Dynamic Data Replication and Consistency in Mobile Environments

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Overview

- Applications (Phone directory, Diary, Photo Album, etc.)
- Shared data, Available data ⇒ Data replication and consistency are necessary

⇒ An application must be adapted to each context
Problem background

- Fixed environment vs Mobile environment
- Data replication (nature of data, Context)

⇒ Data replication must be adapted to the change in context
Design and implementation of an adaptive data replication system that takes into account resource variability and data semantics in order to ensure:

- The data availability and the work in disconnected mode
- The data consistency
- An adaptive replication and consistency management
- A transparent management of data replication
- An optimal use of resources
Work directions

- An initial study to establish the state of the art of existing solutions for the data replication and consistency management
  - Existing replication techniques
  - Context-awareness works and context description approaches
  - Adaptation and dynamic reconfiguration mechanisms
- Proposition of a context-aware replication system
- Implementation and experiments
Outline of the talk

- The state of the art
- Our contribution
  - Execution context
  - Internal view of our replication system
    - Architecture of the system
    - Adaptation process
  - External view of our replication system
- Conclusion
- Future work
The state of the art (1)

Replication and consistency systems

- Fault-tolerant services [Coulouris et al.]
- Distributed databases [Gray et al.]
- Distributed files [Satyanarayanan et al.]
- Content delivery networks [Sivasubramanian et al.]

⇒ Replication system functionalities: creation, placement, read/write, consistency

- Their limitations in mobile environments
  - Nature of data
  - Context

⇒ Proposition of a context-aware replication system
The state of the art (2)
Context-awareness works [Dey et al.][Schmidt et al.]

⇒ Proposition of meta-models for context description
The state of the art (3)

Adaptation and reconfiguration mechanisms

- Adaptation and dynamic reconfiguration algorithms (policy choice algorithm [Capra et al., 2002], placement algorithm [Beloued et al.], ... etc.)

- Adaptation and dynamic reconfiguration infrastructures [Capra et al., 2003] [Ayed et al.], ... etc.

⇒ Identification of the necessary adaptation classes
Our Contribution (1)
Classification of context information [Beloued et al.]

- Required context
  - Data constraints
  - User preferences

- Provided context
  - Software properties
  - Hardware properties
  - Physical environment properties
  - User profile
Our Contribution (2)

Internal view of our replication system
Our Contribution (3)
External view of our replication system
Conclusion

- Architecture of the context-aware replication system
- Adaptation classes
- Necessary meta-models
Future work

- Strategy choice and consensus problem
- Context-aware creation and placement of replicas
- Context-aware localisation and consistency management of replicas
- Strategy reconfiguration and system consistency problem
- Replica placement, localisation and consistency reconfiguration
Questions
References (1)


References (2)


