Sharing IBM i Knowledge

System Administration **Modernisation**

Learn more about the SQL system manager approach

DATE
17 June 2026

Host
Rudi van Helvoirt

"You only know what it is, when it is no longer there.."

The ultimate definition of an invisible foundation.

Projects from my daily life as system administrator

- Migrating BRMS from BR1 to BR2
- Using Audit Data Mart
- The road to TLS only
- Check Object Integrity
- Monitoring the Administrative Domain

Migrating BRMS from BR1 to BR2

- History
- Licensing
- The Migration process
- The New GUI
- Wrap-up

Migrating BRMS from BR1 to BR2 - History

- Backup, Recovery & Media Services for i is the IBM strategic solution for planning and managing the backup of IBM i servers
- BRMS (Backup, Recovery & Media Services) is an IBM LPP (license program product) known as 5770-BR1
- Has been around for decades, since the introduction of the AS/400
- Used to have two GUI options:
    1. iSeries Navigator (part of IBM i Access for Windows V7R1M0)
       End of Service April 30, 2019
    2. Navigator for i - Heritage Version
       IBM i components are affected by CVE-2021-4104 (log4j version 1.x)
- Extended/Sustained Support Complete 2025-09-30
  End of marketing and end of support for IBM Backup, Recovery and Media Services for i (non-expiring version)
- Available replacement is IBM Backup, Recovery and Media Services for i Subscription Term (5770-BR2)

Migrating BRMS from BR1 to BR2 - History

Overview
IBM announced withdrawal of BRMS non-expiring offering (5770-BR1) and replaced it with a new product,BRMS Subscription (5770-BR2). August 27, 2024 Announcement Letter

- 5770-BR2 has license, support, and subscription encapsulated into one product, whereas 5770-BR1 was covered under IBM i Group SWMA.
- The reason for the change to a new product, PID, and model: IBM's direction is to continue to invest in this strategic product, and therefore, the direction includes charging for BRMS instead of continuing to give it at no extra charge under IBM i Group SWMA.
- The August 27, 2024 Announcement Letter announced the change in service level of 5770-BR1 under the current IBM i Group SWMA contract: as stated in the announcement, 5770-BR1 changes to usage and known-defect support starting October 1, 2025.
  Note that this follows the standard policy for IBM to announce the withdrawal from service, in this case, change in service level, and give a minimum of one-year notice (13 months notice in this case).
  IBM i has withdrawn many products and components from IBM i Group SWMA in this same manner.
- 5770-BR1 clients have a non-expiring license and can continue to use this stable product indefinitely. As for service: under active IBM i Group SWMA contracts, and extended IBM i Group SWMA contract for applicable releases, 5770-BR1 customers continue to get usage and known-defect coverage.
- If customers need defect support and/or any of the new enhancements being incorporated into 5770-BR2, then starting October 1, 2025, clients acquire 5770-BR2.

Migrating BRMS from BR1 to BR2 - History

Why the change to BRMS licensing strategy?

- Change to IBM i Group SWMA strategy
  - Historical approach had a group of separately charged LPPs which were included in IBM i Group SWMA
  - Now the strategy and roadmap is to remove separately charged Licensed Program Products (LPPs) from IBM i Group SWMA
  - IBM i and the separately charged LPPs (BRMS, PowerHA SystemMirror, Db2 Mirror, Rational Development Studio)…
  - Will be offered as subscription: license & support incorporated into the license

BRMS Subscription Term (5770-BR2)…

- includes the base, advanced, and network features that were formerly separately acquired with 5770-BR1
- is provided at one price per core regardless of software tier
- includes all 5770-BR1 function. Future enhancements, including the UI, will be in 5770-BR2
- can coexist on the same serial number: in a given partition, a client can have 5770-BR1 or 5770-BR2 but cannot install and use both in one partition
- can coexist in the same network as 5770-BR1

Migrating BRMS from BR1 to BR2 - History

5770-BR2 Additional Information

- Software Licensing
  - In a partition, license to the allocation of IBM i processor entitlements. 5770-BR2 is not licensed to the specific cores used by BRMS, but, instead, licensed for the IBM i workload which is being backed up.
    - E.g.: a partition has 4 IBM i entitlements.
      - License 5770-BR2 for quantity = 4, regardless of the number of cores which BRMS is using

- BRMS (5770-BR2) 7.5 license terms
- BRMS (5770-BR2) 7.4 license terms

- **Migration from 5770-BR1 to 5770-BR2:** see BRMS (5770-BR2) Installation
  - Migration steps, including saving the QUSRBRM library (the BRMS database) before deleting 5770-BR1

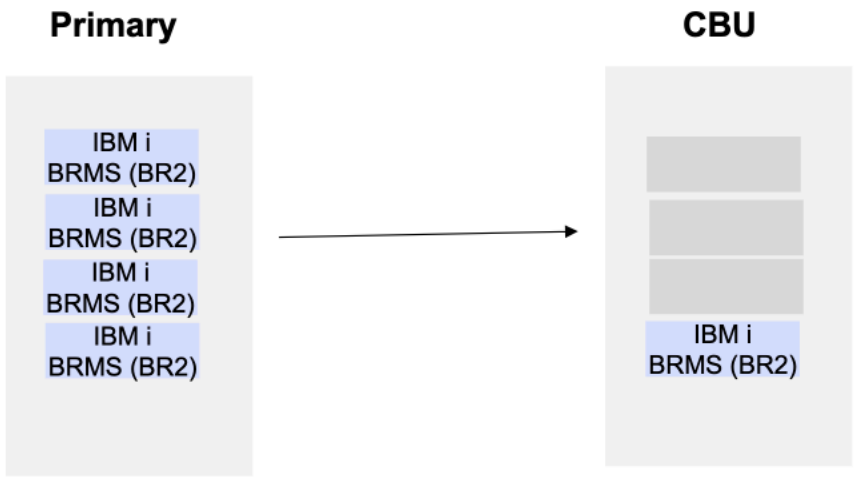
Migrating BRMS from BR1 to BR2 - History

Capacity Backup (CBU) for IBM i and BRMS (5770-BR2)

IBM i
continuous innovation
continuous integration

Example of a primary machine with one partition with 4 cores of IBM i and 5770-BR2

BRMS (5770-BR2) on the primary: licensed quantity = 4



BRMS (5770-BR2) on the CBU:
- Licensed quantity = 1
- CBU temp key quantity = 4

- The primary system is registered to a CBU server with one partition
- The CBU has a minimum of one IBM i processor entitlement licensed (more as required to support workload)
- The CBU has a minimum of one BRMS (5770-BR2) entitlement licensed
- Primary and CBU are owned by the same enterprise

Migrating BRMS from BR1 to BR2 - History

For reference:

PDF document

IBM Backup, Recovery and Media Services for i - Subscription Term (5770-BR2)

Wiki

The BRMS Product and Licensing

Migrating BRMS from BR1 to BR2 - The Process

BRMS (5770-BR2) Installation

Information about the BRMS (5770-BR2) installation process.

IBM has withdrawn the marketing of the IBM Backup, Recovery and Media Services for i (5770-BR1) and is offering IBM Backup, Recovery and Media Services for i Subscription Term (5770-BR2) as the available replacement.

5770-BR2 is simplified to contain all functionality from 5770-BR1 under a single option. In addition, 5770-BR2 has several new enhancements that are not included in 5770-BR1, including the new BRMS web interface.

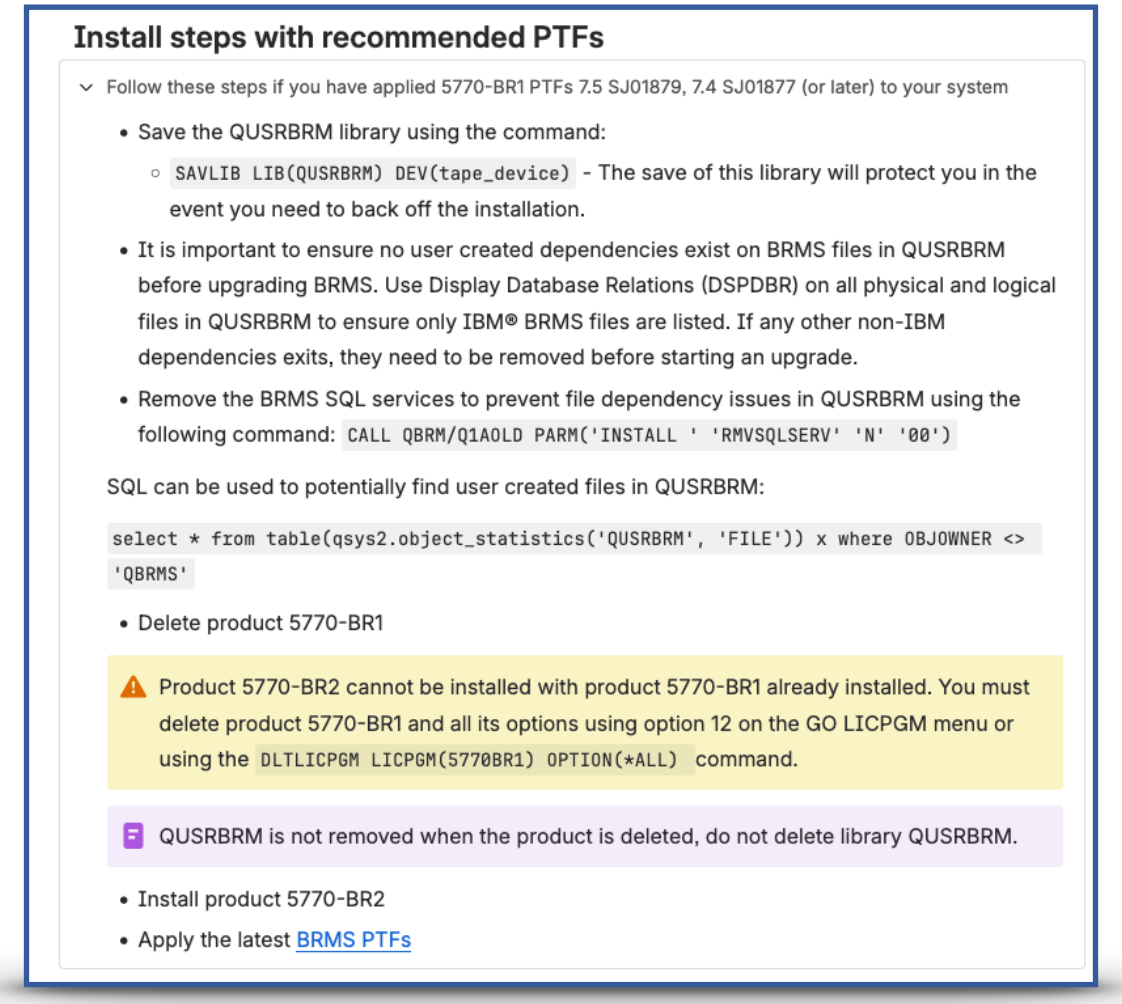
It is recommended to apply BRMS 5770-BR1 PTFs 7.5 SJ01879, 7.4 SJ01877 or the latest BRMS PTFs to improve the migration to 5770-BR2. It is recommended that BRMS PTFs should be applied immediate. The BRMS PTF exit program performs SQL operations which can cause unexpected delays and results if the BRMS PTF is applied delayed at the same time as DB related PTFs.

7.4 Warning: Prior to installing 5770-BR2, you must ensure that PTF SI82606 or the latest are applied on the system where 5770-BR2 is being installed. Related to What's new as of December 2022

When 5770-BR2 is installed, saving QBRM on 7.4 or 7.5 will result in message CPF3906 being logged for objects Q1A0002 and Q1A0003. These are informational messages and can be ignored. This will not occur on 7.6 and later releases.

Users can migrate from 5770-BR1 to 5770-BR2 by either choosing to apply the latest PTFs (see the information above), saving the QUSRBRM library, deleting 5770-BR1, and install 5770-BR2, or they can choose to skip the latest PTFs, save the QUSRBRM library, migrate the BRMS Functional Usage information, delete 5770-BR1, and install 5770-BR2.

Migrating BRMS from BR1 to BR2 - The Process



Install steps with recommended PTFs

Follow these steps if you have applied 5770-BR1 PTFs 7.5 SJ01879, 7.4 SJ01877 (or later) to your system

- Save the QUSRBRM library using the command:
  - `SAVLIB LIB(QUSRBRM) DEV(tape_device)` - The save of this library will protect you in the event you need to back off the installation.
- It is important to ensure no user created dependencies exist on BRMS files in QUSRBRM before upgrading BRMS. Use Display Database Relations (DSPDBR) on all physical and logical files in QUSRBRM to ensure only IBM® BRMS files are listed. If any other non-IBM dependencies exits, they need to be removed before starting an upgrade.
- Remove the BRMS SQL services to prevent file dependency issues in QUSRBRM using the following command: `CALL QBRM/Q1AOLD PARM('INSTALL ' 'RMVSQLSERV' 'N' '00')`

SQL can be used to potentially find user created files in QUSRBRM:

```
select * from table(qsys2.object_statistics('QUSRBRM', 'FILE')) x where OBJOWNER <> 'QBRMS'
```

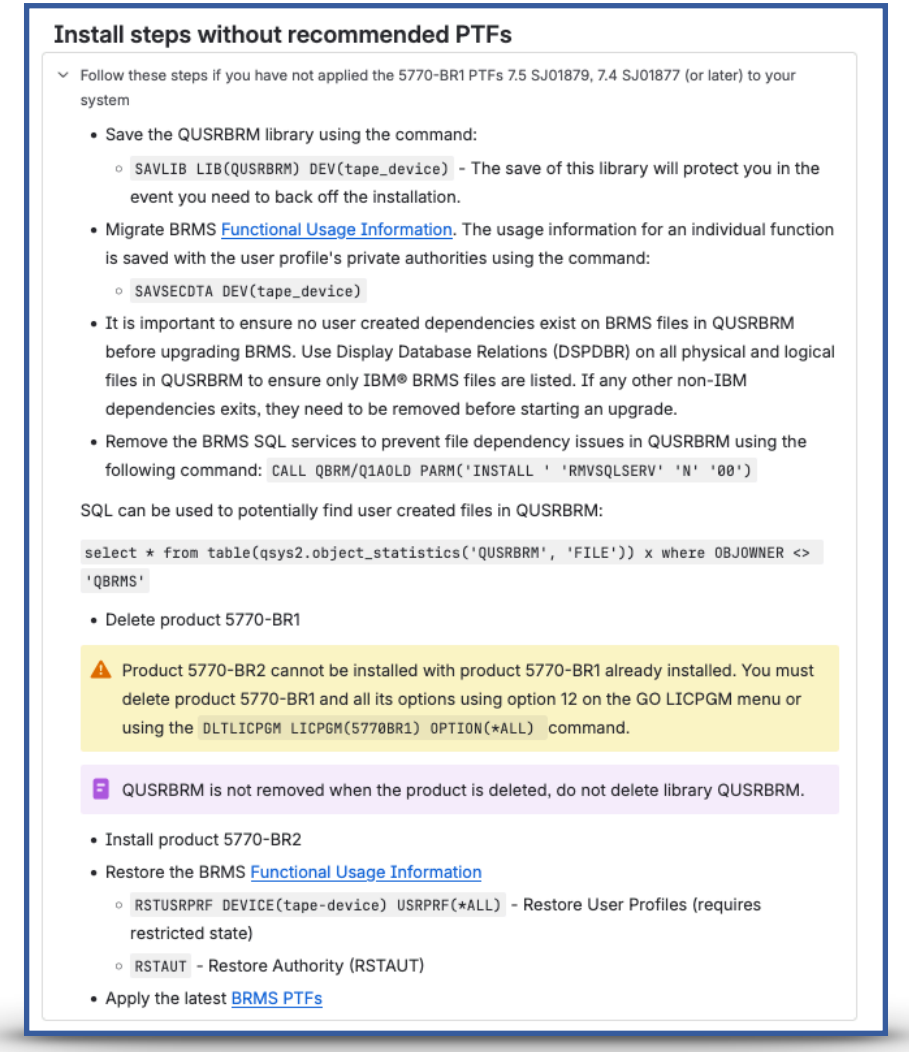
- Delete product 5770-BR1

⚠ Product 5770-BR2 cannot be installed with product 5770-BR1 already installed. You must delete product 5770-BR1 and all its options using option 12 on the GO LICPGM menu or using the `DLTLICPGM LICPGM(5770BR1) OPTION(*ALL)` command.

QUSRBRM is not removed when the product is deleted, do not delete library QUSRBRM.

- Install product 5770-BR2
- Apply the latest BRMS PTFs

Migrating BRMS from BR1 to BR2 - The Process



Install steps without recommended PTFs

Follow these steps if you have not applied the 5770-BR1 PTFs 7.5 SJ01879, 7.4 SJ01877 (or later) to your system

- Save the QUSRBRM library using the command:
  - `SAVLIB LIB(QUSRBRM) DEV(tape_device)` - The save of this library will protect you in the event you need to back off the installation.
- Migrate BRMS Functional Usage Information. The usage information for an individual function is saved with the user profile's private authorities using the command:
  - `SAVSECDTA DEV(tape_device)`
- It is important to ensure no user created dependencies exist on BRMS files in QUSRBRM before upgrading BRMS. Use Display Database Relations (DSPDBR) on all physical and logical files in QUSRBRM to ensure only IBM® BRMS files are listed. If any other non-IBM dependencies exits, they need to be removed before starting an upgrade.
- Remove the BRMS SQL services to prevent file dependency issues in QUSRBRM using the following command: `CALL QBRM/Q1AOLD PARM('INSTALL ' 'RMVSQLSERV' 'N' '00')`

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QUSRBRM is not removed when the product is deleted, do not delete library QUSRBRM.

- Install product 5770-BR2
- Restore the BRMS Functional Usage Information
  - `RSTUSRPRF DEVICE(tape-device) USRPRF(*ALL)` - Restore User Profiles (requires restricted state)
  - `RSTAUT` - Restore Authority (RSTAUT)
- Apply the latest BRMS PTFs

Migrating BRMS from BR1 to BR2 - The Process

Install steps when 5770-BR1 was not previously installed

- Install product 5770-BR2
- Apply the latest BRMS PTFs

Migrating BRMS from BR1 to BR2 - The Process

Install steps with recommended PTFs

File Edit Search View Connection Run Explain Monitor Editor Tools Help

```
1  -- BRMS (5770-BR2) Installation
2  -- Check 5770-BR1 PTFs 7.5 SJ01879, 7.4 SJ01877 or the latest BRMS PTFs for 7.5 SJ07119, 7.4 SJ07118
3  SELECT A.PTF_PRODUCT_ID,
4         A.PTF_IDENTIFIER,
5         A.PTF_LOADED_STATUS,
6         A.PTF_STATUS_TIMESTAMP
7     FROM QSYS2.PTF_INFO A
8     WHERE A.PTF_PRODUCT_ID = '5770BR1'
9     and A.PTF_IDENTIFIER in ('SJ01879', 'SJ01877',  'SJ07119', 'SJ07118')
10    ORDER BY A.PTF_STATUS_TIMESTAMP DESC;;
```

PTF Product ID	PTF Identifier	PTF Loaded Status	PTF Status Timestamp
PTF_PRODUCT_ID	PTF_IDENTIFIER	PTF_LOADED_STATUS	PTF_STATUS_TIMESTAMP
5770BR1	SJ07119	APPLIED	2025-10-24 17:36:23.000000
5770BR1	SJ01879	SUPERSEDED	2025-10-24 17:21:04.000000

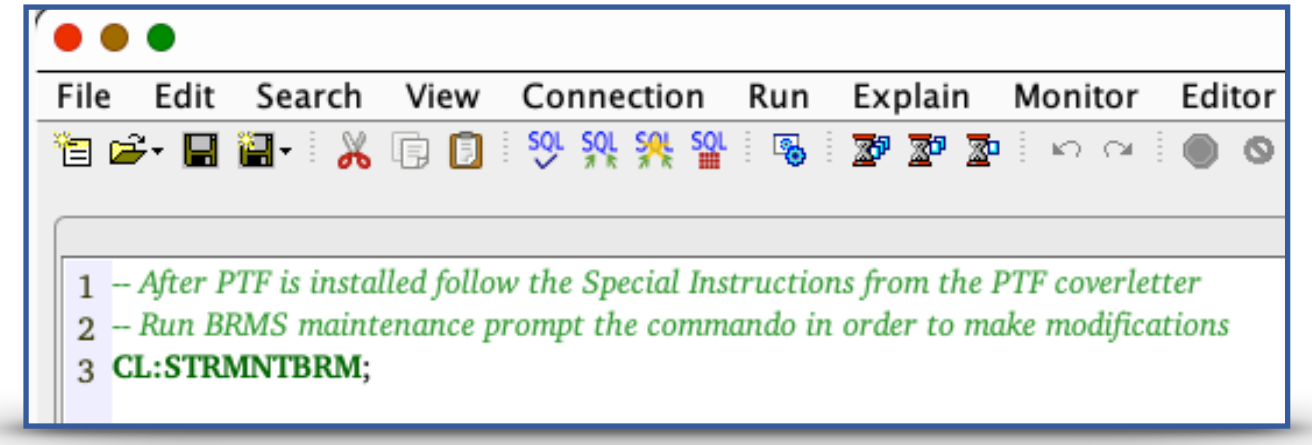
Migrating BRMS from BR1 to BR2 - The Process

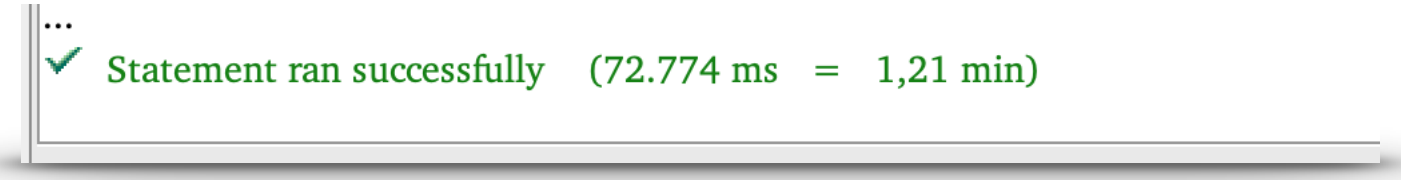
Install steps with recommended PTFs

```
-- Just in case the recommended or latest PTF is not applied order and order and apply it
BEGIN
   DECLARE PTFID_V7R4 CHAR(7);
   DECLARE PTFID_V7R5 CHAR(7);

   DECLARE PTFID CHAR(7);

   DECLARE IBM_i_Version CHAR(3);
   SET PTFID_V7R5 = 'SJ07119';
   SET PTFID_V7R4 = 'SJ07118';

   SET IBM_i_Version = (SELECT OS_VERSION CONCAT '.' CONCAT OS_RELEASE AS IBM_i
              FROM sysibmadm.env_sys_info
              FETCH FIRST 1 ROW ONLY);

   IF (IBM_i_Version = 7.4) THEN
      SET PTFID = PTFID_V7R4;
   END IF;
   IF (IBM_i_Version = 7.5) THEN
      SET PTFID = PTFID_V7R5;
   END IF;
   CALL qsys2.qcmdexc('SNDPTFORD PTFID(' CONCAT PTFID CONCAT ') CHKPTF(*YES)');
   CALL qsys2.qcmdexc('LODPTF LICPGM(5770BR1) SELECT(' CONCAT PTFID CONCAT ')');
   CALL qsys2.qcmdexc('APYPTF LICPGM(5770BR1) SELECT(' CONCAT PTFID CONCAT ')');
END;
```

Migrating BRMS from BR1 to BR2 - The Process

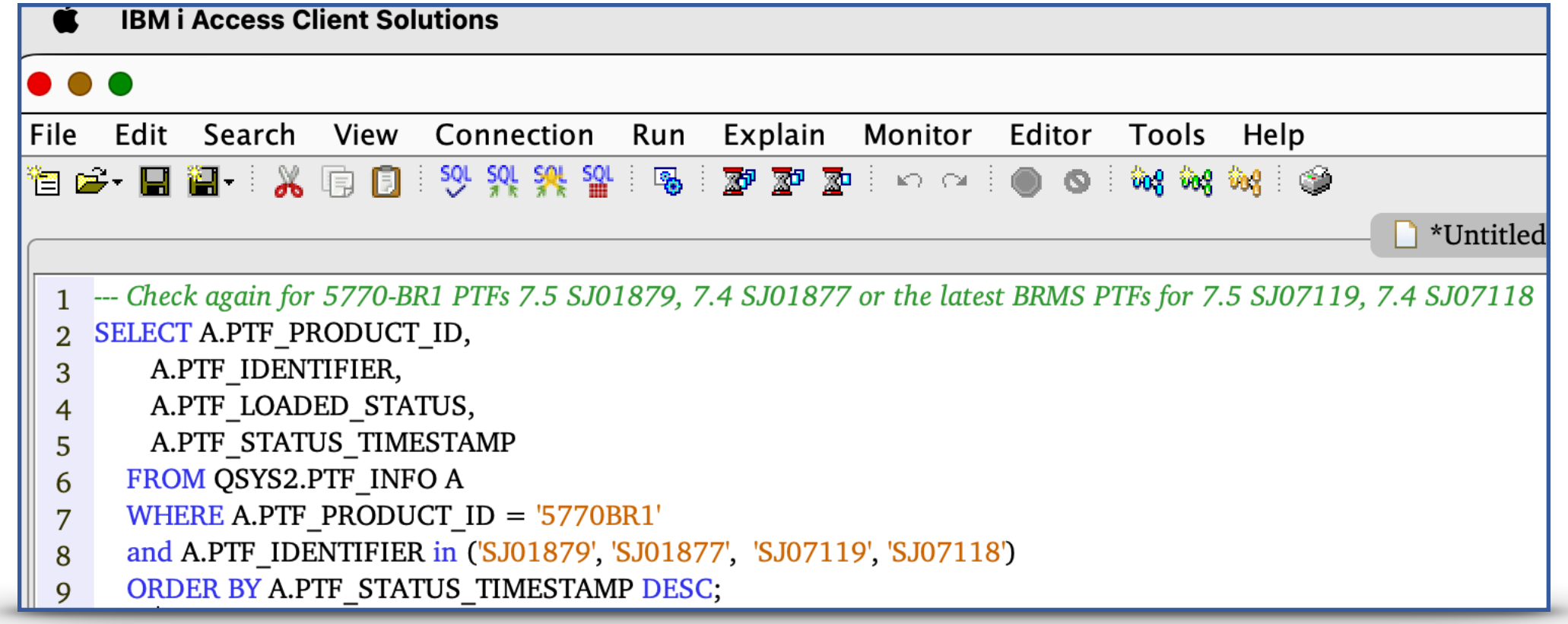
Install steps with recommended PTFs





Migrating BRMS from BR1 to BR2 - The Process

Install steps with recommended PTFs



Migrating BRMS from BR1 to BR2 - The Process

Install steps with recommended PTFs

IBM i Access Client Solutions

Run SQL Scripts - Not connected

File Edit Search View Connection Run Explain Monitor Editor Tools Help

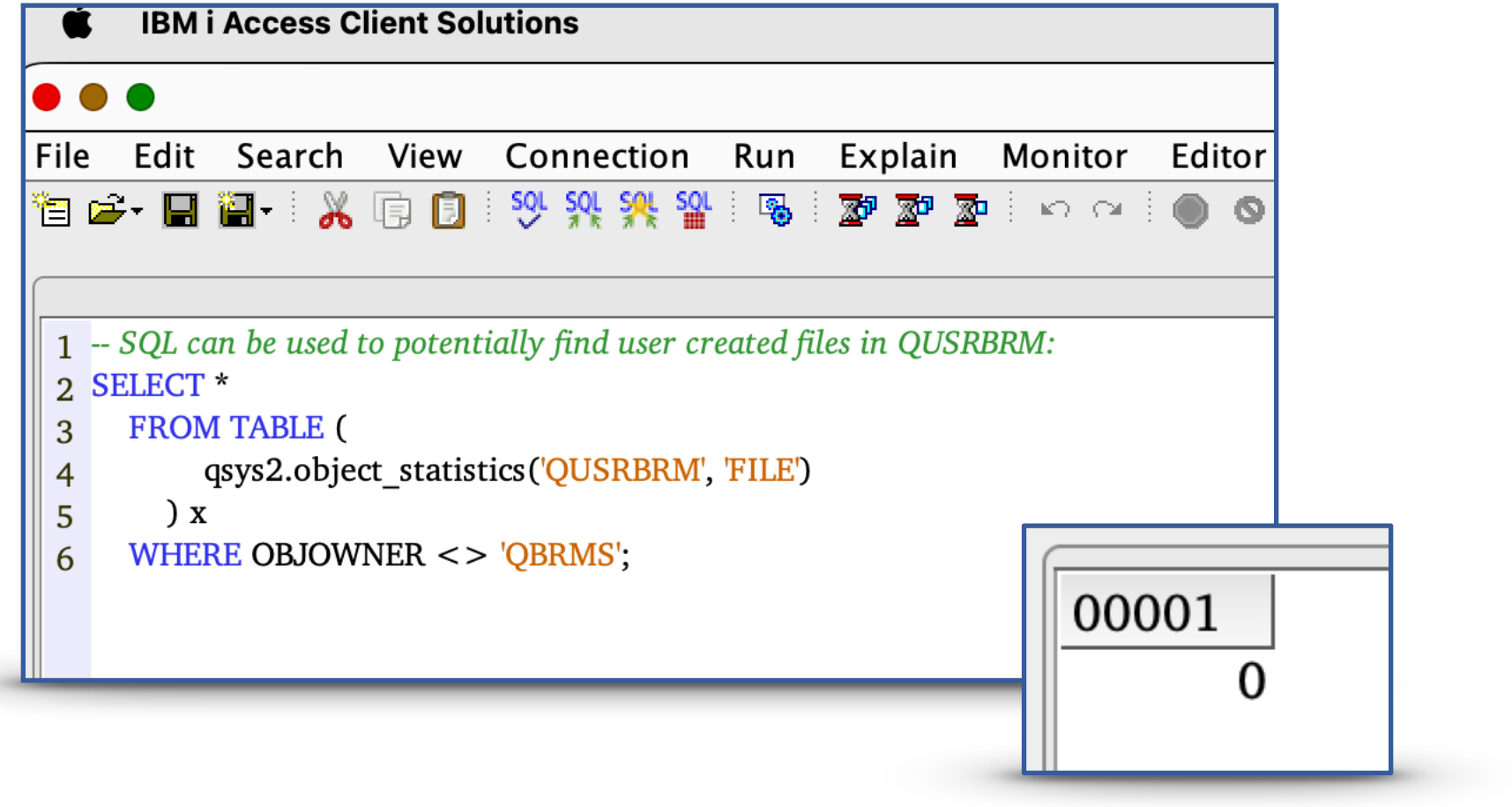
*Untitled 1 *Untitled 2 Unti

```
1  --Ensure no user created dependencies exist on BRMS files in QUSRBRM
2  WITH Database_Relations (Schema, Table, SQL_Schema, SQL_Name, Type, Owner) AS (
3        SELECT SYSTEM_TABLE_SCHEMA,
4               SYSTEM_TABLE_NAME,
5               TABLE_OWNER,
6               SOURCE_SCHEMA_NAME,
7               SOURCE_SQL_NAME,
8               SQL_OBJECT_TYPE
9          FROM qsys2.systables
10           INNER JOIN TABLE (
11                 SYSTOOLS.RELATED_OBJECTS(LIBRARY_NAME => SYSTEM_TABLE_SCHEMA, /* VARCHAR(10)  No default  name - Default: none */
12                    FILE_NAME => SYSTEM_TABLE_NAME)
13               )
14               ON TABLE_OWNER = OBJECT_OWNER
15         WHERE TABLE_SCHEMA = 'QUSRBRM'
16           AND TABLE_TYPE = 'P'
17    )
18    SELECT Database_Relations.*
19      FROM Database_Relations;
```

SCHEMA	TABLE	SQL_SCHEMA	SQL_NAME	TYPE	OWNER
QUSRBRM	QA1ASDC	QBRMS	QUSRBRM	QA1ASDC	VIEW
QUSRBRM	QA1ASL	QBRMS	QUSRBRM	QA1ASL	LOGICAL FILE
QUSRBRM	QA1ASP	QBRMS	QUSRBRM	QA1ASP	VIEW
QUSRBRM	QA1AXC	QBRMS	QUSRBRM	QA1AXC	KEYED LOGICAL FILE
QUSRBRM	QA1AXS	QBRMS	QUSRBRM	QA1AXS	KEYED LOGICAL FILE

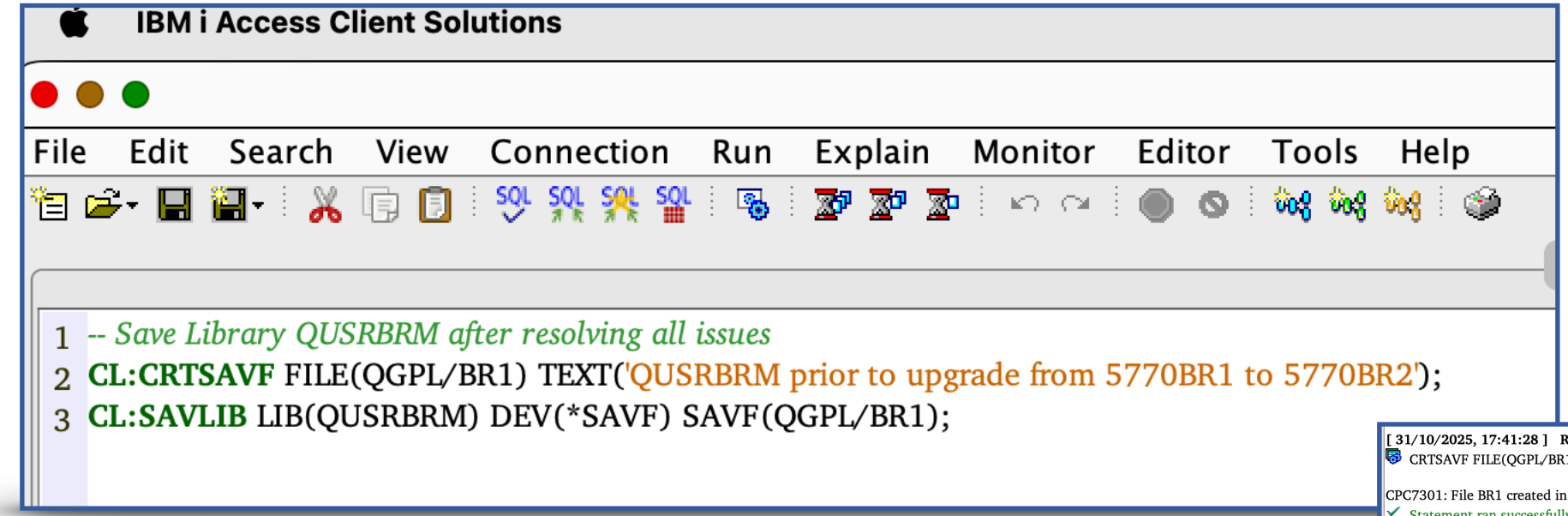
Migrating BRMS from BR1 to BR2 - The Process

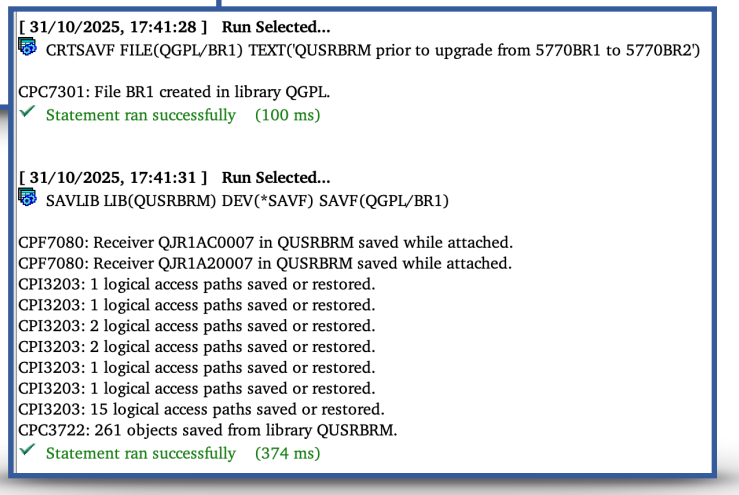
Install steps with recommended PTFs



Migrating BRMS from BR1 to BR2 - The Process

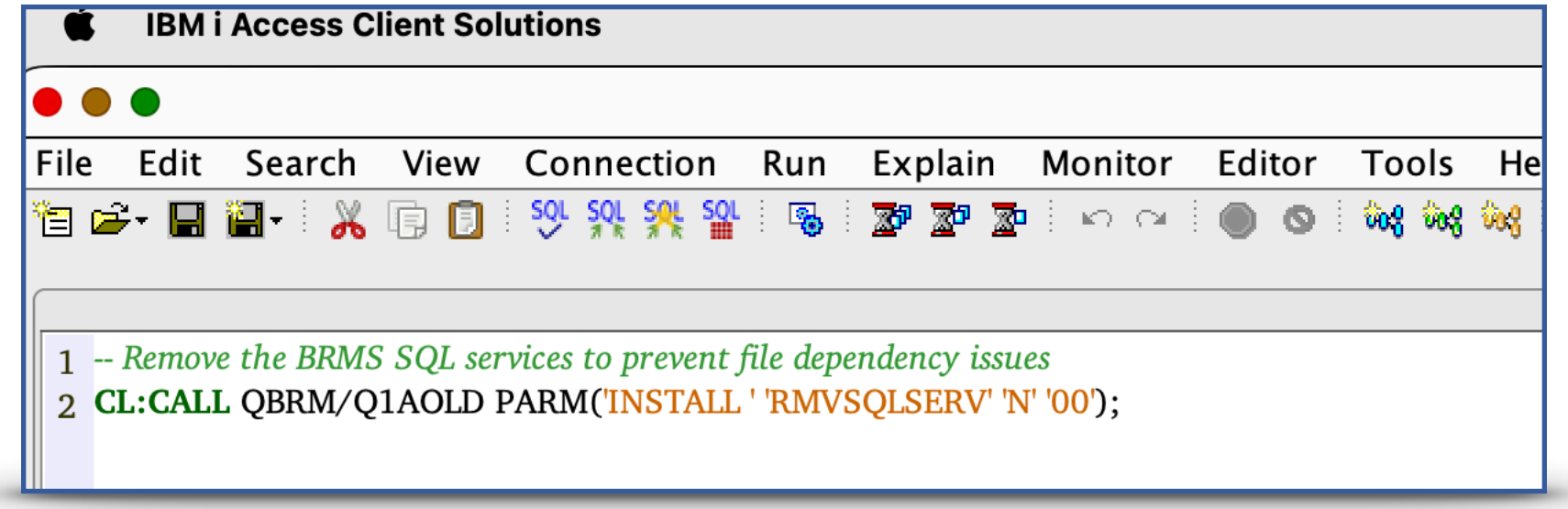
Install steps with recommended PTFs

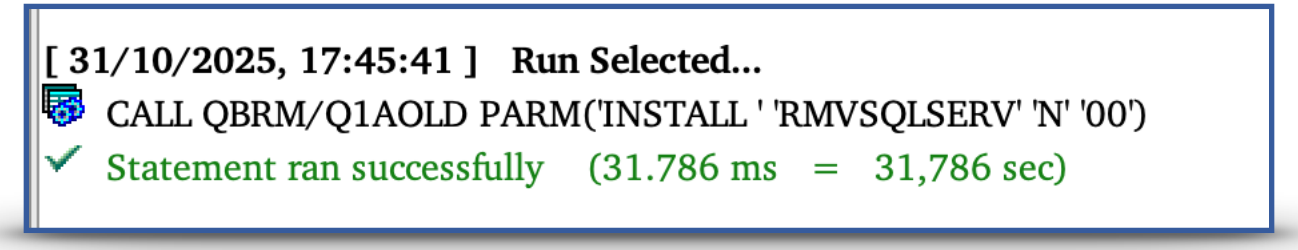




Migrating BRMS from BR1 to BR2 - The Process

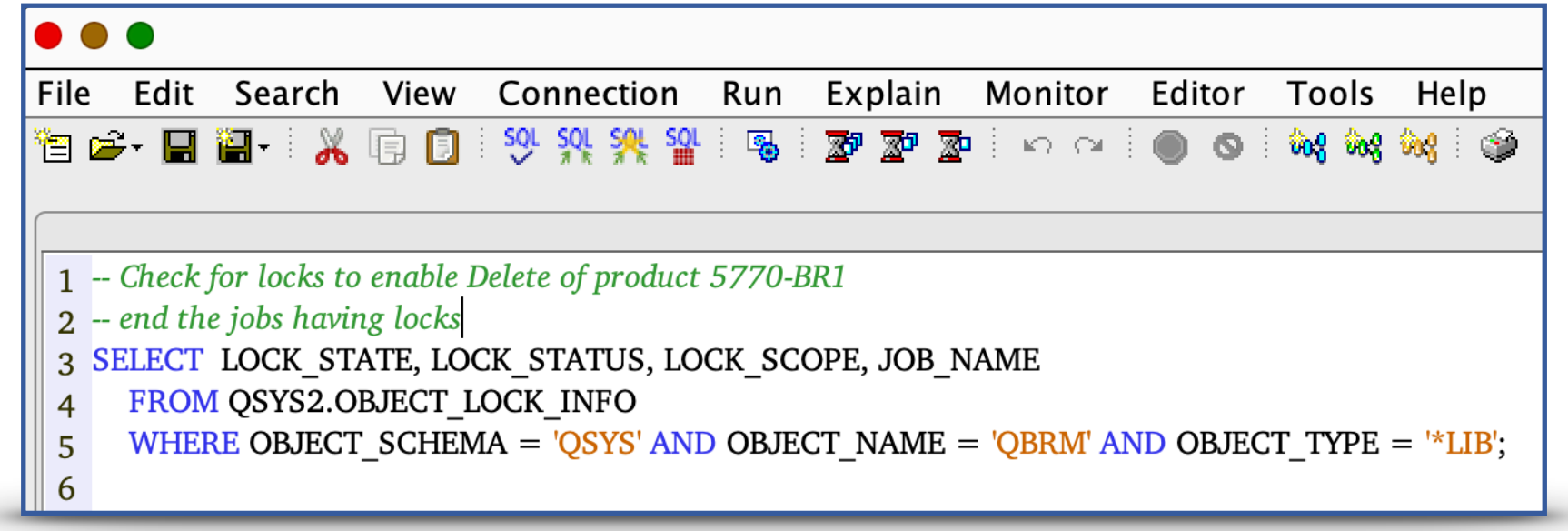
Install steps with recommended PTFs





Migrating BRMS from BR1 to BR2 - The Process

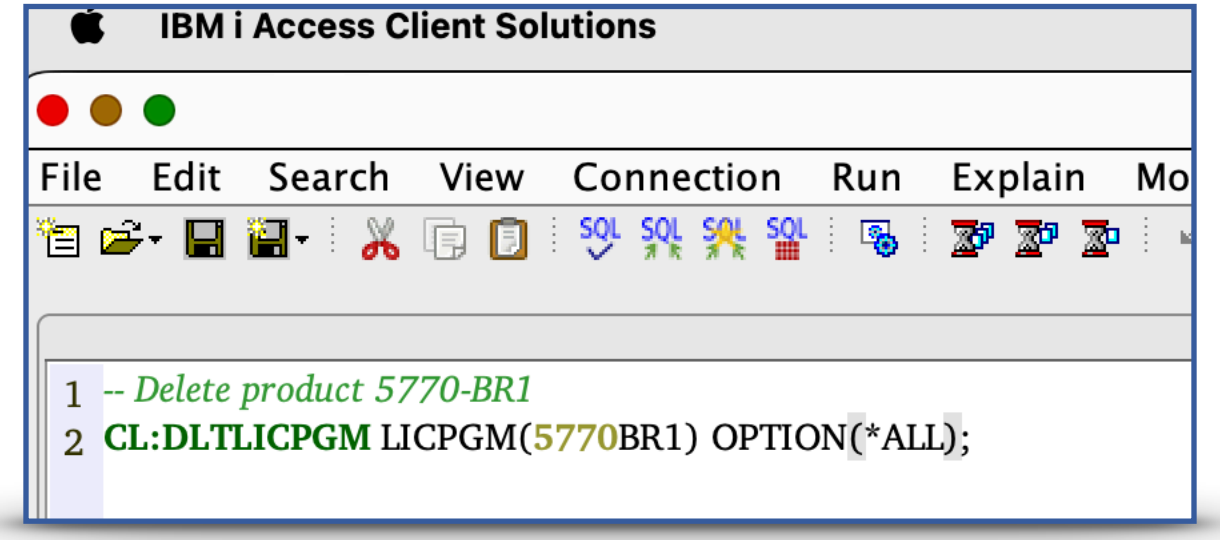
Install steps with recommended PTFs

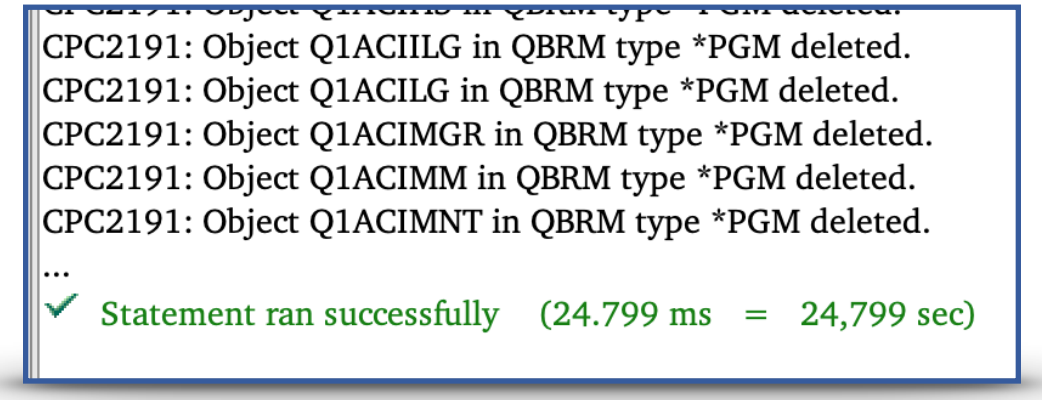


Lock State	Lock Status	Lock Scope	Job Name
LOCK_STATE	LOCK_STATUS	LOCK_SCOPE	JOB_NAME
*SHRRD	HELD	JOB	003597/RUDI/QPADEV0002
*SHRRD	HELD	JOB	003589/QUSER/QZRCSRVS

Migrating BRMS from BR1 to BR2 - The Process

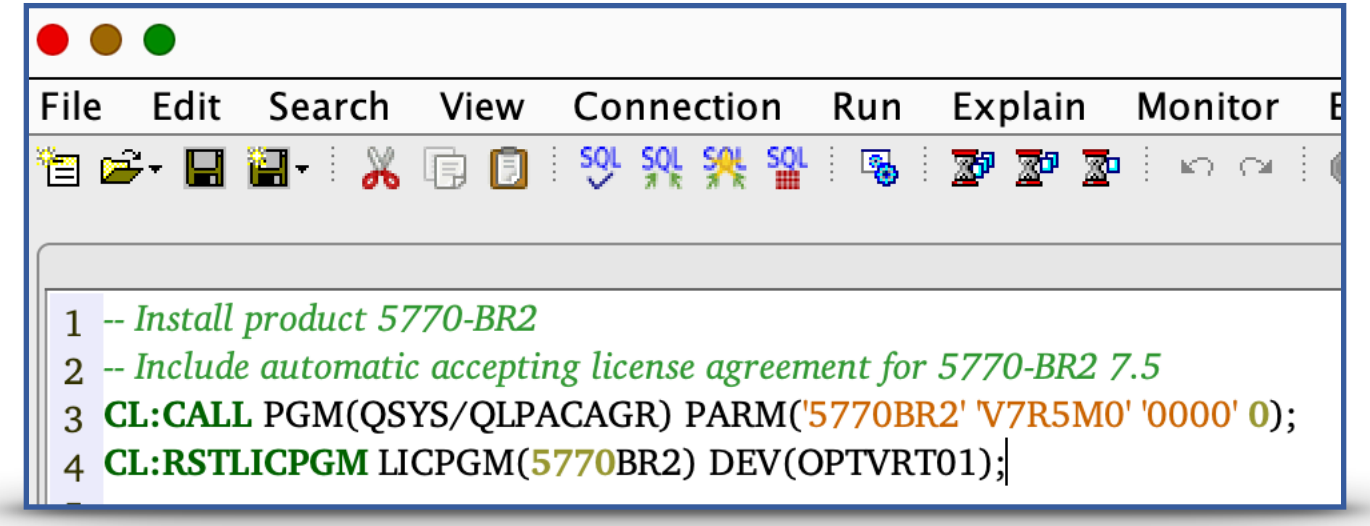
Install steps with recommended PTFs





Migrating BRMS from BR1 to BR2 - The Process

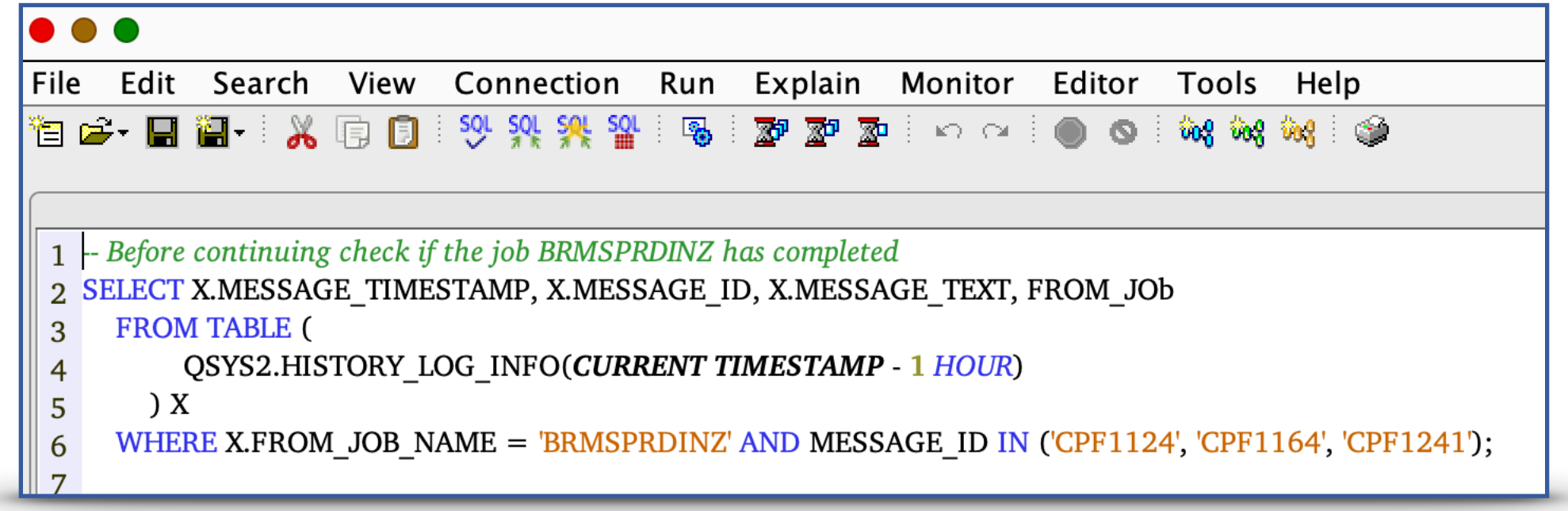
Install steps with recommended PTFs




```
CPF3292: File QA1A1RMT in library QBRM restored.
CPF3292: File QA1ASL in library QBRM restored.
CPF3292: File QA1A1SL in library QBRM restored.
CPF3292: File QA1AXC in library QBRM restored.
CPF3292: File QA1A1XC in library QBRM restored.
CPF3292: File QA1ADI in library QBRM restored.
CPF3292: File QA1A2DI in library QBRM restored.
...
✓ Statement ran successfully  (75.476 ms  =  1,26 min)
```

Migrating BRMS from BR1 to BR2 - The Process

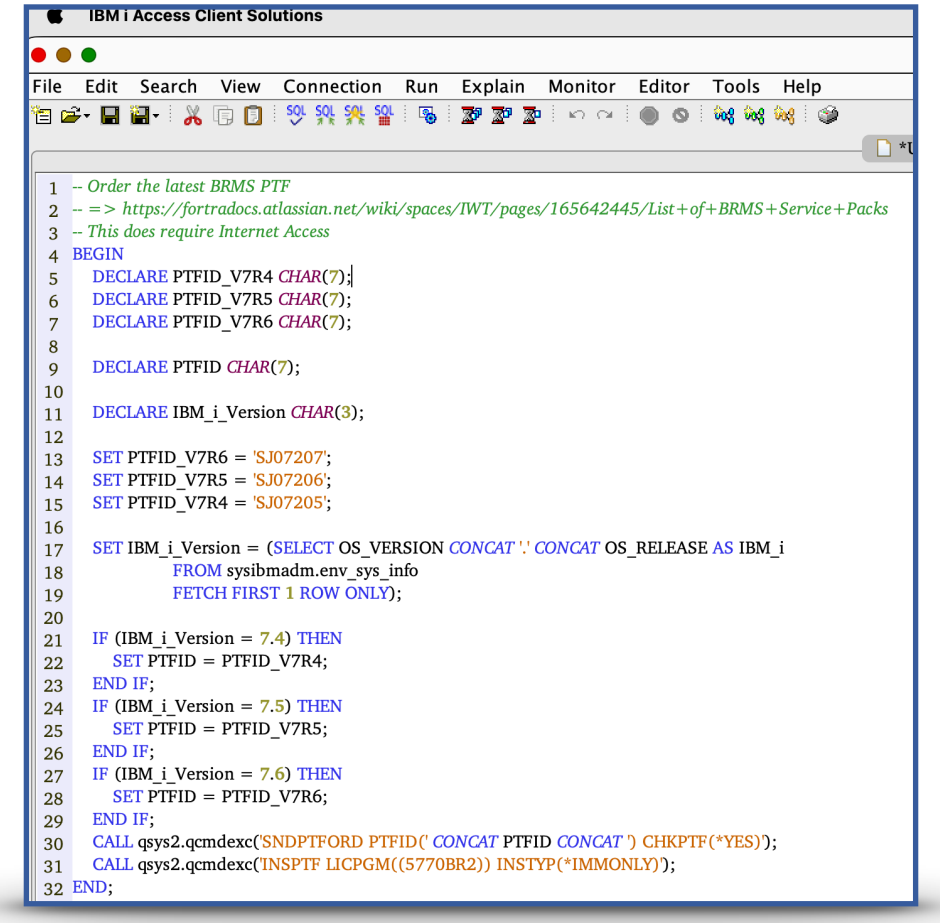
Install steps with recommended PTFs



MESSAGE_TIMESTAMP	MESSAGE_ID	MESSAGE_TEXT	FROM_JOB
2025-10-31 17:39:58.439203	CPF1124	Job 003606/RUDI/BRMSPRDINZ started on 31/10/25 at 17:39:58 in subsystem QBATCH in QSYS. Job entered syste...	003606/RUDI/BRMSPRDINZ
2025-10-31 17:40:55.029167	CPF1164	Job 003606/RUDI/BRMSPRDINZ ended on 31/10/25 at 17:40:55; 14.844 seconds used; end code 0 .	003606/RUDI/BRMSPRDINZ
2025-10-31 17:40:55.029611	CPF1241	Job 003606/RUDI/BRMSPRDINZ completed normally on 31/10/25 at 17:40:55.	003606/RUDI/BRMSPRDINZ

Migrating BRMS from BR1 to BR2 - The Process

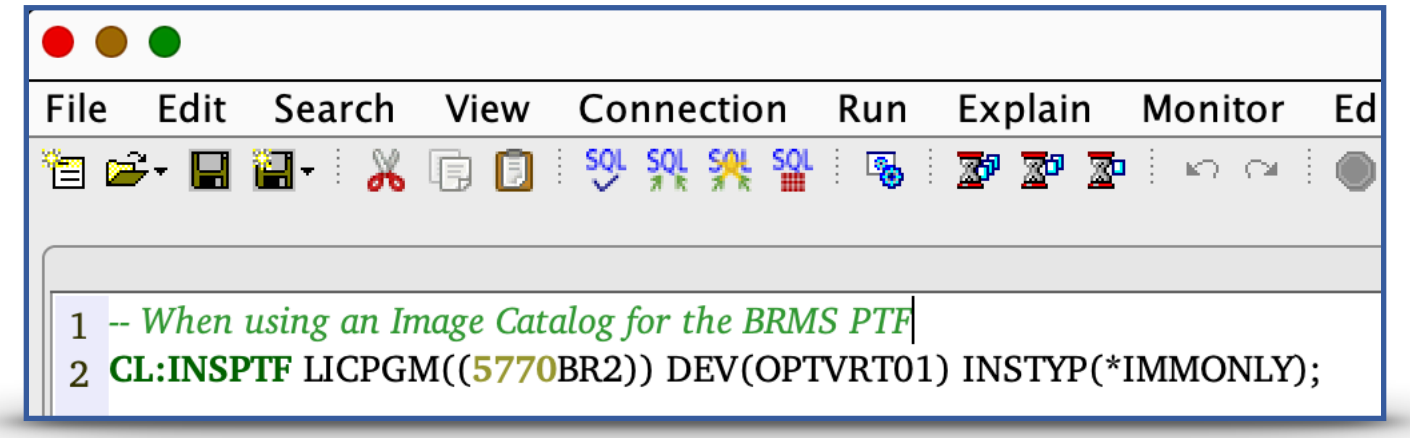
Install steps with recommended PTFs

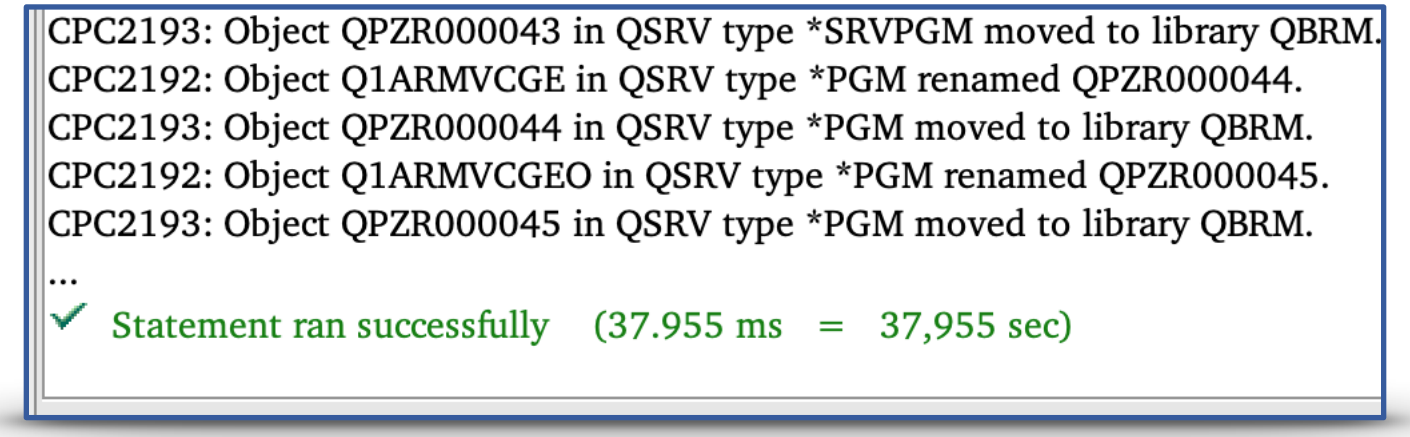



```
1  -- Order the latest BRMS PTF
2  -- => https://fortradocs.atlassian.net/wiki/spaces/IWT/pages/165642445/List+of+BRMS+Service+Packs
3  -- This does require Internet Access
4  BEGIN
5     DECLARE PTFID_V7R4 CHAR(7);
6     DECLARE PTFID_V7R5 CHAR(7);
7     DECLARE PTFID_V7R6 CHAR(7);
8
9     DECLARE PTFID CHAR(7);
10
11    DECLARE IBM_i_Version CHAR(3);
12
13    SET PTFID_V7R6 = 'SJ07207';
14    SET PTFID_V7R5 = 'SJ07206';
15    SET PTFID_V7R4 = 'SJ07205';
16
17    SET IBM_i_Version = (SELECT OS_VERSION CONCAT '.' CONCAT OS_RELEASE AS IBM_i
18                FROM sysibmadm.env_sys_info
19                FETCH FIRST 1 ROW ONLY);
20
21    IF (IBM_i_Version = 7.4) THEN
22       SET PTFID = PTFID_V7R4;
23    END IF;
24    IF (IBM_i_Version = 7.5) THEN
25       SET PTFID = PTFID_V7R5;
26    END IF;
27    IF (IBM_i_Version = 7.6) THEN
28       SET PTFID = PTFID_V7R6;
29    END IF;
30    CALL qsys2.qcmdexc('SNDPTFORD PTFID(' CONCAT PTFID CONCAT ') CHKPTF(*YES)');
31    CALL qsys2.qcmdexc('INSPTF LICPGM((5770BR2)) INSTYP(*IMMONLY)');
32 END;
```

Migrating BRMS from BR1 to BR2 - The Process

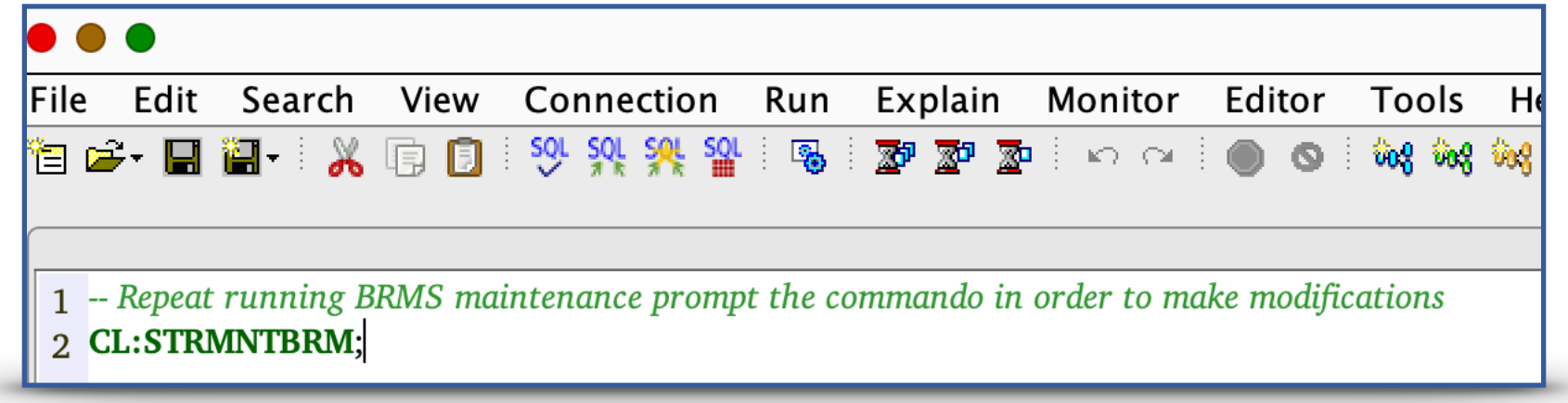
Install steps with recommended PTFs

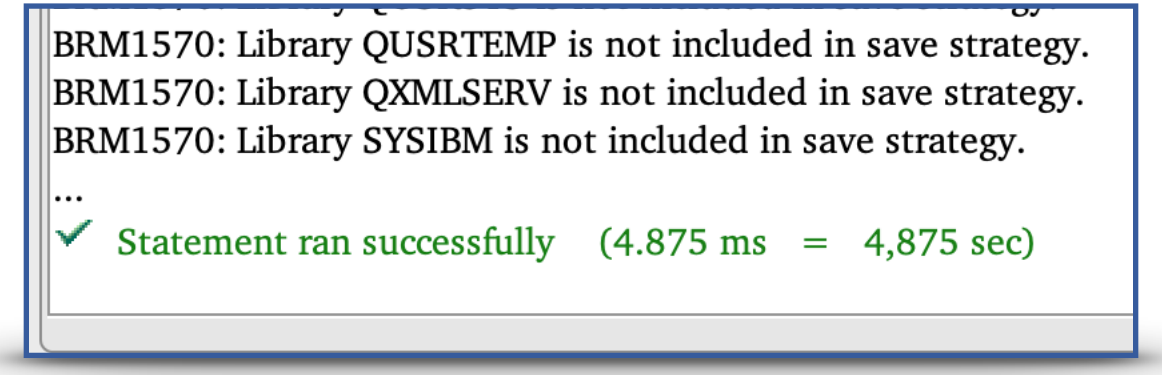




Migrating BRMS from BR1 to BR2 - The Process

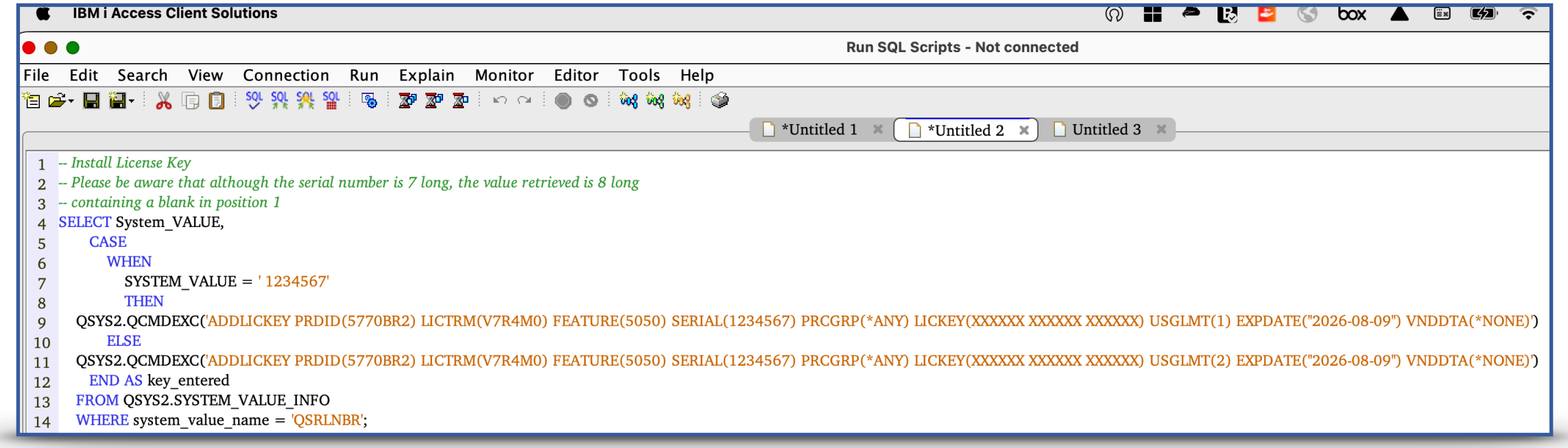
Install steps with recommended PTFs





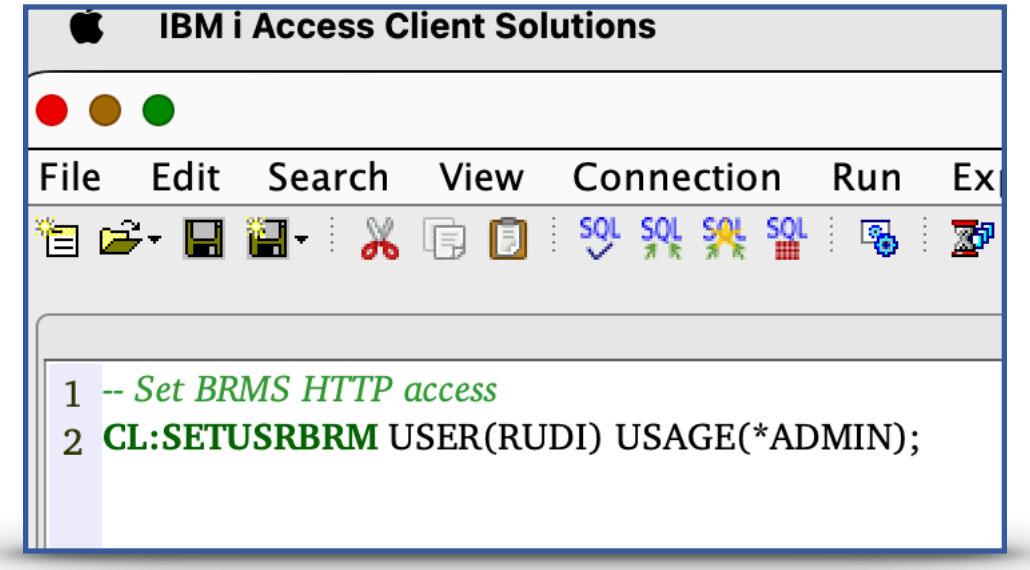
Migrating BRMS from BR1 to BR2 - The Process

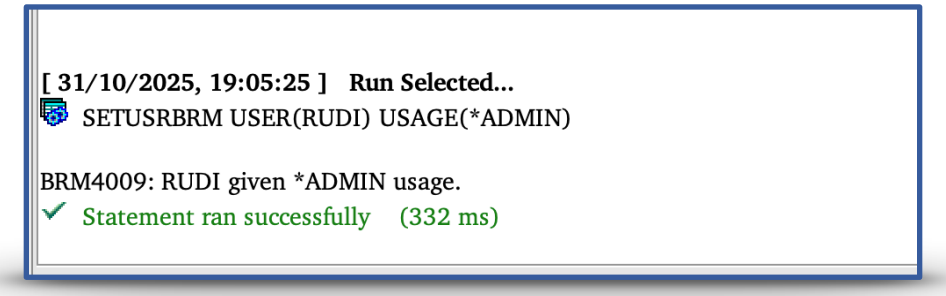
Install steps with recommended PTFs



Migrating BRMS from BR1 to BR2 - The Process

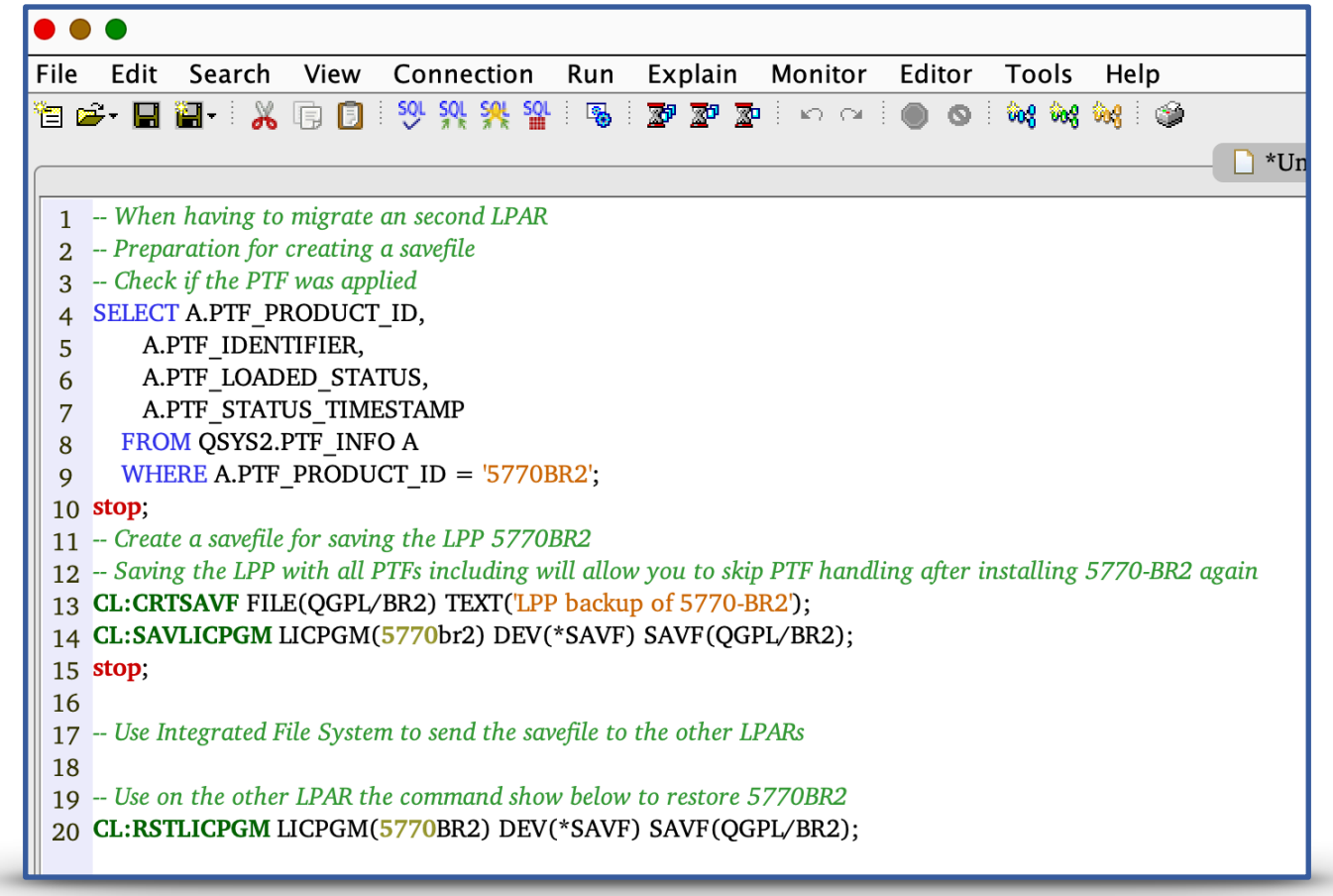
Install steps with recommended PTFs





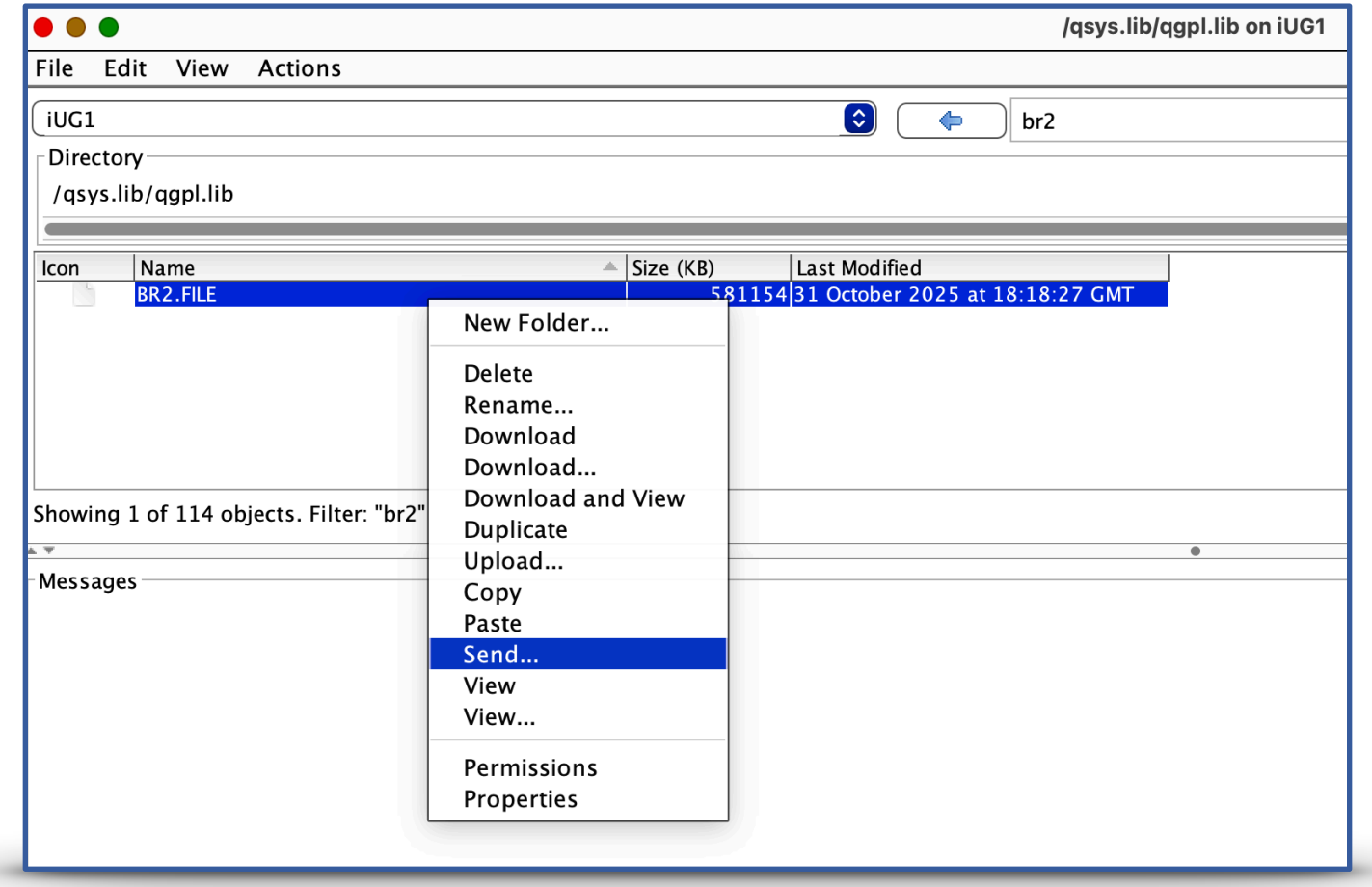
Migrating BRMS from BR1 to BR2 - The Process

Install steps with recommended PTFs



Migrating BRMS from BR1 to BR2 - The Process

Install steps with recommended PTFs



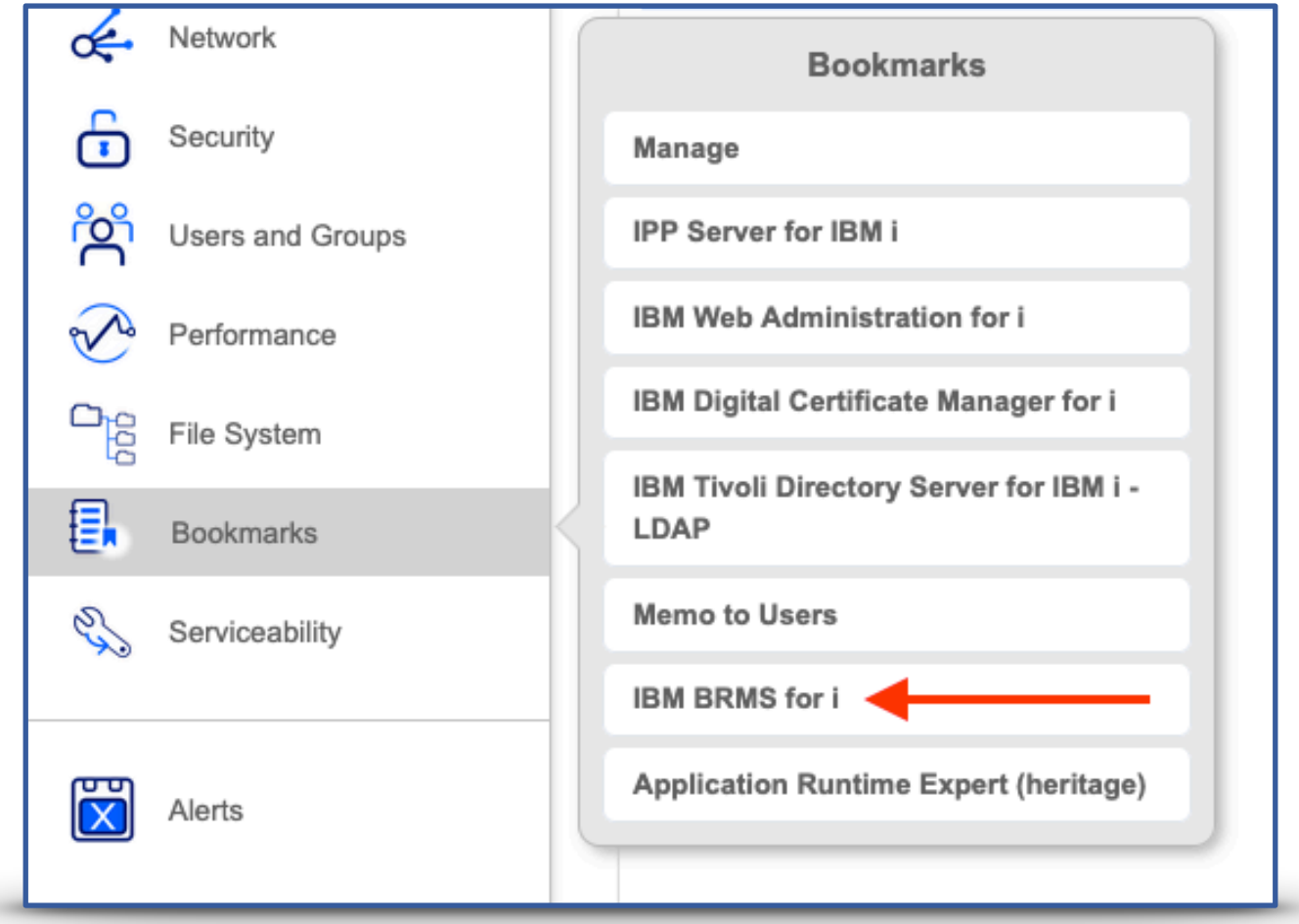
Migrating BRMS from BR1 to BR2 - The Process

Install steps with recommended PTFs

```
21 -- or use the Object Connect server when configured
22 -- =>https://www.ibm.com/docs/en/i/7.4.0?topic=function-setting-up-your-system-use-objectconnect
23
24 CL:SAVRSTOBJ OBJ(BR2) LIB(QGPL) RMTLOCNAME(SYSTEM1) CNNTYPE(*IP) RMTUSER(MYUSER) RMTPWD(MyPassword) OBJTYPE(*FILE);
25 CL:SAVRSTOBJ OBJ(BR2) LIB(QGPL) RMTLOCNAME(SYSTEM2) CNNTYPE(*IP) RMTUSER(MYUSER) RMTPWD(MyPassword) OBJTYPE(*FILE);
26 CL:SAVRSTOBJ OBJ(BR2) LIB(QGPL) RMTLOCNAME(SYSTEM3) CNNTYPE(*IP) RMTUSER(MYUSER) RMTPWD(MyPassword) OBJTYPE(*FILE);
27
```

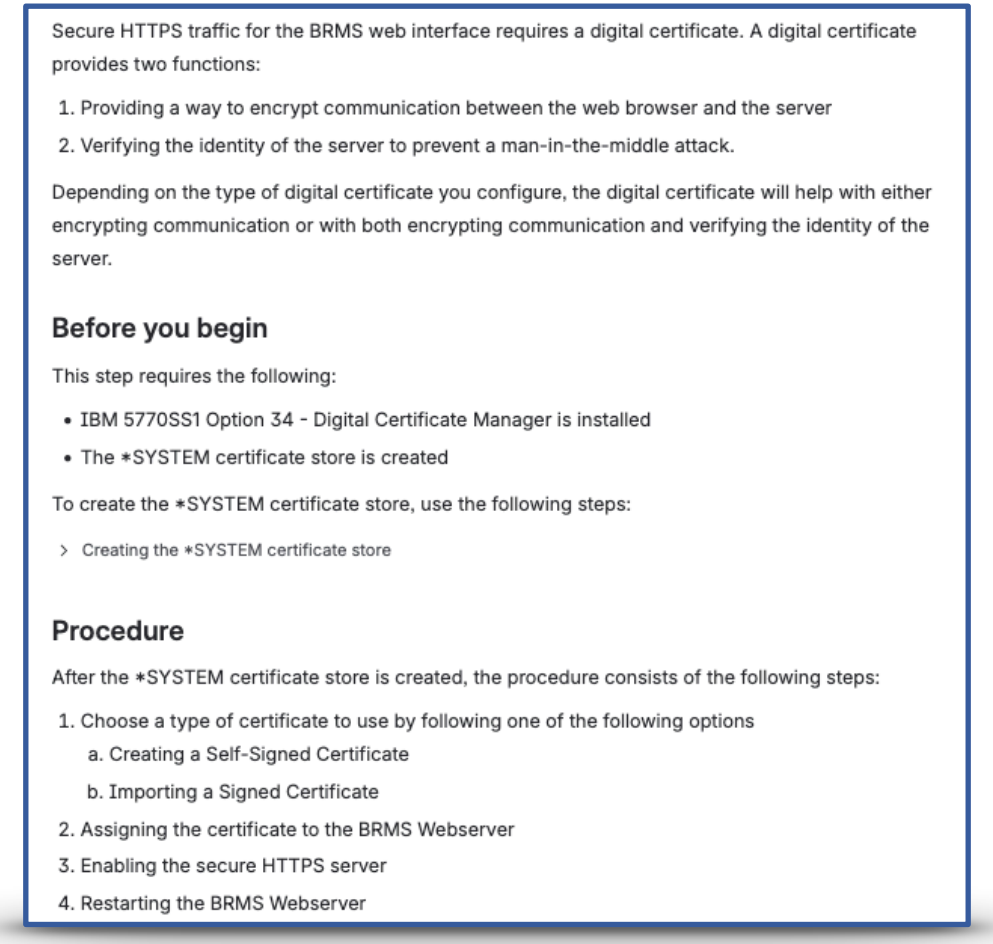
Migrating BRMS from BR1 to BR2 - The New GUI

IBM BRMS for i



Migrating BRMS from BR1 to BR2 - The New GUI

IBM BRMS for i - Enabling Secure HTTPS for the BRMS Web Interface



Secure HTTPS traffic for the BRMS web interface requires a digital certificate. A digital certificate provides two functions:

1. Providing a way to encrypt communication between the web browser and the server
2. Verifying the identity of the server to prevent a man-in-the-middle attack.

Depending on the type of digital certificate you configure, the digital certificate will help with either encrypting communication or with both encrypting communication and verifying the identity of the server.

Before you begin

This step requires the following:

- IBM 5770SS1 Option 34 - Digital Certificate Manager is installed
- The *SYSTEM certificate store is created

To create the *SYSTEM certificate store, use the following steps:

> Creating the *SYSTEM certificate store

Procedure

After the *SYSTEM certificate store is created, the procedure consists of the following steps:

1. Choose a type of certificate to use by following one of the following options
   a. Creating a Self-Signed Certificate
   b. Importing a Signed Certificate
2. Assigning the certificate to the BRMS Webserver
3. Enabling the secure HTTPS server
4. Restarting the BRMS Webserver

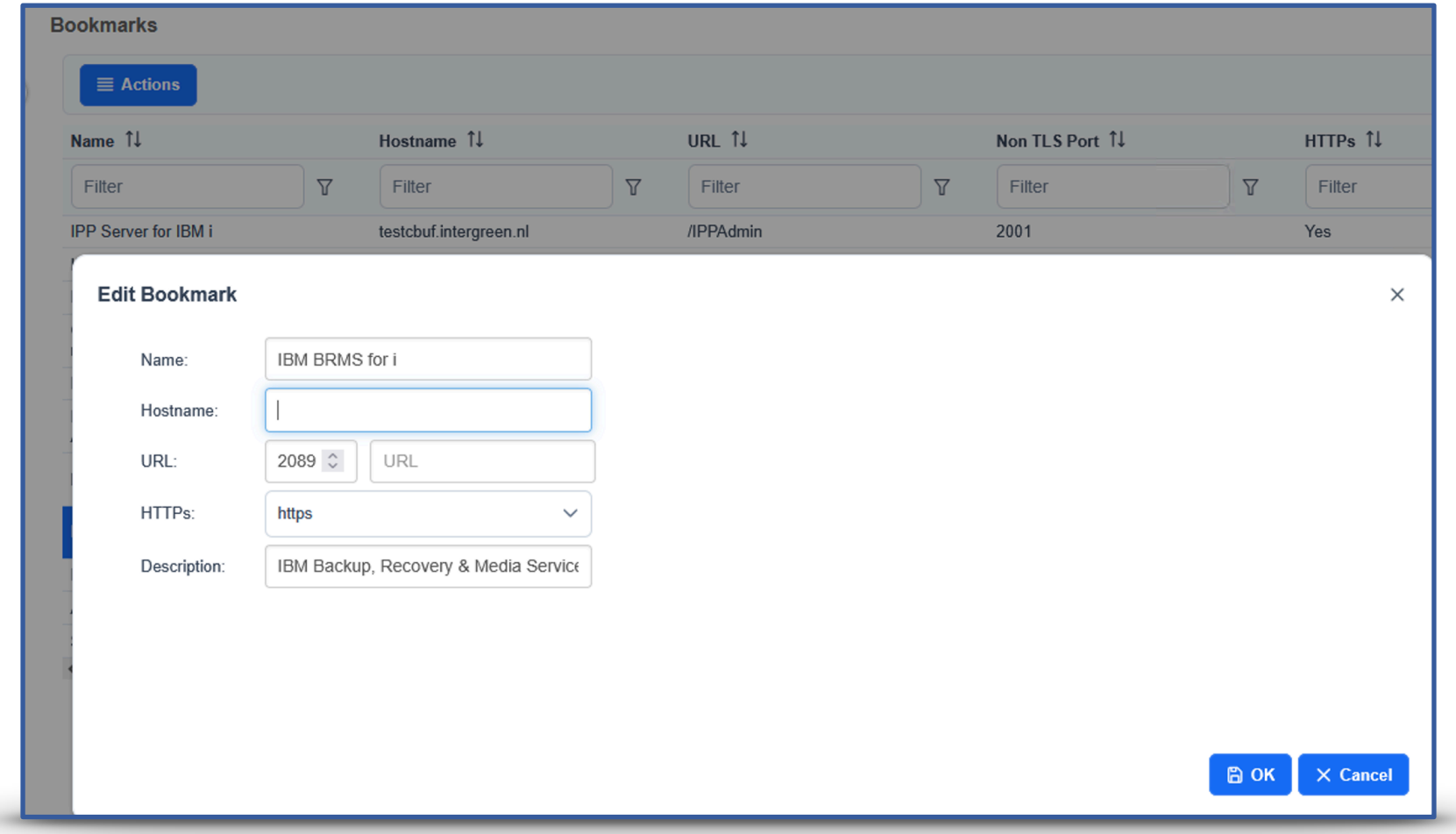
Migrating BRMS from BR1 to BR2 - The New GUI

IBM BRMS for i - Enabling Secure HTTPS for the BRMS Web Interface

```
-- category: System Management
-- description: Configure TLS for HTTP BRMS for i
CL:CHGWEBBRM HTTP(*AUTO 2088) HTTPS(*ON 2089);

CL:ENDTCPSVR SERVER(*HTTP) HTTPSVR(QBRMWEBSVR);
CL:DLYJOB 15;
CL:STRTCPSVR SERVER(*HTTP) HTTPSVR(QBRMWEBSVR);
CL:DLYJOB 15;
-- Check if port 2088 & 2089 are active
SELECT JOB_NAME,
     LOCAL_PORT,
     LOCAL_ADDRESS,
     REMOTE_PORT,
     REMOTE_ADDRESS
  FROM QSYS2.NETSTAT_JOB_INFO
  WHERE LOCAL_PORT IN (2088, 2089);
stop;
-- happy with testing?
-- Disable non-TLS port
CL:CHGWEBBRM HTTP(*OFF) HTTPS(*ON 2089) AUTOSTART(*YES);
stop;
CL:ENDTCPSVR SERVER(*HTTP) HTTPSVR(QBRMWEBSVR);
CL:DLYJOB 15;
CL:STRTCPSVR SERVER(*HTTP) HTTPSVR(QBRMWEBSVR);
```

Migrating BRMS from BR1 to BR2 - The New GUI

IBM BRMS for i - [Enabling Secure HTTPS for the BRMS Web Interface]

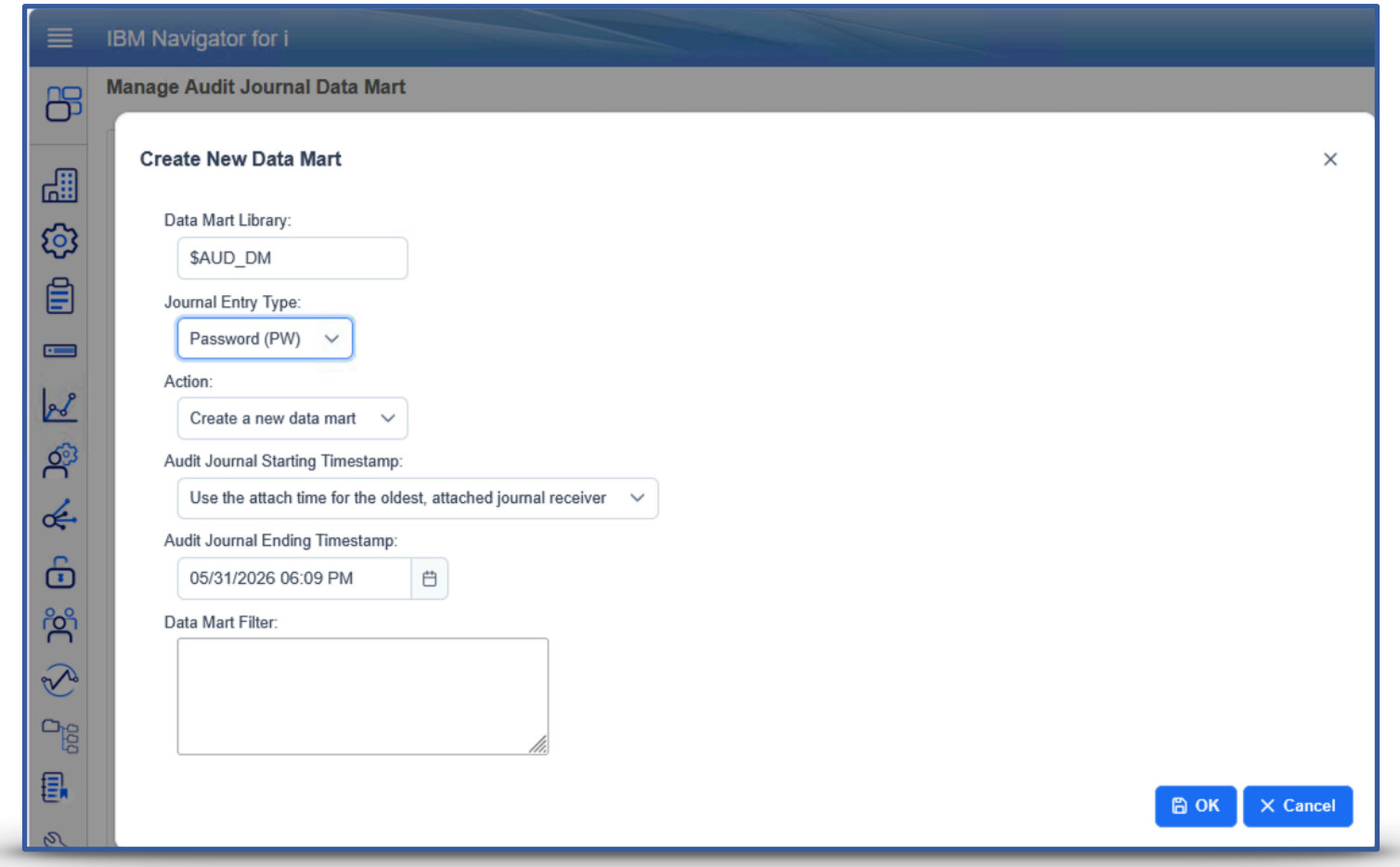


Migrating BRMS from BR1 to BR2 - Wrap-up

- HTTP server IBM BRMS for i
  Currently limited in functionality (keep current with BR2 PTF)
- Managing BRMS using 5250 emulation and BRMS SQL Services
- Using Run SQL Scripts to migrate BRMS will shorten the migration duration
- The good news: you can use 5770-BR2 in the same way as 5770BR1
- Now included with BRMS Network feature & BRMS Advanced Functions feature

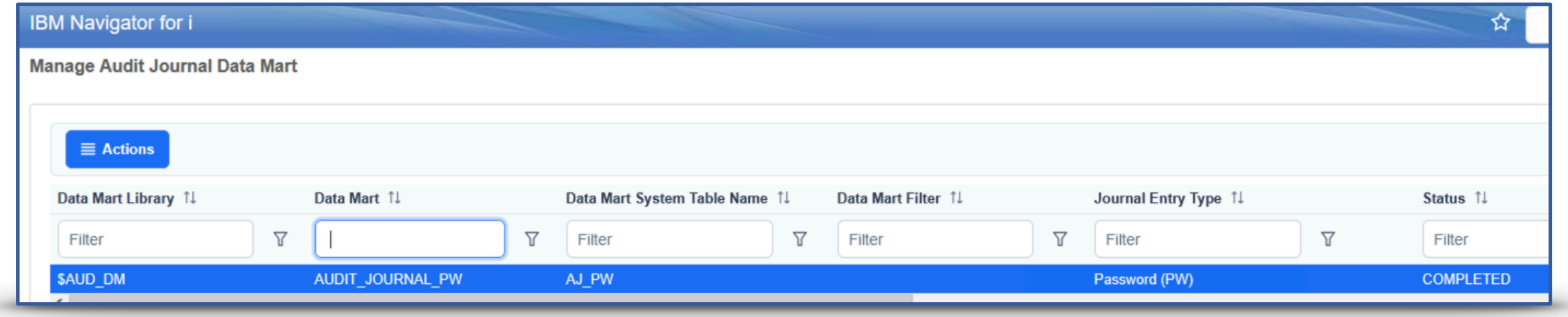
Audit Data Mart

Security is getting more and more important



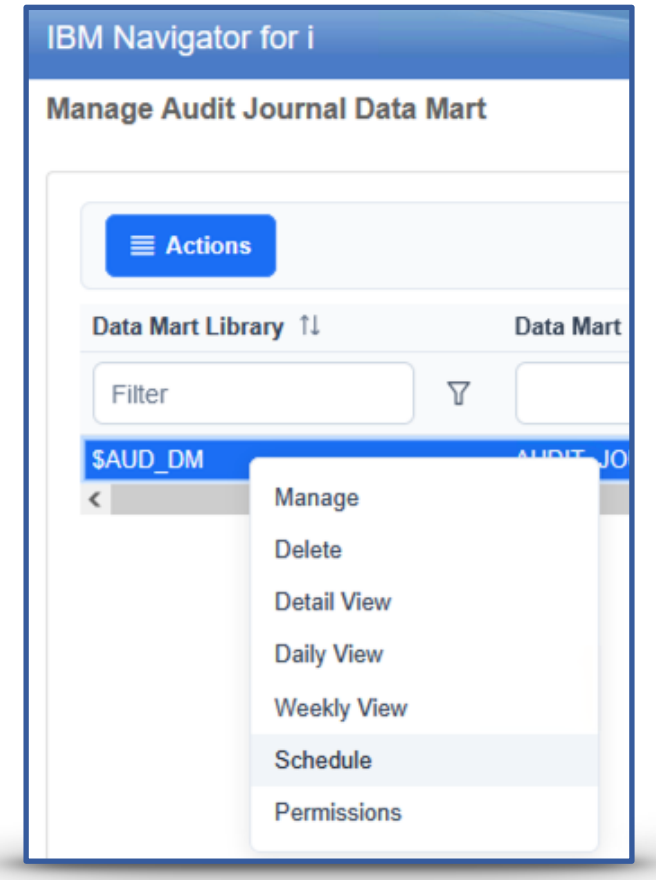
Audit Data Mart

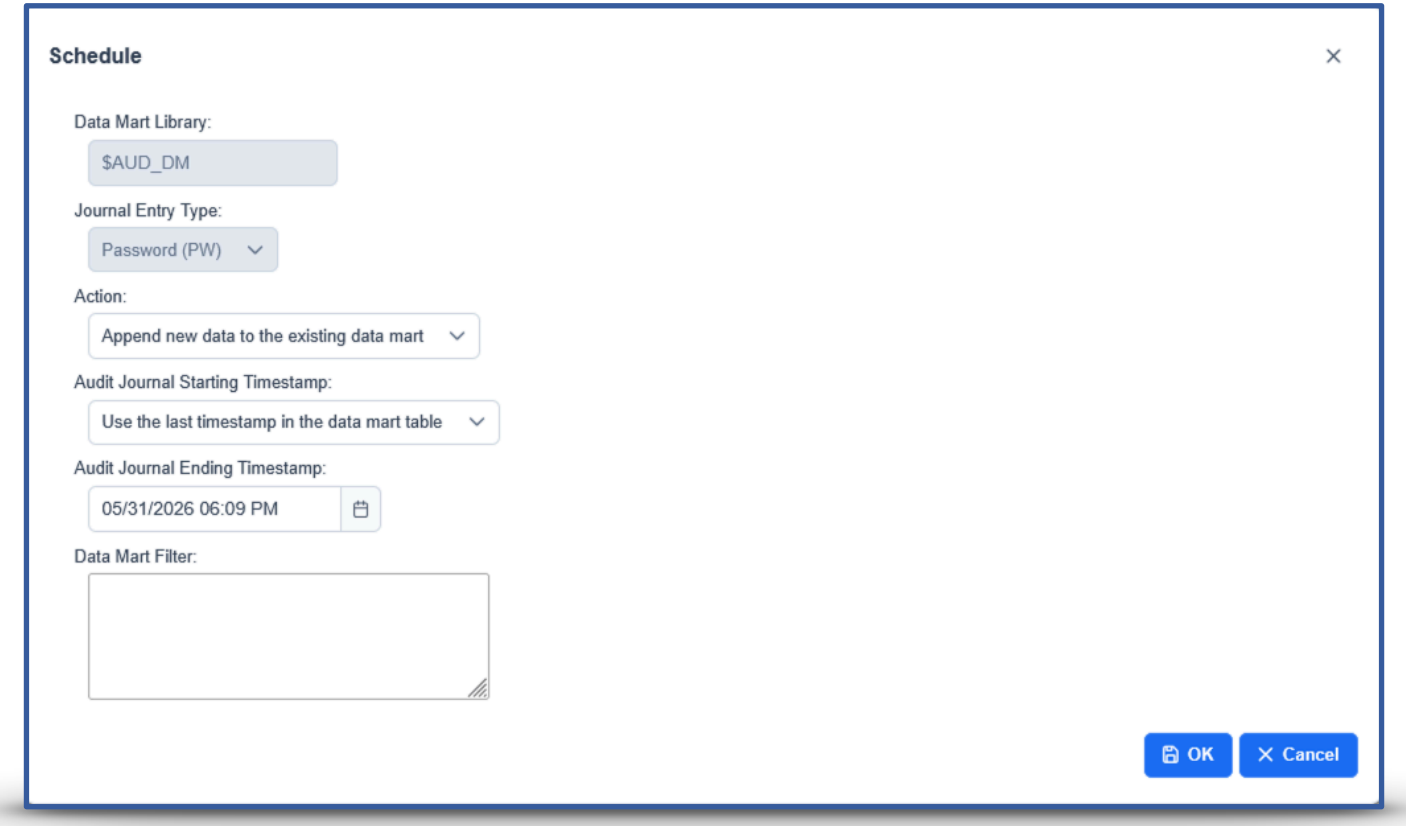
If the Data Mart does not exist it will be created



Audit Data Mart

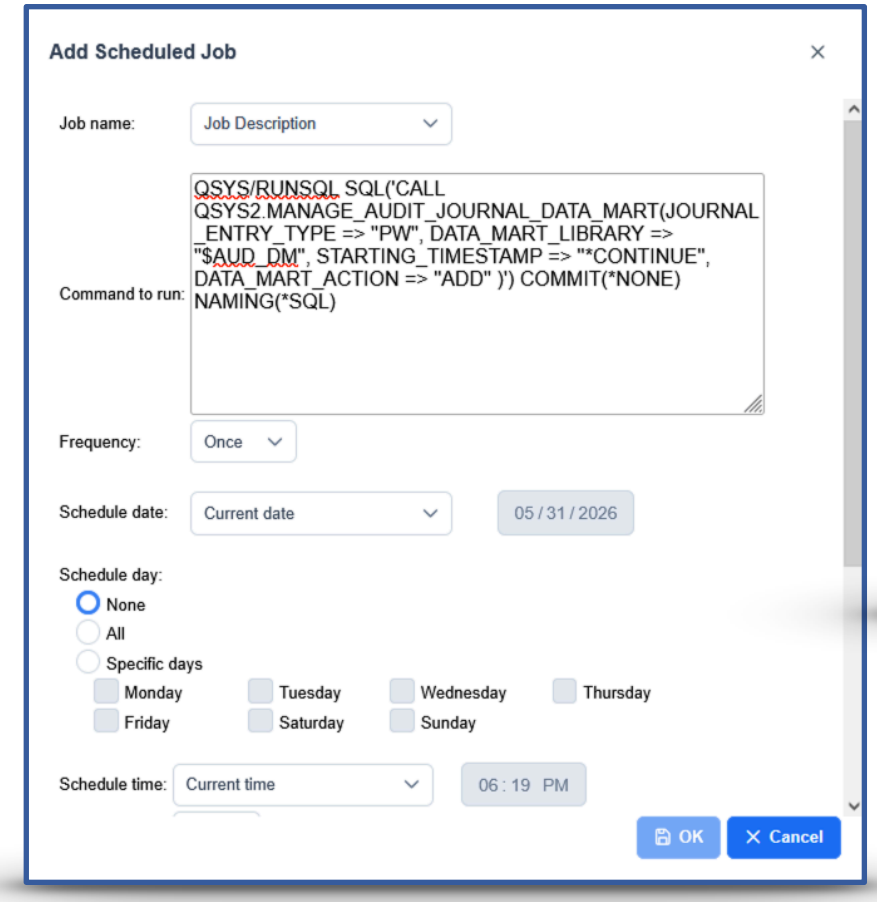
Schedule for keeping the data current

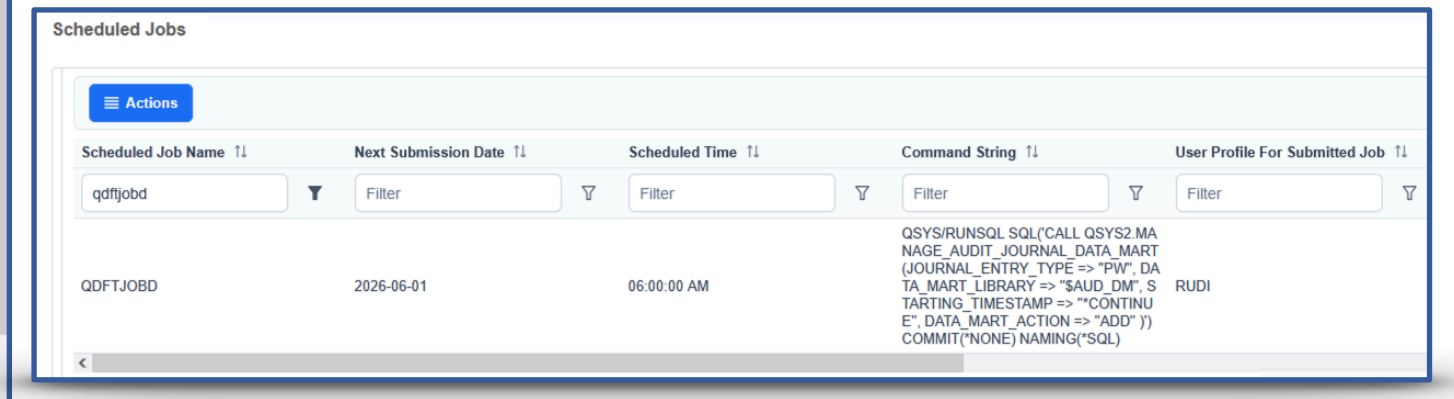




Audit Data Mart

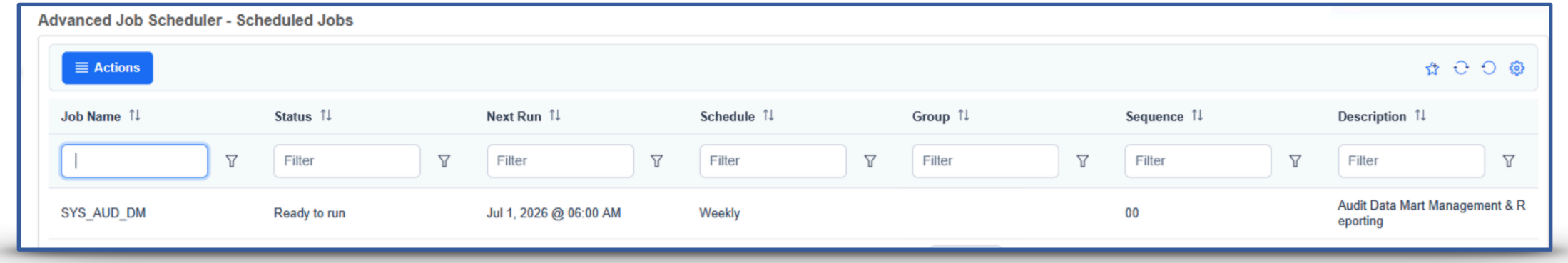
Schedule for keeping the data current

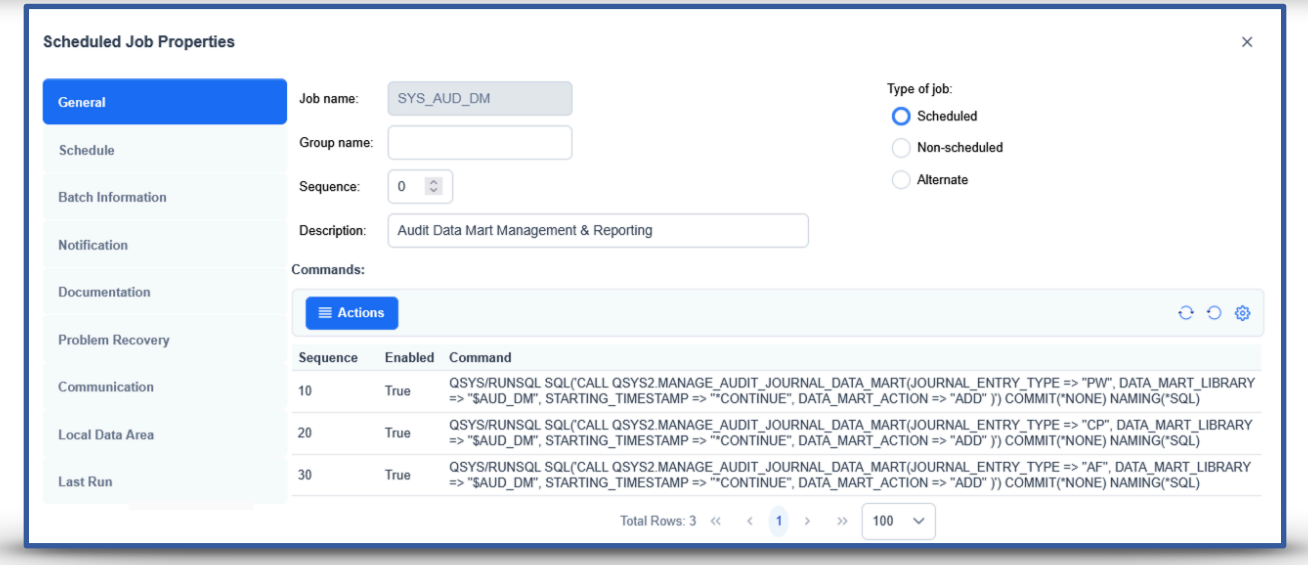




Audit Data Mart

After some 5250 emulation magic and making use of Advanced Job Scheduler functionality😎
(The magic => GO JS => option 5 =>option 7)





Audit Data Mart

Getting a Daily Report in the mail - trying this

```
1 SELECT *
2    FROM $AUD_DM.AUDIT_JOURNAL_AF
3    WHERE ENTRY_TIMESTAMP <= CURRENT TIMESTAMP - 24 HOURS;
```

ENTRY_TIMESTAMP	SEQUENCE_NUMBER	USER_NAME	QUALIFIED_JOB_NAME	JOB_NAME	JOB_USER	JOB_NUMBER	THREAD	P
2026-05-29 22:01:10.016272	1,554,767	QTMHHTTP	743959/QTMHHTTP/ADMIN	ADMIN	QTMHHTTP	743959	80	Q
2026-05-30 22:01:01.847536	1,673,648	QTMHHTTP	744451/QTMHHTTP/ADMIN	ADMIN	QTMHHTTP	744451	7,770	Q

Audit Data Mart

Getting a Daily Report in the mail - trying this

```
1 VALUES
2   SYSTOOLS.GENERATE_SPREADSHEET(
3     PATH_NAME => '/home/RUDI/Audit_AF_Daily_Report' CONCAT ( REPLACE ( CHAR ( CURRENT DATE, ISO ) , '-' , '' )),
4     SPREADSHEET_QUERY => 'SELECT * FROM $AUD_DM.AUDIT_JOURNAL_AF WHERE ENTRY_TIMESTAMP <= CURRENT TIMESTAMP - 24 HOURS' ,
5     SPREADSHEET_TYPE => 'xlsx', COLUMN_HEADINGS => 'COLUMN');
```

```
00001
   -1
```

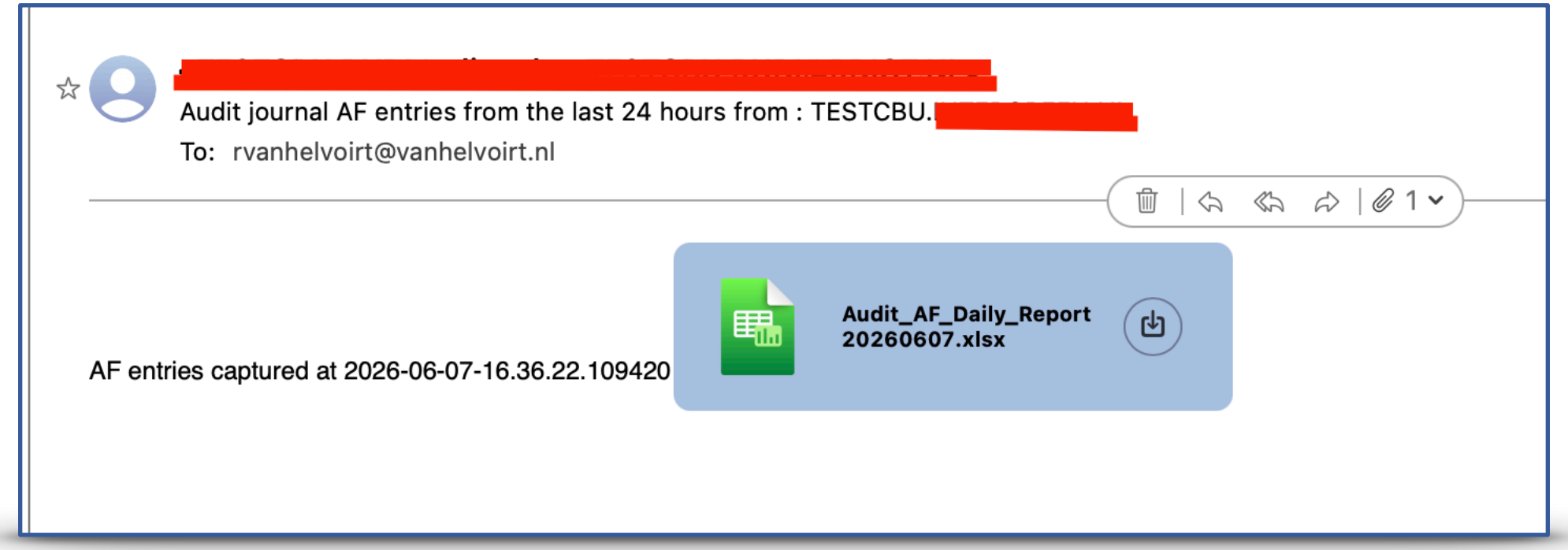
Audit Data Mart

Getting a Daily Report in the mail - ended up with this

```
CREATE OR REPLACE TABLE QRPLOBJ.AF_ENTRIES AS
        (SELECT *
             FROM $AUD_DM.AUDIT_JOURNAL_AF
             WHERE ENTRY_TIMESTAMP <= CURRENT TIMESTAMP - 24 HOURS)
        WITH DATA
   ON REPLACE DELETE ROWS;
;

VALUES
   SYSTOOLS.GENERATE_SPREADSHEET(
      PATH_NAME => '/home/RUDI/Audit_AF_Daily_Report' CONCAT (REPLACE(CHAR(CURRENT DATE, ISO), '-', '')),
      SPREADSHEET_QUERY => 'SELECT * FROM $AUD_DM.AUDIT_JOURNAL_AF WHERE ENTRY_TIMESTAMP <= CURRENT TIMESTAMP - 24 HOURS',
      SPREADSHEET_TYPE => 'xlsx', COLUMN_HEADINGS => 'COLUMN');


VALUES
   SYSTOOLS.SEND_EMAIL(
      TO_EMAIL => 'rvanhelvoirt@vanhelvoirt.nl', SUBJECT => 'Audit journal AF entries from the last 24 hours from : ' CONCAT
        (SELECT host_name
             FROM sysibmadm.env_sys_info), BODY => 'AF entries captured at ' CONCAT CURRENT TIMESTAMP,
      ATTACHMENT => '/home/rudi/Audit_AF_Daily_Report' CONCAT (REPLACE(CHAR(CURRENT DATE, ISO), '-', '')) CONCAT '.xlsx');
```

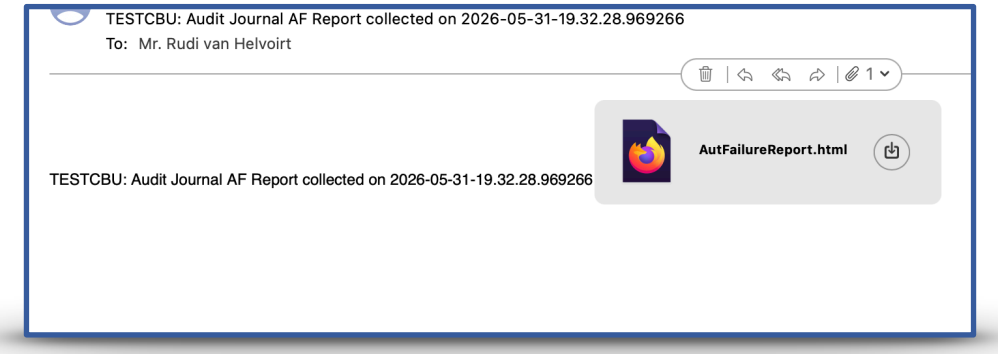
Audit Data Mart

Getting a Daily Report in the mail



Audit Data Mart

Getting a Daily Report in the mail - at one customer I saw this



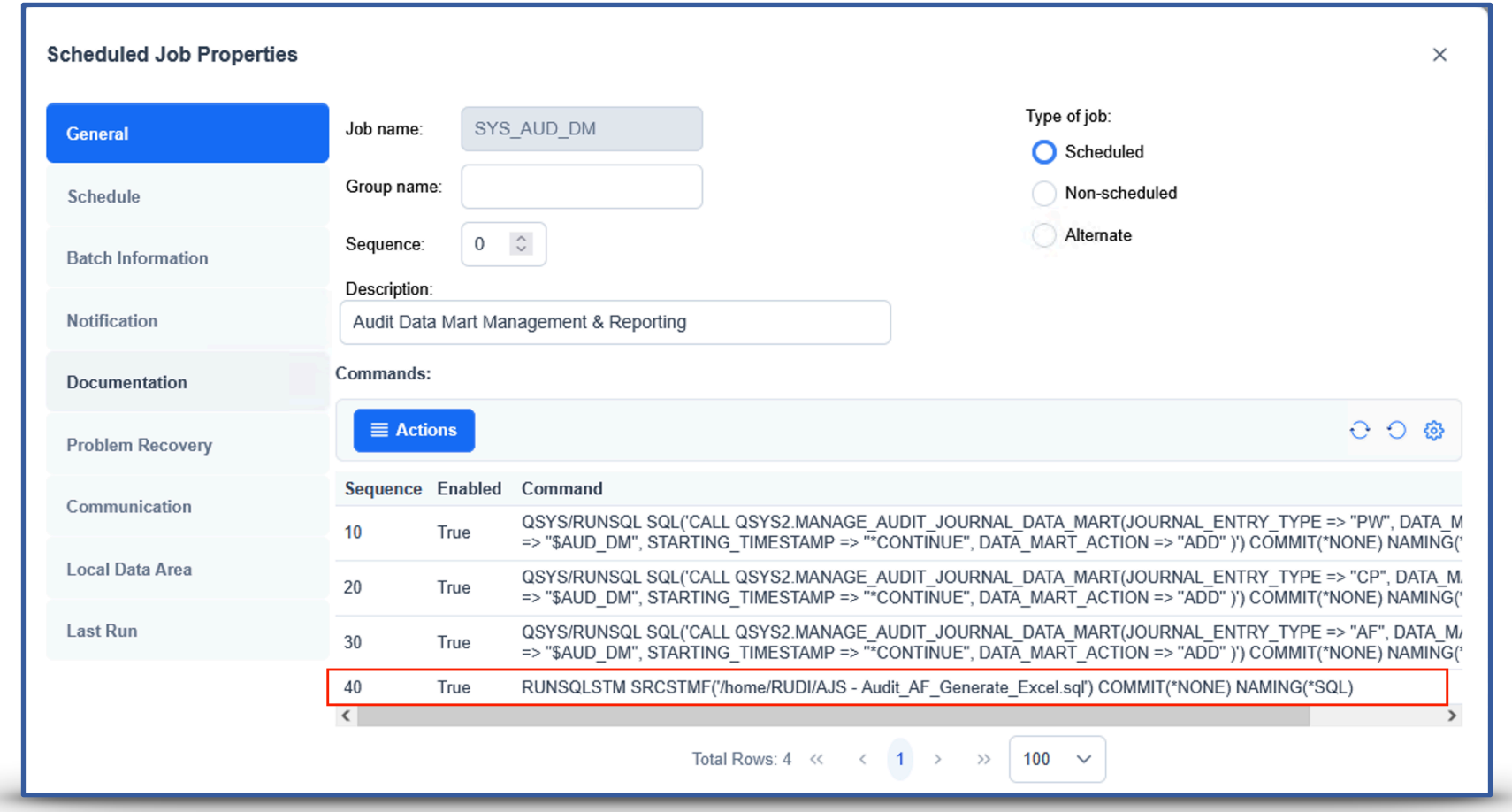
TESTCBU: Audit Journal AF Report collected on 2026-05-31-19.32.28.969266

ENTRY_TIMESTAMP	VIOLATION_TYPE_DETAIL	USER_NAME	OBJECT
2026-05-30-22.01.01.847536	Not authorized to object	QTMHHTTP	/QIBM/ProdData/OS400/Navigator

Total of 1 failures found during last 24 hours.

Audit Data Mart

Getting a Daily Report in the mail



Audit Data Mart

Getting a Daily Report in the mail

```
BEGIN
   DECLARE Generate_spreadsheet_successful INTEGER;
   DECLARE Mailing_spreadsheet_successful INTEGER;
   DECLARE Job_CCSID INTEGER;
   CREATE OR REPLACE TABLE QRPLOBJ.AF_ENTRIES AS
           (SELECT *
                FROM $AUD_DM.AUDIT_JOURNAL_AF
                WHERE ENTRY_TIMESTAMP <= CURRENT TIMESTAMP - 24 HOURS)
           WITH DATA
     ON REPLACE DELETE ROWS;
-- to prevent errors:
-- Derived operands not valid for operator CONCAT. Reason code 12.
-- Character conversion between CCSID 65535 and CCSID 1200 not valid.
 set Job_CCSID = (select  "CCSID" from table (
    QSYS2.ACTIVE_JOB_INFO(JOB_NAME_FILTER => '*', DETAILED_INFO => 'ALL'  )
   ));
   if Job_CCSID = 65535 then
   CALL qsys2.qcmdexc('CHGJOB CCSID(37)');
   END IF;
--
   VALUES
     SYSTOOLS.GENERATE_SPREADSHEET(
        PATH_NAME => '/home/RUDI/Audit_AF_Daily_Report' CONCAT (REPLACE(CHAR(CURRENT DATE, ISO), '-', '')),
        FILE_NAME => 'AF_ENTRIES', LIBRARY_NAME => 'QRPLOBJ', SPREADSHEET_TYPE => 'xlsx', COLUMN_HEADINGS => 'COLUMN')
     INTO Generate_spreadsheet_successful;
   IF (Generate_spreadsheet_successful = -1) THEN
     CALL systools.lprintf('Generate Spreadsheet was not successful');
   END IF;
   VALUES
     SYSTOOLS.SEND_EMAIL(
        TO_EMAIL => 'rvanhelvoirt@vanhelvoirt.nl', SUBJECT => 'Audit journal AF entries from the last 24 hours from : ' CONCAT
          (SELECT host_name
               FROM sysibmadm.env_sys_info), BODY => 'AF entries captured at ' CONCAT CURRENT TIMESTAMP,
        ATTACHMENT => '/home/rudi/Audit_AF_Daily_Report' CONCAT (REPLACE(CHAR(CURRENT DATE, ISO), '-', '')) CONCAT '.xlsx')
     INTO Mailing_spreadsheet_successful;
   IF (Mailing_spreadsheet_successful = -1) THEN
     CALL systools.lprintf('Mailing_spreadsheet_successful was not successful');
   END IF;
END;
```

The road to TLS only

[TCP/IP Ports Required for IBM I Access and Related Functions]

PC Function	Server Name	Port Non-SSL	Port SSL
Server Mapper	as-svrmap	449	---
License Management	as-central	8470	9470
Database Access	as-database	8471	9471
Data Queues	as-dtaq	8472	9472
IFS Access using Access/Navigator	as-file	8473	9473
Network Printers	as-netprt	8474	9474
Remote Command	as-rmtcmd	8475	9475
Signon Verification	as-signon	8476	9476
Host Connection New at IBM i r7.6	as-hostcnn		9480
Telnet (5250 Emulation)	telnet	23	992
Navigator for i (Heritage version)	as-nav	2004	2005
New Navigator for i	as-new-nav	2002	2003
Digital Certificate Manager	as-admin3-http	2006	2007
HTTP Administration	as-admin	2001	2010
DDM/DRDA	DDM/DRDA	446	448
NetServer	netbios >	137	---
NetServer	netbios >	139	---
NetServer (CIFS)	CIFS	445	---
Secure Shell	ssh	22	---
Service Tools Server	as-sts	3000	---
HMC 5250 Console		2300	2301
ACS LAN Console		---	3001, 3002, 2300, 2323

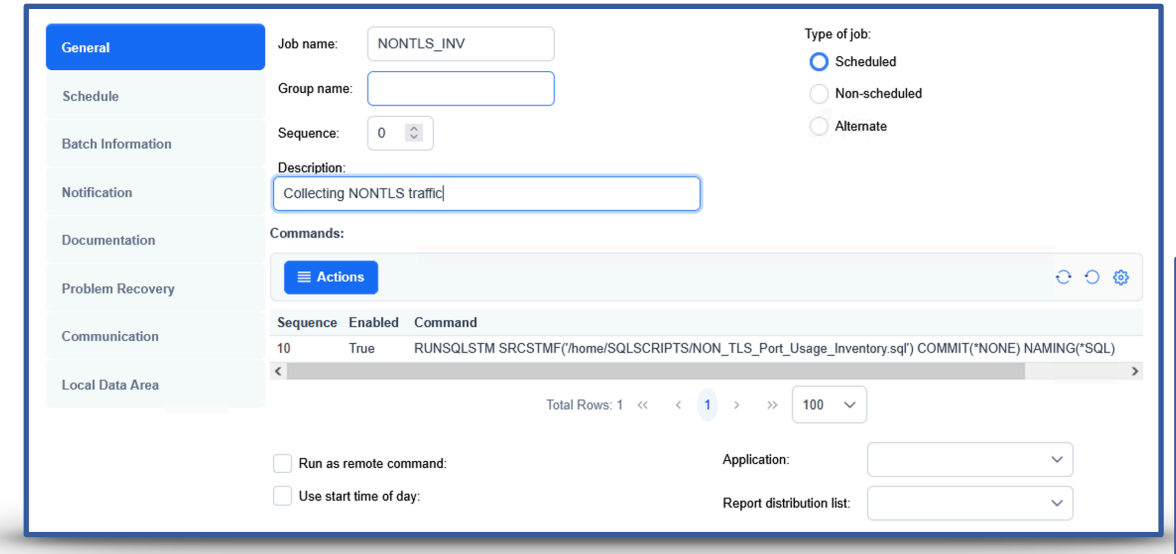
The road to TLS only

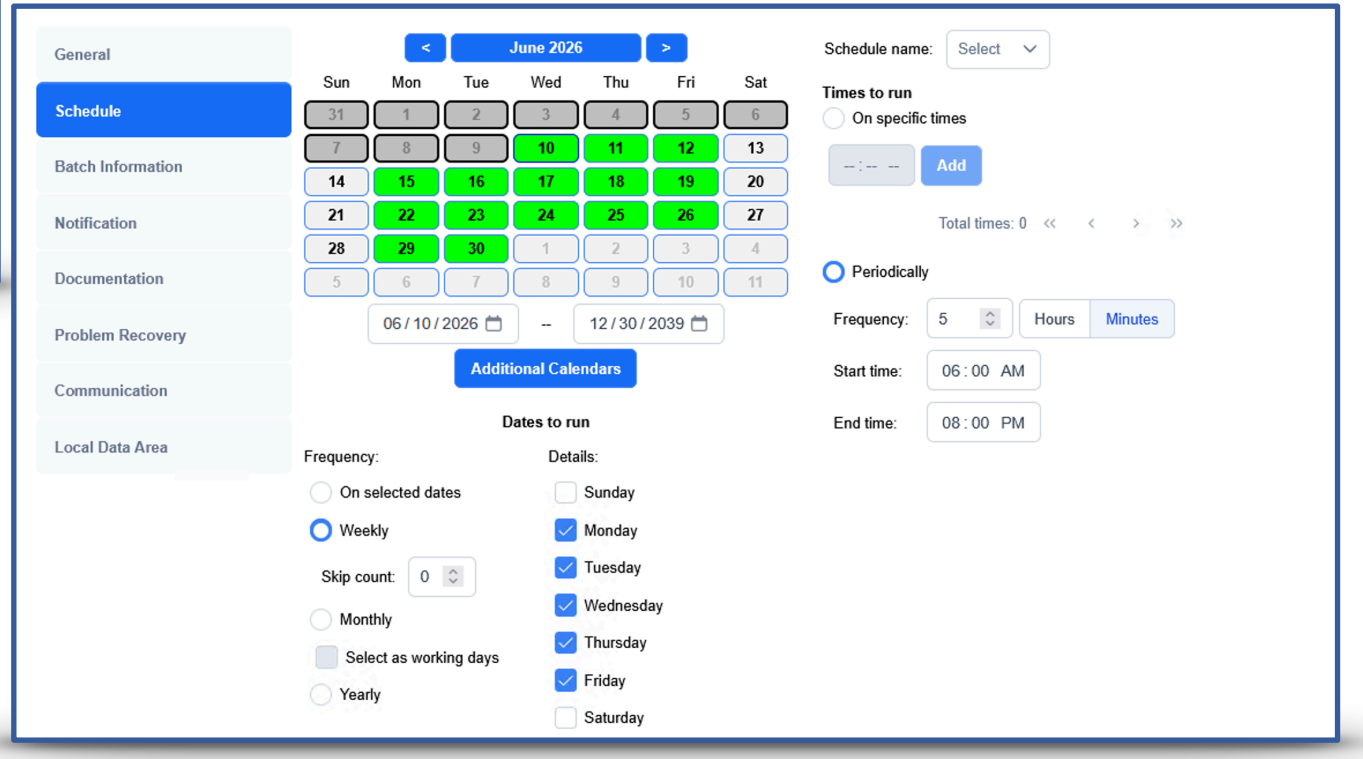
Collecting the Data

```
-- category: System Management
-- description: NONTLS Port Usage Inventory
BEGIN
  IF EXISTS (
          SELECT *
            FROM SYSIBM.SQLTABLES
            WHERE table_name = 'NONTLSPORT_USAGE'
                AND TABLE_SCHEM = 'QRPLOBJ') THEN
    INSERT INTO QRPLOBJ.NONTLSPort_Usage
      (SELECT CURRENT TIMESTAMP AS current_timestamp,
          a.*
        FROM qsys2.netstat_job_info a
        WHERE local_port NOT IN (9470,
              9471, 9472, 9473, 9474, 9475, 9476, 9480, 992, 2005, 2003, 2007, 2010, 448, 2301, 3001, 3002, 22)
            AND Local_Address <> ('127.0.0.1')
            AND Local_Address NOT LIKE ('::%')
            AND Local_Address <> ('0.0.0.0'));
  ELSE
    CREATE TABLE QRPLOBJ.NONTLSPort_Usage AS
          (SELECT CURRENT TIMESTAMP AS current_timestamp,
              a.*
              FROM qsys2.netstat_job_info a
              WHERE local_port NOT IN (9470,
                    9471, 9472, 9473, 9474, 9475, 9476, 9480, 992, 2005, 2003, 2007, 2010, 448, 2301, 3001, 3002, 22)
                  AND Local_Address <> ('127.0.0.1')
                  AND Local_Address NOT LIKE ('::%')
                  AND Local_Address <> ('0.0.0.0'))
          WITH DATA;
  END IF;
END;
```

The road to TLS only

Scheduling Collecting the Data using the Advanced Job Scheduler





The road to TLS only

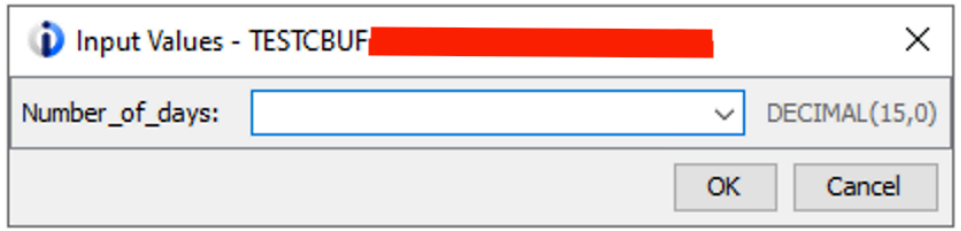
Query the Collected Data

```
SELECT DISTINCT CONNECTION_TYPE,
            REMOTE_ADDRESS,
            LOCAL_ADDRESS,
            LOCAL_PORT,
            NONTLS.AUTHORIZATION_NAME, UI.TEXT_DESCRIPTION,
            JOB_TYPE_SYSTEM,
            JOB_TYPE,
           NONTLS.JOB_NAME_SHORT
   FROM QRPLOBJ.NONTLSPORT_USAGE NONTLS inner join qsys2.user_info UI on NONTLS.AUTHORIZATION_NAME=UI.AUTHORIZATION_NAME
   WHERE REMOTE_ADDRESS not in  ('192.168.53.11',  '0', '0.0.0.0')
   and local_address = '192.168.58.16'
       AND date("CURRENT_TIMESTAMP") >= CURRENT DATE
      -- - 10 DAYS
     --  AND NONTLS.AUTHORIZATION_NAME <> 'SAPPI'
      --  and LOCAL_PORT in ('8472', '8475')
   ORDER BY LOCAL_PORT;



SELECT distinct NONTLS.*,NONTLS."CURRENT_TIMESTAMP",CONNECTION_TYPE,
            REMOTE_ADDRESS,
            LOCAL_ADDRESS,
            LOCAL_PORT,
            NONTLS.AUTHORIZATION_NAME, UI.TEXT_DESCRIPTION,
            JOB_TYPE_SYSTEM,
            JOB_TYPE,
            NONTLS.JOB_NAME_SHORT
   FROM QRPLOBJ.NONTLSPORT_USAGE NONTLS inner join qsys2.user_info UI on NONTLS.AUTHORIZATION_NAME=UI.AUTHORIZATION_NAME
   WHERE REMOTE_ADDRESS not in  ('192.168.53.11',  '0', '0.0.0.0')
      -- AND "CURRENT_TIMESTAMP" >= CURRENT DATE - 3 DAYS
      AND date("CURRENT_TIMESTAMP") >= CURRENT DATE
        AND NONTLS.AUTHORIZATION_NAME not LIKE '%XX%'
   ORDER BY LOCAL_PORT
```

The road to TLS only

Query the Collected Data

```
SELECT DISTINCT /* CURRE00001  TIMESTAMP       */
   CONNECTION_TYPE, /* CONN_TYPE   CHARACTER(4)     */
   REMOTE_ADDRESS, /* RMT_ADDR    VARCHAR(45)      */
   LOCAL_ADDRESS, /* LOCAL_ADDR  VARCHAR(45)      */
   LOCAL_PORT, /* LOCAL_PORT  INTEGER          */
   AUTHORIZATION_NAME, /* USER_NAME   VARCHAR(10)      */
   JOB_TYPE_SYSTEM, /* JOBTYPESYS  VARCHAR(3)       */
   JOB_TYPE /* JOB_TYPE    VARCHAR(11)      */
   FROM QRPLOBJ.NONTLSPORT_USAGE
   WHERE REMOTE_ADDRESS NOT IN ('0', '0.0.0.0')
      AND REMOTE_ADDRESS NOT IN (SELECT IP_ADDRESS
         FROM sysibmadm.env_sys_info,
            LATERAL (
               SELECT *
                  FROM TABLE (
                     QSYS2.DNS_LOOKUP(HOST_NAME)
                  )
            ))
      AND "CURRENT_TIMESTAMP" >= CURRENT TIMESTAMP - :Number_of_days Days
   ORDER BY LOCAL_PORT;
```



Check Object Integrity

- Troubleshooting signed objects
- Troubleshooting signature verification errors
- Interpreting code checker verification error messages
- Code checker integrity verification function
- Verifying code checker function integrity
- Check Object Integrity (CHKOBJITG)

Check Object Integrity

The Check Object Integrity (CHKOBJITG) command checks the objects owned by the specified user profile, the objects that match the specified path name, or all objects on the system to determine if any objects have integrity violations. An integrity violation occurs if:

- a command has been tampered with.
- an object has a digital signature that is not valid.
- an object has an incorrect domain attribute for its object type.
- a program or module object has been tampered with.
- a library's attributes have been tampered with.
- an object failed a file system scan.

If an integrity violation has occurred, the object name, library name (or pathname), object type, object owner, and type of failure are logged to a database file.

The type of violations that can occur are:

- ALTERED - The object has been tampered with.
- BADSIG - The object has a digital signature that is not valid.
- DMN - The domain is not correct for the object type.
- PGMMOD - The runnable object has been tampered with.
- BADLIBUPDA - The library protection attribute is set incorrectly.
- SCANFSFAIL - The object has been scanned by a scan-related exit program, and at the time of that last scan request, the object failed the scan.

If a violation is logged for a Licensed Internal Code module, the object name will be the 8 character RU name where RU name is the replaceable unit name of the Licensed Internal Code module, the library name will be blank, and the object type will be *LIC. If a violation of this type is encountered, contact your service representative to recover.

Also logged to the database file, but not integrity violations, are objects that do not have a digital signature but can be signed, objects that could not be checked, and objects whose format requires changes to be used on this machine implementation.

The type of violations that can occur are:

- NOSIG - The object can be signed but does not have a digital signature.
- NOTCHECKED - The object cannot be checked, it is in debug mode, saved with storage freed, or compressed.
- NOTTRANS - The object has not been converted to the current format or is not compatible with the current version, release, and modification level.

Note: Objects that are compressed, damaged, saved with storage freed, or in debug mode may not be checked.

Note: IBM commands duplicated from a release prior to V5R2 will be logged as ALTERED violations. These commands should be deleted and re-created using the CRTDUPOBJ (Create Duplicate Object) command each time a new release is loaded.

Check Object Integrity

```
1  -- category: System Management
2  -- description: Check Object Integrity Analysis
3  CL:CHKOBJITG USRPRF(*ALL) OUTFILE(QRPLOBJ/CHKOBJITG) CHKSIG(*NONE);
4
5
6  select * from  QRPLOBJ.CHKOBJITG
7  where substring(ailib, 1, 1)= 'Q'
8  order by AILIB, AINAME;
9
10 select distinct AILIB from QRPLOBJ.CHKOBJITG;
11
```

```
SELECT *
   FROM QRPLOBJ.CHKOBJITG
      INNER JOIN TABLE (
            QSYS2.OBJECT_STATISTICS(
               OBJECT_SCHEMA => '' CONCAT AILIB CONCAT '',
               OBJTYPELIST => '' CONCAT AITYPE CONCAT '',
               OBJECT_NAME => '' CONCAT AINAME CONCAT '')
         ) AS X
         ON AINAME = OBJNAME  and AILIB = OBJLIB and AItype = OBJTYPE
   WHERE SUBSTRING(ailib, 1, 1) = 'Q'
   ORDER BY AILIB, AINAME;
```

Check Object Integrity

RCE_FILE	SOURCE_LIBRARY	SOURCE_MEMBER	SOURCE_TIMESTAMP	CREATED_SYSTEM	CREATED_SYSTEM_VERSION	LICENSED_PROGRAM	LICENSED_PROGRAM_VERSION	COMPILER	COMPILER_VERSION	OB
	NULL	NULL	NULL	ELCRTP91	V5R2M0	NULL	NULL	CRTPGM	V5R2M0	NU
	NULL	NULL	NULL	ELCRTP91	V5R2M0	NULL	NULL	CRTPGM	V5R2M0	NU
000090	$BLDVG1	S000000090	2000-04-27 11:03:38.000000	ELCRTP91	V4R4M0	5769VG1	V4R4M0	NULL	NULL	501
000100	$BLDVG1	S000000100	2000-04-27 11:03:48.000000	ELCRTP91	V4R4M0	5769VG1	V4R4M0	NULL	NULL	610
000093	$BLDVG1	S000000093	2000-04-27 11:03:40.000000	ELCRTP91	V4R4M0	5769VG1	V4R4M0	NULL	NULL	610
	NULL	NULL	NULL	ELCRTP91	V4R4M0	5769VG1	V4R4M0	NULL	NULL	231
000072	$BLDVG1	S000000072	2000-04-27 11:03:23.000000	ELCRTP91	V4R4M0	5769VG1	V4R4M0	NULL	NULL	501
	NULL	NULL	NULL	ELCRTP91	V4R4M0	5769VG1	V4R4M0	NULL	NULL	231
	NULL	NULL	NULL	ELCRTP91	V4R4M0	5769VG1	V4R4M0	CRTPGM	V4R4M0	011
	NULL	NULL	NULL	NRIVVI00	V4R4M0	5769VG1	V4R4M0	CRTSRVP	V4R4M0	011
	NULL	NULL	NULL	ELCRTP91	V5R2M0	NULL	NULL	CRTPGM	V5R2M0	NU
	NULL	NULL	NULL	ELCRTP91	V5R2M0	NULL	NULL	CRTPGM	V5R2M0	NU
	NULL	NULL	NULL	ELCRTP91	V4R4M0	5769VG1	V4R4M0	NULL	NULL	010

	E	F	G	H	I	J	K
	0	LIBCOREPLU	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBCSPLUGI	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBFSSPLUG	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBI5OSPLU	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBINVHW	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBPLUGIN	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBREGPLUG	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBSSINV	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	LIBXMLPLUG	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	PRVCACHE	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	PRVSTD	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	WSCANFS	QTIVCIT	*PGM	QSYS	NOTTRANS	
	0	WSCANFS	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	WSCANHW	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	WSCANHW	QTIVCIT	*PGM	QSYS	NOTTRANS	
	0	WSCANSW	QTIVCIT	*PGM	QSYS	NOTTRANS	
	0	WSCANSW	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	WSCANVPD	QTIVCIT	*PGM	QSYS	NOTTRANS	
	0	WSCANVPD	QTIVCIT	*SRVPGM	QSYS	NOTTRANS	
	0	AS400_GFBA	QUERY	*SQLPKG	DEFOWNER	NOTTRANS	
	0	MSACCEAFBA	QUERY	*SQLPKG	DEFOWNER	NOTTRANS	
	0	TLCINST	QUSRTOOL	*PGM	QOTHPRDOWN	NOTTRANS	

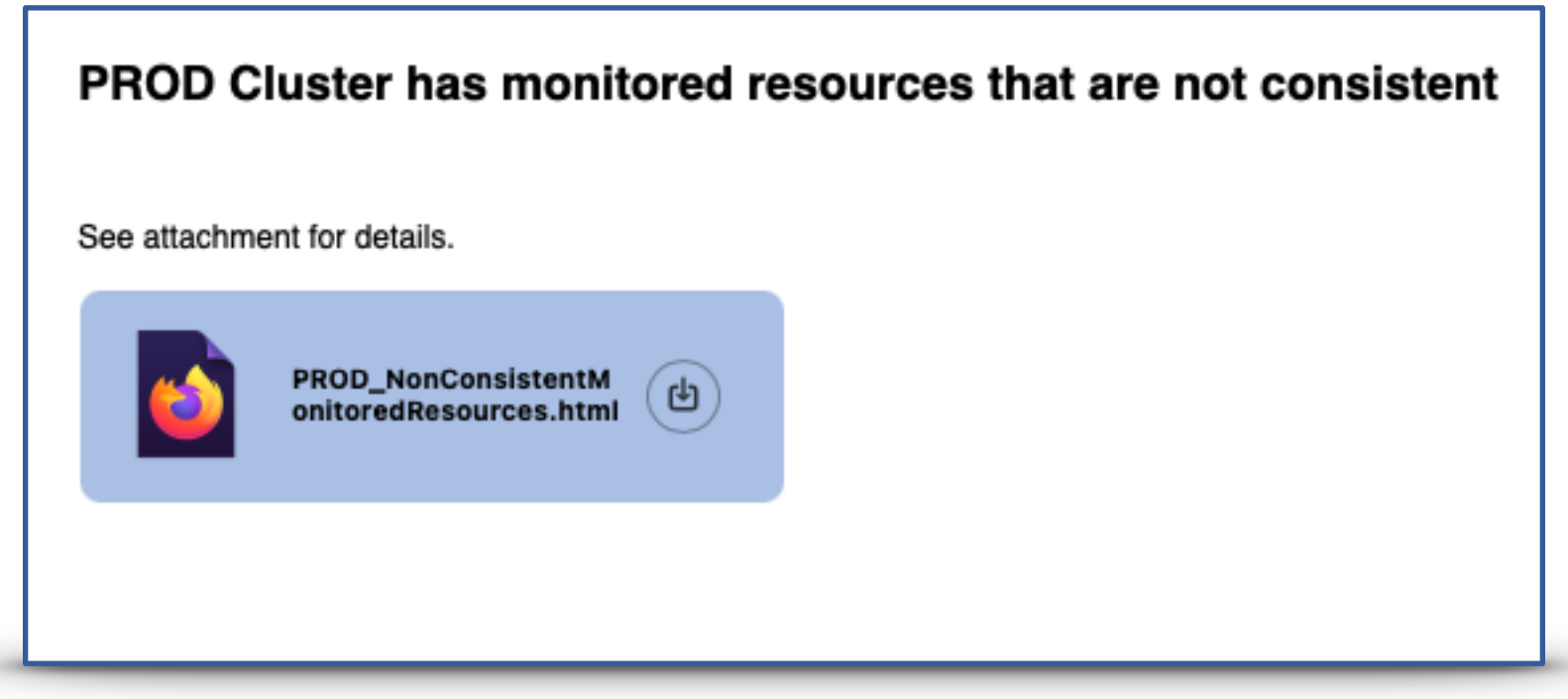
	QCYAGGRE	QPFR	*PGM	QSECOFR	NOTTRANS
	QCYALLIN	QPFR	*PGM	QSECOFR	NOTTRANS
	QCYANDUP	QPFR	*PGM	QSECOFR	NOTTRANS
	QCYANZPN	QPFR	*PGM	QSECOFR	NOTTRANS
	QCYAS4FL	QPFR	*PGM	QSECOFR	NOTTRANS
	QCYASCTX	QPFR	*PGM	QSECOFR	NOTTRANS
	QCYB1CP2	QPFR	*PGM	QSECOFR	NOTTRANS
	QCYB1CPY	QPFR	*PGM	QSECOFR	NOTTRANS

Check Object Integrity

```
-- Check what is in the library but does not have integrity issues
SELECT *
   FROM TABLE (
         QSYS2.OBJECT_STATISTICS(
            OBJECT_SCHEMA => 'QPRATLS', OBJTYPELIST => '*ALL', OBJECT_NAME => '*ALLSIMPLE')
      ) AS X
   WHERE NOT EXISTS (
            SELECT AINAME
               FROM QRPLOBJ.CHKOBJITG
               WHERE AILIB = 'QPRATLS' AND AINAME = OBJNAME)
```

Monitoring the Administrative Domain

The mail notification



Monitoring the Administrative Domain

The mail attachment

PROD Cluster - Monitored resources that are not consistent

Monitored Resource	Resource Type	Library	Global Status
INTAKE_R1	*PRTDEV	QSYS	*INCONSISTENT
INTAKE_R2	*PRTDEV	QSYS	*INCONSISTENT

End of report.

Monitoring the Administrative Domain

PowerHA SQL service used

```
SELECT *
        FROM TABLE (
            QHASM.ADMIN_domain_MRE_LIST(GLOBAL_STATUS => '*ALL')
          )
        WHERE GLOBAL_STATUS <> '*CONSISTENT'
```

Monitoring the Administrative Domain

Solving the issue on the NON Production nodes in the Cluster

```
WITH RESOURCE_INCONSISTENCY (DOMAIN_NAME, RESOURCE_NAME, TYPE_NAME, LIBRARY_NAME, GLOBAL_STATUS, LOCAL_STS, NODE_NAME) AS (
    SELECT A.ADMINISTRATIVE_DOMAIN,
        A.MONITORED_RESOURCE,
        A.RESOURCE_TYPE,
        A.LIBRARY,
        A.GLOBAL_STATUS,
        LOCAL_STATUS,
        NODE
      FROM TABLE (
          QHASM.ADMIN_domain_MRE_LIST(GLOBAL_STATUS => '*INCONSISTENT')
        ) A
        INNER JOIN TABLE (
            QHASM.ADMIN_DOMAIN_MRE_DETAILS(
              MONITORED_RESOURCE => MONITORED_RESOURCE, RESOURCE_TYPE => RESOURCE_TYPE, LIBRARY => LIBRARY,
              ADMINISTRATIVE_DOMAIN => ADMINISTRATIVE_DOMAIN)
          ) B
          ON A.MONITORED_RESOURCE = B.MONITORED_RESOURCE
        INNER JOIN TABLE (
            qsys2.SYSTEM_STATUS()
          ) C
          ON B.NODE = C.HOST_NAME
)
SELECT RESOURCE_INCONSISTENCY.*
  ,'CL:VRYCFG CFGOBJ(' CONCAT RESOURCE_NAME CONCAT ') CFGTYPE(*DEV) STATUS(*OFF);'
  , qsys2.qcmdexc('VRYCFG CFGOBJ(' CONCAT RESOURCE_NAME CONCAT ') CFGTYPE(*DEV) STATUS(*OFF)')
  FROM RESOURCE_INCONSISTENCY
  ORDER BY NODE_NAME;
```

Monitoring the Administrative Domain

Solving the issue on the Production nodes in the Cluster

```
set current degree= '1';
WITH RESOURCE_INCONSISTENCY (DOMAIN_NAME, RESOURCE_NAME, TYPE_NAME, LIBRARY_NAME, GLOBAL_STATUS, LOCAL_STS, NODE_NAME) AS (
    SELECT A.ADMINISTRATIVE_DOMAIN,
        A.MONITORED_RESOURCE,
        A.RESOURCE_TYPE,
        A.LIBRARY,
        A.GLOBAL_STATUS,
        LOCAL_STATUS,
        NODE
      FROM TABLE (
          QHASM.ADMIN_domain_MRE_LIST(GLOBAL_STATUS => '*INCONSISTENT')
        ) A
        INNER JOIN TABLE (
            QHASM.ADMIN_DOMAIN_MRE_DETAILS(
              MONITORED_RESOURCE => MONITORED_RESOURCE, RESOURCE_TYPE => RESOURCE_TYPE, LIBRARY => LIBRARY,
              ADMINISTRATIVE_DOMAIN => ADMINISTRATIVE_DOMAIN)
          ) B
          ON A.MONITORED_RESOURCE = B.MONITORED_RESOURCE
        INNER JOIN TABLE (
            qsys2.SYSTEM_STATUS()
          ) C
          ON B.NODE = C.HOST_NAME
)
SELECT RESOURCE_INCONSISTENCY.*,
     'CL:RMVCADMRE RESOURCE(' CONCAT RESOURCE_NAME CONCAT ') RSCTYPE(*PRTDEV)',
    qsys2.qcmdexc('RMVCADMRE RESOURCE(' CONCAT RESOURCE_NAME concat ') RSCTYPE(*PRTDEV)'),
    QSYS2.QCMDEXC('DLYJOB 10'),
     'CL:ADDCADMRE RESOURCE(' CONCAT RESOURCE_NAME CONCAT ') RSCTYPE(*PRTDEV)',
     qsys2.qcmdexc('ADDCADMRE RESOURCE(' CONCAT RESOURCE_NAME concat ') RSCTYPE(*PRTDEV)')
  FROM RESOURCE_INCONSISTENCY
  ORDER BY NODE_NAME;
```

Q & A

i Thank you