The Bro Network Security Monitor

Bro Live!: Training for the Future

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Motivations

Issues

- Users: Too much time is spent passing around, downloading, and copying Virtual Machines or other materials
  - Networks are slow
  - Virtual harddisks are big
- Users: Technical difficulties can occur and often do that end up putting some behind the group
  - VirtualBox bus configuration
  - VirtualBox network configuration
- Admins: Account management is repetitive
- Everyone: Changes are not easy
  - Insertion of wrong exercises, mistakes, etc.. How is this handled?

⇒ Ultimately, the burden is placed on the users and this affects the overall event experience

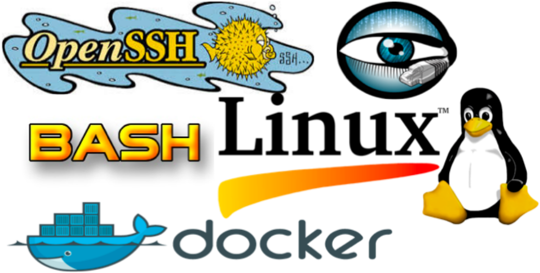
Solutions

Ideas

- Admins: Avoid passing around or downloading VM's if possible. Give user's access to your server. Big time saver!
- Admins: Make barrier to participation as thin as possible
  - Require only a program (e.g. ssh)
  - Opens possibilities to phones, tablets, etc.
- Admins: Automated account management
- Admins: Changes can be easily completed
  - Add, remove, or modify exercises during event
  - Immediately available

⇒ Ultimately, we pass the burden onto the admins (we're used to it anyway)

Major Software Components

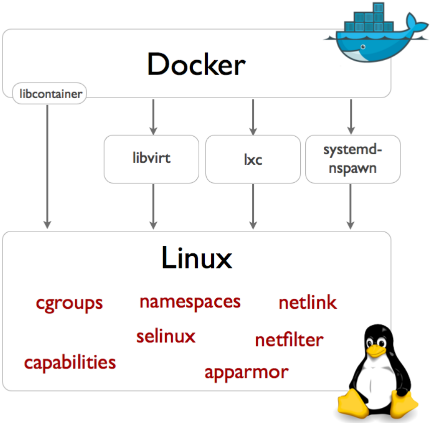


You know at least four of these right?

Docker

What?

- Automates the deployment of Linux based containers
- Provides a layer of abstraction
- Various methods of container creation



Linux Based Containers

- **Important:** "Linux *Based* Containers"
    - There is no container specification
    - There are different container (and like) technologies for Linux
        - **Linux:** LXC, OpenVZ, Google containers, etc.
        - **Non-Linux:** BSD Jails, Solaris Zones, AIX WPAR, etc.
- **What** do containers do?
    - Light-weight process virtualization
- **What** do virtual machines do?
    - Hardware virtualization

Linux Kernel Stuff

- **Support:** Linux Kernel 3.8 introduced the foundation for Linux Based containers
  - Namespaces
    - Currently available: *pid, net, ipc, uts, mnt, and user*
    - Process isolation
  - Control Groups (cgroups)
    - Resource Management
- **It's not magic**, you can create namespaces and cgroups directly from your shell by modifying procfs and sysfs

Container Advantages

- **Density:** Run hundreds or even thousands of containers on a single machine
- **Performance:** Very fast startup and tear down time, little overhead
- **Nesting:** Running containers within containers is possible
- **Isolation:** See or talk to hosts, other containers, or none
- **User Perspective:** Looks and feels like a Virtual Machine
    - Container has its own IP, filesystem, processes, etc.

Our Implementation

1. Users log into a non-privileged system account via SSH
   - Strong crypto, ubiquitious, low overhead
   - ssh demo@live.bro.org
2. Automated account (non-system) creation via shell script
3. Docker is called and ships each user in their own container
   - Appropriately named and thus re-attachable by name
   - Handled via shell script
   - Just in case you forgot each container instance is an isolated process
4. User performs work in container
   - Runs unix commands, traverses filesystem, runs bro
5. User logs out, does something else then is ready to work again
   5.1 They SSH into the same non-privileged user account again
   5.2 Enter their newly created credentials
   5.3 Are automatically re-attached to their container instance

Container Security Considerations

- Networking is disabled
    - Prevent attacks against other hosts, containers, or self
- System resources are limited per container to prevent selfishness and abuse
    - CPU and RAM allocation
- Containers and users are automatically removed after a period of time
    - Length of conference or event
- Containers which get too large are automatically removed to prevent disk space abuse
    - Denial of Service
- Finer environment controls via ulimit
    - fsize, nproc, etc.

Want Your Own?

You can have one too

- Want to host your own Bro training event with a system like this?
  - It's free
  - Publicly available
    - **Vagrant:** http://github.com/jonschipp/vagrant
    - **Docker:** http://hub.docker.com/u/jonschipp/latest-bro-sandbox/
  - System configuration is entirely automated
- Written for and tested on Ubuntu Trusty and Saucy

Installation and configuration on Ubuntu

```
$ wget https://raw.githubusercontent.com/jonschipp/vagrant/
master/bro-sandbox/provision.sh -O - | bash
```

Testing with Vagrant

```
$ git clone http://github.com/jonschipp/vagrant && cd
vagrant/bro-sandbox && vagrant up; ssh -p 2222 demo@127.0.0.1
```

Demo

Let's try it

```
$ ssh demo@live.bro.org
demo@live.bro.org's password:
Welcome to Bro Live!
====================
...
A place to try out Bro.
Are you a new or existing user? [new/existing]: new
...
Enjoy yourself!
Training materials are located in /exercises.
e.g. $ bro -r /exercises/BroCon14/beginner/http.pcap
demo@bro: $
```

Feedback

- **Beta:** The beta is live today!
  - Help me help you
  - Report any problems or concerns with usability or security
  - Send me feature requests
  - Send me patches and pull requests

Let me know

Talk to me

Tweet me: @JonSchipp

E-mail me: jonschipp@gmail.com, jschipp@illinois.edu

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