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## NETWORK BOOTING STRESS LAB - A BETTER TEST SCENARIO FOR VALIDATING THE PXE BOOT FUNCTIONALITY

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## Network Booting Stress Lab

- A better test scenario for validating the PXE boot functionality

### **Abstract**

PXE Stress Lab is an architecture for network booting stress; it could be used to replace the existing PXE stress test tool, called ETD PXE Stress tool. The PXE Stress Lab could have more propinquity to a real DASH process environment.

A validation team could rely on this new test architecture to simulate a real DASH process. Not only can it test the fundamental function of PXE for network devices and BIOS “boot from LAN” function, but it can also validate the quality of network topology in the ODM factory. It can really help to get to mass production launch successfully.

### **Background**

Network Booting is a key portion for operating system (OS) image deployment during the PC manufacturing process. Preboot eXecution Environment (PXE) is used to let a target system boot into a RAM Disk (for example, WinPE) for the OS preinstall process. Since the stability of network booting is an important factor for PC mass production, improving the stability of PXE becomes an important item as well.

Data Applied to the System Hard-Disk (DASH) process is the SW download process to the system build. A specific toolset and requirements are used for the DASH process. “WDT” (Windows Download Tool) is a part of the DASH process. PRISM servers include a Microsoft Windows Deployment Server (WDS). The target machine will boot from a network (PXE) to load the WDT (WinPE) image into system memory as a preinstall environment.

A tester or factory operator needs to boot up the system from the network (PXE boot) as the first step for the SW download process. If the PXE fails, they will restart the unit and try again. The PXE boot not only occurs one time during DASH process, it will boot from the network several times as a process design (such as WDTHook, OA3Injection, WDT logout). Any PXE failure would interrupt the process, then drive to a DASH failure (RedScreen). This is why the PXE stability is so important.

Based on the above opinions, the Validation team maintains the test plan to cover the PXE stability. They use the ETD tool to perform the PXE stability test. It's the PXE stress test by a Linux PXE environment. It can test the fundamental function of PXE, but cannot guarantee the stability under a real DASH environment that builds on more complex architecture (including DHCP, WDS servers, and can go through multiple routers/switches on complex network topology).

R&D and validation teams need to ensure the stability of the boot from network function. A failure rate even less than 2% cannot be accepted since it would impact the production throughput at the factory site.

### **Problems Solved**

Validation teams have submitted numerous issues that reported “boot device not found.” By investigation, it's caused by a boot from network failure when trying to do WDT logout.

Those problems are usually caused by a sudden network environment problem, and the debug team needs to conduct many debugging efforts to arrive at this conclusion.

Our idea is creating a test case that uses the PRSIM server (the actual server that used for DASH) and add a sub-item call “PXE Loop Test.”

“PXE Loop Test” uses the same WinPE environment as WDT, only needing to add a WDTHook to perform “Restart” and “logging test logs.” It could help simulate and stress test the real DASH scenario for the PXE portion. It could also verify if the ODM factory has enough stability for the mass production process.

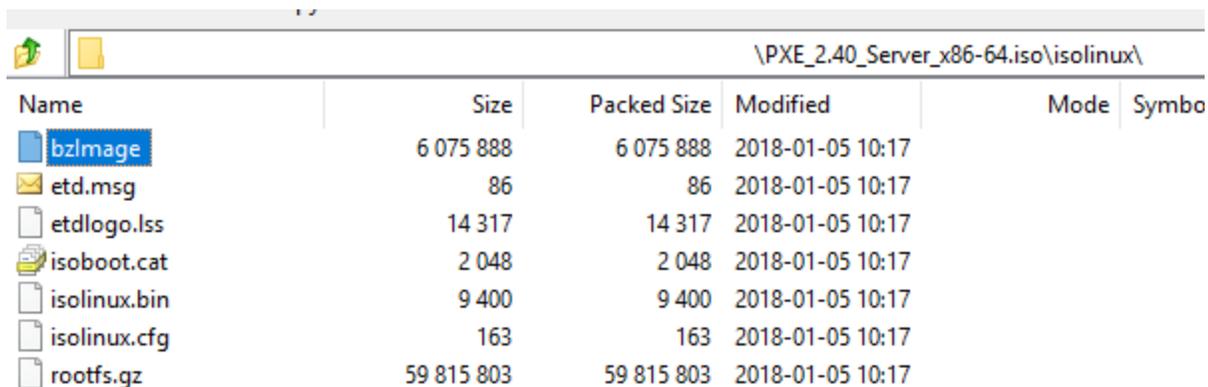
### **Prior Solutions**

As mentioned in the “background” above, a validation team uses the ETD PXE Boot Tool/script to stress the network booting function. The ETD PXE test environment is based on the Linux kernel. It’s a Linux kernel PXE boot loader on the host site.

The boot image named “bzImage” is a Linux kernel OS (see below, Figure 1). It will be loaded into system memory as a RAM Disk. It’s similar to the WinPE environment but with limited features compared with WinPE.

The validation team uses the simple network topology to perform the PXE stress test with “ETD PXE Boot Tool.” It doesn’t connect into the real DASH/PRISM network environment.

It’s fine to verify the fundamental boot-from-LAN function, however, it cannot verify the stability of a real DASH/PRISM environment.



Name	Size	Packed Size	Modified	Mode	Symbo
bzImage	6 075 888	6 075 888	2018-01-05 10:17		
etd.msg	86	86	2018-01-05 10:17		
etdlogo.lss	14 317	14 317	2018-01-05 10:17		
isoboot.cat	2 048	2 048	2018-01-05 10:17		
isolinux.bin	9 400	9 400	2018-01-05 10:17		
isolinux.cfg	163	163	2018-01-05 10:17		
rootfs.gz	59 815 803	59 815 803	2018-01-05 10:17		

**Figure 1.**

### **Detail Design**

Test procedure:

1. Connect the target system to PRISM environment with DASH port
2. Boot up the system and boot from network (F12), then the system will boot into PRISM
3. Select “PXE Loop Test” from the startup menu (such as “Toast”/ “WDT,” etc.)

4. The system will boot into a WinPE (the boot image located in a remote PRISM WDS server as WDT)
  - 4.1 Backup the original GPT/MBR partition header of local system disk
  - 4.2 Delete the local system disk header to let the system run in a non-OS environment; it could force the system boot from network as DASH process design
  - 4.3 The scripts in this "PXE Loop Test" image will perform a looping stress test, let logs file save into PRISM server (like DASH prism logs)
  - 4.4 Design a program (.exe) to monitor the test process; the test could be terminated by pressing specific hot-key (e.g., Ctrl+T)
  - 4.5 It also can log more test information and log into log file; it could help with debugging and error collections  
for example:  
*REM === PXE Loop Test script ===*  
*timeout /t 30*  
*Wpeutil.exe reboot*
  - 4.6 The GPT/MBR table will be restored after the test is terminated

We can design the tool to config the test arguments like cycles, wait time, or timeout value. It should list into the regular test plan for the validation team to ensure the ability of the lab and factory.

### **Advantages**

- Realistic, it's closer to the real DASH process and PRISM environment.
- Easy to implement. We can base it on the existing PRISM environment and WDT design to develop this new test tool. We only need to create a specific WinPE boot image for this PXE test script.
- Improve product quality. Adding this tool into the regular test plan will produce better product quality for the PXE function. It will also help to verify the network throughput and stability of the ODM factory site.
- Reduce debug efforts. This will reduce R&D debugging efforts for issues that are related to PXE stability. As mentioned above, these kinds of issues usually depend on network performance and specific network topology with intermittent failure rate. R&D needs to provide a lot of effort to prove the functionality of the PXE boot. Once we have confidence with this test item, issues could be directed into the right direction easily.

*Disclosed by Koni Li, Carrie Liao, Edward Kuo, and Bill Su, HP Inc.*