

# 15-410

*“Distributed computing is hard, let's go shopping...”*

Too Many Servers  
Nov. 18, 2005

**Dave Eckhardt**

# Synchronization

## Disk space

- Group AFS quotas raised (to avoid last-minute exhaustion)

## Floppy disk seminar

- Tonight, Wean 5<sup>th</sup> floor lobby, just after P3 deadline
- RSVP!!!
  - <http://www.cs.cmu.edu/~410/diskreg.html>

## P4 registration

- We will create mygroup/p3extra XOR mygroup/p4
- You need to register (by Tuesday) so we know which

## P3extra deadline != P4 deadline

# Outline

**Problem statement**

**Oddities**

**What changed?**

**Huh???**

# Problem Statement

**Wednesday, November 16<sup>th</sup>**

**The cry goes up from the students**

**\*\*\* Failed to checkout feature "simics2"  
: Server node is down or not responding**

# Odd Features of the Problem

## The license servers are *not* down

- They ping just fine
- No configuration change has been made

## One person can still get a simics license...

- Namely, de0u@andrew
- Oddly enough, no special privilege is involved

## Conclusions?

- “The servers” are not down
- “The servers” can issue simics licenses
- Something is “wrong” with the Andrew cluster machines?

# What Exactly is Failing?

## Turn “plot summary” into “tale of woe”

- “Server node is down or not responding”
  - Which server node?
  - Is it “down” or “not responding”?
    - » Neither, but which claim is being made?

## Must dig deeper!

- FLEXlm error: -96,482
  - FLEXlm is a “secure” license management system
  - You're not *supposed* to know how it works
    - » Because then you could circumvent it

## Really, must dig deeper!

# What Exactly is Failing?

## Use Linux system-call trace facility

- `strace -f -o /tmp/trace simics-linux.sh`

## Lots of system calls (of course)

- Worthy of note
  - Network communication to/from various license servers
  - Seems like traffic is two-way
    - » “Down or not responding”?

# What *Exactly* Should Work?

## What do we mean by “license servers”?

- **LICENSE.SRV.CS.CMU.EDU**
  - CS's FLEXlm license server since William Penn founded PA
  - Obsolete hardware, slated for retirement
  - Simics license expired 8/31/05
- **LICENSE-1.SRV.CS.CMU.EDU**
  - CS's new FLEXlm license server
  - Simics license started 8/01/05, expires 8/30/2006
- **DMV.ECE.CMU.EDU**
  - ECE's FLEXlm license server
  - Also contains Simics licenses, configured as backup for you



# What *Exactly* Should Work?

## How do the servers work together?

- FLEXIm client can be told “use server \_\_\_\_\_”
- FLEXIm client can use a license-server cluster
  - 3 nodes, quorum consensus
  - Officially dis-recommended by owner of FLEXIm (!?)
- FLEXIm client can be given a *list* of license servers
  - Checked “in order”
    - » Fallback has been observed to work
    - » So “down or not responding” means all three servers?
    - » But de0u can still get a license?
    - » ?

# Configuration

## CMU FLEXIm server configuration for simics

### 1. LICENSE-1.SRV.CS.CMU.EDU

- CS license server for CS-taught class

### 2. DMV.ECE.CMU.EDU

- Fallback in case LICENSE-1 is down

### 3. LICENSE.SRV.CS.CMU.EDU

- Left in rotation since switch-over
- In mid-August it was 3<sup>rd</sup> on list but had only valid license file
- Since end of August it hasn't had any licenses to issue

# Simics

## Two flavors of simics license

- “simics2”, “simics”

## simics willing to run with either license type

- Asks FLEXlm for “either simics2 or simics”

## Our license is a “simics”, not a “simics2”

- Normal server log file looks like
  - mtelgars wants a “simics2 license” - tough
  - mtelgars checked out a “simics” license
  - mtelgars checked out a Linux-hosted x86-target license
  - ...
  - mtelgars checked in a “simics” license
  - mtelgars checked in a Linux-hosted x86-target license

# What Changed?

## How come today simics can't get a license?

- Did something change since yesterday?

## There **was** a change...which “didn't matter”

- The old LICENSE.SRV was powered off
- Clearly that “doesn't matter”
  - It hasn't had any simics licenses to issue since August
  - It's the third machine on the list
  - The other machines clearly have licenses
    - » Otherwise de0u couldn't get one

# Huh???

## What we know

- Turning off a machine which has no licenses “disables” licenses on two machines which have them
- But this disabling affects only *some* people
  - Who insist they have no special privileges

## What would you measure next?

# LICENSE-1.SRV log file

## What's in the LICENSE-1 log file?

- cbroglie wants a “simics2 license” - tough
- nwf wants a “simics2” license – tough
- cbroglie wants a “simics2 license” - tough
- nwf wants a “simics2” license – tough
- ...
- de0u wants a “simics2” license - tough
- de0u checked out a “simics” license
- de0u checked out a Linux-hosted x86-target license
- de0u checked in a “simics” license
- de0u checked in a Linux-hosted x86-target license

## This is odd...

- How can “LICENSE.SRV down” make this happen?

# Problem Solved

## Solution

- Remove the 3license.lic, the file pointing to LICENSE.SRV

## But why?

- What was going wrong?

# Hypothesis

```
void bail_out(void);  
int fail_reason = 0;  
acquire_license(flavor flavors[],  
                server servers[])  
{  
    alarm(15, &bail_out);  
    foreach flavor (flavors)  
        foreach server (servers)  
            fail_reason = acq(flavor, server);  
}
```



# Hypothesis

```
fail_reason = acq(flavor, server);
```

## Tuesday

- `acq("simics2", *)  $\Rightarrow$  ERR_TOUGH`
- `acq("simics", LICENSE-1)  $\Rightarrow$  Ok`

## Wednesday

- `acq("simics2", LICENSE-1)  $\Rightarrow$  ERR_TOUGH`
- `acq("simics2", DMV)  $\Rightarrow$  ERR_TOUGH`
- `acq("simics2", LICENSE)  $\Rightarrow$  ...`
  - `acquire_license()  $\Rightarrow$  timeout  $\Rightarrow$  "server not responding"`

# Last Nagging Question

**How come it works for de0u?**

# Last Nagging Question

## How come it works for de0u?

- `acq("simics2", LICENSE) ⇒ ERR_HOST_DOWN`
- `acq(?simics", LICENSE-1) ⇒ Ok`

## Why the special treatment?

# Last Nagging Question

## How come it works for de0u?

- `acq("simics2", LICENSE) ⇒ ERR_HOST_DOWN`
- `acq(?simics", LICENSE-1) ⇒ Ok`

## Why the special treatment?

- My office machine and LICENSE.SRV are on the same net
- My office machine ARPs for LICENSE.SRV, gets no answer
- My office machine's kernel returns EHOSTUNREACH
  - Right away!

# Disclaimer / Conclusion

**A distributed system is a system in which I can't do my work because some computer has failed that I've never even heard of.**

-- Leslie Lamport