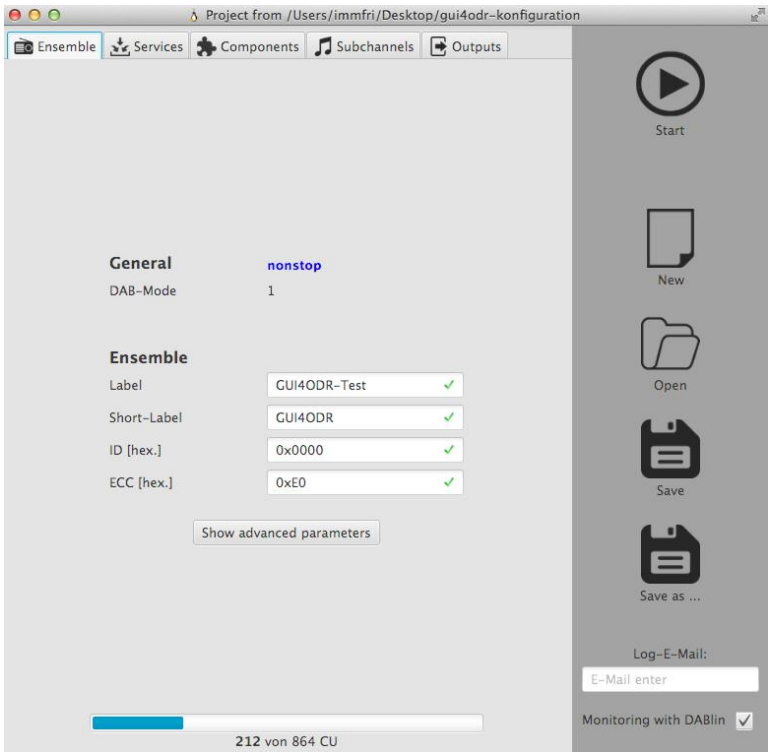
LMK
Landeszentrale für
Medien und Kommunikation
Rheinland-Pfalz

Hochschule
Kaiserslautern
University of
Applied Sciences

User Guide of the Graphical User Interface (GUI) for the ODR-mmbTools

GUI4ODR

- GNU GPL v3 -



Version 0.8 (2017-14-04)

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1 Contents

The open-source software GUI4ODR is an intuitive user interface for the ODR-mmbTools from the organization OpenDigitalRadio.org. With the graphical application can be used to simplify configured the Multiplex of DAB - Digital Radio Broadcasting includes Audioencoding and Modulation. With a correct configuration, this can be extecuted. During operation, GUI4ODR monitors the running processes. If a task fails, the user is notified.

With the small-scale DAB-Transmitter for local broadcasting, GUI4ODR offers a low-cost alternative to the reliable transmission of DAB radio.

Created by Immanuel Friedrichsen

2 Introduction

The application – GUI4ODR – allows a graphical configuration oft he DAB ensemble based on the ODR-mmbTools.

Tools consist of...

- a **DAB multiplexer** (*ODR-DabMux*),
- a **DAB modulator** (*ODR-DabMod*),
- the **audio encoder** (*ODR-AudioEnc*) und
- the **program associated data encoder** (*ODR-PadEnc*).

The software-based DAB receiver – DABlin - is used to monitor the multiplex data during operation. Optionally, the audio output of DABlin can be visualized using the application Pavumeter.

In addition, a remote software, e.g. Teamviewer the system is supervised and controlled.

For using and to configure of the software requires the expertise of DAB and basic knowledge about the ODR-mmbTools and Linux.

GUI4ODR offers the following functionalities:

- **Configure** the multiplexer and modulator
- **Execute** the complete configuration
- **Monitoring** all running tools

3 System requirements

3.1 Hardware

An onboard graphics card is completely sufficient for displaying the GUI. No special hardware requirements are necessary for the **configuration**. The hardware should be designed accordingly for **operation** mode.

In mobile use without any spezial demands on audio, a notebook with integrated sound card can be used!

3.2 Software

The application is completely supported under Linux. With other OS (Windows, Mac OS) only the configuration can be created and edited.

The following ODR-mmbTools versions are required for execution:

- ODR-DabMux >= **v1.1.0**
- ODR-DabMod >= **v0.5.4**
- ODR-AudioEnc >= **v2.0.0**
- ODR-PadEnc >= **v2.0.0**

Best of all, the recent version at https://github.com/Opendigitalradio installed!

If USRP devices are used, the drivers (UHD[1]) must be properly installed and configured.

[1] https://github.com/Opendigitalradio/uhd (2017-03)

4 Preparation

Before GUI4ODR can be started, the system must be prepared.

All steps should be undertake by the expert.

4.1 Linux-Software

For the application GUI4ODR as well as the ODR-mmbTools necessary in the following software components:

- **VLC**-Media player
- **JACK**, for graphical control: **QJackCtl**
- Optional: **MPlayer**

4.2 Java Runtime Environment (JRE)

The Java Runtime Environment (JRE) and the additional JavaFX framework must be installed to run GUI4ODR.

For Installation, the following versions are required:

- Java JRE: 1.8.0 (jre-8uXXX)

Instructions and help for installation:
http://docs.oracle.com/javase/8/docs/technotes/guides/install/install_overview.html

4.3 Monitoring

If a check of the multiplex is required the DAB receiver **DABlin**[2] must be downloaded and installed. The **Pavumeter**[3] software can be installed for viewing the level meter of the audio output.

[2] https://github.com/Opendigitalradio/dablin (2017-03)
[3] http://0pointer.de/lennart/projects/pavumeter/ (2017-03)

4.4 Mail-Service

The mail service **mail** on Linux must be installed for the notification via e-mail. After installation, the client must be linked to a valid e-mail account. The mail service is then ready for operation.

4.5 Remote

E.g. **TeamViewer**[4] can be used for the remote software. The user can also execute the simple installation.

4.6 GUI4ODR

Under the link https://github.com/immfri/gui-dab-odrTools the JAR file gui4odr-v0.7.jar can be downloaded for execution of the GUI.

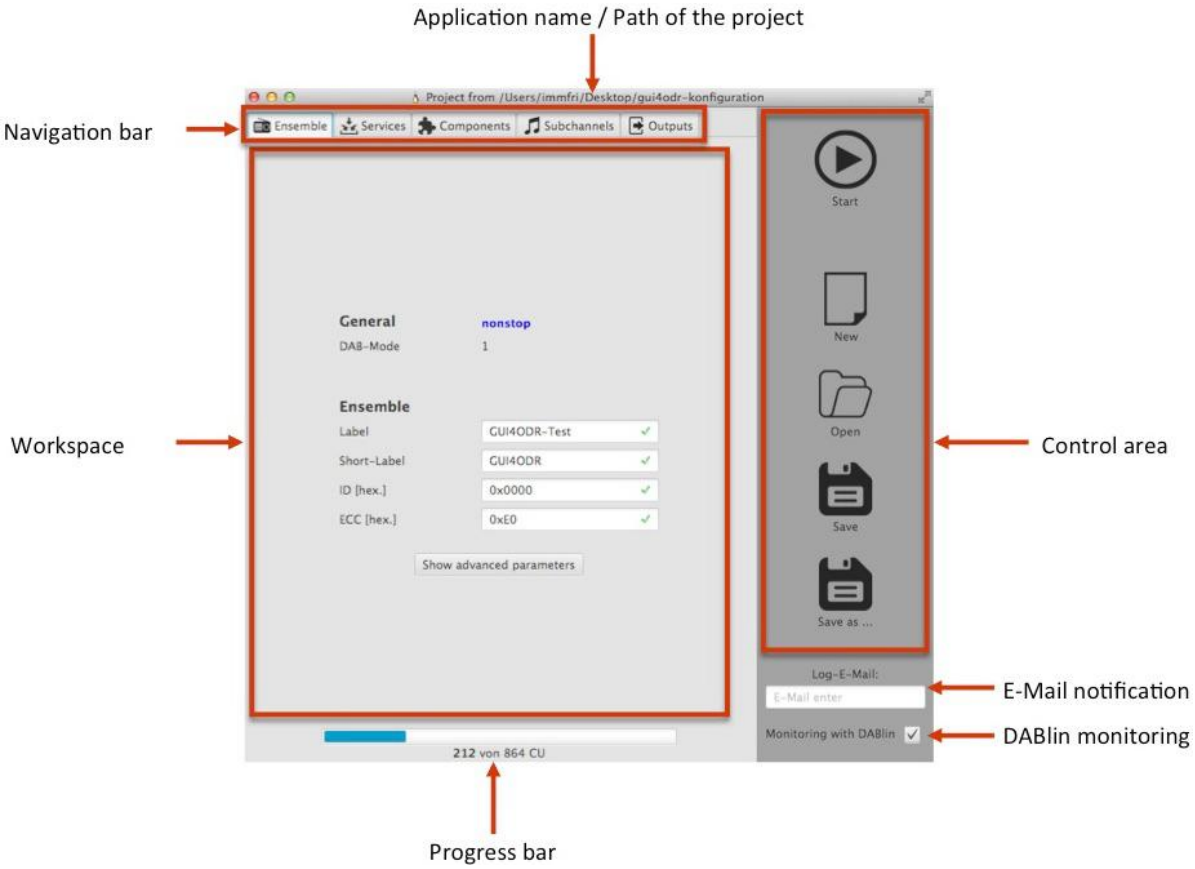
[4] https://www.teamviewer.com/en/ (2017-03)

5 Commissioning

After a successful installation of all necessary software components the application GUI4ODR can be started.

The executable bit should be set under the properties, with a right-click on the application. Than GUI4ODR is started with a double-click.

5.1 Overview of the GUI



Application name/Path of the project

The name of the program or the path is displayed when a project is loaded.

Navigation bar

The workspaces can be changed with the tab bar. Each section of the multiplex configuration is split into separate tabs.

Workspace

In this area, the configuration is implemented.

Control area

This area contains all control elements of the application.

E-Mail notification

This field displays the recipient's e-mail address for notifications.

DABlin monitoring

With the checkbox, DABlin is activated in the execution.

Progress bar

The progress bar shows the occupied and free memory requirements of the multiplex.

5.2 Configuration

The configuration of the multiplex, including the modulators, is done in a project folder.

Create new project

The "New-Button" creates a new and empty configuration. The previous configuration of the project is lost.

Open project

The "Open-Button" can be used to load a complete project from a folder into the application. The previous configuration also will be lost.

Save project

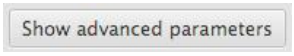
With "Save-Button" the current status of the configuration can be saved under the project path. The old project is certainly overwritten.

Projects save as...

The "Save as..." button is used when newly created configuration or the current configuration is to be stored under a different path.

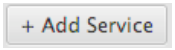
The new project requires creating or selecting a free folder. This is now the project folder of the complete configuration.

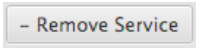
Change view of workspace



The button labeled "Show advanced / basic parameters" can show or hide advanced parameters in the workspace.

Add/Remove Components





The "+ Add..." button can be used to add new components to the corresponding category. With the button "- Remove..." open components can be deleted.

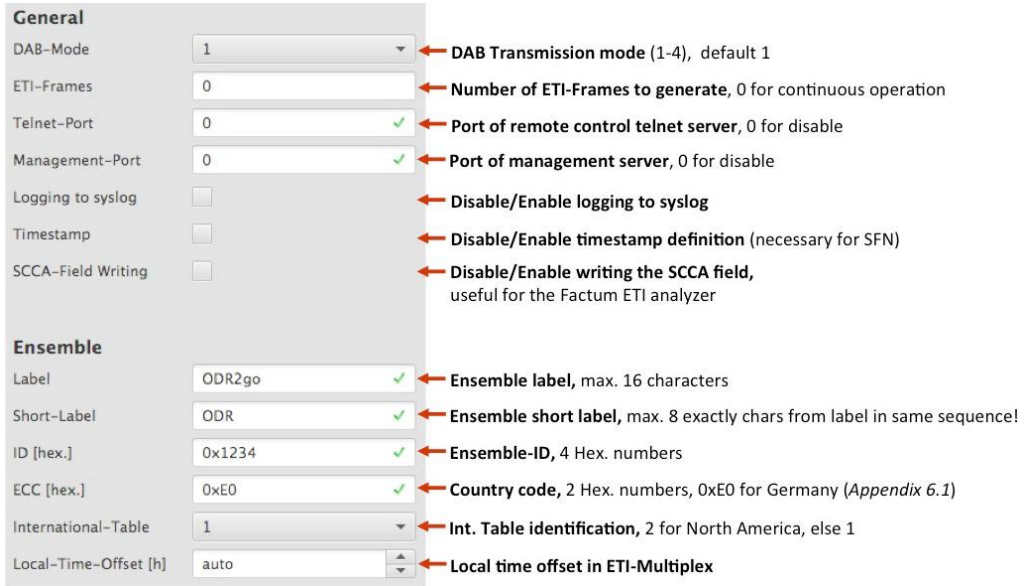
Validate input

The icons in the text field provide information about correct or incorrect input.

All the names of the list components must be unique.

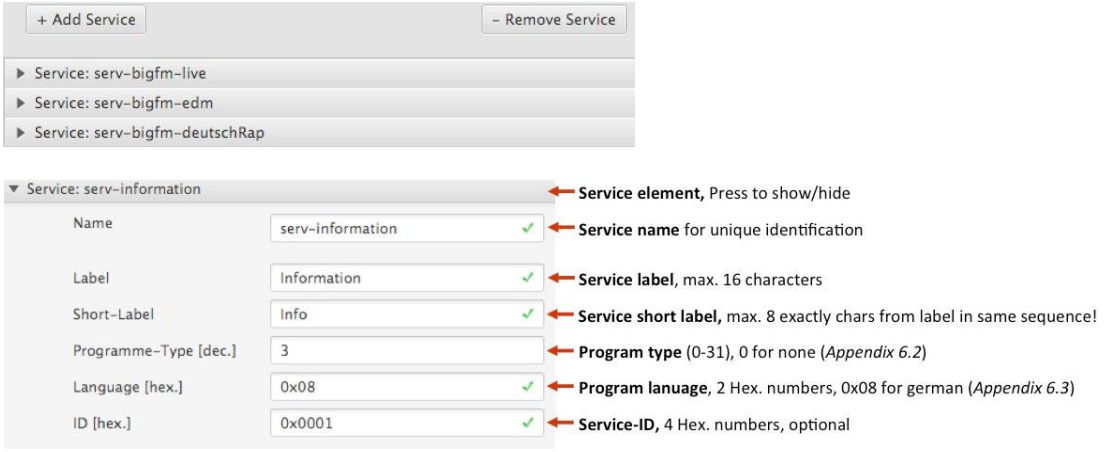
5.2.1 Workspace - Ensemble

The Ensemble workspace contains general settings for the DAB multiplexer. Global parameters of the ensemble are also defined.



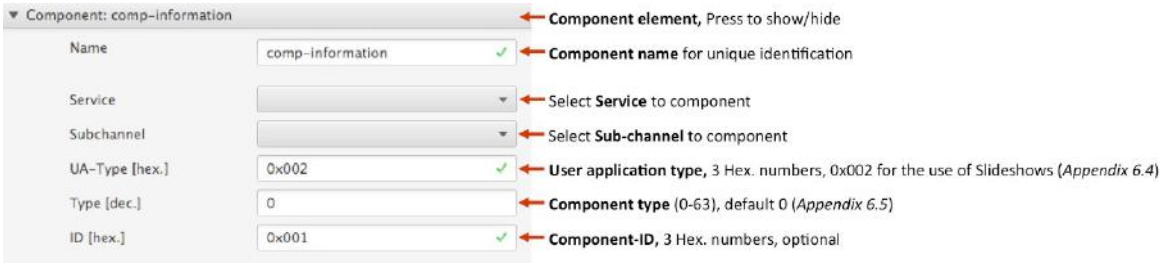
5.2.2 Workspace - Services

The configuration of the services in multiplex is created and edited as lists in the workspace.



5.2.3 Workspace – Components

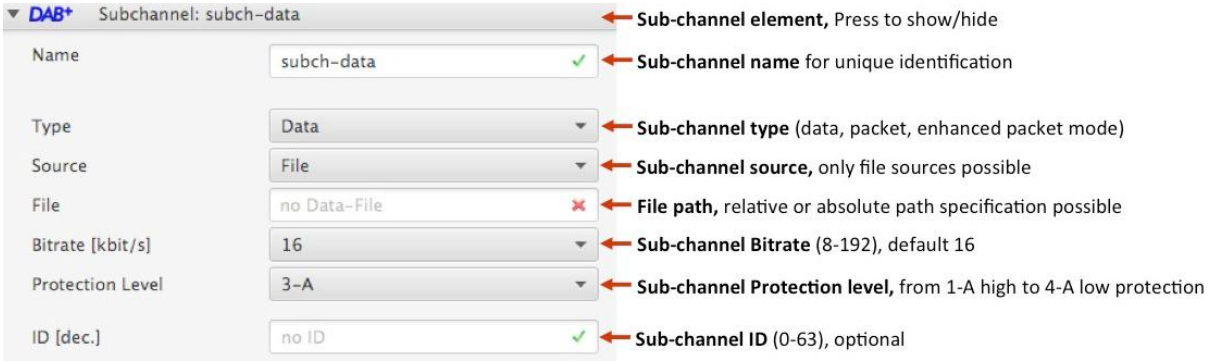
The components of the multiplex are created and edited in this workspace. The associated services and sub-channels are linked to each other in the respective component.



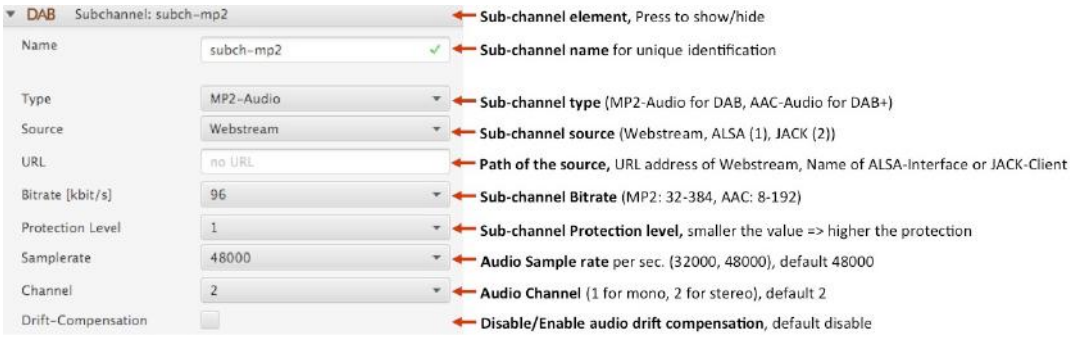
5.2.4 Workspace – Sub-channels

In this workspace all required sub-channels are created for the ensemble. It is possible to configure audio or data sub-channels, program associated data in the audio program is transmitted called PAD.

5.2.4.1 Data Sub-channel



5.2.4.2 Audio Sub-channel



(1) ALSA:

If the audio input is to be used via the sound card, the - Advanced Linux Sound Architecture (ALSA[5]) can be used as an interface.

(2) JACK:

The JACK[6] - Audio Connection Kit - is a sound server under Linux by audio inputs and outputs can be routed. If an audio signal is to be processed in real-time (e.g. with effects) the JACK input is to be used.

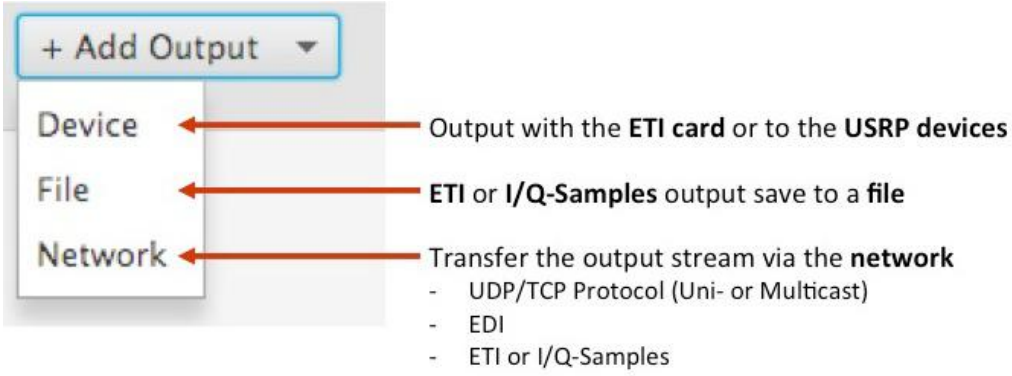
[5] Help under https://wiki.ubuntuusers.de/ALSA/ (2017-03)
[6] Help under https://wiki.ubuntuusers.de/JACK/ (2017-03)

Other parameters:

5.2.4.3 Program associated data (PAD)

5.2.5 Workspace – Outputs

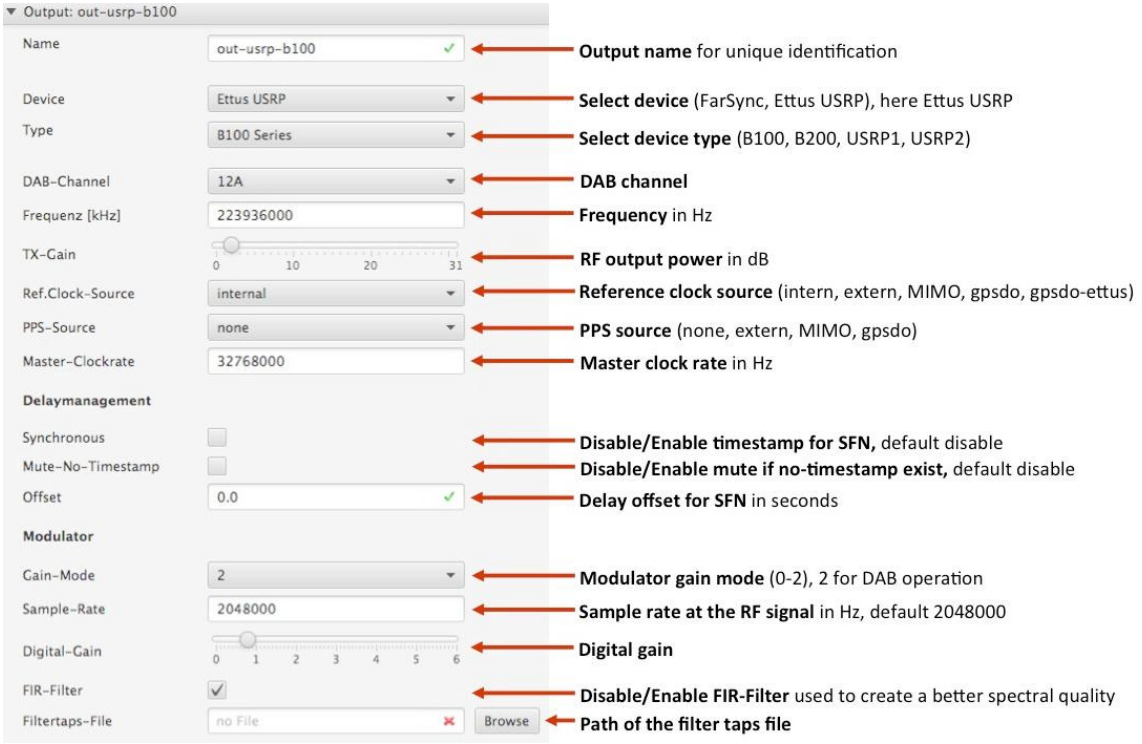
The output of the multiplexed signal can be configured in the output tab. In addition, the multiplex can be converted in I/Q samples for the OFDM transmission using the DAB modulator and then broadcast with the USRP devices.



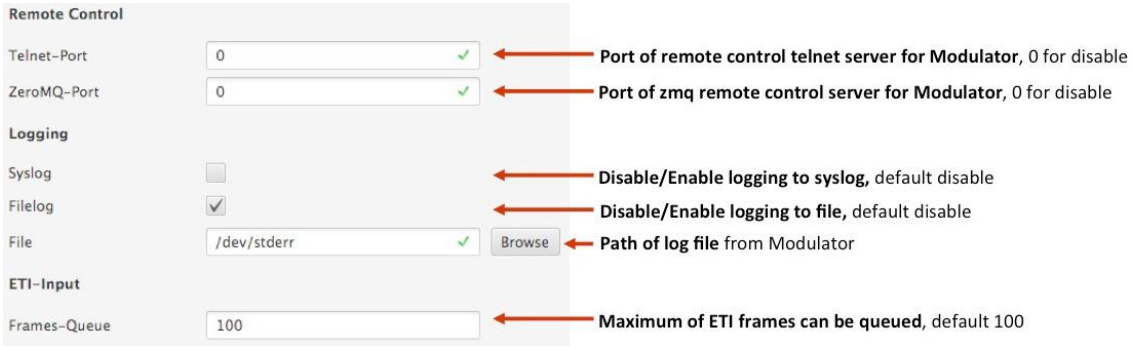
Multiple outputs can be operated simultaneously!

5.2.5.1 Device: ETI-Card

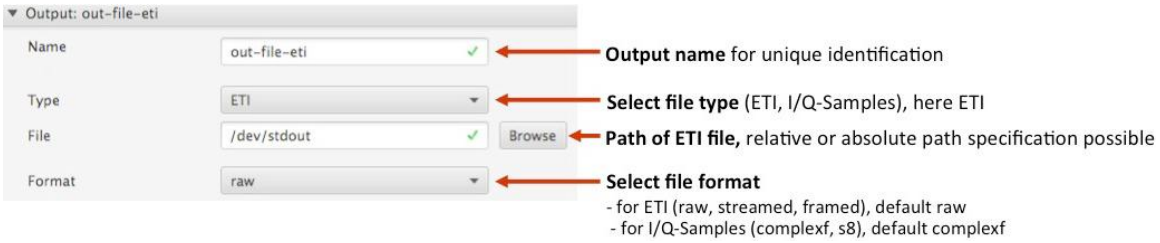
5.2.5.2 Device: USRP



Global modulator parameters:

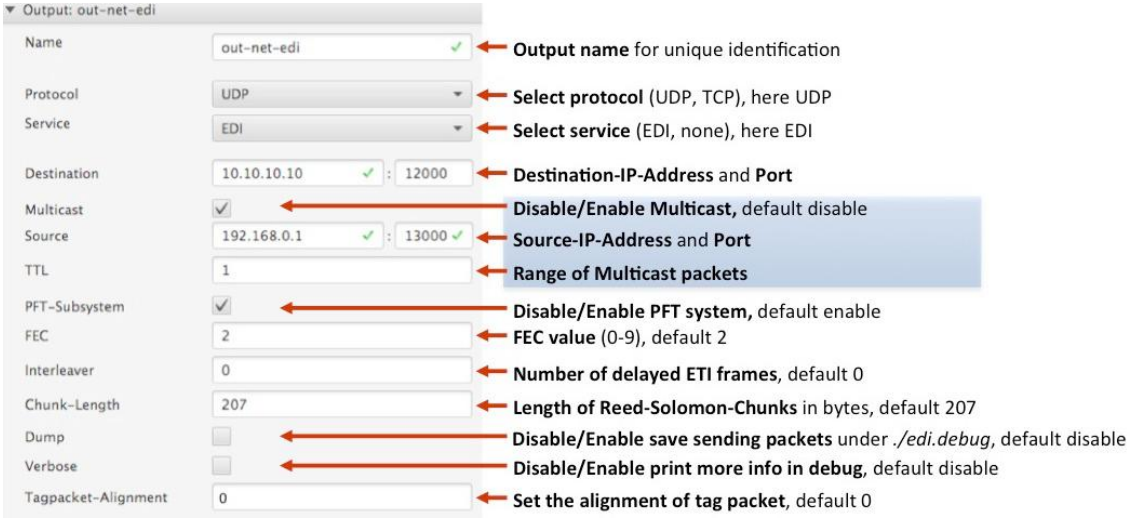


5.2.5.3 File

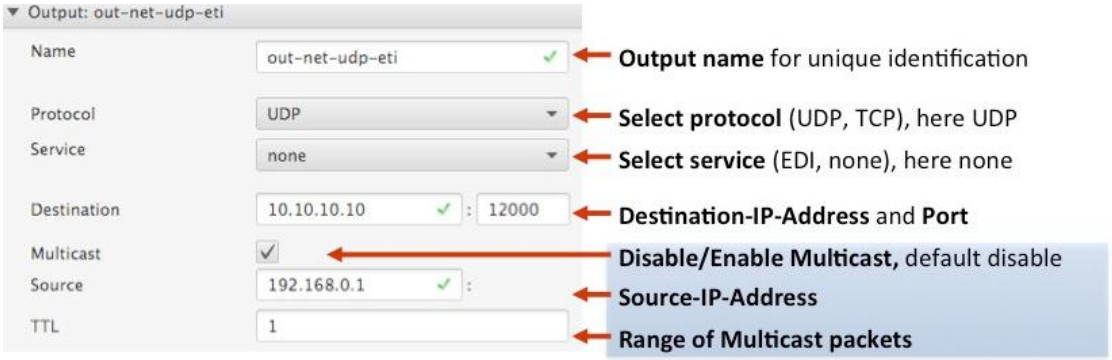


For the modulator configuration of the "I/Q-Samples" file type, see previous section 5.2.5.2!

5.2.5.4 Network: EDI



5.2.5.5 Network: ETI over UDP/TCP

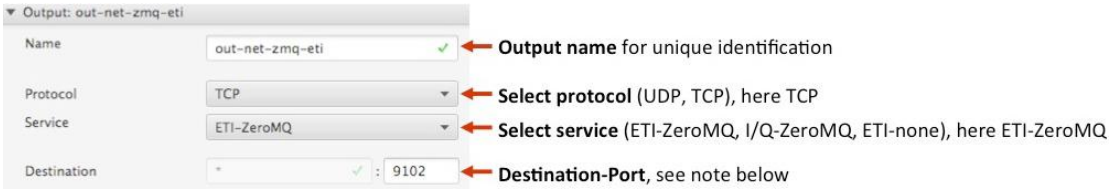


The configuration for TCP is equivalent to this. <TCP> is selected under Protocol and <ETI-none> is selected as a service!

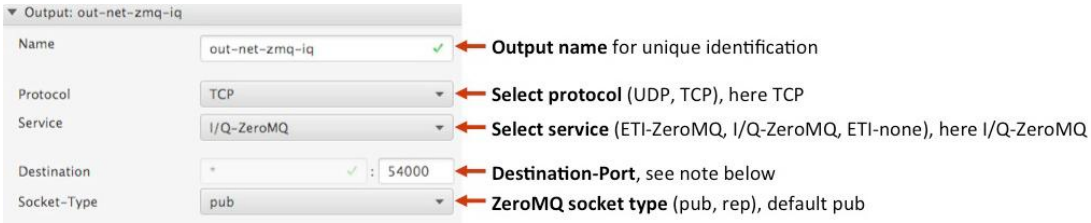
5.2.5.6 Network: ZeroMQ

The transport via ZeroMQ can be done with data from ETI or I/Q-Samples over the network.

ETI by ZeroMQ:



I/Q-Samples by ZeroMQ:



Help for the modulator configuration of the "I/Q-ZeroMQ" service, see section 5.2.5.2!

Be careful when changing the port number. The ports between 9000 and 10000 are required internally for communication of the ODR-mmbTools. If you are unclear, ask a specialist for advice.

5.3 Execution

After a completed configuration, this can be put into operation.

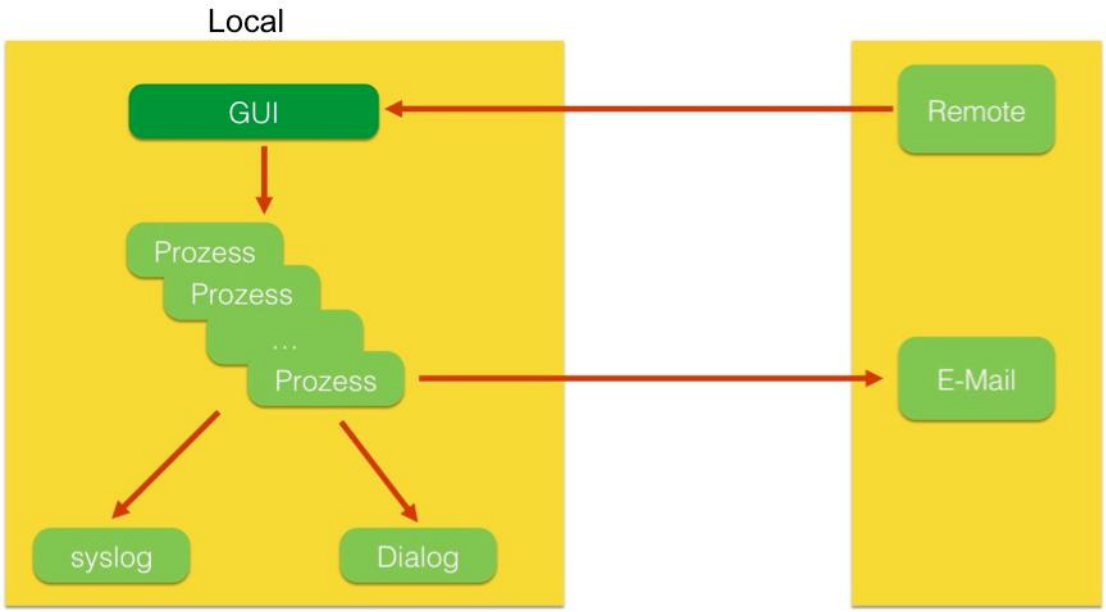
Start/Stop execution

The configuration can be executed with the "Start/Stop-Button". All required tools are started and the monitoring is activated. All processes are set as they are when they are terminated properly.

ETI-FarSync-Card

If the ETI card is to be used, note that this can only be started with Admin rights!

Monitoring scheme of GUI4ODR:

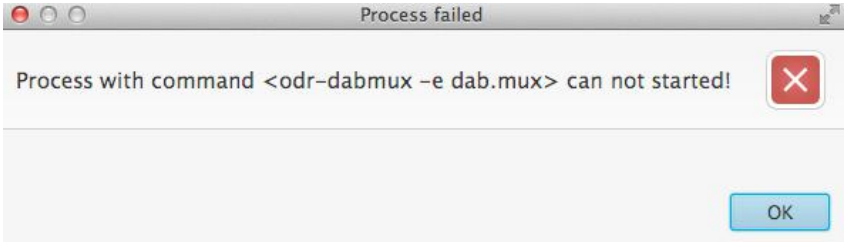


5.3.1 Error message

If processes are terminated prematurely during operation, the user is informed immediately by means of a dialog and if his e-mail address is stored.

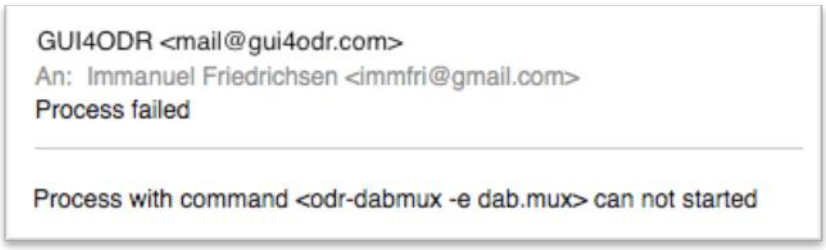
5.3.1.1 Notification window

If the multiplexer can't be started, the following message appears:



5.3.1.2 Notification by E-Mail

In case of a process failure, an e-mail will be sent. The following is a sample mail if the multiplexer could not be started.

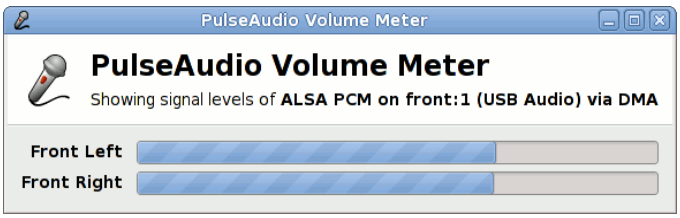


5.3.2 Monitoring

When the output "ETI file" is created, this multiplex is routed to **DABlin** at startup.

Under <Service> the audio programs can be selected and listened to. If DLS text and slideshow are included in the service, they can be displayed.

Display audio level:



The audio output can be visualized with the **Pavumeter**.

Audio problem

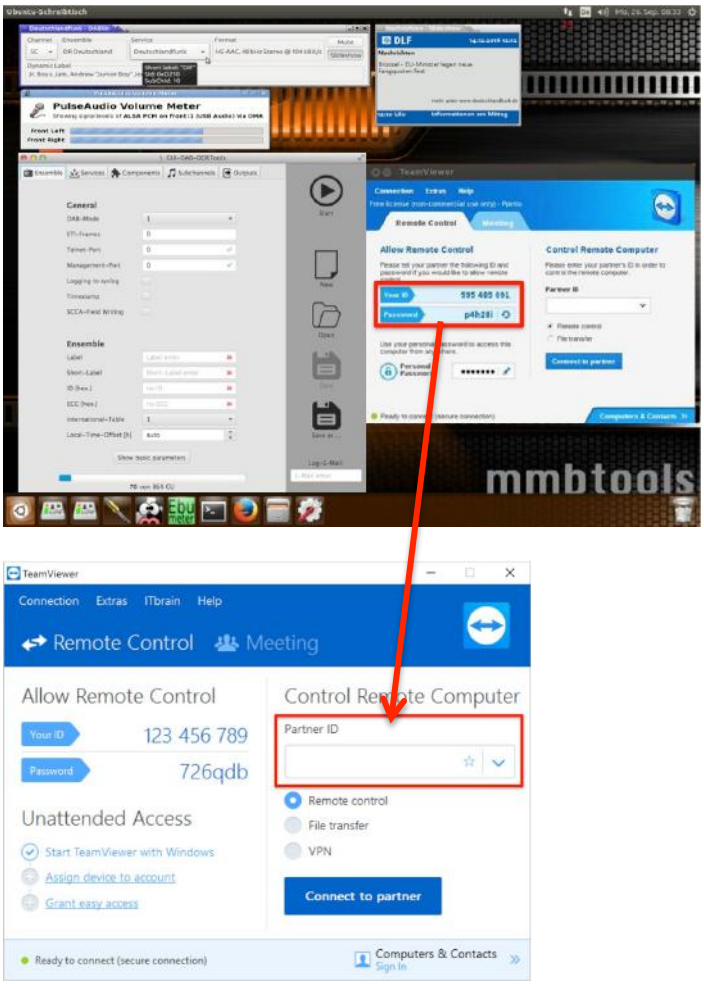
If the system has several sound cards, select the right device under Audio Settings -> Output

5.3.3 Remote control

TeamViewer must be started on both computers to remove access to the system.

Connection

In the remote system, TeamViewer must enter the partner ID, from the system with the GUI, and the associated password. The connection is then established.



6 Appendix

6.1 Contry ID und ECC

Table 1:
Contry ID und ECC gem. ETSI TS 101 756 in ITU Region 1

Country	ITU Code	ECC	Country ID
Albania	ALB	E0	9
Algeria	ALG	E0	2
Andorra	AND	E0	3
Armenia	ARM	E4	A
Austria	AUT	E0	A
Azerbaijan	AZE	E3	B
Azores (Portugal)	AZR	E0	8
Belgium	BEL	E0	6
Belarus	BLR	E3	F
Bosnia Herzegovina	BIH	E4	F
Bulgaria	BUL	E1	8
Canaries (Spain)	CNR	E0	E
Croatia	HRV	E3	C
Cyprus	CYP	E1	2
Czech Republic	CZE	E2	2
Denmark	DNK	E1	9
Egypt	EGY	E0	F
Estonia	EST	E4	2
Faroe (Denmark)	DNK	E1	9
Finland	FNL	E1	6
France	F	E1	F
Georgia	GEO	E4	C
Germany	D	E0	D, 1
Gibraltar (UK)	GIB	E1	A
Greece	GRC	E1	1
Hungary	HNG	E0	B
Iceland	ISL	E2	A
Iraq	IRQ	E1	B
Ireland	IRL	E3	2
Israel	ISR	E0	4
Italy	I	E0	5
Jordan	JOR	E1	5
Kazakhstan	KAZ	E3	D
Kosovo	-	E4	7
Kyrgyzstan	KGZ	E4	3

Country	ITU Code	ECC	Country ID
Latvia	LVA	E3	9
Lebanon	LBN	E3	A
Libya	LBY	E1	D
Liechtenstein	LIE	E2	9
Lithuania	LTU	E2	C
Luxembourg	LUX	E1	7
Macedonia	MKD	E4	3
Madeira	MDR	E2	8
Malta	MLT	E0	C
Moldova	MDA	E4	1
Monaco	MCO	E2	B
Montenegro	MNE	E3	1
Morocco	MRC	E2	1
Netherlands	HOL	E3	8
Norway	NOR	E2	F
Palestine	-	E0	8
Poland	POL	E2	3
Portugal	POR	E4	8
Romania	ROU	E1	E
Russian Federation	RUS	E0	7
San Marino	SM	E1	3
Serbia	SRB	E2	D
SlovaKIA	SVK	E2	5
Slovenia	SVN	E4	9
Spain	E	E2	E
Sweden	S	E3	E
Switzerland	SUI	E1	4
Syria	SYR	E2	6
Tajikistan	TJK	E3	5
Tunisia	TUN	E2	7
Turkey	TUR	E3	3
Turkmenistan	TKM	E4	E
Ukraine	UKR	E4	6
United Kingdom	G	E1	C
Uzbekistan	UZB	E4	B
Vatican	CVA	E2	4

6.2 Programme Type

Table 2:
Programme type codes and abbreviations in the English language, applying to all countries, except for North America, acc. ETSI TS 101 756

Decimal Number	Code					Programme type	16-character abbreviation	8-character abbreviation
	b4	b3	b2	b1	b0			
0	0	0	0	0	0	No programme type	None	None
1	0	0	0	0	1	News	News	News
2	0	0	0	1	0	Current Affairs	Current_Affairs	Affairs
3	0	0	0	1	1	Information	Information	Info
4	0	0	1	0	0	Sport	Sport	Sport
5	0	0	1	0	1	Education	Education	Educate
6	0	0	1	1	0	Drama	Drama	Drama
7	0	0	1	1	1	Culture	Arts	Arts
8	0	1	0	0	0	Science	Science	Science
9	0	1	0	0	1	Varied	Talk	Talk
10	0	1	0	1	0	Pop Music	Pop_Music	Pop
11	0	1	0	1	1	Rock Music	Rock_Music	Rock
12	0	1	1	0	0	Easy Listening Music	Easy_Listening	Easy
13	0	1	1	0	1	Light Classical	Light_Classical	Classics
14	0	1	1	1	0	Serious Classical	Classical_Music	Classics
15	0	1	1	1	1	Other Music	Other_Music	Other_M
16	1	0	0	0	0	Weather/meteorology	Weather	Weather
17	1	0	0	0	1	Finance/Business	Finance	Finance
18	1	0	0	1	0	Children's programmes	Children's	Children
19	1	0	0	1	1	Social Affairs	Factual	Factual
20	1	0	1	0	0	Religion	Religion	Religion
21	1	0	1	0	1	Phone In	Phone_In	Phone_In
22	1	0	1	1	0	Travel	Travel	Travel
23	1	0	1	1	0	Leisure	Leisure	Leisure
24	1	1	0	0	0	Jazz Music	Jazz_and_Blues	Jazz
25	1	1	0	0	1	Country Music	Country_Music	Country
26	1	1	0	1	0	National Music	National_Music	Nation_M
27	1	1	0	1	1	Oldies Music	Oldies_Music	Oldies
28	1	1	1	0	0	Folk Music	Folk_Music	Folk
29	1	1	1	0	1	Documentary	Documentary	Document
30	1	1	1	1	0	Not used		
31	1	1	1	1	1	Not used		

NOTE 1: This table forms part 1 of the International Table Identifier /0000 0001/ (see clause 5.7) which references the PTy codes for DAB use, except in North America.

NOTE 2: The notation _ is used to indicate the use of the "space" character.

6.3 Language code

Table 3:
European languages acc. ETSI TS 101 756

Language	Code (hex)
Unknown/not applicable	00
Albanian	01
Breton	02
Catalan	03
Croatian	04
Welsh	05
Czech	06
Danish	07
German	08
English	09
Spanish	0A
Esperanto	0B
Estonian	0C
Basque	0D
Faroese	0E
French	0F
Frisian	10
Irish	11
Gaelic	12
Galician	13
Icelandic	14
Italian	15
Lappish	16
Latin	17
Latvian	18

Language	Code (hex)
Luxembourgian	19
Lithuanian	1A
Hungarian	1B
Maltese	1C
Dutch	1D
Norwegian	1E
Occitan	1F
Polish	20
Portuguese	21
Romanian	22
Romansh	23
Serbian	24
Slovak	25
Slovene	26
Finnish	27
Swedish	28
Turkish	29
Flemish	2A
Walloon	2B
rfu	2C
rfu	2D
rfu	2E
rfu	2F
Reserved for national assignment	30 to 3F

6.4 UA-Type

Table 4:
User Application Types acc. ETSI TS 101 756

User Application type (hexadecimal)	User Application	Reference
0x000	Reserved for future definition	
0x001	Not used	
0x002	MOT Slideshow	TS 101 499
0x003	MOT Broadcast Web Site	TS 101 498
0x004	TPEG	
0x005	DGPS	
0x006	TMC	TS 102 368
0x007	EPG	TS 102 818
0x008	DAB Java	TS 101 993
0x009	DMB	TS 102 428
0x00a	IPDC services	TS 102 978
0x00b	Voice applications	TS 102 632
0x00c	Middleware	TS 102 635
0x00d	Filecasting	TS 103 177
0x00e to 0x449	Reserved for future definition	
0x44a	Journaline®	TS 102 979
0x44b to 0x7ff	Reserved for future definition	

NOTE: User Application Types marked "Reserved for future definition" are assigned by WorldDAB IRC for user applications whose definition is published by a recognized standards body (e.g. ETSI) or for user applications whose definition is not freely available. WorldDAB IRC retains details of all registrations:

6.5 Service Component Types

Table 5:
Service Component Type for audio (ASCTy) acc. ETSI TS 101 756

b13	b12	b11	b10	b9	b8	Dec	ASCTy types
0	0	0	0	0	0	0	DAB audio (see ETSI TS 103 466)
0	0	0	0	0	1	1	Not used
0	0	0	0	1	0	2	Not used
							Rfu
1	1	1	1	1	1	63	DAB+ audio (see ETSI TS 102 563)

Table 6:
Service Component Type for data (DSCTy) acc. ETSI TS 101 756

b13	b12	b11	b10	b9	b8	Dec	DSCTy types
0	0	0	0	0	0	0	Not used
0	0	0	0	0	1	1	Not used
0	0	0	0	1	0	2	Not used
0	0	0	0	1	1	3	Not used
0	0	0	1	0	0	4	Not used
0	0	0	1	0	1	5	TDC (see ETSI TS 101 759)
							Rfu
0	1	1	0	0	0	24	MPEG-2 TS (see ETSI TS 102 427)
							Rfu
1	1	1	0	1	1	59	Not used
1	1	1	1	0	0	60	MOT (see ETSI EN 301 234)
1	1	1	1	0	1	61	Proprietary service: no DSCTy signalled
1	1	1	1	1	0	62	Not used
1	1	1	1	1	1	63	Not used

7 More Information

7.1 GUI4ODR:

https://github.com/immfri/gui-dab-odrTools (*2017-03)*

7.2 ODR-mmbTools

More information and help with the **ODR-mmbTools** (*2017-03*):

Documentation:	http://opendigitalradio.github.io/mmbtools-doc/mmbtools.pdf
Github:	https://github.com/Opendigitalradio
Homepage:	http://www.opendigitalradio.org
Community:	https://groups.google.com/forum/#!forum/crc-mmbtools

7.3 Additional application

DABlin:

https://github.com/Opendigitalradio/dablin (*2017-03)*

Pavumeter:

http://0pointer.de/lennart/projects/pavumeter/ (*2017-03)*

7.4 Technical reports

Technical reports and development of the small-scale DAB transmitter in Germany from Rheinland-Pfalz:

http://drm-radio-kl.eu (*2017-03*)