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IT599: MASTER’S PROJECT IN APPLIED TECHNOLOGY  
  
  
BITLOCKER PORTFOLIO



Submitted by  
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Company x

July 4, 2015

## Deliverables

IT Project Plan with Critical Path  
Project Management Timeline  
PowerPoint Presentation, discussed in class  
Two Milestone Videos, discussed in class  
Article on SDLC and the Project Management Life Cycle  
Article on Ethical, Legal, and Social Implications  
Article on a Real World Example  
Lessons Learned Discussion

# IT Project Plan

## 1.0 Project Overview

Due to recent security breaches across the nation (Hardekopf, 2015), Company X has become increasingly concerned with securing data on company computer hard drives. Currently, Company X does have anti-virus software, a data loss prevention solution, and malware protection installed on all workstations, but does not have any form of drive encryption. Without encryption, the data on computers could be stolen, hacked while offline, or viewed by unauthorized persons.  
  
For an encryption solution, Microsoft’s BitLocker has been recommended. BitLocker is a full disk encryption solution, which can be implemented using technology that already exists on the company’s workstations. Something worth mentioning, this particular solution will contain a “free” or nearly free management solution. This is to forego the costs of $150 (per workstation) third party solution, or to skip the licensing costs associated with using MBAM and MDOP (Microsoft BitLocker Reporting solutions) at an estimated $10 per seat (Dalecheck Technology Group, 2014)). The project will have a budget for implementing BitLocker, however, the TCO is meant to be very low, while the ROI should be high and continue to grow over time. When using this inexpensive management method, companies can save hundreds of thousands of dollars (potentially millions) in BitLocker implementation and management costs.

## 2.0 Project Scope

The scope of the project includes implementing BitLocker on all company workstations (some ten thousand computers). The time is set at seven months, which includes development and testing of management scripts, providing technical support for failed BitLocker installations, replacing non-working machines with new, working computers, and training support staff. The end goal is to have BitLocker deployed to all company workstations by the first quarter of 2016.

## 3.0 Project Budget

|  |  |  |
| --- | --- | --- |
| **Budget Item** | **Description** | **Cost** |
| Code development | Reporting and TPM Management solutions must be developed in-house | $3,500 |
| Training | Documentation must be created and staff trained | $2,000 |
| 20 x Computers | Twenty computers have been allocated to replace non-working TPM chips: Each computer costs $1,000. | $20,000 |
| Technical Support | $25 per hour, with a breakdown of 25 hours \* $25 \* 3 sites | $1,875 |
| Miscellaneous Costs | Costs include support for Active Directory, Network computers, and the BitLocker solution. | $2,625 |
|  | **Total cost** | $30,000 |

## 4.0 Project Stakeholders

The stakeholders will include the CIO, CFO, the Change Management Team, the Senior Developer, and the Manager and Team Leader from the IT department.

|  |  |
| --- | --- |
| **Title** | **Description** |
| CFO | Chief Financial Officer, in charge of company finances |
| CIO | Chief Information Officer, in charge of company technology |
| Change Management Team | Authorizes changes to enterprise systems |
| Senior Developer | Responsible for software development |
| IT Manager | Communicates directly to IT staff |
| IT Team Leader | Performs training to IT staff |

## 5.0 Project Benefits

|  |  |
| --- | --- |
| **Benefit** | **Description** |
| Secure Data | The data contents of the hard drive will be secured. |
| Offline Attacks | Offline attacks, such as removing the hard drive and placing it into another computer, will be prevented. |
| Unauthorized users | If the user is not a company user, recovery keys will not be available to them, thus, any authorized user cannot access the data on the drive. |
| Disposal | When disposing hard drive, there is peace of mind that company data will not be leaked |
| Savings | A third party utility will not need to be purchased, thus saving the company the costs of maintaining a per machine license. |

## 6.0 Project ROI

The ROI has a few variables. One, standalone encryption software applications cost anywhere from $100-$200, so I will say $150 per workstation (that is $150 \* 10,000 workstations = $1,500,000) (Suneja, 2006). Next, the Microsoft reporting software costs $10 per seat, that is, 10   
  
\* 10,000 workstations = $100,000. The sum of these two figures totals $1,600,000. The proposed solution costs a maximum of $30,000 to implement.

## 7.0 Project Roles and Responsibilities

|  |  |
| --- | --- |
| **Role** | **Responsibility** |
| IT Specialist | Develops all code, deploys code, and runs reports |
| Stakeholders | Authorizes the stages of the project |
| IT Team Leader | Creates documentation and trains staff accordingly |
| Ohio Technician | Site tech is responsible for local support |
| Arizona Technician | Site tech is responsible for local support |
| Florida Technician | Site tech is responsible for local support |

## 8.0 Project Work Breakdown Structure Project Dates: 07/1/2015-02/29/2016, 1st Quarter of 2016 *\* The critical path is in red*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Task Name | Duration | Start | Finish | Predecessors |
| BITLOCKER ROLLOUT PROJECT | 174 days? | Wed 7/1/15 | Mon 2/29/16 |  |
| **1.0 Project Start** | **8 days** | **Wed 7/1/15** | **Fri 7/10/15** |  |
| 1.1 Create Project Overview | 3 days? | Wed 7/1/15 | Fri 7/3/15 |  |
| 1.2 Define Scope | 3 days? | Mon 7/6/15 | Wed 7/8/15 | 3 |
| 1.3 Define Business Plan | 3 days? | Mon 7/6/15 | Wed 7/8/15 |  |
| 1.4 Perform a Risk Assessment | 2 days? | Thu 7/9/15 | Fri 7/10/15 | 5 |
| **2.0 Project Planning** | **5 days** | **Mon 7/13/15** | **Fri 7/17/15** | **2** |
| 2.1 Create Project Proposal | 1 day | Mon 7/13/15 | Mon 7/13/15 |  |
| 2.2 Obtain Initial Approval from Stakeholders | 1 day | Tue 7/14/15 | Tue 7/14/15 |  |
| 2.3 Create Budget | 1 day | Tue 7/14/15 | Tue 7/14/15 |  |
| 2.4 Kickoff Meeting | 1 day | Tue 7/14/15 | Tue 7/14/15 |  |
| 2.5 Identify Risks | 1 day | Wed 7/15/15 | Wed 7/15/15 | 11 |
| 2.6 Create Contingency Plan for Risks | 1 day | Wed 7/15/15 | Wed 7/15/15 |  |
| 2.7 Complete Business Analysis | 1 day | Wed 7/15/15 | Wed 7/15/15 |  |
| 2.8 Draft Project Plan | 1 day | Thu 7/16/15 | Thu 7/16/15 | 14 |
| 2.9 Draft Project Schedule | 1 day | Thu 7/16/15 | Thu 7/16/15 |  |
| 2.10 Stakeholder Meeting for Design Approval | 1 day | Fri 7/17/15 | Fri 7/17/15 | 16 |
| **3.0 Construction** | **32 days** | **Mon 7/20/15** | **Tue 9/1/15** | **7** |
| **3.1 Design** | **3 days** | **Mon 7/20/15** | **Wed 7/22/15** |  |
| 3.1.1 Coded Report for TPM status | 1 day | Mon 7/20/15 | Mon 7/20/15 |  |
| **3.1.2 TPM Management for importing recovery keys** | **2 days?** | **Mon 7/20/15** | **Tue 7/21/15** |  |
| 3.1.2.1 Active Directory Import | 1 day | Mon 7/20/15 | Mon 7/20/15 | 17 |
| 3.1.2.2 LANDesk Import | 1 day | Tue 7/21/15 | Tue 7/21/15 | 22 |
| 3.1.2.3 Email Keys | 1 day | Tue 7/21/15 | Tue 7/21/15 |  |
| 3.1.2.4 SFTP Keys | 1 day | Tue 7/21/15 | Tue 7/21/15 |  |
| 3.1.3 Coded Reports for BitLocker Status | 1 day | Tue 7/21/15 | Tue 7/21/15 |  |
| 3.1.4 Weekly Status email sent to Stakeholders | 1 day | Tue 7/21/15 | Tue 7/21/15 |  |
| 3.1.5 Stakeholder Meeting for Development Approval | 1 day | Wed 7/22/15 | Wed 7/22/15 | 27 |
| **3.2 Development** | **22 days** | **Mon 7/20/15** | **Tue 8/18/15** | **21** |
| 3.2.1 A coded report will be required for TPM status verification | 1 day | Fri 7/24/15 | Fri 7/24/15 |  |
| 3.2.2 Programming code to activate the TPM chip | 1 day | Mon 7/27/15 | Mon 7/27/15 |  |
| 3.2.3 Programming code to take ownership of the TPM chip | 1 day | Tue 7/28/15 | Tue 7/28/15 |  |
| 3.2.4 Programming code to add protectors to TPM chip | 1 day | Wed 7/29/15 | Wed 7/29/15 |  |
| 3.2.5 Programming code to upload recovery keys to FTP server | 1 day | Mon 8/3/15 | Mon 8/3/15 |  |
| 3.2.6 Programming code to email recovery keys to service account | 1 day | Wed 8/5/15 | Wed 8/5/15 |  |
| 3.2.7 Programming code to import rec. keys into Active Directory | 1 day | Mon 8/10/15 | Mon 8/10/15 |  |
| 3.2.8 Programming code to import rec. keys into LANDesk/SCCM | 1 day | Fri 8/14/15 | Fri 8/14/15 |  |
| 3.2.9 A coded report will be required for BitLocker status | 1 day | Mon 8/17/15 | Mon 8/17/15 |  |
| 3.2.10 Weekly Status email sent to Stakeholders | 1 day | Mon 8/17/15 | Mon 8/17/15 |  |
| 3.2.11 All code successfully tested in lab environment | 1 day | Tue 8/18/15 | Tue 8/18/15 |  |
| **3.3 Software Unit Testing** | **6 days** | **Wed 8/19/15** | **Wed 8/26/15** |  |
| **3.3.1 Start Alpha Testing** | **3 days?** | **Wed 8/19/15** | **Fri 8/21/15** |  |
| 3.3.1.1 Identify software issues | 1 day | Wed 8/19/15 | Wed 8/19/15 |  |
| 3.3.1.2 Fix software issues | 1 day | Thu 8/20/15 | Thu 8/20/15 |  |
| 3.3.1.3 Test Again | 1 day | Thu 8/20/15 | Thu 8/20/15 |  |
| 3.3.1.4 Status email sent to Stakeholders | 1 day | Fri 8/21/15 | Fri 8/21/15 |  |
| **3.3.2 Start Beta Testing** | **3 days?** | **Mon 8/24/15** | **Wed 8/26/15** | **42** |
| 3.3.2.1 Identify software issues | 1 day | Mon 8/24/15 | Mon 8/24/15 |  |
| 3.3.2.2 Fix software issues | 1 day | Mon 8/24/15 | Mon 8/24/15 |  |
| 3.3.3.3 Test Again | 1 day | Tue 8/25/15 | Tue 8/25/15 |  |
| 3.3.3.4 Status email sent to Stakeholders | 1 day | Tue 8/25/15 | Tue 8/25/15 |  |
| 3.3.3 Prepare Report for Stakeholders | 1 day | Tue 8/25/15 | Tue 8/25/15 |  |
| 3.3.4 Stakeholder Meeting for UaT Approval | 1 day | Wed 8/26/15 | Wed 8/26/15 |  |
| 3.3.5 Complete Unit Testing | 1 day | Wed 8/26/15 | Wed 8/26/15 |  |
| **3.4 User Acceptance Testing** | **4 days** | **Thu 8/27/15** | **Tue 9/1/15** |  |
| **3.4.1 Start Pilot testing Group 1 Ohio Site** | **1 day** | **Thu 8/27/15** | **Thu 8/27/15** |  |
| 3.4.1.1 Send emails to 5 users | 1 day | Thu 8/27/15 | Thu 8/27/15 |  |
| 3.4.1.2 Enable TPM chips in Pilot Group | 1 day | Thu 8/27/15 | Thu 8/27/15 |  |
| 3.4.1.3 Deploy TPM Management to Pilot Group | 1 day | Thu 8/27/15 | Thu 8/27/15 |  |
| 3.4.1.4 Assess Users 1-5 in Pilot Group | 1 day | Thu 8/27/15 | Thu 8/27/15 |  |
| 3.4.1.5 Address issues in hardware and/or software | 1 day | Thu 8/27/15 | Thu 8/27/15 |  |
| 3.4.1.6 Status email sent to Stakeholders | 1 day | Thu 8/27/15 | Thu 8/27/15 |  |
| **3.4.2 Start Pilot testing Group 1 Arizona Site** | **1 day** | **Fri 8/28/15** | **Fri 8/28/15** | **56** |
| 3.4.2.1 Send emails to 5 users | 1 day | Fri 8/28/15 | Fri 8/28/15 |  |
| 3.4.2.2 Enable TPM chips in Pilot Group | 1 day | Fri 8/28/15 | Fri 8/28/15 |  |
| 3.4.2.3 Deploy TPM Management to Pilot Group | 1 day | Fri 8/28/15 | Fri 8/28/15 |  |
| 3.4.2.4 Assess Users 1-5 in Pilot Group | 1 day | Fri 8/28/15 | Fri 8/28/15 |  |
| 3.4.2.5 Address issues in hardware and/or software | 1 day | Fri 8/28/15 | Fri 8/28/15 |  |
| 3.4.2.6 Status email sent to Stakeholders | 1 day | Fri 8/28/15 | Fri 8/28/15 |  |
| **3.4.3 Start Pilot testing Group 1 Florida Site** | **1 day** | **Mon 8/31/15** | **Mon 8/31/15** | **69** |
| 3.4.3.1 Send emails to 5 users | 1 day | Mon 8/31/15 | Mon 8/31/15 |  |
| 3.4.3.2 Enable TPM chips in Pilot Group | 1 day | Mon 8/31/15 | Mon 8/31/15 |  |
| 3.4.3.3 Deploy TPM Management to Pilot Group | 1 day | Mon 8/31/15 | Mon 8/31/15 |  |
| 3.4.3.4 Assess Users 1-5 in Pilot Group | 1 day | Mon 8/31/15 | Mon 8/31/15 |  |
| 3.4.3.5 Address issues in hardware and/or software | 1 day | Mon 8/31/15 | Mon 8/31/15 |  |
| 3.4.3.6 Status email sent to Stakeholders | 1 day | Mon 8/31/15 | Mon 8/31/15 |  |
| 3.4.4 Prepare report for Stakeholder meeting | 1 day | Mon 8/31/15 | Mon 8/31/15 |  |
| 3.4.5 Stakeholder Meeting for Approval - Go-live approval | 1 day | Tue 9/1/15 | Tue 9/1/15 | 77 |
| 3.4.6 Transfer technical documentation to IT Team Leader | 1 day | Tue 9/1/15 | Tue 9/1/15 | 77 |
| 3.5 User Acceptance Test Complete | 1 day | Tue 9/1/15 | Tue 9/1/15 | 77 |
| **4.0 Implementation** | **152 days** | **Wed 9/2/15** | **Thu 3/31/16** |  |
| **4.1 Enable TPM Chips** | **61 days** | **Wed 9/2/15** | **Wed 11/25/15** |  |
| **4.1.1 Enable TPM Chips at Ohio site 3,300 computers** | **20 days** | **Wed 9/2/15** | **Tue 9/29/15** |  |
| 4.1.1.1 Weekly Status Report (825 computers) | 5 days? | Wed 9/2/15 | Tue 9/8/15 | 80 |
| 4.1.1.2 Weekly Status Report (825 computers) | 5 days? | Wed 9/9/15 | Tue 9/15/15 | 84 |
| 4.1.1.3 Weekly Status Report (825 computers) | 5 days? | Wed 9/16/15 | Tue 9/22/15 | 85 |
| 4.1.1.4 Weekly Status Report (825 computers) | 5 days? | Wed 9/23/15 | Tue 9/29/15 | 86 |
| **4.1.2 Enable TPM Chips at Arizona site 3,300 computers** | **20 days** | **Wed 9/30/15** | **Tue 10/27/15** |  |
| 4.1.2.1 Weekly Status Report (825 computers) | 5 days? | Wed 9/30/15 | Tue 10/6/15 |  |
| 4.1.2.2 Weekly Status Report (825 computers) | 5 days? | Wed 10/7/15 | Tue 10/13/15 | 89 |
| 4.1.2.3 Weekly Status Report (825 computers) | 5 days? | Wed 10/14/15 | Tue 10/20/15 | 90 |
| 4.1.2.4 Weekly Status Report (825 computers) | 5 days? | Wed 10/21/15 | Tue 10/27/15 | 91 |
| **4.1.3 Enable TPM Chips at Florida site 3,400 computers** | **21 days** | **Wed 10/28/15** | **Wed 11/25/15** |  |
| 4.1.3.1 Weekly Status Report (850 computers) | 5 days? | **Wed 10/28/15** | Tue 11/3/15 |  |
| 4.1.3.2 Weekly Status Report (850 computers) | 5 days? | Wed 11/4/15 | Fri 11/13/15 |  |
| 4.1.3.3 Weekly Status Report (850 computers) | 5 days? | Wed 11/11/15 | Tue 11/17/15 | 95 |
| 4.1.3.4 Weekly Status Report (850 computers) | 5 days? | Wed 11/18/15 | Tue 11/24/15 | 96 |
| 4.2 Create TPM Chip Master Status Report | 1 day | Wed 11/25/15 | Wed 11/25/15 | 97 |
| **4.2 Deploy TPM Management** | **68 days** | **Wed 11/25/15** | **Fri 2/26/16** |  |
| 4.2.1 Deploy TPM Management at Ohio site 3,300 computers | **21 days** | **Wed 11/25/15** | **Wed 12/23/15** |  |
| 4.2.1.1 Weekly Status Report (825 computers) | 5 days? | Thu 11/26/15 | Wed 12/2/15 | 98 |
| 4.2.1.2 Weekly Status Report (825 computers) | 5 days? | Thu 12/3/15 | Wed 12/9/15 | 101 |
| 4.2.1.3 Weekly Status Report (825 computers) | 5 days? | Thu 12/10/15 | Wed 12/16/15 | 102 |
| 4.2.1.4 Weekly Status Report (825 computers) | 5 days? | Thu 12/17/15 | Wed 12/23/15 | 103 |
| 4.2.2 Deploy TPM Management at Arizona site 3,300 computers | **20 days** | **Mon 1/4/16** | **Fri 1/29/16** |  |
| 4.2.2.1 Weekly Status Report (825 computers) | 5 days? | Mon 1/4/16 | Fri 1/8/16 | 104 |
| 4.2.2.2 Weekly Status Report (825 computers) | 5 days? | Mon 1/11/16 | Fri 1/15/16 | 106 |
| 4.2.2.3 Weekly Status Report (825 computers) | 5 days? | Mon 1/18/16 | Fri 1/22/16 | 107 |
| 4.2.2.4 Weekly Status Report (825 computers) | 5 days? | Mon 1/25/16 | Fri 1/29/16 | 108 |
| 4.2.3 Deploy TPM Management at Florida site 3,400 computers | **20 days** | **Mon 2/1/16** | **Fri 2/26/16** |  |
| 4.2.3.1 Weekly Status Report (850 computers) | 5 days? | Mon 2/1/16 | Fri 2/5/16 | 109 |
| 4.2.3.2 Weekly Status Report (850 computers) | 5 days? | Mon 2/8/16 | Fri 2/12/16 | 111 |
| 4.2.3.3 Weekly Status Report (850 computers) | 5 days? | Mon 2/15/16 | Fri 2/19/16 | 112 |
| 4.2.3.4 Weekly Status Report (850 computers) | 5 days? | Mon 2/22/16 | Fri 2/26/16 | 113 |
| 4.3 Run TPM Management Status Report | 1 day | Mon 2/29/16 | **Mon 2/29/16** | 114 |
| **5.0 Project Closure** | **1 day** | **Mon 2/29/16** | **Mon 2/29/16** |  |
| 5.1 Discuss Lessons Learned/Create PowerPoint | 1 day | **Mon 2/29/16** | Mon 2/29/16 | 115 |
| 5.2 Project Closure Report | 1 day | **Mon 2/29/16** | Mon 2/29/16 | 117 |
| 5.3 Close out project with Stakeholders | 1 day | **Mon 2/29/16** | Mon 2/29/16 | 118 |
| 5.4 Project Closure is Complete | 1 day | **Mon 2/29/16** | Mon 2/29/16 | 119 |

## 9.0 Project Milestones

|  |  |
| --- | --- |
| **Milestone** | **Description** |
| Development | The first step in the BitLocker rollout is to develop and test all the code that will be necessary to manage BitLocker recovery keys.   The deliverables will be code (1) to report the status on TPM chips, (2) code to manage the recovery keys, (3) code to report on BitLocker compliance, and (4) code for support staff and (5) general administration (backup). |
| TPM Enable | Once all the code has been developed and tested, the next milestone will be to enable TPM chips on all workstations. This stage is critical to the overall process, because without the TPM being turned on, the recovery keys have no place to be stored. Now, there is a possible USB storage solution, however, to keep project costs (and TCO) low, the TPM chip has been selected as the best, cheapest recovery key storage option. This milestone will be complete when all TPM chips have been enabled.   The deliverable will be a report stating the status of all TPM chips. |
| TPM Management | After the TPM chips have been enabled, the step stage of the process will be to collect BitLocker recovery keys. Because I have chosen not to buy a BitLocker management system, I will use code I have created to manage the retrieval and storage of BitLocker recovery information. For this step, I will use SCCM or LANDesk (desktop management software) to deploy my TPM management scripted application. The TPM management does four things (1) Activates the TPM Chip, (2) takes ownership of the TPM, (3) adds protectors to the TPM, and (4) starts and pauses BitLocker encryption.   The deliverables for this milestone is a report verifying that TPM Management was indeed successful and a user manual explaining the segments of code used in BitLocker reporting and management. |

## 10.0 Project Risk Assessment

While BitLocker is already built-in to most of Microsoft’s active operating systems, some problems may arise due to hardware or software failure. It is important to note, overall risks are very low because if the BitLocker process does not work, in nearly 100% of the cases the user’s computer is fine to use; they just will not have BitLocker. For the machines that BitLocker was not installed, refer to the following chart.

|  |  |  |  |
| --- | --- | --- | --- |
| **Risk** | **Description** | **Mitigation** | **Role** |
| Failed TPM due to outdated BIOS | In rare cases, less than 1%, the computer’s BIOS may need to be updated to enable TPM. | BIOS will be manually updated. | Local Technician |
| Failed TPM due to motherboard | In rare cases, less than 1%, the computer’s motherboard will not have a TPM Chip. | Computer will be replaced with either a loaner machine or new computer. | Local Technician |
| Failed key import into Active Directory | The recovery key does not get imported into Active Directory | Try automated process again. Import key manually. | IT Specialist |
| Failed key import into Active Directory | The recovery key does not get imported into Active Directory | Verify computer is in a domain, and is in the proper OU.  Or, enable, ‘Turn on TPM backup to Active Directory Domain Services’ in Local Group Policy | IT Specialist |
| Failed transport of key via email | The recovery key does not transport email service account | Try automated process again. Copy key from Active Directory, or FTP. Transfer manually. | IT Specialist |
| Failed transport of key to FTP server | The recovery key does not transport to FTP server | Try automated process again. Copy key from Active Directory or email. Transfer manually. | IT Specialist |
| Failed key import into LANDesk | The recovery key does not get imported into LANDesk Desktop Management Software | Reinstall LANDesk Agent. Try automated TPM Management. | Local Technician |
| User is receiving prompt to enter BitLocker Recovery Password | When the user restarts their machine, they may receive a prompt to enter the BitLocker Recovery Key | Enter the key from AD, FTP, Email, or LANDesk. Check TPM Chip status. Try automated TPM Management | IT Specialist |
| TPM cannot continue due to ownership error | The TPM ownership must be set before adding protectors to the TPM Chip | Take ownership of the TPM Chip, manually. Try automated TPM Management | IT Specialist |

## 11.0 Communication Plan

Due to the magnitude of the BitLocker project, and the impact it will have on client users, the business must communicate to end-users what BitLocker is and why encryption is important. The users must also be notified that encryption will become mandatory and enforced via company policy. The communication plan can be seen in the following table.

|  |  |
| --- | --- |
| **Title** | **Communication** |
| CIO | Will communicate to the enterprise via email and in quarterly meetings. A summary of the project will be sent out to employees to prepare them for BitLocker deployment. |
| IT Team Leader | Will create documentation and train IT staff on BitLocker maintenance and administration. |
| IT Specialist | Will train the IT Team Leader and demonstrate BitLocker in Stakeholder meetings. Will also be responsible for weekly status updates via email to Stakeholders. |
| IT Manager | Will go over the current status of the BitLocker in bi-weekly IT meetings. |

# Approval and Authority to Proceed

We approve the project as described above, and authorize the team to proceed.

|  |  |  |
| --- | --- | --- |
| Print Name | Title | Sign |
| Daryl Smith | CFO | Daryl Smith |
| John Brown | CIO | John Brown |
| Tina Pippins | Change Management | Tina Pippins |
| Larry Johnson | Senior Software Developer | Larry Johnson |
| Dalia Stoffer | IT Manager | Dalia Stoffer |
| Leslie Lee | IT Team Lead | Leslie Lee |

## Milestone Reports

**Milestone 1 Report**

In Milestone 1, the primary focus of the project is on software development. The development stage includes programming the scripts necessary for BitLocker deployment and administration, performing all unit testing, and completing user acceptance testing, or UaT. The development portion is broken down as follows:

* A script to report the current status of TPM chips
* A script to manage BitLocker recovery key imports
* A script to report on BitLocker compliance in the enterprise
* A script for support staff (to return a single BitLocker recovery password)
* A script to perform the backup of BitLocker recovery passwords

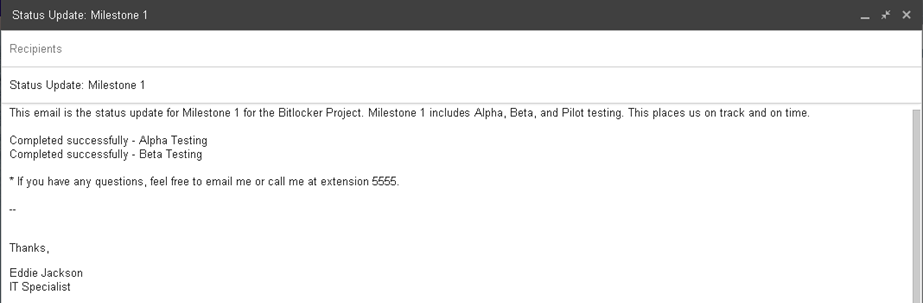
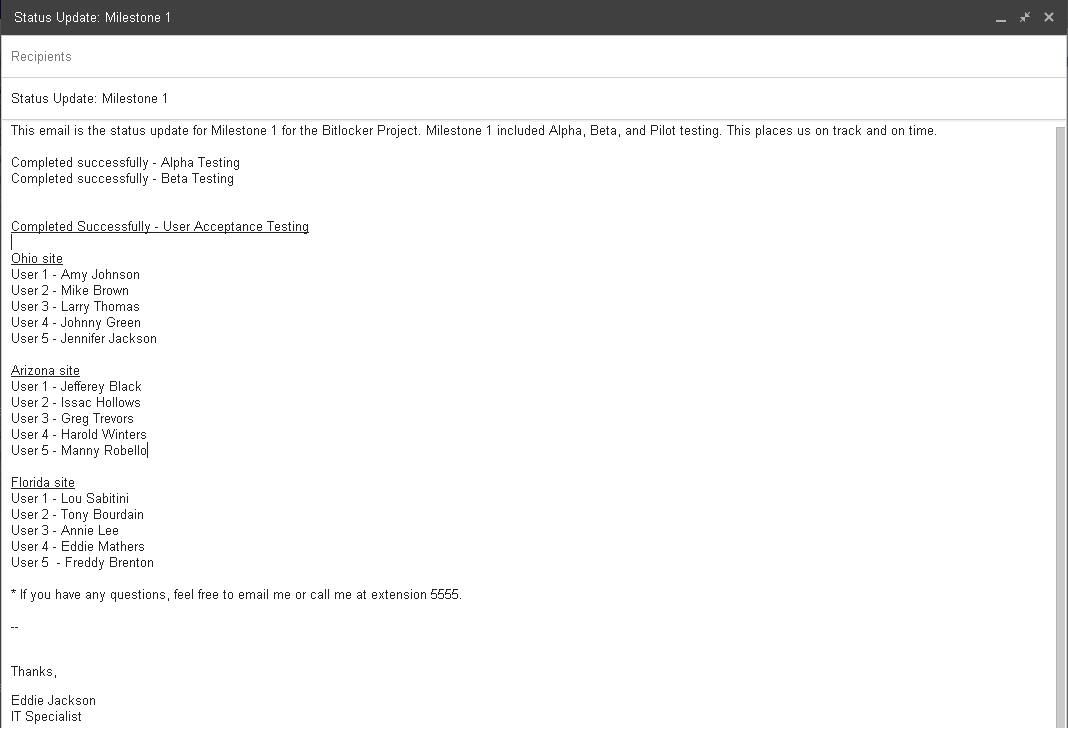
Rather than providing the code for the scripts—which can be viewed in the BitLocker Coding section of this project—the general ideas and concepts in the development process are discussed. To reduce problems associated with the software development stage, i.e. software quality, bugs, and scope creep, it is common that a standardized, proven methodology be applied to the coding process. One of these methodologies is SDLC. SDLC, or software development life cycle, was used as a development guideline in Milestone 1. Because the design, development, and testing of the scripts were essential to reaching Milestone 1, the SDLC methodology became critical to the overall software development and testing process. Specifically, the script development included analyzing what was needed, a script design was created around those needs, the code was developed and tested, and eventually, the scripts would reach the final stage, which meant they were ready for production. The SDLC flow chart is shown in Figure 1.

**■ Figure 1 SDLC Flow Chart**

  
 **SOURCE: http://www.sdlc.ws**  
Once all the coded components passed the user acceptance testing stage, the key stakeholders agreed that we were ready to move to the next stage and the go-live was approved.  
 Considering each script, there were five scripts coded for the business, these were based upon business need and technical support requests. The scripts include (1) check the current status of the TPM chip, (2) TPM management, (3) BitLocker compliance, (4) helpdesk support, and (5) backup of the BitLocker Passwords. The basic flow and thought process behind these scripts can be seen in the following table.

**■ Table 1 Script Flow**

|  |  |
| --- | --- |
| **Script** | **Reasoning/Business Requirement** |
| Check TPM Status | Before enabling BitLocker, a script is required to query the current status of the chip. If off, enable chip. |
| TPM Management | After the TPM chip has been enabled, ownership of the TPM must be taken, protectors must be added to the TPM, and the recovery information needs to be imported into Active Directory and LANDesk. |
| BitLocker Compliance | There needs to be a way to verify which workstations do and do not meet BitLocker compliance. |
| Helpdesk Support | Support staff will need an easy way to retrieve a single BitLocker password, independently of accessing Active Directory or LANDesk. |
| Backup | There is a business need to maintain a backup of BitLocker passwords for disaster recovery. This should be in form of a simple text file. |

Each of the scripts were completed on time and within budget. As stated, the SDLC methodology was used to guide the development and testing process. The stages of programming went through alpha, beta, and pilot phases. In the alpha and beta phases, software issues were identified, they were fixed, and each script was tested again. At the end of alpha and beta development phases, a status email was sent to the stakeholders. The email is shown in Figure 2.  
**■ Figure 2 Status Update Email Sent to Stakeholders**  
  
In the pilot phase, which was officially marked the UaT stage, five test users were selected from each site—Ohio, Arizona, and Florida. These users received the TPM Status and TPM Management scripts (via LANDesk) without any issues. Once all the users had been successfully tested, a status email was sent to the stakeholders. This email can be seen in Figure 3.  
**■ Figure 3 Status Update Email Sent to Stakeholders**  


Additionally, the compliance, helpdesk support, and backup scripts were evaluated for proper operation. All scripts worked as intended, consequently leading to the go-live approval from the stakeholders. Lastly, the technical documentation was transferred to the IT Team Leader to be reviewed, updated, and disseminated accordingly. Milestone 1 is now considered complete.  
  
*\* See Technical Documentation for code and screenshots on page 34.*

**Milestone 2 Report**

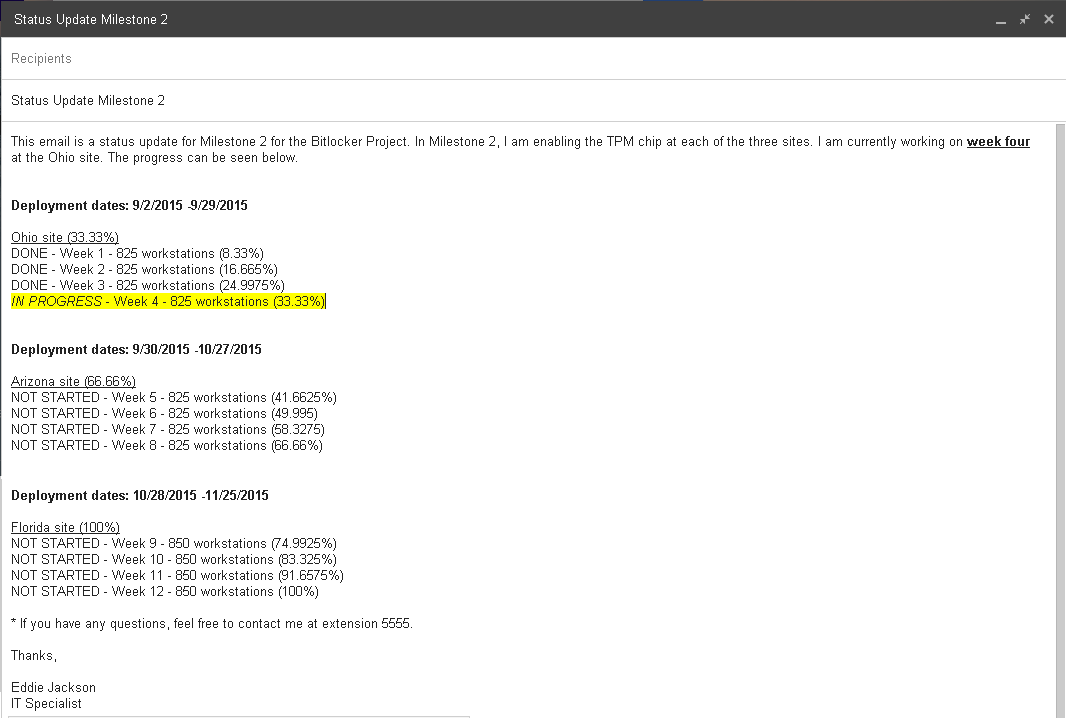
In Milestone 2, the main objective was to enable TPM chips on all workstations at all three sites—Ohio, Arizona, and Florida. This milestone was considered more difficult than Milestone 1, in that it required coordinated efforts with local site technicians, and had the greatest potential for hardware and software problems. Because the enabling of the TPM chips required attention to detail, one site was addressed at a time. Site 1, the Ohio site, had 3,300 computers that needed the TPM chips enabled. As the IT Specialist, and the leader of the project, I was responsible for enabling the TPM chips using the TPM script I created in Milestone 1. Rather than just deploying to all 3,300 computers at once, I setup a deployment schedule of 825 workstations a week, for four weeks. This way, it would be easier to coordinate hardware and software support issues with the local technicians (if problems came up). The Ohio schedule for the TPM status script can be seen in the following table (note, each site schedule was similar to this schedule):

**■ Table 2 Ohio Schedule**

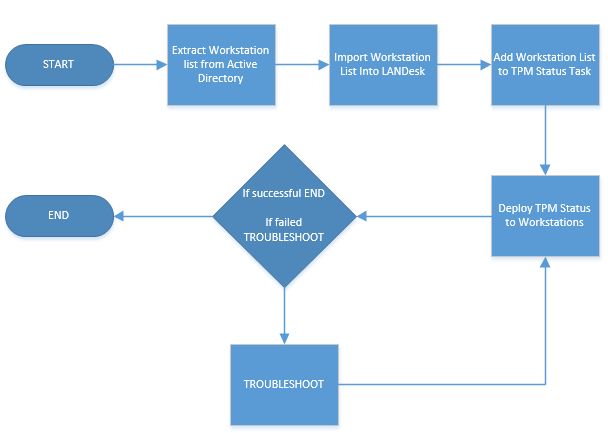
|  |  |  |
| --- | --- | --- |
| **Workstation Count** | **Start Date** | **End Date** |
| 825 | Wed 9/2/15 | Tue 9/8/15 |
| 825 | Wed 9/9/15 | Tue 9/15/15 |
| 825 | Wed 9/16/15 | Tue 9/22/15 |
| 825 | Wed 9/23/15 | Tue 9/29/15 |

At the end of each deployment cycle, a status email was sent to the stakeholders, updating them on the progress of the project thus far (a total of four emails was sent for the Ohio site). A sample email with each site name can be seen in Figure 4. This email tracks the progress of the overall project using percentages, the percentage each deployment cycle accounts for within at each site, and the exact point in the deployment process is highlighted.

**■ Figure 4 Status Update Email Sent to Stakeholders (1 of 12)**

  
After the Ohio site had all the TPM chips enabled, the Arizona and Florida sites followed (a total of twelve status update emails were sent). There were only minor issues associated with Milestone 2, all of which were anticipated for in the project’s risk assessment stage. The two most common problems were broken TPM chips or non-working TPM chips, and misconfigured BIOS settings. In the case of a broken TPM chip, the computer was swapped out by the local site technician. There were only five computers that had to be replaced, and five computers that required hands-on support due to BIOS configuration problems. The exact process for reporting on and enabling the TPM chip is depicted in the flow chart in Figure 5.

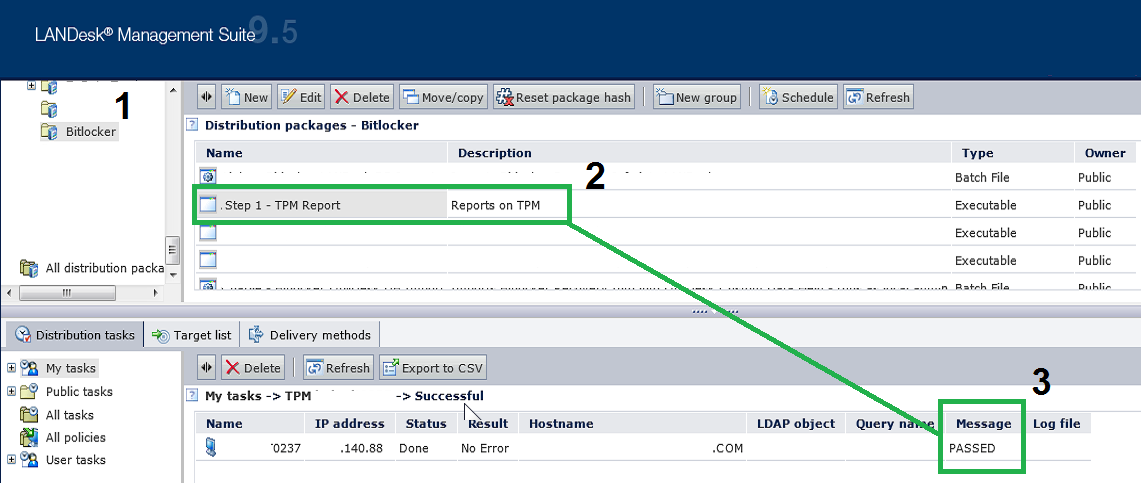
**■ Figure 5 Flow Chart for Deploying TPM Status**

I also compiled the list of computers that had problems during Milestone 2.

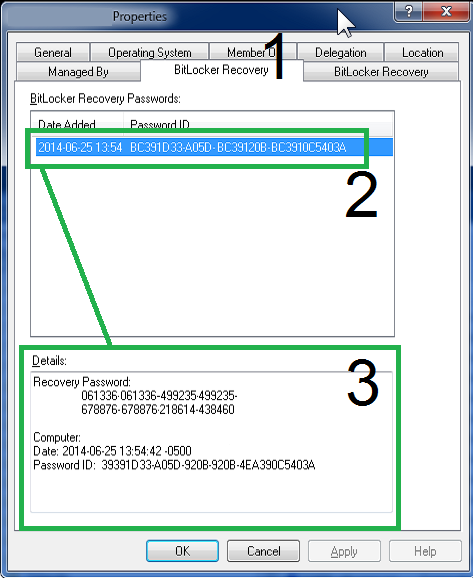
**■ Table 3 Computers for Review**

|  |  |  |  |
| --- | --- | --- | --- |
| **Site Name** | **Problem** | **Old Computer Serial#** | **New Computer Serial #** |
| Ohio | BIOS config | TQ9164 | N/A |
| Ohio | Broken TPM | AJH2381 | MQ5239 |
| Arizona | BIOS config | JU9823 | N/A |
| Arizona | Broken TPM | ZB3321 | IU3103 |
| Arizona | Broken TPM | WE0016 | UU1636 |
| Arizona | BIOS config | BY7153 | N/A |
| Florida | BIOS config | MQ0138 | N/A |
| Florida | Broken TPM | PY7714 | RQ1874 |
| Florida | Broken TPM | ZY2273 | QR0125 |

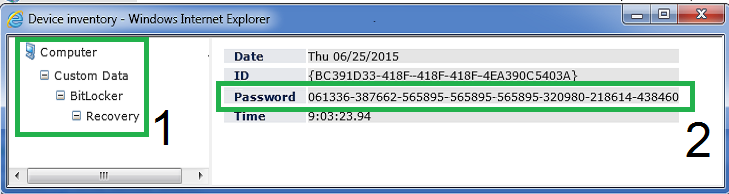
To keep track of the status of TPM chips—which were either *enabled* or *disabled*—a script was deployed from LANDesk. This script determined whether the TPM chip was enabled or disabled, and returned a PASSED or FAILED message back to LANDesk. If the TPM was disabled, the script attempted to enable the chip and returned FAILED back to LANDesk. If the chip was enabled, a PASSED message was returned to LANDesk. A successful message can be seen in Figure 6.  
**■ Figure 6 TPM Status Check in LANDesk**

  
  
Now that all TPM chips are reporting a status of PASSED, Milestone 2 is considered complete.  
 *\* To see the scripting used to report on TPM status, see Technical Documentation on page 35.*

**Milestone 3 Report**

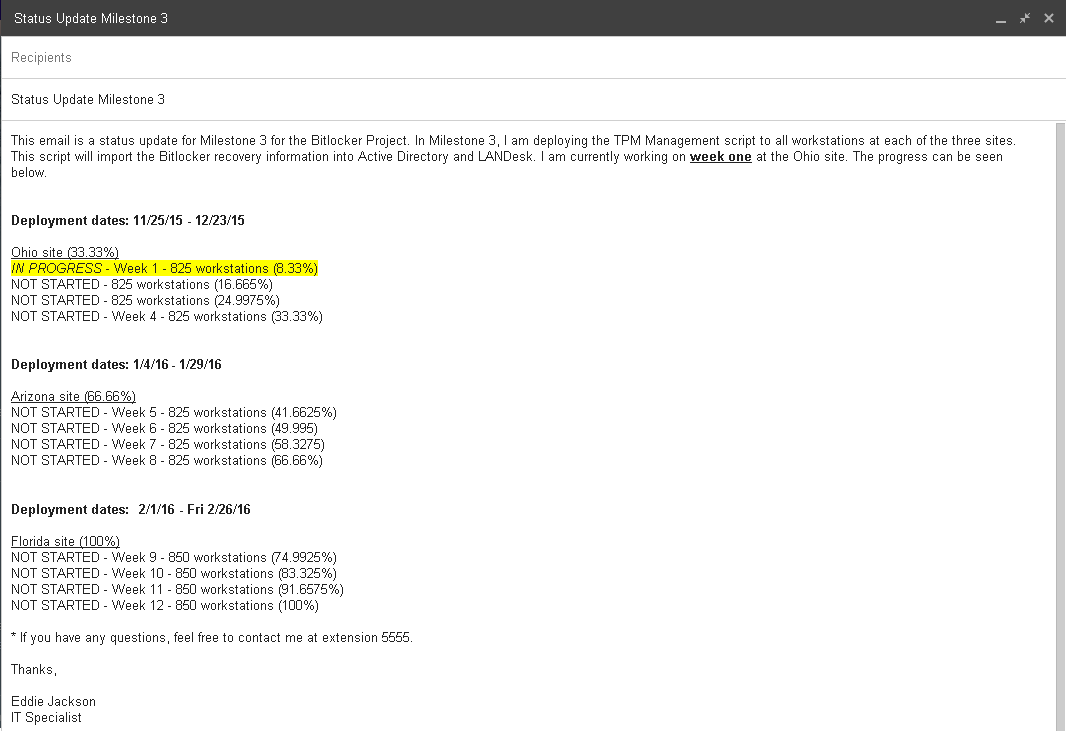
In Milestone 3, the objective was to acquire the BitLocker recovery information. Obtaining and storing the BitLocker passwords are critical to maintaining a BitLocker solution. If the recovery information is not stored, there is the risk that data can become inaccessible. There is the scenario where the 48-digit recovery password may be required to access data. For example, if the hard drive needs to removed, the password will be required. Likewise, if the BIOS settings change on a workstation, the recovery password will need to be entered. Thus, to address the storage and access of BitLocker recovery passwords, the passwords were stored in current server systems that Company X owns and operates. An important part of Milestone 3 was importing BitLocker recovery passwords into Active Directory and LANDesk, which is to be used for recovery purposes. These imports—with the BitLocker recovery information—can be observed in Figure 7 and Figure 8.  
**■ Figure 7 Successful Active Directory Import  
**

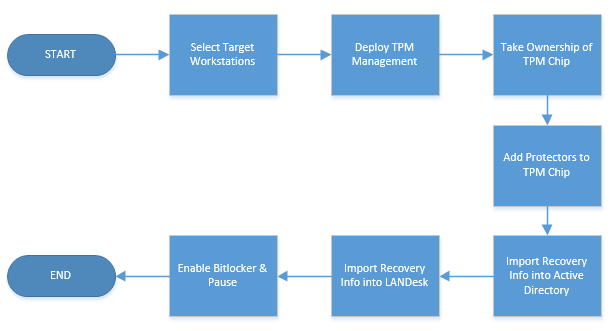
**■ Figure 8 Successful LANDesk Import**



To maintain open lines of communication with the project stakeholders throughout the deployment of the TPM management script, a status update email was sent at the end of each week. The email contains the overall percentage each site accounts for in Milestone 3, the percentage each deployment cycle accounts for at each site, and the exact point in the deployment process is highlighted. The status email can be seen in Figure 9.

**■ Figure 9 Status Update Email Sent to Stakeholders (1 of 12)**



To understand more about the TPM Management script, a flow chart has been prepared which outlines how the script is processed. The flow of the script is illustrated in Figure 10.  
**■ Figure 10 Flow Chart of TPM Management**The operational breakdown of the entire process is as follows:

* I select target machines in LANDesk. Example: 825 workstations for the Ohio site
* I deploy the TPM Management script from LANDesk to target machines
* From LANDesk, I monitor the progress
* On the workstation, the TPM ownership is taken using manage-bde
* On the workstation, protectors are added to the TPM using manage-bde
* On the workstation, the recovery password is imported into Active Directory
* On the workstation, the recovery password is imported into LANDesk
* On the workstation, BitLocker encryption is enabled
* On the workstation, BitLocker encryption is immediately paused

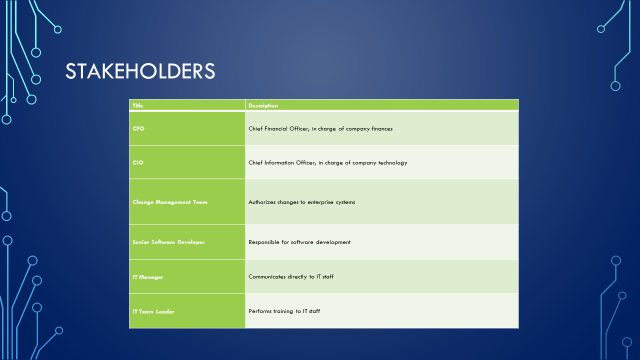
After reviewing the breakdown, it can be observed that the last step—*BitLocker encryption is immediately paused*—stops BitLocker from encrypting the hard drive. This is done by design. Once the drive encryption process has been started, it is not practical to use the workstation, as BitLocker is resource intensive and the speed of the computer is negatively impacted; encrypting the hard drive may take anywhere from two to four hours, depending on the size of the hard drive. It is recommended that encryption be paused, and then started at the end of day, so that the hard drive may be encrypted overnight. Using this approach, productivity will be least affected, and the user experience will remain a positive one throughout the deployment of BitLocker.

I have added these two videos for review.

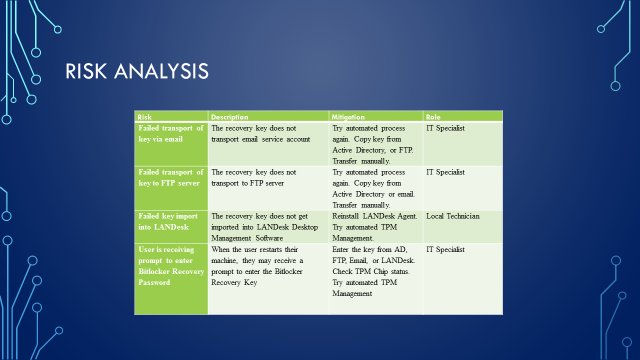
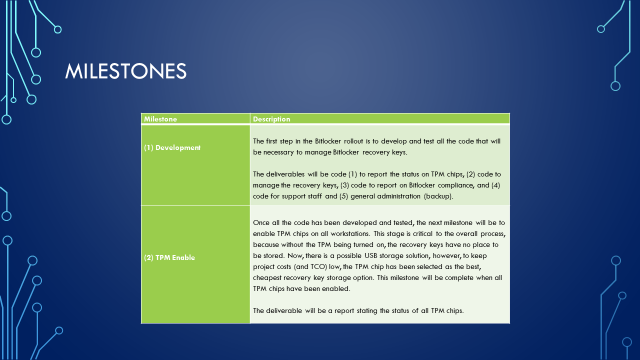
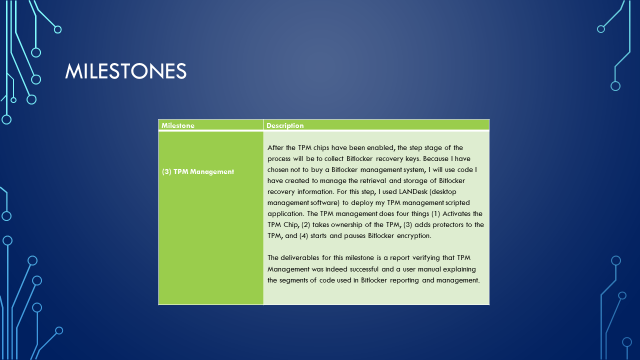
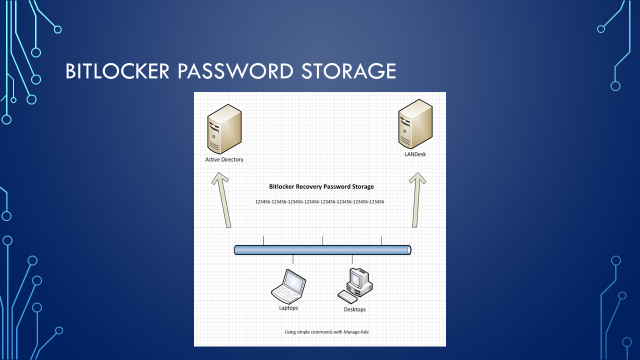
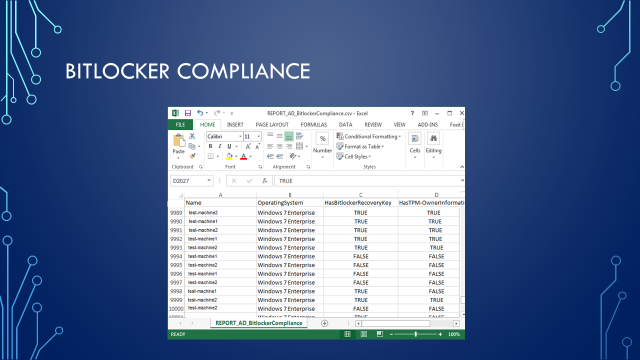
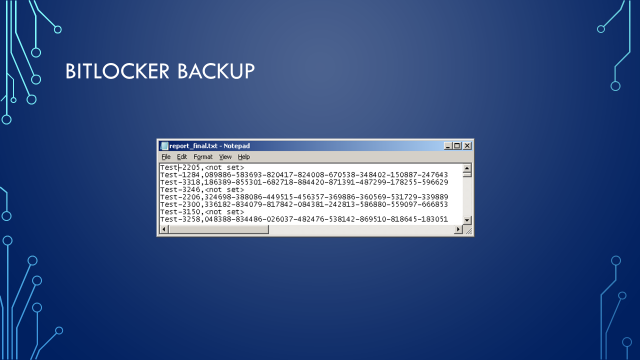
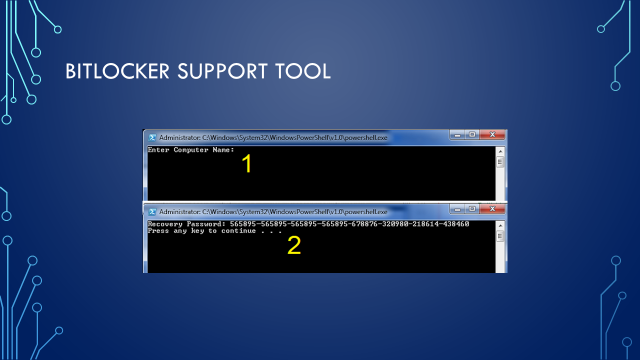
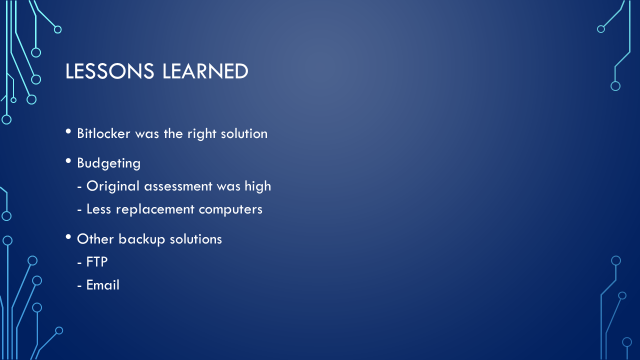
|  |  |
| --- | --- |
| The Milestones | Milestone 3 explained |
| http://www.graphicsfuel.com/wp-content/uploads/2011/05/video-clapperboard-512x512.png | http://www.graphicsfuel.com/wp-content/uploads/2011/05/video-clapperboard-512x512.png |

*\* Videos were sent to the professor and discussed in class.*

**BitLocker Presentation**

This is the presentation given at the end of BitLocker project. Please note, the actual PowerPoint was narrated and contains audio on each slide.**  
  
  



  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
\* Videos have also been prepared detailing the project, the challenges, and the implemented solutions.

## Technical Documentation

*Preface*

This documentation is setup in the form of Problem and Solution; the Problem being a BitLocker reporting or maintenance need, and the Solution being a script that has been developed and implemented in a production environment. Because this particular implementation of BitLocker is not utilizing MBAM, MDOP, SQL, or any other reporting/compliance solution, customized scripts were created to fulfil the needs of Company X. The business requirements include reporting the current status of the TPM chip, enabling the TPM chip, importing critical BitLocker recovery information into Active Directory and LANDesk, and designing other miscellaneous support tools. The primary reason these scripts were engineered were to avoid current and future costs related to owning and operating a Microsoft-based or third party BitLocker management solution, which would include licensing and software support fees. Although every effort has been made to ensure the reliability and efficiency of the scripts, all the code should be tested in a lab before being introduced into a production environment. The documentation includes scripts coded in PowerShell, batch shell, and VBScript; these solutions have been coded in multiple languages, just to prove that creating a BitLocker solution is not limited to a single scripting language. It is also important to note, all the scripts where compiled into secure EXE files before entering a live environment. This was done to maintain the integrity and security of the scripts.

**BitLocker Coding**

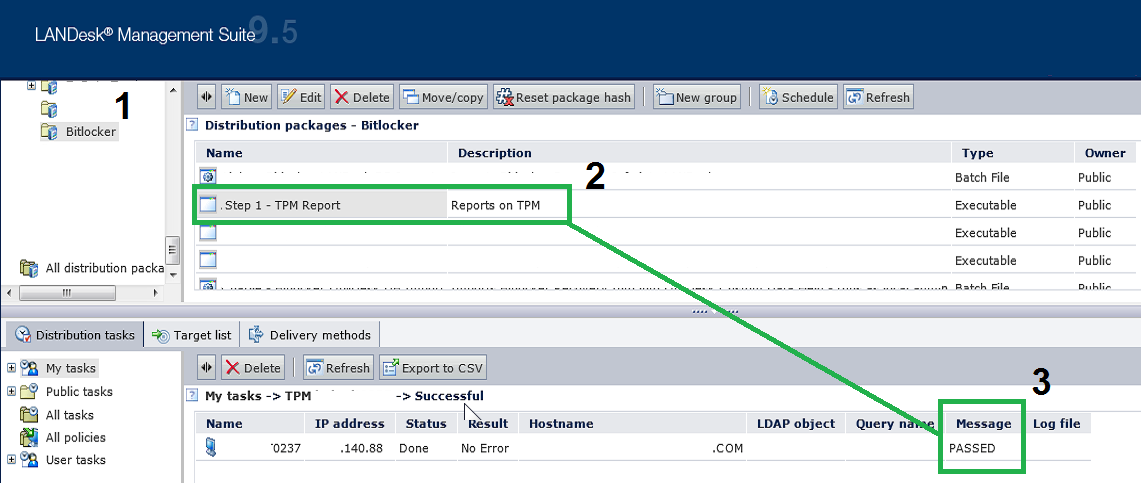
**Check TPM Status**

Problem

Before starting the BitLocker encryption process, a workstation must first have a working and enabled TPM chip. The TPM chip is used to securely store BitLocker recovery information. So, the question is: How can the status of the TPM be checked to verify that it is indeed on? Also, if the TPM status is disabled, steps should be taken to attempt to enable the chip, as well as a ‘FAILED’ status should be reported to LANDesk. If the chip is enabled, a ‘PASSED’ status should be reported to LANDesk.

SolutionCreate a batch script that uses *manage-bde.exe* to output the status of BitLocker; that output will be scanned for specific a specific keyword: ‘not’(as in TPM *not* found). If ‘not’ is found, the script uses the HP BIOS Utility [*BIOSConfigUtility.exe*](http://ftp.hp.com/pub/caps-softpaq/cmit/whitepapers/HP_BCU_FAQ.pdf)to set a BIOS password, which is required by some computer models to enable the TPM Chip. Next, the script runs the Microsoft VBScript [*EnableBitLocker.vbs*](https://gallery.technet.microsoft.com/scriptcenter/780d167f-2d57-4eb7-bd18-84c5293d93e3) to enable the TPM. The ‘FAILED’ status of the TPM is sent back to LANDesk and is also stamped in the registry. Now, if ‘not’ cannot be found in the scripted query, it is assumed that the TPM is enabled. Consequently, a ‘PASSED’ status will be returned to LANDesk, as well as being stamped in the registry. This batch script was created to be deployed from LANDesk *before* continuing to the BitLocker recovery key import stage. By first ensuring that TPM chips are enabled, the import process will go much smoother. The TPM Status Check can be observed in Figure 11.

**■ Figure 11 TPM Status Check in LANDesk**



The Script

@**ECHO** ON

:: CHECK TPM STATUS - IF TPM 'NOT' FOUND IS RETURNED, GOTO FAILED ELSE GOTO PASSED

C:\windows\system32\manage-bde -tpm -TurnOn **|** findstr /f "**not**" && **GOTO** :FAILED

**GOTO** :PASSED

**:FAILED**

**CLS**

COLOR 0c

**ECHO** ERROR: A compatible Trusted Platform Module (TPM) was not detected.

**ECHO**.

:: SEND FAILED TO LANDESK

**IF EXIST** "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"FAILED"

**IF EXIST** "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"FAILED"

**ECHO** **%DATE%** **%TIME%** Sent FAILED message to LANDesk**>>**C:\BitLocker\log.dat

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v TPM\_Status /d FAILED /t REG\_SZ /f

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v Timestamp /d "**%DATE%** **%TIME%**" /t REG\_SZ /f

:: IF TPM ENABLER IS FOUND (A SCRIPT FROM MICROSOFT), RUN SCRIPT WITH 'ON' OPTION AND SET BIOS PASSWORD USING SETPW.EXE

:: WIN7

**IF EXIST** "C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\\enableBitLocker.vbs" (

:: HP BIOS CONFIGURATION UTILITY - SET BIOS PASSWORD - REQUIRED TO ENABLE SOME TPM CHIPS

"C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\BIOSConfigUtility.exe" /nspwdfile:""C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\password.bin"

:: ENABLE TPM

"C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\enableBitLocker.vbs" /on:tpm /l:c:\setup\BitLocker.log

)

:: XP

**IF EXIST** "C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\enableBitLocker.vbs" (

:: SET BIOS PASSWORD - REQUIRED TO ENABLE SOME TPM CHIPS

"C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\BIOSConfigUtility.exe" /nspwdfile:""C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\password.bin"

:: ENABLE TPM

"C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\enableBitLocker.vbs" /on:tpm /l:c:\setup\BitLocker.log

)

:: LAUNCH RESTART COMPUTER PROMPT - SIMPLE EMPTY REBOOT HTA

**IF EXIST** "C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\RESTART.hta" (

start "" "C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\RESTART.hta"

)

**IF EXIST** "C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\RESTART.hta" (

start "" "C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\RESTART.hta"

)

**EXIT** /B 0

**:PASSED**

:: SEND PASSED TO LANDESK

**IF EXIST** "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"PASSED"

**IF EXIST** "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"PASSED"

**ECHO** **%DATE%** **%TIME%** Sent PASSED message to LANDesk**>>**C:\BitLocker\log.dat

:: WRITE PASSED STATUS TO REGISTRY

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v TPM\_Status /d PASSED /t REG\_SZ /f

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v Timestamp /d "**%DATE%** **%TIME%**" /t REG\_SZ /f

**EXIT** /B 0

\* PowerShell and VBScripts were also coded, however due to their length in routines, were not selected.

**TPM Management**

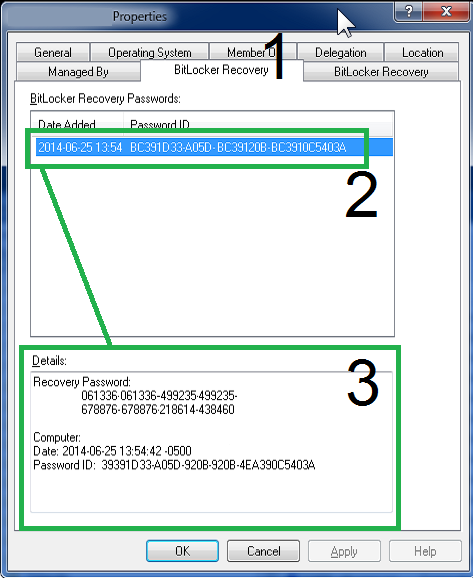
Problem

Once the TPM chip have been enabled, the next stage is to perform TPM management. Managing the TPM includes taking ownership of the TPM chip, adding protectors to the TPM, and importing the BitLocker recovery information into Active Directory and LANDesk. Before beginning the actual BitLocker encryption process, it is critical that the recovery information be stored in central repositories (such as Active Directory). The consequence of not storing recovery information could prove disastrous, as BitLocker requires a 48-digit recovery password to be entered under certain recovery circumstances (such as hard drive restoration and partition access from WinPE). The 48-digit recovery password will look something like this: 749474-424079-255893-309697-487611-671444-219460-369961.

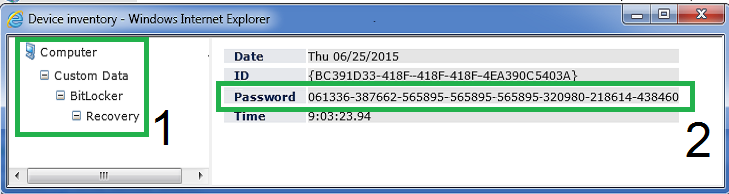
**Solution**

To address each of the *management* requirements, a batch file was created that uses manage-bde, along with some branch logic. The script works by being deployed from LANDesk, and then is launched in the client computer’s system account. Upon execution, it verifies that the machine is online, and if so, takes ownership of the TPM, adds protectors to the TPM, and proceeds to import the BitLocker recovery information into Active Directory and LANDesk. Successful imports can be seen in Figure 12 and Figure 13.

**■ Figure 12 Successful Active Director Import**

****

**■ Figure 13 Successful LANDesk Import**



The Script

@**ECHO** OFF

**CLS**

TITLE TPM Management

COLOR 0E

**SET** MyVar0**=**

**SET** MyVar1**=**

**SET** MyVar2**=**

**SET** FOUND**=**FALSE

**SET** CurDir**=%CD%**

SETLOCAL ENABLEDELAYEDEXPANSION

:: EXTRACTS FILES - CONTAINS ALL SOURCE FILES

**if exist** "C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\tpmman.exe" "C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\tpmman.exe"

**if exist** "C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\tpmman.exe" "C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\tpmman.exe"

:: PRIMARY PATH CHANGE

**Set** CurDir**=**C:\BitLocker

:: SECONDARY PATH CHANGE

**C:**

**CD** C:\BitLocker

:: TEST FOR ONLINE STATUS

**:VERIFYCOM**

**CLS**

**ECHO** Detecting Internet connectivity...

ping -n 4 127.0.0.1**>nul**

:: CHECK ONLINE STATUS - google.com

ping www.google.**com** -n 1 **|** find "Reply" && **SET** FOUND**=**TRUE

**IF** [**%FOUND%**] EQU [TRUE] **GOTO** :FOUND ELSE

**CLS**

COLOR 0C

**Echo** No Internet Connection Found. Exiting now...

ping -n 10 127.0.0.1**>nul**

**exit** /b 1

**:FOUND**

**CLS**

COLOR 0A

**ECHO** Internet Connection Found. Loading TPM Management...

ping -n 10 127.0.0.1**>nul**

**CLS**

COLOR 0B

**ECHO** Checking TPM Compliance...started

**ECHO** Taking Ownership of TPM...pending

**ECHO** Adding TPM Protector...pending

**ECHO** Adding TPM Recovery Password Protector...pending

**ECHO** Importing recovery information into Active Directory...pending

**ECHO** Importing recovery information into LANDesk...pending

:: CHECKS TO SEE IF TPM HAS ALREADY BEEN SETUP...IF YES, SKIP TO END, IF NO, CONTINUE TO CHECK1

**FOR** /f "tokens**=**1" **%%f in** ('"C:\windows\system32\manage-bde.exe -status"') **DO SET** MyVar0**=%%f**

**IF** ["**%MyVar0%**"] EQU ["Numerical"] **GOTO** :PASSED2

**IF NOT EXIST** C:\BitLocker (

**MD** C:\BitLocker

**ECHO** **%DATE%** **%TIME%** Created C:\BitLocker folder.**>>**C:\BitLocker\log.dat

)

**:CHECK1**

:: TAKE OWNERSHIP

C:\windows\system32\manage-bde -tpm -takeownership AddYourPasswordHere

:: CHECK TO SEE IF TPM HAS NO PROTECTORS

**for** /f "skip**=**4 tokens**=**2 delims**=**:" **%%g in** ('"C:\windows\system32\manage-bde.exe -protectors -get c:"') **do set** MyVar1**=%%g**

C:\windows\system32\ping.exe -n 10 127.0.0.1**>nul**

**IF** ["**%MyVar1%**"] EQU [" No key protectors found."] **GOTO** :TPMMGN

**GOTO** :ADIMP

**:TPMMGN**

**ECHO** **%DATE%** **%TIME%** No Key Protectors Found.**>>**C:\BitLocker\log.dat

**ECHO** **%DATE%** **%TIME%** Starting TPM Management.**>>**C:\BitLocker\log.dat

:: THIS IS THE TPM MANAGEMENT ROUTINE

**CLS**

**ECHO** Checking TPM Compliance...DONE.

**ECHO** Taking Ownership of TPM...started

**ECHO** Adding TPM Protector...pending

**ECHO** Adding TPM Recovery Password Protector...pending

**ECHO** Importing recovery information into Active Directory...pending

**ECHO** Importing recovery information into LANDesk...pending

**ECHO**.

**ECHO**.

C:\windows\system32\manage-bde -tpm -takeownership AddTPMPasswordHere

**ECHO** **%DATE%** **%TIME%** Taking Ownership of TPM.**>>**C:\BitLocker\log.dat

**CLS**

**ECHO** Checking TPM Compliance...DONE.

**ECHO** Taking Ownership of TPM...DONE.

**ECHO** Adding TPM Protector...started

**ECHO** Adding TPM Recovery Password Protector...pending

**ECHO** Importing recovery information into Active Directory...pending

**ECHO** Importing recovery information into LANDesk...pending

**ECHO**.

**ECHO**.

**ECHO** **%DATE%** **%TIME%** Adding TPM Protector.**>>**C:\BitLocker\log.dat

C:\windows\system32\manage-bde.exe -protectors -add C: -tpm

**CLS**

**ECHO** Checking TPM Compliance...DONE.

**ECHO** Taking Ownership of TPM...DONE.

**ECHO** Adding TPM Protector...DONE.

**ECHO** Adding TPM Recovery Password Protector...started

**ECHO** Importing recovery information into Active Directory...pending

**ECHO** Importing recovery information into LANDesk...pending

**ECHO**.

**ECHO**.

**ECHO** **%DATE%** **%TIME%** Adding Recovery Password Protector.**>>**C:\BitLocker\log.dat

C:\windows\system32\manage-bde.exe -protectors -add C: -recoverypassword

**GOTO** :CHECK2

**:CHECK2**

**for** /f "skip**=**4 tokens**=**2 delims**=**:" **%%h in** ('"C:\windows\system32\manage-bde.exe -protectors -get c:"') **do set** MyVar2**=%%h**

C:\windows\system32\ping.exe -n 10 127.0.0.1**>nul**

**IF** ["**%MyVar2%**"] NEQ [" No key protectors found."] **GOTO** :ADIMP

**ECHO** **%DATE%** **%TIME%** Adding Protectors failed. TPM has not been enabled.**>>**C:\BitLocker\log.dat

**GOTO** :FAILED

**:ADIMP**

:: IMPORT RECOVERY INFO INTO AD

**CLS**

**ECHO** Checking TPM Compliance...DONE.

**ECHO** Taking Ownership of TPM...DONE.

**ECHO** Adding TPM Protector...DONE.

**ECHO** Adding TPM Recovery Password Protector...DONE.

**ECHO** Importing recovery information into Active Directory...started

**ECHO** Importing recovery information into LANDesk...pending

**ECHO**.

**ECHO**.

**ECHO** **%DATE%** **%TIME%** Starting AD Recovery Import.**>>**C:\BitLocker\log.dat

C:\windows\system32\manage-bde.exe -protectors -adbackup c: -id**%MyVar2%** && **GOTO** :LDIMP

:: LOG

**ECHO** **%DATE%** **%TIME%** AD Recovery Import failed**>>**C:\BitLocker\log.dat

:: STAMP REGISTRY

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v AD\_Import /d FAILED /t REG\_SZ /f

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v LD\_Import /d FAILED /t REG\_SZ /f

**GOTO** :FAILED

**:LDIMP**

:: LOG

**ECHO** **%DATE%** **%TIME%** AD Recovery Import was successful.**>>**C:\BitLocker\log.dat

:: STAMP REGISTRY

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v AD\_Import /d PASSED /t REG\_SZ /f

:: IMPORT RECOVERY INFO INTO LANDESK

**CLS**

**ECHO** Checking TPM Compliance...DONE.

**ECHO** Taking Ownership of TPM...DONE.

**ECHO** Adding TPM Protector...DONE.

**ECHO** Adding TPM Recovery Password Protector...DONE.

**ECHO** Importing recovery information into Active Directory...DONE.

**ECHO** Importing recovery information into LANDesk...started

**ECHO**.

**ECHO**.

**ECHO** **%DATE%** **%TIME%** Starting LANDesk Recovery Import.**>>**C:\BitLocker\log.dat

**if exist** "C:\Program Files (x86)\LANDesk\LDClient\sdmcache\apps\BitLocker\tpmman.exe" **call** "c:\BitLocker\LDCustom64.cmd"

**if exist** "C:\Program Files\LANDesk\LDClient\sdmcache\apps\BitLocker\tpmman.exe" **call** "c:\BitLocker\LDCustom32.cmd"

C:\windows\system32\ping.exe -n 10 127.0.0.1**>nul**

:: ADD TEST FOR LD STILL HAVE TO DO THIS VERIFICATION ROUTINE

:: LOG

**ECHO** **%DATE%** **%TIME%** LANDesk Recovery Import was successful.**>>**C:\BitLocker\log.dat

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v LD\_Import /d PASSED /t REG\_SZ /f

**GOTO** :PASSED

**:PASSED**

:: THIS IS FOR 1st PASS

**ECHO** **%DATE%** **%TIME%** TPM Compliance PASSED. Numerical ID was created.**>>**C:\BitLocker\log.dat

**CLS**

**ECHO** Checking TPM Compliance...DONE.

**ECHO** Taking Ownership of TPM...DONE.

**ECHO** Adding TPM Protector...DONE.

**ECHO** Adding TPM Recovery Password Protector...DONE.

**ECHO** Importing recovery information into Active Directory...DONE.

**ECHO** Importing recovery information into LANDesk...DONE.

**ECHO**.

**ECHO** Computer meets TPM Compliance.

**ECHO**.

:: STAMP REGISTRY

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v TPM\_Status /d PASSED /t REG\_SZ /f

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v Timestamp /d "**%DATE%** **%TIME%**" /t REG\_SZ /f

:: SEND MESSAGE TO LANDESK

**if exist** "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"PASSED"

**if exist** "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"PASSED"

**ECHO** **%DATE%** **%TIME%** Sent PASSED message to LANDesk.**>>**C:\BitLocker\log.dat

manage-bde -on c: -s

C:\windows\system32\ping.exe -n 10 127.0.0.1**>nul**

manage-bde -pause c:

**CLS**

**ECHO** Passed.

C:\windows\system32\ping.exe -n 6 127.0.0.1**>nul**

**GOTO** :END

**:PASSED2**

:: THIS IS FOR 2nd PASS

**ECHO** **%DATE%** **%TIME%** TPM Compliance PASSED. Found Numerical ID.**>>**C:\BitLocker\log.dat

**CLS**

**ECHO** Checking TPM Compliance...DONE.

**ECHO** Taking Ownership of TPM...DONE.

**ECHO** Adding TPM Protector...DONE.

**ECHO** Adding TPM Recovery Password Protector...DONE.

**ECHO** Importing recovery information into Active Directory...DONE.

**ECHO** Importing recovery information into LANDesk...DONE.

**ECHO**.

**ECHO** Computer meets TPM Compliance.

**ECHO**.

:: SEND MESSAGE TO LANDESK

**if exist** "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"PASSED"

**if exist** "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"PASSED"

**ECHO** **%DATE%** **%TIME%** Sent PASSED message to LANDesk.**>>**C:\BitLocker\log.dat

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v TPM\_Status /d PASSED /t REG\_SZ /f

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v Timestamp /d "**%DATE%** **%TIME%**" /t REG\_SZ /f

manage-bde -on c: -s

C:\windows\system32\ping.exe -n 10 127.0.0.1**>nul**

manage-bde -pause c:

**ECHO** Passed.

C:\windows\system32\ping.exe -n 6 127.0.0.1**>nul**

**GOTO** :END

**:FAILED**

manage-bde -protectors -delete c:

**ECHO** **%DATE%** **%TIME%** TPM Compliance FAILED. Check TPM.**>>**C:\BitLocker\log.dat

**ECHO** **%DATE%** **%TIME%** Deleted Recovery Info to start over**>>**C:\BitLocker\log.dat

**CLS**

**ECHO** FAILED!

:: SEND MESSAGE TO LANDESK

**if exist** "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files (x86)\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"FAILED"

**if exist** "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" "C:\Program Files\LANDesk\LDClient\SDCLIENT.EXE" /msg**=**"FAILED"

**ECHO** **%DATE%** **%TIME%** Sent FAILED message to LANDesk**>>**C:\BitLocker\log.dat

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v TPM\_Status /d FAILED /t REG\_SZ /f

C:\windows\system32\REG.exe ADD HKLM\SOFTWARE\BitLocker /v Timestamp /d "**%DATE%** **%TIME%**" /t REG\_SZ /f

C:\windows\system32\ping.exe -n 10 127.0.0.1**>nul**

**ECHO** Failed.

C:\windows\system32\ping.exe -n 6 127.0.0.1**>nul**

**GOTO** :END

**exit** /b 0

**:END**:: PERFORM CLEANUP

**IF EXIST** c:\BitLocker\LDCustom32.cmd **DEL /Q** c:\BitLocker\LDCustom32.cmd

**IF EXIST** c:\BitLocker\LDCustom64.cmd **DEL /Q** c:\BitLocker\LDCustom64.cmd

**IF EXIST** c:\BitLocker\LDSCNHLP32.INI **DEL /Q** c:\BitLocker\LDSCNHLP32.INI

**IF EXIST** c:\BitLocker\LDSCNHLP64.INI **DEL /Q** c:\BitLocker\LDSCNHLP64.INI

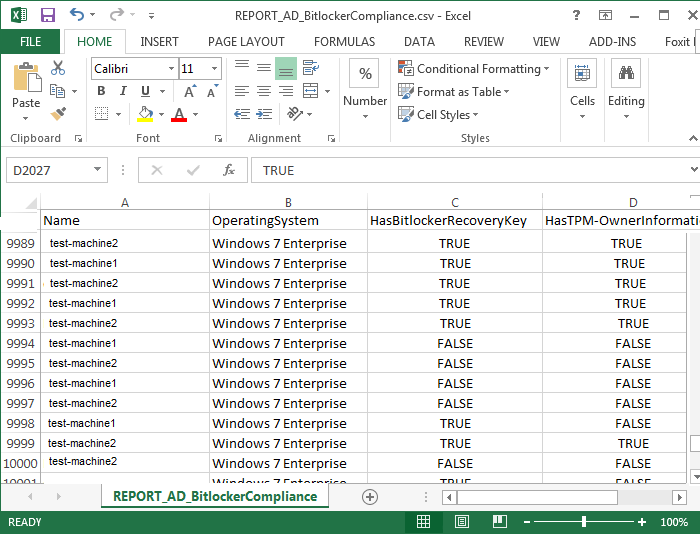
**EXIT** /B 0

**Active Directory BitLocker Compliance Report**

Problem

Once TPM chips have been enabled, and TPM Management has been completed, BitLocker encryption can be started. Although the BitLocker recovery information is being stored in Active Directory, there is no built-in way to audit and report on BitLocker compliance throughout the enterprise. Thus, steps must be taken to create an automated method of reporting BitLocker compliance.

SolutionTo address the Active Directory BitLocker *compliance* request, a PowerShell script was created to scan computer objects in Active Directory, and return ‘true’ or ‘false’ on the status of BitLocker. The recovery key and owner information are returned and outputted to a CSV file. This script is meant to be ran by the compliance officer or BitLocker administrator. The compliance report can be seen in Figure 14.  
 **■ Figure 14 Active Directory BitLocker Compliance Report**



The Script

#SET REPORT NAME

$CsvFilePath **=** "REPORT\_AD\_BitLockerCompliance.csv"

#LOAD COMPUTER OBJECTS BASED ON OBJECT PROPERTIES

$BitLockerEnabled **=** Get**-**QADObject **-**SizeLimit **0** **-**IncludedProperties Name**,**ParentContainer **|** Where**-**Object **{**$\_.type **-**eq "msFVE-RecoveryInformation"**}** **|** Foreach**-**Object **{**Split**-**Path **-**Path $\_.ParentContainer **-**Leaf**}** **|** Select**-**Object **-**Unique

$strComputers **=** Get**-**QADComputer **-**SizeLimit **0** **-**IncludedProperties Name**,**OperatingSystem**,**msTPM**-**OwnerInformation **|** Where**-**Object **{**$\_.operatingsystem **-**like "Windows 7\*" **-**or $\_.operatingsystem **-**like "Windows Vista\*"**}** **|** Sort**-**Object Name

#CREATE ARRAY TO HOLD COMPUTER INFORMATION

$ExportToArray **=** @**()**

foreach **(**$strComputer in $strComputers**)**

**{**

#Create object for each computer

$strComputerObj **=** New**-**Object **-**TypeName psobject

$HOST.UI.RawUI.ReadKey**(**"NoECHO,IncludeKeyDown"**)** **|** OUT**-**NULL

$HOST.UI.RawUI.Flushinputbuffer**()**

#Add name and OS

$strComputerObj **|** Add**-**Member **-**MemberType NoteProperty **-**Name Name **-**Value $strComputer.Name

$strComputerObj **|** Add**-**Member **-**MemberType NoteProperty **-**Name OperatingSystem **-**Value $strComputer.operatingsystem

#SET HasBitLockerRecoveryKey to true or false

if **(**$strComputer.name **-**match **(**'(' + [string]::Join(')|(', $BitLockerenabled) + ')')) {

$strComputerObj **|** Add**-**Member **-**MemberType NoteProperty **-**Name HasBitLockerRecoveryKey **-**Value $true

**}**

else

**{**

$strComputerObj **|** Add**-**Member **-**MemberType NoteProperty **-**Name HasBitLockerRecoveryKey **-**Value $false

**}**

#SET HasTPM-OwnerInformation to true or false

if **(**$strComputer."msTPM-OwnerInformation"**)** **{**

$strComputerObj **|** Add**-**Member **-**MemberType NoteProperty **-**Name HasTPM**-**OwnerInformation **-**Value $true

**}**

else

**{**

$strComputerObj **|** Add**-**Member **-**MemberType NoteProperty **-**Name HasTPM**-**OwnerInformation **-**Value $false

**}**

#Add the computer object to the array

$ExportToArray **+=** $strComputerObj

**}**

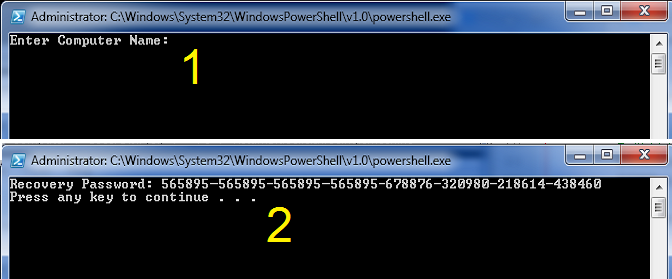
#Export the array with computer information  
$ExportToArray **|** Export**-**Csv **-**Path $CsvFilePath **-**NoTypeInformation

**Helpdesk Support/Tech Support**

Problem

Although the BitLocker recovery information is in Active Directory, not everyone will have the Active Directory User console installed on their machines. This presents a support challenge in the scenario that helpdesk or other support personnel need access to the 48-digit BitLocker password for recovery purposes.

Solution  
To address this *ease of access* requirement, a PowerShell script has been created to allow support staff to enter a specific computer name and the BitLocker recovery password will be returned. This script was compiled into an EXE. The scripting input and output can be seen in Figure 15.

**■ Figure 15 Support Staff Recovery Script**  


The Script

clear

#Retrieve user input

$strComputer = Read-Host 'Enter Computer Name'

#Import AD commands

Import-Module ActiveDirectory

#Check AD Object

$strComputerObject = Get-ADComputer -Filter {cn -eq $strComputer} -Property msTPM-OwnerInformation, msTPM-TpmInformationForComputer

if($strComputerObject -eq $null){

Write-Host "Computer object not found. EXITing the script..."

%compspec% /c PAUSE

EXIT

}

#msTPM-OwnerInformation attribute

if($strComputerObject.'msTPM-OwnerInformation' -eq $null){

#Check TPM info is backed up to AD

if($strComputerObject.'msTPM-TpmInformationForComputer' -ne $null){

# Retrieve TPM Owner Password

$TPMObject = Get-ADObject -Identity $strComputerObject.'msTPM-TpmInformationForComputer' -Properties msTPM-OwnerInformation

$TPMKey = $TPMObject.'msTPM-OwnerInformation'

}else{

$TPMKey = '<not SET>'

}

}else{

#TPM Owner Password

$TPMKey = $strComputerObject.'msTPM-OwnerInformation'

}

#Check computer object AD BitLocker Recovery Password

$BitLockerObject = Get-ADObject -Filter {objectclass -eq 'msFVE-RecoveryInformation'} -SearchBase $strComputerObject.DistinguishedName -Properties 'msFVE-RecoveryPassword' | Select-Object -Last 1

if($BitLockerObject.'msFVE-RecoveryPassword'){

$BitLockerKey = $BitLockerObject.'msFVE-RecoveryPassword'

}else{

$BitLockerKey = '<not SET>'

}

#Return Info to screen

clear

Write-Host 'Recovery Password:' $BitLockerKey

#Export TPM Owner Password File

if($strComputerObject.'msTPM-TpmInformationForComputer' -ne $null){

$ExportToArrayToFile = Read-Host 'Would you like to export the recovery key [y or n]'

if($ExportToArrayToFile -ne 'y'){

EXIT

}

$TPMFile = '<?xml version="1.0" encoding="UTF-8"?><ownerAuth>' + $TPMKey + '</ownerAuth>'

$TPMFile | Out-File "TPMOwnerPasswordFile.tpm"

}else{

Cmd /c PAUSE

}

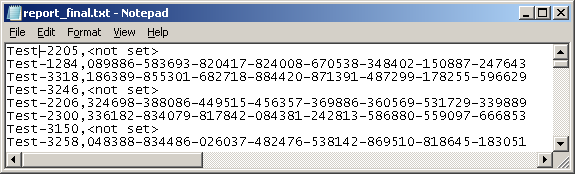
**Backup BitLocker Passwords**

Problem

The BitLocker recovery information is in Active Directory and in LANDesk, however there may be need to export or backup the BitLocker passwords. This will useful for disaster recovery, and is considered best practice to maintain a secondary or even tertiary copy of the BitLocker passwords. Thus, measures should be taken to back up the passwords to a text or CSV file.

Solution  
To address the backup requirement, a PowerShell script was written which uses the Import-Module ActiveDirectory cmdlet. A sample report can be observed in Figure 16. Note, this text file is comma delimited, which can be easily converted to an Excel spreadsheet or CSV report.

**■ Figure 16 Backup of BitLocker Passwords**



The Script

Import-Module ActiveDirectory

**$ou** **=** Get-ADObject **-Filter** **{** ObjectClass **-**eq 'organizationalunit' **}** **-**SearchBase "OU=Workstations,,DC= YourDomainName,DC=com"

**foreach** **($obj** **in** **$ou)** **{**

Get-ADComputer **-Filter** 'ObjectClass -eq "computer"' **-**SearchBase **$obj** **-**ErrorAction SilentlyContinue **-**ResultPageSize 2000 **|** foreach-object **{**

**$Computer** **=** **$\_.**name

#Check if the Computer Object exists  
**$Computer\_Object** **=** Get-ADComputer **-Filter** **{**cn **-**eq **$Computer}** **-**Property msTPM-OwnerInformation**,** msTPM-TpmInformationForComputer

#Check if the computer object has had a BitLocker Recovery Password

**$BitLocker\_Object** **=** Get-ADObject **-Filter** **{**objectclass **-**eq 'msFVE-RecoveryInformation'**}** **-**SearchBase **$Computer\_Object.**DistinguishedName **-**Properties 'msFVE-RecoveryPassword' **|** Select-Object **-**Last 1

**if($BitLocker\_Object.**'msFVE-RecoveryPassword'**){**

**$BitLocker\_Key** **=** **$BitLocker\_Object.**'msFVE-RecoveryPassword'

**}else{**

**$BitLocker\_Key** **=** '<not set>'

**}**

#Display Output

**$strToReport** **=** **$Computer** **+** "," **+** **$BitLocker\_Key**

Write-Host **$strToReport**

#Save to Report

**$strToReport** **|** Out-File Report**.**txt **-**append

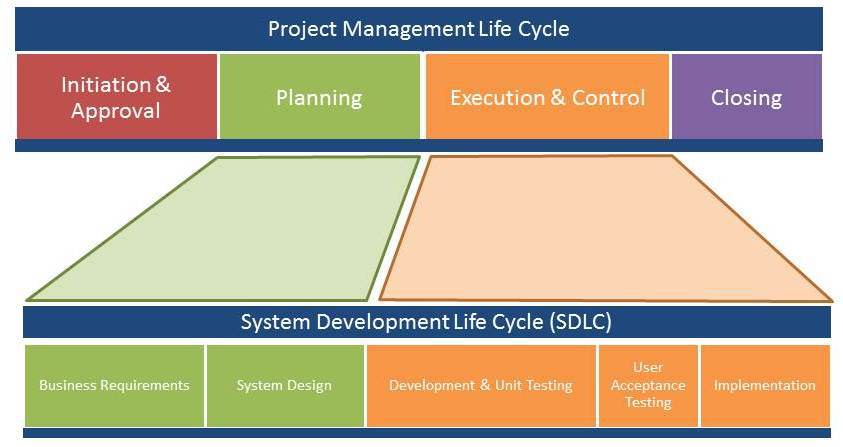
**}** # end for-each

**}** # end for-each

Appendix

**SDLC**

When installing any IT-based system, there should be a strategic approach taken in the design and implementation of that system. A system could refer to a full-fledged enterprise system, such as an ERP or MIS, a new software application, or even a software or hardware service. Without an official business strategy, there is a good chance that the system will take longer to implement and be riddled with problems all along the way. To reduce problems associated with the setup of a new system, it is common (and best practice) that an IT specialist will use a standardized, proven methodology. One of these methodologies is known as SDLC. SDLC, or systems development life cycle, is a phased approach to system design, which includes three main levels or phases that can be further broken down into eight individual steps (Brown, Dehays, Hoffer, Martin, & Perkins, 2012).   
 The primary phases of the SDLC are (1) Definition, (2) Construction, and (3) Implementation. In the Definition phase, there are two steps (1) feasibility analysis and requirements definition (Brown, et al., 2012). In the *feasibility step*, the person leading the systems project will determine the economic, operational, and technical requirements of the system. Of course this person will not work alone; they will meet with a sponsoring manager, the technical people that will be involved with the project, and any other personnel that may have input on the system’s feasibility. The feasibility analysis step is essential to designing and building a new system, in that, this is the step where project leaders and business managers will work together to commit to project resources. The second step in the Definition phase is the *requirements definition*. In the requirements definition step, an official document is drawn up, known as the system requirements document. In the systems requirement document, there will be detailed descriptions of the new system’s input and output, a refined budget sheet, and an updated plan that will be used for project development.   
 In the second phase of the SDLC methodology, the Construction phase, there are three separate steps (1) systems design, (2) system building, and (1) system testing (Brown, et al., 2012). The *systems design* step is just how it sounds; this is where IT specialists design the system, or create a plan for implementing a form of hardware or software. The next step is *system building*. System building is where the code is developed, the hardware is acquired, or the software is built. Once the system building step is complete, the system will need to be tested. In *system testing*, the new system is tested in segments, and then in full. The point of this step is for all those involved in the project to sign-off on a “working” system, and for relative documentation to be created.  
 In the third phase of the SDLC methodology, the Implementation phase, there are three steps (1) installation, (2) operations, and (3) maintenance (Brown, et al., 2012). The *installation* step is where IT specialists and supporting personnel will begin updating older systems, create databases, prepare the environment for the system, and train employees how to use the new system (if applicable). The second step is *operations*. In operations, the “system” is close to production; development, test versions, and production versions will be turned over to the proper teams and employees. Documentation will be reviewed, and any updates will be added to these final documents. If everything is satisfactory, the new system will be deemed acceptable, closing procedures will be concluded to make the new system is fully operational, and the system will now be considered “in production.” The third and final step in the Implementation phase—as well as in the SDLC methodology—is *maintenance*. In the maintenance step, when the system needs updates, patches, and upgrades, these tasks must be scheduled, and the changes made accordingly. Likewise, this is the step where improvements can be applied, and user interfaces and user experience can be updated. The maintenance step is an important step in the SDLC methodology, and should be incorporated into the overall business strategy.  
**Project Management Life Cycle**  
 Of course, as an even better systems management strategy, SDLC may be paired with other best practices management techniques. These techniques should encompass the project life cycle. Understanding the project life cycle will enhance the processes used in the SDLC methodology by adding even more structure to the system design and implementation. The project life cycle is a collection of phases which include initiation, planning, implementation (commonly referred to as execution and control), and closing phases (Watt, 2014). In the *Implementation* phase, a business case is prepared which includes details such as business need, proposed solutions, and any solutions are reviewed and investigated for viability. The next project life cycle phase is the *Planning* phase. The Planning phase is where ideas begin to be developed, and the appropriate resources, personnel, and scope are identified. Additionally, tasks and timelines will be discussed, and scheduled will be created. The third phase in the project management life cycle is the *Implementation* phase. In the Implementation phase, everything comes together; meetings are held, the pieces of the system start to be completed, reporting is done (this includes status reports), and team members work together in testing and implementing the system (pre-production and into production). In the final phase, the *Closing* phase, the responsibility of the system is transferred to the customer, documentation is handed over, and lessons learned are discussed.  
(Watt, 2014)

**Synthesis**  
 A best practice approach to implementing a new system is to use SDLC and the project management life cycle. A successful adaption of SDLC and the project life cycle is to first understand how they align. If the phases of each methodology was divided up and matched respectively (using a simple, condensed chart), both approaches could be added to a single project strategy. This can be seen in Figure 17.  
**■ Figure 17 SDLC and Project Life Cycles** **SOURCE: http://www.thinkforachange.com**  
It is evident, that planning, business requirements, and system design are all closely related. Likewise, execution and control, development, UaT, and implementation can be considered essential to creating the system and then testing a new system.

**Real World Example**

As a real world example of SDLC and the project management life cycle, a brief scenario has been prepared for review. In this example, a company is rolling out a new enterprise email system. The company is currently using Google’s Gmail, and requires something more robust that does not have restrictions in storage and transmission capabilities. An IT specialist is assigned the project by the CIO, and begins the *Initiation and Approval* steps, and starts *Planning* the project. These first steps include holding a few meetings and drafting a project charter. A project charter is an official document that lists details such as project goal, the personnel involved in the project, the stakeholders of the project, and any requirements and constraints that will be essential to the overall project (Rouse, 2012). Additionally, the project charter will discuss milestones and deliverables. Furthermore, business requirements will be considered, such as how many clients need to be upgraded, the cost associated with the project, as well as the scope of the project. These steps are connected to the SDLC *Business Requirements and System Design* phases, and the *Initiation* and *Planning* phases of the project management life cycle.  
 Referencing the chart in Figure 1, the new email system is to be developed and modular testing is to be performed. The system is installed, sample users are created, and the system is tested in a non-production environment. Once the email system is setup, UaT is completed, and the system is implemented. These steps are part of the *Development and Unit Testing*, *UaT*, and *Implementation* phases in SDLC, and *Execution and Control* phase in the project management life cycle. The email system is nearly complete, documentation is updated (where applicable), and the administration of the new email system is turned over to the appropriate IT personnel. These steps are linked to the *Maintenance* phase of SDLC and the *Closing* phase of the project management life cycle. Note, by this point, the email system is live, the documentation has been completed, personnel have been trained, and the technical administration of the email system has been turned over; lessons learned may be discussed at this time.

**SDLC Summary**

SDLC and the project management life cycle create a framework which provides structure and organization to a project. SDLC is a phased approach to system design, which has three main phases (1) Definition, (2) Construction, and (3) Implementation. The project life cycle also uses three primary phases or stages to organize system design (1) Planning, (2) Implementation, and (3) Closing. The importance of using a methodology cannot be understated nor undervalued; there are numerous advantages that all lead to the successful implementation of a new system. Thus, learning the utility aspects of SDLC and the project management life cycle will become essential to controlling project timelines, understanding the scope of the project, keeping the project within budget, and maintaining clear lines of communication with all appropriate personnel, including developers, testers, and project stakeholders. Thus, applying these methodologies is not only a good idea, it is a necessity.

**Ethical, Legal, and Social Implications**

**Ethical**  
 This week’s part 2 assignment is to provide some information about the ethical, legal, and social ramifications of using BitLocker (or any encryption technology for that matter) on company computers. Due to most company computers containing customer and company data, it would be highly unethical for that data not to be protected at all times. Thus, once BitLocker has been installed on all computers, encryption compliance will be enforced by using the scripts created for LANDesk. While encrypting data seems like an obvious solution to a serious risk, i.e. unauthorized access to data recovered from stolen or lost hard drives, BitLocker can be influenced by cultures in other countries. Because Company X employees do occasionally travel outside the country, it is imperative that all company personnel familiarize themselves with the international laws that govern encryption, as it specifically impacts how encryption may and may not be used outside the country. There will be scenarios where encryption must be temporarily disabled when traveling abroad.   
**Legal**  
 When it comes to encryption legislation on a global scale, numerous countries have laws *against* encryption, this would include having computers imported or exported with the recently implemented BitLocker. For example, a short list of countries has been compiled with certain countries and what actions must be taken when encryption enters that country. These can be seen in table 4. (Brown University, 2015):

**■ Table 4 Encryption Concerns by Country**

|  |  |
| --- | --- |
| **Country** | **Action** |
| Burma | A license is required |
| Belarus | Restricted initially until license is approved |
| China | A permit is required from the Beijing Office of State Encryption Administrative Bureau |
| Hungary | Has laws that foreigners must adhere to |
| Iran | Has laws that all people must adhere to |
| Israel | You can have encryption, but the password must be provided to officials |
| Morocco | Has strict laws against all encryption |
| Russia | A license is required |
| Saudi Arabia | Encryption is normally banned everywhere |
| Tunisia | Importing encryption is restricted |
| Ukraine | Has strict laws against all encryption |

Note, this is only a small portion of the actual list. To see more, the U.S. State Department’s website may be referenced. Additionally, the Electronic Code of Federal Regulations, or e-CFR, outlines laws and regulation surrounding encryption commodities, software and technology (U.S. Government Publishing Office, 2015).  
**Social**  
 The social implications of using encryption encompass three primary schools of thought: (1) encryption should be available to everyone, for any kind data that is deemed sensitive; (2) encryption can be employed, but the recovery passwords must be accessible by the government; and (3) no encryption is allowed. In the first approach to encryption, all sensitive, private data should be protected from unauthorized access, this would include encrypting data to protect it against offline attacks. It is important to clarify, even the local and federal government will not have access to view this particular type of encrypted data.  
 In the second approach, sensitive, private data can be encrypted, however the local and national authorities must have access to view the content, and in most scenarios, special permits and official documentation must be acquired *prior* to implementing encryption. Why would this be necessary? Why would law enforcement and government officials require access to encrypted data? In some cases, criminals and terrorists use encryption to hide their criminal activity. Likewise, encryption could be used to steal company data, or commit corporate and government espionage. It is understandable, if everyone is allowed full access to and usage of encryption, the social implications could be severe in the hands of a criminal. If the government had the ability to regulate encryption, they could monitor it for criminal-like activity, thus preventing certain crimes.  
 The third outlook towards encryption is that encrypted data is a national or state security risk, and that it should be denied completely. As referenced in the legal aspects of encryption on a global scale, not all countries share the ideology that encryption is good, and as such, heavy restrictions will apply. In fact, numerous countries have laws *against* enabling any form of encryption on computers, this includes importing, exporting, and domestic forms of encryption.

**Lessons Learned**

As the IT Specialist in my project, I was responsible for the entire project. I did have a few local site technicians assisting with me “hands-on” problems, but mostly, I was the one leading the project, doing all the software development, deploying scripts, and running reports. In lessons learned, the initial problems were determining scope, figuring out the budget for the proposed “cheaper” solution, and performing a practical risk analysis.

For scope, I wanted to determine how many computers would be receiving the BitLocker encryption solution. This was no easy feat, as the workstations in the enterprise span three corporate sites, and not all computers were actively being used. The best solution I came up with was to use our desktop management software, and run a report on computers that had checked in within the last month. This returned around ten thousand computers, which were added to the project’s scope and became the targeted list. This was specifically added to lessons learned because there were several ideas that came up on how to retrieve this target list. For example, it was suggested we use our inventory software, except the inventory software could not return machines that were currently online. Another suggestion was to just have the local technicians compile a list, and then that list could be imported into our desktop management software. This would work, except it would require a lot of time and effort. The best solution was definitely to use our desktop management software and query online machines.

Next in lessons learned, I spent some time trying to figure out exactly what the budget was for this project. There were meetings held, emails sent, and phone calls made. In the end, it came down to figuring out software development time, and how many computers would need to be purchased as replacement computers, if the need arose. I believe, especially because I was the one doing the majority of the work, it was difficult to create a solid budget around the numerous tasks I would be completing during the project. The lessons learned part of this is that I should have just estimated a flat cost for my own time based upon *(hours worked) x (how much I was being paid per hour)*. I actually came in under budget, due to the fact that there were very few problems, and I only had to use five of the twenty computers that were allocated for in the risk analysis.

The final lessons learned item I would like to discuss is the risk analysis itself. What a risk analysis is supposed to do is to discover potential problems, and then allow us to devise mitigation solutions (Brown, Dehayes, Hoffer, Martin, & Perkins, 2012). I actually did quite well in this area, but only because I have experience deploying BitLocker, and have seen common problems during the roll out of a BitLocker solution. For example, a problem when enabling BitLocker is that the TPM chip is disabled, or broken. Because I created a script to “enable” the chip, I knew that would not be a problem. However, broken chips was a whole different story. Some motherboards just are not compatible with BitLocker, or in rarer cases, the TPM chip is broken. In the risk analysis, I did anticipate non-working TPM chips, leading to the purchase of twenty new computers. We ended up using only five of those computers, which I thought was a reasonable estimate. However, I think a more suitable solution would have been to order ten computers, and then—on a case by case basis—order extra computers as needed. This would have saved us $10,000. One last consideration was retrieving and storing the BitLocker recovery passwords using different methods. Although we did have the BitLocker information in Active Directory and LANDesk, additional options, such as secure FTP and email, could have been used to store the recovery data. I would say, overall, the project went as intended, and the company and the customers were pleased to now have secured data on hard drives. The BitLocker project was a success.

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