MOBILE SERVER FRAMEWORK 2.0

DEVELOPER'S GUIDE

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1. OVERVIEW

This document defines Application Program Interface of the Mobile Server Framework 2.0 (MSF) and is intended for developers building client applications using the MSF API. The document assumes you are familiar with Web Services and related technologies, including XML, JSON, HTTP, Protocol Buffers, WebSocket, etc.

The Framework is a web service based on JSON encoded protocol to request data from various Thomson Reuters backends. This data aggregation web service has an ability to execute datapoints in sequence and in parallel. Besides, it can join two and more datapoints. MSF can be deployed on different platforms.

MSF provides access to a wide range of data services like alerts, messaging, news, search, etc. in a unified form with a customized JSON-based communication protocol hereinafter referred to as MSF Protocol. Connectivity is available via HTTPS. For all datapoint requests, the POST method is used. For extracting binary and HTML content as well as for WebSocket connectivity on secure TCP layer, the GET method is used.

MSF 2.0 API is robust and scalable enough to handle traffic from even the most demanding sites while providing highly extensible support abilities to front and back-end infrastructures. Implementation of the JSON protocol allows for ease of integration and rapid deployment of client applications.

MSF API clearly introduces the benefits of maximizing one's best assets to clients (whether information or application-based services), as the platform enables unbounded electronic and information commerce abilities. The MSF platform provides professional, quality investment information and data access from a singular information source. The platform services model caters to a full breadth and range of decision critical investment information (company profiles, portfolios, news, quotes, for example), as well as an infrastructure that allows for ease of discovery, personalization, navigation and subsequent delivery of information services to a firm.

2. GETTING STARTED

Before you can begin accessing Mobile Server Framework 2.0 API, you must contact Thomson Reuters (https://customers.reuters.com/crmcontactus/support.asp) and receive a properly entitled service user credential. Thomson Reuters also gives you an application identification string (appid). This appid is a short descriptive string that uniquely identifies your application.

You should use an individual user credential for each user of your application. For each user credential, the appropriate entitlements (rights) to data from various services are provided. A credential may be limited for accessing specific data sources, such as news, estimates, street events, warrants, etc.

In response to request for credentials, the application gets a session token and all subsequent data requests will be processed with the session token.

The session token is an expiring string that securely identifies the session user. Your application must pass a session token in each web service request.

An application identification string (appid) is a short descriptive string that uniquely identifies your application for tracking purposes. Thomson Reuters assigns an appid to a user during setup. Your application submits this appid with each login request.

2.1 AUTHENTICATION

The MSF API is protected to ensure that only authorized clients use it.

To get an access to MSF, a client must get through authentication procedure.

MSF authentication is based on basic HTTP authentication. Refer to '*HTTP Authentication' RFC (Request for Comments) 2617 Standard* – http://www.ietf.org/rfc/rfc2617.txt.

The main key that MSF uses to identify a user is an MSF session token. It is a cookie name returned by MSF as an **X-Tr-Auth** header value as soon as the **Authorization** header is passed.

If user does not have an active MSF token, the first step is authentication. In case of success, user retrieves the MSF token. Authentication writes the MSF token in cookies on successful login and tries to read on further requests. MSF token is passed and all HTTP requests and responses within the single session.

In case user has MSF token, it must be specified in requests to avoid unnecessary authentication attempts.

Web service that is responsible for session creation is AAA (Authentication, Authorization, and Administration). In special cases, MSF can create a session by its own, refer to section Error! Reference source not found. Error! Reference source not found. (case with TR-ESO delayed) for details.

2.1.1 New Session

The following route is used for MSF login:

http://hostname:port/msf/auth/login

The above-mentioned path is not the only way by which a user logs in. If a user is not already authenticated, any datapoint call invokes authentication.

New MSF session starts as a result of HTTP Basic authentication.

The user should pass the authentication credentials, i.e. user name and password that will be then encoded using the RFC2045-MIME variant of Base64. The encoded string is sent in the HTTP **Authorization** header along with the method and a space put before the encoded string as follows:

Authorization: Basic <encoded text>

For example, for the user with ***Aladdin@thomsonreuters.com*** user name and ***password123*** password, the Authorization HTTP header obtains the ***Aladdin@thomsonreuters.com:password123*** value encoded to Base64.

MSF Sample Request – First-time Login

`POST: https://amers1.MSF.cp.icp2.mpp.ime.reuters.com/msf HTTP/1.1`
`Host: amers1.MSF.cp.icp2.mpp.ime.reuters.com`
`Authorization: Basic` **`QWxhZGRpbkB0aG9tc29ucmV1dGVycy5jb206cGFzc3dvcmQxMjMg`**
`X-TR-Sessionttl: 900`

The following table specifies the additional (non-standard) HTTP headers used:

HTTP Header	Description
X-Tr-Processingtime	Duration of request processing
X-Tr-Startprocessing	Start time of transaction processing
X-Tr-Finishprocessing	End time of transaction processing
X-Tr-Host	Server domain name, for example: "US1I-EM3BWEB07"
X-Tr-Eso	Exclusive Sign-on feature that prevents user from having multiple active sessions. Refer to Error! Reference source not found. Error! Reference source not found. section for details.
X-Tr-Sessionlocation	Workaround feature to avoid use of cookies. Refer to **2.1.5 Avoiding Cookie** section for details.
X-Tr-Sessionttl	MSF session time-to-live (TTL) measured in seconds. Its actual value will remain inactive until deletion. The TTL parameter value ranges from 900 to 86400 seconds; for the given parameter, only integers are accepted. If the parameter is not set, the default value will be applied which is 3600 seconds (equals 1 hour). If TTL is 1 hour, the user session is supposed to be alive during 1 hour after user's last request.
X-Tr-Transactionid	ID of the executed transaction. The transaction ID is passed by a client application. If not, MSF generates the transaction ID by its own. Clients maintain a single transaction ID per login. Due to availability of the transaction ID, it is possible to identify the transaction and keep track its execution.
X-Tr-Msfversion	Number of MSF web service version

Along with the **Authorization** header, user can set MSF session time-to-live for which the **X-Tr-Sessionttl** header is designed. The parameter defines number of seconds allowed for the current session to remain inactive until deletion.

Syntax of the non-standard HTTP headers for MSF 2.0 protocol:

1. The first letter of each header part should be capitalized.
2. All other letters of the header part should be lowercased.

Examples: *X-Tr-Faultcode, X-Tr-Faultmessage, X-Tr-Sessionttl*.

2.1.2 Successful Access

In case of successful authorization, MSF shall send "200 OK" HTTP status code to the client with the additional headers in the response.

In subsequent requests, the client must not use the **Authorization** header. Instead, the MSF token in **X-Tr-Auth** cookie should be passed. If the client passes the authorization token along with the cookie, the token shall be ignored.

Example of the response message if authorization succeeded:

MSF Sample Response – Successful Authorization

Access-Control-Expose-Headers	X-Tr-Faultcode, X-TR-Faultmessage
X-Tr-Processingtime	**3648**
#status#	HTTP/1.1 200 OK
X-Tr-Startprocessing	**02/03/2014 16:05:49**
Set-Cookie	**X-Tr-Auth=34bce5f7-ecb1-489c-6392-b5b64f474864; Expires=Sun, 03 Feb 2064 16:05:53 UTC; HttpOnly**
Access-Control-Allow-Methods	GET, POST
Cache-Control	no-cache
Access-Control-Allow-Headers	Authorization, Cookie, Pragma, X-TR-SessionLocation, X-TR-SessionTtl, Content-Type, X-TR-Authorization
Access-Control-Allow-Origin	*
Date	Mon, 03 Feb 2014 16:05:53 GMT
Transfer-Encoding	chunked
X-Tr-Host	**US1I-EM3BWEB07**
X-Tr-Transactionid	**a43c8232-52f8-4787-6261-1ed1ccc1d0bf**
X-Tr-Sessionttl	**900**
X-Tr-Finishprocessing	**02/03/2014 16:05:53**
X-Tr-Msfversion	**2.0**
Content-Type	application/json

MSF installs cookie on authentication session ID (*X-Tr-Auth* value) which can be considered as MSF session token. The authentication cookie value is stored to the database on the server side.

In every subsequent request from the client, MSF authenticates the user using the stored cookie, i.e. MSF token, until the session expires.

Session expiry is defined by the **expires** property of the cookie. After sending a request to MSF, cookie's expiry term shall be extended. MSF shall renew a session's expiry term with every new request. Expiry term is related to the period of framework inactivity. For example, if the TTL parameter is equal to 1 hour, the session will expire in 1 hour only if no requests are sent. If at least one new request is sent, the expiry term will be extended to 1 hour again.

If a client request contains both the **Authorization** header and the **Cookie** header, the **Authorization** header will be skipped because the cookies item has top priority in MSF.

If cookie in the client request has an invalid MSF token (X-TR-Auth value), MSF shall not authenticate the user through the **Authorization** HTTP header.

2.1.3 Authorization Failure

Aauthorization can fail in consequence of different reasons. If authorization fails, MSF shall send "401 Unauthorized" HTTP status code to the client with the additional headers in the response.

The following table specifies the additional HTTP headers used by default:

HTTP Header	Description
X-Tr- Faultcode	Fault code represented with three-digit number

X-Tr-FaultMessage	Brief description of the fault

Example of the response message if authorization failed:

```
X-Tr-Faultcode: 415
X-Tr-Faultmessage: Incorrect login/password combination.
```

The table below describes authorization errors that may occur:

Fault Code	Description	Actions
410	**Credentials used from another device**: credentials cannot be accepted because of the successful access from another device, so current session was terminated	• Wait until the MSF session at another device will expire and try to authorize once again. OR • Log in once again by canceling already existing session at another device (see details below in the *Error! Reference source not found. Error! Reference source not found.* section of this document).
411	**Session expired**: • Session is invalid OR • User has been inactive more than TTL specified time (60 min by default)	Undertake new attempt to authenticate.
412	**Account locked**	Wait during one hour and log in again, or address the Thomson Reuters First Line Support to unlock your account.
413	**FTL not completed**: temporary password was passed at first-time login	The permanent password should be passed from the client application.
414	**Anonymous login is not allowed**	• Use standard authorization procedure (refer to ***2.1.1 New Session*** section of this document) OR • Address the Thomson Reuters First Line Support for enabling anonymous user login
415	**Incorrect login/password combination**	Make sure that login and password values are correct.
416	**Insufficient PO**: user has no permissions to log in to MSF	Address System Administrator to get the required permissions.
417	**Incorrect anonymous user is configured**	Address the Thomson Reuters First Line Support for valid anonymous user credentials.
418	**Incorrect SAP entry to log in:** User is sending request to incorrect data center. **X-Tr-Sap** response header value contains “home” data center.	Use “home” (correct) data center URL kept in the **X-Tr-Sap** response header when sending your request.
419	**Interactive login required**: Account locked after 10 unsuccessful login attempts. User need to log in to desktop application before logging in to MSF	• Make sure that the user logged in to the Eikon Desktop application, correctly entered the captcha and that the system recognized the captcha. Only after that you can log in to the mobile application OR

		• Address the Thomson Reuters First Line Support for your login enabling
420	**Login Failed, Temporary password**	Log in to the Eikon application, it will ask you to create a new password
421	**Authorization header is missing**	Make sure that the client application has passed session and authentication to MSF.
430	**UUID header is missing or empty**	Make sure that the **X-Tr-Uuid** header has value.
490	**Internal storage malfunction**	Restore MSF storage functioning.
498	**MSF internal error**: MSF was unable to process login request (out of memory error, etc.)	Address the Thomson Reuters First Line Support.
499	**Unknown error**: Authorization backend returned unsupported login fault	Address the Thomson Reuters First Line Support.

498 and 499 fault codes are reserved for the special unhandled exception cases.

2.1.4 Session Termination

Session expiry time is defined by the time-to-live parameter (**X-Tr-Sessionttl** HTTP header). Default session duration is 60 minutes. Refer to section ***2.1.1 New Session*** for details.

Each request from the client application to MSF prolongs session expiry time by TTL value.

Forced termination of the MSF session is executed through logout command from the client. The following route should be used to terminate the session immediately:

http://hostname:port/msf/auth/logout

Logout request must be sent for each Session ID separately. After logout, no requests should be sent with the terminated MSF token because logout request invalidates the MSF session and logs out the user from AAA service.

MSF Sample Request – User Logout

```
POST: http://hostname:port/msf/auth/logout HTTP/1.1
Cookie: X-Tr-Auth=34bce5f7-ecb1-489c-6392-b5b64f474864
Host: hostname:port
Content-Length: 0
```

2.1.5 Avoiding Cookie

For situations when client applications do not use cookies for some reason, the **Session Location** parameter is used at the stage of authorization as a workaround.

The **Session Location** must contain the name of some other header (currently, only the 'Pragma' value is allowed).

If a request specifies non-empty **Session Location**, MSF will put MSF token in the header defined by the **Session Location** value. Cookie-related headers are still valid.

In case of new session creation, it is allowed to provide the **Authorization** and **X-Tr-Sessionlocation** headers. In such a way client receives a copy of MSF token in the specified header.

In all other cases, it is considered an error to provide the **X-Tr-Sessionlocation** header value but omit the given header with MSF token.

MSF token is specified in the cookie named **X-Tr-Auth** for the first time login. Instead of cookie, it is allowed to provide **X-Tr-Sessionlocation** and the given header with MSF token.

MSF Sample Request – First-Time Login

```
GET /msf/login HTTP/1.1
Authorization: QWxhZGRpbjpvcGVuIHNlc2FtZQ==
X-Tr-Sessionlocation: Pragma
Host: localhost:8080
Content-Length: 0
```

After the first time login, the **X-Tr-Auth** token will be sent in the **Pragma** header until the session is terminated.

MSF Sample Response – Successful Authorization

```
HTTP/1.1 200 OK
Access-Control-Allow-Headers: Authorization, Cookie, Pragma, X-Tr-Sessionlocation, X-Tr-Sessionttl, Content-Type, X-Tr-Authorization
Access-Control-Allow-Methods: GET, POST
Access-Control-Allow-Origin: *
Access-Control-Expose-Headers: X-Tr-Faultcode, X-Tr-Faultmessage
Cache-Control: no-cache
Pragma: 1c5cd436-740e-4f25-7e8f-6488c6fd23ea
Set-Cookie: X-Tr-Auth=1c5cd436-740e-4f25-7e8f-6488c6fd23ea; Expires=Mon, 04 Feb 2064 15:27:41 UTC; HttpOnly
X-Tr-Finishprocessing: 02/04/2014 18:27:41
X-Tr-Host: US1I-EM3BWEB07
X-Tr-Msfversion: 2.0
X-Tr-Processingtime: 544
X-Tr-Sessionttl: 3600
X-Tr-Startprocessing: 02/04/2014 18:27:41
X-Tr-Transactionid: e947b00b-d1b8-4df1-7d20-58d91bc2b23a
Date: Tue, 04 Feb 2014 15:27:41 GMT
Content-Length: 0
Content-Type: text/plain; charset=utf-8
```

3. MSF 2.0 PROTOCOL

Valid request to MSF is always represented as a JSON object sent to MSF URL by the HTTP POST method. The response from the server is represented as a JSON object as well.

MSF requests can be operated by the following instructions:

- Entity
- Join
- Batch
- Sequence

3.1 SINGLE REQUEST

Single MSF request has a standard set of parameters. Data for a single datapoint can be retrieved by using the **Entity** instruction.

The following table specifies elements of the MSF JSON request:

Element	Description	Example
"Entity":{<object>}	The **Entity** parameter represents a single datapoint request	See below the table.
"E": "<Datapoint Name>"	Name of the datapoint or entity	"E": "PeerList",
"Id": "<Request ID>"	Unique ID of the MSF request. The parameter can be specified by client and the response will be assigned to this property name as value.	"Id": "PL",
"R": [<Page Numbers>]	Range for pagination. In the [x,y] notation: • x – page number (starts with 1), • y – number of entries on the page	"R": [2,20],
"S": [<Field Name>]	Fields to be selected from the MSF response. One or more datapoint fields can be indicated. Separation of fields by a dot specifies their hierarchy: the left-hand element defines the parental level[1]. The "<ABC>.*" notation means that all attributes of the "<ABC>" field will be selected.	"S": ["SpecialAlerts.Title", "SpecialAlerts.Duid"],
"St": [{< one or multiple objects>}]	Order for sorting array elements from the response. Parameters: • "F" – response field to be sorted, • "O" – sorting order. Acceptable sorting order values (for "O"): • "ASC" – ascending order,	"St": [{"F": "date", "O": "DESC"}],

[1] This rule cannot be applied to **MarketData** datapoint for it has a different structure. In the MarketData request, you can only specify field names in the selected array.

	• "DESC" – descending order. If "O" parameter is not set or has an illegal value (for example: "DISC"), the default value will be applied which is "ASC". Use of the “F” parameter without “O” can be applied only for simple objects of root level.	

'W": {<one or multiple name/values pairs>}	'Where' condition by which query will be performed. In most cases it is represented by an array of name/value pairs. However, sometimes it can have a complex structure where value is a complex object (for example, group of **Portfolio Warehouse** datapoints or complex structures (with logical AND / OR) for filtering operations).	"W": {
		"Filter": "LP",
		"LastStoryId": "",
		"LastStoryDate": "2013-04-12T15:22:47Z+00:00"[2]
		}

MSF Sample Request – multiple values for “Filter” parameter

```
{
  "Entity": {
    "Id": "NA",
    "E": "NewsArticles",
    "W": {
      "HeadlineLang": "ru",
      "Filter": "скандал OR интрига OR расследование"
    }
  }
}
```

MSF Sample Single Request

```
{
  "Entity": {
    "Id": "NA",
    "E": "NewsArticles",
    "S": [
      "Headline.VersionCreated",
      "Headline.InsertDateTime",
      "Headline.Urgency",
      "Headline.PNAC.pnacDate"
    ],
    "W": {
      "Filter": "LP",
      "LastStoryId": "nDJR300A02",
      "LastStoryDate": "2013-04-12T15:22:47Z+00:00"
    },
    "St": [
```

[2] MSF strictly supports date format according to RFC 3999, it is a default date format for all the datapoints in MSF.

```
      {
        "F": "InsertDateTime",
        "O": "DESC"
      }
    ],
    "R": [
      1,
      25
    ]
  }
}
```

The request represented above will retrieve data for a single datapoint which is "NewsArtictles". The following fields will be selected for the client:

- Headline.VersionCreated
- Headline.InsertDateTime
- Headline.Urgency
- Headline.PNAC.pnacDate

Headlines will be sorted by the **InsertDateTime** field in in descending order. Client application will display first twenty-five entries of the first page.

3.2 JOINED REQUEST

Data for two or more datapoints on their properties can be retrieved by using the **Join** instruction.

The **Join** instruction is represented by the "Join" keyword.

The following table specifies elements of the MSF 2 **Join** instruction:

Element	Description	Example(s)
"Join":{<object>}	The **Join** parameter indicates that one or more entities are to be joined with one or more other entities.	See below the table.
"Entities":[<entities>]	Array of entities participating in a **Join** operation	See below the table.
"Id": "<ID>"	Unique ID of the **Join** instruction	"Id": "AllDealsJoin",
"S": [<Entity ID>]	Select statement for the **Join** instruction. The 2nd example shows how to select all fields of the "AD" entity. The 3rd example shows how to select output fields from the other entity (“KD”).	"S": ["AD.Ticker"], "S": ["AD.*"], "S": ["KD.Source"],

The specifics of the joined request is that the outcome value for the 'Where' condition (“W”) of the first datapoint can be retrieved and used as an input parameter for the 'Where' condition (“W”) of the following datapoint in a join.

MSF Sample Joined Request

```
{
  "Join": {
    "Entities": [
      {
```

```
        "E": "MarketDataV2",
        "S": [
          "MarketData.OriginalSymbol"
        ],
        "W": {
          "Tickers": [
            "GOOG.O"
          ],
          "IsChain": false
        },
        "Id": "MDV"
      },
      {
        "E": "IndexMembership",
        "W": {
          "Tickers": "MDV.MarketData.OriginalSymbol"
        },
        "Id": "IM"
      }
    ],
    "S": [
      "IM.*"
    ],
    "Id": "MDV_IMJoin"
  }
}
```

In the request represented above, two datapoints are joined, namely **MarketDataV2** and **IndexMembership**. The requested parameters of the **IndexMembership** datapoint will be obtained in the response.

You can join multiple entities in a single **Join** instruction. The server will first execute the independent entities concurrently and use their response values for executing the dependent ones. Furthermore, dependent entities of the same level will be executed concurrently. Execution of independent entities is also performed concurrently.

3.3 BATCHED REQUEST

Multiple MSF requests can be run in a batch. To send several requests at a time, an array filled with requests objects should be used for which the “Entities” keyword is envisaged.

Several MSF requests can be executed concurrently or in a sequence.

The **Batch** instruction is designed for array of entities that needs to be executed concurrently. It is represented by the "Batch" keyword.

The **Sequence** instruction is designed for array of entities that needs to be executed in a sequence. It is represented by the "Sequence" keyword.

The following table specifies elements of the MSF 2 **Batch** and **Sequence** instructions:

Element	Description	Example
"Batch":{<object>}	The **Batch** parameter indicates that an array of specified entities will be executed in a batch (concurrently).	See ***MSF Sample Batched Request (Batch Instruction)*** below the table.
"Sequence":{<object>}	The **Sequence** parameter indicates that an array of specified entities will be executed in a batch (in a sequence).	See ***MSF Sample Batched Request (Sequence Instruction)*** below the table.

"Entities":[<entities>]	Array of entities participating in a **Batch** or **Sequence** operation	See in both examples below the table.

MSF Sample Batched Request (Batch Instruction)

```
{
  "Batch": {
    "Entities": [
      {
        "Id": "SPC",
        "E": "StoredPortfoliosConstituents",
        "S": [
          "Content.PortfolioId",
          "Content.RIC.Name"
        ],
        "W": {
          "CustomUUID": null,
          "Ids": [
            "262232fc-9b3e-4f2e-8021-ffa6b10dc4a4",
            "162232fc-9b3e-4f2e-8021-ffa6b10dc4a4"
          ]
        }
      },
      {
        "Id": "YTS",
        "E": "YieldTimeSeries",
        "W": {
          "Tickers": [
            "USBMK="
          ]
        }
      }
    ]
  }
}
```

MSF Sample Batched Request (Sequence Instruction)

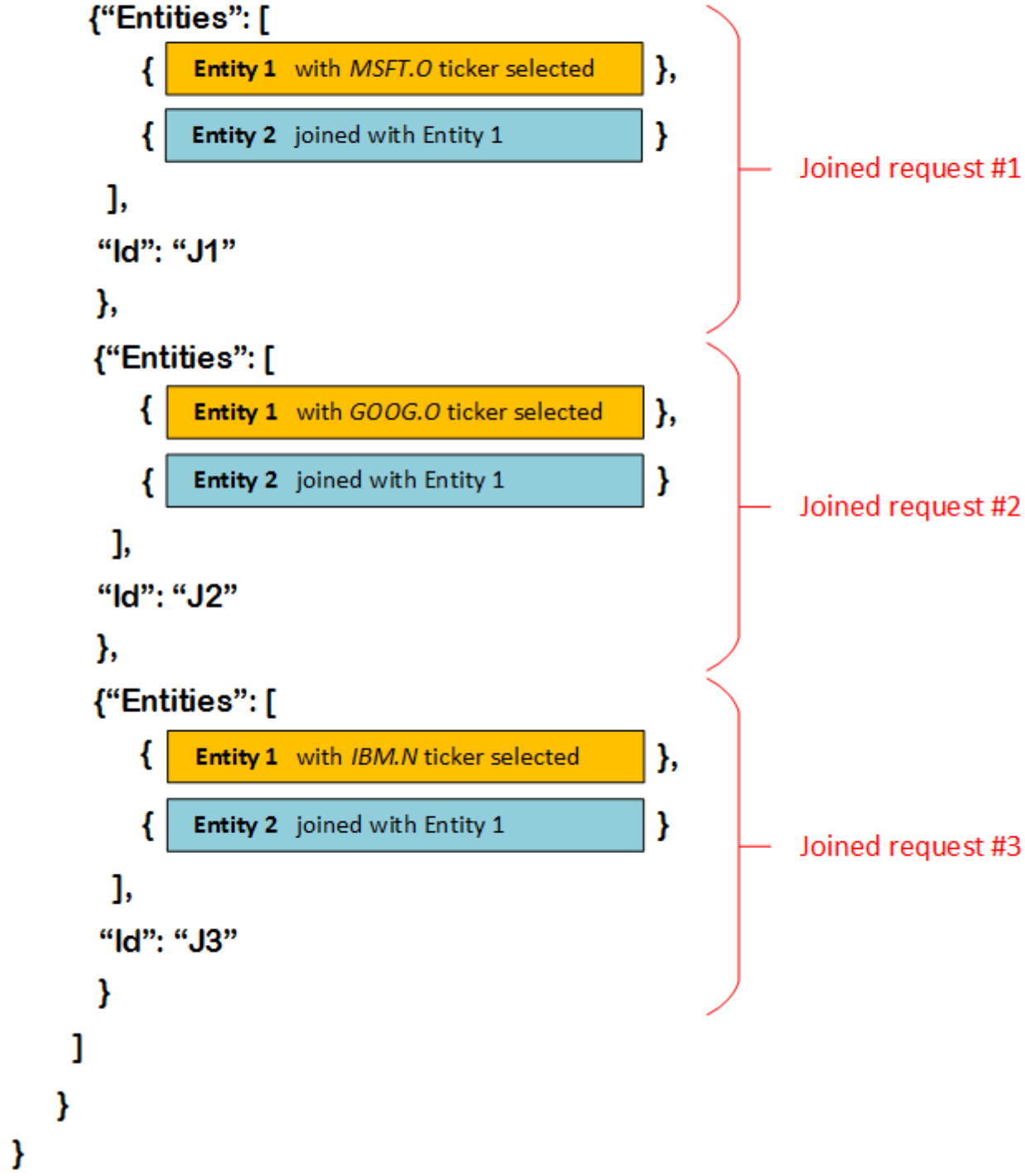
```
{
  "Sequence": {
    "Entities": [
      {
        "Id": "YTS",
        "E": "YieldTimeSeries",
        "W": {
          "Tickers": [
            "USBMK="
          ]
        }
      },
      {
        "Id": "SPTI",
        "E": "StoredPortfoliosTrackerInfo",
```

```
        "S": [
          "Content.RIC.Name",
          "Content.RIC.Ticker"
        ],
        "W": {
          "CustomUUID": null,
          "Id": "262232fc-9b3e-4f2e-8021-ffa6b10dc4a4"
        }
      }
    ]
  }
}
```

You can execute multiple joined requests in a batch. Each joined request will be executed concurrently.

To get corresponding responses in a batch, each request should be valid.

Scheme of MSF 2.0 Joined Requests in a Batch



You can also execute multiple joined requests in a sequence. For that, the **Sequence** instruction should be used (instead of the **Batch** one in the example above).

3.4 PAGINATION AND SORTING

Pagination is controlled by the “R” parameter which has the following notation:

“R”: [x, y]

Both values of the R” parameter are integers.

- x – page number (starts with 1)
- y – page size

For example, if “R”: [3,2], the client application will display the 3rd page with page size as 2.

Sorting procedure is controlled by the “St” parameter. Each item must have "F" required parameter and optional “O” parameter.

The “F” parameter should point to some response's field and “O” parameter specifies sorting order as follows:

- "ASC" – ascending order,
- "DESC" – descending order.

If "O" parameter is not set or has an illegal value (for example: "DISC"), the default value will be applied which is "ASC".

```
{
  "Entity": {
    "Id": "NC",
    "E": "NewsCodes",
    "S": [
      "Codes.Description",
      "Codes.Mnemonic"
    ],
    "W": {
      "Codes": [
        "B:2"
      ],
      "IsExpand": true,
      "Depth": -1,
      "Language": "en"
    },
    "R": [
      1,
      8
    ],
    "St": [
      {
        "F": "Codes.Description",
        "O": "ASC"
      }
    ]
  }
}
```

You can set any number of items for the "St" parameter. The example below contains 4 items for the sorting operation:

```
{
  "Entity": {
    "Id": "NC",
    "E": "NewsCodes",
    "S": [
      "Codes.Description",
      "Codes.Mnemonic"
    ],
    "W": {
      "Codes": [
        "B:2"
      ],
      "IsExpand": true,
      "Depth": -1,
      "Language": "en"
    },
    "St": [
      {
        "F": "Codes.Description",
        "O": "ASC"
      },
      {
        "F": "Codes.Mnemonic",
        "O": "DESC"
      },
      {
        "F": "Codes.OriginalCode",
        "O": "DESC"
      },
      {
        "F": "Codes.Rcs",
        "O": "ASC"
      }
    ]
  }
}
```

The **Path** parameter allows you to specify a path to an array to which pagination and sorting will be applied. The **Id** parameter is not indicated for the **Path** parameter. The **Path** parameter must begin from the very root of JSON, for example:

- *TopNews.RelatedStories* for the **TopNews** datapoint
- *Officers.Officer* for the **Officers** datapoint
- *Developments* for the **SigDevs** datapoint

MSF Sorting Syntax – Path parameter use

```
{
  "Entity": {
    "Id": "IC",
    "E": "InsiderClip",
    "W": {
      "Cid": "1258552"
    },
```

```
    "Path": "PCP.CompanyProfile.PEOfficersDirectors.Person",
    "St": [
      {
        "F": "FirstName",
        "O": "ASC"
      },
      {
        "F": "LastName",
        "O": "ASC"
      }
    ]
  }
}
```

3.5 RESPONSE-BASED FILTERING

MSF supports response-based filtering. Filtering is introduced by the “F” parameter.

The “F” parameter holds an array of filter paths.

MSF Filtering Operation Syntax – “F” parameter level

```
    "F": [
        One or more filter paths
        ]
```

A filter path allows you to filter an immediate array element in the response object hierarchy.

The filter path is represented by two elements as follows:

- “path”: “<value>”
- “and”/”or”:[{<array of conditions>}]

The **path** element defines the path to an array of conditions to which filtering will be applied.

The **and/or** element stands for AND or OR logic operator and defines logic by which filtering will be applied to an array of conditions.

MSF Filtering Operation Syntax – Filter path level with AND logic

```
    "F": [
      {
        "path": "Developments",
        "and": [{<array of conditions>}]
         }
        ]
```

MSF Filtering Operation Syntax – Filter path level with OR logic

```
    "F": [
      {
        "path": "Developments",
        "or": [{<array of conditions>}]
         }
        ]
```

The **and/or** element is an optional. For example, if there is only one condition for filtering, use of AND/OR logic operator is not required. There is no need an array for a single condition.

MSF Filtering Operation Syntax – Filter path level – Single condition

```
"F": [
  {
    "path": "Developments",
    <single filter condition>
     }
    ]
```

Each filter path should have at least one condition to which the filter will be applied. The condition is a JSON object with three mandatory elements as follows:

- "field": "<value>"
- "operator": "<value>"
- "value": "<value>"

The **field** element is a string which points to the field to be filtered, for example: "Topics.Topic1.Code".

The **field** element can be a dot-separated path to an item in the response object. Items can be located at different levels in the hierarchy within a chosen array. If there are different levels of hierarchy, then each level is separated by a dot.

Example:

"field": "result.name" - "name" is the item in the first level.

"field": "result.hits.source" - "source" is the item in the second level.

If the **field** element has void set ("field": ""), filtering will not be executed.

The **operator** element is a condition at which the value is compared against the actual value of the item in the response.

The following table specifies values that operators can take:

Condition	Description
eq	Equal to
ne	Not equal to
lt	Less than
gt	Greater than
le	Less than or equal to
ge	Greater than or equal to
not	Used for Boolean values
contains	Used with string values to see if the item contains the value
startswith	Used with string values to see if the item starts with the value
endswith	Used with string values to see if the item ends with the value

It is obligatory that operator has some value.

The **value** element is a value with which the actual value of the chosen field will be compared.

MSF Filtering Operation Syntax – Condition level with AND logic

```
"F": [
  {
    "path": "Developments",
    "and": [
      {
        "field": "Topics.Topic1.Code",
        "operator": "eq",
        "value": "204"
      },
      {
        "field": "Topics.Topic1.Code",
        "operator": "ne",
        "value": "214"
      }
    ]
  }
 ]
```

If the **value** element has void set (“value”: “”), filtering will not be executed.

Response-based filtering can be performed by using multiple filter paths.

MSF Filtering Operation Syntax – Multiple filter paths

```
"F": [{
    "path": "TopNews",
    "and": [{
        "field": "RelatedStories.USN",
        "operator": "startswith",
        "value": "nL5"
    }]
  },
  {
    "path": "Images",
    "and": [{
        "field": "Path",
        "operator": "contains",
        "value": "222"
    }]
}]
```

Response-based filtering can be performed by using complex filtering logic. It means that within an array of conditions might be several levels of objects introduced by AND or OR logic operators. However, each object can include only one AND or OR logic operator on the root level.

MSF Filtering Operation Syntax – Complex logic

```
"F": [{
  "path": "TopNews",
  "and": [{
     "and": [{
         "field": "RelatedStories.USN",
         "operator": "startswith",
```

```
            "value": "nL5"
        },
        {
            "field": "RelatedStories.USN",
            "operator": "endswith",
            "value": "0K0"
        }]},
        {"or": [{
            "field": "Images.Path",
            "operator": "contains",
            "value": "222"
        },
        {
            "field": "Images.Path",
            "operator": "contains",
            "value": "111"
        }]
    }]
}]
```

Filtering in the example above will be performed in the following way:

(**RelatedStories.USN** starting with **nL5** AND **RelatedStories.USN** ending with **0K0**) AND (**Images.Path** containing **222** OR **Images.Path** containing **111**)

3.6 LOCALIZATION

MSF supports localization. Currently, the following locales are supported:

- Chinese (zh-CN)
- English (en-US) – default
- Japanese (ja-JP)

The required locale setting is performed by using the **Accept-Language** HTTP header in the request.

Example: *Accept-Language: en-US*

Standard locale values are used for the **Accept-Language** header. For the supported locales, there is no need to set the locale as an input parameter further in the query.

At the same time, there are several backends that accept language not as a locale, but as a custom string in the request parameter. Along with Chinese, English and Japanese, other languages can be accepted by some datapoints using a custom string. For example French, German, Russian, and other languages.

For such datapoints, the **Accept-Language** header is not supported and localization is passed by the request parameter.

In future, the unified mechanism for setting locale will be implemented with mandatory use of the **Accept-Language** header.

3.7 USE OF WAMP

For obtaining information on financial instruments, Thomson Reuters can use WebSocket connections that allowed from MSF 2.0. All the datapoints can be executed through WebSocket connection. As MSF 2.0 supports WAMP protocol, clients can use it to connect to the framework:

To get WAMP compliant client library implementations, use the following link:

http://wamp.ws/implementations/wamp1/

The ping request is a request that checks if a WebSocket connection can be established. It is also used to keep the opened WebSocket session alive.

To get the definitions of the ping messages, use the following location:

/src/msf2/server/wampserver/

Below you can find an example with the structure of the sample ping request:

MSF WebSocket Sample Request – Ping request

```
[
    2,
    "1",
    "msf:http.json",
    {
                "skipResponseHeaders" : false,
        "headers": [
            {
                "key": "Cookie",
                "value": "X-TR-Auth=000504f7-7743-459a-659c-b004847dd9cd"
            },
            {
                "key": "Accept",
                "value": "application/json"
            },
            {
                "key": "X-TR-SessionTtl",
                "value": "1000"
            },
            {
                "key": "X-TR-ESO",
                "value": "true"
            },
            {
                "key": "X-TR-ApplicationId",
                "value": "Test"
            }
        ],
        "url": " /msf",
        "bodyAsText": "{\"Entity\":{\"E\": \"PCMarketList\"}}",
        "method": "POST"
    }
]
```

Example explanation:

Parameter	Description
headers	Regular MSF headers
url	Specifies the path where a datapoint can be located. Examples: /msf, /msf/mobile, /msf/template, etc.
bodyAsText	Contains JSON request
method	Indicates HTTP method (either GET or POST)

The authentication to MSF 2.0 for the WebSocket session is performed through standard HTTP protocol. However, currently the WAMP server will authorize clients only if they have the valid MSF token.

The authentication procedure has the following workflow:

1. The client application goes through HTTP Basic authentication.
2. The client application makes a request to /msf/login and fetch the MSF token.
3. The client application establishes a WebSocket connection using the MSF token.

   (the MSF token is passed in the HTTP header, for example: "X-Tr-Auth" : "2356fa83-c0e6-4e87-7e41-88100d2f4f28").
4. The client application makes a request of type msf:subscribe.proto over the WebSocket.
5. The client application uses the msf:ping request regularly to check if the connection is still up.

WebSocket functionality is represented by two types of requests that are sent by client applications:

- msf:ping
- msf:subscribe.proto

3.7.1 Ping Request

The **msf:ping** request is used for keeping the opened WebSocket session alive. If the client does not send the **msf:ping** requests for more than 120 seconds, the server will close the WebSocket connection.

Example of the typical request:

[2, "unique-id", "msf:ping", "some data that will be returned by the ping message"]

3.7.2 Subscribe Request

The **msf:subscribe** request is used for subscribing to updates on a particular topic that Thomson Reuters backends can provide.

Example of the typical request:

[2, "another-unique-id", "msf:subscribe.json", {"Topics" : ["msf:powercurve.json"] }]

Once the user is subscribed to the topic, updates to the topic start to be passed to the user.

4. RULES FOR MAKING REQUESTS

MSF metadata is generated using JSON Schema tool.

There are some rules for making data query using JSON protocol in MSF.

- Predefined rules are used for validation and must start with the “**#**” sign.
- Parameters with default values are optional in the MSF requests. If parameter value is not default, then indication of the given parameter is mandatory.
- Values of string data type in MSF are not case-insensitive. For example, the "IBM.N" value will not be identical to the "ibm.n" value.

The following notational conventions are used to represent patterns of MSF requests on metadata page:

- #a – array elements (parent element is an array)
- #d – default value; the parameter with the #d property is always optional
- #e – enumeration (range) of all acceptable values
- #t – indication of data type
- #v – validation that can be any valid regular expression or some predefined rule

The "#notempty" value of the **#v** parameter always applies either to a string field or to an array. If "#notempty" applies to a string, the string should have some value. If "#notempty" applies to an array, the array with this **#v** parameter should have at least one element.

Example with “notempty” #v parameter

```
"EntityName":{
              "#v": "#notempty",
              "#a": {
                     "#v": "#notempty"
                    }
             }
```

5. MAJOR DATAPOINT GROUPS

This section will specify work of some datapoints by provision of such information as datapoint designation, request input parameters, restrictions, examples, etc.

The complete list of datapoints with their metadata can be found in online help at the following URL:

https://amers2.msf2.cp.ime.reuters.com/msf/help/

This section will cover functionality of some datapoints that are considered to be highly used by client applications.

5.1 NEWS

The Thomson Reuters News service allows user to gain information on top news as well as to query for headlines and also retrieve news content. Storage of news details data is the NEP (News Entry Point) backend which is a common platform for retrieving request-response news information.

There are several datapoints in MSF dedicated to news content retrieval. They differ by their purpose and use. The family of news datapoints that deals with standard news content includes the following datapoints:

- NewsArticles
- NewsArticlesDetails
- MyNews

The other family of news datapoints deals with retrieving top news which content is created by editorial. The family includes the following datapoints:

- TopNewsCategories
- TopNewsGroups
- TopNews
- TopNewsImages
- TopNewsSpecialAlerts
- TopNewsSpecialAlertsGroups

There some news datapoints that do not belong either to standard or top news families:

- NewsCodes
- NewsCodesMap
- NewsLetters

Also functionality of news content retrieval provides some features as follows:

- NewsFormatter

5.1.1 NewsArticles Datapoint

The **NewsArticles** datapoint is used for searching across the news entries.

The **NewsArticles** datapoint retrieves headlines for stories that match specific requirements. For complex searches, datapoint supports sophisticated search filters that express complex Boolean criteria. These filters can incorporate keywords, companies, products, etc., as well as metadata, such as story time, news provider, product and language - and can be used in a single query.

The number of headlines returned by a response is limited to 100 by the NEP backend.

The table below lists input parameters of the **NewsArticles** datapoint:

Property Name	Description	Example Values
BrokerResearch	True/False values. Indicates whether broker research will be included to the results.	false
Codes	Search by RCS (Reuters Classification Scheme) and TRCS (Thomson Reuters Classification Scheme) codes.	M:4C
EndTime	Defines the end of a time window within which news stories must fall. Every story returned will have a revision time that is less than or equal to this value. The default value: “0001-01-01T00:00:00+00:00”.	2013-01-03T12:50:10Z+03:00
Filter	Searching by search string. The **Filter** parameter allows any combination of the following filter fields introduced by prefixes: “L:” – for **HeadlineLang** filter “NP:” – for **Product** filter “RR:” – for **RrrCodes** filter “NS:” – for **Source** filter Tickers can be specified without any additional syntax, however, the following syntax is supported: R:”<Ticker>” – to notify the server that the following symbols should be interpreted as RIC. In case RIC contains special symbols, it is allowed to wrap it in double quotes. For searching by RCS/TRCS codes, no additional syntax is envisaged. Search expressions allow the following operators in expressions: AND, OR, AND NOT, NOT. It is legal to use parentheses to set the order of calculation inside an expression. For more details on filtering, refer to section **News Content Filters** in this document.	L:zh-Hans OR L:zh-Hant NP:ESGF AND NP:E RR:3930 OR RR:529 NS:RTRS OR NS:THST IBM.N R:MSFT.O R:”READ-OBS” G:6J G:8B AND (B:174 OR B:173) More examples can be found in **Table with examples of standard query and generic filter use** below
HeadlineLang	Search by headline language	en
HeadlinesOnly	True/False values. Indicates whether the headline only will be displayed in the result.	true
LastStoryDate	Date of the last story on the previous page (if Order = 'ToEnd') OR Date of the first story on the subsequent page (if Order = 'ToBegin') Parameter is used for pagination.	2012-01-03T12:50:10Z+03:00
LastStoryId	ID of the last story on the previous page (if Order = 'ToEnd')	nDJR300A02

	OR ID of the first story on the subsequent page (if Order = 'ToBegin') Parameter is used for pagination.	
Order	Order in which search with pagination will be applied. The default value: “ToEnd”.	ToEnd ToBegin
Product	Search by product code, i.e. code of the news product/service that the story is routed to. The table of the most important global product codes is provided below.	E – for Securities International News Service G – for General News International News Service MF – for Market Focus International News Service RITV – for Reuters Insider
Repository	News repository type	reuters
RrrCodes	Search by RRR (Recurring Report Register) codes	4884
Source	Search by news provider	BNPP – for BNP Paribas CNBC – for CNBC, Inc. RTRS – for Reuters News THST – for The Street
StartTime	Defines the start of a time window within which news stories must fall. Every story returned will have a revision time that is greater than or equal to this value. The default value: “0001-01-01T00:00:00+00:00”.	2012-01-03T08:50:10Z+03:00
Tickers	Search by a RIC (one or more RICs are allowed within an expression)	IBM.N “IBM.N AND MSFT.O”
Urgency	Indicates degree of news story urgency	2

Table of the of the most important global product codes

Code	Description
A	All major financial news screen services (expands to Product Codes **M E D O C** plus U NAT UKI)
C	**Commodities International News Service** (combines GRO, SOF, MTL – see below)
D	**Debt International News Service** includes all news relevant to international debt market participants
DIA	**Diary Background Information**, applied to all diaries
E	**Securities International News Service**, includes all news that is relevant to international equities markets participants
G	**General News International News Service**
GRO	Grains, oilseeds, animal products (wheat, corn, rice, soy, wool, meat, palm oil, cotton)

M	**Money International News Service,** includes economics, foreign exchange, major political news, and major bank news.
MF	**Market Focus International News Service**, includes regular market reports
MTL	**Metals Specialist News Service**, includes all stories relevant to participants in the international metals markets
O	**Energy International News Service**, includes all news relevant to participants in the international energy markets
RINVM	**Reuters Investment Management News Service**
RITV	**Reuters Insider**, items with Insider content
S	**Sports International News Service**
SOF	**Softs Specialist News Service**, includes stories relevant to participants in the international soft commodities markets (i.e. sugar, coffee, cocoa, rubber, orange juice, tea, pepper, spices)

MSF Datapoint Sample Request – NewsArticles

```
{
  "Entity": {
    "Id": "NA",
    "E": "NewsArticles",
    "S": [
      "Headline.versionCreated",
      "Headline.insertDateTime",
      "Headline.Urgency",
      "Headline.pnacDate"
    ],
    "W": {
      "Filter": "OIL/BRIEF",
      "Order": "ToEnd"
    },
    "St": [
      {
        "F": "insertDateTime",
        "O": "DESC"
      }
    ]
  }
}
```

The request in the example above will retrieve all news headlines which RCS code parameter has the **OIL/BRIEF** value and search will be applied from start to end. Array elements from the response will be will be sorted in descending order by the **insertDateTime** parameter.

5.1.2 News Content Filters

All filtering parameters are optional.

Filters can be divided into 2 groups as follows:

Main	Auxiliary

• Codes • Product • RrrCodes • Source • Tickers	• HeadlineLang • HeadlinesOnly • Pivot Window • Time Window • BrokerResearch • Urgency

The **Pivot Window** filter is a combination of the **LastStoryDate** and **LastStoryID** input parameters.

The **Time Window** filter is a combination of the **EndTime** and **StartTime** input parameters.

Presently, the **BrokerResearch** and **Urgency** filters do not function.

Table with examples of standard query and generic filter use

The following table shows the difference in using filtering parameters of the requests with the same values:

Filter Parameter	Standard Query	Filtering using the Filter parameter (Generic filter)

Codes	{
	"Entity": {
	"Id": "NA",
	"E": "NewsArticles",
	"W": {
	"Codes": "G:8B AND (B:174 OR B:173)"
	}
	}
	}
		{
		"Entity": {
		"Id": "NA",
		"E": "NewsArticles",
		"W": {
		"Filter": "G:8B AND (B:174 OR B:173)"
		}
		}
		}

RrrCodes	{
	"Entity": {
	"Id": "NA",
	"E": "NewsArticles",
	"W": {
	"RrrCodes": "3930 OR 529"
	}
	}
	}
		{
		"Entity": {
		"Id": "NA",
		"E": "NewsArticles",
		"W": {
		"Filter": "RR:3930 OR RR:529"
		}
		}
		}

Product	{
	"Entity": {
	"Id": "NA",
	"E": "NewsArticles",
	"W": {
	"Product": "ESGF AND E"
	}
	}
	}
		{
		"Entity": {
		"Id": "NA",
		"E": "NewsArticles",
		"W": {
		"Filter": "NP:ESGF AND NP:E"
		}
		}
		}
		“NP:”

Source	{	{

	"Entity": {
	"Id": "NA",
	"E": "NewsArticles",
	"W": {
	"Source": "RTRS OR THST"
	}
	}
	}
		"Entity": {
		"Id": "NA",
		"E": "NewsArticles",
		"W": {
		"Filter": "NS:RTRS OR NS:THST"
		}
		}
		}
		“NS:”

Tickers	{
	"Entity": {
	"Id": "NA",
	"E": "NewsArticles",
	"W": {
	"Tickers": "IBM.N AND MSFT.O"
	}
	}
	}
		{
		"Entity": {
		"Id": "NA",
		"E": "NewsArticles",
		"W": {
		"Filter": "R:IBM.N AND R:MSFT.O"
		}
		}
		}
		R:

HeadlineLang	{
	"Entity": {
	"Id": "NA",
	"E": "NewsArticles",
	"W": {
	"HeadlineLang": "zh-Hans OR zh-Hant"
	}
	}
	}
		{
		"Entity": {
		"Id": "NA",
		"E": "NewsArticles",
		"W": {
		"Filter": "L:zh-Hans OR L:zh-Hant"
		}
		}
		}

5.1.3 NewsArticlesDetails Datapoint

The **NewsArticlesDetails** datapoint is used for getting full news stories. Full news stories might be obtained by PNAC (Primary News Access Code) which is news story ID and the date of its issuing (pnacDate).

The table below lists input parameters of the **NewsArticlesDetails** datapoint:

Property Name	Description	Example Values
Date	Date of news creation (pnacDate). Optional parameter. The default value: “0001-01-01T00:00:00+00:00”.	2012-01-05T13:27:52Z+03:00
Id	News story ID (PNAC)	nSin82gDM6

If several news stories were requested and not all of them were found, the error will be displayed only for those stories that were not found.

MSF Datapoint Sample Request – NewsArticlesDetails

```
{
  "Entity": {
    "Id": "NAD",
    "E": "NewsArticlesDetails",
```

```
    "W": {
      "Stories": [
        {
          "Id": "nBER3TwSlP"
        },
        {
          "Id": "nTwnc38JbC"
        },
        {
          "Id": "nEDYB05Gmw"
        }
      ]
    }
  }
}
```

5.1.4 TopNewsCategories Datapoint

Top news categories are pages into which the top news content package is split.

The **TopNewsCategories** datapoint is used for getting all top news categories codes. This datapoint does not have any input parameters.

MSF Datapoint Sample Request – TopNewsCategories

```
{
  "Entity": {
    "Id": "TNC",
    "E": "TopNewsCategories",
    "S": ["TopNewsCategories.Code", "TopNewsCategories.GroupId"]
  }
}
```

5.1.5 TopNewsGroups Datapoint

The **TopNewsGroups** datapoint is used for obtaining the list of all top news to be displayed on the Top News webpage.

The table below lists input parameters of the **TopNewsGroups** datapoint:

Property Name	Description	Example Values
Codes	Top news group codes	urn:newsml:reuters.com:20020924:SPDOC_56021242002
LoadImages	Indicates whether an image is loaded. The default value: “false”. If “true” is selected, two fields in the response (namely **Image** and **SmallImage**) will be filled with base 64 encoded image content. Refer to the **5.1.7 TopNewsImages Datapoint.**	true/false

MSF Datapoint Sample Request – TopNewsGroups

```
{
  "Entity": {
    "Id": "TN",
    "E": "TopNewsGroups",
    "S": [
      "TopNewsGroups.TopNews.RelatedStories.Content",
      "TopNewsGroups.TopNews.RelatedStories.Brief"
    ],
    "W": {
      "Codes": [
        "urn:newsml:reuters.com:20020924:SPDOC_56021242002",
        "urn:newsml:reuters.com:20020924:SPDOC_56045242002",
        "urn:newsml:reuters.com:20030324:SPDOC_46640242003"
      ],
      "LoadImages": false
    }
  }
}
```

5.1.6 TopNews Datapoint

Top News is a package of news content which is being refreshed on unspecified intervals that highly depend on the updates of popular news content (e.g. Iraq conflict, Ukraine crisis, World War 3, etc.).

The **TopNews** datapoint is used for getting top news list. The top news list might be obtained by code.

The table below lists input parameters of the **TopNews** datapoint:

Property Name	Description	Example Values
Codes	Top news codes	urn:newsml:reuters.com:20020924:SPDOC_56021242002
LoadImages	Indicates whether an image is loaded. The default value: “true”. If “true” is selected, two fields in the response (namely **Image** and **SmallImage**) will be filled with base 64 encoded image content. Refer to the **5.1.7 TopNewsImages Datapoint.**	true/false

MSF Datapoint Sample Request – TopNews

```
{
  "Entity": {
    "Id": "TN",
    "E": "TopNews",
    "W": {
      "Codes": [
        "urn:newsml:reuters.com:20020923:SPDOC_119827232002",
        "urn:newsml:reuters.com:20090214:SPDOC_714091420091",
        "urn:newsml:reuters.com:20030212:SPDOC_88894122003"
      ],
      "LoadImages": true
    },
    "R": [
```

```
      2,
      2
    ],
    "St": [
      {
        "F": "HeadLine",
        "O": "DESC"
      }
    ]
  }
}
```

5.1.7 TopNewsImages Datapoint

The **TopNewsImages** datapoint is used to retrieve images from top news list. Usually two images are associated with each Top News story, one large image and one small image (thumbnail).

The **ImageUrl** and **SmallImageUrl** fields in the response of the **TopNews** datapoint are IDs of the corresponding images.

The only input parameter of the **TopNewsImages** datapoint is “Codes” which are IDs of the Top News story images.

MSF Datapoint Sample Request – TopNewsImages

```
{
  "Entity": {
    "Id": "TNI",
    "E": "TopNewsImages",
    "S": [
      "Images.ContentType",
      "Images.Data"
    ],
    "W": {
      "Codes": [
        "2014-03-11T201959Z_1_FB2_RTRLXPP_2_LYNXPACKAGER.JPG",
        "2014-03-11T204426Z_1_AT0_RTRLXPP_2_LYNXPACKAGER.JPG",
        "2014-02-23T063436Z_01_PEK05_RTRIDSP_1_CHINA-ECONOMY-CBANK.jpg"
      ]
    }
  }
}
```

In the response, each found item is represented by the **Images** array consisting of the following fields:

- **ContentType** – specifies type of the image
- **Data** – BASE64 encoded image
- **Guid** – unique code that matches the **Codes** parameter from the request.

Currently, only the **image/jpeg** type is supported as Content Type in MSF.

MSF Datapoint Sample Response – TopNewsImages

```
{
 "TNI": {
   "Images": [
     {
       "ContentType": "image/jpeg",
       "Data": "/9j/4AAQS...AH/2Q==",
       "Guid": "2014-05-15T102832Z_1_OO5_RTRLXPP_2_LYNXPACKAGER.JPG"
     }
   ]
 }
}
```

Another option for retrieving images from top news list is a Binary Route approach as shown on the example below.

Top News Images Retrieval through MSF Binary Route – request sample

```
1.  POST http://msfhost/msf/binary HTTP/1.1
2.  Authorization: Basic a...I=
3.  Host: msfhost
4.  Content-Length: 184
5.
6.
7.  {
8.    "Entity": {
9.      "Id": "TNI",
10.     "E": "TopNewsImages",
11.     "W": {
12.       "Codes": [
13.         "2014-05-15T102832Z_1_OO5_RTRLXPP_2_LYNXPACKAGER.JPG"
14.       ]
15.     }
16.   }
17. }
```

Top News Images Retrieval through MSF Binary Route – response sample

```
1.  HTTP/1.1 200 OK
2.  Accept-Ranges: bytes
3.  Content-Length: 28903
4.  Content-Type: image/jpeg
5.  Set-Cookie: X-Tr-Auth=654eba52-d7aa-4177-7e9c-
    9da82a48add5; Path=/msf; Expires=Thu, 15 May 2064 16:38:10 UTC; HttpOnly
6.  X-Tr-Host: msfhost
7.  X-Tr-Msfversion: 2.0
8.  X-Tr-Transactionid: c6fb1de6-74d7-4dff-6939-a009ebc714e7
9.  Date: Thu, 15 May 2014 16:38:12 GMT
10.
11.
12. ����  JFIF  ``C(non-printable binary data)
```

This special route is open in MSF for binary content retrieval without any extra encoding. Refer to section Error! Reference source not found. Error! Reference source not found. for details.

5.1.8 TopNewsSpecialAlerts Datapoint

The **TopNewsSpecialAlerts** datapoint is used to get information on special alerts within a top news list.

The only input parameter of the **TopNewsSpecialAlerts** datapoint is “Codes” which is top news codes.

MSF Datapoint Sample Request – TopNewsSpecialAlerts

```
{
  "Entity": {
    "Id": "TNSA",
    "E": "TopNewsSpecialAlerts",
    "S": [
      "SpecialAlerts.Title",
      "SpecialAlerts.Duid"
    ],
    "W": {
      "Codes": [
        "urn:newsml:reuters.com:20020923:SPDOC_119827232002",
        "urn:newsml:reuters.com:20090214:SPDOC_714091420091",
        "urn:newsml:reuters.com:20030212:SPDOC_88894122003"
      ]
    }
  }
}
```

5.1.9 TopNewsSpecialAlertsGroups Datapoint

The **TopNewsSpecialAlertsGroups** datapoint is used for obtaining the list of all special alerts for the top news view on the **Top News** website.

The only input parameter of the **TopNewsSpecialAlertsGroups** datapoint is “Codes” which is top news codes.

MSF Datapoint Sample Request – TopNewsSpecialAlertsGroups

```
{
  "Entity": {
    "Id": "TNSAG",
    "E": "TopNewsSpecialAlertsGroups",
    "W": {
      "Codes": [
        "urn:newsml:reuters.com:20020923:SPDOC_119827232002",
        "urn:newsml:reuters.com:20090214:SPDOC_714091420091",
        "urn:newsml:reuters.com:20030212:SPDOC_88894122003"
      ]
    }
  }
}
```

5.1.10 NewsCodes Datapoint

Each content item in Thomson Reuters is coded. News stories can be associated with industries, regions, business sectors, etc. through use of Reuters Classification Scheme (RCS) codes.

The **NewsCodes** datapoint is used to retrieve news stories by RCS codes of the news set. In request, codes are placed inside of the “W” condition, e.g.:

"Codes": ["A:1", "A:4", "B:12", "B:181", "B:19", "B:4", "B:5", "B:7", "B:8", "G:1", "G:2H", "G:5B", "G:K"]

The **NewsCodes** datapoint is used as a navigator only across news set of RCS codes. Search by other sets of RCS codes are allowed, refer Error! Reference source not found. Error! Reference source not found. section to for details.

The table below lists input parameters of the **NewsCodes** datapoint:

Property Name	Description	Example Values
Codes	Code value	"A:1", "A:4", "B:12"
Depth	Number of levels on which the code structure will be unfolded and spanned by search. The default value: “-1”. Other acceptable values: all positive integers and 0. The parameter is used only if the **IsExpand** parameter is set to “true”.	2
IsExpand	Indicates whether the hierarchical structure of codes will be expanded	True/False
Language	Language for displaying code description. Acceptable values: “en”, “ja”, “zh-Hans”.	en

MSF Datapoint Sample Request – NewsCodes

```
{
  "Entity": {
    "Id": "NC",
    "E": "NewsCodes",
    "S": [
      "Codes.Description",
      "Codes.Mnemonic"
    ],
    "W": {
      "Codes": [
        "B:2"
      ],
      "IsExpand": true,
      "Depth": 2,
      "Language": "en"
    }
  }
}
```

5.1.11 NewsCodesMap Datapoint

The **NewsCodesMap** datapoint is a utility datapoint which is used to perform news code conversion (code mapping).

In request, codes are placed inside of the “W” condition, e.g. "Codes": ["STX", "CO", "BMAT", "UTIL", "MINE"].

The table below lists input parameters of the **NewsCodes** datapoint:

Property Name	Description	Example Values
Codes	Code value	"A:1", "A:4", "B:12"
Depth	Number of levels on which the code structure will be unfolded and spanned by search. The default value: “-1”. Other acceptable values: all positive integers and 0. The parameter is used only if the **IsExpand** parameter is set to “true”.	2
From	News codes type to be converted. Acceptable values: “N2K”, “Mnemonic”.	N2K
IsExpand	Indicates whether the hierarchical structure of codes will be expanded. The default value: “false”.	true/false
To	Type into which news codes are be converted. The only acceptable value: “RCS”.	RCS

MSF Datapoint Sample Request – NewsCodesMap

```
{
  "Entity": {
    "Id": "NCM",
    "E": "NewsCodeMap",
    "W": {
      "Codes": [
        "STX",
        "CO",
        "BMAT",
        "UTIL",
        "MINE"
      ],
      "From": "Mnemonic",
      "To": "RCS",
      "IsExpand": false,
      "Depth": -1
    }
  }
}
```

5.1.12 NewsLetters Datapoint

The **NewsLetters** datapoint is a utility datapoint which is used for searching newsletters.

The table below lists input parameters of the **NewsLetters** datapoint:

Property Name	Description	Example Values
EndTime	Defines the end of a time window within which news stories must fall. Every story returned will have a revision time that is	2013-01-03T12:50:10Z+03:00

	less than or equal to this value. Current time is used as default value.	
LastStoryDate	Date of the last story on the previous page (if Order = 'ToEnd') OR Date of the first story on the subsequent page (if Order = 'ToBegin') Parameter is used for pagination.	2012-01-01T12:50:10Z+03:00
LastStoryId	ID of the last story on the previous page (if Order = 'ToEnd') OR ID of the first story on the subsequent page (if Order = 'ToBegin') Parameter is used for pagination.	nDJR300A02
Order	Order in which search with pagination will be applied. The default value: “ToEnd”.	ToEnd ToBegin
RrrCodes	Search by RRR (Recurring Report Register) codes	4884
StartTime	Defines the start of a time window within which news stories must fall. Every story returned will have a revision time that is greater than or equal to this value.	2012-01-03T09:50:10Z+03:00

MSF Datapoint Sample Request – NewsLetters

```
{
  "Entity": {
    "Id": "NL",
    "E": "NewsLetters",
    "W": {
      "StartTime": "2012-01-03T09:50:10Z+03:00",
      "EndTime": "2012-01-03T12:50:10Z+03:00",
      "RrrCodes": "4884",
      "Order": "ToEnd"
    }
  }
}
```

5.1.13 NewsFormatter Datapoint

The **News Formatter** datapoint is used for representing news stories in HTML rather than in plain text format (if to compare with the **NewsArticlesDetails** datapoint). The **NewsFormatter** provides a ready HTML-view story to a client application. In this case, the necessity to process an HTML view by a client is absent.

The required parameters should be passed in the query string as shown below.

Besides that, due to content segmentation and security considerations, the **NewsFormatter** datapoint requires authorization.

Also, it requires a valid Application ID to be provided in the corresponding header for statistics purposes.

Access point: *https://<host>/msf/fwd/news*

The table below lists parameters of the **News Formatter** query string:

Property Name	Description	Example Values
pnacDate	Date of news story issuing. Optional parameter. Used when the **newsDisplay** parameter is a PNAC.	2013-04-09T13:33:41Z+00:00
metadata	Optional parameter. Default value is false. Adds JSON-serialized raw story object at the end of the formatted story.	true / false
newsDisplay	Mandatory parameter. Value is the story ID (PNAC, GUID, RRR). Use the **NewsArticles** datapoint to perform search for news	newsDisplay=nL5N0CW349 newsDisplay=RR:7890

MSF Datapoint Sample Requests – NewsFormatter
`https://<host>/msf/fwd/news?newsDisplay=nTOPNEWS`
`https://<host>/msf/fwd/news?newsDisplay=nAAp94370a&pnacDate=2013-04-09T13:33:41Z+00:00` `(may return error if a particular news story is already removed)`
`https://<host>/msf/fwd/news?newsDisplay=nTOPNEWS&metadata=true`

Example of formatted HTML content:

The resulting HTML may contain **dir** and **style** attributes when the story display direction is **RightToLeft.**

The resulting HTML may contain the **span** attribute with the following class names to indicate story elements:

Class Name	Description
headline	Indicates story headline
source	Indicates story source
releasedDate	Indicates the date of the story release
newsExpression	Indicates news search expressions, like "FRX-!EMRG-FLOWS-FCT", "EMRG-(EEU AEF)-FLOWS-FCT, etc.
pnac	Indicates story PNAC (Primary News Access Code) which is a story ID
rmLink	Indicates Reuters Messenger address
email	Indicates Email address
url	Indicates news story URL
videoLink	Indicates Insider Video URL
ric	Indicates RIC code

Example: class="headline"

5.2 ECONOMIC INDICATORS


```
{
  "Count": {
    "#d": 0,
    "#t": "int"
  },
  "RangeType": {
    "#d": "Last",
    "#e": [
      {
        "#value": "Last"
      },
      {
        "#value": "First"
      }
    ]
  },
  "SeriesCode": {
    "#a": {
      "#v": "#notempty"
    },
    "#v": "#notempty"
  },
  "SeriesComponent": {
    "#a": {
      "#e": [
        {
          "#value": "Metadata"
        },
        {
          "#value": "Series"
        },
        {
          "#value": "Calculations"
        },
        {
          "#value": "Existence"
        }
      ]
    },
    "#d": [
      "Metadata",
      "Series"
    ],
    "#v": "#notempty"
  }
```

```
}
```

5.3 ESTIMATES SUMMARY

```
{
  "properties": {
    "Calculations": {
      "items": [
        {
          "enum": [
            "None",
            "Margin",
            "QuarterOverQuarterChange",
            "QuarterOverQuarterGrowth",
            "YearOverYearChange",
            "YearOverYearGrowth"
          ]
        }
      ],
      "type": "array"
    },
    "Codes": {
      "items": [
        {
          "type": "string"
        }
      ],
      "minItems": 1,
      "type": "array"
    },
    "RelativePeriods": {
      "items": [
        {
          "properties": {
            "Number": {
              "type": "integer"
            },
            "Type": {
              "default": "Annual",
              "enum": [
                "Annual",
                "Interim",
                "Monthly"
              ]
```

```
                }
            },
            "type": "object"
        }
      ],
      "type": "array"
    },
    "Tickers": {
      "items": [
        {
          "type": "string"
        }
      ],
      "minItems": 1,
      "type": "array"
    }
  },
  "required": [
    "Tickers",
    "RelativePeriods"
  ],
  "type": "object"
}
```

5.4 TA TIME SERIES

```
{
  "properties": {
    "Analysis": {
      "items": [
        {
          "enum": [
            "OHLCV",
            "BBAND",
            "RSI",
            "SMA",
            "STOCHF",
            "ABT",
            "AD",
            "ADV"
          ]
        }
      ],
      "type": "array"
    },
```

```
"AnalysisParams": {
  "properties": {
    "ABT": {
      "properties": {
        "channelPeriods": {
          "type": "integer"
        },
        "deviations": {
          "type": "integer"
        },
        "trendPeriods": {
          "type": "integer"
        }
      },
      "type": "object"
    },
    "BBAND": {
      "properties": {
        "deviations": {
          "type": "integer"
        },
        "periods": {
          "type": "integer"
        }
      },
      "type": "object"
    },
    "RSI": {
      "properties": {
        "averagingMethod": {
          "default": "EMA",
          "enum": [
            "SMA",
            "EMA",
            "WSA"
          ]
        },
        "period": {
          "type": "integer"
        }
      },
      "type": "object"
    },
    "SMA": {
      "properties": {
        "period": {
          "type": "integer"
```

```
            }
          },
          "type": "object"
        },
        "STOCHF": {
          "properties": {
            "averagingMethod": {
              "default": "SMA",
              "enum": [
                "SMA",
                "EMA",
                "WSA"
              ]
            },
            "percentDPeriods": {
              "type": "integer"
            },
            "percentKPeriods": {
              "type": "integer"
            },
            "percentKSlowing": {
              "type": "integer"
            }
          },
          "type": "object"
        }
      },
      "type": "object"
    },
    "Currency": {
      "type": "string"
    },
    "DateRange": {
      "default": null,
      "enum": [
        "Day",
        "Month",
        "Year"
      ]
    },
    "DateRangeMultiplier": {
      "type": "integer"
    },
    "EndDate": {
      "format": "date-time",
      "type": "string"
    },
```

```
      "Fields": {
        "items": [
          {
            "type": "string"
          }
        ],
        "type": "array"
      },
      "Interval": {
        "default": "Daily",
        "enum": [
          "Minute",
          "Hourly",
          "Daily",
          "Weekly",
          "Monthly",
          "Quarterly",
          "Yearly"
        ]
      },
      "IntervalMultiplier": {
        "type": "integer"
      },
      "NoInfo": {
        "type": "boolean"
      },
      "StartDate": {
        "format": "date-time",
        "type": "string"
      },
      "Tickers": {
        "items": [
          {
            "type": "string"
          }
        ],
        "minItems": 1,
        "type": "array"
      },
      "Unit": {
        "type": "string"
      }
    },
    "required": [
      "Tickers"
    ],
    "type": "object"
```

```
}
```