
Uni Software Defined Infrastructure Notes

Notes for the software defined infrastructure course at
HdM Stuttgart

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1 Introduction

1.1 Contributing

These study materials are heavily based on [professor Goik's "Software Defined Infrastructure" lecture at HdM Stuttgart](#).

Found an error or have a suggestion? Please open an issue on GitHub (github.com/pojntfx/uni-sdi-notes):



Figure 1: QR code to source repository

If you like the study materials, a GitHub star is always appreciated :)

1.2 License



Figure 2: AGPL-3.0 license badge

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SPDX-License-Identifier: AGPL-3.0

2 Hosts

Add the following A and AAAA records to a public DNS server (with root domain `alphahorizon.io`):

1	<code>felixs-sdi1</code>	<code>10800</code>	<code>IN</code>	<code>A</code>	<code>138.68.70.72</code>
2	<code>felixs-sdi1</code>	<code>10800</code>	<code>IN</code>	<code>AAAA</code>	<code>2a03:b0c0:3:d0::e34:5001</code>
3	<code>*.felixs-sdi1</code>	<code>10800</code>	<code>IN</code>	<code>A</code>	<code>138.68.70.72</code>
4	<code>*.felixs-sdi1</code>	<code>10800</code>	<code>IN</code>	<code>AAAA</code>	<code>2a03:b0c0:3:d0::e34:5001</code>
5	<code>felixs-sdi2</code>	<code>10800</code>	<code>IN</code>	<code>A</code>	<code>159.223.25.154</code>
6	<code>felixs-sdi2</code>	<code>10800</code>	<code>IN</code>	<code>AAAA</code>	<code>2a03:b0c0:3:d0::1092:b001</code>
7	<code>*.felixs-sdi2</code>	<code>10800</code>	<code>IN</code>	<code>A</code>	<code>159.223.25.154</code>
8	<code>*.felixs-sdi2</code>	<code>10800</code>	<code>IN</code>	<code>AAAA</code>	<code>2a03:b0c0:3:d0::1092:b001</code>

3 User

```
1 ssh root@felixs-sdi1.alphahorizon.io
2 adduser pojntfx
3 usermod -aG sudo pojntfx
4 su pojntfx
```

4 SSH

```
1 sudo apt update
2 sudo apt install -y openssh-server
3 sudo systemctl enable --now ssh
4 mkdir -p ~/.ssh
5 chmod 700 ~/.ssh
6 curl 'https://github.com/pojntfx.keys' | tee -a ~/.ssh/authorized_keys
7 chmod 600 ~/.ssh/authorized_keys
8 exit
```

5 UFW

```
1 ssh pojntfx@felixs-sdi1.alphahorizon.io
2 sudo apt update
3 sudo apt install -y ufw
4 sudo systemctl enable --now ufw
5 sudo ufw default deny incoming
6 sudo ufw default allow outgoing
7 sudo ufw allow OpenSSH
```

```
8 sudo ufw enable
```

6 APT

```
1 sudo apt update
2 sudo apt install -y unattended-upgrades
3
4 sudo vi /etc/apt/apt.conf.d/50unattended-upgrades # Now replace/add the
   following:
5 Unattended-Upgrade::Origins-Pattern {
6     "origin=*";
7 }
8 Unattended-Upgrade::Automatic-Reboot "true";
9 Unattended-Upgrade::Automatic-Reboot-Time "02:00";
10
11 sudo dpkg-reconfigure unattended-upgrades # Answer with yes
12 sudo systemctl enable --now unattended-upgrades
13 sudo unattended-upgrades --debug # Test the configuration; this will
   install the available updates right now
14 sudo reboot # If required
```

7 Traefik

```
1 $ sudo apt update
2 $ sudo apt install -y docker.io
3 $ sudo systemctl enable --now docker
4 $ sudo mkdir -p /etc/traefik
5 $ sudo tee /etc/traefik/traefik.yaml<<'EOT'
6 entryPoints:
7   dnsTcp:
8     address: ":53"
9
10  dnsUdp:
11    address: ":53/udp"
12
13  web:
14    address: ":80"
15
16  websecure:
17    address: ":443"
18
19  websecurealt:
20    address: ":8443"
21
22  metrics:
```

```
23     address: "localhost:8082"
24
25 providers:
26   file:
27     filename: /etc/traefik/services.yaml
28     watch: true
29
30 api:
31   dashboard: true
32
33 certificatesResolvers:
34   letsencrypt:
35     acme:
36       email: felix@pojtinger.com
37       storage: /var/lib/traefik/acme.json
38       httpChallenge:
39         entryPoint: web
40
41 log:
42   level: INFO
43
44 metrics:
45   prometheus:
46     entryPoint: metrics
47 EOT
48 $ sudo tee /etc/traefik/services.yaml<<'EOT'
49 udp:
50   routers:
51     dns:
52       entryPoints:
53         - dnsUdp
54       service: dns
55   services:
56     dns:
57       loadBalancer:
58         servers:
59           - address: localhost:54
60
61 tcp:
62   routers:
63     dns:
64       entryPoints:
65         - dnsTcp
66       rule: HostSNI(`*`)
67       service: dns
68     ssh:
69       entryPoints:
70         - websecurealt
71       rule: HostSNI(`*`)
72       service: ssh
73     sshOverTLS:
```

```
74     entryPoints:
75       - websecure
76     rule: HostSNI(`ssh.felixs-sdi1.alphahorizon.io`)
77     service: ssh
78     tls:
79       certResolver: letsencrypt
80       domains:
81         - main: ssh.felixs-sdi1.alphahorizon.io
82   ldap:
83     entryPoints:
84       - websecure
85     rule: HostSNI(`ldap.felixs-sdi1.alphahorizon.io`)
86     service: ldap
87     tls:
88       certResolver: letsencrypt
89       domains:
90         - main: ldap.felixs-sdi1.alphahorizon.io
91   services:
92     dns:
93       loadBalancer:
94         servers:
95           - address: localhost:54
96     ssh:
97       loadBalancer:
98         servers:
99           - address: localhost:22
100   ldap:
101     loadBalancer:
102       servers:
103         - address: localhost:389
104
105   http:
106     routers:
107       cockpit:
108         rule: Host(`cockpit.felixs-sdi1.alphahorizon.io`)
109         tls:
110           certResolver: letsencrypt
111           domains:
112             - main: cockpit.felixs-sdi1.alphahorizon.io
113         service: cockpit
114         entryPoints:
115           - websecure
116     apache:
117       rule: Host(`apache.felixs-sdi1.alphahorizon.io`) || HostRegexp(`{
118         subdomain:[a-z]+}.apache.felixs-sdi1.alphahorizon.io`)
119       tls:
120         certResolver: letsencrypt
121         domains:
122           - main: apache.felixs-sdi1.alphahorizon.io
123           - main: marx.apache.felixs-sdi1.alphahorizon.io
124           - main: kropotkin.apache.felixs-sdi1.alphahorizon.io
```

```
124         - main: secure.apache.felixs-sdi1.alphahorizon.io
125     service: apache
126     entryPoints:
127         - websecure
128     phpmyadmin:
129         rule: Host(`phpmyadmin.felixs-sdi1.alphahorizon.io`)
130         tls:
131             certResolver: letsencrypt
132             domains:
133                 - main: phpmyadmin.felixs-sdi1.alphahorizon.io
134         service: apache
135         entryPoints:
136             - websecure
137     ldapAccountManager:
138         rule: Host(`ldap-account-manager.felixs-sdi1.alphahorizon.io`)
139         tls:
140             certResolver: letsencrypt
141             domains:
142                 - main: ldap-account-manager.felixs-sdi1.alphahorizon.io
143         service: apache
144         entryPoints:
145             - websecure
146     nextcloud:
147         rule: Host(`nextcloud.felixs-sdi1.alphahorizon.io`)
148         tls:
149             certResolver: letsencrypt
150             domains:
151                 - main: nextcloud.felixs-sdi1.alphahorizon.io
152         service: apache
153         entryPoints:
154             - websecure
155     grafana:
156         rule: Host(`grafana.felixs-sdi1.alphahorizon.io`)
157         tls:
158             certResolver: letsencrypt
159             domains:
160                 - main: grafana.felixs-sdi1.alphahorizon.io
161         service: grafana
162         entryPoints:
163             - websecure
164     dashboard:
165         rule: Host(`traefik.felixs-sdi1.alphahorizon.io`)
166         tls:
167             certResolver: letsencrypt
168             domains:
169                 - main: traefik.felixs-sdi1.alphahorizon.io
170         service: api@internal
171         entryPoints:
172             - websecure
173         middlewares:
174             - dashboard
```



```
175
176     middlewares:
177         dashboard:
178             basicauth:
179                 users:
180                     - "admin:$apr1$wBh8VM6G$bZ82XpyH3mX4ha9XBbcL1" # htpasswd -
                        nb admin asdf
181
182     services:
183         cockpit:
184             loadBalancer:
185                 serversTransport: cockpit
186                 servers:
187                     - url: https://localhost:9091
188         apache:
189             loadBalancer:
190                 servers:
191                     - url: http://localhost:8080
192         grafana:
193             loadBalancer:
194                 servers:
195                     - url: http://localhost:3000
196
197     serversTransports:
198         cockpit:
199             insecureSkipVerify: true
200 EOT
201 $ sudo docker run -d --restart=always --net=host -v /var/lib/traefik/:/
    var/lib/traefik -v /etc/traefik/:/etc/traefik --name traefik traefik
    :v2.5
202 $ sudo ufw allow 'DNS'
203 $ sudo ufw allow 'WWW'
204 $ sudo ufw allow 'WWW Secure' # Now visit https://cockpit.felixs-sdi1.
    alphahorizon.io/
205 $ sudo ufw allow '8443/tcp'
206 $ ssh pojntfx@felixs-sdi1.alphahorizon.io # Connect using SSH without
    Traefik
207 $ ssh -p 8443 pojntfx@felixs-sdi1.alphahorizon.io # Connect using SSH
    over Traefik without TLS
208 $ ssh -o ProxyCommand="openssl s_client -connect ssh.felixs-sdi1.
    alphahorizon.io:443 -quiet" pojntfx # Connect using SSH over Traefik
    with TLS
```

8 Cockpit

```
1 echo 'deb http://deb.debian.org/debian bullseye-backports main' | sudo
    tee /etc/apt/sources.list.d/backports.list
2 sudo apt update
```

```
3 sudo apt install -t bullseye-backports -y cockpit
4
5 sudo sed -i /lib/systemd/system/cockpit.socket -e 's/ListenStream=9090/
    ListenStream=9091/g'
6 sudo systemctl daemon-reload
```

9 DNS

9.1 Manager

```
1 sudo apt update
2 sudo apt install -y bind9 bind9utils
3 sudo systemctl enable --now named
4
5 sudo vi /etc/bind/named.conf.options # Now add the following at the end
    of the options block:
6 listen-on port 54 { 127.0.0.1; };
7 listen-on-v6 port 54 { ::1; };
8
9 version "not currently available";
10 recursion yes;
11 querylog yes;
12 allow-transfer { none; };
13 allow-query { any; };
14
15 sudo tee -a /etc/bind/named.conf.local <<'EOT'
16 zone "example.pojtinger" {
17     type master;
18     file "/etc/bind/db.example.pojtinger";
19     allow-query { any; };
20     allow-transfer { 159.223.25.154; 2a03:b0c0:3:d0::1092:b001; };
21 };
22
23 zone "70.68.138.in-addr.arpa" {
24     type master;
25     file "/etc/bind/db.70.68.138";
26     allow-query { any; };
27     allow-transfer { 159.223.25.154; 2a03:b0c0:3:d0::1092:b001; };
28 };
29
30 zone "1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.d.0.0.3.0.0.0.0.c.0.b.3.0.a.2.
    ip6.arpa" {
31     type master;
32     file "/etc/bind/db.1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.d
        .0.0.3.0.0.0.0.c.0.b.3.0.a.2";
33     allow-query { any; };
34     allow-transfer { 159.223.25.154; 2a03:b0c0:3:d0::1092:b001; };
35 };
```

```

36 EOT
37
38 # Increase `1634570712` by one and reload after each change to
   propagate changes to the worker
39 sudo tee /etc/bind/db.example.pojtinger <<'EOT'
40 $ORIGIN example.pojtinger.
41 $TTL 3600
42
43 example.pojtinger.      IN      SOA      ns1.example.pojtinger.
   hostmaster.example.pojtinger. ( 1634570712 7200 3600 1209600 3600
   )
44
45 example.pojtinger.      IN      NS       ns1.example.pojtinger.
46 example.pojtinger.      IN      NS       ns2.example.pojtinger.
47
48 example.pojtinger.      IN      A        138.68.70.72
49 example.pojtinger.      IN      AAAA     2a03:b0c0:3:d0::e34:5001
50
51 ns1.example.pojtinger.  IN      A        138.68.70.72
52 ns1.example.pojtinger.  IN      AAAA     2a03:b0c0:3:d0::e34:5001
53
54 ns2.example.pojtinger.  IN      A        159.223.25.154
55 ns2.example.pojtinger.  IN      AAAA     2a03:b0c0:3:d0::1092:b001
56
57 example.pojtinger.      IN      MX       1      fb.mail.gandi.net.
58 www.example.pojtinger.  IN      CNAME    example.pojtinger.
59 EOT
60
61 # Increase `1634570724` by one and reload after each change to
   propagate changes to the worker
62 sudo tee /etc/bind/db.70.68.138 <<'EOT'
63 $ORIGIN 70.68.138.in-addr.arpa.
64 $TTL 3600
65
66 @      IN      SOA      ns1.example.pojtinger. hostmaster.example.
   pojtinger. ( 1634570724 7200 3600 1209600 3600 )
67
68 @      IN      NS       ns1.example.pojtinger.
69 @      IN      NS       ns2.example.pojtinger.
70
71 72     IN      PTR      example.pojtinger.
72 EOT
73
74 # Increase `1634570724` by one and reload after each change to
   propagate changes to the worker
75 sudo tee /etc/bind/db.1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.0.d
   .0.0.3.0.0.0.0.c.0.b.3.0.a.2 <<'EOT'
76 $ORIGIN 1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.0.d.0.0.3.0.0.0.0.c.0.b.3.0.a
   .2.ip6.arpa.
77 $TTL 3600
78

```

```
79 @      IN      SOA      ns1.example.pojtinger. hostmaster.example.
    pojtinger.    ( 1634570724 7200 3600 1209600 3600 )
80
81 @      IN      NS       ns1.example.pojtinger.
82 @      IN      NS       ns2.example.pojtinger.
83
84 1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.0.0.0.d.0.0.3.0.0.0.0.c.0.b.3.0.a.2.ip6.
    arpa.         IN      PTR      example.pojtinger.
85 EOT
86
87 sudo named-checkconf
88
89 sudo named-checkzone example.pojtinger /etc/bind/db.example.pojtinger
90 sudo named-checkzone 70.68.138.in-addr.arpa. /etc/bind/db.70.68.138
91 sudo named-checkzone 1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.0.0.0.d.0.0.3.0.0.0.0.
    c.0.b.3.0.a.2.ip6.arpa. /etc/bind/db.1.0.0.5.4.3.e
    .0.0.0.0.0.0.0.0.0.0.0.0.d.0.0.3.0.0.0.0.c.0.b.3.0.a.2
92
93 sudo systemctl reload named
```

9.2 Worker

```
1 sudo apt update
2 sudo apt install -y bind9 bind9utils
3 sudo systemctl enable --now named
4
5 sudo vi /etc/bind/named.conf.options # Now add the following at the end
    of the options block:
6 listen-on port 54 { 127.0.0.1; };
7 listen-on-v6 port 54 { ::1; };
8
9 version "not currently available";
10 recursion yes;
11 querylog yes;
12 allow-transfer { none; };
13 allow-query { any; };
14
15 sudo tee -a /etc/bind/named.conf.local <<'EOT'
16 zone "example.pojtinger" {
17     type slave;
18     file "db.example.pojtinger";
19     allow-query { any; };
20     masters { 138.68.70.72; 2a03:b0c0:3:d0::e34:5001; };
21 };
22
23 zone "70.68.138.in-addr.arpa" {
24     type slave;
25     file "db.70.68.138";
26     allow-query { any; };
```

```
27     masters { 138.68.70.72; 2a03:b0c0:3:d0::e34:5001; };
28 };
29
30 zone "1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.d.0.0.3.0.0.0.0.c.0.b.3.0.a.2.
    ip6.arpa" {
31     type slave;
32     file "db.1.0.0.5.4.3.e.0.0.0.0.0.0.0.0.0.d.0.0.3.0.0.0.0.c.0.
        b.3.0.a.2";
33     allow-query { any; };
34     masters { 138.68.70.72; 2a03:b0c0:3:d0::e34:5001; };
35 };
36 EOT
37
38 sudo named-checkconf
39 sudo systemctl reload named
```

9.3 Exercises

Use the dig command to query A/CNAME/MX/NS records from various machines/domains of your choice. Then execute reverse lookups as well.

```
1 # Get A/AAA records from manager server
2 $ dig +noall +answer @138.68.70.72 example.pojtinger A
3 example.pojtinger.      3600    IN      A        138.68.70.72
4 $ dig +noall +answer @138.68.70.72 example.pojtinger AAAA
5 example.pojtinger.      3600    IN      AAAA     2a03:b0c0:3:d0::e34
    :5001
6
7 # Get A/AAAA records from worker server
8 $ dig +noall +answer @159.223.25.154 example.pojtinger A
9 example.pojtinger.      3600    IN      A        138.68.70.72
10 $ dig +noall +answer @159.223.25.154 example.pojtinger AAAA
11 example.pojtinger.      3600    IN      AAAA     2a03:b0c0:3:d0::e34
    :5001
12
13 # Get NS record
14 $ dig +noall +answer @159.223.25.154 example.pojtinger NS
15 example.pojtinger.      3600    IN      NS        ns1.example.pojtinger.
16 example.pojtinger.      3600    IN      NS        ns2.example.pojtinger.
17
18 # Get CNAME record
19 $ dig +noall +answer @159.223.25.154 www.example.pojtinger CNAME
20 www.example.pojtinger.  3600    IN      CNAME     example.pojtinger.
21
22 # Do IPv4 reverse lookup
23 $ dig +short @159.223.25.154 -x 138.68.70.72
24 example.pojtinger.
25
26 # Do IPv6 reverse lookup
```

```
27 $ dig +short @159.223.25.154 -x '2a03:b0c0:3:d0::e34:5001'
28 example.pojtinger.
```

Enable recursive queries to parent nameservers enabling your nameserver to resolve external machines like www.w3.org by delegation.

```
1 # Get AAAA record for felix.pojtinger.com using parent nameservers
2 $ dig +noall +answer @159.223.25.154 felix.pojtinger.com AAAA
3 felix.pojtinger.com.      123      IN      CNAME   cname.vercel-dns.com.
```

Provide a mail exchange record pointing to mx1.hdm-stuttgart.de. Test this configuration using dig accordingly.

```
1 # Get MX record
2 $ dig +noall +answer @159.223.25.154 example.pojtinger MX
3 example.pojtinger.      3600      IN      MX      1 fb.mail.gandi.net.
```

10 LDAP

```
1 sudo apt update
2 sudo apt install -y slapd ldap-utils certbot
3
4 sudo dpkg-reconfigure slapd # ldap.felixs-sdi1.alphahorizon.io, felixs-
   sdi1
5
6 curl ldaps://ldap.felixs-sdi1.alphahorizon.io:443 # Test the connection
7
8 socat tcp-listen:8389,fork openssl:ldap.felixs-sdi1.alphahorizon.io:443
   # Run this on the local system to connect with Apache Directory
   Studio as the latter does not send a SNI header/is not TLS compliant
9 curl ldap://localhost:8389 # Test the proxy's connection
10
11 # Connect in Apache Directory Studio with the following info:
12 # Hostname: localhost
13 # Port: 8389
14 # Bind DN or user: cn=admin,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=
   io
15 # Bind password: The password from `sudo dpkg-reconfigure slapd`
16
17 # Connect with ldapwhoami like so:
18 ldapwhoami -H 'ldaps://ldap.felixs-sdi1.alphahorizon.io:443' -x #
   Anonymous
19 ldapwhoami -H 'ldaps://ldap.felixs-sdi1.alphahorizon.io:443' -W -D cn=
   admin,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io # As admin
20
21 # Now add the objects (you can create a password hash using `slappasswd
   | base64`):
```

```
22 ldapadd -H 'ldaps://ldap.felixs-sdi1.alphahorizon.io:443' -W -D cn=
    admin,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io <<'EOT'
23 version: 1
24
25 dn: dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io
26 objectClass: dcObject
27 objectClass: organization
28 objectClass: top
29 dc: ldap
30 o: felixs-sdi1
31
32 # We already set this up using `dpkg-reconfigure`
33 # dn: cn=admin,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io
34 # objectClass: organizationalRole
35 # objectClass: simpleSecurityObject
36 # cn: admin
37 # userPassword:: e1NTSEF9cEhFK0VQT0cyZ3lSeU9nanZGcXNXT2I1ekdzR2w5Q0Q=
38 # description: LDAP administrator
39
40 dn: ou=departments,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io
41 objectClass: organizationalUnit
42 objectClass: top
43 ou: departments
44
45 dn: ou=software,ou=departments,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,
    dc=io
46 objectClass: organizationalUnit
47 objectClass: top
48 ou: software
49
50 dn: ou=financial,ou=departments,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,
    dc=io
51 objectClass: organizationalUnit
52 objectClass: top
53 ou: financial
54
55 dn: ou=devel,ou=software,ou=departments,dc=ldap,dc=felixs-sdi1,dc=
    alphahorizon,dc=io
56 objectClass: organizationalUnit
57 objectClass: top
58 ou: devel
59
60 dn: ou=testing,ou=software,ou=departments,dc=ldap,dc=felixs-sdi1,dc=
    alphahorizon,dc=io
61 objectClass: organizationalUnit
62 objectClass: top
63 ou: testing
64
65 dn: ou=ops,ou=software,ou=departments,dc=ldap,dc=felixs-sdi1,dc=
    alphahorizon,dc=io
66 objectClass: organizationalUnit
```

```
67 objectClass: top
68 ou: ops
69
70 dn: uid=bean,ou=devel,ou=software,ou=departments,dc=ldap,dc=felixs-sdi1
    ,dc=alphahorizon,dc=io
71 objectClass: inetOrgPerson
72 objectClass: organizationalPerson
73 objectClass: person
74 objectClass: top
75 cn: Audrey Bean
76 sn: Bean
77 givenName: Audrey
78 mail: bean@ldap.felixs-sdi1.alphahorizon.io
79 uid: bean
80 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
81
82 dn: uid=smith,ou=devel,ou=software,ou=departments,dc=ldap,dc=felixs-
    sdi1,dc=alphahorizon,dc=io
83 objectClass: inetOrgPerson
84 objectClass: organizationalPerson
85 objectClass: person
86 objectClass: top
87 cn: Jane Smith
88 sn: Smith
89 givenName: Jane
90 mail: smith@ldap.felixs-sdi1.alphahorizon.io
91 uid: smith
92 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
93
94 dn: uid=waibel,ou=financial,ou=departments,dc=ldap,dc=felixs-sdi1,dc=
    alphahorizon,dc=io
95 objectClass: inetOrgPerson
96 objectClass: organizationalPerson
97 objectClass: person
98 objectClass: posixAccount
99 objectClass: top
100 cn: Jakob Waibel
101 gidNumber: 100
102 homeDirectory: /usr/jakob
103 sn: Waibel
104 uid: waibel
105 uidNumber: 1337
106 givenName: Jakob
107 mail: waibel@ldap.felixs-sdi1.alphahorizon.io
108 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
109
110 dn: uid=simpson,ou=financial,ou=departments,dc=ldap,dc=felixs-sdi1,dc=
    alphahorizon,dc=io
111 objectClass: inetOrgPerson
112 objectClass: organizationalPerson
113 objectClass: person
```



```
114 objectClass: top
115 cn: Homer Simpson
116 sn: Simpson
117 givenName: Homer
118 mail: simpson@ldap.felixs-sdi1.alphahorizon.io
119 uid: simpson
120 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
121
122 dn: uid=pojtinger,ou=testing,ou=software,ou=departments,dc=ldap,dc=
    felixs-sdi1,dc=alphahorizon,dc=io
123 objectClass: inetOrgPerson
124 objectClass: organizationalPerson
125 objectClass: person
126 objectClass: top
127 cn: Felix Pojtinger
128 sn: Pojtinger
129 givenName: Felix
130 mail: pojtinger@ldap.felixs-sdi1.alphahorizon.io
131 uid: pojtinger
132 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
133
134 dn: uid=simpson,ou=testing,ou=software,ou=departments,dc=ldap,dc=felixs-
    -sdi1,dc=alphahorizon,dc=io
135 objectClass: inetOrgPerson
136 objectClass: organizationalPerson
137 objectClass: person
138 objectClass: top
139 cn: Maggie Simpson
140 sn: Simpson
141 givenName: Maggie
142 mail: simpson@ldap.felixs-sdi1.alphahorizon.io
143 uid: simpson
144 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
145
146 dn: uid=aleimut,ou=devel,ou=software,ou=departments,dc=ldap,dc=felixs-
    sdi1,dc=alphahorizon,dc=io
147 objectClass: inetOrgPerson
148 objectClass: organizationalPerson
149 objectClass: person
150 objectClass: top
151 cn: Adelheit Aleimut
152 sn: Aleimut
153 givenName: Adelheit
154 mail: aleimut@ldap.felixs-sdi1.alphahorizon.io
155 uid: aleimut
156 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
157
158 dn: uid=tibbie,ou=testing,ou=software,ou=departments,dc=ldap,dc=felixs-
    sdi1,dc=alphahorizon,dc=io
159 objectClass: inetOrgPerson
160 objectClass: organizationalPerson
```

```
161 objectClass: person
162 objectClass: posixAccount
163 objectClass: top
164 cn: Oswald Tibbie
165 gidNumber: 100
166 homeDirectory: /usr/oswald
167 sn: Tibbie
168 uid: tibbie
169 uidNumber: 1234
170 givenName: Oswald
171 mail: tibbie@ldap.felixs-sdi1.alphahorizon.io
172 userPassword:: e1NTSEF9NGxCMnc4dThQRXI5Rjd3VGZjN3ltNWkwUDk5N3d0eS8=
173
174 dn: uid=operator,ou=ops,ou=software,ou=departments,dc=ldap,dc=felixs-
    sdi1,dc=alphahorizon,dc=io
175 objectClass: inetOrgPerson
176 objectClass: organizationalPerson
177 objectClass: person
178 objectClass: posixAccount
179 objectClass: top
180 cn: Operator Operatis
181 gidNumber: 100
182 homeDirectory: /usr/operator
183 sn: Operator
184 uid: operatis
185 uidNumber: 1235
186 givenName: Operator
187 mail: operator@ldap.felixs-sdi1.alphahorizon.io
188 userPassword:: e1NTSEF9Y1dtYUZ5Zi9HSTNTcFYyaktmYlpieUhedFh5ek5wVEkK
189 EOT
190
191 # And test if we can access using a user
192 ldapwhoami -H 'ldaps://ldap.felixs-sdi1.alphahorizon.io:443' -W -D uid=
    bean,ou=devel,ou=software,ou=departments,dc=ldap,dc=felixs-sdi1,dc=
    alphahorizon,dc=io # As bean using password "password"
```

11 Apache

```
1 sudo apt update
2 sudo apt install -y apache2
3 sudo vi /etc/apache2/ports.conf # Now replace/add the following:
4 Listen 8080
5 sudo systemctl restart apache2
6 sudo systemctl enable --now apache2
7 sudo systemctl status apache2
8
9 sudo tree -T "Example Index" -H '.' -o /var/www/html/index.html /var/
    www/html # Replace the default file with a file listing
```

```
10 sudo mkdir -p /var/www/sdidoc
11 sudo tree -T "Example Index For sdidoc" -H '.' -o /var/www/sdidoc/index
    .html /var/www/html # Create a secondary listing for the alias
12 sudo tee /etc/apache2/sites-available/apache.felixs-sdi1.alphahorizon.
    io.conf <<'EOT'
13 <VirtualHost *:8080>
14     ServerName felixs-sdi1.alphahorizon.io
15     ServerAlias apache.felixs-sdi1.alphahorizon.io
16
17     ServerAdmin webmaster@alphahorizon.io
18     DocumentRoot /var/www/html
19
20     ErrorLog ${APACHE_LOG_DIR}/error.log
21     CustomLog ${APACHE_LOG_DIR}/access.log combined
22
23     <Directory "/var/www/html">
24         Options Indexes FollowSymLinks
25         AllowOverride None
26         Require all granted
27     </Directory>
28
29     Alias /sdidoc /var/www/sdidoc
30
31     <Directory "/var/www/sdidoc">
32         Options Indexes FollowSymLinks
33         AllowOverride None
34         Require all granted
35     </Directory>
36 </VirtualHost>
37 EOT
38 sudo a2disssite 000-default.conf
39 sudo a2ensite apache.felixs-sdi1.alphahorizon.io
40 sudo systemctl reload apache2
41
42 curl https://apache.felixs-sdi1.alphahorizon.io/ # Access the index
43 curl https://apache.felixs-sdi1.alphahorizon.io/sdidoc/ # Access the
    index in `/var/www/sdidoc`
44
45 sudo apt install -y apache2-doc # Install the docs package
46 curl https://apache.felixs-sdi1.alphahorizon.io/manual/en/index.html #
    Access the installed docs; be careful, this applies to all virtual
    hosts
47
48 sudo mkdir -p /var/www/marx.apache.felixs-sdi1.alphahorizon.io
49 echo '<h1>Marx</h1>' | sudo tee /var/www/marx.apache.felixs-sdi1.
    alphahorizon.io/index.html
50 sudo tee /etc/apache2/sites-available/marx.apache.felixs-sdi1.
    alphahorizon.io.conf <<'EOT'
51 <VirtualHost *:8080>
52     ServerName felixs-sdi1.alphahorizon.io
53     ServerAlias marx.apache.felixs-sdi1.alphahorizon.io
```

```
54
55     ServerAdmin webmaster@alphahorizon.io
56     DocumentRoot /var/www/marx.apache.felixs-sd1.alphahorizon.io
57
58     ErrorLog ${APACHE_LOG_DIR}/error.log
59     CustomLog ${APACHE_LOG_DIR}/access.log combined
60
61     <Directory "/var/www/marx.apache.felixs-sd1.alphahorizon.io">
62         Options Indexes FollowSymLinks
63         AllowOverride None
64         Require all granted
65     </Directory>
66 </VirtualHost>
67 EOT
68 sudo a2ensite marx.apache.felixs-sd1.alphahorizon.io
69 sudo systemctl reload apache2
70
71 curl https://marx.apache.felixs-sd1.alphahorizon.io/ # Access the Marx
    site
72
73 sudo mkdir -p /var/www/kropotkin.apache.felixs-sd1.alphahorizon.io
74 echo '<h1>Kropotkin</h1>' | sudo tee /var/www/kropotkin.apache.felixs-
    sd1.alphahorizon.io/index.html
75 sudo tee /etc/apache2/sites-available/kropotkin.apache.felixs-sd1.
    alphahorizon.io.conf <<'EOT'
76 <VirtualHost *:8080>
77     ServerName felixs-sd1.alphahorizon.io
78     ServerAlias kropotkin.apache.felixs-sd1.alphahorizon.io
79
80     ServerAdmin webmaster@alphahorizon.io
81     DocumentRoot /var/www/kropotkin.apache.felixs-sd1.alphahorizon
        .io
82
83     ErrorLog ${APACHE_LOG_DIR}/error.log
84     CustomLog ${APACHE_LOG_DIR}/access.log combined
85
86     <Directory "/var/www/kropotkin.apache.felixs-sd1.alphahorizon.
        io">
87         Options Indexes FollowSymLinks
88         AllowOverride None
89         Require all granted
90     </Directory>
91 </VirtualHost>
92 EOT
93 sudo a2ensite kropotkin.apache.felixs-sd1.alphahorizon.io
94 sudo systemctl reload apache2
95
96 curl https://kropotkin.apache.felixs-sd1.alphahorizon.io/ # Access the
    Kropotkin site
97
98 sudo mkdir -p /var/www/secure.apache.felixs-sd1.alphahorizon.io
```

```
99 echo '<h1>Super secure content!</h1>' | sudo tee /var/www/secure.apache
    .felixs-sdi1.alphahorizon.io/index.html
100 sudo tee /etc/apache2/sites-available/secure.apache.felixs-sdi1.
    alphahorizon.io.conf <<'EOT'
101 <VirtualHost *:8080>
102     ServerName felixs-sdi1.alphahorizon.io
103     ServerAlias secure.apache.felixs-sdi1.alphahorizon.io
104
105     ServerAdmin webmaster@alphahorizon.io
106     DocumentRoot /var/www/secure.apache.felixs-sdi1.alphahorizon.io
107
108     ErrorLog ${APACHE_LOG_DIR}/error.log
109     CustomLog ${APACHE_LOG_DIR}/access.log combined
110
111     <Directory "/var/www/secure.apache.felixs-sdi1.alphahorizon.io"
        >
112         Options Indexes FollowSymLinks
113         AllowOverride None
114
115         AuthType Basic
116         AuthBasicProvider ldap
117         AuthName "Please enter your LDAP username and password"
118         AuthLDAPURL "ldap://localhost:389/ou=devel,ou=software,
            ou=departments,dc=ldap,dc=felixs-sdi1,dc=
            alphahorizon,dc=io"
119         Require valid-user
120     </Directory>
121 </VirtualHost>
122 EOT
123 sudo a2enmod authnz_ldap
124 sudo a2ensite secure.apache.felixs-sdi1.alphahorizon.io
125 sudo systemctl reload apache2
126
127 ldapwhoami -H 'ldap://localhost:389' -W -D uid=bean,ou=devel,ou=
    software,ou=departments,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io
    # Connect to local LDAP server as bean using password "password"
128
129 curl https://secure.apache.felixs-sdi1.alphahorizon.io/ # Try to access
    the secure site anonymously (401 Unauthorized)
130 curl -u bean:password https://secure.apache.felixs-sdi1.alphahorizon.io
    / # Access the secure site as bean (or anyone else in ou=devel,ou=
    software) with password "password" (you can also open it using a
    browser)
```

12 MariaDB and phpMyAdmin

```
1 sudo apt update
2 sudo apt install -y mariadb-server
```

```
3 sudo mysql_secure_installation # Empty string, y, y, yourpassword,
   yourpassword, y, y, y, y
4
5 sudo mysql -u root -e 'GRANT ALL PRIVILEGES ON *.* TO 'phpmyadmin'@'
   localhost' WITH GRANT OPTION;'
6
7 sudo apt install -y phpmyadmin libapache2-mod-php # apache2, y,
   yourpassword, yourpassword
8 sudo phpenmod mbstring
9
10 sudo a2disconf phpmyadmin
11
12 sudo tee /etc/apache2/sites-available/phpmyadmin.felixs-sdi1.
   alphahorizon.io.conf <<'EOT'
13 <VirtualHost *:8080>
14     ServerName felixs-sdi1.alphahorizon.io
15     ServerAlias phpmyadmin.felixs-sdi1.alphahorizon.io
16
17     ServerAdmin webmaster@alphahorizon.io
18     DocumentRoot /usr/share/phpmyadmin
19
20     ErrorLog ${APACHE_LOG_DIR}/error.log
21     CustomLog ${APACHE_LOG_DIR}/access.log combined
22
23     <Directory "/usr/share/phpmyadmin">
24         Options SymLinksIfOwnerMatch
25         DirectoryIndex index.php
26
27         # limit libapache2-mod-php to files and directories
           necessary by pma
28         <IfModule mod_php7.c>
29             php_admin_value upload_tmp_dir /var/lib/phpmyadmin/tmp
30             php_admin_value open_basedir /usr/share/phpmyadmin/:/
               usr/share/doc/phpmyadmin/:/etc/phpmyadmin/:/var/lib/
               phpmyadmin/:/usr/share/php/:/usr/share/javascript/
31         </IfModule>
32     </Directory>
33
34     # Disallow web access to directories that don't need it
35     <Directory "/usr/share/phpmyadmin/templates">
36         Require all denied
37     </Directory>
38     <Directory "/usr/share/phpmyadmin/libraries">
39         Require all denied
40     </Directory>
41 </VirtualHost>
42 EOT
43 sudo a2ensite phpmyadmin.felixs-sdi1.alphahorizon.io
44 sudo systemctl reload apache2
45
```

```
46 # Now visit https://phpmyadmin.felixs-sdi1.alphahorizon.io/ and login
    as root using yourpassword
```

13 LDAP Account Manager

```
1 sudo apt update
2 sudo apt install -y ldap-account-manager
3
4 sudo a2disconf ldap-account-manager
5
6 sudo tee /etc/apache2/sites-available/ldap-account-manager.felixs-sdi1.
   alphahorizon.io.conf <<'EOT'
7 <VirtualHost *:8080>
8     ServerName felixs-sdi1.alphahorizon.io
9     ServerAlias ldap-account-manager.felixs-sdi1.alphahorizon.io
10
11     ServerAdmin webmaster@alphahorizon.io
12     DocumentRoot /usr/share/ldap-account-manager
13
14     ErrorLog ${APACHE_LOG_DIR}/error.log
15     CustomLog ${APACHE_LOG_DIR}/access.log combined
16
17     <Directory "/usr/share/ldap-account-manager">
18         Options +FollowSymLinks
19         AllowOverride All
20         Require all granted
21         DirectoryIndex index.html
22     </Directory>
23
24     <Directory "/var/lib/ldap-account-manager/tmp">
25         Options -Indexes
26     </Directory>
27
28     <Directory "/var/lib/ldap-account-manager/tmp/internal">
29         Options -Indexes
30         Require all denied
31     </Directory>
32
33     <Directory "/var/lib/ldap-account-manager/sess">
34         Options -Indexes
35         Require all denied
36     </Directory>
37
38     <Directory "/var/lib/ldap-account-manager/config">
39         Options -Indexes
40         Require all denied
41     </Directory>
42
```

```
43     <Directory "/usr/share/ldap-account-manager/lib">
44         Options -Indexes
45         Require all denied
46     </Directory>
47
48     <Directory "/usr/share/ldap-account-manager/help">
49         Options -Indexes
50         Require all denied
51     </Directory>
52
53     <Directory "/usr/share/ldap-account-manager/locale">
54         Options -Indexes
55         Require all denied
56     </Directory>
57 </VirtualHost>
58 EOT
59 sudo a2ensite ldap-account-manager.felixs-sdi1.alphahorizon.io
60 sudo systemctl reload apache2
61
62 # Now visit https://ldap-account-manager.felixs-sdi1.alphahorizon.io/
63   templates/config/mainlogin.php, login with `lam` as the master
64   password
65 # - Don't encrypt session
66 # - Use `ldap://localhost:389/` as the server (where `ldaps://` is the
67   default)
68 # - Set the new master password
69
70 # Now visit https://ldap-account-manager.felixs-sdi1.alphahorizon.io/
71   templates/config/confmain.php, and login with `lam` as the profile
72   password
73 # - Set `dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io` as the tree
74   suffix
75 # - Set `cn=admin,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io` as the
76   list of valid users
77 # - Set SSH key file to empty string
78 # - Set the profile password to yourpassword
79 # - Set Users LDAP suffix under "Account types" to `ou=devel,ou=
80   software,ou=departments,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io`
81
82 # - Delete "groups" under "Account types"
83
84 # Now visit https://ldap-account-manager.felixs-sdi1.alphahorizon.io/
85   templates/login.php and login with your the LDAP admin account
86   password
```

14 Nextcloud

```
1 sudo apt update
```



```
2 sudo apt install -y libapache2-mod-php php-ctype php-curl php-dom php-  
gd php-iconv php-json php-xml php-mbstring php-posix php-simplexml  
php-xmlreader php-xmlwriter php-zip php-mysql php-fileinfo php-bz2  
php-intl php-ldap php-ftp php-imap php-bcmath php-gmp php-exif php-  
apcu php-imagick php-phar ffmpeg libreoffice curl unzip  
3  
4 sudo mysql -u root -e "CREATE USER 'nextcloud'@'localhost' IDENTIFIED  
BY 'mypasswd';"  
5 sudo mysql -u root -e "CREATE DATABASE nextcloud;"  
6 sudo mysql -u root -e "GRANT ALL PRIVILEGES ON nextcloud.* TO '  
nextcloud'@'localhost';"  
7 sudo mysql -u root -e "FLUSH PRIVILEGES;"  
8  
9 sudo tee /etc/php/*/apache2/php.ini <<'EOT'  
10 date.timezone = Europe/Berlin  
11 memory_limit = 1024M  
12 upload_max_filesize = 1024M  
13 post_max_size = 1024M  
14 max_execution_time = 300  
15 EOT  
16  
17 curl -Lo /tmp/nextcloud.zip https://download.nextcloud.com/server/  
releases/nextcloud-23.0.0.zip  
18 unzip /tmp/nextcloud.zip 'nextcloud/*' -d /tmp/nextcloud  
19 sudo mv /tmp/nextcloud/nextcloud/ /var/www/nextcloud.felixs-sdi1.  
alphahorizon.io/  
20 sudo chown -R www-data:www-data /var/www/nextcloud.felixs-sdi1.  
alphahorizon.io/  
21 sudo chmod -R 755 /var/www/nextcloud.felixs-sdi1.alphahorizon.io/  
22  
23 sudo tee /etc/apache2/sites-available/nextcloud.felixs-sdi1.  
alphahorizon.io.conf <<'EOT'  
24 <VirtualHost *:8080>  
25     ServerName felixs-sdi1.alphahorizon.io  
26     ServerAlias nextcloud.felixs-sdi1.alphahorizon.io  
27  
28     ServerAdmin webmaster@alphahorizon.io  
29     DocumentRoot /var/www/nextcloud.felixs-sdi1.alphahorizon.io  
30  
31     ErrorLog ${APACHE_LOG_DIR}/error.log  
32     CustomLog ${APACHE_LOG_DIR}/access.log combined  
33  
34     <Directory "/var/www/nextcloud.felixs-sdi1.alphahorizon.io">  
35         Options Indexes FollowSymLinks  
36         AllowOverride None  
37         Require all granted  
38     </Directory>  
39 </VirtualHost>  
40 EOT  
41 sudo a2ensite nextcloud.felixs-sdi1.alphahorizon.io  
42 sudo systemctl reload apache2
```

```
43
44 curl https://nextcloud.felixs-sdi1.alphahorizon.io/ # Access the
    Nextcloud installer
45
46 # Now visit https://nextcloud.felixs-sdi1.alphahorizon.io/index.php and
    create an admin account
47 # - Set `nextcloud` as the database user
48 # - Set `mypasswd` as the database password
49 # - Set `nextcloud` as the database name
50 # - Set `localhost:3306` as the database host
51 # - Click on "finish setup"
52 # - Visit https://nextcloud.felixs-sdi1.alphahorizon.io/index.php/
    settings/admin/richdocuments and select `Use the built-in CODE -
    Collabora Online Development Edition`
53 # - Visit https://nextcloud.felixs-sdi1.alphahorizon.io/index.php/
    settings/apps/installed/user_ldap and click `Enable`
54 # - Visit https://nextcloud.felixs-sdi1.alphahorizon.io/index.php/
    settings/admin/ldap and enter the following:
55 # - Set `localhost` as the host
56 # - Set `389` as the port
57 # - Set `cn=admin,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io` as the
    user DN
58 # - Set the password from `sudo dpkg-reconfigure slapd` as the password
59 # - Set `dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io` as the base DN
60 # Click verify, "continue", verify and "continue"
61 # - Set `organizationUnit` under `Only these object classes:` in the
    groups settings
62 # - Click `Verify settings and count the groups`
63 # - Visit https://nextcloud.felixs-sdi1.alphahorizon.io/index.php/login
    and login as bean using password "password" (if you can't login, go
    back to https://nextcloud.felixs-sdi1.alphahorizon.io/index.php/
    settings/admin/ldap and verify everything again)
```

15 Prometheus

```
1 sudo apt update
2 sudo apt install -y prometheus
3
4 sudo systemctl enable --now prometheus
5
6 sudo tee /etc/prometheus/prometheus.yml <<'EOT'
7 global:
8   scrape_interval:    15s
9   evaluation_interval: 15s
10  external_labels:
11    monitor: 'example'
12
13 alerting:
```

```
14 alertmanagers:
15   - static_configs:
16     - targets: ['localhost:9093']
17
18 rule_files:
19
20 scrape_configs:
21   - job_name: 'prometheus'
22     scrape_interval: 5s
23     scrape_timeout: 5s
24     static_configs:
25       - targets: ['localhost:9090']
26
27   - job_name: node
28     static_configs:
29       - targets: ['localhost:9100']
30
31   - job_name: traefik
32     static_configs:
33       - targets: ['localhost:8082']
34 EOT
35
36 sudo systemctl reload prometheus
```

16 Grafana

```
1 sudo apt update
2 sudo apt install -y apt-transport-https software-properties-common
3
4 curl -L https://packages.grafana.com/gpg.key | sudo apt-key add -
5 echo 'deb https://packages.grafana.com/oss/deb stable main' | sudo tee
   -a /etc/apt/sources.list.d/grafana.list
6
7 sudo apt update
8 sudo apt install -y grafana
9
10 sudo systemctl enable --now grafana-server
11
12 sudo vi /etc/grafana/grafana.ini
13 # Replace the `[auth.ldap]` block with the following:
14 [auth.ldap]
15 enabled = true
16 config_file = /etc/grafana/ldap.toml
17 allow_sign_up = true
18 # Replace the `[log]` block with the following:
19 [log]
20 filters = ldap:debug
21 # Replace the `[smtp]` block with the following:
```

```
22 [smtp]
23 enabled = true
24 host = mail.gandi.net:465
25 user = felixs-sdi1@alphahorizon.io
26 password = OHUyaDNtd2VhZmhlZD290NGgK
27 from_address = felixs-sdi1@alphahorizon.io
28 from_name = Grafana
29 ehlo_identity = grafana.felixs-sdi1.alphahorizon.io
30
31 sudo tee /etc/grafana/ldap.toml <<'EOT'
32 [[servers]]
33 host = "127.0.0.1"
34 port = 389
35 use_ssl = false
36 start_tls = false
37 ssl_skip_verify = false
38
39 bind_dn = "cn=admin,dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io"
40 bind_password = 'yourldapadminpasswordfromdpkgconfigure'
41 search_filter = "(uid=%s)"
42 #search_base_dns = ["dc=ldap,dc=felixs-sdi1,dc=alphahorizon,dc=io"] #
    If we were to use groups
43 search_base_dns = ["ou=ops,ou=software,ou=departments,dc=ldap,dc=felixs-
    sdi1,dc=alphahorizon,dc=io"]
44
45 [servers.attributes]
46 name = "givenName"
47 surname = "sn"
48 username = "cn"
49 member_of = "memberOf"
50 email = "email"
51
52 # Would be useful if we were to use groups
53 #[[servers.group_mappings]]
54 #group_dn = "ou=ops,ou=software,ou=departments,dc=ldap,dc=felixs-sdi1,
    dc=alphahorizon,dc=io"
55 #org_role = "Admin"
56 #
57 #[[servers.group_mappings]]
58 #group_dn = "ou=ops,ou=software,ou=departments,dc=ldap,dc=felixs-sdi1,
    dc=alphahorizon,dc=io"
59 #org_role = "Editor"
60 #
61 #[[servers.group_mappings]]
62 #group_dn = "*"
63 #org_role = "Viewer"
64
65 [[servers.group_mappings]]
66 group_dn = "*"
67 org_role = "Admin"
68 EOT
```

```
69
70 sudo systemctl restart grafana-server
71
72 # Visit https://grafana.felixs-sdi1.alphahorizon.io/?orgId=1 and login
    as `operator` using the password from above; they will be admin. If
    we had set up roles, logging in as `bean` using `password` would
    make them a viewer.
73
74 # Now add a datasource, select Prometheus and use `http://localhost
    :9090` as the URL
75
76 # Now go to create, import and select `1860` as the ID (https://grafana
    .com/grafana/dashboards/1860)
77
78 # Now go to Alerting, create alert with name `HostDiskWillFillIn24Hours`
    and type `Grafana managed alert` using the following query: `(
    node_filesystem_avail_bytes * 100) / node_filesystem_size_bytes < 10
    and ON (instance, device, mountpoint) predict_linear(
    node_filesystem_avail_bytes{fstype!~"tmpfs"}[1h], 24 * 3600) < 0 and
    ON (instance, device, mountpoint) node_filesystem_readonly == 0`, `
    Filesystem is predicted to run out of space within the next 24 hours
    at current write rate\n VALUE = {{ $value }}\n LABELS: {{ $labels
    }}` as description, `Host disk will fill in 24 hours (instance {{
    $labels.instance }})` as the summary and `severity=warning` as the
    labels.
79
80 # Now go to https://grafana.felixs-sdi1.alphahorizon.io/alerting/
    notifications/receivers/grafana-default-email/edit?alertmanager=
    grafana, enter your Email, and click on "Test". Now check your inbox
    , a test mail should have arrived.
81
82 # Now go to create, import and select `4475` as the ID (https://grafana
    .com/grafana/dashboards/4475), go to dashboard settings and select `
    apache@file` as the service
```