

# Adabas SAF Security Operations

This document describes ADASAF operations.

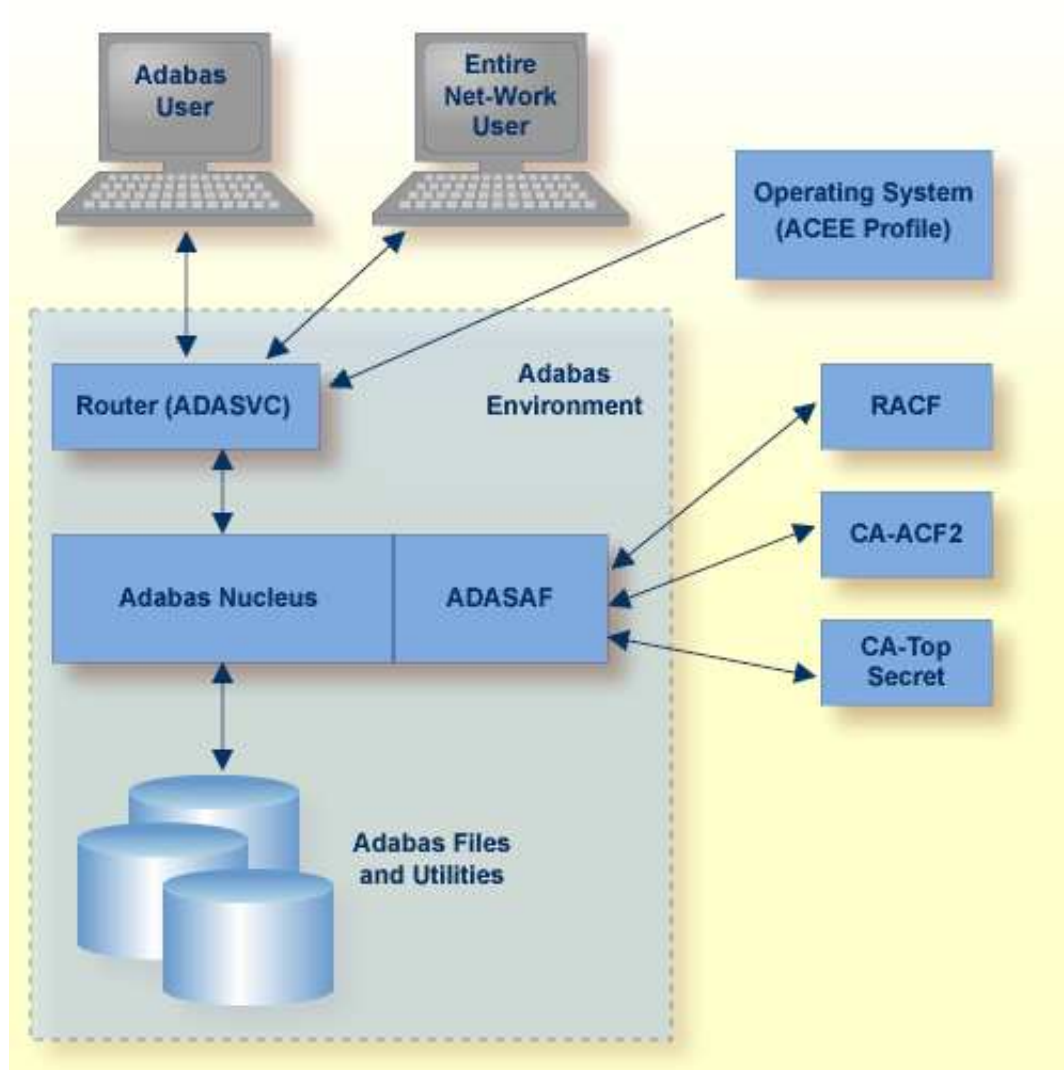
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## ADASAF Components

ADASAF has three main components:

- The ADASAF main module, which operates in each secured Adabas address space
- Router extensions, which are linked with the Adabas SVC
- Online administration and monitoring system, which is a component of the Adabas Online System

As shown in the graphic below, all traffic between the database users and Adabas is controlled by the Adabas router. When ADASAF is installed, the ADASAF component attached to the Adabas router controls all access to the Adabas nucleus.



## Adabas with ADASAF

All users must log on to their system using their Logon ID, usually a user name or code. Through the operating system or TP monitor, the installed security package checks the authorization of the Logon ID.

When calls are from a remote workstation or non-IBM platform, the Logon ID and logon password must be given to ADASAF using a remote logon procedure, as described in the section Logging On to a Database. As an alternative to the remote logon procedure, you may configure ADASAF to use the node name or link name of the remote user as the SAF ID. Obviously, these node or link names must be defined as users in the external security system, with the appropriate access rights to Adabas resources.

For Adabas, the router contains a security exit that extracts the user's Logon ID from the ACEE for the user. Even Adabas itself cannot be started unless the user starting the nucleus has proper authority. Through the SAF interface, ADASAF requests the proper authority from the external security packages whenever one of the following events occurs:

- A nucleus or utility begins operation;

- A user logs on to Adabas;
- A user issues an Adabas call;
- A user logs off Adabas;
- A user issues an Adabas operator command from an MVS console.

## Starting a Utility or Nucleus

When starting an Adabas nucleus, utility or single-user mode batch job, ADARUN calls ADASAF, which checks that the starting user has access to the appropriate resource. The resource name has the format:

*ppp**dbid*.*SVC**svc*

where

Value	Description
<i>ppp</i>	Represents the last three characters of the program name specified by the ADARUN PROG= parameter. For example, NUC for a nucleus, CMP for the ADACMP utility or USR for a single-user mode batch job.
<i>dbid</i>	Specifies the Adabas Database ID in the selected format (3 or 5 digits with leading zeroes, or without leading zeroes). See the configuration parameter DBFLEN for more information.
.	Optional delimiter character, depending on the setting of the DELIM parameter.
<i>SVC</i> <i>svc</i>	The characters SVC followed by the 3-digit decimal number of the Adabas SVC used by this database.

When starting a nucleus, ADASAF uses the access level to determine whether to run in warn mode (that is, violations are logged, but the access is still allowed) or fail mode (violations result in failure, for example response code 200). If the starting user has only read access to the resource, ADASAF runs in warn mode. If the starting user has update access, ADASAF runs in fail mode.

If the starting user has no access to the resource, or the resource has not been defined, the nucleus abends with a U0042. For utilities, ADASAF requires read access to the appropriate resource. If the starting user does not have read access, or the resource has not been defined, the utility abends with a U0042.

### Resource Name Examples

The following Adabas resource name value is for starting the Adabas nucleus for database 1, which runs under SVC 237 (all possible entity constructions are shown):

Resource Name	Values for DELIM and DBFLEN Configuration Parameters
ENTITY=NUC001SVC237	DELIM= N, DBFLEN=0
ENTITY=NUC001.SVC237	DELIM= Y, DBFLEN=0
ENTITY=NUC00001SVC237	DELIM= N, DBFLEN=1
ENTITY=NUC00001.SVC237	DELIM= Y, DBFLEN=1
ENTITY=NUC1SVC237	DELIM= N, DBFLEN=2
ENTITY=NUC1.SVC237	DELIM= Y, DBFLEN=2

**Note:**

Each utility program requires a definition in the external security database.

## Logging On to a Database

- Terminal Logon
- Remote Workstation Logon
- Alternatives to Remote Workstation Logon
- Logging On to Multiple Targets
- Logging Off a Database

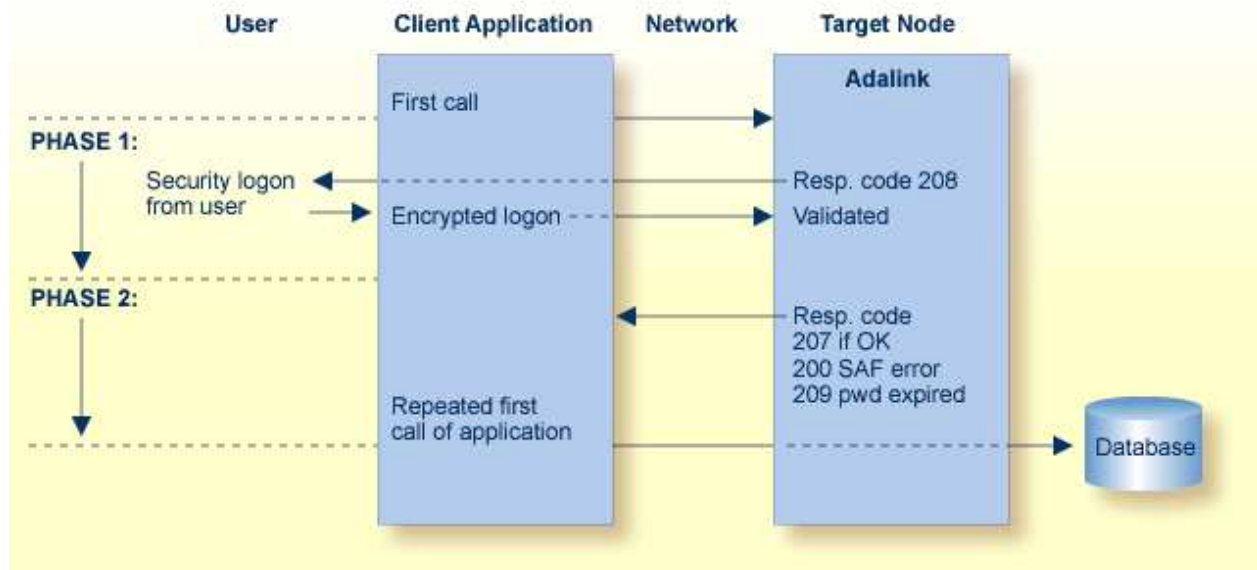
### Terminal Logon

Normally, logging on to a database is done using an Adabas OP command. However, not all applications use an explicit OP command. ADASAF does not make any security check until the user actually attempts to access or update a file, at which point the user's identity will be authenticated.

If one of the non-activity timeout limits expires, the logon must again be validated, just as when logging on to Adabas for the first time.

### Remote Workstation Logon

The logon from a remote workstation client comprises two phases.



### ADASAF Remote Workstation Logon Sequence

During the initial request from the client program, ADASAF checks to ensure that the user is allowed to log on. The Adabas link routine, which actually performs the check, requires that the client send a Logon ID and security package password to the target.

When the initial command is sent from the client, ADASAF at first rejects the command with response code 208 (start of phase 1). This informs the client that an encrypted Logon ID and password are needed at the target for verification. See the section ADASAF User Exits for more information.

The encrypted Logon ID and password are then sent by the client and validated by the target, and the target returns response code 207 indicating successful completion (start of phase 2). If the duration of phase 1 is more than 60 seconds, a security violation occurs. The original user call is then sent by the client link routine to the database, where the user request is executed.

The Logon ID and password are prompted by the Adabas link routine included in the Entire Net-Work running on the supported platforms.

Entire Net-Work is a prerequisite for ADASAF workstation support. For more information, see the related *Entire Net-Work* documentation.

### Alternatives to Remote Workstation Logon

As an alternative to Remote Workstation Logon, you can configure ADASAF to use either the Entire Net-Work node or link name of the remote user as the SAF Logon ID. This may be useful when the issuer of the remote calls cannot prompt for a User ID and password (for example, if it is a server rather than a client). For more information, see the description of the REMOTE parameter.

### Logging On to Multiple Targets

If multiple ADASAF-secured targets are being controlled and these targets reside on different physical machines or nodes, each target node must have the same Logon ID and password assignment per user as every other target node.

## Logging Off a Database

When users log off a database, they may or may not issue an explicit CL command. By default, a close command indicates the end of ADASAF validity for that user and the user is logged off the security system. If the user again logs on to Adabas, the user's validity and access rights are checked again, as though the user were logging on for the first time.

However, in databases where users have many short-lived sessions (for example, control databases or system file databases), this imposes a considerable overhead on the security system. To log a user on generally involves reading and updating security information and building up the cached security checks anew.

To avoid these overheads, you can instruct ADASAF, via the LOGOFF parameter, to log users off only when they time out (or are stopped) in Adabas, or never to log users off (with the exception that, if ADASAF needs to reclaim memory, it will log off the oldest inactive user).

On the other hand, if a user's security profile changes, ADASAF will continue to use the old profile until the user times out or is stopped. So, if you choose LOGOFF=TIMEOUT and a user's profile changes, you should stop the user via the STOPU operator command or Adabas Basic Services to bring the new profile into effect. If you choose LOGOFF=NEVER and a user's profile changes, use ADASAF Online Services to forcibly log the user off from the security system.

## Accessing and Changing Database Data

- Adabas and Natural Commands
- Cross-Level Security Checking
- Caching of Security Checks
- Adabas Basic Services
- Passwords and Cipher Codes

### Adabas and Natural Commands

ADASAF recognizes three categories of Adabas direct call commands:

- Data access commands (Lx, Sx and HI)
- Data update commands (Ax, Ex and Nx)
- Transaction data commands

The equivalent categories of Natural commands are

- Data access commands (READ, HISTOGRAM, FIND)
- Data update commands (UPDATE, DELETE, STORE)

- Transaction data commands (END TRANSACTION with operand1, GET TRANSACTION DATA, generated OP and CL commands with option 2 set to E). For more information, see the description of the ETDATA parameter.

Only these types of calls have significance for ADASAF and the related security package. ADASAF recognizes and classifies all database calls according to one of the command categories described above and performs the authorization check appropriate to the command category (that is, ATTR=READ for access commands and ATTR=UPDATE for update commands).

The entity constructed for a command check takes one of the following formats:

<i>lvl</i> <i>dbid</i> FIL <i>nnnnn</i>	if DELIM=N
CMD <i>dbid</i> .FIL <i>nnnnn</i>	if DELIM=Y

where

Value	Description
<i>lvl</i>	is the required access level (ACC for access commands and UPD for update)
<i>dbid</i>	represents the Database ID, which is specified in the format selected by the DBFLEN parameter.
<i>nnnn</i>	represents the file number, which is specified in the format selected by the DBFLEN parameter.

For example, assuming that DELIM=Y and DBFLEN=1 (5 digits, with leading zeroes), a user who issues a DELETE against database 1, file 456, must have update access to the resource CMD00001.FIL00456.

If the security package does not recognize the user or entity being validated, or the user does not have sufficient access authority, ADASAF returns the following response code to the user:

- 200 when running in fail mode. Application programs that operate on an ADASAF-protected nucleus must check for a non-zero response code
- Zero (0) when running in warn mode

In either case, security violations can optionally be logged in the nucleus DDPRINT or SAFPRINT output.

## Cross-Level Security Checking

At its simplest, ADASAF validates that a user has the necessary authority to access or modify Adabas files. However, additional levels of security are available to protect inadvertent or unauthorized data access.

This is known as cross-level checking and allows both the user's and the job's access permissions to be verified. For example, users may be given access to production data but only when they access it from a production TP monitor or batch job.

To achieve this level of protection, ADASAF performs two security checks against the same resource profile (CMD00001.FIL00456 in the example above), but for different resource classes:

- the user's User ID is checked against the resource in the class defined by the DBCLASS parameter
- the originating job's User ID is checked against the resource in the class defined by the NWCLASS parameter

If either check fails, the Adabas command is rejected with response 200.

### Choosing the XLEVEL Setting

Set XLEVEL to

- 0: when users' access rights are not dependent on which environment (job) the user runs in
- 1: when certain jobs (for example, test TP monitors or TSO users) are not allowed to access this database
- 2: when certain jobs (for example, test TP monitors or TSO users) are only allowed to access some files on this database
- 3: when different users have different access requirements depending on which job they are running in

The following is an example of using XLEVEL=2.

Assume that user ABC is allowed to update file 456 on database 1 from production CICS but not from TSO; and that user XYZ is allowed to update file 456 on database 1 from production CICS and also from TSO; and that production CICS runs under User ID PCICS.

This would require the definition of the profile CMD00001.FIL00456 in both the DBCLASS and NWCLASS resource classes and granting these permissions (DBCLASS=ADASEC and NWCLASS=XLVADA):

User	Class	Profile Name	Access
ABC	ADASEC	CMD00001.FIL00456	Read, Update
ABC	XLVADA	CMD00001.FIL00456	None
PCICS	ADASEC	CMD00001.FIL00456	None
PCICS	XLVADA	CMD00001.FIL00456	Read, Update
XYZ	ADASEC	CMD00001.FIL00456	Read, Update
XYZ	XLVADA	CMD00001.FIL00456	Read, Update

ADASAF performs the following checks:

1. ABC accesses file 456 from production CICS:



- Does ABC (the individual user) have access to resource ADASEC /CMD00001.FIL00456? Yes.
- Does PCICS (the originating job's user) have access to resource XLVADA /CMD00001.FIL00456? Yes.
- The access is allowed.

2. ABC accesses file 456 from TSO:

- Does ABC (the individual user) have access to resource ADASEC /CMD00001.FIL00456? Yes.
- Does ABC (the originating job's user) have access to resource XLVADA /CMD00001.FIL00456? No.
- The access is rejected and the command receives response 200.

3. XYZ accesses file 456 from TSO

- Does XYZ (the individual user) have access to resource ADASEC /CMD00001.FIL00456? Yes.
- Does XYZ (the originating job's user) have access to resource XLVADA /CMD00001.FIL00456? Yes.
- The access is allowed.

In this way the database resources are protected not only for individuals but also for jobs. A user may only access allowed resources from jobs which also have the necessary access to those resources.

However, suppose the requirement is more complicated:

ABC is allowed to update file 456 on database 1 from production CICS but not from TSO; and user XYZ is allowed to access file 456 on database 1 from TSO but not from production CICS.

ABC's security requirements are satisfied, but XYZ can access file 456 from production CICS, even though it is not desired (because once a user has access to a resource, ADASAF will allow that access from any job which also has the necessary permissions).

To achieve this level of security, it is necessary to set the XLEVEL parameter to 3, which instructs ADASAF to verify a user's access to a resource profile of the format:

*uuuuuuuu.dddddddd.fffffff*

where:

<i>uuuuuuuu</i>	is the User ID of the originating job
<i>ddddddd.fffffff</i>	is the Database ID and file number, as in a standard ADASAF resource profile

The resource profile length must be defined to the security system as 26 rather than 17. Therefore, the following definitions must be made in the security system:

User	Class	Profile Name	Access
ABC	ADASEC	PCICS.CMD00001.FIL00456	Read, Update
XYZ	ADASEC	PCICS.CMD00001.FIL00456	None
XYZ	ADASEC	XYZ.CMD00001.FIL00456	Read

And disallow access to undefined resources (DBUNI=N) or define a profile name ABC.CMD00001.FIL00456 and give user ABC no access to it.

ADASAF now performs the following checks:

1. ABC accesses file 456 from production CICS
  - Does ABC have access to resource ADASEC /PCICS.CMD00001.FIL00456? Yes.
  - The access is allowed.
2. ABC accesses file 456 from TSO
  - Does ABC have access to resource ADASEC /ABC.CMD00001.FIL00456? No.
  - The access is rejected and the command receives response 200.
3. XYZ accesses file 456 from TSO
  - Does XYZ have access to resource ADASEC /XYZ.CMD00001.FIL00456? Yes.
  - The access is allowed.
4. XYZ accesses file 456 from production CICS
  - Does XYZ have access to resource ADASEC /PCICS.CMD00001.FIL00456? No.
  - The access is rejected and the command receives response 200.

## Caching of Security Checks

The results of data access and update checks, both successful and unsuccessful, are cached by ADASAF. There are two levels of caching:

- A generalized resource cache, which contains a given number of user-based entries and holds the profile names for resources that have been successfully checked for this SAF user. Both the number of entries and the number of profile names per entry are configurable by parameter. This cache is particularly effective in conjunction with the LOGOFF=TIMEOUT/NEVER parameter as it precludes the need to log on repetitively to the security system (and re-populate the cached resources) in databases where users frequently log on to Adabas, do a small amount of work and logoff again. Each user entry is  $(256 + (\text{DBNCU} * 17) + (\text{NWNCU} * 17))$  bytes in size and, if there are more users than entries, the oldest entry is overwritten when a new entry is required. The total size of this cache is specified by the GWSIZE parameter.

- The second cache is a quick look-up cache and contains an entry for each Adabas user (the number of entries is set to the value of the Adabas NU parameter, plus 25%, so if NU is 200, this cache will have 250 entries). Each entry contains 96 bytes of fixed information and eight times the value of the MAXFILES parameter for holding information about files that the user has attempted to access. Whenever a user accesses or updates an Adabas file, this cached file list is checked to determine whether the user already has the necessary access level.

## Adabas Basic Services

You can use ADASAF to incorporate protection of Adabas Basic Services into your SAF security repository. This option can be activated on a nucleus-by-nucleus basis using the ABS parameter. There are two levels of security, as follows:

Level	Description
1	Only the main functions are protected. If a user has read access to a main function, all subfunctions are automatically permitted (ABS=1).
2	Subfunctions are also protected. The user must have access to the main function and the subfunction (ABS=2).

The resource check is performed against the resource class specified by the DBCLASS parameter and the resource name is built in accordance with the settings of the DBFLEN and DELIM parameters. Access to undefined resources is governed by the DBUNI parameter.

The following tables define the subfunctions for each Adabas Basic Services function, together with the resource name that is checked (assuming DBFLEN is set to 2 - 5 digits with leading zeros, and DELIM=Y).

Before checking any of the individual resources, ADASAF establishes a user's right to use Adabas Basic Services against this nucleus by verifying that the user has read access to the resource ABSdddd.GENERAL.

**Note:**

The Subfunction Profile (listed in the following tables) is used only when ABS=2 (subfunction protection).

### Session Monitoring Function

<b>Function:</b>	Session Monitoring
<b>Function Profile:</b>	ABSdddd.SESSION

Subfunction	Subfunction Profile*	Access
Display Cluster Members	ABSdddd.CLUSTER	Read
Display Installed Products	ABSdddd.DISINST	Read
Maintain User Profiles	ABSdddd.USER	Read
Display Parameters	ABSdddd.PARM	Read
Modify Parameters	ABSdddd.PARM	Update
Display Queues	ABSdddd.QUEUES	Read
Refresh Nucleus Statistics	ABSdddd.REFSTATS	Read
Current Resource Statistics	ABSdddd.STATS	Read
Maintain TCP/IP URL	ABSdddd.TCPIP	Read
Display Resource Utilization	ABSdddd.RESUTIL	Read
Display Maintenance Levels	ABSdddd.ZAPS	Read

\*Used only when ABS=2 (subfunction protection)

### Checkpoint Maintenance Function

<b>Function</b>	Checkpoint Maintenance
<b>Function Profile</b>	ABSdddd.CHECKP

Subfunction	Subfunction Profile*	Access
List Checkpoints	ABSdddd.CHECKP	Read
Delete Checkpoints	ABSdddd.CHECKP	Update

\*Used only when ABS=2 (subfunction protection)

### FILE Maintenance Function

<b>Function</b>	File Maintenance
<b>Function Profile</b>	ABSdddd.FILE

Subfunction	Subfunction Profile*	Access
Define/Modify FDT	ABSdddd.FDT	Read
Release Descriptor	ABSdddd.REL	Read
Delete File	ABSdddd.DEL	Read
Define New File	ABSdddd.DEF	Read
Modify File Parameters	ABSdddd.MOD	Read
Reorder File Online	ABSdddd.ORD	Read
Refresh Rile to Empty	ABSdddd.REF	Read
Allocate/Deallocate File Space	ABSdddd.ALL	Read
Maintain Expanded Files	ABSdddd.EXP	Read

\*Used only when ABS=2 (subfunction protection)

### Database Maintenance Function

<b>Function</b>	Database Maintenance
<b>Function Profile</b>	ABSdddd.DBMAINT

Subfunction	Subfunction Profile*	Access
Add New Dataset to Asso/Data	ABSdddd.ADD	Read
Increase/Decrease Asso/Data	ABSdddd.INCREASE	Read
List/Reset DIB Entries	ABSdddd.DIB	Read
Recover Unused Space	ABSdddd.RECOVER	Read
Uncouple Two Adabas Files	ABSdddd.UNCOUPLE	Read

\*Used only when ABS=2 (subfunction protection)

### Session Opercoms Function

<b>Function</b>	Session Opercoms
<b>Function Profile</b>	ABSdddd.OPERCOMS

Subfunction	Subfunction Profile*	Access
Extended Error Recovery	ABSdddd.ERROR	Read
Force Dual Log Switch	ABSdddd.LOG	Read
Lock/Unlock Files	ABSdddd.LOK	Read
Reset Online Dump Status	ABSdddd.RDUMPST	Read
Stop User(s)	ABSdddd.STOPU	Read
Termination Commands	ABSdddd.TERM	Read
Manage Online Utilities	ABSdddd.UTILS	Read
Allocation/deallocation of CLOGs/PLOGs	ABSdddd.LOGALLOC	Read
User Table Maintenance	ABSdddd.USERTAB	Read

\*Used only when ABS=2 (subfunction protection)

### Database Report Function

<b>Function</b>	Database Report
<b>Function Profile</b>	ABSdddd.REPORT

Subfunction	Subfunction Profile*	Access
List Files with Critical Extents	ABSdddd.EXTENTS	Read
Display Field Description Table	ABSdddd.DFD	Read
Display File	ABSdddd.DIF	Read
General Database Layout	ABSdddd.LAYOUT	Read
List VOLSER Distribution	ABSdddd.VOLSER	Read
Display Asso/Data Block	ABSdddd.DRABN	Read
Display Unused Storage	ABSdddd.UNUSED	Read

\*Used only when ABS=2 (subfunction protection)

### Space Calculation Function

<b>Function</b>	Space Calculation Report
<b>Function Profile</b>	ABSdddd.SPACE

The Space Calculation function has no subfunction profiles.

## Passwords and Cipher Codes

Assuming that an Adabas command satisfies the appropriate security checks, ADASAF can automatically apply Adabas passwords and cipher codes if the SAF security system is RACF. At nucleus initialization, ADASAF extracts the INSTDATA field from the RACF profiles for all files in the current database (if PRMDELIM=N, the ACC prefixed profiles are used) and subsequently applies them to any command for the relevant file. Cipher codes should be specified as `C=nnnnnnnn` where `nnnnnnnn` is the eight-digit cipher code. Passwords should be specified as `P=xxxxxxxx`, where `xxxxxxxx` is the password. If a file has both, they should be separated by a comma, for example `C=12345678 , P=PASSWORD`. A file may have only one cipher code and one password.

The Adabas password and cipher code can be provided by a user exit rather than being stored in RACF. This is activated by specifying `P=USEREXIT` (or `C=USEREXIT`) in the RACF INSTDATA field for the relevant file's profile. Then, whenever a command passes security checks, ADASAF invokes the user exit and uses the returned information as password or cipher code. Member ADASAFX1 in AAFvrs.SRCE contains a sample user exit, a description of the interface, and instructions for installing the exit.

As an alternative to using RACF INSTDATA, or for SAF security systems other than RACF, passwords and cipher codes may be provided at nucleus initialization time by user exit ADASAFX2. If ADASAFX2 is linked with SAFADA, no attempt is made to extract passwords and cipher codes from the security system. Instead, any passwords and cipher codes for files in the current database must be supplied by ADASAFX2.

See the section Password / Cipher Code Exits for more information.

## Adabas Operator Commands

Adabas operator commands entered from an MVS console can be secured by either controlling the predefined group to which the operator command belongs, or by grouping operator commands by keyword. A sample member, ADAEOPTB, is provided in the source library that defines operator commands as belonging to one of three groups, namely DISPLY, MODIFY, and SPECAL. The choice of keywords and how commands are grouped is decided on site, and determines which Adabas operator commands may be entered from an MVS console. If ADAEOPTB is not used, then the first eight characters of the command (up to a space or =) are used as the basis for validation.

### Note:

Operator commands are allowed or disallowed based on either the User ID of the user who starts the Adabas nucleus, or on the identifier of the started task. The choice is *not* based on the User ID of the user issuing the console command.

The following is a sample grouping as supplied in the ADAEOPTB source library member. The following list is not restricted to the commands shown here and can be added to or subtracted from, depending on installation requirements. For more information about Adabas operator commands, see the *Adabas Operations* documentation.

The display-type Adabas commands are:

CSTAT	DHQ	DONLSTAT	DUQE
CSUM	DHQA	DPARM	DUUQE
DAUQ	DLOCKF	DPPT	DXCACHE
DCQ	DMEMTB	DRES	DXFILE
DDIB	DNC	DSTAT	DXLOCK
DDSF	DNFV	DTH	DXSTAT
DFILES	DNH	DUQ	
DFILUSE	DNU	DUQA	

The modify-type Adabas commands are:

ADAEND	CDATAEXT	CFDISABLE	FEOFPL
CANCEL	CDATAV64	CFENABLE	FMXIO
CASSODSP	CDATAHSP	CFILE	HALT
CASSOEXT	CDATAMAX	CFSTAT	RDUMPST
CASSOHSP	CDELETE	CINCLUDE	RESUME
CASSOMAX	CDEMAND	CLOGMRG	REVIEW
CASSOV64	CDISABLE	CPARM	TNAA
CBUFNO	CDISPSTAT	CRETRY	TNAE
CCHANGE	CENABLE	CT	TNAX
CCTIMEOUT	CEXCLUDE	DUMP	TT
CDATADSP	CFDELETE	FEOFCL	

The special Adabas commands are:



ALOCKF	LOGIB	NOLOGRB	SGMT
AOSLOG	LOGIO	NOLOGSB	STOPF
ASYTVS	LOGRB	NOLOGUX	STOPI
CLUFREEUSER	LOGSB	NOLOGVB	STOPU
DELUF	LOGUX	ONLRESUME	SYNCC
DELUI	LOGVB	ONLSTOP	TCPIP
LOCKF	NOLOGCB	ONLSUSPEND	TM
LOCKU	NOLOGFB	RALOCKF	UNLOCKF
LOCKX	NOLOGGING	RALOCKFA	UNLOCKU
LOGCB	NOLOGIB	READONLY	UNLOCKX
LOGFB	NOLOGIO	REVIEWHUBID	UTIONLY
LOGGING			

To validate authorization for operator commands, ADASAF checks for read access to an entity name of the format

<i>OPRdbid.type</i>	if DELIM=Y
<i>OPRdbidtype</i>	if DELIM=N

Where OPR is hard-coded, *dbid* specifies the Database ID in the format appropriate to the setting of the DBFLEN parameter; and *type* is MODIFY, DISPLY or SPECAL if ADAEOPTB is used, or is the command name itself if ADAEOPTB is not used.

For example, assuming that a standard ADAEOPTB is used, that DELIM=Y and DBFLEN=2 (no leading zeroes); when the operator issues a DSTAT command to database 235, ADASAF will check that the User ID under which database 235 is executing has read access to the resource OPR235.DISPLY.

Assuming that ADAEOPTB is not used, that DELIM=Y and DBFLEN=2, when the operator issues a STOPU=X '123' command to database 235, ADASAF will check that the User ID under which database 235 is executing has read access to the resource OPR235.STOPU.

Whether ADAEOPTB is used or not, ADASAF operator commands are always checked against type SPECAL.

## Remote Access to Adabas

### Remote IBM Peer-to-Peer Database Access

With ADASAF and Entire Net-Work, remote Adabas calls to a multi-user node (MPM) can be validated when ADASAF is active on all participating MVS systems.

Entire Net-Work transports the User ID, which it obtains from the active external system on the host node, to the target node. There, ADASAF uses the User ID to construct the RACROUTE REQUEST=AUTH security calls. Support for validation based on dynamic User ID strings or connect groups is available.

## Prerequisites for IBM Peer-to-Peer Access

The prerequisites for running ADASAF with Entire Net-Work are as follows:

- All participating Entire Net-Work nodes that make remote calls to an Adabas nucleus with ADASAF active must be running a current version of Entire Net-Work. All Adabas components must be current;
- An external security system like RACF, CA-Top Secret, and CA-ACF2 must be active on every Entire Net-Work /ADASAF MPM node. The external security systems can vary from node to node, since the external security information being transported by Entire Net-Work is in a format acceptable by all systems;
- The Adabas SVC used by Entire Net-Work must be current and must be linked with the security extensions for ADASAF. See AAFvrs.JOBS(SAGI030) for the sample job stream that shows how to link ADASVC with SVCSAF.

## Database Access from Remote Workstations

When ADASAF is active on a multi-user (MPM) node, you can secure remote Adabas calls with Entire Net-Work for Workstations. The Adabas link routines supplied with Entire Net-Work provide the mechanism required for the two-phase logon described in the section Remote Workstation Logon. Once logon has been completed, all validation of resources occurs just as it does when the remote user is executing on the mainframe.

Additionally, as described in the section Alternatives to Remote Workstation Logon, ADASAF can secure remote Adabas calls by selecting the Entire Net-Work Node name of the remote caller, or the Entire Net-Work Link name used by the remote caller, as the user ID on which security checks are based. If you select either (or both - different databases can use different options) of these mechanisms, you must define the appropriate Node and Link names as users in your security system, with the correct access permissions for the relevant Adabas resources.

## Operating and Remote Call Characteristics

The external security User ID that is transported from the host node takes on the profile of the User ID in the external security system, the User ID must be defined with the proper authority to ensure access to only the proper Adabas resources.

## Calls from Inactive External Security Nodes

A remote call to a target ADASVC with ADASAF active from an inactive external security node causes a security violation (response code 200) on the calling side.

## ADASAF Operator Commands

MVS operator communication with ADASAF is achieved using the OS/390 `Modify (F)` command. All ADASAF operator commands are prefixed with AAF. For example:

```
F ADA123,AAF SSTAT
```

Command	Description
SREST	Restart ADASAF, ensuring that all data held in the ADASAF buffers are flushed. Any data held by the security system itself in the Adabas address space are also flushed. The operation is transparent to all online and batch users.
SSTAT	Display general statistics on the operator console for ADASAF. These statistics are the same as those available using Online Services.
SUSERS	Display a list of active users.
SUSTAT user-id	Display statistics for a specified user. These statistics are the same as those available from Online Services.
SSNAP hhhhhhhh	Display a selected portion of the ADASAF's memory. Operation is not terminated.  <b>Note:</b> The commands SSNAP=AGL, SSNAP=CFA, and SNEWCOPY are activated by the next user logical command to the affected nucleus.
SSNAP=AGL	Display the ADASAF global work area. Operation is not terminated.
SSNAP=CFA	Display the ADASAF user file cache area. Operation is not terminated.
SHELP	Display all possible operator commands.
SNEWCOPY	Restart ADASAF and reload modules. This command may be useful if ADASAF parameters need to be changed, or a ZAP applied to the SAF Security kernel, without interrupting nucleus operation.
<b>Note:</b> All of the above commands can be issued using Online Services.	
TRACE= {0   1   2   3}	TRACE=0: suppress security trace TRACE=1: trace security violations TRACE=2: trace successful security checks TRACE=3: trace all security checks

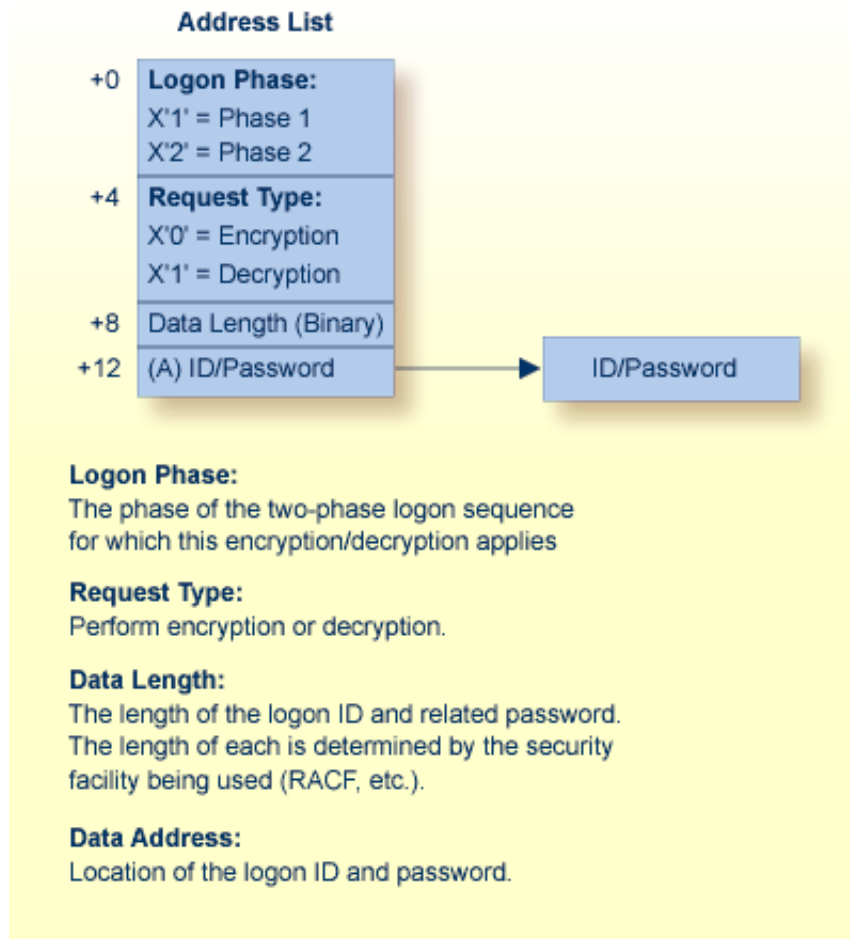
## ADASAF User Exits

### Encryption / Decryption Exit

ADASAF provides an exit for encrypting and decrypting the user Logon ID and password during the two-phase remote logon process. The encryption/decryption algorithms that are used must produce the same result on the workstation as in the Adabas ADASAF mainframe user exit. Information is provided in the appropriate *Entire Net-Work* documentation.

If a user-provided exit is not used with ADASAF, ADASAF uses its own internal encryption/decryption routines during the logon. If a user exit is used, the user exit CSECT must be "ESIEXIT" and must be linked to the SAFADA module.

The following graphic illustrates the parameter list that ADASAF passes to the ADASAF user exit:



## ADASAF Encryption/Decryption User Exit Parameters

### Linking User Exit ESIEXIT into ADASAF

The following example shows how to link the ADASAF user exit ESIEXIT module into the ADASAF module:

```
//JOB
//LKESI      EXEC PGM=IEWL,PARM='XREF,LET,LIST,NCAL,REUS'
//SYSPRINT   DD SYSOUT=*
//SYSUT1     DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//SYSLMOD    DD DSN=YOUR.APF.LOADLIB,DISP=SHR (target execution loadlib)
//AAFLIB     DD DSN=AAFvrs.LOAD,DISP=SHR      (distributed ADASAF loadlib)
//YOURLIB    DD DSN=YOUR.USER.EXIT.LOADLIB,DISP=SHR (user exit loadlib)
//SYSLIN     DD *
INCLUDE AAFLIB (SAFADA)                               (ADASAF module)
INCLUDE YOURLIB (ESIEXIT)                             (your encryption/decryption module)
NAME SAFADA (R)
/*
```

## Password / Cipher Code Exits

If you want ADASAF to provide Adabas passwords and cipher codes, but for any reason these cannot be stored in RACF (or you use a different security system), you may create a user exit to return the passwords and cipher codes to ADASAF.

### ADASAFX1

The ADASAFX1 user exit is used to supply passwords/cipher codes at Adabas command execution time. It is invoked for every file where the RACF profile's INSTDATA specifies P=USEREXIT or C=USEREXIT. The user exit must be re-entrant and must have a CSECT name of ADASAFX1. Addressing mode on entry is 31-bit and the exit must return in the same mode.

### Example

To link the exit into ADASAF, use a job similar to the following:

```
//LINKSAF EXEC PGM=IEWL,
//      PARM='MAP,LET,LIST,XREF,NCAL,REUS'
//SYSPRINT DD SYSOUT=X
//SYSUT1 DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//AAFLOAD DD DSN=AAFvr1.LOAD,DISP=SHR
//EXITLOAD DD DSN=your.LOAD,DISP=SHR
//SYSLMOD DD DSN=your.LOAD,DISP=SHR      must be APF-authorized
//SYSLIN DD DDNAME=SYSIN
//SYSIN DD *
MODE AMODE(31),RMODE(24)
SETCODE AC(1)
INCLUDE AAFLOAD(SAFADA)
INCLUDE EXITLOAD(ADASAFX1)
NAME SAFADA(R)
```

### Registers

The registers on entry to ADASAFX1 are as follows:

<b>R1</b>	Address of the parameter address list
<b>RD</b>	Address of two consecutive 18-word save areas
<b>RE</b>	Return address
<b>RF</b>	ADASAFX1 base address

All registers must be restored to their contents on entry before returning to ADASAF.

R1 on entry contains the address of a six-word address list:

<b>Word 1</b>	Address of call type. Call type is a single byte. If set to X"80", ADASAF expects a password; if set to X"40", ADASAF expects a cipher code.
<b>Word 2</b>	Address of return code. Return code is a full word. If set to X"00000000", ADASAF uses the value returned by the exit as password or cipher code. Otherwise, ADASAF leaves the Adabas control block unchanged.
<b>Word 3</b>	Address of the database ID. The database ID is a two-byte binary number.
<b>Word 4</b>	Address of the file number. The file number is a two-byte binary number.
<b>Word 5</b>	Address of the returned password/cipher code. This is an eight-byte field containing binary zeros on entry. It should be set to the desired password or cipher code, which ADASAF inserts into the Adabas control block if the return code in parameter 2 is 0.
<b>Word 6</b>	Address of the Adabas parameter list for the command being processed. The Adabas parameter list contains the addresses of the Adabas control block, format buffer, record buffer, search buffer, value buffer, and ISN buffer.

## ADASAFX2

The ADASAFX2 user exit is used to supply passwords/cipher codes at nucleus initialization time. It is invoked by ADASAF during nucleus initialization and may return a password and or a cipher code for as many files as required (providing the value of MAXPC is not exceeded). The user exit must be re-entrant and must have a CSECT name of ADASAFX2. Addressing mode on entry is 31-bit and the exit must return in the same mode.

### Example

To link the exit into ADASAF, use a job similar to the following:

```
//ADASAF EXEC PGM=IEWL,
// PARM='MAP,LET,LIST,XREF,NCAL,REUS'
//SYSPRINT DD SYSOUT=X
//SYSUT1 DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//AAFLOAD DD DSN=AAFvr1.LOAD,DISP=SHR
//EXITLOAD DD DSN=your.LOAD,DISP=SHR
//SYSLMOD DD DSN=your.LOAD,DISP=SHR must be APF-authorized
//SYSLIN DD DDNAME=SYSIN
//SYSIN DD *
MODE AMODE(31),RMODE(24)
SETCODE AC(1)
INCLUDE AAFLOAD(SAFADA)
INCLUDE EXITLOAD(ADASAFX2)
NAME SAFADA(R)
```

## Registers

The registers on entry to ADASAFX2 are as follows:

<b>R1</b>	Address of the parameter address list
<b>RD</b>	Address of an 18-word save area
<b>RE</b>	Return address
<b>RF</b>	ADASAFX2 base address

All registers must be restored to their contents on entry before returning to ADASAF.

R1 on entry contains the address of a five-word address list:

<b>Word 1</b>	Address of Database ID. The Database ID is a two-byte binary number. ADASAF passes the current Database ID to the exit.
<b>Word 2</b>	Address of return code. The return code is a four-byte binary number and must be set by ADASAFX2. ADASAF will call the exit repetitively until the return code is not 0. If set to 0, ADASAF will use the values returned by the exit. If not 0, ADASAF will not call the exit again (but will still use the values returned on previous calls).
<b>Word 3</b>	Address of file number. The file number is a two-byte binary number. The first time in, this will be X"0000". On subsequent calls it will contain the most recently returned file number. The exit must set it to the file number to which the returned password or cipher code applies.
<b>Word 4</b>	Address of code type. This is a one-byte binary field. The exit must set this to X"40" when returning a cipher code and to X"80" when returning a password.
<b>Word 5</b>	Address of an eight-byte password/cipher code. The exit must set this to the appropriate password or cipher code. If ADASAFX2 sets this to USEREXIT, ADASAF will subsequently invoke ADASAFX1 to provide a password or cipher code at Adabas command execution time.