WEB & MULTIMEDIA

0

VIDEO ON THE INTERNET
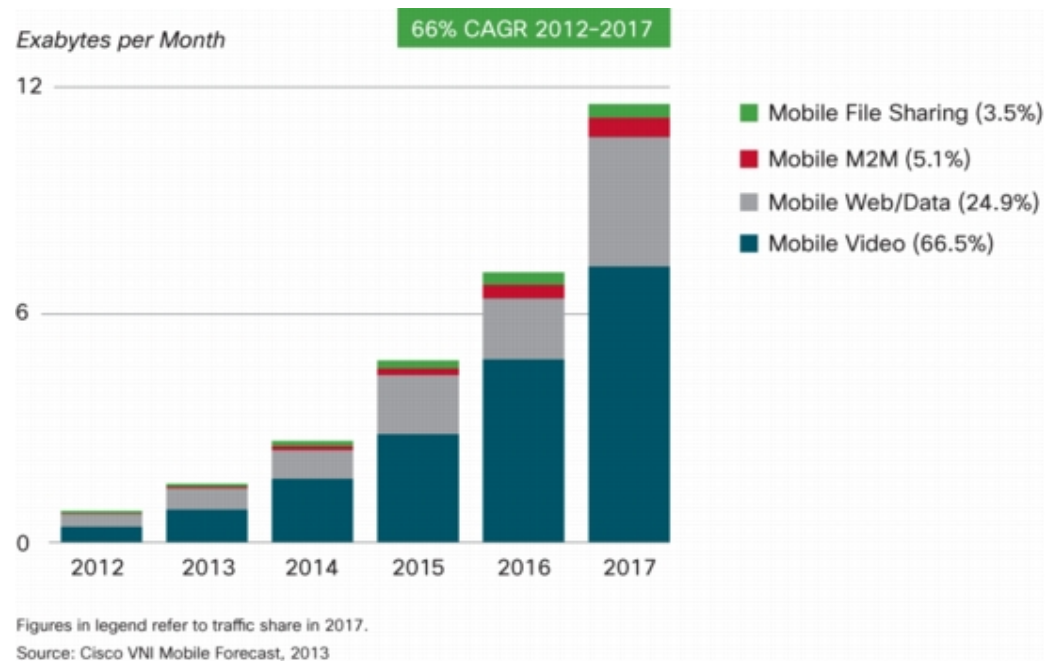## SANDVINE REPORT 1H 2013

US download statistics for fixed Internet Access

- Facebook 1%
- Flash Video 2%
- SSL 2%
- iTunes 2%
- Hulu 2%
- MPEG 3%
- BitTorrent 6%
- HTTP 11%
- YouTube 17%
- Netflix 32%
- Other 22%
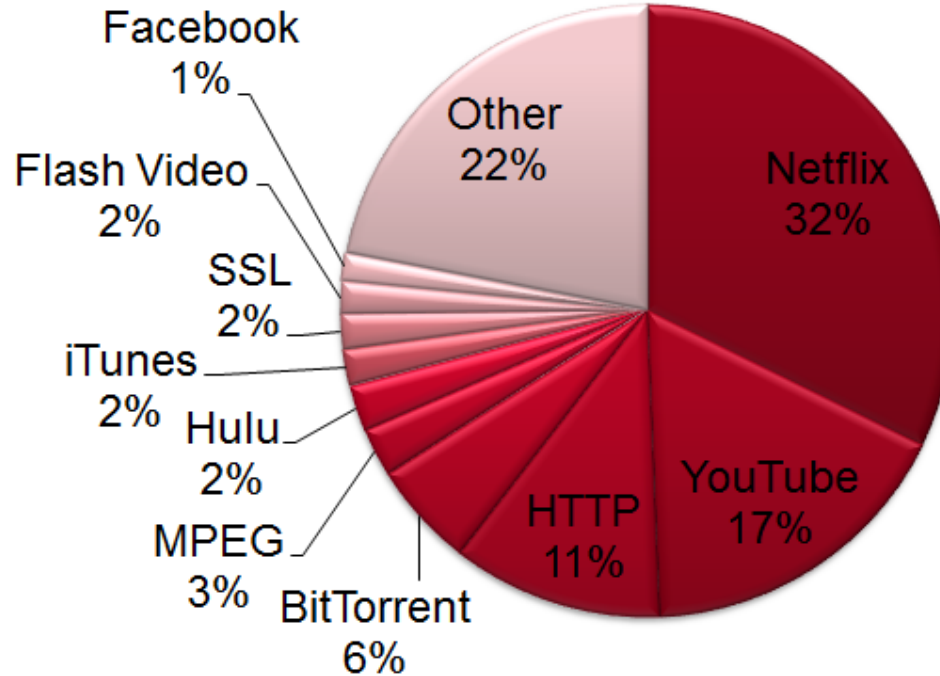
VIDEO ON MOBILE
CISCO INDEX

Exabytes per Month

66% CAGR 2012-2017

12

6

0

2012 2013 2014 2015 2016 2017

■ Mobile File Sharing (3.5%)
■ Mobile M2M (5.1%)
■ Mobile Web/Data (24.9%)
■ Mobile Video (66.5%)

Figures in legend refer to traffic share in 2017.

Source: Cisco VNI Mobile Forecast, 2013

MEDIA FORMATS ON THE WEB

■ Wish to have « Royalty-free » technologies, like other Web technologies
■ Images
  • JPG, PNG, GIF, SVG, WebP

■ Video
  • Container vs. Codec
  • Containers: MP4, OGG, MPEG-2, WebM, Matroska...
  • Codecs: H264/AVC, HEVC, DiVX, Theora, VP8, VP9...

■ Audio
  • AAC, MP3, Opus, Vorbis,...

■ Subtitles
  • SRT, SSA, ...

WEB & MEDIA: THE OLD WAY

```
<object classid="clsid:d27cdb6e-ae6d-11cf-96b8-444553540000"
        width="425" height="344"
        codebase="http://download.macromedia.com/pub/shockwave/cabs/flash/swflash.c
    <param name="allowFullScreen" value="true"/>
    <param name="allowscriptaccess" value="always"/>
    <param name="src" value="http://www.youtube.com/v/oHg5SJYRHA0&hl=en&fs=1&"/>
    <param name="allowfullscreen" value="true"/>
  <embed type="application/x-shockwave-flash" width="425" height="344"
      src="http://www.youtube.com/v/oHg5SJYRHA0&hl=en&fs=1&"
      allowscriptaccess="always" allowfullscreen="true">
  </embed>
</object>
```

- Plugin-based: Flash, Quicktime, …
- Differences between browsers: IE vs. Mozilla, …
- Semantically unclear
- Not accessible
- Does not integrate with the page

MEDIA IN HTML 5

```
<audio controls loop autoplay src="file.mp3"/>
```

- Simple, almost
- Consistent across browsers

```
<video controls poster="sintel.jpg" width="600">
    <source src="sintel.mp4" />
    <source src="sintel.webm" />
    <source src="sintel.ogv" />
</video>
```

HTML 5 MEDIA MARKUP AND JS APIS

- Basic elements
  - `<audio>`
  - `<video>`

- Common attributes
  - `autoplay`
  - `controls`
  - `crossorigin`
  - `loop`
  - `mediagroup`
  - `muted`
  - `preload`
  - `src`
  - `width`

- Common elements
  - `<source>`
  - `<track>`

- Video-specific attribute
  - `poster`
  - `height`

- Common JS Interfaces
  - HTMLMediaElement
  - HTMLMediaController

- Specific JS interfaces
  - HTMLVideoElement
 - HTMLAudioElement

MEDIA AND SECURITY
CROSS ORIGIN RESOURCE SHARING

- Web sites can aggregate data from multiple sources
  - Content hosted on Server A may use an image, a script, a video ... hosted from another Server B
  - Possible phishing: Malicious site uses the video-clips from your bank's web site.

- CORS is a specification by W3C to avoid that
  - Applicable to JavaScript downloads (XMLHttpRequest) and video retrieval

- Requires actions
  - by the browser if using XHR
  - by the server (all the time)

- Server configuration

```
Header set Access-Control-Allow-Origin "*"
Header set Access-Control-Allow-Methods "GET,PUT,POST,DELETE,OPTIONS"
Header set Access-Control-Allow-Headers "Origin, X-Requested-With, Content-Type, Ac
Header set Access-Control-Expose-Headers "Content-Range"
```

HTML 5 MEDIA EVENTS

■ State machines associated to each media element

Network Status
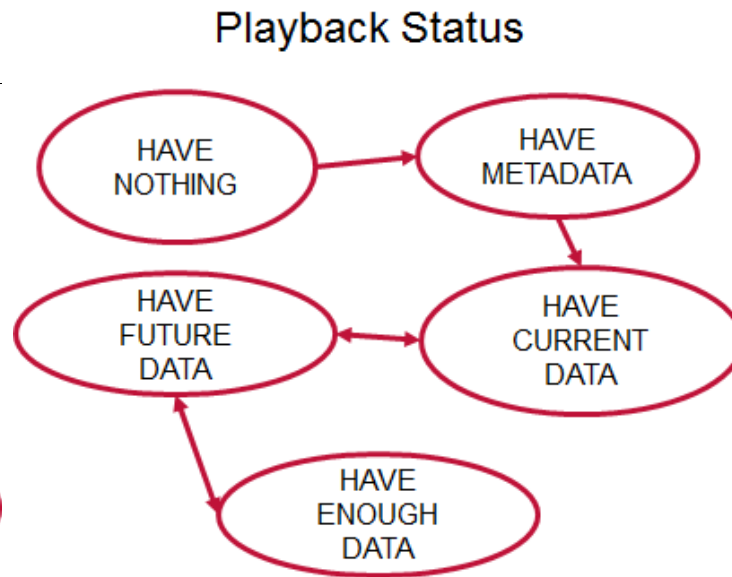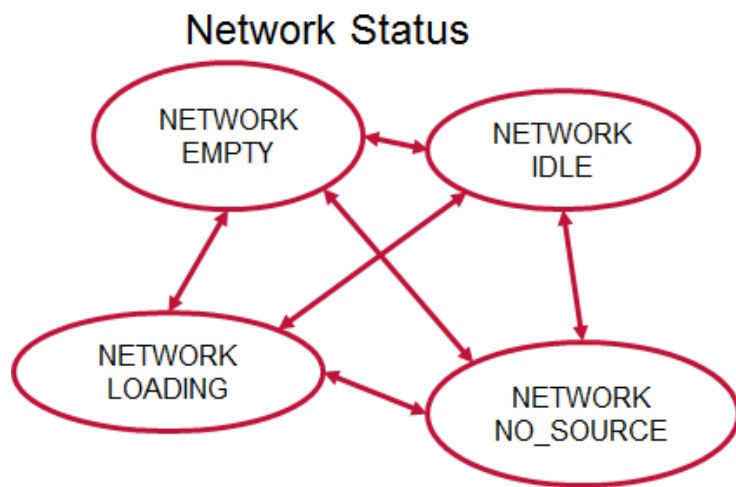
Playback Status

■ Dedicated events to monitor
  • Network & Download progress
  • Decoding & Playback progress

■ Demo

VIDEO AND THE WEB STACK

- Styling videos with CSS
    - Select video size/type using Media Queries
    - Apply effects (1, 2, 3) on videos
    - Transform videos

- Extracting and modifying video content with JavaScript using the `<canvas>` element (1, 2)

AUDIO ON THE WEB

- Using the `<audio>` element & `HTMLAudioElement`
  - For simple file playback

- Using the WebAudio API
  - For sound manipulations
  - For real-time processing and analysis
  - For audio effects
  - Demo

HTML 5 TIMED TEXT TRACKS

New `<track>` element and JS API

```
<video controls>
 <source src="elephants-dream.mp4" type="video/mp4">
 <source src="elephants-dream.webm" type="video/webm">
 <track label="English subtitles" kind="subtitles" srclang="en"
        src="elephants-dream-subtitles-en.vtt" default>
 <track label="Deutsche Untertitel" kind="subtitles" srclang="de"
        src="elephants-dream-subtitles-de.vtt">
 <track label="English chapters" kind="chapters" srclang="en"
        src="elephants-dream-chapters-en.vtt">
</video>
```

Usages

- Synchronized Subtitles, Captions ...
- Thumbnails
- Synchronized Graphics
- Synchronized Metadata

SUBTITLES ON THE WEB
THE NEW WEBVTT FORMAT

```
WEBVTT

Cue-1
00:00:15.000 --> 00:00:18.000
At the left we can see...

AnotherCue
00:00:16.000 --> 00:00:30.000
And some other text
```

On-going work

- Styling with CSS
- Regions
- Conversion from/to TTML
- Conversion from US CEA-608/708

SUBTITLES ON THE WEB
TTML

```xml
<!--?xml version="1.0" encoding="utf-8"?-->
<tt xml:lang="en" xmlns="http://www.w3.org/ns/ttml" xmlns:tts="http://www.w3.org/ns
  <head>
    <metadata>
      <ttm:title>Content Test - div - 001</ttm:title>
      <ttm:desc>Test nested div elements.</ttm:desc>
      <ttm:copyright>Copyright (C) 2008 W3C (MIT, ERCIM, Keio).</ttm:copyright>
    </metadata>
  </head>
  <body>
    <div>
      <div begin="0s" end="5s" tts:color="red">
        <p begin="0s" end="5s">This text must be red.</p>
      </div>
      <div begin="5s" end="10s" tts:color="green">
        <p begin="0s" end="5s">This text must be green.</p>
      </div>
      <div begin="10s" end="20s">
        <p begin="0s" end="5s">This test is over.</p>
      </div>
    </div>
  </body>
</tt>
```

MEDIA FRAGMENTS

- Ability to address a particular time in a videostreams
    - Hyperlinkingwithvideos (youtube-like)

```
<video src='pesto_images/myvideo.webm#t=50,100'></video>
```

JAVASCRIPT PLAYERS

Various tools

- JWPlayer
- Video.js
- MediaElement.js
- MediaElement.js
- Kaltura
- ...

Feature comparison

- iOS Support
- Flash Fallback
- Subtitle support
- Fullscreen
- ...

STREAMING ON THE WEB

- Progressive download & playback of a file
- Adaptive Streaming
  - Download and play multiple small files seamlessly
  - Today's technologies
    - Apple HTTP Live Streaming (HLS)
    - Microsoft Smooth Streaming (MSS)
    - Adobe HDS
    - MPEG DASH using W3C MediaSource API

HTML5 MEDIA SOURCE

■ W3C Recommandation in progress
  • Extension to the HTML5 recommandation
  • Separation between networking and playback
  • Enables adaptive streaming in Web Browsers

■ JavaScript API
  • Controlling media decoding buffers
    - Add, delete media data

  • Supported by Google Chrome, MS IE 11, (Firefox)

■ JavaScript-based players (MP4-based)
  • DASH.js
  • DASH-JS
  • YouTube Test player
  • Akamaï
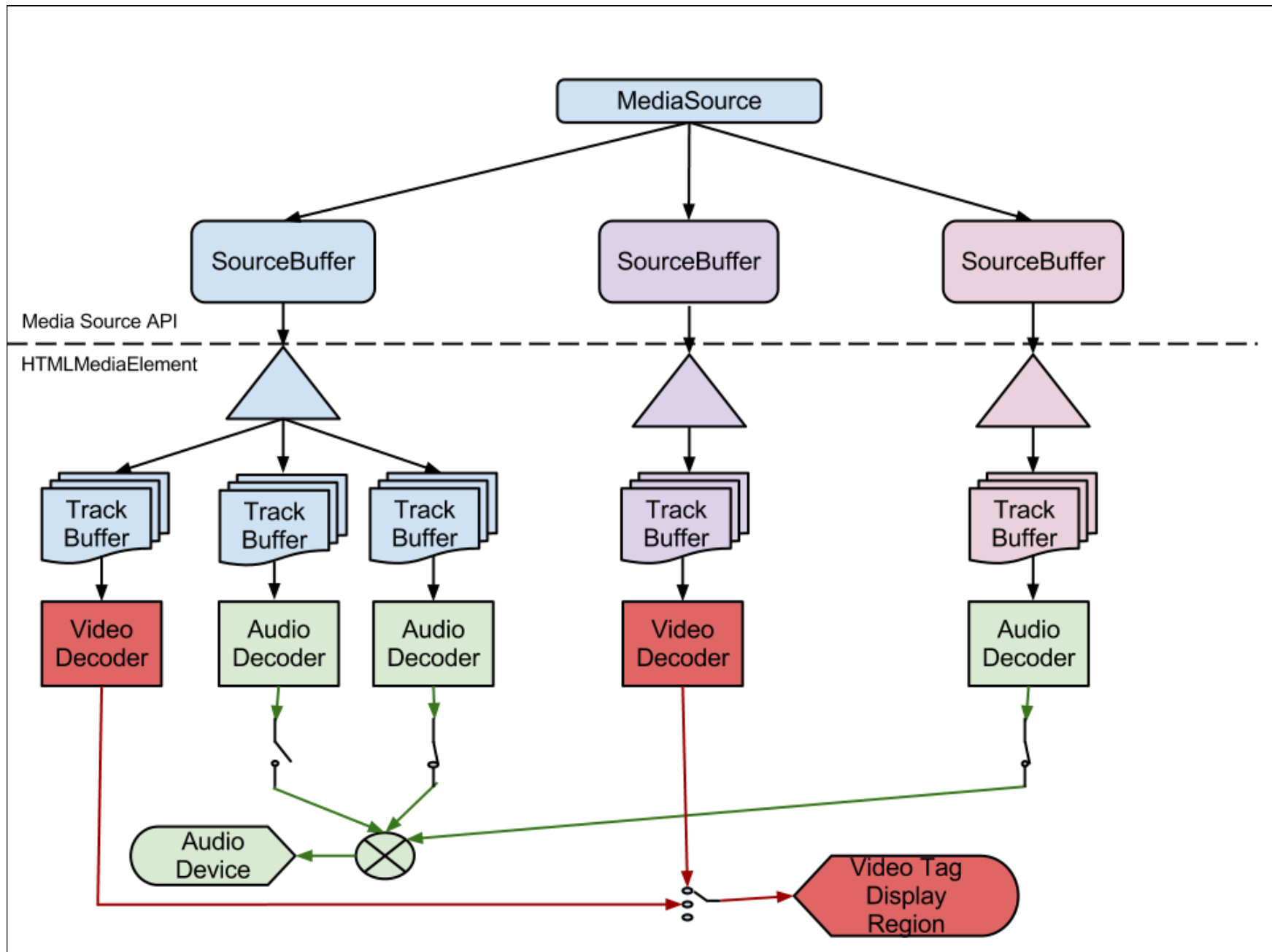
DRM ON THE WEB

■ W3C Recommandation in progress:
Encrypted Media Extensions
- • Extensions to the HTML5 recommandation
- • Used in conjunction with Media Source Extension
- • Enables the streaming of encrypted content and the secure decryption

■ JavaScript API
- • to access to a (proprietary) Content Decryption Module (CDM)
- • Communication with the License Server is out-of-scope
- • Implementation of CDM is out-of-scope

■ In use by Netflix with Microsoft IE 11

USING WEBCAM IN WEB CONTENT

- Applications
    - Voice over IP, Video Conference in the browser
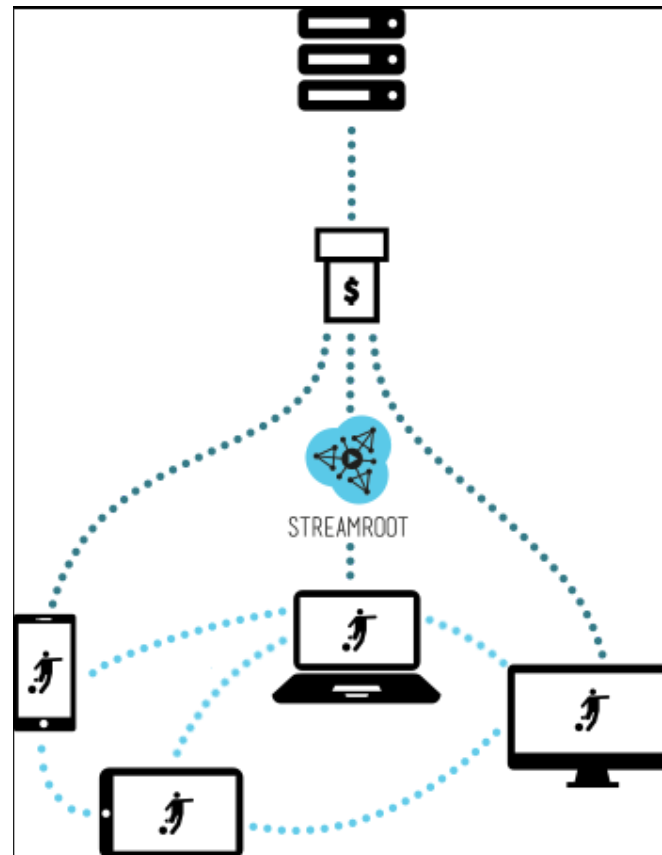   - No Skype plugin

- Two standards
    - HTML Media Capture Interface
        - Capture the audio/video streams
        - Hook them onto HTML 5 `<audio>`/`<video>` elements

    - WebRTC
        - Real time communication between browsers
            - Exchange audio/video compress streams and data

- Demo

WEB P2P AND VIDEO STREAMING

Download media data from CDN or from peers

WEB P2P AND VIDEO STREAMING

Stream torrents in the browser

AD51323FAC3285A981F3CDA21A7FAA061E5765C4

Stream   Download   Upload

Direct, P2P and bittorrent anonymized circuits : 6 circuits

Downloaded Files

0:01:15