

# Unit 3

## Reasons for Replication

- Reliability
  - Replica crash.
  - Data corruption.
- Performance
  - Scaling w.r.t. size. Many processes accessing data on a single server.
  - Scaling w.r.t. geography. Keeping a copy of data at a data centre close to the process reduces access time.

## Replica Management

- 2 problems
  - Placement of replica servers
    - In the past, one could be concerned by where to place an individual server.
    - Now, due to the presence of lots of data centres, this is more of a management and commercial issue.
  - Placement of content
    - Three kinds of replicas
      - Permanent
        - Initial set of replicas. Small in number.
        - Distribution is of 2 types.
          - When replicas are at a single location, requests are forwarded to replicas using a round-robin strategy.
          - Else, replicas are copied to “mirror sites”, which are geographically spread over the world. Requests are sent to the closest mirror.
      - Server-initiated
        - Copies of a data store.
        - Exist to enhance performance.
      - Client-initiated
        - Commonly known as client caches.
        - Local storage facility used to temporarily store a copy of data.
        - Managing cache is left to the client.
        - Data store may inform client that cached data has become stale.

## Failure Masking and Replication

- Process replication
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## Consistency Protocols

### Failure Models

- Several classification schemes.
- Crash failure
  - Server halts, but was working correctly until it stopped.
- Omission failure
  - Server fails to respond to a request.
  - Receive-omission error
    - Server did not receive the request.
  - Send-omission error
    - Server fails to send a response.
- Timing failure
  - Response lies outside a specified real-time interval.
- Response failure
  - Server's response is incorrect.
- Value failure
  - The value of the response is wrong.
- State-transition failure
  - Server reacts unexpectedly to a request.
- Arbitrary failures
  - Most serious.
  - Also called Byzantine failures.
  - Server may produce arbitrary responses at arbitrary times.