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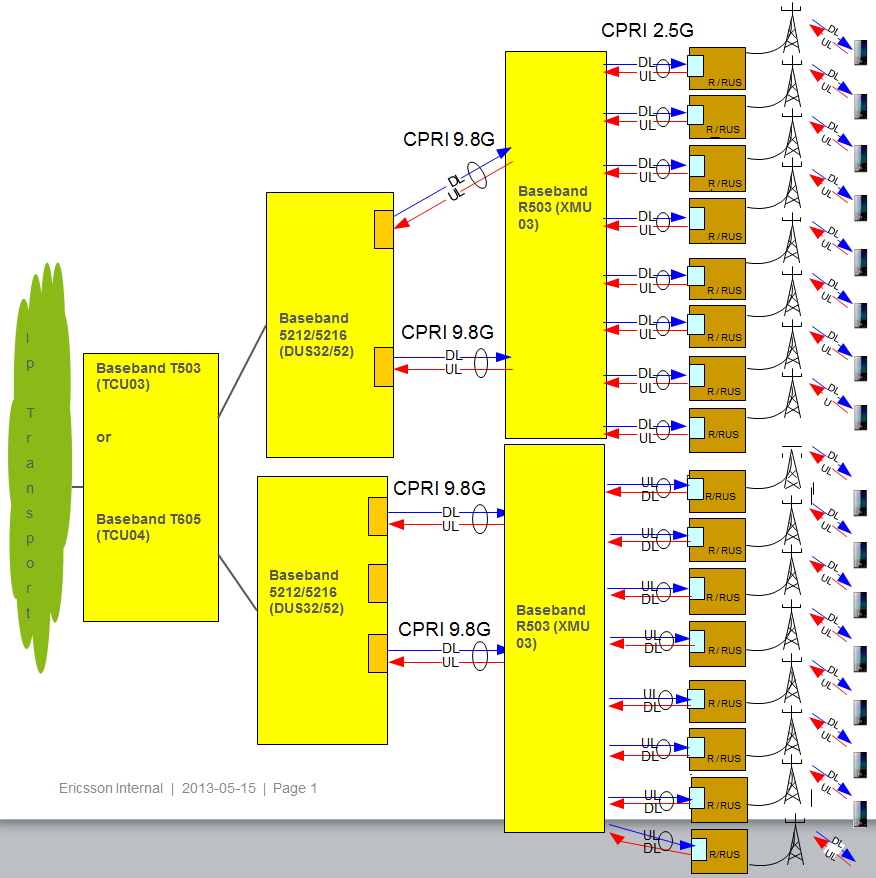
This document is intended as a reference for “Baseband and Transport” support engineers on RCS and security issues.The document is valid for SW release L16A.

## Revision history

|  |  |  |
| --- | --- | --- |
| **Rev.** | **Date** | **Description** |
| PA1 | 2015-06-05 | First release valid for 15B |
| PA2 | 2015-07-01 | Minor updates |
| PA3 | 2015-08-01 | Minor updates |
| PA4 | 2015-08-21 | Updated after internal inspection |
| PA5 | 2016-08-21 | Updated for L16A |
| PA6 | 2016-02-18 | Updated after first round inspection with Tier2 |

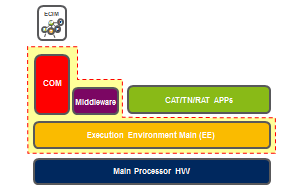
# Overview

## G2 based RAN Network Overview



Figur 1. Baseband & Transport modules in 16A are inluded in the products marked yellow

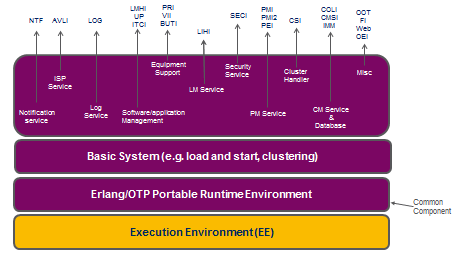
### G2 modules



Figur 2. Modules that are included in a G2 based node

* **LRAT** = LTE traffic control, termination of S1/M1/M3/X2/Uu upper layers, RAN func. , Specific O&M and LTE BB processing RAC = connection against UE
* **WRAT** = WCDMA traffic control, termination of Iuib/Uu upper layers, Specific O&M and WCDMA BB processing
* **GRAT** = RAN funct, termination of Abis, specific O&M and GSM BB processing
* **CAT** = Sector / carrier group handling, antenna system, power and climate control, hw management , synchronization and inter-connect functionality   
   **IPT =** internal package transport  
   **RICM =** radio interconnect control   
   **Sync** = Management of external interface, Supervision on ref candidates, selection on active ref. GPS receiver and NTP  
   **ASC** = Antenna filt, feeder and filter gain / delay. Control of RET and TMA units   
   **APC** = external alarms, climate, power supply and board control for system units  
   **HWM** = board control of RU, CPRI DU – RU  
   **SCH** = Sector configuration   
   **COAM** = auto-integration Equipment handling of RU / XMU
* **Execution Environment** is built on Linux and is not cluster aware. Its main task is to control the hardware and start up the middleware layer. EE is mainly implemented in C.
* **Middleware** contains Operation and Maintenance (O&M) and middleware functionality. The O&M part uses common components to provide a management interface which has the same look and feel as other Ericsson products. MW is mainly implemented in Erlang based on Open Telecom Platform (OTP)

#### **Middleware**



Figur 3 Middleware

* AVLI – Availability Log Interface
* BUTI – Button Interface
* CMSI – Configuration Management Support Interface
* CSI – Cluster State Interface
* FI – File Interface
* IMM – Information Model Management (SA Forum interface)
* ITCI - IMM Class Transfer service Interworking
* LIHI – License Handler Interface
* LMHI – Load Module Handler service Interface
* LOG – LOG interface (SA Forum interface)
* NTF – Notification interface (SA Forum interface)
* OEI – Object Event Interface
* OOT – O&M Over Transport
* PRI – Equipment Resource Interface
* RCS-COLI – COLI cmd registration and authorization
* PMI – Performance Management Interface
* PMI2 – Performance Management Interface version 2; replacing PMI
* PEI – PM Event Interface
* SECI – Security Interface
* UP – Upgrade Package
* VII – Visual Indications Interface
* Web – Web Interface

**The RCS Middleware performs several tasks:**

**AIC** - Auto Integration Configuration. AIC handles the auto-integration part that is running in the UP (after the reboot). This includes running node self-configuration, sending discovery SNMP trap and the MO-interaction with OSS (AutoProvisioning MO)

**ALH**- Availability Log Handling. ALH handles the availability log and the external RBS-CS interface: Availability Log Interface (AVLI).

**APPM** - Application Manager. APPM handles start and stop of application programs and the external RBS-RBS-CS interface: Load Module Handler service Interface (LMHI).

**CEC**– C to Erlang Communication.

**CERT** – Certificate handling. CERT handles certificates in the node including CMPv2 protocol, security logging, secure storage handling and the external RBS-CS interface: Security Interface (SECI).

**CLH** – Cluster Handling. It handles the external RBS-CS interface: Cluster State Interface (CSI).

**COI** – CS Operation and Maintenance Interface. COI handles the external RBS-CS interface. The block/interface contains functions for accessing the MOM, reading MIM information and audit logging. The main user this interface is EMGUI.

**COM** – Common Operation and Maintenance. COM is sourced from CBA and implements the northbound interface and the basic handling of a MOM.

**COMTE** – COM to Erlang. COMTE implements the transportation mechanism to and from COM process and the required COM support agent interfaces.

**COMSA** – COM Support Agent. COMSA handles RCS-MW callbacks which are called to handle modifications to the MOM modeös loaded and configurable in COM

**ECOLI** – Ericsson Command Line Interface. ECOLI handles the RBS-CS COLI and the external RBS-CS interface: COLI cmd registration and authorization (RBS-CS COLI)

**EITC** – Erlang Inter Thread Communication. EITC handles the Erlang interface towards Inter Thread Communication (ITC) mechanism.

**EQS** – Equipment Support. EQS handles the equipment relative external RBS-CS interfaces:   
- Button Interface (BUTI)  
- Equipment Resource Interface (PRI)  
- Visual Indicator Interface (VII)

**GMF** – Generic Management Function. GMF implements the Support Agent functionality according to CBA and interacts with COM (using COMTE) and IMM (via SAF). GMF has the following external RBS-CS interfaces:  
- Configuration Management Support Interface (CMSI)  
- IMM Class Transfer service Interworking (ITCI)

**LMA** – License Management Application. LMA handles licenses and includes the Generic License Management Solution component (GLMS). LMA has the following external RBS-CS interface: License Handler Interface (LIHI).

**LOG** – Log management. LOG handles log management and implements the SAF standard LOG interface (external RBS-CS interface).

**OMC** – O&M Connection. OMC handles the O&M interface functions: ldap for authentication and authorization, ssh login, tls login and https.

**OOT** – O&M over Transport. OOT handles O&M IP address handling, O&M DSCP setting, LMT DHCP, name space and the external RBS-CS interface: CS TN Service Interworking.

**OTP** – Open Telecom Platform. OTP carries the open source distribution of Erlang and OTP.

**PES** – Performance management Event Service. PES handles PM events and the external RBS-CS interface: Performance Management Event Interworking.

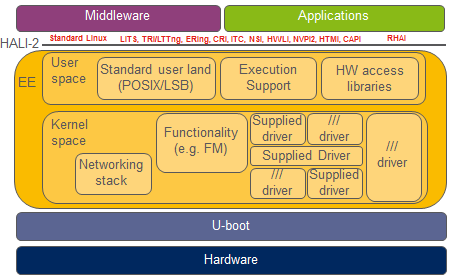
**PMS** – Performance Management Service. PMS implements the PM services provided by RCS. PMS has the following external RBS-CS interface: Performance Management Interface (PMI).

**SAF** – SA Forum service. SAF implements the SA Forums IMM service and NTF service. SAF has the following external RBS-CS interface:  
- Notification service (NTF) – SA Forum specified service  
- Information Model Management (IMM) – SA Forum specified service

**SWM** – Software Management. SWM implements the handling of software packages and configuration backup management. SWM has the following external RBS-CS interface:  
Upgrade Package (UP).

**SYS** – System functions. SYS implements the core of RCS-MW such as startup, server supervision, installation, sftp service, Erlang logging and has the following external RBS-CS interface:  
- Object Event Interface (OEI)  
- Web Interface (Web)  
- File Interface (FI)

#### **Execution Environment**



Figur 4 Execution environment

**EE Interfaces**

* CAPI – Capacity Interface
* CRI – Command Registration Interface
* NSI – Name Server Interface
* TRI – Trace Interface
* ERIng – Error handling Interface
* HWLI – Hardware Log Interface
* HTMI – Hardware Test Management Interface
* ITC – Inter Thread Communication
* LITS – Legacy IPC and Task Support
* LTTng – Linux Trace Toolkit next generation
* NVPI2 – Non-Volatile Parameters Interface version 2
* RHAI – RBS Hardware Access Interface

# SW Allocation

The software is divided in a **central part**, a **local part** and a **device part** (In baseband T it is only central as it is only one board).

**The central software is started on core MPs; the local software is started on all MPs (both core and regular MPs.).** The central part and local part are static and will always be started. It is also possible to start dynamic programs an MP.

**Device software is software started non MP processors such as RU, XMU and Baseband**. The device software is not handled by RCS. Only one CORE MP supported until 16B.

Software is delivered in a Load Module (LM) and one or several LMs are grouped into a Load Module Container (LMC).

# SW Validation

The basic feature Signed SW feature stops SW that is not signed by Ericsson from being executed on the board. The HW has Trusted Anchor preinstalled, which only accepts SW that is signed with Ericsson certificates. **Signed SW validation is activated both on secure and unsecure boards**. The only difference between secure and unsecure boards is that in an unsecure boards, the user can log in as a root to the board which means that he has access to the whole file structure.

# Software registrations – application data

Each LM and LMC contains metadata xml-file(s) called application data files (or short, appdata files). For software handling these application data files contains lot of information regarding:

configuration such as program crash escalation, LM allocation, Coli commands registration, alarms, coli command authentication, upgrade path supportability for IMM classes…. See [Upgrade Metadata file](#_Upgrade_Metadata_file)

# Node Configuration using netconf

The **Network Configuration Protocol** (NETCONF) is a [network management](http://en.wikipedia.org/wiki/Network_management) protocol developed and standardized by the [IETF](http://en.wikipedia.org/wiki/Internet_Engineering_Task_Force). It was developed in the NETCONF working group and published as [RFC 6241](http://tools.ietf.org/html/rfc6241).

NETCONF provides mechanisms to install, manipulate, and delete the configuration of network devices. Its operations are realized on top of a simple [remote procedure call](http://en.wikipedia.org/wiki/Remote_procedure_call) (RPC) layer. The NETCONF protocol uses an XML based data encoding for the configuration data as well as the protocol messages. The protocol messages are exchanged on top of a secure transport protocol.

The format of a netconf file can be checked using [ECT tool](https://rbs-g2-mofwk.rnd.ki.sw.ericsson.se/ectweb/) .

## Example Netconf scripts

The first part must always contain the hello element. Next follows one or more RPC messages. Finally there is the session close message. If any configuration has been done in previous messages this acts as the commit for those transactions.

Exampel of Create an Ethernet port

*<?xml version="1.0" encoding="UTF-8"?>*

*<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<capabilities>*

*<capability>urn:ietf:params:netconf:base:1.0</capability>*

*</capabilities>*

*</hello>*

*]]>]]>*

*<?xml version="1.0" encoding="UTF-8"?>*

*<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<edit-config>*

*<target><running/></target>*

*<config>*

*<ManagedElement xmlns="urn:com:ericsson:ecim:ComTop">*

*<Transport>*

*<EthernetPort>*

*<admOperatingMode>10G\_FULL</admOperatingMode>*

*<administrativeState>UNLOCKED</administrativeState>*

*<autoNegEnable>false</autoNegEnable>*

*<encapsulation>ManagedElement=1,Equipment=1,FieldReplaceableUnit=1,TnPort=TN\_A</encapsulation>*

*<ethernetPortId>TN\_A</ethernetPortId>*

*<userLabel>TN\_A</userLabel>*

*</EthernetPort>*

*</Transport>*

*<managedElementId>1</managedElementId>*

*</ManagedElement>*

*</config>*

*</edit-config>*

*</rpc>*

*]]>]]>*

*<?xml version="1.0" encoding="UTF-8"?>*

*<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="2">*

*<close-session/>*

*</rpc>*

*]]>]]>*

**Exampel of Exporting ESI:**

*<?xml version="1.0" encoding="UTF-8"?>*

*<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<capabilities>*

*<capability>urn:ietf:params:netconf:base:1.0</capability>*

*</capabilities>*

*</hello>*

*]]>]]>*

*<?xml version="1.0" encoding="UTF-8"?>*

*<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<action xmlns="urn:com:ericsson:ecim:1.0">*

*<data>*

*<ManagedElement>*

*<managedElementId>1</managedElementId>*

*<SystemFunctions>*

*<systemFunctionsId>1</systemFunctionsId>*

*<LogM>*

*<logMId>1</logMId>*

*<exportEsi>*

*<uri>sftp://labuser@10.90.1.101/home/labuser</uri>*

*<password>Letmein01</password>*

*</exportEsi>*

*</LogM>*

*</SystemFunctions>*

*</ManagedElement>*

*</data>*

*</action>*

*</rpc>*

*]]>]]>*

*<?xml version="1.0" encoding="UTF-8"?>*

*<rpc xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="2">*

*<close-session/>*

*</rpc>*

*]]>]]>*

# HW characteristic

The Baseband building blocks in the Ericsson Radio System consist of:

**Baseband Main Unit 6601:**

* Multi-standard Mixed Mode 19 inch indoor baseband main unit
* Mix and match Baseband 5212, Baseband 5216, Baseband R503 & Baseband T503 to provide the optimal capacity & configuration of GSM, WCDMA or LTE and combinations thereof

**Baseband 5216 & 5212:**

* Base-band processing for the uplink and downlink of LTE, WCDMA and GSM
* The 3GPP interfaces for radio network elements i.e. S1, X2, Iub, and Abis for traffic control and the O&M interface for the node (Mul and Mub)
* Synchronization from the transport network connection or external GPS
* IP connectivity
* Site Local Area Network (LAN) and maintenance interface
* Direct connection to the Radios or connection to the Radios via a front haul connection
* All 3 ports may be used simultaneously, either for resiliency or for connecting site equipment
* Connectivity of site equipment may be achieved using routing or bridging
* Completely flexible IP address and VLAN configuration for all traffic types
* RPS is replaced by BFD
* Virtual Routing is supported as an enabler for traffic separation

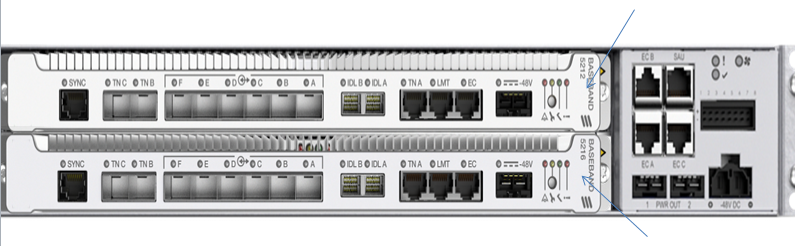
**Baseband R503:**

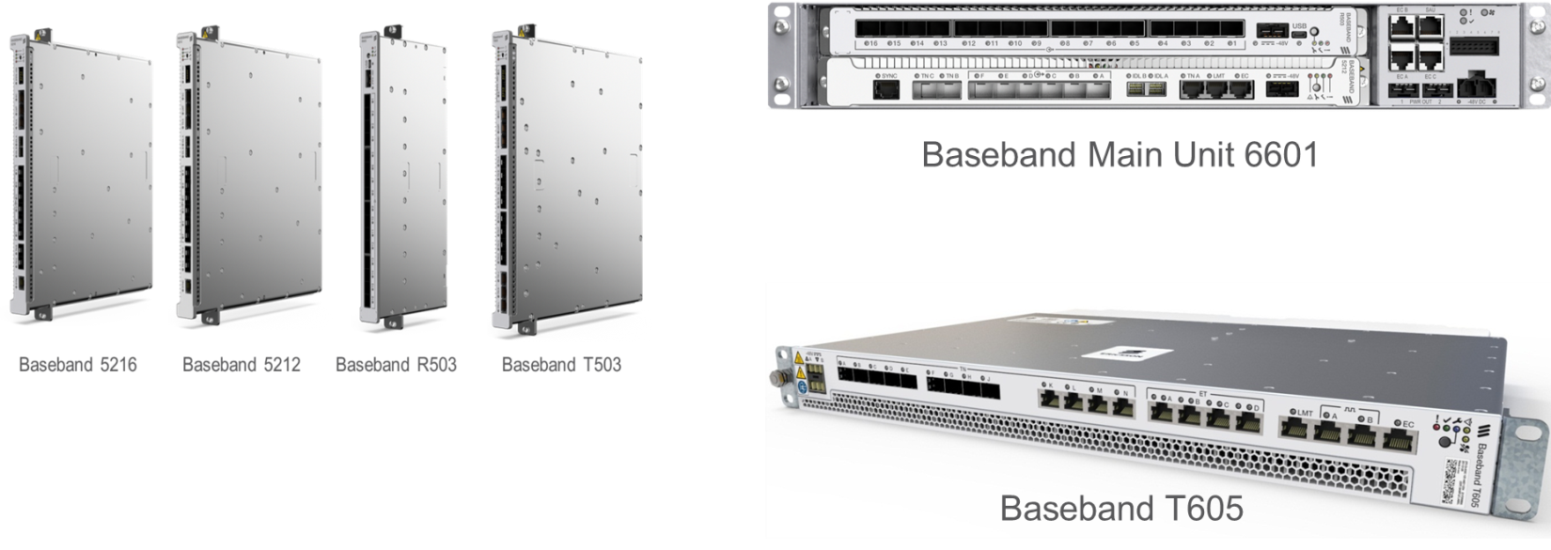
* Increased connectivity for new & existing radio units in large radio system configurations
* CPRI multiplexing and de-multiplexing

**Baseband T503 & T605:**

* Baseband unit for advanced routing functionality & traffic aggregation
* Flexible synchronization support & RAN Grand Master for synchronization of small cells

By flexibly combining the different Baseband building blocks, operators can flexibly meet the challenges of multiple standards across multiple frequency bands





**Baseband T503 (TCU03):**

The TCU 03 provides Transport Network connectivity, including functionality as a switch and a router. It also provides Ethernet and, as an option, IPv4 connectivity on all its TN interfaces. The TCU is designed for aggregating Multi-Standard RBS site traffic

* KDU 137 926/11 secure
* KDU 137 926/1 unsecure

Some characteristic:

* 5x 10/1GigE ports (SFP+/SFP)
* x 1GigE ports (SFP)
* x 1GigE RJ45 electrical ports
* 15 Gb/s IMIX forwarding capacity

**Baseband T605 (TCU04):**

* KDU 137 815/11 secure
* KDU 137 815/1 unsecure

Some characteristic:

* 8x E1/T1 ports (including support for Abis over IP for GSM)
* 5x 10/1GigE ports (SFP+/SFP)
* 4 x 1GigE ports (SFP)
* 4 x 1GigE RJ45 electrical ports
* 15 Gb/s IMIX forwarding capacity

**Baseband 5212 (DUS32)**

* 12 cores
* KDU 137 925/41 secure
* KDU 137 925/4 unsecure

Front width 31 mm: Weight ~3 kg: Power < 250 W

* **DU ports**
  + TN: 1x10Gbps + 1x1Gbps + 1x1Gbps
  + CPRI: 6x10Gbps
  + IDLe: 2x10Gbps Eth
* **GSM Capacity**
  + 24 TRX
* **WCDMA Capacity**
  + 384 RLS & 168 Mbps
  + Support for 3x4, full capacity for 3x1
* **LTE Capacity**
  + Optimized for 3x20x4(FDD) 3x20x8 (TDD)
  + 960 MHz pooled antenna bandwidth at low load
  + 6000 RRC connected (Handheld) 900 RRC (PC/TAB)
  + Throughput: up to 800Mbps DL; up to 400Mbps UL



Figur 5 Baseband 5212

**Baseband 5216 (DUS52)**

* 16 cores
* KDU 137 925/31 secure
* KDU 137 925/3 unsecure

Front width 31 mm: Weight ~3 kg: Power < 350 W

* **DU ports**
  + TN: 1x10Gbps + 1x1Gbps + 1x10Gbps
  + CPRI: 6x10Gbps
  + IDLe: 2x20Gbps Eth + 2x10Gbps CPRI
* **GSM Capacity**
  + 48 TRX
* **WCDMA Capacity**
  + 768 RLS & 336 Mbps
  + Support for 3x8, full capacity for 3x2
* **LTE Capacity**
  + Optimized for 3x60x4(FDD) 3x60x8 (TDD)
  + 1600-2400 MHz pooled antenna bandwidth at low load
  + 12000 RRC connected (Handheld) 1850 (PC/TAB)
  + Throughput: up to 1600Mbps DL; up to 800Mbps UL

The functionality of DUS 52 is divided over 5 different HW modules. They are:

* Central Processing Module, CPM, implemented with the AXM chip.
  + It is called main processor. The Central Processing Module (CPM) comprises of a multicore communications processor AXM5512 (GPP+NPU in one chip) and supporting peripheral devices. Its main functions in the DU are Main Processor (MP) role, IP termination, Ethernet switching as well as running GSM/WCDMA/LTE SW on the CPU cores
* Base Band Module, BBM, implemented with the Trinity ASIC
  + One Base Band Module consists of one Trinity ASIC and two external DDR3 memories. The BBM holds the DSP and accelerator resources needed for implementation of LTE, WCDMA and GSM RATs.
* Intra Connect Module, (ICM), implemented with the COBRA FPGA
* Timing Module controls the frequency and timing in the DUS.
* DC/DC block (Power), supporting the other modules with power and have supervision over power consumption and voltages.

DUS 52 is equipped with 4 baseband modules (BBM)



Figur 6 Baseband 5216

**TN A:** The DU shall support 100/1000 Mb/s Ethernet transmission ports, connected with switching functionality. 100-Base TX/1000-Base.

The TN port shall support Synchronized Ethernet (SyncE).Standard /G.8262/.

**TN B and TN C:** The DU shall support 1/10 Gb/s Ethernet transmission ports, connected with switching functionality. The TN port shall support Synchronized Ethernet (SyncE).Standard /G.8262/.

**Radio Interface (RI):** SFP+. CPRI support of 2.45, 4.9, 9.8, 10.1376 Gbit/s and HWP for 1.2(only HDLC channel) and 10.3 Gbit/s on all RI ports (A to F).

**IDLe:** Ethernet: 1/10 Gbit/s. CPRI: 2.5, 4.9, 9.8G, Gbit/s and HWP for 1.2, 2.5, 4.9, 10.1376, and 10.3125 Gbit/s CPRI. PTP (IEEE 1588) and Synchronous Ethernet (provides frequency distribution) the interface shall follow 10Gbase-1/4 40Gbase-CR4, MACSEC supported.

**LMT:** Local Management Terminal used for OAM access and serial connection.

**DU production test and Verification interface:** On the rear of the DUS. (Debug port) support 1Gbit/s

**16A Support**

Only single DU configuration is supported.

DUS and TCU can have secured or unsecured boards. Secured boards means possibility to login as root is not possible. i.e No Linux shell.

# Node Management

RCS includes the Ericsson common component COM, which terminates node management. The Management Object Model (MOM) loaded to COM at startup, supplies both a **machine to machine** interface (netconf) and a **man to machine interface** (Ericsson Command Line Interface – ECLI or COMCLI).

For Ericsson support an additional **RCS COLI** interface is added, ESLI.

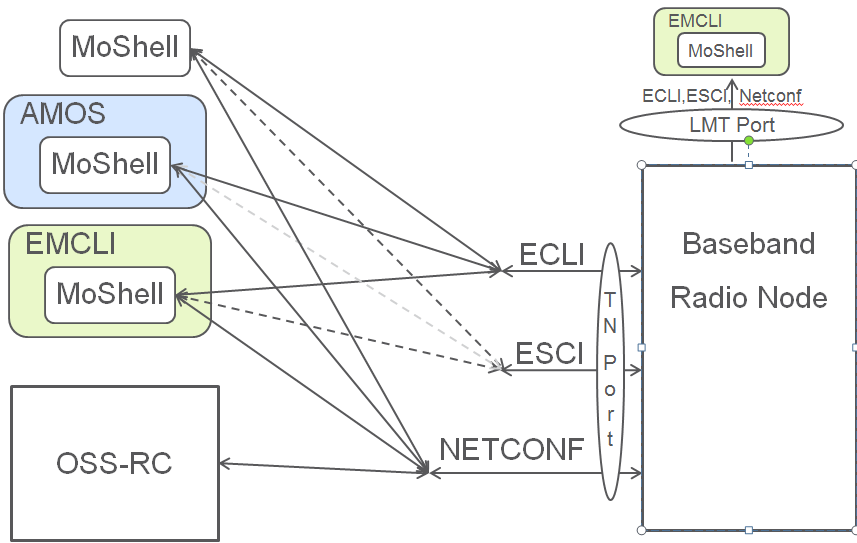
The OaM access make use of the System Function Managed Object ‘OaM Access Point’, which reference an earlier configured Transport IP address for a particular transport interface (i.e. TN A). Currently only IPv4 is supported, in the future either IPv4 or IPv6 will be supported.

The Local Management Terminal (LMT), supports a console interface as well as an Ethernet interface – both used for local access to the node. From an OaM point of view the LMT Ethernet interface is equivalent to a TN port. In addition this is the only interface used for Auto Integration 16A.

The LMT port has two physical interfaces (in same connector), Ethernet (LMT B) and RS-232 (LMT A).

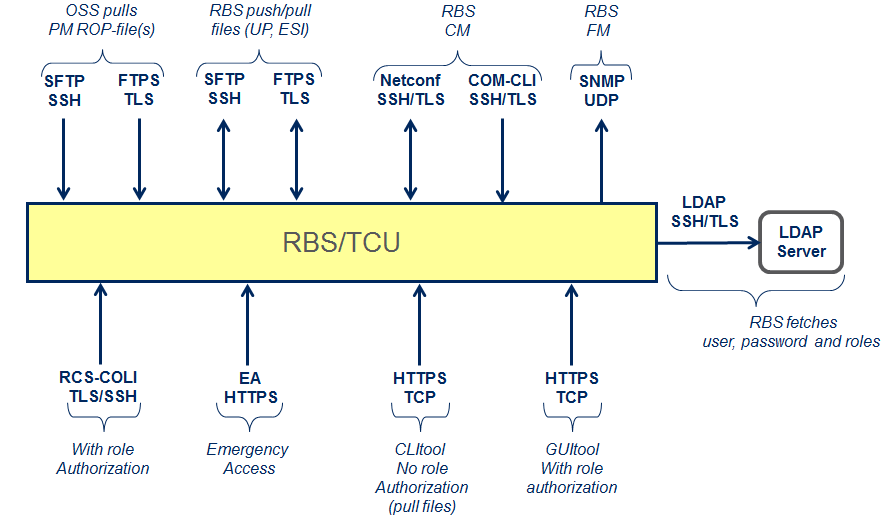
* + LMT B can be used to reach all interfaces in the same way as the TN ports. With the addition that the Emergency Access interface is only reachable via the LMT B (Ethernet) port.
  + The LMT A port is closed for login. It will only send out console messages at boot.

## Node Access



Figur 9 O&M access alternatives

ECLI : Ericsson Command Line Interface (a k a COM-CLI)  
ESCI : Ericsson Support Command Interface, for E/// debugging. ( a k a RCS-COLI or COLI)  
NETCONF: XML based machine-machine interface for MO configuration (normally used by OSS)



Figur 7 Node access

See [Node Hardening Guidelines](http://cpistore.internal.ericsson.com/alexserv?ac=LINKEXT&li=EN/LZN7931020R1C&FB=1a|1ff&FC=zC_931020R1&FN=9_1553-LZA7016014Uen.S.html&SL=EN/LZN7931000R1B) for available ports and services:

* **COM-CLI** = Mo tree access - port 2023 on ssh and 9830 with TLS
* **NETCONF** = Similar to COM-CLI but can use xml scripts – port 2022 on ssh and 6513 with TLS  
  . Possible to change configuration with a xml script
* **ECOLI** = Coli commands from folders – port 4192 on ssh and 9831 with TLS
* **LDAP Server** will contain different users with their roles and accept the user to login. Operator will own the LDAP and decide what user name / roles should access node
* **Maintenance user** is predefined with certain role with a Ericsson certificate, LDAP is not needed. **Ericsson support is a Maintenance User   
  Done in Initial configuration ( AI ) phase only**.

Exampel:

**Linux (only in unsecure boards):**

* **root access to Linux shell in the node**

*ssh root@<ip-address> -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null*

*coli [/]-> misc/cmds*

* **download files to the node with SCP to /home/sirpa/dev\_patches.**

*scp xxxxxxLm.bin root@<node ip-address>:/home/sirpa/dev\_patches/*

* **upload files from the node. Ex. upload sync dcg from the node.**

*scp -r root@<node ip-address>:/rcs/applicationlogs/SyncDusg2\_CXP9030859\_1/sync-dcg.log /home/uabseyo*

**COM-CLI:**

*ssh expert@<ip-address> -p 2023 -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null*

*>help*

**SFTP**

*sftp -oStrictHostKeyChecking=no -oUserKnownHostsFile=/dev/null -oPort=2024 expert@<ip-address>*

*sftp> ls rop*

*rop/A20141027.1200-1215.xml.gz rop/A20141027.1215-1230.xml.gz rop/A20141027.1230-1245.xml.gz*

**ECOLI**:

*ssh expert@<ip-address> -p 4192 -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null*

**Moshell**:

*moshell -v comcli=20,username=expert,password=expert, export\_method=1 <ip-address>*

**Netconf**:

*ssh expert@<IP address> -p 2022 -s netconf < <path for netconf file>*

alternatively netconfo can be run from moshell:

*>netconf <path for netconf file>*

It’s easy to jump between the different shells in moshell:

c+ sets the uservariable comcli to 2, giving access to the comcli shell

c1 sets the uservariable comcli to 1 and coli\_shell to 1, giving access to the rcs-coli shell

c2 sets the uservariable comcli to 1 and coli\_shell to 2, giving access to the linux shell

The c? command is for checking what is the current shell.

By default, moshell will automatically send comcli/coli/linux commands to the appropriate shell.

# Disc partitions

There are 8 GB Disc partitions in baseband 521x

Baseband 5216

Network loader (2x128MB)

Upgrade packages,

Logs,

Backups

PM ROP files

Dumps and PMDs

Boot partition – Linux boot system

**Baseband 521x /sda3 volume**

*Reserved for UP growth*

UP3 450MB

DUMP 700

0,95 GB

2,8 GB

2,7 GB

- linux configuration and logs

- /home all SW is reached from here

- Active UP (uncompressed)

- Two UPs, running and new

-PM counter ROP files when fetching is stalled (size supervised by CS)

-Backups (20 manually + 9 system created)

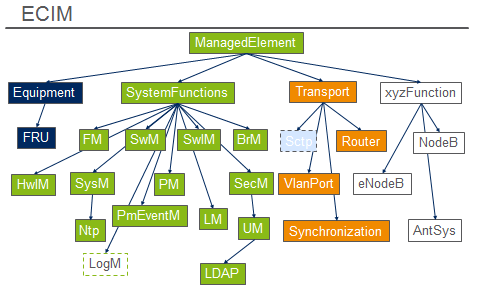
-CS logs (250 MB max) and Application logs (250 MB)

Archive UPs (compressed) (running, rollback and new)

PMDs/Core dumps for MP and DP

# ECIM - Ericsson Common Information Model

ECIM is an Ericsson wide standard that will align OAM so that common OAM use cases are done in a similar way.



Figur 8 ECIM

* There will be a common view of Ericsson products and enable an operator OPEX reduction
* Common North Bound Interface (NBI) protocols and ECIM will enable OSS to become model driven, significantly reducing the cost for OSS development
* Common OAM Module (COM) provide support for common OAM functions (PM, FM, CM, etc.), interfaces (NetConf, CLI, SNMP)

An ECIM model is broken into smaller pieces known as fragments

* Common fragments: used by many different types of node
* Application specific fragments: unique to a specific type of node

The ECIM model for a given node (ManagedElement) is the complete set of common and application specific fragments supported by all the software components on the node

The overall structure of an ECIM model is defined by the ECIM Top fragment

* Managed element. The root class of the model. A management application will communicate with the ME for monitoring and control
* System Functions. OAM functions for the managed entity such as SW mgmt, FM and PM.
* Equipment. This part of the model contains the HW entities that can be managed
* Transport. Managed entities connected to transport

## System functions

|  |  |
| --- | --- |
| **System Functions** | **Description** |
| BrM: Backup and restore Mgmt | -Create, delete and restore backups on a ManagedElement.  -Export + import of backups in file format to/from a remote location |
| FM: Fault Mgmt | -Fetch the set of alarm types supported by a ManagedElement  -Fetch the list of active alarms which are present on the ManagedElement at a given point in time |
| HwIM: Hardware Inventory Mgmt | -Check which hardware items are present on a ManagedElement |
| LicM: License Mgmt | -Download and activate license key files  -Fetch an inventory of the licenses on a ManagedElement. |
| PM: Performance Mgmt | -Determine the PM capabilities of the ManagedElement, for example   * Supported job types: Measurement Job (periodic collection), real time jobs or threshold monitoring jobs * System limits: max number of jobs or files or measurements   -Determine the set of counters (instances of PmGroup + MeasurementType) supported by the ManagedElement  -Configuration of PM jobs on the ManagedElement |
| PM EventM: PM Event Mgmt | -Similar to PM except it covers event based PM |
| SecM: Security Mgmt | -Configuration of authentication and authorization methods and data used for verifying user credentials and permissions.  - LDAP Authentication  - Local Authorization   * Retrieval of predefined user roles and the associated rules * Configuration of custom user roles and the associated rules   -CertM: Certificate Mgmt   * Management of node credentials and trusted certificates |
| SwIM: Software Inventory Mgmt | -Check which software items are loaded on a ManagedElement and which of those items are active |
| SwM: Software Mgmt | -Download, activate and delete upgrade packages |
| SysM: System Mgmt | -SNMP: SNMP Mgmt  -Configure the use of the SNMP protocol by the ManagedElement  -Configure NTP client association to remote NTP servers  -Find the schema files for ECIM MIM fragments supported by the ManagedElement  -OSS uses this to determine which MIM fragments + versions are supported by a ManagedElement and to fetch the MIM files |

## Equipment

* The ECIM Equipment fragment provides a representation of the hardware in the node.
* It supports use cases concerning hardware installation, checking status, performing tests and resets.

## Transport

ECIM Transport is a container for various transport related MIM fragments used by the ManagedElements. Some examples of Transport fragments are:

* L3\_Infrastructure: includes IPv4 and IPv6 interfaces, routers
* SCTP: includes SCTP end points,associations and profiles
* Routes: includes dynamically learned IPv4 and IPv6 routing tables
* ARP/NDP, OSPF, VRRP

# Node configuration using Failsafe Backup Function

The failsafe backup function is highly recommended when performing reconfiguration of a G2 node. An error in the configuration can lead to lost O&M access or other failures from which the system can recover by a restore from a backup. If the failsafe backup function is activated, the system automatically restores from a backup which is automatically created if the configuration has not been confirmed within the predefined rollback time period. After an automatic restore from backup the failsafe backup function is automatically deactivated.

If the operator has performed a successful configuration, the operator confirms the configuration by deactivating the failsafe backup function within the predefined rollback time period.

If there is a restart while the failsafe backup function is active, the rollback timer is stopped. After the restart the rollback timer continues the countdown.

It is not possible to create any manual or scheduled backups while the failsafe backup function is active. Any scheduled backup is suppressed and the ***Scheduled Backup Failed*** alarm is raised.

To use the failsafe backup function, do the following:

* Set attribute **timeoutLength** in MO class **BrmFailsafeBackup** to the desired time period the system waits before automatically restoring from a backup. The default rollback time-out is 1200 seconds, that is 20 Minutes.
* Activate the failsafe backup function by initiating action **activate**() in MO class **BrmFailsafeBackup**. The system automatically creates a backup called **"Failsafe\_backup\_xxxx"** and starts the rollback timer. This backup is used if the rollback timer expires and the system automatically restores. If more time is needed, set the **timeoutLength** in MO class **BrmFailsafeBackup** to the new desired time period (you can’t use a value which was selected when you activated the function the first time. The time remaining is shown in attribute **timeRemaining** in MO class **BrmFailsafeBackup**.
* Confirm the sensitive configuration by deactivating the failsafe backup function through action **deactivate**() in MO class **BrmFailsafeBackup**. The rollback timer is stopped and the backup created at the failsafe backup function activation is removed. The configuration is now saved in the database but will be lost if restore operation is done to another backup, if a backup is not created manually.

**Some comparison to G1 CPP based RBS**

RBS-CS provides a database that is persistently stored in the disk. (similar to windows update behavior or sw update on mobile/tablet devices).

In G2, the mnesia database is used as compared to SQL database in G1. In G2, all configuration entered is written immediately into the disc while in G1, the data is written only after "cv mk" command is issued. This could mean that if a crash occurs which leads to node restart during reconfiguration of the node, then the node will come up will all the data that was entered before the crash. If resetting the data is needed, then one has to restore the node with a backup that was active before the reconfiguration of the node started or if Failsafe function is used let the rollback timer expire so that the system automatically restores to a "Failsafe backup" that was created by the system.

# Software Management

## Software inventory

SW inventory provides information about the SW available on the node.

Attribute **active** in MO class **SwInventory** shows the SW version currently running on the node.

An MO of class **SwVersion** shows the content of the active Upgrade Package (UP).

**Some comparison to G1 CPP based RBS**

SwItem shows the content of a Load Module Container (LMC), equivalent to Loadmodules in G1. There is no connection between Upgrade package MO and loadmodules as in G1.

## System Upgrade

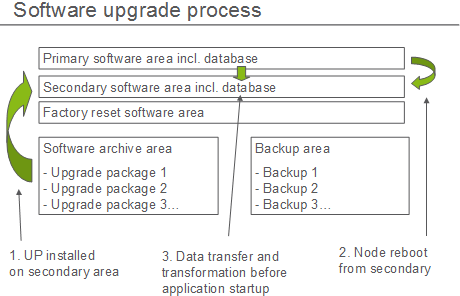
A Upgrade Package is a collection of loadmodule containers (CXP:s), the metadata file (See [Upgrade Metadata file](#_Upgrade_Metadata_file)) and nmsinfo.xml (containes info for SHM in OSS to identify the node type .. see [SHM Upgrade Support Inter Working Description](https://erilink.ericsson.se/eridoc/erl/objectId/09004cff87ac3fad?docno=LMI-14:000031Uen&format=msw8) )

Each LM and LMC contains metadata xml-file(s) called application data files (or short, appdata files). For software handling these application data files contains lot of information regarding:

configuration such as program crash escalation, LM allocation, Coli commands registration, alarms, coli command authentication, upgrade path supportability for IMM classe.

### Upgrade phases

The software handling uses a dump-concept. Each dump contains a software release and the configuration data. At a software upgrade a new dump is created and the old previous dump is untouched. The old previous dump is intact and can easily be activated (during automatic rollback at software upgrade failure or restore operation).



Figur 9 software Upgrade Process

The SW upgrade procedure is performed in a number of operator-initiated action:

* CreateUpgradePackage
* prepare
* verify
* activate
* confirm
* removeUpgradePackage

#### **CreateUpgradePackage**

***CreateUpgradePackage*** action is initiated from the **SWM** MO. The managed element downloads the metadata file (equivalent to UCF file in G1) found at a specific location given by an URI. The URI hould be specified as sftp://username@hostIPadress/dir/subdir, where /dir/subdir is the file path to the UP in the SFTP server. After successful creation, the upgrade package system information (SI) metadata (UCF file in G1) will be downloaded to the node. A new UpgradePackage MO is created in the node and the state of the new UpgradePackage MO is set to ***INITIALIZED***.

One of the following can result in failure of the creation of the UP MO:

* Remote file access is not possible.
* Incorrect UP location or path given by the URI.
* Incorrect password
* Incorrect meta-data format (syntax in SI file(UCF file))

#### **Prepare**

Prepare action is initiated on the **Upgrade package** MO which is instate ***INITIALIZED***. All SW included in the UP package is downloaded to the node. The following checks are made by the system during prepare:

* enough free disk space is available
* load module containers (Top-LMCs) of the UP are downloaded to the UP Archive /rcs/swm/archive/<UPname>
* each Top-LMC is uncompressed and SquashFS mounted and using Execution Environment LM Signed Software validation is performed

The state of the MO-UpgradePackage to ***PREPARE\_COMPLETED*** and

Prepare action fails if one of the following conditions is encountered:

* Another request handled by the MO-UpgradePackage is already in progress.
* Not enough free disk space is available on the board
* No EE top-LMC exists in the new UP.
* The Signed Software validation fails.

#### **Verify**

Verify action is initiated on the Upgrade Package MO by the operator. The verify sequence offers a possibility to warn the operator before proceeding with activation. At this time the condition of the system can be checked, but there will be no checks that depend on the new system software, because at this point it is not yet accessible. **Each application ( CS, WRAT, LRAT, GRAT, CAT,TN) has the opportunity to recommend against proceeding with an upgrade**.

CS performs the following checks:

* Checks if the SquashFS of the LMCs are already mounted. If not, SWM uncompressed all downloaded Top-LMC . EE will automatically validate each LMC. After successful validation of each LMC, the corresponding SquashFS is mounted.
* Checks that required disk space is available
* Checks the IMM schema versions for all fragments to ensure data conversion.

All other applications, WRAT, LRAT, GRAT, CAT,TN start their pre-checks

#### **Activate**

Activate action is initiated when the UP is in state ***PREPARE\_COMPLETED***.

When the operator initiates activation of the UP, the following sequence is triggered:

* The fallback timer is turned on. The default timeout is 20 minutes and set on the ***SWM MO***.
* The file system images are mounted, making the new software accessible.
* A backup called “***Rollabck\_backup\_xxxx*”** is created by the system. This backup is used in case of fallback
* A new verify procedure is initiated. The verify procedure is able to make verifications dependent on the new software version. Furthermore it gives the system the opportunity to verify once again the system state, which may have changed since the initial verification.
* Upgrade start: CS services that shall not be turned on during activations are suspended. From this moment on, any failure will lead to a node restart
* Software preload started. Radio unit software and other software will be preloaded before the boot occurs. RBS CS provides this call to inform the responsible party that it is time, and an API for the loader to use to get the correct load module file paths. Applications that handle preload must be a receiver of upgrade triggers.
* A call offers load modules to do immediate actions necessary before the node reboot. This might for example include a **soft lock of traffic and alarm suppression**.
* Node reboot
* During the process start all CS applications must detect any changes in schema and database objects and makes the necessary transforms.
* During the process start all applications must detect any changes in schema and database objects and use the provided CS API for transforming the objects in changed IMM classes.
* The state of UpgradePackage Mo is changed to ***WAITING\_FOR\_COMMIT***.

The system will issue an alarm “A Fallback Operation will soon be started“ before the fallback timer runs out, in case the operator has forgotten to commit the upgrade

#### **Cancel**

Ongoing actions can be cancelled by the operator by initiating action cancel in MO class SwM and MO class UpgradePackage respectively. Cancellation of an ongoing action stops the action and restores the node to the consistent state that existed before the action was started. Action ***confirm*** cannot be cancelled.

#### **Confirm**

Confirm action is initiated on the Upgrade package MO which is in state WAITING\_FOR\_COMMIT to create a final configuration

* After invoking confirm the upgrade cannot be cancelled.
* It follows the same procedure as verify, which means the applications will have an opportunity to do some cleaning up at this stage.
* fallback timer is cancelled.
* Final backup called “**Final\_backup**\_xxx” is created by the system.
* The state of the active UP will be set to “***COMMIT\_COMPLETED***” while the state of the previously active UP will be set to “***PREPARE\_COMPLETED***”.

**The automatically created backup is recommended to be exported to an external backup server, since it is deleted at the next upgrade**

#### **RemoveUpgradePackage**

A UP can be removed from the node by initiating action removeUpgradePackage in MO class SwM. This action removes MO UpgradePackage and all the files associated with the UP. Removing a UP from the node does not disturb traffic and can be performed during normal operation. The UP that corresponds to the currently used SW cannot be removed.

**Some comparison to G1 CPP based RBS**

If a UP is connected to a backup that is in the escalationlist, it can’t be removed. There is deviation from G1 in that before a UP is removed all backups related to the UP should be deleted first. System\_created backups (***Final\_xxx, Rollback\_xx, Failsafexxx***) can’t be deleted Manually as they are removed by the system 1 hour after node restart. The system can’t delete these backups if they are in the escalation list. This would mean that, it is not possible to delete the latest UP as there would be backups in the escalation list that are dependent on the UP.

See [Manage software](http://cpistore.internal.ericsson.com/alexserv?ac=LINKEXT&li=EN/LZN7931020R1C&FB=1a|1ff&FC=zC_931020R1&FN=15_1553-LZA7016014Uen.C.html&SL=EN/LZN7931000R1B) .

### Upgrade Metadata file

Various design organizations that deliver software for the RBS CS-based node deliver their products in a **load module container** (.cxp format). The load module container consists of metadata document in XML file format with the necessary product information data and the binaries.

The whole upgrade package in G2 is delivered as one zipped file. Example: CXP9024418\_2-R15DT.zip

After unzipping tre UP, one gets a lot of loadmodule containers (.cxp format which is a compressed version of the binary and small .xml files)

*-> ls*

*AIS\_GFF-CXP9024813\_1.cxp CXP9025671\_24-R33AC.cxp  RICM\_CXP9023064\_4-R12L.cxp*

*g2\_rrul81b39\_app-CXP9021507\_4-R6D.cxp AIS\_PMFWK-CXP9024940\_1.cxp EMCLITOOL\_CXP9024020\_1.cxp*

*APC-ARM\_CXP9024886\_3-R24C.cxp   EMGUI\_CXP9026393\_1.cxp T N-DUSG2\_CXP9022846\_10-R24BU.cxp*

*FRUM\_CXP9024280\_4-R29C.cxp          XMU03-LMC\_CXP9027802\_1-R4JU.cxp          g2\_rrus82b41\_app-CXP9025220\_4-R1X.cxp*

*g2\_iru\_app-CXP9024578\_14-R62EA.cxp       g2\_rus5\_app-CXP9024578\_9-R62EA.cxp BBI\_CXP9023495\_3-R17C.cxp*

*MOFWK\_ARM-CXP9024581\_25.cxp         g2\_rru2216b40a\_app-CXP9026768\_4-R1T.cxp  g2\_trus\_app-CXP9024578\_10-R61CB.cxp*

*CXP9023271\_3-R23F.cxp           MOFWK\_ARM-CXP9024581\_26.cxp         g2\_rru22\_app-CXP9025120\_1Z2-R1AF.cxp*

*g2\_xrus\_app-CXP9024578\_6-R61CB.cxp CXP9024079\_3-R1G.cxp         RBSANTC\_CXP9030699\_2-R31A.cxp*

*g2\_rru22f1\_app-CXP9026642\_1Z2-R1N.cxp    CXP9024263\_1-R29AJ.cxp     RBSNC\_CXP9030284\_3-R33C.cxp*

*RCS-DUS2\_CXP9031275\_3.cxp           g2\_rrul81b38\_app-CXP9019797\_4-R7D.cxp*

*SYNC-DUSG2\_CXP9030859\_1-R12S.cxp  g2\_rrul82b41e\_app-CXP9025219\_4-R1AC.cxp*

*g2\_rrus31\_app-CXP9024021\_2Z2-R2J.cxp ARCHSUPP\_PLAB-CXP9024812\_1.cxp*

*ARCHSUPP\_SFA-CXP9024811\_1.cxp   GRAT\_CXP9023458\_3-R19AZJ.cxp*

*IELL-ARM\_CXP9023113\_5-R6A.cxp       g2\_rir5\_app-CXP9028337\_1-R55XF.cxp*

*g2\_rus5x\_app-CXP9024578\_12-R62EA.cxp COBRA\_CXP102171\_1.cxp*

*IPT\_EBCOM-ARM\_CXP9025895\_1-R5A.cxp  g2\_rru2208b41e\_app-CXP9026769\_4-R1U.cxp*

*g2\_trus5\_app-CXP9024578\_13-R62EA.cxp COBRA\_CXP102188\_2.cxp*

*g2\_rrul62b38\_app-CXP9019879\_4-R6N.cxp    CXP9024418\_2-R15DT.zip*

*RBSRASSECTOR\_CXP9024888\_2-R31A.cxp  g2\_rrul62b40\_app-CXP9019880\_4-R6V.cxp*

*nmsinfo.xml*

*CXP9024418\_2-up.xml*

The Upgrade package metadata file is named named “\*-up.xml”, equivalent to UCF file in CPP based nodes

*>cat CXP9024418\_2-up.xml*

*<?xml version="1.0" encoding="ISO-8859-1" ?>*

*<!--*

*<configuration type="MSRBS-UP">*

*<product name="Baseband" id="CXP9024418\_2" version="R15DT"/>*

*<date>2016-01-24T15:51:06</date>*

*<description>N/A</description>*

*<type>RadioNode</type>*

*<release>16A</release>*

*<framework>*

*<product name="RCPI" id="CXS101547" version="R7D"/>*

*<product name="RYT" id="RYT139652\_1" version="R1A"/>*

*</framework>*

*<contentinfo>*

*<product name="RRU22F1LMC" id="CXP9026642\_1Z2" version="R1N" filename="g2\_rru22f1\_app-CXP9026642\_1Z2-R1N.cxp" />*

*<product name="LRAT-ARM" id="CXP9025671\_24" version="R33AC" filename="CXP9025671\_24-R33AC.cxp" />*

*<product name="AIS\_PMFWK" id="CXP9024940\_1" version="R3X" filename="AIS\_PMFWK-CXP9024940\_1.cxp" />*

*<product name="RRUL82B41E" id="CXP9025219\_4" version="R1AC" filename="g2\_rrul82b41e\_app-CXP9025219\_4-R1AC.cxp" />*

*<product name="RUS5" id="CXP9024578\_9" version="R62EA" filename="g2\_rus5\_app-CXP9024578\_9-R62EA.cxp" />*

*<product name="RUS5X" id="CXP9024578\_12" version="R62EA" filename="g2\_rus5x\_app-CXP9024578\_12-R62EA.cxp" />*

*<product name="RRU2216B40A" id="CXP9026768\_4" version="R1T" filename="g2\_rru2216b40a\_app-CXP9026768\_4-R1T.cxp" />*

*<product name="RRUL62B38" id="CXP9019879\_4" version="R6N" filename="g2\_rrul62b38\_app-CXP9019879\_4-R6N.cxp" />*

*<product name="RICM" id="CXP9023064\_4" version="R12L" filename="RICM\_CXP9023064\_4-R12L.cxp" />*

*<product name="Baseband\_MOMCPI" id="CXP9024263\_1" version="R29AJ" filename="CXP9024263\_1-R29AJ.cxp" />*

*<product name="TRUS" id="CXP9024578\_10" version="R61CB" filename="g2\_trus\_app-CXP9024578\_10-R61CB.cxp" />*

*<product name="BBI" id="CXP9023495\_3" version="R17C" filename="BBI\_CXP9023495\_3-R17C.cxp" />*

*<product name="TN-DUSG2" id="CXP9022846\_10" version="R24BU" filename="TN-DUSG2\_CXP9022846\_10-R24BU.cxp" />*

*<product name="COBRA-A10" id="CXP102188\_2" version="R9B01" filename="COBRA\_CXP102188\_2.cxp" />*

*<product name="GRAT" id="CXP9023458\_3" version="R19AZJ" filename="GRAT\_CXP9023458\_3-R19AZJ.cxp" />*

*<product name="ARCHSUPP\_PLAB" id="CXP9024812\_1" version="R3C" filename="ARCHSUPP\_PLAB-CXP9024812\_1.cxp" />*

*<product name="WRAT" id="CXP9023271\_3" version="R23F" filename="CXP9023271\_3-R23F.cxp" />*

*<product name="RRU2208B41E" id="CXP9026769\_4" version="R1U" filename="g2\_rru2208b41e\_app-CXP9026769\_4-R1U.cxp" />*

*<product name="RRU22LMC" id="CXP9025120\_1Z2" version="R1AF" filename="g2\_rru22\_app-CXP9025120\_1Z2-R1AF.cxp" />*

*<product name="EMGUI" id="CXP9026393\_1" version="R1L" filename="EMGUI\_CXP9026393\_1.cxp" />*

*<product name="RCS-DUS2" id="CXP9031275\_3" version="R4AS12" filename="RCS-DUS2\_CXP9031275\_3.cxp" />*

*<product name="RBSANTC" id="CXP9030699\_2" version="R31A" filename="RBSANTC\_CXP9030699\_2-R31A.cxp" />*

*<product name="IPT\_EBCOM-ARM" id="CXP9025895\_1" version="R5A" filename="IPT\_EBCOM-ARM\_CXP9025895\_1-R5A.cxp" />*

*<product name="AIS\_GFF" id="CXP9024813\_1" version="R2M" filename="AIS\_GFF-CXP9024813\_1.cxp" />*

*<product name="3PPOSSASN1-ARM" id="CXP9024079\_3" version="R1G" filename="CXP9024079\_3-R1G.cxp" />*

*<product name="RRUL62B40" id="CXP9019880\_4" version="R6V" filename="g2\_rrul62b40\_app-CXP9019880\_4-R6V.cxp" />*

*<product name="IELL-ARM" id="CXP9023113\_5" version="R6A" filename="IELL-ARM\_CXP9023113\_5-R6A.cxp" />*

*<product name="ARCHSUPP\_SFA" id="CXP9024811\_1" version="R4V" filename="ARCHSUPP\_SFA-CXP9024811\_1.cxp" />*

*<product name="RBSNC" id="CXP9030284\_3" version="R33C" filename="RBSNC\_CXP9030284\_3-R33C.cxp" />*

*<product name="COBRA" id="CXP102171\_1" version="R20D01" filename="COBRA\_CXP102171\_1.cxp" />*

*<product name="RRUL81B38" id="CXP9019797\_4" version="R7D" filename="g2\_rrul81b38\_app-CXP9019797\_4-R7D.cxp" />*

*<product name="RIR5" id="CXP9028337\_1" version="R55XF" filename="g2\_rir5\_app-CXP9028337\_1-R55XF.cxp" />*

*<product name="MOFWK\_ARM" id="CXP9024581\_26" version="R26HF" filename="MOFWK\_ARM-CXP9024581\_26.cxp" />*

*<product name="RRUS31LMC" id="CXP9024021\_2Z2" version="R2J" filename="g2\_rrus31\_app-CXP9024021\_2Z2-R2J.cxp" />*

*<product name="RRUS82B41" id="CXP9025220\_4" version="R1X" filename="g2\_rrus82b41\_app-CXP9025220\_4-R1X.cxp" />*

*<product name="EMCLITOOL" id="CXP9024020\_1" version="R1AJ" filename="EMCLITOOL\_CXP9024020\_1.cxp" />*

*<product name="XRUS" id="CXP9024578\_6" version="R61CB" filename="g2\_xrus\_app-CXP9024578\_6-R61CB.cxp" />*

*<product name="IRU" id="CXP9024578\_14" version="R62EA" filename="g2\_iru\_app-CXP9024578\_14-R62EA.cxp" />*

*<product name="MOFWK\_ARM" id="CXP9024581\_25" version="R25ED" filename="MOFWK\_ARM-CXP9024581\_25.cxp" />*

*<product name="APC-ARM" id="CXP9024886\_3" version="R24C" filename="APC-ARM\_CXP9024886\_3-R24C.cxp" />*

*<product name="RRUL81B39" id="CXP9021507\_4" version="R6D" filename="g2\_rrul81b39\_app-CXP9021507\_4-R6D.cxp" />*

*<product name="XMU03-LMC" id="CXP9027802\_1" version="R4JU" filename="XMU03-LMC\_CXP9027802\_1-R4JU.cxp" />*

*<product name="TRUS5" id="CXP9024578\_13" version="R62EA" filename="g2\_trus5\_app-CXP9024578\_13-R62EA.cxp" />*

*<product name="RBSRASSECTOR" id="CXP9024888\_2" version="R31A" filename="RBSRASSECTOR\_CXP9024888\_2-R31A.cxp" />*

*<product name="SyncDusg2" id="CXP9030859\_1" version="RyYT" filename="SYNC-DUSG2\_CXP9030859\_1-R7YT.cxp" />*

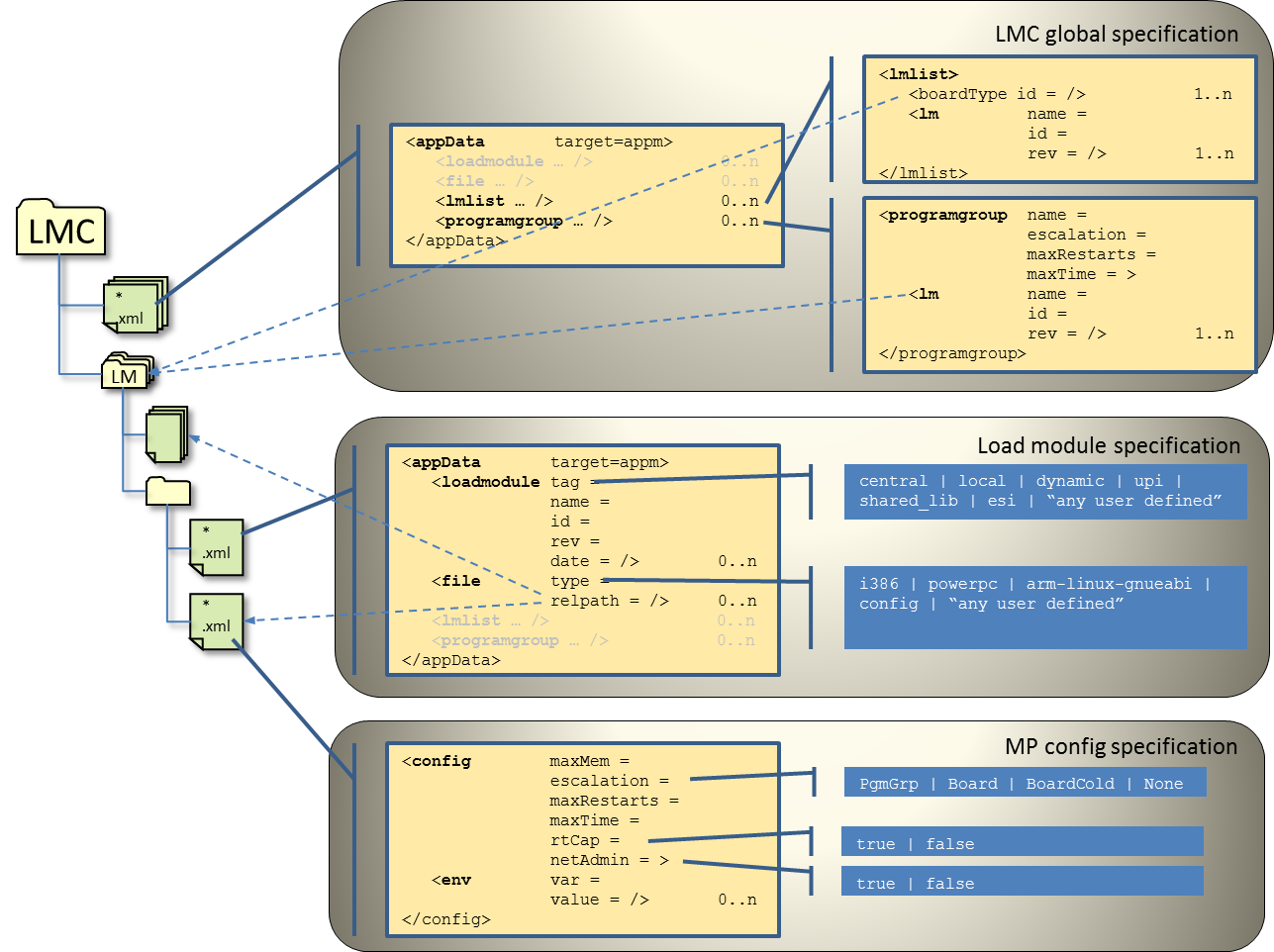
*<product name="FRUM" id="CXP9024280\_4" version="R29C" filename="FRUM\_CXP9024280\_4-R29C.cxp" />*

*</contentinfo>*

*</configuration>*

The **framework** identifies a version of the RBS CS interface.

**The content info** lists all the included load module container (CXP) products in this upgrade package



Figur 10 Overview of XML files for appm

*>tar -xvf SYNC-DUSG2\_CXP9030859\_1-R7YT.cxp -C tmpdir*

*cxp9030859\_1.xml metadatafile*

*sw.ar content file*

*-> cat cxp9030859\_1.xml*

*<?xml version="1.0" encoding="ISO-8859-1"?>*

*<configuration>*

*<product id="CXP9030859\_1" name="SYNC-DUSG2" version="R7YT"/>*

*<date>2015-05-04T19:22:54</date>*

*<description>RCS loadmodule container</description>*

*<type>CXP</type>*

*<framework>*

*<product id="CXS101547" name="RCPI" version="R2A"/>*

*</framework>*

*<contentinfo>*

*<product id="CXC1736861\_2" name="sync-ptp-coli" version="R7YT">*

*<appdata file="CXC1736861\_2\_appdata.xml" relpath="appdata"/>*

*</product>*

*<product id="CXC1736861\_1" name="sync-ptp-central" version="R7YT">*

*<appdata file="ptp\_counters.xml" relpath="share/appdata"/>*

*<appdata file="CXC1736861\_1\_appdata.xml" relpath="appdata"/>*

*<appdata file="CXC1736861\_1\_gmfMim.xml" relpath="appdata"/>*

*<appdata file="CXC1736861\_1\_gmfImm.xml" relpath="appdata"/>*

*</product>*

*<product id="CXC1738028\_1" name="sync-ntp-central" version="R7YT">*

*<appdata file="CXC1738028\_1\_appdata.xml" relpath="appdata"/>*

*<appdata file="CXC1738028\_1\_gmfMim.xml" relpath="appdata"/>*

*<appdata file="CXC1738028\_1\_gmfImm.xml" relpath="appdata"/>*

*</product>*

*<product id="CXC1738041\_1" name="sync-dcg" version="R7YT">*

*<appdata file="CXC1738041\_1\_appdata.xml" relpath="appdata"/>*

*</product>*

*<product id="CXC1736325\_1" name="sync-central" version="R7YT">*

*<appdata file="sync\_central\_alarms.xml" relpath="share/sync-central/appdata"/>*

*<appdata file="coli\_cri\_reg.xml" relpath="share/sync-central/appdata"/>*

*<appdata file="coli\_authorization.xml" relpath="share/sync-central/appdata"/>*

*<appdata file="CXC1736325\_1\_appdata.xml" relpath="appdata"/>*

*<appdata file="CXC1736325\_1\_gmfMim.xml" relpath="appdata"/>*

*<appdata file="CXC1736325\_1\_gmfImm.xml" relpath="appdata"/>*

*</product>*

*<product id="CXC1736862\_2" name="linuxptp" version="R7YT">*

*<appdata file="CXC1736862\_2\_appdata.xml" relpath="appdata"/>*

*</product>*

*<product id="CXC1736862\_1" name="sync-ptp-local" version="R7YT">*

*<appdata file="CXC1736862\_1\_appdata.xml" relpath="appdata"/>*

*</product>*

*<product id="CXC1736326\_1" name="sync-local" version="R7YT">*

*<appdata file="CXC1736326\_1\_appdata.xml" relpath="appdata"/>*

*</product>*

*</contentinfo>*

*</configuration>*

Extract from “sw.ar” using “GNU ar” Unix archiver:

*> ar -x sw.ar*

*cxp9030859\_1.xml*

*sw.ar*

*arch-info.txt ---SquashFS metadata*

*arch-info.sm ----Signature file*

*verity.img -----block checksums of the file system image*

*sqfs.img --------the software content as a SquashFS image file*

SquashFS is a compressed read-only file system for Linux. SquashFS compresses files, and directories.

*>/app/rbs/wrtools/tools-sdk-20130220/usr/sbin/unsquashfs -f -i sqfs.img*

*squashfs-root*

*squashfs-root/appdata*

*squashfs-root/appdata/CXC1736325\_1\_appdata.xml*

*squashfs-root/appdata/CXC1736325\_1\_gmfImm.xml*

*squashfs-root/appdata/CXC1736325\_1\_gmfMim.xml*

*squashfs-root/appdata/CXC1736326\_1\_appdata.xml*

*squashfs-root/appdata/CXC1736861\_1\_appdata.xml*

*squashfs-root/appdata/CXC1736861\_1\_gmfImm.xml*

*squashfs-root/appdata/CXC1736861\_1\_gmfMim.xml*

*squashfs-root/appdata/CXC1736861\_2\_appdata.xml*

*squashfs-root/appdata/CXC1736862\_1\_appdata.xml*

*squashfs-root/appdata/CXC1736862\_2\_appdata.xml*

*squashfs-root/appdata/CXC1738028\_1\_appdata.xml*

*squashfs-root/appdata/CXC1738028\_1\_gmfImm.xml*

*squashfs-root/appdata/CXC1738028\_1\_gmfMim.xml*

*squashfs-root/appdata/CXC1738041\_1\_appdata.xml*

*squashfs-root/bin*

*squashfs-root/bin/ptp4l*

*squashfs-root/bin/sync-central*

*squashfs-root/bin/sync-dcg*

*squashfs-root/bin/sync-local*

*squashfs-root/bin/sync-ntp-central*

*squashfs-root/bin/sync-ptp-central*

*squashfs-root/bin/sync-ptp-coli*

*squashfs-root/bin/sync-ptp-local*

*squashfs-root/cxp9030859\_1.xml*

*squashfs-root/cxp9030859\_1.xml\_1*

*squashfs-root/lib*

*squashfs-root/lib/libscspi.so*

*squashfs-root/share*

*squashfs-root/share/appdata*

*squashfs-root/share/appdata/ptp\_counters.xml*

*squashfs-root/share/conf*

*squashfs-root/share/conf/ptp4l-conf.xml*

*squashfs-root/share/conf/sync-dcg-conf.xml*

*squashfs-root/share/conf/sync-local-conf.xml*

*squashfs-root/share/conf/sync-ptp-local-conf.xml*

*squashfs-root/share/sync-central*

*squashfs-root/share/sync-central/appdata*

*squashfs-root/share/sync-central/appdata/coli\_authorization.xml*

*squashfs-root/share/sync-central/appdata/coli\_cri\_reg.xml*

*squashfs-root/share/sync-central/appdata/sync\_central\_alarms.xml*

*squashfs-root/share/sync-central/imm*

*squashfs-root/share/sync-central/imm/ReqSyncPort\_immR3\_classes.xml*

*squashfs-root/share/sync-central/imm/RsyncFrequencySyncIO\_immR3\_classes.xml*

*squashfs-root/share/sync-central/imm/RsyncGnssInfo\_immR3\_classes.xml*

*.*

*.*

*.*

*/squashfs-root/appdata] -> cat CXC1737649\_1\_appdata.xml*

*<?xml version="1.0" encoding="ISO-8859-1"?>*

*<appdata target="appm">*

*<loadmodule date="20150702" id="CXC1737649\_1" name="tn-upgrader" rev="R21BKN" tag="dynamic">*

*<file relpath="bin/tn-upgrader" type="arm"/>*

*<file relpath="share/conf/tn-upgrader-conf.xml" type="config"/>*

*</loadmodule>*

*<loadmodule date="20150702" id="CXC1737649\_1" name="tn-oam-agent.sh" rev="R21BKN" tag="central">*

*<file relpath="bin/tn-oam-agent.sh" type="arm"/>*

*<file relpath="share/conf/tn-oam-agent.sh-conf.xml" type="config"/>*

*<file relpath="share/mapping/tn-oam-agent.sh-mapping.xml" type="alarm\_mapping"/>*

*</loadmodule>*

*<loadmodule date="20150702" id="CXC1737649\_1" name="tn-dcg" rev="R21BKN" tag="esi">*

*<file relpath="bin/tn-dcg" type="arm"/>*

*<file relpath="share/conf/tn-dcg-conf.xml" type="config"/>*

*</loadmodule>*

*<loadmodule date="20150702" id="CXC1737649\_1" name="libtn-oam-cmds.so" rev="R21BKN" tag="shared\_lib">*

*<file relpath="lib/libtn-oam-cmds.so" type="arm"/>*

*</loadmodule>*

*<loadmodule date="20150702" id="CXC1737649\_1" name="libtn\_trace\_com\_ericsson\_tn\_oam.so" rev="R21BKN" tag="shared\_lib">*

*<file relpath="lib/libtn\_trace\_com\_ericsson\_tn\_oam.so" type="arm"/>*

*</loadmodule>*

*.*

*.*

*.*

*</appdata>*

Attributes in Loadmodule element:

**tag** – string, a tag used to define the purpose of the load module. These tags are reserved for MP programs:

* ***“central***”, the loadmodule defines a program to be started automatically by CS on the core MPs
* “***local”*** , the loadmodule defines a program to be started automatically by CS on each MP
* “***dynamic”*** , the loadmodule defines an MP program that is started by the application on dedicated MP CPUs via the LMHI API.
* “***upi***”, the loadmodule defines a program that will be called during upgrade and participate in triggers
* ***“esi”,*** the loadmodule defines a program that will be called during ESI generation from CORE MP
* “***esi\_local***”, the loadmodule defines a program that will be called during ESI generation from non-CORE MP.
* ***“shared\_lib***”, the loadmodule defines a shared library to be used by MP programs. The shared library will be visible to other MP programs when they are started.

**file** - element has two attributes:

**relpath** - string, the relative path to the file.

**type** – string, a tag that specifies the type of file referenced.

For MP programs the following types are used:

* “i386”, the file is an 32bit-x86 executable for sim environment (“i686” also works, for backward compatibility (deprecated))
* “powerpc”, the file is a powerpc executable
* “arm-linux-gnueabi”, the file is an ARM executable (“armhf” also works, for backward compatibility (deprecated))
* “config”, extra configuration for MP programs :

The **config** element has these attributes:

**maxMem** – integer, maximum memory for program in kB

**escalation** – string, “PgmGrp”, “BoardWarm”,” BoardCold”, “None”. Default value is “BoardWarm”. “None” implies that when escalation would occur (after maxRestarts within maxTime) nothing more is done with that program.

**maxRestarts** – integer, maximum number of restarts within maxTime before escalation. Default is 0, which means that the escalation will happen at first crash.

**maxTime** – integer, Default value is 300.

**rtCap** – boolean, Set to true (only) if program should have real-time capabilities. Sets CAP\_SYS\_NICE|CAP\_IPC\_LOCK for the Linux process

**softRt** – boolean, Set to true (only) if program should have soft real-time capabilities. Program is allowed to use SCHED\_FIFO and SCHED\_RR scheduler policies.

**netAdmin**– boolean, Set to true (only) if program should have privileges to set interface configuration etc. It sets CAP\_NET\_ADMIN|CAP\_NET\_RAW|CAP\_NET\_BIND\_SERVICE for the Linux process.

**sysAdmin**– boolean, Set to true (only) if program should have privileges to handle namespaces etc. It sets CAP\_SYS\_ADMIN for the Linux process.

**heartbeatInterval** – integer, number of seconds, specifying the time between heartbeat signals that the program is sending.

**cardiacArrest\_noOfHb** – integer, specifies how many missing heartbeat signals it takes for the heartbeat supervisor to consider the program to be hanging and thus start escalation for that program. Default value is 1..

The **env** sub element has two attributes:

* **var** – string, the name of the environment variable
* **value** – string, the value of the environment variable

*[squashfs-root/share/conf] -> cat dpsd.sh-conf.xml*

*<?xml version="1.0" encoding="ISO-8859-1" ?>*

*<config*

*sysAdmin = "true"*

*netAdmin = "true"*

*escalation="BoardWarm"*

*maxRestarts="0"*

*maxTime="300" >*

*<env var="ADK\_CFG\_FILES\_RPATH" value="/lib/"/>*

*</config>*

**The same Loadmodule is used in different radio units specified in lmlist**

*/squashfs-root/appdata] -> cat trus5\_ucf.xml*

*<appdata target="appm">*

*<loadmodule*

*tag="xp"*

*name="CXP9013268%13\_R60GF"*

*id="CXP9013268/13"*

*rev="R60GF"*

*date="2015-04-29T10:40:04"*

*>*

*<file type="xp" relpath="xp/bin/CXP9013268%13\_R60GF" />*

*</loadmodule>*

*<lmlist boardType="KRC 161 402/1" >*

*<lm name="CXP9013268%13\_R60GF" id="CXP9013268/13" rev="R60GF"/>*

*</lmlist>*

*<lmlist boardType="KRC 161 484/1" >*

*<lm name="CXP9013268%13\_R60GF" id="CXP9013268/13" rev="R60GF"/>*

*</lmlist>*

*<lmlist boardType="KRC 161 485/1" >*

*<lm name="CXP9013268%13\_R60GF" id="CXP9013268/13" rev="R60GF"/>*

*</lmlist>*

*<lmlist boardType="KRC 161 434/1" >*

*<lm name="CXP9013268%13\_R60GF" id="CXP9013268/13" rev="R60GF"/>*

*</lmlist>*

*<lmlist boardType="KRC 161 520/1" >*

*<lm name="CXP9013268%13\_R60GF" id="CXP9013268/13" rev="R60GF"/>*

*</lmlist>*

*</appdata>*

**In this example the version of the RsyncNtp schema is 1.0.2 and upgrade from version 1.\* is supported.**

*/squashfs-root/appdata] -> cat CXC1738028\_1\_gmfImm.xml*

*<?xml version="1.0" encoding="ISO-8859-1"?>*

*<appdata target="gmfImm">*

*<immInfos>*

*<immInfo file="RsyncNtp\_immR3\_classes.xml" fileType="classes" path="share/sync-ntp-central/imm">*

*<schema name="RsyncNtp" version="1" release="0" correction="2">*

*<fromVersions>*

<fromVersion version="1"/>

*</fromVersions>*

*</schema>*

*</immInfo>*

*</immInfos>*

*</appdata>*

*/squashfs-root/appdata] -> cat CXC1738028\_1\_gmfMim.xml*

*<?xml version="1.0" encoding="ISO-8859-1"?>*

*<appdata target="gmfMim">*

*<mimInfos>*

*<mimInfo file="RsyncNtp\_mp.xml" ifType="imm" path="share/sync-ntp-central/mim"/>*

*</mimInfos>*

*</appdata>*

***IMMclasses***

*[squashfs-root /share/sync-ntp-central/upgrade] -> cat imm\_classes.xml*

*<!-- Upgrade info for IMM schemas -->*

*<schemas>*

*<schema name="RsyncNtp">*

*<fromVersions>*

*<fromVersion version="1"/>*

*</fromVersions>*

*</schema>*

*</schemas>*

***Coli command authorization***

*/squashfs-root/share/sync-central/appdata] -> cat coli\_authorization.xml*

*<?xml version="1.0" encoding="UTF-8" ?>*

*<appdata target="coli\_auth">*

*<coli\_authorization*

*cli\_name ="synccentral"*

*cli\_path ="/netsync/"*

*authorization="basic"*

*/>*

*.*

*.*

*</appdata>*

***Coli command registration***

*squashfs-root/share/sync-central/appdata] -> cat coli\_cri\_reg.xml*

*<?xml version="1.0" encoding="UTF-8" ?>*

*<appdata target="coli\_reg">*

*<coli\_cri\_reg*

*cli\_name = "gps01reset"*

*cli\_path = "/netsync/"*

*usage = "gps01reset execute"*

*subcommand = "gps01reset">*

*<description>*

*gps01reset execute - Reset GPS01 receiver and clear positioning data.*

*Synopsis*

*gps01reset execute*

*Description*

*The command resets the GPS01 receiver to the default configuration,*

*and clears all positioning data when the subcommand execute is*

*specified. If the connected GPS receiver is not a GPS01, the*

*command is not executed and information that the GPS01 receiver*

*is not connected to the DU is printed.*

*</description>*

*</coli\_cri\_reg>*

*.*

*.*

*</appdata>*

***Performance counters***

*[squashfs-root/share/appdata] -> cat ptp\_counters.xml*

*<?xml version="1.0"?>*

*<appdata target="****pms****">*

***<pmgroup>***

*<pmGroupId>ptpPort</pmGroupId>*

*<category>PtpPort Statistics</category>*

*<consistentData>true</consistentData>*

*<switchingTechnology>Packet Switched</switchingTechnology>*

*<validity>true</validity>*

***<moClass>***

*<moClassName>PtpPort</moClassName>*

*<mimName>ECIM\_T\_PtpPort</mimName>*

*<mimVersion>0</mimVersion>*

*<mimRelease>1</mimRelease>*

***</moClass>***

*<description>ptp port statistics</description>*

*<pmGroupVersion>1</pmGroupVersion>*

***<measurementType>***

*<measurementTypeId>delayRspTxCounter</measurementTypeId>*

*<measurementName>delayRspTxCounter</measurementName>*

*<size>8</size>*

*<collectionMethod>CC</collectionMethod>*

*<description>The counter is a measure of delayResponse message has been sent out through this PTP port</description>*

*<condition>Counter is incremented when delayResponse message is sent out</condition>*

*<aggregation>SUM</aggregation>*

*<measurementStatus>USED</measurementStatus>*

*<measurementResult>OK</measurementResult>*

*<multiplicity>0</multiplicity>*

*<initialValue>0</initialValue>*

*<resetAtGranPeriod>true</resetAtGranPeriod>*

*<derSampleRate>0</derSampleRate>*

***</measurementType****>*

*.*

*.*

***<measurementType>***

*.*

*.*

*.*

***</measurementType>***

***</pmgroup>***

*</appdata>*

***Error escalation***

*[squashfs-root/share/conf] -> cat sync-dcg-conf.xml*

*<?xml version="1.0" encoding="ISO-8859-1" ?>*

*<config*

*netAdmin = "false"*

*escalation="BoardWarm"*

*maxRestarts="0"*

*maxTime="300"*

*>*

*</config>*

***Alarm***

*squashfs-root/share/sync-central/appdata] -> cat sync\_central\_alarms.xml*

*<?xml version="1.0" encoding="UTF-8" ?>*

*<appdata target="alarm">*

*<alarmtype*

*name="FrequencySyncIOReferenceFailed"*

*majorType="193"*

*minorType="9175062"*

*moClasses="RadioEquipmentClockReference"*

*specificProblem="FrequencySyncIO Reference Failed"*

*eventType="EQUIPMENTALARM"*

*probableCause="506"*

*isStateful="true"*

*additionalText=""*

*/>*

*.*

*.*

*</appdata>*

***Application log***

*squashfs-root [share/tn-log/appdata] -> cat application\_log.xml*

*<?xml version="1.0" encoding="ISO-8859-1"?>*

*<appdata target="log">*

*<log name = "TnApplicationLog"*

*maxSize = "10"*

*rotatingSegments = "3"/>*

*</appdata>*

**Maxsize -** integer representing a number of megabytes

**rotationSegments** - initial number of rotating files of this between 3 and 256

### Upgrade log troubleshooting

There are 3 logs connected to System Upgrade. The SWM log is intended to be for the external customer where faults which the customer can fix by himself are logged. It could be things like wrong FTP address or user/password while creating the package or lack of space in disc. There are 2 more logs where one can find upgrade related info, SWM-internal (swmi) and erlang log. Erlang log has extensive information from Execution environment and Middleware that can help troubleshoot upgrade failures.

The following important triggers are logged into the erlang log and could be used to track where the upgrade started to fail:

* The fallback timer is turned on. The default timeout is 20 minutes and set on the ***SWM MO***.
* The file system images are mounted, making the new software accessible.
* A backup called “***Rollabck\_backup\_xxxx*”** is created by the system. This backup is used in case of fallback
* A new verify procedure is initiated.
* Upgrade start: CS services that shall not be turned on during activations are suspended.
* Software preload started. Radio unit software and other software will be preloaded before the boot occurs.
* A call offers load modules to do immediate actions necessary before the node reboot. This might for example include a **soft lock of traffic and alarm suppression**.
* During the process start all applications must detect any changes in schema and database objects and use the provided CS API for transforming the objects in changed IMM classes.
* Data conversion starts after node restart
* The state of UpgradePackage Mo is changed to ***WAITING\_FOR\_COMMIT***.
* After upgrade confirmed Final backup is created to make the configuration permanent

Here follows a walk though of an erlang log from a successful upgrade of a node.

>lgk -x erl | grep -i 'swmOs\|swmLib\|swmServer\|comsaLib'

*2015-09-22 14:03:16.981953 ERL INFO swmLib: additionalInfo: createUpgradePackage commenced ----UP created*

*2015-09-22 14:03:18.575388 ERL INFO swmServer: [{peer,{"147.214.14.87",{{147,214,14,87},22}}}, {server\_version,{{2,0},"SSH-2.0-OpenSSH\_5.1"}}, {client\_version,{{2,0},"SSH-2.0-Erlang/3.2.4"}}]*

*2015-09-22 14:03:18.729689 ERL INFO swmServer: Files found at remote dir: ["AIS\_GFF-CXP9024813\_1.cxp", "RCS-T\_CXP9031274\_4.cxp", "EMGUI\_CXP9026393\_1.cxp", "SYNC-T\_CXP9032252\_1-R8DMM.cxp", "TAIPAN\_CXP102172\_2.cxp", "ARCHSUPP\_PLAB-CXP9024812\_1.cxp", "TN-T\_CXP9022846\_12-R21GLB.cxp", "MOFWK\_TCU03-CXP9025783\_25.cxp", "CXP9024262\_3-R9AF.cxp", "RICM\_CXP9023064\_3-R5NX.cxp", "EMCLITOOL\_CXP9024020\_1.cxp", "APC-ARM\_CXP9024886\_2-R11AD.cxp", "KATLA\_CXP102185\_1.cxp", "ARCHSUPP\_SFA-CXP9024811\_1.cxp", "FRUM\_CXP9024280\_2-R19GD.cxp", "RBSTCUNC\_CXP9024279\_2-R21GB.cxp", "nmsinfo.xml","CXP9024419\_3-up.xml", "CXP9024419\_3-R7MZ.zip"]*

*2015-09-22 14:03:18.828797 ERL INFO swmLib: additionalInfo: Reading UP data*

*2015-09-22 14:03:18.844749 ERL INFO swmServer: mkdir -p /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ*

*2015-09-22 14:03:25.050560 ERL INFO swmLib: additionalInfo: createUpgradePackage complete ----UP create complete*

*2015-09-22 14:04:09.339367 ERL INFO swmLib: additionalInfo: Preparing package CXP9024419/3-R7MZ -prepare phase started*

*2015-09-22 14:04:09.339928 ERL INFO swmServer: Preparing package CXP9024419/3-R7MZ*

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*2015-09-22 14:04:10.835053 ERL INFO swmServer: do\_named\_download/3, n. of CXP files: 16*

*2015-09-22 14:04:10.848037 ERL INFO swmServer: Free disk: 365891584 bytes*

*2015-09-22 14:04:10.848805 ERL INFO swmLib: additionalInfo: Downloading RICM\_CXP9023064\_3-R5NX.cxp*

*2015-09-22 14:04:11.034322 ERL INFO swmServer: Free disk: 365535232 bytes ----check of disc space*

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*.*

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*2015-09-22 14:04:24.621043 ERL INFO swmServer: Free disk: 337571840 bytes*

*2015-09-22 14:04:24.622344 ERL INFO swmLib: additionalInfo: Downloading RCS-T\_CXP9031274\_4.cxp ----downloading*

*2015-09-22 14:05:25.871122 ERL INFO swmOs: mv -f /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/RCS-T\_CXP9031274\_4.cxp /tmp/RCS-T\_CXP9031274\_4.cxp Res=0*

*2015-09-22 14:05:48.817937 ERL INFO swmOs: cd /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ; tar -xvzf /tmp/RCS-T\_CXP9031274\_4.cxp cxp9031274\_4.xml RCSEE-T\_CXP9025317\_5.cxp RCSMW-ARM\_CXP9025546\_3.cxp*

*2015-09-22 14:05:48.909265 ERL INFO swmOs: rm -f /tmp/RCS-T\_CXP9031274\_4.cxp*

*2015-09-22 14:05:51.101394 ERL INFO swmOs: Mounting /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/RCSEE-T\_CXP9025317\_5.cxp*

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*2015-09-22 14:06:06.807806 ERL INFO swmServer: Free disk: 217239552 bytes*

*2015-09-22 14:06:06.917346 ERL INFO send\_alarm: ok specificProblem: "Archive Disk Almost Full" dn: [<<"ManagedElement=1">>,<<"SystemFunctions=1">>] major: 193 minor: 9175161 severity: warning text: <<"The archive disk is 84% full. 207M available">> info: [] <-alarm on disc space raised*

*2015-09-22 14:06:49.353387 ERL INFO swmOs: Mounting /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/EMCLITOOL\_CXP9024020\_1.cxp*

*2015-09-22 14:06:51.010650 ERL INFO swmServer: do\_named\_download/3, seen 'os' CXP: true*

*2015-09-22 14:06:51.013095 ERL INFO swmLib: additionalInfo: Preparation complete -prepare completed*

*.*

*2015-09-22 14:07:08.572949 ERL INFO sysInitServer: {"restart event logged","swmServer.erl:458", "upgrade: activate"}*

*2015-09-22 14:07:08.576233 ERL INFO swmLib: additionalInfo: Activating package CXP9024419/3-R7MZ Upgrdade started*

*2015-09-22 14:07:08.586128 ERL INFO comsaLib: Name: Rollback\_backup\_BasebandT\_CXP9024419/3\_R7LE\_20150922T140708+0000*

*2015-09-22 14:07:08.605511 ERL INFO swmBackup: Database size: 2473558*

*2015-09-22 14:07:08.606046 ERL INFO swmBackup: Free disk: 148054016 bytes <- check of disc space*

*2015-09-22 14:07:08.608223 ERL INFO comsaLib: Creating database backup creating Fallback backup*

*2015-09-22 14:07:09.309039 ERL INFO swmBackup: cd /home/sirpa ; tar cfz /rcs/swm/backup/116/bin.tgz --exclude='releases/\*/comte/comea/run/\*' bin*

*2015-09-22 14:07:09.410414 ERL INFO swmBackup: cd /home/sirpa ; tar cfz /rcs/swm/backup/116/releases.tgz --exclude='releases/\*/comte/comea/run/\*' releases*

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*2015-09-22 14:07:28.130098 ERL INFO swmLib: additionalInfo: Cancel will now cause a restart*

*2015-09-22 14:07:28.130666 ERL INFO swmLib: Making symlink "/home/sirpa/mnesia/FALLBACK.BUP" -> "/rcs/swm/backup/116/mnesia\_backup"*

*2015-09-22 14:07:34.509577 ERL INFO swmServer: Fallback timer started. Fallback in 1200 seconds Fallbacktimer set to 20seconds according to SWM MO class.*

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*2015-09-22 14:07:35.220904 ERL INFO swmLib: additionalInfo: Installing upgrade package*

*2015-09-22 14:07:35.221716 ERL INFO swmOs: Installing "CXP9024419/3-R7MZ"*

*2015-09-22 14:07:35.234741 ERL INFO swmOs: mkdir -p /rcs/swm/home1/sirpa/software*

*2015-09-22 14:07:35.235529 ERL INFO swmOs: mount\_software/2, n. of CXP files: 17 mounting of Loadmodule containers*

*2015-09-22 14:07:39.707412 ERL INFO swmOs: Mounting /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/RCSEE-T\_CXP9025317\_5.cxp*

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*2015-09-22 14:07:50.736900 ERL INFO swmOs: Mounting /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/TN-T\_CXP9022846\_12-R21GLB.cxp*

*.*

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*2015-09-22 14:07:51.792702 ERL INFO swmLib: additionalInfo: Software installed. Backing up data.*

*2015-09-22 14:07:51.808387 ERL INFO swmServer: rm -f /rcs/swm/upgrade\_init\_\**

*2015-09-22 14:07:52.847390 ERL INFO sysInitServer: {"restart event logged","swmServer.erl:2638", "upgrade: database backup complete"}*

*2015-09-22 14:07:52.848372 ERL INFO swmLib: additionalInfo: Database backup complete  creation of fallback backup completed*

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*2015-09-22 14:07:53.131248 ERL INFO sysInitServer: {"restart event logged","gmfImmUgVerifyUpgrade.erl:114", "upgrade: verify during activate starts"}*

*2015-09-22 14:07:55.123517 ERL INFO swmLib: additionalInfo: CS verifyUpgrade complete*

*2015-09-22 14:07:55.124800 ERL INFO sysInitServer: {"restart event logged","gmfImmUgVerifyUpgrade.erl:135", "upgrade: verify during activate done"}  Checks the IMM schema version to ensure data conversion*

*2015-09-22 14:07:55.125727 ERL INFO swmLib: additionalInfo: Sending application trigger verifyUpgrade  “verifyUpgrade” trigger sent to applications*

*2015-09-22 14:07:55.204011 ERL INFO appmI: /home/sirpa/software/FRUM\_CXP9024280\_2\_R19FD/RBSTCUFRUMUPGRADEENGINE\_CXC1738581\_1/rbstcufrumupgradeengine-R19FD/priv/tgt\_arm/bin/rbsTcuFrumUpgradeEngineLm verifyUpgrade /software/FRUM\_CXP9024280\_2\_R19GD*

*2015-09-22 14:07:55.334414 ERL INFO appmI: /home/sirpa/software/RBSTCUNC\_CXP9024279\_2\_R21FA/RBSNCUPGRADEENGINE\_CXC1735999\_1/rbsncupgradeengine-R21FA/priv/tgt\_arm/bin/rbsNcUpgradeEngineLm verifyUpgrade /software/RBSTCUNC\_CXP9024279\_2\_R21GB*

*2015-09-22 14:07:55.396833 ERL INFO swmLib: additionalInfo: rbsNcUpgradeEngineLm(CXC1735999\_1): OK: Verify Upgrade*

*2015-09-22 14:07:55.399165 ERL INFO swmLib: additionalInfo: rbsTcuFrumUpgradeEngineLm(CXC1738581\_1): OK: All FieldReplaceableUnits statuses are OK*

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*2015-09-22 14:07:55.402342 ERL INFO swmLib: additionalInfo: CS activateStart complete*

*2015-09-22 14:07:55.404109 ERL INFO swmLib: additionalInfo: Sending application trigger activateStart  synchronize the Applications with CS applications*

*2015-09-22 14:07:55.482237 ERL INFO appmI: /home/sirpa/software/FRUM\_CXP9024280\_2\_R19FD/RBSTCUFRUMUPGRADEENGINE\_CXC1738581\_1/rbstcufrumupgradeengine-R19FD/priv/tgt\_arm/bin/rbsTcuFrumUpgradeEngineLm activateStart*

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*2015-09-22 14:07:58.202722 ERL INFO swmLib: additionalInfo: CS preload complete  trigger “preload” completed from CS applications*

*2015-09-22 14:07:58.203825 ERL INFO swmLib: additionalInfo: Sending application trigger preload - trigger “preload” sent to other applications*

*2015-09-22 14:07:58.274511 ERL INFO appmI: /home/sirpa/software/FRUM\_CXP9024280\_2\_R19FD/RBSTCUFRUMUPGRADEENGINE\_CXC1738581\_1/rbstcufrumupgradeengine-R19FD/priv/tgt\_arm/bin/rbsTcuFrumUpgradeEngineLm preload*

*2015-09-22 14:07:58.398223 ERL INFO appmI: /home/sirpa/software/RBSTCUNC\_CXP9024279\_2\_R21FA/RBSNCUPGRADEENGINE\_CXC1735999\_1/rbsncupgradeengine-R21FA/priv/tgt\_arm/bin/rbsNcUpgradeEngineLm preload*

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*.*

*2015-09-22 14:07:58.465086 ERL INFO swmLib: additionalInfo: Sending application trigger activate  synchronizing with application for soft lock of traffic and alarm suppression.*

*2015-09-22 14:07:58.540511 ERL INFO appmI: /home/sirpa/software/FRUM\_CXP9024280\_2\_R19FD/RBSTCUFRUMUPGRADEENGINE\_CXC1738581\_1/rbstcufrumupgradeengine-R19FD/priv/tgt\_arm/bin/rbsTcuFrumUpgradeEngineLm activate*

*2015-09-22 14:07:58.665385 ERL INFO appmI: /home/sirpa/software/RBSTCUNC\_CXP9024279\_2\_R21FA/RBSNCUPGRADEENGINE\_CXC1735999\_1/rbsncupgradeengine-R21FA/priv/tgt\_arm/bin/rbsNcUpgradeEngineLm activate*

*2015-09-22 14:07:58.726038 ERL INFO swmLib: additionalInfo: rbsNcUpgradeEngineLm(CXC1735999\_1): OK: Undefined Trigger.*

*2015-09-22 14:07:58.727771 ERL INFO swmLib: additionalInfo: rbsTcuFrumUpgradeEngineLm(CXC1738581\_1): OK*

*.*

*.*

*2015-09-22 14:07:58.730135 ERL INFO swmLib: additionalInfo: Reboot upgrade  Restarting node with new SW*

*2015-09-22 14:07:58.731401 ERL INFO swmLib: additionalInfo: Loading OS*

*2015-09-22 14:07:58.732306 ERL INFO swmOs: Preloading...*

*2015-09-22 14:07:58.734382 ERL INFO swmOs: Installing /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/RCSEE-T\_CXP9025317\_5.cxp*

*2015-09-22 14:07:58.766478 ERL INFO swmOs: Moving patches: no /rcs/swm/ug\_patches directory*

*2015-09-22 14:08:12.752067 ERL INFO swmOs: Installed /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/RCSEE-T\_CXP9025317\_5.cxp*

*2015-09-22 14:08:27.277840 ERL INFO swmOs: Installed nl from /rcs/swm/archive/BasebandT\_CXP9024419\_3\_R7MZ/RCSEE-T\_CXP9025317\_5.cxp*

*2015-09-22 14:08:27.278712 ERL INFO swmLib: additionalInfo: Activating*

*2015-09-22 14:08:27.279546 ERL INFO swmOs: Activating...*

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*2015-09-22 14:08:39.368545 ERL INFO appmServer:########## Doing a cold restart #########*

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*2015-09-22 14:09:36.894380 ERL INFO logServer: Opening log "LicensingLog" 14:09:36: lmaDataInit:init\_data() = ok 14:09:36: certDataInit:init\_data() = ok 14:09:36: gmfDataInit:init\_data() = ok 14:09:36: ootDataInit:init\_data() = ok 14:09:36: eqsDataInit:init\_data() = ok 14:09:36: ecoli\_datainit:init\_data() = ok 14:09:36: omc\_datainit:init\_data() = ok 14:09:36: aicDataInit:init\_data() = ok 14:09:36: timDataInit:init\_data() = ok 14:09:36: appmDataInit:init\_data() = ok 14:09:36: ntfDataInit:init\_data/0 undefined sysDbServer:run\_init(MODULES, init\_data) ready*

*.*

*.*

*2015-09-22 14:10:08.117804 ERL INFO swmServer: upgrade is ongoing*

*2015-09-22 14:10:08.118256 ERL INFO swmLib: additionalInfo: Converting database.  Data conversion started*

*2015-09-22 14:10:08.119684 ERL INFO swmServer: Setting heart fallback cmd ++++ Start of pmsSuper : 519387 <0.3142.0>: sysApp:start(normal, [{appname,pes},{initmodule,pesDataInit}])*

*2015-09-22 14:10:08.143310 ERL INFO <0.3142.0>: Starting pesSuper*

*2015-09-22 14:10:08.161154 ERL INFO swmServer: Enable data conversion timeout in 600 seconds*

*2015-09-22 14:10:11.433780 ERL INFO swmLib: upgrWindow\_files2tabs olddb\_upgrWindow: table\_already\_created olddb\_upgrWindow\_alhLog: table\_already\_created olddb\_upgrWindow\_appmNodeTable: table\_already\_created*

*2015-09-22 14:10:22.682823 ERL INFO swmServer: Got activation\_complete*

*2015-09-22 14:10:22.684964 ERL INFO sysInitServer: {"restart event logged","swmServer.erl:611", "upgrade: activate complete"}*

*2015-09-22 14:10:22.687691 ERL INFO swmLib: additionalInfo: Database conversion complete  Data conversion completed*

*.*

*.*

*2015-09-22 14:10:36.719503 ERL INFO send\_alarm: ok specificProblem: "License Key Not Available" dn: [<<"ManagedElement=1">>,<<"SystemFunctions=1">>,<<"Lm=1">>, <<"FeatureState=CXC4011710">>] major: 193 minor: 9175047 severity: major text: <<"Key missing for feature. License key for CXC4011710 required for the configured functioning of the Managed Element is not available in currently installed key file">> info: [] <-sending alarm*

*2015-09-22 14:10:36.722613 ERL INFO sysInitServer: {"restart event logged","comsaServer.erl:374", "COM is running"}*

*2015-09-22 14:10:36.724128 ERL INFO send\_alarm: ok specificProblem: "Ethernet Link Failure" dn: [<<"ManagedElement=1,Transport=1,EthernetPort=TN\_A">>] major: 193 minor: 9175061 severity: minor text: <<"Connected to physical port TnPort=TN\_A">> info: [{<<"0">>,<<"eventId=6">>}]*

*.*

*.*

*2015-09-22 14:10:39.157314 ERL INFO eqs\_mmi\_service: Set status indicator to steady\_on Result: ok <-led blinking steady green*

*.*

*.*

*2015-09-22 14:11:22.693396 ERL INFO swmLib: additionalInfo: Activation complete*

*2015-09-22 14:11:25.254271 ERL INFO sysInitServer: {"restart event logged","swmServer.erl:483", "upgrade: confirm"} <-upgrade confirmed*

*2015-09-22 14:11:25.254655 ERL INFO sysInitServer: {"restart event logged","swmServer.erl:502", "upgrade: confirm"}*

*.*

*.*

*2015-09-22 14:11:26.539117 ERL INFO send\_alarm: ok specificProblem: "A Fallback Operation will soon be started" dn: [<<"ManagedElement=1">>,<<"SystemFunctions=1">>,<<"SwM=1">>, <<"UpgradePackage=CXP9024419/3-R7MZ">>] major: 193 minor: 9175043 severity: cleared text: <<>> info: automatic fallback is started in 300 sec if not confirmed. TimeRemainingBeforeFallback in MO class SwM*

*.*

*.*

*2015-09-22 14:11:28.850972 ERL INFO comsaLib: Name: Final\_backup\_for\_BasebandT\_CXP9024419/3\_R7MZ\_20150922T141128+0000 <- The upgrade is confirmed and backup created*

*2015-09-22 14:11:28.868117 ERL INFO swmBackup: Database size: 2477634*

*2015-09-22 14:11:28.868506 ERL INFO swmBackup: Free disk: 144113664 bytes <- check of disc space performed*

*2015-09-22 14:11:28.870622 ERL INFO comsaLib: Creating database backup*

*2015-09-22 14:11:29.875952 ERL INFO swmBackup: cd /home/sirpa ; tar cfz /rcs/swm/backup/117/bin.tgz --exclude='releases/\*/comte/comea/run/\*' bin*

*2015-09-22 14:11:29.985380 ERL INFO swmBackup: cd /home/sirpa ; tar cfz /rcs/swm/backup/117/releases.tgz --exclude='releases/\*/comte/comea/run/\*' releases*

*2015-09-22 14:11:38.265995 ERL INFO swmBackup: Obtaining lock: {{backup,"111"},<0.3245.0>}*

*2015-09-22 14:11:38.268402 ERL INFO swmBackup: Delayed internal housekeeping will be commenced in one hour (<0.5526.0>) <-internal housekeeping starts in one hour*

*2015-09-22 14:13:34.803921 ERL WARN ecoli\_lib: RCS-COLI: authorization succeeded using legacy roles. This is a temporary measure to maintain compatibility. Please update all RCS-COLI users with new roles: BasebandSupportBasic, BasebandSupportAdvanced, BasebandSupportExpert <-coli authorization*

## Backup and restore

The backup function (equivalent to configuration version, CV, in G1) allows the operator to restore the system to a previously backed up system state, which includes system SW and configuration data. ALL backup MO names are sequential numbers according to ECIM.

A change in the running configuration are persistently stored in the file system on the disk. This means no backup is required to make the configuration persistent. The backup is only required as restoration point.

A backup can be one of three types; MANUAL, SCHEDULED or SYSTEM\_CREATED. A MANUAL backup is created on request from the operator.

A SCHEDULED backup is created automatically by the node according to a preconfigured schedule given by the operator.

A SYSTEM\_CREATED backup is automatically created during SW upgrade and during failsafe mode. This type of backup can’t be deleted by the operator.

**The MANUAL and SCHEDULED backups are subject to housekeeping concerning number of backups stored in the Backup Archive**.

**The SYSTEM\_CREATED backup is subject to only system internal housekeeping. System created backups which are not referred to by the rollback escalation list or the failsafe service will be automatically removed one hour after a node restart.**

The backup file contains the database ***export.bup*** and reference to the UP, ***backupinfo.xml***.

If the system fails, backup restore is used as an automatic recovery mechanism.

One can configure the creation of automatic backups in the node and also export of backups to external backup server using the ***BrmBackupScheduler*** MO. The following types of backup events can be scheduled:

* Single scheduled backup event
* Periodic scheduled backup event
* Periodic scheduled backup event based on calendar

The attribute [***maxStoredScheduledBackups***](http://cpistore.internal.ericsson.com/alexserv?ID=25233&AC=SEARCH&SS=DATABASE&ST=TITLE&PA="class BrmBackupScheduler"&LD=1&CH=maxStoredScheduledBackups) in MO class [***BrmBackupScheduler***](http://cpistore.internal.ericsson.com/alexserv?ID=25233&AC=SEARCH&SS=DATABASE&ST=TITLE&PA="class BrmBackupScheduler"&LD=1) limits the maximum number of scheduled backups to store in the node. The default value is 5. Last one is always ***“SYSTEM\_CREATED”*** and put in on the top of escalation list

The attribute ***maxStoredManualBackups*** in MO class ***BrmBackupHousekeeping*** limitsthe number of manual backups in the node.

Automatic housekeeping is enabled by setting attribute ***autoDelete*** in MO class ***BrmBackupHousekeeping***. Oldest backup will be deleted when housekeeping conditions are met. It is not possible to manually remove ***“SYSTEM\_CREATED” backups.***

**Some comparison to G1 CPP based RBS**

* Manually create and delete a backup  equivalent to creation and delection of CVs in G1
* Manually import and export a backup  equivalent to putToFtpServer/ getFromFtpServer on ConfigurationVersion MO in G1
* Manually restore the node from a backup  equivalent to “cv set” + restart in G1

### BrmBackupLabelStore

MO class **BrmBackupLabelStore** provides the following information:

**lastCreatedBackup** -> Last backup created in the node

**lastExportedBackup** -> Last backup exported from the node

**lastImportedBackup** -> Last backup imported from the node

**lastRestoredBackup** -> Last backup the node was restarted on

**restoreEscalationList** -> Rollback list

If the automatic recovery is escalated to rollback, the node automatically restores from the next backup according to attribute **restoreEscalationList** in MO class ***BrmBackupLabelStore***. The “***restoreEscalationList ”*** is populated with the last ***“SYSTEM\_CREATED”*** backup in the node.i.e the backup which is created by scheduled backup event or by system upgrade. This list, unlike G1, is not configurable manually.

To see what active configuration is running in the node, it is a little bit tricky as compared to G1 where the “cv cu” command will point to the name of the backup that is active in the node. This is due to that in G2, data is stored persistent.

The active configuration in the node is always, the “**lastRestoredBackup**“ in the **BrmBackupLabelStore** MO class plus what ever configuration was changed after the node was restarted with that backup as seen in on the node as seen in Auditrail log. If the node has just been restored with a backup and operator hasn’t done any reconfiguration, then the active configuration is the same as the contents of *“***lastRestoredBackup**” attribue. However, the operator could have done reconfigurations in the node after restoring the node with a backup and even performed node restarts in between.

**Some comparison to G1 CPP based RBS**

The restoreEscalationList , unlike G1, is not configurable manually. The first position is always the last scheduled if any. The other 2 positions are populated by backups that are created by the upgrade logic, the Fina\_lxxx and Rollback\_xx backups.

### Backup handling

#### **Create backup manually**

Manual creation of a backup is performed by initiating action ***createBackup***()in MO class ***BrmBackupManager***. This is equivalent to ***“cv mk”*** in G1.

#### **Delete backup manually**

Manual deletion of a backup is performed by initiating action ***deleteBackup*** (<backupname>) in MO class ***BrmBackup***. This is equivalent to ***“cv rm”*** in G1.

#### **Export backup manually**

The procedure for exporting a backup from the node to an external server is performed by initiating action ***export***()in MO class ***BrmBackupManager (***cvget in moshell***)***. The backup filename is generated by the system according to the following naming convention before it is exported outside the node:

***<exportPackageLabelPrefix>\_<backupName>\_<networkManagedElementId>\_<managedElementType>\_< exportTime>.zip***. Where ***exportPackageLabelPrefix*** is read from ***BrM*** MO while networkManagedElementId and managedElementType are read from ManagedElement MO.

All backup types (MANUAL, SCHEDULED and SYSTEM\_CREATED) can be exported by an operator. They can be exported automatically when they are created. The last SCHEDULED backup is always put on top of the escalation list on **BrmBackupLabelStore** MO.

#### **Import backup manually**

Before importing a backup manually from external server, the backup to import should be placed on an SFTP server, with access from the node.

The Upgrade Package (UP) specified in the backup should exist in the node.

Import of a backup to the node is by initiated by the action ***importBackup*** (<uri>, <password>) in MO class ***BrmBackupManager(***cvget in moshell***)***. The parameter ***uri*** specifies the location and the filename of the backup to import. Example sftp://username@hostIpadress/dir/subdir/filename.

The action ***importBackup*** does not disturb traffic and can be performed during normal operation. All backups will get creationType **MANUAL** after import regardless how they were created prior to the export.

**Some comparison to G1 CPP based RBS**

In G2, the backup is imported to the node and to make it active, “restore” action should be applied on the backup (cvre command in moshell) MO. In G1, getFromFtpServer action on ConfigurationVersion MO (cvget in moshell ) downloads the CV from FTP server to the node and then restore/forcedrestore actvates the CV by restarting the node with the downloaded CV.

#### **Restore backup**

Restore a node from a previously created backup in the node is done by initiating action **restore()** on the *BrmBackup* MO(cvre in moshell). This is equivalent to “cv set” + “node restart” in G1.

#### **Automatic backup Configuration**

The ME can be configured to perform automatic backups. The scheduled backup events can be one of the following types:

* Single Scheduled Backup Event
* Periodic Scheduled Backup Event Based on Calendar
* Periodic Scheduled Backup Event

Each automatically created backup will be put on top of the escalation list while the second and third position in the escalation list are kept unchanged due to that they are upgrade related backups.

#### **Configure backup scheduler**

Before scheduling any backup ensure that the ***exportPackageLabelPrefix*** is set, as described in Section 10.3.2

To configure the backup scheduler, do the following:

* Set attribute ***scheduledBackupName*** in MO class ***BrmBackupScheduler*** to the desired scheduled backup name. The default ***scheduledBackupName*** is BACKUP.
* Set the value of attribute ***maxStoredScheduledBackups*** in MO class ***BrmBackupScheduler*** to the desired maximum number of scheduled backups to store in the ME. The default value is 5. Value 0 is not recommended.
* Print attribute ***schedulerState*** in MO class ***BrmBackupScheduler*** to confirm that the backup scheduler is ENABLED.

#### **Configure Single Scheduled Backup Event**

To configure a single scheduled backup event, do the following:

Create an MO instance of MO class ***BrmSingleEvent***.

Configure the desired date and time of the backup event by setting attribute ***scheduledTime*** in the new MO instance of MO class BrmSingleEvent. The date and time is the local date and time of the ME or the Coordinated Universal Time (UTC). The local time zone of the ME is shown in attribute timeZone in MO class ***ManagedElement***.

For example, to configure a single scheduled backup event to occur at 5 minutes past 2:00 Pm on the 01 september 2015 local date and time, set attribute scheduledTime to 2017-04-15T02:00:00.

***> cr SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmBackupScheduler=1,BrmSingleEvent=MySingleScheduledBackup***

***Attribute 1 of 1, scheduledTime (derivedRef:RcsBrM.DateTime): 2015-09-01T14:05:00***

To configure a single scheduled backup event to occur at 3:00 am on the 16 April 2018 UTC, set attribute scheduledTime to 2018-04-16T03:00:00Z.

#### **Configure Periodic Scheduled Backup Event Based on Calendar**

To configure a periodic scheduled backup event based on the calendar, do the following:

* Create an MO instance of MO class ***BrmCalendarBasedPeriodicEvent***.
* Configure the desired period of the calendar-based scheduled backup event by setting one or several of the attributes time, month, dayOfMonth, dayOfWeek, and dayOfWeekOccurrence in MO class ***BrmCalendarBasedPeriodicEvent***. Attribute time is mandatory to set.

For example, to configure a scheduled backup event to occur every night at 2:22 pm, set attribute time to 14:22:00.

***> cr SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmBackupScheduler=1,BrmCalendarBasedPeriodicEvent=MyCalenderBasedScheduledBackup***

***Attribute 1 of 1, time (derivedRef:RcsBrM.Time): 14:22:00***

If desired, set the optional startTime attribute in MO class ***BrmCalendarBasedPeriodicEvent*** for the periodic scheduled backup event. If attribute startTime is not specified, the current system time is used as the default value.

If desired, set the optional stopTime attribute in MO class ***BrmCalendarBasedPeriodicEvent*** for the periodic scheduled backup event. If attribute stopTime is not specified, the scheduled event continues until cancelled.

#### **Configure Periodic Scheduled Backup Event**

To configure a periodic scheduled backup event, do the following:

* Create an MO instance of MO class ***BrmPeriodicEvent***.
* Configure the desired period of the scheduled backup event by specifying the number of weeks, days, hours, or minutes in the attributes in MO class ***BrmPeriodicEvent***. Attribute hours is mandatory to set.
* Use one or several of the attributes to specify the periodic scheduled backup event. For example, if hours is set to 6 and minutes is set to 30, the scheduled backup event occurs every 6 hour and 30 minutes.
* If desired, set the optional ***startTime*** attribute in MO class ***BrmPeriodicEvent*** for the periodic scheduled backup event. If attribute startTime is not specified, the current system time is used as the default value.
* If desired, set the optional ***stopTime*** attribute in MO class ***BrmPeriodicEvent*** for the periodic scheduled backup event. If attribute stopTime is not specified, the scheduled event continues until cancelled.

#### **Configure Automatic Export of Scheduled backup**

The procedure for configuration of automatic export of scheduled backups is performed by setting the attributes ***autoExportPassword***, ***autoExportUri***, and ***autoExport*** in MO class ***BrmBackupScheduler***. The automatic export is triggered only if the creation of the scheduled backup has been successful.

To configure automatic export of scheduled backups, do the following:

Set attribute ***autoExportPassword*** in MO class ***BrmBackupScheduler*** to the password used for authentication when automatically exporting the scheduled backup. The password can be entered in encrypted format or in cleartext. A cleartext password must be followed by a space and the word "cleartext", for example "Abc123 cleartext".

Set attribute ***autoExportUri*** in MO class ***BrmBackupScheduler*** to specify the location to which the scheduled backup is automatically exported.

Set attribute ***autoExport*** in MO class ***BrmBackupScheduler*** to ENABLED.

#### **Cancel Existing Scheduled Backup Event**

To cancel an existing scheduled backup event, do the following:

Delete the MO instance that represents the scheduled backup event to cancel, that is delete the MO instance of MO class ***BrmSingleEvent***, ***BrmCalendarBasedPeriodicEvent***, or ***BrmPeriodicEvent***.

#### **Suspend Backup scheduler**

The procedure for suspension of the backup scheduler is performed by administratively locking the backup scheduler. No more scheduled backup events are triggered as long as the backup scheduler is in locked administrative state.

To suspend the backup scheduler, do the following:

Set attribute ***adminState*** in MO class ***BrmBackupScheduler*** to LOCKED.

#### **Resume Backup scheduler**

The procedure for resuming the backup scheduler is performed by administratively unlocking the backup scheduler.

To resume the backup scheduler, do the following:

Set attribute ***adminState*** in MO class ***BrmBackupScheduler*** to UNLOCKED.

#### **View Next Scheduled Backup Event**

To view when the next scheduled backup event is triggered, do the following:

Print attribute ***nextScheduledTime*** in MO class ***BrmBackupScheduler*** to view the date and time when the next scheduled event is triggered.

### Exampel scenarios of backup and escalationlist creation

The behavior of backups and escalationlist in 16A is as follows:

The system allows only 3 UPs simultaneously to exist (workaround is /labonly/rcs/disable-max-up-check (not for Live nodes). The reason for 3 is:

* + The currently running release
  + The previously release, in case you need to rollback
  + Space for the next release during preparations for upgrade. After the upgrade you still have 3 UPs and before the next upgrade you need to remove any of the two other UPs above.
* A UP cannot be deleted before all Backups based on the UP is deleted.
* There are different kinds of Backups with different housekeeping rules:
  + Manually created. The house keeping is controlled via a special MO for housekeeping. It can be set to manual or automatic housekeeping. The limit is set on maxStoredManualBackups on BrmBackupHousekeeping MO as well.
  + Scheduled Backups. It can be controlled via an MO when/how often these are created. They have their own house keeping through maxStoredScheduledBackups on BrmBackupScheduler MO.
  + System Created. These Backups are created by different functions like Upgrade and FailSafe reconfiguration. The system handles the housekeeping autonomously without any possibility to control it manually. Each function has its own rules. **The system created backups are not possible to manually delete because they are used for error escalations/rollbacks**.
* Escalation rules and roll back lists
  + The following 3 types of Backups are inserted and removed automatically to/from the escalation list.
    - Rollback Backup taken early during an upgrade
    - Final Backup taken after a successful upgrade
    - Scheduled backup
    - Only one of each type can be included
  + In case the system needs to rollback, for instance at a cyclic restart, it will look for the latest of these 3 Backups. Normally the Scheduled will be the latest and hence the selected one. If Final is later that will be selected. (The reason is that the upgrade was very recent and no Scheduled has been taken yet).
  + The list of backups to choose from is stored in the Backup. After a rollback to an older backup a new list of escalationlist appears from the backup that was just started.   
    **If a system created Backup doesn’t exists in the rollback list, it will be deleted after 1 hour after node restart.**
  + The examination of escalation list and deletion after 1 hour is always done after a restart, including both automatic and manual restore of backup.

After Semi-Autoingration, the following is logged regarding downloading of SW and configurationfiles and reboot of the node:

*> lgk -x ai*

*=======================================================================================*

*Timestamp Type Sev Description*

*=======================================================================================*

*1970-01-01 00:00:21 AI INFO Setting system time to software build time: "2016-01-11 11:32:50"*

*2016-01-11 11:32:50 AI INFO Networkloader type3 booted from partition /dev/sda1*

*2016-01-11 11:32:50 AI INFO Running version: "CNX9012629-R4AS01"*

*2016-01-11 11:33:01 AI INFO Autointegration waiting for user input*

*2016-01-11 11:34:38 AI INFO AutoIntegration started - without download*

*2016-01-11 11:34:38 AI INFO System time difference detected (1820694 sec), adjusting*

*2016-02-01 13:19:32 AI INFO Received RbsSummaryFile*

*2016-02-01 13:19:32 AI INFO Filepaths in RbsSummaryFile valid for Semi Autointegration*

*2016-02-01 13:19:32 AI INFO Path(s) to optional files provided: licensingKeyFilePath labConfigFilePath*

*2016-02-01 13:19:32 AI INFO Download of Configuration files : Started*

*2016-02-01 13:19:32 AI INFO Download of Configuration files : Finished*

*2016-02-01 13:19:32 AI INFO Download of Software package : Started*

*2016-02-01 13:19:32 AI INFO Download progress: 0%*

*2016-02-01 13:19:52 AI INFO Download progress: 18%*

*2016-02-01 13:20:12 AI INFO Download progress: 36%*

*2016-02-01 13:20:32 AI INFO Download progress: 54%*

*2016-02-01 13:20:51 AI INFO Download progress: 73%*

*2016-02-01 13:21:11 AI INFO Download progress: 91%*

*2016-02-01 13:21:20 AI INFO Download of Software package : Finished*

*2016-02-01 13:21:20 AI INFO Prepare filesystem : Started*

*2016-02-01 13:21:36 AI INFO Prepare filesystem : Finished*

*2016-02-01 13:21:36 AI INFO Unpack and install software : Started*

*2016-02-01 13:23:17 AI INFO Unpack and install software : Finished*

*2016-02-01 13:23:17 AI INFO Finishing and storing log files : Started*

*2016-02-01 13:23:19 AI INFO Finishing and storing log files : Finished*

*2016-02-01 13:23:19 AI INFO File and software installation successful*

*2016-02-01 13:23:20 AI INFO Download Completed*

*2016-02-01 13:23:23 AI INFO Enabling boot on installed software*

*2016-02-01 13:23:24 AI INFO Updating logs*

*2016-02-01 13:23:24 AI INFO Integrate will continue after reboot*

*2016-02-01 13:26:17 AI INFO Start loading configuration files*

*2016-02-01 13:26:39 AI INFO Configuration files loaded*

*2016-02-01 13:26:54 AI INFO Mgmt set rbsConfigLevel to SITE\_CONFIG\_COMPLETE*

* *“Auto integration backup - SITE\_CONFIG\_COMPLETE “* backup is created by the system after semi-AI is finished. This backup can’t be deleted manually unless rbsConfigLevel attribute on AutoProvisioning MO is set to READY\_FOR\_SERVICE (=4). Even though this backup is system created, it is possible to delete it, as it is no part of RestoreEscalationList (rollbacklist in G1).
* RestoreEscalationList is empty after AI and it is recommended to create scheduled backups to populate the RestoreEscalationList so that in case of cyclic restarts, the system has some backup to fall to.

*>cvcu*

*==========================================================================================*

*160201-14:28 BackupName SwVersion*

*==========================================================================================*

*LastCreatedBackup: Auto integration backup - SITE\_CONFIG\_COMPLETE CXP9024418/2\_R14JT*

*LastRestoredBackup:*

*------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R14JT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[0] =*

*======================================================================================*

Operator creates backup manually:

*> cvmk ManualCreatedBackup1*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*10 BrM=1,BrmBackupManager=1 createBackup 1*

*>>> Return value = 0*

*==================================================================================================*

The back will have creationType “MANUAL”.

*> cvls*

*==========================================================================================*

*160201-14:29 BackupName SwVersion*

*==========================================================================================*

*LastCreatedBackup: ManualCreatedBackup1 CXP9024418/2\_R14JT*

*LastRestoredBackup:*

*------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R14JT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[0] =*

*======================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*======================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*======================================================================================*

Operator orders a single scheduled backup creation to be performed at *13:35:00* on the First of February. The created Schedule backup is put in the RestoreEscalationList

*> cr SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmBackupScheduler=1,BrmSingleEvent=MySingleScheduledBackup*

*Attribute 1 of 1, scheduledTime (derivedRef:RcsBrM.DateTime): 2016-02-01T13:35:00*

*>>> [Proxy ID = 4608] MO name :ManagedElement=1,SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmBackupScheduler=1,BrmSingleEvent=MySingleScheduledBackup*

*> cvls*

*==========================================================================================*

*160201-14:36 BackupName SwVersion*

*==========================================================================================*

*LastCreatedBackup: BACKUP-2016-02-01T13:35:00+00:00 CXP9024418/2\_R14JT*

*LastRestoredBackup:*

*------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R14JT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[1] = BACKUP-2016-02-01T13:35:00+00:00*

*======================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*======================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 BACKUP-2016-02-01T13:35:00+00:00 2016-02-01 13:35:00 CXP9024418/2\_R14JT SYSCR OK BrmBackup=3*

*======================================================================================*

Operator activates failsafe function ([see failsafe chapter](#_Node_configuration_using)) to start configuring the node

*> get BrmFailsafeBackup*

*==================================================================================================*

*18 SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmFailsafeBackup=1*

*==================================================================================================*

*backup*

*brmFailsafeBackupId 1*

*progress Struct{0}*

*timeRemaining*

*timeoutLength 1200*

*usageState 1 (IDLE)*

*==================================================================================================*

*> acl BrmFailsafeBackup*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*18 BrM=1,BrmBackupManager=1,BrmFailsafeBackup=1 activate 0*

*18 BrM=1,BrmBackupManager=1,BrmFailsafeBackup=1 deactivate 0*

*==================================================================================================*

*> acc BrmFailsafeBackup activate*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*18 BrM=1,BrmBackupManager=1,BrmFailsafeBackup=1 activate 0*

*>>> Return value = 0*

*==================================================================================================*

A new backup is created by the system which can be used in acse the operator failes to confirm the new configuration. This backup is not put in the RestoreEscalationList.

*> cvls*

*==========================================================================================*

*160201-14:38 BackupName SwVersion*

*==========================================================================================*

*LastCreatedBackup: Failsafe\_backup\_20160201T133814+0000 CXP9024418/2\_R14JT*

*LastRestoredBackup:*

*------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R14JT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: BUSY (Time remaining: 1180/1200)*

*RestoreEscalationList: s[1] = BACKUP-2016-02-01T13:35:00+00:00*

*======================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*======================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 BACKUP-2016-02-01T13:35:00+00:00 2016-02-01 13:35:00 CXP9024418/2\_R14JT SYSCR OK BrmBackup=3*

*4 Failsafe\_backup\_20160201T133814+0000 2016-02-01 13:38:14 CXP9024418/2\_R14JT SYSCR OK BrmBackup=4*

*======================================================================================*

Some fault happened which led to loss of OAM so that operator couldn’t cofirm the configuration by deactivating failsafe and after time out (timeRemaing=0), the node will restore it self with the failsafe backup:

*> get BrmFailsafeBackup=1*

*==================================================================================================*

*19 SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmFailsafeBackup=1*

*==================================================================================================*

*backup Failsafe\_backup\_20160201T133814+0000*

*brmFailsafeBackupId 1*

*progress Struct{11}*

*>>> 1.actionId = 1*

*>>> 2.actionName = ACTIVATE*

*>>> 3.additionalInfo = Action started Name: Failsafe\_backup\_20160201T133814+0000 Creating database backup*

*>>> 4.progressInfo = Creating database backup*

*>>> 5.progressPercentage = 100*

*>>> 6.result = 1 (SUCCESS)*

*>>> 7.resultInfo = BrM=1,BrmBackupManager=1,BrmBackup=4*

*>>> 8.state = 3 (FINISHED)*

*>>> 9.timeActionCompleted = 2016-02-01T13:38:23+00:00*

*>>> 10.timeActionStarted = 2016-02-01T13:38:14+00:00*

*>>> 11.timeOfLastStatusUpdate = 2016-02-01T13:38:23+00:00*

*timeRemaining 31*

*timeoutLength 1200*

*usageState 3 (BUSY)*

*==================================================================================================*

*> cvls*

*Unable to connect to 10.68.96.48:2023*

*MO service not ready, retrying in 5 seconds, give up in 1195 seconds...*

*Unable to connect to 10.68.96.48:2023*

*.*

*.*

*==========================================================================================*

*160201-15:58 BackupName SwVersion*

*==========================================================================================*

*LastCreatedBackup: Failsafe\_backup\_20160201T133814+0000 CXP9024418/2\_R14JT*

*LastRestoredBackup: Failsafe\_backup\_20160201T133814+0000 CXP9024418/2\_R14JT*

*------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R14JT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[1] = BACKUP-2016-02-01T13:35:00+00:00*

*======================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*======================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 BACKUP-2016-02-01T13:35:00+00:00 2016-02-01 13:35:00 CXP9024418/2\_R14JT SCHED OK BrmBackup=3*

*4 Failsafe\_backup\_20160201T133814+0000 2016-02-01 13:38:14 CXP9024418/2\_R14JT SYSCR OK BrmBackup=4*

*======================================================================================*

The operator initiated node upgrade for the first time

*> acc SwM=1 createUpgradePackage*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*4490 SwM=1 createUpgradePackage 2*

*Parameter 1 of 2, uri (string): sftp://uabseyo@147.214.14.219/home/uabseyo/CXP9024418\_2-R15DT*

*Parameter 2 of 2, password (derivedRef-RcsSwM.EcimPasswordString): \*\*\*\*\*\*\*\**

*>>> Return value = 2*

*==================================================================================================*

*> get UpgradePackage=CXP9024418/2-R15DT state*

*==================================================================================================*

*MO Attribute Value*

*==================================================================================================*

*SwM=1,UpgradePackage=CXP9024418/2-R15DT state 1 (INITIALIZED)*

*==================================================================================================*

*> get SwVersion*

*============================================================================*

*4886 SystemFunctions=1,SwInventory=1,SwVersion=CXP9024418/2-R15DT*

*==============================================================================*

*administrativeData Struct{6}*

*>>> 1.description = N/A*

*>>> 2.productionDate = 2016-01-24T15:51:06*

*>>> 3.productName = Baseband*

*>>> 4.productNumber = CXP9024418/2*

*>>> 5.productRevision = R15DT*

*>>> 6.type = RadioNode*

*consistsOf [46] =*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9026642/1Z2-R1N*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9025671/24-R33AC*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024940/1-R3X*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9025219/4-R1AC*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024578/9-R62EA*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024578/12-R62EA*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9026768/4-R1T*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9019879/4-R6N*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9023064/4-R12L*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024263/1-R29AJ*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024578/10-R61CB*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9023495/3-R17C*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9022846/10-R24BU*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP102188/2-R9B01*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9023458/3-R19AZJ*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024812/1-R3C*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9023271/3-R23F*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9026769/4-R1U*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9025120/1Z2-R1AF*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9026393/1-R1L*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9031275/3-R4AS12*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9030699/2-R31A*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9025895/1-R5A*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024813/1-R2M*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024079/3-R1G*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9019880/4-R6V*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9023113/5-R6A*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024811/1-R4V*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9030284/3-R33C*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP102171/1-R20D01*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9019797/4-R7D*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9028337/1-R55XF*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024581/26-R26HF*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024021/2Z2-R2J*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9025220/4-R1X*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024020/1-R1AJ*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024578/6-R61CB*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024578/14-R62EA*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024581/25-R25ED*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024886/3-R24C*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9021507/4-R6D*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9027802/1-R4JU*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024578/13-R62EA*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024888/2-R31A*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9030859/1-R12S*

*>>> consistsOf = SystemFunctions=1,SwInventory=1,SwItem=CXP9024280/4-R29C*

*swVersionId CXP9024418/2-R15DT*

*timeOfActivation 2016-02-02T13:23:10+00:00*

*timeOfDeactivation*

*timeOfInstallation 2016-02-01T15:34:05+00:00*

*userLabel*

*===========================================================================================================*

*> acc UpgradePackage=CXP9024418/2-R15DT prepare*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*4492 SwM=1,UpgradePackage=CXP9024418/2-R15DT prepare 0*

*>>> Return value = true*

*==================================================================================================*

*> get UpgradePackage=CXP9024418/2-R15DT state*

*==================================================================================================*

*MO Attribute Value*

*==================================================================================================*

*SwM=1,UpgradePackage=CXP9024418/2-R15DT state 3 (PREPARE\_COMPLETED)*

*==================================================================================================*

*> acc UpgradePackage=CXP9024418/2-R15DT activate*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*4492 SwM=1,UpgradePackage=CXP9024418/2-R15DT activate 0*

*>>> Return value = true*

*==================================================================================================*

*> get UpgradePackage=CXP9024418/2-R15DT state*

*==================================================================================================*

*MO Attribute Value*

*==================================================================================================*

*SwM=1,UpgradePackage=CXP9024418/2-R15DT state 6 (WAITING\_FOR\_COMMIT)*

*==================================================================================================*

An alarm is sent to remind the operator to confirm te upgrade before the node rollback to previous software

*> al*

*=====================================================================================================*

*Sever Specific Problem MO (Cause/AdditionalInfo)*

*=====================================================================================================*

*Warn A Fallback Operation will soon be started SwM=1,UpgradePackage=CXP9024418/2-R15DT (The upgrade operation has not been confirmed yet. A fallback operation will be started in 300 seconds if the upgrade is not confirmed.)*

Operator confirms the upgrade

*> acc UpgradePackage=CXP9024418/2-R15DT confirm*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*4492 SwM=1,UpgradePackage=CXP9024418/2-R15DT confirm 0*

*>>> Return value = true*

*==================================================================================================*

*> get UpgradePackage=CXP9024418/2-R15DT state*

*==================================================================================================*

*MO Attribute Value*

*==================================================================================================*

*SwM=1,UpgradePackage=CXP9024418/2-R15DT state 7 (COMMIT\_COMPLETED)*

*==================================================================================================*

After the upgrade is completed, the 2 backups created during upgrade are put on the top of the RestoreEscalationList. Also note that the new active UP is in state “COMMIT\_COMPLETED” while the state of the previous UP is set to “PREPARE\_COMPLETED”. This is different behaviour as compared to CPP based nodes but it is all according to ECIM.

*> cvls*

*==============================================================================================*

*160201-16:58 BackupName SwVersion*

*==============================================================================================*

*LastCreatedBackup: Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 CXP9024418/2\_R15DT*

*LastRestoredBackup: Failsafe\_backup\_20160201T133814+0000*

*-------------------------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R15DT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[2] = Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

*==============================================================================================*

*UpgradePackage ProductData ProdDate Rel CreationDate State*

*==============================================================================================*

*CXP9024418/2-R15DT CXP9024418/2\_R15DT 20160124 16A 2016-02-01 15:20:21 COMMIT\_COMPLETED*

*CXP9024418/2-R14JT CXP9024418/2\_R14JT 20160201 16A 2016-02-01 13:24:18 PREPARE\_COMPLETED*

*==============================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*==============================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 BACKUP-2016-02-01T13:35:00+00:00 2016-02-01 13:35:00 CXP9024418/2\_R14JT SCHED OK BrmBackup=3*

*4 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 2016-02-01 15:32:29 CXP9024418/2\_R14JT SYSCR OK BrmBackup=4*

*5 Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 2016-02-01 15:56:27 CXP9024418/2\_R15DT SYSCR OK BrmBackup=5*

*==============================================================================================*

*>>> Total: 5 CV's, 2 UP's*

*> h cvls*

*Command description (COM):*

*\* cvcu : display the current backup information only.*

*\* cvls : same as above plus the list of SwVersions, UpgradePackages and BrmBackups. The Id field of the BrmBackup can be used in the commands cvrm and cvget.*

*\* cvmk : create a local backup.*

*\* cvre : restore a backup (equivalent to doing a cvset followed by node restart on CPP)*

*\* cvrm : remove one or more backups from the node. If the argument does not match an existing backup then all backups matching that string will be removed. A confirmation message is printed before removal.*

*\* cvrmu: remove all backups connected to a specific UP (same as cvrm but with the UP as argument).*

*\* cvget : export a backup to the workstation. The second argument is optional. If not given, a default folder is chosen for the backup ~/moshell\_logfiles/logs\_moshell/cv/<node>/<date>\_<time>/*

*\* cvgetu: export all backups connected to a specific UP (same as cvget but with the UP as argument).*

*\* cvput : transfer a backup (zip file) from the workstation to the node.*

*\* cvfa : activate failsafe backup (same as MO action BrmFailsafeBackup.activate)*

*\* cvfd : deactivate failsafe backup (same as MO action BrmFailsafeBackup.deactivate)*

If the operator restarts the node with the backup running with the previous UP, the RestoreEscalationList will change to the values that were present when that backup was created.

*> cvre Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

*.*

*.*

*BrmBackup=4 297s (04m57s) RUNNING 52/100 (52%) Backup restored. Rebooting...*

*BrmBackup=4 302s (05m02s) COM.NO\_CONTACT 0/100 (0%) COM.NO\_CONTACT*

*.*

*> cvls*

*==============================================================================================*

*160201-17:08 BackupName SwVersion*

*==============================================================================================*

*LastCreatedBackup: Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 CXP9024418/2\_R14JT*

*LastRestoredBackup: Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 CXP9024418/2\_R14JT*

*-------------------------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R14JT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[1] = BACKUP-2016-02-01T13:35:00+00:00*

*==============================================================================================*

*UpgradePackage ProductData ProdDate Rel CreationDate State*

*==============================================================================================*

*CXP9024418/2-R15DT CXP9024418/2\_R15DT 20160124 16A 2016-02-01 15:20:21 PREPARE\_COMPLETED*

*CXP9024418/2-R14JT CXP9024418/2\_R14JT 20160201 16A 2016-02-01 13:24:18 COMMIT\_COMPLETED*

*==============================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*==============================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 BACKUP-2016-02-01T13:35:00+00:00 2016-02-01 13:35:00 CXP9024418/2\_R14JT SCHED OK BrmBackup=3*

*4 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 2016-02-01 15:32:29 CXP9024418/2\_R14JT SYSCR OK BrmBackup=4*

*5 Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 2016-02-01 15:56:27 CXP9024418/2\_R15DT SYSCR OK BrmBackup=5*

*==============================================================================================*

*> lgur*

*2016-02-01 16:07:41 UPG INFO BrmBackup=4 Backup restored: Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

*2016-02-01 16:07:42 UPG INFO SwInventory Running upgrade package Baseband CXP9024418/2 R14JT*

The operator exports backup outside the node:

*> cvget Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000*

*# Exporting backup 1 of 1: Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 (BrmBackup=5)*

*=========================================================================================================*

*Proxy MO Action Nr of Params*

*========================================================================================================*

*15 BrM=1,BrmBackupManager=1,BrmBackup=5 export 2*

*>>> Return value = 0*

*========================================================================================================*

*> cvget Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

*# Exporting backup 1 of 1: Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 (BrmBackup=4)*

*============================================================================================================*

*Proxy MO Action Nr of Params*

*============================================================================================================*

*14 BrM=1,BrmBackupManager=1,BrmBackup=4 export 2*

*>>> Return value = 0*

*============================================================================================================*

*>lgur*

*2016-02-01 16:11:07 UPG INFO BrmBackup=4 Backup exported: Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

*2016-02-01 16:11:25 UPG INFO BrmBackup=5 Backup exported: Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000*

*> !unzip \_Rollback\_backup\_Baseband\_CXP9024418\_2\_R14JT\_20160201T153229+0000\_1\_RadioNode\_20160201T161106+0000.zip*

*Archive: /home/uabseyo/moshell\_logfiles/logs\_moshell/cv/10.68.96.48/160201\_171054/\_Rollback\_backup\_Baseband\_CXP9024418\_2\_R14JT\_20160201T153229+0000\_1\_RadioNode\_20160201T161106+0000.zip*

*inflating: export.bup * The configuration, equivalent to db.dat databse in CPP based nodes

*inflating: backupinfo.xml*  reference to the UP that is used in the backup

One hour after node was restored, Housekeeping for system created backups started and deleted the following backups as they are not any longer in escalationlist.

*>lgur*

*2016-02-01 17:07:53 UPG INFO BrmBackupManager Deleting backup Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000*

*2016-02-01 17:07:53 UPG INFO BrmBackupManager Deleting backup Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

Operator import the backup back to the node. The backup is put into the disc but the backup is not active. One needs to restore the node with the backup to make it active. Observe that the imported backups are labelled as type manual and they will be guided by housekeeping policy for manually created backups.

*> cvput \_Final\_backup\_for\_Baseband\_CXP9024418\_2\_R15DT\_20160201T155627+0000\_1\_RadioNode\_20160201T161124+0000.zip*

*==============================================================================*

*Proxy MO Action Nr of Params*

*===========================================================================*

*10 BrM=1,BrmBackupManager=1 importBackup 2*

*>>> Return value = 0*

*============================================================================*

*> cvput \_Rollback\_backup\_Baseband\_CXP9024418\_2\_R14JT\_20160201T153229+0000\_1\_RadioNode\_20160201T161106+0000.zip*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*10 BrM=1,BrmBackupManager=1 importBackup 2*

*>>> Return value = 0*

*==================================================================================================*

*> cvls*

*==============================================================================================*

*160201-21:43 BackupName SwVersion*

*==============================================================================================*

*LastCreatedBackup: Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 CXP9024418/2\_R14JT*

*LastRestoredBackup: Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 CXP9024418/2\_R14JT*

*-------------------------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R14JT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[1] = BACKUP-2016-02-01T13:35:00+00:00*

*==============================================================================================*

*SwVersion ProductData ProdDate Rel LMs InstallationDate ActivationDate DeactivationDate*

*==============================================================================================*

*CXP9024418/2-R14JT CXP9024418/2\_R14JT 20160201 16A 42 2016-02-01 13:24:19 2016-02-01 16:07:42*

*==============================================================================================*

*UpgradePackage ProductData ProdDate Rel CreationDate State*

*==============================================================================================*

*CXP9024418/2-R15DT CXP9024418/2\_R15DT 20160124 16A 2016-02-01 15:20:21 PREPARE\_COMPLETED*

*CXP9024418/2-R14JT CXP9024418/2\_R14JT 20160201 16A 2016-02-01 13:24:18 COMMIT\_COMPLETED*

*==============================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*==============================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 BACKUP-2016-02-01T13:35:00+00:00 2016-02-01 13:35:00 CXP9024418/2\_R14JT SCHED OK BrmBackup=3*

*4 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 2016-02-01 15:32:29 CXP9024418/2\_R14JT MANUAL OK BrmBackup=4*

*5 Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 2016-02-01 15:56:27 CXP9024418/2\_R15DT MANUAL OK BrmBackup=5*

*==============================================================================================*

Operator restores the node with the previous upgraded backup

*> cvre Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000*

*.*

*.*

*BrmBackup=5 298s (04m58s) RUNNING 52/100 (52%) Backup restored. Rebooting...*

*BrmBackup=5 304s (05m04s) COM.NO\_CONTACT 0/100 (0%) COM.NO\_CONTACT*

*.*

*.*

*> cvls*

*==============================================================================================*

*160201-21:52 BackupName SwVersion*

*==============================================================================================*

*LastCreatedBackup: Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 CXP9024418/2\_R15DT*

*LastRestoredBackup: Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 CXP9024418/2\_R15DT*

*-------------------------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R15DT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[2] = Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 BACKUP-2016-02-01T13:35:00+00:00*

*==============================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*==============================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 BACKUP-2016-02-01T13:35:00+00:00 2016-02-01 13:35:00 CXP9024418/2\_R14JT SCHED OK BrmBackup=3*

*4 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 2016-02-01 15:32:29 CXP9024418/2\_R14JT MANUAL OK BrmBackup=4*

*5 Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 2016-02-01 15:56:27 CXP9024418/2\_R15DT MANUAL OK BrmBackup=5*

*==============================================================================================*

Operator configures Periodic Scheduled Backup Event so that backup is created by the system every hour

*> cr SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmBackupScheduler=1,BrmPeriodicEvent=MyBrmPeriodicEvent*

*Attribute 1 of 1, hours (uint16): 1*

*> cvls*

*==============================================================================================*

*160202-11:06 BackupName SwVersion*

*==============================================================================================*

*LastCreatedBackup: BACKUP-2016-02-02T09:26:24+00:00 CXP9024418/2\_R15DT*

*LastRestoredBackup: Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 CXP9024418/2\_R15DT*

*-------------------------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R15DT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[2] = BACKUP-2016-02-02T09:26:24+00:00 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

*==============================================================================================*

*Id BackupName CreationTime SwVersion Type Stat MO*

*==============================================================================================*

*1 Auto integration backup - SITE\_CONFIG\_COMPLETE 2016-02-01 13:26:39 CXP9024418/2\_R14JT SYSCR OK BrmBackup=1*

*2 ManualCreatedBackup1 2016-02-01 13:29:17 CXP9024418/2\_R14JT MANUAL OK BrmBackup=2*

*3 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000 2016-02-01 15:32:29 CXP9024418/2\_R14JT MANUAL OK BrmBackup=4*

*4 Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 2016-02-01 15:56:27 CXP9024418/2\_R15DT MANUAL OK BrmBackup=5*

*5 BACKUP-2016-02-02T04:26:24+00:00 2016-02-02 04:26:24 CXP9024418/2\_R15DT SCHED OK BrmBackup=12*

*6 BACKUP-2016-02-02T05:26:24+00:00 2016-02-02 05:26:24 CXP9024418/2\_R15DT SCHED OK BrmBackup=13*

*7 BACKUP-2016-02-02T06:26:24+00:00 2016-02-02 06:26:24 CXP9024418/2\_R15DT SCHED OK BrmBackup=14*

*8 BACKUP-2016-02-02T07:26:24+00:00 2016-02-02 07:26:24 CXP9024418/2\_R15DT SCHED OK BrmBackup=15*

*9 BACKUP-2016-02-02T08:26:24+00:00 2016-02-02 08:26:24 CXP9024418/2\_R15DT SCHED OK BrmBackup=16*

*10 BACKUP-2016-02-02T09:26:24+00:00 2016-02-02 09:26:24 CXP9024418/2\_R15DT SYSCR OK BrmBackup=17*

*==============================================================================================*

*>lgur*

*.*

*.*

*2016-02-01 22:26:24 UPG INFO BrmBackupScheduler Making backup BACKUP-2016-02-01T22:26:24+00:00*

*2016-02-01 23:26:24 UPG INFO BrmBackupScheduler Making backup BACKUP-2016-02-01T23:26:24+00:00*

*2016-02-02 00:26:24 UPG INFO BrmBackupScheduler Making backup BACKUP-2016-02-02T00:26:24+00:00*

*2016-02-02 01:26:24 UPG INFO BrmBackupScheduler Making backup BACKUP-2016-02-02T01:26:24+00:00*

*2016-02-02 02:26:24 UPG INFO BrmBackupScheduler Making backup BACKUP-2016-02-02T02:26:24+00:00*

*2016-02-02 03:26:24 UPG INFO BrmBackupScheduler Making backup BACKUP-2016-02-02T03:26:24+00:00*

The system is following housekeeping for scheduled backups and keeping only 5 schduled backups in the node accordoing to ***maxStoredScheduledBackups*** in MO class ***BrmBackupScheduler***

*>lgk x – erl*

*.*

*.*

*2016-02-02 04:26:24.037636 ERL INFO comsaLib: Backup BACKUP-2016-02-01T22:26:24+00:00 removed automatically due to housekeeping.*

*2016-02-02 05:26:24.047838 ERL INFO comsaLib: Backup BACKUP-2016-02-01T23:26:24+00:00 removed automatically due to housekeeping.*

*2016-02-02 06:26:24.050802 ERL INFO comsaLib: Backup BACKUP-2016-02-02T00:26:24+00:00 removed automatically due to housekeeping.*

*2016-02-02 07:26:24.038184 ERL INFO comsaLib: Backup BACKUP-2016-02-02T01:26:24+00:00 removed automatically due to housekeeping.*

*2016-02-02 08:26:24.051991 ERL INFO comsaLib: Backup BACKUP-2016-02-02T02:26:24+00:00 removed automatically due to housekeeping.*

*2016-02-02 09:26:24.037035 ERL INFO comsaLib: Backup BACKUP-2016-02-02T03:26:24+00:00 removed automatically due to housekeeping.*

**There is possibility to specify that the system exports the scheduled backup outside the node as soon as it is created**

> set BrmBackupScheduler=1 autoExport ENABLED

===================================================================================

28 SystemFunctions=1,BrM=1,BrmBackupManager=1,BrmBackupScheduler=1

=============================================================================================

Id MO autoExport Result

=============================================================================================

28 BrM=1,BrmBackupManager=1,BrmBackupScheduler=1 1 >>> Set.

=============================================================================================

> set BrmBackupScheduler=1 autoExportPassword cleartext=true,password=labuser

=============================================================================================

Id MO autoExportPassword Result

=============================================================================================

27 BrM=1,BrmBackupManager=1,BrmBackupScheduler=1 labuser cleartext >>> Set.

=============================================================================================

> set BrmBackupScheduler=1 autoExportUri sftp://labuser@10.68.96.230/home/labuser/

=============================================================================================

Id MO autoExportUri Result

=============================================================================================

27 BrM=1,BrmBackupManager=1,BrmBackupScheduler=1 sftp://labuser@10.68.96.230/home/labuser/ >>> Set.

=============================================================================================

> set BrM=1 exportPackageLabelPrefix TestBackup

===================================================================================

Id MO exportPackageLabelPrefix Result

=============================================================================================

13 BrM=1 TestBackup >>> Set.

=============================================================================================

If a node restarts either due to a sw crash or manual intiated node restart the node will retain the configuration that was entered prior to the crash as data is kept persistent in the node. In the below example, we make changes to configuration by creating *FieldReplaceableUnit MO*  and restarting the node without creating a backup**:**

*> netconf LRAT\_basic\_fru\_netconf\_create.xml*

*<?xml version="1.0" encoding="UTF-8"?>*

*<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<capabilities>*

*<capability>urn:ietf:params:netconf:base:1.0</capability>*

*<capability>urn:com:ericsson:ebase:0.1.0</capability>*

*<capability>urn:com:ericsson:ebase:1.1.0</capability>*

*<capability>urn:com:ericsson:ebase:1.2.0</capability>*

*<capability>urn:ietf:params:netconf:capability:writable-running:1.0</capability>*

*<capability>urn:ietf:params:netconf:capability:rollback-on-error:1.0</capability>*

*<capability>urn:ietf:params:netconf:capability:notification:1.0</capability>*

*<capability>urn:ericsson:com:netconf:action:1.0</capability>*

*<capability>urn:ericsson:com:netconf:heartbeat:1.0</capability>*

*<capability>urn:com:ericsson:netconf:operation:1.0</capability>*

*</capabilities>*

*<session-id>4</session-id>*

*</hello>*

*]]>]]>*

*<?xml version="1.0" encoding="UTF-8"?>*

*<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="2">*

*<ok/>*

*</rpc-reply>*

*]]>]]>*

*<?xml version="1.0" encoding="UTF-8"?>*

*<rpc-reply xmlns="urn:ietf:params:xml:ns:netconf:base:1.0" message-id="4">*

*<ok/>*

*</rpc-reply>*

*]]>]]>*

*> pr field*

*===================================================================================*

*Proxy MO*

*===================================================================================*

*2 Equipment=1,FieldReplaceableUnit=1*

*===================================================================================*

*> acc FieldReplaceableUnit=1 restartUnit*

*===================================================================================*

*2 Equipment=1,FieldReplaceableUnit=1*

*==================================================================================================*

*Proxy MO Action Nr of Params*

*==================================================================================================*

*2 FieldReplaceableUnit=1 restartUnit 3*

*Parameter 1 of 3, restartRank (enumRef-ReqFieldReplaceableUnit.RestartRank):*

*Enter one of the following integers: 0:RESTART\_WARM, 1:RESTART\_COLD, 2:RESTART\_COLDWTEST: 0*

*==================================================================================================*

*MO service not ready, retrying in 5 seconds, give up in 1195 seconds...*

*Unable to connect to 10.68.96.48:2023*

*MO service not ready, retrying in 5 seconds, give up in 1190 seconds...*

*Unable to connect to 10.68.96.48:2023*

*MO service not ready, retrying in 5 seconds, give up in 1185 seconds...*

*Unable to connect to 10.68.96.48:2023*

*MO service not ready, retrying in 5 seconds, give up in 1180 seconds...*

*Unable to connect to 10.68.96.48:2023*

Node is restarted and configuration that was entered before node restart is still active even though there was no backup created by operator as data is saved persistent in the node. This is different behaviour as compared to CPP based nodes

*==============================================================================================*

*160202-14:23 BackupName SwVersion*

*==============================================================================================*

*LastCreatedBackup: BACKUP-2016-02-02T12:26:24+00:00 CXP9024418/2\_R15DT*

*LastRestoredBackup: Final\_backup\_for\_Baseband\_CXP9024418/2\_R15DT\_20160201T155627+0000 CXP9024418/2\_R15DT*

*-------------------------------------------------------------------------------------------------------------*

*Current SwVersion: CXP9024418/2\_R15DT (16A)*

*BrmHouseKeeping: ENABLED (max: 20 backups)*

*BrmFailSafe: IDLE*

*RestoreEscalationList: s[2] = BACKUP-2016-02-02T12:26:24+00:00 Rollback\_backup\_Baseband\_CXP9024418/2\_R14JT\_20160201T153229+0000*

*==============================================================================================*

*> pr FieldReplaceableUnit=1*

*===================================================================================*

*Proxy MO*

*===================================================================================*

*2 Equipment=1,FieldReplaceableUnit=1*

*===================================================================================*

# Autointegration

“LMT integration, on-site configuration” and “Zero touch integration, off-site pre-configuration” are the auto-integration functionality implemented in G2 16A. Auto-integration functionality has a part in Network Loader and one part in RCS-MW in the upgrade package.

The Network Loader is an own product which is placed on a board as initial software during production. The main task of the NL is to download an upgrade package and configuration files, install the upgrade package and reboot the board so it starts up on the upgrade package. NL is never used as long as an UP exists.

New Autointegration terminology delployed. See “Autointegration Deployment Guidelines”

|  |  |
| --- | --- |
| **New Name** | **Replaces** |
| Zero touch integration, off-site pre-configuration | Warehouse integration/installation |
| LMT integration, on-site configuration | Semi-automatic/automated integration |

*Table 1    Integration Terminology*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Node/Deployment Solution** | **Baseband Radio Node** | **IPsec** | **Baseband T Node** | **IPsec** |
| Zero touch integration, off-site pre-configuration | WCDMA: Yes | Yes | Yes | Yes |
| LTE: Yes | Yes |
| LMT integration, on-site configuration | WCDMA: Yes | Yes | Yes | Yes |
| LTE: Yes | Yes |

*Table 2    Autointegration Solutions Support*

## Prepare Configuration Files

Prepare the following configuration files according to chapter “**Prepare Configuration Files**” in “**Manage Configuration Files**” CPI. Use **The Equipment Configuration Tool (ECT)** is to verify and create NETCONF files.

**Important to include definition of Maintenance user at Autointegration as it is not possible to add the first maintenance user later**.

**Tabell** 1

|  |  |  |
| --- | --- | --- |
| **Item** | **File Type** | **Type of Data** |
| 1 | RBS summary file | Paths to the files used for the integration. |
| 2 | Site equipment file | For configuration of node equipment. |
| 3 | Site basic file | For security management, system management, and transport network configuration. |
| 4 | Upgrade package (UP) | For installation of node software |
| 5 | License key file | License keys for node features, optional |

**Example of RbsSummaryFile.xml to be used for scratch install:**

*<summary:AutoIntegrationRbsSummaryFile*

*xmlns:summary="*[*http://www.ericsson.se/RbsSummaryFileSchema*](http://www.ericsson.se/RbsSummaryFileSchema)*"*

*xmlns:xsi="*[*http://www.w3.org/2001/XMLSchema-instance*](http://www.w3.org/2001/XMLSchema-instance)*"*

*xsi:schemaLocation="*[*http://www.ericsson.se/RbsSummaryFileSchemaSummaryFile.xsd*](http://www.ericsson.se/RbsSummaryFileSchemaSummaryFile.xsd)*">*

*<Format revision="F"/>*

*<ConfigurationFiles*

*siteBasicFilePath="site\_basic.xml"*

*siteEquipmentFilePath="site\_equipment.xml"*

*upgradePackageFilePath="upgrade\_package.zip"*

*initialSecurityConfigurationFilePath="ForIPsec\_path"*

*licensingKeyFilePath="key.xml"/>*

*</summary:AutoIntegrationRbsSummaryFile>*

**Example of RbsSummaryFile.xml to be used to restore a node with a backup after node is scratched (Emergency restore in CPP based G1):**

*<summary:AutoIntegrationRbsSummaryFile*

*xmlns:summary="*[*http://www.ericsson.se/RbsSummaryFileSchema*](http://www.ericsson.se/RbsSummaryFileSchema)*"*

*xmlns:xsi="*[*http://www.w3.org/2001/XMLSchema-instance*](http://www.w3.org/2001/XMLSchema-instance)*"*

*xsi:schemaLocation="*[*http://www.ericsson.se/RbsSummaryFileSchemaSummaryFile.xsd*](http://www.ericsson.se/RbsSummaryFileSchemaSummaryFile.xsd)*">*

*<Format revision="F"/>*

*<ConfigurationFiles*

*backupFilePath="backup\_file"*

*upgradePackageFilePath="upgrade\_package.zip"/>*

*</summary:AutoIntegrationRbsSummaryFile>*

**Site Basic File**

The purpose of the Site Basic File is to set the attributes defining security management, system management, and transport network configuration. For more information, see Manage Security, Manage Transport Network, and Manage Licenses.

**Note:**

The first maintenance user MUST be added during integration. The maintenance user enables emergency access to the node. Additional maintenance users can be configured after the integration. If no maintenance user is set, it is NOT possible to configure a maintenance user after the integration.

The maintenance user configuration is part of the Site Basic File. A maintenance user can be configured for a TLS client or an SSH client log on, or both. For TLS client log on, a trusted certificate and node credentials are needed. For SSH client log on user name and password are needed. Use a TLS client if possible for the maintenance user log on. If not, the SSH client is acceptable.

For information on how to configure the maintenance user role.

The following MOs are configured in *Site Basic File.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Part to Configure** | **MO Class** | **Part to Configure** | **MO Class** |
| Ethernet port for OAMconnection. | EthernetPort | Create at least one maintenance user. | MaintenanceUser |
| VLAN for OAMconnection. | VlanPort | Network Time Protocol Server to get time-of-day for log-files and performance management Result Output Period file. | NtpServer |
| IP interface address forOAMconnection. | AddressIPv4 | SNMP client information to get alarms and alerts from the node. | Snmp |
| Static route. | DST  NextHop | Reference to Transport IPaddress used for OAMtraffic. | OamAccessPoint |
| IP address of a Domain Name Server. | DnsClient | Netconf over Transport Layer Security. | NetconfTLS |
| Certificate enrollment preparation. | EnrollmentAuthority  EnrollmentServerGroup  EnrollmentServer  NodeCredential | License management fingerprint. | Lm |
| Trusted certificates. | CertM | A unique managed element id. | ManagedElement |
| Node credentials enrollment. | NodeCredential | LDAP server information needed for authentication and authorization. | Ldap |
| Trust categories for trusted certificates. | TrustCategory | LDAPauthentication method. | LdapAuthenticationMethod |

## LMT integration, on-site configuration

In this type of integration, the upgrade package and the configuration files are fetched from a LMT connected PC.

A board is running the Network Loader (initial software) when a board comes directly from production, when a severe software error in the upgrade package caused an escalation down to Network Loader or if the operator uses the emergency access GUI and performs a board restore.

Network Loader has the auto-integration GUI and the operator connects to the auto-integration GUI using a LMT connected PC via https.

**After preparing the RbsSummaryFile.xml file, the following procedure can be used to integrate the node according to CPI “Manage Integration”.**

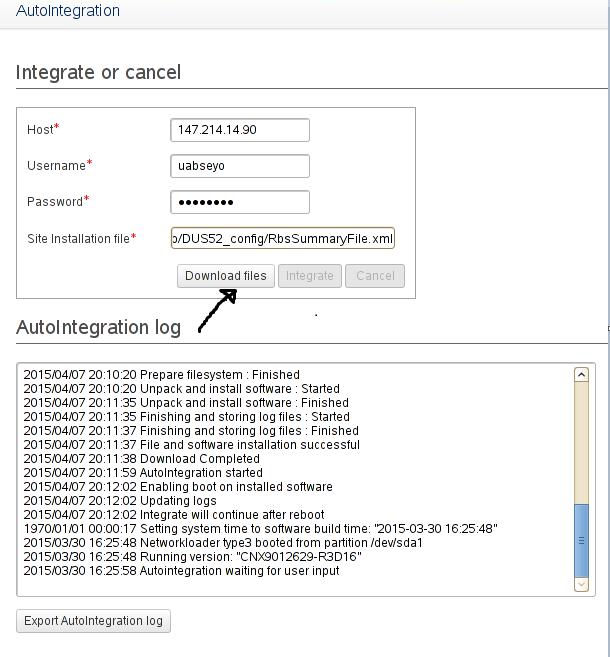
1. Connect the computer to the LMT port.
2. Start a web browser.
3. Disable any proxies in the web browser.
4. Enter the address of the Autointegration web GUI:

* https://169.254.2.2

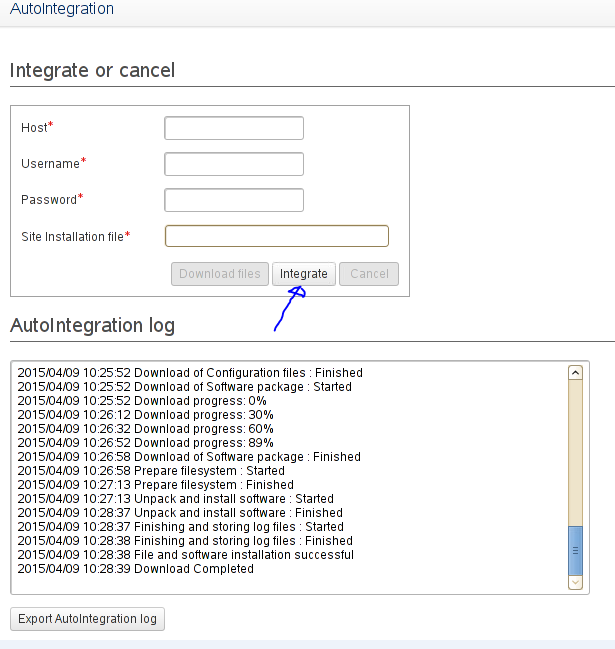
1. Enter the SFTP server IP address where the configuration files are located in the **Host** text field.

**Note:**The SFTP server IP address must be on the same subnet as the node LMT port. For example, the SFTP server IP address can be 169.254.2.1.

1. Enter the SFTP server username in the **Username** text field.
2. Enter the SFTP server password in the **Password** text field.
3. Enter the SFTP server file path for the RBS summary file in the **RBS summary file** text field.
4. Click on the **Download files** button to start integration. The upgrade package and the configuration files are downloaded and the upgrade depackage is installed.



1. When the board is up, Click on the **Integrate** button. (you might need to refresh the browser before you can use this button).



The board is rebooted. Wait until the operational optical indicator is On. This indicates that the on-site part of the integration is finished. If the operational optical indicator is not On or flashing, check the integration status in the Emergency Access (EA) interface.

When the node is up, the result can be inspected in the Autointegration log.

**[Fault Handling](http://cpistore.internal.ericsson.com/alexserv?ID=5841&DB=50078-en_lzn7931020_r1c.alx&FN=45_1553-LZA7016014Uen.A.html&SL=EN/LZN7931000R1B&PA=Prepare+Configuration+Files&ST=ADVSEARCH" \l "TOP)**

If there is a configuration file error and 2 hours has passed without a successful logon, the node is reset to initial start state and an Ericsson Support Information (ESI) package is generated.

The EA interface can also be used to manually set the node to the initial start state before 2 hours has passed.

**Note:**

If several Restore Board actions are triggered in a row, the logs are deleted.

## Zero touch integration, off-site pre-configuration

The purpose of this type of integration is for the operator to be able to prepare a board with upgrade package and configuration files at warehouse before sending out the board to site. It is using the same procedures as “LMT integration, on-site configuration“ steps 1-9. The operator perform step 1-9 at the warehouse and sends the board to site. The integration is continued with steps 10 and 11 at site.

## RAN integration

Durin AI, certificate enrollment is performed, looking up

address in DNS and time is set using NTP.

Now the node has a connection to OSS from

where the final configuration is pushed to target.

# Performance measurement

* The way of working with PM counters and PM events in OSS is the same as before.
* Definition of counters are no longer MO attributes, but are now MO instances of MO **MeasurementType**.
* PM Events for Cell Trace are now visible in the MIB in similar way as for PM counters
* The format of the ROP file has changed to comply to later 3GPP release (Rel 10.0)
* New ECLI command, “show-counters” to show real time values of counters

For each PmGroup MO a “measurementType” MO is created for each counter. Applications define their PmGroups in an Appdata-file which is read and parsed by RCS at initialization time. PM Jobs that are created by the applications are called pre-defined PmJobs. Pre-defined jobs may not be removed by an operator, but only started and stopped.

For statistical counters, the Granularity Period and the Reporting Period are both fixed to 15 minutes. All periods are tied to wall-clock time and starts on the hour. This means that collection of counters is done from HH:00 to HH:15, from HH:15 to HH:30 and so on, where HH represents hours 00 to 23.

The PM-file name and format is standardized by 3GPP and it is a zipped xml format. The ROP-files are stored on disc. The files are stored up to 24 hours on the node.

The network management system collects the ROP-files using the SFTP.).

Exampel:

*> pmom InterfaceIPv6*

*##########################################################################*

*MO Class Pm Counters*

*##########################################################################*

*RtnL3InterfaceIPv6.InterfaceIPv6 28*

*ipIfStatsHCInDelivers*

*ipIfStatsHCInForwDatagrams*

*ipIfStatsHCInMcastOctets*

*ipIfStatsHCInMcastPkts*

*ipIfStatsHCInOctets*

*ipIfStatsHCInReceives*

*ipIfStatsHCOutForwDatagrams*

*ipIfStatsHCOutMcastOctets*

*ipIfStatsHCOutMcastPkts*

*ipIfStatsHCOutOctets*

*ipIfStatsHCOutRequests*

*ipIfStatsHCOutTransmits*

*ipIfStatsInAddrErrors*

*ipIfStatsInBlackHoles*

*ipIfStatsInDiscards*

*ipIfStatsInHdrErrors*

*ipIfStatsInNoRoutes*

*ipIfStatsInSrcAddrErrors*

*ipIfStatsInTruncatedPkts*

*ipIfStatsInUnknownProtos*

*ipIfStatsOutDiscards*

*ipIfStatsOutFragCreates*

*ipIfStatsOutFragFails*

*ipIfStatsOutFragOKs*

*ipIfStatsOutFragReqds*

*ipIfStatsReasmFails*

*ipIfStatsReasmOKs*

*ipIfStatsReasmReqds*

*> pcr MyscannerTest InterfaceIPv6*

*Creating PmJob and 28 MeasurementReader MOs. Please wait...*

*>>> PmJobId: 819*

*10.68.96.216> lpr MyscannerTest*

*Proxy MO*

*========================================================================*

*819 SystemFunctions=1,Pm=1,PmJob=MyscannerTest*

*820 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=42*

*821 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=43*

*822 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=44*

*823 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=45*

*824 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=46*

*825 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=47*

*826 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=48*

*827 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=49*

*828 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=50*

*829 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=51*

*830 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=52*

*831 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=53*

*832 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=54*

*833 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=55*

*834 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=56*

*835 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=57*

*836 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=58*

*837 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=59*

*838 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=60*

*839 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=61*

*840 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=62*

*841 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=63*

*842 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=64*

*843 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=65*

*844 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=66*

*845 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=67*

*846 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=68*

*847 SystemFunctions=1,Pm=1,PmJob=MyscannerTest,MeasurementReader=69*

*===================================================================*

*Total: 29 MOs*

*> pgets MyscannerTest*

*=====================================================================*

*819 PmJob=MyscannerTest ACTIVE ACTIVE 900 28*

*=====================================================================*

*InterfaceIPv6 28 ipIfStatsHCInDelivers*

*ipIfStatsHCInForwDatagrams*

*ipIfStatsHCInMcastOctets*

*ipIfStatsHCInMcastPkts*

*ipIfStatsHCInOctets*

*ipIfStatsHCInReceives*

*ipIfStatsHCOutForwDatagrams*

*ipIfStatsHCOutMcastOctets*

*ipIfStatsHCOutMcastPkts*

*ipIfStatsHCOutOctets*

*ipIfStatsHCOutRequests*

*ipIfStatsHCOutTransmits*

*ipIfStatsInAddrErrors*

*ipIfStatsInBlackHoles*

*ipIfStatsInDiscards*

*ipIfStatsInHdrErrors*

*ipIfStatsInNoRoutes*

*ipIfStatsInSrcAddrErrors*

*ipIfStatsInTruncatedPkts*

*ipIfStatsInUnknownProtos*

*ipIfStatsOutDiscards*

*ipIfStatsOutFragCreates*

*ipIfStatsOutFragFails*

*ipIfStatsOutFragOKs*

*ipIfStatsOutFragReqds*

*ipIfStatsReasmFails*

*ipIfStatsReasmOKs*

*ipIfStatsReasmReqds*

*========================================================================*

*>>> Total: 1 PmJobs*

*> pst*

*====================================================================================================*

*Proxy Job ReqState CurrState Granul nrRdrs/Evts*

*====================================================================================================*

*3426 PmJob=MyscannerTest ACTIVE ACTIVE 900 18*

**Print counter values from ROP files**

*> pmx . pmLicConnectedUsersDistr -m 5 -a*

*Report from 2015-08-14 07:30 UTC to 2015-08-14 12:29 UTC (20 ropfiles)*

*Node SW: CXP9024418\_1 R16ZK ()*

*Start Time: 2015-08-14 07:30:00 End Time: 2015-08-14 12:15:00*

*Object Counter*

*ManagedElement=1,ENodeBFunction=1 pmLicConnectedUsersDistr 18000,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0*

**Print realtime counter values**

*> pget VlanPort=TN\_C\_VLAN1*

*======================================================================*

*MO Attribute Value*

*======================================================================*

*VlanPort=TN\_C\_VLAN1 ifHCInBroadcastPkts 0*

*VlanPort=TN\_C\_VLAN1 ifHCInMulticastPkts 0*

*VlanPort=TN\_C\_VLAN1 ifHCInOctets 237293497644*

*VlanPort=TN\_C\_VLAN1 ifHCInUcastPkts 489375432*

*VlanPort=TN\_C\_VLAN1 ifHCOutBroadcastPkts 1*

*VlanPort=TN\_C\_VLAN1 ifHCOutMulticastPkts 0*

*VlanPort=TN\_C\_VLAN1 ifHCOutOctets 130261340135*

*VlanPort=TN\_C\_VLAN1 ifHCOutUcastPkts 347651792*

*VlanPort=TN\_C\_VLAN1 ifInDiscards 0*

*VlanPort=TN\_C\_VLAN1 ifInUnknownProtos 0*

*VlanPort=TN\_C\_VLAN1 ifOutDiscards 0*

**Print non-zero unicast packets that are requested to be transmitted in 30 seconds**

*> uv pm\_wait*

*pm\_wait = 30*

*Added 2 MOs to group: pdiff\_group*

*> pdiff VlanPort= ifHCOutUcastPkts !^0*

*waiting 29 seconds before next check...*

*.*

*===============================================================================================*

*MO Counter DiffValue*

*================================================================================================*

*VlanPort=TN\_A\_IPSEC ifHCOutUcastPkts N/A*

*VlanPort=TN\_A\_VLAN1 ifHCOutUcastPkts 8276*

*VlanPort=TN\_A\_VLAN2 ifHCOutUcastPkts 127405*

*VlanPort=TN\_B\_IPSEC ifHCOutUcastPkts N/A*

*VlanPort=TN\_B\_VLAN1 ifHCOutUcastPkts 3001892*

*VlanPort=TN\_B\_VLAN2 ifHCOutUcastPkts 1070641*

*VlanPort=TN\_C\_VLAN1 ifHCOutUcastPkts 1294379*

*VlanPort=TN\_C\_VLAN2 ifHCOutUcastPkts 120040*

*===============================================================================================*

# MoM

In G2 there are many MoM fragment files called schemas as compared to One Mom file in G1

*> pv mom*

*$comtopmomversion = ComTop\_10.20.0*

*$momfile = /home/xxxxx/moshell/jarxml/MSRBS\_NODE\_MODEL\_299.28678.61\_34b9.xml.gz <-***full path of the concatenated MOM file**

*$momparts[01] = ComFm\_12.0.0 (ECIM\_FM\_4.0.0)*

*$momparts[02] = ComLocalAuthorization\_11.2.0\_0 (ECIM\_Local\_Authorization\_2.2.0)*

*$momparts[03] = ComSecM\_11.1.0\_0 (ECIM\_Security\_Management\_2.1.0)*

*$momparts[04] = ComTop\_10.20.0 (ECIM\_Top\_2.2.0)*

*$momparts[05] = Grat\_2.5.0\_0*

*$momparts[06] = LratBb\_1.7101.0\_R6A03*

*$momparts[07] = LratMce\_1.7032.1\_R5C04*

*$momparts[08] = LratMp\_1.7101.0\_R6A03*

*$momparts[09] = Lrat\_1.7101.0\_R6A03*

*$momparts[100] = RtnRoutesStaticRouteIPv4\_4.3.2 (ECIM\_T\_Routes\_StaticRouteIPv4\_1.1.0)*

.

*.*

*.*

*$momversion = MSRBS\_NODE\_MODEL\_299.28678.61\_34b9 <* **contains the name of the concatenated MOM file**

$momparts is a hashtable that contains the list of MOMs stored within the concatenated MOM file. If the MOM has a ECIM extension then it is shown in brackets.

*MSRBSV2> hget schema= ^(ident|version)*

*===================================================================================*

*MO Identifier version*

*===================================================================================*

*SysM=1,Schema=ComFm ComFm 12.0.0*

*SysM=1,Schema=ComLocalAuthorization ComLocalAuthorization 11.1.0*

*SysM=1,Schema=ComSecM ComSecM 11.1.0*

*SysM=1,Schema=ComSnmp ComSnmp 10.11.1*

*SysM=1,Schema=ComSysM ComSysM 3.2.1001*

*SysM=1,Schema=ComTop ComTop 10.10.1*

*SysM=1,Schema=Grat Grat 2.0.0*

*SysM=1,Schema=Lrat Lrat 1.7032.2*

*SysM=1,Schema=LratBb LratBb 1.7032.1*

*SysM=1,Schema=LratMce LratMce 1.7032.1*

*SysM=1,Schema=LratMp LratMp 1.7032.1*

*SysM=1,Schema=RcsBrM RcsBrM 1.2.2*

*.*

*.*

*10.68.96.13> mom BrmBackupManager .*

*#########################################################################################################*

*MO Class Attribute Type Flags*

*##########################################################################################################*

*RcsBrM.BrmBackupManager backupDomain string readOnly*

*------------------------------------------------------------------------------------------------------------------------------------*

*Backup domain, for example System.*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*RcsBrM.BrmBackupManager backupType string readOnly*

*------------------------------------------------------------------------------------------------------------------------------------*

*Type of backup, for example System Data or User Data.*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*RcsBrM.BrmBackupManager brmBackupManagerId string key,noNotification*

*------------------------------------------------------------------------------------------------------------------------------------*

*The value component of the RDN.*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*RcsBrM.BrmBackupManager progressReport structRef:RcsBrM.AsyncActionProgress isNillable,readOnly*

*------------------------------------------------------------------------------------------------------------------------------------*

*Represents the progress report and final result of the ongoing (asynchronous) action, for example createBackup.*

*This MO supports only one action to be executed at a time.*

*isNillable: true*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*Total: 1 MOs, 4 attributes*

*############################################################################################################*

*MO Class Action ReturnType Parameters*

*###########################################################################################################*

*RcsBrM.BrmBackupManager cancelCurrentAction derivedRef:RcsBrM.ActionInvocationResult 0*

*------------------------------------------------------------------------------------------------------------------------------------*

*Cancel an ongoing asynchronous createBackup, deleteBackup, or importBackup operation.*

*ReturnType: derivedRef:RcsBrM.ActionInvocationResult*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*RcsBrM.BrmBackupManager createBackup derivedRef:RcsBrM.ActionInvocationResult 1:name:string*

*------------------------------------------------------------------------------------------------------------------------------------*

*Create a new backup of the backupType and backupDomain managed by this BackupManager.*

*This is an asynchronous action - the progress and result are reported in the progressReport attribute.*

*ReturnType: derivedRef:RcsBrM.ActionInvocationResult*

*Parameter 1: name (string). The name of the backup to create.*

*If specified, input name validation is done by the implementation to forbid illegal names. Backup name validation rules are defined by the implementation and include duplicate backup names, names exceeding maximum allowed length, etc.*

*If not specified, the implementation will generate a backup name automatically with format defined by the implementation, example: <managedElementId>\_<YYYY-MM-DDThh-mm-ss>.*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*RcsBrM.BrmBackupManager deleteBackup derivedRef:RcsBrM.ActionInvocationResult 1:name:string*

*------------------------------------------------------------------------------------------------------------------------------------*

*Delete a backup specified by its name and the backupType and backupDomain managed by this BackupManager.*

*This is an asynchronous action. The progress and result are reported in the progressReport attribute.*

*ReturnType: derivedRef:RcsBrM.ActionInvocationResult*

*Parameter 1: name (string). The name of the backup to delete.*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*RcsBrM.BrmBackupManager importBackup derivedRef:RcsBrM.ActionInvocationResult 2:uri:password:string:derivedRef-RcsBrM.EcimPasswordString*

*------------------------------------------------------------------------------------------------------------------------------------*

*Import a backup using the specified resource identifier (uri).*

*This is an asynchronous action where the progress and result are reported in the progressReport attribute. Note that the type and domain of the backup to be imported must match the backup type and domain indicated by the instance of the backup manager on which this action is invoked.*

*ReturnType: derivedRef:RcsBrM.ActionInvocationResult*

*Parameter 1: uri (string). Specifies the location (url) of the backup to import or the resource name (urn) that encapsulates the backup import procedure.*

*Parameter 2: password (derivedRef-RcsBrM.EcimPasswordString). The password required to access the location specified by the uri.*

*If no password is required, this parameter may be omitted.*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

# Alarm handling

Alarm & alert log – Alarm and alert log contains alarm/alerts issued and cleared from the network element. The alarms and alerts are are logged in one log-file for the Managed Element .

Alarm subscription is set up by **external management system through SNMP configuration and alarm events are pushed to external management system which has set up an alarm subscription**. Heartbeats are sent regularly to indicate that AAL(active alarm list) changes. All alarm events are also logged to the system log service. External management systems are then able to retrieve alarm event history.

Alarm types are introduced by Appdata (metadata used during upgrade).

An alarm type is characterized by the following:

* Alarm types are uniquely identified by two key values: majorAlarmType, and minorAlarmType
* An alarm type always maps to an eventType, probableCause, specificProblem and defaultSeverity (i.e. these alarm parameters are always the same for a given alarm type).
* An alarm type can be assigned an operator defined severity (configuredSeverity) different from the defaultSeverity.
* Different MO classes (and instances) can share alarm types.
* Alarm type specific problem shall always be used to as key for lookups of alarm OPI.

**Alarm Filtering**

* If the MO re-raise the alarm within 2 sec from being ceased – no alarm cease notification is sent out.
* If the MO cease the alarm within 2 s from being raised – no alarm notification is sent out.

**A consequence of the transient filter is that both alarm raise and alarm cease is always delayed by 2 s relative to the Alarm Raise or Cease issued by the MO**.

* An alarm is considered "toggling" if it has been raised 3 times in the last 60 s, with alarm cease in between.
* The 3rd raise causes an SNMP trap to be sent out with the text " The alarm is currently toggling."
* Once the alarm has been deemed toggling there will be no more alarm raise sent out until an alarm cease notification occurred followed by 180 s of no further notifications: An alarm cease is then sent out and the toggling condition is ended.

**Characteristics**

* AAL size - It is no limit set for the AAL size.
* Alarm Log size - The alarm log size is 4 MB is and is a rotating log
* Alarm Throughput - 50 alarm per minute. The alarm service itself it not the limiting factor, but the O&M link and node processing capacity.
* Number of alarm subscriptions (SNMP) - 5 clients subscribing for SNMP alarm notification

**Some comparison to G1 CPP based RBS**

Each active alarm is represented by a system-created MO instance of type "FmAlarm", thus it is possible to view the active alarms by listing the FmAlarm MOs (“al” command in moshell). The Alarm log(alarm history) which is located under /rcs/saf\_log/saLogAlarm/ can be exported from the AlarmLog MO (“lgar” command in moshell).

# Log management

Some Logs are present in the system by default. Logs can also be added by means of meta data in a log registration file and/or on request by a log client during runtime. The Log Service follows the standard specification provided by Service Availability (SA) Forum,

There are two types of behavior for Log;

* Halt  
  The repository for a halt log comprises a single file. When a halt log becomes full, no more records can be inserted into the log. The records remain in the log for the life time of the log unless the log is exported. In that case the log is emptied and new records can be inserted into the log.
* Rotation  
  The repository for a rotation log comprises a set of files. When a file becomes full, the next empty file in order will be used to log next record. When logging is started in the last empty file, a new empty file is created and the oldest used file is

A Log can be exported to a specified server either manually on request from Operator. It is also possible to manually export all Logs as an Ericsson Support Information (ESI) package.

## Log streaming

A Log can be transferred automatically by a push log mechanism within the Log Service if the feature [Real-Time Security Event Logging](http://cpistore.internal.ericsson.com/alexserv?ac=LINKEXT&li=EN/LZN7930001R2A&FN=124_22104-LZA7016014Uen.C.html) is activated. The streaming is done in a standardized way from the node to an external Syslog server, compliant with the standard RFC5424 (Syslog).

The behavior of the mechanism can be configured per Log. Two alternatives are possible to select. **One alternative implies a transfer of each log file that becomes full. The other alternative implies a transfer of each Log Record that is logged.**  
The push log mechanism can be associated with the Log only if the Log is represented with MO-Log. The push log mechanism is represented with MO-LogPushTransfer and is created as a child to MO-Log.

See [Log handling](http://cpistore.internal.ericsson.com/alexserv?ac=LINKEXT&li=EN/LZN7931020R1C&FB=1a|1ff&FC=zC_931020R1&fn=15_1553-LZA7016014Uen.C.html&SL=EN/LZN7931000R1B) on how to configure the push log mechanism.

At the server side, a proper syslog daemon must be running to collect the logs. UDP and TCP/TLS is supported for this. Example below is for UDP.

On such program is "syslog-ng". Example configuration file (syslog-ng.conf):

*@version: 3.5.6*

*options {*

*use\_dns(no);*

*sync(0);*

*};*

*source network { udp(); };*

*destination logfiles {*

*file ("/var/log/remote/${FULLHOST}/${FULLHOST}.log"*

*owner(root) group(root) perm(0644) dir\_perm(0755) create\_dirs(yes)) ;*

*};*

*log {*

*source(network);*

*destination(logfiles);*

*};*

Please note that configuration of the server can be done in many ways, and example below might not be optimal. In this example each RBS get its own directory with own logfile.

Exampel of LogPushTransfer config in the node for SecurityLog and AuditTrailLog:

*===================================================================================================*

*1850                                 SystemFunctions=1,LogM=1,Log=AuditTrailLog,LogPushTransfer=1*

*===================================================================================================*

*availabilityStatus                   i[0] =*

*logPushTransferId                    1*

*operationalState                     1 (ENABLED)*

*password                             Struct{2}*

*>>> 1.cleartext = true*

*>>> 2.password =*

*transferType                         1 (STREAM)*

*uri                                  syslog://10.68.96.230*

*================================================================================================*

*1852                                 SystemFunctions=1,LogM=1,Log=SecurityLog,LogPushTransfer=1*

*===============================================================================================*

*availabilityStatus                   i[0] =*

*logPushTransferId                    1*

*operationalState                     1 (ENABLED)*

*password                             Struct{2}*

*>>> 1.cleartext = true*

*>>> 2.password =*

*transferType                         1 (STREAM)*

*uri                                  syslog://10.68.96.230*

*===============================================================================================*

*MO                           description                      featureState*

*===================================================================================================*

*Lm=1,FeatureState=CXC4040010 Real Time Security Event Logging 1 (ACTIVATED)*

The Log fragment is an addition to ECIM and contains the following MOs.

* MO-LogM (created by system)
* MO-Log (created by system via the appdata)
* MO-LogPushTransfer

TnApplicationLog , TnNetworkLog , SwmLog, SecurityLog, AuditTrailLog, AlarmLog and AiLog can be exported outside the node separately .

## ESI package Logs

|  |  |  |
| --- | --- | --- |
| **LOG name** | **Purpose** | **Node Path Location** |
| syslog | standard Linux log for user space and contains info from Linux programs as well as EE programs | /var/log/ |
| auth.log | LDAP log | /var/auth.log |
| llog | RestartReason – Program , board crashes | /var/log/llog/ |
| capilog |  | /var/log/capilog |
| Swm logs | SW inventory, database backup.. | /rcs/swm/esi/ |
| sftp | ROP files |  |
| sasl |  |  |
| saLogSystem | Mandatory for SAF LOG. "best of AVLI". System events from MW(e.g. Escalations, active/stdby move, node down). | /rcs/saf\_log/saLogSystem/ |
| saLogLarm (SAF) | node alarm state changes and node alerts | /rcs/saf\_log/saLogAlarm/ |
| saLogNotification (SAF) |  | /rcs/saf\_log/saLogNotification/ |
| saLogUpgrade |  | /rcs/saf\_log/saLogUpgrade |
| TnApplicationLog | Any kind of TN application issue | /rcs/saf\_log/TnApplicationLog/ |
| TnNetworkLog | Any kind of port issue | /rcs/saf\_log/TnNetworkLog/ |

|  |  |  |
| --- | --- | --- |
| networkloader | AutoIntegration events |  |
| TriLog | Trace and error (”te log”) | /rcs/log/TriLog/ |
| SWM | Upgrade, backup/restore. For external customer | /rcs/log/SwmLog/ |
| SWM internal | For CS debug | /rcs/log/SwmInternal/ |
| SecurityLog | RBS node Security violations | /rcs/log/SecurityLog/ |
| RcsPmEvents | RBS Pm events | /rcs/log/RcsPmEvents/ |
| RcsPmCounters | RCS counters | /rcs/log/RcsPmCounters/ |
| NotificationLog | The Log is used to log ntf events. | /rcs/log/NotificationLog/ |
| MMILog | Led status history | /rcs/log/MMILog |
| LicensingLog | Licensing issues | /rcs/log/LicensingLog/ |
| ComInterfaceLog | For CS debug | /rcs/log/ComInterfaceLog |
| AuditTrailLog | All operator commands logged (netconf, COMCLI & EMCLI) | /rcs/log/AuditTrailLog/ |
| AiLog | Autointegration log | /rcs/log/AiLog |
| applicationlogs | GRAT, LRAT, WRAT, TN, EMCLITOOL,BBI, AIS, XRUS, RICM etc. | /rcs/applicationlogs |
| AvailabilityLog (AVLI) | node Availability ISP LOG - for ISP Analysis | /rcs/alh/ |

|  |  |  |
| --- | --- | --- |
| licensekey.xml | License issues | /rcs/lma |
| erlang | Start up logs for MW and dump av database (mnesia) | /rcs/erlang/ |
| dumps | Post Mortem Dumps. Crashes, Core, kernel, llog etc | /rcs/dumps |
| db | Mnesia database log? | /rcs/db |
| comte | O&M issues, e.g. commit failures | /rcs/comte/ |
| applicationlogs | COM Alarm log, COM Trace log, com log | /rcs/comte/ |
| ee\_esi.log | HW faults | /tmp/ee\_esi/ee\_esi.log |

* llog containes around 100 entrys.
* T&E log for G2 is 65kB\*8 /CPU. Ex. DUS 52 containes 12 CPUs and thus around 6MB

One or more logs which is part of the ESI log can be prased by Amos/moshell using the “lg” command. The exportEsi action is run on th logM MO, put on the /tmp folder of the server specified by the env. Variable “export\_server” and displayed on the screen after parsing.

*ESI log filters (RCS):*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*The ESI (Ericsson Support Information) log filter is specified with "-x <filter>" in the command "lgk" on RCS nodes (TCU03/DUSgen2), to specify the type of logs that will be displayed.*

*The XB log filter shall be given as a combination of one or more of the following strings, separated by commas:*

*- 1) ai : rcs/log/AiLog/AiLog.\**

*- 2) al : rcs/saf\_log/saLogAlarm/saLogAlarm\_\*\_\_\*.log*

*- 3) a\_t : rcs/log/AuditTrailLog/AuditTrailLog.\* (MO part)*

*- 4) atr : rcs/log/AuditTrailLog/AuditTrailLog.\* (COLI part)*

*- 5) capi : cpu\_load.log*

*- 6) com : rcs/comte/com.log.\**

*- 7) coma : rcs/comte/com\_alarm.log.\**

*- 8) comi : rcs/log/ComInterfaceLog/ComInterfaceLog.\**

*- 9) erl : rcs/bootlogs/erlang.log.1 AND rcs/erlang/erlang.log.\**

*- 10) ev : rcs/log/NotificationLog/NotificationLog.\**

*- 11) lic : rcs/log/LicensingLog/LicensingLog.\**

*- 12) ltt : rcs/log/LttngLog/LttngLog.\**

*- 13) mmi : rcs/log/MMILog/MMILog.\**

*- 14) nl : rcs/bootlogs/nl\_log.\* and rcs/networkloader/nl\_log.\**

*- 15) notif : rcs/saf\_log/saLogNotification/saLogNotification\_\*\_\_\*.log*

*- 16) pnp : rcs/saf\_log/PnpApplicationLog/PnpApplicationLog\_\*\_\_\*.log*

*- 17) sys : rcs/saf\_log/saLogSystem/saLogSystem\_\*\_\_\*.log*

*- 18) sec : rcs/log/SecurityLog/SecurityLog.\**

*- 19) swmi : rcs/log/SwmInternal/SwmInternal.\**

*- 20) tnapp : rcs/saf\_log/TnApplicationLog/TnApplicationLog\_\*\_\_\*.log*

*- 21) tnnet : rcs/saf\_log/TnNetworkLog/TnNetworkLog\_\*\_\_\*.log*

*- 22) tri : rcs/log/TriLog/TriLog.\**

*- 23) swm : rcs/log/SwmLog/SwmLog.\**

*- 24) upg : rcs/saf\_log/saLogUpgrade/upgrade\_\*\_\_\*.log*

*- 25) pmc : rcs/log/RcsPmCounters/RcsPmCounters.\**

*- 26) pmev : rcs/log/RcsPmEvents/RcsPmEvents.1*

*- 27) syslog: var/log/syslog*

*- 28) llog : var/log/llog/llog*

*- 29) hw : tmp/ee\_esi/ee\_esi.log*

*Example:*

*>> lgk -x coma,erl,tri --> show the log entries from com\_alarm.log, erlang.log and TriLog in the ESI*

*>> lgk -x 7,9,22 --> same as above*

*>> lgkm -x 2-4,7 --> show the log entries from saLogAlarm, com\_alarm, and AuditTrail (both MO and COLI parts), and merge them chronologically*

# Synchronization

The functions supported in network synchronization are:

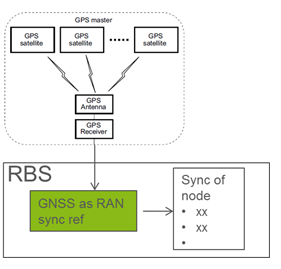
* Time synchronization to GNSS.
* Frequency synchronization using NTP.
* Frequency synchronization to 1PPS.
* Synchronous Ethernet.
* Quality level management.

For more information on GNSS, see GNSS as RAN Synchronization Reference.

For more information on NTP, see [NTP as RAN Synchronization Reference](http://cpistore.internal.ericsson.com/alexserv?ID=9204&fn=168_22104-LZA7016014Uen.PA7.html).

For more information on Synchronous Ethernet (SyncE) see [Synchronous Ethernet](http://cpistore.internal.ericsson.com/alexserv?ID=9204&fn=12_22104-LZA7016014Uen.B.html).

For more information on quality level management, see [SyncE Quality Supervision](http://cpistore.internal.ericsson.com/alexserv?ID=9204&fn=18_22104-LZA7016014Uen.PC1.html).



Figur 10. Exampel of GNSS sync

The network synchronization functionality of the Multistandard RBS and the Baseband T is the same. The difference is that the Multistandard RBS synchronizes its radio interface and its transmission outputs, while the Baseband T only supports the later.

***> lpr Synchronization=1***

*========================================================*

*Proxy MO*

*======================================================*

*6216 Transport=1,Synchronization=1*

*6217 Transport=1,Synchronization=1,RadioEquipmentClock=1*

*6218 Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=GPS*

*6219 Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=PTP*

*6220 Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=SyncE*

*6221 Transport=1,Synchronization=1,TimeSyncIO=GPS*

*6222 Transport=1,Synchronization=1,TimeSyncIO=GPS,GnssInfo=1*

*============================================================*

*>* ***get RadioEquipmentClock=1***

*=======================================================*

*6217 Transport=1,Synchronization=1,RadioEquipmentClock=1*

*===========================================================*

*clockOperQuality 1 (PRC)*

*clockSettledQuality 4 (SSU\_A\_OR\_TNC)*

*currentRadioClockReference Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=GPS*

*minQualityLevel Struct{3}*

*>>> 1.qualityLevelValueOptionI = 2 (SSU\_A)*

*>>> 2.qualityLevelValueOptionII = 2 (STU)*

*>>> 3.qualityLevelValueOptionIII = 1 (UNK)*

*nodeGroupRole 0 (NOT\_ACTIVATED\_AS\_NODE\_GROUP\_MEMBER)*

*radioClockPriorityTable [3] =*

*>>> radioClockPriorityTable = Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=GPS*

*>>> radioClockPriorityTable = Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=SyncE*

*>>> radioClockPriorityTable = Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=PTP*

*radioClockState 4 (TIME\_OFFSET\_LOCKED)*

*radioEquipmentClockId 1*

*selectionProcessMode 1 (QL\_ENABLED)*

*===============================================================*

*>* ***get RadioEquipmentClockReference=***

*===================================================*

*6218 Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=GPS*

*=============================================================*

*adminQualityLevel Struct{3}*

*>>> 1.qualityLevelValueOptionI = 2 (SSU\_A)*

*>>> 2.qualityLevelValueOptionII = 2 (STU)*

*>>> 3.qualityLevelValueOptionIII = 1 (UNK)*

*administrativeState 1 (UNLOCKED)*

*availabilityStatus i[0] =*

*encapsulation Synchronization=1,TimeSyncIO=GPS*

*holdOffTime 1000*

*operQualityLevel 1 (PRC)*

*operationalState 1 (ENABLED)*

*priority 1*

*radioEquipmentClockReferenceId GPS*

*receivedQualityLevel 1 (PRC)*

*referenceStatus 1 (NO\_FAULT)*

*syncRefType 7 (GNSS\_RECEIVER)*

*useQLFrom 1 (RECEIVED\_QL)*

*waitToRestoreTime 60*

*=================================================================*

*6219 Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=PTP*

*===================================================================*

*adminQualityLevel Struct{3}*

*>>> 1.qualityLevelValueOptionI = 2 (SSU\_A)*

*>>> 2.qualityLevelValueOptionII = 2 (STU)*

*>>> 3.qualityLevelValueOptionIII = 1 (UNK)*

*administrativeState 0 (LOCKED)*

*availabilityStatus i[3] = 1 9 5 (FAILED DEPENDENCY\_LOCKED DEPENDENCY)*

*encapsulation Ptp=1,BoundaryOrdinaryClock=1*

*holdOffTime 1000*

*operQualityLevel 1 (PRC)*

*operationalState 0 (DISABLED)*

*priority 3*

*radioEquipmentClockReferenceId PTP*

*receivedQualityLevel 1 (PRC)*

*referenceStatus 7 (PTP\_FAULT)*

*syncRefType 4 (PTP\_TIME)*

*useQLFrom 1 (RECEIVED\_QL)*

*waitToRestoreTime 60*

*========================================================*

*6220 Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=SyncE*

*=============================================================*

*adminQualityLevel Struct{3}*

*>>> 1.qualityLevelValueOptionI = 2 (SSU\_A)*

*>>> 2.qualityLevelValueOptionII = 2 (STU)*

*>>> 3.qualityLevelValueOptionIII = 1 (UNK)*

*administrativeState 0 (LOCKED)*

*availabilityStatus i[1] = 1 (FAILED)*

*encapsulation EthernetPort=TN\_B*

*holdOffTime 1000*

*operQualityLevel 13 (INV)*

*operationalState 0 (DISABLED)*

*priority 2*

*radioEquipmentClockReferenceId SyncE*

*receivedQualityLevel 13 (INV)*

*referenceStatus 4 (LOSS\_OF\_ESMC)*

*syncRefType 1 (SYNC\_E)*

*useQLFrom 1 (RECEIVED\_QL)*

*waitToRestoreTime 60*

*====================================================================*

> get TimeSyncIO=GPS

=========================================================================================

6221 Transport=1,Synchronization=1,TimeSyncIO=GPS

=============================================================================================

availabilityStatus i[0] =

compensationDelay 0

encapsulation FieldReplaceableUnit=1,SyncPort=1

operationalState 1 (ENABLED)

reservedBy [1] =

>>> reservedBy = Transport=1,Synchronization=1,RadioEquipmentClock=1,RadioEquipmentClockReference=GPS

timeSyncIOId GPS

timeSyncIOStatus 0 (NO\_FAULT)

==================================================================================================

Total: 1 MOs

> get TimeSyncIO=GPS,GnssInfo=1

============================================================================================

6222 Transport=1,Synchronization=1,TimeSyncIO=GPS,GnssInfo=1

===========================================================================================

altitude 51.40

gnssInfoId 1

gnssReceiverStatus 6 (SYNCHRONIZED)

hdop 0.00

latitude N 59 24.1335

longitude E 17 57.0977

noOfSatellitesInView 14

observationPointMode 2 (POSITION\_HOLD)

satelliteInformation t[14] =

>>> Struct[0] has 4 members:

>>> 1.azimuth = 261

>>> 2.elevation = 63

>>> 3.satelliteIdentity = 11

>>> 4.signalToNoiseRatio = 52

>>> Struct[1] has 4 members:

>>> 1.azimuth = 278

>>> 2.elevation = 51

>>> 3.satelliteIdentity = 1

>>> 4.signalToNoiseRatio = 52

>>> Struct[2] has 4 members:

>>> 1.azimuth = 196

>>> 2.elevation = 42

>>> 3.satelliteIdentity = 8

>>> 4.signalToNoiseRatio = 52

.

.

=========================================================================================

**Sync log in ESI:**

DUSG2:

rcs/applicationlogs/SYNC-DUSG2\_CXP9030859\_1/sync-dcg.log

TCU03:

/rcs/applicationlogs/SyncT\_CXP9032252\_1/ sync-dcg.log

**Sync related commands:**

/netsync/synccentral scspi info

/netsync/synclocal info all

**PTP specific:**

Attribute clockStatus from BoundaryOrdinaryClock MO will indicate current PTP status

Also check availabilityStatus/operationalStatus of RadioEquipmentClockReference MO when it encapsulates BoundaryOrdinaryClock

(in COLI shell): ptpLocalInfo all

Material for further reading:

[Architecture runaway](https://erilink.ericsson.se/eridoc/erl/objectId/09004cff86a2ca59?docno=23/0363-FCP1301402Uen&action=current&format=msw12)

[NDS Dual DU Sync, latest](https://erilink.ericsson.se/eridoc/erl/objectId/09004cff88fe9bc1?docno=8/10268-10/FCP1304300/15Uen&action=current&format=msw8)

[Use Case Realization Synchronization](https://erilink.ericsson.se/eridoc/erl/objectId/09004cff86a7f4f5?docno=30/15560-CSH103701Uen&action=current&format=pdf)

# Time management

Network Timing Protocol (NTP) is used to synchronize the time of day. The time of day is mainly used to get proper timestamps in logs. The core MP having must be configured by the operator to synchronize its local clock towards one or several NTP servers outside the node. The RBS node is using UTC and is not using time zone. This means that all logs will use UTC timestamps.

# License management

The purpose of License Management is to serve applications (License Users) in the same node with license keys that allow the applications to enable software features or limit capacity usage.

The license keys are contained in a License Key File (LKF). The LKF is valid for one specific node and contains a node fingerprint, which can be checked in the node. Each license key has a start date and a stop date, during the license is valid.

The license manager only takes care of the serving part. It checks the consistency of the LKF, such as the matching of node fingerprint and the validation of the PKI signature.

The way of working with licenses for baseband nodes is the same as for DU based nodes

## Fingerprint

The fingerprint is the node identity used for licensing purposes. The LKF is associated to a given unique fingerprint so that the given LKF can only be deployed on a specific node. At site installation, the operator configures the fingerprint onto the node. The fingerprint remains writable until the node has successfully downloaded a matching LKF. The operator ensures the fingerprint uniqueness. If the fingerprint does not match, no LKF can be downloaded which results in the node not being fully operational.

The fingerprint is the Unique Logical Name (ULN), which is a text string chosen and configured in the node by the operator.

The fingerprint in the LKF must match the node fingerprint where the licenses are to be installed.

Attribute fingerprint of **MO**[**Lm**](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.342.html) shows the node fingerprint.

**Note:**

The fingerprint cannot be changed after the LKF is installed.

## License key File

The LKF contains the License Keys that enable functionality for one specific node and is a readable text file in XML format. One node can have only one LKF. If new license keys are added to the node or license keys are changed in any way, a new LKF must be installed.

A valid LKF must have a sequence number equal to or greater than the sequence number on the latest installed LKF, identified by attribute [sequenceNumber](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.375.html" \l "sequenceNumber) of MO [KeyFileInformation](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.375.html).

The part of the LKF that contains the license keys and information about the node is protected by a digital signature. To prevent misuse, the digital signature is contained in the file. The LKFs are supplied by Ericsson.

Each licensed feature is represented by an entry in the LKF with the following characteristics, marked by XML tags:

* **featureKey id** - the license key of the respective feature. This is a unique code for each feature, for example CXC4010912.
* **description** - the feature name.
* **start and stop** - define the beginning and the end of the license validity period. The length of the license validity period is based on the commercial order criteria.

Each capacity license is represented by an entry in the LKF with the following characteristics, marked by XML tags:

* **capacityKey id** - the license key of the respective capacity feature. This is a unique code for each feature, for example CXC4011022.
* **capacity** - the value of the capacity.
* **description** - the feature name.
* **start and stop** - define the beginning and the end of the license validity period. The length of the license validity period is based on the commercial order criteria.

As a result of the LKF installation, **MO Lm** and MO **KeyFileInformation** is updated to reflect the new license information.  The alarm “**License Key Not Available**” is raised for feature licenses when attribute **featureState** of MO [**FeatureState**](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.407.html) is set to **ACTIVATED** and a valid license key don't exist.

**Exampel of licence Key file:**

*<?xml version="1.0" encoding="UTF-8"?>*

*<licFile xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">*

*<body formatVersion="2.0" signatureType="5">*

*<sequenceNumber>1001</sequenceNumber>*

*<SWLT customerId="946060" productType="WRAN" swltId="G2\_CI\_MSR\_TEST">*

*<generalInfo>*

*<generated>2015-06-10T09:10:27</generated>*

*<issuer>Ericsson AB</issuer>*

*</generalInfo>*

*<fingerprint method="11" print="G2\_CI\_MSR">*

*<featureKey id="CXC4011061">*

*<description>Dynamic QoS Modification</description>*

*<start>2015-06-09</start>*

*<stop>2016-06-09</stop>*

*</featureKey>*

*<featureKey id="CXC4011255">*

*<description>Downlink Frequency-Selective Scheduling</description>*

*<start>2015-06-09</start>*

*<stop>2016-06-09</stop>*

*</featureKey>*

*.*

*.*

*<capacityKey id="CXC4010719">*

*<description>CXC4010719; HWAC for Channel Bandwidth 15MHz</description>*

*<start>2015-06-09</start>*

*<stop>2016-06-09</stop>*

*<capacity>18</capacity>*

*<hardLimit>18</hardLimit>*

*</capacityKey>*

*<capacityKey id="CXC4011161">*

*<description>FAK1010020; HWAC for Output Power 60W to 80W</description>*

*<start>2015-06-09</start>*

*<stop>2016-06-09</stop>*

*<capacity>12</capacity>*

*<hardLimit>12</hardLimit>*

*</capacityKey>*

*.*

*.*

*<emergencyResetKey>*

*<start>2015-06-09</start>*

*<stop>2016-06-09</stop>*

*</emergencyResetKey>*

*</fingerprint>*

*</SWLT>*

*</body>*

*<PKIsignature issuer="CN=TestCA for Signing license files CAX 106 0084/30, OU=License Center, O=Ericsson AB, C=SE" serialnumber="32">op6FH753WMBvxk+dS3uaItnnA4gUR6Dta3kOZUM/WU1Lp3WSPXLi2DEnNqhhTUdAbgEzC3IRJyWg*

*ZrHurgqwY6VJpE2XDn4nl7VcKjqN6Z/tNfTexKOajMVmf77I17Ed+UWF/KvEfLVb8Pl7QXj4Xb/p*

*GT7lMWftAwFOpQoqxGo+6uZtm2KGGE6jkBneXYCWSPEd13iUmxhfCxTZef6Al6jtbI4i/wPdN2nN*

*PaJdXwAyPzwFMr3G5XF6AqISSJy77cTOjq7Yud6QfQKDGJw+g+ScSUfhqCruY9kA/amlz/TOBQnv*

*d2Av++5v/lYH+k0L6QCjRJD0meESXxGGGblOVg==</PKIsignature>*

*<certificatechain>*

*<prodcert>-----BEGIN CERTIFICATE-----*

*MIIETTCCAzWgAwIBAgIBIDANBgkqhkiG9w0BAQUFADB3MQswCQYDVQQGEwJTRTEUMBIGA1UEChML*

*RXJpY3Nzb24gQUIxFzAVBgNVBAsTDkxpY2Vuc2UgQ2VudGVyMTkwNwYDVQQDEzBUZXN0Q0EgZm9y*

*IFNpZ25pbmcgbGljZW5zZSBmaWxlcyBDQVggMTA2IDAwODQvMzAwIBgPMjAxNTA1MTkwMDAwMDBa*

*Fw0xNjA4MjEwODUxNTdaMHkxCzAJBgNVBAYTAlNFMRQwEgYDVQQKEwtFcmljc3NvbiBBQjEXMBUG*

*A1UECxMOTGljZW5zZSBDZW50ZXIxOzA5BgNVBAMTMlRlc3RDZXJ0IGZvciBTaWduaW5nIGxpY2Vu*

*c2UgZmlsZXMgQ0FYIDEwNiAwMDg0LzMwMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEA*

*u04+YEgXAeHigmAI0I7PnLSgW5Nn+bhp+HmeO/ZchPxQPd4U8UnHJ6rtGX0j9pg7UP/6bIRKcaUP*

*8kd+0lBXwlEq67P9829V40KZN+LbIx9OEFjlGPyqwSaiJQO4kxqnkj046xVV+18F8ocITnbErDWP*

*a50cBm4Y9Qf/77bM1FT/vjEsqWA1AD9cEb/jidSBvOLckK/sCI1BL18fhP+Dqz1bdox+BGq996PJ*

*EI6672ocYcf5RZc9cL4117qda76FlVhM2GlkCE1E4An0+3N1BrjFUWm4z3chEa4hBUvIyYprvilk*

*avgfaBqTWELLbm9UB56syBDxVn4TWn8OolP2hQIDAQABo4HfMIHcMB0GA1UdDgQWBBS/4qGcT8CV*

*GaPUG2W+UnBrxWjknjCBnwYDVR0jBIGXMIGUgBQvJ19lY6JJVQRlnkPfRxnf8QILn6F5pHcwdTEL*

*MAkGA1UEBhMCU0UxFDASBgNVBAoTC0VyaWNzc29uIEFCMRcwFQYDVQQLEw5MaWNlbnNlIENlbnRl*

*cjE3MDUGA1UEAxMuUm9vdCBmb3IgU2lnbmluZyBsaWNlbnNlIGZpbGVzIENBWCAxMDYgMDA4NC8z*

*MIIBAjAMBgNVHRMBAf8EAjAAMAsGA1UdDwQEAwIHgDANBgkqhkiG9w0BAQUFAAOCAQEAeJCC5wKV*

*qo+oJvzx+SbJPvscyKUQYiUIbWKoCc/IeUUcu9ErkopZWHoD9qHs8SyAC5xAc0nGT2+9q8d6i/dO*

*Gs6IhDyrvE14CyQ3CgzMTXV3bu3JYuzgMayiRR/hVXqcg1CojJjO6zX9Omq3SLvUBJXk5teHzYR4*

*XcW7U/DN+1gPJTNlHr3TBaSkHEYT412fy4nN5Sve90JNNBj676orrfqHRpy6s5j2exrbERI3g1KF*

*s3skO8kFbJT/wUbZaxdVFBdYJVO5y8ZBBLoIJDPZO0j45m7gq6R7Zk11dlUwqbhy58QSbSOkWtj2*

*8ig28+ZEZE5M135dOxd/7c6jWZLTnA==*

*-----END CERTIFICATE-----</prodcert>*

*<cacert>-----BEGIN CERTIFICATE-----*

*MIIEYTCCA0mgAwIBAgIBAjANBgkqhkiG9w0BAQUFADB1MQswCQYDVQQGEwJTRTEUMBIGA1UEChML*

*RXJpY3Nzb24gQUIxFzAVBgNVBAsTDkxpY2Vuc2UgQ2VudGVyMTcwNQYDVQQDEy5Sb290IGZvciBT*

*aWduaW5nIGxpY2Vuc2UgZmlsZXMgQ0FYIDEwNiAwMDg0LzMwMCIYDzIwMDcwMjI2MDAwMDAwWhgP*

*MjAxNzAyMjYwMDAwMDBaMHcxCzAJBgNVBAYTAlNFMRQwEgYDVQQKEwtFcmljc3NvbiBBQjEXMBUG*

*A1UECxMOTGljZW5zZSBDZW50ZXIxOTA3BgNVBAMTMFRlc3RDQSBmb3IgU2lnbmluZyBsaWNlbnNl*

*IGZpbGVzIENBWCAxMDYgMDA4NC8zMDCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAK9U*

*4sefWKtCOcAstvBHf7pRBsF1mKY3oGvvj5U/jV/Ve1XMPCY4PYEb71DxVS57blJQDU3DY6K6R47Y*

*WAaN38tTuvaXQmFXA/p6rV9QuAw6R5zweL7OohUMeMeAuB3Hf3v7SeIdg7faxNi0eDJcAuamW/Zc*

*lmE6fGz4ft26Nhs2xSmAXmBcJINGL5UE2r8+nrM3GspkNLuvNMjET3Qgh3z2fi9yaMg+JnzK39Ar*

*uXYxJx0kc75ucWJP2N+jD41182Bpso3psWxRydvNMFrLoB+Qzk+2vXTsygPcJaZgVqY28qGSzzHz*

*cyaBFKcM974j3UxvVLdeZelCYJdm+GVLkSsCAwEAAaOB9TCB8jAdBgNVHQ4EFgQULydfZWOiSVUE*

*ZZ5D30cZ3/ECC58wga8GA1UdIwSBpzCBpIAUMlQWj9gJVHqZdyc0TFqgoFk0RLihgYikgYUwgYIx*

*CzAJBgNVBAYTAlNFMQswCQYDVQQHEwJMSTEUMBIGA1UEChMLRXJpY3Nzb24gQUIxFzAVBgNVBAsT*

*DkxpY2Vuc2UgQ2VudGVyMTcwNQYDVQQDEy5Sb290IGZvciBTaWduaW5nIGxpY2Vuc2UgZmlsZXMg*

*Q0FYIDEwNiAwMDg0LzMwggEBMBIGA1UdEwEB/wQIMAYBAf8CAQAwCwYDVR0PBAQDAgEGMA0GCSqG*

*SIb3DQEBBQUAA4IBAQCxuQNY7GovniiqLNPS7P2fqF0HsiNMrniFLzFpAouTLjGpkNHReuV2RHhR*

*uGv2ca7BomFc7yLIB5rm5QlnY/GzGgR17pYXmvw9kyGX4TK+tbtSv4ZWwZS7ZsfsHzGaSQj6Su1k*

*iPUjAmYIYabvvhn9PRZbBptJpK1pnBg2OtvF6lSEGUgx7jHG+UAwtpgTyN3huoupr5o7J6uw7amF*

*gvh7Sq8R+XGYKPvnhM/wrJ0q4UeDq992DuobX3AWdgrfR+LZfGlD2W+ZuEbokzQeJg3h8cld4Cco*

*eoNjJ5iNnlprUy/6jQPcajiXO8kGN4R67TSancFXkQ6unJoLegNoktm5*

*-----END CERTIFICATE-----</cacert>*

*</certificatechain>*

*</licFile>*

## Autonomous Mode

If the connection to the currently installed LKF is lost, the license manager enters a state that it considers faulty. It enters the autonomous mode and alarm [Autonomous Mode Activated](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=6_1543-LZA7016014Uen.B.html) is raised. When autonomous mode is active, no licenses are disabled. When autonomous mode ceases after 36 hours, or when the alarm OPI procedure is followed, the node falls back into NORMAL mode. If the problem has not been solved by then, the licensed features in the LKF cannot be used.

## Emergency Unlock

The Emergency Unlock state is available on the node to handle system needs during emergency situations. The purpose of the Emergency Unlock is to free the software in the node of all license restrictions in an emergency situation, so that the node capacity is maximized.

Emergency Unlock is available for 2 periods of 7 days each. After the 7-day period, the Emergency state ceases automatically, but the [Emergency Unlock Reset Key Required](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=8_1543-LZA7016014Uen.B.html) alarm remains to act as a reminder that the Emergency Unlock Reset Key should be installed.

The Emergency state is activated by initiating action [activate](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.370.html" \l "activate) of the [EmergencyUnlock](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.370.html) MO.Emergency Unlock can only be activated twice and this is indicated by attribute [activationsLeft](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.370.html" \l "activationsLeft) of MO [EmergencyUnlock](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&fn=15554-LZA7016014_2-V1Uen.E.370.html). The activationsLeft can be reset to 2 again by installing a new LKF that contains an Emergency Unlock Reset Key, and is received from Ericsson.

## Install License Key file

Node system clock is set correctly when licenses are installed. If the system clock is incorrectly set, signature validation is affected and the license key file installation can be rejected by the node.

The node fingerprint is configured. The fingerprint cannot be changed after the LKF is successfully installed the first time on the node. Fingerprint setting is not done when LKF is installed to replace the existing LKF.

To install a new License key file:

Activate the failsafe backup function by initiating action activate() in MO class BrmFailsafeBackup.

Start the installation by initiating action **installKeyFile** (<uri>, <password>) of MO **KeyFileManagement**.

As a result, the **Lm** updates its MO structure to reflect the new license information. MO instances of **FeatureKey** and **CapacityKey** are created for each license entry in the LKF. These MO instances have attribute keyId , that receives for feature the value of the featureKey id and for capacity the value of the capacityKey id from the LKF. Attribute licenseState of MO FeatureState and MO CapacityState becomes ENABLED for each of the license in the installed LKF.

## Activate Feature

To activate a software feature:

* Ensure that the corresponding license key is installed by checking that attribute **licenseState** of **FeatureState** MO for the respective feature is ENABLED.
* Activate the failsafe backup function by initiating action activate() in MO class BrmFailsafeBackup.
* Activate the feature by setting attribute **featureState** of MO **FeatureState** for the respective feature to **ACTIVATED**.
* Deactivate the failsafe backup function by initiating action deactivate() in MO class BrmFailsafeBackup.

## Deactivate Feature

* Activate the failsafe backup function by initiating action activate() in MO class BrmFailsafeBackup.
* Deactivate the feature by setting attribute **featureState** of MO **FeatureState** for the respective feature to **DEACTIVATED**.
* Deactivate the failsafe backup function by initiating action deactivate() in MO class BrmFailsafeBackup.

License file in ESI is under:

/rcs/lma/licensekey.xml

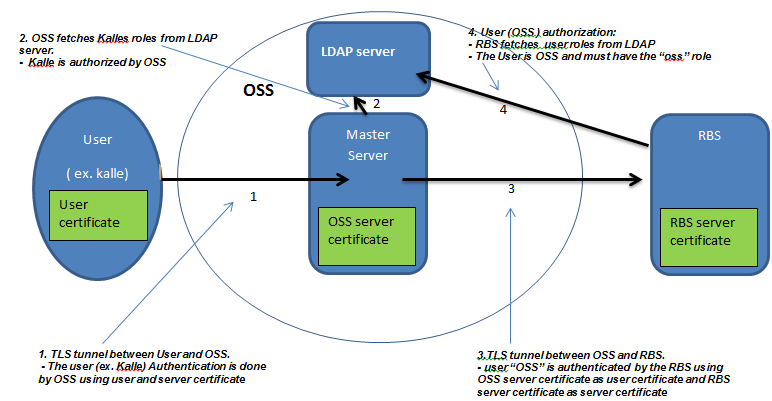
See [Manage Licenses UG](http://cpistore.internal.ericsson.com/alexserv?ac=LINKEXT&li=EN/LZN7931000R1B&FB=1&FC=IH_931000R1&FN=17_1553-LZA7016014Uen.D.html) for further reading

# Security

Operation and Maintenance (OAM) interfaces are secured by encryption over SSH or TLS. SSH is used to log on by using a username and password.

The following preconditions must be met to use TLS:

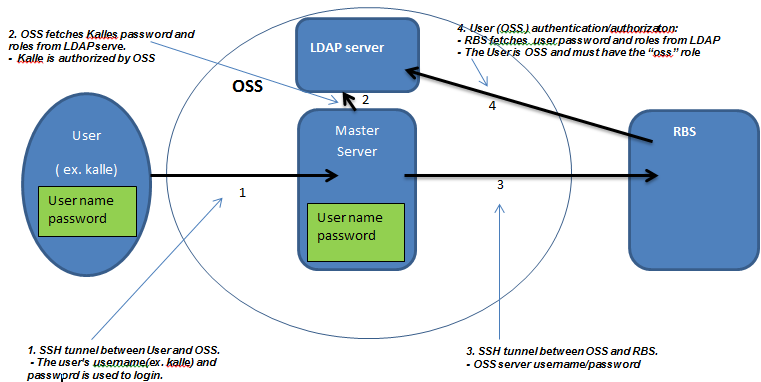
* LDAP connectivity
* Operator user certificate for TLS
* Roles in LDAP for that user exist for targeted node
* For the initial start, the operator trusted certificate(s) must be added at integration



The following preconditions are needed for using SSH:

* LDAP connectivity
* Username and password for SSH
* Roles in LDAP for that user exist for targeted node

If the operator does not want certain users to use SSH, no password is to be added in the LDAP server for those users. Then LDAP cannot validate those users, except with a certificate which is done locally in the node. Note that SFTP is still available even if SSH is closed



Access to the OAM interfaces is possible by using the TN and LMT ports.

* Certificate-based authentication on all available interfaces.
  + No unsecure protocols or services
* Target Based Access Control (TBAC) and Role Based Access Control (RBAC)
* No Root Access to the Operating System (OS)
* No direct access to the File System
* No predefined Local User Accounts (Maintenance Users)
* Only specifically classified COLI commands are available on ESCI
* LMT A (RS-232) is disabled

## Certificates in the node

Ericsson   
root trust certificate

Vendor credential

Node creds + trust certificates

Vendor credentials (Installed on the board at factory )are used to

identify an Ericsson unique node

When new nodes are to be installed, Ericsson trust certificate is installed

in OSS once.

At initial integration CMPv2 is used to install Node certificates and needed

trust certificates. Received trusted certificates are installed in secure

environment. CMPv2 is also used to fetch certificates to be

renewedCan be configured to be performed manually or automatically.

The security administrator invalidates the certificate by adding the

serial number of the rejected certificate to the certificate revocation list

For each validation of peer certificate, the CRL is downloaded using

either http, https or sftp

Root trust certificate

OaM user

COMInf trust certificate

Node credential

Maintenance user

Node creds + trust certificates

Trust certificates are preinstalled in OSS

and LDAP .

Maintenance user Credentials and trust certificate

are fetched by user when needed.

## User Management

LDAP authentication of username and password and authorization of roles. The LDAP server which is located outside the node provides support for centralized user management.

### Authentication

Authentication validates a user using one of the following:

* Username and password - user passwords are verified by the LDAP directory server.
* Certificate - user certificates are locally verified in the node by trusted certificates. The certificates are managed by Node PKI management

### Authorization

Authorization is performed by mapping the **user to a set of roles**. Depending on the assigned roles, the user can access functions and data in the node. This is referred to as Role-Based Access Control (RBAC). Additionally RBAC can be extended with Target-Based Access Control (TBAC).

* Role-Based Access Control (RBAC) - It uses roles and authorization rules concepts: each role has a set of authorization rules defining permissions to access system resources and perform certain operations. Each user acquires the authorization rules through the role (or roles) the user is assigned.
* Target-Based Access Control (TBAC) - It is based on the target concept which controls both which nodes a user has access to and also which roles the user is assigned to when accessing a node. Each node is configured with a list of targets.

Before auto-integration, none of the CLIs are available via LMT or TN. During auto-integration a set of users and roles can be configured.

### User roles

The role is a set of system-defined authorization rules that define permissions to access system resources and perform certain operations. When a role is assigned to a user or to a Role Alias, it may be assigned with a target, which means that the role is only applicable for the user when a node matching the target is accessed.

The following roles are **predefined**, but it is possible to define additional roles.

* System Read Only
* System Administrator
* System Security Administrator
* ENodeB Application Administrator
* ENodeB Application Security Administrator
* ENodeB Application User
* Support System Administrator
* Support System Security Administrator
* Support System User

Each user can be assigned several roles, thus extending their access.

#### **Default System Roles**

The following default system roles are predefined:

* SystemAdministrator (full control over System functions as SwM, FM, PM, LM, Equipment management and Transport etc., but excluding security related functions)
* SystemSecurityAdministrator (full control over security features on node level)
* SystemReadOnly

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Table 1    Default System Roles Permissions* | | | | |
| ***ECIM MOM Fragments*** | | ***System Read Only*** | ***System Administrator*** | ***System Security Administrator*** |
| *System Functions* | *Backup and Restore Management* | *Read* | *Read/Write/Execute* |  |
| *Fault Management* | *Read* | *Read/Write/Execute* | *Read* |
| *License Management* |  | *Read/Write/Execute* | *Read* |
| *Performance Management* | *Read* | *Read/Write/Execute[(1)](http://cpistore.internal.ericsson.com/alexserv?ID=9203&DB=48978-en_lzn7930001_r2a.alx&FN=18_1553-LZA7016014Uen.C.html" \l "tnote1-1)* |  |
| *Security Management* |  | * *Certificate management: Read* * *Local Authorization: Read* * *Local Authentication: Read* | *Security Management: Read/Write/Execute* |
| *Software Inventory Management* | *Read* | *Read/Write* | *Read* |
| *Software Management* | *Read* | *Read/Write/Execute* |  |
| *System Management* | *Read* | *Read/Write/Execute*  *Can configure NTP clock synchronization server associations.* |  |
| *Transport* | *Read* | *Read/Write/Execute* |  |
| *Equipment* | *Read* | *Read/Write/Execute* | *Can view information about HW* |

#### **Default ENodeB Application Roles**

The following default ENodeB application roles are predefined:

* ENodeB\_Application\_Administrator (full control over LTE specific features, excluding security related. Also including control over LM, PM and parts of equipment)
* ENodeB\_Application\_SecurityAdministrator (Full control over LTE specific security features)
* ENodeB\_Application\_User (read-only access to LTE parts of the MOM, including LM, PM and parts of equipment)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Table 2    Default ENodeB Application Roles Permissions for System,Function,* | | | | | | | |
| ***ECIM MOM Fragments*** | | | ***ENodeB Application Administrator*** | | ***ENodeB Application Security Administrator*** | | ***ENodeB Application User*** |
| *System Functions* | *Backup and Restore Management* |  | |  | |  | |
| *Fault Management* | * *Fault Management Alarm: Read/Write/Execute* * *Fault Management Alarm Model: Read* | |  | | *Fault Management: Read* | |
| *License Management* | *Read/Write/Execute* | |  | | *Read* | |
| *Log Management* | *Read/Write/Execute* | |  | | *Read/Write/Execute* | |
| *Performance Management* | *Read/Write/Execute* | |  | | *Read* | |
| *Performance Event Management* | *Read/Write/Execute* | |  | | *Read* | |
| *Security Management* |  | |  | |  | |
| *Software Inventory Management* |  | |  | |  | |
| *Software Management* |  | |  | |  | |
| *System Management* |  | |  | |  | |
| *Node Support* | *AutoProvisioning* | *Read/Write/Execute* | |  | | *Read* | |
| *MpClusterHandling* | *Read/Write/Execute* | |  | | *Read* | |
| *OnSiteActivities* | *Read/Write/Execute* | |  | | *Read* | |
| *SectorEquipmentFunction* | *Read/Write/Execute* | |  | | *Read* | |
| *Transport* |  | *Read/Write/Execute* | |  | | *Read* | |
| *Equipment* | *Antenna Unit Group* | *Read/Write/Execute* | |  | | *Read* | |
| *Cabinet* |  | |  | |  | |
| *External Node* |  | |  | |  | |
| *Field Replaceable Unit* | *Read/Write/Execute* | |  | | *Read* | |
| *Ri Link* | *Read/Write/Execute* | |  | | *Read* | |
| *ENodeB Function* |  | * *Read all sub ENodeB function* * *Read/Write/Execute for all sub ENodeB Function except Security Handling* | | * *Read all sub ENodeB function* * *Read/Write/Execute only for sub ENodeB Function Security Handling* | | *Read all sub ENodeB Function* | |

#### **Default Support System Roles**

The following default support system roles are predefined:

* Support System Administrator
* Support System Security Administrator
* Support System User

The following table describes the default support system roles and their permissions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Table 3    Default Support Application Roles Permissions* | | | | |
| ***ECIM MOM Fragments*** | | ***Support System Administrator*** | ***Support System Security Administrator*** | ***Support System User*** |
| *System Functions* | *Backup and Restore Management* |  |  |  |
| *Fault Management* | * *Fault Management Alarm: Read/Write/Execute* * *Fault Management Alarm Model: Read* |  | *Read* |
| *License Management* | *Read/Write/Execute* |  | *Read* |
| *Log Management* | *Read/Write/Execute* |  | *Read/Write/Execute* |
| *Performance Management* | *Read/Write/Execute* |  | *Read* |
| *Security Management* |  |  |  |
| *Software Inventory Management* |  |  |  |
| *Software Management* |  |  |  |
| *System Management* |  |  |  |
| *Node Support* | *Auto Provisioning* | *Read/Write/Execute* |  | *Read* |
| *Mp Cluster Handling* | *Read/Write/Execute* |  | *Read* |
| *On Site Activities* | *Read/Write/Execute* |  | *Read* |
| *Sector Equipment Function* |  |  |  |
| *Transport* |  |  |  |  |
| *Equipment* | *Antenna Unit Group* |  |  |  |
| *Cabinet* | *Read/Write/Execute* |  | *Read* |
| *External Node* | *Read/Write/Execute* |  |  |
| *Field Replaceable Unit* | *Read/Write/Execute* |  | *Read* |
| *Ri Link* |  |  |  |
| *Equipment Support Function* | *Battery Backup* | *Read/Write/Execute* |  | *Read* |
| *Power Supply* | *Read/Write/Execute* |  | *Read* |
| *Power Distribution* | *Read/Write/Execute* |  | *Read* |
| *Energy Measurement* | *Read/Write/Execute* |  | *Read* |

#### **Custom Roles**

Custom roles can be defined at node level, for which the access rules can be configured.

#### **Maintenance User**

A maintenance user is a special operator. The maintenance user gets all roles for accessing the supported Operation and Maintenance interfaces.

* LDAP connectivity is not required for the maintenance user to login. The login is made over TLS or SSH.
* The first maintenance user must be added at integration together with the trusted certificate and node credentials or username/password.
* The first maintenance user cannot be added after the integration.
* Additional maintenance users can be added at integration or later on.
* A maintenance user can only be changed or added/removed by other maintenance user after integration.
* The last maintenance user cannot be removed.

A Maintenance User is defined in the SiteBasic.xml file and it is used for the initial integration of a node. The role **ErissonSupport** (the MaintainanceUser Role) is automatically given to a MO MaintenanceUser when it is created and hereby giving the user access to the complete MO-tree. **ErissonSupport**  role can never be assigned to a user defined in ldap. The maintenance user will also get the BasebandSupportExpert role to it is authorized to run all ESCI commands.

Exampel of creating maintenance user using netconf. One has to be maintenance user to create another maintenance user:

*<?xml version="1.0" encoding="UTF-8"?>*

*<hello xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<capabilities>*

*<capability>urn:ietf:params:netconf:base:1.0</capability>*

*</capabilities>*

*</hello>]]>]]>*

*<rpc message-id="1" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<edit-config>*

*<target>*

*<running/>*

*</target>*

*<config>*

*<ManagedElement xmlns="urn:com:ericsson:ecim:ComTop">*

*<managedElementId>1</managedElementId>*

*<SystemFunctions>*

*<systemFunctionsId>1</systemFunctionsId>*

*<SecM xmlns="urn:com:ericsson:ecim:ComSecM">*

*<secMId>1</secMId>*

*<UserManagement>*

*<userManagementId>1</userManagementId>*

*<UserIdentity xmlns="urn:com:ericsson:ecim:RcsUser" >*

*<userIdentityId>1</userIdentityId>*

*<MaintenanceUser>*

*<maintenanceUserId>user1</maintenanceUserId>*

*<userName>firstuser</userName>*

*<password>*

*<cleartext/>*

*<password>firstuser</password>*

*</password>*

*</MaintenanceUser>*

*<MaintenanceUser>*

*<maintenanceUserId>user2</maintenanceUserId>*

*<userName>seconduser</userName>*

*<password>*

*<cleartext/>*

*<password>seconduser</password>*

*</password>*

*</MaintenanceUser>*

*</UserIdentity>*

*</UserManagement>*

*</SecM>*

*</SystemFunctions>*

*</ManagedElement>*

*</config>*

*</edit-config>*

*</rpc>*

*]]>]]>*

*<?xml version="1.0" encoding="UTF-8"?>*

*<rpc message-id="2" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<close-session/>*

*</rpc>]]>]]>*

#### **Roles for Troubleshooting**

In order to enable access to ESCI for Ericson personell, following troubleshooting **roles must be set up in LDAP**:

* BasebandSupportBasic
* BasebandSupportAdvanced
* BasebandSupportExpert

These roles "BasebandSupportBasic", "BasebandSupportAdvanced", and "BasebandSupportExpert" are only applicable for authorization of ESCI -COLI and not present in the MOM (No role managed object in the node).

### Rules

Each role has a set of authorization rules defining permissions to access to system resources and perform certain operations. Each user acquires the authorization rules through the role (or roles) the user has.

### Targets

Target is the logical identifier of a node or a group of nodes in the network.

### Configure user management

The LocalAuthorizationMethod MO must be unlocked for the custom rules and roles to be valid. The following configurations can be done on user management, see “Security management” CPI:

* Maintenance User using SSH or TLS can be added.
* Custom Role and Austome rules can be defined
* Add or Remove Custom Rules for a Custom Role
* Change a Custome Rule
* Remove a Custom Rule
* Remove a Custom Role

Exampel:

*> lpr LocalAuthorizationMethod*

*===================================================================================*

*Proxy MO*

*===================================================================================*

*954 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1*

*955 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=EricssonSupport*

*956 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=EricssonSupport,Rule=support*

*957 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator*

*958 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmBrM*

*959 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmCertM*

*960 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmEqm*

*961 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmEqs*

*962 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmFm*

*963 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmHwIM*

*964 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmLm*

*965 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmLogM*

*966 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmME*

*967 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmNodeS*

*968 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmPm*

*969 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSF*

*970 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSecM*

*971 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSwIM*

*972 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSwM*

*973 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSysM*

*974 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmTN*

*975 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly*

*976 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoBrM*

*977 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoEqm*

*978 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoEqs*

*979 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoFm*

*980 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoHwIM*

*981 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoLm*

*982 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoLogM*

*983 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoME\_1*

*984 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoME\_2*

*985 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoNodeS*

*986 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoPm*

*987 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoSF*

*988 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoSwIM*

*989 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoSwM*

*990 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoSysM*

*991 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoTN*

*992 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator*

*993 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmEqm*

*994 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmFm*

*995 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmLicM*

*996 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmLogM*

*997 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmME*

*998 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmSF*

*999 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmSecM*

*1000 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmSwIM*

*===================================================================================*

> hget Rule= ruleData|permission

*=========================================================================================*

*MO permission ruleData*

*=========================================================================================*

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=EricssonSupport,Rule=support 7 (RWX) ManagedElement,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmBrM 7 (RWX) ManagedElement,SystemFunctions,BrM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmCertM 4 (R) ManagedElement,SystemFunctions,SecM,CertM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmEqm 7 (RWX) ManagedElement,Equipment,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmEqs 7 (RWX) ManagedElement,EquipmentSupportFunction,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmFm 7 (RWX) ManagedElement,SystemFunctions,Fm,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmHwIM 6 (RW) ManagedElement,SystemFunctions,HwInventory,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmLm 7 (RWX) ManagedElement,SystemFunctions,Lm,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmLogM 7 (RWX) ManagedElement,SystemFunctions,LogM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmME 7 (RWX) ManagedElement*

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmNodeS 7 (RWX) ManagedElement,NodeSupport,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmPm 7 (RWX) ManagedElement,SystemFunctions,Pm,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSF 7 (RWX) ManagedElement,SystemFunctions*

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSecM 4 (R) ManagedElement,SystemFunctions,SecM$*

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSwIM 6 (RW) ManagedElement,SystemFunctions,SwInventory,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSwM 7 (RWX) ManagedElement,SystemFunctions,SwM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmSysM 7 (RWX) ManagedElement,SystemFunctions,SysM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemAdministrator,Rule=SysAdmTN 7 (RWX) ManagedElement,Transport,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoBrM 4 (R) ManagedElement,SystemFunctions,BrM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoEqm 4 (R) ManagedElement,Equipment,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemReadOnly,Rule=SysRoEqs 4 (R) ManagedElement,EquipmentSupportFunction,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmEqm 4 (R) ManagedElement,Equipment,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmFm 4 (R) ManagedElement,SystemFunctions,Fm,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmLicM 4 (R) ManagedElement,SystemFunctions,Lm,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmLogM 7 (RWX) ManagedElement,SystemFunctions,LogM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmME 4 (R) ManagedElement$*

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmSF 4 (R) ManagedElement,SystemFunctions$*

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmSecM 7 (RWX) ManagedElement,SystemFunctions,SecM,\**

*SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=SystemSecurityAdministrator,Rule=SysSecAdmSwIM 4 (R) ManagedElement,SystemFunctions,SwInventory,\**

*.*

*.*

*> get Rule=support*

*==================================================================================================*

*956 SystemFunctions=1,SecM=1,UserManagement=1,LocalAuthorizationMethod=1,Role=EricssonSupport,Rule=support*

*==================================================================================================*

*permission 7 (RWX)*

*ruleData ManagedElement,\**

*ruleId support*

*ruleName*

*userLabel Access rule for MaintenanceUser only*

**Query the LDAP server of the capabilities of the role “expert”**

*> /secm/authtrace expert*

*AA-trace: 2015-10-01 14:31:09.623450 Trace printing of authorization, parameter info:*

*.*

*.*

*AA-trace: 2015-10-01 14:31:09.635864 Query aggregation process completed successfully*

*AA-trace: 2015-10-01 14:31:09.636006 Query result: {true,*

*["SystemAdministrator",*

*"SystemSecurityAdministrator",*

*"expert"]}*

Or use “/secm/aatrace expert”

**Check Roles and Authorization for an already logged in user**

> /misc/info

User: expert

Roles: ["SystemAdministrator","SystemSecurityAdministrator","expert"]

Authorization level: BasebandSupportExpert

Source IP address: "147.214.14.219"

User name

password

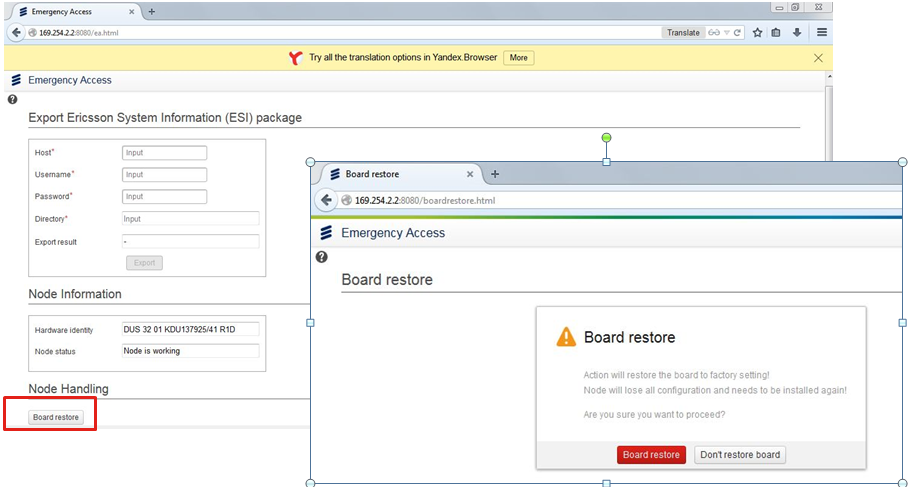
1

3

## Emergency access (EA) to the node

EA is an interface used as a last resort to reach the node to fetch vital Ericsson Support Information (ESI). The ESI package contains logs and other data used by Ericsson to analyze any problems with the node.The EA is accessible onsite through the LMT port.The EA can be accessed by anyone using HTTPS at https://<node\_ip\_address>/ea.html

The EA can also be used to manually reset the node to the initial start configuration (network loader mode) using the **Board restore** button on the web GUI.



# Data Collection Guideline (DCG)

Data collection is performed from EMCLI or AMOS. If it is not possible to log on to the node, data collection is performed by the Emergency Access (EA). Fetching the DCG package is the preferred data collection method. If that is not possible, the ESI package is also acceptable.

The DCG package includes the ESI package. The ESI package contains logs and other data to be used by Ericsson for analyzing the problem. The DCG package contains additional information that is fundamental for an initial analysis of the problem besides the included ESI package.

DCG containes:

* ESI package (including Rop files)
* Transport data
* Modump (kget)
* Output of different coli commands

Data collection with ESI (LogM::exportEsi) in 16A may be limited or chunked in several esi files when not enough RAM is available or too much information is stored on the disk.

* This problem is seen a few times on Baseband5212, but may happen also on Baseband5216. If you have problems with exporting a data collection from the node, please instead try:action “**exportEsi with granularity = small** ” (see MOM Class LogM). This will exclude the DSP PMDs from the result. To mitigate this problem, be aware of the alarm “Archive Disk Almost Full” and clean the disk by removal of UPs or removal of all DSP PMDs with command /sysm/discspace –c on ESCI (default port 9830), or indirectly using EMCLI.
* The “dcgm” command in AMOS will by default collect ESI without DSP PMDs to limit the file size. Full ESI is collected with dcgm –k 1. In addition, command “lgf –d 1” can be used to collect DSP PMDs separately.
* The system detects shortage of memory and modifies the behavior of ESI action depending on situation.
  + Less than 100M /tmp or RAM  rejects ESI action.
  + If enough /tmp or RAM exist  full ESI
  + If /tmp or RAM exist but not enough  chunk ESI in smaller pieces and send out as many esi-files as needed

See [RAN 16A IP2 release notes](https://erilink.ericsson.se/eridoc/erl/objectId/09004cff8a6a4a6c?docno=1/10947-CXP9024418/2-2Uen&format=msw8) for the above limitations

If alarm “Archive Disk Almost” Full is raised, small ESI package is preferred.

If possible, follow the Operating Instruction Archive Disk Almost Full to cease the alarm. If the alarm “Archive Disk Almost” Full is ceased, large ESI package is preferred. If the alarm “Archive Disk Almost” Full is still raised, small ESI package is preferred.

See OPI “data collection guidline”,  50/1543-LZA 701 6014 uen

If dcgm extraction failes, check the *progressReport.resultInfo* attribute

*> get logm progressReport*

*==========================================================================================*

*MO Attribute Value*

*==========================================================================================*

*LogM=1 progressReport Struct{11}*

*>>> 1.actionId = 5648*

*>>> 2.actionName = Export ESI*

*>>> 3.additionalInfo = Generating information Default large ESI Transferring file The action could not be completed*

*>>> 4.progressInfo = The action could not be completed*

*>>> 5.progressPercentage = 100*

*>>> 6.result = 2 (FAILURE)*

*>>> 7.resultInfo = Cannot establish a connection to remote server*

*>>> 8.state = 3 (FINISHED)*

*>>> 9.timeActionCompleted = 2016-02-18T11:42:18+00:00*

*>>> 10.timeActionStarted = 2016-02-18T11:35:15+00:00*

*>>> 11.timeOfLastStatusUpdate = 2016-02-18T11:42:18+00:00*

*========================================================================================*

Often it is the settings in moshell user variabel export\_method than can cause failure. See **moshell parameters** section in [Miscellenous tips & Trix](#_Miscelleneous_Tips_&).

# Boot & Start Sequence



Figure 1 - HW rooted Secure Boot

When the HW starts up, the system will load in sequence the boot SW images verify them in order up to the start of the UP.

If the image verification fails or has any problems, the SBB (Secure Boot Block) in AXM issues an interrupt. This leads to a restart escalation. The Secure Boot starts up the system in stages and protects the boot process up until the OS stage where Signed SW continues to protect the start-up of the Application layers.

The SW architecture introduces keys and certificates for Secure Boot and Signed SW. The lower part of the figure is handled in Supply in the deployment phase at production time. Key Authentication Key (KAK), and the Image Signing Key (ISKn where n is a letter a) to d), are ECDSA-256 key pairs.

KAK(public) is stored in the internal secure storage in the AXM (eFuses).

ISKn(public) and their associated signatures are included in the SW packages, namely:

Uboot stage 2

Uboot stage 3

Network Loader (NL)

The BootFS (the Boot file system) and OS Linux kernel part of an arbitrary Upgrade Package (UP).

The private parts of the key pairs are handled by appropriate authority within Ericsson.

KAK (private) is used to sign each ISKn (public) so that a trust chain is created and enables each ISKn to be verified using KAK (public).

To protect the UP, signed SW is introduced using the embedded support in Linux in terms of squashfs where the file system is protected through a signed hash tree. The signing is done at build time using signing PKI certificates.

**DU Linux Boot overview**

• Power is applied.

• Boot loader (U-Boot) runs.

• System selector is run by the boot loader.

• Kernel image and boot filesystem is loaded into RAM.

• The boot loader hands over execution to the kernel image.

• Software is executed out of the boot filesystem.

• The flash disk is mounted.

• Software is executed out of the root filesystem.

• Control is handed over to the middleware.

**MW startup overview**

• Start database

• Start logging

• Start servers such as:

• IMM database

• License server

• PM server

• Hardware control servers

• Scan application data files and extract information on application registration (only done at installation and then stored in database).

• Start applications programs and supervision of those

• Install COM files

• Start COM and comte (COM to Erlang)

• Register and start Middleware MIB (ME, Equipment, System Functions)

The startup sequence is logged in the erlang.log file.

# Node/FieldReplacableUnit (FRU) restart

3 ranks WARM, COLD and COLD are supported. FRU restart of DU does not include a RU restart.

In a single DU and in the TCU, the FRU restart is the same as node restart.

Manual node restart, including RU, will never be supported as it is not appropriate in multi standard configurations, when 2 standards are connected to 1 RU.

Only during upgrade the FRU restart will escalate to node restart when RU SW should be replaced.

Escalation to node restart will also take place at automatic rollback to an older SW configuration.

**Restart Ranks:**

**Warm restart:** The NPU is reloaded, and all applications started by MW is restarted. EE and MW are not started.

**Cold restart:** Will reset all hardware components and restart the kernel and user space applications. Not all parts of RAM will be initialized. The semi persistent RAM area is still valid.

**Cold restart with test**: Does a cold restart and perform tests on the hardware. After tests are finished and reported the board is power cycled and performs a power on restart. **Two “llog” entries!**

*Reason:   Ordered restart*

*Time:     2016-02-23 07:53:00*

*Program:  -*

*Pid:      -*

*Rank:     Cold With Test*

*Signal:   -*

*PMD:      -*

*Extra:    Manual restart*

*---------------------------------------------------*

*No:       13*

*Reason:   Power on (SW)*

*Time:     2016-02-23 07:59:01*

*Program:  -*

*Pid:      -*

*Rank:     Cold*

*Signal:   -*

*PMD:      -*

*Extra:    -*

**Power on restart:**

All hardware and RAM memory is initialized.

1. **ERROR Escalation**

The Linux kernel initiates ERROR handling functionality when a process terminates abnormally.

If any crash ocures within five minutes after each recovery action, the following escalation sequence is performed:

* Board warm restart
* Board cold restart
* board cold restart with test

If there is more than five minutes between the fault indications, no recovery escalation is performed. If no user logs on to the node and any fault appears within five minutes after the third restart attempt, alarm ***Rollback Escalation Started*** is raised. If no user logs on to the node within one hour, the node automatically restores from the backup in RestoreEscalationList.



* **Program**:   
  - can crash due to SW error or through ERI call   
  - escalation defined in loadmodule xml-file and/or ERI parameter; highest value wins.   
  - a program that supervises something (e.g. EMCA, a BBL2 program,  
   an RU or other external HW, or a program on  
   own or other DU) can escalate by calling ERI with a Rank
* **Program Group:**  
  - Restarts due to escalation from a program within the group  
  - escalation defined in programgroup xml-file
* **Board Warm:**  
  - Restarts due to escalation from Program, ERI, Program Group or MW service  
  - escalation hardcoded to 1, i.e. if a new warm board restart occurs   
   within 5 minutes, it is escalated to Board Cold
* **Board Cold:**  
  - Restarts due to escalation from EE program, Program, ERI, Program Group  
   or Board Warm  
  - escalation hardcoded to 1, i.e. if a new cold or warm board restart occurs   
   within 5 minutes, it is escalated to Board Cold with Test
* **Board Cold with Test:**  
  - Restart due to escalation from Board Cold or ERI

There is new ERROR escalation in G2, see [Manage Faults](http://cpistore.internal.ericsson.com/alexserv?ac=LINKEXT&li=EN/LZN7931020R1C&FB=1a|1ff&FC=zC_931020R1&FN=28_1553-LZA7016014Uen.B.html&SL=EN/LZN7931000R1B).

Program restart-Board warm restart-Board cold restart-Board coldwtest restart-rollback to prvious SW.

Reversion only starts if contact with OSS (or PC) have been lost for the MP with TN (LMT) connection for one hour. During this period a ‘***RollbackEscalationStarted***’ alarm is outstanding and all applications started by MW are stopped. Only MW and EE is running to allow operator to login. If someone logs in during this period the ***‘RollbackEscalationStarted’*** is cleared and ***‘FRUGeneralProblem’*** alarm is issued instead.

For each reversion the escalation ladder as described above is done before reverting again:

* Revert to latest (older than 24h) scheduled backup if exists
* Revert to backup after latest upgrade
* Revert to fallback. SW and data is reverted to state just before last upgrade
* Revert to NL (Network Loader). After this stage only initial installation is possible

Program and “Program group” escalations are handled by APPM and limits defined in Appdata xml

Ex. Of Program group escalation in appdata:

*<?XML version="1.0" encoding="ISO-8859-1" ?>*

*<appdata target="appm">*

*<programgroup*

*name="pgGrp1"*

*escalation = “BoardCold”*

*maxRestarts = “3”*

*maxTime = “300”>*

*<lm name=”app1” id="CXC123456" rev="R1A"/>*

*<lm name=”app2” id="CXC122334" rev="R5A"/>*

*<lm name=”app3” id="CXC123498" rev="R1A"/>*

*</programgroup >*

*</appdata>*

* **name** – the name of the program group.
* **escalation** – “BoardWarm”,” BoardCold”. Default value is “BoardWarm”.
* **maxRestarts** – maximum number of restarts within maxTime before escalation. Default value is 0 which means that the escalation will happen at first crash.
* **maxTime** – the time in seconds during which restarts are counted. This is a sliding window. Default value is 300.

*-----------------------------------------------------------------------------------------------*

*14  Program Crash                 2015-09-09 14:48:36          tn-oam-agent         11552  -*

*-                             pmd-tn-oam-agent-11552-20150909-144836*

*-----------------------------------------------------------------------------------------------*

*15  Ordered restart               2015-09-09 14:48:45          -                    -     Cold*

*Restart due to escalation     -*

*-----------------------------------------------------------------------------------------------*

*16  Program Crash                 2015-09-09 14:51:18          tn-oam-agent         11309  -*

*-                             pmd-tn-oam-agent-11309-20150909-145118*

*-----------------------------------------------------------------------------------------------*

*17  Ordered restart               2015-09-09 14:51:41          -                    -     Cold*

*Restart due to escalation     -*

*-----------------------------------------------------------------------------------------------*

*18  Program Crash                 2015-09-09 14:54:21          tn-oam-agent         11723  -*

*-                             pmd-tn-oam-agent-11723-20150909-145421*

*-----------------------------------------------------------------------------------------------*

*19  Ordered restart               2015-09-09 14:54:40          -                    -     Cold With Test*

*Restart due to escalation     -*

*-----------------------------------------------------------------------------------------------*

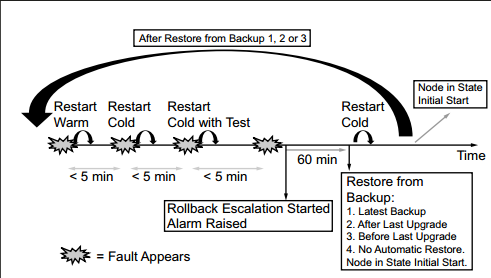
*20  Program Crash                 2015-09-09 15:02:25          tn-oam-agent         11523  -*

*-                             pmd-tn-oam-agent-11523-20150909-150225*

*-----------------------------------------------------------------------------------------------*

*21  Ordered restart               2015-09-09 16:02:57          -                    -     Cold*

*Data restore                  -*



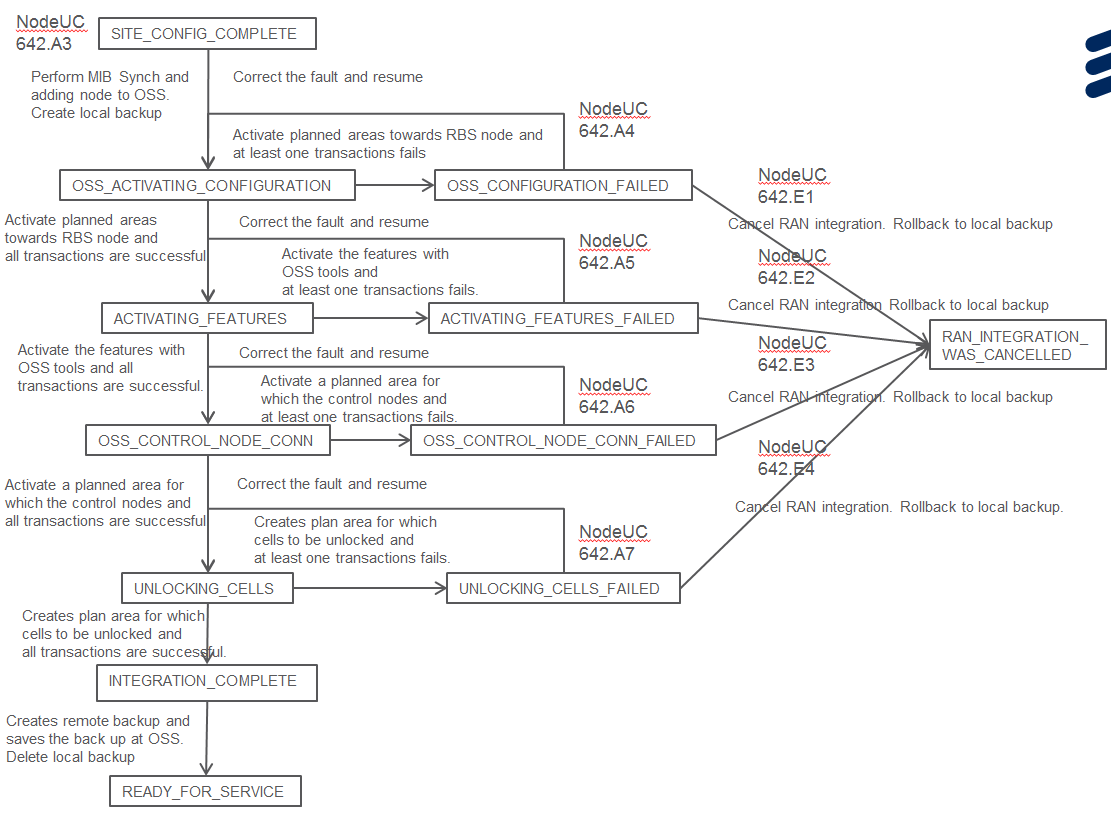
# OSS Sync

The interaction with OSS is controlled by the attribute AutoProvisioning:RbsConfigLevel and by sending SNMP v3 discovery trap.

When semi auto-integration is finished in step 9, in [Autointegration](#_Semi_Auto-integration_(AIS)), the RbsConfigLevel attribute in AutoProvisioning MO is set to SITE\_CONFIG\_COMPLETE and the node starts sending SNMP v3 discovery trap. The trap is only send if a valid SNMP v3 configuration is set in the configuration files.  
  
When OSS sets AutoProvisioning:RbsConfigLevel to OSS\_CONFIGURATION\_SUCCESFUL:  
RCS enters “The node is able to connect towards OSS” (LED).

When OSS sets AutoProvisioning:RbsConfigLevel to INTEGRATION\_COMPLETE:  
RCS enters “The node is ready to carry traffic” and stops sending SNMP v3 discovery traps.

In case of loss of OSS MIB sync, there are few checks that can be performed:



1. **If managedElementId MO value in the node is not matching the one in OSS, one can get the following ERROR message in the OSS:**

*<rpc-error xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">*

*<error-type>application</error-type>*

*<error-tag>resource-denied</error-tag>*

*<error-severity>error</error-severity>*

*<error-message xml:lang="en">no MO iterator available for path:*

*ManagedElement=xxx,*

*error:ComNotExist</error-message>*

*</rpc-error>*

1. **OSS may loose MIB sync with the node if the user in the OSS, COMuser , has not the right roles assigned in LDAP**

From security log (“lgy” command in moshell), the following will be visible:

*SEC  INFO   ManagedElement=xxxx FieldReplaceableUnit=1: src\_ip(yyyy) LDAP: lookup for user: COMUser, Roles: System\_security\_administrator, System\_administrator, NodeB\_Application\_Administrator, SystemSecurityAdministrator, SystemAdministrator, expert*

Following roles should be assigned to COMUser in LDAP:

SystemAdministrator, SystemSecurityAdministrator and ENodeB\_Application\_Administrator for LRAT

SystemAdministrator, SystemSecurityAdministrator and NodeB\_Application\_Administrator for WRAT

1. **Loss of OSS MIB sync after node is moved to another OSS**

The following ERROR message might be visible in OSS:

*2016-01-11 09:22:29,484 [synch:xxxxL] [INFO ] [NetConfTlsSecurityUtil.java]  - Revoked certificate entries set.*

*2016-01-11 09:22:29,485 [synch:xxxxxx] [ERROR] [TlsClientChannel.java]  - Handshake failed, closing the connetion.*

It might be good to redo the enrollment again

*1. Cancel Certification Enrollment:*

*acc NodeCredential cancelEnrollment*

*2. delect MO NodeCredential, need disconnect the service is using NodeCredential=1.*

*set SystemFunctions=1,SysM=1,NetconfTls=1 nodeCredential*

*set SystemFunctions=1,SecM=1,UserManagement=1,LdapAuthenticationMethod=1,Ldap=1 nodeCredential*

*del NodeCredential=1*

*3. Recreate MO NodeCredential, add parameters back to MO.*

*4. Add NodeCredential to services was connected to other MO in step2.*

*5. Start enrollment*

*This starts an Initial Request (IR) towards the OSS CMPv2 server signing with the Vendor Credential*

*acc NodeCredential startOnlineEnrollment*

# LTTng (Linux Trace Toolkit Next Generation) Tracing

Further reading in [Tracing in RCS with LTTng](https://rbs-rde-dev.rnd.ki.sw.ericsson.se/vobs/rcs/dev/RCP_CSX10179/OS_CRX901265/doc/15519/4_tracing-iwd.doc)

## Tracing

**Tracing on CPM is the same as in G1:**

**Exmpel of tracing:**

*> te status ncI\**

*coli>/diagm/te status ncI\**

*TRI status:*

*pid name enabled groups*

*- ncImaIf check error info interface object*

*- ncIndHandlerLU check error info interface object*

*- ncIcStartupSwU check error info interface object*

*- ncIcPathControlIfSwU check error info interface object*

*- ncIcPathAdministrationIfSwU check error info interface object*

*- ncIcPathPropertyIfSubSwU check error info interface object*

*- ncInterConnectPathAdministrationI check error info interface object*

*> te enable all ncIcPathControlIfSwU*

*coli>/diagm/te enable all ncIcPathControlIfSwU*

*> te status ncIcPathControlIfSwU*

*coli>/diagm/te status ncIcPathControlIfSwU*

*TRI status:*

*pid name enabled groups*

*- ncIcPathControlIfSwU check error enter return info trace1 trace2 trace3 trace4 trace5 trace6 trace7 trace8 trace9 state\_change bus\_send bus\_receive rec\_sig send\_sig param interface object user1 user2 user3 user4*

*> te default ncIcPathControlIfSwU*

*coli>/diagm/te default ncIcPathControlIfSwU*

*> te status ncIcPathControlIfSwU*

*coli>/diagm/te status ncIcPathControlIfSwU*

*TRI status:*

*pid name enabled groups*

*- ncIcPathControlIfSwU check error info interface object*

*> te save ncIcPathControlIfSwU*

*coli>/diagm/te save ncIcPathControlIfSwU*

**Tracing on EMCA is the same as in G1:**

*> bbte*

*coli>/diagm/bbte*

*bbte (prints this help info)*

*bbte [listagents | la]*

*bbte log [listduplicateobjects | ldo]*

*bbte log status <agentName>*

*bbte log enable <agent name> <trace object> [<trace group list>]*

*bbte log disable <agent name> [<trace object> <trace group list>]*

*bbte log read <agent name>*

*bbte log stream <agent name>*

*bbte log clear <agent name>*

*bbte log dump <agent name>*

*bbte log save <agent name>*

*bbte log setgrant <agent name> <grant> <threshold>*

*bbte log setdest [<agent name>] [--buffer emca|cpm|emca\_cpm] [--ip MOM\_param\_in\_IP\_addr target\_IP\_addr udp\_port] [dscp] [trace flags]*

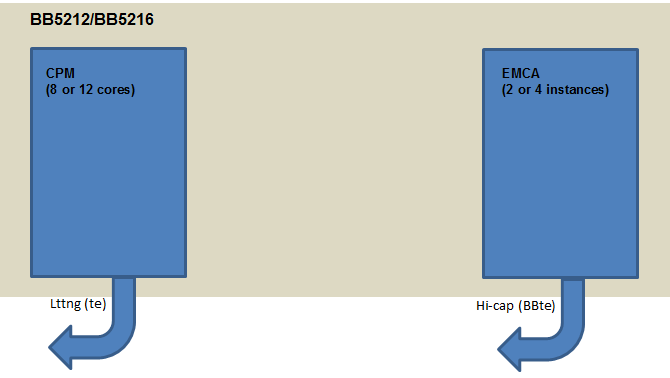
*bbte log export*

*bbte log getreport*

*To print Command usage:*

*bbte log <command>*

## Lttng streaming



There are two supported ways to setup the LTTng streaming, (For more info see: [Tracing in RCS with LTTng](https://rbs-rde-dev.rnd.ki.sw.ericsson.se/vobs/rcs/dev/RCP_CSX10179/OS_CRX901265/doc/15519/4_tracing-iwd.doc) ) one is will result in traces written to file and the other is live streaming where events are continuously viewed live.

**Find free ports you can use in your work station:**

*> netstat -a | egrep 'LISTEN '*

*tcp 0 0 \*:61022 \*:\* LISTEN*

*tcp 0 0 \*:61122 \*:\* LISTEN*

**Activate the trace on the target node in the coli shell:**

*ts ip <work-station-ip>:<high-port-A>:<high-port-B> <session-name>*

Exampel:

*ee/ts ip 10.68.96.230:61022:61122 DUS22\_Default*

*ee/ts save DUS22\_Default*

**Live streaming**

On the work station receiving the trace you should now be able to list live streaming traces:

*babeltrace -i lttng-live net://localhost:<high-port-C>*

**Traces directed to file**

* Start the lttng-relay server (trace receiver) on work station.

*lttng-relayd -C tcp://0.0.0.0:<free-high-port-A> -D tcp://0.0.0.0:<free-high-port-B> -o <trace destination folder> &*

Exampel:

*lttng-relayd  -C tcp://0.0.0.0:61022 -D tcp://0.0.0.0:61122 -o /home/labuser/rci-civ-up/Traces/10.68.96.22/ &*

* run babeltrace on the directory where the trace is located to decode the traces to ASCII:

*babeltrace <trace destination folder>*

If live streaming trace via babeltrace is not working. Stop and start session again on the target node in the coli shell.

*lttng stop <session-name>*

*lttng start <session-name>*

**stop lttng tracing:**

*ee/ts destroy DUS22\_Default*

**Stop lttng-relayd**

*Kill -9 <pid>*

**Lttng streamimg using moshell:**

*> h mon*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*mon/monu/mond/monf/mon?/mon-/monk/monk- [<board(s)|<boardGroup(s)>] [</path/to/logfile.pcap>]*

*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\**

*- mon[t] [<boards>|<boardgroup>] : to start a monitor session. If boards or board groups are not specified then the monitor is started on the core MPs only.*

*The "t" option is for enabling ssh tunnels between the node and the lttng-relayd (can be used in case firewall is blocking lttng ports)*

*By default the first three available TCP ports from 9001 and up will be used, but this can be changed in the uservariables lttng\_port and lttng\_range*

*- mon? : to print the list of active lttng sessions on the node*

*- mon- : to kill all active lttng sessions on the node*

*- monk : to kill all lttng-relayd and ssh port forwarding processes on the workstation (only those processes belonging to the current and which were started by mon command will be affected)*

*- monk- : same as monk and mon- combined*

*> mon?*

*0001: Lttng Session :mon\_10.68.96.13*

*0001: Time of creation:Mon 2016-02-29 21:49:24 UTC*

*0001: Session ID :1*

*0001: Status :active*

*0001: Enabled events:*

*0001: com\_ericsson\_plf\_trace\_util\* (loglevel: TRACE\_INFO)*

*0001: \* (loglevel: TRACE\_INFO)*

*0001: com\_ericsson\_tri\* (loglevel: TRACE\_DEBUG)*

*0001: All the TRI events have default group mask*

*> mon-*

*coli>/fruacc/lhsh 000100 /diagm/ts destroy 1*

*coli>*

*> mon?*

*No active Lttng sessions on this node*

See [LMR TROUBLESHOOTING WIKI](http://lte-plm.rnd.ki.sw.ericsson.se/lte_trsh_wiki/G2P/index.php?n=G2P.TraceAndError" \l "limit) and [G2 trace - Ericsson play](https://play.ericsson.net/media/t/0_j9ancwdn/19564341) for more info

# Decode PMD

Via script:

/env/rbsg2/app/build/0/bin/analyze\_dump.sh <directory\_with\_pmd> arm

Via PMDA (PMD analyzer) webtool,

[https://plf-pmda.rnd.ki.sw.ericsson.se](https://plf-pmda.rnd.ki.sw.ericsson.se/)

# Load black LM

## Load another LM on node manually (unsecure board)

1. Download the black M to the node:

* scp /home/XXXXXX/<laddmodul> root@<nod O&M IP>:/home/sirpa/dev\_patches/
* export PATH=$PATH:/home/sirpa/dev\_patches/
* root@du1:~# reboot

Broadcast message from root@du1 (pts/2) (Tue Jan 13 00:17:31 2015):

The system is going down for reboot NOW!

1. verify it's loaded with ps -ef and grep on the lm

if you want to remove the lm:   
delete the file from directory /home/sirpa/dev\_patches and then restart the node

## Load black LM by using UP

1. Download a UP radiator and clik on the “R-state” link
2. Unzip the UP
3. Unpack the lm and read the xml file so you get the information for the lm

> tar -xvf BlackLm.cxp -C tmp2

BlackLm.xml

sw.ar

-> cat BlackLm.xml

<?xml version="1.0" encoding="ISO-8859-1"?>

<configuration>

<product name="BlackLm" id="CXPxxxxx" version="R1" filename="BlackLm.cxp" />.

.

.

.

1. Remove the BlackLm.xml and sw.ar file but keep BlackLm.cxp. keep BlackLm.xml under the same folder with the other LM containers.
2. Update the xml file which belongs to the UP with the the following line:

<product name="BlackLm" id="CXPxxxxx" version="R1" filename="BlackLm.cxp" />

1. Upgrade the node with the modified UP.

# Miscelleneous Tips & Trix

**Run coli commands on XMU/RU/**

*> lhlist*

*coli>/fruacc/lhlist*

*LINKHANDLER HWTYPE PRODUCT ID REV SERIAL PRODUCTION DATE*

*===========================================================================*

*BXP\_0 RRUS 12mB4 KRC 161 326/1 Rxx BXP\_0 20120411*

*BXP\_1 RRUS 12mB4 KRC 161 326/1 Rxx BXP\_1 20120411*

*BXP\_2 RRUS 12mB4 KRC 161 326/1 Rxx BXP\_2 20120411*

*> lhsh BXP\_1 ?*

*coli>/fruacc/lhsh BXP\_1 ?*

*.*

*?*

*AlmSv*

*CmdTrActTest*

*CmdTrReleaseTest*

*CmdTrsConfigTest*

**In an unsecure boards, there is possibility for a quicker interactive troubleshooting by printing logs online and fetching PMDs. A lot of time can be saved than generating ESI log each time.**

**It is possible to list the whole file system using the Linux command “ls” in moshell as moshell would send it to the Linux shell:**

*> ls /*

*bin boot cxp9025851\_3.xml dev etc home lib linuxrc.sh media mnt opt priv proc rcs root run sbin software sys tmp usr var*

**One can list/print files/logs**

*> find /rcs*

*.*

*.*

*/rcs/log/SwmInternal/SwmInternal.1*

*.*

*.*

*/rcs/log/SwmLog/SwmLog.1*

*.*

*.*

*/rcs/log/SecurityLog/SecurityLog.1*

*.*

*.*

*/rcs/alh/RBS\_CS\_AVAILABILITY\_LOG.xml*

*.*

*.*

*/rcs/dumps/pmd/9/pmd-tn-oam-agent-10967-20160204-145048.tgz*

*> cat /rcs/log/SecurityLog/SecurityLog.1*

*.........1 2016-02-01T13:25:53Z 1 "INFO: src\_ip(-) LDAP: lookup, Authenticated: false, Reason: "primary: erroneous configuration - cannot bind for ldap search, no bindDn, no TLS" (0)"*

*.........2 2016-02-01T13:25:54Z 1 "INFO: src\_ip(-) LDAP: lookup, Authenticated: false, Reason: "primary: erroneous configuration - cannot bind for ldap search, no bindDn, no TLS" (1)"*

*.........3 2016-02-01T13:25:56Z 1 "INFO: src\_ip(-) LDAP: lookup, Authenticated: false, Reason: "primary: erroneous configuration - cannot bind for ldap search, no bindDn, no TLS" (1)"*

*.........4 2016-02-01T13:25:56Z 1 "INFO: src\_ip(147.214.14.219) SSH: cli login failure: Bad user or password"*

*.........5 2016-02-01T13:25:58Z 1 "INFO: src\_ip(-) LDAP: lookup, Authenticated: false, Reason: "primary: erroneous configuration - cannot bind for ldap search, no bindDn, no TLS" (1)"*

*.........6 2016-02-01T13:25:58Z 1 "INFO: src\_ip(147.214.14.219) SSH: cli login failure: Bad user or password"*

*.........7 2016-02-01T13:26:09Z 1 "INFO: src\_ip(-) LDAP: lookup, Authenticated: false, Reason: "primary: erroneous configuration - cannot bind for ldap search, no bindDn, no TLS" (0)"*

*.........8 2016-02-01T13:26:11Z 1 "INFO: src\_ip(-) LDAP: lookup, Authenticated: false, Reason: "primary: erroneous configuration - cannot bind for ldap search, no bindDn, no TLS" (1)"*

*.........9 2016-02-01T13:26:13Z 1 "INFO: src\_ip(-) LDAP: lookup, Authenticated: false, Reason: "primary: erroneous configuration - cannot bind for ldap search, no bindDn, no TLS" (1)"*

*........10 2016-02-01T13:26:13Z 1 "INFO: src\_ip(147.214.14.219) SSH: cli login failure: Bad user or password"*

**…and fetch pmds as well through secure copy**

*!scp -r root@<node IP>:/rcs/dumps/pmd/9/pmd-tn-oam-agent-10967-20160204-145048.tgz /home/xxxx*

**Disable process crash escalation to board restart:**

*coli [/]-> misc/authlevel disabled*

*board/escalation -d*

or on unsecure board:

*touch /home/sirpa/do\_not\_escalate\_restart*

Process kill:

coli>misc/authlevel disabled (get access to whole RCS-COLI)

*/board/restart –ew … enable board warm restart*

*coli>/board/escalation -p cnt*

*PROGRAM GROUP MEMBER ESCALATION MAX RESTARTS MAX TIMEOUT RECENT RESTARTS*

*ipdump\_lmhi\_program no\_group Board 100 300 0*

*tn-oam-agent.sh no\_group BoardWarm 0 300 0*

*dpsd.sh no\_group BoardWarm 0 300 0*

*imi.sh no\_group BoardWarm 0 300 0*

*oamd.sh no\_group BoardWarm 0 300 0*

*ospfd.sh no\_group BoardWarm 0 300 0*

*nsm.sh no\_group BoardWarm 0 300 0*

*npa-init.sh no\_group BoardWarm 0 300 0*

*syncLocal no\_group Board* 0 300 0

**Run moshell on dcgm file:**

*/app/moshell/latest/moshell/moshell <dcgmfile.zip>*

**Exampel of Configuring using COMCLI:**

*$ ssh -p 2023 expert@<LMT\_IP>  -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null  
There are several commands that can be run in the Management View. For information, type help:   
>help*

*Some examples: <br />*

*> show all //Show the whole MIM*

*> show ManagementElement=1,Equipment=1 //Show one MO*

*> configure //Go in to configure-mode*

*configure> ManagedElement=1,SectorEquipmentFunction=mySector //Create new sector*

*configure> top //Go to the tree tope*

*configure> ManagedElement=1,Equipment=1,PlugInUnit=1,administrativeState=LOCKED //Set attribute*

*configure> commit // Commit changes*

*configure>* end //Get back to read mode> <br

**Moshell training for com nodes:** [http://newtran01.au.ao.ericsson.se/moshell/training/Moshell\_for\_COM\_PA36.doc](http://newtran01.au.ao.ericsson.se/moshell/training/Moshell_for_COM_PA27.doc)

**moshell parameters**

Add the following user variables in ”~/.moshellrc” for exporting logs and to be used by by “lg” command in moshell

*export\_method=2*

*export\_server=<ip address>*

*export\_username=userid*

*export\_password=password*

*export\_timeout=120*

**There are four export methods supported by moshell. Which one to use depends on firewall configuration.**

# Export settings. Used on COM nodes for exporting the MOM from Schema MO (comcli\_mom=3) and the Logs from Log/LogM MO ("lg" command)

#

# - export\_method=0

# export to custom SFTP server on a random port specified in sshd\_port and sshd\_range.

# The SFTP server will run on the same machine where moshell is executing and only for the duration of the export.

# No username or password need to be specified. The SFTP port is selected randomly in the range specified by the uservariables sshd\_port/sshd\_range

# This method only works if the firewall does not block the SFTP ports in that range from the node to the workstation.

# The following uservariables are used by export\_method=0: sshd\_port, sshd\_range, sshd\_random

#

# - export\_method=1

# export to the existing SFTP server running on port 22 on the moshell workstation

# With this method, the uservariables export\_username and export\_password must be set.

# If export\_password is not set then it will be prompted at the first export.

# The following uservariables are used by export\_method=1: export\_username, export\_password

#

# - export\_method=2

# export to a remote SFTP server on port 22, the address of the server is specified in the uservariable export\_server

# important: the remote SFTP server must be reachable both from the node as well as from the workstation where moshell is running

# since the logfile will be first transferred from the node to the server, then from the server to the moshell workstation.

# The temporary path where to store the logs on the remote server can be specified with the uv export\_dir

# The export\_dir setting is optional, but if it has been specified then it must actually exist on the server, moshell will not create it automatically.

# If export\_dir has not been specified then the logs will be temporarily stored on the default root path of the SFTP server such as the user's home directory for instance

# After the logs have been successfully transferred back to the moshell workstation, they will be removed from the remote SFTP server.

# With this method, the uservariables export\_username and export\_password must be set.

# If export\_password is not set then it will be prompted at the first export.

# The following uservariables are used by export\_method=2: export\_username, export\_password, export\_server

#

# - export\_method=3

# export to the node's own SFTP server on port 22, then fetch the files from the node's SFTP server

# This is basically an alias to export\_method=2,export\_server=<nodeip>,export\_username=<nodeusername>,export\_password=<nodepassword>

#===============================================================================

**RCS Log Options:**

*- a: Alarm log (AlarmLog)*

*- b: TN Application log (TnApplicationLog)*

*- h: AutoIntegration log (AiLog)*

*- k: Ericsson Support Information log (EsiLog)*

*- l: COLI command log (AuditTrailLog)*

*- o: MO command log (AuditTrailLog)*

*- v: Availability log (RBS\_CS\_AVAILABILITY\_LOG)*

*- u: Upgrade log (SwmLog)*

*- y: Security log (SecurityLog)*

*- z: TN Network log (TnNetworkLog)*

**ESI log filters (RCS):**

The ESI (Ericsson Support Information) log filter is specified with "-x <filter>" in the command "lgk" on RCS nodes to specify the type of logs that will be displayed.

*- 1) ai : rcs/log/AiLog/AiLog.\**

*- 2) al : rcs/saf\_log/saLogAlarm/saLogAlarm\_\*\_\_\*.log*

*- 3) a\_t : rcs/log/AuditTrailLog/AuditTrailLog.\* (MO part)*

*- 4) atr : rcs/log/AuditTrailLog/AuditTrailLog.\* (COLI part)*

*- 5) capi : cpu\_load.log*

*- 6) com : rcs/comte/com.log.\**

*- 7) coma : rcs/comte/com\_alarm.log.\**

*- 8) comi : rcs/log/ComInterfaceLog/ComInterfaceLog.\**

*- 9) erl : rcs/bootlogs/erlang.log.1 AND rcs/erlang/erlang.log.\**

*- 10) ev : rcs/log/NotificationLog/NotificationLog.\**

*- 11) lic : rcs/log/LicensingLog/LicensingLog.\**

*- 12) ltt : rcs/log/LttngLog/LttngLog.\**

*- 13) mmi : rcs/log/MMILog/MMILog.\**

*- 14) nl : rcs/bootlogs/nl\_log.\* and rcs/networkloader/nl\_log.\**

*- 15) notif : rcs/saf\_log/saLogNotification/saLogNotification\_\*\_\_\*.log*

*- 16) pnp : rcs/saf\_log/PnpApplicationLog/PnpApplicationLog\_\*\_\_\*.log*

*- 17) sys : rcs/saf\_log/saLogSystem/saLogSystem\_\*\_\_\*.log*

*- 18) sec : rcs/log/SecurityLog/SecurityLog.\**

*- 19) swmi : rcs/log/SwmInternal/SwmInternal.\**

*- 20) tnapp : rcs/saf\_log/TnApplicationLog/TnApplicationLog\_\*\_\_\*.log*

*- 21) tnnet : rcs/saf\_log/TnNetworkLog/TnNetworkLog\_\*\_\_\*.log*

*- 22) tri : rcs/log/TriLog/TriLog.\**

*- 23) swm : rcs/log/SwmLog/SwmLog.\**

*- 24) upg : rcs/saf\_log/saLogUpgrade/upgrade\_\*\_\_\*.log*

*- 25) pmc : rcs/log/RcsPmCounters/RcsPmCounters.\**

*- 26) pmev : rcs/log/RcsPmEvents/RcsPmEvents.1*

*- 27) syslog: var/log/syslog*

*- 28) llog : var/log/llog/llog*

*- 29) hw : tmp/ee\_esi/ee\_esi.log*

Example*:*

*>> lgk -x coma,erl,tri --> show the log entries from com\_alarm.log, erlang.log and TriLog in the ESI*

*>> lgk -x 7,9,22 --> same as above*

*>> lgkm -x 2-4,7 --> show the log entries from saLogAlarm, com\_alarm, and AuditTrail (both MO and COLI parts), and merge them chronologically*

**Collect all logs and save to a zipfile:**

> lgf

**Print resources**

**Memory usage:**

*cat /proc/vmallocinfo*

*cat /proc/meminfo | grep Vmalloc*

**Disk usage:**

*df*

**Linux, kernel, and ADK kernel module version:**

*strings /etc/issue\**

*uname -a*

*cat /proc/sys/kernel/version*

*cat /sys/module/adkNetD/version*

**Process/task/cpu/core information:**

*top*

*capi tot*

*capi prog*

*capi core all*

*cat /proc/cpuinfo*

*cat /proc/`pidof dpsd`/status*

*cat /proc/`pidof dpsd`/task/\*/status | egrep "^Pid:|State:"*

*ls -la /proc/`pidof dpsd`/task*

*ls -la /proc/`pidof dpsd`/fd | grep tun*

*ls -la /dev/net/tun*

*ps -eL -o pid,tid,class,rtprio,ni,pri,psr,pcpu,stat,wchan:34,comm:15,cmd*

*ps -axo pid,rss,command*

*ps auxfww*

*taskset -p `pidof dpsd`*

**Hw/Sw invenory:**

*inv*

**Find all MO fragments installed on the node:**

find / | grep \_mp.xml

**Print all coli commands in the node:**

Runfirst **“**misc/authlevel disabled" so that full list of RCS\_COLI commands are available.

> *c1*

*> /misc/authlevel disabled*

*> misc/cmds*

*/antm/antcdbi*

*/board/escalation*

*/board/hwinfo*

*/board/hwpid*

*/board/restart*

*/board/vii*

*/cli/welcometext*

*/cm/apc\_signalshark*

*/cm/ncdbi*

*/cm/sysconread*

*/cm/sysconreset*

*/cm/sysconwrite*

*/com/loglevel*

*/com/version*

*.*

Linux command to print directory structure in the form of a tree in unsecure boards:

> find /rcs/log

/rcs/log

/rcs/log/RcsPmEvents

/rcs/log/RcsPmEvents/RcsPmEvents.siz

/rcs/log/RcsPmEvents/RcsPmEvents.1

/rcs/log/RcsPmEvents/RcsPmEvents.idx

/rcs/log/logCounter.dets

/rcs/log/NotificationLog

/rcs/log/NotificationLog/NotificationLog.siz

/rcs/log/NotificationLog/NotificationLog.2

/rcs/log/NotificationLog/NotificationLog.idx

/rcs/log/NotificationLog/NotificationLog.1

/rcs/log/MMILog

/rcs/log/MMILog/MMILog.idx

/rcs/log/MMILog/MMILog.1

/rcs/log/MMILog/MMILog.siz

/rcs/log/ComInterfaceLog

/rcs/log/ComInterfaceLog/ComInterfaceLog.idx

/rcs/log/ComInterfaceLog/ComInterfaceLog.1

/rcs/log/ComInterfaceLog/ComInterfaceLog.3

/rcs/log/ComInterfaceLog/ComInterfaceLog.siz

/rcs/log/ComInterfaceLog/ComInterfaceLog.2

/rcs/log/AuditTrailLog

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# Abbreviations

| Abbreviation | Meaning |
| --- | --- |
| BB | Baseband |
| CAT | Common Access Technology (one of the Function Modules) |
| CPI | Customer Product Information |
| CPRI | Common Public Radio Interface |
| DL | Downlink |
| ECIM | Ericsson Common Information Model |
|  |  |
| RCS | Rbs Control System (one of the Function Modules) |
| SWM | Software management function |
| Xrat | GSM, LTE and WCDMA Radio Access Technology |