

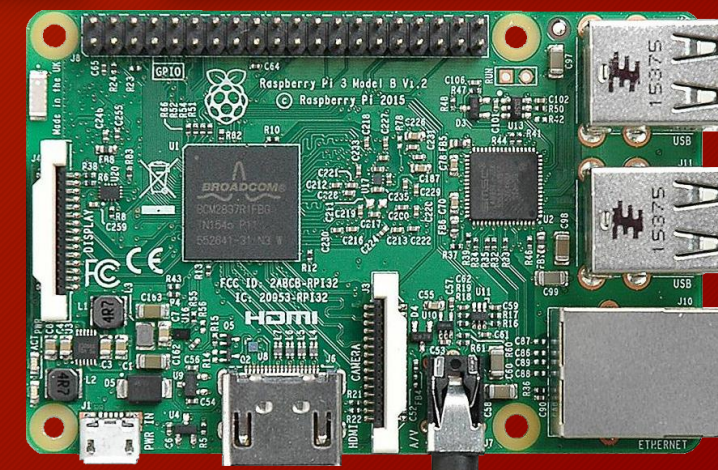
?
?
?
?

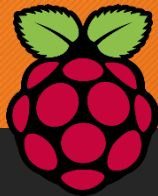
Nuno Fidalgo

21140369

Serviços WEB/BD/Armazenamento com suporte a balanceamento e alta disponibilidade

Disponibilidade e Desempenho 2017/18- Curso Engenharia Informática

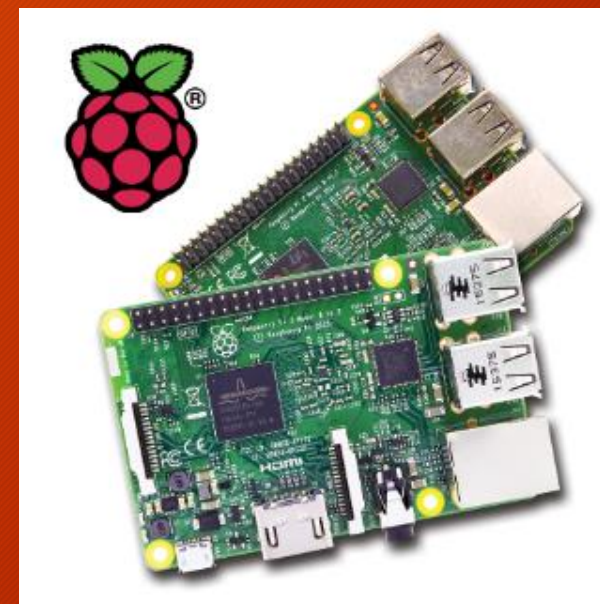


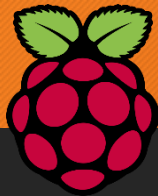


Raspberry Pi

2

- O Raspberry Pi é um computador de tamanho e performance reduzido com a principal tarefa de ser uma plataforma de desenvolvimento.
- Conecta-se a um monitor de computador ou televisão através de uma porta HDMI, possuindo também varias portas usb e uma porta ethernet.



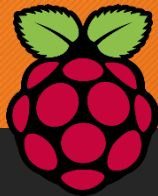


Cluster

3

- Um cluster consiste em computadores que trabalham em conjunto de modo a serem um único sistema.
- É também um aglomerado de computadores que vão executar um trabalho dividindo o processamento nesses mesmos computadores.

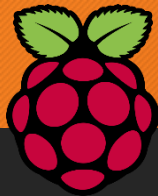




Apache

4

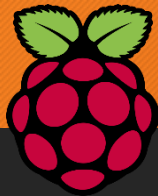
- Aplicação instalada no Raspberry;
- Por si só, o Apache pode servir páginas HTML por HTTP;
- Com módulos adicionais - páginas web dinâmicas que usem linguagens de scripting como o PHP.



Apache

5

- Servidor web Apache numa intranet local;
- Custos reduzidos;
- Instalação e manutenção simplificadas (user-friendly);
- FTP e SSH.



Apache

6



Apache2 Debian Default Page

debian

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Debian systems. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

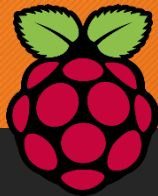
If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Configuration Overview

Debian's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Debian tools. The configuration system is **fully documented in `/usr/share/doc/apache2/README.Debian.gz`**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

The configuration layout for an Apache2 web server installation on Debian systems is as follows:

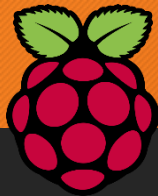
```
/etc/apache2/
|-- apache2.conf
|   |-- ports.conf
|-- mods-enabled
|   |-- *.load
|   |-- *.conf
|-- conf-enabled
|   |-- *.conf
|-- sites-enabled
|   |-- *.conf
```



Apache

7

| PHP Version 7.0.27-0+deb9u1 | |
|---|--|
| System | Linux nustler1 4.9.59-v7+ #1047 SMP Sun Oct 29 12:19:23 GMT 2017 armv7l |
| Build Date | Jan 5 2018 13:51:52 |
| Server API | Apache 2.0 Handler |
| Virtual Directory Support | disabled |
| Configuration File (php.ini) Path | /etc/php/7.0/apache2 |
| Loaded Configuration File | /etc/php/7.0/apache2/php.ini |
| Scan this dir for additional .ini files | /etc/php/7.0/apache2/conf.d |
| Additional .ini files parsed | /etc/php/7.0/apache2/conf.d/10-opcache.ini, /etc/php/7.0/apache2/conf.d/10-pdo.ini, /etc/php/7.0/apache2/conf.d/20-calendar.ini, /etc/php/7.0/apache2/conf.d/20-ctype.ini, /etc/php/7.0/apache2/conf.d/20-exif.ini, /etc/php/7.0/apache2/conf.d/20-fileinfo.ini, /etc/php/7.0/apache2/conf.d/20-ftp.ini, /etc/php/7.0/apache2/conf.d/20-gettext.ini, /etc/php/7.0/apache2/conf.d/20-iconv.ini, /etc/php/7.0/apache2/conf.d/20-json.ini, /etc/php/7.0/apache2/conf.d/20-pdo_pgsql.ini, /etc/php/7.0/apache2/conf.d/20-pgsql.ini, /etc/php/7.0/apache2/conf.d/20-phar.ini, /etc/php/7.0/apache2/conf.d/20-posix.ini, /etc/php/7.0/apache2/conf.d/20-readline.ini, /etc/php/7.0/apache2/conf.d/20-shmop.ini, /etc/php/7.0/apache2/conf.d/20-sockets.ini, /etc/php/7.0/apache2/conf.d/20-sysvmsg.ini, /etc/php/7.0/apache2/conf.d/20-sysvsem.ini, /etc/php/7.0/apache2/conf.d/20-sysvshm.ini, /etc/php/7.0/apache2/conf.d/20-tokenizer.ini |
| PHP API | 20151012 |
| PHP Extension | 20151012 |
| Zend Extension | 320151012 |
| Zend Extension Build | API320151012,NTS |
| PHP Extension Build | API20151012,NTS |
| Debug Build | no |
| Thread Safety | disabled |
| Zend Signal Handling | disabled |

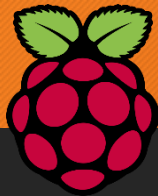


HAProxy

8

- Serviço Linux que garante um balanceamento de carga e alta disponibilidade num aglomerado de servidores.
- Recebe os pedidos e atua como um proxy, criando um canal entre cliente-servidor.





HAProxy

9

Statistics Report for HAProxy on nu: X

192.168.3.29:1935/haproxy?stats

HAProxy version 1.7.5-2, released 2017/05/27

Statistics Report for pid 2192 on nustler2

> General process information

pid = 2192 (process #1, nbroc = 1)
 uptime = 0d 0h02m49s
 system limits: memmax = unlimited; ulimit-n = 528
 maxsock = 528; maxconn = 250; maxpipes = 0
 current conns = 3; current pipes = 0/0; conn rate = 0/sec
 Running tasks: 1/11; idle = 100 %

active UP
 active UP, going down
 active DOWN, going up
 active or backup DOWN
 active or backup DOWN for maintenance (MAINT)
 active or backup SOFT STOPPED for maintenance
 Note: "NOLE"Y"DRAIN" = UP with load-balancing disabled.

backup UP
 backup UP, going down
 backup DOWN, going up
 not checked

Display option:
 External resources:
 • [Primary site](#)
 • [Updates \(v1.7\)](#)
 • [Hide DOWN servers](#)
 • [Disable refresh](#)
 • [Refresh now](#)
 • [CSV export](#)
 • [Online manual](#)

http-in

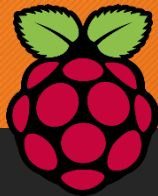
| | Queue | | | Session rate | | | Sessions | | | | Bytes | | Denied | | Errors | | | Warnings | | Server | | | | | | | | | | | | |
|----------|-------|-----|-------|--------------|-----|-------|----------|-----|-------|-------|-------|------|--------|---------|--------|------|-----|----------|------|--------|-------|--------|---------|------|-----|-----|-----|-----|---------|--------|--|--|
| | Cur | Max | Limit | Cur | Max | Limit | Cur | Max | Limit | Total | LbTot | Last | In | Out | Req | Resp | Req | Conn | Resp | Retr | Redis | Status | LastChk | Wght | Act | Bck | Chk | Dwn | Downtme | Thrtle | | |
| Frontend | | | | 0 | 1 | - | 1 | 2 | 2 000 | 4 | | | 12 795 | 350 859 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | OPEN | | | | | | | | | |

backend_servers

| | Queue | | | Session rate | | | Sessions | | | | Bytes | | Denied | | Errors | | | Warnings | | Server | | | | | | | | | | |
|----------|-------|-----|-------|--------------|-----|-------|----------|-----|-------|-------|-------|-------|--------|---------|--------|------|-----|----------|------|--------|-------|----------|-------------|------|-----|-----|-----|-----|---------|--------|
| | Cur | Max | Limit | Cur | Max | Limit | Cur | Max | Limit | Total | LbTot | Last | In | Out | Req | Resp | Req | Conn | Resp | Retr | Redis | Status | LastChk | Wght | Act | Bck | Chk | Dwn | Downtme | Thrtle |
| nustler1 | 0 | 0 | - | 0 | 1 | 0 | 1 | 1 | - | 9 | 9 | 1m45s | 3 271 | 87 737 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2m45s UP | L4OK in 0ms | 1 | Y | - | 0 | 0 | 0s | - |
| nustler2 | 0 | 0 | - | 0 | 1 | 0 | 1 | 1 | - | 9 | 9 | 1m2s | 3 297 | 87 761 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2m45s UP | L4OK in 0ms | 1 | Y | - | 0 | 0 | 0s | - |
| nustler3 | 0 | 0 | - | 0 | 1 | 0 | 1 | 1 | - | 9 | 9 | 20s | 3 282 | 109 204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2m45s UP | L4OK in 0ms | 1 | Y | - | 0 | 0 | 0s | - |
| nustler4 | 0 | 0 | - | 0 | 1 | 0 | 1 | 1 | - | 9 | 9 | 1m40s | 2 945 | 86 007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2m45s UP | L4OK in 0ms | 1 | Y | - | 0 | 0 | 0s | - |
| Backend | 0 | 0 | - | 0 | 4 | 0 | 1 | 200 | 35 | 35 | 35 | 20s | 12 795 | 350 859 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2m45s UP | | 4 | 4 | 0 | 0 | 0 | 0s | - |

stats

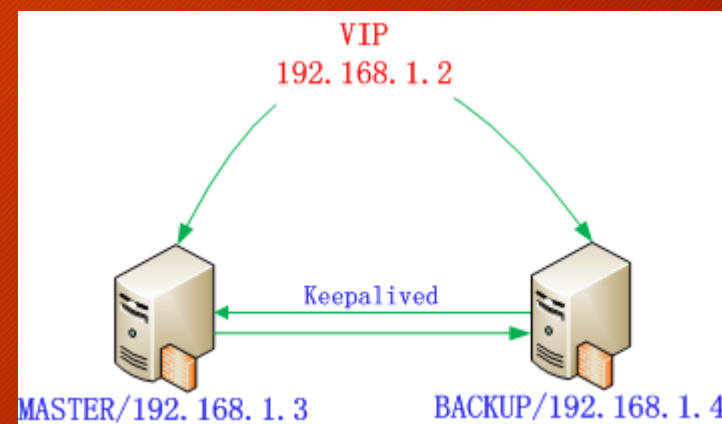
| | Queue | | | Session rate | | | Sessions | | | | Bytes | | Denied | | Errors | | | Warnings | | Server | | | | | | | | | | | | |
|----------|-------|-----|-------|--------------|-----|-------|----------|-----|-------|-------|-------|------|--------|---------|--------|------|-----|----------|------|--------|-------|--------|----------|------|-----|-----|-----|-----|---------|--------|---|--|
| | Cur | Max | Limit | Cur | Max | Limit | Cur | Max | Limit | Total | LbTot | Last | In | Out | Req | Resp | Req | Conn | Resp | Retr | Redis | Status | LastChk | Wght | Act | Bck | Chk | Dwn | Downtme | Thrtle | | |
| Frontend | | | | 0 | 2 | - | 2 | 2 | 10 | 10 | | | 5 679 | 313 229 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | OPEN | | | | | | | | | |
| Backend | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0s | 5 679 | 313 229 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2m45s UP | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

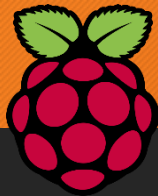


Keepalived

10

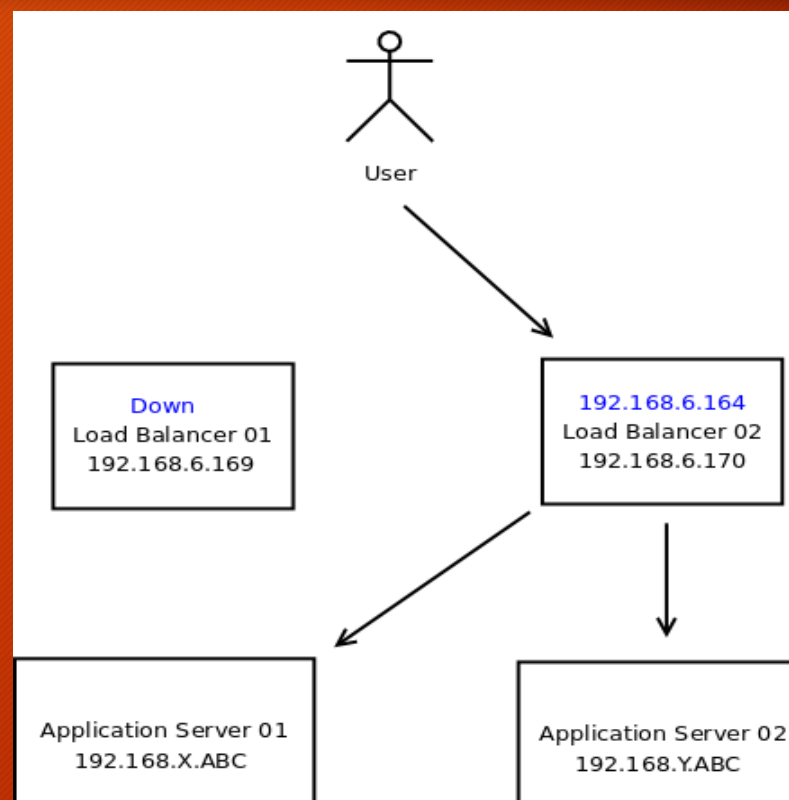
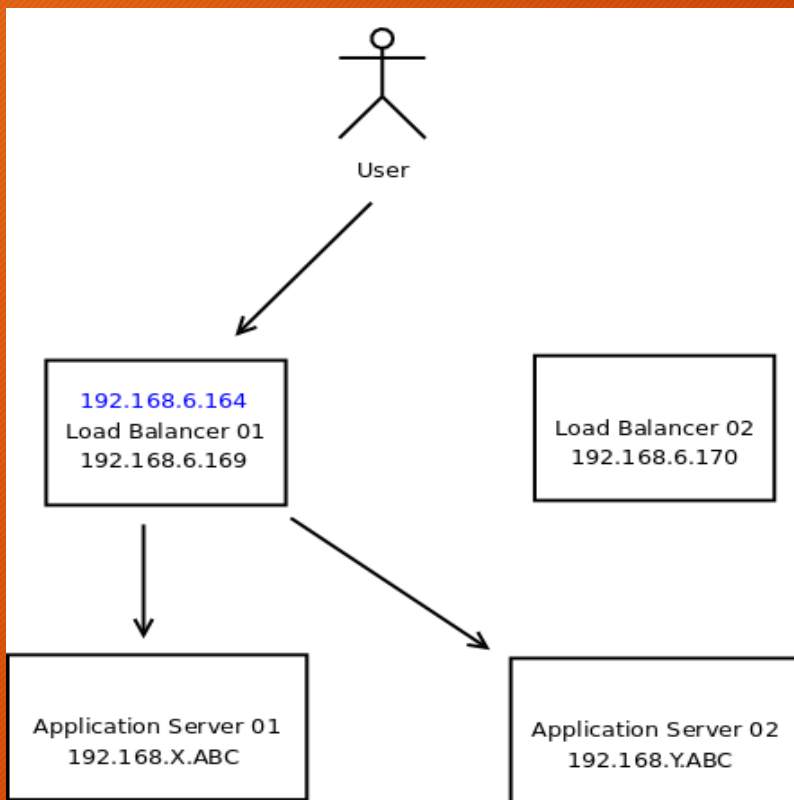
- Software de encaminhamento;
- Base no protocolo VRRP;
- Failover para Standby;
- Health checking - testam se o servidor “real” está up - adicionam/removem o servidor (HAProxy) da pool.

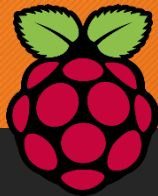




Keepalived

11



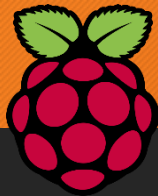


PostgreSQL

12

- O PostgreSQL é um sistema de base de dados open source muito poderoso.
- Possui mais de 15 anos de desenvolvimento e com uma arquitetura comprovada que lhe vale a atual reputação de confiabilidade, integridade de dados e correção

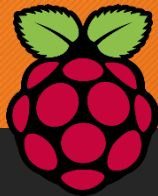




PostgreSQL

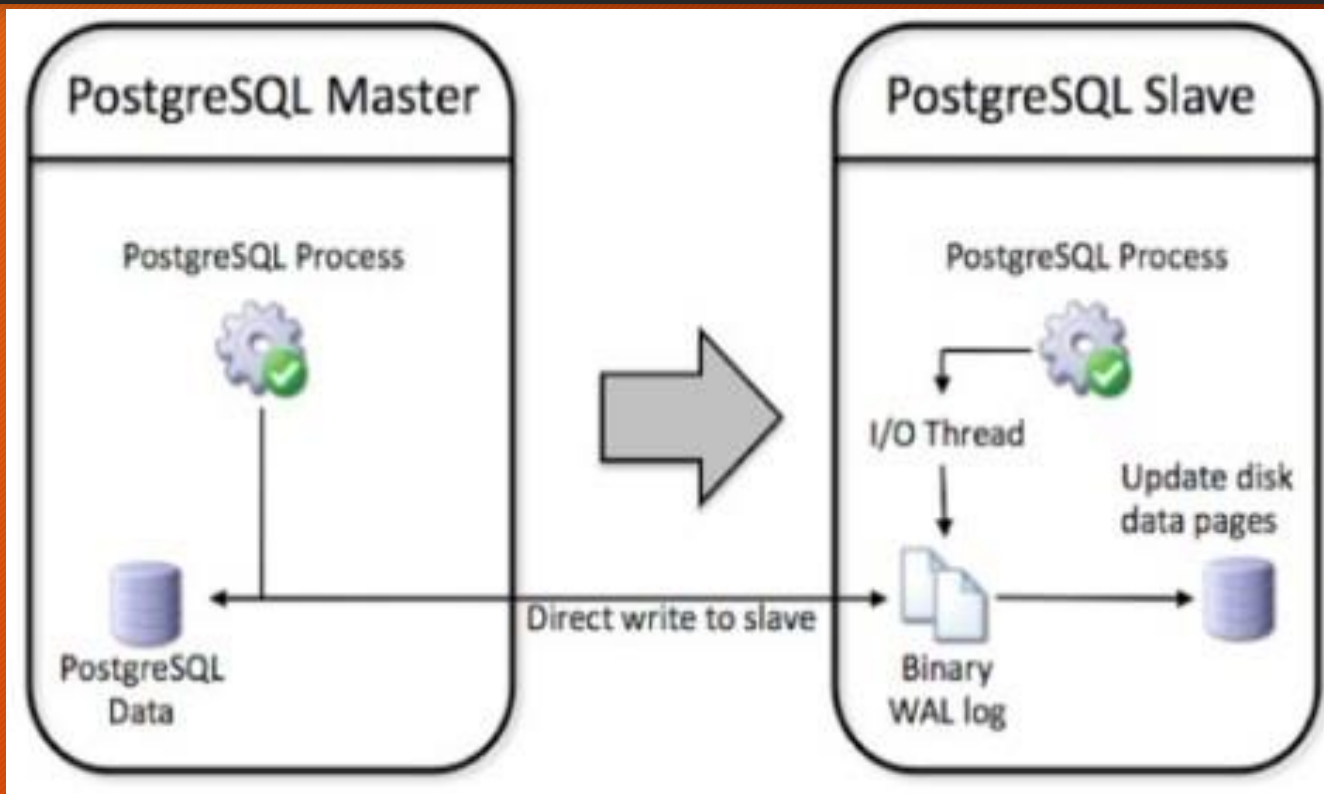
13

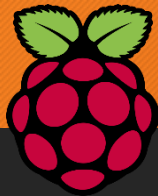
- O PostgreSQL foi instalado nos quatro raspberry pi como base de dados onde foi posteriormente instalado o Pgpool-II, para depois ser possível fazer replicação, que será neste caso a Hot Standby.
- Este tipo de replicação, resume-se a copiar a transacções de logs da base de dados Master para a Slave onde esta tem apenas o papel de read only. Este log de transacção é gerado pelo postgresQL e consiste em todos os snapshots de binários com todas as modificações feitas na base de dados.



PostgreSQL

14

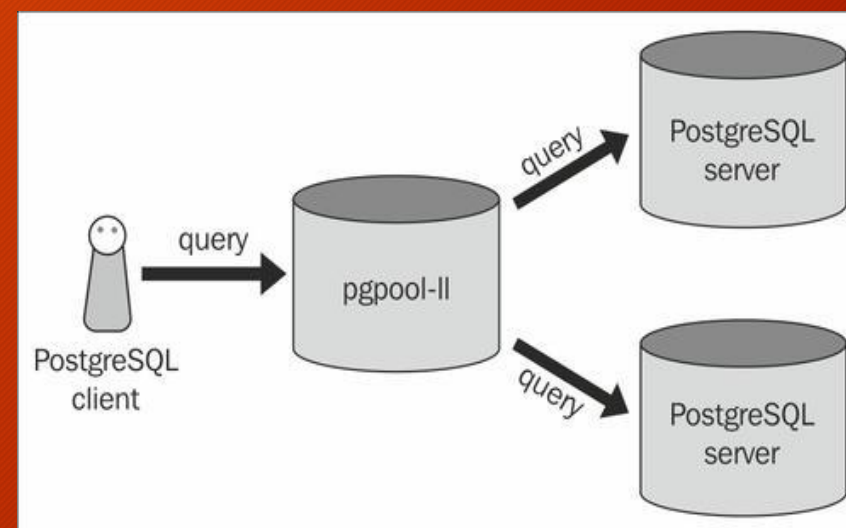


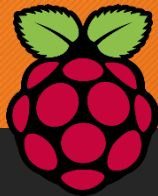


PGPool

15

- O Pgpool-II funciona entre servidores PostgreSQL e um cliente de base de dados PostgreSQL. Fornecendo as seguintes funcionalidades:
 - Pool de Ligação;
 - Replicação;
 - Balanceamento de carga;
 - Excesso de ligações

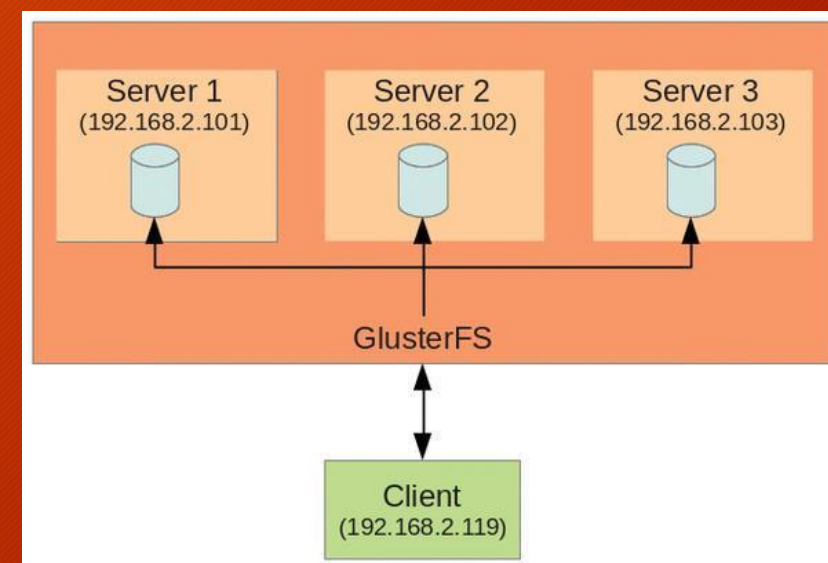


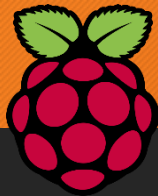


Gluster FS

16

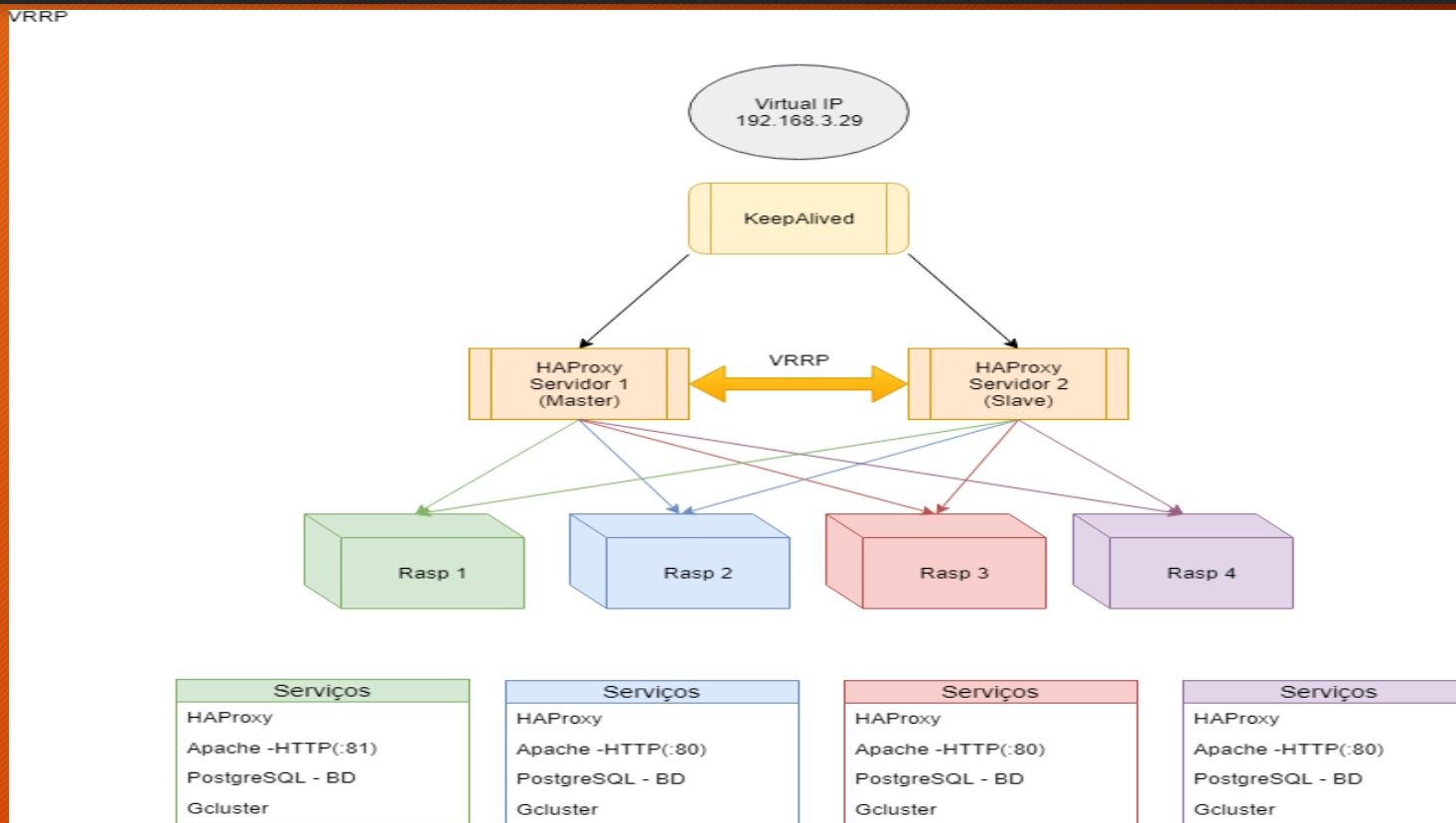
- É um sistema de armazenamento distribuído que agrega múltiplas unidades de armazenamento remotas num único volume.
- As unidades bricks são distribuídas pela rede num único sistema de ficheiros paralelo, permitindo escalabilidade de milhares de bricks

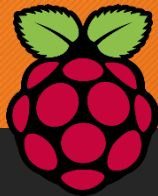




Estrutura

17





Live Demo

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virtual ip:

<http://192.168.3.29>

<http://192.168.3.29/nfo.php>

<http://192.168.3.29/node.php>

<http://192.168.3.29/worpdress>

haproxy

<http://192.168.3.3:1936/haproxy?stats>

<http://192.168.3.4:1935/haproxy?stats>

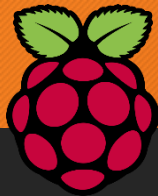
nodes: x={1,2,3,4}

<http://192.168.3.x>

<http://192.168.3.x/nfo.php>

<http://192.168.3.x/node.php>

<http://192.168.3.x/worpdress>



Live Demo

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DB PostgreSQL

<http://192.168.3.3/phpPgadmin>

<http://192.168.3.4/phpPgadmin>

Questões?

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