Cloud Computing on FreeBSD

Orchestrating jails using pot and nomad

FreeBSD DevSummit – EuroBSD 2019
20190918 – Lillehammer

pizzamig@FreeBSD.org
luca.pizzamiglio@trivago.com
Cloud computing on FreeBSD

- What type of Cloud Computing?
- Nomad and pot
- Pot and FreeBSD
- Demo (?)
- Future work
- QA
Cloud Computing

• **Cloud computing is a generic definition for:**
  
  “on-demand availability of computer system resources”

• **I’ll focus only on:**
  
  “container-orchestration system for automating application deployment, scaling and management”

• **Used technologies:**

  • pot (jail abstraction framework)
  
  • FreeBSD only (jails, ZFS, pf)
  
  • Hashicorp stack (nomad, consul, optionally vault)
Container orchestration overview
Container orchestration overview
nomad and pot

- nomad (server and client) and consul are already working on FreeBSD
  - nomad client has few drivers:
    - java, raw exec, isolated exec (?)
- pot already implements several features built on top of jails(8) to provide an easier interface to interact with
- a nomad driver has been developed by Esteban Barrios to allow nomad clients to spawn jails
  - On github: https://github.com/trivago/nomad-pot-driver
**Job description**

```yaml
job "example" {
    datacenters = ["dc1"]
    type = "service"
    group "example-group" {
        task "nginx-pot" {
            driver = "pot"
            service {
                tags = ["nginx-jail"]
                name = "pot-webserver"
                port = "http"
                check {
                    type = "tcp"
                    name = "tcp"
                    interval = "5s"
                    timeout = "2s"
                }
            }
        }
        config {
            image = "https://pot-registry.zapto.org/registry/"
            pot = "FBSD120-nginx"
            tag = "1.0"
            command = "nginx -g 'daemon off;'"
            port_map = { http = "80" }
            copy = [
                "/www/index.html:/usr/local/www/nginx-dist/index.html",
                "/www/nginx.conf:/usr/local/etc/nginx/nginx.conf"
            ]
            mount = [
                "/www/images:/usr/local/etc/www/nginx-dist/images"
            ]
            resources {
                cpu = 200
                memory = 128
                network {
                    mbits = 10
                    port "http" {
                    }
                }
            }
        }
    }
}
```
nomad and pot

• Currently only 3 network setup supported
  • Host (host network stack)
  • Public-bridge (internal virtual network based on VNET)
  • Alias (typical jail setup)

• pot has been extended to provided needed features like:
  • import/export images
  • not returning exec.start command

• one direct contribution to FreeBSD so far
  • R334094 : Improve MAC address uniqueness on if_epair(4)
pot images and the registry

- **a pot image is a compressed ZFS snapshot**
  - Create a pot
  - Provision it (manually or automatically via flavors)
  - Take a snapshot and export it
  - Upload the image to a http server

- **a registry is a http server with pot images**

- **there is no public image registry**
  - I don’t want to maintain one
  - Security concerns
  - I’d keep a recipes catalog
Obstacles

• Not forking command ✓
• Not persistent jails ✓
• Kernel panic when stopping jails with VNET ✓
• Redirection from localhost using external IP ✓
• Dynamic insertion/removal of redirection rules ✓
• Redefinition of cpusets
Future development

- Private bridge support for internal network
- CARP support
- Image size reduction
  - Pkg base (?)
- Multi-dataset support
- Move pot from sh to Rust
- Contribute to FreeBSD in key areas
  - racct
  - bridge & epair
  - libpf (?)
Adoption plan in trivago

- **trivago has an internal cloud solution**
  - It would be nice to have more services based on FreeBSD
- **Plan (?) to adopt nomad-jail orchestration for:**
  - Managed services
  - Infrastructure services (high network traffic services)
- **Moonshots**
  - poudriere-nomad
Questions?

- Questions?
- More questions?

pizzamig@FreeBSD.org
https://github.com/pizzamig/pot
https://github.com/trivago/nomad-pot-driver
https://www.nomadproject.io/