

# Master Thesis

## In-Train Positioning System



von Marcel Suter



# Ablauf

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Problem

Lösungsansatz

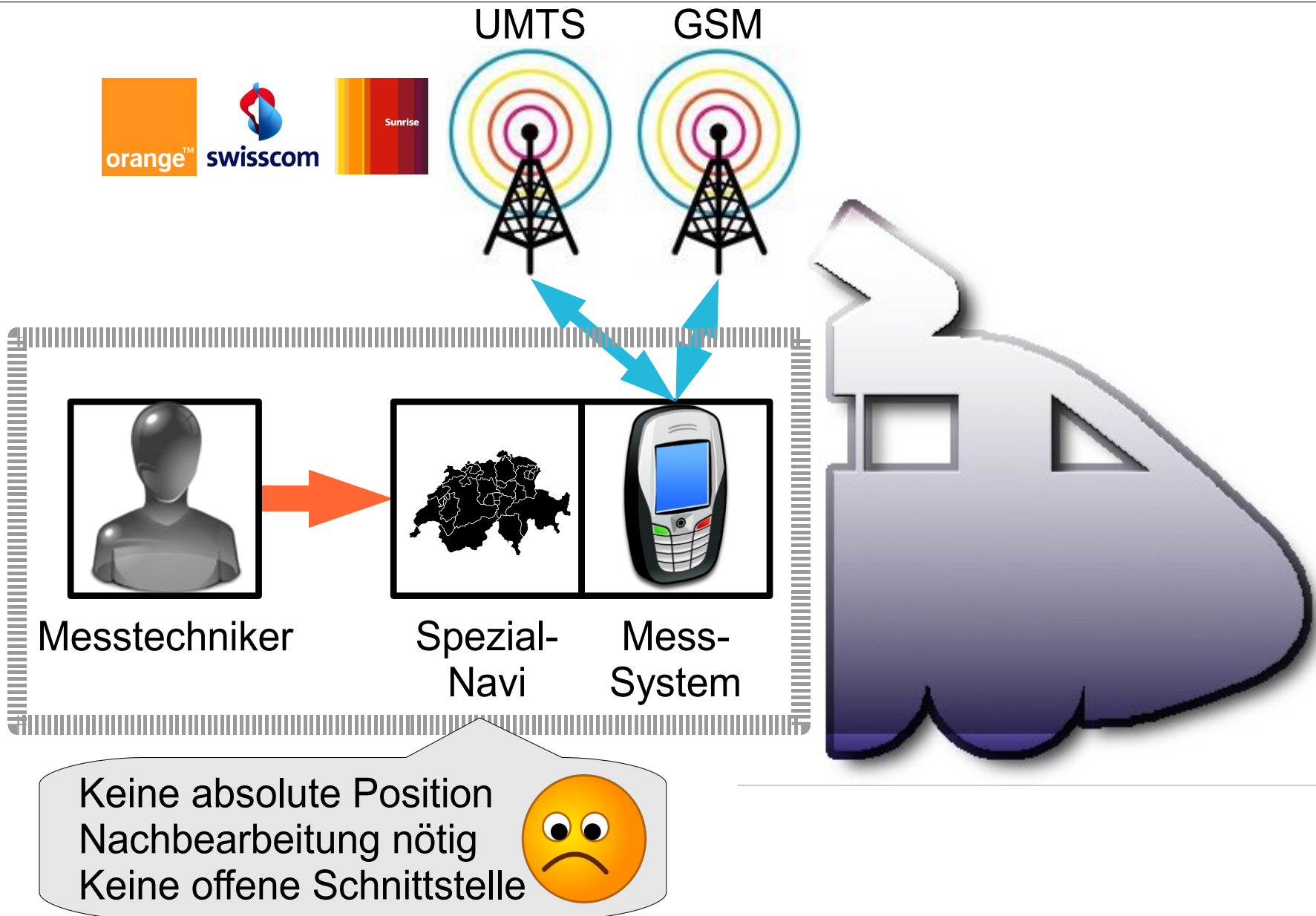
Architektur

Lösung

Schluss



# Problem: Messungen im Zug





# Problem: Kein GPS

Positionierung im Passagierraum schwierig weil:

Schlechter, unterbrochener GPS-Empfang,  
speziell in Bahnhöfen und Tunnels

Kein Weggeber verfügbar

Kein Tacho-Signal verfügbar

...





# Lösungsansatz

Mehrere Sensoren benutzen:

Hochempfindliches GPS

Georeferenzierte WiFi Access Points

3D-Trägheitssensoren

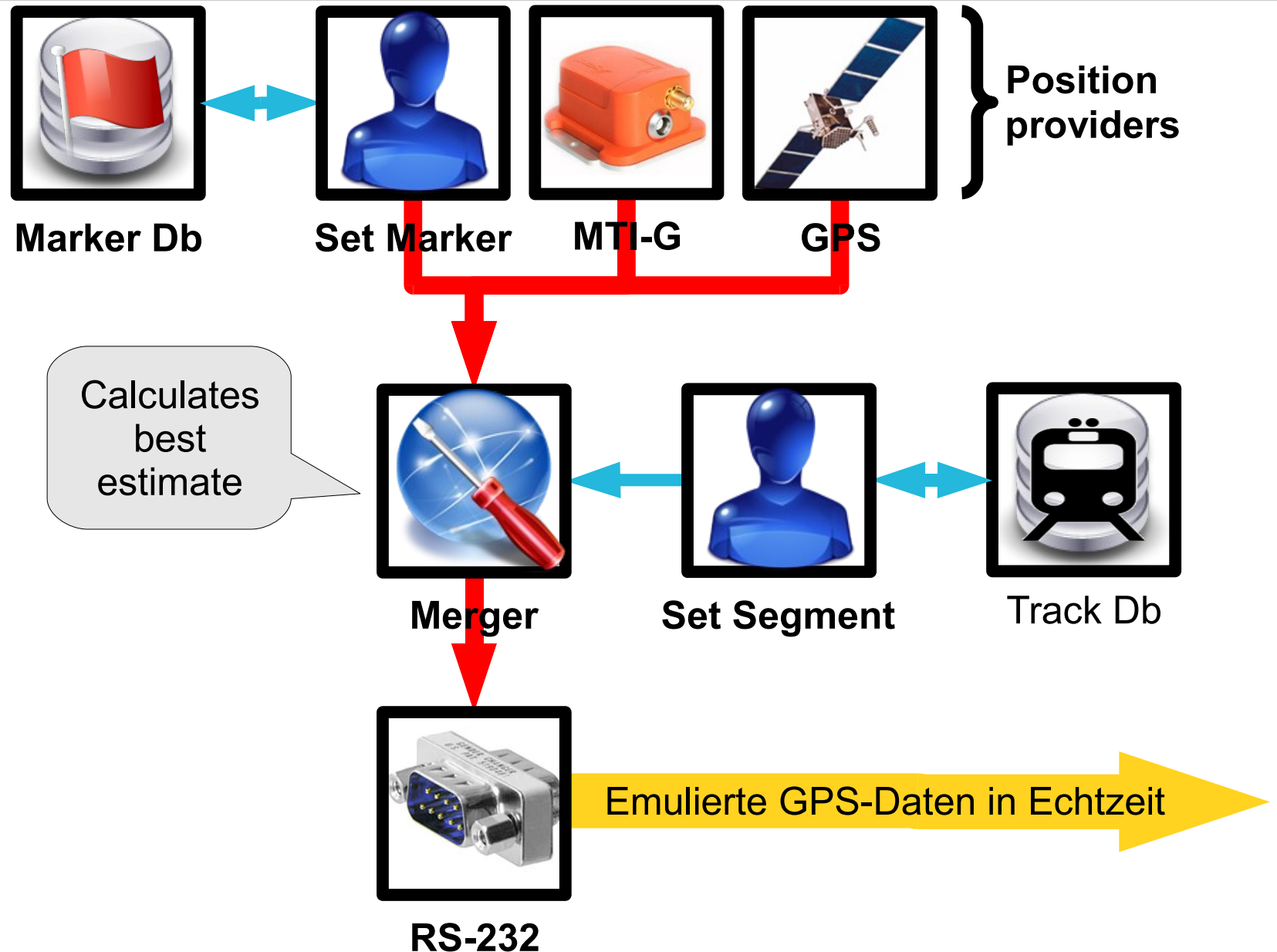
Benutzereingabe via GUI

Strecken-Datenbank





# Architektur







# Lösung



**In-Train Positioning System**

File About

Select Track Segment  
Number 103.100

Fire event markers

Train stopped

| Index | Name                         |
|-------|------------------------------|
| 1     | Überführung gross Wylersfeld |
| 2     | Tunnel Grauholz Süd          |
| 3     | Tunnel Grauholz Nord         |
| 4     | Bhf Hindelbank               |
| 5     | Bhf Lyssach                  |
| 6     | Bhf Burgdorf                 |
| 7     | Tunnel Burgdorf Süd          |
| 8     | Tunnel Burgdorf Nord         |

Status

| Tool                | Status  | Status description               | Last emission | Last status time |
|---------------------|---------|----------------------------------|---------------|------------------|
| GPS input COM3      | Faulty  | Could not open serial port COM3. |               | 13:39:40         |
| Event marker input  | Working | CEP:                             | 13:39:39      | 13:39:39         |
| Accelerometer input | Faulty  | No MT device was found. Che...   |               | 13:39:41         |
| Meiger              | Working | CEP: 14271.1879635358            | 13:39:39      | 13:39:39         |
| Dispenser (1/s)     | Ready   | Timeout.                         | 13:39:33      | 13:39:36         |
| Aligner             | Ready   | Timeout.                         | 13:39:30      | 13:39:35         |
| Serial emitter COM9 | Ready   | Timeout.                         | 13:39:30      | 13:39:35         |
| Keeper              | Ready   | Timeout.                         | 13:37:01      | 13:37:04         |

Database access:

**Attributes**

|                    |                  |
|--------------------|------------------|
| HeightOfGeoid      |                  |
| MagneticVariation  |                  |
| NumberOfSatellites |                  |
| Quality            | ManualInputMode  |
| TimeUtc            | 16.02.2009 13:39 |

**Motion**

|              |                      |
|--------------|----------------------|
| Acceleration | 0@0.7                |
| Heading      |                      |
| Speed        | 0@3.4939371090660076 |

**Position**

|           |                    |
|-----------|--------------------|
| Altitude  |                    |
| Cep       | 14267.847605662431 |
| Latitude  | 46.513087983842254 |
| Longitude | 6.677967780582895  |

**Acceleration**



# Besten Dank!

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[www.intrainpositioning.ch.vu](http://www.intrainpositioning.ch.vu)

Demo an der Ausstellung



