Agenda

What are IBM i Services?

Why should you use them?

How do you use them?

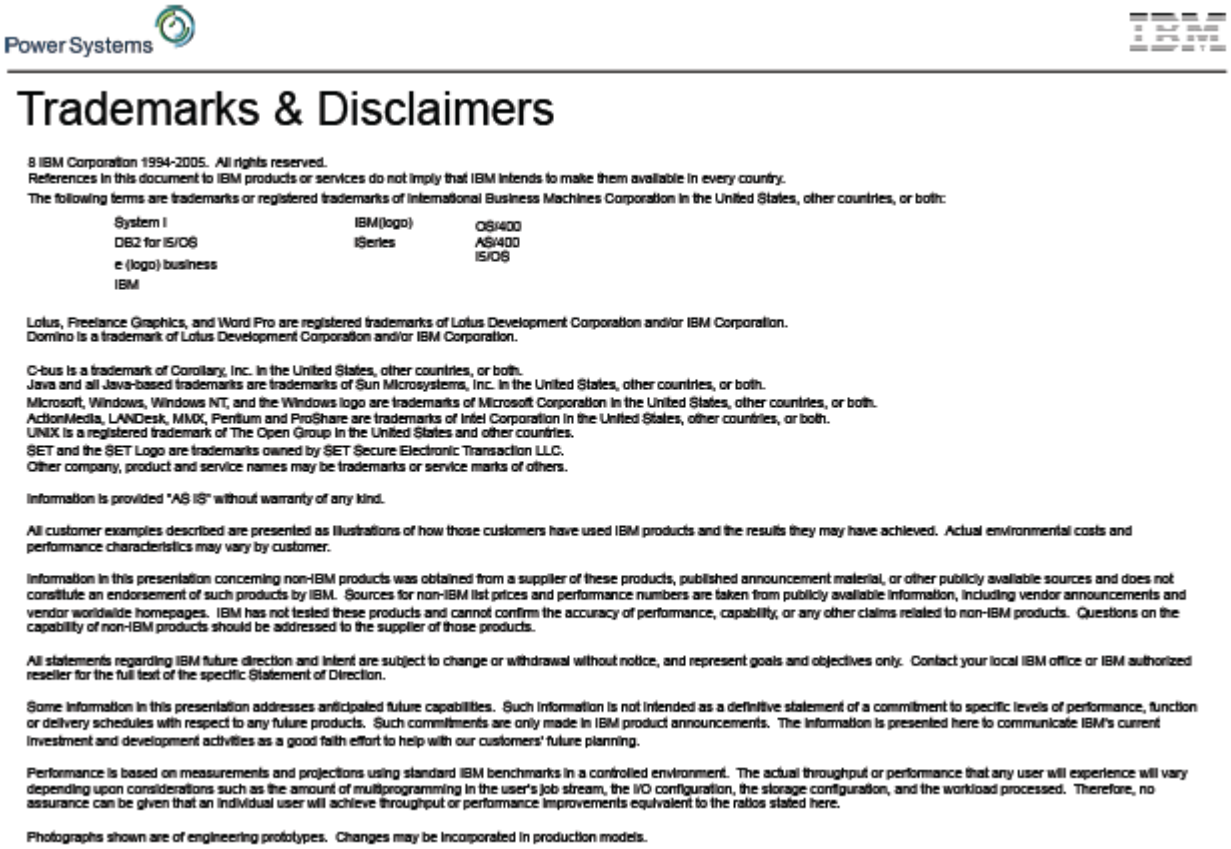
How do you get them?

How much do they cost?

Nearly time to start the presentation

But first a Disclaimer

- You may be used to seeing IBM Disclaimers



Power Systems

Trademarks & Disclaimers

This is mine

- I tried ever so hard to get it right

- *"Opinions are like buttocks – Everyone has them!"*
  - You are hearing mine and not necessarily IBM's
  - My opinions are not necessarily right
  - But then again, neither are yours

IBM i is a platform like no other

- So far I have found 52 IBM i user groups
- I'm told there are many more.
- They are literally a goldmine of information
- Their members are wonderful people

Make contact, drop in on an event

Make learn more than just IBM i skills

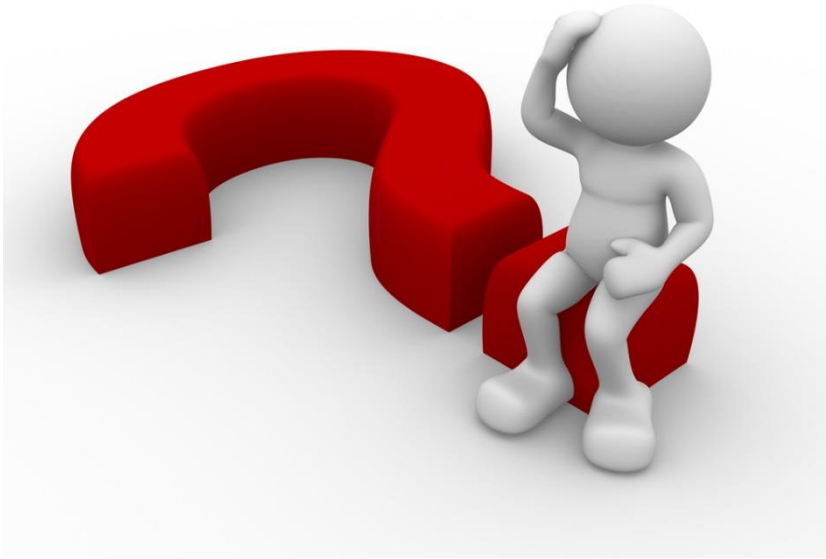
User groups make you happy!

They MIGHT even make smarter
They WILL make you sound smarter

A quick question

Have you heard of IBM i APIs?

Do you use IBM i APIs?



What are IBM i Services?

The next generation of System APIs
(Application Program Interfaces)

Used to Manage and Monitor

Based on standard SQL statements

IBM i APIs – Application Program Interfaces

IBM has provided APIs for many years

Most common reasons to use them are

- To perform advanced system functions
- To access low level (hidden) information
- To give more control to your system

What is the problem with the old APIs?

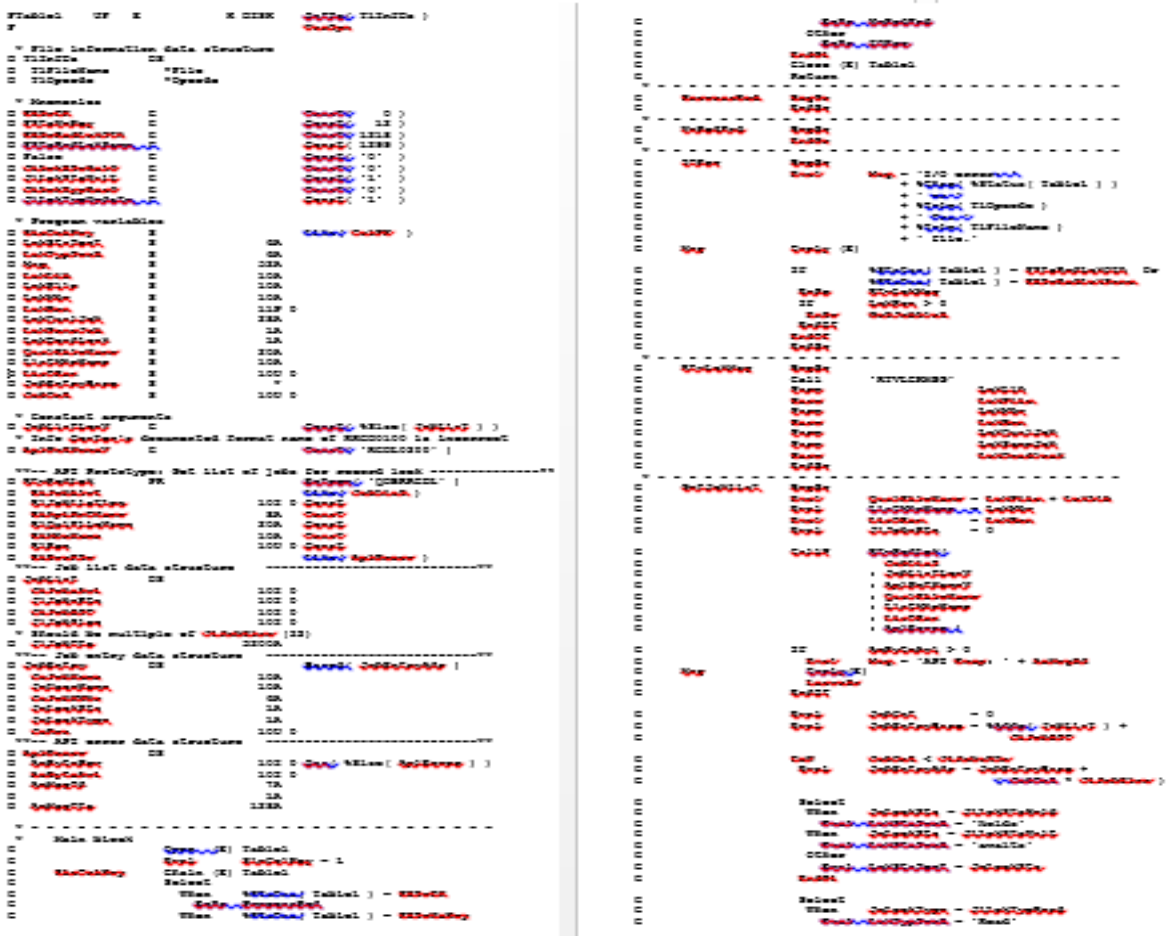
- Designed 30 years ago
- Often require complex RPG Programs
- Hard to integrate into new applications
- Not easy to access the results
- Different APIs use different standards

Lets look at an example

You want to know the following:
which jobs have a lock on records in a file?

An example of an old style IBM i API

Who has a record lock - API QDBRRCDL



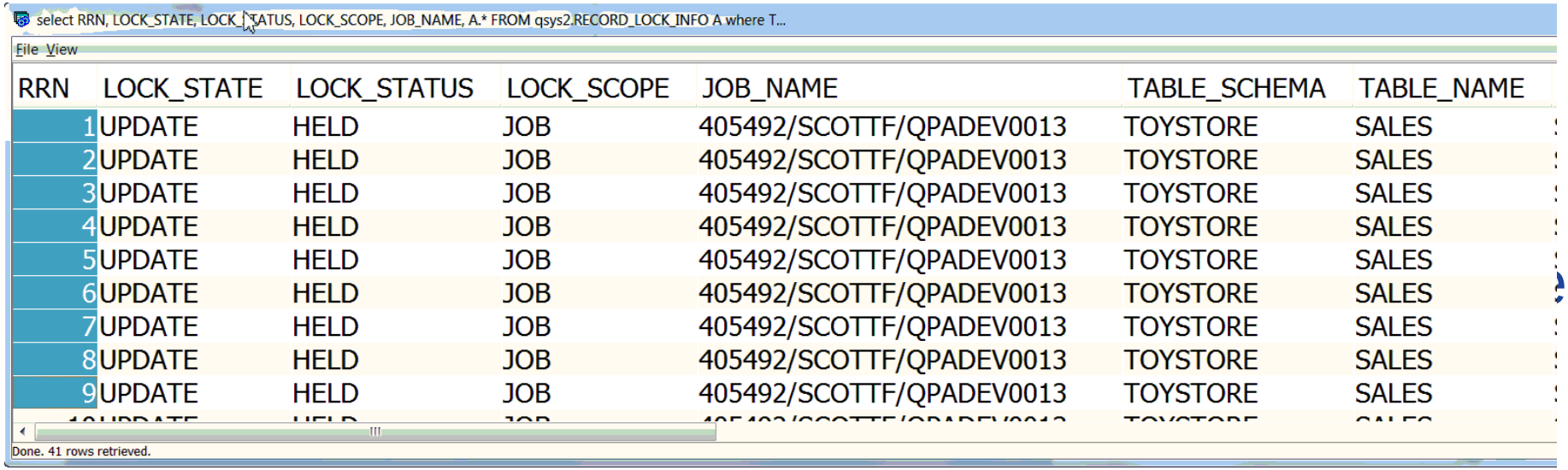
190 lines of code in total, the output sent to screen, this is excellent code but still no way to capture results

Sample by Jamief shared on Code400 website http://www.code400.com/forum/showthread.php/611-Qdbrrcdl

An example of an IBM i Service

Who has a record lock

```
SELECT RRN, LOCK_STATE, LOCK_STATUS, LOCK_SCOPE, JOB_NAME, A.*
FROM QSYS2.RECORD_LOCK_INFO A
WHERE TABLE_SCHEMA = 'TOYSTORE' AND TABLE_NAME = 'SALES'
ORDER BY RRN;
```



RRN	LOCK_STATE	LOCK_STATUS	LOCK_SCOPE	JOB_NAME	TABLE_SCHEMA	TABLE_NAME
1	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
2	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
3	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
4	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
5	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
6	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
7	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
8	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES
9	UPDATE	HELD	JOB	405492/SCOTTF/QPADEV0013	TOYSTORE	SALES

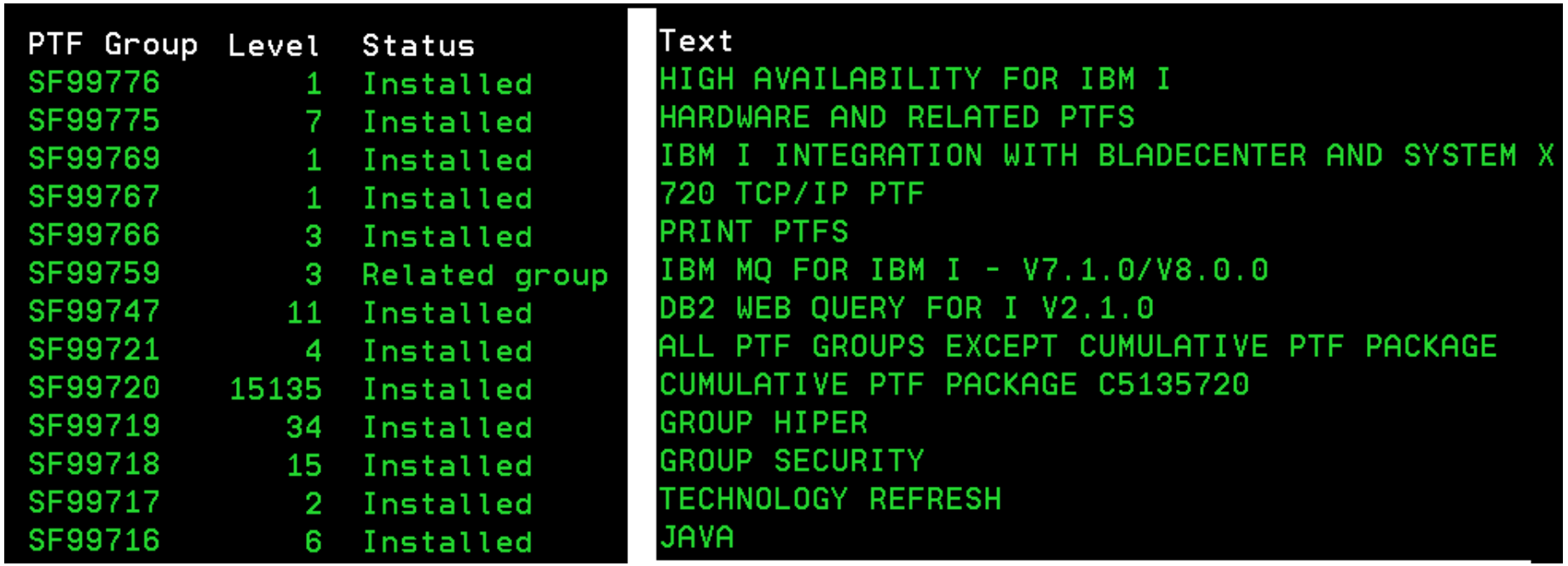
Sample by Scott Forstie of IBM,
More info at ibm.biz/DB2foriServices

Why should you use IBM i Services?

- Simpler – less programming
- Faster – less code and no compilation
- You get more information back
- Can access data from other systems

Access data from other systems

Are you familiar with WRKPTFGRP?



PTF Group	Level	Status	Text
SF99776	1	Installed	HIGH AVAILABILITY FOR IBM I
SF99775	7	Installed	HARDWARE AND RELATED PTFS
SF99769	1	Installed	IBM I INTEGRATION WITH BLADECENTER AND SYSTEM X
SF99767	1	Installed	720 TCP/IP PTF
SF99766	3	Installed	PRINT PTFS
SF99759	3	Related group	IBM MQ FOR IBM I - V7.1.0/V8.0.0
SF99747	11	Installed	DB2 WEB QUERY FOR I V2.1.0
SF99721	4	Installed	ALL PTF GROUPS EXCEPT CUMULATIVE PTF PACKAGE
SF99720	15135	Installed	CUMULATIVE PTF PACKAGE C5135720
SF99719	34	Installed	GROUP HIPER
SF99718	15	Installed	GROUP SECURITY
SF99717	2	Installed	TECHNOLOGY REFRESH
SF99716	6	Installed	JAVA

It would be better if

- All details were on one screen (no F11)
- It told you if the PTFs were up to date

Lets look at another example

You want to know
Are my PTFs up to date?

An example of an IBM i Service

PTF Currency – Are my PTFs current?

```
SELECT * FROM SYSTOOLS.GROUP_PTF_CURRENCY
        ORDER BY ptf_group_level_available - ptf_group_level_installed DESC
```

PTF_GROUP_CURRENCY	PTF_GROUP_ID	PTF_GROUP_TITLE	PTF_GROUP_LEVEL_INSTALLED	PTF_GROUP_LEVEL_AVAILABLE	PTF_GROUP_LAST_UPDATED_BY_IBM	PTF_GROUP_RELEASE
UPDATE AVAILABLE	SF99719	720 Group Hiper	34	45	09/11/2015	R720
UPDATE AVAILABLE	SF99718	720 Group Security	15	20	09/11/2015	R720
UPDATE AVAILABLE	SF99775	720 Hardware and Related PTFs	7	11	09/11/2015	R720
UPDATE AVAILABLE	SF99702	720 DB2 for IBM i	5	8	08/21/2015	R720
UPDATE AVAILABLE	SF99713	720 IBM HTTP Server for i	7	10	08/26/2015	R720
UPDATE AVAILABLE	SF99715	720 Backup Recovery Solutions	11	14	08/25/2015	R720
UPDATE AVAILABLE	SF99481	720 WebSphere App Server V8.5	4	6	09/11/2015	R720
UPDATE AVAILABLE	SF99480	720 WebSphere App Server V8.0	3	4	08/17/2015	R720
UPDATE AVAILABLE	SF99716	720 Java	6	7	08/28/2015	R720
UPDATE AVAILABLE	SF99747	720 DB2 Web Query for i V2.1.0	11	12	08/12/2015	R720
UPDATE AVAILABLE	SF99776	720 High Availability for IBM i	1	2	06/11/2015	R720
INSTALLED LEVEL IS CURRENT	SF99714	720 Performance Tools	2	2	06/02/2015	R720
INSTALLED LEVEL IS CURRENT	SF99717	720 Technology Refresh	2	2	05/29/2015	R720
INSTALLED LEVEL IS CURRENT	SF99720	Current Cumulative PTF Media Documentation	15135	15135	05/29/2015	R720
INSTALLED LEVEL IS CURRENT	SF99721	720 All PTF Groups except Cumulative PTF Package	4	4	03/23/2015	R720
INSTALLED LEVEL IS CURRENT	SF99766	720 Print PTFs	3	3	06/02/2015	R720
INSTALLED LEVEL IS CURRENT	SF99767	720 720 TCP/IP PTF	1	1	06/02/2015	R720
INSTALLED LEVEL IS CURRENT	SF99769	720 IBM i integration with BladeCenter and System x	1	1	06/02/2015	R720

1 SQL Statement

Checks your system, then checks with IBM for updates

This statement took 6 seconds to complete

An example of a new IBM i Service

PTF Currency – Are my PTFs current?

```
SELECT * FROM SYSTOOLS.GROUP_PTF_CURRENCY
        ORDER BY ptf_group_level_available - ptf_group_level_installed DESC
```

PTF_GROUP_CURRENCY	PTF_GROUP_ID	PTF_GROUP_TITLE
UPDATE AVAILABLE	SF99719	720 Group Hiper
UPDATE AVAILABLE	SF99718	720 Group Security
UPDATE AVAILABLE	SF99775	720 Hardware and Related PTFs
UPDATE AVAILABLE	SF99702	720 DB2 for IBM i
UPDATE AVAILABLE	SF99713	720 IBM HTTP Server for i
UPDATE AVAILABLE	SF99715	720 Backup Recovery Solutions
UPDATE AVAILABLE	SF99481	720 WebSphere App Server V8.5
UPDATE AVAILABLE	SF99480	720 WebSphere App Server V8.0
UPDATE AVAILABLE	SF99716	720 Java
UPDATE AVAILABLE	SF99747	720 DB2 Web Query for i V2.1.0
UPDATE AVAILABLE	SF99776	720 High Availability for IBM i
INSTALLED LEVEL IS CURRENT	SF99714	720 Performance Tools
INSTALLED LEVEL IS CURRENT	SF99717	720 Technology Refresh
INSTALLED LEVEL IS CURRENT	SF99720	Current Cumulative PTF Media Documentation
INSTALLED LEVEL IS CURRENT	SF99721	720 All PTF Groups except Cumulative PTF Package
INSTALLED LEVEL IS CURRENT	SF99766	720 Print PTFs
INSTALLED LEVEL IS CURRENT	SF99767	720 720 TCP/IP PTF
INSTALLED LEVEL IS CURRENT	SF99769	720 IBM i integration with BladeCenter and System x

And it tells you when the update is available

ProTip: From 7.3 you can automatically download the PTFs

How do you use IBM i Services?

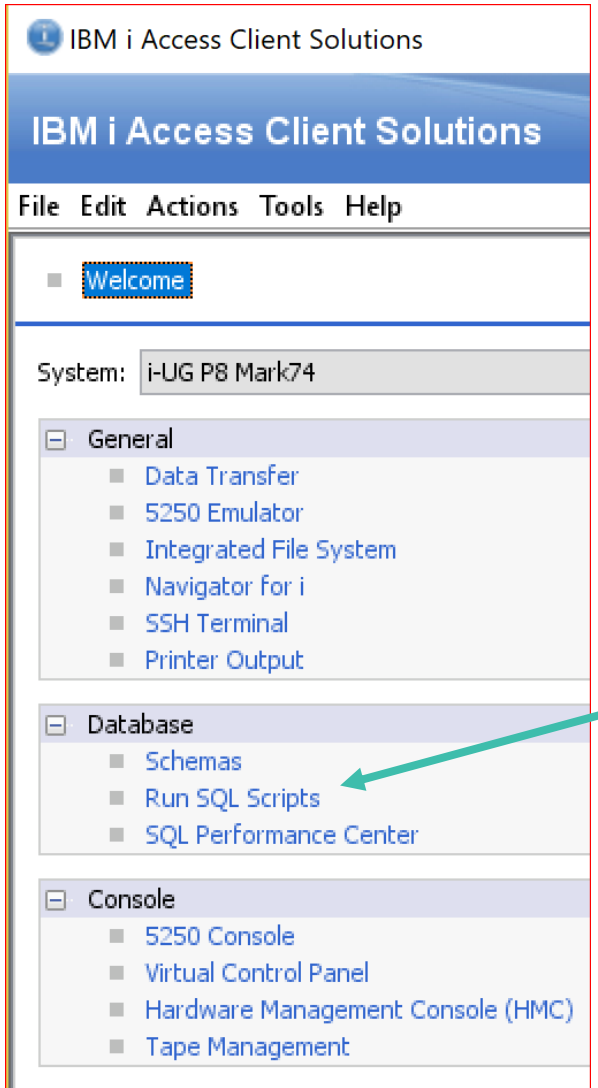
You run an SQL statement

- STRSQL – Not recommended
- IBM i ACS Run SQL
- IBM i Access for Web
- IBM RDi
- IBM Navigator for i
- Any ODBC / JDBC interface you prefer

How do you use IBM i Services?

Advice from Uncle Scott

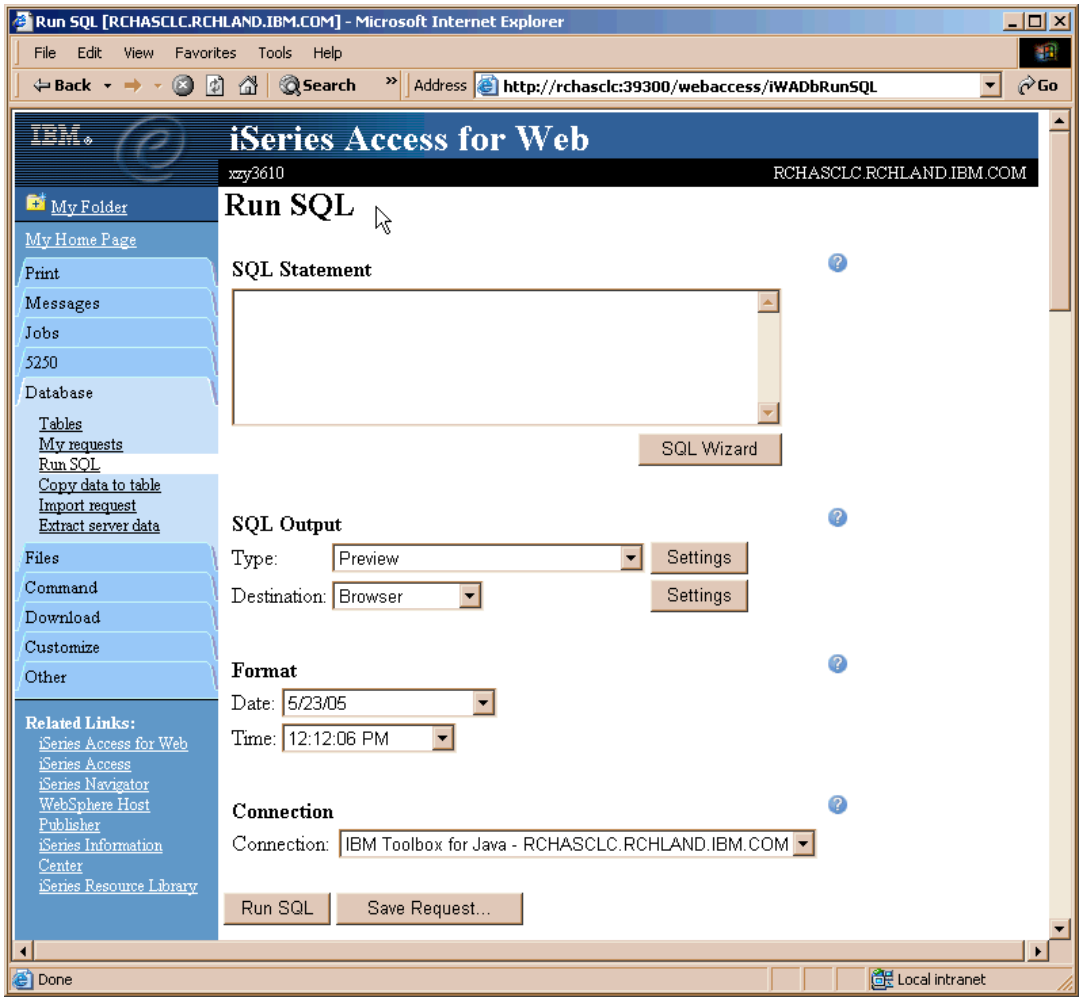
Use IBM ACS Run SQL Scripts



Major overhaul of SQL interface.
Now faster,
more intuitive and has auto formatting

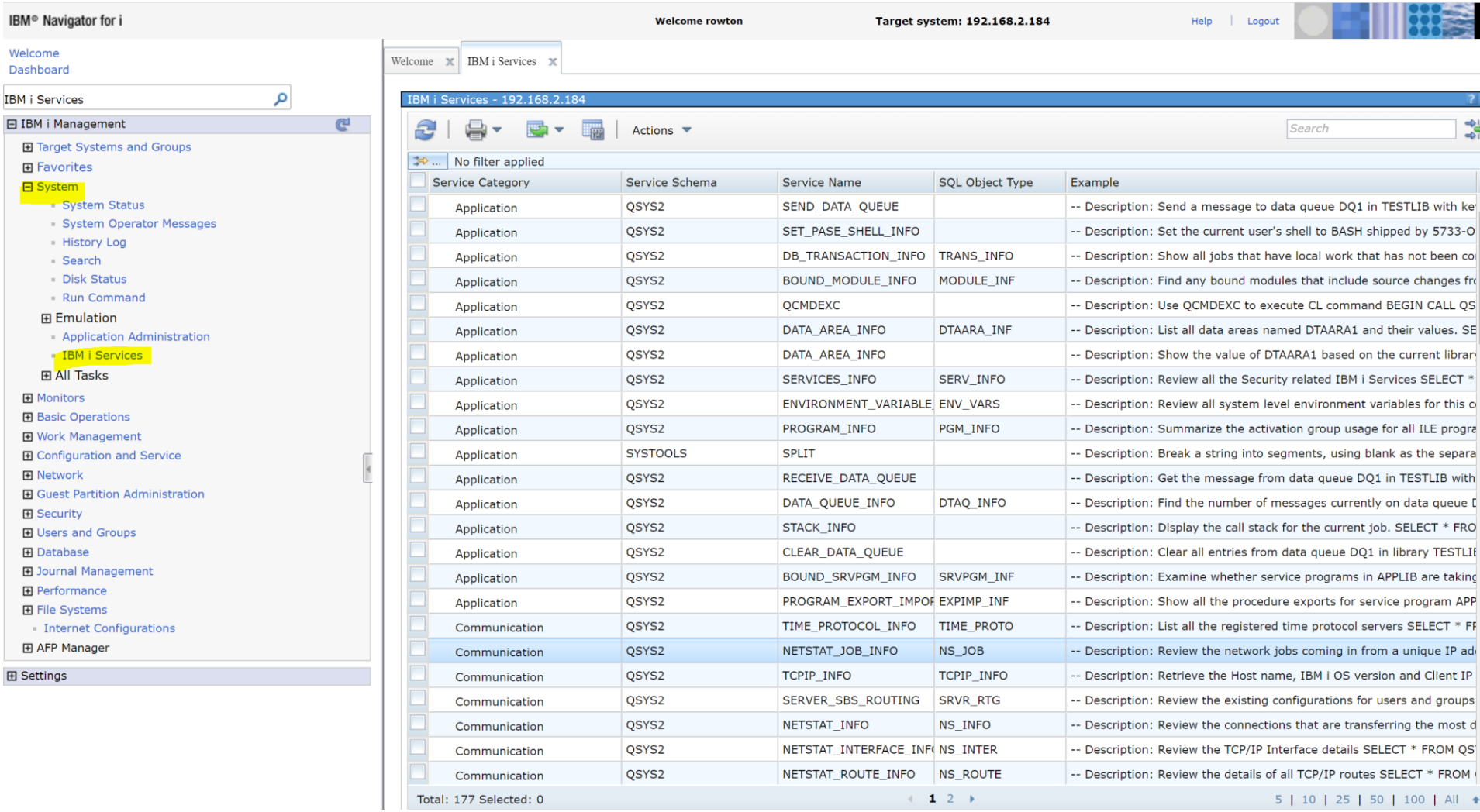
How do you use IBM i Services?

Use IBM i Access for Web (5770XH2)



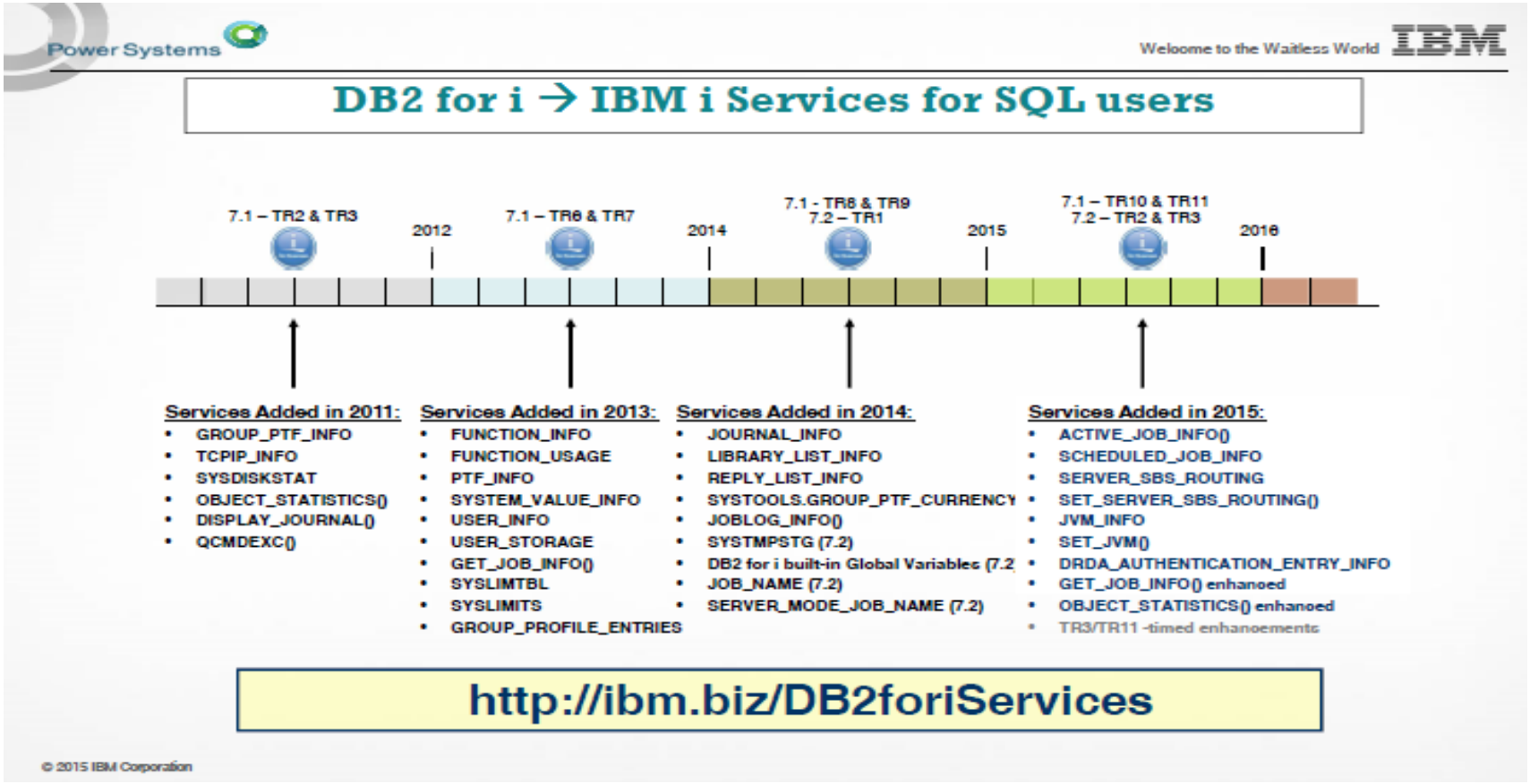
How do you use IBM i Services?

Use IBM Navigator for i (Nav4i)



How do you get IBM i Services?

If you run IBM i 7.1 or later, you have them



ProTip: Check ibm.biz/DB2foriServices after each TR Announcement

Do PTFs really help?

In a word – YES!

PTFs have always helped with database issues and performance
Now more than ever.

Since the introduction of Technology Refreshes in 7.1 IBM are not just fixing bugs and enabling new hardware with PTFs
They boost performance & add new functions

More than half of the new functions written for 7.4 were made available in 7.3 via TR PTFs!

The same was true for 7.3 functions being PTF'd back into 7.2

Lets look at another example

You want to know
Which users on my system have *ALLOBJ?

Can IBM i Services give you a better answer?

Why are IBM i Services better?

Which users have *ALLOBJ authority?

The old way is simple and quick

PRTUSRPRF TYPE(*AUTINFO) SPCAUT(*ALLOBJ)

```
                                                User Profile Information
5770SS1 V7R1M0  100423
 Report type  . . . . . . . . . . :   *AUTINFO
 Select by  . . . . . . . . . . . :   *SPCAUT
 Special authorities  . . . . . . :   *ALLOBJ
                        -------------Special Authorities-------------
                                      *IO
 User         Group        *ALL   *AUD  SYS   *JOB  *SAV  *SEC  *SER  *SPL  User
 Profile      Profiles      OBJ    IT   CFG    CTL   SYS   ADM  VICE   CTL  Class
 QLPAUTO      *NONE         X            X     X     X     X                 *SYSOPR
 QLPINSTALL   *NONE         X            X     X     X     X                 *SYSOPR
 QSECOFR      *NONE         X      X     X     X     X     X     X     X     *SECOFR
 QSECOFR1     *NONE         X      X     X     X     X     X     X     X     *SECOFR
 QSYS         *NONE         X      X     X     X     X     X     X     X     *SECOFR
 ROWTON       *NONE         X      X     X     X     X     X     X     X     *SECOFR
 ZENDADMIN    *NONE         X      X     X     X     X     X     X     X     *SECOFR
                                          * * * * *   E N D   O F   L I S T I N G
```

So how could IBM i Services be better?

Why are IBM i Services better?

Which users have *ALLOBJ authority?

```
SELECT AUTHORIZATION_NAME, STATUS, NO_PASSWORD_INDICATOR, PREVIOUS_SIGNON,
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	STATUS	NO_PASSWORD_INDICATOR	PREVIOUS_SIGNON	TEXT_DESCRIPTION
QLPAUTO	*ENABLED	NO	-	IBM-supplied User Profile
QLPINSTALL	*ENABLED	NO	-	IBM-supplied User Profile
QSECOFR	*ENABLED	YES	2015-09-20 13:05:04.000000	Security Officer
QSECOFR1	*ENABLED	YES	2015-09-20 14:29:08.000000	Security Officer
QSYS	*ENABLED	NO	-	Internal System User Profile
ROWTON	*ENABLED	YES	2015-09-20 13:56:51.000000	Rowton Support
SURPRISE	*ENABLED	YES	2015-09-20 14:29:52.000000	Has AllObj because Rowton is Group Profile
ZENDADMIN	*ENABLED	NO	-	Zend Server Administrator

This looks a lot more complex for the same answer.

So, how can IBM i Services be better?

Why are IBM i Services better?

Let's look at the answers again

User Profile	Group Profiles	*ALL OBJ	*AUD IT	SYS CFG	*JOB CTL	*SAV SYS	*SEC ADM	*SER VICE	*SPL CTL	User Class
QLPAUTO	*NONE	X		X	X	X	X			*SYSOPR
QLPINSTALL	*NONE	X		X	X	X	X			*SYSOPR
QSECOFR	*NONE	X	X	X	X	X	X	X	X	*SECOFR
QSECOFR1	*NONE	X	X	X	X	X	X	X	X	*SECOFR
QSYS	*NONE	X	X	X	X	X	X	X	X	*SECOFR
ROWTON	*NONE	X	X	X	X	X	X	X	X	*SECOFR
ZENDADMIN	*NONE	X	X	X	X	X	X	X	X	*SECOFR

AUTHORIZATION_NAME	STATUS	NO_PASSWORD_INDICATOR	PREVIOUS_SIGNON	TEXT_DESCRIPTION
QLPAUTO	*ENABLED	NO	-	IBM-supplied User Profile
QLPINSTALL	*ENABLED	NO	-	IBM-supplied User Profile
QSECOFR	*ENABLED	YES	2015-09-20 13:05:04.000000	Security Officer
QSECOFR1	*ENABLED	YES	2015-09-20 14:29:08.000000	Security Officer
QSYS	*ENABLED	NO	-	Internal System User Profile
ROWTON	*ENABLED	YES	2015-09-20 13:56:51.000000	Rowton Support
SURPRISE	*ENABLED	YES	2015-09-20 14:29:52.000000	Has AllObj because Rowton is Group Profile
ZENDADMIN	*ENABLED	NO	-	Zend Server Administrator

It does not have *ALLOBJ specified in its own parameters, so does not show up on the PRTUSRPRF. That doesn't stop this user from having full access to every object on the system!

IBM i Services can help with GDPR

Finding sensitive data is hard

- Inconsistent field names
- Multiple copies
- Millions of objects to analyse

Where do you start?

- Start with the System Table Service

```
SELECT SYSTEM_TABLE_SCHEMA library, SYSTEM_TABLE_NAME table, SYSTEM_COLUMN_NAME field, length,
data_type, column_text,column_heading FROM qsys2.syscolumns
WHERE length >= 20 and (lower(column_text)  like '%address%')
ORDER BY library,table,field ;
```

Protip: You can use ANY string that is a sensitive term that is key to your environment!
Zip Code, Credit Card, Salary, Blood Type, Social Security No, Passport No, etc…..
Thanks to Guy Marmorat at resiliane.com for this tip

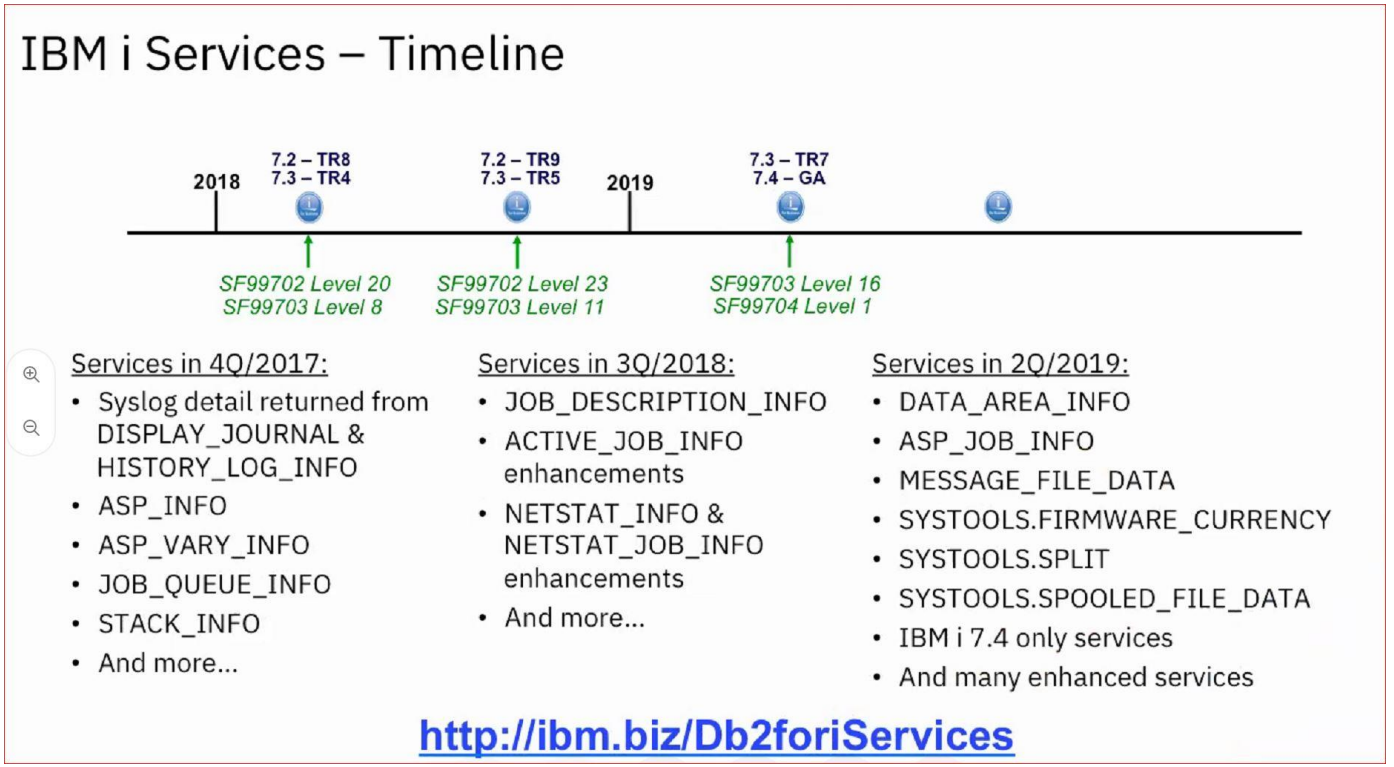
How about the price?

So how much does it cost to purchase IBM i Services?

NOTHING ! They are FREE and included by default

IBM i Services are the future

Currently 147 different IBM i Services



Each service can answer many different questions

New services are regularly added by PTF

Many existing services have been further enhanced in the last 12 months

Source: Scott Forstie SQL for the Security Officer Presentation

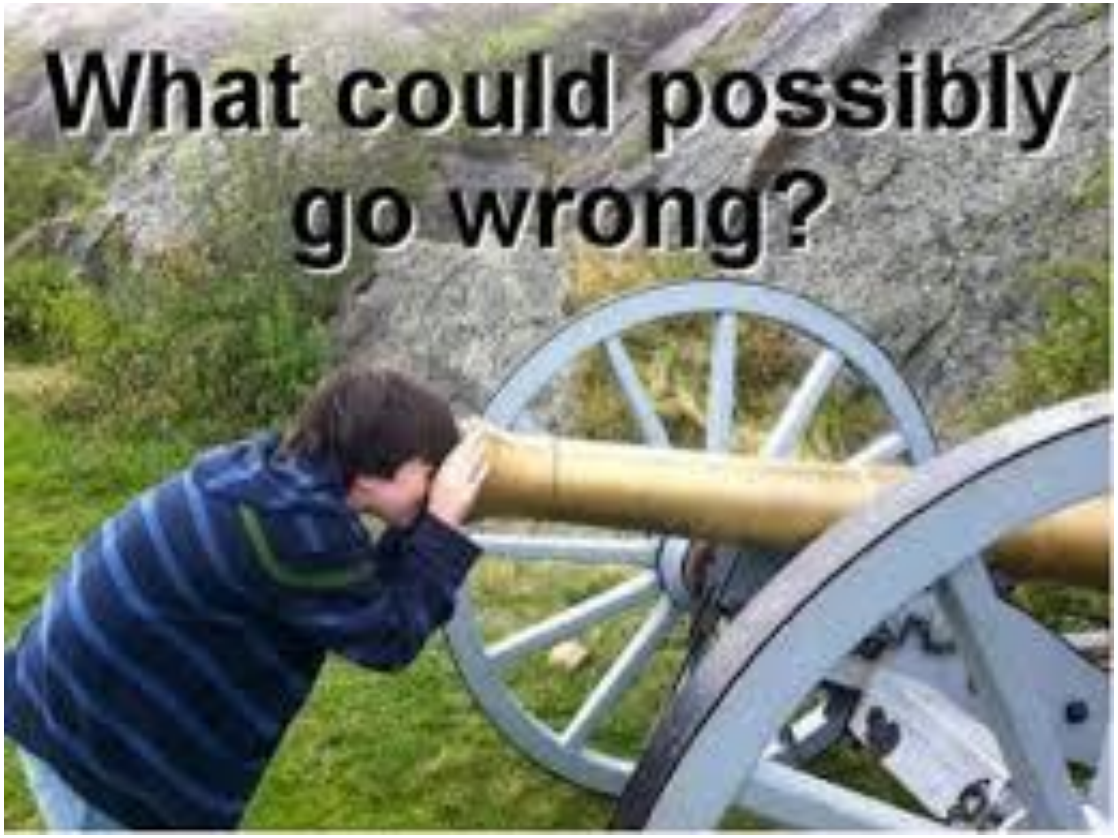
Grouped into the following categories

Group Name	Number of IBM i Services
Application Services	30
Work Management Services	25
Security Services	21
Communication Services	14
IFS Services	12
Storage Services	9
Message Handling Services	7
Spool Services	7
PTF Services	5
Librarian Services	4
Journaling Services	4
Product Services	3
System Health Services	3
Java Services	2
Performance	1

IBM have added new IBM i Services functionality in every TR level since 7.1

Enough talking, let's get hands on

Demonstration time



Changing habits…

- WRKOBJ / DSPOBJ
- DSPOBJAUT
- RTVDIRINF
- WRKACTJOB
- NETSTAT

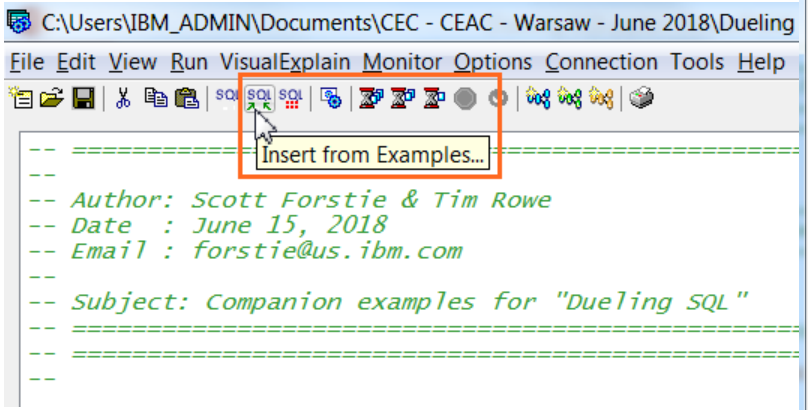
- And the list goes on…

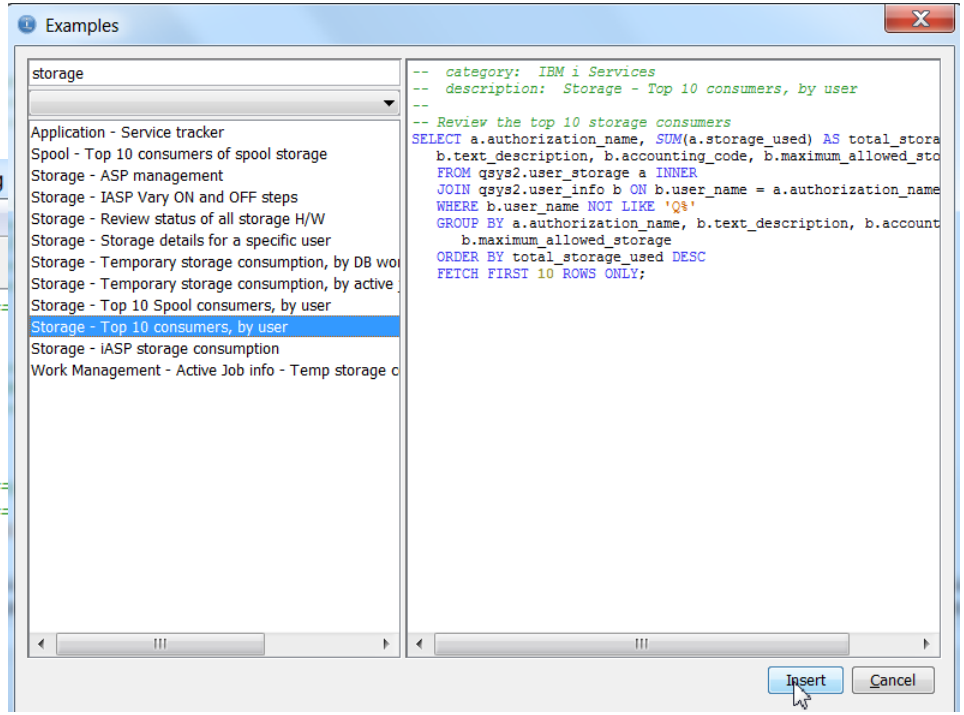
- QSYS2.OBJECT_STATISTICS()
- QSYS2.OBJECT_PRIVILEGES
- QSYS2.IFS_OBJECT_STATISTICS()
- QSYS2.ACTIVE_JOB_INFO()
- QSYS2.NETSTAT_INFO
- QSYS2.NETSTAT_JOB_INFO
- QSYS2.NETSTAT_ROUTE_INFO
- QSYS2.NETSTAT_INTERFACE_INFO
- **#SQLcandoit**

ibm.biz/Db2foriServices

SQL Made Easy – Use Insert From Examples

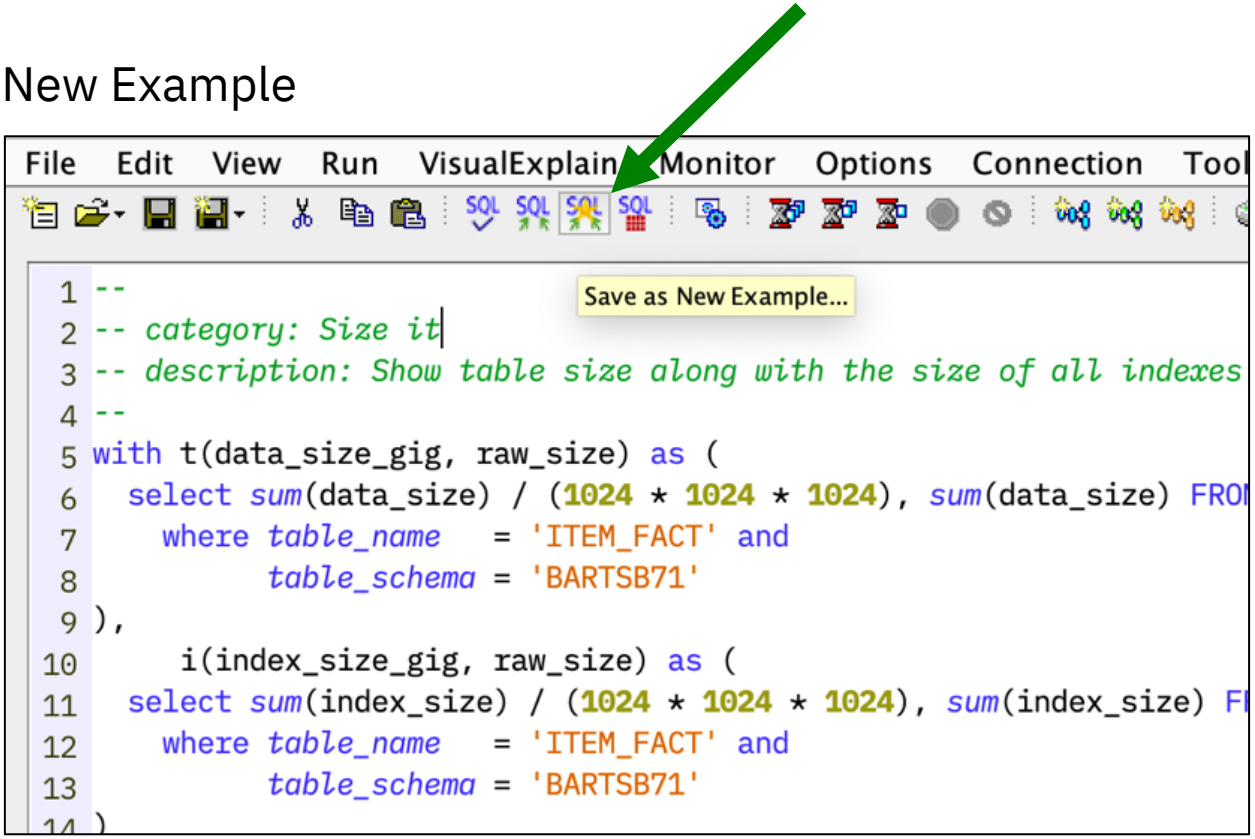
- Working examples are built into ACS
- **Many of the examples are focused on admin tasks**





User Defined – Insert from Examples

- Save as New Example



The new IBM i services are awesome too!

You can now view Journals from IBM i Services

- You can view Audit and Database Journals
- You can visualise more data
- You can select, subset & summarise all in one
- You can use this to link directly from your SIEM

Viewing all User Profile changes in the last 24 hours

```
SELECT journal_code, journal_entry_type, object, object_type, X.*
FROM TABLE (
QSYS2.Display_Journal(
  'QSYS', 'QAUDJRN',                    – Journal library and name
  JOURNAL_ENTRY_TYPES => 'CP' ,         – Journal entry types
  STARTING_TIMESTAMP => CURRENT TIMESTAMP - 24 HOURS  – Time period
) ) AS x
```

Some of my favourites from Scott Forstie

I'm about to IPL, will the IPL impact PTF state?

```
SELECT PTF_IDENTIFIER, PTF_IPL_ACTION, A.*
    FROM QSYS2.PTF_INFO A WHERE PTF_IPL_ACTION <> 'NONE';
```

Which remote journals are the most heavily used?

```
SELECT JOURNALED_OBJECTS, A.* FROM QSYS2.JOURNAL_INFO A WHERE
   NUMBER_REMOTE_JOURNALS > 0 AND JOURNALED_OBJECTS IS NOT NULL ORDER BY
   JOURNALED_OBJECTS DESC;
```

Remote journals that fell behind this week?

```
SELECT MAXIMUM_TIME_BEHIND, MAXIMUM_BEHIND_TIMESTAMP, ESTIMATED_TIME_BEHIND,
   TOTAL_SIZE_JOURNAL_RECEIVERS,
    RTRIM(ATTACHED_JOURNAL_RECEIVER_LIBRARY) CONCAT '/' CONCAT
   RTRIM(ATTACHED_JOURNAL_RECEIVER_NAME) AS JrnName, A.* FROM
   QSYS2.JOURNAL_INFO A WHERE
   MAXIMUM_BEHIND_TIMESTAMP > CURRENT TIMESTAMP - 7 DAYS AND
   MAXIMUM_TIME_BEHIND > 0 AND MAXIMUM_TIME_BEHIND IS NOT NULL ORDER BY
   MAXIMUM_TIME_BEHIND DESC FETCH FIRST 10 ROWS ONLY;
```

Some of my favourites from Scott Forstie

Examine all groups and the group members

```
SELECT * from qsys2.group_profile_entries;
```

Which users are having trouble signing on?

```
SELECT * FROM QSYS2.USER_INFO
  WHERE SIGN_ON_ATTEMPTS_NOT_VALID > 0;
```

Review top 10 storage consumers

```
SELECT A.AUTHORIZATION_NAME, SUM(A.STORAGE_USED) AS TOTAL_STORAGE_USED,
    B.TEXT_DESCRIPTION, B.ACCOUNTING_CODE, B.MAXIMUM_ALLOWED_STORAGE
     FROM QSYS2.USER_STORAGE A
    INNER JOIN QSYS2.USER_INFO B ON B.USER_NAME = A.AUTHORIZATION_NAME
     GROUP BY A.AUTHORIZATION_NAME, B.TEXT_DESCRIPTION, B.ACCOUNTING_CODE,
    B.MAXIMUM_ALLOWED_STORAGE
     ORDER BY TOTAL_STORAGE_USED DESC FETCH FIRST 10 ROWS ONLY;
```

Some of my favourites from Scott Forstie

Which active jobs are the top consumers of temporary storage?

```
SELECT bucket_current_size, bucket_peak_size,
    rtrim(job_number) concat '/' concat rtrim(job_user_name) concat '/' concat rtrim(job_name)
    as q_job_name
    FROM QSYS2.SYSTMPSTG
    WHERE job_status = '*ACTIVE'
    ORDER BY bucket_current_size desc;
```

Which active database server connections are consuming the most temporary storage?

```
WITH TOP_TMP_STG (bucket_current_size, q_job_name) AS (
    SELECT bucket_current_size, rtrim(job_number) concat '/' concat rtrim(job_user_name) concat '/
    concat rtrim(job_name) as q_job_name
    FROM QSYS2.SYSTMPSTG
    WHERE job_status = '*ACTIVE' AND JOB_NAME IN ('QZDASOINIT', 'QZDASSINIT', 'QRWTSRVR',
    'QSQSRVR')
    ORDER BY bucket_current_size desc fetch first 10 rows only
    ) SELECT bucket_current_size, q_job_name, V_SQL_STATEMENT_TEXT, B.* FROM TOP_TMP_STG
    TABLE(QSYS2.GET_JOB_INFO(q_job_name)) B;
```

Some of my favourites from Scott Forstie

What data was deleted from PRODDATA/SALES table this week?

```
select
    cast(cast(substring(entry_data,610-610+1,10) as VARCHAR(10) for bit data) as DATE) AS
    SALES_DATE,
    cast(cast(substring(entry_data,622-610+1,15) as VARCHAR(15) for bit data) as varchar(15) ccsid 37) as
    SALES_PERSON,
    cast(cast(substring(entry_data,638-610+1,15) as VARCHAR(15) for bit data) as varchar(15) ccsid 37) as
    REGION,
    cast(cast(substring(entry_data,655-610+1,4) as VARCHAR(4) for bit data) as varchar(4)) as SALES
      from table (
    QSYS2.Display_Journal(
    'TOYSTORE', 'QSQJRN', -- Journal library and name
    STARTING_TIMESTAMP  => CURRENT TIMESTAMP - 7 DAYS,
    JOURNAL_ENTRY_TYPES => 'DL',
    OBJECT_LIBRARY      => 'TOYSTORE',
    OBJECT_NAME                 => 'SALES',
    OBJECT_OBJTYPE          => '*FILE',
    OBJECT_MEMBER               => 'SALES'
    ) ) as x
    order by entry_timestamp desc;
```

Some of my favourites from Scott Forstie

Compare PTF levels of 2 machines

```
select * from qsys2.ptf_info;

DECLARE GLOBAL TEMPORARY TABLE SESSION . Remote_PTF_INFO
( PTF_PRODUCT_ID,PTF_IDENTIFIER,PTF_LOADED_STATUS,PTF_CREATION_TIMESTAMP )
AS (SELECT PTF_PRODUCT_ID,PTF_IDENTIFIER,PTF_LOADED_STATUS,PTF_CREATION_TIMESTAMP FROM
LP02UT28.QSYS2.PTF_INFO WHERE PTF_LOADED_STATUS <> 'NOT LOADED') WITH DATA
WITH REPLACE;

SELECT 'LP24UT27' AS "System Name",
A.PTF_PRODUCT_ID,A.PTF_IDENTIFIER,A.PTF_LOADED_STATUS,A.PTF_CREATION_TIMESTAMP FROM
QSYS2.PTF_INFO A
LEFT EXCEPTION JOIN SESSION.Remote_PTF_INFO B
 ON A.PTF_PRODUCT_ID = B.PTF_PRODUCT_ID AND
   A.PTF_IDENTIFIER IS NOT DISTINCT FROM B.PTF_IDENTIFIER AND
   A.PTF_LOADED_STATUS IS NOT DISTINCT FROM B.PTF_LOADED_STATUS AND
   A.PTF_CREATION_TIMESTAMP IS NOT DISTINCT FROM B.PTF_CREATION_TIMESTAMP
       UNION ALL
SELECT 'LP02UT28' AS "System Name",
B.PTF_PRODUCT_ID,B.PTF_IDENTIFIER,B.PTF_LOADED_STATUS,B.PTF_CREATION_TIMESTAMP FROM
QSYS2.PTF_INFO A
RIGHT EXCEPTION JOIN SESSION.Remote_PTF_INFO B
 ON A.PTF_PRODUCT_ID = B.PTF_PRODUCT_ID AND
   A.PTF_IDENTIFIER IS NOT DISTINCT FROM B.PTF_IDENTIFIER AND
   A.PTF_LOADED_STATUS IS NOT DISTINCT FROM B.PTF_LOADED_STATUS AND
   A.PTF_CREATION_TIMESTAMP IS NOT DISTINCT FROM B.PTF_CREATION_TIMESTAMP
ORDER BY PTF_IDENTIFIER;
```

New Services for IBM i 7.4
IBM i Services for Message Queues

```
--
-- Review messages sent to the system operator message queue
-- with license expiration details
--
select message_text, M.*
   from Qsys2.Message_Queue_Info M
   where Message_Queue_Name = 'QSYSOPR'
     and message_text like '%exceeded%';
```

MESSAGE_TEXT	MESSAGE_QUEUE_LIBRARY	MESSAGE_QUEUE_NAME	MESSAGE_ID
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
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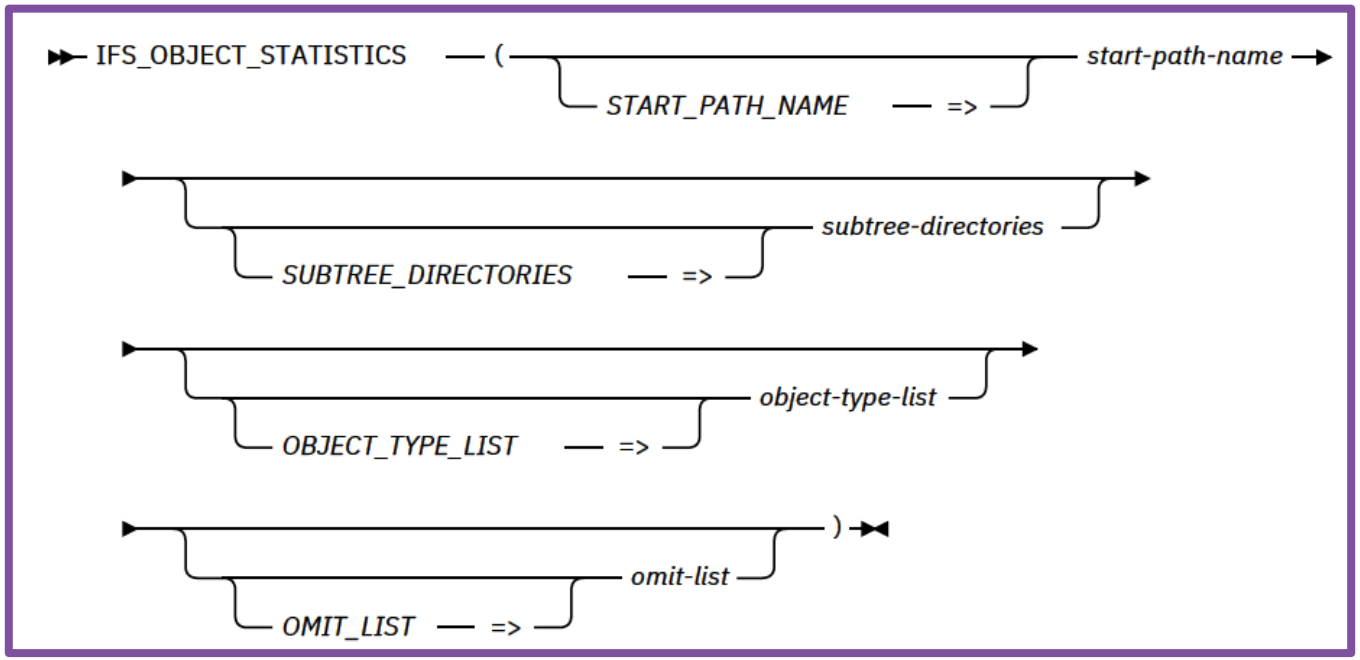
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
Usage limit of 0 exceeded. Grace period expires in 69 days on 14/08/19.	QSYS	QSYSOPR	CPF9E72
IBM i usage limit exceeded - operator action required.	QSYS	QSYSOPR	CPF9E7F
IBM i usage limit exceeded - operator action required.	QSYS	QSYSOPR	CPF9E7F
IBM i usage limit exceeded - operator action required.	QSYS	QSYSOPR	CPF9E7F

Oops, someone forgot to enter the keys!

IFS_OBJECT_STATISTICS

- SQL Alternative to RTVDIRINF, WRKLNK, readdir, opendir, etc...
- 87 columns of data returned



Largest files under an IFS tree

```
select path_name, object_type, data_size, object_owner
  from table(qsys2.IFS_OBJECT_STATISTICS(
                    start_path_name => '/usr',
                    subtree_directories => 'YES'))
   order by 3 desc
   limit 10;
```

PATH_NAME	OBJECT_TYPE	DATA_SIZE	OBJECT_OWNER
/usr/scottf/guard-itap-10.0.0_r79963_trunk_1-aix-5.3-aix-powerpc.sh	*STMF	22990848	SCOTTF
/usr/local/guardium/libprotobuf.a	*STMF	11376527	SCOTTF
/usr/local/guardium/istap	*STMF	7620568	SCOTTF
/usr/local/guardium/just_send	*STMF	3962332	SCOTTF
/usr/bin	*DIR	73728	QSYS
/usr	*DIR	24576	QSYS
/usr/scottf	*DIR	12288	SCOTTF
/usr/local/guardium/iso-swid	*DIR	12288	SCOTTF
/usr/local	*DIR	8192	SCOTTF
/usr/local/guardium	*DIR	8192	SCOTTF

IFS Storage Management by User

```
with ifsobjs (path, type) as (
  select path_name, object_type
    from table(qsys2.object_ownership('SCOTTF')) a
      where path_name is not null
)
select i.*, data_size, z.*
  from ifsobjs i, lateral (
    select * from
      table(qsys2.ifs_object_statistics(
              start_path_name => path,
              subtree_directories => 'NO'))) z
order by data_size desc;
```

PATH	TYPE	DATA_SIZE
/usr/scottf	*DIR	22990848
/usr/scottf/guard-itap-10.0.0_r7...	*STMF	22990848
/usr/local/guardium/libprotobuf.a	*STMF	11376527

IFS Directories – Data size probe

```
select path_name, object_type, data_size, object_owner,
       create_timestamp, access_timestamp,
       data_change_timestamp, object_change_timestamp
  from table (
      qsys2.ifs_object_statistics(
        start_path_name => '/',
        subtree_directories => 'YES',
        object_type_list => '*ALLDIR *NOQSYS'))
   where data_size is not null and
         object_owner not in ('QSYS')
   order by 3 desc limit 10;
```

PATH_NAME	OBJECT_TYPE	DATA_SIZE	OBJECT_OWNER	CREATE_TI
/QOPT/HMC-9.1.910.0	*DDIR	2147483647	QDFTOWN	2018-02-21
/home/jdbctest/ct/out/compare	*DIR	3825664	EBERHARD	2018-07-17
/home/jdbctest/test	*DIR	2646016	EBERHARD	2016-04-28
/tmp/SQE/CLRAMLER_991432	*DIR	909312	CLRAMLER	2019-03-26
/home/jdbctest/stp/locator/exp	*DIR	696320	EBERHARD	2016-04-28

New Services for IBM i 7.4
IBM i Service for Spool Data

```
1  --
2  -- Find the top 5 consumers of SPOOL storage.
3  --
4  select user_name, sum(size) as total_spool_space,
5         varchar_format(sum(size), '999G999G999G999G999')
6           as total_spool_space_formatted
7    from qsys2.output_queue_entries_basic
8    where user_name in (select user_name
9          from qsys2.user_info
10         where user_creator <> '*IBM')
11   group by user_name
12   order by total_spool_space desc
13   limit 5;
```

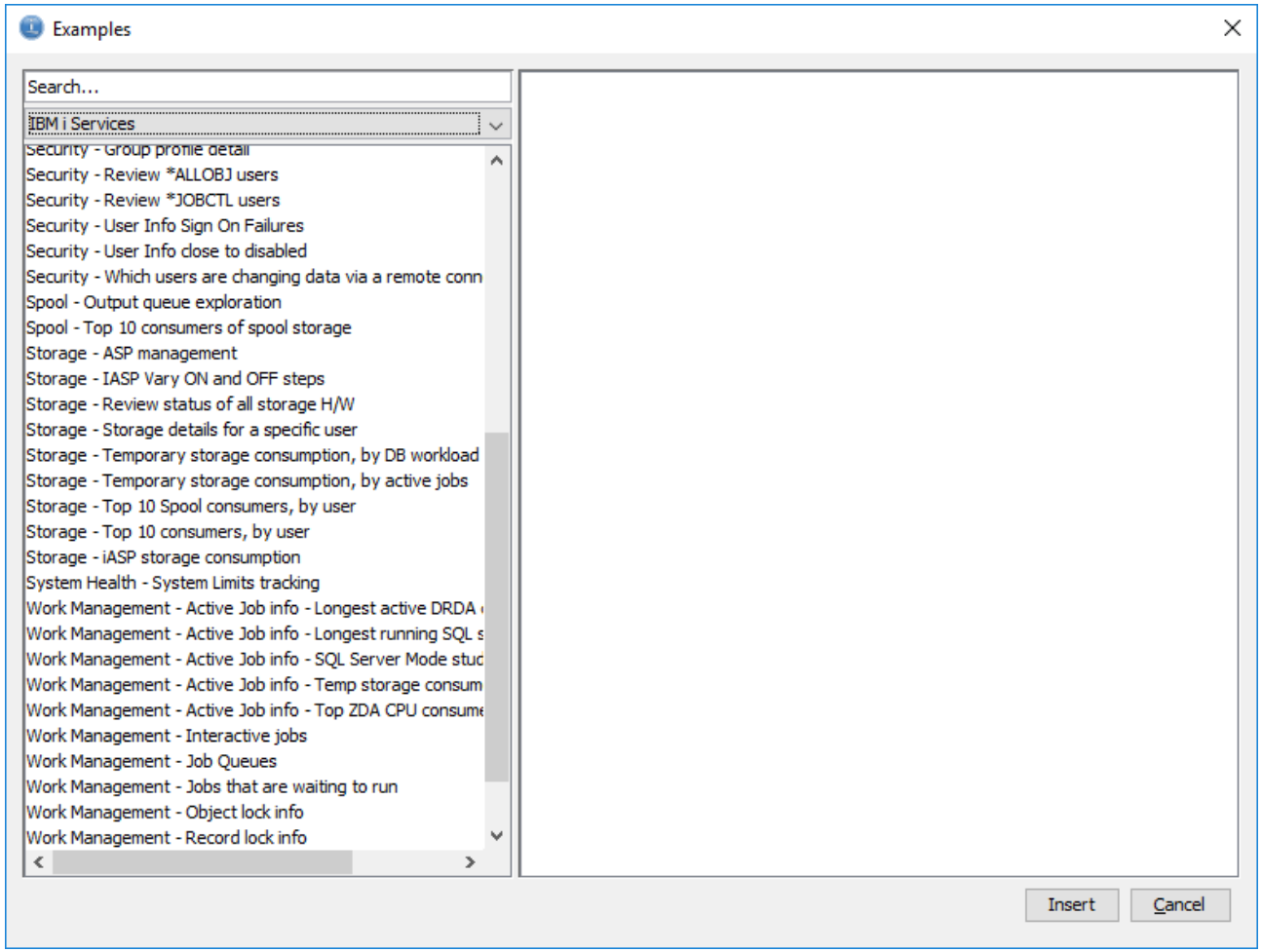
USER_NAME	TOTAL_SPOOL_SPACE	TOTAL_SPOOL_SPACE_FORMATTED
STEVE	41704	41,704
GSTREET	6416	6,416
QIJS	540	540
ROWTON	308	308
RUDI	36	36

Answers delivered in less than a second!

ProTip: This service PTFd back to IBM i 7.3 other OUTQ services go back to 7.2

Where you start?

I recommend ACS Insert from examples



Any Questions?

Want to know more?

Check the Scott Forstie Blog

http://ibm.biz/Db2foriServices

Speak with your local IBM i BP / ISV

Speak with your local IBM support

Read my technical blog
powerwire.eu/author/steve-bradshaw