Stream-Up your life!

- Live-Video-Streaming auf Basis von Web-Standards -

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JavaLand 2016

Video Streaming Plattformen

YouTube

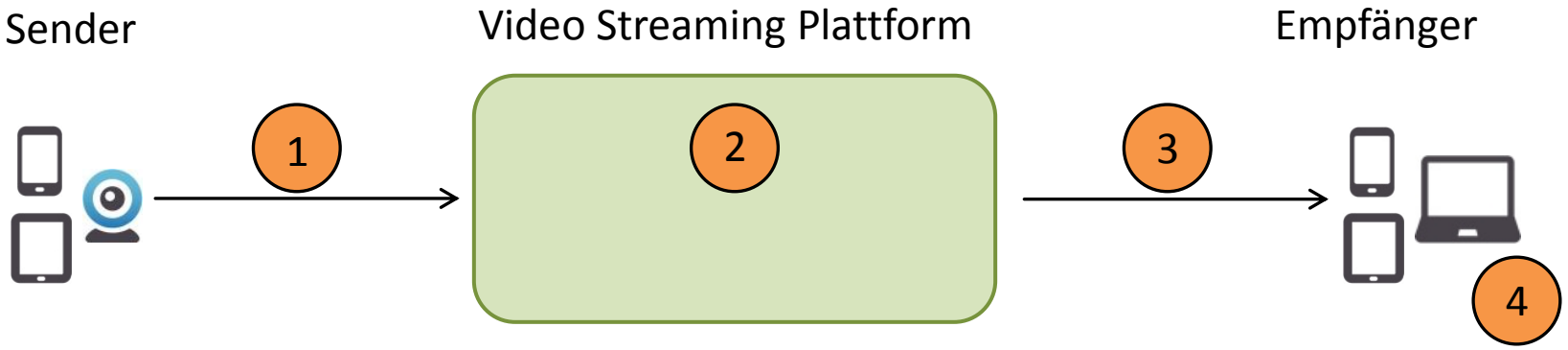
USTREAM

livestream

Periscope

twitch

Ziel

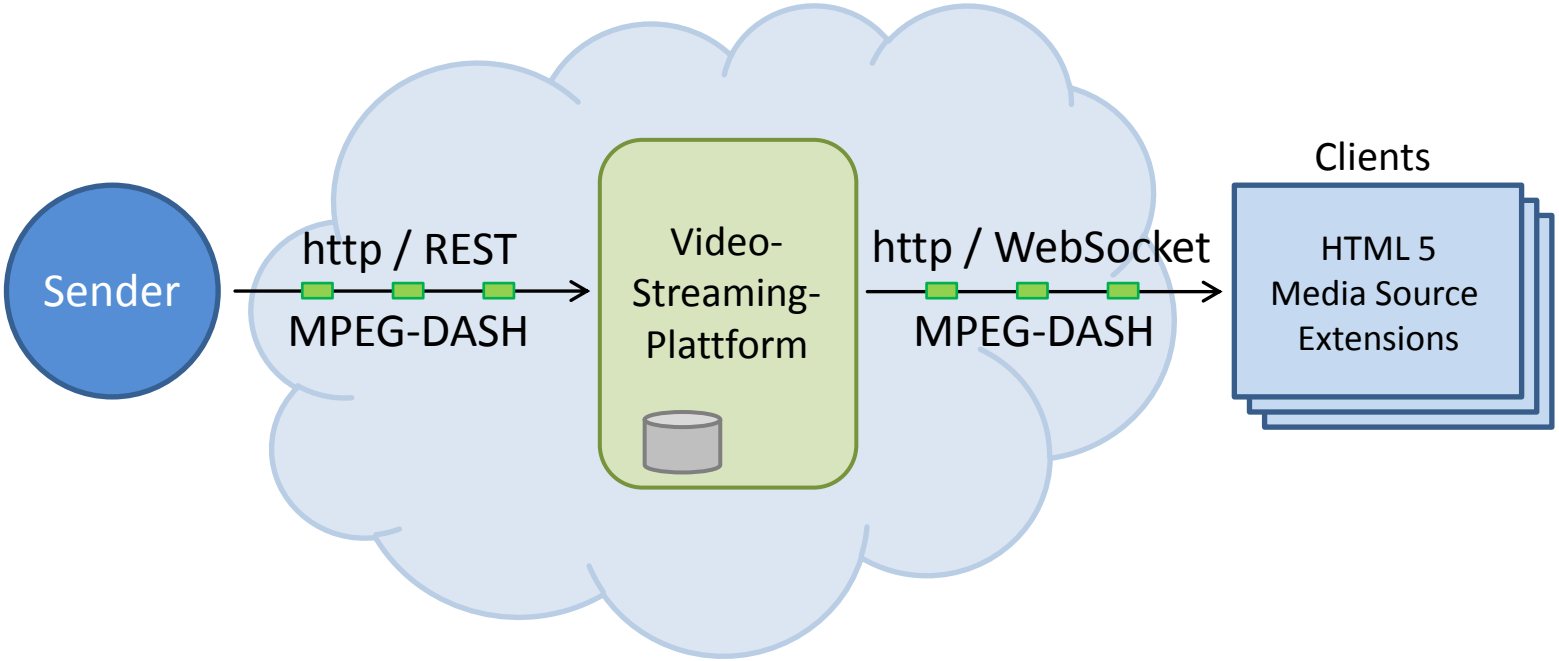


- Wie verpacken?
- Wie übertragen?

- Wie entgegennehmen?
- Wie verteilen?

- Wie übertragen?
- Wie anzeigen?

Lösung



mpeg-DASH

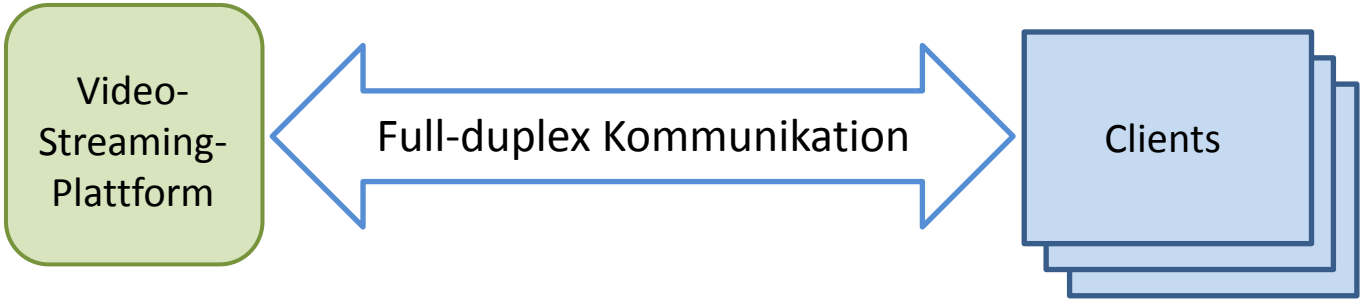
Java EE™ 7

HTML 5

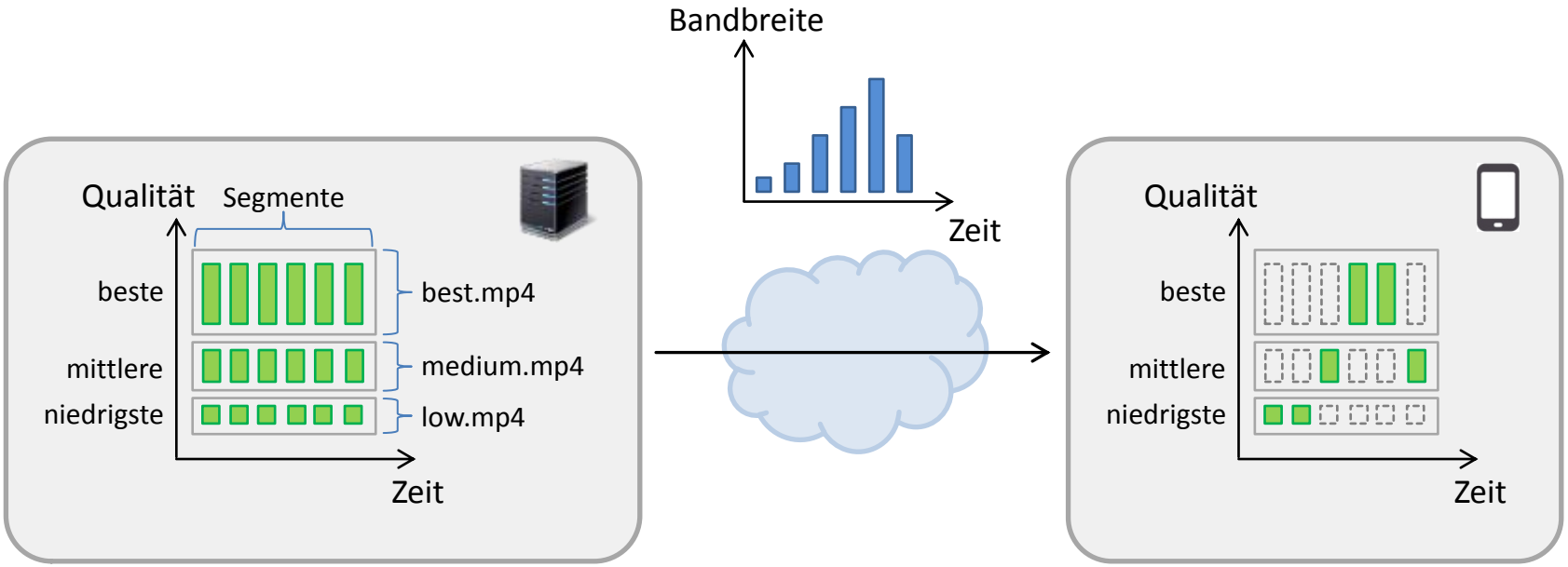
REST und WebSocket

Java API for RESTful Web Services (JAX-RS)

Java API for WebSocket



Dynamic Adaptive Streaming over HTTP (DASH)



HTTP Server
mit Video-Dateien

Netzwerk
mit variabler Bandbreite
(Internet)

Empfänger
z.B. Smartphone

HTML 5 Video-Element

- <video></video>
- für Adaptive Streaming wird **Media Source Extensions** (**MSE**) benötigt
- erlaubt JavaScript das Senden von byte streams an das Video Element
- direkte Anzeige des MPEG-DASH Streams möglich

Implementierung

Stream empfangen

```java
@Path("/video")
public class VideoResource {

    ...

    @Inject
    @Chunk
    private Event<ByteBuffer> chunkEvent;

    @POST
    @Consumes(MediaType.APPLICATION_OCTET_STREAM)
    public Response postChunk(InputStream chunk) {
        try {

            byte[] bytes = ByteStreams.toByteArray(chunk);
            ByteBuffer buf = ByteBuffer.wrap(bytes);

            Files.copy(chunk, Paths.get(PATH_STORE_VIDEOS + filename));

            chunkEvent.fire(buf);

        } catch (Exception e) {
            log.error(e.getMessage());
        }
        return Response.ok().build();
    }

}
```

```
{
 "Local-Start-Time" : "2016-02-23T09:51:30.031",
 "Category" : "Konferenz",
 "Tags"     : ["javaland","stream"],
 "Location" : {
   "Latitude"  : 50.7984,
   "Longitude" : 6.8812,
   "Altitude"  : 129m }
}
```

Stream verteilen

```
@ServerEndpoint(value = "/stream", encoders = { MessageEncoder.class }, decoders = { MessageDecoder.class })
public class StreamingEndpoint {

    private static final Set<Session> sessions = Collections.synchronizedSet(new HashSet<Session>());


    @OnOpen
    public void onOpen(Session session) {
        sessions.add(session);
    }


    public void onChunk(@Observes @Chunk ByteBuffer buffer) {
        for (Session session : sessions) {
            try {
                session.getBasicRemote().sendBinary(buffer);
            } catch (IOException ex) {
                ex.printStackTrace();
            }
        }
    }


    @OnMessage
    public void onMessage(Message message, Session session) {
        for (Session s : sessions) {
            try {
                s.getBasicRemote().sendObject(message);
            } catch (IOException | EncodeException ex) {
                ex.printStackTrace();
            }
        }
    }
```

Videoausgabe vorbereiten

```
<video id="video" autoplay="true"/>
```

```
var video = document.querySelector('video');

var queue = [];
var buffer;

var mediaSource = new MediaSource();
mediaSource.addEventListener('sourceopen', function(e) {
    video.play();

    buffer = mediaSource.addSourceBuffer('video/mp4;codecs="avc1.64001f,mp4a.40.2"');
    buffer.addEventListener('update', function() {
        if (queue.length > 0 && !buffer.updating) {
          buffer.appendBuffer(queue.shift());
        }
    });
}, false);

video.src = window.URL.createObjectURL(mediaSource);
```

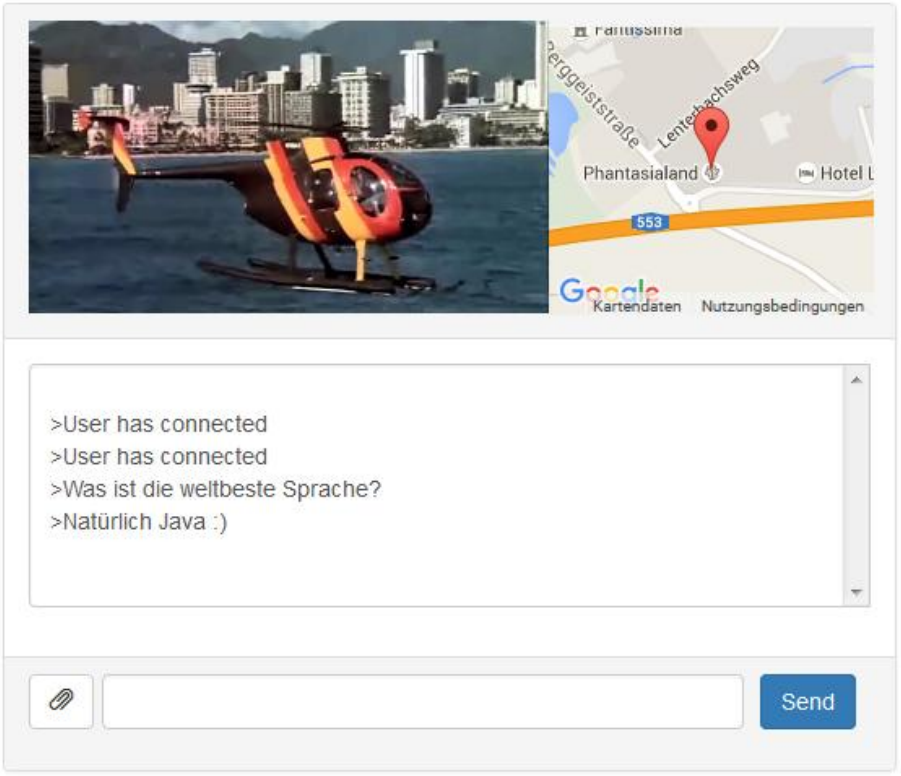
Video Stream anzeigen

```
var webSocket = new WebSocket('ws://localhost:8080/streamup/stream');
webSocket.binaryType = 'arraybuffer';

webSocket.onmessage = function(event){
    if (event.data instanceof ArrayBuffer) {
        console.log('video chunk arrived');
        try {
            if (buffer.updating || queue.length > 0) {
              queue.push(event.data);
            } else {
              buffer.appendBuffer(event.data);
            }
        } catch (e) {
            console.log(e);
        }
    } else {
        writeResponse(event.data);
    }
};
```

Ergebnis

Prototyp



Video Live Streaming

=

MPEG-DASH

+

WebSockets

+

HTML5 Video Tag

+

Media Source Extensions

+

(REST)

Prototyp unter:

http://JavaAkademie.de/javaland2016

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