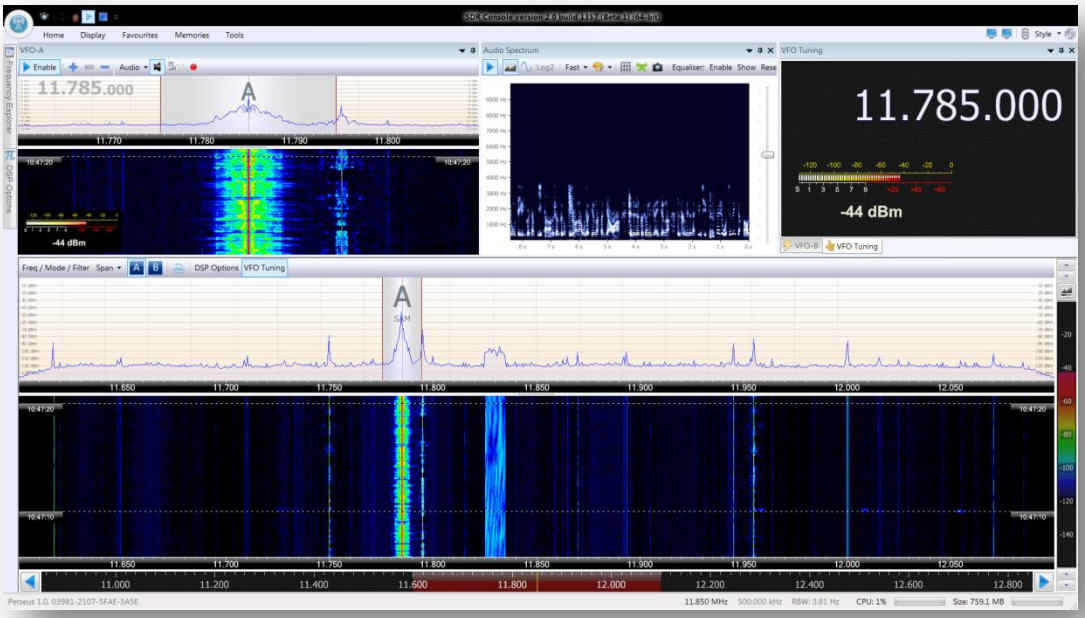

SDR Server (V2)

The ultimate software for your SDR station

SDR-RADIO.com

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1 Introduction

Welcome to the second generation SDR console from SDR-Radio.com. This new server takes the technology developed in version 1 and adds many improvements to bring you the most advanced SDR solution available today.

1.1 Technology

The server consists of two components:

1. A Windows service,
2. A user interface to configure the service.

By using a service the server can run 'lights out'. If your computer is running then the service will be running, it really is that simple.

This user guide describes the server user interface in detail.

1.1.1 Audio

The audio is compressed using the new Opus codec, see http://www.opus-codec.org/ for more information. This new codec offers excellent quality and very low latency; features important for the demanding user.

1.1.2 Waterfall

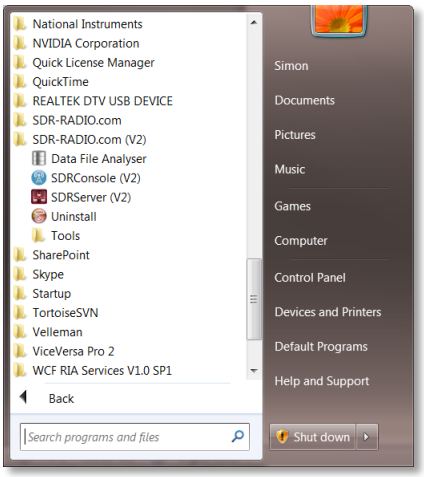
The waterfall data is compressed using an advanced algorithm which is a combination of Huffman, LZSS and delta differences.

1.1.3 Networking

The networking uses two TCP/IP channels: one for command and control, the other for data transport. More information is available later in this document.

2 Server Manager

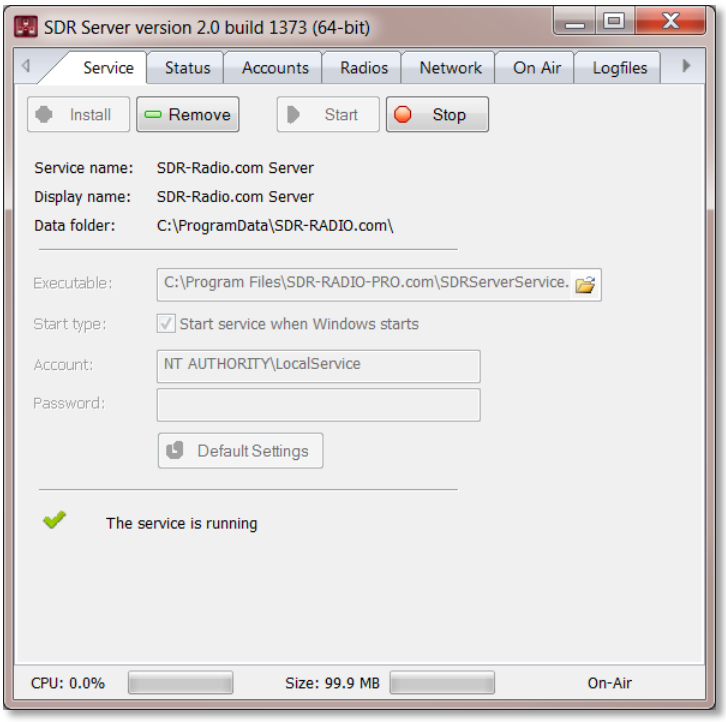
The server manager is started either from the Windows Start menu or the Tools panel in the console's ribbon bar.



The manager is a simple tabbed dialog; the options in each tab will now be explained.

To configure the service you must have administrator privileges enabled.

3 Service



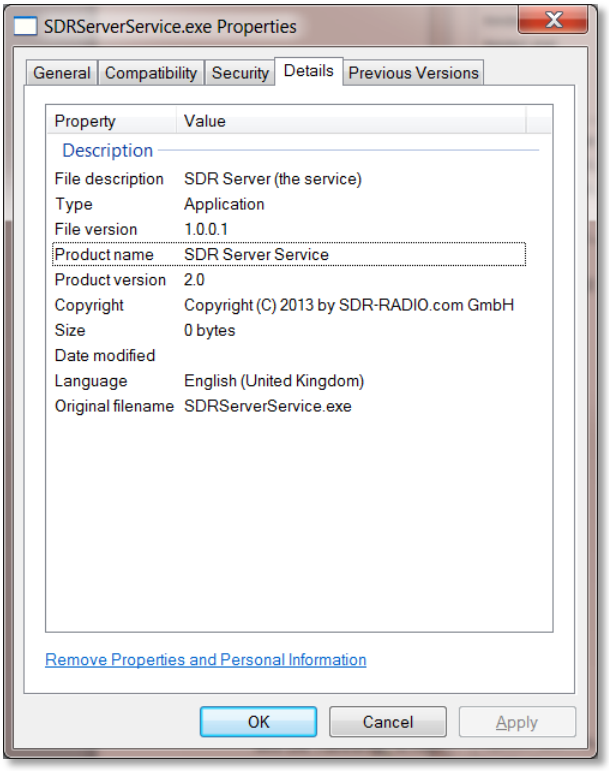
This window configures the service, the default settings are recommended.

- The service uses the LocalService account.
- Select the 'Start service…' checkbox to start the service when the computer starts.

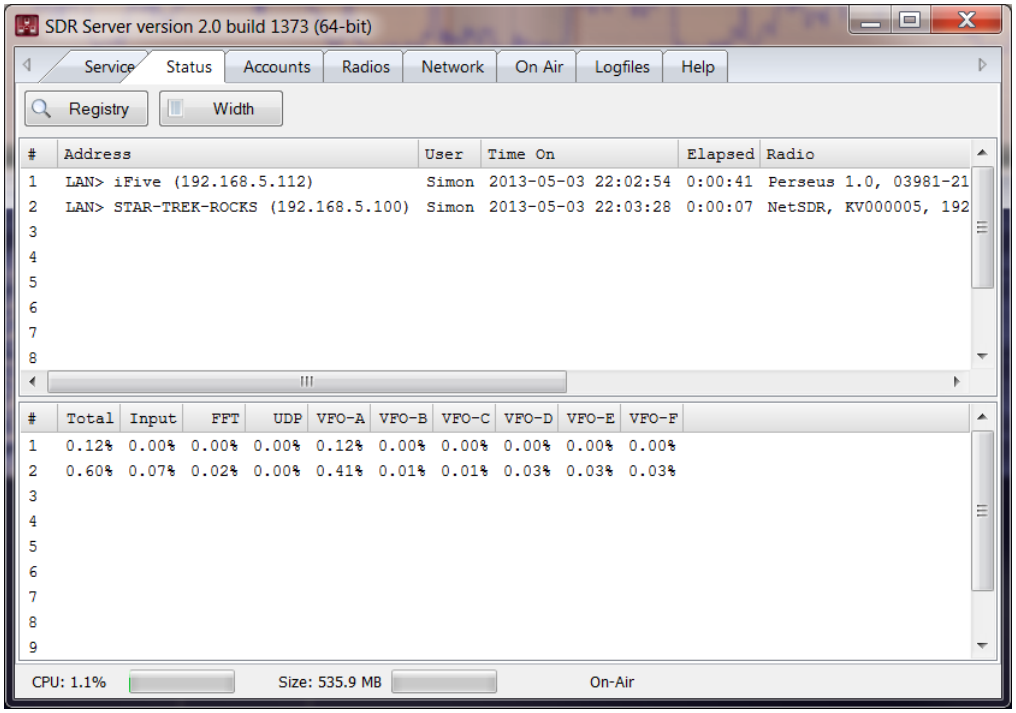
From Microsoft's website: ***"The LocalService account is a predefined local account used by the service control manager. It has minimum privileges on the local computer and presents anonymous credentials on the network."***

3.1 Service

For reference the service properties are shown below:


SDRServerService.exe Properties
General
Compatibility
Security
Details
Previous Versions
Property
Value
Description
File description
SDR Server (the service)
Type
Application
File version
1.0.0.1
Product name
SDR Server Service
Product version
2.0
Copyright
Copyright (C) 2013 by SDR-RADIO.com GmbH
Size
0 bytes
Date modified
Language
English (United Kingdom)
Original filename
SDRServerService.exe
Remove Properties and Personal Information
OK
Cancel
Apply

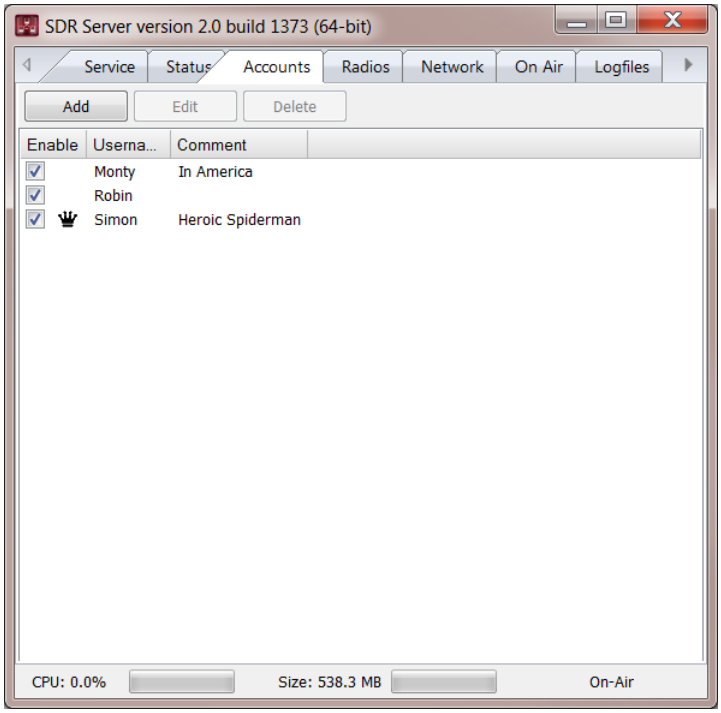
4 Status



This window is display only, it shows the current connections and the CPU used by the main threads of each connection.

- Select Registry to start the registry editor opened at the folder where the settings are stored.
- Select Width to fit the column widths to the displayed data.

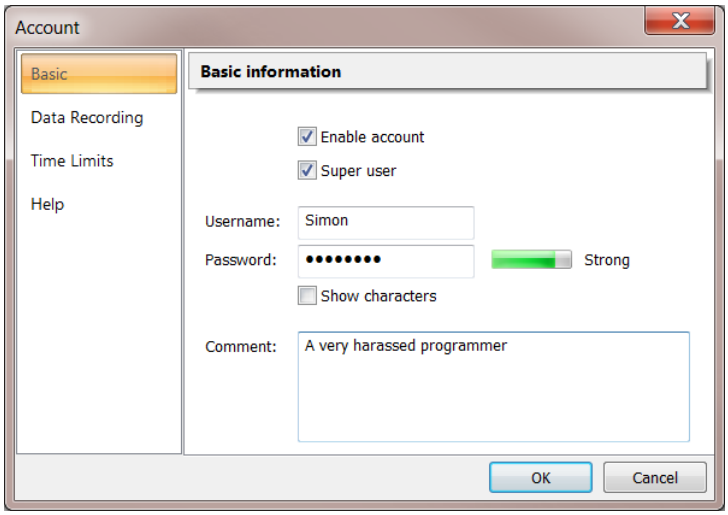
5 Accounts



Every connection uses an account.

5.1 Add

5.1.1 Basic



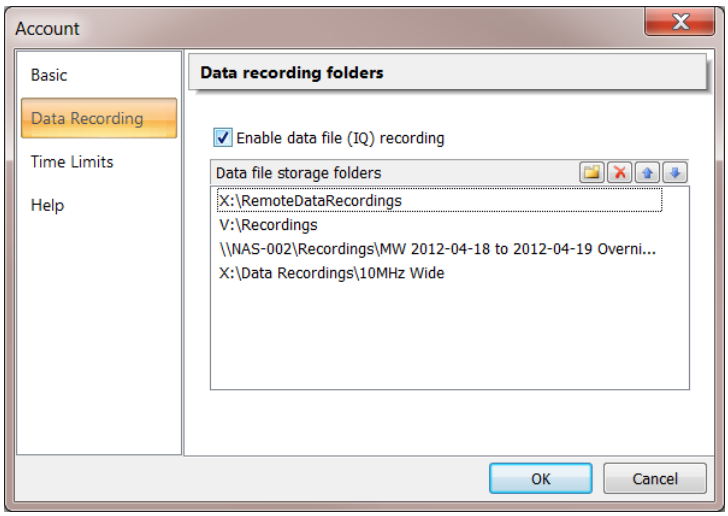
The Basic screen displays the main fields:

- Enabled,

- Super user (for future use),
- Username,
- Password (select ‘Show characters’ to display the password),
- Free-format comment.

The password strength is computed in accordance with Google’s recommendations, for more information https://accounts.google.com/PasswordHelp .

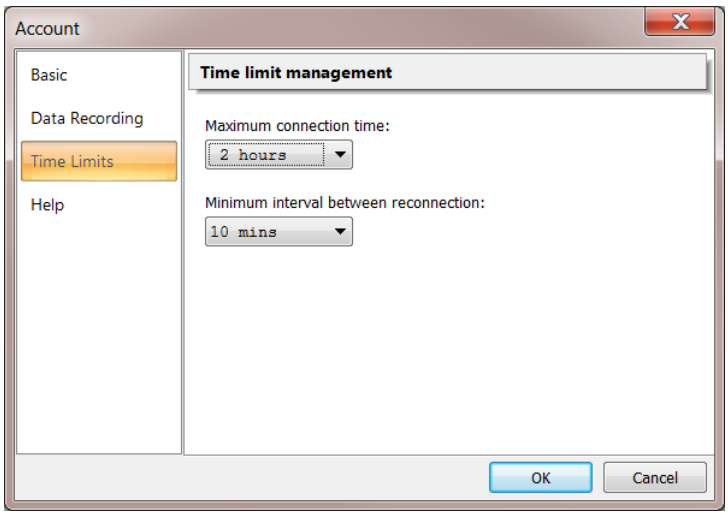
5.1.2 Data Recording



Select ‘Enable data file…’ to enable data recording from the console.

Create one or more data file storage definitions. The console user can create recordings in any of these folders.

5.1.3 Time Limits



Use this screen to restrict the connection time and the reconnection interval. If the reconnection interval is set to 10 minutes then at least ten minutes must elapse before the user can reconnect.

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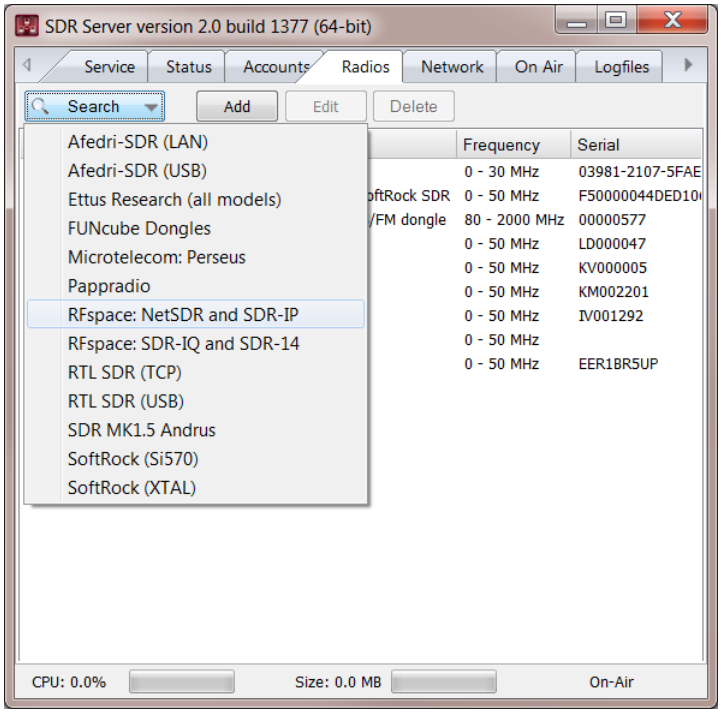
6 Radios



Here you maintain a list of radios the user can start. You either search automatically or add manually.

Each radio definition contains a Range field – this is the frequency range displayed in the Frequency Explorer in the console. After using Search you must check the range and make any changes as necessary.

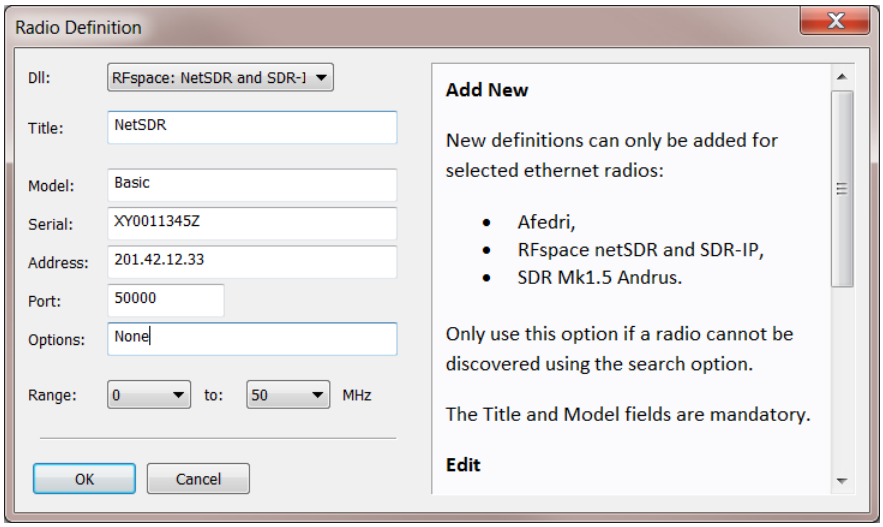
6.1 Search

Select *Search*, and then select an option from the dropdown menu. The software searches for radios matching the search criteria and prompts you to add the new definitions to the list.

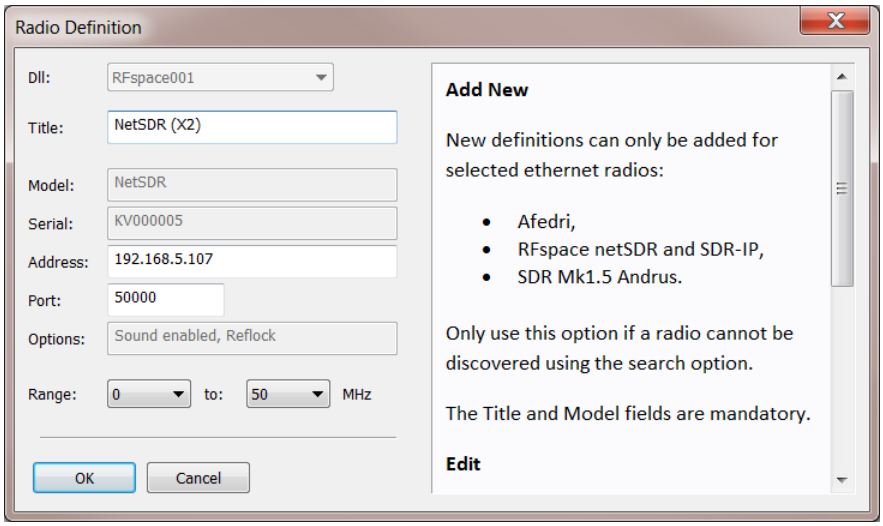
After adding new definitions you can change the definition name and frequency range by highlighting an entry and pressing Edit.

6.2 Add

This window is used to add definitions for Ethernet radios, only use it if you cannot find the radio using the search option.



6.3 Edit

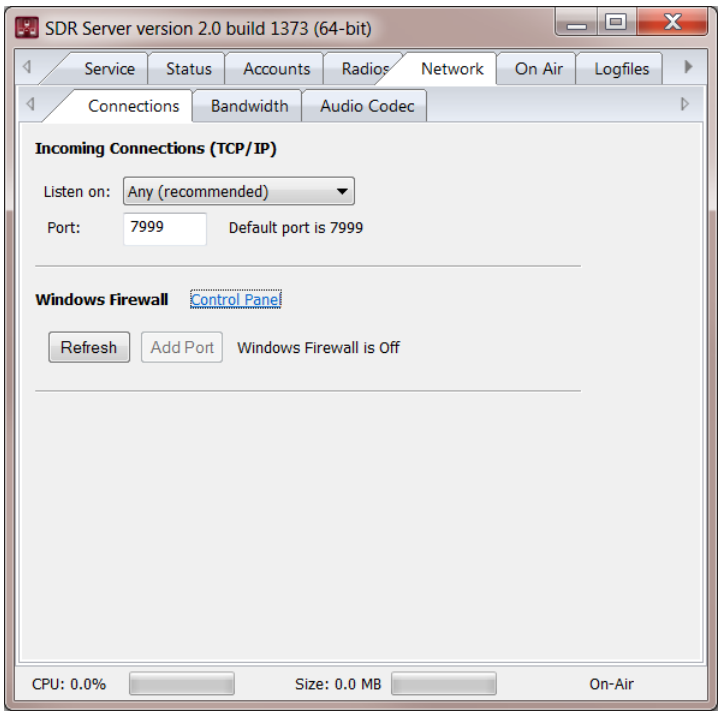


Here you can change an existing definition:

- Address is the radio address in dotted format.
- Port is the port used by the radio for incoming commands.
- Range is the frequency range displayed in the frequency explorer in the console.

7 Network

7.1 Connections



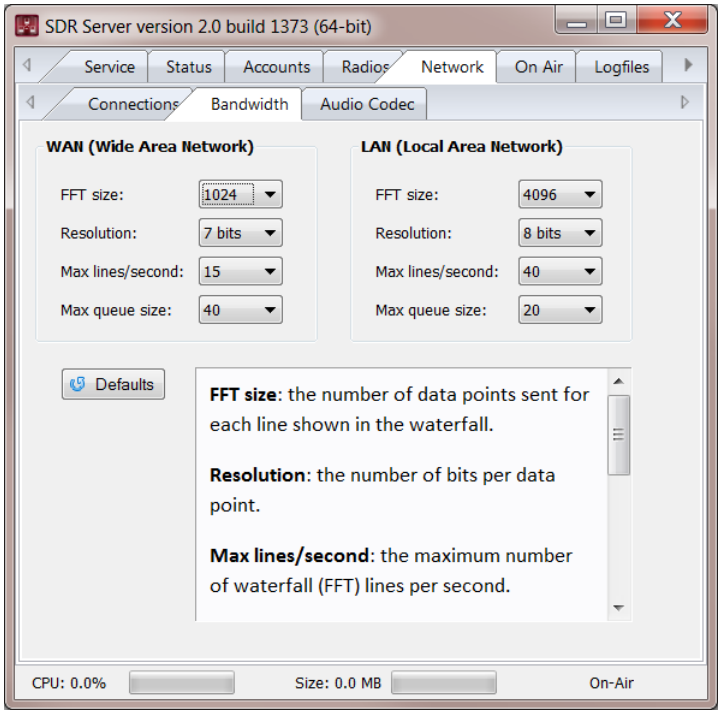
You cannot change these values while the service is started.

These options control incoming connections:

- Listen on either any network address or just a single address,
- The port number for incoming connections (default is 7999).

If your computer has more than one network adapter – for example Wi-Fi and wired it makes sense to only allow incoming connections on the wired connection as this is less prone to interruptions.

7.2 Bandwidth

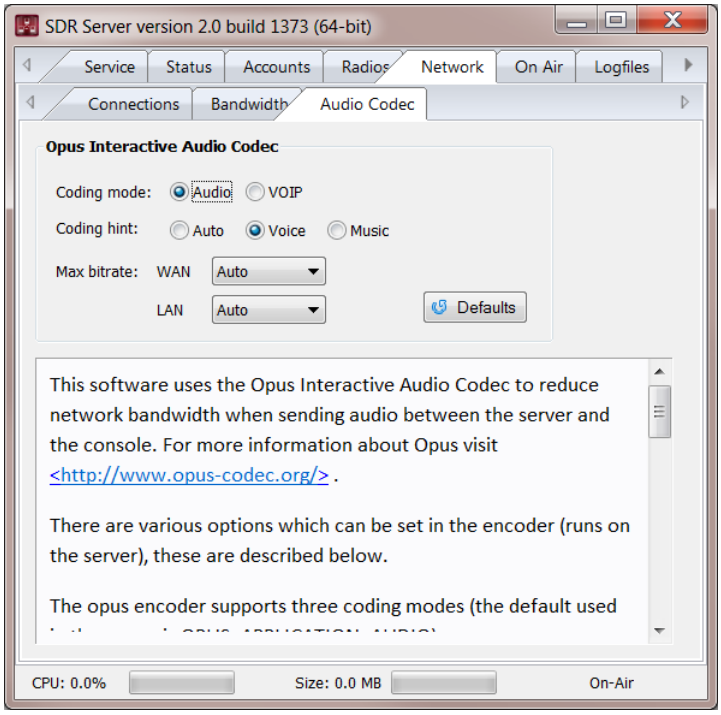


Here you adjust the FFT (waterfall) data for both WAN and LAN connections.

- FFT size: the number of data points sent for each line shown in the waterfall.
- Resolution: the number of bits per data point.
- Max lines/second: the maximum number of waterfall (FFT) lines per second.
- Max queue size: the maximum number of unsent messages before bandwidth throttling algorithms are used. When the unsent message queue size exceeds this value waterfall (FFT) data is discarded first, then audio data.

To reduce the network bandwidth use lower values for FFT size, Resolution and Max lines/second.

7.3 Audio Codec



This software uses the Opus Interactive Audio Codec to reduce network bandwidth when sending audio between the server and the console. For more information about Opus visit http://www.opus-codec.org/.

There are various options which can be set in the encoder (runs on the server), these are described below.

The opus encoder supports three coding modes (the default used in the server is OPUS_APPLICATION_AUDIO):

- VOIP gives best quality at a given bitrate for voice signals. It enhances the input signal by high-pass filtering and emphasizing formants and harmonics. Optionally it includes in-band forward error correction to protect against packet loss. Use this mode for typical VoIP applications. Because of the enhancement, even at high bitrates the output may sound different from the input.
- Audio gives best quality at a given bitrate for most non-voice signals like music. Use this mode for music and mixed (music/voice) content, broadcast, and applications requiring less than 15 ms of coding delay.

The encoder supports a hint which helps the encoder's mode selection (the default used is OPUS_AUTO):

- Auto (default)
- Voice Bias thresholds towards choosing LPC or Hybrid modes.

- Music Bias thresholds towards choosing MDCT modes.
- Maximum bitrate, default value is 40 kbps.

These values cannot be changed:

- The encoder's expected packet loss percentage is set to 1%.
- Complexity is set to the highest complexity (uses most CPU, produces best results), the value is 10.

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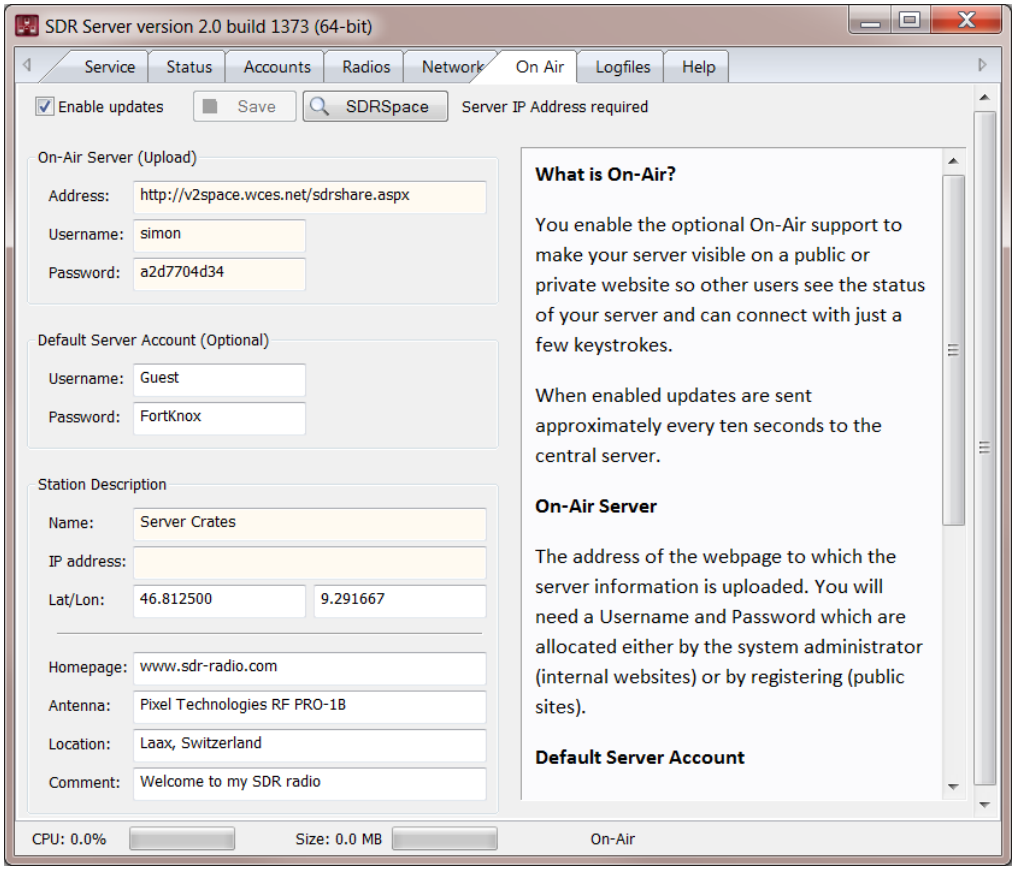
8 On-Air



What is On-Air?

You enable the optional On-Air support to make your server visible on a public or private website so other users see the status of your server and can connect with just a few keystrokes.

When enabled updates are sent approximately every ten seconds to the central server.

On-Air Server

The address of the webpage to which the server information is uploaded. You will need a Username and Password which are allocated either by the system administrator (internal websites) or by registering (public sites).

Default Server Account

Optionally supply the Username and Password for a server account (see Accounts tab in this program).

Station Description

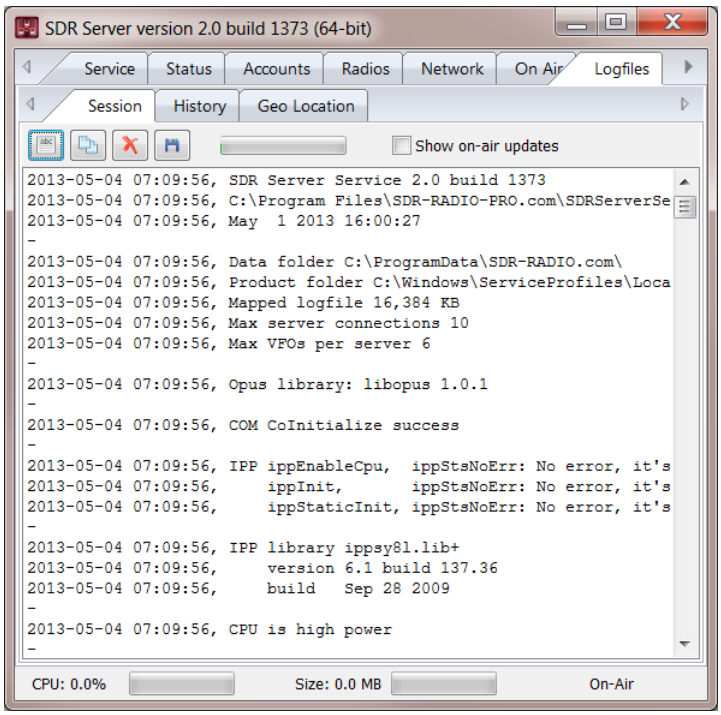
Here you provide information about your station configuration. The IP address is important - this is your public IP address.

Latitude and Longitude are in decimal degrees.

The URL is an optional website where other users see details about your station.

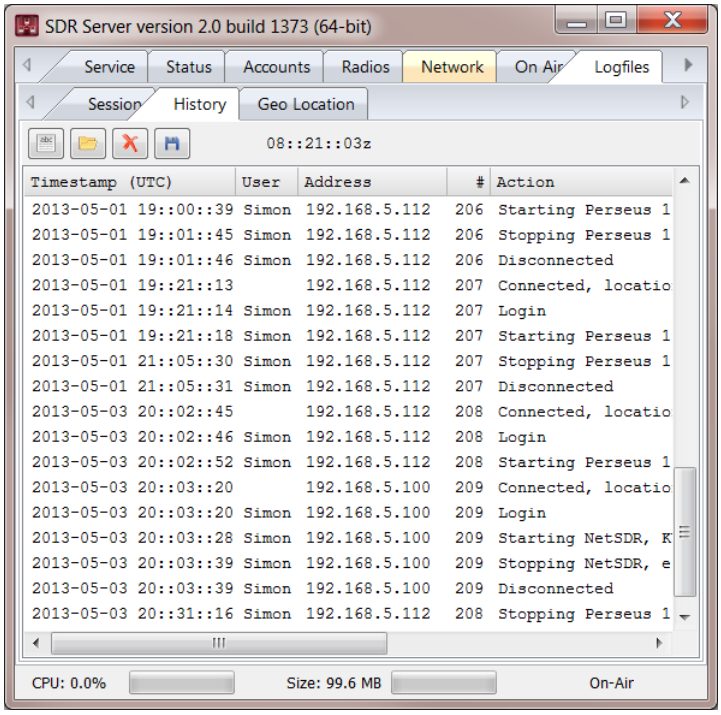
9 Logfiles

9.1 Session



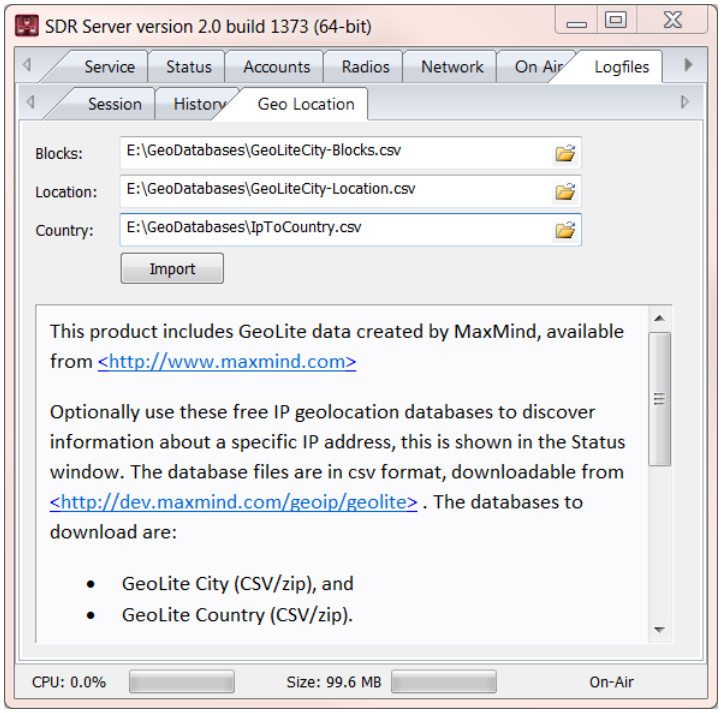
The session logfile shows detailed information since the service started. If on-air updates are enabled and you select the ‘Show on-air updates’ checkbox then the updates are added to the session logfile for the next five minutes.

9.2 History



A history of connections made to server and radios started.

9.3 Geo Location



This product includes GeoLite data created by MaxMind, available from http://www.maxmind.com.

Optionally use these free IP geolocation databases to discover information about a specific IP address, this is shown in the Status window. The database files are in csv format, downloadable from http://dev.maxmind.com/geoip/geolite . The databases to download are:

- GeoLite City (CSV/zip), and
- GeoLite Country (CSV/zip).

Unpack the contents of these files to a folder on your computer, and then select these files in the fields above. The default filenames are:

- GeoLiteCity-Blocks.csv
- GeoLiteCity-Location.csv
- IpToCountry.csv

The files are copied to this product's installation folder. After importing you must stop and start the service.

10 Help

10.1 Firewall

This software uses two TCP connections for communicating between the console and server, also some radios such as the Net-SDR use TCP and UDP, so you must open up the correct ports in your firewalls.

10.1.1 Console

The console connects to the server using TCP, the default port is 7999 (the port is shown in the Network Connection window on the server).

- TCP outgoing on port 7999

10.1.2 Server

The server accepts TCP connections on port 7999 (as selected in the Network Connection window on the server).

- TCP incoming on port 7999

10.1.3 Radios

Ethernet-based radios use TCP and/or UDP so you must know which ports are being used.

10.1.3.1 RFspace

The RFspace Net-SDR and SDR-IP use the same port for incoming TCP connection and outgoing UDP packets, the default is 50,000. This port assignment is user-configurable.

- TCP outgoing on port 50,000
- UDP incoming on port 50,000

10.1.3.2 Ettus Research

The Ettus radios use a default port of 49152 for UDP control and receiving UDP packets. This port assignment is user-configurable.

- UDP outgoing and incoming on port 49152.

11 Network Protocol

All networking uses TCP/IP. The console creates two connections with the server:

- Command and status,
- Audio and FFT data.

Although one connection could be used the aim is to have the audio streaming with the lowest possible latency, hence the two-channel approach. Nothing which is sent on the command channel affects the data channel.

The information presented here is by no means complete; it servers only to outline the technology used. If necessary the exact protocol and message formats will be documented at a later date.

11.1 Command Channel

All commands are sent as UTF-8 XML, the XML is compressed using Lempel–Ziv–Storer–Szymanski (LZSS) to reduce bandwidth.

The messages sent are:

- Connection
  - Ack, sent by the console every 500 milliseconds as a keep alive message. The message contains a timestamp used to determine the round trip time.
  - Login, sent when establishing a connection.
  - UpdateDemod, updates the demodulation options for a VFO channel.
- Radio
  - Start, sent when starting a radio.
  - Stop, sent when stopping a radio.
  - UpdateRadio, update the radio settings such as RF gain.
- Data (IQ) Recording
  - RecorderStart, starts data (IQ) recording on the server.
  - RecorderStop, stops data (IQ) recording on the server.
- Data (IQ) Playback
  - PlaybackFiles, server returns a list of recordings for a specific folder.
  - PlaybackFileInfo, server returns detailed information for a specific recording file.
  - PlaybackFileGain, adjusts the gain in the player.

    - PlaybackFilePause, pauses playback.
    - PlaybackFileRepeat, sets the repeat option for the player.
    - PlaybackFileSpeed, adjust the playback speed (supplies feedback and rate information required for smooth playback).
    - PlaybackFileStart, starts playback.
    - PlaybackFileStop, stops playback.
- Radio Settings
    - GetDialogOptions
    - SetDialogOptions

11.2 Data Channel

The data channel is used by the server to send audio and waterfall (FFT) data to the console.

The audio is compressed using Opus, the FFT data is compressed using an advanced algorithm which is a combination of Huffman, LZSS and delta differences.

If there is insufficient bandwidth waterfall data is dropped to keep the audio flowing.

12 Troubleshooting

12.1 Compatibility

The version 2 server is only compatible with the version 2 console.

12.2 Firewalls

Beware of firewalls, for more information see page 23.

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