

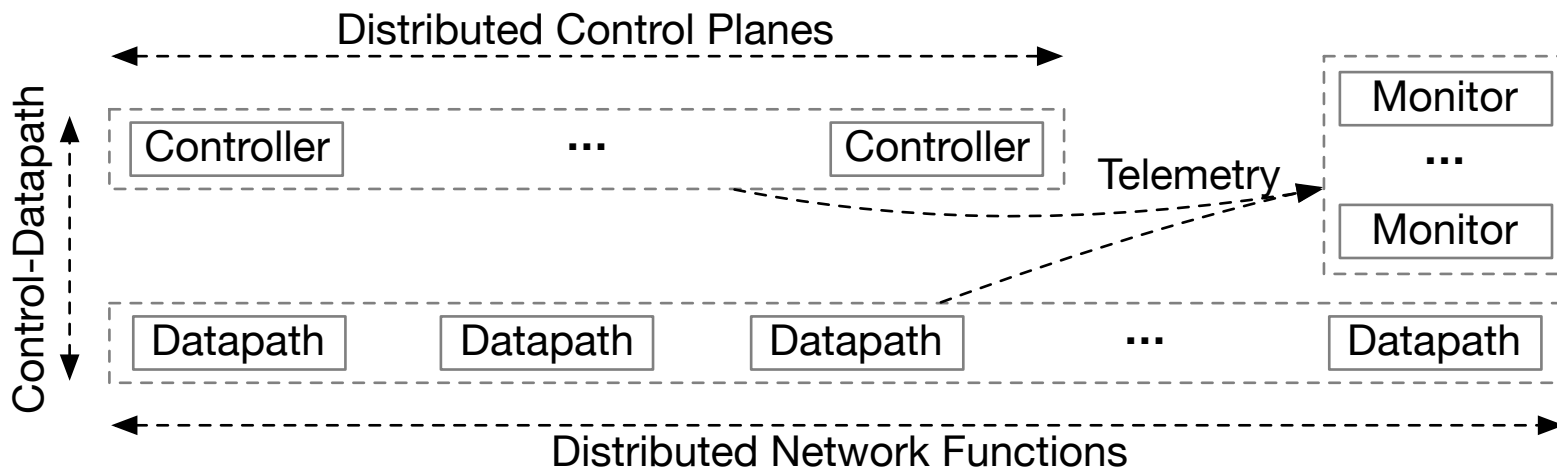
# *Networking Needs a State Management Abstraction*

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# Network Apps: Dist. of Compute & State



Clean modularity to make state available where needed.

# Why a General State Mgmt. Abstraction?

Network apps architects: Focus on logic/compute.

Researchers: Develop better state mgmt. mechanism.

Operators: Interface to inform apps of net. resource constraints.

# Do We Need a New Abstraction?

Net. apps have stringent availability and performance reqs.

- Calls for a high degree of replication.

Fast path and slow path distinction.

- Adding existing tech. to slow path addresses half of the problem.
- How to efficiently make state available to the fast path?

# Desirable Properties

Direct update (decouple app and state sync process)

Isolate app state from concurrent updates (avoid fine-grained sync.)

Update atomicity (simplify correctness)

Minimize staleness (faster convergence/policy compliance)

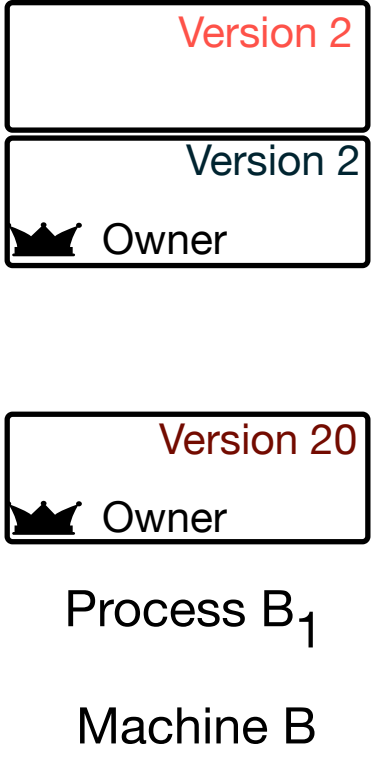
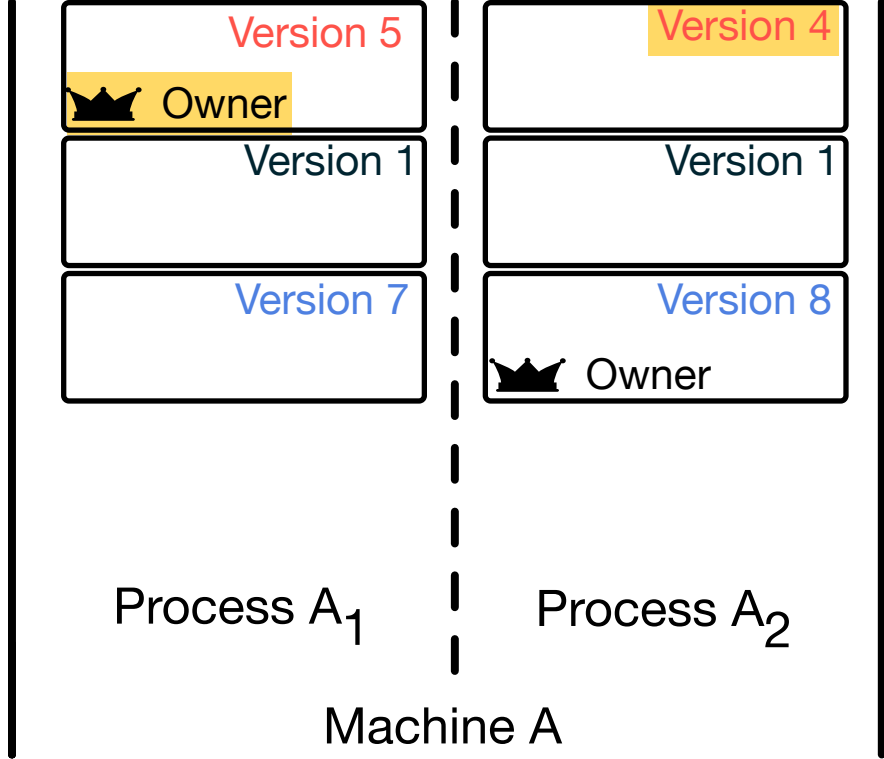
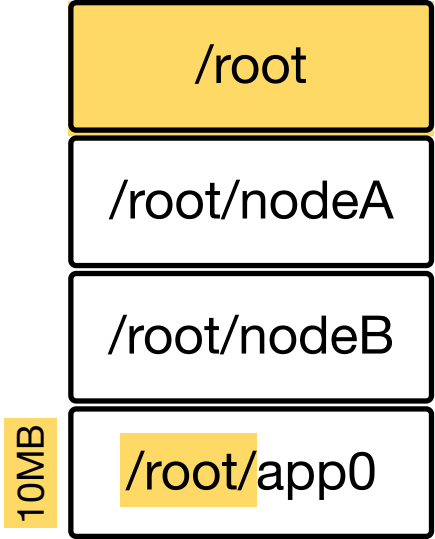
Explicit state ownership (enable conflict-free updates)

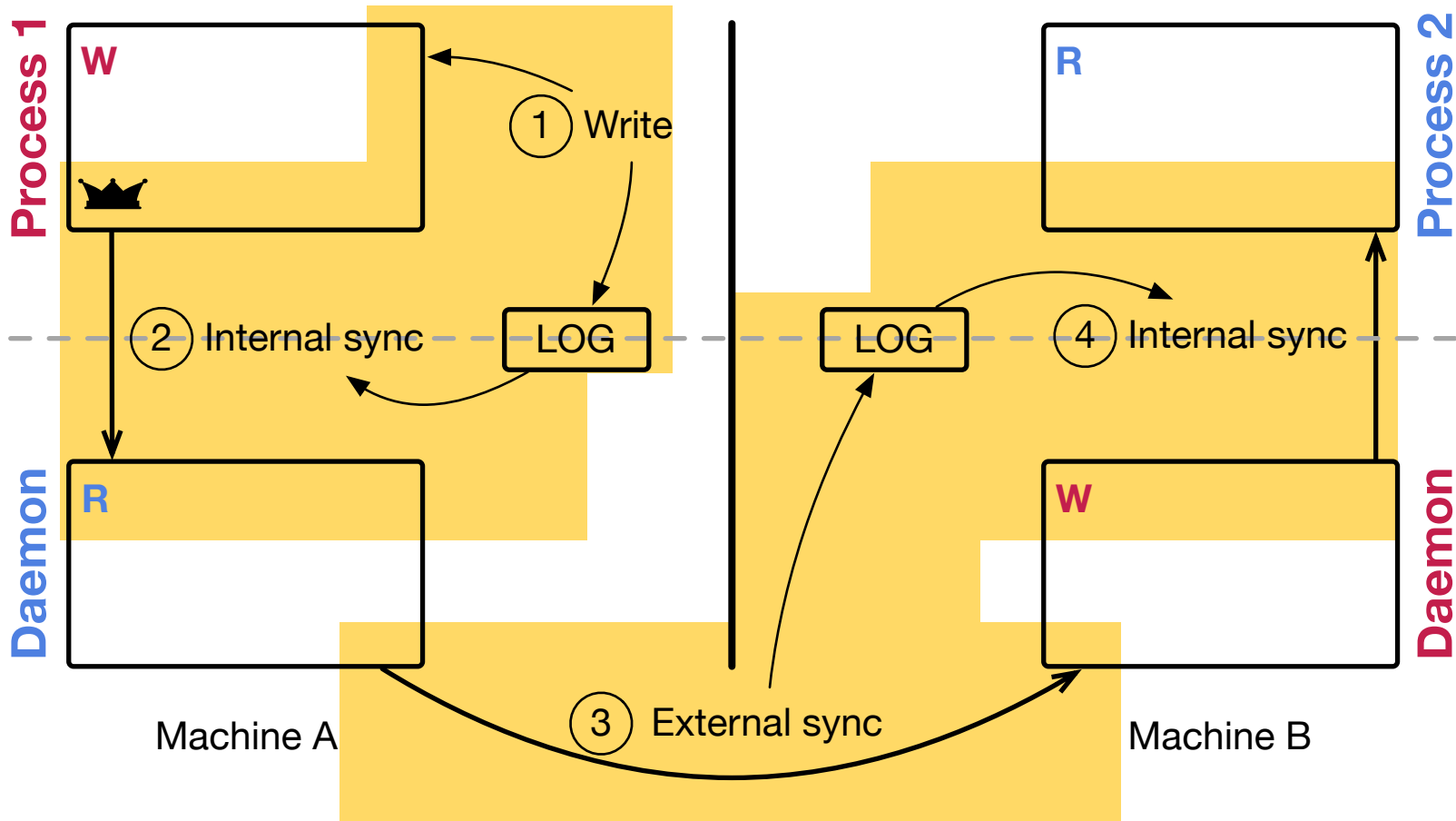
Selective state membership (enable scoping for app. scalability)

Explicit state hierarchy (simplify fault tolerance and scalability)

# *Tasvir*: Versioned Distributed Shared Memory

with explicit user-controlled synchronization







# Programming Model

Organize state in ***single-writer memory regions***.

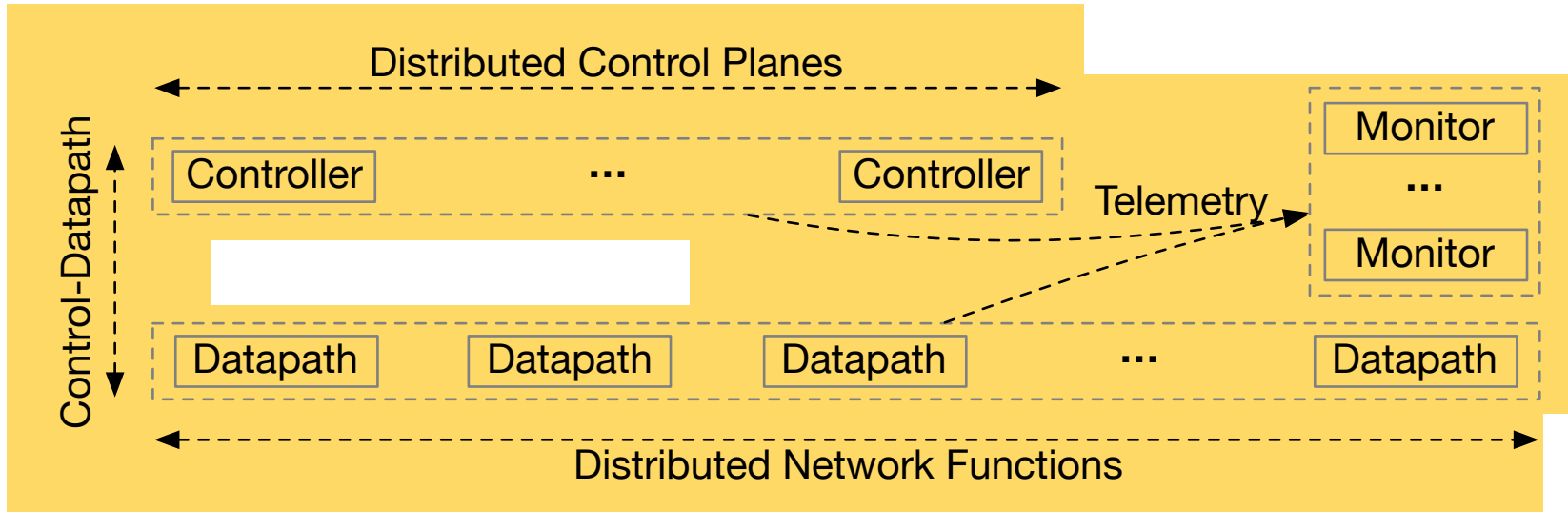
- Aggregate state locally (flat combining, state CRDT, ...).

Use ***local state*** (possibly-stale).

Specify internal & external ***synchronization frequency***.

***Frequently check-in*** for internal synchronization (10 $\mu$ s intervals).

# Applies Broadly to Networks



# Concluding Remarks

Our attempt to make *fast networking easy* for *state replication*.

- Possible to specialize for new tech & architectures.

Can benefit similar general distributed systems.

- Distributed optimization, distributed data stores, etc.

<https://github.com/tootoonchian/tasvir>