



What's New for IBM i IBM i 7.1 TR11 & IBM i 7.2 TR3



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Announcement Areas

- Continued Application Development Transformation
- Database
- Systems Access & Management
- Hardware stuff....

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Transformation



Modern RPG

- Full Free Format Language
- Removal of the 8-80 column restriction
- Major enhancement to Rational Developer for i

Open Source

- Latest Zend PHP engine
- Node.JS, Python, GCC

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Remove 8-80 Column Restriction



- No More column 1-8
- Max Column for content is NO longer 80 (again....punch card)

```

dou wasFound;
//Look up the custId in the file
custName = %LOOKUP('custKey' : custArray
                  : 1
                  : %SIZE(custArray));
custAddress = %SUBST(fullAddress :1 :50);
C custAddress MOVEA fullAddress
CHAIN custId custFile;
enddo;

```

- If column 1 of a source line contains '**FREE', the following lines contain free-form RPG code beginning in column 1 and continuing to the end of the line

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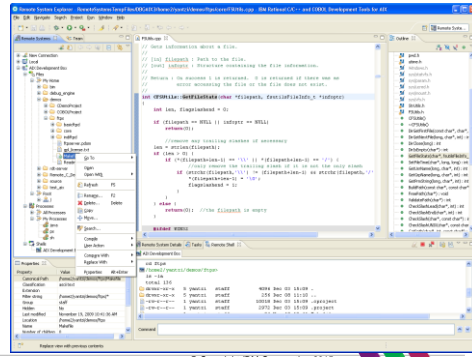


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Rational Developer for i V9.5

- Addition of a built-in 5250 emulator
- Removal of the 80 column restriction in RPG code editor
- Addition of Snippet Support in the Push-to-Client feature
- Enhanced ability to rearrange Remote System Explorer (RSE) Filters
- Improvements to free-form RPG formatting (indentation support) in the RPG code editor
- Improved RPG Content Assist
- General improvements to code coverage analysis capabilities, significant performance improvements



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RD i V9.1 Code Coverage Report

- After running code coverage, a report is shown as an editor.
- You can drill down through programs, modules and procedures and see the coverage statistics for each

Code Coverage Report (RBC4NNF1C_2014_04_23_123357_0632)

Code Coverage Report (Line)

Code Coverage Summary

Code coverage report (analyzed at Apr 23, 2014 12:34:22 PM, generated at Apr 29, 2014 10:55:30 AM)

Element	Coverage	Covered	Total
*PGM MKWAN/RBC4NNF1C	88%	617	699
RBC4NNF1C	88%	617	699
RBC4NNF1CRPGLE	88%	617	699
GPHPRCCMP100	0%	0	6
UCSPRCCMP80	0%	0	6
INDPRC10	0%	0	6
CHRPRCCMP120	0%	0	6
PUT_TC_MSG0	0%	0	13
finish_tco	78%	7	9
chk_result0	89%	8	9
show_error0	90%	18	20
RBC4NNF1C0	91%	406	444
chk_subres0	92%	24	26
DATPRCIS00	100%	3	3
DATPRCIS0A	100%	3	3
DATPRCEUR0	100%	3	3
DATPRCYMD0	100%	3	3



Coverage annotated in the editor

- Drilling down from the report, the editor will be opened on the related member with green and red annotations showing which lines were

```

Line 1490 Column 50 Replace Browse
.....PName.....B.....Keywords.....Comments.....
P finish_tc b export
D finish_tc pi
D tc likeds(tc_t)
/free

// If all variations passed, set the test case status to successful
if tc.succ_v = tc.run;
  RptTest (tc.testname: tc.succ_v: tc.fail_v: SUCCESS);
  return;
endif;

// Otherwise, write a summary line and close the output file
VarFail (*"CLOSE": tc.succ_v);
RptTest (tc.testname: tc.succ_v: tc.fail_v: FAILURE);

close qprint;

/end-free
P finish_tc e

P put_tc_msg b export
D put_tc_msg pi
D msgPtr * value options(*string)
D MAX LINE c 52
  
```



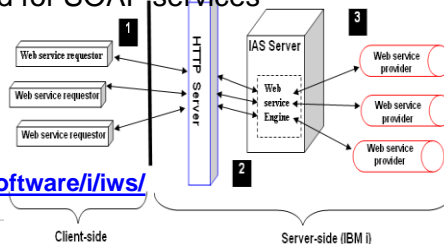
Integrated Web Services Server

Many nuances & limitations eliminated

- Nested output array support
- Improved processing of very large output character fields
- Preserve case sensitivity of identifiers
- Preserve field ordering
- Allow RESTful services to return user defined media types
- New transport metadata values
- Install web service script updated for SOAP services
- Allow Java-based web services

JSON/REST

<http://www-03.ibm.com/systems/power/software/iwsw/>





Zend Server

- New UI
- Cleaner
- More modern
- Z-Ray for IBM i
 - Z-Ray extensibility: create your own Z-Ray extensions
 - Z-Ray Live! - insight on non-browser based requests, such as mobile client requests and APIs/web services
- URL Insights: details on the slowest, poorest performing, and most popular URLs on your website
- Faster runtime engine!
- Run parallel with older versions



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IBM HTTP Server – Apache Updated to 2.4.12

- PCRE regular expression supported in configuration file
- New modules
 - ✓ **mod_proxy_wstunnel** - tunnel web socket connection to backend server
 - ✓ **mod_proxy_html** - rewrite HTML links in proxy situation to ensure links work for users outside the proxy
 - ✓ **mod_macro** - define macro in configuration
- New directives in mod_ssl, SSLRenegotiation and SSLHandshakeTimeout
- SNI implementation optimization and enhancement
- iASP support for pre-start CGI jobs
- Serviceability enhancement – display CGI job information and thread id in log file
- Many other updates to existing modules and directives, reference <http://httpd.apache.org/docs/2.4/>
- PCI compliance – all the CVEs exposed after 2.4.12 released are patched
- Web Sockets!!!



HTTP Server

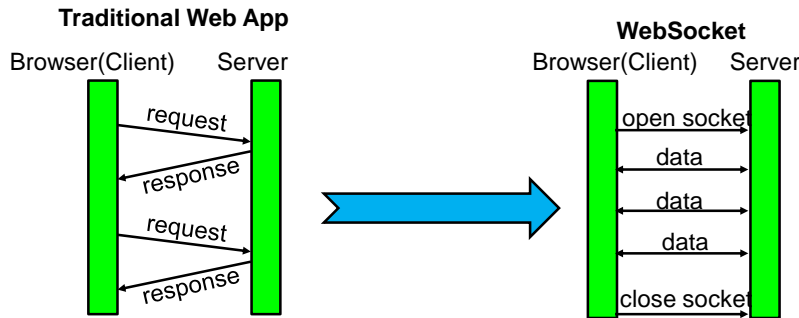


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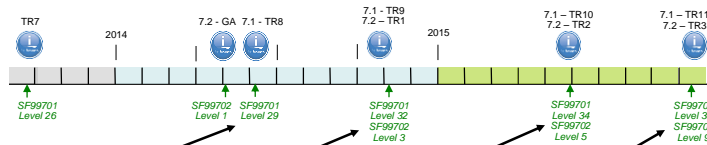
What's WebSocket?

- Developed as part of the HTML5 initiative, JavaScript interface
- Full-duplex single socket connection over web between browser and server. Simplify much of the complexity around bi-directional web communication
- Simplify real-time web application vs existing HTTP request-response mode
- Over HTTP, allow easy connection through firewall
- Reference <http://www.websocket.org/> for more details and examples about WebSocket



DB2 for i – Enhancements delivered via DB2 PTF Groups

IBM i 7.1 & 7.2



7.1 - TR8&TR9 timed Enhancements:

- Generate SQL procedure
- Program & Package statement level statistical catalogs
- Pipelined Functions
- Regular Expressions
- Padding Scalar Functions

7.2 - TR1 timed Enhancements:

- CREATE OR REPLACE support on MASK and PERMISSION
- DB2 Built-in Global Variables for job name
- System Limits Phase 3 - IFS
- And more...

TR2 / TR10 Enhancements:

- Create OR REPLACE table
- JSON - DB2 Store Technology Preview
- SQE Performance improvements
- And more...

Enhancements in TR3 / TR11:

- LIMIT and OFFSET
- Guardium V10 and other database security monitoring enhancements
- SQE Performance improvements
- More IBM i Services
- New SQL built-in functions
- Enhancements for SAP on i clients

Enhancements delivered by PTF are documented here:

www.ibm.com/developerworks/ibmi/techupdates/db2





Application Development Enhancements

SQL Programming enhancements

- LIMIT and OFFSET
- Remote 3-part name support on ASSOCIATE LOCATOR
- CREATE VARIABLE <name> FOR SYSTEM NAME <srvgm-name>
- Remove the 8-80 Column restriction for RPG (SQL Precompiler)
- Debugger improvements for LANGUAGE SQL users

Query enhancements

- Views with Global variables in the WHERE clause can be insert-able
- New Scalar functions
 - OVERLAY
 - LOCATE_IN_STRING & INSTR



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LIMIT and OFFSET

- LIMIT and OFFSET support is popular, but non-standard. The DB2 Family recently decided to add the support.
- This style of data access is most useful for those cases where you only need a subset (page) of rows.
- The **offset-clause** is only allowed as part of the **outer fullselect** of a DECLARE CURSOR statement or a prepared *select-statement*.



Syntax	Alternative Syntax	Action
LIMIT x	FETCH FIRST x ROWS ONLY	Return the first x rows
LIMIT x OFFSET y	OFFSET y ROWS FETCH FIRST x ROWS ONLY	Skip the first y rows and return the next x rows
LIMIT y , x	OFFSET y ROWS FETCH FIRST x ROWS ONLY	Skip the first y rows and return the next x rows

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OFFSET and LIMIT for Stateless Pagination

➔ Connect,
SELECT...OFFSET 0 LIMIT 5
Fetch 5 rows, Close,
Disconnect

➔ Connect,
SELECT...OFFSET 5 LIMIT 5
Fetch 5 rows, Close,
Disconnect

➔ Connect,
SELECT...OFFSET 10 LIMIT 5
Fetch 5 rows, Close,
Disconnect

Result set Row Number	Ordering Data	Unique key (Encrypted)
1	Abcd	1234
2	Abdc	3214
3	Acbd	4131
4	Acdb	2143
5	Bacd	1243
6	Bacd	2341
7	Bcad	4213
8	Bcda	3142
9	Bdac	1423
10	Bdca	2431
11	Bdca	3412
12	Cadb	1324
13	Cbad	4321



OFFSET and LIMIT for Stateless Pagination

```
CREATE OR REPLACE PROCEDURE
TOYSTORE.FIND_EMPLOYEES
(IN P_PAGESIZE BIGINT, IN P_OFFSET BIGINT)
DYNAMIC RESULT SETS 1
LANGUAGE SQL
BEGIN
  DECLARE V_PREP_STMT1 VARCHAR(4096) ;
  DECLARE CEMP_RESULT_SET1 CURSOR
  WITH RETURN FOR PREP_STMT1;
  SET V_PREP_STMT1 =
  'SELECT EMPNO, HIREDATE, LASTNAME FROM
  TOYSTORE.EMPLOYEE
  ORDER BY HIREDATE DESC
  LIMIT ? OFFSET ?';
  PREPARE PREP_STMT1 FROM V_PREP_STMT1 ;
  OPEN CEMP_RESULT_SET1 USING P_PAGESIZE,
  P_OFFSET;
END;

CALL TOYSTORE.FIND_EMPLOYEES(10, 0);
CALL TOYSTORE.FIND_EMPLOYEES(10, 10);
```

Page 1

Page 2

EMPNO	HIREDATE	LASTNAME
000270	09/30/80	PEREZ
000070	09/30/80	PULASKI
000100	06/19/80	SPENSER
000200	05/20/80	PARKER
200240	12/05/79	MONTEVERDE
000240	12/05/79	MARINO
000210	04/11/79	JONES
200170	09/15/78	YAMAMOTO
000170	09/15/78	YOSHIMURA
000160	10/11/77	PIANKA
200140	12/15/76	NATZ
000140	12/15/76	RICHOLLS
200330	02/23/76	WONG
000330	02/23/76	LEE
000260	09/11/75	JOHNSON
000030	04/05/75	KUHN
000190	07/26/74	WALKER
000020	10/10/73	THOMPSON
000060	09/14/73	STERN
000180	07/07/73	SCULLITTEN
000300	06/19/72	SMITH
200120	05/05/72	ORLANDO
000150	02/12/72	ADAMSON
000130	07/28/71	QUIFANA
000090	08/15/70	HENDERSON
000250	10/30/69	SMITH
200220	08/29/68	JOHN
000020	08/29/68	LITZ
200280	03/24/67	SCHWARTZ
000280	03/24/67	SCHNEIDER
000230	11/21/66	JEFFERSON
000200	03/03/66	BROWN
000320	07/07/65	MEHTA





Flexible Views

- Traditional views are based upon a query that is locked in at create time
- Views with WHERE clause references to DB2 built-in global variables or DB2 global variables are flexible
- With the latest DB2 PTF Group, these views are eligible to be insertable, updateable, and deletable

```
CREATE OR REPLACE VARIABLE TOYSTORE.CURRENT_DEPARTMENT FOR SYSTEM NAME
CUR_DEPT CHAR(3) DEFAULT 'D21';
```

```
CREATE OR REPLACE VIEW TOYSTORE.DEPARTMENT_VIEW FOR SYSTEM NAME DEPTV
AS SELECT DEPTNO, DEPTNAME, MGRNO , ADMRDEPT, LOCATION FROM
TOYSTORE.DEPARTMENT WHERE TOYSTORE.CURRENT_DEPARTMENT = DEPTNO;
```

```
-- Update rows where DEPTNO = 'D21'
UPDATE TOYSTORE.DEPARTMENT_VIEW SET LOCATION = 'Kingston';
```

```
-- Insert a new row
INSERT INTO TOYSTORE.DEPARTMENT_VIEW VALUES('D33', 'Gardening and
Landscaping', '000110', 'A00', NULL);
```

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Performance & Availability enhancements

Performance enhancements

- EVI Only Access
- Improved code generation for SQL routines & triggers

Availability enhancement

- Improved internal management of SQL packages for SAP clients

Use the SQL_STMT_COMPRESS_REUSE_MIN QAQQINI control to extend the lifespan of a Process Extended Dynamic *SQLPKG

- 0 → (default) The statement reuse count is not considered when performing package compression
- 1-32767 → The minimum number of times a statement has to be reused in order for it to remain in the package at compression time



```
INSERT INTO QUSRSYS.QAQQINI
VALUES('SQL_STMT_COMPRESS_REUSE_MIN', 3, DEFAULT)
```



DB2 for i
EVI
Index Advisor
Media Preference
SQL Query Engine
In-memory tables
Memory Preference
Encoded Vector Indexes

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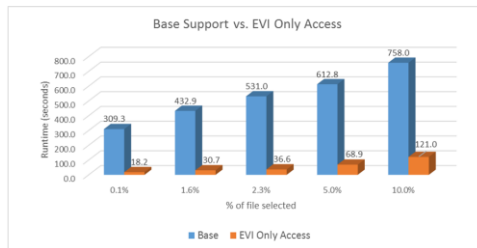


EVI Only Access (EOA)

- EVIs are improved through an enhanced in-memory oriented access capability via its patented database EVI (Encoded Vector Index) technology to facilitate enhanced aggregate query performance.
- EVIs traditionally focus on selection keys with low cardinality
- With this enhancement, EVIs can be used for projection of column values

Example performance benefit:

SELECT COUNT(DISTINCT(fld1)) WHERE fld2 < 'value'



With EOA, the SAP BW-EML Benchmark Improved by more than 20%



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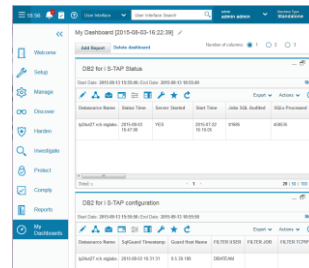
Governance enhancements

Start Database Monitor command enhancements

- Support for Not Equal operator (job, user and table filters)

Guardium enhancements

- Guardium V10 GA'd on August 28th
- Guardium Vulnerability Assessment (VA) for IBM i
- Guardium Database Activity Monitor (DAM)
 - Support for multiple policies
 - IBM i side support for Not Equal operator
 - Encrypted collector communication
 - Load balancing
 - Failover



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How do you access IBM i Information ?

Past

- Write code to call
 - CL Commands
 - System APIs
- Write more code to sort, filter, find what you are after

Today with SQL Services

- With a single SQL statement
 - Retrieve information
 - Leveraging the power of SQL
 - Sort, Filter, find what you are after



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IBM i Services

New IBM i Services for these commands:


- | | | |
|------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Work with Locks | <p>WRKOBJLCK
DSPRCDLCK</p> | <p>OBJECT_LOCK_INFO
RECORD_LOCK_INFO</p> |
| <ul style="list-style-type: none"> • Work with System Status • Work with System Activity | <p>WRKSYSSTS
WRKSYSACT</p> | <p>MEMORY_POOL()
MEMORY_POOL_INFO
SYSTEM_STATUS()
SYSTEM_STATUS_INFO</p> |
| <ul style="list-style-type: none"> • Work with License Information | <p>WRKLCINF</p> | <p>LICENSE_INFO</p> |
| <ul style="list-style-type: none"> • Work with Output Queue | <p>WRKOUTQ</p> | <p>OUTPUT_QUEUE_ENTRIES
OUTPUT_QUEUE_ENTRIES()</p> |
| <ul style="list-style-type: none"> • Work with Media Library Status | <p>WRKMLBSTS</p> | <p>MEDIA_LIBRARY_INFO</p> |
| <ul style="list-style-type: none"> • Work with TCP/IP Network Status | <p>NETSTAT</p> | <p>NETSTAT_INFO
NETSTAT_JOB_INFO
NETSTAT_INTERFACE_INFO
NETSTAT_ROUTE_INFO</p> |

Grouping
Transformation
Advanced
Selection
Easy
Ordering
APIs
Commands
SQL

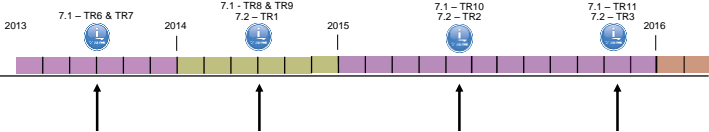
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IBM i Services for SQL users



Year	Services Added
2013	Services Added in 2013: <ul style="list-style-type: none"> FUNCTION_INFO FUNCTION_USAGE PTF_INFO SYSTEM_VALUE_INFO USER_INFO USER_STORAGE GET_JOB_INFO() SYSLIMITBL SYSLIMITS GROUP_PROFILE_ENTRIES
2014	Services Added in 2014: <ul style="list-style-type: none"> JOURNAL_INFO LIBRARY_LIST_INFO REPLY_LIST_INFO JOBLOG_INFO() SYSTMPSTG (7.2) DB2 for i built-in Global Variables (7.2) JOB_NAME (7.2) SERVER_MODE_JOB_NAME (7.2) SYSTOOLS.GROUP_PTF_CURRENCY
2015	Services Added in 2Q/2015: <ul style="list-style-type: none"> ACTIVE_JOB_INFO() SCHEDULED_JOB_INFO SERVER_SBS_ROUTING SET_SERVER_SBS_ROUTING() DRDA_AUTHENTICATION_ENTRY_INFO JVM_INFO SET_JVM()
2016	Services Added in 4Q/2015: <ul style="list-style-type: none"> MEMORY_POOL_INFO SYSTEM_STATUS_INFO LICENSE_INFO OBJECT_LOCK_INFO RECORD_LOCK_INFO OUTPUT_QUEUE_ENTRIES MEDIA_LIBRARY_INFO NETSTAT_INFO NETSTAT_JOB_INFO NETSTAT_INTERFACE_INFO NETSTAT_ROUTE_INFO SYSTOOLS.GROUP_PTF_DETAILS

<http://ibm.biz/DB2foriServices>

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iAccess for Windows





Navigator

iAccess Mobile

Access Client Solutions

Application Runtime Expert



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IBM i Access Client Solutions

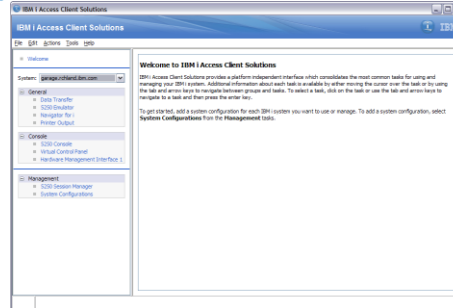


Features

- 5250 display and printer emulator
- Data transfer
- Printer Output
- Console consolidation

Benefits

- Runs everywhere Java runs
 - Windows
 - Apple Mac
 - Linux
- NO INSTALL
- Easy customization



It's the future!

Navigator



IBM i Navigator

- Add Database content to Access Client Solutions (ACS):
 - ✓ Run SQL Scripts
 - ✓ SQL Performance Center
 - ✓ Web ↔ ACS Navigator interplay
- Multiple list support within Schemas → Constraints
- Add multiple View Entries support to Journal Viewer (IBM i Access for Windows only)



Analyze Fast **SQL** Java-based **Run SQL Scripts** Advanced Highlighting
Run Anywhere



Work with Your Data – SQL Performance Center

Navigator and ACS Working together

SQL Performance Monitors → SQL trace
 Plan Cache Snapshots → SQL Plan Cache, "Moment in time"
 Plan Cache Event Monitors → SQL Plan Cache Pruning

Metric	Value	Reports
SQL Statements	45	< Select a report >
Users	1	< Select a report >
Jobs	1	< Select a report >
Threads	1	
Average Table Rows	25.666	
Average Rows Returned	44.666	
Average Runtime	0.014595	
Average Parallel Degree Used	1.00	
Maximum Parallel Degree	1.00	
IOPE	16	< Select a report >
COE	0	
System Naming	0	
SQL Naming	41	< Select a report >
Unique Open Statements	3	< Select a report >
Full Opens	3	< Select a report >
Pseudo Opens	5	< Select a report >
Table Scans	1	< Select a report >
Average MQTs Used	0.000	
	0.666	< Select a report >
	16	
	0	
	0	
	4	< Select a report >
	0	
	0	
Access Plans Rebuilt	2	< Select a report >
Sort Sequence	0	
Call Statements	5	< Select a report >
Error	1	< Select a report >



Work with Your Data – SQL Performance Center

Work with LARGE amounts of data with amazing speed
 Dig into the details of your SQL Performance

Start Time	End Time	Runtime	Statement Outcome	SQLSTATE	SQLCODE	Operation	Statement Text
2014-08-19 15:27:03.312397	2014-08-19 15:27:03.680941	0.368448	Successful	00000		0 CREATE PROC...	CREATE PROCEDURE QIWS.QZDQOSPF (IN FILL...
2014-08-19 15:27:03.704386	2014-08-19 15:27:03.803718	0.099328	Successful	0100C	466	466 CALL	CALL QIWS.QZDQOSPF(?,?)
2014-08-19 15:27:03.134144	2014-08-19 15:27:03.190371	0.056056	Successful	00000		0 FETCH	
2014-08-19 15:27:03.134144	2014-08-19 15:27:03.190027	0.055880	Successful	00000		0 OPEN	SELECT NAME_00001, STATU00001, JOBS_000
2014-08-19 15:26:26.425839	2014-08-19 15:26:26.461764	0.032960	Successful	00000		0 FETCH	
2014-08-19 15:26:26.425839	2014-08-19 15:26:26.458622	0.032784	Successful	00000		0 OPEN	SELECT NAME_00001, STATU00001, JOBS_000
2014-08-19 15:27:03.900606	2014-08-19 15:27:03.920415	0.019808	Successful	00000		0 OPEN	SELECT QQ1000L, QQC102, QQC103 FROM QI...
2014-08-19 15:26:29.857867	2014-08-19 15:26:29.877668	0.019800	Successful	00000		0 CLOSE	CLOSE CRSR0030
2014-08-19 15:27:03.268125	2014-08-19 15:27:03.285062	0.016936	Successful	0100C	466	466 CALL	CALL QIWS.QZDQOSPF(?,?,?)
2014-08-19 15:27:03.882833	2014-08-19 15:27:03.897698	0.014864	Successful	00000		0 PREPARE...DE...	SELECT QQ1000L, QQC102, QQC103 FROM QI...
2014-08-19 15:26:28.556050	2014-08-19 15:26:28.567622	0.011264	Successful	00000		0 FETCH	
2014-08-19 15:26:28.556050	2014-08-19 15:26:28.567180	0.011128	Successful	00000		0 OPEN	select * from qivs.quatocf
2014-08-19 15:27:03.949538	2014-08-19 15:27:03.958738	0.009200	Successful	00000		0 CLOSE	CLOSE CRSR0032
2014-08-19 15:26:28.935660	2014-08-19 15:26:28.944802	0.009144	Successful	00000		0 CLOSE	CLOSE CRSR0025
2014-08-19 15:26:28.141710	2014-08-19 15:26:28.146366	0.007472	Successful	00000		0 FETCH	



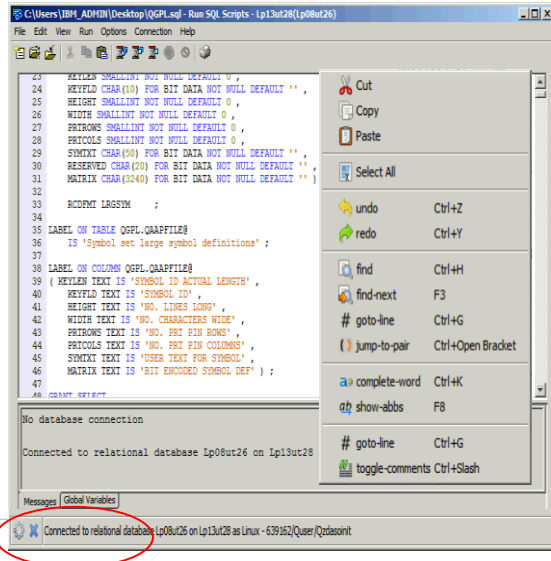


Work with Your Data

Works on Windows, Mac & Linux!!!

Run SQL Scripts

- Faster Startup Time
- Line Numbers
- Highlighting
- Color Coding
- Improved Usability
- Status Bar
- Find (supports Regex)
- Lots of Editor features
- Save Results .xlsx



Multipath Support for Tape is Enhanced IBM i 7.2 TR 3 only



Introduced in IBM i 7.2 TR 2

- Allows redundancy for up to 8 paths
- A preferred path may be specified
- Native and VIOS NPIV attachment are supported
 - Fibre Channel LTO5 and LTO6 drives in the 7226 enclosure
 - TS3100/TS3200 (3573) with LTO5 and LTO6 Fibre Channel drives
 - TS3310 (3576) with LTO5 and LTO6 Fibre Channel drives
 - TS3500/TS4500 with LTO5, LTO6, 3592-E07, and 3592-E08 Fibre Channel drives
 - ProtecTIER® virtual tape library, code level 3.3.5.1 or newer

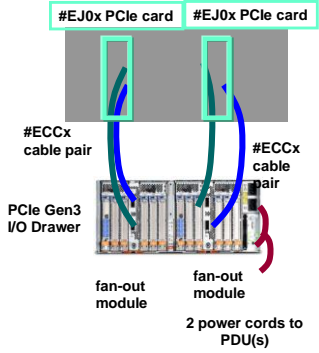
IBM i 7.2 TR 3 adds Automatic Fail-over for many scenarios

- Active path is moved when operation fails
- Tape operation completes without user intervention
- Especially useful for those doing unattended back-ups





4Q 2015 I/O Drawer RAS with FW840



- PCIe cards in Gen3 I/O drawer are hotplug
- Power cords, power supplies, fans are redundant and hot plug
- EJ0x card is hot plug for maintenance – obviously all cards in its fanout module impacted if repair action undertaken
- With FW840: The other fan-out module in that drawer is NOT impacted by a maintenance action = Fan-out modules have concurrent maintenance
- With FW840: #ECCx cables have full redundancy. Either cable can be removed and the other will carry on at half bandwidth. When reconnecting the cable, its fan-out module is taken down to get full bandwidth back, (other side of the drawer is not taken down).
- With FW840: for the Power E870/E880 PCIe3 drawers with one or two fanout modules can be hot added.
- INDIVIDUAL Fan-out modules do not have hot add (any model) when being added to an already installed drawer with just one fan-out module initially installed
- Fan-out modules do not have hot remove

4Q2015 Observation: A single drawer with two fan-out modules has enhanced RAS with firmware 840. Two half drawers no longer have such a significant RAS redundancy advantage

Firmware 840 is not announced for the Power E850 as of October 2015



Thanks!!!