# High Performance Database Replication for Storage Area Networks

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Background

- **High availability** of data has become crucial for the dependability of many applications and services.

- A **replicated database** replicates data in several locations to **increase data availability** and **scalability**.

- **Replication protocols** coordinate the execution of transactions on a replicated DB and the propagation of changes.
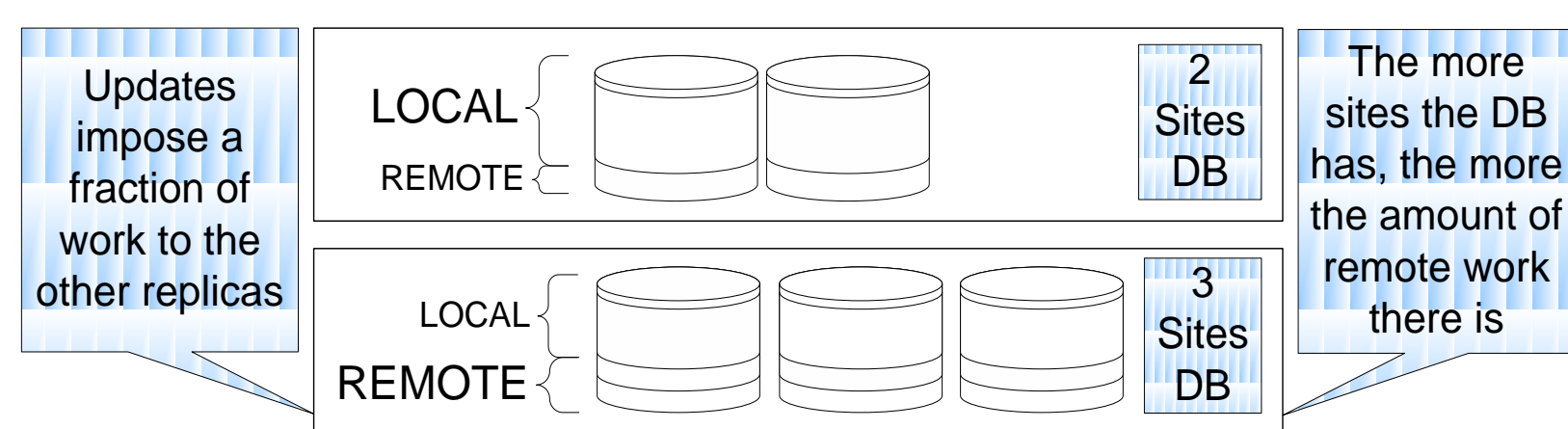
REPLICATION PROTOCOLS TAXONOMY:
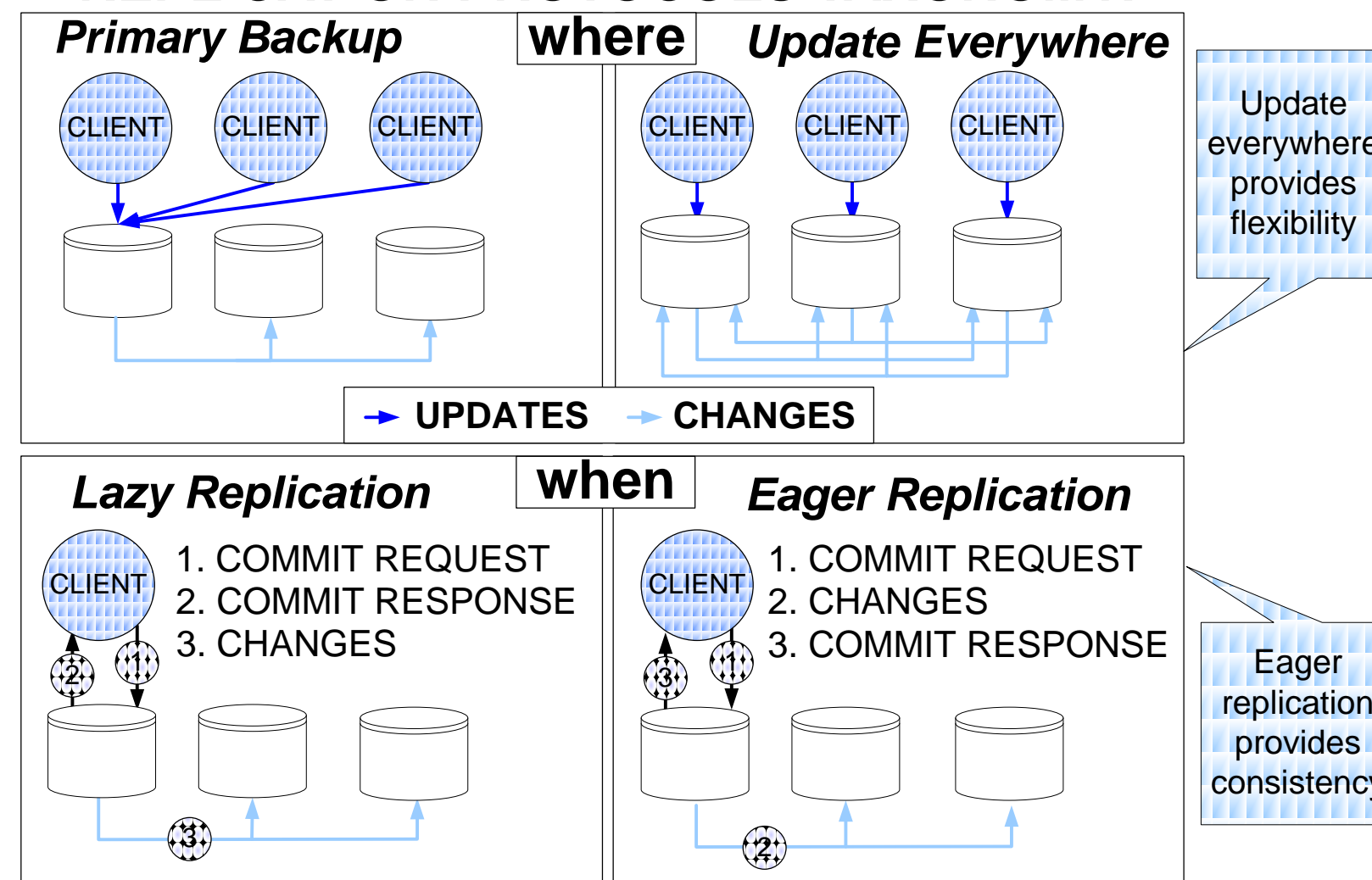
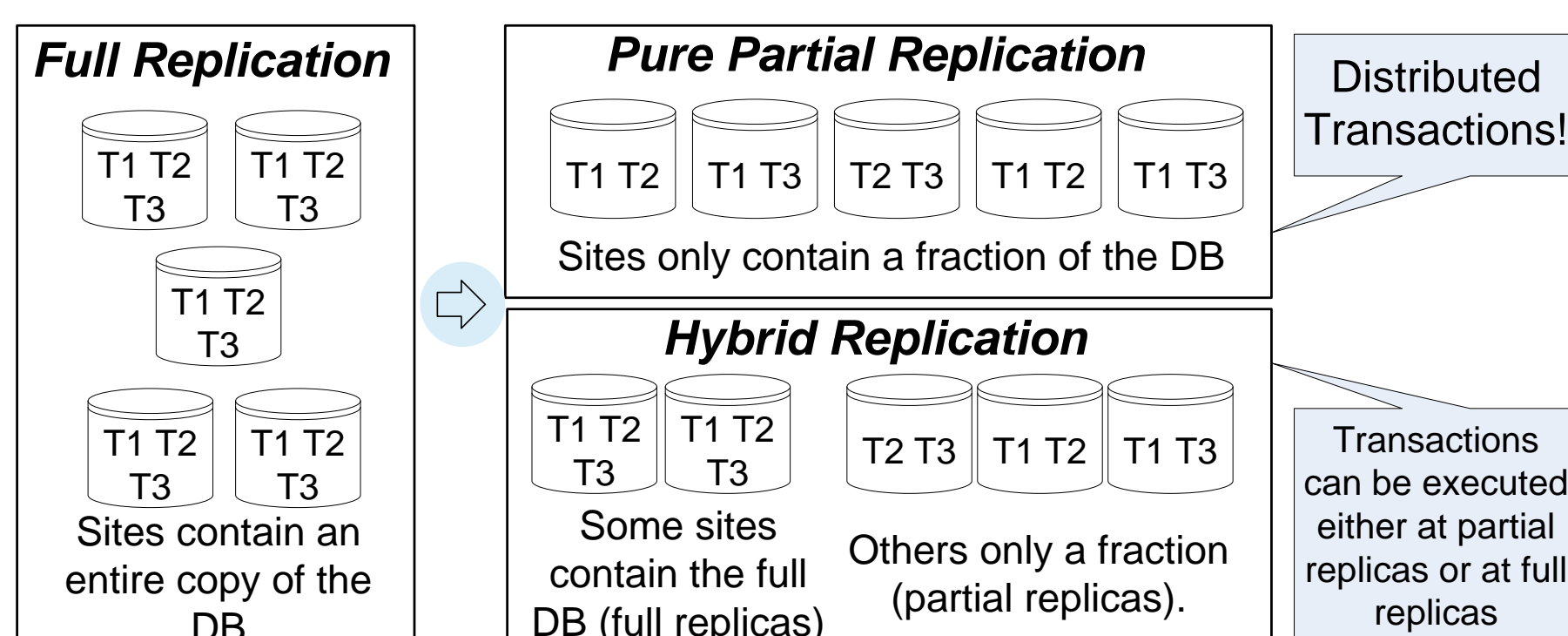- Database **replication protocols attain a medium scalability** (20-30 replicas) with **eager full replication**.

Full Replication

Sites contain an entire copy of the DB
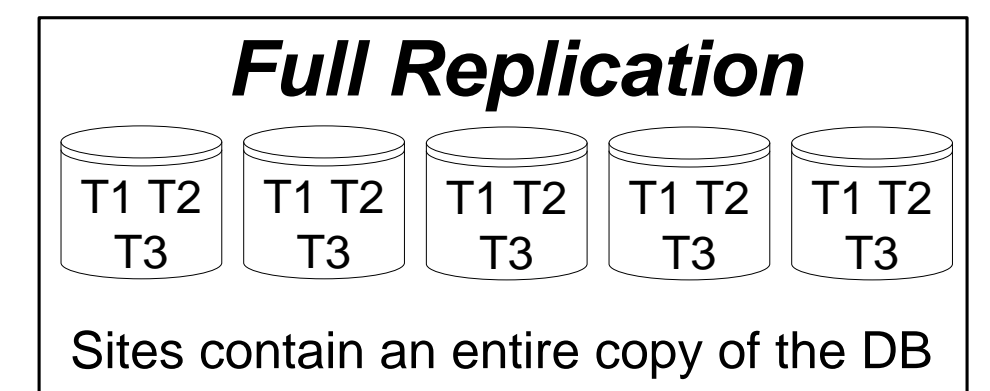
Current Status

- **Full replication** does **not scale** beyond certain limits and is **inappropriate** for **large scale** systems:

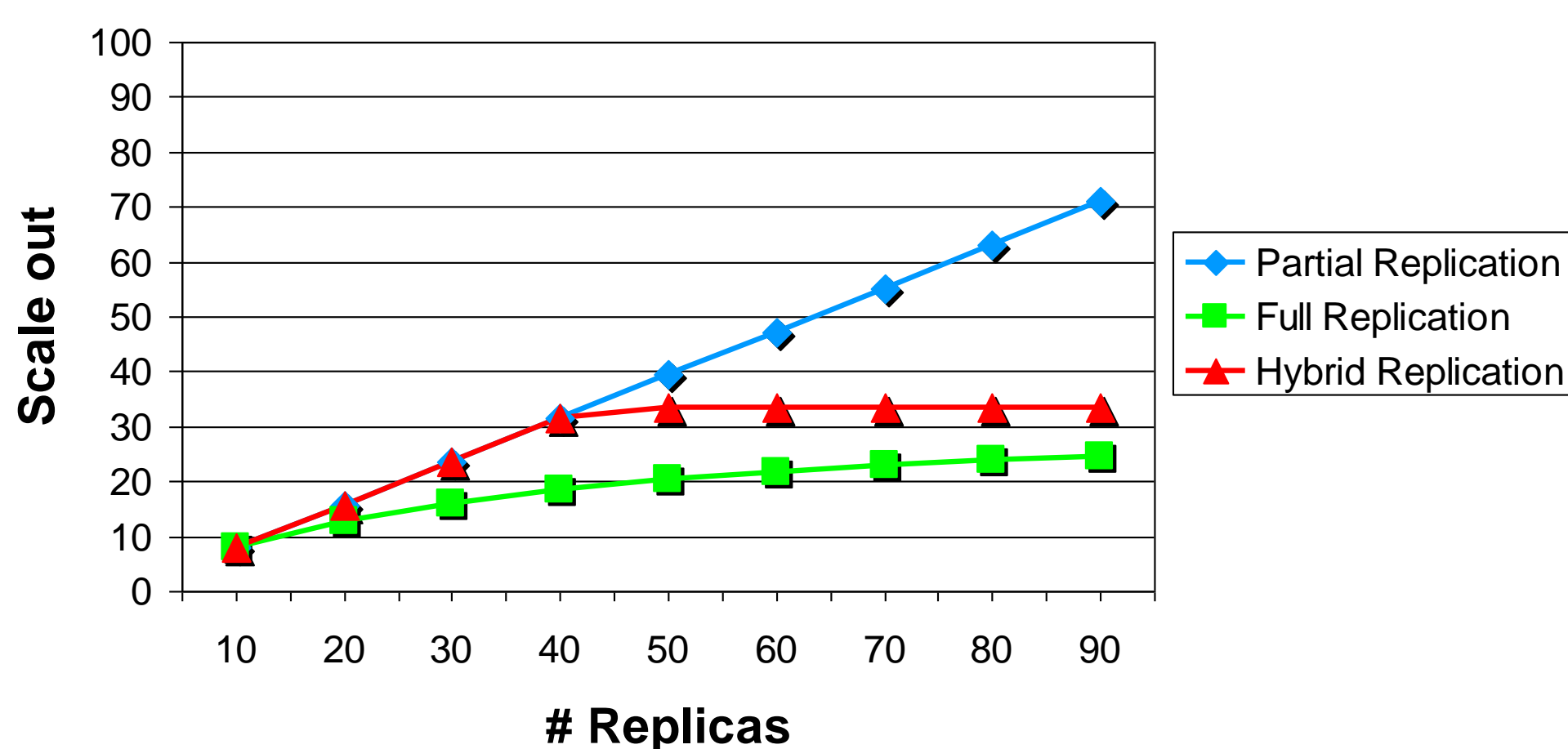- Full replication performance is bounded by the amount of remote work to be done.

First Stage

- **From full replication to partial replication:**

This PhD will

- **explore** partial replication as one additional mechanism to **overcome the scalability** ceiling of current approaches.

- **exploit** new correctness criteria such as 1-copy snapshot isolation to **enhance scalability**.

- **build** a highly scalable replicated database upon **SANs** (low latency and cards that execute firmware to offload protocol processing from the host)

- **develop** autonomic reconfiguration and optimisation techniques to **maximise performance**.

Analytical Model

- An analytical model for the **scale out** of **hybrid** and **pure partial** replication has been developed.

- The **scale out** measures how **many times** the **throughput** of a non-replicated site is **increased** by the replicated system.

- The scale out is modelled as:
  – An equation system.
  – An linear program that **maximizes** the scale out.

Analytical Results

Scale Out

Preliminary Conclusions

- Partial replication increases scalability.

- With pure partial data replication the scale out **only depends** on the **number of replicas**.

- **Hybrid** partial replication **scales slightly** better than full replication.

PhD Timeline

Analytical model + a pure partial replicated database	Improving partial replication taking advantages of SANs	Providing self-adaptation features for partial replication over SANs

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