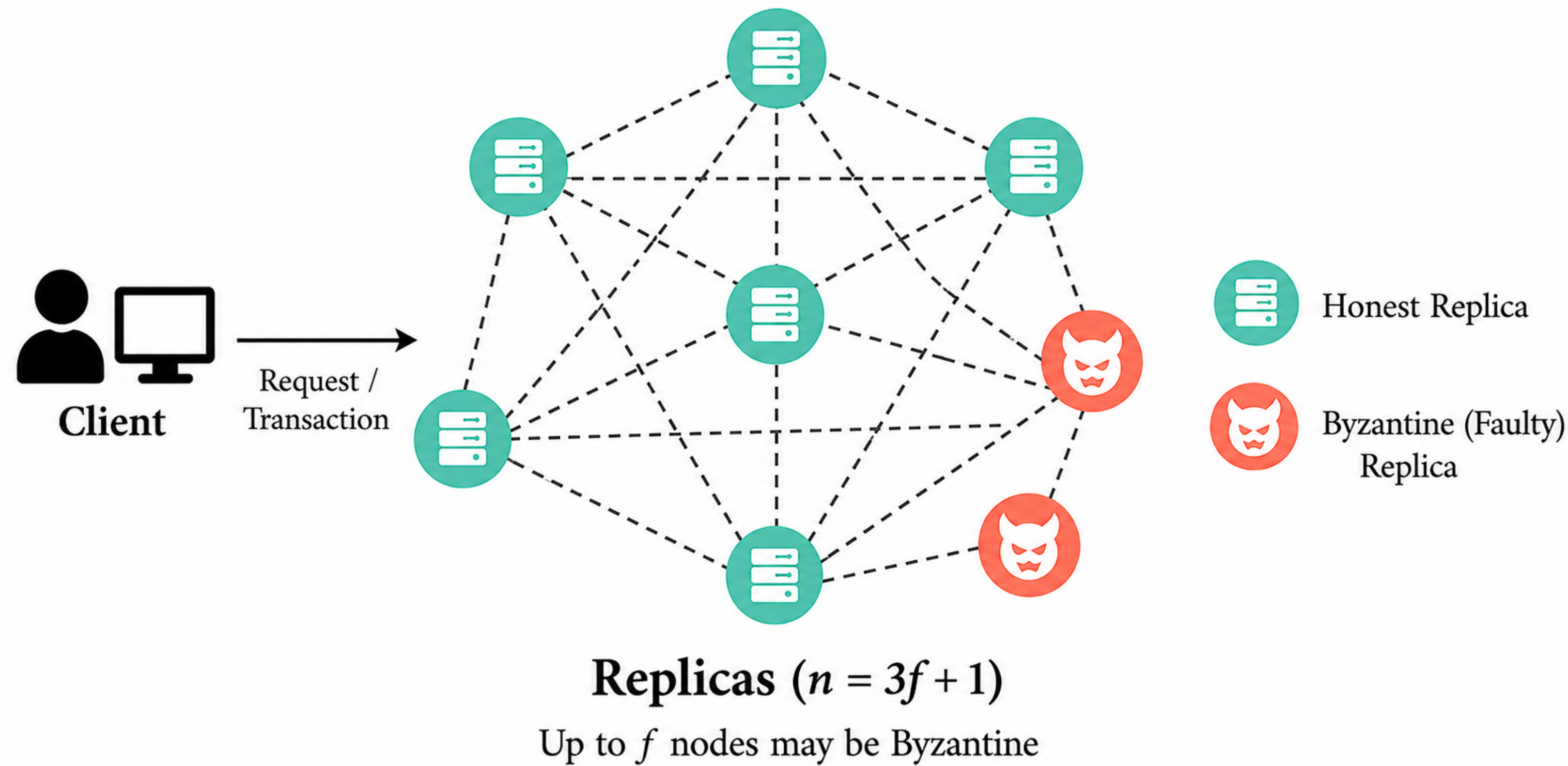


HYDRA: Breaking the Global Ordering Barrier in Multi-BFT Consensus

Background: BFT Consensus

- BFT consensus** allows replicas to reach agreement despite malicious replicas.

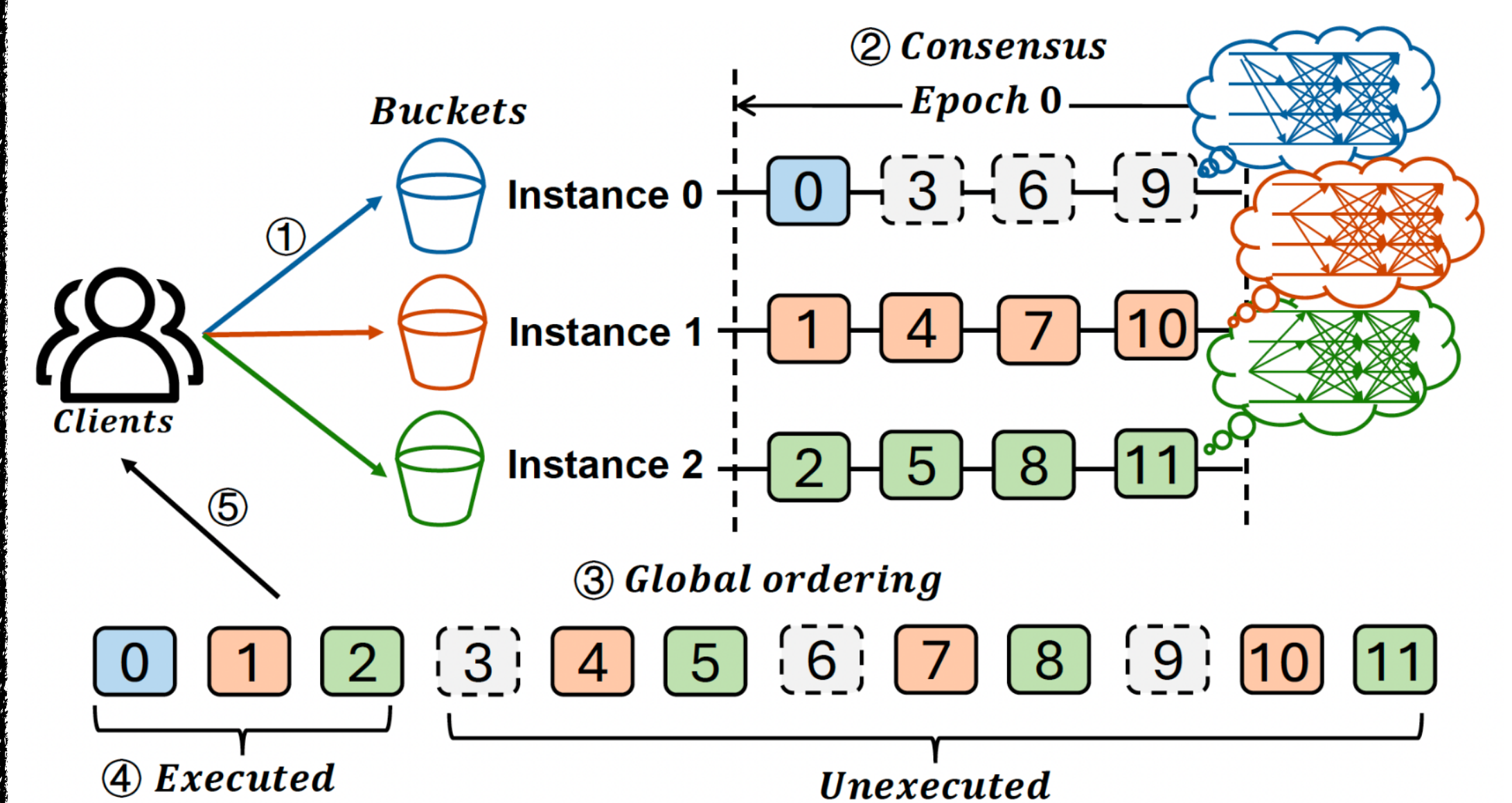


- Traditional Leader-Based BFT consensus relies a single Leader to drive the progress, suffering from **Leader Bottleneck**.
- Multi-BFT** allows multiple leaders operate concurrently to improve scalability.

Motivations: Global Ordering Bottleneck in Multi-BFT

- Global ordering couples all instances:** one straggler can stall the system.
- Double serialization:** transactions are serialized both in ordering and execution.

Missing one index -> Whole progress stall!



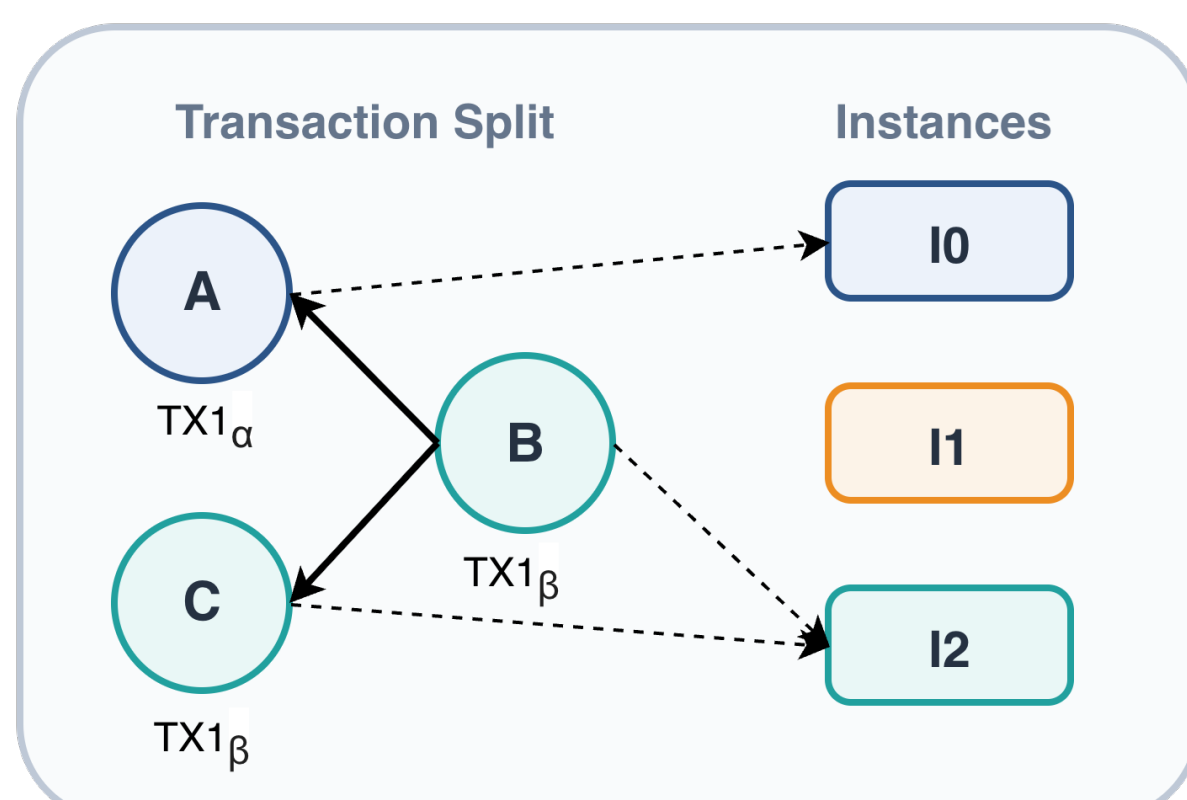
Architecture of Hydra

Key Insight:

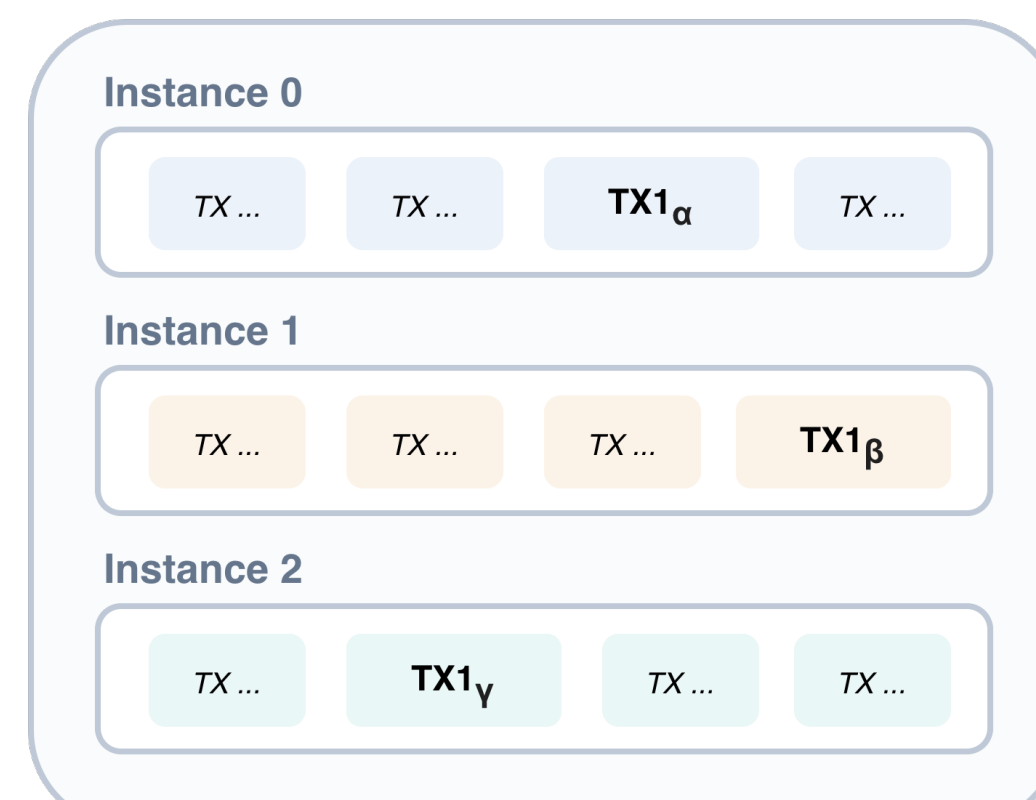
Multi-BFT consensus **does not need a Global Order** for all transactions.
Only **per-object deterministic ordering** is required.

Workflow:

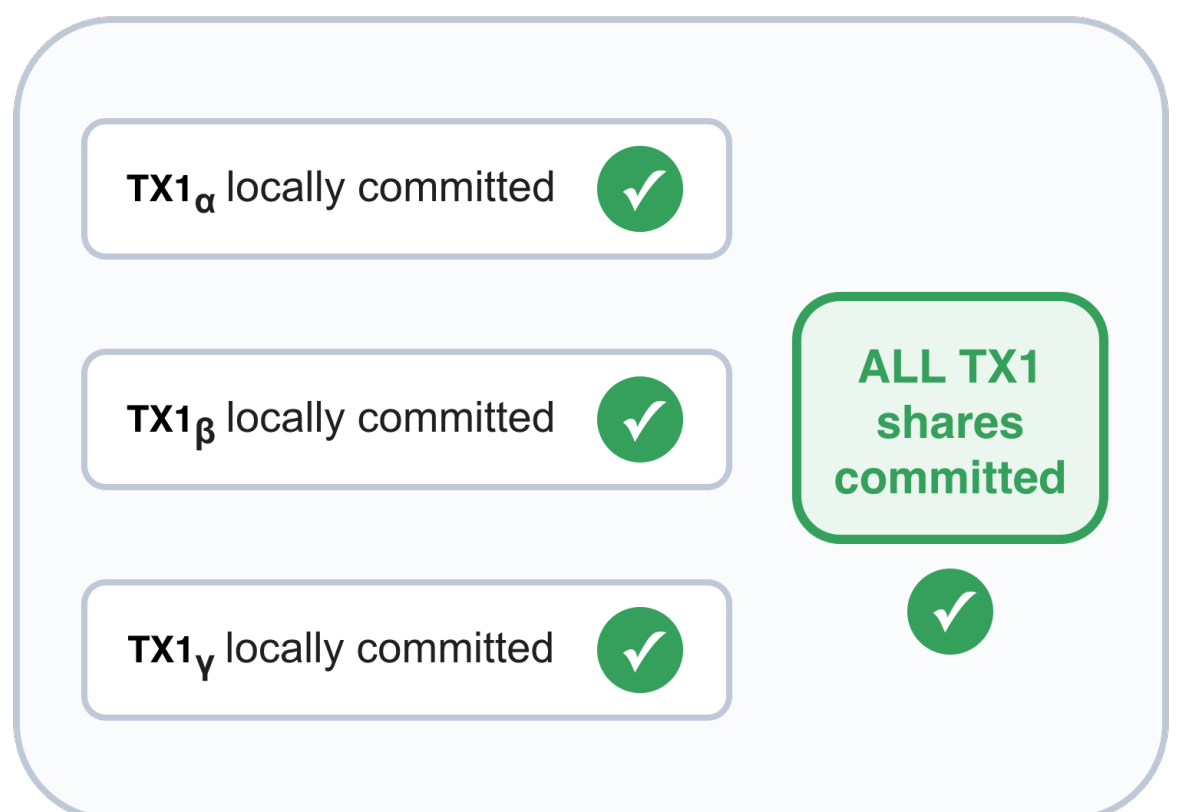
1. TX Partition by Objects:



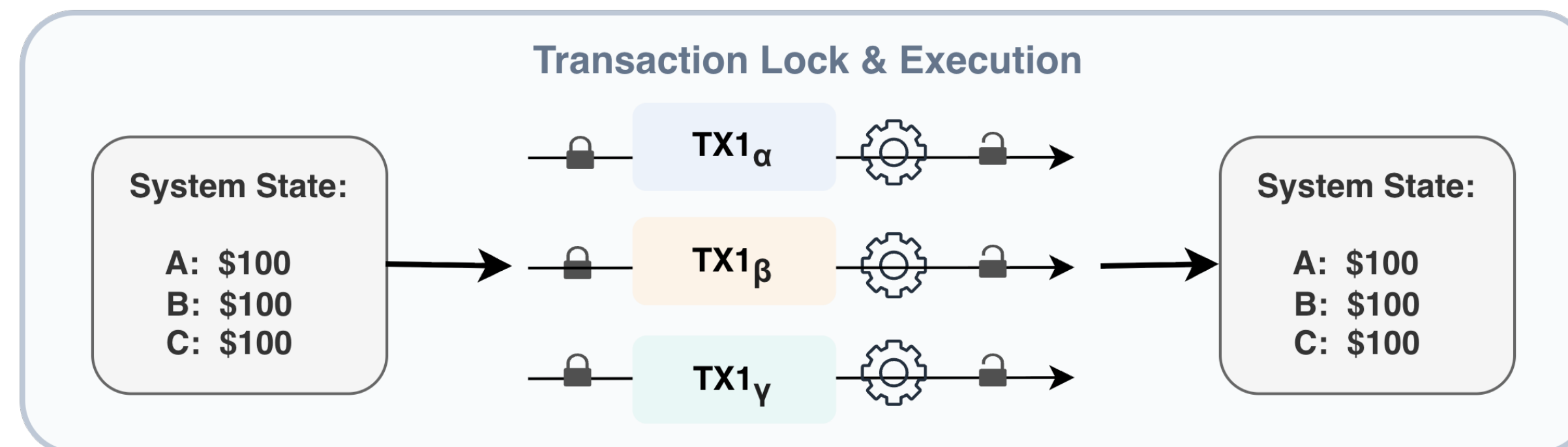
2. Order Locally per Instance:



3. Confirm TXs:



4. Lock & Execute Atomically:

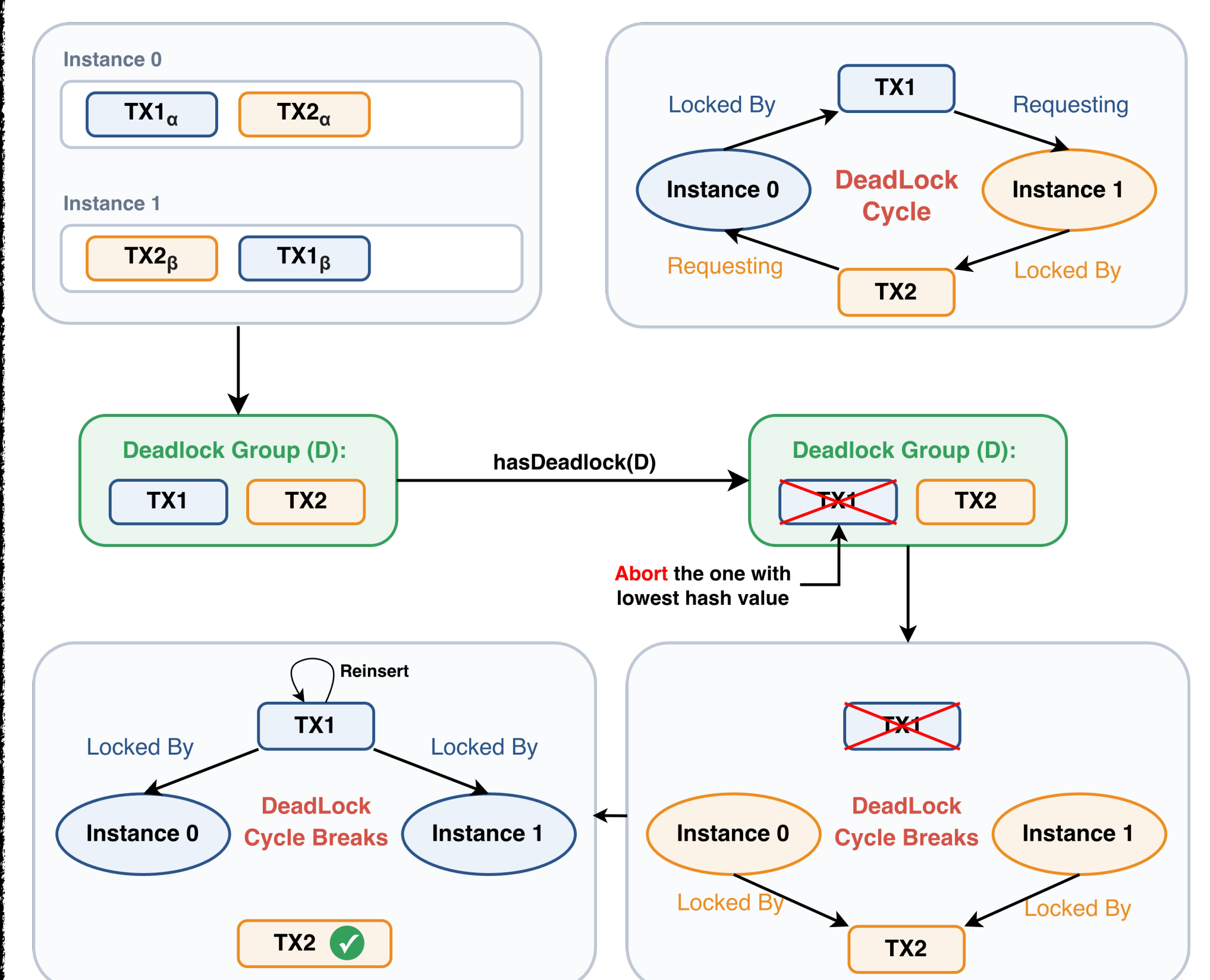


Deadlock Resolution

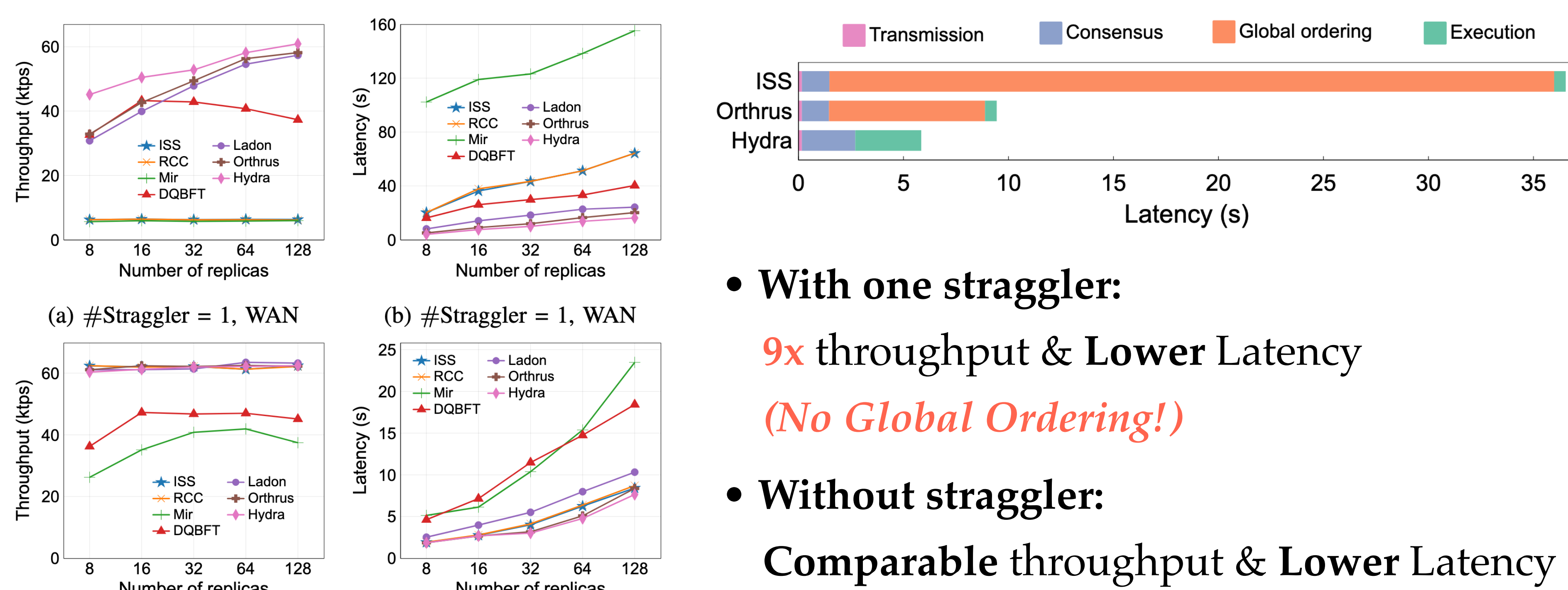
- TX1 and TX2 access A and B in opposite local orders, creating a cyclic wait.
- Build a **Deadlock Group (D)** from ordering conflicts, then deterministically abort and reinsert victim TX(s).

Workflow:

Local Orders Conflict → Wait Cycle → Deterministic Victim Abort → Reinsert



Performance Evaluation



Key Takeaway

- No Global Ordering!**
The first concurrent consensus *without Global Ordering Barrier*.
- Atomic Local Execution.**
Adopts an *object-centric* execution model and allow atomic local execution within instances.