Profile driven transformation service



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Introducing: Dutch Central Bank (DNB)

- Located in the centre of Amsterdam
- Supervisor of the financial sector in The Netherlands
- 1800 staff
- Supervising:
 - ~100 Banks
 - ~250 Insurance companies
 - ~250 Pensionfunds
 - ~2500 Investments corporations
 - ~200 Cash exchange shops
- Supervised by:
 - BIS, EBA, ECB, EIOPA, ESMA, Eurostat, Dutch Ministry of Finance, IMF, SRB, ...



Starting position

- About 400 different report types (both incoming and outgoing)
- Senders to DNB : ~3500, receivers from DNB: ~25
- Channels:
 - HTTPS Portal
 - (s)FTP
 - SMTP
 - Third party gateways on local servers like EXDI (from ECB) and BDA (from BIS)
- Supported formats:
 - JSON
 - XML
 - XBRL
 - SDMX
 - Edifact
 - CSV
 - MS-Excel
 - PDF
- Every report has dedicated software, with UC4 scheduling scripts and the DNB webportal hosting a proprietary XML syntax



Problems

- The in- and out going formats didn't always match;
 - Forcing proprietary single report based transformation solutions
- Software maintenance nightmare;
- The rate in which new reporting requirements were forced upon DNB accelerated with the financial crisis of 2013
 - Multiple EU supervisors requiring data from the same companies causing (unwanted) administrative burden;
 - The DNB proprietary XML format and software reached its end of life;
 - XBRL became 'the new kid in town' and DNB didn't have the appropriate expertise nore software support;
- Maintenance and knowledge required for 'many' channels and formats

Requirements

- Support DNB strategy of a data driven organisation.
- Phase out the DNB proprietary XML for reporters;
- Limit the number of supported formats;
- Limit the authentication issues with channels like FTP and SMTP;
- New reporting requirements for DNB are quick to implement for both DNB and the supervised businesses;
 - Reducing administrative burdon on the market is a secondary goal
- Reduce managing costs on software and (report) specifications;

Solution approach

- MS-sql Server solution to store all data: i-Refact;
- Procesflows: MS-BizTalk;
- Limit data flows for incoming reports to two formats:
 - Store as file in filestore with XBRL as the leading format
 - Store in structured tables with a CSV file per table of the data model
- No more reporter dedicated FTP connections or SMTP for incoming data
 - Use Logius; the Dutch goverment GUI-less portal for commercial businesses
- Replace the old webportal and remove the option of manual input of numbers
- Single (custom) software solution for exchange contracts:
 - Configuration, no programming
 - Data models, no programming
 - Every exchange agreement is a contract, contracts have reporting obligations, reporting obligations have deliveries. Incoming and outgoing data is dealt with in the same manner.
- Retrieve data from the database for outgoing reports in a single format
- Transform single internal format into all requested formats with a single solution

Transformation - architecture

- Single internal input format of the data: XML
 - Single root element node with unlimited attribute nodes representing DB columns
- Seperation of concerns:
 - Syntax requirements
 - XSLT Stylesheet handles the output <u>syntax specification</u> (CSV, SDMX, XBRL, JSON)
 - Node mapping
 - XML mapping file handles <u>mapping</u> between <u>database column</u> name to target node name
 - Value mapping
 - XML mapping file handles <u>mapping</u> between <u>database value</u> to target value
 - ONLY on regular 1:1 value maps, no intelligence added! (NL -> NLD, true -> 1, etc.)
 - ToDo: Structure and repetition insert
 - XML mapping file handles pointers where nesting and/or repetition in the output is required

XML Mapping Template Design

- One Domain Specific Language to control 5 output formats
- Hide technicalities of the output format from **business analysts**
- Offer all features business analysts want to express
- But keep it simple enough to be used by the "only once per year" user
- [and make sure the transform can actually be **implemented**]
- Constraint: Agile in production

DNB XML \Leftrightarrow CSV



CSV - Template example

```
<sectionTemplate>
   <csv encoding="UTF-8" headerInclude="1" seperator=";" quoteEscape="ALL">
        <row>
            <field match="national id"
                   name="ID"/>
            <field match="national id type"
                    mappingTable="NIT"
                    name="Nat ID Type"/>
            <field literal="Jeroen"
                    name="First Names"/>
            <field name="timeProduction"
                    calculatedValue="#DateTime"/>
            <field match="rep ref date"
                    name="ref Date"
                    process="#RIADreducedCharset #RIADdateTime"/>
        </row>
   </csv>
</sectionTemplate>
```

A quick word on mapping

```
<term code="2" value="3"/>
<term code="3" value="2"/>
<term code="4" value="1"/>
</mappingTable>
<mappingTable name="RIAD_LGL_PRCDNGS_STTS_C">
<term code="X" value="0"/>
<term code="F" value="3"/>
<term code="F" value="3"/>
<term code="S" value="2"/>
</mappingTable>
<mappingTable name="NIT">
<term code="S" value="2"/>
<term code="11001" value="S11"/>
<term code="11002" value="S11"/>
<term code="11003" value="S11"/>
<term code="12100" value="S121"/>
<term code="12201" value="S122"/>
```

DNB XML ⇔ SDMX







SDMX Template Header

SDMX Template Body

DNB XML ⇔ XBRL



XBRL Template

You want to see some XSLT?

```
<xsl:template match="meta:obs/meta:dim">
        <xsl:param name="row" tunnel="yes"/>
        <xsl:variable name="this-dim" select="copy-of(.)"/>
        <xsl:variable name="expanded-field" select="fun:expand-field($this-dim, $row)"/>
```

You want to see some XSLT?

Results

- Custom application that holds all exchange contracts
- Migrating old exchange reports: on its way (est. another 2 years)
- No more software that understands SDMX, XBRL, Edifact etc.
- Services and micro-services for all message handling, cloud ready
- Routing slips (configuration file) in control of message handling
- MS-BizTalk not aware of any syntax or report type, only channels
- All syntax related issues in transformation service
 - Using Saxonica EE, XSLT v3.0
- Time to market a new report: days

Observations

- Where to add new functionality?
 - Eg. Compound keys
- Get the balance right
 - Functionality versus complexity
- Continuous training of many business teams
 - We sometimes doubt among ourselves
- Staffing for streaming XSLT3
 - If ever the XSLT needs fixing
- Feedback in syntax is problematic for the business users

Concluding

- Business needs are met
- Separation of concerns
 - IT / syntax concerns with developer, not the business
- Stopped with ad-hoc solutions per report
- Future plans
 - Flexibility in reporting demands upon DNB: bring it to the reporters too
 - making report specifications channel and format independent