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# Die DB2 for i Services...

aus der Sicht eines Anwendungsentwicklers

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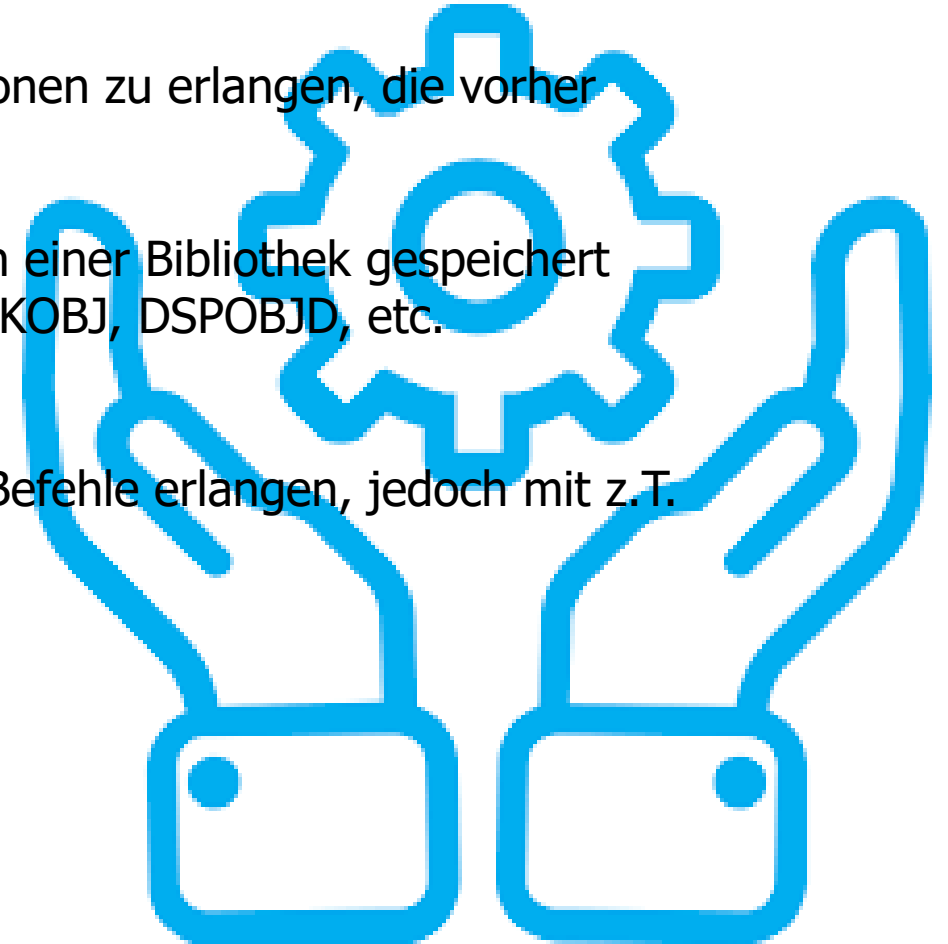
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Seit einigen Jahren hat IBM den Zugriff auf Systemobjekte mittels SQL unter dem Namen **IBM i Services** zugänglich gemacht und baut diese Schnittstelle seitdem ständig aus.

- Grundsätzlich ist es mit diesen Services möglich, Informationen zu erlangen, die vorher ausschließlich dem CL-Umfeld zuzurechnen war.
- Wollten wir in der Vergangenheit wissen, welche Objekte in einer Bibliothek gespeichert waren, so haben wir zu diesem Zweck z.B. Befehle wie WRKOBJ, DSPOBJD, etc. verwendet.
- Heute können wir diese Funktionen auch über SQL-Select-Befehle erlangen, jedoch mit z.T. erheblichem Mehrwert.



Im Rahmen der IBM i Services gibt es eine ganze Reihe von

- **Views,**
- **Stored Procedures,**
- **Functions ( Scalar, Table)**

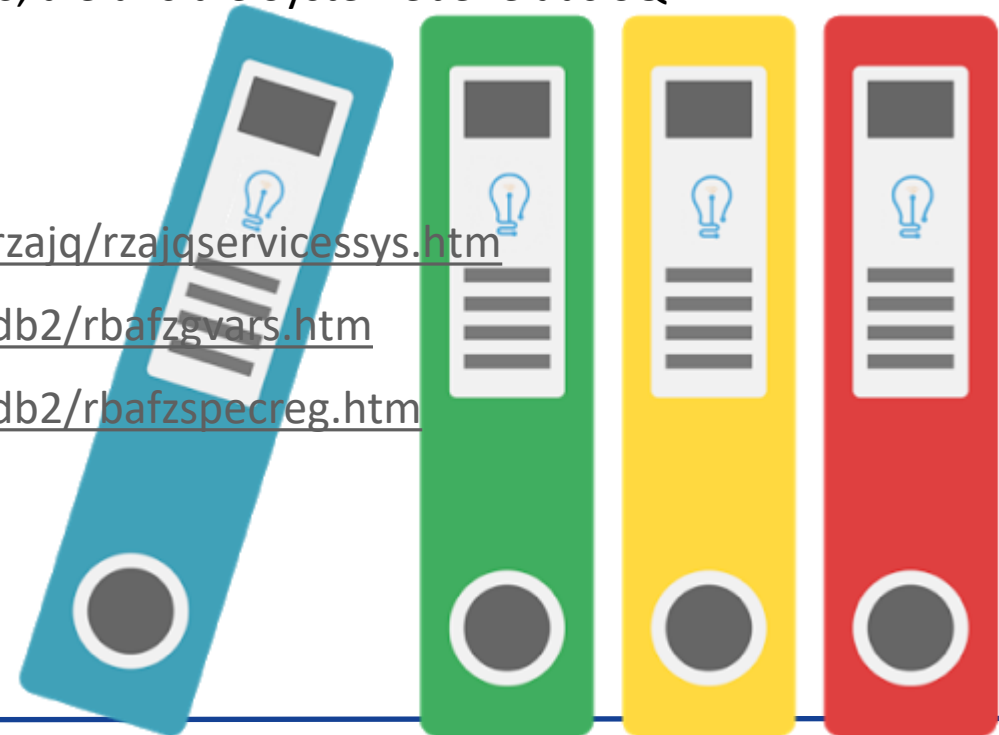
und darüber hinaus **Built-In Global Variables** und **Special Registers**, die uns die Systemebene aus SQL heraus aufschließen.

Genauere Informationen erhalten Sie unter:

[https://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_74/rzajq/rzajqservicessys.htm](https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_74/rzajq/rzajqservicessys.htm)

[https://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_74/db2/rbafzgvars.htm](https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_74/db2/rbafzgvars.htm)

[https://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_74/db2/rbafzspecreg.htm](https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_74/db2/rbafzspecreg.htm)





Welche IBM i Services stehen mir auf meinem System zur Verfügung?

In der Bibliothek QSYS2 befindet sich die Tabelle SERV\_INFO, in der alle auf einem System befindlichen IBM i Services dokumentiert sind.

```
23
24 select * from qsys2.serv_info;
25
```

SERVICE_CATEGORY	SERVICE_SCHEMA_NAME	SERVICE_NAME	SQL_OBJECT_TYPE	OBJECT_TYPE	SYSTEM_OBJECT_NAME
PTF	QSYS2	PTF_INFO	VIEW	*FILE	PTF_INFO
PTF	QSYS2	GROUP_PTF_INFO	VIEW	*FILE	GRPPTFINFO
PTF	SYSTOOLS	GROUP_PTF_CURRENCY	VIEW	*FILE	GRPPTFCUR
PTF	SYSTOOLS	GROUP_PTF_DETAILS	VIEW	*FILE	GRPPTFDTL
SECURITY	QSYS2	USER_INFO	VIEW	*FILE	USER_INFO
SECURITY	QSYS2	FUNCTION_INFO	VIEW	*FILE	FCN_INFO
SECURITY	QSYS2	FUNCTION_USAGE	VIEW	*FILE	FCN_USAGE
SECURITY	QSYS2	GROUP_PROFILE_ENTRIES	VIEW	*FILE	GROUPLIST
SECURITY	QSYS2	SQL_CHECK_AUTHORITY	SCALAR FUNCTION	-	SQL_C00001
SECURITY	QSYS2	SET_COLUMN_ATTRIBUTE	PROCEDURE	-	-
SECURITY	QSYS2	DRDA_AUTHENTICATION_ENTRY_INFO	VIEW	*FILE	DRDA_AUTHE
SECURITY	QSYS2	AUTHORITY_COLLECTION	VIEW	*FILE	AUTH_COL
SECURITY	QSYS2	OBJECT_PRIVILEGES	VIEW	*FILE	OBJ_PRIV
SECURITY	QSYS2	AUTHORIZATION_LIST_INFO	VIEW	*FILE	AUTHL_INFO
SECURITY	QSYS2	AUTHORIZATION_LIST_USER_INFO	VIEW	*FILE	AUTL_USERS
WORK MANAGEMENT	QSYS2	SYSTEM_VALUE_INFO	VIEW	*FILE	SYSVALINFO
WORK MANAGEMENT	QSYS2	GET_JOB_INFO	TABLE FUNCTION	-	-
WORK MANAGEMENT	QSYS2	ACTIVE_JOB_INFO	TABLE FUNCTION	-	-
WORK MANAGEMENT	QSYS2	SCHEDULED_JOB_INFO	VIEW	*FILE	SCHED_JOB
WORK MANAGEMENT	QSYS2	MEMORY_POOL	TABLE FUNCTION	-	-
WORK MANAGEMENT	QSYS2	MEMORY_POOL_INFO	VIEW	*FILE	POOL_INFO
WORK MANAGEMENT	QSYS2	SYSTEM_STATUS	TABLE FUNCTION	-	-
WORK MANAGEMENT	QSYS2	SYSTEM_STATUS_INFO	VIEW	*FILE	SYS_STATUS
WORK MANAGEMENT	QSYS2	OBJECT_LOCK_INFO	VIEW	*FILE	OBJ_LOCK
WORK MANAGEMENT	QSYS2	RECORD_LOCK_INFO	VIEW	*FILE	RCD_LOCK
WORK MANAGEMENT	QSYS2	JOB_INFO	TABLE FUNCTION	-	-
WORK MANAGEMENT	QSYS2	JOB_QUEUE_INFO	VIEW	*FILE	JOBQ_INFO
MESSAGE HANDLING	QSYS2	REPLY_LIST_INFO	VIEW	*FILE	REPLYLIST
MESSAGE HANDLING	QSYS2	JOBLOG_INFO	TABLE FUNCTION	-	-
MESSAGE HANDLING	QSYS2	HISTORY_LOG_INFO	TABLE FUNCTION	-	-
MESSAGE HANDLING	QSYS2	MESSAGE_QUEUE_INFO	VIEW	*FILE	MSGQ_INFO



Was hat sich bei Technology Updates (PTFs) in diesem Bereich geändert?

Zu diesem Zweck gibt es die Technology Update Seite, in der die jeweiligen Neuigkeiten, die ein Technology Update gebracht hat, bzw. bringen wird, dokumentiert ist. Die Technology Updates finden Sie hier:



<https://www.ibm.com/support/pages/node/1119129>

IBM i Technology Updates 

News

Abstract

IBM i operating system levels and related software products are frequently enhanced via PTFs. This site contains information, pointers to information, and articles that show how to use IBM i.

Content

	Enhancement Landing Pages
IBM i 7.4	<a href="#">TR3 - TR2 - TR1 - Base Enhancements</a>
IBM i 7.3	<a href="#">TR9 - TR8 - TR7 - TR6 - TR5 - TR4 - TR3 - TR2 - TR1 - Base Enhancements</a>
IBM i 7.2	<a href="#">TR9 - TR8 - TR7 - TR6 - TR5 - TR4 - TR3 - TR2 - TR1 - Base Enhancements</a>

## Kategorien der IBM i Services

- APPLICATION
- COMMUNICATION
- DATABASE-APPLICATION
- DATABASE-PERFORMANCE
- DATABASE-PLAN CACHE
- DATABASE-UTILITY
- IFS
- JAVA
- JOURNAL
- LIBRARIAN





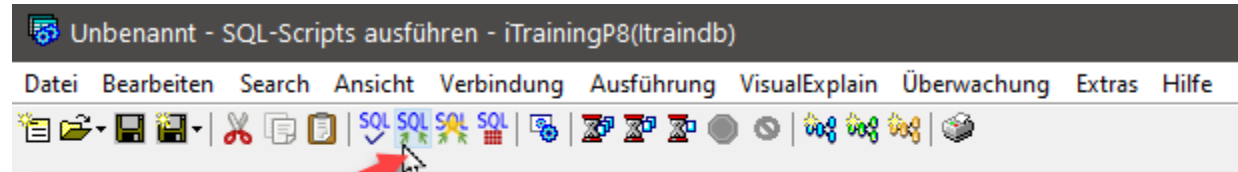
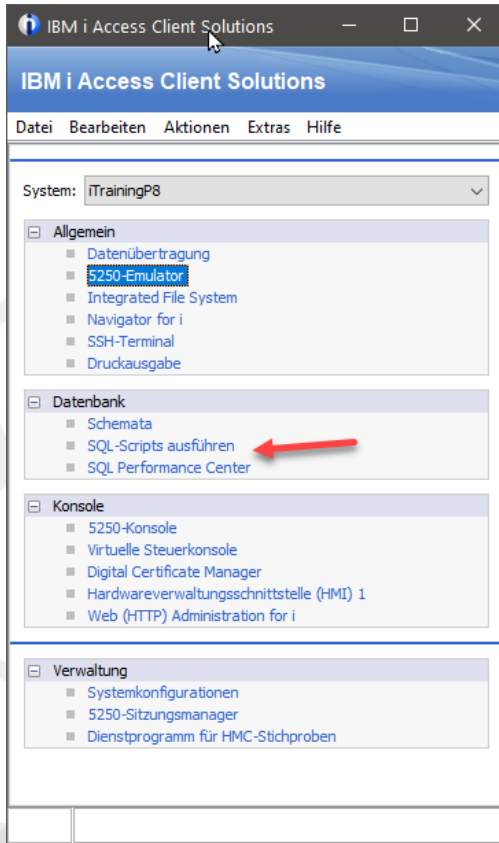
## Kategorien der IBM i Services

- MESSAGE HANDLING
- MIRROR-COMMUNICATION
- MIRROR-PRODUCT
- MIRROR-RECLONE
- MIRROR-REPLICATION
- MIRROR-RESYNCHRONIZATION
- MIRROR-SERVICEABILITY
- PRODUCT
- PTF
- SECURITY
- SPOOL
- STORAGE
- SYSTEM HEALTH
- WORK MANAGEMENT

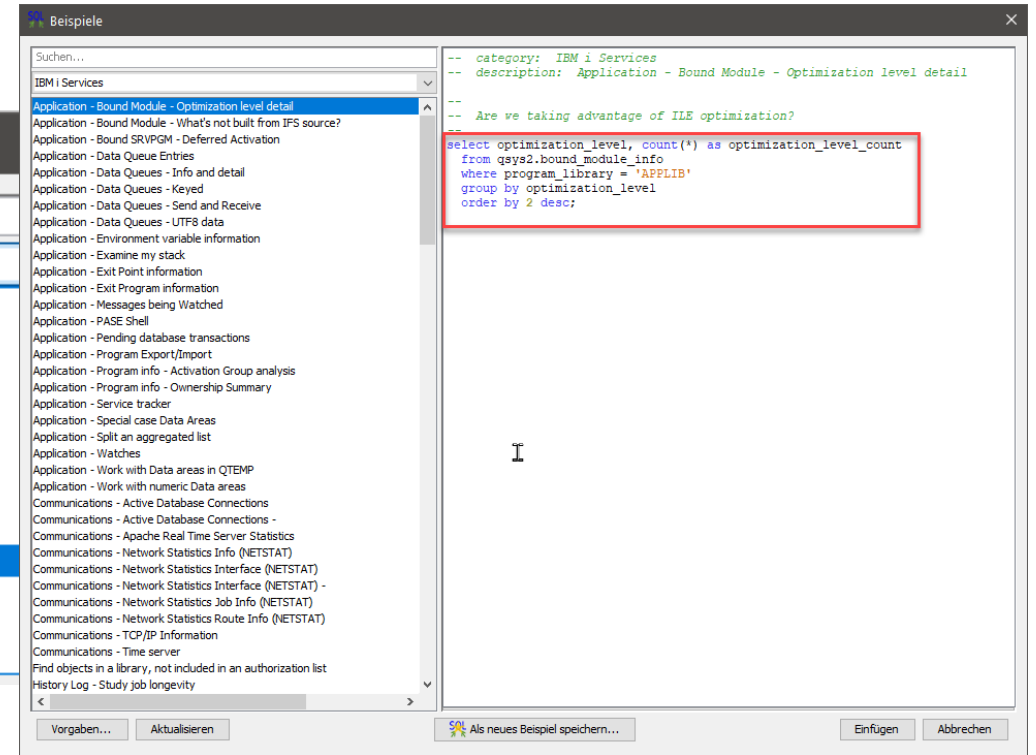
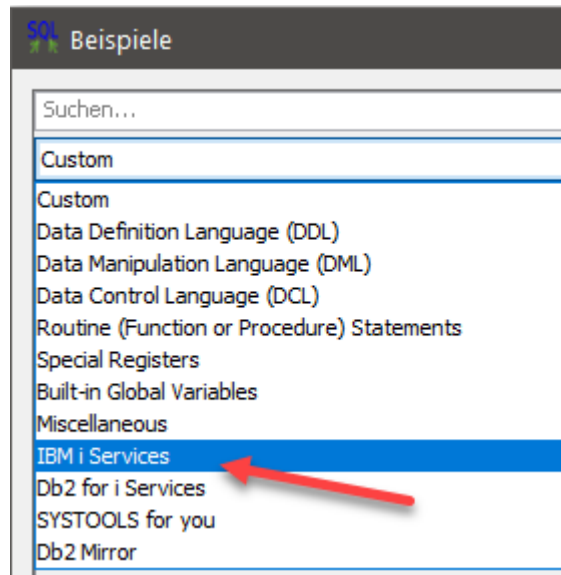
Wenn DB2 Mirror installiert ist



## Hilfe durch den ACS-Client



1  
Aus Beispielen einfügen...



## In welchen Bibliotheken befinden sich die Objekte IBM i Services

- `select distinct service_schema_name from serv_info;`

SERVICE_SCHEMA_NAME
SYSPROC
QSYS2
SYSTOOLS
SYSIBMADM

DB2 Core-Bibliothek

- `c1:ADDLIB LIB(SYSTOOLS);`
- `c1:ADDLIB LIB(SYSIBMADM);`
- `c1:ADDLIB LIB(SYSPROC);`

## Bibliotheksliste prüfen

- `select * from Library_list_info;`

ORDINAL_POSITION	SCHEMA_NAME	SYSTEM_SCHEMA_NAME	TYPE	IASP_NUMBER	TEXT_DESCRIPTION
1	EPSYS	EPSYS	SYSTEM		0Vorschaltbibliothek EPOS
2	QSYS	QSYS	SYSTEM		0Systembibliothek
3	QSYS2	QSYS2	SYSTEM		0Systembibliothek für CPIs
4	QHLPSYS	QHLPSYS	SYSTEM		0 -
5	QUSRSYS	QUSRSYS	SYSTEM		0System Library for Users
6	QIWS	QIWS	PRODUCT		0 -
7	SYSPROC	SYSPROC	USER		0Systembibliothek für DB2 ←
8	SYSIBMADM	SYSIBMADM	USER		0Systembibliothek für DB2 ←
9	TRANSFER	TRANSFER	USER		0 - ←
10	EPSSCLDTA	EPSSCLDTA	USER		0Daten für Schulungen
11	SYSIBM	SYSIBM	USER		0Systembibliothek für DB2
12	SYSTOOLS	SYSTOOLS	USER		0Systembibliothek für DB2 ←
13	GITool	GITool	USER		0COLLECTION - von SQL erstellt.
14	RPGUNIT	RPGUNIT	USER		0iRPGUnit Utility - 3.2.0 (17.04.2020)
15	QGPL	QGPL	USER		0General Purpose Library
16	QTEMP	QTEMP	USER		0 -

# IBM i Services: Application

- `select * from serv_info  
where Service_category = 'APPLICATION';`

SERVICE_CATEGORY	SERVICE_SCHEMA_NAME	SERVICE_NAME	SQL_OBJECT_TYPE
APPLICATION	QSYS2	QCMDXC	PROCEDURE
APPLICATION	QSYS2	SERVICES_INFO	VIEW
APPLICATION	QSYS2	ENVIRONMENT_VARIABLE_INFO	VIEW
APPLICATION	QSYS2	SET_PASE_SHELL_INFO	PROCEDURE
APPLICATION	QSYS2	STACK_INFO	TABLE FUNCTION
APPLICATION	QSYS2	DATA_AREA_INFO	VIEW
APPLICATION	QSYS2	DATA_AREA_INFO	TABLE FUNCTION
APPLICATION	SYSTOOLS	SPLIT	TABLE FUNCTION
APPLICATION	QSYS2	BOUND_MODULE_INFO	VIEW
APPLICATION	QSYS2	BOUND_SRPVGM_INFO	VIEW
APPLICATION	QSYS2	PROGRAM_EXPORT_IMPORT_INFO	VIEW
APPLICATION	QSYS2	PROGRAM_INFO	VIEW
APPLICATION	QSYS2	DATA_QUEUE_INFO	VIEW
APPLICATION	QSYS2	SEND_DATA_QUEUE	PROCEDURE
APPLICATION	QSYS2	RECEIVE_DATA_QUEUE	TABLE FUNCTION
APPLICATION	QSYS2	CLEAR_DATA_QUEUE	PROCEDURE
APPLICATION	QSYS2	DB_TRANSACTION_INFO	VIEW
APPLICATION	SYSTOOLS	LPRINTF	PROCEDURE
APPLICATION	QSYS2	DATA_QUEUE_ENTRIES	TABLE FUNCTION
APPLICATION	QSYS2	WATCH_INFO	VIEW
APPLICATION	QSYS2	WATCH_DETAIL	TABLE FUNCTION
APPLICATION	QSYS2	EXIT_POINT_INFO	VIEW
APPLICATION	QSYS2	EXIT_PROGRAM_INFO	VIEW

# IBM i Services: Application



- PTFs
- `select * from group_ptf_Currency;`

PTF_GROUP_CURRENCY	PTF_GROUP_ID	PTF_GROUP_TITLE	PTF_GROUP_LEVEL_INSTALLED	PTF_GROUP_LEVEL_AVAILABLE
-	SF99653	SF99653 740 Db2 Web Query for i V2.2.1	9	9
INSTALLED LEVEL IS CURRENT	SF99661	SF99661 740 WebSphere App Server V8.5	5	5
UPDATE AVAILABLE	SF99662	SF99662 740 IBM HTTP Server for i	9	11
UPDATE AVAILABLE	SF99663	SF99663 740 Performance Tools	6	7
UPDATE AVAILABLE	SF99664	SF99664 740 Backup Recovery Solutions	19	20
UPDATE AVAILABLE	SF99665	SF99665 740 Java	9	10
UPDATE AVAILABLE	SF99666	SF99666 740 High Availability for IBM i	5	6
INSTALLED LEVEL IS CURRENT	SF99667	SF99667 740 740 TCP/IP PTF	2	2
INSTALLED LEVEL IS CURRENT	SF99668	SF99668 740 IBM Db2 Mirror for i	9	9
INSTALLED LEVEL IS CURRENT	SF99675	SF99675 740 Hardware and Related PTFs	2	2
UPDATE AVAILABLE	SF99704	SF99704 740 DB2 for IBM i	11	12
INSTALLED LEVEL IS CURRENT	SF99736	SF99736 740 Technology Refresh plus Recommended Groups	1	1
UPDATE AVAILABLE	SF99737	SF99737 740 Technology Refresh	3	4
UPDATE AVAILABLE	SF99738	SF99738 740 Group Security	17	19
UPDATE AVAILABLE	SF99739	SF99739 740 Group Hiper	44	48
UPDATE AVAILABLE	SF99740	Current Cumulative PTF Media Documentation	20303	21091
UPDATE AVAILABLE	SF99741	SF99741 740 All PTF Groups except Cumulative PTF Package & MQ	4	8



# IBM i Services: Application



- Systembefehle ausführen
- CALL QCMDExc(<CL-Befehl>)

```
set lclBaseTime = current_timestamp;  
set lclCLCommand = trim(lclCLCommand) || trim(inDelay) || ')';  
call qcmdexc('CHGDTAARA DTAARA(EPSSCLDTA/SYSSTS (1 5)) VALUE('' '')');
```



# IBM i Services: Application



- Nachrichten ins Joblog ausgeben
- CALL SYSTOOLS.LPRINTF(<Nachricht>)

```
110 CALL SYSTOOLS.LPRINTF('Diese Nachricht wurde gesendet von ' CONCAT job_name concat ' am '  
111                        CONCAT DAYOFWEEK(CURRENT DATE) CONCAT ' um '  
112                        CONCAT CURRENT TIME);
```





# IBM i Services: Application



- Programm Informationen anzeigen (DSPPGM)
- View: PROGRAM\_INFO

```
118 -- Programm Informationen (DSPPGM)
119
120 SELECT * FROM QSYS2.PROGRAM_INFO
121 WHERE PROGRAM_LIBRARY = 'EPS007'
122 ORDER BY Program_Attribute;
```

PROGRAM_LIBRARY	PROGRAM_NAME	PROGRAM_TYPE	OBJECT_TYPE	CREATE_TIMESTAMP
EPS007	GETMSG	ILE	*PGM	2020-11-02 16:05:36
EPS007	DLTCST05	ILE	*PGM	2020-11-04 14:58:42
EPS007	INSCST00	ILE	*PGM	2017-10-09 10:23:53
EPS007	INSCST01	ILE	*PGM	2020-11-02 12:20:56
EPS007	INSCST02	ILE	*PGM	2020-11-02 15:54:15
EPS007	INSCST03	ILE	*PGM	2020-11-03 10:23:14
EPS007	INSCST04	ILE	*PGM	2020-11-03 11:30:27
EPS007	INSCST05	ILE	*PGM	2020-11-04 09:49:01
EPS007	UDTCST05	ILE	*PGM	2020-11-04 14:25:45
EPS007	UPDCST05	ILE	*PGM	2020-11-04 14:37:01
EPS007	WRKCST01	ILE	*PGM	2020-11-04 11:48:08
EPS007	WRKCST02	ILE	*PGM	2020-11-04 15:09:52
EPS007	MSG	ILE	*SRVPGM	2020-11-04 09:48:02
EPS007	STRG	ILE	*SRVPGM	2020-11-04 09:48:18



# IBM i Services: Application

- Modul Informationen anzeigen
- View: BOUND\_MODULE\_INFO

```
-- Modul Informationen  
SELECT *  
FROM QSYS2.BOUND_MODULE_INFO  
WHERE PROGRAM_LIBRARY = 'EPS007' and OBJECT_TYPE = '*PGM' and Program_name = 'INSCST05';
```

PROGRAM_LIBRARY	PROGRAM_NAME	OBJECT_TYPE	BOUND_MODULE_LIBRARY	BOUND_MODULE	MODULE_ATTRIBUTE
EPS007	INSCST05	*PGM	QTEMP	INSCST05	RPGLE



- Serviceprogramm Informationen anzeigen
- View: BOUND\_SRVPGM\_INFO

```
130 -- Service Programm Informationen
131 SELECT *
132 FROM QSYS2.BOUND_SRVPGM_INFO
133 WHERE PROGRAM_LIBRARY = 'EPS007' and Bound_service_program not like 'Q%' and Program_name = 'INSCST05'
134 order by Program_name, Bound_Service_Program;
```

PROGRAM_LIBRARY	PROGRAM_NAME	OBJECT_TYPE	BOUND_SERVICE_PROGRAM_LIBRARY	BOUND_SERVICE_PROGRAM
EPS007	INSCST05	*PGM	*LIBL	MSG
EPS007	INSCST05	*PGM	*LIBL	STRG



# IBM i Services: Application

- Programm Export Informationen anzeigen
- View: PROGRAM\_EXPORT\_IMPORT\_INFO

```
148 -- Programm Export Informationen
149 SELECT *
150 FROM QSYS2.PROGRAM_EXPORT_IMPORT_INFO
151 WHERE PROGRAM_LIBRARY = 'EPS007';
```

PROGRAM_LIBRARY	PROGRAM_NAME	OBJECT_TYPE	SYMBOL_NAME	SYMBOL_USAGE
EPS007	MSG	*SRVPGM	MSG_DISPLAYPOPUP	*PROCEXP
EPS007	MSG	*SRVPGM	MSG_GETMESSAGE	*PROCEXP
EPS007	STRG	*SRVPGM	STRG_CENTER	*PROCEXP



# IBM i Services: Application

- Liste von Werten trennen
- Table Function: SPLIT

```

165 SELECT ordinal_position,
166         LTRIM(element) AS special_authority
167 FROM qsys2.user_info u,
168     TABLE (
169         systools.split(input_list => special_authorities,
170                       delimiter => ' ')
171     ) b
172 WHERE u.authorization_name = 'LGADOZ01';

```

ORDINAL_POSITION	SPECIAL_AUTHORITY
1	*ALLOBJ
2	*SECADM
3	*JOBCTL
4	*SPLCTL
5	*SAVSYS
6	*SERVICE
7	*AUDIT
8	*IOSYSCFG



# IBM i Services: Application

- Data Area Info
- View: DATA\_AREA\_INFO, Table Function: DATA\_AREA\_INFO

```

174 -- Data Area Information
175 |
176 select * from data_area_info where data_area_name = 'QSS1MRI' and data_area_library = 'QGPL';
177
178 select * from table(data_area_info('QSS1MRI', 'QGPL')) as Data
179

```

DATA_AREA_LIBRARY	DATA_AREA_NAME	DATA_AREA_TYPE	LENGTH	DECIMAL_POSITIONS	DATA_AREA_VALUE
QGPL	QSS1MRI	*CHAR	750		- V7R4M000 2929



# IBM i Services: Application



- Mit Data Queues arbeiten
- View: DATA\_QUEUE\_INFO
- Procedures: SEND\_DATA\_QUEUE, SEND\_DATA\_QUEUE\_BINARY, SEND\_DATA\_QUEUE\_UTF8  
RECEIVE\_DATA\_QUEUE
- Table Function: RECEIVE\_DATA\_QUEUE

```
185 SELECT * FROM QSYS2.DATA_QUEUE_INFO
186     WHERE DATA_QUEUE_LIBRARY = 'PIXIACCES' AND DATA_QUEUE_NAME = 'ZNDEANDTQ';
187
188 CALL QSYS2.SEND_DATA_QUEUE(MESSAGE_DATA => 'Das ist eine neue Nachricht',
189                            DATA_QUEUE => 'ZNDEANDTQ',
190                            DATA_QUEUE_LIBRARY => 'PIXIACCES');
191
192 SELECT Message_Data FROM TABLE(QSYS2.RECEIVE_DATA_QUEUE(
193                                DATA_QUEUE => 'ZNDEANDTQ',
194                                DATA_QUEUE_LIBRARY => 'PIXIACCES'));
195
196 CALL QSYS2.CLEAR_DATA_QUEUE('ZNDEANDTQ', 'PIXIACCES');
```



# IBM i Services: Application



- Daten aus IFS-Objekten lesen bzw. ins IFS schreiben
- Table Functions: IFS\_READ, IFS\_READ\_BINARY, IFS\_READ\_UTF8
- Procedures: IFS\_WRITE, IFS\_WRITE\_BINARY, and IFS\_WRITE\_UTF8

```
242 SELECT * FROM TABLE(QSYS2.IFS_READ('/home/LGAD0Z01/library_names.txt'));
```

```
233 CALL QSYS2.IFS_WRITE(PATH_NAME => '/home/LGAD0Z01/library_names.txt',  
234 LINE => LIBNAME,  
235 FILE_CCSID => 819,  
236 END_OF_LINE => 'CRLF');
```





**Danke für Ihre Aufmerksamkeit!**



Häufig kommen die Fragen erst am Arbeitsplatz!  
Schreiben Sie mir! Ich helfe Ihnen gern weiter!

**[luttkus@eposgmbh.com](mailto:luttkus@eposgmbh.com)**