

# Real-time audio/video conferences in Linphone thanks to a modern SFU server

presented by Jehan Monnier

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## Presentation



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**Function:** Cofounder of Belledonne Communications  
Involved in Linphone's development since 2010

Belledonne Communications is the company behind  
the **Linphone** project





# Agenda

I. Linphone introduction

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II. Video conference with SIP

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III. Selective Forwarding Unit

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IV. SIP user agent required changes

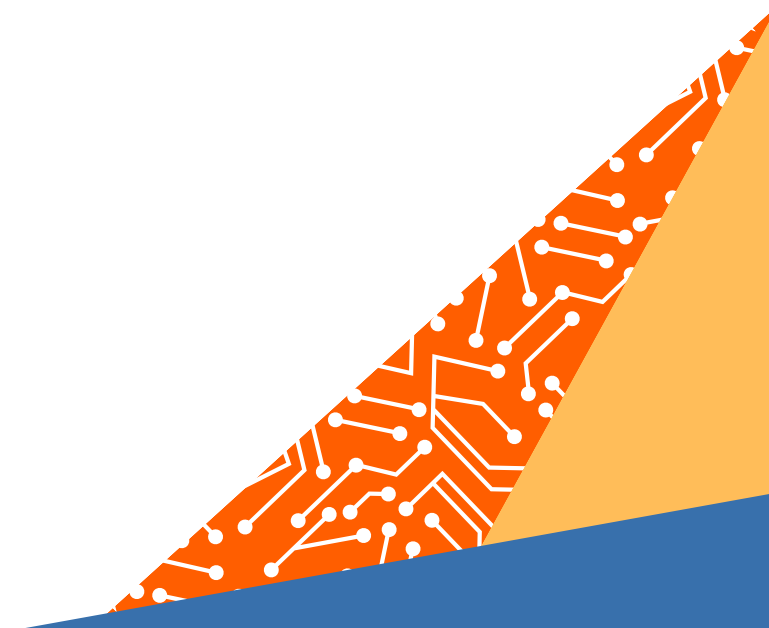
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V. What next

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VI. Conclusion

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# I. LINPHONE INTRODUCTION

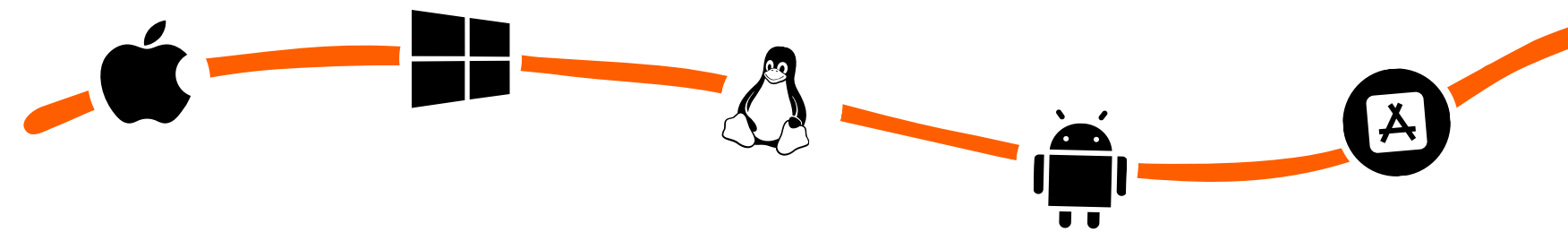




## Quick intro

### Linphone

- Is around since 2001
- Is available on Linux, android, iOS, Windows, Mac
- Uses SIP standards for audio, video and instant messaging
- Secure group messaging using a Signal protocol derivative



### Linphone's team also provides

- Flexisip, an open source SIP Proxy
- A free SIP service [sip.linphone.org](http://sip.linphone.org)

## II. VIDEO CONFERENCE WITH SIP

# Video conference according to IETF and GSMA/RCS specifications

## Session establishment

- SIP methods: INVITE, REFER, BYE between clients and a conference server
- SIP Call Control – Conferencing for User Agents – RFC4579
- Conference Establishment Using Request-Contained Lists in SIP – RFC5366
- Obtaining and Using Globally Routable User Agent URIs (GRUUs) in SIP – RFC5627 : working with multiple devices

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*(someone joined or left the group etc.)*

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  - RTCP mux – RFC8861
  - Bundle mode RFC8108



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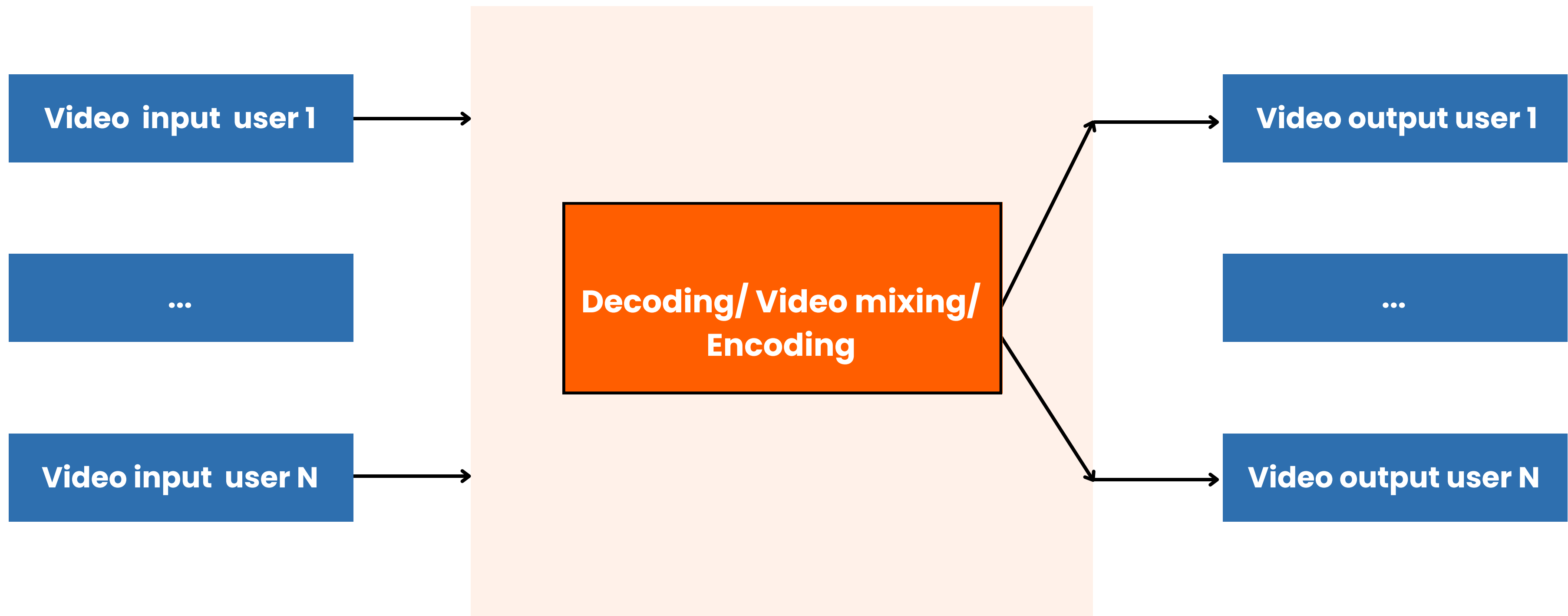
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## Security

- SIPS
- SDP, ZRTP, SRTP-DTLS
- AES 256

## Legacy video Conferencing serveur



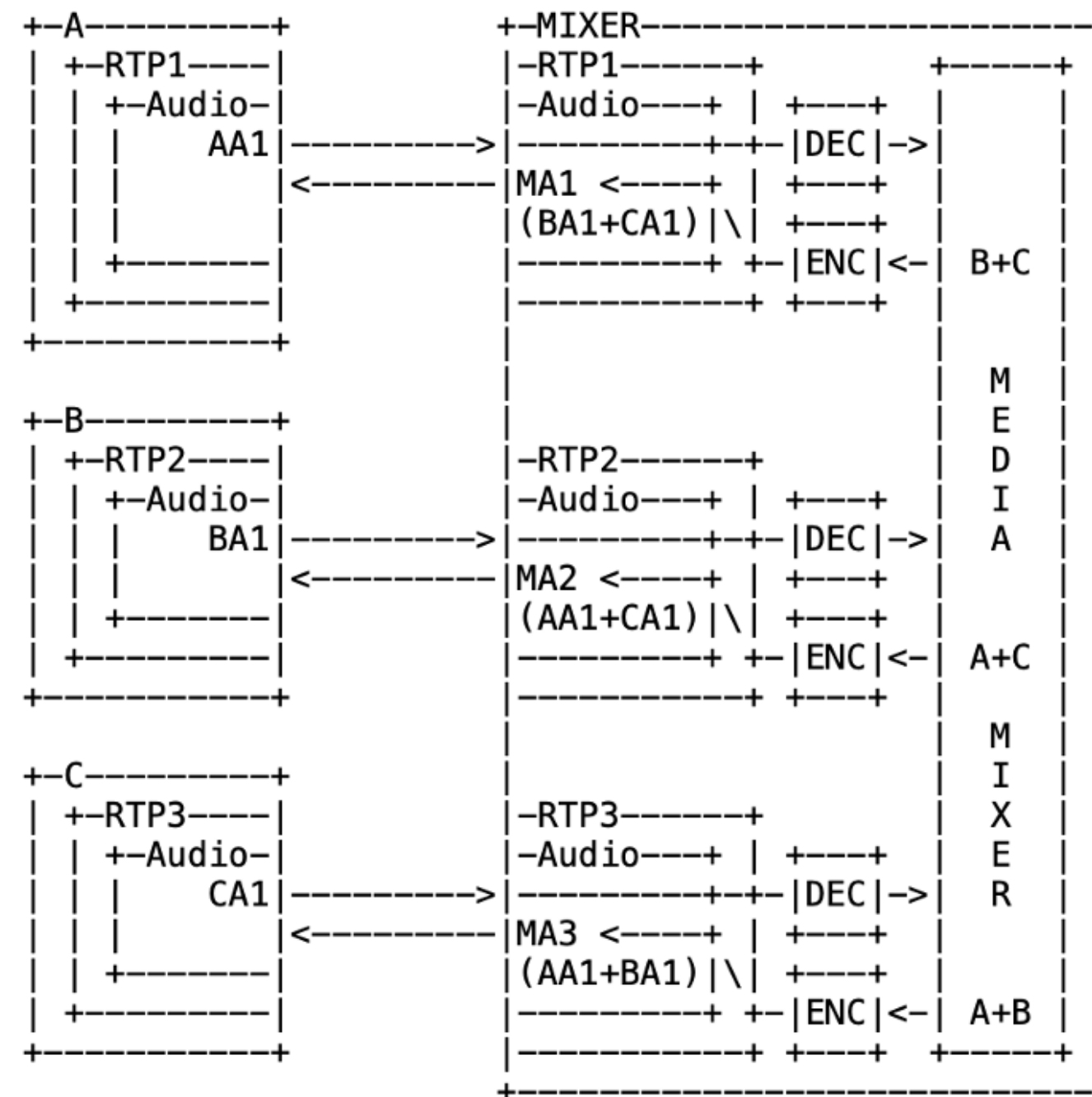


Figure 15: Session and SSRC Details for Media Mixer

## Pros and Cons

- **Pros**

- No changes required client side compared to regular call

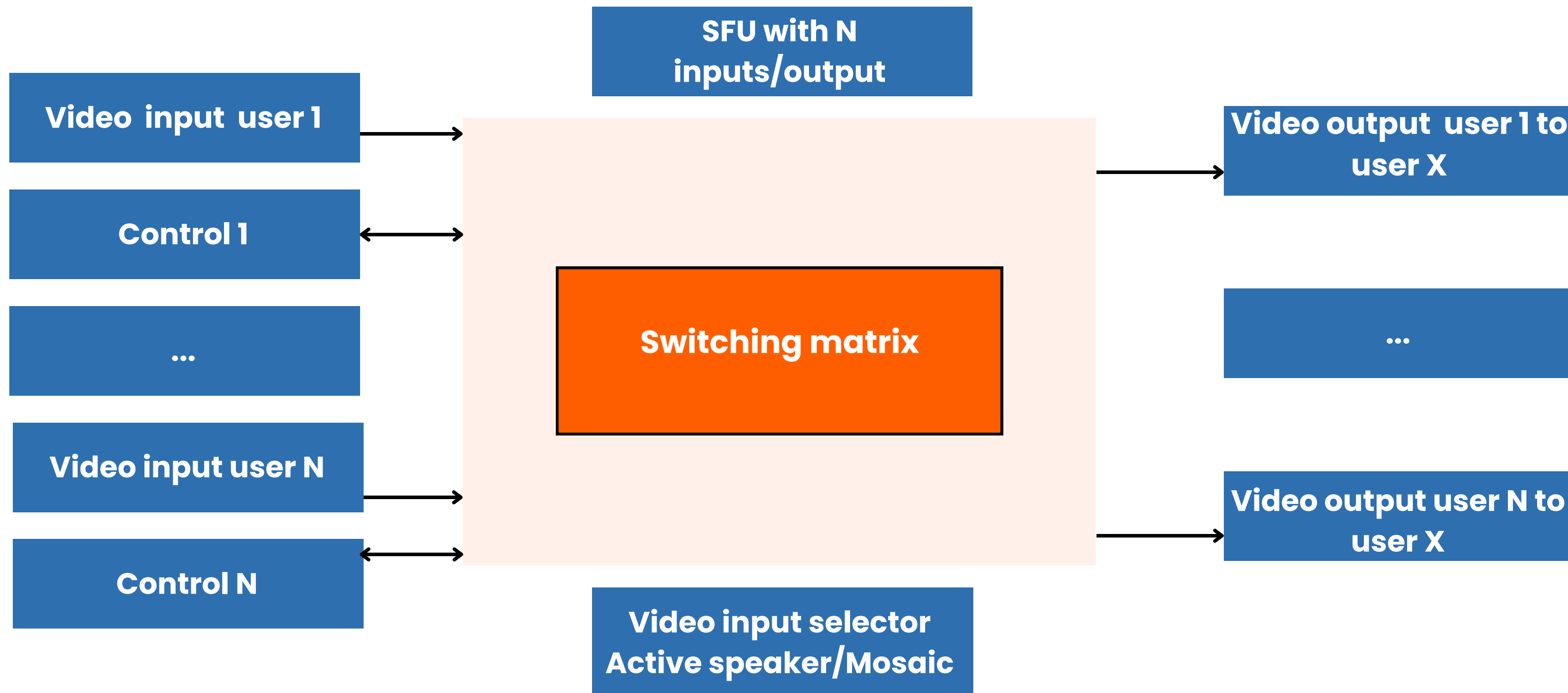
- **Cons**

- Video layout defined server side
- Huge cpu resource consumption server side
- No possible e2e encryption

### **III. SELECTIVE FORWARDING UNIT**



## Selective forwarding Unit



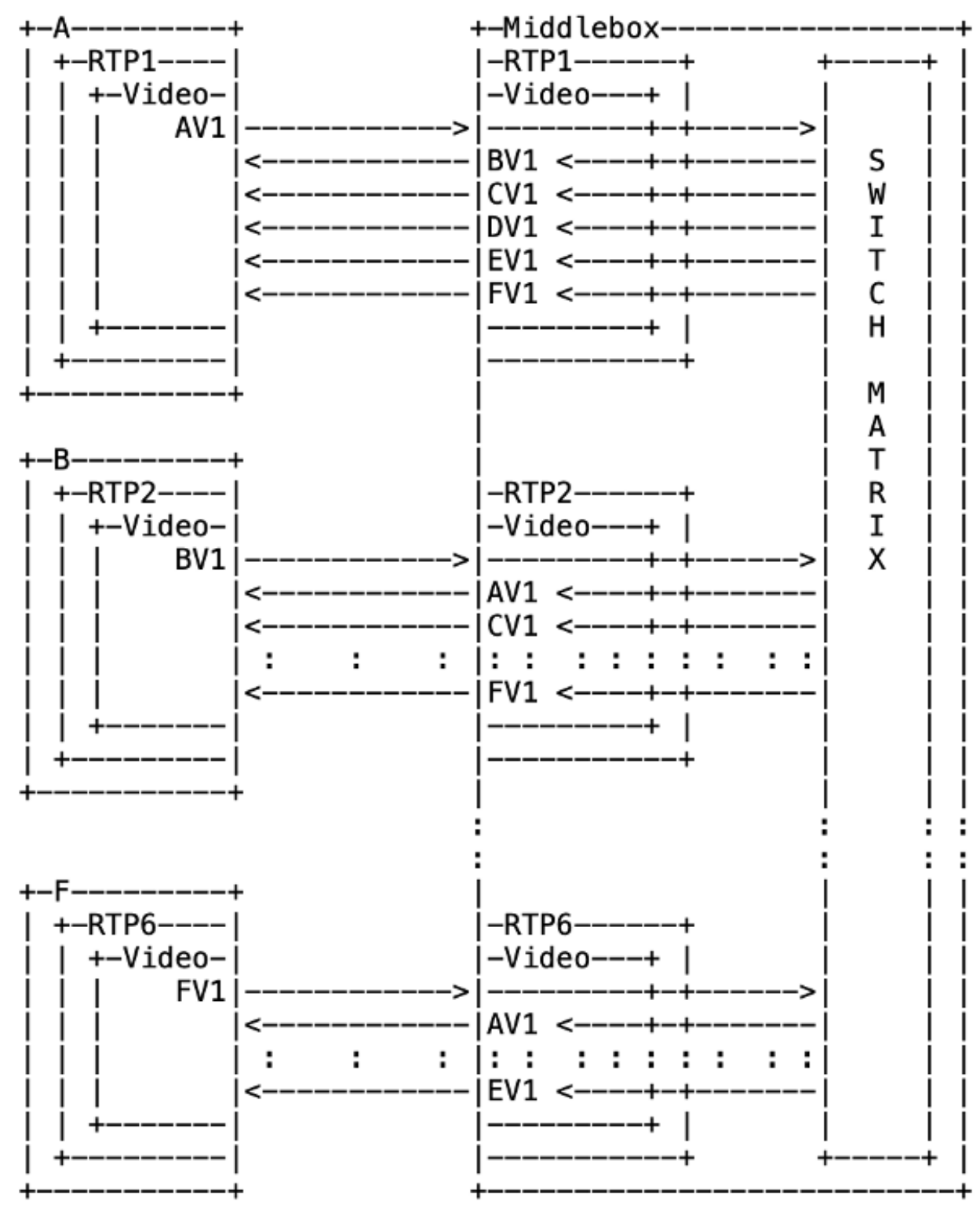


Figure 17: Selective Forwarding Middlebox

## Pros and Cons

- **Pros**

- Video layout defined client side.
- Low cpu footprint server side.
- Allow e2e encryption

- **Cons**

- Requires multi stream management client side

## **IV. SIP USER AGENT CHANGES**

## SIP User Agent changes

- Multi streams requirements
  - Needs for encoding multiple video stream (Main + thumbnails) or to use multi layered video compressor like H264 AVC/VP9
  - Need for decoding multiple video stream, one per conference participants



## Sample SDP server side

- v=0
- o=conference-focus 887 2965 IN IP4 5.135.31.161
- a=group:BUNDLE as vs vsBa9vMejlr vs39~J4bdS7
- m=audio 35906 RTP/AVP 96 97 101
- a=rtpmap:96 opus/48000/2
- a=rtcp-mux
- a=mid:as
- a=extmap:1 urn:ietf:params:rtp-hdext:sdes:mid
- a=extmap:3 urn:ietf:params:rtp-hdext:csrc-audio-level
- a=extmap:2 urn:ietf:params:rtp-hdext:ssrc-audio-level  
vad=off
- a=candidate:1 1 UDP 2130706303 5.135.31.161 35906 typ  
host
- m=video 0 RTP/AVP 96
- a=rtpmap:96 VP8/90000
- a=recvonly
- a=mid:vs
- a=bundle-only
- a=rtcp-fb:\* ccm tmmbr
- a=label:Ba9vMejlr
- a=content:main
- m=video 0 RTP/AVP 96
- a=rtpmap:96 VP8/90000
- a=recvonly
- a=label:Ba9vMejlr
- a=content:thumbnail
- m=video 0 RTP/AVP 96
- a=rtpmap:96 VP8/90000
- a=sendonly
- a=label:39~J4bdS7

## How to test

Testing server compatible with **RFC4579** is available at:

**`sip:videoconference-factory@sip.linphone.org`**

Linphone client above **5.X** can be used



## V. CONCLUSION



## Possible Evolutions

- XCON for advanced conferencing management
- E2E encryption thanks to SFU
- Web client compatibility with Webrtc



# Linphone Conferencing software



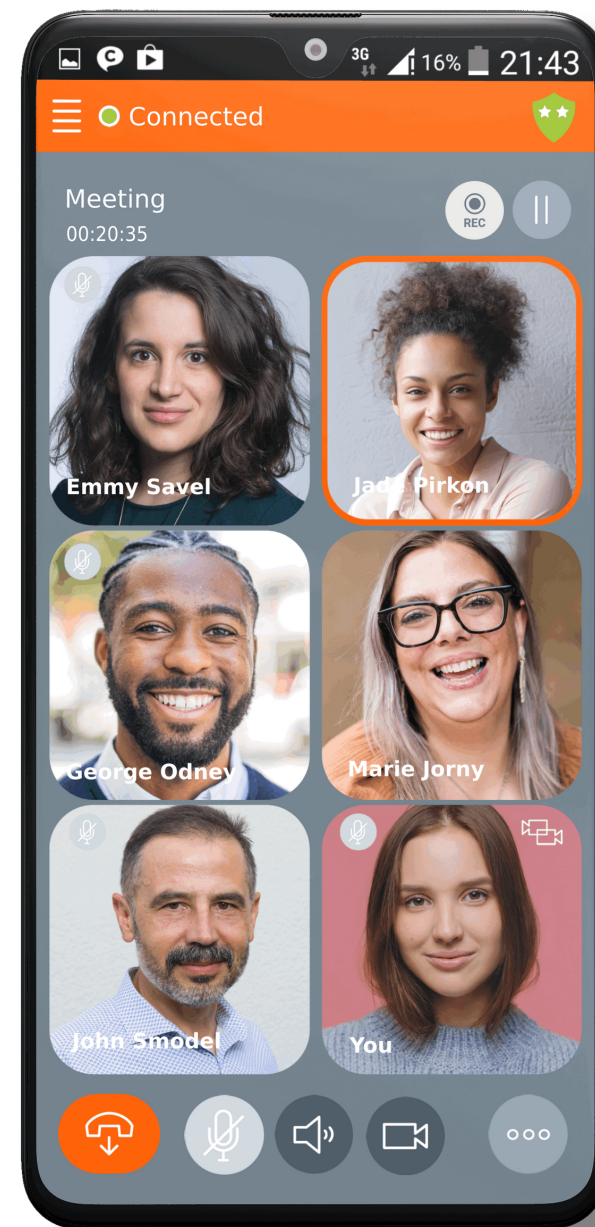
- **3 display modes**
- Meeting scheduling with invitation sending
- Modern open-source video **conferencing solution** based on SIP
- Easy scalability with server-side stream selection (**SFU**)





## Useful links

- **Linphone website:** <https://www.linphone.org>
- **Mediastreamer2:** <https://www.linphone.org/technical-corner/mediastreamer2-ortp>
- **Conference-server:**  
<https://wiki.linphone.org/xwiki/wiki/public/view/Flexisip/A.%20Configuration%20Reference%20Guide/master/conference-server>
- **Linphone Features:** <https://www.linphone.org/features>
- **Linphone on gitlab:** [gitlab.linphone.org](https://gitlab.linphone.org)



**Thank you!**

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**Do you have any  
questions ?**

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