An Introduction to Tilde

Presentation on a FOSS tool for Lua development

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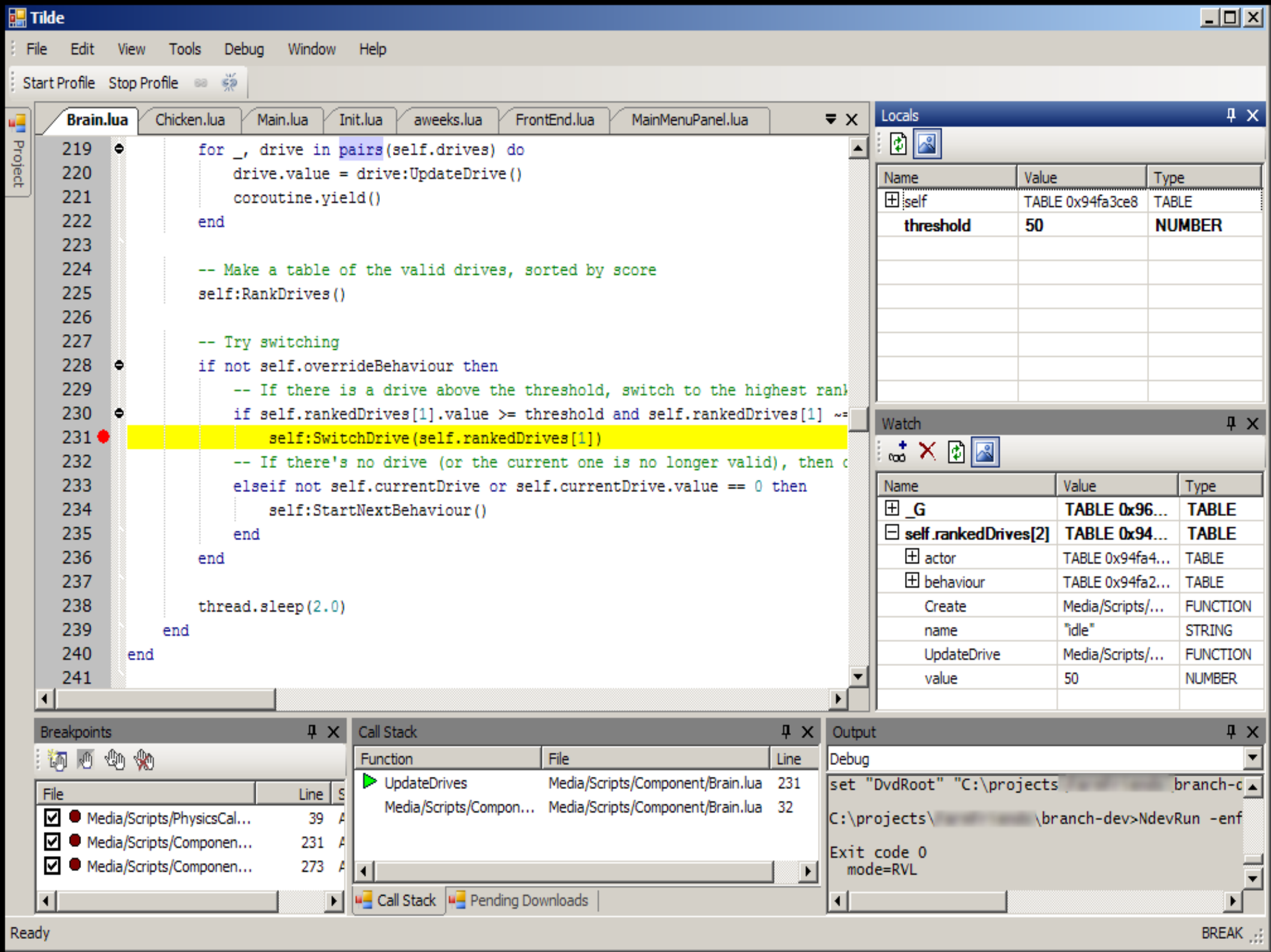

Tilde
File Edit View Tools Debug Window Help
Start Profile Stop Profile
Brain.lua Chicken.lua Main.lua Init.lua aweeks.lua FrontEnd.lua MainMenuPanel.lua
Project
219 for _, drive in pairs(self.drives) do
220 drive.value = drive:UpdateDrive()
221 coroutine.yield()
222 end
223
224 -- Make a table of the valid drives, sorted by score
225 self:RankDrives()
226
227 -- Try switching
228 if not self.overrideBehaviour then
229 -- If there is a drive above the threshold, switch to the highest rank
230 if self.rankedDrives[1].value >= threshold and self.rankedDrives[1] ~=
231 self:SwitchDrive(self.rankedDrives[1])
232 -- If there's no drive (or the current one is no longer valid), then c
233 elseif not self.currentDrive or self.currentDrive.value == 0 then
234 self:StartNextBehaviour()
235 end
236 end
237
238 thread.sleep(2.0)
239 end
240 end
241
Locals
Name Value Type
self TABLE 0x94fa3ce8 TABLE
threshold 50 NUMBER
Watch
Name Value Type
_G TABLE 0x96... TABLE
self.rankedDrives[2] TABLE 0x94... TABLE
actor TABLE 0x94fa4... TABLE
behaviour TABLE 0x94fa2... TABLE
Create Media/Scripts/... FUNCTION
name "idle" STRING
UpdateDrive Media/Scripts/... FUNCTION
value 50 NUMBER
Breakpoints
File Line
Media/Scripts/PhysicsCal... 39
Media/Scripts/Componen... 231
Media/Scripts/Componen... 273
Call Stack
Function File Line
UpdateDrives Media/Scripts/Component/Brain.lua 231
Media/Scripts/Compon... Media/Scripts/Component/Brain.lua 32
Call Stack Pending Downloads
Output
Debug
set "DvdRoot" "C:\projects branch-c
C:\projects\ \branch-dev>NdevRun -enf
Exit code 0
mode=RVL
Ready
BREAK

Overview

- Why Lua?
- Quick Lua Introduction.
- Why Tilde?
- Quick Feature set overview.
- Solutions using Lua and Tilde.
- How to install and implement.
- The Future.
- Where to get it.

Why Lua?

- Game development problems
  - Slow turnaround on code changes
  - Consistent frame rates
  - Complicated and inefficient game logic
    - C++ state machines
      - Polling 'ticks' inefficient
    - C++ fixed (run time) class hierarchies
      - Code refactoring downtime
  - Unrecoverable crashes/asserts when anything goes wrong
    - C++ Pointers! (not worth recovering as any memory can be trashed).

Why Lua? (concepts)

- Lua is a programming language, not a scripting language.
- Use it for Game logic, not services.
- Garbage collector as memory manager (no leaks).

Quick Lua Introduciton

- What is Lua?

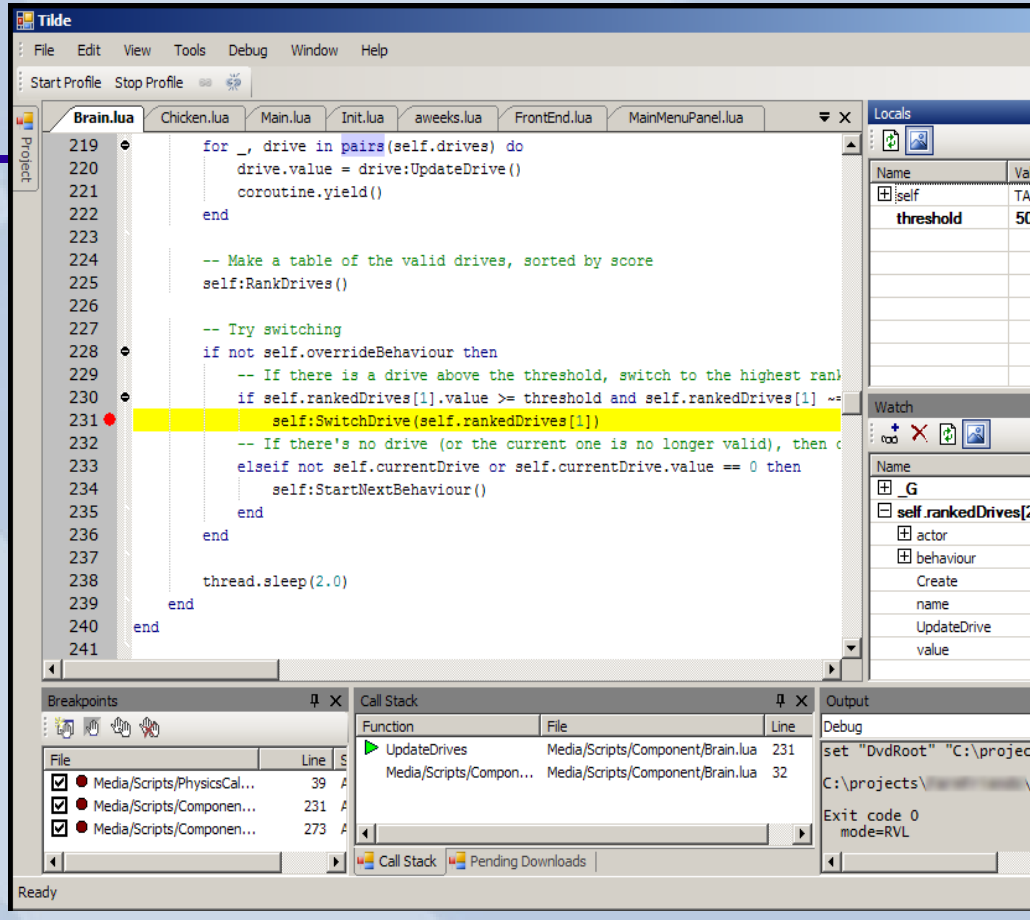
  From http://www.lua.org/about.html :-
  Lua is a powerful, fast, light-weight, embeddable scripting language.
  Lua combines simple procedural syntax with powerful data description constructs based on associative arrays and extensible semantics. Lua is dynamically typed, runs by interpreting bytecode for a register-based virtual machine, and has automatic memory management with incremental garbage collection, making it ideal for configuration, scripting, and rapid prototyping.

Quick Lua Introduciton

- Why choose Lua? (again from the site)
  - Lua is a proven, robust language
  - Lua is fast
  - Lua is portable
  - Lua is embeddable
  - Lua is powerful (but simple)
  - Lua is small
  - Lua is free

Why Tilde?

- Decided to use Lua
  - That only took a decade.
- It's a programming language, it needs debugging.
  - You are kidding yourself if you think not.
- Commercial and Free Debugger availability
  - Poor
- Write our own.
  - Took one week to do POC version.



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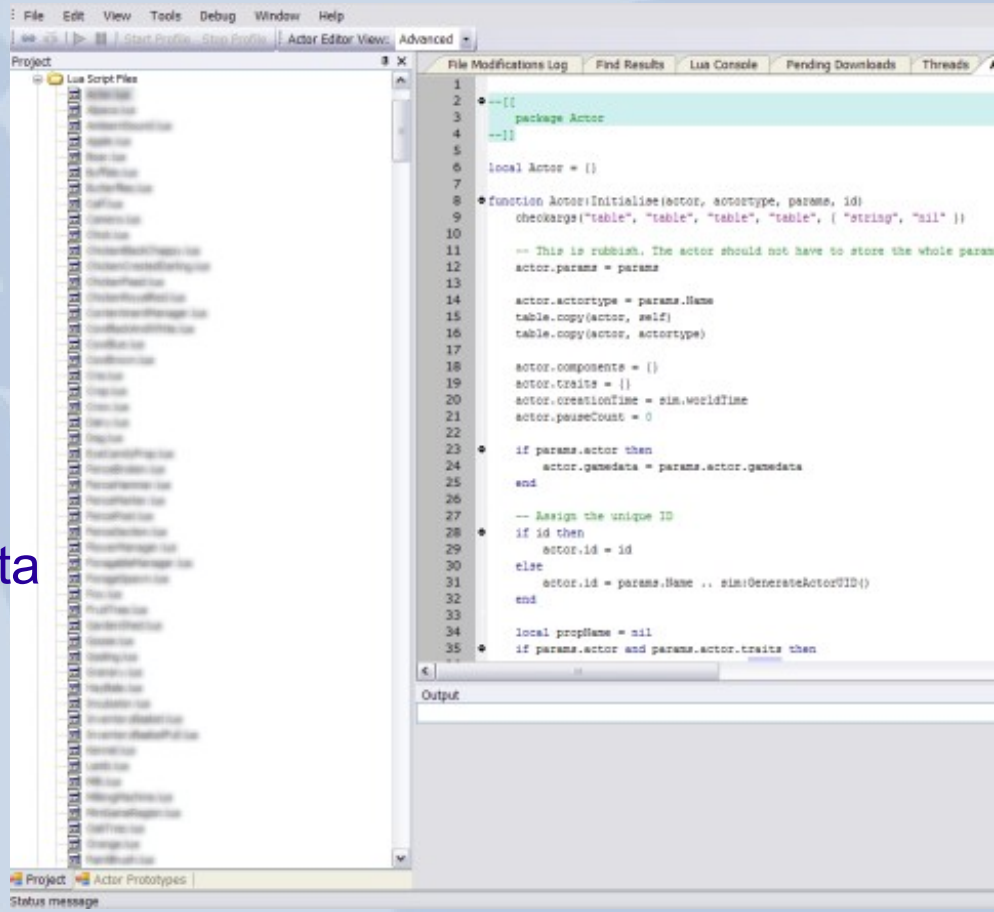
Quick Feature Set Overview

- Lua debugger features
  - Breakpoints
  - Stepping
  - Stack trace
  - Local variables and upvalues
  - Watches
  - Expanding tables and userdata
  - Viewing table and userdata metadata
  - Threads
  - Filtering in variable windows
  - Catching Lua errors
  - Script downloading and execution
  - Lua console
  - Console snippets



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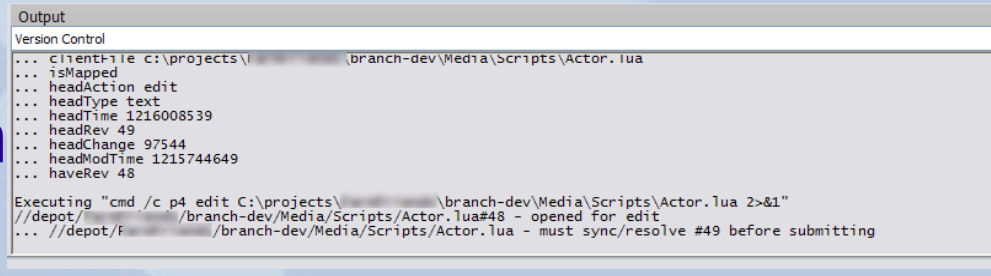
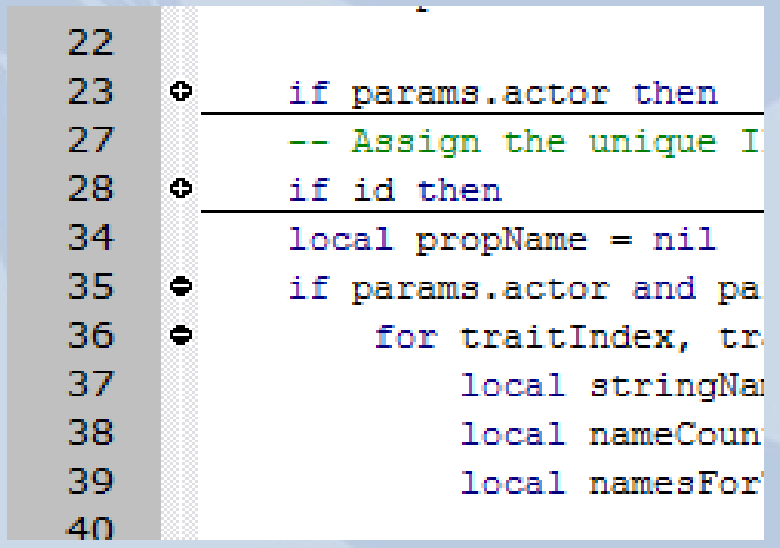
Quick Feature Set Overview

- Editor features
  - Source control integration



  - 'Folding' editor



  - Find and replace
  - Find file in project
  - Customizable project file formats

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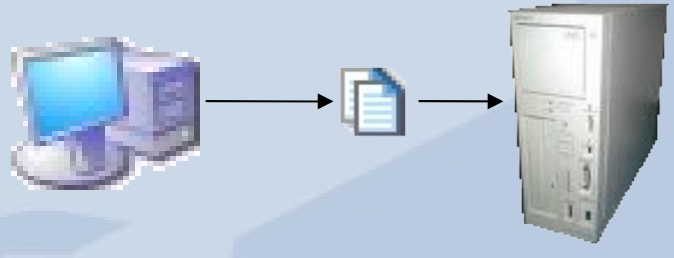
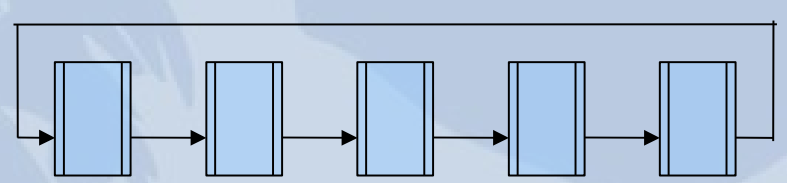
Solutions using Lua and Tilde

- Uploading of new code to running game
- Time budgeting via round robin scheduling
- Writing game logic using co-routines and blocking conditions

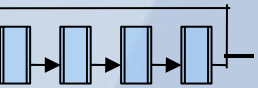




```
-- hide all panels after 3 sec : KEN
if not self.killTutorialThread then
        self.killTutorialThread = thread.create(
                function()
                        thread.sleep(3)
                        self:HideControllerTutorialPanel()
                end, "HUD:AddControllerTutorialPanel")
end
thread.detach(self.killTutorialThread)
```

Solutions using Lua and Tilde

- When Lua code causes an error it just stops running, so



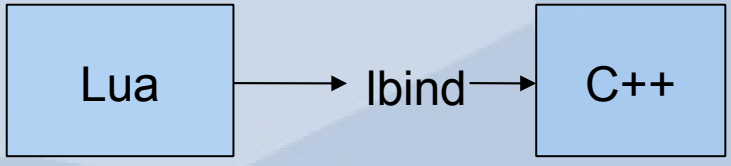
  - a bug in an unrelated part of the game to that being worked on doesn't cause the game to halt

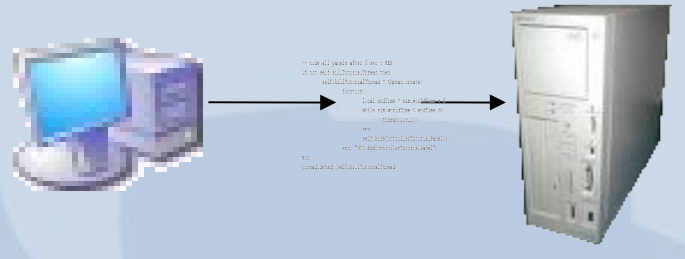
  - errors in code under development can be recovered from, allowing the programmer to try a new version without resetting the game

  - Lua will eventually garbage-collect objects when code is stopped unexpectedly

How using Lua and Tilde has changed the way we make games

- We write game code in two layers: native and script with custom Lua binding glue
- Tilde lets us execute code snippets we enter on the PC, allowing us to experiment or recover from errors (edit and continue that works)





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How using Lua and Tilde has changed the way we make games

- Development builds were much more stable than with other projects, so the game was always playable to some extent.
- Runtime Duck typing frees us from narrow inheritance hierarchies.

How using Lua and Tilde has changed the way we make games

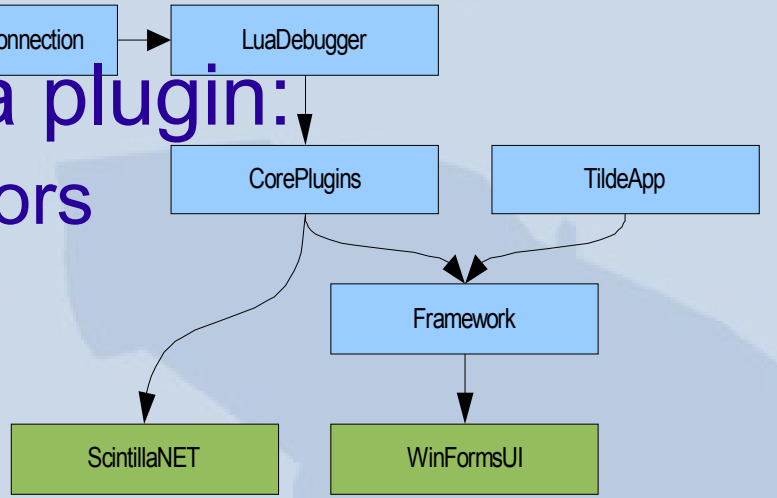
- Coding standards and patterns needed because of less strict compiler checking. This sounds negative but is a good thing.
- Tilde lets us manage the usage of threads in Lua.
- Tilde is a minimal extensible framework for us to embed our own tools; the Lua debugger is itself a plugin
- We could develop the entire game within Tilde, including C++ coding (IDE replacement)

Dealing with Lua issues

- Garbage collector performance
  - We run the GC incrementally under a time budget so it always takes a fixed portion of the frame; it completes a cycle every 5 to 10 seconds.
  - Destructors don't execute immediately, so we need to dispose resources when we have finished with them (change our low-level resource handling a bit).
- Multi-core performance
  - Non issue, Lua shouldn't be using more than one core. LVM is not really re-entrant.
  - Via the co-routines makes it easier to schedule multi-core C++ service code.
  - C++ Thread scheduler needs OS thread mutexing.

Tilde Architecture

- Open source libraries are used extensively:
  - Scintilla - fully featured syntax-highlighting text editor control
  - DockPanel Suite - Visual Studio-style window docking
- Architecture is pluggable and is based on a model/view framework
- Almost everything in Tilde is a plugin:
  - Documents and document editors
  - Project file
  - Source control
  - Lua debugger
  - Debugger transport layer



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How to install and implement

- Integrating the lua debugger
  - Add the tilde source files to your project build system.
  - Modify configuration files as required, and patch Lua source.
  - Extend virtual classes so the host code works in your game engine environment.
  - Modify the main loop of your application to instance the host class, and tick each frame.
  - There is an example for a PC implementation.

The Future

- New features
  - 'Intellisense'
  - Breakpoints conditional on Lua expressions
  - Support for more source-control providers (only Perforce atm)
  - Support for more project file formats (only .vcproj atm)
  - Customizable shortcut keys

The Future

- Documentation
  - Full user documentation
  - Full developer documentation
  - Basic maintainer documentation (for people maintaining or modifying Tilde)

Where to get it

luaforge.net/projects/tilde

License

- MIT
- Contribution license not yet

Questions?

- URL's
  - http://www.tantalus.com.au/tilde
  - http://luaforge.net/projects/tilde
  - http://www.lua.org
  - http://en.wikipedia.org/wiki/Duck_typing