

# Distributed Computing I

March 28, 2022

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Presented for the Software Architecture course  
at the University of Queensland



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

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# Distributed Computing I

Software Architecture

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## 1 Introduction

## 2 Reliable Software

### 2.1 Fault Tolerance

### 2.2 Distributing Risk

## 3 Distributed Architecture

### 3.1 Communication happens

## 4 Fallacies of Distributed Computing

### 4.1 The Network is Reliable

### 4.2 Latency is Zero

### 4.3 Bandwidth is Infinite

### 4.4 The Network is Secure

### 4.5 The Topology Never Changes

### 4.6 There is Only One Administrator

### 4.7 Transport Cost is Zero

### 4.8 The Network is Homogeneous

## 5 Auto-scaling

TODO: Larene in lecture & tutorial

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# Distributed Computing II

Software Architecture

April 4, 2022

Brae Webb

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## 1 Scalable Software

### 1.1 Scaling Up

### 1.2 Scaling Out

## 2 Load Balancing

## 3 Replication

### 3.1 Leaders and Followers

### 3.2 Multi-leader Replication

#### 3.2.1 Conflict Resolution

### 3.3 Leaderless

## 4 Partitioning/Sharding

### 4.1 Partition by Primary Key

### 4.2 Partition by Secondary Index

### 4.3 Re-balancing

## 5 Transactions

They exist? ACID

## 6 Queues & Pubsub — practical?

TODO: Event-driven

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# Distributed Computing III

Software Architecture

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Richard Thomas

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## 1 Consensus

### 1.1 Behaving Nodes

Leaders & Locks

### 1.2 Byzantine Faults

Byzantine Generals Problem

## 2 Consistency

### 2.1 Eventual Consistency

### 2.2 Linearizability

### 2.3 CAP Theorem

???

TODO: Damien micro w/ intro

TODO: Re-visit security