Remote and mass management of systems with finstall

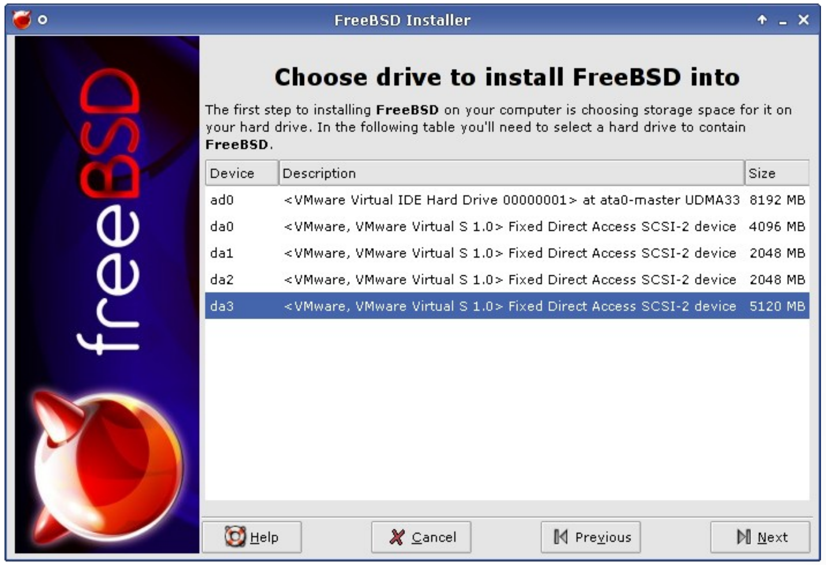
Ivan Voras
<ivoras@freebsd.org>

TOC

What is this all about?

- First there was *finstall* [pronounced eff-in-stall]
    - Google SoC project
    - Not abandoned
    - But stalled, ENOTIME, ENOMONEY
- Important concept of finstall: complete separation of the GUI and the back-end
- <u>The back-end does the work</u>
- Communicates with the client via a RPC-like protocol

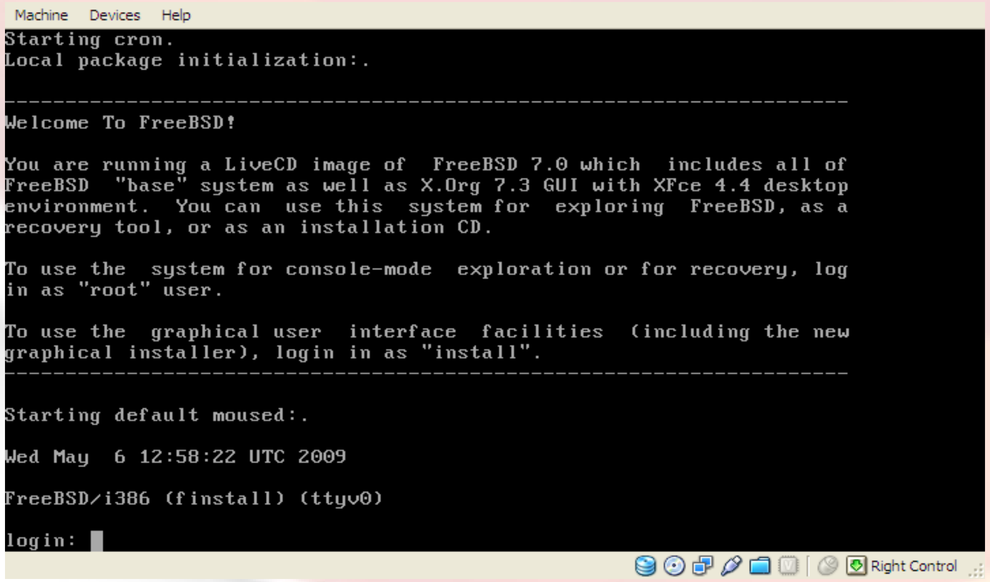
Frontend - Backend



Choose drive to install FreeBSD into

The first step to installing **FreeBSD** on your computer is choosing storage space for it on your hard drive. In the following table you'll need to select a hard drive to contain **FreeBSD**.

Device	Description	Size
ad0	<VMware Virtual IDE Hard Drive 00000001> at ata0-master UDMA33	8192 MB
da0	<VMware, VMware Virtual S 1.0> Fixed Direct Access SCSI-2 device	4096 MB
da1	<VMware, VMware Virtual S 1.0> Fixed Direct Access SCSI-2 device	2048 MB
da2	<VMware, VMware Virtual S 1.0> Fixed Direct Access SCSI-2 device	2048 MB
da3	<VMware, VMware Virtual S 1.0> Fixed Direct Access SCSI-2 device	5120 MB



```
Starting cron.
Local package initialization:.

--------------------------------------------------------------------
Welcome To FreeBSD!

You are running a LiveCD image of  FreeBSD 7.0 which  includes all of
FreeBSD  "base" system as well as X.Org 7.3 GUI with XFce 4.4 desktop
environment.  You can  use this  system for  exploring  FreeBSD, as a
recovery tool, or as an installation CD.

To use the  system for console-mode  exploration or for recovery, log
in as "root" user.

To use the  graphical user  interface  facilities  (including the new
graphical installer), login in as "install".
--------------------------------------------------------------------

Starting default moused:.

Wed May  6 12:58:22 UTC 2009

FreeBSD/i386 (finstall) (ttyv0)

login:
```

The idea

- Use the backend part for system installation and configuration via direct interface
- Enables remote management of systems
- The obvious question: is it similar to Kickstart?
    - Yes, it's going in roughly the same direction
    - It's not there yet
    - It needs much more automation
    - Polish the rough edges
- The backend's name is SysToolD

Backend capabilities

- Simple XML-RPC protocol
  - Developed in Python so some functions are dynamically typed – will need to change in the future
- Offers high(ish)-level functionality to clients
  - Get / set basic system information
  - Get / set data from config files
  - Device partitioning, formatting (newfs), mounting
  - Network configuration
  - ...

A bit about implementation

- trunk/bybackend in Subversion, in SF.Net
- Written in Python
- Good sides:
  - Easy to prototype
  - Easy XML-RPC
  - Easy string, XML parsing, etc.
- Bad sides:
  - Needs Python
  - Cannot directly access C structures

Implementation (2)

- Python implementation invokes command-line system utilities (like sysctl(8), newfs(8))
- Some argument passing, parsing, etc.
- The backend is intended to run as a background daemon
- The daemon optionally issues UDP broadcasts for discovery (for the installer)

RPC Functions (1)

- GetHostId()
- GetDMESG()
- GetHostName()
- GetPhsyMem()

RPC Functions (2)

- GetDrives()
- GetDrivePartitions()
- GetMountPoints()
- Mount()

RPC Functions (3)

- GetLoaderSetting() / SetLoaderSetting()
- GetConf() / SetConf/()
- GetHostName() / SetHostName()
- GetShells()
- AddUser()
- GetNetworkInterfaces() / ConfigureNetworkInterface()
- SetDefaultRouter()
- … etc.

How to use it

- **Step ONE:**
  - The system needs to run systoold.py
  - a) regular system – rc.d
  - b) PXE boot for installing
  - c) bootable ISO image for installing
- **Step TWO:**
  - Access the daemon's services with XML-RPC
  - Python XML-RPC
  - Any other XML-RPC

Few words about XML-RPC

```
POST /RPC2 HTTP/1.0
User-Agent: Frontier/5.1.2 (WinNT)
Host: betty.userland.com
Content-Type: text/xml
Content-length: 181


<?xml version="1.0"?> <methodCall>
<methodName>examples.getStateName</methodName>
<params> <param> <value><i4>41</i4></value> </param>
</params> </methodCall>
```

XML-RPC libraries

- “Script” languages have it easy...
  - Python, Perl, PHP, Flash, JavaScript etc.
- C, BSD-Licensed: http://xmlrpc-c.sourceforge.net/
- Java, Apache Licensed: http://ws.apache.org/xmlrpc/
- .Net / C#, MIT License: http://www.xml-rpc.net/

C example (the most complicated)

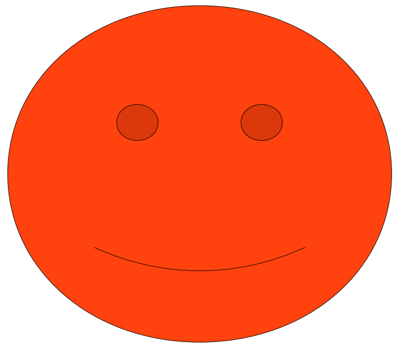
```
result = xmlrpc_client_call
        (&env,
          “http://xmlrpc.host/”,
          “GetSomething”,
          "(ii)",
          (xmlrpc_int32) 5,
          (xmlrpc_int32) 7);
```

Modes of use

- SysToolD doesn't enforce a mode of use – it's a tool for configuration and administration
- **INSTALL mode**
  - Can be used to install a fresh system
  - The front-end is the installer which connects to localhost (or optionally to a remote host)
- **MANAGEMENT mode**
  - Used to (re)configure existing systems
  - Usually used by remote clients

Modes of use

- SysToolD doesn't enforce a mode of use – it's a tool for configuration and administration



- **MANAGEMENT mode**
  - Used to (re)configure existing systems
  - Usually used by remote clients

Example 1

```
from xmlrpclib import ServerProxy
host = ServerProxy(“http://10.0.0.10:1025”)
```

```
host.InstallRemotePackage(“apache22”)
host.SetConf(“apache22_enable=\”YES\””)
host.SetLoaderSetting(“accf_http_load=\”YES\””)
```

Example 1

```
from xmlrpclib import ServerProxy
host = ServerProxy(“http://10.0.0.10:1025”)
```

- Boilerplate code – create a proxy object for XML-RPC
- Looks the same in every language
- Simple

Example 1

- The “meat” of the script
- Note: error checking is pretty much non-optional here

```
host.InstallRemotePackage(“apache22”)
host.SetConf(“apache22_enable=\”YES\””)
host.SetLoaderSetting(“accf_http_load=\”YES\””)
```

Real-world example

- Needs more automation
- Generally:
    - Have a list of SysToolD-enable hosts
    - OR...
    - Gather the list by listening to broadcasts
- Inspect environment(s) of host(s)
- Create threads and (re)configure each host in parallel

Security

- SysToolD is not a remote root shell but is as close to it as doesn't matter
    - Can modify rc.conf and reboot
- Need to bar unwanted accesses
- There is no fine-grained access control once users get to SysToolD
- Current solution: SSL certificates
    - Users need a certificate signed by a server-accepted CA

Current state of development

- A bit slower than expected – part of finstall
  - Can pick up if funding is found
- Features get added when needs shows
- XML-RPC has proven to be a good and robust thing for this kind of usage
- Python has proven to be good for development with minimal problems

Future development

- Automation
- CLI tools
- GUI tools
  - The idea is to have a list of machines (or a icon spread) and have users right-click on a machine and say “run this operation”
- Would like it to remain in Python because of easy development
  - If the protocol is retained, the implementation details can change