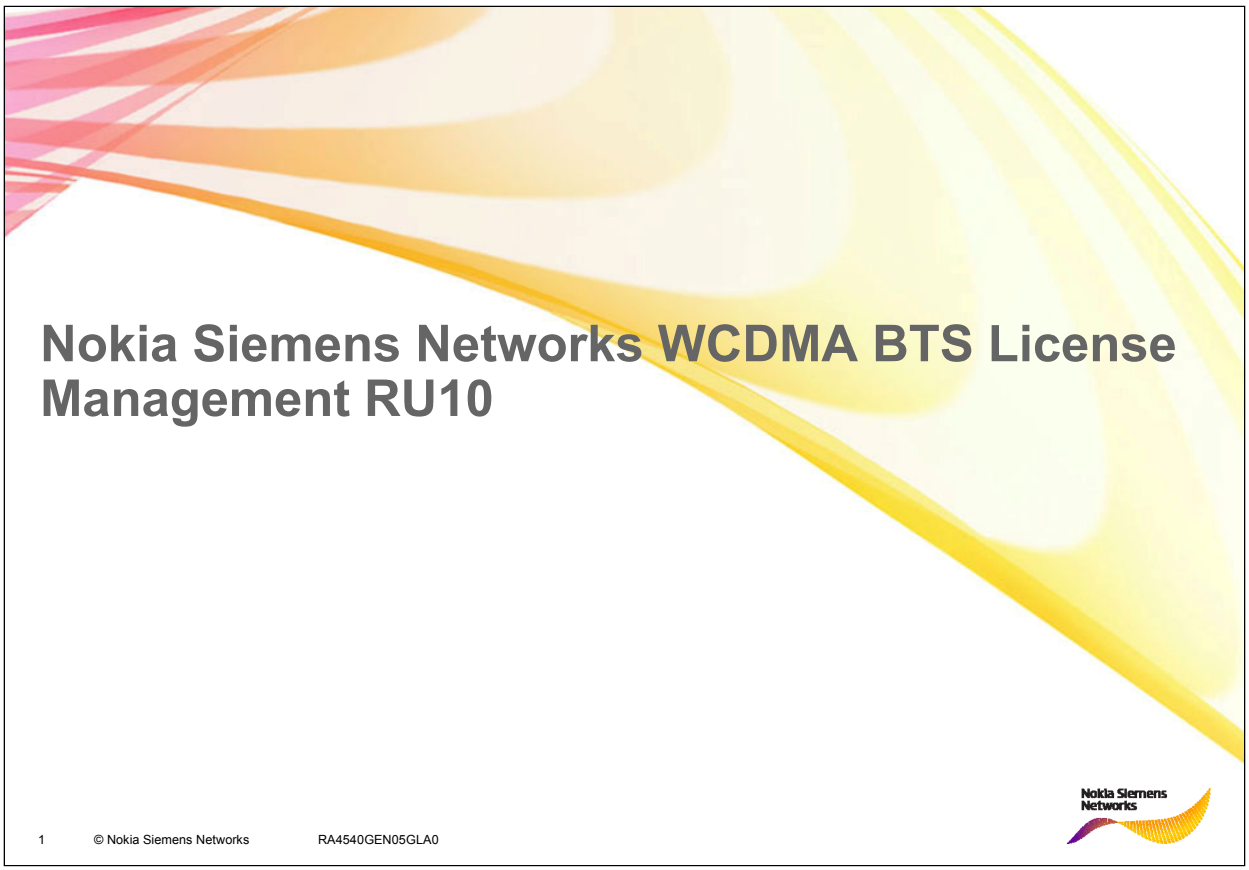
Nokia Siemens Networks WCDMA BTS License Management RU10
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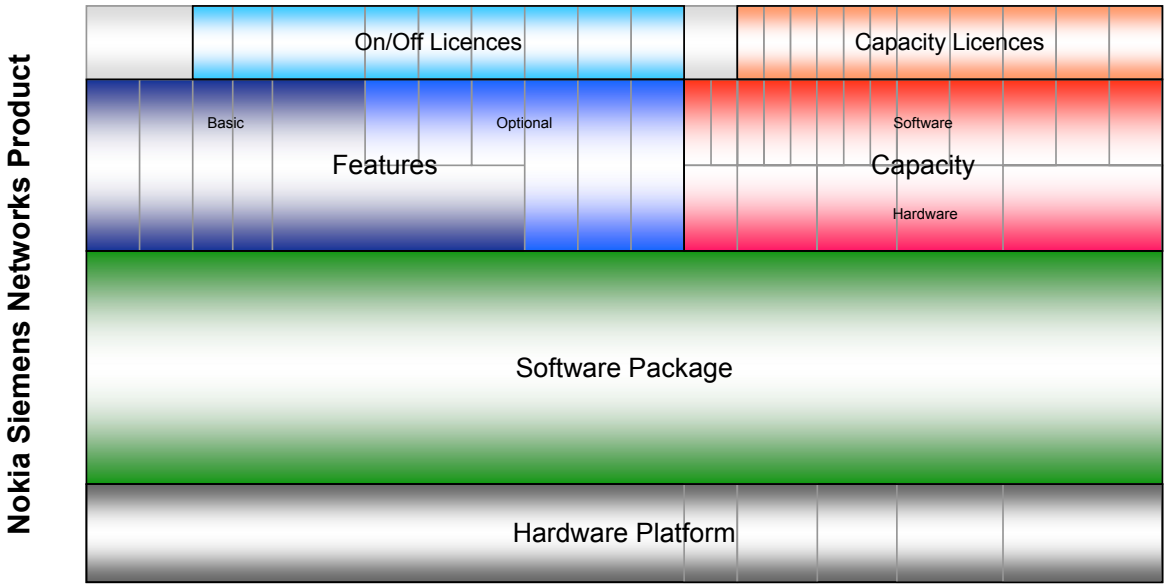
Nokia Siemens Networks WCDMA BTS License Management RU10

Learning Element Objectives

After completing this Learning Element, the participant will be able to:
Theory/Practical:

- List supported licensed features
- Activate Licensed features
- Recognize different license types

Nokia Siemens Networks License: General Concept



License

A Licence File

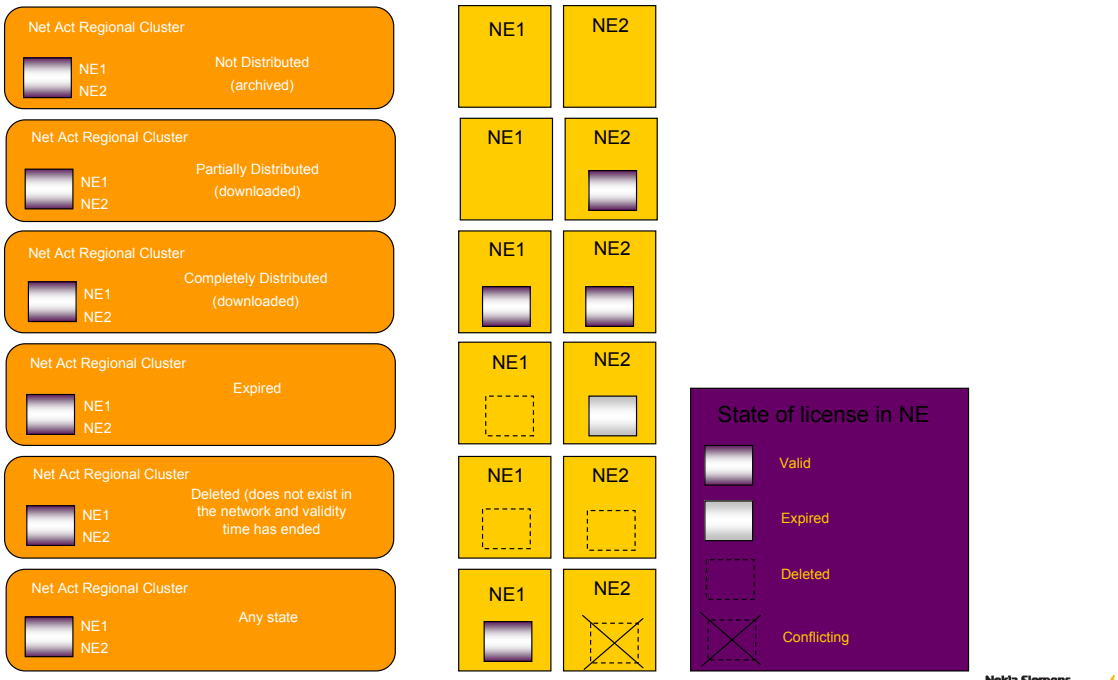
- A licence is an agreement from the owner of a product that gives permission to use or produce the product, features or functionality according to the agreed conditions
- The information that enables the use of licensed software is called a license key
- Is a file in XML format with signature
- Includes a licence code that represents one licence
- Allows to use one or more optional features
- Is fixed to a specific target NE by using target identifier
- Can expire
- Is “capacity” type or “on/off” type
- Can be incremental (capacity licences)

A license file may also define restrictions concerning the use of the licensed features and functionalities

License File State

- License file state at network level
  - Not distributed
  - Partially distributed
  - Completely distributed
  - Expired
  - Deleted from network
- License file state in a network element
  - Not distributed
  - Distributed
  - Expired (still in NE)
  - Exipred (not anymore in NE)
  - Unintegrated
  - Conflicting
  - Invalid

License File State in Network Elements

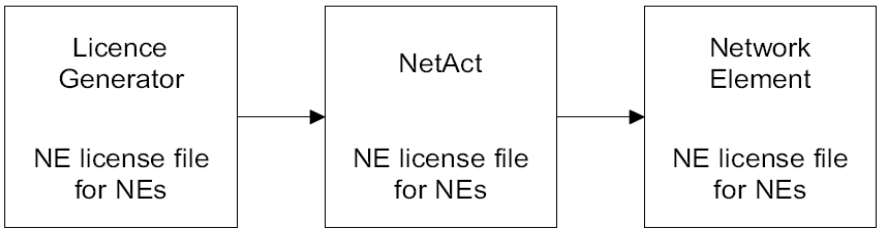


License Model in WCDMA RAN

- NE License
- Pool License
- Network License

Network Element License

- The Network Element (NE) licensing concept is used for low-volume network elements
- NE licenses contain target identifiers for one or several network elements
- NE licenses are installed to network elements either using NetAct License Manager or element managers.



Creation and delivery of NE license files based on target identifiers of NEs

Distribution of NE license files

Pool license

- Pool licenses contain license information for a large number of network elements of the same type. They are used for AXCs, WCDMA WBTSs, and I-HSPA WBTSs
- Pool licence is generated by the LG (License Generator) and it is tied to one single NetAct Regional Cluster (*TargetId* field in the license file contains one NetAct Regional Cluster identifier).
- Based on the Pool licence NetAct Regional Cluster generates “NMS-generated licenses” to the network elements (NE) and distributes the licences to NEs.
- NMS-generated licenses contain the same capacity/validity time (startTime and endTime) as the pool licence
- Every pool license typically includes only one functionality, but the one functionality may have several pools in the same NetAct.

Pool license

Pool licenses can be on-off or capacity licences

- To license on-off SW feature
  - On/Off Pool license contains (in the *maxValue* field) the number of network elements. This is the restriction delivered to NetAct; NetAct cannot create NMS-generated licences for more than the restriction.
  - When installing the license to the NE by NetAct the SW feature is enabled
  - Permits the use of licensed applications
- To license capacity-limited SW feature
  - Pool Capacity license contains (in the *maxValue* field) the total amount of capacity that can be divided between the network elements
  - Defines the amount of capacity provided into the NetAct to be allocated to the network elements
  - Capacity usage is restricted to the capacity value in the license key

Pool License : NMS-generated License

- In order to take the license into use in the network elements, a license file needs to be generated for the network elements from the pool license. The generated file is called an NMS-generated license file and it contains the target identifiers of the network elements
- Based on the Pool licence NetAct generates NMS-generated licences to the network elements according to user requests.
- NMS-Generated licence contains same features and validity time (*startTime* and *endTime*) as the pool licence.
- NMS-Generated licence is tied to one or several network elements (*TargetId* field in the licence file contains one or several network element identifiers).
  - If the allocated capacity value is the same, then several network elements can share a same NMS-Generated licence file (if allocation done from the same pool).
- NMS-Generated licence is distributed by NetAct to the network element(s) in question.
- Generating a license from the pool license decreases the amount of free capacity in the pool
- Pool licenses and NMS-generated licenses are managed with License Manager

Network License

- A network license is a license file that does not contain any target identifiers. Instead, their use is limited to the network element type specified in the license file
- Network licenses can be used to allow fast activation of a licensed functionality for a short period of time
- Network licenses are managed with element managers

License Attributes: Validity Time and Capacity Aspect

- The licence either has a technical validity period or no validity limitation. Thus the licence is either
  - ***time-limited***, i.e. containing an end-date for licence validity or
  - ***non-time-limited*** (valid forever), i.e. containing no end-date for licence validity
- The licence either has a capacity limitation or no limitation at all for the licensed functionality. Thus the licence is either
  - ***on/off licence*** (no capacity limitation)
  - ***capacity licence*** (contains a capacity limit)
- In case of Capacity License, some features may have basic capacity that is available without any licence.
- Capacity expansion is done by installing another capacity licence into the element, capacity will be expanded incrementally, i.e. previous licence files are still valid and the capacity values are summed up.
- In case of On/Off licence, typically it is not possible to activate a feature before correct licence has been installed into the product.

Network element checks the restrictions for

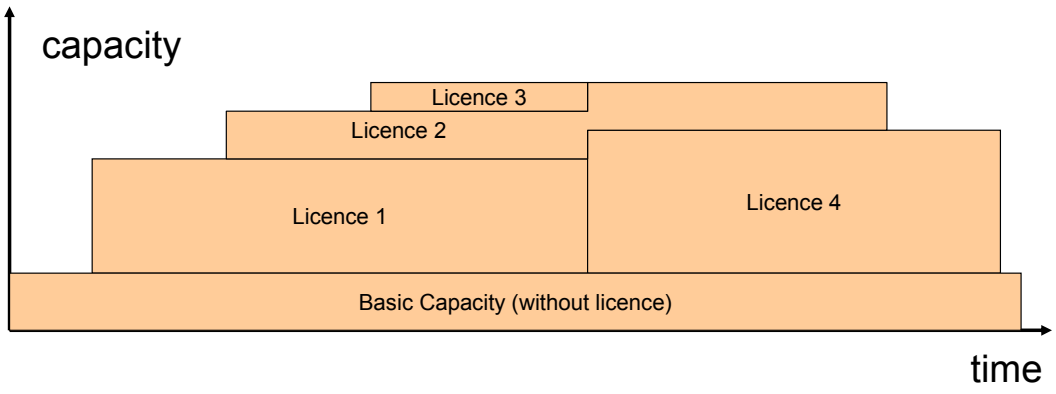
• validity period (time limitation) and

• capacity limitation

and permits the functionality accordingly.

Same functionality may have non-time limited licences and time-limited licences. This allows to increase the capacity for a defined period (e.g. 30 days) when temporary increase of the capacity needed.

Capacity Licences



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A capacity license specifies the capacity value up to which the functionality is permitted, whereas an on/off license does not set any limit for the feature or functionality, the feature is simply permitted. When you need to increase capacity, you can order new capacity licenses and install them in the network element. The total capacity available is summed up from the installed capacity licenses and the possible basic capacity.

The capacity license files for the same feature are called capacity increments. In the figure below, there are two capacity increments for the example element, one increment having capacity value 20, and the other with capacity value 30. Some basic capacity may exist even without a license. In the example below, the element has basic capacity value 10.

Maximum capacity is the maximum amount of capacity network element

can provide for the feature

License Management Tool

There are three applications involved in licensing:

- NSN Standard License Key Generator
- Element managers of network elements.
- Net Act License Manager

NSN Standard License Key Generator

- NSN Standard Licence Key Generator is used for retrieving the licenses from Nokia Siemens Networks
- The NSN Standard Licence Key Generator also takes part in the pool license substitute process by generating a Substitute permission file based on the approved or rejected license substitute requests

Element Managers of Network Elements

- Element manager functionality depends on the supported products
- All element managers support the basic license management operations, which include license installation, license removal, and some reporting functionality
- Element managers cannot be used to manage pool licenses

NetAct License Manager

License Manager application used to deliver correct licenses to various network elements

The Licence Manager functionality includes eight operations:

- Importing licenses to NetAct
  - Licenses have to be imported to the NetAct database and the license repository before they can be managed with Licence Manager.
- Distributing licenses to network elements
  - License distribution is used for transferring the selected licenses to the specified network elements. With pool licenses, you need to select the network elements to which licenses are distributed. With NE licenses, the license contains the target network elements and there is no need to define them

NetAct License Manager

- Setting feature state
  - Some network elements require that the administrative state of the licensed features is set to the appropriate state before the configuration and activation of the feature is possible. There are three feature states: *on*, *conf* and *off*. State *conf* value stands for configuration.
- Synchronising license and feature information in NetAct database
  - Synchronisation updates the NetAct database with the latest license and feature information from the network element. It is needed when license information is changed in the network elements by means other than Licence Manager.
- Reporting
  - Licence Manager offers some basic reports based on the information stored in the NetAct database

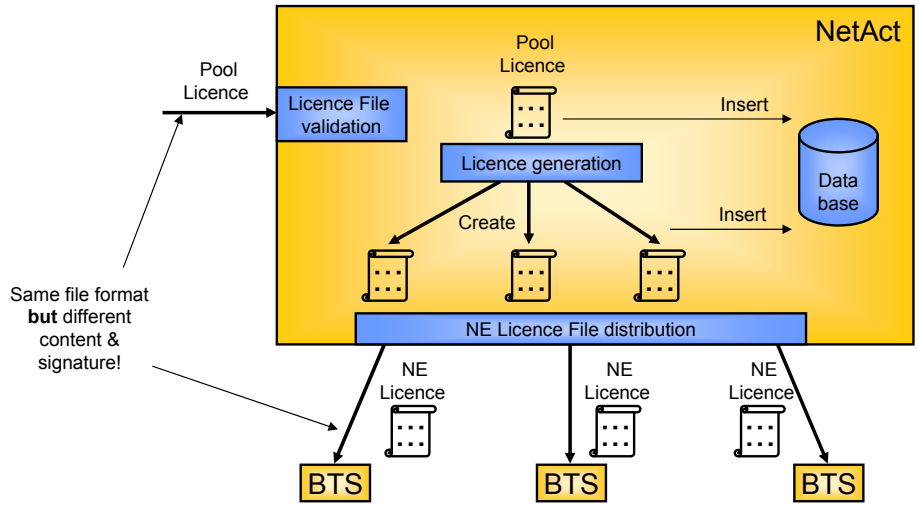
NetAct License Manager

- Deleting licenses
  - License deletion is used for removing expired, irrelevant, or, if necessary, even valid license files from network elements.
- Substituting pool licenses
  - The pool license substitute process is used to release license files tied to a replaced hardware unit back to the pool for further use. It is also used in case a wrong target was selected for a pool license during pool distribution
- Showing NetAct cluster information
  - This operation shows customer names, customer IDs, and target identifier of NetAct Regional Cluster which is needed in pool licenses
- Connecting licenses to network elements
  - This operation is used to distribute previously imported licenses to newly integrated network elements

NetAct License Manager

Centralized Pool Licence Management by NetAct

- Licence creation in NetAct



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Because the AXC and the BTS exist in high volumes in the network, Nokia doesn't generate licences for these network elements directly (NE licences) but so-called pool licences are used. This means that the user gets the licence to use a dedicated amount of features or capacity (pool licence) and it's up to the user to determine how these NE licences are distributed towards the network elements. As an example, the customer buys a pool licence for 10.000 code channels for BTS. He will get a Pool Licence file that allows using this capacity and with this Pool Licence and the help of the licence management tools in NetAct, he's able to distribute the capacity on his own wish, e.g. 120 code channels for BTS-1, 70 code channels to BTS-2 etc. For this purpose, NetAct itself generates appropriate licence files and downloads them to the network elements.

Tasks Performed with License Manager

Task	GUI	Command line user interface
Importing licenses	X	
Distributing NE and NMS generated licenses	X	
Distributing pool licenses	X	
Setting feature state	X	X
Synchronising license and feature information	X	
Reporting on licenses	X	X
Deleting licenses	X	X
Substituting pool licenses	X	
Checking NetAct cluster information	X	
Connecting licenses to NEs	X	

WCDMA BTS License Classification Guideline

Operating SW:

- Channel capacity
- On/Off Activations of HW functionalities (2'nd carrier activation, 40W license etc)
- Basic Functionalities that require separate forecasting (Flexi BTS antenna line functionalities
- Capacity related functionalities that need to be excluded from App SW caps
- Purely BTS related options

Application SW:

- Value added SW functionalities that can be sold as stand-alone functionalities (HSPA features, transmission features)
- RAN level functionalities

WCDMA BTS Operating SW Items

Operating SW Items: (Flexi only)

• RAN912LK	Channel Capacity LK (Operating SW)	RAS05.1
• RAN905LK	Flexi WCDMA BTS Nokia MHA Support LK	RAS05.1
• RAN907LK	Antenna Line Supervision LK	RAS05.1
• RAN1001LK	2nd RF Carrier Support LK	RAS05.1ED
• RAN1002LK	40W Power license for Flexi WCDMA BTS LK	RAS05.1ED
• RAN1144LK	Flexi WCDMA BTS 8 W RF Power Limitation	RAS05.1ED
• RAN908LK	Flexi WCDMA BTS AISG MHA Support	RAS06
• RAN906LK	Flexi WCDMA BTS AISG Ant Tilt Support LK	RAS06
• RAN1282LK	Flexi WCDMA BTS Mast Head RF Module 40W Power Support	RAS06

License-based BTS Channel Capacity

- Capacity License
- Without license 32 Channel Elements are active (Both in master System module and Extension System Module)
- Max CE capacity of FSMB is 240 CE. (192 CE in RAS05.1 ED)
- Example: Flexi BTS with Master and Extension System Module (2 x FSMBs):
  - Max capacity 2 x 240CE = 480CE;
  - Max license capacity = 480 – (32+32)=416CE

RAN 905: Flexi WCDMA BTS Nokia Siemens Networks MHA Support LK

- Bias-T is integrated to RF module of Flexi BTS. It feeds DC power to MHA and controls MHA DC power current consumption. If current consumption is out of specified window range an alarm is generated.
- In UltraSite Bias-Ts have been separated HW units installed to BTS antenna connectors and customer has paid the functionality in Bias-T HW price, typically 6 pieces for 3 sector BTS.
- In Flexi BTS this MHA power feeding and alarm control must be enabled by SW License because HW is integrated to all RF Modules.
- Capacity License.
- Pool license capacity factor = 3 -> Pool License capacity “1” gives MHA support for 3 RF blocks i.e. 1+1+1 configuration

This is an automated message from Licence Key Generator for the following

eChannel order id:

Customer order id:

Customer: NOKIA

Target NE: WBTS

Sales item description: Flexi WCDMA BTS Nokia MHA Support LK Feature code(s): 0000000310 Feature name(s): Flexi WCDMA BTS Nokia MHA Support Licence capacity: 3

File: D2503937.XML

Capacity: 3

Target IDs: L9063100058

With best regards

NET Licence Key Generator

RAN 907: Antenna Line Supervision LK

- Antenna line supervision is integrated to RF module of Flexi BTS. It measures the VSWR i.e. reflected RF power of the BTS TX antenna branch.
- On/Off license (Capacity “1” needed for the whole BTS)

RAN 1001: 2nd RF Carrier Support LK

- In Flexi WCDMA second RF carrier in dual transceiver can be enabled by SW License key.
- Capacity license (capacity “3” needed for 2+2+2 A-type)

RAN 1002: 40W Power license for Flexi WCDMA BTS LK

- Enables 40 W output power
- Capacity license (capacity “3” needed for 1+1+1 40 W)

The Maximum amount of licenses in one BTS depends on what kind of RF Module Variants The Flexi BTS is piled up.

The Maximum amount of 40W Carrier power licenses is 6 with 3 dual type (50W) RF Modules. E.g. 3 x FRGC or 3 x FRIA

The Maximum amount of Multi Carrier licenses is 3 with 3 single type (50W) RF Modules or with one Single and one Dual type (50W) RF Module. E.g. 1 x FRIA + 1 x FRIB or 3 x FRIB

In WN 3.3 only one 8W Power license is supported although HW can support up to 6 with three dual type RF Modules.

Largest configuration without licenses is 1+1+1@20W

All other configurations e.g. 1+1+1@40W or 2+2+2@20W needs always licenses.

Handling of licenses is done via the general License Management Procedures. More information of License handling can be found from License and Option Management EFS

Active System Component is BTSOM.

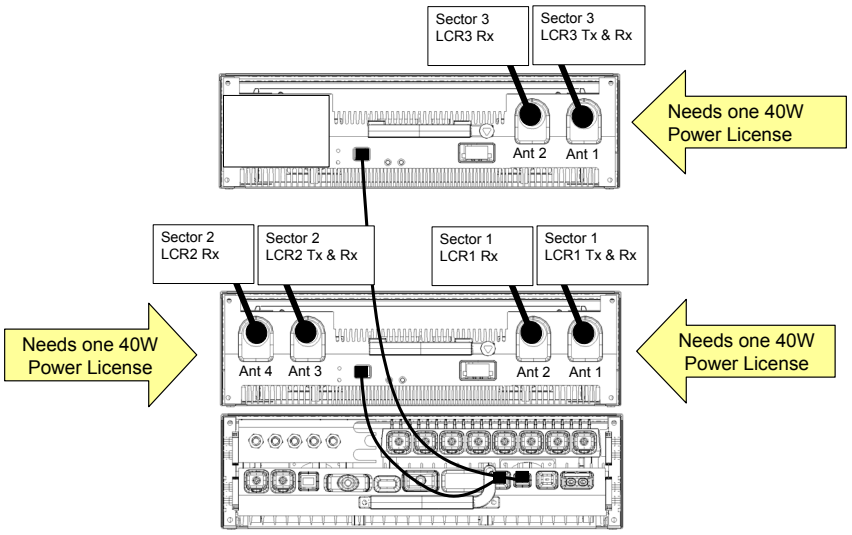
Configurations Against Licenses in WN3.3

1+1+1@40W

(1x single PA RF Module + 1x dual Pa RF Module)

A type configuration

Together three Flexi BTS 40W Power licenses is needed to get the configuration in use.



2+2+2@20W

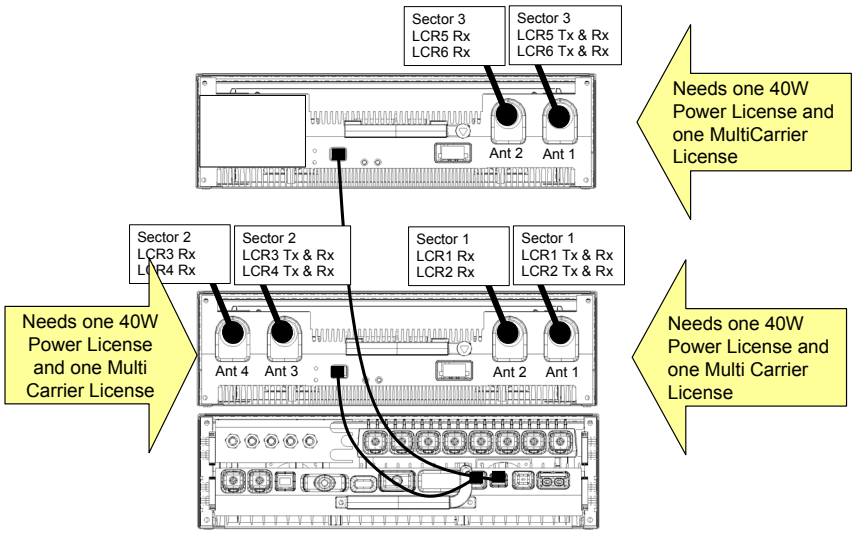
2+2+2@20W

(1x single PA RF Module + 1x dual Pa RF Module)

A type configuration

Together three Flexi BTS 40W Power licenses is needed to get the configuration in use.

Together three Flexi BTS Second Carrier Licenses is needed to get the configuration in use.



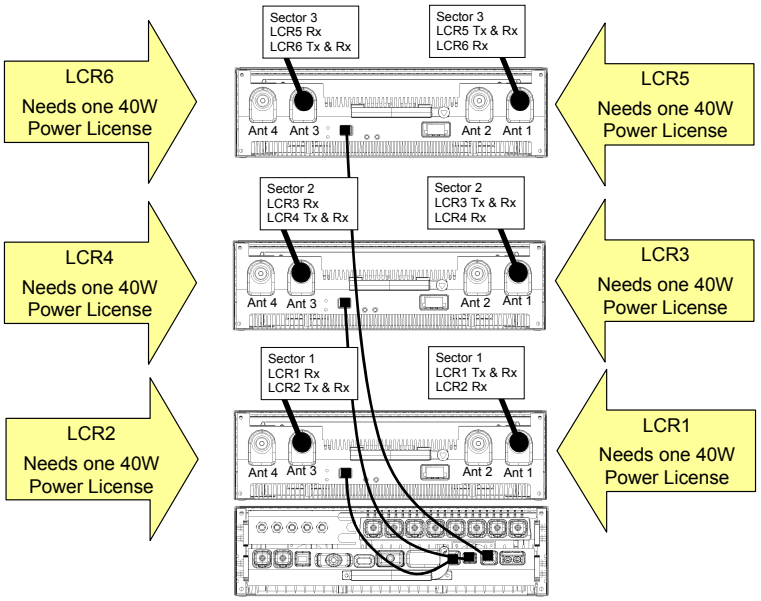
2+2+2@40W

2+2+2@40W

(3 x dual PA RF Module)

B - type configuration

Together six Flexi BTS 40W Power licenses is needed to get the configuration in use.

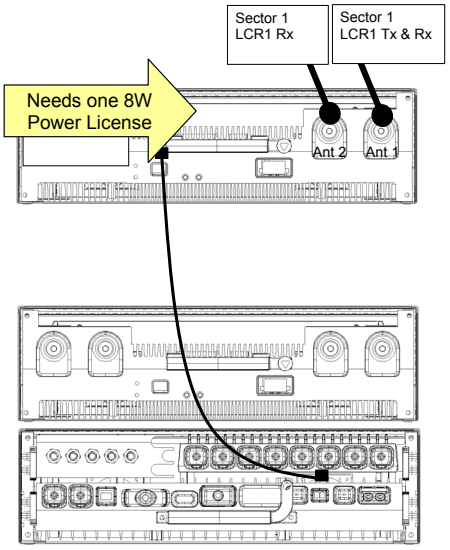


Flexi WCDMA BTS 8W RF Power Limitation

- This feature makes possible to limit Flexi BTS RF power into 8W with current 20/40 W RF module. It makes possible to limit maximum allowed RF exposure from BTS especially on micro sites. RF exposure limits are depending on national or local legislation in each country.
- The operator can select 8W mode in commissioning phase of FlexiBTS. FlexiBTS RF module will internally limit the output power into 8W with control cycle of less than 1ms.
- Capacity license (Capacity “3” needed for 1+1+1 8W)

1@8W

1@8W
(1 x Single PA RF Module)
A - type configuration
8W Power license is needed



RAN 908: Flexi WCDMA BTS AISG MHA Support

- Bias-T is integrated to RF module of Flexi BTS. It feeds DC power to MHA and controls MHA DC power current consumption. If current consumption is out of specified window an alarm is generated.
- AISG has specified more control functionality for MHA. This control is done over OOK modulation using antenna feeder.
- In Flexi BTS AISG MHA power feeding and enhanced MHA alarm control is enabled by SW License because
- On/Off license (Capacity “1” needed for the whole BTS)

The roll-out of 3G systems has accelerated the use of antenna line products with digital remote control and monitoring facilities. The Antenna Interface Standards Group has created an open specification for the control interface for these devices. Future developments of the specification are expected to extend the range of devices and the available command syntax.

RAN 906: Flexi WCDMA BTS AISG Antenna Tilt Support

- Antenna Tilt is integrated to RF module of Flexi BTS. It feeds DC power to Antenna and controls Antenna tilting
- In Flexi BTS AISG specified Antenna tilting functionality is enabled by SW License because HW is integrated to all RF Modules
- On/Off license (Capacity “1” needed for the whole BTS)

RAN1282LK: Flexi WCDMA BTS Mast Head RF Module 40W Power Support

- Flexi WCDMA BTS Mast Head RF Module 40W Carrier Power license will activate full 40W power to Flexi WCDMA BTS Mast Head RF Module.
- Capacity license

WCDMA BTS/AXC Application SW License Keys 1/2

Application SW Items: HSPA (Flexi and Ultra)

• RAN119LK	Power Level Monitoring	RU10
• RAN1254LK	Timing over Packet Application SW	RU10
• RAN1093LK	HSDPA 16 QAM Software Licensing Support	RAS05.1
• RAN849LK	HSDPA PFRP Scheduler LK	RAS05.1
• RAN1034LK	HSDPA Shared Scheduler for BTS	RAS06

Application SW Items: FTM

• RAN1216LK	Flexi RF Module Triple 70W 2100	RU10
• RAN1062LK	IMA (FTM)	RAS05.1
• RAN940.1LK	Additional 2 E1, T1, JT1 interfaces (FTM)	RAS05.1
• RAN1142.1LK	ATM over Ethernet for BTS	RAS06
• RAN1095.1LK	UBR+ for Iub User Plane	RAS06

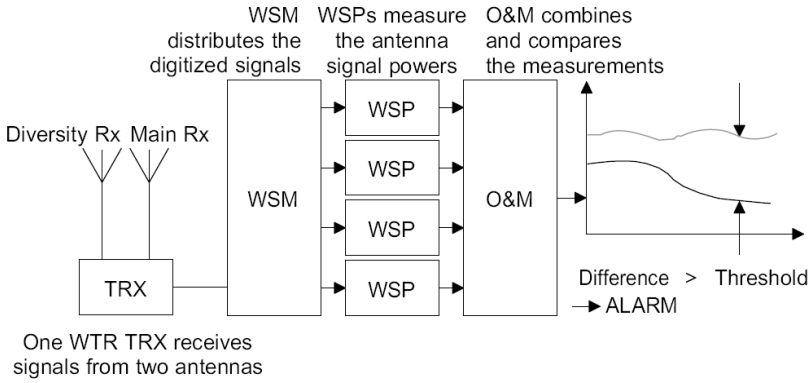
WCDMA BTS/AXC Application SW License Keys 2/2

Application SW Items: AXC

• AAL2 Multiplexing		RAS05
• ATM over Fractional E1, T1 and JT1		RAS05.1
• ATM Circuit Emulation Service (CES) for E1,T1 and JT1		RAS05.1
• Interface Protection on IFUC/IFUF		RAS05.1
• AXC ATM Interface Oversubscription		RAS05.1
• RAN1142.1LK ATM over Ethernet for BTS		RAS06
• RAN1095.1LK UBR+ for Iub User Plane	RAS06	

RAN119: Power Level Monitoring LK (RU10)

- On/off license
- Power level monitoring feature is used for monitoring the performance of the antenna line. The antenna alarm gives information to the operator if, for example, an antenna is broken
- This feature belongs to application software and is under license key management



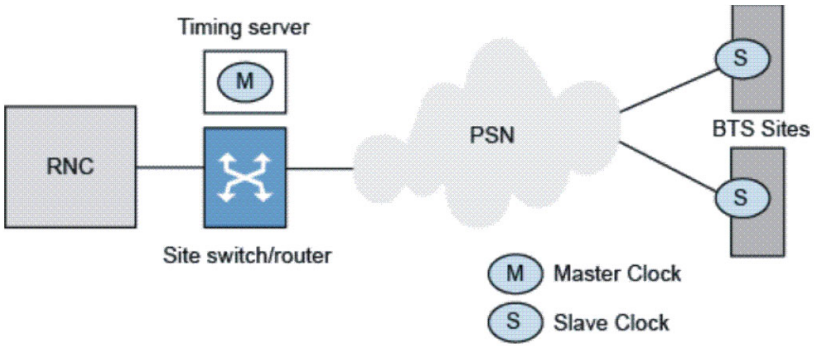
By comparing the signal levels in both receiver antennas, an alarm is raised if there is > 4 dB difference in the received wideband noise between the main and diversity branches. If both main and diversity branches are under -112 dBm, a cell fault and an alarm is raised for both branches.

RAN 1254: Timing over Packet Application SW LK (RU10)

- On/Off License
- Timing over Packet allows synchronization of the WCDMA UltraSite BTS or Flexi WCDMA BTS through an Ethernet physical interface.
- Timing over Packet allows you to take full advantage of Ethernet or packet based BTS backhaul networks. If the Ethernet or packet network is of sufficient quality, it can be used for providing synchronization to the BTS. This brings CAPEX/OPEX savings, as neither TDM links nor additional equipment like GPS receivers are required anymore for BTS synchronization purposes

RAN 1254: Timing over Packet Application SW LK (RU10)

- Timing over Packet can be applied with all packet-based backhaul solutions, i.e. IP based Iub as well as packet-based backhaul with Pseudowire, where ATM based Iub is carried over a packet network
- Packet Backhaul with Pseudowire requires this feature for synchronization if no external synchronization source is available
- This feature belongs to application software and is under licence key
- management



RAN 1093: HSDPA 16 QAM Software Licensing Support

- Enables software licensing to HSDPA 16QAM features
- On/Off license (Capacity “1” needed for the whole BTS)

RAN 849: HSDPA PFRP Scheduler LK

- The proportional fair resource (P-FR) algorithm utilizes the radio channel state information from the UEs in its scheduling decisions.
- The P-FR principle is to select one UE among those active users that have data in their buffers and are not limited by their capabilities for selection, to maximize the relative instantaneous channel quality (ratio of instantaneous throughput to average throughput) for scheduling in the following 2ms TTI.
- The relative instantaneous channel quality is calculated in every 2 ms TTI.
- On/Off license (Capacity “1” needed for the whole BTS)

The HSDPA Proportional Fair Packet Scheduler feature provides a multi-user diversity gain of 30%-60% in terms of improved HSDPA cell throughput for low to medium UE speeds, depending on the environment.

Fud

RAN1034: Shared HSDPA Scheduler for Baseband Efficiency

- This feature enables simultaneous HSDPA transmission to (max) three HSDPA-capable cells by using a single WSPC card or one sub module in FlexiBTS.
- Shared HSDPA Scheduler supports 48 HSDPA users per BTS. 10.8 Mbps maximum HSDPA throughput per BTS is provided. 15 codes per cell and 45 codes per BTS is supported. The peak bit rate for single user is 7.2 Mbps.
- On / Off license

The Shared HSDPA Scheduler for Baseband Efficiency allows a single WSPC card (in case of FlexiBTS one sub module) to handle the processing of HSDPA for 1, 2 or 3 cells simultaneously. 48 simultaneous HSDPA users are supported by the card. These users can be divided in any combination among the cells handled by the card.

It is possible to use all 15 HSDPA codes in all three cells simultaneously with the Shared HSDPA Scheduler for Baseband Efficiency scheduler. However, on each TTI the total bit rate over all cells has to be below 10.8 Mbps. Therefore, even though there is no code limitation, the throughput is limited to 10.8 Mbps per WSPC card (sub module in Flexi). On those TTIs where the total bit rate for all scheduled UEs would exceed 10.8 Mbps, the NodeB will clip data from the highest bit rate user so that the maximum limit of 10.8 Mbps is not exceeded.

Note that 15 codes simultaneously in each cell is beneficial even with the total bit rate limitation, since in optimal link adaptation the number of codes is increased prior to increasing coding rate or modulation. For example, the 15th code should be taken into use already at 2.4 Mbps when codes are available, since spectrally this is more efficient than using less codes but having higher order modulation or less robust error protection coding.

Therefore, all 45 codes of three cells can be taken to full use when the total throughput in the BTS is 3*2.4 Mbps = 7.2 Mbps. As a result, the ability to use all 15 codes in each cell simultaneously increases the practical average cell throughputs significantly, even though the theoretical peak throughputs are not affected.

The benefit of the Shared HSDPA Scheduler for Baseband Efficiency is more efficient utilization of baseband capacity. For 1+1+1 configuration, one WSPC (in case of FlexiBTS one submodule) with Shared HSDPA Scheduler for Baseband Efficiency offers almost the same performance as three WSPCs (in case of FlexiBTS three sub modules). The loss in performance is due to fact that the total combined bit rate on each TTI has to be below 10.8 Mbps. However, as the air interface limits the average cell throughput to around 2 Mbps in macro environment, there is no real difference in cell level throughput.

Note that code shared scheduler is offering clearly better performance on the air interface than using 32 CE reservation per cell (RAS05.1 configuration). This is because with code shared scheduler each cell is capable of achieving the peak bit rate of 10.8 Mbps when other cells are not loaded. Also as code shared scheduler has no limitation on the number of codes (as opposed to max five codes per cell with RAS05.1 configuration), the link adaptation algorithm is able to use spectrally more efficient method of increasing number of codes beyond five before going to more robust coding rate and higher order modulation. This means that on given SINR conditions, 1+1+1 NodeB with code shared scheduler offers significantly better throughput than static allocation of 5 codes per sector.

RAN1216: Flexi RF Module Triple 70W 2100 (RU10)

- New Flexi BTS RF module version Flexi RF Module Triple 70W 2100 is introduced. The output power at the antenna connector is 60W with a 70W Power Amplifier.
- Flexi RF Module Triple 70W 2100 improve OPEX, electricity savings 25% lower compared to configurations implemented with single and dual RF modules (Power Amplifier efficiency >30%)
- One Flexi RF Module Triple 70 W HW supports the following configurations:
  - Up to 1+1+1 @60W
  - Up to 2+2+2 @30W
- There are 2 licensed features for Flexi RF Module Triple70W 2100 :
  - Flexi WCDMA BTS branch activation : Branch activation in the Triple RF Module activates one sector. One to three branch activation licences will be needed per Triple RF Module depending on the configuration
  - Flexi WCDMA BTS 60 W carrier power support : needed when the user needs 60W o/p power per sector. One to three Flexi WCDMA BTS 60W Carrier Power licences will be needed per Triple RF Module depending on the configurations.

RAN 1062: IMA (FTM)

- IMA (Inverse Multiplexing for ATM) is supported for E1, T1, JT1 and Flexbus interfaces of Flexi WCDMA BTS
- If no IMA license available, AAL2 traffic is blocked.
- In network integration phase IMA can be built even without license, DCN (AAL5) link will work and NetAct can be used for License activation later.
- On/Off license (Capacity “1” needed for the whole BTS)

RAN 940: Additional 2 E1, T1, JT1 interfaces (FTM)

- Flexi WCDMA BTS supports standard compliant E1 (UNI) interfaces, both twisted pair (symmetrical, 120 Ohm) and coaxial (asymmetrical, 75 Ohm).
- The following transport sub modules are available:
  - FTPB, 8xE1/T1/JT1 (symmetrical, 120 Ohm)
  - FTEB, 8xE1 coaxial (asymmmetrical, 75 Ohm)
  - FTIA, 4xE1/T1/JT1 (symmetrical, 120 Ohm), 2xFast Ethernet, 1xGigabit Ethernet (optional)
  - FTJA, 4xE1 coaxial (asymmetrical, 75 Ohm), 2xFast Ethernet, 1xGigabit Ethernet (optional)

  This feature supports E1/T1/JT1 interfaces only.
- Capacity license (Pool license capacity factor = 2)
- NMS generated license can be downloaded with factor of 1

RAN 939: Additional Flexbus interface

- FTFA card has 2 Flexbus interfaces
- Second interface must be activated with license
- Not Pool License

RAN1142: Ethernet Interface

- **ATM Over Ethernet** is required for the implementation of the Hybrid Backhaul solution
- FTIA and FTJA card (FTM) and IFUH (AXC) have Ethernet interfaces
- Hybrid BTS Backhaul system solution makes it possible to offload HSPA traffic to a separate path between the BTS and RNC. The less delay sensitive HSPA and optionally also NRT-DCH traffic can be directed to Ethernet transport NW whereas RT-DCH can be directed to TDM NW.
- On/Off license (Capacity “1” needed for the whole BTS)

Hybrid BTS Backhaul is based on emulating one or multiple ATM VCCs over a PS NW. The emulation is performed in accordance with the PWE3 specification of IETF, meaning that ATM cell flows are tunneled through the PS NW. ATM cells are concatenated inside IP packets. The Pseudo Wire extends between the BTS and a stand-alone gateway. The BTS provides 2 Fast Ethernet interfaces and an optional Gigabit Ethernet interface (SFP module) towards the NW. On the RNC site, the corresponding gateway provides STM1/OC3 interfaces towards the RNC and a Gigabit Ethernet interface towards the NW.

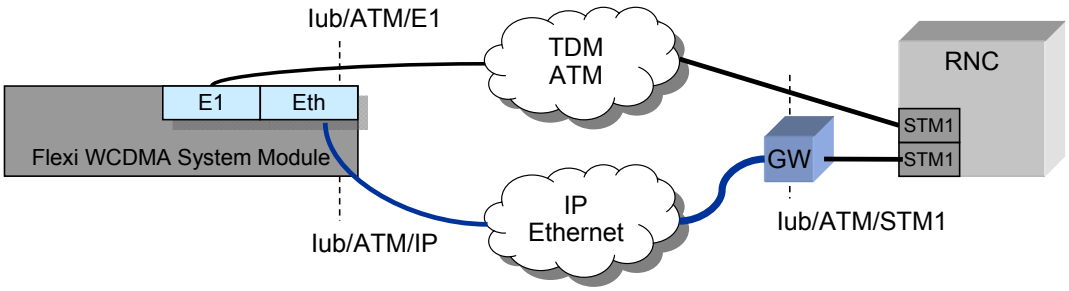
In order to offload only HSPA traffic to the PS NW, Hybrid BTS Backhaul can be combined with the Route Selection or Path Selection feature. In this case, only the ATM VCCs dedicated to HSDPA/HSUPA are emulated, while all other ATM VCCs are conveyed over TDM technologies.

In case the BTS is not connected to a TDM, NW synchronization has to be provided through other means, for example, a 2MHz signal fed from a neighboring GSM/EDGE BTS or a GPS receiver.

Hybrid BTS Backhaul is an umbrella feature consisting of the following building blocks:
- BTS Ethernet interfaces for UltraSite WCDMA BTS and Flexi WCDMA BTS
- RNC site gateway
- ATM over Packet Application Software for BTS
- Route Selection or Path Selection Application Software for RNC, in case only HSPA traffic shall be offloaded.

As an alternative to BTS Ethernet interfaces a stand-alone gateway can be deployed to the BTS site. The gateway provides E1/T1/JT1 interfaces towards the BTS and a Fast Ethernet interface towards the NW. The Pseudo Wire then extends between the gateway on the BTS site and on the RNC site.

RAN1063: Hybrid BTS Backhaul



E1 for R99 traffic and synchronization -> traditional Leased Line

Ethernet for HSPA traffic

- HSPA best effort traffic relaxes requirements for Ethernet service
- Ethernet leased lines offer lowest OPEX per Mbit/s: “Decouple cost from capacity”

RAS05.1 Route Selection or RAS06 Path Selection to separate traffic

RAN1095: UBR+ for Iub User Plane

- This feature introduces a new ATM service category for Iub interface.
- The UBR+ service category increases the transport efficiency and makes it possible to benefit from statistical multiplexing gain in the RAN transport.
- UBR+ is intended to be used together with the Path Selection feature.
- On/Off license (Capacity “1” needed for the whole BTS?)

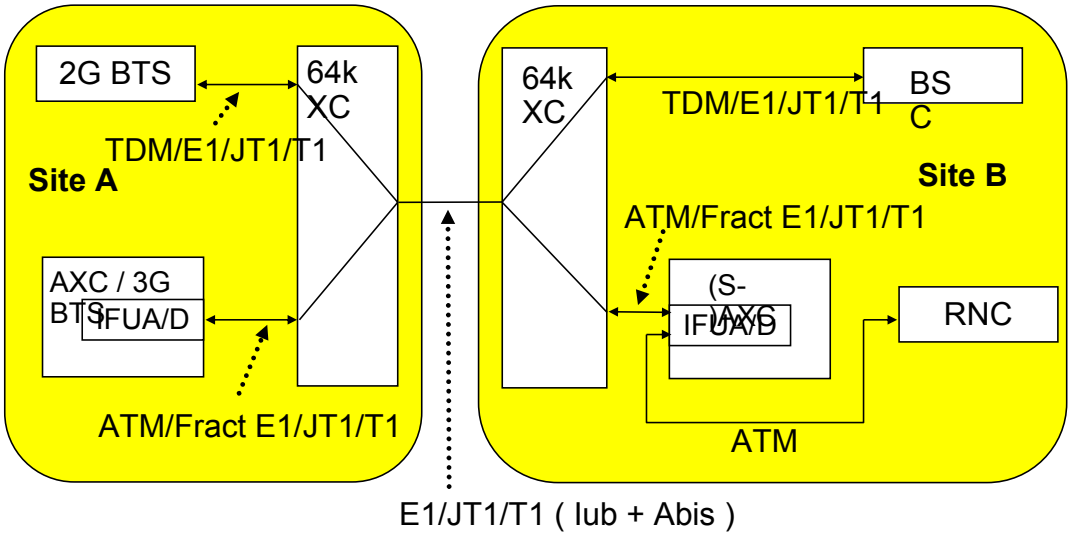
UBR+ VCC is defined by its Minimum Defined Cell Rate (MDCR) and Peak Cell Rate (PCR). User traffic is able to utilize the free capacity up to the PCR value, and a guarantee of MDCR is given in order to support a minimum throughput in case of high Iub load.
With Path Selection, one UBR+ VCC can be used for NRT-DCH traffic, and another UBR+ VCC can be used for HSDPA traffic. It is recommended to keep the real time traffic in CBR VCC to maintain the QoS. In this kind of configuration, UBR+ VCCs can share the free capacity up to the defined PCR. Capacity of MDCR is guaranteed also in case of high Iub load.

Since the NRT traffic carried over the DCH has more stringent Iub delay requirements than HSPA, priorities need to be defined so that it is delivered with lower delay and delay variation. This is supported with UBR+ parameters that are operator configurable:

- MDCR value for NRT-DCH should be set high enough for the guaranteed throughput.
- Among multiple UBR+ VCCs, priority can be assigned by parameters settings. Division of excess bandwidth between NRT-DCH VCC and HSDPA VCC should be set so that NRT-DCH gets higher priority over HSDPA. (At NB/RSxxx this configurable prioritization is not available)

ATM Over Fractional E1/JT1/T1

Purpose : enables the adding of full or partial E1/JT1/T1 channels filled with 3G traffic into existing 2G traffic, without disturbance

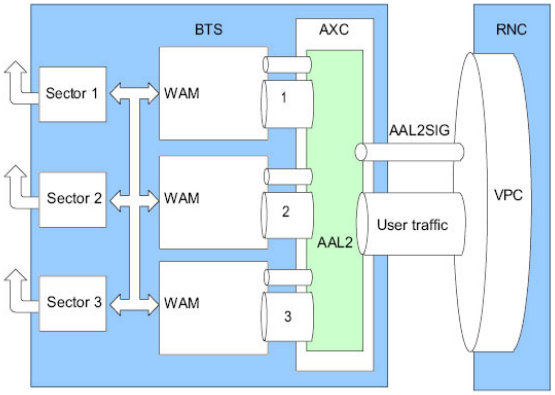


For example with IFUA, each of the eight interfaces can be configured to operate either as ATM over E1/JT1/T1, or as ATM over fractional E1/JT1/T1. In the fractional E1/JT1/T1 links, the timeslots that are unused by ATM traffic can be filled with TDM traffic by external 64 kbit/s cross-connects (Nokia Talk Family BTS, Nokia MetroHub and Nokia UltraSite GSM/EDGE BTS).

“3G uses free capacity of 2G”

AAL2 Multiplexing

Connections from several BTS AAL2 termination points are multiplexed into one or more (depending on the traffic load) user plane AAL2 VCC connections between the BTS and RNC



The AAL2 connections reaching the BTS from RNC are switched into the AAL2 terminating points (1 or 2) of the WAMs

The BTS AAL2 multiplexing feature provides the following **benefits**:

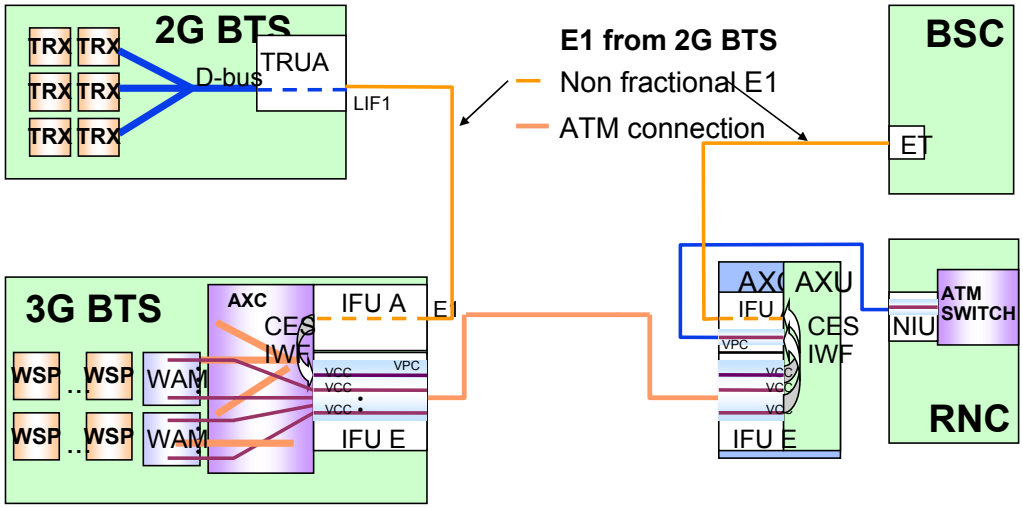
- depending on the traffic mix and the parameters, the Iub transmission capacity savings can be notable (up to 30%)
- the number of VCCs between the RNC and BTS is minimised
- only one VCC per BTS is needed while the sector/unit redundancy inside the BTS is still enabled
- transmission network planning is simplified because transmission capacity can be calculated for the entire BTS instead of each sector
- the Iub capacity of the BTS is sufficient for a longer period of time

Availability:

- AAL2 MUX is an optional feature that requires a licence.
- Not available for AXUA, Nokia provides an upgrade service for AXUA tp AXUB

Circuit Emulation Service (CES)

Circuit Emulation Service (CES) is a technique that allows mapping TDM traffic into ATM cells



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Circuit Emulation Service (CES) is a technique that allows to map TDM traffic into ATM cells. It is implemented simply as a software upgrade for the interface units IFUA, IFUD, and IFUE.
CES for unstructured E1/JT1/T1 emulates a point-to-point E1/ JT1/T1 circuit, which means that the complete E1/JT1/T1 frame is transported within ATM cells (granularity of E1/JT1/T1).
CES for structured E1/JT1/T1 emulates a point-to-point fractional E1/JT1/T1 circuit, where only the timeslots filled by the TDM signal are transported within ATM cells (granularity of 64 kbit/s).

Up to 32 CES connections can be supported by the NOKIA AXC.
Each CES connection equals one logical interface!!

“2G into 3G transport“

AXC Protection Option

Nokia AXC feature protection mechanism, which enable to maintain the transmission service in the event of failure :

- IFUE Interface Protection
- IFUC and IFUF Interface Protection

IFUC interface protection: MSP 1:1 (Multiplexer Section Protection)

Protecting interfaces can be on the same or another IFUC

In case of MSP 1:1 the protecting interface is only carrying user traffic once the main link is broken. MSP1:1 can easily be mixed up with MSP 1+1 where the user traffic is transmitted onboth paths simultaneously but just received from one of them.

AXC MSP 1:1 is compatible by enabling the MSP Protocoll with the RNC MSP1+1

IFUF interface protection requires a second unit.

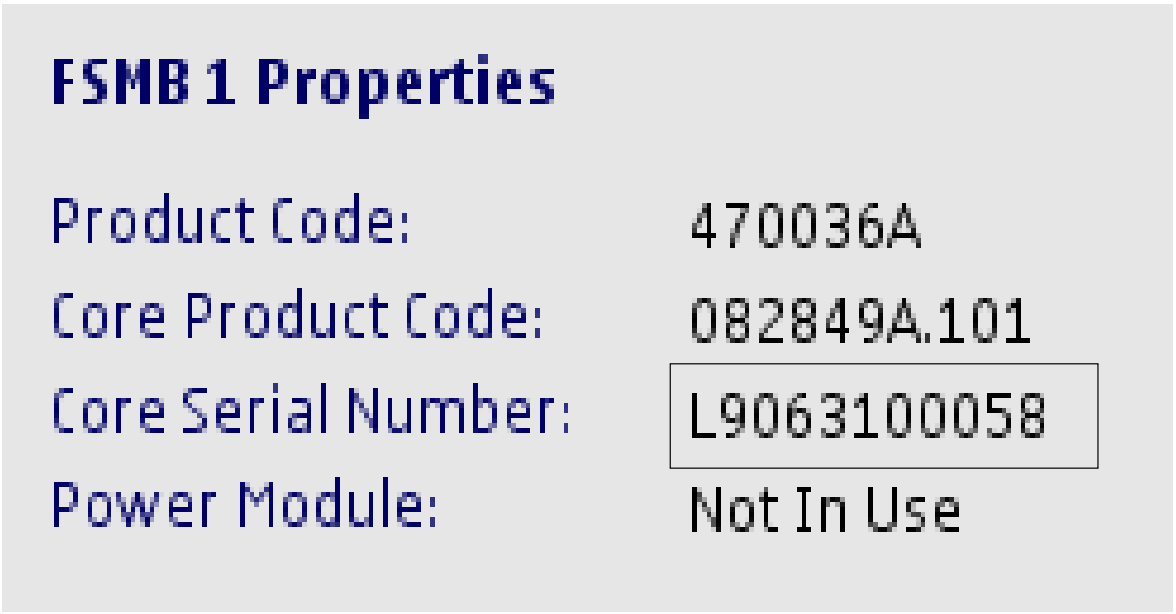
ATM Interface Oversubscription

- AXC ATM Interface Oversubscription provides the means to oversubscribe the physically available bandwidth of an AXC ATM interface to allow that physical trunk transport capacity in Hub Node-B/S-AXC can be dimensioned smaller than the aggregate of the transport capacity it is concentrating
- The physical bandwidth and the ATM interface bandwidth are controlled by two different functional layers:
  - the physical layer function adapts the ATM traffic rate to the physical line rate. The physical layer inserts idle ATM cells if it does not receive any user ATM cells from the ATM layer
  - the ATM layer function provides traffic management, such as Connection Admission Control (CAC), and performs the traffic scheduling among the ATM service categories and ATM connections

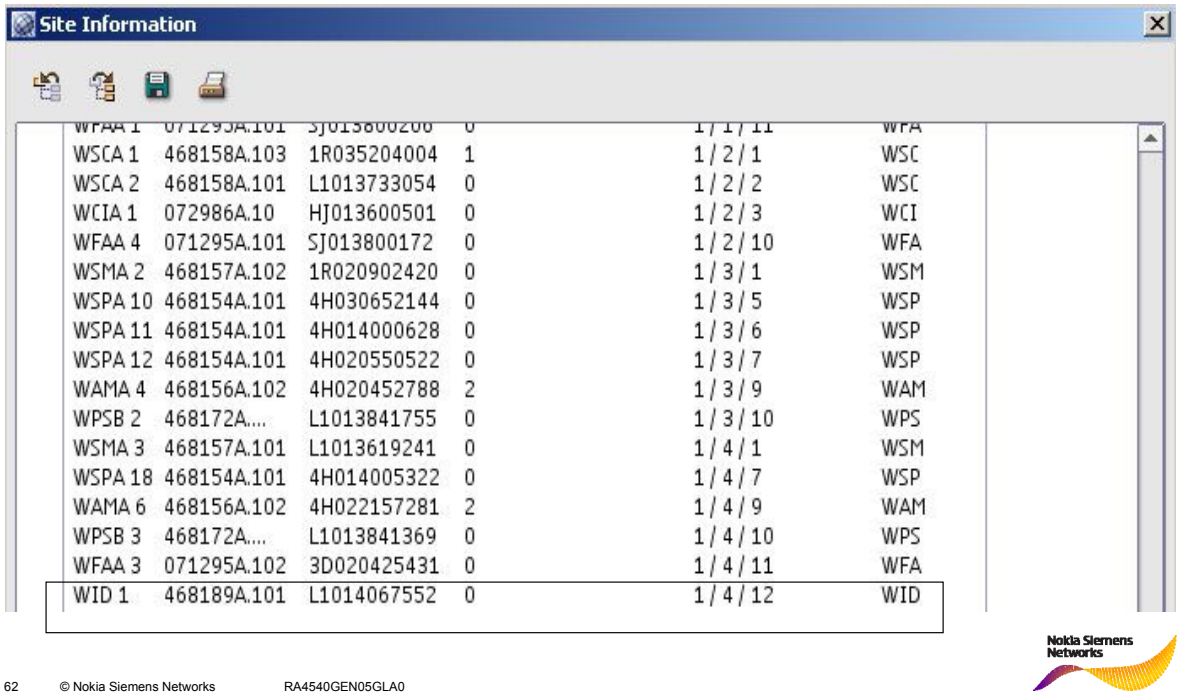
Target Identifier in WCDMA RAN

Network element	Unit where the keys are stored	Identifier
AXC	AXUx/AXCx unit	AXC subrack serial number *
UltraSite and MetroSite WCDMA BTS	WAMx unit	BTS rack HW serial number
Flexi WCDMA BTS	System Module	System Module serial number
Flexi Transport Module - FlexBus	Flexi Transport Module - FlexBus	Flexi Transport Module – FlexBus serial number

Flexi System Module Serial Number



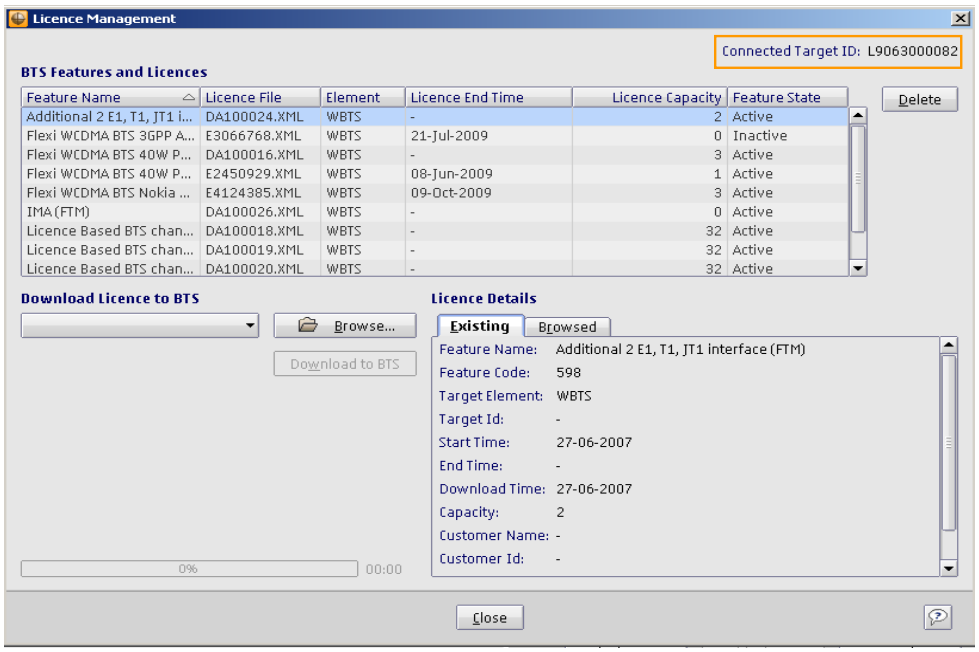
WID Serial Number in Supreme WCDMA BTS



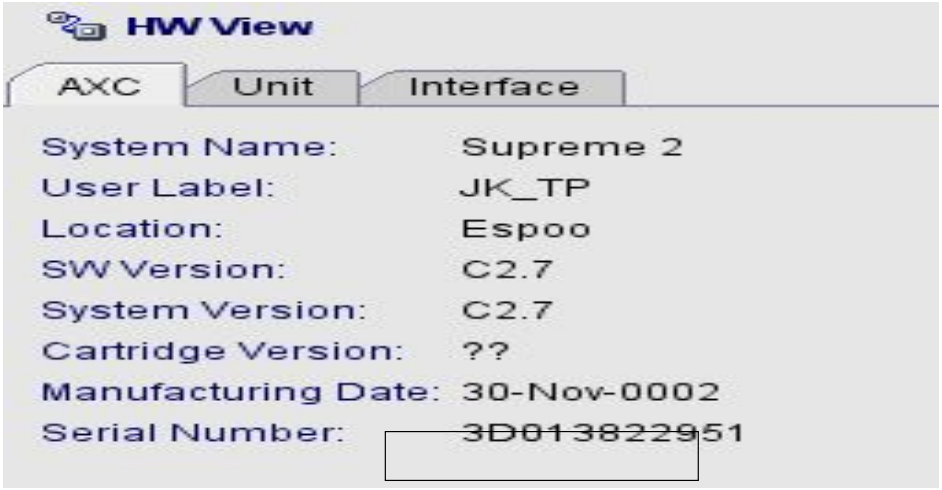
License file is mapped to WID serial number (Supreme, Optima, Metro), AXC backplane serial number or Flexi System Module Serial number.

Fetch serial number data with Element manager, don't trust HW labels!

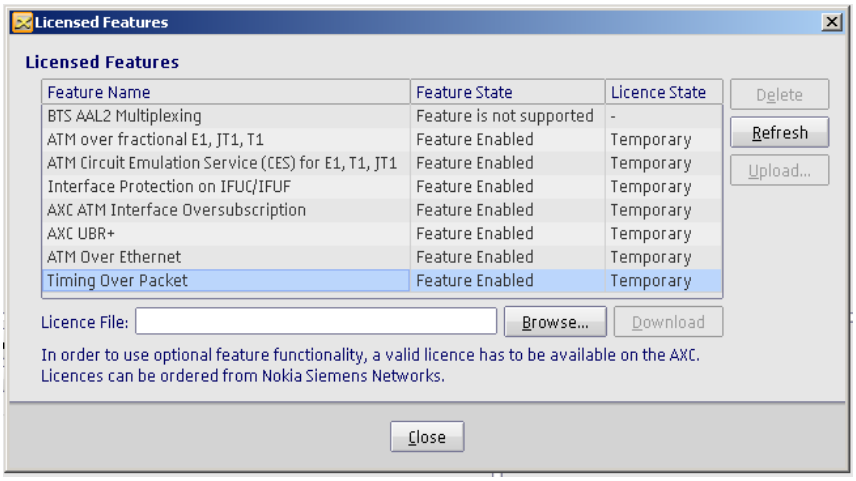
Download License in WBTS



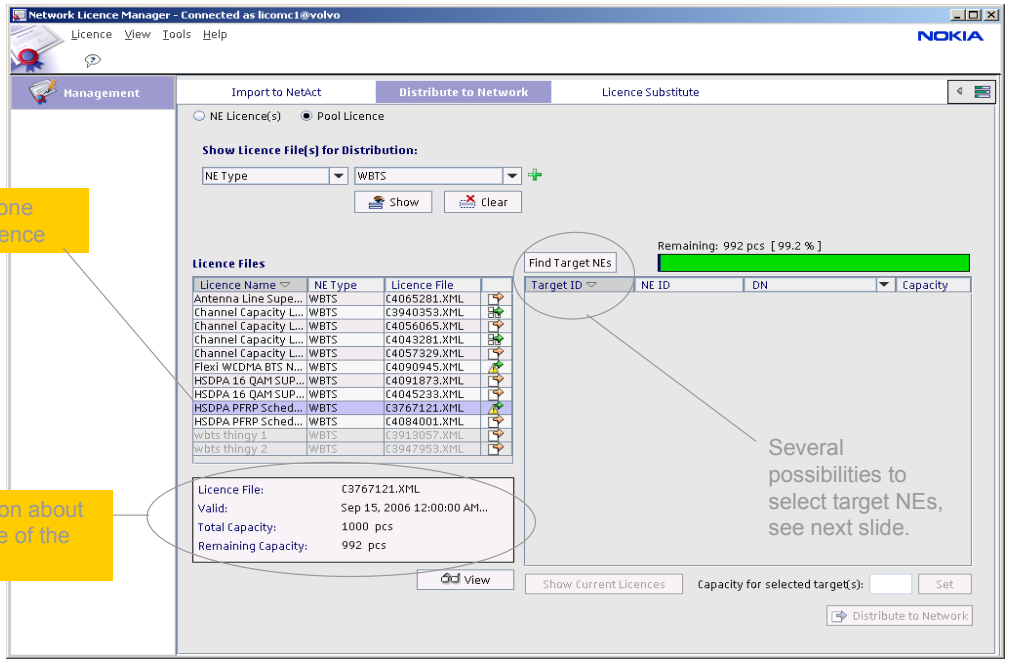
AXC Serial Number



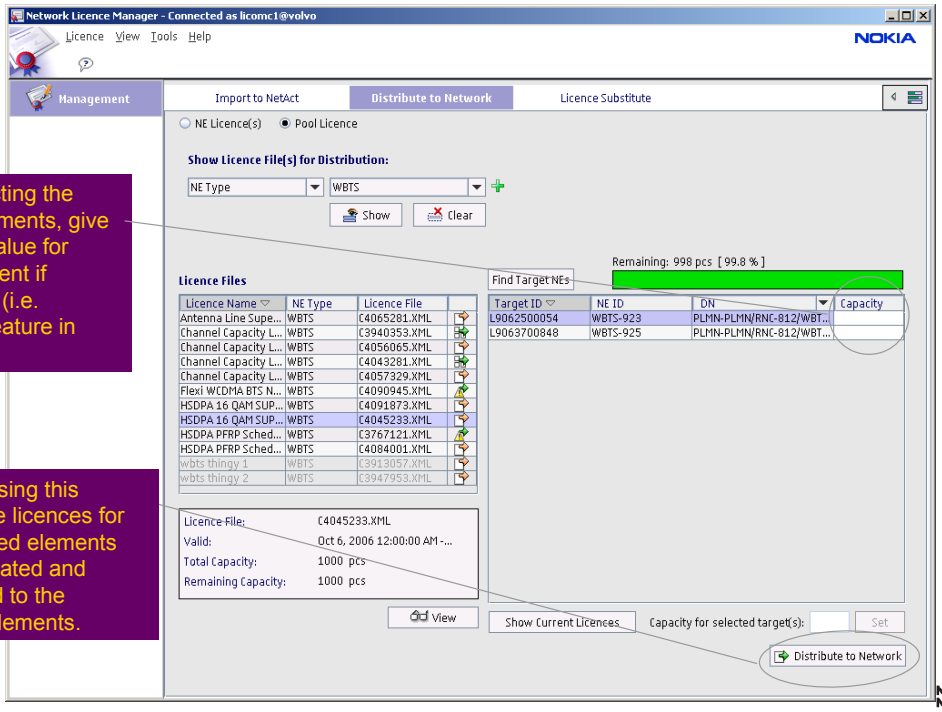
License Activation in AXC



License Activation from NetAct



License Activation from NetAct



After selecting the Target elements, give capacity value for each element if applicable (i.e. capacity feature in question).

After pressing this button, the licences for the selected elements will be created and distributed to the network elements.

License Alarms

- If capacity of license is out of range, alarm “HW capacity too low for feature…” is generated

Licensing in Network Management Operations 1/2

There are some network management operations that require license management. These are:

- Integration of new network elements
- Activating new functionalities
- Expanding capacity
- Replacing hardware
- Network element rehosting.

Licensing in Network Element Integration 2/2

- Before a newly integrated network element can be managed with the License Manager, License Manager needs to know its target identifier and software version
- License Manager reads this information from the NetAct topology database, so you must check after integration that this information is correct in topology
- Network elements like AXC, WBTS, RNC, and MGW have its target identifier field in topology
- For AXC and WBTS elements, you need to synchronize the NetAct database with the network elements information to differentiate hardware variants that support different sets of licensed features
- If synchronization is not done, a confirmation dialog stating that the feature is not supported by the element opens during pool distribution

Licensing in Activation of New Functionality in the Network Element

To activate new functionality in the network element, distribute licenses according to the feature activation instructions

Licensing in Capacity Expansion

To expand capacity in the network element, distribute licenses according to feature activation instructions

Licensing in Hardware Replacement

License files are tied to Target Identifiers of NEs. Broken HW may have an impact on the license files depending on whether the unit stores the license files or the target identifier of the NE.

There are three situations that require action in licensing in hardware replacement:

- If the hardware unit containing the licenses, but not the target identifier is replaced, new licenses are not needed
  (e.g. Ultrasite WCDMA BTS WAM unit, AXC AXUx and AXCx units)
- If the hardware unit containing the target identifier of the element is replaced, new licenses are needed
  (e.g. Flexi WCDMA BTS System Module, Ultrasite WCDMA rack)
- If the hardware do not store the license file nor the target ID of the NE, there is no impact of swapping the hardware according to the OM procedure
  (e.g. Flexi WCDMA BTS RF-modules, Ultrasite WCDMA BTS PIUs *without* WAM, AXC IFUx units)

There must always be license pools available, so that new licenses can be delivered to the NE as soon as the new HW has been installed

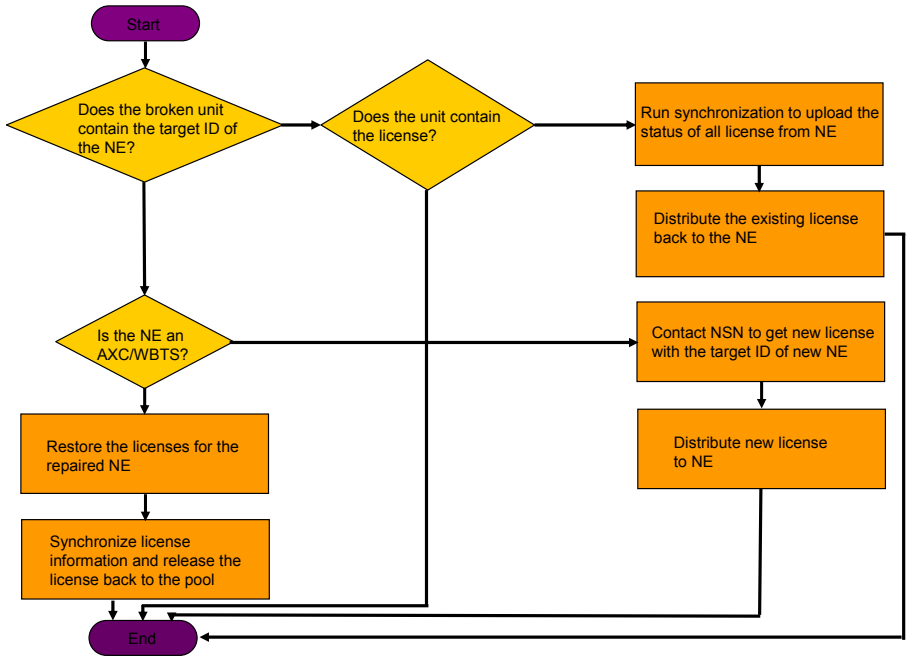
Hardware Replacement in NE License Cases

- If the replaced element only contains the licenses, and not the target identifier, new licenses are not needed, as the target identifier does not change
- To update the information about the removal of the licenses to NetAct, a synchronization operation needs to be run. Licenses can then be redistributed to the network element from the NetAct database
- If the replaced hardware unit contains the target identifier of the element, new licenses are needed. In this case, the target identifier changes and makes the existing licenses invalid

Hardware Replacement in Pool License Cases

- Pool licenses are applicable only to AXC, WCDMA WBTS, and I-HSPA WBTS elements
- If the hardware unit contains only the licenses, and not the target identifier, new licenses are not needed
- If the replaced hardware unit contains the target identifier of the element, new licenses are needed. In this case, the target identifier changes and makes the existing licenses invalid
  - The procedure in this case is divided into two parts: the time-critical tasks aimed at replacing the hardware and distributing new licenses, and synchronization and releasing licenses back to the pool, which can be performed later
- New licenses must be generated for the new target identifier
- The old licenses are no longer valid for the element and the capacity allocated to them should be released back to the pool

License Management Workflow in Hardware Replacement



Licensing in network Element Rehosting

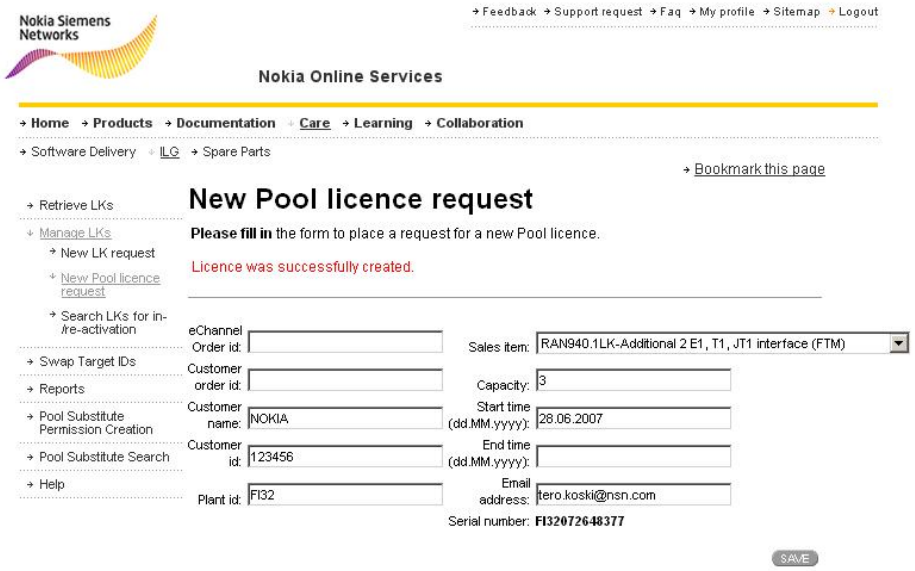
- After a rehosting operation, the topology and license information has to be updated to NetAct
- Licenses related to rehosted network elements are still valid as the licenses are tied with the target identifier to the actual hardware unit and not the logical place in the network

Pool Substitute Process

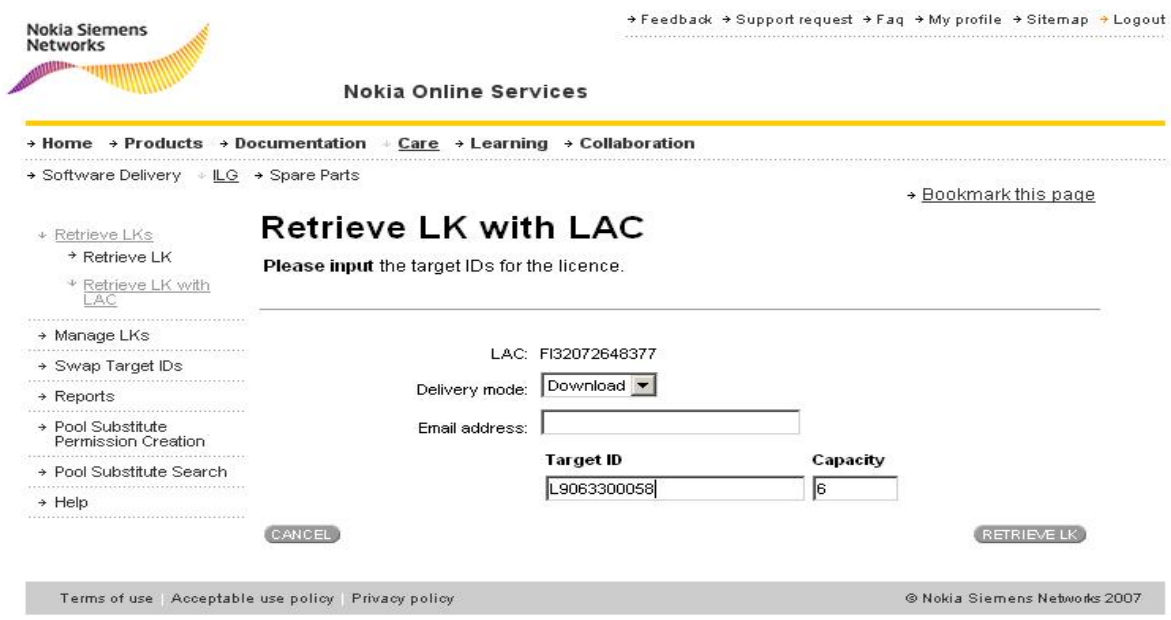
The pool substitute process includes the following steps:

- The request to substitute licenses related to broken HW is recorded (including a reason code) to Network License Manager application
- A pool substitute request file is generated using the NetAct Network License Manager application
- The substitute request file is send to Nokia Siemens Networks
- Nokia Siemens Networks will send back the pool substitute permission file
- The pool substitute permission file is then imported to the NetAct Cluster in question. Licenses related to the broken HW are released back to the pool

Example 1: Create Additional 2E1 License in NOLS



Example 1: Create Additional 2E1 License in NOLS



Example 2: Create Additional 2E1 License in NOLS

Example 2: Create Additional 2E1 License in NOLS