

sp_invoke_external_rest_endpoint

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Introduction

The stored procedure `sp_invoke_external_rest_endpoint` is a new stored procedure in Azure SQL Database that went public preview on November 16, 2022 and is scheduled for GA in February 2023.

The stored procedure allows the ability to call a REST API endpoint natively from SQL Database. A usage example:

There's an online form to create work orders. Those get entered as new rows into a SQL Database. As each new row is entered, it triggers an operation to map the location, which is now written back into the same row of the database. Then a few additional operations use Azure Functions to find the closest technician with the availability to do the job, assigns them and writes their information to our database.

How it works is the form inserts a row into a database, then calls `sp_invoke_external_rest_endpoint` triggering a REST API, which in turn uses an Azure Function with the payload with address information needed to map location. This stored procedure allows us to call out to an Azure Function endpoint each time the work order form is submitted.

Another thing interesting about this, we're using JSON formats as our content type. The SQL engine can both validate JSON documents, or convert SQL data into JSON, like we're doing here to post data, to Azure Functions using the JSON format.

Refer to [sp_invoke_external_rest_endpoint \(Transact-SQL\)](#) for syntax, arguments, return values, allowed endpoints, limitations, best practices, examples and more.

Kusto table

The Kusto table to query for troubleshooting is: *MonExternalEndpoint*

IcM details

If an IcM is necessary the following information should be included in the IcM:


1. Which Azure service the customer is trying to invoke.


2. Expected request payload size (roughly, not looking for an exact number here. just something like 500kb vs 25mb).
3. Expected response payload size (same, roughly, not looking for an exact number).
4. When they called `sp_invoke_external_rest_endpoint` (accurate information as possible).

The ICM should be created in queue: *SQL DB Perf : Extensibility, ML services*

Error messages

The complete list of possible error messages:

```
// ErrorNumber: 10928
// ErrorSeverity: EX_USER
// ErrorFormat: Resource ID : %d. The %ls limit for the database is %d and has been reached. See
'https://docs.microsoft.com/azure/azure-sql/database/resource-limits-logical-server ' for assistance.
// ErrorInserts: Resource type (requests, sessions) workload group worker limit
// ErrorInformationDisclosure: SystemMetadata
RES_GOV_GROUP_MAX_LIMIT

// ErrorNumber: 10936
// ErrorSeverity: EX_USER
// ErrorFormat: Resource ID : %d. The %ls limit for the elastic pool is %d and has been reached. See
'https://docs.microsoft.com/azure/azure-sql/database/resource-limits-logical-server ' for assistance.
// ErrorInserts: Resource ID, resource type (requests or sessions), elastic pool limit
RES_GOV_POOL_LIMIT

// ErrorNumber: 31601
// ErrorFormat: The size of the provided %ls is %u bytes, which exceeds the maximum allowed size of %u bytes.
// ErrorInserts: parameter name, actual size in bytes, max allowed size in bytes.
// ErrorCause: The @payload value is too big
// ErrorCorrectiveAction: Provide a smaller payload.

// ErrorNumber: 31604
// ErrorSeverity: EX_USER
// ErrorFormat: The value '%d' is not within range for the '%.*ls' parameter. Mo: this was used if user specifies
out of range @timeout,
// ErrorCause: The value is out of range for the parameter.
// ErrorCorrectiveAction: Refer to SQL Books Online for the range of valid values for the parameter and update
the parameter value.
// ErrorInserts: integer parameter value, parameter

// ErrorNumber: 31605
// ErrorFormat: The specified method '%.*ls' is not supported. Mo: if user specifies an unsupported HTTP
method (out of our spec)
// ErrorInserts: HTTP Method

// ErrorNumber: 31606
// ErrorFormat: Serializing payload value failed. Mo: if converting payload to UTF8 is failed.
```

// ErrorNumber: 31607
// ErrorFormat: Outbound connection not allowed for the specified external endpoint. Mo: this is for user-defined allow-list (the one that server-admin add from the portal – this is outbound firewall rules that we’ve integrated with as a part of JEDI requirement)
// ErrorCause: Data exfiltration prevention is enabled, but the target server is not in the allowed FQDN list.

// ErrorNumber: 31608
// ErrorFormat: An error occurred, failed to communicate with the external rest endpoint. HRESULT: 0x%x. Mo: general error that can happen at each stage of winhttp connection, the hresult is the same as winhttp error codes documented on MSDN.
// ErrorInserts: Error code

// ErrorNumber: 31609
// ErrorFormat: An error occurred, failed to parse url. HRESULT: 0x%x. Mo: any issues with cracking the url. It returns a documented winhttp hresult error code.
// ErrorInserts: Error code

// ErrorNumber: 31610
// ErrorFormat: Accessing the external endpoint is only allowed via HTTPS. Mo: if user provided a url with HTTP scheme or anything else rather than HTTPS.
// ErrorCause: To ensure the security, the communication protocol should be encrypted.

// ErrorNumber: 31611
// ErrorSeverity: EX_USER
// ErrorFormat: The response's headers size exceeds the maximum allowed size of %u bytes.
// ErrorInserts: Maximum allowed size in bytes.
// ErrorCause: The response's headers size is too big
// ErrorCorrectiveAction: Reduce size of response headers.
const int EXTERNAL_REST_ENDPOINT_RESPONSE_HEADERS_TOO_BIG = 11;

// ErrorNumber: 31612
// ErrorFormat: Connections to the domain %ls are not allowed. Mo: this is MS services allow list (system-defined allow list)
// ErrorInserts: The domain name that was extracted from the url.
// ErrorCause: URL contains a domain name that is not allowed.

// ErrorNumber: 31613
// ErrorFormat: The length of the provided %ls after percent-encoding is %u, which exceeds the maximum allowed length of %u bytes. Mo: the issue could be with query string or the whole url length (we say it to the user in provided %ls part if the issue was with url or query string)
// ErrorInserts: actual url component length, maximum allowed bytes.
// ErrorCause: This component of the url is too long.
// ErrorCorrectiveAction: Provide a shorter url component.

// ErrorNumber: 31614
// ErrorFormat: Only alphanumeric characters, hyphens, underscores, and dots are allowed in the hostname or in the fully qualified domain name. Mo: illegal chars in subdomains (the prefix of allow listed domains in the url)
// ErrorCause: The fully qualified domain name contains one or more characters that are not letter, digit, hyphen, underscore, or dot.
// ErrorCorrectiveAction: Remove invalid characters.

// ErrorNumber: 31615
// ErrorFormat: The %ls JSON parameter cannot contain nested structures. Please check the formatting of the JSON and try again with a flat structure. Mo: can be for request headers or credential
// ErrorInserts: the parameter name.
// ErrorCause: The parameter is not flat JSON
// ErrorCorrectiveAction: Update the parameter to be flat JSON.

// ErrorNumber: 31616
// ErrorFormat: Warning: header '%ls' was overwritten by a system-defined value.
// ErrorInserts: Header name
// ErrorCause: The header was overwritten by a system-defined value
// ErrorCorrectiveAction: Remove the overwritten header.

// ErrorNumber: 31617
// ErrorFormat: The %ls JSON parameter parameter contains invalid characters. Only printable US ASCII characters are allowed.
// ErrorInserts: the parameter name.
// ErrorCause: The parameter contains invalid characters. Only printable US ASCII characters are allowed
// ErrorCorrectiveAction: Remove the invalid characters.

// ErrorNumber: 31618
// ErrorFormat: The %ls JSON parameter contains an empty key.
// ErrorInserts: the parameter name.
// ErrorCause: The parameter contains an empty key
// ErrorCorrectiveAction: Update the parameter key to a non-empty key.

// ErrorNumber: 31619
// ErrorFormat: The %ls JSON parameter could not be parsed. jsonError = %d. (Mo: parsing the json values have been failed: can be for request headers or credential)
// ErrorInserts: the parameter name, the json error
// ErrorCause: Unable to parse the json parameter
// ErrorCorrectiveAction: Update the parameter to remove invalid json.

// ErrorNumber: 31620
// ErrorFormat: The %ls JSON parameter is not a json object datatype. Mo: REQUEST_HEADERS_NOT_JSON_OBJECT (i.e. the user specified an array)
// ErrorInserts: the parameter name.
// ErrorCause: The parameter that is not a json object
// ErrorCorrectiveAction: Update the parameter to use a json object datatype.

// ErrorNumber: 31621
// ErrorFormat: One of the %ls JSON parameter's values could not be parsed. Mo: EXTERNAL_REST_ENDPOINT_JSON_VALUE_PARSING_ERROR
// ErrorInserts: the parameter name
// ErrorCause: The parameter value failed to parse
// ErrorCorrectiveAction: Update the value in the JSON parameter.


// ErrorNumber: 31622
// ErrorSeverity: EX_USER
// ErrorFormat: An unexpected error occurred during validating that the connection is allowed to the hostname.

See 'https://aka.ms/sqlldb_httpinvoke_errordetails ' for assistance.

// ErrorCause: SQL might have failed to initialize an external endpoint related object. Please see the error logs.
Mo: if for any reason, we couldn't populate the list of allowed domains (the MS services one) or block lists.
This error blocks the whole invocation.

// ErrorNumber: 31624

// ErrorSeverity: EX_USER


// ErrorFormat: Connection to the external endpoint IP is not allowed. URL contains a hostname that is resolved to a blocked IP. See 'https://aka.ms/sqlldb_httpinvoke_errordetails ' for assistance.

// ErrorCause: URL contains a hostname that is resolved to a blocked IP.

// ErrorOwner: monamaki

// ErrorNumber: 31624

// ErrorSeverity: EX_USER

// ErrorFormat: Connection to the external endpoint IP is not allowed. URL contains a hostname that is resolved to a blocked IP. See 'https://aka.ms/sqlldb_httpinvoke_errordetails ' for assistance.

// ErrorCause: URL contains a hostname that is resolved to a blocked IP.

// ErrorNumber: 31625

// ErrorSeverity: EX_USER

// ErrorFormat: DNS resolution of the hostname has failed with windows sockets error %d.

// ErrorInserts: The error value indicates the error code for this thread's last Windows Sockets operation that failed.

// ErrorCause: A windows socket operation failed with an error code that extracted from WSAGetLastError().

Mo: we return a MSDN documented WSA error if any issue happens in dns resolution.

// ErrorNumber: 31627

// ErrorSeverity: EX_USER

// ErrorFormat: An out of memory exception has occurred during external endpoint invocation.

// ErrorCause: An out of memory exception has occurred during external endpoint invocation.

// ErrorNumber: 31628

// ErrorSeverity: EX_USER

// ErrorFormat: The database scoped credential '%.*ls' has an invalid identity '%.*ls' for use with an external rest endpoint.

// ErrorCause: The user used an invalid credential identity.

// ErrorNumber: 31629

// ErrorSeverity: EX_USER

// ErrorFormat: The external rest endpoint execution exceeded the timeout value.

// ErrorCause: The external rest endpoint execution has taken more time than user-provided timeout value.

// ErrorNumber: 31630

// ErrorSeverity: EX_USER

// ErrorFormat: The database scoped credential '%.*ls' cannot be used to invoke an external rest endpoint.

// ErrorCause: The user used a credential name that is not valid to use with an external endpoint.

Mo: if the credential name violates the rules that we have

// ErrorNumber: 31631

// ErrorSeverity: EX_USER

```
// ErrorFormat: An error has occurred while waiting for the external rest endpoint result: %d.
// ErrorCause: An error has occurred while waiting for the external rest endpoint result.
// ErrorInserts: The error value that indicates the SOS result.
Mo: we donâ€™t expect to get this error.

// ErrorNumber: 31632
// ErrorSeverity: EX_USER
// ErrorFormat: The request's headers size exceeds the maximum allowed size of %u bytes.
// ErrorInserts: Maximum allowed size in bytes.
// ErrorCause: The request's headers size is too big
// ErrorCorrectiveAction: Reduce size of request headers.

// ErrorNumber: 31633
// ErrorSeverity: EX_USER
// ErrorFormat: The length of the provided %ls exceeds the maximum allowed length of %u bytes.
// ErrorInserts: Maximum allowed size in bytes.
// ErrorCause: This component of the url is too long.
// ErrorCorrectiveAction: Provide a shorter url component.
Mo: url/querystring if exceeds the max length.

// ErrorNumber: 31634
// ErrorSeverity: EX_USER
// ErrorFormat: The %ls must contain a '%ls' for use with managed identity.
// ErrorInserts: the parameter name, the key name
// ErrorCause: The parameter does not contain the specified key
// ErrorCorrectiveAction: Add the key value to the parameter.
Mo: if the header or query string does not have the 'resourceid' key =>
EXTERNAL_REST_ENDPOINT_MSI_JSON_MISSING_KEY

// ErrorNumber: 31635
// ErrorSeverity: EX_USER
// ErrorFormat: The %ls's '%ls' value must be a %ls for use with managed identity.
// ErrorInserts: the parameter name, the key name, the type
// ErrorCause: The keys's value is the wrong type
// ErrorCorrectiveAction: Fix the type of the keys's value.
Mo: EXTERNAL_REST_ENDPOINT_JSON_MSI_INVALID_TYPE; it happens if the resource id value is not string

// ErrorNumber: 31636
// ErrorSeverity: EX_USER
// ErrorFormat: Error retrieving the managed identity access token for the resource id '%ls'
// ErrorInserts: the resource id.
// ErrorCause: there was an error retrieving the access token
// ErrorCorrectiveAction: Make sure resource id is correct.
```


Public Doc Reference

[sp_invoke_external_rest_endpoint \(Transact-SQL\)](#) 

[Azure SQL Database External REST Endpoints Integration Public Preview \(public preview announcement article\)](#)



[Azure SQL for Developers - Performance and Automation Updates](#) 

[Guthub code example for assigning orders based on geolocation](#) 

[sp_invoke_external_rest_endpoint - video with Bob Ward](#) 

Root Cause Classification

Cases resolved by this TSG should be coded to the following root cause:

<to be added later>

How good have you found this content?



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