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# DEMYSTIFYING THE DECISION MODEL AND NOTATION SPECIFICATION

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# THE POWER OF A COMMON LANGUAGE

## The Tower of Babel

According to the story, a united humanity ..., speaking a single language ..., agree to build a city and a tower tall enough to reach heaven.

God, observing their city and tower, confounds their speech so that they can no longer understand each other, and scatters them around the world.

*Source:* [https://en.wikipedia.org/wiki/Tower\\_of\\_Babel](https://en.wikipedia.org/wiki/Tower_of_Babel)

*Picture:* Tower of Babel, by Lucas Van Valckenborch, 1594, Louvre Museum



# DMN AS WE KNOW IT

a.k.a.: the power of stating the obvious

DMN has generated a lot of buzz recently, but...

- DMN does not invent anything: decision management, decision automation, etc, already existed
- It is basically a common language to express decision logic
- **DMN is a means to an end, not the end on itself**

# HOW TO DELIVER VALUE TO USERS?

What do users really need/want?

- Formal methodologies and best practices
- Tools to help with knowledge capturing/mining/modelling
- Scalable, cloud based, dynamic runtimes
- Integrated BAM KPI monitoring and analysis for decisions
- ...

*Maybe, if we can speak a common language, we can reach heaven! ;)*

# HOW DO WE MOVE FORWARD?

By overcoming the entropy:

- Implement the language
- Ensure interoperability
- And move on to deliver real value to customers/users

# DEMYSTIFYING THE DMN SPECIFICATION

Goal of the presentation

To share with the community the lessons I learned while learning the DMN specification and hopefully help others to adopt it.

# WHO AM I TO TALK ABOUT LESSONS LEARNED?

I am a code developer that implemented a complete (or close enough) runtime for DMN.

- The implementation:
  - Open source, runtime implementation
  - Drools version 7.0.0, Apache v2.0 Licensed
  - No built-in authoring tool (but seamlessly integrated with Trisotech's DMN Modeller)
- Basked on the joys, felt the pain
- Feedback to the RTF for future DMN versions
  - I was not a member of the RTF group for DMN 1.0 and 1.1
  - Submitted tickets for DMN 1.2
  - Joining the RTF soon

A large bridge structure, possibly the Golden Gate Bridge, is shown in the background. A large, semi-transparent red diagonal shape covers the upper portion of the slide, from the top-left corner to the middle-right. The text is centered within this red area.

# LESSON 1: CONFORMANCE LEVEL 3 IS IMPORTANT (I.E., THE FULL SPEC)

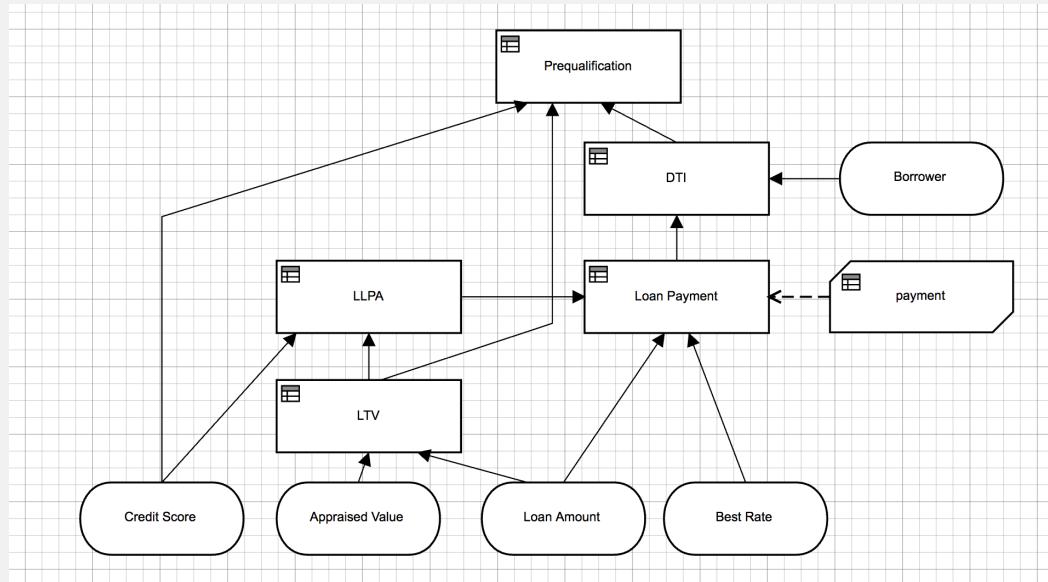
# CONFORMANCE LEVELS

The spec defines 3 incremental conformance levels for implementations:

- Conformance Level 1:
  - Requires support for authoring of Decision Requirements Diagram, Decision Logic and Decision Tables
  - This conformance level is basically “documentation only”, no execution required (although allowed)
- Conformance Level 2:
  - Everything from conformance level 1, plus support for the S-FEEL (simplified FEEL) expression language
  - Requires execution, and requires the logic modelled in CL1 to be expressed in S-FEEL
- Conformance Level 3:
  - Everything from conformance level 2, plus support for the full FEEL language
  - This includes additional modeling elements like: boxed contexts, boxed functions, etc.

# CONFORMANCE LEVEL 2

## Decision Requirements Diagram



Source: Bruce Silver's "Prequalification" example

# CONFORMANCE LEVEL 2

## Boxed Literal Expressions

LTV
Loan Amount / Appraised Value

## Decision Tables

Prequalification					
P	LTV	DTI	Credit Score	Prequalification	Description
P			[300..850]	"Approved", "Declined"	
1	<=0.75	<=0.36	>=620	"Approved"	
2		(0.36..0.45]	>=640	"Approved"	
3	(0.75..0.80]	<=0.36	>=680	"Approved"	
4		(0.36..0.45]	>=700	"Approved"	
5	-	-	-	"Declined"	

Source: Bruce Silver's "Prequalification" example

# CONFORMANCE LEVEL 2

## Business Knowledge Model (function definition)

payment	
F	( principal , rate , term )
$\text{principal} * \text{rate} / 12 / (1 - (1 + \text{rate} / 12)^{-\text{term}})$	

## Function Invocation

Loan Payment	
payment	
principal	Loan Amount
rate	$\text{LLPA} * .00125 + \text{Best Rate}$
term	360

Source: Bruce Silver's "Prequalification" example

# CONFORMANCE LEVEL 2

Expression Language support at Conformance Level 2: S-FEEL (Simplified FEEL)

- S-FEEL is limited to arithmetic expressions and comparisons
  - no function calls: no data type conversion, no numeric functions, no string manipulation
  - still supports date/time/duration types as they are considered literals. E.g.: date("2017-06-18")



# WHAT DOES CONFORMANCE LEVEL 3 ADD?

# CONFORMANCE LEVEL 3

*Boxed Context*  
*(to represent data)*

Applicant Data		
Age	51	
MaritalStatus	"M"	
EmploymentStatus	"EMPLOYED"	
ExistingCustomer	false	
Monthly	Income	10000.00
	Repayments	2500.00
	Expenses	3000.00

*Boxed Context*  
*(to decompose complex decisions)*

Evaluate Match	
( User , Candidate )	
Is Match	Is a Match(User, Candidate) and Is a Match(Candidate, User)
Score	Number of Matching Interests(User, Candidate) - absolute( User.Age - Candidate.Age )
if Is Match then Score else 0	

Source: DMN specification

# CONFORMANCE LEVEL 3

*Boxed Context  
(to improve readability)*

*Source: DMN specification*

Post-Bureau Risk Category				
Existing Customer		Applicant. ExistingCustomer		
Credit Score		Report. CreditScore		
Application Risk Score		Affordability Model(Applicant, Product). Application Risk Score		
U	Existing Customer	Application Risk Score	Credit Score	Post-Bureau Risk Category
1	true	<=120	<590	"HIGH"
2			[590..610]	"MEDIUM"
3			>610	"LOW"
4		>120	<600	"HIGH"
5			[600..625]	"MEDIUM"
6			>625	"LOW"
7	false	<=100	<580	"HIGH"
8			[580..600]	"MEDIUM"
9			>600	"LOW"
10		>100	<590	"HIGH"
11			[590..615]	"MEDIUM"
12			>615	"LOW"

# CONFORMANCE LEVEL 3

## Boxed Lists and Relations

Sales Tax			
Province	Type	Province Rate	Total Rate
"Alberta"	"GST"	0.00	0.05
"British Columbia"	"GST", "PST"	0.07	0.12
"Manitoba"	"GST", "RST"	0.08	0.13
"New Brunswick"	"HST"	0.10	0.15
"Ontario"	"HST"	0.08	0.13

## Boxed Function Definitions

area	
F	( height , width )
height * width	
absolute	
J	( value Number )
class	"java.lang.Math"
method signature	"abs( double )"

# CONFORMANCE LEVEL 3

Full FEEL language syntax and semantics, including:

- Function invocation support:

```
First Name : string before( Full Name, “ ” )
```

```
Cheapest Price : min( Shopping Cart.Price )
```

- Logical expressions “if”, “every”, “some”:

```
every Passenger in Passenger List satisfies Passenger.Documents = “verified”
```

```
    if Stock.Price > Order.Stop Loss Price then “hold” else “sell”
```

- Support for list operations, like mapping values with “for”, filters, etc:

```
Sales Tax : for Product in Shopping Cart return Product.Price * Tax Rate
```

```
Names : Employees[ Department = “Sales” ].Name
```

# CONFORMANCE LEVELS: SUMMARY

Key take-away:

- Conformance level 3 adds only a few constructs to the language, but increases language expressiveness to the level required to handle real world decision modelling
- Conformance level 3 defines standard ways of integrating DMN models with external models and tools (Java, PMML)
- Not providing conformance level 3 forces customers/users to use non-standard constructs/integration:
  - Introduces vendor lock-in, fails to protect customer's investment
  - Increases training costs and TCO in general



## LESSON 2: CONFORMANCE LEVELS DO NOT REFLECT THE MARKET REALITY

# CONFORMANCE LEVELS: REALITY

What is the reality of the DMN tools in the market?

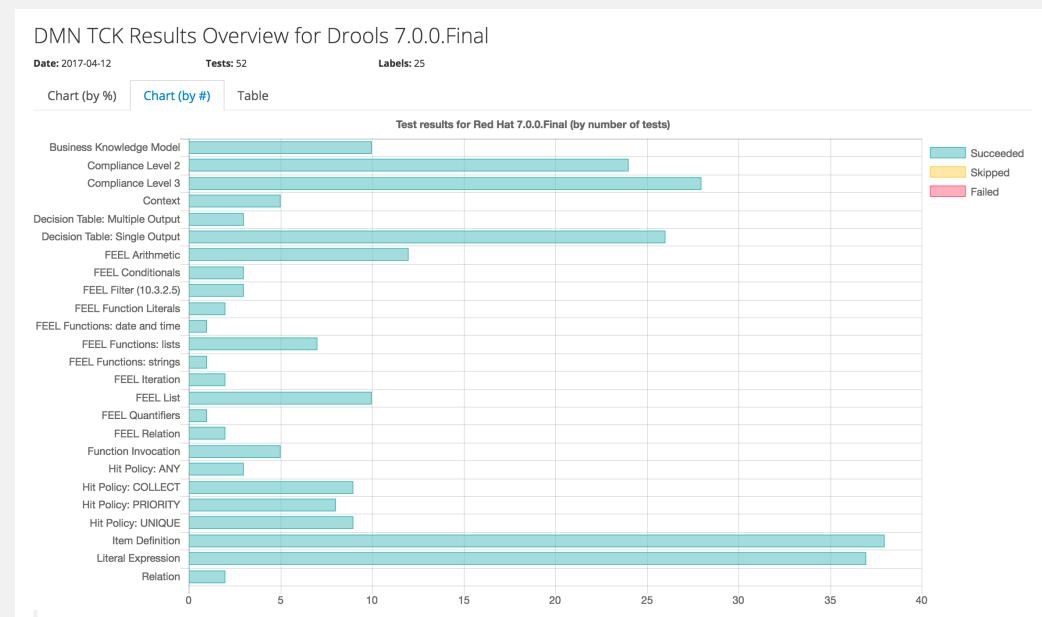
- Many vendors claiming compliance, few go beyond Compliance Level 1
  - Question: can Microsoft Paint from Windows version 3.0 (from 1990) claim level 1 compliance? ☺
- Most implementations driven by internal and/or external requirements:
  - Mix of compliant and non-compliant features
  - Mix of features that do not match “official” compliance levels (i.e., mix of level 2 and 3 features)
  - Features that are part of the standard not completely supported (e.g. Decision Tables)
- Vendors only starting to target level 3 (full compliance); only a couple at level 3 or close;
- **CONCLUSION: classification by Compliance Levels (1, 2, 3) is not enough for the current market**

# CONFORMANCE LEVELS

What conformance level do mine/yours/his product implement?

- OMG does not provide a TCK or reference implementation
- A community driven TCK is being developed by a group of vendors and users, led by Keith Swenson (Fujitsu):
  - Defines categories (test labels) and measures compliance for each category
  - Work in progress, but already publishes results:

<https://dmn-tck.github.io/tck/>





LESSON 3: THE PROBLEM IS NOT TO SUPPORT SPACES, BUT TO LIMIT THEM

# LESSON 3

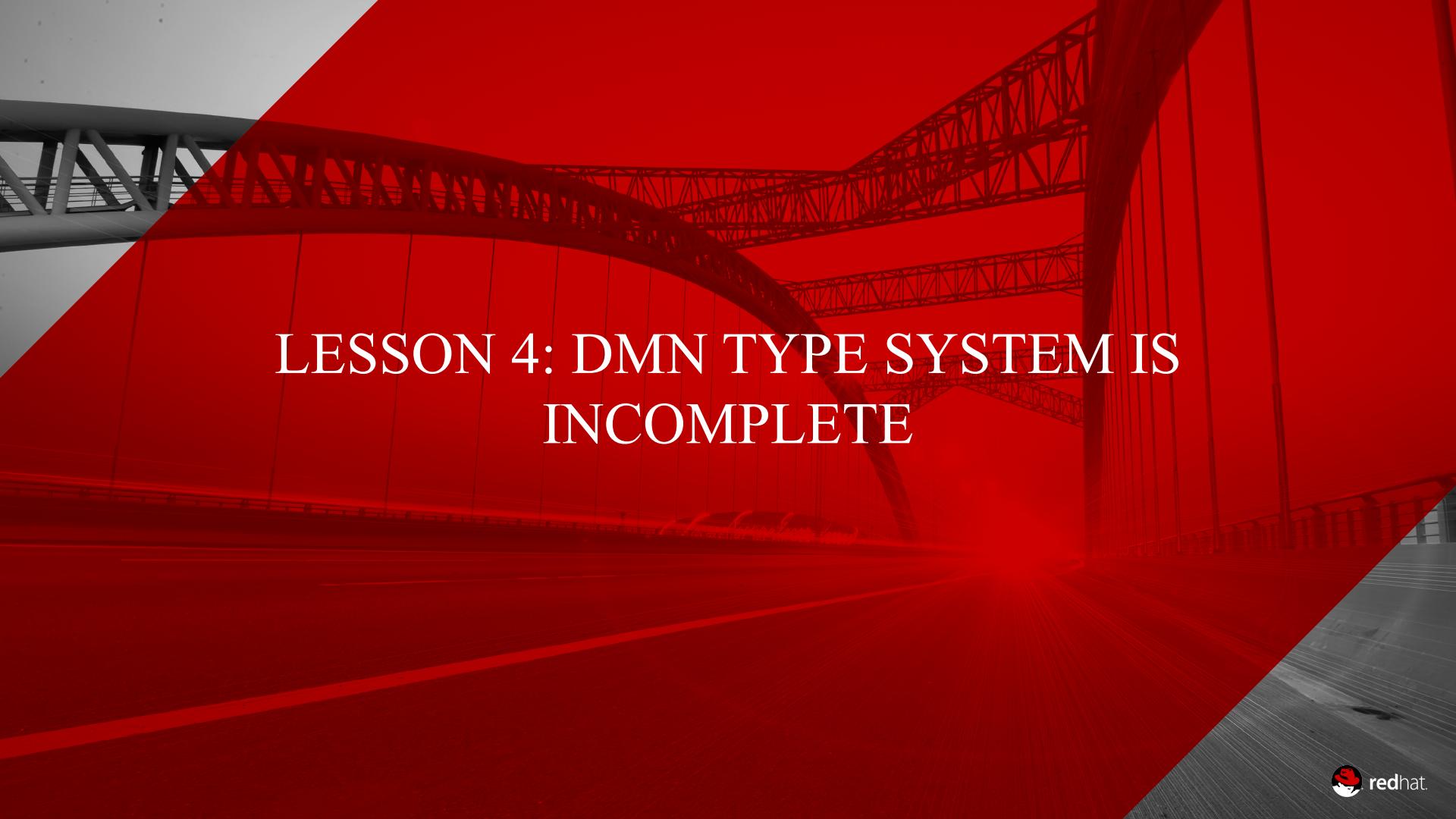
The elephant in the room: **spaces in variable names**

- DMN supports spaces (and a number of other characters) as part of names (variables, decisions, BKM, etc)
- Makes FEEL grammar context sensitive
  - Computer scientists (like myself) cringe when they see it
  - Vendors claim it is too difficult to implement
- Having implemented it myself I can say:
  - Users L-O-V-E it! Whom are we building these tools for?
  - It is not as hard as people think. Don't believe me? Drools is open source... go look!
  - **The problem is NOT supporting spaces, but limiting spaces**

# LESSON 3

## The elephant in the room: **spaces in variable names**

- The specification says:  
“A name may contain spaces but may not contain a sequence of 2 or more spaces”
- Logic (decision) results should not depend on the presence or absence of an INVISIBLE character.
- On large models, it is hard for users to find errors based on a typo of an invisible character
  - First Name should be the same as First Name
- There are many invisible characters: white spaces, non-breakable white spaces, line breaks, tabs, etc
  - How one differentiates between them if they are invisible?
- **SOLUTION: ignore all white spaces and normalize all variable names; remove the restriction on the sequence of spaces.**

A red-tinted photograph of a suspension bridge, likely the Golden Gate Bridge, with its signature towers and cables. A white diagonal banner is overlaid across the middle of the image, containing the text.

# LESSON 4: DMN TYPE SYSTEM IS INCOMPLETE

# LESSON 4

DMN typerefs: **the missing FEEL types**

- The FEEL grammar allows expressions to return results of the types:
  - context. E.g.: { x : 10, y: 8 }
  - list. E.g.: [ 1, 2, 3 ]
  - range. E.g.: [“a”..“z”]
  - function. E.g.: function( x, y ) x+y
  - unary test. E.g.: < 18
- No way to declare a variable of type range, function or unary test. Declaring a variable of types context or list requires creating an item definition first.
- **SOLUTION: add support for these types and document them, even if not part of the current standard**

A photograph of a large bridge, possibly the Golden Gate Bridge, with a strong red diagonal overlay. The text is positioned in the upper left quadrant of the slide.

LESSON 5: THERE ARE SOME MINOR BUGS  
(BUT, BEING ADDRESSED AT DMN 1.2)

# LESSON 5

DMN typerefs: **defined as QNames in the XML schema**

- Some FEEL types contain spaces in their names:
  - date and time, days and time duration, years and months duration
- XML QNames do not allow spaces
- DMN schema defines typerefs as QNames
- **SOLUTION: until DMN 1.2 fixes this issue:**
  - **Create, document, and support synonyms for these types: `dateTime`, `dayTimeDuration`, `yearMonthDuration`**
    - **Aligned with Trisotech and Bruce Silver's Method & Style**
  - **Ignore schema rules and process QName as a string, supporting spaces. E.g.:**
    - `<variable name="Birth Date" typeref="feel:date and time"/>`



## LESSON 6: GET INVOLVED WITH THE COMMUNITY

# LESSON 6

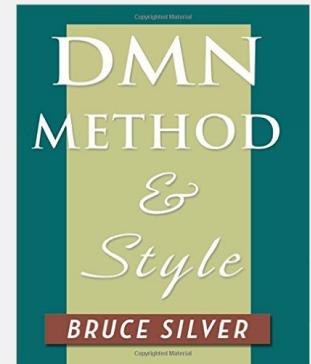
Some chapters/paragraphs of the DMN specification are a bit hard to understand

- A few contradictions in some places, a few ambiguities inherent to the English language in others, a lot of content to learn
- DMN success relies on the fact that it defines not only syntax, but semantics
- **SOLUTION: engage with the community and subject matter experts**
  - **Huge thank you to Bruce Silver, always accessible and open to discussions**
    - + wrote a great book, much easier to read than the spec
    - + created the initial TCK tests
  - **Huge thank you to Trisotech (Denis Gagné, Mélanie Gauthier, Simon Ringuete)**
  - **Thank you to the DMCommunity forum**

# Q&A

Where to get more information:

- DMN specification: <http://www.omg.org/spec/DMN/>
- Drools Website: <http://drools.org/>
- Drools IRC: <http://drools.org/community/chat.html>
- Bruce Silver's book: **DMN Method & Style** : <http://methodandstyle.com/books/>





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