LTE OTS 100, 102, 103, 104 and LTE OTS UE 100

Version: 2018-07-10

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1 Introduction

1.1 General description.

This document describes how to use your OTS 10x or OTS UE 100 system.
It explains basic procedure and where to find software.
For advanced use, please refer to software documentations.
The delivered PC is installed with Fedora 26 Linux ditribution.
Basic knowlegde of Unix system is required.
Difference between OTS 100, 102, 103 and 104 depends on number of PCIe RF boards.
OTS UE 100 has only one PCIe RF boards and only includes UE simulator software.
Note that you can easily upgrade your system with additional card.
If needed, please contact sales@amarisoft.com.

1.2 Antenna

Depending on your config, you may have several PCIe card.
Here is the connectors description:

2 PC access

2.1 Startup

Once you have received your OTS system, plug power supply and antenna.
You can also connect the PC to a network but it is not mandatory. Then you can power on PC.

2.2 Local PC access

You can connect a monitor and a keyboard to the PC to access it.
Note that graphical interface is disabled.
To log in, please use `root` / `toor` as login / password.

2.3 Remote PC access

The ethernet interface of the PC is configured with DHCP.
If you are not able to have the IP address, please access PC locally and type following command:

```
ifconfig
```

Then you can connect to the PC using SSH.
If you are accessing PC from a Windows environment, you can use PuTTY client (`http://www.putty.org/`).

3 LTE OTS 100, 102, 103, 104

3.1 Introduction

Once PC is started, just power on UE, it will automatically connect to the network. You may connect PC to a network that has internet access.
This will give to your UE access to the internet and you should see a 4G/LTE icon should be displayed (This depends on UE model).

If your UE can't connect, please check your antenna connection.
It may also due to interferences. The system is configured on band 7, 2665 Mhz wit a 5 Mhz cell bandiwdth.
Thus, you should configure you system to another band or even better use Faraday chamber.

3.2 Access to software monitors

Once you are logged in PC, you can access software components (eNB, MME, MBMSGW, ...) using screen command:

```
screen -x lte
```

This will connect you to different component monitor.

Next sections show you basic methods. For more information please refer to `screen` documentation (`https://www.gnu.org/software/screen/manual/screen.html`).

3.2.1 Select component

Each component monitor is inside a window, you can switch from a window to another the following way:

```
ctrl+a <window index>
```

Where window index is:

- 0 MME
- 1 eNB
- 2 MBMSGW
- 3 IMS

NB: press simultaneously `CTRL` key and `a` key, release them, then press number key.

You can also switch to next window:

```
ctrl+a <space>
```

3.2.2 Exit screen

```
ctrl+a d
```

3.3 Components

All software are installed in `/root` directory.
You may find different version of each component inside

The systems uses symlinks (mme, enb, mbms) that points to a version of each component. You can change those links if you need to change version to use.

Each component has a doc subdirectory where you will find its documentation.
It also have a config subdirectory where config files are placed.

3.4 Change config

The LTE automatic service starts each component with the following config files:

- eNB `/root/enb/config/enb.cfg`
- MME `/root/mme/config/mme.cfg`
- IMS `/root/mme/config/ims.cfg`
- MBMSGW `/root/mbms/config/mbmsgw.cfg`

Please note that these files are symbolic links to real configuration files as depicted below for `enb.cfg`.

```
-rw-rw-r-- 1 user user  6643 Jul  4 16:24 enb-ca.cfg
-rw-rw-r-- 1 user user  6675 Jul  4 16:24 enb-catm1.cfg
lrwxrwxrwx 1 root root    17 Jul  4 16:37 enb.cfg -> mimo-2x2-5mhz.cfg
-rw-rw-r-- 1 user user  5500 Jul  4 16:24 enb.default.cfg
```

In order to change the configuration, you have two options:

- Editing the above files to change the configuration directly.
- Changing the symbolic link to point to another configuration file. Following example shows the commands to change the default config to a carrier aggregation configuration on eNodeB side.

```
cd /root/enb/config
rm enb.cfg
ln -s enb-ca.cfg enb.cfg
```

Once you have changed your config, you need to restart the LTE service using the following command:

```
service lte restart
```

NB: you may use screen to check that all components are correctly started.

For more details on config files, please refer to each component documentation.

3.5 Manage LTE automatic service

3.5.1 Stop

You can stop all LTE components this way:

```
service lte stop
```

3.5.2 Start

You can start them again thius way:

```
service lte start
```

3.5.3 Disable

You may also prevent them to start at boot time:

```
systemctl disable lte
```

NB: it does not stop service right now.

NB2: this command is not available on Ubuntu version <= 14

3.5.4 Enable

You may enable service at boot time this way:

```
systemctl enable lte
```

NB: it does not stop service right now.

NB2: this command is not available on Ubuntu version <= 14

4 OTS UE 100

4.1 Introduction

We strongly recommend to use cables between RF connectors of OTS UE 100 and base station for your simulation.

4.2 Usage

Once PC is started, connect to the PC.

The UE simulator software is located in `/root/ue`. You can start it with following command:

```
./lteue config/ue.cfg
```

Please read documentation located in `/root/ue/doc` to configure your system.

5 Miscellaneous

5.1 Logs

Components put their current logs in `/tmp` directory.
Logs will be backed up in `/var/log/lte` directory.

The `/tmp/lte.log` file is log for service.

5.2 Graphical interface

You may use Gnome 3 GUI by typing following command hwne logged locally on PC:

```
startx
```

5.3 Upgrade system

When a new release is a available, you'll need to update your system. The steps to follow are explained below.

- Download your release from Amarisoft Extranet at `https://extranet.amarisoft.com/`. The downloaded file would be a tarball file: *amarisoft.YYYY-MM-DD.tar.gz* where YYYY-MM-DD is the release date.
- Put this file on the PC at any place using the method you want (scp, http, USB key...) and extract it:

  ```
  tar xzf amarisoft.YYYY-MM-DD.tar.gz
  ```

  This would create a directory called YYYY-MM-DD.
- Go to the directory YYYY-MM-DD and execute the provided script *install.sh* with root access as follows:

  ```
  ./install.sh <path> --default
  ```

  – By default if no `<path>` is specified, components are installed in `/root`, you can choose other directories by specifying a new destnation in `<path>`. Please note that `www` component will always be located under `/var/www/html` in Fedora or `/var/www` in Ubuntu.

  – The `--default` option forces answer to default for all questions asked during install phase. The default answers for `OTS 10x` are depicted below:

```
* Installing Amarisoft LTE 2017-07-04 *
**************************************

Fedora 20 found
1) Configuration
  You can exit install script during this step, nothing will be changed
  until next step
  * Do you want to install LTE automatic service ? y
      - Do you want to enable LTE automatic service ? y
  * Do you want to install EPC ? y
      - Do you want to install IMS ? y
      - Do you want to use IPv6 ? n
  * Do you want to install eNB ? y
    - Select TRX radio frontend:
      1) sdr (default)
      > sdr
    - Do you want to use MIMO ? y
  * Do you want to install MBMS gateway ? y
  * Do you want to install Web interface ? y
2) Configure Automatic Service
3) Install Web interface
4) Install TRX sdr
5) Install eNB
    Use TRX sdr
    [TRX] Fedora 20 found
    [TRX] === Device /dev/sdr0 ===
    [TRX] Hardware ID=0x4b02
    [TRX] FPGA revision=0.9.51
    [TRX] Software version=2017-03-28
    [TRX] === Device /dev/sdr1 ===
    [TRX] Hardware ID=0x4b02
    [TRX] FPGA revision=0.9.51
    [TRX] Software version=2017-03-28
    [TRX] === Device /dev/sdr2 ===
    [TRX] Hardware ID=0x4b01
    [TRX] FPGA revision=0.9.51
    [TRX] Software version=2017-03-28
    [TRX] === Device /dev/sdr0 ===
    [TRX] The FPGA firmware is already up to date
    [TRX] === Device /dev/sdr1 ===
    [TRX] The FPGA firmware is already up to date
    [TRX] === Device /dev/sdr2 ===
    [TRX] The FPGA firmware is already up to date
6) Install EPC
7) Install IMS
8) Install MBMS gateway
9) Start service

#########################
# Installation successful #
#########################
```

The default answers for `OTS UE 100` are depicted below:

```
[root@localhost 2017-07-04]# ./install.sh --default
**************************************
* Installing Amarisoft LTE 2017-07-04 *
**************************************

Fedora 23 found
1) Configuration
  You can exit install script during this step, nothing will be changed
  until next step
  * Do you want to install LTE automatic service ? y
      - Do you want to enable LTE automatic service ? y
  * Do you want to install UE simulator ? y
    - Select TRX radio frontend:
      1) sdr (default)
      > sdr
  * Do you want to install Web interface ? y
2) Configure Automatic Service
3) Install Web interface
4) Install TRX sdr
5) Install UE simulator
    Use TRX sdr
    [TRX] Fedora 23 found
    [TRX] === Device /dev/sdr0 ===
    [TRX] Hardware ID=0x4b02
    [TRX] FPGA revision=0.9.51
    [TRX] Software version=2017-03-28
    [TRX] === Device /dev/sdr1 ===
    [TRX] Hardware ID=0x4b01
    [TRX] FPGA revision=0.9.51
    [TRX] Software version=2017-03-28
    [TRX] === Device /dev/sdr0 ===
    [TRX] The FPGA firmware is already up to date
    [TRX] === Device /dev/sdr1 ===
    [TRX] The FPGA firmware is already up to date
6) Start service

#########################
# Installation successful #
#########################
```

Take a look at messages at the end of install phase, you may be requested to power on/off your PC. This would be the case if there is, for example, an FPGA upgrade of your PCIe SDR card.
If you would like to have a custom install, you can run the script without `--default` option and answer each question separately. For `OTS 10x` product, this would typically be the case if you do not want to enable automatic LTE service or if you would like to install eNB and MME components on different PCs.

6 Advanced configuration

There are some parameters you can change in your setup if needed.
To do this, create `/root/.lte` file and place config inside.

This file has to follow syntax of `/etc/ltestart.conf` file so please take a look at it. All variable set in `/root/.lte` will override `/etc/ltestart.conf` definitions.

Of course, you need to restart LTE service to use new config.

7 Reinstall your OTS system

You can reinstall your system with following procedure.
This allow you to reset everything.
Note that all previously stored information on OTS system will be deleted.

7.1 Create bootable USB dongle

7.1.1 Download Linux ISO

Download `https://download.fedoraproject.org/pub/fedora/linux/releases/25/Workstation/x86_64/iso/Fedora-Workstation-Live-x86_64-25-1.3.iso`

7.1.2 Install tools

```
dnf install livecd-tools
```

7.1.3 Prepare USB device

Get a USB key bigger than downloaded ISO file (> 2GB).
Note that all data on it will be lost.

Then in a shell, with root permissions:

```
dmesg -w
```

Plug your USB dongle and you should see lines display on the terminal.

Identify your USB device node with such a line:

```
[23846.382531]  sdb: sdb1
```

Our device is *sdb*, you can now create it:

```
livecd-iso-to-disk --format --reset-mbr Fedora-Workstation-Live-x86_64-26-1.1.iso /dev/sdb
```

7.2 Install OS

7.2.1 Boot

Reboot the OTS system and when BIOS screen is displayed enter it by clicking on *F2* and select USB device to boot on.

When booting, select *Start Fedora-Workstation-Live*.

7.2.2 Install

When GUI is displayed, select *Install to hard drive*.

The follow installation procedure until you reach *Installation destination*. Click on it.

Inside menu, check *I would like to make additional space available*.

Then click on *Done*, *Delete All* and *Reclaim space*.

Continue until end of procedure.

7.2.3 Configure

When system is ready, install following packages:

```
dnf -y install gcc lksctp-tools.x86_64 kernel-devel.x86_64 ipsec-tools
```

If you are using Ettus radio frontend:

```
dnf -y install uhd
```

7.3 Install software

Log on your extranet account at `https://extranet.amarisoft.com` and download latest release, then install it.

8 Troubleshoot

8.1 Contact

- Our Extranet site is located at `extranet.amarisoft.com`. This site would give you access to our documentation and new releases.
- For all technical issues, you can create a ticket describing your problem on our support site at `support.amarisoft.com`. Please note that you need to have an active account in our Extranet in order to be able to login to our support site. Your credentials are the same as the ones you use to access Extranet.
- our FTP server is located at `ftp.amarisoft.com`. This server should be used to exchange big logs. Your credentials are the same as the ones you use to access Extranet. Please note that you need to use an FTP client supporting SSL such as Filezilla.
- For any request concerning license delivery or addition of new accounts, please send an email to `delivery@amarisoft.com`.

8.2 Remote

Sometimes, the efficient way to solve an issue is to give our support team a remote connection to the system.

- Connect PC to internet.
- Start GUI (See [Graphical interface], page 7).

- Start a shell and type `teamviewer`.
- Provide ID and password to support team.