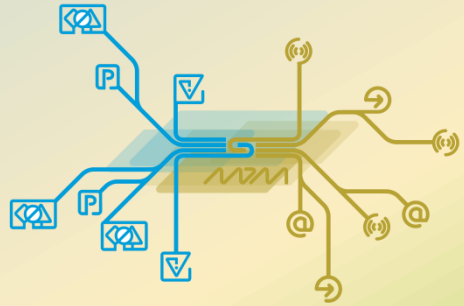


Mobilitäts
Daten
Marktplatz

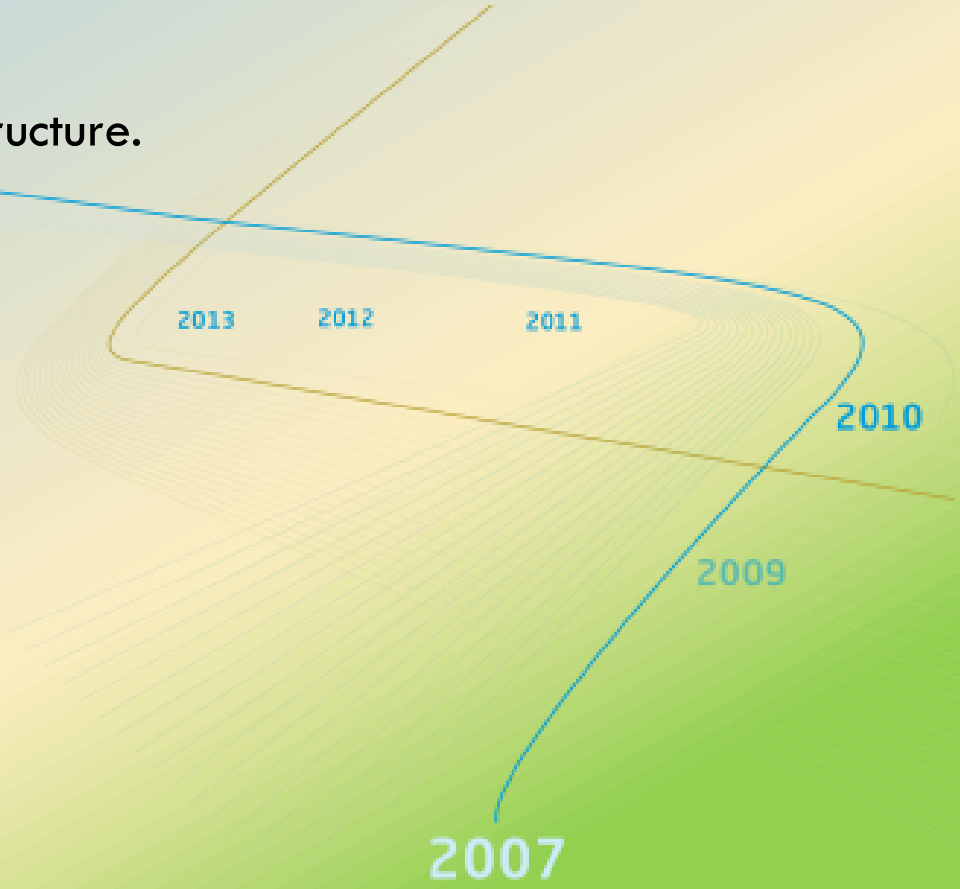
THE GERMAN MDM

European Commission
Mobility & Transport

Experiences in implementing and operating
a DATEX II exchange platform

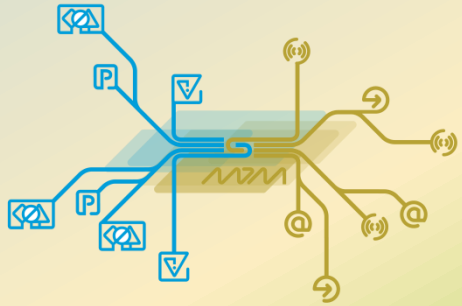
MDM – Mobility Data Marketplace

- Project owner: Federal Highway Research Institute (BASt)
  on behalf of the Federal Ministry of Transport and Digital Infrastructure.
- In 2010, Materna won the tender to build and operate the MDM
- Pilot phase 07/2011 – 12/2013,
  MDM operated in Materna‘s own data center
- MDM works now as central point in Germany
  to share real time traffic information (RTTI)
- Candidate to become the German single point of access (SPA)

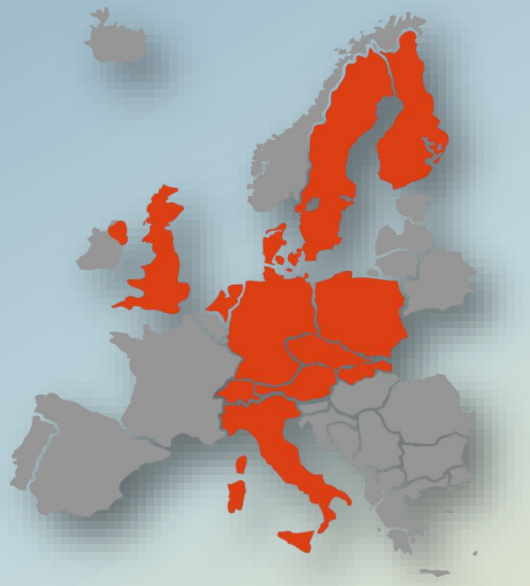


Let‘s talk about

- Materna – Who we are? What we do?
- MDM architecture
- Platform users and contents
- Special requirements and their solutions
- Figures of usage
- Experiences and recommendations for a SPA
- Any Questions?



Materna GmbH



our branch offices

Helmut an de Meulen — Dr. Winfried Materna — Ralph Hartwig

Founders and Managing Directors — **CFO**

What we do

We deliver services and infrastructure

Developing strategies, implementing and running your IT

We manage information

Collecting, administering and presenting your digital content

MATERNA

We create customized applications

Analyzing and implementing your business and administration processes

We develop communication solutions

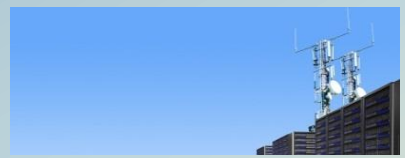
Concepts, services and platforms for communicating with your target group

Our Sectors – Our Customers

Public Sector

Bundesagentur für Arbeit
BUNDES FINANZ VERWALTUNG
bast
Bundeskriminalamt
Bundesministerium der Finanzen
Bundesverwaltungsamt
IHK
Presse- und Informationsamt der Bundesregierung
Deutsche Rentenversicherung Bund

ICT



Atos
FIDUCIA Ihr IT-Partner
GAD IT für Banken
finanz informatik
Deutsche Telekom
T-Systems
Nokia Siemens Networks
Telefónica
vodafone

Automotive & Discrete Manufacturing

DAIMLER
BOSCH Technik fürs Leben
BMW
Volkswagen

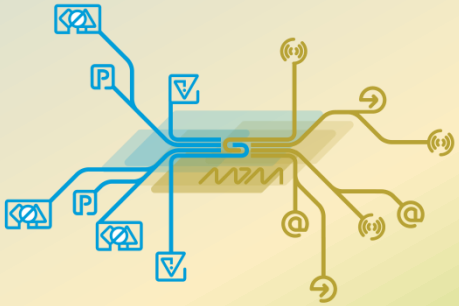
Industry, Retail, Services

DHL
OTTO

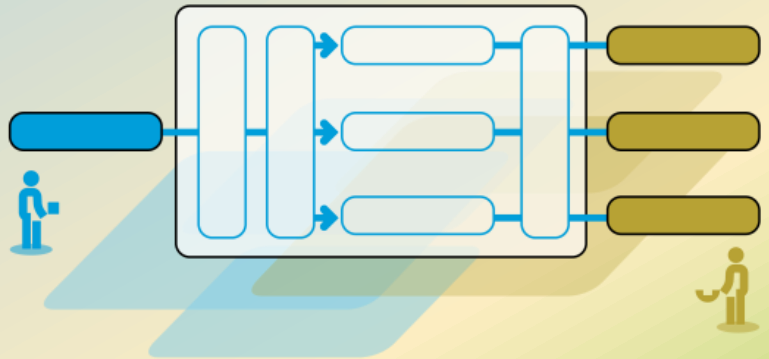
Trusted by Germany's most recognized organizations and companies

Let‘s talk about

- Materna – Who we are? What we do?
- MDM architecture
- Platform users and contents
- Special requirements and their solutions
- Figures of usage
- Experiences and recommendations for a SPA
- Any Questions?

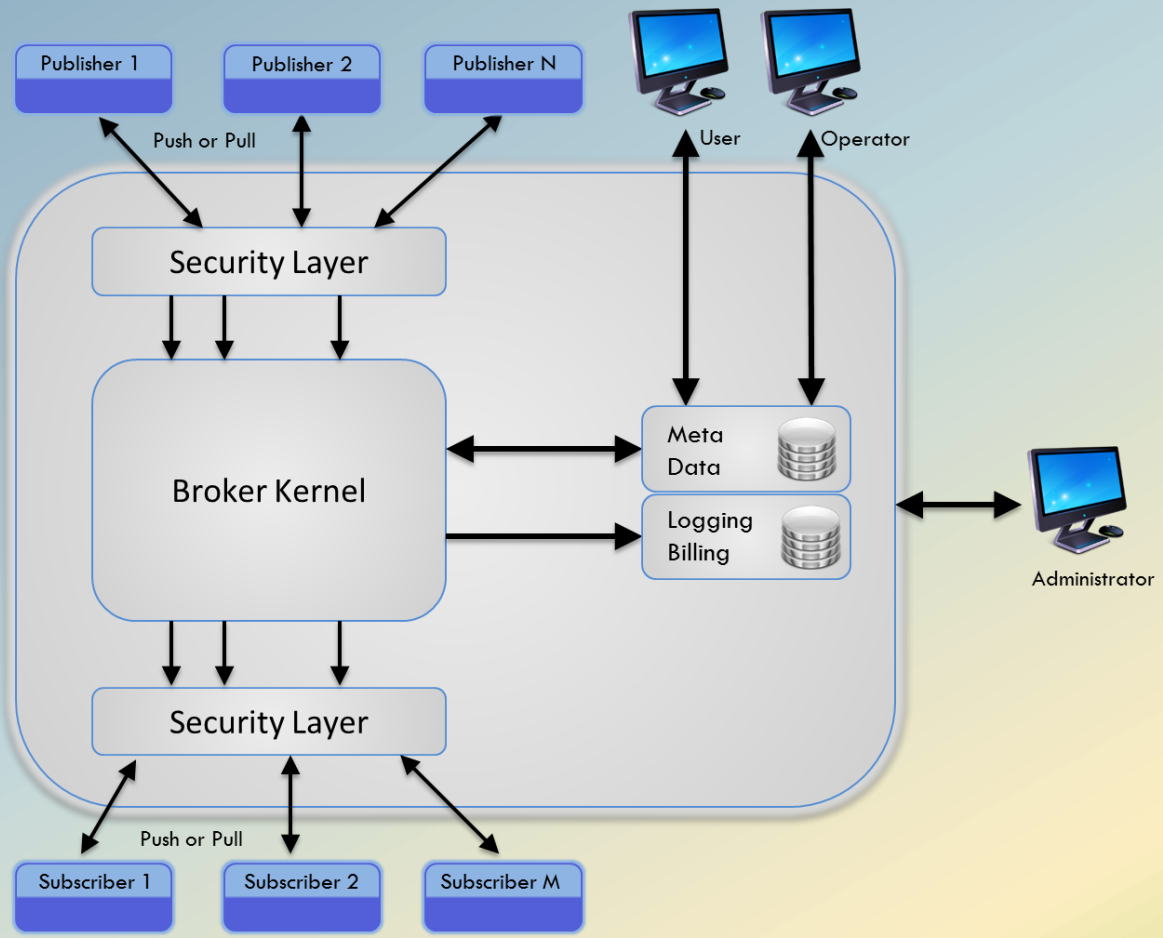


Broker vs. Data Warehouse Concept



- **Message Broker (Publisher – Subscriber – Pattern):**
  - Broker acts as one-to-many data switch (decoupling pub. and sub. systems)
  - Message buffer stores only one package per publication
  - Publisher delivers data packages for a dedicated publication
  - Subscribers will get the content immediately pushed (SLA: t <= 10 sec., 99%) or can pull it
  - Subscriber can use a protocol different from publisher‘s system (protocol conversion)
- **Data Warehouse:**
  - Collects data feeds completely in a database (requires large database capacity)
  - Benefit: Historical data available

MDM – The Architecture

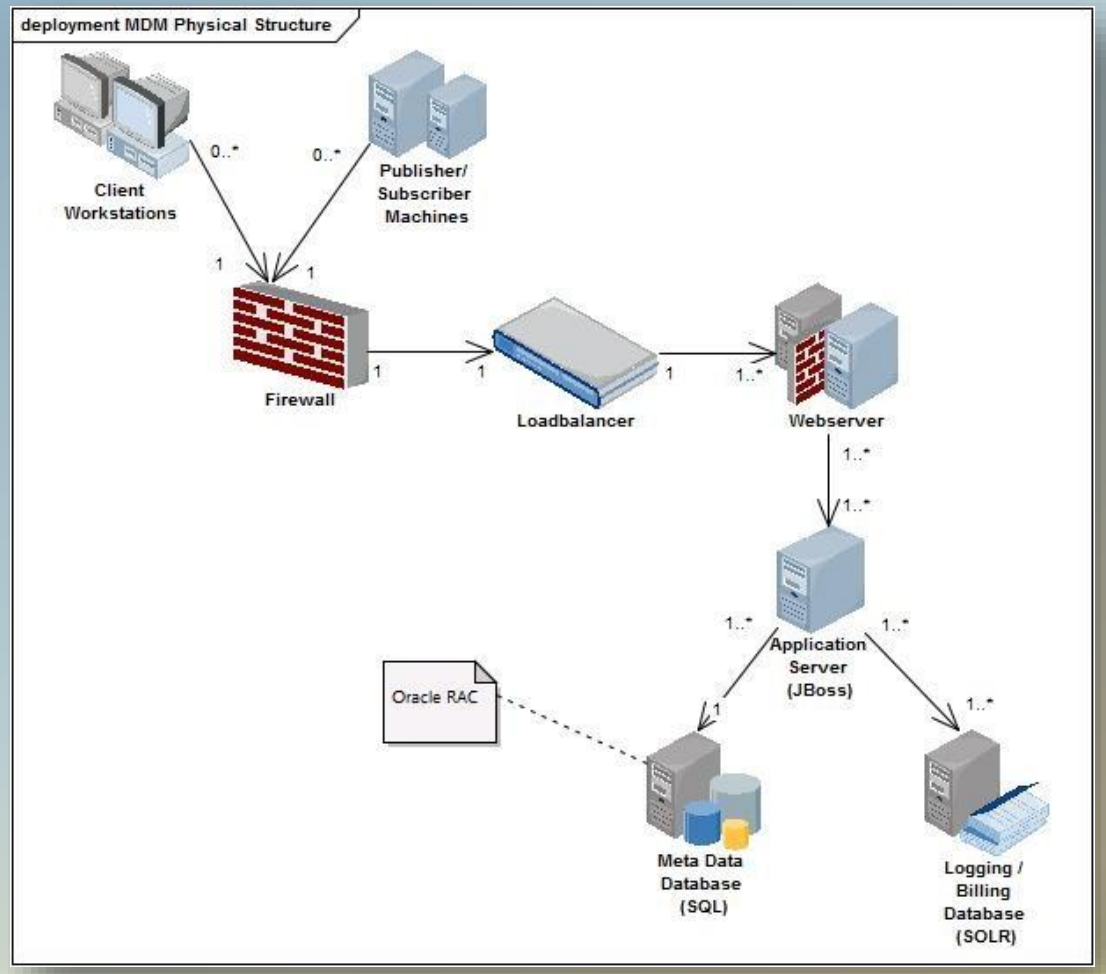


Top Level Component Structure:

- Broker kernel,
  based on Materna product MACS*
- Interface components incl. Security
  for different data formats and protocols
- Meta data repository
- Logging/billing DB
- Portals (user, operator & administrator)

**Multimedia Application and Content Server*

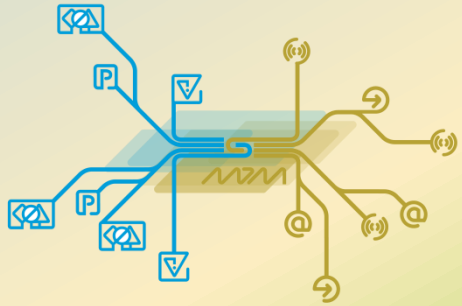
MDM – Physical Structure



- Scalable HA Java Application Server Infrastructure
- Requests distributed by a loadbalancer
- Webserver in front of the application server
- 2 different Databases:
  - Oracle RAC (Meta Data)
  - Apache Solr DB (Event Log)
- Redundancy by 2 sites

Let‘s talk about

- Materna – Who we are? What we do?
- MDM architecture
- Platform users and contents
- Special requirements and their solutions
- Figures of usage
- Experiences and recommendations for a SPA
- Any Questions?



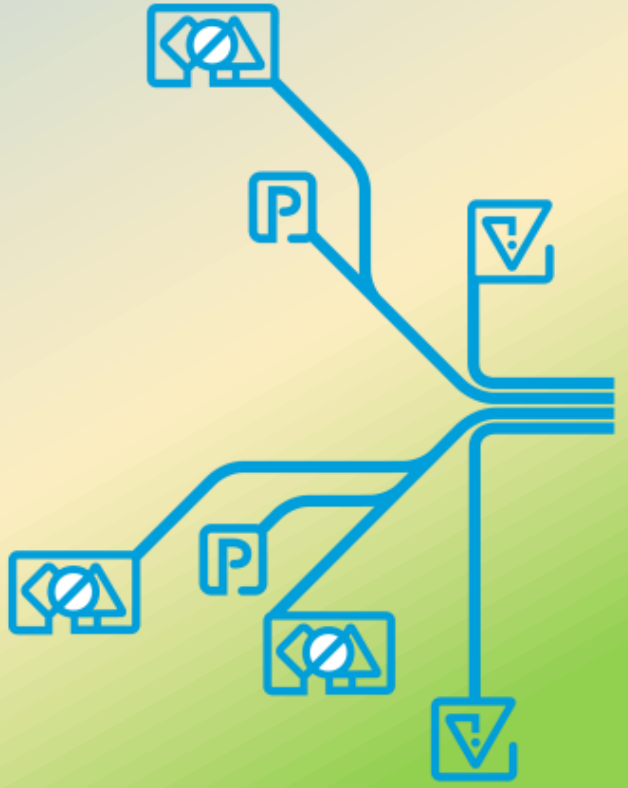
MDM – Who are the users?

- Regional authorities
- Municipalities
- Industry / Automobile manufacturers
- Automobile associations
- Private service providers
- Market Transparency Unit for Fuel (MTS-K),

  branch of the Bundeskartellamt, Germany's competition authority
- Mineral oil companies and petrol station operators

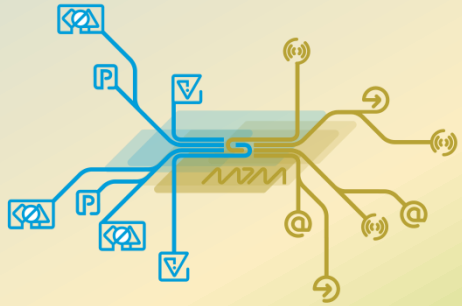
MDM – Which content is offered today?

- Traffic messages (alerts, traffic jams, moving roadworks,…)
- Roadworks (short + long term)
- Traffic management measures, e.g. alternative route recommendations
- Parking data (municipal + motorway)
- Traffic measures data (from loop detectors, etc.)
- Weather information
- Motorway webcam pictures (MDM Container format)
- Fuel prices (DATEX II Level C extension format):
  - Static data: station information (brand, location, opening times)
  - Dynamic data: actual fuel prices (diesel and petrol E5 + E10)



Let‘s talk about

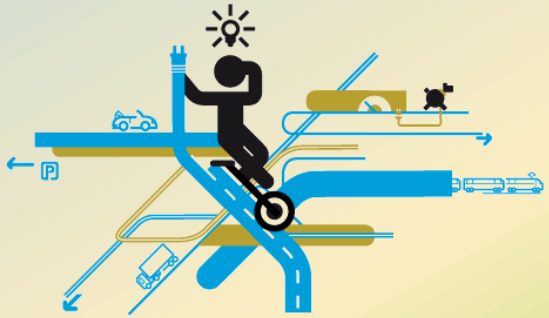
- Materna – Who we are? What we do?
- MDM architecture
- Platform users and contents
- Special requirements and their solutions
- Figures of usage
- Experiences and recommendations for a SPA
- Any Questions?



MDM Container Format

Requirement to exchange any data independent from formatting

Solution: Definition of a proprietary MDM data exchange format



- XML formatted content with 2 parts:
  - One header part
    (meta data of the content and transport information)
  - One body partwith payload to transfer

- Body can hold
  - XML-formatted data
  - Binary content (JPG, CSV, etc.), base64 coded,
  - Collections of data objects are possible (like ZIP-archive)

The Many-to-Many Issue

The Fuel Price Scenario, caused by MTS-K in Summer 2013:

- More than 300 publishing organisations with > 700 publications
- Many subscribers (> 200 interested organisations)
- Each subscriber needs all packages
- Not sufficient bandwidth to deliver each package to each subscriber

Solution: MDM Container Collector Feature

- Every minute all data packages of the same data type are grouped in one container document
- Subscriber must only receive one container package

Parking data: possible candidate for the next many-to-many issue

- Many different companies control the parking space facilities
- Probably a lot of service providers are interested in all parking data publications

No Confirmation of Receipt

Publisher's requirement to monitor the delivery of content to his subscribers

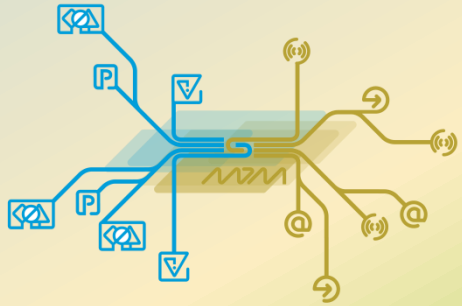
- Requested by public authorities for security relevant RTTI (alerts, …)
- Problem: MDM gives positive acknowledge for handover the data package to the broker, not for shipping to the subscribers

Solution: End-to-End Delivery Control Feature

- Broker measures delivery time for dedicated publications with push-push communication
- Publisher receives e-mail notifications for delayed or failed delivery
- Subscriber could also configure e-mail notifications

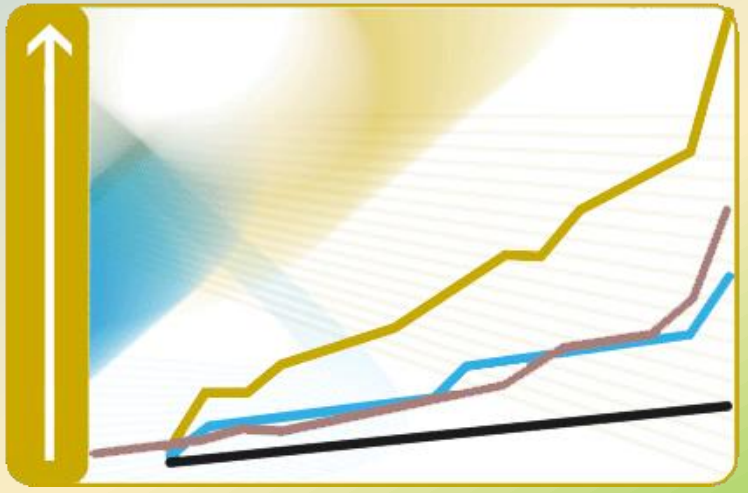
Let‘s talk about

- Materna – Who we are? What we do?
- MDM functionality and architecture
- Platform users and contents
- Special requirements and their solutions
- Figures of usage
- Experiences and recommendations for a SPA
- Any Questions?



MDM – Figures (Status 04/2014)

- Registered organisations: > 700
- Configured publications: ~1.200
- Configured subscriptions: ~ 16.000



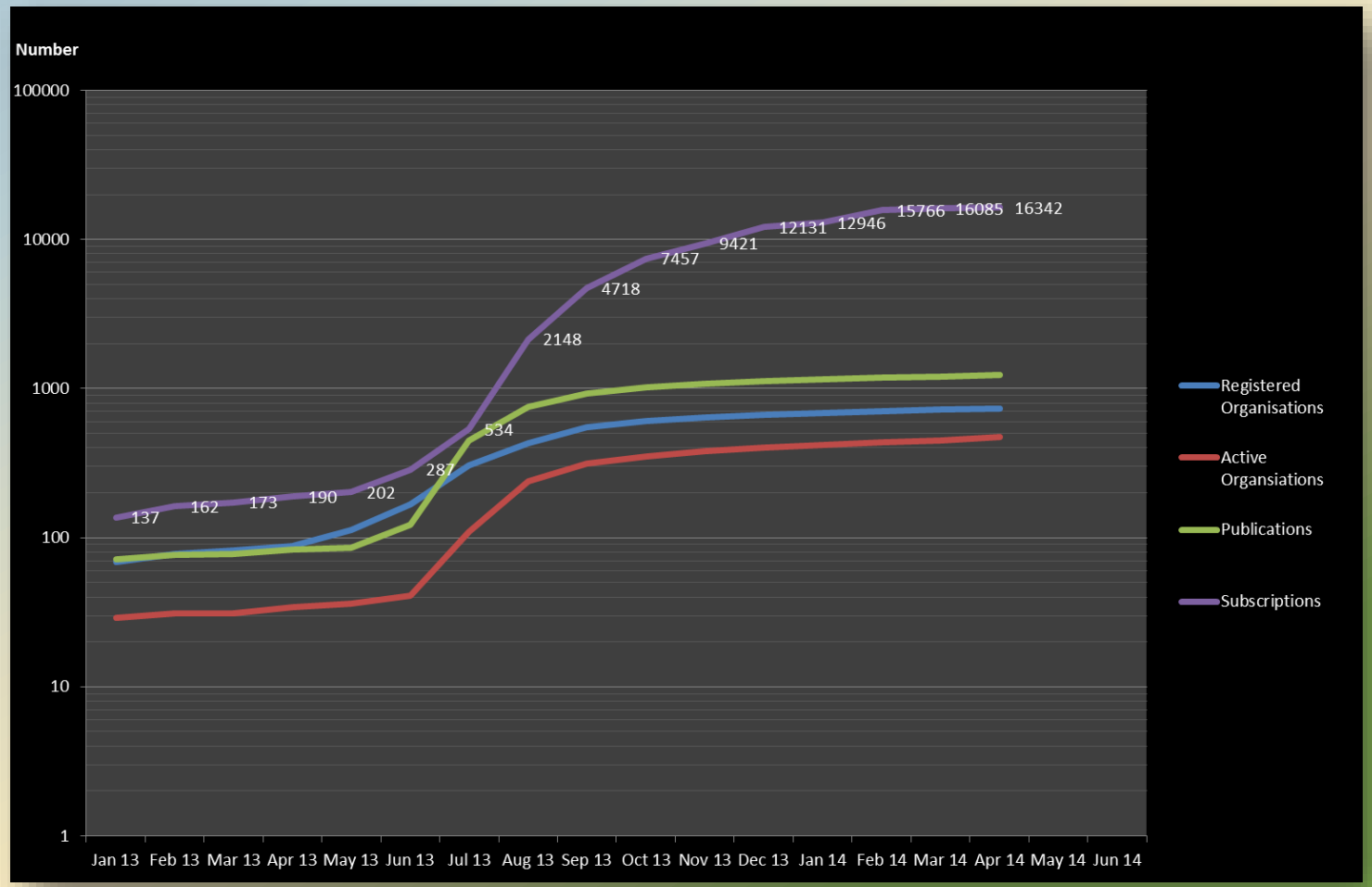
- Incoming packages / day: ~ 125.000
- Push deliveries / day: ~ 1.350.000
- Pull deliveries / day: 425.000
- System transactions total / day: ~ 2.000.000

- System infrastructure originally configured for a pilot phase with
  - 40 organisations
  - 1.600 subscriptions

MDM – Figures over the years

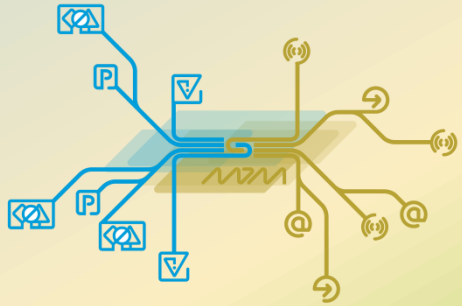
What you see:

- Until summer 2013, usage as forecast for pilot phase
- Since summer 2013, increasing number of publications due to MTS-K usage
- Resulting in an increasingly high growth of subscriptions
- Increasing subscriptions stopped by introducing container collector in March 2014



Let‘s talk about

- Materna – Who we are? What we do?
- MDM architecture
- Platform users and contents
- Special requirements and their solutions
- Figures of usage
- Experiences and recommendations for a SPA
- Any Questions?



Experiences and recommendations for a SPA

Experiences from MDM's pilot phase

- There is a need for other formats beside standardised DATEX II
- Heavily distributed content generation could be an issue
- Slow subscriber systems can block system resources and slow down system performance

Recommendations

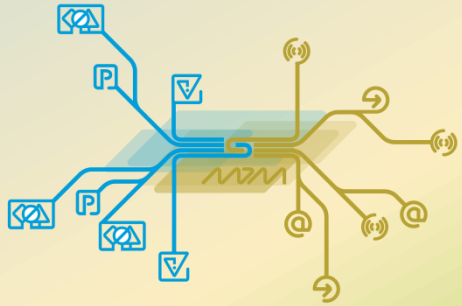
- Think about suitable transport formats like Container format
- Think about content collection or aggregation
- Control and measure delivery to subscriber systems; have an emergency switch to stop delivery to meet the SLA

Conclusion

- MDM architecture has passed pilot phase scuccessfully
- MDM architecture is sufficient scalable
- J2EE technology offers the necessary facilities to manage the requirements
- Broker concept is well qualified to fulfill requirements of a SPA with reasonably costs
- MDM is ready to become Germany‘s SPA

Let‘s talk about

- Materna – Who we are? What we do?
- MDM architecture
- Platform users and contents
- Special requirements and their solutions
- Figures of usage
- Experiences and recommendations for a SPA
- Any Questions?



Any Questions?

Thank you for your attention!

- **Contact Information:**
- **Andreas Rydzek**
  Materna GmbH
  Vosskuhle 37
  44141 Dortmund – Germany
  andreas.rydzek@materna.de
  + 49 (231) 5599-309