

Migrating Overture to a different IDE



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Contribution

- **VDM-Mode for Emacs**
 - Syntax highlighting
 - Syntax validation
 - REPL
 - VDM Templates
 - Pretty printing
 - Packages accepted into MELPA



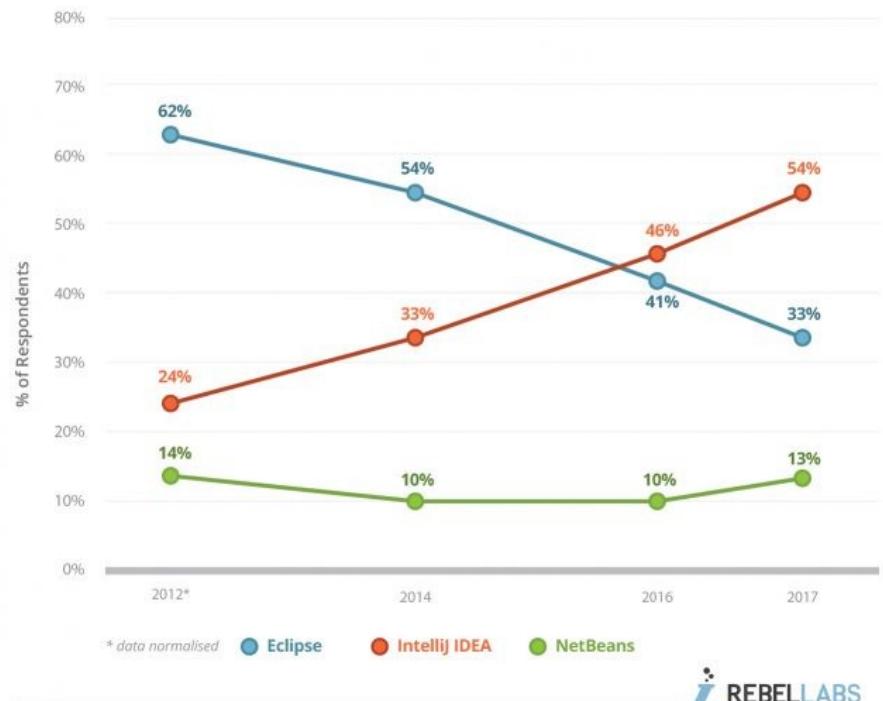
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The need

- Eclipse usage is falling
- Pointed at 16th Overture workshop
- Emacs package as a case study

Comparing 2012, 2014, 2016 and 2017 results: IDEs



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Why Emacs?

- Popular text editor
- Often used as IDE
- Massively extensible
- Use of third party packages
- **Less than 400 LoC**



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Enabling Emacs packages

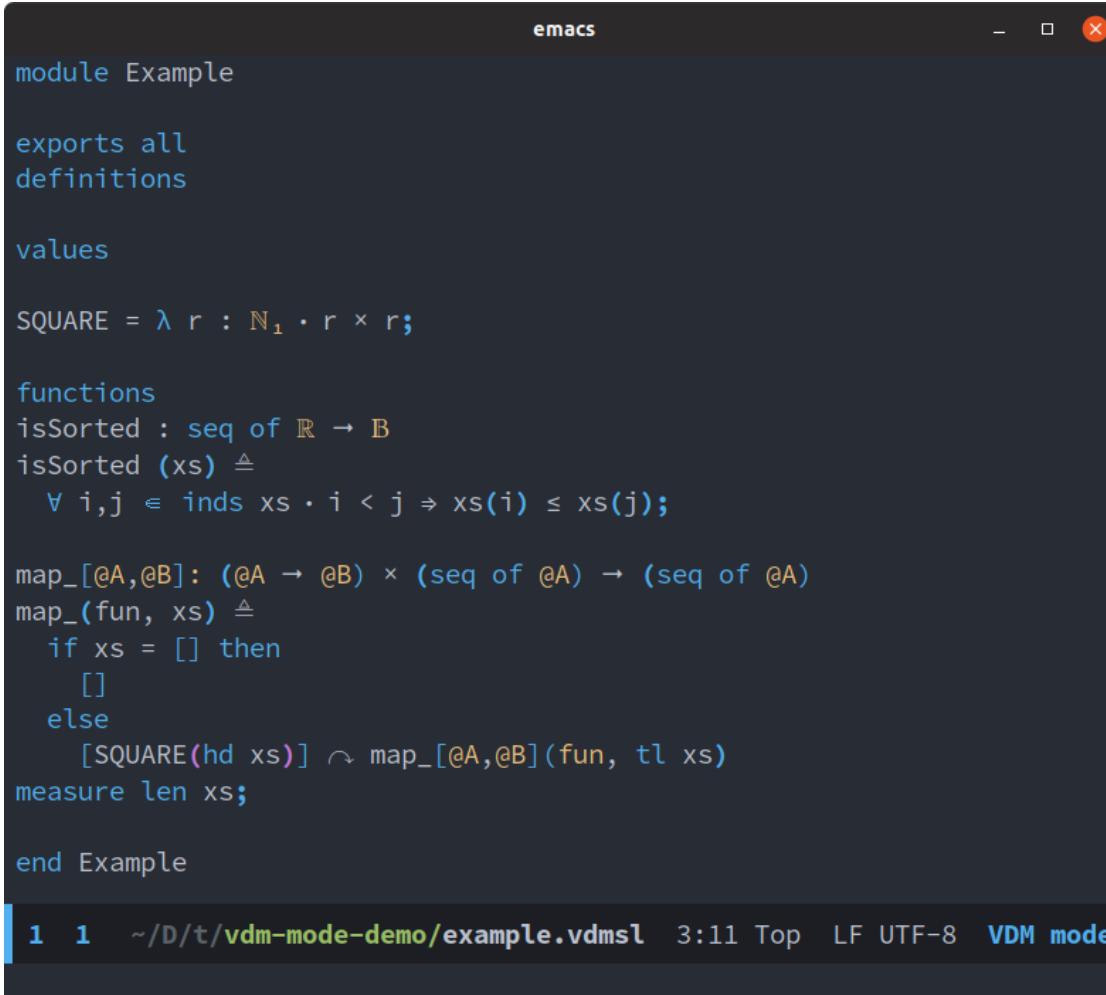
- **prog-mode**
 - Syntax highlighting and indentation rules
- **comint-mode**
 - REPL (interactive shell)
- **flycheck**
 - Syntax checking framework
- **yasnippet**
 - Template expansion system
- **prettify-symbols-mode**
 - Replacement of ASCII characters with Unicode



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Syntax highlighting



The screenshot shows an Emacs window titled "emacs" displaying VDM code. The code defines a module named "Example" which exports all definitions and values. It includes a function "SQUARE" and two sortedness functions ("isSorted" and "sorted"). It also defines a mapping function "map_". The code concludes with a "measure" declaration for "len" and an "end Example". The status bar at the bottom indicates the file path (~/.vdm-mode-demo/example.vdmsl), line numbers (1 1), and mode (VDM mode).

```
module Example

exports all
definitions

values

SQUARE = λ r : N₁ . r × r;

functions
isSorted : seq of ℝ → B
isSorted (xs) △
  ∀ i,j ∈ inds xs . i < j ⇒ xs(i) ≤ xs(j);

map_[@A,@B] : (@A → @B) × (seq of @A) → (seq of @A)
map_(fun, xs) △
  if xs = [] then
    []
  else
    [SQUARE(hd xs)] ∪ map_[@A,@B](fun, tl xs)
measure len xs;

end Example
```

1 1 ~/.vdm-mode-demo/example.vdmsl 3:11 Top LF UTF-8 VDM mode



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Syntax highlighting

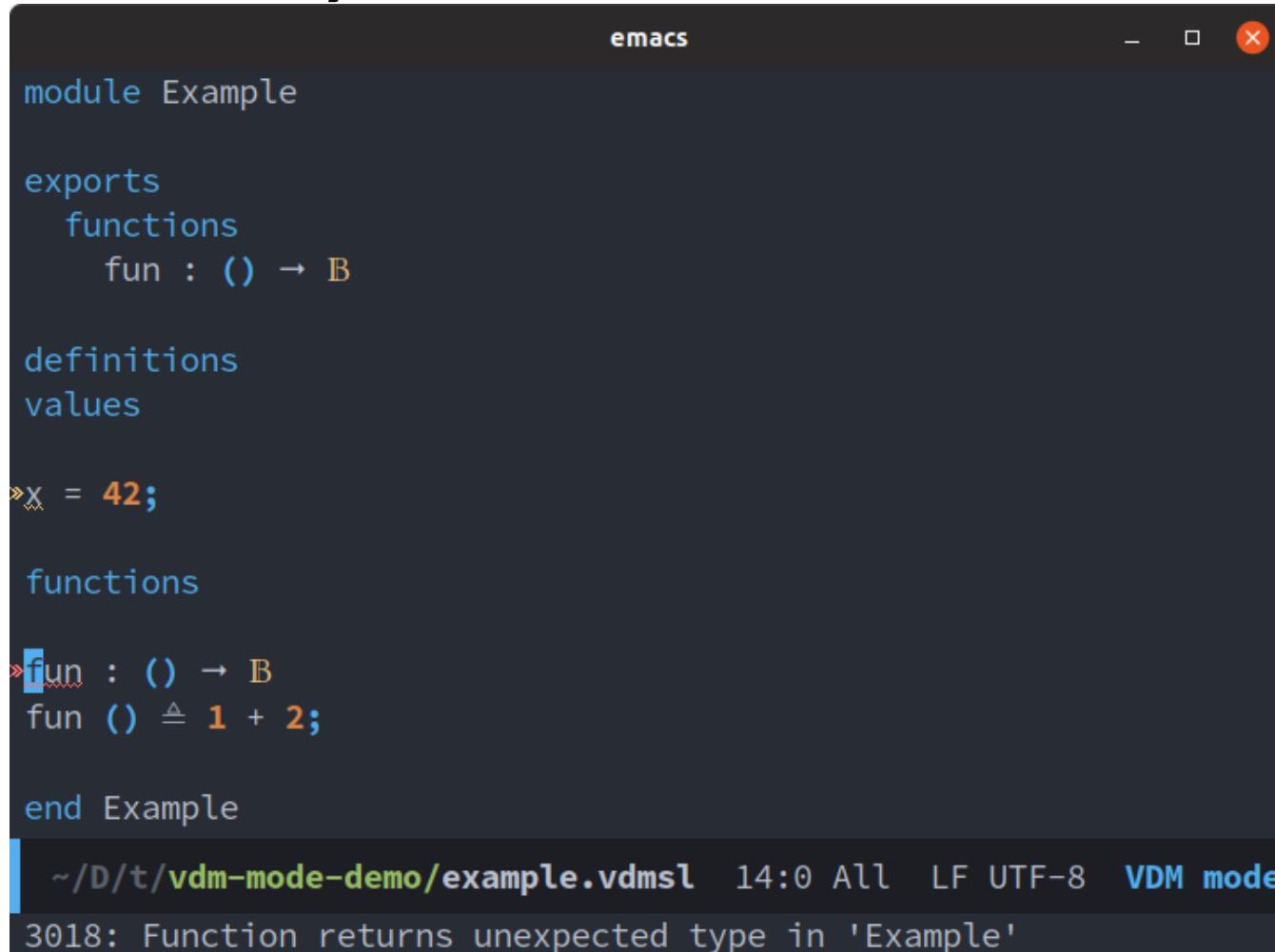
- **vdm-mode derived from prog-mode**
 - Keyword, type, value highlighting
 - Pretty printing of characters
 - Characters saved as ASCII representation
 - Detection of VDM dialect
- **Comparable to Overture**



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Syntax validation



The screenshot shows an Emacs window titled "emacs" displaying a VDM module definition. The code is as follows:

```
module Example

exports
  functions
    fun : () → B

definitions
values

»x = 42;

functions

»fun : () → B
fun () ≡ 1 + 2;

end Example
```

The status bar at the bottom indicates the file path is `~/D/t/vdm-mode-demo/example.vdmsl`, the buffer position is 14:0, and the mode is **VDM mode**. A message in the status bar states: "3018: Function returns unexpected type in 'Example'".



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Syntax validation

- **Based on flycheck**
 - Errors
 - Warnings
 - In margin and echo area
 - Interactive list of errors
 - Errors as pop ups



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The REPL

```
emacs - □ ×
> reload
Parsed 1 module in 0.005 secs. No syntax errors
Type checked 1 module in 0.013 secs. No type errors
Initialized 1 module in 0.008 secs.
Interpreter started
> p isSorted([5, 10, 99, 97, 101, 999])
= false
Executed in 0.009 secs.
> p map_[N1, N1](SQUARE, [1, 2, 3, 4, 5, 6])
= [1, 4, 9, 16, 25, 36]
Executed in 0.015 secs.
> █
1 1  *VDM REPL*  12:2 All          UTF-8  VDM REPL :run
```



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The REPL

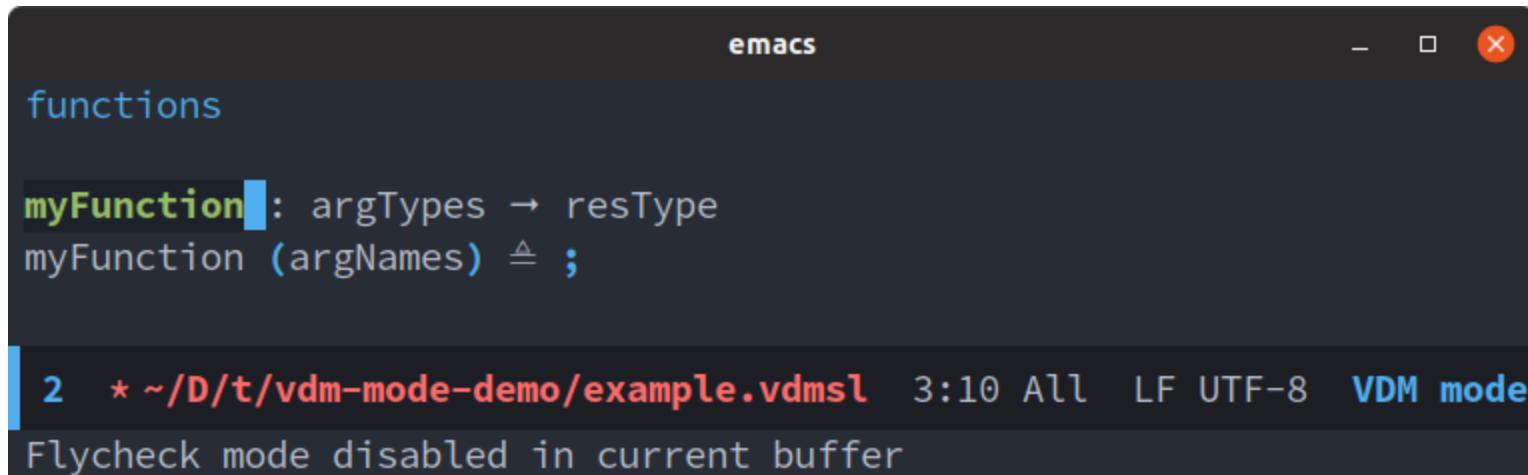
- **vdm-comint based on comint**
 - Run VDM in REPL-like fashion
 - Send parts of the model directly to the REPL
 - Load files associated with current VDM project



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VDM templates



The screenshot shows an Emacs window titled "emacs" with a dark theme. The buffer contains VDM code:

```
functions

myFunction: argTypes → resType
myFunction (argNames) ≡ ;
```

In the status bar at the bottom, the text "2 * ~/D/t/vdm-mode-demo/example.vdmsl 3:10 All LF UTF-8 VDM mode" is displayed, indicating the file name, modification time, encoding, and mode. Below the status bar, a message says "Flycheck mode disabled in current buffer".



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VDM templates

- **vdm-snippets based on yasnippet**
 - Generation of skeleton of VDM syntax
 - Function template expansion
 - Operation template expansion
 - Module template expansion
 - Class template expansion
- **Generate and fill in placeholders**



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What did it take?

- Surprisingly little:

File	Blank	Comment	Code
vdm-mode.el	38	61	145
vdm-comint.el	30	35	102
vdm-mode-util.el	18	23	57
flycheck-vdm.el	15	32	32
vdm-snippets.el	14	25	13
SUM	115	176	349



How does it compare?

Features	Overture	Emacs packages
Syntax highlighting	✓	vdm-mode
Symbol prettyfication	÷	vdm-mode
Syntax validation	✓	flycheck-vdm
Evaluation	✓	vdm-comint
Debugging	✓	vdm-comint
POG	✓	vdm-comint
LaTeX report generation	✓	vdm-comint
Combinatorial testing	✓	vdm-comint
Code generation	✓	÷
Auto completion (limited)	✓	company-mode (simple, non-semantic)
Template expansion	✓	vdm-snippets
Standard library import	✓	÷ (must be added manually)



Conclusion and future plans

- Basic VDM features in few LoC
 - Syntax highlighting (145)
 - Syntax validation (32)
 - REPL (102)
 - Template expansion (13)
- Much more work required to reach full IDE
- Language Server Protocol (LSP)
 - Increase uptake of Overture



Where to find?

- Github:
- <https://github.com/peterwvj/vdm-mode>



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