

# CS 544, Cassandra

## Partitioning+Replication

### Token Map:

$\text{token}(n1) = \{-2, 4\}$        $\text{token}(n2) = \{-6, 0\}$        $\text{token}(n3) = \{-4, 2, 5\}$

**Problem 1:** how many *nodes* are there? How many *vnodes*?

3; 7

**Problem 2:** which node likely has greater resources (compute, memory, etc.)?

$n3$

**Problem 3:** one of the vnode positions of  $n2$  is drawn in the ring below. Draw the rest.



**Problem 4:** what ring positions are in the *wrapping range*? Draw the region above.

**Problem 5:** what node is responsible for each of the following tokens?

4:  $n1$  \_\_\_\_\_, 1:  $n3$  \_\_\_\_\_, 6:  $n2$  \_\_\_\_\_

**Problem 6:** a row's *primary key* is ("A", "B"). The primary key consists of one partition column followed by one cluster column. Which node owns this row? Assume  $\text{token}("A") = -3$ ,  $\text{token}("B") = -6$ , and  $\text{token}(("A", "B")) = 3$ .

$n1$

**Problem 7:** assume a new node  $n4$  joins the cluster with vnodes  $-3$  and  $-1$ . Which existing nodes will pass off some data to this new node?  $n1$   $n2$

**Ring (this is the same as the previous page, filled in for you):**

-8 | -7 | <sup>n2</sup>-6 | <sup>n3</sup>-5 | <sup>n1</sup>-4 | <sup>n2</sup>-3 | <sup>n3</sup>-2 | <sup>n1</sup>-1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7

**Problem 8:** assuming 2x replication, what are the positions of the vnodes responsible for a row with token -1?

n2, n3

**Problem 9:** assuming 3x replication, what are the positions of the vnodes responsible for a row with token 1?

n3, n1, n2

**Problem 10:** assume R=2, W=2, and RF=3. Assume the token of a row being written is -3. To which nodes will the coordinator attempt to write the data?

n1, n2, n3

**Problem 11:** assume R=2, W=2, and RF=3. Assume the token of a row being written is -3. The timeline is as follows:

1. n1 is down
2. the row is written
3. n1 recovers, but n3 crashes
4. the row is read

Which nodes perform reads? n1, n2 --> conflict resolution

Which nodes perform writes? n2, n3

Is the data that was written read back? Yes

**Problem 12:** W=3 and RF=4. What should R be to make sure readers see successful writes?

$R > 1 / R \geq 2$