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CSCI 101
Connecting with Computer Science
Lecture 3: Multimedia Technology II

Jetic Gū

2020 Fall Semester (S3)

Overview

- Focus: Digital Media
- Architecture: von Neumann
- Readings: 2, 3
- Core Ideas:

    1. Digital Content Distribution

P0
Review

Digital Multimedia

- Digital Multimedia Content
  - Digital Multimedia Representations
  - Digital Multimedia Creation
- Digital Multimedia Content Delivery
  - Traditional Means
  - Online Means

Review

P0
Review

Digital Content Representations

- Text
- Graphics
  - Still
  - Motion picture
- Sound
- Interactive media: text/graphics/sound + interaction

Review

P1
Delivery

Digital Content Delivery

For content distribution

Summary

P1
Delivery

Content Delivery

Concept

P1
Delivery

Content Delivery

- Traditional

Concept

P1
Delivery

Content Delivery

- Traditional
  - Text and still graphics: publications, posters, etc.

Concept

P1
Delivery

Content Delivery

- Traditional
  - Text and still graphics: publications, posters, etc.
  - Motion pictures: projectors,

Concept

P1
Delivery

Content Delivery

- Traditional
  - Text and still graphics: publications, posters, etc.
  - Motion pictures: projectors,
  - Sound: live performances, record players, stereo systems

Concept

P1
Delivery

Content Delivery

- Digital
  - Text and still graphics: Online viewing, Internet download, etc.
  - Motion pictures: Internet download, streaming, live streaming
  - Sound: Internet download, streaming, live streaming
  - Interactive: gaming

Concept

P1
Delivery

Content Delivery

- Offline Viewing
  - Download, Digital Medium Purchase (Blu-ray, etc.)
- Online Viewing
  - Streaming
  - Live streaming

Concept

P1
Delivery

Streaming

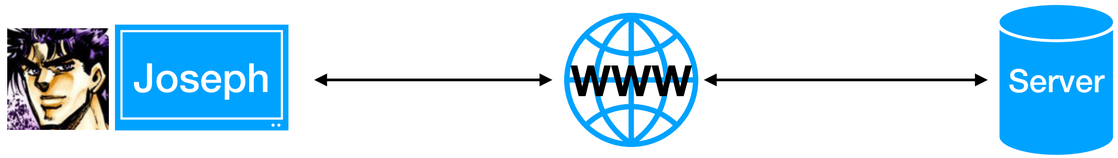
- Stream is a sequence of data elements made available over time
- Stream is not an exclusive concept for internet content delivery, in fact, modern computers also take input and outputs as streams (keyboard, mouse, display, etc.)

Concept

P1
Delivery

Streaming

- Streaming media on the internet
- User Joesph requests content, server delivers content

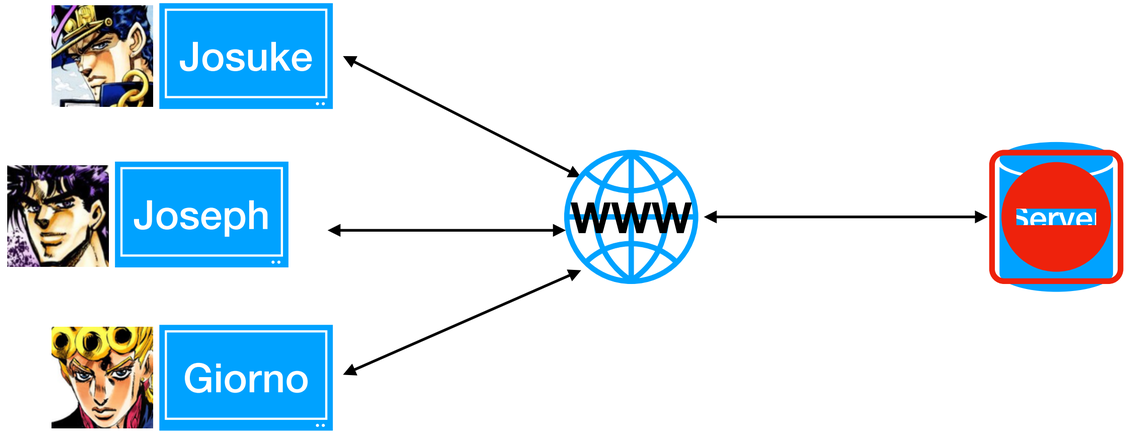


Technical

P1
Delivery

Streaming

- Streaming media on the internet
- User Joesph requests content, server delivers content
- A single server can only handle limited requests!

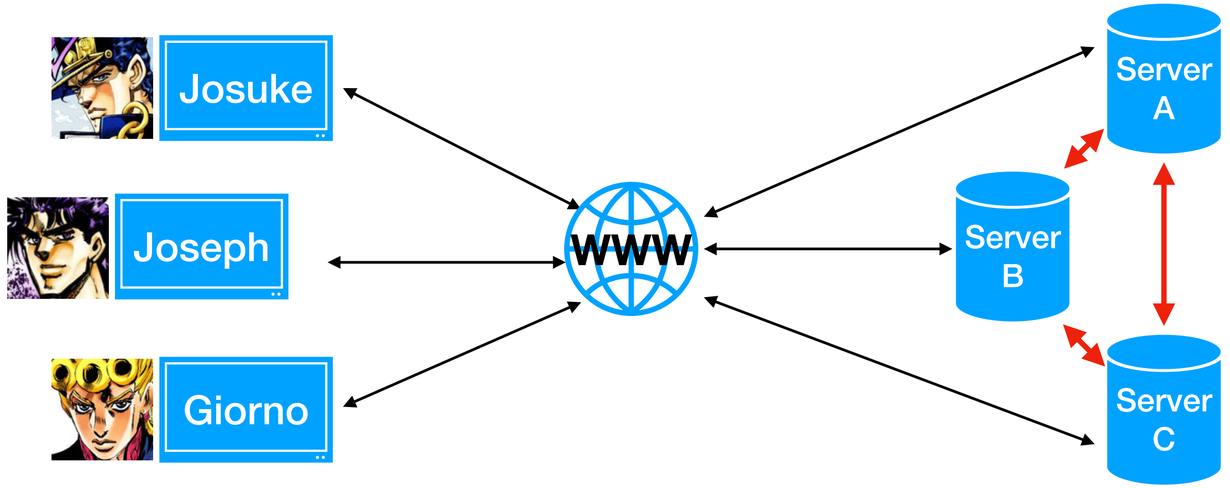


Technical

P1
Delivery

Streaming

- Content Delivery Networks (CDN)
- A complete data centre with internal network, designed to serve multiple users simultaneously



1. Netflix is using Amazon's CDN

Technical

Streaming

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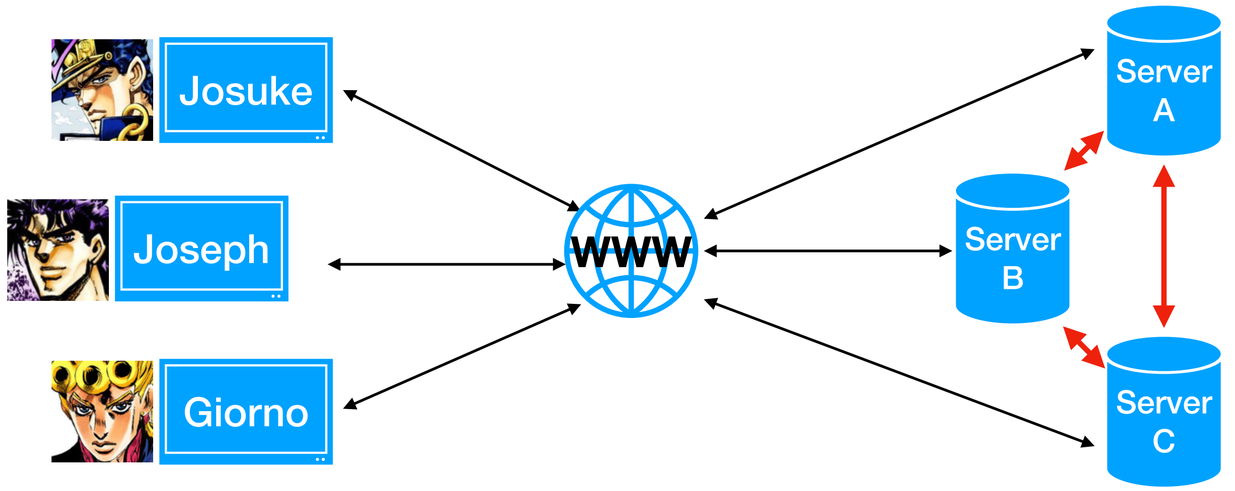

Server A, B, C are interconnected and have their own local network

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Technical

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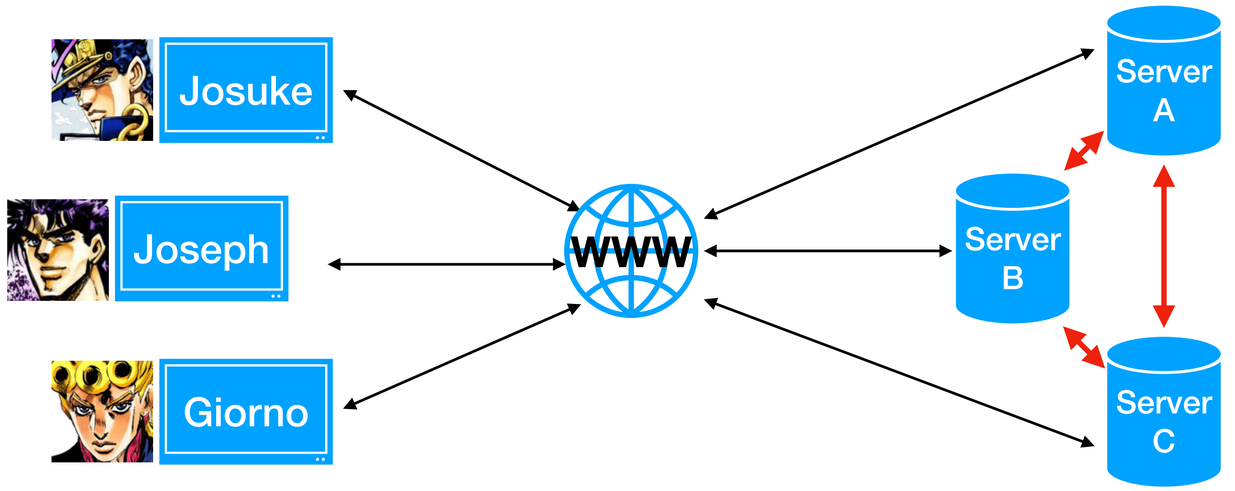

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Server A, B, C's data are synchronised, so they can deliver the same content

Technical

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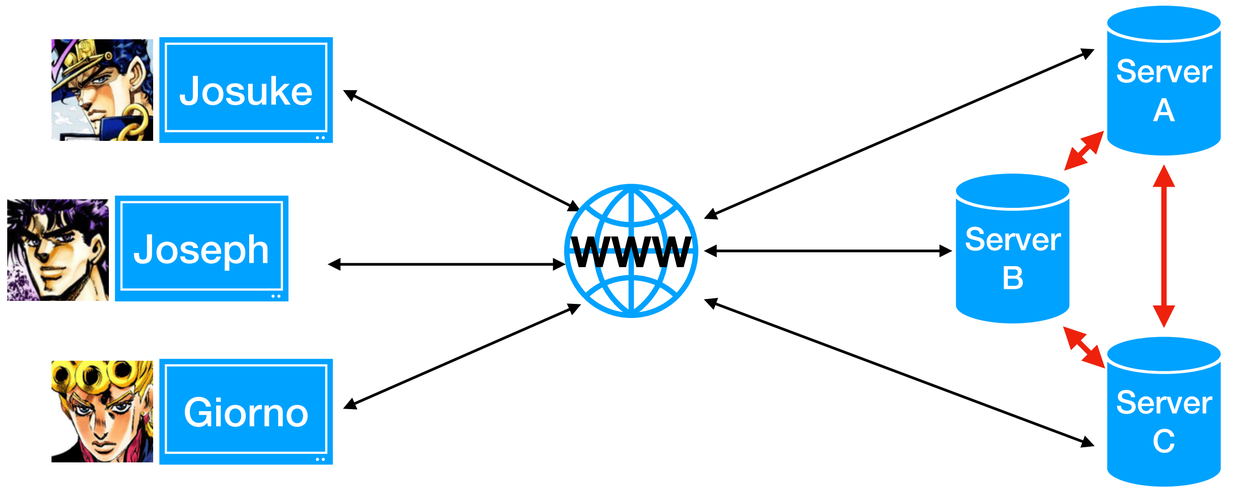

Server A, B, C are interconnected and have their own local network

Server A, B, C's data are synchronised, so they can deliver the same content

Server A, B, C each have independent links to the internet, so they can serve requests independently

1. Netflix is using Amazon's CDN

Technical

P1
Delivery

Streaming vs Live Streaming

- Have you tried to watch the champions league on the internet? Notice it is always a few seconds off?

Concept

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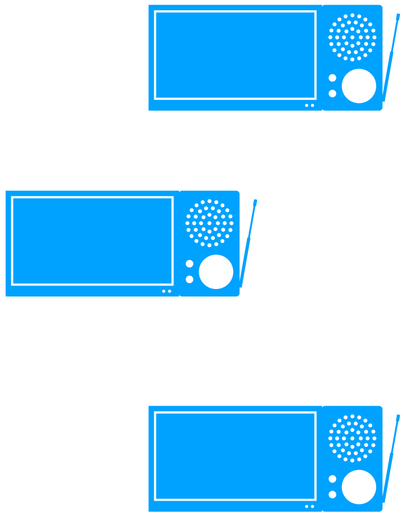

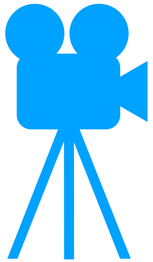

Review

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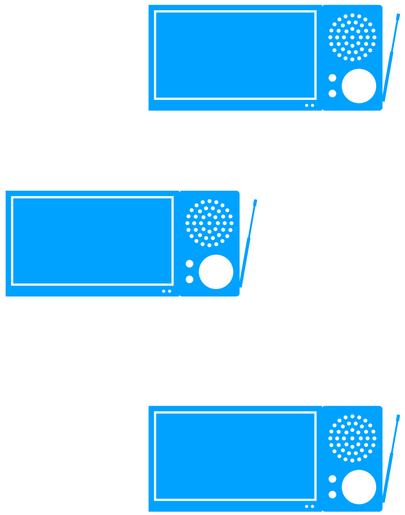

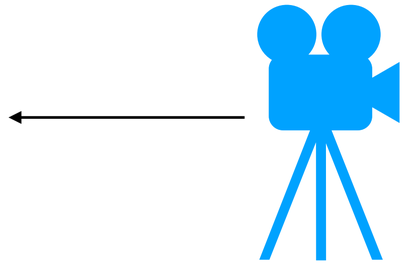

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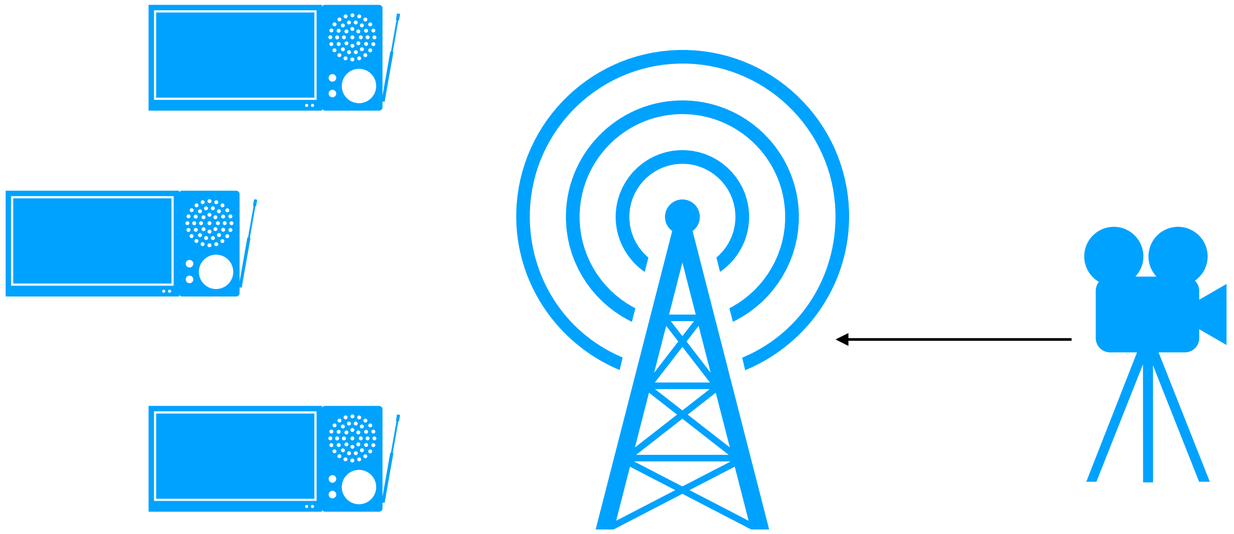

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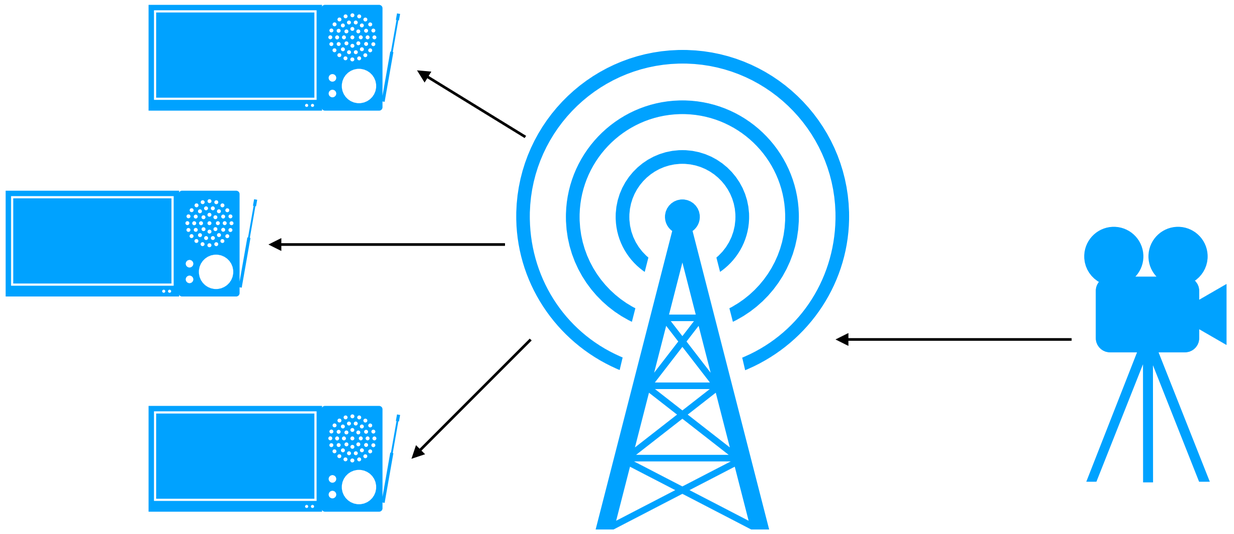

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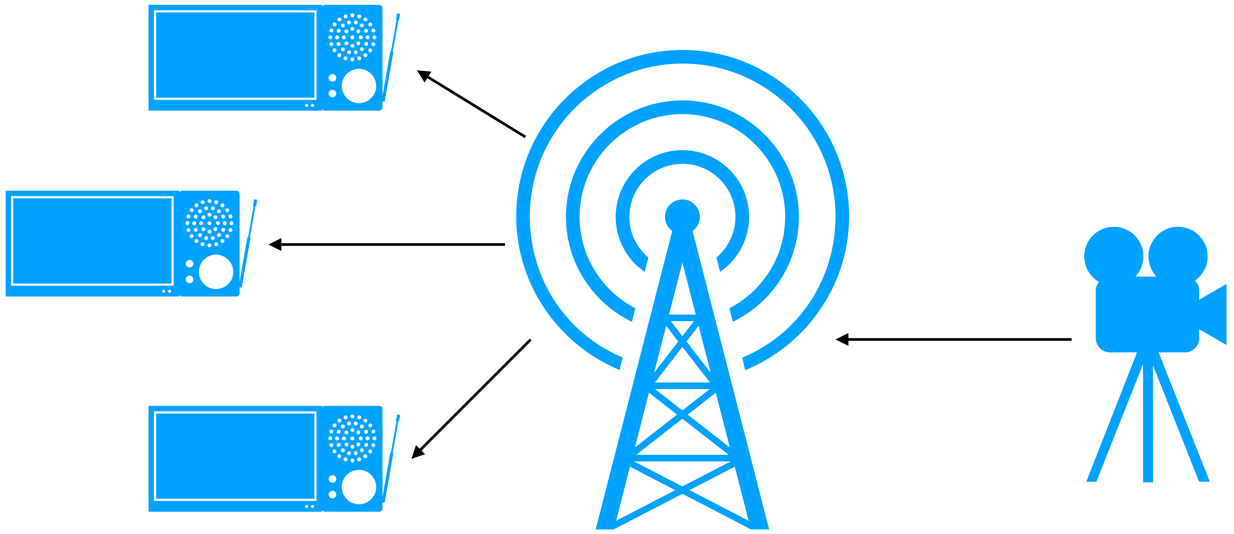

Optical fibre TV, cable TV, Satellite TVs were all like this:
They were single directional broadcasts

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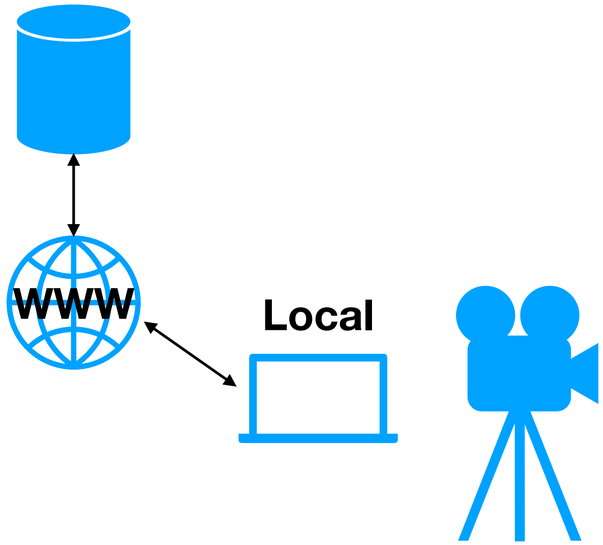
Josuke


Joseph


Giorno



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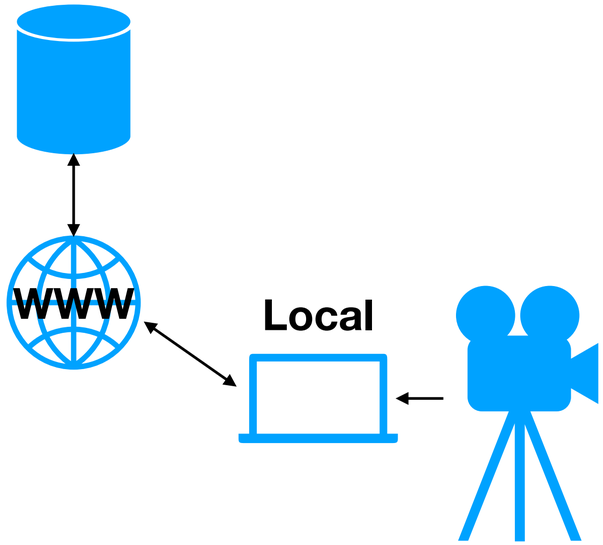

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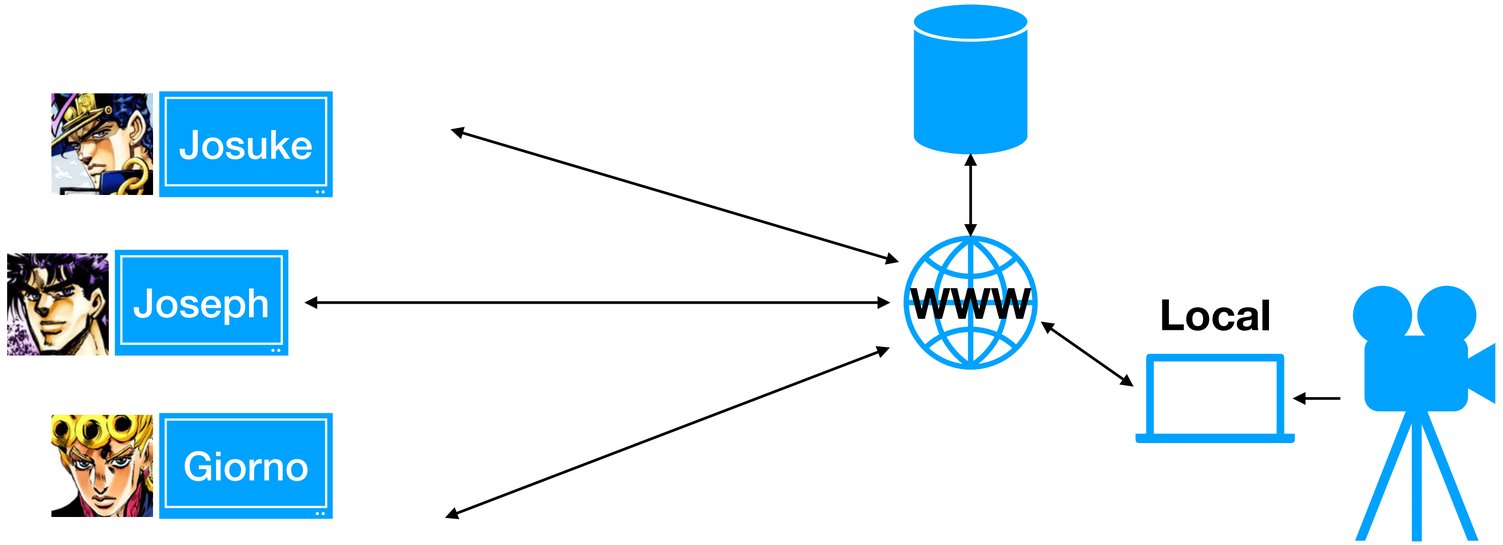

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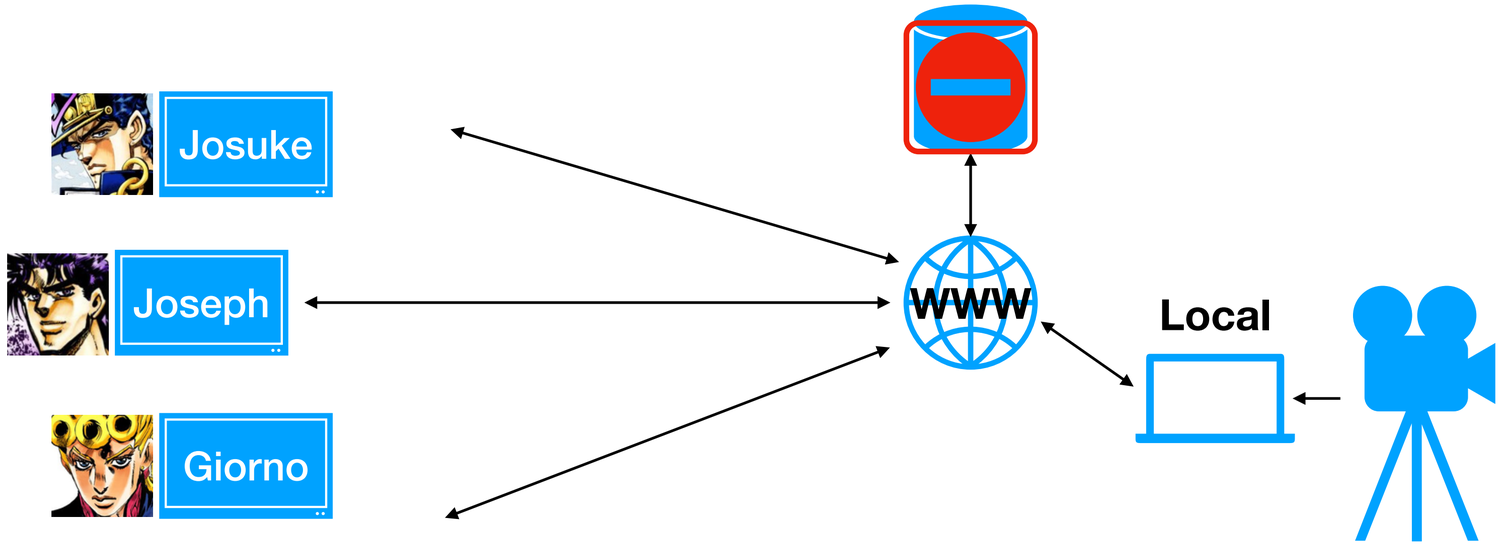

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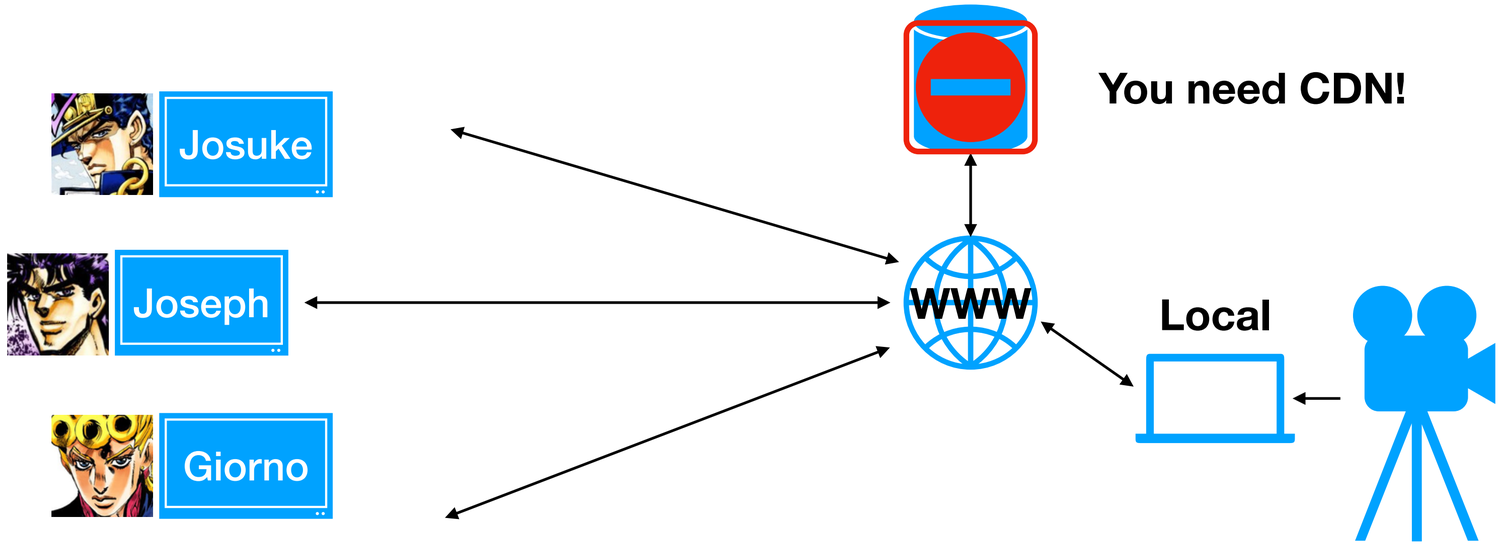

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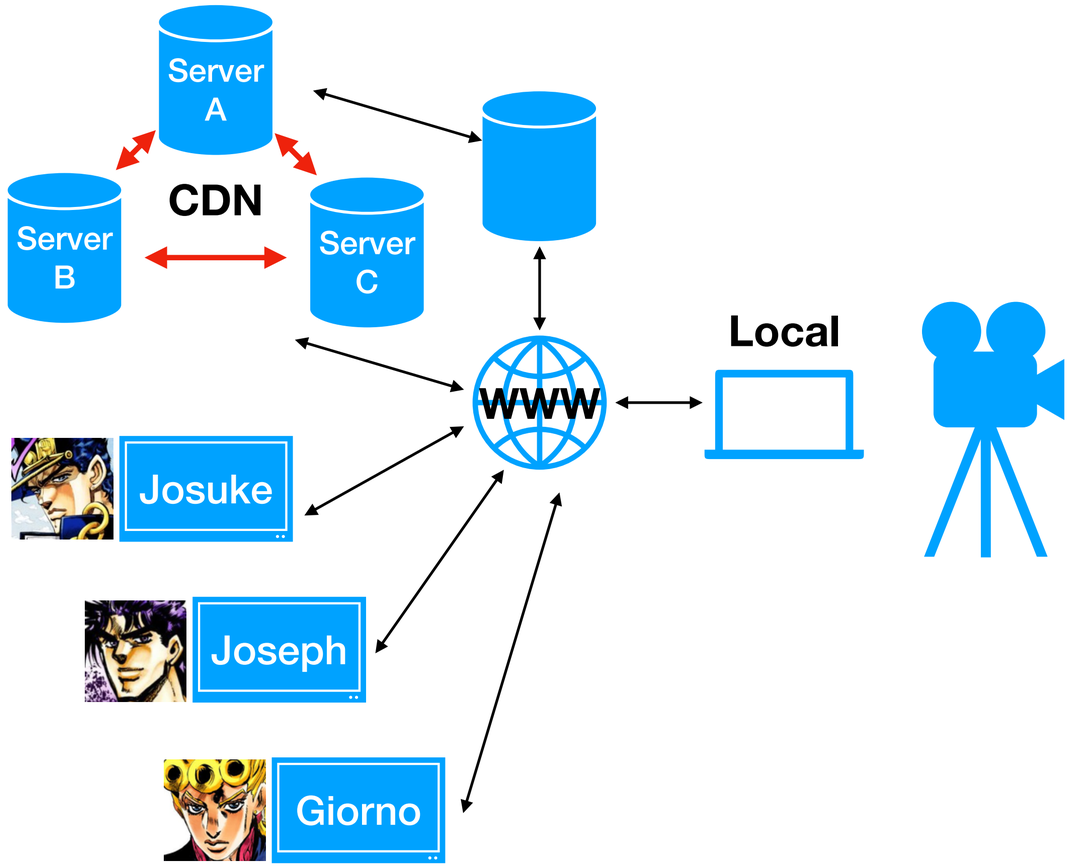

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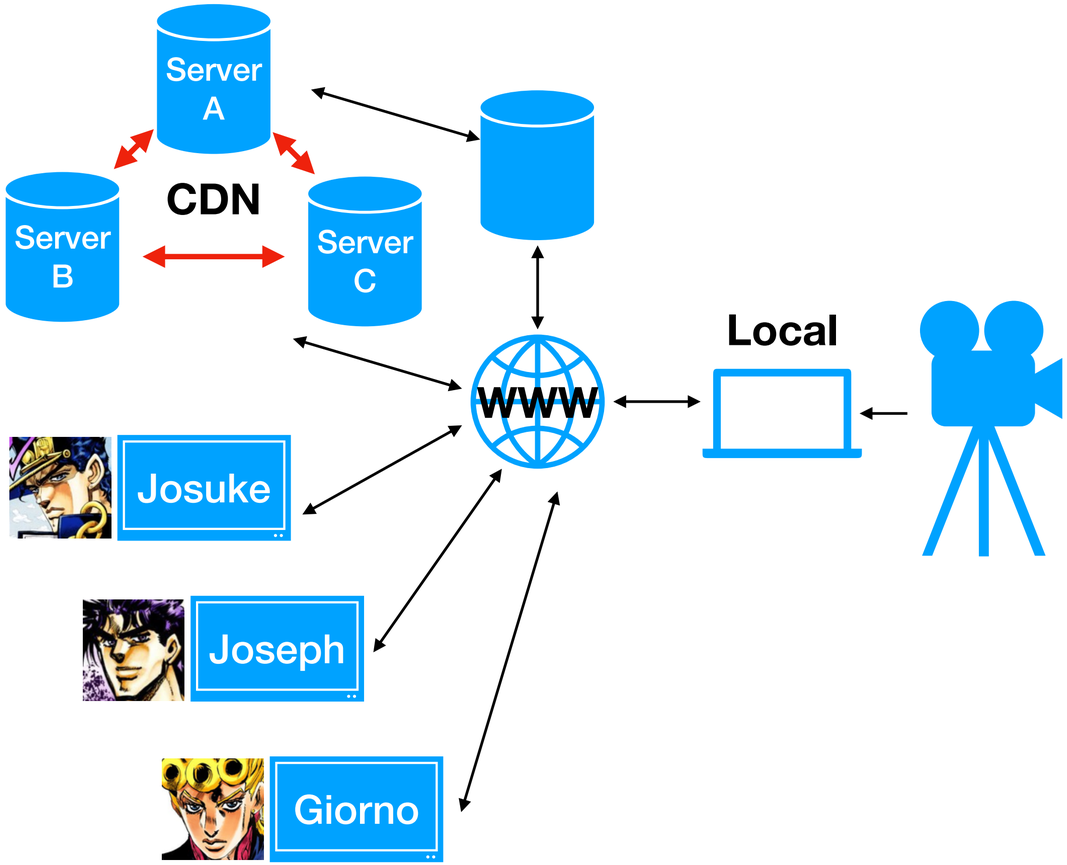

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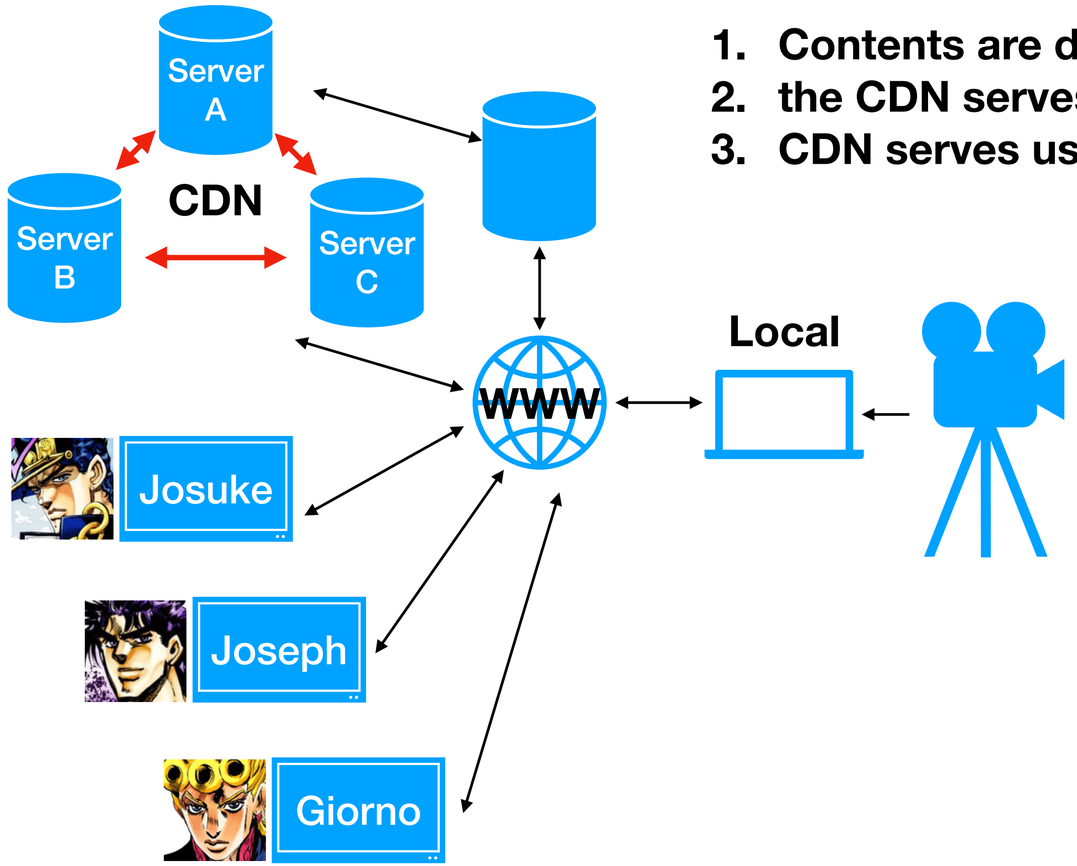

1. **Contents are delivered to the CDN**
2. **the CDN serves sync internally**
3. **CDN serves users**

Technical

P1
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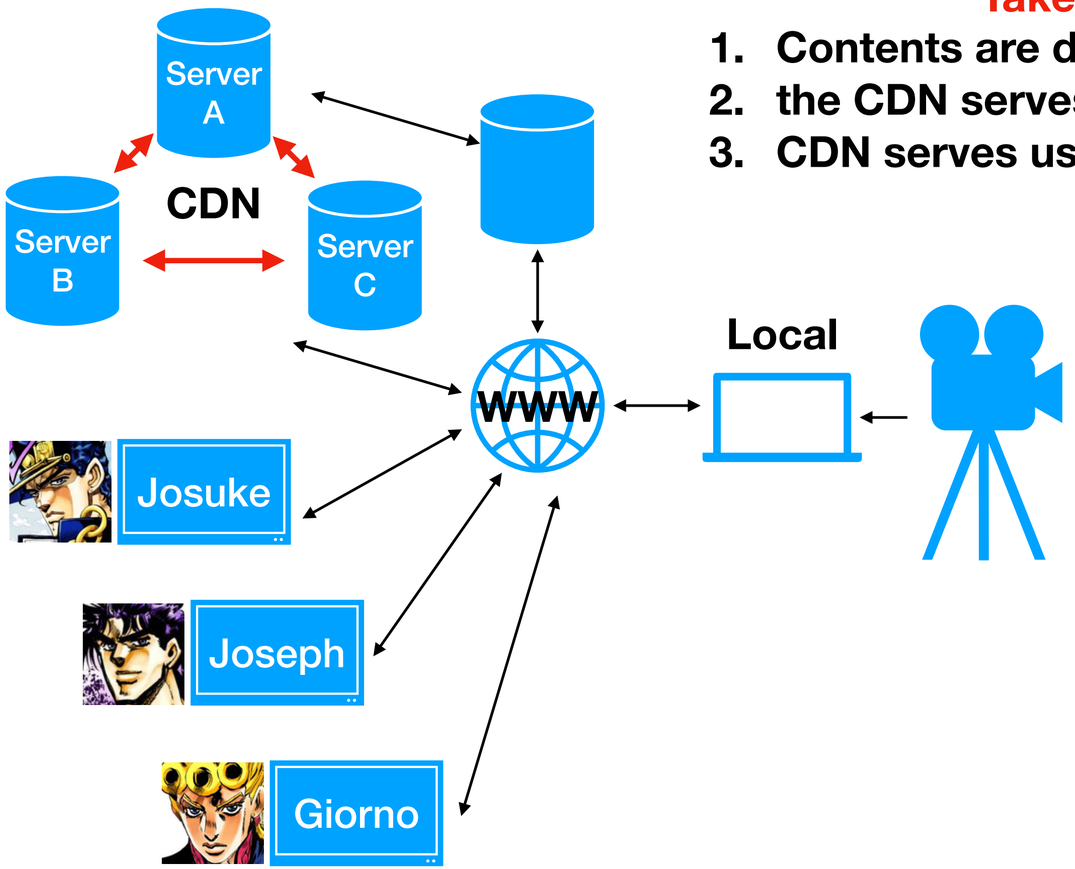

Takes time!

1. **Contents are delivered to the CDN**
2. **the CDN serves sync internally**
3. **CDN serves users**

Technical

P1
Delivery

This is also what makes 5G important!

Concept

P1
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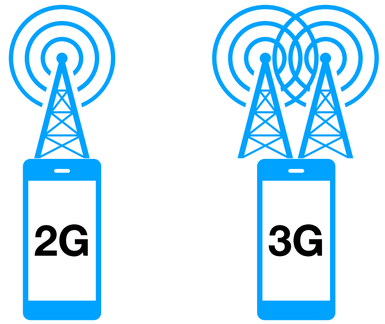

Concept

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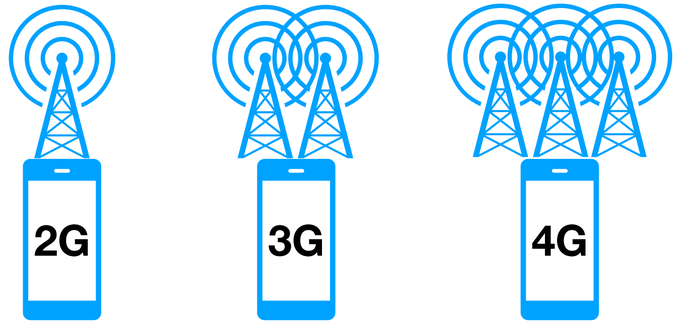

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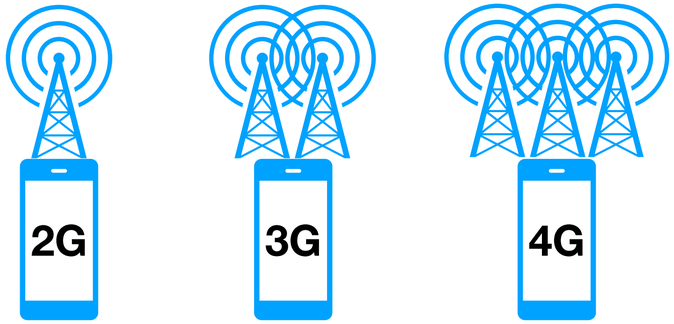

multiple-input and multiple-output antenna array for data

Concept

P1
Delivery

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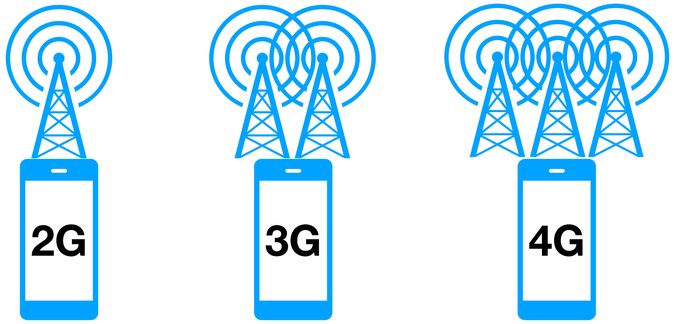

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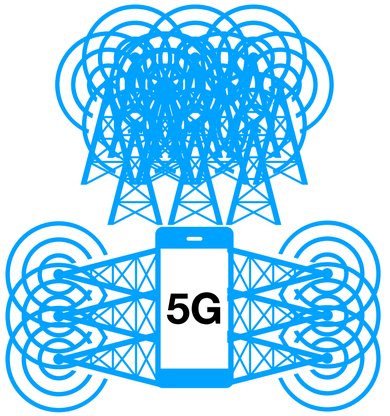
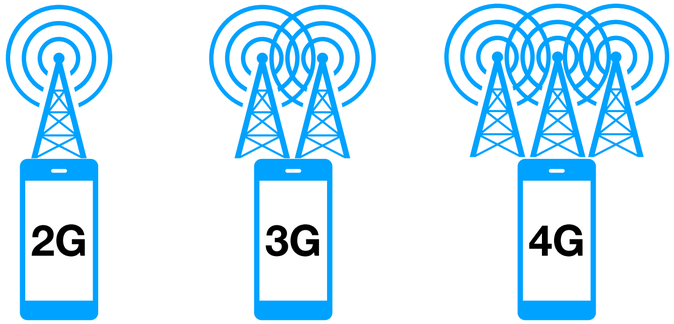


Concept

P1
Delivery

This is also what makes 5G important!

- High-bandwidth **guarantee**



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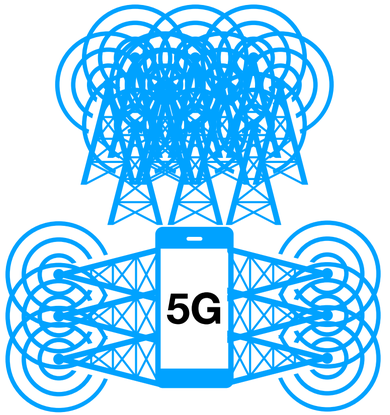

Concept

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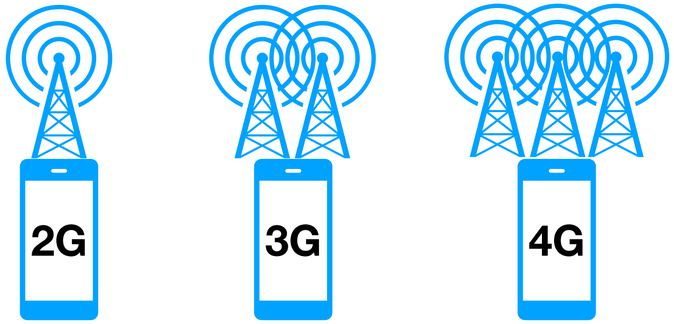
- High-bandwidth **guarantee**
- Low-latency **guarantee**



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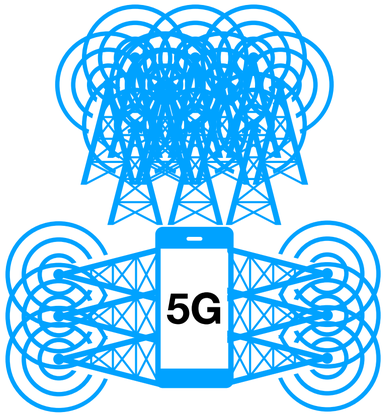

Concept

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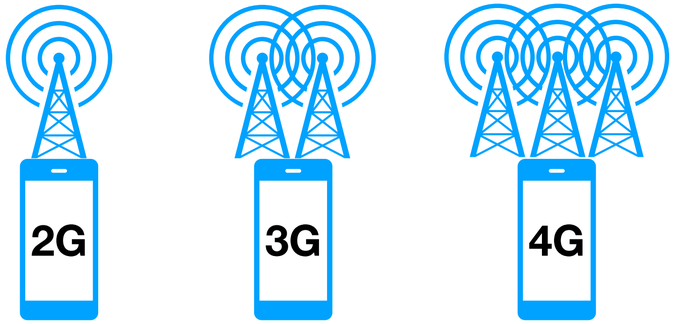
This is also what makes 5G important!

- High-bandwidth **guarantee**
- Low-latency **guarantee**
- Device-to-Device **direct** communications



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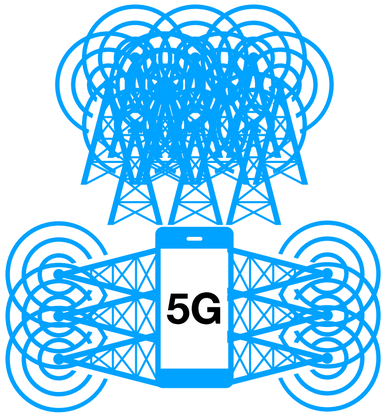

Concept

P1
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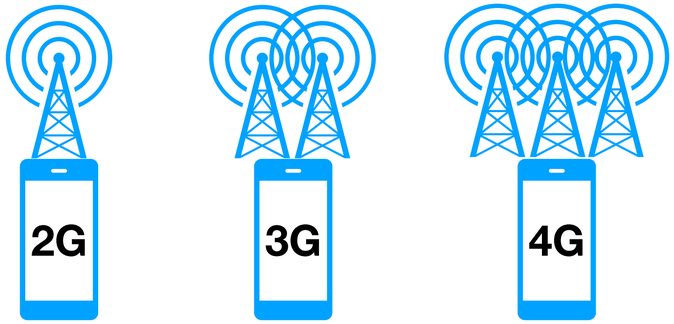
This is also what makes 5G important!

- High-bandwidth **guarantee**
- Low-latency **guarantee**
- Device-to-Device **direct** communications
- Integration of Wifi, Cellular, Optical Fibre, Satellite, etc.



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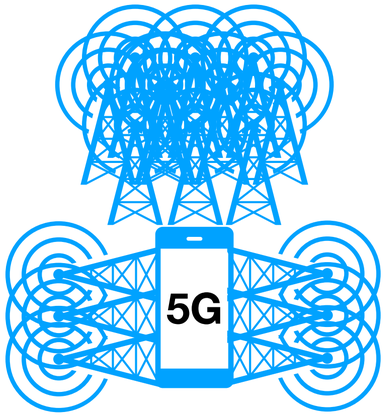
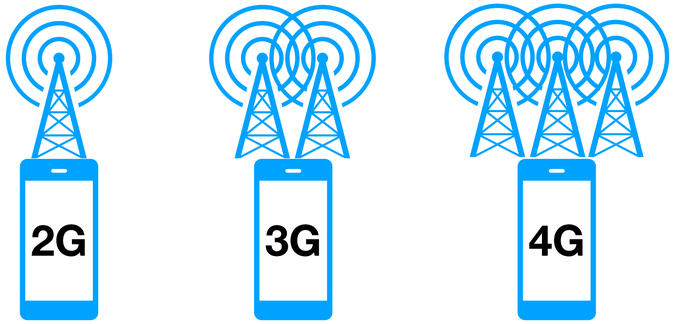


Concept

P1
Delivery

This is also what makes 5G important!

- High-bandwidth **guarantee**
- Low-latency **guarantee**
- Device-to-Device **direct** communications
- Integration of Wifi, Cellular, Optical Fibre, Satellite, etc.
- Everything is 5G (Internet of Things)



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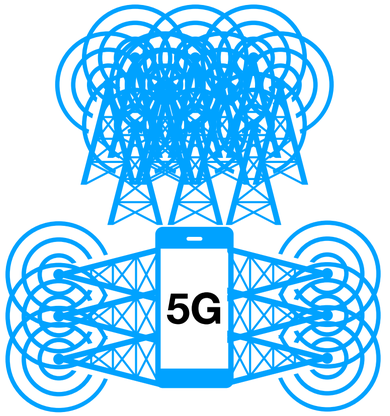

Concept

P1
Delivery

What will 5G do for you?

Concept

P1
Delivery

What will 5G do for you?

- Much much better streaming services

Concept

P1
Delivery

What will 5G do for you?

- Much much better streaming services
  - In fact, 5G was developed with streaming in mind, there are bandwidth and protocols reserved exclusively for streaming

Concept

P2
Medium

Research Topics

- Challenges in Streaming 
- Piracy in the Internet 
- Effect of Streaming Services on the Music Industry 
- How are videos streamed on the internet? 

Research