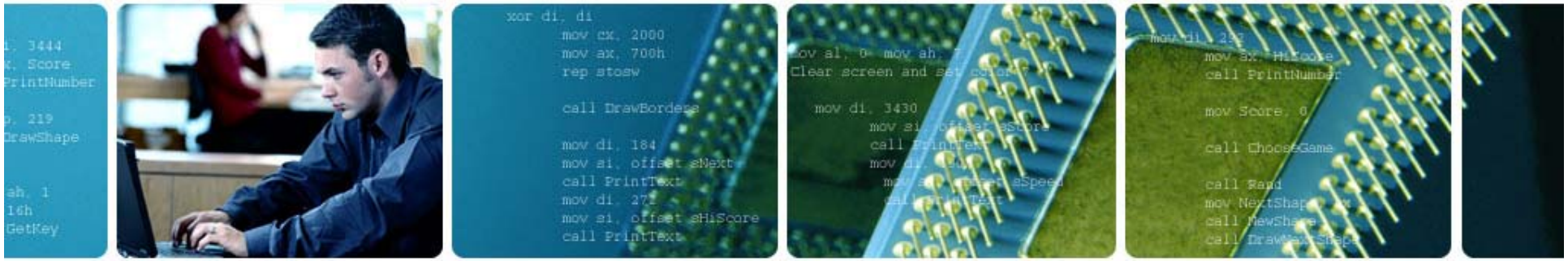
Introduction to the new mainframe

Chapter 11 Security on z/OS



Objectives

In this chapter you will learn to:

- Explain security and integrity concepts
- Explain RACF and its interface with the operating system
- Authorize a program
- Discuss integrity concepts
- Explain the importance of change control
- Explain the concept of risk assessment

Key terms

- authorized libraries
- authorized program facility (APF)
- encryption
- SAF
- SVC
- PASSWORD
- firewall
- hacker
- page protection bit
- Resource Access Control Facility (RACF)
- security policy
- separation of duties
- system integrity
- user ID

Introduction

- An installation’s data and programs are among its most valuable assets and must be protected
- At one time data was secure because no one knew how to access it
- As more people become computer literate and able to use simple tools unprotected data is becoming more accessible
- Data security is now more important than ever including the prevention of inadvertent destruction

Why security?

- **Any system security must allow authorized users the access they need and prevent unauthorized access.**
- **Many companies' critical data is now on computer and is easily stolen if not protected**
- **z/OS Security Server provides a framework of services to protect data**

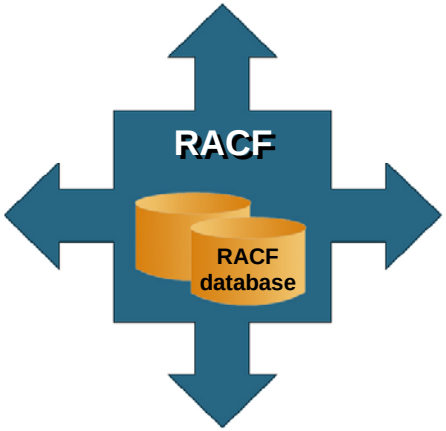
RACF

- RACF (part of Security Server) and the other available packages are add-on products which provide the basic security framework on a z/OS mainframe
- Identify and authenticate users
- Authorize users to access protected resources
- Log and report attempted unauthorized access
- Control means of access to resources

RACF functions overview

Security administration

User identification and authorization



Audit and integrity reports violation alerts

Resource authorization checking and system control

Identification and verification of users

- **RACF uses a userid and system encrypted password to perform its user identification and verification**
- **The userid identified the person to the system**
- **The password verifies the user's identity**
- **Passwords should not be trivial and exits can be used to enforce policies.**

Protection Levels

RACF works on a hierarchical structure

- ALLOC allows data set creation and destruction
- CONTROL allows VSAM repro
- WRITE allows update of data
- READ allows read of data
- NONE no access

A higher permission implies all those below

Protecting a dataset

- A data set profile is created and stored in the database
- It will give users or groups an access level
- A universal access level will also be set
- The profile can be specific or generic, with or without wild cards

RACF typical display

```
INFORMATION FOR DATASET SYS1.*.** (G)

LEVEL   OWNER    UNIVERSAL ACCESS                  WARNING    ERASE
-----   -------- --------------------------------  -------    -----
 00     SYS1     READ                              NO         NO

AUDITING
--------
FAILURES(READ)

NOTIFY
--------
NO USER TO BE NOTIFIED

YOUR ACCESS            CREATION GROUP              DATASET TYPE
--------------------   --------------------------  -----------------
----
 ALTER                  SYS1                        NON-VSAM
```

RACF access list for SYS1.*.**

ID	ACCESS
SYS1	ALTER
KARRAS	ALTER
WANDRER	ALTER
SCHUBER	ALTER
KURTKR	UPDATE
KURTKR2	UPDATE
KURTKR3	NONE
CICSRS1	ALTER
CICSRS2	ALTER
HEISIG	UPDATE
JUSTO	UPDATE
GERALD	READ

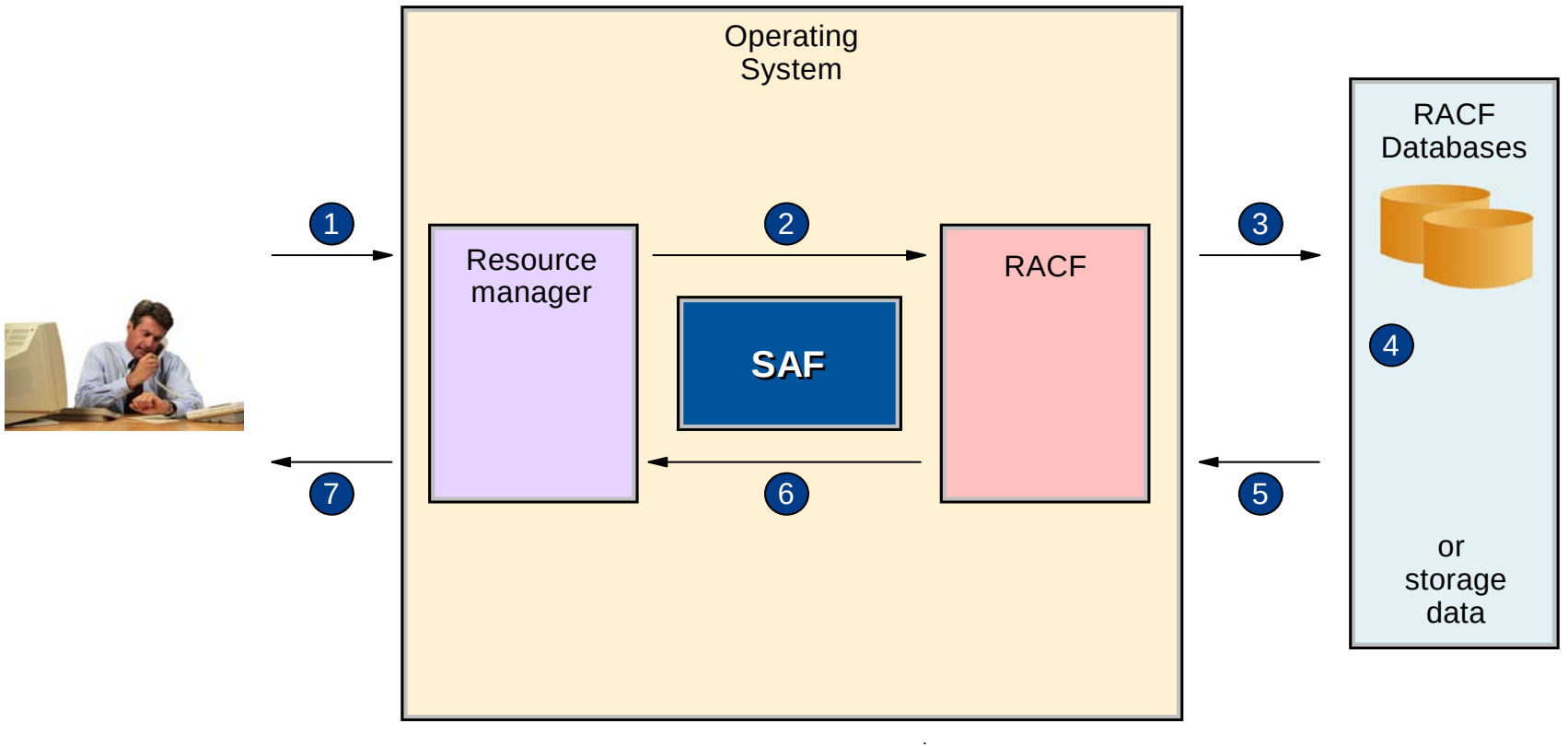
Protecting general resources

Many system resources can be protected

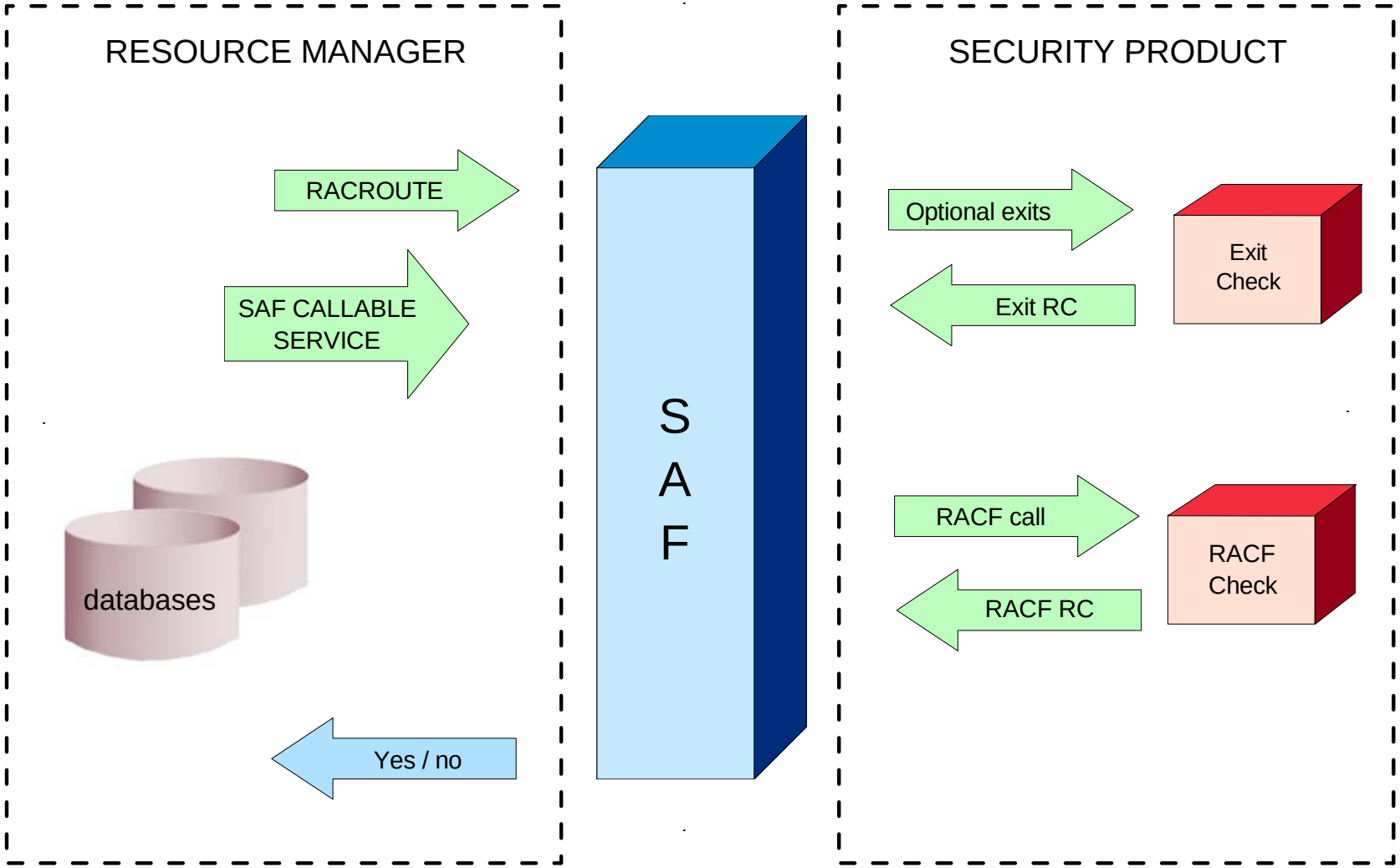
- DASD volumes
- Tapes
- CICS or IMS transactions
- JES spool datasets
- System commands
- Application resources and many more

RACF is flexible and more can be added

Operating system and RACF



Concepts of RACF profile checking



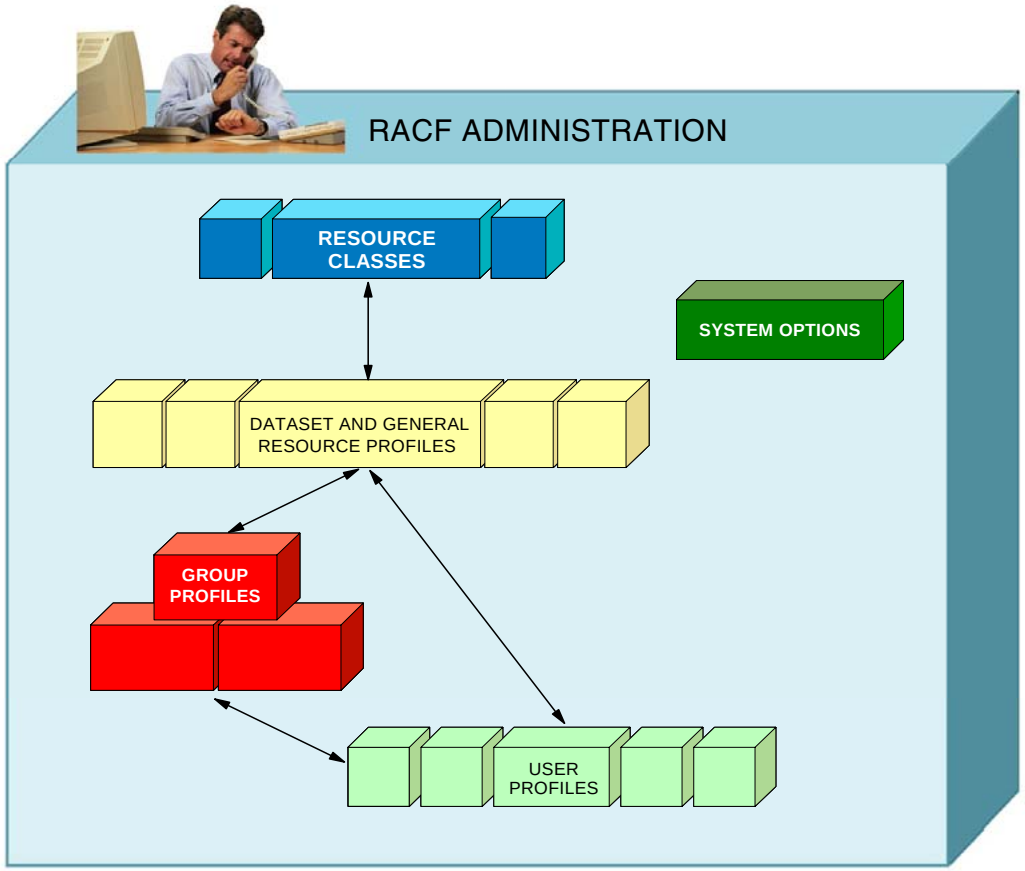
System Authorization Facility

- SAF is part of z/OS
- Uses RACF if it is present
- Can also use an optional exit routine
- SAF is a system service and is a common focal point for all products providing resource control.
- SAF is invoked at control points within the code of the resource manager

RACF Structure

- **Userid**
- **Group**
  - Every userid belongs to at least one group
  - Group structures are often used for access to resources
- **Resource**
- **Resource classes**
- **Class descriptor table – used to customize**

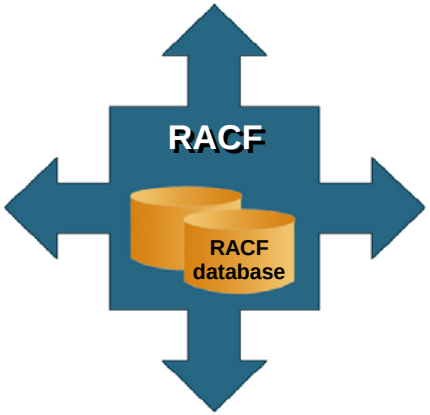
RACF structure overview



RACF Functions

Security administration

User identification and authorization



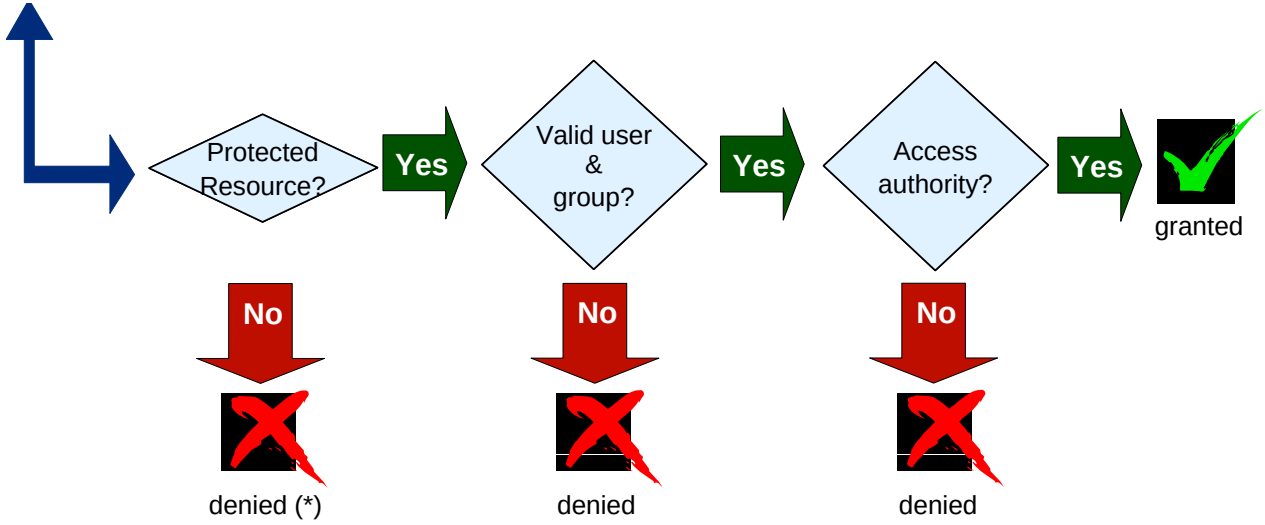
Audit and integrity reports violation alerts

Resource authorization checking and system control

User Identification

- RACF identifies you when you logon
- Userid and password are required
- Each RACF userid has a unique password
- Password is one way encrypted so no one else can get your password not even the administrator
- Userid is revoked after a preset number of invalid password attempts

RACF profile checking



(*) if Protect All option is in effect

Logging and reporting

RACF maintains statistical information

RACF writes a security log when it detects:

- **Unauthorized attempts to enter the system**
- **Access to resources**
  - This depends on the settings for the resource
  - For example AUDIT(ALL(UPDATE) will record all updates to a resource
- **Issuing of commands**

Security Administration

Interpret the security policy to:

- Determine which RACF functions to use
- Identify the level of RACF protection
- Identify which data to protect
- Identify administrative structures and users

RACF sysplex data sharing and RRSF

- If many systems share a RACF database there can be contention problems
- RACF will propagate commands throughout a sysplex
- RACF can use a coupling facility in a parallel sysplex to improve performance
- RRSF can be used to keep distributed RACF databases in line

Authorized programs

- **Authorized tasks running authorized programs are allowed to access sensitive system functions**
- **Unauthorized programs may only use standard functions to avoid integrity problems**

Authorized Program Facility

APF

Authorized libraries

- SYS1.LINKLIB
- SYS1.LPALIB
- SYS1.SVCLIB

+

- List of installation defined libraries

Authorized Libraries

A task is authorized when the executing program has the following characteristics:

- **It runs in supervisor state**
- **It runs in PSW key 0 to 7**
- **All previous programs in the same task were APF programs**
- **The module was loaded from an APF library**

Problem Programs

- Normal programs are known as problem programs as they run in problem state (as opposed to supervisor state)
- They run in the problem key – 8
- They may or may not be in an APF library

APF Libraries

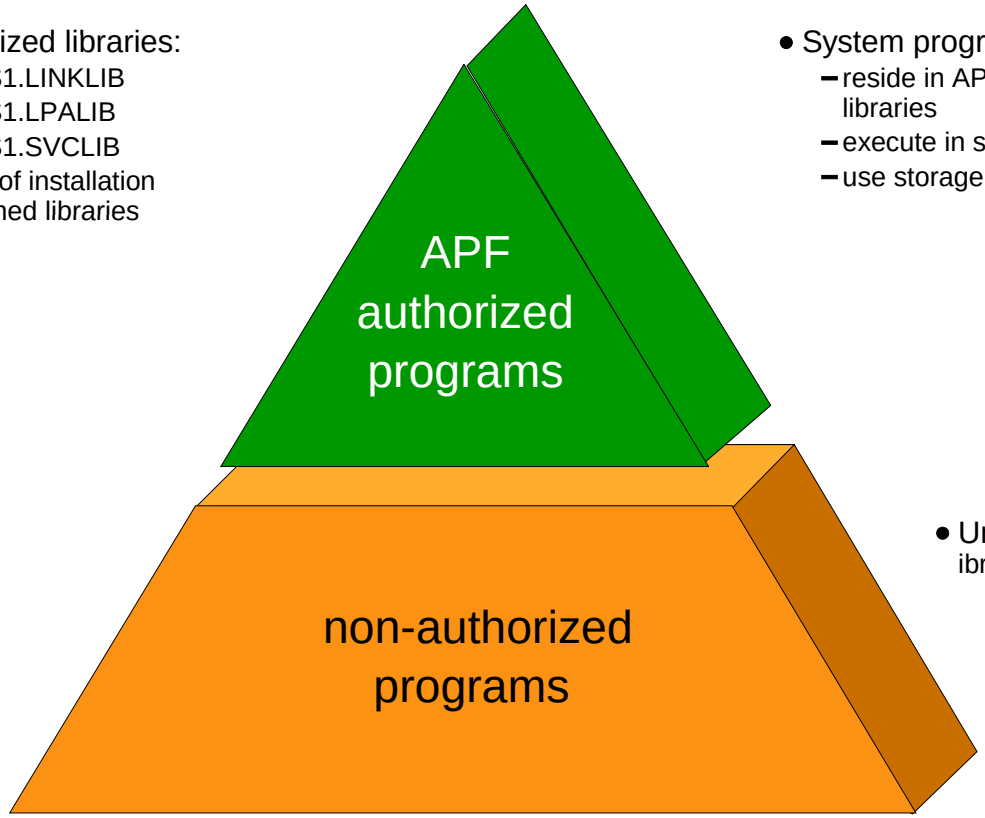
- Authorized libraries are defined by the APF list in SYS1.PARMLIB
- SYS1.LINKLIB, SYS1.SVCLIB and SYS1.LPALIB are automatically authorized
- Installation libraries are defined in PROGxx
- By default all libraries in the linklist are authorized but many installations set LNKAUTH=APFTAB, often prompted by auditors, so that this is no longer the case and only those in the list are authorized

Authorizing a program

- The first, and only the first, load module of the program must be linked with the authorization code AC=1
- It and all subsequent modules must be loaded from an authorized library
- APF libraries must be protected so that only authorized users can store programs there

Authorizing libraries

- Authorized libraries:
  - SYS1.LINKLIB
  - SYS1.LPALIB
  - SYS1.SVCLIB
  - List of installation defined libraries



- System programs usually:
  - reside in APF-authorized libraries
  - execute in supervisor state
  - use storage key 0 to through 7

- Unauthorized ibraries.

- Application programs usually:
  - reside in non-authorized libraries
  - execute in problem state
  - use storage key 8

Authorizing libraries

- **The APF list is built during IPL using those libraries listed in the PROGxx parmlib member**
- **If a dynamic list is specified then it may be updated by operator command**

An example APF list

```
BROWSE SYS1.PARMLIB(PROGTT) -    01.01         Line 00000000 Col 001 080
Command ===>                                          Scroll ===> PAGE
***************************** Top of Data ********************************
APF FORMAT(DYNAMIC)
APF ADD
    DSNAME(SYS1.VTAMLIB)
    VOLUME(******)
APF ADD
    DSNAME(SYS1.SICELINK)
    VOLUME(******)
APF ADD
    DSNAME(SYS1.LOCAL.VTAMLIB)
    VOLUME(TOTCAT)
APF ADD
    DSNAME(ISP.SISPLOAD)
    VOLUME(*MCAT*)
***************************** Bottom of Data *****************************
```

Dynamic APF

- Update a PROGxx member and then activate it with operator command SET PROG=xx
- Use the SETPROG APF command
- DISPLAY PROG,APF command will display the current list

D PROG,APF

```
D PROG,APF
CSV450I 12.46.27 PROG,APF DISPLAY 027
FORMAT=DYNAMIC
   ENTRY        VOLUME      DSNAME
       1        Z04RE1      SYS1.LINKLIB
       2        Z04RE1      SYS1.SVCLIB
       3        Z04RE1      ANF.SANFLOAD
       4        Z04RE2      AOP.SAOPLOAD
       5        Z04RE1      AOP.SAOPLOAD
       6        Z04RE1      ARTURO.BFSLMOD
       7        Z04RE1      ASMA.V1R2M0.SASMMOD1
       8        TOTDBZ      ASN.V7R1M0.SASNALNK
       9        TOTDBZ      ASN.V7R1M0.SASNLLNK
      10        TOTDBZ      ASN.V8R1M0.SASNLOAD
      11        TOTPT1      ASNA.V5R1M0.SASNALNK
      12        TOTPT1      ASNL.V5R1M0.SASNLLNK
......
```

Operator Console Security

Consoles are assigned authority levels in CONSOLxx parmlib member

Commands are grouped:

- **INFO informational commands**
- **SYS system control commands**
- **IO I/O commands**
- **CONS console control commands**
- **MASTER master console commands**

Each console may have one or more levels

Consoles

- At least one console must have master authority
- In a sysplex consoles are shared
- It is possible to require logon to consoles using RACF
- All extended MCS consoles should require a logon

Security Roles

- Systems programmer sets up RACF
- Systems administrator implements the policies
- Security Manager sets the policies
- Separation of duties is required to prevent uncontrolled access

Summary

- z/OS Security Server
- RACF
- SAF
- Authorized Programs
- APF list
- Console security

Backup