PEERTUBE

Grupo 3

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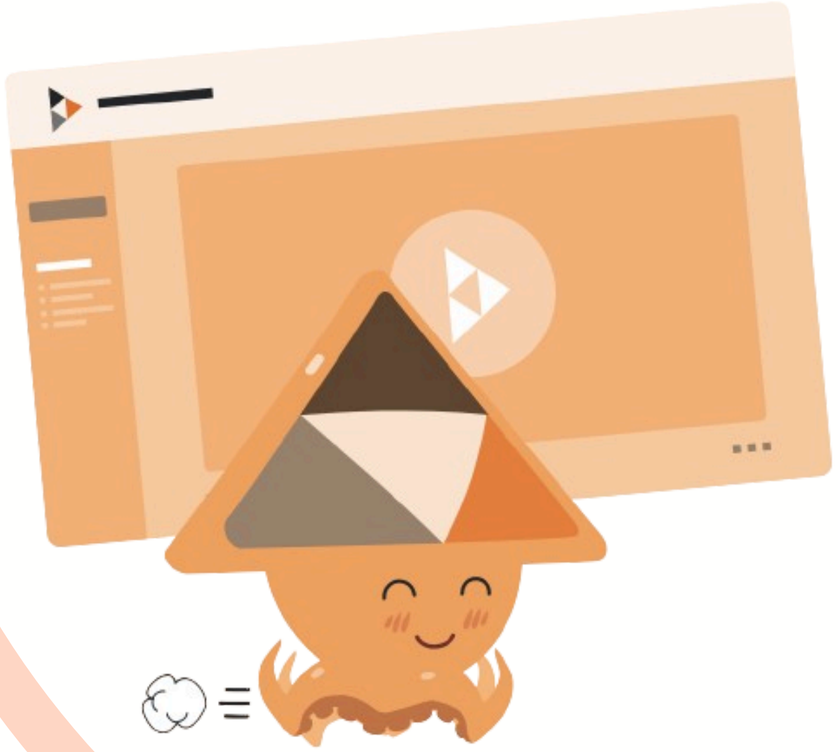
¿Qué es PeerTube?

- PeerTube es una herramienta que nos permite crear un sitio web de alojamiento de videos y compartirlos.

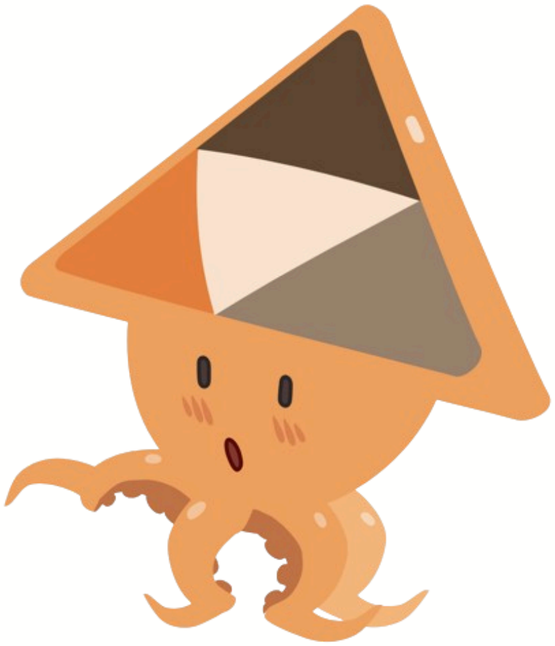
- El concepto de PeerTube es crear una red de múltiples pequeños proveedores de alojamiento de video interconectados.

- Es una alternativa libre, open source, descentralizada y usa Peer-to-peer broadcasting



https://joinpeertube.org/

What is PeerTube?



¿Cuáles son sus funcionalidades?

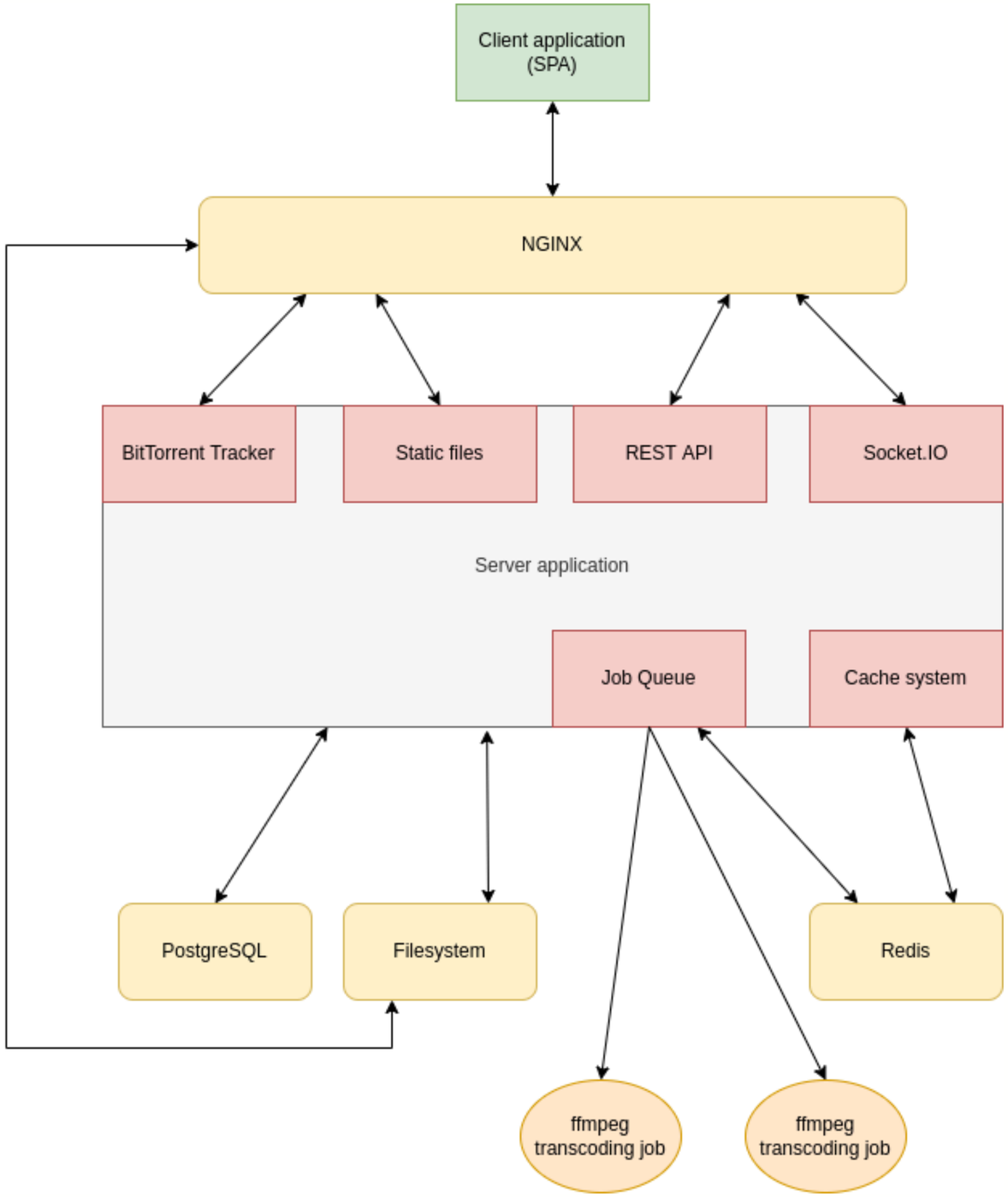
- **Streaming:** Soporta la transmisión de contenido de vídeo.
- **Video Hosting:** Permite a los usuarios subir, compartir y alojar vídeos
- **Instance Following:** Permite a los usuarios seguir las instancias que les interesan y replicar sus videos.
- **Redundancia:** Proporciona redundancia mediante la distribución de contenido entre varias instancias.

¿Cuáles son sus funcionalidades?

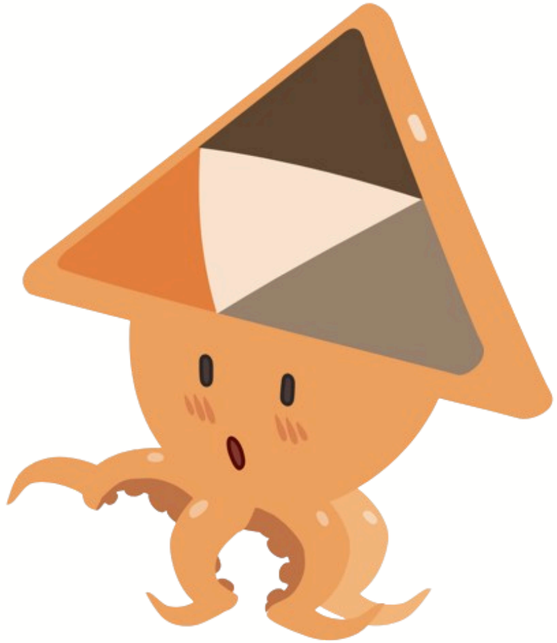
- **Panel de administración:** Proporciona a los administradores de instancias un panel donde pueden administrar varios aspectos de la misma.

- **Personalización**: Los administradores de las instancias pueden personalizar la apariencia y funcionalidad de sus sitios mediante temas y plugins

- **Transmisión en Vivo**: Algunas versiones de PeerTube soportan el streaming en vivo, lo que permite a los usuarios transmitir eventos en tiempo real a sus espectadores



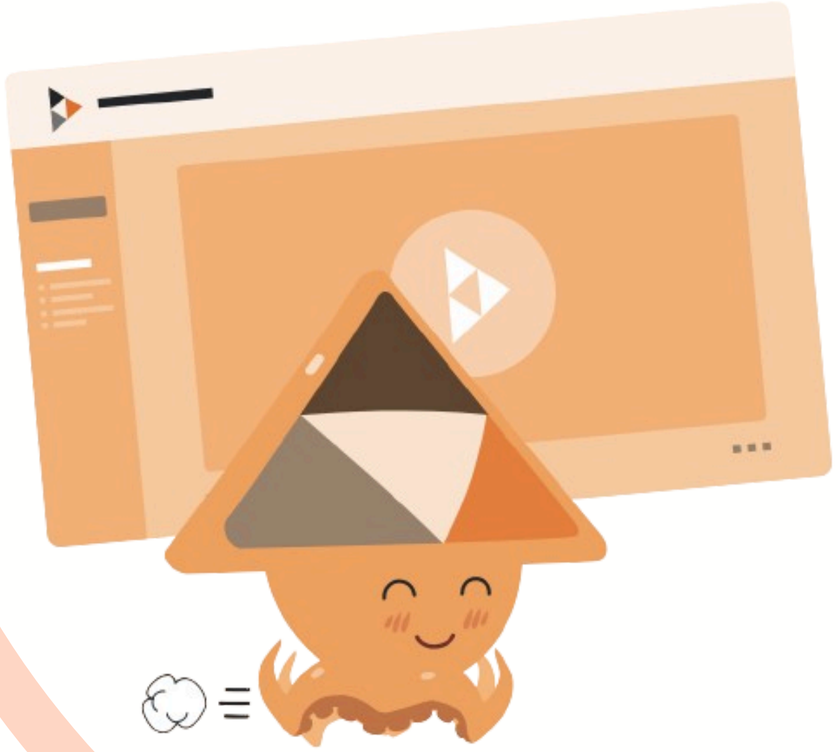
¿Cuál es su arquitectura?



https://docs.joinpeertube.org/contribute/architecture

¿Qué es Peering (P2P)?

- En una red de peering, los clientes obtienen información tanto del servidor central como de otros nodos de la red.
- Mismo si están accediendo a instancias sincronizadas distintas.
- Este tipo de arquitectura distribuye la carga de trabajo y mejora la disponibilidad de los datos.

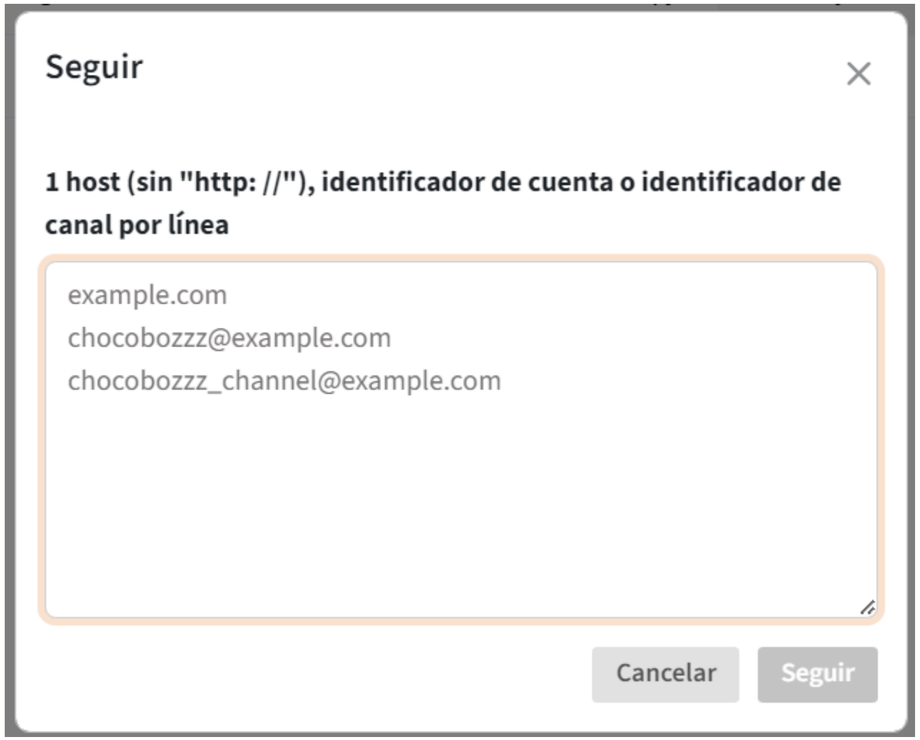


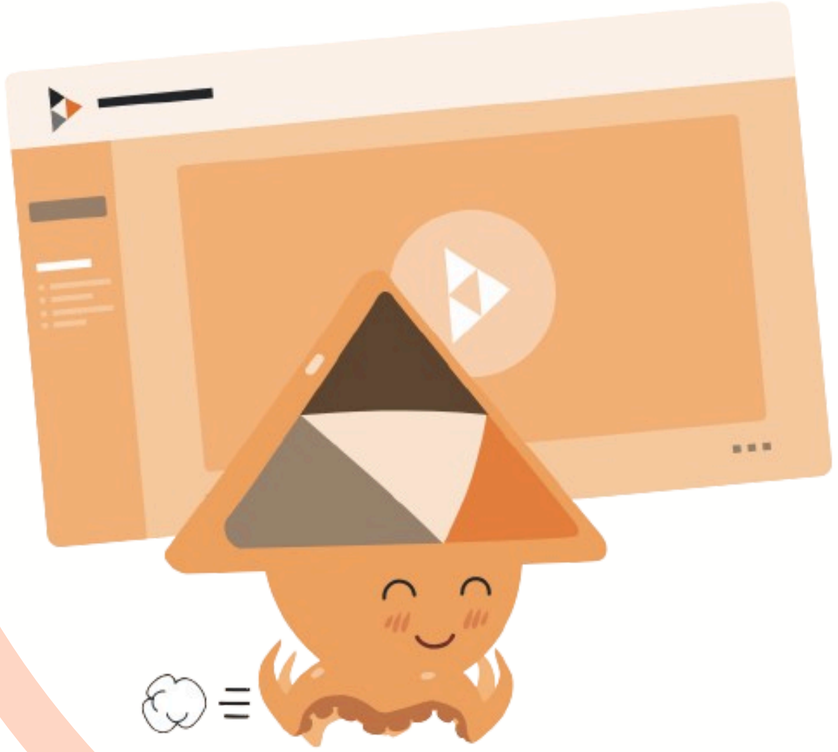
Peers

Notemos en (4) la información de los peers consumiendo el mismo video que nosotros

Instance Follows

Seguir servidores y ser seguido como servidor, asegura la visibilidad de nuestros videos en otras instancias y viceversa.





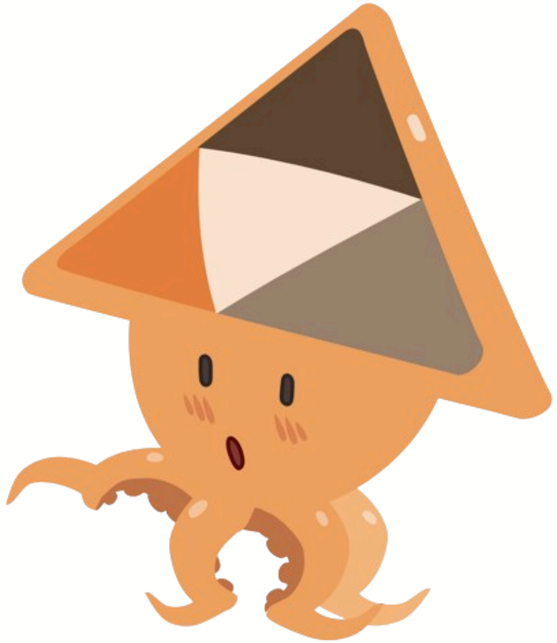
https://docs.joinpeertube.org/admin/following-instances#instance-follows-redundancy

Instancias Públicas

En instances.joinpeertube.org/instances, podemos ver todas las instancias públicas

Search among instances

Name	URL	Version	Following	Followers	Local videos	Total videos	Users	Signup	Live	Location	Health
SassoTube	peertube2.vasquez.com.ar	6.1.0	1	1	1	4	1	✗	✗		
VasquezTube	peertube.vasquez.com.ar	6.1.0	1	2	3	4	2	✓	✗		
DigitalDragon Videos	vid.digitaldragon.club	6.0.3	0	2	0	0	2	✗	✓		
Cocam'server Video OPEN BETA	peertube.cocamserverguild.com	6.1.0	0	0	1	1	7	✓	✓		
ZetaMC | PeerTube	peertube.zetamc.net	6.1.0	1	28	2	12 K	2	✗	✓		
WR Services Media	wrtube.wrservices.lat	6.1.0	12	19	42	23 K	4	✓	✗		



Las dos de arriba son las nuestras! :)

Redundancia

PeerTube tiene incorporado un sistema de redundancia de videos, permitiendo que una instancia duplique y sirva el contenido de otra

Si tu instancia duplica un video, el Web Browser de un cliente va a descargar segmentos aleatorios del mismo de tu instancia y de la instancia original, aliviando la carga de esta última

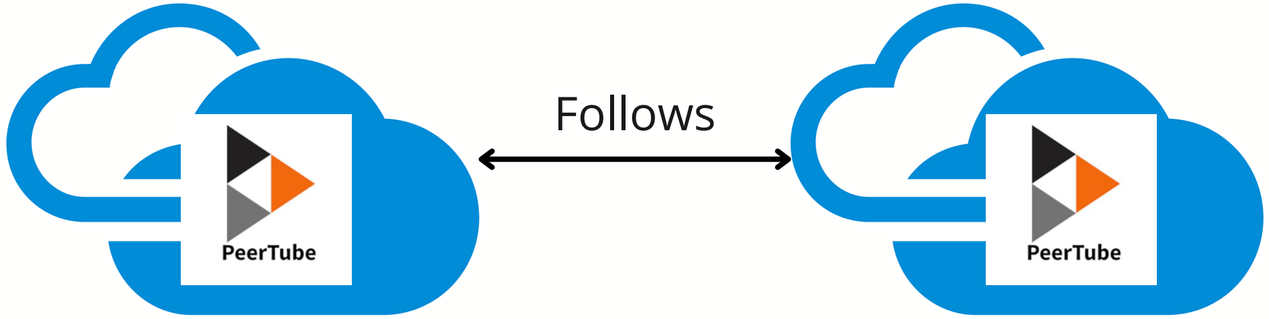
NUESTRA IMPLEMENTACIÓN

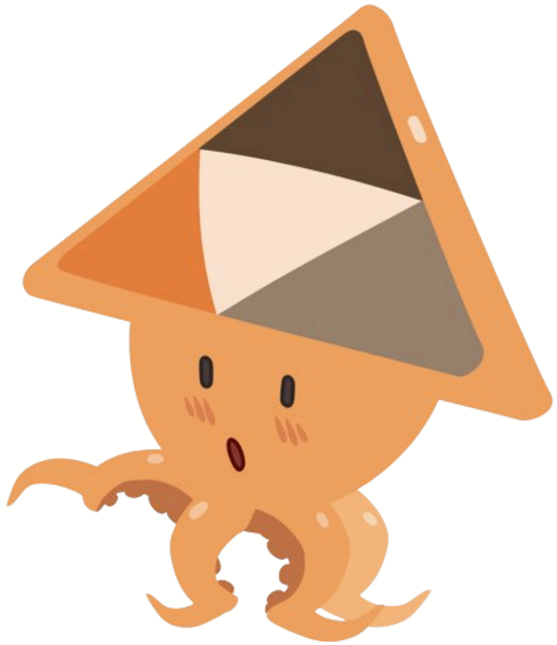
¿Cuál es nuestra configuración?

Microsoft Azure Cloud

Instance 1
IP Agus: 186.137.150.17
IP VasquezTube: 20.121.58.241
peertube.vasquez.com.ar

Instance 2
IP Juli: 152.168.65.247
IP Sassotube: 191.233.251.70
peertube2.vasquez.com.ar





Instancias publicadas

Search among instances

Name	URL	Version	Following	Followers	Local videos	Total videos	Users	Signup	Live	Location	Health
SassoTube	peertube2.vasquez.com.ar	6.1.0	0	0	1	1	1	×	×		
VasquezTube	peertube.vasquez.com.ar	6.1.0	0	0	3	3	2	✔	×		

Instancias sincronizadas

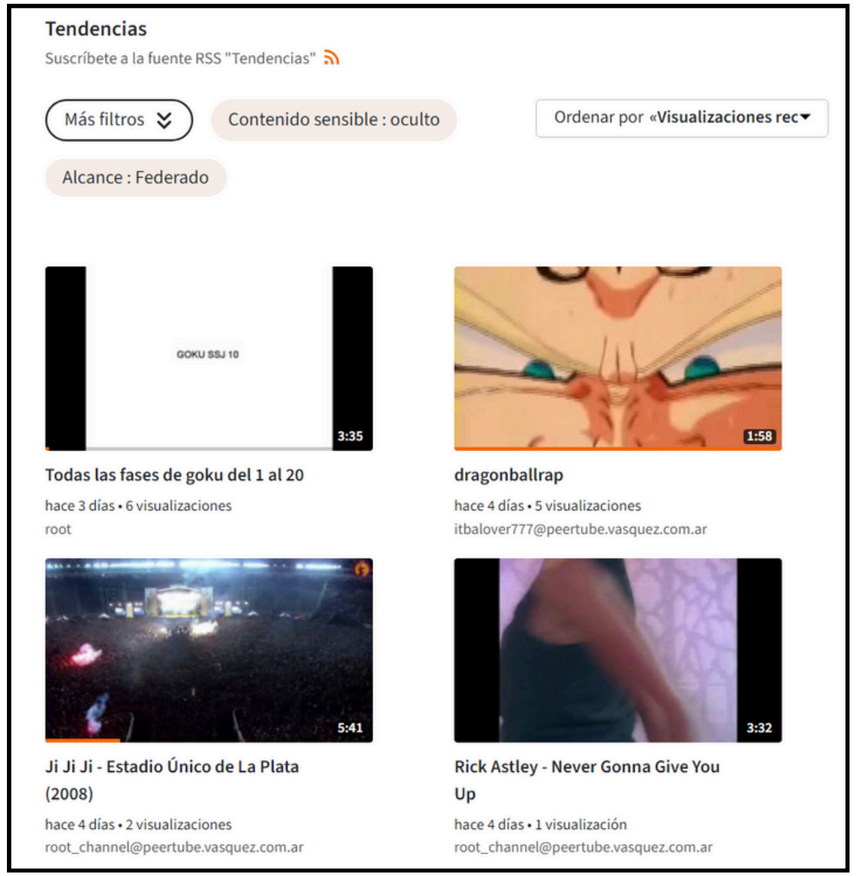
Suscripciones de tu instancia

Seguir

Filtrar...

Acción	Siguiendo	Estado	Creado	Redundancia permi...
Eliminar	peertube@peertube2.vasquez.com.ar	ACEPTADO	30/5/24, 17:51	✔

Videos Replicados



Streaming P2P

Veamos capturas de Wireshark en la PC de Juli*

Juli se conecta a SassoTube (*peertube2.vasquez.com.ar*) mediante HTTPS

Source	Destination	Protocol	Length	Info
Juli (IP Priv)	SassoTube	TLSv1.2	134	Application Data
SassoTube	Juli (IP Priv)	TCP	66	443 → 38608 [ACK] Se
SassoTube	Juli (IP Priv)	TLSv1.2	321	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	101	Application Data
SassoTube	Juli (IP Priv)	TCP	66	443 → 38608 [ACK] Se
Juli (IP Priv)	SassoTube	TLSv1.2	141	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	134	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	139	Application Data

Luego, empieza a consumir un video

* Configuramos Wireshark para que no se resuelvan las IPs y así poder agregarle nuestros propios nombres, para facilitar la legibilidad

Streaming P2P

Viendo un video...

Source	Destination	Protocol	Length	Info
Juli (IP Priv)	SassoTube	TLSv1.2	156	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	249	Application Data,
Juli (IP Priv)	SassoTube	TLSv1.2	181	Application Data
SassoTube	Juli (IP Priv)	TCP	66	443 → 38608 [ACK]
SassoTube	Juli (IP Priv)	TCP	66	443 → 38608 [ACK]
SassoTube	Juli (IP Priv)	TCP	66	443 → 38608 [ACK]
SassoTube	Juli (IP Priv)	TLSv1.2	359	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	101	Application Data
SassoTube	Juli (IP Priv)	TLSv1.2	359	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	101	Application Data
SassoTube	Juli (IP Priv)	TLSv1.2	360	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	101	Application Data
SassoTube	Juli (IP Priv)	TCP	1514	443 → 38608 [ACK]
SassoTube	Juli (IP Priv)	TCP	1514	443 → 38608 [PSH,
SassoTube	Juli (IP Priv)	TCP	1514	443 → 38608 [ACK]
Juli (IP Priv)	SassoTube	TCP	66	38608 → 443 [ACK]
SassoTube	Juli (IP Priv)	TCP	1514	443 → 38608 [PSH,
SassoTube	Juli (IP Priv)	TLSv1.2	151	Application Data,
Juli (IP Priv)	SassoTube	TCP	66	38608 → 443 [ACK]
Juli (IP Priv)	SassoTube	TLSv1.2	214	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	169	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	160	Application Data
SassoTube	Juli (IP Priv)	TCP	66	443 → 38608 [ACK]
Juli (IP Priv)	SassoTube	TLSv1.2	192	Application Data
SassoTube	Juli (IP Priv)	TCP	66	443 → 38608 [ACK]
SassoTube	Juli (IP Priv)	TLSv1.2	360	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	101	Application Data
Juli (IP Priv)	SassoTube	TLSv1.2	176	Application Data

Streaming P2P

Agus se conecta a VasquezTube (*peertube.vasquez.com.ar*)
y empieza a consumir el mismo video que Juli

Source	Destination	Protocol	Length	Info
Juli (IP Priv)	SassoTube	TLSv1.3	1054	Application Data
Juli (IP Priv)	Agus	STUN	138	Binding Request user: +xJV:ylsD
SassoTube	Juli (IP Priv)	TCP	66	443 → 39324 [ACK] Seq=1919 Ack=7774 Win=64128 Len=0 TSval=4204308532
Agus	Juli (IP Priv)	STUN	142	Binding Request user: ylsD:+xJV
Agus	Juli (IP Priv)	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 152.168.65.247:59062
Juli (IP Priv)	Agus	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 186.137.150.17:32827
Juli (IP Priv)	Agus	DTLSv1.2	199	Client Hello
Agus	Juli (IP Priv)	DTLSv1.2	657	Server Hello, Certificate, Server Key Exchange, Certificate Request,
Juli (IP Priv)	Agus	DTLSv1.2	586	Certificate, Client Key Exchange, Certificate Verify, Change Cipher
Agus	Juli (IP Priv)	STUN	142	Binding Request user: ylsD:+xJV
Juli (IP Priv)	Agus	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 186.137.150.17:32827
Agus	Juli (IP Priv)	DTLSv1.2	612	New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
Juli (IP Priv)	Agus	DTLSv1.2	123	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	123	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	175	Application Data
Agus	Juli (IP Priv)	STUN	142	Binding Request user: ylsD:+xJV
Juli (IP Priv)	Agus	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 186.137.150.17:32827
Agus	Juli (IP Priv)	DTLSv1.2	175	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	143	Application Data

Notemos las consultas **STUN** para lograr el *Hole Punching* y el intercambio de información del video mediante **DTLS**

Streaming P2P

Seguimos viendo el mismo video...

Source	Destination	Protocol	Length	Info
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Agus	DTLSv1.2	107	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	1267	Application Data

Streaming P2P

Entra Sol a SassoTube a ver el mismo video

Source	Destination	Protocol	Length	Info
Juli (IP Priv)	SassoTube	TLSv1.3	1052	Application Data
SassoTube	Juli (IP Priv)	TCP	66	443 → 39324 [ACK] Seq=2865 Ack=8760 Win=64128 Len=0 TSval=420432695
Juli (IP Priv)	Sol	STUN	138	Binding Request user: bd2L:sLAF
Juli (IP Priv)	Sol	STUN	138	Binding Request user: bd2L:sLAF
Sol	Juli (IP Priv)	STUN	142	Binding Request user: sLAF:bd2L
Juli (IP Priv)	Sol	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 24.232.183.155:53621
Sol	Juli (IP Priv)	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 152.168.65.247:41351
Juli (IP Priv)	Sol	DTLSv1.2	199	Client Hello
Sol	Juli (IP Priv)	DTLSv1.2	658	Server Hello, Certificate, Server Key Exchange, Certificate Request
Sol	Juli (IP Priv)	STUN	142	Binding Request user: sLAF:bd2L
Juli (IP Priv)	Sol	DTLSv1.2	587	Certificate, Client Key Exchange, Certificate Verify, Change Cipher
Juli (IP Priv)	Sol	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 24.232.183.155:53621
Sol	Juli (IP Priv)	DTLSv1.2	612	New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
Juli (IP Priv)	Sol	DTLSv1.2	123	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	123	Application Data
Juli (IP Priv)	Sol	DTLSv1.2	175	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	175	Application Data
Juli (IP Priv)	Sol	DTLSv1.2	143	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	143	Application Data

Streaming P2P

Entra Male a VasquezTube a ver el mismo video

Source	Destination	Protocol	Length	Info
Juli (IP Priv)	SassoTube	TLSv1.3	1054	Application Data
SassoTube	Juli (IP Priv)	TCP	66	443 → 39324 [ACK] Seq=3814 Ack=9748 Win=64128 Len=0 TSval=420434555
Juli (IP Priv)	Male	STUN	138	Binding Request user: vt4v:SXhk
Male	Juli (IP Priv)	STUN	142	Binding Request user: SXhk:vt4v
Juli (IP Priv)	Male	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 181.229.158.108:50797
Male	Juli (IP Priv)	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 152.168.65.247:55403
Juli (IP Priv)	Male	DTLSv1.2	199	Client Hello
Male	Juli (IP Priv)	DTLSv1.2	656	Server Hello, Certificate, Server Key Exchange, Certificate Request
Juli (IP Priv)	Male	DTLSv1.2	587	Certificate, Client Key Exchange, Certificate Verify, Change Cipher
Male	Juli (IP Priv)	STUN	142	Binding Request user: SXhk:vt4v
Juli (IP Priv)	Male	STUN	106	Binding Success Response XOR-MAPPED-ADDRESS: 181.229.158.108:50797
Male	Juli (IP Priv)	DTLSv1.2	612	New Session Ticket, Change Cipher Spec, Encrypted Handshake Message
Male	Juli (IP Priv)	DTLSv1.2	123	Application Data
Juli (IP Priv)	Male	DTLSv1.2	123	Application Data
Juli (IP Priv)	Male	DTLSv1.2	175	Application Data
Male	Juli (IP Priv)	DTLSv1.2	175	Application Data
Juli (IP Priv)	Male	DTLSv1.2	143	Application Data
Male	Juli (IP Priv)	DTLSv1.2	143	Application Data
Juli (IP Priv)	Male	DTLSv1.2	95	Application Data

Streaming P2P

Finalmente, Juli está intercambiando bytes del video con todos los *peers* que lo consumen en simultáneo

Source	Destination	Protocol	Length	Info
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Agus	Juli (IP Priv)	DTLSv1.2	107	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	107	Application Data
Male	Juli (IP Priv)	DTLSv1.2	107	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Male	Juli (IP Priv)	DTLSv1.2	107	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Juli (IP Priv)	Male	DTLSv1.2	1267	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	107	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	107	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	107	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	107	Application Data
Sol	Juli (IP Priv)	DTLSv1.2	107	Application Data
Male	Juli (IP Priv)	DTLSv1.2	107	Application Data

Protocolos que Intervienen

Comunicación entre Cliente y Servidor:

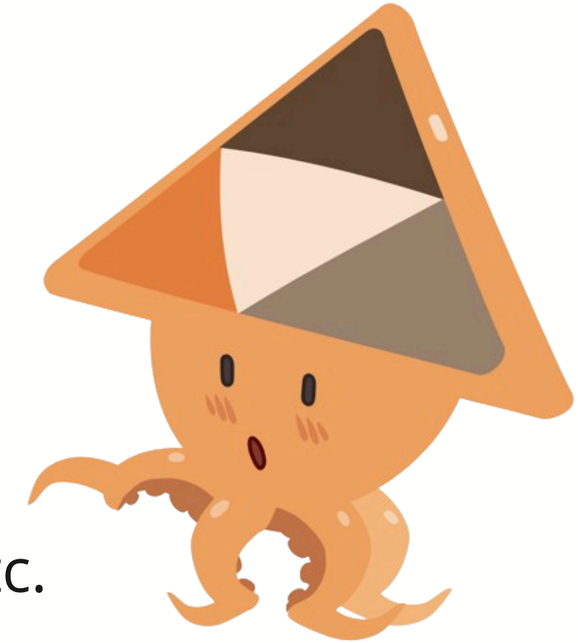
- TLS (v1.2)
- TCP

Comunicación entre Peers:

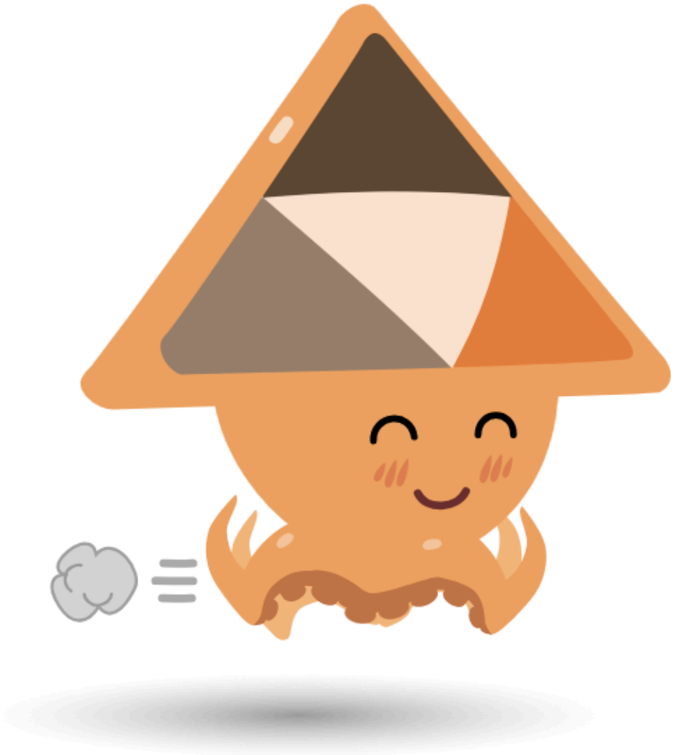
- STUN
- DTLS (v1.2)

A más alto nivel:

- ActivityPub: Subir videos, seguir instancias, etc.
- WebRTC: P2P en páginas Web



DEMO



Gracias

¿Preguntas?