

CUDB Network Impact Report, Upgrade from CUDB 15A CP1 to CUDB 1

NETWORK IMPACT REPORT

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1 Introduction

The Network Impact Report (NIR) describes the new and changed functions of the latest Ericsson Centralized User Database (CUDB) 1 product compared to the previous release of CUDB 15A CP1, and indicates how these functions affect the product, packages, and the overall network used by operators.

The NIR complies to the Ericsson Software Model (ESM), and is therefore structured by the available CUDB packages instead of features. For more information about this model, refer to Section 2.7.1 on page 9 and Section 4 on page 12.

The CUDB 1 product introduces the following new capabilities:

- Electronic Software Licenses (affecting all Base Packages and Value Packages).
- ENUM Profile

The CUDB 1 product introduces the following new functions:

- LDAP Data Views (affecting the Application Facilitator Value Package).
- Virtualized Network Function (VNF) support (affecting the 2G/3G/4G Profile and Generic Profile Base Packages).

The CUDB 1 product also contains the following enhancements for the already existing functions:

- Application Counters Presentation (affecting the Operation and Maintenance function).
- Automatic Handling of Network Isolation (affecting the System and Node Architecture function).
- Flexible PL Deployment (affecting the System and Node Architecture and Global Access functions).
- GEP3 and GEP5 Nodes Coexistence in CUDB Systems (affecting the System and Node Architecture function).
- Hardware Migration to BSP 8100 (affecting the System and Node Architecture function).
- Increased Import/Export Speed (affecting the Operation and Maintenance function).
- Multi-Application Support on BSP 8100 (affecting the System and Node Architecture function).



- OAM Automation with NETCONF Support (affecting the Operation and Maintenance function).
- OAM Centralized Authentication (affecting the Operation and Maintenance function).
- Provisioning Assurance after CUDB Mastership Change (affecting the System and Node Architecture function).
- Self-Ordered Backup and Restore (affecting the Operation and Maintenance and the System and Node Architecture functions).
- Service Automation in Minority (affecting the System and Node Architecture function).
- Support for Binary Attributes in Notifications (affecting the Notification Support function).

Refer to the “Functions” section of *CUDB Technical Product Description*, Reference [11] for more information on these capabilities and functions.

1.1 Revision Information

Rev. A Initial release.

Rev. B This revision contains the following changes:

- Section 7.1.1 on page 21 and Section 7.2 on page 26: Updated information on OAM Automation with NETCONF Support impacts.

**Rev. C**

This revision contains the following changes:

- Document structure rearranged.
- Section 2.1.1 on page 4: Updated Table 1, Table 2 and Table 3 with new capacity information.
- Section 2.4 on page 7: Updated with information on hardware migration.
- Section 2.6 on page 8: Updated with information on changing IP plan because of hardware migration.
- Section 5.6 on page 17: Updated with impact on notifications process.
- Section 6.1 on page 20: Updated Table 8 with changes on error code handling.
- Section 7.1.1 on page 21: Updated Table 9 with new, modified, and removed commands and command options.
- Section 7.1.4 on page 26: Added new section listing new administrative operations.
- Section 7.2 on page 26: Updated Table 12 with new, modified and removed classes and attributes.
- Section 7.3 on page 29: Updated Table 13 with alarms affected by Virtualized Network Function support.
- Section 7.4 on page 30: Updated with information on application counter installation.
- Section 7.5 on page 31: Updated with new and modified logging components.
- Section 7.7 on page 32: Added new section on executing Schema Update Tool dependency check.
- Updated Glossary.



2 General Impact

This section provides information about the changes in user capacity, network performance, memory consumption, hardware, interfaces, and the Customer Product Information (CPI) between CUDB 15A CP1 and CUDB 1.

2.1 Capacity and Performance

This section provides information about changes related to capacity and performance.

2.1.1 Subscriber Capacity

The subscriber capacity of CUDB is mainly affected by the following factors:

- The size of the CUDB deployment.
- The individual subscriber memory size (also known as subscriber footprint).
- The processing capacity of the system, affected by the different traffic models and subscriber profiles used by the application Front Ends (FEs), such as the Home Location Register (HLR) and the Home Subscriber Server (HSS).
- The optional CUDB features.

The subscriber capacity values are shown in Table 1, Table 2, and Table 3. The figures of these tables have been obtained by using the *Advanced* processing option of the Ericsson default profile tool. The figures were calculated with an IP backbone Quality of Service (QoS) of RTT=40 ms and PLR=10E-4, on a 1+1 CUDB configuration.

The detailed capacity information for default Ericsson profiles on Blade Server Platform (BSP) 8100 with Generic Ericsson Processor version 3 (GEP3) boards is shown in Table 1. Individual operator profile characteristics can vary significantly.



Table 1 CUDB 1 Capacity Summary for BSP 8100 GEP3 (1+1)

BSP 8100 GEP3	HLR ⁽¹⁾	MNP ⁽²⁾	IMS ⁽³⁾ ₍₄₎	EPC ⁽³⁾⁽⁵⁾	SAPC ⁽²⁾⁽⁶⁾	AAA ⁽²⁾⁽⁷⁾	M2M ⁽²⁾	EIR ⁽²⁾⁽⁸⁾	ENUM ⁽²⁾
Maximum system capacity ⁽⁹⁾	160.4	167.1	89.2	177.1	219.8	221.4	179.8	289.5	273.5
Maximum node capacity ⁽⁹⁾	33.6	98.8	7.1	39.3	94.3	28.0	34.0	127.2	86.2

(1) Default CANDI profile.

(2) Estimated figures.

(3) Ericsson default profile.

(4) IMS-fixed BB users.

(5) AVG Authentication. No LDAP optimization.

(6) Usage Reporting and 1 Traffic_ID. No subscriber groups.

(7) AAA-FE GPRS.

(8) IMEI only. All IMEIs used by the active subscribers are provisioned. BHCI=1.

(9) Million subscribers.

The detailed capacity information for default Ericsson profiles on BSP 8100 with Generic Ericsson Processor version 5 (GEP5) boards is shown in Table 2. Individual operator profile characteristics can vary significantly.

Table 2 CUDB 1 Capacity Summary for BSP 8100 GEP5 (1+1)

BSP 8100 GEP5	HLR ⁽¹⁾	MNP ⁽²⁾	IMS ⁽³⁾ ₍₄₎	EPC ⁽³⁾⁽⁵⁾	SAPC ⁽²⁾⁽⁶⁾	AAA ⁽²⁾⁽⁷⁾	M2M ⁽²⁾	EIR ⁽²⁾⁽⁸⁾	ENUM ⁽²⁾
Maximum system capacity ⁽⁹⁾	514.3	536.1	286.1	568.1	704.8	710.1	576.7	928.3	877.0
Maximum node capacity ⁽⁹⁾	104.9	206.1	18.0	67.9	182.7	87.3	77.1	270.3	169.8

(1) Default CANDI profile.

(2) Estimated figures.

(3) Ericsson default profile.

(4) IMS-fixed BB users.

(5) AVG Authentication. No LDAP optimization.

(6) Usage Reporting and 1 Traffic_ID. No subscriber groups.

(7) AAA-FE GPRS.

(8) IMEI only. All IMEIs used by the active subscribers are provisioned. BHCI=1.

(9) Million subscribers.

Note: In case of hybrid systems (that is mixing GEP3 and GEP5 nodes), consider the smaller capacity figures for maximum system capacity (whenever Processing Layer, or PL memory is the limit). To determine the maximum node capacity, use the Ericsson default profile tool.

The detailed capacity information for default Ericsson profiles on virtualized CUDB deployments over Cloud Execution Environment (CEE) on BSP 8100 GEP5 hardware is shown in Table 3. Individual operator profile characteristics can vary significantly.

**Table 3 CUDB 1 Capacity Summary for Virtualized CUDB over CEE on BSP 8100 GEP5 (1+1)**

Virtualized CUDB over CEE on BSP 8100 GEP5 (16 vCPUs)	HLR ⁽¹⁾⁽²⁾	MNP ⁽¹⁾	IMS ⁽¹⁾⁽³⁾	EPC ⁽¹⁾⁽⁴⁾	SAPC ⁽¹⁾⁽⁵⁾	AAA ⁽¹⁾⁽⁶⁾	M2M ⁽¹⁾	EIR ⁽¹⁾⁽⁷⁾	ENUM ⁽¹⁾
Maximum system capacity ⁽⁸⁾	375.4	391.3	178.4	414.6	514.5	518.3	420.9	667.6	640.1
Maximum node capacity ⁽⁸⁾	58.2	113.3	9.9	37.3	100.4	63.7	42.4	148.6	93.4

(1) Estimated figures.

(2) Default CANDI profile.

(3) IMS-fixed BB users.

(4) AVG Authentication. No LDAP optimization.

(5) Usage Reporting and 1 Traffic_ID. No subscriber groups.

(6) AAA-FE GPRS.

(7) IMEI only. All IMEIs used by the active subscribers are provisioned. BHCI=1.

(8) Million subscribers.

Note: The maximum node capacity has been calculated for a 1+1 configuration. Consider that system capacity does not scale linearly with the number of nodes.

Note: The CUDB 1 release received improvements in LDAP-FE processing that are not clearly visible in the tables above, as the LDAP-FE processing capacity is not the limiting factor in such maximum configurations. The maximum system capacity is usually limited by the PL memory, but the maximum node capacity in these 1+1 configurations is limited instead by the Data Store (DS) memory in the Home Location Register (HLR), and by the DS processing in the IP Multimedia Subsystem (IMS). However, in most CUDB deployments, LDAP-FE capacity is usually the limiting factor, and they will therefore benefit from this improvement. In case of HLR in a 2+2 configuration deployed on BSP 8100 GEP5 hardware, the maximum capacity is increased from 158 million subscribers (or 79 million subscribers per node) on 16A FD1 to 168 million subscribers (or 84 million subscribers per node) on CUDB 1.

2.1.2 Network Performance

No impact.

2.2 Hardware

This section provides information about hardware-related impacts.

CUDB 1 supports only the BSP 8100 hardware with both GEP3 and GEP5 blade types for native systems. Maiden installations of CUDB 1 support only the BSP 8100 hardware with GEP5 blades for native systems.



CUDB 1 also supports virtualized environments, but in case of maiden installations only. Virtual CUDB is verified to run on the Ericsson Cloud Execution Environment (CEE), on BSP 8100 hardware with GEP5 blades. Support for other virtualized environments or hardware is possible, but they must be secured through an integration project.

The CUDB 1 system supports the combination of nodes with different blade types (GEP3 or GEP5). Hybrid systems mixing GEP3 nodes and GEP5 nodes are allowed; however, combining GEP3 and GEP5 blades in the same node is not supported.

The minimum number of Processing Layer Database (PLDB) blades supported by this release is 2, instead of the previous value of 4 blades. Refer to *CUDB Node Configuration Data Model Description*, Reference [1] for more information.

2.2.1 Updated Hardware

No impact.

2.3 Software

No impact.

2.4 Upgrade Impact

The upgrade process received the following impacts:

- During the upgrade process (but before the upgrade of any node), the `backboneReliability` parameter is automatically set to `true` on CUDB systems that have this attribute set to `false`. Refer to the *IP Backbone Reliability Parameter* section of the *CUDB High Availability Facility Description (7/155 34-HDA 104 03/7)* in the *Ericsson Centralized User Database (CUDB) 15A CP1* documentation for more details on the system behavior related to the `backboneReliability` parameter.

Note: Once the complete system is upgraded, the `backboneReliability` attribute is marked as deprecated, and has no further effect in the system.

- CUDB 1 also includes a new optional Quality Of Service (QoS) policy for marking outgoing traffic with the proper Differentiated Services Code Point (DSCP). Upgrade from CUDB systems with customized QoS policies is not supported, and those customizations must be properly deleted before the upgrade is executed.
- CUDB 1 introduces Electronic Software Licenses. This function requires to perform licensing-related activities during the upgrade, such as getting



digital fingerprints on every node in the system and requesting License Key Files from Ericsson Sourcing and Supply.

- During the software upgrade process, the Hardware Monitoring function is disabled on the node currently being upgraded.
- In case of using deployments with DMX or BSP hardware, the Distributed Main Switch (DMX) software is updated to BSP 8100 during the upgrade procedure. This process is referred to as “HW Migration”.

2.5 Obsolete Functions

No impact.

2.6 Other Network Elements

During the migration procedure, the System Controller Switch Board (SCXB) and the System Controller (SC) blade access will be separated, and the SYSOAM /28 subnet will be split into BSP_NBI and SYSMGMT /29 subnets. This requires changing the current IP plan, therefore prepare the following parameters before the migration procedure as shown in Table 4 and Table 5.

Table 4 BSP NBI Subnet IP Addresses

Name	Description
BSP_NBI_PREFIX	BSP NBI subnet address - reuse at least a /29 subnet of the current SYSOAM network that contains the current SYSOAM VRRP address.
BSP_NBI_MASK	BSP NBI subnet mask
BSP_NBI_TAG	VLAN tag for the BSP NBI subnet - reuse of the SYSOAM tag is mandatory.
BSP_NBI_VRID	VRRP virtual router ID for BSP NBI subnet
BSP_NBI_SCX_CNB	BSP Northbound IP - reuse of SYSOAM_SCX is recommended. The address cannot be the same as any other address currently in use in the SYSOAM network.
BSP_NBI_CMx0	CMX-0-26 IP in BSP NBI subnet
BSP_NBI_CMx1	CMX-0-28 IP in BSP NBI subnet

Table 5 SYSMGMT Subnet

Name	Description
SYSMGMT_PREFIX	SYSMGMT subnet address - reuse of the other half of the SYSOAM subnet is recommended.
SYSMGMT_MASK	SYSMGMT subnet mask



Name	Description
SYSMGMT_VRID	VRRP virtual router ID for SYSMGMT subnet
SYSMGMT_ROUTER0_ADDR	CMX-0-26 IP in SYSMGMT subnet
SYSMGMT_ROUTER1_ADDR	CMX-0-28 IP in SYSMGMT subnet
SYSMGMT_SC1	SC_2_1 IP
SYSMGMT_SC2	SC_2_2 IP
SYSMGMT_VRRP_IP	Floating IP in SYSMGMT subnet

If, for any reason, it is impossible to arrange the above addresses into two subnets within the current SYSOAM network, a new subnet must be allocated for the SYSMGMT network, and routed towards the CUDB OAM network. In this case, the entire SYSOAM network can be reused for the new BSP_NBI network.

Note: Make sure that the external routing (that is, the site router) is (re)configured accordingly. During the first part of the procedure, the original SYSOAM IPs are used, and later the new SYSMGMT/BSP_NBI addresses. Once the whole procedure is done and node is working properly, the unnecessary routes can be cleaned up.

Note: To ensure that external connectivity is maintained throughout the procedure, the new BSP_NBI network uses the same VRRP IP address as the original SYSOAM network. Do not change this VRRP IP address.

2.7 Packages in CUDB

All functions in CUDB are grouped into packages. For details about CUDB functions, see Section 5 on page 15.

2.7.1 CUDB Base and Value Packages

CUDB contains the following packages, according to the ESM:

- Base Packages:
 - 2G/3G/4G Profile
 - Generic Profile
- Value Packages:
 - Deployment Flexibility
 - Application Facilitator
 - Advanced Network Protection

The mapping between features and packages is shown in Table 6.

Table 6 Feature to Base Package and Value Package Mapping

Feature Number	Feature Name	Base Packages/Value Packages
FAJ 901 831	Basic CUDB System	All Base Packages
FAJ 901 832	Access Control	All Base Packages
FAJ 901 834	Support for Layered N+1 Redundancy in HLR Classic Networks	2G/3G/4G Profile Base Package
FAJ 901 852	Data Schema Management Tool	All Base Packages
FAJ 901 0015	Enhanced Overload Protection and Cooperative Load Regulation FE-BE	All Base Packages
FAJ 901 0001	Evolution of Monolithic Storage to Centralized User Data Base CUDB	2G/3G/4G Profile Base Package (HLR, AUC), Generic Profile Base Package (MNP)
FAJ 901 817	Traffic Prioritization per application under Overload	All Base Packages
FAJ 901 682	Ericsson HLR Profile	2G/3G/4G Profile Base Package
FAJ 901 760	Ericsson MNP Profile	Generic Profile Base Package
FAJ 901 816	Ericsson AUC Profile	2G/3G/4G Profile Base Package
FAJ 901 683	Ericsson HSS-IMS Profile	2G/3G/4G Profile Base Package
FAJ 901 685	Ericsson HSS-EPC Profile	2G/3G/4G Profile Base Package
FAJ 901 828	Ericsson SAPC Profile	Generic Profile Base Package
FAJ 901 827	Ericsson M2M Profile	2G/3G/4G Profile Base Package
FAJ 901 829	Ericsson EIR Profile	Generic Profile Base Package
FAJ 901 0046	Ericsson ENUM Profile	Generic Profile Base Package
FAJ 901 927	Ericsson AAA Profile	Generic Profile Base Package
FAJ 901 687	General Profile Basic	Generic Profile Base Package
FAJ 901 695	Double Geographical Redundancy	All Base Packages
FAJ 901 599	Triple Geographical Redundancy	Advanced Network Protection Value Package
FAJ 901 688	Binary Large Object (BLOBs)	All Base Packages
FAJ 901 689	EPC Mobility	2G/3G/4G Profile Base Package



Table 6 Feature to Base Package and Value Package Mapping

Feature Number	Feature Name	Base Packages/Value Packages
FAJ 901 690	Notifications	All Base Packages
FAJ 901 691	Multiple Geographical Areas	Deployment Flexibility Value Package
FAJ 901 759	External Data Access	All Base Packages
FAJ 901 764	Subscription Reallocation	All Base Packages

For changes in packages, see Section 4 on page 12.

3 Summary of Impacts per Package

This chapter summarizes the impacts that the functions of the new release have on the available packages.

The description of impact is as follows:

Major Impact The function has done an incompatible change so that another node requires an update.

Minor Impact The function has caused changes that affect other nodes, but with extra configuration, the previous behavior can be kept.

No Impact The function has no impact on the system.

The new and enhanced functions of CUDB 1 are listed in Section 1 on page 1. Refer to *CUDB Technical Product Description*, Reference [11] for more information on these functions.

The available packages and impacts in CUDB 1 are listed in Table 7.

Table 7 Summary of Impacts on Base and Value Packages

Package Name	Impact		
	Major	Minor	None
2G/3G/4G Profile Base Package	X		
Generic Profile Base Package	X		
Deployment Flexibility Value Package		X	

*Table 7 Summary of Impacts on Base and Value Packages*

Package Name	Impact		
	Major	Minor	None
Application Facilitator Value Package	X		
Advanced Network Protection Value Package	X		

4 Impact on Packages

This section provides detailed information about the impacts on the available packages in CUDB.

The CUDB system (also referred to as CUDB network) is a distributed system of connected CUDB nodes that cooperate to provide seamless database service.

CUDB stores subscriber profiles and provisioned (static) or non-provisioned (dynamic) service data associated to subscribers. As a subscriber-centric database, CUDB also holds the service profiles for the supported applications.

All the Base Packages allow the use of the following functions.

- Access Control
- CUDB High Availability
- Data Consolidation
- Global Access
- Installation Based Upgrade
- Notification Support
- Operation and Maintenance
- Overload Protection
- Subscription Reallocation
- System & Node Architecture

For more information about the functions mentioned in this section, refer to *CUDB Technical Product Description*, Reference [11].



4.1 All Base Packages

The changes common for all Base Packages are the following:

- Changes in supported hardware. See Section 2.2.1 on page 7 for more details.
- Changes in Operation and Maintenance. See Section 7 on page 21 for more details.
- All Base Packages have been expanded with the following new functions:
 - VNF support
 - Electronic Software License (see Section 4.1.1 on page 13 below).
- All Base Packages have been expanded with the following new enhancements:
 - ENUM Profile
 - Flexible PL Deployment
 - OAM Automation with NETCONF Support

Refer to the “Functions” section of *CUDB Technical Product Description*, Reference [11] for more information on these functions and enhancements.

4.1.1 Electronic Software License

This section provides information about impacts related to Electronic Software License.

4.1.1.1 Description

The Electronic Software License function requires to perform licensing-related activities during the upgrade, such as getting digital fingerprints on every node in the system and requesting License Key Files from Ericsson Sourcing and Supply.

4.1.1.2 Impact

New function.

4.1.2 Dependencies

No dependencies.



4.1.3 Impacts

The `cudbReallocate` command received a new command-line option, and also had an existing option removed. See Section 7.1.1 on page 21 for more information.

4.2 Base Packages

4.2.1 2G/3G/4G Profile Base Package

No other function is present in this package beside the general ones.

4.2.1.1 Dependencies

No dependencies.

4.2.1.2 Impact

NETCONF is enabled, so all configuration changes can be done through the NETCONF interface.

See Section 4.1 on page 12 for more information on common impacts and changes for all Base Packages.

4.2.2 Generic Profile Base Package

No other function is present in this package beside the general ones.

4.2.2.1 Dependencies

The Generic Profile Base Package requires Ericsson Multi-Vendor Verification/Integration Services (MVV/MVI), except in case of using PCRF-FE, MNP-FE, AAA-FE, ENUM-FE, or EIR-FE.

4.2.2.2 Impact

- EIR subscriber data (IMEI only) can now be stored both in the PLDB and the DSGs.

See Section 4.1 on page 12 for more information on common impacts and changes for all Base Packages.

4.3 Value Packages

This section describes the available value packages in CUDB.



4.3.1 Deployment Flexibility Value Package

The Deployment Flexibility Value Package allows subscription distribution between defined geographical areas according to policies of the customers, providing a reduction of the bandwidth needed from the IP backbone between each of the geographical areas.

4.3.1.1 Dependencies

Base package bandwidth requirements are reduced for inter-geographical areas communication.

4.3.1.2 Impact

No impact.

4.3.2 Application Facilitator Value Package

The Application Facilitator Value Package allows the definition and use of the **LDAP Data Views** function. See Section 5.11 on page 20 for more information on the function.

4.3.2.1 Dependencies

If the Application Facilitator License is not installed on the system, then the functions of this Value Package cannot be used.

4.3.2.2 Impact

This Value Package has been enhanced with the **LDAP Data Views** function.

4.3.3 Advanced Network Protection Value Package

The Advanced Network Protection Value Package allows an advanced network protection, where a third replica for each DSG is added in a third geographical location (one main and two redundant), providing higher data availability.

4.3.3.1 Dependencies

If the Advanced Network Protection License is not installed on the system, then the functions of this Value Package cannot be used.

4.3.3.2 Impact

No impact.



5 Impact on Functions

This section describes the impacts of the new and enhanced functions of CUDB 1. Refer to the “Functions” section of *CUDB Technical Product Description*, Reference [11] for more information on these functions.

5.1 Global Access

This section provides information about impacts related to Global Access.

5.1.1 Description

5.1.2 Impact

This function has received the Flexible PL Deployment enhancement. When activated, the enhancement requires a new network design, as nodes without a PLDB blade or VM cannot receive direct traffic from application FEs.

5.2 CUDB High Availability

This section provides information about impacts related to CUDB High Availability.

5.2.1 Description

The CUDB system provides data and service access in high availability (HA). The system is designed to ensure HA on several levels, aiming that in case of failure in any of its hardware or software components, the overall CUDB system (or the data stored in it) is not compromised, and the database can continue providing as much service and data consistency as possible. Refer to *CUDB High Availability*, Reference [12] for more information.

5.2.2 Impact

No impact.

5.3 System and Node Architecture

This section provides information about impacts related to System & Node Architecture.



5.3.1 Description

5.3.2 Impact

This function received the following enhancements:

- Automatic Handling of Network Isolation
- Provisioning Assurance after CUDB Mastership Change
- Multi-Application Support on BSP 8100
- Service Automation in Minority
- GEP3 and GEP5 Nodes Coexistence in CUDB Systems
- Hardware Migration to BSP 8100
- Self-Ordered Backup and Restore
- Flexible PL Deployment

5.4 Data Consolidation

This section provides information about impacts related to Data Consolidation.

5.4.1 Description

5.4.2 Impact

No impact.

5.5 Access Control

This section provides information about impacts related to Access Control.

5.5.1 Description

CUDB supports the dynamic configuration of access control policies for LDAP provisioning and traffic. This is performed through the definition of users, groups, and their associated set of data access privileges.

5.5.2 Impact

No impact.



5.6 Notification Support

This section provides information about impacts related to Notification Support.

5.6.1 Description

CUDB supports outbound notifications, so whenever a piece of data is modified in a subscriber profile, CUDB can send Simple Object Access Protocol (SOAP) based notifications towards the corresponding application FE.

5.6.2 Impact

This function received the Support for Binary Attributes in Notifications enhancement.

The `notifications` process now runs on all blades of the node.

5.7 Operation and Maintenance

This section provides information about impacts related to Operation and Maintenance.

5.7.1 Description

CUDB provides different interfaces for different administrative purposes, such as configuration and supervision. Focusing on customer needs, the goal is to provide operators with a flexible, cost-effective and secure management system. CUDB offers Operation and Maintenance (OAM) on a per node level.

5.7.2 Impact

This function received the following enhancements:

- OAM Centralized Authentication
- Increased Import/Export Speed
- Application Counters Presentation
- Self-Ordered Backup and Restore
- OAM Automation with NETCONF Support

For other changes in Operation and Maintenance, see Section 7 on page 21 for more details.



5.8 Subscription Reallocation

This section provides information about impacts related to Subscription Reallocation.

5.8.1 Description

CUDB supports the administrative management of the geographical location of the subscriber or resource data stored in CUDB. This function (also known as "reallocation") allows the relocation of stored data from one DSG to other DSGs to ensure that all DSGs have an optimal level of data occupancy.

5.8.2 Impact

No impact.

5.9 Overload Protection

This section provides information about impacts related to Overload Protection.

5.9.1 Description

The CUDB nodes incorporate a self-protection mechanism, and internal load regulation between its components, so that excessive incoming traffic (overload) cannot lead to service interruption. If the extent of the overload is measured up to 150% of the engineered capacity, CUDB guarantees that at least 90% of the throughput at the engineered capacity is served.

5.9.2 Impact

No impact.

5.10 Virtualized Network Function Support

This section provides information about impacts related to Virtualized Network Function (VNF) support.

5.10.1 Description

This function makes possible to decouple software and hardware through virtualization, thereby enabling the harmonization of hardware across multiple products and vendors, and the optimization of hardware utilization.



The support of virtualization in CUDB covers the installation, configuration and adaptation of CUDB OAM functions. A virtualized CUDB system provides the same functions and architecture as a native CUDB system.

5.10.2 **Impact**

New function.

5.11 **LDAP Data Views**

This section provides information about impacts related to LDAP Data Views.

5.11.1 **Description**

This function makes it possible for applications to access the data stored in CUDB through a custom Directory Information Tree (DIT) and a custom schema. LDAP users can be configured to access CUDB either by using the “native” view and core DIT, or by using one of the defined LDAP data views.

Several LDAP data views can be defined to accommodate different kinds of application FEs.

5.11.2 **Impact**

New function.

6 **Interfaces**

This section describes interface changes between the existing and new revisions of the product.

6.1 **Inter-Node Interface**

The inter-node interface impacts caused by new or modified CUDB 1 features are shown in Table 8. Refer to *CUDB SOAP Interwork Description*, Reference [2] and *CUDB LDAP Interwork Description*, Reference [4] for more information.



Table 8 *Interface Impacts*

Interface	Nodes	Protocol	Impact	Function
LDAP	CUDB-HLR CUDB-HSS CUDB-PG All Application FEs	LDAP V3	<ul style="list-style-type: none"> Behavior in symmetrical split scenarios has changed to allow provisioning in the partition where there is a master replica of PLDB. In these situations, traffic will be accepted, when it used to be rejected with result code 53. Other minor updates in split situations and related error codes. Refer to <i>CUDB LDAP Interwork Description</i>, Reference [4] and <i>CUDB LDAP Data Access</i>, Reference [3] for further details. The LDAP interface received new conditions and error messages for Error Code 52. Error 52 can also be raised when application FEs send direct traffic to a node without PLDB. 	Flexible PL Deployment OAM
LDAP	CUDB-HLR CUDB-HSS CUDB-PG All Application FEs	LDAP V3	Deleting parent entries of Distribution Entries (DEs) is not allowed and will result in Error Code 53 with the text message: Deleting parent of distribution entry is not allowed.	OAM

6.2 Man-Machine Interface

No impact.

6.3 Other Interface Impacts

No impact.

7 Operation and Maintenance

This section describes changes to commands, configuration parameters, alarms, counters, logging and tools.

7.1 Commands

This section describes the new, modified, and removed Command Line Interface (CLI) commands in CUDB.



7.1.1 CUDB CLI Commands

The CUDB CLI command and command option changes are shown in Table 9. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.

Table 9 Summary of New, Modified, and Removed CUDB CLI Commands

Command	Command Option	Impact	Function
cudbApplyConfig	-s --scope all	Deprecated command and command option, replaced by the applyConfig administrative operation of the CudbLocalNode class. See Section 7.1.4 on page 26 for more information on applyConfig.	OAM Automation with NETCONF Support
	-n --noimmsave	Removed command option.	OAM Automation with NETCONF Support
cudbCheckConsistency	-o --object-tables	New command option used to check and report any difference between the OBJECT_CLASSES and MULTI_VALUE_OBJECTS tables.	OAM
cudbCollectInfo	-a --action	Added the following actions to the --action -a command option: <ul style="list-style-type: none"> bc_client: Used to collect the data stored in the BC cluster. upgrade: Used to collect upgrade logs from the cudbUpgradeWorkDir directory. 	OAM
cudbConsistencyMgr	--max-replica-lag	Modified command option, default value changed to 10000.	OAM
cudbClusterConfConverter		New restricted command.	Flexible PL Deployment
cudbDsgMastershipChange		Modified the mastership change logic of the command. In case the destination node has a PLDB slave that is unable to synchronize with its master, then the mastership change request will be rejected. The --force option overrides this behavior.	OAM
cudbEvipConfigExtension	-r --removePLDB	New restricted command option.	Flexible PL Deployment
cudbLdapFeRestart	-p --parallel	Restricted command option.	OAM
cudbLdapFeRestart	--with-monitor	Deprecated command option.	Increment Alert Key Command
	--no-prompt	New restricted command option.	



Table 9 Summary of New, Modified, and Removed CUDB CLI Commands

Command	Command Option	Impact	Function
cudbLicensingTool	<ul style="list-style-type: none"> • --help -h • --calculate-fingerprint -c • --upgrade -u • --restore-fingerprint -r 	New command and command options used to calculate unique fingerprint or restore saved fingerprint and store it in the License Manager during installation or upgrade.	Electronic Software License
cudbManageBCServer	-help	Removed command option.	OAM
cudbManageStore	-s --restore-stored-procedures	New command option added to the restore order to restore stored procedures for application counters after the data restore.	Self-Ordered Backup and Restore
cudbManageStore	-o --order restorestoredprocedures	New administrative order added to the -o --order command option, used to restore the stored procedures for application counters.	Self-Ordered Backup and Restore
cudbManageStore	-f --fresh-backup	New command option added to the backup order to not reuse already ongoing backups.	Self-Ordered Backup and Restore
cudbManageStore	--no-prompt	New restricted command option.	Increment Alert Key Command
cudbPrepareStore		Modified command to also support nodes without PLDB.	Flexible PL Deployment
cudbReallocate	<ul style="list-style-type: none"> • -a --auto • -f --force • -t --stoponsource • -e --empty 	Removed command options specified on the left.	Subscription Reallocation
cudbReallocate	-p --entriespercentage	New command option used to define the percentage of the DS entries in the specific source DSG that is required to be moved away.	Self-Ordered Backup and Restore
cudbReallocate		Updated command output.	Flexible PL Deployment
cudbRemoteTrust	-b --banner	New command option used to disable the legal warning banner for internal CUDB logins.	OAM
cudbServiceContinuity		New command used to change mastership manually to a working site that has been left in Minority after a CUDB system split situation.	Automatic Handling of Network Isolation
cudbSystemDataBackupAndRestore	-f --forced	<ul style="list-style-type: none"> • Modified command option: -f --forced now disables checking of the systemDataBackup and automatedBackupStorage folders in case the backup or restore is executed with the -R command option. • Updated output messages. 	OAM

**Table 9** Summary of New, Modified, and Removed CUDB CLI Commands

Command	Command Option	Impact	Function
cudbSystemStatus	-R	Modified command and command option, updated output messages on replication information.	OAM
cudbSystemStatus	-t --hardware-type	<ul style="list-style-type: none"> New option used to print the value of the <code>hwType</code> attribute of each CUDB node, and whether each DSG in the CUDB system is running on hybrid hardware. Modified command. Command issued on systems with different hardware types (that is, hybrid hardware) inform the user about the hardware types used. 	Hybrid Hardware Support
cudbSystemStatus		Modified command output. PLDB sections now missing from output if the node contains no PLDB.	Flexible PL Deployment
cudbSwBackup	-o --delete-oldest	<ul style="list-style-type: none"> Modified command to perform backup rotation automatically with confirmation message. New <code>-o --delete-oldest</code> command option used to suppress confirmation message. 	OAM
cudbSwBackup	-f --force	New command option used to allow SW restore in case the mysqlds of the PLDB are down, or the CUDB node does not have a defined PLDB cluster.	OAM
cudbSwBackup	-r	Deprecated command option.	Increment Alert Key Command.
	--no-prompt	New restricted command option.	
cudbUnitDataBackupAndRestore	-q --queued-copy	<ul style="list-style-type: none"> New restricted command option. The script now restores the stored procedures for application counters. 	Self-Ordered Backup and Restore
cudbUnitDataBackupAndRestore	--no-prompt	New restricted command option.	Increment Alert Key Command.



Table 9 Summary of New, Modified, and Removed CUDB CLI Commands

Command	Command Option	Impact	Function
<code>cudbUpdateUserInfo</code>		Deprecated command, replaced by the <code>updateUserInfo</code> administrative operation of the <code>CudbLocalNode</code> class. See Section 7.1.4 on page 26 for more information on <code>updateUserInfo</code> . Also modified to support refreshing CUDB LDAP users from a remote PLDB.	OAM Automation with NETCONF Support
<code>slapadd</code>	<ul style="list-style-type: none"> <code>--pldb</code> <code>--dsg <dsgid></code> 	<ul style="list-style-type: none"> The command now requires the use of the <code>--pldb</code> or <code>--dsg <dsgid></code> flag for specifying the database on which the provided LDIF file is imported. Updated output messages. <p>Refer to <i>CUDB Import and Export Procedures</i>, Reference [7] for more information.</p>	OAM

7.1.2 COM CLI Commands

No impact.

7.1.3 ESA Commands

The Ericsson SNMP Agent (ESA) command and command option changes are shown in Table 10. Refer to *ESA Performance Management*, Reference [13] and *ESA Fault Management*, Reference [14] for more information.

Table 10 Summary of New, Modified, and Removed ESA Commands

Command	Command Option	Impact	Function
<code>esaclusterstatus</code>		Modified command: blade designations <code>SC_2_1</code> and <code>SC_2_2</code> are changed to <code>OAM1</code> and <code>OAM2</code> respectively.	OAM
<code>fmactivealarms</code>		<p>Modified the Operating Instructions (OPIs) of all alarms as follows:</p> <ul style="list-style-type: none"> Removed <code>Time</code> attribute. Added <code>Timestamp First</code>, <code>Repeated Counter</code>, <code>Timestamp Last</code> and <code>Sequence Number</code> attributes. <p>See Section 7.6 on page 32 for more details.</p>	OAM
<code>pmdeleteinstance</code>		New command used to delete an abstract counter instance. Not used in CUDB.	OAM

**Table 10** Summary of New, Modified, and Removed ESA Commands

Command	Command Option	Impact	Function
pmjob		New command used to view counter jobs that are configured and managed in the PM Agent.	OAM
pmreadcounter		Modified command: new Instance id column added to output.	OAM
pmverifydatasource	Collection Id	Modified command: removed parameter.	OAM
pmwritecounter	Instance id	Modified command: added new optional parameter. Not used in CUDB.	OAM

7.1.4 Administrative Operations

The administrative operations of the CUDB system are shown in Table 11. Refer to the “Administrative Operations” section of *CUDB Node Configuration Data Model Description*, Reference [1] for more information about administrative operations.

Table 11 Summary of New, Modified, and Removed Administrative Operations

Class	Administrative Operation	Impact	Function
CudbLocalNode	applyConfig	New administrative operation replacing the deprecated cudbApplyConfig command, used to activate configuration changes.	OAM Automation with NETCONF Support
CudbLocalNode	updateUserInfo	New administrative operation replacing the deprecated cudbUpdateUserInfo command, used to update user information in the node.	OAM Automation with NETCONF Support
CudbLocalNode	cancelApplyConfig	New restricted administrative operation.	OAM Automation with NETCONF Support

7.2 Parameters

The configuration object and attribute changes are shown in Table 12. Refer to *CUDB Node Configuration Data Model Description*, Reference [1] for detailed information about the configuration objects and their attributes.

Table 12 New and Modified Configuration Objects and Attributes

Class	Attribute	Impact	Function
CudbDsGroupRepairAndResync		New class used to hold the configuration attributes related to the Automatic Handling of Network Isolation and the Self-Ordered Backup and Restore functions.	Automatic Handling of Network Isolation Self-Ordered Backup and Restore



Table 12 *New and Modified Configuration Objects and Attributes*

Class	Attribute	Impact	Function
CudbLdapUser	<ul style="list-style-type: none"> • userLdapAuth • userLdapHash 	<p>Modified userLdapAuth and userLdapHash attributes as follows:</p> <ul style="list-style-type: none"> • If no specific value is defined for userLdapAuth, then the default value of the attribute is equal to the value of the nodeLdapAuth attribute when the user is created. • If no specific value is defined for userLdapHash, then the default value of the attribute is equal to the value of the nodeLdapHash attribute when the user is created. 	OAM
CudbLdapUser	cudbLdapViewId	New attribute used as the identifier of the LDAP view attached to the specific user for the LDAP Data Views function.	LDAP Data Views
CudbLdapView		New class representing the LDAP views for the LDAP Data Views function.	LDAP Data Views
CudbLdapViewsMgmt		New class representing the container of the LDAP views for the LDAP Data Views function.	LDAP Data Views
CudbLocalDS	cudbLocalDsId	Modified attribute. The value range of cudbLocalDsId is 1-17 if the CudbLocalNode class containing the CudbLocalDS object has no CudbLocalPl object created.	Flexible PL Deployment
CudbLocalNode	applyConfigStatus	<p>New read-only attribute that stores the following information about the progress of the asynchronous applyConfig administrative action:</p> <ul style="list-style-type: none"> • actionId • actionName • additionalInfo • progressInfo • progressPercentage • result • resultInfo • state • timeActionStarted • timeActionCompleted • timeOfLastStatusUpdate 	OAM Automation with NETCONF Support

**Table 12** *New and Modified Configuration Objects and Attributes*

Class	Attribute	Impact	Function
CudbLocalNode	updateUserInfoStatus	New read-only attribute that stores the following information about the progress of the asynchronous updateUserInfo administrative action: <ul style="list-style-type: none">• actionId• actionName• additionalInfo• progressInfo• progressPercentage• result• resultInfo• state• timeActionStarted• timeActionCompleted• timeOfLastStatusUpdate	OAM Automation with NETCONF Support
CudbLocalPL		Modified class. The CudbLocalPL class is now optional.	Flexible PL Deployment
CudbPlGroup	memoryWarningThreshold	New attribute used to define the memory threshold after which an alarm is raised.	Hybrid Hardware Support
CudbRemoteDs	cudbRemoteDsId	Modified attribute. The value range of cudbRemoteDsId is 1-17 if the CudbLocalNode class containing the CudbRemoteDs object has no CudbRemotePl object created.	Flexible PL Deployment
CudbRemotePl	numAssignedNodes	Modified class. The CudbRemotePl class is now optional. New numAssignedNodes attribute used to define the number of PLDB dedicated blades on a remote node.	Flexible PL Deployment Hybrid Hardware Support
cudbSystem	automaticServiceContinuity	New attribute used to enable or disable the automatic triggering of Service Continuity for minority scenarios.	Automatic Handling in Network Isolation
cudbSystem	backboneReliability	Deprecated attribute with no functional behavior. The attribute is now optional, restricted, and its default value is true ¹¹ .	OAM



Table 12 New and Modified Configuration Objects and Attributes

Class	Attribute	Impact	Function
CudbTrafficControlManager		New class serving as the container of the traffic blocking rules.	OAM
CudbTrafficBlockingRule		New class used to block access to certain CUDB VIPs or services running on certain CUDB VIP ports. It is used to replace the existing procedure for node isolation.	OAM

(1) During the upgrade of the CUDB system, the `backboneReliability` parameter is automatically set to `true` before the upgrade of any node. See Section 2.4 on page 7 for more details.

Note: When modifying the configuration model, always use one `commit` command to commit changes, and then one call of the administrative operation `applyConfig` to activate the configuration changes. Avoid several commits followed by one single call of the administrative operation `applyConfig`.

Also, read-only attributes are now read from the BC cluster instead of the database.

7.3 Alarms

The alarms impacted by new or modified CUDB 1 functions are shown in Table 13. Refer to *CUDB Node Fault Management Configuration Guide*, Reference [5] and the related alarm Operating Instructions (OPIs) for detailed information about the alarms.

Table 13 New and Modified Alarms

Alarm	Impact	Function
Control, Blackboard Coordination Server Down	Modified alarm	VNF
LDAP Front End, Server Down	Modified alarm	VNF
Licensing, Autonomous Mode Activated, License Management	New alarm	Electronic Software License
Licensing, Capacity Usage Threshold Reached, License Management, Major	New alarm	Electronic Software License
Licensing, Capacity Usage Threshold Reached, License Management, Warning	New alarm	Electronic Software License
Licensing, Emergency Unlock Reset Key Required, License Management	New alarm	Electronic Software License
Licensing, Key File Fault, License Management	New alarm	Electronic Software License
Licensing, License Key Not Available, License Management, Major	New alarm	Electronic Software License
Licensing, License Key Not Available, License Management, Minor	New alarm	Electronic Software License

**Table 13** *New and Modified Alarms*

Alarm	Impact	Function
Licensing, License Management Not Available, License Management	New alarm	Electronic Software License
Operating System, Disk Usage Too High	Modified alarm	VNF
SAF, LOTC Time Synchronization Failed	Modified alarm	OAM
Server Platform, Storage Performance Degradation Detected	New alarm	Hardware Monitoring Function
Storage Engine, Automatic Handling of Network Isolation not Completed for DS	New alarm	VNF
Storage Engine, Automatic Handling of Network Isolation not Completed for PLDB	New alarm	VNF
Storage Engine, Execution of Selective Replica Consistency Check Failed, DS, Major	New alarm	Automatic Handling of Network Isolation
Storage Engine, Data Inconsistency between Replicas Repaired, DS	New alarm	Automatic Handling of Network Isolation
Storage Engine, Data Inconsistency between Replicas Repaired, PLDB	New alarm	Automatic Handling of Network Isolation
Storage Engine, DS Cluster Node Down	Modified alarm	VNF
Storage Engine, PLDB Cluster Node Down	Modified alarm	VNF
Storage Engine, Execution of Selective Replica Consistency Check Failed, PLDB, Major	New alarm	Automatic Handling of Network Isolation
Storage Engine, Unable to Synchronize Cluster In DS	Modified alarm	Automatic Handling of Network Isolation
Storage Engine, Unable to Synchronize Cluster in DS, Warning	New alarm	Automatic Handling of Network Isolation
Storage Engine, Unable to Synchronize Cluster In PLDB	Modified alarm	Automatic Handling of Network Isolation
Storage Engine, Unable to Synchronize Cluster In PLDB, Warning	New alarm	Automatic Handling of Network Isolation
Storage Engine, Unrepaired Data Inconsistency between Replicas, DS	New alarm	Automatic Handling of Network Isolation
Storage Engine, Unrepaired Data Inconsistency between Replicas, PLDB	New alarm	Automatic Handling of Network Isolation

7.4 Counters

The changes affecting the counters used in CUDB are as follows:

- The `appCountersLib.sh` script has been modified not to contain the MySQL server user and password. The functions for retrieving and formatting counter data remained the same. Refer to the “ESA



Configuration” section of *CUDB Application Counters*, Reference [9] for more information.

- The maximum size for cumulative counters is extended from $2^{31}-1$ to $2^{63}-1$. Refer to the “Counter Descriptions” section of *CUDB Counters List*, Reference [8] for more information.
- DS cluster counters can now provide information about up to 17 local DS database clusters. Also, application counters can now only be installed and used on nodes containing PLDB blades or virtual machines (VMs).
- The following new counters have been introduced:
 - HLR_accounting_report
 - HSS_IMS_accounting_report
 - HSS_EPC_accounting_report
 - AUC_accounting_report
 - SMALL_accounting_report
 - MEDIUM_accounting_report
 - LARGE_accounting_report

Refer to *CUDB Counters List*, Reference [8] for more information.

7.5 Logging

The following new components writing on the logs have been included in the CUDB system:

- LDAP Counters
- License Manager
- Replica Consistency
- SmartHWFaultReaction

New and modified logging events are included due to impacts in the following components:

- DataBackupRestore
- Cluster Supervisor
- Configuration Management
- DbmsTools



- Fault Management
- LDAP FE Monitor
- Reconciliation
- Security
- System Monitor

Note: Consider the following changes related to logging:

- The Management Server logs of MySQL clusters are no longer forwarded to syslog. These logs are still available in the separate log files of each MySQL cluster.
- All application-related logging events in CUDB are reported using Linux `rsyslog` instead of `syslog-ng`. Refer to [RFC 3195: Reliable Delivery for syslog](#), Reference [15] for more information.

For more information, refer to *CUDB Node Logging Events*, Reference [10].

7.6 ESA Uplift Impacts

This section describes the changes related to the ESA component uplift.

7.6.1 Changes in the Alarm OPIs

The `Time` attribute was removed from the OPIs. At the same time, the following attributes were added:

- `Timestamp First`: Indicates the date and time when the alarm was raised for the first time.
- `Repeated Counter`: Indicates how many times the alarm was raised.
- `Timestamp Last`: Indicates the date and time of the most recent alarm raise.
- `Sequence Number`: Indicates the order in which alarms are raised.

The above changes are applicable to all OPIs.

7.6.2 Changes in ESA Commands

For more information regarding the changes in ESA commands, see Section 7.1.3 on page 25.



7.7 Tools

This section lists the changes affecting the tools used in the CUDB system.

7.7.1 Schema Update Tool

It is recommended (but not required) to run the Schema Update Tool on the SCs of the CUDB system. If the Schema Update Tool is executed elsewhere, check the version of the shared libraries required for the `slapd` process to determine if the Linux version of the current machine is sufficient for executing the tool.





Glossary

AAA

Authentication, Authorization and Accounting

AUC

Authentication Center

BE

Back End

BLOB

Binary Large Object

BSP

Blade Server Platform

CEE

Cloud Execution Environment

CLI

Command Line Interface

COM

Common Operation and Maintenance

CUDB

Ericsson Centralized User Database

DMX

Distributed Main Switch

DS

Data Store

DSCP

Differentiated Services Code Point

DSG

DS Unit Group

EBS

Ericsson Blade System

EIR

Equipment Identity Register

ENUM

E.164 Number Mapping

EPC

Evolved Packet Core

ESA

Ericsson SNMP Agent

ESM

Ericsson Software Model

FE

Front End

GEP

Generic Ericsson Processor board

GEP3

Generic Ericsson Processor version 3

GEP5

Generic Ericsson Processor version 5

GUI

Graphical User Interface

HLR

Home Location Register

HLR-FE

HLR Front End

HSS

Home Subscriber Server

HTTP

Hypertext Transfer Protocol

IMEI

International Mobile Station Equipment Identity

IMS

IP Multimedia Subsystem

LDAP

Lightweight Directory Access Protocol



MNP

Mobile Number Portability

M2M

Machine-to-Machine

MVI

Multi-Vendor Integration

MVV

Multi-Vendor Verification

NETCONF

Network Configuration Protocol

NIR

Network Impact Report

OAM

Operation and Maintenance

OPI

Operating Instruction

PCRF

Policy and Charging Rules Function

PG

Provisioning Gateway

PL

Processing Layer

PLDB

Processing Layer Database

QoS

Quality of Service

SAPC

Service-Aware Policy Control

SLF

Subscription Locator Function

SNMP

Simple Network Management Protocol

SOAP

Simple Object Access Protocol

SW

Software

UDC

User Data Consolidation

UUID

Universally Unique Identifier

VNF

Virtualized Network Function



Reference List

CUDB Documents

- [1] *CUDB Node Configuration Data Model Description*, 1/192 02-CSH 109 067/10
- [2] *CUDB SOAP Interwork Description*, 3/155 19-HDA 104 03/9
- [3] *CUDB LDAP Data Access*, 5/155 34-HDA 10403/10
- [4] *CUDB LDAP Interwork Description*, 1/155 19-HDA 104 03/10
- [5] *CUDB Node Fault Management Configuration Guide*, 3/1553-CSH 109 067/10
- [6] *CUDB Node Commands and Parameters*, 1/1553-CSH 109 067/10
- [7] *CUDB Import and Export Procedures*, 6/1553-HDA 104 03/10
- [8] *CUDB Counters List*, 1/006 51-CSH 109 067/10
- [9] *CUDB Application Counters*, 10/155 34-HDA 104 03/10
- [10] *CUDB Node Logging Events*, 4/1553-CSH 109 067/10
- [11] *CUDB Technical Product Description*, 221 02-FGC 101 3147
- [12] *CUDB High Availability*, 7/155 34-HDA 104 03/10

Other Ericsson Documents

- [13] *ESA Performance Management*, 3/1543-CSH 109 532
- [14] *ESA Fault Management*, 2/1543-CSH 109 532

Other Documents and Online References

- [15] *Reliable Delivery for syslog* <https://www.ietf.org/rfc/rfc3195.txt>