LOCATING DATA ON THE NETWORK: P2P NETWORKS, CHORD, AND DYNAMODB

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ATTRIBUTION

- These slides incorporate material from:
  - Christo Wilson, NEU (used with permission)
  - Kyle Jamieson, Princeton
  - Tanenbaum and Van Steen, 3rd edition

ANNOUNCEMENTS

Reading for Thursday:

"The Tail at Scale" (Dean and Barroso), linked off canvas

Optional reading for today:

DynamoDB paper linked off canvas

Today:

Finish up Chord, talk a bit about DynamoDB

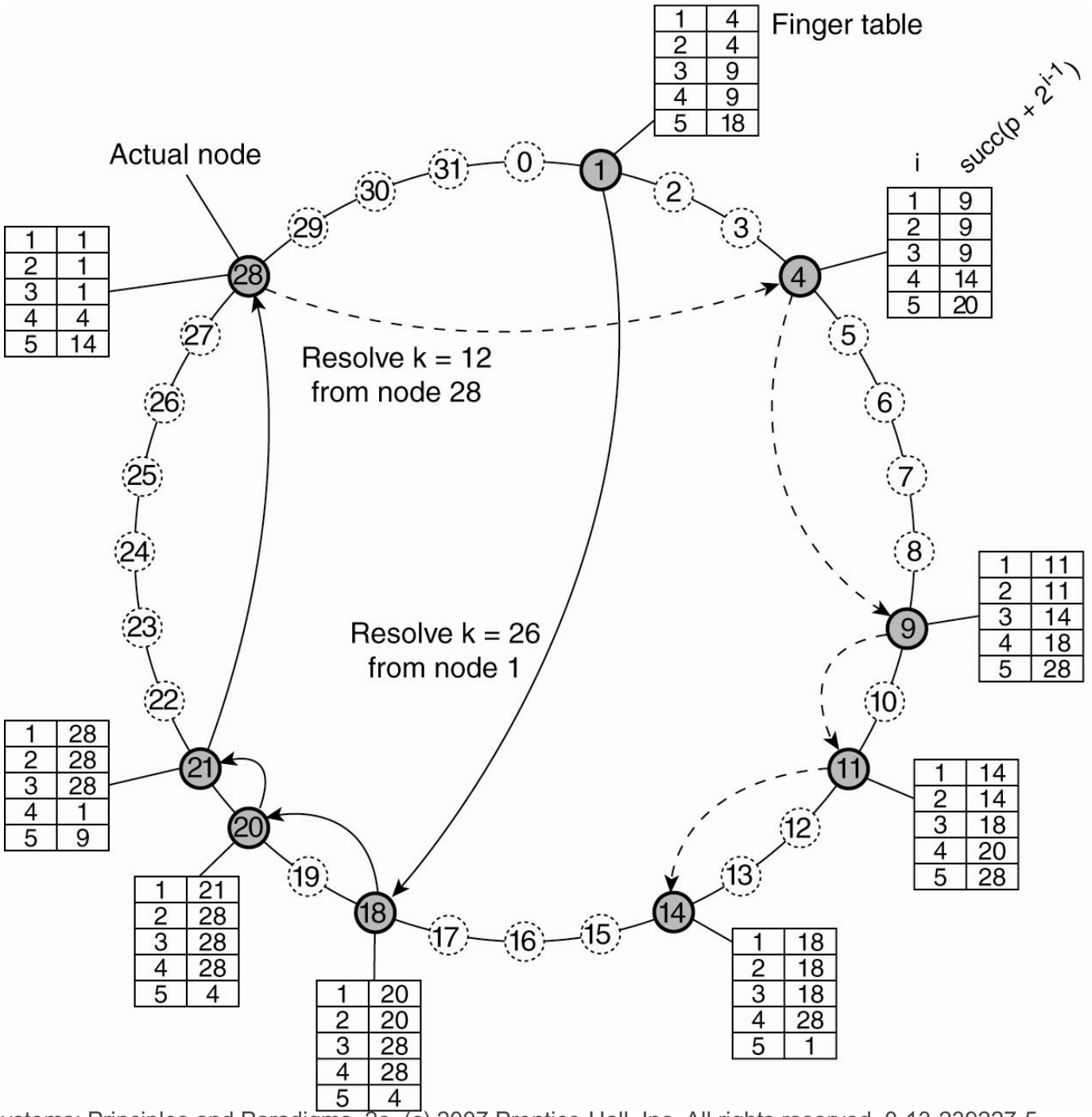
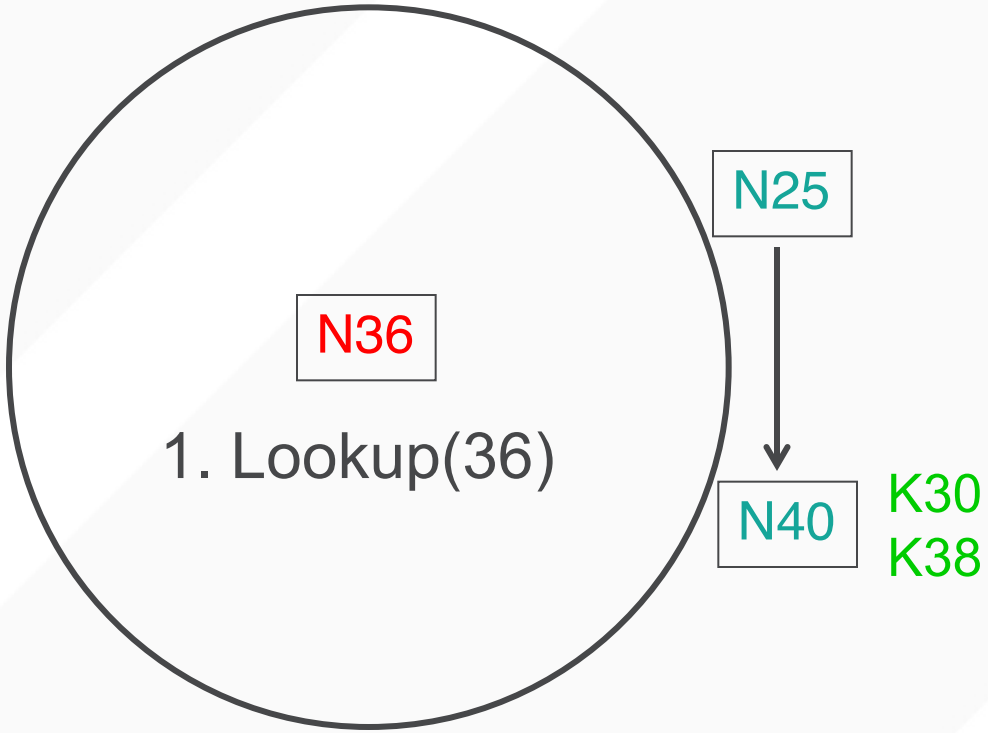


Figure 5-4. Resolving key 26 from node 1 and key 12 from node 28 in a Chord system.

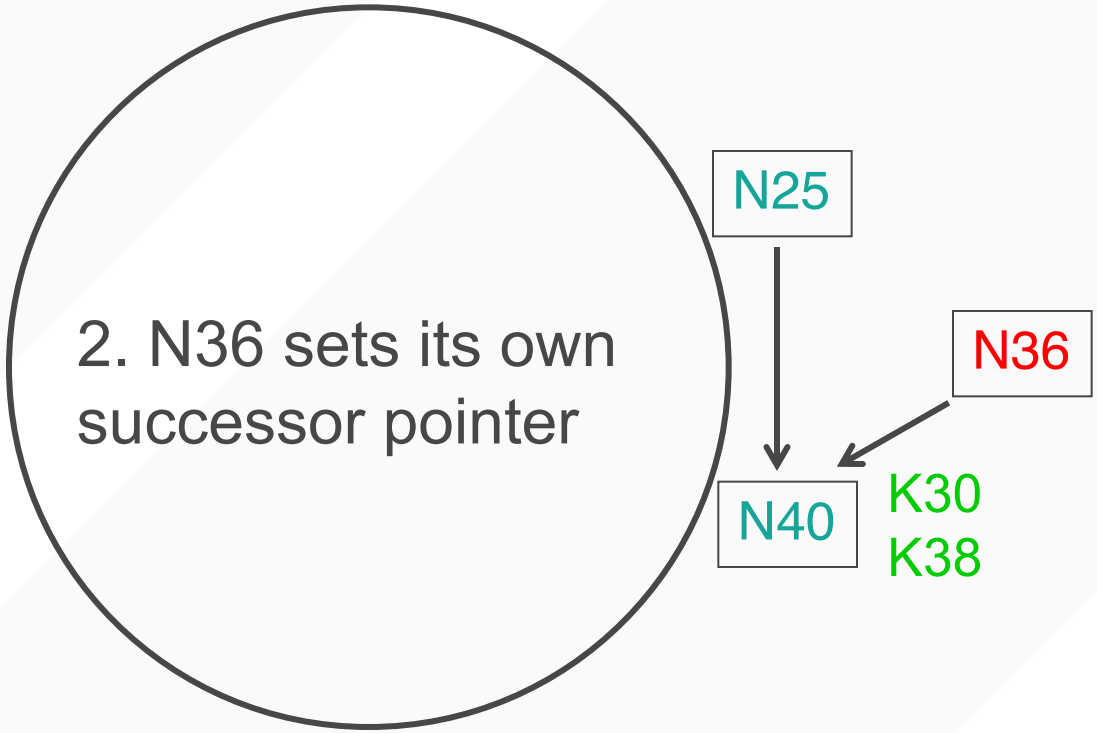
AN ASIDE: IS LOG(N) FAST OR SLOW?

- For a million nodes, it's 20 hops
- If each hop takes 50 milliseconds, lookups take **a second**
- If each hop has 10% chance of failure, it's a couple of timeouts
- So in practice log(n) is better than O(n) but **not great**

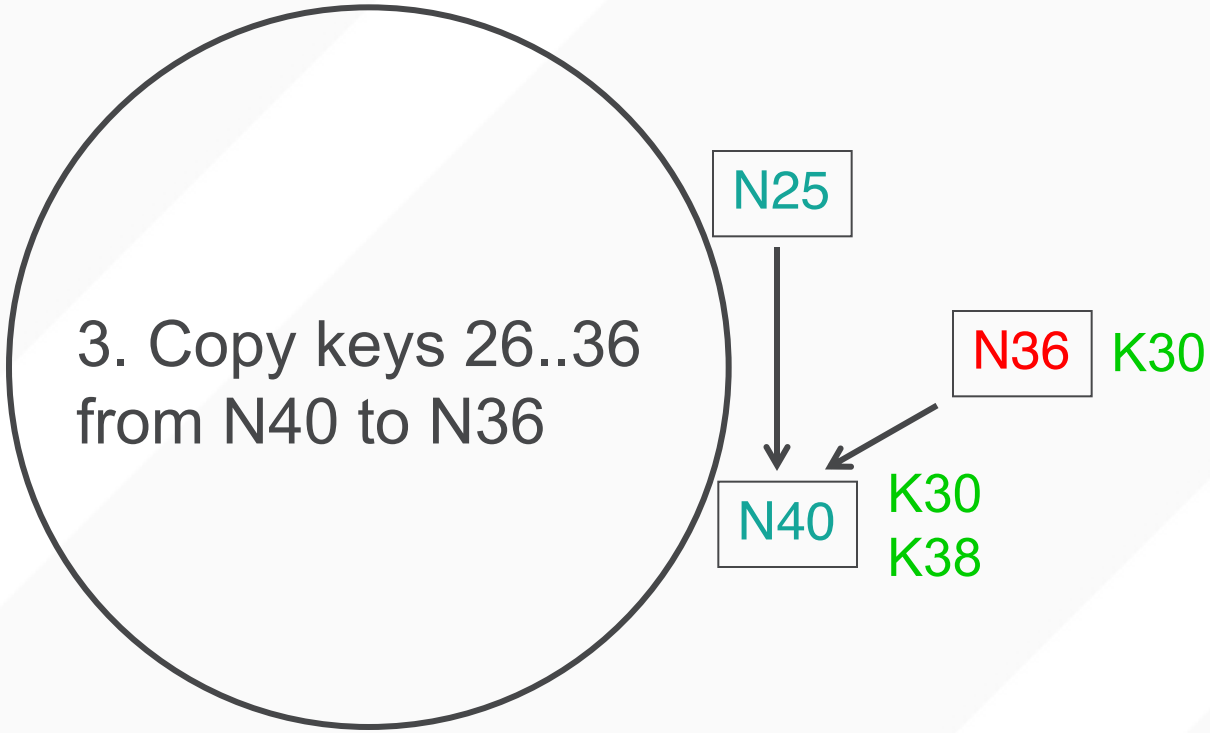
JOINING: LINKED LIST INSERT



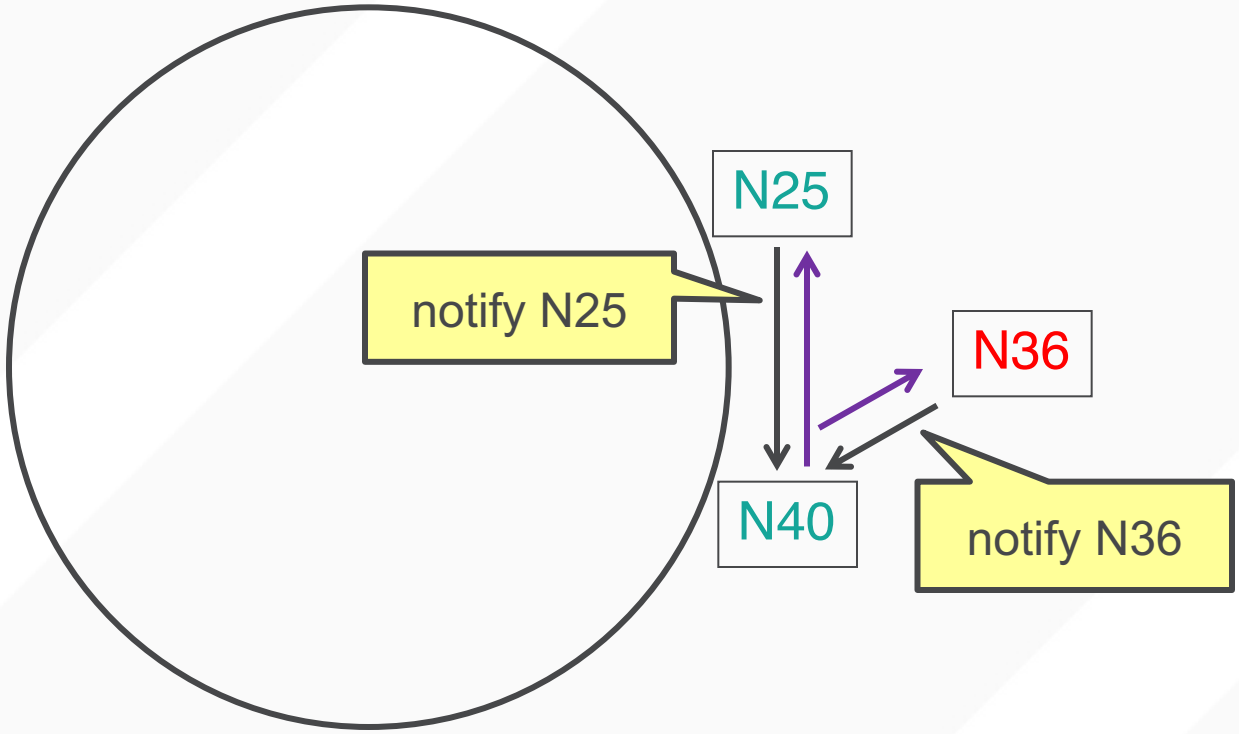
JOIN (2)



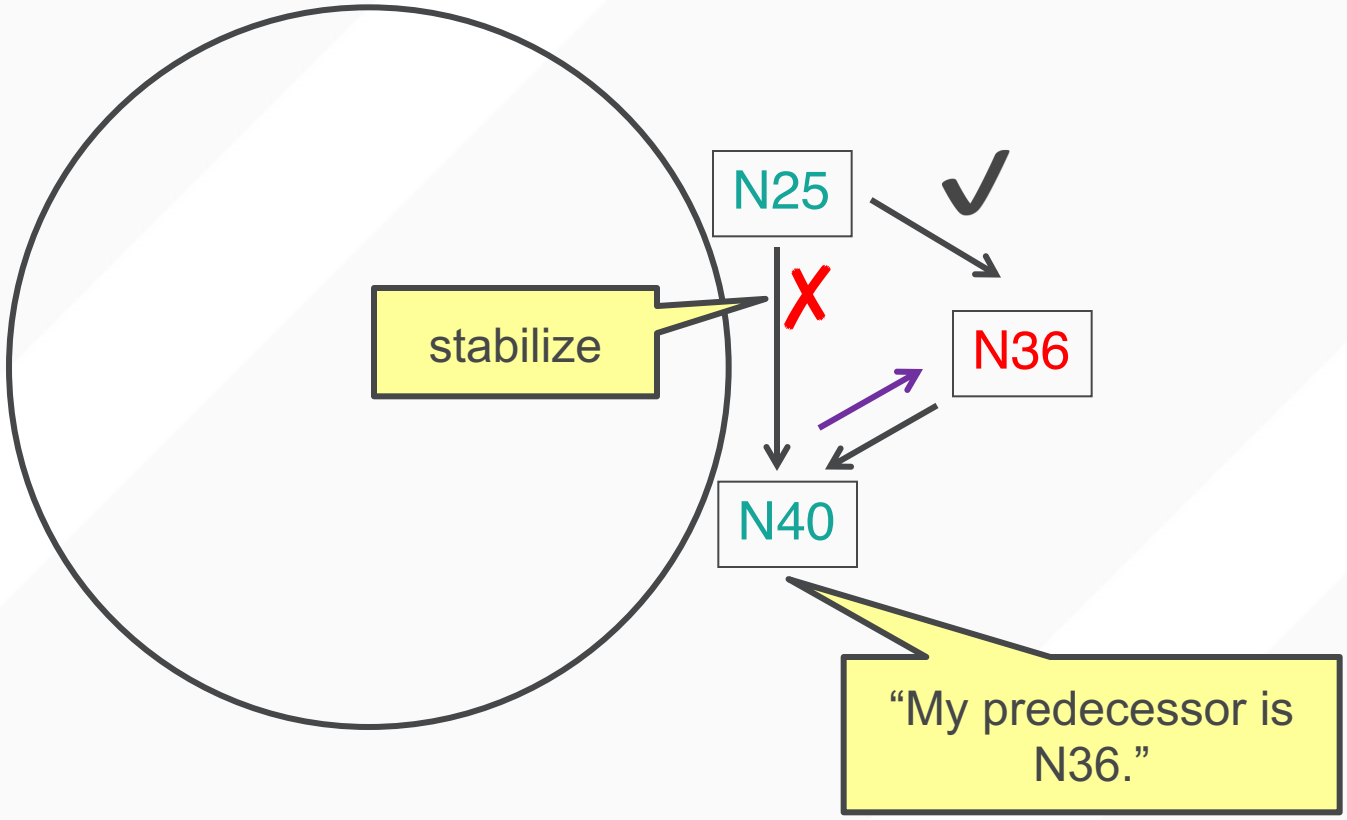
JOIN (3)



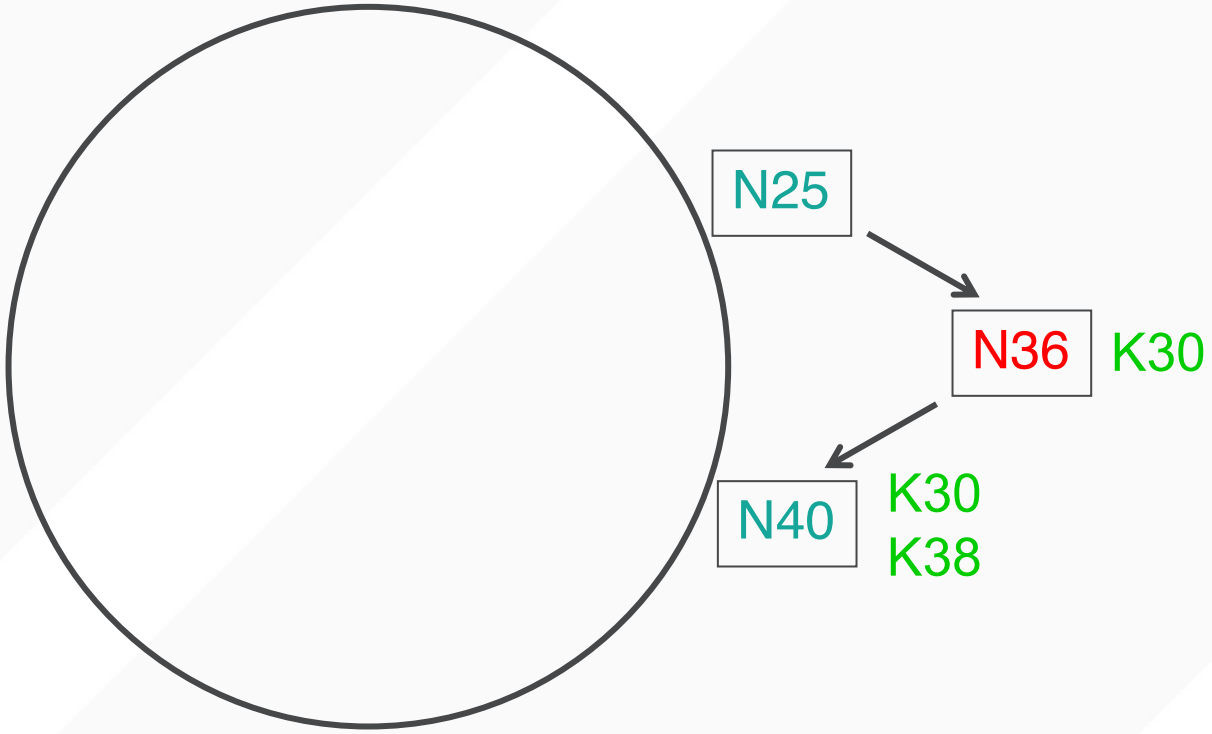
NOTIFY MESSAGES MAINTAIN PREDECESSORS



STABILIZE MESSAGE FIXES SUCCESSOR



JOINING: SUMMARY



- Predecessor pointer allows link to new node
- Update finger pointers in the background
- Correct successors produce correct lookups

WHAT CHORD GOT RIGHT

- **Consistent hashing**
  - Elegant way to divide a workload across machines
  - Very useful in clusters: actively used today in Amazon Dynamo and other systems
- **Replication** for high availability, efficient recovery after node failure
- **Incremental scalability:** “add nodes, capacity increases”
- **Self-management:** minimal configuration
- **Unique trait:** no single server to shut down/monitor

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