



Janus

L. Miniero

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WebRTC

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A few examples

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Janus: a general purpose WebRTC gateway

Lorenzo Miniero lorenzo@meetecho.com

FOSDEM 2016 Real Time devroom
30th January 2016, Brussels 🍰



Outline

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- 1 A brief introduction
- 2 Some context
WebRTC and standardization activities
- 3 Writing a WebRTC gateway from scratch
Programmable Real-time Media Components
- 4 Janus: a general purpose WebRTC gateway
Modular architecture
What is it used for today, and by whom?
- 5 Next steps



Who am I?

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- Someone not used to this weather!
 - From sunny Sorrento, Italy ☺
- Current activities
 - Just got my Ph.D @ UniNA
 - Co-founder @ Meetecho
- Worked on real-time applications for a long time
 - IETF participant
 - Several WGs
 - First time in IETF67 San Diego (2006)
 - Open source contributor
 - libbfc, libmsrp, confiance, mediactrl, Asterisk, ...
 - Janus WebRTC gateway main author
- Getting older but, unlike whisky, not getting any better
 - <https://twitter.com/elminiero>



Christmas in Napoli!

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Real-time media in browsers

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- No standard solution!
 - No interoperability
 - Plugins need to be installed anyway

WebRTC = Joint standardization efforts

- Internet Engineering Task Force (IETF)
- World Wide Web Consortium (W3C)

- RTCWEB (IETF)
 - Real-Time Communication in WEB browsers WG
 - Defines protocols and formats to use
- WEBRTC (W3C)
 - Web Real-Time Communications WG
 - Defines UI and API to access devices



WebRTC reference architecture

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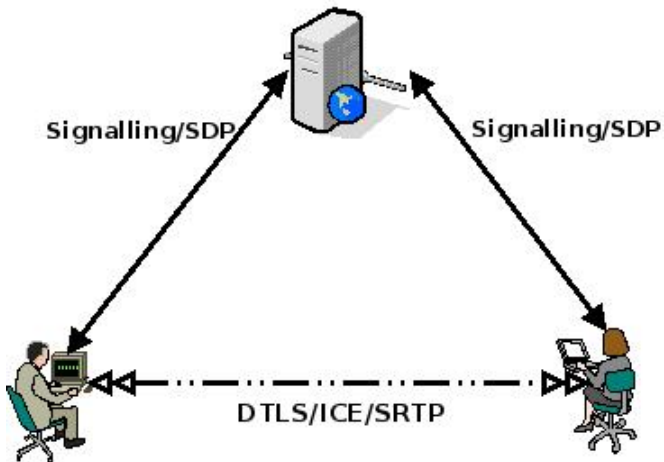
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Involving a gateway (and applications)

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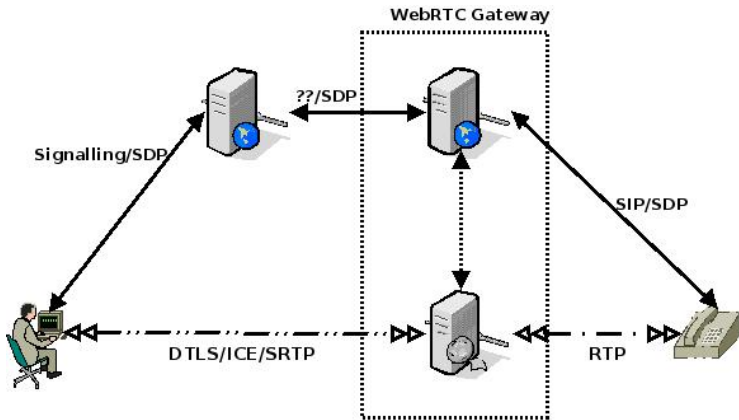
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Involving different technologies as well

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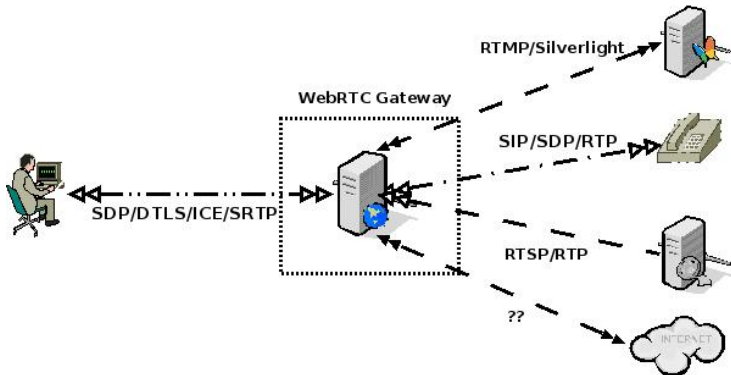
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Do we really need a gateway?

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- Several reasons for a YES, here
 - Relieve full-meshes (heavy on the client side)
 - Leveraging widespread technologies (e.g., SIP infrastructures)
 - Fixing things between implementations
- Reason for a NO?
 - You won't go beyond interaction among few users
 - You don't want an infrastructure
 - You don't care about legacy stuff

“What is a WebRTC Gateway anyway?”

- <http://webrtcchacks.com/webrtc-gw/>



Real-time Media Components

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- Writing a gateway from scratch is a heavy task
 - Implementation of the WebRTC protocol suite
- Bridge between “legacy” stuff (SIP, RTMP, etc.) and WebRTC
 - Needs to support both (WebRTC gateway)
 - What about statistics?
 - Reachability may be an issue
- Programmable interface
 - Different applications/technologies, different requirements
 - Dynamic management of media flows and users
 - Something *à la* MEDIACTRL?



The WebRTC protocol suite

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- Signalling (well, sort of) and Negotiation
 - Javascript Session Establishment Protocol (JSEP)
 - Session Description Protocol (SDP) adaptation
- Connection Establishment and NAT Traversal
 - Session Traversal Utilities for NAT (STUN)
 - Traversal Using Relay NAT (TURN)
 - Interactive Connectivity Establishment (ICE)
- Media Transport and Control
 - Real-time Transport (and Control) Protocol (RTP/RTCP)
 - Secure Extensions to RTP (SRTP)
 - Datagram Transport Layer Security (DTLS)
- Media Transport and Control
 - Opus audio codec (MTI, Mandatory-to-implement)
 - VP8 video codec (MTI candidate)
- Generic Data
 - WebRTC Data Channels (SCTP)



Janus: a general purpose WebRTC gateway

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“In ancient Roman religion and myth, Janus [...] is the god of beginnings and transitions, and thereby of gates, doors, passages, endings and time. He is usually depicted as having two faces, since he looks to the future and to the past.”

<http://en.wikipedia.org/wiki/Janus>



Janus: a general purpose WebRTC gateway

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- A door between the communications past and future
 - Legacy technologies (the “past”)
 - WebRTC (the “future”)

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General purpose, open source WebRTC gateway

- <https://github.com/meetecho/janus-gateway>
- Demos and documentation:
<https://janus.conf.meetecho.com>





Modular architecture

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- The core only implements the WebRTC stack
 - JSEP/SDP, ICE, DTLS-SRTP, Data Channels, ...
 - Modules for API over HTTP / WebSockets / RabbitMQ
- Application logic implemented in server side plugins
 - Users attach to plugins via the gateway core
 - The gateway handles the WebRTC stuff
 - Plugins route/manipulate the media/data
- Some proof of concept plugins implemented
 - Echo Test
 - Streaming (→ Live events!)
 - Conferencing (→ Meetecho!)
 - SIP Gateway (→ “Legacy” SIP!)
 - ...



Extensible Architecture and API

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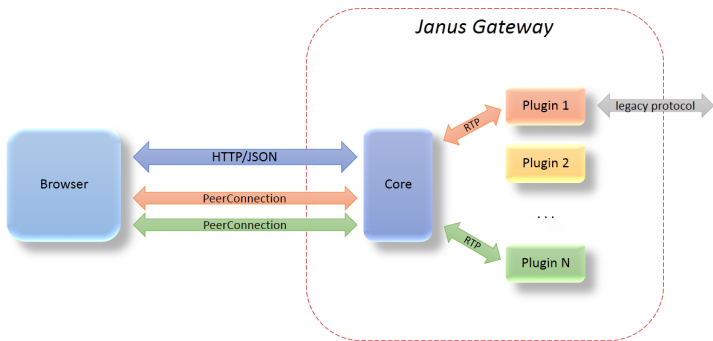
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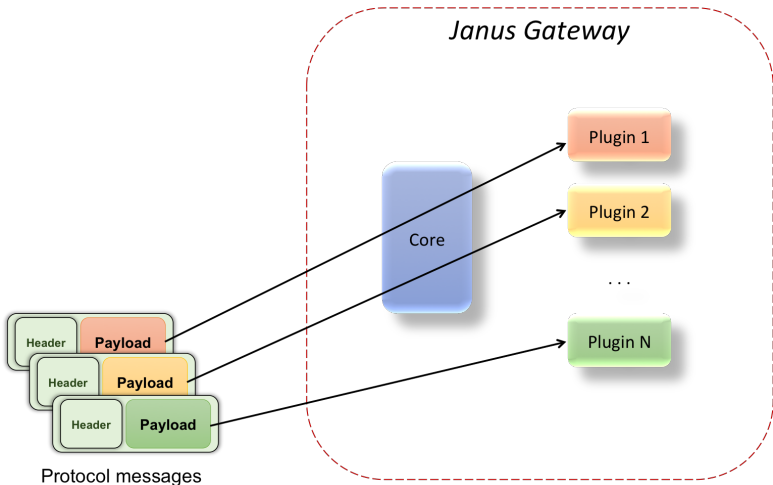
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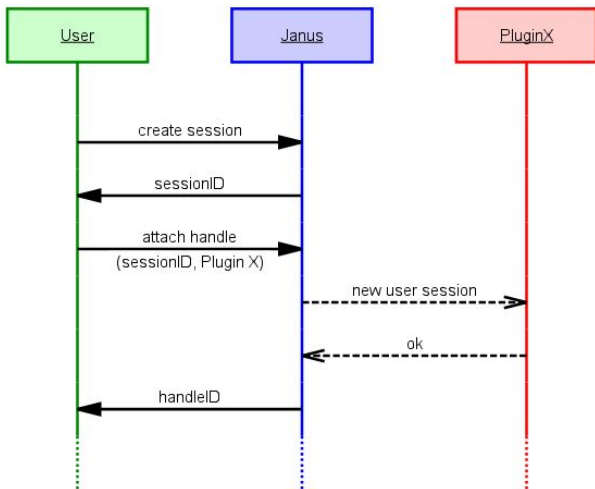
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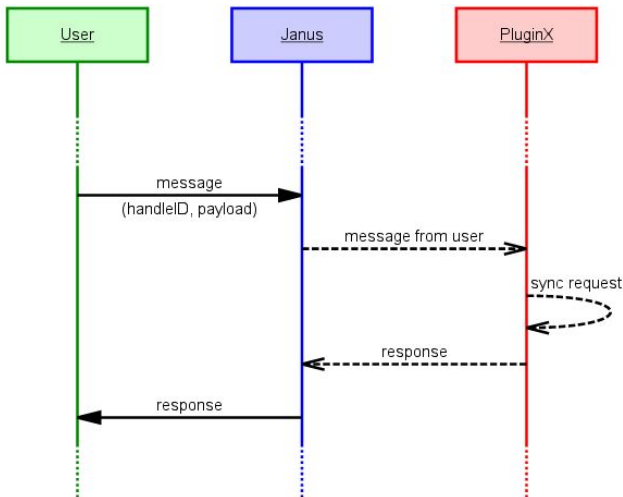
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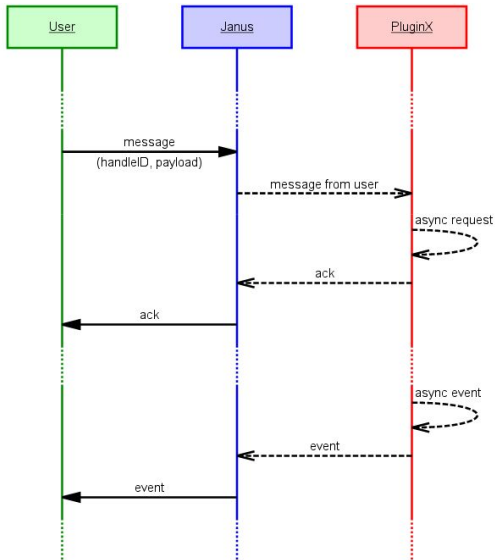
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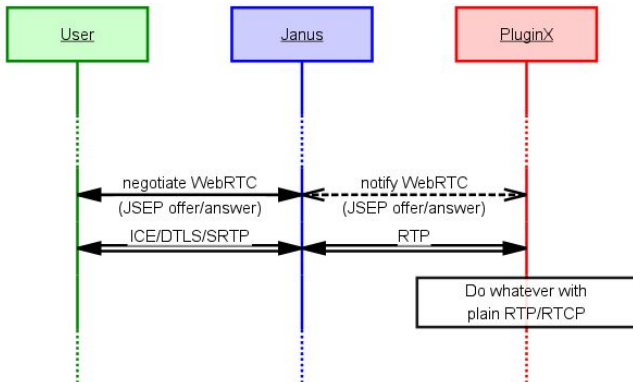
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Plugins as “bricks”

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- Each plugin is a feature, not an application
- Application can be composed out of different features
 - Features as “bricks” for a complex scenario
- A few examples...
 - Webinar with Q&A
 - Video Room (screen) + Video Room (speakers) + Audio Bridge (questions)
 - Video communication in social networks
 - SIP plugin (calls) + Echo Test (diagnostics) + Voice Mail (messaging)
 - Social TV
 - Streaming (TV channel) + Video Room (interaction)



Webinar with Q/A

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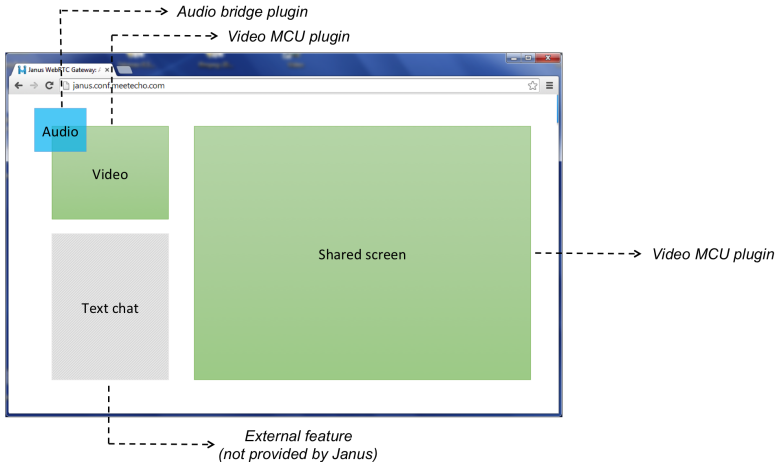
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Social TV

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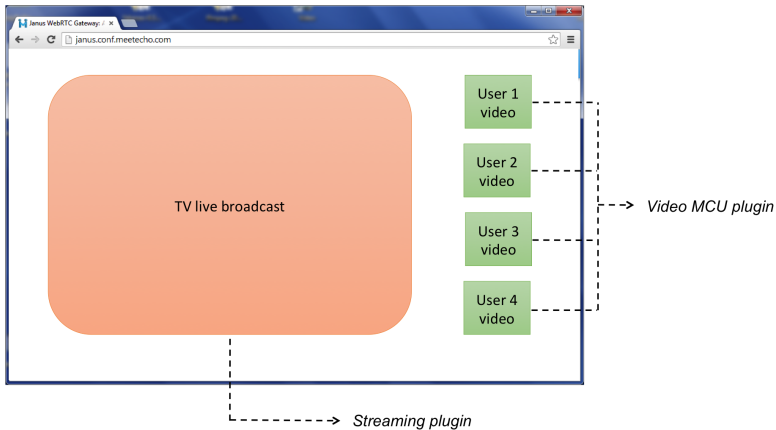
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How do I...

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- ... use Janus in my web app?
 - JavaScript library available (`janus.js`)
 - <https://janus.conf.meetecho.com/docs/JS>
 - Several demos available to start from
- ... use Janus, but keeping my API?
 - Wrap the Janus API on the server side
 - <https://janus.conf.meetecho.com/docs/rest>
 - <https://janus.conf.meetecho.com/docs/resources>
 - Effective way to control what users can do
 - Also helps to orchestrate pool of Janus servers
- ... do this or that?
 - <https://janus.conf.meetecho.com/docs/FAQ>
 - <https://groups.google.com/forum/#!forum/meetecho-janus>



Anything wrong? Check the Admin API!

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- Requests/response API to poll Janus
 - Query server capabilities
 - Control some aspects (e.g., enable/disable debugging)
 - Inspect handles and WebRTC “internals”

Sessions (1) ↻

1489448365

Handles (1) ↻

783422373

Handle Info ↻

```
{
  "session_id": 1489448365,
  "handle_id": 783422373,
  "plugin": "janus.plugin.echotest",
  "plugin_specific": {
    "audio_active": "true",
    "video_active": "true",
    "bitrate": 0,
    "slowlink_count": 0,
    "destroyed": 0
  },
  "flags": {
    "processing_offer": 0
```

<http://www.meetecho.com/blog/understanding-the-janus-admin-api/>



What is Janus used for today, and by whom?

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- We use it ourselves for many things (obviously)
 - Web conferencing and Webinars
 - WebRTC-to-SIP gateway
 - Streaming of live events (e.g., IETF meetings)
- Many folks/companies also using it in creative ways!
 - E-learning
 - Coworking
 - TV broadcasting and Social TV
 - Home automation
 - Internet of Things
 - Mobile devices, Raspberry Pis, drones, etc.
- New third-party tools are starting to come out
 - <https://janus.conf.meetecho.com/docs/resources>
 - New plugins for ad-hoc requirements
 - Server-side API wrappers (node.js, .NET, ...)



“Director” room @ IETF meetings

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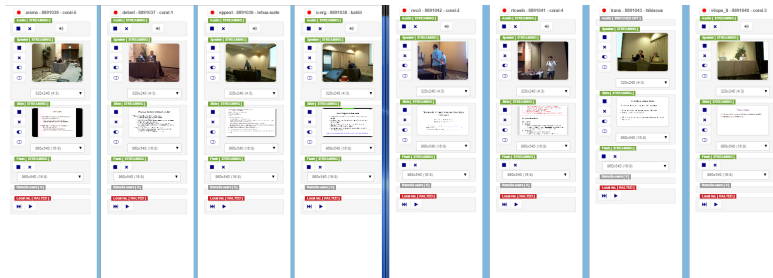
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Completely WebRTC-based media streams

- Slides as a video feed from the beamer
- Static video feed from the room
- Dynamic video feeds for remote speakers





Meetecho: IETF meeting example

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XMPP-Grid
Enabling the Potential of Network-Wide Information Sharing

I have reputation info!
I need threat data...

I have application info!
I need location & auth-group...

I have sec events!
I need reputation...

I have NBAR info!
I need identity...

I have NetFlow!
I need entitlement...

I have location!
I need identity...

I have threat data!
I need reputation...

I have firewall logs!
I need identity...

I have app inventory info!
I need posture...

I have MDM info!
I need location...

I have identity & device-type!
I need app inventory & vulnerability...

XMPP-Grid Context Sharing
Single Framework
Direct, Secured Interfaces

Participants: Simon Romano (Passivo), 19 others

Chat: [16:53] - This room is not anonymous

Adam Montville: Do we need the Webex audio any longer? [16:54]

[16:54] If not I would like to hang up my phone

[16:55] Put another way: is anyone using WebEx to listen?

Meetecho logo

<https://ietf.org/meeting/remote-participation.html>



Meetecho: IETF recordings

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The screenshot shows a video player displaying a presentation slide. The slide has a blue background with a silhouette of a bird in flight. The text on the slide includes the title "THE PPSP PEER PROTOCOL (PPSPP)", the names of the speakers: Arno Bakker, Riccardo Petrocco (Spotify/TU Delft), and Victor Grishchenko (Citrea LLC), and the VU logo with the tagline "LOOKING FURTHER". The video player interface shows a progress bar at 70.6% and a timestamp of 2:10. In the top right corner of the video frame, there is a small inset showing two people at a conference table. The bottom right corner of the video frame features the IETF logo.

<https://www.youtube.com/user/ietf>



A “silly” use case: The Jumping Janus!

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Neil and Tim's Jumping Sumo hack.

Stream

Controls

Forward Left Right Backwards

Neil Stratford @neilstratford
Tim Panton @teewy_gint
Using Janus WebRTC Gateway © Meetecho

0:57 / 1:50

<https://www.youtube.com/watch?v=isGSnMIKcss>



A “silly” use case: The Jumping Janus!

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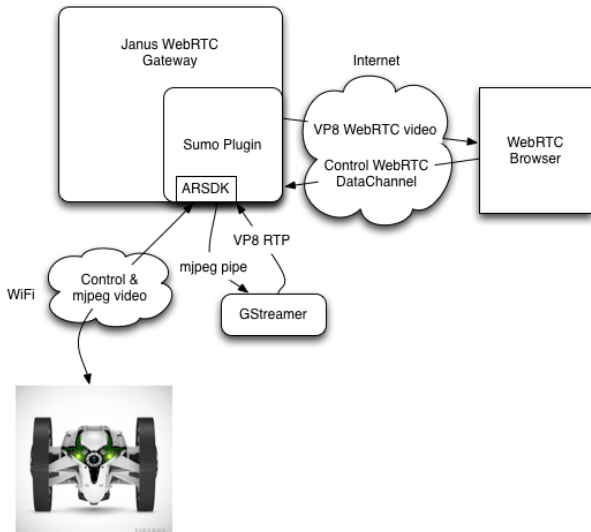
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“Matrix wins Best of Show at WebRTC World!”

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<https://www.youtube.com/watch?v=OMzDklvDS3c>



“Matrix wins Best of Show at WebRTC World!”

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<https://www.youtube.com/watch?v=NpBStIIq6fM>



Jangouts (for "Janus Hangouts" 😊)

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Muted: Trying to say something? You are muted. Unmute Do not show again

schubi has joined the room

mvidner
It's "brüling", not "brüling" 11:20 AM

ancor
chat supports smileys and emoji icons 🍌 11:20 AM

ancor
👤 11:20 AM

lslezak
<https://rele.com/koXoZ8WQA/249-3-sies12-sp1-p2-956597-after-installation-zypper-in-repo-list-was-empty> 11:21 AM

mcht
mvidner: we have a "ch" so lets use it :) 11:21 AM

lslezak
<https://rele.com/3dNM20u234-5-siw12-sp1-bcc-954445-snapper-roll-back-on-data-snapshot-fatal> 11:21 AM

mvidner
<https://rele.com/cRg7b0r-P367-5-add-4bstorage-snapper-to-jenkins> 11:22 AM

schubi
https://bugzilla.novell.com/show_bug.cgi?id=954905 11:23 AM

ancor
and images 11:23 AM

ancor
https://pbs.twimg.com/profile_images/551143684671291392/4x_h21L_400x400.jpg 11:23 AM

Type your message here... Send

© SUGS 2015 Version 0.4.0

<https://github.com/jangouts/jangouts>



SylkServer (more on that later, I guess!)

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The screenshot shows a 'Blink Chat' window. On the right is a video feed of a man with glasses and a black hoodie, celebrating with his arms raised. On the left is a sidebar with the following information:

- Participant: Saül (On the phone)
- Session Information
- Duration: 0:00:17
- Account: 31208005163@ag-projects.com
- Remote Agent: Janus WebRTC Gateway SIP Plugin 0.0.5
- Chat: N/A
- Audio: opus 48kHz
- Video: H264 @ 62fps
- Screen: N/A
- Network Latency: 13ms, max=13ms
- Packet Loss: 0.0%, max=0.0%
- Traffic: 15.0kbps / 49.4kbps

A red arrow points to the 'Remote Agent' field.

<http://sylkserver.com/>



Lenovo's AirClass

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The screenshot displays a video conference interface. The main video feed shows a man with a beard speaking into a microphone. A 'LIVE' indicator is in the top left corner. The video player has a volume icon and a timestamp of 00:05:21. To the right, a chat window titled 'Session 1' contains the text 'Continue the discussion on policies'. Below the chat are 'Mute All' and 'Unmute All' buttons. A 'Broadcasting - Video' bar is visible below the chat. At the bottom, a 'Look who's here' section lists four participants: Kate Andrews (Muted), Isabella Marlon (Muted), Alden Johnson (Muted), and Gavin Jameson (Muted). Each participant has a small video thumbnail and a red 'Muted' indicator.

<https://www.airclass.com>



Sqwiggle / Speak.io

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The screenshot displays a web browser window with a chat application on the left and a video conference grid on the right. The chat interface includes a sidebar with a list of team members: Matt Boyd (Sqwiggle Main), Eric Bieller (Sqwiggle Main), Tom Moor (Dev Ops), John Smith (Marketing), Ashley Jamison (Marketing), and Julie Abrahms (Marketing). The main chat area shows messages from Matt Boyd, Eric Bieller, and Tom Moor. Eric Bieller has shared a GIF of a hot air balloon. Tom Moor has shared a code snippet. The video conference grid shows six participants in a 2x3 layout. The top row shows Eric Bieller (10:54am) and another participant. The middle row shows another participant and a woman with glasses. The bottom row shows another participant and a dark area, possibly a muted participant.

Invite a Team Member...

- Matt Boyd
Sqwiggle Main
- Eric Bieller
Sqwiggle Main
- Tom Moor
Dev Ops
- John Smith
Marketing
- Ashley Jamison
Marketing
- Julie Abrahms
Marketing

Matt Boyd
1 minute ago
Hey Guys, do you happen to have those mockups I was discussing w/ you earlier? I've got a presentation in a few minutes.

Eric Bieller
15 minutes ago
Hey Matt Boyd - here it is... I added a hot air balloon though. I hope you don't mind, I think it's really great!

Tom Moor
16 minutes ago
Hey what do you think about this code? It kinda sucks I know... because I can't code

```
1 #requires_authorization
2 def somefunc(param1="", param2=0),
3   s""A dostring""
4   if param1 > param2: # interesting!
5     print "Gree" * s""
6     return (param2 - param1 + 1) or
7
8 class SomeClass:
9     """
```

Share something...

Eric Bieller
10:54am

<https://www.sqwiggle.com>

<https://speak.io>



Sqwiggle / Speak.io

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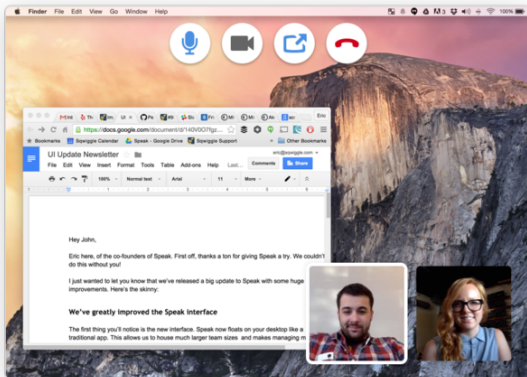
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<https://www.sqwiggle.com>
<https://speak.io>



Veeting rooms

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veeting rooms

LANGUAGE | CONTACT | SUPPORT | BLOG | LOGIN

HOME FEATURES PRICING SCHEDULE MEETING JOIN MEETING

Agenda Slide decks Documents Chat Minutes Private notes

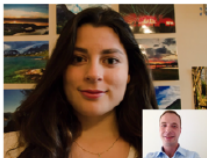


veeting rooms

How Are We Different

- ▶ All servers are **hosted in Switzerland**, we don't use the cloud.
- ▶ Our business customers know where their data is, can choose the **jurisdiction they have most trust in**.
- ▶ Strong focus on **privacy, data protection and user experience**.
- ▶ All data **communication is end-to-end encrypted** and runs either peer-to-peer or through Swiss servers.
- ▶ **No software installation** is required, it runs directly in most web browsers, on **all major platforms** including Android.
- ▶ **No account required** for guests.

Audio call Video call Close call



 **Christian**
christian@veeting.com

Audio Video Leave

<https://www.veeting.com>



What to do next?

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- Finalize the WebRTC implementation
 - Better RTCP management
 - Implement multistream (Unified Plan)
 - Add octets (besides strings) to DataChannels
 - Keep up-to-date with newest stuff
- Keep on improving and fixing things
 - Implement admin API notifications (subscription)
 - Reference counters (currently in a PR)
 - Why not, some new transport modules
 - Maybe some changes to the pluggable architecture too?
- **Help us improve this!**
 - Play with it, more testing is important
 - Write your own plugins/applications!



Questions? Comments?

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