Dicas de implementação e solução de problemas de provisionamento zero-touch

Contents

Introduction

Este documento descreve as dicas de solução de problemas para implantações iniciais do ZTP (Zero Touch Provisioning, provisionamento automatizado).

O ZTP foi introduzido para reduzir a interação humana no fornecimento de dispositivos XR. O ZTP usa uma implementação do Preboot eXecution Environment (iPXE).

Informações de Apoio

O ZTP pode executar:

- Atualização da configuração automática: Baixar e aplicar a configuração XR após a instalação da imagem
- Execução do script: Baixe e execute os arquivos de script definidos pelo usuário. Vários métodos/funções podem ser implementados como parte da execução do script: Atualização de vários pacotesinstalação de SMUVerificaçõesO eXR decide quais ações executar com base no conteúdo da primeira linha do arquivo Se o arquivo começar com **!! O IOS XR** denota um arquivo de configuração e executa apply_config.Da mesma forma, os arquivos que começam com **#! /bin/bash** ou **#! /bin/sh** ou **#!/usr/bin/python** indica um arquivo de script e executa a execução de script.O suporte para python é apresentado do eXR 6.2.2O eXR iPXE suporta Trivial File Transfer Protocol (TFTP), File Transfer Protocol (FTP) e Hypertext Transfer Protocol (HTTP). O protocolo HTTPS (Hypertext Transfer Protocol Secure) não é suportado porque não pode prever qual assinatura verificar.

Configuração do servidor Linux

O iPXE é um aprimoramento sobre o PXE que requer TFTP/FTP/HTTP para download de imagem/configuração e usa o Dynamic Host Configuration Protocol (DHCP) para obter/fornecer informações sobre a imagem e a configuração.

Configuração DHCP

Em um exemplo posterior, há uma revisão de uma captura de pacote para confirmar a operação do DHCP.

Requisitos do servidor HTTP

O servidor HTTP deve estar acessível na interface Ethernet Mgmt.

Dicas para Troubleshooting

Quando o servidor Linux estiver configurado, Execute a verificação de acessibilidade e funcionalidade do servidor DHCP/HTTP.

Nesta configuração, um único servidor Linux é usado como servidor DHCP/HTTP. Se houver servidores separados para essas funções, verifique essas etapas em todos os servidores, se necessário.

```
[root@xxxxxxxxxx]# service dhcpd status
Redirecting to /bin/systemctl status  dhcpd.service
dhcpd.service - DHCPv4 Server Daemon
   Loaded: loaded (/usr/lib/systemd/system/dhcpd.service; disabled; vendor preset: disabled)
   Active: active (running) since Mon 2017-05-29 10:30:59 PDT; 15h ago
     Docs: man:dhcpd(8)
           man:dhcpd.conf(5)
 Main PID: 26913 (dhcpd)
   Status: "Dispatching packets..."
   CGroup: /system.slice/dhcpd.service
           26913 /usr/sbin/dhcpd -f -cf /etc/dhcp/dhcpd.conf -user dhcpd -group dhcpd --no-pid
<SNIP>
```
Dica: Algumas linhas foram redimensionadas, use -l para mostrar na íntegra.

```
[root@xxxxxxxx]# service httpd status
Redirecting to /bin/systemctl status  httpd.service
   httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor preset: disabled)
   Active: active (running) since Fri 2017-05-26 05:50:30 PDT; 3 days ago
     Docs: man:httpd(8)
           man:apachectl(8)
  Process: 28088 ExecStop=/bin/kill -WINCH ${MAINPID} (code=exited, status=0/SUCCESS)
  Process: 11036 ExecReload=/usr/sbin/httpd $OPTIONS -k graceful (code=exited, status=0/SUCCESS)
 Main PID: 28095 (httpd)
   Status: "Total requests: 0; Current requests/sec: 0; Current traffic:   0 B/sec"
   CGroup: /system.slice/httpd.service
           11037 /usr/sbin/httpd -DFOREGROUND
           11038 /usr/sbin/httpd -DFOREGROUND
           11039 /usr/sbin/httpd -DFOREGROUND
```

```
        11040 /usr/sbin/httpd -DFOREGROUND
        11041 /usr/sbin/httpd -DFOREGROUND
        26998 /usr/sbin/httpd -DFOREGROUND
        27426 /usr/sbin/httpd -DFOREGROUND
        27427 /usr/sbin/httpd -DFOREGROUND
        27428 /usr/sbin/httpd -DFOREGROUND
        27889 /usr/sbin/httpd -DFOREGROUND
        28095 /usr/sbin/httpd -DFOREGROUND

May 26 05:50:30 xxxxx systemd[1]: Starting The Apache HTTP Server...
May 26 05:50:30 xxxxx systemd[1]: Started The Apache HTTP Server.
May 27 03:16:01 xxxxx systemd[1]: Reloaded The Apache HTTP Server.
May 28 03:37:01 xxxxx systemd[1]: Reloaded The Apache HTTP Server.
```

Ativar o roteador para obter o endereço IP com DHCP

```
Interface MgmtEth 0/RP0/CPU0/0
Ipv4 address dhcp
Shut/no shut
```

Verificar se o servidor HTTP está funcionando

- Teste se http://<ip-servername> está funcionando.
- Abra um navegador para o endereço IP/nome do servidor.

Se o DHCP ou HTTP falhar, pode haver problemas de firewall ou de alcance.

Para verificar as propriedades do firewall no servidor, execute estes comandos ou adicione os protocolos específicos:

Usar o comando de tabelas IP para verificar as regras de firewall:

```
Iptables -L -n
Chain IN_public_allow (1 references)
target     prot opt source               destination
ACCEPT     udp  --  0.0.0.0/0            0.0.0.0/0                udp dpt:67 ctstate NEW
ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0                tcp dpt:80 ctstate NEW
ACCEPT     tcp  --  0.0.0.0/0            0.0.0.0/0                tcp dpt:22 ctstate NEW
```

Use este comando de firewall para listar as entradas permitidas:

```
[root@xxxxxxxxx ~]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: enp2s0f0
  sources:
  services: dhcp dhcpv6-client http ssh
  ports:
  protocols:
  masquerade: no
  forward-ports:
  sourceports:
  icmp-blocks:
  rich rules:
```

Use os comandos para permitir portas permanentemente:

```
firewall-cmd --permanent --add-service=http
firewall-cmd --permanent --add-service=dhcp
```
Ativar a captura de pacotes no servidor DHCP:

```
tcpdump -i <interface id> port (bootpc & bootps & port http) -s 0(buffer size) -w <dest. File
name>
```

```
ex: tcpdump -i enp2s0f0 port 67 or port 68 or port 80 -s 0 -w iPXEboot.pcap
```

Como iniciar o ZTP?

Iniciar ZTP manualmente

Use o comando **ZTP start** exec CLI para chamar ZTP. Por padrão, a interface usada para ZTP é MGMTEth. Para iniciar esse processo em outras interfaces, use esta opção:

```
ZTP initiate interface <type> <number> <cr>
```
OU

```
Ztp initiate <cr>
```
Inicialize o roteador com iPXE

1. A partir de Calvados, inicie o comando reload CLI:

Esse comando faz com que um roteador seja recarregado, iniciando a inicialização do iPXE.

> **Note**: As informações de classe de usuário são interpretadas como uma **opção mal formada** devido a um bug no Wireshark.

2. O roteador inicia o DHCP Discover, observe que a classe de usuário é preenchida com a opção iPXE:

```
43 2017-05-26 04:55:24.207214 172.16.58.…  172.16.58.212  DHCP    342 DHCP Offer    - Transaction ID 0xf2e1f250
44 2017-05-26 04:55:24.208101 172.16.58.…  172.16.58.212  DHCP    342 DHCP ACK      - Transaction ID 0xf2e1f250
45 2017-05-26 04:56:09.890179 0.0.0.0       255.255.255.…  DHCP    449 DHCP Discover - Transaction ID 0x97c7ee55
```

▼ Instance of User Class: [0]
   User Class Length: 105
  ▼ [Expert Info (Error/Protocol): User Class Information: malformed option]
    [User Class Information: malformed option]
    [Severity level: Error]
    [Group: Protocol]

NCS5K->DHCP Server

▼ Option: (55) Parameter Request List
   Length: 22
   Parameter Request List Item: (1) Subnet Mask
   Parameter Request List Item: (3) Router
   Parameter Request List Item: (6) Domain Name Server
   Parameter Request List Item: (7) Log Server
   Parameter Request List Item: (12) Host Name
   Parameter Request List Item: (15) Domain Name
   Parameter Request List Item: (17) Root Path
   Parameter Request List Item: (43) Vendor-Specific Information
   Parameter Request List Item: (60) Vendor class identifier
   Parameter Request List Item: (66) TFTP Server Name
   Parameter Request List Item: (67) Bootfile name
   Parameter Request List Item: (119) Domain Search
   Parameter Request List Item: (128) DOCSIS full security server IP [TODO]

```
00e0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00f0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0100  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0110  00 00 00 00 00 00 63 82  53 63 35 01 01 39 02 05   ......c. Sc5..9..
0120  c0 5d 02 00 09 5e 03 01  03 0a 4d 04 69 50 58 45   .]...^.. ..M.iPXE
0130  37 16 01 03 06 07 0c 0f  11 2b 3c 42 43 77 80 81   7....... .+<BCw..
0140  82 83 84 85 86 87 af cb  af 24 b1 05 01 80 86 15   ........ .$......
0150  21 eb 03 01 00 00 17 01  01 24 01 01 13 01 01 2a   !....... .$.....*
0160  01 01 27 01 01 20 01 01  15 01 01 26 01 01 3d 0b   ..'.. .. ...&..=.
0170  46 4f 43 32 30 32 36 52  33 38 5a 3c 30 50 58 45   FOC2026R 38Z<0PXE
0180  43 6c 69 65 6e 74 3a 41  72 63 68 3a 30 30 30 30   Client:A rch:0000
0190  39 3a 55 4e 44 49 3a 30  30 33 30 31 30 3a 50 49   9:UNDI:0 03010:PI
01a0  44 3a 4e 43 53 2d 35 35  30 32 2d 53 45 61 11 00   D:NCS-55 02-SEa..
01b0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
01c0  ff                                                 .
```

User-class info

3. A oferta DHCP do servidor inclui o nome do arquivo de inicialização na Opção 67:

No.	Time	Source	Destination	Protocol	Length	Info
46	2017-05-26 04:56:09.890388	172.16.58.115	172.16.58.110	DHCP	342	DHCP Offer - Transaction ID 0x97c7ee55
47	2017-05-26 04:56:10.889556	0.0.0.0	255.255.255.…	DHCP	449	DHCP Discover - Transaction ID 0x97c7ee55
48	2017-05-26 04:56:10.889765	172.16.58.115	172.16.58.110	DHCP	342	DHCP Offer - Transaction ID 0x97c7ee55

   Hardware type: Ethernet (0x01)
   Hardware address length: 6
   Hops: 0
   Transaction ID: 0x97c7ee55
   Seconds elapsed: 4

DHCPServer -> NCS5K

▶ Bootp flags: 0x0000 (Unicast)
   Client IP address: 0.0.0.0
   Your (client) IP address: 172.16.58.110
   Next server IP address: 0.0.0.0
   Relay agent IP address: 0.0.0.0
   Client MAC address: Cisco_1c:a5:1a (00:62:ec:1c:a5:1a)
   Client hardware address padding: 00000000000000000000
   Server host name not given
   Boot file name: http://172.16.58.115/images/ncs5500-mini-x.iso-6.1.2
   Magic cookie: DHCP

Server responds with Boot file information

▶ Option: (53) DHCP Message Type (Offer)
▶ Option: (54) DHCP Server Identifier
▶ Option: (51) IP Address Lease Time
▶ Option: (1) Subnet Mask
▶ Option: (3) Router
▶ Option: (6) Domain Name Server

```
0000  00 62 ec 1c a5 1a cc 46  d6 f8 8f 86 08 00 45 10   .b.....F ......E.
0010  01 48 00 00 00 00 80 11  6c 93 ac 10 3a 73 ac 10   .H...... l...:s..
0020  3a 6e 00 43 00 44 01 34  5d 97 02 01 06 00 97 c7   :n.C.D.4 ].......
0030  ee 55 00 04 00 00 00 00  00 00 ac 10 3a 6e 00 00   .U...... ....:n..
0040  00 00 00 00 00 00 00 62  ec 1c a5 1a 00 00 00 00   .......b ........
0050  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0060  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0070  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0080  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0090  00 00 00 00 00 00 68 74  74 70 3a 2f 2f 31 37 32   ......ht tp://172
00a0  2e 31 36 2e 35 38 2e 31  31 35 2f 69 6d 61 67 65   .16.58.1 15/image
00b0  73 2f 6e 63 73 35 35 30  30 2d 6d 69 6e 69 2d 78   s/ncs550 0-mini-x
00c0  2e 69 73 6f 2d 36 2e 31  2e 32 00 00 00 00 00 00   .iso-6.1 .2......
00d0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00e0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
```

4. O roteador inicia o download da imagem:

No.	Time	Source	Destination	Protocol	Length	Info
46	2017-05-26 04:56:09.890388	172.16.58.115	172.16.58.110	DHCP	342	DHCP Offer - Transaction ID 0x97c7ee55
47	2017-05-26 04:56:10.889556	0.0.0.0	255.255.255.…	DHCP	449	DHCP Discover - Transaction ID 0x97c7ee55
48	2017-05-26 04:56:10.889765	172.16.58.115	172.16.58.110	DHCP	342	DHCP Offer - Transaction ID 0x97c7ee55
49	2017-05-26 04:56:12.888299	0.0.0.0	255.255.255.…	DHCP	461	DHCP Request - Transaction ID 0x97c7ee55
50	2017-05-26 04:56:12.888506	172.16.58.115	172.16.58.110	DHCP	342	DHCP ACK - Transaction ID 0x97c7ee55
51	2017-05-26 04:56:25.659940	172.16.58.110	172.16.58.115	TCP	74	36332 → 80 [SYN] Seq=0 Win=65532 Len=0 TSval=36…
52	2017-05-26 04:56:25.660031	172.16.58.115	172.16.58.110	TCP	74	80 → 36332 [SYN, ACK] Seq=0 Ack=1 Win=28960 Len…
53	2017-05-26 04:56:25.660153	172.16.58.110	172.16.58.115	HTTP	168	GET /images/ncs5500-mini-x.iso-6.1.2 HTTP/1.1
54	2017-05-26 04:56:25.660206	172.16.58.115	172.16.58.110	TCP	66	80 → 36332 [ACK] Seq=1 Ack=103 Win=29056 Len=0 …
55	2017-05-26 04:56:25.661660	172.16.58.115	172.16.58.110	TCP	14546	[TCP segment of a reassembled PDU]
56	2017-05-26 04:56:25.661864	172.16.58.115	172.16.58.110	TCP	66	36332 → 80 [ACK] Seq=103 Ack=4345 Win=262144 Le…
57	2017-05-26 04:56:25.661918	172.16.58.115	172.16.58.110	TCP	8754	[TCP segment of a reassembled PDU]

▶ Frame 53: 168 bytes on wire (1344 bits), 168 bytes captured (1344 bits)
▶ Ethernet II, Src: Cisco_1c:a5:1a (00:62:ec:1c:a5:1a), Dst: Cisco_f8:8f:86 (cc:46:d6:f8:8f:86)
▶ Internet Protocol Version 4, Src: 172.16.58.110, Dst: 172.16.58.115
▼ Transmission Control Protocol, Src Port: 36332, Dst Port: 80, Seq: 1, Ack: 1, Len: 102
    Source Port: 36332
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 102]
    Sequence number: 1   (relative sequence number)
    [Next sequence number: 103   (relative sequence number)]
    Acknowledgment number: 1   (relative ack number)
    Header Length: 32 bytes
    ▶ Flags: 0x018 (PSH, ACK)

```
0000  cc 46 d6 f8 8f 86 00 62  ec 1c a5 1a 08 00 45 00   .F.....b ......E.
0010  00 9a 09 b3 00 00 40 06  a3 a9 ac 10 3a 6e ac 10   ......@. ....:n..
0020  3a 73 8d ec 00 50 30 83  ab 5e 7a d3 a4 16 80 18   :s...P0. .^z.....
0030  02 00 25 b4 00 00 01 01  08 0a 02 25 c3 af 94 c7   ..%..... ...%....
0040  56 00 47 45 54 20 2f 69  6d 61 67 65 73 2f 6e 63   V.GET /i mages/nc
0050  73 35 35 30 30 2d 6d 69  6e 69 2d 78 2e 69 73 6f   s5500-mi ni-x.iso
0060  2d 36 2e 31 2e 32 20 48  54 54 50 2f 31 2e 31 0d   -6.1.2 H TTP/1.1.
0070  0a 55 73 65 72 2d 41 67  65 6e 74 3a 20 69 50 58   .User-Ag ent: iPX
0080  45 2f 31 2e 30 2e 30 2b  20 28 65 32 39 31 29 0d   E/1.0.0+ (e291).
0090  0a 48 6f 73 74 3a 20 31  37 32 2e 31 36 2e 35 38   .Host: 1 72.16.58
00a0  2e 31 31 35 0d 0a 0d 0a                            .115....
```

NCS5K initiates download of ISO image

5. Depois que a imagem for baixada com êxito, a instalação das imagens no dispositivo começará.

6. Quando o roteador inicializa com êxito com a imagem baixada, ele inicia outra solicitação DHCP:

No.	Time	Source	Destination	Protocol	Length	Info
418654	2017-05-26 05:04:12.051436	172.16.58.115	172.16.58.212	DHCP	342	DHCP Offer - Transaction ID 0xd…
418655	2017-05-26 05:04:12.052378	172.16.58.115	172.16.58.212	DHCP	342	DHCP ACK - Transaction ID 0xd…
418656	2017-05-26 05:06:52.778102	0.0.0.0	255.255.255.…	DHCP	367	DHCP Discover - Transaction ID 0x5…
418657	2017-05-26 05:06:52.778327	172.16.58.115	172.16.58.110	DHCP	342	DHCP Offer - Transaction ID 0x5…
418658	2017-05-26 05:06:52.778626	0.0.0.0	255.255.255.…	DHCP	379	DHCP Request - Transaction ID 0x5…

    Your (client) IP address: 0.0.0.0
    Next server IP address: 0.0.0.0
    Relay agent IP address: 0.0.0.0
    Client MAC address: Cisco_1c:a5:1a (00:62:ec:1c:a5:1a)
    Client hardware address padding: 00000000000000000000
    Server host name not given
    Boot file name not given
    Magic cookie: DHCP
    ▶ Option: (53) DHCP Message Type (Discover)
    ▶ Option: (55) Parameter Request List
    ▼ Option: (60) Vendor class identifier
        Length: 45
        Vendor class identifier: PXEClient:Arch:00009:UNDI:003010:PID:NCS-5500
    ▶ Option: (61) Client identifier
    ▼ Option: (77) User Class Information
        Length: 10
        ▶ Instance of User Class: [0]
    ▼ Option: (255) End
        Option End: 255

NCS5K-> DHCP Server

```
0080  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0090  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00a0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00b0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00c0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00d0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00e0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
00f0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0100  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ........ ........
0110  00 00 00 00 00 00 63 82  53 63 35 01 01 37 07 01   ......c. Sc5..7..
0120  1c 02 03 0f 06 0c 3c 2d  50 58 45 43 6c 69 65 6e   ......<- PXEClien
0130  74 3a 41 72 63 68 3a 30  30 30 30 39 3a 55 4e 44   t:Arch:0 0009:UND
0140  49 3a 30 30 33 30 31 30  3a 50 49 44 3a 4e 43 53   I:003010 :PID:NCS
0150  2d 35 35 30 30 3d 0b 46  4f 43 32 30 32 36 52 33   -5500=.F OC2026R3
0160  38 5a 4d 0a 65 78 72 2d  63 6f 6e 66 69 67 ff      8ZM.exr- config.
```

NCS user-class has info on "exr-config"

Nesta descoberta, observe que as informações de classe de usuário incluem ***.exr-config**. Como o DHCP está configurado para retornar o **arquivo de configuração** ou o **script** (por exemplo, Outra declaração em **etc/dhcp/dhcpd.conf**).

7. O servidor DHCP retorna as informações de arquivo necessárias na opção 67:

8. O roteador faz o download da configuração:

O script pode ser incluído como uma resposta do servidor DHCP e fazer com que ele copie a imagem/configuração. Isso também pode ser usado como um script pós-instalação, como no exemplo abaixo.

Automação pós-instalação

Várias automações podem ser realizadas após a instalação no software eXR.

Neste exemplo, este script instala todos os pacotes necessários e aplica a configuração. Esta é uma versão ligeiramente modificada de **ztp_helper.sh**. Este script é chamado de xr-linux-shell:

```
RP/0/RP0/CPU0:NCS-5502-A#more disk0:/ztp/ztp_helper_file.sh
Wed May 31 00:55:54.529 UTC
#!/bin/bash
##########################################################################
# Install config and additional packages
##########################################################################

source /disk0:/ztp/ztp_helper.sh

export HTTP_SERVER=http://10.10.10.10
export RPM_PATH=images
export CONFIG_PATH=images
#Config
export INITIAL_CONFIG=NCS-5502-A.cfg
export FINAL_CONFIG=NCS-5502-A.cfg

#Packages
K9SEC_RPM=ncs5500-k9sec-2.2.0.0-r612.x86_64.rpm
MCAST_RPM=ncs5500-mcast-2.0.0.0-r612.x86_64.rpm
```

```
ISIS_RPM=ncs5500-isis-1.1.0.0-r612.x86_64.rpm
OSPF_RPM=ncs5500-ospf-1.1.0.0-r612.x86_64.rpm
MGBL_RPM=ncs5500-mgbl-3.0.0.0-r612.x86_64.rpm
MPLS_RPM=ncs5500-mpls-2.1.0.0-r612.x86_64.rpm
MPLSTE_RPM=ncs5500-mpls-te-rsvp-2.2.0.0-r612.x86_64.rpm


function download_config(){
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${CONFIG_PATH}/${FINAL_CONFIG} -O
/harddisk:/new-config 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading system configuration ###"
    else
        printf "### Downloading system configuration complete ###";
    fi
}


function apply_config(){
        # Applies initial configuration
    printf "### Applying initial system configuration ###";
    xrapply_with_reason "Initial ZTP configuration" /harddisk:/new-config 2>&1;
    printf "### Checking for errors ###";
    local config_status=$(xrcmd "show configuration failed");
    if [[ $config_status ]]; then
        echo $config_status
        printf "!!! Error encounter applying configuration file, review the log !!!!";
    fi
    printf "### Applying system configuration complete ###";
}


function install_pkg(){
        #Download packages
        printf "Downloading Packages"
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${RPM_PATH}/${K9SEC_RPM} -O
/harddisk:/$K9SEC_RPM 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading $K9SEC_RPM ###"
    else
        printf "### Downloading $K9SEC_PKG complete ###";
    fi

    printf "Downloading Packages"
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${RPM_PATH}/${MCAST_RPM} -O
/harddisk:/$MCAST_RPM 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading $MCAST_RPM ###"
    else
        printf "### Downloading $MCAST_RPM complete ###";
    fi

    printf "Downloading Packages"
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${RPM_PATH}/${ISIS_RPM} -O
/harddisk:/$ISIS_RPM 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading $ISIS_RPM ###"
    else
        printf "### Downloading $ISIS_RPM complete ###";
    fi

    printf "Downloading Packages"
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${RPM_PATH}/${OSPF_RPM} -O
/harddisk:/$OSPF_RPM 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading $OSPF_RPM ###"
    else
```

```
        printf "### Downloading $OSPF_RPM complete ###";
    fi
    printf "Downloading Packages"
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${RPM_PATH}/${MGBL_RPM} -O
/harddisk:/$MGBL_RPM 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading $MGBL_RPM ###"
    else
        printf "### Downloading $MGBL_RPM complete ###";
    fi

     printf "Downloading Packages"
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${RPM_PATH}/${MPLS_RPM} -O
/harddisk:/$MPLS_RPM 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading $MPLS_RPM ###"
    else
        printf "### Downloading $MPLS_RPM complete ###";
    fi
      printf "Downloading Packages"
        ip netns exec tpnns /usr/bin/wget ${HTTP_SERVER}/${RPM_PATH}/${MPLSTE_RPM} -O
/harddisk:/$MPLSTE_RPM 2>&1
        if [[ "$?" != 0 ]]; then
        printf "### Error downloading $MPLSTE_RPM ###"
    else
        printf "### Downloading $MPLSTE_RPM complete ###";
    fi

    xrcmd "install update source /harddisk:/ $K9SEC_RPM $MCAST_RPM $ISIS_RPM $OSPF_RPM $MGBL_RPM
$MPLS_RPM $MPLSTE_RPM" 2>&1
  local complete=0
  while [ "$complete" = 0 ]; do
        complete=`xrcmd "show install active" | grep k9sec | head -n1 | wc -l`
        printf "Waiting for k9sec package to be activated"
        sleep 5
    done
    rm -f /harddisk:/$K9SEC_RPM /harddisk:/$MCAST_RPM /harddisk:/$MCAST_RPM /harddisk:/$ISIS_RPM
/harddisk:/$OSPF_RPM /harddisk:/$MGBL_RPM /harddisk:/$MPLSTE_RPM /harddisk:/$MPLS_RPM
    printf "### XR PACKAGE INSTALL COMPLETE ###"
}

printf "Start Auto provision"
install_pkg;
download_config;
apply_config;
```

Informações Relacionadas

- https://xrdocs.github.io/software-management/tutorials/2016-08-26-working-with-ztp/
- https://xrdocs.github.io/software-management/tutorials/2016-07-27-ipxe-deep-dive/
- https://xrdocs.github.io/software-management/blogs/2016-10-14-ios-xr-packages-and-security/