Synchronous single initiator spanning tree algorithm using flooding

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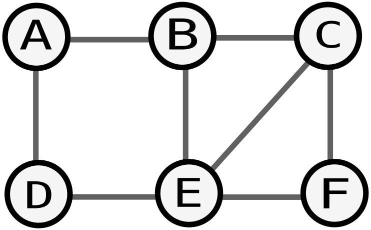
Introduction

- We use BFS to compute a spanning tree of a graph.

Example



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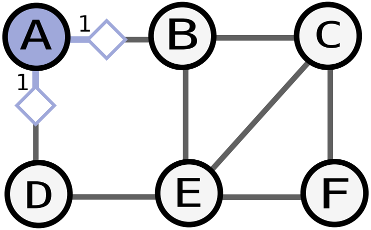

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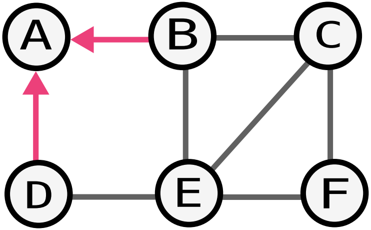

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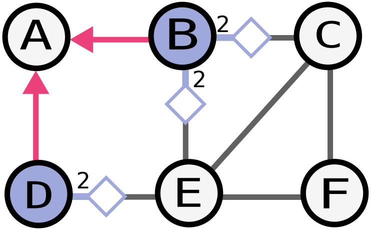

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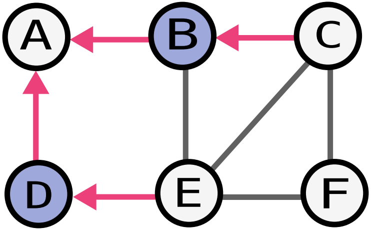

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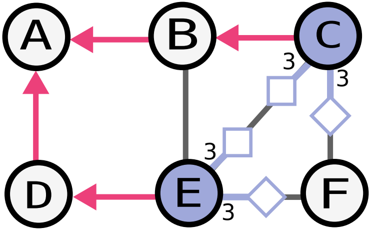

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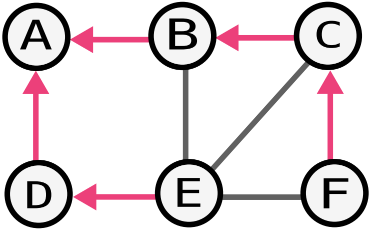

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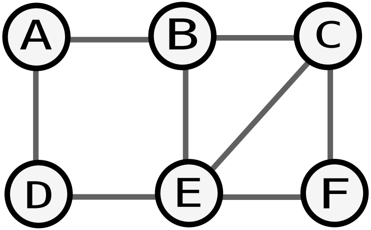

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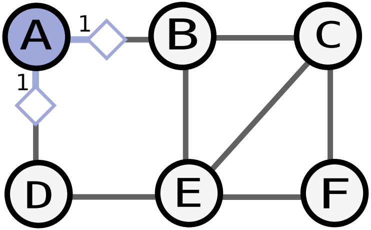

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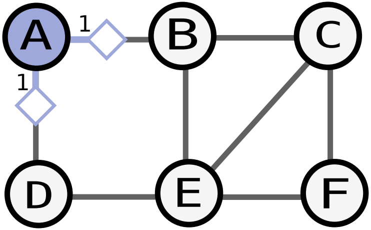

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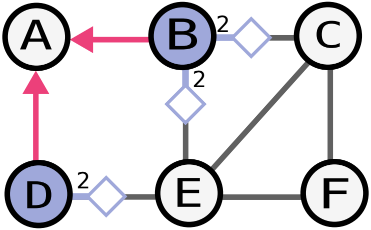

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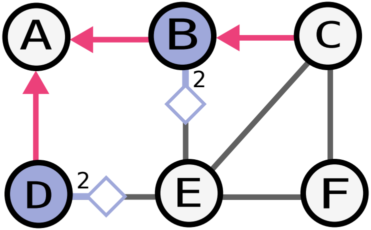

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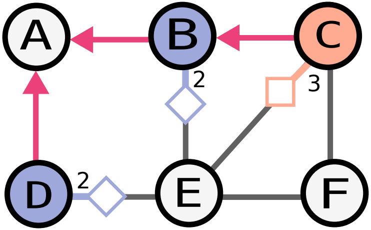

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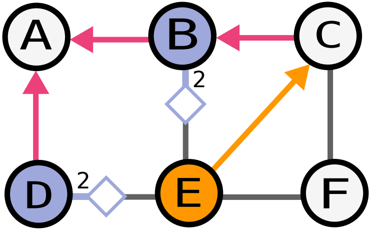

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      if self.queries: # if we have a query
        # randomly choose from queries
        parent = random.choice(self.query)
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        # randomly choose from queries
        parent = random.choice(self.query)
        self.visited = True
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        # synchronous
        for n in self.neighbours: n.send(self.id)
    self.queries = [];
```

Synchronous BFS (Ending earlier if visited)

```
def bfs_spanning_tree(self):

  if self.id == ROOT_ID:
    self.depth = 0;
    for n in self.neighbours: n.send(self.id)

    return # early-exit for root node

  for round in range(1, DIAMETER+1):

      if self.queries: # if we have a query
        # randomly choose from queries
        parent = random.choice(self.query)
        self.visited = True
        self.depth = round

        # synchronous
        for n in self.neighbours: n.send(self.id)

        return # early-exit for child
```

Synchronous BFS (Learning children)

- Assume root begins computation.
- Algorithm is synchronous.

```
def bfs_spanning_tree(self):
  if self.id == ROOT_ID:
    self.visited = True; self.depth = 0;
    for n in self.neighbours: n.send(self.id)
  for round in range(1, DIAMETER+1):
    if self.visited: # if visited, wait for children
      for q in self.queries: self.children.append(q)
    else: # if not visited, run code
      if self.queries: # if we have a query
        # randomly choose from queries
        parent = random.choice(self.query)
        self.visited = True
        self.depth = round
        # synchronous
        for n in self.neighbours: n.send(self.id)
        parent.send(self.id) # send to parent
    self.queries = [];
```

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- 1 or 2 messages / edge. Message complexity $\leq 2|E|$.

Thank you!

Asynchronous Bounded Delay Network

- All processes have physical clocks: **need not be synchronized**.
- Message delivery time is bounded by constant $\mu \in \mathbb{R}$.

ABD Synchronizers: Bounded Delay $\rightarrow$ Synchronized

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Key idea

Chunk "real time" into units of μ. Each μ block of time behaves like a logical synchronized tick!