Assignment 1

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Assignment 1: Quizzes + A Coding Task

- Two sets of quizzes (15 ponts)
  - Basic C++ syntax,
  - Pointers, references and containers
  - C++ inheritance and data structures.
- One coding task (10 ponts)
  - Practicing C++ graph traversal algorithm
  - A warm up coding task for later assignments.

All the above quizzes and coding task is due by **23rd August**. You are encouraged to finish the quizzes before starting your coding task.

Assignment 1: C++ Coding Task

Graph Traversal

- You will be using what you have learned to build a C++ program.
- **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.
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Depth First Search (DFS)

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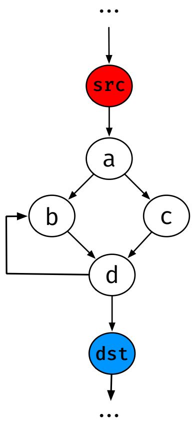
Why DFS?

- 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.

Assignment 1: C++ Coding Task

Graph Traversal

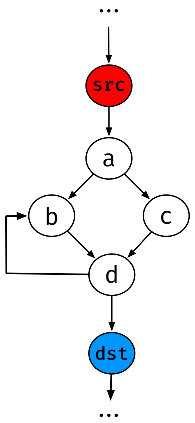


Given a source node `src` and a destination node `dst` on a graph

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

Assignment 1: C++ Coding Task

Graph Traversal



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Answer:

- (1) Yes.

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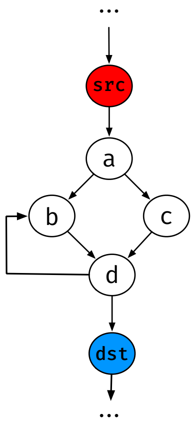

Given a source node `src` and a destination node `dst` on a graph

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

Answer:

- (1) Yes.
- (2) All possible paths:
  - src $\rightarrow$ a $\rightarrow$ b $\rightarrow$ d $\rightarrow$ dst
  - src $\rightarrow$ a $\rightarrow$ c $\rightarrow$ d $\rightarrow$ dst
  - src $\rightarrow$ a $\rightarrow$ b $\rightarrow$ d $\rightarrow$ b $\rightarrow$ d $\rightarrow$ dst
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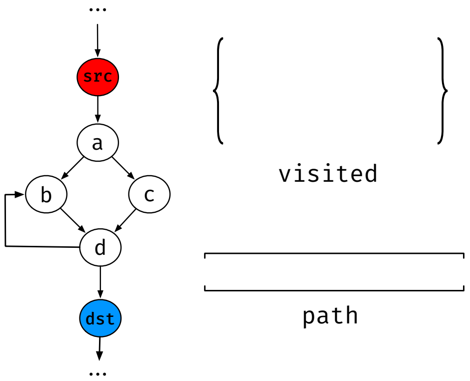
Assignment 1: C++ Coding Task

DFS algorithm and an example



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

DFS(visited, path, src, dst)
  visited.insert(src);
  path.push_back(src);
  if src == dst then
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  foreach edge e ∈ outEdges(src) do
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Assignment 1: C++ Coding Task

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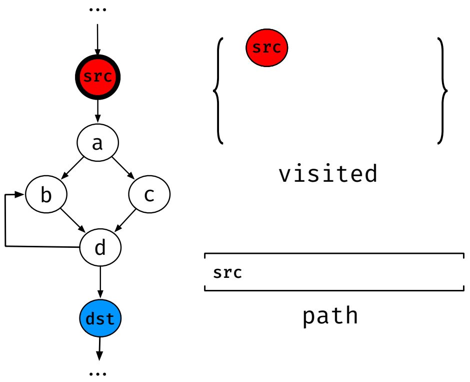

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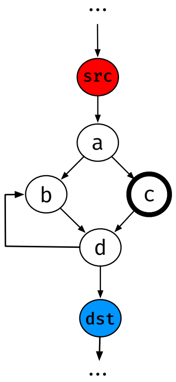

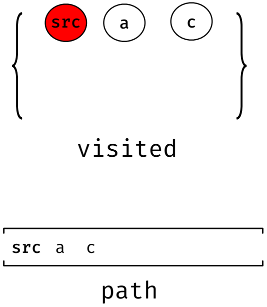

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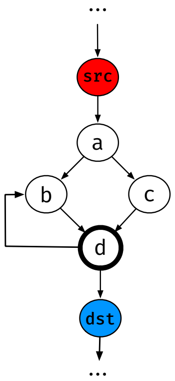

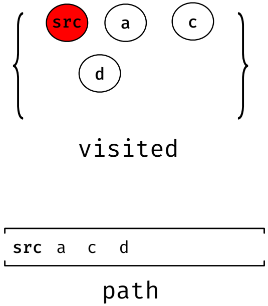

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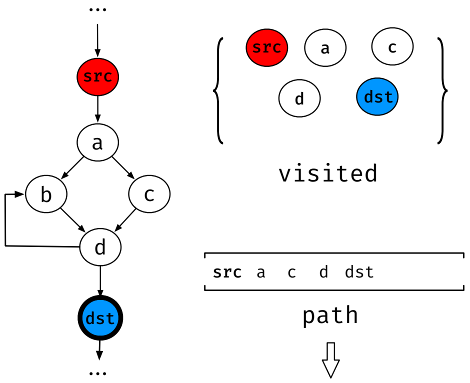

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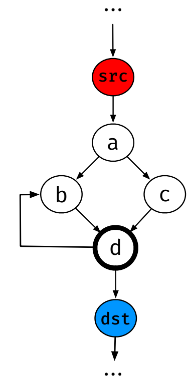

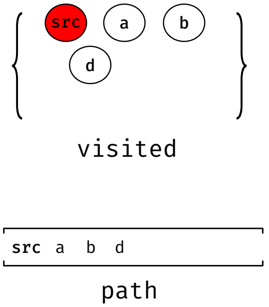

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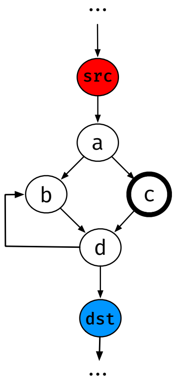

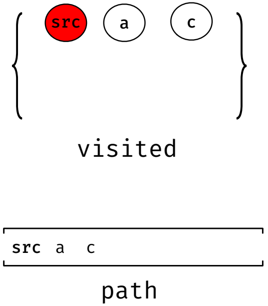

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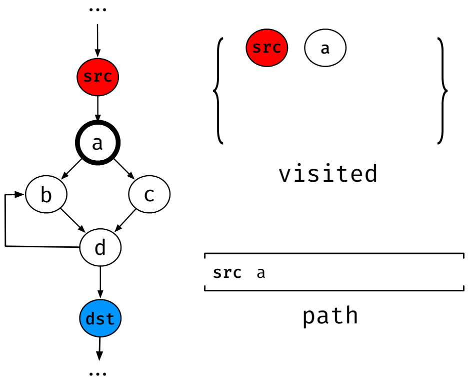

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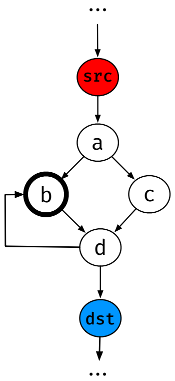

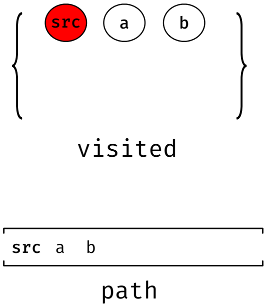

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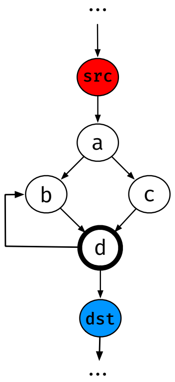

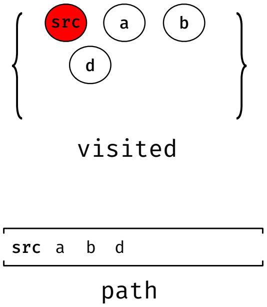

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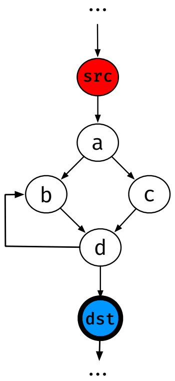

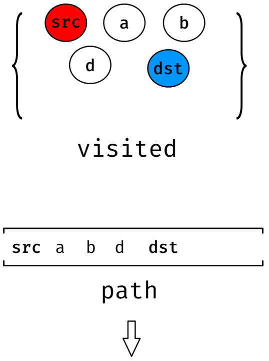

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