Browser-based RDP, VNC, and SSH Access
Using Guacamole

Do you want VMs with that?

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1. Introduction

2. Guacamole

3. Future Work
Introduction
Where and How we use Bhyve

- **$DAYJOB**: Big Data Cluster administration at the Computer Science department of the University of Applied Sciences, Darmstadt, Germany
- Used in data science course of studies: teaching, projects, thesis, and research around Big Data and NoSQL databases

- Big demand for lab machines in summer '16 forced us to use bhyve as we had not enough cluster nodes for students

  - All running on ZFS with `volmode=dev` and LZ4 compression

- No performance measurements were done as part of the lab

- Winter semester 16/17: Big Data Analytics lab with same bhyve setup had similar positive results

- We are generally happy with the resource use and stability of bhyve
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The Hardware We Use

- 40 Nodes, Dell C6320 and C6220 machines
- Intel Xeon E5 2609, 2620, and 2695 CPUs
- Memory ranges between 32 GB and 128 GB
- 2 machines with 2 NVIDIA CUDA GPUs each
- 4x 1 TB SAS disks in each node, a few with SSDs
Client Issues

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- Lab machines and student laptops need RDP, VNC, and SSH (Putty) clients installed to get access to cluster machines
- We want to make access as easy as possible so that students can focus on their lab work
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• In February ’17, our CS department’s IT migrated from VMware ESXi to Proxmox
  • A lot of issues with the SPICE protocol, did not work on my machine
  • no snapshot as VM users (coming soon™)
  • 320x200 resolution as serial console left a lot to be desired...
• → Encouraged by bhyve, I decided to find a better solution for the client issue
Guacamole
What is Guacamole?

• Remote desktop gateway
  • HTML5 based: no extra clients or plugins needed to use!
  • All your (virtual) machines accessible in your browser
  • Also works from tablets and smartphones via touch input
  • No changes needed on the target machines
  • Supports VNC, RDP, SSH, telnet (don’t use the latter)

• Apache 2 license

• Well documented API and user manual

• Current release: 0.9.11-incubating 2017-02-02

• http://guacamole.incubator.apache.org/
DEMO
Guacamole Architecture

HTML5 Web Browser

Guacamole protocol over HTTP

Guacamole Server

Servlet Container (such as Apache Tomcat)

Guacamole

Guacamole protocol

guacd

Arbitrary remote desktop protocols

Remote Desktops

RDP

VNC

Other
What else can Guacamole do?

**Session recording:** Recordings on video (using ffmpeg) and/or typescripts

Use cases: compliance, demonstrations

**Device redirection:** Make a server directory available for file transfers (or read-only)

**RDP Remote App:** serve only a single application to clients, close connection when program exits

**Authentication:** plain-text file (MD5 password hashes), database (MySQL/PostgreSQL), LDAP
Guacamole’s Porting History in FreeBSD

2014-08-12: I added Guacamole to FreeBSD’s WantedPorts wiki page\(^1\) (for lack of a ports bit)

2015-08-29: Porting work started in PRs 202754 and 202755 by Ultima (Thanks!)

2016-06-02: Port committed by pi@

→ net/guacamole-server
→ www/guacamole-client

\(^1\)https://wiki.freebsd.org/WantedPorts
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- Get my first windows bhyve VM running
- Test PCI-passthrough with our NVIDIA GPUs into that VM
- Run the Guacamole server “in production” for one semester
- Find ways to optimize the server to increase user experience
- Allow more parallel connections without overloading the Guacamole server
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- Profit
Special Thanks

- All bhyve developers, especially Neel Natu and Peter Grehan
- Michael Dexter for his enthusiasm and engagement for bhyve
- My student Daniel Kissel for exploring Guacamole with me
- My CS department for letting me play with expensive hardware