Agenda

• The company FleetBoard
• Heavy trucks telematics – an overview
• DispoPilot project
• Software challenges
The Company FleetBoard

• 100 % subsidiary of DaimlerChrysler AG
• Market launch in 1999
• 68 employees in Stuttgart with 28 engineers in the development department
• Roundabout 1.000 satisfied customers
• Roundabout 15.000 equipped vehicles
• European market leader in heavy trucks telematics
Transportation Industry under efficiency Pressure

**Intensity of competition**

- Ongoing liberalization
- EU extension

**Increasing costs**

- External: Environmental taxes, road pricing
- Internal: Wages, etc.

**Increasing demand for on time delivery**

- Increase of JIT/JIS production systems
- Less warehousing along value chain

**Road capacity constraints**

- Partly already exceeded
- Up-/unloading constraints
Heavy Truck Telematics - an overview

FleetBoard system overview

FleetBoard system overview

Carrier / Dispatching
Internet
FleetBoard Service Center
GSM
Telematic Platform, DispoPilot
GPS

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Vehicle Installation until 09/2004

Telematic Platform - DCTP
- Display position of vehicle and fleet
- Service and technical vehicle data
- Driver identification
- Application analysis
- Trip record & analysis

Driver Workstation
- Manual trip planning
- Monitoring / analyzing journeys
- Sending text messages
- Shipment monitoring

Mercedes-Benz Actros inside view

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FleetBoard Services

Vehicle / Driver Management
- Service (V)
- Performance Analysis (V/D)
- Trip Record (D)

Transport Management Services
- Logistics
- Navigation

Additional Services
- Messages
  (free of charge in addition with trip record, application analysis and the packages)
- Mapping
  (only in addition with trip record or FleetBoard logistics)
Dispatcher Workplace

- Manual trip planning
- Monitoring and analyzing journeys
- Sending text messages
- Shipment monitoring
- Digital map
DispoPilot Project

SW requirements for the next generation FleetBoard driver workstation due to new customer requirements

- Barcode scanning
- Navigation with destination handover
- Open flexible system
- Easy to extend with new features
- Remote software update capable
- Hardware independent
- Ready for a growing system

- Product launch: Truck fair (IAA) 2004
HW requirements for the next generation FleetBoard driver workstation

• Switch from a fixed installed unit to a mobile unit
• Ruggedized design (shockproof 1,5m to concrete / IP64)
• 2-D imager
• Intel XScale CPU – 400MHz
• 64 MB RAM, 96 MB ROM
• 9,7cm touch screen (240 x 320)
• SD & CF cardslot
• e11 certification
• Vehicle integration
Vehicle Installation from 10/2004

Telematic Platform - DCTP
- Display position of vehicle and fleet
- Service and technical vehicle data
- Driver identification
- Application analysis
- Trip record & analysis

Driver Workstation - DispoPilot
- Manual trip planning
- Monitoring / analyzing journeys
- Sending text messages
- Shipment monitoring
- **Barcode scanning**
- **On-Board navigation**

Mercedes-Benz Actros inside view
DispoPilot – The big Picture

Truck
- AT/RMC/PPP
- Scanning
- Navigation
- Disposition
- Tracking
- Device Management

Service Center
- SMS
- IP
- WEDM Server
  - Bundle & Device Management

Carrier contractor
- TM-Protocol

Browser
- http
DispoPilot System Overview

- DispoPilot is implemented using a number of OSGi bundles that run on IBM's J9/SMF
- "Near OS" components require C.
- Most bundles are loosely coupled using OSGi ServiceTracker or WireAdmin Service

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Some of the Software Challenges

• We had to solve a couple of integration issues
  – Device hardware and operating system
  – Telematic platform/truck
  – On board navigation

• Some of the functional requirements I’ll talk about
  – Custom look & feel
  – Remote software-update via GSM/GPRS
Custom Look and Feel

- Requirements
  - Intuitive operation
  - RTF fields and other custom controls
  - Various (virtual) keyboards
  - Dynamic form definition
- Solution
  - DispoPilot uses IBM’s Bare Metal Graphics instead of OS controls, which gives the application full control of the GUI
  - BMG is a fast, portable, low overhead graphics system
  - Application implements skinning and custom controls
Device Integration

- **Requirements**
  - Hide OS specifics as far as possible, no user access to OS features and programs
  - Cold / warm boot detection and device automatic configuration
  - Integration of flash storage, imager and other hardware components

- **Solution**
  - Application specific bootstrap which controls the system
  - Integrated device settings replace OS functionality (Language, Locale, Sound, …)
  - Flash-aware storage system
  - Watchdog monitors system health
DCTP and Truck Integration

• Requirements
  – Use GPS for time synchronization, positioning and navigation
  – Use GSM for SMS communication and IP connectivity.
  – Use DCTP for truck data like mileage and configuration information
  – DispoPilot hardware has only one serial port

• Solution
  – Serial Multiplex gives us multiple virtual COM ports
  – All devices are accessible through (virtual) serial communication link(s)
  – Serial Multiplex gives us multiple virtual COM ports
Integration of OnBoard Navigation system

• Requirements
  – Standard navigation system functionality (e.g. Voice)
  – Seamless integration into DispoPilot MMI
  – Integration into DispoPilot functions e.g. order based navigation

• Solution
  – Integration of commercial PDA navigation system
  – Maps and software require an extra CF card up to 1GB
  – Wrapping Navigation functionality into OSGi bundle
  – DispoPilot “controls” navigation behavior
Remote Software Update

• Requirements
  – Update DispoPilot software via GSM/GPRS
  – Ensure system integrity - system must always be functional, no partial updates
  – Fault tolerant because the truck may be moving or device may be taken out of the cradle

• Solution
  – On demand IP connectivity using OS PPP API
  – Integration of IBM WebSphere Everyplace Device Manager (WEDM)
  – Application controls retry behavior e.g. in case of communication breakdowns
  – Support for atomic installs
  – Rollback facility if new software version is not functional
Lessons learned

- IBM’s J9/SMF combination is a rock solid, highly configurable system. JXEs are helpful when size and speed matter
  - Our VM is statically linked and does not use a JIT (~750KB)
  - Stripped CDC+SMF JXE is about 1.5MB
- WebSphere Everyplace Device Manager (WEDM) significantly lowers the effort to manage soft- and hardware. It integrates nicely into the OSGi software model, enables remote software update and (remote) device management
- OSGi R3 lacks adequate support for software update and installation.
  - Operations on single bundles only (install/update/…)
  - No built-in rollback-support
- Pocket PC 2002 is hard to deal with when used as an embedded platform
- OSGi is a wonderful programming model and framework
backup
Vehicle and Driver Management: 5-15% reduced Fuel Consumption

Features:
- Vehicle service condition
- Maintenance planning and prognosis
- Telediagnosis in case of breakdown
- Analysis of driver and vehicle performance
- Trip recording, journey times and stop duration
- Driver text messaging

Benefits:
- Reduction of fuel consumption
- Optimization truck usage