

Norm-Conformant Data Exchange Between Distributed Agents

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Context: Organizations are eager to come together to share and exchange data and compute resources.



Problem: It is difficult to exchange data while preserving relevant norms such as EU regulations and access control policies.



Solution: Build an infrastructure for generic data exchange, programmable with norm specifications to be automatically enforced.

My Contribution



Context: Work exists to formally specify norms, and to drive conformant execution given a specification.

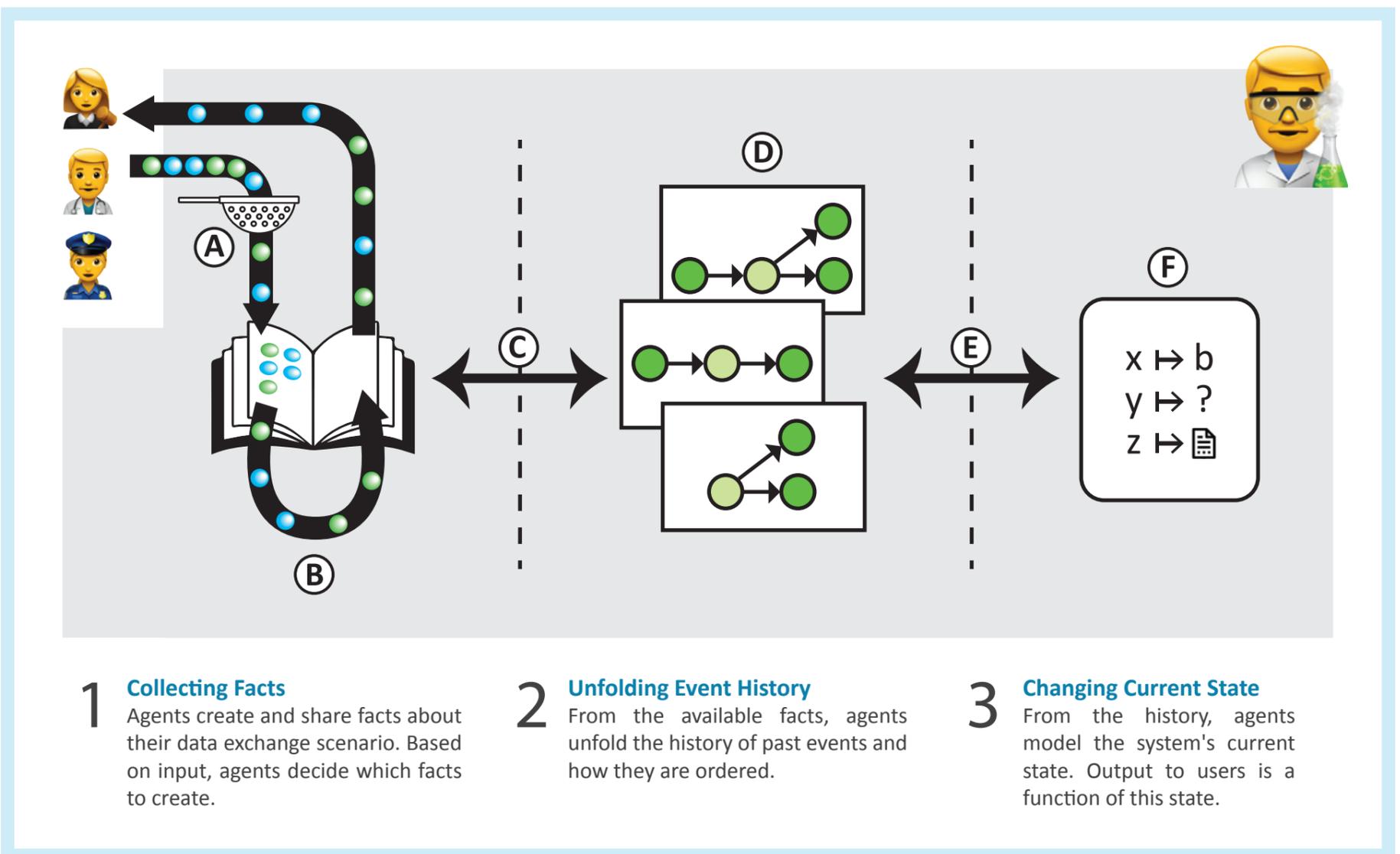


Problem: Existing work encourages centralized design, emphasizing consistency over agent autonomy, which does not suit all use cases.



Solution: We develop a formalism and prototype which enables balancing consistency and autonomy as best suits the use case.

Agent-Local Execution



Related Work

Agents accept facts from peers, but only if they conform to the **static specification**, e.g., they are appropriately **cryptographically signed**.

(A)

(B)

Facts are created via **inference** based on **multi-modal logics** such as **epistemic logic** and **fluent calculus**.

Event histories are unfolded, but only those that preserve **static safety** properties, defined offline via **model checking**. These choices determine the balance between inter-agent **consistency, autonomy and trust**.

(D)

Events are partially chronologically ordered, much like tasks in **computational workflows**, encouraging **parallelism** in computing the current state.

(C)

The system state is modeled by two abstractions interfaced by unfolding graphs of immutable events, much like the unfolding chains of immutable transaction blocks in **blockchains**.

(F)

Manual and **automated monitoring** of the facts, histories, and state incentivize agents to play by the rules.

(E)

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