IBM

E48

VSE Security Concepts

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September 19 - 23, 2005

San Francisco, CA

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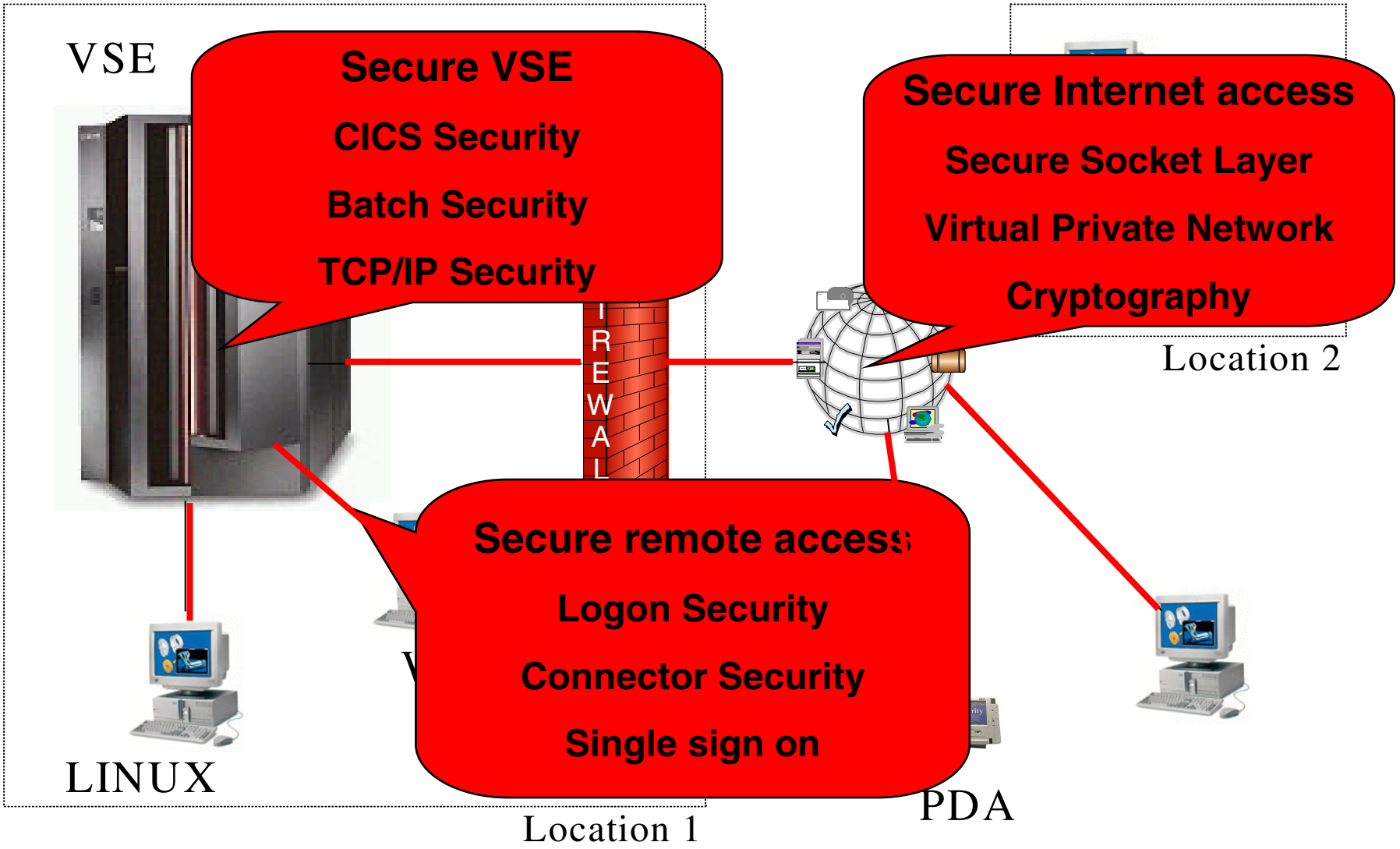
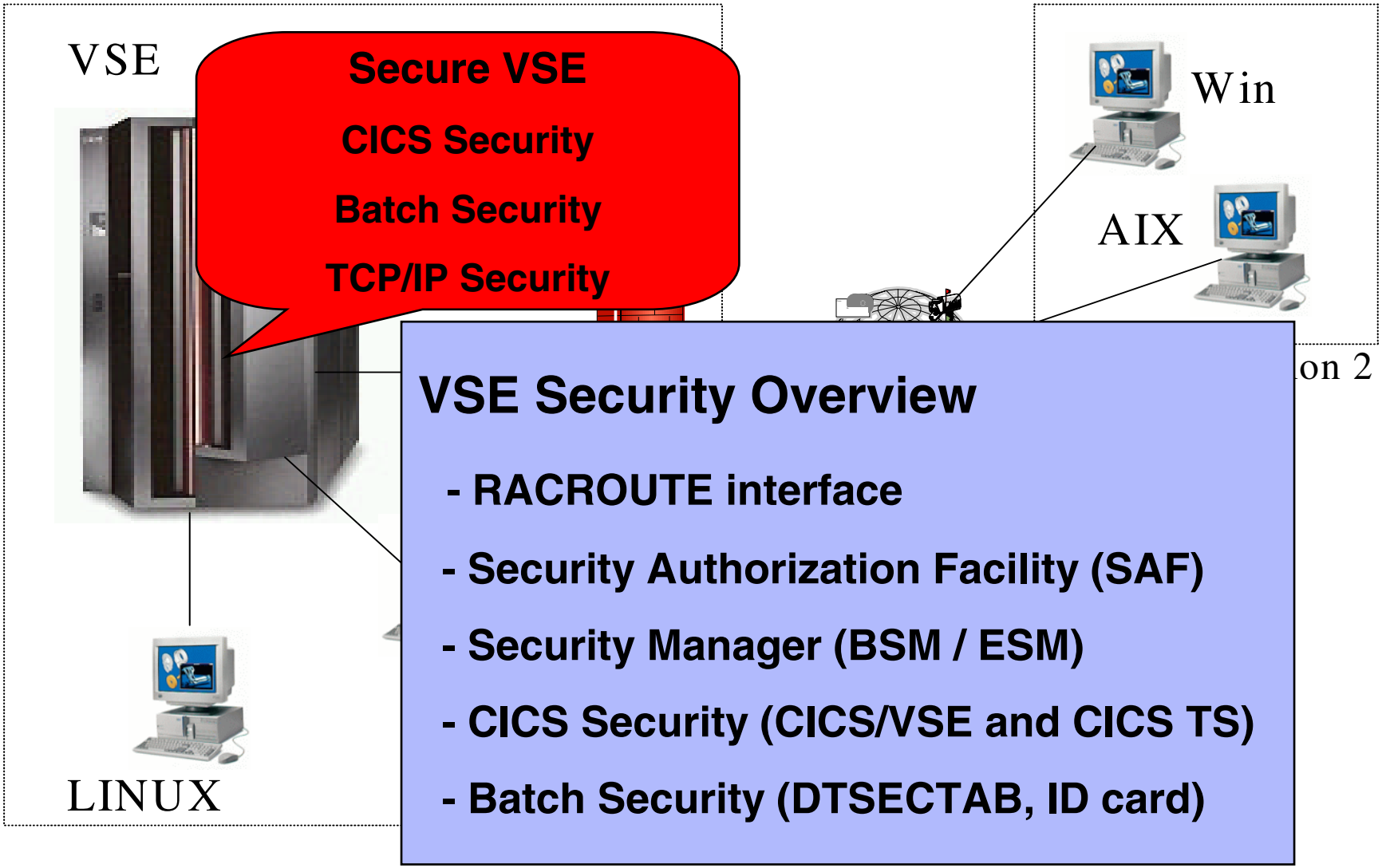
Security in a heterogeneous environment



Security in a heterogeneous environment

- **Security is very important**
  - Restrict access to systems
  - Keep secrets
  - Prove identity of users
  - Prevent data modification
- **Security can be very complex**
  - In an heterogeneous environment
  - A lot of different servers and technologies
- **You must know what you are doing !**
  - Incomplete security setup can be more dangerous
  - than NO security

Security in a heterogeneous environment



Why secure VSE ?

- **Prevent unauthorized access to VSE and data**
  - Keep secret data secret
  - Data modification by unauthorized users
- **Prevent users from damaging the VSE system (maybe by accident)**
  - Deletion of members or entries
  - Submission of jobs

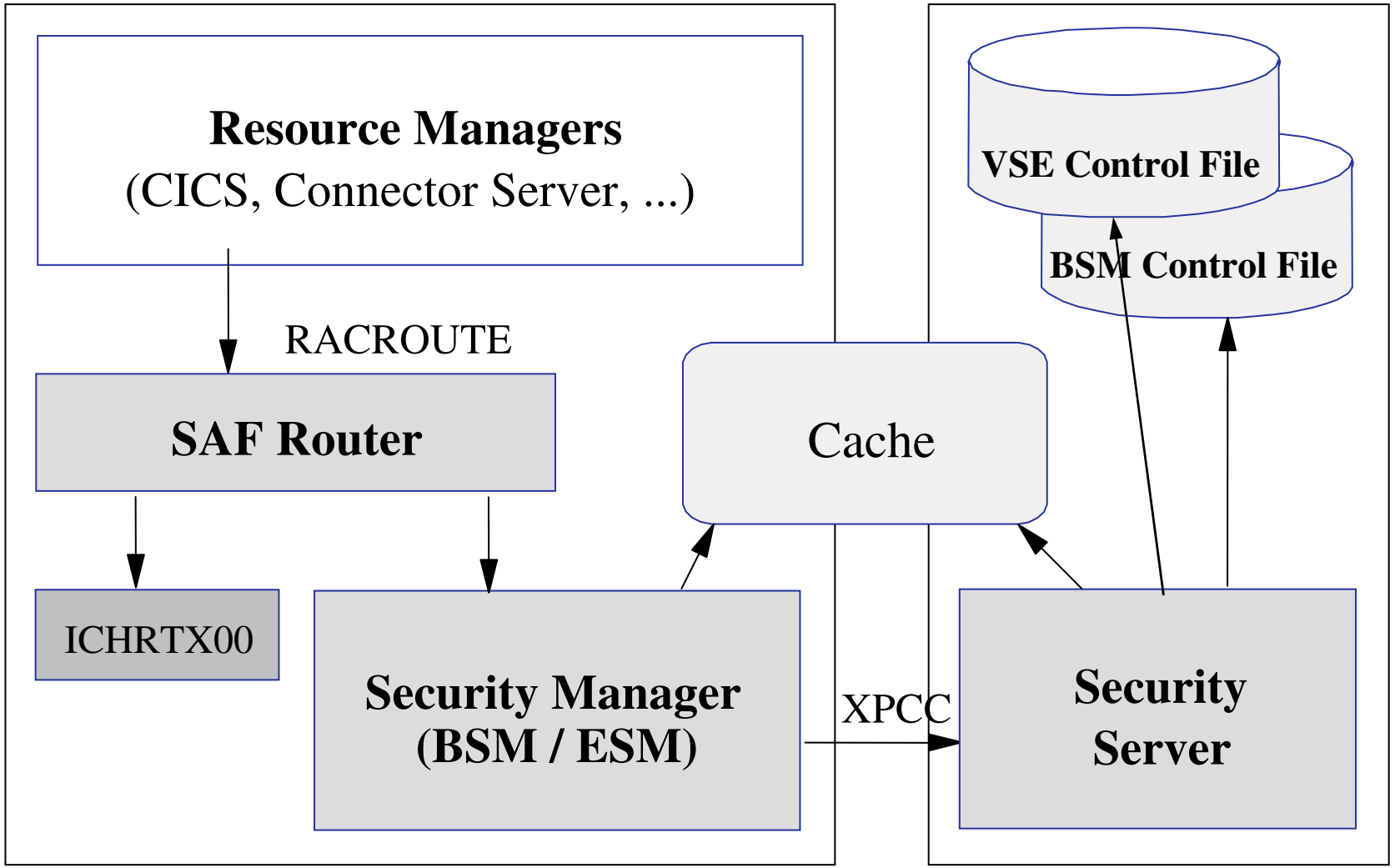
VSE Security Overview

- **VSE/ESA 2.3 (or below)**
  - SECHECK macro (DTSECTAB)
  - CICS/VSE internal security
- **VSE/ESA 2.4-2.7, z/VSE 3.1**
  - RACROUTE calls
  - Security Server (BSM/ESM)
  - Security decisions delegated to Security Manager
  - Architectured interface (RACROUTE)
- **New: BSM enhancements**
  - User Groups
  - Description field for all profiles
  - BSM Resource Profiles
  - New resource classes

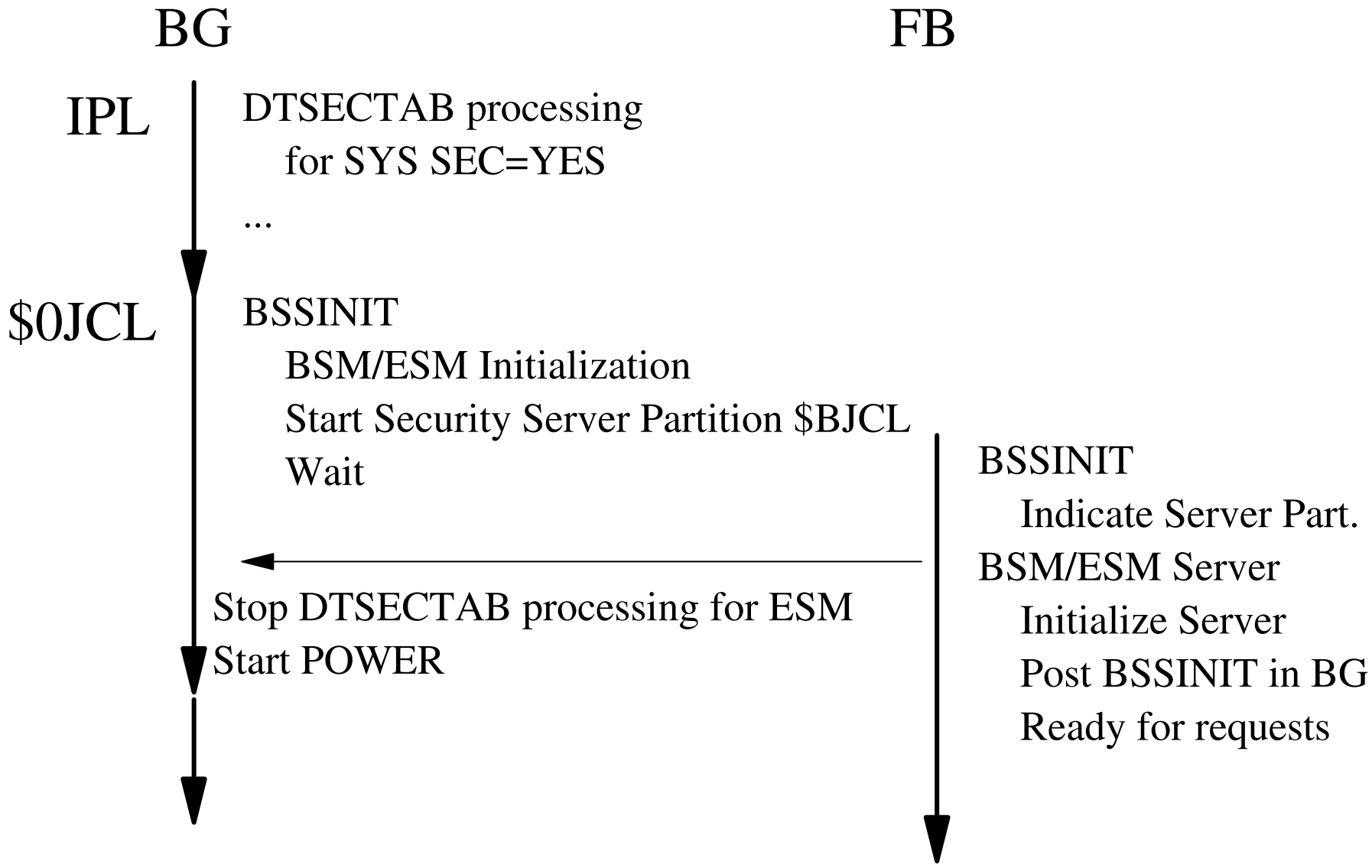
RACROUTE

- **Architectured interface**
- **External interface to the Security Authorization Facility (SAF)**
- **To be used by Resource Managers and Subsystems**
  - CICS TS
  - VSE Connector Server
  - DITTO/ESA for VSE
  - TCP/IP Security Exit
  - Interactive Interface Signon

Security Authorization Facility (SAF)



Common Security Startup



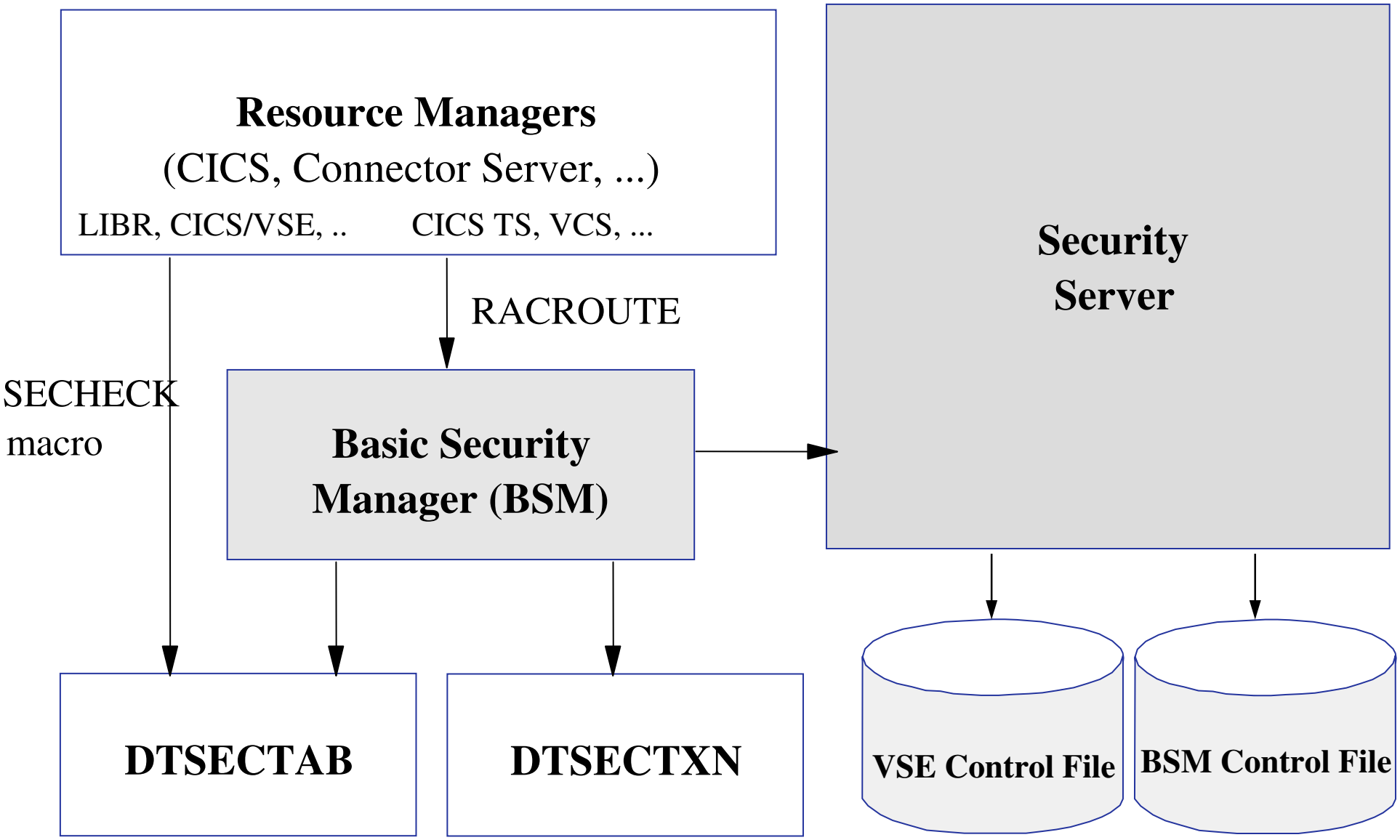
Common Security Startup (continued)

- **Security manager (BSSINIT) has to initialize before other partition or POWER are active**
- **BSSINIT will fail, if there are other partition active**
- **Static partition required for Security Server**
- **SYS ESM=phasename in IPL proc to start ESM**
- **If no ESM is started, BSM is activated**
- **For SYS SEC=YES with ESM a DTSECTAB protection is active until ESM is initialized**

Security Managers

- **Basic Security Manager (BSM)**
  - Part of VSE Central Functions
  - Sign on Security
  - Transaction Security
  - Resource Security
- **External Security Manager (ESM)**
  - CA-Top Secret
  - BIM Alert
  - Vendor

Basic Security Manager



Basic Security Manager (continued)

- **Provides RACROUTE support for**
  - Sign on (CICS and VSE Connector Server)
  - Batch sign on (ID statement)
  - Transaction security
- **Supports also the SVC-based security calls**
  - SECHECK
- **Resource classes**
  - USER
  - DATASET
  - VSELIB, VSESLIB, VSEMEM
  - TCICSTRN
  - New: MCICSPPT, FCICSFCT, JCICSJCT, SCICSTST, DCICISDCT, ACICSPCT, APPL, FACILITY

Basic Security Manager – Enhancements

- New BSM repository
  - BSM Control File (VSAM file)
  - Maintains a copy in data space for performance reasons
  - Replaces DTSECTXN
- Description field for all profiles (20 characters)
- User Groups
  - Replaces the security classes concept for CICS
- BSM Resource Profiles
  - New resource classes
- Password rules can be changed by command
  - Replaces IESRCVT
- New admin functions
  - BSTADMIN (console or batch)
  - Interactive Interface Dialogs

Basic Security Manager – Enhancements (2)

- New resource classes
  - TCICSTRN - Transactions (not new)
  - MCICSPPT - Application programs
  - FCICSFCT - Files
  - JCICSJCT - Journals
  - SCICSTST - Temporary storage queues
  - DCICISDCT - Transient data queues
  - ACICSPCT - Transactions (CICS START)
  - APPL - Applications
  - FACILITY - Miscellaneous resources

Basic Security Manager - Repositories

- **VSE Control File (IESCNTL)**
  - VSAM KSDS file
  - Contains all user profiles
  - used for CICS, Batch and Connector Sign on
- **DTSECTAB**
  - Contains resources like files, libraries, sub libraries and members
  - Only 2 user ids are still needed in DTSECTAB
  - (FORSEC, DUMMY)
- **DTSECTXN (replaced by BSM Control File)**
  - Transaction security profiles
  - Dialog (28) to define the profiles
- **New: BSM Control File**
  - Resource Profiles
  - Password rules
  - User groups

Basic Security Manager - Recovery

- **If an active Security Manager does not allow to recover from a problem**
  - IPL cuu LOADPARM ..P
  - STOP=DPD
  - 0 SYS SEC=RECOVER
  - BSSINIT will not start a Security Manager
  - Re-IPL required to start Security Manager again

Basic Security Manager - User Profiles

- **VSE Control File (IESCNTL)**
  - All Users must be defined here (SNT no longer supported by CICS TS)
  - VSE/ESA 2.4 (or above) Control File records are NOT compatible with previous releases
  - New: description field
  - Definition
    - User Maintenance Dialog (211)
    - Batch utility IESUPDCF
- **DTSECTAB**
  - Contains 2 user ids for ASI procedure
  - No CICS TS user settings

Basic Security Manager - User Groups (new)

- **BSM Control File**
  - User Groups are stored in BSM Control File
  - User IDs can be added (connected) into a group
  - Replaces the security classes for CICS resources
  - Definition
    - Security Maintenance Dialogs (282)
    - Batch utility BSTADMIN

Password rules – VSE/ESA 2.7

- **Password rules can be changed**
  - include the following in USERBG

```
// EXEC IESIRCVT
 PASSWORD(LENGTH(5))
 PASSWORD(WARNING(3))
 PASSWORD(REVOKE(4))
/*
```

  - LENGTH: minimum password length of password
  - WARNING: number of days a warning is displayed before password is expired
  - REVOKE: number of unsuccessful sign-on attempts before user id is revoked
- **The password-revoke specification via IESIRCVT "wins" against a specification via IESELOGO**

Password rules – with new BSM enhancements

- **Password rules can be changed**
  - Use BSTADMIN

```
PERFORM PASSWORD HISTORY|NOHISTORY
                 LENGTH(5)
                 REVOKE(4)
                 WARNING(3)
```

  - HISTORY: a password history is maintained
  - LENGTH: minimum password length of password
  - WARNING: number of days a warning is displayed before password is expired
  - REVOKE: number of unsuccessful sign-on attempts before user id is revoked
- **Do not use IESRCVT anymore !**

CICS Security

- **CICS/VSE uses SNT for user verification**
  - Duplicate user definitions
  - SNT users can not change password
- **CICS TS uses RACROUTE calls for**
  - Sign on
  - Resource Security (new)
  - Transaction Security

CICS TS Sign on

- **Native CICS TS sign on (CESN)**
- **VSE/Interactive Interface sign on (IEGM)**
- **Private sign on programs based on CICS SIGNON**
- **Sign on characteristics**
  - Inherit user identification and password verification by Security Manager
  - CICS TS and Interactive Interface extracts subsystem specific user settings
    - CICS: Operator ID, Operator classes, ...
    - II: User type, Initial panel, access flags, ...
  - No user definitions to subsystems necessary

CICS TS Resource Security (new)

- **All CICS TS resources can be protected now**
  - Protection via Resource Classes and Resource Profiles, held in VSE.BSTCNTL.FILE
  - One class allowed per resource type (e.g. FCT)
  - Transactions – as in previous releases
  - Programs, Files, Journals, Temporary storage, Transient data, Start Transactions, VTAM Applications, miscellaneous resources
- **This is similar to Resource Level Checking under CICS/VSE**
  - RSLC=YES defined within a transaction
  - RSLKEY defined for
  - Users being allowed to access protected resources
  - Resources for being allowed to be accessed

CICS TS Resource Security (new)

- Resource security definitions under CICS TS
  - **DFHSIT**
    - SEC=YES — Enables security
    - XTRAN=YES — Resource Class TCICSTRN
    - XDCT=YES — Resource Class DCICSDCT
    - XFCT=YES — Resource Class TCICSTRN
    - XJCT=YES — Resource Class TCICSTRN
    - XPCT=YES — Resource Class TCICSTRN
    - XPPT=YES — Resource Class TCICSTRN
    - XTST=YES — Resource Class TCICSTRN

CICS TS Resource Security (new)

- Resource security definitions under CICS TS….
  - **Definition within single resource definition (e.g. file FILEA and FILEB)**
    - Within DEFINE FILE: RESSEC(YES)
    - With BSTADMIN Resource Profiles for Resource Class FCICSFCT:
      - ADD FCICSFCT FILEA UACC(NONE) (resource = FILEA)
      - ADD FCICSFCT FILEA UACC(NONE) (resource = FILEB)
      - PERMIT FCICSFCT FILEA(GROUP1) ACCESS(UPDATE)
      - PERMIT FCICSFCT FILEB(GROUP1) ACCESS(READ)

CICS TS Resource Security (new)

- Enhancement for Report Controller Facility (RCF) to browse reports
  - **Access protection under CICS/VSE**
    - RSLKEY for program DFHPSBRS – just 1 level of protection
    - All users with that RSLKEY can access all reports
  - **Access protection under CICS TS**
    - RSL concept retained for compatibility reasons
    - Profiles DFHRCF.BRSL01 – DFHRCF.BRSL24
    - Now there are 24 levels of protection
  - **Definition for RCF protection**
    - ADD FACILITY DFHRCF.RSLnn UACC(NONE)
    - PERMIT FACILITY DFHRCF.RSLnn ID(usergroup1) ACCESS(READ)

CICS Security - Prefixing

- **CICS Prefixing can be used to differentiate between two or more CICS TS running on the same VSE system**
- **CICS Prefix is identical with the user id of the CICS startup job**
  - SECPRFX=YES in SIT
  - SYS SEC=YES: user id in * $$ JOB or ID statement is used
  - SYS SEC=NO: user id in ID statement is used
  - When no user id is given: FORSEC is used

CICS Security - DTSECTXN Macro

- **Macro to support CICS transaction profiles**
  - Replaced by new BSM Control File
    - Can still b used for compatibility
  - CICS-region = user id in CICS startup job
  - transid = up to 4 characters
  - class = 1-64
  - 1 = public transactions
  - 64 = interactive interface transactions

```
DTSECTXN NAME={CICS-region.}transid,
         TRANSEC=(class)
         [,SUBTYPE={INITIAL | FINAL}]
         [,TYPE=GENERIC]
```

Migrating to the new BSM Resource Profiles

- **DTSECTXN no longer used**
  - Use the new BSM Control File to protect CICS resources
- **Migration steps:**
  - Create group profiles from existing User-IDs
    - User Maintenance Dialog 211 – press PF6
  - Migrate DTSECTXN definitions
    - Use Migrate Security Entries Dialog 285
    - Creates a group for each security class (e.g. GROUP01)
- **Detailed description:**
  - See Administration Guide

Administrating new BSM resources

- **BSTADMIN provides command to administer the new BSM profiles**
  - From the console in a PAUSE job
  - In a batch job
- **Commands**
  - ADD, CHANGE, DELETE
  - ADDGROUP, CHNGROUP, DELGROUP
  - CONNECT, REMOVE
  - LIST, LISTG, LISTU
  - PERFORM
  - STATUS
- **Security Maintenance Dialogs - 282**

CICS Security - Coexistence

- **Exit program for CICS/VSE to do user verification against BSM user profiles**
- **DFHXSE and DFHXSSCO in PRD1.BASE**
  - Requires RACROUTE macro from GENLIB
- **Requires default user entry in SNT**
- **Activate ESM in CICS/VSE**
  - EXTSEC=YES in SIT

CICS Security – Migration from CICS/VSE

- **Security related resource to be migrated**
  - Interactive Interface user profiles from an old VSE control file
  - ICCF user records in DTSFILE
  - CICS user profiles from a CICS/VSE sign on table (SNT)
  - Transaction definitions from CICS/VSE PCT
  - For Batch security users: DTSECTAB
  - VSE migration utility IESBLDUP
  - migrate user profiles
- **see VSE System Utilities manual**

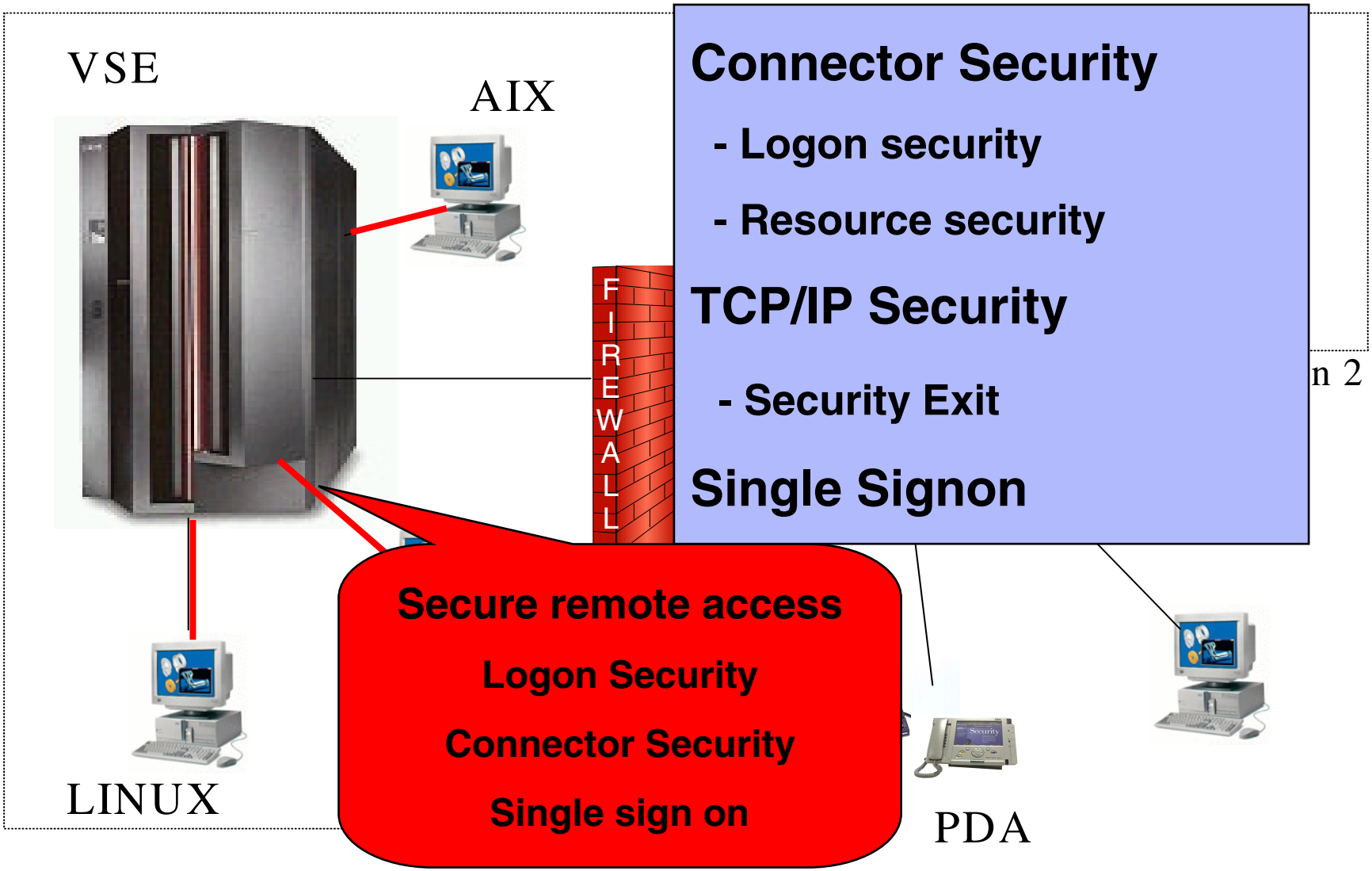
Batch Security

- **ID statement or * $$ JOB specifies user id and password for a job**
- **User id and password are verified against**
  - DTSECTAB
  - Security Manager (RACROUTE)
- **Subsystems (LIBR, VSAM, ...) uses this user id to verify access rights against DTSECTAB**

Security Checklist for VSE

- **SYS SEC=YES/NO**
  - YES if batch security is required
- **CICS SIT SEC=YES (!)**
  - If NO, all users can logon without a password
- **Change passwords for predefined users**
  - POST, PROG, OPER, SYSA, ...

Security in a heterogeneous environment



Why secure remote access ?

- **Today most computers are part of a network**
  - Can connect to your VSE system
- **Prevent unauthorized access to VSE and data**
  - Requires to authenticate the user (logon)
- **FTP allows to access production data**
  - VSAM
  - POWER entries (listings)

Connector Security

- **VSE Connector Server acts as a Resource Manager**
  - Issues RACROUTE calls for
    - User id and password verification
    - Resource security
- **Connector user ids are the same as for CICS TS and Batch**
- **No additional user profile setup required**
- **But:**
  - Additional access restriction by user id and/or IP address possible

Connector Security - Logon

- **VSE Connector Server requires a client to logon with valid user id and password**
- **User id and password is checked via RACROUTE calls**
- **Additional information is extracted from ACEE and IUI or AF segment**
  - User type, access flags, ...
- **The user's ACEE is kept during the whole session**
- **Used to do resource access checking**
- **Multiple logon attempts with same userid is possible**

Connector Security - Resource Security

- **When a client issues a resource access request**
  - The server does RACROUTE calls to check if the user is allowed to access the resource
  - Access is done only if user is allowed to access the resource
- **VSE Connector Server runs under a special userid (VCSRV)**
  - specified in ID statement in startup job
  - should be allowed to access all resources

Connector Security - Internals

- **Logon processing**
  - RACROUTE VERIFY CREATE
  - RACROUTE EXTRACT (user type checking)
    - AF segment, if this fails (e.g. CA-TopSecret)
  - IUI segment
  - Flags used in AF segment
    - AFADMIN — user is a administrator = type 1
    - AFMCONS — user is allowed to open a console
  - Flags used in IUI segment
    - IESISUTP — user type (1,2 or 3)
    - IESISFL1 — user flag byte 1
    - IESISFL2 — user flag byte 2

Connector Security - User types

- **Type 1 (Administrator)**
  - read and write access for all resources
- **Type 2 (Programmer)**
  - read only access for all resources
  - allowed to submit jobs
- **Type 3 (Application User)**
  - read only access for selected resources

Connector Security - Resource classes

- **The following Resource class are used**
  - VSELIB, VSESLIB, VSEMEM (LIBR)
  - DATASET (VSAM)
- **Resource not protected by Security Manager**
  - POWER queue entries
    - protected by user type and access flag
  - Console
    - protected by user type and access flag
    - If user is allowed to access the console, he can issue all console commands, even REIPL NOPROMPT (!)
  - ICCF Libraries and Members
  - VSAM Record Mappings

Connector Security - Additional Security

- **Configuration member allows to restrict logon (connect) by**
  - User id
  - IP address
- **See skeleton SKVCSUSR in ICCF library 59**

```
* ************************************************************
* USERS FROM THIS IP'S ARE ALLOWED TO LOGON
* ************************************************************
IP   = *,              LOGON = ALLOWED
* IP = 9.164.123.456, LOGON = DENIED
* IP = 9.165.*       , LOGON = DENIED
* IP = 10.0.0.*      , LOGON = ALLOWED
* ************************************************************
* THIS USERS ARE ALLOWED TO LOGON
* ************************************************************
USER = *,              LOGON = ALLOWED
* USER = BOBY,         LOGON = ALLOWED
* USER = SYS*,         LOGON = DENIED
```

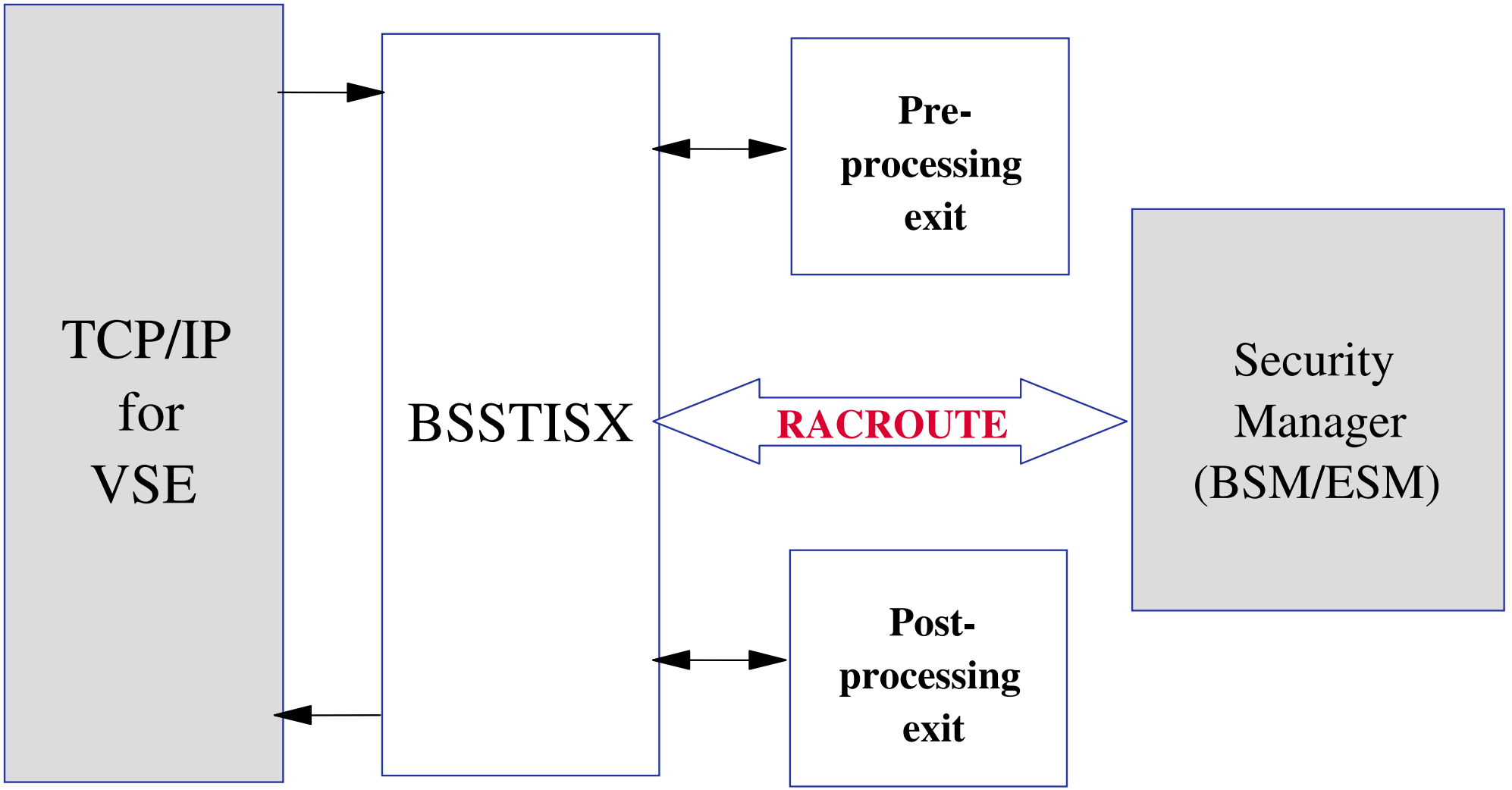
Deactivation of Connector Security

- **Since PTF UQ66736 (VSE/ESA 2.6), UQ66733 (VSE/ESA 2.5) Connector Security can be deactivated**
  - New keyword SECURITY in main configuration member:
    - SECURITY = FULL (default, as before)
    - SECURITY = RESOURCE (no user type checking)
    - SECURITY = LOGON (no resource, only logon)
    - SECURITY = NO (no security at all)
  - Access restriction (previous foil) is still active, even if SECURITY = NO

TCP/IP Security

- **In general TCP/IP uses its own user id definitions**
  - DEFINE USER,ID=user,PASSWORD=pwd
  - Readable in initialization member (IPINITxx.L)
  - Duplicate user definitions
  - Used for
    - FTP
- **Security Exit available from IBM to check the user ids and resource access via Security Manager**
  - see next foil

TCP/IP Security Exit



TCP/IP Security Exit

- **Issues RACROUTE calls for**
  - User identification and verification
  - Resource access control
    - VSE files, libraries, members
    - POWER entries
    - SITE commands
- **Provides a pre- and post-processing exit interface**
  - Activation
    - DEFINE SECURITY,DRIVER=BSSTISX[,DATA=data]
      - DATA=anonym_uid,anonym_pwd,preproc,postproc, mode
  - SET SECURITY=ON
- **For details see VSE/ESA Software Newsletter #20 (First/Second Quarter, 2000)**

TCP/IP Security - HTTPHACK.L

- **Typical hacker attacks are normally no problem for VSE, only for Windows**
- **Rejects hacker attacks**
  - by filtering known URL prefixes
- **HTTPHACK.L:**

```
* Example:
*
* "SCRIPTS/" will cover...
*       GET /SCRIPTS/ROOT.EXE?C+D
*       GET /SCRIPTS/ROOT.EXE?CAT+PASSWD
*       etc...
* ================================================
SCRIPTS/
MSADC/
_VTI_BIN/
_MEM_BIN/
C/WINNT/SYSTEM32/CMD.EXE
D/WINNT/SYSTEM32/CMD.EXE
CGI-BIN/
```

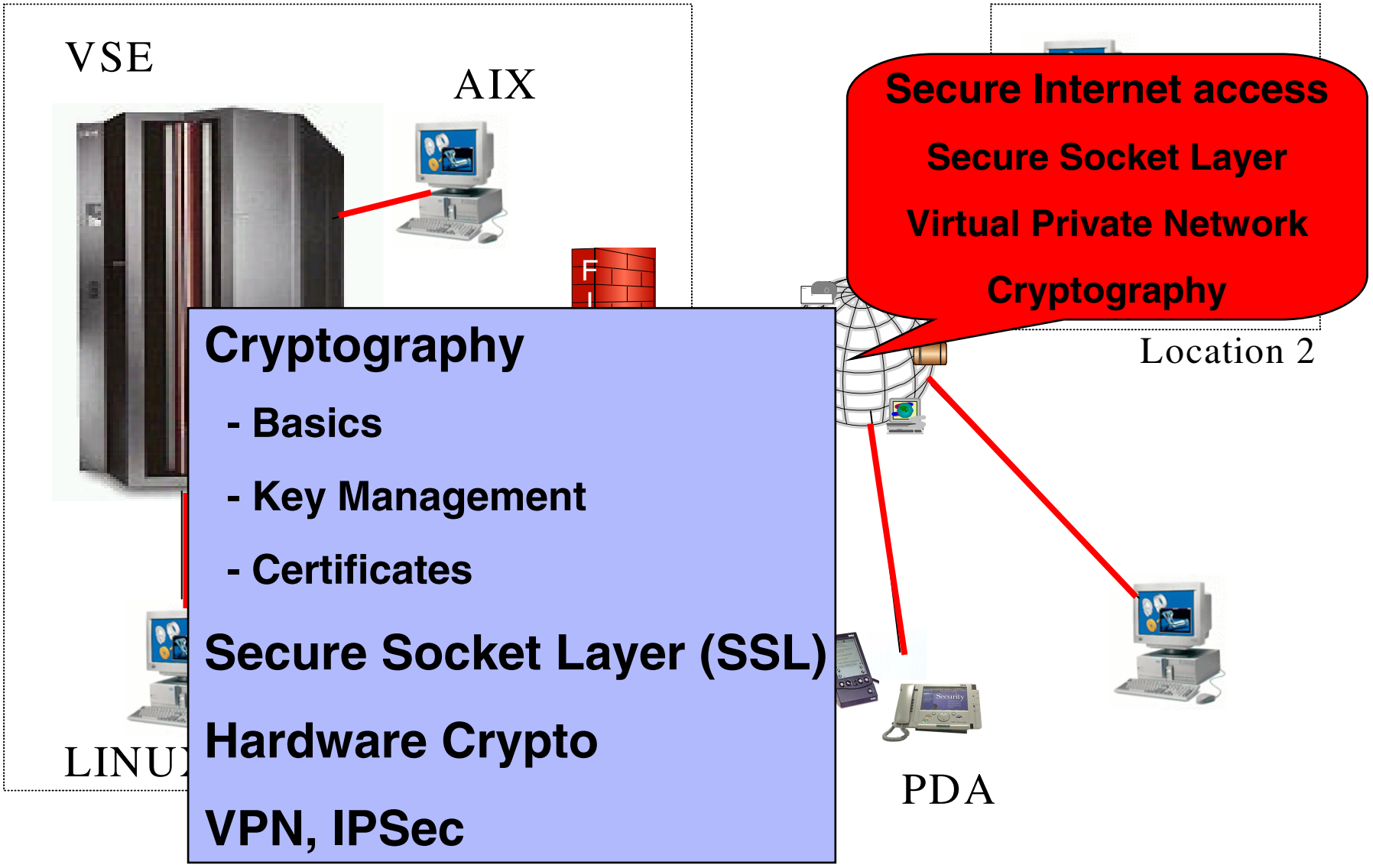
Single Sign on Solutions

- **Every server/application requires you to logon**
  - Different user ids and passwords for each server
- **A single sign on solution**
  - Requires a user to sign on only once
    - one user id, one password
  - Stores sign on information for several servers or applications
  - Automatically performs a sign on on each server or application
  - Using the stored sign on information
- **Example: LDAP**

Security Checklist for TCP/IP

- **Connector Security**
  - Set SECURITY=FULL (SKVCSCFG)
  - Define resource access rights (BSM/ESM)
  - Restrict remote access to specific users and IPs (SKVCSUSR)
- **TCP/IP Security**
  - SET SECURITY=ON in IPINIT member
  - Use Security Exit
  - Do not define users in IPINIT member

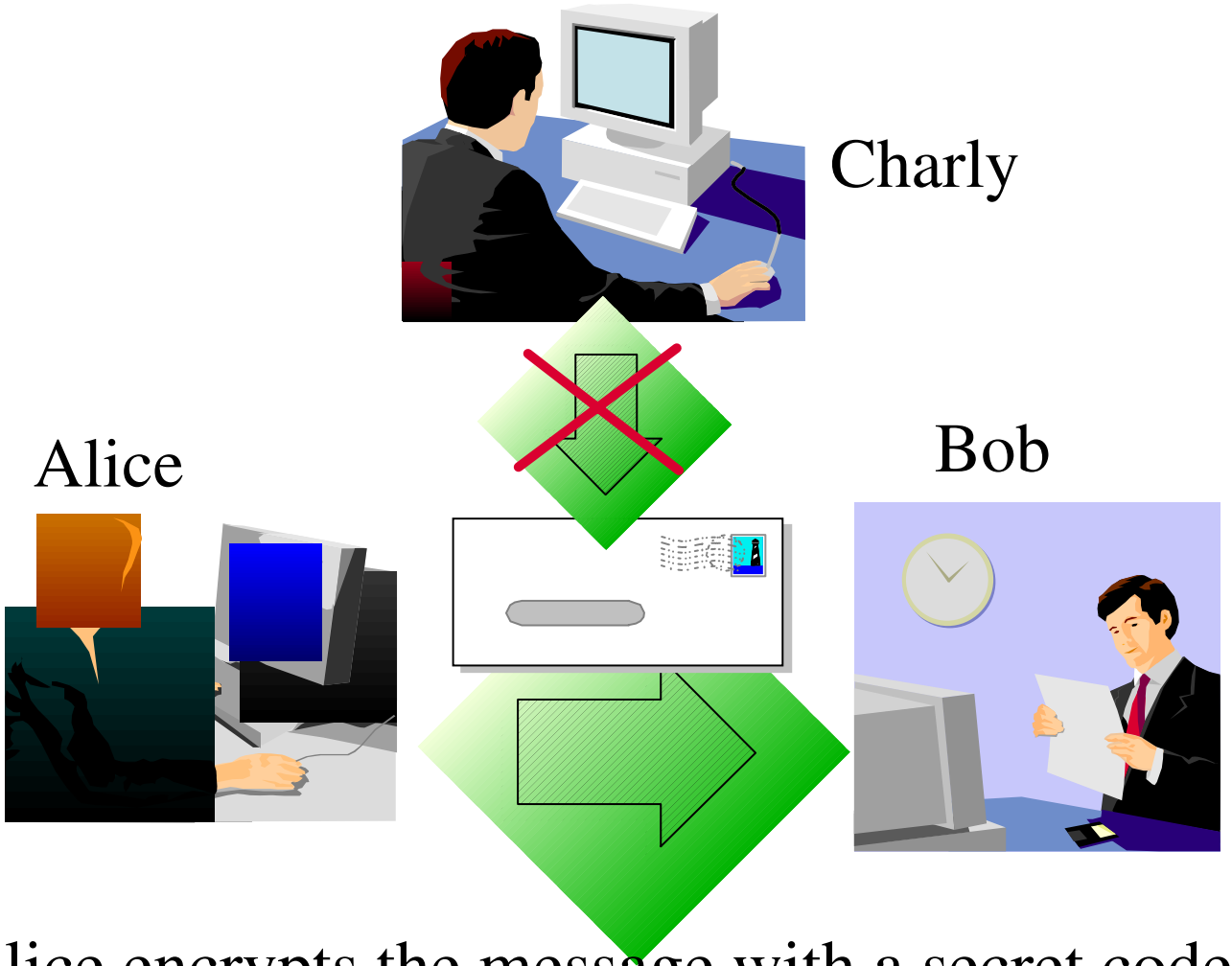
Security in a heterogeneous environment



Why Cryptography ?

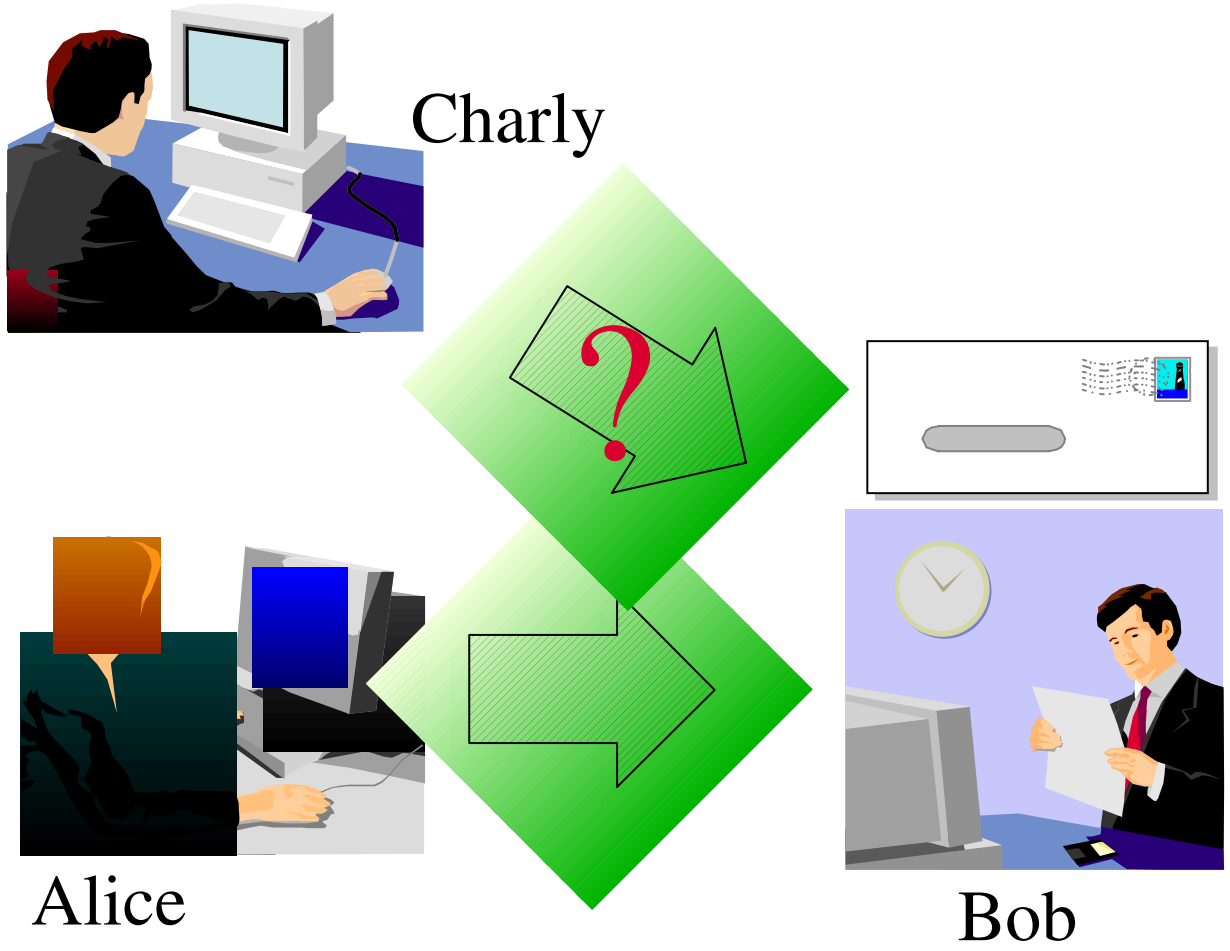
- **Keeping secrets**
  - Alice wants to send Bob confidential information,
  - Charly should not be able to read it.
- **Proving identity**
  - Bob receives a message from Alice. How he can be sure that it is really from Alice?
- **Verifying information**
  - Bob receives a message from Alice. How he can be sure that the content has not been modified?

Keeping Secrets



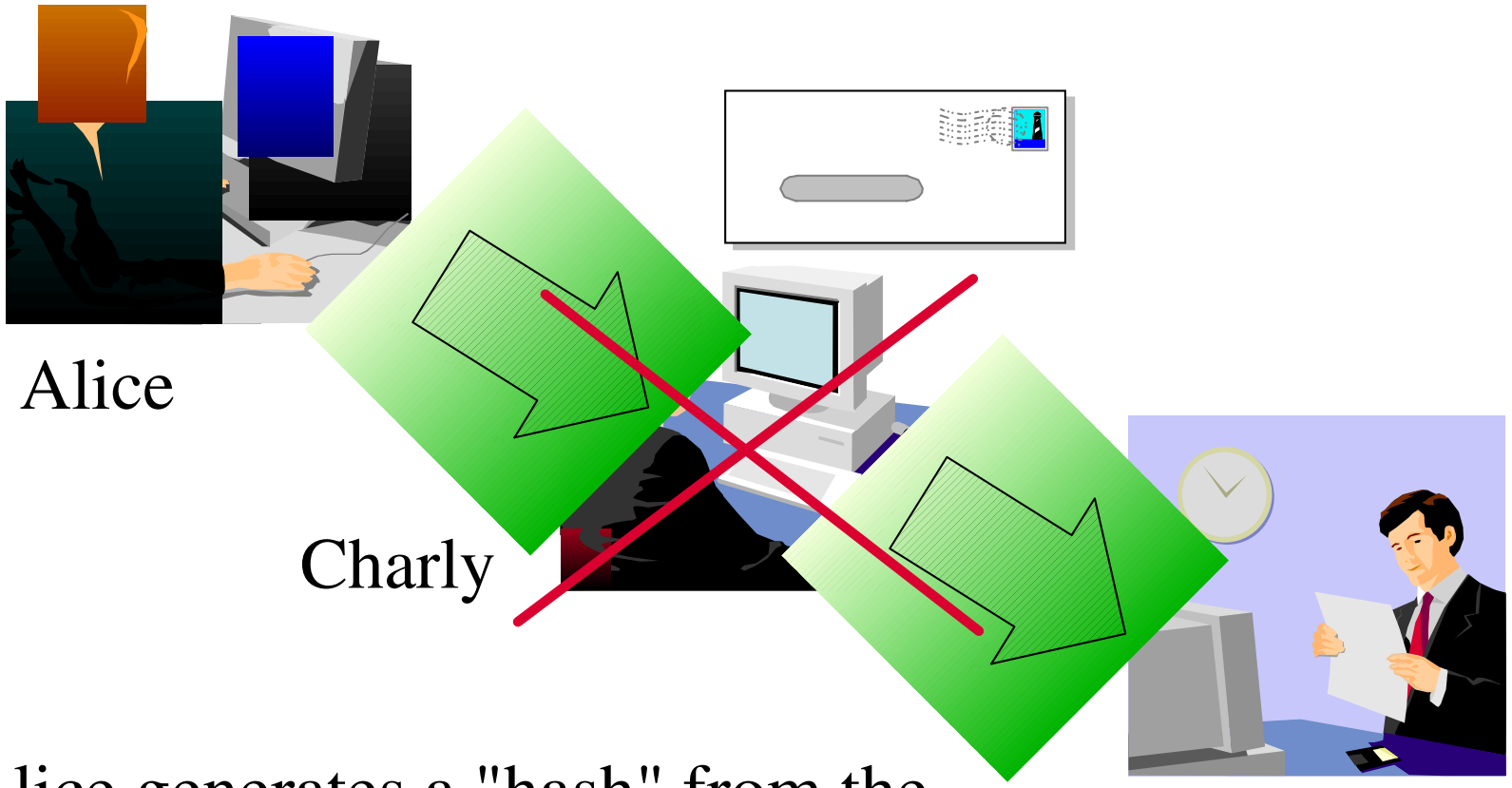
Alice encrypts the message with a secret code that only she and Bob knows

Proving Identity



Alice "signs" the message by attaching a secret phrase that only she and Bob knows

Verifying Information

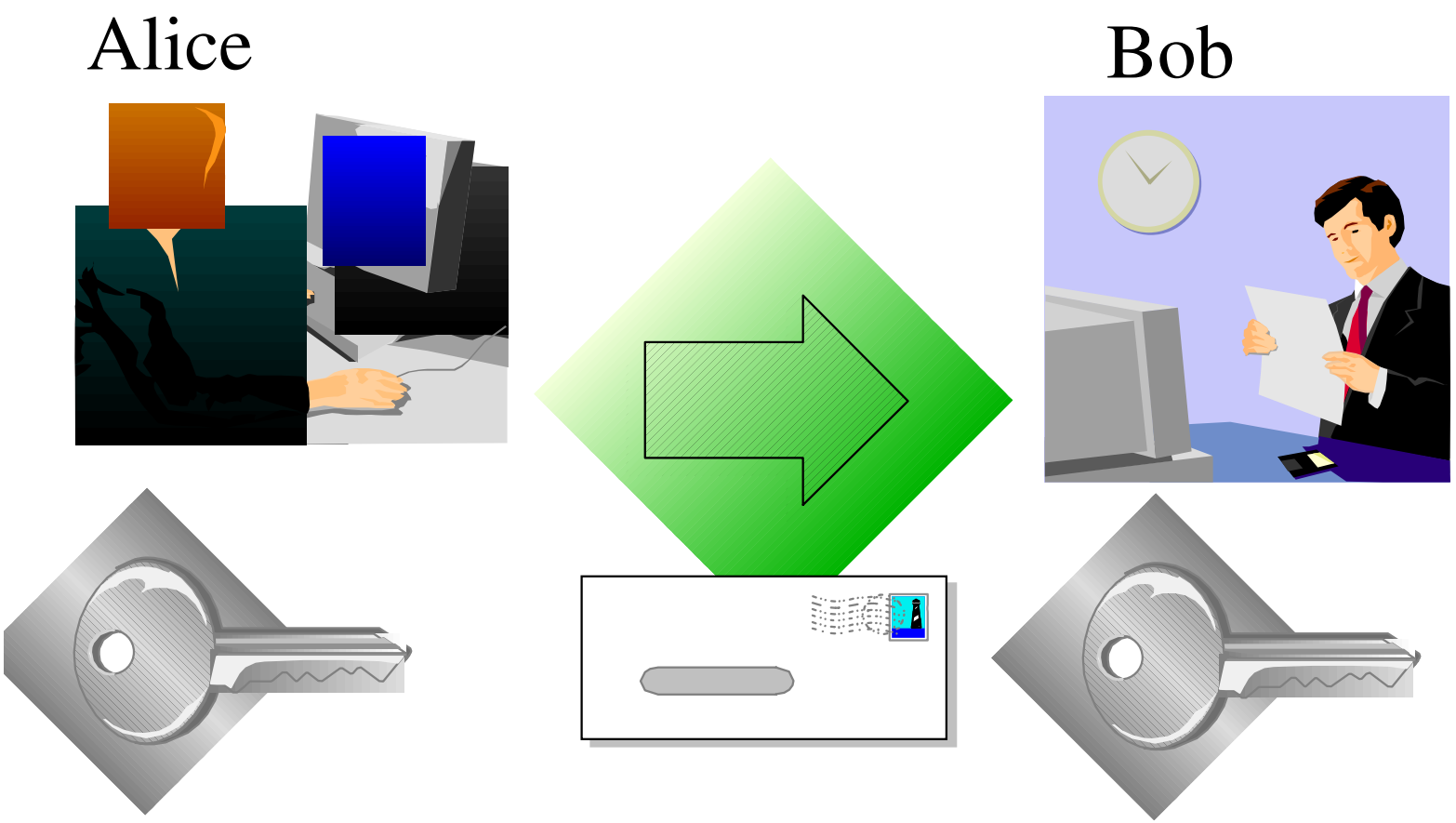


Alice generates a "hash" from the message using a secret code and attaches it to the message. Bob also generates the hash from the received message and compares it.

Secret Key Cryptography (symmetric)

- **Both parties know the same secret code (key)**
- **The key must be kept secret**
- **Encryption algorithm = mathematical transformation of the data with the key**
  - DES — Data Encryption standard
  - 3DES — Triple strength DES
  - RC2 — Rivest Cipher 2
  - RC4 — Rivest Cipher 4
- **Typical key length: 40, 56, 128 or 256 bit**

Secret Key Cryptography - continued

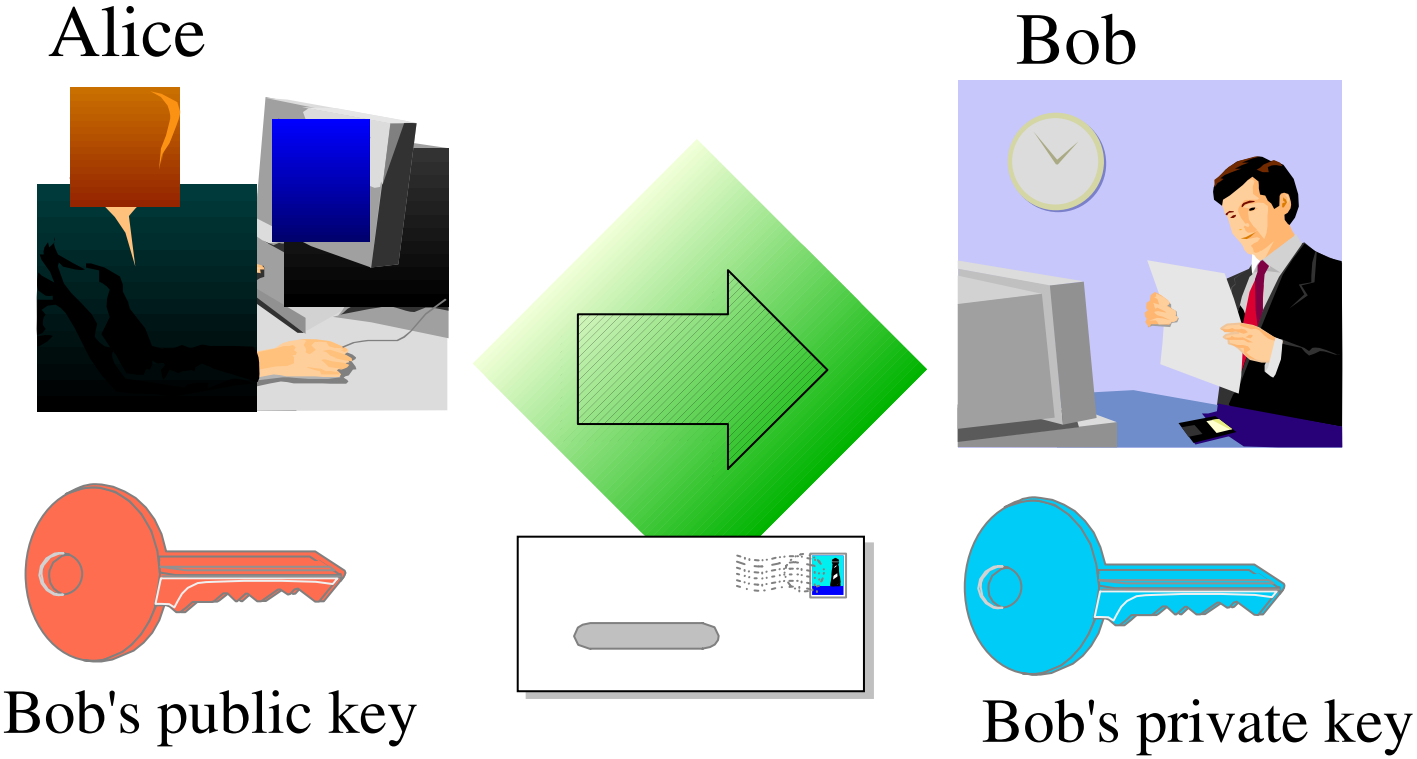


Alice encrypts the message with the secret key and sends it to Bob. Bob decrypts the message with the secret key.

Public Key Cryptography (asymmetric)

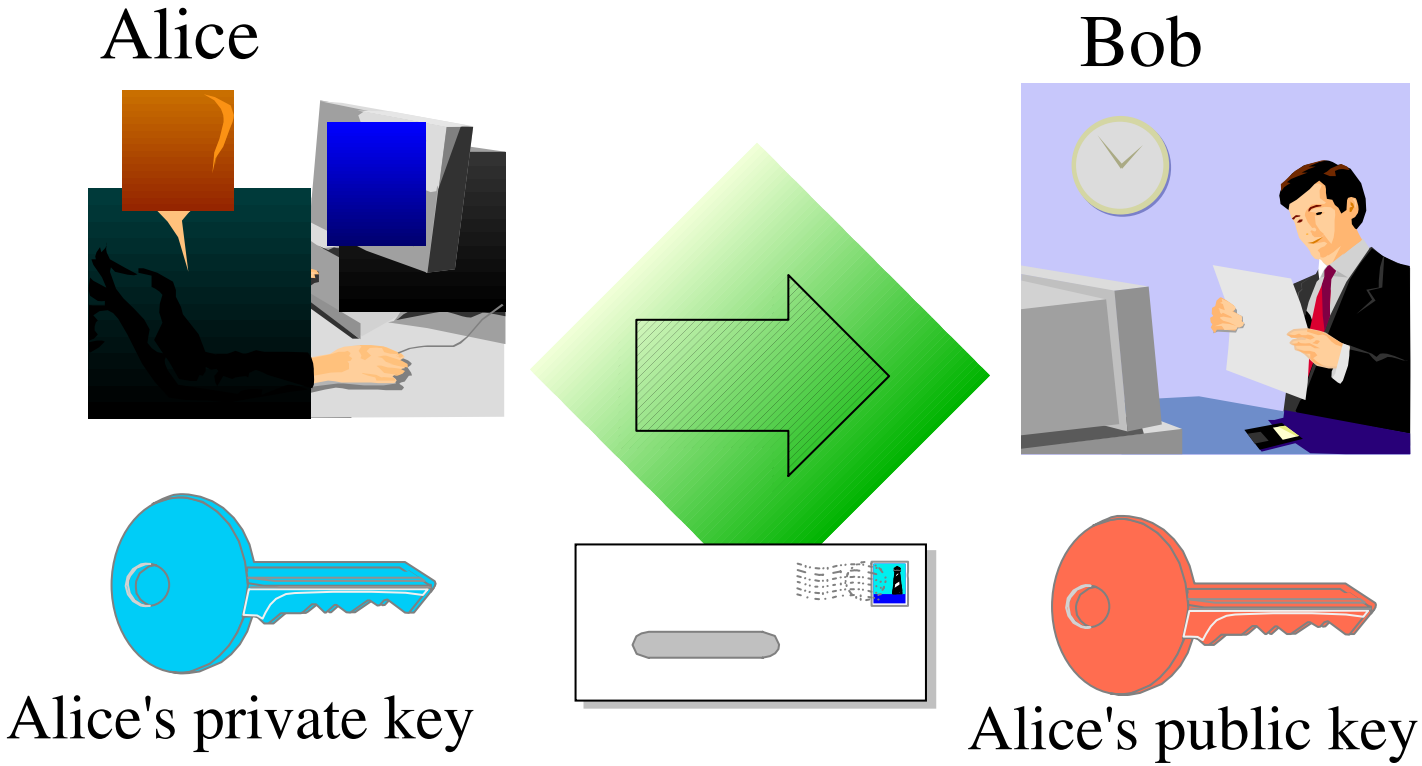
- **One "public key" and one "private key"**
- **"Private key" is kept secret (private)**
- **"Public key" is published**
- **Asymmetric cryptography is based on mathematical problems, that are much easier to create than to solve**
  - RSA Rivest Shamir Adleman
  - DSA Digital Signature Algorithm
  - DHE Diffie Hellman Algorithm
- **Typical key length: 512, 1024 or 2048 bit**

Public Key Cryptography - Encrypting



Alice encrypts the message using Bobs public key and sends it to Bob. Bob decrypts it using his private key.
Since only Bob knows his private key, only he can read the message.

Public Key Cryptography - Signing



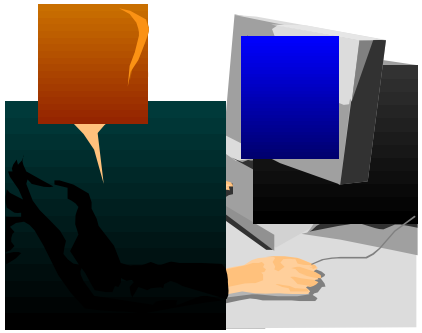
Alice encrypts the message using her private key and sends it to Bob. Bob decrypts it using Alice's public key.
The message is "signed" by Alice since it can only be decrypted using **her** public key.

Combined Symmetric and Asymmetric Cryptography

- **Asymmetric cryptography is very CPU-time consuming**
- **Use asymmetric cryptography only for secret key exchange**
- **Data encryption uses symmetric cryptography**
- **Secret key is generated by random**
- **SSL also uses this mechanism**

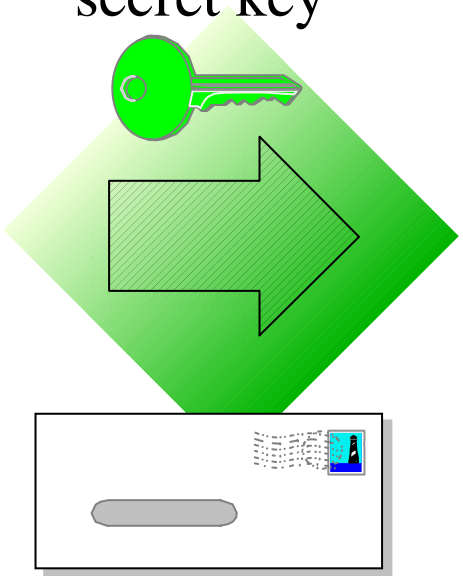
Combined Symmetric and Asymmetric Cryptography

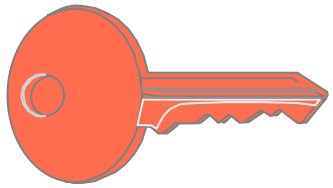
Alice



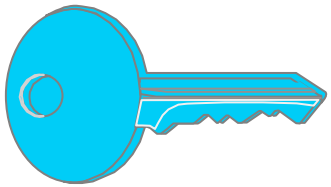
Bob

secret key

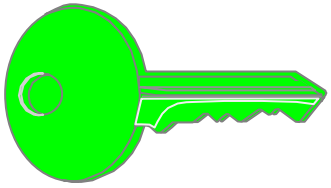




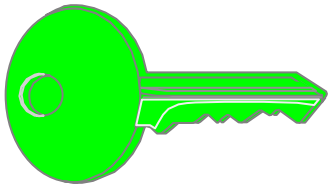
Bob's public key



Bob's private key



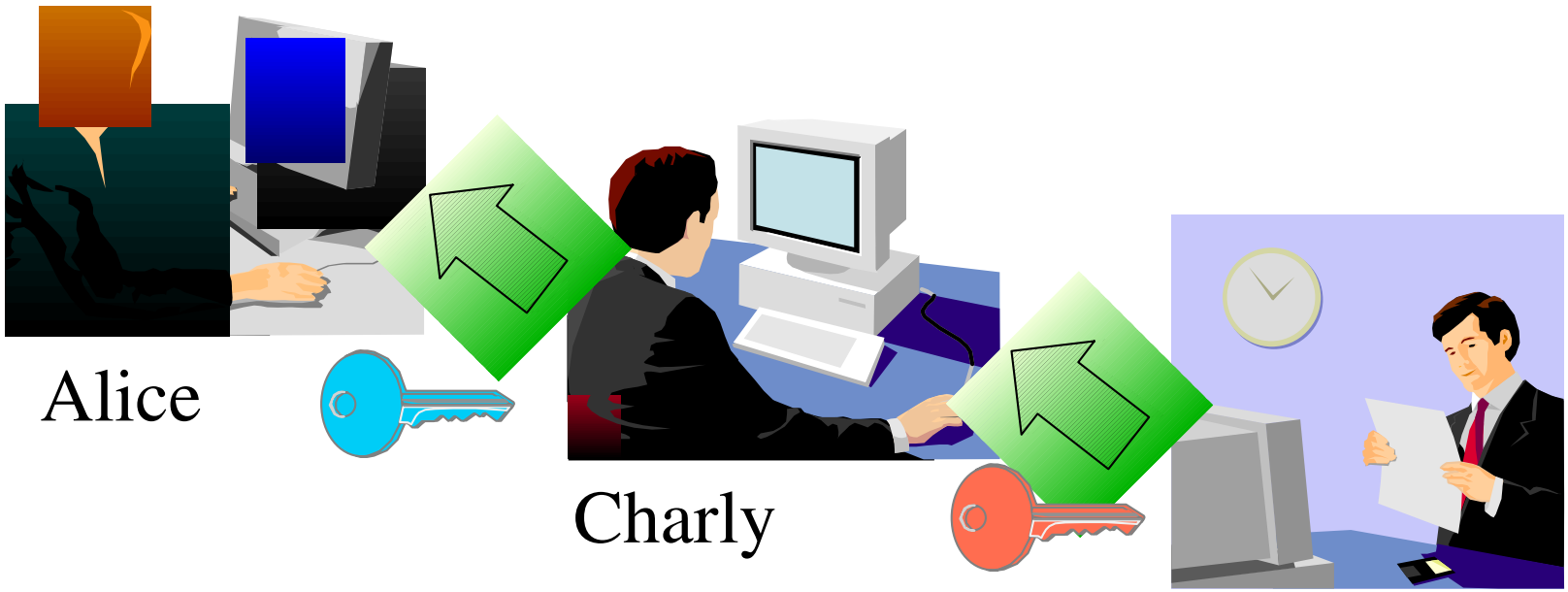
secret key



secret key

Key Management

- Key management is not trivial:
  - Is the public key really from the right person?



Bob publishes his public key, but Charly intercepts this and instead sends his public key to Alice.

Certificates

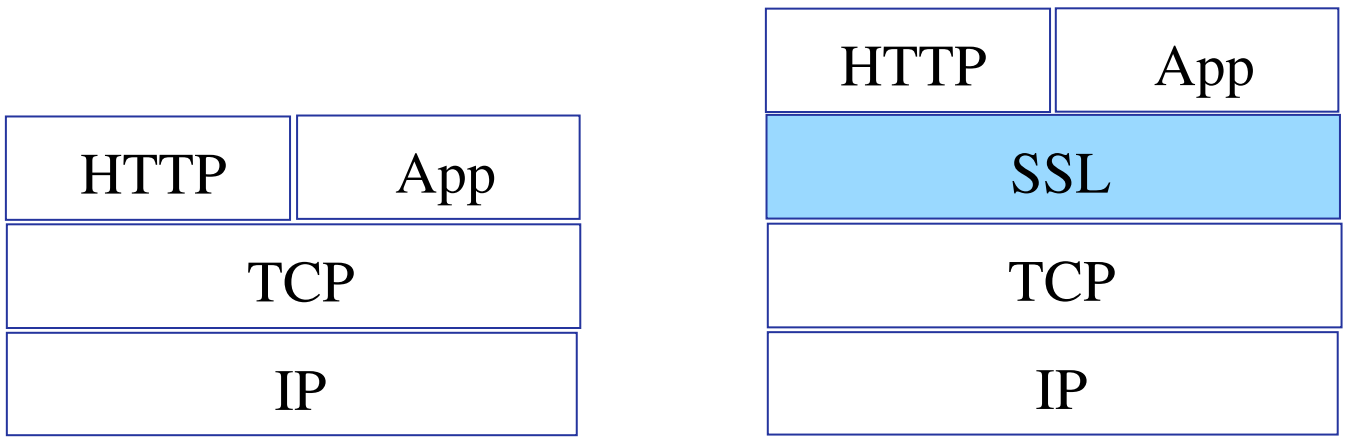
- **A certificate contains the following items**
  - The subject (name of the person)
  - The subject's public key
  - Period of validity
  - The issuer
  - Issuers signature
- **The issuer "signs" the certificate by encrypting a hash of the certificate content with his private key**
- **Everyone can check the sign by decrypting it with the issuers public key**

Certificate Authorities

- **A certificate is issued by a certificate authority (CA)**
- **If a user trusts the certificate authority, he can trust the certificates issued by this CA**
- **CAs identify itself with a "self signed certificate":**
  - The public key in the certificate is also the public key used to decrypt the signature
  - Subject and issuer are the same
- **It is possible to build certificate hierarchies**
- **Certificate revocation lists are used to mark certificates that have been issued by error**

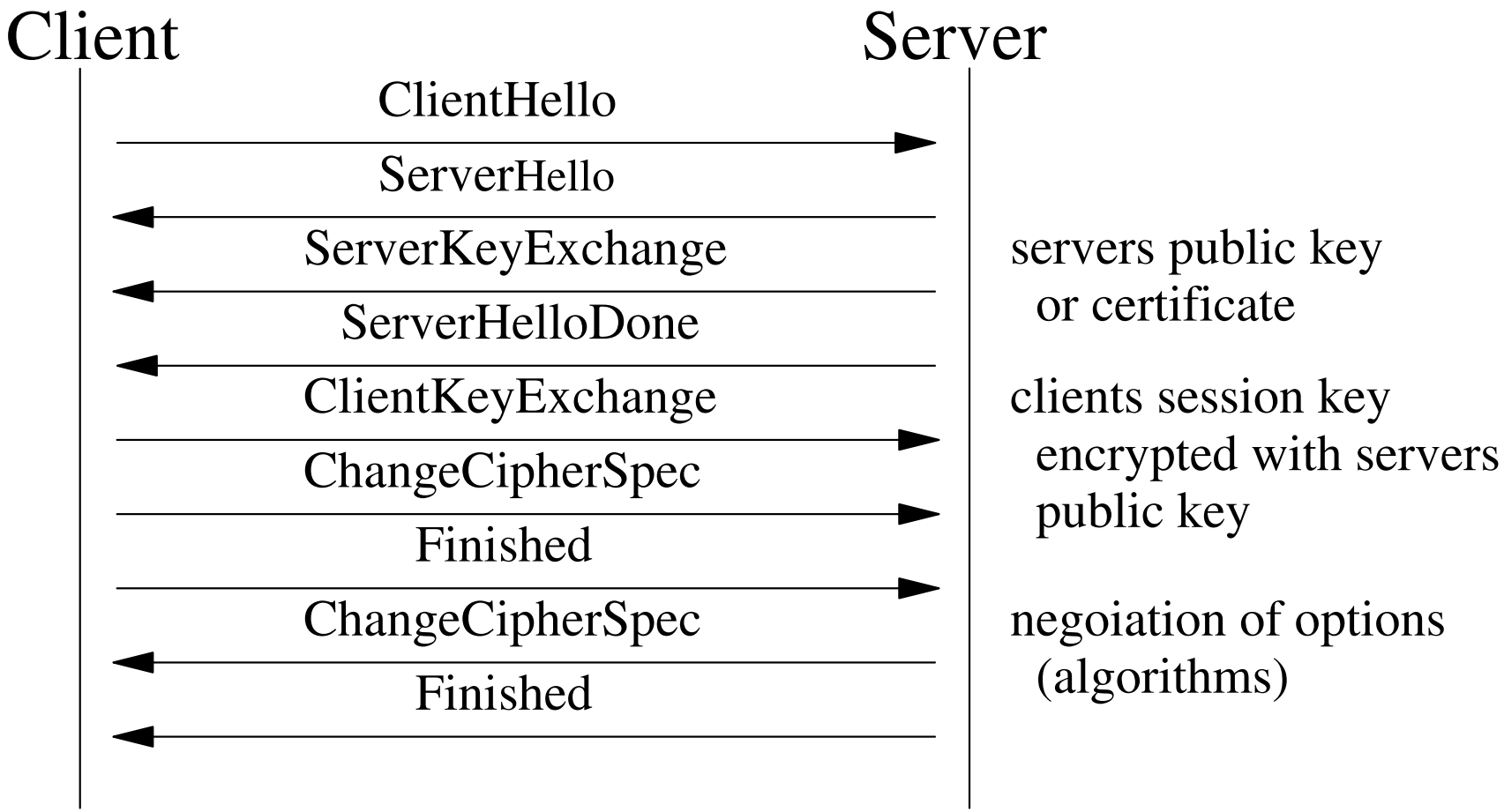
SSL (Secure Socket Layer)

- **As the name implies, SSL is a layer on top of TCP**
- **SSL uses a TCP connection to transfer encrypted messages**
- **Uses asymmetric cryptography for session initiating**
- **Uses symmetric cryptography for data encryption**



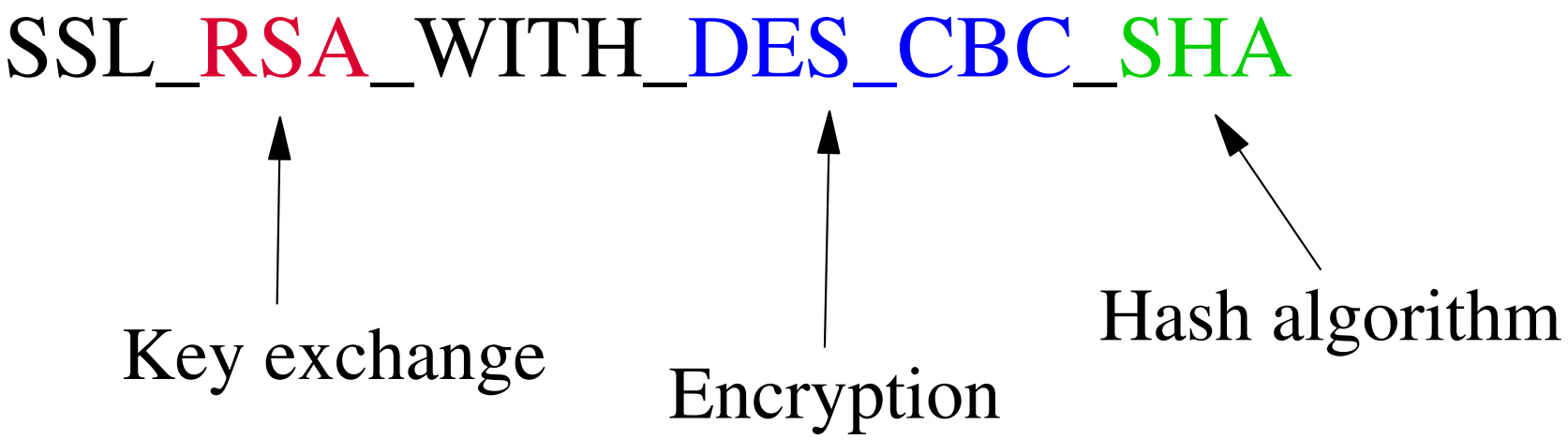
SSL Protocol

- **The SSL protocol defines a set of messages**



Cipher Suites

- **Cipher suites defines the algorithms used:**
  - For key exchange
  - For encryption
  - For hash algorithm



Server / Client Authentication

- **Server authentication means:**
  - The server sends his certificate to the client
  - Client checks the certificate (using the signature)
  - Client does not authenticate itself
- **Client authentication means:**
  - The client sends his certificate to the server
  - Server checks the certificate
  - Optionally associates access rights or privileges

Session Caching

- **"SSL Session" means**
  - Secret key used for data encryption
  - Negotiated algorithms
- **Establishing a SSL Session is a complex and time consuming mechanism**
- **Session caching allows to reuse previously negotiated SSL parameters**
- **No need of repeating the negotiations or authentications**
  - The same symmetric key is used
- **The connection becomes more unsecured**
- **A SSL Session time-out defines how long a session is kept alive**

SSL for VSE

- **SSL for VSE is part of the TCP/IP for VSE base**
- **Enabled with the Application Pak**
- **Integrated into TCP/IP for VSE**
- **Supports SSL 3.0 and TLS 1.0**
- **Key exchange: RSA**
- **Data Encryption: DES and Triple DES**
- **Hash algorithm: MD5, SHA**
- **Supports X.509v3 PKI Certificates**
- **SSL daemon implementation for HTTPS, Telnet**
- **SSL API compatible with the OS/390 SSL API**

SSL Daemon (SSLD)

- **Define a SSL daemon for each TCP port that you want to secure:**

```
DEFINE TLSD,ID=MYSSLD,
            PORT=443,
            HTTPS port
            PASSPORT=443,
            CIPHER=0A096208,   Cipher suites
            CERTLIB=CRYPTO,    library name
            CERTSUB=KEYRING,   sub library name
            CERTMEM=MYKEY,     member name
            TYPE=1,            server application
            MINVERS=0300,      SSL 3.0
            DRIVER=SSLD        Driver phase name
```

Secure Socket Layer API

- **Compatible to OS/390 SSL API**
- **Functions available for**
  - Session initiating
  - Sending/receiving data
  - Ending a session
- **SSL API is based on Socket API**
- **SSL API can be called from**
  - LE-C programs
  - Assembler programs

CryptoVSE API

- **Native cryptographic API**
- **Provides cryptographic services:**
  - Data encryption
    - DES
    - Triple DES
    - RSA PKCS #1
  - Message Digest
    - MD5
    - SHA-1
  - Digital Signatures
    - RSA PKCS #1 with SHA1 or MD5
  - Message Authentication
    - HMAC
- **Uses Hardware Crypto functions transparently when available**

Tools for setting up SSL

- **Keyman/VSE**
  - Creation of RSA keys and digital certificates
  - Upload of keys and certificates to VSE
  - Creation of PKCS#12 keyring files (use with Java-based connector or import into a Web browser)
- **Keyman Professional**
  - Provided by Zurich Research Lab
  - No VSE specific functions

→ **Downloadable from VSE Homepage**
http://www.ibm.com/servers/eserver/zseries/zvse/downloads/#vkeyman

Hardware Crypto Overview

- **Pluggable crypto cards**
  - PCICA (VSE/ESA 2.7 and higher)
  - Crypto Express2 (z/VSE 3.1 with APAR DY46230, PTF UD52721)
  - Supports RSA operations, i.e. SSL handshaking
- **CPACF (CPU Assist for Cryptographic Function)**
  - Available on z890 and z990 on board
  - z/VSE 3.1 GA level, PTF for 2.7 with DY46230
  - Supports symmetric algorithms (DES, SHA-1), i.e. data encryption/decryption

requires TCP/IP 1.5 E

Support on zSeries processors

	z800	z900	z890	z990
PCICA	-	yes	yes	yes
CEX2C	-	-	yes	yes
CPACF	-	-	yes	yes
CEX2A	-	-	-	-

CEX2C = Crypto Express2 in coprocessor mode

CEX2A = Crypto Express2 in accelerator mode

VSE Hardware Configuration

- **VSE hardware configuration not necessary for crypto hardware**
  - No IOCDS definition in VSE
  - No device type
  - No ADD statement
- **Use of crypto hardware is transparent to end users and even TCP/IP applications**
  - But use of crypto hardware can be disabled via TCP/IP SOCKOPT phase

HW-Crypto related console messages

- **System with crypto hardware**

```
FB 0095 1J023I FOUND A CRYPTO EXPRESS2 CARD AT DEVICE INDEX 0
FB 0095 1J023I FOUND A CRYPTO EXPRESS2 CARD AT DEVICE INDEX 1
FB 0095 1J014I FOUND A PCICA CARD AT DEVICE INDEX 6
FB 0095 1J014I FOUND A PCICA CARD AT DEVICE INDEX 7
FB 0095 1J005I HARDWARE CRYPTO ENVIRONMENT INITIALIZED SUCCESSFULLY.
FB 0095 1J006I USING CRYPTO DOMAIN 0
FB 0095 1J022I CPU CRYPTOGRAPHIC ASSIST FEATURE AVAILABLE.
```

- **System without crypto hardware**

```
FB 0093 1J020W THERE WAS NO PCICA OR CRYPTO EXPRESS2 CARD
FB 0093        FOUND. HARDWARE CRYPTO NOT AVAILABLE.
```

Encrypted backups or tapes

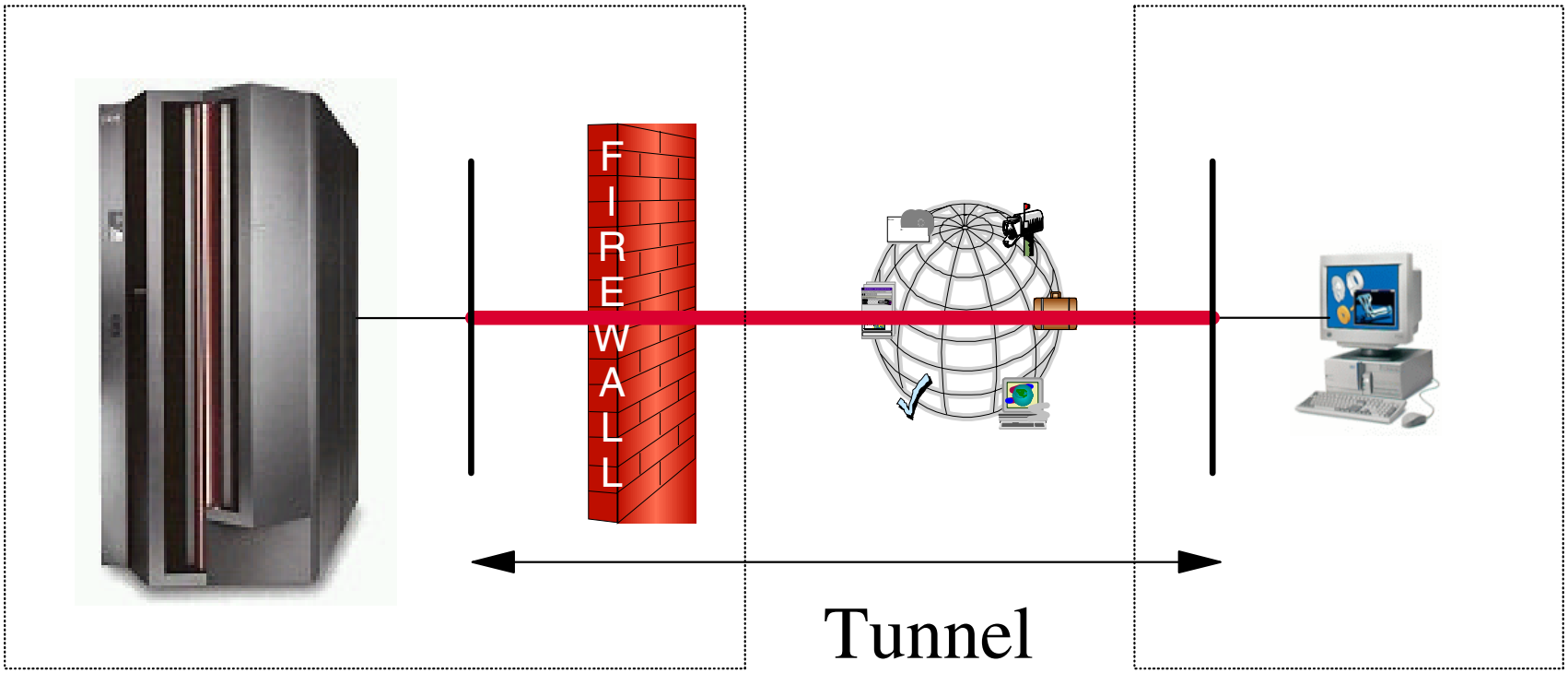
- **Statement of direction:**
  - IBM TotalStorage encryption:
    - To address customers growing concern with data security, IBM is planning for the development, enhancement, and support of encryption capabilities within storage environments such that the capability does not require the use of host server resources (so called “outboard” encryption capabilities). This includes the intent to offer, among other things, capabilities for products within the IBM TotalStorage portfolio to support outboard encryption and to leverage the key management functions provided by the Integrated Cryptographic Service Facility (ICSF).
    - All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice. Any reliance on these Statements of General Direction is at the relying party’s sole risk and will not create liability or obligation for IBM.
  - Can be found in the IBM System z9 109 announcement letter

Encrypted backups or tapes

- **Can today e done using VTAPE**
  - Create a backup on a remote virtual tape
  - Store the tape image on an encrypted medium
    - Encrypted file system or directory (e.g. Windows)
    - Use encryption tools (e.g. TrueCrypt)
    - Use Tivoli Storage Manager to store the backup data
- **Encrypt data in applications**
  - Use CryptoVSE API to encrypt the data
    - Uses Hardware Crypto Support if available

Virtual Private Network, IPSec

- **Can be used to define a secure tunnel between two locations**
  - Makes use of cryptographic functions



Security Checklist for SSL / Crypto

- **Secure Socket Layer**
  - Use SSL if you have a need for
    - Keeping secrets
    - Proving identity
    - Verifying information
  - Use suitable cipher suite
    - E.g. RSA512_NULL_MD5: No data encryption
  - Use Hardware Crypto if available
- **VPN, IPSec**
  - Use if you dial in from outside the company
  - Encrypt data before sending through the Internet

Related Documentation

- **Security Homepage**
  - http://www.ibm.com/servers/eserver/zseries/zvse/documentation/security.html
- **z/VSE Planning**
- **z/VSE Administration**
- **VSE/ESA Software Newsletter No. 17, 18 and 20**
- **OS/390 Security Server External Security Interface (RACROUTE) Macro Reference (GC28-1922)**
- **OS/390 Security Server (RACF) Data Areas (SY27-2640)**
- **z/VSE V3R1.0 e-business Connectors, User's Guide, SC33-8231**
  - http://www-1.ibm.com/servers/eserver/zseries/zvse/documentation/
- **CICS Enhancements Guide, GC34-5763**
  - http://www-1.ibm.com/servers/eserver/zseries/zvse/documentation/
- **VSE/ESA 2.7.3 Release Guide, Chapter 1, section “Hardware Crypto Support”**
  - ftp://ftp.software.ibm.com/eserver/zseries/zos/vse/pdf3/vse27/iesrie24.pdf
- **IBM PCI Cryptographic Accelerator**
  - http://www.ibm.com/security/cryptocards/pcica.shtml
- **zSeries cryptography for highly secure transactions**
  - http://www.ibm.com/servers/eserver/zseries/security/cryptography.html
- **Q & A for Cryptographic Support for z990 servers**
  - http://www.ibm.com/security/cryptocards/zservcryptofaq.shtml

Questions ?