CRICOS PROVIDER 00123M

School of Computer Science

COMP SCI 1103/2103 Algorithm Design & Data Structure

Graph Traversals

Graph Traversal

- We want to have algorithms that visit every node of a given graph in linear time.
  - Breadth-first-search (BFS)
  - Depth-first-search (DFS)

Breadth-First-Search (BFS)

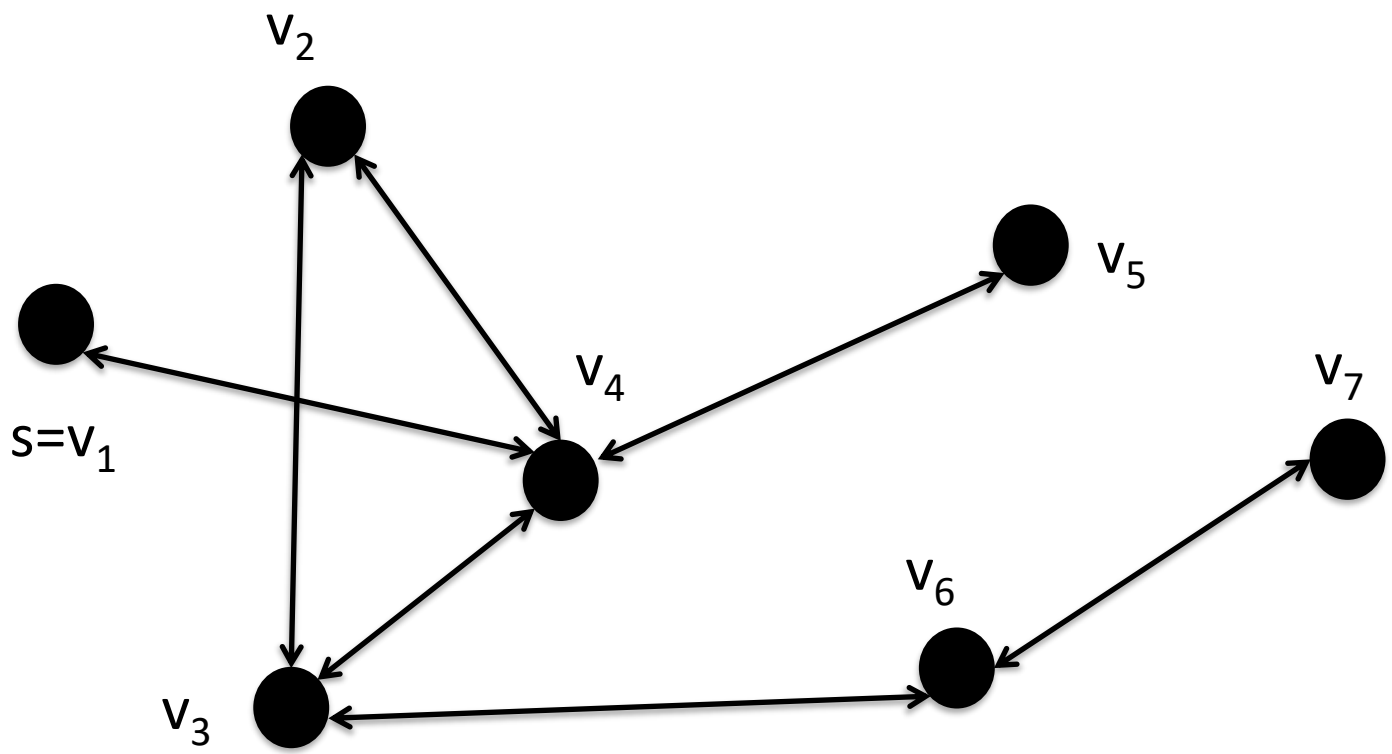
- Idea:
  - Start at a node s
  - Visit a node level by level
  - In iteration i, visit all nodes of distance i to s

Breadth-First-Search (BFS)

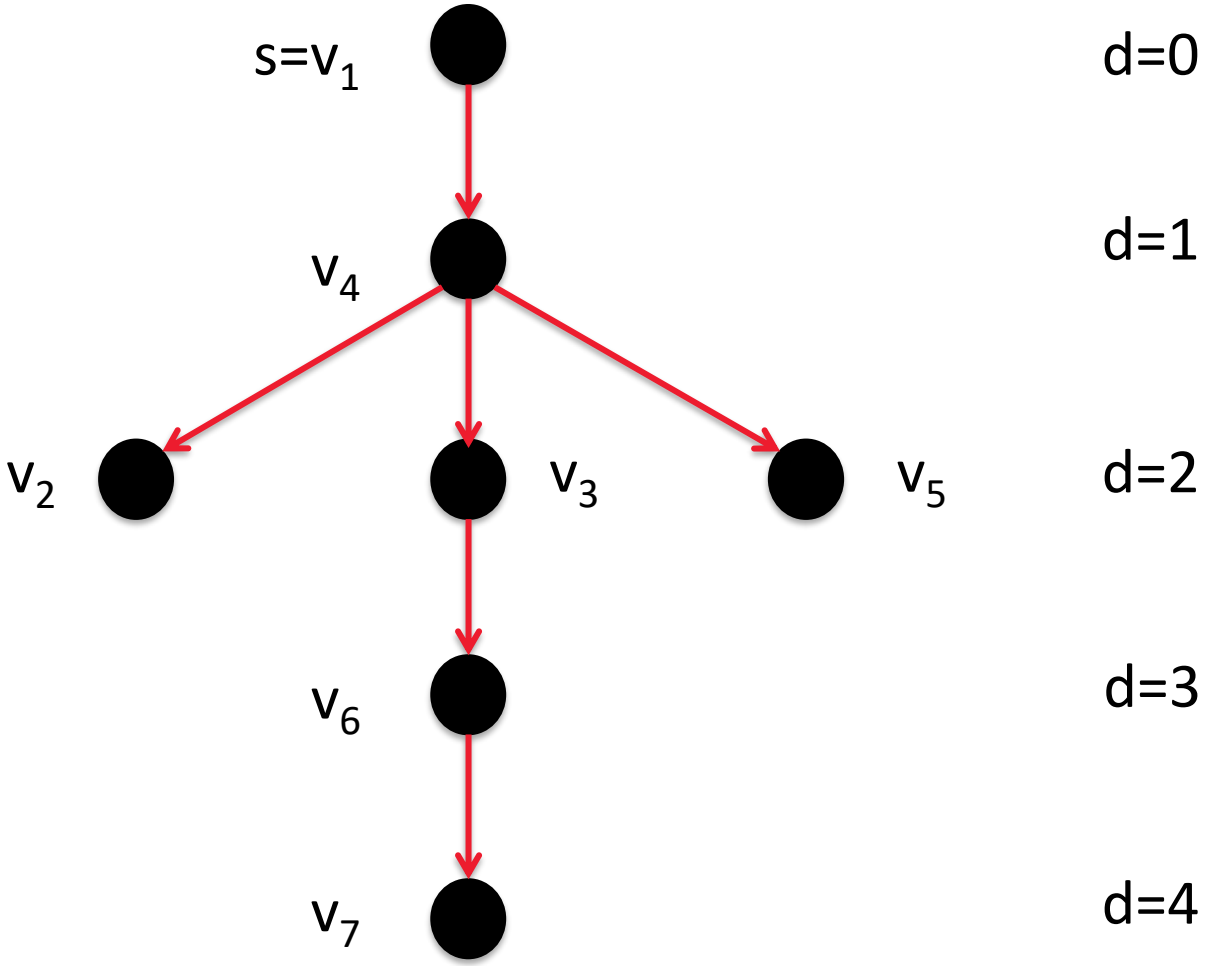
- Idea:
  - Start at a node *s*
  - Visit a node level by level
  - In iteration *i*, visit all nodes of distance *i* to *s*

- Implementation:
  - Assume graph with *n* node and *m* edges
  - Use queue
  - Introduce each node into the queue only once, time O(n)
  - Consider a node in the queue with its edges once, time O(n+m)
  - Total runtime: O(n+m)

Breadth-First-Search (BFS)



Breadth-First-Search Tree



Depth-First-Search (DFS)

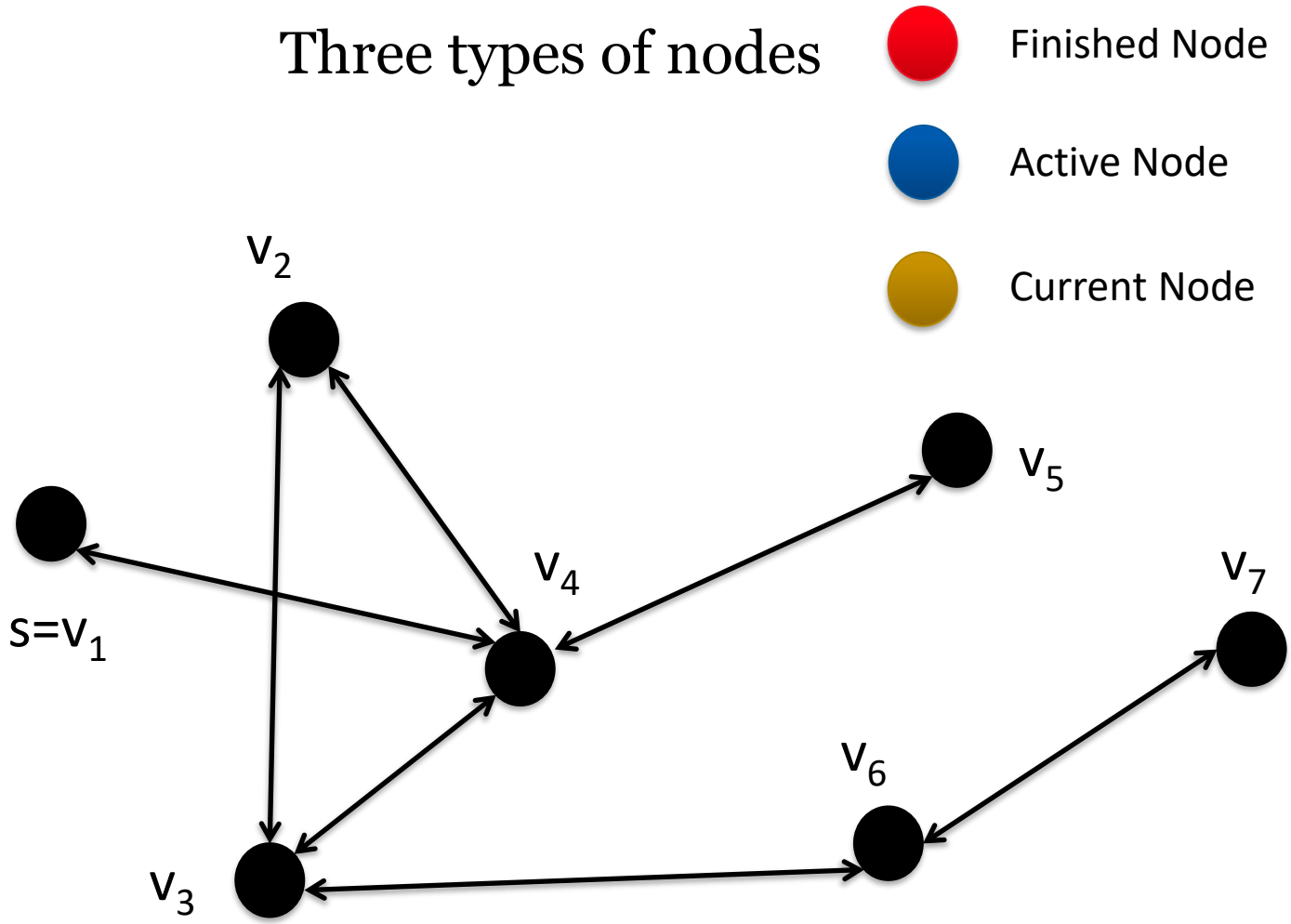
- Idea:
  - When visiting a node, mark it as visited and recursively call DFS for one of its non-visited neighbors
  - If there is no non-visited neighbor end recursive call.

Depth-First-Search (DFS)

- Idea:
  - When visiting a node, mark it as visited and recursively call DFS for one of its non-visited neighbors
  - If there is no non-visited neighbor end recursive call.

- Implementation:
  - Assume graph with n node and m edges
  - Use stack
  - Push each non-visited neighbors into stack only once, time O(n)
  - Consider a node with its edges once, time O(n+m)
  - Total runtime: O(n+m)

Depth-First-Search (DFS)



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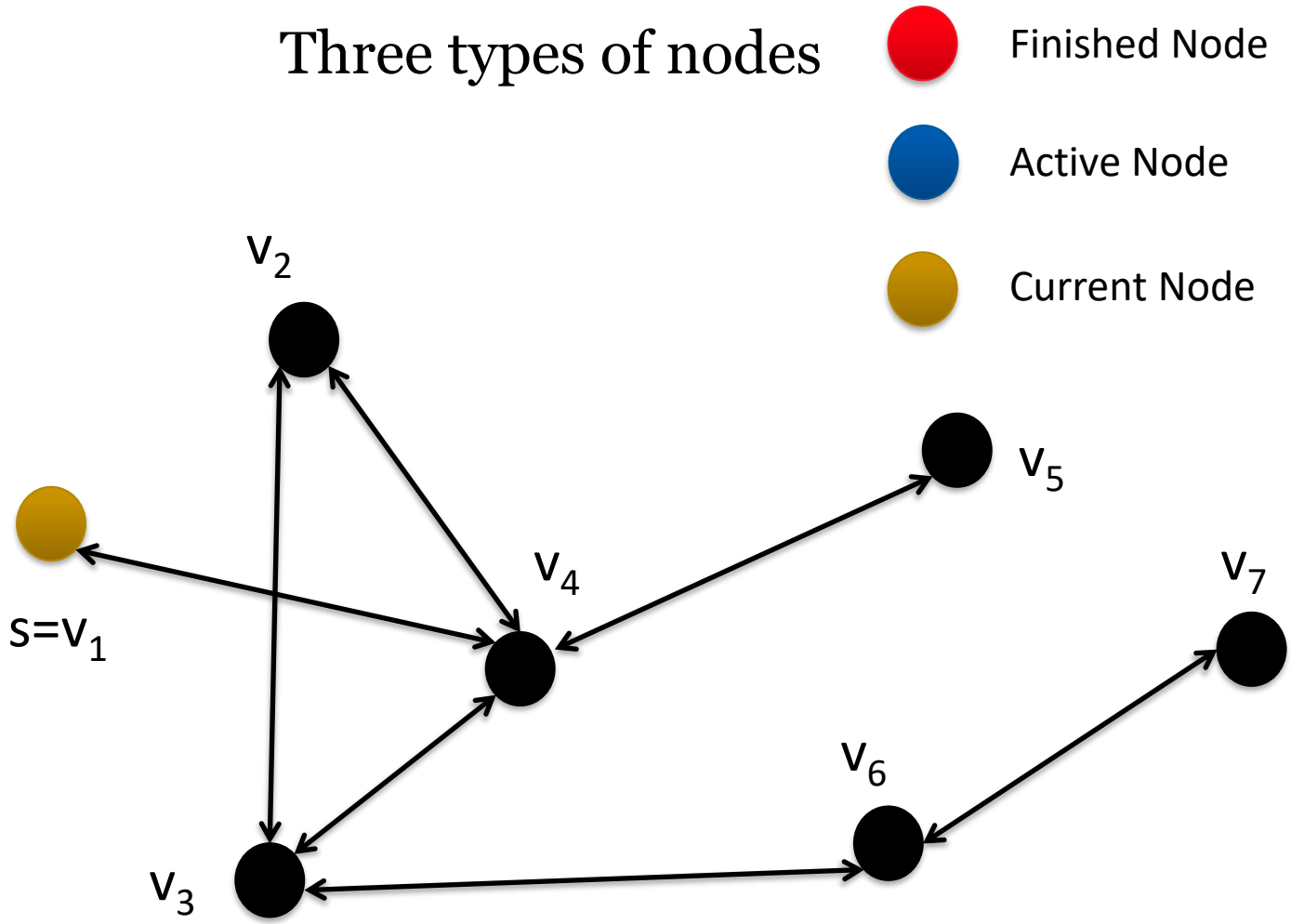

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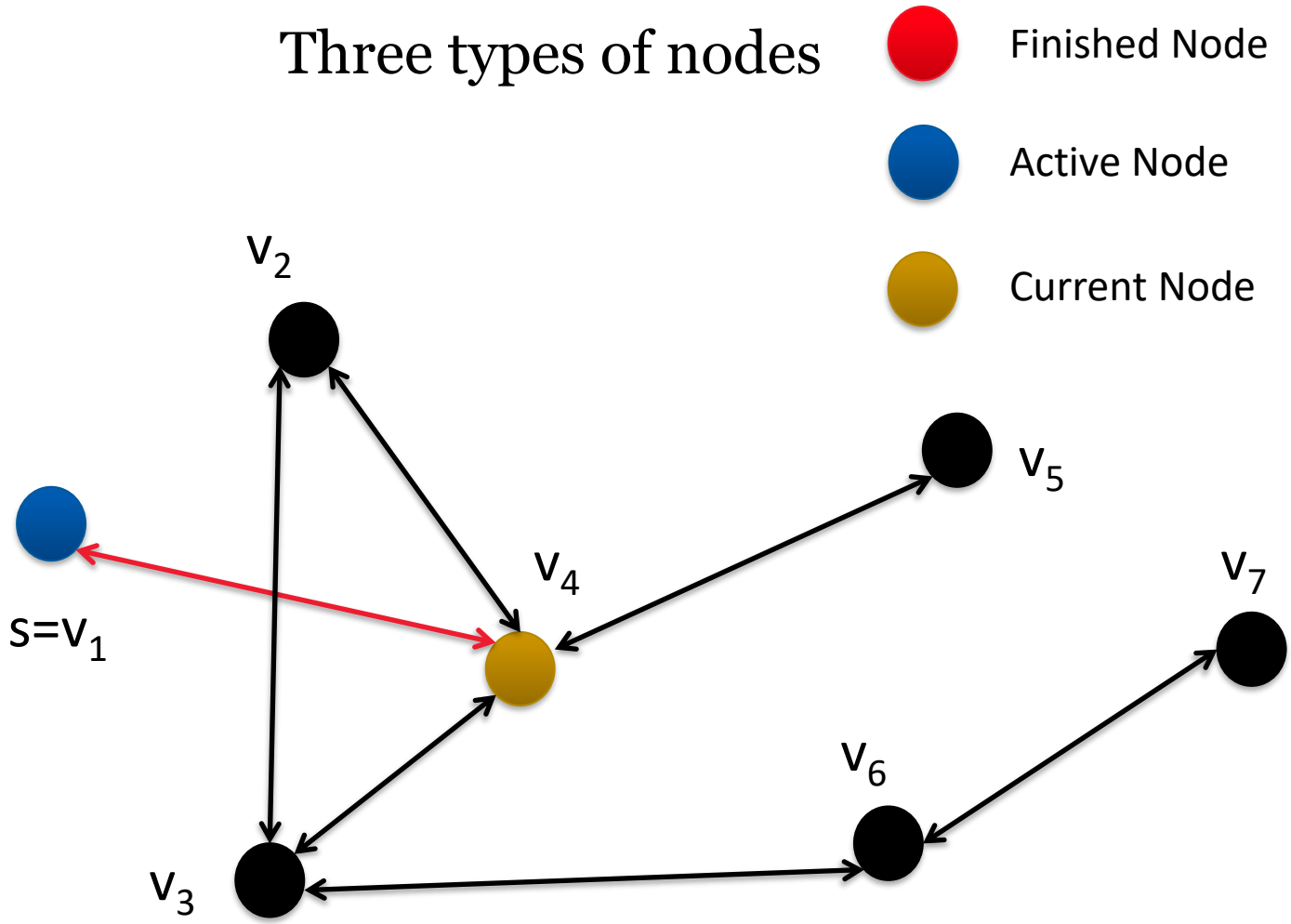

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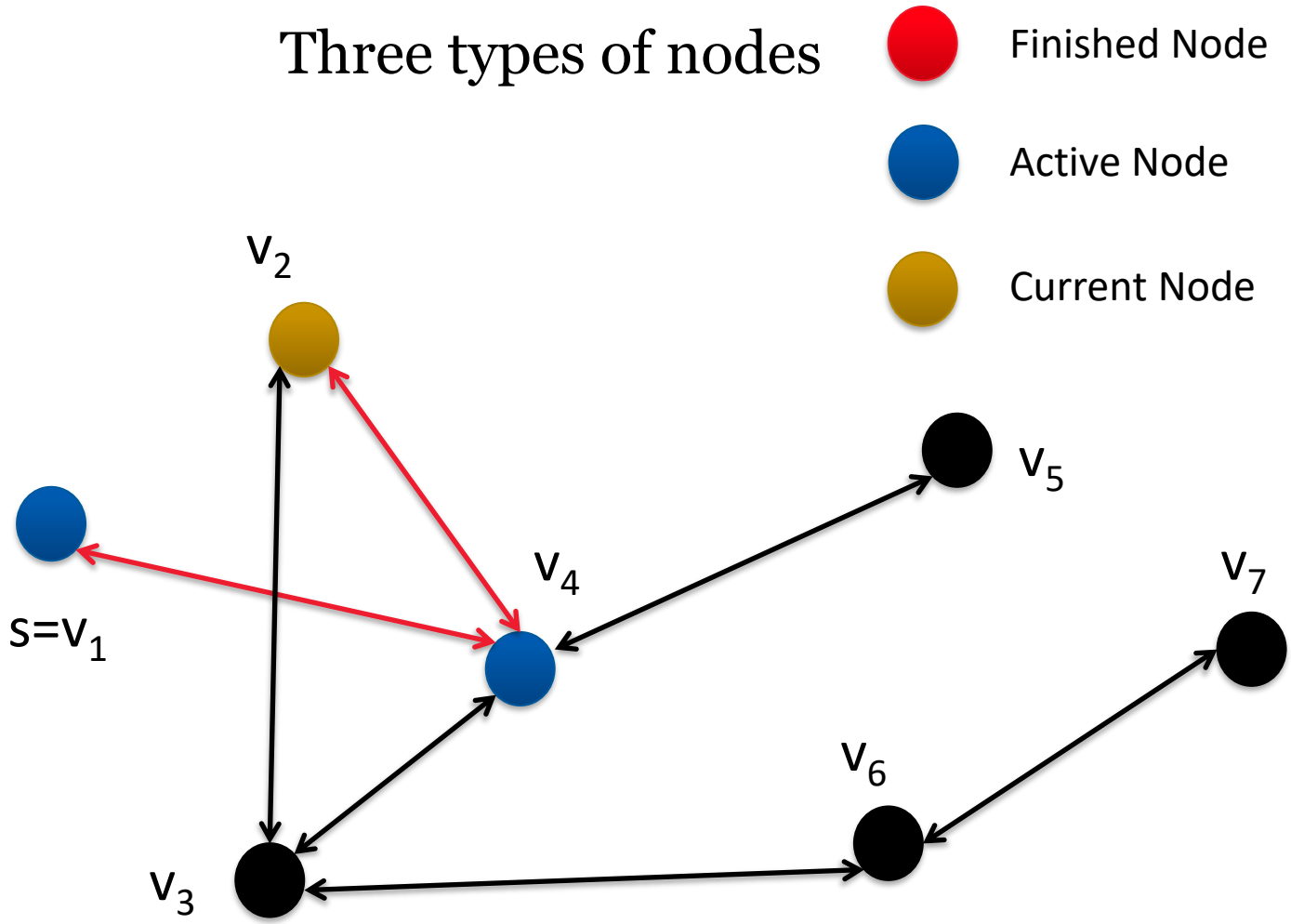

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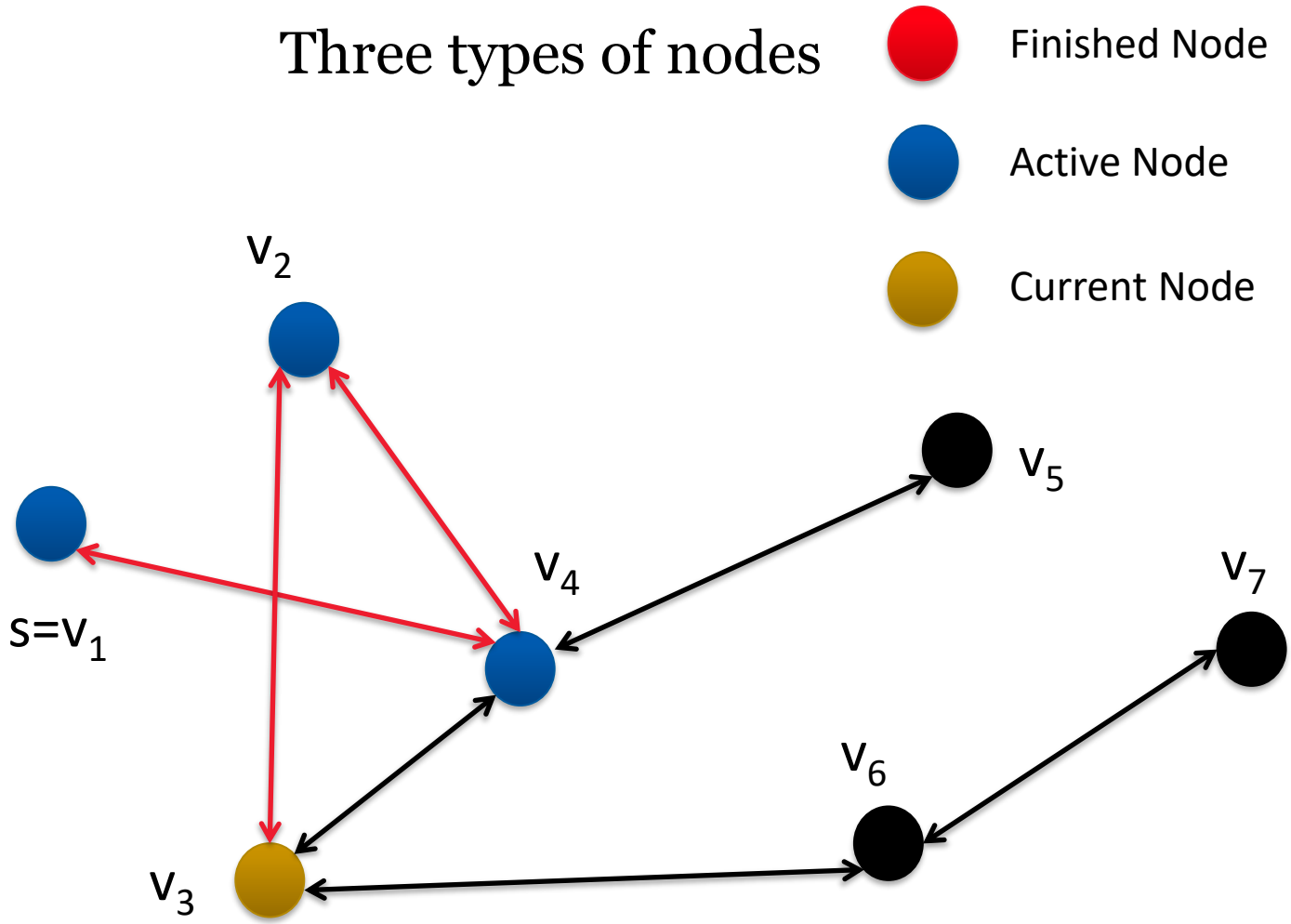

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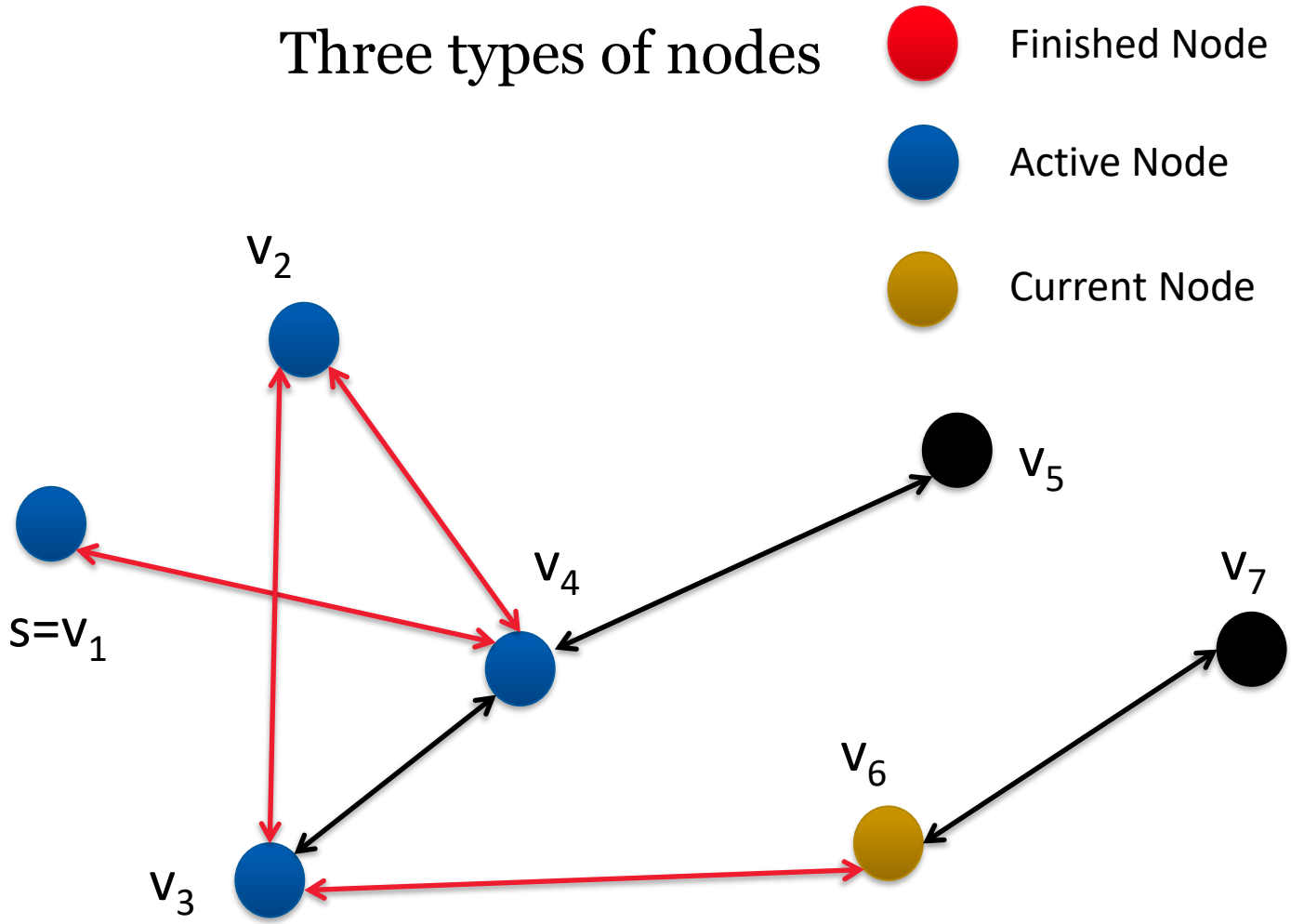

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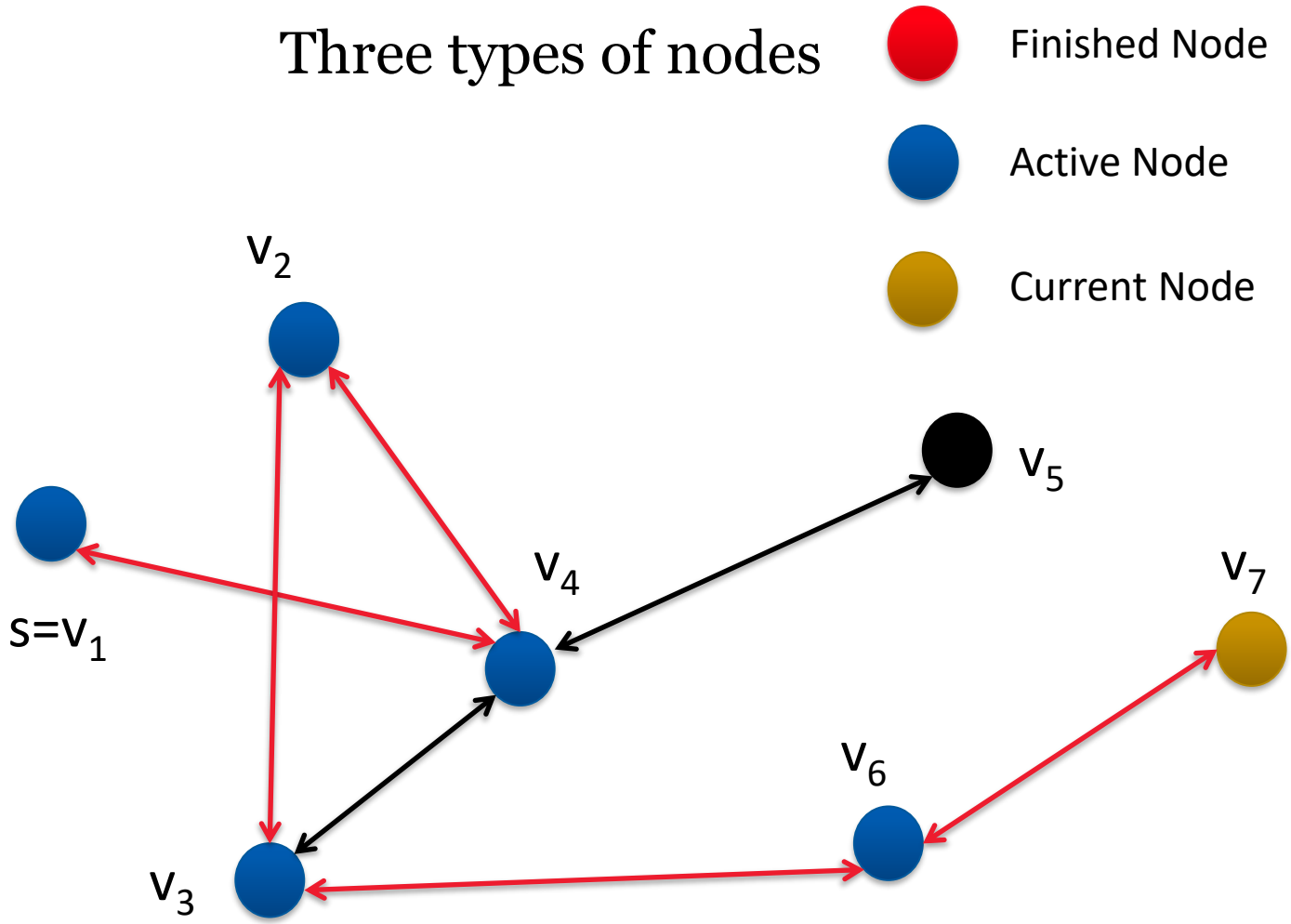

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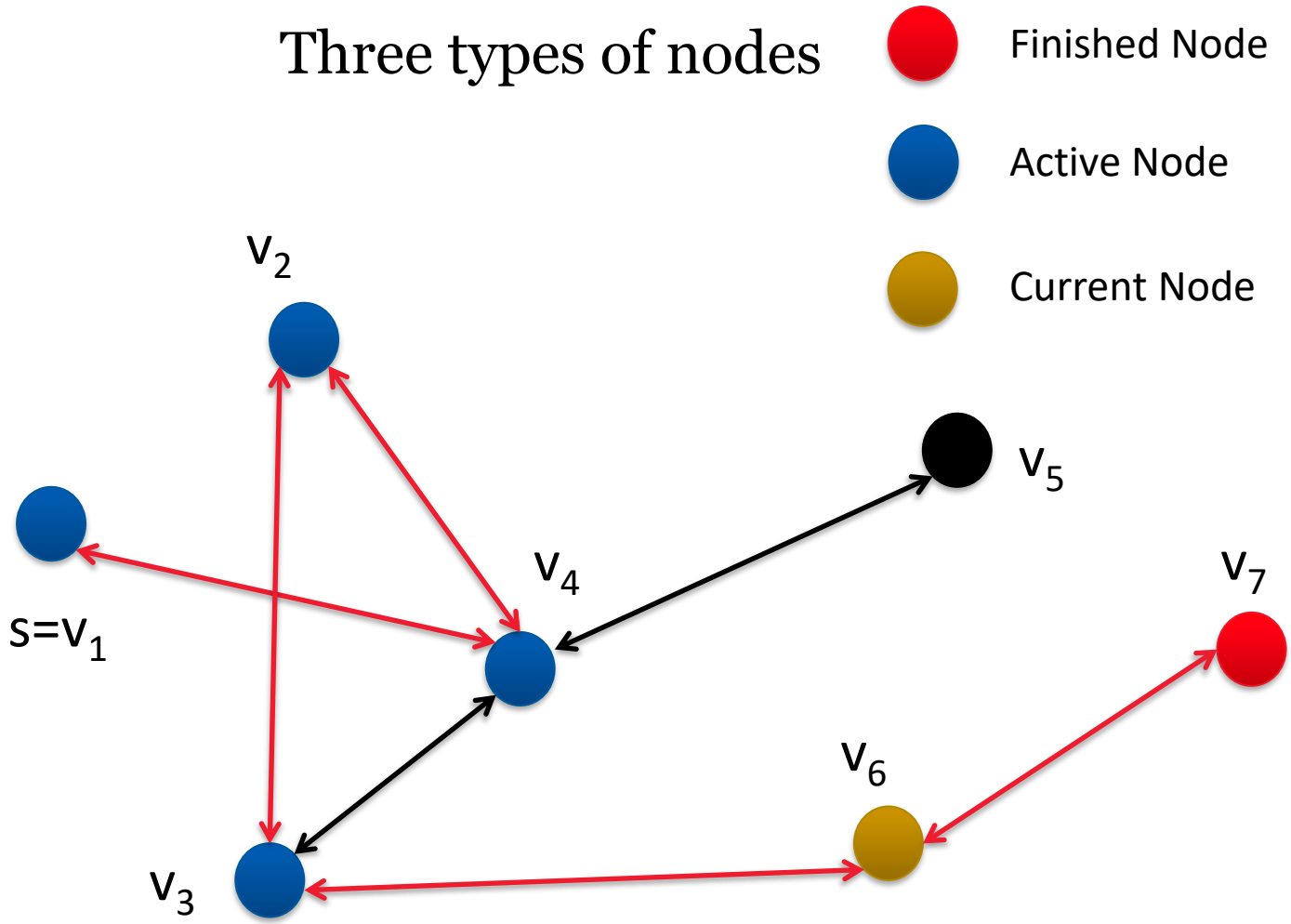

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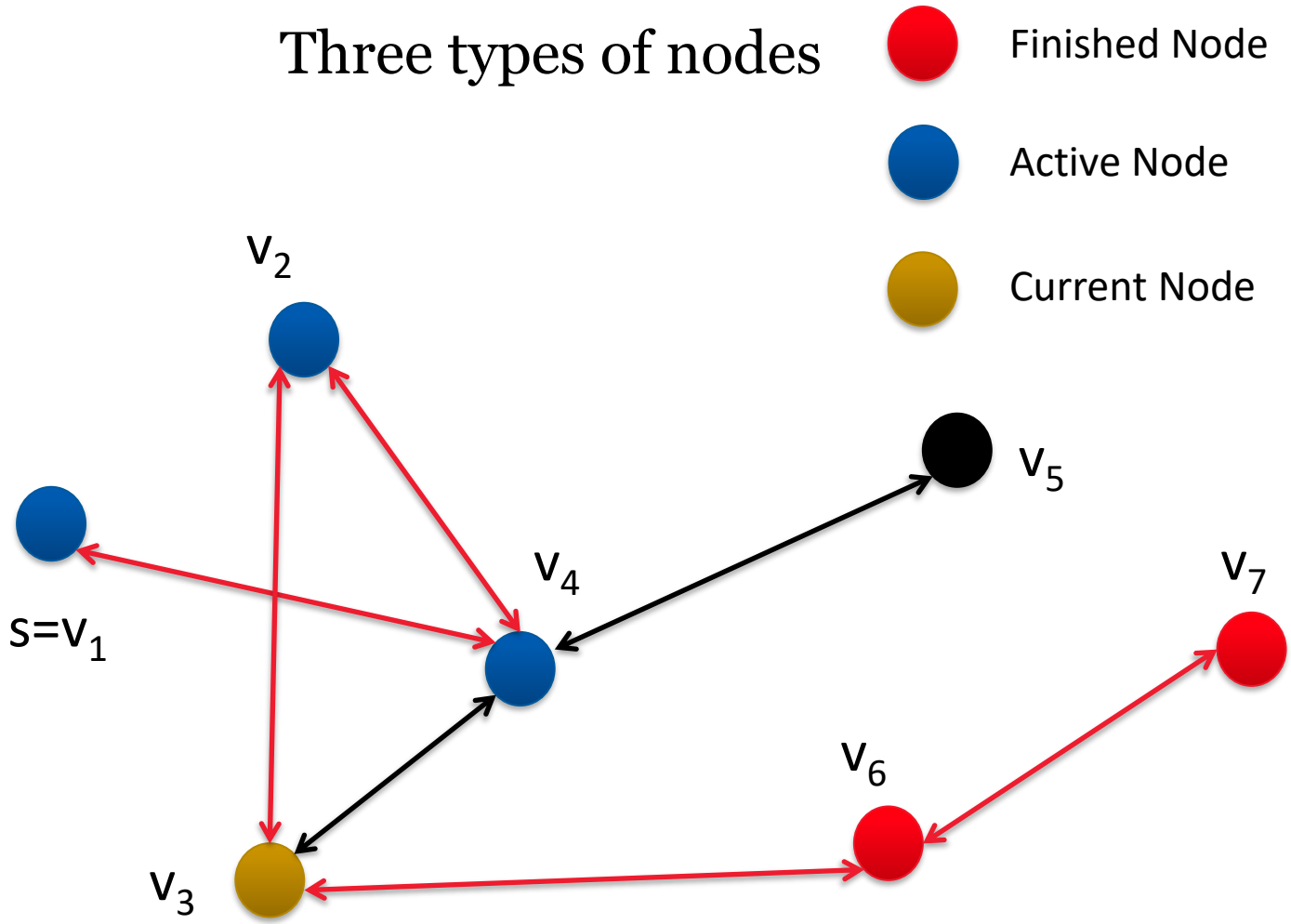

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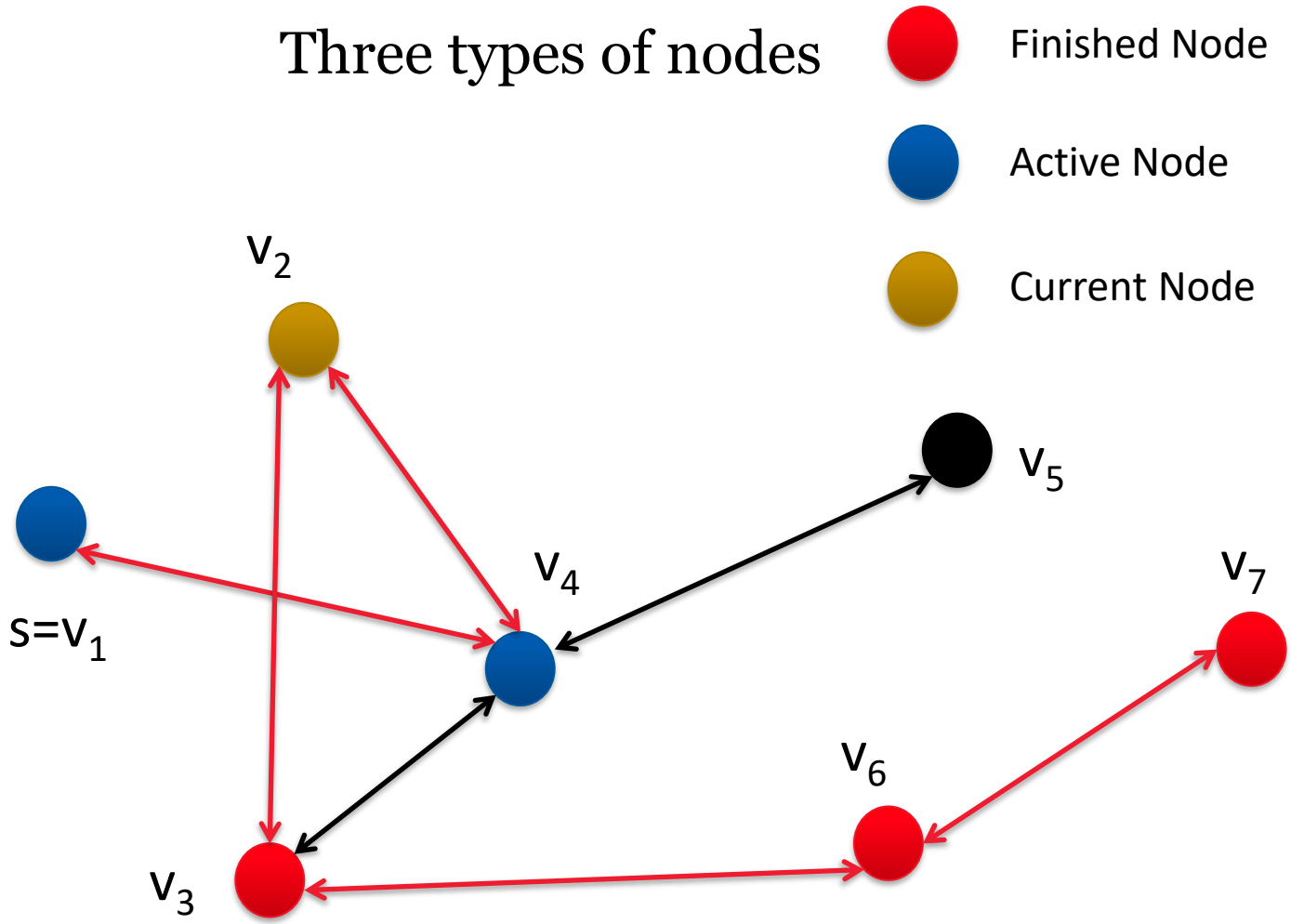

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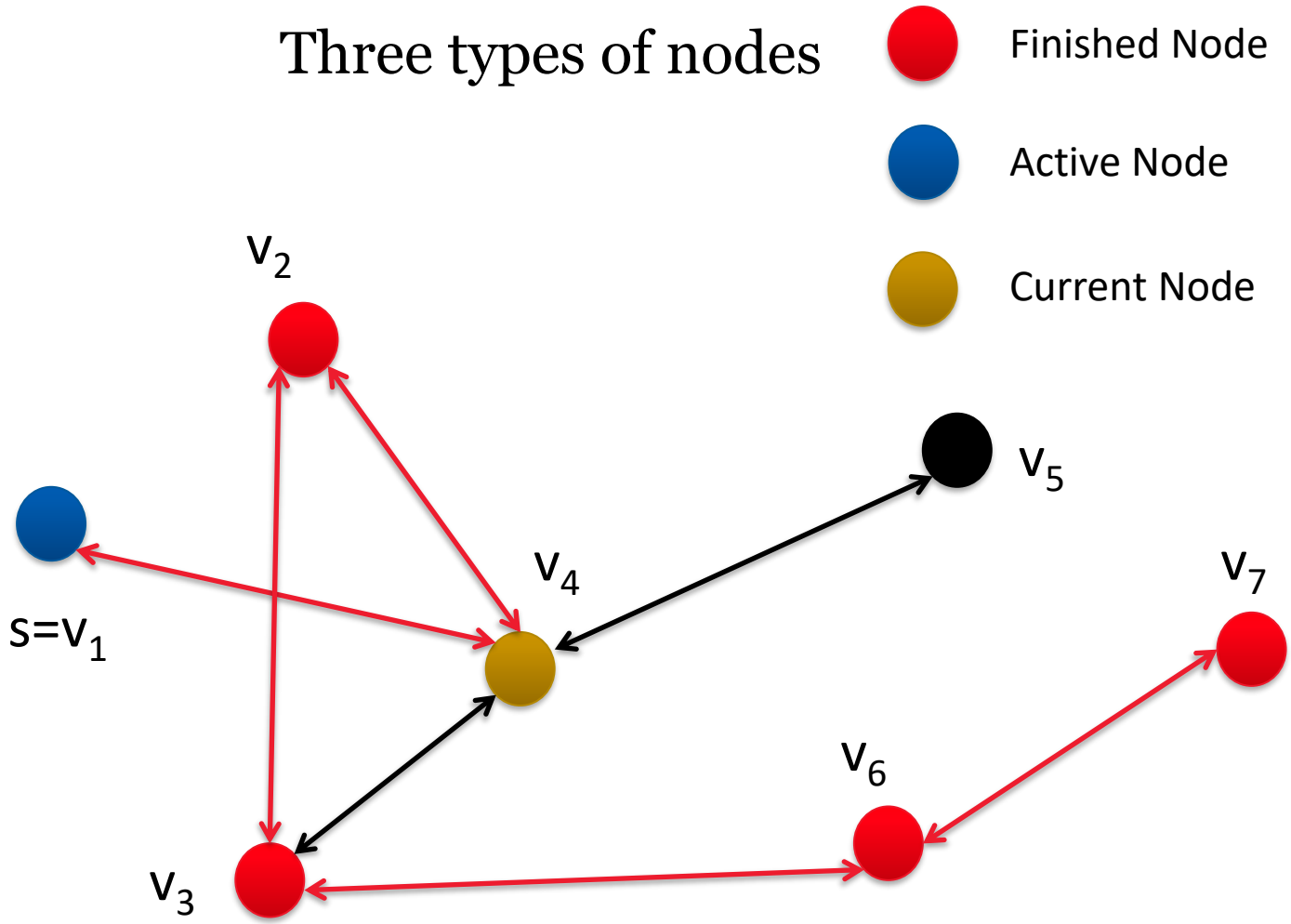

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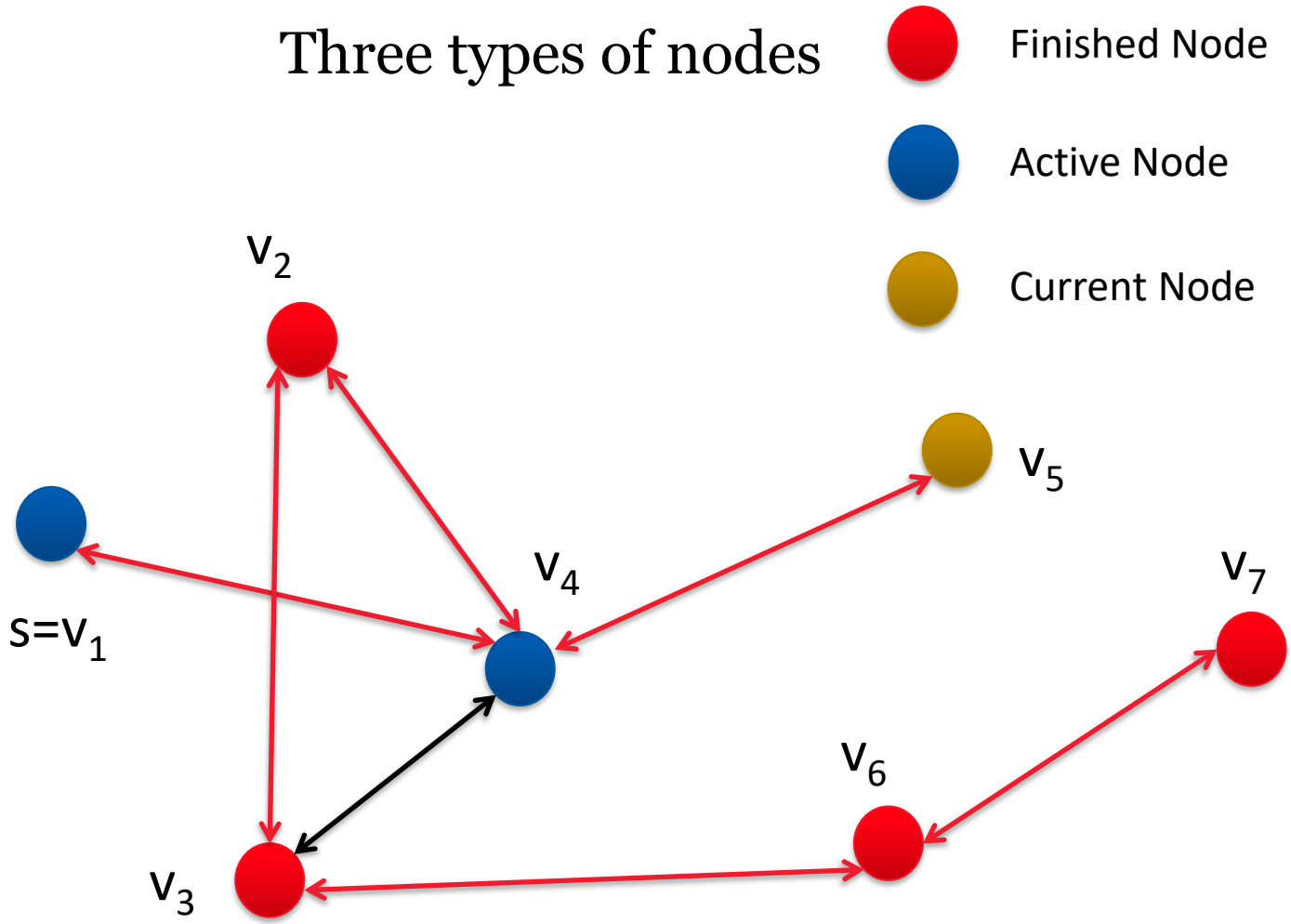

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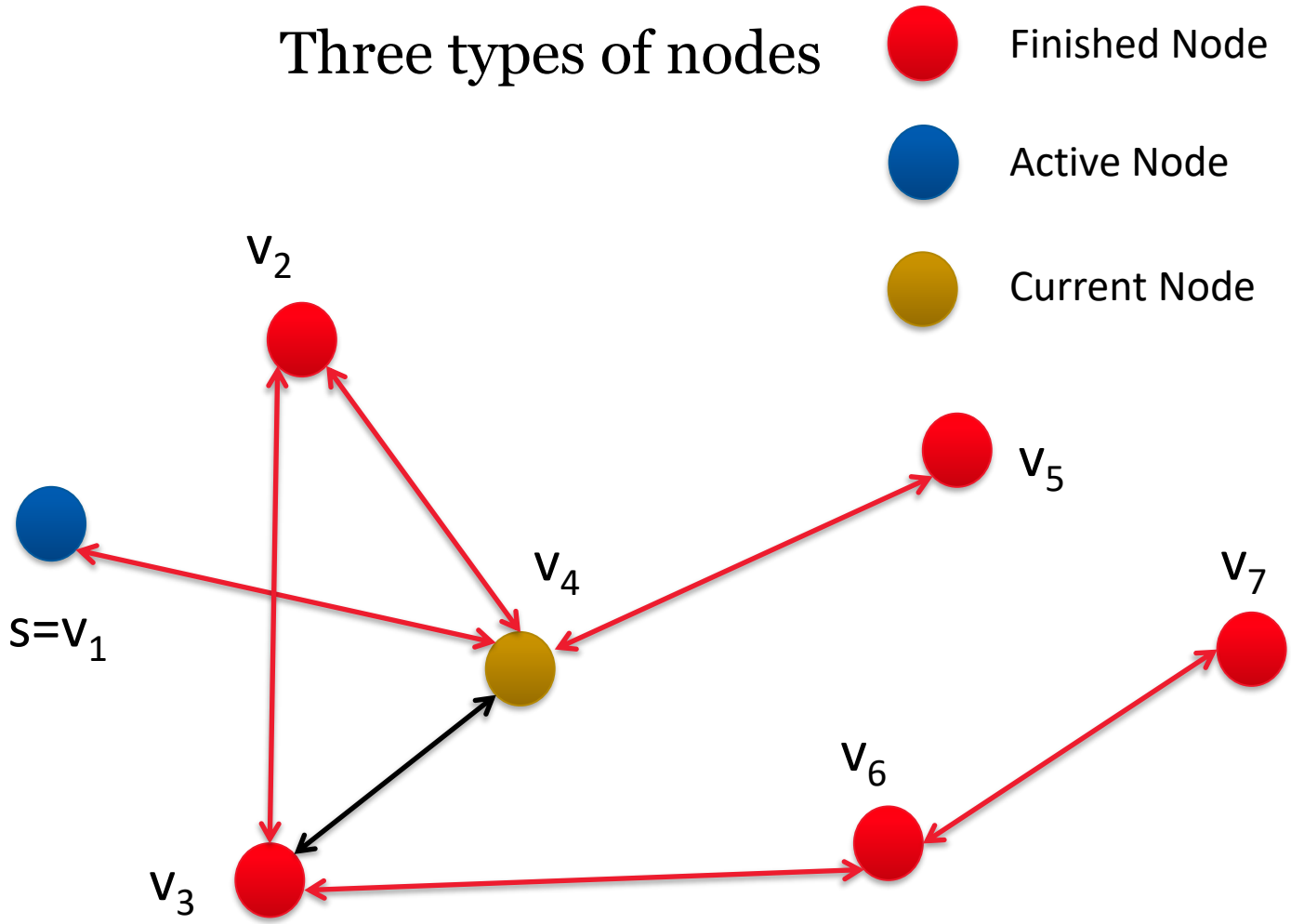

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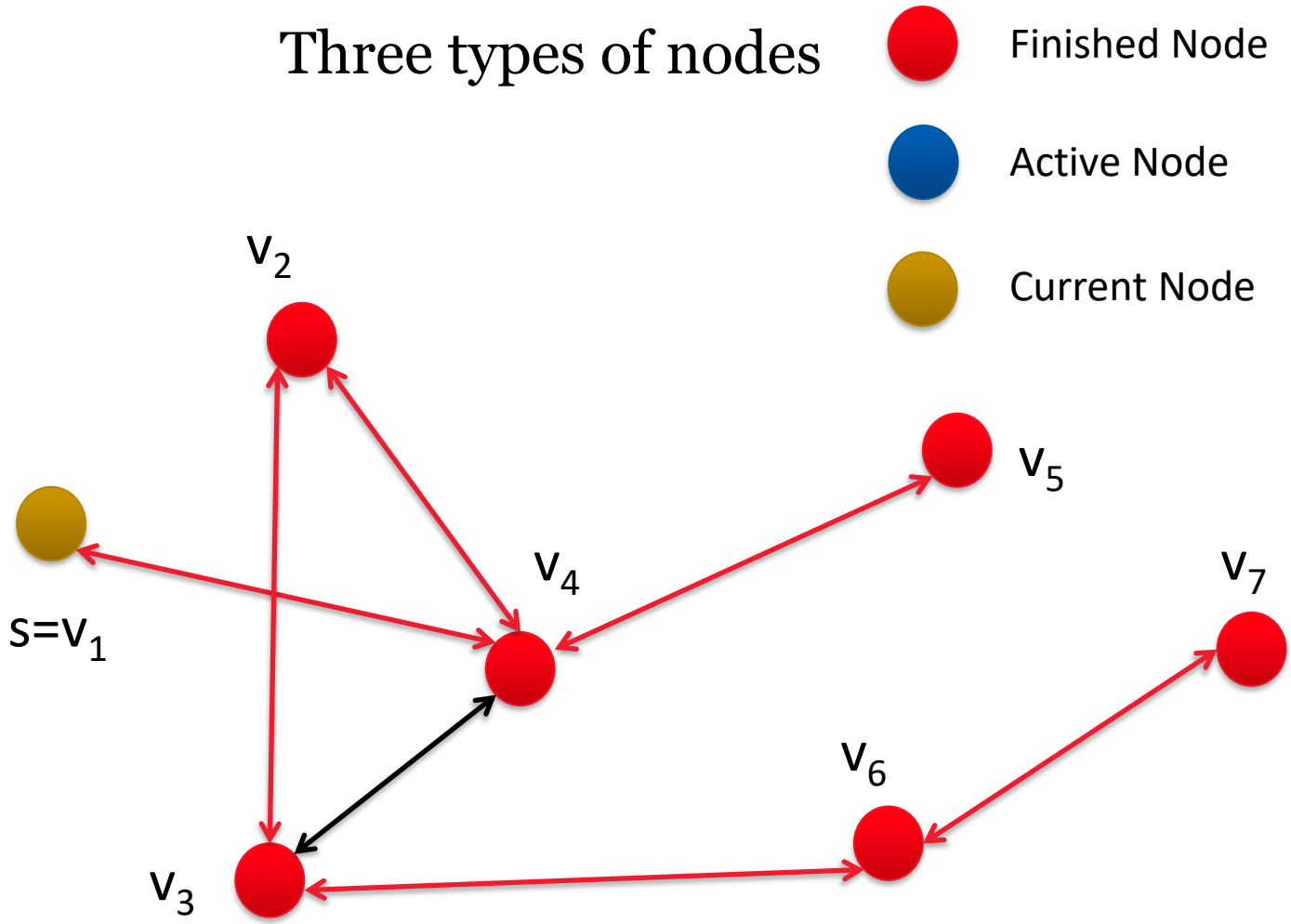

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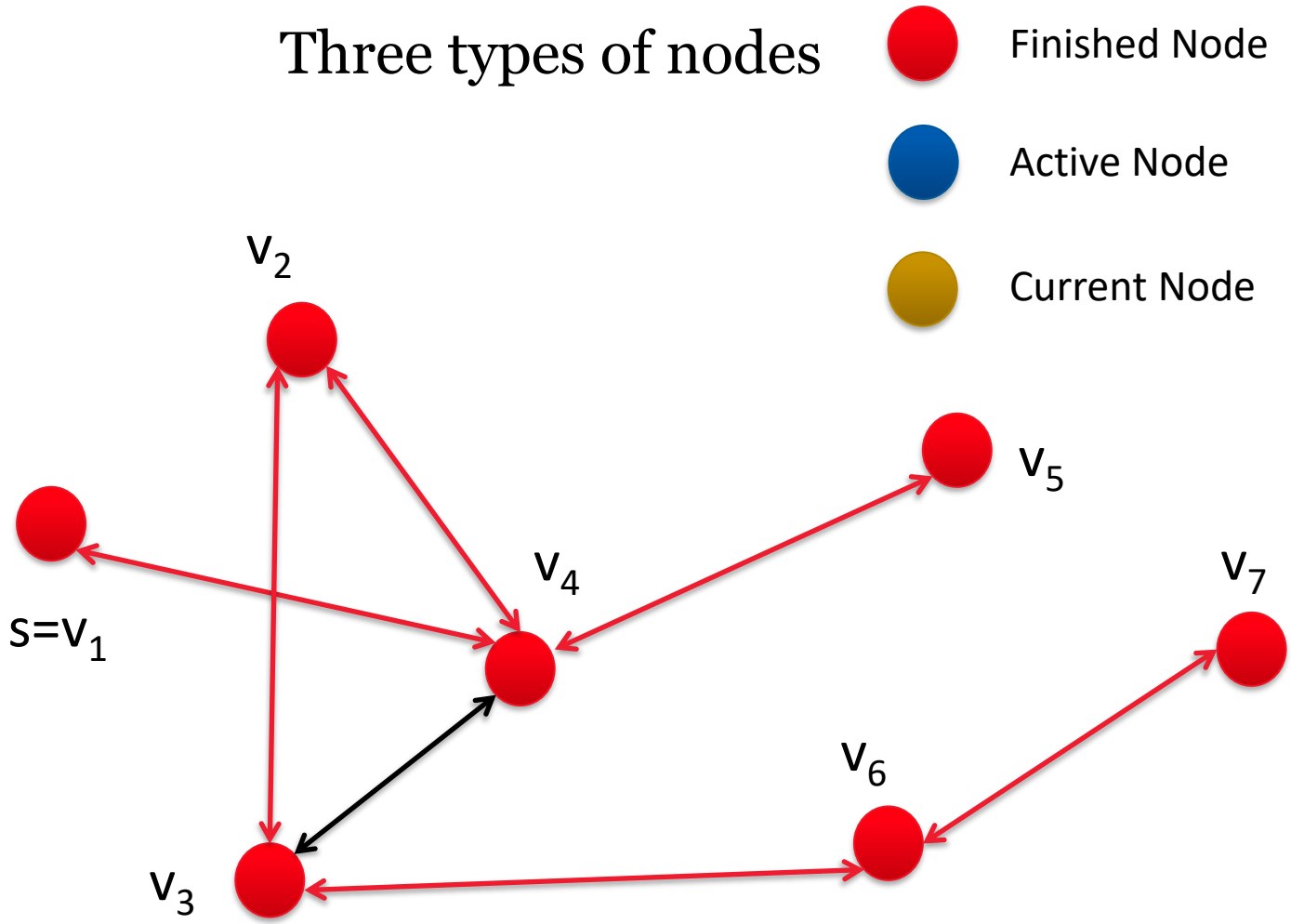

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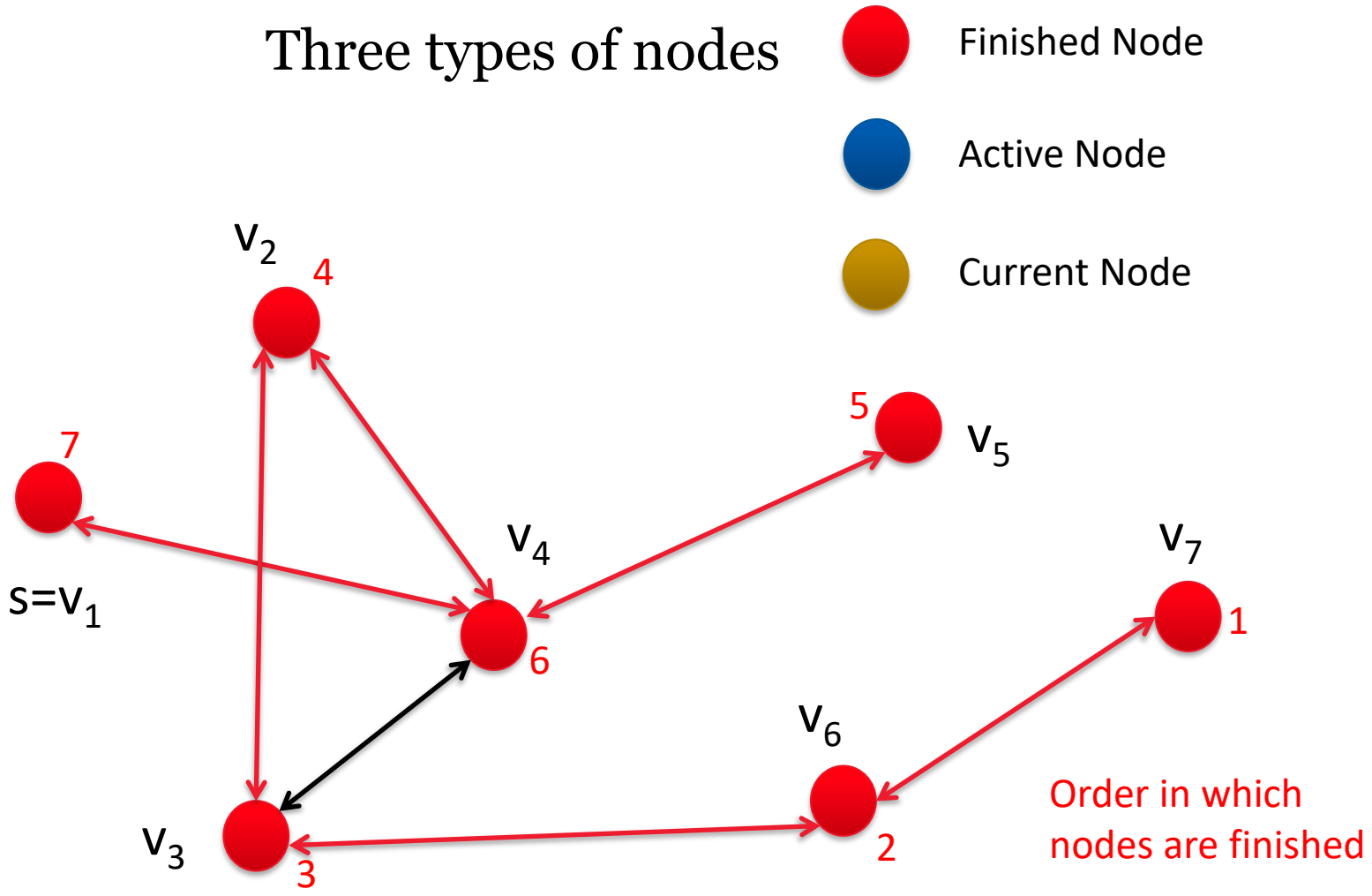
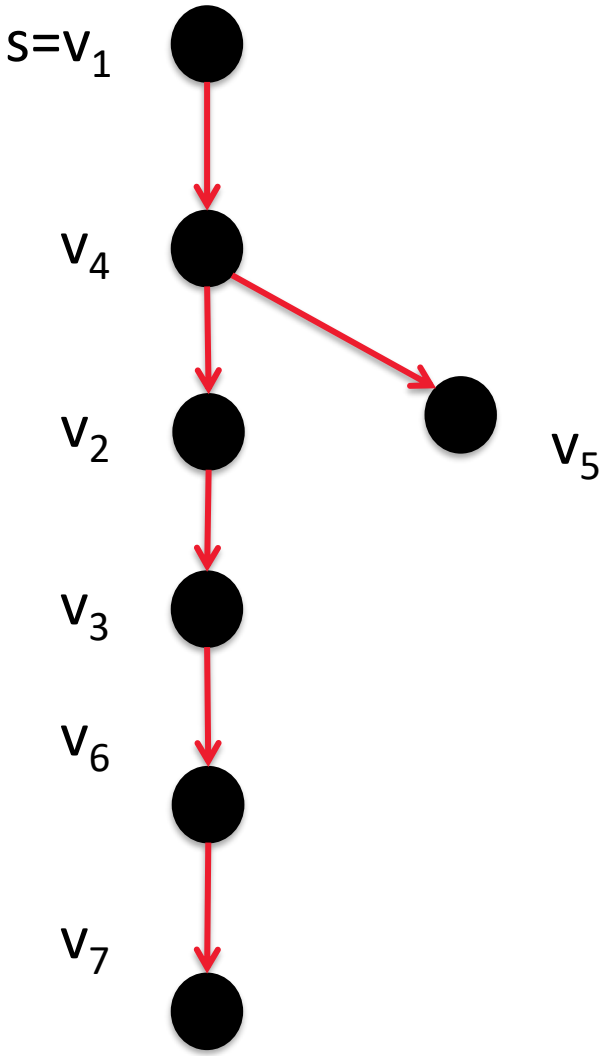
Depth-First-Search Tree