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-- Lua Workshop 2011, Frick

```
function presentation()
   print(„Lua in the NetBSD Kernel")
end
```

Ideas for Users

Modifying software written in C is hard^wimpossible for users

Give the power to modify and extend the system to the user

Let the user explore the system

Ideas for Developers

Rapid Application Development approach to driver development

Modifying the system behaviour

Configuration of kernel subsystems

*This was *NOT* my Goal:*

Provide a language to write system software in

Considering Some Alternatives

Python

Java

But not Perl, Tcl, Javascript

Python

Not to difficult to integrate in C

Huge library

Memory consumption

Difficult object mapping

Java

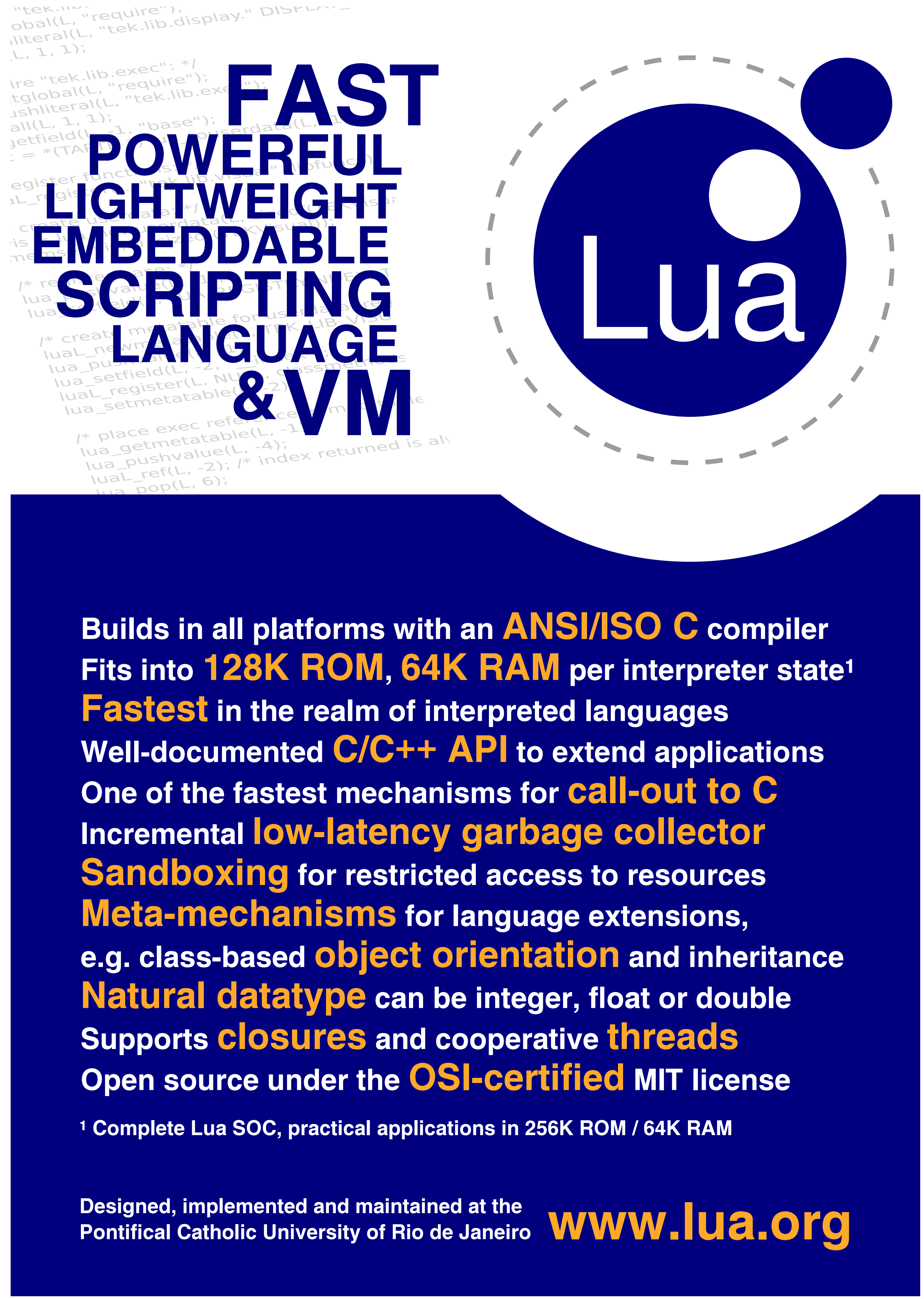
Easy to integrate

Difficult object mapping

Memory considerations

Has been used for driver development

This caught my eye:



Lua in NetBSD Userland

Library (liblua.so) and binaries (lua, luac) committed to -current

Will be part of NetBSD 6

No back port to NetBSD 5 stable

Lua in the NetBSD Kernel

Linux project „Lunatic“

GSoC 2010 project „Lunatic“

Research type of project

WORK IN PROGRESS!

Userland

Every process has its own address space

Lua states in different processes are isolated

Kernel

One address space

Every thread that „is in the kernel“ uses the same memory

Lua states are not isolated

⇢ Locking is an issue

A first look

```
# modload lua
# luactl create test_1
# luactl load test_1 ./hello.lua
# luactl destroy test_1
```

Implementation

Components

The lua(4) device driver (as module)

Lua States

Lua Modules

Lua Users

The lua(4) Device

ioctl(2) interface to userland

create, manage, destroy states

‚require‘ modules to states

maintain a list of loaded modules

load and execute code

Lua States

Are always created „empty“

Can be assigned to subsystems

Are under control of lua(4)

Lua Modules

Are regular kernel modules

Have its own class: MODULE_CLASS_LUA

Register with lua(4) when loading

Can only be unloaded if not used

Lua Users

Kernel subsystems that use Lua

Create Lua states

Register themselves with lua(4)

The luactl(8) Userland Command

Used to control the lua(4) device via ioctl(2) calls

Create, destroy states

Load Lua code into states

‚require‘ in the Kernel

require can be disabled

Check if a module already registered

If not, do a module autoload, if not prohibited

‚require' Implementation

Check if a module already registered

If not, do a module autoload, if not prohibited, and try again

Naming scheme:
require ‚xyz' ⇢ luaxyz.kmod

sysctl(8) Variables

kern.lua.require=1

kern.lua.autoload=1

kern.lua.maxcount=0

kern.lua.bytecode=0

Loading Lua Code

LUALOAD ioctl(2)

Path must contain ‚/‘

call lua_load()

Checks kern.lua.maxount

calls lua_pcall()

Kernel lua_Reader

uses the vn_open(9) functions:

vn_rdwr(UIO_READ, ...)

Security

No automatic code loading

module autoload in ‚require' can be turned off, as can ‚require' itself

Execution count can be limited

Bytecode loading turned off by default

Todos

MP-safeness

More bindings to standard kernel services

Implement pwdog(4) in Lua

Conclusions so far...

It works

C bindings can be substantial overhead

MP-safeness must be guaranteed

Still no real driver written in Lua

Lua in FreeBSD (not yet...)

Userland parts can be considered done

Interest from the team

Future Work

split compiler/interpreter?

gpio, watchdog, PCI

tty line disciplines

In god we trust, in C we code!

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