LuaTask 1.6 Manual

Introduction

Who has to read this

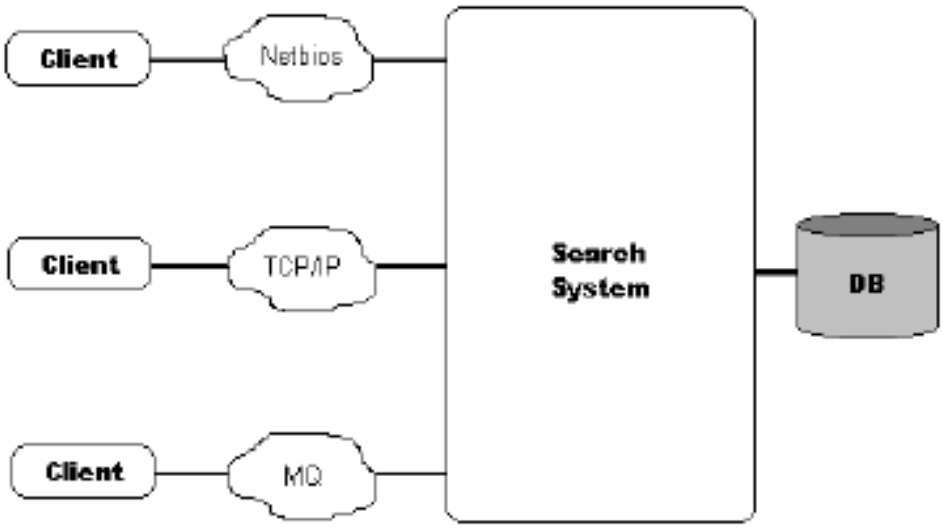
Target audience is the programmer wishing to have multiple Lua universes, each running into a independent
OS thread.

The name

We choose the "task" name to avoid confusion with "lua threads".

The idea

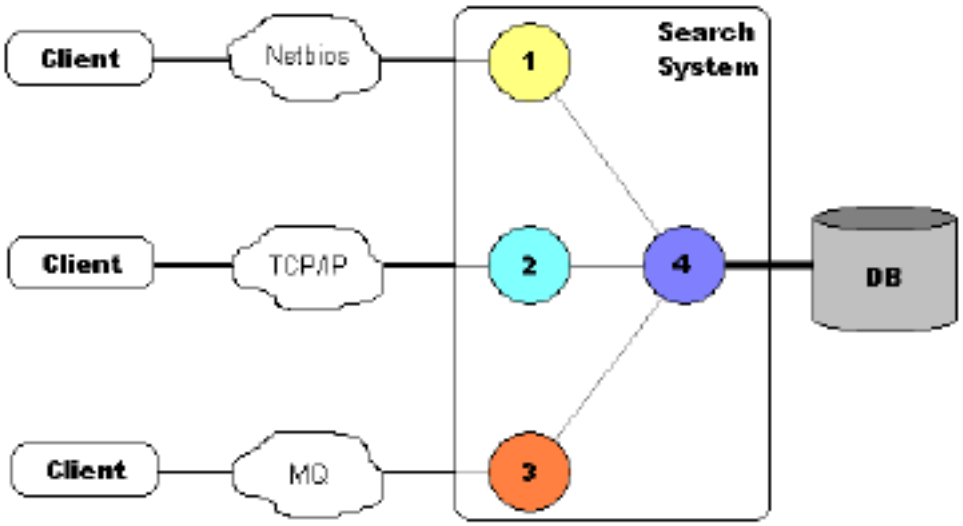
Imagine a data base search system, waiting for requests from clients with different communication mechanism: Netbios, TCP/IP and Websphere MQ:



We will assume that the Data Base Server outperform our needs.
Now, we can identify at least four specific functions inside the system:

1. Netbios communications.
2. TCP/IP communications.
3. MQ communications.
4. Search and retrieval.

Let me redraw the previous figure:



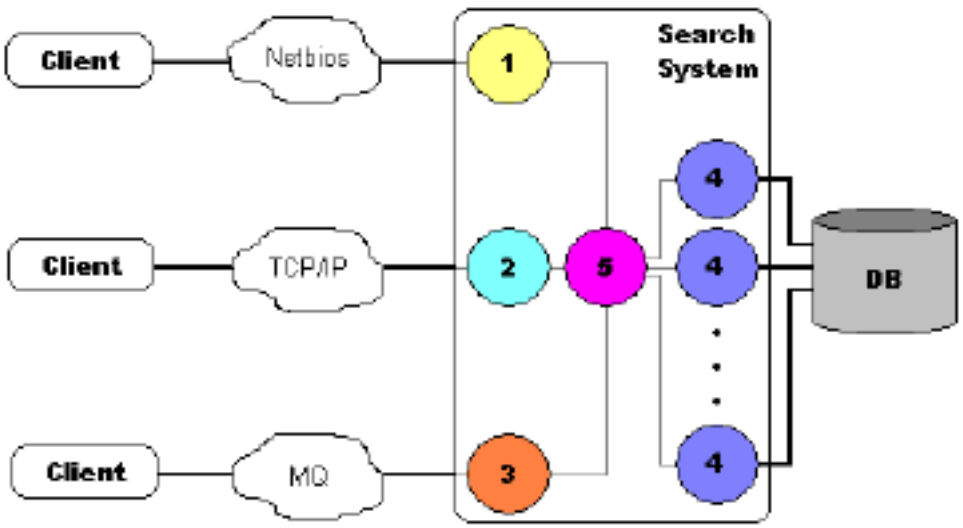
With a moderated load, our system can do functions 1 to 4 in a sequential manner.

But when clients number grows, we must try to overlap unrelated functions in order to speed up the whole

system.

LuaTask helps you to accomplish that by using multiple threads of execution.

Dealing with a heavy load...



adds some complexity and, probably, a new task:

5. The dispatcher.

Tasks 1 to 5 run independently and communicate each other through message queues.

Using LuaTask, it is possible the following sequence of events:

1. A communication task receives a message from a client.
2. It passes the message to the dispatcher.
3. The dispacher chooses a search task, and puts the message in its queue.
4. The search task does its job and sends the response directly to the communication task.
5. The communication task sends the response to the client.

Each task has a message queue, implemented as a memory fifo linked list.
Each entry in a message queue has a dynamically allocated data area, and a 32 bit general purpose number.

All this can be easily programmed in plain Lua, LuaTask and libraries like LuaSocket, LuaSQL, etc.

Building

Step 1

Expand src directory from tgz inside src directory of your Lua installation.

Step 2

Win32

You must select the threading support:

1. define NATV_WIN32 : Original code without cancellation.
2. not define NATV_WIN32 : Pthreads-Win32 code dependent. (You must have Pthreads-Win32 SNAPSHOT 2004-06-22 or later)

Static

Adapt your LibLuaLib.dsp using build/win32/static/LibLuaLib.dsp as an example.

Build lua.exe

Loadable module

Put build/win32/module/task.dsp inside src/LuaTask of your installation.

Add it to Lua.dsw

Build task.dll

Linux/BSD

Static

Adapt your config using build/ix/static/config as an example.

Adapt your src/lib/Makefile using build/ix/static/Makefile as an example.

Build lua binary.

Loadable module

Adapt your config using build/ix/module/config as an example.

Put build/ix/module/Makefile inside src/LuaTask of your installation.

Build libtask.so

Programming

How to use it

If you statically linked LuaTask, you must put a call to luaopen_task( ) after calling to lua_open( ) in your

program. This is the only thing to code in C language.

If you are using the LuaTask dynamic library, you must include the following code in the main task:

```
require 'task'
```

Initialization code inside LuaTask creates the global tasks list, gets a thread specific key, and creates the

"task" namespace.

Now, you can use the functions inside "task" namespace to manipulate tasks and messages.

Look at the "LuaTask Reference Guide" for functions syntax.

A very simple example with two tasks

1. A main task showing a prompt and getting a command.
2. A secondary echo task.

The main task (t1.lua):

```
require 'task'
local myid = task.id() -- gets the current task id
local tsk, err = task.create( 't2.lua', { myid}) -- creates a new task
while true do
	io.stdout:write( '\necho> ') -- shows prompt
	local cmd = io.stdin.read( '*l') -- gets command
	if cmd == 'quit' then
		break -- if command is quit, terminates
	else
		task.post( tsk, cmd, 0) -- sends command text to echo task
		local buf, flags, rc = task.receive( -1) -- waits for answer
		io.stdout:write( buf) -- shows answer
	end
end
task.post( tsk, '', 1) -- sends dummy message with "1" as stop flag
task.receive( 1000) -- waits (1 sec) for stop acknowledge from echo task
```

The "echo" task (t2.lua):

```
local main_id = arg[1] -- gets the main task id   from arg[1]

while true do

     local buf, flags, rc = task.receive( -1) --  waits for message

     if flags == 1 then

          break -- if flags is stop, terminates

     else

          task.post( main_id, 'Echo: {' .. buf .. '}', 0) -- sends echo

     end

end

task.post( main_id, '', 1) -- sends acknowledge   for stop message
```

The data base search system example

1. A main task dispatching requests from input tasks to worker tasks.
2. A Netbios input task.
3. A TCP/IP input task.
4. A MQ input task.
5. Five SQL worker tasks.

The Dispatcher (dispatcher.lua):

```
require 'task'

-- sets number of workers

local workers = 5

-- saves task id

local me = task.id()

-- creates workers task id table

local WTable = {}

-- starts workers

for w = 1, workers do

     WTable[1] = task.create( 'worker.lua', { me})

end

-- starts input tasks

task.create( 'netbios.lua', { me})

task.create( 'mq.lua', { me})

task.create( 'tcpip.lua', { me})

local w = 0

while true do

     -- receives request

     local request, flags, err = task.receive( -1)

     -- does a simple round-robin dispatching

     if w == workers then

          w=1

     else

          w=w+1

     end

     -- forwards the request to selected worker

     task.post( WTable[w], request, flags)

end
```

The Nebios input task (netbios.lua):

```
-- The Netbios interface has been simplified a lot
-- Session startup and shutdown are hidden.
-- Sorry, we'll use polling for simplicity
-- Adds a Netbios name
NB_AddName( 'MyNetbiosName')
-- saves dispatcher task id
local dispatcher = arg[1]
-- saves task id
local me = task.id()
while true do
     -- Receives with timeout
     local request, lsn, err = NB_ListenAndReceive( 100)
     if not err then
          -- sends request if no error
          -- flags contains this task id and the lsn origin of the
          -- message ( 8 bits) shifted 4 bits left
          task.post( dispatcher, request, me + lsn * 16)
     end
     local response, flags, err = task.receive( 100)
     if response then
          -- sends response
          err = NB_Send( math.floor( flags / 16), response)
     end
end
```

The TCP/IP input task (tcpip.lua):

```
-- The Tcp interface has been simplified a lot
-- Session startup and shutdown are hidden.
-- Sorry, we'll use polling for simplicity
-- Creates a server socket
local svrskt = CreateServerSocket( '*', 12321)
-- saves dispatcher task id
local dispatcher = arg[1]
-- saves task id
local me = task.id()
while true do
     -- Receives with timeout
     local request, cidx, err = AcceptAndReceive( svrskt, 100)
     if not err then
          -- sends request if no error
          -- flags contains this task id and the socket index
          -- origin of the message ( 16 bits) shifted 4 bits left
          task.post( dispatcher, request, me + cidx * 16)
     end
     local response, flags, err = task.receive( 100)
     if response then
          -- sends response
          err = SendAndClose( math.floor( flags / 16), response)
     end
end
```

The MQ input task (mq.lua):

```
-- The MQ interface has been simplified a lot
-- Sorry, we'll use polling for simplicity
-- Connects to the Queue Manager
local qmhandle, compcode, reason = MQCONN( 'MyQMName')
-- saves dispatcher task id
local dispatcher = arg[1]
-- saves task id
local me = task.id()
while true do
     -- Receives with timeout
     local request, msgobjidx, err = MQ_GetWithTimeout( 100)
     if not err then
          -- sends request if no error
          -- flags contains this task id and the message object
          -- index origin of the message ( 24 bits)
          -- shifted 4 bits left
          task.post( dispatcher, request, me + msgobjidx * 16)
     end
     local response, flags, err = task.receive( 100)
     if response then
          -- sends response
          err = MQ_PutByIndex( math.floor( flags / 16), response)
     end
end
```

The SQL Worker task (worker.lua):

```
-- Loads ODBC support

local ENV = SQLOpen( 'odbc')

-- Connects to SQL Server

local CON = ENV:Connect( { dsn = 'srch', uid = 'srch', pwd = 'srch'})

while true do

     -- gets request

     local request, flags, err = task.receive( -1)

     -- obtains which input task did send this

     local returnto = math.mod( flags, 16)

     -- invokes a stored procedure

     local STMT = CON:Execute( "exec sp_srch( '" .. request .. "')")

     -- gets the response

     local response = STMT:Fetch()

     -- closes the cursor

     STMT:Close()

     -- sends response

     task.post( returnto, response, flags)

end
```

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