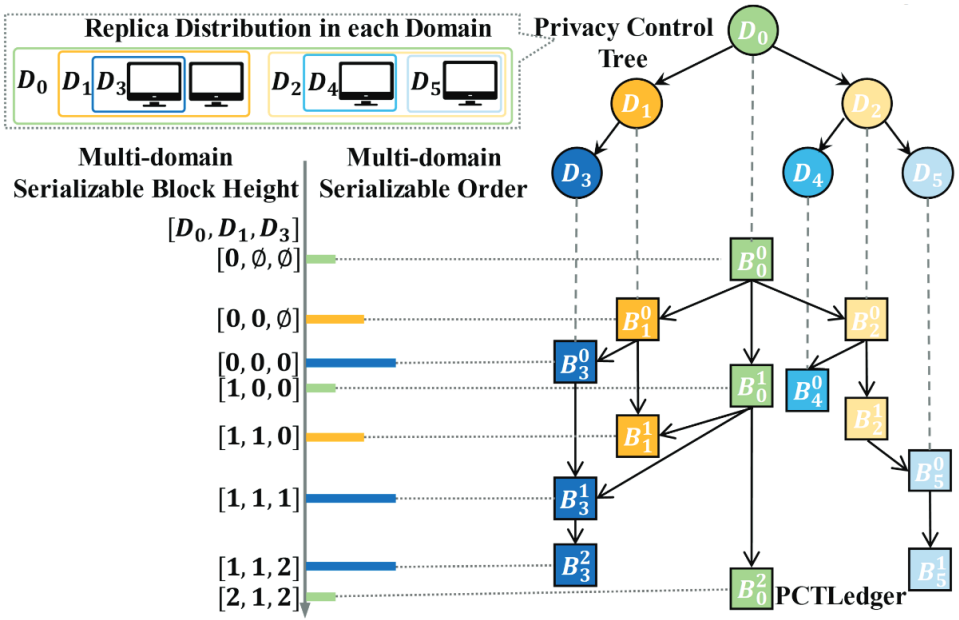
PCTLedger: A Privacy Control Tree-Based Blockchain Ledger for Multi-Enterprise Collaboration

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Problems & Ideas

- Problems of privacy control in multi-enterprise collaboration:
  - Existing works adopt a two-layer privacy model, which is insufficient for multi-level privacy requirements in practice.
  - Existing works support only simple privacy control and limited data-sharing.
- Ideas: PCTLedger organizes privacy domains as a privacy control tree, where each node maintains a subchain and deeper domains correspond to higher privacy levels. PCTLedger employs an on-chain/off-chain hybrid data-sharing mechanism based on the common ancestor domain of the participating domains.



The privacy level of D3 is higher than that of D1. D4 and D5 share data in their common ancestor domain D2. Similarly, D3, D4, and D5 share data in domain D0.

Main Contributions

- Contributions:
  - A privacy control tree-based blockchain ledger with an on-chain/off-chain hybrid multi-domain data-sharing mechanism leveraging the common ancestor domain, enabling multi-level privacy control and authenticated cross-domain sharing.
  - A deterministic concurrency control mechanism based on the dangerous structures to ensure intra-domain data consistency and cross-domain transaction serializability.
  - A hybrid serial–parallel commit mechanism to reduce waiting time among multiple domains during the commitment.

