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Experiences using OCL for Business Rules on Financial Data

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Introduction

- Have built own OCL implementation, for executing OCL over XML
  - Generate OCL to Java
- Execute rules on XML messaging
  - focus on finance
- Have encountered three common requirements

Three Problems

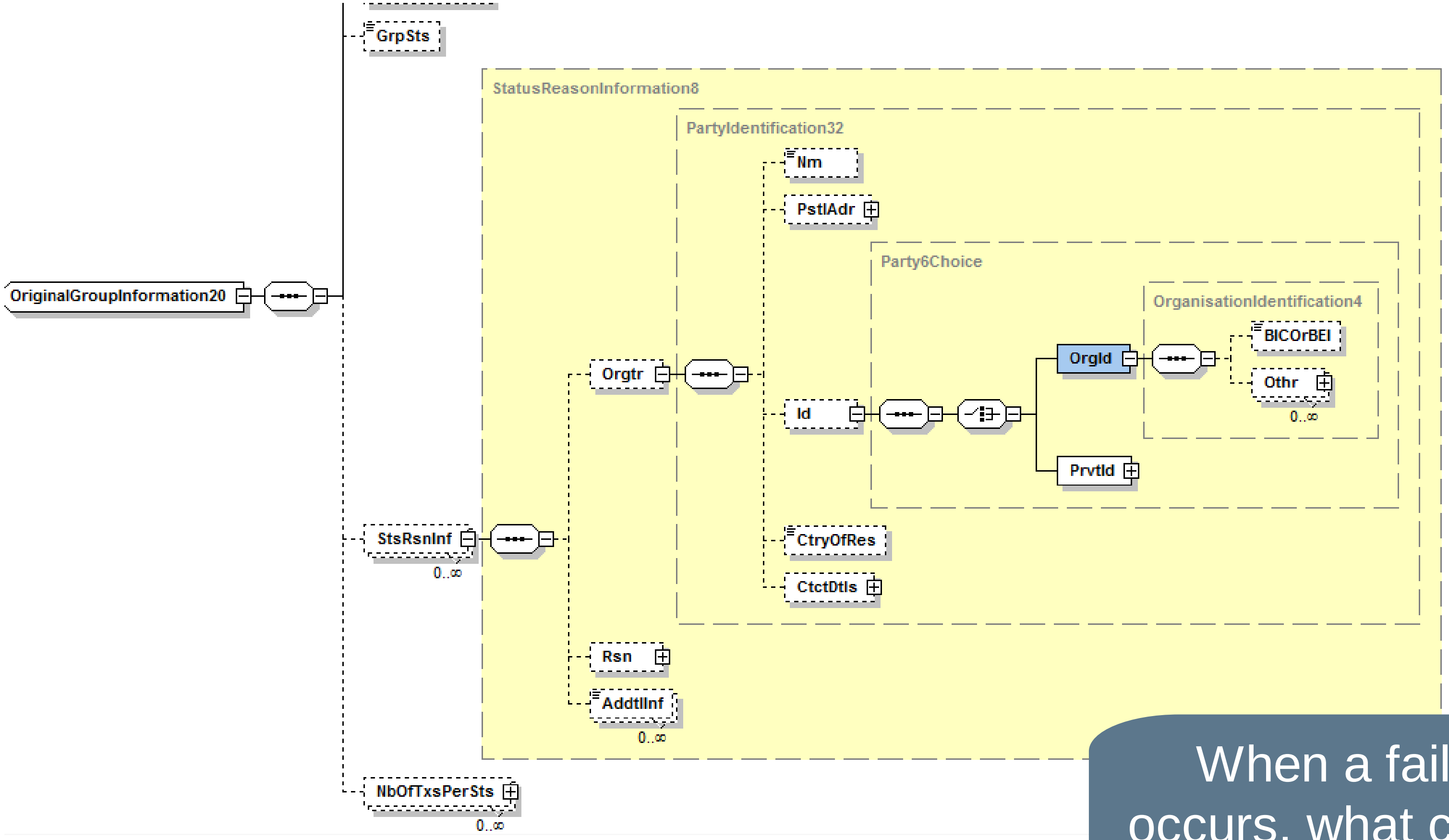
- Identifying exact error locations
- Supporting additional data types with operations
- Checking against external data sources

Identifying Error Locations

- Commercial usage:
  - detect issues in messaging, and provide troubleshooting report to originators of the messaging
  - report must be comprehensive; originators have no debugging capability
  - we replace a process whereby message originators must ensure they comply with paper-based messaging guidelines

- Problem:
  - Need to report exact error location / cause of error
  - Depending on the OCL expression, this can be difficult
  - We do not write the OCL and can't control expressions used

Exact Error Locations



When a failure occurs, what caused the failure?

```
context OriginalGroupInformation20

StsRsnInf->forAll(a |
  (a.Orgtr.Nm->size() = 1 or
      (a.Orgtr.Id->size() = 1 and a.Orgtr.Id.OrgId.BICOrBEI->size() = 1))
  and a.Orgtr.PstlAdr->size() = 0
  and a.Orgtr.CtryOfRes->size() = 0)
```

Some Options

- Rewrite the rule
  - Split into a number of rules;
    - Often a good option, but not in all cases. In the example, the rule is a discrete rule from a standards specification, so don’t want to split
  - Follow a more suitable OCL pattern; See IEEE paper “Testing-oriented improvements of OCL specification patterns”
    - Likely to make the OCL authoring more difficult. May not solve every case

- Our solution
  - Trigger OCL queries on failed contexts
  - Author of the OCL constraint also authors the queries, and decides what is the most useful information to return

Query Rules

OCL Constraint

```
context OriginalGroupInformation20

StsRsnInf->forAll(a |
  (a.Orgtr.Nm->size() = 1 or
      (a.Orgtr.Id->size() = 1 and a.Orgtr.Id.OrgId.BICOrBEI->size() = 1))
  and a.Orgtr.PstlAdr->size() = 0
  and a.Orgtr.CtryOfRes->size() = 0)
```

Returns any postal address and country of residence information included

- Should also include queries to return names and Ids

Triggered OCL Queries

```
Context OriginalGroupInformation20::getPstlAdr() :
Set(PostalAddress6)

body: self.Orgtr.PstlAdr->asSet()


Context OriginalGroupInformation20::getCtryOfRes() :
Set(CountryCode)

body: self.Orgtr.CtryOfRes->asSet()
```

Additional Data Types and Operations

- Commercial usage
  - OCL authors work with domain-specific models e.g. FpML, or ISO20022 payments
  - Need to be able to write commonly occuring rules for these domains easily
- Examples:
  - For FpML (messaging for derivatives trading) need rules on dates (and timezones)
    - Need support for date types, with operations like after, before etc
  - For ISO20022, an IBAN type is included (unique bank id)
    - Need support for checking structure of the IBAN (checksums etc)
- Extensions to OCL for domain-specific models must be ‘easy’/’lightweight’
  - Date / time operations can be made available to all
  - But operations such as checking IBAN should only be available for the ISO20022 models

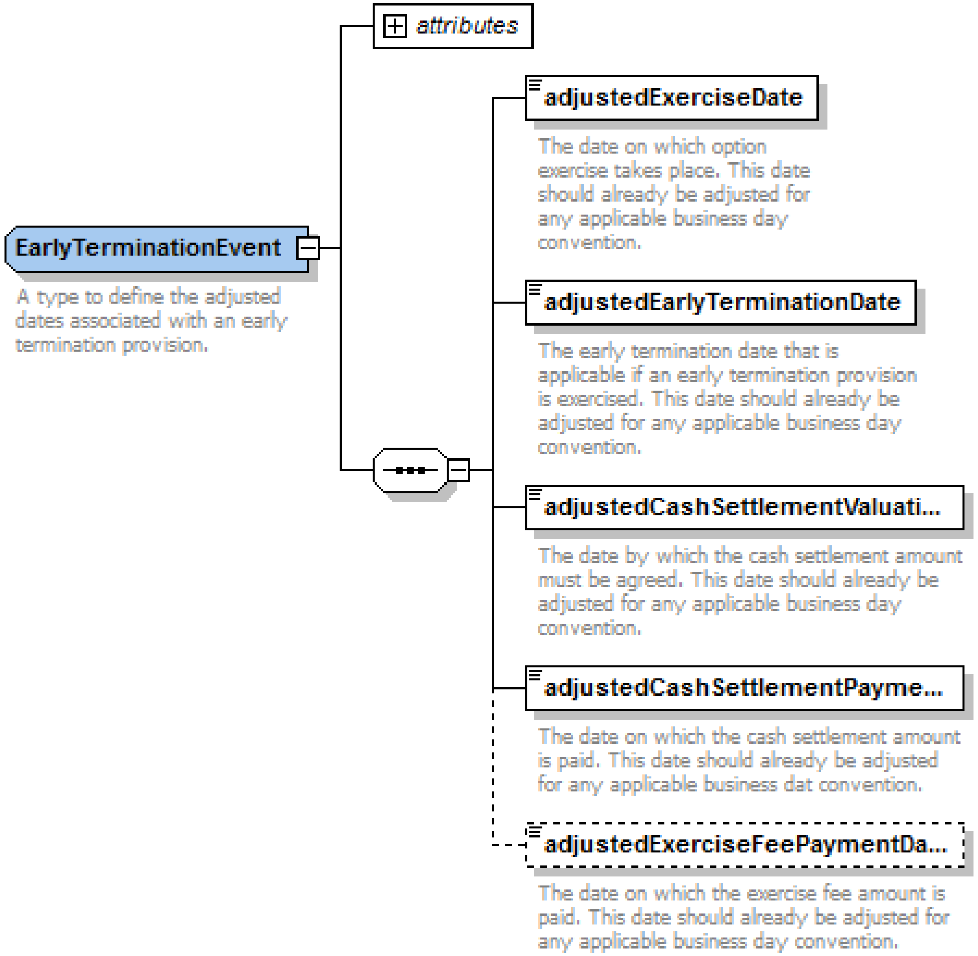
Additional Data Types and Operations

- We do code generation…
- Rather than defining operations using OCL expressions
- We make the operations available on the types
  - And ensure there are implementations in our code generation target (java)

Example of Date Operation

context EarlyTerminationEvent

adjustedExerciseDate.before(adjustedEarlyTermDate)



attributes
EarlyTerminationEvent
adjustedExerciseDate
adjustedEarlyTerminationDate
adjustedCashSettlementValuati...
adjustedCashSettlementPayme...
adjustedExerciseFeePaymentDa...

A type to define the adjusted dates associated with an early termination provision.

The date on which option exercise takes place. This date should already be adjusted for any applicable business day convention.

The early termination date that is applicable if an early termination provision is exercised. This date should already be adjusted for any applicable business day convention.

The date by which the cash settlement amount must be agreed. This date should already be adjusted for any applicable business day convention.

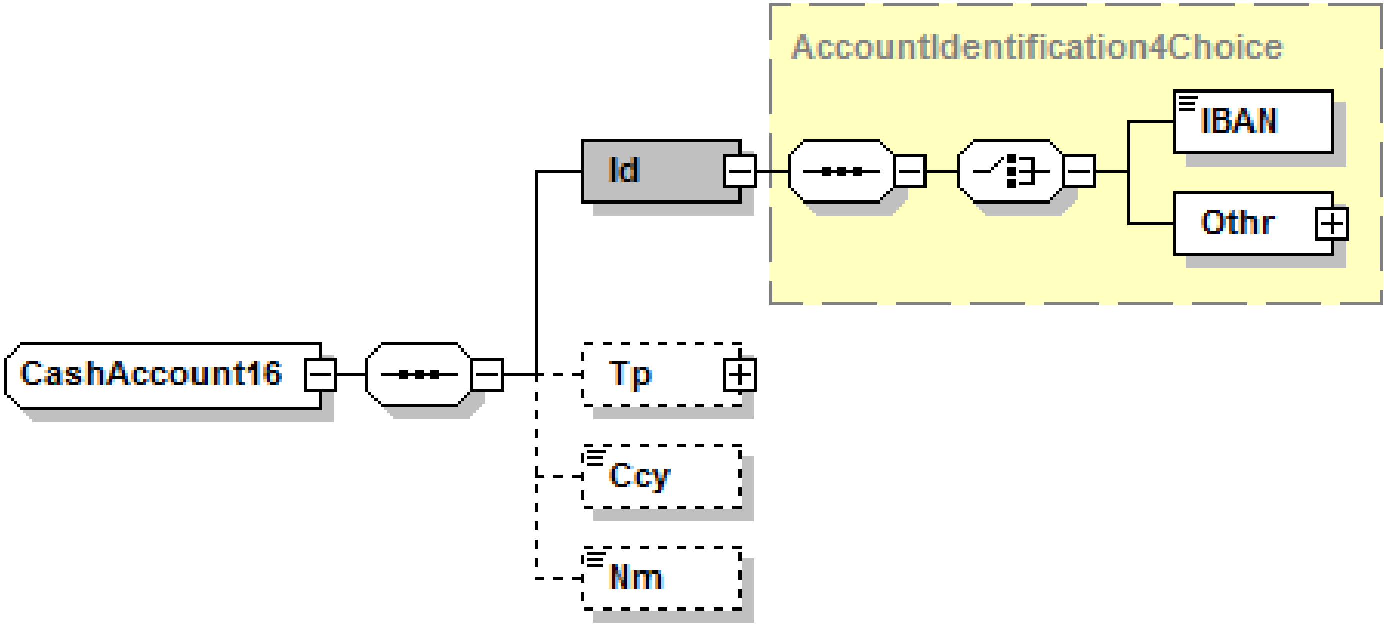
The date on which the cash settlement amount is paid. This date should already be adjusted for any applicable business dat convention.

The date on which the exercise fee amount is paid. This date should already be adjusted for any applicable business day convention.

Example of isValidIBAN Operation

```
context CashAccount16

self.Id.IBAN.isValidIBAN()
```



```
<xs:simpleType name="IBAN2007Identifier">
  <xs:restriction base="xs:string">
    <xs:pattern value="[A-Z]{2,2}[0-9]{2,2}[a-zA-Z0-9]{1,30}"/>
  </xs:restriction>
</xs:simpleType>
```

Referencing External Data Sources

- Commercial Usage
  - Frequently need to check data against external data sources
    - Codelists managed by external organisations
    - Data in customer databases

- Need mechanism to allow customers to write OCL expressions that include these types of checks

- Needs to be easily configurable
  - Customer needs to be able to define which types of checks they want to make available
  - Depending on the runtime environment, the external data source may change
    - e.g. one database instance in a test environment, another in the production environment

Referencing External Data Sources

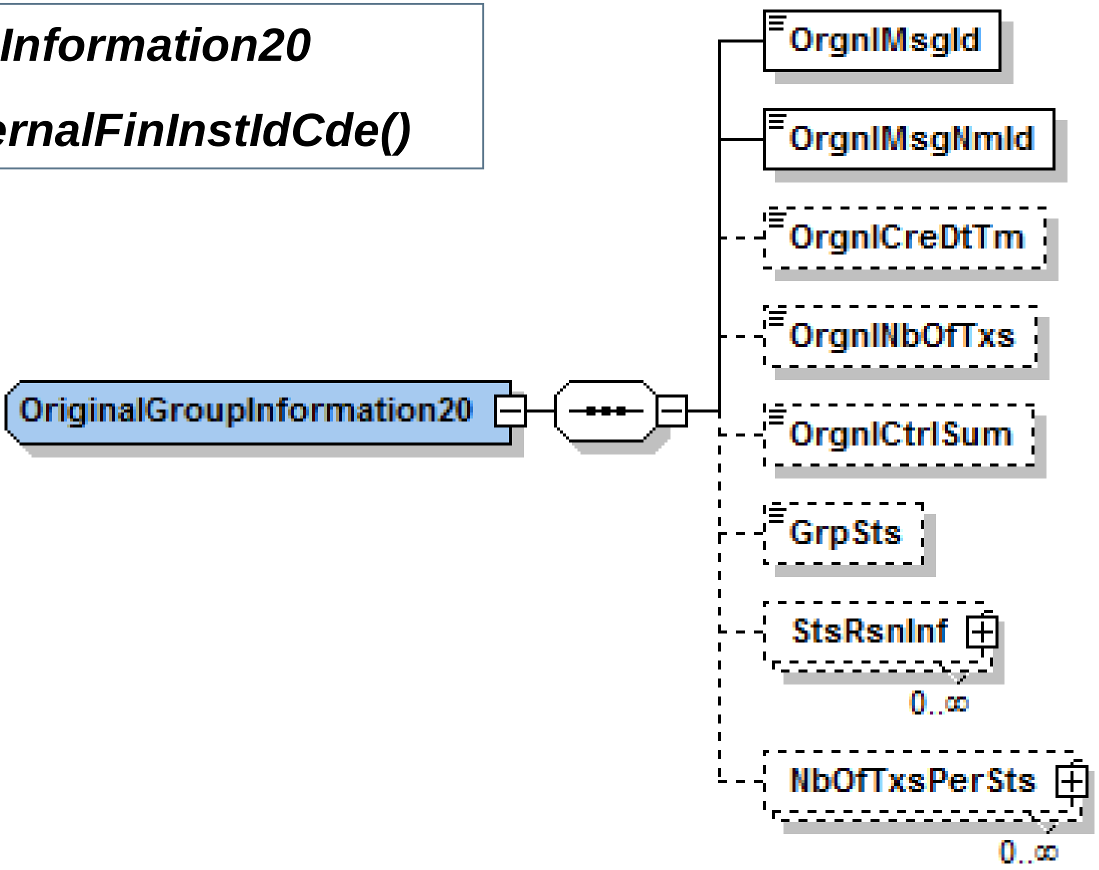
- We provide a mechanism to allow customers to configure functions on the types we support

- And they provide the runtime implementation in java

Example of Operation to Check Codelists

context OriginalGroupInformation20

self.OrgnlMsgId.isExternalFinInstIdCde()



Conclusion

- We have outlined some requirements that we have needed to address

- We try to find practical ways to solve the problems
  - Taking account of user needs
  - And implement quickly, simply and flexibly

- Purpose on presenting here:
  - generate discussion on how to provide a common approach to solving these problems for OCL users

Nomos at a Glance

Mission: Fast Deployment of Business Rules

Company

Private company, software vendor, founded 2007, Ireland

Tricia Balfe, founder and CEO

David Garry, founder and CTO

Chris Horn, non-executive director, formerly of Iona Technologies (CORBA)

Partnerships

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