. Top-ups allow the subscriber to extend their access to services beyond the time or volume limits typically enforced.

2 Overview of User Data Repository 12.1 Features

This section provides an overview of the User Data Repository 12.1 release features that may impact OAM interfaces and activities.

2.1 User Data Repository 12.1 New Features

User Data Repository 12.1 introduces the following new Features.

Table 3: Feature Discription

Name	Description	Scope
R12.1 OAMP Enhancements (eBug: 19882819, 19882862, 19882893, 19882904, 19652706, 19731138 20950852)	The feature bundles together several enhancements that customers have specified for the User Data Repository OAMP interfaces. The feature bugs covered : • Bug 19652706 – Provisioning Commands for Pool Quota Reset • Bug 19731138 – User Data Repository Provisioning Command Log Export • Bug 20950852 – User Data Repository support for Enterprise Pools • Bug 19882819 – Provisioning Row Level Updates for Dynamic Quota with SOAP/XML • Bug 19882862 – Provisioning Row Level Updates for State with SOAP/XML • Bug 19882893 – Provisioning Row Level Updates for Dynamic Quota with REST/XML • Bug 19882904 – Provisioning Row Level Updates for State with REST/XML	Major feature
User Data Repository Configuration and Performance (eBug: 20808453, 20822313, 20883835)	This feature characterizes the User Data Repository performance on three different hardware configurations: • Gen8 DL380 RMS with 600 GB 10K RPM low speed drivers • Gen 9 BL460 C-class servers • Oracle X5-2 Servers. Low speed drive support on Gen 8 DL380 RMS configuration is introduced in User Data Repository 12.1 release. On Gen 9 BL460 C-class servers and Oracle X5-2 Servers, Sh traffic performance has been increased from the previous release (10.2) by maximizing the physical resources available on these cards like the CPU Cores, RAM size, memory access rate etc.	Major feature
Cloud Deployable User Data Repository (eBug 20822291)	The Cloud Deployable User Data Repository feature is a testing effort that exercises User Data Repository software in the following virtualization infrastructures: • Production deployments leveraging VMware hypervisior with vCloud Director Management Lab PoC testing with KVM and OVM hypervisors	Major feature

2.2 Hardware Changes

2.2.1 Hardware Supported

Table 4: Hardware Information

Hardware	Comment
HP BL460c Gen8	c-Class
HP BL460c Gen9	c-Class
HP BL460 Gen8	c-Class
HP BL460 Gen9	c-Class
HP DL380 Gen8	Rack Mount
HP DL380 Gen9	Rack Mount
Oracle Server X5-2	Rack Mount
D2200sb	Storage Array
D2220sb	Storage Array
HP 3020, 6125 (1G)	Enclosure Switch
HP 6120XG, 6125XLG	Enclosure Switch
Cisco 4948	Enclosure Switch

Note:

Mixed Sun/HP deployments are not generally supported.
Gen 8 Blade will support the D2200sb and D2220sb Storage Array
Gen9 Blade support the D2220sb Storage Array with HP Smart Array P246br Controller
HP Smart Array P220i Controller won't work with D2220sb Storage Array

2.3 Software Changes

Software change include a new release of the software Platform components, and new User Data Repository release.

2.3.1 Platform 7.0.2

Platform Release 7.0.2 inherits all the functionality of Release 6.7.

Platform 7.0.2 Component Versions

Table 5: Platform Information

Component	Release
TPD (IPM) 64-bit	7.0.2.0.0-86.28.0 [GA TPD Version to be installed on a fresh system]
TPD (User Data Repository build on) 64-bit	7.0.2.0.0-86.36.0 [TPD Version upgraded to after User Data Repository ISO installation]
TVOE	3.0.2.0.0-86.36.0
PM&C	6.0.3.0.0-60.25.0
COMCOL	6.4p262
AppWorks	6.0.1-60.38.0
EXGSTACK	7.1.0_71.26.0
DPI	7.1.1-71.32.0
Firmware	HP FUP 2.2.9 Oracle FUP 3.1.6

2.3.2 User Data Repository Release 12.1

User Data Repository Release 12.1 inherits all functionality from User Data Repository 10.2

Table 6: User Data Repository Build

Component	Release
User Data Repository Release	12.1.0.0.0-13.8.0

2.4 User Data Repository Server Hardware Specifications

Note: The table below specify the hardware specifications for 3 servers which are updated in Release 12.1. other servers which are not updated in Release 12.1 remains same.

Table 7: Servers benchmarked for Release 12.1

Server	CPU	RAM	Disks used for OS/backup partition	Disks used for rundb partition	HP Smart Array controller	Num of Cores
HP ProLiant DL380 Gen8 Server (RMS)	Intel(R) Xeon(R) CPU E5-2670 0 @ 2.60GHz	64GB/128GB	2x900 GB 10K RPM	6x 600GB 10K RPM HDD	N/A	32
HP ProLiant BL460c Gen9 C-Class server	Intel(R) Xeon(R) CPU E5-2695 @ 2.3 GHz	128GB (Fully virtualized SOAM, MP server) 256GB (bare metal NOAMP server)	2x900 GB 10K RPM 2x900 GB 10K RPM		Smart Array P246br controller, HP D2220sb Storage Blade	56
Oracle Server X5-2 (RMS)	Intel(R) Xeon(R) CPU E5-2699 v3 @ 2.30GHz	256GB	2 x 1.2TB HDD(Hard Disk Drive)	4x400GB SDD (Solid State Drive)	N/A	72

2.5 User Data Repository Configuration

Servers are configured to achieve maximum performance and subscriber capacity

2.5.1 HP Gen 8 DL380 RMS with low speed drives – Low Capacity Configuration

HP Gen 8 DL380 RMS server is supported in Release 10.x with high-speed 15K drives. Release 12.1 introduces support for low-speed 10K drives.

In this configuration, each DL380 Gen8 RMS server hosts NOAM, SOAM, MP, and PMAC functionalities. Each Site has 2 servers to take care of a single server failure. If both servers fail, the DR site assumes the functionality.

Note: Low Capacity Configuration can also be achieved with other supported RMS servers having same configuration as DL380 Gen8 RMS

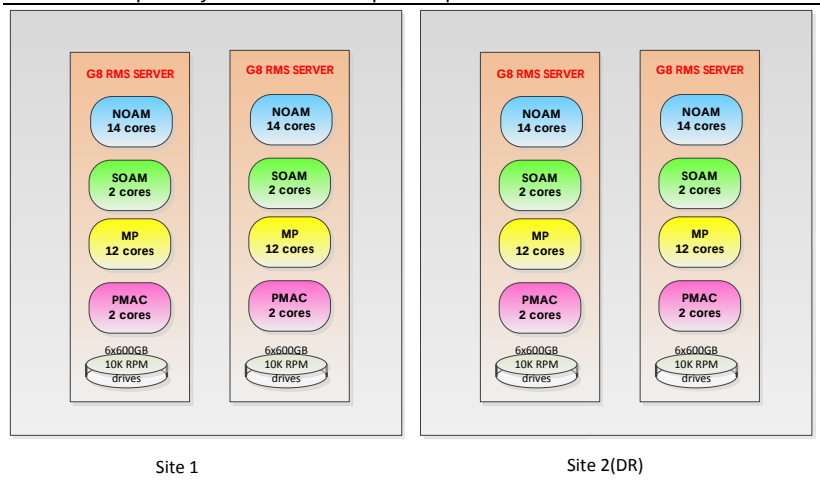

Figure 1: User Data Repository Configuration - DL380 Gen8 RMS servers with low speed drives – Low Capacity

2.5.1.1 Targeted Capacity

The targeted capacity for this configuration is as shown below. Release 10.2 Subscriber/Pool models; traffic mix is used for benchmarking.

Table 8: Targeted Capacity - DL380 RMS Server with low speed disks

Server	Subscriber + Pool Capacity	Provisioning TPS "Provisioning Response with Durability Confirmation" is unchecked	Sh TPS
2 HP Gen 8 RMS per site - 64G/128G RAM with 6x600GB 10K RPM HDDs	12M	300TPS	7K single site 7K geo redundant

2.5.2 HP Gen 9 BL460c Server with D2220 Storage Array -Low Capacity Configuration

HP Gen 9 C-Class servers existed in User Data Repository 10.2 release. These servers are used in the low capacity and normal capacity configuration as a replacement for Gen 8 servers. The physical resources like CPU cores and fast memory access of the Gen 9 servers were not completely utilized in User Data Repository 10.2 Release. In User Data Repository 12.1 release, higher Subscriber capacity and Diameter Sh traffic rate will be supported on these servers.

The HP Gen 9 BL460c Low Capacity configuration is depicted in Figure 2.

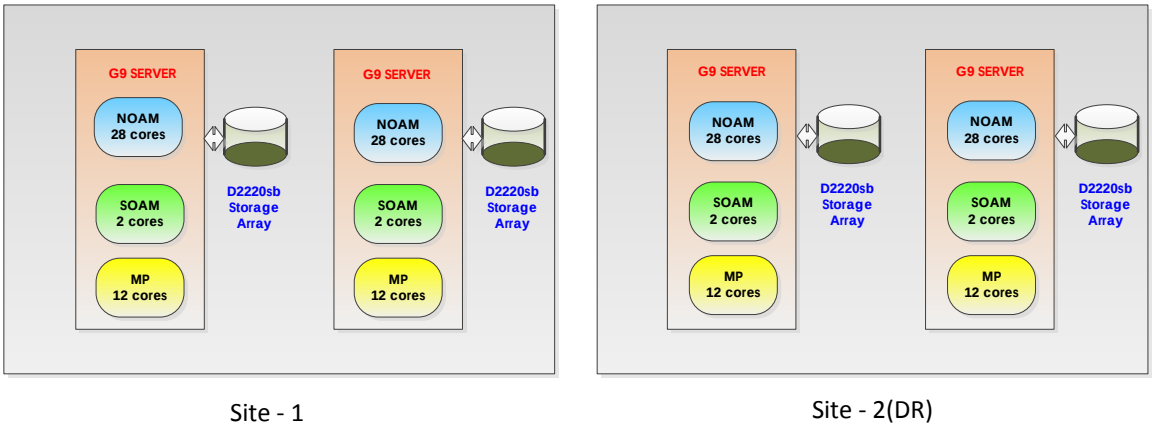

Figure 2: User Data Repository Configuration - BL460c Gen9 C-Class servers with Storage Arrays – Low capacity

2.5.2.1 Targeted Capacity

The targeted capacity for this configuration is as shown below. User Data Repository Release 10.2 Subscriber/Pool models; traffic mix is used for benchmarking. The Subscriber+Pool capacity has gone up to 30M from 15M target in 10.2 Release. Sh TPS has gone up to 25K from 15K supported in User Data Repository 10.2 Release in the geo redundant configuration.

Table 9: Targeted Capacity - BL460c Gen9 C-Class servers with Storage Arrays Server- Low capacity

Server	Subscriber + Pool Capacity	Provisioning TPS Over SOAP or REST "Provisioning Response with Durability Confirmation" is unchecked	Sh TPS
2 HP Gen 9 BL460c servers per site – 256G RAM with D2220sb storage array 2x900GB 10K RPM HDDs	30M	500TPS	12.5K single site 25K geo redundant

2.5.2.2 Software upgrade from the previous User Data Repository releases

On upgrade from previous releases, the server gets configured with the new profile and remains capable of supporting higher Subscriber+Pool records and Sh TPS.

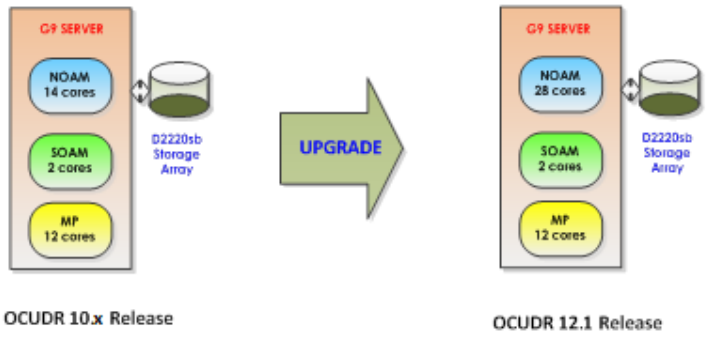

Figure 3: Gen 9 BL460c Low Capacity upgrade from User Data Repository 10.x to 12.1 release

2.5.3 Gen 9 BL460c Server with D2220 Storage Array- Normal Capacity Configuration

HP Gen 9 BL460c servers existed in User Data Repository 10.2 release. These servers are used in the low capacity and normal capacity configuration as a replacement for Gen 8 servers. The physical resources like CPU cores and fast memory access of the Gen 9 servers were not completely utilized in User Data Repository 10.2 Release. In User Data Repository 12.1 release, higher Subscriber capacity and Diameter Sh traffic rate will be supported on these servers.

Gen 9 BL460c are capable of hosting more than 2 MP functional components per server; availability of more vcpu cores at the bare metal allows the NO to process more traffic.

The HP Gen 9 BL460c Normal Capacity configuration is depicted in Figure 4. Each site has 4 servers to take care of the failovers of the servers at DR site as well as the single or two server outages within the site. Figure 4 below depicts the proposed configuration. In this configuration two types of Gen 9 BL460c servers are used. One type has 256GB RAM and the other type has 128GB RAM. Servers with 256G RAM are used to host NOAMP on bare metal non-virtualized configuration, since it has to support large number of Subscriber+Pool records in memory. Servers with 128GB RAM are used to host SOAM, 3 MP functional components as virtualized and deployed over TVOE.

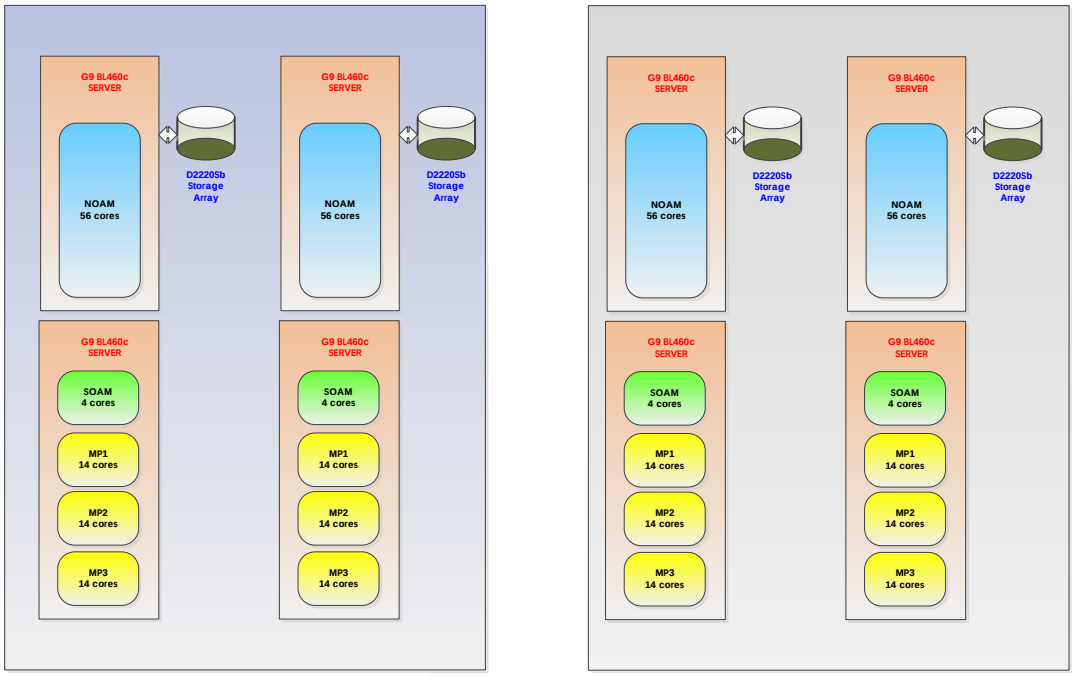

Figure 4: User Data Repository Configuration - BL460c Gen9 C-Class servers with Storage Arrays – Normal capacity

2.5.3.1 Targeted Capacity

The targeted capacity for this configuration is as shown below. User Data Repository Release 10.2 Subscriber/Pool models; traffic mix is used for benchmarking. Sh TPS has been increased to75K from 50K supported in User Data Repository 10.2 Release in the geo redundant configuration.

Table 10: Targeted Capacity - BL460c Gen9 C-Class servers with Storage Arrays Server- Normal capacity

Server	Subscriber + Pool Capacity	Provisioning TPS Over SOAP or REST "Provisioning Response with Durability Confirmation" is unchecked	Sh TPS
2 HP Gen 9 BL460c servers per site – 256G RAM with D2220sb storage array 2x900GB 10K RPM HDDs 2 HP Gen 9 BL460c servers per site – 128G RAM with 2x900GB 10K RPM HDDs	80M	2000TPS	37.5K single site 70K geo-redundant

2.5.3.2 Software upgrade from the previous User Data Repository releases

When User Data Repository software is upgraded from the previous releases, the new physical resource allocation will be in effect, if the Gen 9 BL460c Servers have the required resources (128G RAM). Only 2 MPs in the virtualized configuration be functioning; MP1 and MP2.

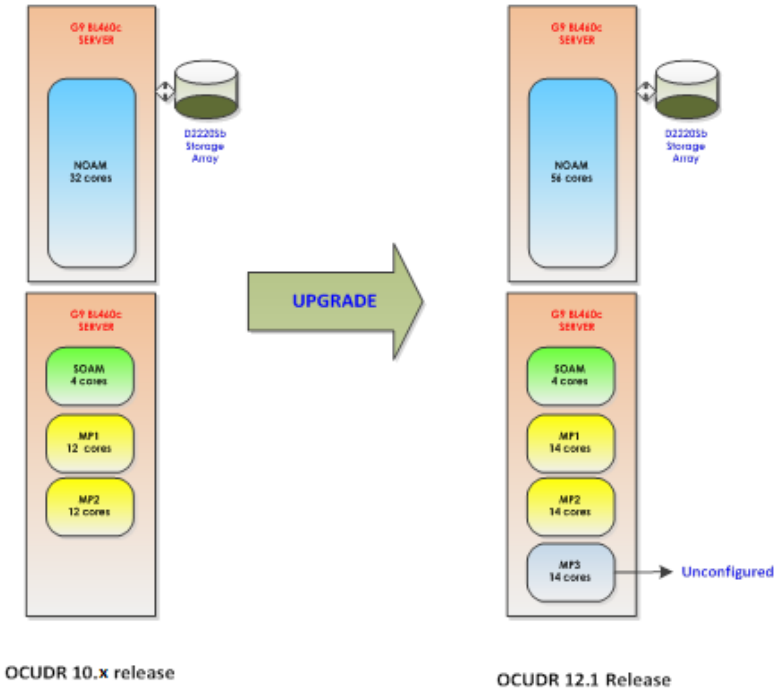

Figure 5: Gen 9 BL460c Normal Capacity upgrade from User Data Repository 10.x to 12.1 release

A new procedure shall be provided to add the third MP (MP3) into the virtualized environment on the server that has 128G RAM.

2.5.4 Oracle X5-2 RMS - Low Capacity Configuration (User Data Repository in box)

The Oracle X5-2 RMS server has 72 cores and also has 4x400GB SSD (Solid State Disks) that can be used for subscriber data storage. In the User Data Repository 10.2 release, X5-2 Servers are used in the Low Capacity Configuration to support 15M subscribers, 12.5K Sh TPS (15K Sh TPS for geo-redundant systems) and 400 provisioning TPS.

In the User Data Repository 12.1 release, the Low Capacity Configuration for Oracle X5-2 RMS will undergo some change. The number of MP functions deployed over each TVOE will increase from 1 to 2 to achieve greater capacity limits. The configuration will now support 50M subscribers, 25K Sh TPS (37.5K Sh TPS for geo-redundant systems) and 1000 provisioning TPS.

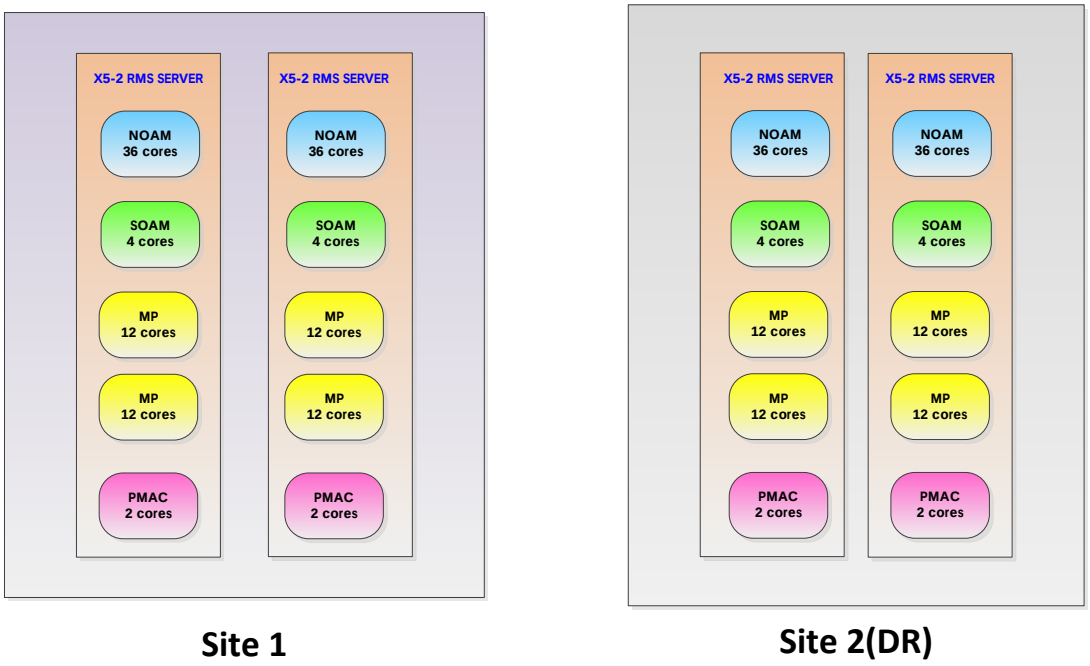

Figure 6: User Data Repository Configuration - Oracle X5-2 Servers – Low capacity

2.5.4.1 Targeted Capacity

The targeted capacity for this configuration is described in Table below. User Data Repository 10.2 Release Subscriber/Pool models; traffic mix is used for benchmarking. The Subscriber+Pool capacity has gone up to 50M from 15M target in 10.2 Release. Sh TPS has been increased to 37.5K from the 15K supported in the User Data Repository 10.2 Release in the geo redundant configuration.

Table 11: Targeted Capacity – Oracle X5-2 RMS servers - Low capacity

Server	Subscriber + Pool Capacity	Provisioning TPS Over SOAP or REST "Provisioning Response with Durability Confirmation" is unchecked	Sh TPS
2 Oracle X5-2 Servers with 4x400GB SDDs and 2x1.2TB HDDs	50M	1000TPS	25K single site 37.5K geo-redundant

2.5.4.2 Software upgrade from the previous User Data Repository releases

On Upgrade from previous releases, the server gets configured with the new profile and remains capable of supporting more Subscriber+Pool records and higher Sh TPS.

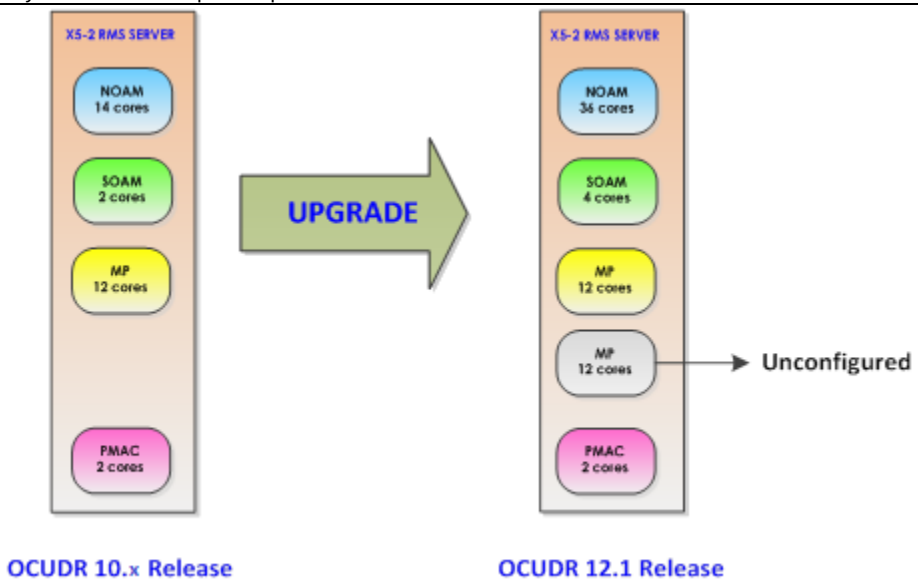

Figure 7: Oracle X5-2 RMS Servers upgrade from User Data Repository 10.x to 12.1 releases

A new procedure will be provided to add the second MP into the virtualized environment on the server.

2.5.5 Summary of the 12.1 User Data Repository configurations

Table 12: Summary of the User Data Repository configurations

User Data Repository Configuration	Capacity			VM Guest profiles
	Subscriber/Pool Records	Benchmarked Sh TPS (Single site/Geo sites)	Benchmarked Provisioning TPS	
2 HP Gen 8 RMS Servers per site (6x600G low speed 10K RPM drives) **Gen 8 Low Capacity RMS – Low speed disks**	12M	7k/7k	300	UDR_NO_LowCapacity_64GB UDR_SO_LowCapacity_64GB UDR_MP_LowCapacity_64GB
2 HP Gen9 C-Class Servers with Storage Array per site **Gen 9 Low Capacity**	30M	12.5/25K	500	UDR_25K_NO_LowCapacity UDR_SO_LowCapacity UDR_MP_LowCapacity
4 HP Gen 9 C-Class Servers per site **Gen 9 Normal Capacity**	80M	37.5K/-70K Note: 56K Sh with 2000 TPS of SOAP traffic.	2000	UDR_SO UDR_MP_G9_NormalCapacity Note: No VM Guests for NO as NO is loaded on the bare metal server.
2 Oracle X5-2 RMS servers per site **Oracle X5-2 Low Capacity**	50M	25K/37.5K Note: 30K with 1000 TPS of SOAP traffic	1000	UDR_NO_LowCapacity_X5_2 UDR_SO_LowCapacity_X5_2 UDR_MP_LowCapacity_X5_2

2.6 User Data Repository Support for Enterprise Pools

User Data Repository 12.1 introduces "Enterprise Pools", a pools type that supports up to 1500 members.

User Data Repository R10.2 provides one 'Basic' pool type that supports an unenforced recommended limit of 25 pool members. User Data Repository R12.1 updates the 'Basic' pool type to establish a 25 pool member limit for new pools created in R12.1.

An enterprise pool is provisioned in User Data Repository using the existing SOAP or REST Pool Operations with an addition of a new field in the Pool Profile called "Type". If the "Type" field is not present, then this implies that the pool is a "basic pool". A "basic pool" can be converted to an "enterprise pool" by updating the profile to include the "Type=enterprise" field/value combination.

The main functional difference between a Basic Pool and an Enterprise Pool is that Enterprise Pools will not generate PNR messages whenever provisioning or usage updates occur on the pool. This protects the network from large bursts of PNR and RAR messages whenever an update is performed to the pool profile.

User Data Repository R12.1 supports post-upgrade continuation of 'Basic' pools established on User Data Repository R10.2. This includes R10.2 'Basic' pools with more than 25 members. User Data Repository R12.1 restricts adding new pool members to 'Basic' pools established on User Data Repository R10.2 with more than 25 members

The value of the database statistics for "Enterprise Pools" will be 0 for the scenario when a fresh installation of User Data Repository R12.1 has been performed and the subscriber data/subscription notification table Audit has not been executed

2.7 User Data Repository Provisioning Command Log Export

User Data Repository's NOAMP GUI Main Menu: UDR → Maintenance → Command Log screen can be used to view the last 10,000 provisioning logs.

The Provisioning Command Log Export feature provides the ability to export the existing Provisioning Command Logs at regular intervals. The command log export can be initialized using Main Menu: UDR → Configuration → Command Log Export Options GUI screen. A log file is generated every time the export is triggered and is transferred to a remote server to enable the customers to archive these provisioning command logs for further analysis and auditing.

When Command Log Export is enabled, User Data Repository checks if the command log export is needed every 5 minutes and begins export only if one of the following two criteria is met
Time based – Export is triggered on top of every hour
Size based – Export is triggered when the size of the Provisioning Command Log table reaches 80% of its maximum size.

Comcol APIs are used to calculate the size of the Command Log table. The cursor used to calculate the size is reset after every export using the APIs. No records are deleted from the table. The exported file contains only those records that were logged after the previous export was triggered. The size of the command log table is also increased from 4GB to 8GB in User Data Repository R12.1.

The "time based" command log export begins on top of every hour irrespective of when the "size based" export was triggered.
E.g. 11:00 am -> Time based export is triggered
11:35 am -> Size based export is triggered
12:00 pm -> Time based export is triggered
If no provisioning requests were sent to User Data Repository between 11:35 am and 12:00 pm, an export file would still be created at 12.00 pm and would be empty.
The "size based" command log export could be triggered in 5 minutes after the option "Remote Command Log Export Enabled" is enabled, if the command log has reached 80% of its maximum size.
E.g. 11:15 am -> Remote Command Log Export Enabled option is enabled
11:20 am -> Size based export is triggered
12.00 pm -> Time based export is triggered

2.8 User Data Repository Provisioning Commands for Pool Quota Reset

Provisioning commands to reset quota rows were introduced in earlier versions of User Data Repository. In User Data Repository R12.1 this functionality is being extended to support reset of pool quota rows. New provisioning commands are introduced in R12.1 to allow a reset to occur to a specific pool quota row. The reset operation is performed by specifying the PoolID requiring the reset, or the PoolID/pool quota name, or the PoolID/pool quota name/cid.

2.9 User Data Repository Provisioning Dynamic Quota Entity

In earlier releases of User Data Repository, Dynamic Quota Entity was supported as an opaque entity -"data blobs", which implies that the Subscriber Profile Repository did not allow the customers provisioning system to update specific fields or rows within the data. If a customer needed to update the dynamic quota entity, the provisioning system would first read the existing data blob and perform updates and then write the entire data entity back into the database.

For the support of top-up and passes it is required that the provisioning system be able to add a new dynamic quota row into an existing dynamic quota entity, as well as be able to read, update or delete a specific dynamic quota row in existing records or read, update, delete the value of a specific field of a dynamic quota row. This ability is consistent with the capabilities provided for quota rows and fields.

As part of introducing this feature capability, the User Data Repository SEC is updated with the dynamic quota entity definition and customers are given an option to change it from "opaque" to "transparent" to support row level updates.

The figure below shows the pre-configured Dynamic Quota Entity definition.

Main Menu: UDR -> Subscriber Entity Configuration -> Transparent Entity -> Field Set -> [Edit]

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Warning

Field Set Name	DynamicQuotaV1 *	Name of this Transparent Entity Field Set Definition. [Default = n/a; Range = A 64-character string. Valid characters are alphanumeric and underscore. Must contain at least one alpha and must not start with a digit.]
Element String	dynamicquota *	XML element name under which defined fields reside. [Default = n/a; Range = A 64-character string. Valid characters are alphanumeric and underscore. Must contain at least one alpha and must not start with a digit.]
Repeatable	Instance Identifier Attribute ☑ name	Check box if Field Set is repeatable. [Default = unchecked] If "repeatable", specify the XML attribute Instance Identifier. [Range = A 64-character string. Valid characters are alphanumeric and underscore. Must contain at least one alpha and must not start with a digit.]

	Element String	Type	Field Set Name	Min Value	Max Value	Updatable	Resettable	Reset Value	Defaultable	Default Value	Min Occur	Max Occur	Special Format
01	InstanceId	RegEx		0	0	☐	☐		☐		0	1	^[\x20-\x7e]{(
02	Type	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
03	Priority	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
04	Duration	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
05	InitialTime	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
06	InitialTotalVc	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
07	InitialInputVo	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
08	InitialOutputV	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
09	InitialService	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
10	InterimRepor	RegEx		0	0	☑	☐		☐		0	1	^[\x20-\x7e]{(
11	activationdat	RegEx		0	0	☑	☐		☐		0	1	(^\d{4}\-\d{2
12	expirationdat	RegEx		0	0	☑	☐		☐		0	1	(^\d{4}\-\d{2
13	purchasedat	RegEx		0	0	☑	☐		☐		0	1	(^\d{4}\-\d{2

Add Field

Figure 8: Pre-configured Dynamic Quota Entity

The figure below shows how to change the dynamic quota entity from opaque to transparent.

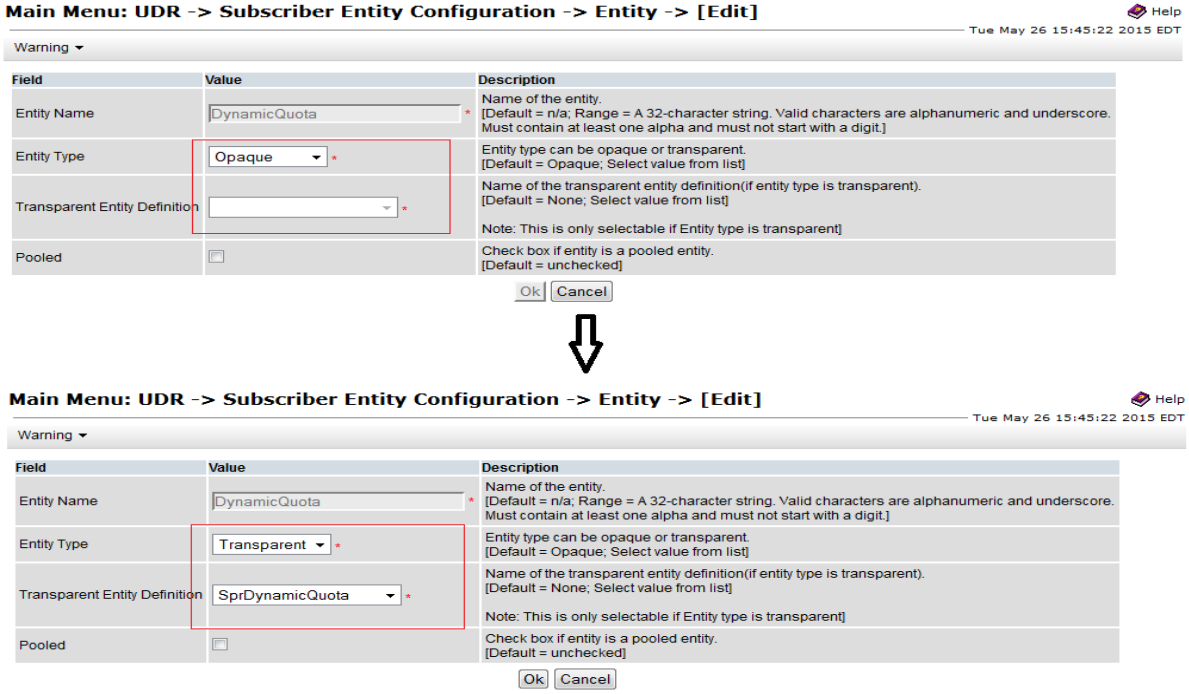

Figure 9: Changing Dynamic Quota Entity from Opaque to Transparent

2.10 User Data Repository Provisioning State Entity

In earlier releases of User Data Repository, State Entity was supported as opaque -"data blobs", which implies that the SPR did not allow the customers provisioning system to update specific fields or rows within the data. If a customer needed to update the State entity, the provisioning system would first read the existing data blob and perform updates and then write the entire data entity back into the database.

For the support of various types of monthly and weekly rolling offers, the provisioning system needs to be able to add a new state property into a new or existing state data blob, as well as read, update or delete an existing state property. This ability shall be consistent with the capabilities provided for quota rows and fields.
As part of introducing this feature capability, the User Data Repository SEC is updated with the State entity definition and customers are given an option to change it from "opaque" to "transparent" to support row level updates. The individual property names are not defined since they are created dynamically based on the policies configured in PCRF.

The figure below shows the pre-configured State entity definition

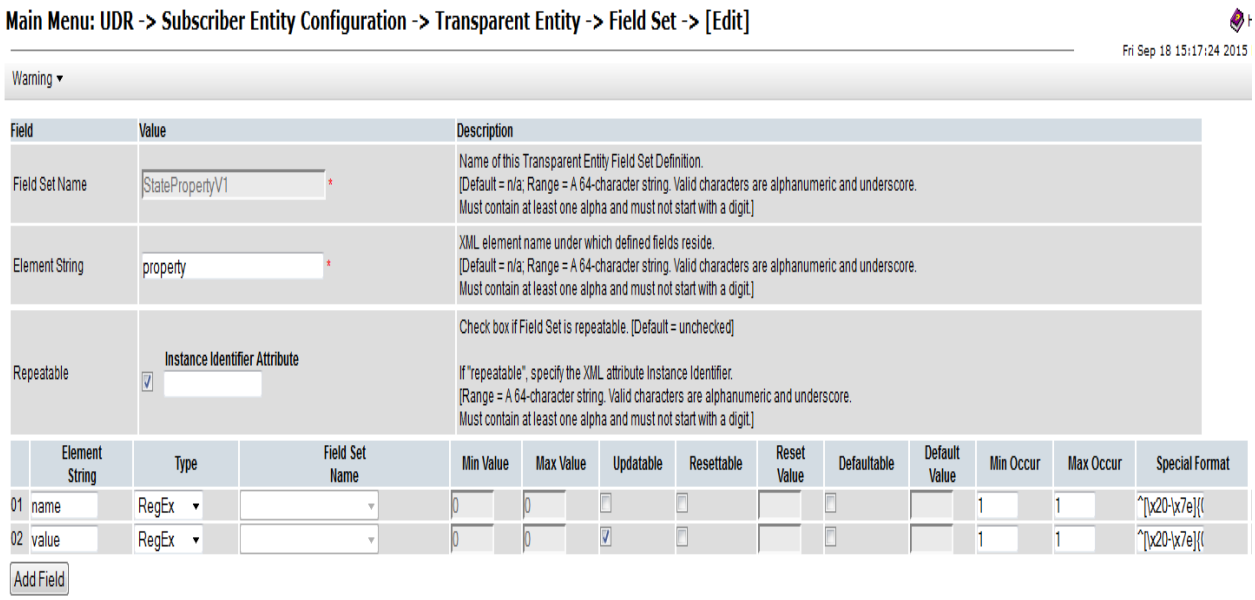

Figure 10: Pre-configured State Entity

The figure below shows how to change the State entity from opaque to transparent.\

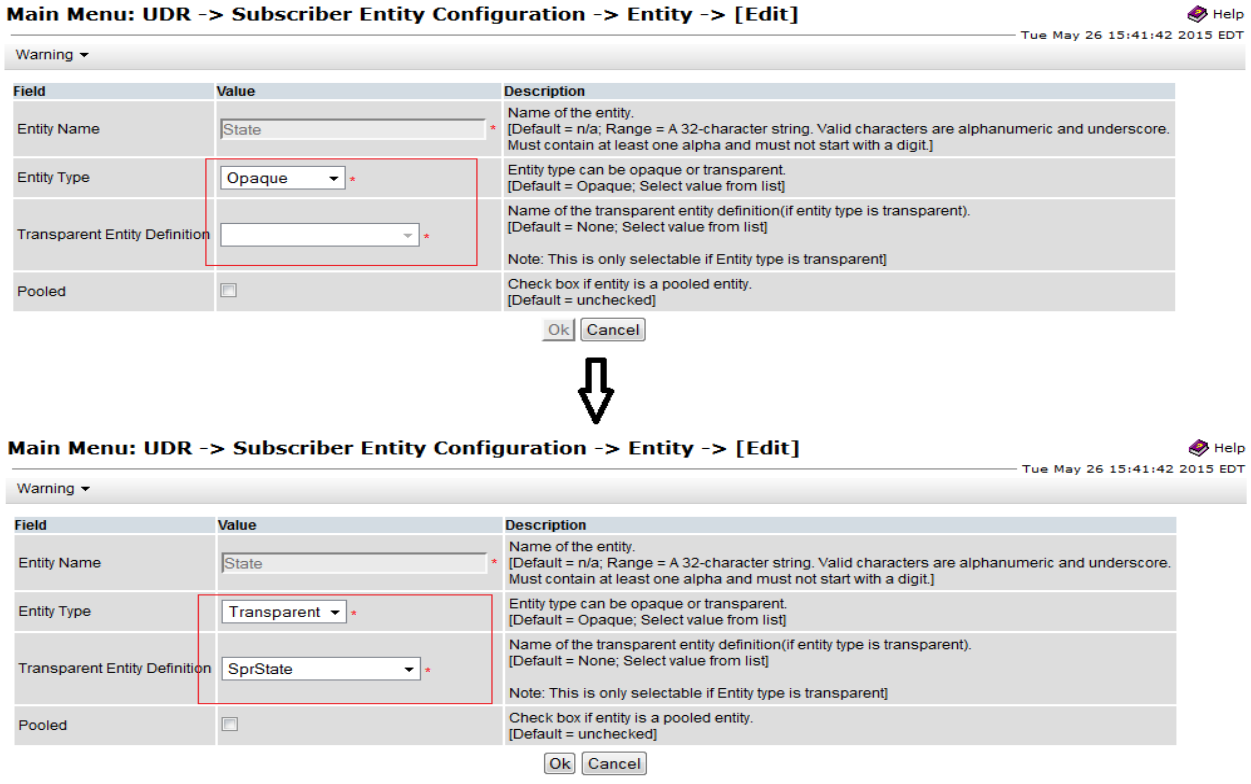

Figure 11: Changing State Entity from Opaque to Transparent

2.11 General Provisioning Updates

The system behavior after fresh install of User Data Repository R12.1 is as below:

- SOAP and REST interface is disabled by default
- REST interface is unsecure by default
- One critical *Alarm 13075: Provisioning Interfaces Disabled* is raised
- Manual Action:
    - If at least one of SOAP or REST interface is enabled manually, *Alarm 13075: Provisioning Interfaces Disabled* is cleared and a major *Alarm 13071: No Northbound Provisioning Connections* is raised.

The system behavior after upgrade to User Data Repository R12.1 is as below:

- REST interface remains enabled if it was enabled before upgrade
- SOAP interface remains enabled if it was enabled before upgrade
- REST interface remains unsecure or secure based on the configuration prior to upgrade.
- Major Alarms 13001 and 13027 are not raised
- Major Alarms 13000 and 13026 are not raised
- If at least one of SOAP or REST interface is enabled, a major *Alarm 13071: No Northbound Provisioning Connections* is raised
- If both SOAP and REST interfaces are disabled, a critical *Alarm 13075: Provisioning Interfaces Disabled* is raised

2.12 Cloud Deployable User Data Repository Configuration

The following configurations are supported:

- Non-Highly Available User Data Repository - all components are included in the setup; however, high availability is not provided.
- Highly Available Full User Data Repository – normal HA redundancy models for a single production site
- Highly Available Geo –redundant User Data Repository – normal User Data Repository two (or more) site production deployment

2.13 Anti-Affinity Considerations for Cloud Deployable User Data Repository

Table 13: User Data Repository HA Configuration per site

Virtual Machine	Affinity Rules	Minimum VMs	Maximum VMs	How used
NOAMP	Anti-affinity NOAMPs must be hosted on different servers	2	2	Active-Standby
SOAM	Anti-affinity SOAMs must be hosted on different servers	2	2	Active-Standby
MP	Anti-affinity MPs must be hosted on different servers	2	2	Active-Standby

2.14 Non-High Availability Cloud Deployable User Data Repository

The Non-High availability User Data Repository configuration has the following components, each installed in a separate VM:

- NOAM - User Data Repository network OAM
- SOAM - User Data Repository system OAM
- MP - Message processor

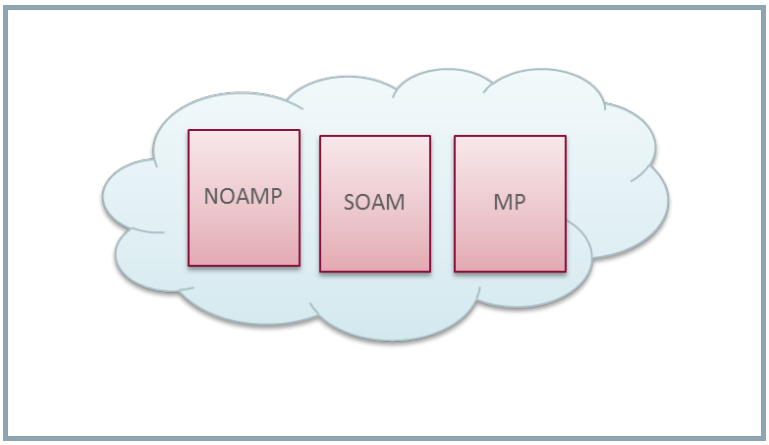

Figure 12: Non-High Availability User Data Repository Deployment

This configuration can be used for sales demonstration kits and small customer trials. Although the virtual machines are shown grouped together in the figure, they could be anywhere in the cloud. Affinity rules for the VMs do not need to be set.

Table 14: Non-High Availability User Data Repository Components

Virtual Machine	Affinity Rules	Optional/Mandatory	Min VMs	Max VMs	How Used?
NOAM	None	Mandatory	1	1	Min 1 per network. Up to 2 for optional HA.
SOAM	None	Mandatory	1	1	Min 1 per network. Up to 2 for optional HA.
MP	None	Mandatory	1	1	1 DA for core routing

2.15 High Availability Cloud Deployable User Data Repository

The high availability deployment has redundant VMs for each of the components. To ensure high availability, anti-affinity rules come into play.

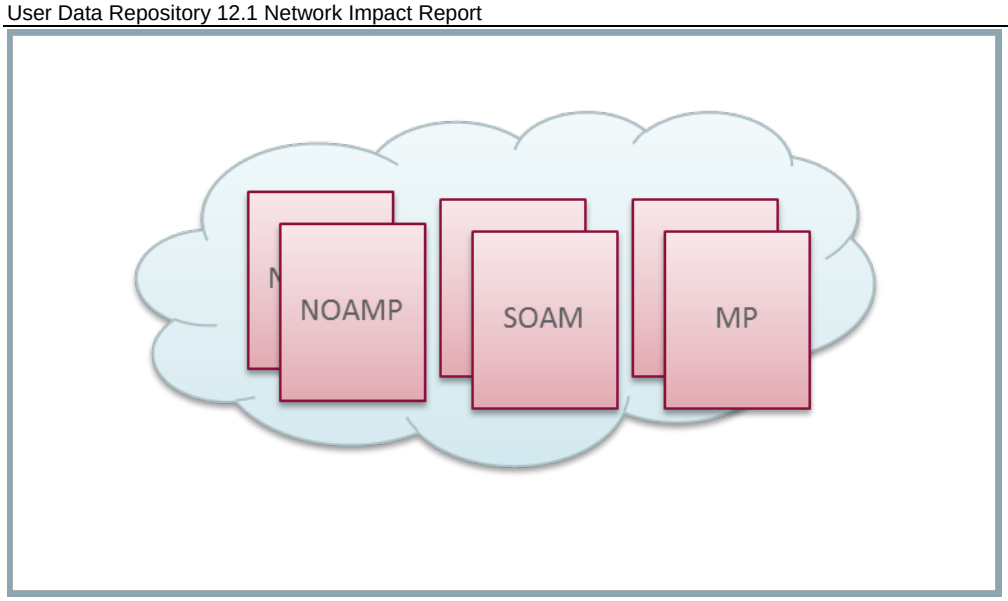

Figure 13: High Availability User Data Repository Deployment

Table 15. High Availability User Data Repository Components

Virtual Machine	Affinity Rules	Optional/ Mandatory	Min VMs	Max VMs	How Used?
NOAM	Anti-affinity. NOAMs must be hosted on different servers	Mandatory	2	2	Active-Standby
SOAM	Anti-affinity. SOAMs must be hosted on different servers	Mandatory	2	2	Active-Standby
MP	Anti-affinity. MPs must be hosted on different servers	Mandatory	2	4	Active-Active

2.16 Geo-Redundant High Availability Cloud Deployable User Data Repository

An HA, geo-reduntant configuration has two User Data Repository sites that are geographically separated.

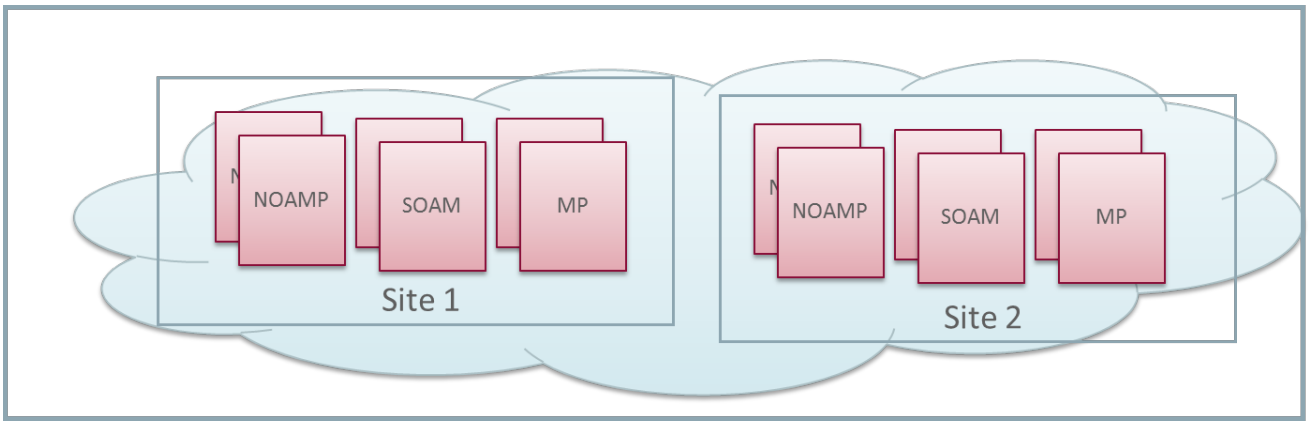

Figure 14: Geo-Redundant High Availability User Data Repository Deployment

Table 16: HA, Geo-reduntant Configuration Requirements

Virtual Machine	Node Type	Affinity Rules	Optional/ Mandatory	Min VMs	Max VMs	How Used?
NOAM	NOAM	Anti-affinity. NOAMs must be hosted on different servers at a site Network elements must be hosted at different geographic site.	Mandatory	4	4	Active-Standby
SOAM	Signaling 1	Anti-affinity. SOAMs must be hosted on different servers at a site Network elements must be hosted at different geographic site.	Mandatory	4	4	Active-Standby
MPs	Signaling 1	Anti-affinity. MPs must be hosted on different servers Network elements must be hosted at different geographic site.	Mandatory	4	8	Active-Active

3 User Data Repository 12.1 GUI Functions

OAM include: User Interfaces (NO GUI, SO GUI), Measurements Reports, Alarms, and KPIs. This section describes updated/new NO GUI menu.

3.1 User Data Repository Permissions

The Access Control for User Data Repository screens is updated as below. The permissions can be granted or removed on *Main Menu: Administration* → *Access Control* → *Groups GUI screen*. The administrative group "admin" (to which the super user *guiadmin* belongs) shall have access to all User Data Repository GUI permissions by default.

Resource	View	Insert	Edit	Delete	Manage
UDR Configuration Permissions	☐	☐	☐	☐	☐
Provisioning Options	☑		☑		
UDRBE Options	☑		☑		
Command Log Export Options	☑		☑		
Provisisoning Connections	☑	☑		☑	
Subscribing Client Permissions	☑	☑		☑	
Auto Enrollment Options	☑		☑		
Auto Enrollment Blacklist	☑	☑		☑	
UDR SEC Permissions	☐	☐	☐	☐	☐
Entity	☑	☑	☑	☑	
Interface Entity Map	☑	☑		☑	
Entity FieldSet	☑	☑	☑	☑	
Entity BaseFieldSet	☑	☑	☑	☑	
Entity Definition	☑	☑	☑	☑	
UDR Maintenance Permissions	☐	☐	☐	☐	☑
Subscriber Query	☑				
Connections	☑				
Command Log	☑			☑	
Import Status	☑			☑	
Export Schedule	☑	☑	☑	☑	
Export Status	☑				
Subscribing Client Availability	☑				
Quota Reset Scheduler Tasks	☑	☑	☑	☑	☑
Database Auditor	☑				☑
Command Log Export Status	☑				

Figure 15: User Data Repository Permissions

3.2 Provisioning Options

The Provisioning Option screen is modified to keep REST and SOAP interfaces disabled by default. There are no changes to the error messages or to any screen behavior.

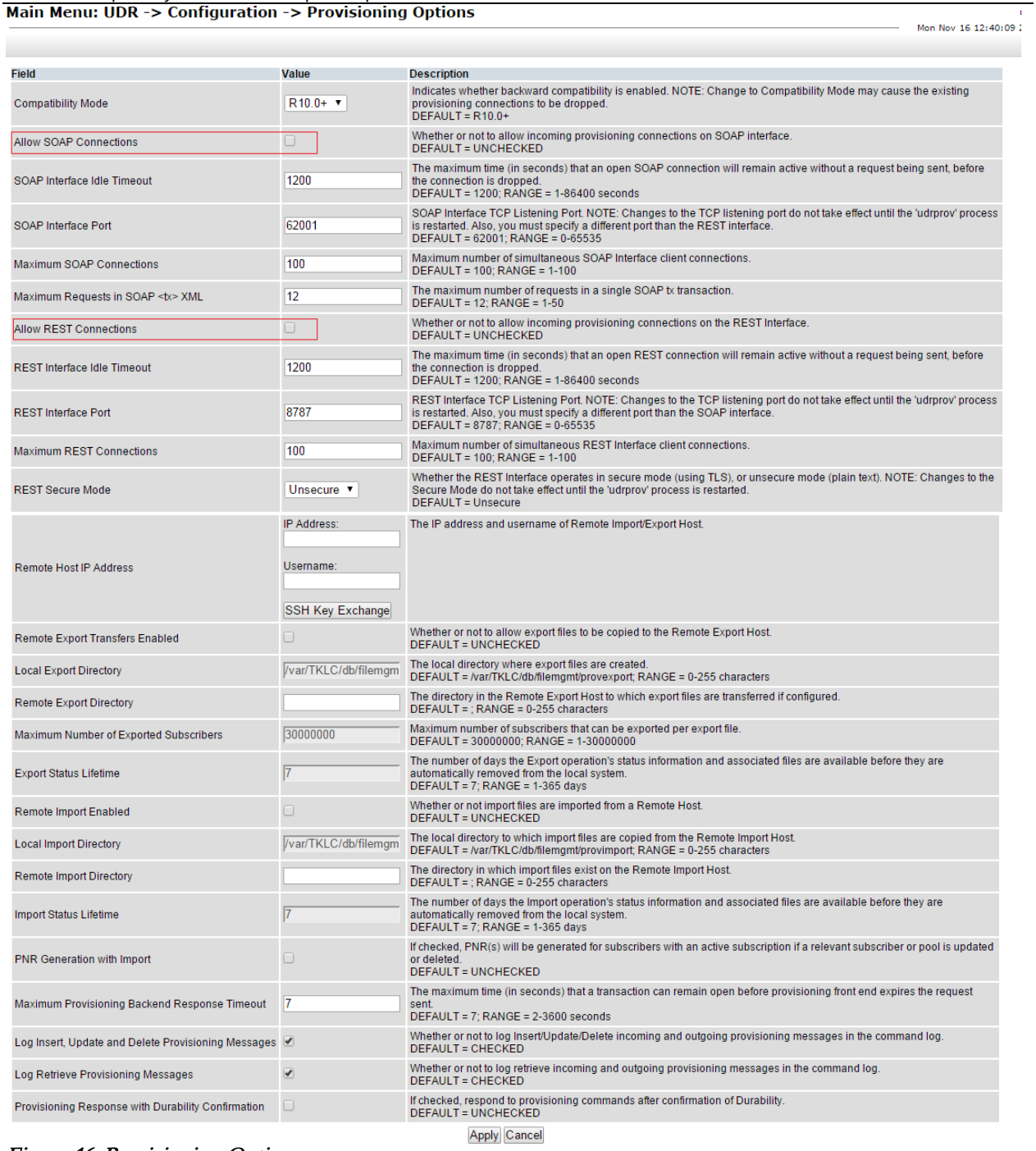

Figure 16: Provisioning Options

Table 17: Provisioning Options

Purpose	To allow an operator to update Provisioning options.
Required Permissions	*UDR Configuration Permissions* → *Provisioning Options* permissions group that is defined on the *Main Menu: Administration* → *Access Control* → *Groups* GUI screen
Tooltips	None
Nuances	• The Apply button is disabled until a value is modified.
Security Log Entries	Successful Update Failed Update

Error/Status Message Trigger Condition	*[Error Code 13101] – The option 'x' requires a value containing only digits.* The value specified for option x requires an integer value.
Error/Status Message Trigger Condition	*[Error Code 13102] – The option 'x' requires a minimum value of y.* The value specified for option x is less than y.
Error/Status Message Trigger Condition	*[Error Code 13103] – The option 'x' requires a maximum value of y.* The value specified for option x is greater than y.
Error/Status Message Trigger Condition	*[Error Code 13107] - Invalid IP address [0.0.0.0] - the first octet must be between 1-255, the other three must be between 0-255* The IP address octets specified for "IP Address" fell outside valid ranges.
Error/Status Message Trigger Condition	*[Error Code 13108] – Invalid IP address 'x' – Ipv4 dot-decimal notation is required (e.g. 192.168.0.1)* The value specified for "IP Address" was not specified in Ipv4 dot-decimal notation.
Error/Status Message Trigger Condition	*Update successful.* The options were updated successfully.

3.3 Command Log Export Options

Command Log Export Options control the initialization and working of the command log export feature. The GUI is used to specify values for various parameters that guide the behavior of the User Data Repository's Command Log export. A new GUI *Main Menu: UDR → Configuration → Command Log Export Options screen* is introduced in R12.1.

Table 18: Options added to Command Log Export Options screen

New Configuration Option Name	Description
Remote Host IP Address for Command Log Export	The IP address and username of Remote Command Log Export Host. Only Ipv4 is supported.
Local Command Log Export Directory	The local directory where Command Log Export files are created. DEFAULT = /var/TKLC/db/filemgmt/cmdlogexport; RANGE = 0-255 characters
Remote Command Log Export Directory	The directory in which the command log export files exist on the Remote Command Log Export Host. DEFAULT = ; RANGE = 0-255 characters
Command Log Export Status Lifetime	The number of days the Command Log Export operation's status information and associated files are available before they are automatically removed from the local system. DEFAULT = 1; RANGE = 1- 365 days
Remote Command Log Export Enabled	If checked, Command Log Export will be enabled and logs will be exported at regular intervals. DEFAULT = UNCHECKED

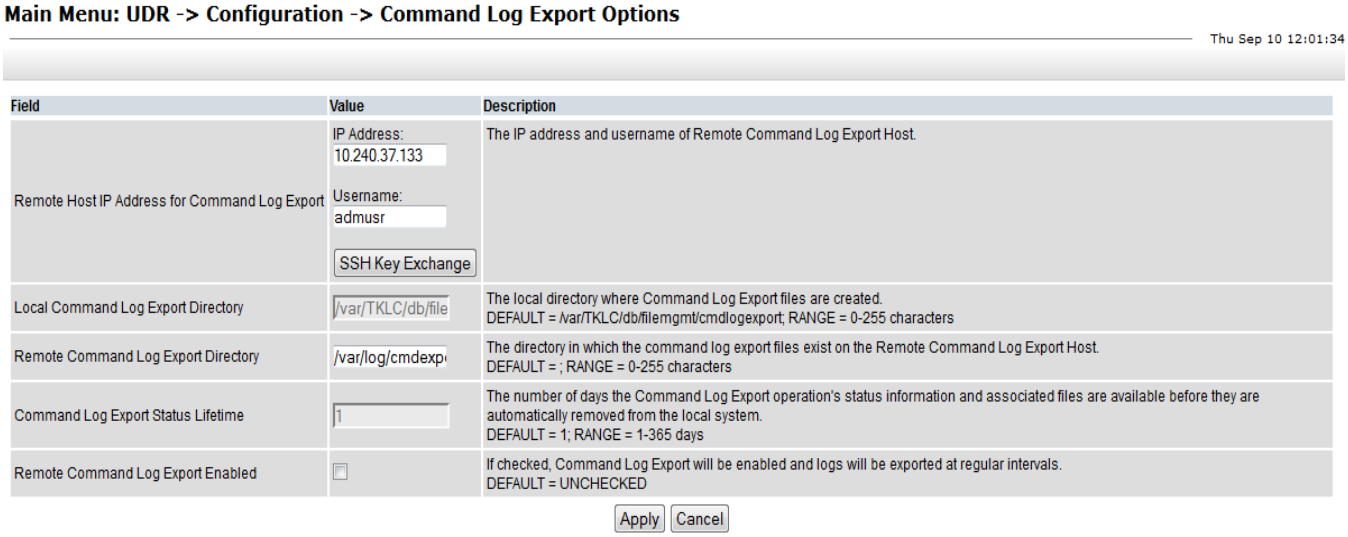

Figure 17: Command Log Export Options

Table 19: Command Log Export Options

Purpose	To allow an operator to update Command Log export options.
Required Permissions	*UDR Configuration Permissions* → *Command Log Export Options* permissions group that is defined on the *Main Menu: Administration* → *Access Control* → *Groups* GUI screen
Tooltips	None
Nuances	• The Apply button is disabled until a value is modified.
Security Log Entries	Successful Update Failed Update
Error/Status Message Trigger Condition	*[Error Code 13158] – Invalid IPv4 address 'x'* The value specified for "IP Address" was not a valid Ipv4 address.
Error/Status Message Trigger Condition	*Update successful.* The options were updated successfully.

3.4 Maintenance

3.4.1 Subscriber Query

The Subscriber Query screen in User Data Repository R12.1 is updated to include a new database statistic "*Enterprise Pools*".

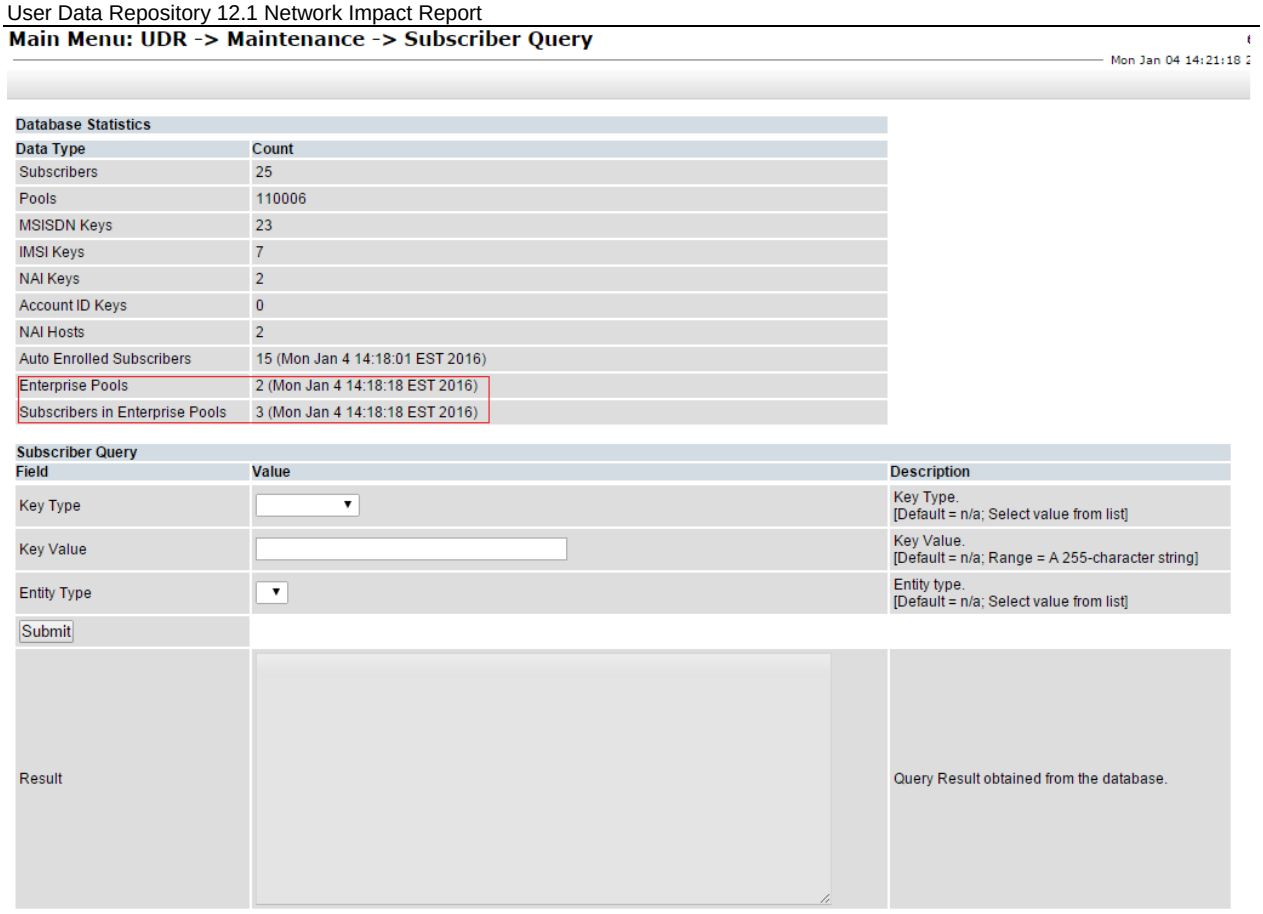

Figure 18: Subscriber Query

Table 20: Subscriber Query

Purpose	Display database statistics and Subscriber Information after query attributes are entered and submitted.
Required Permissions	UDR Maintenance Permission Group
Tooltips	• "Key Type" (Key Type (IMSI, MSISDN, NAI, Account Id or PoolID)) • "Key Value" (Key Value – a 255 character string used to identify the subscriber or pool) • "Entity Type" (Entity Type (DynamicQuota, Profile, Quota, State, Pool Information, PoolDynamicQuota, PoolProfile, PoolQuota, PoolState or new entities created from SEC GUI)) • "Result" (Subscriber Query Information)

Nuances	• The Database Statistics section contains counts for number of records in the User Data Repository database for each of the listed data types. These numbers are updated every time the screen is refreshed or the *Submit* button is pressed. • The "*Subscribers*" count indicates the total number of provisioned and auto-enrolled subscribers. • The "*Pools*" count indicates the total number of basic and enterprise pools. • The "*Auto Enrolled Subscribers*" count indicates the total number of auto-enrolled subscribers only. **The value displayed on the screen could be calculated over the past 24 hours. The date and time when the value was last calculated is displayed on the screen.** • The "Enterprise Pools" count indicates the total number of enterprise pools. **The value displayed on the screen could be calculated over the past 24 hours. The date and time when the value was last calculated is displayed on the screen.** • The Result section contains subscriber information that is extracted after query attributes are entered and the *Submit* button is pressed. • The "Entity Type" available values are based upon the current "Key Type" value. If the "Entity Type" value is "PoolID", the "Entity Type" legal values are: PoolDynamicQuota, PoolProfile, PoolQuota and PoolState. If the "Entity Type" value is not "PoolID", the "Entity Type" legal values are: DynamicQuota, Profile, Quota, State, and Pool Information.
Security Log Entries	Successful Query Failure Query
Error/Status Message Trigger Condition	*[Error Code 13131] – Bad Request* Occurs when the key value doesn't go with the key type (example putting a character when a digit is expected)
Error/Status Message Trigger Condition	*[Error Code 13132] – Data not found* Requested subscriber data does not exist (If the query doesn't detect a Subscriber Record)
Error/Status Message Trigger Condition	*[Error Code 13133] – Service Unavailable* Occurs when the provisioning front end process is down
Error/Status Message Trigger Condition	*[Error Code 13134] – [x]* The "x" here denotes any runtime error message that came up.

3.4.2 Command Log Export Status

The Command Log Export Status screen is a new screen introduced in User Data Repository R12.1. This screen is used to view and monitor the status of the command log export operations.
Command Log export task is initialized from User Data Repository GUI's *Main Menu: UDR → Configuration → Command Log Export Options*. It is configured to export the provisioning command logs on an hourly basis to a remote configured server.

Main Menu: UDR -> Maintenance -> Command Log Export Status

Filter

Command Log Export File	Time Started	Time Completed	Records Count	Status
commandLog_export_201508241650.exml.zip	2015-08-24 16:50:05	2015-08-24 16:55:07	239	Completed
commandLog_export_201508261405.exml.zip	2015-08-26 14:05:17	2015-08-26 14:10:04	120	Completed
commandLog_export_201508261410.exml.zip	2015-08-26 14:10:06	2015-08-26 14:15:08	30	Completed
commandLog_export_201508261420.exml.zip	2015-08-26 14:20:11	2015-08-26 14:25:13	5670	Completed
commandLog_export_201508261445.exml.zip	2015-08-26 14:45:15	2015-08-26 14:50:02	33	Completed
commandLog_export_201508261450.exml.zip	2015-08-26 14:50:04	2015-08-26 14:55:06	467	Completed
commandLog_export_201508261610.exml.zip	2015-08-26 16:10:09	2015-08-26 16:15:11	987	Completed
commandLog_export_201508261615.exml.zip	2015-08-26 16:15:14	2015-08-26 16:20:00	100	Completed

Figure 19: Command Log Export Status

Table 21: Command Log Export Status

<table>
<tr><td>Purpose</td><td>To allow an operator to view the status of all Command Log Exports Initiated. Command Log export is initiated from the Main Menu: UDR → Configuration → Command Log Export Options GUI screen.</td></tr>
<tr><td>Required Permissions</td><td>UDR Maintenance Permissions → Command Log Export Status permissions group that is defined on the Main Menu: Administration → Access Control → Groups GUI screen</td></tr>
<tr><td>Tooltips</td><td>
<table>
<tr><th>Field Name</th><th>Description</th><th>Possible Value</th><th>Default Value</th></tr>
<tr><td>Export File</td><td>Name of the command log export file</td><td>39 character string commandLog_export_<yyyymmddhhmm>.csv.zip
where <yyyymmddhhmm> is in local time</td><td>None</td></tr>
<tr><td>Time Started</td><td>Time the command log export was started</td><td>Date/Time in local time</td><td>None</td></tr>
<tr><td>Time Completed</td><td>Time the command log export was completed</td><td>Date/Time in local time</td><td>None</td></tr>
<tr><td>Records Count</td><td>Number of command logs exported</td><td>A number(10 digits)</td><td>None</td></tr>
<tr><td>Status</td><td>Status of the command log export</td><td>Initializing
Queued
In Progress
Transferring
Completed
Failed</td><td>None</td></tr>
</table>
</td></tr>
<tr><td>Nuances</td><td>

Records in the Command Log Export Status table may not be modified or deleted by a GUI operator. Records are automatically removed after 1 day.
The Display Filter select box has the following options:

“-None-” (default)
“Command Log Export File Like”
“Status equal to…”.

When the “Command Log Export File/Status” select box option is selected, a hidden text box becomes visible to the user where the user is expected to enter the value they want to filter on.
When the “Time range…” select box option is selected, the user is expected to enter the time range that they want to filter on.

</td></tr>
<tr><td>Security Log Entries</td><td>Successful Display</td></tr>
</table>

4 User Data Repository 12.1 MEAL Summary

This section will summarize the Alarms, Measurements, KPIs and Events.

4.1 Alarms

Table 22: Alarms

Alarm ID	Alarm Name	New/ Modified / Deleted	Severity	HA Score	MIB Required (Y/N)
13000	RAS interface disabled	Deleted	Critical	Normal	Yes
13001	No Remote RAS Client Connections	Deleted	Major	Normal	Yes
13026	XSAS interface disabled	Deleted	Critical	Normal	Yes
13027	No Remote XSAS Client Connections alarms	Deleted	Major	Normal	Yes
13068	Command Log Export Initialization Failed	New	Major	Normal	Yes
13069	Command Log Export Generation Failed	New	Major	Normal	Yes
13070	Command Log Export Transfer Failed	New	Major	Normal	Yes
13071	No Northbound Provisioning Connections	New	Major	Normal	Yes
13075	Provisioning Interfaces Disabled	New	Critical	Normal	Yes

4.2 Measurements

Measurements are A level measurements aggregated at NOAMP and viewable from NOAMP GUI.

Table 23: Measurements

ID	Tag	Group	New/ Modified / Deleted	Collect Interval	Description
	Provisioning Measurements				
3019	RxRasResetReqReceived	Provisioning Performance	New	5 min	The total number of REST Reset requests that have been received on the provisioning interface.
3046	RxXsasResetReqReceived	Provisioning Performance	New	5 min	The total number of SOAP Reset requests that have been received on the provisioning interface.
3061	RxCmdLogExportExecuted	Provisioning Performance	New	5 min	The total number of Command Log Export tasks executed.

4.3 KPIs

Table 24: KPIs

ID	Name	New/ Modified / Deleted	Avg. Interval	Description
13014	RxRasResetReqReceivedRate	New	10 sec	The number of REST Reset requests that have been received on the provisioning interface per sec.
13041	RxXsasResetReqReceivedRate	New	10 sec	The number of SOAP Reset requests that have been received on the provisioning interface per sec.

4.4 Events

Table 25: Events

ID	Name/Descr Text	New/ Modified / Deleted	Addl Info	Description
13362	Pool Audit Complete	New	None	This event is generated each time a Pool audit completes

4.5 Current MEAL Data

Currently available MEAL data (unchanged, new, modified) in Release12.1 is specified in the attached sheet – "MEAL_udr-10.2.0.0.0-12.15.0-udr-12.1.0.0.0-13.8.0.xlsx"

MEAL_udr-10.2.0.0.
0-12.15.0-udr-12.1.0

Appendix A. Locate Product Documentation on the Oracle Help Center Site

Oracle customer documentation is available on the web at the Oracle Help Center (OHC) site, http://docs.oracle.com. You do not have to register to access these documents. Viewing these files requires Adobe Acrobat Reader, which can be downloaded at www.adobe.com.

A.1 User Data Repository Documentation

To access User Data Repository User Guides follow the following steps:

1. Log into the Oracle Help Center site at http://docs.oracle.com
2. Select "Industries"
3. Select "Oracle Communications documentation" under "Oracle Communications"
4. Select "User Data Repository" under "Network Session Delivery and Control Infrastructure"
5. Select the Release
6. To download a file to your location, right-click the PDF link and select Save Target As

A.2 Platform Documentation

To access Platform User Guides and Release Notes follow the following steps:

1. Log into the Oracle Help Center site at http://docs.oracle.com
2. Select "Industries"
3. Select "Oracle Communications documentation" under "Oracle Communications"
4. Select "Tekelec" under "Platform"
5. Select the Release
6. To download a file to your location, right-click the PDF link and select Save Target As