! " # $ % & ' ( ) * + , - .

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Œ •

! " # $

F70/F71/F220/F221 9 : ; < = > ? @ A B C D < ! " # $ % & ' ( ) 9 : ; < ! " # $ ( ) B E F , G H I J K C L M G N I * ( ) C D < Alpine Linux O > P * Q P # R S T E U V * ! " # $ W C X Y G I J K C L M G 9 Q P # R ! " # $ B N I * Z [< init \ ] [Z ^ _ ` a b c d > Q e " K f X g h M G N apk ! i " j ` k E + , G H I J C l m n o p a * q " P n > = r a s b t u > j \ v w C G N

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x y C D < ; z W { | V } ~ * • € E z • ¸ ~ } M G N

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* + , $ - . /

† ‡ ˆ ‰ E z • ¸ ~ } M G N

Š ‹ ˆ ‰ E z • ¸ ~ } M G N

Œ • Ž • E z • ¸ ~ } M G N

0 1 2 3

¥ • 8 C D < Alpine Linux 3.12 * ‘ ’ o j q “ > ” E + , , Z ! " # $ ( ) * • x – ` X — ˜ ™ E … š ~ › œ M G N S ~ * a b c d > Q e " | V } ~ X — ˜ ™ < • ž < X — Ÿ , ~ } H \ * C D ¡ œ M ¢ £ * C < ¤ [¥ ¦ § ¨ © g } N

¥ ! " # $ ( ) | ª G H ƒ « ¬ c # - ª ® D < ¯ ° i Q " J ± ^ * ª ® E ² , ~ ¨ © g } N ƒ « ¬ c # - ª ® E ³ š Z I J | | ´ H µ ¶ r · ¸ ` k | ¹ , ~ D < • 8 D U º * » ¼ E ½ } Y ¾ M G * C < ¤ [¥ ¦ § ¨ © g } N

¥ ! " # $ ( ) * + , | f ¿ G H µ ¶ r · ¸ ` k | ¹ , ~ < • 8 D U º * » ¼ E ½ } Y ¾ M G * C < ¤ [¥ ¦ § ¨ © g } N

4 5 6 7

Alpine Linux * a b c d > Q e " r Q P # R * + } - | ¹ , ~ D < ; z * À q n ` k E Á Â | , ~ ¨ © g } N

¥ Welcome to Alpine Linux Wiki[1]

= > ? @ A * i Ã ¬ a = \ ¡ Ä ¢ ~ Á Å , ~ ¨ © g } N

¥ ! i " j c m Æ u " P-Ç È É Ê Ë[2] Ì Í ! " # $ Î w * Ï É Ð * Ñ | = > ? OS * Ï É ! i " j * • € K ¥ Ò } M G N

¥ ! i " j c m Æ u " P-Ó , Ô ° Ë[3] Ì Í ! " # $ Î w ¹ Õ Ð * Ñ | ! " # $ ( ) * Ö × ˜ ™ r Ø s ‘ a s b - . * z • K ¥ Ò } M G N

8 9 : ;

[1] Welcome to Alpine Linux Wiki https://wiki.alpinelinux.org/wiki/Main_Page

[2] ! i " j c m Æ u " P-Ç È É Ê Ë https://www.furukawa.co.jp/fitelnet/f/man/70_220/pdf/cmd_refe_config.pdf

[3] ! i " j c m Æ u " P-Ó , Ô ° Ë https://www.furukawa.co.jp/fitelnet/f/man/70_220/pdf/cmd_refe_ope.pdf

< = > ? @ A ' B C D E C F

! " # $ ( ) D < = > ? OS 9 = > ? @ A * OS B J D Ù Ú , Z ( ) J ` œ M G N ! " # $ ( ) * a b c d > Q e " D < = > ? OS * CLI C D ` ¨ < ! " # $ ( ) | Û t q " , ~ „ … } Z © ¨ I J K Ü ‹ C G N

! " # $ ( ) E + , G H Z [| Ü ‹ ` Ï É - . | V } ~ • € , M G N Ý | ; z * Ï É K Ü ‹ J ` œ M G N

¥ = > ? OS * Ï É

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Ï É - . Þ = > ? OS | Û t q " , ~ Ï É , M G

¥ ! " # $ ( ) à * Ï É

Ï É W { Þ á > â a ã o " n < ä s n å > ‘ ` k * Q P # R ¹ Õ * Ï É < æ a b c d > Q e " * Ï É ` k

Ï É - . Þ ! " # $ ( ) W ç | Û t q " , ~ Ï É , M G

! 1. F70/F71/F220/F221 " # $ % & ' (

< = > ? @ A ' GH + I

F70/F71/F220/F221 C D < ! " # $ ( ) 9 Q P # R ! " # $ B E U V * è — È G H I J K v w C G N ! " # $ ( ) | D < = > ? @ A * ; z c l > P K é œ • ~ ê h M G N

¥ CPU

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ë , < a b c d > Q e " K + , v w ` ! a D 1 V * è C G N \ ì U V D Ý | ã > ä = K + , , M G N

= > ? @ A * b ' s n m í > R D < ARM i = î ! a 9 ï 4 ! a B C G N

¥ “ ó c

F70/F71 Þ ñ ò 0.7GB 9 ó m í = n D 0.5GB B

F220/F221 Þ ñ ò 2.0GB 9 ó m í = n D 1.5GB B

¥ [redacted] u > ”

2.0GB 9 á > â F , ô õ D 0.5GB B

¥ n å > ‘ q " ? m p > P

1Gbps 9 = > ? @ A W ç * P q s î * ö > n K ! " # $ ÷ , J , ~ 1 V é œ • ~ ê h ~ } M G N B

¥ ! " # $ ( ) C Ÿ ø , Z m Æ q = D = > ? @ A W ç * P n u > ” | Ÿ ø g h M G N › ù ^ K — È , Z ó > ? * Ÿ Ô › ´ ž Ø s ‘ a s b — 4 D < › ù ^ * » ¼ C … š ~ ¨ © g } N ! " # $ ( ) | Ÿ ø , Z ó > ? * Ÿ Ô | ¹ , ~ D < • 8 C D U º * » ¼ E ½ } Y ¾ M G * C < ¤ [¥ ¦ § ¨ © g } N

¥ ! " # $ ( ) E F , , ~ } H ñ ú | 1 û OFF ü C = > ? @ A K ý þ , Z ÿ ! D < ! " # $ ( ) * ó > ? K " # G H v w $ K ¡ œ M G N Ü ‹ | % & ~ < ý 1 ª ® r ! " # $ ( ) * É ' – ` Ø s ‘ a s b ` k E … š ~ ¨ © g } N

¥ ! " # $ ( ) | Ÿ ø C L H ó > ? * { (| D) œ K ¡ H * C < À q * * ò L ` ó > ? E Ÿ ø G H ÿ ! D < Ü ‹ | % & ~ < ! " # $ ( ) + ç * ó - P ‘ E + , , ~ ¨ © g } N

¥ “ ð c { (* À q * D < container limits memory ! i " j C Ï É v w C G N , - D < ! i " j c m Æ u " P - Ç È É Ê Ë [1] E Á Å , ~ ¨ © g } N

¥ ! " # $ ( ) D < . / 0 ! " # $ J , ~ X — , M G N

J + K ' L M

! " # $ ( ) E ä s n å > ‘ | 1 2 , ~ F , G H Z [| D < = > ? OS | ~ ; z * Ï É E … ì Ü ‹ K ¡ œ M G N

¥ ! " # $ ( ) ß È

¥ q " ? m p > P 3 4 5

¥ 6 7 ± '

< = > ? @ A N) ' O # ' L M

t Û > Ø = ð > j C ; z * Ï É E … } M G N

```
Router(config)#
```

> D & [~ ! " # $ E ß È G H ÿ ! D Ï É 8 9 (refresh) | 1 : 2 ; E ‹ G H I J K ¡ œ M G N

P = K Q R + I L M S

! " # $ ( ) C + , G H LAN à q " ? m p > P (F70/F71:Giga 1/1 : 1/4, F220/F221:Giga 1/1 : 1/8) * Ï É E ... } M G N ! " # $ ( ) | < = , Z } q " ? m p > P E container-use ! i " j (q " ? m p > P Ï É ð > j) C Ï É , ~ ¨ © g } N > ? @ < Giga 1/3 * q " ? m p > P | Ï É G H ÿ ! D < A * ´ ì | B C , M G N

```
Router(config-if-ge 1/3)#
```

Giga 1/3 * q " ? m p > P E A * ´ ì | Ï É , Z ÿ ! < bridge-group 30 J L2 1 2 v w ` q " ? m p > P 9 VLAN-ID:50 B K ! " # $ ( ) | ß È g h M G N ± ^ * Ï É E D * Giga q " ? m p > P \ , ¨ D À E q " ? m p > P | ª , ~ Ï É G H J < ! " # $ ( ) | D F G * q " ? m p > P K — È g h M G N

) * + 1. # $ % & ' (, - . / 0 1 $ 2 3 4 5 3 * " 6 7 8

```
interface GigaEthernet 1/3
Êvlan-id 50
Êbridge-group 30
Êchannel-group 30
Ê
exit
!
interface Port-channel 30
Êip address 10.10.30.1 255.255.255.0
exit
```

! " # $ ( ) à * ä s n å > ‘ Ï É | V } ~ D < ! " # $ ( ) * ä s n å > ‘ Ï É * Ñ | ~ ¥ • € , M G N

- ! " # $ ( ) C D < "eth + brdige-group H I "K J K J ` H q " ? m p > P K ß È g h M G 9 L z * > C D < "eth30" K ß È g h M G B N
- L z > * "ip address 10.10.30.1 255.255.255.0" D < = > ? OS à * a j u P J ` œM G N ! " # $ ( ) | IP a j u P E M N G H Z [| D < ! " # $ ( ) | Û t q " , ~ Ï É G H I J K Ü ‹ C G 9 ! " # $ ( ) * ä s n å > ‘ Ï É * Ñ E Á Å , ~ ¨ © g } B N
- b ’ q O > n IP a j u P E + , G H ÿ ! < ! " # $ ( ) Y ê + ç ä s n å > ‘ O 1 2 G H Z [| D NAT * Ï É K Ü ‹ J ` œM G N Ü ‹ | % & ~ = > ? OS à C Ï É , ~ ¨ © g } 9 , - D ! i " j c mÆ u " P - Ç È É Ê Ë [1] * NAT * Ñ E Á Å , ~ ¨ © g } B N
- L z * Ï É E 8 9 G H J = > ? à C D VLAN * q " ? m p > P J , ~ Ï É g h M G K < ! " # $ ( ) W C D P Q * q " ? m p > P J , ~ R ? M G N IP a j u P ü * Ï É D ! " # $ ( ) W | a ‘ ƒ P , ~ Ï É E ... ì Ü ‹ K ¡ œM G N

! " # $ ( ) Y ê + ç * ä s n å > ‘ O * a ‘ ƒ P K Ü ‹ | ` H ÿ ! K ¡ œM G N I * Z [< = > ? OS à C +

ç * ä s n å > ‘ | 1 2 G H Z [* Giga q " ? m p > P(2/1 \ , ¨ D3/1) * Ï É E A * ´ ì | ... } M G 9 Giga 3/1 D F220/F221 * è B N

```
interface GigaEthernet 2/1
Êvlan-id 31
Êbridge-group 31
Êchannel-group 31
exit
!
interface Portchannel 31
Êip address xxx.xxx.xxx.xxx yyy.yyy.yyy.yyy
exit
```

! " # $ ( ) D = > ? OS * ó > ? b u > " S T C + ç * ä s n å > ‘ O 1 2 , M G N

T U V W ' O # ' L M

! " # $ ( ) E + ç * ä s n å > ‘ | 1 2 , Z U " ’ q " * ( ) C + , G H ÿ ! D < 6 7 ± ' * Ï É E … š ~ ¨ © g } N 6 7 K ± ' g h ~ } ` } J < V s d > ” * W X ü C Y ’ > J ` H v w $ K ¡ œ M G N

t Û > Ø = ð > j C ; z * Ï É E … } M G N NTP À > Ø * a j u P D ¥ F , * ( ) | ¡ Ä ¢ ~ Ï É , ~ ¨ © g } N

) * + 2. 9 : ; < " 6 7 8

```
Router(config)#
```

> M Z Þ Elastic Stack E + , , Z ó > ? * v [5 E … ì ÿ ! D < 6 7 ± ' * Ï É K Ü \ J ` œ M G N

6] * c l > P | ¹ , ~ D ! " # $ ( ) W C & ' 5 G H I J K C L M ¢ £ N = > ? OS à * 6 7 c l > P J ^ P J ` H Z [< ! " # $ ( ) à C 6 7 ± ' * Ï É E … ì Ü ‹ D ¡ œ M ¢ £ N

> ! " # $ ( ) à C D < 6 7 ± ' E … ì Z [* ó > ð " b Û ƒ P (systemd-timesyncd) K q " P n > = g h ~ } M G K < ; z * ´ ì | À > _ P E f X G H I J D C L M ¢ £ N Ü ` = > ? OS à C 6 7 ± ' E … ì ´ ì | Ï É , ~ ¨ © g } N

```
root@container:~# systemctl status systemd-timesyncd
Ê systemd-timesyncd.service - Network Time Synchronization
Ê  Loaded: loaded (/lib/systemd/system/systemd-timesyncd.service; enabled; vendor preset:
enabled)
Ê  Active: inactive (dead)
Condition: start condition failed at Mon 2019-12-02 06:16:35 UTC; 1min 6s ago
Ê          mq ConditionVirtualization=!container was not met
Ê    Docs: man:systemd-timesyncd.service(8)
```

< = > ? @ A ' X Y

! " # $ ( ) E f X G H | D < = > ? O S * C L I Y ê container start ! i " j E „ … , ~ ¨ © g } N

```
Router# container start
start ok?[y/N]:yes

Router#
```

> f X ! " m - t (boot.cfg) | container enable ! i " j E Ï É , Z Ö × C = > ? @ A E f X , Z ÿ ! D < a X – | ! " # $ ( ) * f X K … Ä h M G N

! " # $ ( ) f X b < ! " # $ | Ï É E … š ~ } ` } Ö × C D < show container list › ´ ž show container information | ~ A * ´ ì ` c d K ˜ ™ g h M G N Á Â Þ ! i " j c m Æ u " P - Ó , Ô ° Ë[2]

```
Router#show container list

------------------------------------------------------------------+
|   NAME    | BASE IMAGE |    IMAGE VERSION    |  STATE  | IPV4 | IPV6 |
------------------------------------------------------------------+
| container | 5c4e1566dd | 3.12 20201012_15:00 | RUNNING |      |      |
------------------------------------------------------------------+
Router#show container information

Name: container
Remote: unix://
Architecture: aarch64
Created: 2019/10/08 02:09 UTC
Status: Running
Type: persistent
Profiles: default
Pid: 3602
Ips:
Ê lo:   inet    127.0.0.1
Ê lo:   inet6   ::1
Resources:
Ê Processes: 59
Ê CPU usage:
Ê   CPU usage (in seconds): 18
Ê Memory usage:
Ê   Memory (current): 30.74MB
Ê   Memory (peak): 33.24MB
Ê Network usage:
Ê   lo:
Ê     Bytes received: 237.99kB
Ê     Bytes sent: 237.99kB
Ê     Packets received: 2858
Ê     Packets sent: 2858
Ê   sit0:
Ê     Bytes received: 0B
Ê     Bytes sent: 0B
```

```
Ê     Packets received: 0
Ê     Packets sent: 0
Ê   eth30:
Ê     Bytes received: 0B
Ê     Bytes sent: 0B
Ê     Packets received: 0
Ê     Packets sent: 0
Router#
```


< = > ? @ A Z ' [\

! " # $ ( ) O * 1 2 - . D ; z * 3 V K ¡ œ M G N

¥ Q p = f X

= > ? O S * C L I Y ê ! " # $ ( ) W * Q p = E f X , ~ a ‘ ƒ P , M G N V P å > j B C ` , C root á > â J , ~ Û t q " v w C G N

¥ l > = 1 2

= > ? O S * C L I Y ê ! " # $ ( ) W * ! " l > = E f X , ~ a ‘ ƒ P , M G N Û t q " G H Z [| D V P å > j K Ü ‹ C G N

¥ n å > ‘ 1 2

= > ? @ A + ç Y ê ! " # $ ( ) O S S H 1 2 , ~ a ‘ ƒ P , M G N ó m í = n C D < root á > â | ´ H Û t q " D C L M ¢ £ N

> ¥ e ' Ö × C D ! " # $ ( ) * root V P å > j K Ï É g h ~ } ` } * C < Q p = f X | ´ œ ! " # $ ( ) O 1 2 , ~ V P å > j E Ü ` Ï É , ~ ¨ © g } N
>
> ¥ Q p = f X | ´ H ! " # $ ( ) O * 1 2 D < = > ? O S à * / 0 á > â C ¡ h @ f C \ a ‘ ƒ P v w C G N / 0 á > â * Ô ° D < › ù ^ * » ¼ C g º | … š ~ ¨ © g } N
>
> ¥ ! " # $ ( ) | D ¼ ‡ * á > â a ã o " n E — È v w C G N á > â * Ô ° D < › ù ^ * » ¼ C g º | … š ~ ¨ © g } N

! " # $ ( ) | Û t q " G H Z [* a ã o " n D ¤ [— È , ~ › ¨ Ü ‹ K ¡ œ M G N ; z * ´ ì | < Q p = f X | ´ œ ! " # $ ( ) | Û t q " , ~ Y ê — È , ~ ¨ © g } N

```
F220#container attach
~ # useradd -m furukawa
~ # passwd furukawa
New password:
Retype new password:
passwd: password updated successfully
~ # su - furukawa
container:~$ id
uid=1000(furukawa) gid=1000(furukawa) groups=1000(furukawa)
container:~$
```

> container attach C ! " # $ ( ) | a ‘ ƒ P , Z ÿ ! D < root á > â J , ~ Û t q " , M G N root á > â * V P å > j \ g º | Ï É , ~ ¨ © g } N
>
> ```
> ~ # id
> uid=0(root) gid=0(root)
> ~ # passwd
> ```

```
New password:
Retype new password:
passwd: password updated successfully
~ #
```

: ; | a ‘ ƒ P > E d , M G N

] R J X Y

= > ? OS * CLI L C container attach E „ … , M G N

```
Router#container attach
~ # uname
Linux
~ # exit
exit

Router#
```

exit E B C G H J = > ? OS * CLI | h œ M G N

< = H + J [\

= > ? OS * CLI L C container attach console E „ … , M G N ! " l > = 1 2 E … ì J < f X 6 r Q i s n j o " 6 * Û t Ž • K k l | m C g h M G N

```
Router#container attach console
To detach from the console, press: <ctrl>+a q

Welcome to Alpine Linux 3.12
Kernel 4.14.47 on an aarch64 (/dev/console)

container login: root
Password:
Welcome to Alpine!

The Alpine Wiki contains a large amount of how-to guides and general
information about administrating Alpine systems.
See http://wiki.alpinelinux.org/.

You can setup the system with the command: setup-alpine

You may change this message by editing /etc/motd.

container:~# uname -snm
Linux container aarch64
container:~# exit

Welcome to Alpine Linux 3.12
Kernel 4.14.47 on an aarch64 (/dev/console)

container login:
Router#
```

> = > ? OS * CLI | h H | D < <ctrl>+a q E B C , ~ ¨ © g } N

^ C D _ + , [\

= > ? @ A + ç * k l Y ê SSH a ‘ ƒ P E … } M G N

```
root@remote:~# ssh 10.10.30.10
root@10.10.30.10's password:
Welcome to Alpine!

The Alpine Wiki contains a large amount of how-to guides and general
information about administrating Alpine systems.
See http://wiki.alpinelinux.org/.

You can setup the system with the command: setup-alpine

You may change this message by editing /etc/motd.

container:~#
container:~# cat /etc/os-release
NAME="Alpine Linux"
ID=alpine
VERSION_ID=3.11.0
PRETTY_NAME="Alpine Linux v3.11"
HOME_URL="https://alpinelinux.org/"
BUG_REPORT_URL="https://bugs.alpinelinux.org/"
container:~# exit
Connection to 10.10.30.10 closed.
root@remote:~#
```

> ¥ ! " # $ ( ) | ~ < SSH 1 2 n J ` HIP a j u P * Ï É K Ü ‹ C G N ! " # $ ( ) * ä s n å > ‘ Ï É * Ñ | ~ ¥ • € , M G N
>
> ¥ ó m í = n C D SSH À > _ P * V P å > j ™ D o 4 J ` š ~ } M G N Ï É p W G H ÿ ! D < SSH À > Ø * Ñ E Á Å , ~ ¨ © g } N q r s ™ E + , G H ÿ ! D < V P å > j * B C D Ü ‹ ¡ œ M ¢ £ N

q r s ™ C Û t q " G H ÿ ! D < ¤ [‘ ’ q a " n à C ™ s E ß È , ~ ! " # $ ( ) à | q r s * Ž • E t Z , ~ › ¨ Ü ‹ K ¡ œ M G N ™ s D ; z * ! i " j C — È v w C G N — È , Z q r s D < u • G H á > â * v > R ó - u ‘ n c w ; | ¡ H authorized_keys 9 ~/.ssh/authorized_keys B | t Z , ~ ¨ © g } N , - D U " ’ q " i Ã ¬ a = ü E Á Å , ~ ¨ © g } N

) * + 3. SSH = > ? " @ A 8

```
root@remote:~# ssh-keygen
```

ssh-copy-id ! i " j K + , C L H ( ) C D < ; z * ´ ì | c ð > n * k l à Y ê q r s * t Z K v w C G N

) * + 4. SSH B C ? " D E 8

```
root@remote:~# ssh-copy-id root@192.168.127.21
```

> SSH À > Ø * V P å > j ™ E 3 4 | , ~ › ¨ Ü ‹ K ¡ œ M G N t Z K x ¦ , Z ê < V P å > j ™ E o 4 | , ~ › ¨ I J E › y [, M G N

< = > ? @ A ' ^ C D _ + , L M

CLI ! i " j | ´ œ Ï É v w C G N : ; | Ï É > E d , M G N , - D ! i " j c m Æ u " P - Ç È É Ê Ë[3] E ¥ Á Å ¨ © g } N

```
container configuration
Êdns x.x.x.x y.y.y.y Ì z  › ù ^ * ( ) | ! Ä ¢ ~ Ï É , ~ ¨ © g }
Êhostname F221-Container
Ê!
Êinterface 1
Ê bridge-group 1 Ì z  = > ? O S à * L A N q " ? m p > P * E c s ” t = > b H I | ! Ä ¢ ~ ¨ © g }
Ê ip address 192.168.127.21 255.255.255.0
Êexit
Ê!
Êinterface 2
Ê bridge-group 30 Ì z  = > ? O S à * L A N q " ? m p > P * E c s ” t = > b H I | ! Ä ¢ ~ ¨ © g }
Ê ip address 10.10.30.10 255.255.255.0
Ê ip gateway 10.10.30.1
Êexit
Ê!
exit
```

> q " ? m p > P Ï É > * Ñ C { | Z P œ < ! " # $ ( ) à * q " ? m p > P * „ T D = > ? O S à * V L A N q " ? > m p > P J ` œ M G N ! " # $ ( ) à C V L A N q " ? m p > P * Ï É E … š ~ \ X — , M ¢ £ N

Ï É K x ¦ , Z ê < r e f r e s h ! i " j E „ … , ~ Ï É E 8 9 , M G N

> = > ? O S à * L A N q " ? m p > P Ï É | ~ E c s ” t = > b H I r ä s n å > ‘ a j u P E p W , Z ÿ ! D < } ¢ ~ ! " # $ à * q " ? m p > P Ï É E p W G H Ü ‹ K ¡ œ M G N

< = > ? @ A ' ` a

! " # $ ( ) E ý þ G H ÿ ! D < ! " # $ ( ) W C poweroff ! i " j ü | ´ œ Q i s n j o " E … š ~ ¨ © g } N

```
container:~# poweroff
```

\ , ¨ < = > ? O S * C L I à Y ê container stop ! i " j E „ … , ~ ¨ © g } N

```
Rou #container stop
sto k?[y/N]:yes

Rou #
```

> ! " # $ ( ) E ~ • f X G H ÿ ! D < = > ? O S * C L I à Y ê container start E „ … , ~ ¨ © g } N ! " # $ ( ) W C reboot ! i " j E „ … , Z ÿ ! D < ! " # $ ( ) K ~ f X G H * C container start E „ … G H Ü ‹ D ¡ œ M ¢ £ N
>
> = > ? O S à C container enable ! i " j E € • , ~ ! " # $ Î w E o 4 5 , Z ÿ ! D < a X – | ! " # $ ( ) \ Q i s n j o " g h M G N
>
> ! " # $ ( ) E F , , ~ } H ñ ú | 1 û O F F ü C = > ? @ A E ý þ , Z ÿ ! D < ! " # $ ( ) * ó > ? K " # G H v w $ K ¡ œ M G N = > ? @ A E Q i s n j o " G H , D < = > ? O S à C container enable ! i " j E € • , ~ ! " # $ Î w E o 4 5 , ~ ¨ © g } N

! " # $ ( ) ý þ b < show container list › ´ ž show container information | ~ A * ´ ì ` c d K ˜ ™ g h M G N Á Â Þ ! i " j c m Æ u " P - Ó , Ô ° Ë [2]

```
Router#show container list

------------------------------------------------------------------+
|   NAME    | BASE IMAGE |    IMAGE VERSION    |  STATE  | IPV4 | IPV6 |
------------------------------------------------------------------+
| container | 5c4e1566dd | 3.12 20201012_15:00 | STOPPED |      |      |
------------------------------------------------------------------+
Router#show container information

Name: container
Remote: unix://
Architecture: aarch64
Created: 2019/10/08 02:09 UTC
Status: Stopped
Type: persistent
Profiles: default
Router#
```

L M S

! " # $ ( ) E F , G H Z [* < ä s n å > ‘ Ç È * Ï É > E ¥ • € , M G N

! 2. # $ % & ' (" F G + H 3 I J A 8 (2 K " 1 $ 2 4 5 3 * L M N O P Q R)

Á Â Þ Î w • € y [4] 2.19.3 E c s ” t = > b * @ A W ç Ç È

CLI Ï É D A * P œ C G N

) * + 5. # $ % & ' (" F G + H 3 I J A 8 (2 K " 1 $ 2 4 5 3 * L M N O P Q R) " C L I 6 7

```
container configuration
Êdns x.x.x.x y.y.y.yÌ z  › ù ^ * ( ) | ! Ä ¢ ~ Ï É , ~ ¨ © g }
Êhostname F221-Container
Ê!
Êinterface 1
Ê bridge-group 1
Ê ip address 192.168.127.21 255.255.255.0
Êexit
Ê!
Êinterface 2
Ê bridge-group 30
Ê ip address 10.10.30.10 255.255.255.0
Ê ip gateway 10.10.30.1
Êexit
Ê!
exit
!
ntp server xxx.xxx.xxx.xxx
!
interface GigaEthernet 1/1
Êvlan-id 50
Êbridge-group 30
Êchannel-group 30
```

```
Êcontainer-use
exit
!
interface GigaEthernet 1/2
Êvlan-id 1
Êbridge-group 1
Êchannel-group 1
Êcontainer-use
exit
!
interface GigaEthernet 1/3
Êvlan-id 1
Êbridge-group 1
Êchannel-group 1
Êcontainer-use
exit
!
interface GigaEthernet 1/4
Êvlan-id 1
Êbridge-group 1
Êchannel-group 1
Êcontainer-use
exit
!
interface GigaEthernet 2/1
Êvlan-id 31
Êbridge-group 31
Êchannel-group 31
exit
!
interface Port-channel 1
Êip address 192.168.127.20 255.255.255.0
exit
!
interface Port-channel 30
Êip address 10.10.30.1 255.255.255.0
exit
!
interface Port-channel 31
Êip address xxx.xxx.xxx.xxx yyy.yyy.yyy.yyy
exit
!
```

show container list › ´ ž show container information D A * ´ ì | c d g h M G N

```
Router#show container list

-------------------------------------------------------------------------------+
|   NAME    | BASE IMAGE |    IMAGE VERSION    |  STATE  |         IPV4          | IPV6 |
-------------------------------------------------------------------------------+
| container | 5c4e1566dd | 3.12 20201012_15:00 | RUNNING | 192.168.127.21 (eth1) |      |
|           |            |                     |         | 10.10.30.10 (eth30)   |      |
-------------------------------------------------------------------------------+
Router#show container info
```



```
Name: container
Remote: unix://
Architecture: aarch64
Created: 2019/10/08 07:46 UTC
Status: Running
Type: persistent
Profiles: default
Pid: 23852
Ips:
Ê lo:   inet    127.0.0.1
Ê lo:   inet6   ::1
Ê eth1: inet    192.168.127.21   sit0
Ê eth1: inet6   fe80::280:bdff:fef0:5a76        sit0
Ê eth30:        inet    10.10.30.10     sit0
Ê eth30:        inet6   fe80::280:bdff:fef0:5a76        sit0
Resources:
Ê Processes: 24
Ê CPU usage:
Ê   CPU usage (in seconds): 15
Ê Memory usage:
Ê   Memory (current): 4.98MB
Ê   Memory (peak): 8.13MB
Ê Network usage:
Ê   eth1:
Ê     Bytes received: 3.89kB
Ê     Bytes sent: 908B
Ê     Packets received: 68
Ê     Packets sent: 12
Ê   eth30:
Ê     Bytes received: 170.38kB
Ê     Bytes sent: 9.82kB
Ê     Packets received: 100
Ê     Packets sent: 120
Ê   lo:
Ê     Bytes received: 1.06kB
Ê     Bytes sent: 1.06kB
Ê     Packets received: 12
Ê     Packets sent: 12
Ê   sit0:
Ê     Bytes received: 0B
Ê     Bytes sent: 0B
Ê     Packets received: 0
Ê     Packets sent: 0
```


8 9 : ;

[1] ! i " j c mÆ u " P-Ç È É Ê Ë https://www.furukawa.co.jp/fitelnet/f/man/70_220/pdf/cmd_refe_config.pdf

[2] ! i " j c mÆ u " P-Ó , Ô ° Ë https://www.furukawa.co.jp/fitelnet/f/man/70_220/pdf/cmd_refe_ope.pdf

[3] ! i " j c mÆ u " P-Ç È É Ê Ë https://www.furukawa.co.jp/fitelnet/f/man/70_220/pdf/cmd_refe_config.pdf

[4] Î w • € y https://www.furukawa.co.jp/fitelnet/f/man/70_220/pdf/kinou.pdf

E F G b +] c = ' d e

! " # $ ( ) C D < Alpine Linux O > P * Q P # R K f X , M G N Alpine Linux K ƒ „ G H l m n o p a * …
| À > j V > # - † * l m n o p a ` k \ a T | q " P n > = , ~ X — g ¢ H I J K v w C G N

x Ñ C D < ; z * l m n o p a | V } ~ < ! " # $ ( ) W C * „ … > E d , M G N

- ¥ SSH À > Ø
- ¥ V d s n « i b î i (tcpdump)
- ¥ SNMP Y > ” p " n
- ¥ ä s n å > ‘ ‡ ˆ ‰ > = (ntopng) ä s n å > ‘ V d s n a $ ’ q â > (packetbeat)

  Û t Š ‹ ‰ > = (filebeat)

> æ l m n o p a * + , Œ • r ’ q ƒ " P E g º | Ž š ~ + , , ~ ¨ © g } N

f g h i j E F G b +] c =

! " # $ ( ) C D < Alpine Linux * q “ > ” |] M h ~ } H I m n o p a E + , G H I J K C L M G N M Z < apk[1] ! i " j E + , , ~ Alpine Linux K ƒ „ G H I m n o p a * q " P n > = r a s b t u > j \ v w C G 9 ë , < I * ÿ ! D ! " # $ ( ) K + ç * ä s n å > ‘ | 1 2 , ~ } H I J K Ü ‹ C G B N

apt ! i " j E + , , ~ I m n o p a E q " P n > = G H ÿ ! D < ¤ [V s d > ” c P n E W X , ~ › ¨ Ü ‹ K ¡ œ M G N W X G H ÿ ! D < ; z * ´ ì | ! i " j E „ … , ~ ¨ © g } N

```
root@container:~# apk update
```

q " P n > = • è * V s d > ” D < ; z * ! i " j C ˜ ™ C L M G N

```
root@container:~# apk list --installed
```

> q " P n > = • è V s d > ” * a s b ó > n \ apk ! i " j C „ … C L M G N g • a s b ó > n E … š ~ ¨ © g } N

IMPORTANT: q " P n > = À q * * ò L ` V s d > ” r ‘ G * V s d > ” < = ` k E … ì J < ! " # $ ( ) * ó - P ‘ { (K ’ • G H “ ¿ J ` œ M G N ’ ‹ ` V s d > ” ` k D € • G H ` k , ~ g º ` V s d > ” G C Ó , G H I J E › y [, M G N

Alpine Linux * a b c d > Q e " r Q P # R * + } - | ¹ , ~ D < ; z * j « ¬ “ " n ` k E Á Â | , ~ ¨ © g } N

¥ Alpine Linux package management[2]

k + l

OpenSSH Server[3] K ¤ [q " P n > = g h ~ } MGN : ; | „ … > E d , MGN

) * + 6. SSH S 3 T " U V 8

```
container:~# rc-service sshd start
Ê* Caching service dependencies ...                        [ ok ]
ssh-keygen: generating new host keys: RSA DSA ECDSA ED25519
Ê* Starting sshd ...                                       [ ok ]
container:~# rc-service sshd status
Ê* status: started
container:~#
```

! " # $ ( ) f X 6 | a X – | À > _ P E f X g ¢ Z } ÿ ! D < ; z * ´ ì | Ï É E … š ~ ¨ © g } N

) * + 7. SSH S 3 T " W V U V 8

```
container:~# rc-update add sshd
Ê* service sshd added to runlevel default
container:~# rc-status
Runlevel: default
Ênetworking                          [  started  ]
Êmonit                               [  started 00:48:50 (0) ]
Êchronyd                             [  started  ]
Êcrond                               [  started  ]
Êsshd                                [  started  ]
Dynamic Runlevel: hotplugged
Dynamic Runlevel: needed/wanted
Dynamic Runlevel: manual
container:~#
```

> ¥ root á > â * V P å > j ™ E 3 4 | G H Z [| D < g ê | PermitRootLogin * Ï É ‰ ” E 3 4 | G H Ü ‹ K ¡ œ M G N , - D < U " ’ q " j « ¬ “ " n ü E Á Å , ~ ¨ © g } N
>
> ¥ root á > â * V P å > j ™ E • v G H J ƒ « ¬ c # - – | — — J ` œ M G * C < ˜ ; | ¥ † ‡ ¨ © g } N
>
> ¥ ! " # $ ( ) | ¤ [q " P n > = g h ~ } H l m n o p a * ì ™ < Ø s ‘ t ’ o " j C X — , ~ Î w E ƒ „ G H b Û t ’ R 9 ó > ð " B D < rc-service ! i " j C Ô ° C L M G N , - D U " ’ q " j « ¬ “ " n ü E Á Å , ~ ¨ © g } N

‘ ’ q a " n à Y ê * 1 2 D < ä s n å > ‘ 1 2 * Ñ E Á Å , ~ ¨ © g } N

m b CDn o F p o

A * ´ ì | < tcpdump | ´ œV d s n « i b î i E… ì I J K C L MGN

) * + 8. X Y G+ Z [\ ] [" ^ _ 8

```
container:~# tcpdump -i eth1 -vvv
tcpdump: listening on eth1, link-type EN10MB (Ethernet), capture size 262144 bytes
05:07:55.996932 STP 802.1d, Config, Flags [none], bridge-id 807f.b8:be:bf:06:dc:00.8004, length
43
Ê       message-age 0.00s, max-age 20.00s, hello-time 2.00s, forwarding-delay 15.00s
Ê       root-id 807f.b8:be:bf:06:dc:00, root-pathcost 0
05:07:56.780103 IP6 (flowlabel 0x489cc, hlim 255, next-header ICMPv6 (58) payload length: 16)
container > ip6-allrouters: [icmp6 sum ok] ICMP6, router solicitation, length 16
Ê         source link-address option (1), length 8 (1): 00:80:bd:f0:5a:76
Ê           0x0000:  0080 bdf0 5a76
05:07:57.998935 STP 802.1d, Config, Flags [none], bridge-id 807f.b8:be:bf:06:dc:00.8004, length
43
Ê       message-age 0.00s, max-age 20.00s, hello-time 2.00s, forwarding-delay 15.00s
Ê       root-id 807f.b8:be:bf:06:dc:00, root-pathcost 0
^C
3 packets captured
3 packets received by filter
0 packets dropped by kernel
```

« i b î i š › E mÆ q = | Ÿ ø G H I J \ v w C G N

```
container:~# tcpdump -i eth1 -w packet.cap
tcpdump: listening on eth1, link-type EN10MB (Ethernet), capture size 262144 bytes
^C1 packet captured
1 packet received by filter
0 packets dropped by kernel
root@container:~# ls -l packet.cap
-rw-r--r-- 1 root root 100 Oct  8 05:08 packet.cap
```

> ¥ mÆ q = | Ÿ ø G H ÿ ! D < ó - P ‘ { (E " œ , M G N « i b î i G H ó > ? (K ‘ } ÿ ! D ¥ † ‡ ¨ © g } N
>
> ¥ ó > ? À q * * ò L ` mÆ q = E Ÿ ø G H ÿ ! r < ó - P ‘ I/O * ½ • K ž } y L Ÿ è ° E… ì ÿ ! ` k D < USBm ’ s Q ¬ “ ð c ` k * + ç z ¡ ó - P ‘ O Ÿ ø G H I J E › y [, M G N

= > ? OS * ö > n ð Ã ? c " t Î w E + , G H J < ! " # $ ( ) à C = > ? @ A * ú ¢ ó > ? E « i b î i G H I J K v w C G N I * ÿ ! < ! " # $ ( ) à C D A * ´ ì | eth0 * q " ? m p > P | ª , ~ « i b î i E… } M G N

) * + 9. ` 3 2 OS " a b c 3 2 " Z [\ ] [^ _ 8

```
con    ner:~# tcpdump -i eth0 -vvv
```

ö > n ð Ã ? c " t Î w * , - J † ‡ £ D < M Z Þ ö > n ð Ã ? c " t Î w * + , E Á Å , ~ ¨ © g } N

ž ½ • ` ú ¢ ó > ? E « i b î i G H ÿ ! D < = > ? @ A * ú ¢ $ w | ¤ ¥ E N ? H v w $ K ¡ H * C < ¥ † ‡ ¨ © g } N

! " # $ ( ) K + ç * ä s n å > ‘ | 1 2 , ~ } H ÿ ! D < = > ? @ A + ç * k l L C « i b î i š › E c d G H I J \ v w C G N Wireshark * c ð > n « i b î i Î w E + , , Z > E : ; | d , M G N

M ` < c ð > n * k l L C Wireshark E f X , ~ SSH remote capture * q " ? m p > P U b Q e " E ¦ § , ~ ¨ © g } N

! 3. Wireshark " sshdump d \ e f $

u • G H U b Q e " K c d g h ~ } ` } ÿ ! D < sshdump * ‰ > = K q " P n > = g h ~ } H Y k ì Y E ˜ ™ , ~ ¨ © g } N

; z * ´ ì | „ ... G H J < GUI L C « i b î i š › E c a = ? q R | c d G H I J K C L M G N

! 4. Wireshark ") g 3 + Z [\ ] [^ _ 8 (GUI " Q R)

æ ¨ | D < ; z * © E B C , ~ ¨ © g } N

- ¥ Remote interface : ! " # $ ( ) L * q " ? m p > P J E B C , ~ ¨ © g } 9 = > ? @ A * ú ¢ ó > ? E « i b î i G H ÿ ! D eth0 E B C , ~ ¨ © g } B
- ¥ Remote capture command : tcpdump -Unw - vlan and not port ssh
- ¥ Remote cature filter : Ü ‹ | % & ~ B C , ~ ¨ © g }

! " # $ ( ) * IP a j u P D < ; z * ª « C B C C L M G N ¥ F , * ( ) | ¡ Ä ¢ ~ B C , ~ ¨ © g } N

! 5. Wireshark ") g 3 + S 3 T " 6 7 8

root á > â C Û t q " G H Ü ‹ K ¡ œ M G N ; z * ´ ì | ¬ É , ~ ¨ © g } N

! 6. Wireshark ") g 3 + S 3 T " = > 6 7 8

L z D q r s ™ C Û t q " G H > C G N SSH | ´ H root á > â * Û t q " | V } ~ D < SSH À > Ø * Ñ E Á Å , ~ ¨ © g } N

! i " j ' q " Y ê \ ± ^ | „ … G H I J K v w C G N ; z * ´ ì | „ … , ~ ¨ © g } N

) * + 10. Wireshark ") g 3 + Z [\ ] [^ _ 8 (# h $ i " Q R)

```
wireshark -k -i <(ssh root@192.168.127.21 "tcpdump -Unw - -i eth0 vlan and not port ssh")
```

V P å > j ™ C Û t q " G H ÿ ! D < V P å > j * B C ? q - " t | ´ š ~ D Y ' > J ` H v w $ K ¡ œ M G N I * ÿ ! D < q r s ™ | ´ œ Û t q " , ~ „ … , ~ ¨ © g } N

q + r R = D

SNMP Y > ” p " n * a b c d > Q e " E „ ... G H J < ! " # $ ( ) * SNMP MIB * Ž • E ® ¯ G H I J K C L M G N g º | Ï É E ... š Z L C < ; z * ´ ì | „ ... , ~ ¨ © g } N

! " # $ ( ) K + ç ä s n å > ‘ | 1 2 g h ~ } H Ü ‹ K ¡ œ M G N

a X – | À > _ P E f X g ¢ H ´ ì | , Z } ÿ ! D < ; z * ´ ì | Ï É , ~ ¨ © g } N

) * + 11. SNMP j 3 k 5 $ + " U V 8

```
container:~# rc-update add snmpd
Ê* service snmpd added to runlevel default
```

! " # $ ( ) < \ , ¨ D < = > ? @ A + ç * k l Y ê ; z * ´ ì | MIB E ® ¯ C L M G N

```
# snmpwalk -v2c -c public -OSX -IR 192.168.127.21 host
```

MIB É Ê m Æ q = E Ÿ ø , ~ } H ó - u ‘ n c K ’ € ` ÿ ! < Symbol OID 9 L z * > C D < "host" B * ¬ É K C L ` } ÿ ! K ¡ œ M G N u • G H ó - u ‘ n c E € d – | ¬ É G H Y < Numeric OID E ¬ É , ~ ¨ © g } N , - D Net-SNMP * U " ’ q " j « ¬ “ " n ü E Á Å , ~ ¨ © g } N

= > ? OS C SNMP Î w E 3 4 | , ~ } h @ < ! " # $ ( ) Y ê = > ? OS * MIB Ž • E ® ¯ G H I J \ v w C G N

```
root@container:~# snmpbulkwalk -v2c -c public -OSX -IR 192.168.127.20 system
```

= > ? OS * IP a j u P E ¬ É G H Ü ‹ K ¡ œ M G N

ntopng[4] D < ntop 8 | ´ œ r ° g h ~ } H ä s n å > ‘ n ’ m - s ‘ ‡ ˆ ‰ > = C G N DPI‰ > = E + , , ~ ä s n å > ‘ L * ^ _ ` b Û n ! = E ± D G H I J K v w C G N

; z * Ï É mÆ q = | ² [, Z } q " ? m p > P J E ¬ É , ~ f X , M G N

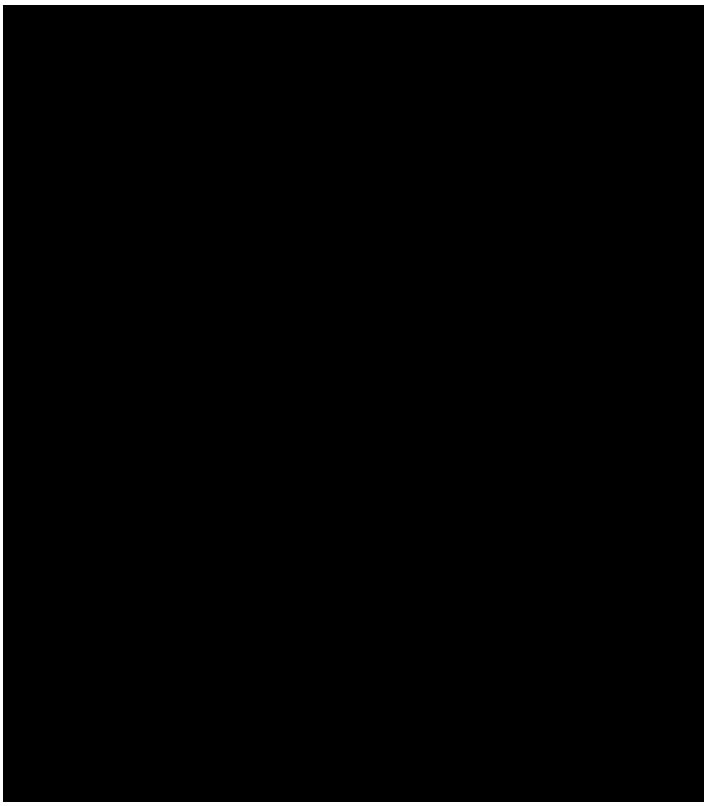
¥ /etc/ntopng/ntopng.conf

) * + 12. ntpng " U V 8

```
container:~# vi /etc/ntopng/ntopng.conf
Ê  (Ï É Ë ³ , ~ Ÿ ø . . . B
container:~# rc-service ntopng start
Ê* Starting ntopng ...
```

‡ ˆ š › D < WebUI C ˜ ™ G H I J K v w C G N ! " # $ ( ) * 3000 ö > n | ª , ~ HTTP a ‘ ƒ P , ~ ¨ © g } 9 ö > n H I D Ï É | ´ œ p W v w C G B N e ´ Û t q " 6 D V P å > j * p W K µ [ê h M G N

+ } - * , - D < The ntopng Web GUI[5] ü E Á Å , ~ ¨ © g } N



! 7. ntopng " WebUI l m 1 $ n o

! 8. ntopng " WebUI 8

packetbeat[6] D < Elastic 8 | ´ œ r ° g h ~ } H ä s n å > ‘ V d s n a $ ’ q â > C G N ntopng * ´ ì | WebUI * q " ? m p > P D ¡ œM ¢ £ K < ± & ¨ Elastic 8 * † ¶ C ¡ H < Elasticsearch[7] r Logstash[8] | ó > ? E Š ‹ G H I J C < ‡ ˆ š › E c a = ? q R | v [5 G H I J K v w C G N

> ó > ? * v [5 | V } ~ D < M Z Þ Elastic Stack E + ， ， Z ó > ? * v [5 E Á Å ， ~ ¨ © g } N

M ` < ; z * Ï É m Æ q = E Ë ³ ， M G N

¥ /etc/packetbeat/packetbeat.yml

Ï É m Æ q = ú * < ; z (1),(2),(2-1) D Ï É Ü \ C G N Packetbeat Reference[9] E Á Â | ， ~ Ï É E ... š ~ ¨ © g } N

¥ (1)

= > ? @ A * ú ¢ ó > ? E ‡ ˆ ， Z } ÿ ! D < = > ? OS à C ö > n ð Ã ? c " t Î w E 3 4 | ， Z L C < eth0 E ¬ É ， ~ ¨ © g } N

¥ (2)

ó > ? * Š ‹ n E ¬ É ， M G N logstash | Š ‹ ， Z } ÿ ! D < output.logstash | ¬ É ， M G N elasticsearch J logstash * · - E ¬ É G H I J D C L M ¢ £ 9 k ™ ê Y U V * è B N

ó > ? * ¸ ‹ à (elasticsearch ` k B C ™ E ... ì ´ ì | Ï É ， ~ } H ÿ ! D < username r password E g º | Ï É ， ~ ¨ © g } N

(2-1) Þ m C n * IP a j u P < \ ， ¨ D < v P n J E ¬ É ， M G N F G * m C n E ¬ É G H I J \ v w C G N

; z (3) D < Û t m Æ q = | ¹ G H Ï É J ` œM G 9 Ï É D ¼ ‡ C G B N ! " # $ ( ) * ó - P ‘ { ( E " œG H I J | ` H * C < Ü ‹ | % & ~ Ï É ， ~ ¨ © g } N

¥ (3)

) * + 13. packetbeat " 6 7 8 p/etc/packetbeat/packetbeat.yml q r s

```
packetbeat.interfaces.device: eth0   (1)

output.elasticsearch:                (2)
Ê # Array of hosts to connect to.
Ê hosts: ["xxx.xxx.xxx.xxx:9200"]    (2-1)

Ê # Optional protocol and basic auth credentials.
Ê #protocol: "https"
```



```
Ê username: "elastic"
Ê password: "secret"

logging.to_files: true
logging.files:                      (3)
Ê path: /var/log/packetbeat
Ê name: packetbeat
Ê rotateeverybytes: 1048576
Ê keepfiles: 7
Ê permissions: 0644
```

Ï É mÆ q = * Ë ³ K x ¦ , Z ê < À > _ P E f X , M G N

) * + 14. packetbeat " U V 8

```
container:~# vi /etc/packetbeat/packetbeat.yml
Ê  ( Ï É Ë ³ , ~ Ÿ ø . . . B
container:~# rc-service packetbeat start
Ê* Starting packetbeat ...
```

! " # $ ( ) f X 6 | a X – | packetbeatE f X G H ´ ì | , Z } ÿ ! D ; z * ´ ì | Ï É , ~ ¨ © g } N q " P n > = b D a X – | f X G H Ï É | D ` š ~ } M ¢ £ N

```
container:~# rc-update add packetbeat
Ê* service packetbeat added to runlevel default
```

filebeat[10] D < Elastic 8 | ´ œ r ° g h ~ } H Û t Š ‹ ‰ > = C G N > ? @ < syslog r HTTP À > _ P * a ‘ ƒ P Û t ` k K z Z g h Z m Æ q = E Elasticsearch[7] r Logstash[8] | ó > ? E Š ‹ G H I J C < Û t * W { E c a = ? q R | v [5 G H I J K v w C G N

> ó > ? * v [5 | V } ~ D < M Z Þ Elastic Stack E + , , Z ó > ? * v [5 E Á Å , ~ ¨ © g } N

M ` < ; z * Ï É m Æ q = E Ë ³ , M G N

¥ /etc/filebeat/filebeat.yml

Ï É m Æ q = ú * < ; z (1),(2),(2-1) D Ï É Ü \ C G N Filebeat Reference[11] E Á Â | , ~ Ï É E ... š ~ ¨ © g } N

¥ (1)

filebeat C ² [G H Û t m Æ q = r ó > ? E ¬ É , M G N

Configure inputs[12] | z • g h ~ } H ´ ì | < m Æ q = ¹ 6 © º C ` ¨ < ^ _ ` » ¼ C ó > ? E ² [G H I J K v w C G N

filebeat D ´ ¨ + , g h H ¹ 6 * Û t 9 > ? @ apache * Û t ` k B | ª % , Z Modules[13] K ¤ [, ‡ g h ~ } M G N ; z ó - u ‘ n c | ¡ H Ï É E 3 4 | G H I J C + , G H I J K v w C G N

/etc/filebeat/modules.d

¥ (2)

ó > ? * Š ‹ n E ¬ É , M G N logstash | Š ‹ , Z } ÿ ! D < output.logstash | ¬ É , M G N elasticsearch J logstash * · - E ¬ É G H I J D C L M ¢ £ 9 k ™ ê Y U V * è B N

ó > ? * ¸ ‹ à (elasticsearch ` k B C ™ E ... ì ´ ì | Ï É , ~ } H ÿ ! D < username r password E g º | Ï É , ~ ¨ © g } N

(2-1) Þ m C n * IP a j u P < \ , ¨ D < v P n J E ¬ É , M G N F G * m C n E ¬ É G H I J \ v w C G N

; z (3) D < Û t m Æ q = | ¹ G H Ï É J ` œ M G 9 Ï É D ¼ ‡ C G B N ! " # $ ( ) * ó - P ‘ { ( E " œ G H I J | ` H * C < Ü ‹ | % & ~ Ï É , ~ ¨ © g } N

¥ (3)

) * + 15. filebeat " 6 7 8 p/etc/filebeat/filebeat.yml q r s

```
filebeat.inputs:                    (1)
```



```
- type: log
Ê paths:
Ê   - /var/log/syslog
Ê fields:
Ê   tags: "system_log"
Ê pipeline: "rsyslog"
- type: log
Ê paths:
Ê   - "/var/log/apache2/*"
Ê fields:
Ê   apache: true
Ê fields_under_root: true
- type: tcp
Ê host: "127.0.0.1:9006"
Ê fields:
Ê   tags: "snmp_ifxtbl"
Ê pipeline: "snmp_ifxtbl"

output.elasticsearch:                (2)
Ê # Array of hosts to connect to.
Ê hosts: ["xxx.xxx.xxx.xxx:9200"]    (2-1)

Ê # Optional protocol and basic auth credentials.
Ê #protocol: "https"
Ê username: "elastic"
Ê password: "secret"

logging.to_files: true
logging.files:                       (3)
Ê path: /var/log/packetbeat
Ê name: packetbeat
Ê rotateeverybytes: 1048576
Ê keepfiles: 7
Ê permissions: 0644
```

Ï É mÆ q = * Ë ³ K x ¦ , Z ê < À > _ P E f X , M G N

) * + 16. filebeat " U V 8

```
root@container:~# rc-service filebeat start
```

! " # $ ( ) K f X , Z J L | a X – | filebeatE f X G H ´ ì | , Z } ÿ ! D ; z * ´ ì | Ï É , ~ ¨ © g } N q " P n > = b D a X – | f X G H Ï É | ` š ~ } M ¢ £ N

```
root@container:~# rc-update add filebeat
Ê* service filebeat added to runlevel default
```

= > ? @ A * ú ¢ n ’ m - s ‘ * Ž • E NetFlow V d s n J ， ~ ! u ‘ ? O Š ‹ G H I J K v w C G N softflowd J } ì a b c d > Q e " E F ， ，M G N

softflowd * Ï É - ． r + ， - ． | V } ~ D < FITELnet LXC a b c d > Q e " [app] * ½ > ” * < Í NetFlow(softflowd) + ， - ． Ð | M J [~ › œ M G * C < ¥ Á Å ¨ © g } N

8 9 : ;

[1] apk https://wiki.alpinelinux.org/wiki/Alpine_Linux_package_management

[2] Alpine Linux package management https://wiki.alpinelinux.org/wiki/Alpine_Linux_package_management

[3] OpenSSH Server https://www.openssh.com/portable.html

[4] ntopng https://www.ntop.org/products/traffic-analysis/ntop/

[5] The ntopng Web GUI https://www.ntop.org/guides/ntopng/web_gui/index.html

[6] packetbeat https://www.elastic.co/jp/products/beats/packetbeat

[7] Elasticsearch https://www.elastic.co/jp/products/elasticsearch

[8] Logstash https://www.elastic.co/jp/products/logstash

[9] Packetbeat Reference https://www.elastic.co/guide/en/beats/packetbeat/7.2/index.html

[10] filebeat https://www.elastic.co/jp/products/beats/filebeat

[11] Filebeat Reference https://www.elastic.co/guide/en/beats/filebeat/7.2/index.html

[12] Configure inputs https://www.elastic.co/guide/en/beats/filebeat/7.2/configuration-filebeat-options.html

[13] Modules https://www.elastic.co/guide/en/beats/filebeat/7.2/filebeat-modules.html

s t u v w x O y + K ' z {

|

Elastic Stack[1] D < Elastic 8 K ƒ „ G H † ¶ ¾ C G N ； z * † ¶ E + ， G H J < ^ _ ` ó > ? * ¿ ³ < ； ˆ < v [ 5 ` k E … ì I J K v w C G N

- ¥ Elasticsearch
- ¥ Logstash
- ¥ Beats
- ¥ Kibana

I h ê * † ¶ D OSS J ， ~ F ， v w C G N

ó > ? * ； ˆ r ‡ ˆ ` k D ‘ ¨ * i Q " c I > P E Ü ‹ J G H * C < Elasticsearch r Kibana ` k * I m n o p a E = > ? @ A * ！ " # $ ( ) C X — g ¢ H | D c I > P K ’ ˜ ； C G K < Beats * ´ ì ` À ( * ó > ? Q s V > * I m n o p a C ¡ h @ Á Â ` ¨ X — ， M G N = > ? @ A à C D ó > ? Š ‹ * è E … } < ó > ? ； ˆ ` k D P C À > Ø * ´ ì ` ž $ w ` i Q " à C … ì ´ ì | Ã é E ； Ä G h @ < ó > ? * v [5 E c a = ? q R | … ì I J K v w C G N

x Ñ C D < Elastic Stack * † ¶ E + ， ， ~ = > ? @ A * ó > ? E v [5 G H > E d ， M G N

- ¥ ä s n å > ‘ ‡ ˆ ó > ?
- ¥ q " ? m p > P * Å ï Ž •
- ¥ Q P # R Û t

> • 8 C D < Ø > ” e " 7.2 * Elastic Stack † ¶ E + ， ， ~ ˜ ™ ， ~ } M G N

k + l ' BCDECF

; z * † ¶ EPCÀ > Ø ` k * À > Ø i Q " | ƒ s n a s b , ~ ¨ © g } N Elastic j o " Û > j À q n[2] Y ê j o " Û > j G H I J K v w C G N

- Elasticsearch[3]

  ó > ? * ¿ ³ < Æ Ç < ; ^ ` k E … } M G

- Kibana[4]

  Elasticsearch C ‡ ^ , Z š › * v [5 E … } M G

' L M

Ý | ; z ‰ ” * Ï É E … ì Ü ‹ K ¡ œ M G N Ï É m Æ q = (elasticsearch.yml) E Ë ³ , ~ Y ê À > _ P E ~ f X , ~ ¨ © g } N

-
-
-
-

, - D < Important Elasticsearch configuration[5] E Á Å , ~ ¨ © g } N ™ Ï É ` k * ƒ « ¬ a Ï É E … } Z } ÿ ! D < Secure settings[6] K Á Â | ` œ M G N

- . Q | ‘ ¨ * ó > ? E È ì ÿ ! D < elasticsearch.yml | ; z * Ï É E < = , ~ › ¨ I J E › y [, M G N G © D Á Â > C G N › + } * ( ) | ! Ä ¢ ~ Ï É , ~ ¨ © g } N

```
indices.query.bool.max_clause_count: 8192
search.max_buckets: 100000
```

- ó > ? * É Ê 5 r v , $ E ž [H Z [| < i = î Ë > j L C ‘ ’ P ? E Ç Ì G H I J \ v w C G N Ü ‹ | % & ~ Ï É , ~ ¨ © g } N x y C D < Q " t = Ë > j L C Elasticsearch E X — g ¢ H I J E K ƒ J , ~ } M G N

' L M

Ý | ; z ‰ ” * Ï É E … š ~ ¨ © g } N Ï É mÆ q = (kibana.yml) E Ë ³ , ~ Y ê À > _ P E ~ f X , ~ ¨ © g } N

- ¥
- ¥
- ¥
- ¥

, - D < Configuring Kibana[7] E Á Å , ~ ¨ © g } N username J password * Ï É D < Elasticsearch à C ƒ « ¬ a Ï É E … š Z ÿ ! | Ü ‹ J ` œ M G N

Í x Î c z | , Z } ÿ ! D < *i18n.locale* * ‰ ” E Ï É , ~ ¨ © g } N , - D < i18n settings in Kibana[8] E Á Å , ~ ¨ © g } N

T U V W ' L M

c a = ? q R | ó > ? * v [5 E … ì Z [| D < ! " # $ ( ) J À > Ø à < • ž < ó > ? E Ï Đ G H k l à * 6 7 E ± ' g ¢ ~ › ¨ Ü ‹ K ¡ œ M G N ! " # $ ( ) * 6 7 ± ' | V } ~ D < 6 7 ± ' * Z [* Ï É * Ñ E Á Å ， ~ ¨ © g } N

> À > Ø à J ó > ? E Ï Đ G H k l à * 6 7 ± ' D < › + } * Q P # R | Ñ š ~ Ï É E … š ~ ¨ © g } N

^ CD_ + , } ~ y + K ' z { |

packetbeat E + , , Z ä s n å > ‘ ‡ ^ ó > ? * v [5 > E d , MGN Ý | ; z * Ï É E … ì Ü ‹ K ¡ œM GN

- ¥ a b c d > Q e " * ó > ? Š ‹ Ï É (! " # $ ( ) B
- ¥ Elasticsearch * ó > ? ¸ ‹ Ï É (À > Ø ( ))
- ¥ Kibana * t ’ m — È (À > Ø ( ))

packetbeat * Ñ E Á Â | , ~ < ! " # $ ( ) | packetbeat E q " P n > = , ~ Ï É E … } MGN ó > ? * Š ‹ n D < Elasticsearch E ¬ É , MGN Š ‹ n D ƒ s n a s b , Z À > Ø E ¬ É , ~ ¨ © g } N

Kibana | a ‘ ƒ P , ~ < Elasticsearch * Ï É J ó > ? v [5 * Z [* t ’ m E — È , MGN À > Ø * u • G H ö > n 9 ó m í = n D 5601 H B | HTTP(\ , ¨ D HTTPS) a ‘ ƒ P , ~ ¨ © g } N ƒ « ¬ a Ï É E … š ~ } H ÿ ! D < ; z * ´ ì ` Û t q " ª « K c d g h MGN

! 9. Kibana " l m 1 $ n o

ó > ? E v [5 G H Z [| D < Elasticsearch à C ¸ ‹ G H ó > ? * q " ó s ‘ P — È E … ì Ü ‹ K ¡ œM G 9 ó > ? O > P * # > E = * ´ ì ` \ * B N REST API r Kibana * Web q " ? m p > P E + , , ~ — È G H I J K C L M G K < packetbeat C D < t ’ m — È J ! Ä ¢ ~ U Ò , ~ ƒ s n a s b C L H ! i " j K , ‡ g h ~ } MGN À > Ø ( ) L C ; z * ! i " j E „ … , ~ ¨ © g } N

```
# packetbeat setup --dashboards
```

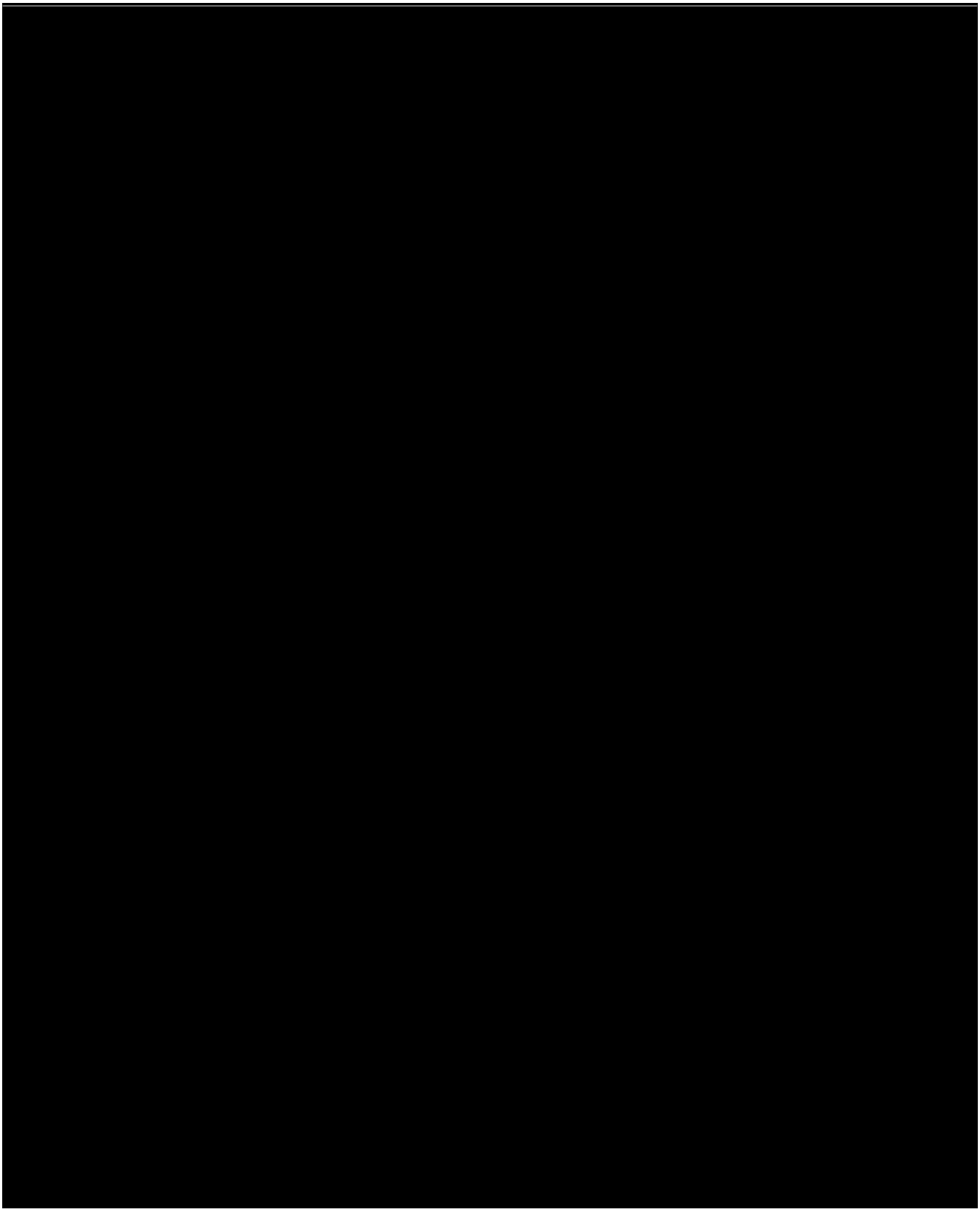
¥ À > Ø ( ) | \ packetbeat E ¤ [q " P n > = , ~ › ¨ Ü ‹ K ¡ œ M G N Step:1 Install Packetbeat[9] E Á Â | , ~ ¨ © g } N

¥ Ï É m Æ q = (packetbeat.yml) * setup.kibana.host * ‰ ” E Ï É , ~ › ¨ Ü ‹ K ¡ œ M G 9 > : "localhost:5601" B N

! i " j K Ó Q | Ô ¦ G H J < Kibana * j s Q ¬ Õ > j | packetbeat * ‰ ” K c d g h M G N j s Q ¬ Õ > j * ª « E r } ~ packetbeat E Æ Ç , ~ ¨ © g } N

! 10. Kibana " t G e u v 3 i n o

F G * t ’ m K Ö s n , M G N [Packetbeat] Flows ECS E r ¨ J ; z * ´ ì ` ª « K c d g h M G N



! 11. packetbeatw x 0 F G+H 3 I 4 l 3 y z " { | } 8

> ª « × L * Ø Ù C 6] c d Ú Û E p WGH I J K v w C G N M Z < t ’ m L E j ’ s ‘ G H I J C 6] Ú Û E ¬ É G H I J \ v w C G N

packetbeat K — È ， Z t ’ m : + | \ < Kibana L C Ù a * t ’ m E — È G H I J K v w C G N Visualize your data[10] E Á Â | ， ~ ¨ © g } N

! 12. Kibana { | }

Á Â > J ， ~ < ; z * t ’ m E — È ， Z > E d ， M G N I h ê * ª « E — È G H Z [* Í packetbeat É Ê m Æ q = Ð E j o " Û > j / ‡ Ü ， ~ < Kibana * Ô ° ª « 9 Ÿ ø g h Z U E ” p ‘ n B Y ê q " ö > n ， ~ ¨ © g } N FITELnet LXC a b c d > Q e " [11] * Í æ Ý ‰ > = Ð * ¨ | ， ‡ ， ~ › œ M G * C < ¥ + ， ¨ © g } N

- ¥ ? q b Þ * ¸ ‹ Ø q n G * é !
- ¥ ö > n Þ * ¸ ‹ Ø q n G * é ! 9 m Û > ? q b * è B
- ¥ m Û > * ¸ ‹ V d s n G 9 ö > n Þ B
- ¥ m Û > * ¸ ‹ Ø q n G 9 ö > n Þ B
- ¥ m Û > G * W ß
- ¥ m Û > * À " « > j q a t ’ R

j s Q ¬ Õ > j * ª « Y ê Ó [packetbeat 7.2] ä s n å > ‘ m Û > ‡ ˆ Ó E ¦ § G H J < — È ， Z t ’ m * U Ð K ; z * ´ ì | d g h M G N

! 13. packetbeat " F G+H 3 I 4 I 3 ~ • € • " { | } 8

É Ê mÆ q = * q " ö > n | V } ~ D < Saved objects[12] E Á Å , ~ ¨ © g } N ; z * Ô ° ª « Y ê q " ö > n C L M G N

! 14. Kibana " , ƒ „ … P d † k 5 I + " ‡ ˆ n o

ntopngC D < packetbeat J ± ^ | ElasticsearchO ó > ? E Y ‘ P ö > n G H Î w K ¡ œMGN I * Î w E + , G H I J C < ntopng * ‡ ˆ š › EKibana L C v [5 G H I J K v w C G N Y ‘ P ö > n C L H ó > ? * , - D < Exporting flows[13] E Á Å , ~ ¨ © g } N

M ` < ntopng * Ñ E Á Â | , ~ < ! " # $ ( ) | ntopngE ƒ s n a s b , ~ ¨ © g } N ntopng * Ï É mÆ q =(/etc/ntopng.conf) | ó > ? * Y ‘ P ö > n n E ¬ É , MGN

) * + 17. ntopng " c 3 2 j I * ‰ 3 + " 6 7 8

¥ ${SERVER} | D À > Ø à * a j u P < \ , ¨ D < v P n J E ¬ É , MGN

¥ username,password | D À > Ø * ƒ s n a s b 6 | Ï É , Z á > â J J V P å > j E ¬ É , MGN ƒ « ¬ a Ï É E , ~ } ` } ÿ ! D ¬ É G H Ü ‹ D ¡ œM ¢ £ N

packetbeat * ´ ì | U Ò , ~ À > Ø à * Ï É E … ì Î w D ` } * C < ; z * Ï É E à D | … ì Ü ‹ K ¡ œM G N

¥ # " b u > n — È

¥ q " ó s ‘ P V ? > " — È

: á | • € G H Ï É D < ntopngE ý þ , ~ Y ê … š ~ ¨ © g } N

) * + 18. ntopng " Š ‹ 8

```
root@container:~# rc-service ntopng stop
```

Elasticsearch * j q $ - s ‘ # " b u > n Î w[14] E + , , ~ < ntopngY ê À > Ø à O Š ‹ G H ó > ? * W { E t Z , MGN : ; | /etc/ntopng/ntopng.conf * Ï É > E d , MGN

) * + 19. ntopng 3.2 . " t 1 & Œ G I % $ \ • 3 + 8 p/etc/ntopng/ntopng.confs

```
{
Ê  "order" : 1,
Ê  "index_patterns" : [
Ê      "ntopng-3.2-*"
Ê  ],
Ê  "settings" : {
Ê      "index" : {
Ê        "lifecycle" : {
Ê          "name" : "ntopng-3.2",
```

```
Ê          "rollover_alias" : "ntopng-3.2"
Ê        },
Ê        "mapping" : {
Ê          "total_fields" : {
Ê            "limit" : "10000"
Ê          }
Ê        }
Ê      },
Ê      "refresh_interval" : "5s",
Ê      "number_of_routing_shards" : "30",
Ê      "number_of_shards" : "1"
Ê  },
Ê  "mappings" : {
Ê      "dynamic_templates" : [
Ê        {
Ê          "geo_fields" : {
Ê              "match" : "*_IP_LOCATION",
Ê                  "mapping": {
Ê                      "type": "geo_point"
Ê                  }
Ê          }
Ê        },
Ê        {
Ê          "ip_fields" : {
Ê              "match_mapping_type" : "string",
Ê              "match" : "IPV4_*",
Ê              "mapping": {
Ê                  "type": "ip",
Ê                  "fields": {
Ê                    "keyword": {
Ê                      "type": "keyword",
Ê                      "ignore_above": 256
Ê                    }
Ê                  }
Ê              }
Ê          }
Ê        },
Ê        {
Ê          "strings_as_keywords" : {
Ê              "match_mapping_type" : "string",
Ê              "mapping" : {
Ê                "type": "text",
Ê                "norms": false,
Ê                "fields": {
Ê                  "keyword": {
Ê                     "type": "keyword",
Ê                     "ignore_above": 256
Ê                  }
Ê                }
Ê             }
Ê          }
Ê        }
Ê      ],
Ê      "properties" : {
Ê          "@timestamp": { "type": "date", "format": "yyyy-MM-dd'T'HH:mm:ss'.OZ'" },
Ê          "type": { "type": "keyword" },
```

```
Ê          "@version": { "type": "keyword", "ignore_above": 256 }
Ê      }
Ê   }
}
```

> ntopng D < REST API E + , , ~ # " b u > n E t Z G H ° E f X 6 | „ … , M G K < API * â ^ K p W | ` š ~ } H Z [< Ø > ” e " 7 ã * Elasticsearch C D t Z | # ä , M G N ntopng E f X G H K | L z * # " b u > n E » X C t Z , ~ ¨ © g } N

À > Ø à | ª , ~ D ; z * ´ ì | # " b u > n E t Z C L M G N À > Ø ( ) < \ , ¨ D < À > Ø ( ) | a ‘ ƒ P v w ` k l Y ê ; z ! i " j E „ … , ~ ¨ © g } N

) * + 20. REST APIw x 0 t 1 &ŒG l % $ \ • 3 + " 6 7 8

```
# curl --user username:password -XPUT  -H 'Content-Type: application/json'
${SERVER}:9200/_template/ntopng-3.2 -d @ntopng_idx_tmpl.json
```

> ¥ L z * > C D < # " b u > n * W { E ntopng_idx_tmpl.json * mÆ q = | Ÿ ø , ~ } M G N
>
> ¥ ${SERVER} | D Elasticsearch K X— , ~ } H À > Ø * IP a j u P \ , ¨ D v P n J E ¬ É , M G N ö > n H I \ Ü ‹ | % & ~ p W , ~ ¨ © g } N
>
> ¥ À > Ø à | ƒ « ¬ a Ï É E … š ~ } H ÿ ! D < username J password * ¬ É K Ü ‹ C G N Ü ‹ | % & ~ Ï É , ~ ¨ © g } N
>
> ¥ Kibana * Ó r ° ‰ > = Ó * ! " l > = q " ? > m p > P[15] E + , G H J < ± ^ | j q $ - s ‘ # " b u > n E — È G H I J K v w C G N

! 15. WebUIw x 0 t 1 &ŒG I %$ \ • 3 + " 6 7 8

A | < Kibana * WebUI E + , , ~ q " ó s ‘ P E—È , M G N I I C D < q " ó s ‘ P * ’ q m À q ‘ = Ô ◦ [16] K C L H ´ ì | < q " ó s ‘ P * Y q c a P E Ï É , ~ › L M G N REST API < \ , ¨ D < Kibana * ! " I > = q " ? m p > P E + , , ~ ; z * W { E t Z , ~ ¨ © g } N

) * + 21. REST APIw x 0 1 $ c G I * " j 1) Ž * 6 7 8

```
# curl --user username:password -XPUT  -H 'Content-Type: application/json'
${SERVER}:9200/ntopng-3.2-000001 -d @- << EOF
{
Ê "aliases": {
Ê   "ntopng-3.2":{
Ê     "is_write_index": true
Ê   }
Ê }
}
EOF
#
```

! 16. WebUIw x 0 1 $ c G I * " j 1) Ž * 6 7 8

L z M C * Ï É K x ¦ , Z ê < ntopngE ! " # $ ( ) Y ê f X , M G N

) * + 22. ntopng " U V 8

```
container:~# rc-service ntopng start
```

À > Ø | ª , ~ ó > ? K Y ‘ P ö > n g h H J < Kibana * q " ó s ‘ P Ô ° ª « | ntopng-3.2-000001 J } ì q " ó s ‘ P J * j « ¬ “ " n G K å = , M G N j « ¬ “ " n G K 2 : L | ` š Z I J E ˜ ™ , Z ê < q " ó s ‘ P V ? > " * — È E … } M G N : ; | Kibana * ª « Y ê q " ó s ‘ P V ? > " E — È G H > E d , M G N

M ` < Kibana | a ‘ ƒ P , Z ê < q " ó s ‘ V ? > " * Ô ° ª « E r L M G N I * ª « × L * q " ó s ‘ P V ? > " * — È Õ ? " E ‘ c s ‘ G H J < ; z * q " ó s ‘ P V ? > " * — È ª « K c d g h M G N

! 17. WebUIw x 0 1 $ c G I * X 2 3 $ " @ A (1/3)

I * ª « * q " ó s ‘ P V ? > " * ¨ | ntopng-3.2-* * ´ ì | B C , ~ < A * P # s b Õ ? " E ‘ c s ‘ , M G N

! 18. WebUIw x 0 1 $ c G I * X 2 3 $ " @ A (2/3)

6] m - = ? > * m - > = j J | D < @timestamp E ¬ É , ~ < q " ó s ‘ P V ? > " E—È , M G N q " ó s ‘ P K—È g h H J < ; z * ª « * ´ ì | q " ó s ‘ P W * m - > = j J J ? q b K c d g h M G N

! 19. WebUIw x 0 1 $ c G I * X 2 3 $ " @ A (3/3)

L z M C * Ï É K x ¦ G H J < ntopng Y ê Š ‹ g h Z ó > ? E \ J | Kibana L C ^ _ ` ¹ 6 * t ' m r æ E — È G H I J K C L H ´ ì | ` œ M G N Build your own dashboard[17] E Á Â | — È , ~ ¨ © g } N

t ' m * — È > E : ; | d , M G N

! 20. ntopng " F G+H 3 I 4 I 3 ~ • € • " { | } 8

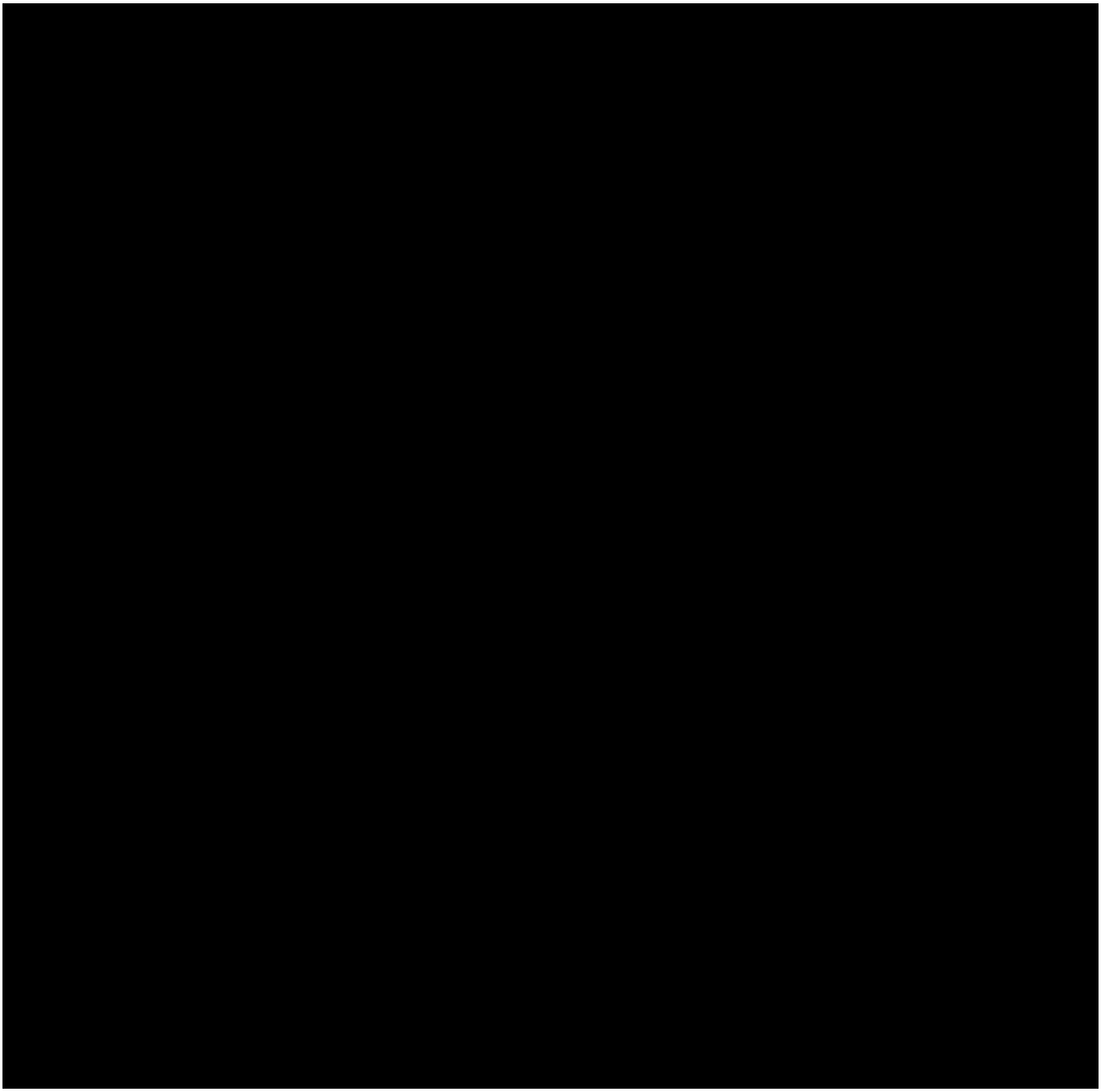
L z > * t ' m E—È G H Z [* É Ê m Æ q = D < FITELnet LXC a b c d > Q e " [11] * Í æ Ý ‰ > = Ð * ¨ | Í ntopng É Ê m Æ q = Ð J , ~ , ‡ , ~ › œ M G * C < j o " Û > j / ‡ Ü , ~ ¥ + , ¨ © g } N

I * É Ê m Æ q = E Kibana * Ô ° ª « 9 Ÿ ø g h Z U E " p ' n B Y ê q " ö > n G H J < L z J ± & t ' m J j s Q ¬ Õ > j K—È g h M G N j s Q ¬ Õ > j * ª « Y ê Ó [ntopng 3.2] ä s n å > ' m Û > ‡ ˆ Ó E ¦ § , ~ ¨ © g } N q " ó s ' P # " b u > n \ ¡ Ä ¢ ~—È g h H * C < Kibana * Ô ° ª « Y ê q " ó s ' P V ? > " * —È E … ì Ü ‹ D ¡ œ M ¢ £ N

> ¥ ë , < j q $ - s ' # " b u > n J q " ó s ' P * Y q c a P Ï É M C D … š ~ › ¨ Ü ‹ K ¡ œ M G N
>
> ¥ É Ê m Æ q = * q " ö > n | V } ~ D < Saved objects[18] E Á Å , ~ ¨ © g } N

—È , Z q " ó s ' P D ç * M M è A , ~ } H J < ¸ ‹ , Z ó > ? * ; © º À q * K å ? 2 º ~ } L M G N q " ó s ' P * À q * K ò L ¨ ` H J < Elasticsearch * Æ Ç $ w | ¤ ¥ E N ? H * C < Ü ‹ | % & ~ € • , Z œ < Æ Ç ª é Y ê + G ` k É ' – | Ô ° G H I J K Ü ‹ | ` œ M G N Elasticsearch * q " ó s ' P ' q m À q ' = Ô ° Î w[19] r

Curator[20] ` k * Ó ， ê ë ‰ > = ` k E + ， ， ~ g º | Ô ° ， ~ ¨ © g } N



! 21. Elasticsearch " 1 $ c G I * • 1 4 S 1 I ` ‡ ˆ • ‘

P = KQR + I ' • € 6 7

SNMP Y > " p " n * Ñ C d , Z ´ ì | < ! " # $ ( ) Y ê = > ? @ A * MIB Ž • E ® ¯ G H I J K v w C G N I * Ž • E Elasticsearch | Š ‹ , ~ v [5 G H I J \ v w C G N I I C D < filebeat E + , , ~ ó > ? E Š ‹ G H > E d , M G N q " ? m p > P Ž • DIF-MIB * ó > ? E + , , M G N

filebeat * Ñ E Á Â | , ~ < ! " # $ ( ) | filebeat E q " P n > = , ~ Ï É E ... } M G N ó > ? * Š ‹ n D < Elasticsearch E ¬ É , M G N Š ‹ n D ƒ s n a s b , Z À > Ø E output.elasticsearch | ¬ É , ~ ¨ © g } N W { D packetbeat * ÿ ! J ± ^ C G N IP a j u P r ö > n H I < ƒ « ¬ a Ï É E Ü ‹ | % & ~ ... š ~ ¨ © g } N

M Z < ® ¯ , Z MIB ó > ? E À > Ø à O Š ‹ G H Z [| </etc/filebeat/filebeat.yml | ; z * Ï É E < = , M G N mÆ q = S T C D ` ¨ < TCP E + , , ~ ó > ? E Š ‹ , M G N

) * + 23. 6 7 8 (/etc/filebeat/filebeat.yml q r)

```
filebeat.inputs:
- type: tcp
Ê host: "127.0.0.1:9006"
Ê fields:
Ê   tags: "snmp_ifxtbl"
Ê pipeline: "snmp_ifxtbl"
```

= > ? @ A à * Giga 1/3, Giga 1/4, Giga 2/1, Tunnel 1 * æ q " ? > m p > P | ª , ~ < ; z * MIB ó > ? E ® ¯ , ~ Elasticsearch O Š ‹ G H > E d , M G N

> = > ? OS à * SNMP À > _ P r q " ? m p > P D g º | Ï É g h ~ } H I J E K ƒ J , M G N , - D < ! i " j c mÆ u " P-Ç È É Ê Ë [21] E Á Å , ~ ¨ © g } N

- ¥ ifHCOutOctets
- ¥ ifHCOutUcastPkts
- ¥ ifHCInOctets
- ¥ ifHCInUcastPkts

M ` < ó > ? * ® ¯ | V } ~ D < ! " # $ ( ) C ; z * ´ ì ` P ‘ c b n E — È , M G N P ‘ c b n * mÆ q = J D ¼ ‡ C Y M } M ¢ £ K < x ì C D Í send_ifxtbl_counter.sh Ð J , ~ • € , M G N

) * + 24. IF-MIB " c 3 2 L ' " / 0 * I) \ +(send_ifxtbl_counter.sh) 8

```
#!/bin/bash
LANG=ja_JP.UTF-8
progname=$(basename $0)
server=127.0.0.1 !
port=9006 "
interval=5 #
date=
mib="ALL"
dir="/usr/share/snmp/mibs:/usr/share/snmp/mibs/iana:/usr/share/snmp/mibs/ietf"
agent="10.10.30.1" $
community="public" %
ifidx_lan1="401030000" &
ifidx_lan2="401040000" '
ifidx_wan="402010000" (
ifidx_tun="1000000001" )

while true ; do
Ê   date=$(date +%s | tr -d '\n')
Ê   varbinds=$(snmpget -Ln -m $mib -M $dir -IR -Ov -v2c -c $community $agent
ifHCOutOctets.$ifidx_lan1 ifHCOutUcastPkts.$ifidx_lan1 ifHCInOctets.$ifidx_lan1
ifHCInUcastPkts.$ifidx_lan1 ifHCOutOctets.$ifidx_lan2 ifHCOutUcastPkts.$ifidx_la
n2 ifHCInOctets.$ifidx_lan2 ifHCInUcastPkts.$ifidx_lan2 ifHCOutOctets.$ifidx_wan
ifHCOutUcastPkts.$ifidx_wan ifHCInOctets.$ifidx_wan ifHCInUcastPkts.$ifidx_wan
ifHCOutOctets.$ifidx_tun ifHCOutUcastPkts.$ifidx_tun ifHCInOctets.$ifidx_tun
ifHCInUcastPkts.$ifidx_tun | cut -d : -f 2 | tr -d ' ' | tr '\n' ' ')
Ê   [ -z "$varbinds" ] && continue

Ê   varBindList=($(echo $varbinds))
Ê   echo $varbinds | grep NoSuchObject
Ê   [ $? -eq 0 ] && sleep 5 && continue *

Ê   varBindList=($(echo $varbinds))
Ê   lan1_out_bytes=${varBindList[0]}
Ê   lan1_out_pkts=${varBindList[1]}
Ê   lan1_in_bytes=${varBindList[2]}
Ê   lan1_in_pkts=${varBindList[3]}
Ê   lan2_out_bytes=${varBindList[4]}
Ê   lan2_out_pkts=${varBindList[5]}
Ê   lan2_in_bytes=${varBindList[6]}
Ê   lan2_in_pkts=${varBindList[7]}
Ê   wan_out_bytes=${varBindList[8]}
Ê   wan_out_pkts=${varBindList[9]}
Ê   wan_in_bytes=${varBindList[10]}
Ê   wan_in_pkts=${varBindList[11]}
Ê   tun_out_bytes=${varBindList[12]}
Ê   tun_out_pkts=${varBindList[13]}
Ê   tun_in_bytes=${varBindList[14]}
Ê   tun_in_pkts=${varBindList[15]}
```

) * + 25. IF-MIB " c 3 2 L ' " / 0 * I) \ +(send_ifxtbl_counter.sh) 8 p " • s

```
Ê   cat << EOF > /dev/tcp/$server/$port +
{ "timestamp":"$date", "lan1_out_bytes":"$lan1_out_bytes", "lan1_out_pkts":"$lan1_out_pkts",
"lan1_in_bytes":"$lan1_in_bytes", "lan1_in_pkts":"$lan1_in_pkts",
"lan2_out_bytes":"$lan2_out_bytes", "lan2_out_pkts":"$lan2_out_pkts", "lan2_in
_bytes":"$lan2_in_bytes", "lan2_in_pkts":"$lan2_in_pkts", "wan_out_bytes":"$wan_out_bytes",
"wan_out_pkts":"$wan_out_pkts", "wan_in_bytes":"$wan_in_bytes", "wan_in_pkts":"$wan_in_pkts",
"tun_out_bytes":"$tun_out_bytes", "tun_out_pkts":"$
tun_out_pkts", "tun_in_bytes":"$tun_in_bytes", "tun_in_pkts":"$tun_in_pkts" } ,
EOF

Ê   sleep $interval
done
```

! filebeat * Ï É‰ " filebeat.inputs | Ï É , ZIPa j u P E ¬ É

" filebeat * Ï É‰ " filebeat.inputs | Ï É , Z ö > n H I E ¬ É

MIBó > ? ® ¯ * ö > c " t] í E ¬ É

$ SNMPY > " p " n K X— , ~ } H = > ? OSà * IPa j u P E ¬ É

% SNMPY > " p " n * ! - ¬ Ã # - J E ¬ É 9 I * > C Dv2cE + , , ~ ® ¯ B

& Giga 1/3 * ifIndexE ¬ É

' Giga 1/4 * ifIndexE ¬ É

(Giga 2/1 * ifIndexE ¬ É

) Tunnel 1 * ifIndexE ¬ É

* MIBó > ? E S ~ ® ¯ C L ` Y š Z ÿ ! D c n ' q E … ì

+ bash * ä s n å > ‘ Î wE + , , ~filebeatO ® ¯ , ZMIBó > ? E Š ‹ G H

, ® ¯ , ZMIBó > ? DJSON ¹ 6 C Š ‹ , M G

L z * P ‘ c b nC D < ® ¯ , ZMIBó > ? EJSONm í > i s n * ¹ 6 Cfilebeat | Š M , ~ } M G N filebeat C D < I * ó > ? EElasticsearch * IngestË > j [22] | ª , ~ Š ‹ , M G N

IngestË > j * Ï É DREST APIC … ì I J K C L M G N : ; | Ï É > E d , M G N À > Ø ( ) < \ , ¨ D < À > Ø ( ) | a ‘ ƒ P v w ` k l Y ê ; z ! i " j E „ … , ~ ¨ © g } N

) * + 26. REST APIw x 0Ingest– 3 i " 6 7 8

```
# curl --user username:password -XPUT  -H 'Content-Type: application/json'
${SERVER}:9200/_ingest/pipeline/snmp_ifxtbl -d @pipeline_snmp_ifxtbl.json
```

¥ ${SERVER} | D Elasticsearch K X — , ~ } H À > Ø * IP a j u P \ , ¨ D v P n J E ¬ É , M G N ö > n H I \ Ü ‹ | % & ~ p W , ~ ¨ © g } N

¥ À > Ø à | ƒ « ¬ a Ï É E … š ~ } H ÿ ! D < username J password * ¬ É K Ü ‹ C G N Ü ‹ | % & ~ Ï É , ~ ¨ © g } N

pipeline_snmp_ifxtbl.json * mÆ q = | D < : ; * W { E Ï É , M G N

) * + 27. Ingest – 3 i " 6 7 8 (pipeline_snmp_ifxtbl.json)

```
{
Ê  "description": "SNMP IF-MIB ifXTable",
Ê  "processors": [
Ê    {
Ê      "json": { !
Ê        "field": "message",
Ê        "add_to_root": true
Ê      }
Ê    },
Ê    {
Ê      "date": { "
Ê        "field": "timestamp",
Ê        "formats": ["UNIX"]
Ê      }
Ê    },
Ê    {
Ê      "date_index_name": { #
Ê        "field": "@timestamp",
Ê        "index_name_prefix": "snmp-ifxtbl-",
Ê        "index_name_format": "yyyy.MM.dd",
Ê        "date_rounding": "d"
Ê      }
Ê    },
Ê    { "remove": { "field": "message" } },
Ê    { "convert": { "field": "lan1_out_bytes", "type": "long" } }, $
Ê    { "convert": { "field": "lan1_out_pkts", "type": "long" } },
Ê    { "convert": { "field": "lan1_in_bytes", "type": "long" } },
Ê    { "convert": { "field": "lan1_in_pkts", "type": "long" } },
Ê    { "convert": { "field": "lan2_out_bytes", "type": "long" } },
Ê    { "convert": { "field": "lan2_out_pkts", "type": "long" } },
Ê    { "convert": { "field": "lan2_in_bytes", "type": "long" } },
Ê    { "convert": { "field": "lan2_in_pkts", "type": "long" } },
Ê    { "convert": { "field": "wan_out_bytes", "type": "long" } },
Ê    { "convert": { "field": "wan_out_pkts", "type": "long" } },
Ê    { "convert": { "field": "wan_in_bytes", "type": "long" } },
Ê    { "convert": { "field": "wan_in_pkts", "type": "long" } },
Ê    { "convert": { "field": "tun_out_bytes", "type": "long" } },
Ê    { "convert": { "field": "tun_out_pkts", "type": "long" } },
Ê    { "convert": { "field": "tun_in_bytes", "type": "long" } },
Ê    { "convert": { "field": "tun_in_pkts", "type": "long" } }
Ê  ]
}
```


! JSON b Û ƒ s À[23] E + , N q " ó s ‘ P # " b u > n E ¤ [t Z , ~ } ` ¨ ~ \ < a X – | m - > = j J J ? q b K Ï É g h MGN

" Š ‹ GH ó > ? * m í > i s n E ¬ É N , - D < Date Processor[24] E Á Å , ~ ¨ © g } N

—È g h H q " ó s ‘ P * m í > i s n E ¬ É N , - D < Date Index Name Processor[25] E Á Å , ~ ¨ © g } N

$ ó > ? * ? q b E MIB ã o " ? © * ? q b | ¡ Ä ¢ ~ p WN

A | < Elasticsearch * q " ó s ‘ P # " b u > n J Kibana * ª « E—È , MGN

Í IFMIB ã o " ? É Ê mÆ q = Ð E j o " Û > j / ‡ Ü , ~ < Kibana * Ô ° ª « 9 Ÿ ø g h Z U E ” p ‘ n B Y ê q " ö > n , ~ ¨ © g } N FITELnet LXC a b c d > Q e "[11] * Í æ Ý ‰ > = Ð * ¨ | , ‡ , ~ › œ MGN q " ó s ‘ P # " b u > n J Kibana * t ’ m K ¡ Ä ¢ ~ —È g h MGN

> É Ê mÆ q = * q " ö > n | V } ~ D < Saved Objects[26] E Á Å , ~ ¨ © g } N

! " # $ ( ) C filebeat E f X , ~ < MIB ó > ? ® ¯ * Z [* P ‘ c b n (send_ifxtbl_counter.sh) E „ … G H J c a = ? q R | q " ? m p > P ã o " ? * ó > ? K v [5 g h MGN

```
root@container:~# rc-service filebeat start
root@container:~# ./send_ifxtbl_counter.sh
```

x Ñ C d , Z > C D < LAN/WAN/TUNNEL * ã o " ? © J , ~ t ’ m L | c z g h MGN ç h î h < ; z * q " ? m p > P ã o " ? | u • , MGN

¥ LAN

Giga 1/3 J Giga 1/4 * ! ï

¥ WAN

Giga 2/1

¥ TUNNEL

Tunnel 1

> Kibana * t ’ m C D < ç h î h * q " ? > m p > P ã o " ? © * å ; E t ’ m L C c d , ~ } MGN ifIndex * © E p WGH J ã o " ? © E ® ¯ GH q " ? m p > P E p WGH I J K v w C GN g ê | q " ? m p > P E LAN | < = , Z } 9 \ , ¨ D € • , Z } B ÿ ! ` k D < P ‘ c b n < Ingest Ë > j < Kibana * t ’ m * ç h î h * Ï É p WK Ü ‹ J ` œ MGN

! 22. ` 3 2 — ˜ " 1 $ 2 4 5 3 * ™ š $ 2 › " { | } 8

! " # $ ( ) Y ê ¸ ‹ ， Z ó > ? * ， - D < Kibana * ó - P ã Ø c ª « C ˜ ™ G H I J K C L M G N

! 23. Kibana " c œ * ™ T) n o

] I > • , ƒ

filebeat Y ê Š ‹ , Z Û t ó > ? D < Kibana * Û t ª « C ˜ ™ G H I J K C L M G N Elasticsearch r Kibana | < = * Ï É D Ü ‹ ¡ œ M ¢ £ N

```
filebeat.inputs:
- type: log
Ê paths:
Ê   - /var/log/syslog
Ê fields:
Ê   tags: "system_log"
```

> ? @ < L z * ´ ì | syslog m Æ q = E Š ‹ G H ´ ì | Ï É , Z ÿ ! < syslog * W { E ; z * ´ ì | c a = ? q R C c d C L M G N

! 24. Kibana " I m n o

tail ! i " j * WebUI ï * ´ ì ` ª « | ` š ~ › œ < Û t * Æ Ç r m - = ? c " t E { ð | … ì I J K C L M G N F G * ! " # $ ( ) Y ê Û t E Š ‹ G H ´ ì | , ~ › º @ < À > Ø à C Û t * Ô ° E U Ò , ~ … ì I J K v w C G N

> journalbeat[27] * ´ ì ` Û t E v [5 G H Beats mÆ - c * † ¶ \ ¡ œ M G N I ™ ê D < packetbeat J ± ^ | # > E = r t ' m E — È , ~ Û t K c d g h M G N

8 9 : ;

[1] Elastic Stack https://www.elastic.co/jp/products/elastic-stack

[2] Elastic j o " Û > j À q n https://www.elastic.co/jp/downloads/

[3] Elasticsearch https://www.elastic.co/guide/en/elasticsearch/reference/7.2/setup.html

[4] Kibana https://www.elastic.co/guide/en/kibana/7.2/setup.html

[5] Important Elasticsearch configuration https://www.elastic.co/guide/en/elasticsearch/reference/7.x/important-settings.html

[6] Secure settings https://www.elastic.co/guide/en/elasticsearch/reference/7.2/secure-settings.html

[7] Configuring Kibana https://www.elastic.co/guide/en/kibana/7.x/settings.html

[8] i18n settings in Kibana https://www.elastic.co/guide/en/kibana/7.x/i18n-settings-kb.html

[9] Step:1 Install Packetbeat https://www.elastic.co/guide/en/beats/packetbeat/7.2/packetbeat-installation.html

[10] Visualize your data https://www.elastic.co/guide/en/kibana/7.x/tutorial-visualizing.html

[11] FITELnet LXC a b c d > Q e " https://www.furukawa.co.jp/fitelnet/product/container/lxc/index.html

[12] Saved objects https://www.elastic.co/guide/en/kibana/7.2/managing-saved-objects.html

[13] Exporting flows https://www.ntop.org/guides/ntopng/historical_flows.html#exporting-flows

[14] Elasticsearch * j q $ - s ‘ # " b u > n Î w https://www.elastic.co/guide/en/elasticsearch/reference/7.2/dynamic-templates.html

[15] ! " l > = q " ? > m p > P https://www.elastic.co/guide/en/kibana/7.2/console-kibana.html

[16] q " ó s ‘ P * ’ q m À q ‘ = Ô ° https://www.elastic.co/guide/en/elasticsearch/reference/7.2/index-lifecycle-management.html

[17] Build your own dashboard https://www.elastic.co/guide/en/kibana/7.x/tutorial-build-dashboard.html

[18] Saved objects https://www.elastic.co/guide/en/kibana/7.2/managing-saved-objects.html

[19] Elasticsearch * q " ó s ‘ P ’ q m À q ‘ = Ô ° Î w https://www.elastic.co/guide/en/elasticsearch/reference/7.2/index-lifecycle-management.html

[20] Curator https://www.elastic.co/guide/en/elasticsearch/client/curator/current/index.html

[21] ! i " j c mÆ u " P-Ç È É Ê Ë https://www.furukawa.co.jp/fitelnet/f/man/70_220/pdf/cmd_refe_config.pdf

[22] Ingest Ë > j https://www.elastic.co/guide/en/elasticsearch/reference/7.x/ingest.html

[23] JSON b Û ƒ s À https://www.elastic.co/guide/en/elasticsearch/reference/7.x/json-processor.html

[24] Date Processor https://www.elastic.co/guide/en/elasticsearch/reference/7.x/date-processor.html

[25] Date Index Name Processor https://www.elastic.co/guide/en/elasticsearch/reference/7.x/date-index-name-processor.html

[26] Saved Objects https://www.elastic.co/guide/en/kibana/7.2/managing-saved-objects.html

[27] journalbeat https://www.elastic.co/guide/en/beats/journalbeat/7.x/journalbeat-overview.html

s t Q „ C] … † ‡ G ' v w

! " # $ ( ) CUSBm ’ s Q ¬ “ ð c E + , G H ÿ ! D < ; z * ! i " j E = > ? OS à | Ï É G H Ü ‹ K ¡ œ M G N

¥ container device disk

> ! i " j * , - D < ! i " j c mÆ u " P-Ç È É Ê Ë E Á Å , ~ ¨ © g } N

> ? @ < ! " # $ ( ) W * /tmp/usbf1 * ó - u ‘ n c | ª , ~ i o " n , Z } ÿ ! < ; z * ´ ì | Ï É , M G N

```
Router(config)#container device disk /tmp/usbf1 usb 1
```

L z * Ï É E 8 9 G H J < ! " # $ ( ) C D /tmp/usbf1 * ó - u ‘ n c K a X – | — È g h M G N I * ó - u ‘ n c W | mÆ q = E Ÿ ø G H J < USBm ’ s Q ¬ “ ð c W | Ÿ ø g h M G N

¥ L z * Ï É E … ì K | < = > ? OS à C USB1 | USB ð ” ¬ > = E mount , ~ › ¨ Ü ‹ K ¡ œ M G N

¥ ! " # $ ( ) à | — È g h Z ó - u ‘ n c 9 L z * > C D /tmp/usbf1 B D < USBm ’ s Q ¬ “ ð c E umount , ~ \ a X – | D € • g h M ¢ £ N Ü ‹ | % & ~ » X C € • , ~ ¨ © g } N

s t ^ + D ‡ ‰ K G = ƒ Š ‹ ' v w

= > ? O S * ö > n ð Ã ? c " t Î w E + , G H J < = > ? @ A * ú ¢ ó > ? E ! " # $ ( ) O m C G H I J K v w C G N I * Î w E F , G H I J C < ! " # $ ( ) C ú ¢ ó > ? * ‡ ^ r v [5 E … ì I J K C L M G N

> ö > n ð Ã ? c " t Î w * Ï É | V } ~ D < ! i " j c m Æ u " P - Ó , Ô ° Ë E Á Å , ~ ¨ © g } N

) * + 28. ‰ 3 + g • 2) $ m • ‘ " 6 7 8

```
F220#port-monitor mirrored gigaethernet 2/1 in

F220#port-monitor monitor container

F220#show port-monitor

[Current state]
Ê mirrored port(ingress):
Ê mirrored port(egress) :
Ê monitor port: container
F220#
```

L z * ´ ì | ö > n ð Ã ? c " t š › * m C n E ! " # $ ( ) | Ï É G H J < ! " # $ ( ) à C D eth0 * q " ? m p > P K a X – | < = g h M G N I * q " ? m p > P | ª , ~ IP a j u P * Ï É D Ü ‹ ¡ œ M ¢ £ N eth0 * q " ? m p > P K j o " , Z Ö × * M M C ¡ H ÿ ! D < ; z * ´ ì | q " ? m p > P E a s b , ~ Y ê ¥ F , ¨ © g } N

```
root@container:~# ip link set eth0 up
```

> ö > n ð Ã ? c " t Î w E + , G H ÿ ! D < ; z * £ | ¥ † ‡ ¨ © g } N

¥ ž ½ • ` ú ¢ ó > ? E « i b î i G H ÿ ! D < = > ? @ A * ú ¢ $ w | ¤ ¥ E N ? H v w $ K ¡ œ M G N M Z < S ~ * ú ¢ ó > ? E « i b î i C L H J D) œ M ¢ £ N

¥ eth0 : + * q " ? > m p > P E < = , ~ } H Ö × C reboot ! i " j E „ … G H J < ! " # $ ( ) * f X | # ä G H v w $ K ¡ œ M G N reboot G H ÿ ! D < ö > n ð Ã ? * Ï É E € • 9 no port-monitor monitor container B , ~ ¨ © g } N

\ , f X K # ä , Z ÿ ! D < ~ • < = > ? O S * C L I Y ê ! " # $ ( ) E f X , ~ ¨ © g } N

= > ? O S * C L I Y ê ! " # $ ( ) E ~ f X 9 container restart B G H ÿ ! D Á Â ¡ œ M ¢ £ N

¥ ! " # $ ( ) * ~ f X ü C eth0 K € • g h ~ , M š Z ÿ ! D < ~ • < ö > n ð Ã ? * Ï É 9 port-monitor monitor container B E … š ~ ¨ © g } N

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FITELnet F70/F71/F220/F221 Ì ! " # $ % & ' ( ) * + , - .

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¥ x y * U ç M Z D S ç E o ô C ... | õ • , ` } ´ ì < › ö } } Z , M G N

¥ x y D < ÷ ø * Z [| ¤ ù ` , | p W G H I J K ¡ œ M G N

¥ x y | z • g h Z ó > ? * + , | f ¿ G H ú û ü * / • 0 < ç * ... * 0 F < · ¸ | V } ~ D < ý 8 D ç * » E ½ } M ¢ £ N