Managing IBM i Security Using IBM i Services

Carol Woodbury, CISSP, CRISC, PCIP

IBM CHAMPION

carol@dxrsecurity.com

1

Agenda

- What are these Services and Why use them?
- Using Services in ACS
- Using Services in a CL program
- Using Services in ARE
- More information

2

IBM i Services

3

What and Why

- SQL views which provide access to IBM i data using SQL rather than running a command or writing to an API otherwise writing a ‘traditional’ program
- Typically faster access
- Easy access to data via languages such as python
- Provides information in a ‘better’ format

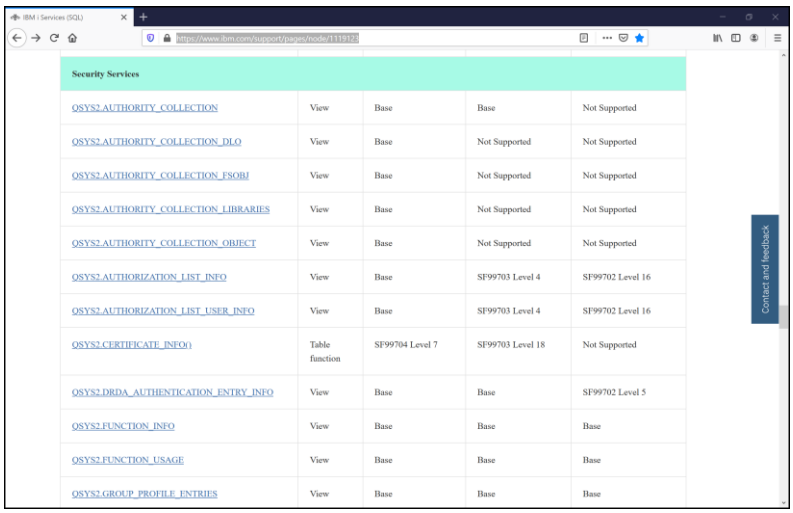
4

Don't Run Away!

- Just because these are SQL-based – don't be frightened and think you can't use them if you aren't familiar with SQL!

5

IBM i Service Webpage

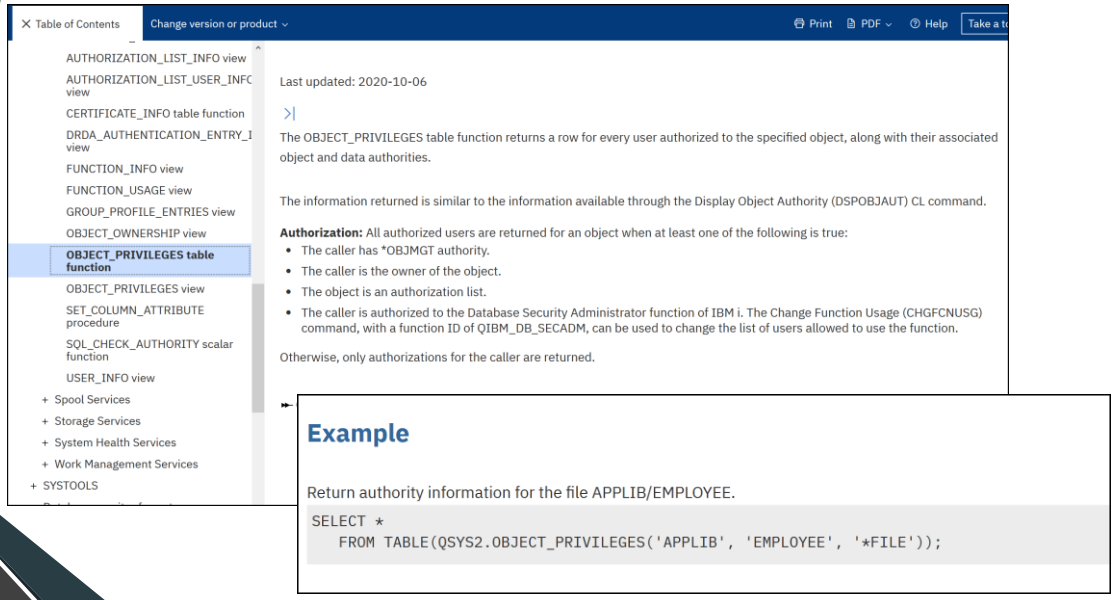


Security Services				
QSYS2.AUTHORITY_COLLECTION	View	Base	Base	Not Supported
QSYS2.AUTHORITY_COLLECTION_DLO	View	Base	Not Supported	Not Supported
QSYS2.AUTHORITY_COLLECTION_FSOBJ	View	Base	Not Supported	Not Supported
QSYS2.AUTHORITY_COLLECTION_LIBRARIES	View	Base	Not Supported	Not Supported
QSYS2.AUTHORITY_COLLECTION_OBJECT	View	Base	Not Supported	Not Supported
QSYS2.AUTHORIZATION_LIST_INFO	View	Base	SF99703 Level 4	SF99702 Level 16
QSYS2.AUTHORIZATION_LIST_USER_INFO	View	Base	SF99703 Level 4	SF99702 Level 16
QSYS2.CERTIFICATE_INFO()	Table function	SF99704 Level 7	SF99703 Level 18	Not Supported
QSYS2.DRDA_AUTHENTICATION_ENTRY_INFO	View	Base	Base	SF99702 Level 5
QSYS2.FUNCTION_INFO	View	Base	Base	Base
QSYS2.FUNCTION_USAGE	View	Base	Base	Base
QSYS2.GROUP_PROFILE_ENTRIES	View	Base	Base	Base

https://www.ibm.com/support/pages/node/1119123

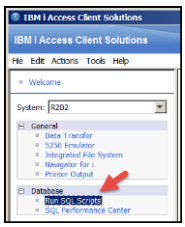
6

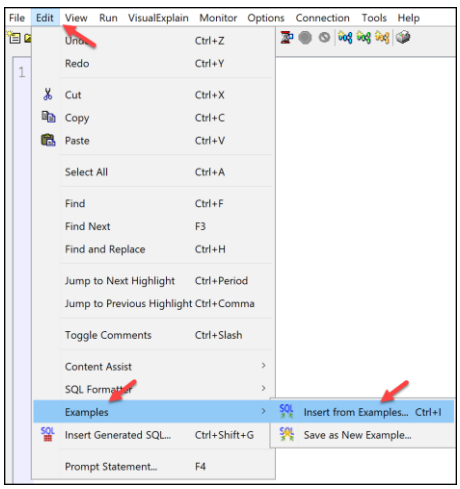
Detailed Description of the Service

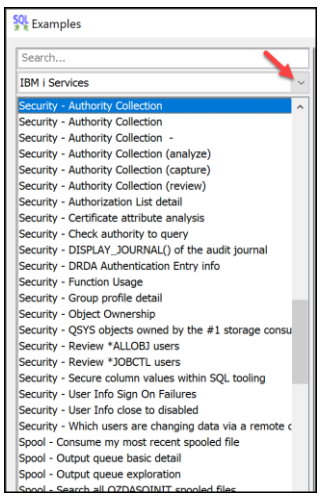


7

Access Client Solutions (ACS) – Run SQL Scripts

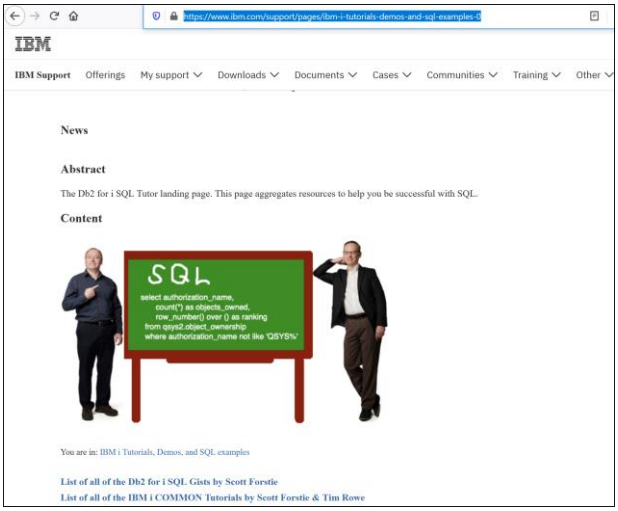






8

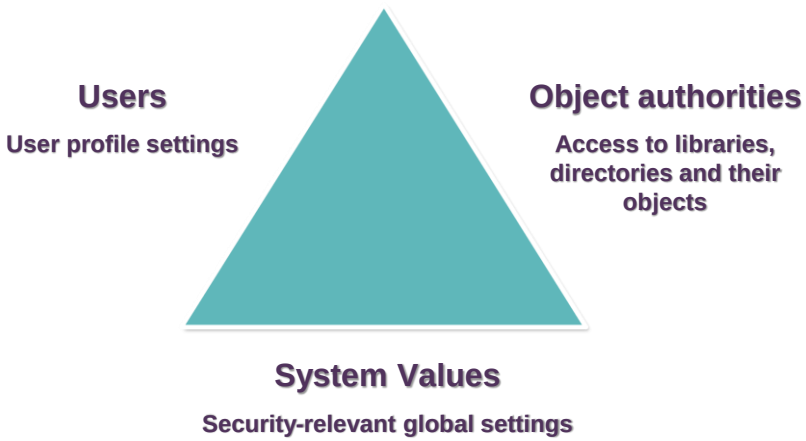
Resources from IBM (Scott Forstie and Tim Rowe)



https://www.ibm.com/support/pages/ibm-i-tutorials-demos-and-sql-examples-0

9

Core of IBM i Security



10

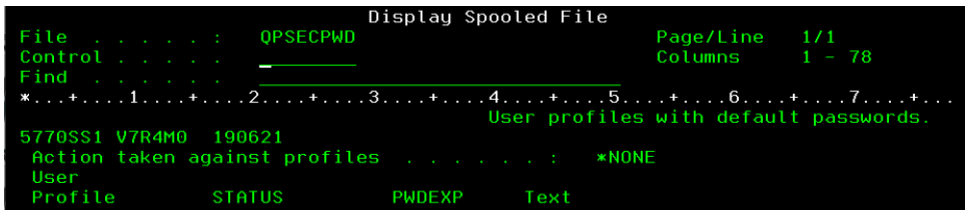
User Profiles

- QSYS2.user_info
  - DSPUSRPRF USRPRF(*ALL) OUTPUT(*OUTFILE) and QSYRUSRI
  - SELECT * from qsys2.user_info;
- Benefits:
  - *Immediately* current regardless of new, changed or deleted profile
  - Select any fields based on any criteria (e.g., special authorities, groups, limited capabilities, last used date, default password)

11

QSYS2.user_info – Default Passwords

- ANZDFTPWD



- SELECT authorization_name, password_expiration_interval, special_authorities, group_profile_name, supplemental_group_list, last_used_timestamp, status, text_description from **qsys2.user_info** where user_default_password = 'YES' order by status;

12

QSYS2.user_info – Special Authorities

```
SELECT authorization_name, special_authorities,
group_profile_name, supplemental_group_list, text_description FROM QSYS2.USER_INFO
WHERE SPECIAL_AUTHORITIES LIKE '%*ALLOBJ%'
OR AUTHORIZATION_NAME IN (
SELECT USER_PROFILE_NAME
FROM QSYS2.GROUP_PROFILE_ENTRIES
WHERE GROUP_PROFILE_NAME IN (
SELECT AUTHORIZATION_NAME
FROM QSYS2.USER_INFO
WHERE SPECIAL_AUTHORITIES like '%*ALLOBJ%'
)
)
ORDER BY AUTHORIZATION_NAME;
```

Authorization Name				Group Profile Name	Supplemental Group List	Text Description
AUTHORIZATION_NAME	SPECIAL_AUTHORITIES			GROUP_PROFILE_NAME	SUPPLEMENTAL_GROUP_LIST	TEXT_DESCRIPTION
AARONC	*ALLOBJ	*SECADM	*JOBCTL...	*NONE	-	-
ACADMN01	*ALLOBJ	*SECADM		*NONE	-	Admin user for aut

13

QSYS2.user_info – Use Your Imagination!

- Get a list of profiles to disable or delete
  - Last used -> Creation date -> Restore date
- Profiles not owned by xx user profile
- Profiles with Authority Collection active and/or collection exists
- Action auditing values enabled at the profile
- Profiles that are limited capability *NO or *PARTIAL

https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_74/rzajq/rzajqviewuserinfo.htm

14

QSYS2.group_profile_entries

- DSPAUTUSR SEQ(*GRPPRF)

```
25 -- Groups
26 select * from qsys2.group_profile_entries;
```

GROUP_PROFILE_NAME	USER_PROFILE_NAME	User Text USER_TEXT
ACGRPPRF	ACUSER01	Test user for authority collection

- DSPUSRPRF PYLAB *GRPMBR

```
25 -- Groups
26 select * from qsys2.group_profile_entries
27 where group_profile_name = 'PYLAB';
```

GROUP_PROFILE_NAME	USER_PROFILE_NAME	User Text USER_TEXT
PYLAB	PYUSR01	-
PYLAB	PYUSR02	-

15

Object Authority Services

- QSYS2.object_privileges (DSPOBJAUT)

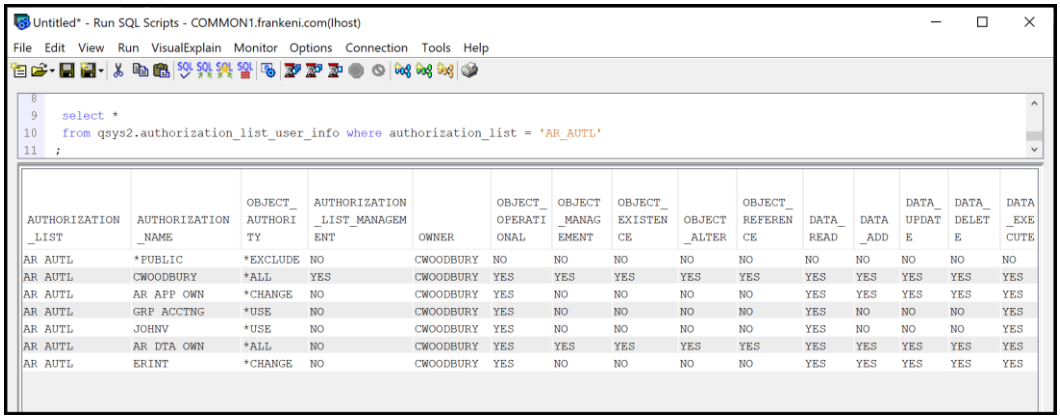
```
-- Permissions
-- Ownership
select * from qsys2.object_privileges where
system_object_schema = 'CWOODBURY' and
owner <> 'CWOODBURY';

-- *PUBLIC authority
select * from qsys2.object_privileges where
system_object_schema = 'CWOODBURY' and
authorization_name =    '*PUBLIC'   and
object_authority <>     '*EXCLUDE';
```

- QSYS2.ifs_object_privileges (DSPAUT)
- QSYS2.object_ownership (WRKOBJOWN / QSYLOBJA)

16

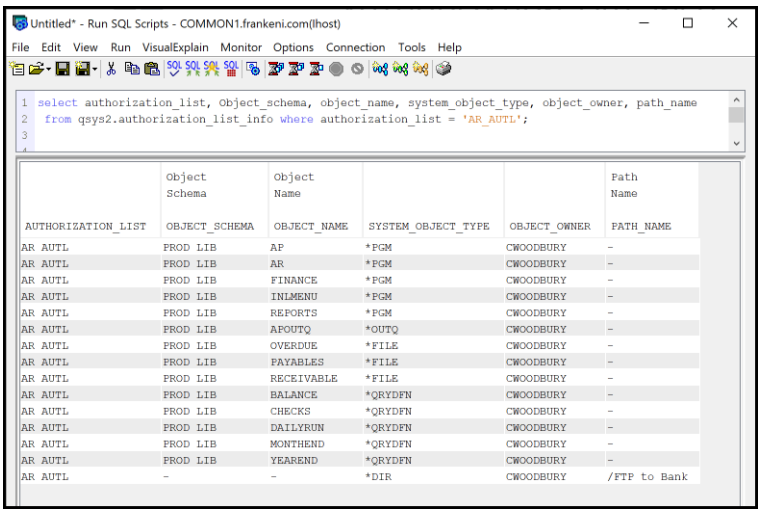
QSYS2.authorization_list_user_info (DSPAUTL)



AUTHORIZATION_LIST	AUTHORIZATION_NAME	OBJECT_AUTHORITY	AUTHORIZATION_LIST_MANAGEMENT	OWNER	OBJECT_OPERATIONAL	OBJECT_MANAGEMENT	OBJECT_EXISTENCE	OBJECT_ALTER	OBJECT_REFERENCE	DATA_READ	DATA_ADD	DATA_UPDATE	DATA_DELETE	DATA_EXECUTE
AR AUTL	*PUBLIC	*EXCLUDE	NO	CWOODBURY	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
AR AUTL	CWOODBURY	*ALL	YES	CWOODBURY	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
AR AUTL	AR APP OWN	*CHANGE	NO	CWOODBURY	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES
AR AUTL	GRP ACCTNG	*USE	NO	CWOODBURY	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
AR AUTL	JOHNV	*USE	NO	CWOODBURY	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
AR AUTL	AR DTA OWN	*ALL	NO	CWOODBURY	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
AR AUTL	ERINT	*CHANGE	NO	CWOODBURY	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES

17

QSYS2.authorization_list_info (DSPAUTLOBJ)

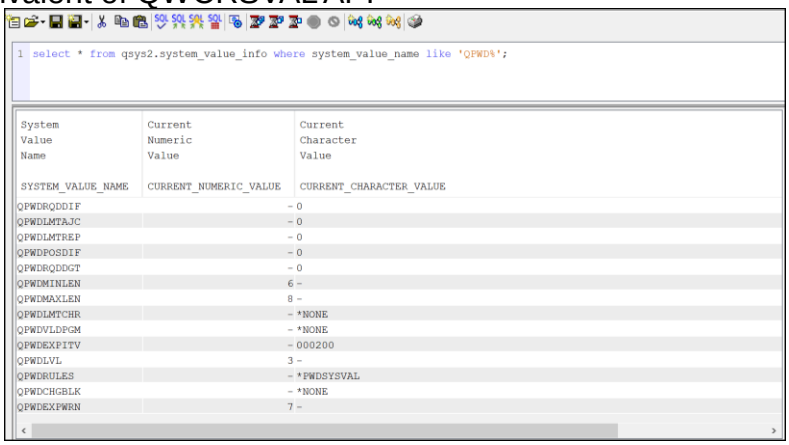


AUTHORIZATION_LIST	Object Schema OBJECT_SCHEMA	Object Name OBJECT_NAME	SYSTEM_OBJECT_TYPE	OBJECT_OWNER	Path Name PATH_NAME
AR AUTL	PROD LIB	AP	*PGM	CWOODBURY	-
AR AUTL	PROD LIB	AR	*PGM	CWOODBURY	-
AR AUTL	PROD LIB	FINANCE	*PGM	CWOODBURY	-
AR AUTL	PROD LIB	INLMENU	*PGM	CWOODBURY	-
AR AUTL	PROD LIB	REPORTS	*PGM	CWOODBURY	-
AR AUTL	PROD LIB	APOUTQ	*OUTQ	CWOODBURY	-
AR AUTL	PROD LIB	OVERDUE	*FILE	CWOODBURY	-
AR AUTL	PROD LIB	PAYABLES	*FILE	CWOODBURY	-
AR AUTL	PROD LIB	RECEIVABLE	*FILE	CWOODBURY	-
AR AUTL	PROD LIB	BALANCE	*QRYDFN	CWOODBURY	-
AR AUTL	PROD LIB	CHECKS	*QRYDFN	CWOODBURY	-
AR AUTL	PROD LIB	DAILYRUN	*QRYDFN	CWOODBURY	-
AR AUTL	PROD LIB	MONTHEND	*QRYDFN	CWOODBURY	-
AR AUTL	PROD LIB	YEAREND	*QRYDFN	CWOODBURY	-
AR AUTL	-	-	*DIR	CWOODBURY	/FTP to Bank

18

System Values

- QSYS2.system_value_info
  - Equivalent of QWCRSVAL API



```
1 select * from qsys2.system_value_info where system_value_name like 'QPWD%';
```

System Value Name	Current Numeric Value	Current Character Value
SYSTEM_VALUE_NAME	CURRENT_NUMERIC_VALUE	CURRENT_CHARACTER_VALUE
QPWDRQDDIF	- 0	
QPWDLMTAJC	- 0	
QPWDLMTREP	- 0	
QPWDPOSDIF	- 0	
QPWDRQDDGT	- 0	
QPWDMINLEN	6 -	
QPWDMAXLEN	8 -	
QPWDLMTCHR	- *NONE	
QPWDVLDPGM	- *NONE	
QPWDEXPITV	- 000200	
QPWDLVL	3 -	
QPWDRULES	- *PWDSYSVAL	
QPWDCHGBLK	- *NONE	
QPWDEXPWRN	7 -	

19

Authority Collection

20

Ways to Use the Authority Collection – V7R3

- Determine the authority required for service accounts to work with database files. Simply turn on the authority collection for the service account, examine the entries, and determine the authority required. Undoubtedly it will not require *ALLOBJ!
- Determine where authority is coming from
- Debug authority failures

21

Determining What Authorities a Profile Needs

```
                    Start Authority Collection (STRAUTCOL)

Type choices, press Enter.

Type of authority collection . . > *USRPRF      *USRPRF, *OBJAUTCOL
User profile . . . . . .           winsvr       Name
Library and ASP device:
  Library . . . . . .              carolnew     Name, *NONE, *ALL
  ASP device . . . . . .           ____________ Name, *SYSBAS
               + for more values _
Object . . . . . .                 *ALL         Name, generic*, *ALL
               + for more values   ____
Object type . . . . . .            *ALL         *ALL, *CMD, *DTAARA...
               + for more values   ____
Include DLO . . . . . .            *NONE        *NONE, *ALL, *DOC, *FLR
                                   ____
Include file system objects . .    *NONE        *NONE, *ALL, *BLKSF...
               + for more values   ____
Delete collection . . . . . .      *NO          *NO, *YES, *ALL
Detail . . . . . .                 *OBJINF      *OBJINF, *OBJJOB
                                                                  Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

22

Analyzing the Profile's Collection

```
1 select authorization_name,system_object_name, system_object_type,
2 detailed_required_authority,current_authority, authority_source
3 from qsys2.authority_collection
4 where authorization_name = 'WINSVR'
5 and adopting_program_owner IS NULL;
```

Authorization Name AUTHORIZATION_NAME	System Object Name SYSTEM_OBJECT_NAME	System Object Type SYSTEM_OBJECT_TYPE	DETAILED_REQUIRED_AUTHORITY	CURRENT_AUTHORITY	Authority Source AUTHORITY_SOURCE
WINSVR	MAINT00001	*PGM	*OBJOPR *READ *EXECUTE	*ALL	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*FILE	*ADD	*ALL	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*FILE	*READ	*ALL	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*FILE	*READ *DLT	*ALL	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*FILE	*OBJOPR	*ALL	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*FILE	*OBJOPR	*ALL	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*FILE	*OWNER *OBJEXIST *OBJMG...	*ALL	USER *ALLOBJ

23

V7R4 - Authority Collection *by Object*

- By object, collects the users accessing the objects along with:
  - Current authority
  - Source of the authority
  - Specific authority required by the Operating System

24

```
1 select distinct authorization_name, system_object_name,
2 detailed_required_authority, authority_source
3 from qsys2.authority_collection_libraries
4 where system_object_name = 'ALLOBJUSRS' and
5 adopting_program_owner IS NOT NULL
6 and adopt_authority_used = 0
7 and authorization_name IS NOT NULL;
```

Authorization Name AUTHORIZATION_NAME	System Object Name SYSTEM_OBJECT_NAME	DETAILED_REQUIRED_AUTHORITY	Authority Source AUTHORITY_SOURCE
WINSVR	ALLOBJUSRS	*OBJOPR	USER *ALLOBJ
CWOODBURY	ALLOBJUSRS	*OBJOPR *READ	USER *ALLOBJ
CWOODBURY	ALLOBJUSRS	*OBJOPR	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *REA...	USER *ALLOBJ
CWOODBURY	ALLOBJUSRS	*OBJEXIST *OBJMGT *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	USER *ALLOBJ
CWOODBURY	ALLOBJUSRS	*READ *ADD *DLT *UPD	USER *ALLOBJ
CWOODBURY	ALLOBJUSRS	*ADD	USER *ALLOBJ
WINSVR	ALLOBJUSRS	*OBJEXIST *OBJMGT *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	USER *ALLOBJ
CWOODBURY	ALLOBJUSRS	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *REA...	USER *ALLOBJ

25

Configure Authority Collection on the Directory

```
                    Change Authority Collection (CHGAUTCOL)

Type choices, press Enter.

Object . . . . . .   '/home/cjwdemo'
_____
Authority collection value . . .   *objinf       *NONE, *OBJINF
Include dependent objects  . . .   *NO           *NO, *LF
Directory subtree  . . . . . .     *NONE         *NONE, *ALL
Symbolic link  . . . . . .         *NO           *NO, *YES
Delete collection  . . . . . .     *NO           *NO, *YES
```

Notes:
Object authority collection is already started so no need to run the STRAUTCOL command
Not starting the collection for '/home' – only /home/cjwdemo

26

```
71 -- Authority Collection - directory
72 select distinct authorization_name, path_name,
73 detailed_required_authority, authority_source
74 from qsys2.authority_collection_fsobj
75 where path_name = '/home/cjwdemo' and
76 adopting_program_owner IS NULL and
77 adopt_authority_used = 0 and
78 authorization_name IS NOT NULL;
79
```

Not needed

Authorization Name	Path Name		Authority Source
AUTHORIZATION_NAME	PATH_NAME	DETAILED_REQUIRED_AUTHORITY	AUTHORITY_SOURCE
TESTER1	/home/cjwdemo	*OBJOPR *READ	GROUP *ALLOBJ
WINSVR	/home/cjwdemo	*OBJOPR *EXECUTE	USER *ALLOBJ
TESTER1	/home/cjwdemo	*OBJOPR *EXECUTE	GROUP *ALLOBJ
WINSVR	/home/cjwdemo	*OBJOPR *ADD *DLT *UPD *EXECUTE	USER *ALLOBJ

Notice – no information for '/home'

27

Object Authority Collection Views

- QSYS2.AUTHORITY_COLLECTION_OBJECT
  - Use when the number of entries in the authority collection is large and you are looking for a specific object or objects in a specific library
- QSYS2.AUTHORITY_COLLECTION_LIBRARIES
  - Use when the number of entries in the authority collection is small or you are looking for all or most objects in the authority collection.
- QSYS2.AUTHORITY_COLLECTION_FSOBJ (IFS objects)
- QSYS2.AUTHORITY_COLLECTION_DLO

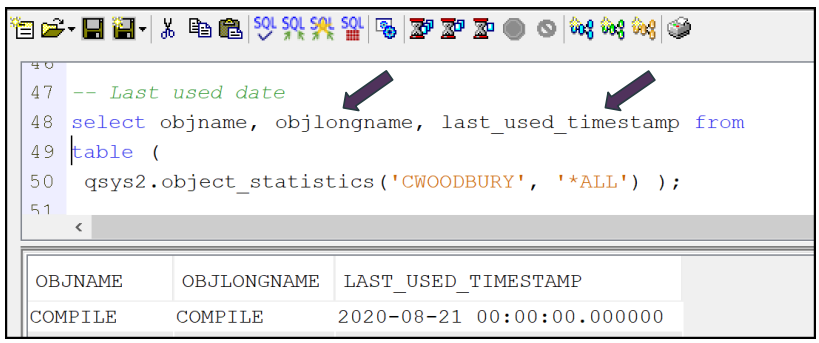
28

28

Other Services

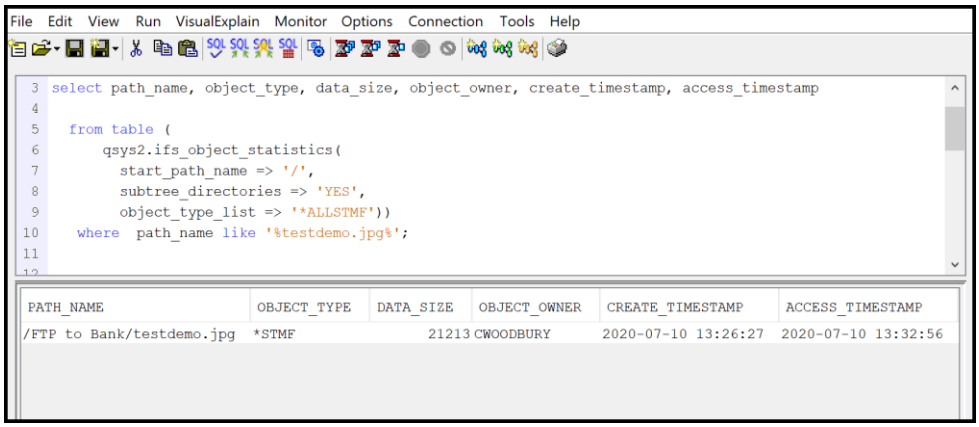
29

QSYS2.object_statistics (DSPOBJD)



30

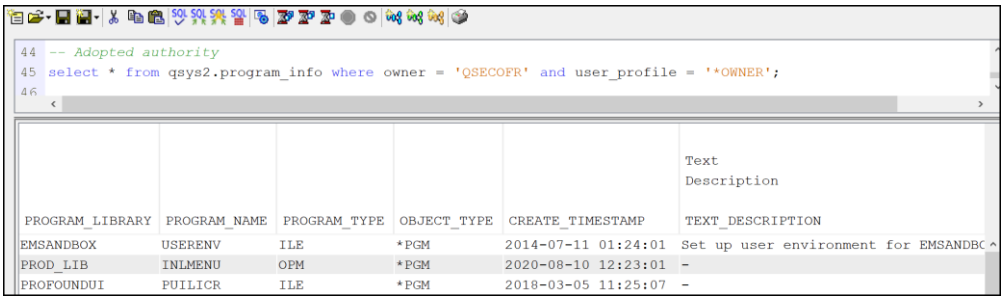
QSYS2.ifs_object_statistics



31

Adopted Authority

- QSYS2.program_info (DSPPGM / DSPPGMADP)



- QSYS2.sql_check_authority
  - Flips Dynamic User Profile attribute from *OWNER to *USER (or vice versa)

32

SYSTOOLS.group_PTF_currency

```
40
41 -- Group PTFs
42 select * from systools.group_PTF_currency;
```

PTF_GROUP_CURRENCY	PTF_GROUP_ID	PTF_GROUP_TITLE	Group Level PTF_GROUP_LEVEL_INSTALLED	PTF
INSTALLED LEVEL IS CURRENT	SF99653	SF99653 740 Db2 Web Query for i V2.2.1	9	
UPDATE AVAILABLE	SF99661	SF99661 740 WebSphere App Server V8.5	1	
UPDATE AVAILABLE	SF99662	SF99662 740 IBM HTTP Server for i	7	
UPDATE AVAILABLE	SF99663	SF99663 740 Performance Tools	3	
UPDATE AVAILABLE	SF99664	SF99664 740 Backup Recovery Solutions	15	

33

QSYS2.server_share_info

File Edit View Run VisualExplain Monitor Options Connection Tools Help

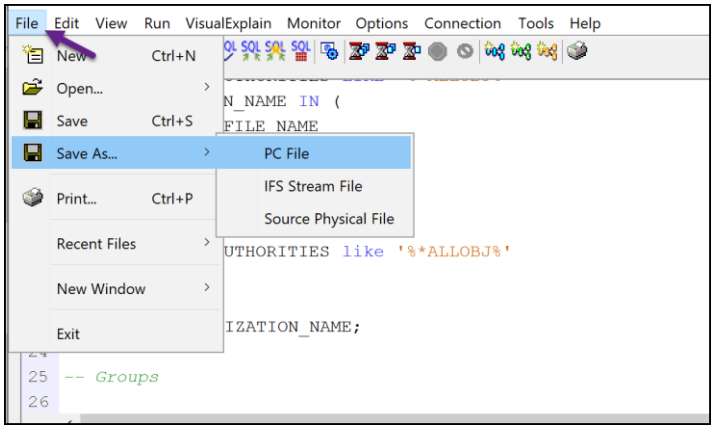
```
1 select * from qsys2.server_share_info where share_type = 'FILE';
```

SERVER_SHARE_NAME	SHARE_TYPE	Text Description TEXT_DESCRIPTION	ENCRYPTION_REQUIRED	Path Name PATH_NAME	Permissions PERMISSIONS	Current Connections CURRENT_CONNECTIONS
	FILE	-	NO	-	-	-
QDIRSRV	FILE	OS/400 -- Directory Ser...	NO	/QIBM/ProdData/OS400/DirSrv	*RW	0
CHOWLIN	FILE	-	NO	/chowlin	*RW	0
CLAIMIMAGE	FILE	IFS lab	NO	/claimimage	*R	0
LABXL	FILE	-	NO	/LABXL	*RW	0
LABPX	FILE	-	NO	/LABPX	*RW	0
WALABRO	FILE	System i Access for Web...	NO	/walab	*R	0

- Just released 10/06/2020!!!
  - V7R4: SF99704 Level 10
  - V7R3: SF99703 Level 22

34

Save Your Work!



35

Using Services in a CL PGM

36

Two Options

- RUNSQL – added V7R1
  - Runs SQL statements from within a CL program
    - https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_74/sqlp/rbafyrunsql.htm
    - https://www.rpgpgm.com/2014/03/run-sql-statements-in-your-cl.html (Simon Hutchinson)
- RUNSQLSTM
  - Runs SQL statements defined in a source file
    - https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/cl/runsqlstm.htm
- BOTH have the restriction that you can't run SELECT

37

RUNSQL

```
PGM
        DCLF      FILE(QTEMP/LIBRARY) ALWVARLEN(*YES)   ALWNULL(*YES)
        DCL       VAR(&LIBNAME) TYPE(*CHAR) LEN(10)
        CHGJOB  CCSID(37)                                                    /* Set CCSID (from 65535)          */
        DLTF      FILE(QTEMP/LIBRARY)
        MONMSG    MSGID(CPF2105)
        RUNSQL      SQL('CREATE TABLE QTEMP.LIBRARY   AS   +
                    (SELECT SYSTEM_OBJECT_NAME,  OBJECT_TYPE,  OBJECT_AUTHORITY,   AUTHORIZATION_NAME,  TEXT_DESCRIPTION +
                    FROM QSYS2.OBJECT_PRIVILEGES                +
                    WHERE OBJECT_TYPE = '*LIB"  AND AUTHORIZATION_NAME = '*PUBLIC" AND  OBJECT_AUTHORITY <> '*EXCLUDE" )  +
                    WITH DATA') COMMIT(*NONE) NAMING(*SQL)
        MONMSG    MSGID(SQL9010) EXEC(GOTO CMDLBL(DONE)
        OVRPRTF   FILE(QPQUPRFIL) MAXRCDS(*NOMAX) SPLFNAME(LIBAUT) OVRSCOPE(*CALLLVL)   /* Name spooled file – LIBAUT      */
        RUNQRY    QRYFILE((QTEMP/LIBRARY)) OUTTYPE(*PRINTER) FORMSIZE(*RUNOPT 378)          /* Print report                    */
DONE:
ENDPGM
```

38

Administration Runtime Expert (ARE)

39

Administration Runtime Expert (ARE)

- Check various system settings across multiple partitions
  - Authorities, User profile configurations, System value settings
  - PTFs
  - Network configuration
  - ... and more – including the ability to customize your own
- You create a template of what you want checked
  - Run via ARE scheduler or ad hoc
- Reports can be emailed
- Can also ‘fix’ or push out changes

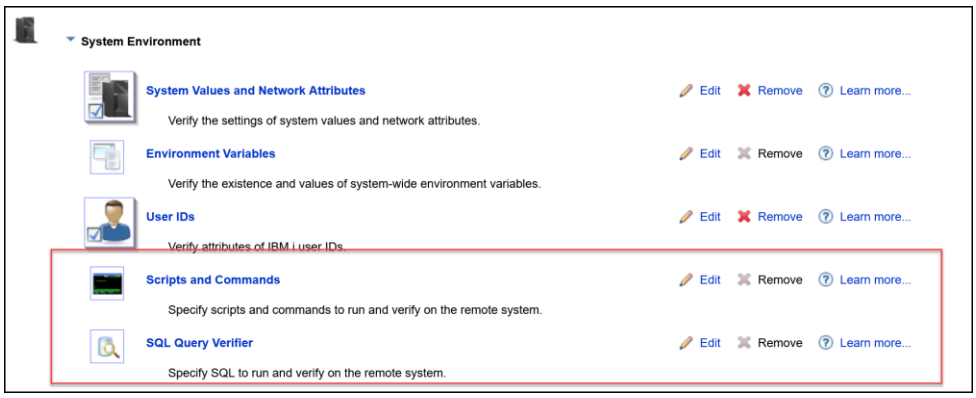
40

Security-relevant features

- File and directory authorities
- System values
- User profile configuration

41

Customize what is Checked



42

Summary

- SQL isn't that difficult!
- MANY examples exist to help you
  - Scott Forstie's github gists https://gist.github.com/forstie
- Views often provide information more easily, is up-to-date and often performs better
- Views allow you to gather information from multiple partitions without having to physically sign on
- CL programs running SQL can be added to your favorite job scheduler

DXR SECURITY

43

DXR SECURITY

44

For More Information

IBM i Services page

- https://www.ibm.com/support/pages/node/1119123

IBM Tutorials

- https://www.ibm.com/support/pages/ibm-i-tutorials-demos-and-sql-examples-0

IBM Application Runtime Environment support page

- https://www.ibm.com/support/pages/ibm-administration-runtime-expert-i

IBM i Security Reference – PDF

https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_74/rzarl/sc415302.pdf?view=kc

- Chapter 10 – Authority Collection

IBM i Security Administration and Compliance, 3nd edition, by Carol Woodbury, 2020.

45

45

Questions?

Contact: carol@DXRSecurity.com

46