NHMUG
New Hampshire
Midrange User Group

IBM

Accessing Data Outside of Db2 for i

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An Expanding World

The Internet. A big, ~~beautiful~~ big world

- A wealth of information at your fingertips with a browser
- Its also available programmatically
- But, is it useful?
- Maybe, we'll see

Examples of Public Data sources

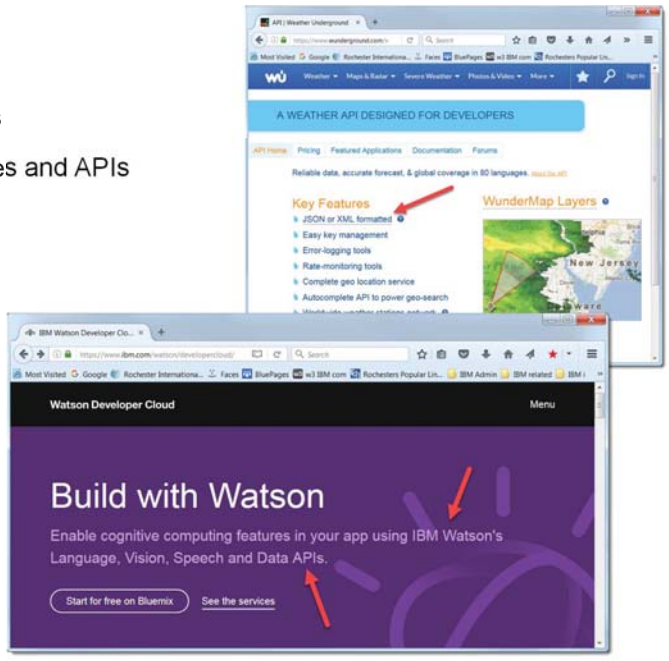
- Weather data
  - Weather under ground, Yahoo, Dark Sky, NOAA, AccuWeather, Weather.com
- Data.gov
  - Agriculture, Census, Energy, Finance, Health…. Science and Research
- Google Finance https://www.google.com/finance 40 years' worth of stock market data, updated in real time
- The following link is a list compiled by Forbes
  - https://www.forbes.com/sites/bernardmarr/2016/02/12/big-data-35-brilliant-and-free-data-sources-for-2016/#76b79dd8b54d
- IBM Watson
  - https://www.ibm.com/watson/products-services/

Web Service

- A web service is a software function that makes itself available over the internet
- Web Services use a standardized messaging system
- XML or JSON is used to encode communications to the service
- The client invokes a web service by sending a message, and waits for the corresponding response
- A web service allows a program or query to talk to a web page
- Typical data formats are HTML, XML and JSON

Web Services and APIs

- IBM Watson services and APIs
- The Weather Company services and APIs
- Google maps
- Etc.



First - XML and JSON

What are we talking about?

- XML and JSON are self describing data formats
  - A document can 'stand alone'
- They are commonly used for transferring data across the internet and between businesses
- They are most often represented in Unicode (universal) encoding
- XML is the more traditional form of data interchange
  - But can be quite bloated
- JSON is a newer form
  - More terse. Partially came about as a response to XML bloat

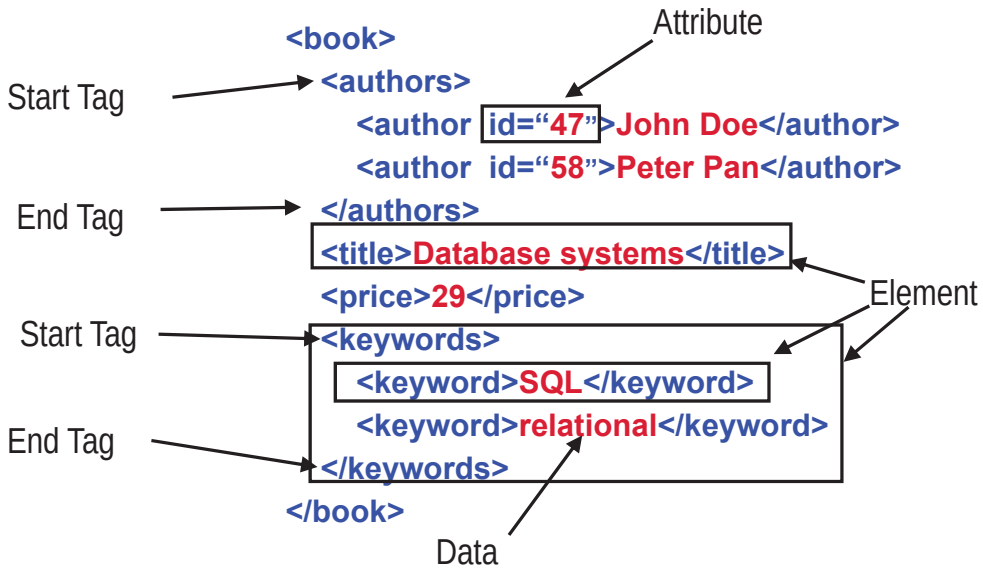
What is XML?

XML is "self-describing data"

```
<book>
   <authors>
      <author  id="47">John Doe</author>
      <author  id="58">Peter Pan</author>
   </authors>
   <title>Database systems</title>
   <price>29</price>
   <keywords>
      <keyword>SQL</keyword>
      <keyword>relational</keyword>
   </keywords>
</book>
```

XML: Describes data
HTML: Describes display

What is XML?



XML: Describes data
HTML: Describes display

Database support for XML

- **Rich XML Support within DB2 for i (since v7.1)**
- **Integrated solution**
  - XML data type to simplify storage and retrieval of XML documents
    - XML data access protected with rock-solid DB2 security
    - XML covered by database backup and recovery processes
  - Annotated decomposition of XML documents into DB2 columns
  - Generate XML document with SQL-XML publishing functions
  - Can replace (no longer supported) DB2 XML Extender product

Database - XML Data Type

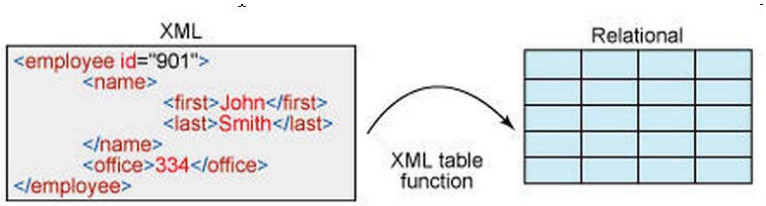
- XML data type
  - Supports XML documents up to 2 GB
  - Type can be used for column, parameter, and host variable values

```
CREATE TABLE  Reservations
(  res_ID          INTEGER
                   GENERATED ALWAYS AS IDENTITY,
   res_Doc         XML,
   res_TimeStamp TIMESTAMP
                   NOT NULL
                   IMPLICITLY HIDDEN
                   FOR EACH ROW ON UPDATE AS ROW CHANGE TIMESTAMP
   )
```

ID	XML	Timestamp

Converting XML - SQL XMLTABLE table function

- XMLTABLE table function extracts relational data from XML, dynamically



- Function uses an XPath expression to define and extract columns from xml elements and attributes

XMLTABLE (<XPath Expr> COLUMNS
<col1> PATH <path ref>,
<col2> PATH <path ref>,
…)

XMLTABLE Example

SQL table **emp** has a column named **doc** that has an XML data type. The table contains two rows (xml documents):

Row 1:
```
<dept bldg="101">
  <employee id="901">
   <name> <first>John</first> <last>Doe</last> </name>
   <office>344</office>
  </employee>
  <employee id="902">
   <name> <first>Peter</first> <last>Pan</last> </name>
   <office>216</office> <phone>905-416-5004</phone>
</employee>
</dept>
```

Row 2:
```
<dept bldg="114">
  <employee id="903">
    <name> <first>Mary</first> <last>Jones</last> </name>
    <office>415</office> <phone>905-403-6112</phone>
</dept>
```

Using XMLTABLE to extract certain elements and attributes into relational columns:

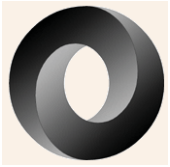
```
SELECT X.*
FROM emp,
 XMLTABLE ('$d/dept/employee' passing emp.doc as "d"
 COLUMNS
  EMPID INTEGER PATH '@id',
  FIRSTNAME VARCHAR(20) PATH 'name/first',
  LASTNAME VARCHAR(25) PATH 'name/last') AS X
```

Result

EMPID	FIRSTNAME	LASTNAME
901	John	Doe
902	Peter	Pan
903	Mary	Jones

What is JSON?

JSON is a simplified format for describing information



- **J**ava**S**cript **O**bject **N**otation
- A textual data format
- Designed to transport and store data
- Uses key/value pairs
- Can be arbitrarily complex: key/values within values (nested)
- Curly braces **{ }** indicate object start and end

JSON Value Pairs

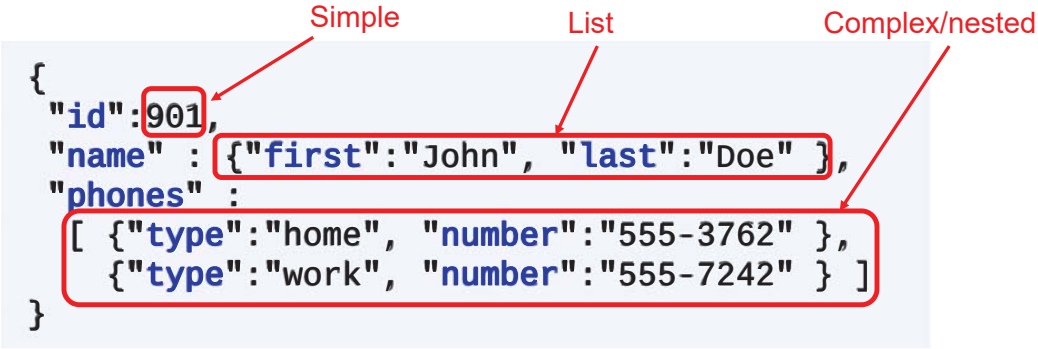
- **JSON Keys**
  - Must be a string – a sequence of Unicode characters surrounded by double quotation marks
  - For example: “id”, “name”, “phone”…

```
{
"id" : 901,
"name" : "John",
"phone" : "555-3762"
}
```

Keys

JSON Value Pairs…

- **JSON Values**
  - Can be arbitrarily complex: from simple values to key/values within values
  - Colon (:) separates key and value
  - Comma (,) separates pairs
  - Braces ({} and []) identify lists and 'complex' sets



Converting JSON – SQL JSON_TABLE

- Converts a JSON expression into relational data
- **JSON-expressions** can be:
  - Character or Graphic
    (use FORMAT JSON)
  - Binary
    (use FORMAT BSON)
- **JSON path expression**
  - **lax**
    - Structural problems are tolerated
    - Arrays are automatically unnested
  - **strict**
    - Structural problems result in an error
    - Arrays are not automatically unnested
- Can leverage HTTP Functions

```
SELECT * FROM
JSON_TABLE(
   <JSON-expression> ,
   <JSON-path-expression>
   COLUMNS (
   <column-definitions>
   )
   <error-option>
)
```

JSON_TABLE example

- JSON objects are represented using a list of key-value pairs
  - Curly braces **{}** indicate object start and end
  - Value Pairs are separated by commas
  - Keys and values separated by colons

```
SELECT * FROM
json_table('{"first":"John","last":"Doe"}', '$'
columns("first" VARCHAR(40), "last" VARCHAR(40))) x;
```

first	last
John	Doe

Accessing the Web

HTTP functions available in SYSTOOLS

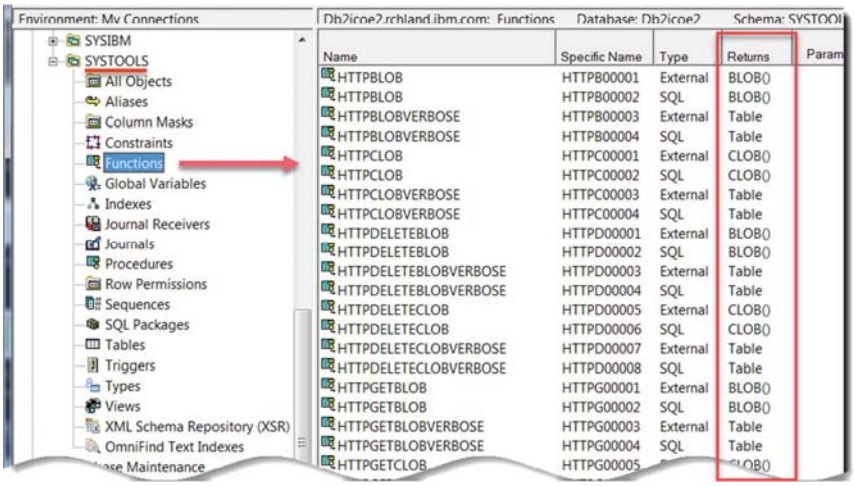
- HTTP is the preferred way for communicating on the Web
- **REST**ful services provide access to information addressable via a URL and accessed using HTTP
  - XML and JSON are part and parcel of the data flows
- Db2 for i has shipped HTTP functions in the SYSTOOLS schema
  - SYSTOOLS contain 'as is' tools and examples from Db2

"Query the web"

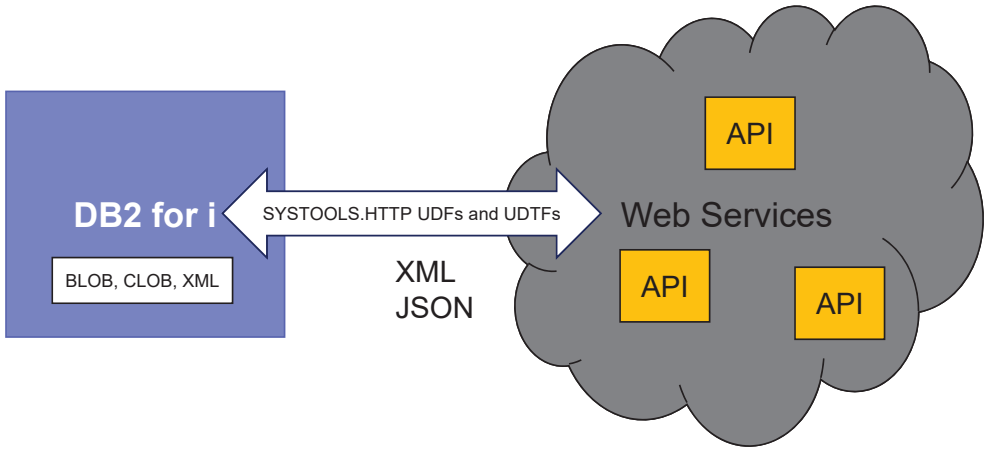
HTTP functions:

httpGetBlob	**httpDeleteBlob**	**URLencode**
httpGetClob	**httpDeleteClob**	**URLdecode**
httpPutBlob	**httpBlob**	**Base64encode**
httpPutClob	**httpClob**	**Base64decode**
httpPostBlob	**httpHead**	
httpPostClob		

Calling Web Services and APIs from DB2 for i



Extending and Expanding Capability

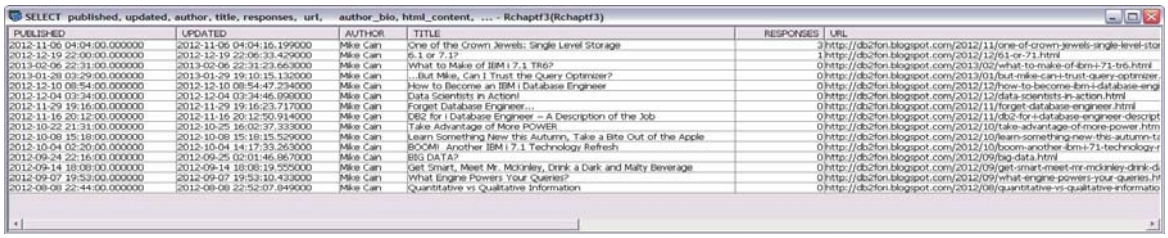


Let's Do Some Examples

HTTP functions - Query the web example - XML

```
-- Blog Posts for the last 6 months, order by reader responses
SELECT published, updated, author, title, responses, url, author_bio, html_content, url_atom
FROM
XMLTABLE(
XMLNAMESPACES(DEFAULT 'http://www.w3.org/2005/Atom',
'http://purl.org/syndication/thread/1.0' AS "thr"),
'feed/entry'
PASSING XMLPARSE(DOCUMENT
SYSTOOLS.HTTPGETBLOB(
-- URL --
'http://db2fori.blogspot.com/feeds/posts/default?published-min=' ||
SYSTOOLS.URLENCODE(QGPL.RFC339_DATE_FORMAT(CURRENT_TIMESTAMP - 6 MONTHS), 'UTF-8') ||
'&published-max=' || SYSTOOLS.URLENCODE(QGPL.RFC339_DATE_FORMAT(CURRENT_TIMESTAMP + 1
DAYS) , 'UTF-8') ,
-- header --
'<httpHeader> <header name="Accept" value="application/atom+xml"/> </httpHeader>'
) )
COLUMNS ... (see developerWorks for details)
```

XMLTABLE
XMLPARSE
HTTPGETBLOB



SELECT published, updated, author, title, responses, url, author_bio, html_content, ... - Rchaptf3(Rchaptf3)

PUBLISHED	UPDATED	AUTHOR	TITLE	RESPONSES	URL
2012-11-06 04:04:00.000000	2012-11-06 04:04:16.199000	Mike Cain	One of the Crown Jewels: Single Level Storage	3	http://db2fori.blogspot.com/2012/11/one-of-crown-jewels-single-level-stor
2012-12-19 22:00:00.000000	2012-12-19 22:06:33.429000	Mike Cain	6.1 or 7.1?	1	http://db2fori.blogspot.com/2012/12/61-or-71.html
2013-02-06 22:31:00.000000	2013-02-06 22:31:23.663000	Mike Cain	What to Make of IBM i 7.1 TR6?	0	http://db2fori.blogspot.com/2013/02/what-to-make-of-ibm-i-71-tr6.html
2013-01-28 03:29:00.000000	2013-01-29 19:10:15.132000	Mike Cain	...But Mike, Can I Trust the Query Optimizer?	0	http://db2fori.blogspot.com/2013/01/but-mike-can-i-trust-query-optimizer.
2012-12-10 08:54:00.000000	2012-12-10 08:54:47.234000	Mike Cain	How to Become an IBM i Database Engineer	0	http://db2fori.blogspot.com/2012/12/how-to-become-ibm-i-database-engi
2012-12-04 03:34:00.000000	2012-12-04 03:34:46.998000	Mike Cain	Data Scientists in Action!	0	http://db2fori.blogspot.com/2012/12/data-scientists-in-action.html
2012-11-29 19:16:00.000000	2012-11-29 19:16:23.717000	Mike Cain	Forget Database Engineer...	0	http://db2fori.blogspot.com/2012/11/forget-database-engineer.html
2012-11-16 20:12:00.000000	2012-11-16 20:12:50.914000	Mike Cain	DB2 for i Database Engineer -- A Description of the Job	0	http://db2fori.blogspot.com/2012/11/db2-for-i-database-engineer-descript
2012-10-22 21:31:00.000000	2012-10-25 16:02:37.333000	Mike Cain	Take Advantage of More POWER	0	http://db2fori.blogspot.com/2012/10/take-advantage-of-more-power.htm
2012-10-08 15:18:00.000000	2012-10-08 15:18:15.529000	Mike Cain	Learn Something New this Autumn, Take a Bite Out of the Apple	0	http://db2fori.blogspot.com/2012/10/learn-something-new-this-autumn-t
2012-10-04 02:20:00.000000	2012-10-04 14:17:33.263000	Mike Cain	BOOM! Another IBM i 7.1 Technology Refresh	0	http://db2fori.blogspot.com/2012/10/boom-another-ibm-i-71-technology-r
2012-09-24 22:16:00.000000	2012-09-25 02:01:46.967000	Mike Cain	BIG DATA?	0	http://db2fori.blogspot.com/2012/09/big-data.html
2012-09-14 18:08:00.000000	2012-09-14 18:08:19.555000	Mike Cain	Get Smart, Meet Mr. McKinley, Drink a Dark and Malty Beverage	0	http://db2fori.blogspot.com/2012/09/get-smart-meet-mr-mckinley-drink-d
2012-09-07 19:53:00.000000	2012-09-07 19:53:10.433000	Mike Cain	What Engine Powers Your Queries?	0	http://db2fori.blogspot.com/2012/09/what-engine-powers-your-queries.ht
2012-08-08 22:44:00.000000	2012-08-08 22:52:07.849000	Mike Cain	Quantitative vs Qualitative Information	0	http://db2fori.blogspot.com/2012/08/quantitative-vs-qualitative-informatio

JSON in action

- Build the query…

```
-- Which IT strategy provides the greatest ROI?
-- JSON Feed Source: U.S. Department of Commerce
select * from JSON_TABLE(
SYSTOOLS.HTTPGETCLOB('https://www.commerce.gov/sites/commerce.gov/
   files/costsavings.json', null),
   'lax $.strategies[*]' COLUMNS (
   "strategyTitle" VARCHAR(100),
   "amountType"    VARCHAR(100),
   amount_saved_2012  DECIMAL(10,3)  PATH 'lax $.fy2012.amount',
   amount_saved_2013  DECIMAL(10,3)  PATH 'lax $.fy2013.amount',
   amount_saved_2014  DECIMAL(10,3)  PATH 'lax $.fy2014.amount',
   amount_saved_2015  DECIMAL(10,3)  PATH 'lax $.fy2015.amount',
   amount_saved_2016  DECIMAL(10,3)  PATH 'lax $.fy2016.amount'
   )) x
   order by amount_saved_2016  desc
   limit 10;
```

JSON in action

- Review the results…

select * from JSON_TABLE(SYSTOOLS.HTTPGETCLOB('https://www.commerce.gov/sites/commerce.gov/files/co...

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strategyTitle	amountType	AMOUNT_SAVED_2012	AMOUNT_SAVED_2013	AMOUNT_SAVED_2014	AMOUNT_SAVED_2015
Cloud Infrastruture as a service (...	Cost-Avoidance	0.000	0.000	128.000	128.000
Data Center Consolidation	Both	0.070	45.600	78.700	110.980
Cloud Email	Cost-Avoidance	0.000	45.000	35.000	15.000
Desktop and Laptop Management	Cost-Avoidance	0.000	1.200	2.899	10.788
Server Virtualization	Both	2.120	4.509	5.150	1.350
Data Center Consolidation by Census	Cost-Avoidance	1.960	1.899	2.000	0.650
Server Consolidation and Improvements	Both	0.830	0.424	0.315	0.357
Personal Computer Purchasing Agree...	Cost-Savings	0.059	0.020	0.135	0.100
Server Virtualization Optimization	Cost-Avoidance	0.000	0.315	0.555	0.089
Adobe Licenses	Cost-Savings	0.012	0.012	0.010	0.010

Consume JSON Feeds:

- Government (local, state, national, …)
- Social Media (Twitter, Facebook, …)
- Intranet
- Etc…

Web Services and APIs (Watson translate)

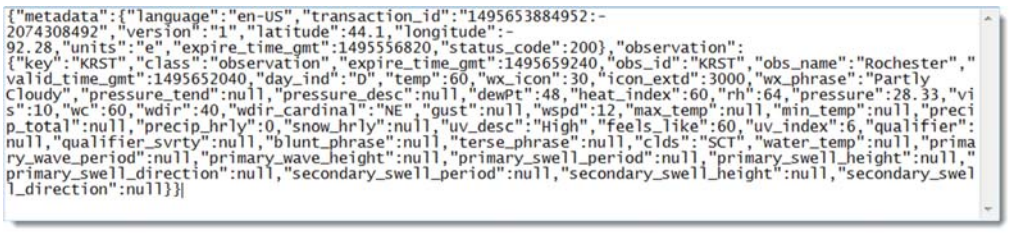
```
CREATE OR REPLACE FUNCTION  TRANSLATE_TO_SPANISH
(STR VARCHAR(1000) )
        RETURNS VARCHAR(1000)
        LANGUAGE SQL
BEGIN
RETURN CAST ( SYSTOOLS.HTTPGETCLOB ( 'https://watson-api-
explorer.mybluemix.net/language-
translator/api/v2/translate?model_id=en-es&text=' CONCAT
SYSTOOLS . URLENCODE ( STR , '' ) , '' ) AS VARCHAR ( 1000 ) ) ;
END  ;


VALUES (TRANSLATE_TO_SPANISH( ‘Can I see the wine list?‘ ));
```

¿Puedo ver la lista vino?

Web Services and APIs (The Weather Company)

```
-- Obtain current conditions for a geo location
SELECT  SYSTOOLS.HTTPGETCLOB
        ('https://851c6f68-cc03-4358-84c0-
00c78f78ca9e:LUxZKOECRZ@twcservice.mybluemix.net/api/weather/v1/geocode/44.1/-
92.28/observations.json?language=en-US&units=e' ,'')
FROM    SYSIBM.SYSDUMMY1;
```

JSON document




```
{"metadata":{"language":"en-US","transaction_id":"1495653884952:-
2074308492","version":"1","latitude":44.1,"longitude":-
92.28,"units":"e","expire_time_gmt":1495556820,"status_code":200},"observation":
{"key":"KRST","class":"observation","expire_time_gmt":1495659240,"obs_id":"KRST","obs_name":"Rochester","
valid_time_gmt":1495652040,"day_ind":"D","temp":60,"wx_icon":30,"icon_extd":3000,"wx_phrase":"Partly
Cloudy","pressure_tend":null,"pressure_desc":null,"dewPt":48,"heat_index":60,"rh":64,"pressure":28.33,"vi
s":10,"wc":60,"wdir":40,"wdir_cardinal":"NE","gust":null,"wspd":12,"max_temp":null,"min_temp":null,"preci
p_total":null,"precip_hrly":0,"snow_hrly":null,"uv_desc":"High","feels_like":60,"uv_index":6,"qualifier":
null,"qualifier_svrty":null,"blunt_phrase":null,"terse_phrase":null,"clds":"SCT","water_temp":null,"prima
ry_wave_period":null,"primary_wave_height":null,"primary_swell_period":null,"primary_swell_height":null,"
primary_swell_direction":null,"secondary_swell_period":null,"secondary_swell_height":null,"secondary_swel
l_direction":null}}
```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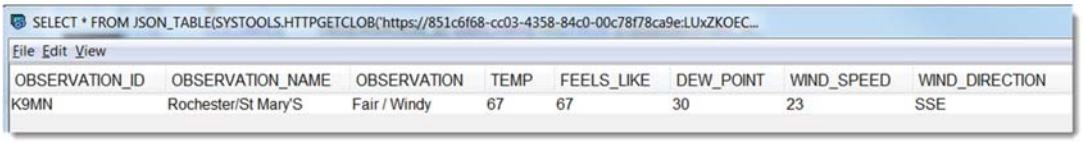
```
"metadata": {
    "language": "en-US",
    "transaction_id": "1495653884952:-2074308492",
    "version": "1",
    "latitude": 44.1,
    "longitude": -92.28,
    "units": "e",
    "expire_time_gmt": 1495556820,
    "status_code": 200
},
"observation": {
    "key": "KRST",
    "class": "observation",
    "expire_time_gmt": 1495659240,
    "obs_id": "KRST",
    "obs_name": "Rochester",
    "valid_time_gmt": 1495652040,
    "day_ind": "D",
    "temp": 60,
    "wx_icon": 30,
    "icon_extd": 3000,
    "wx_phrase": "Partly Cloudy",
    "pressure_tend": null,
    "pressure_desc": null,
    "dewPt": 48,
    "heat_index": 60,
    "rh": 64,
    "pressure": 28.33,
    "vis": 10,
    "wc": 60,
    "wdir": 40
```

Web Services and APIs

```
-- Obtain current conditions for a geo location and decompose JSON response
SELECT *
FROM JSON_TABLE(SYSTOOLS.HTTPGETCLOB
('https://851c6f68-cc03-4358-84c0-00c78f78ca9e:LUxZKOECRZ@twcservice.mybluemix.net/api/weather/v1/geocode/44.1/-92.28/observations.json?language=en-US&units=e' ,'') ,  '$'
      COLUMNS(   OBSERVATION_ID VARCHAR(100) PATH '$.observation.obs_id',
                                    OBSERVATION_NAME VARCHAR(100) PATH '$.observation.obs_name',
                                    OBSERVATION VARCHAR(100) PATH '$.observation.wx_phrase',
                                    TEMP VARCHAR(100) PATH '$.observation.temp',
                                    FEELS_LIKE VARCHAR(100) PATH '$.observation.feels_like',
                                    DEW_POINT VARCHAR(100) PATH '$.observation.dewPt',
                                    WIND_SPEED VARCHAR(100) PATH '$.observation.wspd',
                                    WIND_DIRECTION VARCHAR(100) PATH '$.observation.wdir_cardinal'
                  )
  ) AS OBSERVATION;
```



SELECT * FROM JSON_TABLE(SYSTOOLS.HTTPGETCLOB('https://851c6f68-cc03-4358-84c0-00c78f78ca9e:LUxZKOEC...

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OBSERVATION_ID	OBSERVATION_NAME	OBSERVATION	TEMP	FEELS_LIKE	DEW_POINT	WIND_SPEED	WIND_DIRECTION
K9MN	Rochester/St Mary'S	Fair / Windy	67	67	30	23	SSE

Web Services APIs with a list of locations

```
WITH POSTAL_CODES(CODE) AS (
 VALUES('55901'),('57785'),('01701')),

WEATHER AS (SELECT * FROM POSTAL_CODES,
 JSON_TABLE(SYSTOOLS.HTTPGETCLOB(
  'http://api.openweathermap.org/data/2.5/weather?zip=' CONCAT CODE CONCAT',us&APPID=9b7e02012b849ae994bc687b40bffb43' ,'') ,
  'lax $'
      COLUMNS(OBSERVATION_ID VARCHAR(100) PATH 'lax $.id',
                  OBSERVATION_NAME VARCHAR(100) PATH 'lax $.name',
                  OBSERVATION VARCHAR(100) PATH 'lax $.weather.description',
                  TEMP_KELVIN VARCHAR(100) PATH 'lax $.main.temp',
                  HUMIDITY VARCHAR(100) PATH 'lax $.main.humidity',
                  WIND_SPEED VARCHAR(100) PATH 'lax $.wind.speed',
                  WIND_DIRECTION VARCHAR(100) PATH 'lax $.wind.deg')) AS OBSERVATION)
SELECT
 CODE AS POSTAL_CODE,
 OBSERVATION_NAME,
 OBSERVATION,
 INT(TEMP_KELVIN * 9/5 -459.67) AS TEMP_F,
 HUMIDITY,
 INT(WIND_SPEED * 1.15) AS WIND_MPH,
 WIND_DIRECTION
FROM WEATHER;
```

POSTAL_CODE	OBSERVATION_NAME	OBSERVATION	TEMP_F	HUMIDITY	WIND_MPH	WIND_DIRECTION
55901	Rochester	light rain	60	88	2	290
57785	Spearfish	overcast clouds	45	100	4	310
01701	Worcester	clear sky	47	82	1	90

Google Maps

```
-- Get directions and time between locations
select * from JSON_TABLE(
  SYSTOOLS.HTTPGETCLOB(
    'http://maps.googleapis.com/maps/api/directions/json?' CONCAT
    'origin='      CONCAT SYSTOOLS.URLENCODE('Rochester, MN', 'UTF-8') CONCAT
    '&destination=' CONCAT SYSTOOLS.URLENCODE('Framingham, MA', 'UTF-8') CONCAT
    '&sensor=false&mode=drive', ''),
  'lax $.routes[*].legs[*].steps[*]' COLUMNS (
  distance          VARCHAR(10)    PATH 'lax $.distance.text',
  duration          VARCHAR(10)    PATH 'lax $.duration.text',
  instructions      VARCHAR(100)   PATH 'lax $.html_instructions',
  maneuver          VARCHAR(100)   PATH 'lax $.maneuver',
  distance_value    DECIMAL(10,2)  PATH 'lax $.distance.value',
  duration_value    DECIMAL(10,2)  PATH 'lax $.duration.value'
  )) AS DIRECTIONS;
```

select * from JSON_TABLE(SYSTOOLS.HTTPGETCLOB('http://maps.googleapis.com/maps/api/directions/json...

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DISTANCE	DURATION	INSTRUCTIONS	MANEUVER	DISTANCE_VALUE	DURATION_VALUE
0.2 mi	1 min	Head west on Plummer Cir SW toward Plummer Ln SW	-	299.00	64.00
207 ft	1 min	Turn left at 10th St SW	turn-left	63.00	18.00
463 ft	1 min	Turn left onto 9th St SW	turn-left	141.00	26.00
0.2 mi	1 min	Turn right onto 14th Ave SW	turn-right	294.00	41.00
0.2 mi	1 min	Turn left onto 6th St SW	turn-left	319.00	45.00
9.1 mi	9 mins	Turn left to merge onto US-52 S	-	14688.00	529.00
150 mi	2 hours 8	Turn left to merge onto I-90 E toward La Crosse<div sty...	-	240660.00	7682.00
45.3 mi	38 mins	Keep left to continue on I-90 E/I-94 E	keep-left	72910.00	2300.00
103 mi	1 hour 29	Keep right at the fork to continue on I-90 E<div style="font-size:0....	fork-right	166481.00	5334.00
19.6 mi	17 mins	Keep left at the fork to stay on I-90 E<div style="font-size:0.9em"	fork-left	31546.00	1015.00

IBM provided

Gather latest group PTF information and compare to system level

SELECT * FROM systools.group_ptf_currency

PTF_GROUP_CURRENCY	PTF_GROUP_ID	PTF_GROUP_TITLE	PTF_GROUP_LEVEL_INSTALLED	PTF_GROUP_LEVEL_AVAILABLE	PTF_GROUP_LAST_UPDATED_BY_IBM	PTF_GROUP_RELEASE	PTF_GROUP_STATUS_ON_SYSTEM
INSTALLED LEVEL IS CURRENT	SF99225	SF99225 730 IBM Open Source Solutions for i	6	6	11/06/2017	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99252	SF99252 730 Content Manager OnDemand for i -...	9	9	05/22/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99433	SF99433 730 Db2 Web Query for i V2.2.1	3	3	07/12/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99581	SF99581 730 WebSphere App Server V8.5	6	6	08/17/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99703	SF99703 730 DB2 for IBM i	11	11	09/14/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99722	SF99722 730 IBM HTTP Server for i	15	15	07/25/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99723	SF99723 730 Performance Tools	4	4	10/25/2017	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99724	SF99724 730 Backup Recovery Solutions	22	22	09/20/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99725	SF99725 730 Java	9	9	06/28/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99727	SF99727 730 Technology Refresh	5	5	09/13/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99728	SF99728 730 Group Security	32	32	09/18/2018	R730	INSTALLED
INSTALLED LEVEL IS CURRENT	SF99729	SF99729 730 Group Hiper	67	67	09/18/2018	R730	INSTALLED
UPDATE AVAILABLE	SF99730	Current Cumulative PTF Media Documentation	17283	18242	09/14/2018	R730	INSTALLED

Built-in by IBM on your system!

Data Models and Application Data Interfaces

Created, documented and published by a **database** team

- APIs
- VIEWs
- Stored Procedures
- Table Functions
- I/O modules
- SQL statement snippets
- SQL statement templates

- Supported by code and usage reviews

Use these to interact with other data stores or outside data

More Information

Who is the DB2 for i Center of Excellence?

A highly skilled and experienced IBM Team delivering:

- Product Offerings Developed through Engagements
- **Briefings, consulting and guidance on demand**
- IBM i for Business Intelligence Installation Services
- DB2 Web Query Getting Started Services
- Query/400 Modernization Services
- DB2 for i Modernization Workshop(s)
- DB2 for i SQL Performance Workshop
- DB2 for i SQL Performance Health Check
- DB2 for i Very Large Database (VLDB) Assessment
- DB2 for i remote database administration and engineer services

For more information, contact Mike Cain (cain@us.ibm.com)
Or Doug Mack (mackd@us.ibm.com)

Thank You!