

Conference and lecture recording for (F)OSS enthusiasts

CCC Video Operation Center

MiniDebConf 15 Cambridge



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- 2 Hardware
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- FrOSCon Video Team
- MUC Easterhegg Video Team
- GPN Video Team
- FeM (Forschungsgemeinschaft elektronische Medien an der TU Illmenau)
- AGS (Wissenschaftliche Arbeitsgemeinschaft für Studio- und Senderfragen an der TU Braunschweig)
- and many more

- Audio / video (stage management)
- Recording
- Streaming
- Publishing
- Broadcasting (DVB-T, DAB, FM, Teletext)

- Subtitles @c3subtitles
- Translation @c3translations
- Kodi (xbmc) and Plex plugins
- Integration into Fahrplan apps
- Infobeamer
- Chaosradio Berlin / CCCB Datengarten



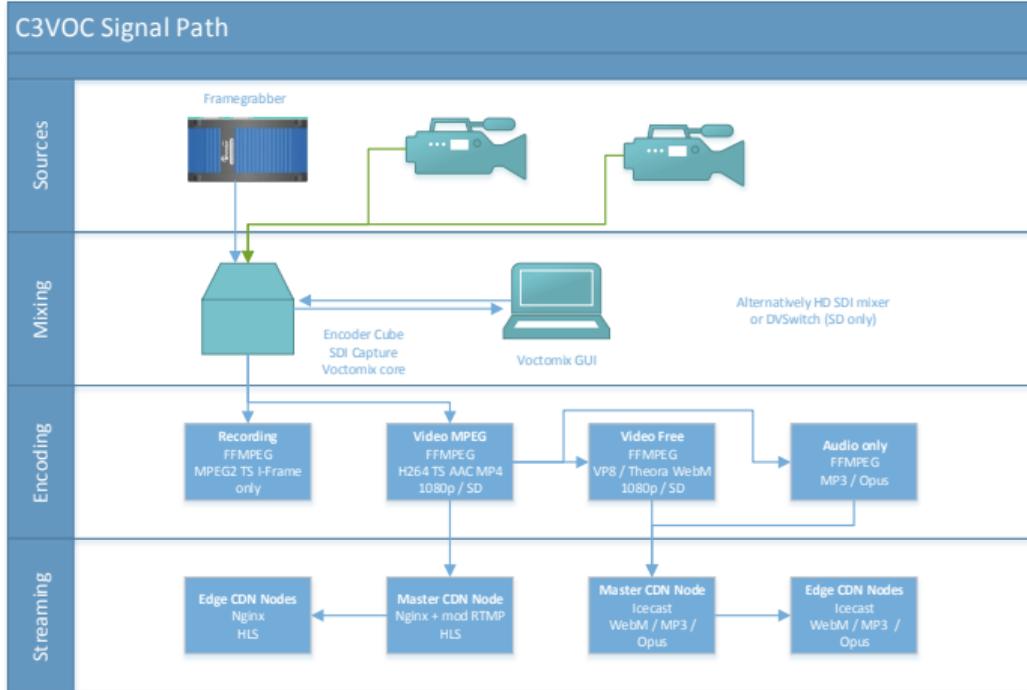
Introduction
Hardware
Postprocessing
Live streaming
Operation
WiP

Team
Fields of work
Associated projects
Complexity
Signalpath

Pentabarf Mirrorbrain
c3voc.de Byobu Voctomix
MQTT SDIscript FuseTS Samba
gitolite Viri Debian Infobeamer
HAProxy Gstreamer SuperTee DVSswitch
Frab
Runit FFmpeg C3TT Python IRC
Nginx
SSH Perl Oggfwd Ansible Rsync
Screen Icecast2 git NFS
ruby FuseVDV Graphana
Inkscape
VIM Tmux Dokuwiki
media.ccc.de virtmanager
bmd-tools KVM

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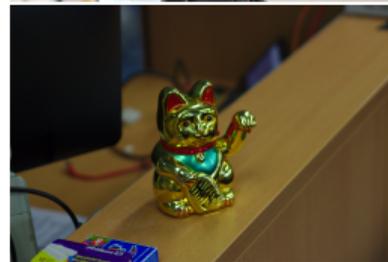
- Encoder cubes
 - i7-3770 CPU @ 3.40GHz
 - 8GB RAM
 - 2x 3TB HDD
 - 2x Black Magic Design SDI Recorder Mini PCIe
- Minions (Gigabyte Brix GB-BXi7-4770R)
 - i7-4770R CPU @ 3.20GHz
 - 8GB RAM
 - 2TB HDD and 120GB mSata SSD
- Streaming server
 - Xeon E3-1265L V2 @ 2.50GHz
 - 32GB RAM
 - 10 GE Ethernet (+/- 8k FullHD viewer)



- Custom flight case for 4 lecture room
 - OpenWRT VPN router for events with bad network
 - Switches, Ethernet cables, adapters, etc
 - SDI cable, XLR cable, many adapters
 - SIP / DECT Phones
 - ...
- Server case
 - Storage Server
 - 10GE capable Switch
 - 2x Stream Server



- Cameras 1080i with XLR Audio input and SDI output
 - Panasonic AG-AC 160 AEJ
 - JVC GY-HM200E (build-in RTMP streaming)
- Infobeamer on RaspberryPi
- Mixer laptops ThinkPad T530 i5 8GB RAM
- Winkekatze
- Boxes of AV adapters



- Epiphan Broadcaster
- Video scaler
 - BM SDI-HDMI + Hutchiminflowerpowerenterprises all2HDMI converter
 - Different Roland and Barco scaler

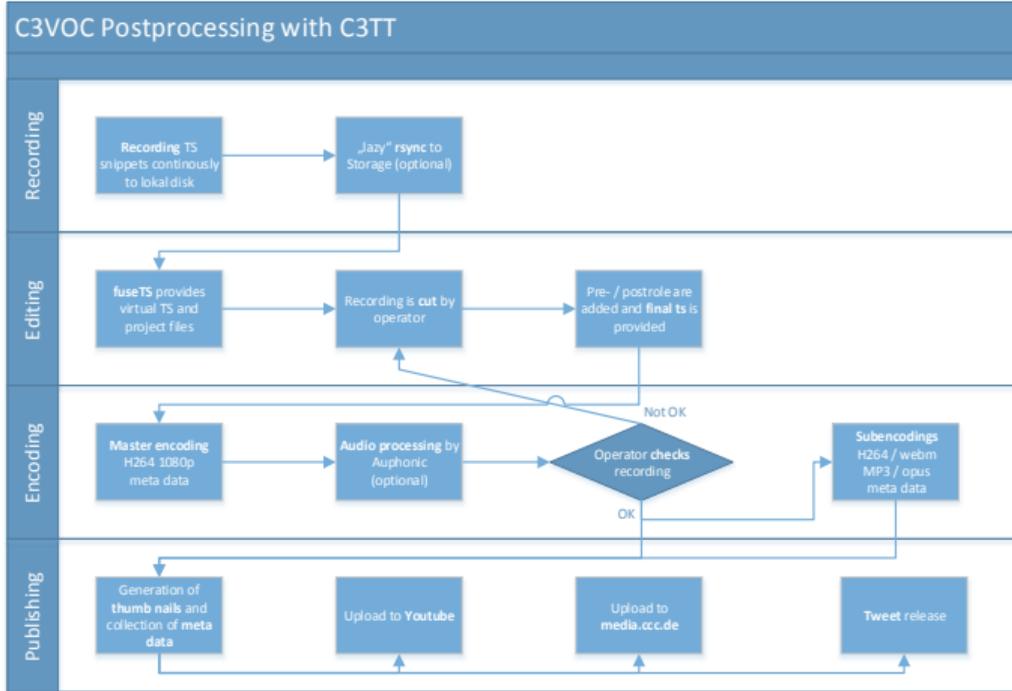


- Voctomix
- DVSwitch
- Black Magic Television Studio / ATEM
- Panasonic MX100

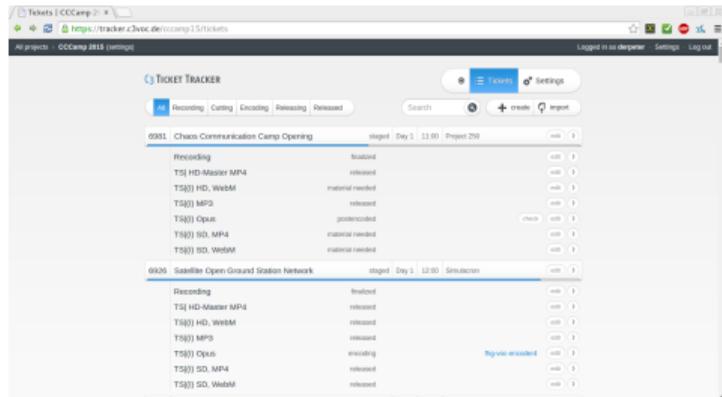


- Many XLR cables and DI boxes
- QSC TouchMix-8
- 2 hand mics and 1 belt pack by Sennheiser (E-Band)





- Written by FeM
- Ticket system to track the state of each recording
- PHP application with xml rpc api and webUI
- Will soon be released under a free software license
- Worker clients in Perl and Python



Tickets | CCCamp 2015 x

https://tracker.c3voc.de/cccamp15/tickets

All projects > CCCamp 2015 (settings) Logged in as **derpeter** · Settings · Log out

TICKET TRACKER

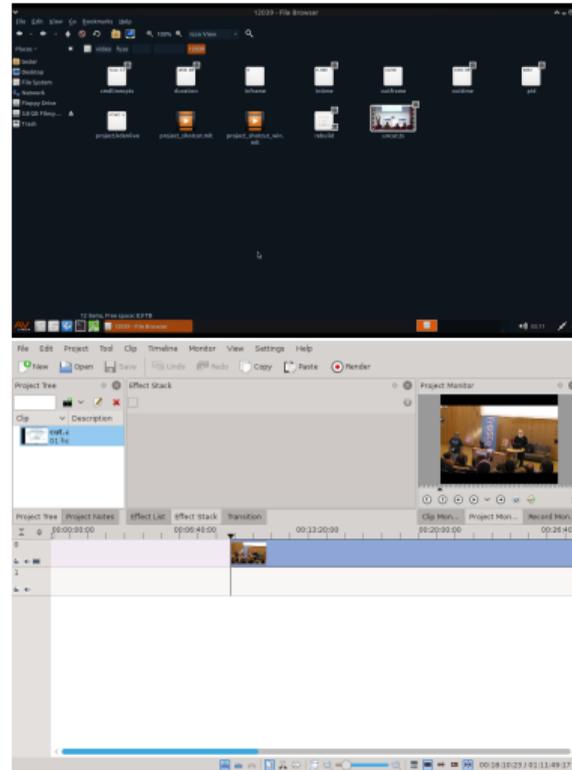
Tickets Settings

All Recording Cutting Encoding Releasing Released

Search + create import

6981	Chaos Communication Camp Opening	staged	Day 1	11:00	Project 250	edit >
	Recording	finalized				edit >
	TS HD-Master MP4	released				edit >
	TS () HD, WebM	material needed				edit >
	TS () MP3	released				edit >
	TS () Opus	postencoded			check	edit >
	TS () SD, MP4	material needed				edit >
	TS () SD, WebM	material needed				edit >
6926	Satellite Open Ground Station Network	staged	Day 1	12:00	Simulacron	edit >
	Recording	finalized				edit >
	TS HD-Master MP4	released				edit >
	TS () HD, WebM	released				edit >
	TS () MP3	released				edit >
	TS () Opus	encoding			fhg-voc-encoder4	edit >
	TS () SD, MP4	released				edit >

- fuseTS, fuseVDV
 - provides virtual video files
 - provides project files
- Kdenlive, Shotcut
 - User interface to edit project files



Tickets | CCCamp 2015

https://tracker.c3voc.de/cccamp15-ber/tickets?t=encoding

All projects > CCCamp 2015 - BER (settings) Logged in as **derpeter** · Settings · Log out

TICKET TRACKER Tickets Settings

All Recording Cutting **Encoding** Releasing Released Search + create import

27	BER für Eilige	staged	Day 1	17:00	BER	edit	>
	TS HD-Master MP4	encoding			atze	edit	>
	TS () HD, WebM	ready to encode				edit	>
	TS () MP3	ready to encode				edit	>
	TS () Opus	ready to encode				edit	>
	TS () SD, MP4	ready to encode				edit	>
	TS () SD, WebM	ready to encode				edit	>
42	c-base birthday event	staged	Day 1	21:00	BER	edit	>
	TS () HD, WebM	encoding			fhg-voc-encoder1	edit	>
	TS () MP3	encoding			fhg-voc-encoder4	edit	>
	TS () Opus	encoding			fhg-voc-encoder4	edit	>
	TS () SD, MP4	encoding			fhg-voc-encoder3	edit	>
	TS () SD, WebM	encoding			fhg-voc-encoder2	edit	>
123	c-base birthday party	staged	Day 1	23:45	BER	edit	>

- media.ccc.de
- youtube
- twitter

The screenshot shows a web browser window with the address bar containing the URL `https://media.ccc.de/v/camp2015-6907-let_s_encrypt#video&t=5`. The page title is "Let's Encrypt" and the subtitle is "A Certificate Authority To Encrypt the Entire Web". The video player shows a thumbnail with a hexagonal grid of icons and the text "CHAOS COMMUNICATIONS CAMP 2015 August 06th - 11th 2015". Below the video player, there is an "About" section with the following text: "Let's Encrypt is a new free and automated certificate authority, launching in summer 2015. This talk will explain how Let's Encrypt works, and show you how to use it to automate HTTPS on a range of different Web, mail and other server types. It will cover obtaining new certificates, renewing them automatically, and enabling various advanced TLS security features. We also discuss the roadmap to a Web that is HTTPS by default." There is also a "Tags" section with the tag "Security & Hacking". The footer of the page reads "© Chaos Computer Club e.V."

The screenshot shows a web browser window with the URL <https://tracker.c3voc.de/cccamp15-ber/tickets?t=released>. The page title is "Tickets | CCCamp 2015 - BER (settings)". The user is logged in as "derpeter".

The main content area is titled "TICKET TRACKER" and features a navigation menu with "Tickets" (selected) and "Settings". Below the menu are tabs for "All", "Recording", "Cutting", "Encoding", "Releasing", and "Released" (selected). There is also a search bar and buttons for "+ create" and "import".

The main content displays a list of tickets, each with a table of associated recordings. The tickets are:

- 42: c-base birthday event (staged, Day 1, 21:00, BER)
- 123: c-base birthday party (staged, Day 1, 23:45, BER)
- 3: German Parliamentary Inquiry on Mass... (staged, Day 2, 17:00, BER)
- 24: Sutra of Innovation Spaces (staged, Day 3, 15:00, BER)
- 5: Detecting IMSI-catchers and other... (staged, Day 3, 17:00, BER)

Each ticket row has an "edit" button and a right arrow. Each recording row shows the recording name (e.g., "TS| HD-Master MP4"), its status (e.g., "released"), and an "edit" button with a right arrow.

Tickets | CCCamp 2015 | camp2015 | Media

https://api.media.ccc.de/admin/conferences/66

Media Backend Dashboard Admin Users Api Keys Conferences Events Import Templates News Recordings derpeter@berlin.ccc.de Logout

ADMIN / CONFERENCES /

camp2015

Edit Conference Delete Conference Download Schedule Add Event Compile Fast Compile

Conference Details

ACRONYM	camp2015
TITLE	Chaos Communication Camp 2015
RECORDINGS PATH	events/camp2015 (/srv/ftp/events/camp2015)
IMAGES PATH	conferences/camp2015 (/srv/www/media.ccc.de/media/conferences/camp2015)
WEBGEN LOCATION	conferences/camp2015
LOGO	camp15-logo.png
ASPECT RATIO	16-9
SCHEDULE URL	https://events.ccc.de/camp/2015/Fahrplan/schedule.xml
SCHEDULE XML	<?xml version="1.0" encoding="utf-8" ?> <schedule> <version>1.5 this corrosion</version> <conference> <acronym>camp2015</acronym> <title>Chaos Communication Camp 2015</title> <start>2015-08-13</sta...
SCHEDULE STATE	downloaded
CREATED AT	July 19, 2015 13:41
UPDATED AT	August 13, 2015 20:00

Events

[ber15-24-sutra_of_innovation_spaces \(Sutra of Innovation Spaces\)](#)

Tickets | CCCamp 2 | Events | Media Back

https://api.media.ccc.de/admin/events

Media Backend Dashboard Admin Users Api Keys Conferences **Events** Import Templates News Recordings

ADMIN / New Event Update promoted

Batch Actions -

<input type="checkbox"/>	GUID	Title	Thumb Filename	Poster Filename	Conference	Promoted	Created At	
<input type="checkbox"/>	6393a33b-889d-4850-b0e3-cbc7caeab1cb	Detecting IMSI-catchers and other mobile network attacks	5-hd.jpg	5-hd_preview.jpg	camp2015	<input type="checkbox"/>	2015-08-16 18:38	View Edit Delete
<input type="checkbox"/>	ec0adfcf-eb0b-47d3-a0c9-454abbb24e	Sutra of Innovation Spaces	24-hd.jpg	24-hd_preview.jpg	camp2015	<input type="checkbox"/>	2015-08-16 18:23	View Edit Delete
<input type="checkbox"/>	e8f03c57-4500-492a-9028-b91acffe7695	Singing Capacitors and Whining Inductors	6867-hd.jpg	6867-hd_preview.jpg	camp2015	<input type="checkbox"/>	2015-08-16 18:06	View Edit Delete
<input type="checkbox"/>	55a2a1d7-f022-4e5a-8d24-568e42b8da23	c-base birthday party	123-hd.jpg	123-hd_preview.jpg	camp2015	<input type="checkbox"/>	2015-08-16 16:59	View Edit Delete
<input type="checkbox"/>	9db475b9-d3a3-42a0-aaa1-08ef21f7355a	NoTube	6709-hd.jpg	6709-hd_preview.jpg	camp2015	<input type="checkbox"/>	2015-08-16 16:14	View Edit Delete
<input type="checkbox"/>	afe359da-56c9-4e76-8f56-45ed406494e5	Carhacking – state of the art	6854-hd.jpg	6854-hd_preview.jpg	camp2015	<input type="checkbox"/>	2015-08-16 14:30	View Edit Delete
<input type="checkbox"/>	5d066320-5680-46f7-866e-	Analogue Mission Simulations	6737-hd.jpg	6737-hd_preview.jpg	camp2015	<input type="checkbox"/>	2015-08-16 14:27	View Edit Delete

Filters

GUID
Contains

TITLE
Contains

LINK
Contains

CONFERENCE
Any

PROMOTED
Any

SLUG
Contains

TAGS
Contains

DATE
 -

RELEASE DATE
 -

UPDATED AT

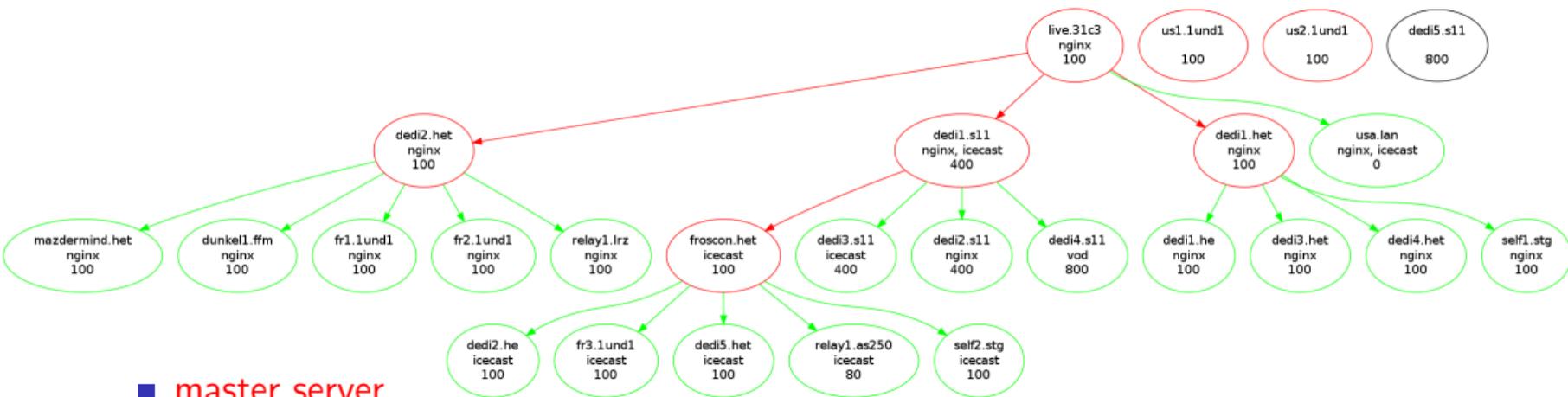
- It's just another sink
- Most encoding are done on site
- WebM and HLS for clients and RTMP for CDN server
- Load balancing with HAProxy
- → HTTP-only for all clients

- Encoding stream has the right™ encoding already
- nginx-rtmp generates playlists and divides MPEG-2 TS streams into fragments
- Mostly used by Apple devices

```
ffmpeg -re -f mpegts -i rtmp://encoder.cube/stream \  
-c:v:0 libx264 -c:a:0 libfdk_aac \  
-b:a 96k -ar 44100 -f flv rtmp://hls.streaming.master
```

- (single) CPU bound
- Destination streaming server: Icecast 2
- Plays natively an *up to date* browser

```
ffmpeg -re -y -i rtmp://... -threads:0 0 \  
-c:v libvpx -g 75 -keyint_min 75 -deadline realtime \  
-b:v 2800k -maxrate:a 96k \  
-c:v libvpx -c:a libvorbis -f webm - | \  
mse_webm_remuxer -cm 2000 - - | \  
oggfwd -w icecast.streaming.master 8000
```



■ master server

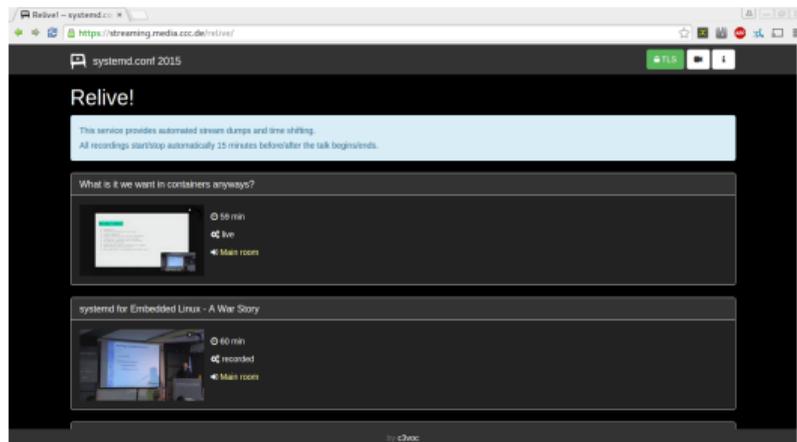
■ edge relays

- Currently 19423 files 2,7TB
- 75 conferences 2760 events
- 14 mirror server (2 by the CCC)
- Mirrobrain provides meta4 and torrent files

Current Mirrors

Name	Location	Last Scan	Files	Stats
berlin	eu/de	2015-10-22 17:00	19423	
c3media.vsos.ethz.ch	eu/ch	2015-10-22 17:00	19423	
ccc1.mirror.xt0.org	eu/de	2015-10-22 17:00	3250	
darmstadt	eu/de	2015-10-07 18:00	91	
fau.de	eu/de	2015-10-22 17:00	19423	fau.de
halifax	eu/de	2015-10-22 17:00	11476	
koeln	eu/de	2015-10-22 17:00	19423	
kullen	eu/de	2015-10-22 17:00	1444	
netcologne	eu/de	2015-10-22 17:00	19424	netcologne
nusedu	as/sg	2015-10-22 15:49	19423	
oneEU	eu/de	2015-10-27 11:54	19507	oneEU
oneUS	na/us	2015-10-22 17:00	19423	
selfnet	eu/de	2015-10-22 17:00	19423	
speedpartner	eu/de	2015-04-03 08:32	915	

- Video on Demand solution
- Dumps HLS streams directly on the server (driven by the conference schedule) and add a nice frontend
- Provides timeshift during the talk for HLS
- Only supported in-browser on Apple devices or with Flash ☹

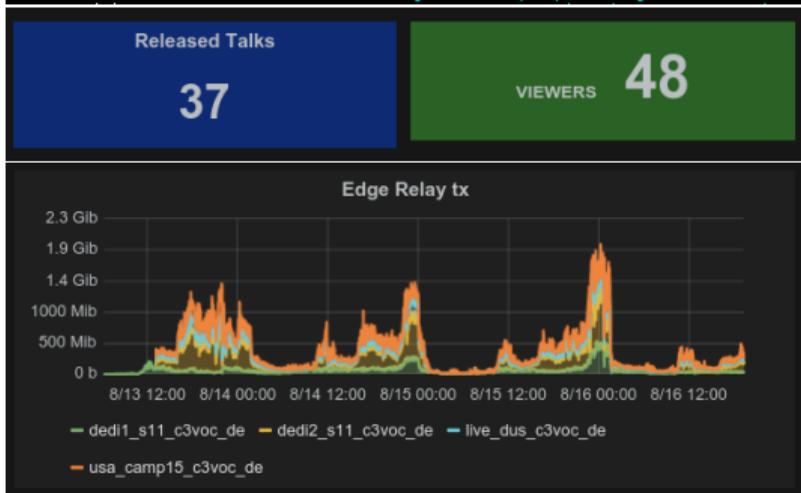


- IRC
- Mumble
- Mailinglist
- etherpad lite
- dokuwiki
- SIP on events
- DECT by eventphone (if available)
- PMR or HAM radio
- VOC event calendar
(reads events from doku wiki templates)¹

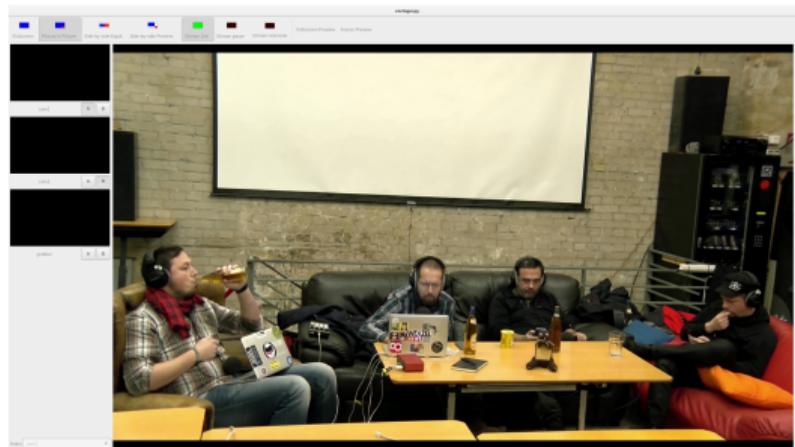
¹<https://c3voc.de/eventkalender/>

- IRC bot viri
- MQTT consumer and provider for status and error messages
- Server monitoring
 - Graphite
 - Grafana
 - collectd
 - Icinga

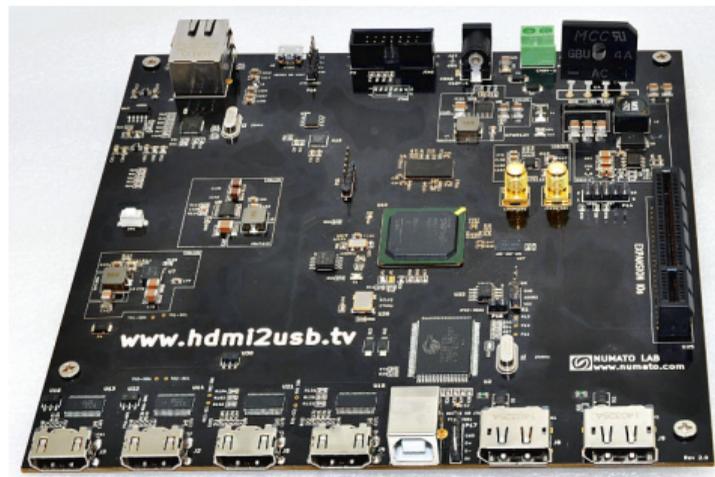
```
14:15 < viri WARN fahrplan/froscon2015: Talk optout 'WebSocket - WS^2 2.0' in room C117
14:15 < viri INFO tracker/froscon2015: mazdermind checked ticket 1604 (Postfix, dovecot)
14:16 < viri INFO tracker/froscon2015: storage started postprocessing ticket 1604 (Postfix, dovecot)
14:16 < viri INFO tracker/froscon2015: storage finished postprocessing ticket 1604 (Postfix, dovecot)
```



- FullHD and probably 4K video mixer
- python3 gstreamer 1.5 ffmpeg
- server / client GUI architecture
- TCP sockets as In / Outputs
- Raw I420 frames / raw S16LE audio in mkv
- JPG frames / S16LE audio in mkv for preview
- Stream blanking
- not tested in production yet



- Firmware supporting two boards (more in future!):
 - Atlys FPGA development board
 - Numato Ophis, first FOSS hardware
- Designed for debuggability!
- Maybe full "hardware" mixer in future?
Help out!



wink

So long an thanks for all the fish !1!11



- <https://c3voc.de>
- <https://c3voc.de/wiki/>
- <https://github.com/voc/>
- <https://github.com/cccc/>
- <https://twitter.com/c3voc/>
- https://twitter.com/c3voc_releases/
- IRC: #voc-lounge on irc.hackint.eu