The ActivContentGateway API

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Contents

1.0 Introduction

This document describes the C++ ActivContentGateway API, a component of the ACTIV Content Platform.

A full introduction to the ACTIV Content Platform and the role of the ActivContentGateway API can be found in [1]. We highly recommend reading this before continuing.

2.0 Overview of the ActivContentGateway API

The ActivContentGateway API is a set of C++ classes and types that together form the client interface to the Content Gateway.

The ContentGatewayClient class handles connection to the Content Gateway and provides overrideable virtual methods for receiving asynchronous responses and updates.

The RealtimeRequestHelper, TimeSeriesRequestHelper, SymbolDirectoryRequestHelper and NewsRequestHelper classes provide functionality for launching data requests and decoding response messages.

Various other support classes provide additional data types and helper functionality.

2.1 Server Connection

The ActivContentGateway API is a traditional connection-based client. Communications with a Content Gateway begin when the client initiates a TCP/IP connection and end when the client disconnects. Delivery and correct ordering of data during the lifetime of a connection are guaranteed. Connection state changes are communicated reliably to both client and server.

Additionally, the API can attempt various HTTP tunneling strategies when connectivity is limited (either by port number or type of traffic):

1. HTTP CONNECT via an HTTP proxy. The proxy requires access to the Content Gateway; traditionally the port used on the Content Gateway would be 443. The API can connect to the proxy and transparently issue an HTTP CONNECT request to the target Content Gateway. Once the tunnel is in place, the data protocol used is the regular binary ACTIV format. Note that all traffic is now being routed via the proxy server so whilst there are no bandwidth implications there are latency effects with this type of tunneling.
2. Two-connection COMET-style HTTP tunneling, optionally via an HTTP proxy. In this mode, all API to Content Gateway traffic is base64-encoded in HTTP GET requests over a unique TCP connection. Traffic flowing from the Content Gateway to the API (mainly responses to requests and record updates) are sent over a second TCP connection that is logically bound to the first. This traffic is pure ACTIV binary format once the initial handshake is complete. In this mode, the Content Gateway access would most likely be on port 80. There are bandwidth and latency implications with this style of tunneling.

The tunneling functionality is a property of the ActivMiddleware the API is built on and as such the details are out of scope for this document. Please contact ACTIV developer support (developersupport@activfinancial.com) for further information.

2.2 Content Gateway Discovery

The ActivMiddleware Directory Service supports various dynamic and static service location strategies. The ActivContentGateway API uses the Directory Service to locate

and connect to a Content Gateway server, and to reconnect in the case of a service failure. The default connection and reconnection policies can be overridden by the application programmer if desired.

2.3 Logon and Field Level Permissioning

The ActivContentGateway API must log-on to the Content Gateway before data can be accessed. The log-on credentials are used to establish a set of user permissions, which are enforced by the Gateway when any request for data is made.

Permission checks are performed at field level, not record level. Thus records containing data from mixed sources are fully supported by the permissioning system, as are delayed-data feeds where certain fields are only permitted to be viewed in real-time.

2.4 Interactive Requests

The ActivContentGateway API offers a rich set of interactive requests for both record-based and time series data. Snapshot only and real time watches (with or without initial full data image) are supported. Requests for single and multiple record retrieval, partial matches and list requests are supported, as are flexible time series requests.

2.5 Updates

In addition to new values of changed fields, updates contain:

an Update Id, which is a sequential per-record counter that increments on each update.
an Event Type, which is an enumeration value indicating what caused the update (e.g. a new quote, a trade, a trade correction).

2.6 Interactive Request Modes

The ActivContentGateway API supports three request modes for interactive requests. These are:

Asynchronous
Synchronous
Non-Blocking Synchronous

Asynchronous requests accept a RequestId which is used to identify the response when it is received via a callback. Asynchronous requests are preferred in most real-time applications since they offer the best possible system throughput.

Synchronous requests block until the full result set has been retrieved, and provide this data as output parameters to the request call. This is convenient for some kinds of application, e.g. where the result of a request is needed before processing can continue.

Non-Blocking Synchronous requests complete immediately, returning a SyncRequestId object. The user is free to go on and do additional processing, and in particular can launch additional overlapping requests with further SyncRequestId objects. Once the caller is ready, a call (with configurable timeout) is made using the SyncRequestId to pick up the results.

The Non-Blocking Synchronous request mode offers the key advantage of synchronicity (the results are returned in the callers own context) but is almost always a more performant choice than a fully synchronous request. It lends itself to tasks such as building a complex web page, where single-context execution is required, but overlapping of requests is desirable to reduce page build time.

Non-Blocking Synchronous requests are not currently implemented for Time Series requests.

Note that the Content Gateway receives all requests asynchronously, regardless of the request mode used by the ActivContentGateway API – synchronous request behavior is implemented entirely on the client side. The Gateway will generally overlap response processing to ensure fair treatment of all connected clients.

2.7 Bandwidth Efficiency and Network Latency

ActivMiddleware is highly optimized for performance and latency. To further reduce on-wire costs, the ActivContentGateway API supports features such as field-level requests, including, critically, field level permissioning of requests.

As will be seen in later sections, the ActivContentGateway API supports a very flexible request syntax allowing complex requests to be made in a single step. As an example, a single record request can be used to fetch listing level data for MSFT.Q whilst at the same time determining all indices of which MSFT.Q is a member, retrieving all option root symbols for MSFT.Q, and returning data fields on all of these items.

Complex requests are convenient for the application programmer, but crucially also offer bandwidth savings and significantly reduce the number of network round-trips required to complete complex data retrieval tasks. This leads to very low response latency.

3.0 The Content Platform Data Model

3.1 Record Data

The ActivContentGateway API accesses record based data stored within the Content Server by making requests via the Content Gateway. The data is stored in ActivDatabase (a generic highly optimized real-time database management system) tables optimized for random access.

Each table has a primary key which is typically the *symbol* of a financial instrument, e.g. MSFT.Q, and a set of fields each identified by a *field Id*. Tables containing record data are generally referred to as *market data tables*. Every table is uniquely identified by an integer *table number*.

The set of fields (plus metadata such as the field type and maximum field length) for a given table is termed a *table template*, or alternatively, *table specification.* Differing kinds of data need different fields and hence live in different tables. Each table has its own table template, and the terms table number and table template are often used synonymously. A typical global market data system may have many hundreds of market data tables.

A given symbol can appear in only one market data table (but will also be used to identify the time series for this item in the time series database). The term *key* is used within this document to mean the combination of symbol and the table number of the table where that symbol resides.

3.2 Time Series Data

Time Series data is held in data tables optimized for the serial nature of the data (adds are usually at the end of the series, lookups are usually sequential). The tables are keyed by time as well as symbol, and are referred to as *time series tables*. Time series tables have table numbers just as market data tables do.

The time series database can accumulate tick-by-tick data, end-of-day data and intraday bars of various bar periods. These series are stored in separate tables.

3.3 News Stories

The ActivContentGateway API accesses news stories stored in the News Server by making requests via the Content Gateway. The News Server supports a rich query syntax that is described in News Server Requests below.

4.0 The Navigation Model

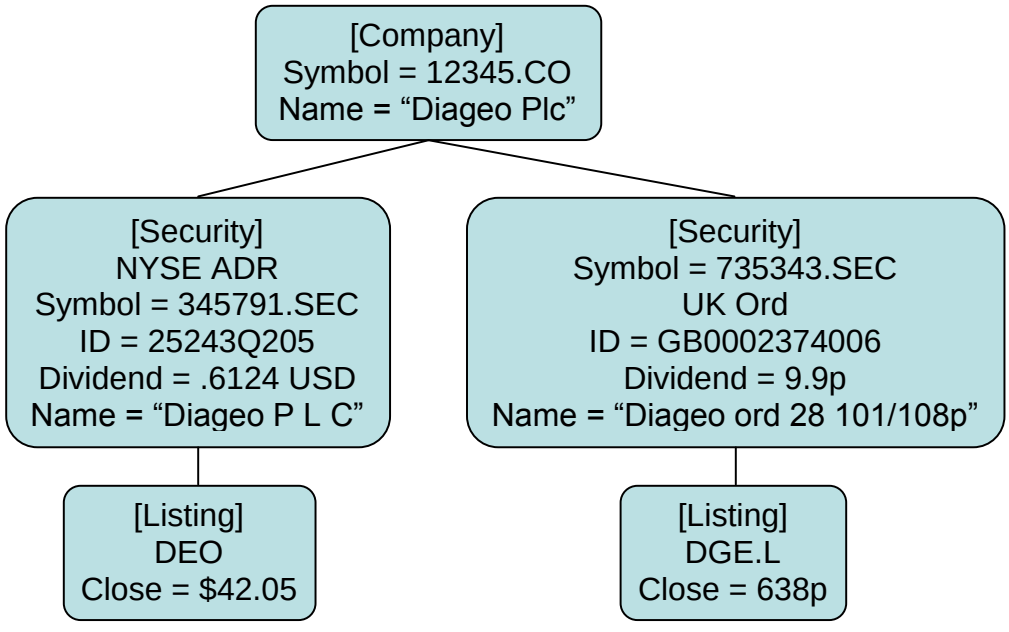
It is important to note that it is not necessary to use the navigation data model to make data requests in the ActivContentGateway API. However, the model allows far greater flexibility and expressiveness in each request and allows complex results to be retrieved in a single network round trip.

4.1 Background to Navigation Data

Navigation data is meta-data which expresses links between related items. This concept is well illustrated by considering the relationship between a company, the securities it has issued, and the prices at which those securities are traded on various regional exchanges - this is often referred to as the 'Company-Security-Listing' model. (Note that this model is a simplification of real-world corporate equity structure – an interesting discussion of this topic can be found in [2]).

'Company' refers to aspects of the company itself such as its name, business segments and total market capitalization. Although traditional market data systems often take an ad-hoc approach as to where to store this data, these items can best be represented in their own database record, a 'company level record'. 'Security' refers to the properties of each security – for example ISIN code, par value and dividend details. This data can best be held as 'security level records', one per security. 'Listing' refers to the details of trading a particular security on a particular exchange, for example last trade price, current quote and cumulative volume, and these also deserve their own database record. This is the 'listing level record'.

This model is illustrated in the following diagram:



The symbols employed for the company and securities are arbitrary values given for the purposes of example only. The database representation of the above (ignoring currency issues) is:

Companies table:

			…	…
		…	…	…

Securities table:

				…
				…

Listings table:

		…	…	…
		…	…	…
		…	…	…

The above data model is clean and easily maintained, and avoids the problems of data duplication and inconsistencies typically present in market data systems which try to 'cram' the company and security level data into listing level records. However, a mechanism is needed to relate the symbols to each other. For example, it is clear from the diagram that DGE.L, 735343.SEC and 12345.CO are related entities, but we need a way to represent this programmatically. The ACTIV Content Platform does this through *relationships*, which will be discussed further in the next section.

Company-security-listing is one useful example of navigation but there are many others. Other commonly encountered relationships include option to option root to underlying, performance chains, index and sector index chains, and currency forward points chains, to name but a few. The ACTIV Content Platform supplies many navigation relationships as standard and allows administrators to define additional ones as necessary.

4.2 Using the Navigation Model in Requests

A major feature of the ACTIV Content Platform is its extremely powerful and extensible framework for building navigation models, and the ability to use the navigation model seamlessly when making requests for data.

The navigation model uses relationships to link entities such as Companies, Securities, Listings, Option Roots, Indexes and many others. Each relationship is identified by an integer *Relationship Id.*

To illustrate the idea of navigation-based requests, let's look at some examples. A pseudo request syntax is used for clarity – the actual parameters to Feed API methods are C++ structures and are slightly more complex than those shown here.

Canonical Requests

The following illustrates how to request the close price for DGE.L (the UK listing of Diageo) along with the related dividend, security name, company name and operating profit.

1. GetEqual("12345.CO", {FIELD_ID_NAME, FIELD_ID_OP_PROFIT});
2. GetEqual("56789.SEC", {FIELD_ID_NAME, FIELD_ID_DIV});
3. GetEqual("DGE.L", {FIELD_ID_CLOSE});

The GetEqual request takes a single symbol and a list of fields and returns the appropriate data from the database. (Note - these three separate requests could have been represented instead by a single GetMultipleEqual request which would have executed in a single network round trip. API users should batch symbols and use the 'list' requests whenever possible.)

Navigation-Based Requests

The requests above are termed *canonical* because the real key is being specified with each. Here is an equivalent request made using the navigation model:

1. GetEqual("DGE.L",
   {[RELID_NONE] FIELD_ID_CLOSE},
   {[RELID_SECURITY] FIELD_ID_NAME, FIELD_ID_DIV},
   {[RELID_COMPANY] FIELD_ID_NAME, FIELD_ID_OP_PROFIT});

This request is processed by the Content Gateway in three steps:

1. the record for DGE.L is found and the CLOSE field added to the results.
2. the SECURITY relationship for DGE.L is 'followed' to reach the relevant security symbol. The security record is located and the NAME and DIV fields are added to the results.
3. the COMPANY relationship for DGE.L is followed to reach the relevant company symbol. The associated record is located and the NAME and OP_PROFIT fields are added to the results.

This request returns exactly the same results as the previous canonical request. Navigation requests of this kind can be arbitrarily complex, and usually execute in a single network round trip (very large results sets may be returned by the Content Gateway in multiple parts, but this is still preferable to multiple round trips).

There are two big advantages of the navigation-based request:

Firstly, the company and security symbols did not need to be known by the requesting application – only the listing level symbol was required. This will often be known or can be looked up. The only additional prior knowledge was the relationship names, which have fairly obvious meaning. The end result is that the user can access more of the available data with less prior knowledge about its symbology and location.

Secondly, many kinds of relationship resolve differently over time. For example, consider a request for the trade price of every Dow Jones Industrial Index constituent:

1. GetEqual("=DJI.CB", {[RELID_LISTING] FIELD_ID_TRADE}

This request will always resolve to the current list of Dow Jones constituents, even though that changes over time.

In general there may be any number of ways in which a particular result may be requested using navigation-based requests – it depends on the relationships set up on your system. For example, here are two navigation-based requests that return identical results:

1. GetEqual("DGE.L", {[RELID_COMPANY] FIELD_ID_OP_PROFIT}
2. GetEqual("56789.SEC", {[RELID_COMPANY] FIELD_ID_OP_PROFIT}

This capability has important implications for data caching, since the returned symbols don't in general match the requested symbol. Responses from the ActivContentGateway API always include enough information for the user to be able to maintain this mapping – see ResponseParameters, which discusses the response format in detail.

One-To-Many Relationships

The above index constituent example makes it clear that some navigation relationships are one-to-many - this is accommodated by the ActivContentGateway API. A request for a single symbol may result in a table of results.

Updating Navigation Links

We noted above that relationships, such as that between the Dow Jones Industrial Average and its constituents, are liable to change over time.

When a relationship Id is used in a request, it is resolved based on the current state of the navigation database, and record images are returned to the user followed by real time updates as they occur. Whenever a request is made, the most up-to-date navigation data is used to resolve it, so new requests always receive the correct data.

Field Scope

Another way to look at relationship Ids is to regard them as a field scope. Market data systems typically have fields which may have broad applicability – for example 'Name'. FIELD_ID_NAME is present in many table templates, so the intended meaning is not clear until a symbol is specified. The meaning of the field is relative to the supplied symbol, and the field is said to be *implicitly scoped*.

On the other hand {[RELID_SECURITY]FIELD_ID_NAME} has an explicit meaning, regardless of whether the symbol provided in the request refers to a listing, security or any other entity. The Content Gateway will always look for a navigation path to a security, and if one exists will follow it and return the security name. This field is said to

be *explicitly scoped.* We can write fully scoped fields as <scope>.<field id> for brevity, e.g. SECURITY.NAME.

The idea of explicitly scoped fields is potentially interesting – here is an example GUI grid display which can accept any kind of entity and uses navigation to try to show meaningful data:

Here is how the grid looks without explicitly scoped fields:

Of course, such a grid may have to handle one-to-many display issues in practice. For example, LISTING.CLOSE for a security symbol will typically result in multiple targets (one for each listing). GUIs can handle this using a drill-down mechanism – e.g. double click the cell to see the complete list of values.

5.0 The ActivContentGateway API in detail

5.1 Use of the C++ Standard Template Library

Many of the types used in the ActivContentGateway API are typedefs of STL types, particularly std::vector. std::string is also used extensively. Familiarity with basic STL operations (e.g. iteration) is assumed. For further information on the STL, please consult an appropriate text book, such as [3].

5.2 Use of ActivMiddleware Functions

The ActivContentGateway API relies on ActivMiddleware to provide services such as network communications and service location.

ContentGatewayClient is the main class in the ActivContentGateway API. It is derived from Activ::Component, making all middleware base Component functionality (such as messaging, alarm callbacks, remote console user-interface support and access to directory services) available. This additional functionality is optional – the API described in this document is all you need to write fully functional Feed API applications. Some of the enhanced middleware functionality is licensed separately from the ActivContentGateway API.

The ContentGatewayClient class constructor requires an Application object reference (which can be Activ::AgentApplication, or Activ::ThinApplication) and a ManagedEndPoint object reference.

AgentApplication provides all necessary middleware core services and allows you to write stand-alone applications. ThinApplication expects to connect via the ACTIV Shared Memory transport to an AgentApplication running in a different process on the same machine, and should be used where multiple clients wish to share middleware services.

5.3 Namespaces

The ActivContentGateway API makes use of the following namespaces:

Activ
This is the top level namespace. All ACTIV headers reside in this namespace, or a child-namespace.

Activ::ContentPlatform
All headers in the include/ActivContentPlatform directory reside in this namespace, or a child-namespace.

Activ::ContentPlatform::Feed
Headers which relate to ActivFeed, but not specifically to APIs which can access the feed, reside in this namespace. For example, include/ActivContentPlatform/ActivFeedCommon.

Activ::ContentPlatform::FeedApi
Headers which are common to all ActivFeed APIs (currently the ActivContentGateway API and the ActivContentServer API) reside in this namespace.

Activ::ContentPlatform::ContentGatewayApi
Headers which relate to the ActivContentGateway API itself reside in this namespace.

ACTIV makes use of the 'using' directive in the sample applications provided with the SDK for code clarity and brevity:

```
using namespace Activ;
using namespace Activ::ContentPlatform;
```

We will assume the above in the code examples that follow.

5.4 The ContentGatewayClient Class

ContentGatewayClient provides methods for:

- connecting to Content Gateways and connection management;
- starting and stopping feed-level subscription;
- making interactive requests (via helper classes);
- receiving asynchronous data and notifications;
- validating and decoding asynchronous responses;
- handling multi-part responses.

The ContentGatewayClient uses helper classes to implement interactive request functionality for record, time series, symbol lookup, meta-data and news requests. Interactive requests are described in detail below.

ContentGatewayClient is seldom used directly. Instead application programmers usually derive their own class from ContentGatewayClient so that they can override virtual methods to receive asynchronous notifications. Nonetheless we continue to refer to 'ContentGatewayClient' in this document for simplicity.

Creating a ContentGatewayClient

The following code fragment shows how to initialize a ContentGatewayClient. In this example, the code constitutes the 'main' function of a console application.

Threading

Application gives you control over the threading model for your program. In the above example, the main thread is being used to drive the Application object, and all callbacks will be driven from this thread. Run() does not return until the Application has been shut down (typically via its user interface).

If you wish to start a separate thread to drive callbacks, call:

This call returns immediately, allowing you to proceed with other processing on your thread. If you do this, you must take care of thread synchronization issues between your thread and the callback thread. You should also stop the callback thread once you are finished using:

When WaitForThreadsToExit() returns thread cleanup is complete and you can exit your application.

StartThread() can be called once only and this is enforced within the API. It is not possible to guarantee correct ordering of data if more than one thread is servicing callbacks.

If you intend to access the ContentGatewayClient from a single thread (i.e. receive updates and make all API method calls from the same thread), you could instantiate a client using the ContentGatewayClient::Settings object as follows:

This saves a small amount of thread synchronization overhead.

5.5 Connecting to a Content Gateway

The ContentGatewayClient class offers the following functionality to support connection and management of connection state:

- The Connect() and Disconnect() methods.
- A ConnectParameters member class.
- Overrideable OnConnect(), OnDisconnect() and OnBreak() methods with default handlers.
- A current connection state via the GetState() method and a StateToString() helper.
- The GetServiceLocation() method which returns the url of the Content Gateway that the ContentGatewayClient is currently connected to.

The GetContentGatewayInfo() method which returns detailed information about the Content Gateway the ContentGatewayClient is currently connected to, including hostname, OS it is running on, uptime, etc.

Connecting to a Content Gateway is a two stage process. The first step is to discover the url of a Content Gateway which is accomplished using the FindServices() method provided by the ServiceApi class of ActivMiddleware.

The second stage is to call the Connect() method, passing a filled in ConnectParameters object and a timeout value. Please see any of the provided samples for detailed examples of using the FindServices() and Connect() methods.

A timeout value of zero indicates that an Asynchronous connect will be performed. In this case, you can override OnConnect() to be notified when connection completes – you should call the inherited version of OnConnect() from your override as this updates internal Feed API state; this function returns STATUS_CODE_SUCCESS if connection was successful.

A non-zero timeout value leads to a synchronous connect. On return from Connect(), provided the return value is good, connection and authentication has succeeded. The timeout is in milliseconds.

At any time the current state of the connection can be determined by calling GetState().

The ConnectParameters class contains the following members:

	you'll leave them set to the

OnBreak() is called when a connection to a gateway is lost unexpectedly. By default, the client will attempt to reconnect to the gateway if the connection is broken for any reason. If m_policy is set to POLICY_FIND_NEXT_ALTERNATIVE, after m_failoverSeconds the client re-resolves the service Id with the directory service and tries to connect to the next available server. If no connection is possible, this process is repeated – all available servers are tried in a round-robin fashion until a connection succeeds. POLICY_FIND_RANDOM_ALTERNATIVE is similar, except instead of attempting connections in round-robin, a random gateway will be chosen from those available.

If overriding OnBreak(), call the inherited method if standard reconnection policies are being used. If the standard policies are not appropriate, your OnBreak handler can use the appropriate Middleware services to implement your own custom policy. This is beyond the scope of this document.

Disconnection from the Gateway is instigated by calling Disconnect() and is always performed asynchronously. To receive notification of a completed disconnection, override OnDisconnect() and call the inherited OnDisconnect() handler which returns STATUS_CODE_SUCCESS if disconnection was successful. You may continue to receive updates or responses until the OnDisconnect() callback is invoked.

5.6 Feed Level Subscription

Feed level subscription provides ‘raw’ access to ACTIV’s complete feed, after filtering the content at field level according to user permissions.

The ContentGatewayClient supports feed level subscription via the SubscribeToFeed() method.

Various modes of feed level subscription are available via the SubscribeFeedParameters object passed to the SubscribeToFeed() method. It is possible to receive all record update

messages, receive only updates from a subset of event types or just to receive new record and record delete messages. Record updates are delivered via the OnRecordUpdate() callback.

The message stream is closed by calling Unsubscribe(); either the “all” variant or by passing in the cookie returned from the SubscribeToFeed() call for finer-grained control (if other subscriptions are active that you wish to remain in place).
The SubscribeFeedParameters class contains the following members:

The message stream is closed by calling Unsubscribe(); either the "all" variant or by passing in the cookie returned from the SubscribeToTable() call.

Again, due to the volume of data, SubscribeToTable() is generally disabled on shared-access Content Gateways.

5.8 Interactive Record Requests

Request Types

The following interactive requests return record data:

GetEqual, GetMultipleEqual
GetMultiplePatternMatch, GetMultiplePatternMatchList
GatMatch, GetMultipleMatch
GetFirst, GetLast
GetNext, GetPrevious

GetEqual and **GetMultipleEqual** accept a key or list of keys respectively and return the matching record(s) from the Content Server database. If a table number is not provided, the gateway will search all appropriate Content Server tables.

GetMultiplePatternMatch accepts a symbol pattern and returns all matching records. The pattern syntax is described here:
http://support.activfinancial.com/modules/smartfaq/faq.php?faqid=57

GetMultiplePatternMatchList is similar to GetMultiplePatternMatch but with support for a list of symbol patterns instead of just one. The ordering of returned records will be all symbols that match the first symbol pattern, followed by all symbols matching the second symbol pattern, and so on.

A **GetMatch** request will use a heuristic to search for a matching symbol. Two are currently provided:

MATCH_TYPE_COMPOSITE – attempts to find a composite record that matches the provided symbol or, if no composite exists, the first regional record for that symbol.

MATCH_TYPE_PRIMARY – attempts to find the primary exchange record for the provided symbol, or, if not found, any record that matches.

GetMatch is provided primarily for applications where the user does not wish to know the details of the ACTIV symbology with respect to exchange codes; instead of being required to enter a fully qualified symbol such as 'IBM.N', they can enter 'IBM' and get either the primary or composite IBM record.

Some examples may clarify this:

Match type	*Input symbol*	*Returned symbol*	*Reason*
Composite	MSFT	MSFT.	A composite for MSFT was found
Composite	MSFT.	MSFT.	MSFT. already the composite record
Composite	MSFT.Q	MSFT.Q	MSFT.Q was an exact match *
Composite	MSFT.PA	MSFT.PA	MSFT.PA was an exact match *
Composite	ADGO	ADGO.QB	No composite, so first regional returned
Composite	ADGO.	ADGO.QB	No composite, so first regional returned
Composite	ADGO.QB	ADGO.QB	No composite, so first regional returned
Primary	MSFT	MSFT.Q	Primary exchange for MSFT found
Primary	MSFT.	MSFT.Q	Primary exchange for MSFT. found
Primary	MSFT.Q	MSFT.Q	MSFT.Q already the primary record
Primary	MSFT.PA	MSFT.Q	Primary exchange for MSFT found

* A future Content Gateway release will change the functionality of the composite GetMatch in this case to return the more consistent MSFT.

Note the SymbolId provided to GetMatch can leave the table number undefined in a similar vein to GetEqual.

GetMultipleMatch is similar to GetMatch but accepts a list of symbols to search for.

GetFirst, **GetLast**, **GetNext** and **GetPrevious** together support forward and reverse table walks. GetFirst and GetLast return, respectively, the N records at the start or end of a specified table (where N is specified by the caller). GetNext and GetPrevious accept a table number and symbol and return the N records following or preceding the specified symbol (note that the provided symbol does not actually have to exist).

Common Characteristics

The interactive record requests have many characteristics in common:

All use very similar RequestParameters objects – there are slight differences depending whether the request needs a key, a wildcard symbol pattern, or a list of keys, etc.
All have identical ResponseParameters.

All allow both canonical and navigation-based requests to be made (and the two can be mixed together).
All support all three request modes, namely Asynchronous, Synchronous and Non-Blocking Synchronous.
All give the option of receiving all, none, or some fields from the record (subject to permissioning restrictions).
All give the option of subscribing to the results of the request. See Subscription and Updates for further information.

To make the interface to the various request types as consistent as possible, helper classes are used.

Bulk requests are preferred to individual requests. For example, if you have 1000 symbols you wish to request, a single GetMultipleEqual is preferred to launching 1000 individual GetEqual requests. This has various advantages:

More efficient processing both client and server-side.
More bandwidth efficient.
Less likely to cause resource limits to be reached for your session. For example, the Content Gateway only allows so many requests to be pending at the same time for a particular user; if this limit is reached your request will be failed with an appropriate status code. In this case client code is likely to retry the request which causes more load.

Record Request Helper Classes

Each request type has an associated helper class which works in conjunction with ContentGatewayClient to allow requests to be made simply and efficiently. They are named GetFirst, GetLast, GetNext, etc. to match the name of the request.

The helper class:

Makes the correct request parameters available to you under the standard name 'RequestParameters'.
Makes the correct response parameters available to you under the standard name 'ResponseParameters'.
Has methods which let you submit your request as Synchronous, Asynchronous or Non-Blocking Synchronous.
Has methods which decode asynchronous responses for you.

The helper classes are nested classes of the ContentGatewayClient, so are accessible as (for example) ContentGatewayClient::GetFirst. If you are within a class derived from ContentGatewayClient, you can dispense with the scope operator and just write GetFirst.

Example Record Requests

To demonstrate the interaction of ContentGatewayClient and the Record Request helpers, this section presents example record requests for all three request modes. The code fragments introduce types and concepts which have not yet been discussed – details of these will be presented in later sections.

Synchronous Request Mode

See DoSynchronousGetFirstRequest() in DocumentationSample.

Asynchronous Request Mode

Here is an example of how to make an asynchronous GetEqual request for Microsoft Corporation's NASDAQ quote, MSFT.Q. We ask for only the ASK and BID prices. The request is canonical, i.e. does not make use of navigation.

See DoAsynchronousGetEqualRequest() in DocumentationSample.

The above launches the request and returns immediately. To receive the data we need to override a callback.

See OnGetEqualResponse() in DocumentationSample.

Each record request type has a corresponding overrideable response handler in ContentGatewayClient.

Asynchronous requests offer the highest possible performance and throughput for your application.

Non-Blocking Synchronous Request Mode

Here is an example non-blocking synchronous version of the above request.

See DoNonBlockingSynchronousGetEqualRequest() in DocumentationSample.

Non-Blocking Synchronous requests are almost always a higher performance choice than pure Synchronous requests, because they allow you to overlap requests or do other work while the request is executing. They still offer you the convenience of picking up the results within your own thread context and flow-of-control, rather than via some separate callback function (as in the asynchronous case). They are not as performant as fully asynchronous requests.

RequestParameters

Having looked at the basic form of all three record request modes, we need to look in more detail at the parameters being used.

Common Parameters

RequestParameters for all record requests include the following members:

Flags

Possible values for m_flags are:

	contain ‘alias’ records, which the case and instead you’ll receive –

Permission Level

Possible values for m_permissionLevel are:

MaxResponseBlocks

The m_maxResponseBlocks member indicates the maximum number of response blocks that should be returned in a single response. If the total response is too large to send in one go, it will be sent as a multi-part response with a maximum of m_maxResponseBlocks response blocks per partial response.

RequestBlockList

The m_requestBlockList member specifies the fields being requested. This is a list of RequestBlock objects, each of which has the following members:

Flags

Possible values for m_flags are:

Refer to 4.2 Using the Navigation Model in Requests for a discussion of canonical and navigational requests and field scope. Canonical requests are made by specifying RELATIONSHIP_ID_NONE. Navigation requests are made by specifying a valid relationship Id value for m_relationshipId, this is then the scope of each field in the list.

Canonical and navigational requests can be mixed together in a request, just use RELATIONSHIP_ID_NONE in one RequestBlock and valid relationship Ids in others.

The Content Gateway will fail requests if the same relationship Id appears in more than one request block. It is never necessary to do this – just specify the additional fields you require in the first block for that relationship.

A record request takes a list of request blocks, and this list applies to all keys specified in the request. For example, if you do a GetMultipleEqual on MSFT.Q and DELL.Q, the same request blocks apply to both. If you need different request blocks for each key, you must launch two separate requests.

The combination of a requested symbol and a request block is called a *partial request*. The number of partial requests in a complete request is therefore equal to the product of the number of requested symbols and the number of request blocks. A valid response will have at least this number of response blocks (more if a one-to-many navigation link was used; potentially less if there was a problem with the request).

Request-Specific Parameters

In addition to the common parameters, record requests need the following additional parameters depending on request type.

ResponseParameters

All record requests share a common response data format. There are no bespoke parameters for any record request type. A ResponseParameters object contains the following fields:

The response format is somewhat complex, so the discussion is split into sub-sections below.

Cookie

If subscription was used in the request, this cookie must be used when unsubscribing. Otherwise it is set to SUBSCRIPTION_COOKIE_UNDEFINED.

For further discussion of subscription cookies, please see Subscription and Updates.

ResponseBlockList

The m_responseBlockList member contains the bulk of the response data as a list of ResponseBlocks.

The ResponseBlock is the most significant object in record data responses. It defines a set of field data values for a particular partial request.

Typical responses include at least one ResponseBlock for each RequestBlock in the request. If, however, a one-to-many navigation link was used in a RequestBlock it will generate multiple ResponseBlocks, one for each target of the navigation link.

Furthermore, GetMultipleEqual, GetMultipleMatch, GetMultiplePatternMatch and GetMultiplePatternMatchList operations will return ResponseBlocks for each requested symbol. It is easy to see that a ‘multiple’ request which also uses one-to-many navigation links can potentially lead to a large response.

ResponseBlock has the following format:

Relating Response Data to your Request

A typical request may include many request blocks, using various different relationshipIds and fields. Requests like GetMultipleEqual also provide a list of keys in one step. The result can be a long list of response blocks.

Here are example request and response blocks for a GetMultipleEqual request for two stocks. We ask for the last close price and a security level item, the current dividend yield.

Requested key 1: MSFT.Q
Requested key 2: MMM.N

RequestBlock1:

RequestBlock2:

As long as the request succeeds, the response blocks will look like this (ignoring table numbers, which will be present in both of the key fields):

ResponseBlock1:

ResponseBlock2:

ResponseBlock3:

ResponseBlock4:

Each response block holds enough information to let you match it back to the relevant part of the request. The combination of m_resolvedKey and m_relationshipId gives you the relevant request block and requested symbol.

Significantly, the response block gives you the mapping of request key to canonical response key. From the above, we now know that our request for MSFT.Q, RELATIONSHIP_ID_SECURITY led us to the canonical key MSFT.SEC. Similarly we know that MMM.N, RELATIONSHIP_ID_SECURITY led us to MMM.SEC. This may be important to us when we come to receive updates on MSFT.SEC and MMM.SEC, since the updates are marked only with the canonical keys.

There are some further example request and response blocks in Appendix 1 - Example RequestBlock and ResponseBlock usage.

Status

The status field applies only to this ResponseBlock. Remember that there is also a status associated with the response as a whole. This is determined by calling ContentGatewayClient::IsValidResponse().

m_status field can take any of the following values:

STATUS_SUCCESS indicates that the data in this ResponseBlock is good.

To understand the relationship Id status values, bear in mind that a relationship Id defines a mapping between a source symbol and a target symbol or symbols. The source symbol is the one you specified in the request, the target is the one that the navigation walk leads you to.

This mapping is held in a database table in the Content Server. When navigation resolution takes place, either the source or the target of the mapping may be missing from the table (STATUS_SOURCE_NOT_FOUND, STATUS_TARGET_NOT_FOUND), there may be no entries at all for this relationship Id (STATUS_NAVIGATION_NOT_FOUND), or your user Id may not be permissioned to use the relationships (STATUS_NAVIGATION_NOT_PERMISSIONED). Finally, the Content Gateway may not recognize the relationship Id that you have specified (STATUS_RELATIONSHIP_NOT_FOUND or your user Id may not be permissioned to use it (STATUS_RELATIONSHIP_NOT_PERMISSIONED).

Flags

The m_flags member can have the following values:

Field Data

m_fieldData is a self-describing but compressed block of field values and field-level status. The same format is used for record updates. Please see 5.10 Parsing Field Data for a full description of how to decode this data.

Relationship Id

The m_relationshipId value matches the relationship Id that you specified in the request block.

Request and Response Keys

The field is the key specified in the original request before any server-side resolution takes place

The field indicates to which requested symbol a particular response block relates. You may have specified the requested symbol(s) directly (GetEqual or

GetMultipleEqual) or it may be implicit (GetFirst, GetNext, GetLast, GetPrevious, GetMultiplePatternMatch, GetMultiplePatternMatchList). Note that always includes the correct table number even if you did not specify it in the request.

The value of is the canonical key of the target data, regardless of whether you made a canonical or navigational request. The fields in the response block always refer to the Again, always contains the correct table number.

For a canonical request, m_resolvedKey == m_responseKey. For a navigational request, you can consider m_resolvedKey the "source" of the navigation and m_responseKey as the "target".

Responses and Update Handling

Earlier examples have shown that the response key in the response from a navigational request may not match the key asked for in the request. For this reason, responses are always marked with both the request key (m_resolvedKey plus m_relationshipId) and the (canonical) response key (m_responseKey).

Updates are marked with canonical (response) keys only. A client making a subscription request generally needs to remember the mapping of resolved key to response key as it cannot match updates to the related request without this knowledge.

Subscription and Updates

Receiving updates to records returned by an interactive request is controlled by the m_subscribeParameters member of the RequestParameters classes. It is similar to the subscription options available when using the SubscribeToFeed() method. Here are the members of the SubscribeParameters class:

If the value of m_subscribeParameters.m_type is TYPE_NONE, users will receive a 'snapshot' of the data they requested, with no subsequent updates.

If two requests are made for the same symbol, one specifying a subscription type of TYPE_EVENT_TYPE_FILTER_INCLUDE_LIST and one TYPE_EVENT_TYPE_ FILTER_EXCLUDE_LIST for the same event type, inclusion is given preference – i.e. the client will receive any updates for that symbol.

If subscription was requested, a valid m_subscriptionCookie is returned in ResponseParameters, provided the request succeeded. When the updates are no longer desired, the subscription should be canceled by passing this cookie to one of the unsubscribe methods in ContentGatewayClient.

This unsubscribe mechanism is designed to work correctly with both canonical and navigation-based requests, even if the resolution of the navigation-based request has changed since it was made (see Updating Navigation Links).

Partial Unsubscribe

Where a multiple symbol request has been made, Unsubscribe(cookie, sourceSymbolIdList) may be used to unsubscribe from part of the result set.

Note - the granularity of partial unsubscribe is limited to those symbols specified in the **request**; not those received in the response as part of a navigation walk. For example, if I make a GetEqual request for =DJI.CB but use navigation to retrieve all Dow Jones Industrial constituents, I can unsubscribe from all the constituents but not from individual constituents. If on the other hand I make a canonical GetMultipleEqual request for MSFT.Q and IBM.N I can unsubscribe separately from either symbol.

Subscription information

It is possible to query the Content Gateway to retrieve the current active subscriptions. This is accomplished using the ContentGatewayClient::GetSubscriptionInfo() method. It takes two parameters: the first parameter is the permission level for which you wish to retrieve the subscription information (currently Feed::PERMISSION_LEVEL_REALTIME and Feed::PERMISSION_LEVEL_DELAYED are supported). The second parameter is a reference to a SubscriptionInfoList object. If the call is successful, the SubscriptionInfoList object will be populated with all the symbols that are currently subscribed at the given permission level and the number of times each symbol has been subscribed.

Conflated Updates

In addition to subscribing to full updates the Content Gateway API allows the client to request conflated updates on a per subscription basis. Conflation is applied inside the Content Gateway per symbol using the event type (see later) of the update and requested conflation type to determine whether the update should be conflated or sent to the client.

Conflation is only available when the subscription is of TYPE_FULL. Conflation is controlled by the m_conflationParameters member of the RequestParameters classes. The members of the ConflationParameters class are detailed below:

The Content Gateway currently supports two forms of conflation - quote and trade. m_interval governs the time period over which updates will be conflated before being sent to the client.

If a user requests CONFLATION_TYPE_QUOTE then the client will receive all non-quote updates without any delay. All quote data will be conflated such that only a single quote update is received within each time interval. If a non-conflated event occurs such as a trade / correction / cancelation then the interval will terminate prematurely and the current cache will be sent to the client followed by the non-conflated update. A new conflation interval will start at receipt of the next quote update.

When using CONFLATION_TYPE_TRADE all quote and trade data is conflated over the defined interval. Given that updates outside of trades or quotes are infrequent this will essentially limit the number of updates that any one symbol can produce to one update per interval. At the end of a time period the currently conflated updates are sent to the client and a new time period is started.

In the event that a symbol has been subscribed to multiple times with differing conflation parameters, the client will receive updates conflated with the parameters constituting the least conflation. This selection favors conflation type over interval so if a client

subscribes with CONFLATION_TYPE_QUOTE at 500ms and CONFLATION_TYPE_TRADE at 100ms then the client will receive CONFLATION_TYPE_QUOTE at 500ms.

Updating a Subscription Conflation Parameters

The Content Gateway API supports modification of the conflation parameters being applied to each subscription in real-time. This removes the need for the client to unsubscribe and subsequently re-subscribe solely to change conflation parameters.

The conflation parameters are modified by calling the ContentGatewayClient method UpdateSubscriptionConflationParameters() which takes as its parameters the subscription cookie received during the original subscription and the new conflation parameters to be used.

Dynamic Conflation

The Content Gateway supports dynamic (adaptive) conflation. In broad terms this allows a client's subscription set to have variable intervals of conflation applied in an attempt to manage the bandwidth and/or server side resources used by a particular client. The decision to allow the application of dynamic conflation is at the client's discretion and is enabled on a per subscription basis by setting m_shouldEnableDynamicConflation to true.

There are two scenarios which will lead to the Content Gateway applying dynamic conflation to a client's subscription set. Firstly if the Content Gateway determines that a client is not consuming data at a sufficient rate then the Content Gateway will increase the level of conflation being applied. Secondly the Content Gateway API allows a client to define a bandwidth limit for the client connection (see below) which the Content Gateway will attempt to maintain. The level of conflation will be increased if the client bandwidth usage exceeds the requested limit.

When dynamic conflation is applied to a client the type of conflation is always changed to CONFLATION_TYPE_TRADE; this ensures that trade updates do not overwhelm the attempt to manage the resource usage. This also allows dynamic conflation to be enabled with CONFLATION_TYPE_NONE. If further conflation is required then the interval will be incremented to the next supported interval of the Content Gateway. These increments will continue to occur until the resource usage and/or bandwidth is within the required limits.

Any additional conflation applied to a client's subscription set will be gradually removed once the resource usage returns to normal and the client bandwidth usage drops below the requested limit.

In the event that the Content Gateway changes the conflation parameters of a client subscription the client will be notified via the ContentGatewayClient callback OnDynamicConflationChange(). This callback provides a class containing details of which subscriptions were changed and why.

Setting the Client Bandwidth Limit

The Content Gateway API allows a client to specify a bandwidth limit to be applied to their subscription set. This will cause individual subscriptions with dynamic conflation enabled to have more conflation applied in the event that this bandwidth is exceeded. The client bandwidth limit can be set by calling the ContentGatewayClient method UpdateClientConflationParameters() which takes as its parameter a class of type ClientConflationParameters which is detailed below.

Deletes

A delete is an update that has the FLAG_DELETE bit set. This informs the user that any cached values for the deleted item should be invalidated, and that no further updates will be received on the item.

Multi-Part Responses

Record requests based on GetMultipleEqual, GetMultiplePatternMatch, GetMultiplePatternMatchList, GetMultipleMatch or navigational requests using one-to-many navigation links can have large results sets. The Content Gateway may split these up and send them to the client in multiple parts – this is termed a *multi-part response*. The Content Gateway does this to protect other clients from being 'locked out' by large requests. The Gateway tries to give each connected client a fair share of its resources.

The effect of a multi-part response from the ActivContentGateway API programmer's point of view depends on the request mode used. For synchronous requests, there is no apparent difference as far as the programmer is concerned – the request call blocks until all parts have been received and a single ResponseParameters object is returned with the complete data set. (Remember that synchronicity is implemented purely on the client).

For asynchronous requests, the Response callback will be called multiple times with the same RequestId; that of the original request. The ContentGatewayClient provides the IsCompleteResponse() method to allow you to test for the last part of a multi-part response. Note that the decoder functions in the request helper classes do not clear the ResponseParameters passed to them – you can pass the same ResponseParameters object from each Response callback to build up the complete result set.

For the non-blocking synchronous case, the status code returned by the helper class GetResponse() method is STATUS_CODE_PENDING if there is an additional part to be retrieved. The user should continue to call GetResponse() until it returns STATUS_CODE_SUCCESS or an error code.

5.9 Processing Record Updates

Both feed-level and interactive users receive record updates by overriding the virtual ContentGatewayClient method OnRecordUpdate(). Feed-level users also receive refreshes this way.

See OnRecordUpdate() in DocumentationSample.

RecordUpdate

The RecordUpdate structure contains the following fields:

	– – – – – –

The m_symbolId is always the canonical key of the item being updated.
m_updateId is a sequential counter which is incremented each time an update is sent.

m_eventType is an enumeration which indicates the cause of the update. See the header file include/ActivContentPlatform/ActivFeedCommon/EventTypes.h for a current list.

An update will be received when a field (or fields) have changed in a record due to an event. The update will contain the set of fields that have changed plus additionally certain event types will always include a minimal set of fields, described in appendix A. If FLAG_REFRESH is set, all fields are present.

The RecordUpdate class provides the self-explanatory helper methods IsNewRecord() and IsDelete().

The 'stale' concept is described further here:
http://support.activfinancial.com/modules/smartfaq/faq.php?faqid=50

5.10 Parsing Field Data

Field data is sent as a self-describing but opaque data block. The format is the same regardless of whether the data was sourced from a record response, or an update.

To decode the field data, use the FieldListValidator class. It accepts a reference to the m_fieldData object of an update or response and provides the following functionality:

Parses the data into a map of field Id to field status and field values
Provides random access to fields via GetField(FieldId)
Provides forward const iterator support through the fields

The validator caches the field data it parses, which then has a lifetime independent of the m_fieldData used to initialize it. This means the validator can be retained as an efficient field data cache even after you return from the function or callback where you received the update message or response.

The access methods of the FieldListValidator return Field objects, which contain the following members:

Field status can have any of these values:

	'undefined'.

IFieldType * is a pointer to one of the basic field types supported in the ACTIV Content

represented by separate objects with appropriate access methods. Currently Tick, HistoryBar and IntradayBar objects are defined. These all derive from a common base, FieldSet, which provides limited common functionality such as conversion of the data to string form for debugging purposes.

Request Types

The following interactive requests return time series data:

GetHistory
GetIntraday
GetTicks

These return closing price history series, intraday bar series of various periods, and tick-by-tick data series respectively. The TSS can maintain a configurable amount of tick-by-tick and intraday bar history (subject to available storage space). 10 years or more of closing price history are available, depending on which stock is requested.

Common Characteristics

Time series requests all take the same RequestParameters object. Some values (e.g. field filters) are applicable to only some request types, as described in the following sections. The Content Gateway fails requests that have invalid parameter combinations.

All three request types support both synchronous and asynchronous request modes.

All three request types support a GetFirst / GetNext style request mode. This differs somewhat from the record request non-blocking synchronous implementation, and is discussed further below.

Helper Classes

As is the case for record requests, there is a helper class for each time series request type, and these are implemented as nested classes of ContentGatewayClient. The helpers make correctly typed RequestParameters and ResponseParameters objects available and allow requests to be initiated using any of the available request modes. They also provide decoders for asynchronous responses.

Overrides

The ContentGatewayClient class provides the following virtual methods which may be overridden to receive asynchronous time series responses:

Example Time Series Requests

Here are some examples of typical time series requests which demonstrate the available request types and the role of the helper classes.

Synchronous GetFirst / GetNext for Closing Price History

See DoSynchronousGetHistoryRequest() in DocumentationSample.

Asynchronous GetFirst / GetNext for Tick Series

See DoAsynchronousGetTickRequest(), OnGetFirstTicksResponse() and OnGetNextTicksREsponse() in DocumentationSample.

Extracting Time Series Data

Once you have a valid ResponseParameters object you can extract the time series points from the m_fieldSetList member. This is an STL vector where each entry is a Tick, a HistoryBar or an IntradayBar depending on the request you made. It is normally preferable to use a separate handler for each of these types, since each provides functionality and accessors specific to the series being returned. For a simple example of handling a tick series response, see DisplayFieldSetList() in DocumentationSample.

For full details of the access methods of Tick, HistoryBar and IntradayBar, please see the relevant header files.

Request Modes for Time Series Requests

The synchronous and asynchronous behavior for time series requests is the same as for record requests; the former blocks the caller's thread until the results are available, returning these as out parameters; the latter returns immediately and the results are delivered by an asynchronous callback at some later time.

There is no direct equivalent of non-blocking synchronous request mode for time series requests. Instead there is a request mode (referred to as GetFirst/GetNext) which allows the client to retrieve multi-part response messages whilst controlling the rate at which time series data is received. This cookie-based mechanism is explained in the following section.

TimeSeriesCookie

A time series request may specify a very large data set. For example, a request for 1 day of tick data (quotes plus trades) for an active stock may contain over a million data points.

There are two reasons why the initial response to a time series request may not contain the full data set:

1. The Gateway imposes a limit on the size of responses, to protect other Feed API clients against being 'locked out' while the Gateway services a very large request.

2. It is good practice for Feed API application programmers to specify a maximum response size when they make the request. The response will then contain at most this number of data points. This allows the programmer to control the amount of data received and avoid being 'swamped'.

In either case the return code of the initial time series request will be STATUS_CODE_PENDING. The user needs to have a way to request the remainder of the series, and this is supported by the use of TimeSeriesCookie.

All time series responses include a TimeSeriesCookie. This contains all of the state necessary for the Content Gateway to continue a fetch operation where it left off. The cookie allows the server side of time series requests to be implemented statelessly, which enhances scalability.

The time series request helper classes offer the methods SendGetNextRequest and PostGetNextRequest which allow the next part of the dataset to be retrieved. Call either of these passing the cookie. They both return a further cookie and the next part of the response. They return STATUS_CODE_SUCCESS if the final part of the response has been retrieved, and STATUS_CODE_PENDING otherwise. The process should be repeated until STATUS_CODE_SUCCESS (or an error code) is returned.

Because the server side of the request is stateless, there is no obligation on the ActivContentGateway API programmer to complete the request in any particular time frame, or indeed at all. The only proviso is that the data must still be in the database by the time the cookie is used, otherwise the next part of the request will fail.

The synchronous method pair SendGetFirstRequest / SendGetNextRequest is similar in some respects to the non-blocking synchronous request mode used in the record request model.

There is no record request equivalent of the asynchronous PostGetFirstRequest / PostGetNextRequest pair. Similarly, there is no time series equivalent of the asynchronous multi-part responses that the Content Gateway supports for record requests – additional time series response parts are never sent by the Content Gateway unless the client explicitly requests them using a SendGetNextRequest or PostGetNextRequest call.

RequestParameters

All time series requests share the same parameter format, which has the following structure:

It is not necessary to specify a table number when setting m_symbolId – use

Flags can be either or . The former causes results to be returned in decreasing date order (i.e. most recent data point first), while the latter causes the order to be reversed (oldest data point first).

A maximum of m_maxFieldSets data points will be returned from your request. If the number of data points in the entire requested series exceeds this value, you can request the remainder using GetNext with the cookie.

Series type can take the following values:

Only history series types will be accepted for GetHistory requests, and only intraday series types will be accepted by GetIntraday requests. GetTick requests currently have only one possible series type.

RecordFilterType currently has values defined only for tick and intraday series:

	Return only 'normal' trades.
	Return only 'normal' trades.

The tick database records both quotes (separate asks and bids) and trades. TICK_RECORD_FILTER_TYPE_REGULAR_TRADES excludes trade types such as late trades, but the exact definition of what is included is exchange-specific.

FieldFilterType can take the following values:

There is no field filter for tick series. Mini bars include Date/Time, Open, High, Low, Close and Volume values but exclude 'value added' values such as VWAP-related fields.

Specifying Periods for Time Series

The range of data points in a time series request can be specified very flexibly using the m_periodList member of the request parameters object.

m_periodList is a typedef for an STL vector, and can accept any number of Period objects.

Each period object has a PeriodType taken from the following selection:

Periods are designated as absolute or relative, depending on whether their value denotes a fixed point in the database. The third column of the above matrix denotes absolute types by 'A' and relatives by 'R'.

The rules for building a valid m_periodList are as follows:

1. Any number of Periods may be added to the list.
2. The first Period in the list defines the oldest data point in the request range.
3. The last Period in the list defines the youngest data point in the request range.
4. At least one absolute period must be specified.
5. No more than two absolute periods may be specified.
6. A relative period may not appear between two absolute periods.
7. There may be any number of relative periods before an absolute.
8. There may be any number of relative periods after an absolute.
9. If a sequence of more than one relative is adjacent to an absolute, the relatives are applied in order of proximity to the absolute and the effect is cumulative.

The Content Gateway will validate the contents of the list and fail requests with invalid combinations.

The idea is that the list is interpreted in chronological order, from the first entry to the last. Absolute periods can be mapped onto fixed points in the time series database and allow the meaning of relative periods to be understood as offsets. The offsets are before

the absolute period (going back in time) if the relative value appears in front of the absolute in the list, and vice versa.

Here are some examples of the uses of the period list.

Two DateTimes

PeriodList entries (in order, top is first in list):

The time series will begin on 20 July 1999 (the least recent point) and run until 20 July 2000 (the most recent point). The Content Gateway will reject time series requests if the specified Periods in the list are not in chronological order (oldest time is first in list).

Use now to get a series ending at the current time

PeriodList:

The time series will begin at 1-JUN-2003 12:45 and run until the latest point available in the database at the time the request is processed.

Use a count to get additional data points

PeriodList:

The time series will run from 50 points before the point at 1st June 2003 12:45pm until the latest available point. This kind of request can be useful when performing technical analysis on charts – for example, when calculating a 50 point moving average. To avoid gaps in the display, 50 additional points are needed at the beginning of the main data range. It is generally not possible to guess what DateTime to use to get these additional points.

This case illustrates the mixture of relative and absolute periods in the list. Because it is followed by 1-JUN-2003 12:45, the data point count is interpreted as an offset going back in time from that date time.

Relatives may not appear between two absolutes. There is no sense in the following:

There may or may not be as many as 50 points between these two date times in the database – the data point count is irrelevant either way, since the data range is unambiguously established by the two absolute Periods.

Use minus infinity to retrieve all data

PeriodList:

The time series will contain the entire series held in the database.

Use plus infinity to request coherent real-time updates

PeriodList:

The time series will contain all points from one trading day ago until now. Use a specific data point address

PeriodList:

The data point address of the last point in a series is available from the TimeSeriesCookie object. The above request is a convenient way to request an additional 100 points of data starting precisely where a previous request left off.

The best way to become familiar with the capabilities of the period list is to make some trial requests using the ActivContentGatewayApiSample program.

ResponseParameters

The time series response parameters class has a single member m_fieldSetList, which is an STL vector of HistoryBar, IntradayBar or Tick objects depending on the request made.

These objects derive from a common base class called FieldSet. FieldSet supports the basic access functions GetField, SetField and GetType which allow the derived types to be treated in a polymorphic way. Normally, however, the accessor methods of the derived type should be used for efficiency and flexibility.

The following section gives a brief overview of the data available in each object.

HistoryBar

The HistoryBar class is used to store daily, weekly, and monthly data points. Fields supported include date, open, high, low, close, total volume and VWAP fields (total value, total price, and tick count).

All historical data available through the Content Gateway has split factors applied. Future versions of the Content Platform and Feed API may represent aggregate dividend and split adjustment fields in the bar, instead of adjusting the closing price.

Depending on request parameters, some fields may not be populated – specifically, the VWAP related fields are not transmitted if the
filter is specified. Unused fields are not transmitted over the network.

IntradayBar

Pre-built Intraday Bars are constructed by the Content Server from tick data for various time intervals.

Tick

The Tick class represent a single trade or quote made on an instrument.

Valid tick types are:

5.12 Symbol Directory Requests

The Symbol Directory is a sub-process of the Content Gateway; it keeps track of all instruments and certain fields which can be searched upon. Currently these fields are (311) and (301). More fields will be added in due time.

The symbol directory API offers functions for searching instrument names and local codes to get matching symbols. There is also an option to filter the matching symbols on entity types.

Request Types

The following interactive requests return symbol directory data:

GetSymbols

The GetSymbols is available in synchronous, asynchronous and non-blocking synchronous modes.

Helper Classes

As is the case for record requests, there is a helper class for the symbol directory request type, and this is implemented as a nested class of ContentGatewayClient. The helpers make correctly typed RequestParameters and ResponseParameters objects available and allow requests to be initiated using any of the available request modes. They also provide decoders for asynchronous responses.

Overrides

The ContentGatewayClient class provides the following virtual method which may be overridden to receive asynchronous symbol directory responses:

Example Symbol Directory Requests

Here are some examples of typical symbol directory requests which demonstrate the available request types and the role of the helper classes.

Synchronous Request Mode

See DoSynchronousGetSymbolsRequest() in DocumentationSample.

Asynchronous Request Mode

See DoAsynchronousGetSymbolsRequest() and OnGetSymbolsResponse() in DocumentationSample.

Non-Blocking Synchronous Request Mode

See DoNonBlockingSynchronousGetSymbolsRequest() in DocumentationSample.

RequestParameters

The symbol directory request parameters format has the following structure:

Currently the only fields available to search on are (311) and (301). Other fields to search on will be added, such as (293).

When searching for a name, the symbol directory tries to match the string against all words in the name, and a trailing wildcard character ("*") is not required. When searching for a local code, the symbol directory tries an exact match on the local code.

m_filterType can be
or .

will perform no filtering on the results and is the default,
will only include entity types in the list and
will exclude entity types in the list from the response.

m_matchType is only used when searching for a name. It can be to perform a partial match on the provided string, or for an exact match on a single word. The default is .

ResponseParameters

The symbol directory response parameters format has the following structure:

The SymbolResponse object represents one instrument that matched the request and has the following structure:

The symbol can be used in subsequent calls to the Content Gateway, such as GetEqual.

Flags can be or . They are used internally and can be safely ignored.

Overrides

The ContentGatewayClient class provides the following virtual methods which may be overridden to receive asynchronous news server responses or updates for a subscription request:

Example News Server Requests

Here are some examples of typical news server requests which demonstrate the available request types and the role of the helper classes.

Synchronous Request Mode

See DoSynchronousNewsServerRequest() in DocumentationSample.

Asynchronous Request Mode

See DoAsynchronousNewsServerRequest() and OnGetNewsStoriesResponse() in DocumentationSample.

Non-Blocking Synchronous Request Mode

See DoNonBlockingSynchronousNewsServerRequest() in DocumentationSample. This example also shows how to subscribe to new stories matching the query; see OnNewsUpdate() for an example of processing these updates.

RequestParameters

The news server request parameters format has the following structure:

	– –

is the query to specify what stories you wish to be returned. It can contain tags and operators for those tags. The operators are , e.g. . Note that the NOT operators can only be ANDed. To retrieve every story, use * (an asterisk). Tags are specified as: tag=value. Valid tags are:

symbol	

Here are some example queries:

is used to specify where to start the search from and should be populated with the last symbol received from a previous request (see below). All other fields in the request should be the same as the initial request, this is to approximate a GetNext type request.

The news server response parameters format has the following structure:

will be populated if the request had the subscription flag set; it can be used to unsubscribe from the query using the Unsubscribe() method. It is also used in news updates to identify which query the update matched (see below).

Each entry in represents one news story that matched the query and has the following structure:

can be used in subsequent calls to retrieve more fields, or used in .

The news update format has the following structure:

has the same structure as each entry in above.

will contain a subscription cookie for each request you made that this news story matches. This can be used to work out which news stories match which query, by matching against the subscription cookies returned in the response (see above).

News Story Specific Fields

- the language of the news story e.g. ‘ ’, ‘ ’, ‘ ’.

- the character set of the news story that should be used to display the story e.g. ‘ ’.

- for those sources that allow news stories to be linked together these two fields refer to the previous and next symbol. This is usually to provide further updates to a breaking story or to shorten larger stories. (Presently only supported by Dow Jones.)

- contains state information about the news story (see Enumerations.h). The indicator is used to identify an important story, like a news flash. The indicator is for stories that should not be archived. The indicator is for stories that should not create a news alert, this is for less important stories.

- is the date the story should be removed, and only applies to temporary news stories.

5.14 Metadata Requests

Using the ActivContentGateway API, you can access metadata about the feed itself. These metadata methods are available in the MetaData nested class of ContentGatewayClient.

Currently supported are the following:

Getting a list of the permission ids your user id can access, and the fields you have access to within each permission id: GetPermissionInfo()
A list of all tables that data can be requested from: GetTableInfoList()
A detailed specification of a particular table containing a list of the fields in that table, along with the type of each field (unsigned int, rational, etc.): GetTableSpecification()
A list of all navigational relationships that are available, or those that are available for a particular source context: GetRelationshipInfoList()
A list of all the field ids currently available on the feed, along with a description of the field, its type and the C++ name for the field: GetUniversalFieldHelperMap()
Information about a particular field id: GetUniversalFieldHelper()
The time-zone a particular exchange publishes its times in: GetExchangeTimeZone()

As usual, the ActivContentGatewayApiSample demonstrates each of these methods. Additionally, the MetaDataSample can use the metadata methods to generate up-to-date

copies of the FieldIds.h, RelationshipIds.h and TableNumbers.h header files. This may be useful when new content is added to the feed and you do not wish to hardcode any new table numbers or field ids in your code.

Note that only synchronous mode is supported for metadata requests so as such they should not be called regularly or in time critical code. The intention is they would be used on startup, or maybe once after a successful logon.

An exception to this is the field metadata methods, which cache the field information locally in your ContentGatewayClient once retrieved from the Content Gateway. In this case, it is safe to use the field metadata APIs as a replacement for the FieldIds.h interface (which is static and can only return useful information about fields known at the time the ActivContentGateway API was compiled). The same is true of the exchange time-zone method.

5.15 Feed Conflation

In addition to client requested conflation applied to subscriptions within the Content Gateway, an ACTIV data centre may also provide bulk conflation on a per table basis. This functionality is provided via a standalone conflation application (Conflator) which sits between the Downstream Content Server and the Content Gateway.

When a Conflator is present in the data path a standard subscription with no requested conflation will in fact be conflated, as there is no non-conflated data. The Content Gateway API function GetContentGatewayInfo() can be used to obtain details of any tables which have bulk conflation applied and the conflation interval(s) in use.

The Conflator has the capability to change the conflation interval being applied to each table in real-time. In the event that this occurs a ContentGatewayClient will receive notification via the OnFeedConflationChange() callback. The data provided within this callback will detail the table number which had its conflation interval changed and the previous and new values.

5.16 Important Auxiliary Classes and Types in the ActivContentGateway API

Here is a short description of some other important auxiliary classes and types in the ActivContentGateway API.

Feed::TableNo

Identifies a market data table or time series data table within the content platform.

Feed::FieldId

FieldId identifies a field in an Activ Content Server data table.

Feed::RelationshipId

Identifies a navigation relationship.

Feed::PermissionId

Identifies the permission group a record is associated with. For example, PERMISSION_ID_NASDAQ_LEVEL1.

Feed::Context

Context Identifiers are used by the Content Gateway to assist with navigation lookups, and may be regarded as opaque by the application programmer. Each symbol in the data universe belongs to exactly one context, which is represented by a context Id.

ContentGatewayApi::SymbolId

SymbolId represents a *fully qualified key*. 'Fully qualified' means that the correct table number is present.

Table number is the market data table where the specified symbol resides. Responses always contain a valid value for table number, but it is not mandatory to specify one when you make a request.

6.0 References

[1] ActivContentPlatformOverview.pdf. Find this in the docs/ActivContentPlatform directory of your SDK.

[2] Discussion Paper - In Search of Unique Instrument Identifier
Szeto, Iman et al.
Reference Data User Group (RDUG)
&
Reference Data Coalition (REDAC).
June 2003

[3] The C++ Standard Library. A Tutorial and Reference.
Josuttis, Nicolai M.
Addison-Wesley 1999.
ISBN 0-201-37926-0

Appendix 1 - Example RequestBlock and ResponseBlock usage

Here are some further examples which illustrate the use of request and response block. Note not all members of the RequestBlock and ResponseBlock classes are shown; only those of interest.

1. A simple GetEqual request for “MSFT.Q” for fields ASK and BID.

Requested Key : MSFT.Q
RequestBlock:

ResponseBlock:

This is a canonical request, so the resolved keys and response keys are equal and the relationship used is RELATIONSHIP_ID_NONE. There is only one response block, matching the single canonical request block.

2. A canonical GetMultiplePatternMatch request for latest trade prices for anything matching “MSFT”.

Requested Pattern: MSFT*
RequestBlock:

ResponseBlock1:

ResponseBlock2:

ResponseBlock3:

… and so on for all further symbols that begin with “MSFT”.

This was a canonical request, but the request specified (indirectly) multiple symbols, so there are multiple response blocks. The response keys together indicate the list of matches made by the Content Gateway for the “MSFT*” pattern.

3. A navigational GetMultipleEqual request for the current yield of the primary Microsoft Corp. and 3M Corp. securities traded on NASDAQ and NYSE respectively.

Requested Key 1: MSFT.Q
Requested Key 2: MMM.N
RequestBlock:

ResponseBlock1:

ResponseBlock2:

There are two response blocks. This is because there were two symbols in the request but only one request block, and the navigation link used was one-to-one.

The value allows us to relate the response blocks back to the requested symbols.

An excellent way to become familiar with the response format is to try out some sample requests using the ActivContentGatewayApiSample program, which ships as part of the ActivFeed API SDK.

Appendix 2 - Symbology Reference

Exchange provided ticker symbols are always part of the symbol and are typically used without alteration. Generally, a LocalCode field will also be provided in the database record that only contains the exchange provided ticker symbol. Most symbols contain the exchange delimiter '.' (dot) followed by the exchange code (see section A at the end of this document). The exchange portion of the symbol need not be at the end of the symbol (e.g. Market Market Quotes).

A2.1 Equities

<Issue Symbol>.<Exchange Code>

Examples: IBM.N, MSFT.Q

Composite U.S. equity symbols have no exchange code, but end in a period:
Examples: IBM**.**

A2.2 Equity Options

Option Roots

<Root Symbol>.<Exchange Code>

Examples: MSQ.OCC

Option Deliverables

<Root Symbol>#<Index Number>.<Exchange Code>

The index number is present only to ensure uniqueness of the symbol in cases where multiple deliverable records are associated with an option root. Exchange code is the same as that of the associated option root symbol.

Examples: MSQ#1.OCC

Option Contracts

<Root Symbol>/<Month Code>/<Strike Price Code>.<Exchange Code>

Examples: IBM/A/A.AO, MSQ/A/A.XO

A2.3 Futures

<Root Symbol>/<Year><Month Code>.<Exchange Code>

Examples: C/08H.CB, LC/08Z.CM

A2.4 Future Options

<Root Symbol>/<Year><Month Code>/<Strike Price ><Put/Call>.<Exchange Code>

Examples: C/8G/24000C.CB, LH/8G/42000P.CM

A2.5 Future Spreads

<Root Symbol>/<Year1><Month Code1>–<Year2><Month Code2>.<Exchange Code>

Examples: C/08H-08K.CB, LH/08J-08K.CM

A2.6 Market Makers

<Underlying Symbol>:<Market Maker Id>

Examples: MSFT.Q:LEHM, INTC.Q:ISLD

A2.7 Order Book

<Underlying Symbol>;<Order Id>

A2.8 Exchange Traded Funds

< Underlying Symbol >.<Exchange Code>

Examples: NIR.A, ONEQI.Q

A2.9 Forex

Spots

<Base Currency><Value Currency>.<Exchange Code>

Examples: USDGBP.TF, AUDEUR.TF

Spot quotes

<Base Currency><Value Currency>.<Exchange Code>:<Market Maker Id>

Examples: USDGBP.TF:BARC, CADDKK.TF:DRES

Forwards

<Base Currency><Value Currency>/<Forward Code>.<Exchange Code>

where Forward Codes is one of:

ON - Overnight
SN - Spot Next
TN - Tomorrow Next
<Number><Duration> where <Duration> can be one of:

W - Weeks
M - Months
Y - Years

Examples: USDGBP/1W.TF, CHFEUR/2Y.TF

Forward quotes

<Base Currency><Value Currency>/<Forward Code>.<Exchange Code>:<Market Maker Id>

Examples: NZDHKD/TN.TF:UBSW

A2.10 Index

=< Issue Symbol>.<Exchange Code>

Examples: =COMP.Q, =XAX.A

A2.11 Mutual Fund

<Fund Id>.<Exchange Code>

Examples: BMCGX.Q, JAMFX.Q

A2.12 Money Market

<Fund Id>.<Exchange Code>

Examples: AALXX.Q, ITTXX.Q

A2.13 Rankings

CUMVAL/ACT+<Exchange Code>
Contains the top 20 most active equities based on cumulative value.

CUMVOL/ACT+<Exchange Code>
Contains the top 20 most active equities based on cumulative volume.

PERCENT/ADV+<Exchange Code>
Contains the top 20 advancing equities based on percent change.

PERCENT/DEC+<Exchange Code>
Contains the top 20 declining equities based on percent change.

Example: CUMVAL/ACT+Q, CUMVOL/ACT+Q, PERCENT/ADV+Q, PERCENT/DEC+Q

A2.14 Exchange Statistics

ISSUES/DAY+<Exchange Code>
Contains the number of equities that are up/down/unchanged on the day.

ISSUES/TICK+<Exchange Code>
Contains the number of equities that are up/down on the last tick.

CUMVAL/DAY+<Exchange Code>
Contains the cumulative value of equities that are up/down/unchanged on the day.

CUMVOL/DAY+<Exchange Code>
Contains the cumulative volume of equities that are up/down/unchanged on the day.

Examples: ISSUES/DAY+Q, ISSUES/TICK+Q, CUMVAL/DAY+Q, CUMVOL/DAY+Q

TICK+<Exchange Code>
Number of advancing equities - Number of declining equities.

TRIN+<Exchange Code>
(Number of advancing equities / Number of declining equities) / (Advancing cumulative volume / Declining cumulative volume).

Examples: TICK+Q, TRIN+Q

A2.15 News Stories

< News ID > /HL% <Magazine>

Example: 090b5625/HL%BIZ

A2.15 News Story

< News ID > % <Magazine>

Example: 090b5625%BIZ

Appendix 3 - Exchange List

Exchange Name	Exchange Code
NYSE_AMEX	A
EURONEXT_AMSTERDAM	AM
NYSE_AMEX_OPTIONS	AO
ASX	ASX
ALPHA_TRADING	ATS
NASDAQ_OMX_BX	B
BERLIN	BE
BORSA_ITALIANA	BIT
BULGARIAN	BL
BMF	BMF
BOSTON_OPTIONS	BO
EURONEXT_BRUSSELS	BR
BOVESPA	BS
BATS	BT
BATS_Y	BY
NSX	C
CBOE_C2	C2
CBOT	CB
CBOT_GLOBEX	CBE
INSTINET_CBX	CBX
CFE	CF
CHX_DIRECT	CH
CHI_X_CANADA	CHIC
CHI_X_EUROPE	CHIX
CME	CM
CME_GLOBEX	CMG
COPENHAGEN	CO
CONFLATION	CONF
CNQ	CQ
COMEX	CX
COMEX_ACCESS	CXA
DUSSELDORF	D
EDGA	DA
DUBAI_MERCANTILE_EXCHANGE	DME
DUBLIN	DU
EDGX	DX
NYSE_ARCA_DIRECT	EA
BATS_DIRECT	EB
BATS_Y_DIRECT	EBY

EDGA_DIRECT	EDA
EDGX_DIRECT	EDX
FUKUOKA_FULL	EFU
NASDAQ_DIRECT	EI
KABU	EK
EDX_LONDON	EL
NAGOYA_FULL	ENG
SAPPORO_FULL	ESP
TSE_FULL	ET
TOKYO_AIM_FULL	ETM
EUREX	EX
NASDAQ_OMX_PHLX_OPTIONS_DIRECT	EXO
NASDAQ_OMX_PHLX_OPTIONS_ORDERS_DIRECT	EXOO
FRANKFURT	F
FEED_STATUS	FEED
FIRST_NORTH_ESTONIA	FNEE
FIRST_NORTH_LITHUANIA	FNLT
FIRST_NORTH_LATVIA	FNLV
FIRST_NORTH_SWEDEN	FNSE
FUKUOKA	FU
HAMBURG	H
HANOVER	HA
HELSINKI	HE
HKFE	HF
HKSE	HK
ISE_DIRECT	I
ICELAND	IC
ICE	ICE
FIRST_NORTH_ICELAND	ISEC
ITA	ITA
JASDAQ	JQ
KCBOT	KC
KCBOT_ELECTRONIC	KCE
KOSDAQ	KQ
KOREA	KS
LSE	L
EURONEXT_LIFFE	LI
LME	LM
EURONEXT_LISBON	LS
LATENCY	LTCY
MONTREAL	M

SIBE_MERCADO_CONTINUO	MC
MEFF	MEF
MGEX	MG
MGEX_ELECTRONIC	MGE
MUNICH	MU
CHX	MW
NYSE	N
NYSE_ARCA_EUROPE	NAE
NYBOT	NB
NYBOT_ELECTRONIC	NBE
NAGOYA	NG
NYSE_LIFFE_US	NL
NYSE_BEST_QUOTES	NQ
NYMEX	NX
NYMEX_ACCESS	NXA
NYMEX_CLEARPORT	NXC
E_NYMEX_EUROPE	NXE
E_NYMEX	NXF
NYMEX_GLOBEX	NXG
NYMEX_EUROPE	NXL
US_OPTIONS_COMPOSITE	O
NYSE_OPEN_BOOK	OB
ONE_CHICAGO	OC
OMX_NORDIC	ON
OSE	OS
EURONEXT_PARIS	P
NYSE_ARCA	PA
NYSE_ARCA_OPTIONS	PO
PINK_SHEETS	PS
PURE_TRADING	PT
NASDAQ	Q
NASDAQ_BULLETIN_BOARD	QB
FINRA_ADF	QD
NASDAQ_OTHER_OTC	QO
OTCQX	QX
RIGA	RI
SCOACH	SC
SYDNEY_FUTURES	SF
SGX	SG
SAPPORO	SP
EURONEXT_SMART_POOL	SPO

STOCKHOLM	ST
STOXX	SX
TSE	T
TOCOM	TC
TENFORE	TF
TALLINN	TL
TOKYO_AIM	TM
TSX	TO
TSX_VENTURE	TV
TAIFEX	TX
US_VIRTUAL_BOOK	US-VB
VILNIUS	VN
CBOE	W
WCE	WC
NASDAQ_OMX_PSX	X
PBOT	XB
XETRA	XE
FIRST_NORTH_DENMARK	XFND
NASDAQ_OMX_PHLX_OPTIONS	XO
XOMF	XOMF
XOPV	XOPV
AKTIETORGET	XSAT
ISE	Y

This exchange list is subject to change, the latest exchange list can be extracted from TABLE_NO_EXCHANGE (37). An example of how to do this using one of the Content Gateway API samples is shown below:

Appendix 4 - Event Types

This appendix describes each of the event types used on ACTIV Feed and the fields associated with each event. The definition of event type can be found in the header file include/ActivContentPlatform/ActivFeedCommon/EventTypes.h (included as part of the ActivFeed API SDK), together with details of all allowed values for this field. Every update message disseminated on ACTIV Feed includes an event type. Some of the events have a specific set of fields associated with them which will always be included in a message. However, messages with these event types may also contain other fields besides the event specific set. Additionally, DCSes can be configured such that *only* the changed fields are forwarded (i.e. there would be no guarantee for a given event type that field N is always present).

A4.1 EVENT_TYPE_NONE

Used when there is no specific event associated with the message.

Fields always present:

None.

A4.2 EVENT_TYPE_TRADE

Indicates that a trade has occurred.

Fields always present:

FID_TRADE
FID_TRADE_CONDITION
FID_TRADE_DATE
FID_TRADE_EXCHANGE (only present for composite symbols)
FID_TRADE_SIZE
FID_TRADE_TIME

The following fields are also always present if they exist in the table that was updated by the message:

FID_TRADE_BUYER_ID
FID_TRADE_SELLER_ID

A4.3 EVENT_TYPE_TICK

Tick events are used when the trade fields associated with an instrument are updated at fixed time intervals. A good example of an instrument type that would have tick events rather than trade events is index.

Fields always present:

FID_TRADE
FID_TRADE_CONDITION
FID_TRADE_DATE
FID_TRADE_SIZE
FID_TRADE_TIME

A4.4 EVENT_TYPE_TRADE_CORRECTION

Indicates that a previous trade was reported incorrectly and includes the corrected values for the fields.

Fields always present:

FID_TRADE
FID_TRADE_CONDITION
FID_TRADE_DATE
FID_TRADE_SIZE
FID_TRADE_EXCHANGE (only present for composite symbols)
FID_TRADE_TIME

A4.5 EVENT_TYPE_TRADE_CANCEL

Indicates that a previously reported trade has been cancelled.

Fields always present:

FID_TRADE
FID_TRADE_CONDITION
FID_TRADE_DATE
FID_TRADE_EXCHANGE (only present for composite symbols)
FID_TRADE_SIZE
FID_TRADE_TIME

A4.6 EVENT_TYPE_TRADE_NON_REGULAR

Indicates that the information contained in the message is for a non-regular trade. An example of a non-regular trade would be a late trade. This event type was formerly called the now deprecated EVENT_TYPE_TRADE_LATE.

Fields always present:

FID_TRADE
FID_TRADE_CONDITION
FID_TRADE_DATE
FID_TRADE_EXCHANGE (only present for composite symbols)

FID_TRADE_SIZE
FID_TRADE_TIME

In the cash of late reported trades, the update message will include rules information for each of these fields that indicates that the value received in the message should not overwrite any cached (i.e. latest) value.

A4.7 EVENT_TYPE_BBO_QUOTE

Indicates that the message contains best bid/offer information.

Fields always present:

If any of the bid fields have changed as a result of an update then all of the following fields will be present in the resulting message:

FID_BID
FID_BID_CONDITION
FID_BID_EXCHANGE (only present for composite symbols)
FID_BID_SIZE
FID_BID_TIME

If any of the ask fields have changed as a result of an update then all of the following fields will be present in the resulting message:

FID_ASK
FID_ASK_CONDITION
FID_ASK_EXCHANGE (only present for composite symbols)
FID_ASK_SIZE
FID_ASK_TIME

If either a bid or an ask field has changed then the following fields will also be included in the message:

FID_QUOTE_DATE

A4.8 EVENT_TYPE_QUOTE

Indicates that the message contains the latest bid and ask information for a particular market maker.

Fields always present:

Exactly the same as detailed in EVENT_TYPE_BBO_QUOTE.

A4.9 EVENT_TYPE_COMPOSITE_BBO_QUOTE

Used internally in the system between the Upstream and Downstream content servers. This event type if forwarded by the Downstream Content Server as an EVENT_TYPE_BBO_QUOTE message and is processed in exactly the same way.

Fields always present:

Exactly the same as detailed in EVENT_TYPE_BBO_QUOTE.

A4.10 EVENT_TYPE_CLOSING_QUOTE

Used internally in the system between the Upstream and Downstream Content Servers to indicate that a market maker has stopped quoting for the day. It also includes the last values for the quote fields. This event type is forwarded by the Downstream Content Server as an EVENT_TYPE_QUOTE message.

Fields always present:

Exactly the same as detailed in EVENT_TYPE_BBO_QUOTE.

On receipt of this event type, the Downstream Content Server will indicate that the quote has closed by setting the STATE_BIT_CLOSED (see Enumerations.h) in the FID_STATE field (field id 361). It will also set the following fields:

FID_CLOSING_BID
FID_CLOSING_ASK
FID_CLOSING_QUOTE_DATE.

If this results in a change to the value of one of these fields, it will also be included in the update message.

A4.11 EVENT_TYPE_CLOSING_BBO_QUOTE

Used internally in the system between the Upstream and Downstream Content Servers to indicate that an instrument has stopped quoting for the day. It also includes the last values for the quote fields. This event type if forwarded by the Downstream Content Server as an EVENT_TYPE_BBO_QUOTE message.

Fields always present:

Exactly the same as detailed in EVENT_TYPE_BBO_QUOTE.

On receipt of this event type, the Downstream Content Server will set the following fields:

FID_CLOSING_BID

FID_CLOSING_BID_EXCHANGE (only present for composite symbols)
FID_CLOSING_ASK
FID_CLOSING_ASK_EXCHANGE (only present for composite symbols)
FID_CLOSING_QUOTE_DATE.

If this results in a change to the value of one of these fields, it will also be included in the update message.

A4.12 EVENT_TYPE_OPEN

Indicates that the instrument has opened.

Fields always present:

None.

On receipt of this event type, the Downstream Content Server will clear the Closed bit in the FID_STATE field to indicate that the instrument is now open.

See Enumerations.h for definitions of the State field.

A4.13 EVENT_TYPE_CLOSE

Indicates that the instrument has closed.

Fields always present:

None.

On receipt of this event type, the Downstream Content Server will set the following fields:

FID_CLOSE
FID_CLOSE_DATE
FID_CLOSE_EXCHANGE (only present for composite symbols)
FID_CLOSE_STATUS

The following fields will also be set but are only applicable for certain instrument types:

FID_CLOSE_CONDITION
FID_CLOSE_CUMULATIVE_VALUE
FID_CLOSE_CUMULATIVE_VALUE_STATUS
FID_CLOSE_CUMULATIVE_VOLUME
FID_CLOSE_CUMULATIVE_VOLUME_DATE
FID_CLOSE_CUMULATIVE_VOLUME_STATUS

If this results in a change to the value of one of these fields, it will also be included in the update message.

The Downstream Content Server will also set the Closed bit in the FID_STATE field to indicate that the instrument is now closed.

See Enumerations.h for details on how to interpret the Status fields and for definitions of the State field.

A4.14 EVENT_TYPE_RESET

Used to initiate the archiving and clear down of certain fields in readiness for the next trading day.

Fields always present:

FID_RESET_DATE

On receipt of this event type, the Downstream Content Server will set the following fields:

FID_PREVIOUS_ASK
FID_PREVIOUS_BID
FID_PREVIOUS_QUOTE_DATE
FID_PREVIOUS_CLOSE
FID_PREVIOUS_CLOSE_DATE
FID_PREVIOUS_CUMULATIVE_PRICE
FID_PREVIOUS_CUMULATIVE_VALUE
FID_PREVIOUS_CUMULATIVE_VOLUME
FID_PREVIOUS_CUMULATIVE_VOLUME_DATE
FID_PREVIOUS_NET_CHANGE
FID_PREVIOUS_OPEN
FID_PREVIOUS_PERCENT_CHANGE
FID_PREVIOUS_TRADE_HIGH
FID_PREVIOUS_TRADE_LOW
FID_PREVIOUS_TRADING_DATE
FID_PREVIOUS_OPEN_INTEREST
FID_PREVIOUS_OPEN_INTEREST_DATE

Note that some of these fields are only applicable for certain instrument types.

The Downstream Content Server will then clear down fields so they are ready to receive values on the next trading day. The fields that get cleared vary according to instrument type but will typically include all bid, ask, trade and volume fields.

A4.15 EVENT_TYPE_NEWS

Indicates that the message is a news story.

A4.16 EVENT_TYPE_NEWS_DELETE

Indicates that a news story should be deleted.

A4.17 EVENT_TYPE_PURGE

Indicates that a record is going to be purged from the Downstream Content Server database. It does not mean that the record has to be deleted on any client systems: It is simply used as a mechanism to clear out old records from tables where only a limited history is kept, e.g. a corporate actions table.

A4.18 EVENT_TYPE_ALERT

Indicates that some important property of a record has changed, generally relating to the trading of the record. For example, messages with this event type are generated when an instrument enters a restricted trading state.

A4.19 EVENT_TYPE_BBO_DEPTH

Indicates that any of up to 25 levels of Bid or Ask depth fields have changed. For example FID_BID2, FID_BID2_COUNT, FID_BID2_SIZE, FID_BID2_TIME.

Fields always present:

None.

A4.20 EVENT_TYPE_ORDER

Indicates that the message contains order details.

Fields always present:

None.

A4.21 EVENT_TYPE_STATUS_CHANGE

Indicates that the instrument has either halted trading or has resumed being traded.

Fields always present:

FID_STATE

The FID_STATE field indicates whether the instrument has halted or resumed. See Enumerations.h for details on how to interpret the State field.

A4.22 EVENT_TYPE_IMBALANCE_VOLUME

Indicates that the instrument has an imbalance of order volume.

Fields always present:

FID_IMBALANCE_BUY_VOLUME
FID_IMBALANCE_SELL_VOLUME
FID_IMBALANCE_VOLUME_TIME

A4.23 EVENT_TYPE_PRICE_INDICATION

Indicates that price indications are available for the instrument.

Fields always present:

FID_HIGH_INDICATION_PRICE
FID_LOW_INDICATION_PRICE
FID_INDICATION_PRICE_TIME

A4.24 EVENT_TYPE_REFRESH

Used internally on the upstream content servers to request a refresh of a record to be sent to all downstream content servers.

Fields always present:

None.

A4.25 EVENT_TYPE_REFRESH_CYCLE

Used internally between the upstream and downstream content servers to indicate that a complete refresh of the upstream database has been sent.

Fields always present:

None.

A4.26 EVENT_TYPE_OPTION_REFRESH

Used internally by the options feed handler translator devices to get a complete refresh of an options record to the content servers.

Fields always present:

None.

A4.27 EVENT_TYPE_CONFLATED

Indicates that the update contains conflated data. This event type is used when an update is sent to a client from a Content Gateway and contains more than one event type due to conflation. Additionally the Content Gateway can be configured such that when using CONFLATION_TYPE_TRADE all updates subject to conflation, whether containing mixed event types or not, are sent with this event type.

Fields always present:

None.

A4.28 Other Event Types

The following event types are used for corporate actions and are used by the Downstream Content Server to identify when adjustments need to be made to its database:

EVENT_TYPE_IPO
EVENT_TYPE_IPO_CANCEL
EVENT_TYPE_DELIST
EVENT_TYPE_DELIST_CANCEL
EVENT_TYPE_DIVIDEND
EVENT_TYPE_DIVIDEND_CANCEL
EVENT_TYPE_DIVIDEND_CORRECTION
EVENT_TYPE_SPLIT
EVENT_TYPE_SPLIT_CANCEL
EVENT_TYPE_SPLIT_CORRECTION
EVENT_TYPE_SYMBOL_CHANGE
EVENT_TYPE_SYMBOL_CHANGE_CANCEL
EVENT_TYPE_OPTION_SYMBOL_CHANGE
EVENT_TYPE_OPTION_SPLIT
EVENT_TYPE_PRICE_ADJUSTMENT
EVENT_TYPE_PRICE_ADJUSTMENT_CANCEL

The following event types are used internally by the system:

EVENT_TYPE_TIME_SERIES_CORRECTION
EVENT_TYPE_TIME_SERIES_DELETE
EVENT_TYPE_TIME_SERIES_ADJUSTMENT
EVENT_TYPE_LATENCY

The following event types are currently unused:

EVENT_TYPE_FORCE_PROCESS_REFRESH
EVENT_TYPE_CACHE_FLUSH

A4.29 Deprecated Event Types

The following event types are deprecated:

EVENT_TYPE_TRADE_LATE
EVENT_TYPE_MARKET_DEPTH

Appendix 5 - Magazine list

Source Name	Magazine	Supplied by
Asia Business News	ABN	Comtex
MENA News from Al Bawaba	ABW	Comtex
ABIX Australasian Business Intelligence	ABX	Comtex
African Press Organization	AFP	Comtex
Asia in Focus	AIF	Comtex
Al-Bawaba	ALB	Comtex
AM Best	AMB	Comtex
Asia Pulse Datasources	APD	Comtex
Asia Pulse	APU	Comtex
Sinocast	ASI	Comtex
BBC Monitoring	BBC	Comtex
BusinessWire	BIZ	Comtex
Briefing.com	BSI	Comtex
ACCESSWIRE	BSR	Comtex
FIND -- FedBizOps	CBD	Comtex
Marketwire Canada	CCN	Comtex
Closeup Media	CLM	Comtex
CNW Group	CNW	Comtex
Collegiate Presswire	COL	Comtex
DailyFX	DFX	Comtex
DMEurope	DME	Comtex
Datamonitor Financial Deals Tracker	DTF	Comtex
Datamonitor	DTM	Comtex
Edgar Online - Glimpse Feed	EDG	Comtex
Edgar Online 8-K Glimpse	EDK	Comtex
EFE News	EFE	Comtex
Advicetrade	ETF	Comtex
PRNewswire Europe	EUR	Comtex
EWorldWire	EWW	Comtex
FreshBrewedMedia	FBM	Comtex
FIND Inc. -- Fed Register	FFR	Comtex
FIND Inc. -- Government Info	FGI	Comtex
Filing Services Canada	FSC	Comtex
OsterDowJones	FWN	Comtex
OsterDowJones Select	FWS	Comtex
Thomson Reuters One	HUG	Comtex

Marketwire	INW	Comtex
IPO Monitor	IPM	Comtex
Inter Press Service	IPS	Comtex
Investrend Financial Wire	ITR	Comtex
JapanCorp.net	JCN	Comtex
McClatchy Tribune News	KNS	Comtex
McClatchy Tribune Business News	KRO	Comtex
Midnight Trader	MID	Comtex
MarketNewsVideo.com	MNV	Comtex
Eteligis	MRP	Comtex
M2 Airline Industry	MTA	Comtex
M2 Banking and Credit News	MTB	Comtex
M2 Communications	MTO	Comtex
Newsfile Canada	NFI	Comtex
TheNewswire.ca	NWC	Comtex
Comtex SmarTrend	PSM	Comtex
GlobeNewswire	PMZ	Comtex
PRNewsChannel.com	PRC	Comtex
PRLine	PRL	Comtex
PRNewswire	PRN	Comtex
PRWeb	PRW	Comtex
Inter Press Service -- QNA/WAM	QNA	Comtex
Commodity News Service Canada	RNI	Comtex
RBC Network	ROS	Comtex
Stockselector Earnings Guidance Summaries	SEG	Comtex
United Press International	UPI	Comtex
Vickers Stock Research	VKR	Comtex
FIND Inc. -- Washington Day Book	WDB	Comtex
Wall Street Horizon	WSH	Comtex
WorldStockWire	WSW	Comtex
Xinhua Economic News	XEC	Comtex
Xinhua News Agency	XIN	Comtex
Zacks.com	ZAX	Comtex
Toronto Stock Exchange News	TSX	TSX
Dow Jones News Service	DJDN	Dow Jones

Appendix 6 - Non common stock issues

There are several different notations from different exchanges for non common stock issues. ACTIV provides a uniform symbology which will be available as alias symbols in addition to the already existing exchange notations. This uniform symbology is described below:

Each ticker code can be optionally followed by any of the following three combinations:

<ticker>,<series or class>.<exchange>
<ticker>,<suffix>.<exchange>
<ticker>,<suffix>,<series or class>.<exchange>

Where <suffix> is a two character string representing an issue type other than common stock and <series or class> is a single character representing the class.

Note that the <suffix> and the <series or class> are preceded by a comma character.

The following suffixes are currently used:

1B	First Convertible Bond
1P	First Preferred, Same Company
2B	Second Convertible Bond
2P	Second Preferred, Same Company
3B	Third Convertible Bond
3P	Third Preferred, Same Company
4P	Fourth Preferred, Same Company
AD	American Depository Receipts
BD	Bonds
BR	Bankruptcy
CB	Convertible Bond
CC	Convertible Called
CL	Called
CV	Convertible
DB	Debentures
DQ	Delinquent In Filings
EC	Emerging company
FO	Foreign
IQ	Issuer Qualifications
IR	Installment Receipts
LV	Limited Voting Shares
MF	Mutual Funds
MP	Miscellaneous Situations (Such As Certificates Of Preferred When Issued)
MS	Miscellaneous
MV	Multiple Voting Shares

NO	Notes
NS	Notes
NT	Notes
NV	Non-Voting Shares
NW	New
PC	Preferred Called
PD	Preferred When Distributed
PI	Preferred When Issued
PP	Partial Paid
PR	Preferred Issue
PV	Preferred Convertible
RT	Rights
RV	Restricted Voting Shares
RW	Rights When Issued
SB	Shares Of Beneficial Interest
SV	Subordinate Voting Shares
TE	Test symbol
UN	Units
US	Trading In Us Dollars
VO	Voting
WA	Warrants Same Company
WD	When Distributed
WH	Warrants When Issued
WI	When Issued
WS	Warrants
WW	With Warrants Or With Rights

Appendix 7 – Future Aliases

ACTIV provide a shorthand alias for futures by stripping out the expiration date separator ("/") and the immediate zero ("0") after that if it exists. For example:

ACTIV also manually maintains a "rolling contract" alias determined by our Data Quality team based on open interest and cumulative volume. For example:

This mapping will be reviewed periodically and updated to reflect the current most active contract.

For completeness, ACTIV also provide a shorthand for the above alias by removing the expiration date separator.

This can be seen in the GetMatch example below using the ActivContentGatewayApiSample: