

# Replication and Consistency



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@paulofallon

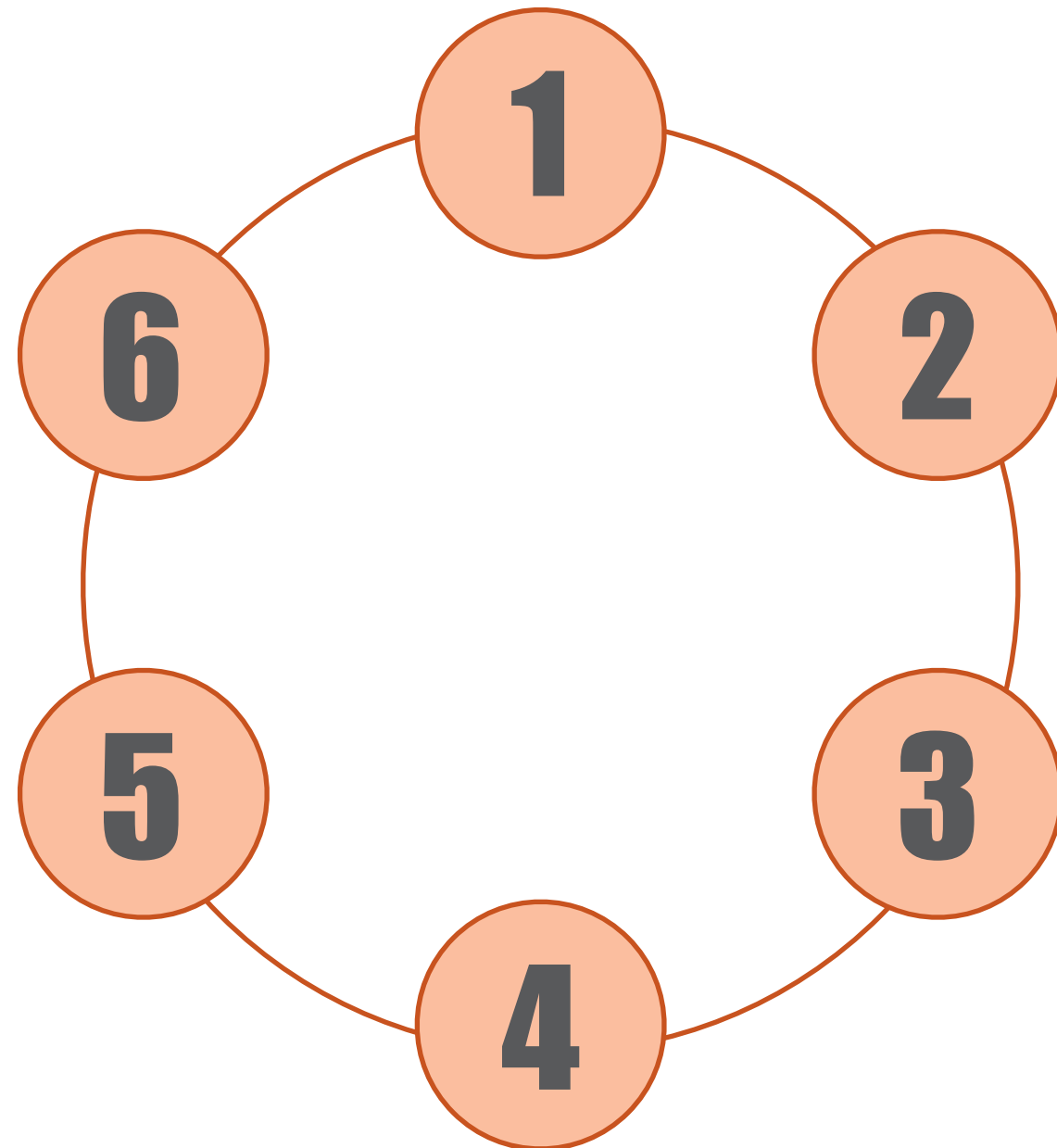
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# Replication and Consistency

Replication  
Strategies

Tunable  
Consistency

# Replication

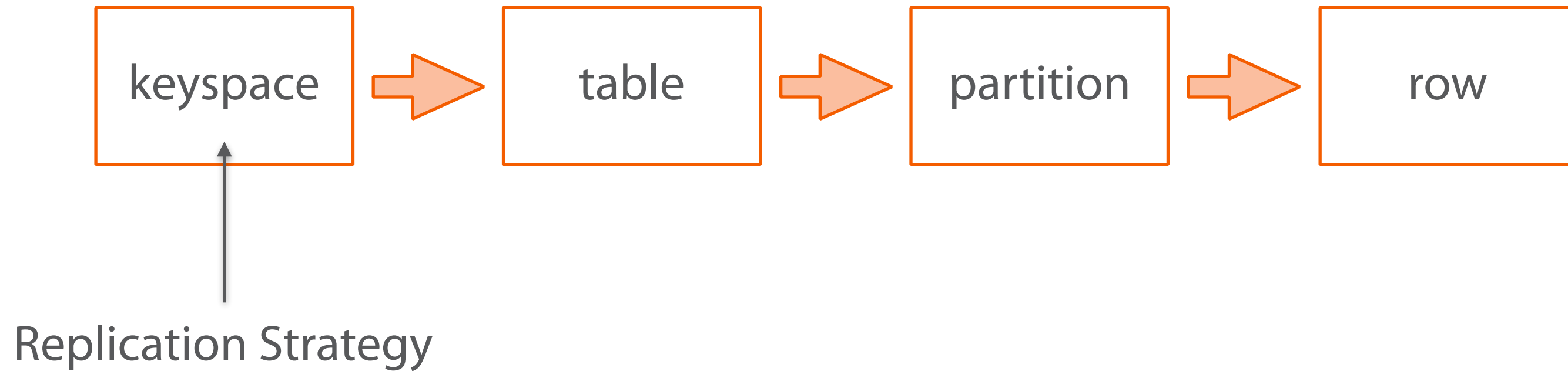


A 4x6 grid of numbers, each in a rounded square cell with an orange border. The numbers are arranged as follows:

1	2	3	5	4	6
5	2	4	6	3	<u>1</u>
4	6	1	2	3	5
3	5	2	4	6	1

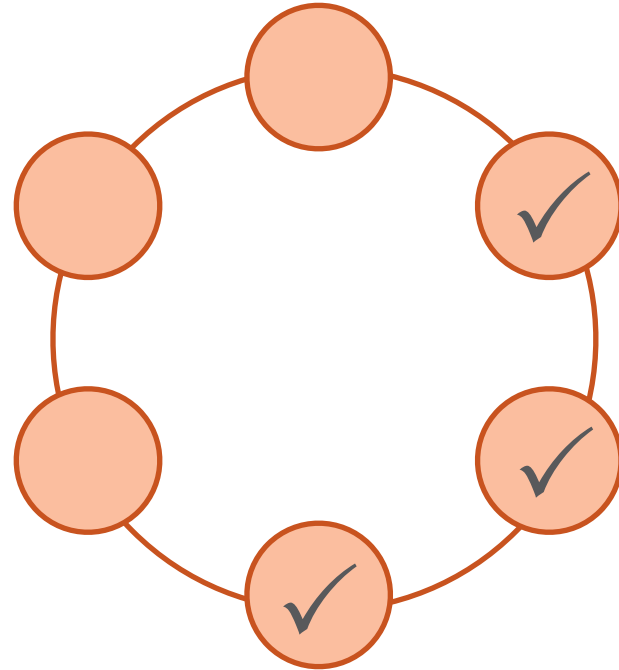
A curved orange arrow points from the right side of the grid towards the cell containing the underlined number 1 in the second row, sixth column.

# Cassandra Terminology



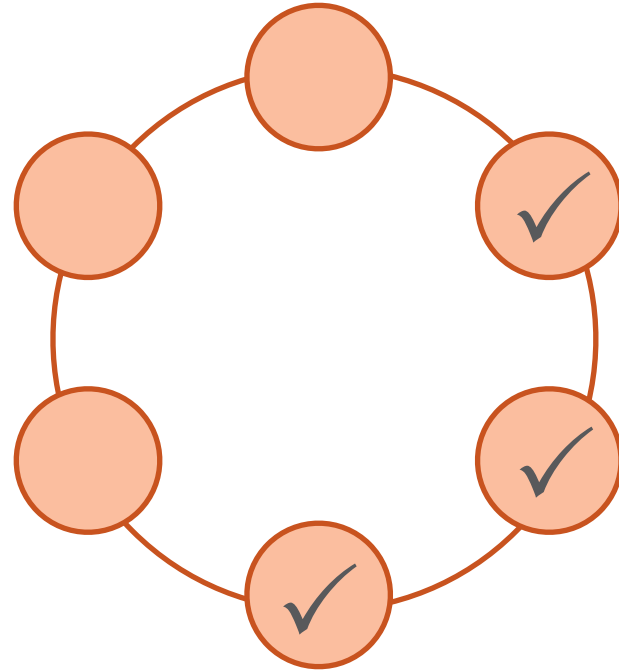
# SimpleStrategy

```
create keyspace pluralsight with replication =  
  {'class': 'SimpleStrategy', 'replication_factor': 3};
```



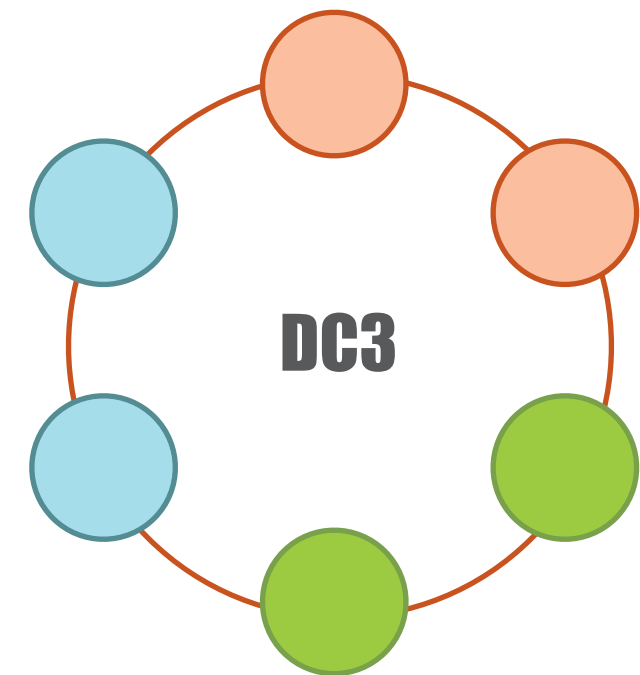
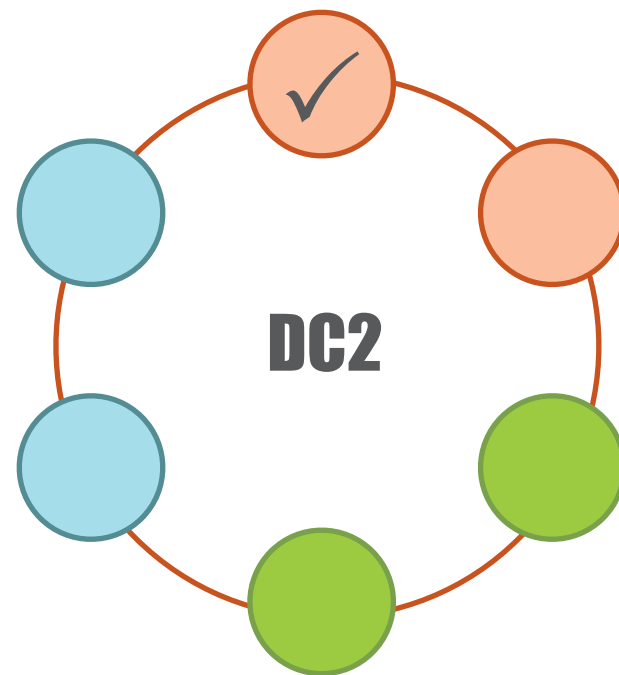
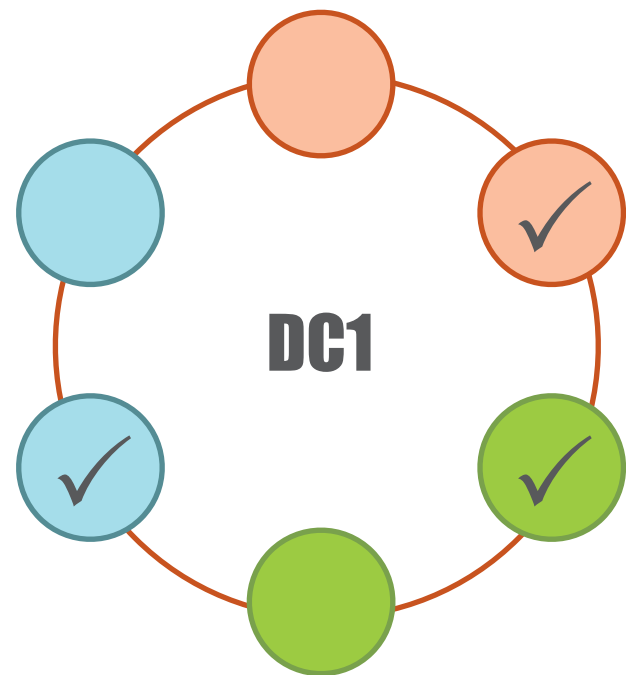
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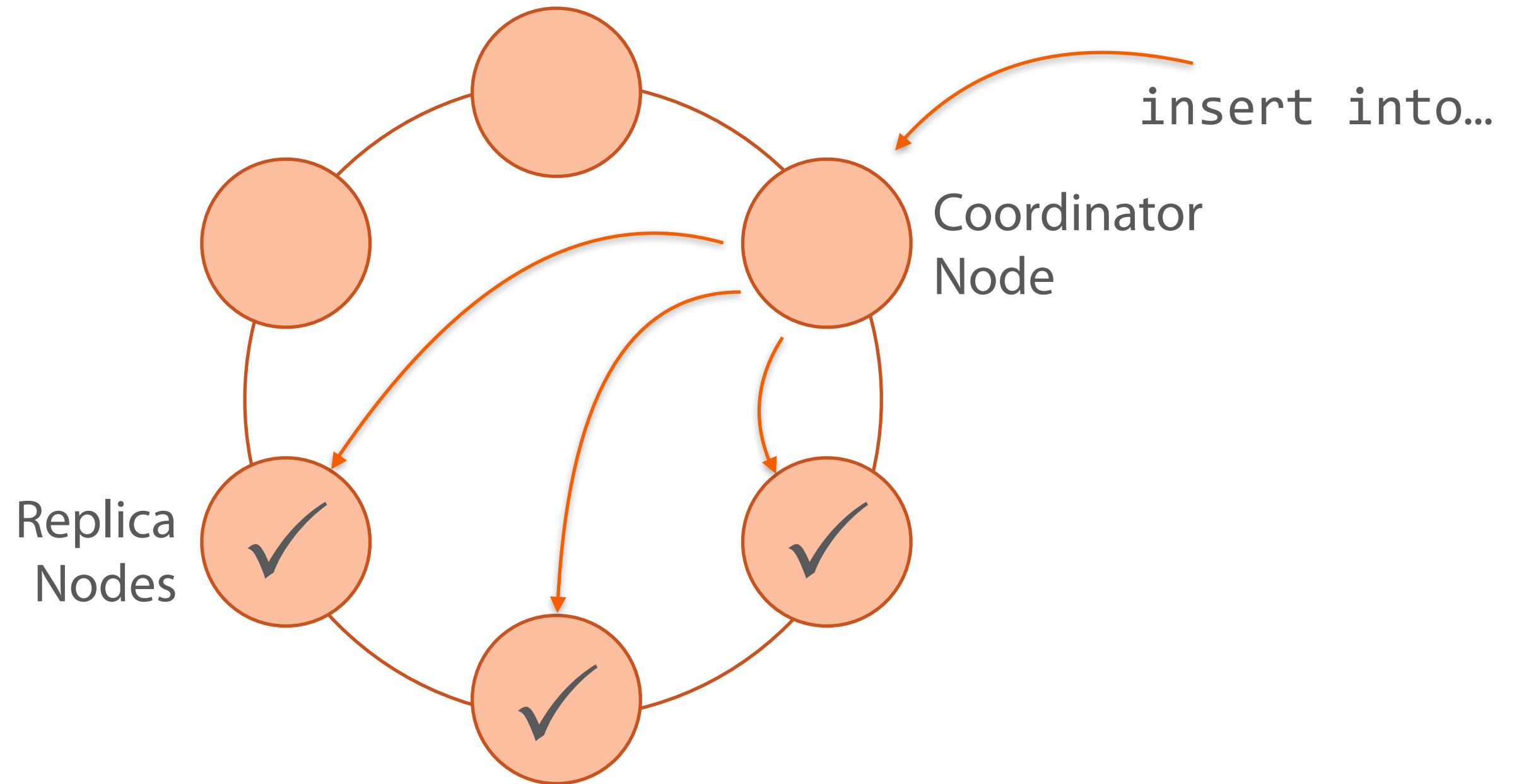


# NetworkTopologyStrategy

```
create keyspace pluralsight with replication =  
  {'class': 'NetworkTopologyStrategy', 'DC1': 3, 'DC2': 1};
```

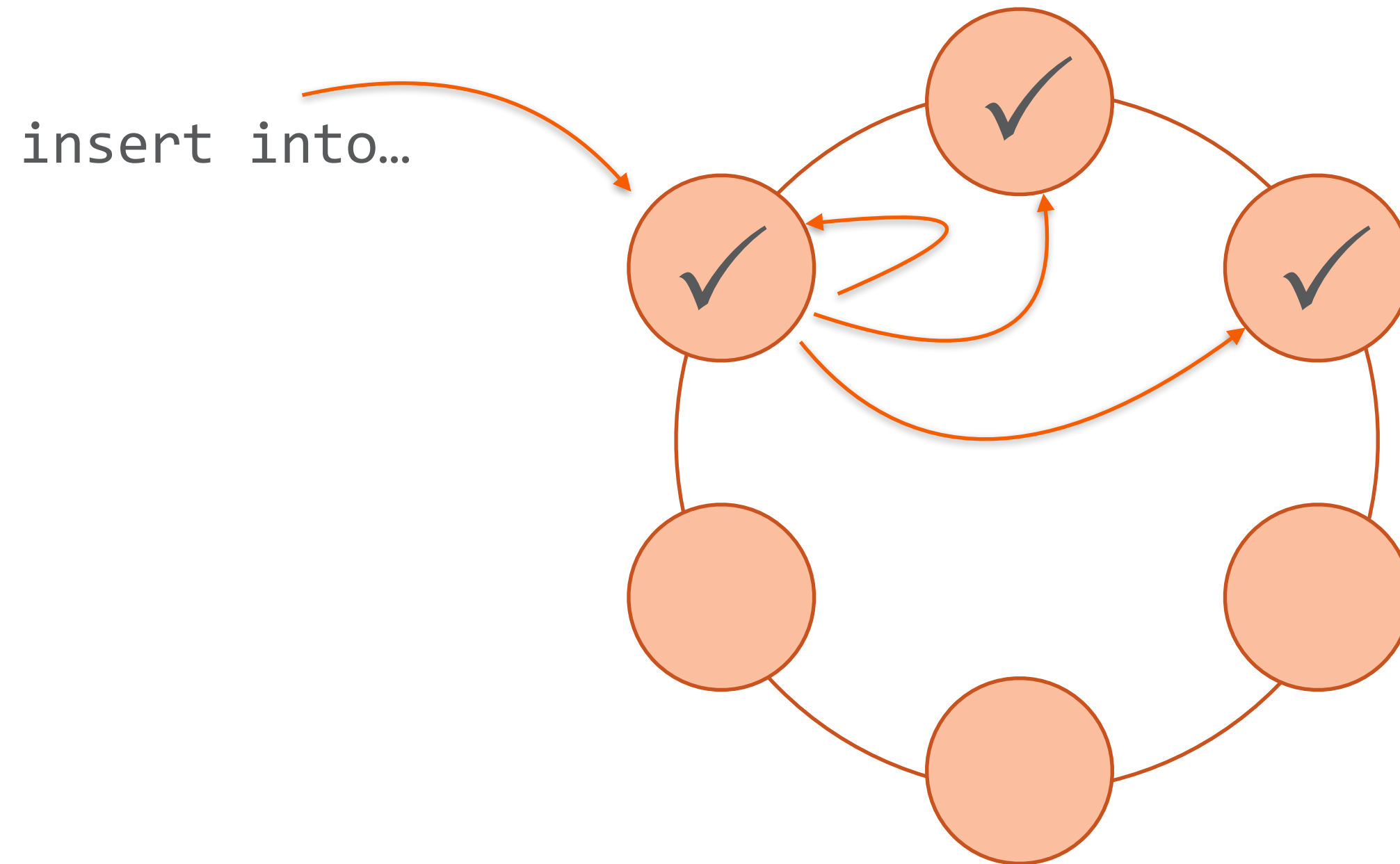


# Reads and Writes in Cassandra

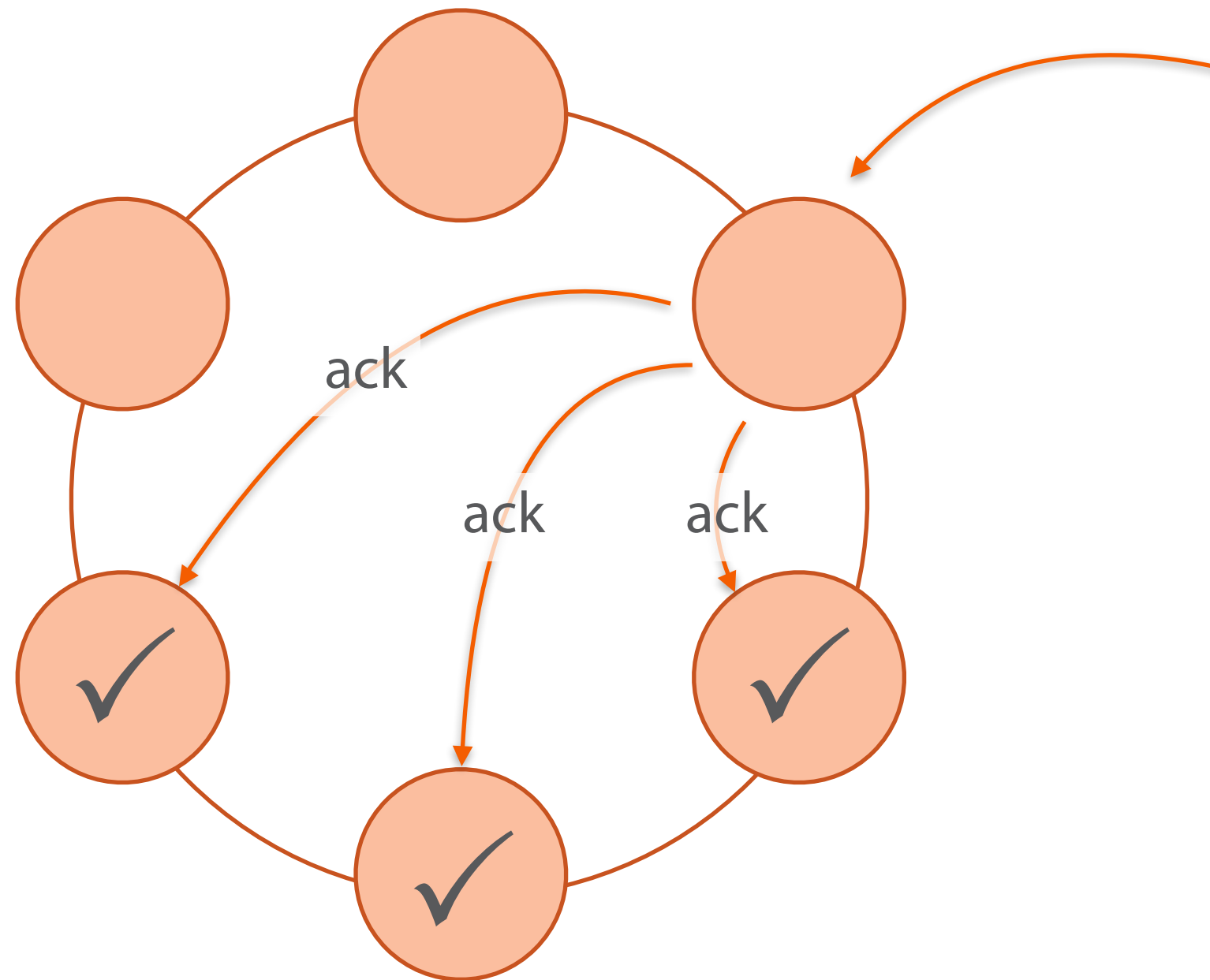




# Reads and Writes in Cassandra

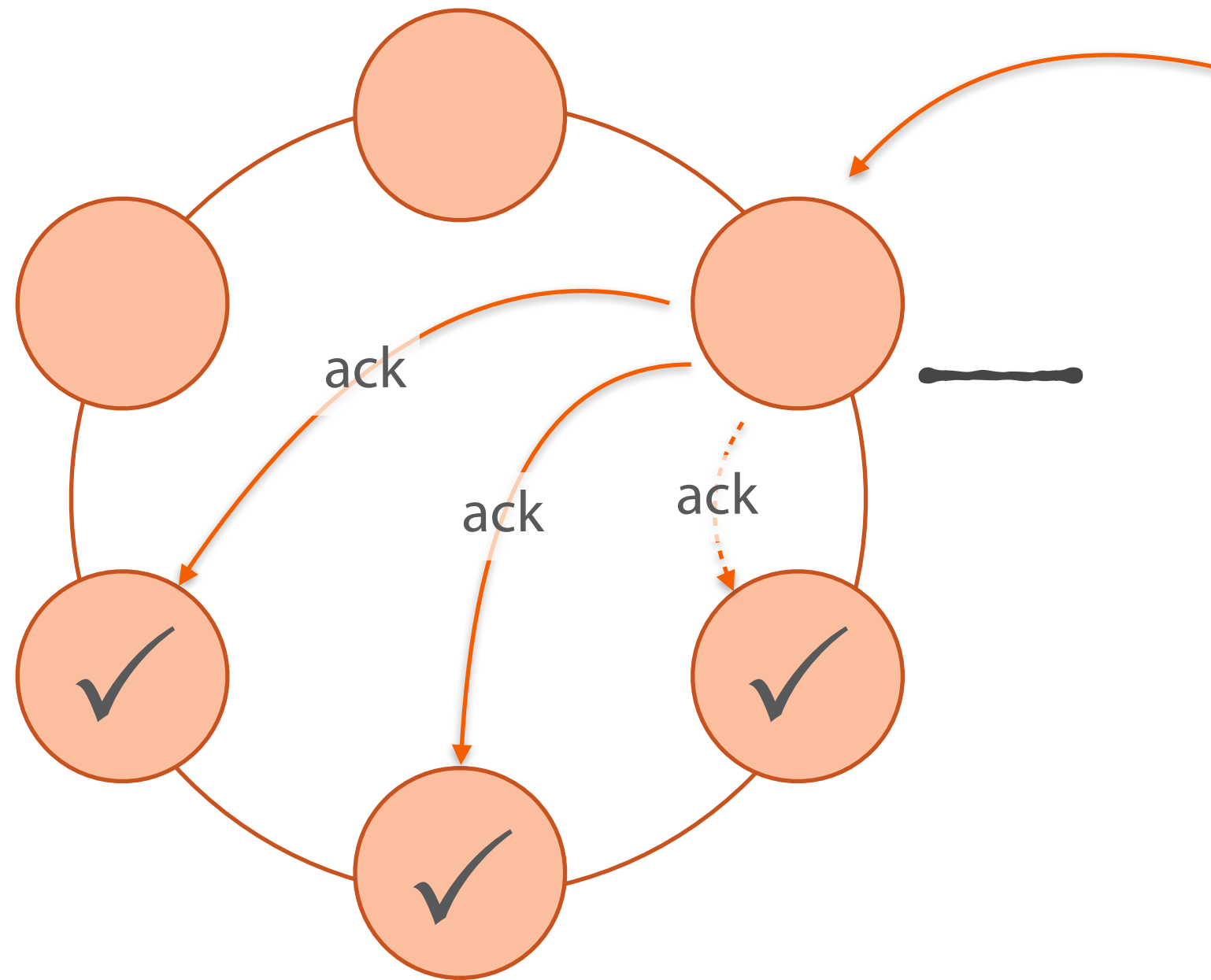


# Tunable Consistency - Writes

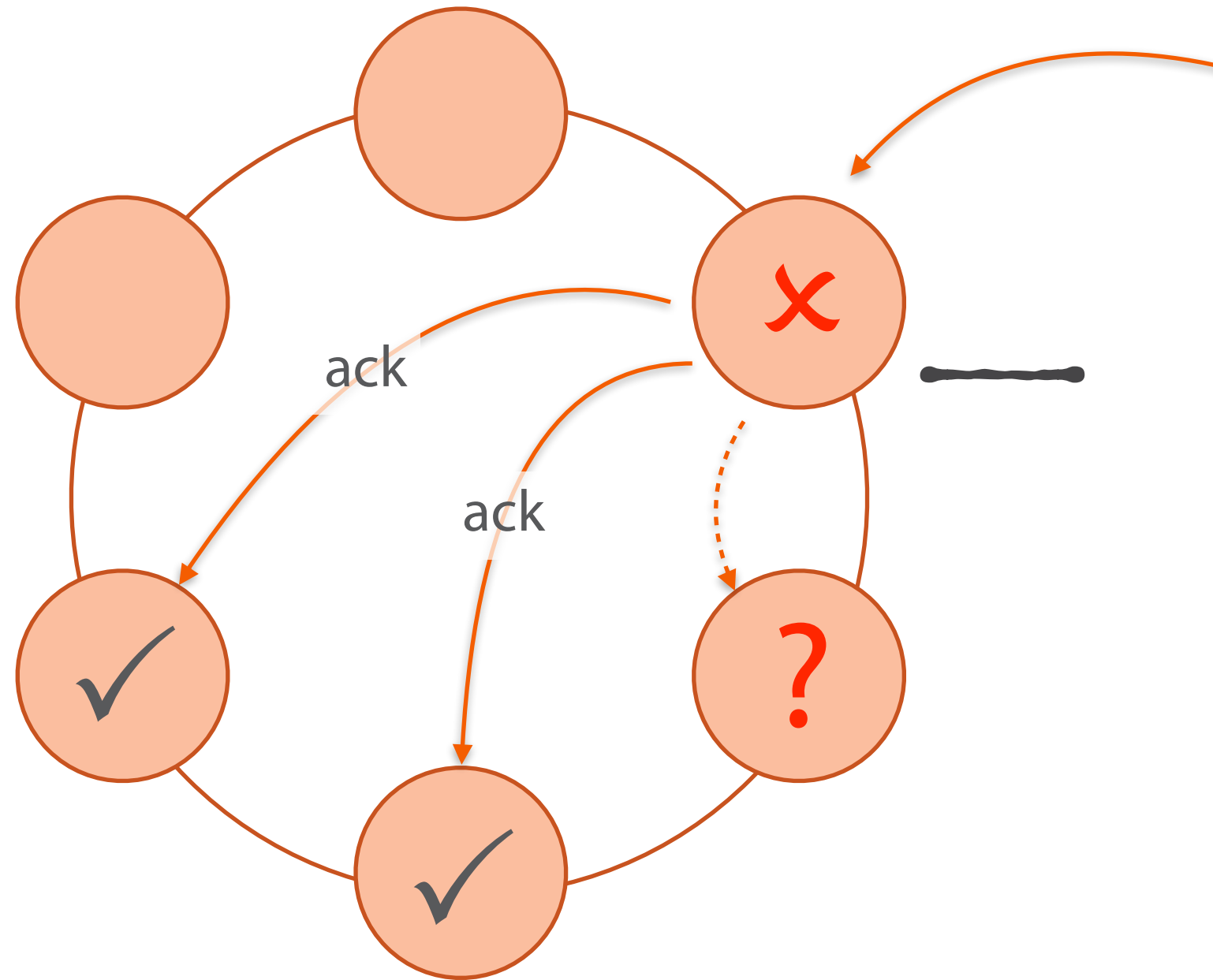


ONE  
TWO  
THREE  
QUORUM  
ALL  
ANY

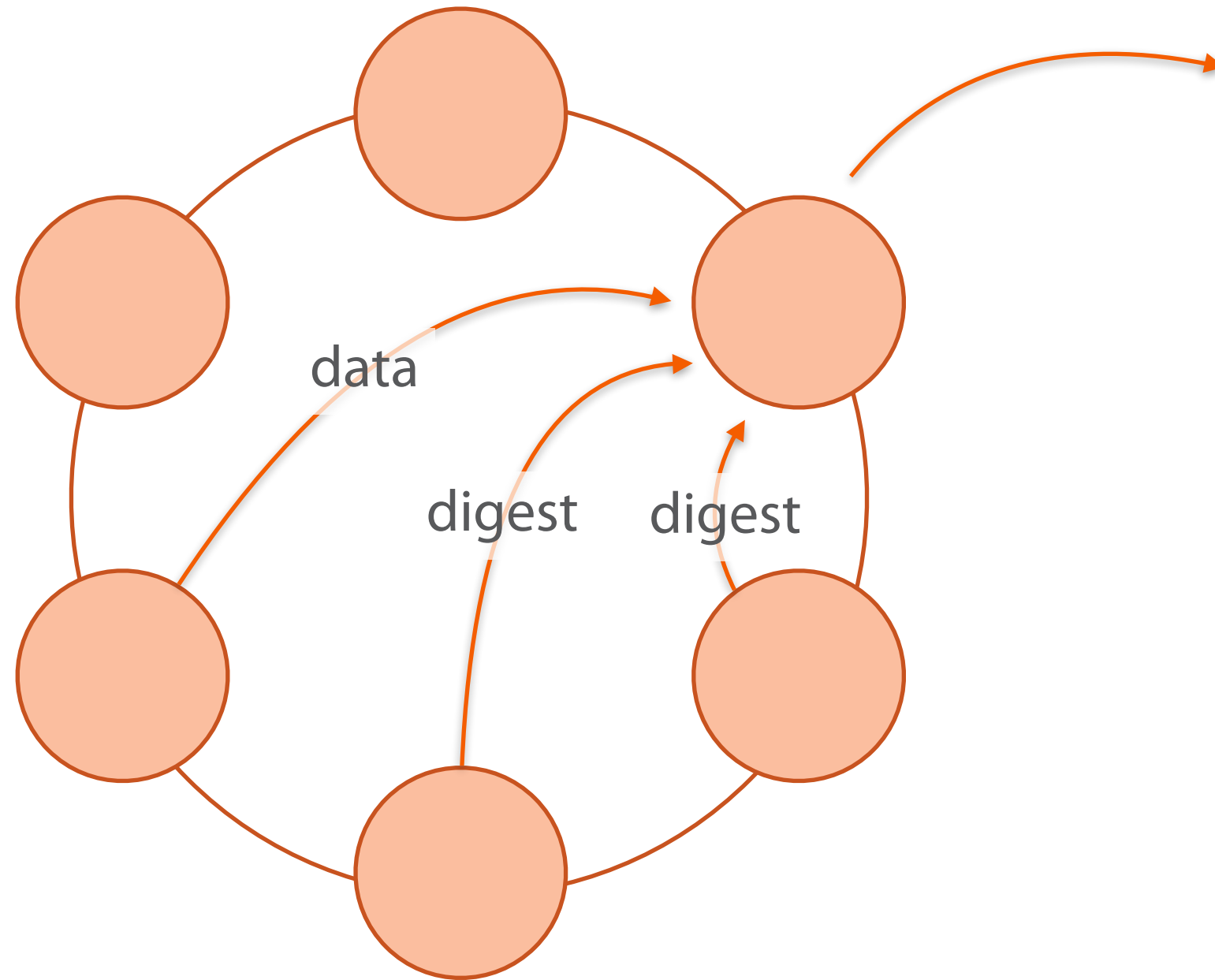
# Hinted Handoff



# Hinted Handoff

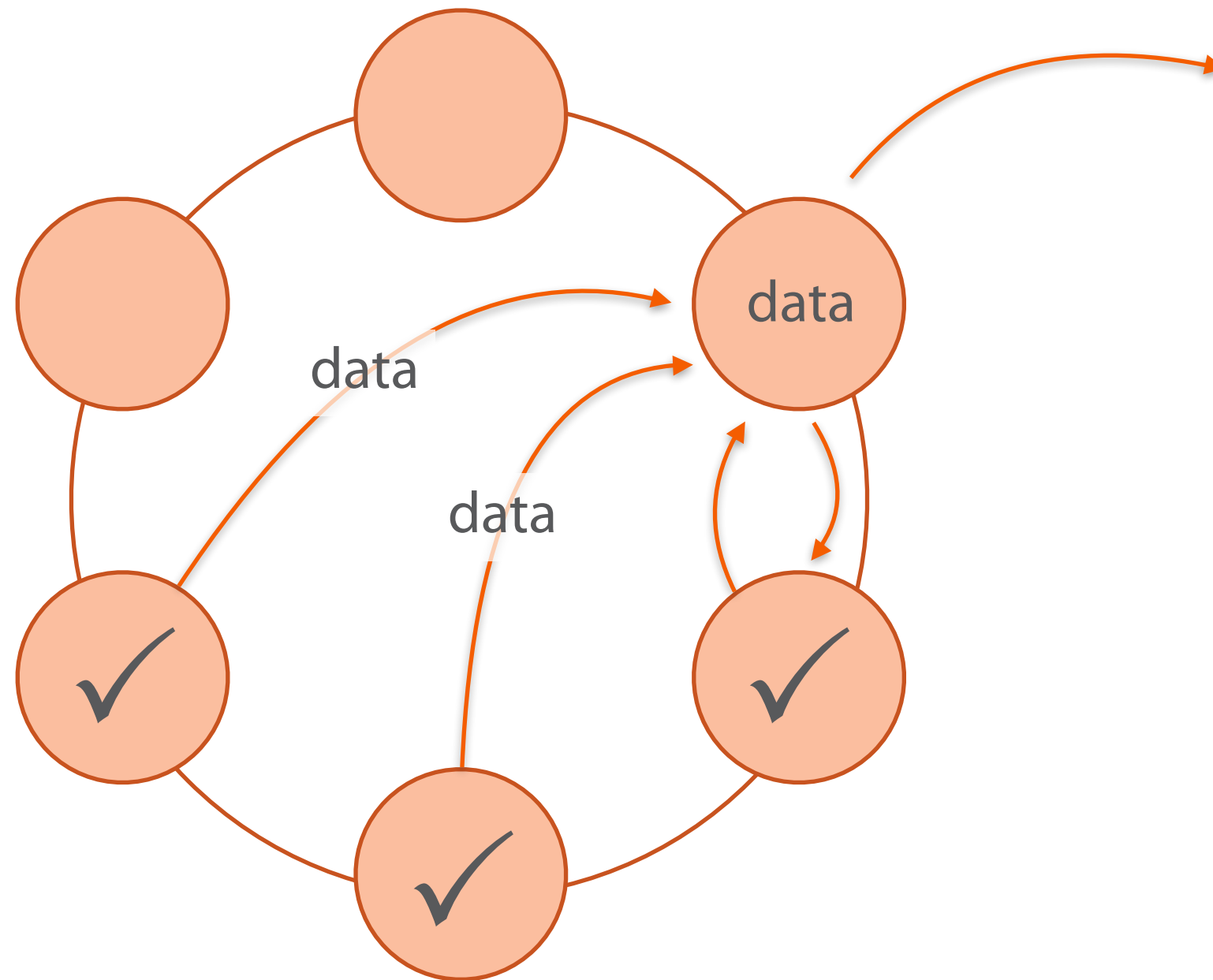


# Tunable Consistency - Reads

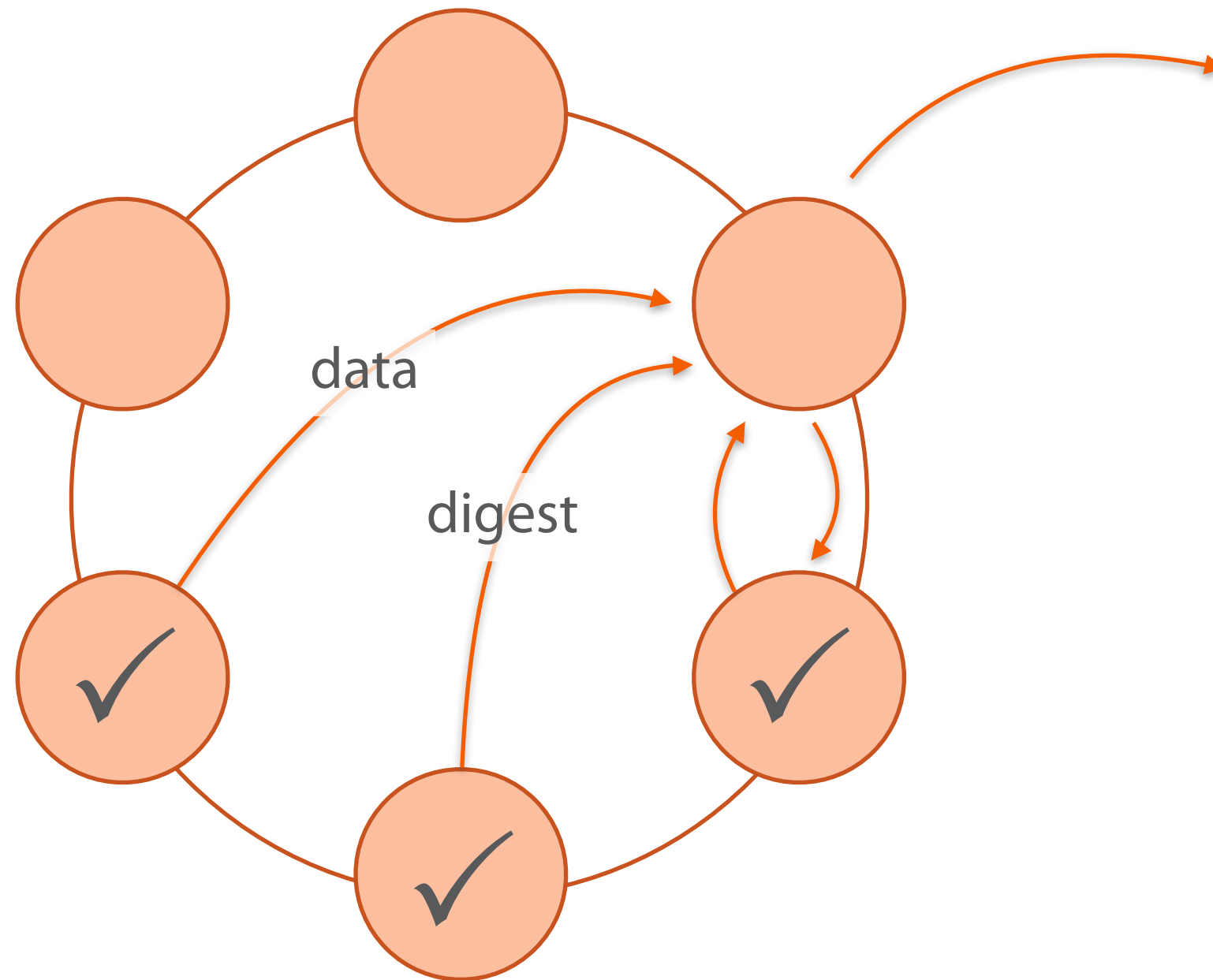


ONE  
TWO  
THREE  
QUORUM  
ALL

# Read Repair



# Read Repair



**nodetool repair**

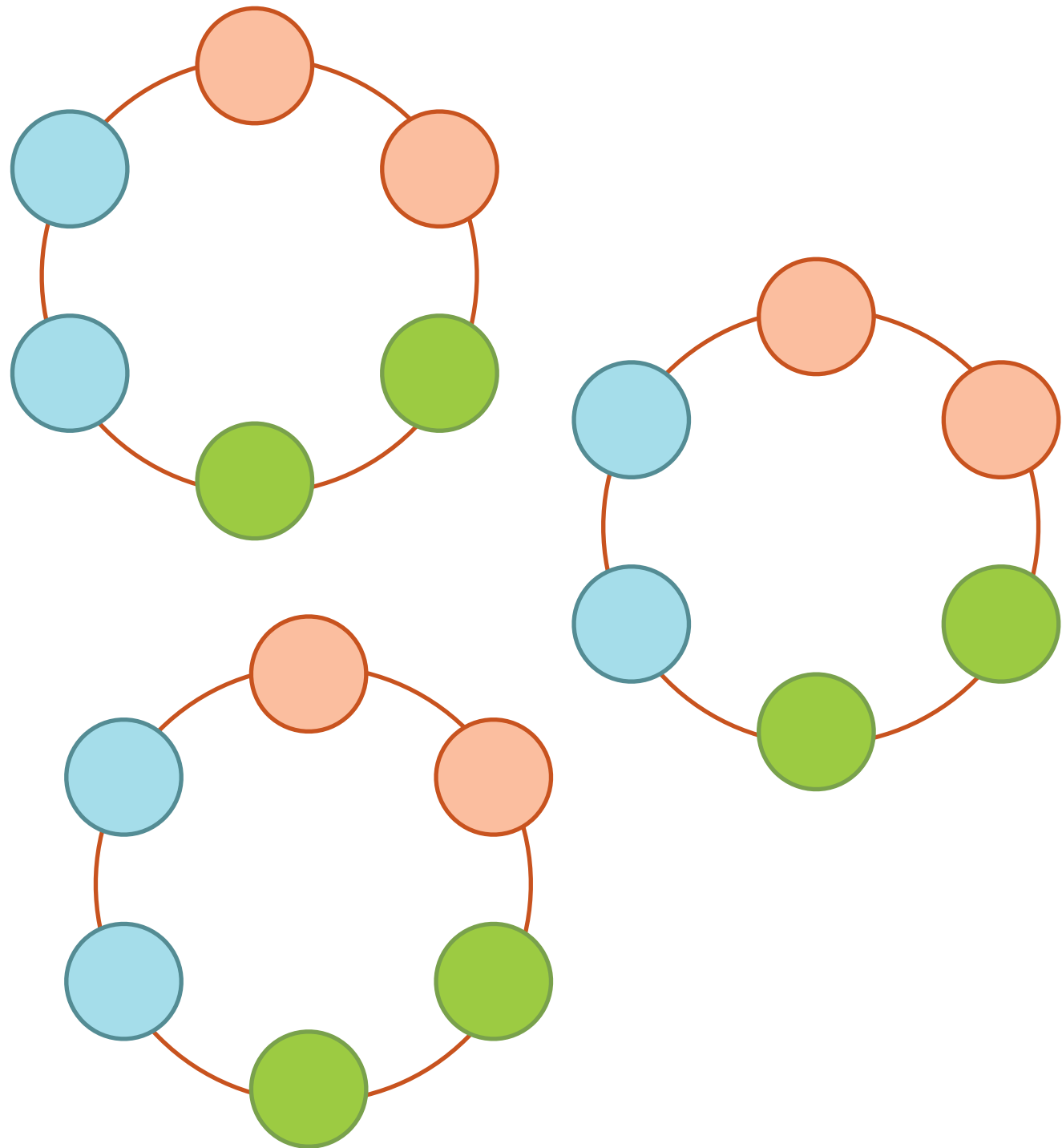
# Achieving Strong Consistency

$(\text{Write Consistency} + \text{Read Consistency}) > \text{Replication Factor}$

ONE	QUORUM	3	✗
ONE	ALL	3	✓
ONE	ONE	3	✗
QUORUM	QUORUM	3	✓



# Consistency With Multiple Data Centers



EACH\_QUORUM

LOCAL\_QUORUM

LOCAL\_ONE

# Extra Credit: Tracing a Read Repair

- Launch a simple three node cluster
- Create “pluralsight” keyspace with SimpleStrategy and replication factor of 3
- Create “courses” table in the “pluralsight” keyspace
- Run the “nodetool pausehandoff” command
- Shutdown one of the nodes with “docker stop”
- Run cqlsh and insert one row into the courses table
- Bring up the node with “docker start” that you just shutdown
- Run cqlsh and set the consistency to “all”
- Set tracing to “on”
- Run a select statement to retrieve the row you inserted above
- Look for “Digest mismatch” in the tracing output

# Conclusion

- Cassandra Terminology
- Replication Strategies
- Read & Write Consistency
- Achieving Strong Consistency
- Hinted Handoff and Read Repair