Janus

L. Miniero

Intro

WebRTC
Standardization

Gateways
Requirements

Janus
Modules and APIs
A few examples

Next steps

Janus: a general purpose WebRTC gateway

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FOSDEM 2016 Real Time devroom
30th January 2016, Brussels

Outline

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?

- 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
    - libbfcp, 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!

Real-time media in browsers

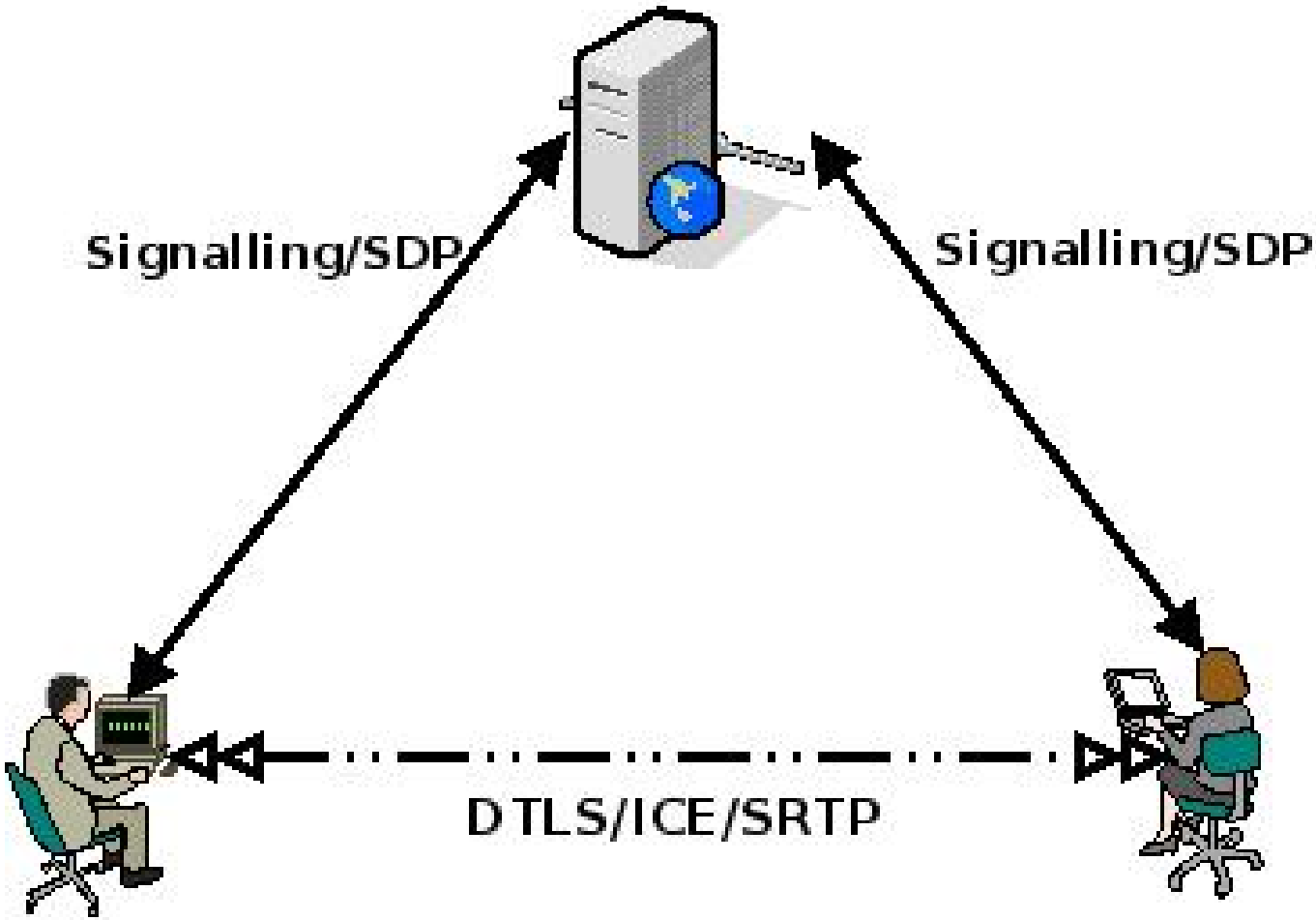
- No standard solution!
  - No interoperability
  - Plugins need to be installed anyway

WebRTC = Joint standardization efforts

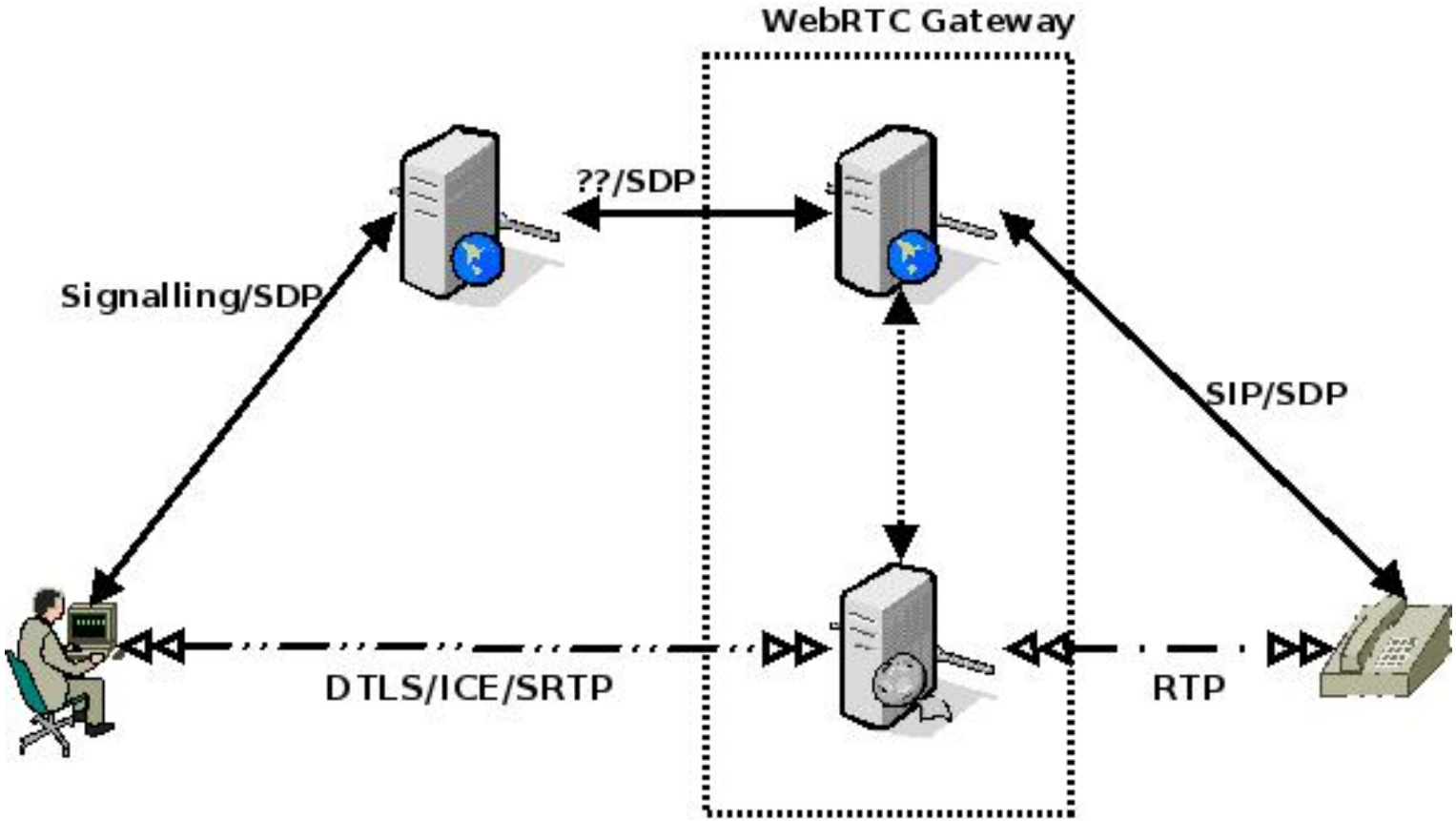
- Internet Engineering Task Force (IETF)
- World Wide Web Consortium (W3C)

- 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

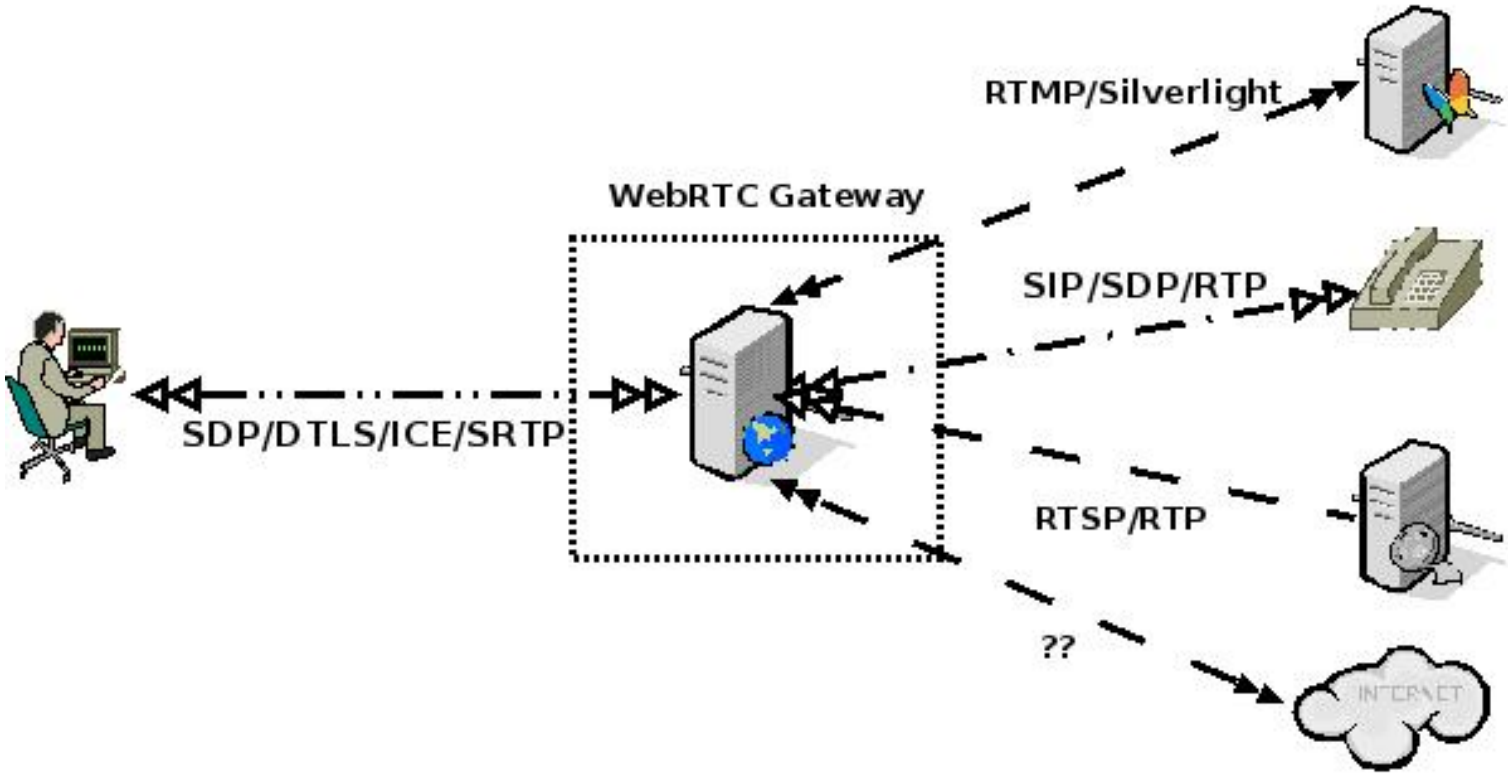
WebRTC reference architecture



Involving a gateway (and applications)



Involving different technologies as well



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://webrtchacks.com/webrtc-gw/

Real-time Media Components

- 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

- 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)

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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

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

Janus

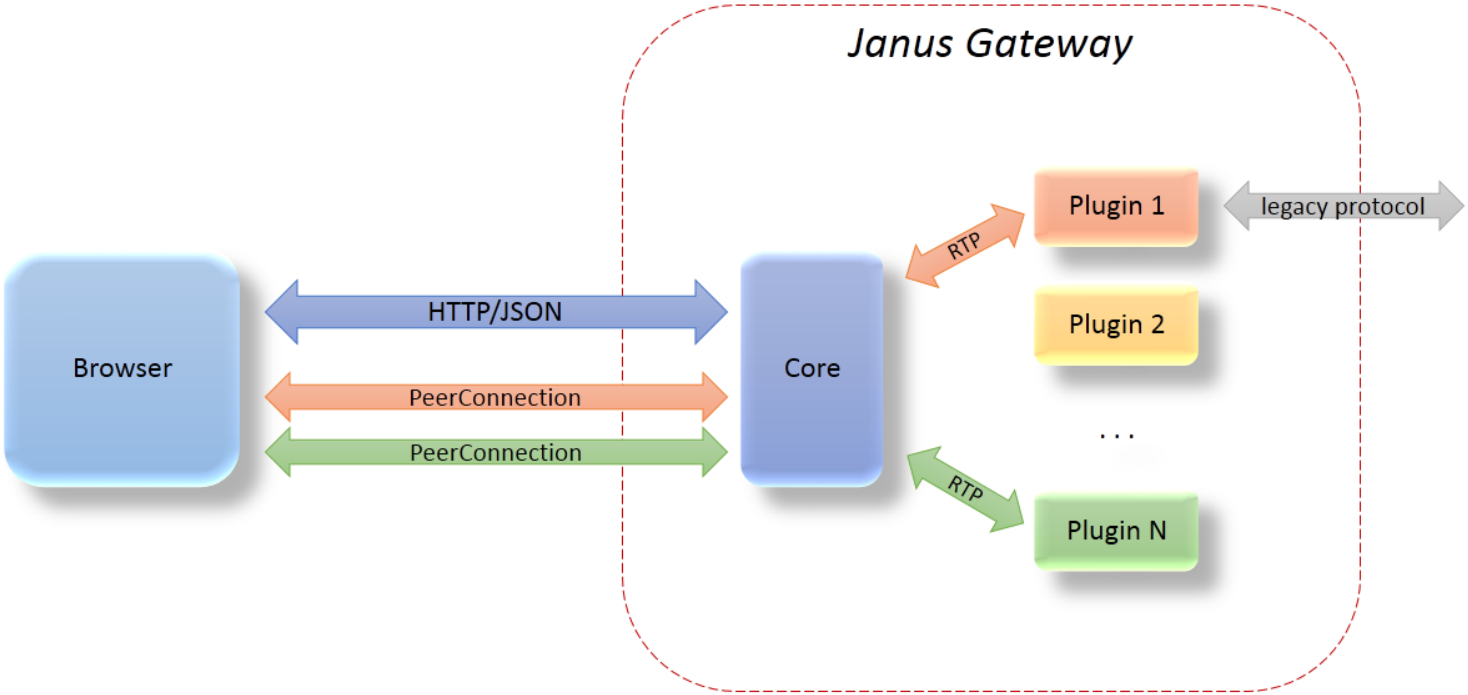
General purpose, open source WebRTC gateway

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

Modular architecture

- 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 ($\rightarrow$ Live events!)
  - Conferencing ($\rightarrow$ Meetecho!)
  - SIP Gateway ($\rightarrow$ “Legacy” SIP!)
  - ...

Extensible Architecture and API



Extensible Architecture and API

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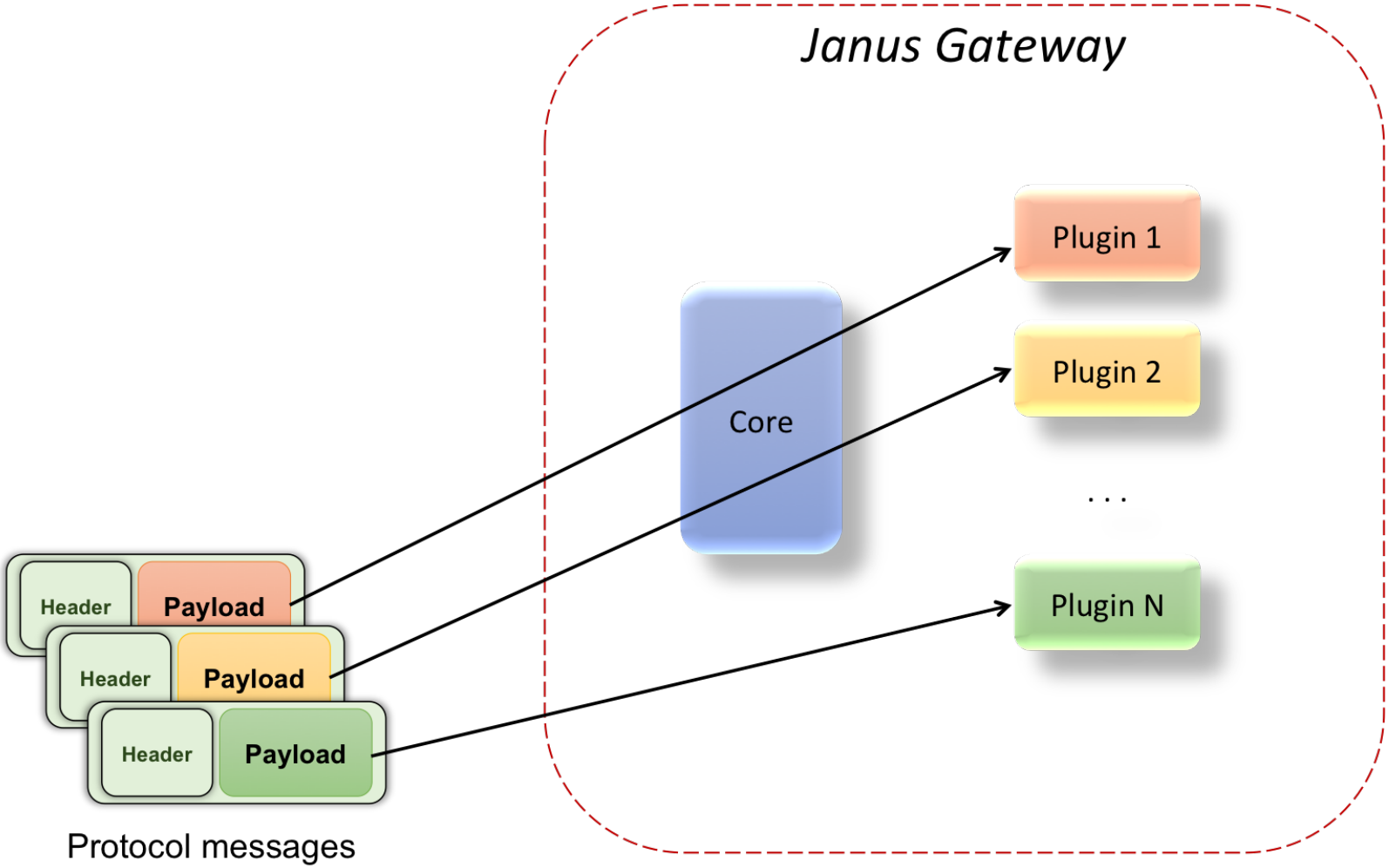
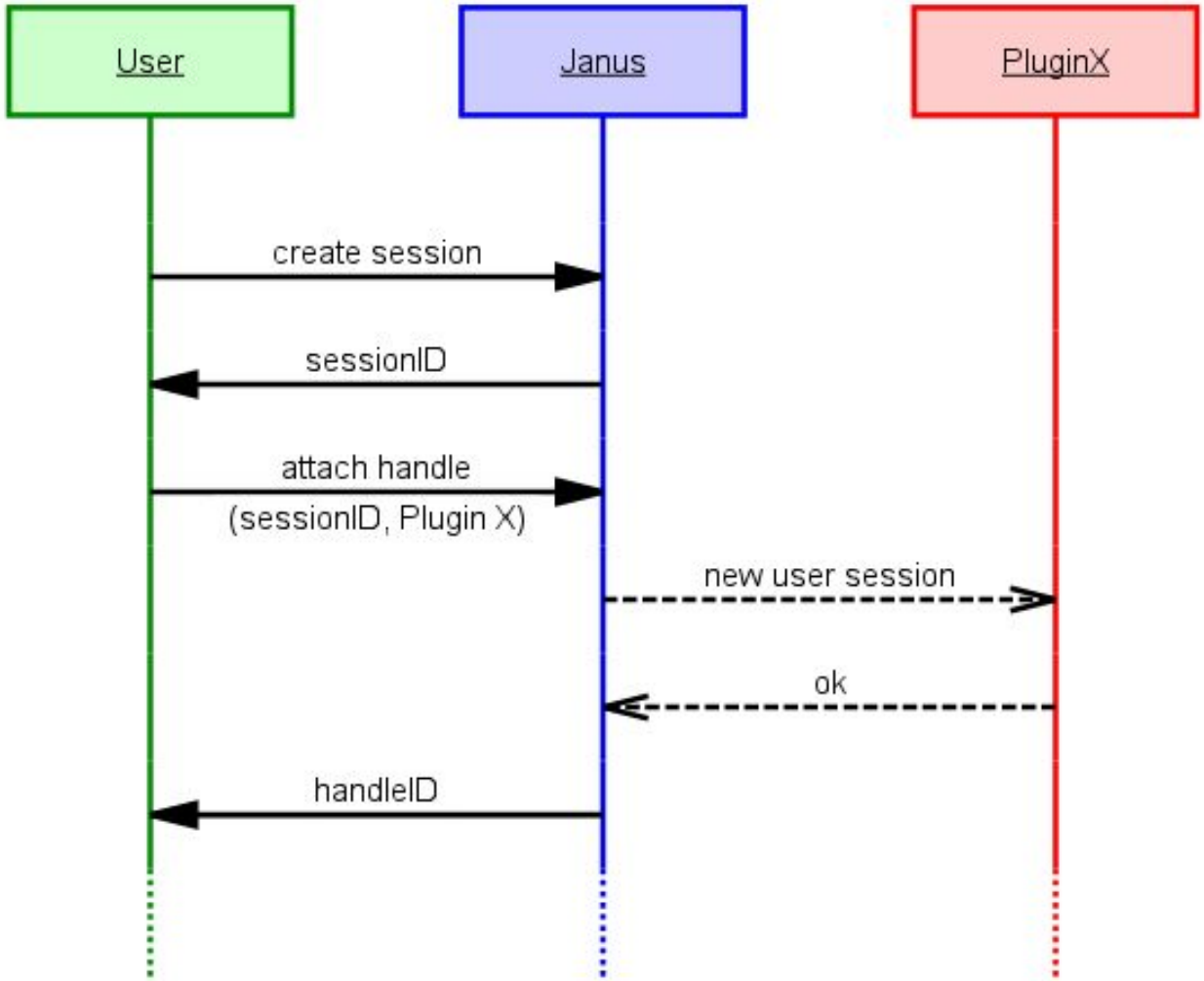


Extensible Architecture and API



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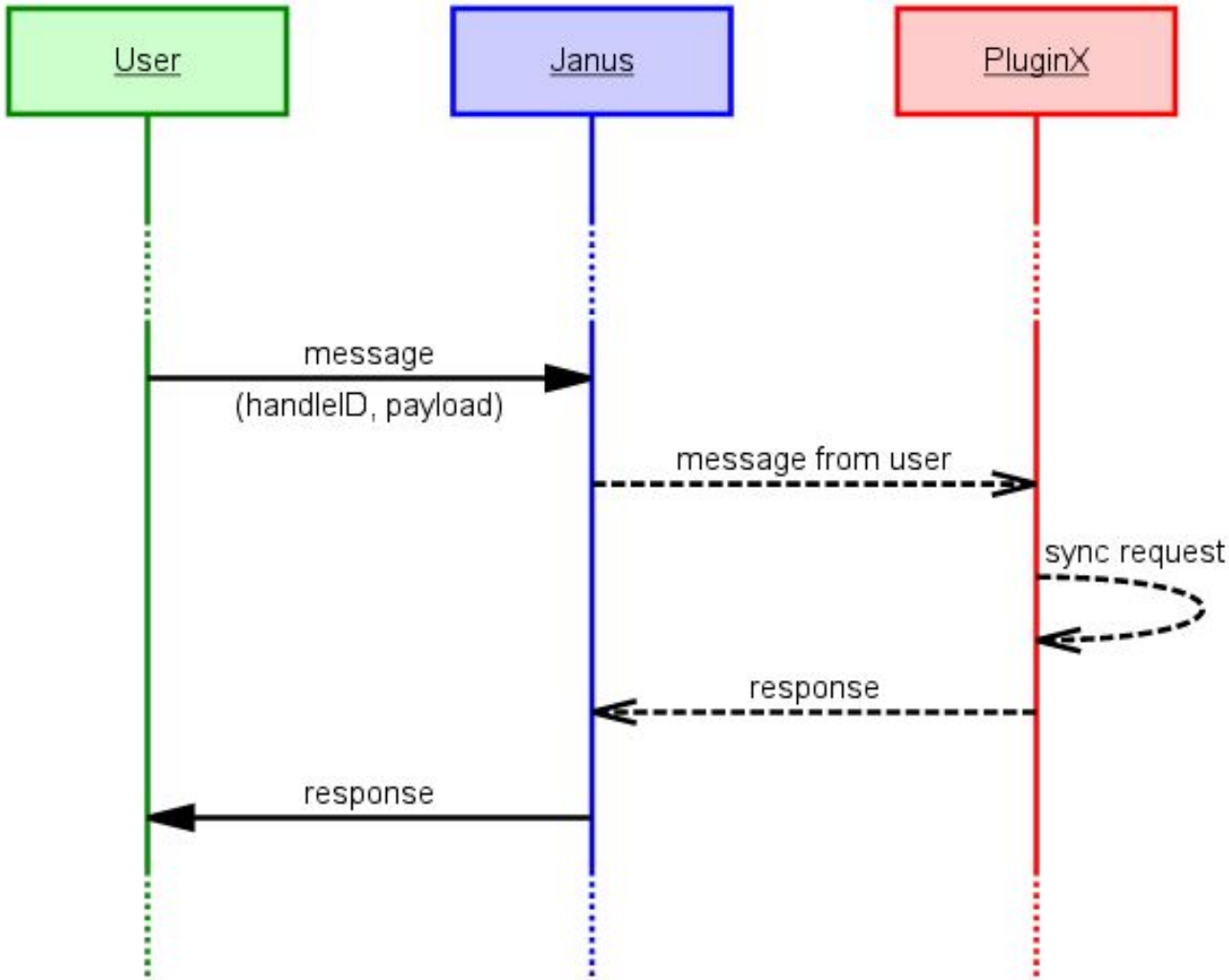

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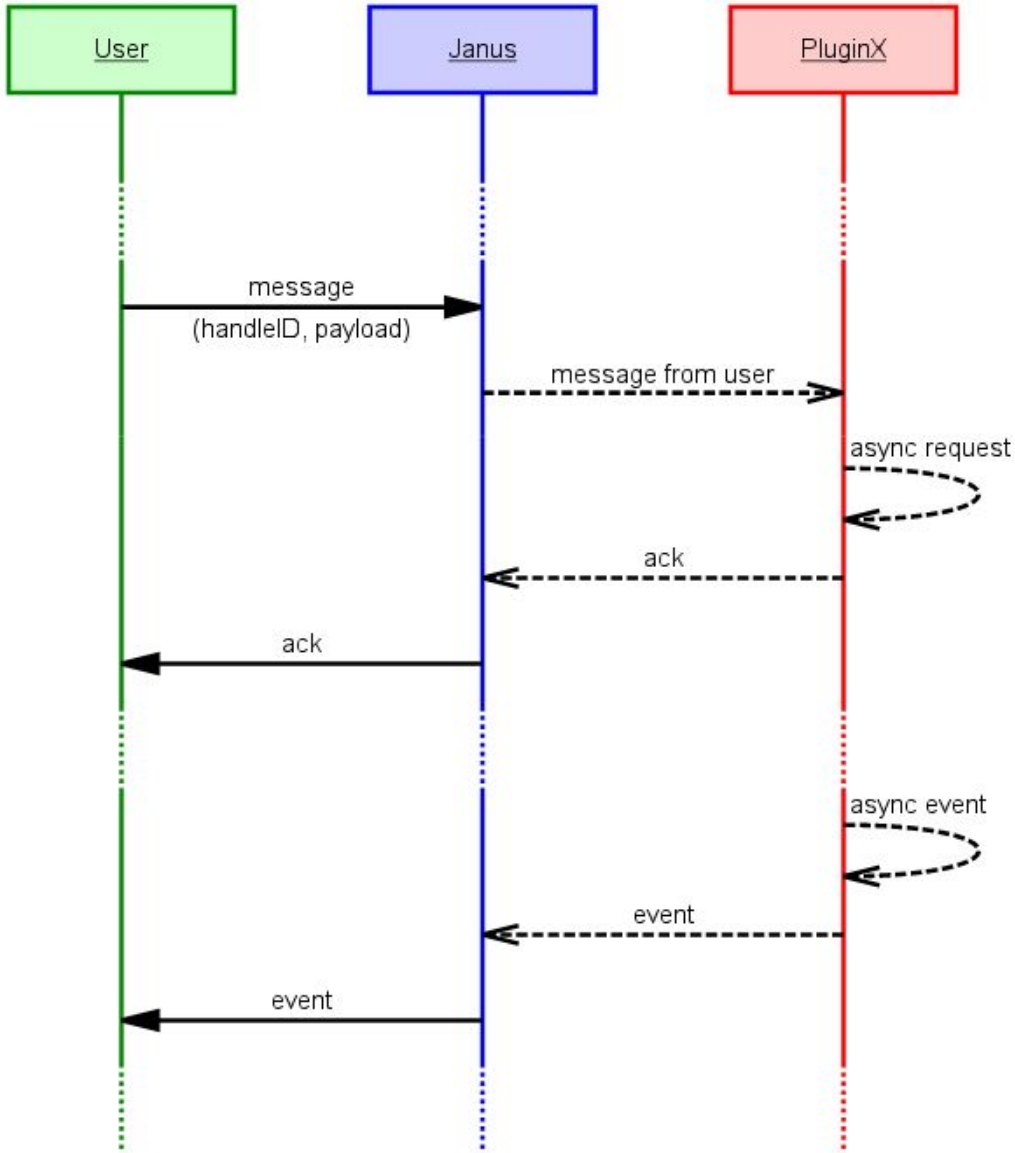

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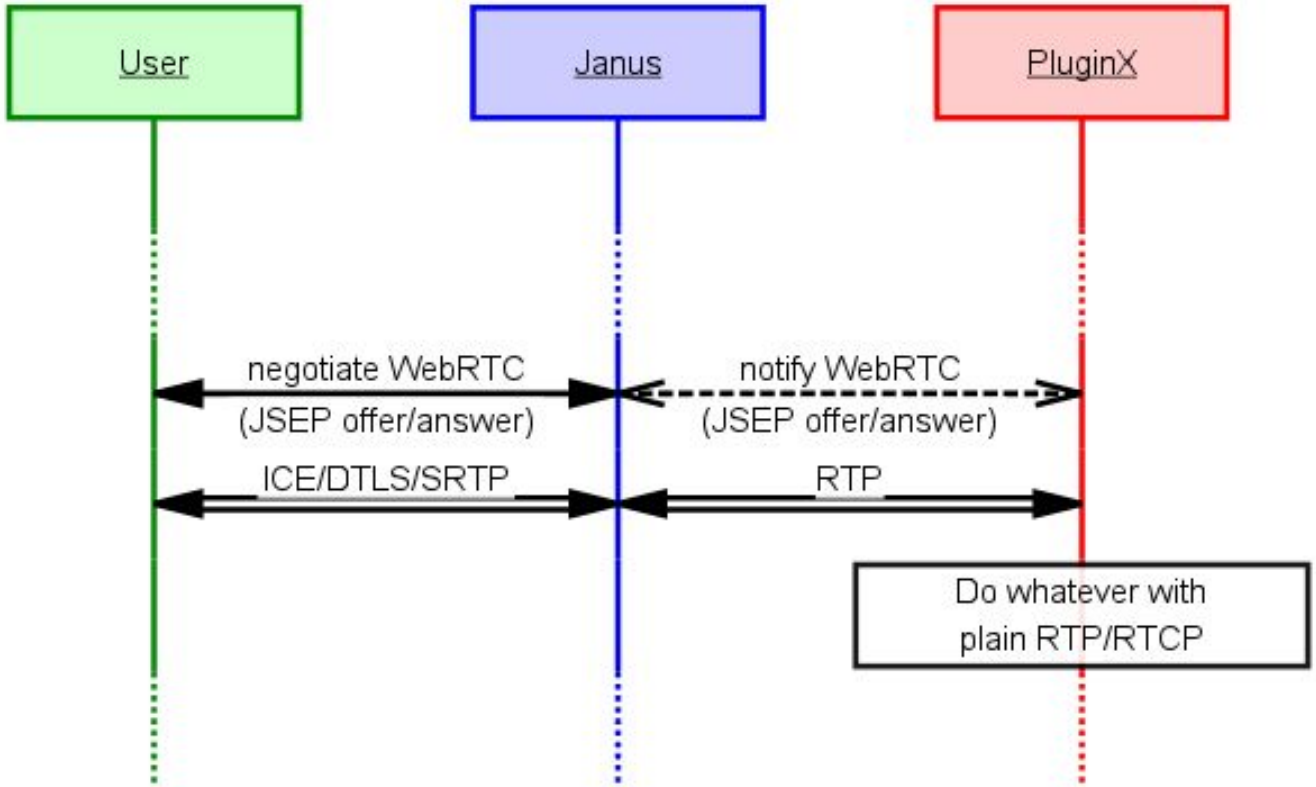
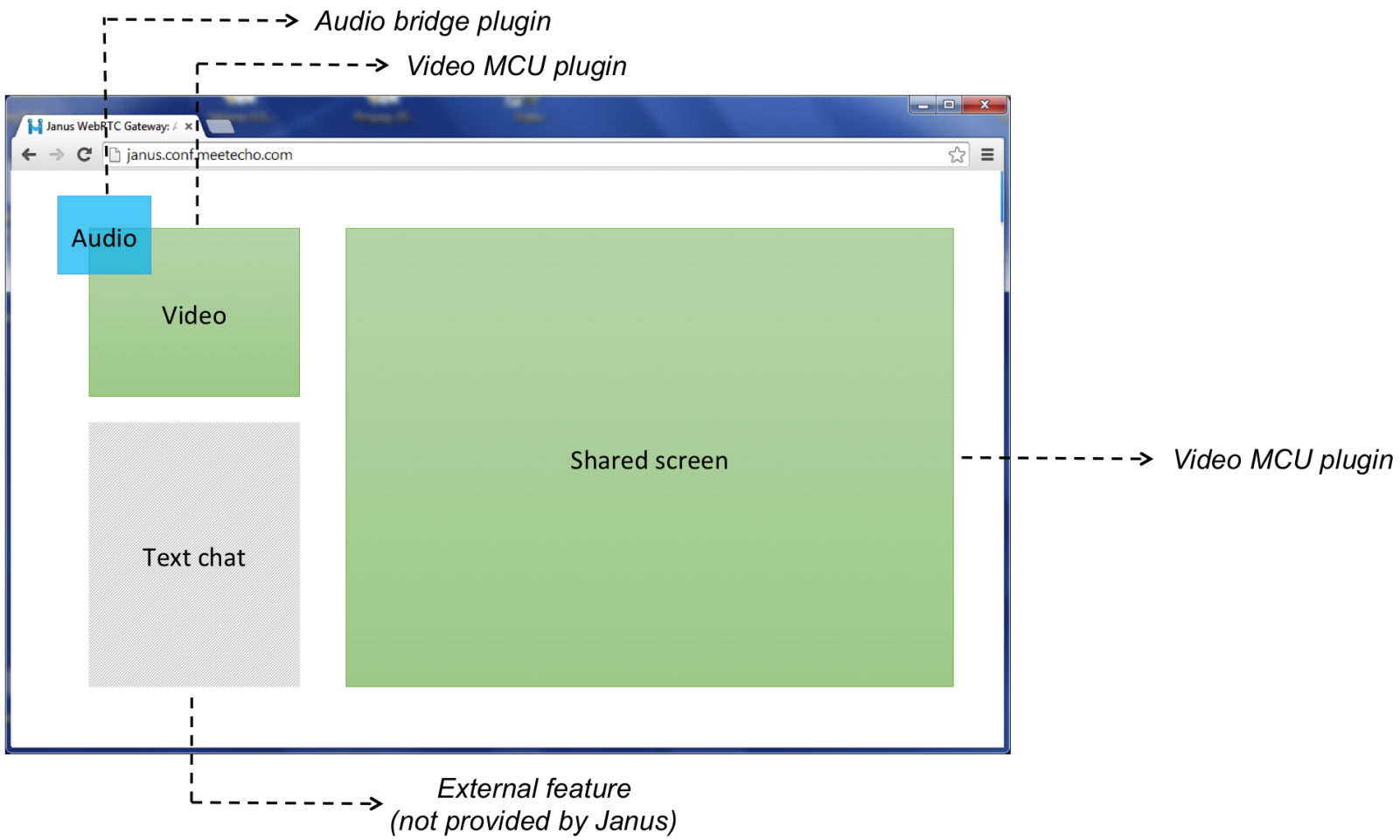


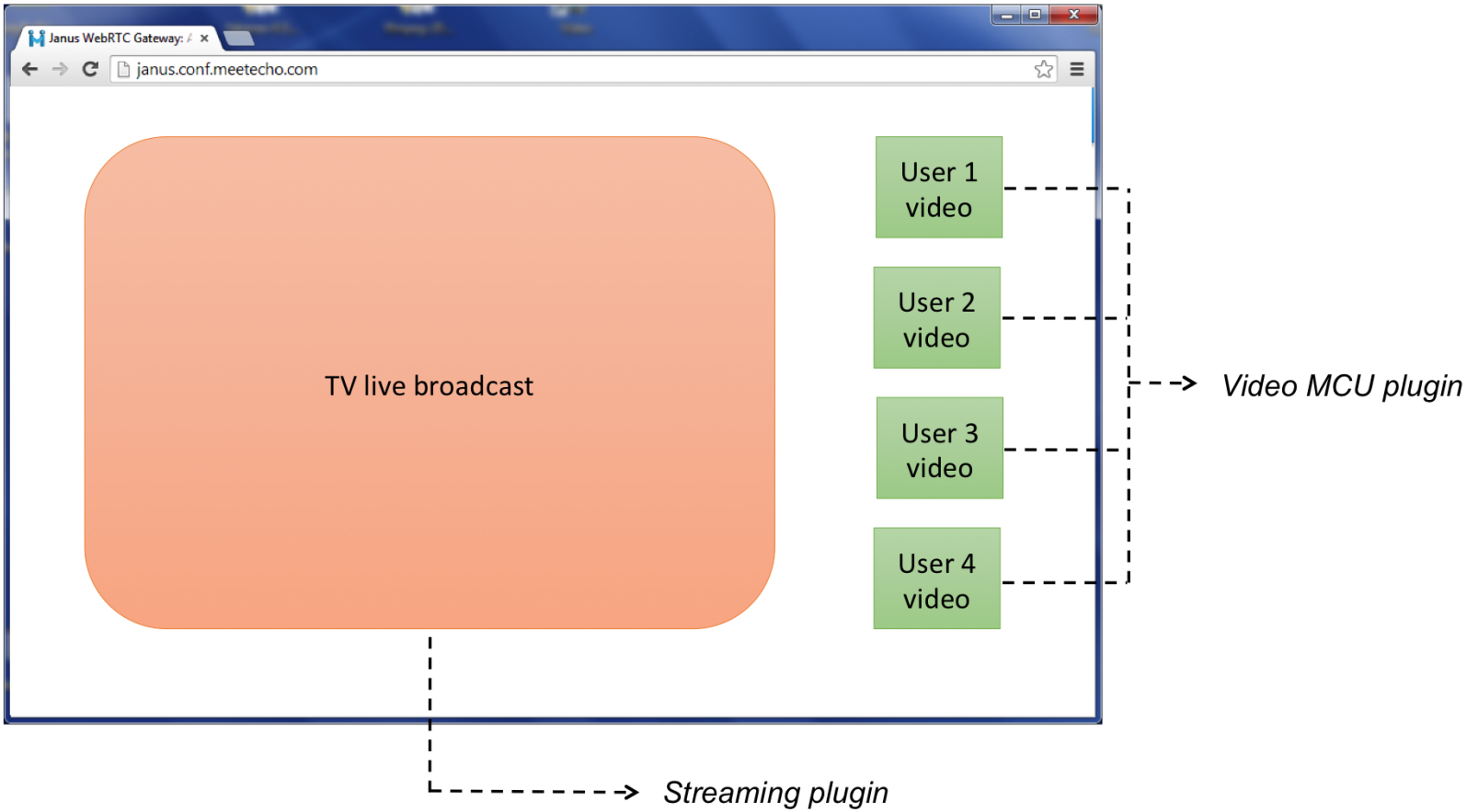
Plugins as “bricks”

- 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



Social TV


Janus WebRTC Gateway:
janus.conf.meetecho.com
TV live broadcast
User 1 video
User 2 video
User 3 video
User 4 video
Video MCU plugin
Streaming plugin

How do I...

- ... 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!

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

Sessions (1) Handles (1) Handle Info

1489448365 783422373


```
{
    "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/

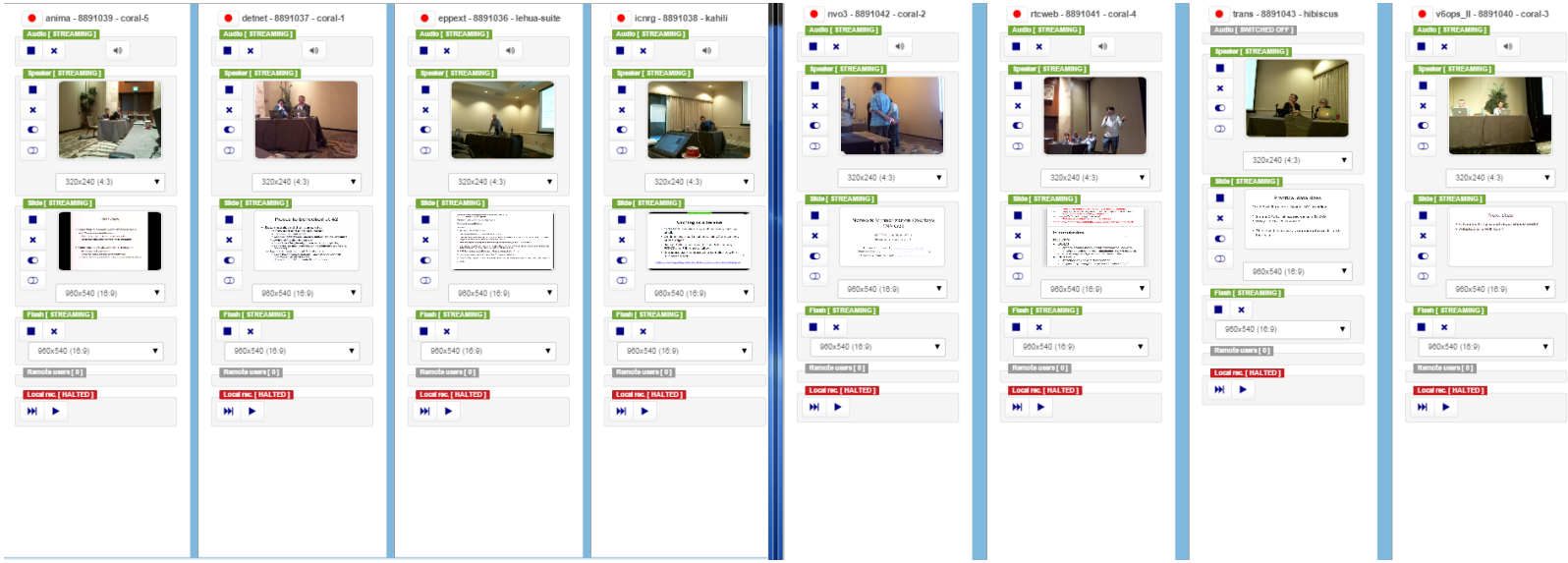
What is Janus used for today, and by whom?

- 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, ...)

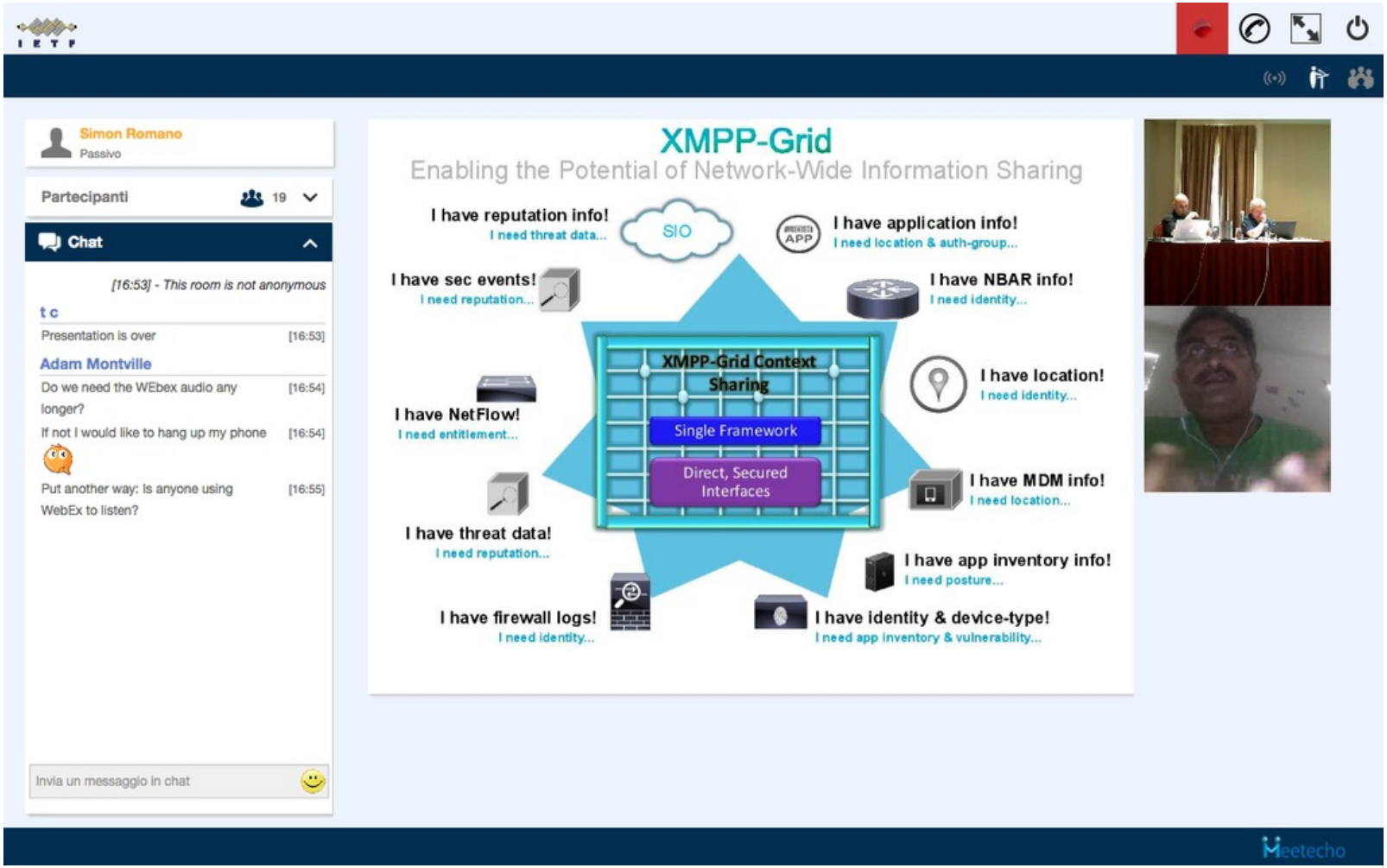
“Director” room @ IETF meetings

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

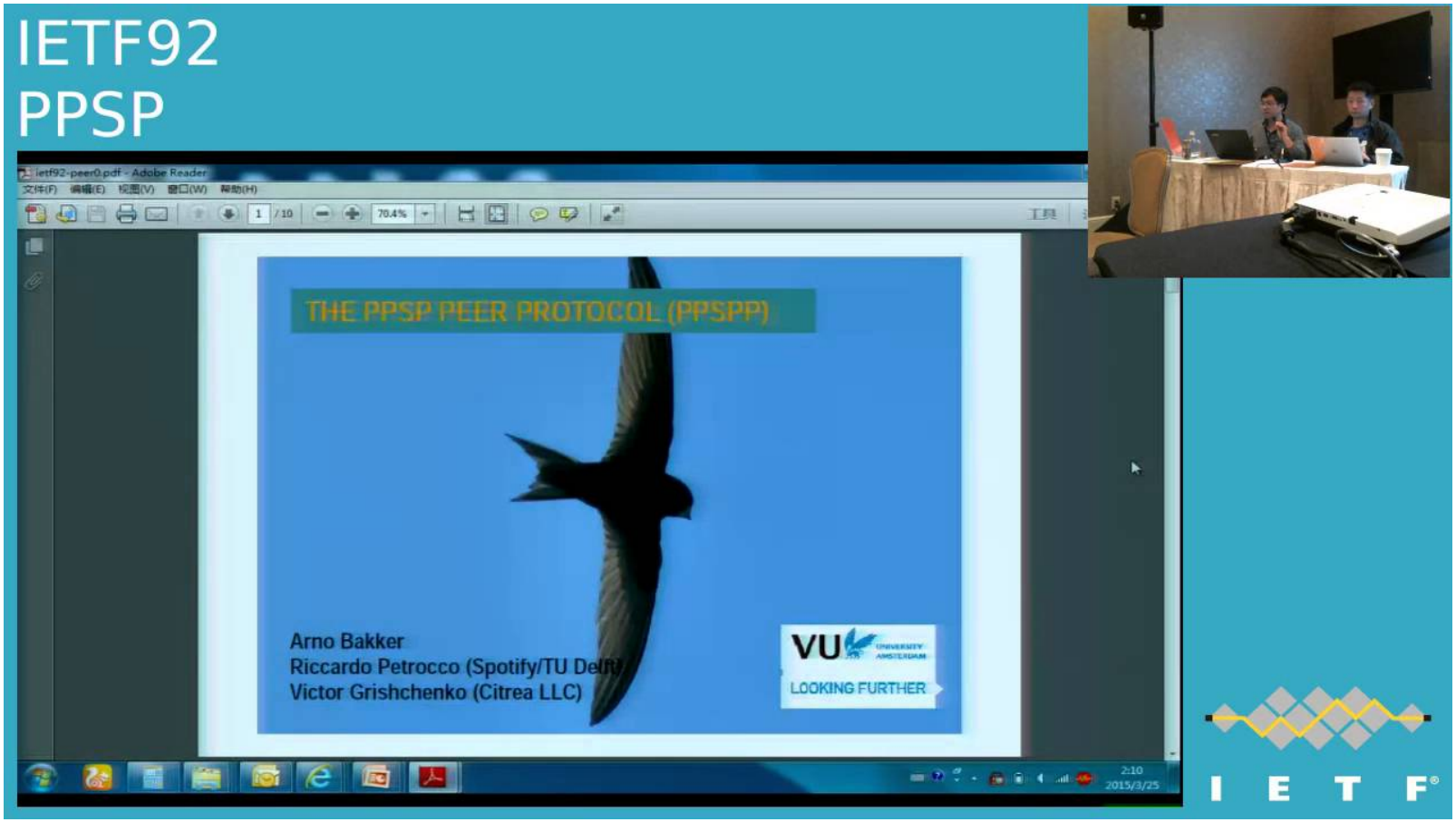


Meetecho: IETF meeting example



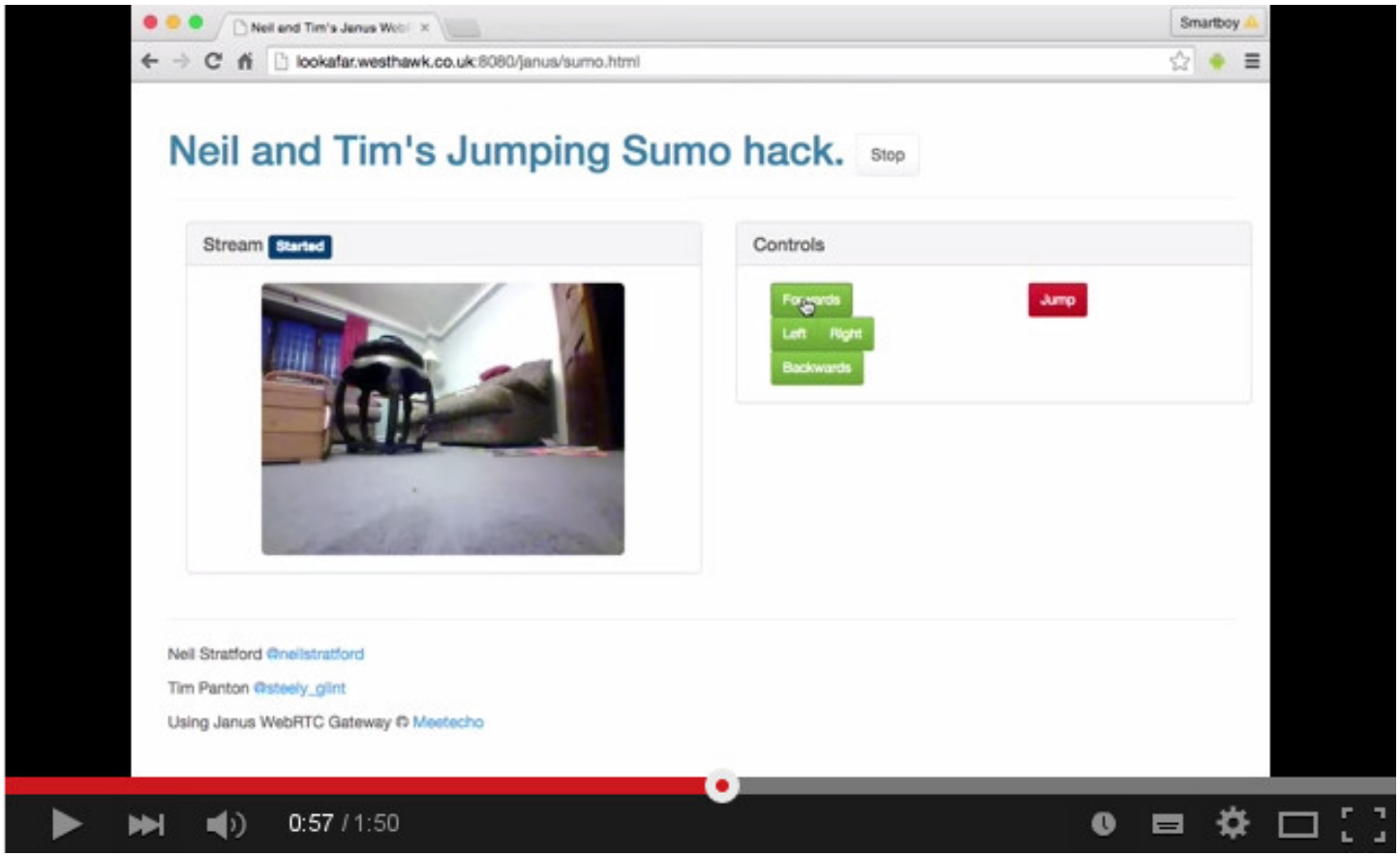
https://ietf.org/meeting/remote-participation.html

Meetecho: IETF recordings



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

A “silly” use case: The Jumping Janus!



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

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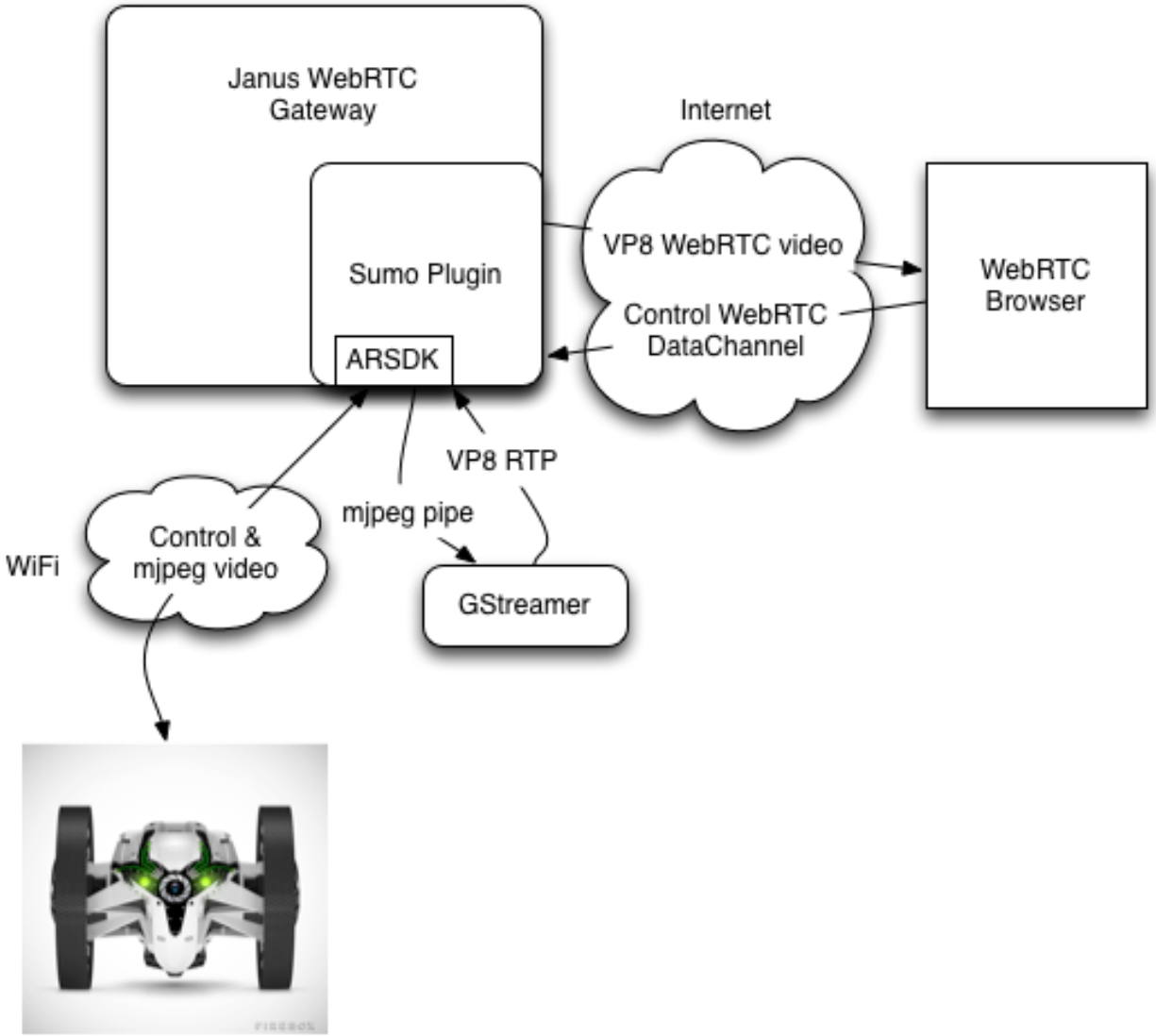

“Matrix wins Best of Show at WebRTC World!”

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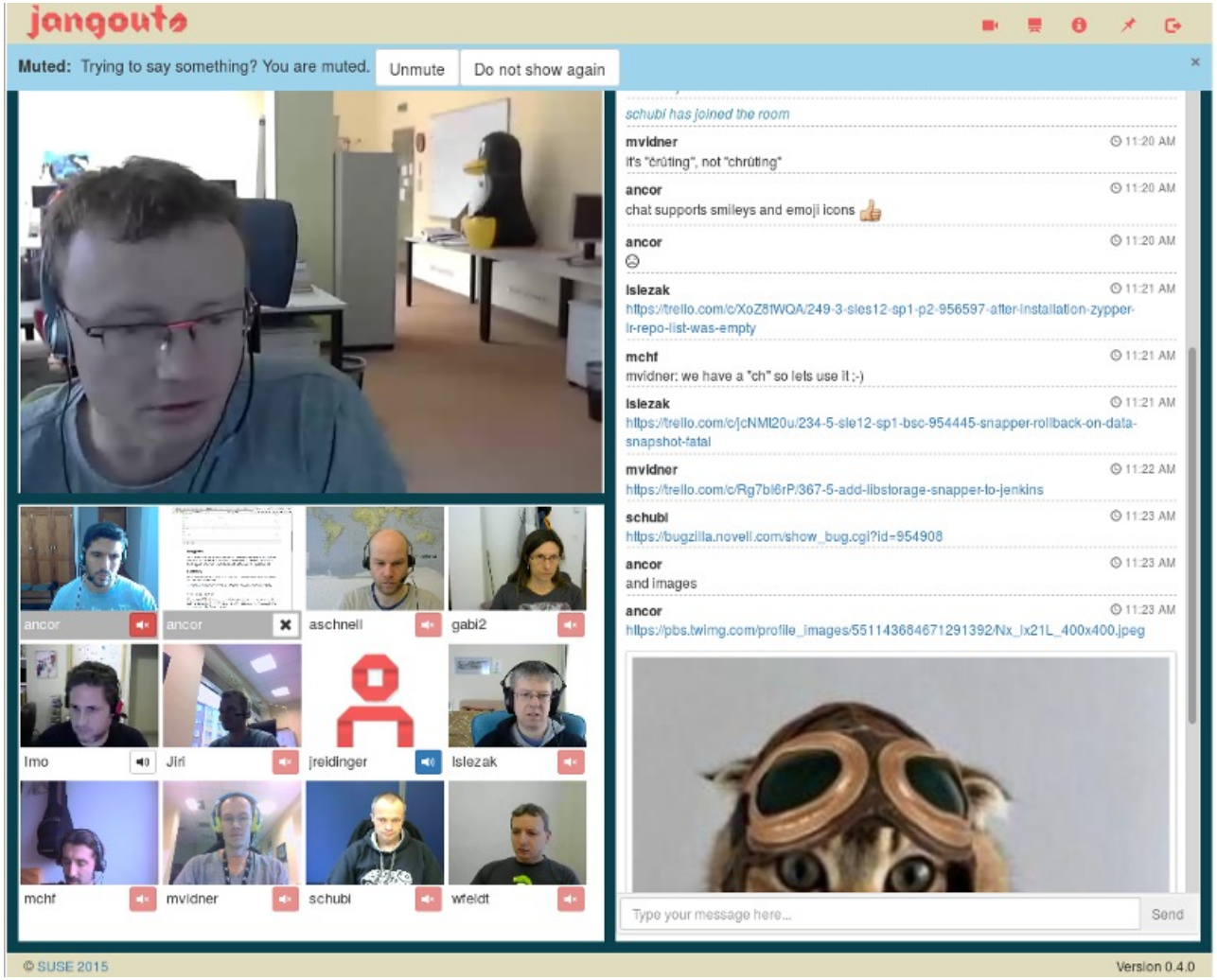
https://www.youtube.com/watch?v=OMzDkIvDS3c

“Matrix wins Best of Show at WebRTC World!”

https://www.youtube.com/watch?v=NpBStIlq6fM

Jangouts (for "Janus Hangouts" ☺)



https://github.com/jangouts/jangouts

SylkServer (more on that later, I guess!)

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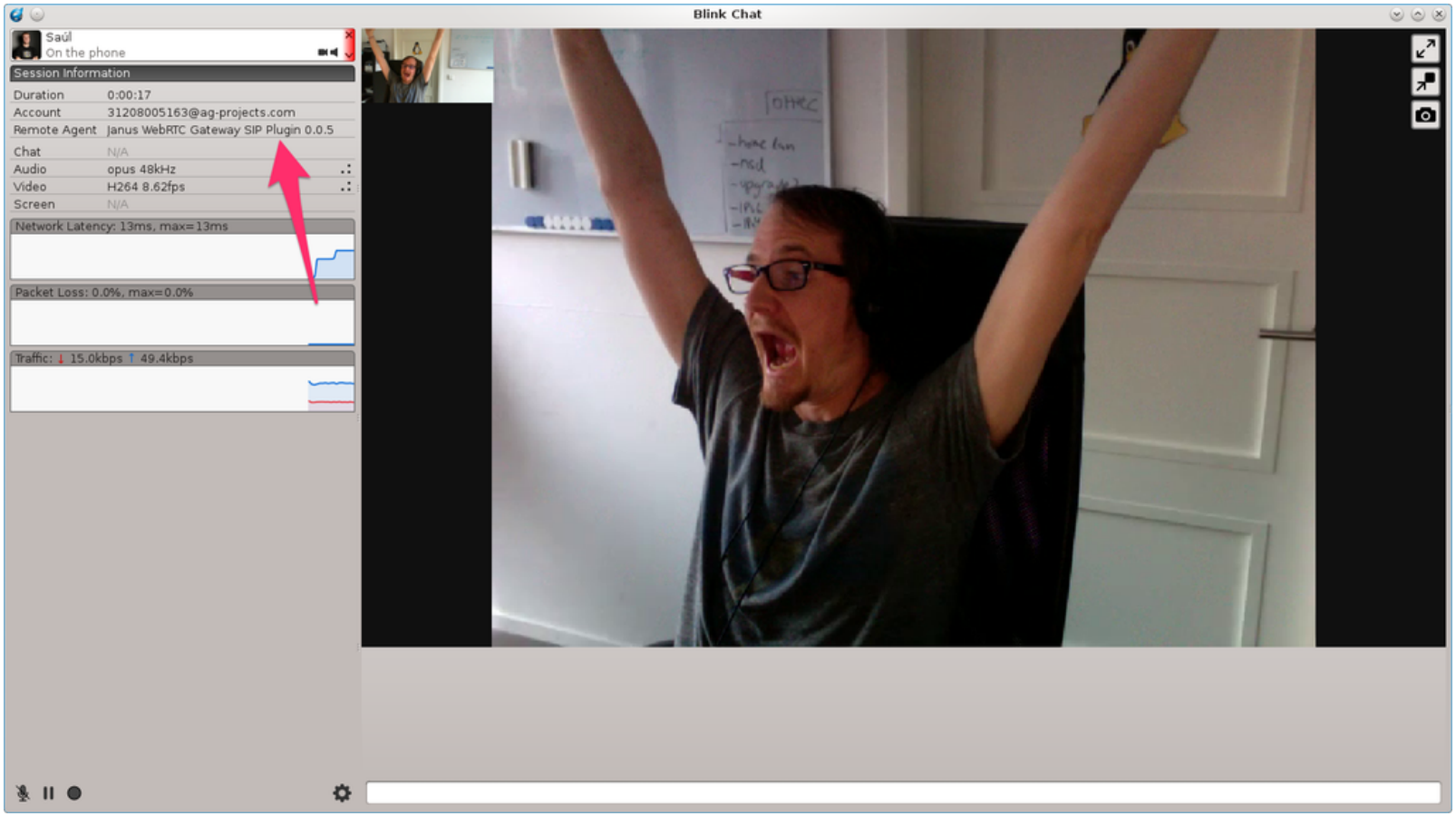
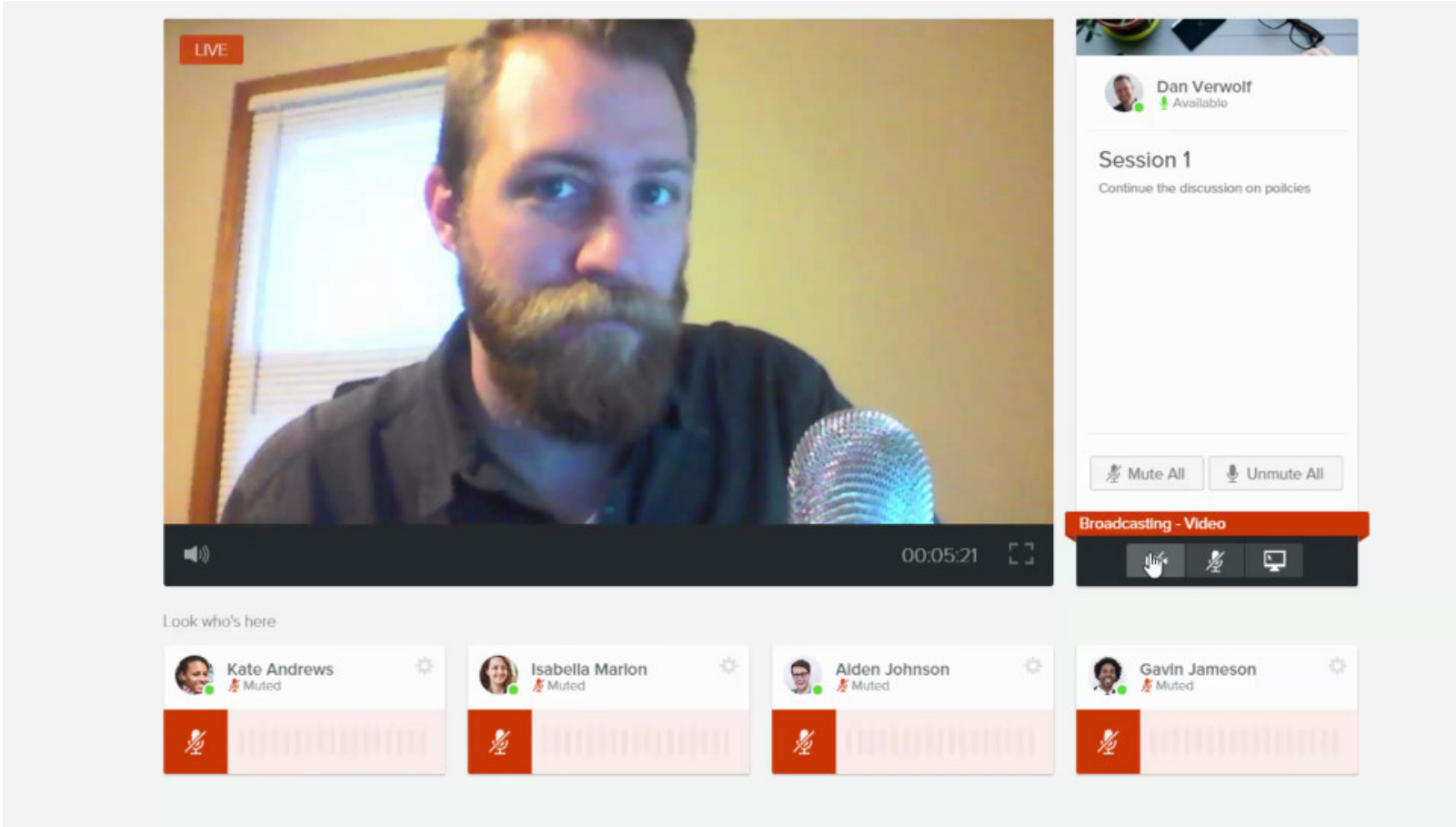


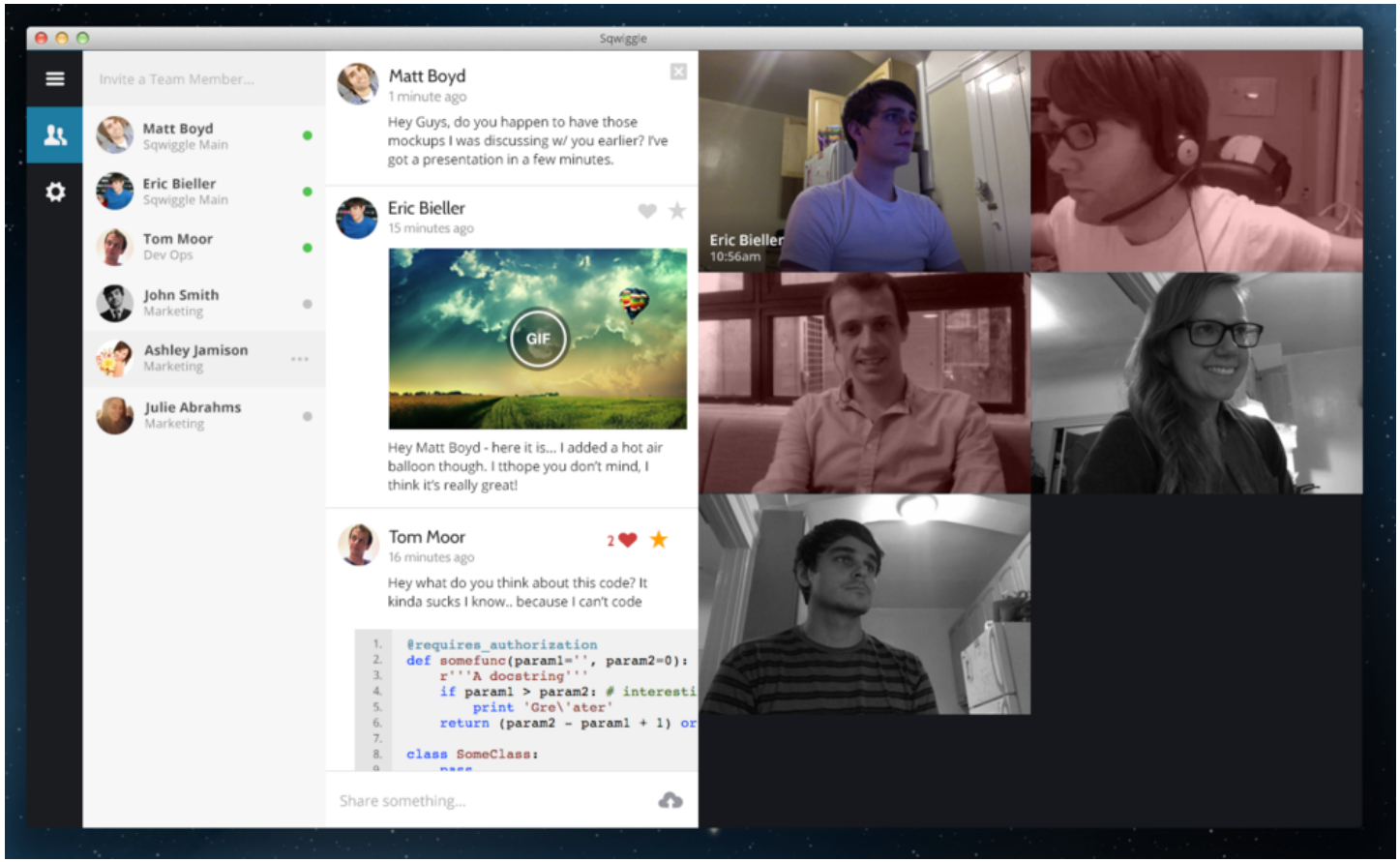
http://sylkserver.com/

Lenovo's AirClass



https://www.airclass.com

Sqwiggle / Speak.io



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

Sqwiggle / Speak.io

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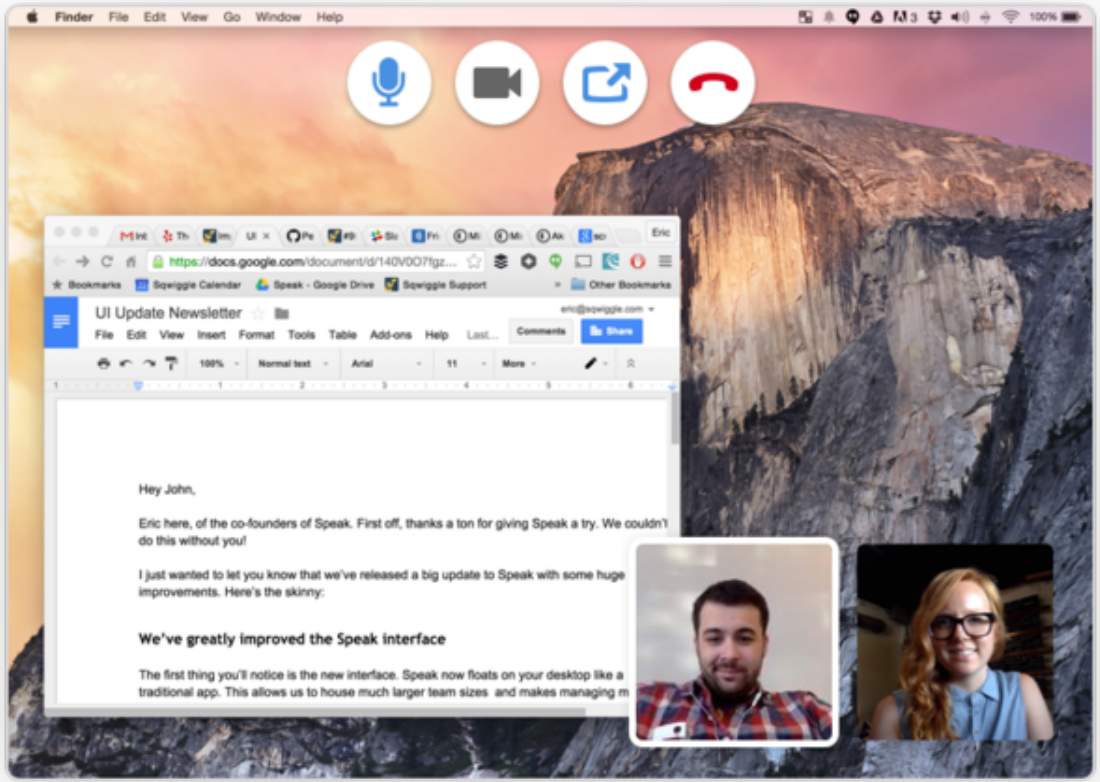
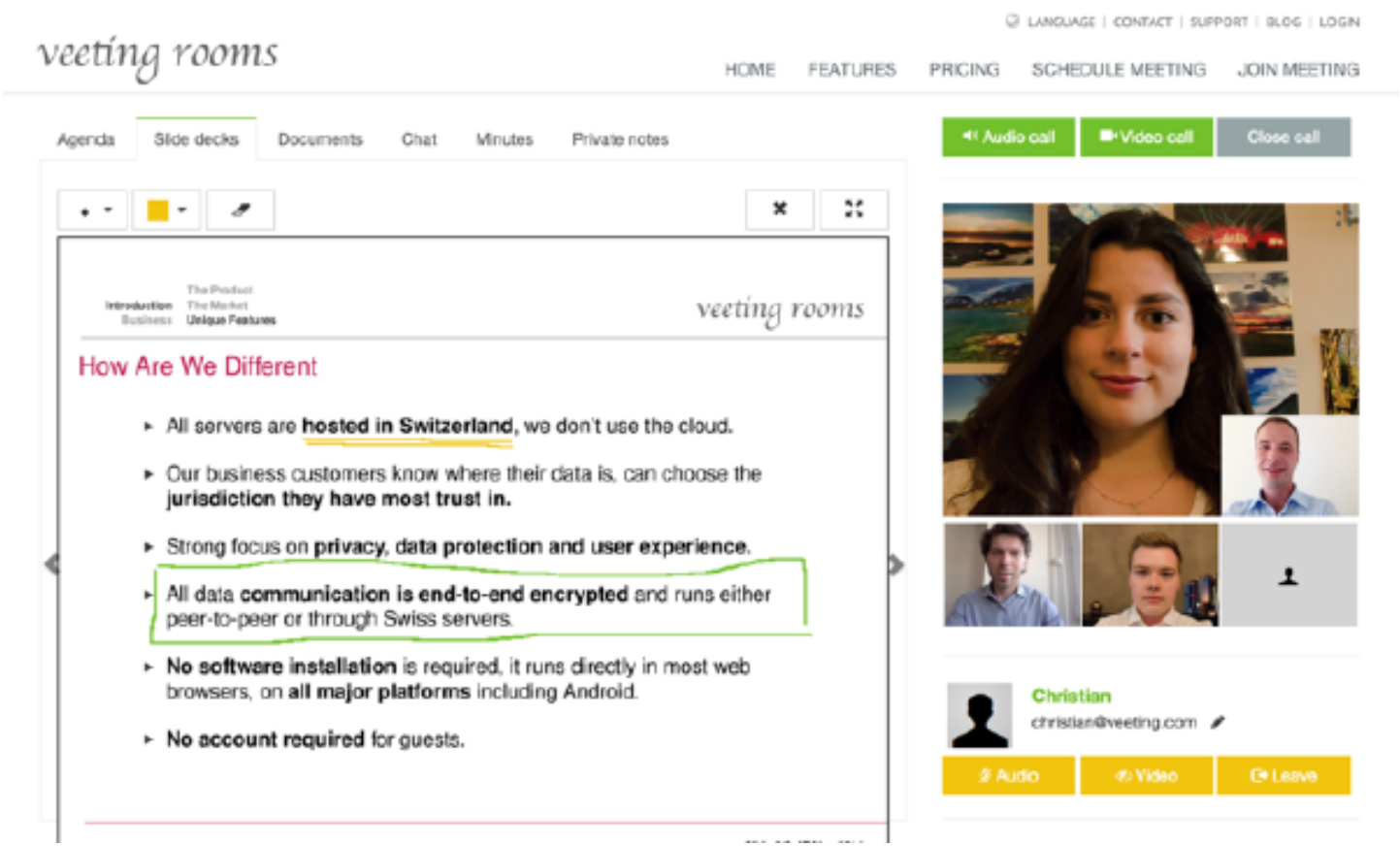


https://www.sqwiggle.com

https://speak.io

Veeting rooms



https://www.veeting.com

What to do next?

- 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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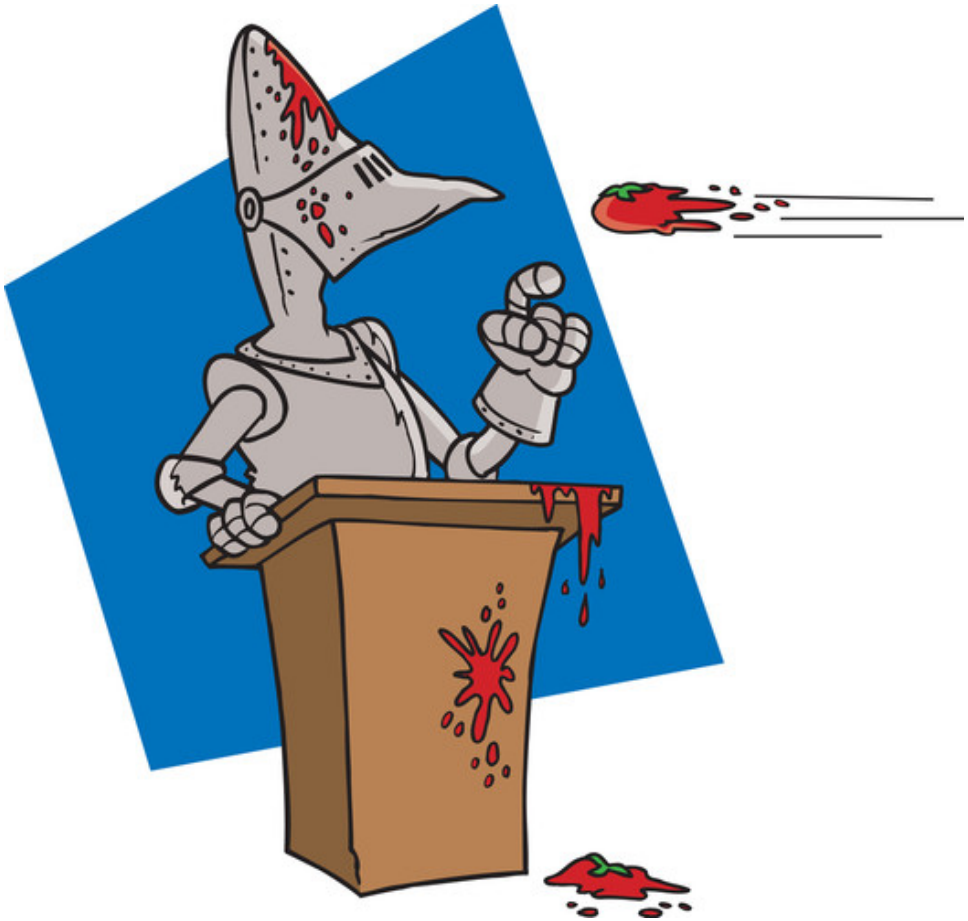
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