FAKULTÄT FÜR !INFORMATIK

Masterstudium:
Software Engineering/Internet Computing

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# Heterogeneous SQL-Database Cluster via Virtual Shared Memory

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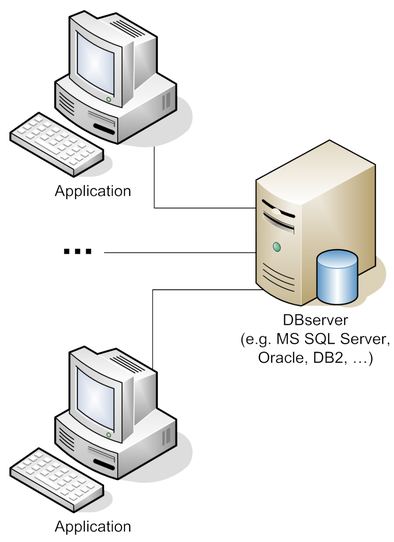
## Problem

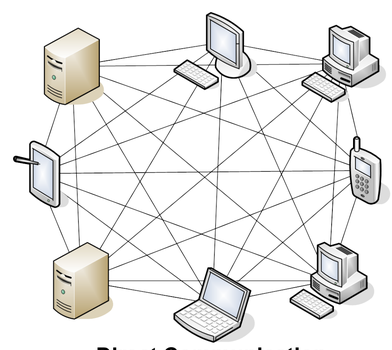
Databases constitute an essential part of business infrastructures. Nearly every organization has at least one business critical database, therefore solutions are needed that achieve highest availability, reliability and data consistency. Many solutions on the market provide these characteristics but they target big companies. So, there is a lack of inexpensive, simple solutions for small organizations.



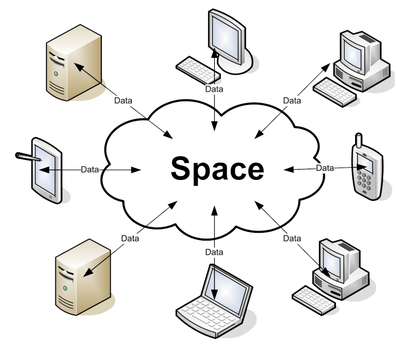

**Situation in many small Organizations**

## Communication

For a Heterogeneous SQL*-Database Cluster System a strong communication structure is needed. Direct communication is nearly unmanageable already in very small environments. eXtensible Virtual Shared Memory simplifies communication following the Space Based Computing paradigm.



**Direct Communication**

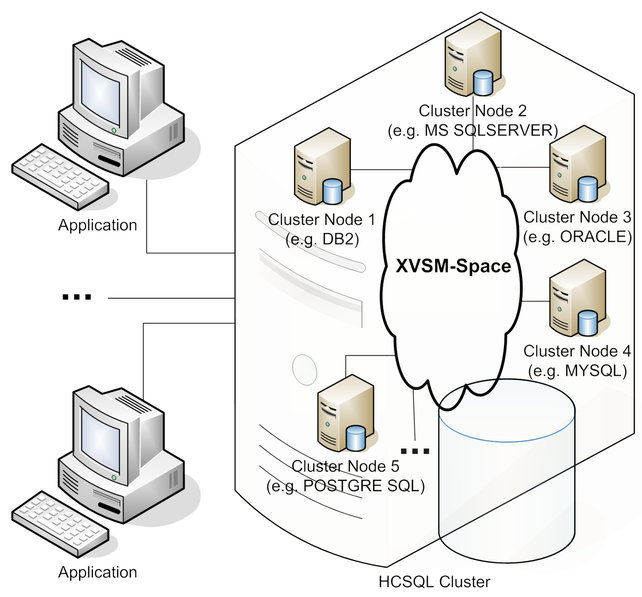



**Communication via Virtual Shared Memory**

## Developed Solution

### **H**eterogeneous **C**lustered **SQL*** – Database Management System (HCSQL)

A bunch of independent DBMS** reacts as a single DBMS. This cluster has the advantage that it is highly available and reliable. The DBMSs used within HCSQL can be from different vendors (hetero-geneous). This way the advantages of each system add up and make the whole cluster stronger.




**HCSQL** is a **clustered** database management system.

**HCSQL** is a **distributed** software solution.

**HCSQL** implements a **middleware** approach.

**HCSQL** provides **high availability** and **reliability**.

**HCSQL** detects and **corrects consistency violations** automatically and is **self-recovering**.

**HCSQL** uses existing DBMS** as data storage, which should be **heterogeneous**.

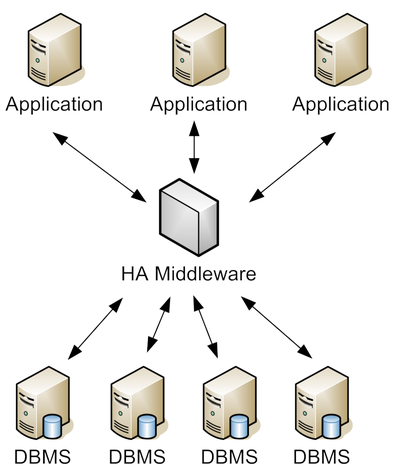
**HCSQL** provides a **common API***** for database connections, and is therefore interchangeable with other DBMS without changing the application.

**HCSQL** is **completely transparent** to the user and application programmer.

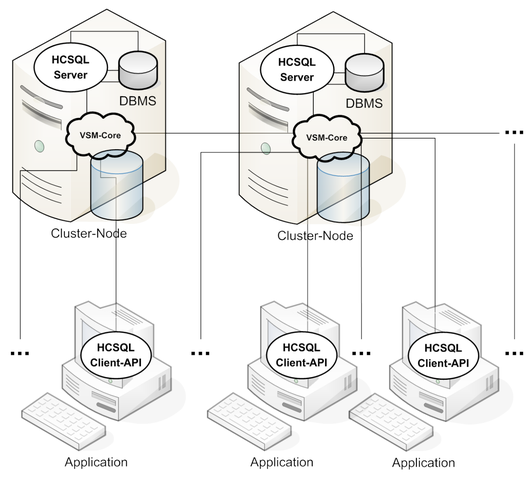
**HCSQL** does **not** use data/**passive replication**.

**HCSQL** needs **no special hardware** (e.g. shared storage).

**HCSQL** is designed to use **inexpensive** standard personal computer **hardware**, instead of expensive high-end server hardware.

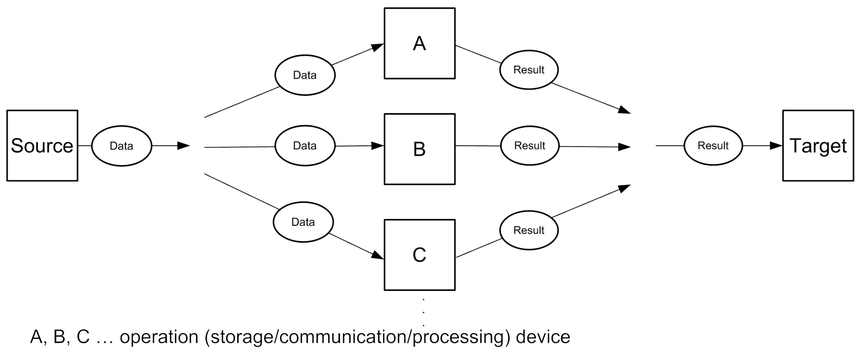



**High Availability Middleware**



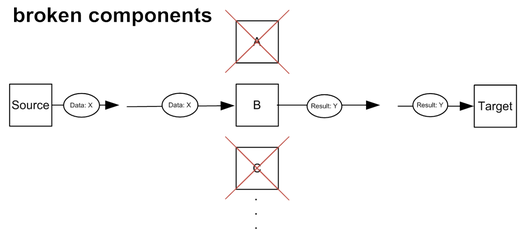

**Component Architecture**

## Generalized Approach - Parallel Consistency Checked Operations



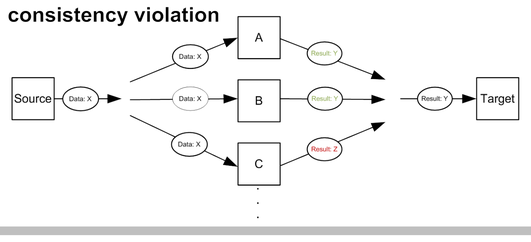

Any operation, whether storage, communication or processing, is executed in parallel on a defined number of independent devices. The results of these parallel operations are compared and a consistency leveled approach decides what the correct result is. Depending on the consistency level a certain number of identical results is needed to accept a result as valid.

**broken components**




The target node receives information if at least one of the processing components works.

**consistency violation**




A limited number of faulty results can be compensated and corrected.

* **SQL** **S**tructured **Q**uery **L**anguage
** **DBMS** **D**atabase **M**anagement **S**ystem
*** **API** **A**pplication **P**rogramming **I**nterface

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