Two Issues With Content distribution

* meta server overload (storing <key, value>)
* Origin server overload (Storing content)

Origin Server overload

Two Solutions

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  - not good enough for slashdot effect

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How to Democratize content distribution?

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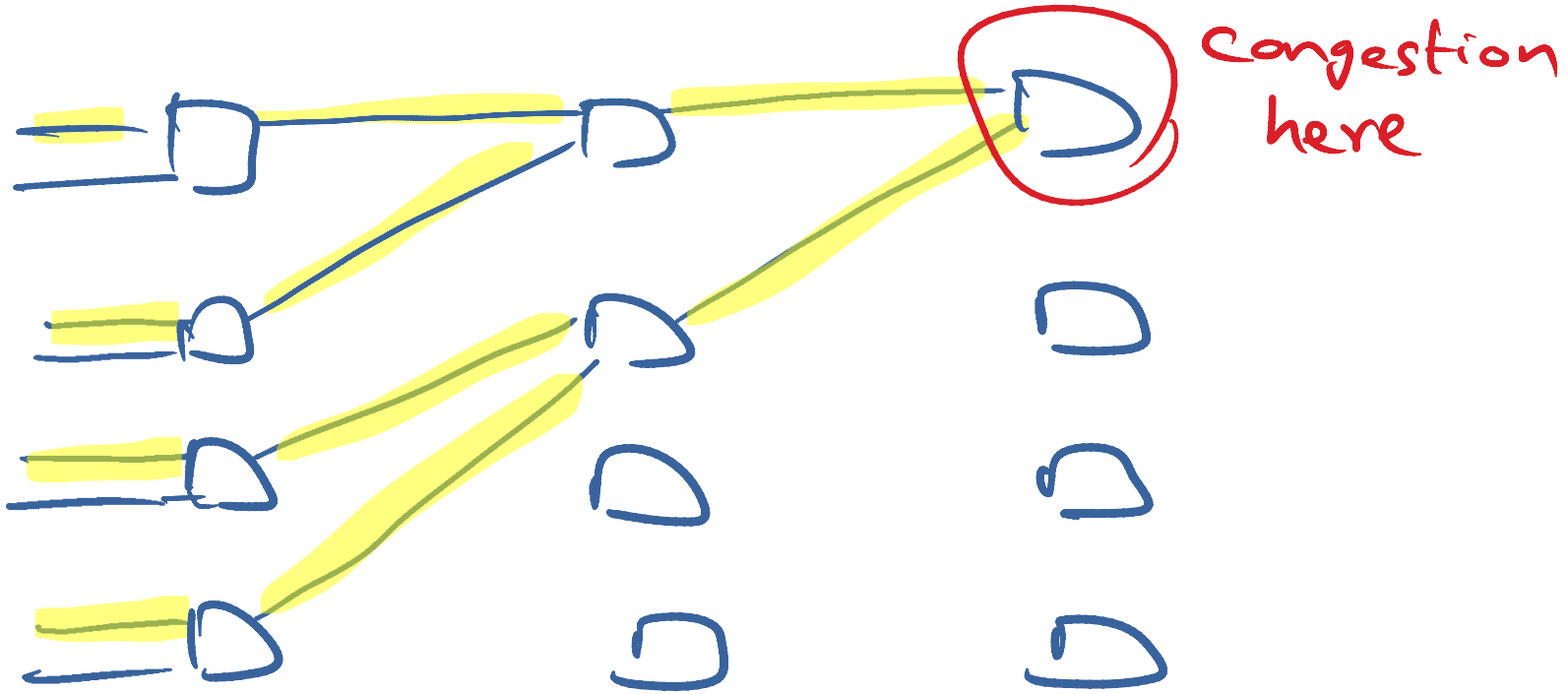
How to Democratize content distribution?

Enter Coral System

Greedy Approach leads to "tree saturation"



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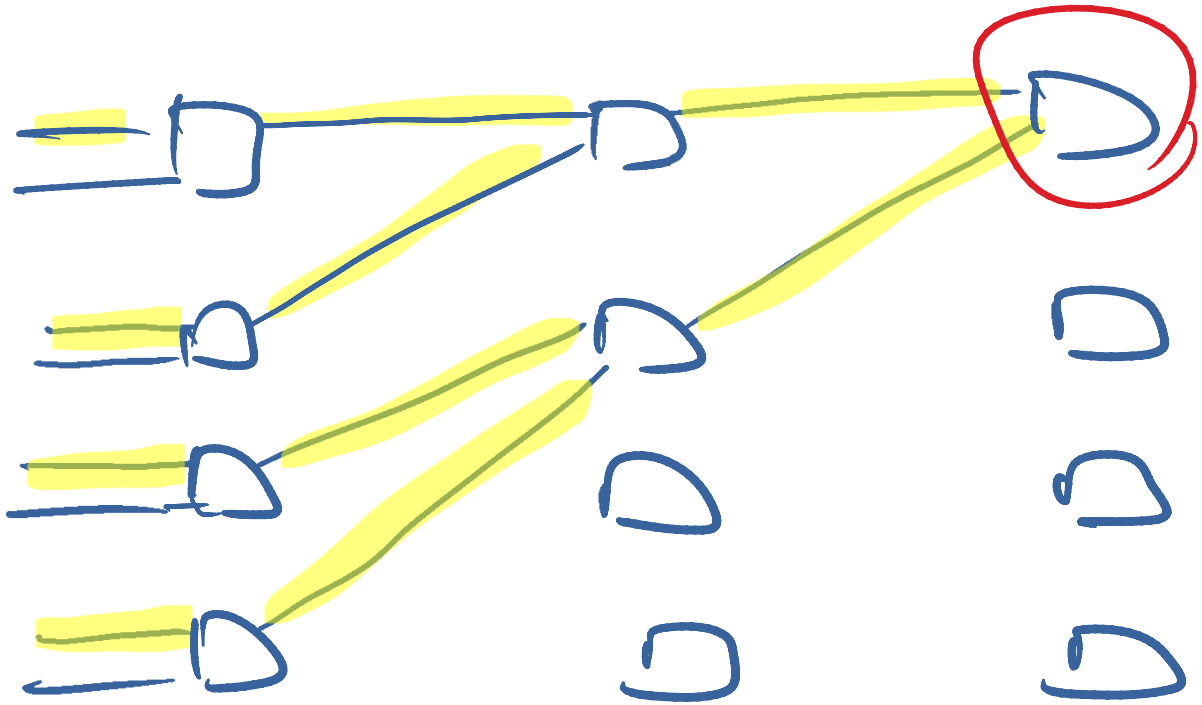

Congestion here

Coral approach

Don't be greedy!

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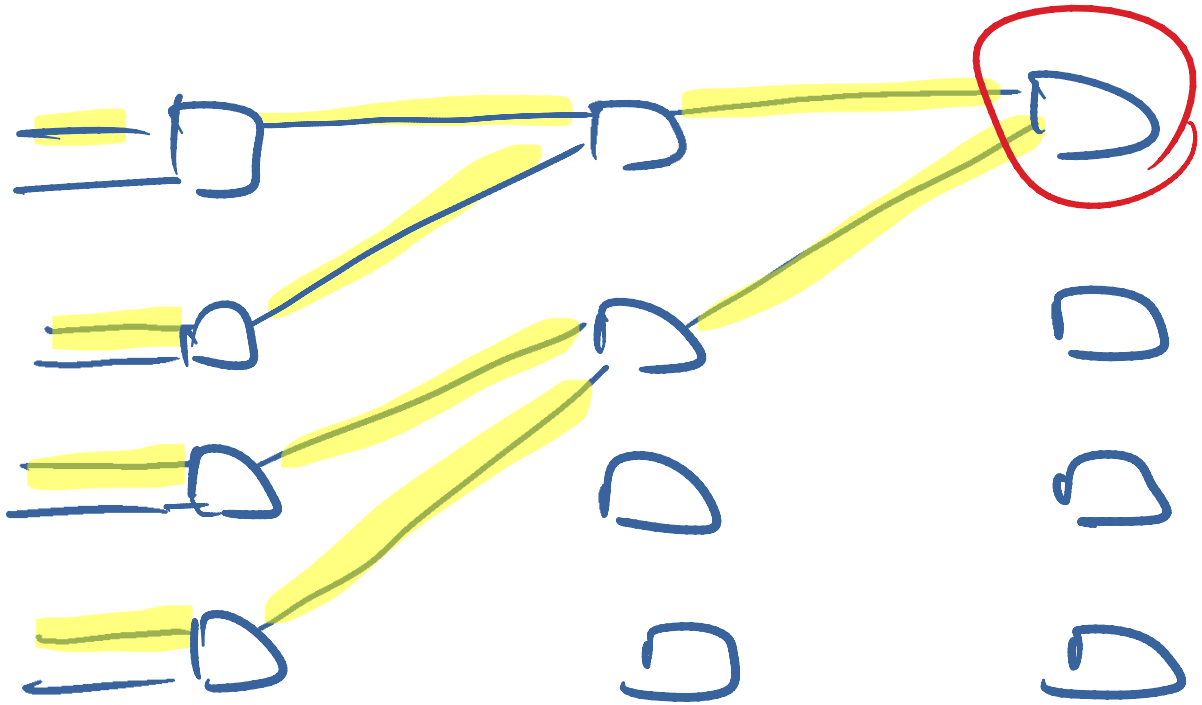

Congestion here

Coral approach

Don't be greedy!

K ≪ N

⇒

hint not absolute

Coral DHT

- Get/put satisfied by nodes different from $<N \cong key>$ ⇒ Sloppy DHT

Rationale

- avoid tree saturation
- spread metadata overload

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How?

- Novel key-based routing
- basis
  - XOR distance between src & dst
    N_{src} XOR N_{dst} (e.g., 14 XOR 4 = 10)

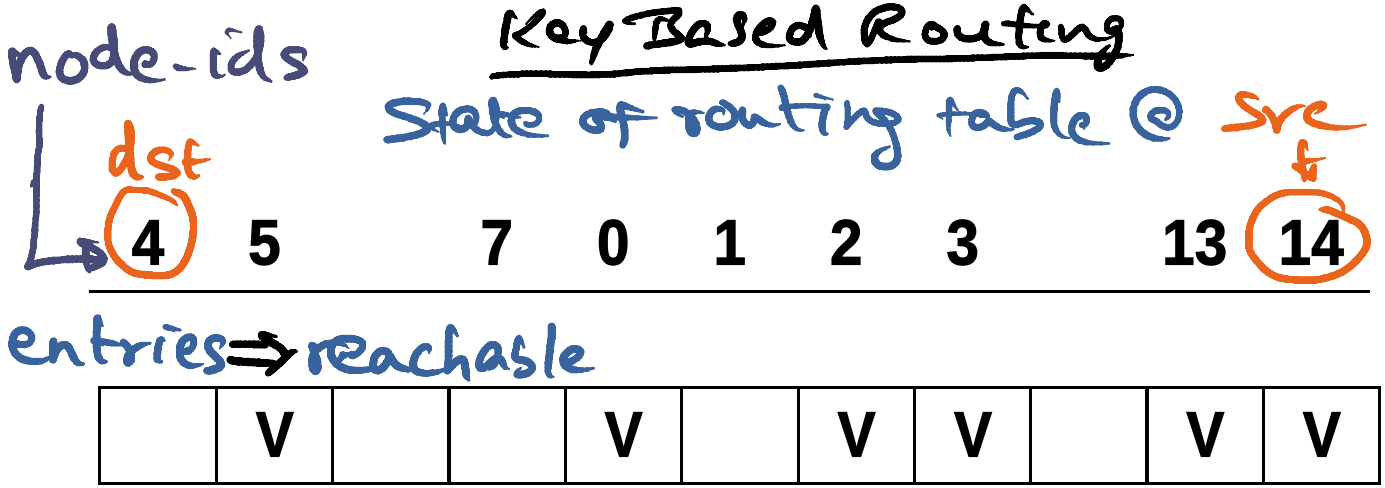
Key Based Routing

node-ids

dst

4	5		7	0	1	2	3		13	14
	V			V		V	V		V	V

Key Based Routing



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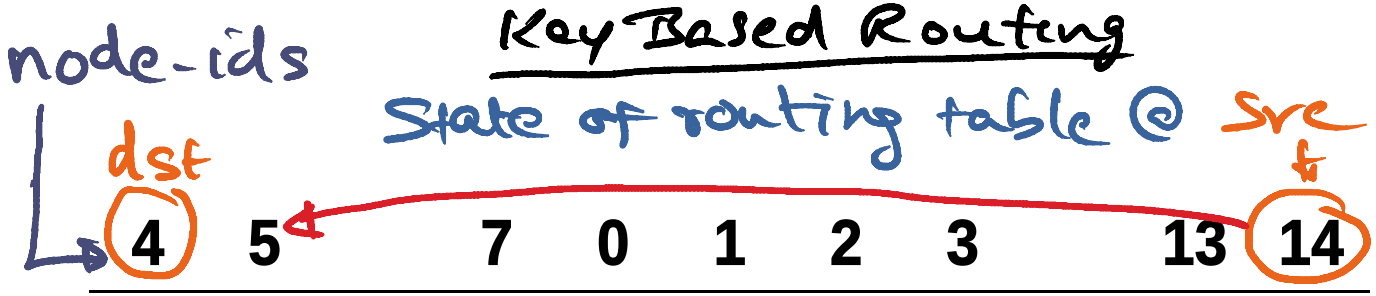
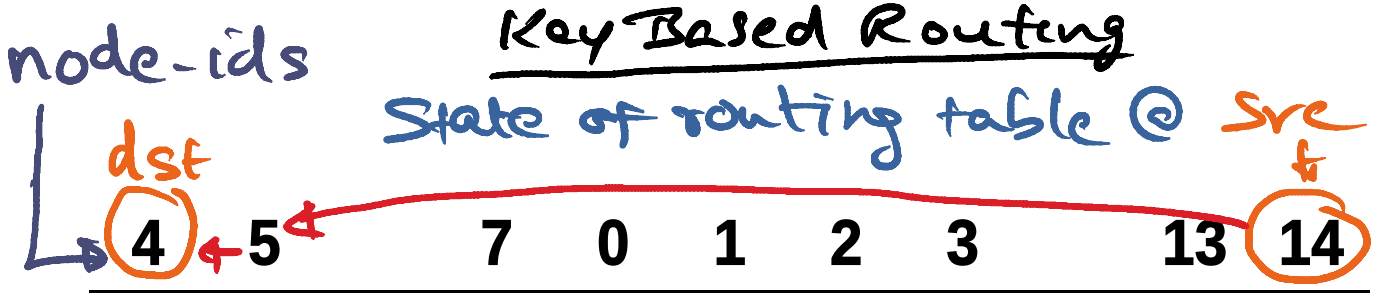


entries ⇒ reachable

	V			V		V	V		V	V

Intuition in greedy approach
- get as close to the desired dst in node-id namespace

Key Based Routing



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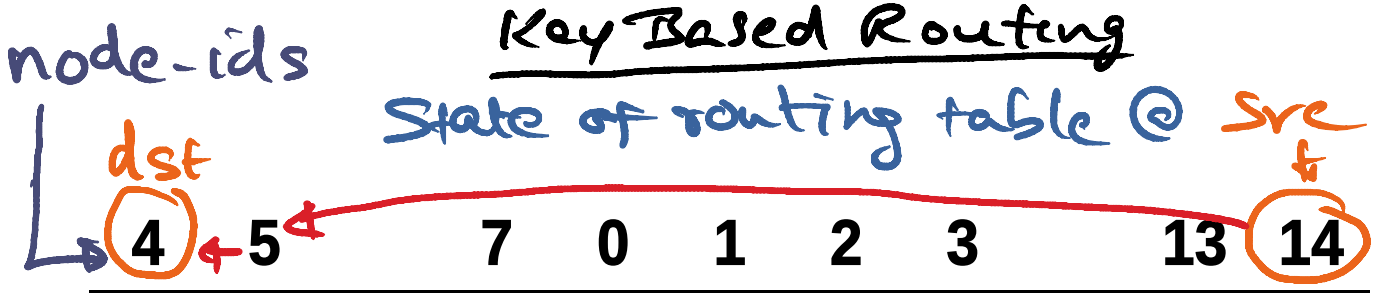

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Objective?
- reach dst with fewest number of hops

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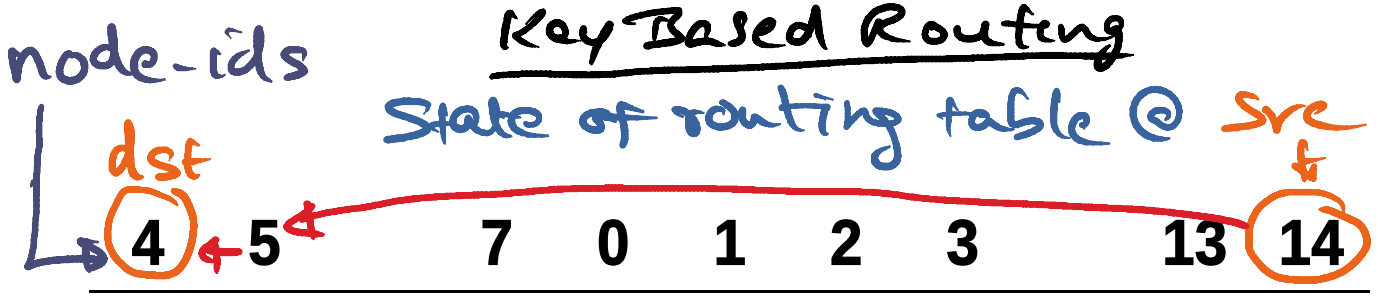

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- get as close to the desired dst in node-id namespace
- he may know route to get me to desired dst

Objective?
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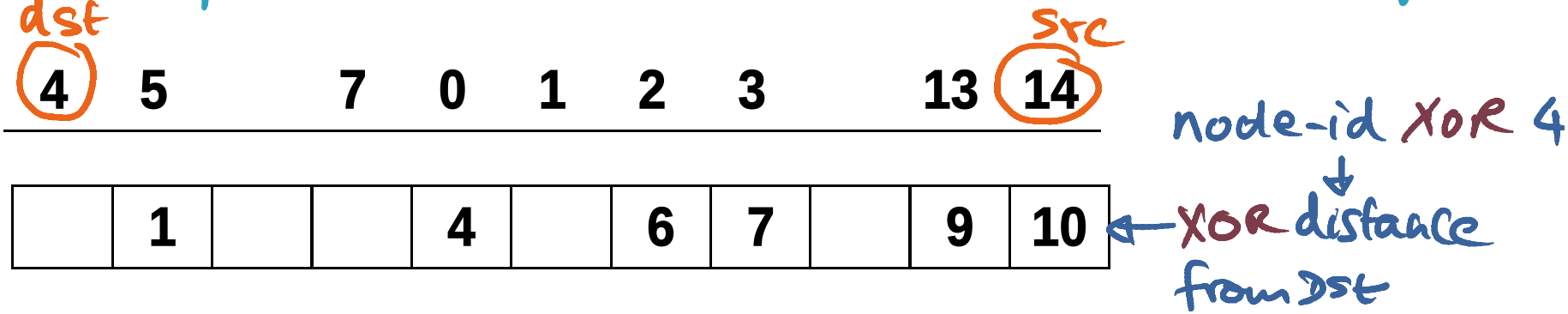
⇒ "me first" approach leads to congestion

Coral Key-based routing

- Each hop go to some node that is half the distance to dst in node-id namespace



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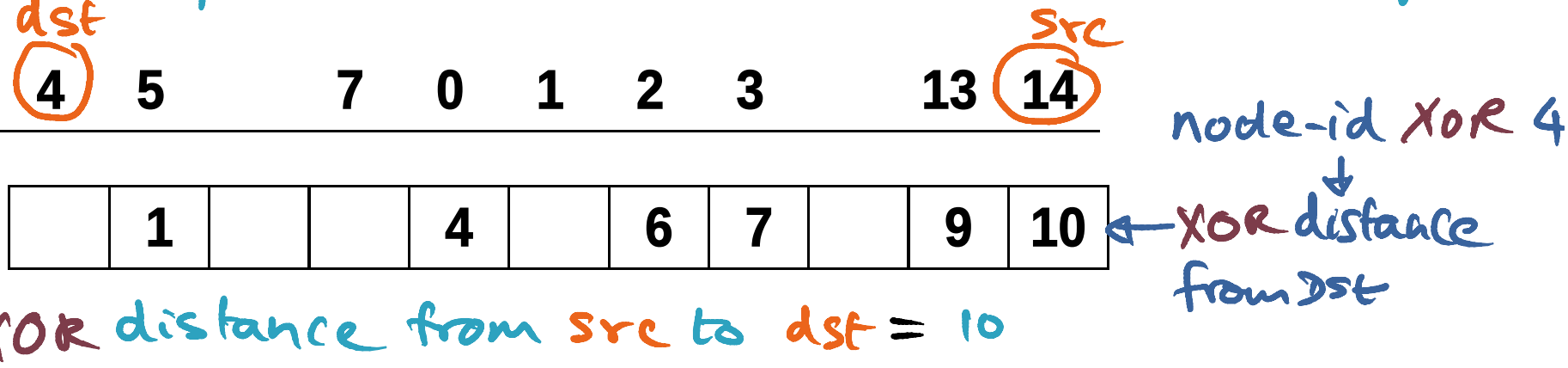

XOR distance from src to dst = 10

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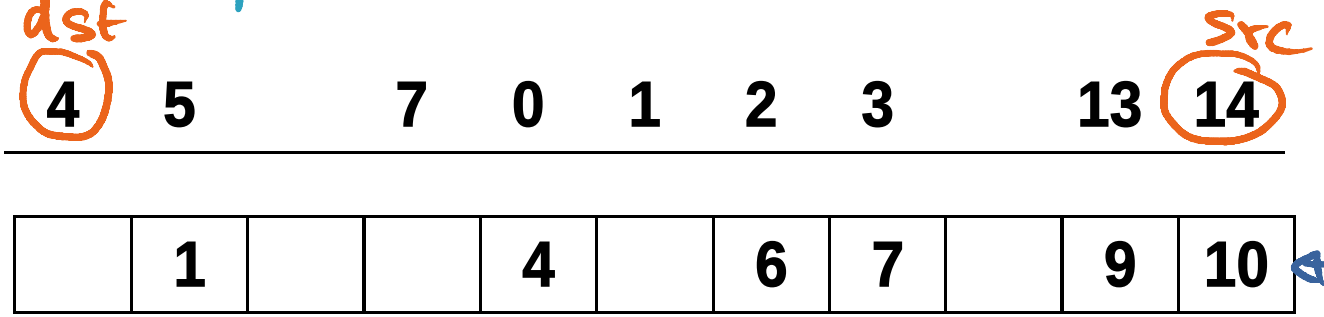

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1st hop go to $\frac{10}{2} \Rightarrow 5$ distant

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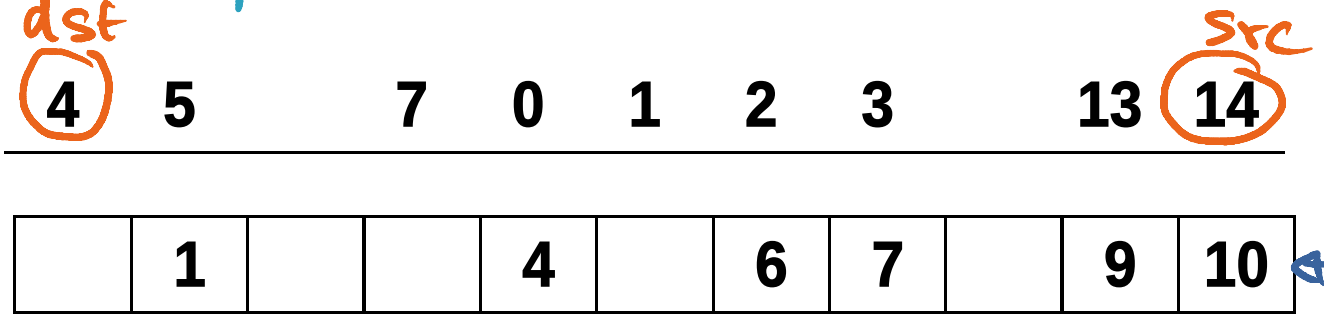

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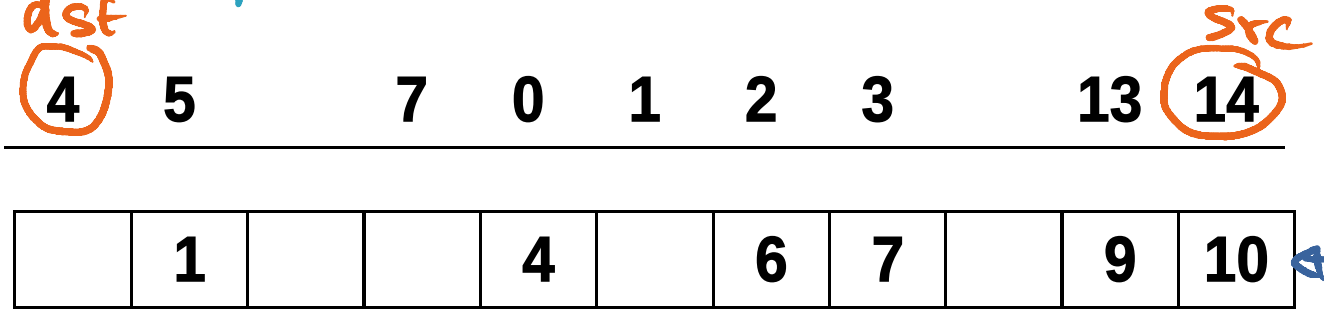

XOR distance from src to dst = 10

1st hop go to $\frac{10}{2}$ => 5 distant

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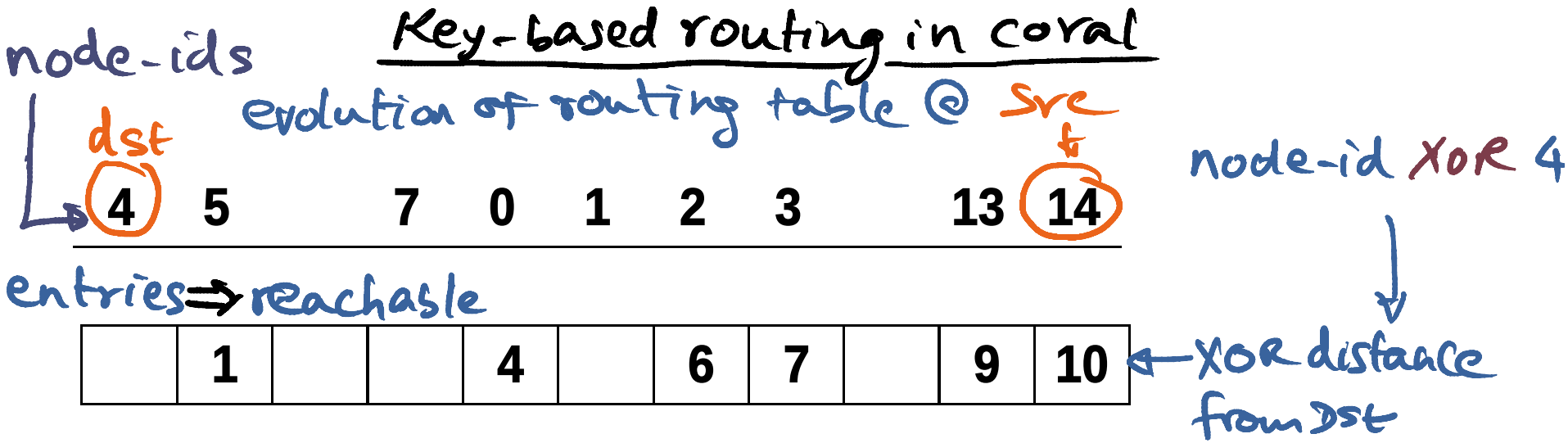
3rd hop go to $\frac{2}{1}$ => 1 distant

.... finally home!!

Key-based routing in coral



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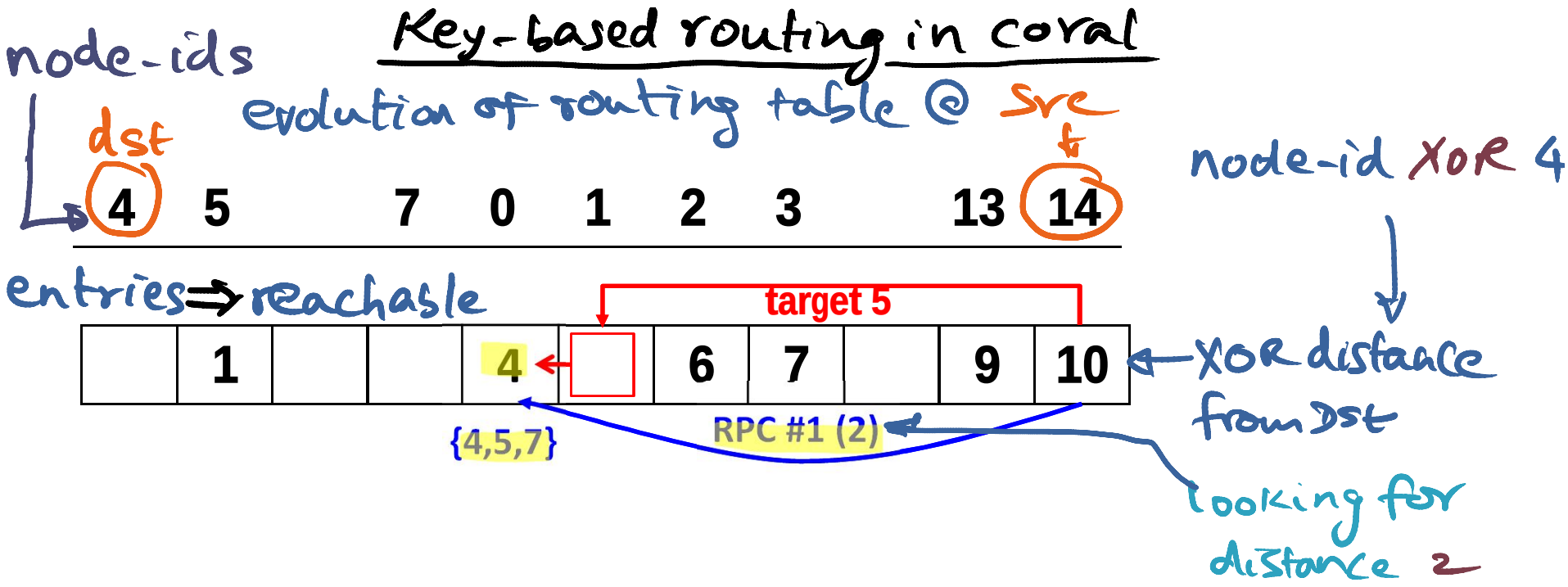

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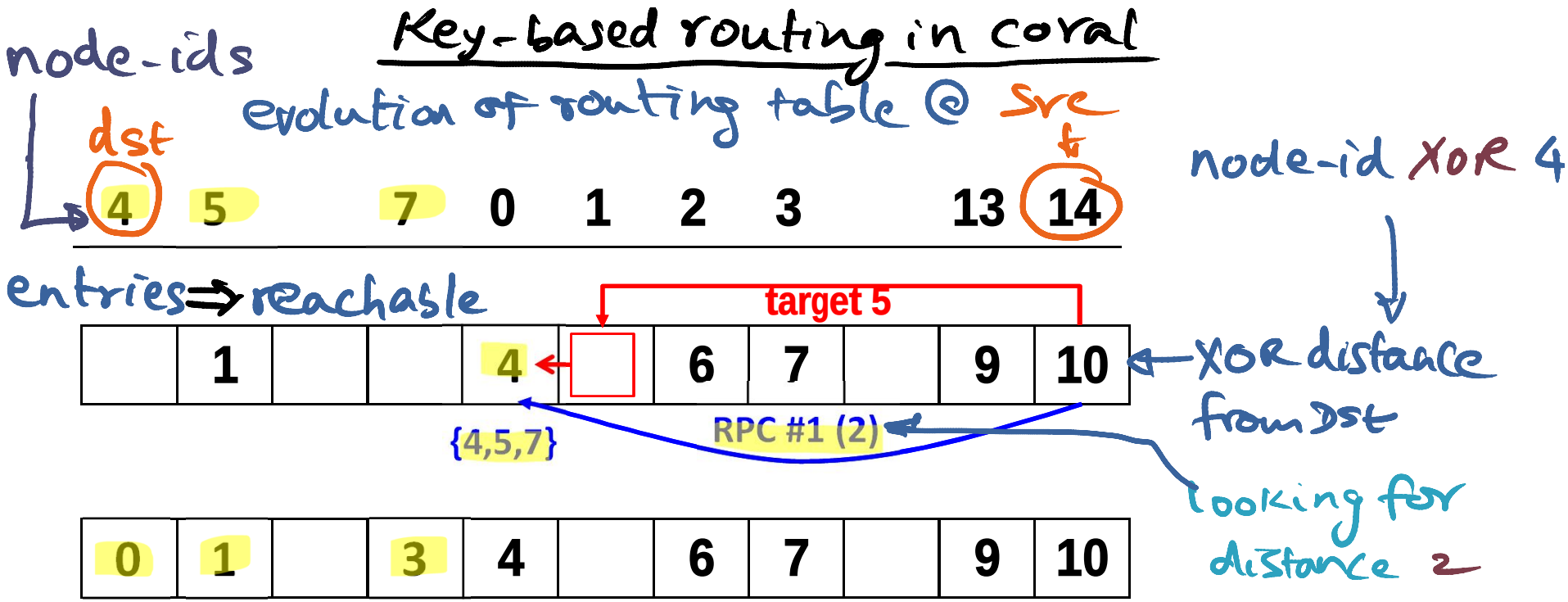

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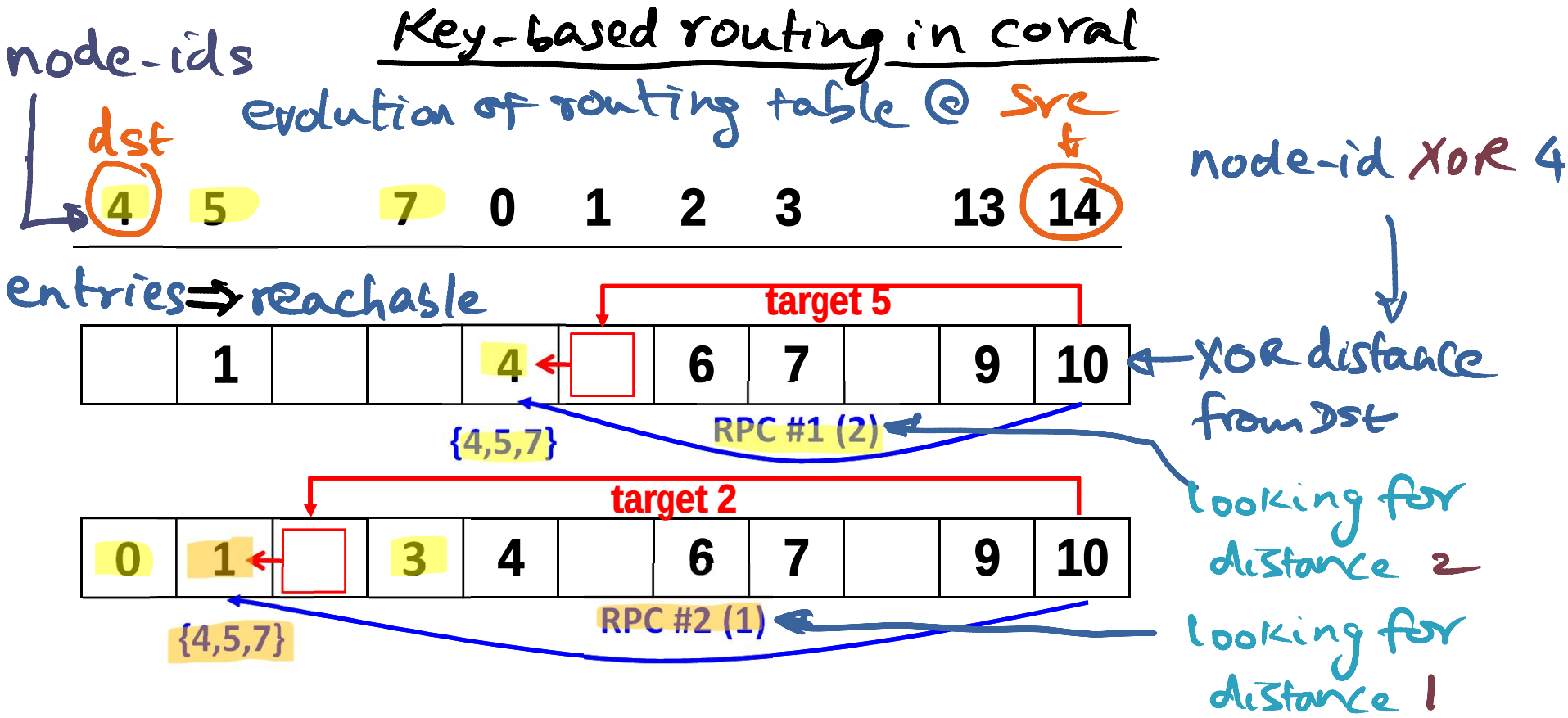

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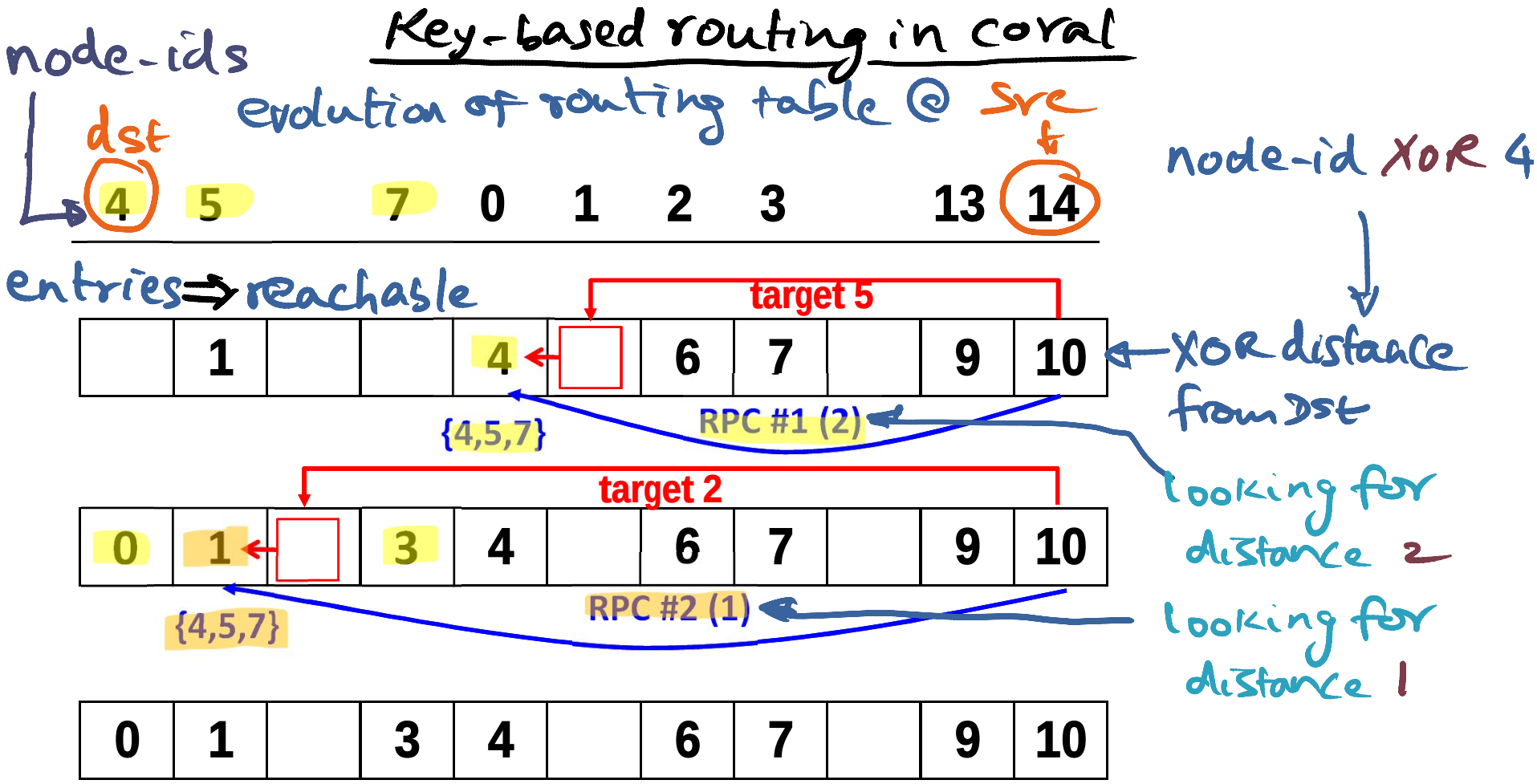

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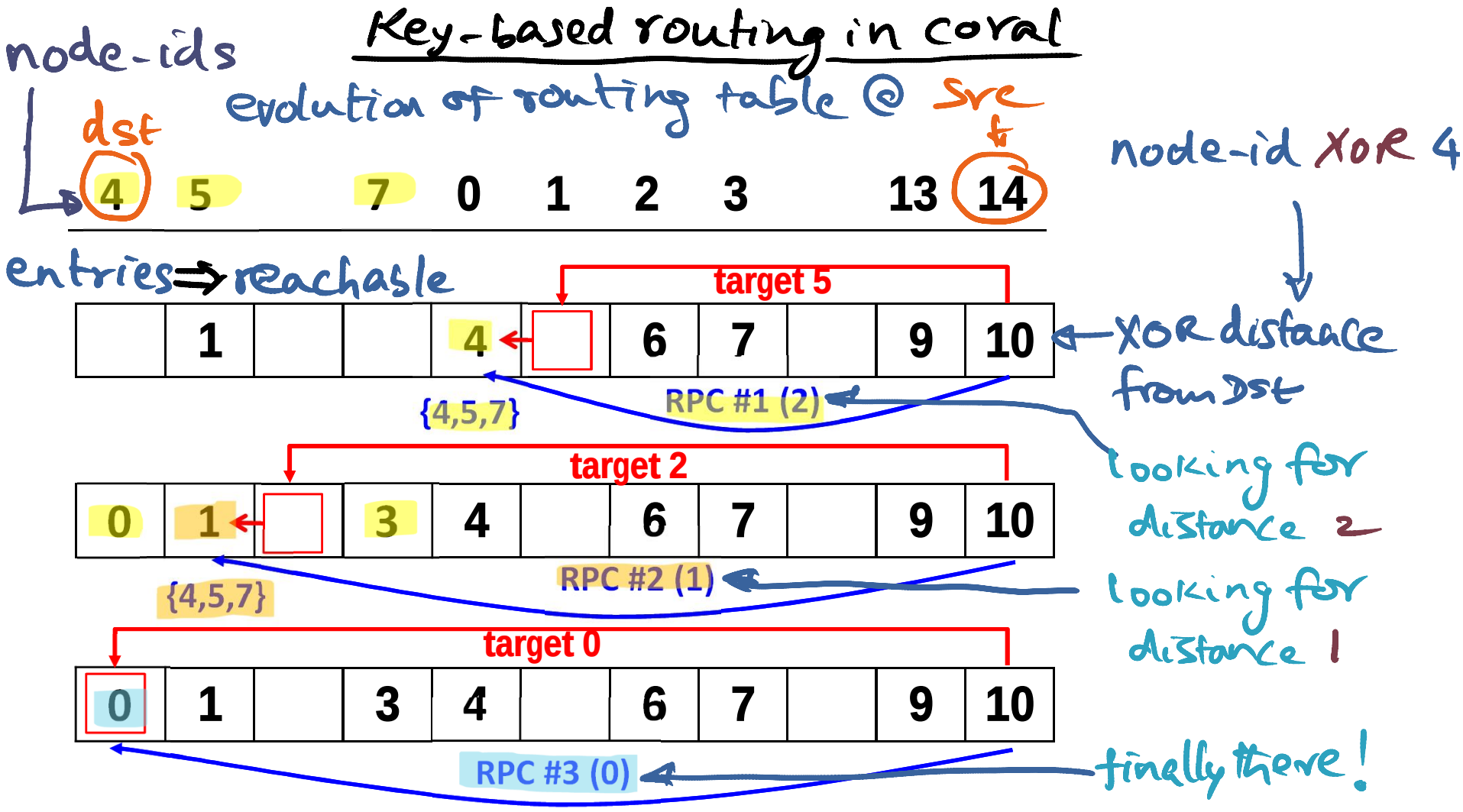

Coral Sloppy DHT

Coral primitives

- put (key, value)

  value: node-id of proxy with content for key

  * announcing willingness to serve as proxy

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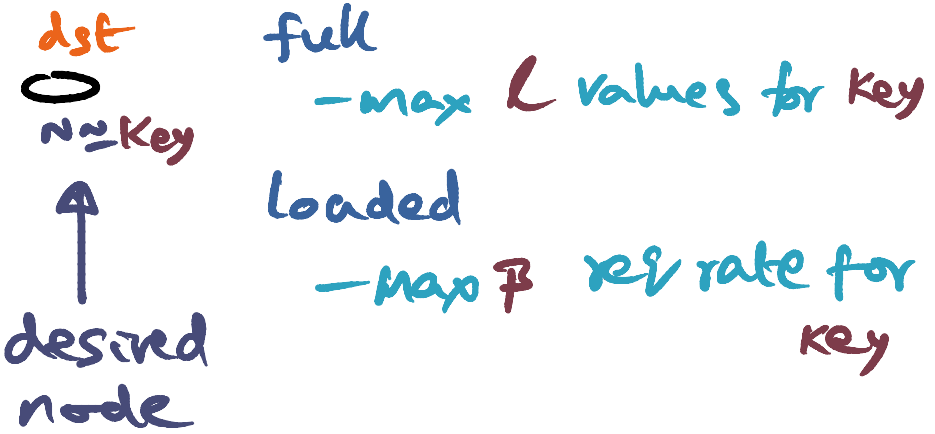

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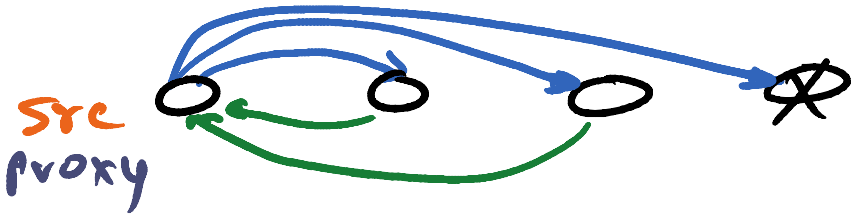

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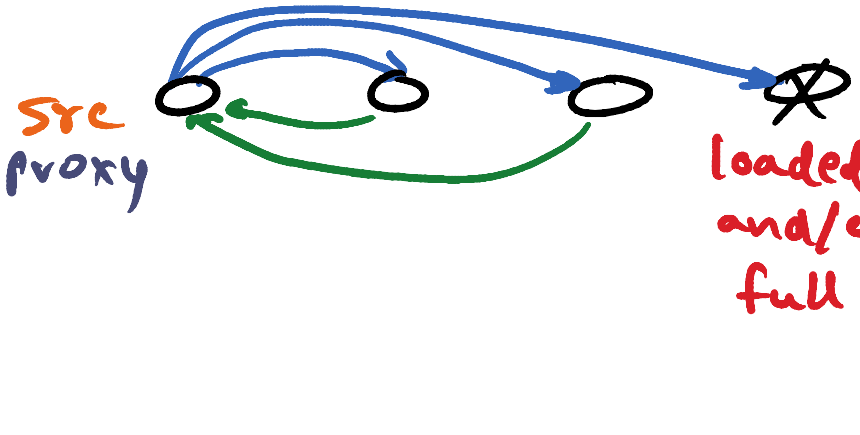

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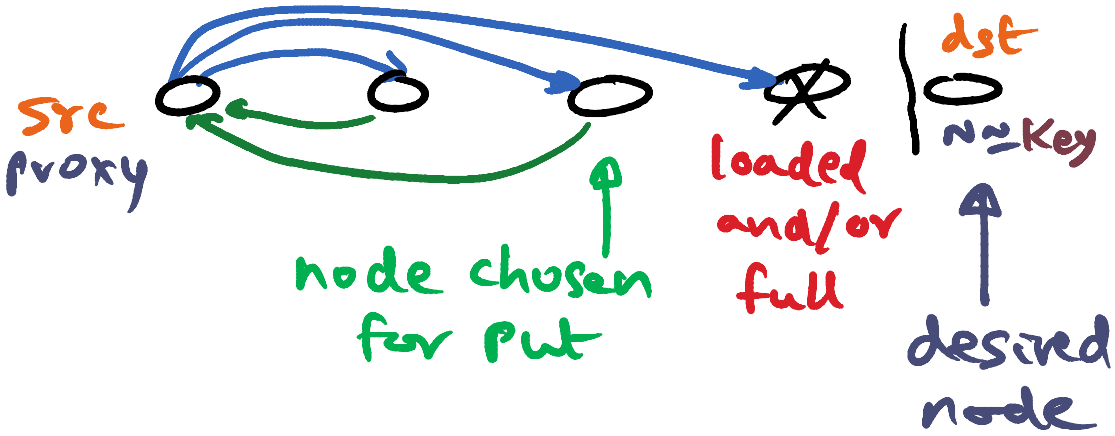

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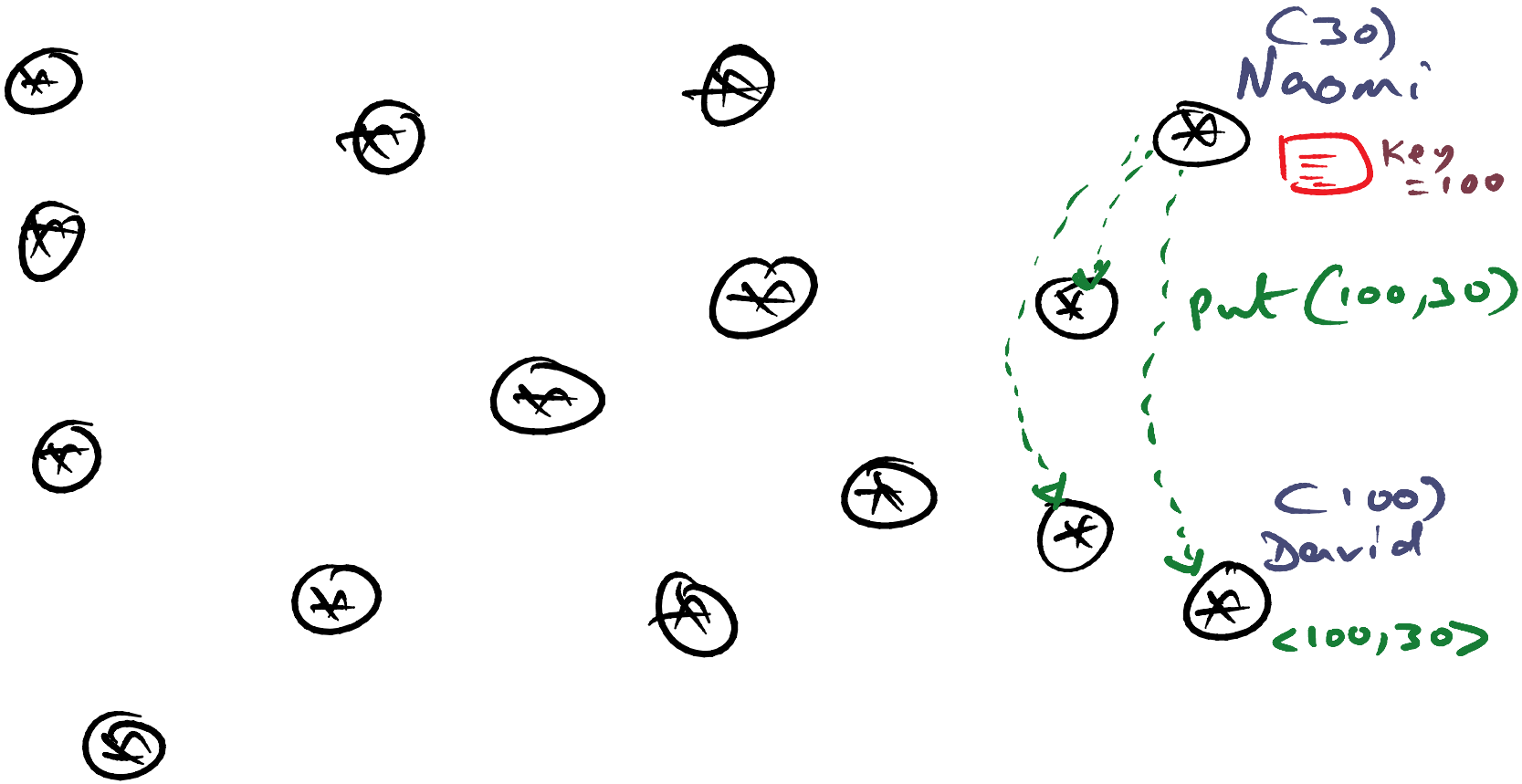
Coral in action



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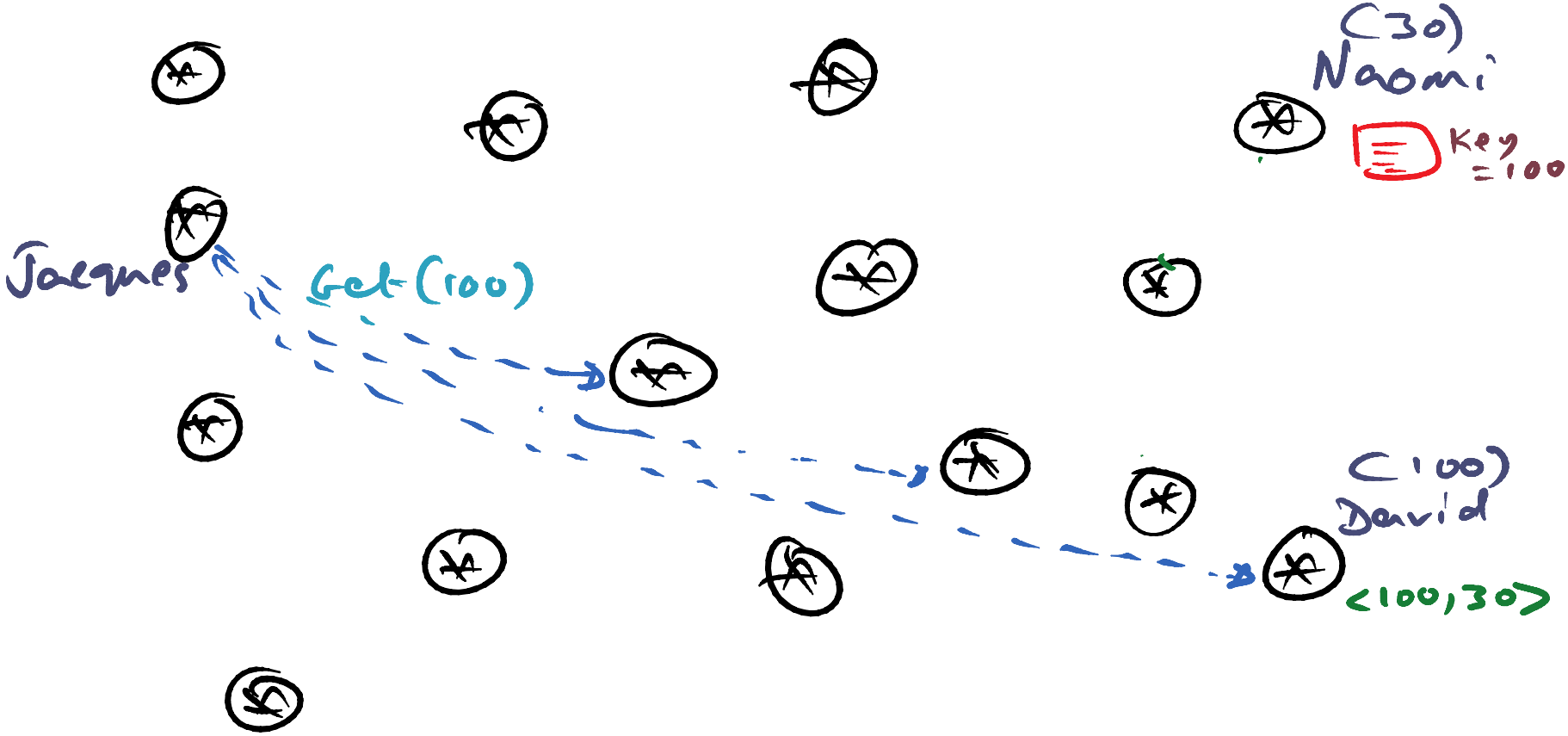

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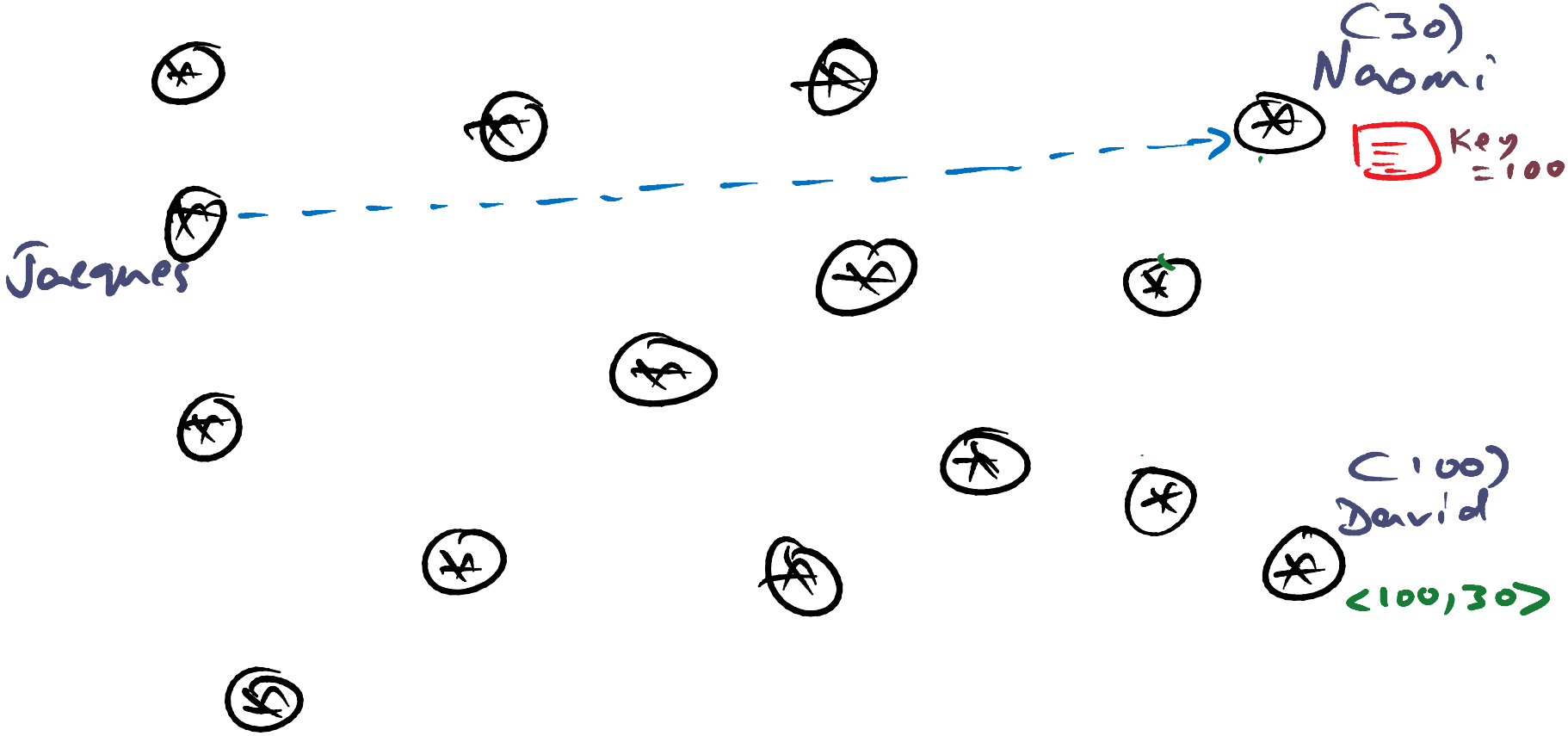

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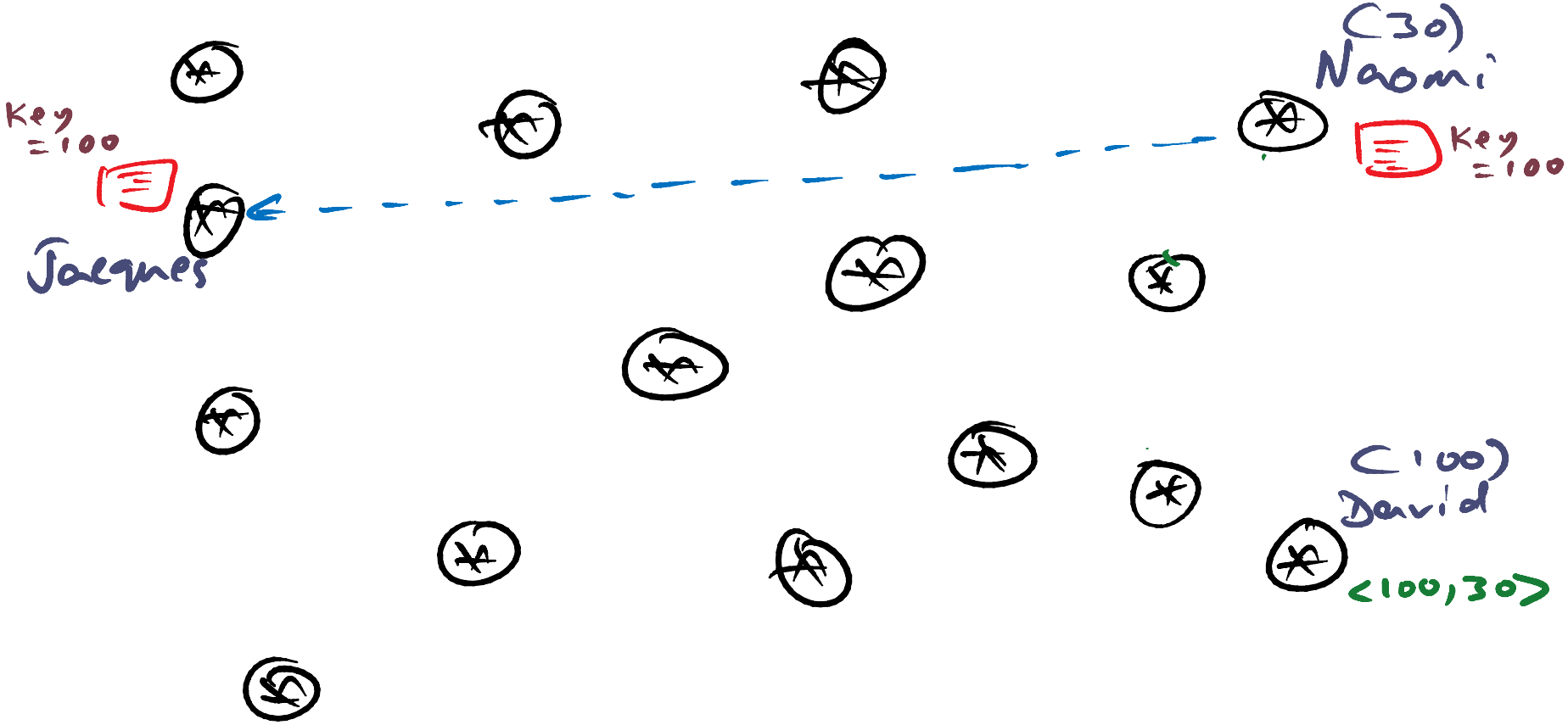

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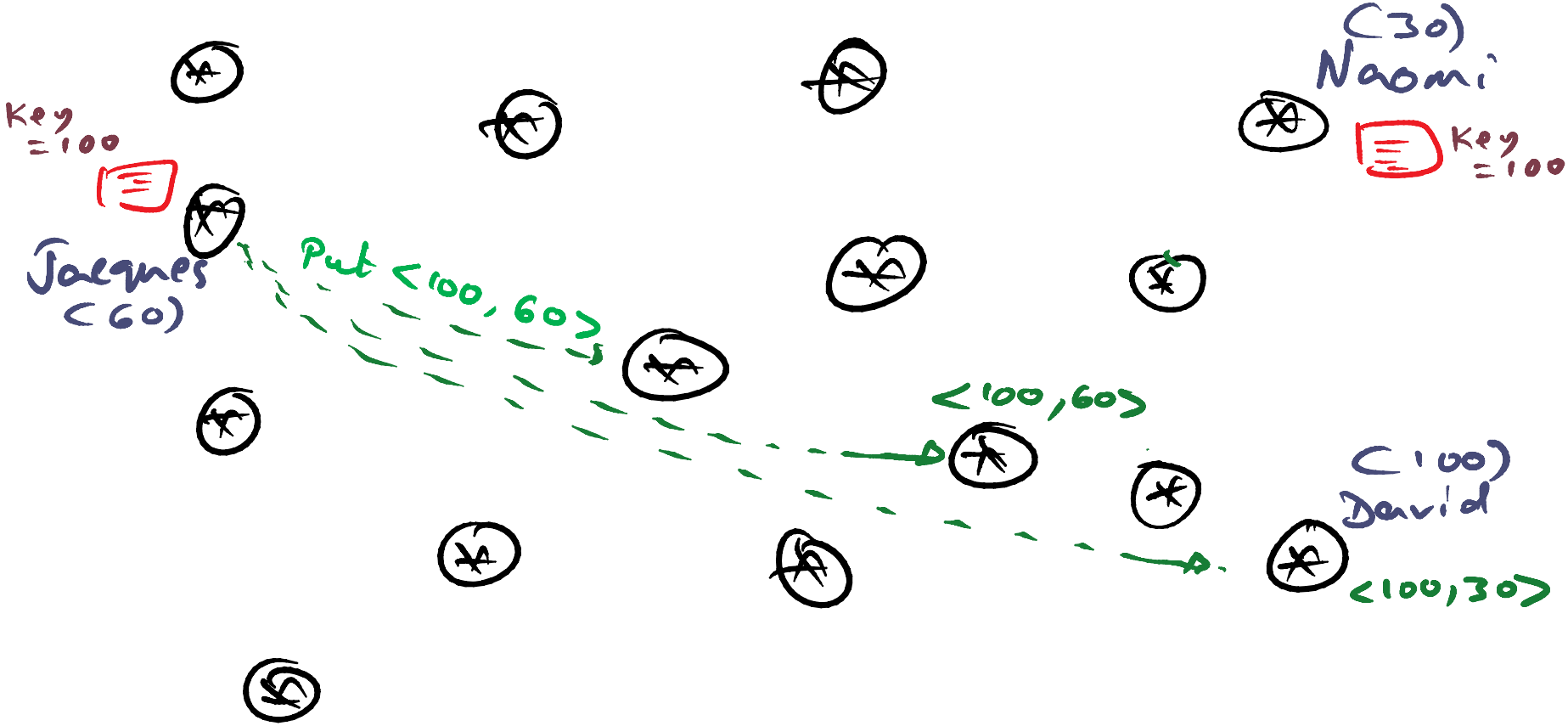

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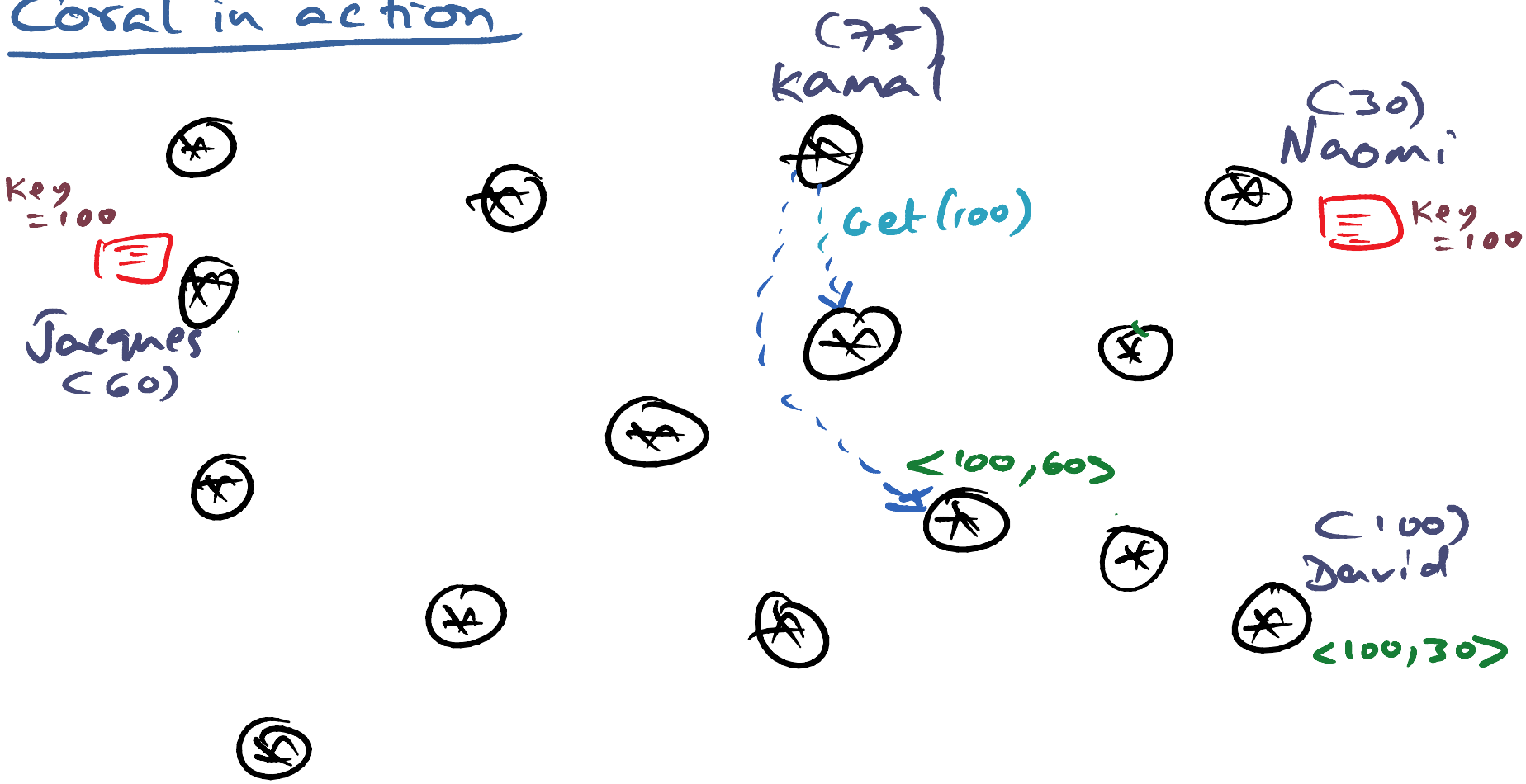

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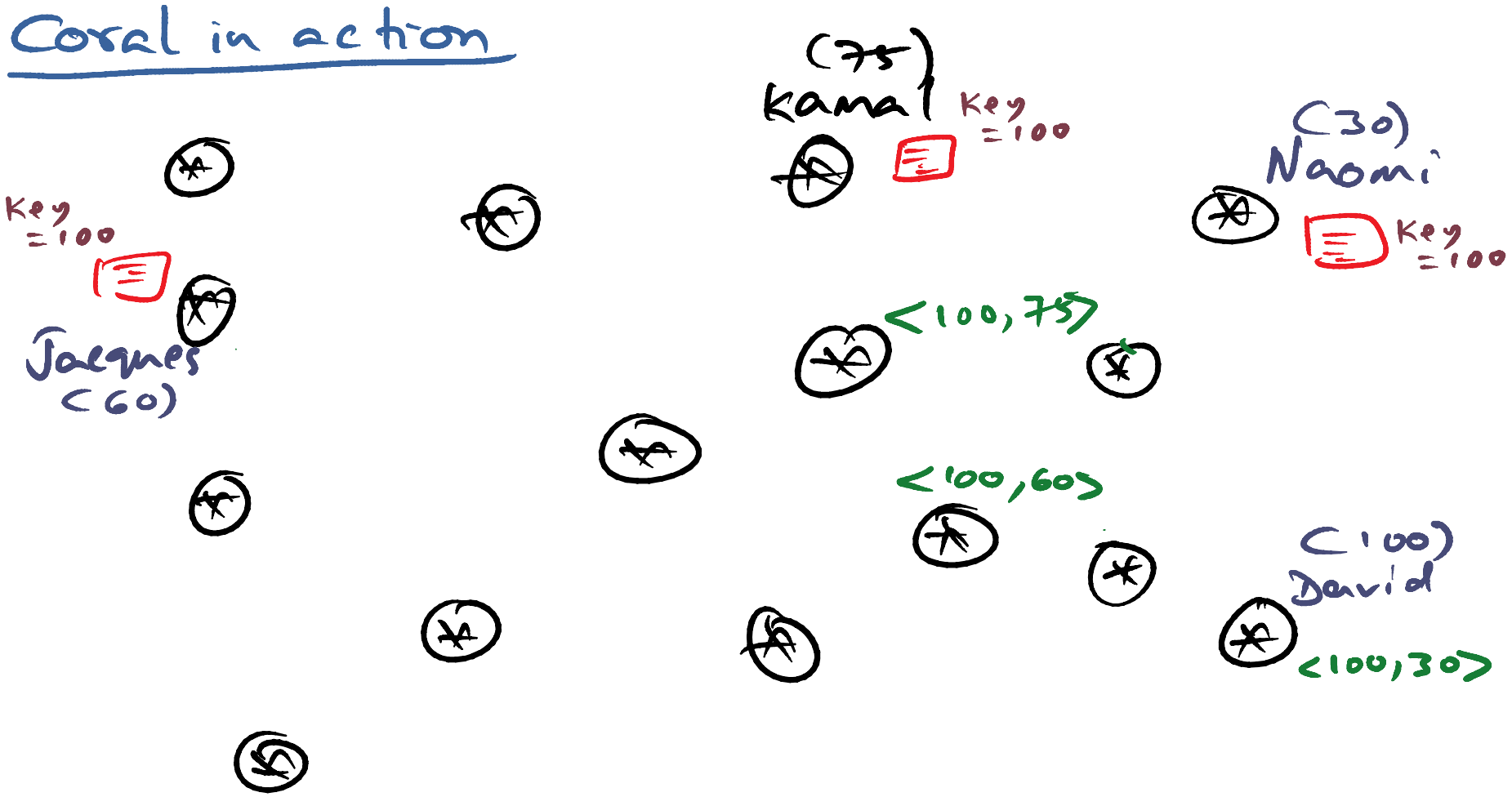

Coral in action

Origin server not stressed
mete server distributed

Key takeaways

- How to avoid overloading the meta-server and origin server
- Coral system democratize content generation, storage, and distribution
- Of course, commercial CDNs like Akamai do not operate this way. They are in it for the money!