

Distributed deadlock detection algorithms can be divided into four classes:

- path-pushing
- edge-chasing
- diffusion computation
- global state detection.

Path-Pushing Algorithms

- In path-pushing algorithms, distributed deadlocks are detected by maintaining an explicit global WFG.
- The basic idea is to build a global WFG for each site of the distributed system.
- In this class of algorithms, at each site whenever deadlock computation is performed, it sends its local WFG to all the neighboring sites.
- After the local data structure of each site is updated, this updated WFG is then passed along to other sites, and the procedure is repeated until some site has a sufficiently complete picture of the global state to announce deadlock or to establish that no deadlocks are present.
- This feature of sending around the paths of global WFG has led to the term path-pushing algorithms.

Edge-Chasing Algorithms

- In an edge-chasing algorithm, the presence of a cycle in a distributed graph structure is verified by propagating special messages called probes, along the edges of the graph.
- These probe messages are different than the request and reply messages.
- The formation of cycle can be deleted by a site if it receives the matching probe sent by it previously.
- Whenever a process that is executing receives a probe message, it discards this message and continues.
- Only blocked processes propagate probe messages along their outgoing edges.
- Main advantage of edge-chasing algorithms is that probes are fixed size messages which is normally very short.

Diffusing Computations Based Algorithms

- In *diffusion computation* based distributed deadlock detection algorithms, deadlock detection computation is diffused through the WFG of the system.
- These algorithms make use of echo algorithms to detect deadlocks.
- This computation is superimposed on the underlying distributed computation. If this computation terminates, the initiator declares a deadlock.
- To detect a deadlock, a process sends out query messages along all the outgoing edges in the WFG.
- These queries are successively propagated (i.e., diffused) through the edges of the WFG.

- When a blocked process receives first query message for a particular deadlock detection initiation, it does not send a reply message until it has received a reply message for every query it sent.
- For all subsequent queries for this deadlock detection initiation, it immediately sends back a reply message.
- The initiator of a deadlock detection detects a deadlock when it receives reply for every query it had sent out.

Global State Detection Based Algorithms

- Global state detection based deadlock detection algorithms exploit the following facts:
 - 1 A consistent snapshot of a distributed system can be obtained without freezing the underlying computation and
 - 2 If a stable property holds in the system before the snapshot collection is initiated, this property will still hold in the snapshot.
- Therefore, distributed deadlocks can be detected by taking a snapshot of the system and examining it for the condition of a deadlock.