HTML5 WebRTC

The New Real-Time Web

Markus Konrad <post@mkonrad.net>

2013-07-09

Structure

- What is WebRTC?
- Peer to Peer Networks
- Architecture & Features
- APIs
- Libraries
- Practical example
- Conclusion

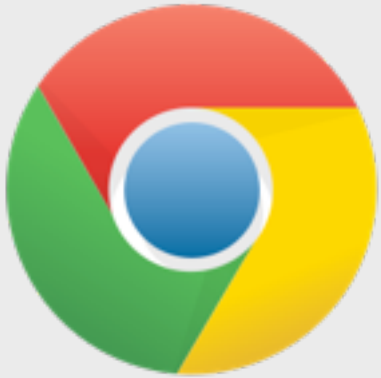
WebRTC implementations are still

experimental.

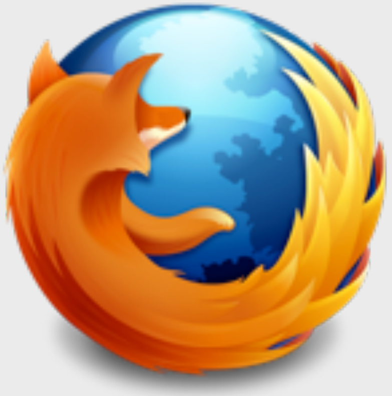
What is WebRTC?

- **R**eal **T**ime **C**ommunication
  - Voice Calling
  - Video Chat (also: Webcam access)
  - Data exchange
  - File Sharing
  - **Plugin-less!**
- W3C Working Draft
  - Mozilla & Google vs. Microsoft (CU-RTC)

Browser Support



≥ 26

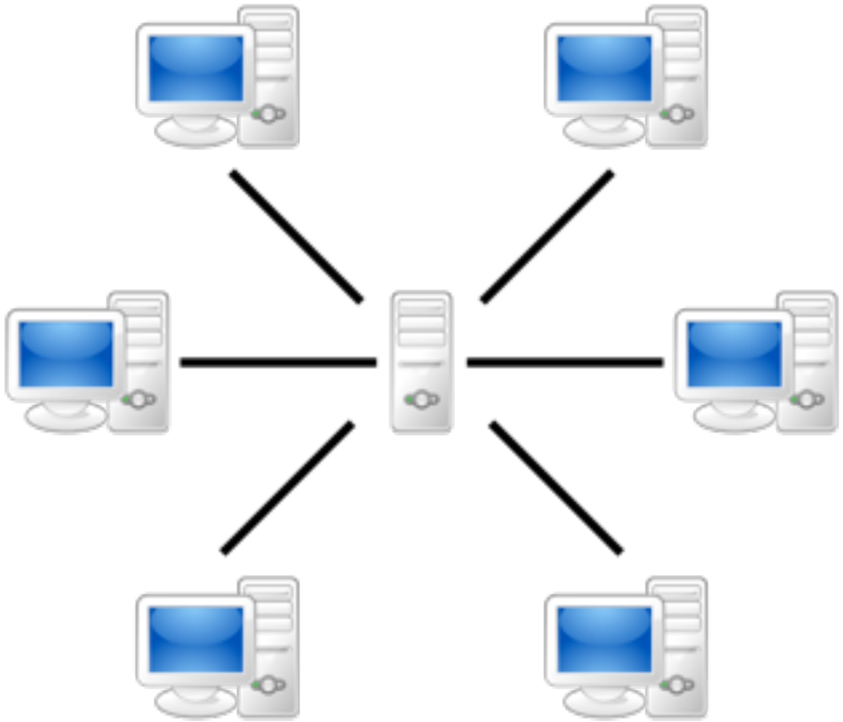


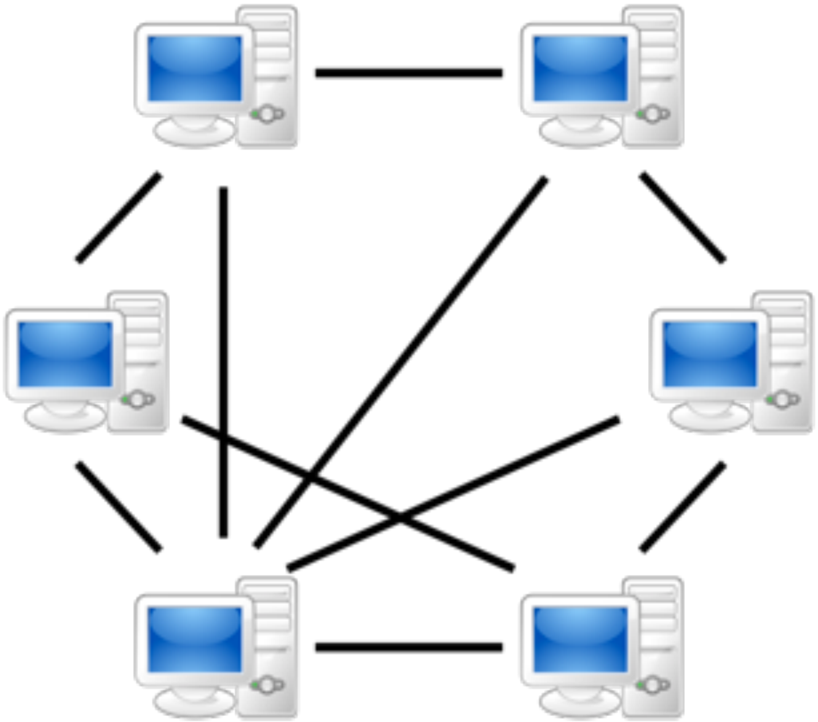
≥ 22

Peer to Peer

- vs.-

Client-Server

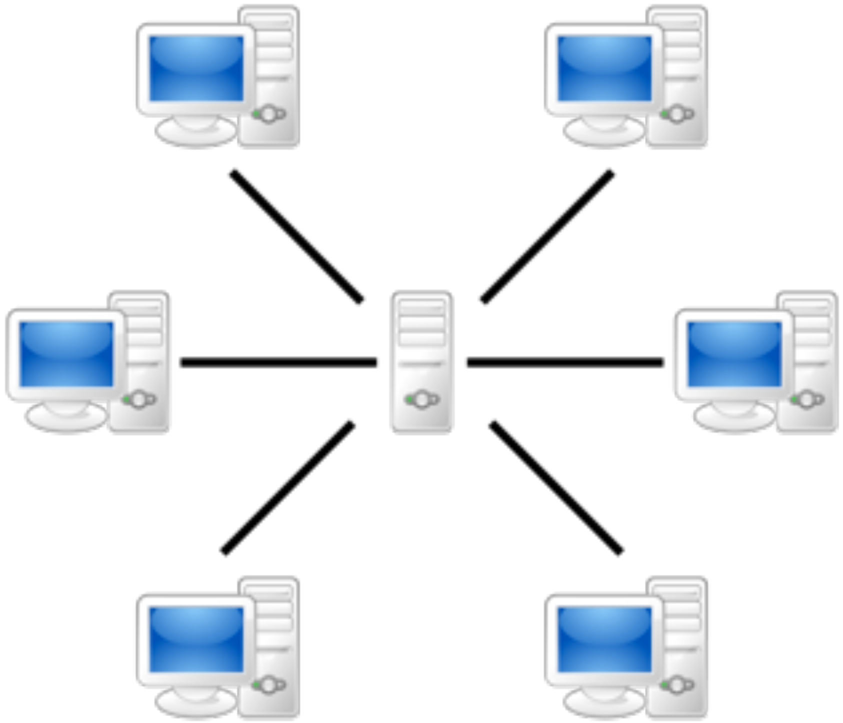




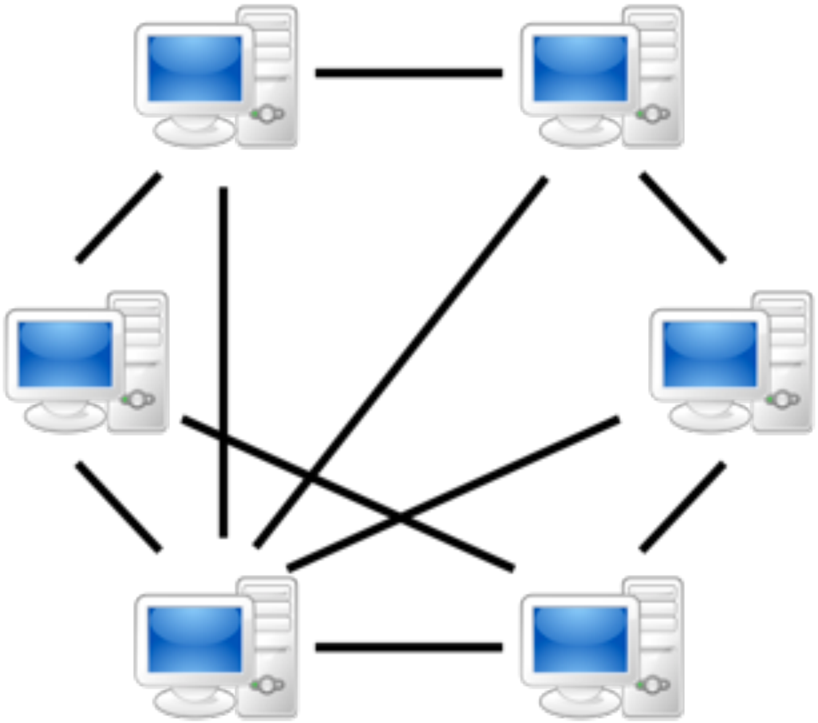
Peer to Peer

- vs.-

Client-Server



Client-Server



Peer To Peer

Peer to Peer Networks

- Peers are ...
  - ... equally privileged
  - ... both suppliers and consumers

Advantages	Disadvantages
lowest possible latency	needs „mesh“ topology
more peers: more capacity, less failure	less peers: less capacity, more failure
no *single point of failure*	might need brokering (signaling) server
no control about exchanged data	no control about exchanged data

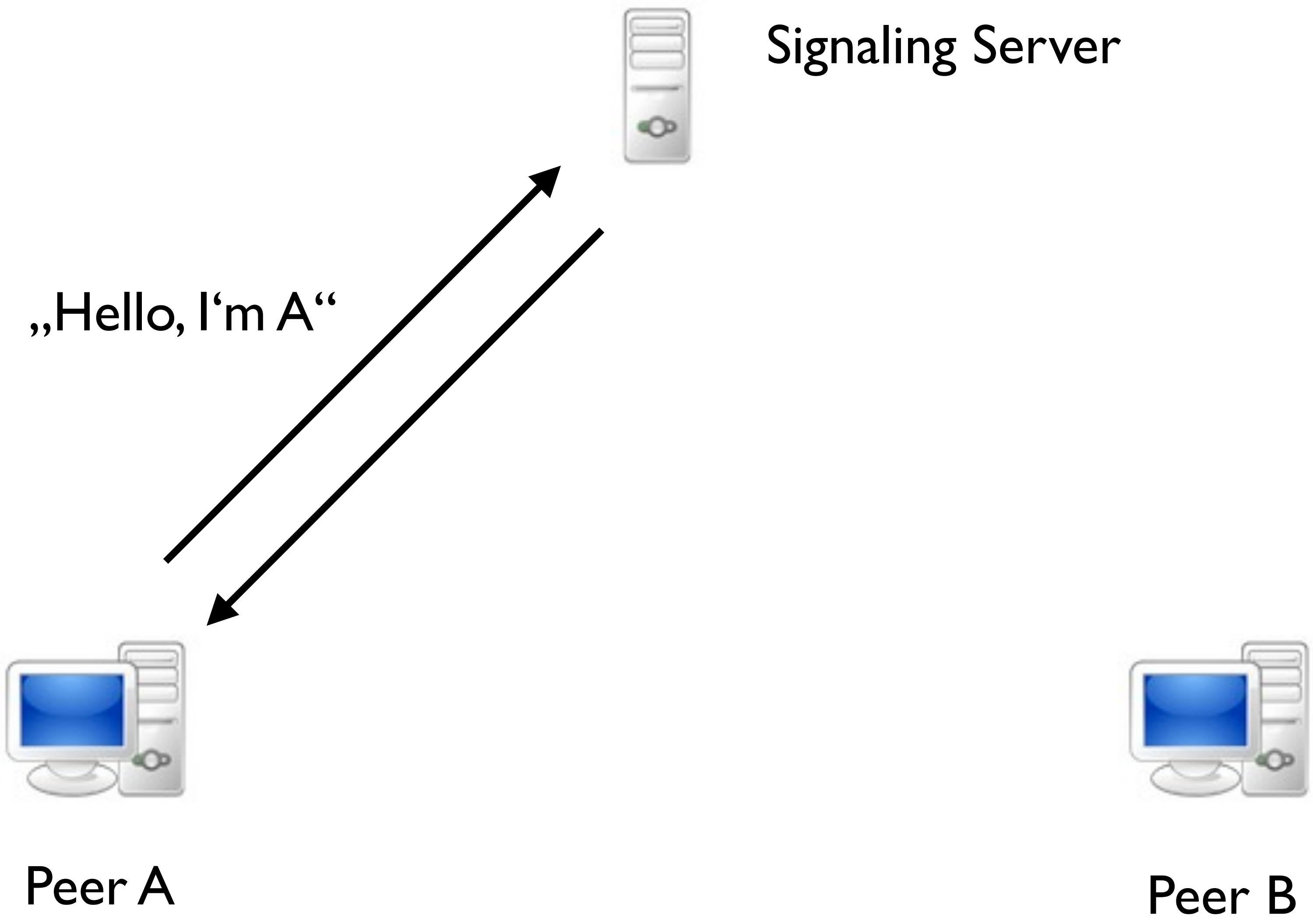
Peer Signaling

Signaling Server

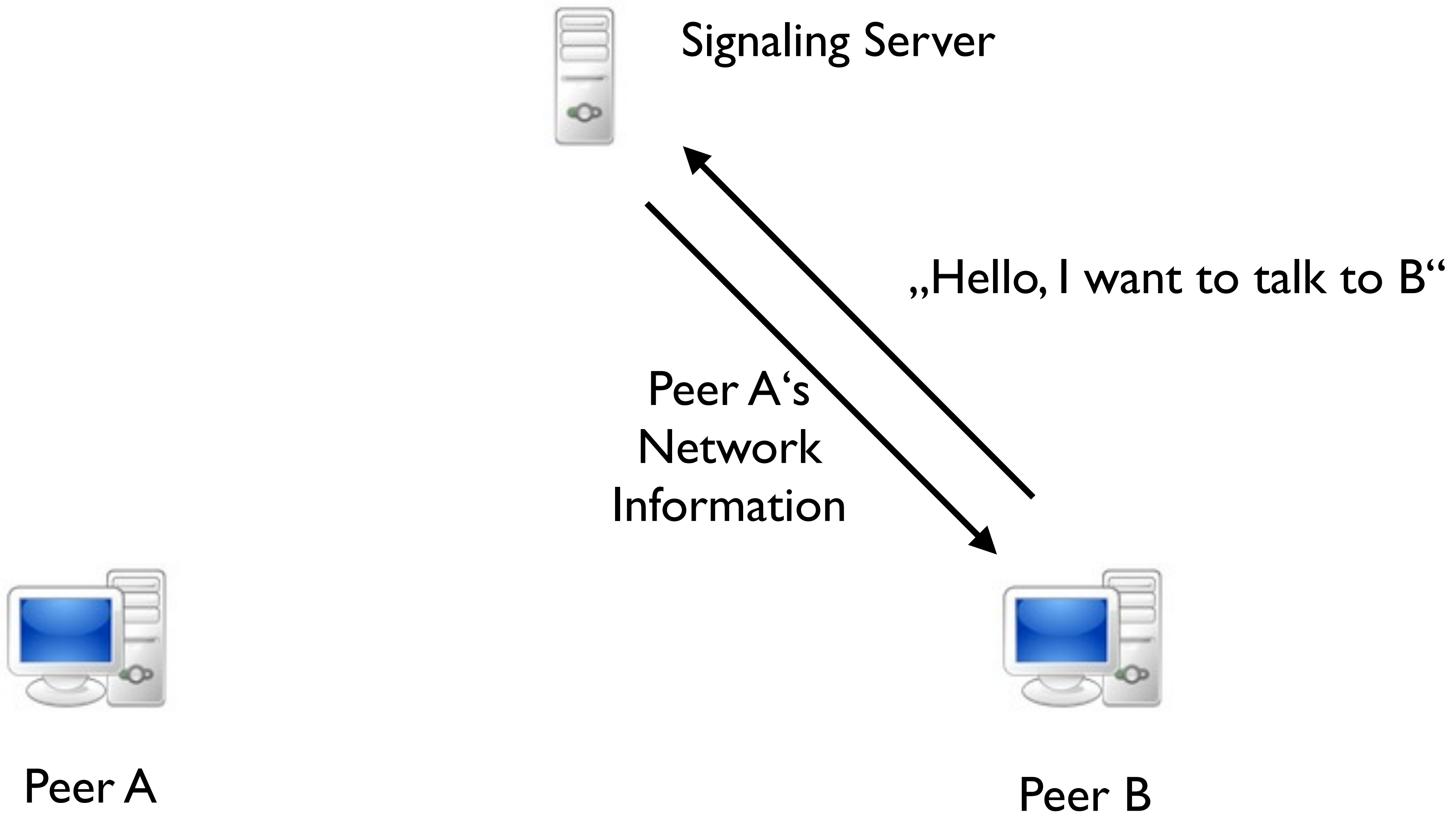
Peer A

Peer B

Peer Signaling



Peer Signaling



Signaling Server

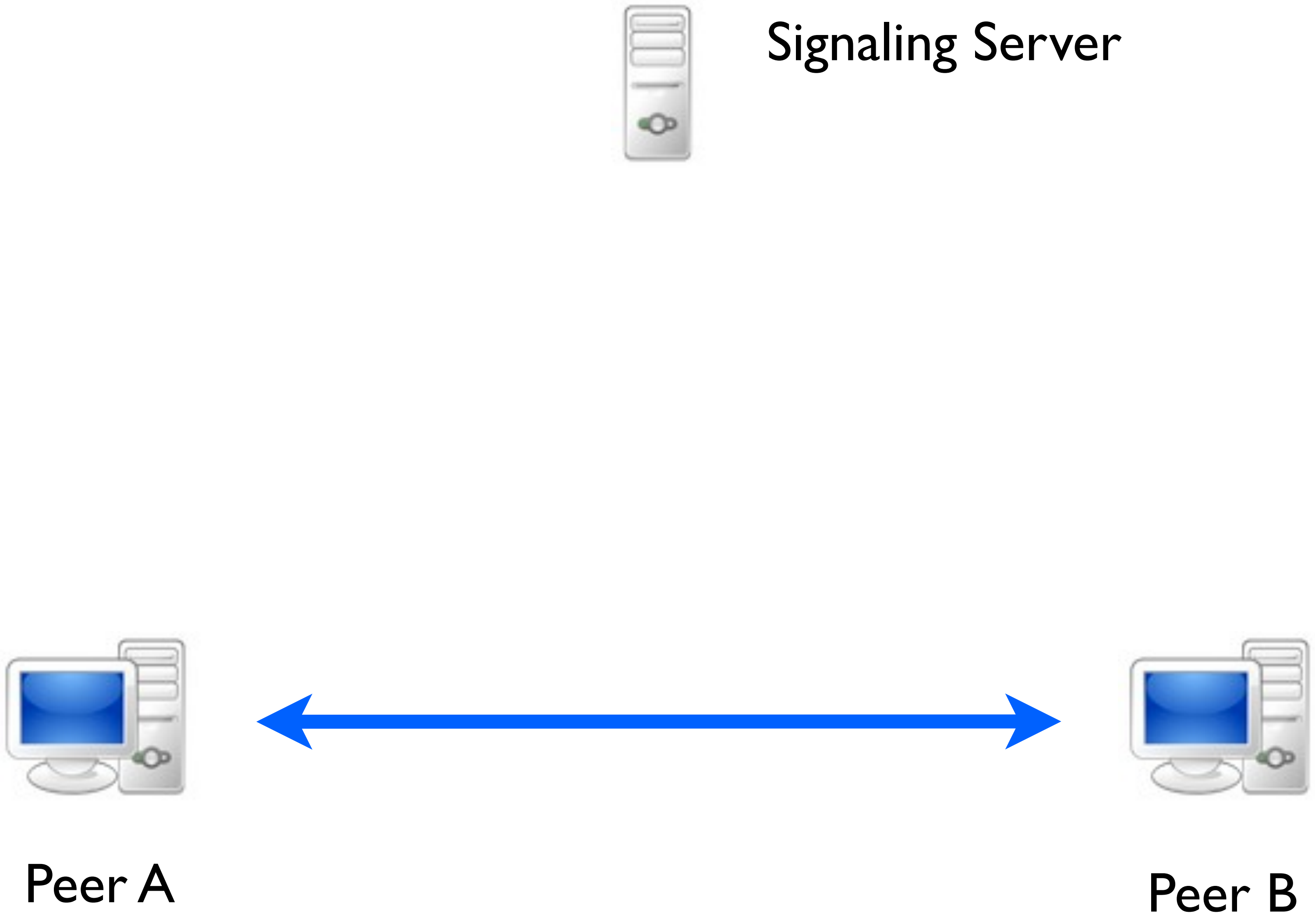
„Hello, I want to talk to B“

Peer A‘s Network Information

Peer A

Peer B

Peer Signaling

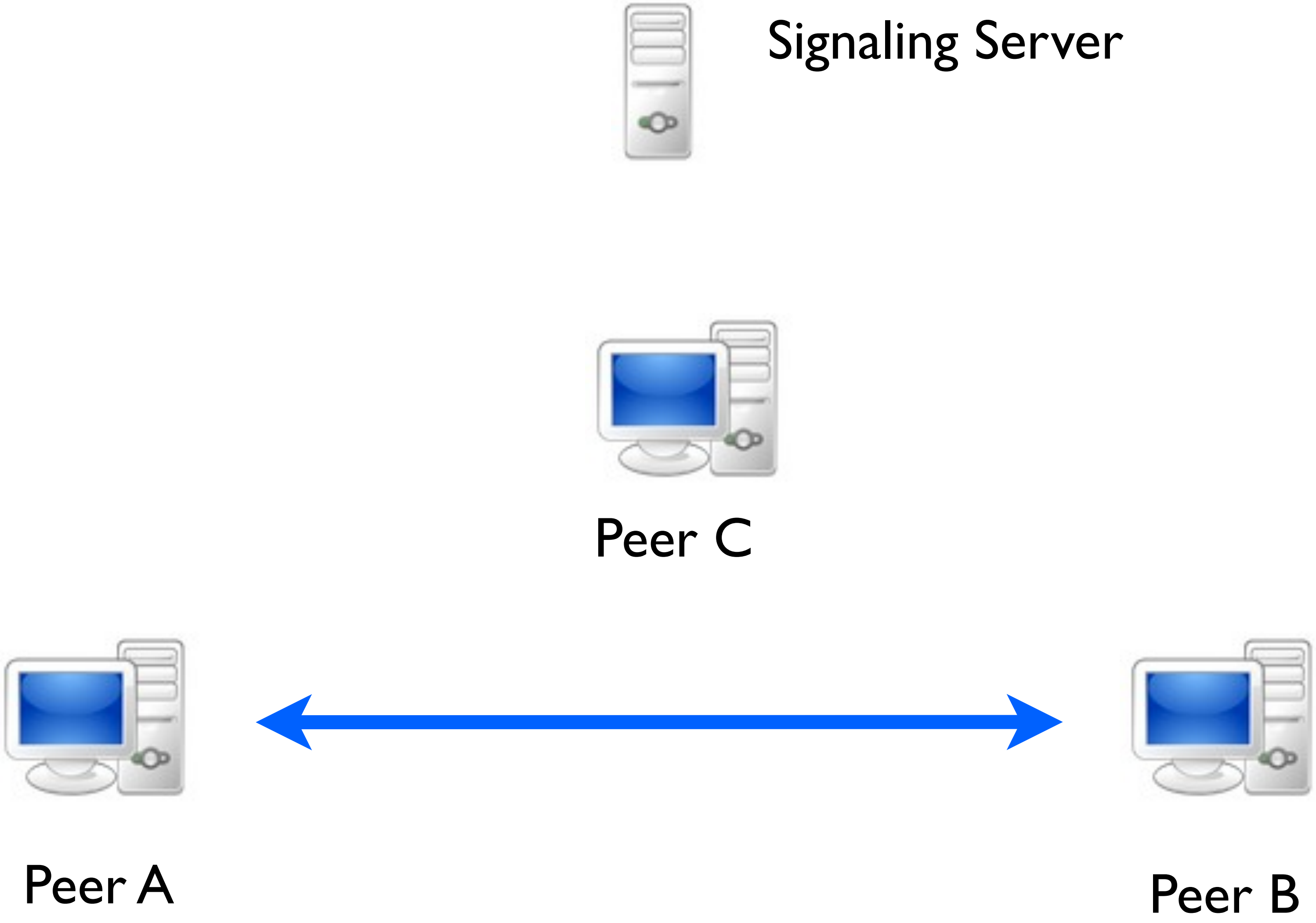


Signaling Server

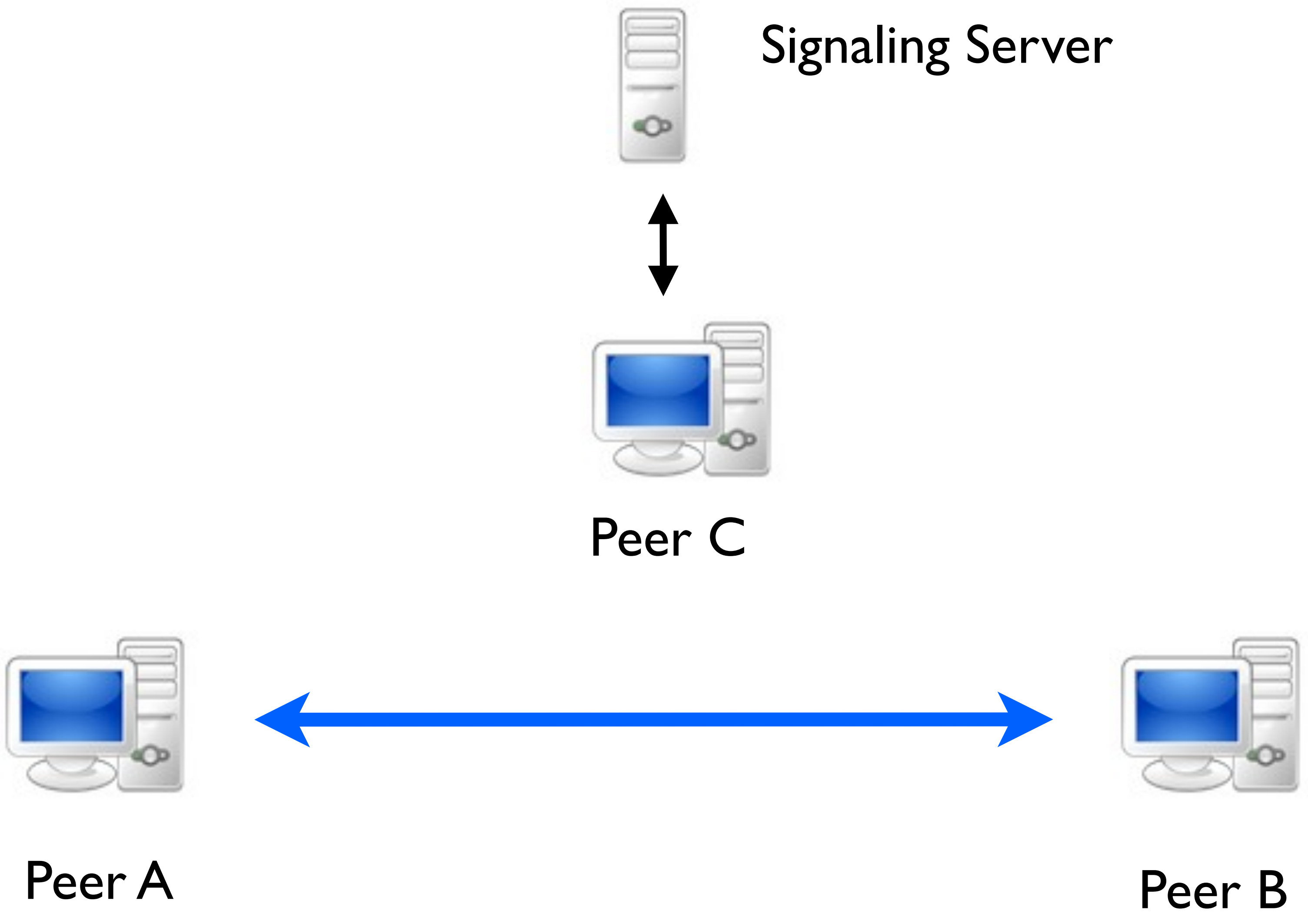
Peer A

Peer B

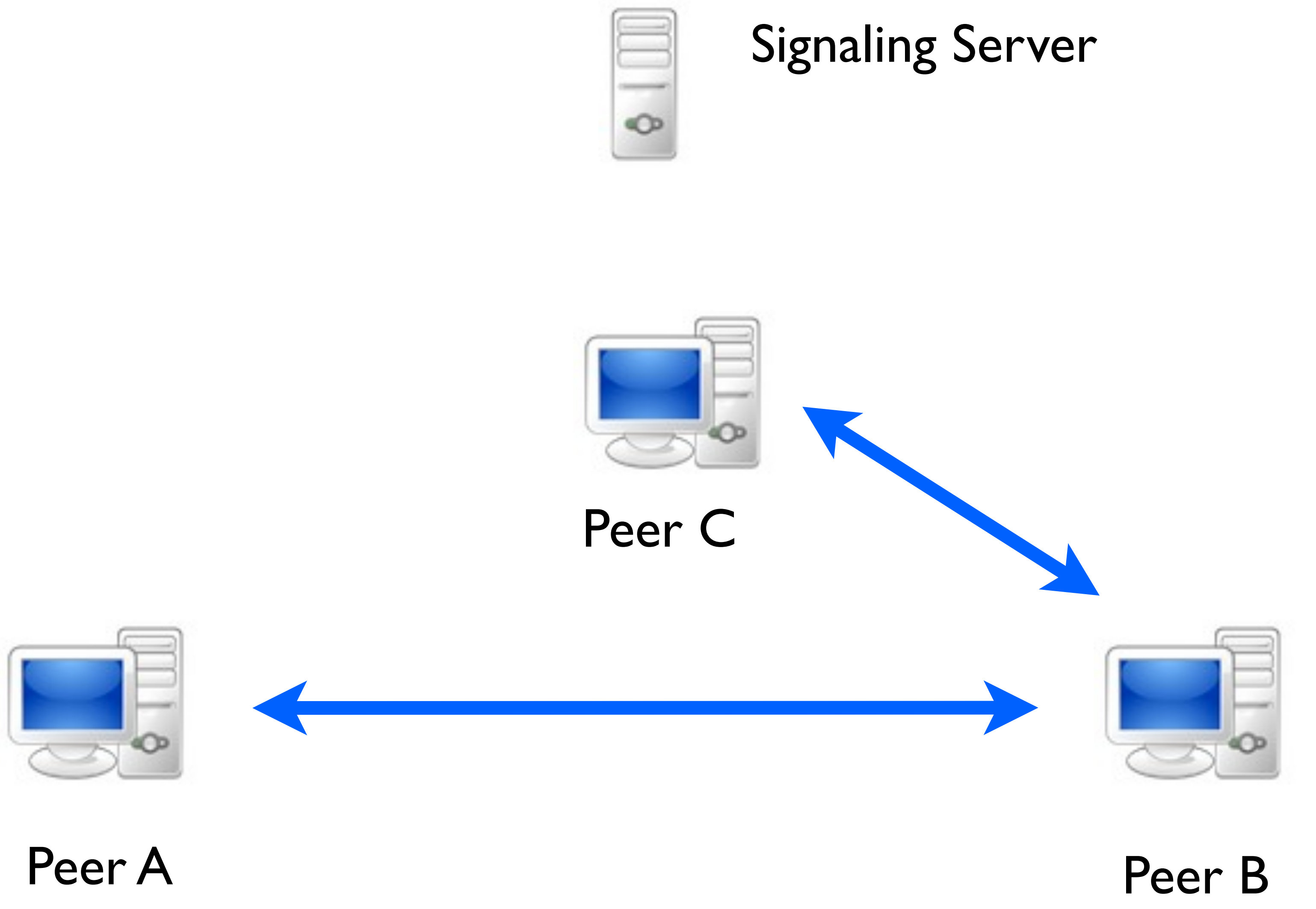
Peer Signaling



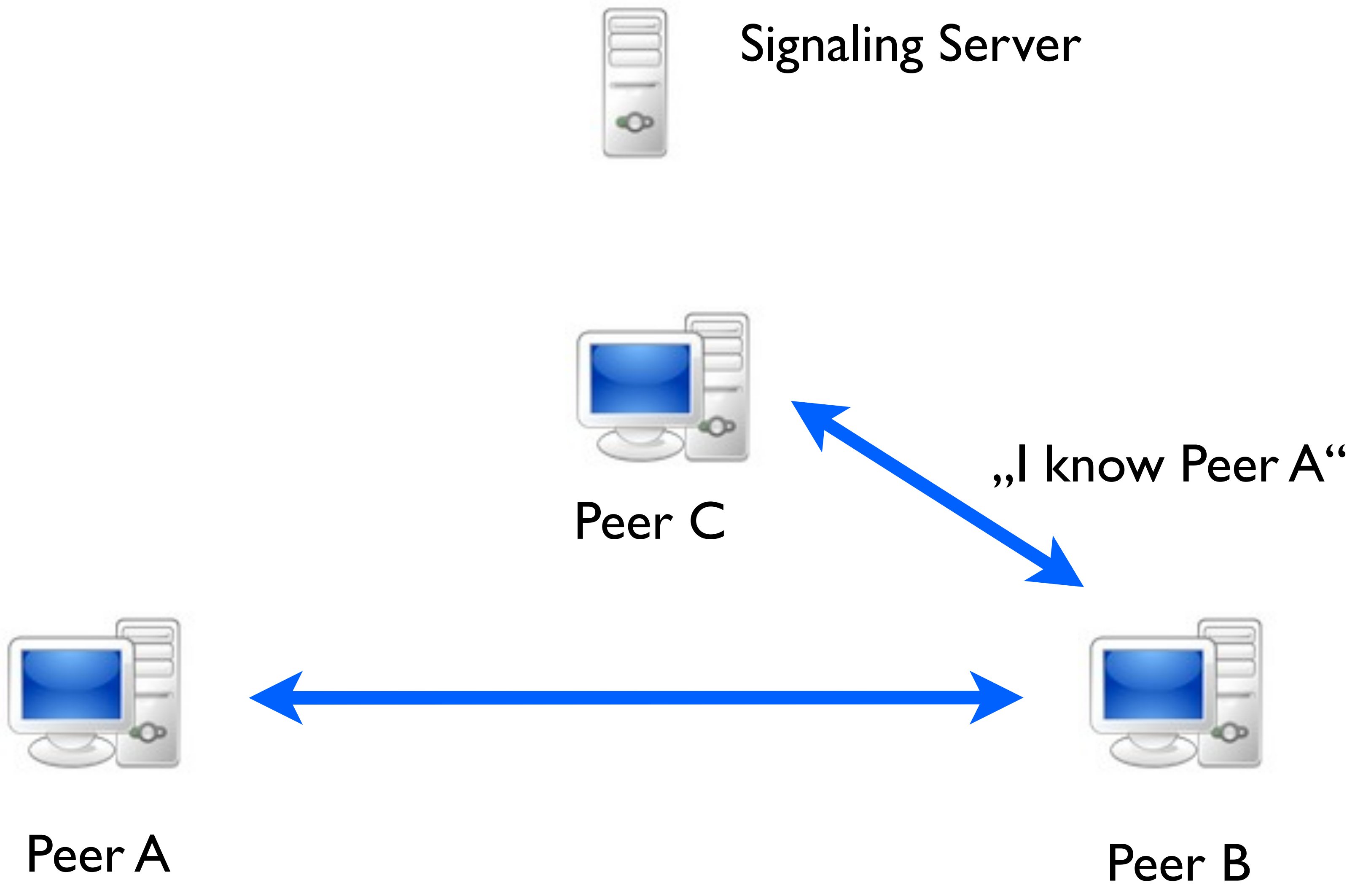
Peer Signaling



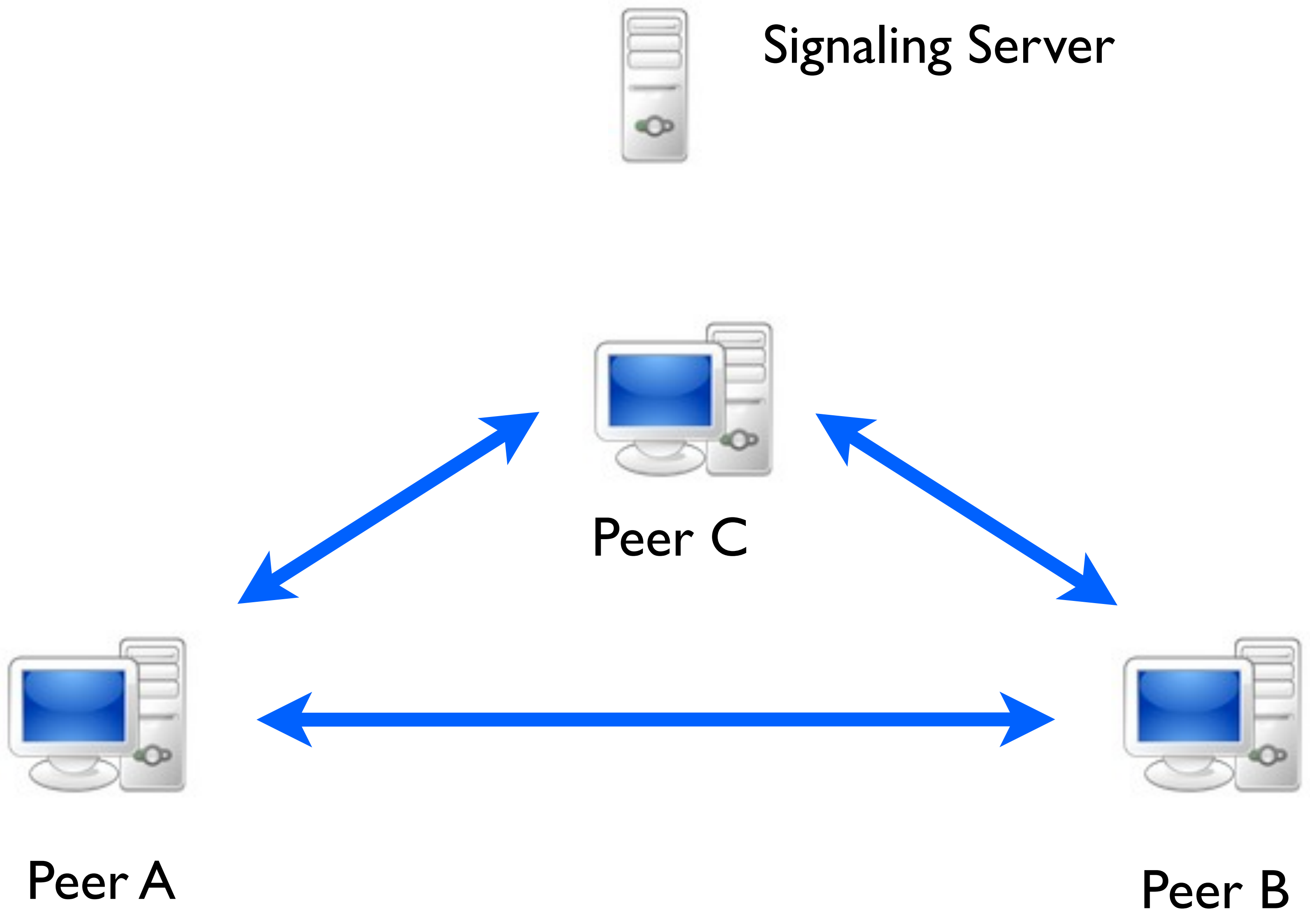
Peer Signaling



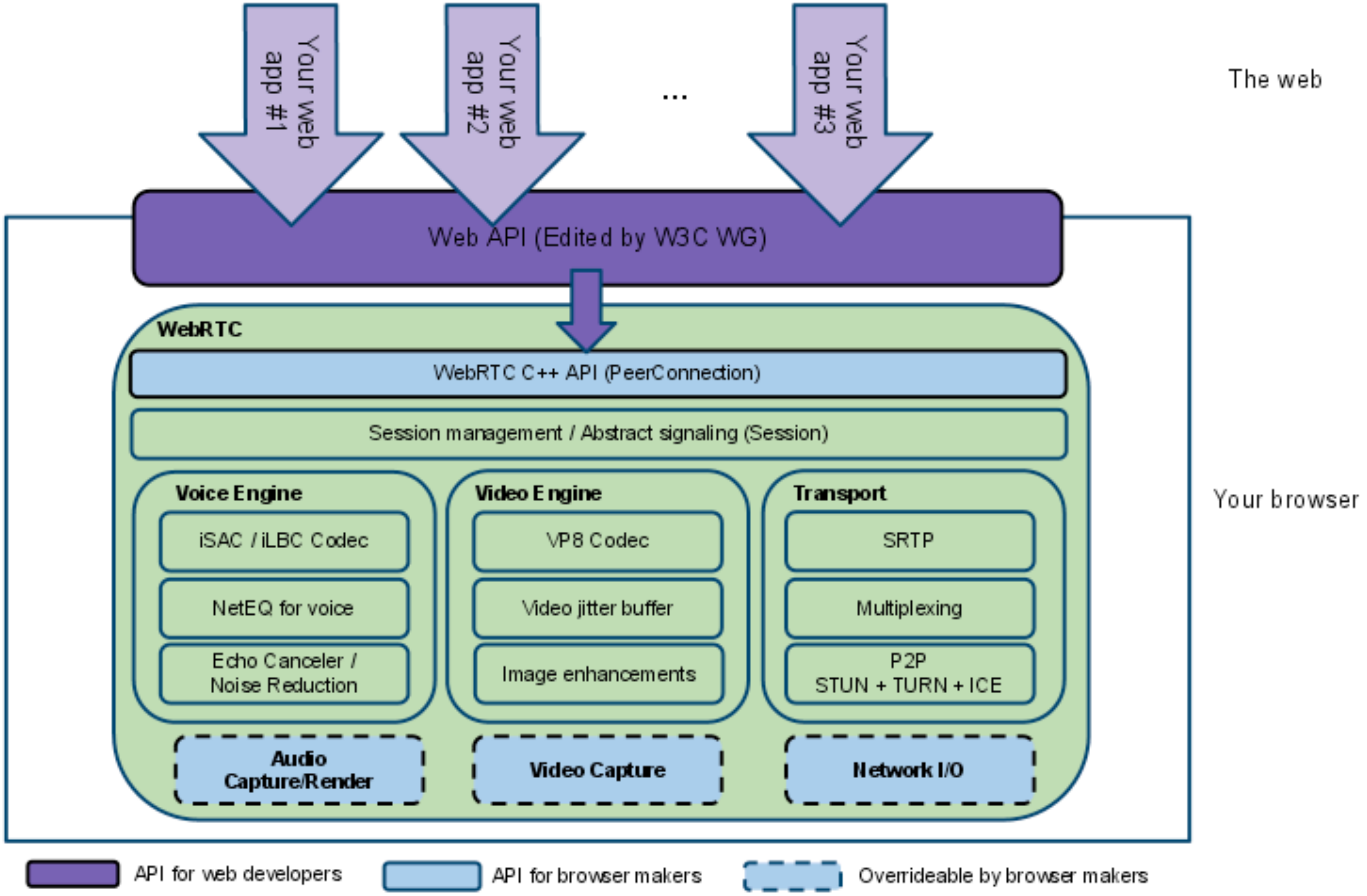
Peer Signaling



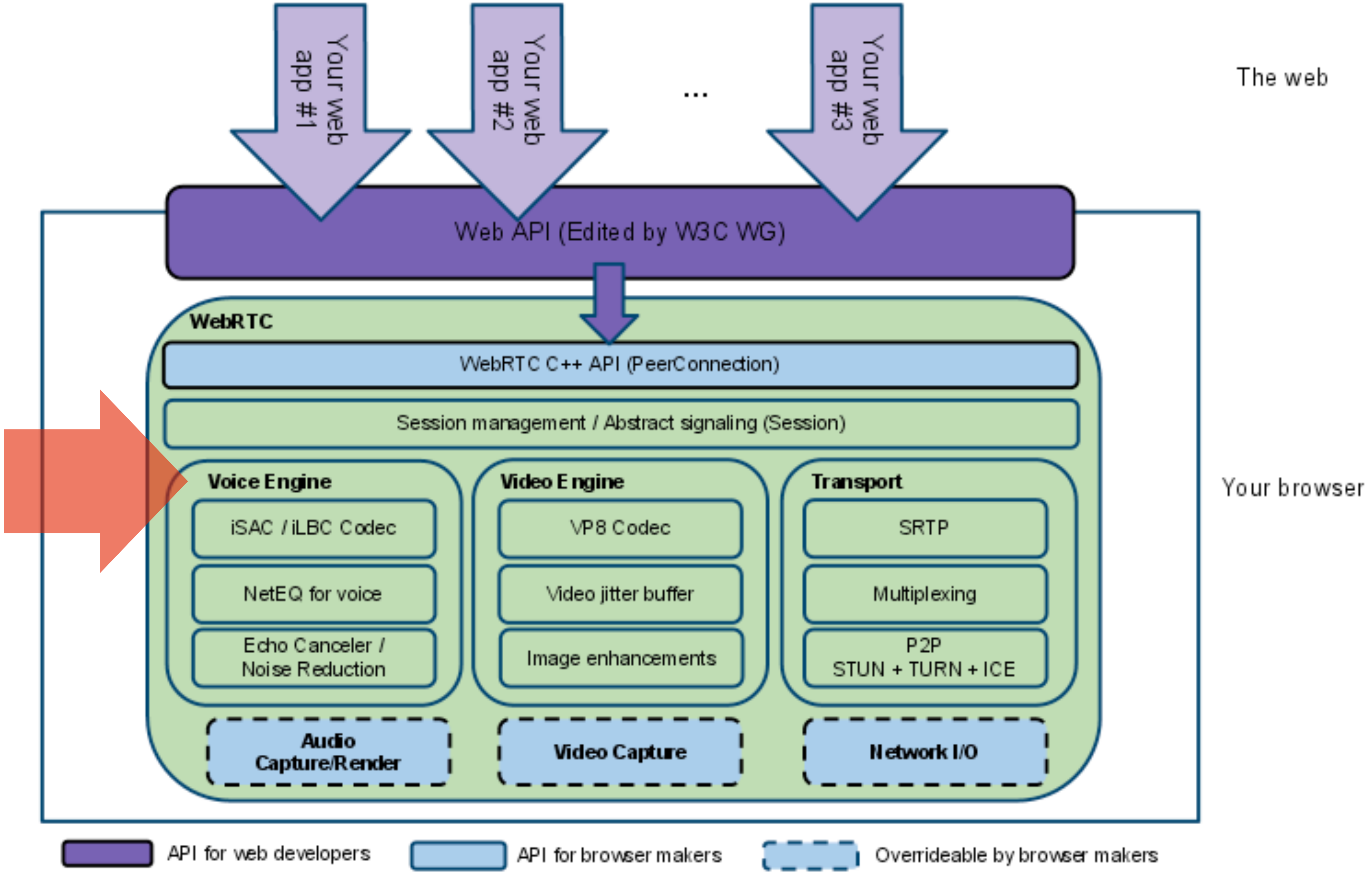
Peer Signaling



Architecture

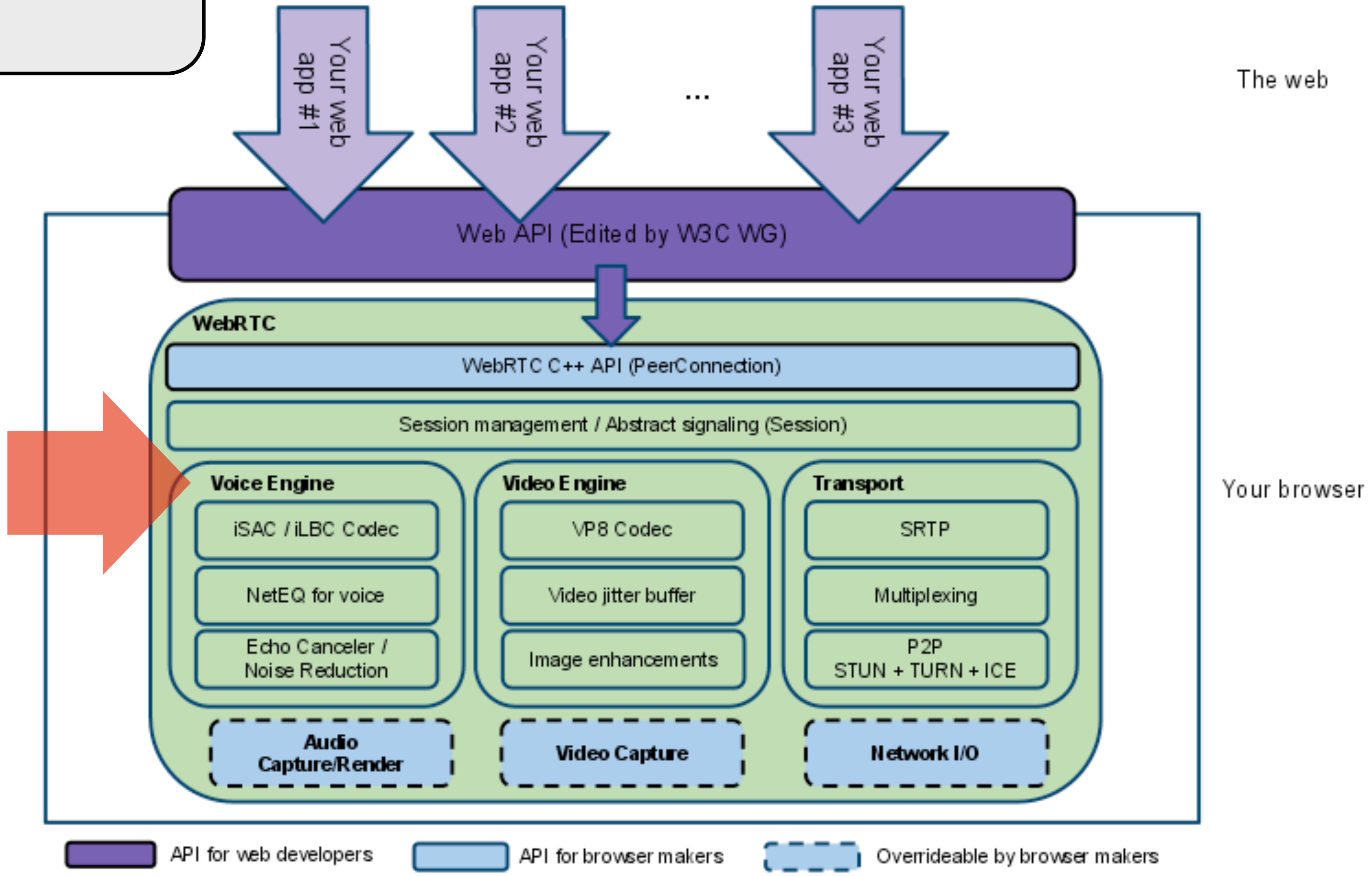


Architecture



√ Capturing Audio

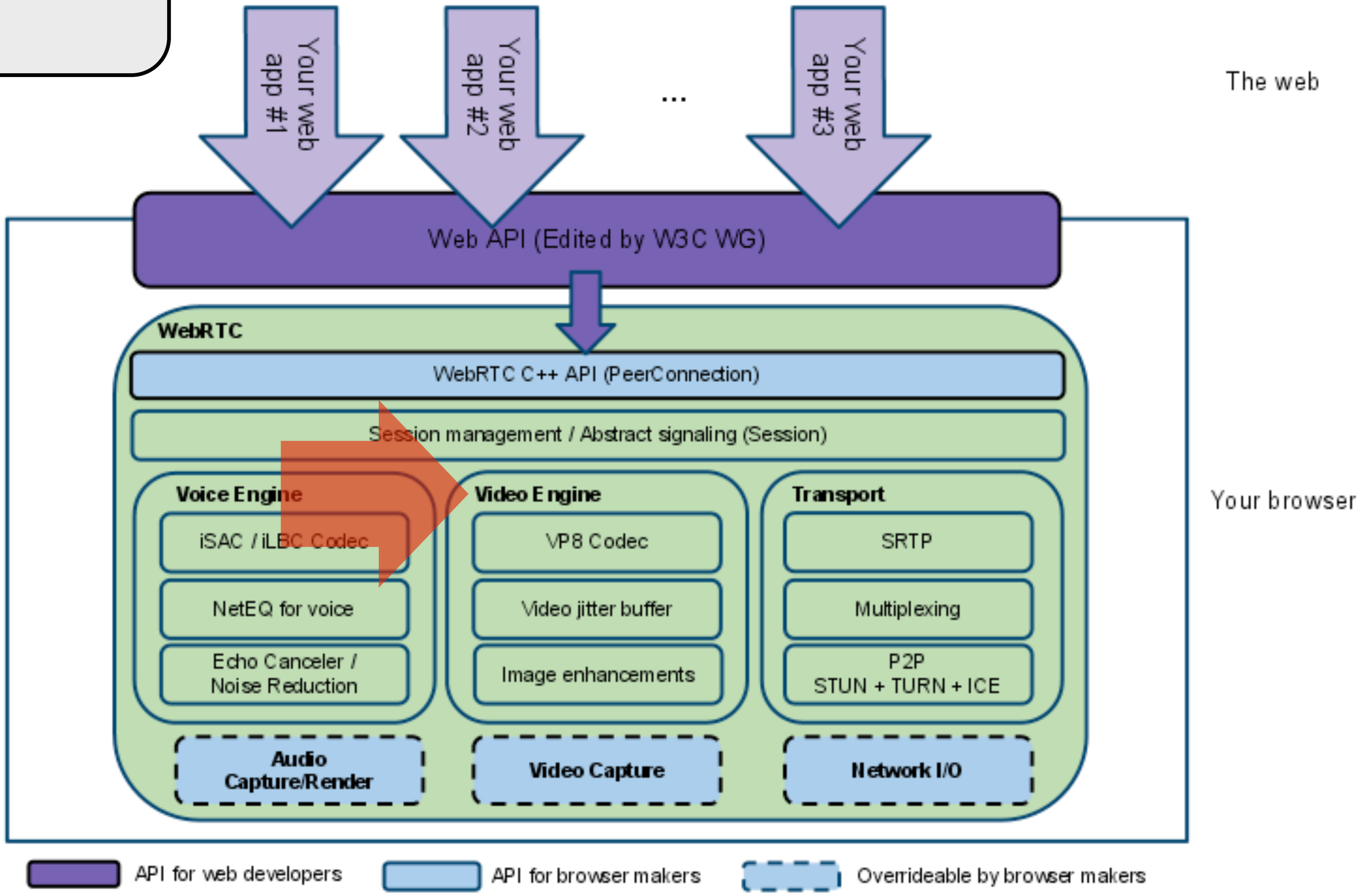
Architecture



√ Capturing Audio

√ Capturing Video

Architecture



Your web app #1

Your web app #2

...

Your web app #3

The web

Web API (Edited by W3C WG)

WebRTC

WebRTC C++ API (PeerConnection)

Session management / Abstract signaling (Session)

Voice Engine

iSAC / iLBC Codec

NetEQ for voice

Echo Canceler / Noise Reduction

Video Engine

VP8 Codec

Video jitter buffer

Image enhancements

Transport

SRTP

Multiplexing

P2P STUN + TURN + ICE

Audio Capture/Render

Video Capture

Network I/O

Your browser

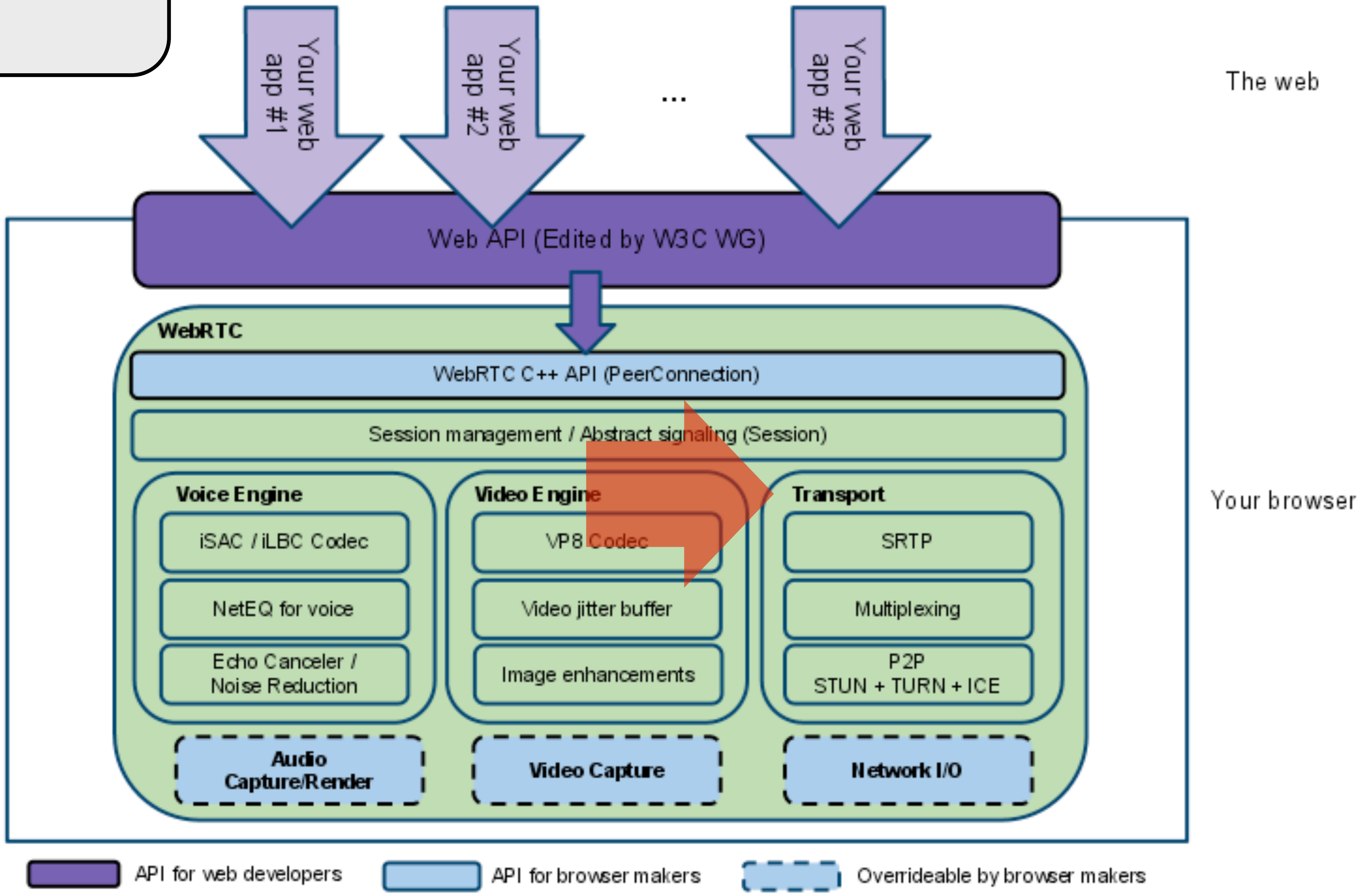
API for web developers

API for browser makers

Overrideable by browser makers

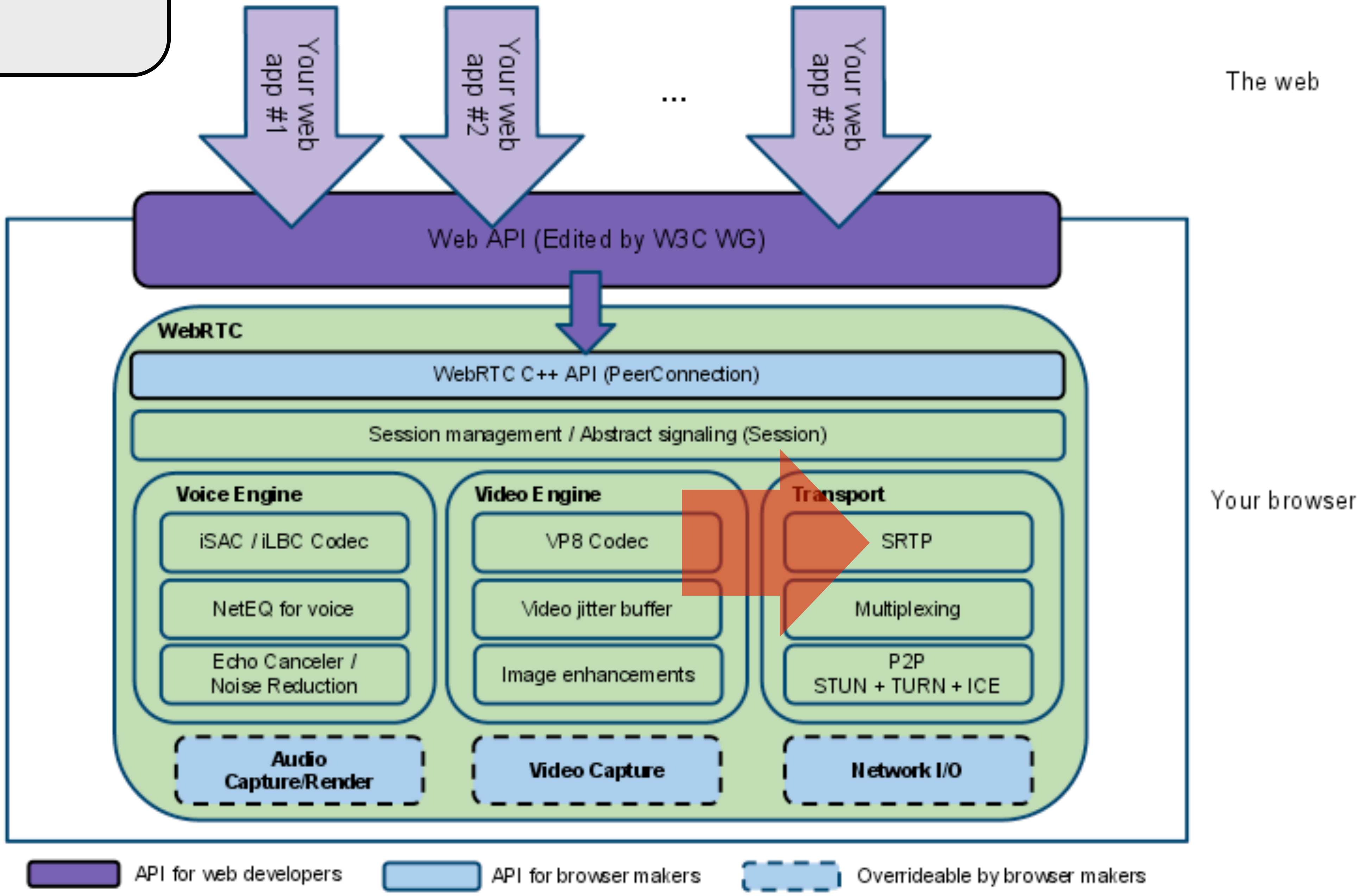
√ Capturing Audio
√ Capturing Video
√ P2P Comm.

Architecture



- √ Capturing Audio
- √ Capturing Video
- √ P2P Comm.
- √ Encryption

Architecture



Your web app #1

Your web app #2

...

Your web app #3

The web

Web API (Edited by W3C WG)

WebRTC

WebRTC C++ API (PeerConnection)

Session management / Abstract signaling (Session)

Voice Engine

iSAC / iLBC Codec

NetEQ for voice

Echo Canceler / Noise Reduction

Video Engine

VP8 Codec

Video jitter buffer

Image enhancements

Transport

SRTP

Multiplexing

P2P STUN + TURN + ICE

Audio Capture/Render

Video Capture

Network I/O

Your browser

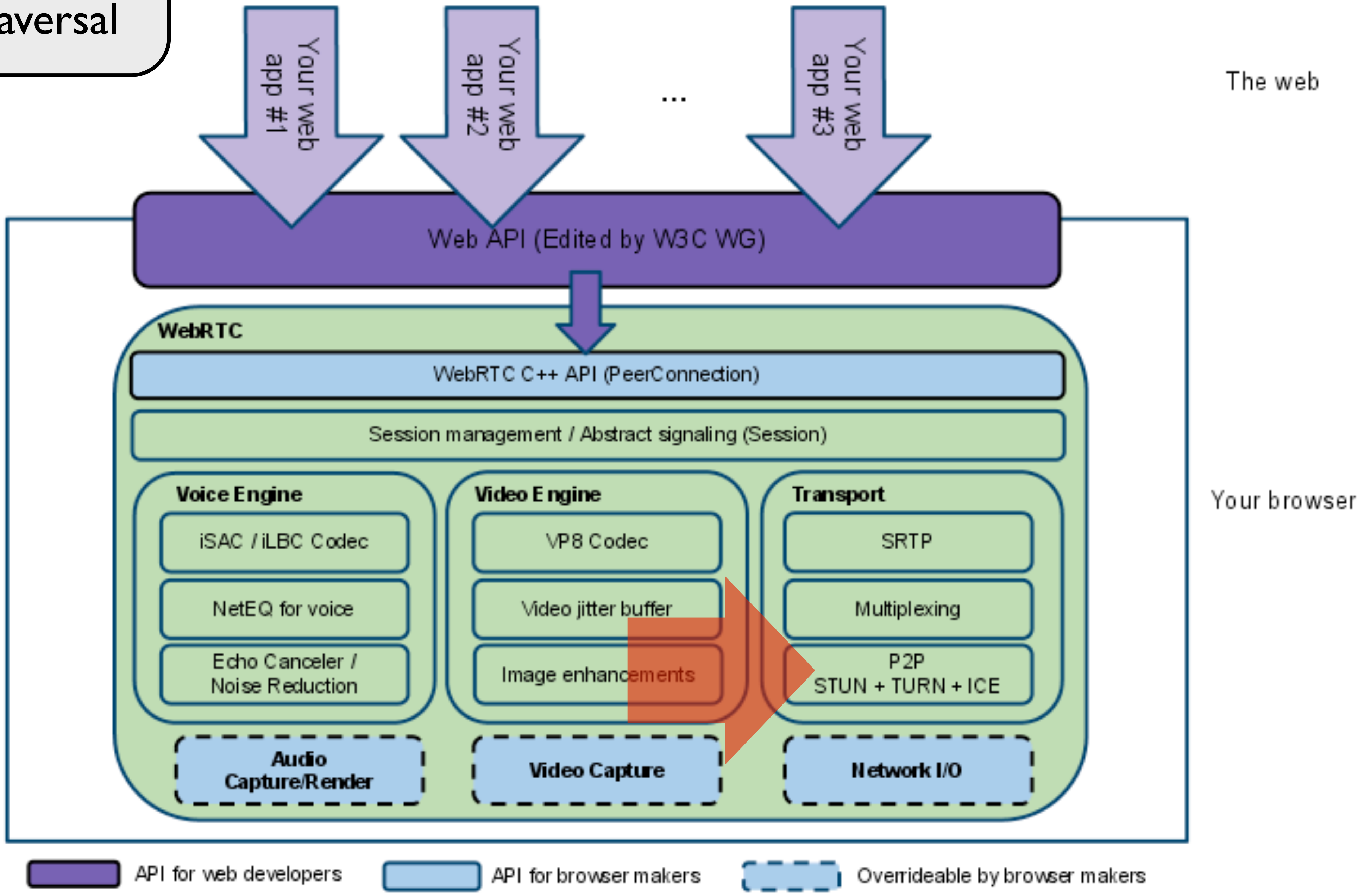
API for web developers

API for browser makers

Overrideable by browser makers

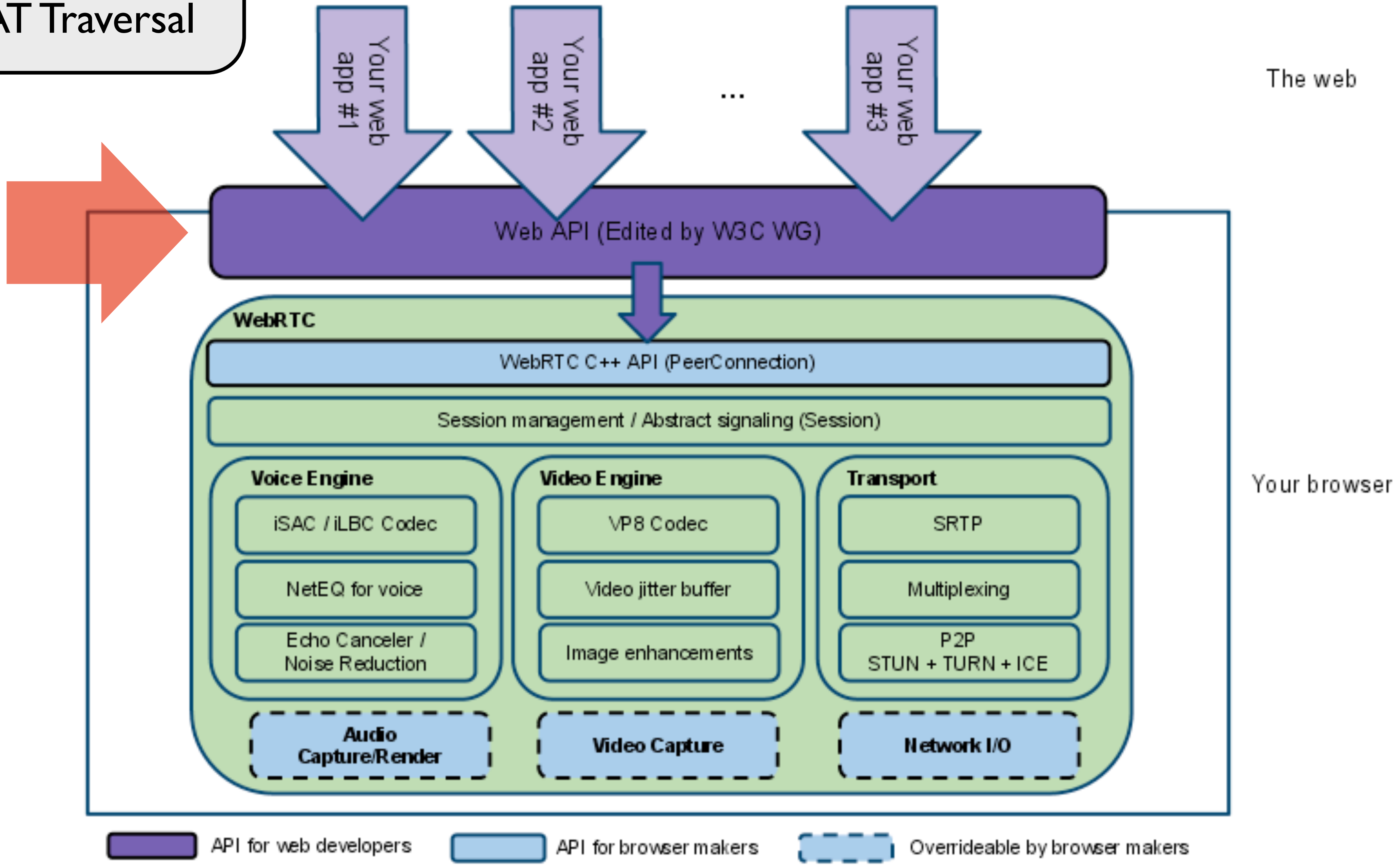
- √ Capturing Audio
- √ Capturing Video
- √ P2P Comm.
- √ Encryption
- √ NAT Traversal

Architecture



- √ Capturing Audio
- √ Capturing Video
- √ P2P Comm.
- √ Encryption
- √ NAT Traversal

Architecture



WebRTC APIs

- `MediaStream (getUserMedia)`
- `RTCPeerConnection`
- `RTCDataChannel`

- Note class prefixes: `moz/webkit`

Libraries

- peer.js – http://peerjs.com/
- webrtc.io – https://github.com/webRTC/
- peergaming – http://peergaming.net/

Practical Example

- join game: demo.hello-it.eu/p2p/src/
- code: github.com/internaut/p2p-bomberman

Conclusion

- plugin-less audio / video access
- no intermediate servers means:
  - lowest-latency communication
  - much less server load
  - reclaim control over your data
- WebRTC will come!

Sources

- Johnston, Burnett 2012: *WebRTC*
- http://www.webrtc.org/
- http://www.html5rocks.com/en/tutorials/webrtc/basics/
- http://dev.w3.org/2011/webrtc/editor/webrtc.html

Thank you.

Any questions?

Markus Konrad <post@mkonrad.net>

2013-07-09