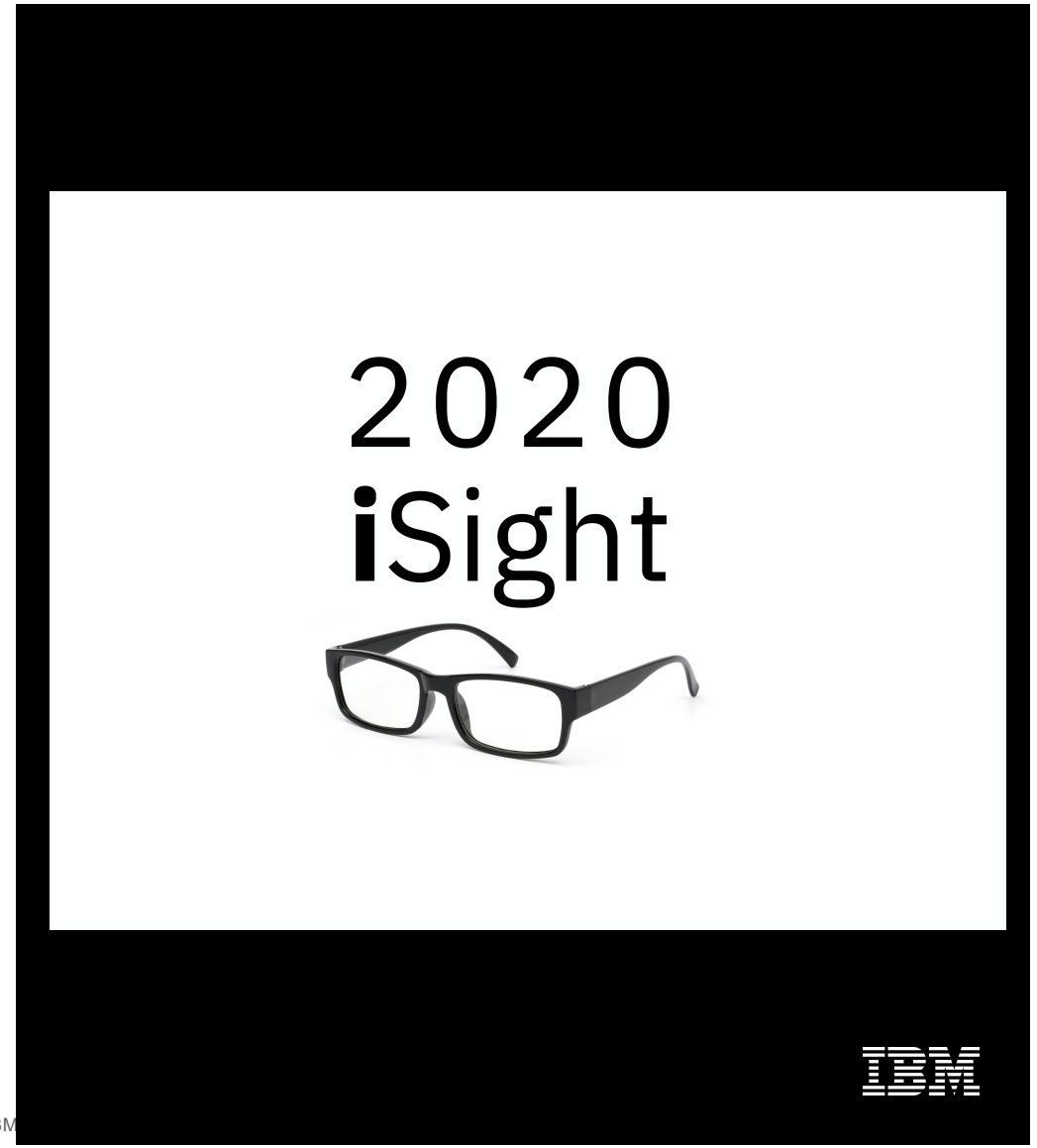
What's new in Db2 for i

Scott Forstie
forstie@us.ibm.com
Architect Db2 for i



The Omni User

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iSight

Database enhancements with:
IBM i 7.4 TR3
IBM i 7.3 TR9

Announced → October 6, 2020
Software GA → November 13, 2020

2020
iSight

Database enhancements are delivered via:
Db2 PTF Group SF99703 Level 22
Db2 PTF Group SF99704 Level 10

Announced → October 6, 2020
Software GA → November 13, 2020

www.ibm.com/ibmi/techupdates

2020 iSight

	Enhancement Landing Pages
IBM i 7.4	TR3 - TR2 - TR1 - Base Enhancements
IBM i 7.3	TR9 - TR8 - TR7 - TR6 - TR5 - TR4 -TR3 - TR2 -TR1 - Base Enhancements
IBM i 7.2	TR9 - TR8 - TR7 - TR6 - TR5 - TR4 - TR3 - TR2 - TR1 - Base Enhancements

SQL

DROP IF EXISTS

2020 iSight

- Deploying DDL just became simpler
- The DROP won't fail if the table does not exist
- Applies to all types of DROP <DDL-Object-Type>

```
-- Don't fail me now
DROP TABLE if exists TOYSTORE.SALES;
```

Hands-Free SQL DROPs with New IF EXISTS Support

KENT MILLIGAN / 12 NOVEMBER 2020

www.mcpressonline.com/programming/sql/hands-free-sql-drops-with-new-if-exists-support

Look who's back!

2020 iSight

Kent Milligan

- Db2 for i Lab Services
- Consultant for SQL & Database topics
- Industry speaker
- Active Author
- Blogger

Db2 for i

Insight and perspectives on data management using IBM i

db2fori.blogspot.com

kmill@us.ibm.com

IBM i Service Vouchers and Education Vouchers

Service Vouchers

- To be used toward IBM i services
- Earned when purchase certain Power systems with IBM i and register on-line
- Services can be delivered by IBM Lab Services or qualified BP (except BP cannot deliver ½ day service)
- Expires in 5 years from year of hardware ship date
- Redeem by email request to Services Voucher Admin
- Services Voucher Admin = Cindy Scrodin (cscrodin@us.ibm.com)

Education Vouchers

- To be used toward IBM workshops or technical events
- Earned when purchase certain Power systems with IBM i and register on-line
- Must be IBM workshop or technical event only
- Expires in 1 year from registration
- Redeem with voucher # when registering for event
- Education Voucher Admin = voucher@us.ibm.com

https://www.ibm.com/it-infrastructure/services/lab-services/power

Shred JSON arrays

2020 iSight

```
-- Total positive COVID-19 tests in the US
select varchar_format(sum("positiveIncrease"), '999G999G999G999') as
total_cases
from json_table(systools.httpgetclob(
'https://api.covidtracking.com/v1/states/daily.json', ''),'lax $[*]'
      columns(
        "state" char(2),
        "positiveIncrease" integer
      ) error on error);
```

TOTAL_CASES
10,122,703

← November 10

November 16 →

TOTAL_CASES
11,046,956

The Omni User

Shred JSON arrays

2020 iSight

```
-- Total positive COVID-19 tests in the US, by state
select "state", sum("positiveIncrease") as total_cases
from json_table( systools.httpgetclob(
'https://api.covidtracking.com/v1/states/daily.json', ''),'lax $[*]'
   columns(
     "state" char(2), "positiveIncrease" integer) error on error)
  group by "state" order by 2 desc;
```

state	TOTAL_CASES
CA	977165
TX	974229
FL	840652
NY	536139
IL	511179

← November 10

November 16 →

state	TOTAL_CASES
CA	1029182
TX	1027888
FL	877340
IL	585244
NY	563684

IBM i Access Client Solutions (ACS)

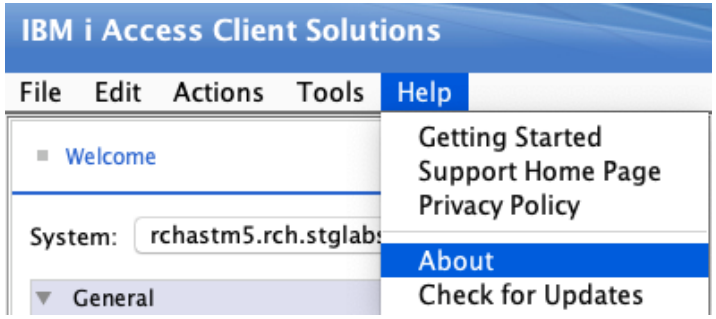
ACS – 1.1.8.5 is available

2020 iSight

Full description of the ACS 1.1.8.5 enhancements:
ftp://ftp.software.ibm.com/as400/products/clientaccess/solutions/readmespacs.txt

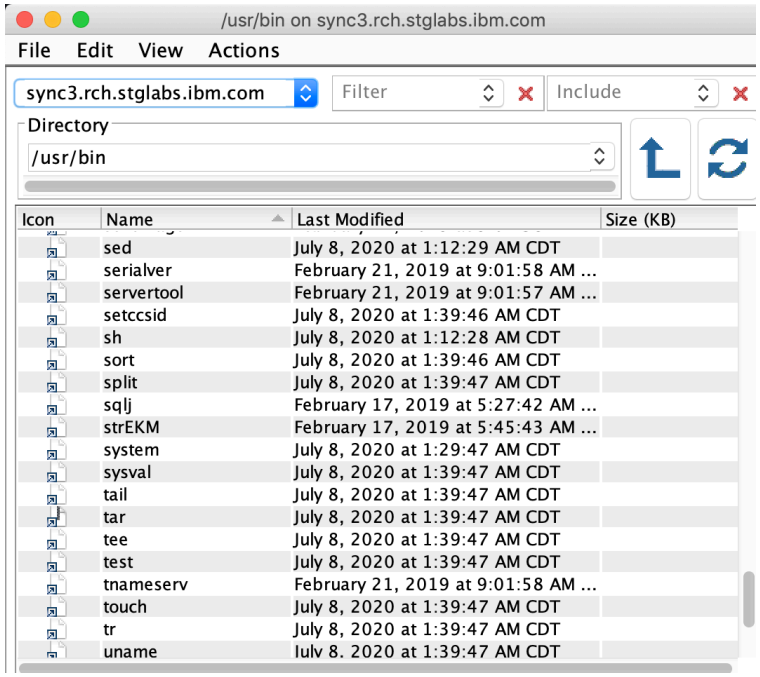
ACS Download site:
https://www.ibm.com/services/forms/preLogin.do?source=swg-ia

ACS Product Page:
https://www.ibm.com/support/pages/ibm-i-access-client-solutions

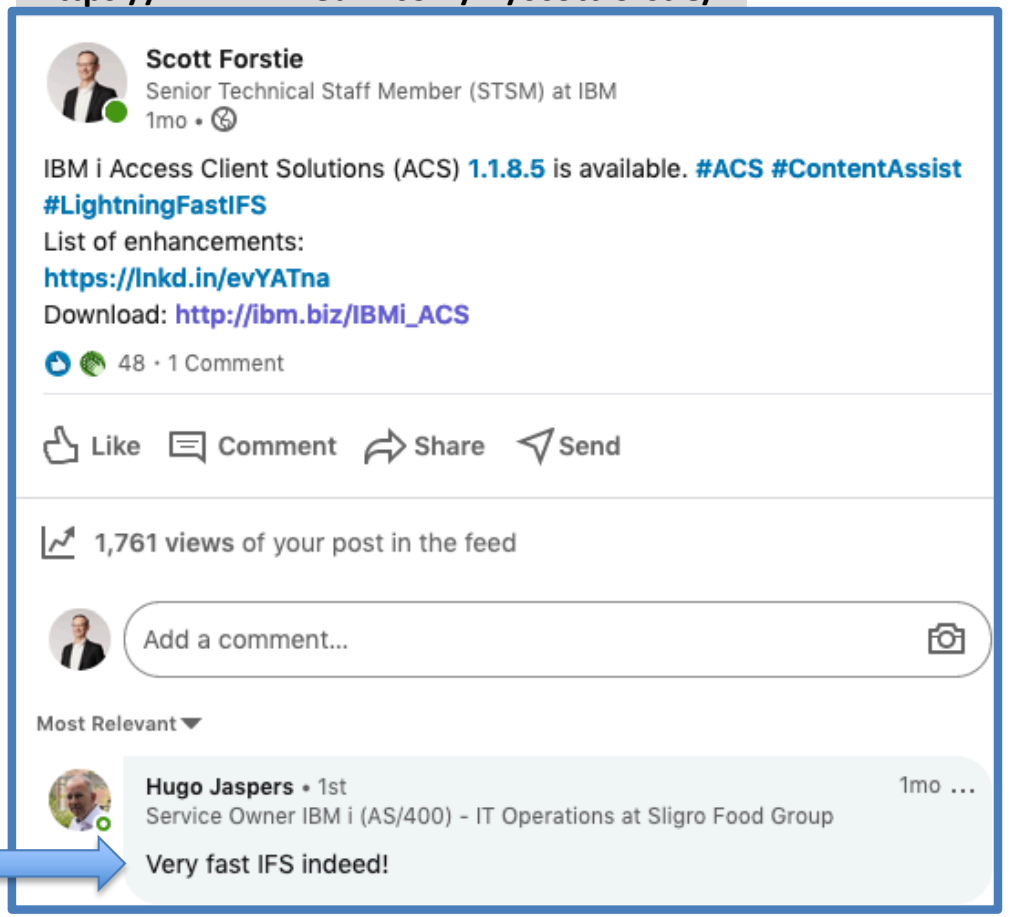


IBM i Access Client Solutions
(64-bit)
Version: 1.1.8.5
Build id: 0320
2020-08-30 21:51:50
/Applications/IBM i Access Client Solutions.app/acsbundle.jar

Integrated File System



https://www.linkedin.com/in/scottforstie/

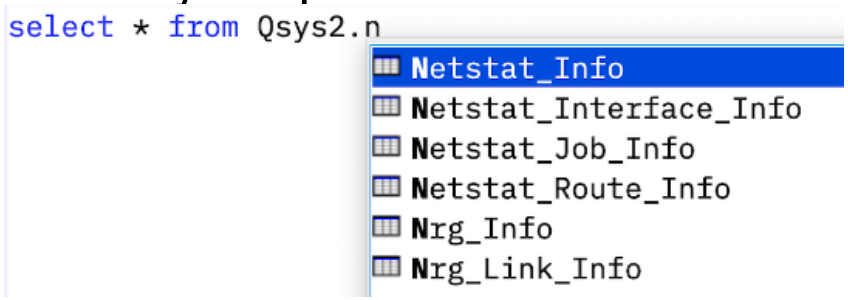


Content Assist

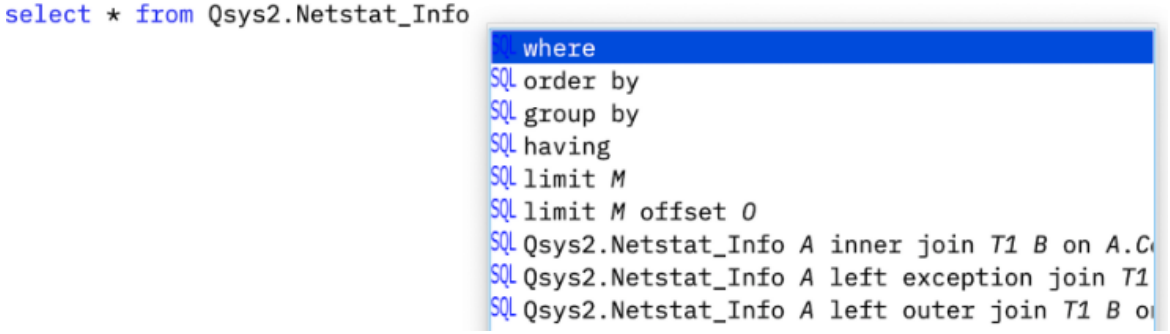
2020 iSight

<Control> and **<Space Bar>**

- 1st key sequence – Database Proposals



- 2nd key sequence – SQL Proposals



What's coming in ACS 1.1.8.6?

2020 iSight

- Target delivery – December 2020
- **Content Assist**
  - Extended coverage for SQL statements
  - Extended coverage for SQL syntax
  - Special case coverage like QTEMP

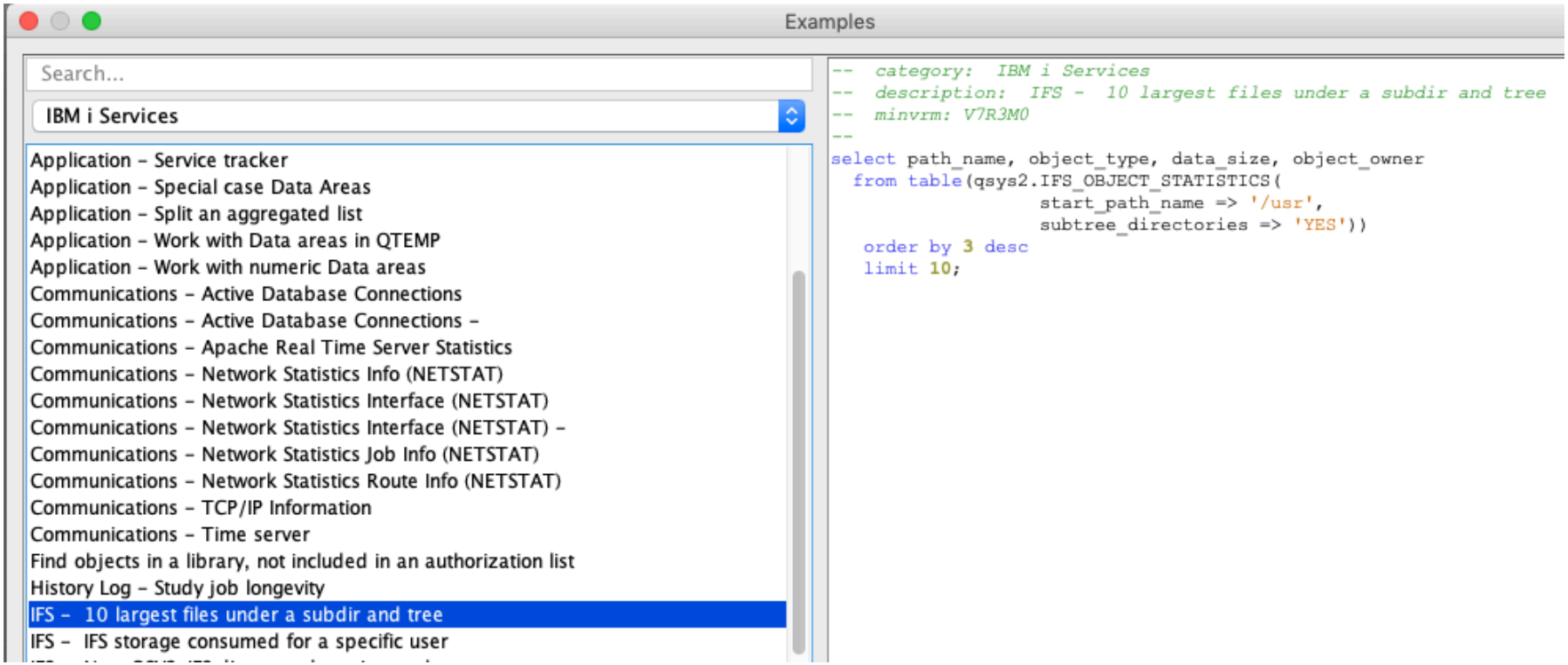
Press:
CTRL and **Space Bar**

- **Run SQL Scripts**
  - Converged and Enhanced Preferences dialog
  - Performance and Usability improvements
  - Automatic closing of incompletely consumed queries

Run SQL Scripts

What's coming in 1.1.8.6 (December, 2020)

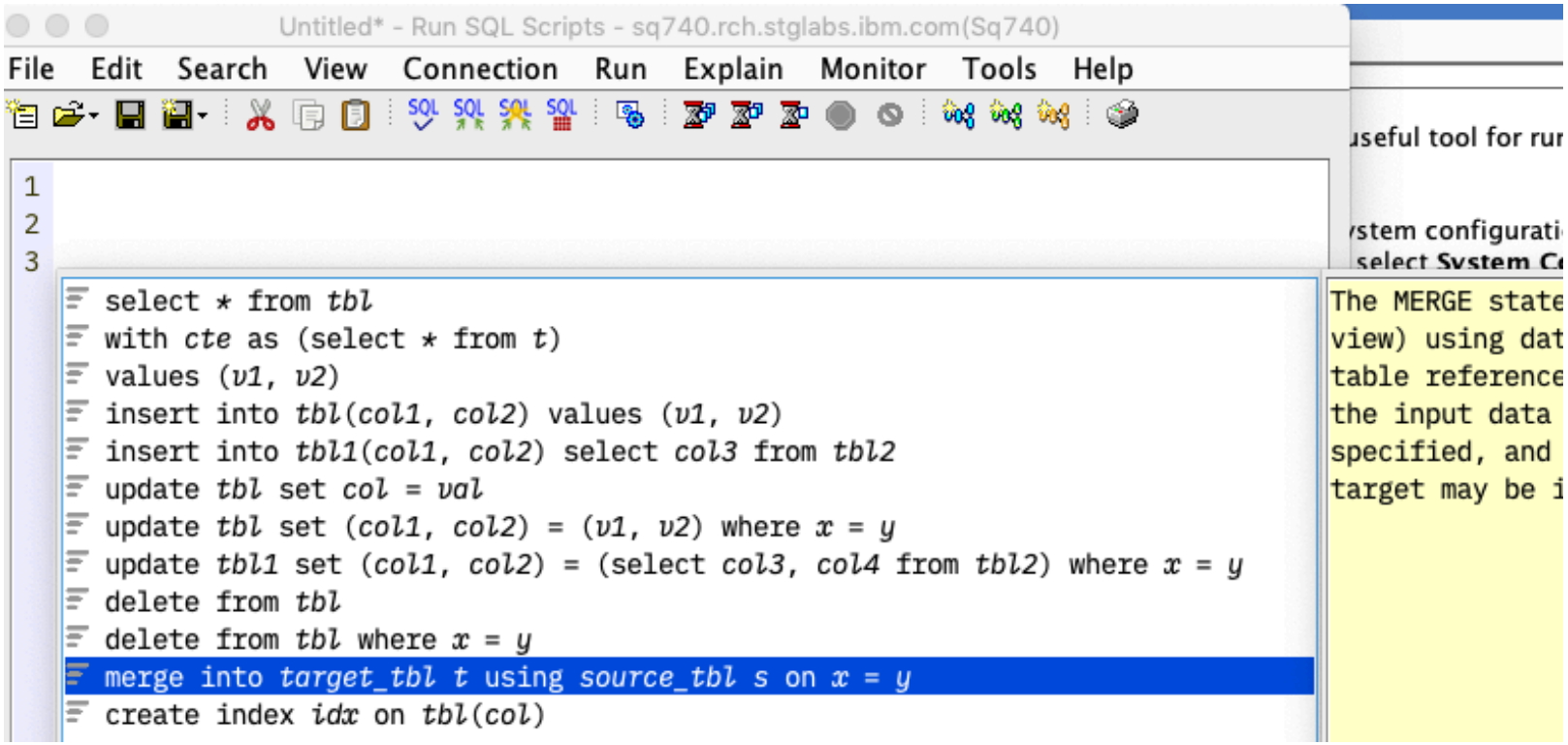
Insert from Examples – Additions for IBM i Services and more



Content Assist

What's coming in 1.1.8.6 (December, 2020)

Expanded SQL language proposals



Content Assist

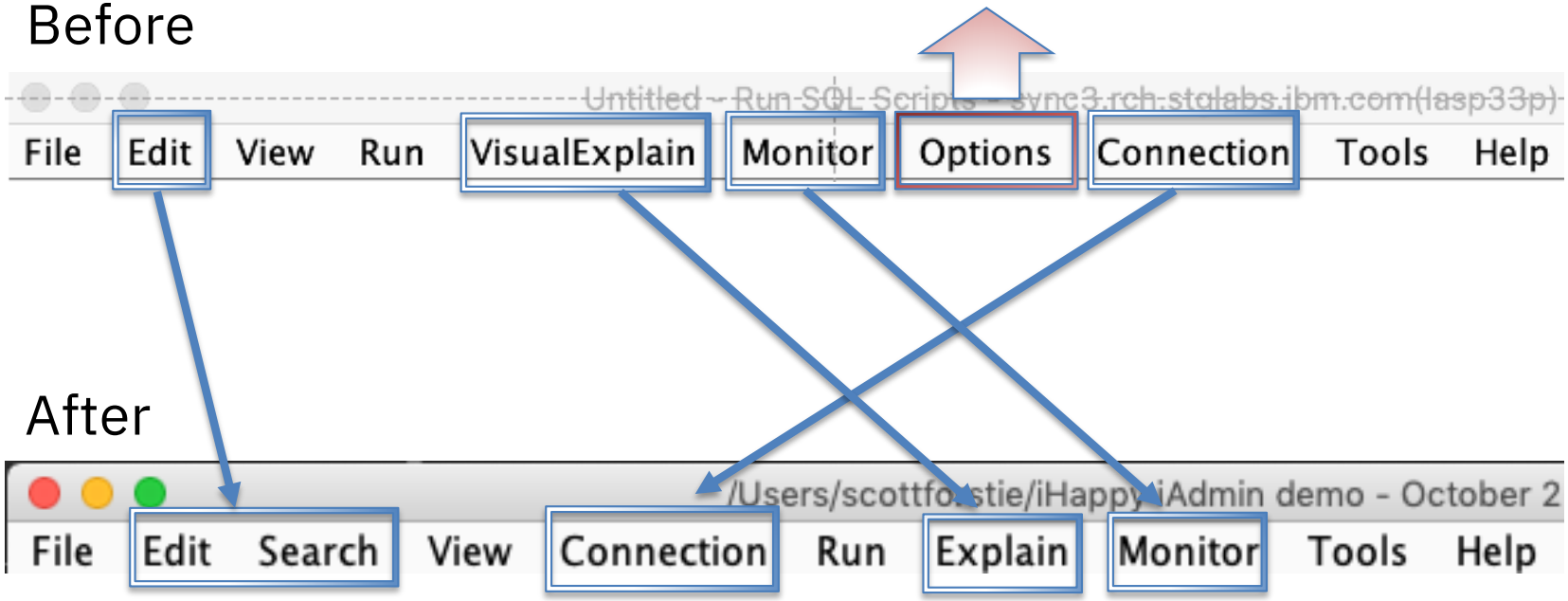
What's coming in 1.1.8.6 (December, 2020)

- Syntax Proposals for:
  INSERT
  UPDATE
  DELETE
  MERGE
  TRUNCATE
  CREATE INDEX
- Support for CASE and OLAP expressions
- Enhanced support for built-in functions
- Derived table and UDTF as syntax proposals
- And more

Run SQL Scripts

What's coming in 1.1.8.6 (December, 2020)

Before

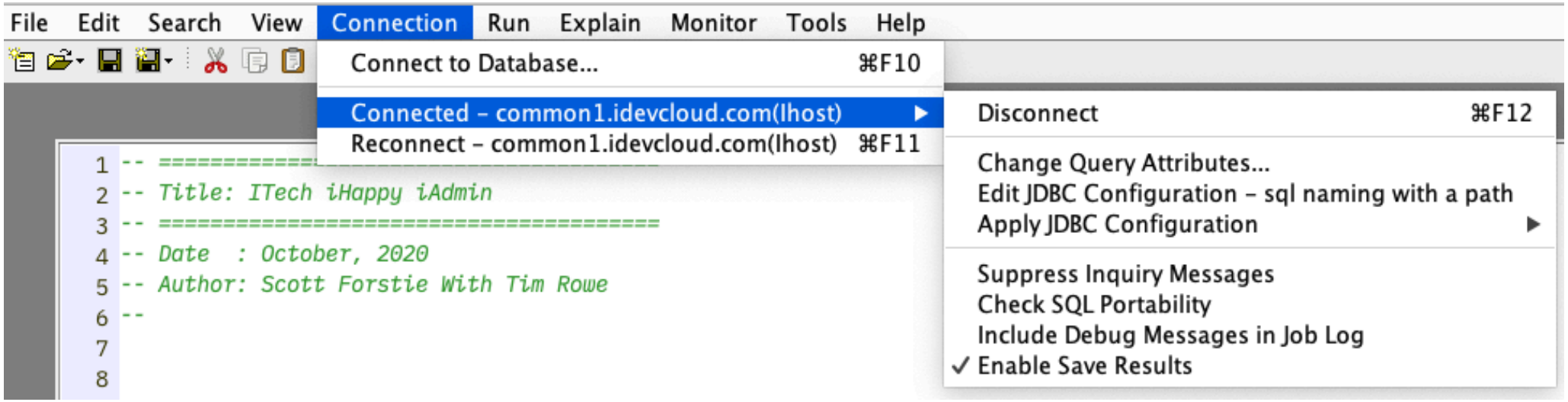


After

Run SQL Scripts

What's coming in 1.1.8.6 (December, 2020)

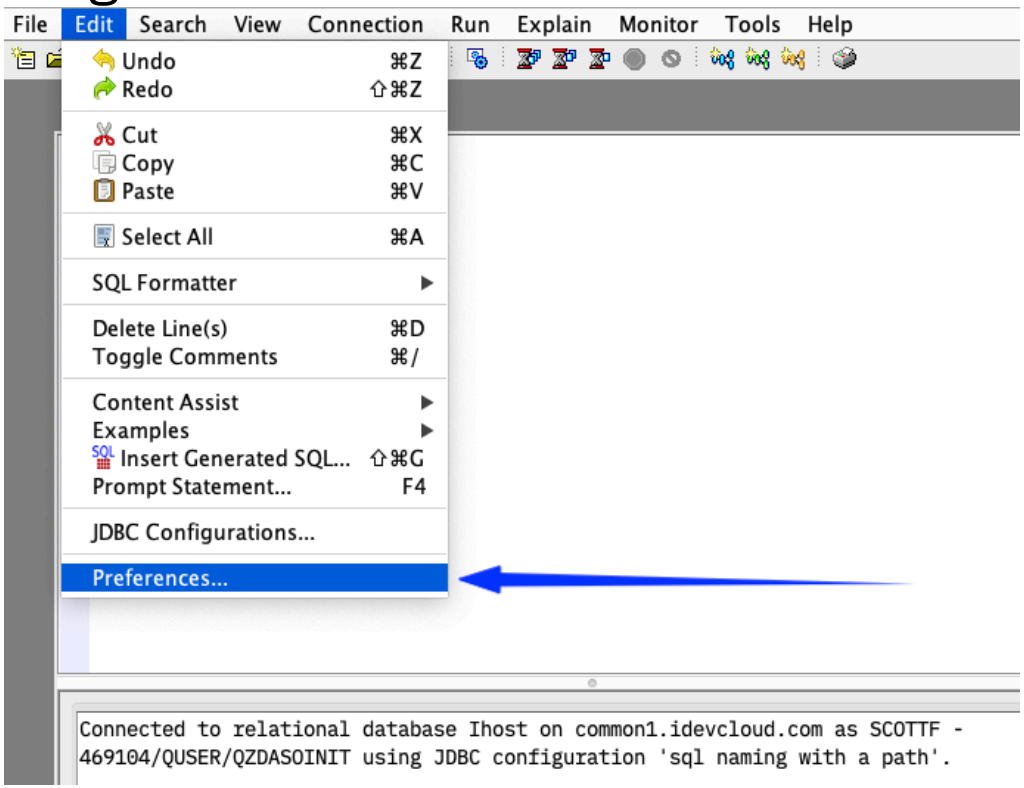
(Database) Connection specific controls



Run SQL Scripts

What's coming in 1.1.8.6 (December, 2020)

Preferences dialog

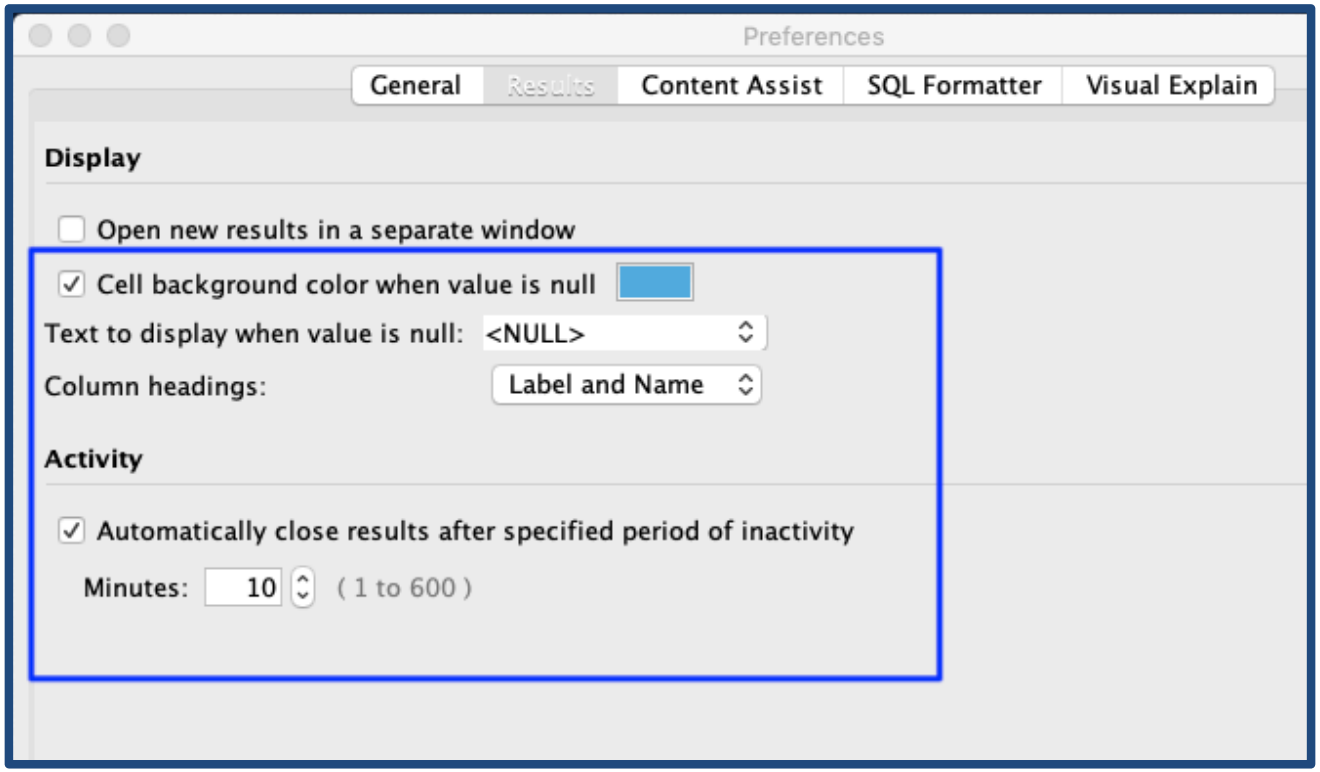


Run SQL Scripts

2020 iSight

What's coming in 1.1.8.6 (December, 2020)

Preferences dialog



Run SQL Scripts

2020 iSight

What's coming in 1.1.8.6 (December, 2020)

Configurable representation of NULL values

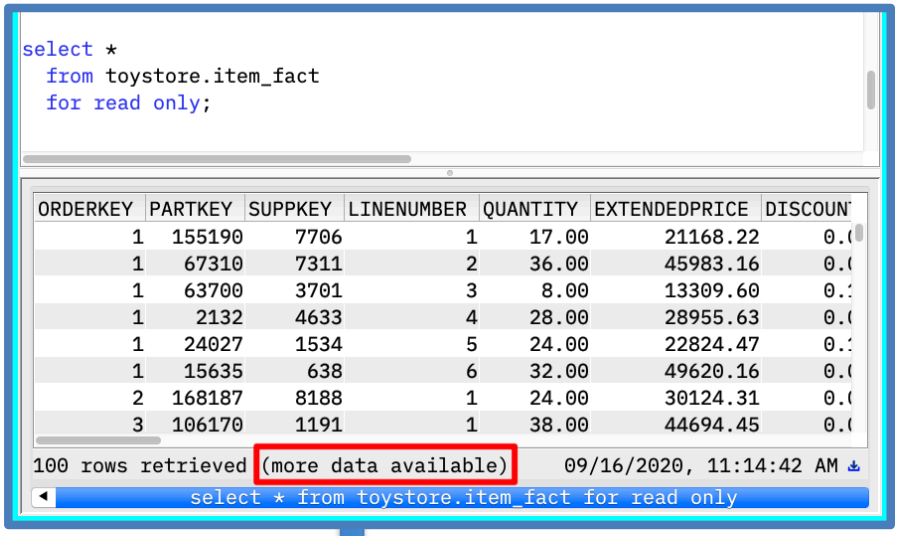
```
1 select *
2   from table (
3       qsys2.active_job_info()
4     );
```

AUTHORIZATION_NAME	JOB_TYPE	FUNCTION_TYPE	FUNCTION	JOB_STATUS
QSHSVR	PJ	<NULL>	<NULL>	PSRW
QSHSVR	PJ	<NULL>	<NULL>	PSRW
QUSER	PJ	<NULL>	<NULL>	PSRW
QSHSVR	BCH	PGM	SERVER	TIMW
QSYS	SBS	<NULL>	<NULL>	DEQW
QSYS	SBS	<NULL>	<NULL>	DEQW
QSYS	BCH	PGM	QPMCOLUSRJ	DEQW
QSVMSS	BCH	PGM	QCQEPMON	MSGW
OSVMSS	BCH	PGM	OCOAPDRM	MSGW

Run SQL Scripts

2020 iSight

What's coming in 1.1.8.6 (December, 2020)



- When "more data" is available, a shared read lock remains on the file
- But… for how long?

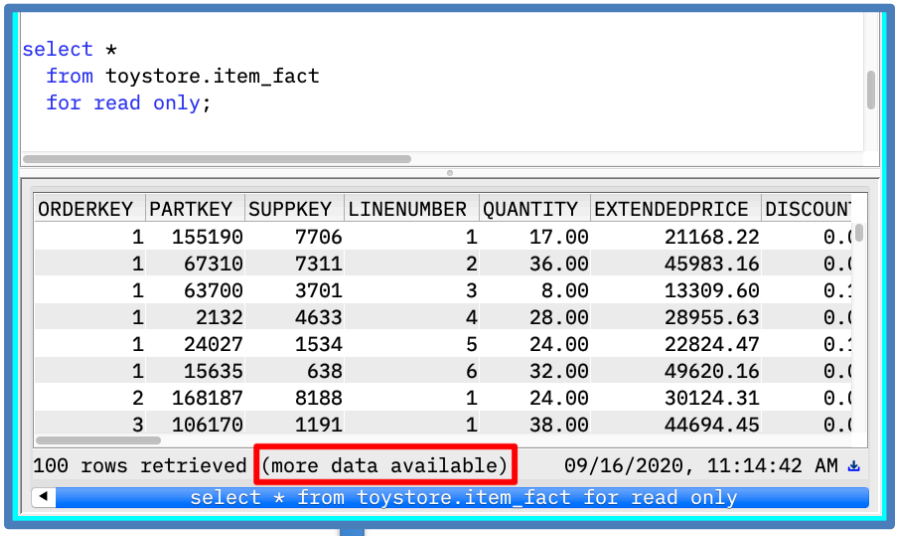
```
select *
  from table (
      qsys2.job_lock_info('111014/QUSER/QZDASOINIT')
    ) where object_library = 'TOYSTORE'
```

LOCK_CATEGORY	OBJECT_NAME	OBJECT_TYPE	LOCK_STATE	LOCK_STATUS
EXTERNAL	ITEM_FACT	*FILE	*SHRRD	HELD
MEMBER	ITEM_FACT	*FILE	*SHRRD	HELD
MEMBER	ITEM_FACT	*FILE	*SHRRD	HELD

Run SQL Scripts

2020 iSight

What's coming in 1.1.8.6 (December, 2020)



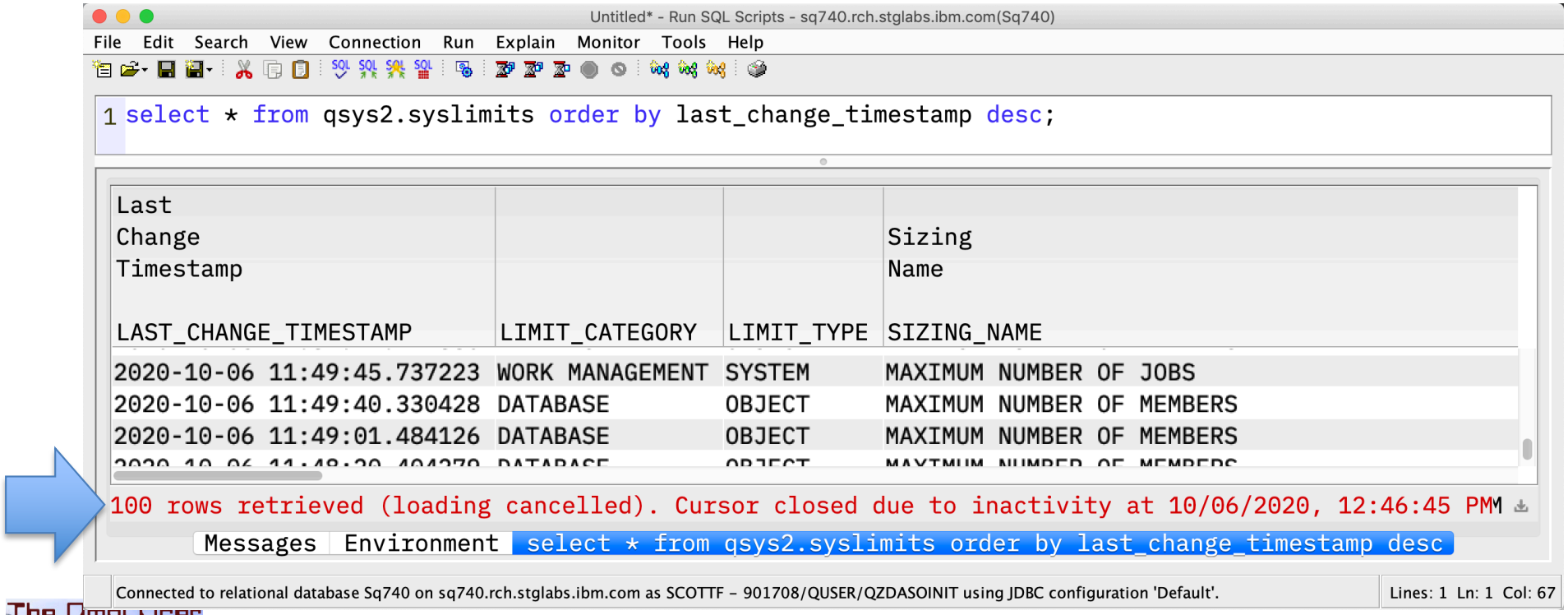
- When "more data" is available, a shared read lock remains on the file
- But… for how long
- And… at what impact?

Run SQL Scripts

2020 iSight

What's coming in 1.1.8.6 (December, 2020)

- ACS will close the cursor once the inactivity period has expired
- "Activity" includes clicking on the result dialog (timer is reset)



Db2 for i – DBE Services

IBM® Db2® for i Services

2020 iSight

Health Center Procedures

QSYS2.HEALTH_ACTIVITY
QSYS2.HEALTH_DATABASE_OVERVIEW
QSYS2.HEALTH_DESIGN_LIMITS
QSYS2.HEALTH_ENVIRONMENTAL_LIMITS
QSYS2.HEALTH_SIZE_LIMITS
QSYS2.RESET_ENVIRONMENTAL_LIMITS

Utility Services

QSYS2.ANALYZE_CATALOG - UDTF
QSYS2.CANCEL_SQL - PROCEDURE
QSYS2.COMPARE_FILE - UDTF
QSYS2.DUMP_SQL_CURSORS - PROCEDURE
QSYS2.EXTRACT_STATEMENTS - PROCEDURE
QSYS2.FIND_AND_CANCEL_QSQSRVR_SQL - PROCEDURE
QSYS2.FIND_QSQSRVR_JOBS - PROCEDURE
QSYS2.GENERATE_SQL - PROCEDURE
QSYS2.GENERATE_SQL_OBJECTS - PROCEDURE
QSYS2.RESTART_IDENTITY - PROCEDURE
QSYS2.SWAP_DYNUSRPRF - PROCEDURE
SYSTOOLS.CHECK_SYSCST - PROCEDURE
SYSTOOLS.CHECK_SYSROUTINE - PROCEDURE
SYSTOOLS.RELATED_OBJECTS - UDTF
SYSTOOLS.VALIDATE_DATA - UDTF

Application Services

QSYS2.DELIMIT_NAME – UDF
QSYS2.OVERRIDE_QAQQINI – PROCEDURE
QSYS2.OVERRIDE_TABLE – PROCEDURE
QSYS2.PARSE_STATEMENT – UDTF
SYSPROC.WLM_SET_CLIENT_INFO – PROCEDURE

Performance Services

QSYS2.CONDENSEDINDEXADVICE – VIEW
QSYS2.DATABASE_MONITOR_INFO – VIEW
QSYS2.RESET_TABLE_INDEX_STATISTICS – PROCEDURE
QSYS2.SYSIXADV – TABLE
SYSTOOLS.ACT_ON_INDEX_ADVICE – PROCEDURE
SYSTOOLS.HARVEST_INDEX_ADVICE – PROCEDURE
SYSTOOLS.REMOVE_INDEXES – PROCEDURE

Plan Cache Procedures

QSYS2.CHANGE_PLAN_CACHE_SIZE
QSYS2.CLEAR_PLAN_CACHE
QSYS2.DUMP_PLAN_CACHE
QSYS2.DUMP_PLAN_CACHE_PROPERTIES
QSYS2.DUMP_PLAN_CACHE_TOPN
QSYS2.DUMP_SNAP_SHOT_PROPERTIES
QSYS2.END_ALL_PLAN_CACHE_EVENT_MONITORS
QSYS2.END_PLAN_CACHE_EVENT_MONITOR
QSYS2.IMPORT_PC_EVENT_MONITOR
QSYS2.IMPORT_PC_SNAPSHOT
QSYS2.REMOVE_PC_EVENT_MONITOR
QSYS2.REMOVE_PC_SNAPSHOT
QSYS2.REMOVE_PERFORMANCE_MONITOR
QSYS2.START_PLAN_CACHE_EVENT_MONITOR

The Omni User

New or Enhanced @ IBM i 7.3 TR9 and IBM i 7.4 TR3

RELATED_OBJECTS

2020 iSight

- Given a database file, what is dependent upon it?
- Alternative to the Display Data Base Relations (DSPDBR) command
- Shipped in SYSTOOLS

```
-- What's dependent upon STAR1G/ITEM_FACT *FILE?
select * from table (
  systools.related_objects(
        library_name => 'STAR1G',
        file_name    => 'ITEM_FACT'));
```

RELATED_OBJECTS

2020 iSight

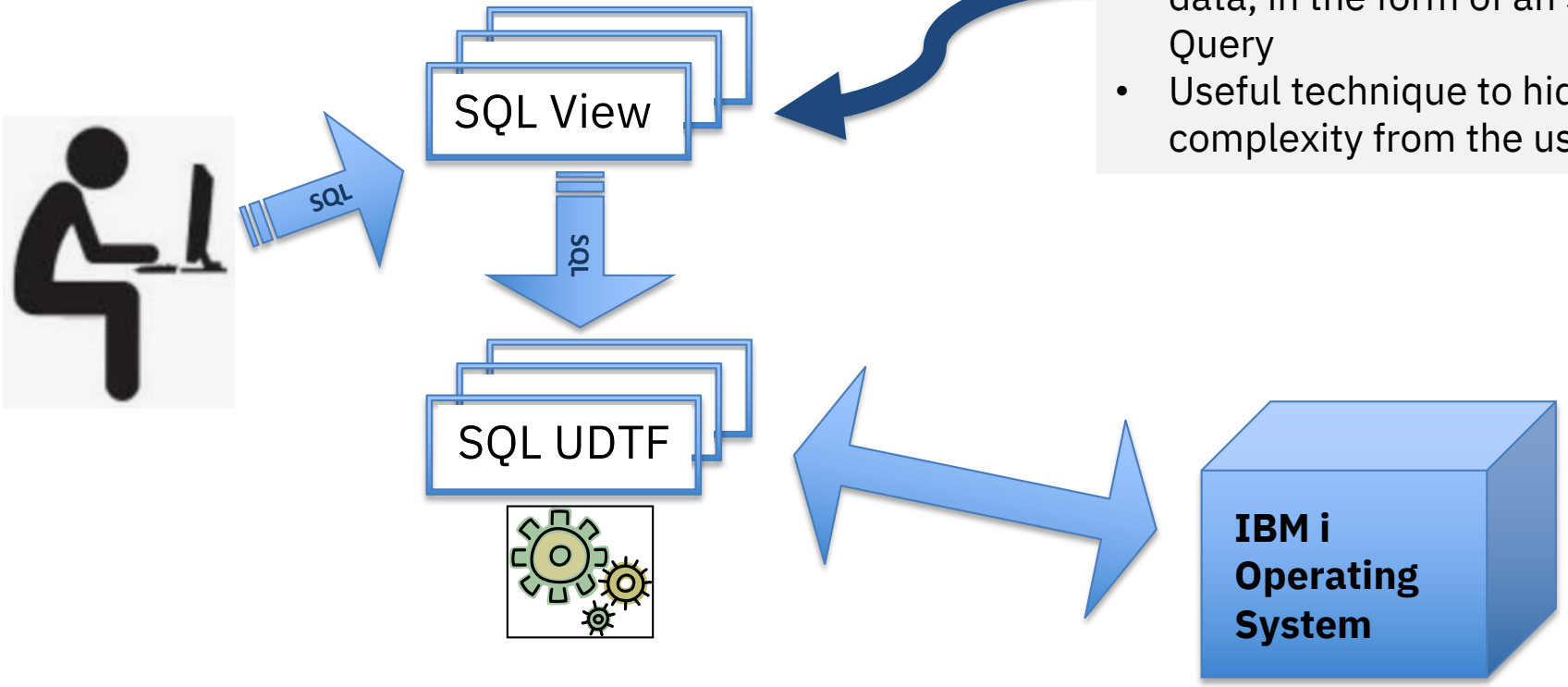
SQL_OBJECT_TYPE	SCHEMA_NAME	SQL_NAME	LIBRARY_NAME	SYSTEM_NAME	OBJECT_OWNER
INDEX	STAR1G	EVI_ADVANCED_YQM	STAR1G	EVI_A00001	SCOTTF
MATERIALIZED QUERY TABLE	STAR1G	YQM_REVENUE_PROFIT_MQT	STAR1G	YQM_R00001	SCOTTF
INDEX	STAR1G	ITEM_FACT_INX100	STAR1G	ITEM_00005	QDFTOWN
INDEX	STAR1G	WHOLEFILESUMMARY	STAR1G	WFS	SCOTTF
INDEX	STAR1G	ITEM_FACT_EVI_INCLUDE_QTY	STAR1G	ITEM_00014	QDFTOWN
INDEX	STAR1G	ITEM_FACT_EVI2	STAR1G	ITEM_00002	QDFTOWN
INDEX	STAR1G	ITEM_FACT_IX_CUSTKEY_DESC	STAR1G	ITEM_00017	QDFTOWN
VIEW	STAR1G	ITEM_FACTROLLUPV	STAR1G	ITEM_00015	SCOTTF
MATERIALIZED QUERY TABLE	STAR1G	ITEM_YQM	STAR1G	ITEM_YQM	QDFTOWN
VIEW	STAR1G	FACT_PLUS_DIMS	STAR1G	FACT_00001	QDFTOWN
INDEX	STAR1G	ITEM_FACT_EVI3	STAR1G	ITEM_00004	QDFTOWN
INDEX	STAR1G	ITEM_FACT_INX1	STAR1G	ITEM_00001	QDFTOWN
VIEW	STAR1G	FACT_PLUS_DIMS2	STAR1G	FACT_00002	SCOTTF
INDEX	STAR1G	ITEM_FACT_INX101	STAR1G	ITEM_00006	QDFTOWN
VIEW	STAR1G	ITEM_FACTV	STAR1G	ITEM_FACTV	SCOTTF
VARIABLE	STAR1G	HOW_MANY	STAR1G	HOW_MANY	SCOTTF
PROCEDURE	STAR1G	CHECK_ON_STUFF	-	STAR1G/CHECK00001	SCOTTF

IBM i (SQL) Services

IBM i Services – What is an SQL service?

- **What:** SQL alternative to IBM i APIs and CL Commands

SQL View –
- A logical representation of data, in the form of an SQL Query
- Useful technique to hide complexity from the user

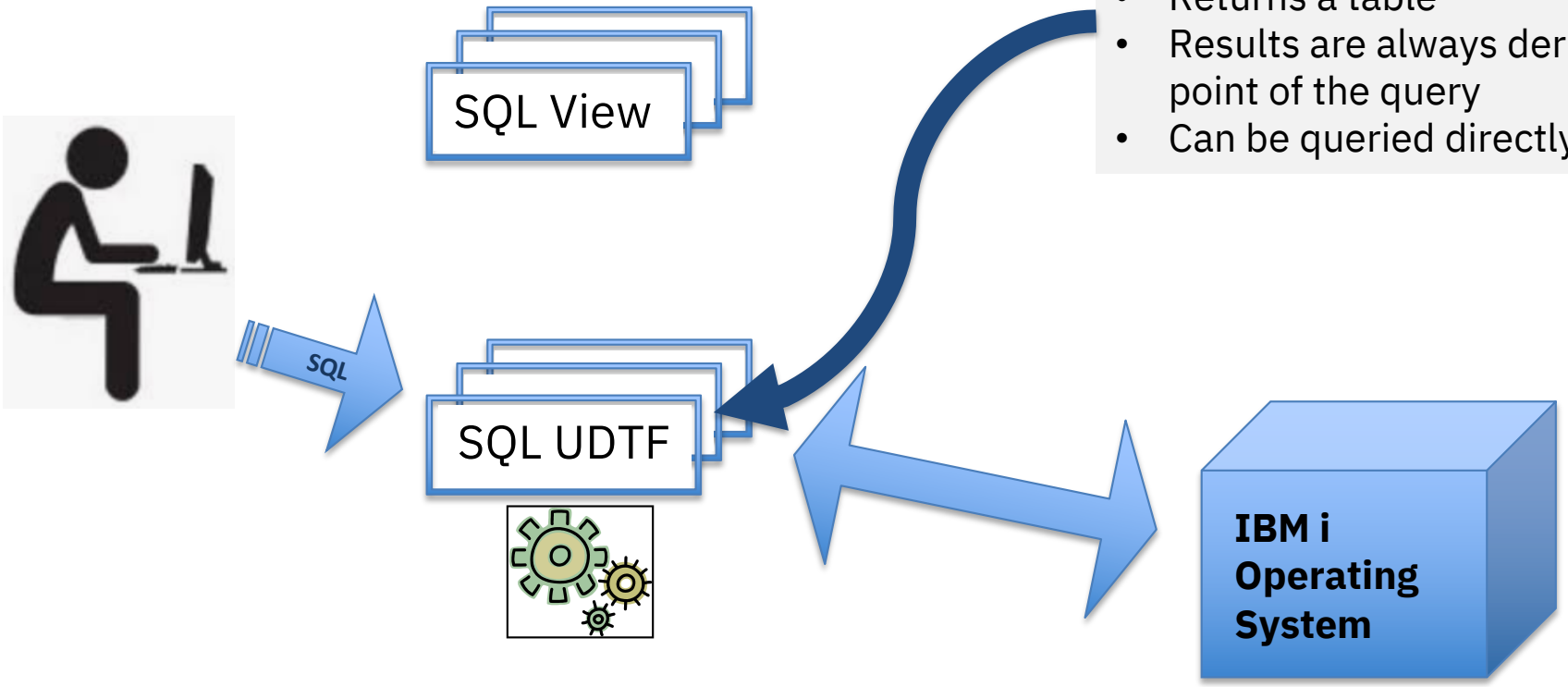


IBM i Services – What is an SQL service?

2020 iSight

- **What:** SQL alternative to IBM i APIs and CL Commands

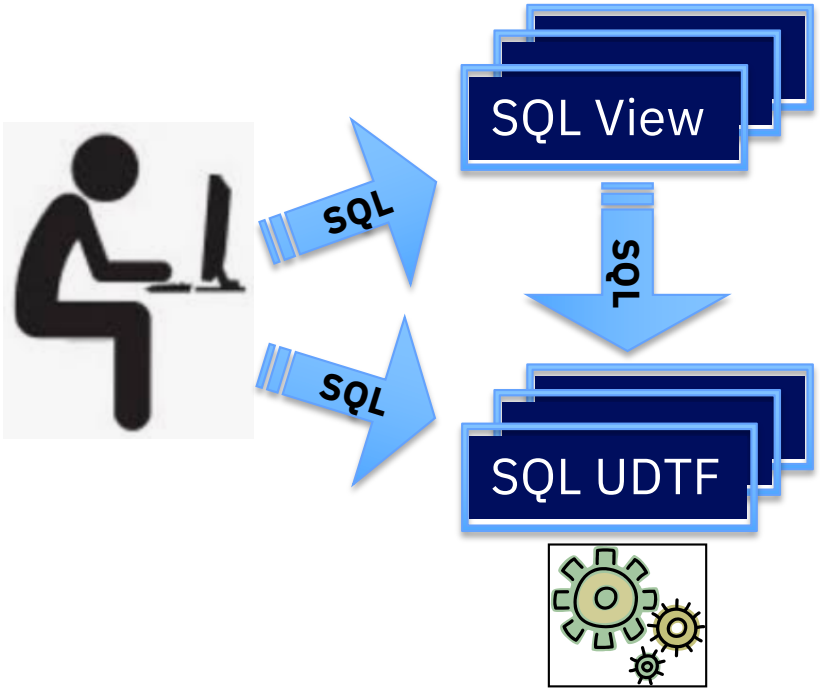
SQL User Defined Table Function –
- Accepts parameters
- Returns a table
- Results are always derived at the point of the query
- Can be queried directly



IBM i Services – What's new with TR3/TR9?

2020 iSight

29 new or enhanced IBM i Services



- Access Software Resources
- Discover IBM® i NetServer shares
- Manage Exit Programs
- Leverage more System status info
- And much more…

- Query Data Queue entries
- Read the contents of IFS stream files
- Extract complete Audit Journal detail using SYSLOG format
- Explore system Watches
- Probe into active jobs in new way
- And much more…

2020 iSight

IBM® i Services

Application Services

QSYS2.BOUND_MODULE_INFO – VIEW
QSYS2.BOUND_SRVPGM_INFO – VIEW
QSYS2.CLEAR_DATA_QUEUE – PROCEDURE
QSYS2.DATA_AREA_INFO – UDTF & VIEW
QSYS2.DATA_QUEUE_ENTRIES – UDTF
QSYS2.DATA_QUEUE_INFO – VIEW
QSYS2.DB_TRANSACTION_INFO – VIEW
QSYS2.ENVIRONMENT_VARIABLE_INFO – VIEW
QSYS2.EXIT_POINT_INFO – VIEW
QSYS2.EXIT_PROGRAM_INFO – VIEW
QSYS2.PROGRAM_EXPORT_IMPORT_INFO – VIEW
QSYS2.PROGRAM_INFO – VIEW
QSYS2.QCMDEXC – PROCEDURE
QSYS2.RECEIVE_DATA_QUEUE – UDTF
QSYS2.SEND_DATA_QUEUE – PROCEDURE
QSYS2.SERVICES_INFO – TABLE
QSYS2.SET_PASE_SHELL_INFO – PROCEDURE
QSYS2.STACK_INFO – UDTF
QSYS2.WATCH_DETAIL – UDTF
QSYS2.WATCH_INFO – VIEW
SYSTOOLS.LPRINTF – PROCEDURE
SYSTOOLS.SPLIT – UDTF

PTF Services

QSYS2.GROUP_PTF_INFO – VIEW
QSYS2.PTF_INFO – VIEW
SYSTOOLS.FIRMWARE_CURRENCY – VIEW
SYSTOOLS.GROUP_PTF_CURRENCY – VIEW
SYSTOOLS.GROUP_PTF_DETAILS – VIEW

Message Handling Services

QSYS2.HISTORY_LOG_INFO – UDTF
QSYS2.JOBLOG_INFO – UDTF
QSYS2.MESSAGE_FILE_DATA – VIEW
QSYS2.MESSAGE_QUEUE_INFO – VIEW
QSYS2.REPLY_LIST_INFO – VIEW

New or Enhanced @ IBM i 7.3 TR9 and IBM i 7.4 TR3

http://ibm.biz/Db2foriServices

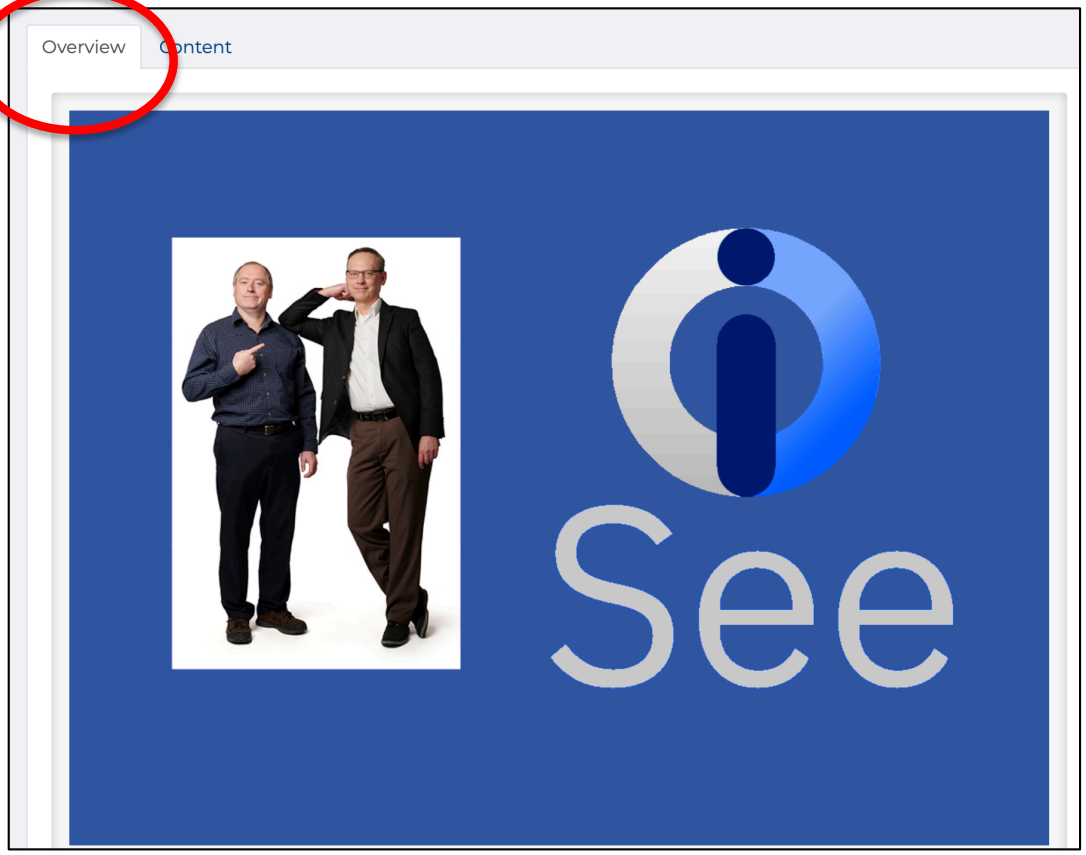
Group PTF Currency – The most “popular” service?

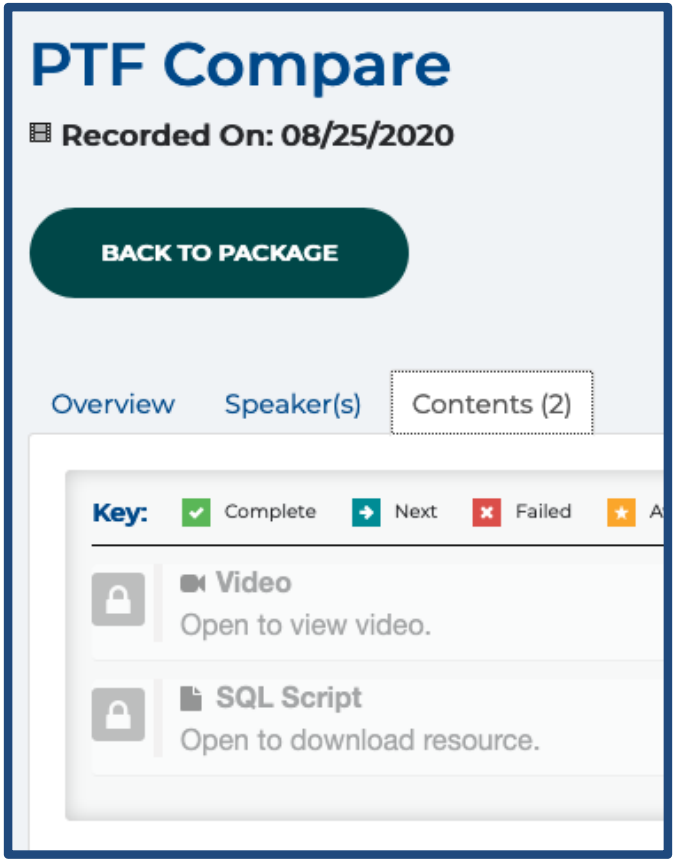
2020 iSight

```
With iLevel(iVersion, iRelease) AS
(
select OS_VERSION, OS_RELEASE from sysibmadm.env_sys_info
)
SELECT P.* FROM iLevel, systools.group_ptf_currency P
     WHERE ptf_group_release =
           'R' CONCAT iVersion CONCAT iRelease concat '0'
     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
UPDATE AVAILABLE	SF99859	SF99859 730 IBM MQ for...	3	30
UPDATE AVAILABLE	SF99433	SF99433 730 Db2 Web Qu...	3	9
UPDATE AVAILABLE	SF99727	SF99727 730 Technology...	4	8
UPDATE AVAILABLE	SF99722	SF99722 730 IBM HTTP S...	26	27
UPDATE AVAILABLE	SF99723	SF99723 730 Performanc...	7	8
UPDATE AVAILABLE	SF99728	SF99728 730 Group Secu...	52	53
UPDATE AVAILABLE	SF99729	SF99729 730 Group Hiper	116	117
INSTALLED LEVEL IS CURRENT	SF99225	SF99225 730 IBM Open S...	6	6

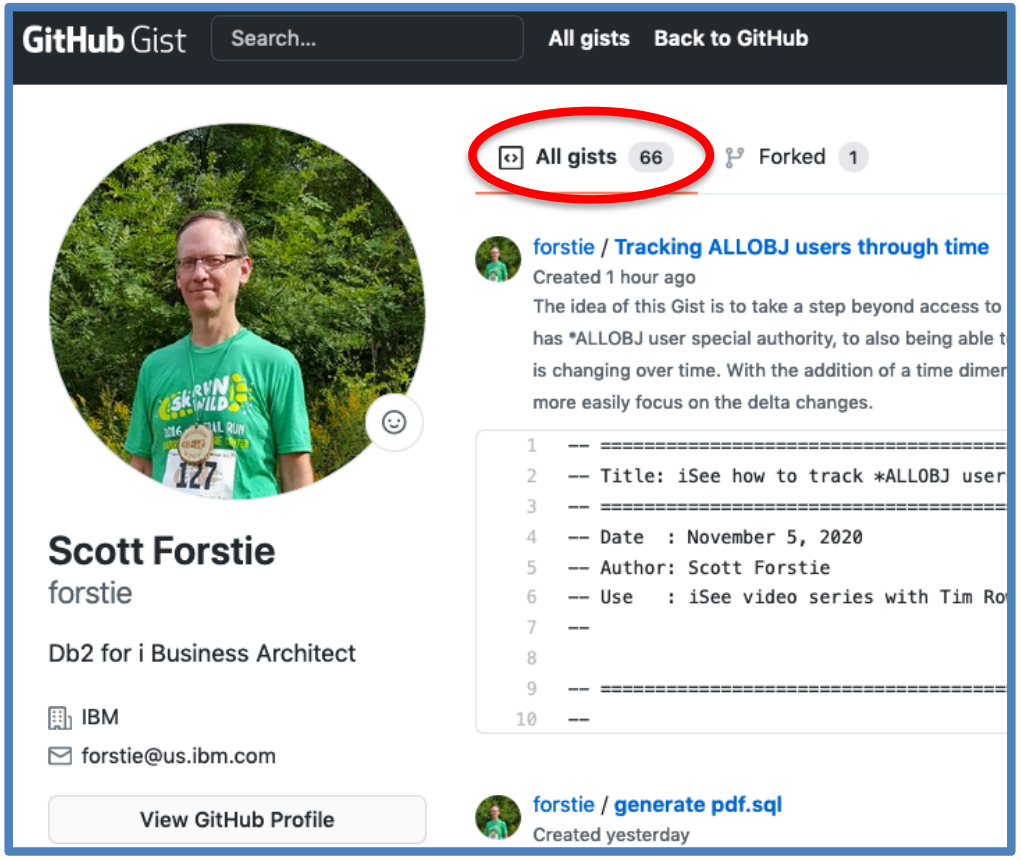
IBM iSee Video Blog





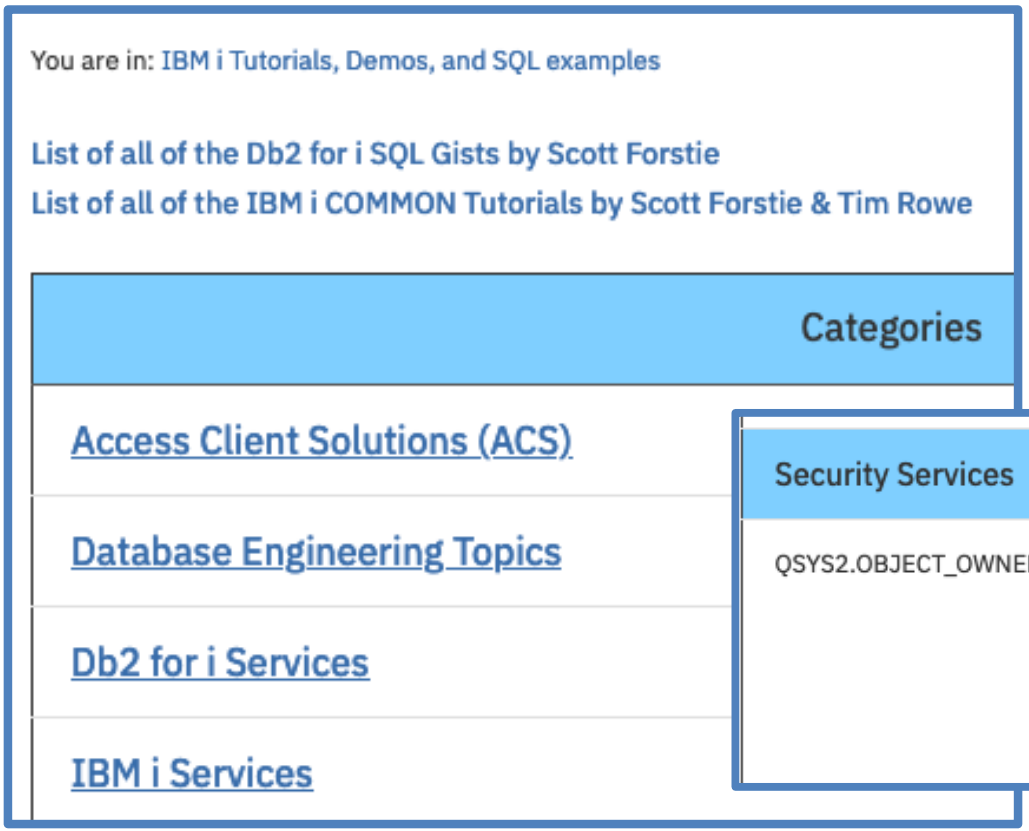
https://learn.common.org/products/ibm-isee#tab-product_tab_overview

SQL Examples published on Github

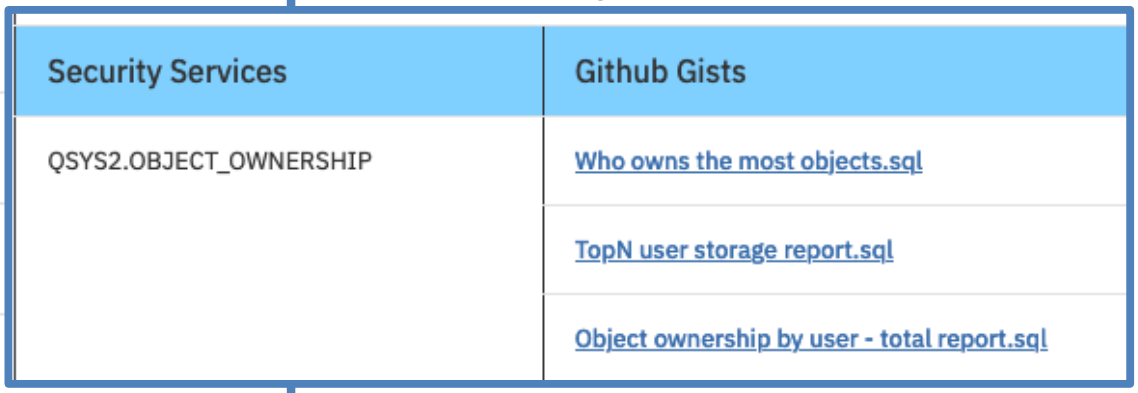


gist.github.com/forstie

SQL Tutor



- Aggregation of all Gist Examples
- Aggregation of all iSee video blogs
- Different perspectives to easily find what you want



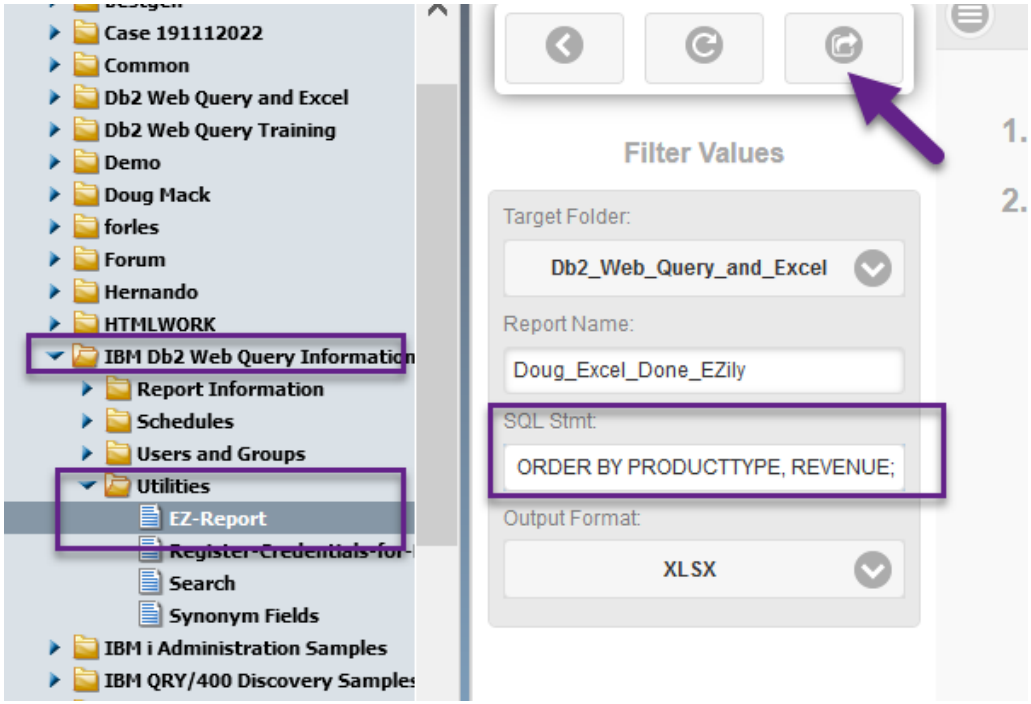
ibm.biz/Db2foriSQLTutor

Db2 Web Query

EZ-Report: Auto Generate Reports from SQL

2020 iSight

- Use Cases
  - **Fast** report over a Table/File
  - **Fast** report over IBM i Services
  - **Fast** report over any SQL Statement
  - Conversion Tools
- What does it do?
  - Auto creates a synonym over the data source
  - Auto creates a report in the folder you specify
  - Run report as is, or modify



- **Set output to Excel or let the user choose output format at run time**

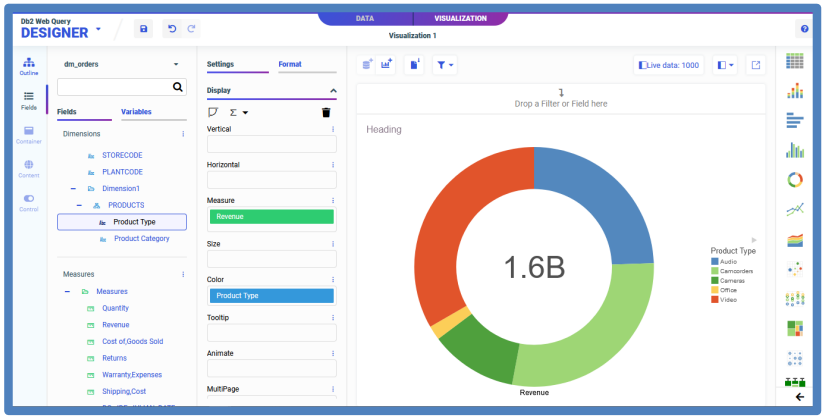
QU2@us.ibm.com

The Omni User

New Db2 Web Query Editions

2020 iSight

- Db2 Web Query **Scheduler Edition 5733-WQB**
  - **Express + Job Scheduling**
  - Unlimited report “consumers”
    - Distributed via email, FTP, or placed on network drive
    - Users can work with data offline
    - Support Mobile or At Home Workers



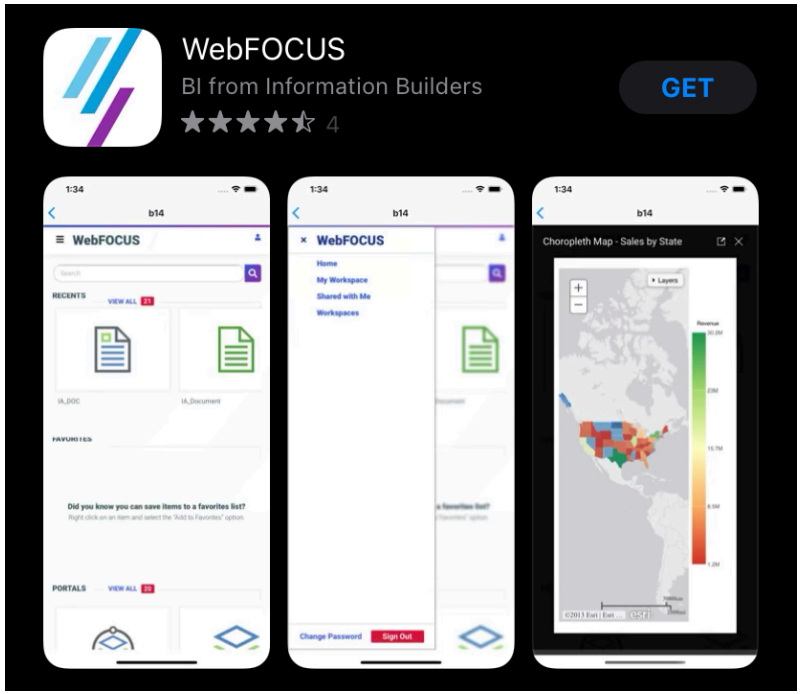
- Db2 Web Query **RunTime User Edition 5733-WQR**
  - **Express + RunTime Licensing**
  - Users can run interactive reports with live data

ibm.biz/db2wq-blog-neweditions

The Omni User

New Mobile Apps for Apple and Android Devices

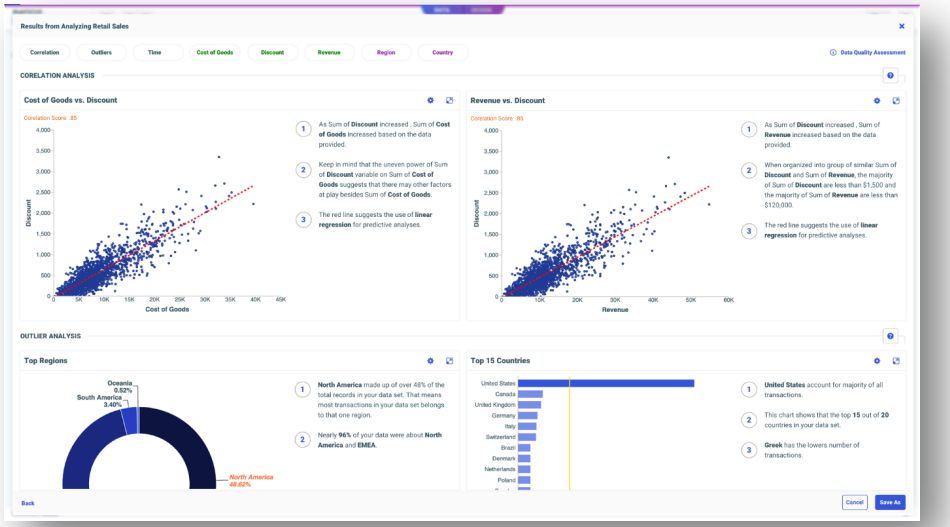
- **New (no charge) Apps** from Apple and Google Store
  - Search for WebFOCUS
- Connect to your IBM i through the APP
  - Renders output to your device
- Receive reports via email and open in the APP
- You could also
  - Use a browser
  - Embed reports in your own web application
    - Through API available in Standard Edition



What's coming in Db2 Web Query Version 2.3.0

2020 iSight

- Announced in October, Available in December
  - Upgrade from previous versions
  - Requires IBM i 7.3 and up



- **New Home Page**
  - Easily navigate to your favorite topic

- **New Page Designer**
  - Powerful visualization editor

- **Generate Automated Analytics**
  - Adds built-in machine learning to share insights about your data

2020 iSight

IBM® i Services

Security Services

QSYS2.AUTHORITY_COLLECTION – VIEW
QSYS2.AUTHORITY_COLLECTION_DLO – VIEW
QSYS2.AUTHORITY_COLLECTION_FSOBJ – VIEW
QSYS2.AUTHORITY_COLLECTION_LIBRARIES – VIEW
QSYS2.AUTHORITY_COLLECTION_OBJECT – VIEW
QSYS2.AUTHORIZATION_LIST_INFO – VIEW
QSYS2.AUTHORIZATION_LIST_USER_INFO – VIEW
QSYS2.CERTIFICATE_INFO – UDTF
QSYS2.DRDA_AUTHENTICATION_ENTRY_INFO – VIEW
QSYS2.FUNCTION_INFO – VIEW
QSYS2.FUNCTION_USAGE – VIEW
QSYS2.GROUP_PROFILE_ENTRIES – VIEW
QSYS2.OBJECT_OWNERSHIP – VIEW
QSYS2.OBJECT_PRIVILEGES – UDTF & VIEW
QSYS2.SQL_CHECK_AUTHORITY – UDF
QSYS2.USER_INFO – VIEW
SYSPROC.SET_COLUMN_ATTRIBUTE – PROCEDURE

Spool Services

QSYS2.OUTPUT_QUEUE_ENTRIES – UDTF & VIEW
QSYS2.OUTPUT_QUEUE_ENTRIES_BASIC – VIEW
QSYS2.OUTPUT_QUEUE_INFO – VIEW
SYSTOOLS.DELETE_OLD_SPOOLED_FILES – PROCEDURE
SYSTOOLS.SPOOLED_FILE_DATA – UDTF

Storage Services

QSYS2.ASP_INFO – VIEW
QSYS2.ASP_JOB_INFO – VIEW
QSYS2.ASP_VARY_INFO – VIEW
QSYS2.MEDIA_LIBRARY_INFO – VIEW
QSYS2.SYSDISKSTAT – UDTF & VIEW
QSYS2.SYSTMPSTG – VIEW
QSYS2.USER_STORAGE – VIEW

Journal Services

QSYS2.DISPLAY_JOURNAL – UDTF
QSYS2.JOURNAL_INFO – VIEW
QSYS2.JOURNALED_OBJECTS – VIEW

Java Services

QSYS2.JVM_INFO – VIEW
QSYS2.SET_JVM – PROCEDURE

Librarian Services

QSYS2.JOURNAL_INHERIT_RULES – VIEW
QSYS2.LIBRARY_INFO – UDTF
QSYS2.LIBRARY_LIST_INFO – VIEW
QSYS2.OBJECT_STATISTICS – UDTF

System Health Services

QSYS2.SYSLIMITS – VIEW
QSYS2.SYSLIMITS_BASIC – VIEW
QSYS2.SYSLIMTBL – TABLE

The Omni User

New or Enhanced @ IBM i 7.3 TR9 and IBM i 7.4 TR3

http://ibm.biz/Db2foriServices

DELETE_OLD_SPOOLED_FILES

2020 iSight

- Manage spooled files by age
- Older than the specified timestamp? The spooled file is deleted…
- Wow, that was easy


```
-- Preview removal of any spooled file older than 30 days
call systools.delete_old_spooled_files(
    delete_older_than => current date - 30 days,
    preview => 'YES');
```

DELETE_OLD_SPOOLED_FILES

2020 iSight

Filter by:

- Age
- Output queue
- User

Preview before removing

Parameters:

Number	Mode	Name	Data Type	Length	CCSID	Locator	Default Value
1	IN	DELETE_OLDER_THAN	TIMESTAMP	6			(CURRENT_TIMESTAMP – 3 MONTHS)
2	IN	P_OUTPUT_QUEUE_LIBRARY_NAME	VARCHAR	10			'*ALL'
3	IN	P_OUTPUT_QUEUE_NAME	VARCHAR	10			'*ALL'
4	IN	P_USER_NAME	VARCHAR	10			'*ALL'
5	IN	PREVIEW	VARCHAR	3			'NO'

2020 iSight

IBM® i Services

Security Services

QSYS2.AUTHORITY_COLLECTION – VIEW
QSYS2.AUTHORITY_COLLECTION_DLO – VIEW
QSYS2.AUTHORITY_COLLECTION_FSOBJ – VIEW
QSYS2.AUTHORITY_COLLECTION_LIBRARIES – VIEW
QSYS2.AUTHORITY_COLLECTION_OBJECT – VIEW
QSYS2.AUTHORIZATION_LIST_INFO – VIEW
QSYS2.AUTHORIZATION_LIST_USER_INFO – VIEW
QSYS2.CERTIFICATE_INFO – UDTF
QSYS2.DRDA_AUTHENTICATION_ENTRY_INFO – VIEW
QSYS2.FUNCTION_INFO – VIEW
QSYS2.FUNCTION_USAGE – VIEW
QSYS2.GROUP_PROFILE_ENTRIES – VIEW
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Spool Services

QSYS2.OUTPUT_QUEUE_ENTRIES – UDTF & VIEW
QSYS2.OUTPUT_QUEUE_ENTRIES_BASIC – VIEW
QSYS2.OUTPUT_QUEUE_INFO – VIEW
SYSTOOLS.DELETE_OLD_SPOOLED_FILES – PROCEDURE
SYSTOOLS.SPOOLED_FILE_DATA – UDTF

Storage Services

QSYS2.ASP_INFO – VIEW
QSYS2.ASP_JOB_INFO – VIEW
QSYS2.ASP_VARY_INFO – VIEW
QSYS2.MEDIA_LIBRARY_INFO – VIEW
QSYS2.SYSDISKSTAT – UDTF & VIEW
QSYS2.SYSTMPSTG – VIEW
QSYS2.USER_STORAGE – VIEW

Journal Services

QSYS2.DISPLAY_JOURNAL – UDTF
QSYS2.JOURNAL_INFO – VIEW
QSYS2.JOURNALED_OBJECTS – VIEW

Java Services

QSYS2.JVM_INFO – VIEW
QSYS2.SET_JVM – PROCEDURE

Librarian Services

QSYS2.JOURNAL_INHERIT_RULES – VIEW
QSYS2.LIBRARY_INFO – UDTF
QSYS2.LIBRARY_LIST_INFO – VIEW
QSYS2.OBJECT_STATISTICS – UDTF

System Health Services

QSYS2.SYSLIMITS – VIEW
QSYS2.SYSLIMITS_BASIC – VIEW
QSYS2.SYSLIMTBL – TABLE

The Omni User

New or Enhanced @ IBM i 7.3 TR9 and IBM i 7.4 TR3

http://ibm.biz/Db2foriServices

DISPLAY_JOURNAL

2020 iSight

- **Performance** advantaged searching
  Accept a list of objects as an optional input parameter

- **Comprehensive** support for Syslog
  All audit journal entries support Syslog format
  User generated audit entries support Syslog format

- **Ease** of use
  Extend the JOB input filter to accept qualified job format

SYSLOG and IBM i

2020 iSight

- Audit Journal authorization and password failures

```
SELECT SYSLOG_EVENT, SYSLOG_SEVERITY FROM
  table(qsys2.display_journal('QSYS', 'QAUDJRN',
          JOURNAL_CODES => 'T',
          JOURNAL_ENTRY_TYPES => 'AF,PW',
          STARTING_TIMESTAMP => CURRENT DATE,
          GENERATE_SYSLOG => 'RFC5424')) J;
```

	SYSLOG_SEVERITY
CEF:0|IBM|IBM i|7.2|QSYS-QAUDJRN|T-PW|Low|reason=Invali...	5
CEF:0|IBM|IBM i|7.2|QSYS-QAUDJRN|T-AF|Medium|reason=Aut...	4
CEF:0|IBM|IBM i|7.2|QSYS-QAUDJRN|T-AF|Medium|reason=Aut...	4

Syslog Reporting Manager (SRM)

2020 iSight

- Lab Services offering…

```
SLMON    Security and Compliance Tools for IBM i - Syslog Reporting Manager

  Global environment                        History monitor
     1. Add product access code               30. Configure history monitoring
     2. Configure global settings             31. Start history monitor
                                              32. Stop history monitor
  Data Journal Monitor (JET)
     3. Configure Jrn Extract Tool          Message queue monitoring
                                              40. Configure message queue mon.
  Audit journal monitor                       41. Manage monitored msg queues
    10. Configure audit monitoring            42. Start message queue monitor
    11. Start audit monitor                   43. End message queue monitor
    12. Stop audit monitor
    13. Audit journal configuration         Configuration management
                                              70. Export configuration
  IFS file monitor                            71. Import configuration
    20. Configure IFS file monitoring       Monitor job status
    21. Start IFS file monitor job            80. Work with monitor jobs
    22. Stop IFS file monitor job             81. Start SLSBS subsystem
                                              82. End SLSBS subsystem

Selection or command
===>
```

Thomas Barlen – barlen@de.ibm.com

Syslog Reporting Manager (SRM)

2020 iSight

Use SRM to connect your IBM i to your SIEM

What's New in V1.4.0

- Panel driven setup, configuration, selection and monitoring
- All audit journal system entry event types are supported
  - Initially only 30 T-journal code entry types supported, this version supports all 75 event types
  - User type entries are also supported
- Audit journal entries can now be filtered by user profile
- And many other enhancements…

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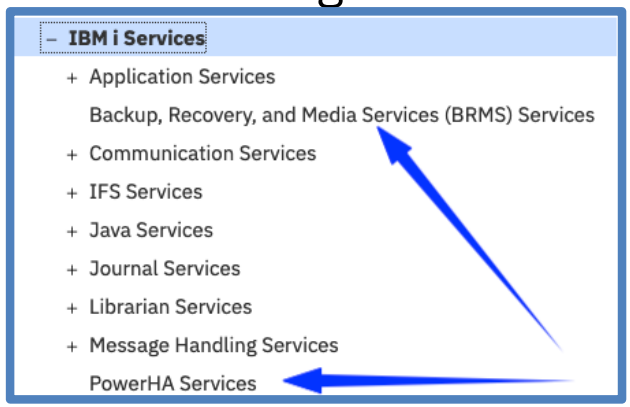
PowerHA – SQL services

2020 iSight

- Epic delivery **June**, 2020
  a. **Administrative Domain Services**
  b. **Cluster Services**
  c. **CRG Services**
- Located in the QHASM schema
- IBM Knowledge Center has been updated



helpsystems

PowerHA Service	Type of Service	IBM i 7.2	IBM i 7.3	IBM i 7.4
Administrative Domain Services				
QHASM.ADMIN_DOMAIN_LIST	View	SIxxxxx	SIxxxxx	SIxxxxx
QHASM.ADMIN_DOMAIN_NODES	Table Function	SIxxxxx	SIxxxxx	SIxxxxx
QHASM.MRE_ATTRIBUTES	Table Function	SIxxxxx	SIxxxxx	SIxxxxx
QHASM.MRE_DETAILS	Table Function	SIxxxxx	SIxxxxx	SIxxxxx
QHASM.MRE_LIST	Table Function	SIxxxxx	SIxxxxx	SIxxxxx
Cluster Resource Group Services				
QHASM.CRG_CONFIGURATION_OBJECTS	Table Function	SIxxxxx	SIxxxxx	SIxxxxx
QHASM.CRG_INFO	Table Function	SIxxxxx	SIxxxxx	SIxxxxx
QHASM.CRG_LIST	View	SIxxxxx	SIxxxxx	SIxxxxx
QHASM.CRG_RECOVERY_DOMAIN	Table Function	SIxxxxx	SIxxxxx	SIxxxxx
Cluster Services				

BRMS – SQL services

2020 iSight

BRMS SQL Services

- GA – **September 10**, 2020
- Located in the QUSRBRM schema

helpsystems

```
-- Which BRMS volumes are expired?
select *
  from qusrbrm.media_info
  where volume_status = 'EXPIRED';
```

VOLUME_SERIAL	VOLUME_IDENTIFIER		VOLUME_STATUS	OWNING_SYSTEM	MEDIA_CLASS
123456	123456	...	EXPIRED	APPN.UT52P17	SAVSYS
001122	001122	...	EXPIRED	APPN.UT52P17	ULTRIUM3

What's coming?

2020 iSight

BRMS SQL Services

- Expect staged delivery **(Q4 / 2020)**
- Next up: **Display Log for BRM (DSPLOGBRM)**
- Followed by: Backup status and object omits

PowerHA SQL Services

- Expect staged delivery **(Q4 / 2020)**
- Next up: **SESSION_LIST** – Work with ASP Copy Descriptions (WRKASPCPYD)
  SESSION_INFO – Display ASP Session (DSPASPSSN)
  Display CSM Session (DSPCSMSSN)
  Display SVC Session (DSPSVCSSN)

2020 iSight

IBM® i Services

Product Services

QSYS2.LICENSE_INFO – VIEW
QSYS2.SOFTWARE_PRODUCT_INFO – VIEW
SYSTOOLS.LICENSE_EXPIRATION_CHECK – PROCEDURE

IFS Services

QSYS2.IFS_JOB_INFO – UDTF
QSYS2.IFS_OBJECT_LOCK_INFO – UDTF
QSYS2.IFS_OBJECT_PRIVILEGES – UDTF
QSYS2.IFS_OBJECT_REFERENCES_INFO – UDTF
QSYS2.IFS_READ – UDTF
QSYS2.IFS_OBJECT_STATISTICS – UDTF
QSYS2.IFS_WRITE – UDTF
QSYS2.SERVER_SHARE_INFO – UDTF

Communication Services

QSYS2.ACTIVE_DB_CONNECTIONS – UDTF
QSYS2.ADD_TIME_SERVER – PROCEDURE
QSYS2.HTTP_SERVER_INFO – VIEW
QSYS2.NETSTAT_INFO – VIEW
QSYS2.NETSTAT_INTERFACE_INFO – VIEW
QSYS2.NETSTAT_JOB_INFO – VIEW
QSYS2.NETSTAT_ROUTE_INFO – VIEW
QSYS2.REMOVE_TIME_SERVER – PROCEDURE
QSYS2.SERVER_SBS_CONFIGURATION – VIEW
QSYS2.SERVER_SBS_ROUTING – VIEW
QSYS2.SET_SERVER_SBS_ROUTING – PROCEDURE
QSYS2.TCPIP_INFO – VIEW
QSYS2.TIME_PROTOCOL_INFO – VIEW
SYSIBMADM.ENV_SYS_INFO – VIEW

Work Management Services

QSYS2.ACTIVE_JOB_INFO – UDTF
QSYS2.AUTOSTART_JOB_INFO – VIEW
QSYS2.COMMUNICATIONS_ENTRY_INFO – VIEW
QSYS2.GET_JOB_INFO – UDTF
QSYS2.JOB_DESCRIPTION_INFO – VIEW
QSYS2.JOB_INFO – UDTF
QSYS2.JOB_LOCK_INFO – UDTF
QSYS2.JOB_QUEUE_INFO – VIEW
QSYS2.MEMORY_POOL – UDTF
QSYS2.MEMORY_POOL_INFO – VIEW
QSYS2.OBJECT_LOCK_INFO – VIEW
QSYS2.OPEN_FILES – UDTF
QSYS2.PRESTART_JOB_INFO – VIEW
QSYS2.PRESTART_JOB_STATISTICS – UDTF
QSYS2.RECORD_LOCK_INFO – VIEW
QSYS2.ROUTING_ENTRY_INFO – VIEW
QSYS2.SCHEDULED_JOB_INFO – VIEW
QSYS2.SUBSYSTEM_INFO – VIEW
QSYS2.SUBSYSTEM_POOL_INFO – VIEW
QSYS2.SYSTEM_STATUS – UDTF
QSYS2.SYSTEM_STATUS_INFO – VIEW
QSYS2.SYSTEM_STATUS_INFO_BASIC – VIEW
QSYS2.SYSTEM_VALUE_INFO – VIEW
QSYS2.WORKSTATION_INFO – VIEW

The Omni User

New or Enhanced @ IBM i 7.3 TR9 and IBM i 7.4 TR3

http://ibm.biz/Db2foriServices

IFS's /tmp directory... similar to QGPL?

2020 iSight

```
select object_owner as owner, count(*) as count
  from table (
    qsys2.ifs_object_statistics(start_path_name => '/tmp',
                                subtree_directories => 'NO')
    ) i group by i.object_owner
    order by 2 desc;
```

OWNER	COUNT
TIMMR	147
SCOTTF	47
DRIVEWAY	36
QTMHHTTP	34
IOSSLAB3	17
IOSSLAB1	17

IFS's /tmp directory... similar to QGPL?

2020 iSight

```
select object_owner as owner, count(*) as count
  from table (
    qsys2.ifs_object_statistics(start_path_name => '/tmp',
                                subtree_directories => 'YES')
    ) i group by i.object_owner
    order by 2 desc;
```

OWNER	COUNT
DRIVEWAY	15259
TIMMR	4505
SCOTTF	153
IOSSLAB3	151

IFS’s /tmp directory… similar to QGPL

2020 iSight

```
select
varchar_format(sum(data_size),'999G999G999G999G999G999G999')
tmp_size
from table(
    qsys2.ifs_object_statistics(start_path_name => '/tmp',
                                subtree_directories => 'YES')
    ) ;
```

TMP_SIZE
1,309,091,178

IFS_READ

2020 iSight

- Read data directly from an IFS stream file
  - Provide the path name to the file to read
  - Read as character or UTF-8, controlling the end-of-line as CR, CRLF, LF, LFCR, or **ANY**
  - Read as binary, controlling the maximum number of bytes read

```
select * from table (qsys2.ifs_read(
   path_name   => '/annotate.log',
   end_of_line => 'CRLF'));
```

LINE_NUMBER	LINE
1	<?xml version="1.0" encoding="ISO-885...

IFS_WRITE

2020 iSight

- Write data directly to an IFS stream file
  - Write one “line” at a time
  - Append, Replace, or Create
  - Write as character, UTF-8, or binary data

```
call qsys2.ifs_write(
  path_name   => '/tmp/newfile1',
  line        => 'this is my new text',
  overwrite   => 'REPLACE’,
  end_of_line => 'CR');
```

Search the IFS

2020 iSight

```
select path_name, count(*) as hits
  from table (
         qsys2.ifs_object_statistics(
           start_path_name => '/home/SCOTTF',
           subtree_directories => 'YES',
           object_type_list => '*ALLSTMF')
) o, lateral (
         select *
           from table (
               qsys2.ifs_read(
                 path_name => path_name, end_of_line => 'ANY')
             )
) i where upper(line) like '%IFS%' group by path_name order by 2 desc;
```

PATH_NAME	HITS
/home/SCOTTF/Run SQL Scripts/iSee blog - Spreadsheets and Emails with SQL & ACS.sql	20
/home/SCOTTF/Run SQL Scripts/create_and_email_logger_joblog.sql	16
/home/SCOTTF/Run SQL Scripts/print private authorities - SQL style.sql	13
/home/SCOTTF/Run SQL Scripts/ifs_read and ifs_write.sql	12
/home/SCOTTF/Run SQL Scripts/iChime with Charlie.sql	5
/home/SCOTTF/Run SQL Scripts/Reviewing the security of an IFS tree.sql	4

2020
iSight

IBM

The Omni User

SYSTEM_STATUS_INFO

2020 iSight

- Add Job Table In-Use detail

- Add journal cache and journal recovery count detail

SYSTEM_STATUS_INFO

2020 iSight

- Display Job Tables (DSPJOBTBL) alternative

```
select available_job_table_entries,
       total_job_table_entries,
       max_jobs,
       dec(total_job_table_entries /
       dec(max_jobs, 11, 2) * 100, 11, 2) as percent_consumed
  from qsys2.system_status_info;
```

AVAILABLE_JOB_TABLE_ENTRIES	TOTAL_JOB_TABLE_ENTRIES	MAX_JOBS	PERCENT_CONSUMED
116653	118493	163520	72.46

SYSDISKSTAT

2020 iSight

- Extended to include ‘Work with Disk Status (WRKDSKSTS)’ detail

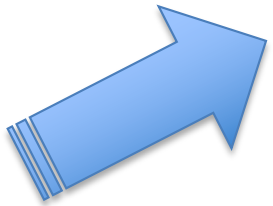
```
                                Work with Disk Status                   SYNC18
                                                          10/26/20  14:22:57 CDT
Elapsed time:   00:00:00

                  Size    %      I/O   Request    Read   Write    Read   Write    %
Unit  Type         (G)  Used     Rqs  Size (K)     Rqs    Rqs     (K)    (K)  Busy
   1  2145         104  16.2      .0        .0      .0     .0      .0     .0     0
   2  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
   3  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
   4  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
   5  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
   6  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
   7  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
   8  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
   9  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
  10  2145         104   7.2      .0        .0      .0     .0      .0     .0     0
4001  2145         104   8.6      .0        .0      .0     .0      .0     .0     0
4002  2145         104   8.6      .0        .0      .0     .0      .0     .0     0
4003  2145         104            .0        .0      .0     .0      .0     .0     0
```

SYSDISKSTAT

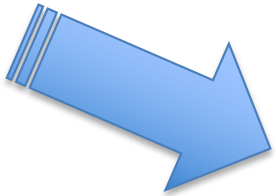
Before

- asp_number
- disk_type
- disk_model
- unit_number
- unit_type
- unit_nvme
- unit_storage_capacity
- unit_space_available
- percent_used
- unit_media_capacity
- logical_mirrored_pair_status
- mirrored_unit_status

After



New Columns



- asp_number
- disk_type
- disk_model
- unit_number
- serial_number
- resource_name
- resource_status
- multiple_path_unit
- unit_type
- unit_nvme
- unit_storage_capacity
- unit_space_available
- unit_space_available_gb
- percent_used
- unit_media_capacity
- unit_media_capacity_gb
- storage_for_system
- storage_allocation_allowed
- protection_type
- protection_status
- raid_type
- logical_mirrored_pair_status
- mirrored_unit_status
- availability_parity_set_unit
- hyperswap
- total_sample_count
- total_not_busy_count
- total_read_requests
- total_write_requests
- total_blocks_read
- total_blocks_written
- total_permanent_blocks_written
- total_permanent_write_requests
- elapsed_time
- elapsed_io_requests
- elapsed_request_size
- elapsed_read_requests
- elapsed_write_requests
- elapsed_data_read
- elapsed_data_written
- elapsed_percent_busy

SYSDISKSTAT

2020 iSight

- Work with Disk Status (WRKDSKSTS) alternative

```
select unit_number, serial_number, resource_name,
       unit_media_capacity_gb, unit_space_available_gb
  from qsys2.sysdiskstat
  order by 1,3;
```

UNIT_NUMBER	SERIAL_NUMBER	RESOURCE_NAME	UNIT_MEDIA_CAPACITY_GB	UNIT_SPACE_AVAILABLE_GB
10	98-1007E1E	DMP037	97	90
10	98-1007E1E	DMP038	97	90
10	98-1007E1E	DMP039	97	90
10	98-1007E1E	DMP040	97	90
4001	98-1008053	DMP009	97	89
4001	98-1008053	DMP010	97	89

DDL Tip – Use FOR SYSTEM NAME

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Optional system name control:

CREATE INDEX
CREATE SCHEMA
CREATE TABLE
CREATE TRIGGER
CREATE VARIABLE
CREATE VIEW
CREATE FUNCTION
CREATE PROCEDURE
CREATE SEQUENCE

Only SQL names allowed:

- CREATE ALIAS
- CREATE TYPE
- CREATE MASK
- CREATE PERMISSION

Control the system name of SQL Sequence objects

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- Specify the system object name for a sequence
- Avoid system generated names (EMPLO00004)

```
-- create a sequence with a predictable system name
CREATE SEQUENCE employee_numbers
      for system name emp_nums
      as integer;
```

SYSCOLUMNS2_SESSION

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- A catalog returning column metadata for QTEMP (aka SESSION)
- Columns match QSYS2.SYSCOLUMNS2

```
select * from qsys2.syscolumns2_session;
```

```
select ordinal_position, table_name, column_name, system_column_name,
       data_type, length, inline_length
  from qsys2.syscolumns2_session;
```

ORDINAL_POSITION	TABLE_NAME	COLUMN_NAME	SYSTEM_COLUMN_NAME	DATA_TYPE	LENGTH	INLINE_LENGTH
1	QSQ_SQL_VAR_VALUES	SQL_IDENTITY	SQL_I00001	INTEGER	4	-
2	QSQ_SQL_VAR_VALUES	VARIABLE_SCHEMA	VARSCHEMA	VARCHAR	128	0
3	QSQ_SQL_VAR_VALUES	VARIABLE_NAME	VARNAME	VARCHAR	128	0
4	QSQ_SQL_VAR_VALUES	VARIABLE_VALUES	QQDBCLOB1	DBCLOB	1073741823	24

SOFTWARE_PRODUCT_INFO

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- Alternative to the Display Software Resources **(DSPSFWRSC)** command and Retrieve Product Information (QSZRTVPR) API

```
-- Is QSYSINC installed?
select count(*) as gtg_count
  from qsys2.software_product_info
  where upper(text_description) like '%SYSTEM OPENNESS%'
        and load_error = 'NO'
        and load_state = 90
        and symbolic_load_state = 'INSTALLED';
```

GTG_COUNT
1

EXIT_PROGRAM_INFO

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- Alternative to Work with Registration Information (WRKREGINF) and Retrieve Exit Information (QUSRTVEI, QusRetrieveExitInformation)

```
-- Which commands have exit programs?
select exit_point_name, exit_program,
       exit_program_data,
       exit_program_data_ccsid
  from qsys2.exit_program_info
  where exit_point_name = 'QIBM_QCA_RTV_COMMAND';
```

EXIT_POINT_NAME	EXIT_PROGRAM	EXIT_DATA_CHAR				EXIT_PROGRAM_DATA_CCSID
QIBM_QCA_RTV_COMMAND	QPYDJCSTR	ADDDWDFN	QSYS		...	37
QIBM_QCA_RTV_COMMAND	QPYDJCSTR	ADDJWDFN	QSYS		...	37
QIBM_QCA_RTV_COMMAND	QPYDJCSTR	STRDW	QSYS		...	37
QIBM_QCA_RTV_COMMAND	QPYDJCSTR	STRJW	QSYS		...	37
QIBM_QCA_RTV_COMMAND	QPYDJCSTR	ADDPEXDFN	QSYS		...	37
QIBM_QCA_RTV_COMMAND	QPYDJCSTR	CHGPEXDFN	QSYS		...	37
QIBM_QCA_RTV_COMMAND	QDLTFLOG	DLTF	QSYS	*BEFORE	...	37

WATCH_INFO

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- Alternative to the WRKWCH (Work with Watches) CL command and the Retrieve Watch List (QSCRWCHL) and Retrieve Watch Information (QSCRWCHI) APIs

```
select * from qsys2.watch_info;
```

SESSION_ID	SESSION_ORIGIN	QUAL_JOB_NAME	START_TIME	SESSION_USERID	SESSION_STATUS	WATCH_SESSION_TYPE
SRVMON0046	QSCSWCH	802018/QSYS/QSRVMON	2020-06-05 04:18:26.776000	QSECOFR	ACTIVE	*SRVMON
SRVMON0048	QSCSWCH	802018/QSYS/QSRVMON	2020-06-05 04:18:26.790000	QSECOFR	ACTIVE	*SRVMON
SRVMON0049	QSCSWCH	802018/QSYS/QSRVMON	2020-06-05 04:18:26.817000	QSECOFR	ACTIVE	*SRVMON
TESTWCH1	STRWCH	803495/JAVAD/QPADEV000Z	2020-06-05 13:47:04.578000	JAVAD	ACTIVE	*STRWCH
WCH2	STRWCH	803495/JAVAD/QPADEV000Z	2020-06-05 13:47:23.375000	JAVAD	ACTIVE	*STRWCH
WATCH4	STRWCH	803495/JAVAD/QPADEV000Z	2020-06-05 13:47:50.607000	JAVAD	ACTIVE	*STRWCH
WATCH3	STRWCH	803495/JAVAD/QPADEV000Z	2020-06-05 13:48:18.234000	JAVAD	ACTIVE	*STRWCH
WATCH5	STRWCH	803495/JAVAD/QPADEV000Z	2020-06-05 13:48:52.964000	JAVAD	ACTIVE	*STRWCH
WATC9	STRWCH	803495/JAVAD/QPADEV000Z	2020-06-05 16:05:53.925000	JAVAD	ACTIVE	*STRWCH
WATC10	STRWCH	803495/JAVAD/QPADEV000Z	2020-06-05 16:07:42.798000	JAVAD	ACTIVE	*STRWCH

WATCH_DETAIL

- Alternative to the WRKWCH (Work with Watches) CL command and the Retrieve Watch List (QSCRWCHL) and Retrieve Watch Information (QSCRWCHI) APIs

```
select lic_major_code concat ' ' concat lic_minor_code
       as vlog_watch
  from table (
      qsys2.watch_detail(session_id => 'SRVMON0049'));
```

VLOG_WATCH
1D00 0202
1D00 0203
1D00 0204
1D00 0205

DATA_QUEUE_ENTRIES

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```
create schema TheQueen;
cl:CRTDTAQ DTAQ(TheQueen/OrderDQ) MAXLEN(100) SEQ(*KEYED) KEYLEN(3);
call qsys2.send_data_queue(message_data       => 'Sue - Dilly Bar',
                           data_queue         => 'ORDERDQ',
                           data_queue_library => 'THEQUEEN',
                           key_data           => '010');
call qsys2.send_data_queue(message_data       => 'Sarah - Mint Blizzard',
                           data_queue         => 'ORDERDQ',
                           data_queue_library => 'THEQUEEN',
                           key_data           => '020');
call qsys2.send_data_queue(message_data       => 'Scott - Strawberry Sundae',
                           data_queue         => 'ORDERDQ',
                           data_queue_library => 'THEQUEEN',
                           key_data           => '030');
call qsys2.send_data_queue(message_data       => 'Scott - Pineapple Shake',
                           data_queue         => 'ORDERDQ',
                           data_queue_library => 'THEQUEEN',
                           key_data           => '030');
```

DATA_QUEUE_ENTRIES

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- Probe all the messages on a data queue
- Search by: ALL, FIRST, KEY, LAST, or REVERSE

```
select message_data, key_data from table
     (qsys2.data_queue_entries('ORDERDQ', 'THEQUEEN',
                               selection_type => 'KEY',
                               key_data       => '030',
                               key_order      => 'EQ'));
```

MESSAGE_DATA	KEY_DATA
Scott - Strawberry Sundae	030
Scott - Pineapple Shake	030

SPLIT table function

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- Deconstruct a list into individual rows

```
SELECT * FROM
  TABLE(SYSTOOLS.SPLIT('aaa bbb ccc', ' '));
```

ORDINAL_POSITION	ELEMENT
1	aaa
2	bbb
3	ccc

```
SELECT * FROM
  TABLE(SYSTOOLS.SPLIT('a, bbbbbbb, ccc', ', '));
```

ORDINAL_POSITION	ELEMENT
1	a
2	bbbbbbb
3	ccc

SPLIT table function – Enhanced

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- Optional parameter for an escape character

```
SELECT * FROM
  TABLE(systools.split(input_list => 'AN/,HE,AW,QQ,ZZ',
                       delimiter  => ',',
                       escape     => '/'));
```

ORDINAL_POSITION	ELEMENT
1	AN,HE
2	AW
3	QQ
4	ZZ

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