Creating a PXE Boot Environment with TinyCore

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For supplementary content visit www.andydoestech.com/olf2018.html
Objective

- Gain a general understanding of PXE Boot functionality
- Learn how to configure dnsmasq to provide necessary services
- Learn how to create custom remixes of TinyCore Linux for use in a PXE environment
What is PXE Boot?

Preboot eXecution Environment

Definition:

Provides functionality to provision an in-memory boot environment on client machines using DHCP and TFTP
How DHCP Works

1. Broadcast request for available DHCP servers
2. Response from available DHCP server
3. Request for IP address from DHCP server
4. Response with available IP Address
## DHCP Options

### Packet Structure

<table>
<thead>
<tr>
<th>IP Headers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Host Config Data (IP address)</td>
</tr>
<tr>
<td>DHCP Options</td>
</tr>
</tbody>
</table>

### Options include:

- Lease information
- Router(s)
- DNS
- Time
- TFTP server
Trivial File Transfer Protocol (TFTP)

- No Authentication/Authorization
- No directory browsing capabilities
- Get/Put file using whole path

\[ \text{Low operational overhead} \quad \text{Simple to implement} \]
PXE Booting Linux

- Request DHCP Lease
- Receive IP Lease w/ boot configuration
  - Bootloader file location (full path on server)
  - TFTP server address
  - Bootloader configuration (path relative to TFTP root)
  - Working Directory (relative to TFTP root)

- Load necessary bootfiles via TFTP
  - pxelinux.0 – PXE Firmware
  - vmlinuz – kernel
  - initrd – init ramdisk
Preparing the Boot Environment

• Step 1: Configure DNSMasq
  - DHCP server (with options)
    • dhcp-boot=<pxelinux.0-full-path>[,<TFTP-address>]
    • dhcp-option-force
      - 209 – pxelinux configuration file (isolinux.cfg)
      - 210 – pxelinux path prefix
      - 66 – TFTP server address
  - TFTP
    • enable-tftp
    • tftp-root=<full-path-tftp root>
Preparing the Boot Environment

- Step 2: Obtain pxelinux.0 firmware file
  - Contained within the syslinux project
  - Shortcut: Download syslinux-4.04.tar.gz (contains pre-built binary)
Preparing the Boot Environment

- Step 3: Obtain content of /boot folder from TinyCore ISO
  - Mount ISO image as loop device (mount -o loop)
  - Copy the content including:
    - core.gz – init ramdisk
    - vmlinux – kernel
    - isolinux folder – boot menu
Preparing the Boot Environment

- Step 4: Configure init ramdisk to boot as desired
  - Decompress and extract core.gz (using inity.sh)
  - Download necessary TCZ packages (using getcz.sh)
  - Modify startup commands (located in /etc/profile)
    - Install TCZ packages on boot
    - Start xwindows (if necessary)
  - Add files and compress new core.gz file
Preparing the Boot Environment

- Step 5: Add new configuration to isolinux.cfg
  - LABEL <environment-short-name>
  - MENU <environment-descriptive-name>
  - KERNEL <relative-TFTP-path>
  - INITRD <relative-TFTP-path>
Ready to Boot

- Remember to configure BIOS to allow PXE/Network boot
- All in memory
Something else…..booting raw disk images

• Copy disk image to TFTP server
• Copy memdisk from syslinux-4.04.tar.gz to boot folder
• Modify isolinux.cfg
  – KERNEL /boot/memdisk
  – INITRD <DISK-IMAGE>
Demo Time!!

Questions!!!