Magic of Rest APIs

Tim Rowe

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RESTful APIs **rule** the world!

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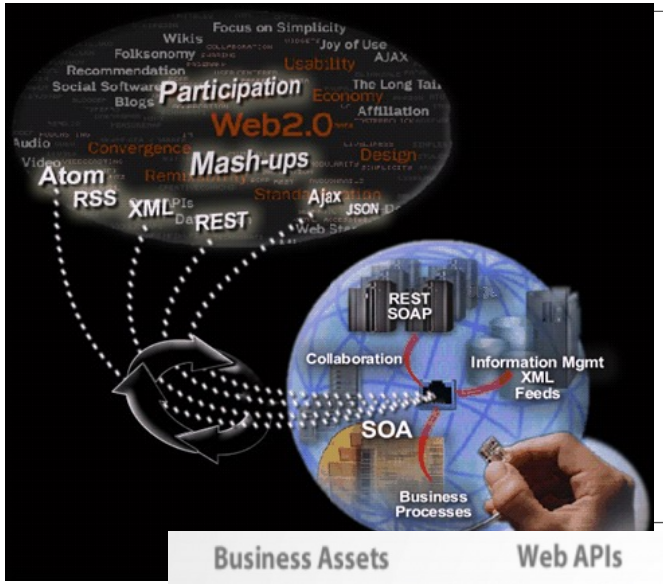

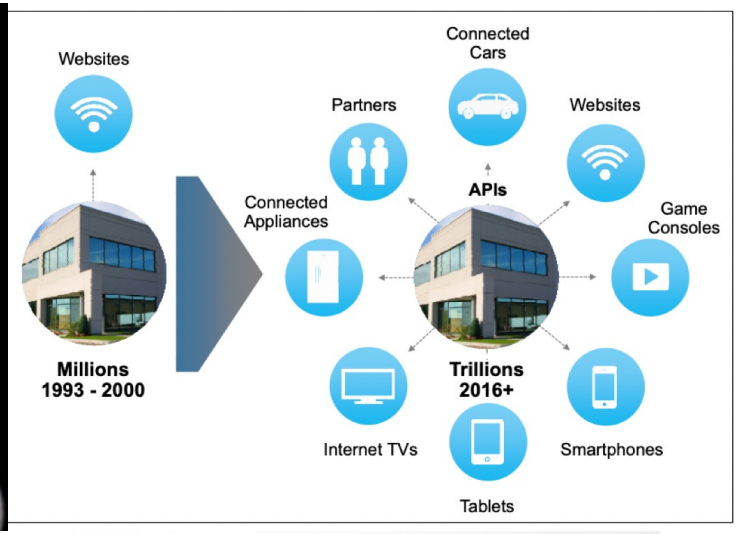

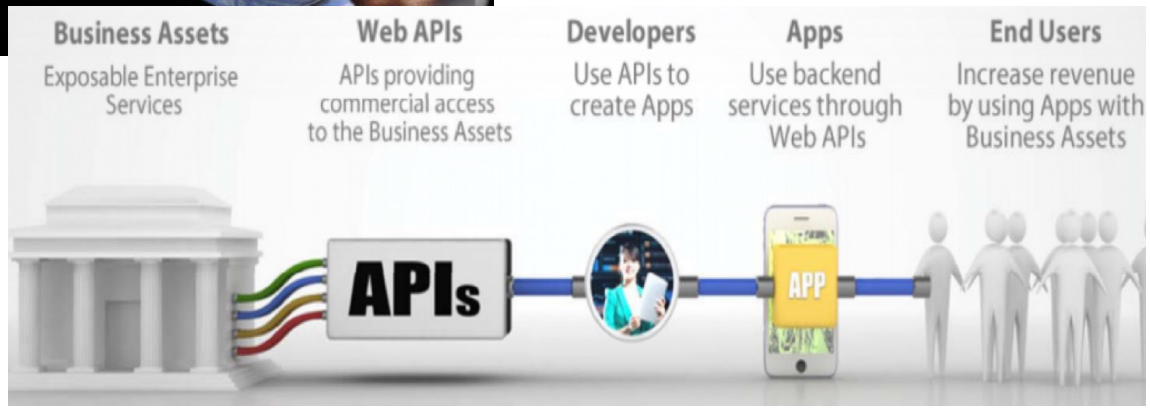

Apis - How do you create the connections ?

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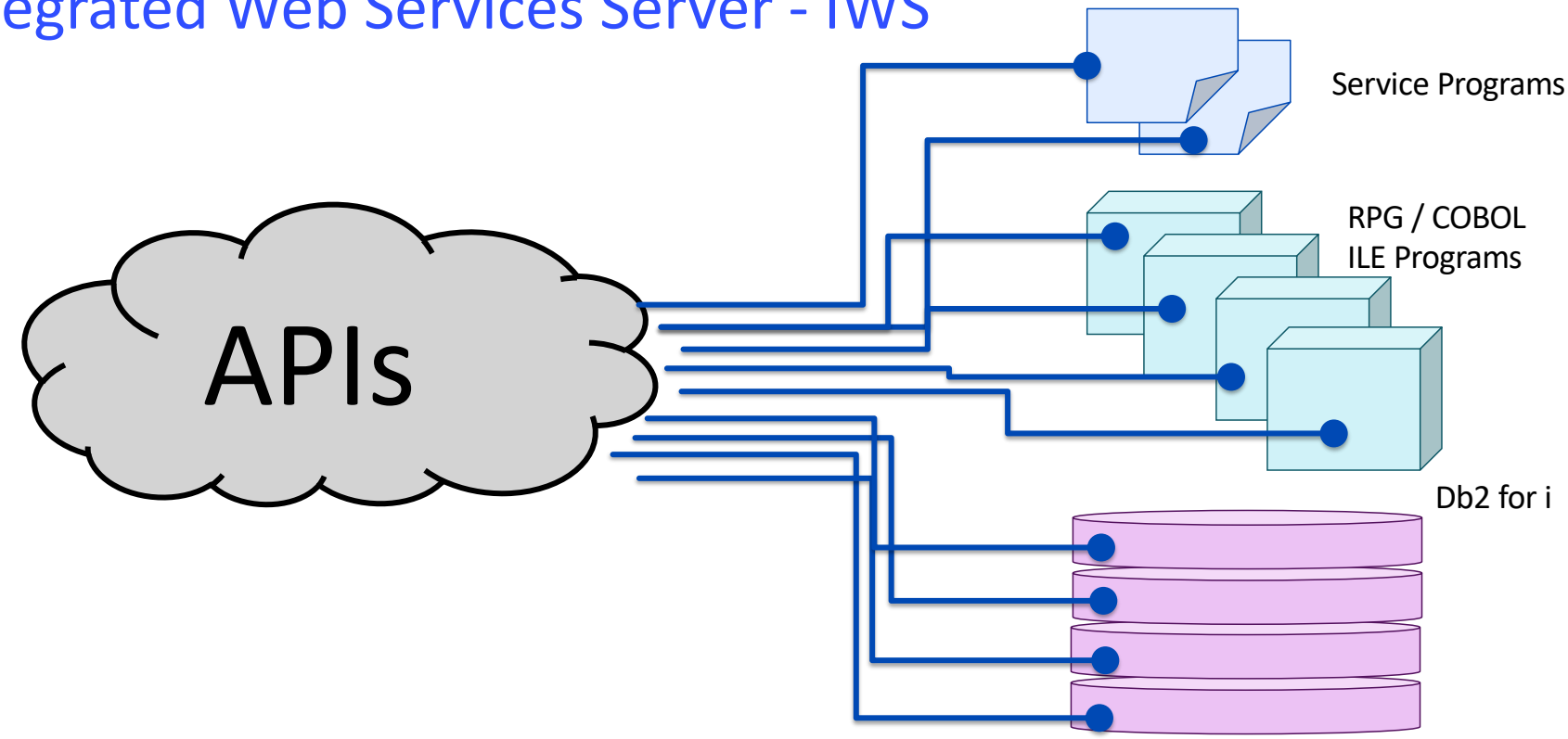
Integrated Web Services Server - IWS



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SOAP vs REST

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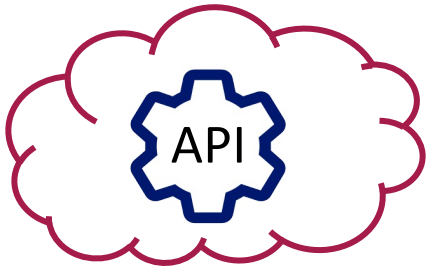
SOAP

Simple Object Access Protocol



- Exposes **operations** that implement logic
- Standardized
- Aligns with Enterprise Application needs
  - Support **multi** transport
  - Enterprise security – WS.Security
  - Governance with strong typing
  - Broad Development tooling support
- XML Based message protocol
- Uses WSDL as a contract between consumer and provider

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Representational State transfer

- Architectural Style as described by Roy Fielding
- Resource focused
- Every request is via hyperlink ie http request
- Easily consumed by any client, especially web clients
- Light weight
  - Uses JSON vs XML
  - No required header for each message
- Resources are driven by HTTP Specification
  - GET, PUT, DELETE, POST, PATCH

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SOAP vs. REST example

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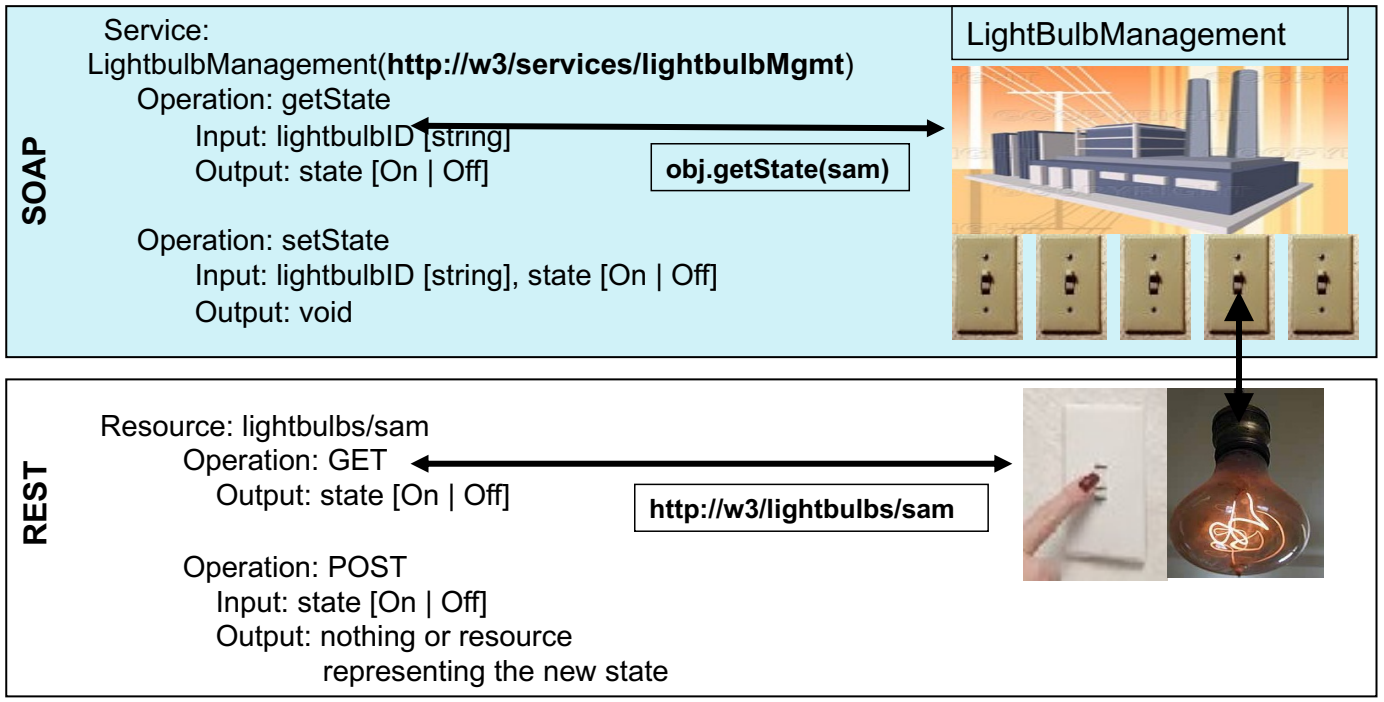
Is the light bulb currently on?



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SOAP vs. REST example data flows

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SOAP request

```
POST /services/LightBulbManager HTTP/1.1
Host: example.com
Content-Type: text/xml; charset=UTF-8
SOAPAction: "LightBulbManager#getState"

<?xml version='1.0' ?>
<env:Envelope xmlns:env="…">
<env:Body>
  <ns1:getState xmlns:ns1="…">
    <in0 xsi:type="xsd:string">SAM</in0>
  </ns1:add>
</SOAPenv:Body>
</env:Envelope>
```

REST request

```
GET http://w3/lightbulbs/SAM HTTP/1.1
Host: example.com
Accept: application/xml
```


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About Integrated Web Services

IBM i

Released December of 2007 on IBM i 5.4, 6.1, and 7.1

- Installed as part of base operating system option 3
- Always load latest HTTP Group PTF for latest fixes and enhancements

Consists of two separate entities

- Integrated web services client for ILE
- Integrated web services server

Latest information, including product prerequisites, can be found at

http://www.ibm.com/systems/i/software/iws/

Continues to be re-invented and enhanced on 7.3 & 7.4 & 7.5

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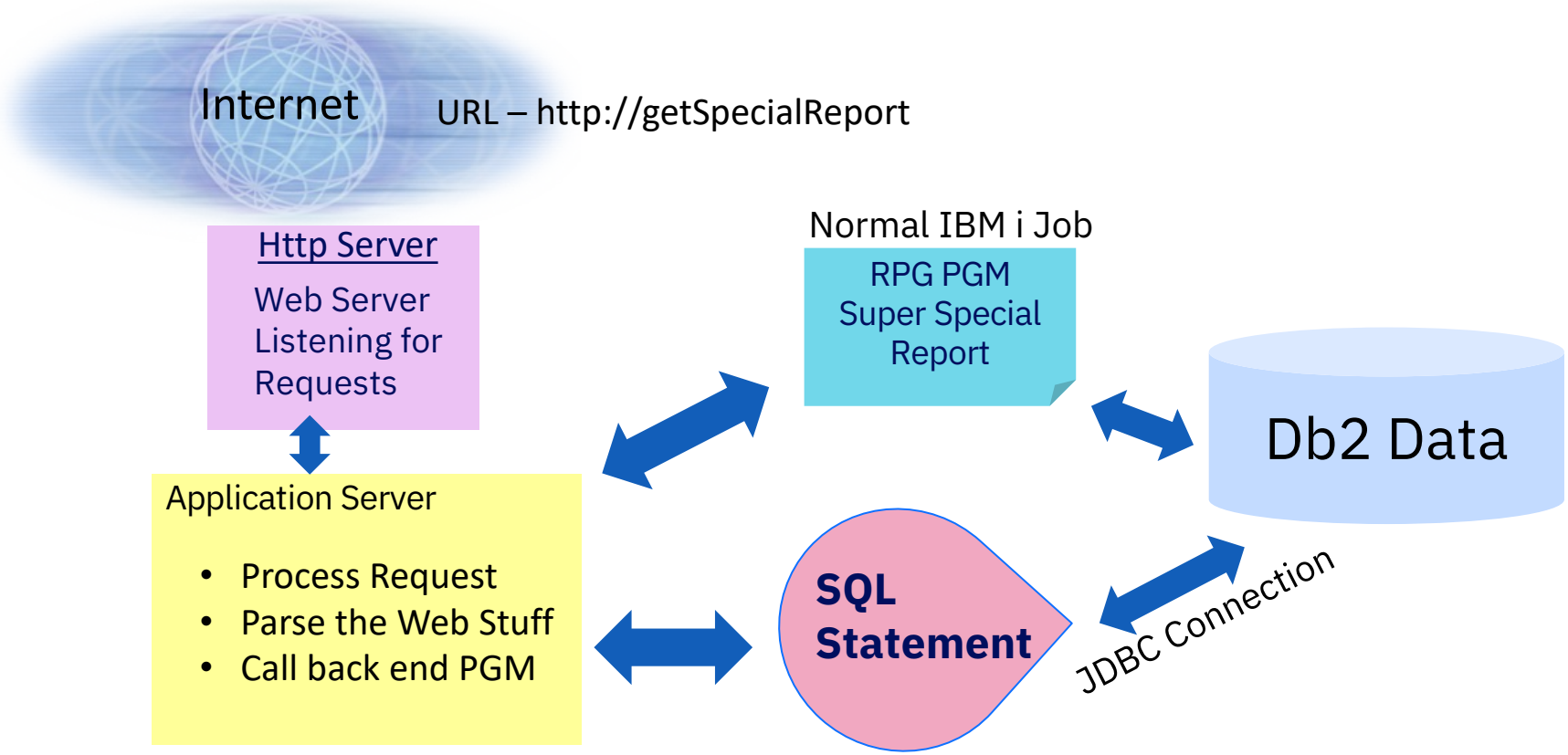
IWS



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Administration…

IBM Web Administration GUI

- Deploy
  - Rest
  - SOAP
  - ILE & SQL
- Manage
  - Performance, Security, Start/Stop, Re-Deploy, and more

Scriptable

- QShell script installWebService.sh updated to support REST
- Qshell Scripts for virtually all functions within IWS, everything can be programmatically configured

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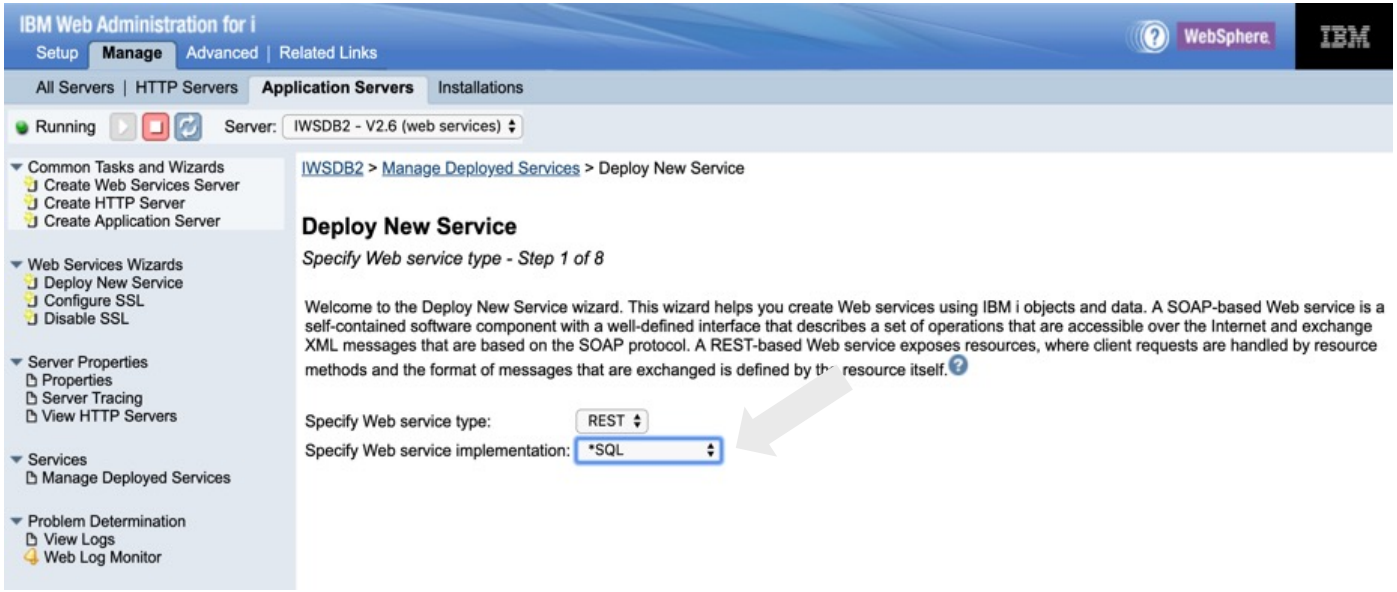
Deployment demo



http://hostname:2001/HTTPAdmin

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How do you test things ?

Free Download

https://www.soapui.org

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Recent IWS server updates

- User interface performance improvements and filter support (usability)
- PATCH HTTP method now an option with GET, POST, PUT, and DELETE for REST web services (functionality)
- Cross-Origin Resource Sharing (CORS) support (security)
- HTTP Strict Transport Security (HSTS) support (security)
- Server JSON logging (observability)
- HTTP access logging (observability)
- HTTP message logging (observability)
- Procedures in service programs can have up to 248 parameters (functionality)
- User registry, groups, and roles (security)
- Trust association interceptor (TAI) support (security)

Details for updates may be found at Technology Updates web page:
https://www.ibm.com/support/pages/node/1138612

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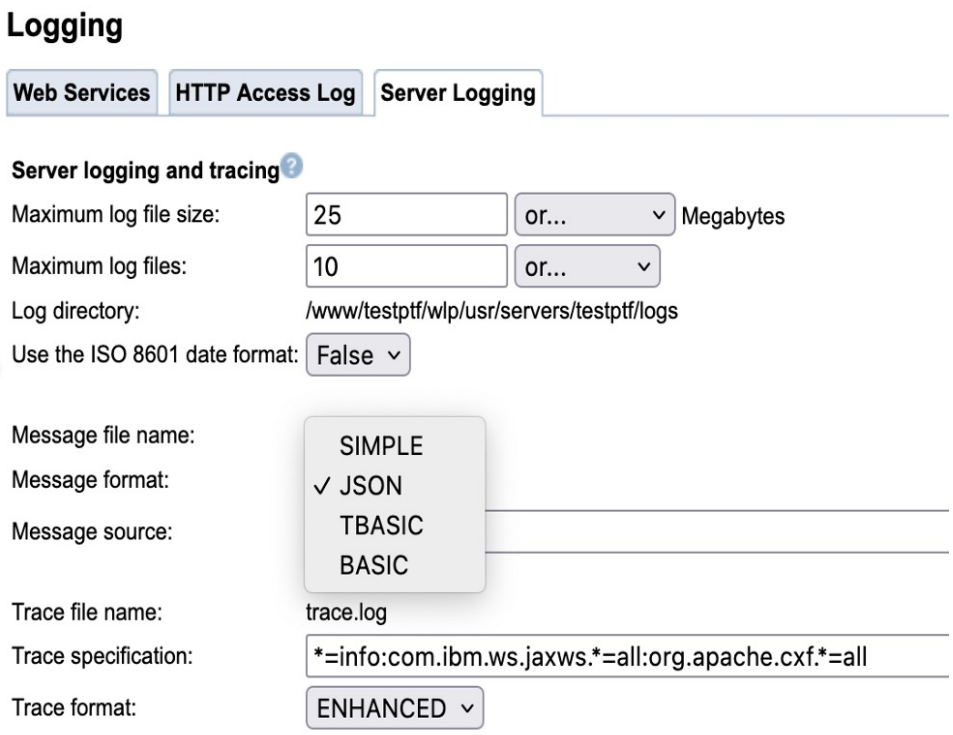
Server JSON logging



Example log record


```
{
    "type":"liberty_message",
    "host":"9e1eceec70c1",
    "ibm_userDir":"\/opt\/ol\/wlp\/usr\/",
    "ibm_serverName":"defaultServer",
    "message":"BADAP0004W: BadApp Angry for test",
    "ibm_threadId":"0000009f",
    "ibm_datetime":"2020-05-04T12:33:26.064+0000",
    "ibm_messageId":"BADAP0004W",
    "module":"com.ibm.ws.lumberjack.badness.Angry",
    "loglevel":"WARNING",
    "ibm_methodName":"doGet",
    "ibm_className":"Angry",
    "ibm_sequence":"1588595606064_0000000000024",
    "ext_thread":"Default Executor-thread-108"
}
```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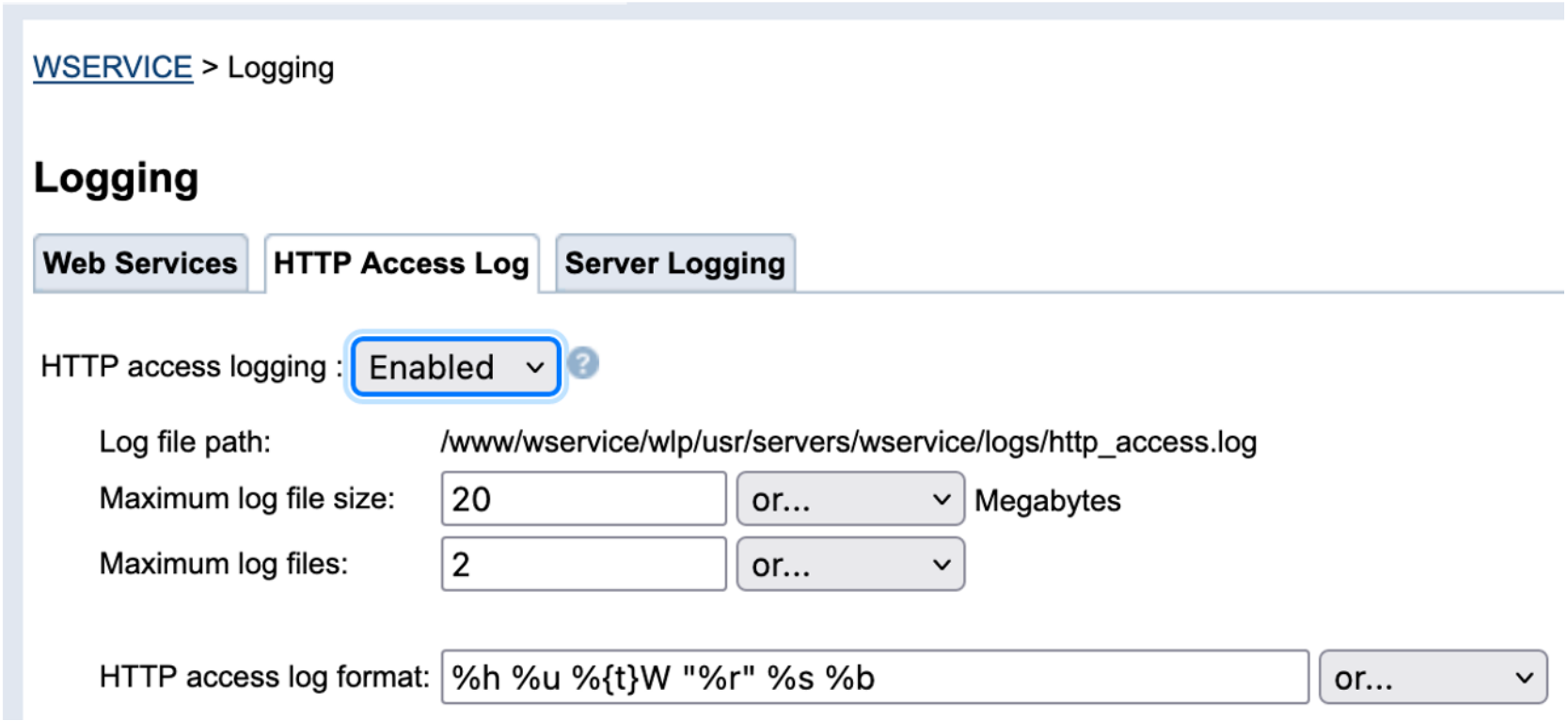
HTTP access logging



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HTTP message logging

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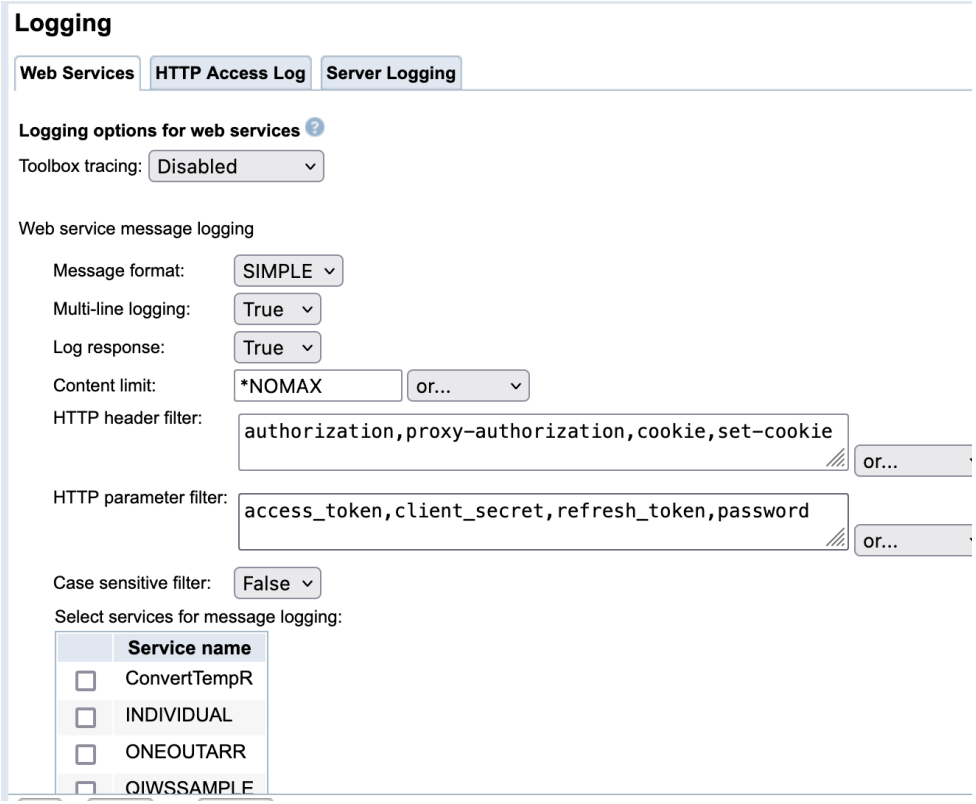

Example log record (simple format - request)

```
{
type: liberty_ibmihttpmessagelog,
host: HOST52P12,
ibm_flow: request,
ibm_datetime: 2022-03-27T19:36:59.338,
ibm_correlation: 0000000008052_1648427819337,
ibm_remoteIP: 10.10.220.148,
ibm_remoteUserID: null,
ibm_requestMethod: GET,
ibm_requestHost: HOST52P12.ibm.com,
ibm_requestPort: 10000,
ibm_uriPath: /web/services/QIWSSAMPLE,
ibm_queryString: null,
ibm_contentType: null,
ibm_headers: {
  Accept: ["text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8"],
  Accept-Encoding: ["gzip, deflate"],
  Accept-Language: ["en-US,en;q=0.9"],
  Connection: ["keep-alive"],
  Cookie: ["REDACTED"],
  Host: ["HOST52P12.ibm.com:10000"],
  Upgrade-Insecure-Requests: ["1"],
  User-Agent: ["Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605
},
ibm_messageBodyLength: 0,
ibm_messageBody: null
}
```


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PATCH HTTP method now an option

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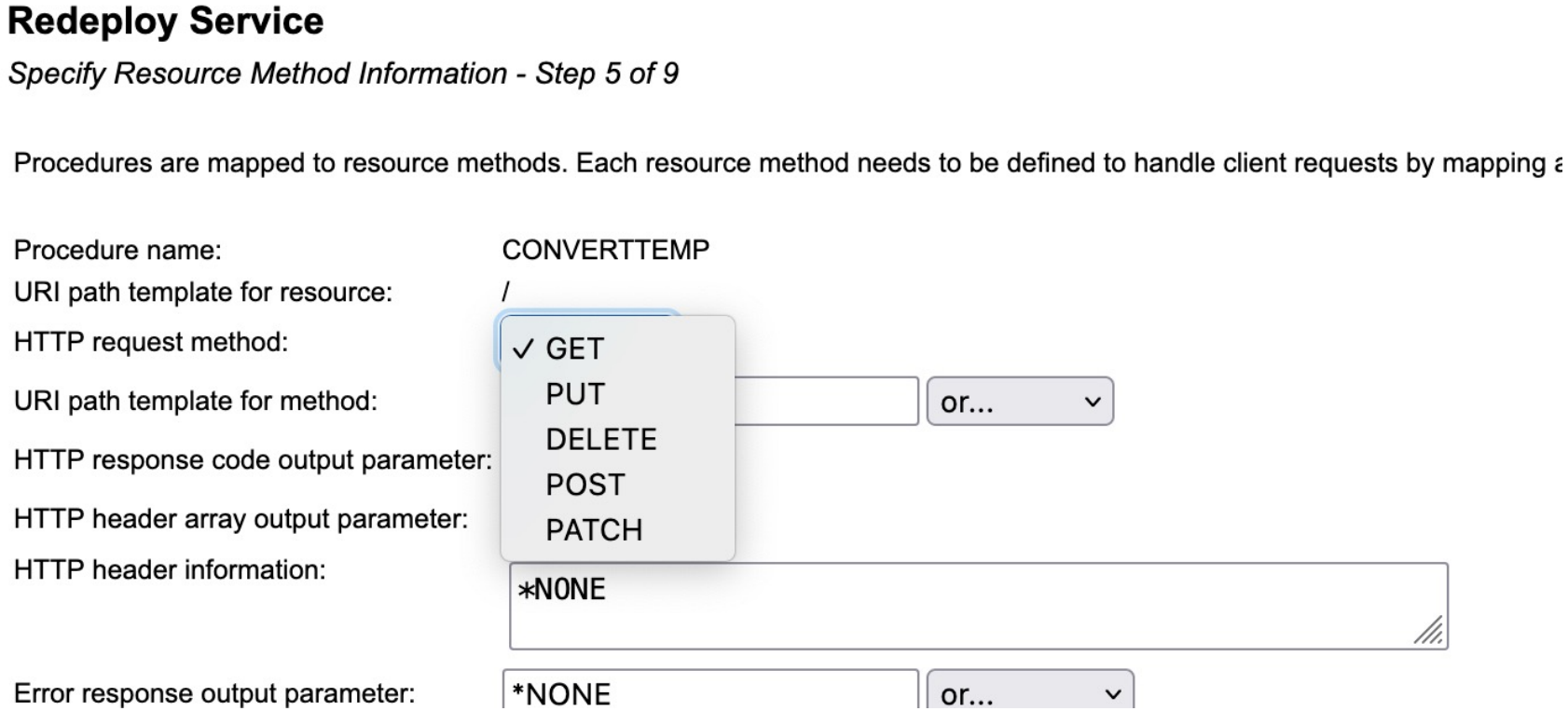

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Rest APIs - Resources

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Latest Security support available in the most recent PTF Groups for 7.3, 7.4, 7.5
- Also available for 7.2 see product Web site for PTF Details

Product Web Page

https://www.ibm.com/support/pages/integrated-web-services-ibm-i-web-services-made-easy

Video recording of REST Api for RPG/COBOL

https://www.youtube.com/watch?v=tMPUbsrRXnk

Video recording of REST using direct Db2 Access

https://www.youtube.com/watch?v=Q-hp0_a6ka8

Calling Rest APIs from RPG

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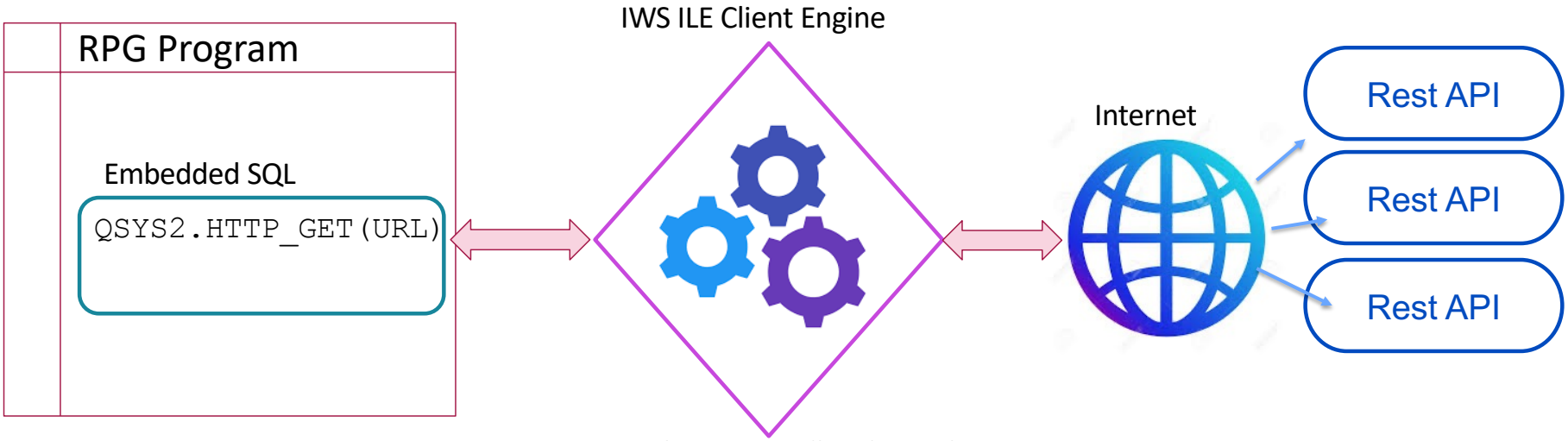
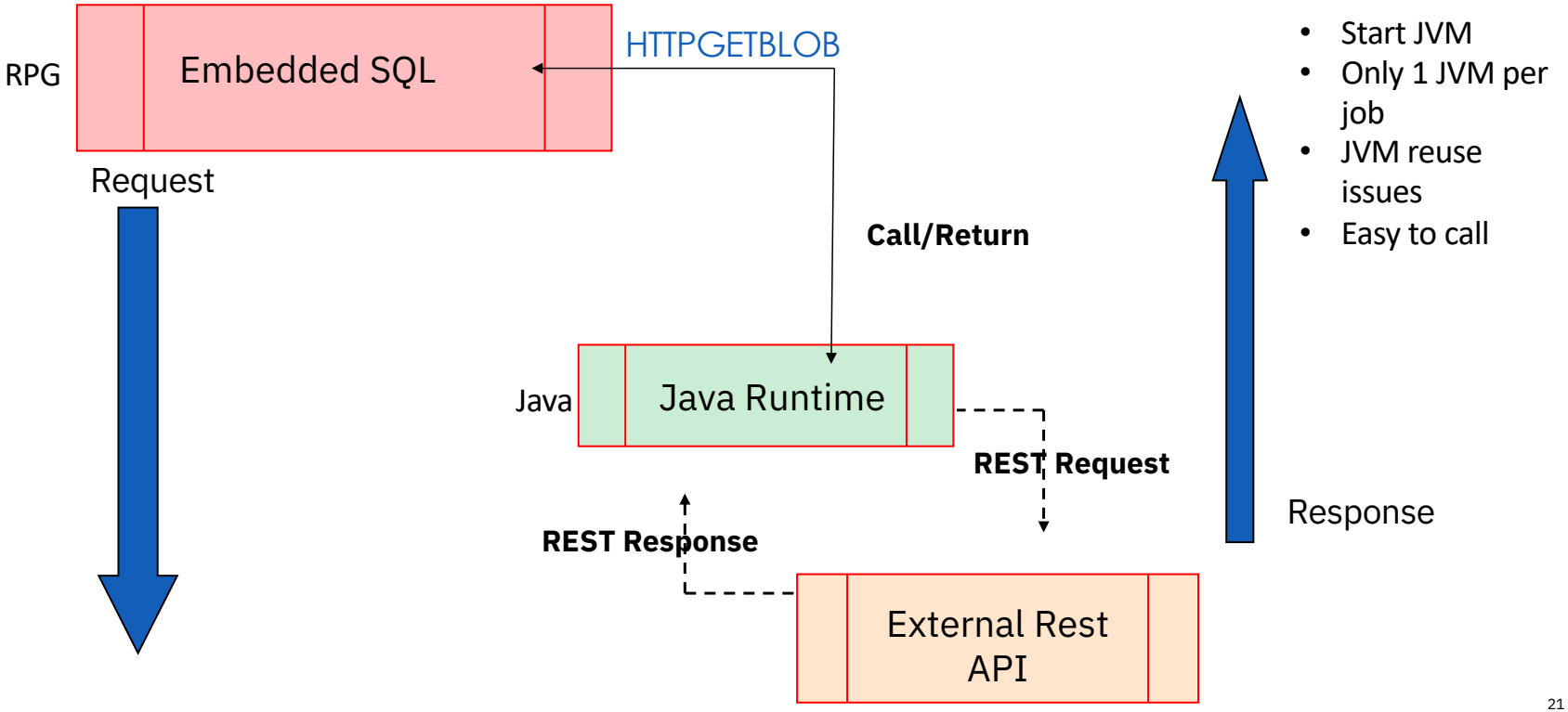
New QSYS2 HTTP Function!!! ILE Based, no Java



https://www.ibm.com/support/pages/node/6486889

Options for Calling Rest APIs from ILE

SYSTOOL HTTP Functions - Native SQL functions to interact with Rest APIs. Creates a JVM and uses Java to interact with the endpoint Rest APIs. From RPG, leverage embedded SQL.



- Start JVM
- Only 1 JVM per job
- JVM reuse issues
- Easy to call

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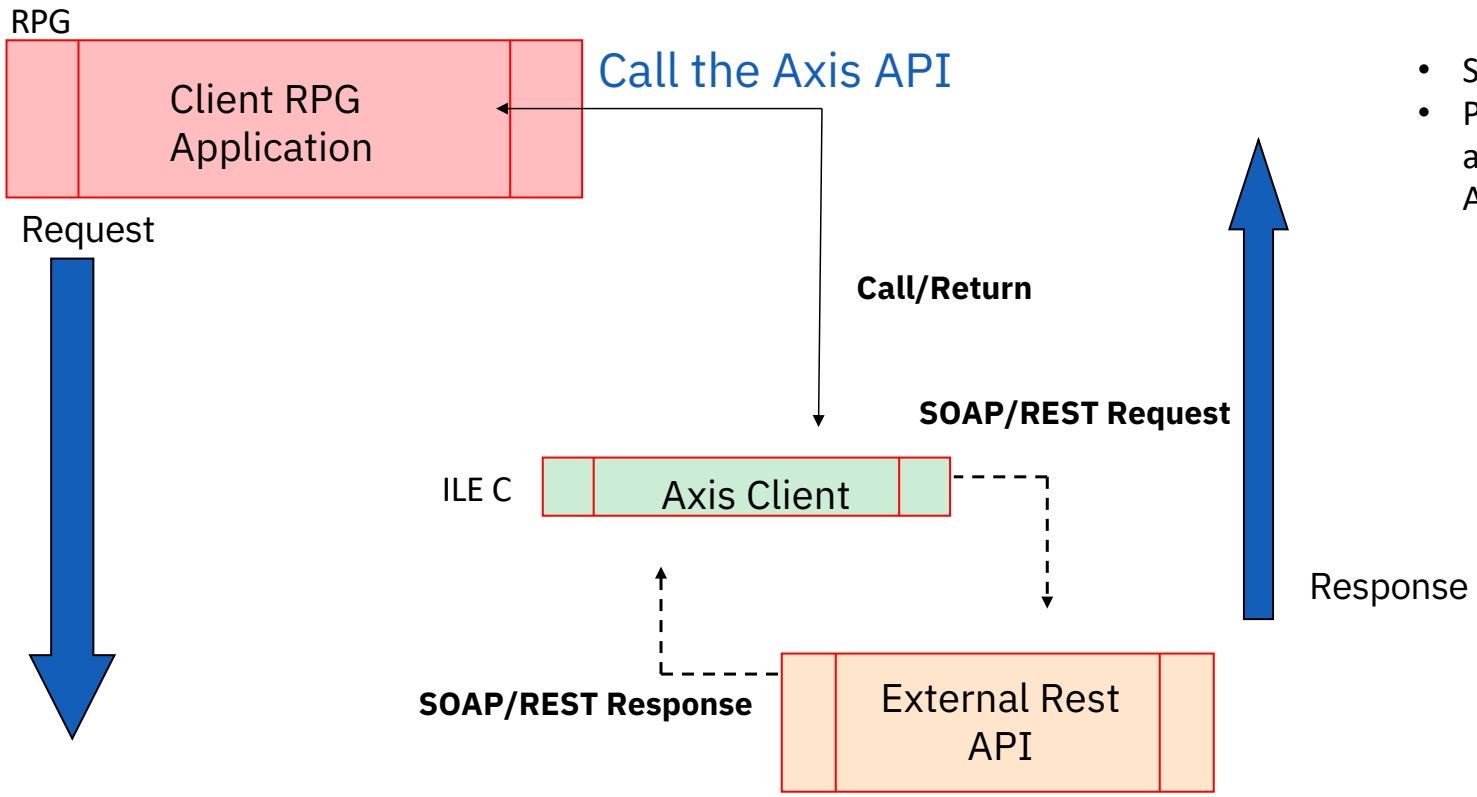
Options for Calling Rest APIs from ILE

IWS Client - ILE programs (Axis.C) interfaces that handle the Rest API interactions. These are ILE programs running in C. RPG program would be required to code to the AXIS APIs and call them directly.



- Super fast as its all ILE
- Pain in the neck to call as you have to code the AXIS api!

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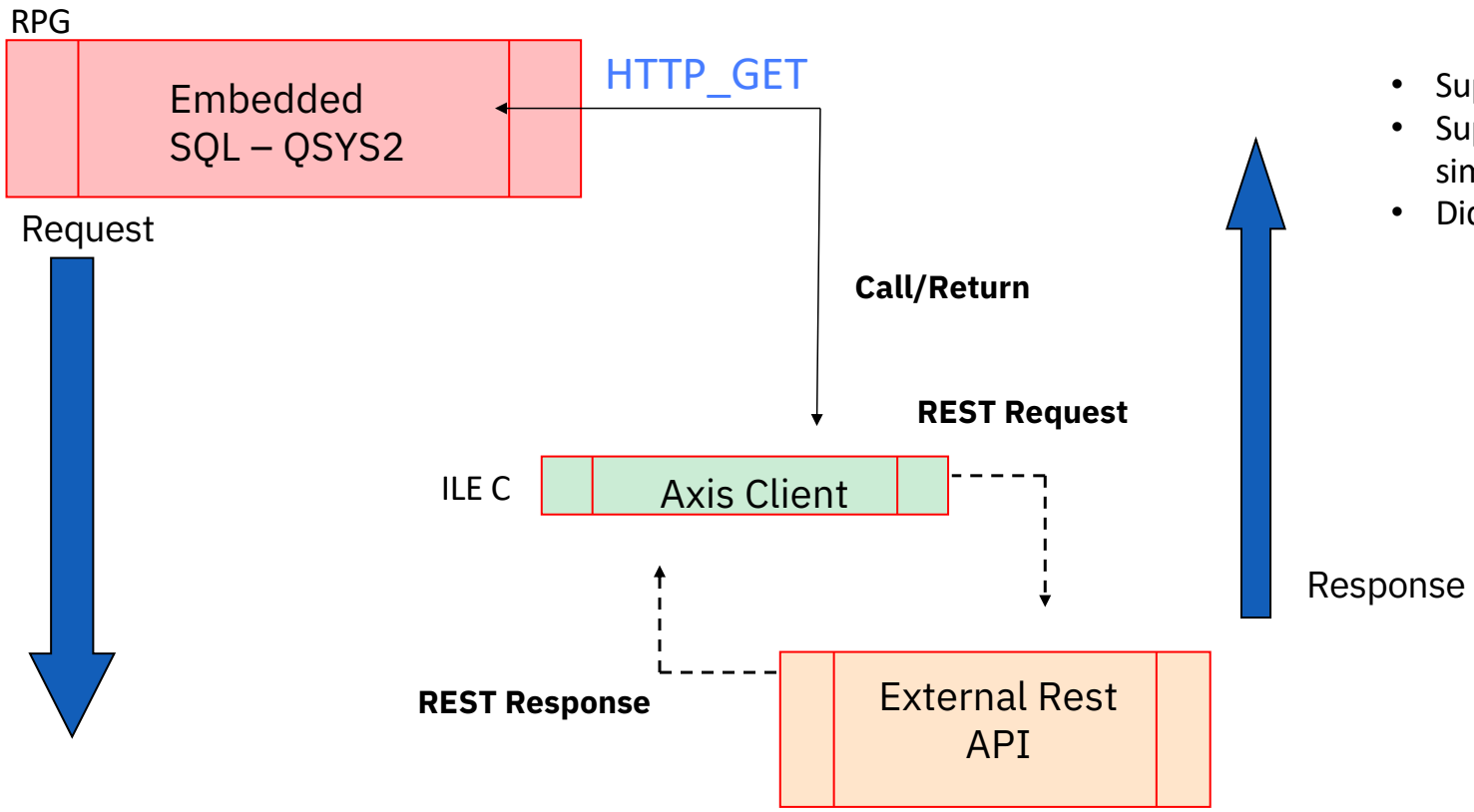
Options for Calling Rest APIs from ILE – NEW!!

QSYS2 HTTP Functions – SQL functions to call the native IWS Client ILE programs (Axis.C) interfaces that handle the Rest API interactions. Users leverages embedded SQL for easy calls, these call the ILE programs running in C.



- Super fast as its all ILE
- Super easy to call as its simple embedded SQL
- Did I mention its fast ?

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Contrasted with SYSTOOLS predecessors

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```
select *
  from json_table(
      SYSTOOLS.HTTPGETCLOB('https://official-joke-api.appspot.com/jokes/ten
      'lax $'
      columns(
        "id" integer,
        "type" varchar(100),
        "setup" varchar(100),
        "punchline" varchar(100)
      )
    ) x;
-- Statement ran successfully   (6,693 ms  =  6.693 sec)

--
-- Count all threads in my job
--
select count(distinct(THREAD_ID))
  from table (
      QSYS2.STACK_INFO('*', 'ALL')
    ) as x;
-- ============================================================
-- 49 threads
-- ============================================================
```

```
select *
  from json_table(
      QSYS2.HTTP_GET('https://official-joke-api.appspot.cor
      'lax $'
      columns(
        "id" integer,
        "type" varchar(100),
        "setup" varchar(100),
        "punchline" varchar(100)
      )
    ) x;
-- Statement ran successfully   (2,539 ms  =  2.539 sec)

--
-- Count all threads in my job
--
select count(distinct(THREAD_ID))
  from table (
      QSYS2.STACK_INFO('*', 'ALL')
    ) as x;
-- ============================================================
-- 1 thread
-- ============================================================
```

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New HTTP Functions for SQL (QSYS2)

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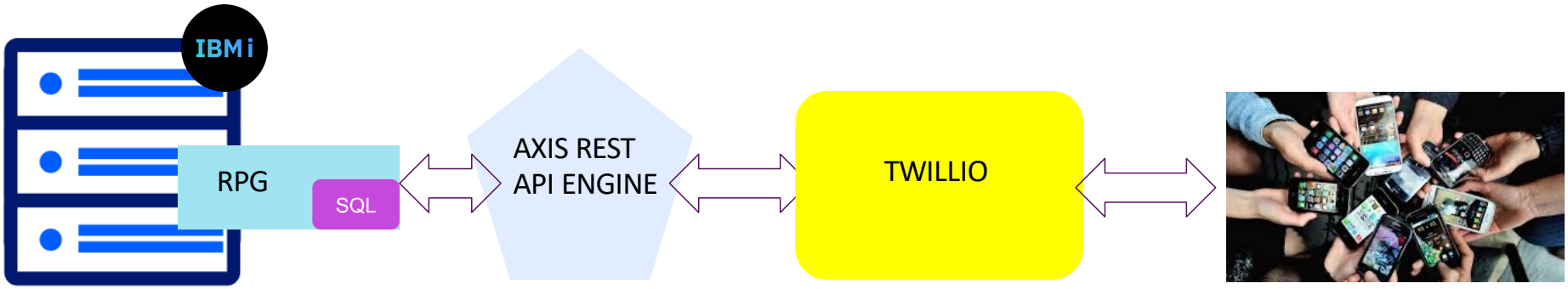
Why not send your phone a text message…..from your IBM i, using RPG ??

Sure… its easy…



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Tim Rowe - The Magic of Rest APIs on IBM i

Please take the last minute of this session to complete the evaluation. A direct link to the survey can be found using the QR code on the right.

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