IOB22

Digital Product Development

Demo

TU Delft

Module 2
Infrastructure

By Jacky Bourgeois

The Connected Lightbulb

- Infrastructure

- Internet Architectures

- Influence of design choices

- World-wide-web

Conceptual Model

How the user understand the system

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Infrastructure

The fundamental facilities and systems that support the sustainable functionality [of a digital product].

Wikipedia

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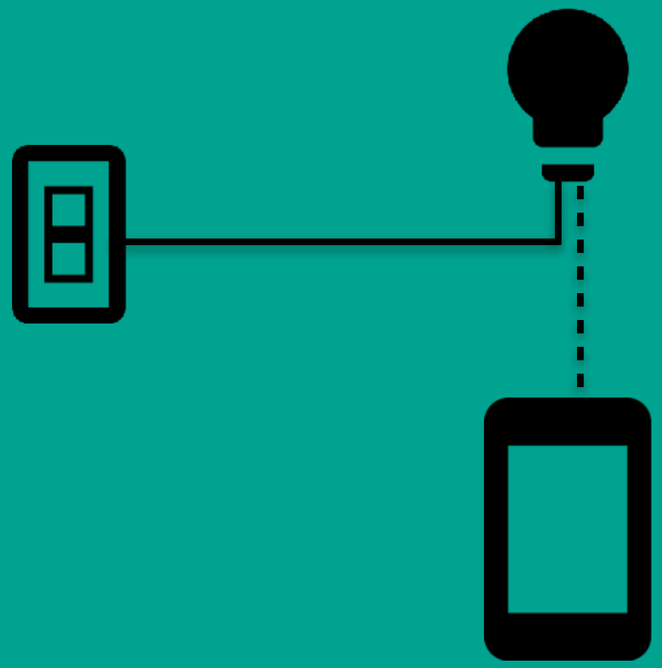
Conceptual Model



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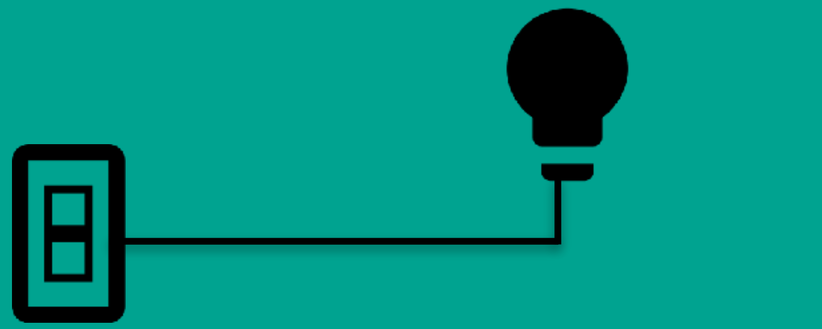
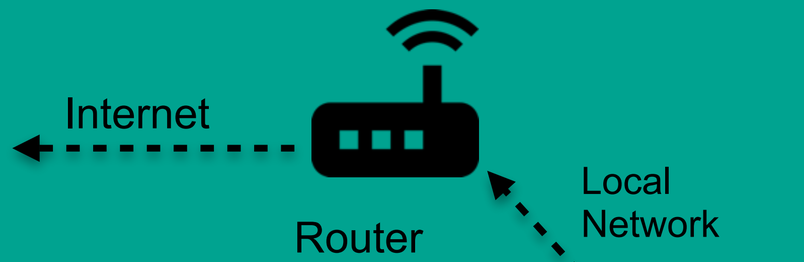
The Internet

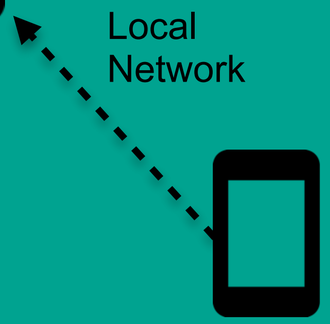
Global Network to exchange information

Examples of applications: emails, video streaming, web page

Technical Model







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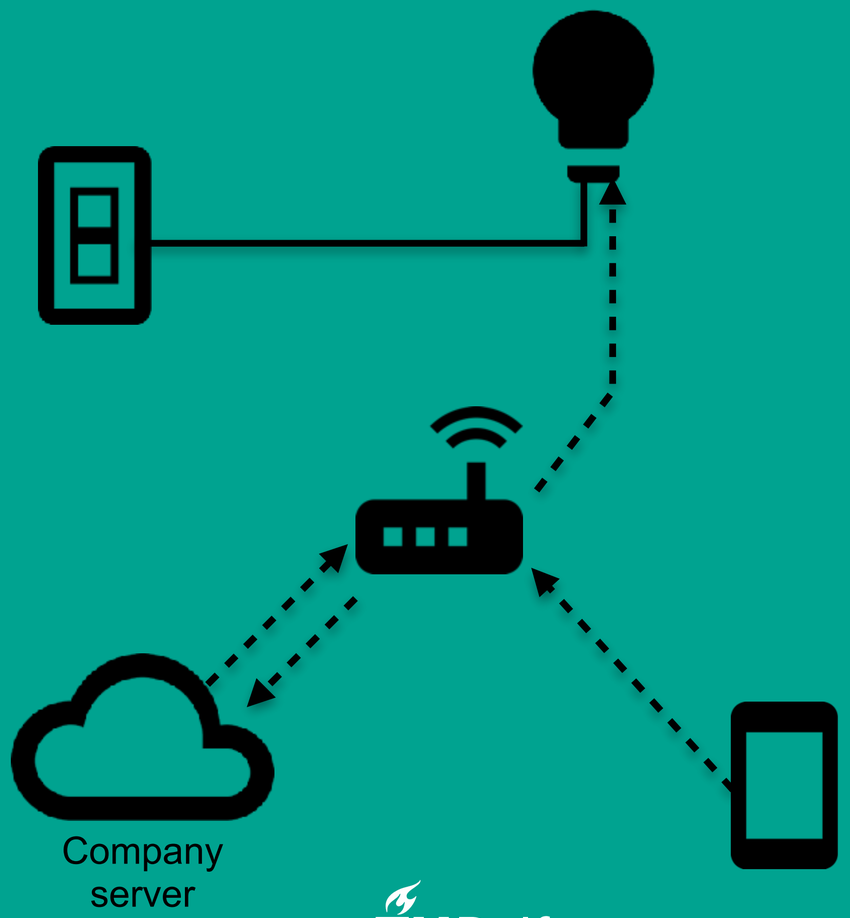
Technical Model



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Web Application

Demo

- Infrastructure, fundamental facilities and systems

- The Internet, a global network

- The web, an Internet application

- Client, requesting information over the network

- Server, serving information over the network

Demo

The Connected Lightbulb

- Infrastructure, fundamental facilities and systems
- The Internet, a global network
- The web, an Internet application
- Client, requesting information over the network
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Module 2
Infrastructure

By Jacky Bourgeois

- What is the Internet?
- What are Internet architectures?
- How do they influence the seven product dimensions?

Network Protocol

A set of rules and conventions enabling computers to communicate through a network

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Internet Layers

Internet Layers

Link: WiFi, Ethernet

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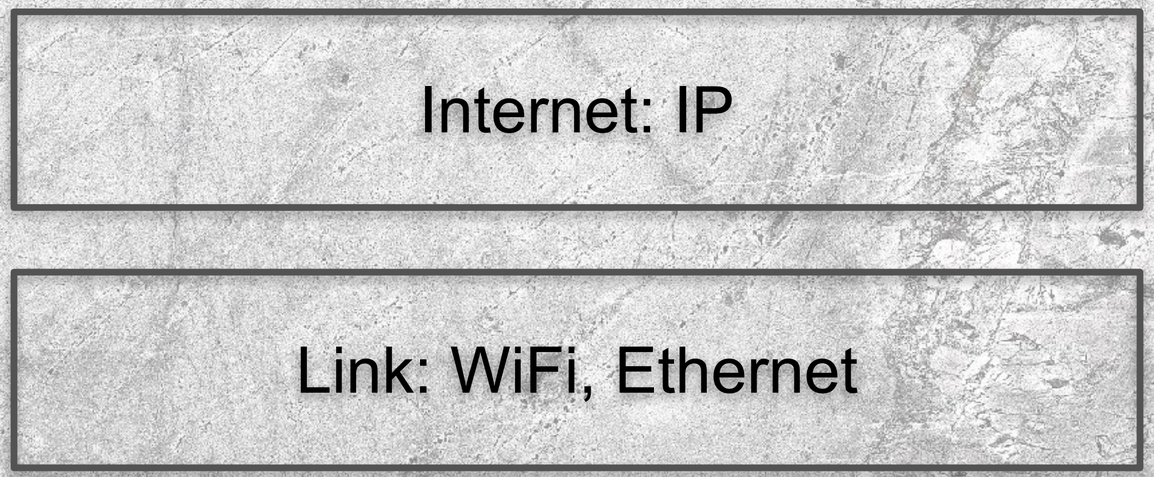
Internet Layers



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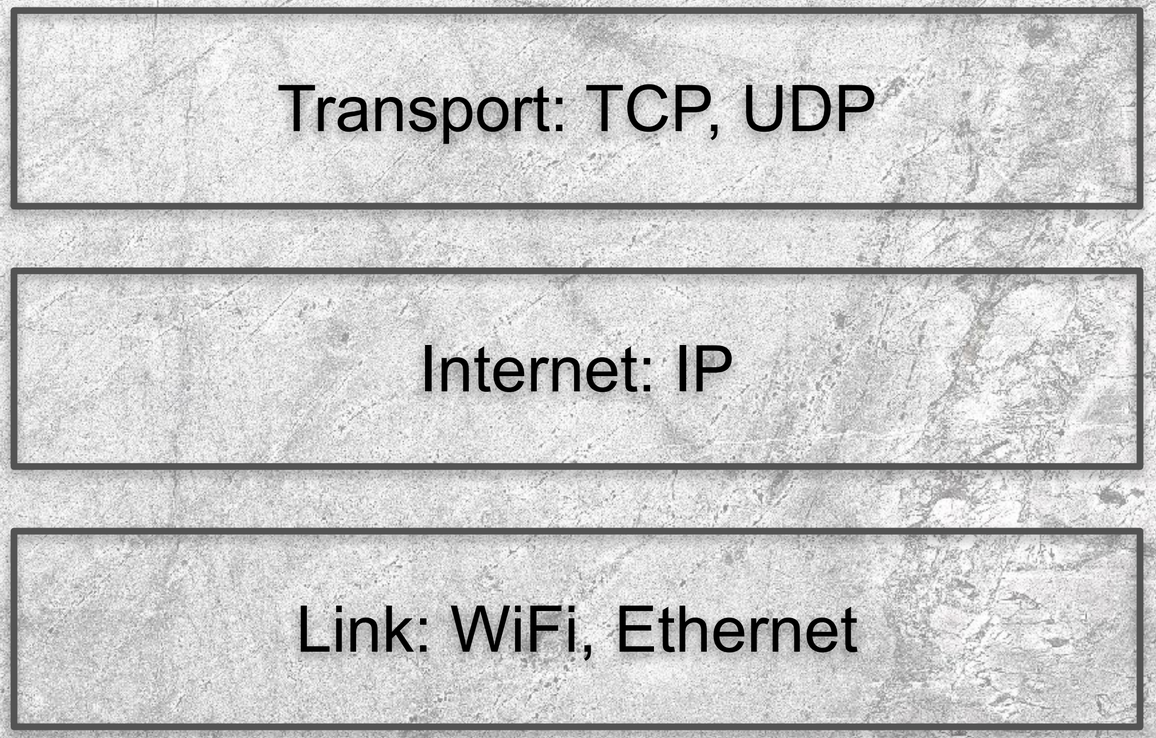
Internet Layers



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Internet Layers

Application: HTTP, SMTP, MQTT

Transport: TCP, UDP

Internet: IP

Link: WiFi, Ethernet

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What about the cloud?

Cloud

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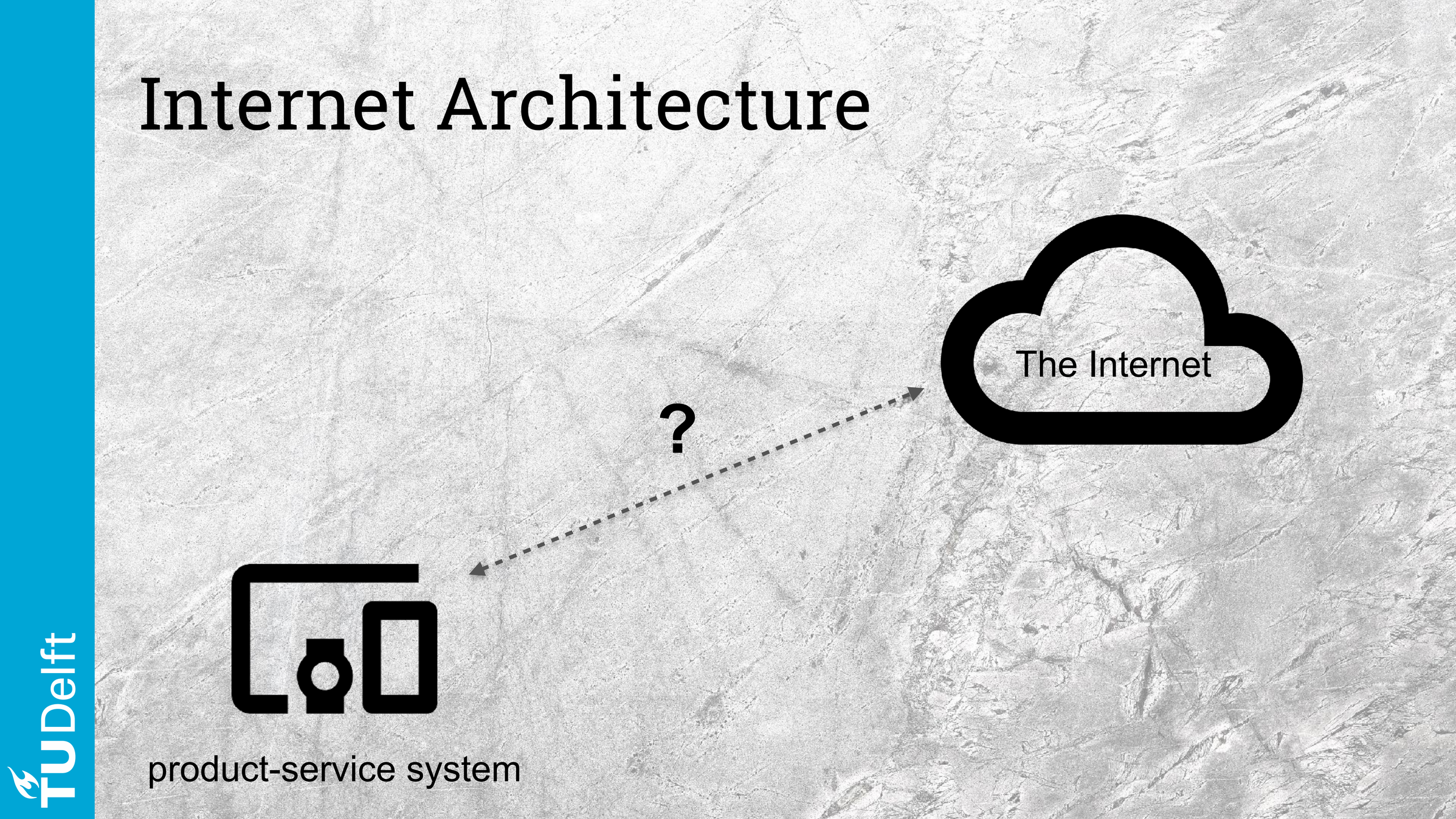
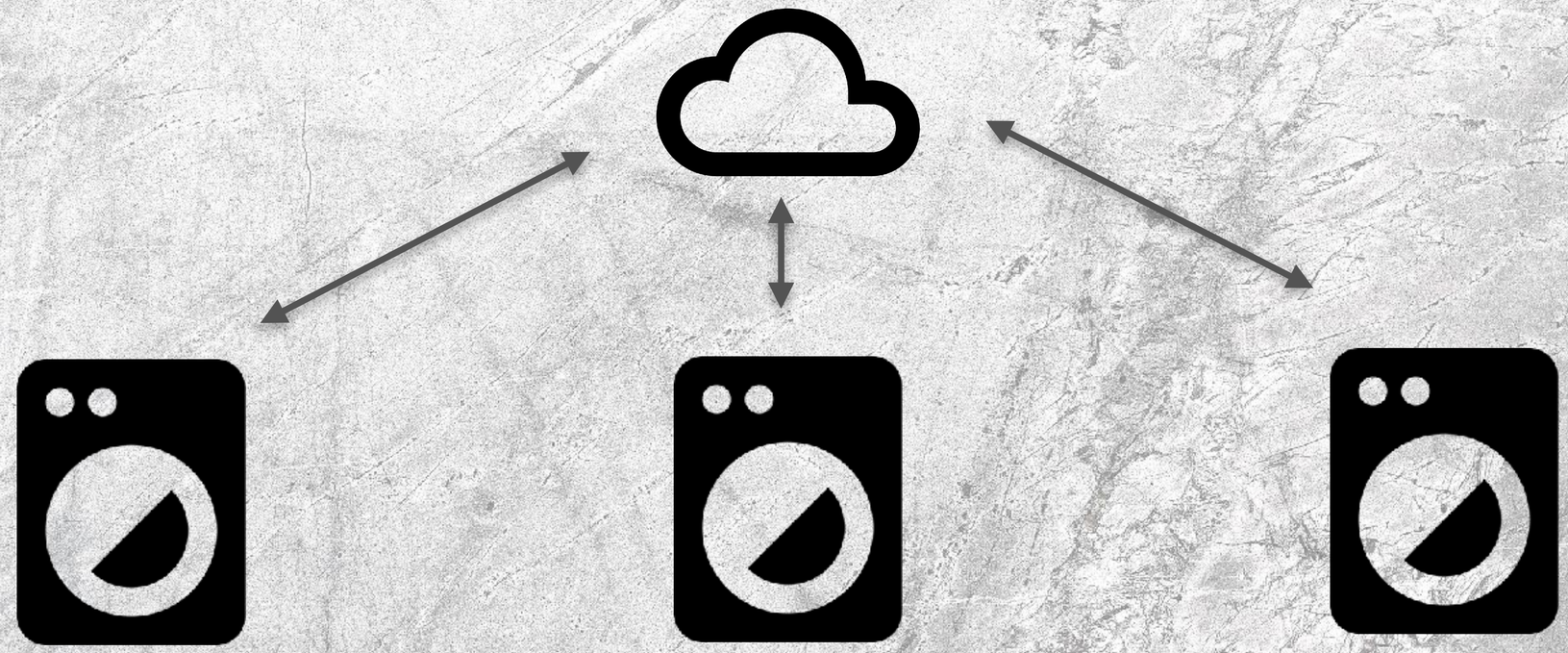
What about the cloud?

Internet Architecture



Connected washing machine?

What Internet Architecture for a Product Service System?



Pay-per-wash

Shared laundry Facility

Sun/Wind powered Wash

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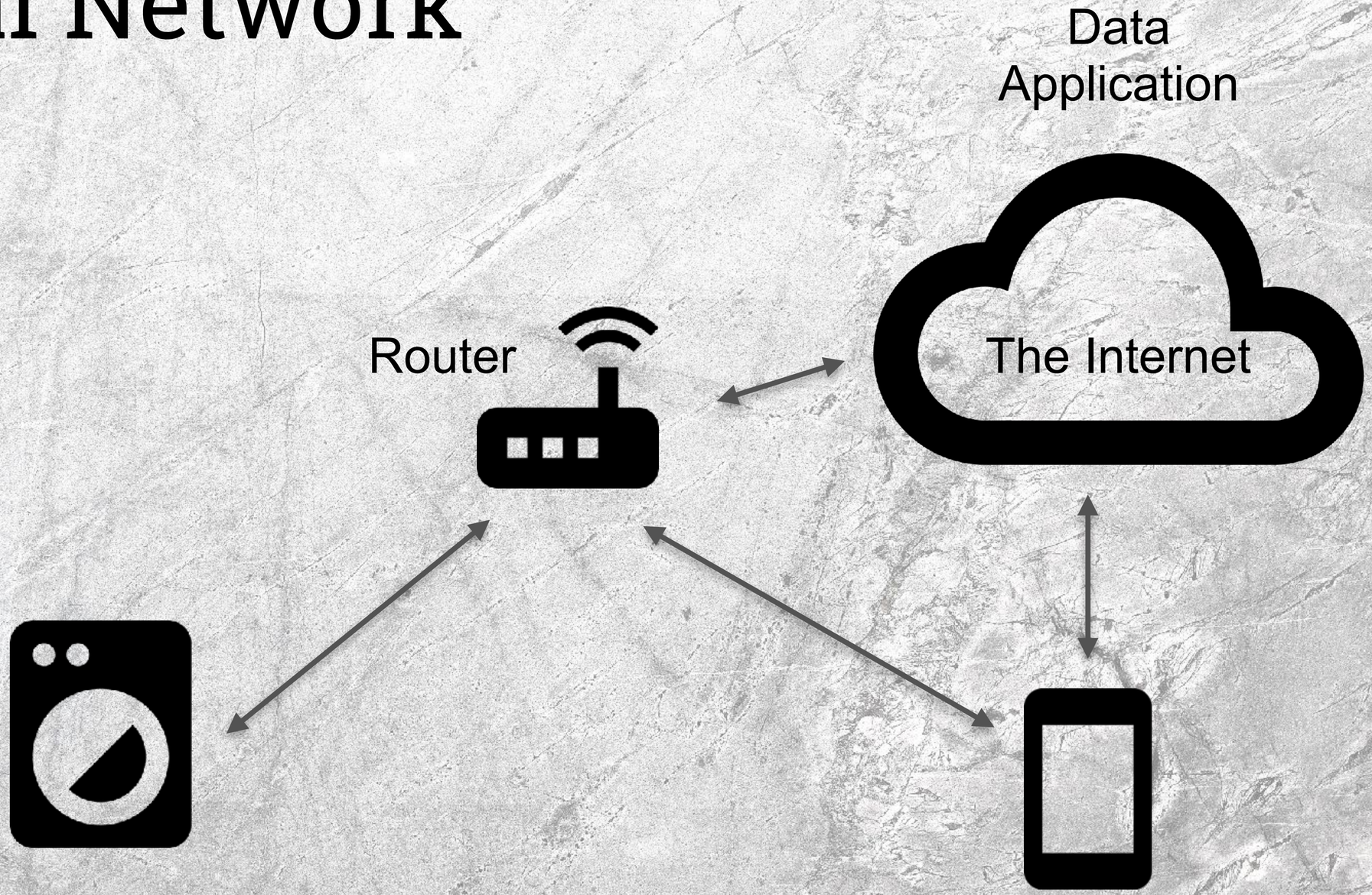
Direct Internet Connection

Local Network



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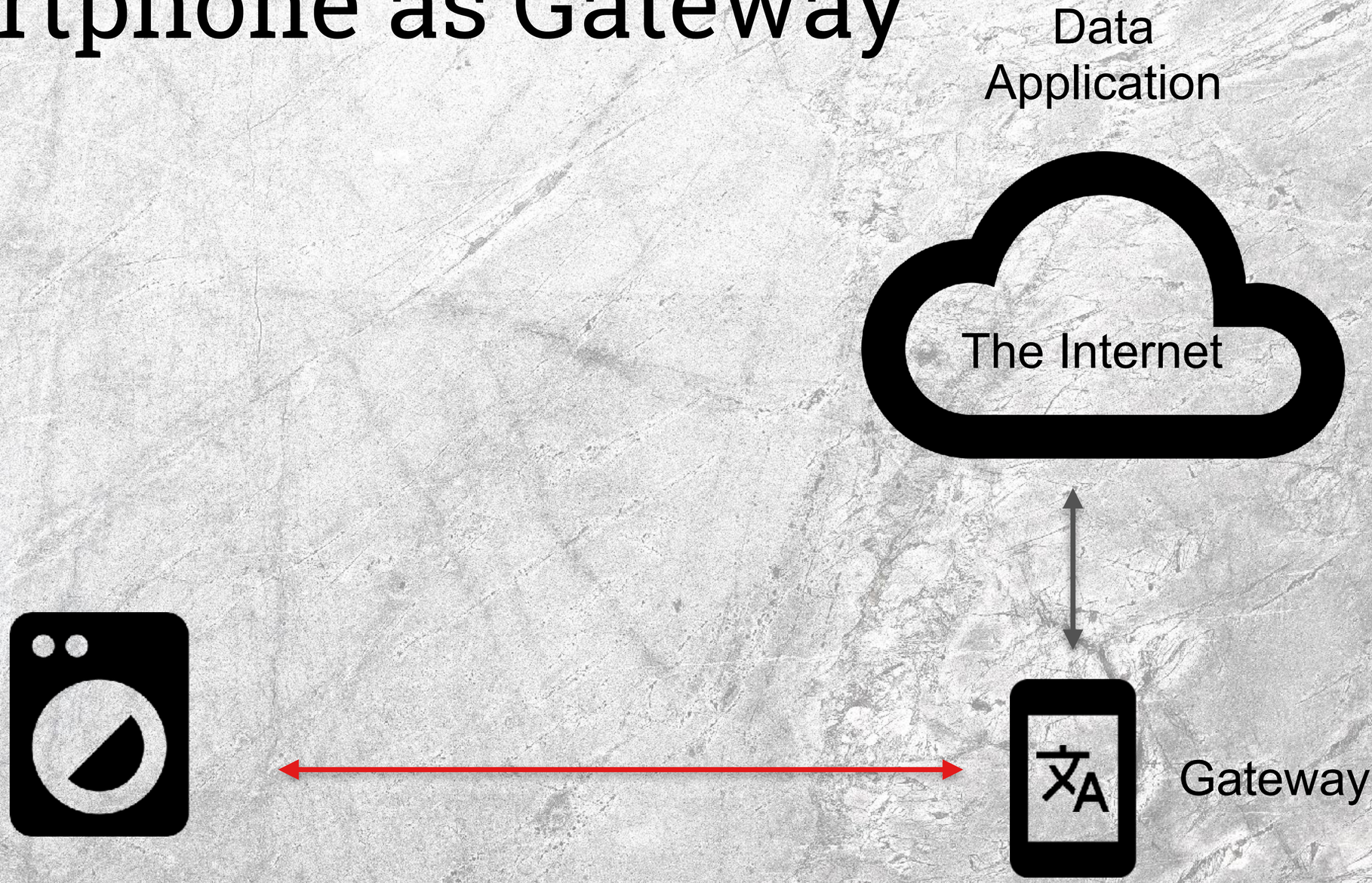
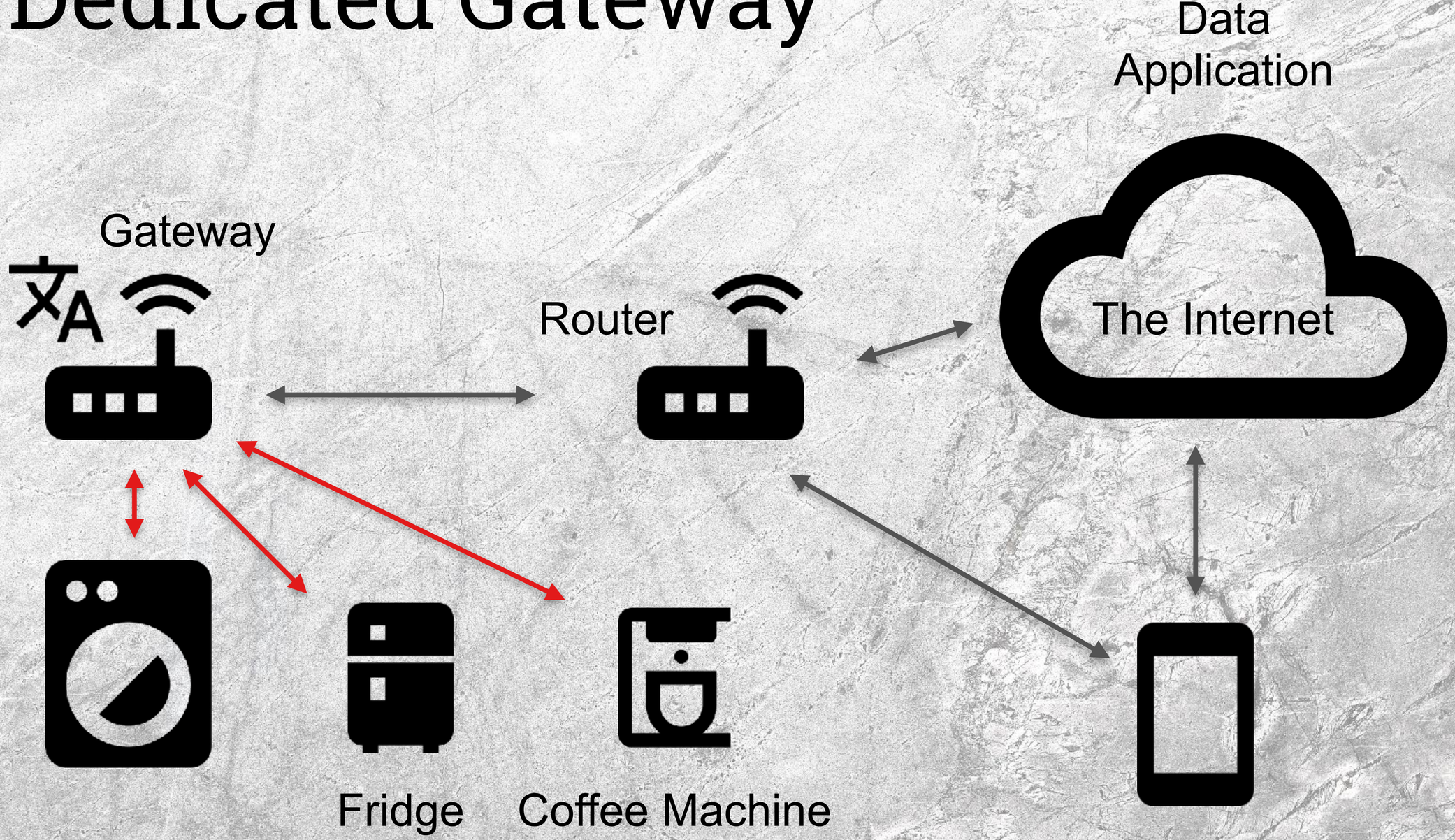
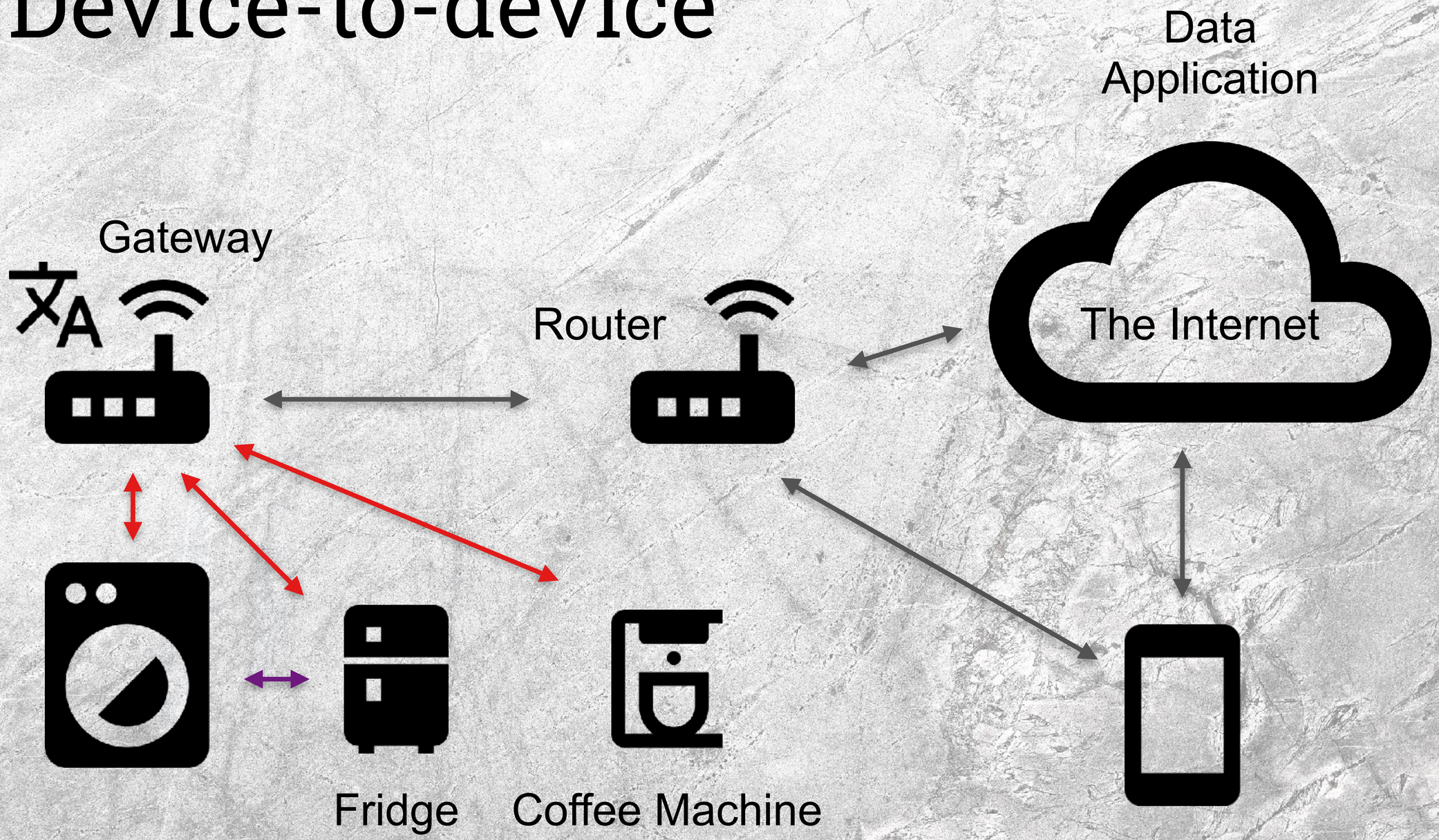
Smartphone as Gateway



Dedicated Gateway



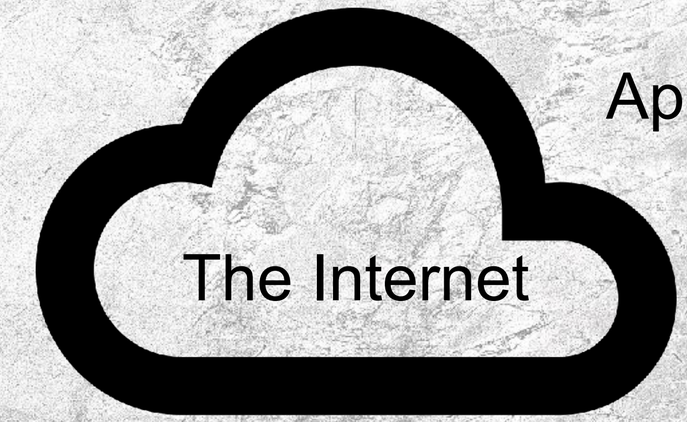
Device-to-device



Service-to-service

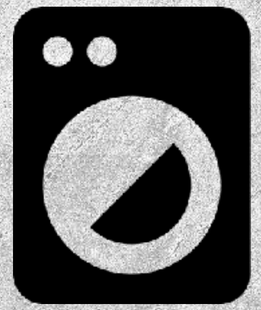
3rd party company

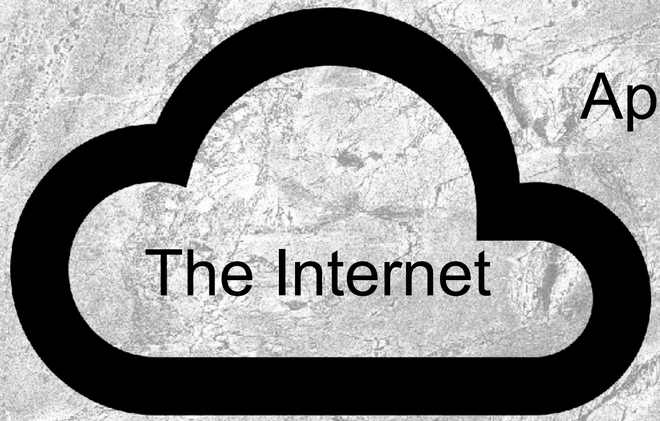
Electric Car



The Internet

Data Application





The Internet

Data Application

Qualities influenced by the Internet Architecture

- Complexity
- Learning curve
- Maintenance
- Latency
- Internet availability
- Controllability (by the company, by the user)
- Revenue stream
- Interoperability
- Etc.

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8 Fallacies of Distributed Computing

1. The network is reliable
2. Latency is zero
3. Bandwidth is infinite
4. The network is secure
5. Topology does not change
6. There is one administrator
7. Transport cost is zero
8. The network is homogeneous

By Peter Deutsch, Fallacies of Distributed Computing

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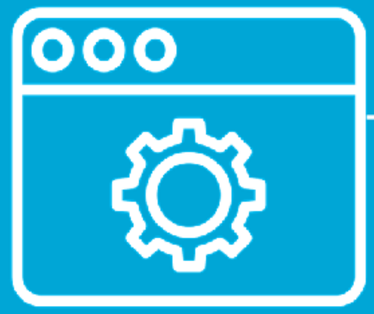

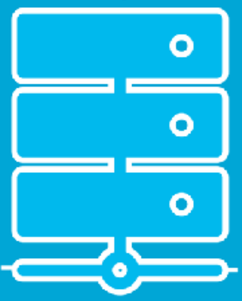

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Credits

Background:
http://www.techandall.com/
https://www.pexels.com/photo/grey-wall-2117937/

Music: https://www.bensound.com

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Digital Product Development

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Infrastructure

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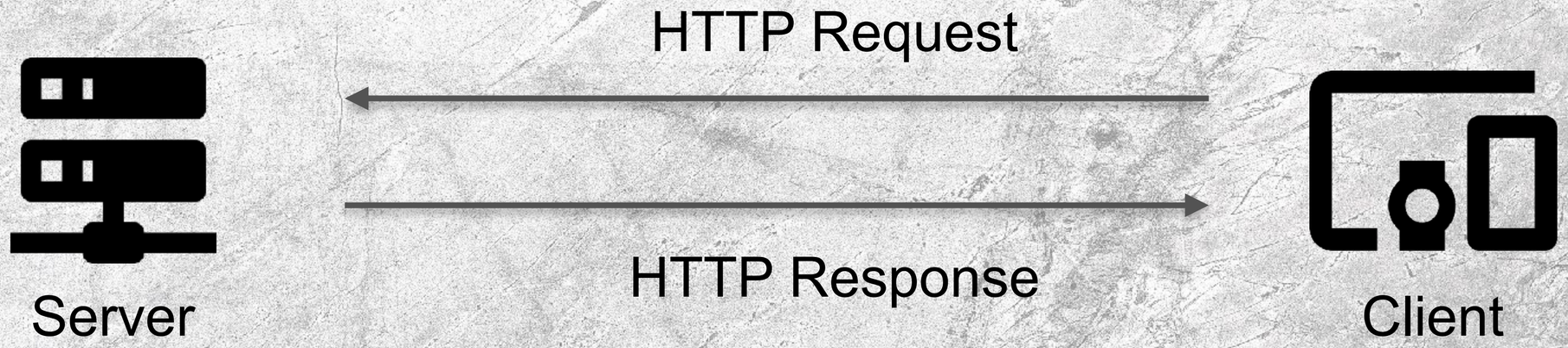
- What is the Web?
- What are web APIs?
- How can designers play a key role with regards to APIs?

Client / Server



- Content a web page
- Action of a device
- Processing of data

- Show web page
- Show ON/OFF switch
- Show Data visualisation

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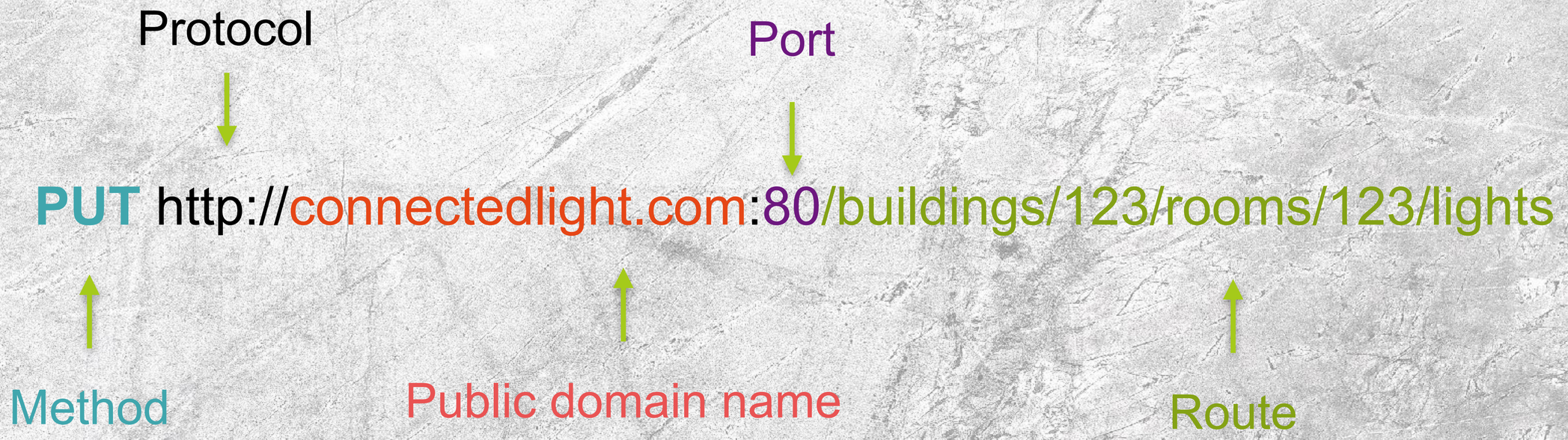
Anatomy of HTTP Request



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HTTP Methods and Routes

- **POST** /lights — Create/Add a light
- **GET** /lights — List all lights
- **DELETE** /lights — Delete all lights

- **PUT** /lights/123 — Update a lights
- **GET** /lights/123 — Read a light
- **DELETE** /lights/123 — Delete a light

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Web APIs

- API = Application Programming Interface

- What resources/capabilities does the product expose?
- What resources/capabilities does the product reach out for?

- Design specifications based on a holistic understanding of the context

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Granularity and Structure

GET /householders/bob

GET /householders/alice

GET /householders/eric

GET /householders/count

GET /house/kitchen/coffeemaker

GET /house/kitchen/fridge

GET /house/bathroom/light

GET /devices/coffeemaker

GET /devices/fridge

GET /devices/light

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Getting data from the Internet

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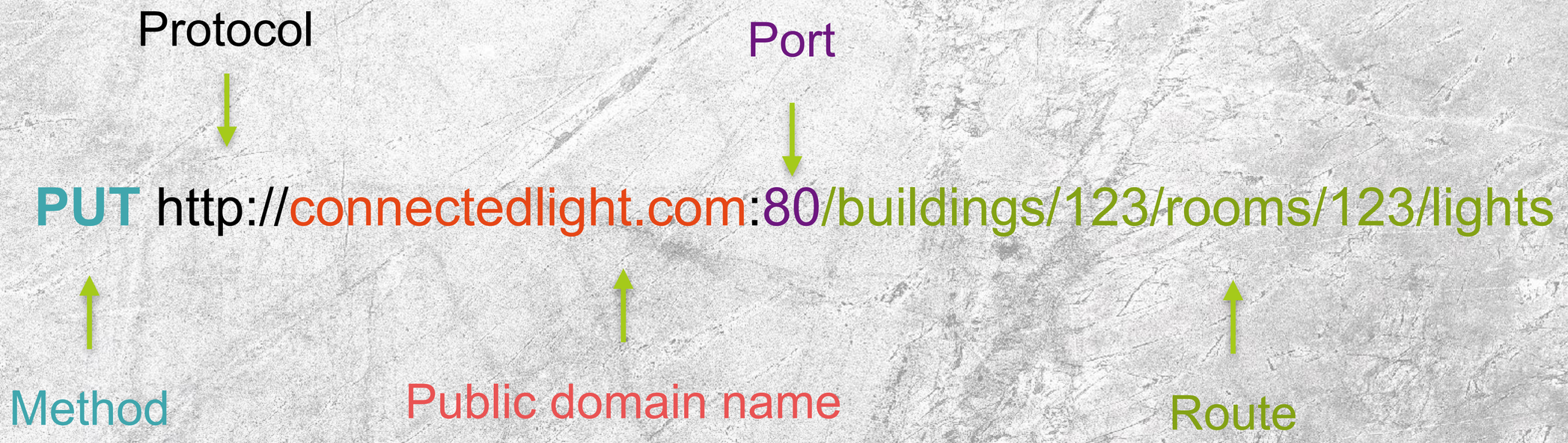
Anatomy of HTTP Request




```
Content-Type: application/json
```

Headers

```
{“action”: “switch_on”}
```

Body

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Data Structures

JSON (JavaScript Object Notation)

```
{
    "lightbulb": {
        "id": "123xyz",
        "name": "Living room fixture"
        "color": "#cc0000",
        "brightness": 90,
        "on": true
    }
}
```

XML (Extensible Markup Language)

```
<lightbulb>
    <id>123xyz</id>
    <name>Living room fixture</name>
    <color>#cc0000</color>
    <brightness>90</brightness>
    <on>true</on>
</lightbulb>
```

CSV (Comma Separated Value)

```
id,name,color,brightness,on
123xyz,Living room fixture,#cc0000,90,true
```

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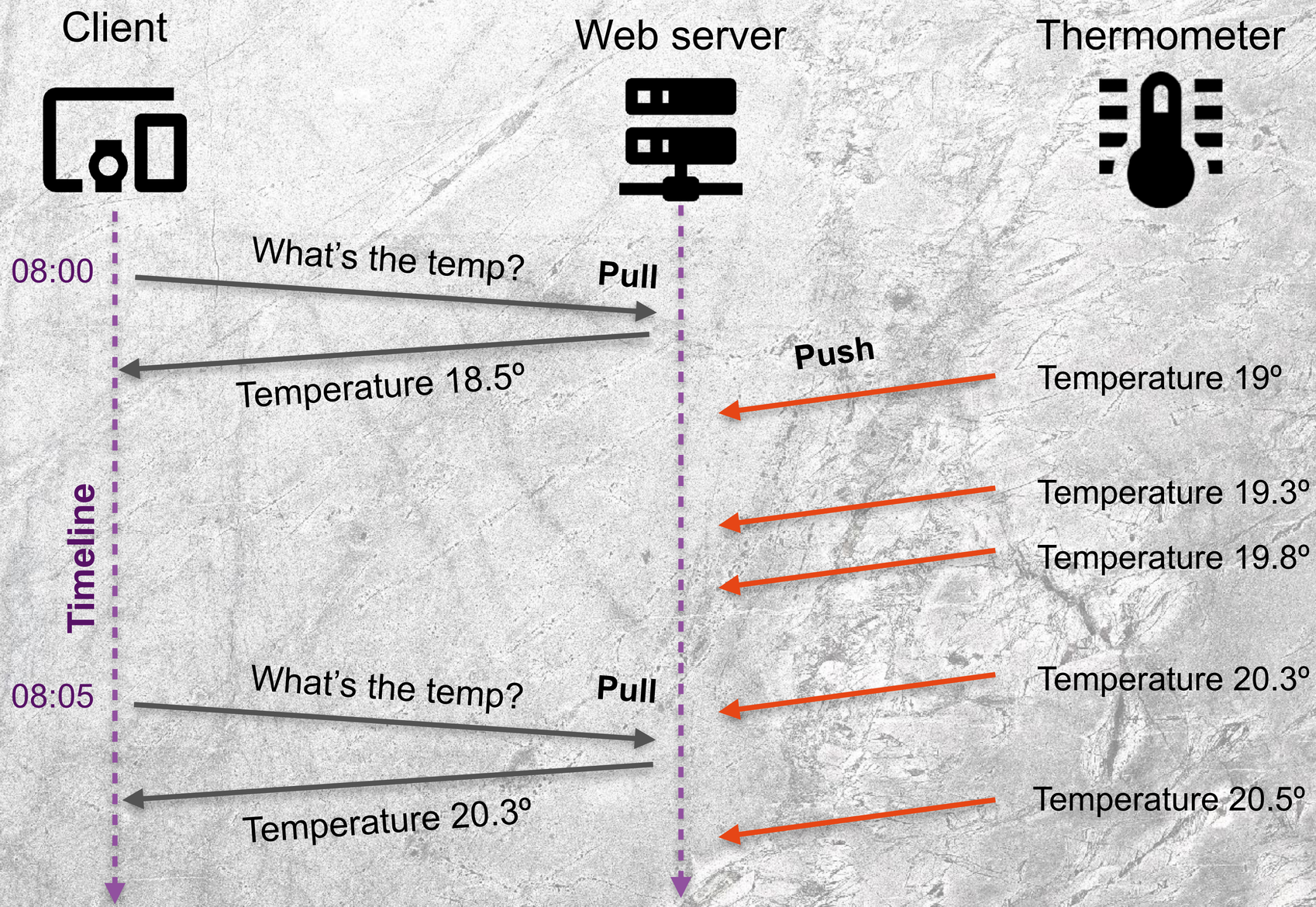
Communication Pattern - Polling



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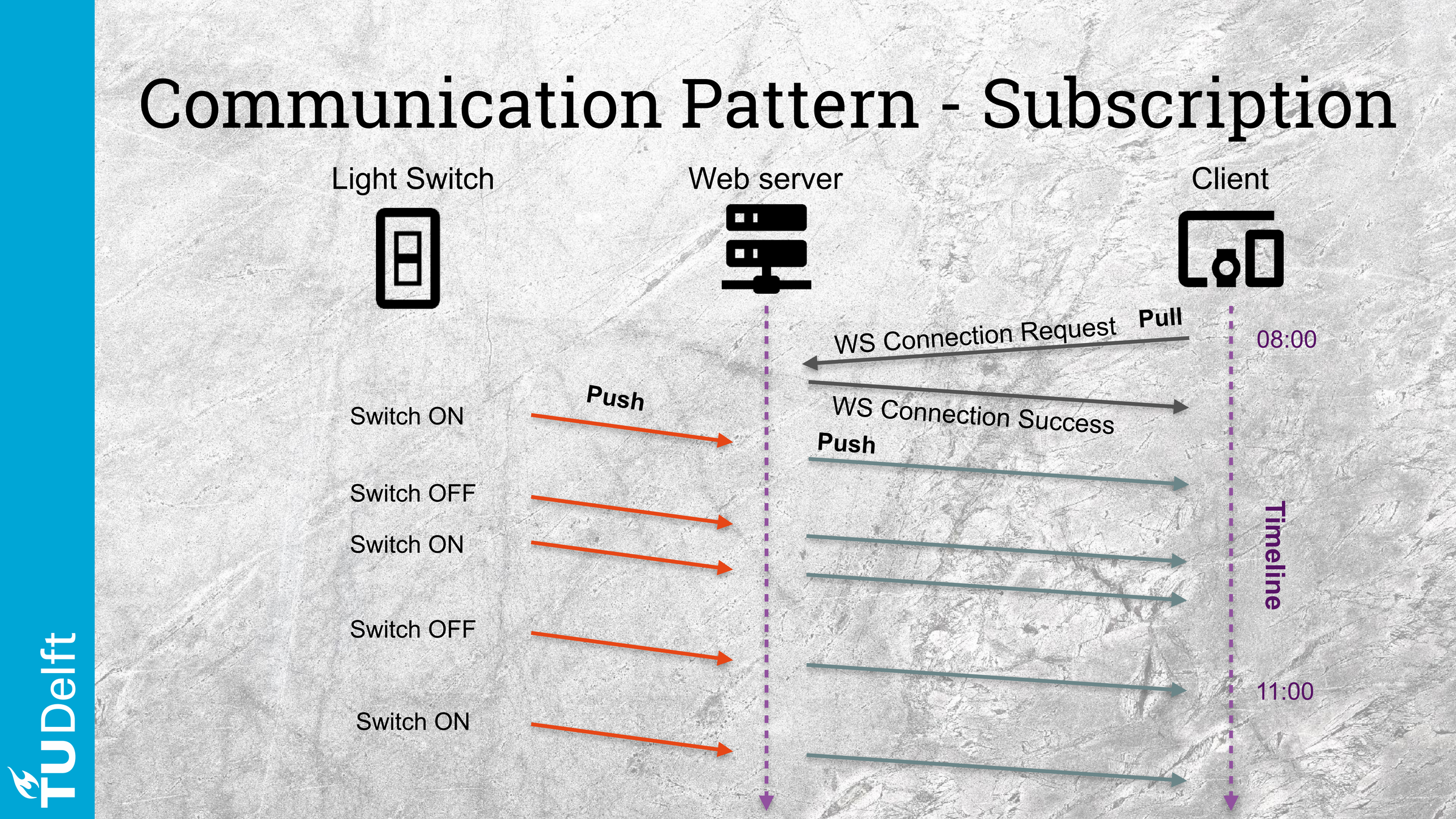
Communication Pattern - Subscription



Wrap up

- Web, an application of the Internet, relying on the HTTP protocol
- Web APIs, services to expose or rely on
- Specification through data structure and communication patterns

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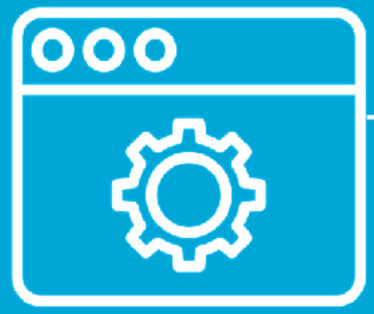

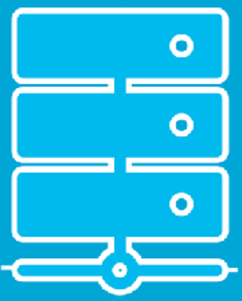

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