CSE 550: Systems for all

Au 2021

Ratul Mahajan
Distributed transactions

Atomic update of data across multiple nodes

Why is the data distributed?
  • Replication: Tolerate failures
  • No replication: Need more compute / storage
Fault tolerance in distributed systems

<table>
<thead>
<tr>
<th></th>
<th>Replication</th>
<th>Non-replication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fail stop</strong></td>
<td>Paxos</td>
<td>2PC, 3PC</td>
</tr>
<tr>
<td><strong>Byzantine</strong></td>
<td>PBFT</td>
<td>N/A</td>
</tr>
</tbody>
</table>
CAP theorem: Fundamental trade-off for fault tolerance

Consistency
(last written values are read)

Availability
(works can always be done)

Partition tolerance
(operate with arbitrary messages failures)

Can pick at most two
Over to Diya and Peter
Next few weeks

Learned many of the fundamental techniques thus far
  • Sharing resources, ordering events, handling failures, building large networks

Will focus on applications
  • Different types data stores (files, KV stores, structured data)
  • Different types of compute logic (streams, dataflow, ML)

Some fundamentals still coming
  • Security, correctness reasoning