



#Janus

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Janus: an open source bridge towards the WebRTC ecosystem

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University of Naples Federico II & Meetecho S.R.L.



20th April 2016, #GARR2016, <http://www.garr.it/ws16>



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



What's Meetecho?

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- A company born in 2009 as an academic spin-off
 - University research efforts brought to the market
 - Proudly brewed in sunny Napoli, Italy ☺
- Focus on real-time multimedia applications
 - Web conferencing only, at first
 - Then widened the scope to multimedia in general
 - Strong perspective on standardization and open source
 - *WebRTC rulez!*



How do you pay your bills?

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- Meetecho Web Conferencing and Collaboration
 - Meetings, conference calls, webinars, etc.
 - Subscription, one-shot, ...
- Streaming of live events
 - Internet Engineering Task Force (IETF)
 - ACM SIGCOMM
- Consultancy services
 - Mostly (but not only) involving WebRTC and Janus
 - Installation and configuration
 - Custom plugins for custom use cases
 - Wrapping/orchestration of Janus resources
 - Sponsored development on new features or improvements
 - ...
- Commercial support



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Ok, ok, got it... now what's WebRTC about?

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- Real-time media in a browser
- Up to some time ago, no standard solution!
 - No interoperability
 - Plugins needed 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



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WebRTC reference architecture

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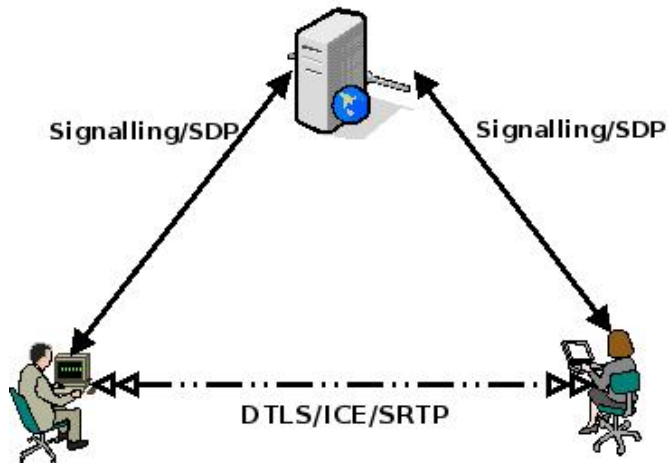
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Wanna get to know more about WebRTC?

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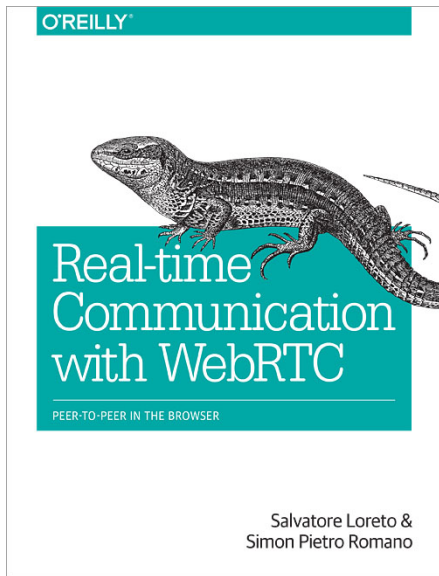
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Involving a gateway (and applications)

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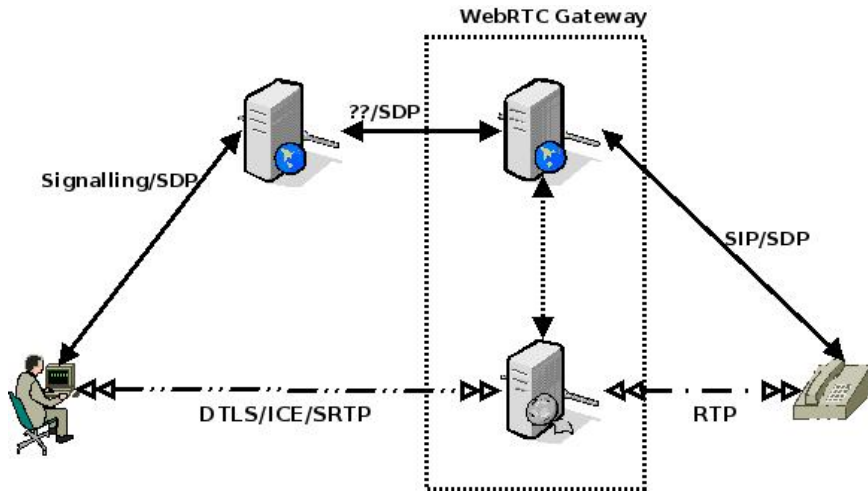
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Involving different technologies as well

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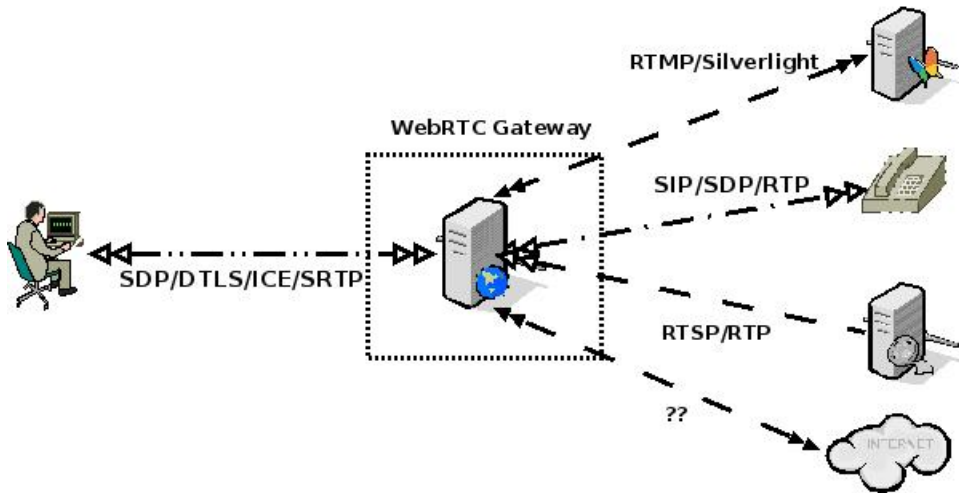
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Do we really need a gateway?

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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/>



Do we really need a gateway?

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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?



Real-time Media Components

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Real-time Media Components

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The WebRTC protocol suite

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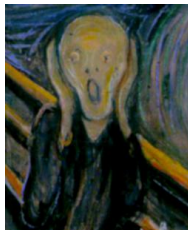
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- Signalling (well, sort of) and Negotiation
 - Javascript Session Establishment Protocol (JSEP)
 - Session Description Protocol (SDP) adaptation
- Connection Establishment and NAT Traversal
 - Session Traversal Utilities for NAT (STUN)
 - Traversal 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)
- Multimedia codecs
 - Opus audio codec (MTI, Mandatory-to-implement)
 - VP8 and H.264 video codecs (MTI, Mandatory-to-implement)
- 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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Next steps

- 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!)
 - Video Room (→ Selective Forwarding Unit!)
 - SIP Gateway (→ “Legacy” SIP!)
 - ...



Modular architecture

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Extensible Architecture and API

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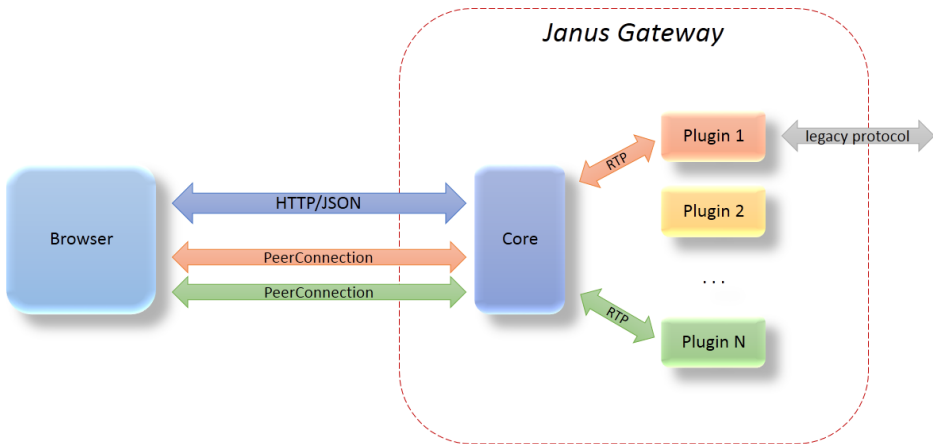
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Extensible Architecture and API

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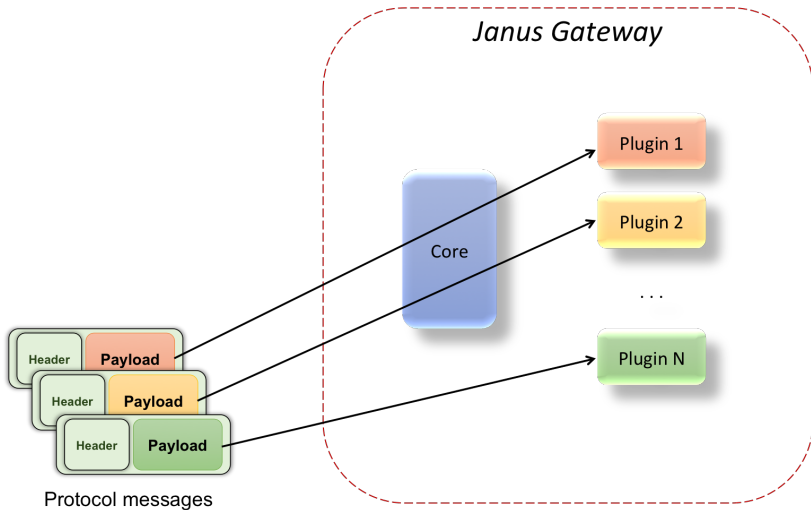
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Plugins as “bricks”

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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...
 - Multimedia conferencing with PSTN support
 - Video Room (participants video & screen) + SIP (participants audio)
 - Webinar with Q&A
 - Video Room (screen) + Video Room (speakers) + Audio Bridge (questions)
 - Social TV
 - Streaming (TV channel) + Video Room (interaction)
 - Contact center / Communication in social networks
 - SIP plugin (calls) + Echo Test (diagnostics) + Record & Play (messaging)



Plugins as “bricks”

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Webinar with Q/A

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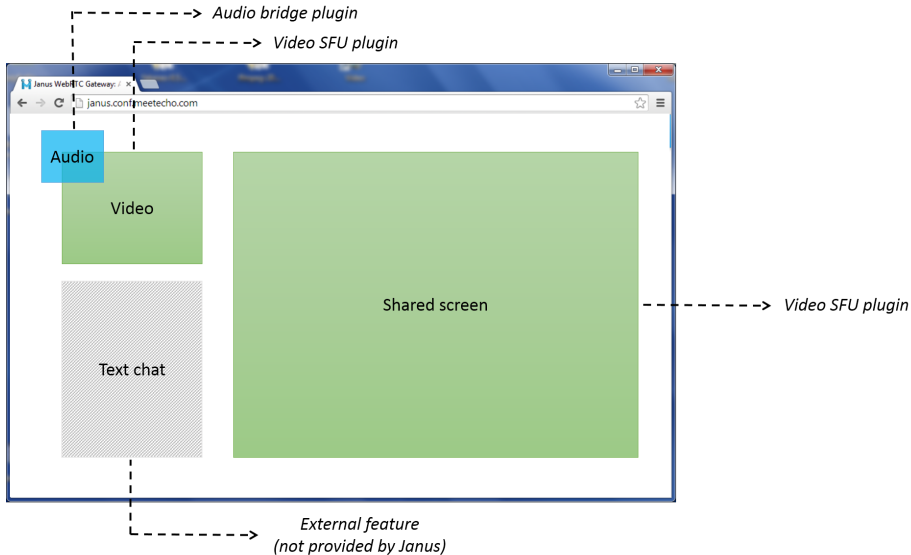
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Social TV

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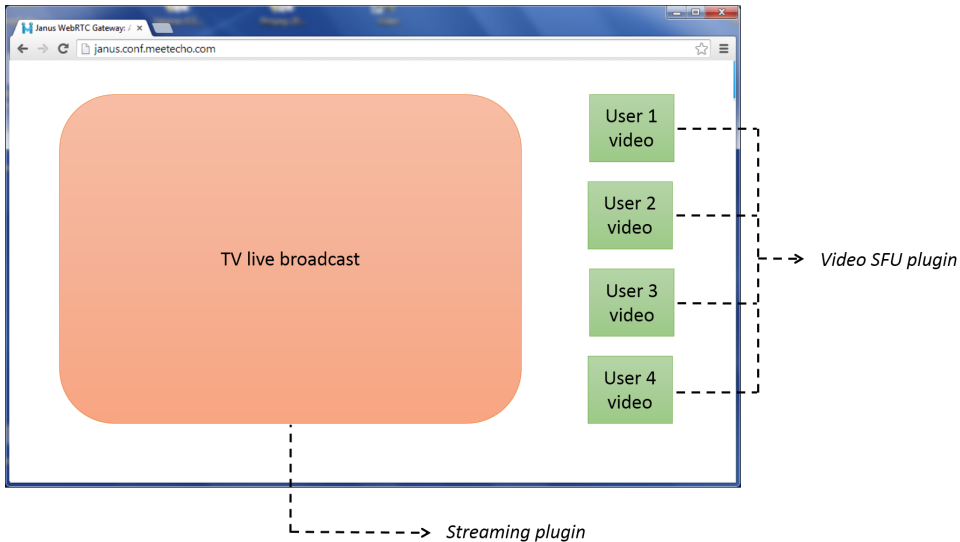
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- ... use Janus in my web app?
 - JavaScript library available (`janus.{jquery.}js`)
 - <https://janus.conf.meetecho.com/docs/JS>
 - Several demos available to start from
- ... use Janus, but keeping my API?
 - Wrap the Janus API on the server side
 - <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
- ... ask questions, report issues, contribute, or do this/that?
 - <https://git.io/v2hWD> (contributing guidelines)
 - <https://groups.google.com/forum/#!forum/meetecho-janus>
 - <https://janus.conf.meetecho.com/docs/FAQ>



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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
 - Contact centers
 - TV broadcasting and Social TV
 - Surveillance systems
 - 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, ...)



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“Director” room @ IETF meetings

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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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The screenshot displays a Meetecho interface for an IETF meeting. On the left, a chat window shows a list of participants: Simon Romano (Passivo) and Adam Montville. The chat history includes messages from Adam Montville at 16:53, 16:54, and 16:55. The main area features a presentation slide titled "XMPP-Grid: Enabling the Potential of Network-Wide Information Sharing". The slide contains a central diagram with a blue star shape labeled "XMPP-Grid Context Sharing" and "Single Framework" and "Direct, Secured Interfaces". Surrounding this are various icons and text boxes representing different data types and their needs: "I have reputation info! I need threat data..." (SIO), "I have application info! I need location & auth-group..." (APP), "I have NBAR info! I need identity..." (NBAR), "I have location! I need identity..." (Location), "I have MDM info! I need location..." (MDM), "I have app inventory info! I need posture..." (App Inventory), "I have identity & device-type! I need app inventory & vulnerability..." (Identity & Device-Type), "I have firewall logs! I need identity..." (Firewall Logs), "I have threat data! I need reputation..." (Threat Data), "I have NetFlow! I need entitlement..." (NetFlow), and "I have sec events! I need reputation..." (Sec Events). On the right, there are two video feeds: the top one shows two people at a table, and the bottom one shows a close-up of a man with glasses. The Meetecho logo is visible in the bottom right corner of the interface.

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



Meetecho: IETF recordings

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IETF92
PPSP

THE PPSP PEER PROTOCOL (PPSPP)

Arno Bakker
Riccardo Petrocco (Spotify/TU Delft)
Victor Grishchenko (Citrea LLC)

VU
Vrije Universiteit Amsterdam
LOOKING FURTHER

I E T F®

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



A “silly” use case: The Jumping Sumo!

#Janus

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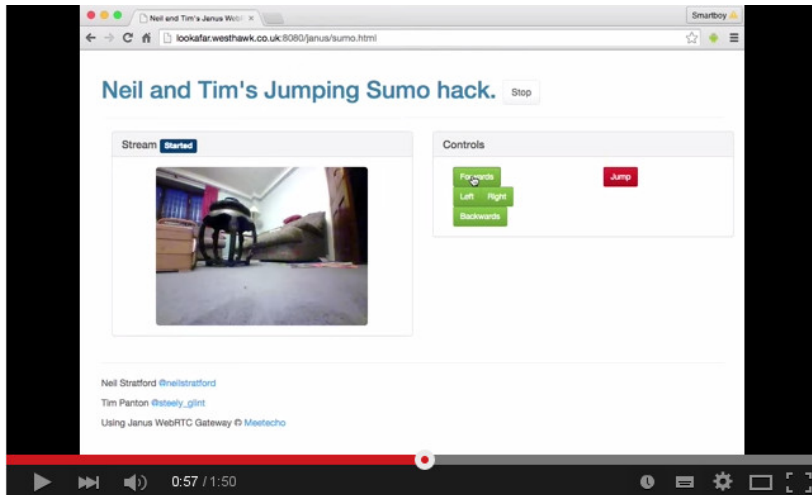
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<https://www.youtube.com/watch?v=isGSnMIKcss>



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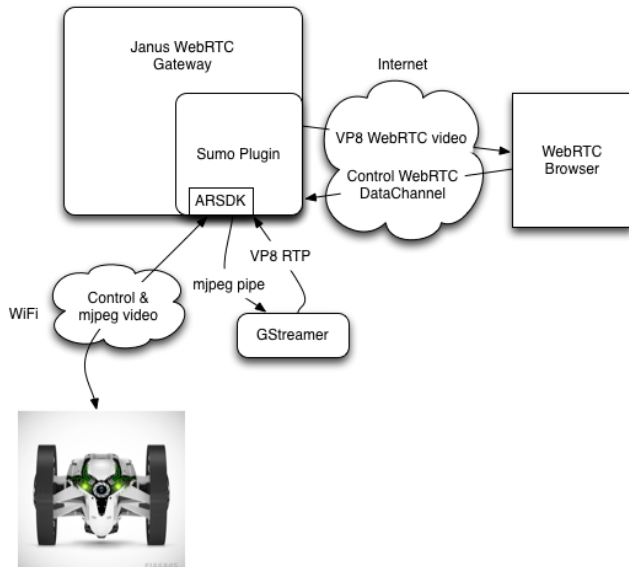
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“Matrix wins Best of Show at WebRTC World!”

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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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The screenshot shows the Jangouts web interface. At the top, there's a status bar indicating the user is muted. Below this is a large video feed of a man with glasses and a headset. To the right of the main video is a chat window with messages from participants like mrvldner, anc0r, and schubi. Below the main video is a grid of smaller video feeds for other participants. The interface includes a 'Muted' status bar at the top and a 'Send' button for the chat.

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



SylkServer (SIP/XMPP Application Server)

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Saul
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 8.62fps |
| Screen | N/A |

Network Latency: 13ms, max=13ms

Packet Loss: 0.0%, max=0.0%

Traffic: ↓ 15.0kbps ↑ 49.4kbps

Blink Chat

http://sylkserver.com/

<http://sylkserver.com/>



Slack? (team co-working)

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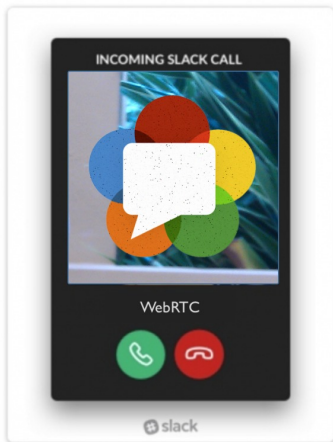
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<https://webrtcchacks.com/dear-slack/>



Lenovo's AirClass (e-learning)

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The screenshot displays a web-based video conference interface. At the top left, a red 'LIVE' badge is present. The central video feed shows a man with a beard and a microphone. Below the video, a control bar includes a speaker icon, a timer at 00:05:21, and a 'Broadcasting - Video' status bar with icons for mute, unmute, and video. To the right, a sidebar shows the session title 'Session 1' and a description 'Continue the discussion on policies'. Below this, there are buttons for 'Mute All' and 'Unmute All'. At the bottom, a list of participants is shown, each with a profile picture, name, and a 'Muted' status indicator. The participants are Kate Andrews, Isabella Marion, Aiden Johnson, and Gavin Jameson.

<https://www.airclass.com>



Sqwiggle / Speak.io (team co-working)

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The screenshot displays the Squiggle web application interface. On the left is a sidebar with navigation links: #Janus, Meetecho team, Intro, WebRTC, Gateways, Janus, and Next steps. The central chat area shows a list of team members (Matt Boyd, Eric Bieller, Tom Moor, John Smith, Ashley Jamison, Julie Abrahms) and a chat log with messages and a code snippet. The right side features a video grid with six participants in a 3x2 layout.

Chat Log:

- 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 tthope 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.     z'''A docstring'''
4.     if param1 > param2: # interesting
5.         print 'Gre\'ater'
6.         return (param2 - param1 + 1) or
7.
8.     class SomeClass:
9.         ....
```

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



Sqwiggle / Speak.io (team co-working)

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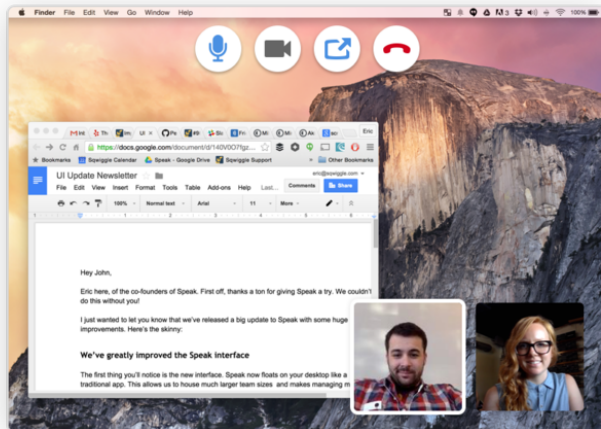
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<https://www.sqwiggle.com>
<https://speak.io>



Veeting rooms (web conferencing)

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veeting rooms

HOME FEATURES PRICING SCHEDULE MEETING JOIN MEETING

LANGUAGE | CONTACT | SUPPORT | BLOG | LOGIN

Agenda Slide decks Documents Chat Minutes Private notes

Audio call Video call Close call



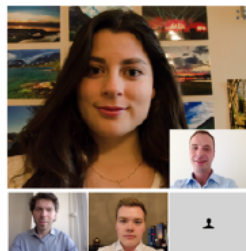
Introduction
Business

The Product
The Market
Unique Features

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.



 **Christian**
christian@veeting.com

Audio Video Leave

<https://www.veeting.com>



What to do next?

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



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Last month's events

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- IETF 95
 - April 3-8, Buenos Aires (Argentina)
 - More than 140 interactive (webrtc-enabled) sessions in a week...without being bashed!
- IEEE INFOCOM 2016
 - April 10-15, San Francisco (USA)
 - Innovation Challenge Panel/Pitchfest...and guess what? We won!!



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Pitchfest: souvenirs from San Fran ☺

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Come meet us at upcoming events!

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- OpenSIPS Summit
 - May 10-11, Amsterdam (Netherlands)
 - Presentation on Janus and SIP
- Kamailio World
 - May 18-20, Berlin (Germany)
 - Presentation on Janus and SIP
 - ...with live demos of the Janus pluggable architecture



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Questions? Comments?

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