MPS

Client:

Dutch Tax and Customs Administration (DTCA)

Belastingdienst

Short description:

Domain-specific languages to implement Dutch tax legislation and process changes of that legislation.

Problem:

The Dutch Tax and Customs Administration (DTCA), is a part of the Ministry of Finance, which are responsible for levies and collecting taxes, as well as calculating and providing the benefits people are entitled to. Annually, the Tax Administration processes the individual tax returns of over 6 million private citizens and 1.1 million entrepreneurs. DTCA has one of the biggest internal software houses in the country.

In 2016, DTCA was responsible for the collection of 243 billion euros. One small mistake in the process of this collection could result in enormous losses. Due to this risks DTCA is extremely careful in changing the technology which is responsible for this tax calculations.
Every major law change was a long and complicated implementation coordinated between the lawyer, Tax experts, and the IT specialists to deliver the requirements to all of the subsystems.

Solution:

Agile Law Execution Factory (ALEF), is an IDE developed with JetBrains MPS that uses a natural language to specify services, fact patterns, tax rules, and test cases. Using a Model-driven engineering approach, they are able to facilitate adaptation of tax-calculation services to the frequent changes that occur in laws, regulations, policies, and meet the objectives of the organization.

The results of the analysis of legislation and internal policies consist of structured descriptions of rights, duties, legal concepts, fact patterns, concept descriptions, legal actions, legal actors, legal documents, and legal rules. These are brought together in knowledge models, which can be used for developing or generating service applications. For that part of the tax system which uses this approach, it results in a situation which can be easily adjusted when legislation changes.

Example of a Tax Rule:

Rule result tax amount first bracket 01
valid from 2014

The result tax amount of the first bracket of a taxpayer must be set at the `maximum` value of `A` and `B` if he meets `all` of the following conditions:

- **applying table 2.10a is `equal` to *'no'***
- **the taxable income Box-1 minus the applied different rate is `smaller or equal to` the MAXIMUM AMOUNT TO WHICH THE FIRST DISC IS APPLIED.**

The following applies:

A is rounded down to whole euros ((the taxable income Box-1 minus applied different rate times THE PERCENTAGE OF THE FIRST DISC))
B is 0.

The image above is a real example of a tax rule that is currently being used in ALEF. The rule is valid from 2014 and defines the calculated amount of taxes of a taxpayer when they meet the following conditions:

- The taxpayer is born after 1946. Applying the table 2.10a is a function to know if the taxpayer is born after 1946.
- The box1 (all the things that are taxable, including total income) is smaller or equal to the maximum amount in the first column of table 2.10a.

Where the amount must be set at the maximum of A and B:
A is the income for box1 multiplied by the tax percentage for people born after 1946 rounded down to whole euros.
B is 0.

Based on these tax rules ALEF generates code for the FICO Blaze rule engine, which is a highly scalable solution for the mass calculations of DTCA. The Blaze rule code is deployed as a decision service on the Mainframe and is **used by the back office systems and legal experts.**

Why MPS?

MPS enables DTCA to implement RegelSpraak, a Dutch Controlled Natural Language.

Main benefits:

- Rich semantic to allow domain experts to operate the tax rules and languages.
- Agility to quickly change controlled language pattern and a smooth migration to new versions of our languages.
- Editor support for refactoring languages, code completion, and error checking.
- Creation of interpreters with test cases to allow quality assurance and provide context-sensitive constraints.

> Model-Driven Software Engineering is the future and the Tax Authorities are already on their way!
> — *Diederik Dulfer*

Useful links:

- MPS Community Meetup 2018: Interpreters in MPS by Gert Veldhuijzen.
- MPS Community Meetup 2018: Challenges of the Dutch Tax and Customs Administration (DTCA) by Diederik Dulfer.
- MPS Community Meetup 2018: Separating functionality from technical implementation by Betsy Pepels.
- Creating software with a factory.