

# Replication and Consistency in Mobile Environments

## Definitions

- **Connectivity**: the ability to establish a connection between two devices;
  - **Intermittent connectivity**: the connection is not always available;
  - **Disconnection**: the connection is lost;
  - **Weak connectivity**: the connection is slow or unstable;
- **Item**: a piece of data that can be replicated - named by some form of global unique identifier;
- **Collection**: a set of items;
- **Replica**: a copy of an item;
  - **Full replica**: a replica that contains all items in the collection;
  - **Partial replica**: a replica that contains only some items in the collection;
- **CRUD operations**: create, read, update, delete.

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## Data Consistency

- **Strong consistency**: identical behavior as a non-replicated system;
  - A read operation returns the most recent write;

Requirement	Remote Access	Device-Master	Peer-to-Peer	Pub-Sub
Continuous Connectivity	Yes	No	No	No
Update anywhere	No	Yes	Yes	No
Consistency	No	Yes	Yes	Yes
Topology Independence	No	No	Yes	No
Conflict Handling	No	Yes	Yes	No
Partial Replication	No	Yes	Yes	Yes

- Requires **substantial coordination** between replicas, which is not compatible with intermittent connectivity;
- **Weak consistency**: allows replicas to diverge temporarily;
  - **Eventual consistency**: replicas will converge if no new updates are made;
  - **Causal consistency**: preserves causality between updates;
- **Session consistency**: provides a **user** with a view of the data that is consistent with the **user's updates**;
  - **Read your writes**: a user sees updates made by the user;
  - **Monotonic reads**: a user sees updates in the order they were made;
  - **Writes follow reads**: updates are made after reads on which they depend;
  - **Monotonic writes**: updates are made in the order they were requested;