

# Lynforedrag





# Utfordringer og muligheter for datastudenter rundt streaming

MarioNetWork med Jakob Lund Johannessen



# Kjapt om meg

23 år fra Oslo

Teknisk sjef i Abakusrevyen 2020 og 2021

Jobbet 2.5 år i Spond

Jobber i Skypass som full stack utvikler



# Kjapt om teamet



# Årets utfordring: Streaming

Hvordan får vi til streaming?

Hvordan tar man betalt for billetter til et digitalt arrangement som streames?

- Hvordan skal vi autentisere billetter?
- Hvordan skal vi ta betalt?
- Hvor mye skal en billett koste?
- Hvor god produksjon må vi levere for å kunne kreve penger for å se på?

Tillit

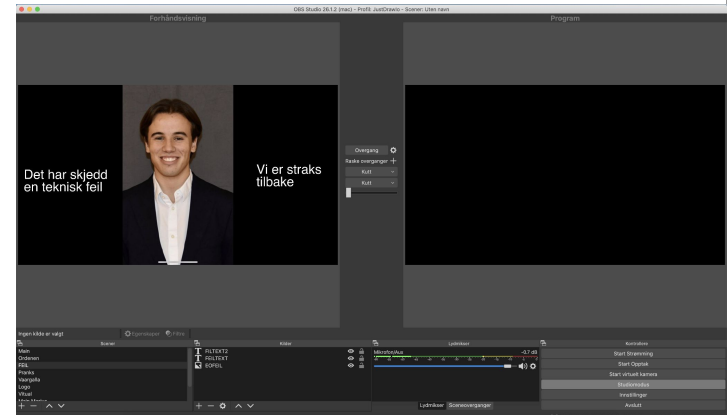
# Kort: Hvordan vi streamet?

Leide 3 kameraer fra Studentmediene

Brukte OBS (Open broadcaster studio) på en over powered stasjonær som et medlem hadde

Atem MINI fra backup, RØDE PROCaster fra backup

Gopro til bandet



# Problem: Autentisering og autorisering

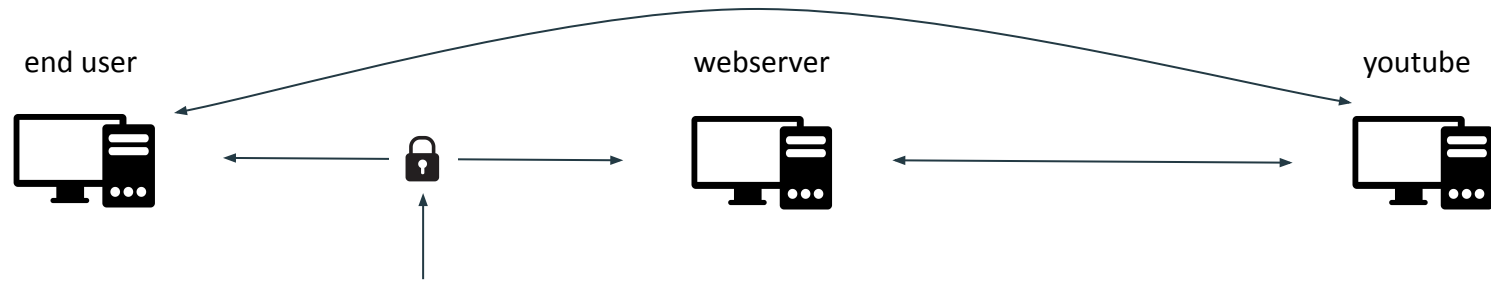
Autentisering: bekrefte at vedkommende er den de er

Autorisering: bekrefte at vedkommende har tilgang til denne ressursen

Kun de som har betalt får tilgang til streamen?

- Logge inn på en nettside med embedded Youtube?
  - Youtube unlisted?
- Tredjeparter som gir tilgang til autentiserte løsninger

# Embedde unlisted Youtube til Authenticated side: Mulig løsning?



Can only open page one place  
Can ensure chat is only used one place



# Tredjeparter?

Sumo, Discovery+, Netflix tar alle betalt for innhold som streames

- Vier.live (15% cut)
  - Uaktuelle pga Hoopla :/
- Dacast (Dyrt, gir én autentisering)
  - Tilsvarende med Youtube unlisted
- Vimeo (7.5k kr, gir én autentisering)
  - Tilsvarende med Youtube unlisted
- Cloudflare
  - Ble lagt for lite energi i dette alternativet, hadde funket bra

# Streamingprotokoller

RTMP (Real time messaging protocol)

HDS

HLS (HTTP Live streaming)

DASH

# Løsning: Lage vår egen streamingtjeneste

## MarioNetWork™

(Et ordspill på revynavnet, Marionett)



Kilder: <https://images.nintendolife.com/f6d9ad158aa3c/supermariosunshinefeatured-large-original.jpg>  
<http://binus.ac.id/binussquare/wp-content/uploads/2016/11/wifi-2.png>

# Løsning: Lage vår egen streamingtjeneste

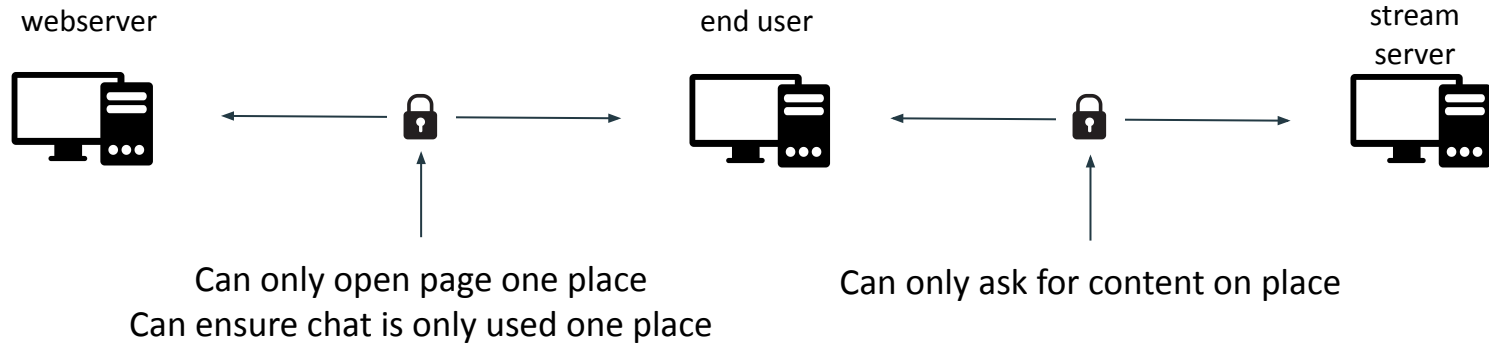
## Hva må på plass:

- En billett kan kun sees på en skjerm av gangen
  - Autentisering
  - Autorisering
- Nok opplastningshastighet til å serve innhold til samtlige brukere
  - CDN

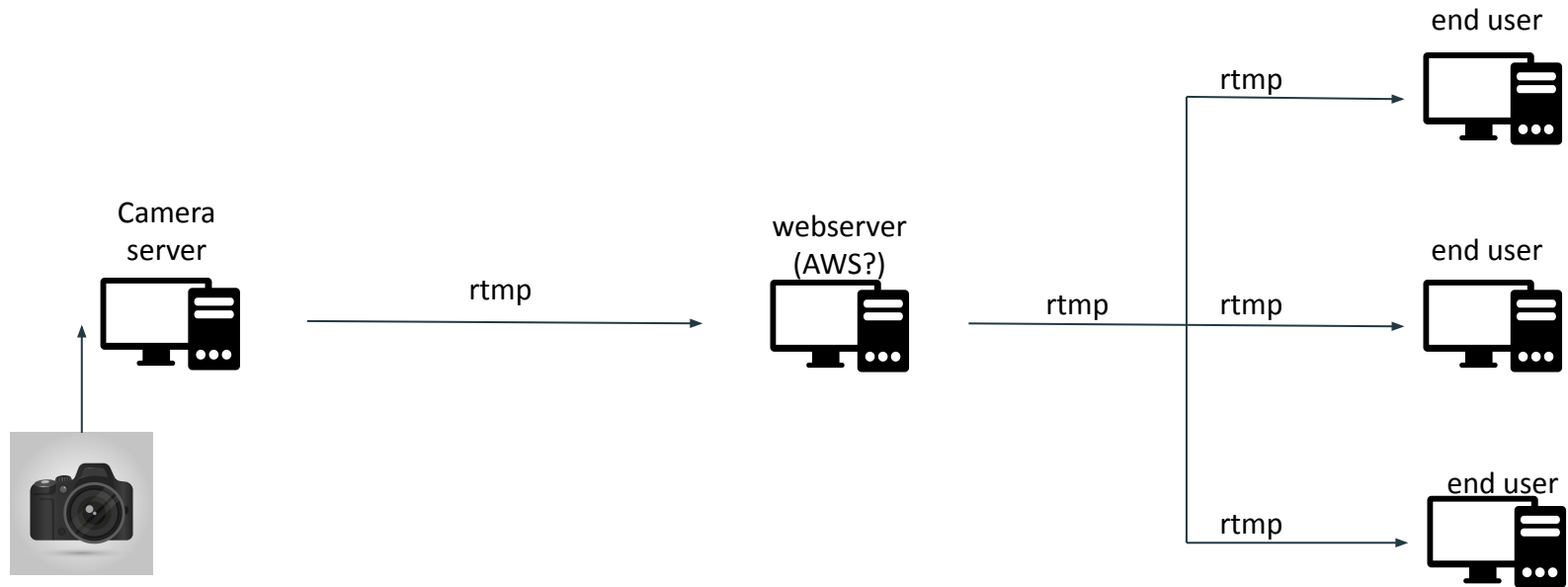
## Plan

- Step 1: UDP stream til serveren (nginx-rtmp)
- Step 2: Stream UDP (rtmp-data)
- Step 3: Lagre stream i HLS (nginx-rtmp, rtmp -> hls)
- Step 4: Stream HLS (nginx-rtmp serves hls)
- Step 5: Skriv en custom webserver for å streame HLS

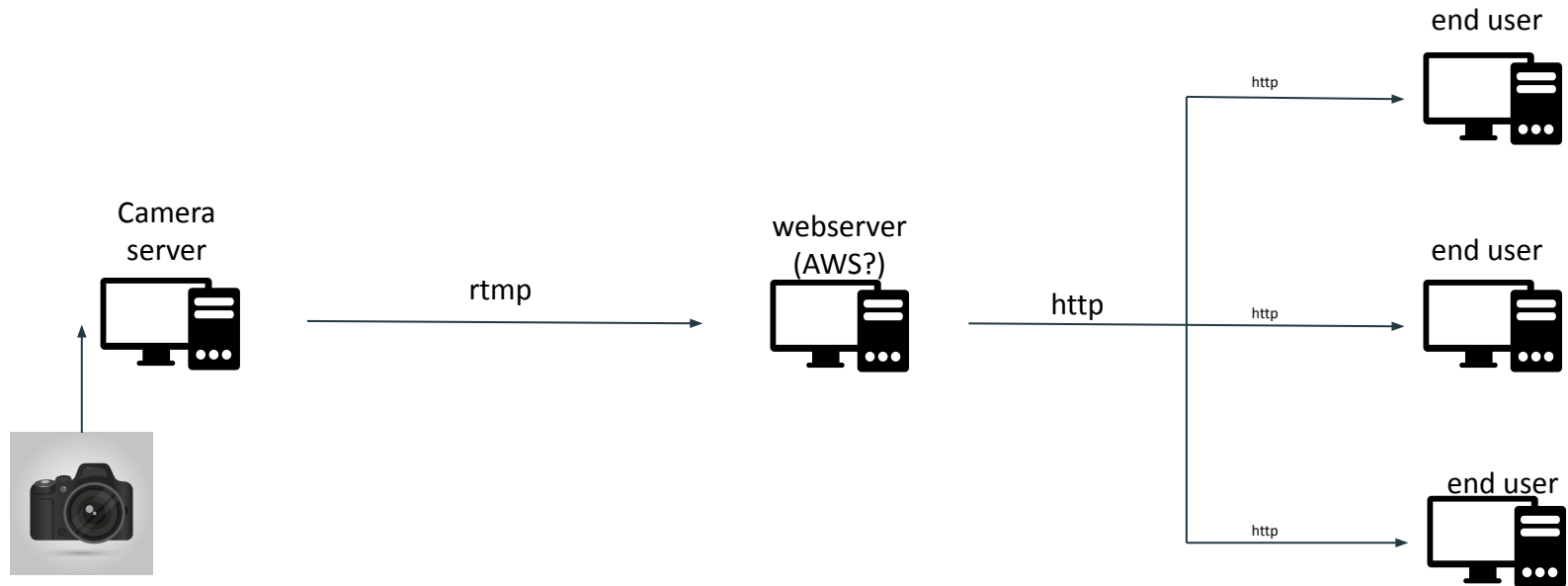
# Målet for utviklingen



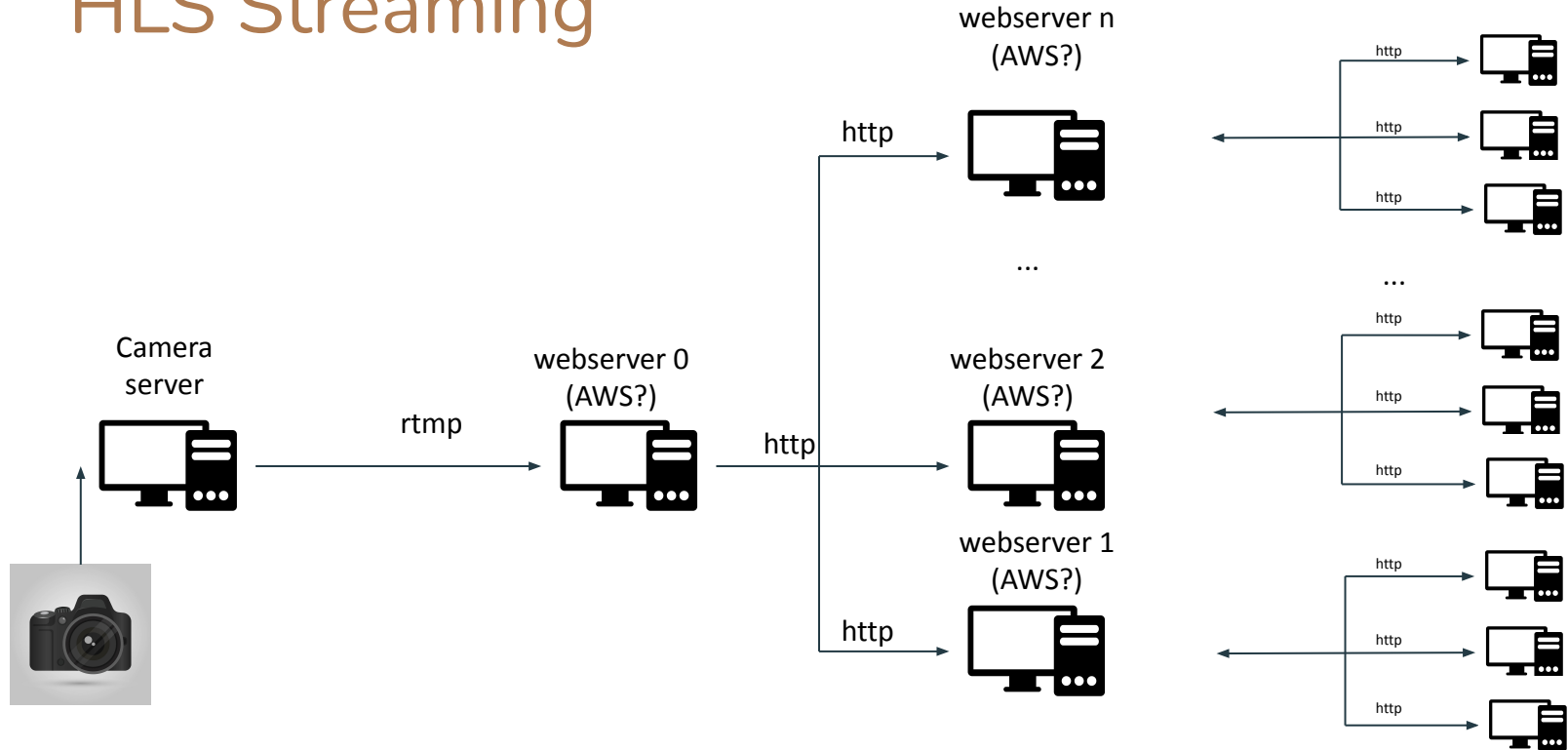
# RTMP Streaming



# HLS Streaming



# HLS Streaming





# Manifest

200	GET	👤	CvoENT0eFNEnngJ5kcn0_CISdI6LX2SgMH9	fetch	vnd....	13.07 KB	19.08 KB
206	GET	👤	CqQFWia3g6ADfG3U4lx0JA2WvPM0DBqbzU	fetch	oct....	32.22 KB	32 KB
200	GET	👤	CvoEr3qNd73KnmBdjaWOZxvSWrq6-dGP09y	:/1173 (fetch)	vnd....	13.13 KB	19.08 KB
200	GET	👤	CqQFi1lI9zJigMRS40h6qCclxKQiautZf_kwgRt	:/1173 (fetch)	oct....	356.90 KB	356.72 KB
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200	GET	👤	CqQFqOMc7WrJqBh93GZUth2X9qSbIFNBHE	:/1173 (fetch)	oct....	352.12 KB	351.95 KB
200	GET	👤	CvoEr3qNd73KnmBdjaWOZxvSWrq6-dGP09y	:/1173 (fetch)	vnd....	13.09 KB	19.08 KB
	GET	1	vendor-a88...			0 B	0 B
🚫	GET	s 1	vendor-a88...		NS_BINDING...		
302	GET	👤	p?c1=2&c2=6745306&ns_type=hidden&ns_st	core-666d5...	gif	1.71 KB	43 B
200	GET	👤	p?c1=2&c2=6745306&ns_type=hidden&ns_	core-666d5...	gif	309 B	43 B
206	GET	👤	CqQFWia3g6ADfG3U4lx0JA2WvPM0DBqbzU	:/1173 (fetch)	oct....	32.22 KB	32 KB
200	GET	👤	CvoENT0eFNEnngJ5kcn0_CISdI6LX2SgMH9	:/1173 (fetch)	vnd....	13.06 KB	19.08 KB
200	GET	👤	CqQFMWIdDgHNYOSH-gfate9aUyCgagGfP	:/1173 (fetch)	oct....	829.47 KB	829.29 KB
204	POST	👤	Cig1DiSQMoqFWYyHRJpToA0mjJ1BM6XofeZ	core-666d5...	plain	5.33 KB	0 B
🚫	GET	s 1	vendor-a88...		NS_BINDING...		
🚫	GET	s 1	vendor-a88...		NS_BINDING...		
206	GET	👤	CqQFWia3g6ADfG3U4lx0JA2WvPM0DBqbzU	:/1173 (fetch)	oct....	32.22 KB	32 KB
200	GET	👤	CqQFhDHFcpdxAKnyJHkWfoEAzWJLurloSAI	:/1173 (fetch)	oct....	851.31 KB	851.14 KB
200	GET	👤	CvoENT0eFNEnngJ5kcn0_CISdI6LX2SgMH9	:/1173 (fetch)	vnd....	13.06 KB	19.08 KB
200	GET	👤	CvoENT0eFNEnngJ5kcn0_CISdI6LX2SgMH9	:/1173 (fetch)	vnd....	13.06 KB	19.08 KB
204	POST	👤	Cig1DiSQMoqFWYyHRJpToA0mjJ1BM6XofeZ	core-666d5...	plain	5.34 KB	0 B
204	OP...	👤	CqQFhDHFcpdxAKnyJHkWfoEAzWJLurloSAI	fetch	plain	204 B	0 B
206	GET	👤	CqQFhDHFcpdxAKnyJHkWfoEAzWJLurloSAI	:/1173 (fetch)	oct....	32.22 KB	32 KB
200	GET	👤	CvoEr3qNd73KnmBdjaWOZxvSWrq6-dGP09y	:/1173 (fetch)	vnd....	13.09 KB	19.08 KB
200	GET	👤	CqQFHk4ePQaoDeZLX4_q2Jy1VwzGoRixcfh	:/1173 (fetch)	oct....	348.82 KB	348.64 KB

```
1 #EXTM3U
2 #EXT-X-VERSION:3
3 #EXT-X-TARGETDURATION:5
4 #EXT-X-MEDIA-SEQUENCE:11
5 #EXT-X-TWITCH-ELAPSED-SECS:79265,169
6 #EXT-X-TWITCH-TOTAL-SECS:79299,169
7 #EXT-X-DATERANGE:ID="source-1617798725",CLASS="twitch-stream-source",START-DATE="2021-04-07T12:32:05,621Z",END-ON-NEXT=YES,X-TV-TWITCH-STREAM-SOURCE="live"
8 #EXT-X-DATERANGE:ID="trigger-1617798710",CLASS="twitch-trigger",START-DATE="2021-04-07T12:31:50,453Z",END-ON-NEXT=YES,X-TV-TWITCH-TRIGGER-URL="https://video-weaver.arn0
9 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:11,621Z
10 #EXTINF:2.000,Live
11 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFRkD1A8Xb5QzU931LDqj7P5mbC5KpddX05DzldgEdigroSWuDRdSn9D0R8k4GawpMC1DA7nTqB3NgcpA8cm_oeaCJ9-CcoFFC
12 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:13,621Z
13 #EXTINF:2.000,Live
14 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFcdg6hUKAVhBzJtSdrhw01REEHxAtUWJAfdqPJwEXHAGXs5ga432ng31LAR5FK1F7cKcQJKRIz0YER0MFDdLIvBbapR0R8SLsTpPgP
15 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:15,621Z
16 #EXTINF:2.000,Live
17 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFddJlBunBb4cJEJ79mRfX0bVcsAht5W0R12PgEniRUlJNNz_FH5xnsioiqXmAlIcwmvVPzjNCapUCiBFjMxzWFGH6DCNPL0o_CbwttN
18 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:17,621Z
19 #EXTINF:2.000,Live
20 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFPUGIE_HdqDvoe1-HFwyOPvBua10BVMwHx0vxFWp28-LnnT44lpMjLR7b-ha0vpUB12eiWcdA-bu-oUFSvFRJ0Ry4KB0wJb50fIbx_NL
21 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:19,621Z
22 #EXTINF:2.000,Live
23 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFq5cse1EAghLrVhLfnHPQ53-PdtyUhl1cv0gJCjCQWqV4rrB3UWttksfTswFbInbc38sqAmDz1Y87q2837XK5j1LfSmALmZNF_M33
24 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:21,621Z
25 #EXTINF:2.000,Live
26 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFxfYhjbmdem9HHT9v9Fu-has7ng87-9WPKGxNXZ3aV0hFpp20RPM25otAuV1zMTm-I-VIMz6kzCtAEgVgexcx1qM4rrRjzqepT4Z
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37 #EXTINF:2.000,Live
38 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFA8qjH5ZvVlUetWiE-EFo9dx_wYfURbjox5ZwWVLu21GGUtsuyw1-d-FmRltpgtgrwTWhRwj0KakUuHbChot09pntB4TzZew56Sf
39 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:31,621Z
40 #EXTINF:2.000,Live
41 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQFevbWAvgnf12F4j3oGMA5X_DWvtBUs615YE_5kxxw0HGA19d-cbmPLkg7uPzTnQ1-ETrATKM0peyD0T15y-50dMY7wt-Lsv313
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43 #EXTINF:2.000,Live
44 https://video-edge-68140.arn03.abs.hls.ttvnw.net/v1/segment/CqQF0R8hL814-dc8Yivu-_6fdr5Z1jsEP5PookGgt4hPRMqWvtV3kqHe7860271jYaAW5zpsKNL-E8HtagP35eL8AgRRP7Uj7fytVezrM
45 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:35,621Z
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48 #EXT-X-PROGRAM-DATE-TIME:2021-04-07T12:32:37,621Z
```

# Stream data

Stat...	Met...	File	Initiator	Type	Transferred	Size	Headers	Cookies	Request	Response	Timings	Security
204	POST	Cig1DiSQMoqFWYyHRJpToA0mjJ1BM6XofeZ(	fetch	plain	9.20 KB	0 B	Response Payload					
200	GET	CvoENT0efNDEnngJSkcno_CISdl6LX2SgMH9	fetch	vnd....	13.07 KB	19.08 KB	1	R0AAHQAAAsA0AAcEAAAAB8AAqsQSy//////////				
206	GET	CqQFWia3g6ADFG3U4lx0JA2WvPM0DBqzbU	fetch	oct....	32.22 KB	32 KB						
200	GET	CvoEr3qNd73KnmBdjaWOZxvSWrq6-dGP09y	/:1173 (fetch)	vnd....	13.13 KB	19.08 KB						
200	GET	CqQFi1lI9zJigMRS40h6qQclxKQIAutzf_kwgrI	/:1173 (fetch)	oct....	356.90 KB	356.72 KB						
206	GET	CqQFWia3g6ADFG3U4lx0JA2WvPM0DBqzbU	/:1173 (fetch)	oct....	32.22 KB	32 KB						
200	GET	CqQFqOMc7WrJqBH93GZUth2X9qSbIFNBHE	/:1173 (fetch)	oct....	352.12 KB	351.95 KB						
200	GET	CvoEr3qNd73KnmBdjaWOZxvSWrq6-dGP09y	/:1173 (fetch)	vnd....	13.09 KB	19.08 KB						
	GET	1	vendor-a88...		0 B	0 B						
	GET	s 1	vendor-a88...	NS_BINDING...								
302	GET	p?c1=2&c2=6745306&ns_type=hidden&ns_sl	core-666d5...	gif	1.71 KB	43 B						
200	GET	p2?c1=2&c2=6745306&ns_type=hidden&ns_	core-666d5...	gif	309 B	43 B						
206	GET	CqQFWia3g6ADFG3U4lx0JA2WvPM0DBqzbU	/:1173 (fetch)	oct....	32.22 KB	32 KB						
200	GET	CvoENT0efNDEnngJSkcno_CISdl6LX2SgMH9	/:1173 (fetch)	vnd....	13.06 KB	19.08 KB						
200	GET	CqQFmWtdDgHNYOSh-gfate9aUuGcgadGrP	/:1173 (fetch)	oct....	829.47 KB	829.29 KB						
204	POST	Cig1DiSQMoqFWYyHRJpToA0mjJ1BM6XofeZ(	core-666d5...	plain	5.33 KB	0 B						
	GET	s 1	vendor-a88...	NS_BINDING...								
	GET	s 1	vendor-a88...	NS_BINDING...								
206	GET	CqQFWia3g6ADFG3U4lx0JA2WvPM0DBqzbU	/:1173 (fetch)	oct....	32.22 KB	32 KB						
200	GET	CqQFhDHFcpdxAknyJJHkWfoEAzWjLEurloSAl	/:1173 (fetch)	oct....	851.31 KB	851.14 KB						
200	GET	CvoENT0efNDEnngJSkcno_CISdl6LX2SgMH9	/:1173 (fetch)	vnd....	13.06 KB	19.08 KB						
200	GET	CvoENT0efNDEnngJSkcno_CISdl6LX2SgMH9	/:1173 (fetch)	vnd....	13.06 KB	19.08 KB						
204	POST	Cig1DiSQMoqFWYyHRJpToA0mjJ1BM6XofeZ(	core-666d5...	plain	5.34 KB	0 B						
204	OP...	CqQFhDHFcpdxAknyJJHkWfoEAzWjLEurloSAl	fetch	plain	204 B	0 B						
206	GET	CqQFhDHFcpdxAknyJJHkWfoEAzWjLEurloSAl	/:1173 (fetch)	oct....	32.22 KB	32 KB						
200	GET	CvoEr3qNd73KnmBdjaWOZxvSWrq6-dGP09y	/:1173 (fetch)	vnd....	13.09 KB	19.08 KB						
200	GET	CqQFHk4ePKqoDezLX4_q2Jy1VwzgAoRixcfHl	/:1173 (fetch)	oct....	348.82 KB	348.64 KB						

Dette minner veldig om webservere og programmering jeg har gjort før?

HLS: Http live streaming

Nodejs-server

# Siste utfordring

Opplastning av innholdet?

Vi trenger solide 10-20 Gbps

Jakob -> Uninett:

Kan vi få 20Gbps?

Uninett -> Jakob

Null stress



# Hvordan det endte

## **Gratis revy!**

Få solgte billetter, mye større publikum hvis gratis

Like dyrt å se på om du sitter alene i karantene eller sammen med venner

# Takk for meg!

[me@jakoblj.com](mailto:me@jakoblj.com)

Ta gjerne kontakt på Slack, LinkedIn, Facebook, Instagram, A3

Digger å hjelpe til med teknologiske utfordringer, jeg hører gjerne dine tanker!



**Jakob Lund Johannessen** ●

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[jakoblj@stud.ntnu.no](mailto:jakoblj@stud.ntnu.no)