

Getting to DB2 10 for z/OS

- Migration Considerations

Agenda

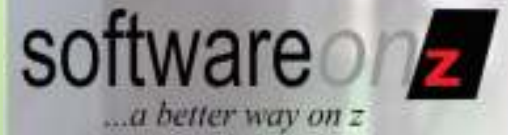
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- Overview
- Migration Issues and Concerns
- Skip Level Migration
- Deprecated Features
- Access Paths
 - New Features
 - Changed Access Paths
 - Categorizing Changes
- Using zAPX to Automate Migration
- Conclusion



DB2 10 for z/OS



- DB2 10 for z/OS was released for GA on October 19, 2010.
- Highlights of the release include:
 - Out-of-the-box reduction in CPU utilization and from 5 to 10 times more concurrent users on a single DB2 subsystem (as compared to DB2 9; results based on early customers and internal IBM testing)
 - Greater concurrency for data management, data definition, and data access, including additional online changes for data definitions, utilities, and subsystems
 - Improved security with better granularity for administrative privileges, data masking, and audit capabilities
 - Temporal or versioned data to understand system and business times at the database level
 - Hashed indexes
 - pureXML™ and SQL enhancements to simplify portability from other database solutions
 - Productivity improved for database administrators, application programmers, and systems administrators
 - Many QMF improvements
- ...and there are a lot of optimizer enhancements and performance improvements that you won't get without a REBIND.

Migration Issues



- In August 2010, IBM announced the end of service for DB2 for z/OS Version 8
 - In the announcement letter (910-169) IBM indicates that the date for EoS will be April 30, 2012.
 - This is less than a year and a half away.

DB2 Version	GA Date	EoM Date	EoS Date
7	March 30, 2001	March 5, 2007	March 30, 2008
8	March 26, 2004	September 8, 2009	April 30, 2012
9	March 16, 2007		
10	October 22, 2010		

EoS: End of Service EoM: End of Marketing

Issues and Conclusion

- Many sites are still running DB2 Version 8
- IBM is offering skip level migration
 - DB2 V8 → ~~DB 9~~ → DB2 10
- Of course, you can also migrate to 10 from 9
 - DB2 9 → DB2 10
- 2011 will be a year of many migrations
 - DB2 V8 to DB2 9
 - DB2 V8 to DB2 10
 - DB2 9 to DB2 10



Migration Concerns



- Issues with skipping a DB2 version
- Regular issues with any version migration
 - System pre-requisites
 - System software versions (z/OS, IMS, CICS, programming languages, etc.)
 - Fallback PTF
 - Deprecated features?
 - Defaults changed?
 - Building a migration plan
 - Vendor support?
 - Test Implementation Plan
 - Moving to Production
 - Validation
 - Access path changes?



Skipping DB2 9?

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- Should you skip from V8 to 10?
 - Gauge your organization’s “bleeding edge” tolerance
 - DB2 10 is still very new; You are on an older version of DB2... why?
 - DB2 10 will have more defects at first, then fewer as the software matures (and DB2 9 is mature, at this point)
 - Are there features in DB2 10 that compel you to move more quickly to it?
 - A skip migration project requires a longer timeline, and involves more risk
 - Are there organizational hurdles?
 - Training – for two versions, not just one!
- If you make an informed and educated decision, migrating directly to DB2 10 from V8 can be a smart move.



Check the Pre-requisites

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- Read the information APAR
- Read the *What's New* manual
 - GC19-2985-01
- System pre-requisites
 - System software versions (z/OS, IMS, CICS, programming languages, etc.)
 - Fallback PTF
- New Reserved Words
 - PERIOD
 - ORGANIZATION
 - ZONE




Deprecated Features (9 – 10)



- Private protocol DRDA
 - No surprise since IBM has been indicating this was on its way out for a number of releases now. Not too difficult to convert to DRDA (some help w/DSNTP2DP).
- ACQUIRE(ALLOCATE) is no longer supported for BIND | REBIND PLAN
 - Rebind with ACQUIRE(USE)
- REBIND plans & packages that haven't been rebound since V5 or before.
- EXPLAIN tables prior to V8 format are no longer supported (→UNICODE)
 - Information APAR **PK85068**.
- DB2 MQ XML functions and the DB2 XML Extender no longer supported
 - Use pureXML.
- DB2 Management Clients no longer supported
(DB2 Administration Server, Control Center, and Development Center)
 - Data Studio is IBM's new management client
- BookManager no longer supported
 - Instead use the PDF versions and/or the Info Center online.

Deprecated: Plans w/DBRMs

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- As of DB2 10, plans containing DBRMs are no longer supported
 - MEMBER parameter is no longer supported for BIND | REBIND PLAN
 - You will have to convert the DBRMs to packages.
- REBIND PLAN(X) COLLID(*)
 - "*" is the default value
 - It creates DSN_DEFAULT_COLLID_X (where X is the plan name)
 - This enables customer to convert plans with DBRMs bound directly into them into packages under a collection ID (DSN_DEFAULT_COLLID_X) automatically.

Deprecated Features (V8 – 9)



- Don't forget that if you are skipping from V8 to 10 then you need to consider the features deprecated for DB2 9, too!
 - AIV Extender, Text Extender, and Net Search Extender are removed.
 - Net.Data, stabilized at V7, is removed.
 - WebSphere is IBM's strategic solution for getting DB2 data to Web applications.
 - DB2 Estimator is not provided for DB2 9.
 - DB2-managed stored procedure support is removed.
 - Simple table space creation support is removed.
 - JDBC/SQLJ Driver for OS/390 and z/OS support is removed.

The DB2 Catalog

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- The Catalog is SMS-managed as of DB2 10.
- Links are removed from the DB2 Catalog and Directory.
- More usage of LOBs.
 - SYSVIEWS.TEXT, SYSTRIGGERS.TEXT, SYSROUTINES_SRC.CREATEMST, and SYSPACKSTMT.TEXT
- Many more table spaces.
 - Table \leftarrow 1 to 1 \rightarrow Table Space
 - Each table is in its own partition-by-growth table space in new-function mode
 - Each table space uses row-level locking, and all tables are in reordered-row format.
- And for skip-level migration:
 - Don't forget the V8 to DB2 9 changes to the DB2 Catalog!



DSNZPARMs



- Be sure to include a review of your DSNZPARM settings in your migration plan.
 - New DSNZPARMs
 - e.g.) CATDDACL, CATDMGCL, CATDSTCL
 - Deprecated DSNZPARMs
 - e.g.) STATCLUS, SEQCACH, etc.
 - Removed DSNZPARMs
 - e.g.) PARTKEYU, TABLES_JOINED_THRESHOLD, etc.
 - DSNZPARMs with new default values
 - e.g.) CHKFREQ
 - Old default: 500,000 records
 - New default: 5 minutes
- Any/all of these can impact your DB2 subsystem



Willie Favero's blog at <http://it.toolbox.com/blogs/db2zos/> has several great articles on this topic.

DB2 10: BIND & Access Path Stuff

- Ability to EXPLAIN existing packages
 - Command: BIND PACKAGE...EXPLAIN (ONLY)
 - Works for all packages.
 - SQL: EXPLAIN PACKAGE
 - The package being explained must have been created in DB2 9 or above.
 - Older packages cannot be explained like this!
- CURRENT EXPLAIN MODE special register
 - Controls how EXPLAIN behaves for eligible dynamic SQL (SELECT, INSERT, and the searched form of UPDATE and DELETE).
 - **NO** - turns off capture of EXPLAIN information. (default)
 - **YES** - turns on capture of EXPLAIN information; plan tables will be updated.
 - **EXPLAIN** - this option is the same of YES. However, the dynamic SQL statements are not executed.
- New authority that can be granted: EXPLAIN

DB2 10: BIND & Access Path Stuff



- New DB2 10 feature: Safe Query Optimization
- The DB2 Optimizer now considers the uncertainty of predicate filtering when selecting an index.
 - Previously, overestimating the filtering of a predicate was possible when the value of a host variable was not known (i.e. no literal).
 - As of DB2 10, when indexes have a close cost estimate, the DB2 Optimizer factors in the uncertainty of matching and screening predicates.



Access Path Changes

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- Access Paths
 - This is perhaps the most time-consuming and worrisome aspects of DB2 version migration.
 - A new version typically means Optimizer enhancements.
 - And that means changes to access paths!
 - Changes that occur are not always predictable
 - There may be trends that you can anticipate, though
 - Other migration issues can cause access path changes, too
 - Statistics changes
 - Environment changes



Additional DB2 10 REBIND Issues

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- Incremental Rebinds
 - DB2 incrementally rebinds static SQL statements that use parallelism after migration to Version 10.
 - Incremental rebinds can cause performance degradation, so you should manually rebind those statements.
 - A query in DSNTIJPM is provided that you can run to determine which statements can use parallelism.
- Thread Constraint Relief
 - DB2 10 improves the number of concurrent threads that can be running. To get this relief, though, you must REBIND.
 - After you REBIND, the work areas are moved above the bar.

Remembering V7 => V8 ?



- DB2 Version 8 had many *typical* access path changes that could be anticipated based on trends
- Most installations had the same changes, e.g.
 - matching index scan => ts scan for small tables
 - non-matching index scan => ts scan for large indexes
- Special rules were applicable

DB2 9 and 10 are different

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- Although DB2 9 typically caused access path changes...
 - Different types of changes in every installation
 - A general set of special rules was not applicable
- DB2 10 seems to show the same behavior

Categorize Access Path Changes

- Why?
 - Reduction of manual effort
 - Typically, in a migration scenario, between 10% to 35 % of all SQL statements experience changed access paths
 - The good news...
 - Many changes may be ignored (remember V8)



Access Paths Rely on Statistics

- Always remember that access paths rely on statistics
- The better the statistics, the better the DB2 Optimizer can be at determining the appropriate access paths
- If you are going from V8 to 10: keep in mind
 - Between DB2 V8 and DB2 9
 - The algorithm used for RUNSTATS changed.
 - Different “opinion” as to what is clustered.
 - When will you update RUNSTATS?
- Always a good idea, though:
 - Save performance and access path information
 - To be able to compare before and after

Let's Talk About Rebinding and Access Paths



When Are Access Paths Changed?



Program changes:
BIND is required

Application
Development

Statistics change:
REBIND after RS

Maintenance

Optimizer changes:
REBIND

New DB2 Release
Version or PTF

Migration Scenario



New DB2
Release or PTF

No Program changes
No Statistic changes *
Optimizer changes

(* depending on your strategy)

Version Migration Concerns

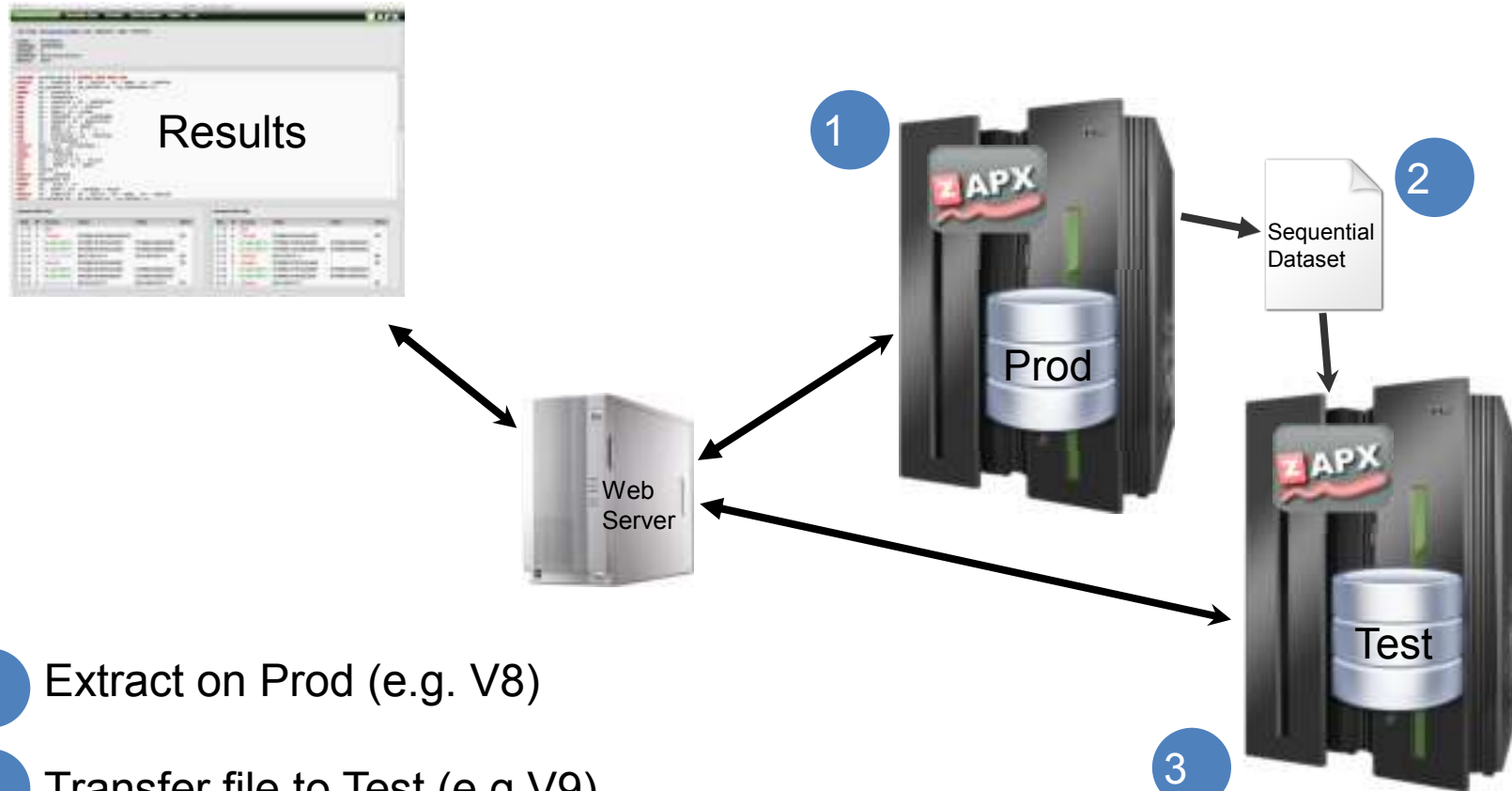


- Typically, it is not a hard & fast **requirement** to REBIND all of your packages and plans when you move to a new version of DB2.
 - However, it is a really good idea to REBIND the most critical.
- There are a lot of optimizer enhancements and performance improvements that you won't get without a REBIND.
- And there are some REBINDs you cannot avoid.
 - For DB2 9, plans and packages from DB2 V4 or earlier will be automatically rebound when accessed by DB2 9.
 - For DB2 10:
 - Plans and packages from DB2 V5 or earlier will be automatically rebound when accessed by DB2 10.
 - Plans bound with DBRMs are automatically rebound to convert it to a PKLIST and the DBRMs are bound into packages.

Easing DB2 Version Migration with zAPX



Migration Scenario



- 1 Extract on Prod (e.g. V8)
- 2 Transfer file to Test (e.g V9)
- 3 Compare on Test

Graphical Overview



Generate Charts about SQL Access Path Progression over time or Categories

Statement Overview



Webint - zSystems zAPX

SYSTEST Functions Worklist Save Mail About Logout

Job Time: 2010-09-02 14:42:10.607958

Collid: CSPM14
Package: ZSPM
Version:
Bindtime: 2010-09-02 14:39:35.830448

Sv	Stmntno	Sectno	Access Path				Chg	Service Units			Length	Stmnt
			Old	New	Old	New		Old	New	Diff		
1920		0			lp(1)	lp(1)	IX, AT, MC, PF	311	2	-309	43	DELETE FROM ZSPM_
5054		0			lp(1)	TS(1)		2743	49668	48825	78	DELETE FROM ZSPM_
5051		0			lp(1)	TS(1)		4753	44924	40171	72	DELETE FROM ZSPM_
5090		0			lp(1)	TS(1)	IX, AT, MC, PF	10	3168	3178	261	SELECT SUM (CALC_
6141		0			lp(1)	TS(1)	IX, AT, MC, PF	141	44880	44719	43	DELETE FROM ZSPM_
6649		0			nmix(2), sort(1)	lp(2), hb(1), sort(1), lp(1)	IX, MTD(1), AT, JSQ, JSQ, PF	10	485	475	3187	DECLARE LPS_SELEC
2403		0			lp(1), nmix(1)	lp(1), nmix(1)	PF	75	2	-73	371	SELECT CASE WHEN F
3308		0			lp(1), nmix(1)	lp(1), nmix(1)	PF	75	2	-73	361	SELECT CASE WHEN F
4186		0			lp(1), nmix(1)	lp(1), nmix(1)	PF	75	2	-73	368	SELECT CASE WHEN F
5103		0			lp(1), nmix(1)	lp(1), nmix(1)	PF	75	2	-73	368	SELECT CASE WHEN F
2370		0			lp(1)		PF	80	7	-73	45	DELETE FROM ZSPM_
930		0			lp(1)	lp(1)		1	1	0	66	SELECT CURRENT TIM
1790		0						1	1	0	152	SELECT LAST_SNAPS
1845		0						1	1	0	197	UPDATE ZSPM_ORDEI
1887		0						1	1	0	72	UPDATE ZSPM_ORDEI
1994		0						2	2	0	275	INSERT INTO ZSPM_M
2081		0						2	2	0	414	INSERT INTO ZSPM_SF
2162		0			lp(1)	lp(1)		2743	198	-2545	85	DELETE FROM ZSPM_
2195		0			lp(1)	lp(1)		2743	2	-3741	90	DELETE FROM ZSPM_
2208		0			lp(1)	lp(1)		2743	325	-2418	78	DELETE FROM ZSPM_
2278		0						2	2	0	375	INSERT INTO ZSPM_SF
2490		0						2	2	0	419	INSERT INTO ZSPM_SF

Access path rating & changes at a glance

Improved Rule System

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A table space scan is not always a table space scan!


zAPX has different ratings for ACCESSSTYPE='R'

Object size and TABLETYPE (B, C, F, M, Q, R, S, T, W) are taken into account

(Similar handling for non matching index scan)

Change Detection

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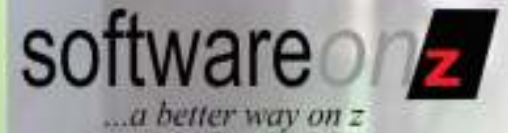
zAPX not only identifies changes like usage of a different index or a changed join sequence.

zAPX reports these changes, so the user can search for specific changes

e.g.: Find all SQL with a changed join sequence where table T1 is involved

Access Path Change Profiler

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- Often when reviewing access path comparison results e.g. in a migration scenario, you find the same access path changes again and again.
- Let's say before a migration from DB2 V8 to V9 you analyze the access paths in a V9 test system.
- You find a lot of access paths that have changed from sequential to dynamic prefetch. These are listed as "changed".
- With zAPX you setup a search profile, like shown in the next foil, where you specify that you want to find all SQL that have changed from sequential to dynamic prefetch, but no other changes in the access path except for TS Lockmode, which you don't care for.
- The result is a list of statements that match your criteria.
- In the result screen you may change the category of some or all statements from „changed“ to e.g. "irrelevant" to reduce the number of statements you have to review.

Access Path Change Profiler



- 1 Select changes that you look for
- 2 Select changes that should not occur
- 3 Select changes that you don't care for
- 4 Get a list of SQL matching your filters
- 5 Change the category of SQL statements

	Sv	Stmntno	Sectno	Old	New	Old	New	Chg
<input checked="" type="checkbox"/>	Yellow	2403	0	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	PF
<input checked="" type="checkbox"/>	Yellow	3306	0	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	PF
<input checked="" type="checkbox"/>	Yellow	4186	0	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	PF
<input checked="" type="checkbox"/>	Yellow	5103	0	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	ts(1), nmix(1)	PF
<input checked="" type="checkbox"/>	Green	2370	0	lp(1)	lp(1)	lp(1)	lp(1)	PF

Access Path Change Profiler



The screenshot shows the APX Access Path Profiler interface. It includes a navigation menu with 'Functions', 'Worklist', 'Save', 'Mail', 'About', and 'Logout'. The main content area is divided into several sections: 'Catalog' (Packages, Plans), 'Batch Extracts' (Static, Dynamic), and 'Comparison Results' (Static, Dynamic). Below these are filter sections for 'Package/Plan Filter' (Date, Package, Version, Owner) and 'Access Types (occurrence new > old)'. The 'Access Types' section has a list of checkboxes, with 'Tablespace Scan on a table > 500 pages' selected. Below this is the 'Access Path' section with various filters. At the bottom, there is a 'Select Job' section with a job ID and 'Search'/'View' buttons.

Access Path 7							
<input checked="" type="checkbox"/>	Sv	Stmtno▲▼	Sectno.▲▼	Old	New	Old▲▼	New▲▼
<input checked="" type="checkbox"/>		5551	0	Yellow	Red	ts(1)	TS(1)
		5054	0	Yellow	Red	ts(1)	TS(1)

The context menu is open over the second row of the table, showing options: 'reset', 'reviewed', 'irrelevant', and 'severe' (which is selected).

- 1 Select changes that you look for
- 2 Get a list of SQL matching your filters
- 3 Change the category of SQL statements

3

Worklist



Worklist - zSystems z10

Results APX DEMO Generate Jobs Worklist About Exit

z APX

Worklist

Created By	In Charge	Insert TS	Status	Severity	Remarks	
Neumann	bernd@dev	2010-05-18 18:58:47	new	high	Please review access path	  
Neumann	karl@inform.com	2010-05-14 08:50:37	new	high	Stmt List	  
Neumann	Neumann	2010-05-18 11:25:37	new	high	Workfile TS Scans	  
Neumann	karl@inform.com	2010-05-14 08:50:12	new	medium	Stmt	  
Neumann	Neumann	2010-05-18 18:01:12	new	medium	AP with sequence changes	  
Neumann	Neumann	2010-05-17 17:04:41	new	medium	Longer AP	  

Worklist allows direct access to the stored results

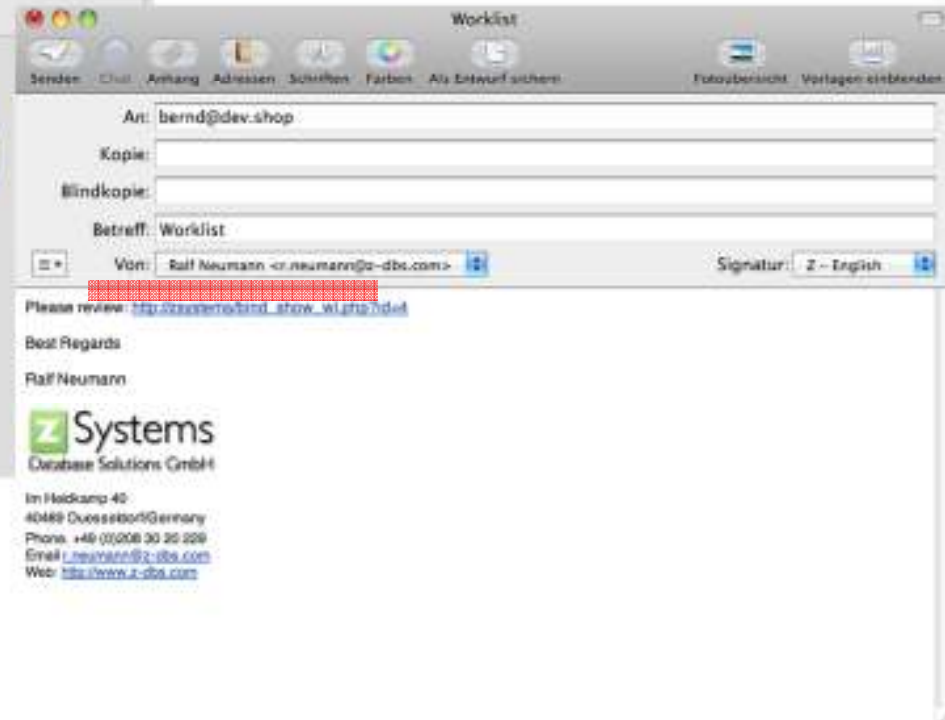


Send Worklist As Link



Created By	In Charge	Insert TS	Status	Severity	Remarks
Neumann	Bernolden	2013-05-16 19:55:47	new	high	Please review system path
Neumann	raff@dbis.com	2013-05-14 08:30:37	new	high	Send List
Neumann	Neumann	2013-05-15 11:28:07	new	high	Shuttle T2-Siem
Neumann	raff@dbis.com	2013-05-14 09:50:12	new	medium	Site
Neumann	Neumann	2013-05-10 19:01:12	new	medium	All soft accounting changes
Neumann	Neumann	2013-05-11 17:54:51	new	medium	Larger MP

ZAPX user Interface is web-based, so all pages may be stored as bookmark in the worklist and provided to person in charge by email.



Additional Benefits

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- Search for specific access types for static and dynamic SQL
- Find static and dynamic SQL that refers to specific objects
 - Tables
 - Indexes

Find Static SQL

The screenshot shows the zAPX Access Path Profiler interface. The left sidebar contains filter sections: 'Package/Plan Filter' (1), 'Object Filter' (2), 'Access Types (for above objects)', and 'Access Types (general)' (3). The main area displays a table of results (4) with columns: Cost, Package, Version, Access, Objects, Rows, Length, and Item. The table lists several SQL queries with their associated costs and lengths.

Cost	Package	Version	Access	Objects	Rows	Length	Item
2076	2076		321	54	1	39	SELECT CURRENT TIME INP=QC - FROM DBNAME, DEDUPLY=PTCH QP
2076	2076		3421	2451	18	211	SELECT TABE INW M UNDER, TIME IS MA WITH WIP=PT=PT=00000000000000000000
2076	2076		3200	3045	18	4331	DECLARE CAG, SELECT CURSOR FOR SELECT * FROM CAGNFCT28, WARD, AL-
2076	2076		3200	3100	18	381	SELECT CASE WHEN W_CNDXK, TIME IS NULL THEN WIP=PT=PT=00000000000000000000
2076	2076		3128	2108	31	9684	DELETE EQ, SELECT CURSOR FOR SELECT * FROM WARD AS DWANET, LCAE EQE I
2076	2076		4100	4100	20	305	SELECT CASE WHEN M_CNDXK, TIME IS NULL THEN WIP=PT=PT=00000000000000000000
2076	2076		4200	4400	27	1042	DELETE W, SELECT CURSOR FOR SELECT * FROM WIP=PT=PT=00000000000000000000
2076	2076		3100	3100	31	300	SELECT CASE WHEN M_CNDXK, TIME IS NULL THEN WIP=PT=PT=00000000000000000000
2076	2076		3040	3040	34	1147	DELETE LPS, SELECT CURSOR FOR SELECT FROM DBNAME, WIP=PT=PT=00000000000000000000

- 1 Specify Package / Plan Filter
- 2 Specify Objects + Access Type Rules
- 3 Specify Additional Rules
- 4 Get a list of SQL matching your filters

Find Static SQL

Package/Plan Filter

Collid * Add * Uppercase

Package *

Version *

Owner *

+

Access Types (general)

Merge scan join

Physical sort

Hybrid join

Tablespace scan on a table > pages

Non matching index scan on an index > % of the table

Multiple index access

List prefetch

+

Object Filter

Table Index

Creator * Add * Uppercase

Name *

Access Types (for above objects)

Merge scan join

Hybrid join

Tablespace scan

Non matching index scan

Multiple index access

No index only access

List prefetch

Source is the PLAN_TABLE

Find Dynamic SQL

The screenshot shows the APX Access Path Profiler interface. It includes sections for Catalog, Batch Extracts, Comparison Results, Object Filter, Access Types (for above objects and general), and Runtime Information. A table of results is displayed on the right side of the interface.

Stmtid	Program	Cached TS	Execs	Getp	Elapsed	CPU	AvgElapsed	Avg CPU
201	ZSPM	2010-11-25 19:01:28.870678	2	6593	00:00:06.313618	00:00:06.166041	00:00:04.156806	00:00:03.084021
202	ZAPX05CS	2010-11-25 15:05:15.401418	2	2398	00:00:07.382467	00:00:06.916588	00:00:03.891233	00:00:02.958295
203	SYSSH200	2010-11-29 11:15:34.377800	4	6224	00:00:06.417888	00:00:06.320372	00:00:01.804475	00:00:01.330593
201	SYSSH200	2010-12-01 11:13:20.594362	1	1525	00:00:03.850604	00:00:02.741249	00:00:03.630804	00:00:02.741249
303	SYSSH200	2010-12-01 11:12:37.830188	1	1518	00:00:02.913497	00:00:02.139078	00:00:02.913497	00:00:02.139078
301	ZAPX05CS	2010-11-30 11:57:29.326781	1	1831	00:00:02.780710	00:00:02.520087	00:00:02.520087	00:00:02.520087
302	SYSSH200	2010-12-01 11:13:44.127001	1	1518	00:00:02.867578	00:00:02.587627	00:00:02.587627	00:00:02.587627
81	SYSSH200	2010-11-25 14:36:14.786641	1	94	00:00:01.740321	00:00:01.506020	00:00:01.506020	00:00:01.506020
84	SYSSH200	2010-11-25 12:48:55.484640	1	94	00:00:01.566478	00:00:01.393782	00:00:01.566478	00:00:01.393782
301	SYSSH200	2010-11-30 14:16:51.306665	1	2057	00:00:01.301513	00:00:01.196615	00:00:01.301513	00:00:01.196615

1 Specify Objects + Access Types

2 Specify Additional Rules

3 Specify Runtime Filters

4 Get a list of SQL matching your filters

Find Dynamic SQL

Object Filter

Table Index

Creator * Add * Uppercase

Name *

Access Types (for above objects)

Merge scan join
 Hybrid join
 Tablespace scan
 Non matching index scan
 Multiple index access
 No index only access
 List prefetch

+

Access Types (general)

Merge scan join
 Physical sort
 Hybrid join
 Tablespace scan on a table > pages
 Non matching index scan on an index > % of the table
 Multiple index access
 List prefetch

+

Runtime Information

Avg.Elapsed > sec.
 Avg.CPU > sec.
 Avg.Getpages >
 # Executions >
 Rows examined : processed > :1
 Avg.TS scans >

Source is the PLAN_TABLE

Summary



- zAPX provides
 - A granular rule system for intelligent access path comparison
 - A system to easily identify SQL showing specific changes / access types
 - Smoother workflow by allowing to override the change-categories
 - and much more like Explain, Catalog Browser, Worklists etc.

Additional Information

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- **IBM DB2 main web page:** <http://www.ibm.com/software/data/db2/zos/>
- **DB2 10 web page:** <http://www.ibm.com/software/data/db2/zos/db2-10/>
- **DB2 Information Center:**
<http://www.ibm.com/support/docview.wss?uid=swg27019288>
- **DB2 for z/OS IBM Redbooks:**
<http://www.redbooks.ibm.com/cgi-bin/searchsite.cgi?query=DB2+AND+z/OS&SearchOrder=4&SearchFuzzy=>

For More Information



- To learn more about **Z APX** or to start a trial

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