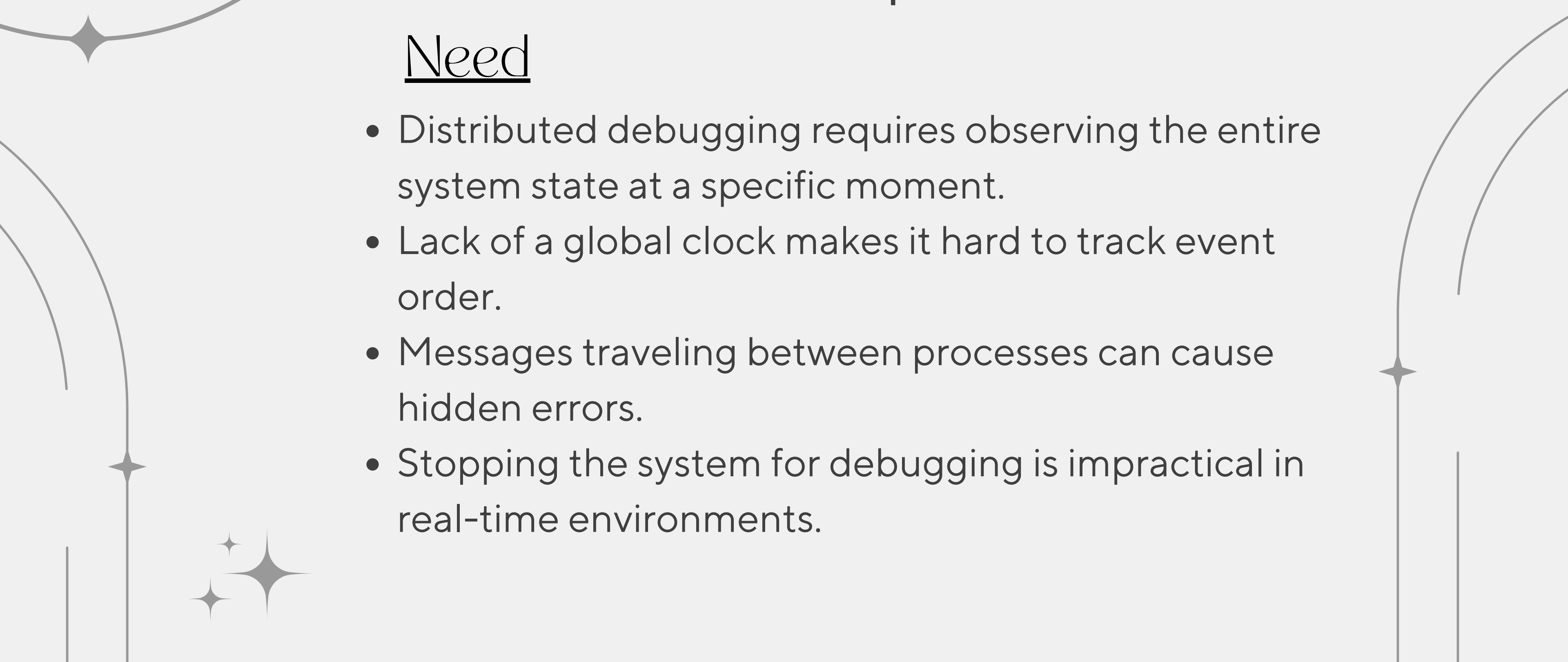


Chandy Lamport Algorithm



Need and Importance

Need

- Distributed debugging requires observing the entire system state at a specific moment.
 - Lack of a global clock makes it hard to track event order.
 - Messages traveling between processes can cause hidden errors.
 - Stopping the system for debugging is impractical in real-time environments.
- 



Importance

- Captures a consistent global snapshot without interrupting execution.
- Helps identify deadlocks, race conditions, message loss, and inconsistent states.
- Provides an accurate view of process and channel states.
- Improves reliability and simplifies debugging in complex distributed systems.

Algorithm

Marker Sending Rule for process i

- ➊ Process i records its state.
- ➋ For each outgoing channel C on which a marker has not been sent, i sends a marker along C before i sends further messages along C .

Marker Receiving Rule for process j

On receiving a marker along channel C :

if j has not recorded its state **then**

Record the state of C as the empty set

Follow the “Marker Sending Rule”

else

Record the state of C as the set of messages received along C after j 's state was recorded and before j received the marker along C



Real-Time Applications

- Monitoring system behavior during execution
- Detecting deadlocks and synchronization problems
- Analyzing message flow between processes
- Creating checkpoints for failure analysis
- Debugging large-scale systems like cloud platforms and microservices



Requirements to Implement

- Multiple processes communicating via message passing
- Reliable FIFO channels to maintain message order
- Ability to record local process states
- Mechanism to send and receive marker messages
- Storage to save snapshot data for later debugging
- Tools to reconstruct and analyze the global state

The background is a light gray color. It features several decorative elements: thin, dark gray lines forming arcs and straight segments, and small, dark gray starburst or spark-like shapes. These elements are positioned in the corners and along the edges, creating a subtle, elegant frame around the central text.

Thank You