Distributed Computing I

CSSE6400

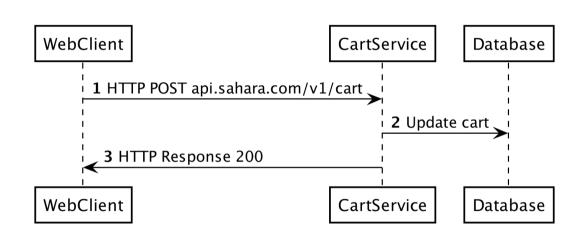
Brae Webb

March 28, 2022

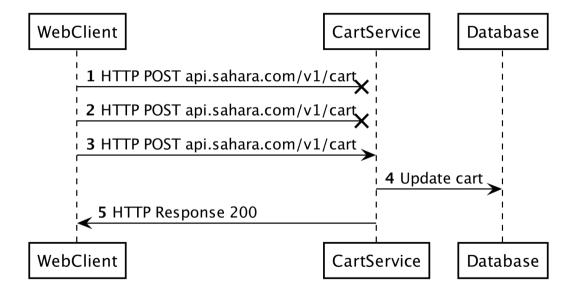


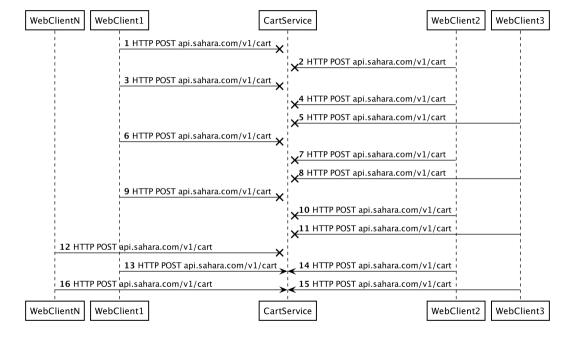
There are only two hard problems in distributed systems: 2. Exactly-once delivery 1. Guaranteed order of messages 2. Exactly-once delivery

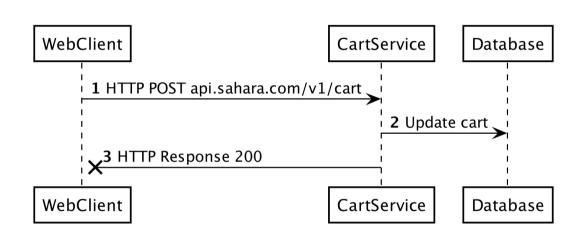
The network is reliable

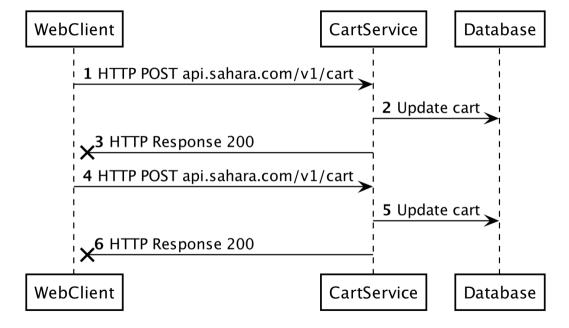


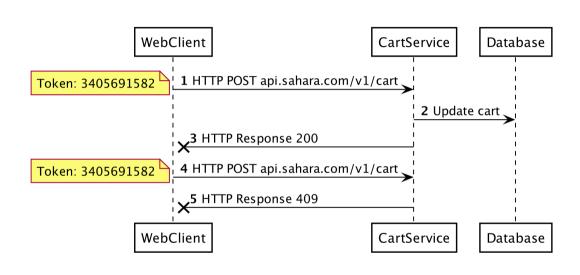












Latency is zero

Bandwidth is infinite

The network is secure

The topology never changes

There is only one administrator

Transport cost is zero

The network is homogeneous

Focus

Reliability

Question

What makes software unreliable?

'Working' software

Satisfies the functional requirements

Definition 1. Reliable Software

Continues to work correctly, even when things go wrong.

Definition 2. Fault

Something goes wrong.

Death, taxes, and computer system failure are all inevitable to some degree.

Plan for the event.

- Howard and LeBlanc

Reliable software is

Fault tolerant

Problem

Individual computers fail *all the time*

Solution

Spread the risk of faults over *multiple computers*

Spreading Risk

If you have software that works with *just one* computer, spreading the software over *two* computers *halves* the risk that your software will fail.

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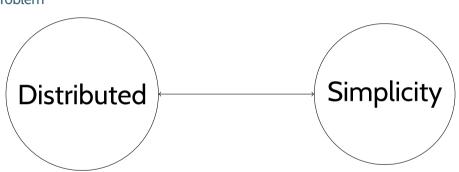
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Definition 3. Distributed Computing

Multiple software components that are on multiple computers, but run as a single system

The Problem



A lot of modern software development focuses on dealing with the *complexity* of

distributed systems.

Question

What makes distributed computing complex?

- Faults
- Asynchronous communication

And much more...

- Monitoring