Using Windows XP Embedded Based Systems in a Control System

Tim Gray, Bob Mannix
ISIS Controls Group
STFC, Rutherford Appleton Laboratory
UK

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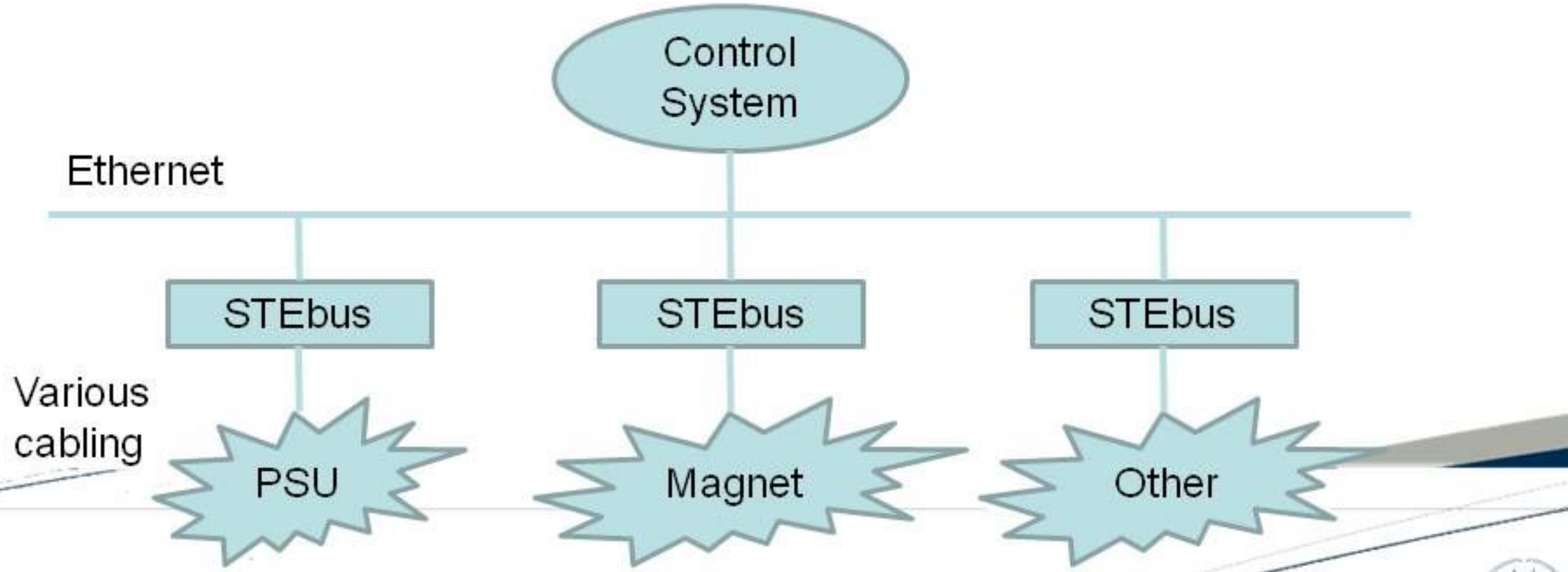
Presentation Outline

- Why did we do this?
- Platform choices.
- Building a Windows XP Embedded Image.
- The application program.

Why did we do this?

- Needed a platform to interface between VSystem software and various types of hardware: magnets, power supplies etc.



Platform Choices

Hardware:

- CompactPCI based
- J2 Connector for rear IO

An example chassis

A picture of a fully configured chassis. This is the Central Timing Distributor (CTD) for ISIS, a fairly important piece of equipment!!

Platform Choices

Operating System:

- Windows CE Embedded
- Windows XP Embedded
- Embedded Linux
- QNX

BUILDING A WINDOWS XP EMBEDDED IMAGE

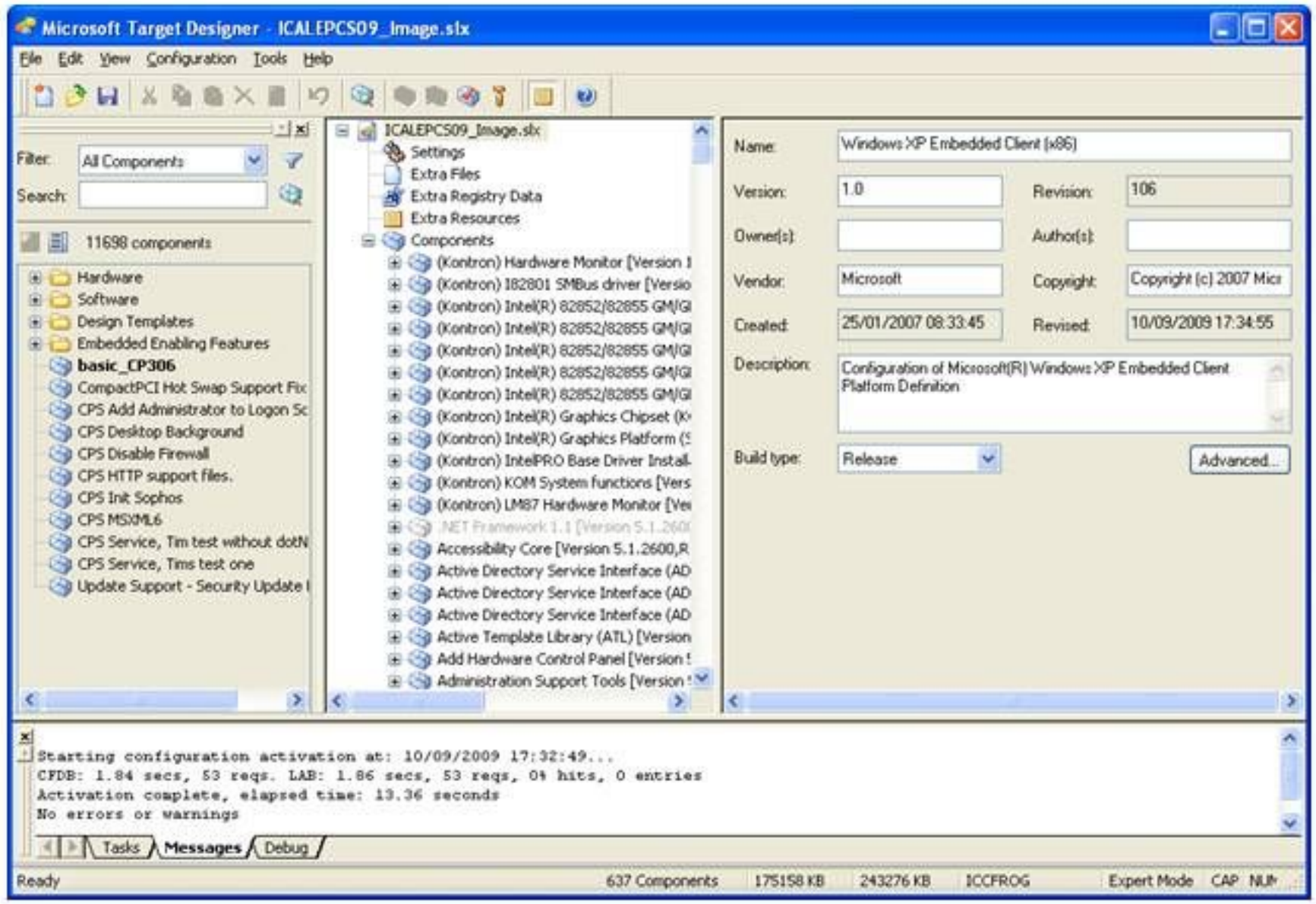
Windows Embedded Studio

- Target Analyzer
- Component Database Manager
- Target Designer
- Component Designer
- SDI Loader & sdimgr.exe
- Remote Boot Manager

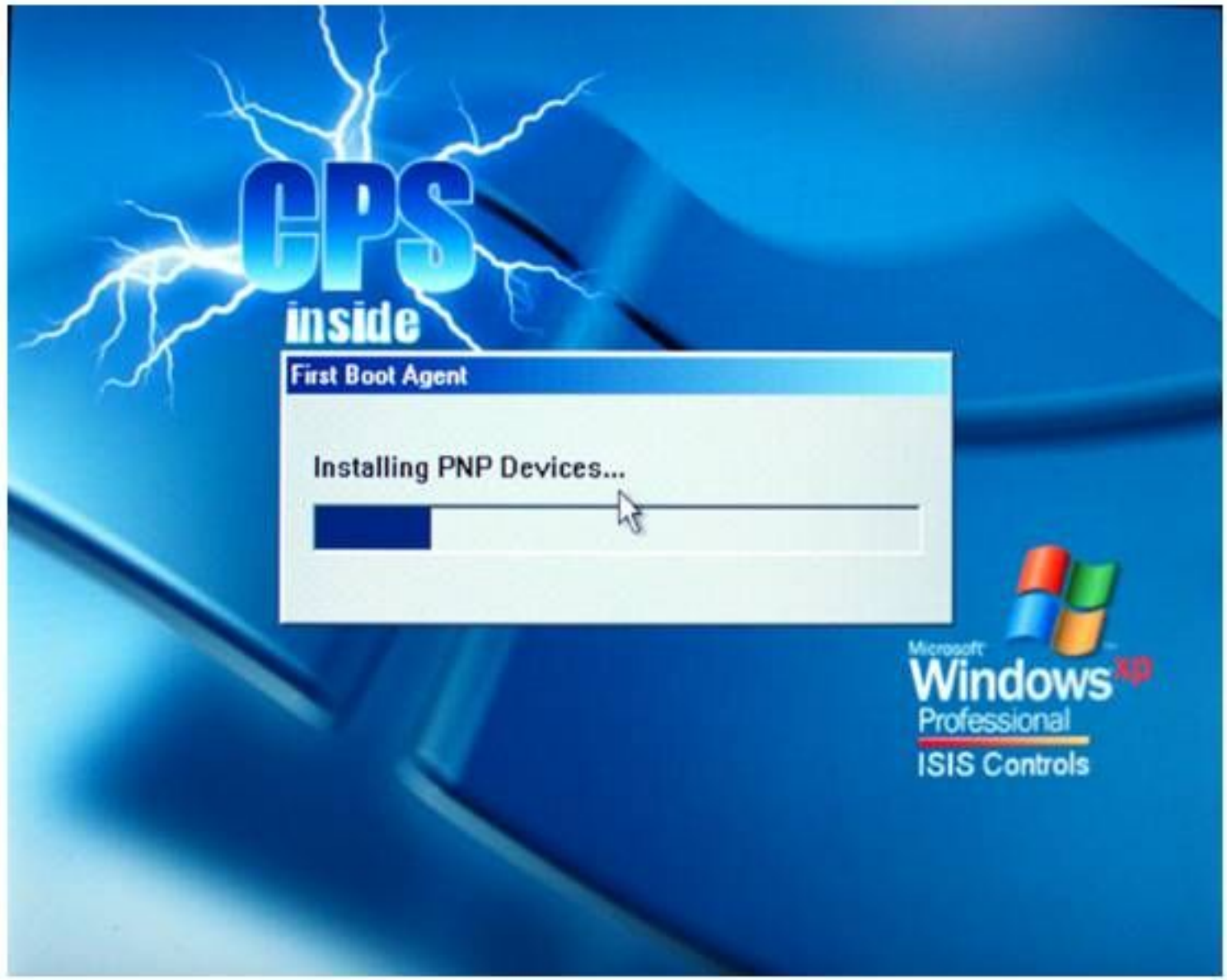
Beginning with XP Embedded

- Windows XP Embedded is component based.
- Using a Board Support Package (BSP)
- Analyze your target hardware.

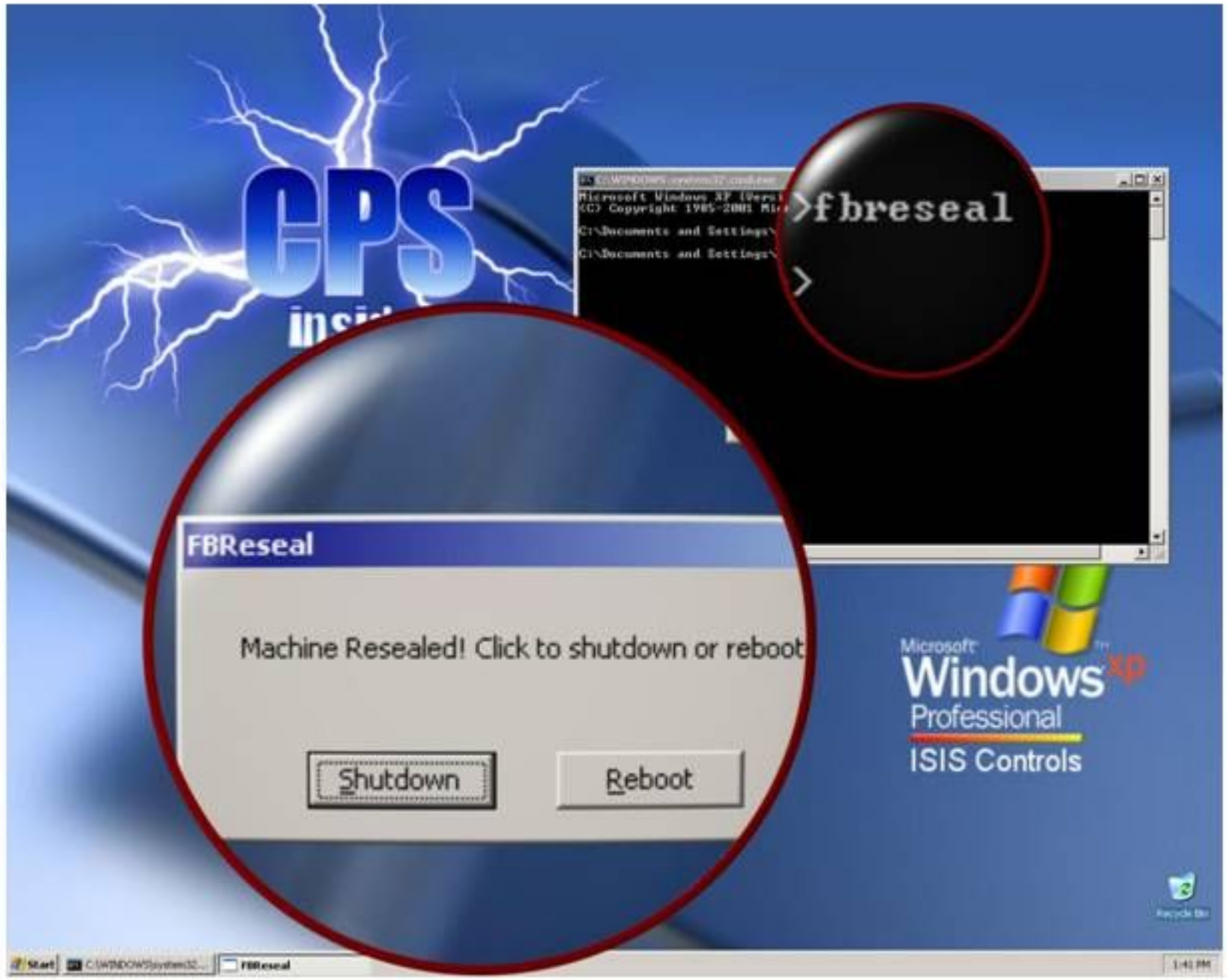
Target Designer

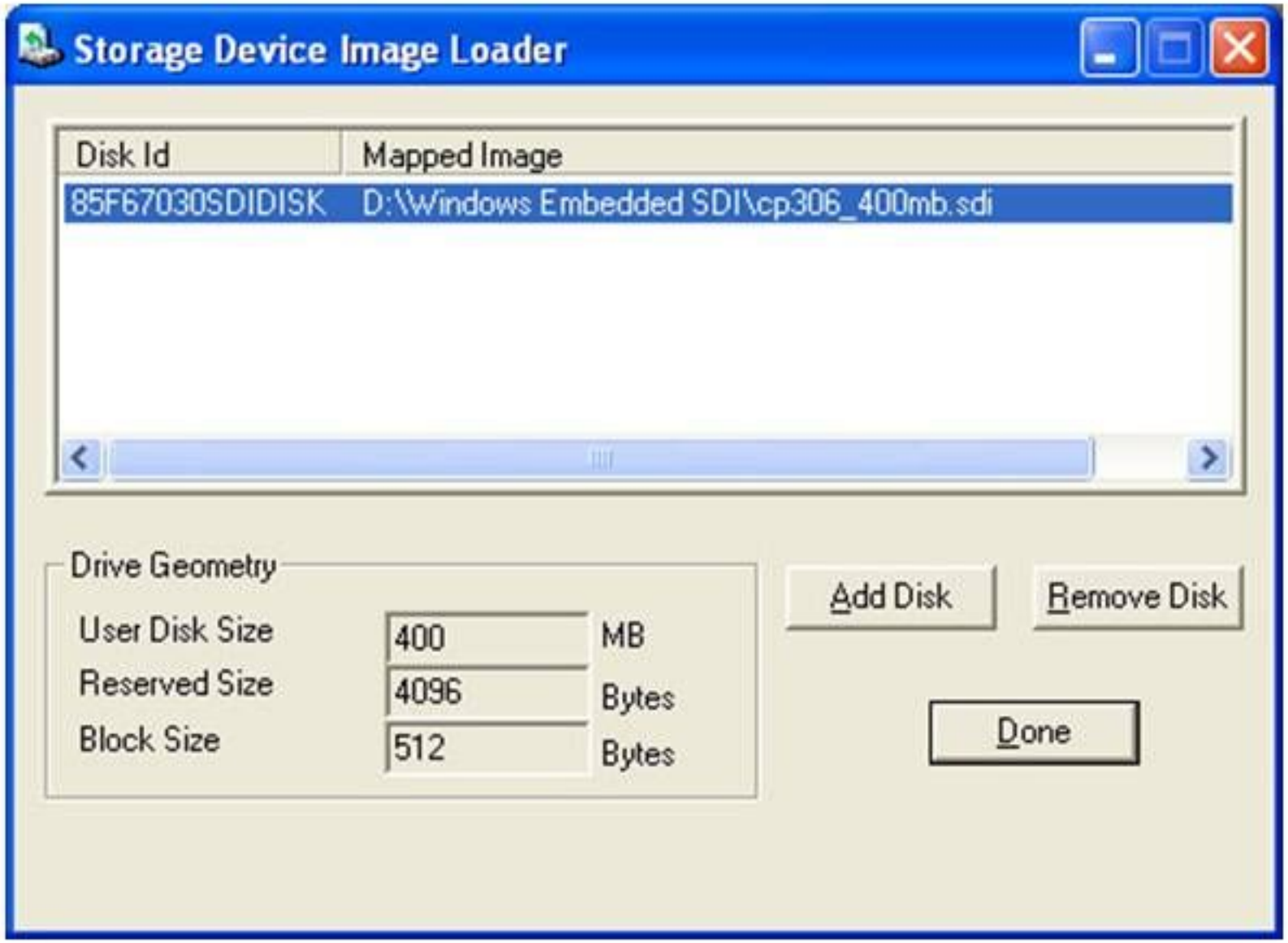


First Boot Agent (FBA)



Fbreseal

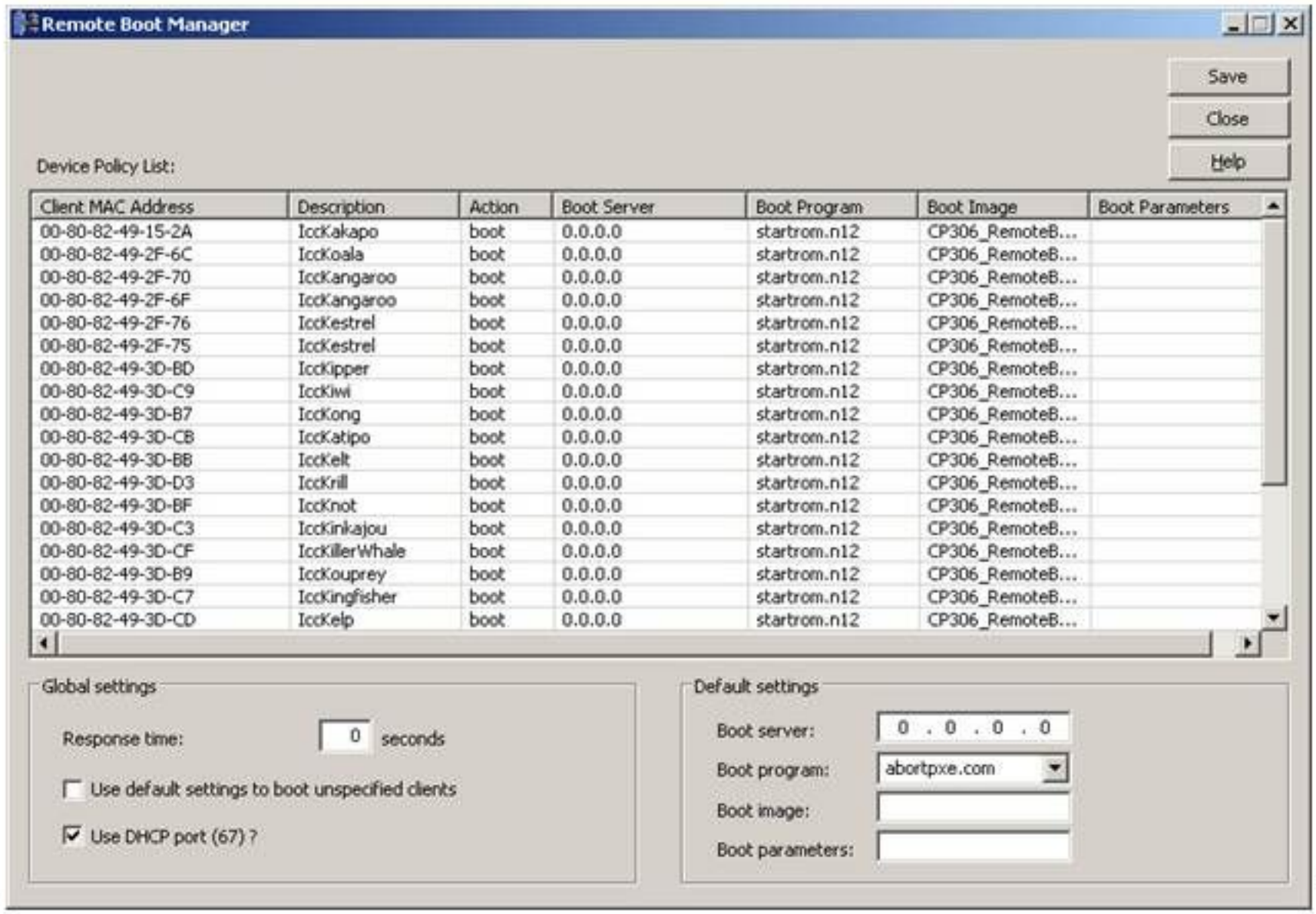

CPS
>fbreseal
FBReseal
Machine Resealed! Click to shutdown or reboot
Shutdown
Reboot
Microsoft
Windows xp
Professional
ISIS Controls



SDI Loader.

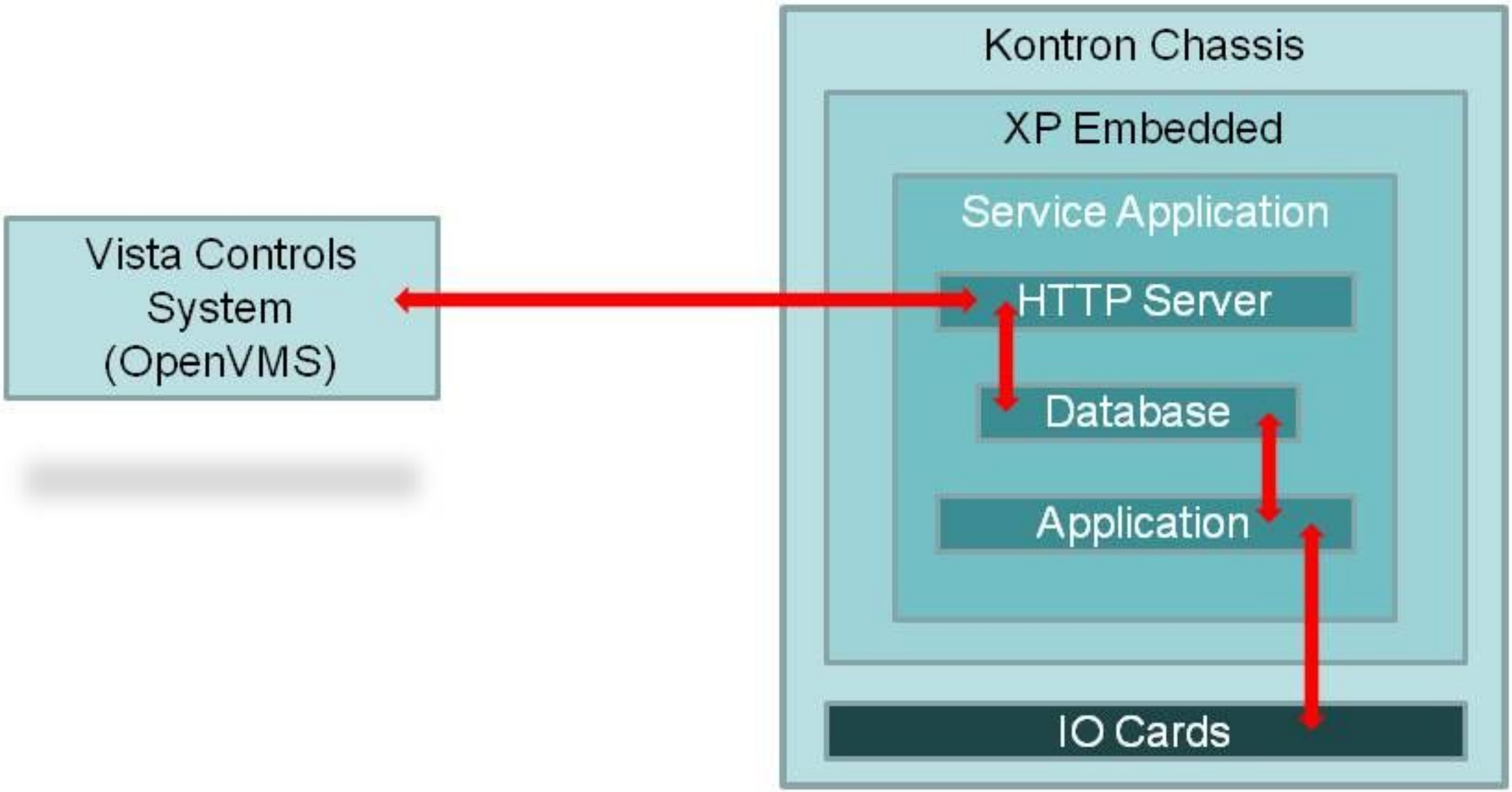
SDI Loader is used to create a network boot file to use in conjunction with the PXE protocol in a compatible BIOS.

Remote Boot Manager



THE APPLICATION PROGRAM

Application Layout



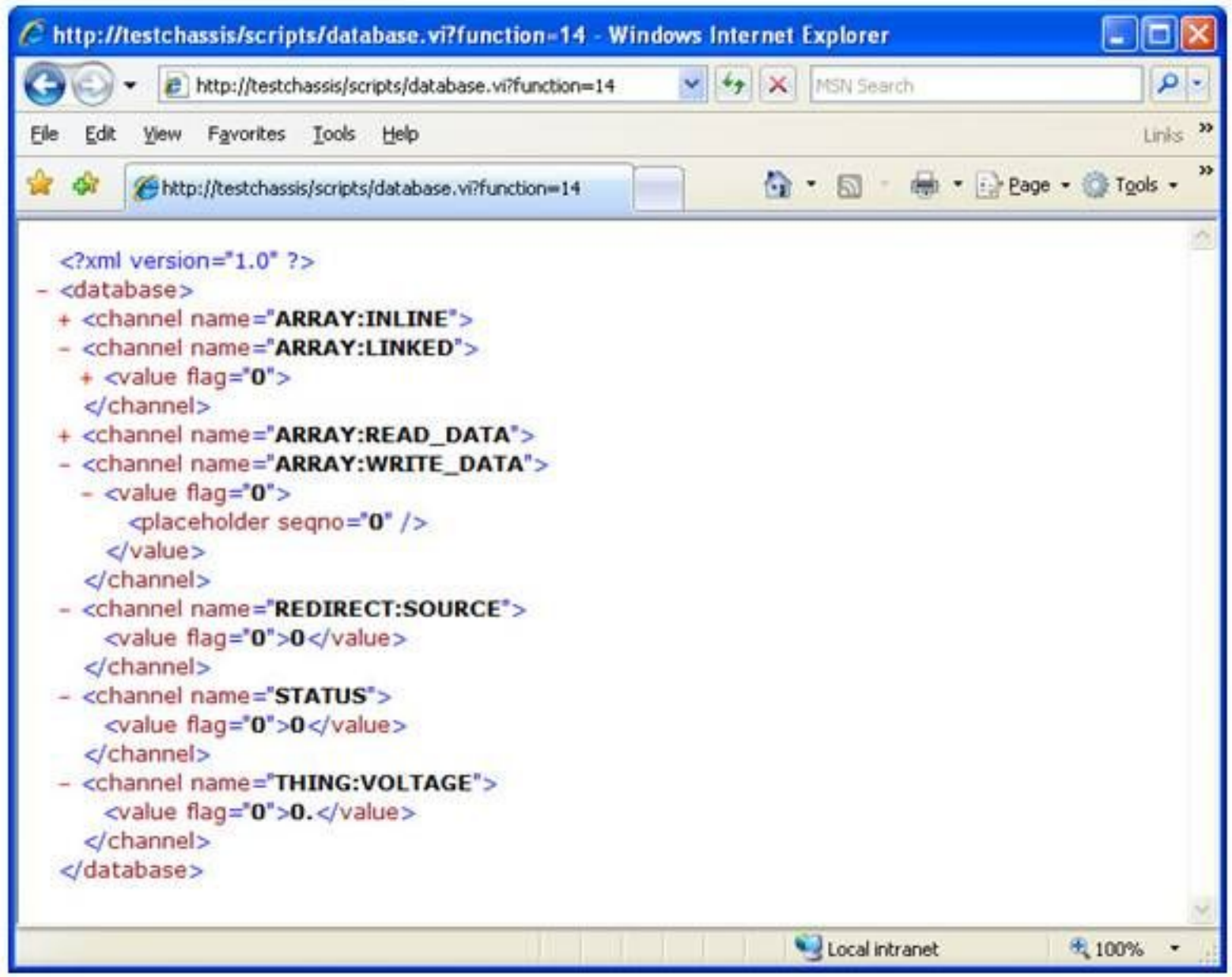
```
POST /scripts/database.vi?function=15 HTTP/1.1
Content-Length: 1639

<?xml version="1.0" encoding="UTF-8"?>

<database>
    <channel name="THING:VOLTAGE">
        <params type="integer" activity="1" cid="1" slot="2">
            <hparams>1 2 3 4 5</hparams>
            <cparams>3.1 1.5</cparams>
        </params>
    </channel>
    <channel name="ARRAY:READ_DATA">
        <params type="integer" size="10" activity="1" function="4">
            <hparams>1 2 3 4 5</hparams>
            <sparams>FTO</sparams>
        </params>
    </channel>
    <channel name="REMOTE:FREQUENCY">
        <params type="integer" activity="2">
            <hparams>1 2 3 4 5</hparams>
        </params>
    </channel>
    <channel name="REMOTE:DEBUGLEVEL">
    <channel name="THING:RESISTANCE">
        <params type="float" activity="1" cid="5" slot="1">
            <hparams>1 2 3 4 5</hparams>
            <cparams>4.1 1.1</cparams>
        </params>
    </channel>
            <sparams>FTO</sparams>
        </params>
    </channel>
    <channel name="ACTION:CAMERA">
        <params type="integer" activity="4"/>
            <hparams>1 2 3 4 5</hparams>
    </channel>
    <channel name="REMOTE:FTEST">
        <params type="float" activity="2">
            <hparams>1 2 3 4 5</hparams>
        </params>
    </channel>
</database>
```

Database download XML format

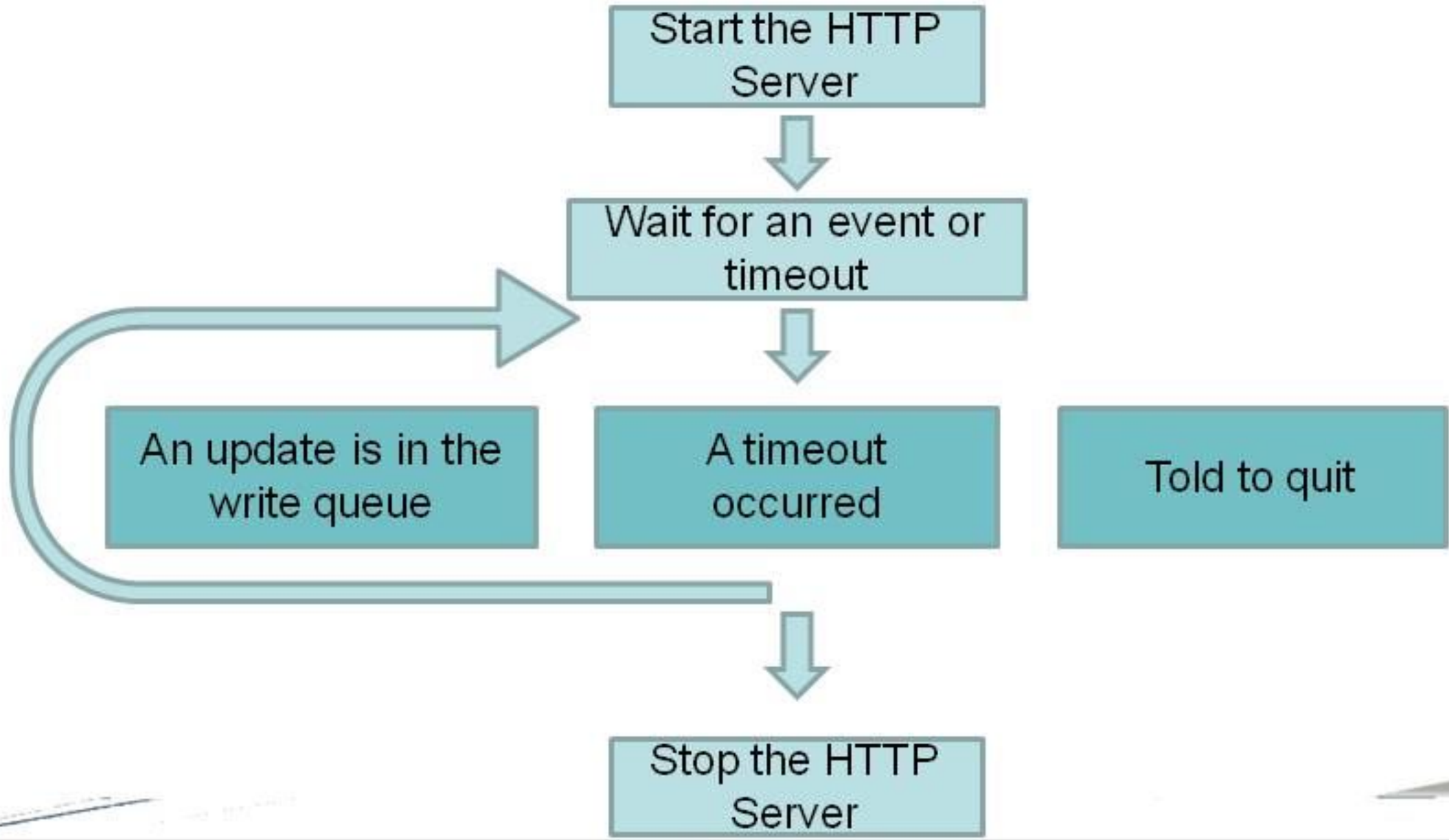
This is an example of the XML with the HTTP POST header that is sent from the controls system to the Windows XP Embedded chassis where it will be processed into a Database object.



Database through a browser.

You can view the current Database object via a browser, this is the same information that the reader process on the controls system periodically retrieves.

Application Service



Common Use

- Database Class
  - Create it before use, contents sent via HTTP once HTTP Server starts.
  - Exposes an event that signals when it has been updated from Vista.
  - Contains Channel objects, application works with these.
  - IsItNew() – Has a new database been downloaded.
  - IterateChannels() – Step through each channel in the database.
  - UpdateChannel() – Update a channel in the database.
  - Lock() & Unlock() – Multi channel operations mainly.
- HttpServer Class
  - Handles database/channel writes from VMS, all exchanged via HTTP/XML.
  - Supply a database as a parameter using Start() method.

Common Use

- Channel Class
  - GetType(), retrieves the data type of channel e.g. CPS_FLOAT, CPS_FLOAT_ARRAY
  - GetValue() / SetValue() , to modify channel data.
  - GetActivity()
  - GetCardId()

Conclusion

- It works!
- It has freed the hardware guys from writing networking software.
- Pretty easy to deploy a new image.
- Slower booting, but this is mitigated because it doesn't happen often.
- Changing the image for regular updates is a necessary evil, as is anti-virus & a firewall. But you can mitigate the exposure by limiting the components.
- Useful to view from a browser.

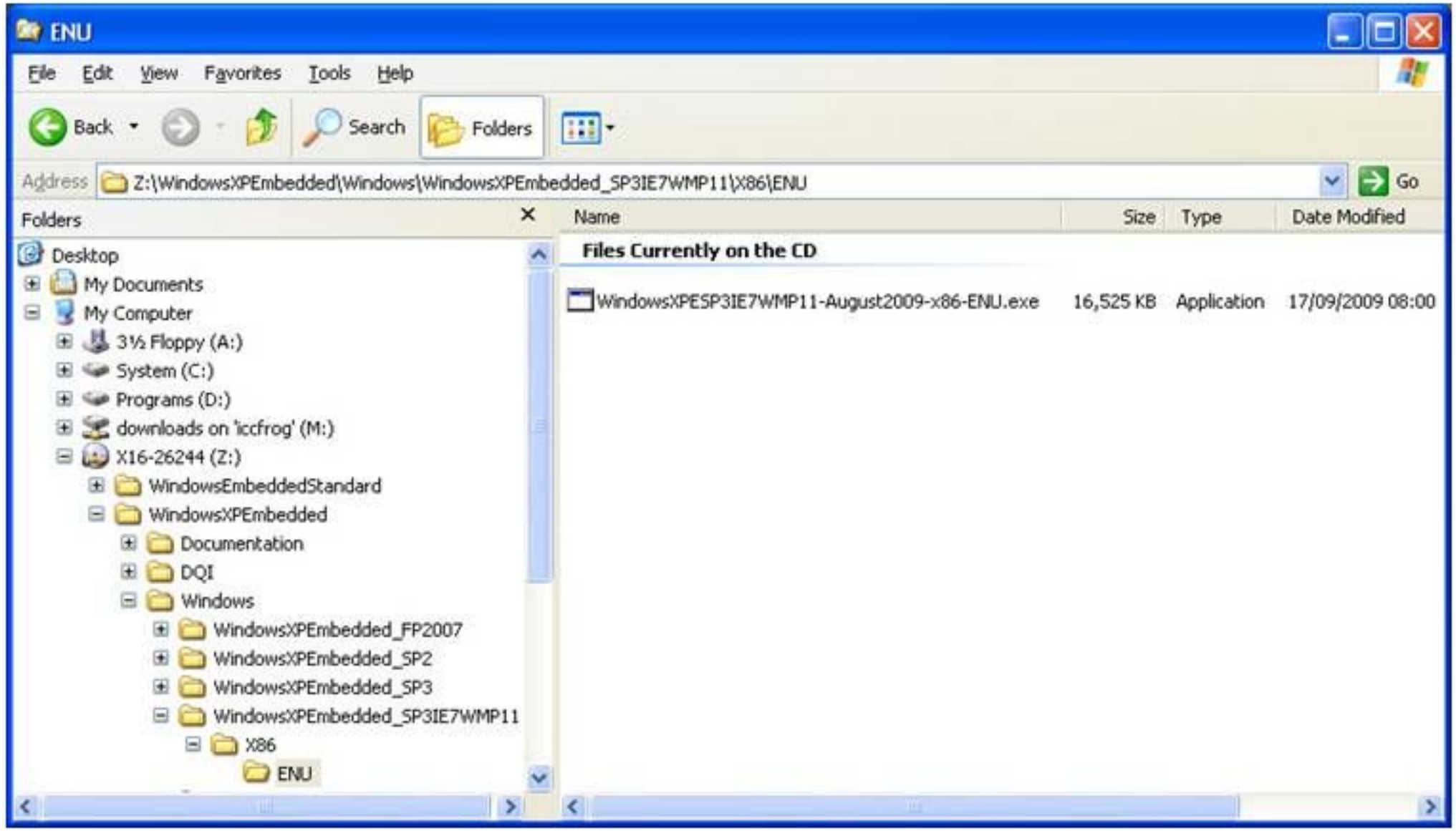
WINDOWS XP EMBEDDED SECURITY

Windows XP Embedded Security

- Windows Updates
- Firewall
- Anti-Virus Software

Windows Updates

- Supplied as an ISO image, or use WSUS or SMS.
- Two types DQI & database.
- Database
  - Run exe to apply to DB.
  - Use Target Designer to update image
  - Reboot chassis, download over network.

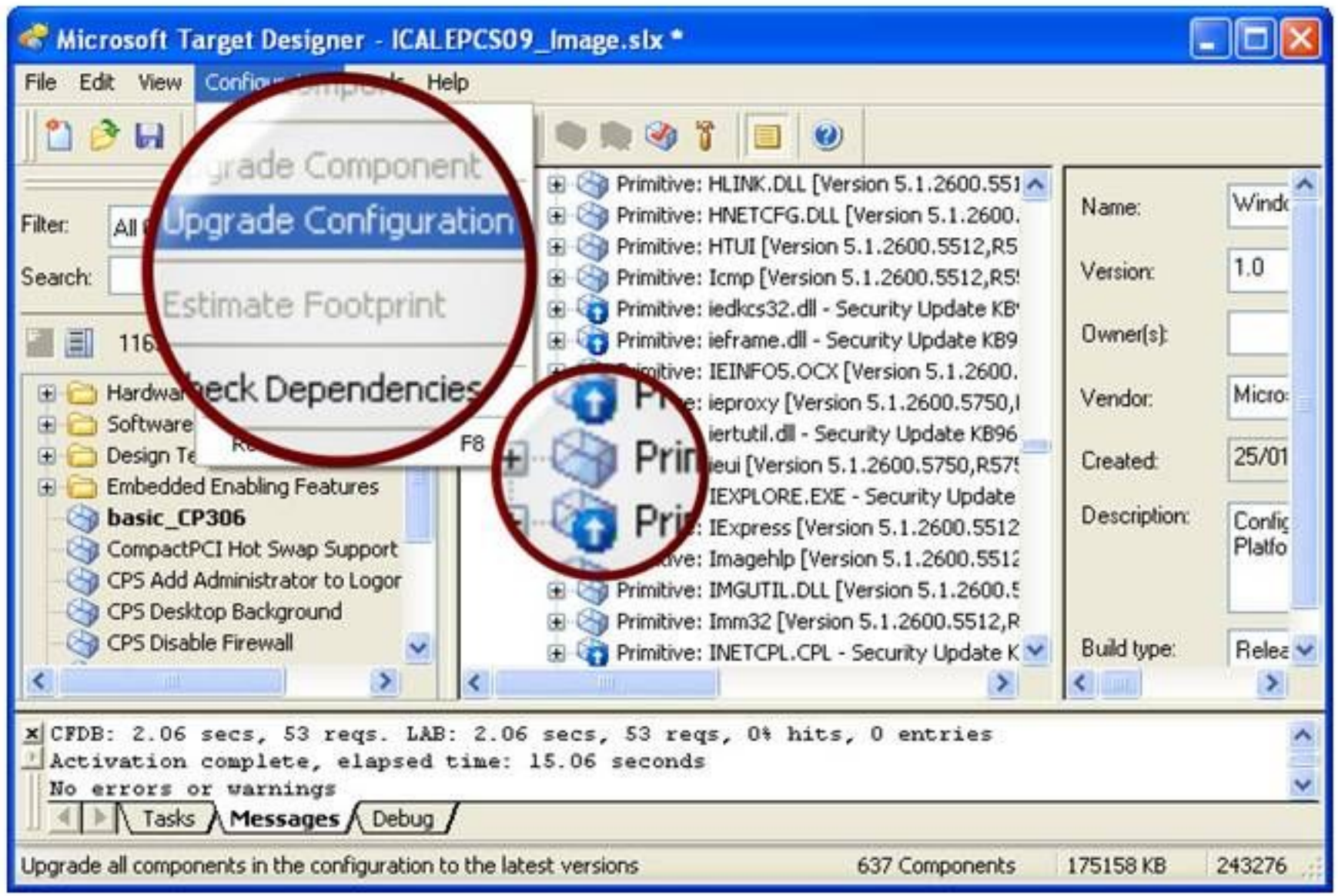


Monthly Updates CD, Database Update

The monthly updates CD contains quite a few different directories for different component database versions of XP Embedded. Ours is WindowsXPEmbedded_SP3IE7WMP11

Applied Updates

Running the update executable will apply the updates to the component database, producing a summary on completion.



Upgrade Configuration

Once updates have been applied to the component database, loading an image in Target Designer will give you the option to apply them to the image.

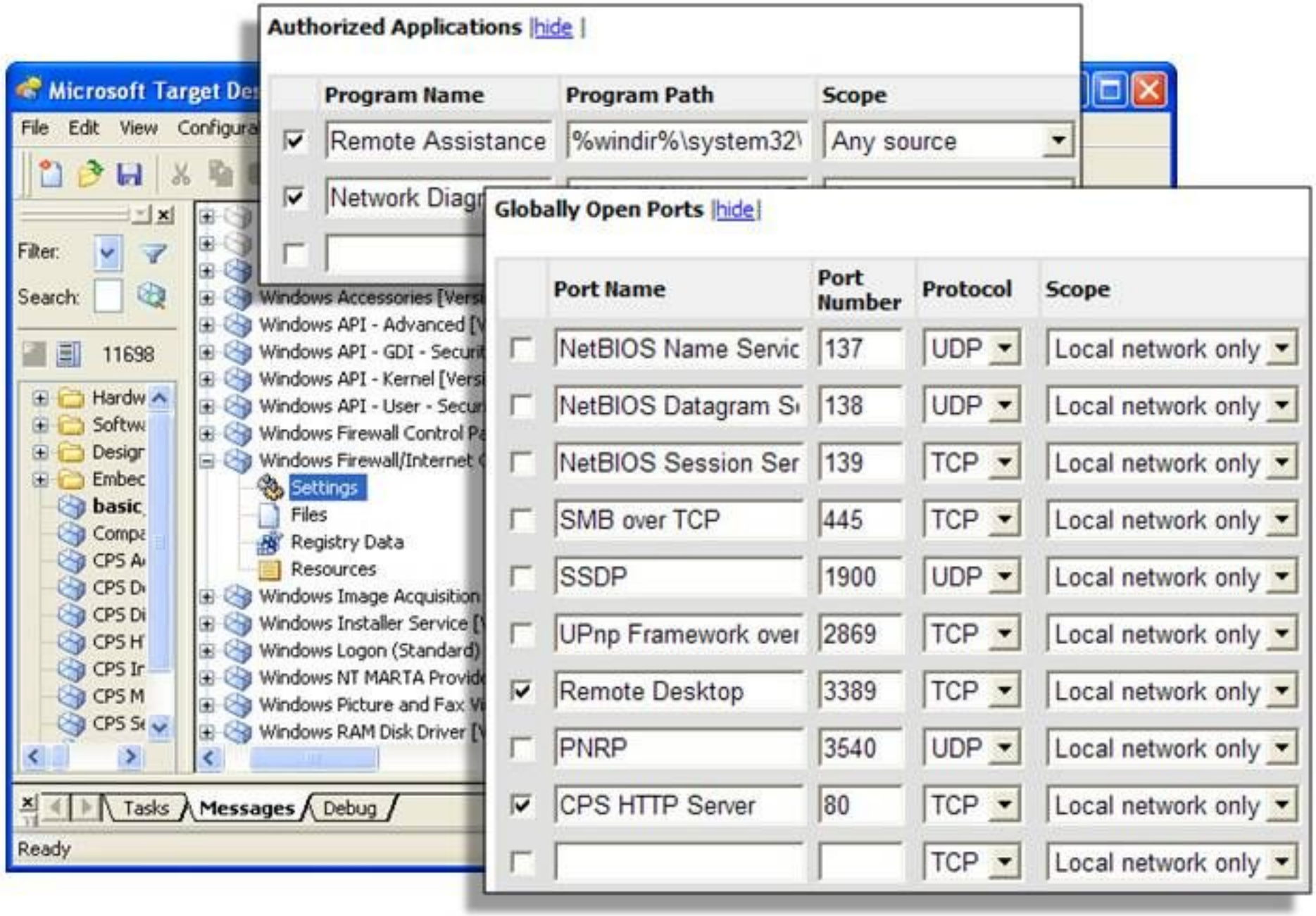
Windows XP Embedded Security

- Windows Updates
- Firewall
- Anti-Virus Software

Windows Firewall

There are several ways to configure Windows Fire in XP Embedded:

1. Modify the Component Settings in Target Designer.
2. Use .INF file or directly configure the registry.
3. Windows Firewall Control Panel Applet
4. NetSH or edit the registry.
5. Group Policy in an Active Directory domain.



Windows Firewall Configuration

You can configure The Windows Firewall within Target Designer, before building your image.

Windows XP Embedded Security

- Windows Updates
- Firewall
- Anti-Virus Software

Sophos Anti-Virus

- Originally used the desktop version.
  - Too big a footprint, both application and downloads.
- XP Embedded version imminent (~2weeks).
  - Hopefully way smaller! That's the aim!
  - Hopefully fits with existing management tools.

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