Week 2-3 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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- **Specification and code template**:
  https://github.com/SVF-tools/SVF-Teaching/wiki/Assignment-1

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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)
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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: A C++ Programming Practice
Graph Traversal

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

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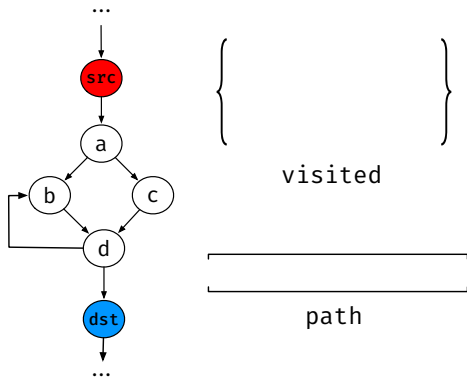- (2) if so, what are the possible paths from `src` to `dst` along the graph?

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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?

Answer:

- (1) Yes.

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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?

Answer:

- (1) Yes.
- (2) All possible paths:
    - `src` → a → b → d → `dst`
    - `src` → a → c → d → `dst`
    - `src` → a → b → d → b → d → `dst`
    - `src` → a → b → d → b → d → . . . `dst`

Assignment 1: A C++ Programming Practice
DFS algorithm and an example


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

DFS(visited, path, src, dst)
1   visited ← visited ∪ {src};
2   path.push_back(src);
3   if src = dst then
4     Print path; //Print node seq of current path
5   foreach edge e ∈ outEdges(src) do
6     if (e.dst ∉ visited)
7         DFS(visited, path, e.dst, dst);
8   visited.erase(src);
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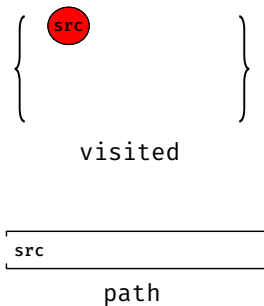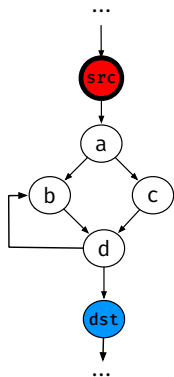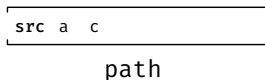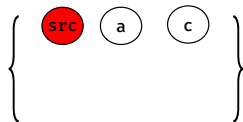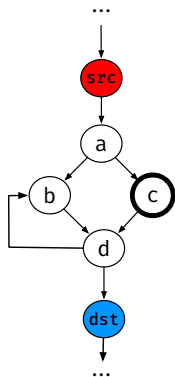
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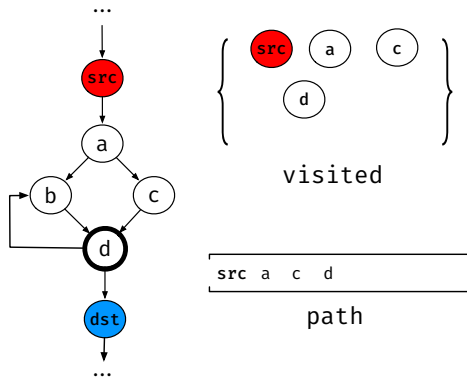
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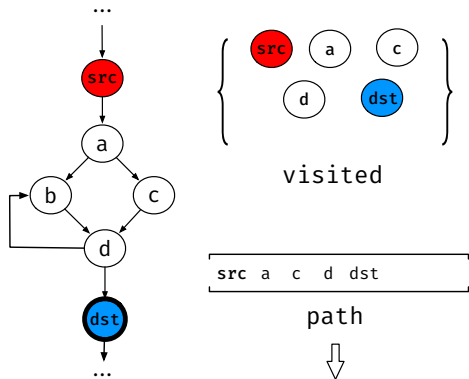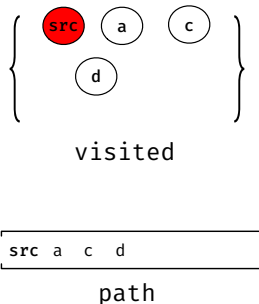
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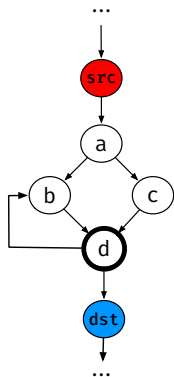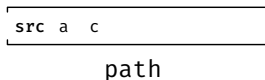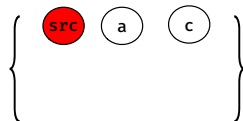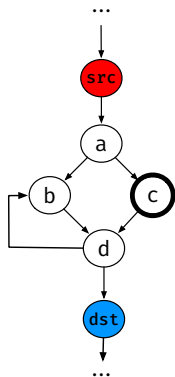
OUTPUT<src→ a→ c → d → dst>

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DFS algorithm and an example

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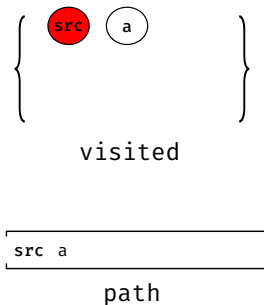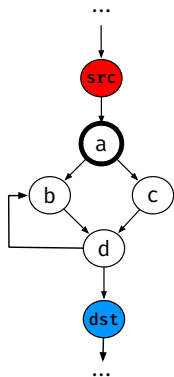


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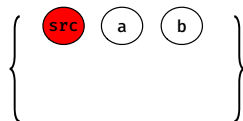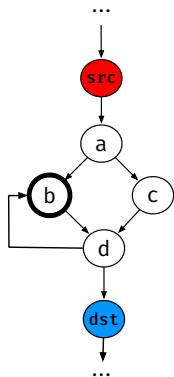
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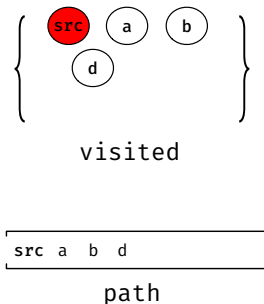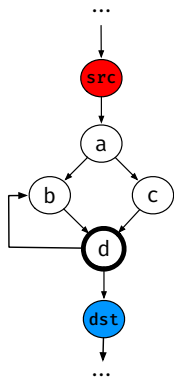
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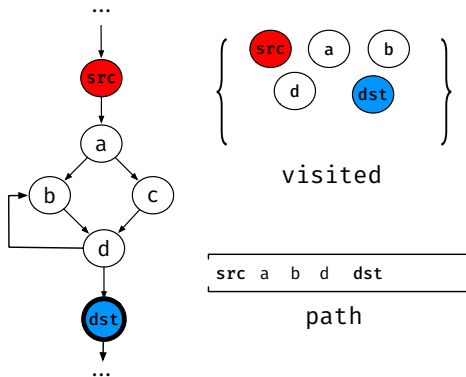**DFS algorithm and an example**


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