THE UNIVERSITY OF SYDNEY

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COMP5338: Advanced Data Models **Sem. 2/2020**

Week 8: Distributed NoSQL System: Amazon Dynamo

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Learning Objectives

This tutorial focuses on understanding the architecture of Amazon Dynamo. In particular we review the following:

- Consistent hashing and virtual nodes
- Eventual consistency property

Sample system and data

Suppose we have a Dynamo ring consists of five nodes, each is assigned one or two tokens in the ring space [0,99]. The respective token(s) for each nodes are as follows:

- n_0: 0, 30
- n_1: 15, 80
- n_2: 40, 60
- n_3: 50, 90
- n_4: 70

we store data about university faculties in this Dynamo instance. The data is keyed with the faculty. Table 1 shows a few sample keys and their corresponding hashes.

Table 1: Sample keys and hashes

Key	Arts	Business	Education	Engineering	Law	Medicine	Science
Hash	31	93	29	13	71	47	43

Question 1: Data Partition and Replication: consistent hashing

Answer the following questions:

1. What are the token range(s) of each node? What is the order of physical nodes in the ring?
2. Suppose node n3 receives a request to insert a record with key “Law”. Which node will it forward the request to?
3. Which other nodes will eventually get a copy of the inserted data?

Question 2: Eventual Consistency property

We assume that the consistency configuration (N,R,W) of the system has the value (3,2,2). The preference list consists of 4 nodes. Answer the following questions:

1. The record with key “Engineering” currently have three replicas all with the vector clock([n1,1]). Suppose node n1 is temporarily not available between two time points: t1 and t2. A write request on key “Engineering” is received by node n4 during this period. Which node will coordinate the write? What will the vector clock be after the write request is processed?
2. Suppose n1 is back to life after t2 and receives a read request for key “Engineering”. How will this requested be processed and what will be returned to the client?