

CUDB 1.10 Network Impact Report

NETWORK IMPACT REPORT

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1 Introduction

The Network Impact Report (NIR) describes the new and changed functions implemented in the Ericsson Centralized User Database (CUDB) since CUDB 16A FD1 and indicates how these changes affect the product and the overall network used by operators.

To find the changes applicable to a specific upgrade path, apply the filters by using the funnel icon on the upper left side of the browser.

The document also describes changes that are introduced with the software upgrade, but are part of functions planned for coming releases, see Section 6 on page 45. Each of the changes is described in the corresponding referenced documents.

Refer to the *Functions* section of *CUDB Technical Product Description*, Reference [1] for more information on CUDB functions.

1.1 Revision Information

Rev. A

Initial release.

Rev. B

Other than editorial changes, this document has been revised as follows:

- **CUDB CLI Commands and Parameters:** Updated information on OAM Automation with NETCONF Support impacts.

Rev. C

Other than editorial changes, this document has been revised as follows:

- Document structure rearranged.
- Section 2.1.1 on page 9: Updated Table 1, Table 2, and Table 3 with new capacity information.
- Section 5.1.3 on page 34: Updated with impact on notifications process.
- **CUDB CLI Commands:** Updated table with new, modified, and removed commands and command options.
- **Administrative Operations:** Added new section listing new administrative operations.



- **Parameters:** Updated table with new, modified, and removed classes and attributes.
- **Alarms:** Updated table section with alarms affected by Virtualized Network Function support.
- **Counters:** Updated with information on application counter installation.
- **Logging:** Updated with new and modified logging components.
- **Tools:** Added new section on executing Schema Update Tool dependency check.
- Updated Glossary.

Rev. D

Other than editorial changes, this document has been revised as follows for the CUDB 1.1 release:

- Section 1 on page 1: Added CUDB Key Performance Indicators (KPIs) to the list of enhancements.
- **Section 5.7.2. Impact:** Indicated KPI as enhancement impacting the function.
- **CUDB CLI Commands:** Updated table with new and modified command options.
- **Parameters:** Updated table with the new `cudbCounterPublishingPeriod` attribute.
- **Counters:** Updated section with list of new and modified counters.
- **Logging:** Updated list of new components with CUDB KPIs logging component.

Rev. E

Other than editorial changes, this document has been revised as follows for the CUDB 1.1 release:

- Complete restructure.
- Section 4.4 on page 27: Added information on the KpiCentral component.
- Section 6 on page 45: New section listing planned functions.

Rev. F

Other than editorial changes, this document has been revised as follows for the CUDB 1.2 release:



- Complete restructure: Functions and their related changes can now be found in separate sections.
- Section 3.1 on page 14: Added LDAP FE to the list of new and modified logging events.
- Section 5.3.2 on page 35: Updated Table 33 as follows:
 - Changed command option `-b` | `--bc-status` and new command option `-B` | `--new-bc-status` for `cudbSystemStatus`.
 - Deprecated command option `-R` for `cudbSystemDataBackupAndRestore`.
- Section 4.5 on page 29: Updated to reflect support of extended POSIX regular expressions.
- Section 5.3.1 on page 35: Added section to include the new tool option `-v` for `cudbCheckLdapViewMapping`.

Rev. G

Other than editorial changes, this document has been revised as follows for the CUDB 1.3 release:

- Section 3.2.1.3 on page 17: Updated section to note that only important events are logged in `ldap` logs.
- Section 4.1.2.1 on page 23: Added `-d` | `--dsg` and `-b` | `--blade` modified command options to `cudbEvipConfigExtension` command in Table 18.
- Section 4.5 on page 29: Added SOAP Notifications function enhancement.
- Section 5.1.2 on page 33: Added `ldapRootPassword` attribute to Table 31.
- Section 5.1.4 on page 34: Added new subsection on MySQL and LDAP root password improvements.
- Section 5.4 on page 36: Updated Table 34 as follows:
 - Added modified alarm `Operating System, Server Configuration Backup Fault`.
 - Added a modified attribute of `CudbExternalAuthServer, tlsMode`.
 - Added modified attribute of `CudbLocalNode, networkElementName`.
- Section 3.4.2 on page 18: Added new section to include `localReadsDSReplicationSafetyThreshold` attribute in new Table 12.



Rev. H

Other than editorial changes, this document has been revised as follows for the CUDB 1.4 release:

- Minor restructuring of the document.
- Section 2.1.1 on page 9: Updated Table 2 and Table 3 with new capacity information.
- Section 2.2 on page 11: Updated with new hardware migration procedure.
- Section 2.4 on page 12: Added changes concerning synchronous and asynchronous process.
- Section 3.3.1.1 on page 17: Updated Table 10 with new attribute `ldapViewName` in `CudbLdapView` class.
- Section 3.4 on page 18: Added Local Reads to new functions.
- Section 3.4.2 on page 18: Added new section. Added the following modified attribute to Table 12:
 - `localReadsDsReplicationDelayThreshold` in class `CudbLdapUser`. Updated the name of `localReadsDsReplicationDelayThreshold`.
- Section 3.4.2.1 on page 18: Added new counters.
- Section 3.4.2.2 on page 18: Updated impact of `localReadsDsReplicationDelayThreshold` attribute.
- Section 4 on page 22: Updated description.
- Section 4.1.1 on page 22: Updated impact in Table 17 of Flexible PL Deployment.
- Section 4.5 on page 29: Updated description.
- Section 4.6 on page 29: Added asynchronous LDAP proxy as new enhanced function.
- Section 5.1.1 on page 32: Updated Table 30 with asynchronous LDAP communication.
- Section 5.3.1 on page 35: Moved information back to current section and fixed `-v` to be tool option.
- Section 5.5 on page 37: Added the following to Table 35:
 - `cudbDataBackup`, `cudbSystemDataBackupAndRestore`, `cudbManageStore`, and `/opt/ericsson/cudb/OAM/bin/slappcat`, CLI commands and command options.



- Section 5.5.2.1 on page 38: Added LDAP FE Monitor, a modified logging component.
- Section 5.5.2.1.2 on page 38: Added `commandlog`.
- Section 5.5.1 on page 37: Added new section on `cron` task configuration procedure.
- **Section 6.1 CUDB Combined Hardware and Software Procedure:** Added new planned function.

Rev. J

Other than editorial changes, this document has been revised as follows for the CUDB 1.5 release:

- Section 2.4 on page 12: Updated the list of impacts with custom modifications in `sudoers` files.
- Section 4.1.1 on page 22: Updated the list of nodes in Table 17.
- Section 5.1.1 on page 32: Added example to Table 30 and updated the list of nodes.
- Section 5.1.4 on page 34: Added information about a new, more restrictive `umask`.
- Section 5.6.1 on page 38: Added the following to Table 36:
 - Updated access level of the `cudbadmin` group.
 - `cudbBCServersRestart` CLI command with `-f` | `--fast` command option.
 - `cudbFollowLdapfeLogs` CLI command with `-v` | `--invert-match` command option.
 - `cudbManageBCServer` CLI command with `-reset` `-no_check` command option.
 - `cudbManageNode` CLI command with `-d` | `--disable`, `-e` | `--enable`, `-b` | `--block`, `-u` | `--unblock`, `-n` | `--nodes`, `--no-prompt`, `--allow-node-skip`, `--apply-on-node`, `-h` | `--help` command options.
 - `cudbSystemStatus` CLI command with `-C` | `--new-cluster-status` command option.
 - `cudbSystemStatus` CLI Command `-r` is deprecated.
 - `cudbSystemStatus` CLI command with `-R` | `--new-replication-status` command option.



- Section 5.6.2 on page 39: Added new section containing new SOAP Notifications alarms.
- Section 5.6.3 on page 40: Added new section containing `rootdn` password changes.
- **Section 6.1.2 Changes in Upgrade Procedure:** Added new section to CUDB Combined Hardware and Software Procedure planned function about the changes in the upgrade procedure.
- Section 3.5 on page 19: Added new planned function.
- **Section 6.2 Virtualized CUDB Adaptation Framework:** Added new planned function.

Rev. K

Other than editorial changes, this document has been revised as follows for the CUDB 1.6 release:

- Section 2.1.1 on page 9: Updated description indicating the validity of measurements in Table 3.
- Section 2.2 on page 11: Updated title and added subsections Section 2.2.1 on page 12 and Section 2.2.2 on page 12.
- Section 2.2.1 on page 12: Updated with changes in hardware support from CUDB 1.6.
- Section 2.4 on page 12: Updated with impacts in CUDB 1.6.
- Section 3.5 on page 19: Added new section.
- Section 4.7 on page 30 and Section 4.8 on page 30: Added new sections and removed them from Functions Planned for Coming Releases.
- Section 5.7 on page 41: Added new section, and subsections and added `cudbLdapFeRestart` and Multicast Requirement Removal to the list of improvements. Updated the impact of new `-f` command option.
- Section 5.7.1 on page 41: Added Table 41.
- **Section 6.1 Improvement in Subscription Reallocation and Section 6.2 Smooth Migration to Virtualized CUDB:** Added new planned functions.

Rev. L

Other than editorial changes, this document has been revised as follows for the CUDB 1.7 release:

- Updated document title to CUDB 1.7 Network Impact Report.
- Added new upgrade path from 16A FD1 CP1.



- Section 2.1.1 on page 9: Updated figures in Table 2 and in Table 3.
- Section 5.2 on page 35: Updated the impact of `cudbSystemStatus` command in Table 32 and removed the examples.
- Section 5.8 on page 42: Added new section with subsections Section 5.8.1 on page 42, Section 5.8.2 on page 42, Section 5.8.3 on page 42, and Section 5.8.4 on page 43.
- Section 6 on page 45: Updated description.
- Section 6.1 on page 45: Added section.

Rev. M

Other than editorial changes, this document has been revised as follows for the CUDB 1.8 release:

- Section 2.1 on page 9: Updated description.
- Section 2.1.1 on page 9: Updated note. Updated EPC maximum node capacity in Table 3.
- Section 2.4 on page 12: Updated with impact in CUDB 1.8.
- Section 3.6 on page 20: Added section.
- Section 3.7 on page 20: Added section.
- Section 4.9 on page 30: Added Subscription Reallocation improvement to new enhanced functions.
- Section 5.9 on page 43: Added section with subsection Section 5.9.1 on page 43, regarding alarm changes in Table 46, and subsection Section 5.9.2 on page 43, regarding Centralized Security Event Logging Improvements.
- **Section 6.1 Smooth Migration to Virtualized CUDB:** Removed section because feature has been delivered and added to Section 3.7 on page 20.
- Section 6.1.1.1 on page 45: Added `CudbTrafficBlockingRule` class to Table 49.
- Section 6.1.1.2 on page 46: Added section with Table 50.
- Section 6.2 on page 46: Added section.
- Section 3.8 on page 21: Added section.

Rev. N

Other than editorial changes, this document has been revised as follows for the CUDB 1.9 release:

- Section 2.1.1 on page 9: Updated Table 2.
- Section 2.2.2 on page 12: Updated Table 5 with supported workflows from CUDB 1.9 onwards.
- Section 2.7 on page 14: Updated with backward compatibilities.
- Section 6.2 on page 46: Added section, regarding new planned function Image Based Instantiation.

Rev. S

Other than editorial changes, this document has been revised as follows for the CUDB 1.10 release:

- Section 2.1 on page 9: Added new consideration regarding Automatic Mastership Change when Master Replica is Degraded. Updated the list of considerations.
- Section 2.2.1 on page 12: Removed vCUDB impact from Table 4. Updated Table 1 and Table 2.
- Section 2.2.2 on page 12: Added vCUDB impacts to Table 5.
- Section 2.4 on page 12: Added changes in the upgrade procedure from CUDB 1.4 and CUDB 1.10 onwards to Table 6.
- Section 2.5.2 on page 13: Added section.
- Section 3.9 on page 21: Added section with Section 3.9.1 on page 21, Section 3.9.2 on page 21, Section 3.9.2.1 on page 21 subsections, regarding HSS-EPC 5G Profile.
- Section 4.6 on page 29: Updated feature description.
- Section 4.10 on page 31: Added section.
- Section 5.10 on page 44: Added section with the following subsections:
 - Section 5.10.1 on page 44: Added section regarding LDAP FE log files.
 - Section 5.10.2 on page 44: Added section regarding Electronic Software License Improvement.
- Section 6.3 on page 47: Added section regarding planned Optimized Subtree Searches function.



2 General Impact

This section provides information about changes in the system that affect general areas, such as user capacity, network performance, memory consumption, and hardware.

2.1 Capacity and Performance

The capacity tables in the following section are not intended for dimensioning a CUDB system. Moreover, the figures may not reflect the latest updates. For dimensioning purposes, use the Ericsson dimensioning tool, which considers all the parameters and contains the latest figure updates.

Due to the one software track, the following considerations must be taken into account:

- The figures included in the following section are applicable from CUDB 1.10 onwards.
- The figures in Table 3 (Virtualized CUDB (vCUDB) do not reflect the impact of the `multivalued attributes` (CUDB 1.8) for LTE and IMS traffic yet.
- The figures in Table 3 (vCUDB) do not reflect the improvement of the Automatic Mastership Change added in CUDB 1.10 yet.

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 for this CUDB release 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 Capacity Summary for CUDB Systems Deployed on Native BSP 8100 GEP3 (1+1)

BSP 8100 GEP3	HLR ⁽¹⁾	MNP ⁽²⁾	IMS ₍₄₎ ⁽³⁾	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	141.4	86.2

(1) Default HLR profile.

(2) Estimated figures.

(3) Ericsson default profile.

(4) IMS-fixed BB users.

(5) AVG Authentication. No LDAP optimization.

(6) Usage Reporting (BLOB=1 KB) 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 Capacity Summary for CUDB Systems Deployed on Native BSP 8100 GEP5 (1+1)

BSP 8100 GEP5	HLR ⁽¹⁾	MNP ⁽²⁾	IMS ₍₄₎ ⁽³⁾	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	22.2	102.6	200.9	87.3	84.8	324.7	203.7

(1) Default HLR profile.

(2) Estimated figures.

(3) Ericsson default profile.

(4) IMS-fixed BB users.

(5) AVG Authentication. No LDAP optimization.

(6) Usage Reporting (BLOB=1 KB) 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 vCUDB deployments over Cloud Execution Environment (CEE) on BSP 8100 hardware with GEP5 blades is shown in Table 3. Individual operator profile characteristics can vary significantly. The measurements are valid only for vCUDB_16CPU_47GB flavor.



Table 3 Capacity Summary for vCUDB over CEE on BSP 8100 GEP5 (1+1)

vCUDB 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	208	414.6	514.5	518.3	420.9	667.6	640.1
Maximum node capacity ⁽⁸⁾⁽⁹⁾	76.5	113.3	16.2	57.7	110.5	63.7	46.6	148.6	112

(1) Estimated figures.

(2) Default HLR 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.

(9) It is considered a full Virtualized Network Function (VNF) with 34 blades for Processing Layer (PL) and Data Store (DS). A full GEP5 cabinet, with CEE installed on top, only allows 30 blades for DS and PL.

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.
- From CUDB 1 onwards, CUDB received improvements in Lightweight Directory Access Protocol (LDAP) FE processing that are not clearly visible in the tables above, as the LDAP Front End (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 DS memory in the 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 CUDB 16A FD1 to 168 million subscribers (or 84 million subscribers per node) on this CUDB release.
- In case of hybrid CUDB systems (consisting of native GEP3 coexisting with GEP5 nodes, or native nodes coexisting with vCUDB nodes), consider the smaller capacity figures for maximum system capacity (whenever PL memory is the limit). To determine the maximum node capacity, use the Ericsson default profile tool.

2.1.2 Network Performance

No impact.



2.2 Changes in Infrastructure Support

2.2.1 Changes in Hardware Support

Hardware related impacts are listed in Table 4.

Table 4 Summary of Changes in Hardware Support

Release	Impact
From CUDB 1 onwards	Maiden installations support BSP 8100 hardware with GEP5 blades only.
	The combination of nodes with different blade types (GEP3 or GEP5) is supported. Hybrid systems, mixing GEP3 nodes and GEP5 nodes, are allowed, except for maiden installations, but mixed GEP3 and GEP5 blades within the same node are not supported.
	The minimum number of Processing Layer Database (PLDB) blades supported is 2 (the previous value is 4). ⁽¹⁾
From CUDB 1.4 onwards	Hardware migration from GEP3 to GEP5 based on backup and restore is provided.
From CUDB 1.6 onwards	Hardware migration procedure based on expansion, reallocation and decommission is supported.

(1) Refer to CUDB Node Configuration Data Model Description, Reference [2] for more information.

2.2.2 Changes in Cloud Support

Cloud support related impacts are listed in Table 5.

Table 5 Summary of Changes in Cloud Support

Release	Impact
From CUDB 1 onwards	vCUDB is verified to run on the CEE, on BSP 8100 hardware with GEP5 blades, and is supported for maiden installations only. Support for other virtualized environments or hardware is possible through an integration project only.
From CUDB 1.6 onwards	A TCP-based message system is in place, the requirement to support multicast traffic in the cloud infrastructure has been removed.
From CUDB 1.9 onwards	CUDB supports the following workflows on the full Ericsson cloud infrastructure (ECEE & BSP 8100): <ul style="list-style-type: none">• Instantiation.⁽¹⁾• Termination.⁽¹⁾
From CUDB 1.10 onwards	vCUDB software compliant package is certified on VMware vSphere 6.5 and vCloud Director for Service Provider 8.20.

(1) Refer to CUDB VNF Lifecycle Management, Reference [3] for further details.

2.3 Changes in Software Handling

No impact.



2.4 Changes in Upgrade Procedure

Upgrade procedure related impacts are listed in Table 6.

Table 6 Summary of Changes in Upgrade Procedure

Release	Impact
From CUDB 1 onwards	The Electronic Software Licenses function performs 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 procedure, the Hardware Monitoring function is disabled on the node currently being upgraded.
	During the upgrade procedure, and before it is fully completed, the LDAP proxy traffic sent from CUDB nodes that have not been upgraded is synchronous, while the LDAP proxy traffic sent from already upgraded CUDB nodes is asynchronous.
From CUDB 1.1 onwards	The Installation Based Upgrade method, based on maiden installation, is introduced.
	If the CUDB system has custom modifications in the <code>sudoers</code> files, the modifications will not be adapted automatically after the upgrade process has been completed, because the CUDB upgrade does not have any means to know what custom modifications are still supported in the new version. The upgrade process checks, during the System Validation phase, if the <code>sudoers</code> file is different from the standard CUDB configuration, and if it is the case, it displays a warning message and the <code>sudoers</code> file is copied to the <code>cudbUpgradeWorkDir</code> for later use. After the upgrade process has been completed, the <code>sudoers</code> file needs to be updated manually with the applicable content from the <code>sudoers</code> file located in <code>cudbUpgradeWokDir</code> .
From CUDB 1.4 onwards	The number of defined SITE_VIP addresses may decrease after upgrade from previous releases due to the application of the new formula for calculating this value.
From CUDB 1.6 onwards	The upgrade is improved with combined hardware and software upgrade procedure. See Section 4.7 on page 30 for more details.
	The upgrade on vCUDB is supported. See Section 4.8 on page 30 for more details.
From CUDB 1.7 onwards	A new upgrade path from 16A FD1 CP1 is available. It is not possible to upgrade from 16A FD1 CP1 to any previous CUDB 1.x version.
From CUDB 1.8 onwards	The upgrade to hybrid CUDB systems, consisting of native and vCUDB nodes, is possible. See Section 3.7 on page 20 for more details.
From CUDB 1.11 onwards	During upgrade procedure, the Automatic Mastership Change Improvements are disabled.

2.5 Changes in Tools

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

2.5.1 Schema Update Tool

It is recommended (but not required) to run the Schema Update Tool on the System Controllers (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.

2.5.2 CUDB Licensing Fingerprint Tool

From CUDB 1.10 onwards, a new tool is included to generate the fingerprints needed to request License Key Files to Ericsson Sourcing and Supply. This tool is meant to be used separately from the CUDB installation or upgrade procedures. See Section 5.10.2 on page 44 for more information.

2.6 Obsolete Functions

From CUDB 1 onwards, the Subscription Control function is obsolete.

2.7 Other Network Elements (Dependencies)

To achieve full capacity at User Data Consolidation (UDC) solution level of the Key Performance Indicators (KPIs) function introduced in CUDB 1.1, Network Management System (NMS) and User Profile Gateway (UPG) support is needed.

All the changes in CUDB 1.9 Fault Management and Performance Management are backward compatible with the Operations Support System for Radio and Core (OSS-RC) or Ericsson Network Manager (ENM) interfaces.

The minimum version of Ericsson NMS required to support *CUDB VNF Lifecycle Management*, Reference [3] is:

- OSS-RC including VNF-LCM 17.14 or higher.
- ENM including VNF-LCM 17.14 or higher.

3 New Functions

3.1 Virtualized Network Function Support

This function makes it 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 Operation and Maintenance (OAM) functions. A vCUDB system provides the same functions and architecture as a native CUDB system.



3.1.1 Changes in Operation

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

3.1.1.1 Alarms

The alarms impacted by new or modified functions are shown in Table 7. Refer to *CUDB Node Fault Management Configuration Guide*, Reference [4] and the related alarm Operating Instructions (OPIs) for detailed information about the alarms.

Table 7 Summary of New and Modified Alarms

Alarm	Impact
Control, Blackboard Coordination Server Down	Modified alarm
LDAP Front End, Server Down	Modified alarm
Operating System, Disk Usage Too High	Modified alarm
Storage Engine, Automatic Handling of Network Isolation not Completed for DS	Modified alarm
Storage Engine, Automatic Handling of Network Isolation not Completed for PLDB	Modified alarm
Storage Engine, DS Cluster Node Down	Modified alarm
Storage Engine, PLDB Cluster Node Down	Modified alarm

3.1.1.2 Logging

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

- Cluster Supervisor (CS)
- LDAP FE Monitor

Refer to *CUDB Node Logging Events*, Reference [5] for more information on logging.

3.2 Electronic Software License

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.



3.2.1 Changes in Operation

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

3.2.1.1 Alarms

The alarms impacted by new or modified functions are shown in Table 8. Refer to *CUDB Node Fault Management Configuration Guide*, Reference [4] and the related alarm OPIs for detailed information about the alarms.

Table 8 Summary of New and Modified Alarms

Alarm	Impact
Licensing, Autonomous Mode Activated, License Management	New alarm
Licensing, Capacity Usage Threshold Reached, License Management, Major	New alarm
Licensing, Capacity Usage Threshold Reached, License Management, Warning	New alarm
Licensing, Emergency Unlock Reset Key Required, License Management	New alarm
Licensing, Key File Fault, License Management	New alarm
Licensing, License Key Not Available, License Management, Major	New alarm
Licensing, License Key Not Available, License Management, Minor	New alarm
Licensing, License Management Not Available, License Management	New alarm
Licensing, Number of Profile Subscriptions has Reached the Purchased Number, Subscriptions Control	Removed alarm

3.2.1.2 Commands and Command Options

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

The 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 and Command Options

Command	Command Option	Impact
cudbLicensingTool	<ul style="list-style-type: none">-c --calculate-fingerprint-h --help-r --restore-fingerprint-u --upgrade	New command restricted to Ericsson personnel.



3.2.1.3 Logging

The following new component writing on the logs has been included in the CUDB system:

- LDAP Counters

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

- DataBackupRestore
- Reconciliation

Only important events are logged. Successful operations are no longer logged into the `ldap` logs.

Refer to *CUDB Node Logging Events*, Reference [5] for more information on logging.

3.3 LDAP Data Views

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.

3.3.1 Changes in Operation

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

3.3.1.1 Data Model

The configuration object and attribute changes are shown in Table 10. Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and their attributes.

Table 10 Summary of New and Modified Configuration Objects and Attributes

Class	Attribute	Impact
CudbLdapUser	cudbLdapViewId	Attribute used as the identifier of the LDAP view attached to the specific user for the LDAP Data Views function. CudbLdapUser::cudbLdapViewId must be equal to one CudbLdapView::ldapViewName.
CudbLdapView	cudbLdapViewId	Attribute uniquely identifying LDAP view for the LDAP Data Views function.
CudbLdapView	ldapViewName	New attribute representing the name of unique LDAP view for the LDAP Data Views function.



3.4 Local Reads

This function allows data to be read from the closest DS replica. It is activated by setting `readModeInDS` in and LDAP user or via LDAP control, only if the Deployment Flexibility Value Package is available.

3.4.1 Changes in Interfaces

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

Table 11 Summary of New, Modified, and Removed CUDB Interfaces

Protocol	Nodes	Impact
LDAP LDAP v3	CUDB	Implemented a new LDAP Control <code>ReadMode</code> applicable only for search operations to override the default read mode in PL and DS.

3.4.2 Changes in Operation

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

3.4.2.1 Counters

The following new counters have been introduced:

- `processedLocalReadsLocalNode`
- `processedLocalReadsOtherNodesInSite`
- `processedLocalReadsRemoteSites`

Refer to *CUDB Counters List*, Reference [7] for more information.

3.4.2.2 Data Model

The configuration object and attribute changes are shown in Table 12. Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and their attributes.



Table 12 Summary of New, Modified, and Removed CUDB Configuration Parameters

Class	Attribute	Impact
CudbSystem	localReadsDSReplicationDelayThreshold	This attribute defines the maximum threshold (in seconds) for replication delay value, which is used to determine if the slave replica is too far behind the master replica. If the slave replica is too far behind, the data will not be read locally, even if DS read mode is set to Local Preferred. ⁽¹⁾
CudbLdapUser	localReadsDSReplicationDelayThreshold	If provided, the value in this attribute is used to override the value of localReadsDSReplicationDelayThreshold attribute of the CudbSystem class for an ldap user.

(1) This applies only to users that have DS read mode set to Local Preferred.

3.5 Commercial UDC IoT Offering

The feature introduces support for new Internet of Things (IoT) Profile License into the CUDB.

This enables CUDB to offer competitive licensing for data storage of IoT subscriptions as part of dedicated UDC IoT deployments for massive IoT devices (for example, related to smart cars, smart metering, and so on).

3.5.1 Changes in Licensing

This function requires to create a new capacity license for new UDC IoT dedicated deployments.

3.5.2 Changes in Operation

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

3.5.2.1 Alarms

The alarms impacted by new or modified functions are shown in Table 13.

Refer to *CUDB Node Fault Management Configuration Guide*, Reference [4] and the related alarm OPIs for detailed information about the alarms.

Table 13 Summary of New and Modified Alarms

Alarm	Impact
Licensing, License Key Not Available, License Management, Major	Modified alarm
Licensing, Capacity Usage Threshold Reached, License Management, Major	Modified alarm
Licensing, Capacity Usage Threshold Reached, License Management, Warning	Modified alarm



3.6 Support for Static Routing

This new function enables CUDB deployment on cloud infrastructures that do not support route supervision from the routers towards the VNFs.

3.6.1 Changes in Operation

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

3.6.1.1 Commands and Command Options

The changes are shown in Table 14. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.

Table 14 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbEvipEncapsulator	-b --blade	Modified command option restricted to Ericsson personnel.

3.7 Smooth Migration to Virtualized CUDB

Allows to migrate a native CUDB system to a virtualized one following the next steps:

- the expansion of a native CUDB system with vCUDB nodes as part of the CUDB System Expansion procedure.
- the migration of a native CUDB system to a vCUDB system as part of CUDB Hardware Migration through Subscription Reallocation procedure.

3.7.1 Changes in Operation

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

3.7.1.1 Commands and Command Options

This section describes the new, modified, and removed CLI commands and command options in CUDB.

The changes are shown in Table 15. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.



Table 15 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbReallocate	--force	New command option to force reallocation if blocked.
		Modified command behavior to block reallocation when DS Unit Group (DSG) is disabled for the provisioning of Distribution Entries (DEs).
		Updated command output.

3.8 Migration to Virtualized CUDB through Backup and Restore

Migration of a native CUDB system to a virtualized one will be possible through the Backup and Restore procedure.

3.9 Support for HSS-EPC 5G Profiles

The feature introduces support for HSS-EPC 5G profiles in CUDB.

This enables CUDB to offer licensing for data storage of HSS-EPC 5G subscriptions.

3.9.1 Changes in Licensing

This function requires to add a new capacity license for Base Package profile.

HSS-EPC 5G license acts as an add-on on top of HSS-EPC license, so both are required for HSS-EPC 5G subscriptions.

3.9.2 Changes in Operation

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

3.9.2.1 Alarms

The alarms impacted by new or modified functions are shown in Table 16. Refer to *CUDB Node Fault Management Configuration Guide*, Reference [4] and the related alarm OPIs for detailed information about the alarms.

**Table 16** *Summary of New and Modified Alarms*

Alarm	Impact
Licensing, License Key Not Available, License Management, Major	Modified alarm. Additional Resource ID suffix has been added to support HSS-EPC 5G Profile license.
Licensing, Capacity Usage Threshold Reached, License Management, Major	Modified alarm. Additional Resource ID suffix has been added to support HSS-EPC 5G Profile license.
Licensing, Capacity Usage Threshold Reached, License Management, Warning	Modified alarm. Additional Resource ID suffix has been added to support HSS-EPC 5G Profile license.

4 New Enhanced Functions

This section describes the new enhanced functions of this CUDB release. Refer to the *Functions* section of *CUDB Technical Product Description*, Reference [1] for more information on these functions.

4.1 Flexible PL Deployment

This is an enhancement to the CUDB Global Access and the System and Node Architecture functions.

When activated, the enhancement requires a new network design, as nodes without a PLDB blade or Virtual Machine (VM) cannot receive direct traffic from application FEs.

4.1.1 Changes in Interfaces

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



Table 17 Summary of New, Modified, and Removed CUDB Interfaces

Protocol	Nodes	Impact
LDAP LDAP v3	All application FEs	<p>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.</p> <p>If alias entry (or alias present in entry path) is pointing to a non-existing entry, error will be 33 instead of 32.</p> <p>Error code 11 is changed to error 80 for maximum number of threads reached for a DS and maximum number of threads reached for connection.</p> <p>Error code 3 returned for timed out proxy search operations is changed to error code 11 in those cases where the proxy operation was caused by exceeding the value of the timeout set by the LDAP FE (if the timeout set by the LDAP client is smaller than the one set by the LDAP FE in the proxy operation and the operation timed out, the operation will return err=3). Refer to <i>CUDB LDAP Interwork Description</i>, Reference [9] for further details.</p>

4.1.2 Changes in Operation

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

4.1.2.1 Commands and Command Options

This section describes the new, modified, and removed CLI commands and command options in CUDB.

The changes are shown in Table 18. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.

Table 18 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbClusterConfConverter		New command restricted to Ericsson personnel.
cudbEvipConfigExtension	-d --dsg and -b --blade	Modified command option restricted to Ericsson personnel.
	-r --removePLDB	New command option restricted to Ericsson personnel.
cudbPrepareStore		Modified command to also support nodes without PLDB.
cudbReallocate		Updated command output.
cudbSwBackup	-f --force	Modified command option to allow software restore also when the CUDB node does not have a defined PLDB cluster.
cudbSystemStatus		Modified command output. PLDB sections are not included in the output if the node contains no PLDB.



4.1.2.2 Data Model

The configuration object and attribute changes are shown in Table 19. Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and their attributes.

Table 19 Summary of New and Modified Configuration Objects and Attributes

Class	Attribute	Impact
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.
CudbLocalPl		Modified class. The CudbLocalPl class is optional.
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.
CudbRemotePl		Modified class. The CudbRemotePl class is optional.

4.1.2.3 Logging

The following new component writing on the logs has been included in the CUDB system:

- License Manager

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

- Configuration Management

Refer to *CUDB Node Logging Events*, Reference [5] for more information on logging.

4.2 OAM Automation with NETCONF Support

This is an enhancement to the OAM CUDB function.

4.2.1 Changes in Operation

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



4.2.1.1 Commands and Command Options

This section describes the new, modified, and removed CLI commands and command options in CUDB.

The changes are shown in Table 20. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.

Table 20 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbApplyConfig	-n --noimmsave	Removed command option.
	-s --scope all	Deprecated command, replaced by the applyConfig administrative operation of the CudbLocalNode class.
cudbUpdateUserInfo		Deprecated command, replaced by the updateUserInfo administrative operation of the CudbLocalNode class. Also modified to support refreshing CUDB LDAP users from a remote PLDB.

4.2.1.1.1 Administrative Operations

The administrative operations of the CUDB system are shown in Table 21. Refer to the *Administrative Operations* section of *CUDB Node Configuration Data Model Description*, Reference [2] for more information about administrative operations.

Table 21 Summary of New, Modified, and Removed Administrative Operations

Class	Administrative Operation	Impact
CudbLocalNode	applyConfig	New administrative operation replacing the deprecated cudbApplyConfig command, used to activate configuration changes.
CudbLocalNode	updateUserInfo	New administrative operation replacing the deprecated cudbUpdateUserInfo command, used to update user information in the node.
CudbLocalNode	cancelApplyConfig	New administrative operation restricted to Ericsson personnel.

4.2.1.2 Data Model

The configuration object and attribute changes are shown in Table 22. Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and their attributes.

**Table 22** *Summary of New and Modified Configuration Objects and Attributes*

Class	Attribute	Impact
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
CudbLocalNode	updateUserInfoStatus	<p>New read-only attribute that stores the following information about the progress of the asynchronous updateUserInfo administrative action:</p> <ul style="list-style-type: none">• actionId• actionName• additionalInfo• progressInfo• progressPercentage• result• resultInfo• state• timeActionStarted• timeActionCompleted• timeOfLastStatusUpdate

4.3 Increment Alert Key Command

This is an enhancement to the CUDB Global Access and the System and Node Architecture functions.

4.3.1 Changes in Operation

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



4.3.1.1 Commands and Command Options

This section describes the new, modified, and removed CLI commands and command options in CUDB.

The changes are shown in Table 23. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.

Table 23 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbLdapFeRestart	--with-monitor	Deprecated command option.
	--no-prompt	New command option restricted to Ericsson personnel.
cudbManageStore	--no-prompt	New command option restricted to Ericsson personnel.
cudbSetDsgMaster	--no-prompt	New command option restricted to Ericsson personnel.
cudbSwBackup	--no-prompt	New command option restricted to Ericsson personnel.
	-r	Deprecated command option.
cudbSystemDataBackupAndRestore	--no-prompt	New command option restricted to Ericsson personnel.
	-r	Deprecated command option.
cudbUnitDataBackupAndRestore	--no-prompt	New command option restricted to Ericsson personnel.

4.4 CUDB Key Performance Indicators

This is an enhancement to the OAM CUDB function.

CUDB KPIs are a special set of CUDB counters, for CUDB systems deployed on native BSP 8100, that help the users evaluate and quantify the usage of the processing and memory capacity of certain CUDB resources.

4.4.1 Changes in Operation

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

4.4.1.1 Commands and Command Options

This section describes the new, modified, and removed CLI commands and command options in CUDB.

The changes are shown in Table 24. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.



Table 24 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbHaState		Additional printouts were included due to the introduction of KpiCentral process. Example: saAmfSISUHaState."safSu=SC-2,safSg=2N,safApp=ERIC-CUD B_KPICENTRAL". "safSi=2N-1": active(1)
cudbSystemStatus	-p --check-cudbprocess	KpiCentral process was added to the output when listing processes running on OAM blades. Example: KpiCentral process.....Running in: OAM2

4.4.1.2 Data Model

The configuration object and attribute changes are shown in Table 25. Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and their attributes.

Table 25 Summary of New and Modified Configuration Objects and Attributes

Class	Attribute	Impact
CudbLocalNode	cudbCounterPublishingPeriod	New attribute used to change the frequency of Performance Management (PM) report file generation.

4.4.1.3 Counters

The following new counters have been introduced:

- kpiClusterLoad
- kpiRatioDroppedCluster
- kpiLdapFeLoad
- kpiRatioDroppedLdap

Refer to *CUDB Counters List*, Reference [7] for more information.

4.4.1.4 Logging

The following new component writing on the logs has been included in the CUDB system:

- CUDB KPIs



Refer to *CUDB Node Logging Events*, Reference [5] for more information on logging.

4.5 SOAP Notifications Improvements

This is an enhancement of the Simple Object Access Protocol (SOAP) notifications function. It enables and simplifies SOAP notification events configuration by allowing to monitor sets of LDAP entries configuring in a single notification event. It helps to reduce the number of configured notification events and therefore to optimize CUDB Notification resources. With the enhancement, it will be possible to configure Portable Operating System Interface (POSIX) extended regular expressions in the `dn` associated to `CudbNotificationObjectClass` classes of type `monitor` or `monitorAll`. The `dn` attribute can be configured with the full Distinguished Name (DN) of the entry.

4.5.1 Changes in Operation

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

4.5.1.1 Data Model

This section describes the new, modified, and removed configuration parameters in CUDB. Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for more information.

Table 26 Summary of New, Modified, and Removed CUDB Configuration Parameters

Object	Attribute	Impact
<code>CudbNotificationObjectClass</code>	<code>dn</code>	<ul style="list-style-type: none"> Modified attribute. The <code>dn</code> attribute can contain the partial or full DN of the attribute or object to be monitored. The DN can be configured using POSIX extended regular expressions.
<code>CudbNotificationEvent</code>	<code>numberOfSoapThreads</code>	New restricted attribute defining the number of SOAP threads to start for a specific notification event.

4.6 Asynchronous LDAP Proxy

This is an enhancement to the asynchronous LDAP proxy function that allows releasing resources in a CUDB node until a response for a proxied LDAP operation is received. The LDAP FE can wait for the response, asynchronously handling the queue of pending operations. As a result, the maximum traffic capacity of the node is increased.

The benefits are the following:



- Increases CUDB node capacity therefore decreasing the need for hardware resources.
- Reduces the probability of overload situations.
- Decouples CUDB capacity from IP backbone delay.
- Increases CUDB node capacity by increasing its proxy traffic processing capacity.

This feature modifies the formula for calculating the number of SITE_VIP addresses due to the increase of node traffic capacity. Refer to the *Multiple SITE_VIPs* section of *CUDB Node Network Description*, Reference [8] for more information. As a consequence, the number of defined SITE_VIP addresses may decrease after upgrade from previous releases.

4.7 CUDB Combined Hardware and Software Upgrade Procedure

This is an enhancement to the software upgrade function in CUDB 1.6. The simplified hardware migration from EBS 1.0 or EBS 2.0 to BSP 8100 is a more flexible procedure and supports more customer adaptations.

4.8 Virtualized CUDB Adaptation Framework

This is an enhancement to the software upgrade function and it allows the upgrade of vCUDB systems.

4.9 Subscription Reallocation Improvement

This is an enhancement to the Subscription Reallocation function. It enables faster reallocation of the stored data by packing together all the data related to a particular subscription and moving them in a single LDAP operation. With this enhancement, it is possible to run one `cudbReallocate` command on each SC separately in the node hosting the PLDB master. To get the benefits of the enhanced Subscription Reallocation function, both node hosting DSG from where data is reallocating and node hosting DSG to where data is reallocating, need to be on the software level supporting enhancements.

4.9.1 Changes in Interfaces

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



Table 27 Summary of New, Modified, and Removed CUDB Interfaces

Protocol	Nodes	Impact
LDAP v3	All application FEs	<p>The error message for code 80 Distribution entry is locked is changed to CUDB lock due to Reallocation.</p> <p>A new branch 'ou=dsgLocks,{root dn}' is added due to the improved locking mechanism. This branch is used solely for the internal mechanism of the subscription reallocation, to mark entries being reallocated as locked and forbid modification until their movement is completed.</p>

4.9.2 Changes in Operation

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

4.9.2.1 Command and Command Options

It is possible to run a `cudbReallocate` command on each SC separately in the node hosting the PLDB master, so two reallocation processes can run in parallel in a CUDB system. Refer to the *Configuring Subscription Reallocation* section of *CUDB System Administrator Guide*, Reference [14] for more information.

Command output has been changed. Refer to the *Output* section of *CUDB Node Commands and Parameters*, Reference [6] for more information on the output of the `cudbReallocate` command.

The changes are shown in Table 28.

Table 28 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
<code>cudbReallocate</code>	<code>-n --nthreads</code>	Command option restricted to Ericsson personnel.

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.

4.10 Automatic Mastership Change Improvements

This is an enhancement of the Automatic Master Change (AMC) function that intends to improve the system capacity under situation of degradation in master replicas.

A smooth mastership change is attempted in case the master replica is degraded.



This enhancement improves the footprint in dimensioning exercises in which DSG processing is the bottleneck, since both blades can always be counted during the dimensioning exercise.

Refer to the *Automatic Mastership Change when Master Replica is Degraded* section of *CUDB High Availability*, Reference [12] for more information.

4.10.1 Changes in Operation

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

4.10.1.1 Command and Command Options

This section describes the new, modified, and removed CLI commands and command options in CUDB.

The changes are shown in Table 29.

Table 29 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Impact
cudbDsgMastershipChange	Command output is modified to show a warning in case the master is manually moved to a degraded replica.

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.

5 System Improvements

5.1 Improvements in CUDB 1

This section describes updates to the CUDB system.



5.1.1 Interface Improvements

Table 30 Summary of New, Modified, and Removed CUDB Interfaces

Protocol	Nodes	Impact
LDAP LDAP v3	All application FEs	<p>Deleting parent entries of DEs is not allowed and results in Error Code 53 with the text message: Deleting parent of distribution entry is not allowed.⁽¹⁾</p> <p>Example of parent entries that cannot be deleted:</p> <pre>ou=multiSCs,dc=<root entry>, ou=association,dc=<root entry></pre> <p>Asynchronous LDAP communication between CUDB nodes (in the previous version it was synchronous).</p>
LDAP LDAP v3	CUDB	<p>Implemented new LDAP Control</p> <p>TimestampBasedConditionalUpdate for extended LDAP modify and delete operations, used internally by the Data Repair process.</p>

(1) Already included in 16A FD1 CP1.

5.1.2 OAM Improvements

Table 31 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options, and CUDB Configuration Parameters

Command	Command Option	Impact
cudbCheckConsistency	-o --object-tables ⁽¹⁾	New command option used to check and report any difference between the OBJECT_CLASSES and MULTI_VALUE_OBJECTS tables.
cudbConsistencyMgr	--max-replica-lag ⁽¹⁾	Modified command option, default value changed to 10000.
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.
cudbManageBCServer	-help	Removed command option.
cudbRemoteTrust	-b --banner	New command option used to disable the legal warning banner for internal CUDB logins.
Class	Attribute	Impact
CudbLdapAccess	ldapRootPassword ⁽¹⁾	MySQL and LDAP root passwords can contain only ASCII alphabetic characters, numeric digit characters, and the following symbols: , - % = ? + ~ _



Table 31 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options, and CUDB Configuration Parameters

Class	Attribute	Impact
CudbTrafficControlManager		New class serving as the container of the traffic blocking rules.
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.

(1) Already included in 16A FD1 CP1.

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.

Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and attributes.

5.1.2.1 Logging

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

- CountersFw
- Fault Management
- Security

Refer to *CUDB Node Logging Events*, Reference [5] for more information on logging.

Note: Consider the following changes related to logging:

- 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 [16] for more information.

5.1.3 Notification Support Improvements

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

5.1.3.1 Impact

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



5.1.4 Security Improvements

The following changes improve security functions:

- MySQL and LDAP root passwords can contain only ASCII alphabetic characters, numeric digit characters, and the following symbols: `, - % = ? + ~ _`

For more information, refer to the *Configuring Password Strength* and *Changing the Password of the rootdn User* sections of *CUDB Security and Privacy Management*, Reference [10].

- Security is enhanced with a new, more restrictive `umask (027)`. When a user creates a file, the new `umask` is applied, restricting the visibility of these files to fewer users.

5.2 OAM Improvements in CUDB 1.1

This section describes updates to the CUDB system that are not released as part of specific function.

Table 32 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
<code>cudbInstall</code>		Modified command restricted to Ericsson personnel.
<code>cudbMpStat</code>		This command is restricted to Ericsson personnel.
<code>cudbReplicaRepair</code>		Modified command to execute extended LDAP modify or delete operations with the <code>TimestampBaseConditionalUpdate</code> LDAP Control during the Data Repair process.
<code>cudbSystemStatus</code>	<code>-p --check-cudbprocess</code>	Error status of CS process provides additional information related to reporting status in Blackboard Coordination (BC) Cluster.

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.

5.3 Improvements in CUDB 1.2

This section describes updates to the CUDB system.

5.3.1 LDAP Data Views

The `cudbCheckLdapViewMapping` checking tool has been improved with the `-v` optional parameter to get verbose error messages.



5.3.2 OAM Improvements

Table 33 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbSystemDataBackupAndRestore	-R	Deprecated command option.
cudbSystemStatus	-b --bc-status	This command option is restricted to Ericsson personnel.
	-B --new-bc-status	<p>New command option to print the status of the BC process. The output is the Node ID and application designations (OAM1, OAM2, and DS2_0IDS1_0IPL2, depending on PLDB deployment) instead of Node CUDB VIP address and Linux Open Telecom Cluster (LOTIC) designations.</p> <p>Example:</p> <pre>[Site 1] SM leader: Node 10 OAM1 Node 10 BC server in OAM1 running BC server in OAM2 running (Leader) BC server in PL2 running</pre> <p>This is a default command option, that is, if no other command option is supplied for cudbSystemStatus, the command runs with -v -B -s -C -R -a -m -p options.</p> <p>If the node is disabled, the output will be Disabled instead of the BC server status.</p>

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.

5.4 OAM Improvements in CUDB 1.3

This section describes updates to the CUDB system that are not released as part of a specific function.



Table 34 Summary of New, Modified, and Removed Alarms and Modified Configuration Objects and Attributes

Alarm		Impact
<i>Operating System, Server Configuration Backup Fault</i>		<p>Modified active description of alarm. The <i><fault reason></i> parameter is available in the output to provide more information on configuration backup failures.</p> <p>The possible values are the following:</p> <ul style="list-style-type: none"> • <code>applyConfig</code> action is ongoing. • There are pending configuration changes. • Backup with the same name already exists. • Internal fault.
Class	Attribute	Impact
<code>CudbExternalAuthServer</code>	<code>tlsMode</code> ⁽¹⁾	<p>New attribute that indicates if a secure session will start:</p> <ul style="list-style-type: none"> • From an insecure session: STARTTLS (port 389) • Directly: LDAP over SSL (LDAPS) (port 636)
<code>CudbLocalNode</code>	<code>networkElementName</code>	<p>Modified attribute.</p> <p>Added restriction to attribute name to allow only characters A to Z, a to z, 0 to 9 and characters “-” and “_”.</p>

(1) Already included in 16A FD1 CP1.

Refer to *CUDB Node Fault Management Configuration Guide*, Reference [4] and the related alarm OPIs for detailed information about the alarms.

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.

5.5 Improvements in CUDB 1.4

This section describes updates to the CUDB system.

5.5.1 Application Counters

`Cron` task configuration procedure for application counters is changed to provide a persistent configuration for multiple `.cron` files after SC reboot.

Refer to the *Configure Cron Task* section of *CUDB Application Counters*, Reference [11] for more information regarding the changes.



5.5.2 OAM Improvements

Table 35 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
<code>cudbDataBackup</code>		Created backups are accessible to users in <code>cudbadmin</code> group. ⁽¹⁾
<code>cudbManageStore</code>	<code>backup</code>	Created backups are accessible to users in <code>cudbadmin</code> group.
<code>cudbSystemDataBackupAndRestore</code>	<code>-c --create</code>	Created backups are accessible to users in <code>cudbadmin</code> group.
<code>/opt/ericsson/cudb/OAM/bin/sl apcat</code>		To access export files, users in <code>cudbadmin</code> group must execute <code>slapcat</code> command without <code>sudo</code> .

(1) Already included in 16A FD1 CP1.

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.

5.5.2.1 Logging

5.5.2.1.1 LDAP FE Monitor

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

- LDAP FE Monitor

Refer to *CUDB Node Logging Events*, Reference [5] for more information on logging.

5.5.2.1.2 commandlog

The number of logs in `commandlog`, generated by user login to CUDB, has been reduced and it contains only one log.

5.6 Improvements in CUDB 1.5

This section describes updates to the CUDB system.

5.6.1 OAM Improvements

Users that belong to the `cudbadmin` group can access NETCONF SSH subsystem.



Table 36 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbBCServersRestart	-f --fast ⁽¹⁾	New command option restricted to Ericsson personnel.
cudbFollowLdapfeLogs	-v --invert-match	New command option restricted to Ericsson personnel.
cudbManageBCServer	-restart -no_check ⁽¹⁾	New command option restricted to Ericsson personnel.
cudbManageNode	<ul style="list-style-type: none"> • -d --disable • -e --enable • -b --block • -u --unblock • -n --nodes • --no-prompt • --allow-node-skip • --apply-on-node • -h --help 	New command restricted to Ericsson personnel.
cudbSystemStatus	-C --new-cluster-status	<p>In case of erroneous behavior of a system, when no status is reported in BC Cluster for DS replicas on a node, cudbSystemStatus reports the retrieved information as an error with appropriate description.</p> <p>Example:</p> <p>Checking Clusters status:</p> <ul style="list-style-type: none"> • [-E-] No information about DSG status from BC Cluster.
	-r	Deprecated command option.
	-R --new-replication-status	cudbSystemStatus handles disabled node(s), disabled DS(s), or both in the system by marking them as Xu (unreachable) in Replication Channels Table. Furthermore, in case of a disabled node, the Detailed Replication Status for the Slave Replicas will show that a specific node is Disabled and the replication for its DS(s) is Stopped as Data Store is disabled. Similarly, in case of disabled DS(s), Detailed Replication Status will show that the replication is Stopped as Data Store is disabled.

(1) Already included in 16A FD1 CP1.

Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information on CLI commands and command options.



5.6.2 SOAP Notifications

Two new alarms have been introduced to indicate unwanted events that may occur during the notification process. These events were only logged, previously. Refer to *CUDB Node Fault Management Configuration Guide*, Reference [4] and the related alarm OPIs for detailed information about the alarms.

Table 37 Summary of New Alarms

Alarm	Impact
SOAP Notifications, Endpoint Unreachable	New alarm
SOAP Notifications, Discarded Notifications	New alarm

5.6.3 Encrypted rootdn Password

This is an improvement to the CUDB security functions. This improvement allows the `rootdn` password to be stored encrypted when the root user is defined.

5.6.3.1 Interface Improvements

Table 38 Summary of Interface Changes

Protocol	Nodes	Impact
LDAP LDAP v3	CUDB	<p>The use of a custom SASL mechanism (CUDB-CRYPTO) is allowed, to avoid storing LDAP root user password in cleartext in configuration files.</p> <p>When custom SASL mechanism (CUDB-CRYPTO) is used within LDAP commands (search, modify, add, delete) the user is forced to introduce LDAP root user password in a prompt not echoed to the console.</p>

5.6.3.2 Data Model

Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and attributes.

Table 39 Summary of Data Model Changes

Class	Attribute	Impact
CudbLdapAccess	ldapRootPassword	Attribute type changed from <code>EcimPasswordString</code> to <code>EcimpassPhraseString</code> . When configured through CLI, value has to be introduced twice and is not echoed.



5.7 Improvements in CUDB 1.6

This section describes updates to the CUDB system.

5.7.1 OAM Improvements

Table 40 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
cudbLdapFeRestart	-f --force	New -f command option that provides the same behavior as the command (without modifiers) in the previous versions. Continue with restart, even if any slapd process fails to start.

Table 41 Summary of New, Modified, and Removed Alarms

Alarm	Impact
Licensing, Emergency Unlock Reset Key Required	Removed translation and definition of this alarm in CUDB.

5.7.2 Multicast Requirement Removal

This enhancement to the CUDB Data Availability Coordination system replaces multicast by a TCP based messaging infrastructure.

The main benefit is that it allows the deployment of CUDB in scenarios where multicast support is limited or restricted (for example, cloud environments).

5.7.2.1 Changes in Operation

5.7.2.1.1 Alarms

The alarms impacted by new or modified functions are shown in Table 42.

Table 42 Summary of New and Modified Alarms

Alarm	Impact
Control, Messaging Service Server Down	New alarm
Control, Messaging Service Cluster Down	New alarm



5.7.2.1.2 OAM Improvements

Table 43 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Impact
<code>cudbManageMsgSrv</code>	New command used to manage the Messaging Service servers in the CUDB node. Refer to <i>CUDB High Availability</i> , Reference [12] for more information.

5.8 Improvements in CUDB 1.7

This section describes updates to the CUDB system.

5.8.1 OAM Improvements

Table 44 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
<code>cudbSwBackup</code>	<code>-U</code> <code>--Unschedule</code>	Remove a periodic software and configuration backup according to the defined <i><cron expression></i> . The format of the <i><cron expression></i> follows the standard UNIX cron expression format.
<code>cudbPmJobReload</code>		Deprecated command. If ESA PM Agent needs to be restarted, execute <code>/sbin/service esapma restart</code> in both SCs. See Section 5.8.4 on page 43 for more information.

Table 45 Summary of New and Modified Alarms

Alarm	Impact
SAF, AMF Component Cleanup Failed	Modified alarm. Resource ID does not contain the complete DN, but a relative path from 'ManagedElement=1' instead.
SAF, AMF Component Instantiation Failed	Modified alarm. Resource ID does not contain the complete DN, but a relative path from 'ManagedElement=1' instead.
SAF, AMF SI Unassigned	Modified alarm. Resource ID does not contain the complete DN, but a relative path from 'ManagedElement=1' instead.

5.8.2 Centralized Security Event Logging

The Centralized Security Event Logging function allows a CUDB node to send log information to an external logging server. The format of the logs sent to the Remote Server has been modified as explained in the *Sending Logs to a Remote Server* section of *CUDB Node Logging Events*, Reference [5].



5.8.3 Import and Export Procedures

To export LDIF file, `-l` parameter must be used. The output redirection “>” is deprecated.

```
/opt/ericsson/cudb/OAM/bin/slapcat -l <output-file>
```

5.8.4 Application Counters

Due to the deprecation of `cudbPmJobReload` command, the following procedures have been updated to handle the application counters correctly:

- *Configure Jobs to Generate Output Files in CUDB Application Counters*, Reference [11].
- *Configuring Counter Output Files Names in CUDB Performance Guide*, Reference [13].
- *Creating a New DSG*, available to Ericsson personnel only, in *CUDB System Administrator Guide*, Reference [14].

5.9 Improvements in CUDB 1.8

This section describes updates to the CUDB system.

5.9.1 OAM Improvements

Table 46 Summary of New and Modified Alarms

Alarm	Impact
Storage Engine, Unable to Synchronize Cluster in DS, Major	Modified alarm. Alarm Active Description attribute also contains human readable date format along with the timestamp.
Storage Engine, Unable to Synchronize Cluster in DS, Warning	Modified alarm. Alarm Active Description attribute also contains human readable date format along with the timestamp.
Storage Engine, Unable to Synchronize Cluster in PLDB, Major	Modified alarm. Alarm Active Description attribute also contains human readable date format along with the timestamp.
Storage Engine, Unable to Synchronize Cluster in PLDB, Warning	Modified alarm. Alarm Active Description attribute also contains human readable date format along with the timestamp.

5.9.2 Centralized Security Event Logging

The Centralized Security Event Logging function allows a CUDB node to send log information to an external logging server. The format of the logs sent to the Remote Server has been modified as follows:

- Logs sent to the remote server include an identity of the sender process.
- Timestamp of collected logs follow [RFC 3339](#), Reference [17].



For further details on logs sent to remote server, refer to the *Sending Logs to a Remote Server* section of *CUDB Node Logging Events*, Reference [5].

5.10 Improvements in CUDB 1.10

This section describes updates to the CUDB system.

5.10.1 Logging

LDAP FE log files are allowed to grow up to 10 MB and are rotated three times before being removed. For further information, refer to the *LDAP FE* section of *CUDB Node Logging Events*, Reference [5].

5.10.2 Electronic Software License Improvement

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

This function has been improved with a new tool for the generation of the digital fingerprints.

5.10.2.1 Changes in Operation

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

5.10.2.1.1 Commands and Command Options

This section describes the new, modified, and removed CLI commands and command options in CUDB.

The changes are shown in Table 47. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.

Table 47 *Summary of New, Modified, and Removed CUDB CLI Commands and Command Options*

Command	Impact
cudbLicensingTool	Removed command.



5.10.2.1.2 Data Model

The configuration object and attribute changes are shown in Table 48. Refer to *CUDB Node Configuration Data Model Description*, Reference [2] for detailed information about the configuration objects and their attributes.

Table 48 Summary of New and Modified Configuration Objects and Attributes

Class	Attribute	Impact
CudbSystem	customerId	New attribute that uniquely identifies the customer identity.
CudbSystem	deploymentId	New attribute that uniquely identifies the deployed customer system.
CudbSystem	productNumber	New attribute with the CXP product number for the CUDB software.

6 Functions Planned for Coming Releases

This section provides changes in the product that are parts of the functions planned for coming releases.

These functions are not generally available, yet. They are either in a ready-for-tendering status only, or they are delivered in phases, following the continuous delivery to a software track strategy.

The use of partially delivered functions will not take effect in the system until the function is completed and is generally available. Legacy behavior is not changed.

6.1 Full IPv6 Support in CUDB

This new function will allow external IPv6 communication in CUDB.

6.1.1 Changes in Operation

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

6.1.1.1 Data Model

Data type of attributes representing external IP addresses in CUDB node configuration model will be changed to `IpDNSAddress` that will allow



configuration of addresses in IPv4 or IPv6 format. This change will not affect configuration of nodes with IPv4 addresses. Impacted attributes are shown in Table 49.

Table 49 Summary of Data Model Changes

Class	Attribute	Impact
CudbExternalAuthServer	<ul style="list-style-type: none">primaryServersecondaryServer	Data type is changed to IpDNSAddress.
CudbExternalLogServer	<ul style="list-style-type: none">externalLogServerIp	Data type is changed to IpDNSAddress.
CudbLocalNode	<ul style="list-style-type: none">cudbVIPoamVIPtrafficVIP	Data type is changed to IpDNSAddress.
CudbRemoteNode	<ul style="list-style-type: none">cudbVIPoamVIPtrafficVIP	Data type is changed to IpDNSAddress.
CudbTrafficBlockingRule	<ul style="list-style-type: none">blockedVIP	Data type is changed to IpDNSAddress.

6.1.1.2 Alarms

The alarms impacted by new or modified functions are shown in Table 50. Refer to *CUDB Node Fault Management Configuration Guide*, Reference [4] and the related alarm OPIs for detailed information about the alarms.

Table 50 Summary of New and Modified Alarms

Alarm	Impact
Security, OAM User Exceeded Number Of Failed Logins	Modified alarm. Alarm Active Description attribute is updated.
Security, OAM User Gaining Privilege Failed	Modified alarm. Alarm Active Description attribute is updated.
Security, OAM User Privilege Raise To Root Failed	Modified alarm. Alarm Active Description attribute is updated.
Security, Root Login Failed	Modified alarm. Alarm Active Description and Resource ID attributes are updated to support IPv6 addresses.
Control, Blackboard Coordination Server Down	Modified alarm. Alarm Active Description and Resource ID attributes are updated to support IPv6 addresses.

6.2 Image Based Instantiation

This new function will allow deployment based on images created offline. Image supports customer configuration injection after deployment.



6.2.1 Changes in Operation

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

6.2.1.1 Commands and Command Options

The changes are shown in Table 51. Refer to *CUDB Node Commands and Parameters*, Reference [6] for more information.

Table 51 Summary of New, Modified, and Removed CUDB CLI Commands and Command Options

Command	Command Option	Impact
<code>cudbAutomatedInstall</code>		New command restricted to Ericsson personnel.
<code>cudbEvipConfigExtension</code>	<code>-i --install</code>	Modified command option restricted to Ericsson personnel.
<code>cudbRegenerateClusterConfFile.sh</code>		New command restricted to Ericsson personnel.

6.3 Optimized Subtree Searches

This function increases the performance of preconfigured sub-tree LDAP searches associated to specific LDAP Users, reducing the response time of these requests and consequently increasing LDAP processing capacity. Optimized search will narrow down the scope of the search and allow CUDB to optimize the query towards the storage engine instead of performing a whole sub-tree scan. When an LDAP sub-tree search is not configured, the function has no effect and a complete search is performed without optimization.





Glossary

AMC

Automatic Mastership Change

BC

Blackboard Coordination

BSP

Blade Server Platform

CEE

Cloud Execution Environment

CLI

Command Line Interface

CS

Cluster Supervisor

CUDB

Ericsson Centralized User Database

DE

Distribution Entry

DIT

Directory Information Tree

DN

Distinguished Name

DS

Data Store

DSG

DS Unit Group

FE

Front End

GEP3

Generic Ericsson Processor version 3

GEP5

Generic Ericsson Processor version 5

HLR

Home Location Register

HSS

Home Subscriber Server

IoT

Internet of Things

IMM

Information Model Management

IMS

IP Multimedia Subsystem

KPI

Key Performance Indicator

LDAP

Lightweight Directory Access Protocol

LDAP FE

LDAP Front End

LDAPS

LDAP over SSL

LOTG

Linux Open Telecom Cluster

NIR

Network Impact Report

NMS

Network Management System

OAM

Operation and Maintenance

OPI

Operating Instruction

PL

Processing Layer

PLDB

Processing Layer Database

PM

Performance Management



POSIX

Portable Operating System Interface

QoS

Quality of Service

SC

System Controller

SOAP

Simple Object Access Protocol

UDC

User Data Consolidation

UPG

User Profile Gateway

VM

Virtual Machine

VNF

Virtualized Network Function



Reference List

CUDB Documents

- [1] *CUDB Technical Product Description*, 221 02-FGC 101 3147
- [2] *CUDB Node Configuration Data Model Description*, 1/192 02-CSH 109 067/10
- [3] *CUDB VNF Lifecycle Management*, 1/1553-CNL 121 695/10
- [4] *CUDB Node Fault Management Configuration Guide*, 3/1553-CSH 109 067/10
- [5] *CUDB Node Logging Events*, 4/1553-CSH 109 067/10
- [6] *CUDB Node Commands and Parameters*, 1/1553-CSH 109 067/10
- [7] *CUDB Counters List*, 1/006 51-CSH 109 067/10
- [8] *CUDB Node Network Description*, 4/1551-CSH 109 067/10
- [9] *CUDB LDAP Interwork Description*, 1/155 19-HDA 104 03/10
- [10] *CUDB Security and Privacy Management*, 8/1553-HDA 104 03/10
- [11] *CUDB Application Counters*, 10/155 34-HDA 104 03/10
- [12] *CUDB High Availability*, 7/155 34-HDA 104 03/10
- [13] *CUDB Performance Guide*, 4/1553-HDA 104 03/10
- [14] *CUDB System Administrator Guide*, 2/1543-HDA 104 03/10
- [15] *CUDB Glossary of Terms and Acronyms*, 0033-HDA 104 03/10

Other Documents and Online References

- [16] *Reliable Delivery for syslog* <https://www.ietf.org/rfc/rfc3195.txt>
- [17] *Date and Time on the Internet: Timestamps. IETF RFC 3339*
<https://www.ietf.org/rfc/rfc3339.txt>