DEVELOPMENT OF STANDARD OPERATING ENVIRONMENT (SOE) EXPANDING ON THE BASEMENT OF AUTOMATED AND STANDARDIZED SYSTEM IMAGING

V. GOPEYENKO, V. ZENIN

Information Systems Management Institute
Department of Natural Sciences and Computer Technologies
Lomonosov 1, Riga, LV-1019, Latvia
E-mail: via@latnet.lv, vadzen@apollo.lv

It would perhaps be no exaggeration to say that using computers in business increases the productivity and the effectiveness of management. However, with the increasing of the quantity of workstations in the long run, grows the heterogeneity of computer systems on workstations. Non-homogeneous systems make the installation of additional applications and users’ support more difficult, increase help desk calls and time for new application compatibility testing, as well as time of system restoring on desktops; create the unstable platform for business applications and decrease uptime. It should be noted as well that increasing the time of updating operation systems and patch distribution decreases the security on the whole. As a result, the costs for supporting workstations extend.

The method of deployment of computer workplaces in education institutes, middle and large corporations, the principals of the creation of different types of clones of Standard Operating Environment, the design, creation and deployment of the real system of Standard Operating Environment based on Microsoft Windows 2000 Professional and Microsoft Windows 2000 Server for the classrooms of Information Systems Management Institute are discussed.

Keywords: Operating system imaging, Standard Operating Environment

1. Standard Operating Environment (SOE)

For solving the above-mentioned problems we must standardize operation systems and applications on all desktops and notebooks. The method of standard environment is called Standard Operating Environment (SOE).

The Standard Operating Environment (SOE) is a specification for standards for computer hardware, operating system, security and applications software, arrived at through extensive consultation, development and testing undertaken by * company’s project.

The major advantage of having an SOE within a large scale environment is that the time taken to deploy and configure a new computer is greatly reduced. In a scenario where departments might be buying different computer configurations, it is not possible to have a streamlined install and setup process due to variations such as disk sizes, hardware, and other factors. The SOE concept also includes a life cycle component and the SOE will be reviewed annually. Hardware will have a life-span of four years. The concept of the SOE is currently limited to standard Windows-based PCs, but could be extended to cover other platforms.

Figure 1. With the increasing of the quantity of workstations in the long run, grows the heterogeneity of computer systems on workstations
2. SOE image’s best practices

2.1. SEPARATE USERS PROFILES, PROGRAM AND FILES FROM SYSTEM FILES

Best practice is if SOE image has 3 different partitions with:
- Hidden Partition for TOOLS (ZENWORKS, Symantec Ghost system partition etc.);
- Operation System Files;
- Users’ Data Files.

If workstation has software problems with operation system or common software, the best solution is to clone only System partition from SOE image. This solution decreases workstation down time and saves User Data Files and User Profile settings (Favourite, Files from Desktop, etc.).

For example, we have workstation with 80 GB HDD. We separate HDD as 10 GB for System partition and 70 GB for User Data Files partition. If we have crash of Windows system, the only clone System partition is needed and there is no need to copy 70 GB of Users’ Files from HDD and copy back 70 GB of Users Files to HDD after imaging.
2.2. MOVE A USER'S DOCUMENTS AND SETTINGS FOLDER TO D:\ PARTITION

![Figure 4. Move a User's Documents and Settings Folder to D:\ partition](http://support.microsoft.com/default.aspx?scid=kb:en-us:322014#2)

2.3. CUSTOMIZE DEFAULT USER PROFILE

![Figure 5. Customize Default User Profile](http://support.microsoft.com/default.aspx?scid=kb:en-us:305709)

2.4. SECURITY TEMPLATES PREPARING AND USING

With Group Policy, you can ensure that the machines on your network remain in a secure configuration after you deploy them. When you create or modify a Group Policy Object (GPO), you can configure several security settings located under Group Policy Editor (GPE) Computer Configuration, Windows Settings, Security Settings. As you can see, Group Policy makes it easy to configure security settings on the machines in your Win2K domain. In addition, two tools, Security Templates and Security Configuration and Analysis, are extremely useful for applying network security policy and evaluating whether individual machines comply with the policy, as Image shows. With these tools, you can build templates with particular security settings, apply the settings to the machines, and then periodically evaluate the machines to verify that they remain properly configured.

**Security Templates.** You can use the Microsoft Management Console's (MMC's) Security Templates snap-in to build different templates that you can import into Group Policies. You can either create a new policy from scratch or modify one of the built-in policies. After you decide which template to use, you can import the template settings into your GPO using Group Policy Editor (GPE) by right-clicking Computer Configuration, Windows Settings, and Security Settings and choosing Import Policy. This process applies all the settings you configured in the template to all the computers in the container (e.g., site, domain, OU) that you link the Group Policy to.

**Security Configuration and Analysis.** You can use the MMC's Security Configuration and Analysis snap-in to verify that the security settings you apply with Group Policy are in use. Before you perform an analysis, create a database to store the results. After you create and open the database and choose the template containing the settings that you want to apply to a specific machine, right-click the snap-in and choose Analyze Computer Now to check the actual security settings against the desired settings. You can also use Security Configuration and Analysis to apply the security template to the machine, but it's better
to use Group Policy. If you use Security Configuration and Analysis to apply the settings, a user can come behind you and change the settings. With Group Policy, if a user changes a security setting, it changes back to its original value the next time Win2K applies the policy.

3. Three main methods of deploying a base operating system

3.1. PURE OS IMAGE

This method is used when hardware is near identical Enterprise wide (Classes, Operation Centre, etc.). Extremely rapid development of SOE. Fast installation (5-10 minutes). Really examples: SOE PURE image with higher compression (~ 2:1) 2.6 GB – deploy in 7 minutes; SOE PURE image for Information Systems Management Institute with higher compression (~ 2:1) 6.7 GB or 11 CD – deploy in 15 minutes.

3.2. SYSPREP IMAGE

SOE SYSPREP image allows for more varied hardware. SOE can be developed and customized quickly for middle and large corporation. Fast installation (15–30 minutes). Real example: SOE SYSPREP image with higher compression (~ 2:1) 2.6 GB – deploy in 20 min.

3.3. UNATTENDED OR SCRIPTED INSTALLATION

Install anywhere – almost hardware agnostic. Installation is extremely slow (35–90 minutes). Scripted installation doesn’t guarantee homogeneous Standard Operating Environment; therefore we don’t discuss this method of installation. For example restoring of IBM ThinkPad Notebook use Unattended or Scripted installation takes 120–180 minutes.
4. SOE image’s distribution

There are 3 main methods for Standard Operating Environment image’s distribution. Locally from CD, DVD, HDD. Through Network to 1 workstation (Network sharing). From Image Server through Network to many workstations at the same time (Multicast Image Server). It is the best approach for fast SOE image deployment in classes, operation centres, call centres, exhibitions, etc.

**Figure 7. Methods of deploying a base operating system**

**Pure OS Image**
- Use when hardware is near identical Enterprise wide
- Extremely rapid development of SOE
- Fast installation (5–10 minutes)

**SYSPREP Image**
- SYSPREP allows for more varied hardware
- SOE can be developed and customized quickly
- Fast installation (15–30 minutes)

**Unattended or Scripted Installation**
- Install anywhere – almost hardware agnostic
- Most complex to develop SOE
- Slower installation (35–90 minutes)

**Figure 8. Sources for Users’ Computers and Notebooks cloning**

- **CD, DVD, HDD**
- **Through Network (TCP/IP, IPX) with/without PXE (Pre-boot Execution Environment).**
- **Image Server**
4.1. POST SOE DEPLOYMENT

![Diagram of Pure OS Image, SYSPREP Image, and Common]

- **Pure OS Image**: System Identification (SID) and Computer Name change (1-5 minutes)
- **SYSPREP Image**: Install Drivers from Network (5-30 minutes)
- **Common**: Install corporate applications and settings

_Figure 9. Post SOE Deployment_

4.2. PURE OS IMAGE

When you clone a Windows NT/2000/XP installation to many computers, the destination computers have the same SID and computer name as the source Windows installation. Because Windows NT/2000/XP networks use each computer's SID and computer's name to uniquely identify the computer on the network, you must change the SID and computer name on each destination (client) computer after cloning. Computer Security Identifier (SID) and Computer Name should be changed. For example, with Ghost Walker or NewSID programs. Ghost Walker is a Ghost utility included in the corporate Ghost Enterprise versions. Ghost Walker is a DOS program that allows you to change the SID and computer name at each client computer after cloning, that is, before restarting the computer into Windows. NewSID is a program that changes a computer's SID. It is free, comes with full source, and is a Win32 program, meaning that it can easily be run on systems that have been previously cloned. NewSID works on Windows NT 4, Windows 2000, Windows XP and Windows 2003 Server.

4.3. SYSPREP IMAGE

When you clone a Windows NT/2000/XP installation to many computers with different hardware, Drivers from Network servers should be installed. Time for installation depends on Hardware and Network speed, 5-30 minutes.

4.4. COMMON

Finally should be installed corporate applications and settings for current User. Centralized and automated installation of company’s applications and patch distribution to SOE workstations is very simple, manageable and scalable solution.

4.5. HARDWARE REQUIREMENTS

Hardware requirements is Pre-Boot Execution Environment (PXE) – compatible Network Card with Ndis2 and Packet Driver. Network Card is needed for SOE imaging and post SOE deployment through network. For using Pure Standard Operation Environment image hardware should be identical.
4.6. CHOICE OF SOFTWARE FOR (SOE)

Our choice of software for Standard Operating Environment (SOE) is the following: If company has NOVELL Network Environment, the best and obvious solution is Novell ZENworks. If company has only classes or operate centres (Educational institutions, Call Centres, etc.) the best solution is Symantec Ghost Solution Suite. If company has only Microsoft Windows Network Environment, the program could be selected from Novell ZENworks and Altiris Client Management Suite.


![Diagram of enterprise solution for deployment Hewlett-Packard workstation in large company with SYSPREP SOE image](image)

**Figure 10.** Enterprise solution for deployment Hewlett-Packard workstation in large company with SYSPREP SOE image

4.7. ANALYSES OF STATISTIC INFORMATION OF SOE IMAGE DISTRIBUTION IN INFORMATION SYSTEMS MANAGEMENT INSTITUTE

Microsoft Windows 2000 Professional **Standard Operation Environment** (SOE) image for Information Systems Management Institute has size 6.7 GB with compression (11 CD). Windows SOE has 11 GB size on the HDD. Microsoft Windows 2000 Professional SOE for ISMI includes 85 Applications, Services Pack 4 and all last fixes. There is “Time of classes cloning (ours)” = “SOE image deploying to all classes quantity” * “Classes” * “Time of 1 class cloning”, where “Time of 1 class cloning” = 30 minutes from Symantec Ghost Multicast server.
There are “Administrators’ ours needed for deployment manually” = “Total images deployment” * “ours needed for manual deployment OS and all applications to 1 workstation”, where “ours needed for manual deployment OS and all applications to 1 workstation” = 40 Administrator’s work ours.

There are “Administrators’ work days” = “Administrators’ ours needed for deployment manually” / “Work ours in day”, where “Work ours in day” = 8 ours.

**TABLE 1. SOE image deploying statistics in ISMI classes**

<table>
<thead>
<tr>
<th></th>
<th>2003 -2004</th>
<th>2004 - 2005</th>
<th>Total 1.5 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOE image deploying to all classes quantity</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Classes</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Time of classes cloning (ours)</td>
<td>9</td>
<td>6</td>
<td>4.5</td>
</tr>
<tr>
<td>Administrators’ hours needed for deployment manually</td>
<td>12960</td>
<td>8640</td>
<td>6480</td>
</tr>
<tr>
<td>Administrators’ work days</td>
<td>1620</td>
<td>1080</td>
<td>810</td>
</tr>
<tr>
<td>Needed Administrators for this deployment manually in semester</td>
<td>18.00</td>
<td>12.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Administrators’ costs in semester (Ls)</td>
<td>24 300</td>
<td>16 200</td>
<td>12 150</td>
</tr>
</tbody>
</table>

There are “Needed Administrators for this deployment manually in semester” = “Administrators’ work days” / “Works days in semester”, where “Works days in semester” = 90 days (4.5 months).

There are “Administrators' costs in semester (Ls)” = “Needed Administrators for this deployment manually in semester” * “Administrator's costs in month” * 4.5 (months), where “Administrator's costs in month” = Ls 300.

Finally for SOE clone deployment to 54 student workstation of ISMI in 1.5 years (3 semesters):

Windows **Standard Operating Environment** (SOE) + standardized image deployment software + 1 Computer engineer =

- 702 Windows 2000 SOE images deploying in 1.5 year to 54 students workstations;
- Cut down spending for Ls 52 650 in 1.5 year;
- There are **equivalent for work of 13 administrators**.

**Conclusion**

For solving the above mentioned in Introduction problems we must standardize operation systems and applications on all desktops and notebooks. The method of standard environment is called **Standard Operating Environment** (SOE).

The following method – **Standard Operating Environment**, allows achieving the following results:

- helps to centralize and automate application management, patch management,
- centralizes and automates desktop configuration,
- improves the availability and protection of user’s data,
- keeps systems secure,
- keeps up-to-date operation systems by automating the rollout and maintenance of a standard operating environment—including the latest patches and updates—across all desktops as well as the risk of security breaches and virus attacks,
- enables simplified maintenance and reduced help desk calls through standardization,
- facilitates creation and enforcement of a secure computing base for all employees,
- minimizes management variables and costs,
- assures business continuity,
- increases productivity by keeping crucial systems available to users and quickly restores them if a disaster occurs,
- strategically helps to create holistic damage recovery solution.

In my opinion, **Standard Operating Environment (SOE)** is more than it is needed for Educational institutions, Call Centres, corporations, middle and large company.
Information technologies

References


Received on the 22nd of April 2006