



| z/VSE Live Virtual Class Series

Securing Data Transfers using IPv6/VSE

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Agenda

- **Basic threats (Jeff Barnard)**
- **OpenSSL on z/VSE (Joerg Schmidbauer)**
- **IPv6/VSE (Jeff Barnard)**



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Basic threats

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Testing platform

- **Fully-integrated enterprise-class penetration testing platform (Linux)**
- **Onboard high-gain 802.11b/g/n wireless**
- **Onboard high-gain Bluetooth (1000')**
- **Onboard dual-Ethernet**
- **Includes external 3G/GSM adapter**
- **Includes 16GB internal disk storage**
- **Fully functional 120/240v AC outlets!**



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[Basic Setup](#)[Plug Services](#)[Reverse Shells](#)[System Status](#)[Help](#)

Evil AP

Current Status: **Enabled**

Evil AP name (SSID):

Enter SSID:

* Pwnie

Start Evil AP

Stop Evil AP

Stop Evil AP

Log tail (/var/log/evilap.log)

```
08:36:57 Access Point with BSSID F8:D1:11:13:BC:8F started.
08:36:57 Got directed probe request from 00:1E:8F:A6:5B:70 - "StaplesHotspot"
08:36:57 Got directed probe request from 00:1E:8F:A6:5B:70 - "StaplesHotspot"
08:36:58 Got directed probe request from 00:1E:8F:A6:5B:70 - "StaplesHotspot"
08:36:58 Got directed probe request from 00:1E:8F:A6:5B:70 - "StaplesHotspot"
08:36:58 Got broadcast probe request from 00:1E:8F:A6:5B:70
08:36:58 Got directed probe request from 00:1E:8F:A6:5B:70 - "StaplesHotspot"
08:36:58 Got an auth request from 00:1E:8F:A6:5B:70 (open system)
08:36:58 Client 00:1E:8F:A6:5B:70 associated (unencrypted) to ESSID: "StaplesHotspot"
08:36:58 Got directed probe request from 00:1E:8F:A6:5B:70 - "StaplesHotspot"
```

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Text-to-Bash

Current Status: **Enabled**

Enable Text-to-Bash:

Enter 10-digit number of cell phone to accept commands from.
Bash command output will also be texted back to this phone.

*

Disable Text-to-Bash

Log tail

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Basic Setup

Plug Services

Reverse Shells

System Status

Help

Current Status: **Enabled**

Enable Passive Recon

☐ Enable

Disable Passive Recon

☐ Disable

HTTP requests, user-agents, cookies, etc. (/var/log/recon/http.log)

```
192.168.001.160.41104-074.125.228.101.00080: GET /__utm.gif?utmwv=5.3.1&utms=3&utmn=1188701272&utm
Host: www.google-analytics.com
User-Agent: [REDACTED]
Referer: http://www.pwnieexpress.com/downloads.html
192.168.001.160.54915-064.207.139.243.00080: GET /support.html HTTP/1.1
Host: www.pwnieexpress.com
User-Agent: [REDACTED]
Referer: http://www.pwnieexpress.com/downloads.html
Cookie: __utma=129171085.635249979.1328500426.1337200676.1337242611.159; __utmoz=129171085.13371
192.168.001.160.41104-074.125.228.101.00080: GET /__utm.gif?utmwv=5.3.1&utms=4&utmn=916220297&utm
```

Passive OS discovery (/var/log/recon/p0f.log)

```
192.168.1.160:45998 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 192.168.1.5:8443 (distance 0, link: ethernet/modem)
192.168.1.160:45999 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 192.168.1.5:8443 (distance 0, link: ethernet/modem)
192.168.1.160:46000 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 192.168.1.5:8443 (distance 0, link: ethernet/modem)
192.168.1.160:54911 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 64.207.139.243:80 (distance 0, link: ethernet/modem)
192.168.1.160:41104 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 74.125.228.101:80 (distance 0, link: ethernet/modem)
192.168.1.160:53454 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 173.194.74.189:443 (distance 0, link: ethernet/modem)
192.168.1.160:54451 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 173.194.68.189:443 (distance 0, link: ethernet/modem)
192.168.1.160:54915 - Linux 2.6 (newer, 3) (up: 2 hrs) -> 64.207.139.243:80 (distance 0, link: ethernet/modem)
```

Clear-text passwords (/var/log/recon/dsniff.log)



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OpenSSL support in z/VSE

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Agenda

- **What is OpenSSL**
- **Why OpenSSL on z/VSE?**
- **What has been ported / added?**
- **RSA keys / key stores**
- **Random numbers**
- **Performance**
- **Outlook**



What is OpenSSL

- **OpenSSL is an Open Source project providing an SSL implementation and key management utilities.**
- **OpenSSL is written in C**
- **Available for most Unix-style operating systems, MAC, Windows, and:
IBM System i (OS/400)**
- **For details on OpenSSL refer to**

<http://www.openssl.org/>



Why OpenSSL on z/VSE?

- **The TCP/IP stack from Connectivity Systems, Inc. has an own SSL implementation, but:**
 - What about the other two stacks: IPv6/VSE from Barnard Systems, Inc. and Linux Fast Path (LFP) provided by IBM.
- **All stacks could use one single SSL implementation: OpenSSL**
- **OpenSSL is widely used in the industry**
- **Latest RFC's implemented**
- **One central place for access to crypto hardware, software updates, migration to higher versions**

What has been ported to z/VSE?

- **OpenSSL 1.0.0d runtime library**
 - Phase IJBSSL in PRD1.BASE
 - About 550+ C source parts and 90+ H-files
 - Total of 70.000+ Lines of code
 - Software implementations for all algorithms with all key lengths
 - Subset of the OpenSSL API
- **Built-in tests**
 - Known-answer tests for algorithms (IBM internal)
 - OpenSSL speed test (available to customers/vendors)

What has been added for z/VSE?

- **OS390 / z/OS compatible SSL API**

- Described in “z/OS Cryptographic Services, SSL Programming”, SC24-5901
- Consists of gsk_initialize(), gsk_secure_soc_init(), etc.
- Allows existing z/VSE SSL applications to run unchanged

- **Hardware crypto support**

- Crypto cards (crypto express adapters)
 - RSA encrypt/decrypt
 - RSA key generation on coprocessor cards
 - Random number generation on coprocessor cards
- CPACF (on board crypto feature)
 - AES, TDES encrypt/decrypt
 - SHA hashing
 - PRNG (pseudo random number gen)

Two APIs available

■ GSK API

- Existing VSE SSL applications use the OS/390 SSL API (gsk-API), described in “z/OS Cryptographic Services, SSL Programming, SC24-5901”.
 - gsk_initialize()
 - gsk_secure_soc_init()
 - gsk_read()
 - gsk_write()
 - etc.

■ OpenSSL API

- The OpenSSL API consists of 200+ functions
- A subset is available to VSE applications via IJBSLVSE.OBJ

With both APIs HW-crypto is supported.

z/VSE-specific parameters

- **GSK API: parms specified in JCL**
 - Values evaluated in gsk_initialize()
 - HW crypto support
 - `// SETPARM SSL$ICA = [ 'YES' | 'NO' ]`
 - Debug trace
 - `// SETPARM SSL$DBG = [ 'YES' | 'NO' ]`
- **OpenSSL API: parms specified via PARM='...'**
 - Values evaluated by application
 - HW crypto support:
 - Use special API functions `ssl_enable_ibmca` / `ssl_disable_ibmca`
 - Debug trace
 - Use `ssl_enable_debug` / `ssl_disable_debug`

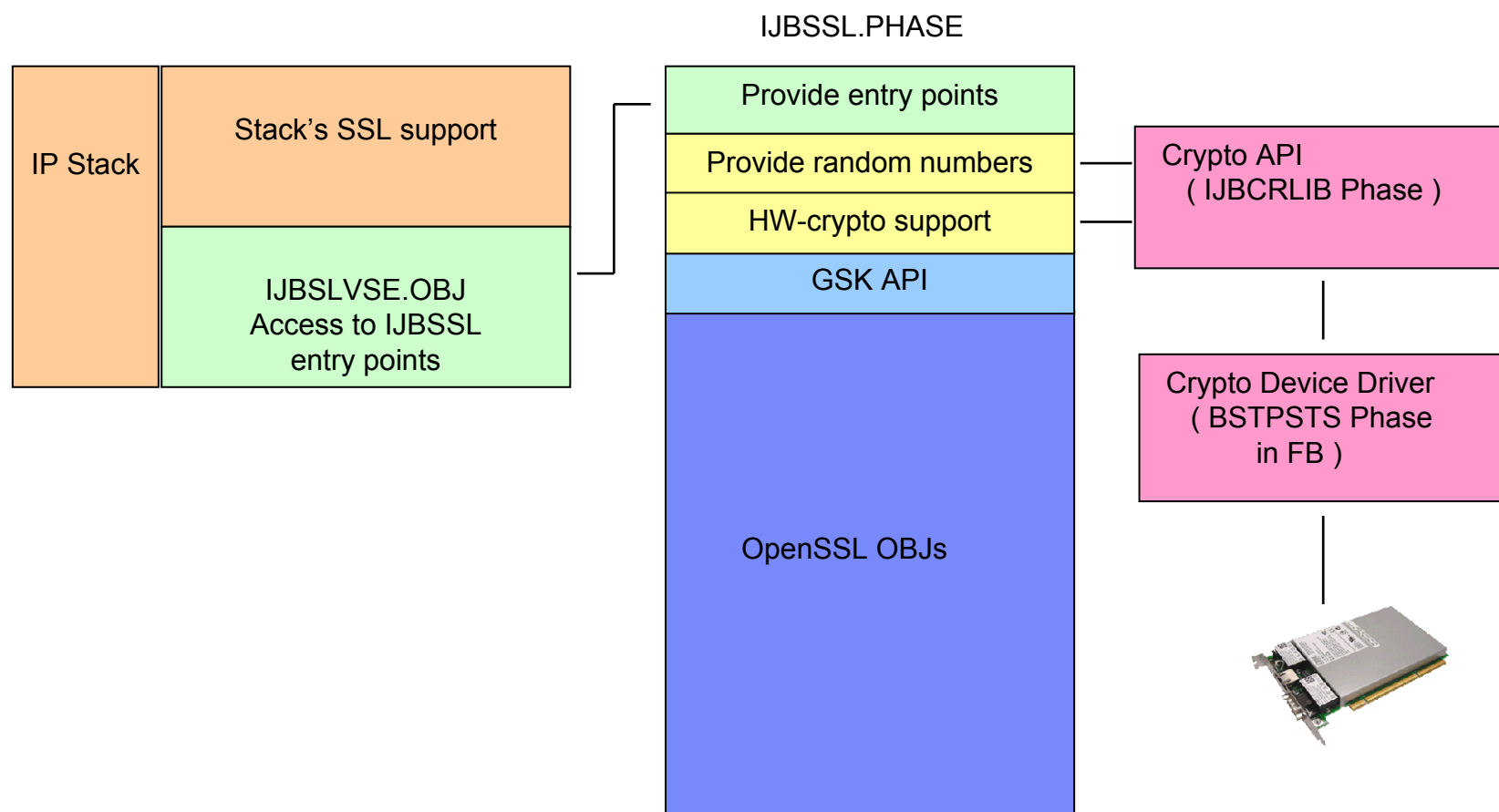
How is OpenSSL shipped on z/VSE?

- **New z/VSE 5.1 system component:**
 - z/VSE cryptographic services, 5686-CF9-17-51S
 - Installed in PRD1.BASE
 - Consists of
 - IJBSSL phase (the OpenSSL runtime)
 - SPEEDTST phase (invokes the built-in speed test)
 - NOTICES.Z (license)
 - IJBVLVSE.OBJ (provides access to the APIs)
 - IJBSSL.H (provides function prototypes)
- **Two PTFs necessary for z/VSE 5.1:**
 - [DY47397](#) / [UD53864](#) – OpenSSL 1.0.0d update
 - [DY47414](#) / [UD53863](#) – VSE/AF update for HW crypto support

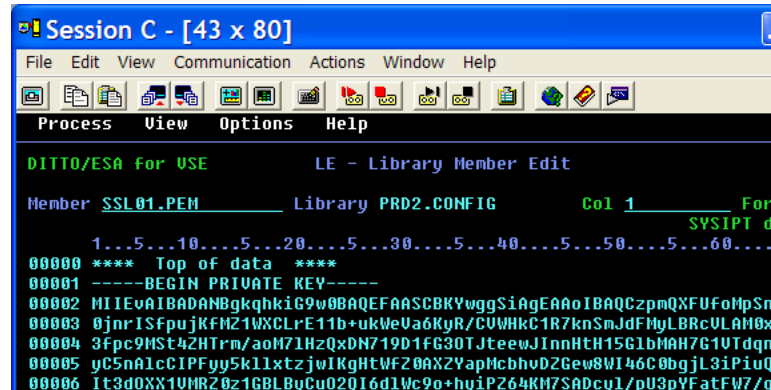
What is not available on z/VSE?

- **The openssl command line tool is not available on z/VSE**
 - Key management is done on a workstation (Windows, Linux, etc.)
 - Keystores (PEM files) are uploaded to z/VSE
- **Some algorithms are not available on z/VSE due to legal reasons**
 - IDEA, RC5, MDC2
- **Non-LE/C applications not supported**
 - OpenSSL is coded in C, therefore an LE/C-runtime environment is required for callers

How is OpenSSL integrated in z/VSE?



How do I setup my key store?

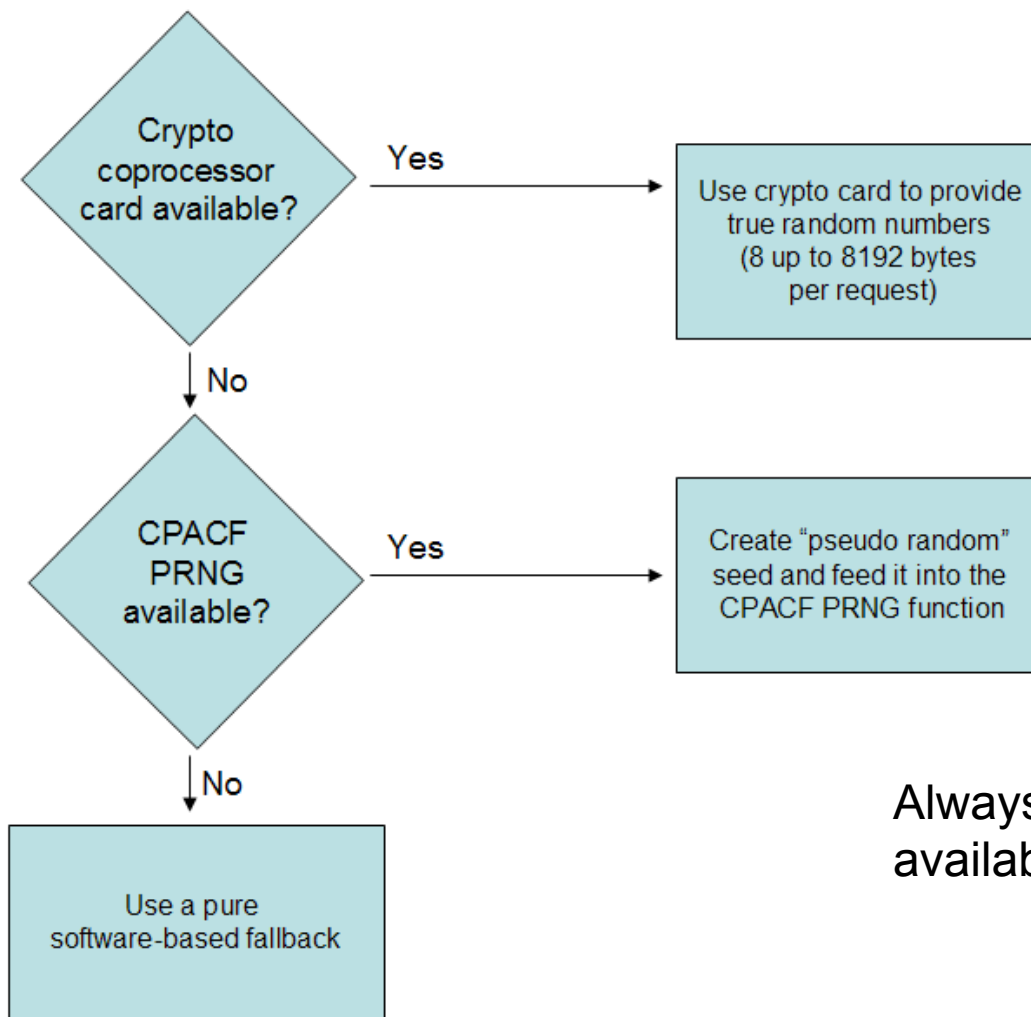
- **Step 1: create RSA key and certificate request using OpenSSL on a workstation**
 - `openssl req -x509 -nodes -days 365 -newkey rsa:1024 -keyout mykey.pem -out mycert.pem`
 - **Step 2: Sign certificate request via official CA or Keyman/VSE**
 - **Step 3: Add CA certificate and VSE certificate to PEM file**
 - **Step 4: When using Windows, edit the PEM file with Wordpad and save without changes.**
 - This adds the correct CRLF line endings
 - **Step 5: Upload key store to VSE**
 - It's a text file, therefore use ASCII to EBCDIC translation
 - As VSE Librarian member, or
 - As VSAM file
- 
- ```
Session C - [43 x 80]
File Edit View Communication Actions Window Help
[Icons]
Process View Options Help
DITTO/ESA for USE LE - Library Member Edit
Member: SSL01.PEM Library: PRD2.CONFIG Col 1 For
SYSTPT d
1...5...10...5...20...5...30...5...40...5...50...5...60...
00000 **** Top of data ****
00001 -----BEGIN PRIVATE KEY-----
00002 MIIEvAIBADANBgkqhkiG9w0BAQEFAASCBKYYggSiAgEAAoIBAQCzpmQXFUfoMpSn
00003 0jnrISfpujKFH21WXLrE11b+ukWeUa6KyR/CVWHkC1R7knSmJdFMyLBRCVLM0x
00004 3Fpc9Mst42HTrm/aom71HzQxDN719D1fG30TJteewJInnHtH15G1bMAN7G1UTdq
00005 yC5nA1cCIPFyy5K11xtzjwIKgHtWF20AX2YapMcbbvD2Gew8WI46C0bgjL3iPiUq
00006 It3d0XX1UHR20z1GBLBuCu02QI6d1Wc9o+huipZ64KM7SADcu1/pU3pYFatFW7/
```

## Creating random numbers

- **Essential for the security / vulnerability of a crypto system**
- **Problem with software-based random number generators:**
  - They need a seed value (initial start value)
  - Difficulty to find good seed values:
    - TOD clock
    - Process states
    - Other sources of randomness in the system
- **Two general types distinguished:**
  - Pseudo random number generator (PRNG, software based)
  - True random number generator (TRNG, hardware based)



## Random number generator on z/VSE



Always try to use best available generator

## Performance

- **Built-in speed test shows performance numbers about crypto algorithms**
- **Significant performance boost with crypto hardware**
- **Invocation via SPEEDTST phase:**

```
// EXEC SPEEDTST, PARM= 'RSA AES-128-CBC IBMCA '
// EXEC SPEEDTST, PARM= 'SHA1 '
// EXEC SPEEDTST, PARM= 'DES-EDE3 SHA256 AES-128-CBC '
```

PARM='IBMCA' enables HW-crypto for speed test

Use openssl on a workstation to get a list of possible parms:

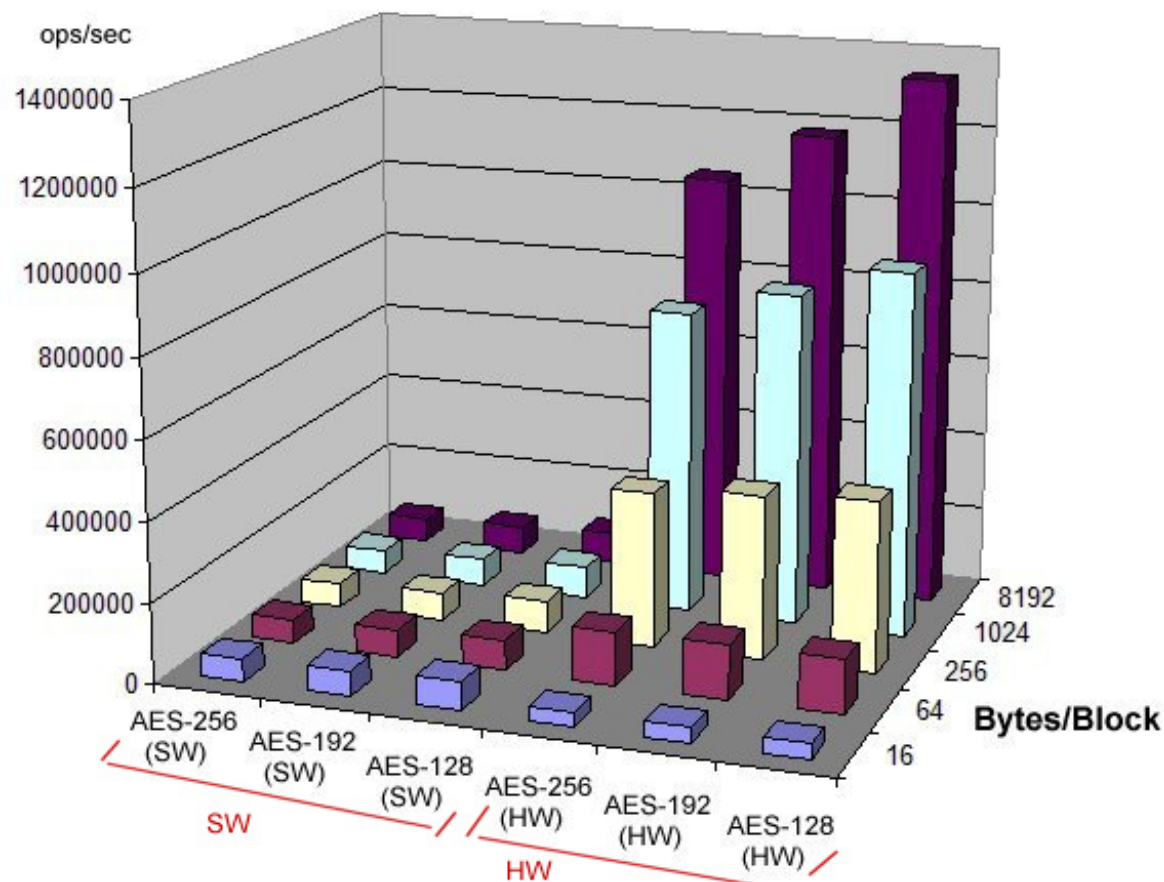
```
openssl speed ?
```

## AES Performance

| Key length | Times faster with HW |
|------------|----------------------|
| AES-128    | 16                   |
| AES-192    | 16                   |
| AES-256    | 17                   |

SW is faster for very small blocks of data due to overhead calling CPACF

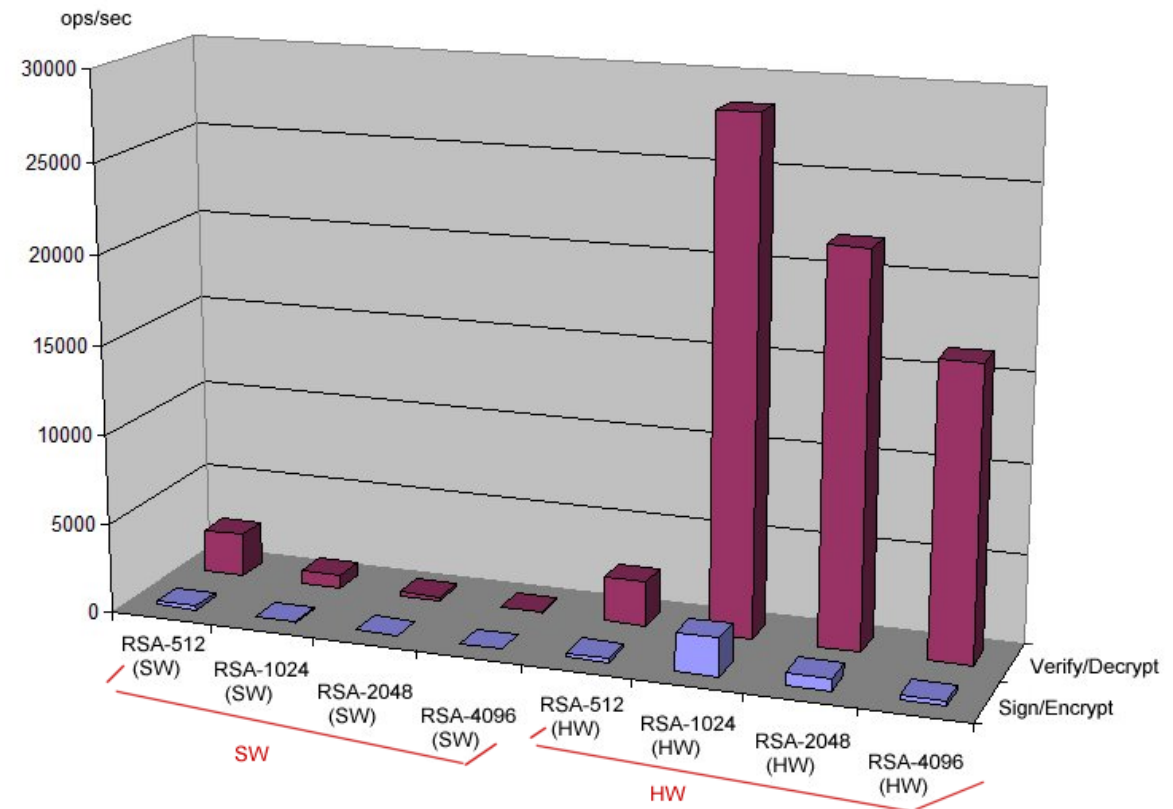
Measured on a z196



## RSA Performance

| Key length | Times faster with HW |
|------------|----------------------|
| RSA-512    | - (*)                |
| RSA-1024   | 40 - 60              |
| RSA-2048   | 112 - 122            |
| RSA-4096   | 302 - 308            |

(\*) RSA-512 is not supported by HW



Measured on a z196 with Crypto Express3

## Where do I find documentation?

- **Jeff Barnard's doc:**
  - IP-IPv6\_VSE-SSL\_Creating and Using SSL Certificates.pdf
- **IBM doc:**
  - Will be provided with next books update / release
  - White papers on z/VSE homepage (tbd):  
<http://www.ibm.com/systems/z/os/zvse/documentation/security.html#howto>

## What comes next?

- **Support for non-LE apps / Assembler sockets (EZASOCKET/EZASMI)**
- **Regular upgrades to latest OpenSSL service level**
- **Dynamic access to OpenSSL from all applications based on SYSID**
- **Support for DSA keys**
- **Support for Elliptic Curve Cryptography (ECC)**



## More information

OpenSSL website

<http://www.openssl.org/>

OpenSSL License

<http://www.openssl.org/source/license.html>

OpenSSL command line documentation

<http://www.openssl.org/docs/apps/openssl.html>

A good collection of OpenSSL commands is provided at

<http://www.madboa.com/geek/openssl/>

z/OS Cryptographic Services, SSL Programming, SC24-5901-08

<http://www.ibm.com/support/docview.wss?uid=pub1sc24590107>



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## IPv6/VSE SSL Support

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<http://twitter.com/IBMzVSE>



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## IPv6/VSE SSL support

- **Available in GA Build 252**
- **GSK API provided**
- **EZASMI, EZASOKET, LE/C support**
- **BSTTPRXY SSL Proxy Server**
- **BSTTATLS Automatic TLS Facility**

## IPv6/VSE SSL Support

- **Based on IJBSSL from IBM**
- **Port of OpenSSL 1.0.0**
- **IJBSSL introduced with z/VSE 5.1**
- **C/VSE application**
- **Will run on any version of z/VSE**
- **Provides software SSL**
- **Supports CPACF and Crypto Express on z/VSE 5.1+**

## IPv6/VSE SSL Support

- **IJBSSL API currently uses LE/C**
- **Requires application be LE**
- **Only batch LE applications can use GSK() API at this time. CICS not supported.**
- **These restrictions will be removed**
- **All applications are supported by the BSTTPRXY SSL Proxy Server and BSTTATLS Automatic TLS Facility**

Why convert your applications to use SSL/TLS when we will do it for you!

## Proxy Types

| Source                         | Destination                      |
|--------------------------------|----------------------------------|
| Accept clear text connection   | Proxy to clear text connection   |
| Accept SSL connection          | Proxy to SSL connection          |
| Accept clear text connection   | Proxy to SSL connection          |
| Accept SSL connection          | Proxy to clear text connection   |
|                                |                                  |
| Accept IPv4 or IPv6 connection | Proxy to IPv4 or IPv6 connection |



## Proxy Examples

Accept a clear text connection from BSTTMTPC on port 25 and proxy the connection to an SMTP server listening on SSL port 465. This type of connection is commonly called *smtps*.

Accept an SSL connection on port 443 and proxy the connection to CICS TS Web Services on clear text port 80. This type of connections commonly called *https*.

Accept an SSL connection on port 992 and proxy the connection to the BSTTVNET TN3270E server on clear text port 23. This type of connection is commonly called *telnets*.

Accept a clear text connection from BSTTFTPC on port 21 and proxy the connection to an FTP server listening on SSL port 990. This type of connection is commonly called *ftps*.

Accept an SSL connection on port 990 and proxy the connection to the BSTTFTPS FTP server on clear text port 21. This type of connection is commonly called *ftps*.

```
// OPTION SYSPARM='66'
// SETPARM IPTRACE='NNNNNNN'
// LIBDEF *,SEARCH=(ssllib.slib,bsilib.slib)
// EXEC BSTTPRXY,SIZE=BSTTPRXY
ID 66
*
KEYRING PRD2.CONFIG
DNAME MYCERT
SECTYPE TLSV1
*
OPTION SERVER
*
PROXY TCP V4 1234 SSL * TO V4 23 TXT * LOCALHOST
/*
```

| Command          | Description                                                                                                            |
|------------------|------------------------------------------------------------------------------------------------------------------------|
| ID nn            | Stack ID                                                                                                               |
| BUFFERSIZEK      | Buffer size in K bytes<br>The default is 16K. This is recommended.                                                     |
| KEYRING          | KEYRING location<br>Either VSAM -or- lib.slib                                                                          |
| KEYFILE          | Default RSA key and certificate location<br>Either VSAM ESDS dlbl name -or<br>library member name (member type is PEM) |
| SECTYPE          | Security type<br>Either SSL30 or TLSV1<br>TLSV1 is recommended                                                         |
| SESSION_TIMEOUT  | Session Timeout value in seconds<br>The default is 900.                                                                |
| HANDSHAKE_CLIENT | 0, 3<br>The default is 3.                                                                                              |
| HANDSHAKE_SERVER | 1, 2<br>The default is 1.                                                                                              |

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OPTION       | FTP<br>Indicates FTP PORT/PASV/EPRT/EPSV processing required                                                                                                                                                                                                                                                                                                                                                                                  |
| OPTION       | SERVER CLIENT<br>Indicates server mode (default) or client mode                                                                                                                                                                                                                                                                                                                                                                               |
| CA_AUTH      | YES NO<br>NO is the default                                                                                                                                                                                                                                                                                                                                                                                                                   |
| CA_AUTH_TYPE | Authorization type value 0, 1, 2, 3. The default is 3.<br>This parameter is only used when CA_AUTH is YES.<br>0 Validate client certificate using just the local database<br>1 Obtain CA certificates and certificate revocation lists not found in the local database from LDAP server<br>2 Obtain CA certificates and certificate revocation lists not found in the local database from LDAP server<br>3 Do not validate client certificate |



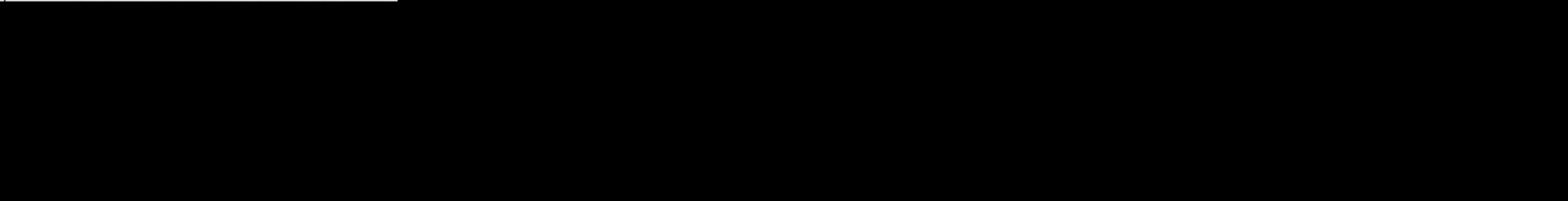
| Command    | Description                    |
|------------|--------------------------------|
| PROXY      | PROXY command                  |
| Protocol   | TCP                            |
| IP         | V4 or V6                       |
| Port       | Port number                    |
| Mode       | TXT (clear) or SSL (encrypted) |
| DNAME      | DNAME member name or *         |
| TO         |                                |
| Protocol   | TCP                            |
| IP         | V4 or V6                       |
| Port       | Port number                    |
| Mode       | TXT (clear) or SSL (encrypted) |
| DNAME      | DNAME member name or *         |
| IP Address | IPv4 or IPv6 IP address        |

| Handshake                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GSK_AS_CLIENT: (0)                  | Client receives server's public key and cert.<br>Client authenticates server's public key and cert.<br>Client checks its local CA-cert file to authenticate.<br>DNAME = Dummy RSA key and CA-cert for authentication *(1)                                                                                                                                                                                                                                            |
| GSK_AS_SERVER: (1)                  | Server sends its public key and cert to client.<br>DNAME = Public RSA key and cert *(1)                                                                                                                                                                                                                                                                                                                                                                              |
| GSK_AS_SERVER_WITH_CLIENT_AUTH: (2) | Server sends its public key and cert to client.<br>Client authenticates server's public key and cert.<br>Client checks its local CA-cert file to authenticate.<br>DNAME = public RSA key and cert AND CA-cert for authentication<br>Client sends its public key and cert to server.<br>Server authenticates client's public key and cert.<br>Server checks its local CA-cert file to authenticate.<br>DNAME = public RSA key and cert AND CA-cert for authentication |
| GSK_AS_CLIENT_NO_AUTH: (3)          | Client receives server's public key and cert.<br>Client accepts server's public key and cert without authentication.<br>DNAME not used! no RSA key or cert required.                                                                                                                                                                                                                                                                                                 |



```
// OPTION SYSPARM='66'
// SETPARM IPTRACE='NNNNNNNN'
// LIBDEF *,SEARCH=(ssllib.slib,bsilib.slib)
// EXEC BSTTPRXY,SIZE=BSTTPRXY
ID 66
KEYRING PRD2.CONFIG
DNAME BSICERT
SECTYPE TLSV1
OPTION SERVER
PROXY TCP V4 992 SSL * TO V4 23 TXT * LOCALHOST
/*
```

```
// EXEC BSTTPRXY,SIZE=BSTTPRXY,PARM='TRAP(OFF) /'
ID 00
*
KEYRING PRD2.CONFIG
KEYFILE ZVSE51
SECTYPE TLSV1
*
OPTION CLIENT
* 74.125.157.108 IS SMTP.GMAIL.COM
```



```
// EXEC BSTTMTPC,SIZE=BSTTMTPC
ID 00
OPEN 127.0.0.1 25
*
EHLO gmail.com
AUTH LOGIN jeffrey.webmail ??????????
MAIL From: <jeffrey.webmail@gmail.com>
RCPT To: <jefff@bsiopti.com>
SUBJ Subject: Test Email
ORGA Organization: Barnard Software, Inc.
*
DATA
*
QUIT
/*
This is a test email text.
See http://www.bsiopti.com

Jeff
/*
```

## BSTTATLS

- **BSTTATLS Automatic TLS facility**
- **Automatically converts any application into SSL/TLS application**
- **Transparent to application**

## ATLS types

### ATLS Types

| Source      | Destination                                                                                |
|-------------|--------------------------------------------------------------------------------------------|
| Server      | Accept SSL connection<br>Convert to clear text for local server application                |
| Client      | Accept clear text local client connection<br>Convert to SSL/TLS connection for destination |
|             |                                                                                            |
| IPv4 socket | To IPv4 socket                                                                             |
| IPv6 socket | To IPv6 socket                                                                             |

## Sample ATTLS commands

### Sample ATTLS Commands

| Command                                                                | Description                                                                                                                                 |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| OPTION CLIENT<br>ATTLS 25 TO SMTP.GOOGLE.COM AS 465 SSL                | Intercept outbound CLIENT connections made to SMTP.GOOGLE.COM on port 25, convert them to SSL connections on port 465 (Implicit-SMTPS).     |
| OPTION CLIENT<br>OPTION FTP<br>ATTLS 21 TO FTPS.BSIOPTI.COM AS 990 SSL | Intercept outbound FTP CLIENT connections made to FTPS.BSIOPTI.COM on port 21, convert them to SSL connections on port 990 (Implicit-FTPS). |
| OPTION SERVER<br>ATTLS 23 AS 992 SSL                                   | Intercept inbound SERVER connections made on SSL port 992 (Implicit-TELNETS), convert them to clear text connections on port 23.            |
| OPTION SERVER<br>ATTLS 80 AS 443 SSL                                   | Intercept inbound SERVER connections made on SSL port 443 (Implicit-HTTPS), convert them to clear text connections on port 80.              |
| OPTION SERVER<br>OPTION FTP<br>ATTLS 21 AS 990 SSL                     | Intercept inbound SERVER connections made on SSL port 990 (Implicit-FTPS), convert them to clear text connections on port 21.               |



```
// OPTION SYSPARM='00'
// SETPARM IPTRACE='NNNNNNNN'
// SETPARM LRGBUF=YES
// LIBDEF *,SEARCH=(ssllib.slib,bsilib.slib)
// EXEC BSTTWAIT,SIZE=BSTTWAIT
/*
// EXEC BSTTATLS,SIZE=BSTTATLS
ID 00
*
KEYRING PRD2.CONFIG
DNAME MYCERT
SECTYPE TLSV1
*
* Convert outbound SMTP connections to Implicit-SMTPS
* but only connections to SMTP.GOOGLE.COM
OPTION CLIENT
ATTLS 25 TO SMTP.GOOGLE.COM AS 465 SSL
*
* Convert Implicit-TELNETS connections to TELNET
OPTION SERVER
ATTLS 23 AS 992 SSL
*
* Convert Implicit-HTTPS connections for CICS TS CWI
OPTION SERVER
ATTLS 80 AS 443 SSL
*
* Convert outbound FTP connections to Implicit-FTPS
OPTION CLIENT
OPTION FTP
ATTLS 21 TO FTPS.BSIOPTI.COM AS 990 SSL
*
* Convert inbound Implicit-FTPS connections to FTP
OPTION SERVER
OPTION FTP
ATTLS 21 AS 990 SSL
/*
```

## IPv6/VSE Automatic TLS facility

- **The IPv6/VSE TCP/IP stacks run in separate partitions. The IPv4 stack (BSTTINET) runs in one partition and the IPv6 stack (BSTT6NET) runs in another. The TCP/IP stacks are then coupled together acting as a single stack. The BSTTATLS application is associated with a specific stack (BSTTINET or BSTT6NET). When running a typical dual stack configuration there will be two BSTTATLS application partitions. One for each TCP/IP stack.**
- **The reasons for this design are performance, reliability and robustness. Since the BSTTATLS application is performing SSL/TLS functionality, the overhead of this functionality is offloaded from both the TCP/IP stack and the applications BSTTATLS is servicing.**

## Difference between PRXY and ATLS

- **BSTTPRXY is single application**
- **One BSTTPRXY partition for each application**
- **BSTTATLS is multiple application**
- **One BSTTATLS partition for each stack**
- **Each run in their own partition(s)**
- **Better performance, better isolation, better management, more robust**

More information

See <http://bsitcpip.blogspot.com/>

**The BSI BLOG!**

Questions?



Thank You!

- **Jeffrey Barnard, Barnard Software, Inc.**
- **Joerg Schmidbauer, IBM**

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