

**Power  
Week**

# Université IBM i 2019

**22 et 23 mai**

IBM Client Center Paris



## **S15 – IBM i 7.4 overview**

*Wednesday May 22 – 14:45-15:45*

**Steve Will**

IBM

*IBM i Chief Architect*

# IBM i Roadmap



2014

2016

2019



7.2



7.3



7.4



i Next



i Next+1

Technology  
Refreshes



.....

7.3 TR6



.....



.....



.....

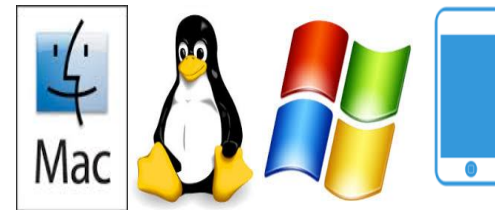
\*\* All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

\*\* Arrows indicate "ongoing status" and do not imply any specific dates.

# Strong Foundation for Continuous Innovation



- Db2 – Integrated Analytics, Security & Service Orientation
- Solution Development Innovation – Modern RPG plus Open options
- Intuitive Management & Access on any platform
- Reliable, Securable, Auditable, Scalable on site or in a cloud



# IBM i 7.4 & More Cornerstone Announcements





## **Continuous Availability**

- IBM Db2 Mirror for i

## **Security**

- Authority collection - object based control
- Latest industry standards

## **Application Development**

- From Db2 to RPG and COBOL
- Open Source and REST

## **Accessing IBM i**

- Access Client Solutions (ACS)
- Services

**POWER; Workload Groups; Cloud options and More!**

# Continuous Availability Db2 Mirror for i



# Anytime, Anywhere



# Anytime, Anywhere





# How Close to “Anytime” or “All the time” do you need?



# How Close to “Anytime” or “All the time” do you need?



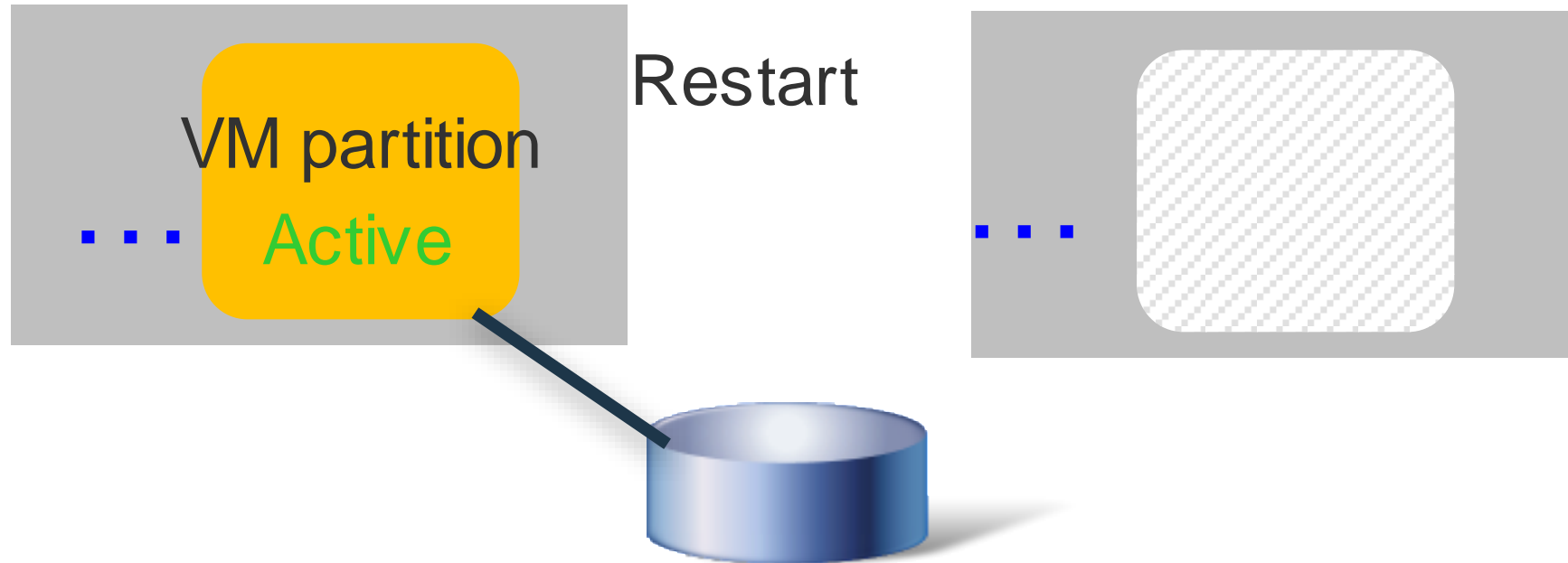
- RTO – Recovery Time Objective
  - How long are you willing to accept your application cannot do its work?



# How Close to “Anytime” or “All the time” do you need?

- RTO – Recovery Time Objective
  - How long are you willing to accept your application cannot do its work?
- Recovery Point Objective
  - How much time are you willing to let pass between your last good data and your next good data?

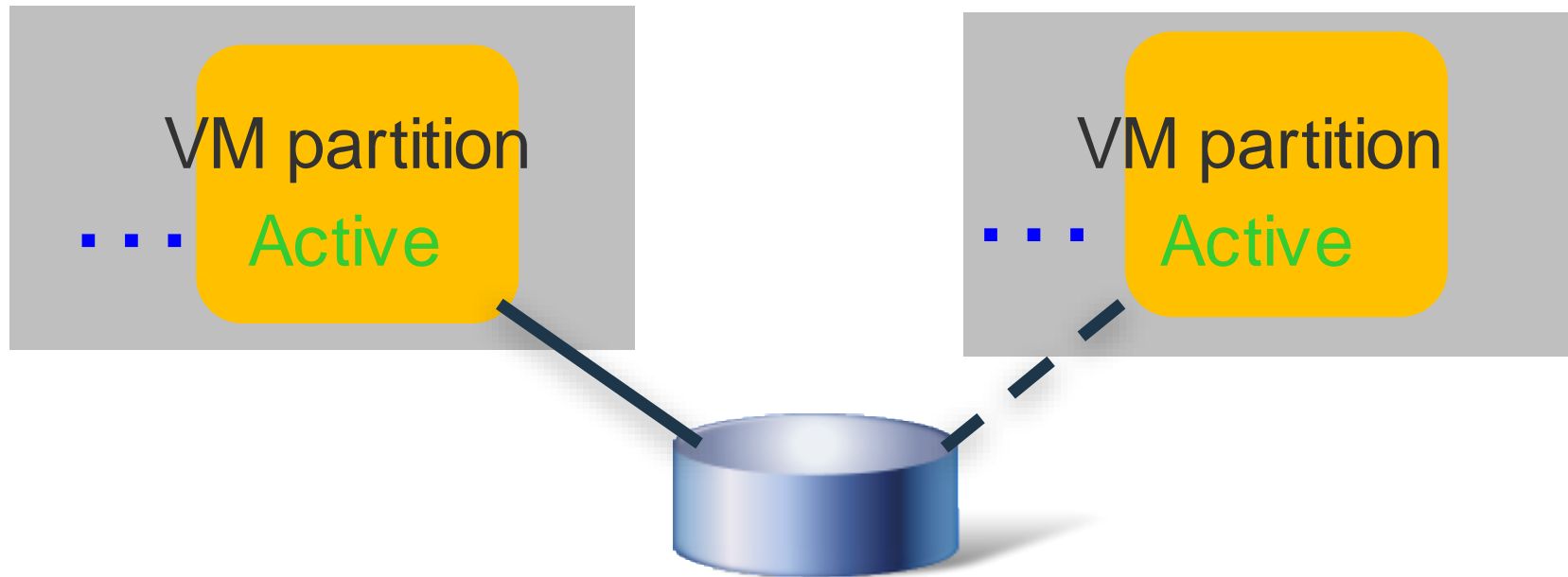
## Active/inactive



RTO significantly greater than 0.

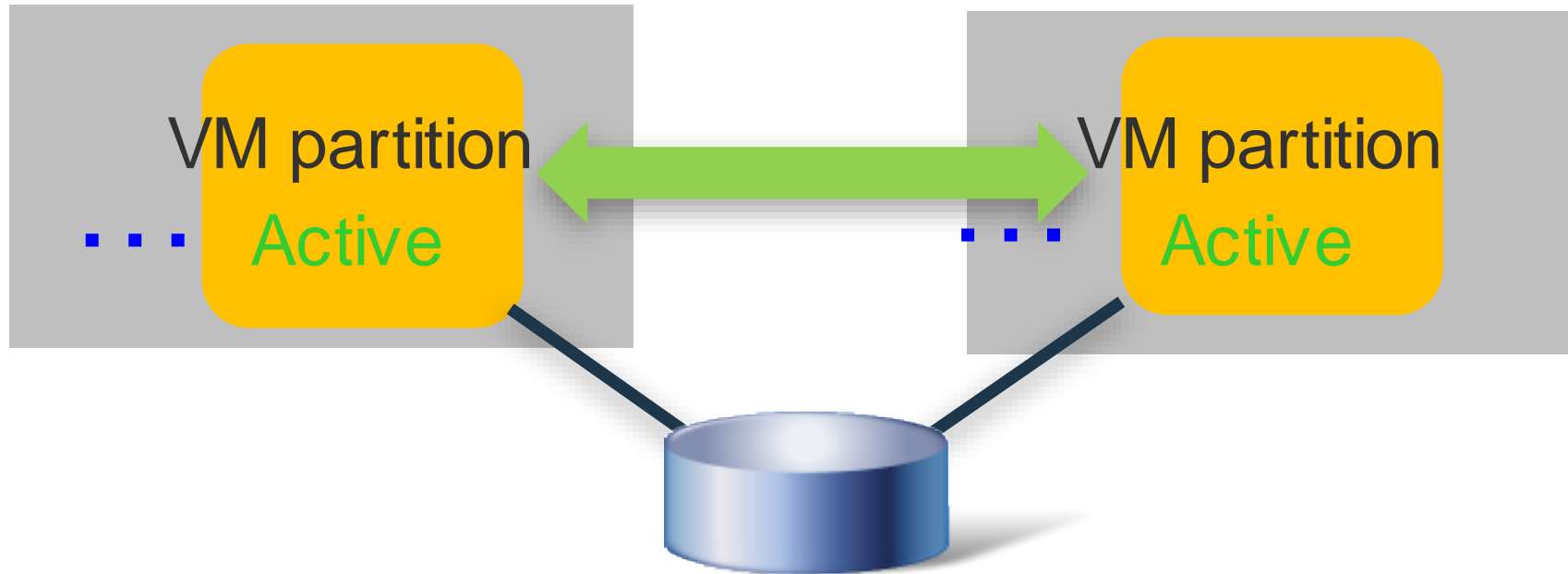
RPO allows for a relatively long period of no data processing.

## Active/Passive



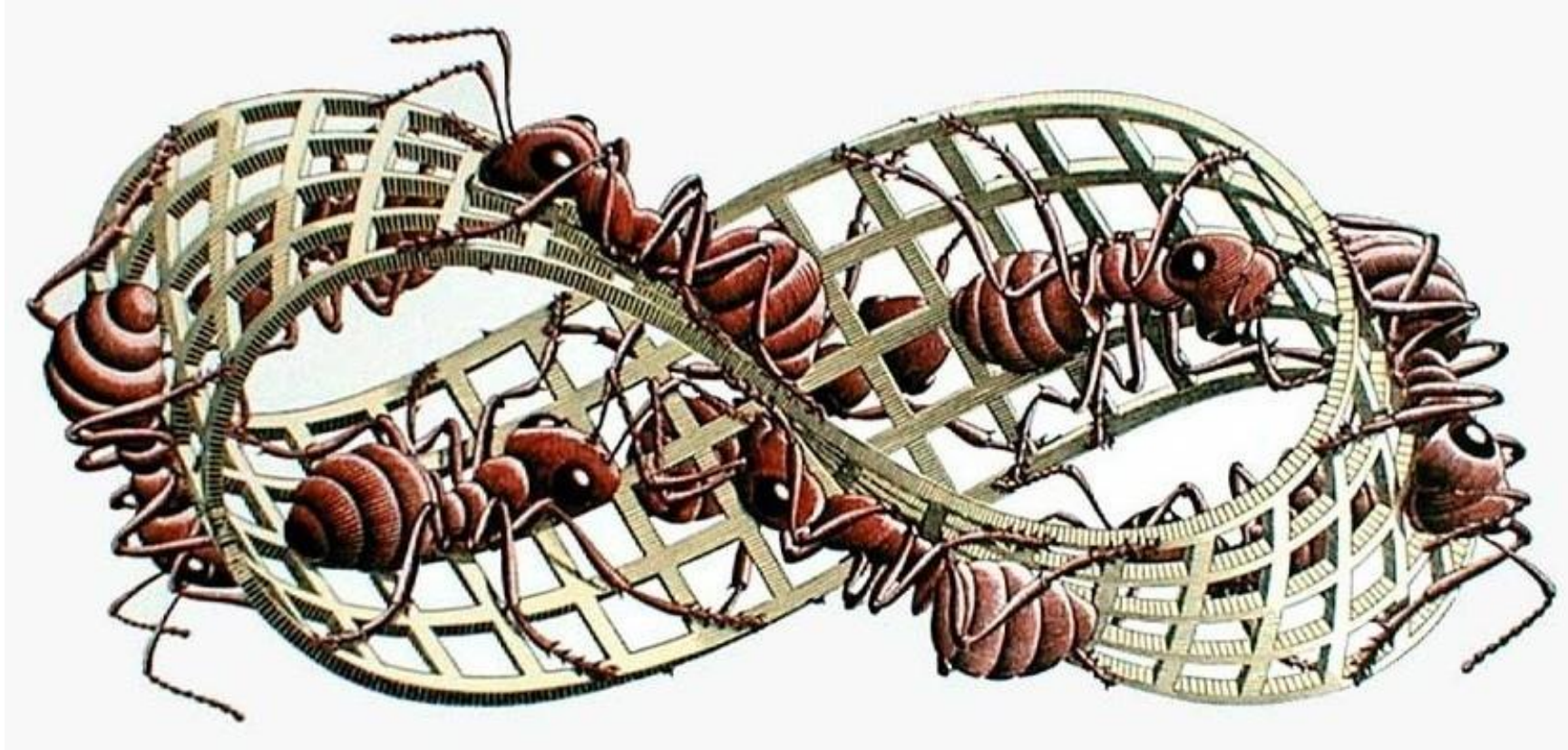
RTO could be small but still greater than 0.  
RPO still allows for a break in data processing.

## Active/Active

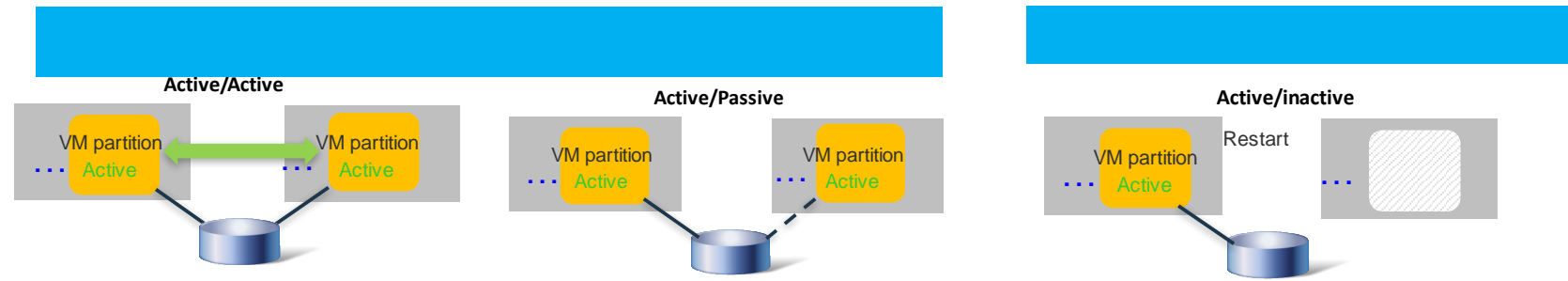


RTO 0 in most cases; very close to 0 at maximum.  
RPO does not allow data processing gaps.

# Continuous



# High Availability topology classification & positioning



Technology	Active/Active Clustering	Active/Passive Clustering	Active/Inactive
Definition	<b>Application level clustering;</b> applications in the cluster have simultaneous access to the production data therefore no app restart upon an app node outage. Certain types enable read-only access from secondary nodes	<b>OS level clustering;</b> one OS in the cluster has access to the production data, multiple active OS instances on all nodes in the cluster. Application is restarted on a secondary node upon outage of a production node.	<b>VM level clustering,</b> One VM in a cluster pair has access to the data, one logical OS, one or two physical copies. OS and applications must be restarted on a secondary node upon a primary node outage event. LPM enables the VM to be moved non-disruptively for a planned outage event.
Outage Types	SW,HW,HA, planned, unplanned RTO 0, limited distance	SW,HW,HA,DR, planned, unplanned, RTO>0, multi-site	HW,HA,DR, planned, unplanned, RTO>0, multi-site
OS integration	Inside the OS	Inside the OS	OS agnostic
RPO	Sync mode only	Sync/Async	Sync/Async
RTO	0	Fast (minutes)	Fast Enough (VM Reboot)
Licensing*	N+N licensing	N+1 licensing	N+0 licensing
Industry Examples	Oracle RAC, <b>Db2 Mirror</b> , pureScale	PowerHA, Redhat HA, Linux HA	VMware, VMR HA, LPM,

- N = number of licensed processor cores on each system in the cluster
- Illustrations represent two-node shared-storage configurations for conceptual simplicity. There are many other topologies and data resiliency combinations



# IBM Db2 Mirror for i



**Operating System Synchronous Replication**

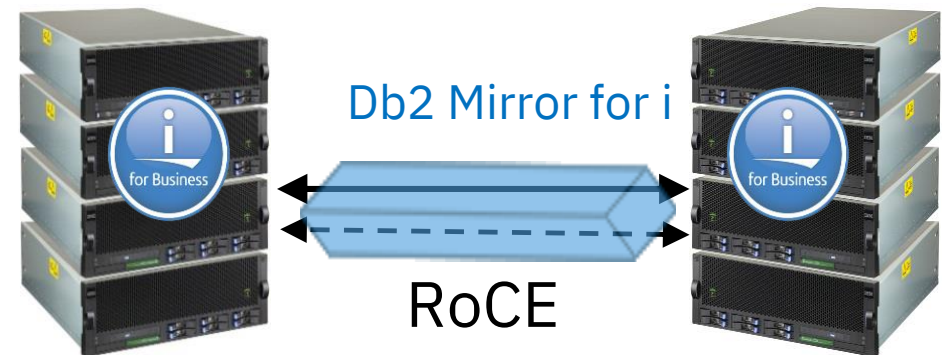
**Continuous Availability**

**24 x 7 Up Time**

**Rolling Upgrades**

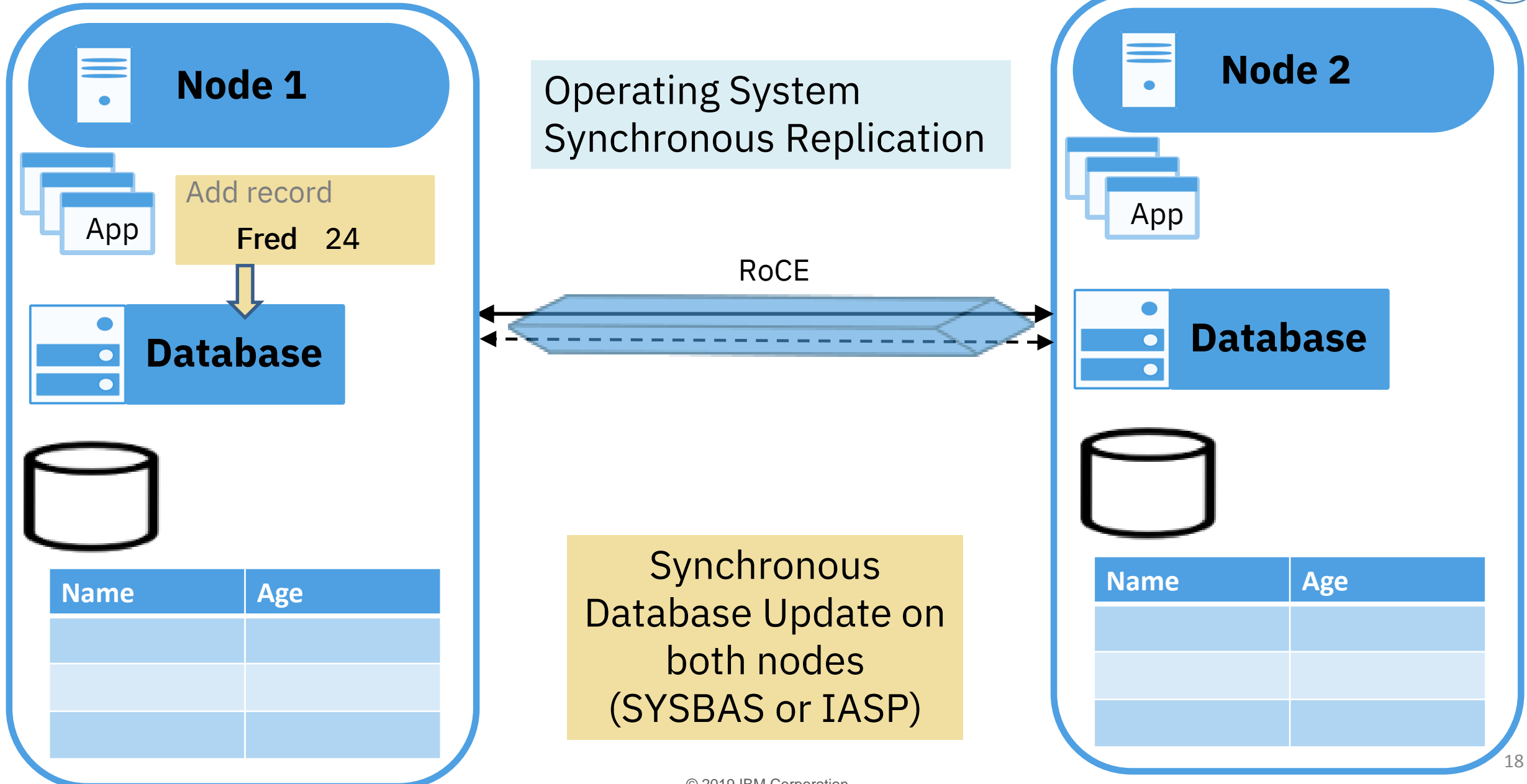
**RTO/RPO Near Zero**

IBM Db2 Mirror for i (5770-DBM)



**POWER8 or later & IBM i 7.4  
+ External Storage**

# Db2 Mirror – Active Active



# Db2 Mirror – Database Supported Objects



Database replication eligible objects

## Native:

- Database Physical & Logical File

## SQL:

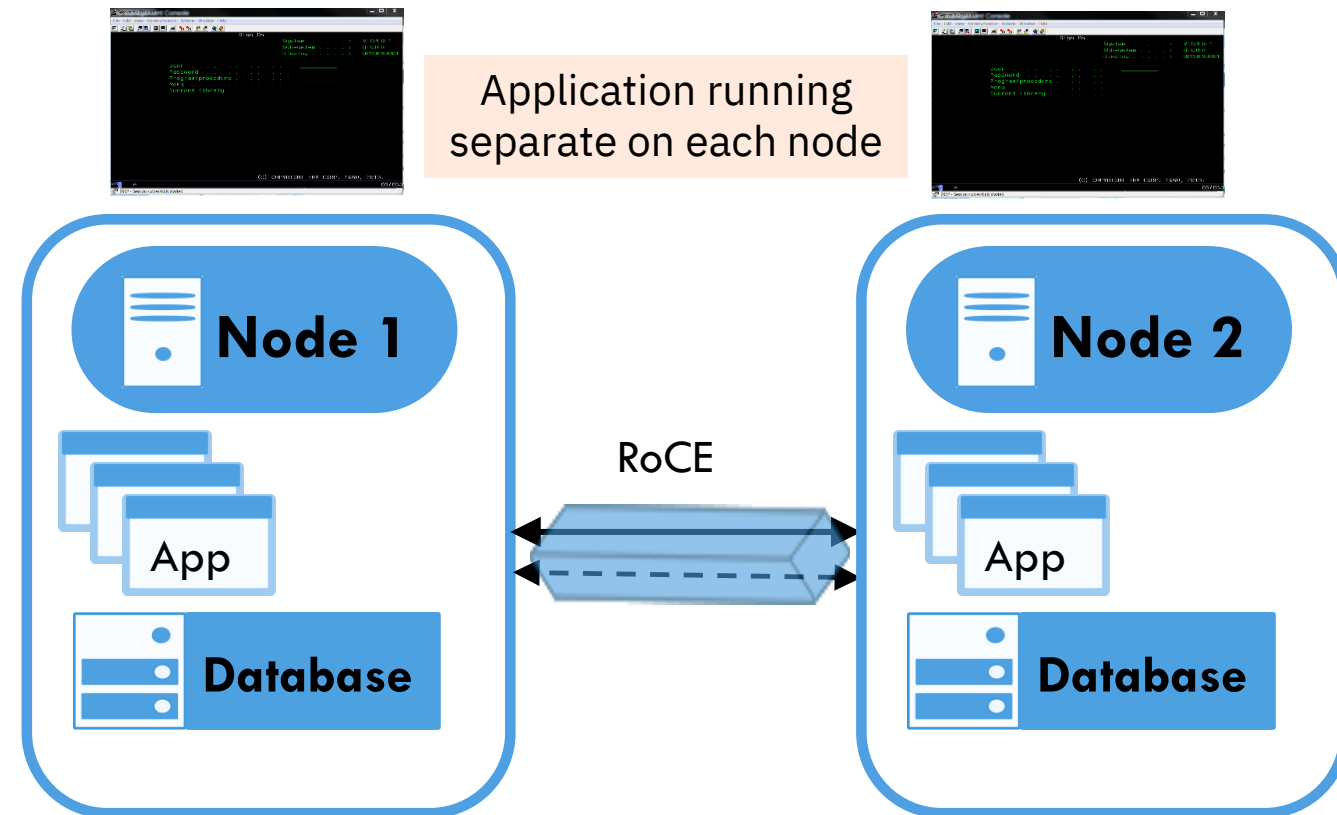
- Alias
- Function
- Global Variable
- Index
- Procedure
- Schema
- Sequence
- SQL Package
- Table
- Trigger
- User Defined Type
- View
- XML Schema Repository

Included with File support:

- Row Permission
- Column Mask
- Temporal Table
- Constraint
- Etc...



DDS / Record Level Access  
SQL / Set Based Access



# Db2 Mirror – Other Supported Objects

## Other Objects

- User profile
- Authority
- Ownership
- Security
- PGM/SRVPGM
- Data Area
- Data Queue (DDL Only)
- System Values
- Environment Variable LEVEL(\*SYS)
- Library
- Job Description
- Journal

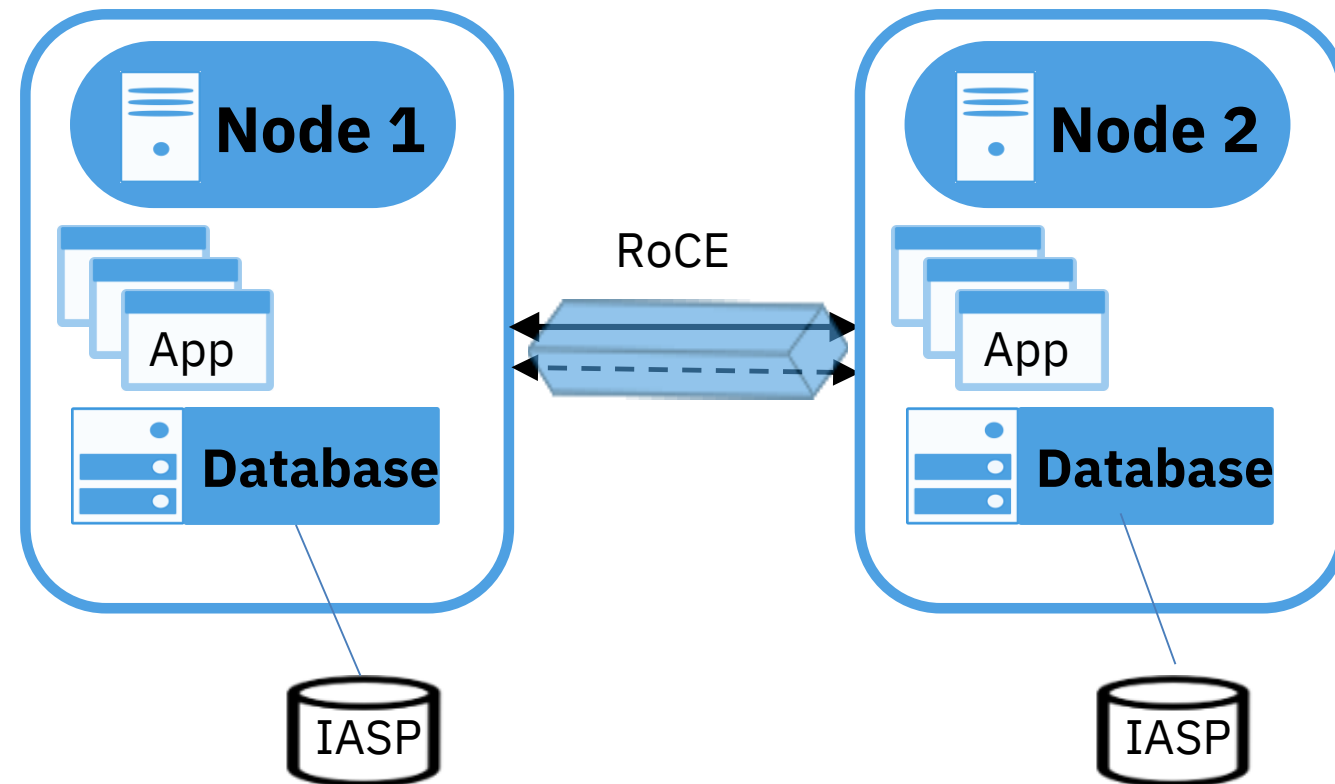
## Special Handling

- o Output Queue & Spool
- o Job Queue

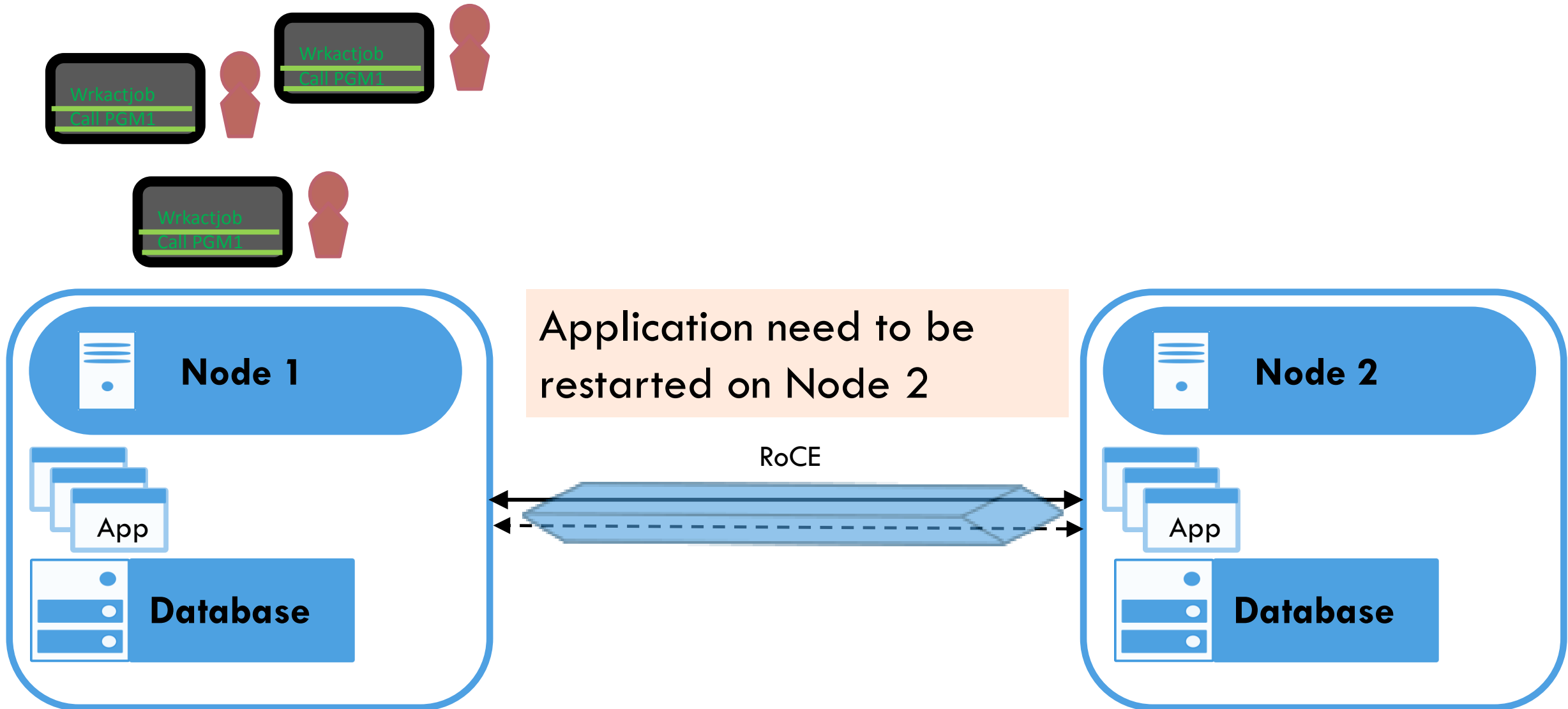
## Exceptions

- User Space
- User Index
- User Queue
- Journal Receiver

✓ SYSBAS  
✓ Database IASPs



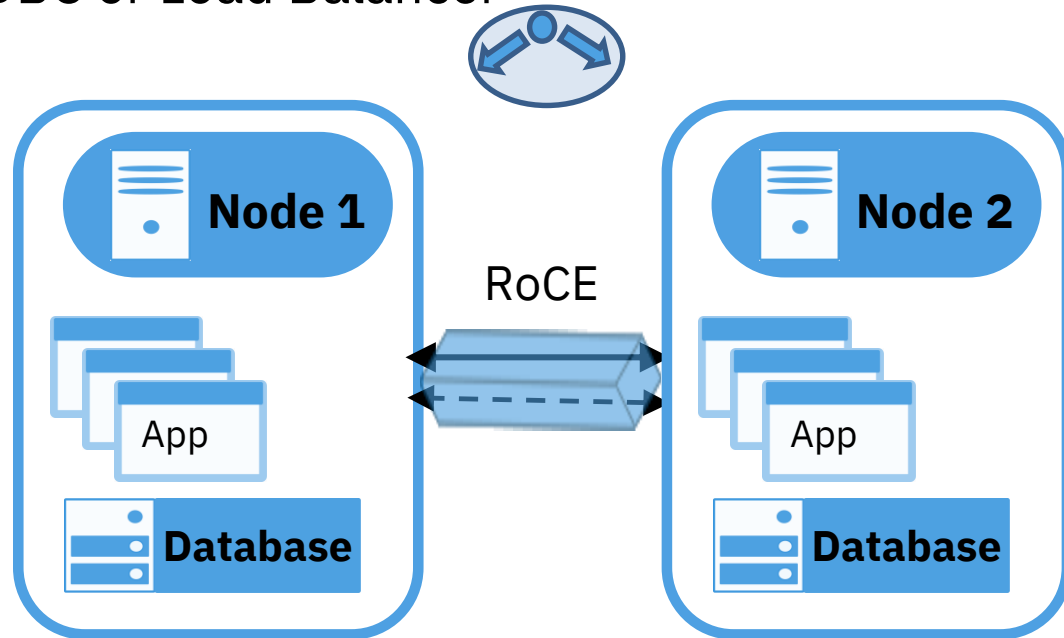
# Db2 Mirror – Active Active, Green Screen Application



# Db2 Mirror – Active Active



Application layer connects with either JDBC or Load Balancer

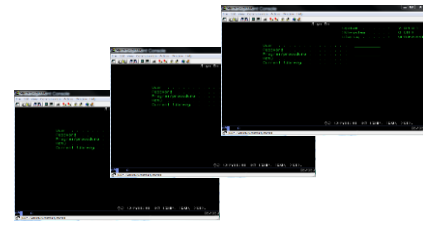
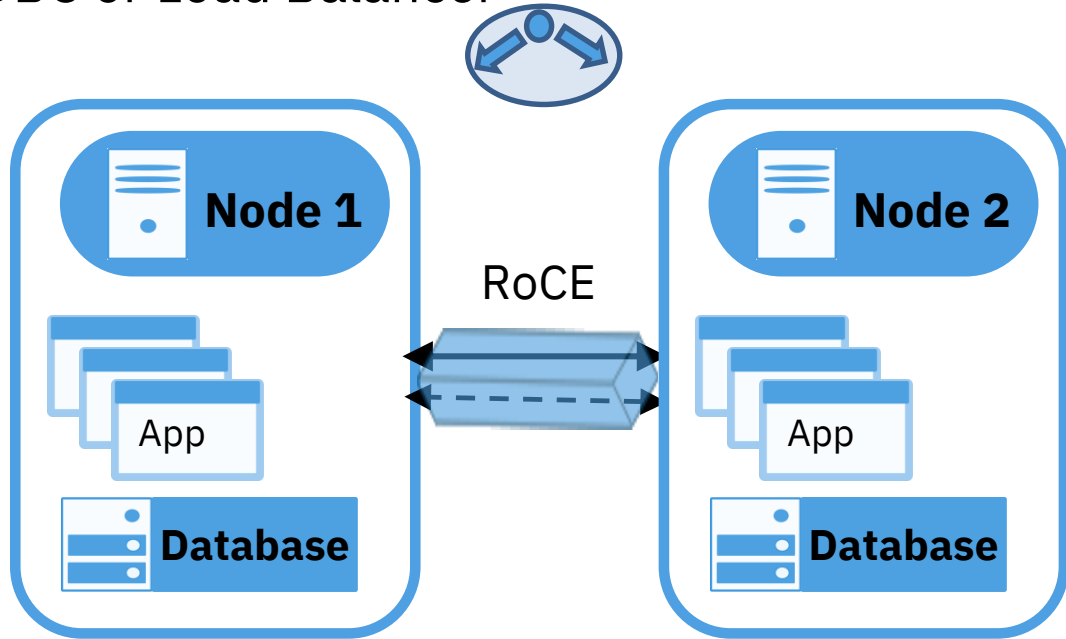


# Db2 Mirror – Active Active

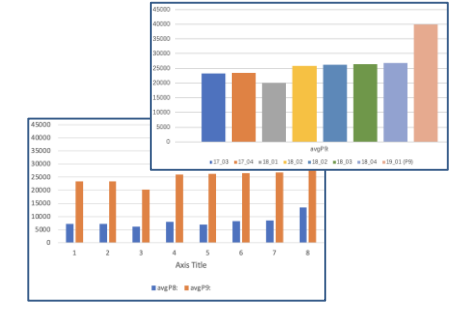
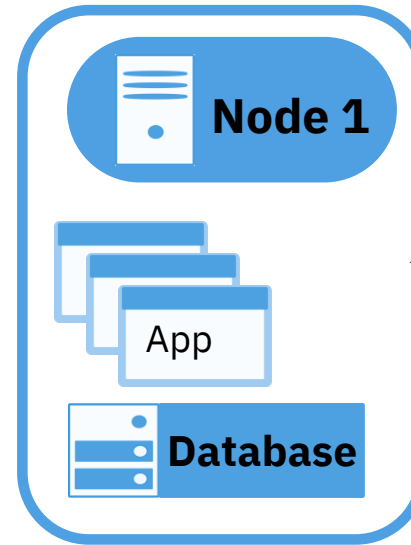
# Active “Less Active”



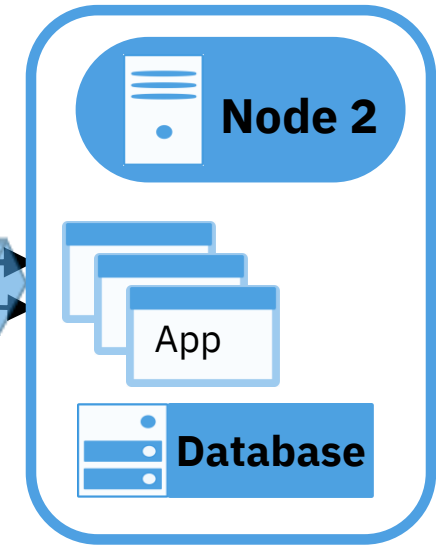
Application layer connects with either JDBC or Load Balancer



Run Production Workloads

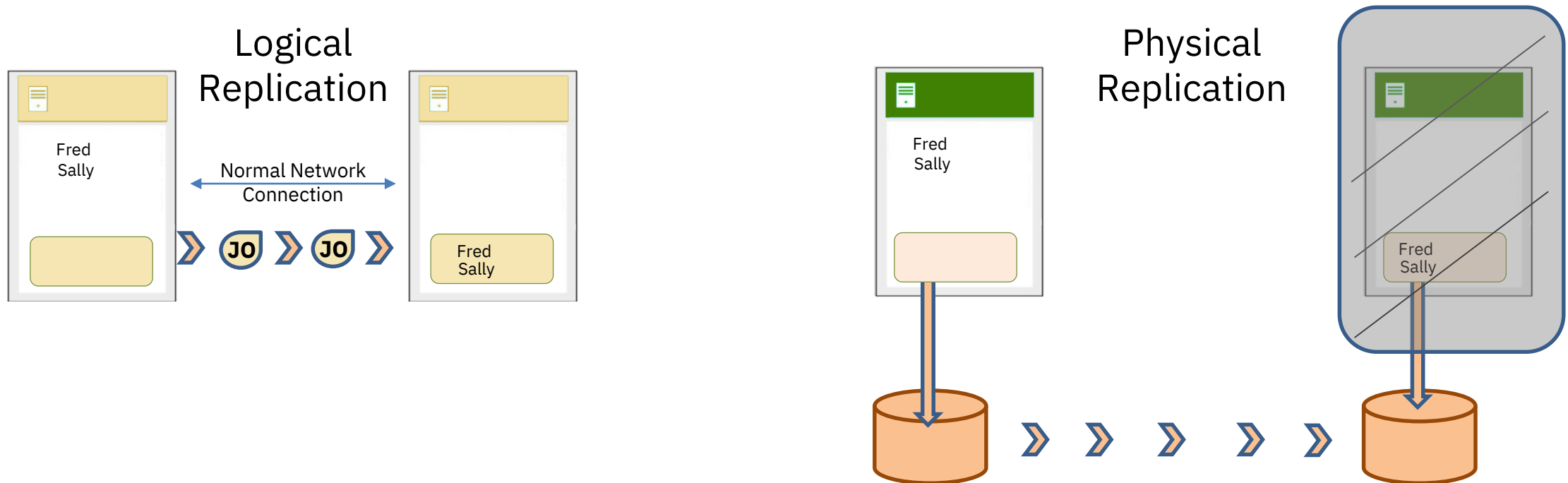


Run Queries and reports



# Db2 Mirror – What makes it different

- IBM i Operating System synchronization technology
- Does not leverage any previous Availability technology to provide continuous availability
  - But does work with existing technology





# Db2 Mirror – Where to get more information



[http://www-01.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_74/db2mi/db2mintro.htm](http://www-01.ibm.com/support/knowledgecenter/ssw_ibm_i_74/db2mi/db2mintro.htm)

Home > IBM i 7.4 > Availability >

## Db2 Mirror

☰ Table of Contents    Change version or product ▾

IBM® Db2® Mirror for i is a continuous availability solution which offers the ability to keep database files synchronized between two nodes and

- **PDF file for Db2 Mirror**  
Use this to view and print a PDF of this information.
- **Intro and architecture**  
IBM Db2 Mirror for i enables a continuous availability solution for data on IBM i. This solution allows for the availability of Db2 content acc or eliminate common downtime windows.
- **Db2 Mirror concepts**  
This section describes the basic concepts you need to understand when working with Db2 Mirror.
- **Application considerations**  
The design of your production applications will affect the response time objective possible with IBM Db2 Mirror for i. Changes to your app Mirror environment.
- **Planning and setup**  
Many decisions need to be made as you prepare and step through the Db2 Mirror setup process. Db2 Mirror configuration concepts shoul decisions for your business.
- **Managing and monitoring Db2 Mirror**  
To facilitate continuous availability of your applications, it is necessary to understand how to monitor the Db2 Mirror environment, how to maintain your Db2 Mirror environment as your production environment evolves.
- **Db2 Mirror services**  
There are many SQL services that you can use to work directly with the Db2 Mirror environment.

# Security Enhancements with IBM i 7.4



# Continuous Security - Topics



- Authority Collection – Objects
- TLS
- SMB3



# Authority Collection by User Profile

IBM i 7.3



## Concept

- Capture detail related to authority checks for a specific **user**

## Benefits

- ❖ **Safely reduce** excess authorization
- ❖ **Review** authorization model prior to deploying new solutions
- ❖ **Train** your IBM i security officers
- ❖ **Diagnose** authorization failures

## Acquisition Cost

- None - included in IBM i 7.3



# Authority Collection by Object

IBM i 7.4



## Concept

- Capture detail related to authority checks for a specific **object**

## Benefits

- ❖ **Safely reduce** excess authorization
- ❖ **Review** authorization model prior to deploying new solutions
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## Acquisition Cost

- None - included in IBM i 7.4



# Authority Collection by Object

- As of IBM i 7.4 authority collection support allows the collection of authority information for **specific objects** when accessed by **any user**
- The authority collection value for an object set with the new **Change Authority Collection (CHGAUTCOL) command**
- Object types:
  - QSYS file system
  - "root" (/)
  - QOpenSys
  - User-Defined File Systems
  - Document Library Objects



# Authority Collection – Capturing the detail

- **Change Authority Collection**

- Point to specific objects to opt IN or OUT
- Optionally include dependent objects
- Change Authority Collection (CHGAUTCOL) or Navigator for i



- **Start Authority Collection**

- Point to a specific user profile or \*OBJAUTCOL
- To monitor objects, this is the ON / OFF switch
- Start Authority Collection (STRAUTCOL) or Navigator for i



- **End Authority Collection**

- Point to a specific user profile or end all object collection
- End Authority Collection (ENDAUTCOL) or Navigator for i



# Authority Collection Interfaces



- **Configure Authority Collection:**

- CL Commands
- Navigator for i

Authority Collection for Objects

Display Authority Collection - Localhost

No filter applied

Authorization Name	Detailed Current Authority	Detailed Required Authority	Current Authority	Required Authority	System Object
Scottf	*OWNER *OBJEXIST *	*READ	*ALL		Employee
Scottf	*OWNER *OBJEXIST *	*OBJOPR	*ALL		Employee
Scottf	*OWNER *OBJEXIST *	*OBJOPR	*ALL		Employee
Frankdba	*OBJEXIST *OBJMGT *	*DLT	*ALL		Employee

- **Is collection on-going:**

- Display Security Attributes (DSPSECA) command
- Retrieve Security Attributes (QSYRTVSA) API

```

Display Security Attributes
User ID number . . . . . : 286
Group ID number . . . . . : 209
Security level . . . . . : 50
Password level . . . . . : 2
Allow change of security related system
values . . . . . : *YES
Allow add of digital certificates . . . . . : *YES
Allow service tools user ID with default
and expired password to change its own
password . . . . . : *NO
Authority collection for objects active . . : *YES
    
```

- **Specific object detail:**

- Display Object Description (DSPOBJD)
- Display Attributes (DSPATR)
- QSYS2.OBJECT\_STATISTICS()
  - ACS Insert from Examples
- Navigator for i

AUTHORITY_COLLECTION_VALUE	OBJNAME	OBJTYPE	SQL_OBJECT_TYPE	OBJATTRIBUTE
*OBJINF	EMPLOYEE	*FILE	TABLE	PF
*OBJINF	VASTRDE1	*FILE	VIEW	LF
*OBJINF	VASTRDE2	*FILE	VIEW	LF
*OBJINF	VDEPMG1	*FILE	VIEW	LF
*OBJINF	VEMP	*FILE	VIEW	LF



# Authority Collection by Object – All activity



```
-- Show all activity over TOYSTORE/EMPLOYEE *FILE
with emp_activity ( username, cur_auth, req_auth
) as (
    select "CURRENT_USER", DTLCURAUTH, DTLREQAUTH
    from qsys2.authority_collection_object
    where system_object_schema = 'TOYSTORE' and
          system_object_name   = 'EMPLOYEE'
) select * from emp_activity;
```

USERNAME	CUR_AUTH	REQ_AUTH
SCOTT	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*READ
SCOTT	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*OBJOPR
SCOTT	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*OBJOPR
FRANK	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*DLT
FRANK	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*ADD
FRANK	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*READ
FRANK	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*OBJOPR
MARYSEC	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*READ
MARYSEC	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*OBJOPR

# Authority Collection by Object – All activity



Change your included columns

Authority Collection - Columns

Available Columns:

- Title

Current Columns:

- Title
- Authorization Name
- Detailed Current Authority
- Detailed Required Authority
- Current Authority
- Required Authority

Display Authority Collection - Localhost

Search

Actions

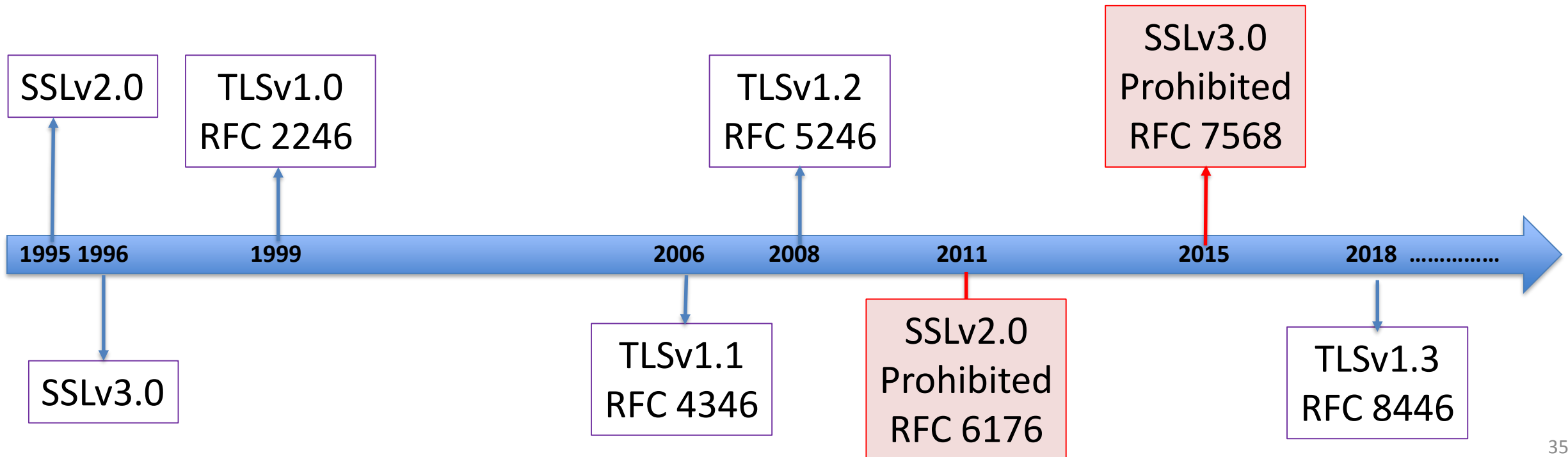
- Permissions
- Columns...
- Save as Favorite

No filter applied

<input type="checkbox"/>	Authorization Name	Detailed Current Authority	Detailed Required Authority
<input type="checkbox"/>	Scottf	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*READ
<input type="checkbox"/>	Scottf	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*OBJOPR
<input type="checkbox"/>	Scottf	*OWNER *OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*OBJOPR
<input type="checkbox"/>	Frankdba	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*DLT
<input type="checkbox"/>	Frankdba	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*ADD
<input type="checkbox"/>	Frankdba	*OBJEXIST *OBJMGT *OBJALTER *OBJREF *OBJOPR *READ *ADD *DLT *UPD *EXECUTE	*READ

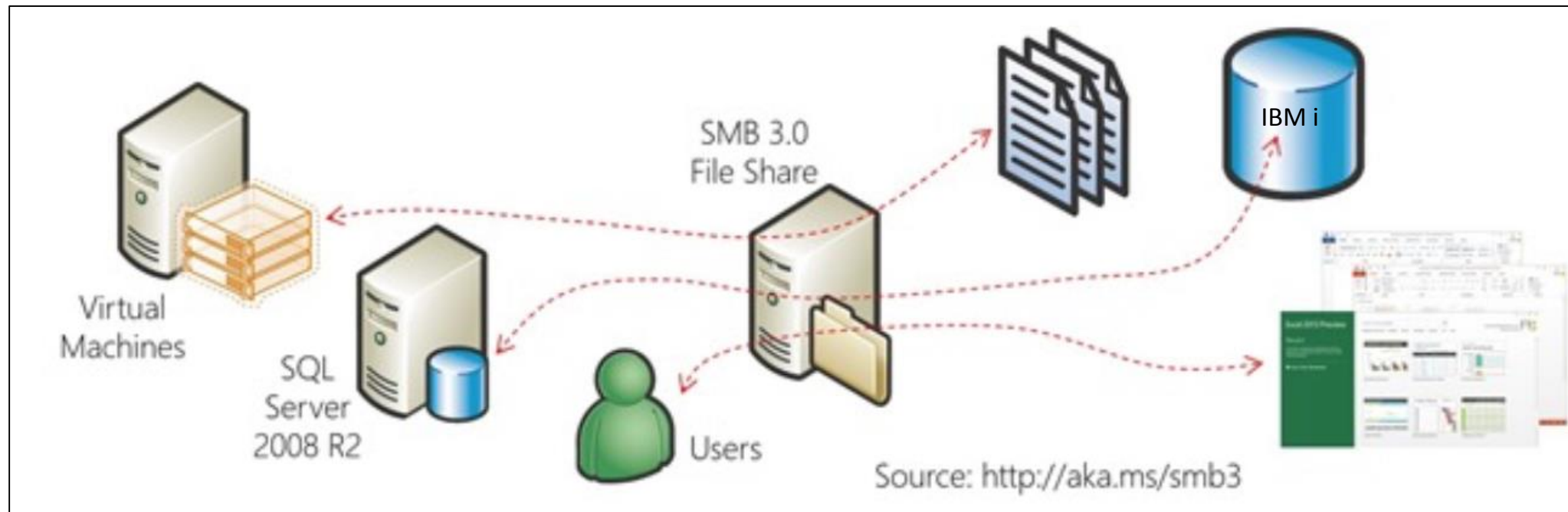
# TLS - Transport Layer Security v1.3

- Newest and most secure version of the TLS/SSL protocols replacing TLSv1.2
  - All key negotiation protected by elliptical curve algorithms
  - Majority of handshake messages are encrypted
  - Fixed or removed features susceptible to existing named vulnerabilities
  - Used at IBM i 7.4 when QSSLPCL is set to \*OPSYS



# Server Message Block Version 3 - SMB 3

- **Supported by both NetServer and QNTC**
- Support for larger read and write sizes (512 Kb, in our case) to improve performance in high latency networks
- End to end data encryption for entire client/server conversations or just on access to specific shares



# Application Development

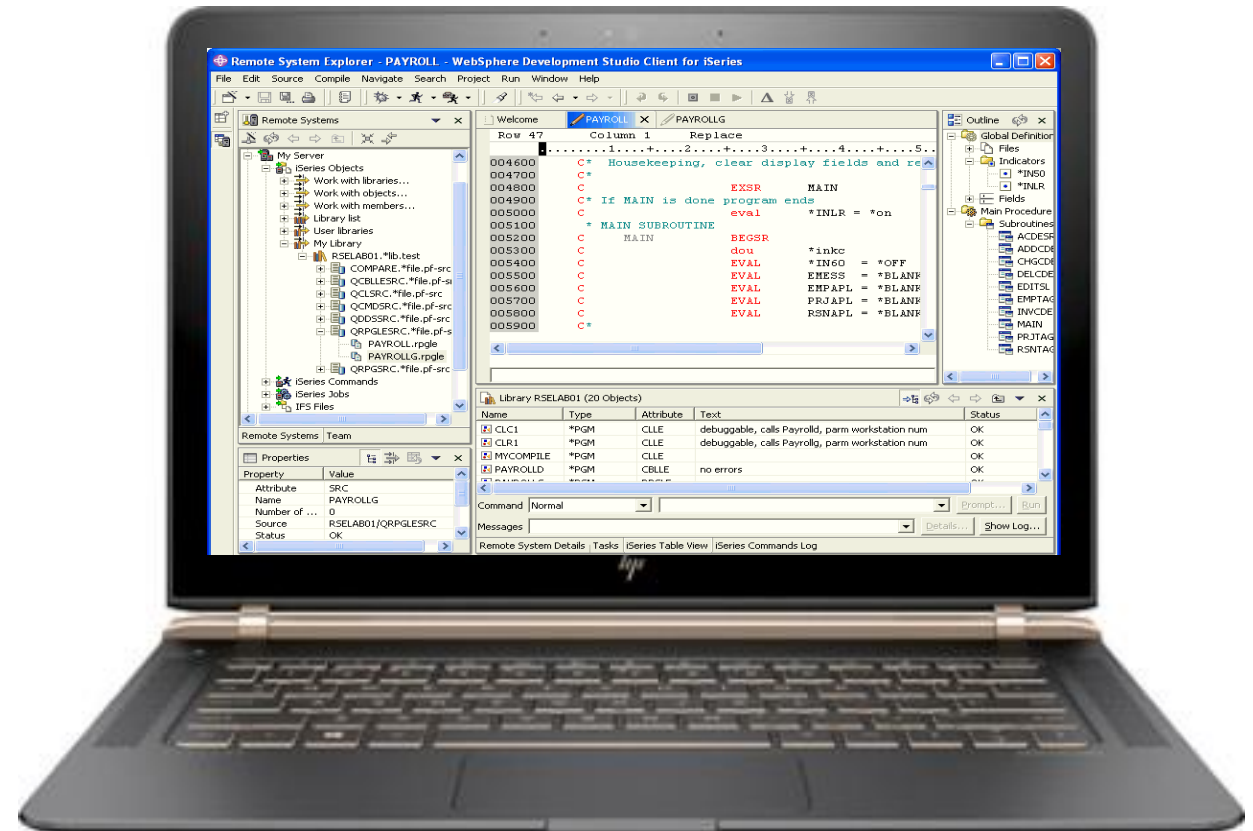


# Application Development Enhancements



## Traditional Language Updates

- RPG IV
  - Varying dimension arrays
  - Same position subfields
- COBOL
  - COPY Enhanced
  - Conditional Compilation
  - FREE and ALLOCATE statements
  - INITIALIZE statement
  - EXIT statement
  - Inline comments



# Node.js version 10

- Long-term-support (LTS) release
  - Performance improvements
  - New version of node package manager (NPM)
  - JavaScript language enhancements
- Buildable from community source
  - Anyone can use a tool like nvm to manage their own versions, including feature releases
- Expecting version 12 soon!






















# R: a new programming language on IBM i!

- Great for:
  - Data analysis
  - Statistical computing
  - Data mining
  - Big Data



- Ranked #7 by IEEE

<https://spectrum.ieee.org/at-work/innovation/the-2018-top-programming-languages>

Language Rank	Types	Spectrum Ranking
1. Python	  	100.0
2. C++	  	99.7
3. Java	  	97.5
4. C	  	96.7
5. C#	  	89.4
6. PHP		84.9
7. R		82.9
8. JavaScript	 	82.6



# Tools



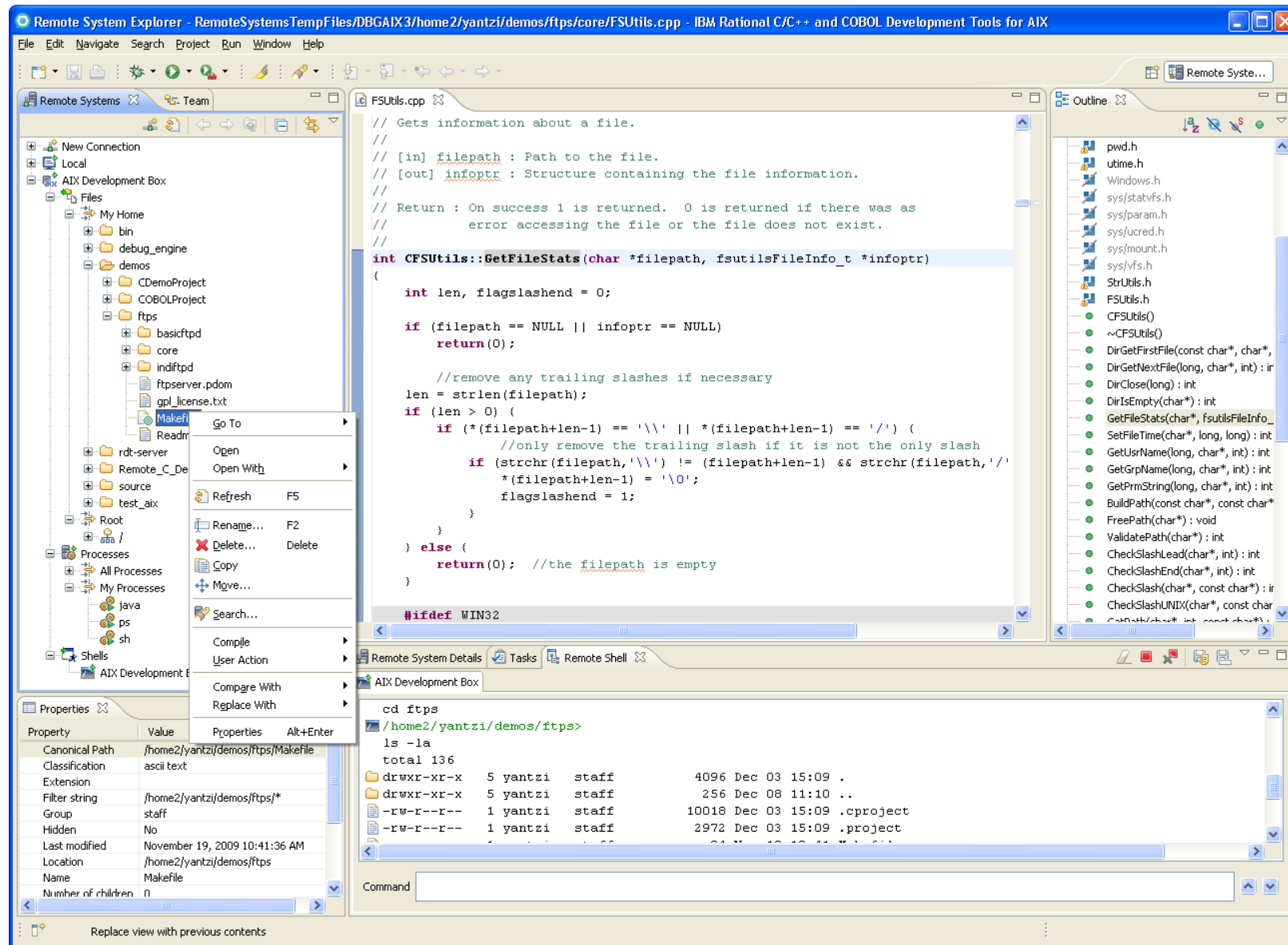
# Rational Developer for i - 9.6.06



- *Modern*
- Supports RPG, COBOL, CL, C, C++, SQL, DDM

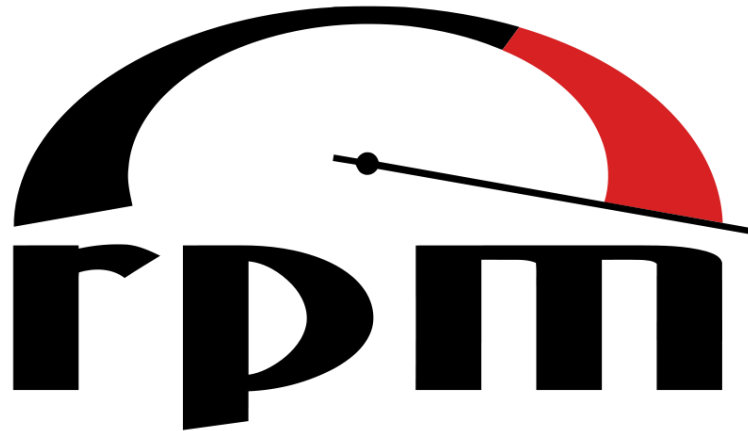
## What's New:

- New PDM View
- Refactoring Updates – extract constants
- Improved SQL Formatting
- 7.4 RPG & COBOL updates
- ILE Parser finds anomalies
- Quick Zoom with command keys
- Code Coverage updates



# Open Source RPMs

- 5733-OPS is sunset, and no longer needed!
- Now delivered with RPMs

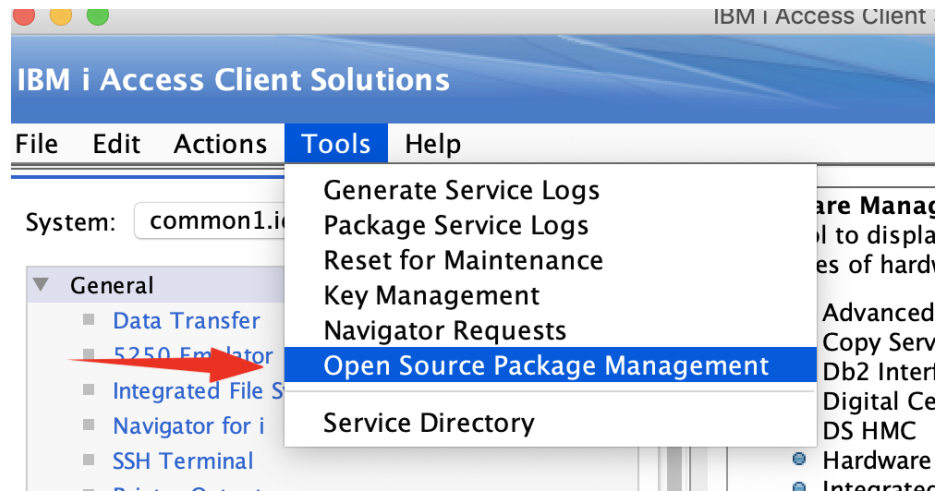


&



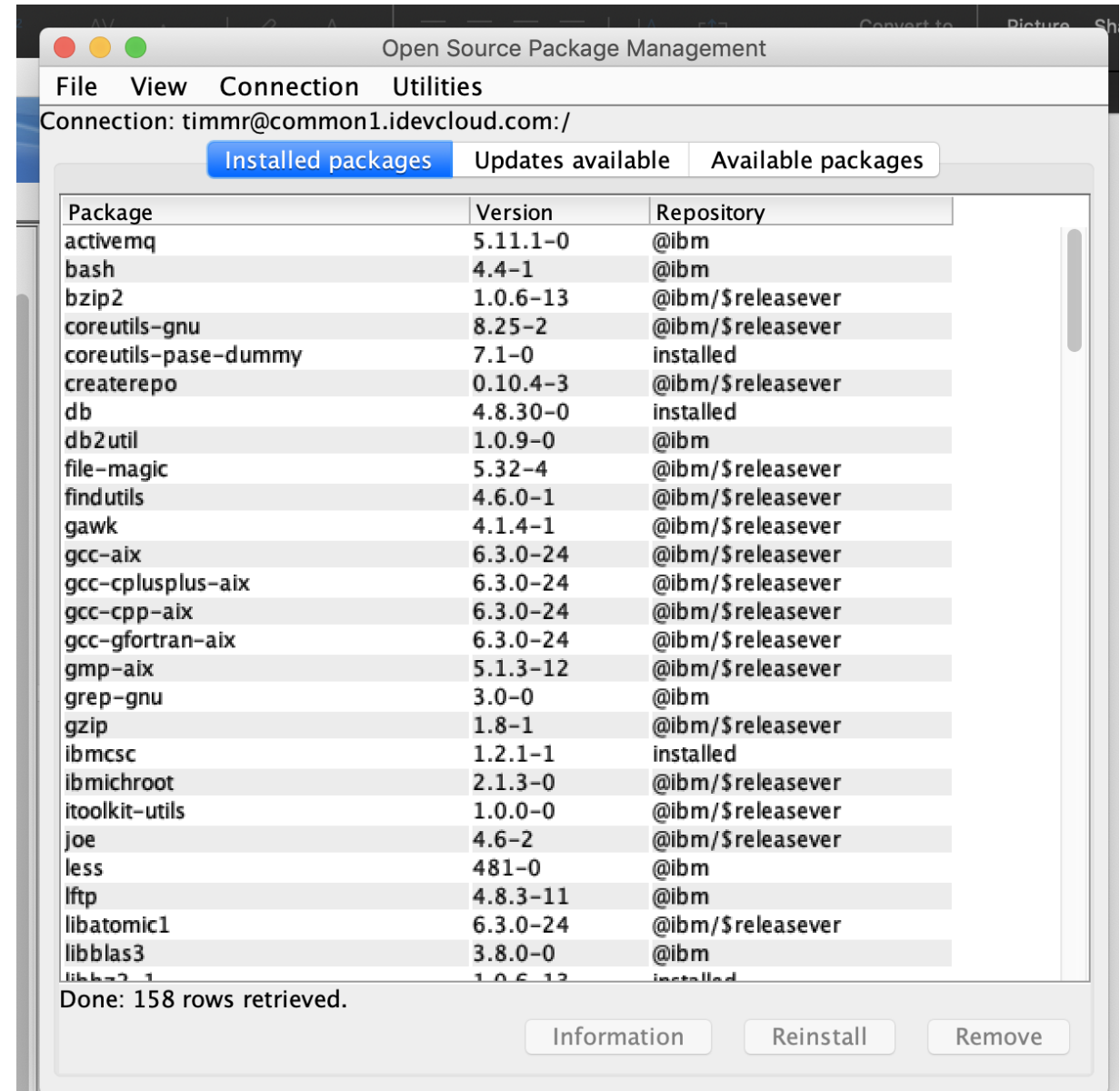
- To get started:
  - <http://ibm.biz/ibmi-rpms>

# ACS – Open Source Package Manager



View and Update packages easily

Easily update packages in a CHROOT



# ActiveMQ



- Open source message broker (Java-based)
- Supported protocols:
  - OpenWire
  - STOMP
  - MQTT
  - AMQP
  - REST
  - WebSockets



# Python Machine Learning and Data Science



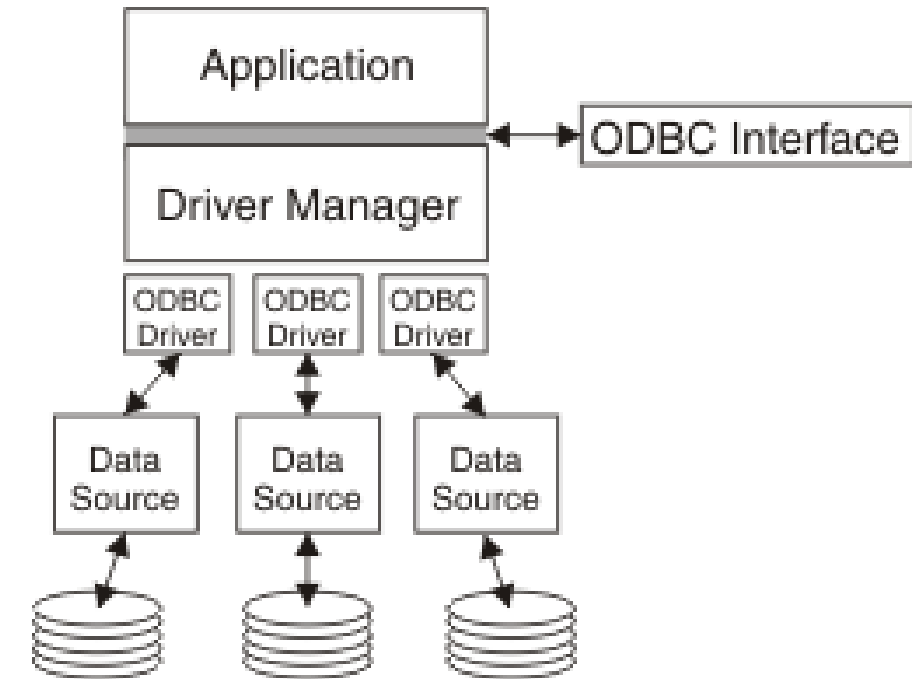
- Either available via RPM or buildable with Python “pip3” command
  - NumPy, Pandas
    - data processing
  - Scipy, Scikit-Learn
    - Machine Learning (ML) and scientific analysis
  - ipython
    - interactive python language support
  - nltk,
    - natural language toolkit for ML
  - matplotlib, jupyter notebook
    - visual/interactive ML/data analysis



# ODBC Driver

- IBM i Access ODBC driver now supported on:
  - Windows
  - Linux
  - **IBM i**

ODBC Components



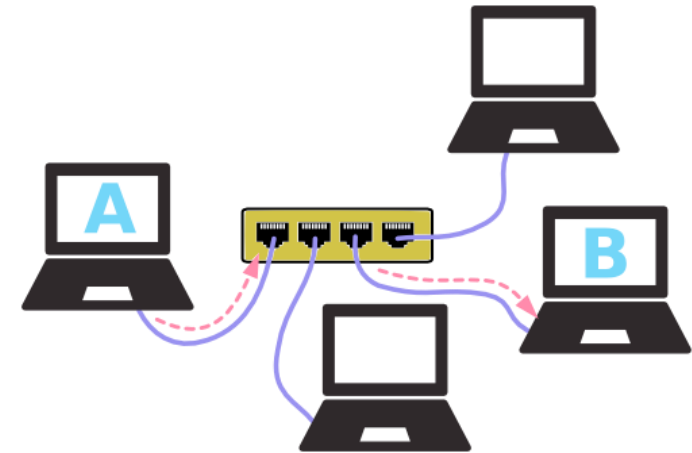
- Why ODBC on IBM i?
  1. Develop on Windows/Linux, deploy on IBM i
  2. Use standard ODBC libraries from various languages (PHP, Python, Node.js, Ruby, R, etc)

RV3W364-1

# IBM i Application Connectivity Improvements



- JTOpen JDBC
  - Previously - when connection lost, a new connection had to be re-established with the backup server
  - IBM i 7.4 – Connection is NOT lost in the application, the ‘backup’ server just takes over
  - Also can choose to delay and retry to the same IBM i





# Loopback support

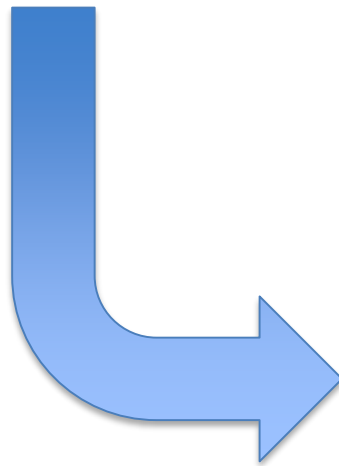


- Easily create REST APIs with a popular Node.js framework

**book** Show/Hide List Operations Expand Operations

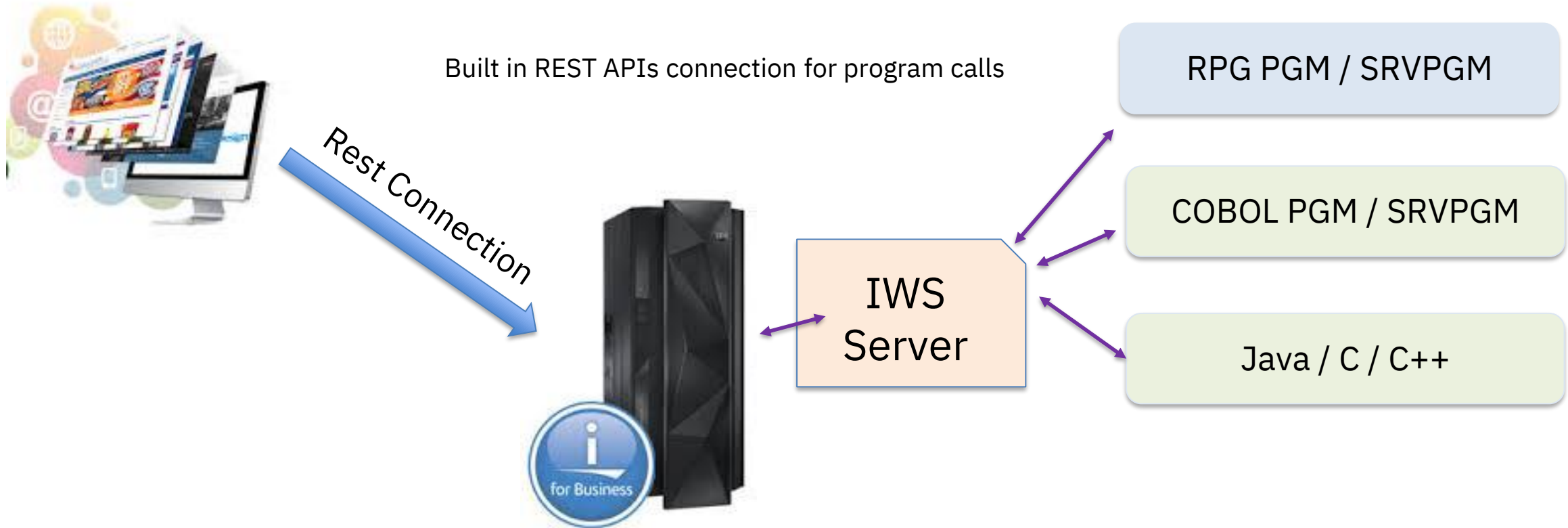
PATCH	/books	Patch an existing model instance or insert a new one into the data source.
GET	/books	Find all instances of the model matched by filter from the data source.
POST	/books	Replace an existing model instance or insert a new one into the data source.

Table	Columns	Key Constraints	Foreign Key Constraints	Check Constraints	Materialized Query	Partitioning	
	Column Name	System Name	Data Type	Length	Nullable	Generated Value	Default Value
	"isbn"	ISBN_00001	INTEGER		Yes		No default
	"id"	ID___00001	INTEGER		No	Identity	
	"personId"	PERSO00001	INTEGER		Yes		No default
	"title"	TITLE00001	VARCHAR	128	Yes		No default

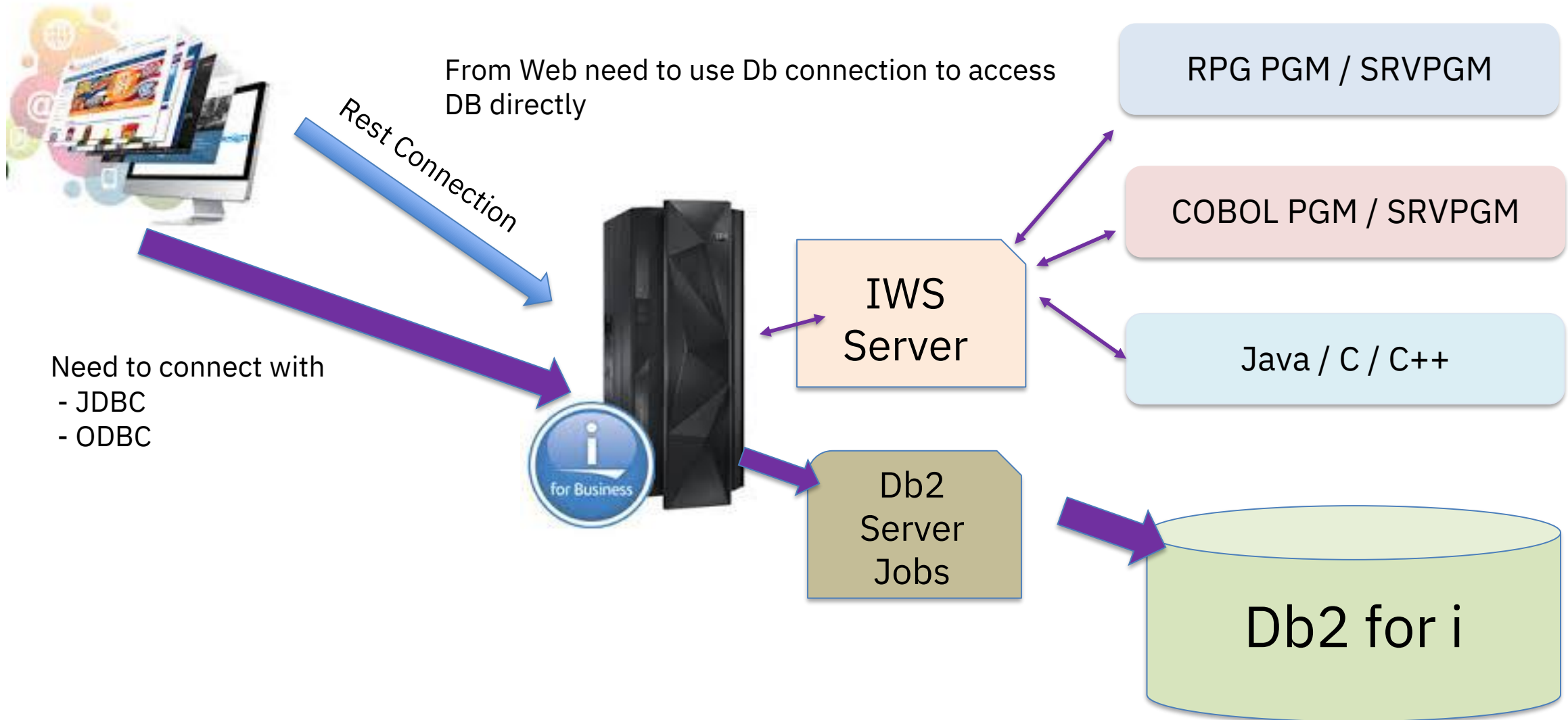


GET	/books/{id}/exists	Check whether a model instance exists in the data source.
GET	/books/{id}/person	Fetches belongsTo relation person.
POST	/books/{id}/replace	Replace attributes for a model instance and persist it into the data source.
GET	/books/change-stream	Create a change stream.
POST	/books/change-stream	Create a change stream.
GET	/books/count	Count instances of the model matched by where from the data source.
GET	/books/findOne	Find first instance of the model matched by filter from the data source.
POST	/books/replaceOrCreate	Replace an existing model instance or insert a new one into the data source.
POST	/books/update	Update instances of the model matched by {{where}} from the data source.
POST	/books/upsertWithWhere	Update an existing model instance or insert a new one into the data source based on the where criteria.

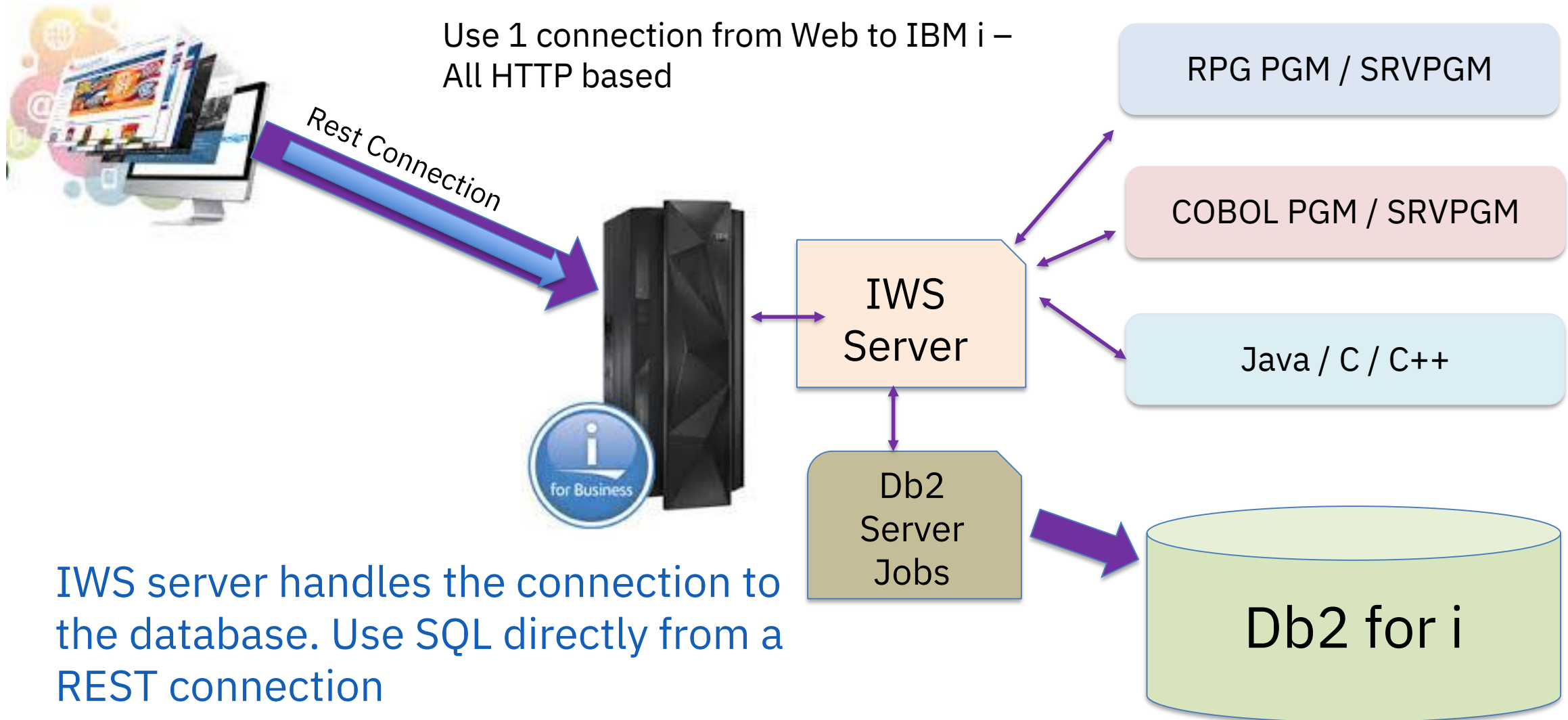
# IWS before IBM i 7.4



# IWS and Db2 before IBM i 7.4



# IWS & Db2 Connections – IBM i 7.4



IWS server handles the connection to the database. Use SQL directly from a REST connection

# IWS Wizard Updated



IBM Web Administration for i

Setup **Manage** Advanced | Related Links

All Servers | HTTP Servers **Application Servers** Installations

Running Server: SQLBaby - V2.6 (web services)

- Common Tasks and Wizards
  - Create Web Services Server
  - Create HTTP Server
  - Create Application Server
- Web Services Wizards
  - Deploy New Service**
  - Configure SSL
  - Disable SSL
- Server Properties
  - Properties
  - Server Tracing
  - View HTTP Servers
- Services
  - Manage Deployed Services

[SQLBaby](#) > [Manage Deployed Services](#) > Deploy New Service

## Deploy New Service

*Specify Web service type - Step 1 of 8*

Welcome to the Deploy New Service wizard. This wizard helps you specify web services that are accessible over the Internet and exchange XML messages. The type of XML message exchanged is defined by the resource itself.

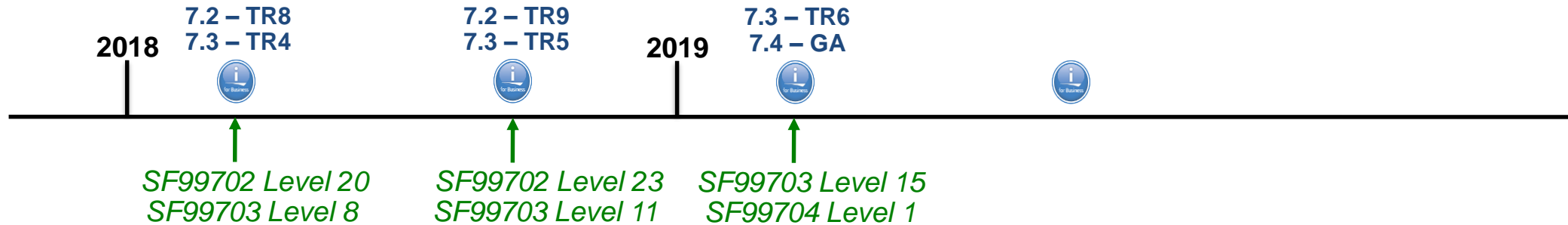
Specify Web service type: REST

Specify Web service implementation: \*SQL

Database



# Enhancements delivered via Db2 PTF Groups



## Enhancements timed with TR5 & TR9

- RPG Embedded SQL Enhancements
- New and Enhanced SQL built-in functions
- New and Enhanced IBM i Services
- Additional Database features in ACS
- SQL Language Improvements
- OmniFind Text Search enhancement
- And more...

## Enhancements timed with IBM i 7.4 GA & TR6

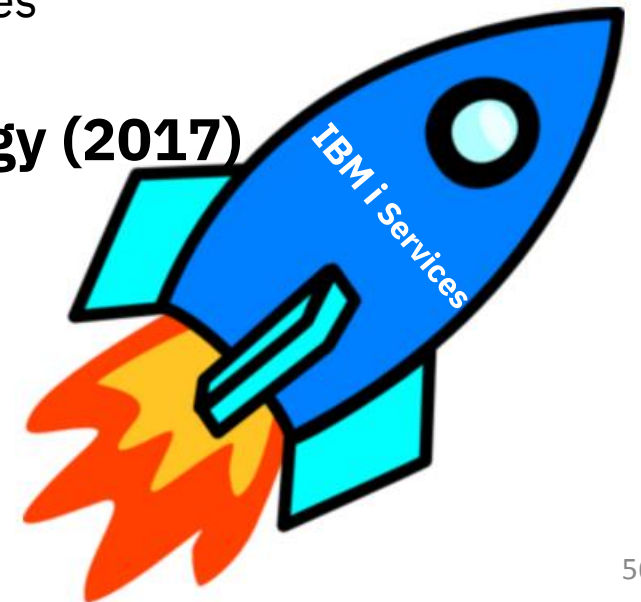
- **IBM Db2 Mirror for i**
- **Authority Collection for objects**
- **RPG Embedded SQL Enhancements**
- **New and Enhanced IBM i Services**
- **Additional Database features in ACS**
- **SQL Language Improvements**
- **And more...**

[www.ibm.com/developerworks/ibmi/techupdates/db2/groupptf](http://www.ibm.com/developerworks/ibmi/techupdates/db2/groupptf)

# IBM i Services – A Brief History

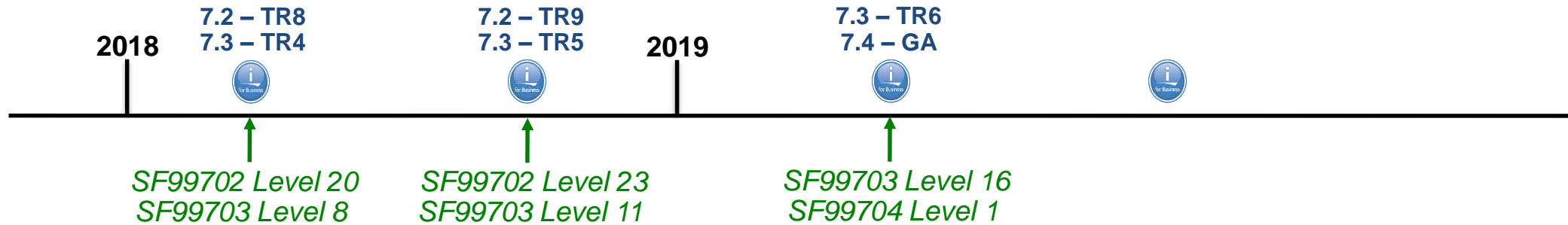


- **What:** Use SQL, SQL DDL and SQE to provide alternatives to IBM i APIs and CL Commands
- **Dawn of the 1<sup>st</sup> IBM i Service (2013) – QSYS2.PTF\_INFO**
  - Alternative to the DISPLAY PTF (DSPPTF) command
  - Proof of concept that SQL Views paired with SQL UDTFs provide significant value, for low cost
- **IBM i Services take root (2015)**
  - Enhancements delivered with every Technology Refresh
  - Examples shift from IBM presentations into ACS's Insert from Examples
- **IBM i Services begin to be used as a modernization technology (2017)**
- **IBM i Services consist of 13 topical categories (2019)**
  - Significant ISV adoption
  - RFEs too numerous to count





# IBM i Services – Timeline



## Services in 4Q/2017:

- Syslog detail returned from DISPLAY\_JOURNAL & HISTORY\_LOG\_INFO
- ASP\_INFO
- ASP\_VARY\_INFO
- JOB\_QUEUE\_INFO
- STACK\_INFO
- And more...

## Services in 3Q/2018:

- JOB\_DESCRIPTION\_INFO
- ACTIVE\_JOB\_INFO enhancements
- NETSTAT\_INFO & NETSTAT\_JOB\_INFO enhancements
- And more...

## Services in 2Q/2019:

- **DATA\_AREA\_INFO**
- **ASP\_JOB\_INFO**
- **MESSAGE\_FILE\_DATA**
- **SYSTOOLS.FIRMWARE\_CURRENCY**
- **SYSTOOLS.SPLIT**
- **SYSTOOLS.SPOOLED\_FILE\_DATA**
- **IBM i 7.4 only services**
- **And many enhanced services**

<http://ibm.biz/Db2foriServices>

# SYSTOOLS – A trifecta of enhancements



- **SYSTOOLS – Home of Db2 for i provided tools and examples**
  - **SPOOLED\_FILE\_DATA() – Query spooled files**
  - SPLIT() – LISTAGG() builds a list of values, SPLIT() deconstructs the list into single values
  - FIRMWARE\_CURRENCY – **Fix Level Recommendation Tool (FLRT)** consumable with SQL

```
select * from table(systools.spooled_file_data(
                    job_name => '083866/QSYS/SCPF',
                    spooled_file_name => 'QPJOBLOG',
                    spooled_file_number => '*LAST'));
```

ORDINAL_POSITION	SPOOLED_DATA
1	5770SS1 V7R4M0 190621 Job Log SYNC18 04
2	Job name . . . . . : SCPF User . . . . . : QSYS Number . . . . .
3	Job description . . . . . : *SYS Library . . . . . :
4	MSGID TYPE SEV DATE TIME FROM PGM LIBRARY INST
5	CPF1124 Information 00 03/28/19 20:53:03.667160 QWCISCFR QSYS 238F
6	Message . . . . . : Job 000000/QSYS/SCPF started on 03/28/19
7	subsystem *NONE in *NONE. Job entered system on 03/28/19
8	CPC2609 Completion 00 03/28/19 20:53:20.109928 QDCVRC QSYS 0984
9	Message . . . . . : Varv on completed for controller OCTL.

# SYSTOOLS – A trifecta of enhancements



```
--  
-- Find QZDASOINIT joblogs related to a specific TCP/IP address  
--  
with my_spooled_files (job, file, file_number, user_data, create_timestamp) as (  
    select job_name, spooled_file_name, file_number, user_data, create_timestamp  
    from qsys2.output_queue_entries_basic  
    where user_data = 'QZDASOINIT' and spooled_file_name = 'QPJOBLOG' and  
    create_timestamp > current timestamp - 24 hours  
    order by create_timestamp desc),  
all_my_spooled_file_data (job, file, file_number, spool_data) as (  
    select job, file, file_number, spooled_data  
    from my_spooled_files, table (  
        systools.spooled_file_data(  
            job_name => job, spooled_file_name => file,  
            spooled_file_number => file_number))  
select * from all_my_spooled_file_data  
where upper(spool_data) like upper('%client 9.80.229.177 connected to server%') ;
```

JOB	FILE	FILE_NUMBER	SPOOL_DATA
088544/SCOTT/OPADEV0008	QPJOBLOG	1	Message . . . . : User SCOTT from client 9.80.229.177 connected...

# SYSTOOLS – A trifecta of enhancements



- **SYSTOOLS – Home of Db2 for i provided tools and examples**
  - SPOOLED\_FILE\_DATA() – Query spooled files
  - **SPLIT() – LISTAGG() builds a list of values, SPLIT() deconstructs the list into single values**
  - FIRMWARE\_CURRENCY – **Fix Level Recommendation Tool (FLRT)** consumable with SQL

```
SELECT ordinal_position, LTRIM(element) AS special_authority
FROM qsys2.user_info u,
     TABLE (systools.split(input_list => special_authorities,
                           delimiter => ' '))
WHERE u.authorization_name = 'SCOTT';
```

ORDINAL_POSITION	SPECIAL_AUTHORITY
1	*ALLOBJ
2	*SECADM
3	*JOBCTL
4	*SPLCTL

# SYSTOOLS – A trifecta of enhancements

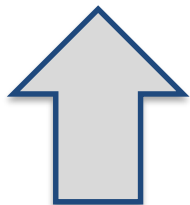


- **SYSTOOLS – Home of Db2 for i provided tools and examples**

- SPOOLED\_FILE\_DATA() – Query spooled files
- SPLIT() – LISTAGG() builds a list of values, SPLIT() deconstructs the list into single values
- **FIRMWARE\_CURRENCY – Fix Level Recommendation Tool (FLRT) consumable with SQL**

```
select * from systools.firmware_currency;
```

FW_CURRENCY	FW_CURRENTFIXPACK	FW_MACHINE_TYPE_MODEL	FW_RECOMMENDED_UPGRADE
UPGRADE AVAILABLE	AM760_089	9179-MHD	AM780_100



# DATA\_AREA\_INFO



- Alternative to the Retrieve Data Area (RTVDTAARA) command
- **Logical and Character types, Decimal types, QTEMP, and more...**

```
select * from qsys2.data_area_info
where data_area_library = 'GONZ0333';
```

DATA_AREA_LIBRARY	DATA_AREA_NAME	DATA_AREA_TYPE	LENGTH	DECIMAL_POSITIONS	DATA_AREA_VALUE
GONZ0333	MYBOOLEAN	*LGL	1	-1	
GONZ0333	MYPLACE	*CHAR	100		-Place holder : 555

# MESSAGE\_FILE\_DATA

- Returns one row for each message in a message file
- SQL Alternative to the Display Message Description (DSPMSGD) CL command and the Retrieve Message (QMHRTVM) API

```
select * from qsys2.MESSAGE_FILE_DATA
  where message_file_library = 'QSYS' and
         message_file       = 'QSQLMSG' and
         message_id like 'SQ20%';
```

MESSAGE_ID	MESSAGE_TEXT	Message Second Level Text	MESSAGE_DATA_COUNT	Message Data
SQ20038	Clauses not valid in same definition.	Cause . . . . . : &1 and &2 cannot be spe...	2	&1 *CHAR *VARY 2
SQ20054	File &1 in &2 has DataLinks in link ...	Cause . . . . . : The accessed file &1 ha...	3	&1 *CHAR *VARY 2
SQ20055	Result column not compatible with co...	Cause . . . . . : The data type of a resu...	1	&1 *CHAR *VARY 2
SQ20058	Subselect for materialized query tab...	Cause . . . . . : &1 in &2 cannot be crea...	3	&1 *CHAR *VARY 2
SQ20073	Attribute not valid for function &1 ...	Cause . . . . . : Function &1 in &2 canno...	2	&1 *CHAR *VARY 2

# 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.DRDA\_AUTHENTICATION\_ENTRY\_INFO – VIEW**  
**QSYS2.FUNCTION\_INFO – VIEW**  
**QSYS2.FUNCTION\_USAGE – VIEW**  
**QSYS2.GROUP\_PROFILE\_ENTRIES – VIEW**  
*QSYS2.OBJECT\_PRIVILEGES – VIEW*  
**QSYS2.SQL\_CHECK\_AUTHORITY – UDF**  
**QSYS2.USER\_INFO – VIEW**  
**SYSPROC.SET\_COLUMN\_ATTRIBUTE – PROCEDURE**

## Spool Services

**QSYS2.OUTPUT\_QUEUE\_ENTRIES – VIEW**  
**QSYS2.OUTPUT\_QUEUE\_ENTRIES\_BASIC – VIEW**  
**QSYS2.OUTPUT\_QUEUE\_ENTRIES – UDTF**  
**QSYS2.OUTPUT\_QUEUE\_INFO – VIEW**  
*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 – VIEW**  
**QSYS2.SYSTMPSTG – VIEW**  
**QSYS2.USER\_STORAGE – VIEW**

## Journal Services

**QSYS2.DISPLAY\_JOURNAL – UDTF**  
**QSYS2.JOURNAL\_INFO – VIEW**

## Java Services

**QSYS2.JVM\_INFO – VIEW**  
**QSYS2.SET\_JVM – PROCEDURE**

## Librarian Services

**QSYS2.LIBRARY\_LIST\_INFO – VIEW**  
**QSYS2.OBJECT\_STATISTICS – UDTF**

## System Health Services

*QSYS2.SYSLIMITS – VIEW*  
*QSYS2.SYSLIMTBL – TABLE*



— *Added in IBM i 7.4*



— *Added or Enhanced @ IBM i 7.3 TR6*

<http://ibm.biz/Db2foriServices>

<http://www.ibm.com/developerworks/ibmi/techupdates/db2/landscape>



# IBM® i Services

## Product Services

QSYS2.LICENSE\_INFO – VIEW  
 SYSTOOLS.LICENSE\_EXPIRATION\_CHECK – PROCEDURE

## Application Services

*QSYS2.DATA\_AREA\_INFO – UDTF & VIEW*  
 QSYS2.ENVIRONMENT\_VARIABLE\_INFO – VIEW  
 QSYS2.QCMDEXC – PROCEDURE  
 QSYS2.SERVICES\_INFO – TABLE  
 QSYS2.SET\_PASE\_SHELL\_INFO – PROCEDURE  
 QSYS2.STACK\_INFO – UDTF  
*SYSTOOLS.SPLIT – UDTF*

## Communication Services

*QSYS2.ADD\_TIME\_SERVER – PROCEDURE*  
 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\_ROUTING – VIEW  
 QSYS2.SET\_SERVER\_SBS\_ROUTING – PROCEDURE  
 QSYS2.TCPIP\_INFO – VIEW  
*QSYS2.TIME\_PROTOCOL\_INFO – VIEW*  
 SYSIBMADM.ENV\_SYS\_INFO – VIEW

 — *Added in IBM i 7.4*

 — *Added or Enhanced @ IBM i 7.3 TR6*

## 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

## 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

## Work Management Services

QSYS2.ACTIVE\_JOB\_INFO – UDTF  
*QSYS2.GET\_JOB\_INFO – UDTF*  
 QSYS2.JOB\_DESCRIPTION\_INFO – VIEW  
 QSYS2.JOB\_INFO – UDTF  
 QSYS2.JOB\_QUEUE\_INFO – VIEW  
 QSYS2.MEMORY\_POOL – UDTF  
 QSYS2.MEMORY\_POOL\_INFO – VIEW  
 QSYS2.OBJECT\_LOCK\_INFO – VIEW  
 QSYS2.RECORD\_LOCK\_INFO – VIEW  
 QSYS2.SCHEDULED\_JOB\_INFO – VIEW  
 QSYS2.SYSTEM\_STATUS – UDTF  
 QSYS2.SYSTEM\_STATUS\_INFO – VIEW  
 QSYS2.SYSTEM\_VALUE\_INFO – VIEW

# Accessing IBM i



# Access Client Solutions – Strategic Interface



## WHO?

Users



System Management



Database Engineer



## WHERE?

[http://ibm.biz/IBMi\\_ACS](http://ibm.biz/IBMi_ACS)

## WHAT?



5250

IFS

Spool

Run SQL Scripts

Create Excel Spreadsheets

Schemas

Console

## Gone...

IBM i Access for Windows (5733XE1)

End of Life – April 2019



# Access Client Solutions – What's New



New Formatter!

- It works 😊

Syntax Validation

- No extra charge

IASP and DB  
Connections  
Remembered

The screenshot shows the IBM Access Client Solutions interface. The main window displays a SQL script with the following content:

```
1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18
```

The menu bar includes: File, Edit, View, Run, Visual Explain, Monitor, Options, Connection, Tools, Help. The Edit menu is open, showing options like Undo, Redo, Cut, Copy, Paste, Select All, Find, Find Next, Find and Replace, SQL Formatter, Toggle Comments, Insert from Examples..., Insert Generated SQL..., and Prompt CL... The SQL Formatter option is highlighted, and a sub-menu is visible with options: Format Selected, Format All, and Configure... The SQL Formatter Settings dialog is open, showing the following settings:

- Keywords and built-in functions: Lowercase
- Identifiers: Uppercase
- Maximum line length: 100
- Indent: 1
- New lines: All - New line after
- New line on comma: All - New line after
- New line on AND/OR: New line before

The Preview window shows the formatted SQL code:

```
'1400101',  
'19',  
1,  
1  
)  
else overlay(  
'1400101',  
'20',  
1,  
1  
)  
end,  
'YYYYMMDD'  
) as MY_TIME  
from SYSIBM.SYSDUMMY1
```

The dialog has OK and Cancel buttons at the bottom.

# IBM® i Services – ACS Run SQL Scripts!



## 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.DRDA\_AUTHENTICATION\_ENTRY\_INFO – VIEW
- QSYS2.FUNCTION\_INFO – VIEW
- QSYS2.FUNCTION\_USAGE – VIEW
- QSYS2.GROUP\_PROFILE\_ENTRIES – VIEW
- QSYS2.OBJECT\_PRIVILEGES – VIEW
- QSYS2.SQL\_CHECK\_AUTHORITY – UDF
- QSYS2.USER\_INFO – VIEW
- SYSPROC.SET\_COLUMN\_ATTRIBUTE – PROCEDURE

## Spool Services

- QSYS2.OUTPUT\_QUEUE\_ENTRIES – VIEW
- QSYS2.OUTPUT\_QUEUE\_ENTRIES\_BASIC – VIEW
- QSYS2.OUTPUT\_QUEUE\_ENTRIES – UDTF
- QSYS2.OUTPUT\_QUEUE\_INFO – VIEW
- 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.SYS...
- QSYS2.SY...
- QSYS2.USER...

## Journal Services

- QSYS2.DISPLAY...
- QSYS2.JOUR...

## Java Services

- QSYS2...
- QSYS2.SET\_JV...

## Librarian Services

- QSYS2.LIBRARY\_I...
- QSYS2.OBJECT\_S...

## System Health

- QSYS2.S...
- QSYS2.SY...

All in ACS!  
No more posters required

Visual Explain Monitor Options Connection Tools Help

```
1 with emp_activ  
2 username,  
3 ) as (  
4 select "CT  
5 from qsy  
6 where sy  
7 )  
8 select * fr  
9  
10
```

USERNAME	CUR AU
FRANKDBA	*OBJEX
FRANKDBA	*OBJEX
FRANKDBA	*OBJEX
FRANKDBA	*OBJEX
MARYSEC	*OBJEX

# Access Client Solutions – IFS



Include - Only bring into the IFS interface the files & directories that match the include value

Filter – Contextual filter of displayed content

The screenshot shows a web browser window with the URL `/ on common1.idevcloud.com`. The browser's address bar contains `common1.idevcloud.com`. Below the address bar, there are two buttons: `Filter` and `Include`, both of which are circled in red. The main content area displays a directory listing for `/`. The listing is a table with columns for `Icon`, `Name`, `Size (KB)`, and `Last Modified`. The table contains 15 rows of directory entries, including `.ssh`, `ACSLab`, `ALAMO`, `COMMON`, `dev`, `etc`, `home`, `IFSMP06`, and several `IWSLAB01` through `IWSLAB07` entries. The `Last Modified` column shows various dates and times, such as `March 30, 2019 6:00:57 PM CDT` and `November 5, 2018 10:51:29 AM CST`. Below the table, it says `Listing objects: 31 objects`. At the bottom of the browser window, there is a `Messages` section.

# ACS Version 1.1.8.2 (released 4/24/19)



- Updated several times per year (stay current)
- Something for every user
- Database features and much more

[Download site:](#)

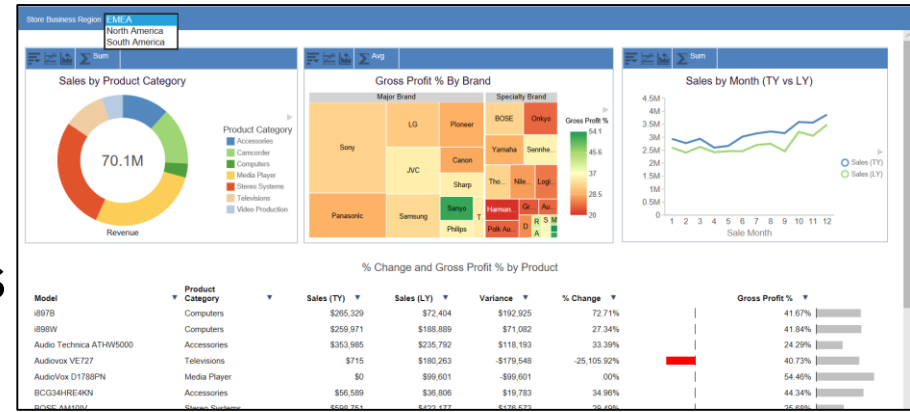
**[ibm.biz/IBMi\\_ACS](http://ibm.biz/IBMi_ACS)**



# Db2 Web Query for i



- Integrated IBM i Business Intelligence and Data Warehousing family of products
  - IBM i Licensed Program Products (5733-WQX)
- From Basic Reports to Powerful Interactive Dashboards
- Updated EZ-Install Package for Fast Start



## – **NEW** reports for the IBM i Systems Administrator

- System Limits; Track File/Temp Storage Size Growth; Display Journal Info;
- Cross System Reports: PTF Currency, CPU Utilization; System Status

System	OS Release	Date Information Gathered	Status	PTF Group ID	PTF Name	Installed Level	Level Available	Date of last IBM Update
DB2IC0E3	V7R2M0	2019/04/15	INSTALLED LEVEL IS CURRENT	SF99718	Group Security	72	72	2019/04/02
				SF99719	Group Hiper	144	144	2019/04/02
				SF99720	Current Cumulative PTF Media Documentation	18249	18249	2018/03/01
				SF99721	All PTF Groups except Cumulative PTF Package	10	10	2018/01/12
				SF99747	DB2 Web Query for i V2.1.0	17	17	2017/08/24
				SF99766	Print PTFs	3	3	2015/01/07
				SF99767	720 TCP/IP PTF	4	4	2018/06/22
				SF99769	IBM i integration with BladeCenter and System	1	1	2014/12/18
				SF99775	Hardware and Related PTFs	33	33	2019/02/08
				SF99776	High Availability for IBM i	10	10	2018/09/14
DB2IC0E4	V7R3M0	2019/04/12	INSTALLED LEVEL IS CURRENT	SF99702	DB2 for IBM i	24	25	2019/04/10
				SF99759	IBM MQ for IBM i - v7.1.0/v8.0.0/v9.0.0/v9.1.0	7	22	2019/04/01
				SF99225	IBM Open Source Solutions for i	6	6	2017/11/06
				SF95252	Content Manager OnDemand for i - 5770-RD1 7.3	10	10	2018/10/15
				SF99433	DB2 Web Query for i V2.2.1	5	5	2018/12/23
				SF99723	Performance Tools	4	4	2017/10/25
				SF99727	Technology Refresh	5	5	2018/09/13
				SF99730	Current Cumulative PTF Media Documentation	18242	18242	2018/09/14
				SF99731	All PTF Groups except Cumulative PTF Package	11	11	2018/08/28
				SF99867	730 TCP/IP PTF	1	1	2018/06/21
			RELATED GROUP	SF99767	High Availability for IBM i	7	7	2018/09/14
				SF99333	DB2 Web Query for i V2.2.0	5	5	2018/05/13
				SF99581	WebSphere App Server V8.5	6	7	2019/03/01
				SF99703	DB2 for IBM i	12	14	2019/03/04
			UPDATE AVAILABLE	SF99722	IBM HTTP Server for i	16	18	2019/04/08
				SF99724	Backup Recovery Solutions	23	27	2019/03/20
				SF99725	Java	10	12	2019/03/28
				SF99728	Group Security	37	39	2019/04/02

## – GA May 2019 - To Request EZ-Install:

- Send email to [QU2@us.ibm.com](mailto:QU2@us.ibm.com) and include name, company name, and serial number of your system

Learn more at [ibm.biz/db2webqueryi](http://ibm.biz/db2webqueryi) & [db2webqueryi.blogspot.com](http://db2webqueryi.blogspot.com)



# Db2 Web Query for i - System and Security Management



Db2 Web Query for i
scottf | Sign Out | Resources | Administ

Powered By Information Builders

Reporting

- Repository
  - Common
  - IBM Db2 Web Query Information
  - IBM i Administration Samples
    - Utilities
      - Get Status of Sys Admin Reports
      - PTF Group Currency Report**
      - Spool File Usage
      - Subsystem summary report
      - System CPU Dashboard
      - System environment info report
      - System(s) status dashboard
      - Systems CPU Utilization over 1 hour
      - Systems CPU Utilization over 2 hours
      - Systems CPU Utilization over 24 hours
      - Systems CPU Utilization over 8 hours
      - Top 10 jobs by CPU chart
      - Top 10 jobs by disk I/O chart
      - Top 10 jobs by temp storage chart
      - Top 10 spool file consumers chart
      - Top 10 spool files by output queues chart
  - Retail Samples
  - Century Electronics
  - Favorites
  - Mobile Favorites
  - Reporting Servers
  - Change Management

### PTF Group - Currency Report

Status	PTF Group ID	PTF Group Name	Installed Level	Level Available	Date of last IBM Update
<b>UPDATE AVAILABLE</b>	SF99433	Db2 Web Query for i V2.2.1	4	5	2018/12/23
	SF99727	Technology Refresh	4	5	2018/09/13
	SF99730	Current Cumulative PTF Media Documentation	16299	18242	2018/09/14
SF99859	IBM MQ for IBM i - v7.1.0/v8.0.0/v9.0.0/v9.1.0	3	15	2018/12/20	
RELATED GROUP					
<b>INSTALLED LEVEL IS CURRENT</b>	SF99333	DB2 Web Query for i V2.2.0	5	5	2018/05/13
	SF99225	IBM Open Source Solutions for i	6	6	2017/11/06
	SF99252	Content Manager OnDemand for i - 5770-RD1 7.3	10	10	2018/10/15
	SF99581	WebSphere App Server V8.5	6	6	2018/08/17
	SF99703	DB2 for IBM i	12	12	2018/09/25
	SF99722	IBM HTTP Server for i	17	17	2018/12/27
	SF99723	Performance Tools	4	4	2017/10/25
	SF99724	Backup Recovery Solutions	25	25	2019/01/02
	SF99725	Java	11	11	2018/12/18
	SF99728	Group Security	38	38	2019/01/08
	SF99729	Group Hiper	75	75	2019/01/08
	SF99731	All PTF Groups except Cumulative PTF Package	11	11	2018/08/28
	SF99867	730 TCP/IP PTF	1	1	2018/06/21
	SF99875	Hardware and Related PTFs	15	15	2018/06/01
	SF99876	High Availability for IBM i	7	7	2018/09/14

13 January, 2019 at 10.08.56

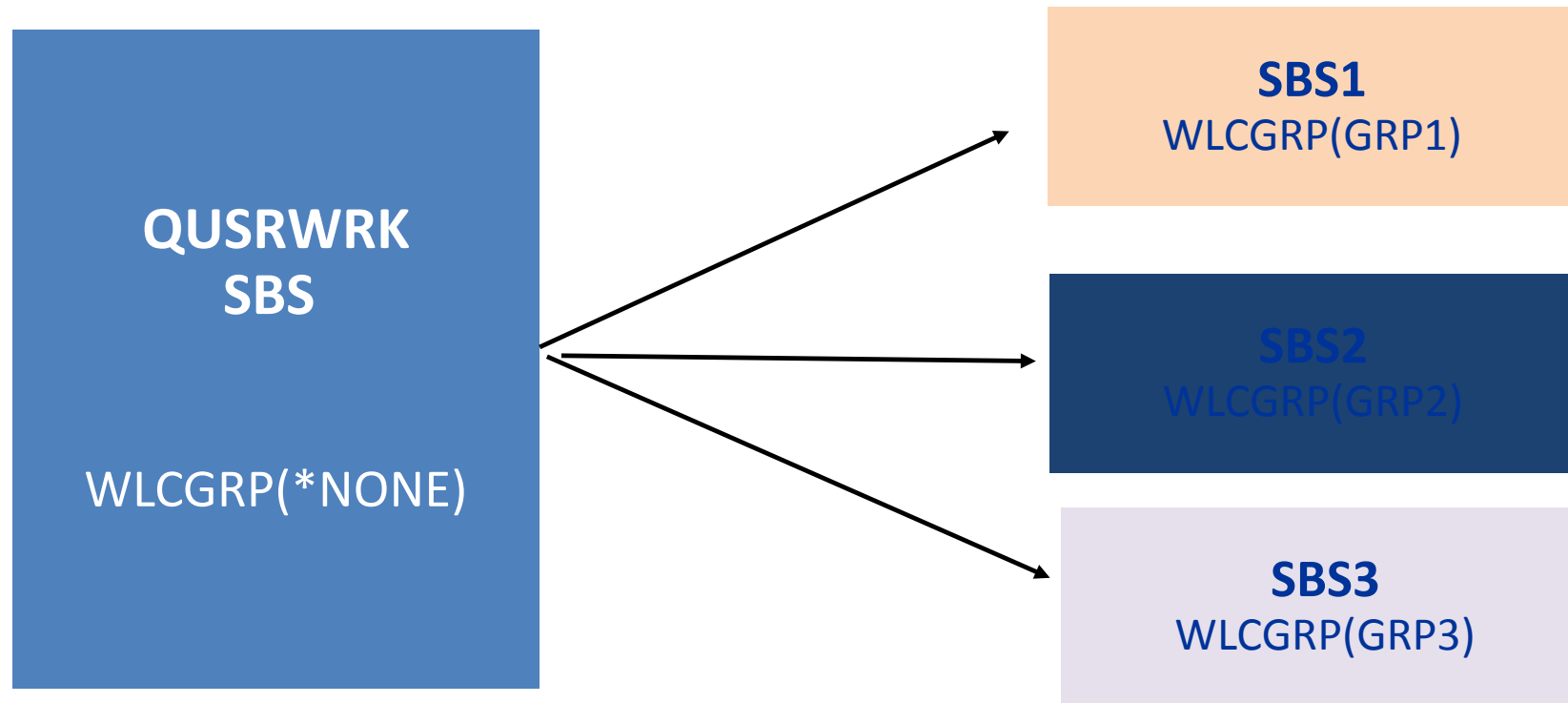
# Integrated Capabilities

IBM i 7.4



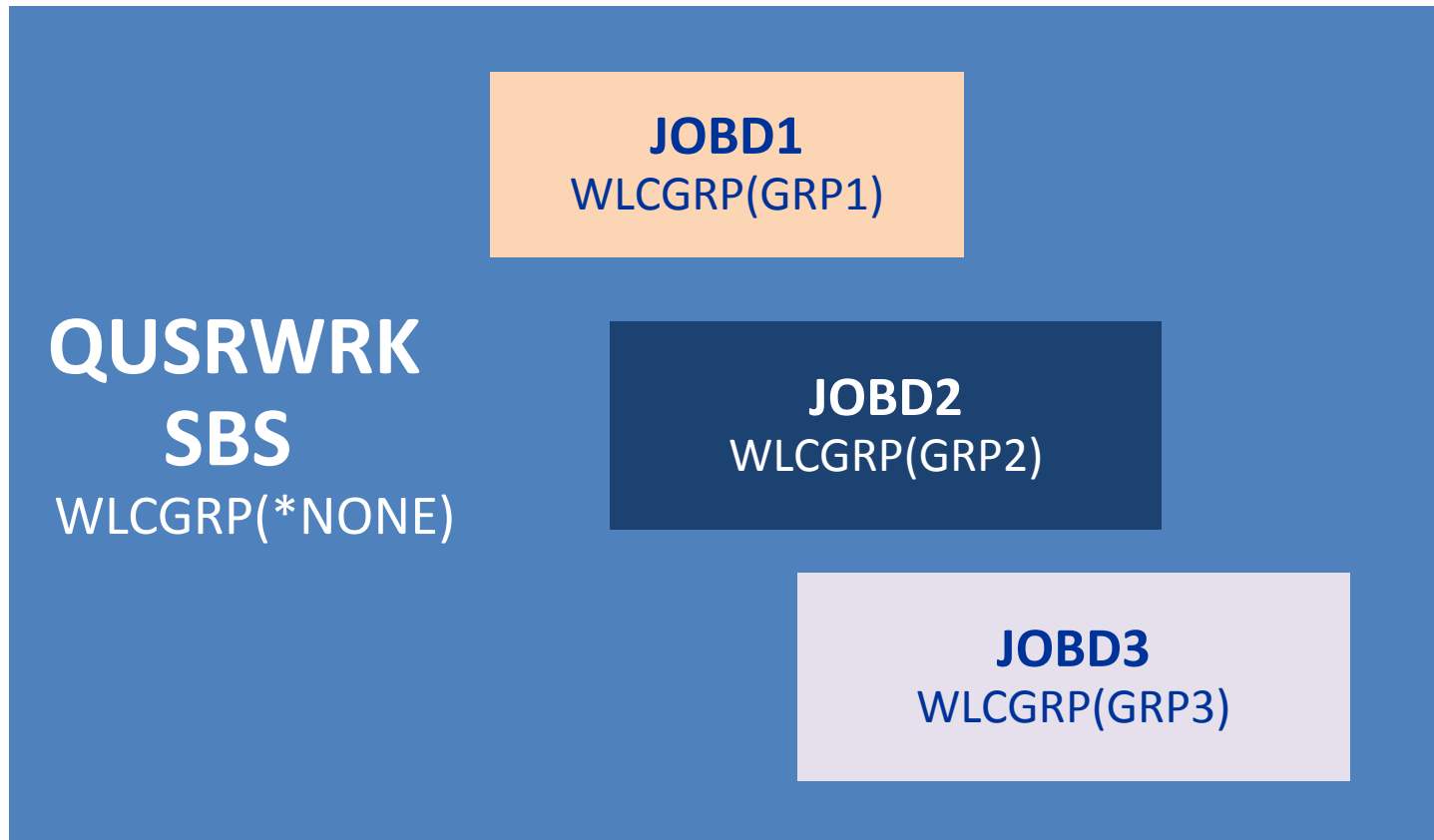
# Workload groups before 7.4

- Prior to 7.4, configure by **Subsystem** only (CRTSBSD, CHGSBSD)
- Every job in the subsystem runs in same group
- Must split workloads into separate subsystems for each workload group



# Workload groups on JOBD in 7.4

- Configure by Job description – CRTJOBDD, CHGJOBDD
- Workloads can now run in different groups within same subsystem



Easy to set up, just create a group and then CHGJOBDD to use the workload group.

No need to restart the subsystem!

# Increased LUN Sizes for IBM i 7.4

- 4096-byte block size LUNs
  - IBM FlashSystems 900
  - Can now be larger than 2 TB
  - Can go up to 16 TB in size
- 4160-byte block size LUNs
  - Internal disk or VSCSI-attached
  - Can now be larger than 4 TB
  - New 7.45 TB SSDs available in May 2019
    - ESJF (Gen3 for System Unit slots)
    - ESJ7 (Gen2 for #ESLS SAS Storage enclosure)



# ILE compiler updates in 7.4: CL

- Supports building CLLE program and CL command from IFS source file
  - Supports both absolute and relative IFS path name
  - SRCSTMF parameter is added for
    - Create command (CRMCMMD)
    - Create CL Module (CRTCLMOD)
    - Create Bound CL Program (CRTBNDCCL)
  - INCDIR parameter is added for
    - Include CL source (INCLUDE)
  - Also available in 7.3 via PTF SI67337, SI67358
- New built-in function %PARMS for CLLE program

## Examples:

1. Create CLLE program from IFS source file

```
CRTBNDCCL PGM(TEST/HELLO)
          SRCSTMF('/tmp/examples/hello.clle' )

PGM PARM(&NAME)

  DCL &NAME *CHAR 10
  SNDPGMMSG MSG('HELLO, ' *CAT &NAME)

ENDPGM
```

2. Create CL command from IFS source file

```
CRTCMD CMD(TEST/HELLO) PGM(TEST/HELLO)
       SRCSTMF('hello.cmd' )

CMD1: CMD PROMPT('HELLO')
      PARM KWD(NAME) TYPE(*CHAR) LEN(10) MIN(1) +
      PROMPT('Your Name')
```

3. New %PARMS built-in

```
PGM PARM(&mb1)

  DCL VAR(&mb1) TYPE(*CHAR) LEN(10)
  DCL VAR(&num) TYPE(*INT) LEN(2) VALUE(0)

  CHGVAR VAR(&num) VALUE(%PARMS())
  SNDPGMMSG MSG('%PARMS: ' *CAT %CHAR(&num))

ENDPGM
```

# IBM i Cores/Partition – SMT – Threads



Processor	Limit	IBM i 7.1	IBM i 7.2	IBM i 7.3	IBM i 7.4
POWER7	Max Cores/Partition (Lab Services RPQ only)	64 (SMT4)	96 (SMT4)	96 (SMT4)	---
POWER7	Max Threads	256	384	384	---
POWER8	Max Cores/Partition (Lab Services RPQ only)	64 (SMT4) 32 (SMT8)	96 (SMT8)	192 (SMT4) 96 (SMT8)	192 (SMT4) 96 (SMT8)
POWER8	Max Threads	256	768	768	768
POWER9	Max Cores/Partition (Lab Services RPQ only)	---	96 (SMT8)	192 (SMT4) 96 (SMT8)	<b>192 (SMT8)</b>
POWER9	Max Threads	---	768	768	<b>1536</b>

# Limits – Disk Arms and Max LUN size



	IBM i 7.1	IBM i 7.2	IBM i 7.3	IBM i 7.4
Disk arms in all <b>basic auxiliary storage pools</b> (ASPs 1 – 32), per partition	2047	2047	2047	<b>3999</b>
Disk arms in all <b>independent auxiliary storage pools</b> (iASPs 33 – 255) in all nodes in a cluster	2047	2047	2047	<b>5999</b>
Maximum combined number of disk arms and redundant connections to disk units (i.e., maximum number of disk paths)	2800	35,600	35,600	35,600
<b>512/520 byte block size LUNs (Note 1):</b> <ul style="list-style-type: none"> <li>• 5xx block SAS disks (internal or vSCSI attached)</li> <li>• DS8000 LUNs</li> <li>• IBM Storwize LUNs</li> <li>• SVC LUNs</li> </ul>	1.2 TB or 2 TB (Note 2)	2 TB	2 TB	2 TB
<b>4160 byte block size LUNs (Note 1):</b> <ul style="list-style-type: none"> <li>• 4K block SAS disks (internal or vSCSI attached)</li> </ul>	2 TB	4 TB	4 TB	<b>16 TB</b>
<b>4096 byte block size LUNs (Note 1):</b> <ul style="list-style-type: none"> <li>• 4K block SAS disks (vSCSI attached)</li> <li>• FlashSystems LUNs</li> </ul>	N/A	2 TB	2 TB	<b>16 TB</b>

Note 1 – Actual limit is one block short of the max shown in the table.

Note 2 – For IBM i 7.1 the load source max is up to 1.2 TB. Other LUNs can be up to 2 TB.



# IBM i System Support



Servers	IBM i 7.2	IBM i 7.3	IBM i 7.4
<b>POWER9</b> S914, S922 (VIOS only), H922 (VIOS only), S924, H924, E980	✓	✓	✓
<b>POWER8</b> S812, S814, S822 (VIOS only), S824, E870, E870C, E880, E880C	✓	✓	✓
<b>POWER7/7+</b> 710, 720, 730, 740, 750, 760, 770, 780, 795	✓	✓	
<b>POWER7 BladeCenter</b> PS700/701/702/703/704 (all VIOS only) <b>POWER7/7+ Flex</b> p260/270/460 (all VIOS only)	✓		
<b>POWER6+</b> 520, 550, 560, 570, JS23/43 (VIOS only) <b>POWER6</b> 520, 550, 570, 595, JS12/22 (VIOS only)	✓ 1		

Current as of 2019-04-23

1 – no IOP or HSL support

<http://www-01.ibm.com/support/docview.wss?uid=ssm1platformibmi>

# Cloud Options



**IBM POWER9 on  
IBM Cloud: More  
Choice and  
Flexibility, On-  
Premise and Off**



<https://www.ibm.com/blogs/bluemix/2019/02/ibm-power9-on-ibm-cloud/>

# IBM i & IBM Cloud



With IBM i access in the IBM Cloud:

- 1) **Reach** new markets with the global IBM Cloud data center footprint
- 2) **Enable** their core applications in the cloud without migration disruption
- 3) **Leverage** our leadership in cloud-native services
- 4) **Rely** on our built-in security for highly sensitive, compliance-heavy data



<https://www.ibm.com/blogs/bluemix/2019/02/ibm-power9-on-ibm-cloud/>

# IBM Cloud Storage Solutions (5733ICC)



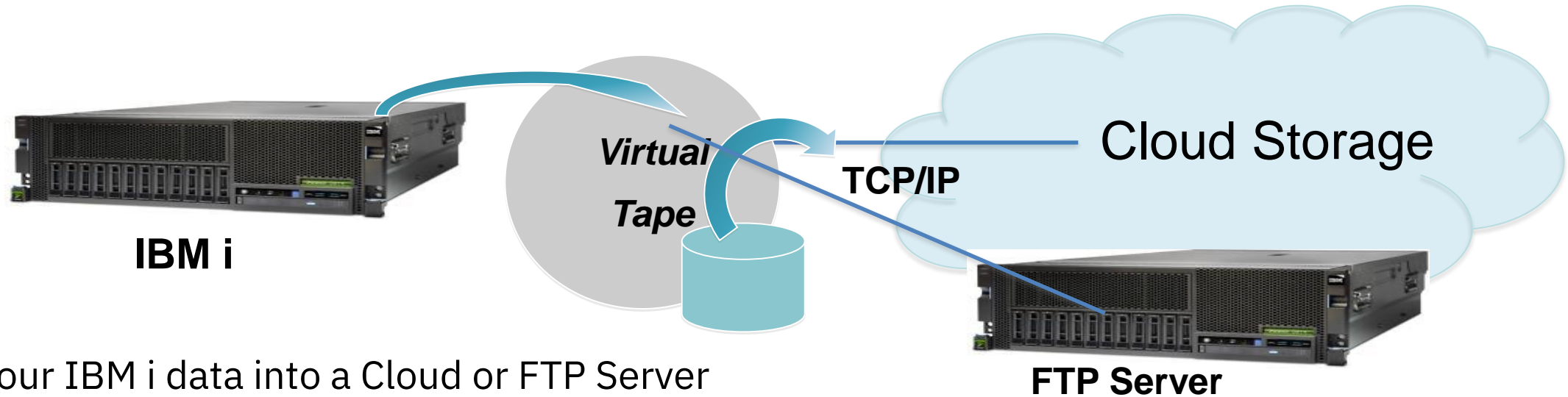
- Today
  - Tape Drives
  - Tapes are then shipped to offsite location
  - Disaster Recovery
  - Tapes need to be shipped back
- Why not remove the tape drive from the equation
- Send the backup 'directly' to an off site location



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# IBM Cloud Storage Solutions for i (5733ICC)



Save your IBM i data into a Cloud or FTP Server

- Two modes
  1. BRMS to Cloud for backup operations
  2. GUI dashboard for storing files in the Cloud (think of BOX-like usage cases)

[http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_73/icc/topics/iccuoverview.htm](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_73/icc/topics/iccuoverview.htm)

... and More!



# Domino V10.0.1 for i

- Released on Feb 5, including Traveler V10.0.1
- Supports IBM i 7.2 and later releases
- Product ID: 5733D10, first release to support double digit VRM, please use 100001 when vvrmm format VRM is required
- [A significant release](#), including
  - Automatic Notes client updates
  - MarvelClient Essentials for IBM Notes Management solution
  - Publishing statistics to external services
  - Larger database(256GB) and folders
  - Apache Tika conversion filter for attachments searches
  - Features that save your time, such as Indexing/clusters/database replicas management
  - ...

**#dominoforever**





# ... and More Innovations!

- PowerHA
- IFS
- Apache 2.4.36
- SMTP
- Service Tools
- System Limits
- More Cores & Threads per partition
- LUN Sizes
- ...

# Important Dates and Links

- **IBM i 7.3 TR6 and IBM i 7.4 – Announce: April 23, 2019**
  - Books updated in IBM Knowledge Center
  - Enhancement fact pages added to the IBM i Technology Updates wiki
- **IBM i 7.3 TR6 – GA: May 10, 2019**
- **IBM i 7.4 – GA: June 21, 2019**
- **Enhancement Landing pages...**  
<http://www.ibm.com/developerworks/ibmi/techupdates/i73-TR6>  
and  
<http://www.ibm.com/developerworks/ibmi/techupdates/i74>
- **IBM i 7.2 → No further enhancements**

# More Details at COMMON Events



## CEC 2019



Radisson Blu Hotel  
Berlin, Germany

## Common Europe Congress

16-19 June Berlin Germany

IBM i 7.4 will be covered extensively at the COMMON conferences.

