Strong Consistency with NoSQL Databases

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Facts & Figures

Founded 1994

More than 100 employees

2013 more than 15 million Euro turnover

Independent – of product vendors and banks

Long-time customer relations

Close connection with our customers

Offices in Münster, Köln
Eventual Consistency Is Acceptable

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über Produkte informieren
ACID Transactions

- All or nothing
- Once committed, it will remain
- Concurrent serially
- One valid state → another valid state
CAP Theorem (Brewer, 2000)

Consistency

Partition tolerance

Availability
• Amazon popularized the concept of **Eventual Consistency**
  
  • “the storage system guarantees that if no new updates are made to the object, eventually all accesses will return the last updated value”

*Werner Vogels, Amazon.com*
bestellbar® – easy.mobile.order.

Customer orders with app

Handle order

Bartender handles orders

Still delivered personally!

Place order

Edit menu

bestellbar® manager
Edit products, prices, tables, promotions etc.
bestellbar® Architecture

Android (native app)  iOS (native app)  bestellbar® manager  Cash point

REST / JSON Resources  GWT-RPC Services  XMPP Services

Data Access Layer (Objectify)

Datastore  Blobstore  App Engine API

Google App Engine

Backend
Accept Eventual Consistency

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Getränk
mit 2Klicks bestellen
Accept Eventual Consistency

Über das Internet
kommt die Bestellung direkt an die Theke
Agile Approach

- Design
- Test
- Develop

Diagram showing the iterative cycle of Design, Test, and Develop.
Pitfalls with Eventual Consistency
<table>
<thead>
<tr>
<th>Operation</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Put (with primary key)</td>
<td>Strong Consistency</td>
</tr>
<tr>
<td>Delete (with primary key)</td>
<td>Strong Consistency</td>
</tr>
<tr>
<td>Get (with primary key)</td>
<td>Strong Consistency</td>
</tr>
<tr>
<td>Query (without ancestor)</td>
<td>Eventual Consistency</td>
</tr>
<tr>
<td>Ancestor Query (entity group)</td>
<td>Strong Consistency</td>
</tr>
</tbody>
</table>
bestellbar® Data Model (Simplified)
• we decided in favor of a two-level hierarchy in order to simplify the data access operations
  • one parent instead of a complete hierarchy of up to six ancestors
• the Entity Group is identical for both approaches
Ancestor Queries

- SELECT * FROM Category
  WHERE ancestor IS location.key()
- SELECT * FROM Table
  WHERE ancestor IS location.key()
- SELECT * FROM Article
  WHERE ancestor IS location.key()

- the two-level hierarchy enabled us to migrate the data
- works well with n:m-relationship at lower levels
Datastore Migration

- Ancestor for entity group has to be given at insert time.
- Cost = about 10 person-days
  - Migration was the smaller amount.
  - Changing the queries to include the ancestor was the main part.
- Downtime = about half an hour (after careful preparation).
"There is no such thing as a free lunch"

1 write per second

CAP told us

tradeoff C vs. A
A Deliberate Decision

strong consistency → relational database

scale accepting eventual consistency → NoSQL database

strong consistency for some cases → apply consciously
Thank you for your attention