



Porting Lua to the XINU Operating System

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The Embedded XINU Operating System

- Used for OS, Networking, and Programming Language classes¹
- Used in OS and Embedded Systems research¹
- Written entirely in C
- Deployed on Linksys router platforms
- Simple shell for interaction over serial port



Figure 1. The XINU Logo and welcome screen

Why Add Scripting?

- Aid in XINU development
- Increase OS flexibility
- Easy prototyping and proofs-of-concepts
- Enable creation of new features at run time

The Lua Scripting Language

- Lightweight and multi-paradigm
- Extensive standard libraries
- Small—full implementation < 250 kB²
- Designed for extending and embedding with C³
- OS independent
- 3 components: liblua.a library, lua interpreter, luac compiler

Configuring Lua

- luaconf.h is the configuration file for liblua.a
- Set Lua data types to C analogs (lua_number → int)
- Control use of 3rd-party libraries
- Set OS- and platform-specific definitions

Resolving Dependencies

- XINU implements subset of C standard library
- Lua requires functions not in XINU's C library
- Linker symbol tables reveal dependencies
- Dependencies resolved by implementing missing functions

Removing Dependencies

- Some dependencies impossible or pointless to fulfill
- Linksys router platform provided many limitations
- These dependencies removed from Lua
- Several Lua standard library functions unsupported

Results

- All Lua dependencies resolved or removed
- Reduced liblua.a compiles with XINU
- Lua can be embedded in C programs on XINU platforms
- Several basic tests pass consistently

```

Test Suite 36: Basic Lua
Create Lua state [PASS]
Checking stack availability [PASS]
Pushing string [PASS]
Checking stack size [PASS]
Checking type [PASS]
Getting string [PASS]
Checking stack availability [PASS]
Pushing numbers [PASS]
Adding numbers [PASS]
Negating result [PASS]
Close Lua state [PASS]

```

Figure 3. A successful RUN of the Lua test case on XINU

Summary

- Embedded XINU OS relies on C for all development
- Lua adds useful scripting capabilities to XINU
- Embedding Lua in C programs is now possible on XINU
- Lua interpreter is not yet usable

Future Work

- Clear up lingering memory errors
- Implement Lua interpreter as XINU Shell command
- Increase functions available in Lua standard libraries
- Rewrite or create new XINU components with Lua

References

[1] *Embedded Xinu*. 21 June 2011. Marquette University MSCS Department. <http://xinu.ms.cs.mu.edu/Main_Page>

[2] Ierusalimsky, Roberto. *Programming in Lua*, 1 ed. Lua.org, Dec. 2003

[3] R. Ierusalimsky, L. H. de Figueiredo, W. Celes. *Lua 5.2 Reference Manual*. Lua.org, Aug 2006

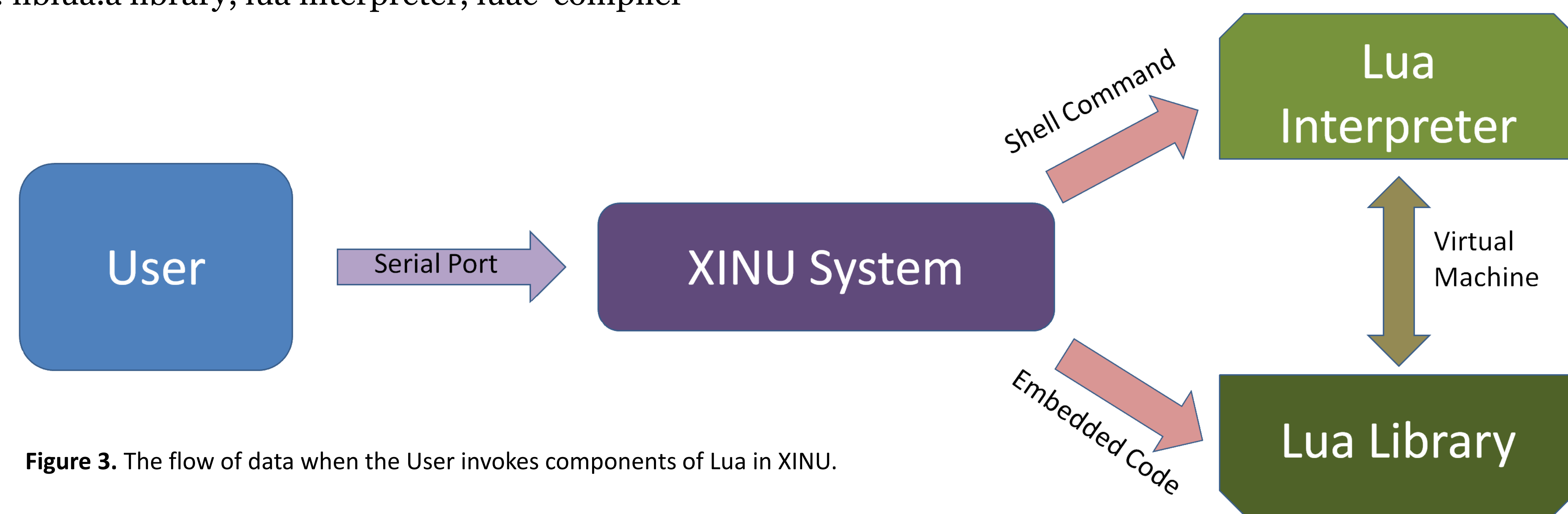


Figure 3. The flow of data when the User invokes components of Lua in XINU.