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Software Communications Architecture v2.2 Reference Implementation Project

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Analog FM Application User Guide

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1. INTRODUCTION

This document describes the various steps needed to install and use the Analog FM application developed by CRC in the scope of the SCAv2.2 Reference Implementation project. The first section describes the hardware required to run the application. In the second section, the software configuration required to deploy an application is described and the third section explains how to install and use this application.



2. HARDWARE REQUIREMENTS

To run the provided applications, your system must meet the following requirements:

- 1 - Speakers
- 2 - Microphone
- 3 - Sound board that supports full duplex communication
- 4 - RF Transceiver Box (RF Unit)
- 5 - Family Radio Service (FRS) or Global Mobile Radio Service (GMRS) band running at 462.57 MHz
- 6 - Linux device called “/dev/dsp” that is properly configured

Note: The AudioDevice provided is implemented using the “ioctl” function to configure the “/dev/dsp” device with the following properties:

- SNDCTL_DSP_SETDUPLEX
- SNDCTL_DSP_SAMPLESIZE
- SNDCTL_DSP_PROFILE
- SNDCTL_DSP_STEREO
- SNDCTL_DSP_SPEED
- SNDCTL_DSP_GETBLKSIZE

If your soundboard does not support the above “ioctl” configuration, it is possible to download different drivers such as those provided by the Advanced Linux Sound Architecture (ALSA) project.

See <http://www.alsa-project.org/> for more details.

Note: On most computers, the microphone is set to use a hardware by-pass to send its input directly to the speakers. For the demonstration application, the microphone must be configured to send its output to the operating system software mixer. This can be done using the command “kmix” in KDE.



3. SOFTWARE CONFIGURATION

Prior to performing any instruction described in this document, the SCARI-Open environment must be setup and the associated node and application preparation must have been performed as described in the associated “Readme.pdf” document.

3.1 *Starting the Naming Service*

Start the CORBA naming service.

Run the following script in the first shell (i.e. command line window or Konsole)

```
cd $SCA_HOME  
./startNamingService
```

3.2 *Booting Node1*

Start Node 1. Node 1 is composed of the following components: DomainManager, DeviceManager, ExecutableDevice, AudioDevice, RFDevice, LogService.

Run the following script in a second shell:

```
cd $SCA_HOME\  
./DemoPlatformNode1Bootup
```

3.3 *Starting the Component Inspector*

The Component Inspector is a basic tool used to introspect an SCA radio. It provides a Graphical User Interface (GUI) to query the SCA radio and display run-time information regarding active SCA components in the radio. Figure 1 shows the Component Inspector layout. It is a useful tool to inspect the status of a radio after a node boot or application deployment. It provides the user with quick access to information such as the list of SCA components that have been started, where they have been deployed, and the established and pending connections. It also offers a log viewer displaying the SCA log messages generated in the radio.

Run the following commands in a separate shell.

```
cd $SCA_HOME  
./startComponentInspector
```

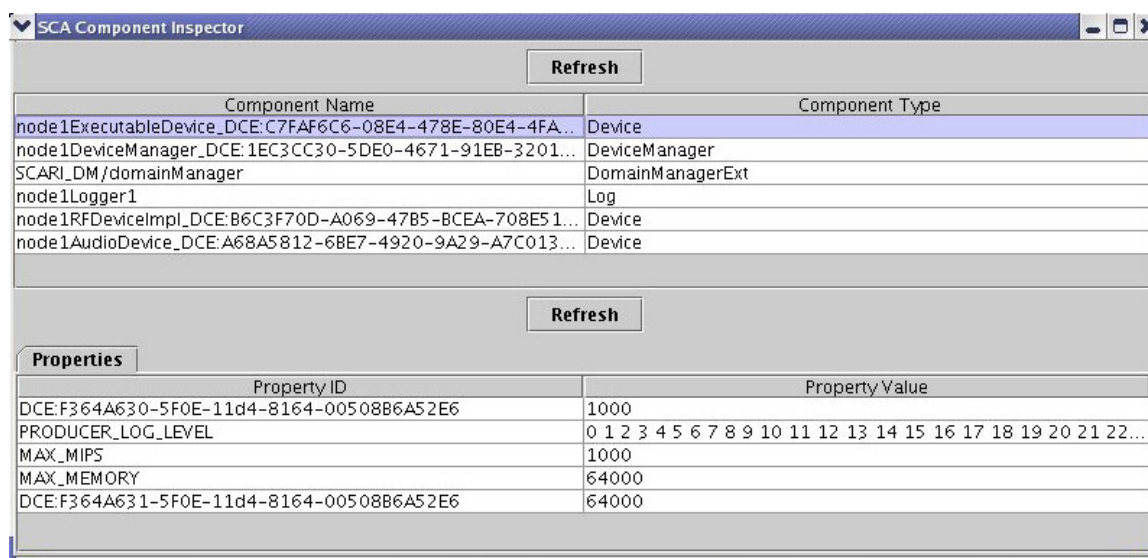


Figure 1: Component Inspector

3.4 Starting the Application Manager

The Application Manager is a basic tool used to install/uninstall SCA applications as well as control applications through their configuration properties.

Run the following commands in a separate shell.

```
cd $SCA_HOME
./startApplicationManager
```

The Application Manager is used in the next section to start and control the application.

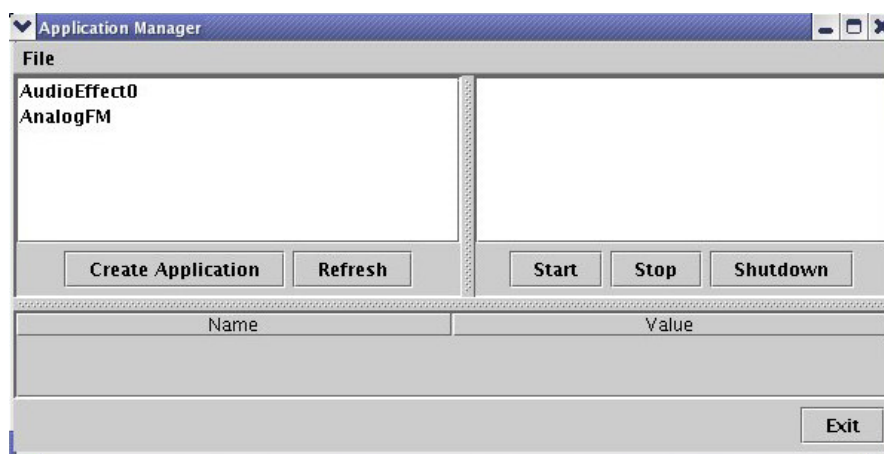


Figure 2: Application Manager

4. ANALOG FM APPLICATION DEMONSTRATION

The AnalogFM Application performs FM Modulation and FM Demodulation on an audio stream. It has two configurable parameters: RF_MODE and THRESHOLD. Depending of the value of RF_MODE, the SDR operates either as a receiver or a transmitter. The THRESHOLD value act as a type of squelch triggering demodulation only if the RF signal detected has enough energy.

4.1 Hardware Connections

To run this application with a commercial radio, an RF Unit is required. The schematic diagram of the RF Unit and the component list is provided in the companion document “AnalogFM Hardware Design Document.pdf”. The application can also be ran using two computers, each running the AnalogFM applications.

The following connections are needed to operate the SDR with the RF Unit as shown in Figure 3:

- Connect the microphone to the “MIC” input port of the RF Unit.
- Connect the “Computer MIC” port of the RF Unit to the “microphone input” of the computer soundcard.
- Connect the “Computer SPKR” port of the RF Unit to the “speaker output” of the computer soundcard.
- Connect the “SPKR” port of the RF Unit to the speakers.
- Connect a parallel cable between the computer parallel port and and the RF Unit.

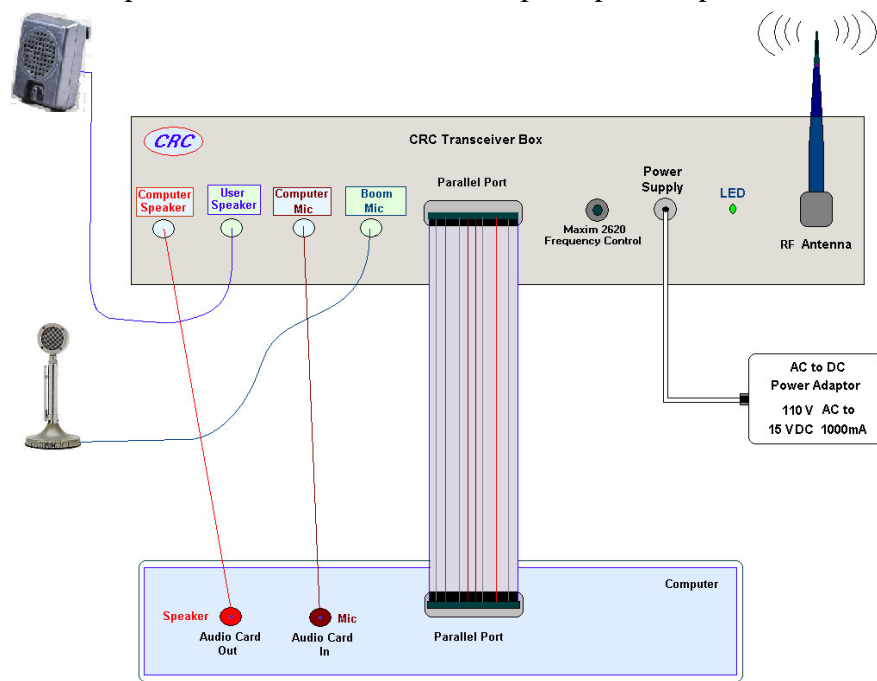


Figure 3: Connection layout between the RF Unit and the Computer



4.2 Installing the AnalogFM Application

- From the toolbar menu of the RadioManager controller, select File then Install/Uninstall. The *PackagedApplicationInstaller* window will appear (see Figure 4).
- Click on the Browse button on the *PackagedApplicationInstaller*:
 - Double click on the *demosources* folder
 - Double click on the *Waveforms* folder
 - Double click on the *FMTransmitterReceiver* folder
 - Select the file *ApplicationPackage.jar*
 - Click on the Select Application button
- Click on the Install button in the *PackagedApplicationInstaller*. After few seconds, a dialog window indicating that the application has been installed successfully appears.
- Click on the OK button.
- Click on the Exit button.

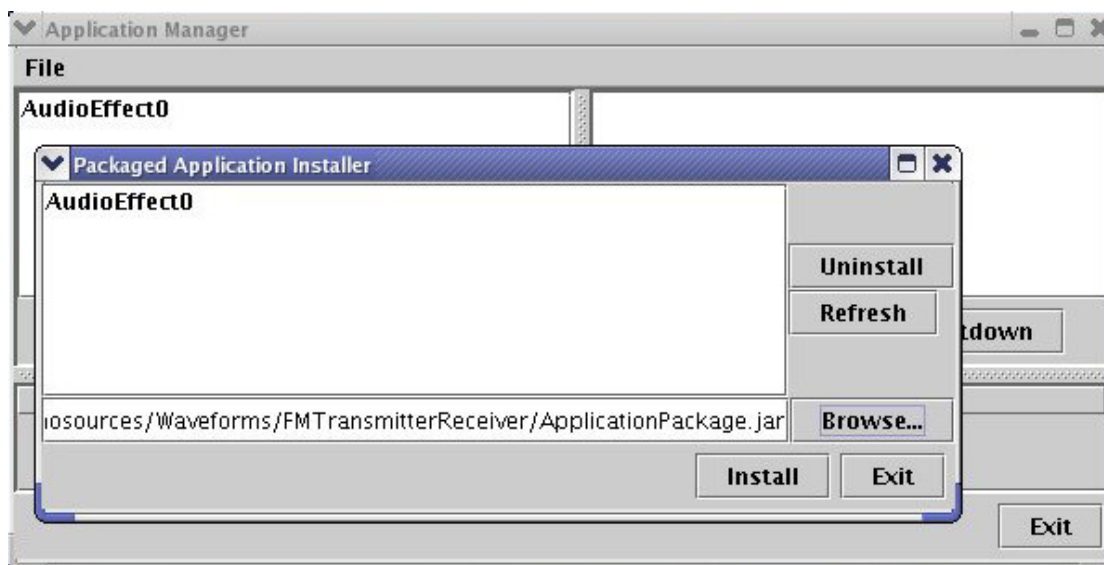


Figure 4: Installing the AnalogFM Application

4.3 Instantiating the AnalogFM

- Select the *AnalogFM* in the list on the left in the *ApplicationManager*.
- Click the Create Application button on the *ApplicationManager*.



- Enter 'AnalogFMAApp' as the application name, and then press Enter. After few seconds, a dialog window indicating that the application has been created successfully appears.
- Click on the OK button.
- The application of type *AnalogFM* has been created and the name 'AnalogFMAApp' is shown in the application list (right pane).

4.4 Starting the Application

- Select the Application 'AnalogFMAApp' instance in the list on the right of ApplicationManager.
- Click the Start button. A dialog window indicating that the application has been started appears.
- Click the OK button.

4.5 Configuring the Application

- Select the 'AnalogFMAApp' application instance in the list on the right of the ApplicationManager.
- Double click on the RM_MODE parameter value in property table of the *ApplicationManager*.
 - Modify the value and press enter (e.g. 1 or 2).
 - If RF_MODE = 1:
 - Configures the SDR in a receive mode
 - Speak in the commercial radio and hear your voice on the computer speaker.
 - If RF_MODE = 2:
 - Configures the SDR in the transmit mode
 - Speak in the microphone and hear your voice on the commercial radio.
- Double click on the THRESHOLD parameter value in property table of the *ApplicationManager*. (NOTE: modifying the threshold has an effect only for the demodulation, RF_MODE = 1, since threshold is a squelch parameter of the receiver)



- Modify the value and press enter (e.g. from 0.00001 to 0).
- Speak in the commercial radio.

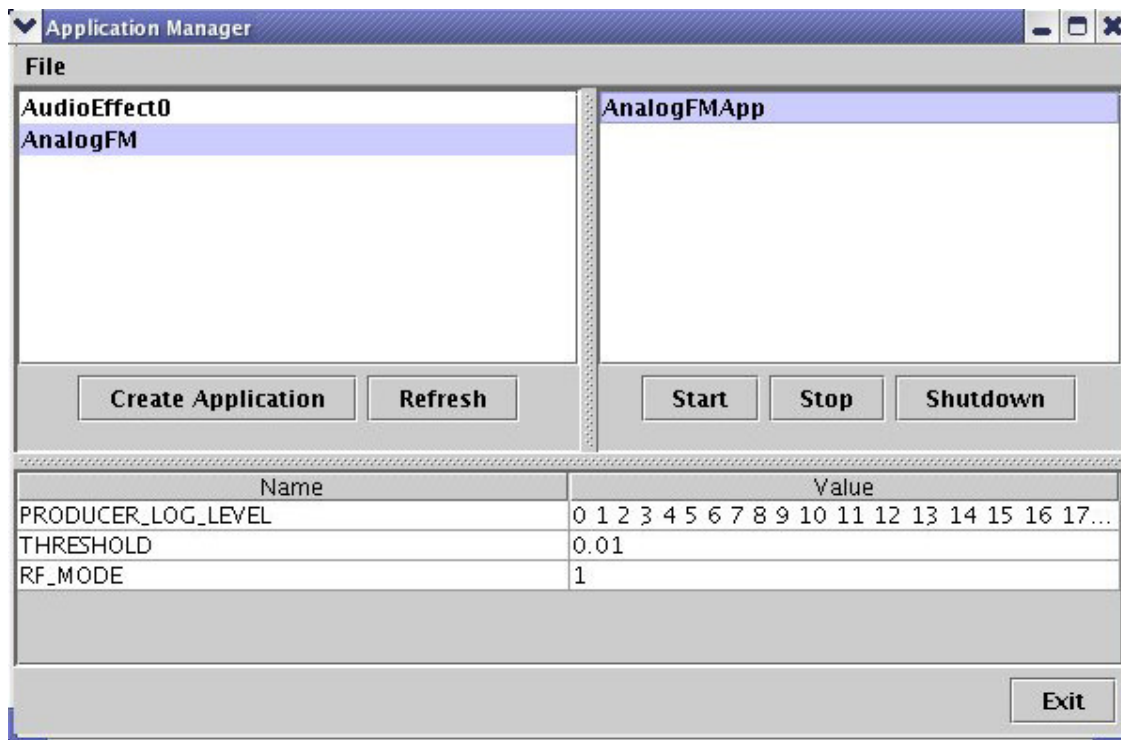


Figure 5: AnalogFM Application

4.6 Stopping the Application

- Select the Application 'AnalogFMApp' instance in the list on the right of ApplicationManager.
- Click the Stop button. A dialog window indicating that the application has been stopped appears.
- Click the OK button.

4.7 Shutting Down the Application

- Select the Application 'AnalogFMApp' instance in the list on the right of ApplicationManager.
- Click the Shutdown button. A dialog window indicating that the application has been stopped appears.



- Click the OK button.

4.8 Uninstalling the Application

- From the toolbar menu select File then Install/Uninstall... The *PackagedApplicationInstaller* window will appear.
- Select the AnalogFM application in the list of the *PackagedApplicationInstaller*.
- Click on the Uninstall button. A dialog window will appear indicating that the application has been uninstalled successfully. After the message is displayed, the list of the *PackagedApplicationInstaller* will be empty.
- Close window.

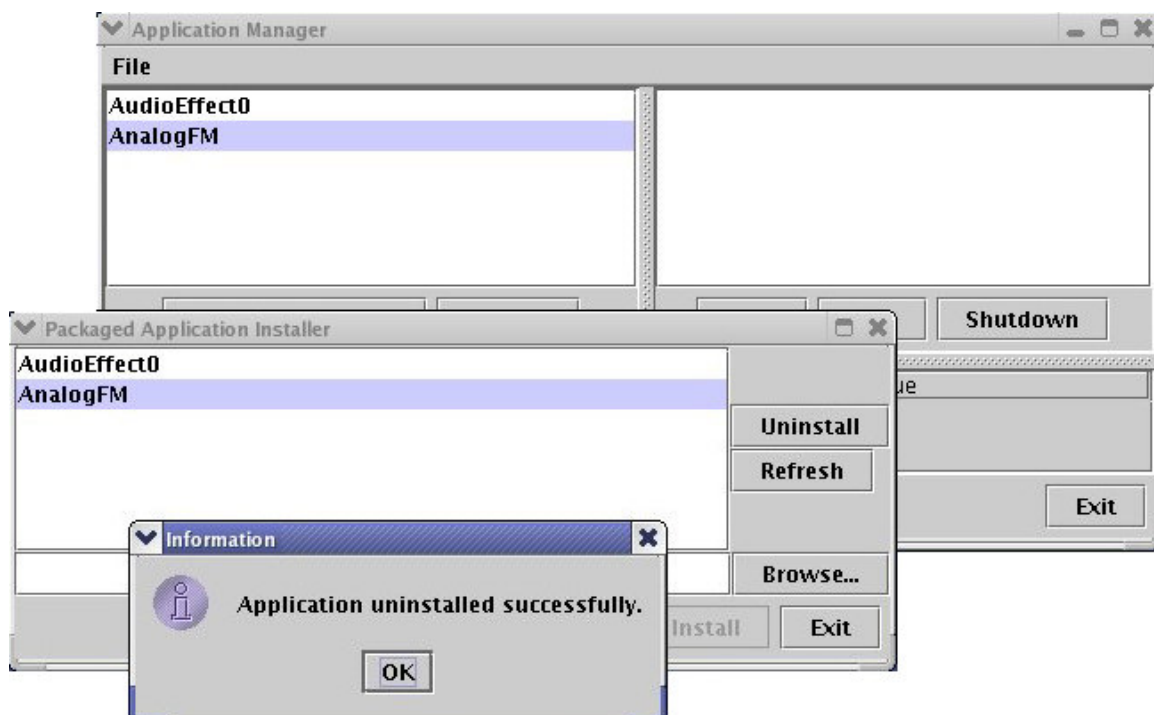


Figure 6: Uninstalling the AnalogFM Application