

# RACF and z/OS Security Server Update



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# Agenda

## ● OS/390 Version 2 Release 10

### ■ Selected Security Server enhancements

#### – RACF:

- ✓ Program control usability enhancement
- ✓ Application identity mapping
- ✓ Mixed case profiles

#### – New Security Server Component: Network Authentication Service

### ■ Selected Communications Server enhancements

#### – TN3270

#### – SERVAUTH controls

# Agenda...

## ● z/OS Release 2 Enhancements

### ■ Security Server

#### – RACF:

- ✓ UNIVERSAL groups
- ✓ SAF Trace
- ✓ Cross-system VLF
- ✓ Coupling Facility error toleration

#### – Network Authentication Service

- ✓ New encryption methods
- ✓ New client commands
- ✓ Additional exploiters

### ■ Communications server

- Express Logon
- Network authentication
- Intrusion detection
- FTP

# Agenda...

## ● **z/OS Release 3 Security Server Enhancements**

- UNIX Access Checking Enhancements
  - **Access Control Lists**
  - RESTRICTED User ID Support
- New PKI Services Component

## ● **z/OS Release 4 Security Server Enhancements:**

- UNIX Security Management Usability
- Program Control and PADS Usability and Security
- Enterprise Identity Mapping Support
- Network Authentication Services Enhancements
- LDAP Server Enhancements
- Firewall Technologies Enhancements

## ● **z/OS Release 4 System SSL Enhancements**

# Selected OS/390 V2R10 Functions

## Program Control Usability

- **New diagnostic messages when functions requiring "clean" environment (PADS, execute-control, UNIX server / daemon) fail**
  - Messages will state that failure occurred because of "dirty" environment
  - Messages will give the reason environment became dirty
    - module name, library name, etc.
  - Example: ICH420I PROGRAM PAYROL5 FROM LIBRARY SYS2.PAYLIB CAUSED THE ENVIRONMENT TO BECOME UNCONTROLLED.
- **New RACROUTE REQUEST=AUTH reason code to inform ICHRCX02 that the request would have worked except for dirty environment**
- **Should greatly reduce the need for GTF tracing for Program Control and PADS problems.**



## Mixed-Case Profile Name Support

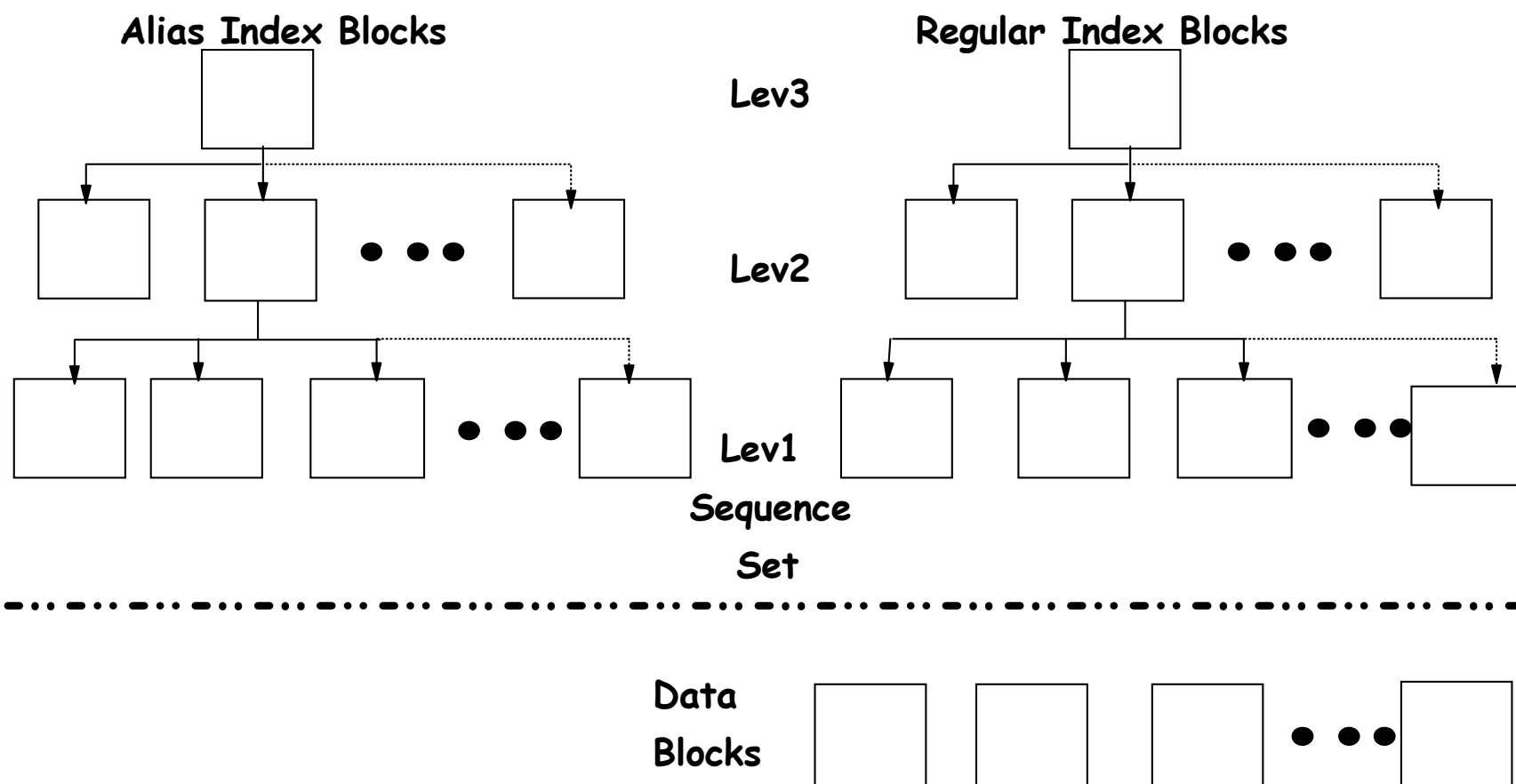
- **Supports Enterprise Java Beans in WebSphere via new classes EJBROLE, GEJBROLE**
- **New CDT option CASE= UPPER | ASIS** allowed for customer-defined classes
- No existing IBM resource classes changed
  - helps ensure compatibility and avoid administrative surprises
- For mixed-case classes, RACF commands and ISPF panels will use profile names as specified by the user
  - RDEFINE EJBROLE ( xyz XYZ xYz )
    - defines 3 different profiles
- Also available on OS/390 V2R8 and V2R10 via SPE APAR OW46859
- Full documentation in SYS1.SAMPLIB(IRR46859) or in z/OS books

# Application Identity Mapping

- **Eliminates need for some kinds of "mapping" profiles:**
  - UNIXMAP -- UNIX UID / GID to user ID or group name
  - NDSLINK -- Novell Directory Services UNAME to user ID
  - NOTELINK -- Lotus Notes (Domino) SNAME to user ID
- **Should:**
  - reduce size of RACF database by eliminating the profiles
  - provide better data integrity in the database
  - provide consistent mapping for shared UIDs or GIDs
- **Uses new "alias" index structure in RACF data base**

# Alias Index Structure...

- Alias IX blocks, are similar to regular IX blocks at upper levels. In the Sequence Set, instead of pointers to data profiles, Alias IX entries contain base profile info.



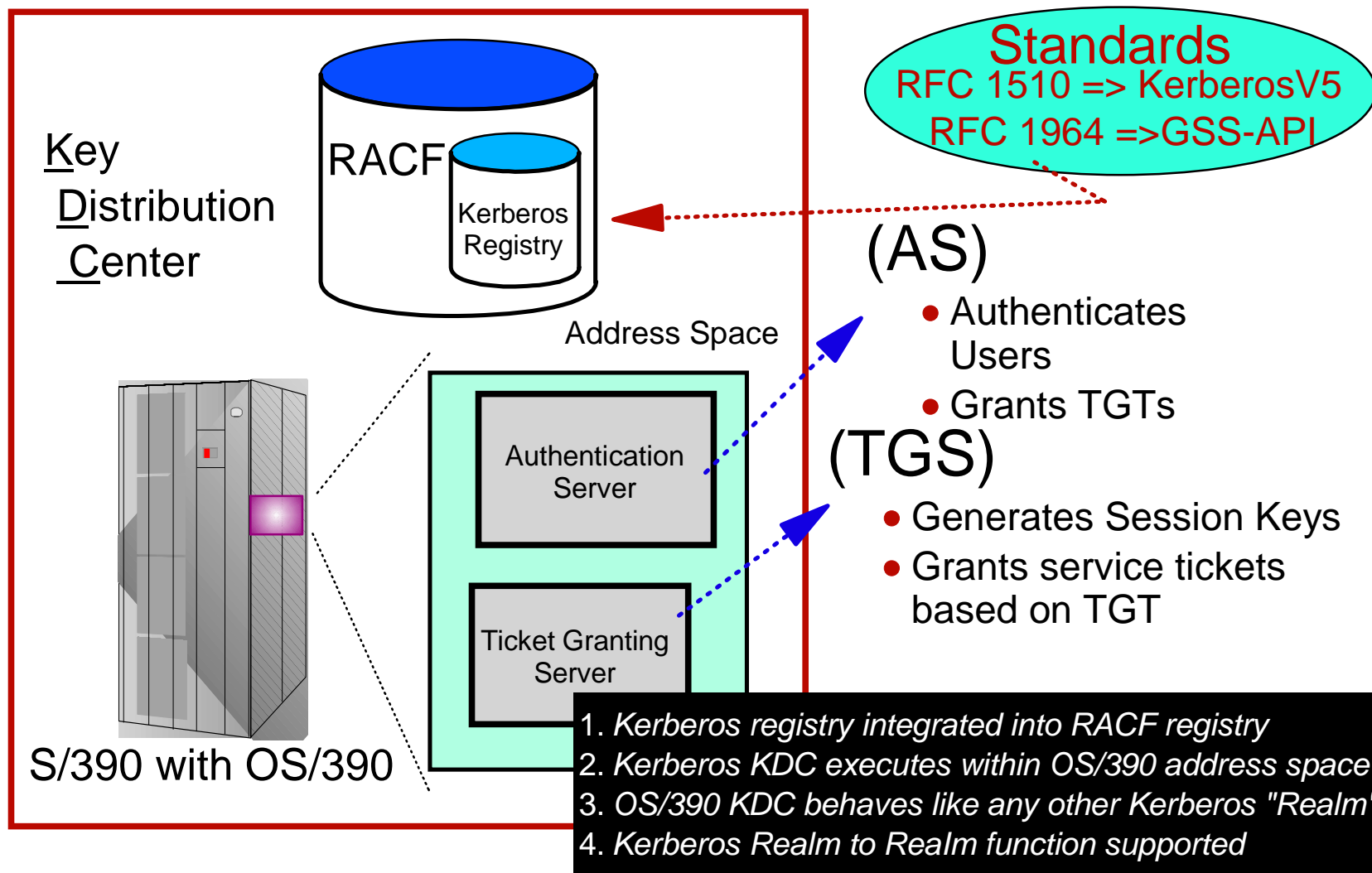
# Network Authentication Service

- **New Security Server component**
  - licensed with OS/390 base, for all OS/390 customers, like the LDAP server
  - requires RACF support or compatible other security product
- **OS/390 implementation of MIT's Kerberos Version 5**
- **Provides services for:**
  - USER AUTHENTICATION
  - DELEGATION
  - DATA CONFIDENTIALITY
- **Interoperates with other industry Kerberos Version 5 implementations**
- **Can provide consistent user authentication for Kerberos-aware applications spanning a network including, e.g. OS/390, Windows 2000, UNIX, AS/400**

## Network Authentication Service...

- **RACF provides support for the server:**
  - definition of local Kerberos principals (users)
    - KERB segment
  - definition of the local Kerberos realm & foreign realms
    - REALM class
  - definition of foreign Kerberos principals with a local identity
    - KERBLINK profiles
  - Basically, the RACF database **IS** the Kerberos registry for OS/390
  - RACF password **IS** the user's Kerberos password
- **Server uses SAF callable services to interact with RACF: parse Kerberos tickets to obtain principal names; map from principal to RACF user and vice versa**
  - Enhanced R\_usermap service
  - new R\_kerbinfo service
  - new R\_ticketserv service

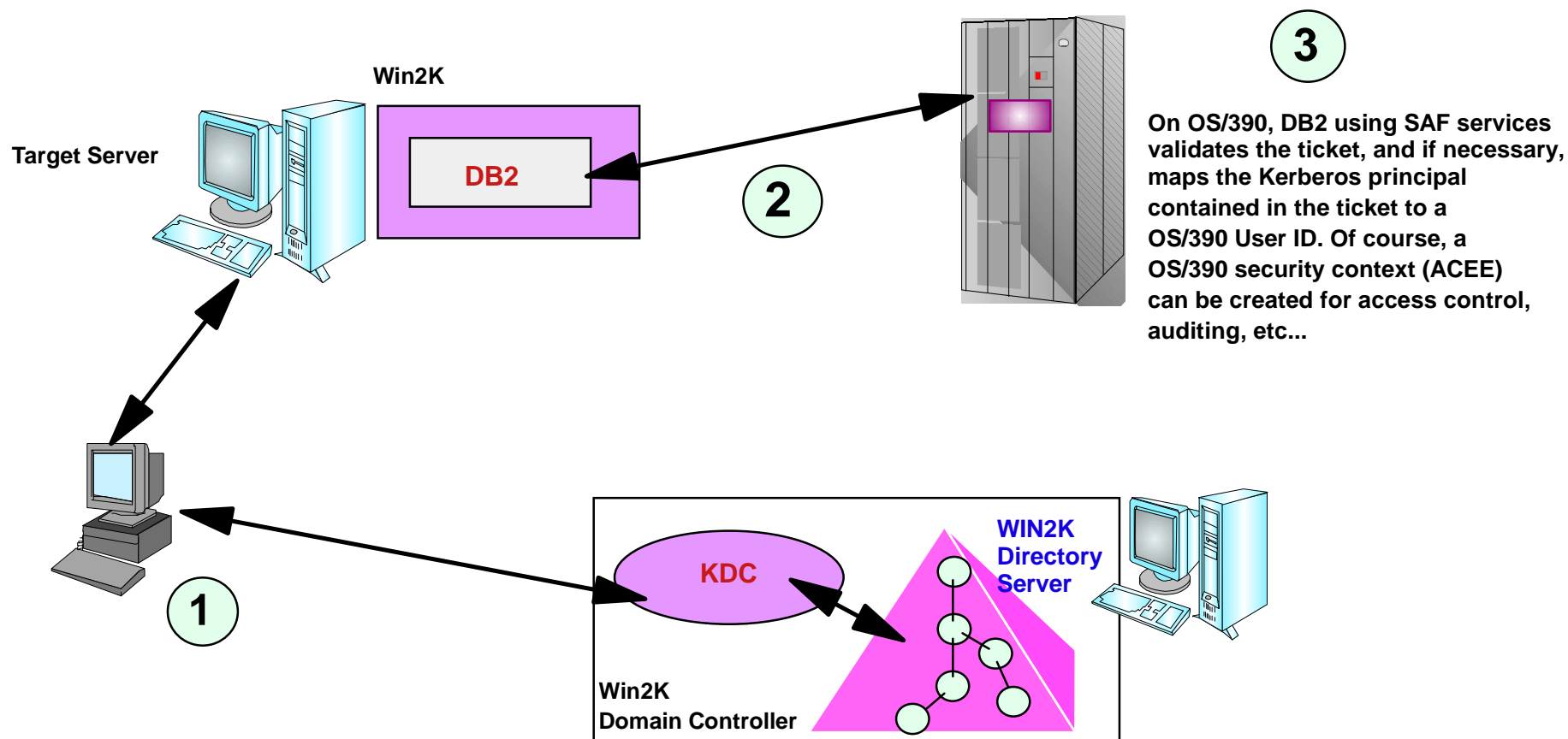
# Network Authentication Service...



## OS/390 and WIN2K Kerberos Domain

The client authenticates to the KDC, and obtains a ticket for the target server. 1

The assumption in this chart, is that the target server is Win2k running DB2, and the target server makes a request to a DB2 instance on OS/390. The DB2 instance on the target server passes the ticket of the user client on the flow to the OS/390 host. 2



# Network Security and Usability

- **Functions provided by IBM Communications Server for OS/390**
- **TN3270E Server SSL enhancements**
  - Implements SSL negotiation based on enterprise security policy
  - Can force use of SSL based on IP address, hostname, or link
  - Allows use of same port for SSL and non-SSL, simplifying server and client configuration
- **TCP/IP protection of network resources**
  - Controls OS/390 users' access to
    - TCP/IP stack
    - TCP or UDP port
    - Network
  - Uses profiles in the SERVAUTH class
  - Allows grouping of network IP addresses into a "security zone" that you can protect as a RACF resource.



# **z/OS R2 RACF Enhancements**

## UNIVERSAL Groups

- **Goal: You want to connect many (say, 10K) users to a group**
- **Problem: RACF limits you to 5957 users per group**
- **z/OS R2 solution: ADDGROUP xyz UNIVERSAL**
  - Can have an unlimited number of regular users ( USE authority )
  - Limit of 5957 still applies to users with more privilege:
    - users with CREATE, CONNECT, or JOIN in the group
    - users with group-SPECIAL, group-OPERATIONS, or group-AUDITOR
  - Available only for ADDGROUP, not ALTGROUP

## UNIVERSAL Groups...

- **CONNECT user1 GROUP(xyz) AUTH(use)**
  - updates user1 USER profile to show a connection to xyz.
  - does not update xyz GROUP profile.
  
- **LISTGRP xyz will not show the regular users**
  - they are not actually present in the GROUP profile
  - listing would be difficult to use given its size, anyway
  - for reporting, use IRRDBU00 output
  
- **LISTUSER user1 will show xyz as one of the user's groups**
  
- **RACROUTE REQUEST=VERIFY will include xyz in the ACEE**
  - access lists with xyz in them will work as you expect

## SAF Trace

- **Provides tracing of RACROUTE, SAF callable service, and ICHEINTY requests to aid problem diagnosis**
- **Enabled via RACF subsystem SET TRACE command**
- **Can specify which requests to trace and which address spaces to trace**
  - Example: SET TRACE( JOBNAME(xyz) RACROUTE( TYPE(1) ))
    - will trace all RACROUTE REQUEST=AUTH from job xyz
  - SET TRACE( ASID(25) DATABASE(ALTER) )
    - will trace all ICHEINTY ALTER, ADD, DELETE, RENAME from address space 25
- **Trace goes to GTF, like other RACF SET TRACE output**
- **Use IPCS to read the trace, with the GTF USR command**

## Cross-System VLF Enhancement

- **IRRACEE class in VLF helps improve performance by caching ACEEs for later reuse**
- **Problem: If system A and system B share the RACF database, a USER profile change from system A will purge all the cached ACEEs on system B**
- **Solution: Use XCF to communicate between z/OS R2 systems:**
  - System A can tell system B exactly which ACEE changed
  - System B can purge just the changed ACEEs, not all of them
  - Requires RACF sysplex communications
- **Does not help in all cases:**
  - Group changes or port-of-entry changes could still cause purging
  - However: most purging comes from user profile changes

## Coupling Facility Error Enhancement

- **RACF Data Sharing mode uses Coupling Facility (CF) in a sysplex as a large data buffer**
- **Improves performance**
- **Problem: CF errors treated as RACF database I/O errors**
  - Can cause ABENDs
  - Has caused problems like IMS subsystem failures
- **Solution: In z/OS R2, if CF failure occurs, RACF will attempt to wait for a CF REBUILD operation to fix the problem, and retry the CF operation**

# Other z/OS R2 Security Server Enhancements

# z/OS R2 Network Authentication Service Enhancements

- **Supports three Kerberos encryption methods:**
  - DES (previously supported in R10)
  - Triple DES
  - DES with derivation keys
- **Supplies kpasswd and kadmin client commands to run on z/OS**
  - allows administration of foreign Kerberos realms.
- **Additional exploiters:**
  - LDAP server and client
  - FTP, TELNET, RSH



## z/OS R2 LDAP Server Enhancements

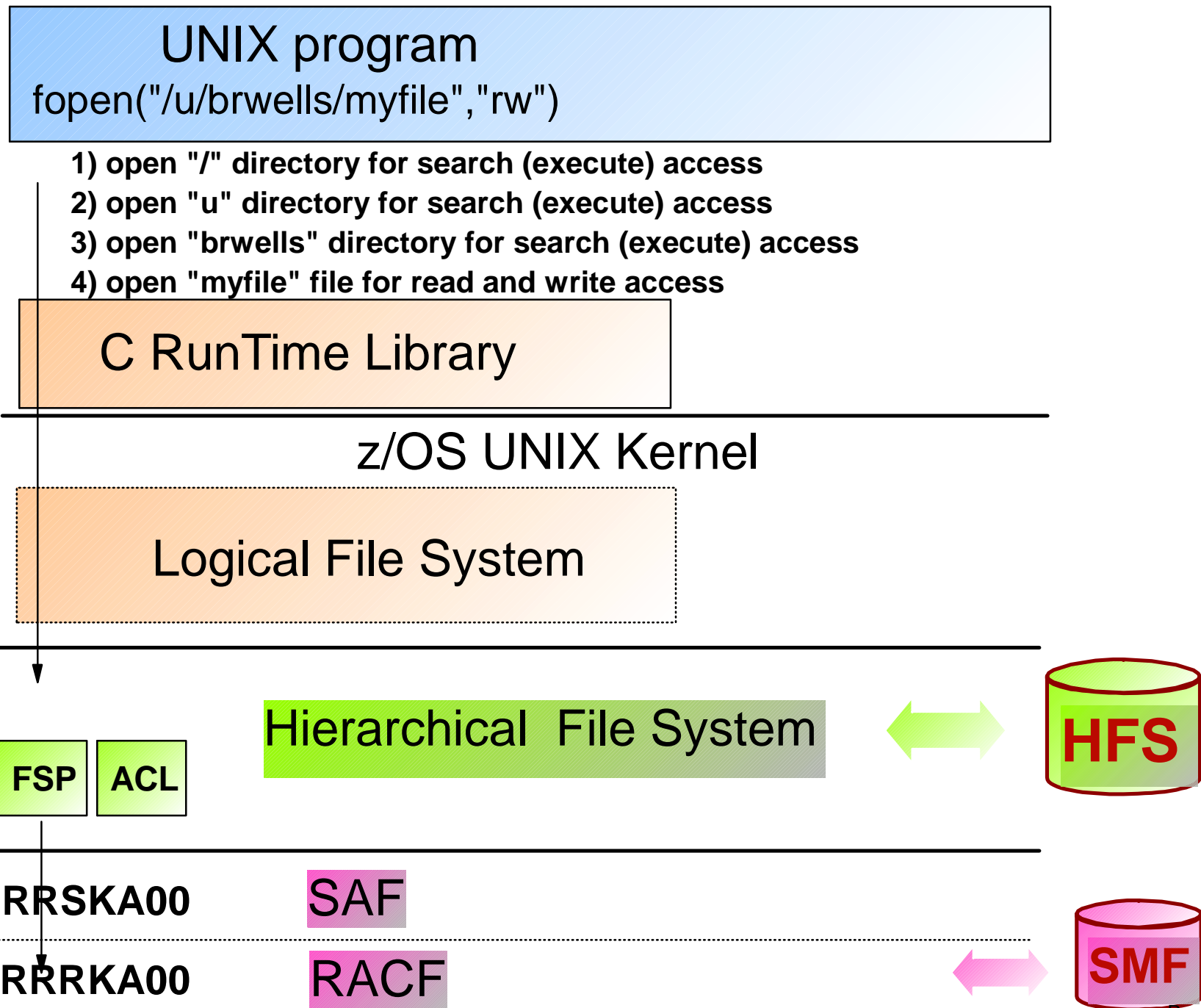
- **Ability to manage USER->GROUP connections**
  - i.e. CONNECT command support
- **Support for LNOTES, NDS, and KERB segments for USER profiles**
- **Ability to search for a**
  - USER via UID
  - GROUP via GID
- **Support for authentication via Kerberos V5**

# **z/OS R3 RACF/SAF Enhancements: UNIX File Security Enhancements**

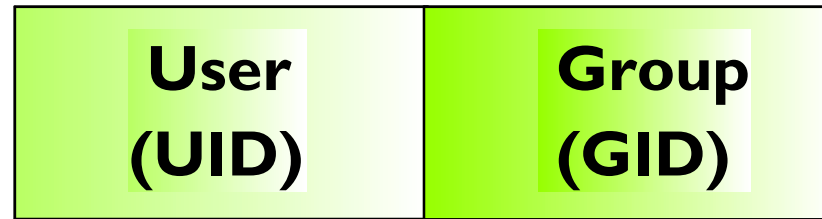
# UNIX File Security

- **UNIX invokes RACF through SAF services**
- **No profiles in RACF database**
- **Access control by permission bits and (NEW) access control lists (ACLs)**
  - read, write, execute permissions (non-hierarchical)
  - POSIX-compliant 'owner', 'group', 'other' classes
  - ACL entries for individual users and groups
- **File security info stored with file in file system**
  - owning UID and GID
  - permission bits and ACLs
  - audit settings
  - extended attributes (APF, program-controlled, etc)

# Access Checking Architecture



File Owner



Permission Bits



**oedit /etc/profile**

**User**

As per the UNIXPRIV profile  
RESTRICTED.FILESYS.ACCE!

<b>effective UID</b>
<b>effective GID</b>
<b>Supplemental Groups</b>

IF no access, check  
SUPERUSER.FILESYS  
in UNIXPRIV class

## Making the RESTRICTED attribute applicable to UNIX files

- **UNIX 'OTHER' bits analogous to RACF profile UACC**
  - but RESTRICTED attribute does not apply by default
- **Define RESTRICTED.FILESYS.ACCESS in the UNIXPRIV class with UACC(NONE)**
  - RESTRICTED applies to 'OTHER' bits system-wide
- **For exceptions, permit RESTRICTED user with READ access**
  - This does **not** grant access to the file (that's what an ACL is for), it just allows the 'OTHER' bits to be checked

## Access Control Lists (ACLs)

- **Loosely based on the POSIX draft (never adopted)**
  - similar to the Solaris implementation
- **Contained within the file system**
  - file security is portable
- **Enabled with SETROPTS CLASSACT(FSSEC)**
  - Can be defined prior to activating FSSEC
- **Deleted automatically with file**
  - even on downlevel systems

## Access Control Lists (ACLs) ...

- **Are displayed with the getfacl UNIX command and created, modified, and deleted with the setfacl UNIX command**
  - Must be UID(0), file owner, or have READ access to UNIXPRIV profile SUPERUSER.FILESYS.CHANGEPERMS
  
- **Can contain a maximum of 1024 entries**
  - an entry consists of a type (user or group) and identifier (UID or GID) and permissions (read, write, and execute)
  
- **Support inheritance**



# File Access Control with Permission Bits and ACLs

## Permission Bits

<b>OWNER</b> rwx	<b>GROUP</b> rwx	<b>OTHER</b> rwx
<b>User1</b> rwx	<b>Group1</b> rwx	As per UNIXPRIV profile RESTRICTED.FILESYS.ACCESS  IF no access, check SUPERUSER.FILESYS                    or SUPERUSER.FILESYS.ACLOVERRIE
<b>User2</b> rwx	<b>Group2</b> rwx	
<b>Usern</b> rwx	<b>Groupn</b> rwx	

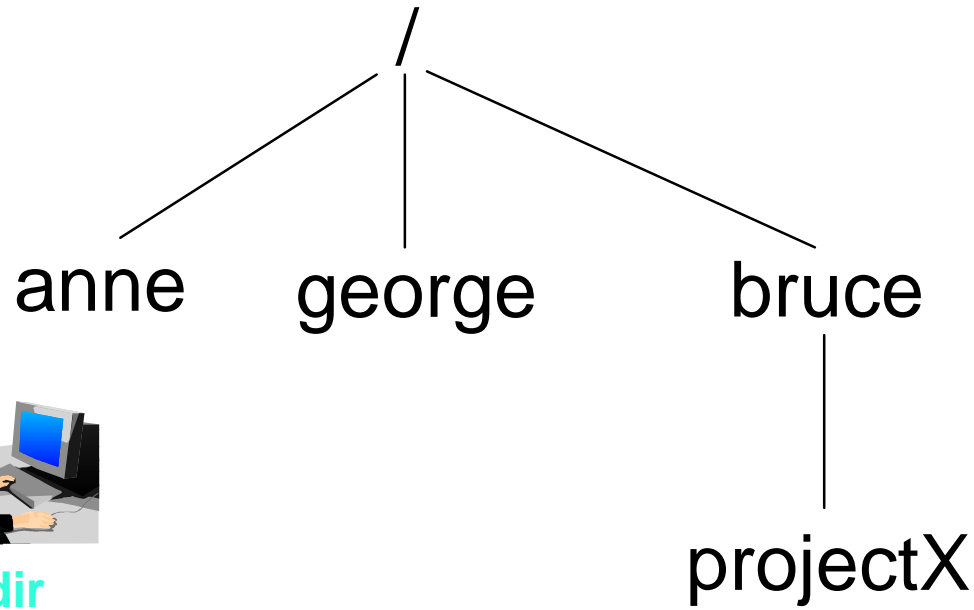
IF FSSEC class active

**A C L**  
c o i  
c n s  
e t t  
s r  
s o  
l

# ACL Inheritance

- Can establish default (or 'model') ACLs on a directory
- Get automatically applied to new files/directories created within the directory
- Separate default used for files and subdirectories
- Reduces administrative overhead

# ACL Inheritance ...



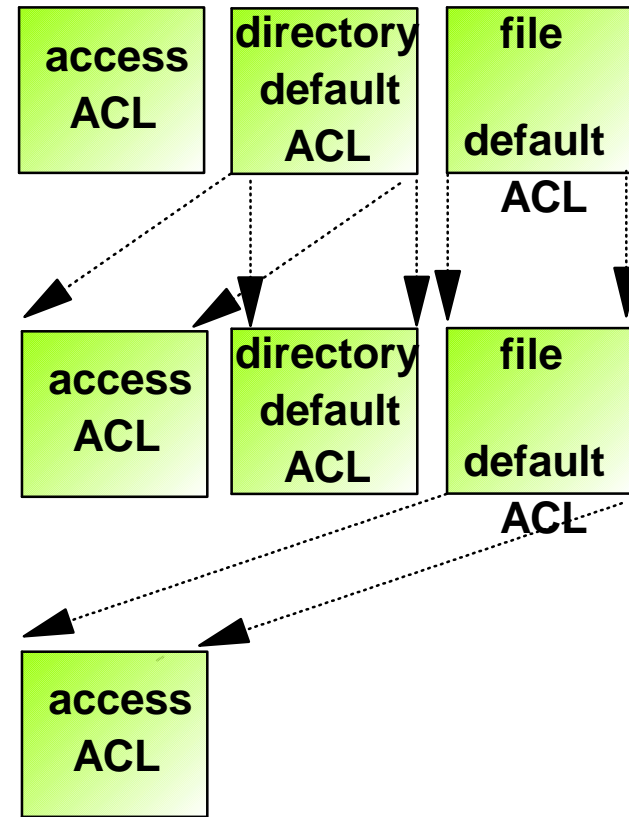
`mkdir /u/bruce/projectX`



`oedit /u/bruce/projectX/status`

projectX

- status



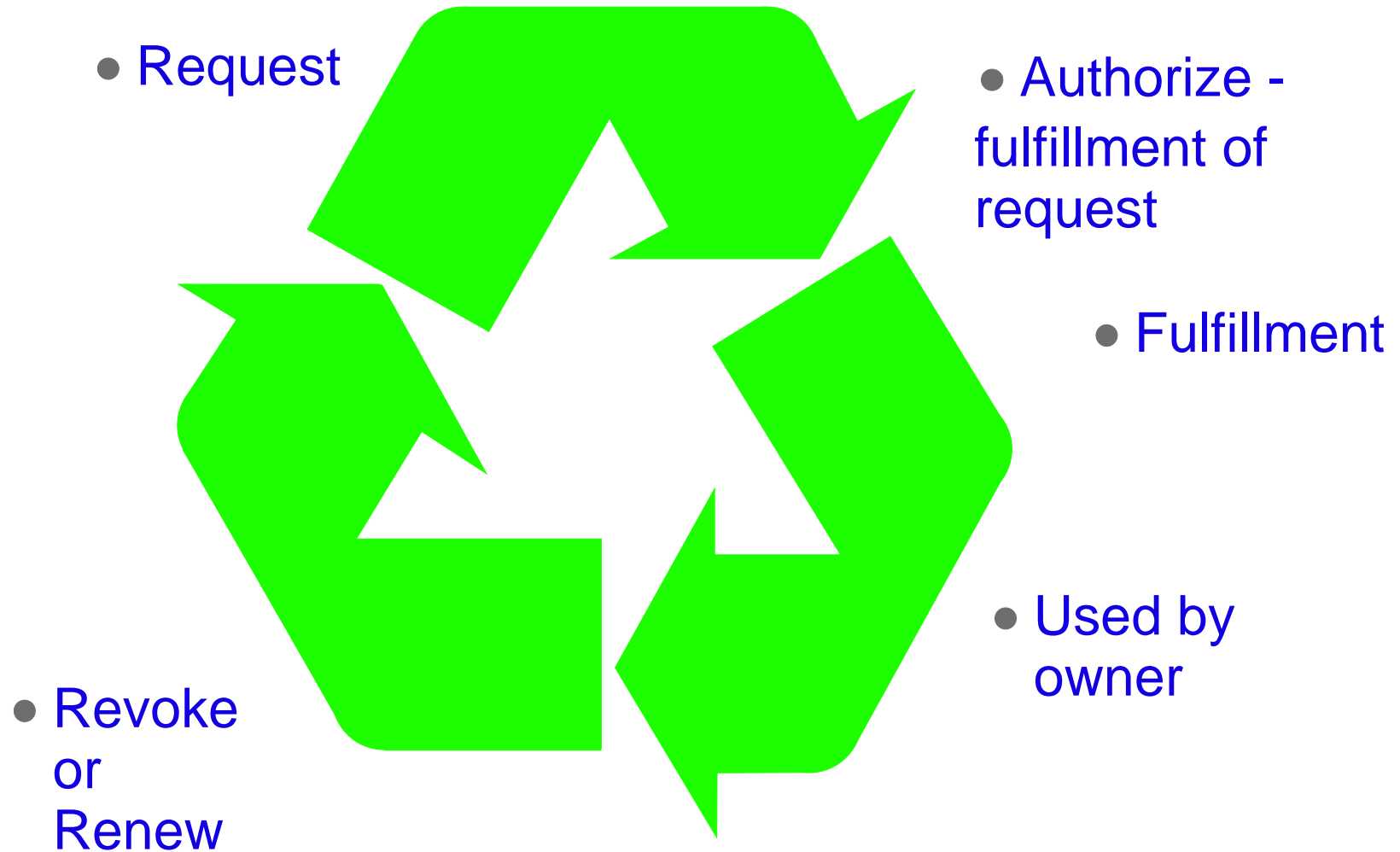
# **z/OS R3 PKI Services**

## Introduction

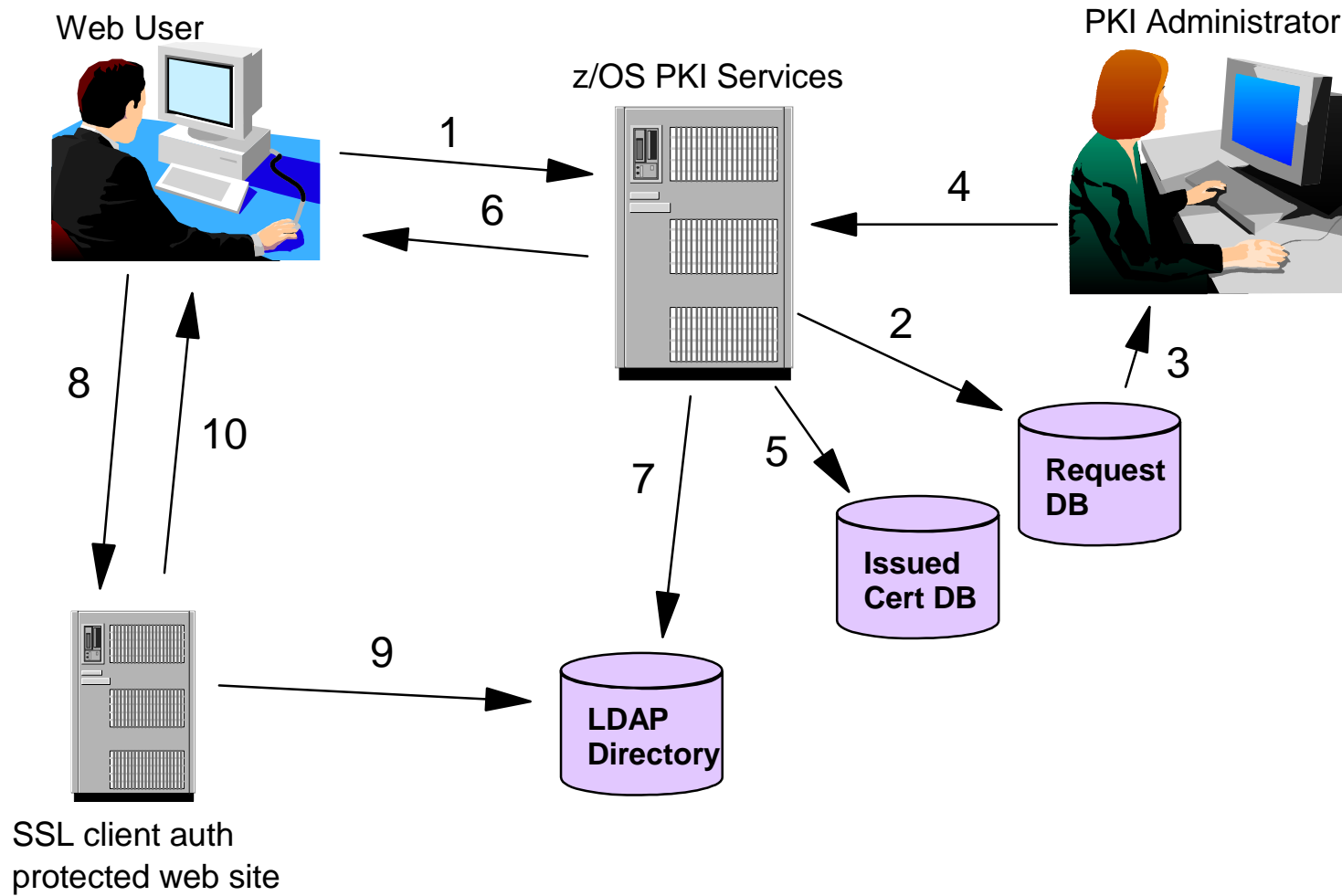
### ● **What is PKI Services?**

- New component of the z/OS Security Server
  - Always enabled but closely tied to RACF
- Complete Certificate Authority (CA) package
  - Full certificate life cycle management
    - ✓ User request driven via customizable web pages
    - ▶ Browser or server certificates
      - ✓ Automatic or administrator approval process
    - ▶ Administered using same web interface
      - ✓ End user / administrator revocation process
- Manual - "z/OS Security Server PKI Services Guide and Reference"

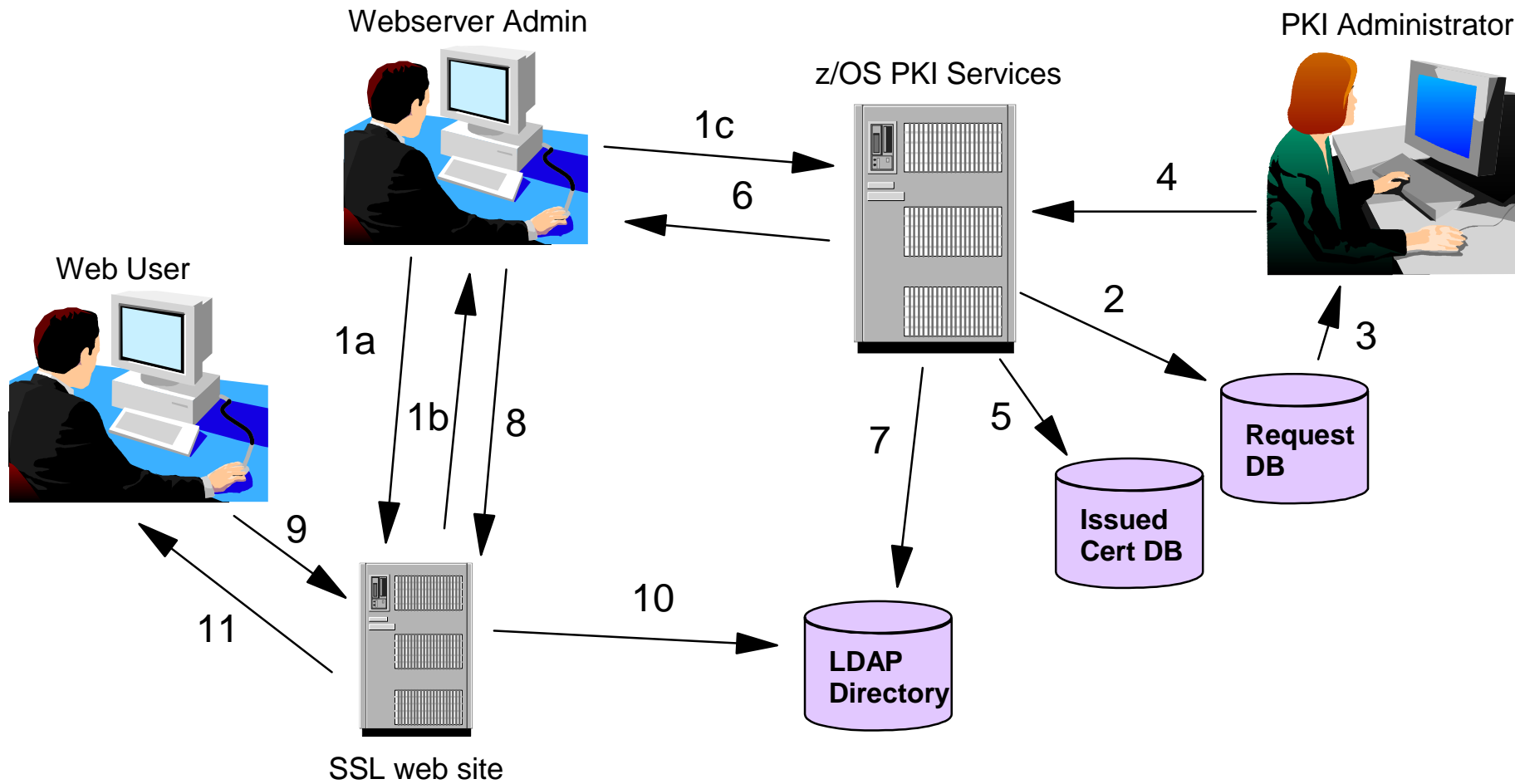
# Certificate Life Cycle



# Browser Certificates



# Server Certificates





# z/OS PKI Services Architecture

## ● HTTP Server

- Provides browser/CGI interface for end-users and administrators
  - Web page logic defined in certificate templates file
  - CGIs - Read template file, control flow
    - ✓ Optional customer provided exit - pkiexit
    - ✓ Invoke z/OS PKI Services through SAF interface R\_PKIServ

## ● R\_PKIServ - SAF callable service backed by RACF (or other)

- End-user functions - Request, retrieve, verify, revoke, or renew a certificate
- Administrator functions - Query, approve, modify, or reject certificate requests, query and revoke issued certificates
- Interface to call PKI Services
- SMF auditing

## ● PKI Services Daemon

- Services threads for incoming requests
- Background threads for certificate/certificate revocation list (CRL) issuance
- VSAM DBs for requests (ObjectStore) and issued certificate list (ICL)

# z/OS PKI Services Architecture...

- **Open Cryptographic Services Facility (OCSF) and Open Cryptographic Enhanced Plug-ins (OCEP)**

- Provided the crypto facilities for PKI Services
  - OCEP - Access to CA certificate and private key in RACF
  - OCSF - BSAFE or ICSF (Hardware) crypto engines

- **LDAP Directory**

- Publication of issued certificates and CRLs

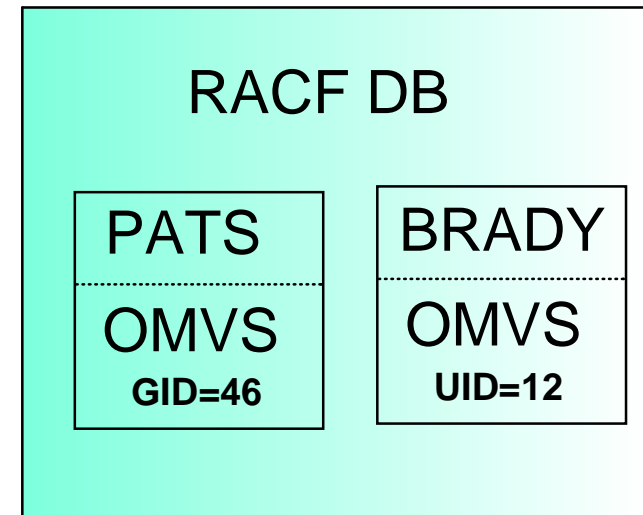
# **z/OS R4 Security Server Enhancements**

## Prevention of shared UID/GID

- **New SHARED.IDS profile in the UNIXPRIV class**
- **Acts as a system-wide switch to prevent assignment of an ID which is already in use**
- **No generic characters allowed in name: discrete profile name must be used**
- **Requires AIM stage 2 or 3**
- **Does not affect pre-existing shared IDs**
  - Customer must clean those up separately, if desired
    - Not a pre-req for using the new support
  - Can use IRRICE report to find shared UIDs
    - Can modify this report to find shared GIDs

## Prevention of shared IDs ... Example

- **RDEFINE UNIXPRIV SHARED.IDS UACC(NONE)**
- **SETROPTS RACLIST(UNIXPRIV) REFRESH**
- **ADDUSER MARCY OMVS(UID(12))**
  
- **ADDGROUP ADK OMVS(GID(46))**



**IRR52174I Incorrect UID 12. This value is already in use by BRADY.**

**IRR52174I Incorrect GID 46. This value is already in use by PATS.**

## Prevention of shared IDs ... SHARED keyword

- **There are valid reasons to assign a non-unique UID/GID**
  - E.G. Assigning UID(0) to started task user IDS
- **Do so using the new SHARED keyword in the OMVS segment of the ADDUSER, ALTUSER, ADDGROUP, and ALTGROUP commands**
- **SHARED requires SPECIAL, or at least READ authority to SHARED.IDS**
  - Profile level audit settings can be used to log successes and failures to SHARED.IDS

## SEARCH enhancement to map UIDs and GIDs

- **SEARCH CLASS(USER) UID(0)**  
**OMVSKERN**  
**BPXOINIT**  
**SUPERGUY**
- **SEARCH CLASS(GROUP) GID(99)**  
**RACFDEV**
- **SEARCH CLASS(USER) UID(1234567)**  
**ICH31005I NO ENTRIES MEET SEARCH CRITERIA**

## Automatic UID/GID Assignment

- **New AUTOUID keyword in the OMVS segment of the ADDUSER and ALTUSER commands**
- **New AUTOGID keyword in the OMVS segment of the ADDGROUP and ALTGROUP commands**
- **Derived values are guaranteed to be unique**



**ADDUSER MELVILLE OMVS(AUTOUID)**

**IRR52177I User MELVILLE was assigned an OMVS UID value of 4646**

**ADDGROUP WHALES OMVS(AUTOGID)**

**IRR52177I Group WHALES was assigned an OMVS GID value of 105.**



## Automatic UID/GID Assignment ... BPX.NEXT.USER

- **Uses APPLDATA of new BPX.NEXT.USER profile in the FACILITY class to derive candidate UID/GID values**
- **APPLDATA consists of 2 qualifiers separated by a forward slash ('/')**
  - left qualifier specifies starting UID value, or range of UID values
  - right qualifier specifies starting GID value, or range of GID values
  - qualifiers can be null, or specified as 'NOAUTO', to prevent automatic assignment of UIDs or GIDs

## Obtaining this new function

- **All of this new function is available on OS/390 V2R10 through z/OS V1R3 via APAR OW52135**
  - PTF UW89970 (OS/390 V2R10, z/OS R1)
  - PTF UW89971 (z/OS R2)
  - PTF UW89972 (z/OS R3)
- RACF ISPF Panels **NOT** updated via these PTFs
- Full function (including panels) available in z/OS R4
- For more information:
  - RACF Home Page What's New section
    - <http://www.ibm.com/servers/eserver/zseries/zos/racf/whatsnew.html>
  - z/OS R4 books

## z/OS R4 UNIX File Group-Ownership

- **UNIX Files have an owner (UID) and an owning group (GID)**
- **Previously owning group inherited from directory**
- **Can now choose:**
  - Assign from owning group of directory, as before
  - Assign from effective GID of user creating the file
- **RDEFINE UNIXPRIV FILE.GROUPOWNER.SETGID**
  - Directory set-gid on: assign from directory
  - Directory set-gid off: assign from user

## z/OS R4 Basic PADS Usability / Security

- **PADS Usability & Security Improvement**

- **Suppose:**

- User runs program ABC
- You want to allow READ to ABC.DATA from program ABC
- However, ABC invokes ABC2, and ABC2 does the OPEN

- **Previously:**

- RDEFINE PROGRAM ABC\* ADDMEM('ABC.LINKLIB'//NOPADCHK)
- PERMIT ABC.DATA ID(\*) ACCESS(READ)  
WHEN(PROGRAM(ABC2))

## z/OS R4 Basic PADS Usability / Security...

- **New alternative:**

- RDEFINE PROGRAM ABC\* ADDMEM('ABC.LINKLIB'//NOPADCHK)
- PERMIT 'ABC.DATA' ID(\*) ACCESS(READ)  
WHEN(PROGRAM(ABC))

- **Better Usability**

- Administrator needs less knowledge about application structure
- Less chance for error

- **Better security**

- PERMIT 'SYS1.LINKLIB' ID(SYSPROG) ACCESS(UPDATE)  
WHEN(PROGRAM(GIMSMP))

## z/OS R4 Program Security Modes

- **Two modes of operation**

- BASIC (original/default)
- ENHANCED (better security)
  - PADS and EXECUTE work only from programs defined as MAIN

- **RDEFINE FACILITY IRR.PGMSECURITY**

- APPLDATA('BASIC') --> BASIC mode
- APPLDATA('ENHANCED') --> ENHANCED mode
- Other values --> ENHANCED-WARNING mode

- **Three types of programs**

- MAIN        RDEF PROGRAM xyz ... APPLDATA('MAIN')
- BASIC       RDEF PROGRAM xyz ... APPLDATA('BASIC')
- normal      RDEF PROGRAM xyz ...

- **You still need to keep environment clean!**

## z/OS R4 Program Security Modes...

- **Consider: // EXEC PGM=AAA  
TSOEXEC AAA**

- AAA then OPENS AAA.DATA, and you want to use PADS to allow this access;  
or

- AAA calls AAA2, and AAA2 OPENS AAA.DATA and you want to use PADS

- **If running in ENHANCED mode, this will work only if**

- you define AAA as MAIN:

- RDEFINE PROGRAM AAA ADDMEM('library.name'//NOPADCHK)  
APPLDATA('MAIN')

or

- you define AAA or AAA2 as BASIC:

- RDEFINE PROGRAM AAA ADDMEM('library.name'//NOPADCHK)  
APPLDATA('BASIC')

- **Provides better security and safety from malicious users**

## z/OS R4 Program Security Modes...

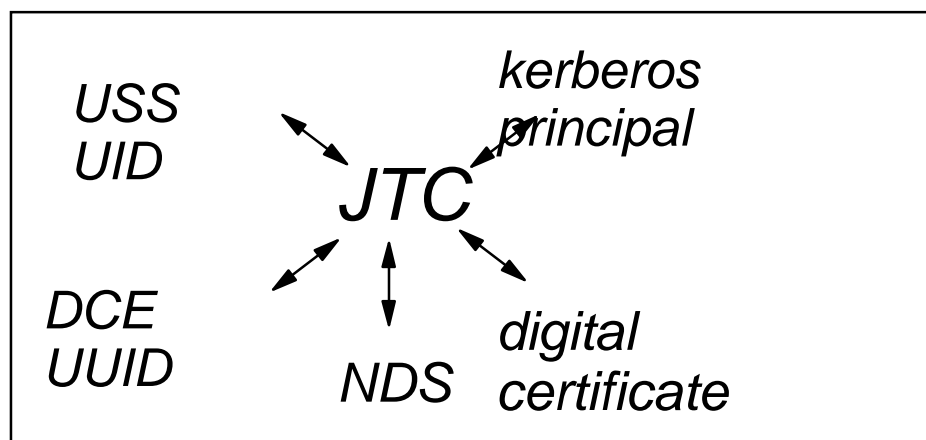
- **Consider: TSO command AAA, invoked at READY or within ISPF, or via TSO/E CALL command**
  - AAA then OPENS AAA.DATA, and you want to use PADS to allow this access;
  
- **If running in ENHANCED mode, this will work only if**
  - you define AAA as BASIC:
    - RDEFINE PROGRAM AAA ADDMEM('library.name'//NOPADCHK)  
APPLDATA('BASIC')
    - or
  - AAA runs APF-authorized or via TSOEXEC and you define it as either BASIC or MAIN (preferred)



# **z/OS R4 Enterprise Identity Mapping (EIM) Support**

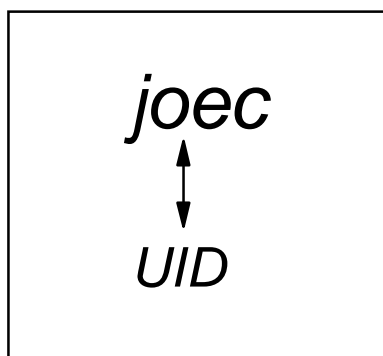
# Enterprise User Problems

## z/OS

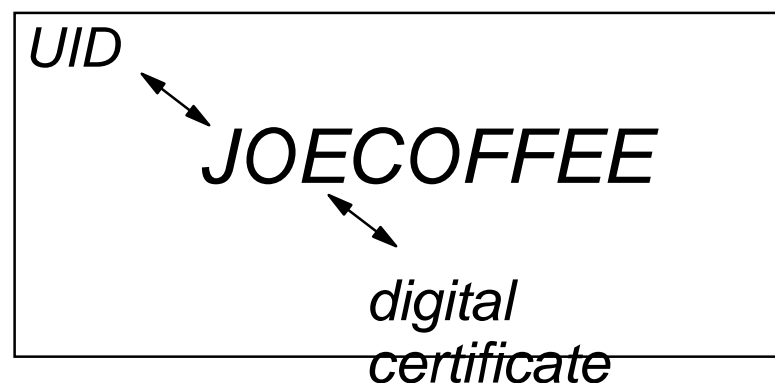


Joe T.  
Coffee

## AIX



## OS400



# The Enterprise User Problems

- **Many userids represent an enterprise user**
  - operating systems with different registries
  - application specific user identification schemes
  - distributed technologies for user identification
- **System/application specific authorization mechanisms**
- **Managing the enterprise user**
  - creating / changing / deleting
  - auditing a user's activity

## z/OS R4 Enterprise Identity Mapping (EIM) Support

- **New eServer cross-platform initiative**
- **Infrastructure component**
  - New services and API (C/C++)
  - LDAP extensions
- **Allows development of servers and administrative applications to**
  - Transform user IDs as work flows across systems
  - Administer multi-system, cross-platform ID mappings
- **EIM provides a foundation to solve the Enterprise User problems**
- **RACF support in z/OS R4: new EIM segment, new LDAPBIND class**

# z/OS R4 Network Authentication Service (Kerberos) Extensions

- Support for IPV6 Network Addressing
- NDBM Support
  - Supports KDC database in UNIX file system instead of RACF database
  - Better interoperability with other platforms
    - remote administration via kadmin
    - database propagation
  - However:
    - May not scale as well as RACF database configuration for large numbers of users
    - SYSPLEX support not as robust
    - May require administering users in both RACF and NDBM

## z/OS R4 PKISERV Enhancements

- **email Notification For**
  - Completed Certificate Requests
  - Certificate Expiration Warnings
- **MAIL, STREET, POSTALCODE qualifiers for DNs**
- **Support for PKCS#7 Certificate Chains**
- **Use PCI Crypto Coprocessor to generate key pairs**

## z/OS R4 LDAP Server Enhancements

- **New authentication methods:**
  - CRAM-MD5
  - DIGEST-MD5
- **SSL V3 and TLS V1 support**
  - including support for conversations that start unprotected and then switch to SSL/TLS protection
- **TDBM ACL enhancements**
  - attribute-level access control
  - ability to explicitly deny access to information
- **TDBM Modify DN support, including subtree relocation**
- **Server Activity Logging**
- **Removal of RDBM; only TDBM and SDBM supported**

## z/OS R4 Firewall Technologies Enhancements

### ● **SYSPLEX support for Dynamic VIPA**

- DVIPA a.b.c.d on System A
- a.b.c.d moved to System B
- Firewall ISAKMP server will recognize this and
- Move Security Association (SA) from A to B and
- Renegotiate tunnel with remote server



## z/OS R4 System SSL

- **Added AES cipher support for SSL V3 and TLS V1**
- **IPV6 Network Address Support**
- **CRL Caching in storage for improved performance**
- **SYSPLEX SSL/TLS Session Cache**
  - allows session takeover on another system
- **RACF keyring enhancements**
  - private key storage in ICSF
  - applications can be allowed to use other user's keyrings
- **New APIs**
  - Build/manage key database (like gskkyman does)
  - use kdb or keyring certificates for non-SSL purposes
  - build/process PKCS#7 messages for application communication
  - gskkyman enhancements for
    - export/import of PKCS#12 V3 and PKCS#7 certificates
    - creation of Digital Signature Standard certificates (FIPS 186-1)
    - modification of certificate labels

# Additional Information

## Reminder: Service End Dates

- **Already out of service:**
  - All OS/390 Releases below V2R10

# IBM Manuals

## ● On the web, in either PDF or Book Manager formats:

- Security Server for OS/390 V2R10:  
[http://publibz.boulder.ibm.com/cgi-bin/bookmgr\\_OS390/Shelves/ICH1K132](http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/ICH1K132)
  - Security Server for z/OS R4:  
[http://publibz.boulder.ibm.com/cgi-bin/bookmgr\\_OS390/Shelves/ICHZBK31](http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/Shelves/ICHZBK31)
  - OS/390 library: <http://www.ibm.com/servers/s390/os390/bkserv/index.html>
  - z/OS library: <http://www.ibm.com/servers/eserver/zseries/zos/bkserv/>
  - General Site: <http://publibfp.boulder.ibm.com/cgi-bin/bookmgr/LIBRARY>
- ## ● Redbooks:
- <http://www.ibm.com/redbooks>

# RACF Home Page

- <http://www.ibm.com/servers/eserver/zseries/zos/racf/>
  - Latest release information on RACF
  - Links to announcement letters
  - Sample code
  - Frequently Asked Questions
  - RACF user group information
  - RACF-L information
  - Presentations on RACF-related topics

## OS/390 Security Home Page

- <http://www.ibm.com/servers/eserver/zseries/zos/security>
  - Overview of security concepts, including animations
  - Overview of S/390, zSeries, OS/390, and z/OS security functions
  - Links to related web sites for OS/390 and z/OS components