

Power Week 2025

18 - 19 - 20 novembre 2025
IBM Innovation Studio Paris

#pw2025

S65 - Web-Services avec SQL

20 novembre 11:15 - 12:15

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Agenda

Introduction

Créer un serveur de services web

- Tip: Modification du fichier httpd.conf

Créer des services web RESTful SQL

Exemples



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Introduction

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Qu'est-ce qu'un service Web?

Une méthode simple pour connecter des points d'extrémité (endpoints)

- Envoyer une requête et recevoir une réponse

Services (Web), aussi appelés API (= Application Programming Interface)

→ Programmes ou procédures appelés à travers le Web

- Exécuter l'action demandée
- Retourner les données demandées

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Types de services web

SOAP (Simple Object Access Protocol)

- Standardisé
- Basé sur XML (toujours XML)
 - Chaque opération est explicitement définie avec le format XML de la requête ainsi que le format de la réponse
 - Chaque paramètre d'entrée est lié à un type de données → fortement typé
- Utilise WSDL (Web Service Description Language) comme moyen de contact entre le consommateur et le fournisseur
 - Peut être considéré comme une méthode de signature

REST (Representational State Transfer)

- Aucun format standard
- Simplicité
- Echange de données
 - JSON (mais aussi XML, HTML YAML ...) peuvent être utilisés
- Data driven
- Stateless communications protocol (http)
 - HTTP types de demande:
 - GET (Récupérer des données)
 - POST (Ajouter de nouvelles données)
 - PUT (Actualiser les données)
 - DELETE (Supprimer des données)

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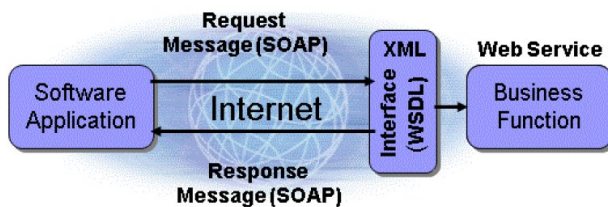
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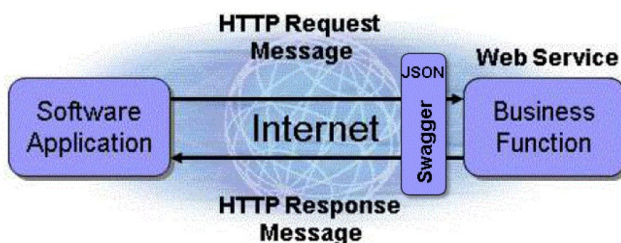
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Types de services Web

- Service Web SOAP



- Service Web RESTful



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Les bases des services Web RESTful

Utilisation explicite des méthodes HTTP :

- **GET** Récupérer des données depuis le serveur
- **POST** Envoyer des données au serveur
- **PUT** Remplacer des données ou créer une nouvelle ressource
- **DELETE** Supprimer une ressource

Sans état → Statelessness

URI (Uniform Resource Identifier) de type structure de répertoire

- Utilisation de noms (au lieu de verbes)
- Exemples: **GET /customers** – Afficher tous les clients
POST /customers/4711 – Ajouter Client 4711 (avec POST request body)

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Déployer des services web sur IBM i

HTTP Web Administration Interface

- Pour enregistrer des **programmes** ou des **procédures** écrits dans une HLL (tel que RPG, Cobol ou C) comme **service web RESTful** (Representational State Transfer) ou **SOAP** (Simple Object Access Protocol), pour qu'ils puissent être appelés via le Web.
- **Instructions SQL** peuvent être enregistrées comme **services web RESTful**, pendant que **Db2 for i** agit comme **serveur de services RESTful**.



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Créer un serveur de services web

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Start TCP/IP Server (STRTCPSVR) – Instance du serveur *ADMIN

```

Start TCP/IP Server (STRTCPSVR)

Type choices, press Enter.

Server application . . . . . > *HTTP          *ALL, *AUTOSTART...
+ for more values
Restart server . . . . . *NONE              *NONE *HTTP *DNS *QMROUTED *C
HTTP server:
  Server instance . . . . . > *ADMIN          Name, *ALL, *ADMIN
  Instance startup values . . . *NONE

-----
work with Subsystem Jobs
Subsystem . . . . . : QHTTSPVR                20-05-05 12:06:32 UTC

Type options, press Enter.
2=Change 3=Hold 4=End 5=work with 6=Release 7=Display message
8=work with spooled files 13=Disconnect

F3=Exit  F4=Prompt Opt Job      User      Type      Status      Function
F24=More keys
-----
ADMIN    QTMHHTTP  BATCH    ACTIVE      PGM-QZHMMAIN
ADMIN    QTMHHTTP  BATCH    ACTIVE      PGM-QZSRLOG
ADMIN    QTMHHTTP  BATCH    ACTIVE      PGM-QZSRHTTP
ADMIN    QTMHHTTP  BATCH    ACTIVE      PGM-QZSRGCI
ADMIN1   QLWISVR     BATCH    ACTIVE      JVM-/QIBM/Prod
ADMIN2   QLWISVR     BATCH    ACTIVE      JVM-/QIBM/Prod
ADMIN3   QLWISVR     BATCH    ACTIVE      JVM-/QIBM/Prod
ADMIN4   QWEBADMIN    BATCH    ACTIVE      JVM-/QIBM/Prod

Parameters or command
====
F3=Exit  F4=Prompt  F5=Refresh  F9=Retrieve  F11=Display schedule data
F12=Cancel F17=Top      F18=Bottom
  
```

• Démarrer l'instance du HTTP Serveur *ADMIN dans le sous-système QHTTSPVR

• l'instance du HTTP Serveur *ADMIN est activé

```

Select Job_Name_Short as Job, Job_User as User, Job_Type, Job_Status,
Trim(Function_Type) concat '-' concat Trim(Function) Function
From Table (QSYS2.ACTIVE_JOB_INFO(RESET_STATISTICS
-> 'NO',
SUBSYSTEM_LIST_FILTER -> 'QHTTSPVR',
JOB_NAME_FILTER -> 'ALL',
CURRENT_USER_LIST_FILTER -> '',
DETAILED_INFO -> 'NONE')) a
Where Job_Name_Short like 'ADMIN%'
Order By SUBSYSTEM, JOB_NAME_SHORT, RUN_PRIORITY, JOB_NUMBER;
  
```

JOB	USER	JOB_TYPE	JOB_STATUS	FUNCTION
ADMIN	QTMHHTTP	BCH	SIGN	PGM-QZHMMAIN
ADMIN	QTMHHTTP	BCH	SIGN	PGM-QZSRLOG
ADMIN	QTMHHTTP	BCH	SIGN	PGM-QZSRHTTP
ADMIN	QTMHHTTP	BCH	TIMW	PGM-QZSRGCI
ADMIN1	QWEBADMIN	BCH	THDW	JVM-/QIBM/Prod
ADMIN2	QLWISVR	BCH	THDW	JVM-/QIBM/Prod
ADMIN3	QWEBADMIN	BCH	THDW	JVM-/QIBM/Prod
ADMIN4	QLWISVR	BCH	THDW	JVM-/QIBM/Prod

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Créer un serveur de services Web

• Démarrer le Navigator for i (de l'ACS)

• Bookmarks → IBM Web Administration for i

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Créer un nouveau serveur de services Web

• Choisir: Create a New Web Service Server

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Créer un nouveau serveur de services Web

IBM Web Administration for i Welcome HAUSER

Setup Manage Advanced Related Links

Common Tasks and Wizards

- Create Web Services Server
- Create HTTP Server
- Create Application Server

Create Web Services Server

Specify Web services server name - Step 1 of 5

Welcome to the Create Web Services Server wizard. A Web services server provides a secure and easy way to configure an environment for hosting Web services that are based on IBM i objects such as RPG and COBOL programs and SQL statements. This wizard creates everything needed to run Web services.

For more information, please visit: <https://www.ibm.com/support/pages/node/633935>

Specify a unique name for this server ?

Server name: BHATEST03

Server description: Web services server created by the Create Web Services Server

☒ Create HTTP server

- Enregistrer le nom et la description du serveur WebService

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Créer un nouveau serveur de services Web

IBM Web Administration for i Welcome HAUSER

Setup Manage Advanced Related Links

Common Tasks and Wizards

- Create Web Services Server
- Create HTTP Server
- Create Application Server

Create Web Services Server

Specify network attributes for server - Step 2 of 5

Your server may listen for requests on specific IP addresses or on all IP addresses of the system. A command port is used to manage the server.

Specify internet addresses and ports for server ?

Specify server command port: 10023

Specify internet address and port for the server

IP address: All IP addresses

Port: 10022

Specify internet address and port for the HTTP server

IP address: All IP addresses

Port: 10032

- Les prochains ports sont déterminés automatiquement
- Les ports peuvent être précisés individuellement, mais doivent > 5000 ou, mieux encore, compris entre 20000 et 65535

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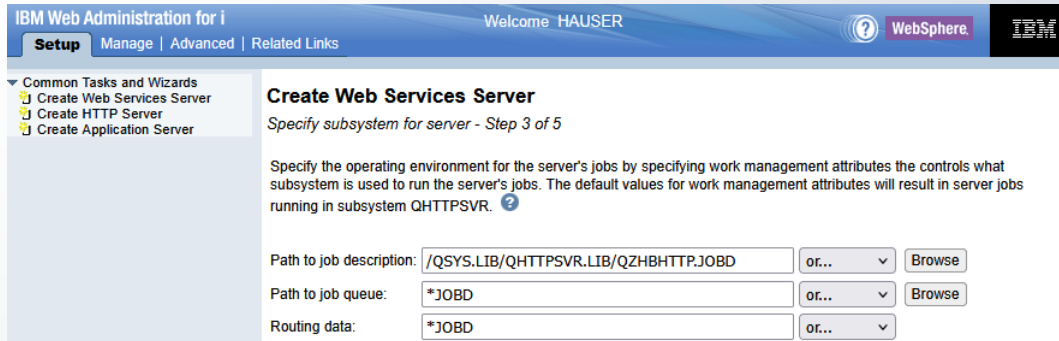
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Créer un nouveau serveur de services Web



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Setup | Manage | Advanced | Related Links

Common Tasks and Wizards

- Create Web Services Server
- Create HTTP Server
- Create Application Server

Create Web Services Server

Specify subsystem for server - Step 3 of 5

Specify the operating environment for the server's jobs by specifying work management attributes the controls what subsystem is used to run the server's jobs. The default values for work management attributes will result in server jobs running in subsystem QHTTPSVR. ?

Path to job description: /QSYS.LIB/QHTTPSVR.LIB/QZHBHTTP.JOBD or... Browse

Path to job queue: *JOBQ or... Browse

Routing data: *JOBQ or...

- peut être accepté comme il est

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Créer un nouveau serveur de services Web



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Setup | Manage | Advanced | Related Links

Common Tasks and Wizards

- Create Web Services Server
- Create HTTP Server
- Create Application Server

Create Web Services Server

Specify User ID for Server - Step 4 of 5

The server requires an IBM i user ID to run the server's jobs. It is recommended that a special user ID is specified to run the server's jobs since this user ID is given authority to all of the server's objects, such as files and directories.

Specify user ID for this server: ?

☐ Use default user ID

☒ Specify an existing user ID

User ID: WSERVICK

☐ Create a new user ID

- Spécifier un user id existant:
User profile qui exécutera les jobs serveur
- Créer une nouvel User Id:
Créera un nouveau profil utilisateur sans lancer l'écran 5250

- Utiliser le User Id par défaut :
QWSERVICE livré avec l'état *DISABLED et le mot de passe *NONE
→ Avant de l'utiliser, il faut l'activer (*ENABLED) et ajouter un mot de passe (commande CL : CHGUSRPRF)

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Créer un nouveau serveur de services Web - Résumé

The screenshot shows the IBM Web Administration console interface. The left sidebar contains a navigation menu with 'Common Tasks and Wizards' and 'Servers'. The main content area displays the 'Create Web Services Server' wizard, which is currently on 'Step 5 of 5'. The wizard shows the configuration details for a new web services server named 'BHATEST03'. The configuration includes the server name, description, port (10023), command port (10023), server root, server URL, user ID for server (WSERVICX), context root (/web), job queue (*JOB), job description (QHTTPSVR/QZBHHTTP), subsystem (QHTTPSVR/QHTTPSVR), and routing data (*JOB).

Below the wizard, there is a section for 'HTTP Server Information' which shows the HTTP server name (BHATEST03), description, port (10023), document root, server root, server association, job queue, job description, subsystem, and routing data.

On the right side, there is a 'Manage Web Services Server' page for the server 'BHATEST03'. It shows the server is in the process of being created and provides a link to the IBM support page for more information.

At the bottom of the console, there is a status bar with the date '16/11/2025', the event 'Power Week 2025 - 18-19-20 Novembre 2025 - S65 - Services Web RESTful avec SQL - Birgitta Hauser', the page number 'Page 18', and the text 'IBM Champion depuis 2020'.

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Travailler avec des Services Web

The screenshot shows the IBM Web Administration console interface. The left sidebar contains a navigation menu with 'Common Tasks and Wizards' and 'Servers'. The main content area displays the 'Manage All Servers' page. The page has a tabbed interface with 'All HTTP Servers' and 'All Application Servers'. The 'All HTTP Servers' tab is currently selected, showing a table of servers.

The table lists the following servers:

Server	Version	Status	Address:Port	Description
Admin1	V8.5 (int app svr)	Running	*:2002	
Admin2	V8.5 (int app svr)	Running	*:2004,2005	
Admin3	V8.5 (int app svr)	Running	*:2006,2007	
Admin4	V8.5 (int app svr)	Running	*:2008	
Admin5	V8.5 (int app svr)	Running	*:2011	
AJSP	V8.5 (int app svr)	Stopped	*:8211	
BHATEST03	V2.6 (web services)	Running	*:10022	Web services server created by the Create Web Services Server wizard.
BHAWSSQL01	V2.6 (web services)	Running	*:10000	WebServices based on SQL Statements
BHAWSSQL02	V2.6 (web services)	Running	*:10011	Web services server created by the Create Web Services Server wizard.

Below the table, there are buttons for 'Refresh', 'Start', 'Stop', 'Restart', 'Manage Details', 'Delete', and 'Rename'.

At the bottom of the console, there is a status bar with the date '16/11/2025', the event 'Power Week 2025 - 18-19-20 Novembre 2025 - S65 - Services Web RESTful avec SQL - Birgitta Hauser', the page number 'Page 19', and the text 'IBM Champion depuis 2020'.

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Répertoires IFS pour serveur Web

/www/BHATEST03 on BHADEV.RZKH.DE

File Edit View Actions

BHADEV.RZKH.DE

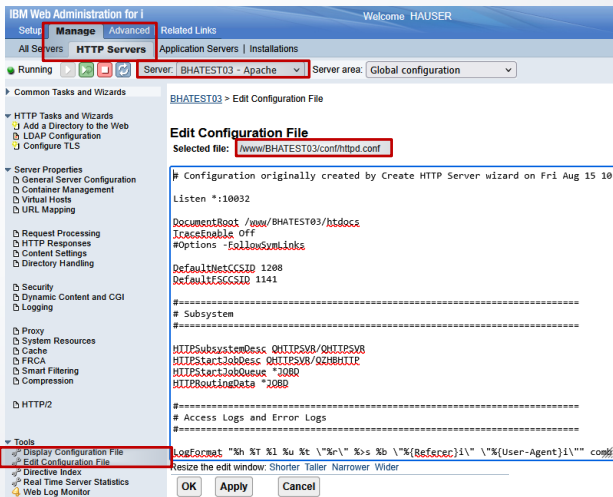
Directory

/www/BHATEST03

Icon	Name	Size (KB)	Last Modified
Folder	conf		August 15, 2025 at 3:10:26 PM GMT+2
Folder	htdocs		August 15, 2025 at 11:28:46 AM GMT+2
File	iasCreateBHATEST03.properties	1	August 15, 2025 at 11:28:47 AM GMT+2
Folder	logs		August 15, 2025 at 11:29:05 AM GMT+2
Folder	webservices		August 15, 2025 at 11:28:48 AM GMT+2
Folder	wlp		August 15, 2025 at 11:28:46 AM GMT+2

Fichier de configuration httpd.conf

Modifier le fichier de configuration



• Manage → Http Servers

• Choisir le Serveur

• Modifiez le fichier de configuration en UTF-8 (CCSID 1208)

Commande CL:

```
CHGATR OBJ(' /www/BHATEST03/conf/httpd.conf')
      ATR(*CCSID)
      VALUE(1208)
```

• Display/Edit Configuration File

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Modifier le fichier de configuration

```
Listen *:10032

DocumentRoot /www/BHATEST03/htdocs
TraceEnable Off
```

```
DefaultNetCCSID 1208
DefaultFSCSID 1141
```

```
#=====
# Access Logs and Error Logs
#=====

LogFormat "%h %T %l %u %t \"%r\" %>s %b \"%{Referer}i\" \"%{User-Agent}i\"" combined
LogFormat "%(Cookie)n \"%r\" %t" cookie
LogFormat "%{User-agent}i" agent
LogFormat "%{Referer}i -> %U" referer
LogFormat "%h %l %u %t \"%r\" %>s %b" common
```

```
CustomLog logs/access/access_log combined
ErrorLog logs/error/error_log
```

```
LogMaint logs/access/access_log 30 0
LogMaint logs/error/error_log 30 0
```

• Le Port et le Document Root sont déterminés automatiquement

• DefaultNetCCSID doit toujours être 1208 (=UTF-8)

• DefaultFSCSID (CCSID par défaut) peut être défini
→ 1141=EBCDIC allemand avec €

• access_log et error_log seront placés dans deux répertoires différents

• access_log et error_log sont tous les deux supprimés après 30 jours

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Modifier le fichier de configuration

```
#=====
# GZIP Options
#=====

LoadModule deflate_module /QSYS.LIB/QHTTPSVR.LIB/QZSRCORE.SRVPGM

#LoadModule mod_IBM_lwi /QSYS.LIB/QHTTPSVR.LIB/QLWIIHSMOD.SRVPGM
#LoadModule was_ap20_module /QSYS.LIB/QHTTPSVR.LIB/QSVTAP24.SRVPGM

# Insert Filter for Content Types except Images
AddOutputFilterByType DEFLATE text/html text/plain text/xml text/css text/javascript application/javascript application/json application/xml

# Compression Level Highest 9 - Lowest 1
DeflateCompressionLevel 1

ExpiresActive On

ExpiresDefault                "modification plus 1 seconds"

ExpiresByType image/gif       "access plus 1 days"
ExpiresByType image/jpg       "access plus 1 days"
```

- Utiliser du nouveau JavaScript si la dernière modification date de plus d'une seconde
- Seulement pour les applications Web

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Modifier le fichier de configuration

```
#=====
# E-Tag
#=====

Header unset ETag
FileETag None

#=====
# Directories
#=====

DirectoryIndex index.html

<Directory />
  Require all denied
</Directory>

<Directory /www/BHATEST03/htdocs>
  Require all granted
</Directory>
```

- Default: Seulement pour les applications Web

- Default: Seulement pour les applications Web

- Default: L'accès à **tout** répertoire est **rejeté**

- Default: Seul le répertoire **/www/BHATEST03/htdocs** est accessible

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Modifier le fichier de configuration – Programmation Web

```
#=====
# Aliases
#=====
Alias /codebase/ /home/apps/codebase/
Alias /test/ /home/apps/test/

#----- Programs
#-----
ScriptAliasMatch /testpgm/(.*) /qsys.lib/test.lib/$1

<Directory /qsys.lib/test.lib>
  SetEnv QIBM CGI_LIBRARY LIST "TEST;TEST DTA;SYSTOOLS;WEBSRVUTL"
  AuthType Basic
  AuthName "Test Applications"
  PasswordFile %%SYSTEM%%
  UserID %%CLIENT%%
  Require valid-user
</Directory>
```

- Programmation Web: symbolic link pour **codebase**

- Programmation Web: symbolic link pour **application test**

- Appeler des programmes avec toutes sortes d'extensions

- Bibliothèque programme - **\$1** tout programme

→ Utiliser une bibliothèque **séparée** qui contient **TOUS** les programmes appelés **via le Web!**

- Liste des bibliothèques

- Authentification par rapport au User Profile (IBM i)

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Déployer un nouveau service Web (SQL)

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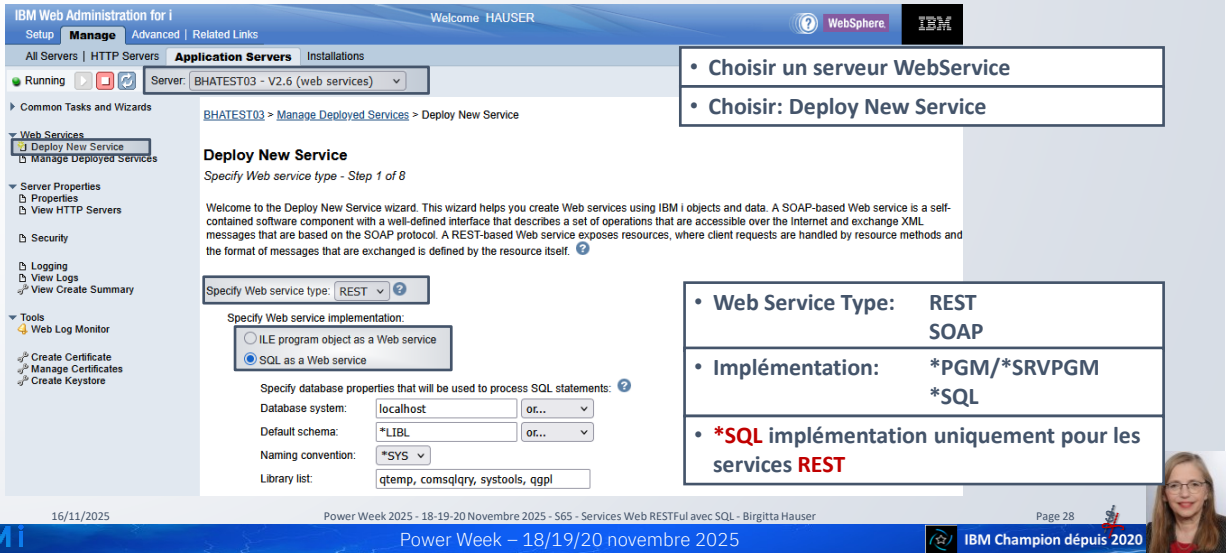


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Déployer un nouveau service Web: Step 1 of 8



IBM Web Administration for i
Setup **Manage** Advanced | Related Links
Welcome HAUSER

All Servers | HTTP Servers **Application Servers** Installations
Server: BHATEST03 - V2.6 (web services)

Common Tasks and Wizards
Web Services
Deploy New Service
Manage Deployed Services

Server Properties
Properties
View HTTP Servers
Security
Logging
View Logs
View Create Summary

Tools
Web Log Monitor
Create Certificate
Manage Certificates
Create Keystore

BHATEST03 > 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 create Web services using IBM i objects and data. A SOAP-based Web service is a self-contained software component with a well-defined interface that describes a set of operations that are accessible over the Internet and exchange XML messages that are based on the SOAP protocol. A REST-based Web service exposes resources, where client requests are handled by resource methods and the format of messages that are exchanged is defined by the resource itself.

Specify Web service type: REST

Specify Web service implementation:
☐ ILE program object as a Web service
☒ SQL as a Web service

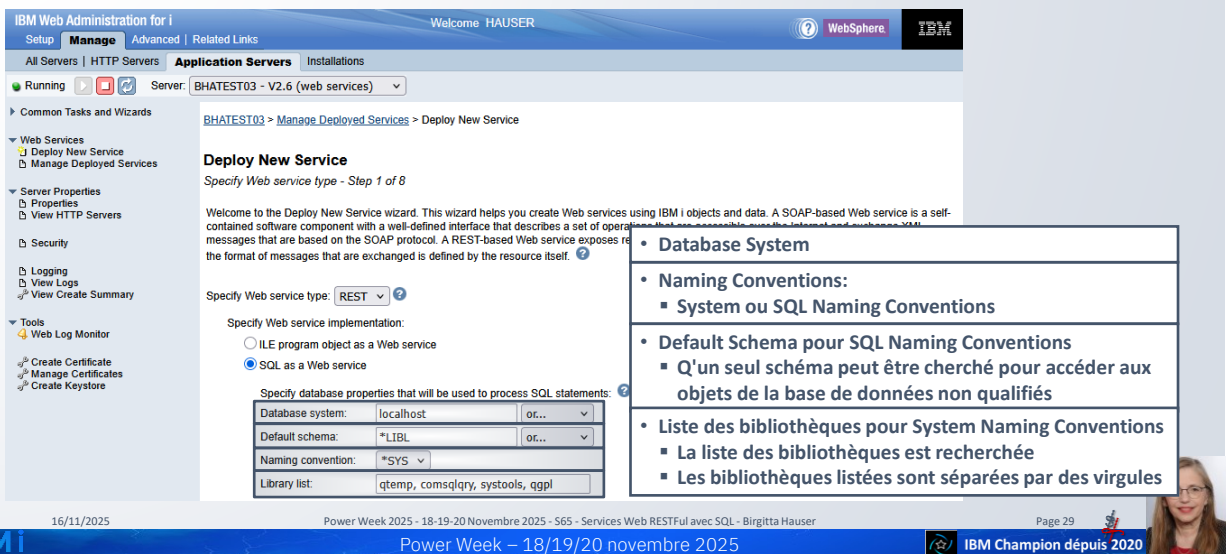
Specify database properties that will be used to process SQL statements:
 Database system: localhost
 Default schema: *LIBL
 Naming convention: *SYS
 Library list: qtemp, comsqlqry, systools, qqpl

- Choisir un serveur WebService
- Choisir: Deploy New Service
- Web Service Type: REST SOAP
- Implémentation: *PGM/*SRVPGM *SQL
- *SQL implémentation uniquement pour les services REST

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Déployer un nouveau service Web: Step 1 of 8



IBM Web Administration for i
Setup **Manage** Advanced | Related Links
Welcome HAUSER

All Servers | HTTP Servers **Application Servers** Installations
Server: BHATEST03 - V2.6 (web services)

Common Tasks and Wizards
Web Services
Deploy New Service
Manage Deployed Services

Server Properties
Properties
View HTTP Servers
Security
Logging
View Logs
View Create Summary

Tools
Web Log Monitor
Create Certificate
Manage Certificates
Create Keystore

BHATEST03 > Manage Deployed Services > Deploy New Service

Deploy New Service

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☐ ILE program object as a Web service
☒ SQL as a Web service

Specify database properties that will be used to process SQL statements:
 Database system: localhost
 Default schema: *LIBL
 Naming convention: *SYS
 Library list: qtemp, comsqlqry, systools, qqpl

- Database System
- Naming Conventions:
 - System ou SQL Naming Conventions
- Default Schema pour SQL Naming Conventions
 - Q'un seul schéma peut être cherché pour accéder aux objets de la base de données non qualifiés
- Liste des bibliothèques pour System Naming Conventions
 - La liste des bibliothèques est recherchée
 - Les bibliothèques listées sont séparées par des virgules

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Déployer un nouveau service Web: Step 2 of 8

Deploy New Service
Specify Name for Service - Step 2 of 8

The Web service to be externalized is a resource. The URI path template identifies matching patterns for incoming HTTP requests. The path is relative to the context root and can be a simple string or one or more template parameters that can contain regular expressions to further restrict what is allowed.

Resource name: BHAWXSQLTest
Service description: Test Webservice SQL
URI path template: /Sales e.g. /temperature, /temperature/{temp:ld+}

- Nom de la ressource : Nom de l'appel
- Description
- Template de chemin URI paramètres inclus
- Spécification des paramètres : entre accolades

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Déployer un nouveau service Web: Step 3 of 8

Deploy New Service
Specify security constraint - Step 3 of 8

The security constraint limits who can access the web service.

Secure transport required: No
Protect using authentication method: *NONE

- Secure Transport: Yes/No → https:// or http://
- Méthode d'authentification:
 - *NONE: Tous les utilisateurs peuvent utiliser le service Web
 - *BASIC: Seuls les utilisateurs authentifiés

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Déployer un nouveau service Web: Step 4 of 8

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

Running Server: BHATEST03 - V2.6 (web services)

Common Tasks and Wizards

- Web Services
 - Deploy New Service
 - Manage Deployed Services
- Server Properties
 - Properties
 - View HTTP Servers
- Security
 - Logging
 - View Logs
 - View Create Summary
- Tools
 - Web Log Monitor
 - Create Certificate
 - Manage Certificates
 - Create Keystore

BHATEST03 > Manage Deployed Services > Deploy New Service

Deploy New Service
Specify SQL Statements - Step 4 of 8

Specify SQL statements that will be externalized as a Web service:

Procedure name	SQL statement/Parameter name
<input checked="" type="checkbox"/> AllSales	Select * From Sales

Add Remove Remove All Continue Insert from example

- Spécifier l'API/le service Web
- Plusieurs API peuvent être spécifiées
- Instruction SQL:
 - SELECT (GET Method)
 - UPDATE (POST Method)
 - INSERT (POST/PUT Method)
 - DELETE (DELETE Method)
 - CALL Stored Procedure
 - VALUES: Calling an UDF
GET_CLOB_FROM_FILE
GET_BLOB_FROM_FILE
- Une instruction SQL peut contenir des Parameter Markers (?) pour les valeurs des paramètres.

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Déployer un nouveau service Web: Step 4 of 8 (Continue)

IBM Web Administration for i
Setup **Manage** Advanced | Related Links
All Servers | HTTP Servers **Application Servers** Installations

Running Server: BHATEST03 - V2.6 (web services)

Common Tasks and Wizards

- Web Services
 - Deploy New Service
 - Manage Deployed Services
- Server Properties
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 - View Create Summary
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 - Create Certificate
 - Manage Certificates
 - Create Keystore

BHATEST03 > Manage Deployed Services > Deploy New Service

Deploy New Service
Specify SQL Statements - Step 4 of 8

Specify SQL statements that will be externalized as a Web service:

Procedure name	SQL statement/Parameter name	Usage	Data type
<input checked="" type="checkbox"/> SalesCust	Select Year(SalesDate) SalesYear, CustNo, Sum(Amount) From Sales Where Year(SalesDate) = ? and CustNo = ? Group By RollUp(Year(SalesDate), CustNo) Order By SalesYear, CustNo		

ParSalesYear input INTEGER
ParCustNo input CHAR

Add Remove Remove All Continue Insert from example Back Next Cancel

- SQL Instruction avec plusieurs Parameter Markers (?)
- Les paramètres sont listés en bas avec des noms par défaut : PARM00001, PARM00002 ...)
→ Peut être modifié!
- Le type de données est automatiquement déterminé par les métadonnées.

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Déployer un nouveau service Web: Step 4 of 8 (Résumé)

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

Running Server: BHATEST03 - V2.6 (web services)

Common Tasks and Wizards
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Deploy New Service
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Web Log Monitor
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Create Keystore

BHATEST03 > Manage Deployed Services > Deploy New Service

Deploy New Service

Specify SQL Statements - Step 4 of 8

Specify SQL statements that will be externalized as a Web service:

Procedure name	SQL statement/Parameter name	Usage	Data type
<input checked="" type="checkbox"/> SalesCust	Select Year(SalesDate) SalesYear, CustNo, Sum(Amount) From Sales Where Year(SalesDate) = ? and CustNo = ? Group By Rollup(Year(SalesDate), CustNo) Order By SalesYear, CustNo		
	ParSalesYear	input	INTEGER
	ParCustNo	input	CHAR

Add Remove All

- Résumé de toutes les procédures enregistrées avec toutes les informations
 - Instructions SQL
 - Paramètres
- Ajouter des nouvelles procédures
- Supprimer toutes les procédures
- Modifier une procédure existante

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Déployer un nouveau service Web: Step 5 of 8

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Setup **Manage** Advanced | Related Links
Welcome HAUSER

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

Running Server: BHATEST03 - V2.6 (web services)

Common Tasks and Wizards
Web Services
Deploy New Service
Manage Deployed Services
Server Properties
Properties
View HTTP Servers
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View Logs
View Create Summary
Tools
Web Log Monitor
Create Certificate
Manage Certificates
Create Keystore

BHATEST03 > Manage Deployed Services > Deploy New Service

Deploy New Service

Specify SQL Information - Step 5 of 8

Customize how each procedure will process SQL statements. For query statements, this includes the type of result sets that may be returned and how pagination is handled for result sets.

Procedure name: SalesCust

SQL Statement: Select Year(SalesDate) SalesYear, CustNo, Sum(Amount)
From Sales
Where Year(SalesDate) = ?
and CustNo = ?
Group By Rollup(Year(SalesDate), CustNo)
Order By SalesYear, CustNo

SQL result type: Multi-row result set

Trim mode for output fields: Trailing

SQL state information in response: On errors Yes

Treat warnings as SQL Errors: Yes

User-defined error message:

HTTP status code on SQL success: 200

HTTP status code on SQL failure: 500

- Instruction SQL avec Parameter Markers
- Type de résultat SQL :
 - Multi-row result set (Arrays)
 - Single-row result set (Objects)
 - Media resource Images / Documents PDF
- Trim mode for output fields
 - Trailing Supprimer les caractères suivants
 - Leading Supprimer les caractères de début
 - Both Supprimer les caractères précédents et suivants
 - None Ne pas supprimer des caractères

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Déployer un nouveau service Web: Step 5 of 8

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Running Server: BHATEST03 - V2 6 (web services)

Common Tasks and Wizards

- Web Services
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 - Create Keystore

BHATEST03 > Manage Deployed Services > Deploy New Service

Deploy New Service

Specify SQL Information - Step 5 of 8

Customize how each procedure will process SQL statements. For query statements, this includes the type of result sets that may be returned and how pagination is handled for result sets: ?

Procedure name: SalesCust
SQL Statement: Select Year(SalesDate) SalesYear, CustNo, Sum(Amount) From Sales Where Year(SalesDate) = ? and CustNo = ? Group By Rollup(Year(SalesDate), CustNo) Order By SalesYear, CustNo

SQL result type: Multi-row result set
Trim mode for output fields: Trailing

SQL state information in response: On errors
Treat warnings as SQL Errors: Yes
User-defined error message:

HTTP status code on SQL success: 200 or...
HTTP status code on SQL failure: 500 or...

• SQL State information in response:

- Never Jamais
- Always Toujours
- On Errors en cas d'erreur

• Traiter les warnings comme des erreurs

- Yes
- No

• Message d'erreur défini par l'utilisateur

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Déployer un nouveau service Web: Step 5 of 8

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Running Server: BHATEST03 - V2 6 (web services)

Common Tasks and Wizards

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 - Web Log Monitor
 - Create Certificate
 - Manage Certificates
 - Create Keystore

BHATEST03 > Manage Deployed Services > Deploy New Service

Deploy New Service

Specify SQL Information - Step 5 of 8

Customize how each procedure will process SQL statements. For query statements, this includes the type of result sets that may be returned and how pagination is handled for result sets: ?

Procedure name: SalesCust
SQL Statement: Select Year(SalesDate) SalesYear, CustNo, Sum(Amount) From Sales Where Year(SalesDate) = ? and CustNo = ? Group By Rollup(Year(SalesDate), CustNo) Order By SalesYear, CustNo

SQL result type: Multi-row result set
Trim mode for output fields: Trailing

SQL state information in response: On errors
Treat warnings as SQL Errors: Yes
User-defined error message:

HTTP status code on SQL success: 200 or...
HTTP status code on SQL failure: 500 or...

• HTTP status code on SQL Success:

- Peut être modifié pour correspondre aux codes d'état HTTP standard, par exemple 201 chaque fois qu'une ressource est créée

• HTTP status code on SQL Failure:

- Peut être modifié pour correspondre aux codes d'état HTTP standard, par exemple, 404 pour NOT FOUND (introuvable).

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Déployer un nouveau service Web: Step 6 of 8

Deploy New Service
Specify Resource Method Information - Step 6 of 8

Procedures are mapped to resource methods. Each resource method needs to be defined to handle client requests by mapping an HTTP request method to a resource method.

Procedure name: SalesCust
URI path template for resource: /Sales/(SalesYear:Id-)/(CustNo)
HTTP request method: GET
URI path template for method: *NONE
HTTP header information: *NONE
Allowed input media types: *ALL
Returned output media types: *JSON
Identifier for input wrapper element: SalesCustInput
Identifier for output wrapper element: SalesCustResult
☐ Wrap input parameters

Parameter name	Data type	Input source	Identifier	Default Value
ParSalesYear	INTEGER	- Select -		*NONE
ParCustNo	CHAR	- Select -		*NONE

- **Méthode de requête HTTP:**
 - GET Recevoir des données
 - PUT Modifier/Remplacer une ressource
 - POST Créer une nouvelle ressource
 - DELETE Supprimer une ressource
- **Header Information – peuvent être ajoutées**

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Déployer un nouveau service Web: Step 6 of 8

Deploy New Service
Specify Resource Method Information - Step 6 of 8

Procedures are mapped to resource methods. Each resource method needs to be defined to handle client requests by mapping an HTTP request method to a resource method.

Procedure name: SalesCust
URI path template for resource: /Sales/(SalesYear:Id-)/(CustNo)
HTTP request method: GET
URI path template for method: *NONE
HTTP header information: *NONE
Allowed input media types: *ALL
Returned output media types: *JSON
Identifier for input wrapper element: SalesCustInput
Identifier for output wrapper element: SalesCustResult
☐ Wrap input parameters

Parameter name	Data type	Input source	Identifier	Default Value
ParSalesYear	INTEGER	- Select -		*NONE
ParCustNo	CHAR	- Select -		*NONE

- **Types de médias d'entrée autorisés (si l'option Type de média SQL est définie):**
 - For example: image/gif, application/pdf
- **Types de médias de sortie retournés**
 - *XML
 - *JSON
 - *HTML
 - *XML, *JSON
 - *XML, *JSON, *HTML

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Déployer un nouveau service Web: Step 6 of 8

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Deploy New Service
Specify Resource Method Information - Step 6 of 8

Procedures are mapped to resource methods. Each resource method needs to be defined to handle client requests by a resource method.

Procedure name: SalesCust
URI path template for resource: /Sales/(SalesYear:Id+)/(CustNo)
HTTP request method: GET
URI path template for method: *NONE
HTTP header information: *NONE
Allowed input media types: *ALL
Returned output media types: *JSON
Identifier for input wrapper element: SalesCustInput
Identifier for output wrapper element: SalesCustResult

☐ Wrap input parameters

Parameter name	Data type	Input source	Identifier
ParSalesYear	INTEGER	- Select -	*NONE
ParCustNo	CHAR	- Select -	*NONE

- Faut-il encapsuler les paramètres d'entrée ? :
 - Wrap par exemple Méthode PUT
 - Do not wrap par exemple Méthode GET

- Mappings des paramètres d'entrée – Source d'entrée
 - *QUERY_PARAM
 - *PATH_PARAM
 - *FORM_PARAM
 - *COOKIE_PARAM
 - *MATRIX_PARAM
 - *TRANSPORT_METADATA
 - *NONE

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Déployer un nouveau service Web: Step 6 of 8

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Running | Server: BHATEST03 - V2.6 (web services)

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Deploy New Service
Specify Resource Method Information - Step 6 of 8

Procedures are mapped to resource methods. Each resource method needs to be defined to handle client requests by mapping an HTTP request method to a resource method.

Procedure name: SalesCust
URI path template for resource: /Sales/(SalesYear:Id+)/(CustNo)
HTTP request method: GET
URI path template for method: *NONE
HTTP header information: *NONE
Allowed input media types: *ALL
Returned output media types: *JSON
Identifier for input wrapper element: SalesCustInput
Identifier for output wrapper element: SalesCustResult

☐ Wrap input parameters

Parameter name	Data type	Input source	Identifier	Default
ParSalesYear	INTEGER	*PATH_PARAM	SalesYear	*NONE
ParCustNo	CHAR	*PATH_PARAM	CustNo	*NONE

- Source d'entrée = *PATH_PARAM:
L'identifiant est automatiquement défini sur la base des noms des paramètres

- Source d'entrée = *TRANSPORT_METADATA
Choisir le formulaire d'identifiant:
 - QUERY_STRING
 - REQUEST_METHOD
 - REQUEST_URL
 - SERVER_PORT
 - REMOTE_ADDR
 - REQUEST_URI
 - SERVER_NAME

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Déployer un nouveau service Web: Step 7 of 8

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Welcome HAUSER

Setup **Manage** Advanced | Related Links

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

Running [Stop] [Refresh] [Help] Server: BHATestSQL - V2.6 (web services)

BHATestSQL > Manage Deployed Services > Redeploy Service

Deploy New Service

Specify User ID for this Service - Step 7 of 8

The service requires an IBM i user ID to run the Web service business logic. The user ID must have the necessary authority to any resources that the Web service requires.

Specify User ID for this Service:

☐ Use server's user ID

☒ Specify an existing user ID

User ID: QWSERVICEX

☒ Update the server's user ID to have *USE authority to this user ID.

☐ Use authenticated user ID

- Exécuté par l'Id de l'utilisateur du serveur WebService
- Exécuté par un profil utilisateur particulier qui est autorisé à accéder à tous les fichiers et répertoires du service web
- Exécuté par un profil utilisateur authentifié

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Déployer un nouveau service Web: Step 8 of 8

Deploy New Service

Summary - Step 8 of 8

When you click Finish the web service is deployed.

Service Security JDBC Properties Methods

Resource name: BHAWSSQLTest

Resource description: Test WebServiceSQL

Service install path: /www/bhatest03/web services/services/BHAWSSQLTest

URI path template: /Sales/(SalesYear:Id+)/(CustNo)

Service Security JDBC Properties Methods

User ID for this service: WSERVICEX

Protect using authentication method: *NONE

Secure transport required: No

Service Security JDBC Properties Methods

Database system: localhost

Default schema: *LIBL

Naming convention: *SYS

Library List: Qltemp, comsqlqry, systools, qgpl

- Résumé
 - Si tout est bien, cliquez sur Finish
 - Sinon, retournez et corrigez

Service	Security	JDBC Properties	Methods
Procedure name:	SalesCust		
SQL Statement:	Select Year(SalesDate) SalesYear, CustNo, Sum(Amount) From ComSQLQry.Sales Where Year(SalesDate) = ? and CustNo = ? Group By Rollup(Year(SalesDate), CustNo) Order By SalesYear, CustNo		
SQL result type:	Multi-row result set		
Trim mode for output fields:	Trailing		
SQL state information in response:	On errors		
Treat warnings as SQL Errors:	Yes		
User-defined error message:			
HTTP status code on SQL success:	200		
HTTP status code on SQL failure:	500		
HTTP request method:	GET		
URI path template for method:	*NONE		
HTTP header information:	*NONE		
Allowed input media types:	*ALL		
Returned output media types:	*JSON		
Identifier for input wrapper element:	SalesCustInput		
Identifier for output wrapper element:	SalesCustResult		
Input parameter mappings:			
Parameter name	Data type	Input source	Identifier
ParSalesYear	INTEGER	*PATH_PARAM	SalesYear
ParCustNo	CHAR	*PATH_PARAM	CustNo
			Default Value
			*NONE
			*NONE

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Services – Administrer les services déployés

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

Running | Server: BHATestSQL - 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

Problem Determination

- View Logs
- Web Log Monitor
- View Create Summary

Tools

- Create Certificate
- Manage Certificates
- Create Keystore

BHATestSQL > Manage Deployed Services

Manage Deployed Services

Data current as of Apr 26, 2020 5:03:16 PM.

Deployed services:

Service name	Status	Type	Startup type	Service definition
<input type="radio"/> BHATestSQL	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWPDF02	Running	REST	Manual	View Swagger
<input type="radio"/> BHAWS01	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPDF	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPDF02	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPUT	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPicture	Running	REST	Automatic	View Swagger
<input checked="" type="radio"/> BHAWSalesCust	Installing	REST	Automatic	View Swagger
<input type="radio"/> BHAWSalesYear	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSStrProc	Running	REST	Automatic	View Swagger
<input type="radio"/> ConvertTemp	Running	SOAP	Automatic	View WSDL

Deploy | Properties | Uninstall | Redeploy | Refresh

Services Déployés

- BHAWSalesCust est actuellement en train d'être installé
- Cliquez sur Refresh

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Administrer les services déployés

IBM Web Administration for i

Setup | **Manage** | Advanced | Related Links

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Running | Server: BHATestSQL - 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

Problem Determination

- View Logs
- Web Log Monitor
- View Create Summary

Tools

- Create Certificate
- Manage Certificates
- Create Keystore

BHATestSQL > Manage Deployed Services

Manage Deployed Services

Data current as of May 3, 2020 10:54:38 AM.

Deployed services:

Service name	Status	Type	Startup type	Service definition
<input type="radio"/> BHATestSQL	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWPDF02	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWS01	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPDF	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPDF02	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPUT	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSPicture	Running	REST	Automatic	View Swagger
<input type="radio"/> BHAWSalesCust	Running	REST	Automatic	View Swagger
<input checked="" type="radio"/> BHAWSalesYear	Stopped	REST	Automatic	View Swagger
<input type="radio"/> BHAWSStrProc	Running	REST	Automatic	View Swagger
<input type="radio"/> ConvertTemp	Running	SOAP	Automatic	View WSDL

Deploy | Start | Properties | Uninstall | Redeploy | Refresh

Serveur WebService:

- État: Running
- Change Status → Stop/Start
- Refresh

Start/Stop: Démarrer/terminer le service Web

Properties: Afficher la définition du service Web

Uninstall: Supprimer le service Web (Definition)

Redeploy: Modifier le service Web (Definition)

Refresh: Actualiser la liste des services déployés

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Exemples

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BHAWSSalesYear – Requête GET – Output JSON

Service Properties

General Methods Swagger Connection Pool JDBC Properties

Service information

Resource Name: BHAWSSalesYear
 Resource description: Accumulated Sales per Year/Customer
 URI path template: /SalesYear
 Startup type: Automatic
 Service install path: /www/BHATestSQL/webservices/services/BHAWSSalesYear
 Base resource URL: http://[redacted]/web/services/BHAWSSalesYear
 User ID for this service: QWSSERVICEX or...
☒ Update the server's user ID to have *USE authority to this user ID.

- Requête GET avec un seul paramètre et
- Output JSON

Service Properties

General Methods Swagger Connection Pool JDBC Properties

Resource information for methods

Procedure name: SalesYearCust
 SQL Statement: Select Year(SalesDate) SalesYear, CustNo, Sum(Amount) from sales Where Year(SalesDate) = ? Group By Year(SalesDate), CustNo Order By SalesYear, CustNo
 HTTP request method: GET
 URI path template for method: *NONE
 SQL result type: Multi-row result set
 Trim mode for output fields: Trailing
 SQL state information in response: On errors
 Treat warnings as SQL Errors: Yes
 User-defined error message:
 HTTP status code on SQL success: 200
 HTTP status code on SQL failure: 500
 HTTP header information:
 Allowed input media types: *ALL
 Returned output media types: *JSON
 Input parameter mappings:

Parameter name	Data type	Input source	Identifier	Default Value
ParSalesYear	INTEGER	*PATH_PARAM	SalesYear	*NONE

http://yourServer:YourPort/web/services/BHAWSSalesYear/2009

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

▼ BHAWSSalesYear_SalesYearCustNo

SALESYEAR:	CUSTNO:	AMOUNT:
2009	"10001"	2634.2
2009	"10002"	1636.25
2009	"10003"	4589.86
2009	"10004"	2673.95
2009	"10005"	3741.95

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BHAWSStrProc – Requête GET – Appeler une Stored Procedure

Service Properties

General Methods Swagger Connection Pool JDBC Properties

Service information

Resource Name: BHAWSStrProc
 Resource description: Call Stored Procedure
 URI path template: /(Search)
 Startup type: Automatic
 Service install path: /www/BHATestSQL/webservices/services/BHAWSStrProc
 Base resource URL: http://[redacted]/web/services/BHAWSStrProc
 User ID for this service: QWSERVICEX or...

☒ Update the server's user ID to have "USE authority to this user ID.

- Appeler une Stored Procedure renvoyant un Result Set

http://YourServer:YourPort/web/services/BHAWSStrProc/Bau

Service Properties

General Methods Swagger Connection Pool JDBC Properties

Resource information for methods

Procedure name: CallProcRS
 SQL Statement: Call GetCompany(?)
 HTTP request method: GET
 URI path template for method: *NONE
 SQL result type: Multi-row result set
 Trim mode for output fields: Both
 SQL state information in response: On errors
 Treat warnings as SQL Errors: Yes
 User-defined error message:
 HTTP status code on SQL success: 200
 HTTP status code on SQL failure: 500
 HTTP header information:
 Allowed input media types: *ALL
 Returned output media types: *JSON
 Input parameter mappings:

Parameter name	Data type	Input source	Identifier	Default
ParSearch	VARCHAR	*PATH_PARAM	Search	*NONE

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

▼ BHAWSStrProc_CallProcRS_1

▼ 0:

CUSTNO:	"00239"
CUSTNAME1:	"002-Baumarkt AG"
STREET:	"Schillerstrasse 38"
COUNTRY:	"D"
ZIPCODE:	"20045"
CITY:	"Hamburg"

▼ 1:

CUSTNO:	"10002"
CUSTNAME1:	"Hermann & Bauer GmbH"
STREET:	"Winterm langen Riechtplatz 13"
COUNTRY:	"D"
ZIPCODE:	"75683"
CITY:	"Karlsruhe"

▼ 2:

CUSTNO:	"200012"
CUSTNAME1:	"Einbau-Küchen vom Feinsten"
STREET:	"Bachstr. 47"
COUNTRY:	"D"
ZIPCODE:	"63303"
CITY:	"Langen"

▼ 3:

CUSTNO:	"20046"
CUSTNAME1:	"Freilichtmuseum Tiroler Bauernhöfe"
STREET:	"angerberg 10"
COUNTRY:	"A"
ZIPCODE:	"6233"
CITY:	"Kramsach"

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BHAWSSalesYear – Requête GET – Output HTML

Service Properties

General Security Methods Swagger Connection Pool JDBC Properties

Service information

Resource Name: BHAWSHTML
 Resource description: Sales per Customer and Year / HTML
 URI path template: /(SalesYear)/(CustNo)
 Startup type: Automatic
 Service install path: /www/BHAWSSQL01/webservices/services/BHAWSHTML
 Base resource URL: http://[redacted]/web/services/BHAWSHTML

- WebService with HTML Output

dot Secure https://[redacted]/web/services/BHAWSHTML/2009/10001

BHAWSHTML_SalesCust_R

SALESYEAR	CUSTNO	ITEMNO	ITEM	TOTAL	POS
2009	10001	5100	King Stephen - Es	1374.35	9
2009	10001	5200	King Stephen - Drei	363.20	2
2009	10001	5300	Grisham John - Die Akte	896.65	4
2009				2634.20	15

http://YourServer:YourPort/web/services/BHAWSHTML/2009/10001

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BHAWSPicture – Requête GET – Renvoyant Media Resource

Service Properties

General Methods Swagger Connection Pool JDBC Properties

Service information

Resource Name: BHAWSPicture
 Resource description: Picture
 URI path template: /{id}
 Startup type: Automatic
 Service install path: /www/BHATestSQL/webservices/services/BHAWSPicture
 Base resource URL: 10012/web/services/BHAWSPicture
 User ID for this service: QWSERVICEX or...
☒ Update the server's user ID to have *USE authority to this user ID.

- Renvoyer une image stockée dans une colonne CLOB d'une table Db2 pour i

• <http://YourServer:YourPort/web/services/BHAWSPicture/1>

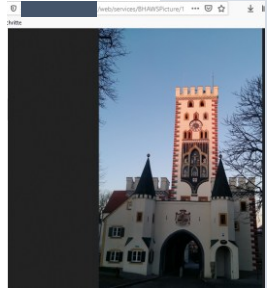
Service Properties

General Methods Swagger Connection Pool JDBC Properties

Resource information for methods

Procedure name: Picture
 SQL Statement: Select Picture from ComSQLQry.Pictures Where Id = ?
 HTTP request method: GET
 URI path template for method: *NONE
 SQL result type: Media resource
 Trim mode for output fields: Trailing
 SQL state information in response: On errors
 Treat warnings as SQL Errors: Yes
 User-defined error message:
 HTTP status code on SQL success: 200
 HTTP status code on SQL failure: 500
 HTTP header information:
 Allowed input media types: *ALL
 Returned output media types: image/jpg
 Input parameter mappings:

Parameter name	Data type	Input source	Identifier	Default Value
ParId	INTEGER	*PATH_PARAM	Id	*NONE



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BHAWSPDF02 – Requête GET – Revoyant Media Resource

Service Properties

General Security Methods Swagger Connection Pool JDBC Properties

Service information

Resource Name: BHAWSPDF
 Resource description: Display PDF Documents in IFS
 URI path template: /{id}
 Startup type: Automatic
 Service install path: /www/BHAWSSQL01/webservices/services/BHAWSPDF
 Base resource URL: http://10012/web/services/BHAWSPDF

- Renvoyer un document PDF situé dans l'IFS

<http://YourServer:YourPort/web/services/BHAWSPDF/1>

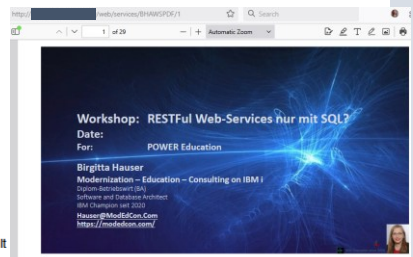
Service Properties

General Security Methods Swagger Connection Pool JDBC Properties

Resource information for methods

Procedure name: PDFFromIFS
 SQL Statement: Values(Get_Blob_From_File('home/Hauser/PDF/PDFDocument_0' concat ' ? concat '.pdf'))
 HTTP request method: GET
 URI path template for method: *NONE
 SQL result type: Media resource
 Trim mode for output fields: Both
 SQL state information in response: On errors
 Treat warnings as SQL Errors: Yes
 User-defined error message:
 HTTP status code on SQL success: 200
 HTTP status code on SQL failure: 500
 HTTP header information: *NONE
 Allowed input media types: *ALL
 Returned output media types: application/pdf
 Identifier for input wrapper element: PDFFromIFSInput
 Identifier for output wrapper element: PDFFromIFSResult
 Input parameter mappings:

Parameter name	Data type	Input source	Identifier	Default Value
ParId	VARCHAR	*PATH_PARAM	Id	*NONE



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Des Questions?

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Biographie brève: Birgitta Hauser

Birgitta Hauser

Diplom-Betriebswirt (BA)

Database and Software Architect

Diplômée en gestion d'entreprise, Birgitta Hauser a d'abord travaillé plusieurs années dans le contrôle de gestion avant de se tourner vers la programmation (RPG) sur AS/400. Aujourd'hui, elle travaille encore quelque fois comme programmeur sur l'IBM i. Son travail se concentre toutefois sur la modernisation et l'optimisation des applications IBM i existantes, en particulier des bases de données, ainsi que sur l'intégration de nouvelles technologies.

Depuis 2020, Birgitta travaille à son compte et assiste ses clients dans des projets de modernisation d'applications et de bases de données et de l'optimisation des performances SQL sur l'IBM i et Db2 for i.

De plus, Birgitta donne régulièrement des cours pour des programmeurs IBM i (RPG/CL) et des spécialiste Db2 for i et des utilisateurs SQL.

Depuis 2002, Birgitta intervient régulièrement lors de conférences des COMMON User Groups en Allemagne, dans d'autres pays européens, ainsi qu'aux États-Unis et au Canada.

Birgitta est co-auteur de 2 IBM Redbooks, ainsi que de plusieurs articles spécialisés pour IBM DeveloperWorks and IT-Jungle. Elle écrit régulièrement des articles spécialisés (RPG/SQL) pour le ITP-Verlag (daison d'édition allemande)

En 2015, Birgitta a reçu la bourse d'études John Earl Speaker. En 2018, elle a reçu la bourse d'études commémorative Al Barsa.

Depuis 2020 elle est un IBM Champion.

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Un grand merci à

Holger Scherer – RZKH Rechenzentrum Kreuznach

- Pour avoir offert un système IBM i permettant la création des exemples et du code utilisés dans mes présentations.
- <http://www.rzkh.de>



■ Your data is save! ... in the bunker

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Références

Navigator for i – Documentation

- <https://www.ibm.com/support/pages/node/6483299>

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Merci!

Services Web seulement avec SQL?

Yes i can!

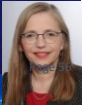
Si vous êtes intéressé par des classes individuelles plus détaillées, sur place ou à distance,
veuillez me contacter directement

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