IBM TRAINING

Session B37

SECURE SOCKET LAYER

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SSL

- What is SSL?
- How is the VM SSL server set up?
- Steps to make it work
- Linux specifics - start, locations, obtaining control

What is SSL?

- SSL was developed by Netscape to provide secure communications
  - Connection is trusted
    - Certificates authenticate identity
  - Connection is private
    - Cryptographic parameters established during handshake
  - Connection is reliable
    - *Message digest is sent with message*
- Standardized by RFC 2246 (Transport Layer Security - TLS)

Why is this interesting?

- SSL is important in today's marketplace
- Any server running on VM can be secure
  - Update the TCPIP profile
- Can talk with any SSL client that conforms to RFC 2246
  - Telnet clients
  - FTP clients
  - HTTPS clients
- Assistance provided for certificate management

VM TCP/IP support for SSL

- Support for SSL 3.0, TLS 1.0
- Provides security functions for any server
- Certificate database and management
- Provided as a BLACK BOX

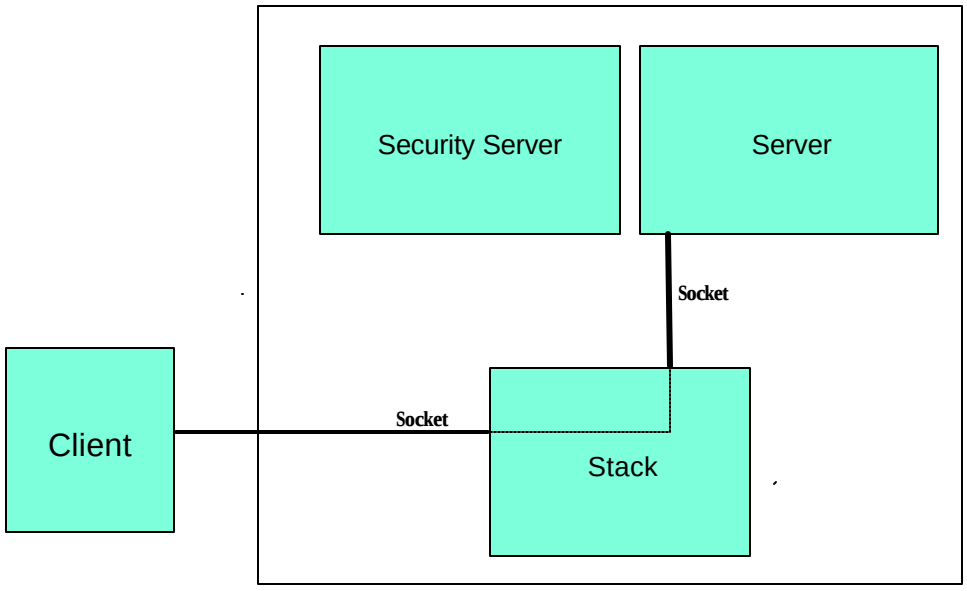
VM TCP/IP support for SSL

- Supports these encryption suites:
  - **FIPS_3DES_168_SHA"**
  - **FIPS_DES_56_SHA"**
  - **RC4_128_SHA"**
  - **RC4_128_MD5"**
  - **3DES_168_SHA"**
  - **RC2_128_MD5"**
  - **DES_EXP1024_56_SHA**
  - **RC4_EXP1024_56_SHA**
  - **RC4_40_MD5"**
  - **RC2_40_MD5"**
  - **DES_56_SHA"**
  - **NULL_SHA"**
  - **NULL_MD5"**
  - **NULL"**

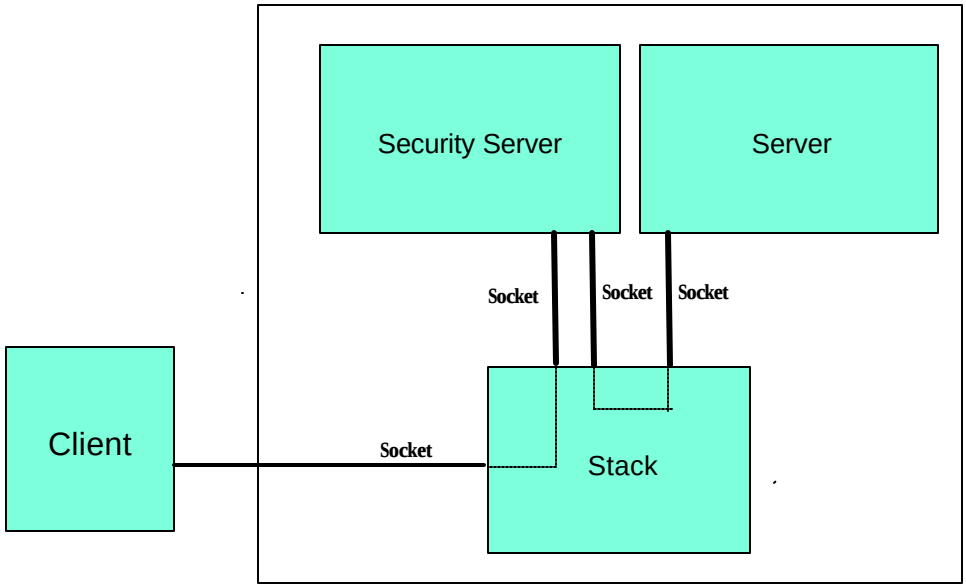
What's not supported

- SSL for VM TCP/IP clients
- Client authentication
- Hardware encryption
- Negotiated security

Client's and Server's View



Stack's View (Reality)



What Happens

- Client Stack SS Stack Server
  (1) Connect (secure port) ----->
  <---------- Accept
  Connect ---------->
  <---------- Accept

  (2) Client Hello ---------->
  <---------- Server Hello
  <---------- Certificate
  <---------- Hello Done
  Key Exchange ---------->
  Chg Cipher ---------->
  Finished ---------->
  <---------- Chg Cipher Spec
  <---------- Finished

What Happens

- Client Stack SS Stack Server

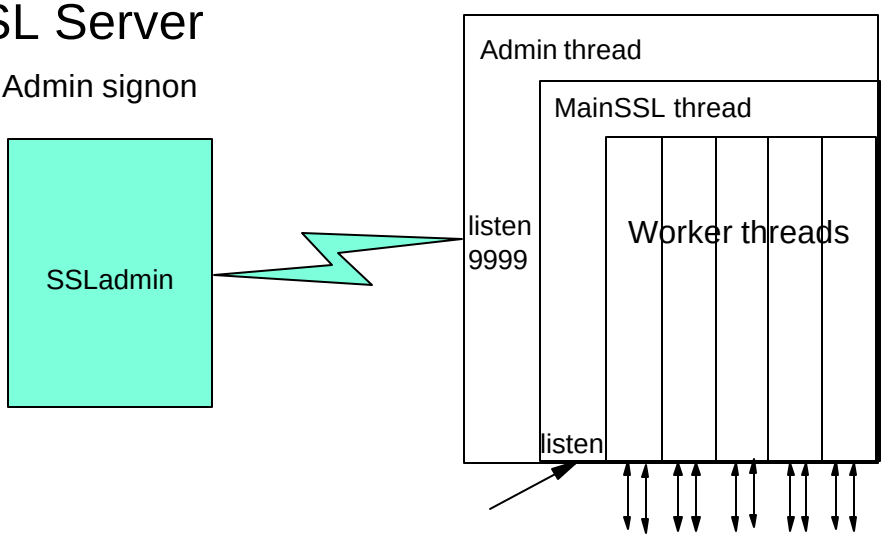
  (3) Send ------ encrypted data ------>
  Send -- decrypted data -->
  <---- unencrypted data --- Send
  <----- encrypted data ---- Send

  (4) Close ---------->
  Close ---------->
  <---------- Close
  <---------- Close

How the Server works

- SSL Server

  Admin signon



How the Server works

- Stack
  - Recognizes that a connection is destined for a secure port
  - Redirects the connection to the Security Server sending:
    - Address of the real server
    - Certificate label to use for authentication
    - Connection number
  - Maintains the illusion

How the Server works

- Security Server
  - Administration thread
    - Listens on a port for commands
      - Server administration
      - Certificate management
    - Commands issued from a CMS virtual machine
    - Only accepts connections from users in the obey list
  - Main SSL thread
    - Obtains a socket
    - Waits for connections
    - Passes connections to a worker thread for handling

How the Server works

- Security Server
  - *Worker thread*
    - Connects to the real server
    - Conducts the handshake with the client:
      - Check for resuming session
      - Sends server certificate for authentication
      - Agrees on protocol version
      - Selects cryptographic algorithms
      - Uses asymmetric encryption to generate shared secrets
      - Generates symmetric keys from shared secrets
    - Decrypts data sent from the client to the real server
    - Encrypts data sent from the real server to the client

How the Server works

- Cache
  - Maintains information from a previous handshake
  - Choices:
    - How many can be saved? (0-4095)
    - How many hours can they kept? (0-24)
- Maxusers
  - Determines how many Worker Threads are set up
- Exempt
  - Cipher Suites that are not to be used
- FIPS - Federal Information Processing Standards
  - Places SSL into FIPS mode

How the Server works

- Trace
  - Set with Initially with DTCPARMS or with SSLadmin.
  - Options:
    - **notrace** - just messages
    - **trace normal** - one message per connection
    - **trace connections nodata** - connection detail
    - **trace connections data** - ... plus every data movement
    - **trace flow** - enter and exit routines with values
    - **trace vmsock** - trace the Linux / VM Stack interface
  - To limit output:
    - ip ip:port :port
    - connection number from *netstat connect*
    - admin and main SSL threads always traced
  - ***And... the Server runs on LINUX***

Why Linux?

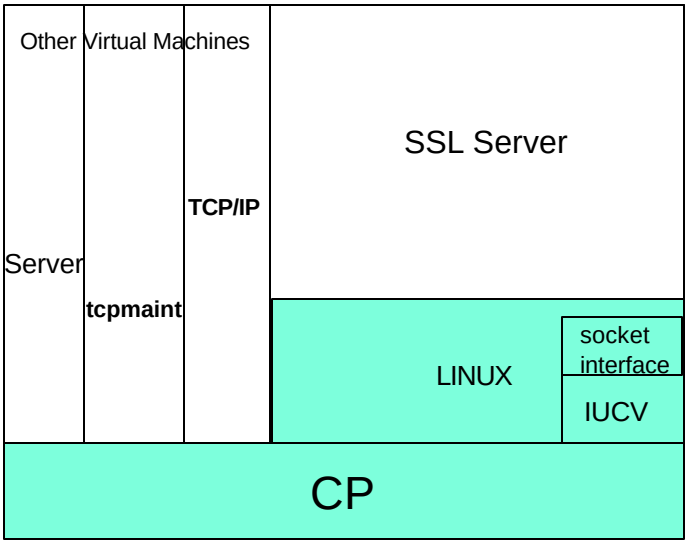
- Made decision to use an IBM-written SSL toolkit:
  - Quicker to marketplace
  - More functionality
  - Better maintainability
  - Easier to enhance
- SSL toolkit written in C++
- Linux provided the capability needed

What Linux?

- **SuSE**
  - SLES 8 31 bit
  - SLES 9 31 bit
  - SLES 9 64 bit
- **Red Hat Enterprise**
  - AS3 31 bit
  - AS3 64 bit
  - AS4 31 bit
  - AS4 64 bit

How it is Set Up on LINUX

- VM



Server on Linux

- Security server looks like any other VM TCP/IP server
  - Does not use the IP stack on Linux
  - Communicates with the VM IP stack using IUCV
  - Installation updates DTCPARMS for the server
  - CMS command interface to communicate with the server
- Enhancements to Linux
  - Specific socket interface layer
  - Specific IUCV device driver
- Proof that Linux can complement VM

How to Set Up the SSL Server

- Install a LINUX
  - IBM GSKit RPM Package (31 bit or 64 bit)
  - SSL RPM Package
- Stack updates
- Start SSL Server
- Certificate Database updates
- Designate Secure Ports (Use OBEYFILE)
- Dynamic Operation

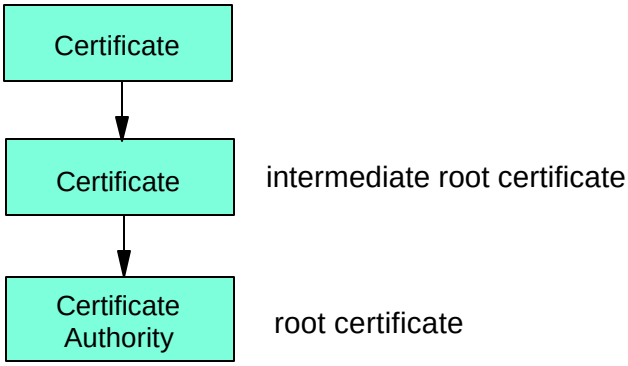
How to Set Up the SSL Server

- Stack updates
  - **PROFILE TCPIP**
    - AUTOLOG SSLSERV 0
    - PORT 9999 TCP SSLSERV
  - **DTCPARMS**
    - MAXUSERS
    - CACHESIZE
    - CACHELIFE
    - EXEMPT ...
    - NOTRACE/TRACE
  - **ETC Services**
    - SSLADMIN 9999/tcp

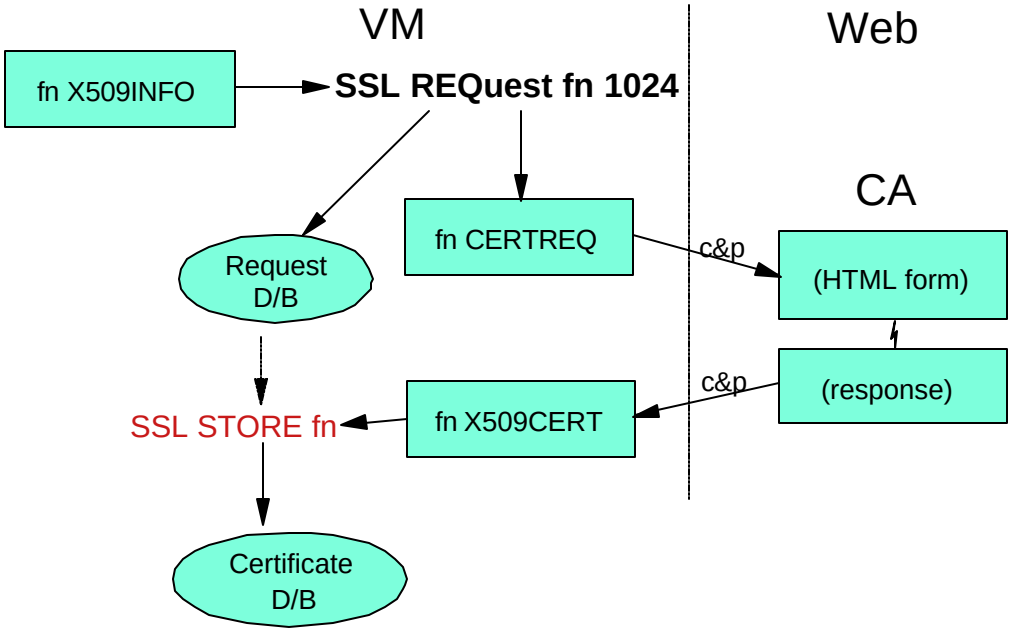
How to Set Up the SSL Server

- Start the Server
  - **Autolog by Stack**
    - Logon SSLSERV
      - DTCPARMS is read
      - VMSSL exec runs
      - admin port is found
      - stack userid is determined
      - funny disk is updated
      - LINUX is IPLed
        - starts VMSSL

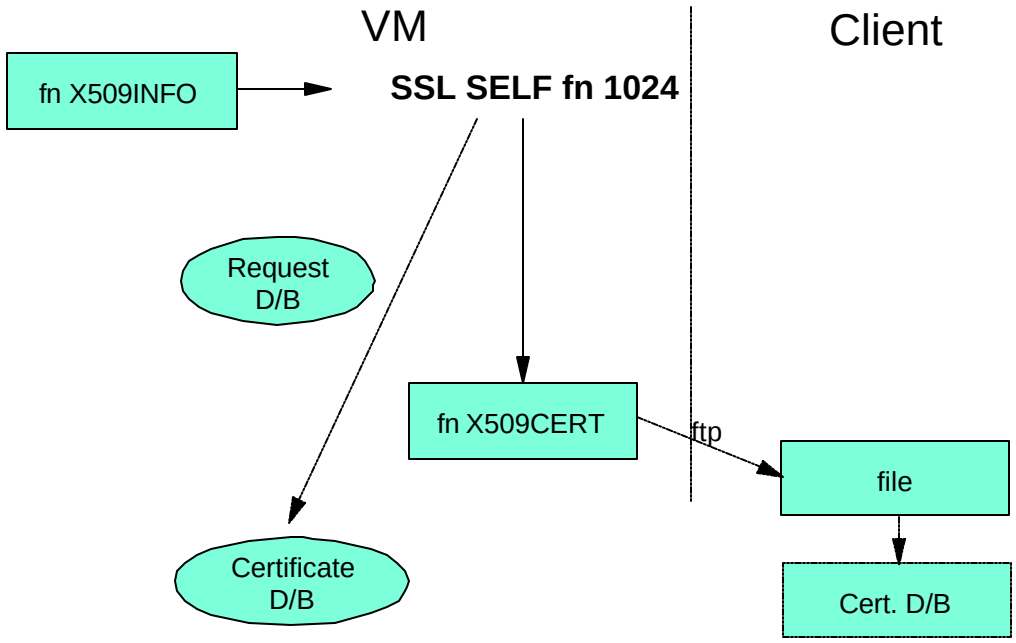
How Certificates work



How to set up Certificates



How to set up Self Signed Certificates



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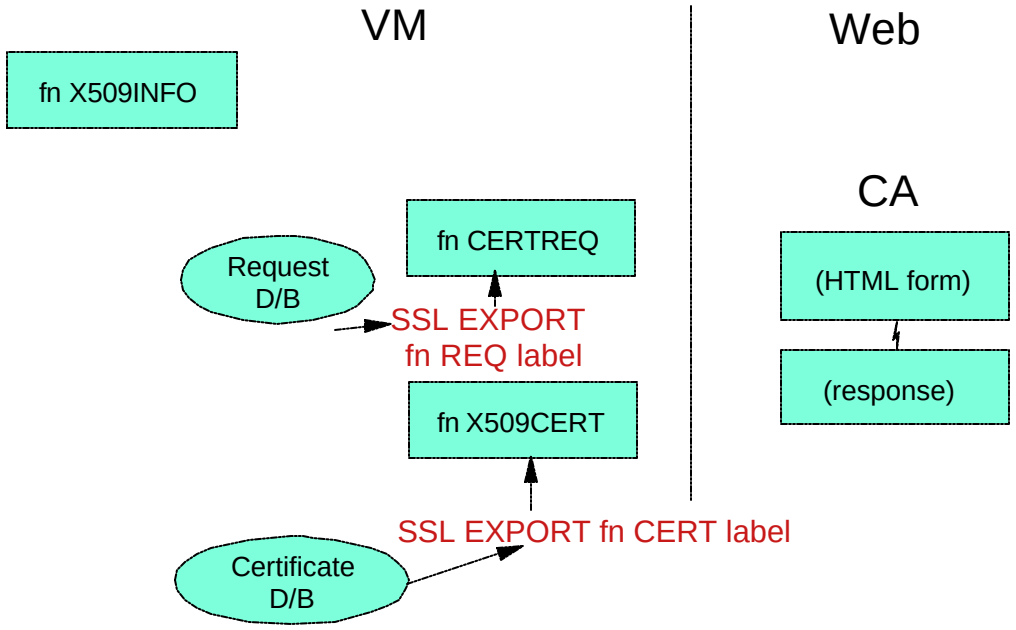
How to Get Certificates Again



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Other SSLadmin Database Commands

- SSLadmin
  - What is there?
    - QUERY REQUEST *
    - QUERY CERTIFICATE *
  - Clean up
    - DELETE REQ label
    - DELETE CERT label
    - REGENERATE - use a new internal password
    - REMOVE - removes certificate database Dangerous!!

How to Set Up the SSL Server

- Re-start the Server
  - **SSLadmin STOP (from tcpmaint)**
    - shutdown LINUX
    - Virtual machine left in CP READ
  - **IPL CMS (from sslserv)**
    - same as: *Start the Server*
  - **Autolog by Stack**

Designate Secure Ports

- TCP/IP profile changes
  - Secure keyword on Port statement
  - Certificate label
    - i.e. PORT 23 SECURE label
- Issue OBEYFILE command or
- restart stack

Dynamic Operation

- SSLadmin - Other Updates
  - QUERY STATUS
  - QUERY CACHE
  - QUERY SESSIONS
  - NOTRACE
  - TRACE NORMAL
  - TRACE CONNECTIONS (data/nodata) (ip:port)
  - TRACE FLOW
  - LOG

Dynamic Operation

- Stack
  - **Netstat changes**
    - For secure connections - Identification of the two connections forming a secure session
  - **To trace stack activity**
    - New process name, SSL

Normal Start

- dtcparms - /opt/vmssl/parms/dtcparms
- startup script - /opt/vmssl/bin/vmsslds s
  - /etc/init.d/vmssld - link to script
- start up dir on SuSE - /etc/rc.d/rc5.d
  - start up - S95vmssl
  - shutdown - K05vmssl
- changing automatic startup.
  - cd /opt/vmssl/bin/
  - modsymlinks -m - to set up vmssl
  - modsymlinks -r - to use Linux stack
  - rm /etc/init.d/vmssl.symlinkdata

Where do I find it in Linux?

- vmssl
  - code - /opt/vmssl/bin
  - No source is provided
- vmsock
  - code - /opt/vmssl/lib
  - source
    - /usr/src/linux/drivers/s390/net/vmsock.c
    - /usr/src/linux/drivers/s390/net/vmsock.h
- log - /var/log/vmssl/vmssl.log
  - alt log: - /var/spool/ssllog

Getting Control

- To Linux:
  - ssladmin stop - stops the vmssl machine.
  - cd /opt/vmssl/bin/
  - rm /etc/init.d/vmssl.symlinkdata
  - ./modsymlinks -r
  - halt
  - #cp i cms (enter twice, sign on as root)
- To VMSSL:
  - cd /opt/vmssl/bin/
  - ./modsymlinks -m
  - halt
  - #cp i cms (enter twice)

Summary

- SSL support for any server on VM
  - No change to the server
  - Easy to configure
  - Connections with SSL-enabled clients
- Certificate database
  - Consolidate certificates and keys in one location
  - Share certificates and keys
  - Obey list authorization
  - CMS command interface for management

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