The Belgian Car-Pass System
A success story

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Agenda

The Company Profile
Business background

The Case description
What & How

What worked or NOT & NEXT phases
Why Car-Pass?

- Mileage fraud was a serious problem in Belgium before 2006
  - Estimation based on data technical inspection > 60,000 new cases a year
  - Estimated value of the fraud: 150 – 200 million €/year
  - Estimated value of the fraud in FR, DE, NL, LUX: 1.4 - 2.8 billion €/year

- Authorities and automotive professional associations joined efforts to create a comprehensive and adequate legal framework. Furthermore they put into place an effective business model
The legal framework

• Legal framework (federal law of 2004)
  • Mileage fraud is considered a serious crime sanctioned with severe penalties (up to 1 year imprisonment)
  • Creation of a central database containing the odometer readings of all vehicles registered in Belgium
  • All professional car dealers and repair shops are required to transfer VIN number, mileage and date when repairing or maintaining a vehicle or replacing parts (ex. tyres, windscreens,...)
  • The seller of a second hand vehicle is obliged by law to deliver a certificate showing the mileage history of the vehicle to the buyer. If he fails to do so the transaction is void

• Supported by all stakeholders: consumers, automotive sector and government
What is Car-Pass?

Car-Pass is a non-profit organisation authorised by Royal Decree, to manage the central database with the mileage recordings.

All stakeholders are represented in the Car-Pass board:
- Association of the car importers (FEBIAC)
- Association of the dealers, repair shops, ... (TRAXIO)
- Association of the companies performing the technical inspection (GOCA)
- Associations of motor car users (Touring, VAB)
- Ministry of Economic Affairs
- Ministry of Transport

Cost-efficient and self supporting. Sale of this mileage certificate (€ 7,00) is the only revenue for Car-Pass. No public funding.

Almost no extra administrative burden since recording mileages is common practice in the automotive business.

Car-Pass mileage certificates are delivered by the technical inspection.
No personal data shown on the document

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Aucune donnée n'est renseignée pour la période entre la date de première mise en circulation et la date de kilométrage la plus ancienne.

Unique ID

General data about the vehicle

Mileage history

In bold: date of issue and actual mileage
Facts & Figures

- 191 million odometer readings in the database
- 21 million vehicles in the database (cars and LCV)
- 1.4 million odometer readings reported per month
- 12,000 companies report odometer readings per month
- 6,720,000 Car-Pass certificates issued since 2006
- Staff: 8
Results: A Success

• The Car-Pass model has proven it’s necessity in an effective way!
  • In 2014 only 1.239 new cases of mileage fraud took place (0,17 % of used cars registered in Belgium). Before the introduction of the CAR-PASS system, 60.000 cases were observed (conservative estimation)

• Key factors of success
  • A simple legal framework with clear and effective sanctions (cancellation of the sale if the Car-Pass isn't provided to the buyer)
  • Potential fraud is clearly apparent with the certificate. As a result, the person committing fraud will not receive the sale amount they expected
  • Active support from the automotive sector in Belgium
  • The system is based on a common practice in the sector which consists in recording a vehicle's mileage whenever it is brought in for service.
  • A fast and reliable IT infrastructure (architecture, software, ...)
CHALLENGES
Business challenges / issues #1

- Delivery of odometer readings via web services were not possible on old platform, due to architectural limitations
- Need for real-time & accurate data from the Ministry of Economic Affairs
- Issues with custom developed Queueing architecture based on Bizztalk and SQL server
- No Bizztalk expertise available in the organisation; e.g. Performance tuning on Bizztalk database
- Improve user experience of Back Office employees to a unified experience (dual screens; popups)
Business challenges / issues #2

- Guarantee the support of the delivery of the certificates to the technical inspection: e.g. double use of credential set configured in GOCA client
- Be able to provide real-time information after a periodical technical inspection
- Centralize databases (3 different database with synchronisation algorithms)
- Ensuring that the rendering of Certificates is guaranteed under any load (scaling)
- Enable Business to create Advanced Reporting.
What was the IT Challenge?

- Implement a proven, standard & flexible Queueing architecture
- Introduce proper transaction management
- Migrate the whole platform in 1 go / lights off/on
  - Infrastructure / Database / Applications / ...  
  - Central / PTI’s
- Decrease the turnaround time of processes
  - e.g. Car-Pass request to ready for delivery 9 seconds (now 300 ms)
- Resolve security issues with PTI client
- Merge duplicate data sources in one Database
- Rationalization of the IT Infrastructure
THE SOLUTION
Basic principles

• Use Mainstream Open-Source
  • Development libraries (API’s)
  • Tools, Applications & Platform
• Design a Service Oriented Architecture
  • Enabling re-use: internally & externally
  • Opening up the platform to 3rd parties
• Prefer Asynchronous over Synchronous
  • Enabling scalability and prioritization
• Develop Agile – and Test Driven
• Reduce complexity, keep it light-weight
  • Merge different databases into a central one
  • Unify the different Back-Office applications
Ensure Car-Pass delivery under any load

- Prioritize processing
  - Based on JMS Queues (ActiveMQ)
- Improve PDF rendering
  - Use of a stable, full-featured and lightweight PDF framework (iText)
- Enable SOAP web services
  - Replace binary and proprietry protocol client/server protocol
  - Develop small standalone client to ensure continuity
  - Allow for direct integration based on web services
- Authenticate over separate credential-set
  - Making use of mutual-authentication (certificates)
- Automate testing (SOAP UI)
Improve/Extend the ways to register Odometers readings

- Odometer reading could already be provided by
  - Uploading TXT or XML files over FTPS (ProFTPD)
  - Posting TXT or XML files over HTTPS
  - Manual Data Entry on a secure website
  - Sending a fax to Car-Pass; who will digitize
- Enable Odometer readings registrations over web services
  - SOAP to enable data entry by technical inspection and professionals
  - REST to enable data entry via mobile website & - devices
- Allows Car-Pass to deprecate old ways of working
- Possible due to a Service Oriented Architecture
  - Develop the Service once
  - Re-use/publish it on different End-points
Improve the Back-Office user experience

- Unify the mixed environment of Client/Server - & web applications into one RIA
  - Build on a mature and full featured framework (Ext JS)
  - Enabling a Web application with Client/Server look-and-feel
  - One application to handle all Back-Office requirements
  - No more copy/paste between applications
  - Multiple screens no longer a requirement to be able to work
- Merge databases into a Central database
- CUPS enabled local printing from a web application
- Integrate scanning based on FTP
Improve information on Organisations

- Most reliable Source of Truth: Ministry of Economic Affairs (MoE)
- Used to communicate over complex TXT files
  - Tedious to parse
  - High possibility on missing import information on updates
- Switch to the periodic MoE XML extracts and SOAP web services
- Enabled the MoE SOAP web service as a Service on the ESB
- This enables
  - The regular XML extracts to be processed
  - The Back-Office user to request an Organisation updates directly from the Back-Office application
  - A daily batch job to update stale Organisations
Improve/ensure security?

• Involve security Experts early and often
  • Define a checklist
  • Discuss best-practices
  • Train the development team
  • Test / pen-test
• Enable SSL on all communication: external & internal
• Close everything by default; Open only if required
• Use recent, stable versions of Development Libraries
The New Landscape

- Red Hat: a solution on every level
  - Red Hat Enterprise Linux to enable cloud computing
  - JBoss EAP as web – and services platform
  - JBoss Fuse as ESB / Middleware
- JBoss Fuse is like a box of chocolates
  - ActiveMQ as JMS broker; Camel, Quartz, OpenJPA, Spring, ...
- Microsoft SQL Server 2012 (Database Engine + BI platform)
- iText for PDF handling
- Ext JS as RIA framework for the Back Office application
- CUPS to enable printing from the datacenter on local printers
- ProFTPd as FTPS server
- OpenLDAP for Identity management
- ...

Car-Pass
How the Solutions Solve the issues #1

- Prioritization bases on JMS; guarantees performance under any load
- Active/Active cluster to replace Active/Pasive and enable load-balancing
- JBoss Fuse to manage asynchronous processes
  - JMS on Queues
  - FTPS, SFTP, ... file processing
  - Batch jobs
- Optimization of User Experience through a unified RIA Back-Office Applicaiton
- One centralized database
- Build Technical inspection client based on secure web services
  - Enabling the technical inspection to integrate directly (in time)
  - Authentication based on certificates
How the Solutions Solve the issues #2

- iTex improved PDF handling focussing on performance & reduced filesize
- Integration with Ministry of Economic Affairs over Web Services
- Advanced reporting in SQL Server BI
Lessons Learned
What did work?

- JBoss Fuse delivered as Middleware, it enabled
  - Asynchronous processing, JMS, Web Services ... it all works and improves performance and scalability
  - A clean separation of the different logic layers enables re-use, improves testability and improves maintainability
  - Reduction in complexity facilitates deploy life cycles
- See previous slides ...
What has room for improvement

- JBoss Fuse 6.0 missed stability; current release resolves this issue
- JBoss Fuse deployment on a developers laptop
- OSGI
- Version of modules in JBoss Fuse (eg Camel) are not the most recent
- Red Hat Support
  - Works fine for development questions and simple use cases.
  - Works based on test cases that depict the problem. This is difficult to create when your project gets bigger
- JBoss Fuse documentation was hard to find
  - FuseSource acquisition was fresh; duplication; version numbers
  - Documentation/Examples were hard to find/missing eg XA Transactions
Next steps

- Get ready for data exchange between European countries
- Extend / Improve existing business processes
- Improve Back-Office experience even further with PBX integration