

Free Software for Free Radio with GStreamer

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<https://www.gnome.org/~ole/GC2019.pdf>

What is Free Radio?

My presentation at the GStreamer Conference 2019 in Lyon, France as the GNOME Radio developer and maintainer is about Civil Rights and Social Action with Free Software.

Live radio broadcasts covers events on every continent, every conflict, every human tragedy and triumph in the world and Free Radio is about promoting news about human rights, peace and knowledge sharing between humans just like Free Software.

The title of my Bachelor of Science thesis at Oslo Metropolitan University in Norway is “Public Internet Radio Client for Accessing Free Audio Maps in Countries with Free Speech” available from <http://www.oleaamot.com/thesis/thesis.pdf>

GNOME Radio (gnome-radio) was the future Public Network Radio Software for Accessing Free Audio Broadcasts from the Internet on GNOME after 5 years of work on GNOME Internet Radio Locator (gnome-internet-radio-locator) since 2014 that began at Norwegian Computing Center in 2002.

Live playback support was implemented with GStreamer in GNOME Radio.

Introduction to GNOME Internet Radio Locator

GNOME Internet Radio Locator (`gnome-internet-radio-locator`) is a Free Software program that allows computer users to easily locate and listen to radio programs on broadcasters on the Internet such as BBC, KEXP and WMBR, as well as NASA's Third Rock Station and 113 other Internet Radio stations broadcasting from many universities around the world.

GNOME Internet Radio Locator (`gnome-internet-radio-locator`) is developed for the GNOME 3.34 desktop and requires GStreamer (<https://gstreamer.freedesktop.org/>) and the codec plugins to be installed for live audio playback. The player code was based on code from `gst-play` written by Tim-Philipp Müller, Sebastian Dröge and Brijesh Singh. (See <https://gitlab.gnome.org/GNOME/gnome-internet-radio-locator/blob/master/src/gnome-internet-radio-locator-player.c>)

GNOME Internet Radio Locator (`gnome-internet-radio-locator`) is not officially a part of GNU or GNOME, but using the `*.gnome.org` infrastructure on <http://gitlab.gnome.org/GNOME/gnome-internet-radio-locator> and <https://download.gnome.org/sources/gnome-internet-radio-locator/>

Why do I write gnome-internet-radio-locator?

- ⊙ I am a supporter of
 - Free Radio
 - Free Software
 - Free Speech
- ⊙ I want to give something back to the Free Software community
- ⊙ Internet Radio is a free Internet resource
- ⊙ Many Universities run non-profit Internet radio stations

History of gnome-internet-radio-locator

2019

- gnome-internet-radio-locator version 2.1.1 was released on October 24
 - ▷ Fancy City Color Markers
 - ▷ 117 Internet Radio Stations from 90 Major World Cities
 - ▷ Graphical Map Markers
 - ▷ Textual City Search
- ▷ gnome-internet-radio-locator version 2.0.0 was released on February 20th
 - ▷ Graphical Map Markers

2018

- gnome-internet-radio-locator version 1.0.0 was released on September 16th
 - ▷ Textual Search

2017

- gnome-internet-radio-locator version 0.1.0 was released on April 26th

What is the definition of Free Software?

From FSF's home page (<https://www.gnu.org/philosophy/free-sw.html>):

- ① Free Software is a good idea because you have
 - The freedom to run the program as you wish, for any purpose (freedom 0).
 - The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
 - The freedom to redistribute copies so you can help your neighbor (freedom 2).
 - The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Existing Music Services

⊙ Apple Music, Google Music and Spotify

- Require non-free client software
- DRM (Digital Restrictions Management)
- Impose EULAs that restrict more than copyright
- Track what the user listens to

One redeeming feature of some of these music services:

- You can't access some of these music services from GNU/Linux at all. If you're a GNU/Linux user, this saves you from paying for these proprietary software programs for streaming music at a price.

Why did I write gnome-internet-radio-locator?

The first public talk I gave in the UK, was a talk on Music Recording, Production and Distribution with Free Software at UKUUG Linux 2005 at University of Wales, Swansea, in 2005.

The first talk is available from <http://home.nuug.no/~ole/UKUUG2005.pdf>

The second public talk I gave in Oslo, Norway, was a talk on GNOME Internet Radio Locator at OSDC 2015 in Oslo, Norway in 2015.

The second talk is available from <http://home.nuug.no/~ole/ODSC2015.pdf>

The third talk I prepared was Mapping Free Software in GNOME for GUADEC 2017 at Manchester Metropolitan University, in 2017.

The third talk is available from <http://www.gnome.org/~ole/GUADEC2017.pdf>

The fourth talk I prepared was “GNOME Radio / Public Network Radio Software for Accessing Free Audio Broadcasts” for GUADEC 2019 at Greek University, in 2019.

The fourth talk is available from <http://www.gnome.org/~ole/GUADEC2019.pdf>

- ① Free Radio
- ① Free Software
- ① Free Speech

Features in gnome-internet-radio-locator version 2.1.1

- ⊙ 117 non-profit, commercial and independent radio stations are supported.
- ⊙ 16 language translations (see `gnome-internet-radio-locator/AUTHORS` and `gnome-internet-radio-locator/THANKS`).
- ⊙ Radio station search by physical location, but just city names.
- ⊙ Click-to-play map feature for 108 cities.
- ⊙ Support for New/Personal Stations (“`$HOME/.gnome-internet-radio-locator/gnome-internet-radio-locator.xml`”).
- ⊙ Live radio playback in all of the audio codecs supported by GStreamer.

Supported Internet Radio Station Cities

The following major cities are supported in gnome-internet-radio-locator 2.1.1:

- Aalborg, Denmark
- Adelaide, Australia
- Alta, Norway
- Auckland, New Zealand
- Austin, Texas
- Ayr, Scotland
- Bergen, Norway
- Berkeley, California
- Berlin, Germany
- Bern, Switzerland
- Bristol, United Kingdom
- Brno, Czech Republic
- Bronx, New York
- Brooklyn, New York
- Bruxelles, Belgium

- Budapest, Hungary
- Buenos Aires, Argentina
- Calgary, Canada
- Cambridge, United Kingdom
- Cape Town, South Africa
- Centralia, District of Columbia
- Chapel Hill, North Carolina
- Chicago, Illinois
- Cleveland, Ohio
- Coimbra, Portugal
- Copenhagen, Denmark
- Cornwall, United Kingdom
- Dubai, Saudi Arabia
- Dublin, Ireland
- Gent, Belgium
- Guatemala City, Guatemala
- Hammond, Louisiana
- Honolulu, Hawaii

- Houston, Texas
- Kárášjohka, Norway
- Kingston, Canada
- Kristiansand, Norway
- Leeds, United Kingdom
- London, United Kingdom
- Long Island, New York
- Los Angeles, California
- Lund, Sweden
- Lyon, France
- Manchester, United Kingdom
- Memphis, Tennessee
- México City, México
- Minneapolis, Minnesota
- Moscow, Russia
- Narvik, Norway
- Nashville, Tennessee
- Newcastle, Australia

- New Orleans, Louisiana
- New York City, New York
- Nicosia, Cyprus
- Nordkapp, Norway
- Nottingham, United Kingdom
- Oslo, Norway
- Oswego, New York
- Ottawa, Canada
- Oxford, United Kingdom
- Paris, France
- Phoenix, Arizona
- Pisa, Italy
- Pittsburgh, Pennsylvania
- Portland, Oregon
- Reykjavik, Iceland
- Rochester, Michigan
- Salford, United Kingdom
- San Francisco, California

- San Marcos, Texas
- Santiago, Chile
- São Paulo, Brazil
- Seattle, Washington
- Space
- Stanford, California
- Stockholm, Sweden
- St. Pölten, Austria
- Sydney, Canada
- Tampere, Finland
- Thessaloniki, Greece
- Toronto, Canada
- Tórshavn, Faroe Islands
- Trondheim, Norway
- Tuscaloosa, Alabama
- Warsaw, Poland
- Washington, District of Columbia
- Waterloo, Canada

- WBUR, Boston, Massachusetts
- WHRB-FM, Cambridge, Massachusetts
- WMBR-FM, Cambridge, Massachusetts
- WTBU, Boston, Massachusetts
- York, United Kingdom
- Zürich, Switzerland

See <https://www.gnome.org/~ole/gnome-internet-radio-locator/gnome-internet-radio-locator.xml> for the current list of supported radio stations in gnome-internet-radio-locator.

Supported Radio Codecs

The radio stations stream live audio with several different audio codecs supported by the GStreamer program, see <https://gstreamer.freedesktop.org/>

The audio codecs in GStreamer among the supported 117 radio stations are:

- ① gstreamer-plugins-bad-1.0
 - “AAC, v4 LC”
 - “MPEG 1 Audio, Layer 3 (MP3)”
 - “MPEG ADTS, layer III (Joint Stereo)”
 - “MPEG-2 AAC (AAC+)”
 - “MPEG-2 AAC”
 - “MPEG-4 AAC”
 - “Ogg Vorbis”

gnome-internet-radio-locator Data Type Definition (DTD)

- ⊙ gnome-internet-radio-locator 2.0.0 DTD
- ⊙ Short description of each radio station (<station ...>).
- ⊙ Short description of each radio station stream (<stream ...>).
- ⊙ gnome-internet-radio-locator 2.0.0 DTD is available from <https://www.gnome.org/~ole/gnome-internet-radio-locator/gnome-internet-radio-locator-0.1.dtd>
- ⊙ gnome-internet-radio-locator 2.0.0 XML data renders as HTML using XSLT in at least Firefox 54.0 at <https://www.gnome.org/~ole/gnome-internet-radio-locator/gnome-internet-radio-locator.xml>

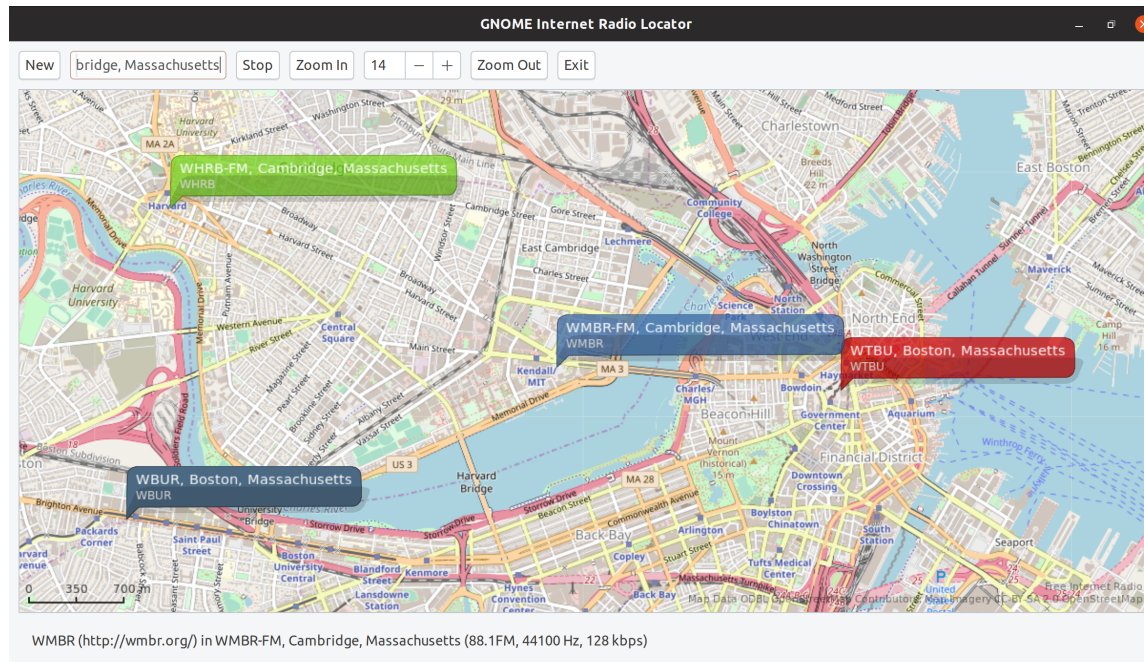
Current gnome-internet-radio-locator 2.0.0 DTD

```
<!ATTLIST frequency uri CDATA #REQUIRED >
<!ELEMENT description ( #PCDATA ) >
<!ATTLIST description lang CDATA #REQUIRED >
<!ELEMENT frequency ( #PCDATA ) >
<!ELEMENT email ( #PCDATA ) >
<!ELEMENT location ( lat | lon | href)* >
<!ELEMENT gnome_internet_radio_locator ( station+ ) >
<!ATTLIST gnome_internet_radio_locator version NMTOKEN #REQUIRED >
<!ELEMENT station ( frequency | location | description | stream)* >
<!ATTLIST station band CDATA #REQUIRED >
<!ATTLIST station icon CDATA #REQUIRED >
<!ATTLIST station id NMTOKEN #REQUIRED >
<!ATTLIST station lang CDATA #REQUIRED >
<!ATTLIST station name CDATA #REQUIRED >
<!ATTLIST station rank CDATA #REQUIRED >
<!ATTLIST station type CDATA #REQUIRED >
<!ELEMENT stream EMPTY >
<!ATTLIST stream bitrate NMTOKEN #REQUIRED >
<!ATTLIST stream channels NMTOKEN #IMPLIED >
<!ATTLIST stream codec CDATA #REQUIRED >
<!ATTLIST stream mime CDATA #REQUIRED >
<!ATTLIST stream samplerate NMTOKEN #REQUIRED >
<!ATTLIST stream uri CDATA #REQUIRED >
```

Example of gnome-internet-radio-locator 2.1.1 XML data

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl"
  href="https://www.gnome.org/~ole/gnome-internet-radio-locator/gnome-internet-radio-locator.xsl" ?>
<!DOCTYPE gnome_internet-radio-locator SYSTEM "gnome-internet-radio-locator-0.1.dtd">
<gnome_internet_radio_locator version="2.1.1">
  <station band="88.1FM" id="wmbr" lang="en" name="WMBR" rank="1.0" type="edu">
    <frequency>88.1 FM in Cambridge, Massachusetts</frequency>
    <location>WMBR-FM, Cambridge, Massachusetts</location>
    <description lang="en">
      WMBR is the MIT campus radio station.
      We broadcast on 88.1 FM between 20 and 24 hours per day,
      365 days a year. We transmit at 720 watts, effective radiated power
      from the top of the Eastgate Building in Kendall Square in Cambridge,
      Massachusetts. Our programming includes a wide range of music shows,
      public affairs programs and eclectic audio entertainment.
    </description>
    <stream mime="audio/mpeg"
      uri="http://wmbr.org:8000/hi"
      codec="MPEG 1 Audio, Layer 3 (MP3)"
      samplerate="44100 Hz"
      channels="Stereo"
      bitrate="128 kbps" />
    <uri>http://wmbr.org/</uri>
  </station>
</gnome_internet_radio_locator>
```

Screenshot



Screenshot of gnome-internet-radio-locator 2.1.1

Legal stuff

- ① Internet Radio stations in the U.S. need a broadcast license permit from the F.C.C.
 - Read `gnome-internet-radio-locator/BROADCAST` for some details on radio and music licensing
 - http://en.wikipedia.org/wiki/Broadcast_license
 - <https://www.dnalounge.com/backstage/webcasting.html>
- ① Personal Radio Stations can be set up using Icecast streaming server
 - Download Icecast from <http://www.icecast.org/> and add your station in `$HOME/.gnome-internet-radio-locator/gnome-internet-radio-locator.xml`
- ① Only Internet radio stations with broadcast permit are included in `gnome-internet-radio-locator`

Internet Radio Fairness Act

- ⊙ Many Internet radio stations can't afford to pay royalty fee collection agencies
 - The American Society of Composers, Authors and Publishers (ASCAP)
 - Broadcast Music, Inc. (BMI)
 - Society of European Stage Authors and Composers (SESAC)
- ⊙ New bill in support of Internet Radio introduced in U.S. Congress 2002:
 - <https://www.eff.org/Internet-Radio-Fairness-Act-Explanation>
 - http://en.wikipedia.org/wiki/Internet_Radio_Equality_Act
- ⊙ EFF had a 2012 campaign in support of the Internet Radio Fairness Act
 - <https://www.eff.org/Internet-Radio-Fairness-Act-Explanation>
- ⊙ The IRFA bill may be reintroduced in U.S. Congress in 2019, but who knows?

Email from Dr. Richard M. Stallman of FSF



From: Richard Stallman <rms@gnu.org>
Subject: Re: Internet Radio Fairness Act? (Re: It's your birthday)
Date: Mon, 23 Mar 2015 22:43:25 -0400
To: oka@oka.no

[[[To any NSA and FBI agents reading my email: please consider]]]
[[[whether defending the US Constitution against all enemies,]]]
[[[foreign or domestic, requires you to follow Snowden's example.]]]

> Regarding updating the LETTER included in GNOME Internet Radio Locator,
> I don't know what to write/who to contact to promote Internet Radio
> Fairness Act again in U.S. politics, except you.

Ask people to contact their congressional representatives.

Can you write a message to the public about this?

--

Dr Richard Stallman
President, Free Software Foundation
51 Franklin St
Boston MA 02110
USA
www.fsf.org www.gnu.org
Skype: No way! See stallman.org/skype.html.

Questions?

① gnome-internet-radio-locator 2.1.1 is available here and now.

- <http://download.gnome.org/sources/gnome-internet-radio-locator/2.1/gnome-internet-radio-locator-2.1.1.tar.xz>

① Debian 10 stable package

- https://www.gnome.org/~ole/debian/gnome-internet-radio-locator_2.1.1-1_i386.deb

① Fedora 31 RPM

- https://www.gnome.org/~ole/fedora/RPMS/x86_64/gnome-internet-radio-locator-2.1.1-1.fc31.x86_64.rpm

① Fedora 30 RPM

- https://www.gnome.org/~ole/fedora/RPMS/x86_64/gnome-internet-radio-locator-2.1.1-1.fc30.x86_64.rpm

① Ubuntu 19.10 package

- https://www.gnome.org/~ole/ubuntu/gnome-internet-radio-locator_2.1.1-1_amd64.deb

Source repository

- `git://gitlab.gnome.org/GNOME/gnome-internet-radio-locator`
- `https://gitlab.gnome.org/GNOME/gnome-internet-radio-locator`
- `ssh://$USERNAME@gitlab.gnome.org/GNOME/gnome-internet-radio-locator`

L^AT_EX source code for this presentation

`https://gitlab.gnome.org/GNOME/gnome-internet-radio-locator/plain/talk/
GC2019.tex`

GNOME Wiki page for GNOME Radio

<https://wiki.gnome.org/Apps/Radio>

GNOME Wiki page for GNOME Internet Radio Locator

<https://wiki.gnome.org/Apps/InternetRadioLocator>