Implementation of Custom Routing Algorithm in Cloud

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Basic Idea

- Algorithm for distributing data to all nodes in a network based on the concept of percolation centrality (PC) or betweenness centrality (BC)

- Enhancement of the controlled flooding algorithm
  - Adding concept of percolation centrality

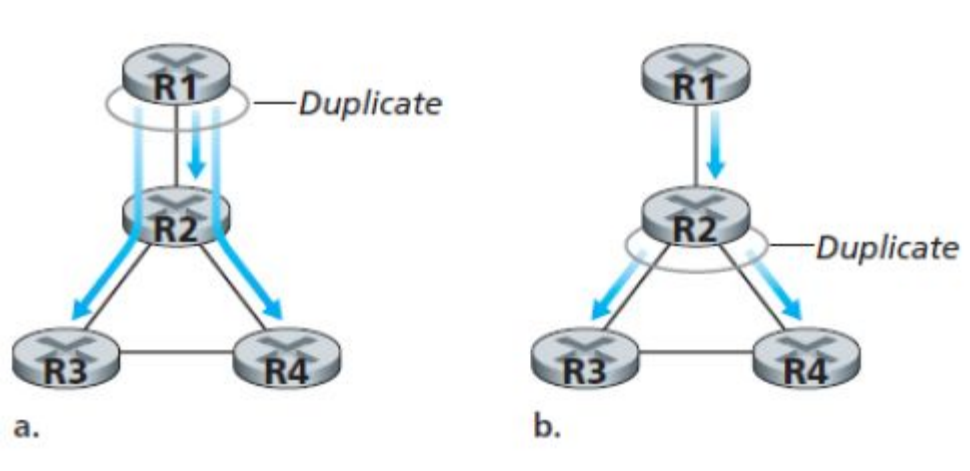
Purpose

- The purpose of the routing algorithm is to make decisions for the router concerning the optimal paths for data distribution
- The router uses the routing algorithm to get the path that would best serve to transport the data throughout the network
- The routing algorithm that our protocol uses is a major factor in the performance of our routing environment

Broadcasting

- Message is destined to all network devices
- Most straightforward way: N-way-unicast
- Broadcast Algorithms:
  - 1. Uncontrolled Flooding
  - 2. Controlled Flooding
  - 3. Spanning Tree Broadcast

Broadcasting



Source duplication vs in-network duplication

Brief Description

- Similar to the controlled flooding algorithm
- Enhance the flooding algorithm using the concept of percolation centrality
- Send a message that percolates via the nodes of the network
- Time taken will be the least by using the concept of percolation centrality

Implementation

Tech Stack:

Algorithm Implementation

Algorithm 1

To start routing from node with highest Betweenness Centrality

1. procedure
2. graphPC = descending_PercCentrality(G)
3. for i <- 0, n-1 do
4. graphPC[i].MARK = False
5. for i <- 0, n-1 do
6. Call enhanced_flooding(graphPC[i])

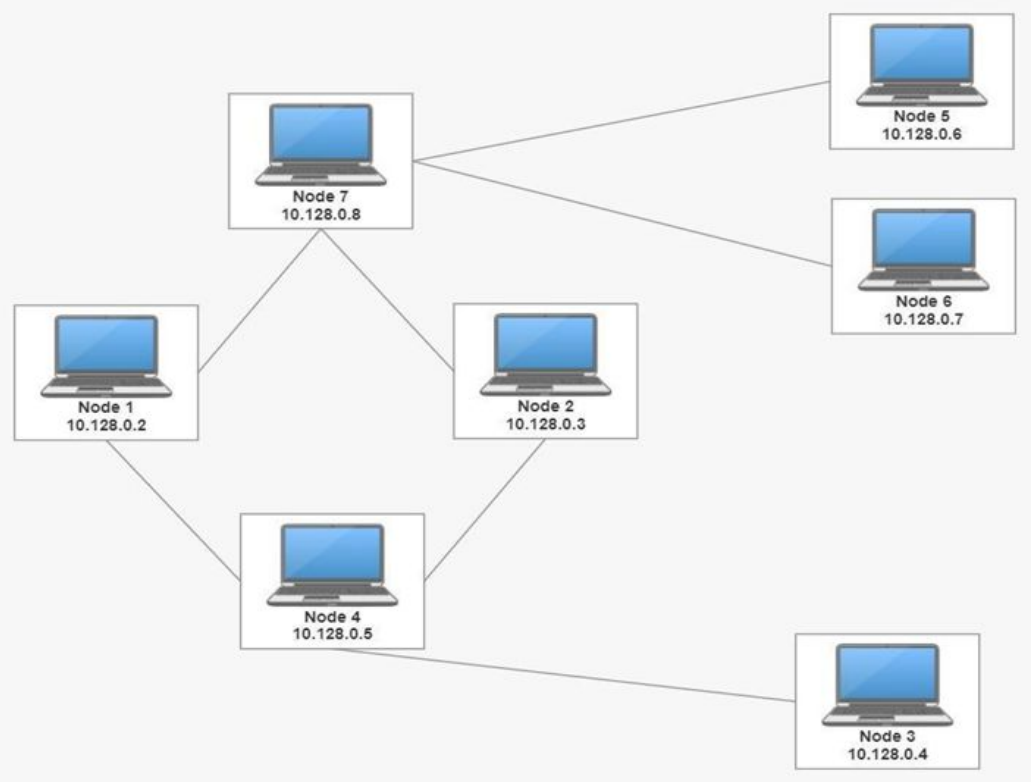
Algorithm Implementation

Algorithm 2

Algorithm for controlled flooding mechanism

```
1.  procedure enhanced_flooding(v)
2.  if v.MARK = False then
3.          v.MARK = True
4.          Accept message in v
5.          parfor each node k E v.adjacent() do
6.                  Call enhanced_flooding(k)
7.          end parfor
```

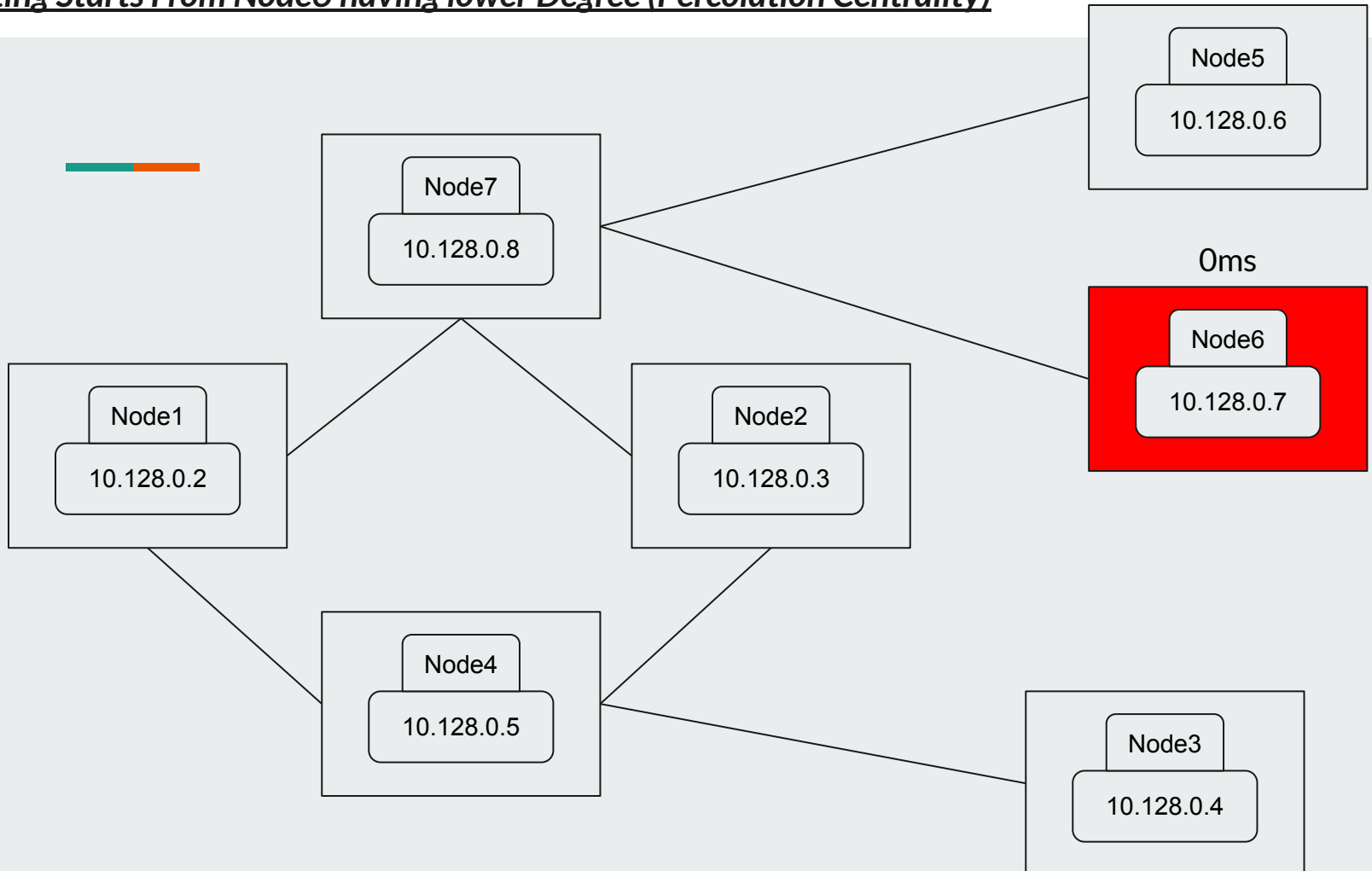
Network Formation



Betweenness Centrality of Nodes

Node ID	Betweenness Centrality
1	0.2
2	0.2
3	0
4	0.366667
5	0
6	0
7	0.633333

Routing Starts From Node6 having lower Degree (Percolation Centrality)



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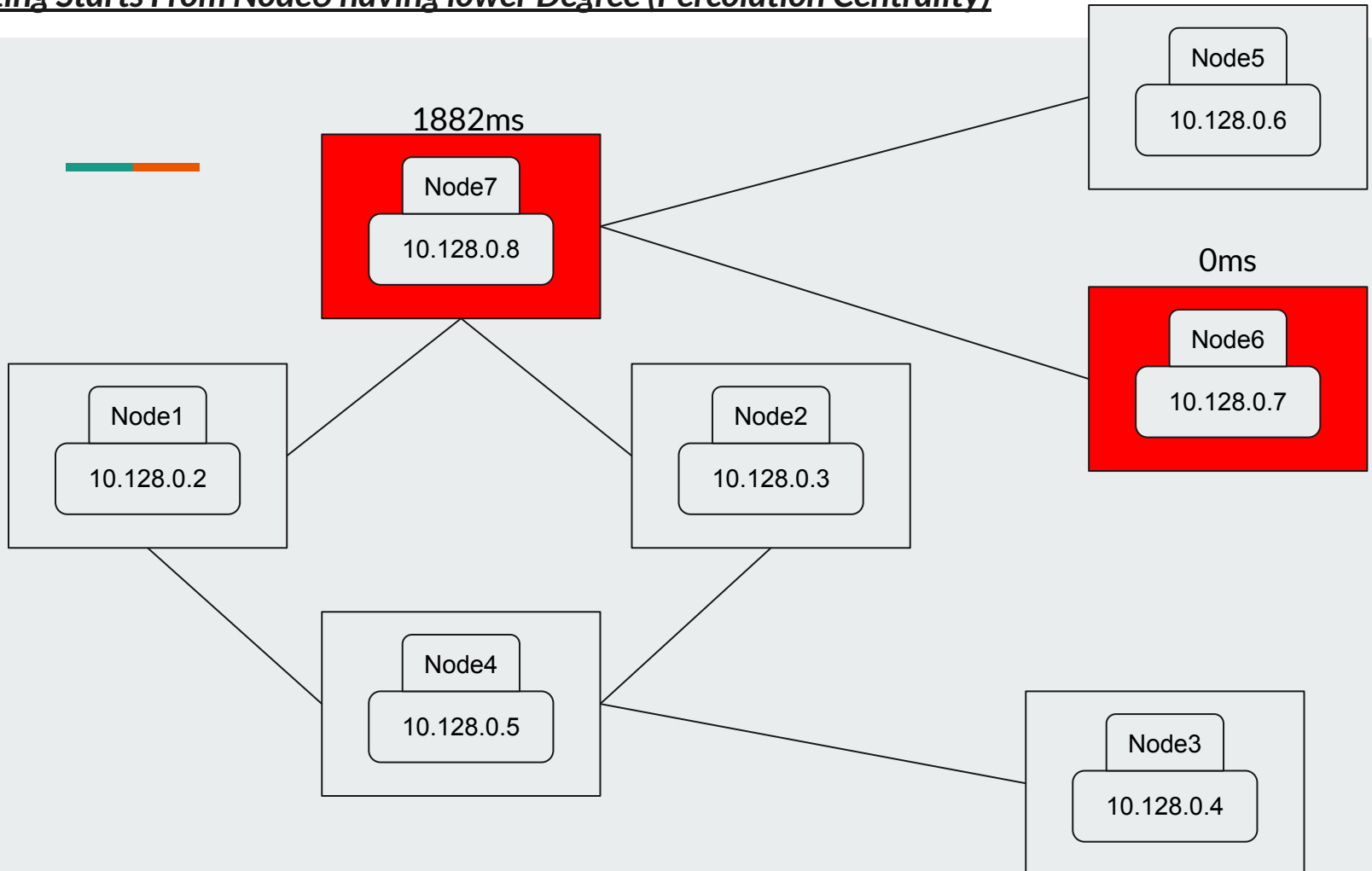

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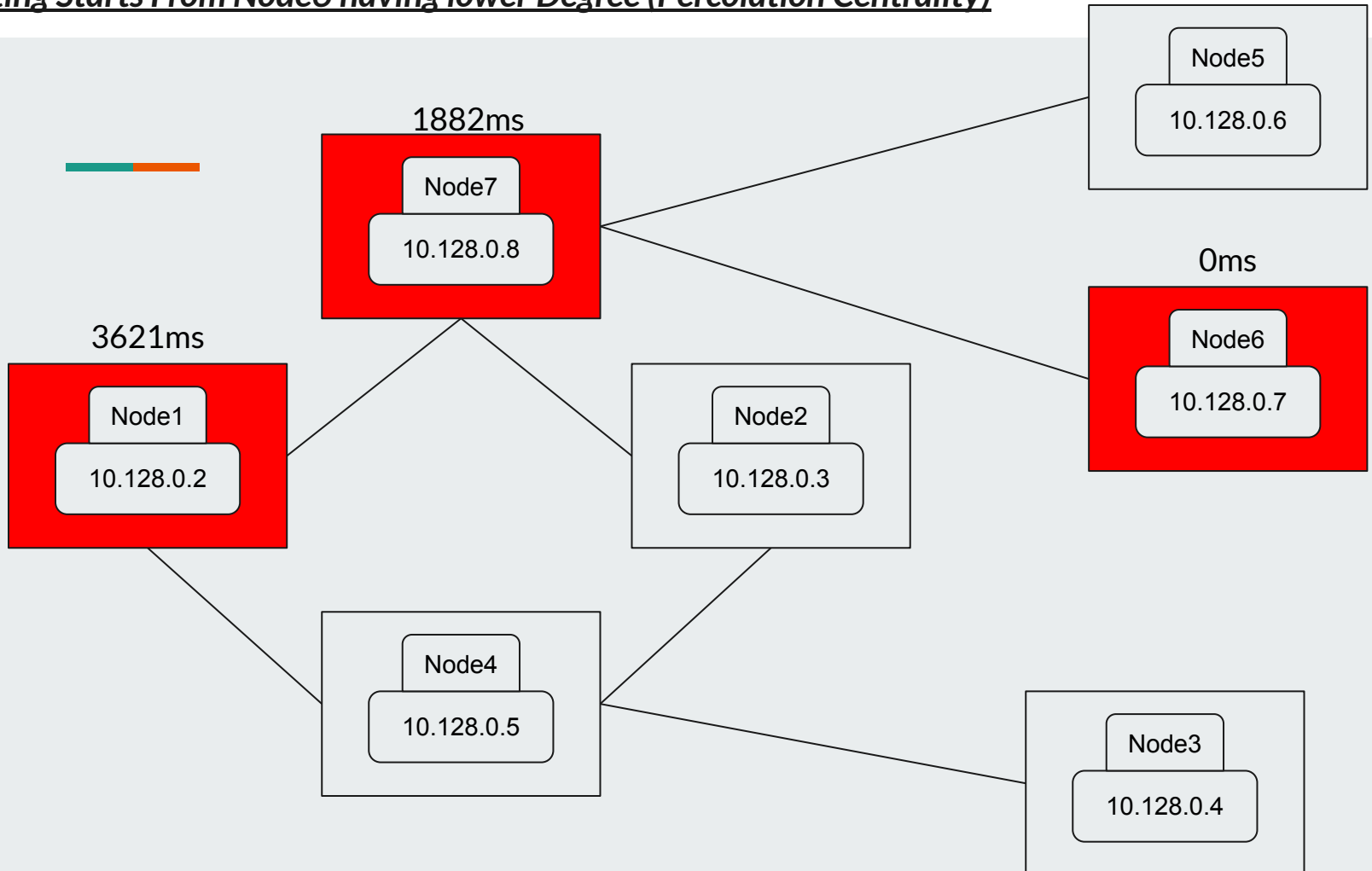

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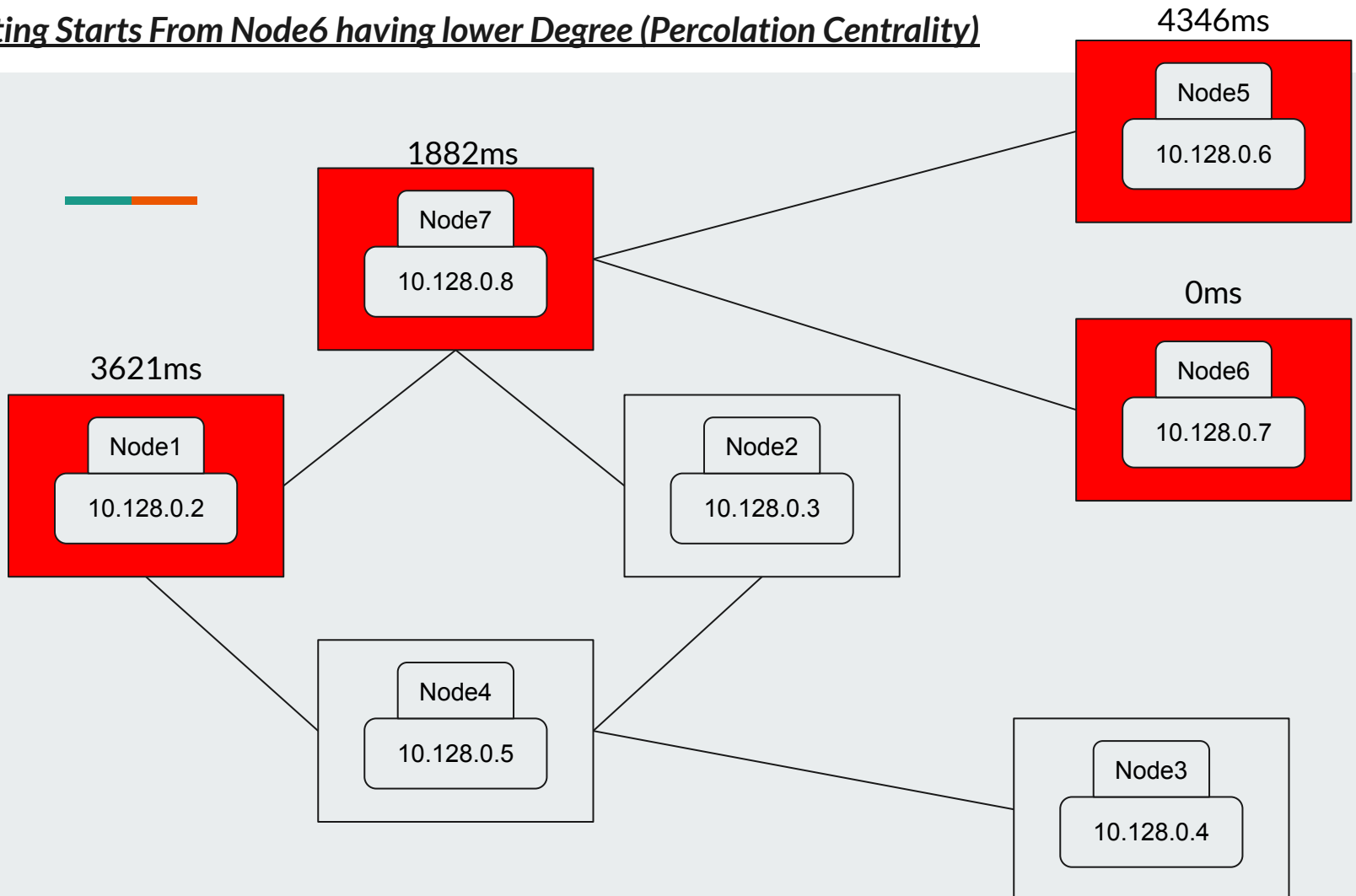

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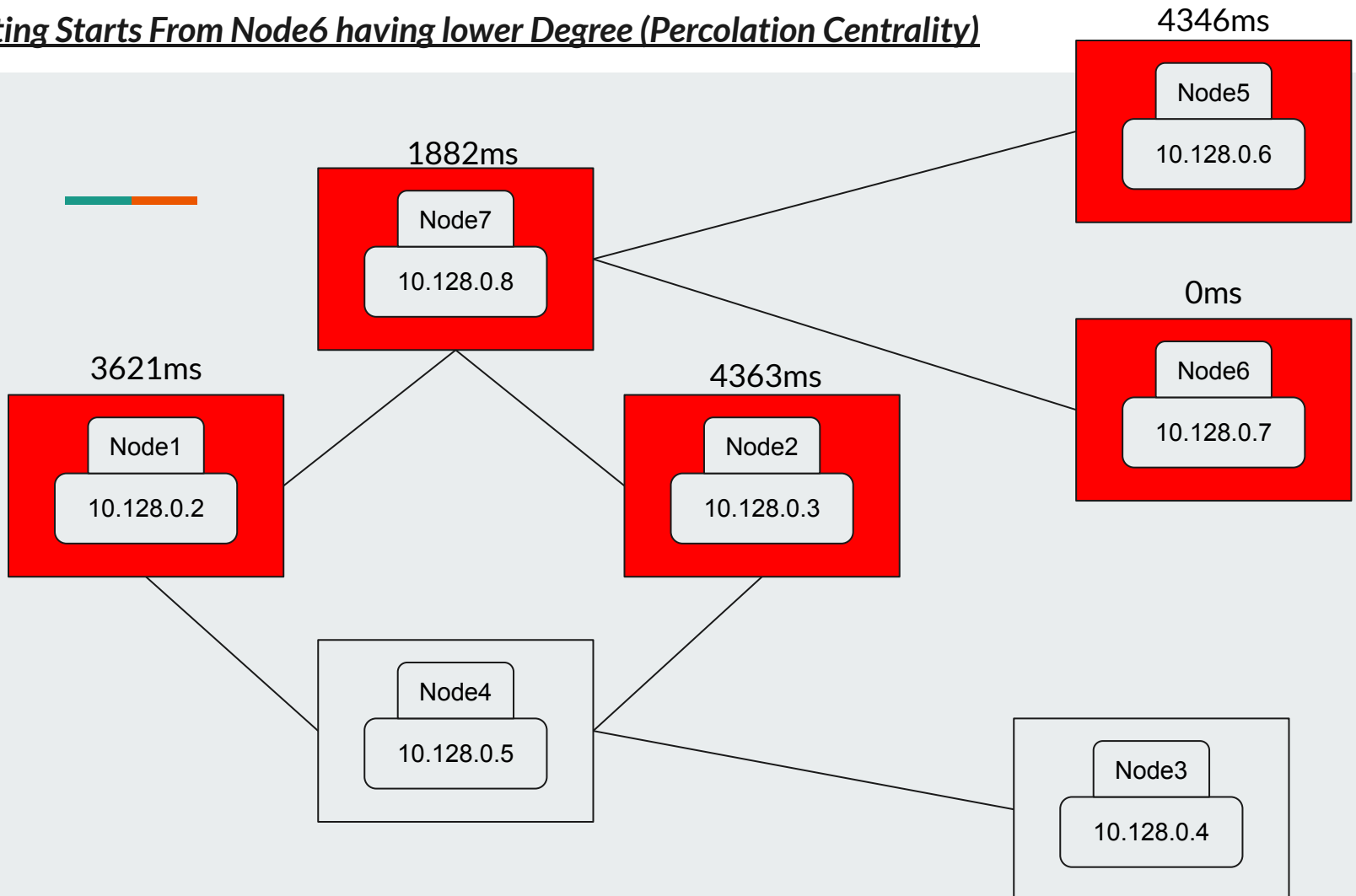

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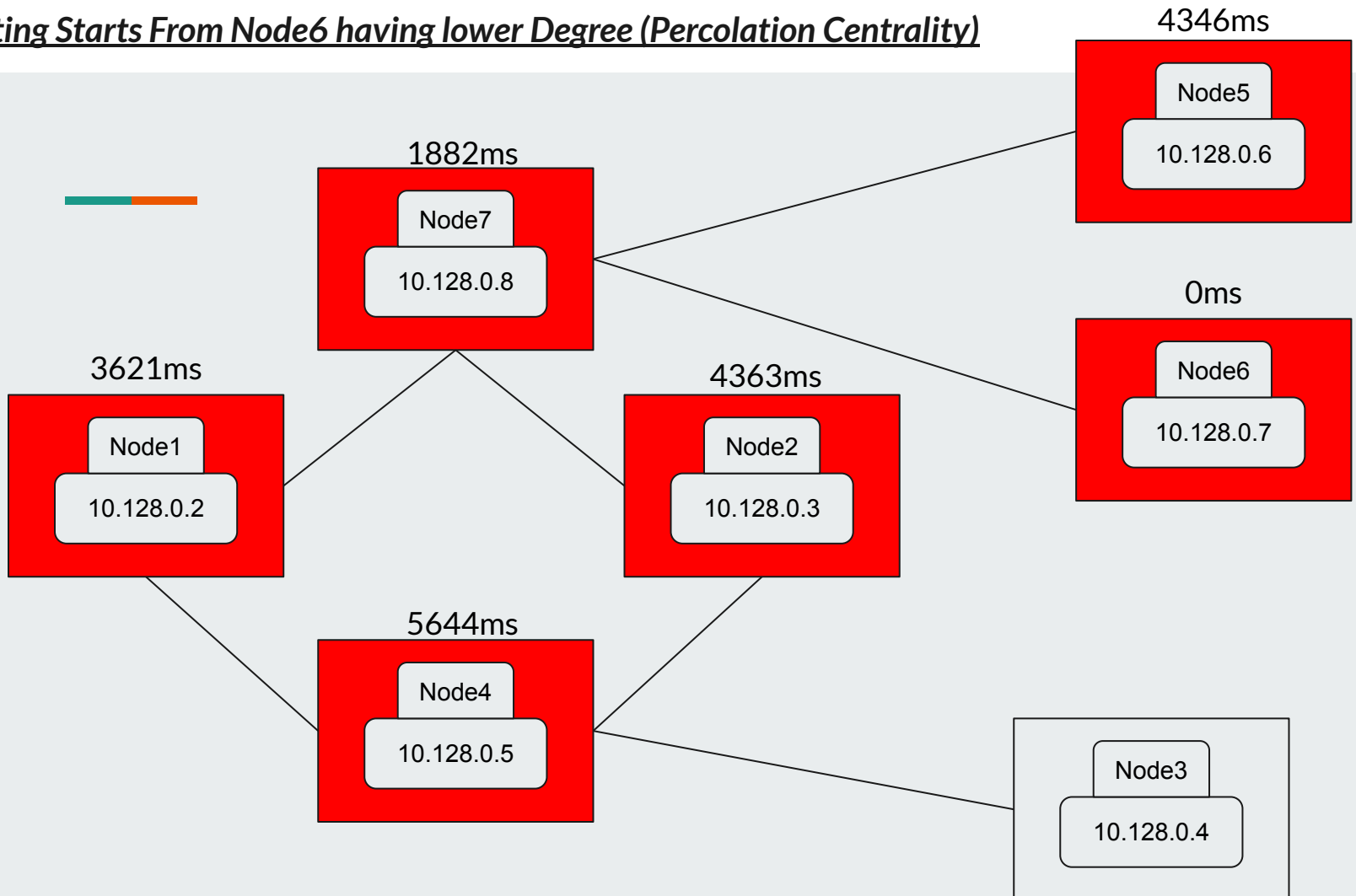

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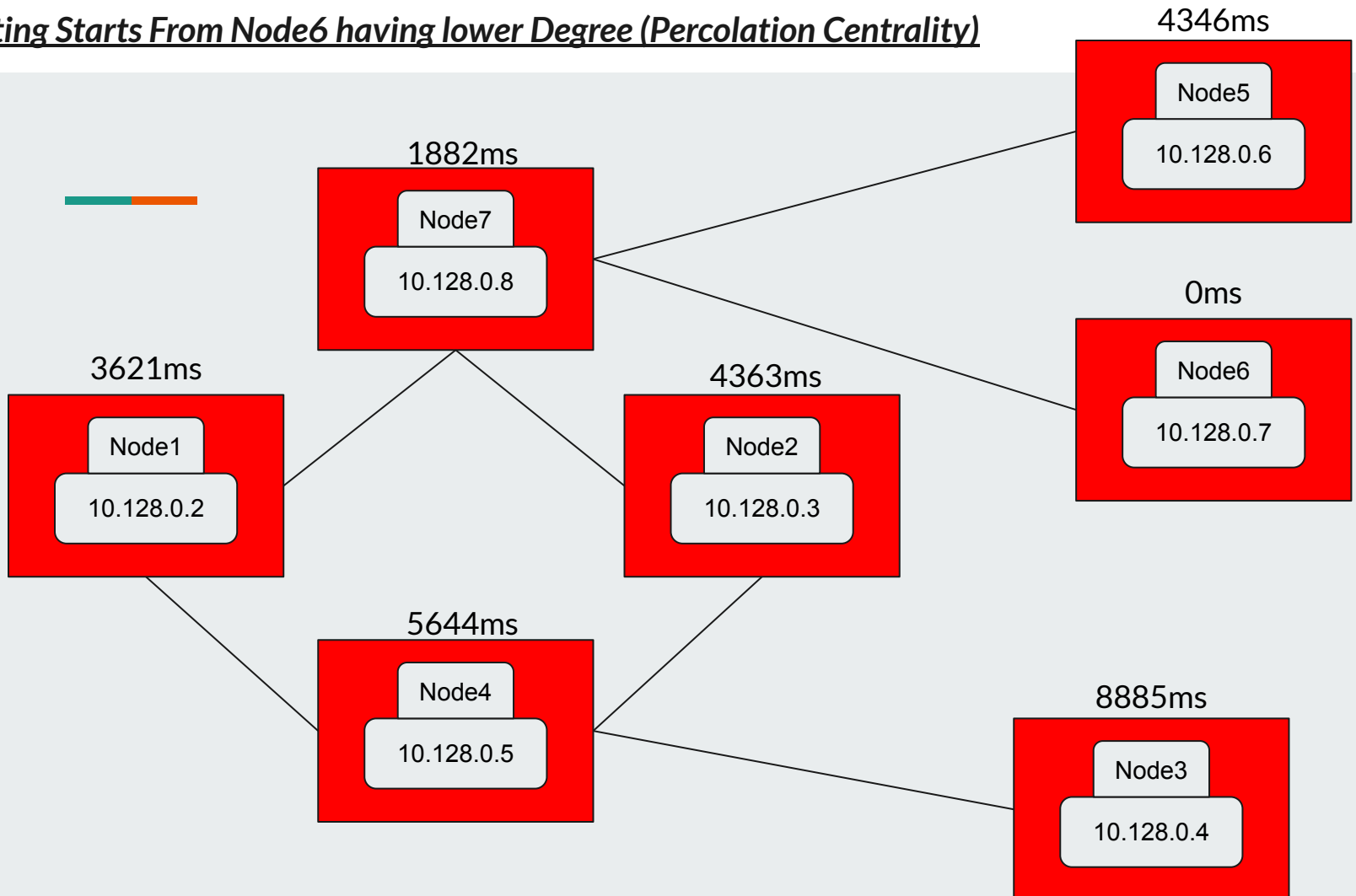
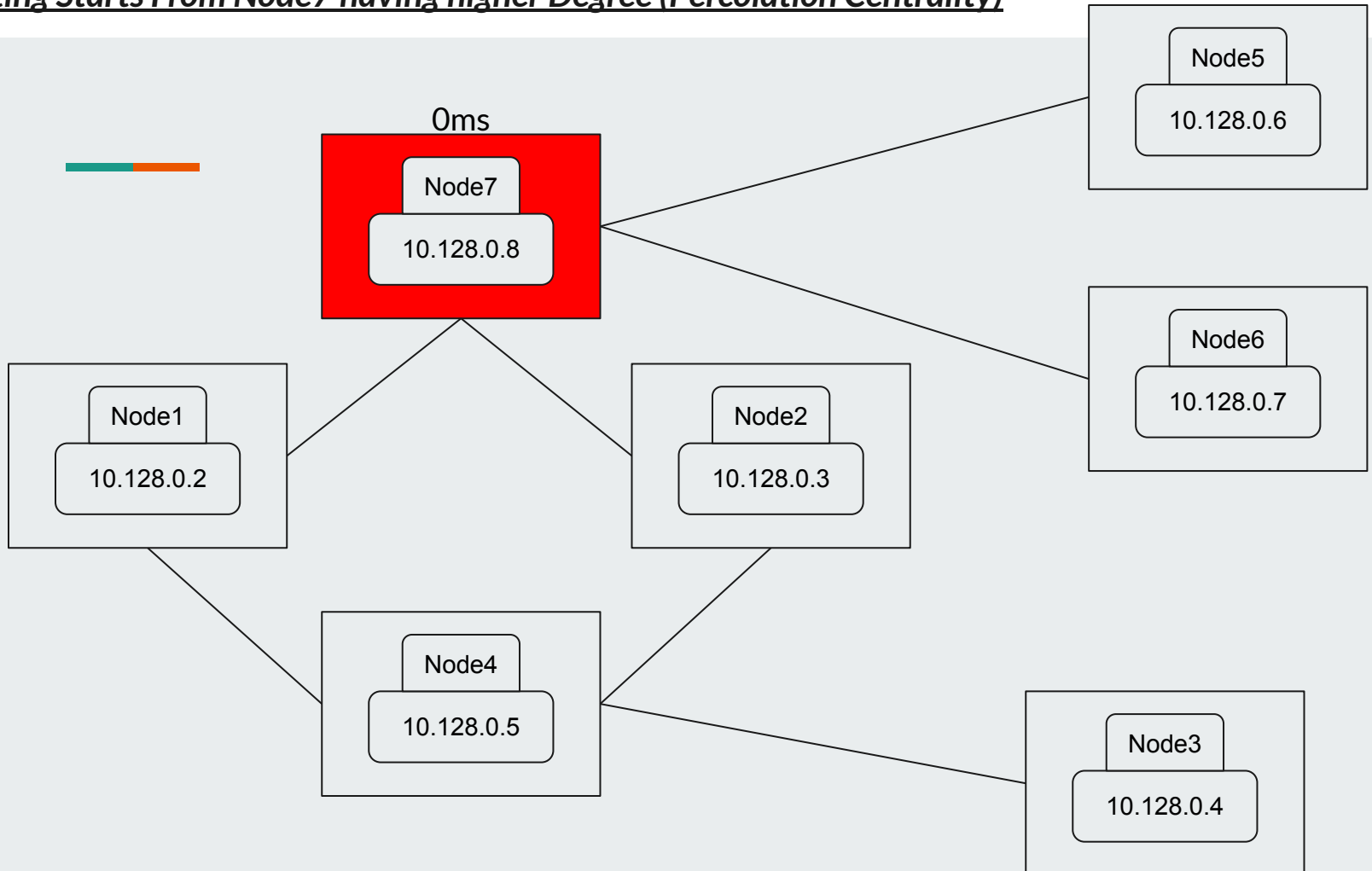


Routing Starts From Node7 having higher Degree (Percolation Centrality)



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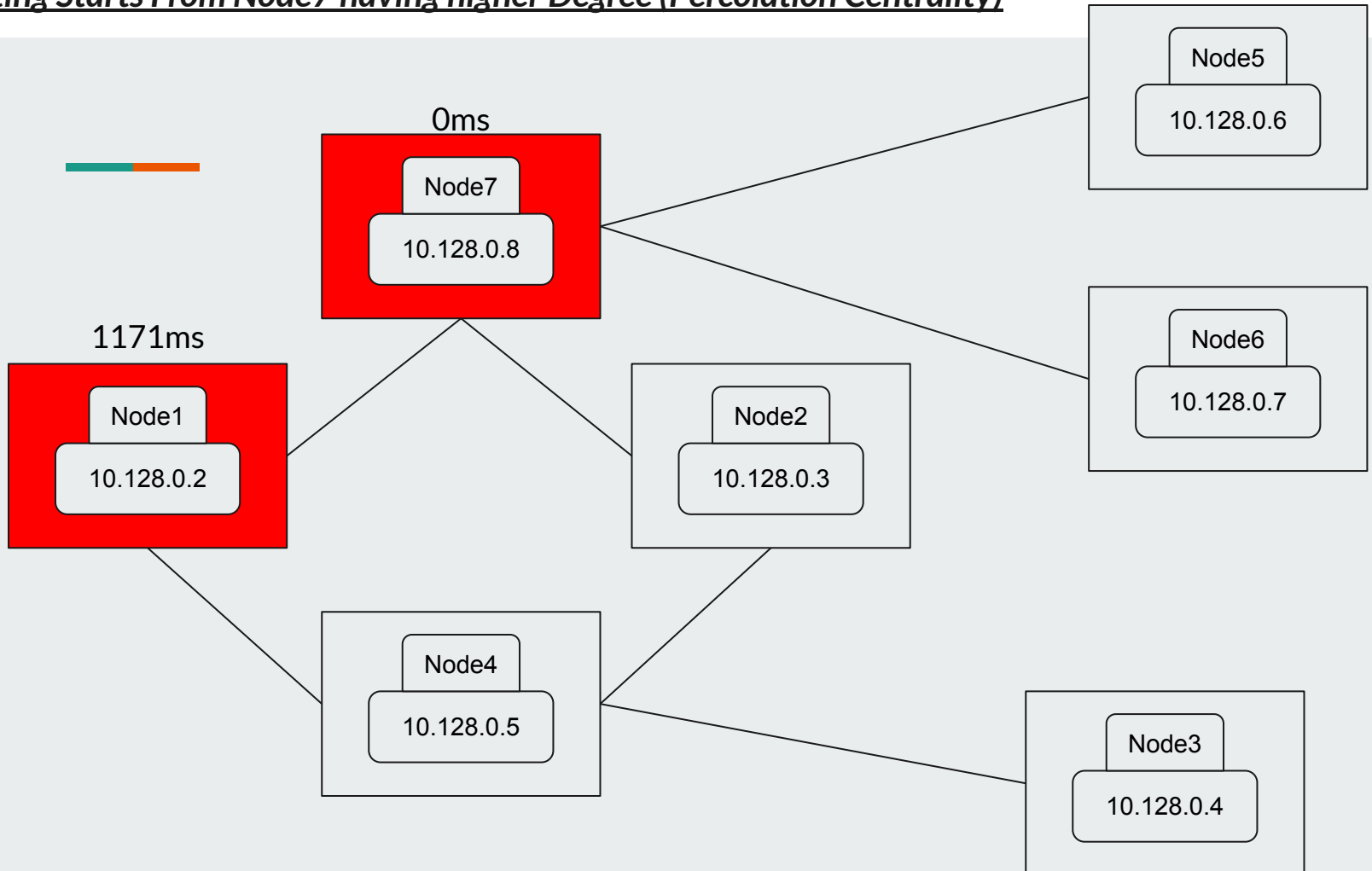

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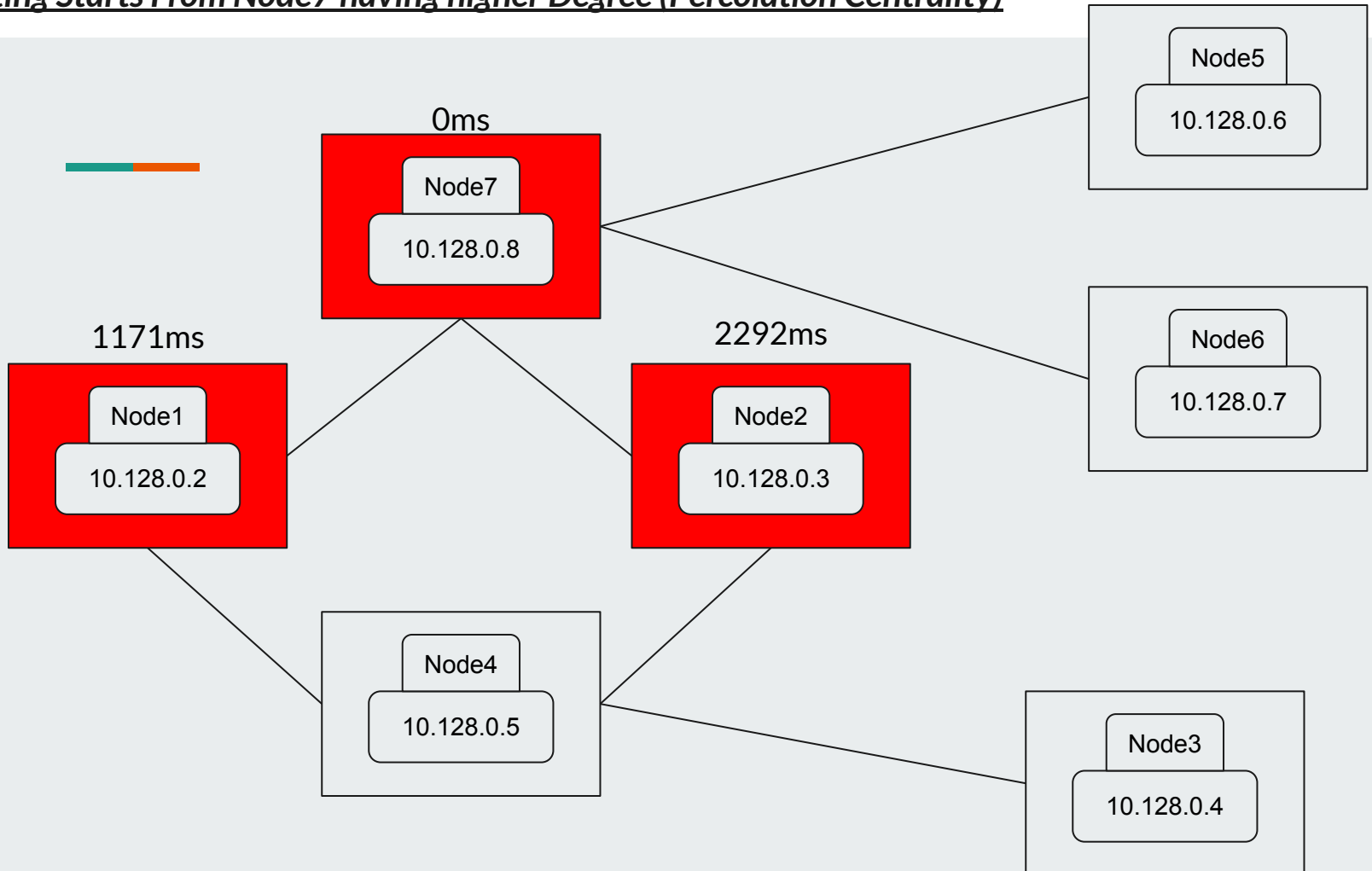

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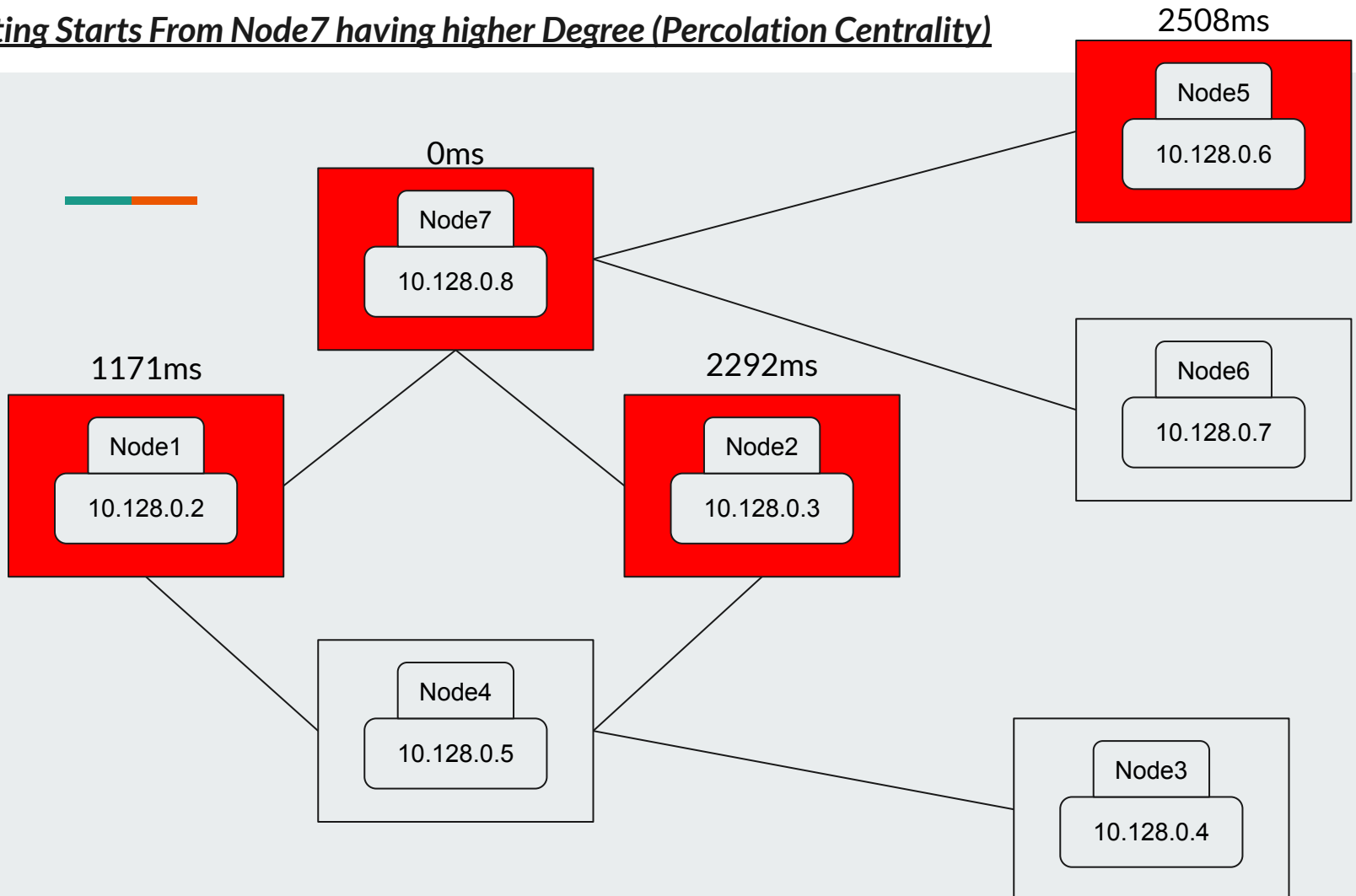

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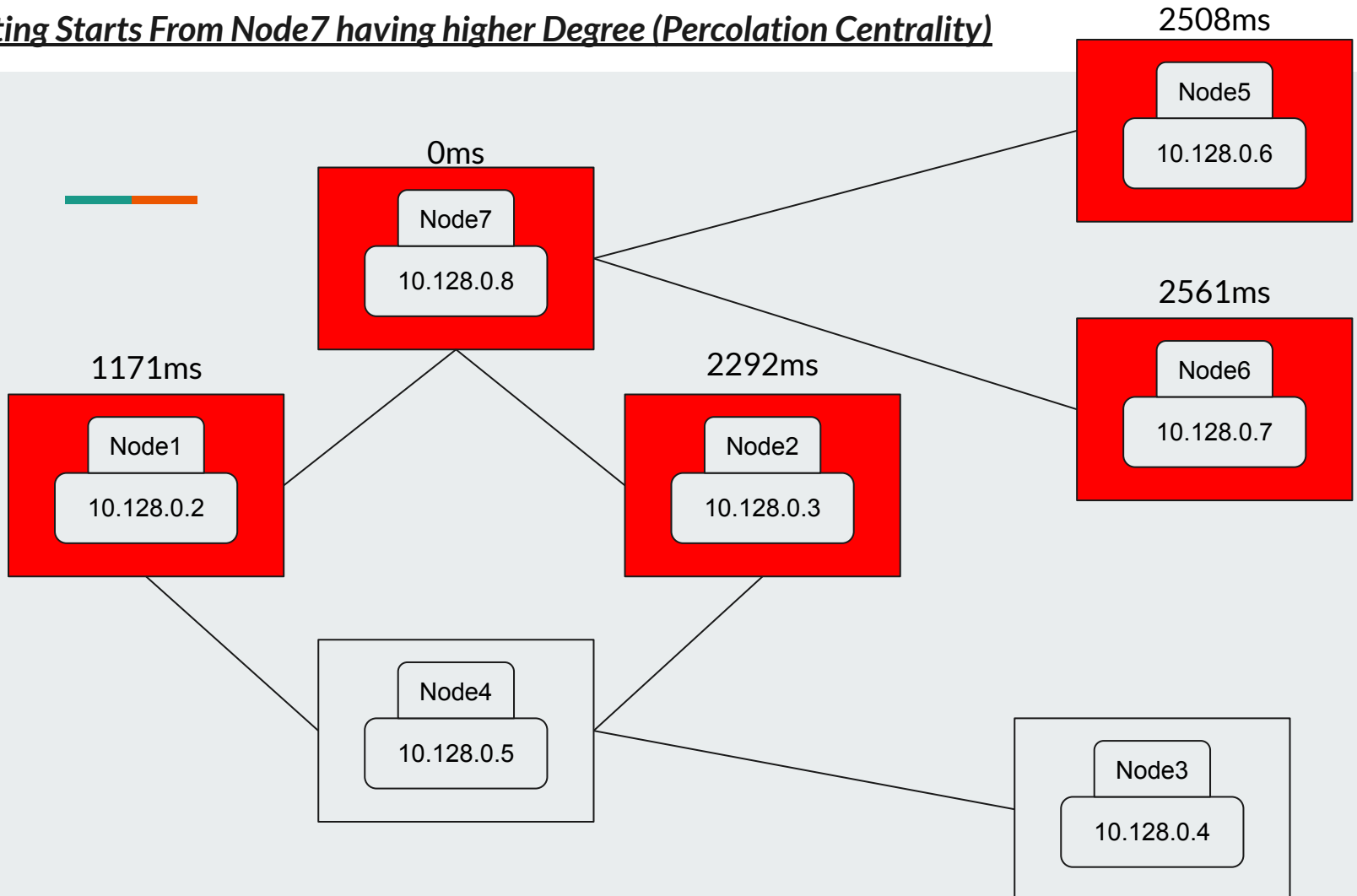

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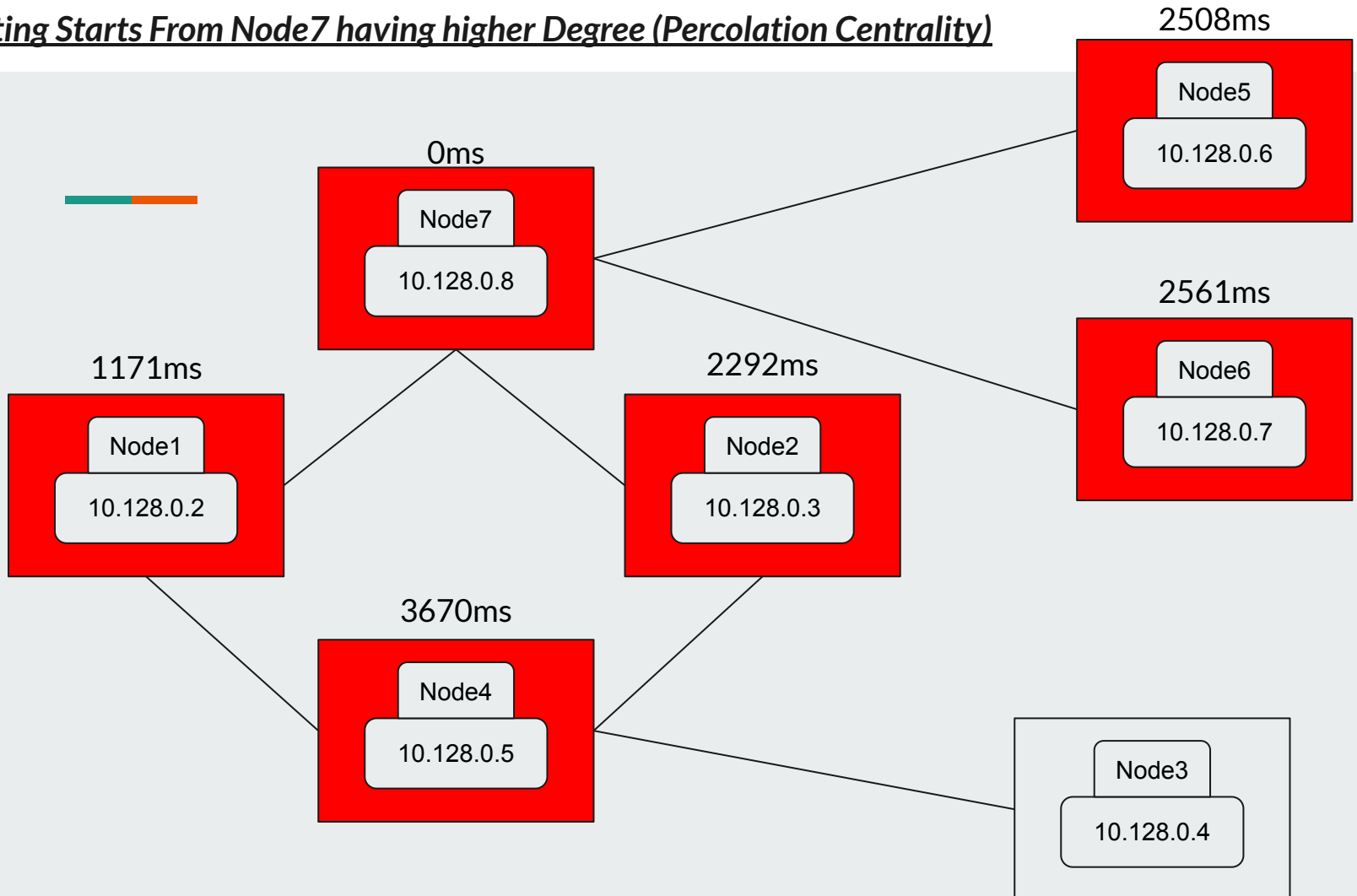

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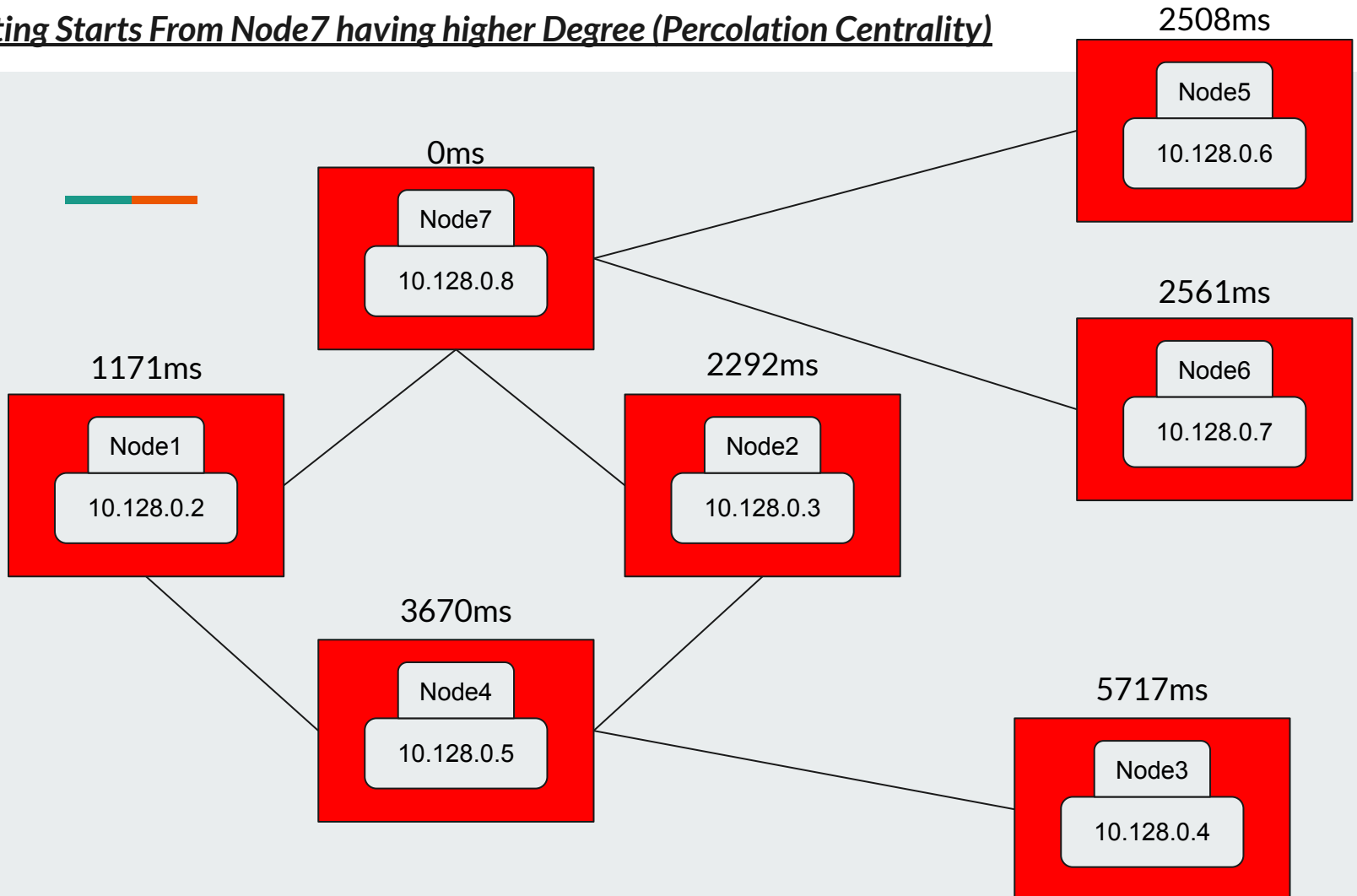
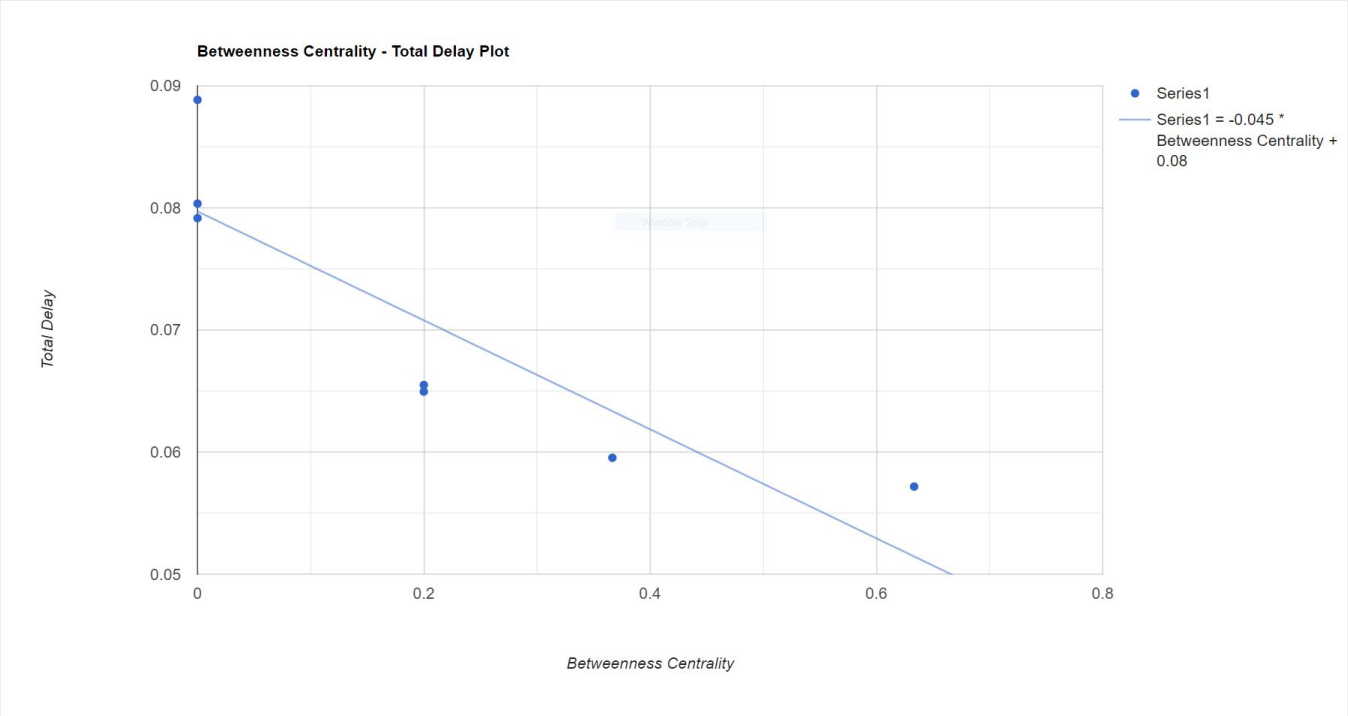


Observation

Time taken for distribution:

	Time in msec →							
Starting Node ↓	1	2	3	4	5	6	7	Total Time
1	0	0.03729	0.03861	0.01765	0.05247	0.06495	0.02108	0.06495
2	0.03818	0	0.03931	0.0181	0.05266	0.06549	0.022	0.06549
3	0.03671	0.04063	0	0.01897	0.07665	0.07916	0.05724	0.07916
4	0.01862	0.02246	0.02237	0	0.05953	0.0583	0.03896	0.05953
5	0.03961	0.04219	0.08035	0.05755	0	0.04908	0.02033	0.08035
6	0.03621	0.04363	0.08885	0.05644	0.04346	0	0.01882	0.08885
7	0.01711	0.02292	0.05717	0.0367	0.02508	0.02561	0	0.05717

Betweenness Centrality vs. Total Delay



Conclusion

- It can be concluded from the scatter plot that the node having higher value of betweenness centrality will distribute the data/file in lesser time than the one having lower value of betweenness centrality.

Future Scope

- Introduction of automation to minimize the number of manual steps to run the scripts for each routing.
- Distributing resources with complex format

Thank You