

Application and Environment Requirements

Formal-language Requirements

Amadeo Ascó, Trifork

SyncFree: **W**ork **P**ackage **1**

M12

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What is it?

Work Package 1: Application and environment requirements

D1.1 [6 months] Natural-language requirements

D1.2 [18 months] Formal-language requirements



WP1 at M12

Mathematical notation

- Reasoning
 - Validation of the representation
- Verification
 - Constraints
 - Objectives
 - Properties
- Computation
- Dissemination



Mathematical notation

Difficult to get all in one mathematical notation



Mathematical notation

Constraints mathematical representation

Temporal Logic of Actions, TLA+

$$(VUW) \cap Q$$

$$A_{an} = \sum_{q \in N} B_{anq} + C_a$$

$$Spec == Init \wedge \Box [Next]_{-vars}$$

THEOREM $Spec \Rightarrow TypeInvariant \mid * \wedge Consistency *$



Mathematical notation

Temporal Logic of Actions, TLA+

- Based on the use of simple mathematics
- Well suited for concurrent and distributed systems
- Open-Source Project



Mathematical notation

Temporal Logic of **A**ctions, TLA+

- Parser and Syntax checker
- Model checker and Simulator, TLC
- Converter from TLA+ to LaTeX, TLATeX
- Other components



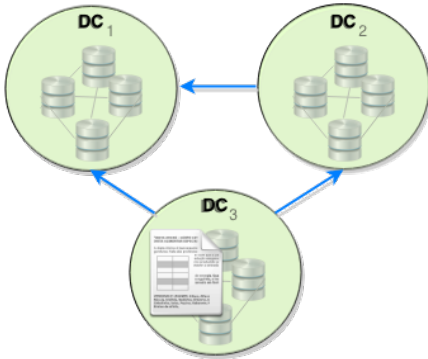
Adaptive Replication

Adaptive Location of Replicas

Partial Replication

Adaptive Location of Replicas

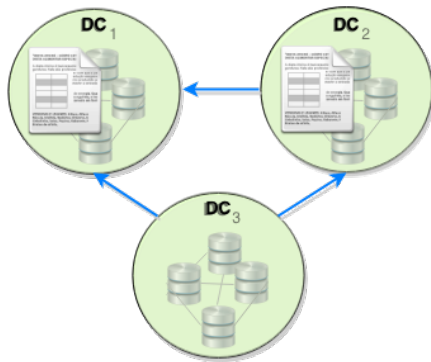
Do not replicate into all Data Centres (DC)



Adaptive Location of Replicas

Do not replicate into all Data Centres (DC)

Not necessarily only in one DC

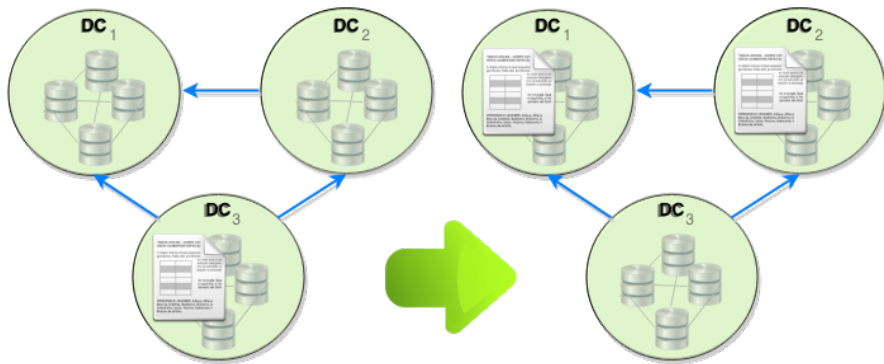


Adaptive Location of Replicas

Do not replicate into all Data Centres (DC)

Replica not necessarily only in one DC

Replicate where it is most advantageous





Adaptive Location of Replicas

Proposed an Ant Colony based algorithm

A simple Java GUI application

Partial Replication

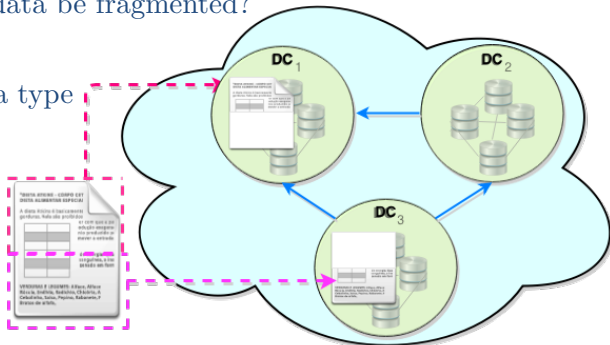
Replicate parts of the data

The data is fragmented and spread between the different DCs

No Data Centre may have the whole data

Can \ Should the data be fragmented?

- Data size
- Underlying data type



Summary

- Mathematical Representation
 - Simple mathematical representation
 - Already provided for the six use cases, available in D1.2
 - Temporal Logic of Actions (TLA+) representation
 - Already provided for the two use cases in D1.2:
“Ad Counter” and “Virtual Wallet”
 - In progress for two more use cases in D1.2:
“Leader Board” and “FMK”
- Adaptive Replication
 - Adaptive Location of Replicas
 - A simple algorithm has been proposed
 - Java GUI application
 - Partial Replication

Any Questions?

Thank You!

