Assignment 1

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Assignment 1: A C++ Programming Practice

Graph Traversal

- You will be using what you have learned to conduct a C++ programming practice.
- **Goal**: implement a depth first search on a graph and print path from a source node to a sink node on the graph

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Depth First Search (DFS)

- An algorithm to traverse or search a graph data structure.
- Exploring as far as possible along each branch before backtracking.

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Depth First Search (DFS)

- An algorithm to traverse or search a graph data structure.
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Why DFS?

- Efficient, linear time complexity, i.e., O(V+E), where V is nodes and E is edges.
- One of the most commonly used graph algorithms.

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Graph Traversal

Given a source node `src` and a destination node `dst` on a graph

- (1) can `src` reach `dst`?
- (2) if so, what are the possible paths from `src` to `dst` along the graph?

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Answer:

- (1) Yes.

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- (1) can `src` reach `dst`?
- (2) if so, what are the possible paths from `src` to `dst` along the graph?

Answer:

- (1) Yes.
- (2) All possible paths:
  - $\texttt{src} \rightarrow \texttt{a} \rightarrow \texttt{b} \rightarrow \texttt{d} \rightarrow \texttt{dst}$
  - $\texttt{src} \rightarrow \texttt{a} \rightarrow \texttt{c} \rightarrow \texttt{d} \rightarrow \texttt{dst}$
  - $\texttt{src} \rightarrow \texttt{a} \rightarrow \texttt{b} \rightarrow \texttt{d} \rightarrow \texttt{b} \rightarrow \texttt{d} \rightarrow \texttt{dst}$
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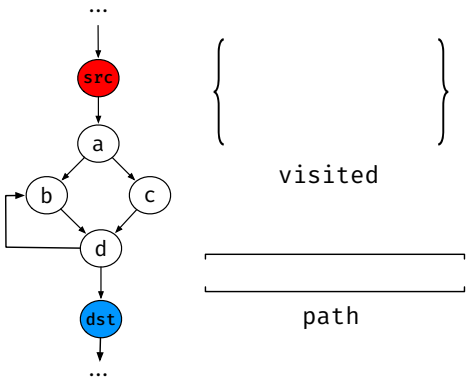
DFS algorithm and an example

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//node seq in the current path during traversal
path: vector<NodeID>

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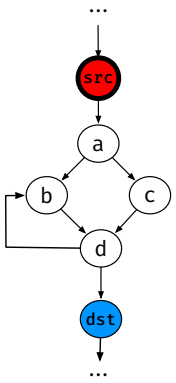

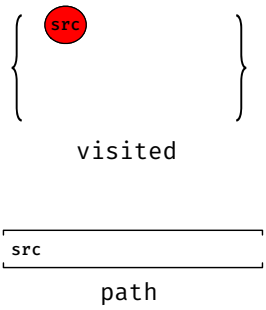


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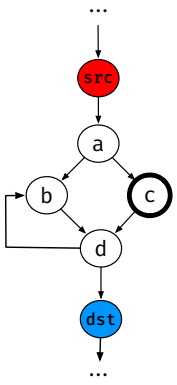

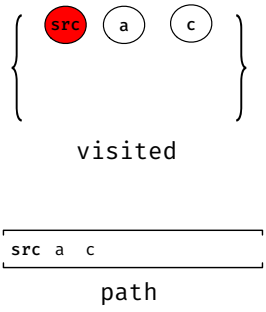


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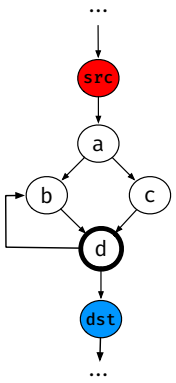

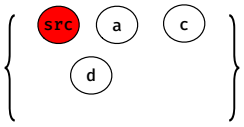

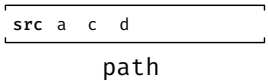


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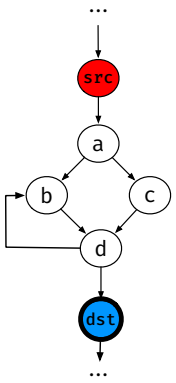

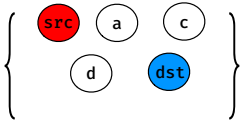

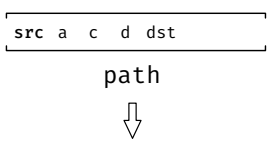


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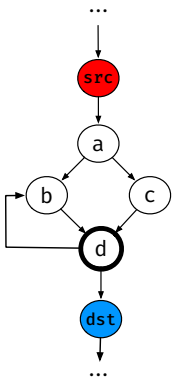

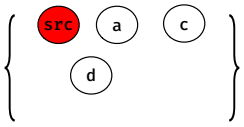

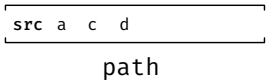


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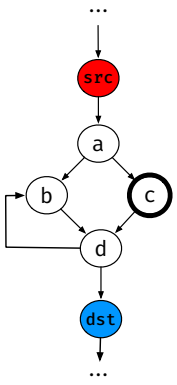

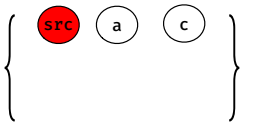

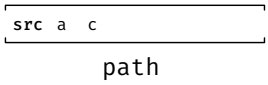


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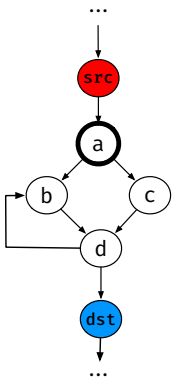

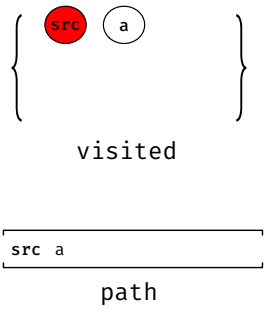


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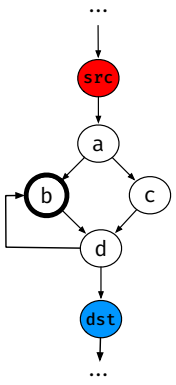

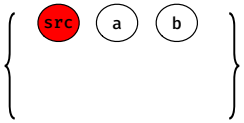

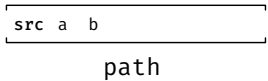


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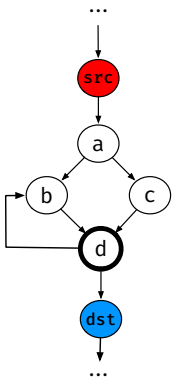

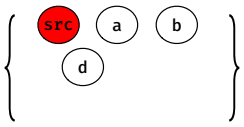

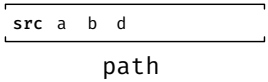


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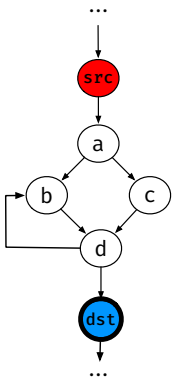

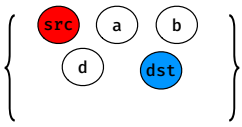

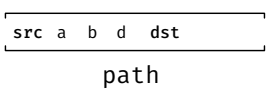


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