

Oracle® Hospitality OPERA Property Management

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5.0.04.03, and 5.0.05.00

PA-DSS 3.0 Implementation Guide

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Nothing herein shall be construed as limiting or reducing your obligations to comply with any applicable laws, regulations or industry standards relating to security or otherwise including, but not limited to PCI PA-DSS and DSS.

The retailer may undertake activities that may affect compliance. For this reason, Oracle is required to be specific to only the standard software provided by it.

About this Document

This document describes the steps that must be followed in order for your Oracle Hospitality OPERA 5 installations to comply with Payment Application – Data Security Standards (PA-DSS). The information in this document is based on PCI Security Standards Council Payment Application - Data Security Standards program (version 3.0 dated November 2013)¹.

Oracle instructs and advises its customers to deploy Oracle applications in a manner that adheres to the PCI Data Security Standard (v3.0). Subsequent to this, best practices and hardening methods, such as those referenced by the Center for Internet Security (CIS) and their various “Benchmarks”, should be followed in order to enhance system logging, reduce the chance of intrusion and increase the ability to detect intrusion, as well as other general recommendations to secure networking environments. Such methods include, but are not limited to, enabling operating system auditing subsystems, system logging of individual servers to a centralized logging server, the disabling of infrequently-used or frequently vulnerable networking protocols and the implementation of certificate-based protocols for access to servers by users and vendors.

You must follow the steps outlined in this *Implementation Guide* in order for your Oracle Hospitality OPERA 5 installation to support your PCI DSS compliance efforts.

¹ PCI [PA-DSS 3.0](#) can be downloaded from the PCI SSC Document Library.

Revision Information

Date	Description of Change
April 29, 2015	Initial Publication.
December 17, 2015	Changed 168-bit 3DES to AES256.
April 7, 2016	Deployment Considerations for Single Server section added.
May 26, 2016	External document reference removed.

Note: This PA-DSS Implementation Guide must be reviewed on a yearly basis, whenever the underlying application changes or whenever the PA-DSS requirements change. Updates should be tracked and reasonable accommodations should be made to distribute or make the updated guide available to users. Oracle will distribute this guide to new customers through the Oracle Help Center at <http://docs.oracle.com>.

Executive Summary

Oracle Hospitality OPERA 5 Version 5.0.05.00 has been Payment Application - Data Security Standard (PA-DSS) validated, in accordance with PA-DSS Version 3.0. For the PA-DSS assessment, we worked with the following PCI SSC approved Payment Application Qualified Security Assessor (PAQSA):

Coalfire Systems, Inc. 361 Centennial Parkway Suite 150 Louisville, CO 80027	Coalfire Systems, Inc. 1633 Westlake Ave N #100 Seattle, WA 98109
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This document also explains the Payment Card Industry (PCI) initiative and the Payment Application Data Security Standard (PA-DSS) guidelines. The document then provides specific installation, configuration, and ongoing management best practices for using Oracle's Oracle Hospitality OPERA 5 Version 5.0.05.00 as a PA-DSS validated Application operating in a PCI DSS compliant environment.

PCI Security Standards Council Reference Documents

The following documents provide additional detail surrounding the PCI SSC and related security programs (PA-DSS, PCI DSS, etc.):

- Payment Card Industry Payment Applications - Data Security Standard (PCI PA-DSS)
https://www.pcisecuritystandards.org/security_standards/index.php
- Payment Card Industry Data Security Standard (PCI DSS)
https://www.pcisecuritystandards.org/security_standards/pci_dss.shtmlhttps://www.pcisecuritystandards.org/security_standards/index.php
- Open Web Application Security Project (OWASP)
<http://www.owasp.org>
- Center for Internet Security (CIS) Benchmarks (used for OS Hardening)
<https://benchmarks.cisecurity.org/downloads/multiform/>

Application Summary

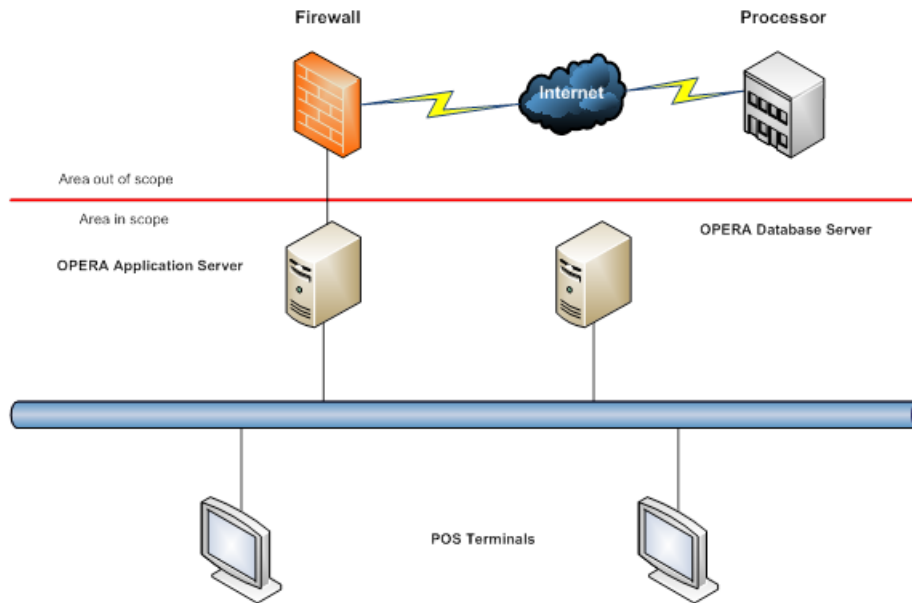
Payment Application Name	Oracle Hospitality OPERA 5	Payment Application Version	5.0.05.00
Application Description	<p>Oracle Hospitality OPERA 5 is a Windows-based software application used to process payment card payments. The application can accept both card present and card-not-present transactions. Oracle Hospitality OPERA 5 Version 5.0.05.00 does not support PIN-based debit transaction nor does it include the capability to perform chargebacks. For the purpose of settling transactions, the application retains the PAN, expiry date, and cardholder name in an Oracle 11g database, using AES256 encryption. The application also stores the truncated card number with just the last four digits of the PAN, if needed for reference by the merchant employee. Cardholder data can be either swiped or manually entered into the application. When manually entered, card validation codes are requested. All sensitive authentication data collected during a transaction, including PAN, magnetic track data and card validation codes, CVV2, is stored in VRAM prior to authorization. Subsequent to authorization, data is purged from VRAM. Oracle Hospitality OPERA 5 Version 5.0.05.00 is only sold as a software package with the responsibility of hardware purchase up to the customer.</p> <p>Oracle provides functionality within Oracle Hospitality OPERA 5 to enter sensitive personal information (including passport, date of birth, and credit card numbers) in specific fields on the user interface. The form fields that are intended to receive this information are clearly labeled, and are designed with heightened security controls such as data masking in the form and encryption of at rest. Entering this sensitive personal information in any other field (for example, in a Notes or Comments field), does not provide it with these heightened security controls and is not consistent with the requirements for protecting cardholder data as detailed in the Payment Card Industry Data Security Standards (PCI DSS).</p>		
Typical Role of Application	<p>Oracle Hospitality OPERA 5 (OPERA 5.0.05.00) is a payment application used in hotels for processing credit card transactions and handling authorization and settlement. OPERA 5.0.05.00 can handle card-present and card-not-present transactions but not debit or other PIN-based transactions. The application consists of a PC-based POS terminal client, an application server, and a database server. The application accepts cardholder data, including PAN, magnetic track and CVV2 codes, directly through the POS terminal client, which passes the cardholder data to the application server, which is used to facilitate the authorization of transactions through communications with the merchant's processor. The database stores cardholder data, including the PAN, cardholder name and expiry date only for the purpose of settlement of transactions, using AES256 encryption. The Opera software resides on both the POS terminal clients and the application server.</p>		

Target Market for Payment Application	Target Market for Payment Application (check all that apply):			
	<input type="checkbox"/>	Retail	<input type="checkbox"/>	Processors
	<input type="checkbox"/>	e-Commerce	<input type="checkbox"/>	Small/medium merchants
	<input checked="" type="checkbox"/>	Others (please specify): Hospitality Industry		
Stored Cardholder Data	The following is a brief description of files and tables that store cardholder data:			
	File or Table Name		Description of Stored Cardholder Data	
	name_credit_card		Full PAN, cardholder name, expiry date	
	name_credit_card		Truncated PAN	
	Individual access to cardholder data is logged as follows: Access to this table is logged by the Oracle 11g database software. <i>Include in this section a description of how access to any clear text PAN is logged by the payment application.</i>			
Components of the Payment Application	The following are the application-vendor-developed components which comprise the payment application:			
	Oracle Hospitality OPERA 5 is designed to be run on Microsoft Windows-based systems. The application is comprised of an application server, a database server running Oracle 11gR2 and PC-based POS terminal clients. All components are meant to be installed within the customer's corporate network. The application server provides all communication to the processing bank as well as reporting and management functions. The POS terminal client component runs on Microsoft Windows 7 or 8.1. The application server runs on Windows Server 2012 R2 and the database server component runs on Windows Server 2012 R2 and Oracle Linux 6.4. The application requires the database server to run Oracle 11gR2 on any platform that is supported by Oracle for that version.			
Required Third Party Payment Application Software	The following are additional third party <u>payment application</u> components required by the payment application:			
	Not Applicable			
Database Software Supported	The following are database management systems supported by the payment application:			
	The application utilizes the Oracle 11gR2 database server. Encrypted cardholder data, including PANs, expiry date and cardholder name are stored in the database located on the back office server using AES256 encryption.			
Other Required Third Party Software	The following are other required third party software components required by the payment application:			
	Not Applicable			
Operating System(s)	The following are Operating Systems supported or required by the payment application:			

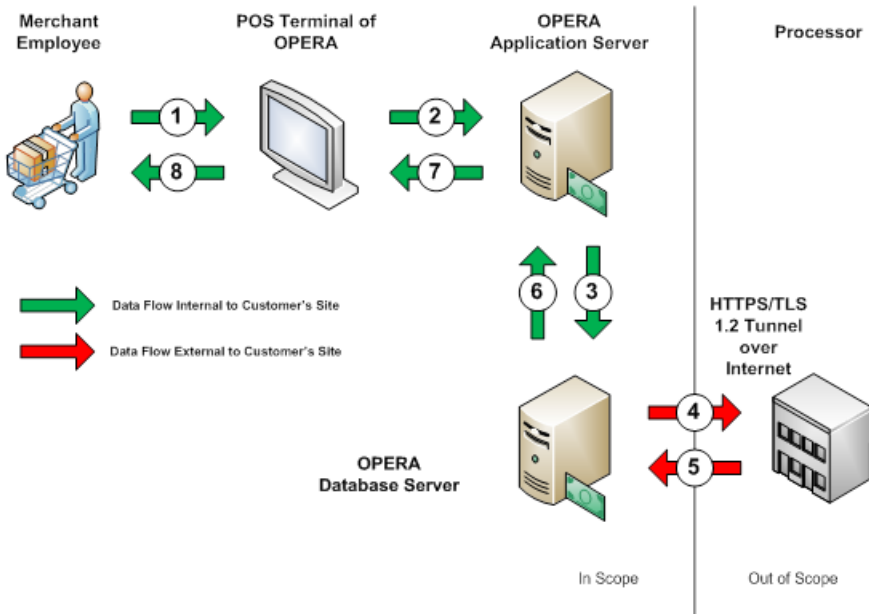
Supported	List Operating system(s) and versions/SP's supported.					
	Linux x86-64		Oracle Linux 6.4			
	Microsoft Windows x64 (64-bit)		8.1 7 2012 R2 2008 R2			
Application Authentication	Authentication to the POS application is handled separately from the operating system. Authentication credentials are held within the application's database. These credentials are stored in the database using DBMS_CRYPTO.Hash_SH1 in Database 11g and DBMS_CRYPTO.SH512 in Database 12c. During the authentication process, clear text credentials are not sent over the network. When the POS terminal client initiates a connection to the application server a HTTPS/TLS 1.2 tunnel is opened between the two. All communication including authentication traffic is encrypted.					
Application Encryption	The database server provides back-end storage for application data including cardholder data, the PAN, cardholder name and expiry date encrypted using AES256. The POS software can be installed on a standard PC with a cash drawer. The application is not designed to be implemented in a web-based environment.					
Application Functionality Supported	Payment Application Functionality (check only one):					
	<input type="checkbox"/>	Automated Fuel Dispenser	<input type="checkbox"/>	POS Kiosk	<input type="checkbox"/>	Payment Gateway/Switch
	<input type="checkbox"/>	Card-Not-Present	<input type="checkbox"/>	POS Specialized	<input type="checkbox"/>	Payment Middleware
	<input type="checkbox"/>	POS Admin	<input type="checkbox"/>	POS Suite/General	<input type="checkbox"/>	Payment Module
	<input checked="" type="checkbox"/>	POS Face-to-Face/POI	<input type="checkbox"/>	Payment Back Office	<input type="checkbox"/>	Shopping Cart & Store Front
Payment Processing Connections:	Oracle Hospitality OPERA 5 Version 5.0.05.00 uses the standard Microsoft TCP/IP stack that is included with the Windows Operating system when deployed on an Ethernet network. All communications between the application's components (POS terminal client, application server and database server) are performed via HTTPS/TLS 1.2 tunnels.					
Description of Listing Versioning Methodology	<p>Oracle uses a major.development.revision.service pack scheme for Oracle Hospitality OPERA 5 versioning. Here is a common example:</p> <p>Oracle Hospitality OPERA 5 versioning has four levels, Major, Development, Revision, and Service Pack: <Major>.<Development>.<Revision>.<Service Pack></p> <ul style="list-style-type: none">• Major includes substantial modification to the application in both operational functionality and appearance would have an impact on PA-DSS requirements.• Development identifies the milestone steps towards the next major release and may or may not have an impact on PA-DSS requirements.• Revision contains fixes to moderate defects and may or may not have an impact on PA-DSS requirements.					

	<ul style="list-style-type: none">• Service Pack contains minor coding enhancements and fixes for minor issues and may or may not have an impact on PA-DSS requirements. <p>Based on the above versioning methodology the application version being listed with the PCI SSC is: 5.0.05.00.</p>
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Typical Network Implementation



Credit/Debit Cardholder Dataflow Diagram



1. Merchant Employee swipes card data on POS terminal or enters card data manually for card not present transactions into the POS terminal.
2. PAN and Track 2 (if swiped) encrypted data are sent from the POS Terminal to the OPERA Application Server.
3. The OPERA Application Server sends this data to the OPERA Database Server.
4. The OPERA Database formats the data into a request message and sends the transaction to the Processor.
5. The Processor responds with the approval or decline of the transaction.
6. The OPERA Database sends the response to the OPERA Application Server.
7. The OPERA Application Server directs the response to the correct terminal.
8. The response is displayed to the user to action if needed or to complete the business transaction.

Difference between PCI Compliance and PA-DSS Validation

As a software vendor who develops payment applications, our responsibility is to be “PA-DSS Validated.” We have performed an assessment and payment application validation review with our independent assessment firm (PAQSA), to ensure that our platform does conform to industry best practices when handling, managing and storing payment related information.

PA-DSS Version 3.0 is the standard against which Payment Application has been tested, assessed, and validated.

PCI Compliance is then later obtained by the merchant, and is an assessment of your actual server (or hosting) environment called the Cardholder Data Environment (CDE).

Obtaining “PCI Compliance” is the responsibility of you the merchant and your hosting provider, working together, using PCI compliant architecture with proper hardware & software configurations and access control procedures.

The PA-DSS Validation is intended to ensure that Oracle Hospitality OPERA 5 will help you facilitate and maintain PCI Compliance with respect to how the payment application handles user accounts, passwords, encryption, and other payment data related information.

The Payment Card Industry (PCI) has developed security standards for handling cardholder information in a published standard called the PCI Data Security Standard (DSS). The security requirements defined in the DSS apply to all members, merchants, and service providers that store, process, or transmit cardholder data.

The PCI DSS requirements apply to all system components within the payment application environment which is defined as any network device, host, or application included in, or connected to, a network segment where cardholder data is stored, processed or transmitted.

The 12 Requirements of the PCI DSS:

Build and Maintain a Secure Network and Systems

- 1. Install and maintain a firewall configuration to protect cardholder data*
- 2. Do not use vendor-supplied defaults for system passwords and other security parameters*

Protect Cardholder Data

- 3. Protect stored cardholder data*
- 4. Encrypt transmission of cardholder data across open, public networks*

Maintain a Vulnerability Management Program

- 5. Protect all systems against malware and regularly update anti-virus software or programs*
- 6. Develop and maintain secure systems and applications*

Implement Strong Access Control Measures

- 7. Restrict access to cardholder data by business need-to-know*
- 8. Identify and authenticate access to system components*

9. *Restrict physical access to cardholder data*

Regularly Monitor and Test Networks

10. *Track and monitor all access to network resources and cardholder data*

11. *Regularly test security systems and processes*

Maintain an Information Security Policy

12. *Maintain a policy that addresses information security for all personnel*

Considerations for the Implementation of Payment Application in a PCI-Compliant Environment

The following areas must be considered for proper implementation in a PCI-Compliant environment.

- ✓ Remove Historical Sensitive Authentication Data
- ✓ Handling of Sensitive Authentication Data
- ✓ Secure Deletion of Cardholder Data
- ✓ All PAN is masked by default
- ✓ Cardholder Data Encryption & Key Management
- ✓ Removal of Historical Cryptographic Material
- ✓

Remove Historical Sensitive Authentication Data (PA-DSS 1.1.4)

The following previous versions of Oracle Hospitality OPERA 5 stored Sensitive Authentication Data (SAD) including Track 2 data:

- OPERA Version 3
- OPERA Version 2
- Below OPERA Version 2

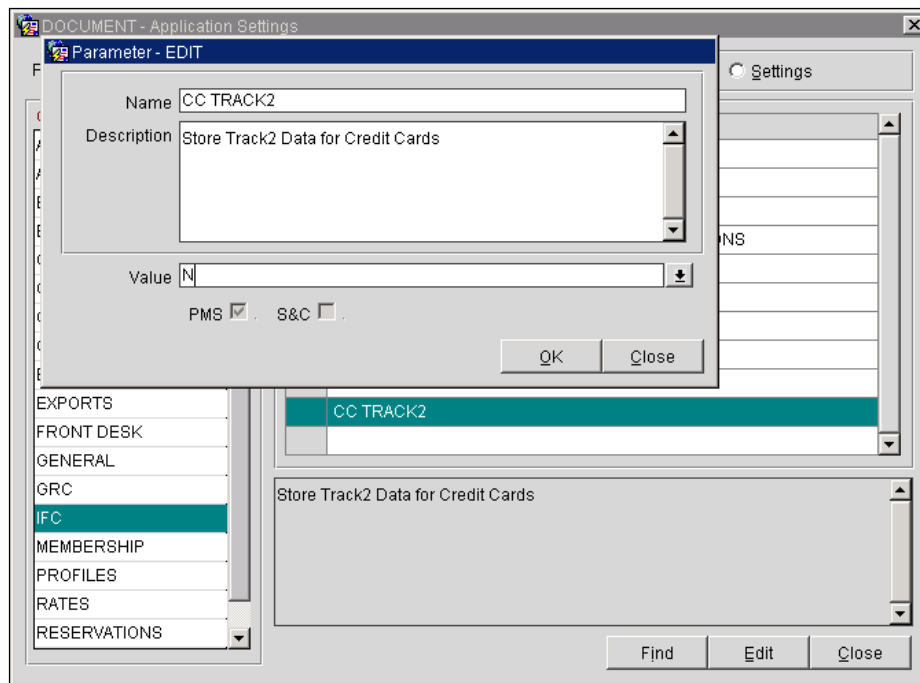
*Sensitive Authentication Data*² includes security-related information (including but not limited to card validation codes/values, full track data (from the magnetic stripe or equivalent on a chip), PINs, and PIN blocks) used to authenticate cardholders and/or authorize payment card transactions.

Historical SAD stored by previous versions of Oracle Hospitality OPERA 5 must be securely deleted and removal is absolutely necessary for PCI DSS compliance. Oracle provides a secure deletion tool which includes capabilities to securely delete historical SAD as follows:

After the release of OPERA Version 4, no historical credit card data is stored. But should an upgrade from a version previous to 4 be required, OPERA offers a solution to deleting any sensitive data.

To stay in compliance with the Payment Card Industries – Security Standards Council requirements, when upgrading from a version of OPERA previous to Version 4.0, the CC_TRACK2 parameter must first be turned off in the previous version. This will delete the Track 2 data from the OPERA database. To turn off the parameter in OPERA Version 3.0, select **Setup>Application Settings**, and set the IFC Group Application Parameter to **No**, as shown below.

² [Sensitive Authentication Data](#) as defined in the PCI SSC's Glossary of Terms, Abbreviations, and Acronyms



Handling of Sensitive Authentication Data (PA-DSS 1.1.5)

Oracle stores Sensitive Authentication Data for troubleshooting purposes only and only during the time we are supporting a customer issue. The following guidelines are followed when dealing with Sensitive Authentication Data used for pre-authorization (swipe data, validation values or codes, PIN or PIN block data):

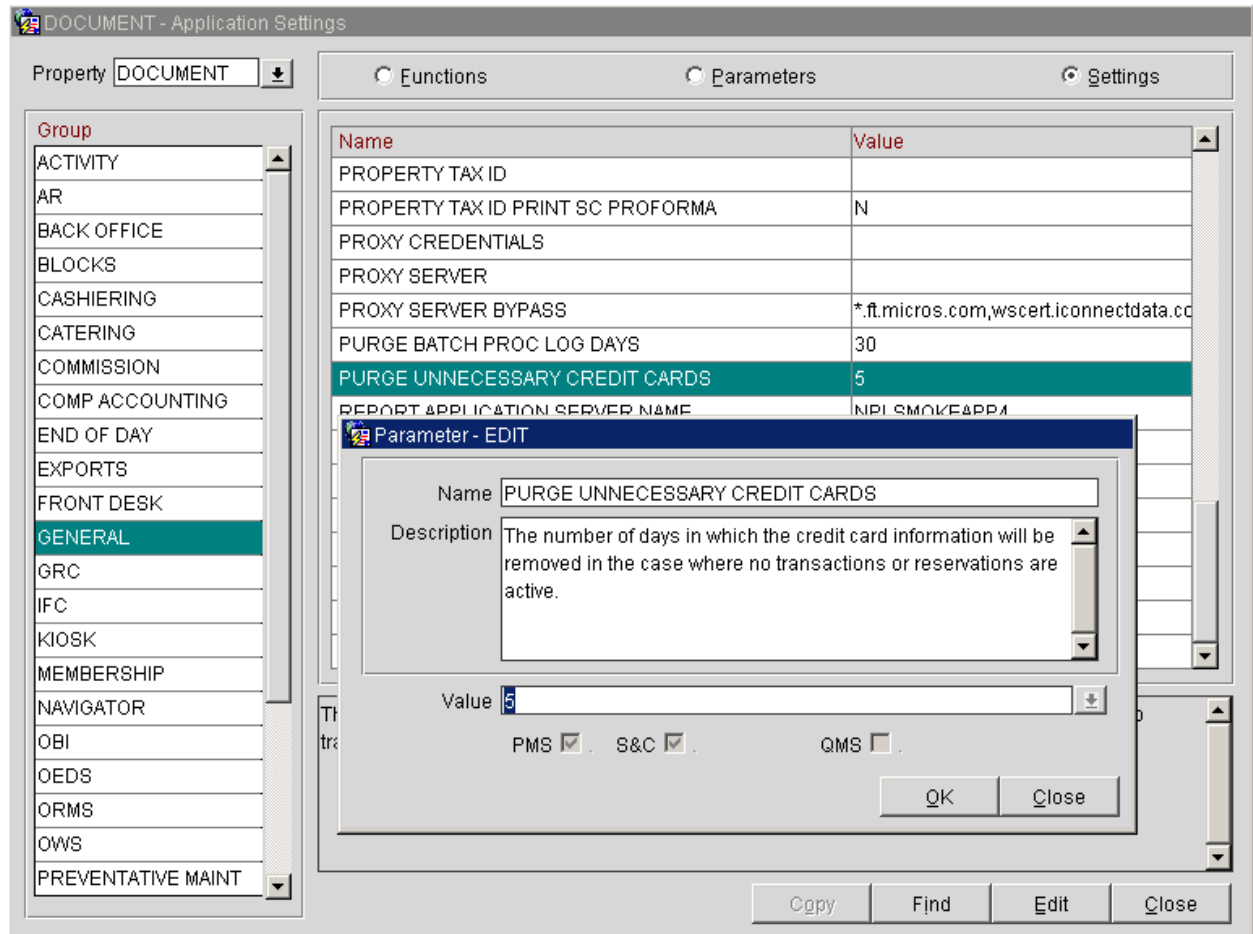
- Collect sensitive authentication data only when needed to solve a specific problem
- Store such data only in specific, known locations with limited access
- Collect only the limited amount of data needed to solve a specific problem
- Encrypt sensitive authentication data while stored
- Securely delete such data immediately after use

For troubleshooting purposes of the Credit Card Vault Conversion Utility, only the records exchanged during the conversion are logged to the table VAULT_CONVERSION_LOG. It is best to run a query in OPERA SQL for the table and then conduct an Export to easily search/view the data (credit card numbers are always masked).

We strongly recommend that you do not store Sensitive Authentication Data for any reason. However, if you should do so, the preceding guidelines must be followed when dealing with Sensitive Authentication Data used for pre-authorization (swipe data, validation values or codes, PIN or PIN block data).

Secure Deletion of Cardholder Data (PA-DSS 2.1)

Oracle recommends activating the **General>Purge Unnecessary Credit Cards** application setting and entering the number of days to use to determine which credit cards are eligible for removal from the database, provided the credit card is not attached to any other current or future reservations in any property (in multi-property environments). Actual removal is handled by the Purge Credit Cards procedure, which is included in the Opera Data Purge Routine, and will be implemented at the next scheduled run of that routine. Here is how this setting affects credit card information removal.



Please note that the procedure will execute each time the Opera Data Purge Routine is scheduled. The procedure will refer to the Days to Remove Unnecessary Credit Cards setting only to determine all the valid credit card information that is older than that many days.

- Days entered will be the days after the departure date of the reservation which was settled by credit card. For example, if Days is set to 5, and the reservation departure date is April 7, the credit card information will be eligible to be removed on April 12 (regardless of whether the reservation was cancelled or was no show).
- Days entered will be the days after the folio close date (when the Cashiering>Open Folio application parameter is set to Y) if payment was made by credit card and the reservation is checked out with open folio. For example, if Days is set to 5, and the guest

checks out on April 7 with open folio, if the folio is closed on April 11, the credit card information will be eligible to be removed on April 16.

- Days entered will be the days after reconciliation if the reservation is checked out to a credit card payment method having an AR account attached. For example, if Days is set to 5, and a reservation checks out paying by credit card, an AR invoice will be created in the associated AR account. If this AR invoice is reconciled on May 12, the credit card information will be eligible to be removed on May 17 provided this reconciled AR invoice has already been purged. If the invoice is not purged even after reconciliation, the credit card information will NOT be removed.
- Days entered will be the days after the credit card information has been added to the profile (available when the Profiles>Profile Credit Card application function is set to Y), provided the credit card has not been attached to any current or future reservations. For example, if Days is set to 5, and the credit card information is attached to a profile on April 7, the credit card information will be eligible to be removed on April 12.
- Credit card information will NOT be removed in case there is a pending batch/offline settlement for the credit card.

For all users, credit card information will only be available in truncated format (e.g., XXXXXXXXXXXX4317, expiration date XX/XX) once it has been removed from the database. (After the purge routine runs, all that actually remains of the credit card number in the Opera database is the last four digits; all other credit card information, including the expiration date, is entirely removed.) The truncated format information will be displayed, as required, in screens and in response to requests for reports and historical information.

All underlying software (this includes operating systems) must be configured to prevent the inadvertent capture of PAN. Instructions for configuring the underlying operating systems and/or databases can be found in Appendix A.

All PAN is Masked by Default (PA-DSS 2.2)

Oracle masks all PAN by default in all locations that display PAN (screens) and truncates PAN in all outputs (screens, paper receipts, printouts, reports, etc.) by displaying only the last 4 digits of the credit card number. Users with the correct permission (Credit Card Information View) can double-click on the masked PAN details and view the full unmasked PAN details within OPERA. But when a user completes this action, it is logged in the User Activity Log as described later in the document in the Logging section.

Screens

- Reservation screen
- Enrollment screen
- Lookup screen. Credit card information returned from a third party is inserted into the OPERA tables in encrypted format but it is not displayed.
- Profile Credit Card screen
- Rooming List screen
- Billing screen
- Payment screen

- Journal screen
- Cashier Reports
- Credit Card Settlements screen
- AR Account screen
- AR Payment screen
- AR Posting History screen
- AR Apply Credit screen
- AR Research screen

Reports (

- AR Credit Invoice (arcrdlist)
- AR Credit Card Transfer (arcctransfer)
- AR Ledger (arledger)
- Membership Pre-Check In (arrprecheckinmem)
- Check Report (check_rep)
- Credit Card History (creditcard_history)
- Credit Card Rebates (creditcard_rebates)
- Credit Card Authorization History (cc_auth_history)
- Journal by Cashier and Article Code (finjrnل_articles)
- Journal by Foreign Currency (finjrnلbyforcurr)
- Financial Transactions by Tax Type (finjrnلbytax)
- Journal By Cashier and Transaction Code (finjrnلbytrans)
- Financial Transactions with Generates (finjrnلbytrans2)
- Cashier Audit (finpayments)
- Credit Limit Report- All Payment Methods (gi_authlimit)
- Rate Variance (giratevariance)
- Group Rooming List (grprmlist)
- Night Audit Credit Card Authorization (nacc_authorization)
- No Shows of the Day (nanoshow)
- Paid Outs (napaidout)
- No Show Extended Reservations (noshow_ext)
- Arrivals: Detailed (res_detail)
- Folios/Receipts
- All the Payment Receipts that can be reprinted

Cardholder Data Encryption & Key Management (PA-DSS 2.3, 2.4, and 2.5)

Oracle Hospitality OPERA 5 Version 5.0.05.00 does store cardholder data and does not have the ability to output PAN data for storage outside of the payment application. All PAN must be rendered unreadable anywhere it is stored (including data on portable digital media, backup media, and in logs). The payment application uses an encryption methodology with dynamically generated keys to automatically encrypt all locations/methods where cardholder data is stored.

The following key management functions are performed automatically using AES256 dynamic encryption key methodology and there are no key custodians or intervention required by customers or resellers/integrators.


- Generation of strong cryptographic keys.
- Secure cryptographic key distribution.
- Secure cryptographic key storage.
- Cryptographic key changes for keys that have reached the end of their cryptoperiod.
- Retire or replace keys when the integrity of the key has been weakened and/or when known or suspected compromise. If retired or replaced cryptographic keys are retained, the application cannot use these keys for encryption operations.
- Manual clear-text cryptographic key-management procedures require split knowledge and dual control of keys.
- Prevention of unauthorized substitution of cryptographic keys.

Oracle uses credit card masking and AES256 encryption to store the personal account number (PAN), account name, expiration date and ensure credit card data is stored in a manner compliant with the PCI Data Standard.

The OPERA Credit Card Vault functionality generates the encrypted key is dynamically and eliminates the storage of credit card numbers.

Note: The Credit Card Vault functionality can only be activated by the IFC>Credit Card Vault application function that is a GLOBAL function. If activated in a multi-property environment for one property, then it will be active for all the properties in the environment.

To eliminate the storage of credit card numbers in OPERA, Unique IDs (encrypted credit card keys) will be used to replace any credit card numbers; thereafter, these unique IDs will be used for any of the guest's transactions at the property. This Unique ID can be attached to the guest's profile, just as the credit card could be, and will be used for any future stays or transactions that they have.

Working with the any EFT vendor that supports tokenization, all credit card entries will be completed through the external MICROS Payment Application. This application is accessed by selecting the  icon that is displayed next to any credit card entry field. The MICROS Payment Application is an external software application that is not part of the OPERA application.

Based on where the MICROS Payment Application is accessed from, two different entry forms could be displayed. But the user will know that they have accessed the MICROS Payment Application because the following image will be displayed once the application is activated:



When accessing the MICROS Payment Application from the Reservation, Check In, or Multi-Payment screens and the **Reservations>Payment Types Per Window** application functions is set to **Y**, then the following credit card entry form will be displayed:

Window	Pay Type	Credit Card	Expiry	Name	Status
1	CC LONG	XXXXXXXXXXXX0000	XXXX	public jrjohn q.mr.	
2	VA	XXXXXXXXXXXX1881	XXXX	public jrjohn q.mr.	
3					
4					
5					
6					
7					
8					

OK Close

From here, you would simply swipe the credit card or manually enter the credit card information. If swiping the credit card, the *Credit Card*, *Expiry*, and *Name* fields will be populated automatically. But the *Pay Type* field will not be populated until the **OK** button has been selected and the credit card has had its Unique ID converted. Once the ID is converted, then the credit card type will be returned and populated into the *Pay Type* field.

Now if the MICROS Payment Application is accessed from, for example, the Payment screen, then the following form will be displayed:


Credit Card Number: XXXXXXXXXXXX1007

Credit Card Expiry Date: XXXX

Card Holder Name: public jrjohn q mr

OK Close

Once the credit card has been swiped or its information manually entered, select the OK button to convert the credit card number to a Unique ID from the external application.

From the **Configuration>Setup>Property Interfaces>Credit Card Interface>Functionality Setup** menu option, if the *Deposit CVV2 Check* or *Deposit Address Verification* check box is selected, then the following MICROS Payment Application form will be displayed when clicking the  from the Reservation Deposit Payments screen.

In order to keep any records from being compromised, Oracle strongly suggests that access the keys used to secure cardholder data be restricted to the fewest number of persons and where the keys are stored should be limited to the fewest number of locations.

Removal of Historical Cryptographic Material (PA-DSS 2.6)

Oracle Hospitality OPERA 5 has the following versions that previously encrypted cardholder data:

- OPERA 4

If the historical Cardholder data is no longer needed, the following must be completed to ensure PCI Compliance:

Note: The following processes should only be used if the Vault functionality is inactive within OPERA and:

1. The Vendor supports it
2. The Vault Conversion tool is configured correctly.

All cryptographic material for previous versions of the payment application (encryption keys and encrypted cardholder data) must be rendered irretrievable when no longer needed.

To render historical encryption keys and/or cryptograms irretrievable you must do the following to decrypt and re-encrypt the data with new encryption keys:

In order to update previously stored material, Oracle recommends using the OPERA Credit Card Conversion utility. The Credit Card Conversion utility is used to convert credit card numbers to Unique ID numbers that will be used in place of the credit card to process transactions. This utility will convert all numbers to unique ID's as well as convert all unique id's back to credit card numbers.

Table Name	Total Records	# Processed	% Completed	Status

Test
Passed
Pre Auth
C/I Auth
Future ID
Convert ID
Close

Deleting Encrypted Materials

Encrypted materials are deleted based on the above **General>Purge Unnecessary Credit Cards** application setting during that night scheduled End of Day routine.

Re-Encrypt Historic Data with New Keys

Select **Utilities>Change CC Encrypt Key** to access this utility.

This utility allows OPERA users with appropriate permissions to change the encryption key that is used to secure customer credit card data. This utility should be used with extreme caution.

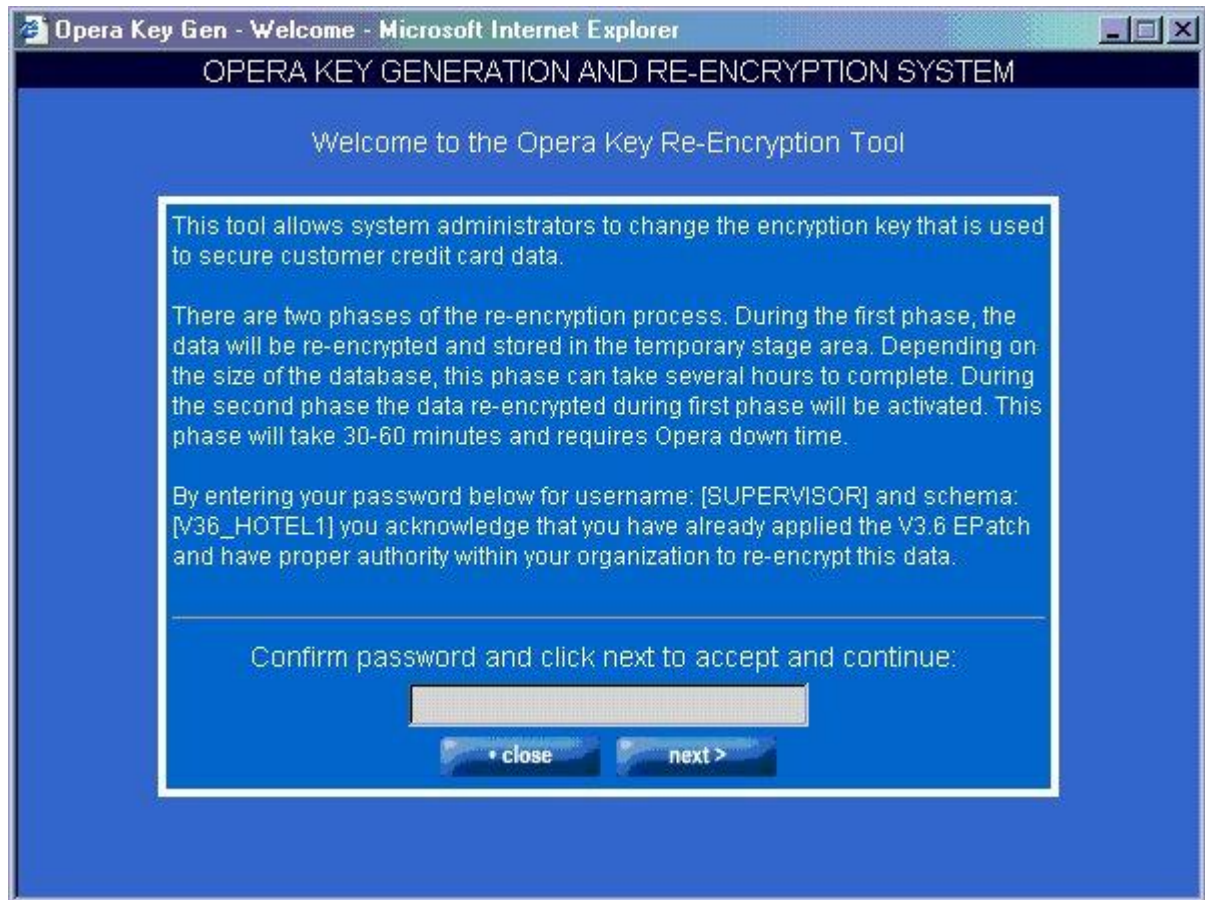
The following permissions are required to run this utility:

Reservations>Credit Card Information Edit

Utilities>Change Encrypt Key

To use this utility, follow these steps:

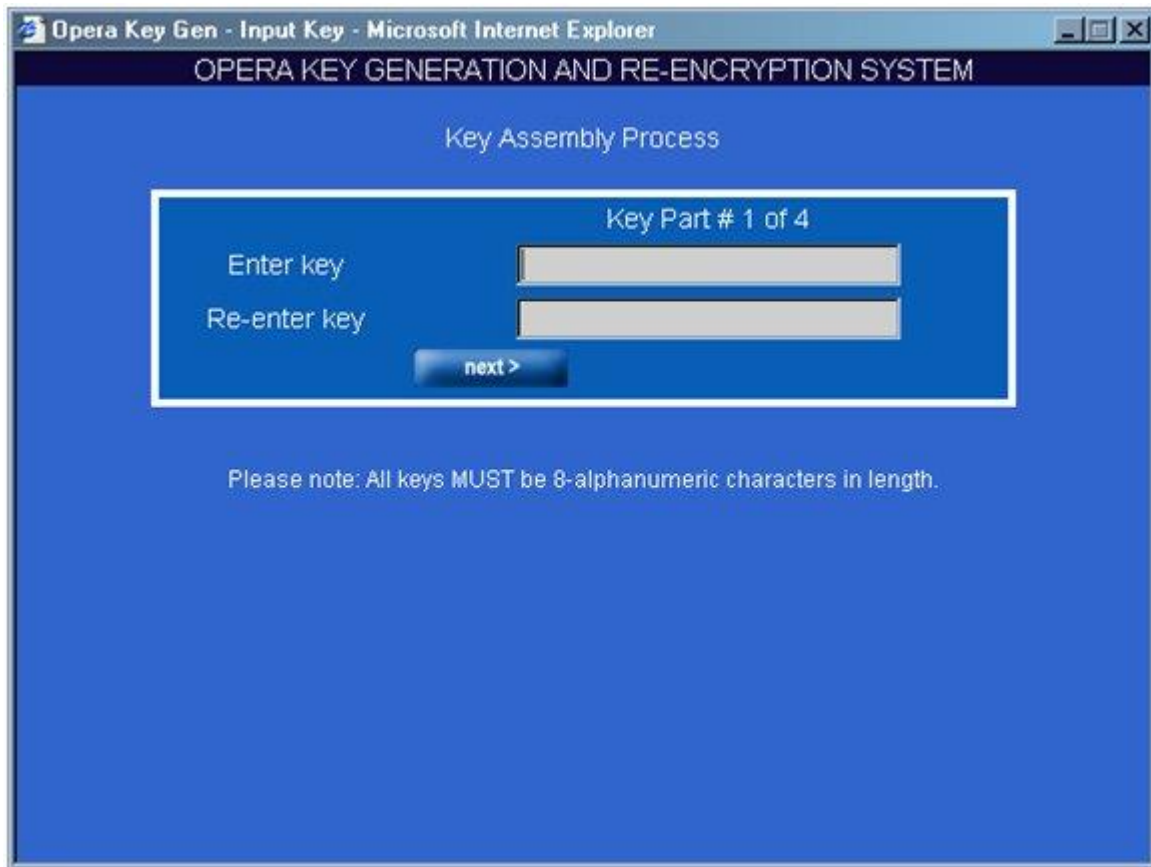
1. Enter the utility password and click **next**.



2. If there is a validation error, reenter utility password and select **next** to continue.



3. New encryption key is entered in 4 parts. At your option, 4 key segments may be entered by individual key custodians. Click **next** to continue.



Opera Key Gen - Input Key - Microsoft Internet Explorer

OPERA KEY GENERATION AND RE-ENCRYPTION SYSTEM

Key Assembly Process

Key Part # 1 of 4

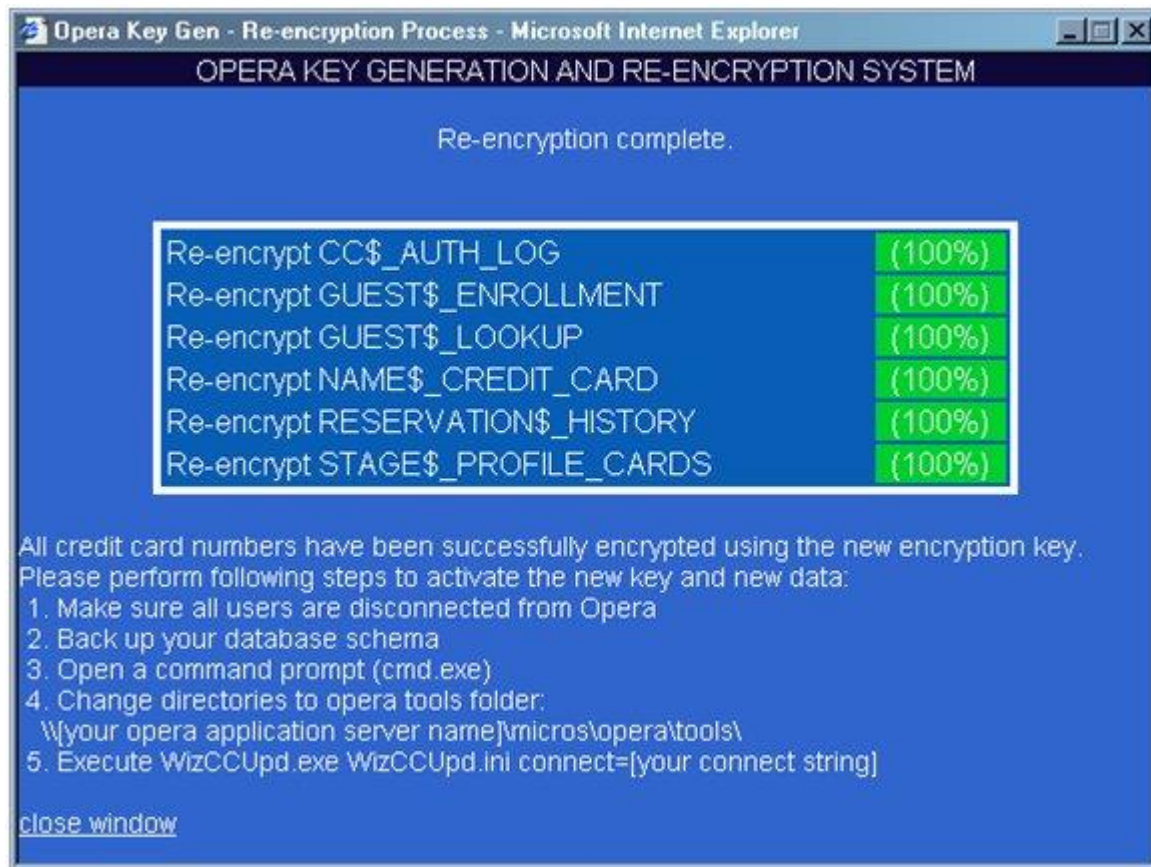
Enter key

Re-enter key

next >

Please note: All keys MUST be 8-alphanumeric characters in length.

4. If phase 1 of re-encryption process is successful, you will see the following screen:



5. If there was an exception raised during the previous run of the re-encryption system, reenter password and click **next** to restart the re-encryption process.



Set up Strong Access Controls (3.1 and 3.2)

The PCI DSS requires that access to all systems in the payment processing environment be protected through use of unique users and complex passwords. Unique user accounts indicate that every account used is associated with an individual user and/or process with no use of generic group accounts used by more than one user or process.

All authentication credentials are generated and managed by the application. Secure authentication is enforced automatically by the payment application for all credentials by the completion of the initial installation and for any subsequent changes (for example, any changes that result in user accounts reverting to default settings, any changes to existing account settings, or changes that generate new accounts or recreate existing accounts). To maintain PCI DSS compliance the following 11 points must be followed per the PCI DSS:

1. The payment application must not use or require the use of default administrative accounts for other necessary or required software (for example, database default administrative accounts) (PCI DSS 2.1 / PA-DSS 3.1.1)
2. The payment application must enforce the changing of all default application passwords for all accounts that are generated or managed by the application, by the completion of

- installation and for subsequent changes after the installation (this applies to all accounts, including user accounts, application and service accounts, and accounts used by Oracle for support purposes) (PCI DSS 2.1 / PA-DSS 3.1.2)
3. The payment application must assign unique IDs for all user accounts. (PCI DSS 8.1.1 / PA-DSS 3.1.3)
 4. The payment application must provide at least one of the following three methods to authenticate users: (PCI DSS 8.2 / PA-DSS 3.1.4)
 - a. Something you know, such as a password or passphrase
 - b. Something you have, such as a token device or smart card
 - c. Something you are, such as a biometric
 5. The payment application must NOT require or use any group, shared, or generic accounts and passwords (PCI DSS 8.5 / PA-DSS 3.1.5)
 6. The payment application requires passwords must to be at least 7 characters and includes both numeric and alphabetic characters (PCI DSS 8.2.3 / PA-DSS 3.1.6)
 7. The payment application requires passwords to be changed at least every 90 days (PCI DSS 8.2.4 / PA-DSS 3.1.7)
 8. The payment application keeps password history and requires that a new password is different than any of the last four passwords used (PCI DSS 8.2.5 / PA-DSS 3.1.8)
 9. The payment application limits repeated access attempts by locking out the user account after not more than six logon attempts (PCI DSS 8.1.6 / PA-DSS 3.1.9)
 10. The payment application sets the lockout duration to a minimum of 30 minutes or until an administrator enables the user ID. (PCI DSS 8.1.7 / PA-DSS 3.1.10)
 11. The payment application requires the user to re-authenticate to re-activate the session if the application session has been idle for more than 15 minutes. (PCI DSS 8.1.8 / PA-DSS 3.1.11)

You must assign strong passwords to any default accounts (even if they won't be used), and then disable or do not use the accounts.

These same account and password criteria from the above 11 requirements must also be applied to any applications or databases included in payment processing to be PCI compliant. Oracle Hospitality OPERA 5, as tested in our PA-DSS validation, meets, or exceeds these requirements for the following additional required applications or databases:

[Note: These password controls are not intended to apply to employees who only have access to one card number at a time to facilitate a single transaction. These controls are applicable for access by employees with administrative capabilities, for access to systems with cardholder data, and for access controlled by the application.

The requirements apply to the payment application and all associated tools used to view or access cardholder data.]

PA-DSS 3.2: Control access, via unique username and PCI DSS-compliant complex passwords, to any PCs or servers with payment applications and to databases storing cardholder data.

Properly Train and Monitor Admin Personnel

It is your responsibility to institute proper personnel management techniques for allowing admin user access to cardholder data, site data, etc. You can control whether each individual admin user can see credit card PAN (or only last 4).

In most systems, a security breach is the result of unethical personnel. So pay special attention to whom you trust into your admin site and who you allow to view full decrypted and unmasked payment information.

Log settings must be compliant (PA-DSS 4.1.b, 4.4.b)

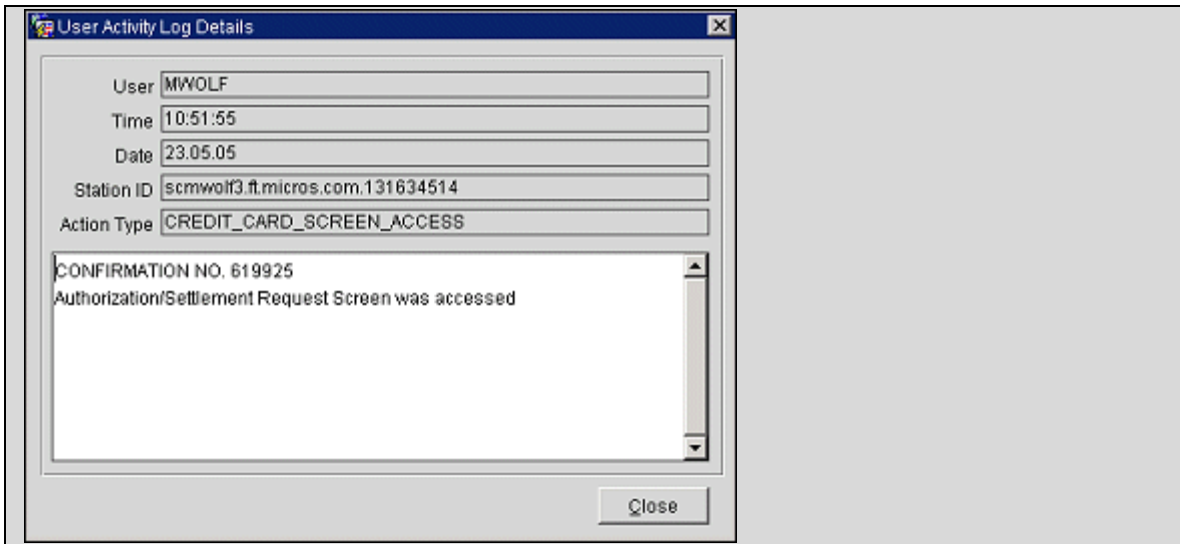
4.1.b: Oracle Hospitality OPERA 5 has PA-DSS compliant logging enabled by default. This logging is not configurable and may not be disabled. Disabling or subverting the logging function of Oracle Hospitality OPERA 5 in any way will result in non-compliance with PCI DSS.

Oracle provides a comprehensive audit trail utility, within OPERA, that allows privileged users to track OPERA specific activities. The advent of open database structure means that anyone with system level access to the database server (Oracle) has access to system components covered under this requirement, and thus would require logging of user access and activity. MICROS strongly recommends logging of activity on the database server.

4.4.b: Oracle Hospitality OPERA 5 facilitates centralized logging.

The OPERA User Activity Log records a "history" of user activity in the OPERA database and is accessed via Miscellaneous>User Activity Log. This logs data related to credit card authorizations, settlements, credit card information entry and deletion, and other transactions. This includes offline settlements taking place for a reservation due to interface time out or when user performs the settlement of temporarily stored offline settlements via **Cashiering>Credit Cards>Settlement** option, or when End of Day attempts to perform the settlement of temporarily stored offline settlements.

Note: If the user is granted the **Reservations>Credit Card Information View** permission, the user activity log records each time such user accesses an OPERA screen that displays credit card information (i.e., credit card numbers and expiration dates) — which in these cases will be unmasked — regardless of whether any action was taken on the credit card information itself. These screens include the Reservation screen, the Payment screen, the Profile screen, the Group Rooming List, and others. Following is an example of the activity log details in this situation:



Services and Protocols (PA-DSS 5.4.c)

Oracle Hospitality OPERA 5 does not require the use of any insecure services or protocols. Here are the services and protocols that Oracle Hospitality OPERA 5 does require:

SSL PROTOCOLS UTILIZED

SFTP

HTTPS

IPSec

Oracle recommends that all sensitive information that is transmitted over the Internet be secured using a form of encryption such as SSL Protocols; this includes all wireless transmissions, email and use of services such as Telnet and FTP.

Additionally Oracle recommends using IPSec between the Application and Database servers to secure communications. The IPSEC tunnel is also the proposed solution for all other non-strictly app servers that connect directly to the DB (OWS, ADS, GDS, OXI). Please refer to IPSecConfig.pdf for configuration of this feature which can be found on our information security website.

Oracle strongly suggests that when using our web based credit card interface, it is set up to use SSL Protocol communication. To configure this, do the following. Select **Configuration>Setup>Property Interfaces>Interface Configuration** and edit the active EFT Interface. On this form you will see a section to configure the URL that you are to connect to. Be sure that this URL starts with HTTPS. This will ensure a secure SSL Protocol connection is made to the vendor prior to transmitting credit card data.

PCI-Compliant Wireless settings (PA-DSS 6.1.f and 6.2.b)

Oracle Hospitality OPERA 5 does support wireless technologies and the following guidelines for secure wireless settings must be followed per PCI Data Security Standard 1.2.3, 2.1.1 and 4.1.1:

Oracle Hospitality OPERA 5 uses wireless access within the payment application. The following guidelines for secure wireless settings must be followed according to PCI DSS 1.2.3, 2.1.1, and 4.1.1.

PCI DSS 1.2.3

Install perimeter firewalls between any wireless networks and the cardholder data environment, and configure these firewalls to deny or control (if such traffic is necessary for business purposes) any traffic from the wireless environment into the cardholder data environment.

PCI DSS 2.1.1

For wireless environments connected to the cardholder data environment or transmitting cardholder data, change wireless vendor defaults, including but not limited to default wireless encryption keys, passwords, and SNMP community strings. Verify the following regarding vendor default settings for wireless environments:

- Verify encryption keys were changed from default at installation, and are changed anytime anyone with knowledge of the keys leaves the company or changes positions.
- Verify default SNMP community strings on wireless devices were changed.
- Verify default passwords/passphrases on access points were changed.
- Verify firmware on wireless devices is updated to support strong encryption for authentication and transmission over wireless networks.
- Verify other security-related wireless vendor defaults were changed, if applicable.

PCI DSS 4.1.1

For wireless networks transmitting cardholder data or connected to the cardholder data environment, verify that industry best practices (for example, IEEE 802.11i) are used to implement strong encryption for authentication and transmission.

Never store cardholder data on Internet-accessible systems (PA-DSS 9.1.b)

Never store cardholder data on Internet-accessible systems (e.g., web server and database server must not be on same server.)

Oracle uses separate development and production environments to ensure software integrity and security. Updated patches and security updates are available via the Oracle website, <<http://www.oracle.com>>.

Although Oracle Hospitality OPERA 5 uses Apache web server to distribute the application internally to your network, this server should not be used for any external web applications.

Access to this server from the internet has to be severely restricted by use of a firewall. Never keep the database server and web server on the same server for your environment.

Deployment Considerations for Single Server

In order to meet PCI Requirement 2.2.1 in a single Server OPERA deployment, none of the components of that Single Server can be used for any purpose other than to run the OPERA application.

The Single Server cannot be exposed to the Internet and only https/http related ports (443/80) can be opened.

PCI-Compliant Remote Access (10.2)

The PCI standard requires that if employees, administrators, or vendors are granted remote access to the payment processing environment; access should be authenticated using a two-factor authentication mechanism. The means two of the following three authentication methods must be used:

1. Something you know, such as a password or passphrase
2. Something you have, such as a token device or smart card
3. Something you are, such as a biometric

Oracle Hospitality OPERA 5 utilizes this two-factor authentication by having the user have to sign into the OPERA application itself with a User ID and Password and then another User ID and Password must be entered to get into other sections within OPERA, such as Cashiering.

And when swiping a credit card on an encrypted credit card reader from within the MICROS Payment Application (widget), OPERA will read the configuration of the credit card reader and pass this configuration information on to the MICROS Payment Application. The widget then parses the credit card information. The Expiration Date, Name of the Credit Card holder, the last 4 digits of the credit card number, and encrypted track data are extracted and sent to the Credit Card Vendor, based on the credit card reader device configuration. The Credit Card Vendor then decrypts the data and returns a token to OPERA to be used with any following credit card transactions.

Also, OPERA supports the Chip and PIN method of credit card and membership card authorization for both offline and online transactions. In addition, OPERA Kiosk supports Chip and PIN credit card payments to be made through a hotel kiosk system. Chip and PIN relies on a microchip inserted into the card; the chip stores cardholder authentication information. When the card is inserted into a specially designed reader, the microchip is accessed and the cardholder is prompted to enter a PIN (Personal Identification Number) to authorize the card.

PCI-Compliant Delivery of Updates (PA-DSS 10.3.1)

Oracle Hospitality OPERA 5 delivers patches and updates in a secure manner:

PCI DSS 1

Install and maintain a firewall configuration to protect cardholder data.

PCI DSS 12.3.9

Activation of remote-access technologies for vendors and business partners only when needed by vendors and business partners, with immediate deactivation after use.

As a software development company, we pay close attention to security concerns and vulnerabilities within OPERA V5. Once a security issue is identified, we work to develop and test a solution that will protect OPERA V5 from this and many other possible security concerns. OPERA V5 publishes E-Patches and Hot-Fixes for multiple versions every week.

Then a Oracle Regional Office or Customer themselves are notified of the fix and are encouraged to install the updates. It is then the responsibility of the Regional Office or Customer to make sure that the fix gets implemented into their version of the OPERA software. Also, these fixes are made available on the Oracle website < <http://support.oracle.com> > for download.

PCI-Compliant Remote Access (10.3.2.b)

The PCI standard requires that if employees, administrators, or vendors are granted remote access to the payment processing environment; access should be authenticated using a two-factor authentication mechanism (username/ password and an additional authentication item such as a token or certificate).

In the case of vendor remote access accounts, in addition to the standard access controls, vendor accounts should only be active while access is required to provide service. Access rights should include only the access rights required for the service rendered, and should be robustly audited.

If users and hosts within the payment application environment may need to use third-party remote access software such as Remote Desktop (RDP)/Terminal Server, Oracle Support, etc. to access other hosts within the payment processing environment, special care must be taken.

In order to be compliant, every such session must be encrypted with at least 128-bit encryption (in addition to satisfying the requirement for two-factor authentication required for users connecting from outside the payment processing environment). For RDP/Terminal Services this means using the high encryption setting on the server, and for Oracle Support it means using symmetric or public key options for encryption. Additionally, the PCI user account and password requirements will apply to these access methods as well.

When requesting support from a vendor, reseller, or integrator, customers are advised to take the following precautions:

- Change default settings (such as usernames and passwords) on remote access software (e.g. VNC)
- Allow connections only from specific IP and/or MAC addresses
- Use strong authentication and complex passwords for logins according to PA-DSS 3.1.1 – 3.1.10 and PCI DSS 8.1, 8.3, and 8.5.8-8.5.15
- Enable encrypted data transmission according to PA-DSS 12.1 and PCI DSS 4.1
- Enable account lockouts after a certain number of failed login attempts according to PA-DSS 3.1.8 and PCI DSS 8.5.13
- Require that remote access take place over a VPN via a firewall as opposed to allowing connections directly from the internet
- Enable logging for auditing purposes
- Restrict access to customer passwords to authorized reseller/integrator personnel.
- Establish customer passwords according to PA-DSS 3.1.1 – 3.1.10 and PCI DSS Requirements 8.1, 8.2, 8.4, and 8.5.

Data Transport Encryption (PA-DSS 11.1.b)

The PCI DSS requires the use of strong cryptography and encryption techniques with at least a 128 bit encryption strength (either at the transport layer with SSL PROTOCOL or IPSEC; or at the data layer with algorithms such as RSA or AES256) to safeguard cardholder data during transmission over public networks (this includes the Internet and Internet accessible DMZ network segments).

PCI DSS requirement 4.1: Use strong cryptography and security protocols such as secure sockets layer (SSL PROTOCOL) / Transport Layer Security (TLS 1.1 or higher)(requires OHS 12c web tier) and Internet protocol security (IPSEC) to safeguard sensitive cardholder data during transmission over open, public networks.

Examples of open, public networks that are in scope of the PCI DSS are:

- The Internet
- Wireless technologies
- Global System for Mobile Communications (GSM)
- General Packet Radio Service (GPRS)

Refer to the Dataflow diagram for an understanding of the flow of encrypted data associated with Oracle Hospitality OPERA 5.

Oracle recommends that all sensitive information that is transmitted over the Internet be secured using a form of encryption such as SSL Protocol; this includes all wireless transmissions, email and use of services such as Telnet and FTP.

Additionally Oracle recommends using IPsec between the Application and Database servers to secure communications. The IPSEC tunnel is also the proposed solution for all other non-strictly app servers that connect directly to the DB (OWS, ADS, GDS, OXI). Please refer to IPsecConfig.pdf for configuration of this feature which can be found on our information security website.

Oracle strongly suggests that when using our web based credit card interface, it is set up to use SSL Protocol communication. To configure this, do the following. Select **Configuration>Setup>Property Interfaces> Interface Configuration** and edit the active EFT Interface. On this form you will see a section to configure the URL that you are to connect to. Be sure that this URL starts with HTTPS. This will ensure a secure SSL Protocol connection is made to the vendor prior to transmitting credit card data.

PCI-Compliant Use of End User Messaging Technologies (PA-DSS 11.2.b)

Oracle Hospitality OPERA 5 facilitates/enables the sending of PANs via end user messaging technology by ensuring that PAN is always masked on materials that can be printed, emailed, and faxed which makes the PAN unreadable to any person viewing the item.

Non-console administration (PA-DSS 12.1)

Oracle Hospitality OPERA 5 or server allows non-console administration, so you must use SSH, VPN, or SSL PROTOCOL / Transport Layer Security (TLS 1.1 or higher)(requires OHS 12c web tier) for encryption of this non-console administrative access.

Network Segmentation

The PCI DSS requires that firewall services be used (with NAT or PAT) to segment network segments into logical security domains based on the environmental needs for internet access. Traditionally, this corresponds to the creation of at least a DMZ and a trusted network segment where only authorized, business-justified traffic from the DMZ is allowed to connect to the trusted segment. No direct incoming internet traffic to the trusted application environment can be allowed. Additionally, outbound internet access from the trusted segment must be limited to required and justified ports and services.

- ✍ Refer to the standardized Network diagram for an understanding of the flow of encrypted data associated with Oracle Hospitality OPERA 5.

Maintain an Information Security Program

In addition to the preceding security recommendations, a comprehensive approach to assessing and maintaining the security compliance of the payment application environment is necessary to protect the organization and sensitive cardholder data.

The following is a very basic plan every merchant/service provider should adopt in developing and implementing a security policy and program:

- ✍ Read the PCI DSS in full and perform a security gap analysis. Identify any gaps between existing practices in your organization and those outlined by the PCI requirements.
- ✍ Once the gaps are identified, determine the steps to close the gaps and protect cardholder data. Changes could mean adding new technologies to shore up firewall and perimeter controls, or increasing the logging and archiving procedures associated with transaction data.
- ✍ Create an action plan for on-going compliance and assessment.

- ✍ Implement, monitor and maintain the plan. Compliance is not a one-time event. Regardless of merchant or service provider level, all entities should complete annual self-assessments using the PCI Self Assessment Questionnaire.
- ✍ Call in outside experts as needed.

Application System Configuration

Below are the operating systems and dependent application patch levels and configurations supported and tested for continued PCI DSS compliance.

List Operating system(s) and versions/SP's supported.

Linux x86-64	Oracle Linux 6.4
Microsoft Windows x64 (64-bit)	8.1 7 2012 R2 2008 R2

Payment Application Initial Setup & Configuration

The Credit Card Vault feature is used to eliminate the storage of credit card numbers in OPERA. When this feature is active, instead of storing credit card numbers, unique ID's (tokens) provided by the EFT system replace credit card numbers for all of the guest's credit card transactions. With this feature active, a card number can only be entered on the Payment Application to retrieve the token. The Payment Application is an external component (JAVA) that communicates the card data out to the EFT system and only the token in to OPERA. The token is saved in the OPERA database and used for all the guest's payment transactions. E2EE devices can also be utilized to further reduce the entry of clear card data in the Payment Application.

When initially configuring OPERA to function with the external Credit Card Vault application, the following application settings must be considered for configuration within OPERA.

- IFC>CREDIT CARD VAULT
- IFC> CREDIT CARD VAULT ID
- IFC>CREDIT CARD VAULT MAX CC PROCESSED
- IFC>CREDIT CARD VAULT TIMEOUT
- IFC>CREDIT CARD VAULT CHAIN CODE
- IFC>CREDIT CARD VAULT WEB SERVICE URL
- IFC>WALLET PASSWORD
- GENERAL>DAYS TO MASK CREDIT CARD INFORMATION –no longer avail. with Vault, not needed as card # not in OPERA
- GENERAL>MASK CREDIT CARD NUMBERS- no longer exists in OPERA (Vault and non-Vault), this setting was removed when we started always masking the card # and only users with permission could double-click to view it.

Pre-Installation

Installing Client Side Certificates for Vault Functionality

The CcHttpLib.dll allows client side certificates utilizing mutual authentication to be imported on workstations at a Computer Account level in order to be scalable to all North American properties and viable for franchised workstations. The CcHttpLib.dll is placed on the OPERA Application Server for automatic deployment to the workstations when accessing OPERA.

The .crt and .p12 certificates and password (needed to import the certificate) are supplied by the credit card vendor.

The workstations that will access OPERA and conduct credit card transactions must have Microsoft Management Console (MMC) and Microsoft Windows HTTP Services certificate configuration tool (WinHttpCertCfg.exe) installed.

The following steps must be performed by an administrator on each workstation or a similar process followed to push the certificates to the workstation.

A. Save the vendor provided .crt and .p12 on the workstation.

B. Run **MMC** and import the certificate using the following steps.

1. Go to **File > Add or Remove Snap-ins**.
2. Select **Certificates** under the *Available snap-ins* section and add it to the *Selected snap-ins* section.
3. On the *Certificates snap-ins* screen, select **Computer account** and then click **Next**.
4. Keep the option **Local computer** and click **Finish**.
5. Click **OK** to go back to the main *MMC* window.
6. Right-click on a folder under the *Certificates* folder and select **All Tasks > Import...**
7. Click **Next** on the **Import Wizard** and **Browse** to find the .crt that was saved on the workstation in step A.
8. Click **Next** and select the option **Automatically select the certificate store based on the type of certificate**.
9. Click **Next** and **Finish**. The message 'The import was successful.' appears.
10. Right-click again on a folder under the *Certificates* folder and select **All Tasks > Import...**
11. Click **Next** on the **Import Wizard** and **Browse** to find the .p12 that was saved on the workstation in step A.
12. Click **Next** and enter the password provided by the vendor.
13. Click **Next** and select the option **Automatically select the certificate store based on the type of certificate**.
14. Click **Next** and **Finish**. The message 'The import was successful.' appears.

The certificate can now be found in three Stores.

C. Open a cmd window and run the following command.

```
WinHttpCertCfg.exe -g -c LOCAL_MACHINE\MY -s "www.micros.com" -a everyone
```

A successful response will be similar to this:

Microsoft (R) WinHTTP Certificate Configuration Tool

Copyright (C) Microsoft Corporation 2001.

Matching certificate:

CN=www.micros.com

OU=ODH

O=TARPON

L=Silver Spring

S=Maryland

C=US

OID.1.3.6.1.4.1.99999.10.1=UAT Opera Transaction Vault

Granting private key access for account:

\Everyone

An unsuccessful response may be similar to this:

Unable to update security info for key container, error = 0x5

If this occurs, initialize cmd with *Run as administrator* and execute the command again.

D. Log out of the workstation and log in as a regular user to access OPERA and conduct credit card transactions.

Any user account that has the permissions to log on to the domain and workstation has access to the certificate to successfully conduct business.

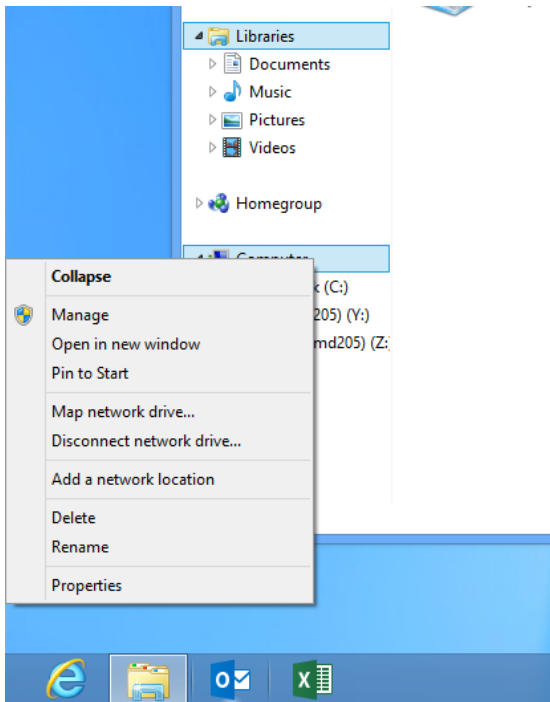
- Installing the Payment Application – the needed dll's and jar files are automatically downloaded with the OPERA installation. With the above Application Settings active and certificates installed, the Payment App will be available from the icon on the OPERA forms.
- Defining the Payment Gateway - use an SSL connection for communication between OPERA and the EFT system. The vendor provided p12 is used as the Server side certificate and imported to the Oracle Wallets folder on the OPERA database server.
- Obtaining and Installing the 128 bit SSL Protocol Certificate
- Conducting Test Transactions - can be completed only if Vendor supports test card data
- Special Instructions for Upgrades –existing card numbers in the OPERA database can be converted to tokens from the EFT system in a process initiated through OPERA Utilities.
- Resetting Administrator Passwords -OPERA User Passwords have mandatory expiry every 30 days
- Performing Maintenance - recommend setup purge of historical data
- Updating your Encryption Key on a Periodic basis- recommend setup purge of historical data and execute the Encryption Utility on a scheduled basis as mentioned in above section 'Removal of Historical Cryptographic Material (PA-DSS 2.6)'. Not needed when Vault is active.

Appendix A: Addressing Inadvertent Capture of PAN

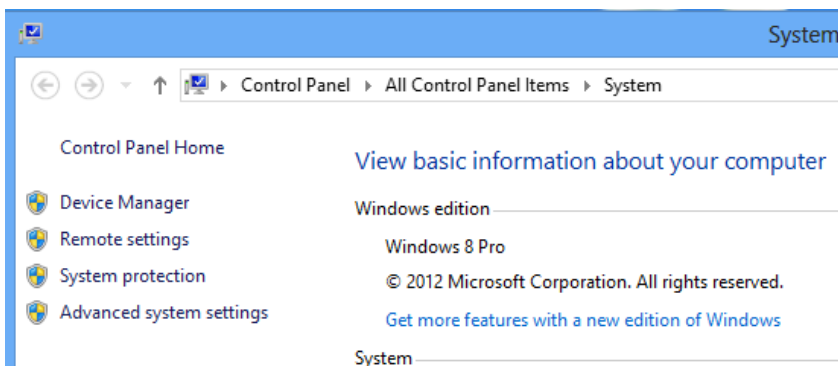
Addressing Inadvertent Capture of PAN on WINDOWS 8

Disabling System Restore – Windows 8

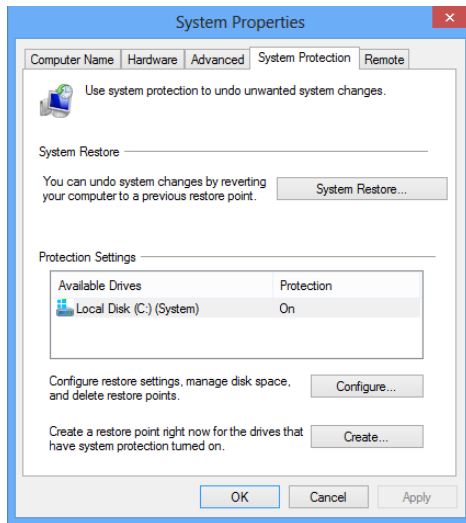
- Right Click on Computer > Select “Properties”:



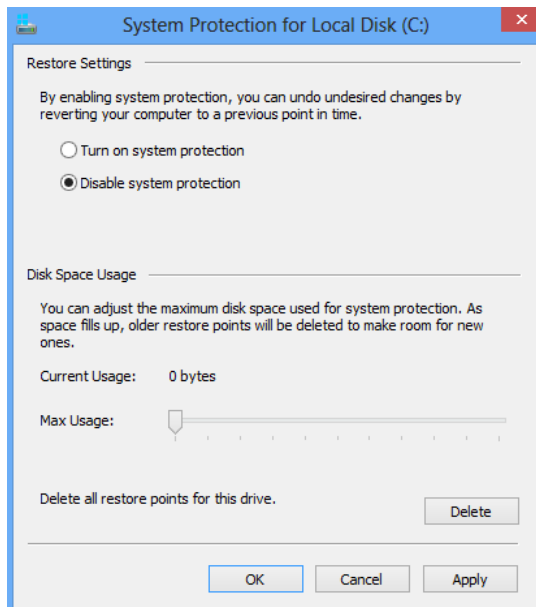
- Select “Advanced System Settings” from the System screen:



- Select “System Protection” on the top left list, the following screen will appear:



- Select Configure, the following screen will appear:



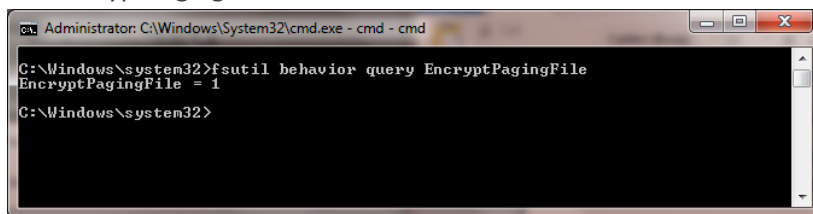
- Select “Disable system protection”
- Click apply, and OK to shut the System Protection window
- Click OK again to shut the System Properties window

- Reboot the computer

Encrypting PageFile.sys – Windows 8

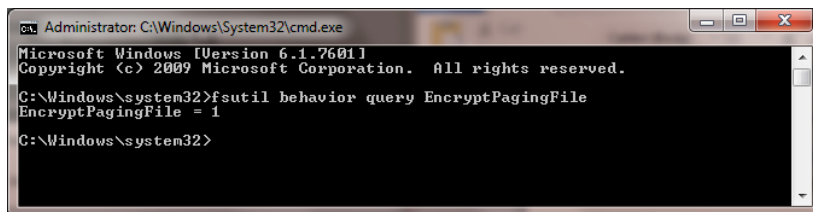
* Please note that in order to perform this operation the hard disk must be formatted using NTFS.

- From the desktop hold down the “Windows” key and type “F” to bring up the “Search” charm, select “Apps” in the “Apps” box type in “cmd”.
- Right click on “Command Prompt” icon located on the left side of your screen, a selection bar will appear at the bottom of the screen, select “Run as Administrator”
- To verify configuration type the following command: fsutil behavior query EncryptPagingFile”



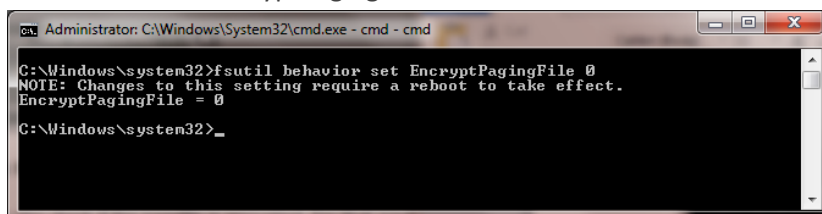
```
Administrator: C:\Windows\System32\cmd.exe - cmd - cmd
C:\Windows\system32>fsutil behavior query EncryptPagingFile
EncryptPagingFile = 1
C:\Windows\system32>
```

- If encryption is enabled EncryptPagingFile = 1 should appear
- If encryption is disabled EncryptPagingFile = 0 should appear
- To Encrypt the Pagefile type the following command: fsutil behavior set EncryptPagingFile 1



```
Administrator: C:\Windows\System32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.
C:\Windows\system32>fsutil behavior query EncryptPagingFile
EncryptPagingFile = 1
C:\Windows\system32>
```

- In the event you need to disable PageFile encryption type the following command: fsutil behavior set EncryptPagingFile 0



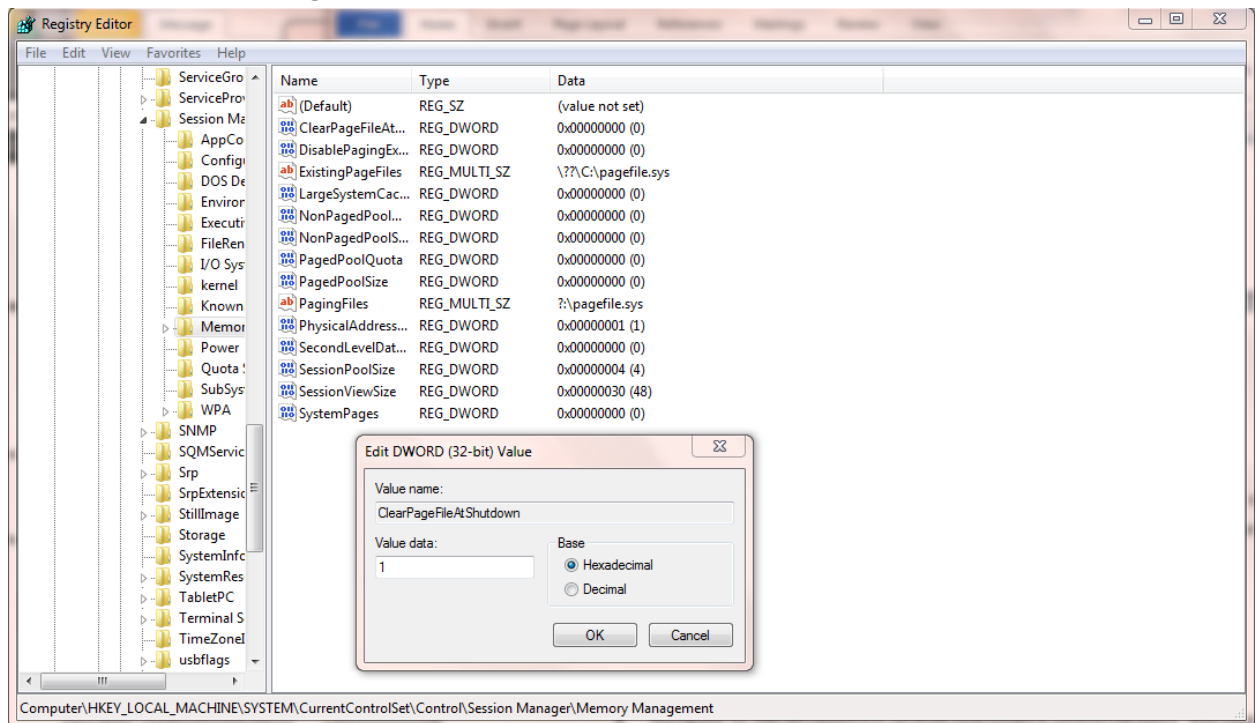
```
Administrator: C:\Windows\System32\cmd.exe - cmd - cmd
C:\Windows\system32>fsutil behavior set EncryptPagingFile 0
NOTE: Changes to this setting require a reboot to take effect.
EncryptPagingFile = 0
C:\Windows\system32>_
```

Clear the System Pagefile.sys on shutdown

Windows has the ability to clear the Pagefile.sys upon system shutdown. This will purge all temporary data from the pagefile.sys (temporary data may include system and application passwords, cardholder data (PAN/Track), etc.).

NOTE: Enabling this feature may increase windows shutdown time.

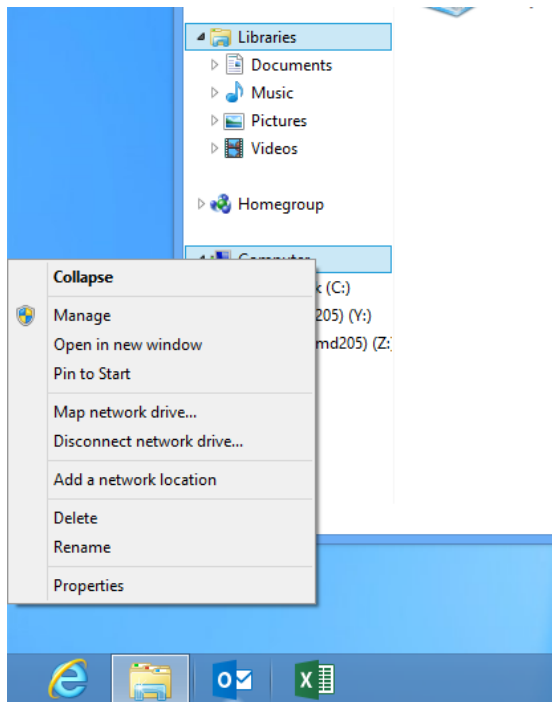
- From the desktop hold down the “Windows” key and type “F” to bring up the “Search” charm, select “Apps” in the “Apps” box type in “regedit”.
- Right click on regedit.exe and select “Run as Administrator”
- Navigate to HKLM\System\CurrentControlSet\Control\Session Manager\Memory Management
- Change the value from 0 to 1 on the “ClearPageFileAtShutdown” DWORD.
- Click OK and close Regedit



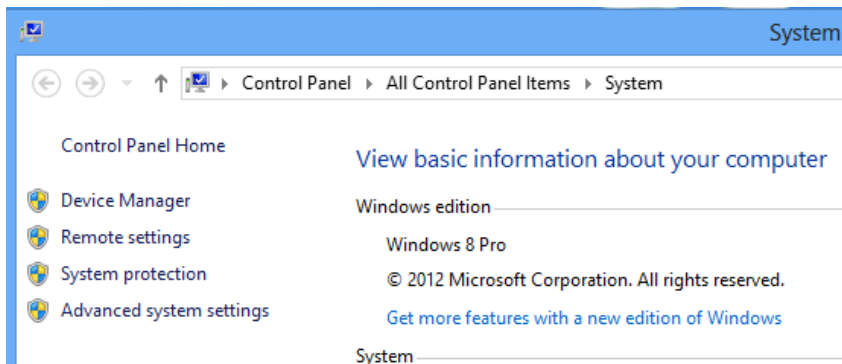
- If the value does not exist, add the following:
 - Value Name: ClearPageFileAtShutdown
 - Value Type: REG_DWORD
 - Value: 1

Disabling System Management of PageFile.sys – Windows 8

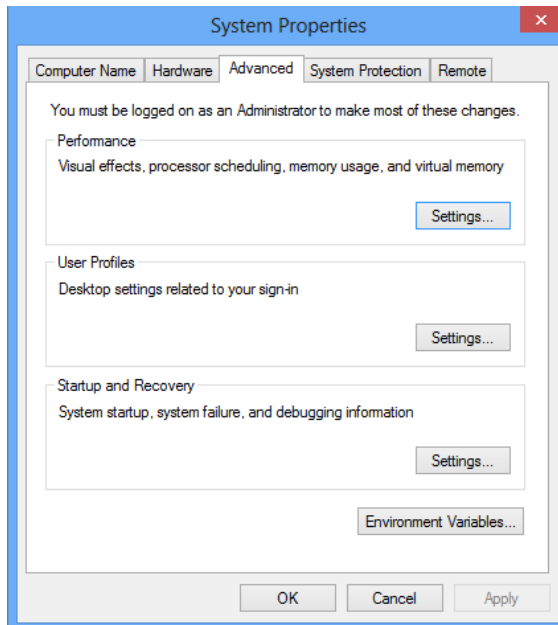
- Right Click on Computer > Select “Properties”:



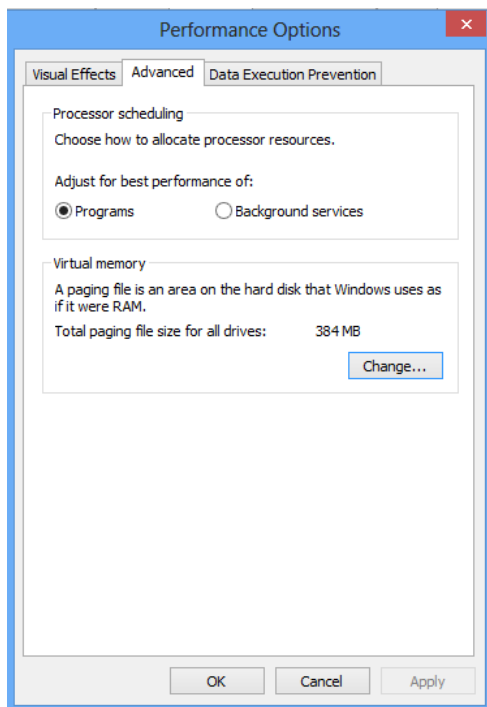
- Select “Advanced System Settings” from the System screen:



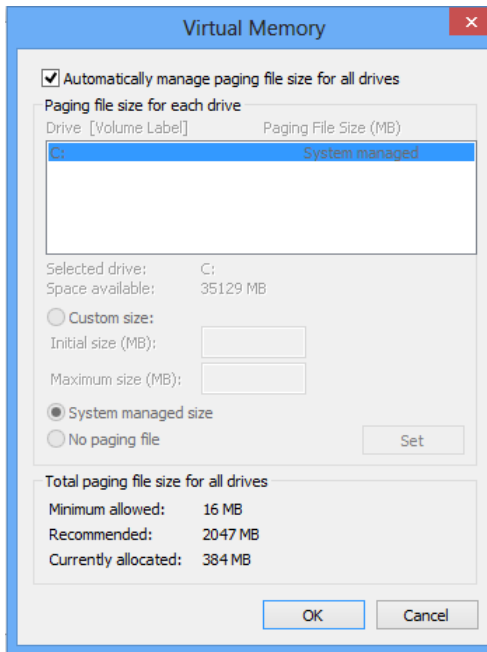
- Select the “Advanced” tab:



- Under performance select “Settings” and go to the “Advanced” tab, the following screen will appear:



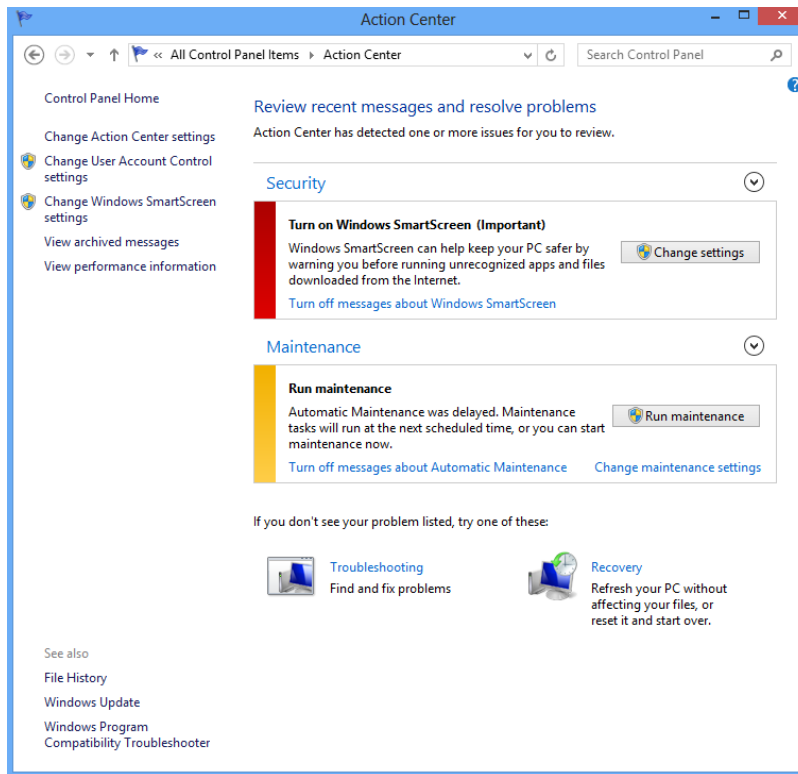
- Select “Change” under Virtual Memory, the following screen will appear:



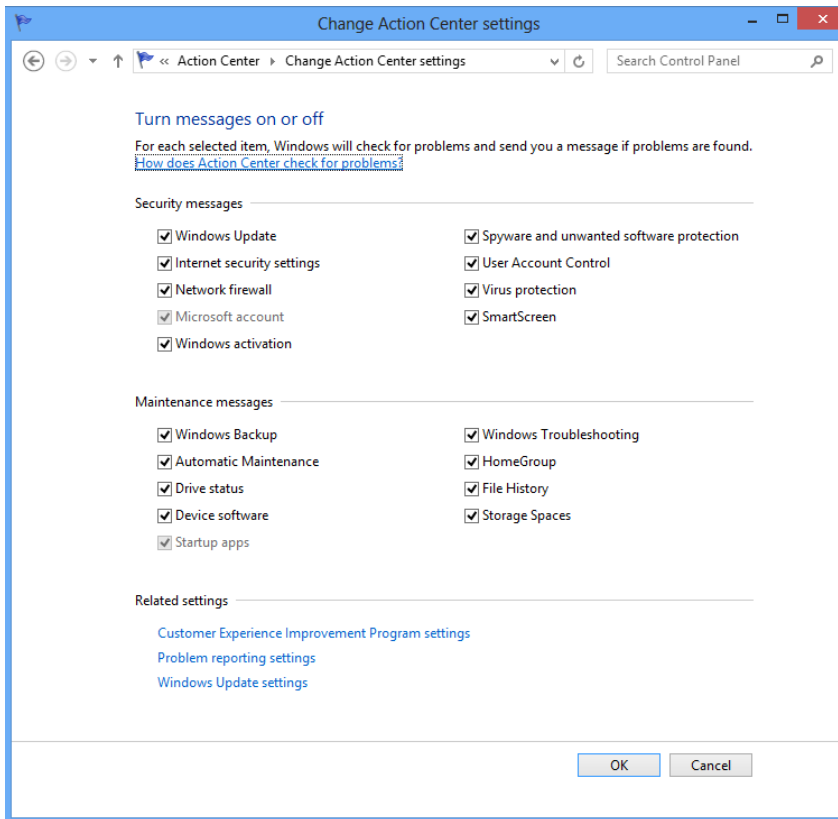
- Uncheck “Automatically manage page file size for all drives”
- Select “Custom Size”
- Enter the following for the size selections:
 - Initial Size – as a good rule of thumb, the size should be equivalent to the amount of memory in the system.
 - Maximum Size – as a good rule of thumb, the size should be equivalent to 2x the amount of memory in the system.
- Click “Ok”, “OK”, and “OK”
- You will be prompted to reboot your computer.

Disabling Windows Error Reporting – Windows 8

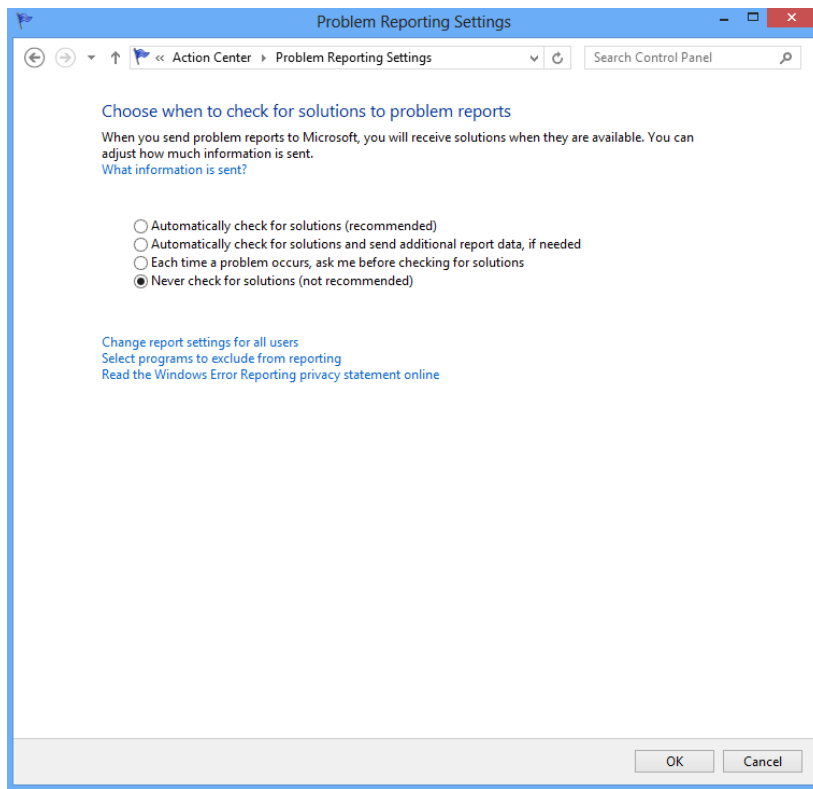
- From the desktop hold down the “Windows” key and type “I” to bring up the “Settings” charm, select “Control Panel”.
- Open the Action Center
- Select “Change Action Center Settings”:



- Select “Problem Reporting Settings”:



- Select “Never Check for Solutions”:

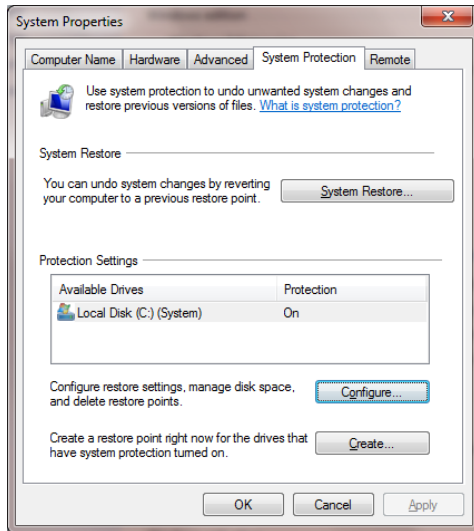


- Select “OK” twice and then close Action Center.

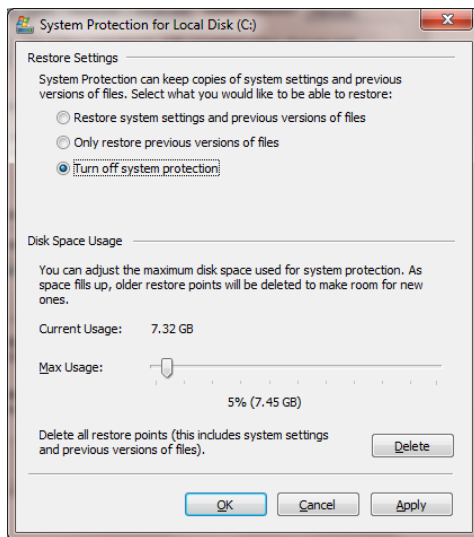
Addressing Inadvertent Capture of PAN on WINDOWS 7

Disabling System Restore – Windows 7

- Right Click on Computer > Select “Properties”
- Select “System Protection” on the top left list, the following screen will appear:



- Select Configure, the following screen will appear:

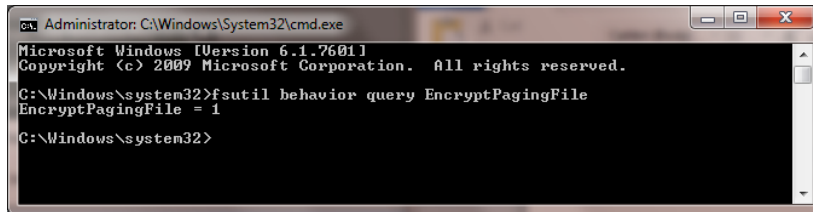


- Select “Turn off system protection”
- Click apply, and OK to shut the System Protection window
- Click OK again to shut the System Properties window
- Reboot the computer

Encrypting PageFile.sys – Windows 7

* Please note that in order to perform this operation the hard disk must be formatted using NTFS.

- Click on the Windows “Orb” and in the search box type in “cmd”.
- Right click on cmd.exe and select “Run as Administrator”
- To Encrypt the Pagefile type the following command: fsutil behavior set EncryptPagingFile 1

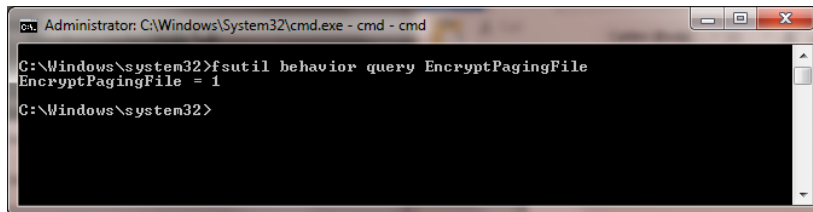


```
Administrator: C:\Windows\System32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Windows\system32>fsutil behavior query EncryptPagingFile
EncryptPagingFile = 1

C:\Windows\system32>
```

- To verify configuration type the following command: fsutil behavior query EncryptPagingFile

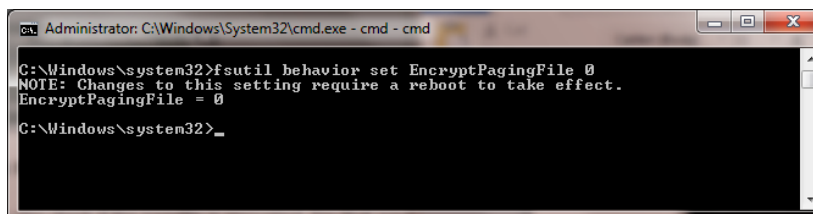


```
Administrator: C:\Windows\System32\cmd.exe - cmd - cmd

C:\Windows\system32>fsutil behavior query EncryptPagingFile
EncryptPagingFile = 1

C:\Windows\system32>
```

- If encryption is enabled EncryptPagingFile = 1 should appear
- In the event you need to disable PageFile encryption type the following command: fsutil behavior set EncryptPagingFile 0

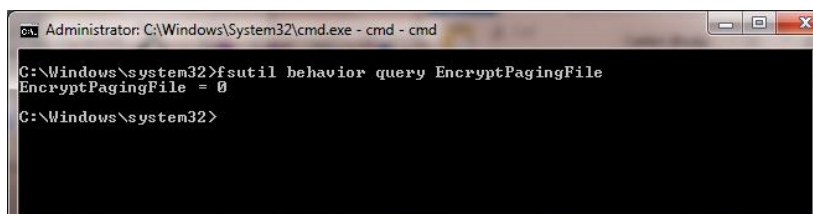


```
Administrator: C:\Windows\System32\cmd.exe - cmd - cmd

C:\Windows\system32>fsutil behavior set EncryptPagingFile 0
NOTE: Changes to this setting require a reboot to take effect.
EncryptPagingFile = 0

C:\Windows\system32>
```

- To verify configuration type the following command: fsutil behavior query EncryptPagingFile



```
Administrator: C:\Windows\System32\cmd.exe - cmd - cmd

C:\Windows\system32>fsutil behavior query EncryptPagingFile
EncryptPagingFile = 0

C:\Windows\system32>
```

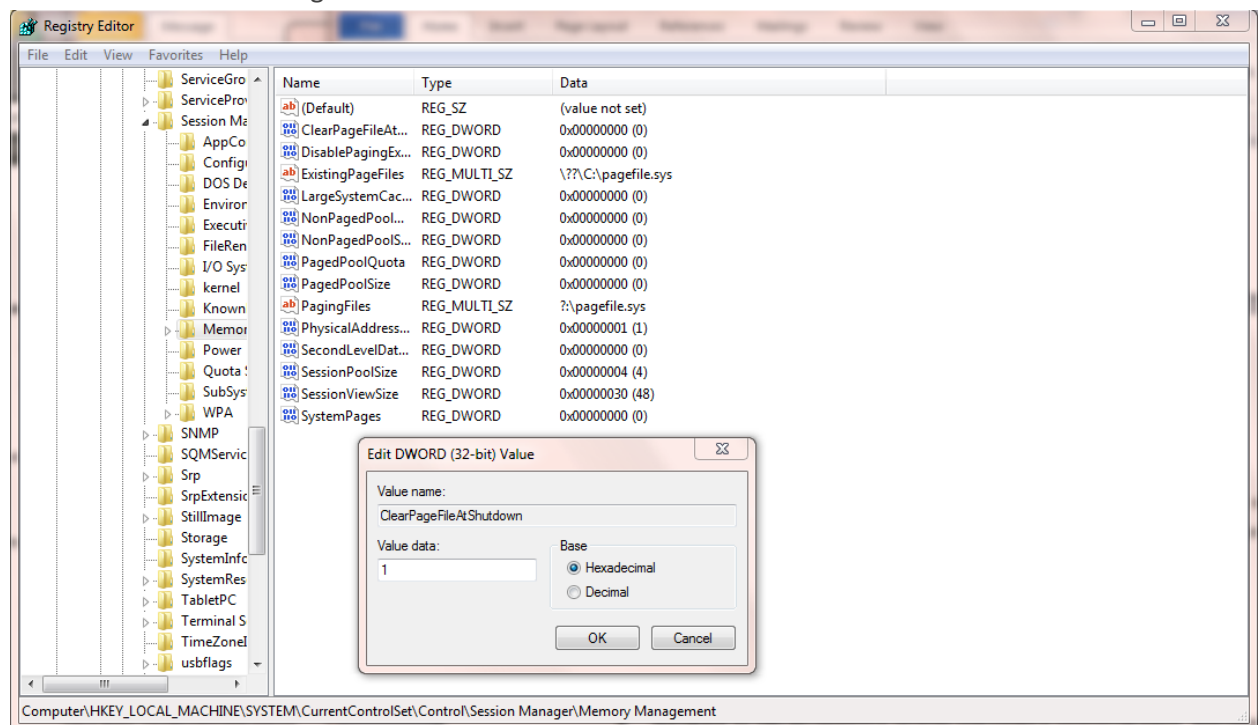
- If encryption is disabled EncryptPagingFile = 0 should appear

Clear the System Pagefile.sys on shutdown

Windows has the ability to clear the Pagefile.sys upon system shutdown. This will purge all temporary data from the pagefile.sys (temporary data may include system and application passwords, cardholder data (PAN/Track), etc.).

NOTE: Enabling this feature may increase windows shutdown time.

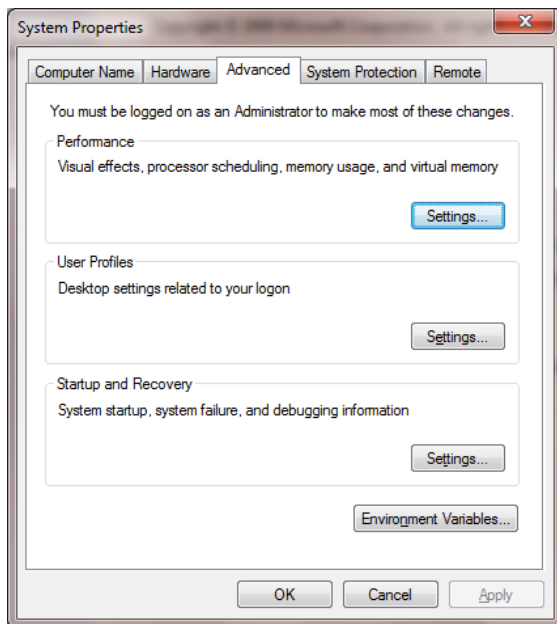
- Click on the Windows “Orb” and in the search box type in “regedit”.
- Right click on regedit.exe and select “Run as Administrator”
- Navigate to HKLM\System\CurrentControlSet\Control\Session Manager\Memory Management
- Change the value from 0 to 1
- Click OK and close Regedit



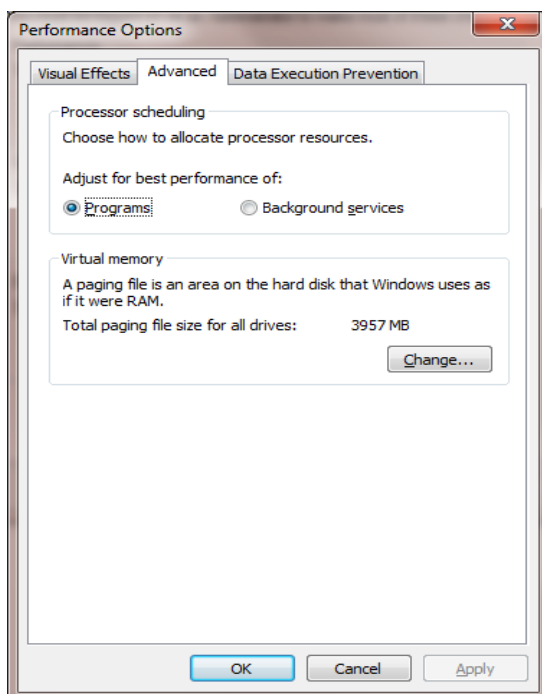
- If the value does not exist, add the following:
 - Value Name: ClearPageFileAtShutdown
 - Value Type: REG_DWORD
 - Value: 1

Disabling System Management of PageFile.sys – Windows 7

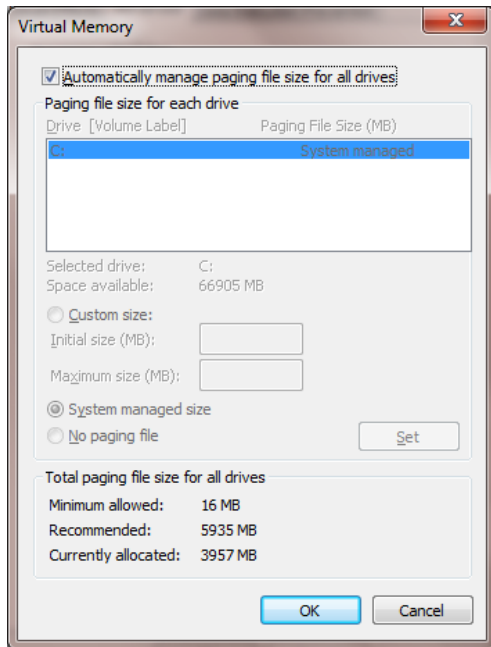
- Right Click on Computer > Select “Properties”
- Select “Advanced System Settings” on the top left list, the following screen will appear:



Under performance select “Settings” and go to the “Advanced” tab, the following screen will appear:



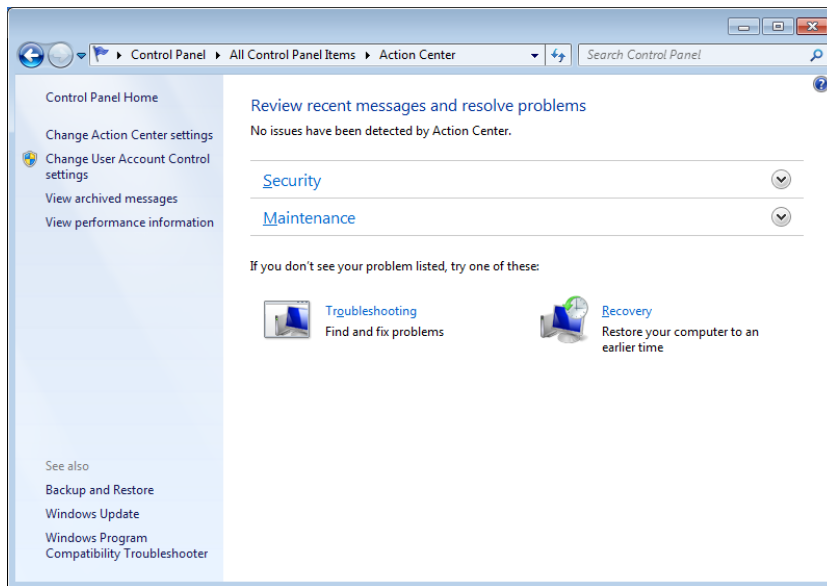
- Select “Change” under Virtual Memory, the following screen will appear:



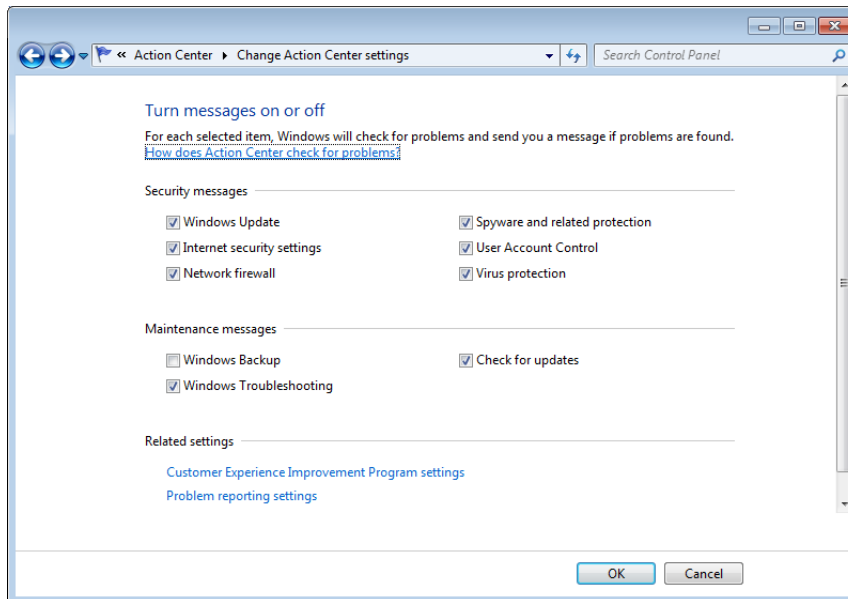
- Uncheck “Automatically manage page file size for all drives”
- Select “Custom Size”
- Enter the following for the size selections:
 - Initial Size – as a good rule of thumb, the size should be equivalent to the amount of memory in the system.
 - Maximum Size – as a good rule of thumb, the size should be equivalent to 2x the amount of memory in the system.
- Click “Ok”, “OK”, and “OK”
- You will be prompted to reboot your computer.

Disabling Windows Error Reporting – Windows 7

- Open the Control Panel
- Open the Action Center
- Select “Change Action Center Settings”



- Select “Problem Reporting Settings”



- Select “Never Check for Solutions”

