

INTRODUCTION

ComStock is the leading supplier of real-time and near time market data to redistributors. We currently supply hundreds of redistribution customers globally which includes the following range of customers: local quote vendors, online brokers, banks, media portals and corporates. In Europe, example customers include FT.com, MSN (Microsoft), DLJ Direct, Comdirect, Credit Agricole, VWD and the Madrid Stock Exchange. ComStock carries information from more than 180 sources and exchanges globally.

The following information is intended to give a general overview of the ComStock data delivery process. For more detailed information refer to the development documentation or contact the Developer Support team on eurosupport@cmstk.com or call **+44 (0)20 7825 7777**.

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DATA DELIVERY

The ComStock datafeed is a broadcast datafeed. The broadcast feed contains all the exchange and news data transmitted by ComStock. This data is separated by market using a system based on Hexadecimal codes.

The task of decoding this data is carried out by the Client Site Processor (CSP), which is explained later in this document.

ComStock currently delivers data using the following methods:

- Internet
- Satellite
- Lease Line
- Xpressnet

INTERNET

This is used on a trial basis only. Developers are given access to a CSP for a limited period. This allows clients to begin developing to the ComStock datafeed before a CSP is installed at their site.

SATELLITE - XPRESSFEED

The most common delivery system is a 256 Kilobyte Satellite feed that broadcasts data to a dish that will be installed at the customer site, by our appointed agents. This data flows through a satellite receiver and into the CSP.

LEASE LINE – XPRESSFEED IP

From Data centres in London, Paris, Frankfurt and Brussels TCP/IP datafeed lease lines can be installed to the customer site. Currently these lease lines can be 512K to 2MB in size.

XPRESSNET

This service provides real-time streaming market data over the Internet. XpressNet is controlled and administered by ComStock and is located within the New York Data centre.

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THE CLIENT SITE PROCESSOR (CSP)

The CSP, or Client Site Processor, is the key component of the data delivery system. More detailed information is as follows:

- Physical Specifications
- Entitlements
- Communication Modes
- Real-time databasing

PHYSICAL SPECIFICATIONS

The CSP is physically a normal PC with the following specification (correct as at Dec 2002), please note that the specifications may be upgraded at any time:

- Industry standard 2U rack mountable case
- P4 1.7 Gig Processor
- Intel Chipset Motherboard
- 1 GB DDR RAM
- 40 GB Hard Drive
- 2 Intel Ether Express Pr0 100 PCI NICs as network cards
- 3.5 Inch Floppy Disk Drive
- Operating System is Red Hat Linux ver 6.2

All CSPs are assembled in our European Headquarters in London and dispatched from there.

ENTITLEMENTS

The CSP controls the client exchange entitlements for the exchanges the customer is contractually allowed to view or disseminate. The entitlements are downloaded to the CSP via the datafeed and cannot be changed via the CSP.

Entitlements also includes the delivery mode of the data, i.e. whether the data is Real-time, Delayed a specified number of minutes depending upon the exchange or is available End of Day only. The CSP will delay required data internally in a memory loop on an individual exchange basis. Please note that it is not possible to provide both delayed and real-time output for the same exchange on the same CSP.

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COMMUNICATION MODES

The CSP supports one physical communication interface to the client system. This connection can be either UDP/IP or TCP/IP, from these we generally recommend that TCP/IP be used for the following reasons:

1. The TCP/IP connection allows up to 32 simultaneous connections. Each of these connections can have a separate set of entitlements (based on the general CSP permissions) which allows a great deal of flexibility in processing the ComStock data.
2. The TCP/IP protocol has inbuilt error correction, and is considered to be the most reliable of the two protocols.

Whether TCP/IP or UDP/IP is used we strongly recommend that the CSP is on a separate network segment from the client's main LAN. In addition to this we also recommend that a firewall should be used between the CSP and the client application.

REAL-TIME DATABASING

While the CSP does not store any historical data it keeps a record of the current trading values in a memory resident database. This means that the CSP will keep in memory the latest trading values of a number of fields, including Open, High Low, Last, Bid, Ask etc. This data can be retrieved by the client for either snapshot purposes or simply to populate their own database.

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INTERFACE MODES

Independent of the communication mode chosen the CSP allows the client to choose a number of different methods of getting the data into their application:

- Broadcast mode
- Snapshot mode
- Watchlist mode

BROADCAST MODE

This is the most commonly utilised mode. All the data that a client is permitted for, either for the entire CSP (UDP/IP) or the individual TCP/IP connection, is sent through to the client application.

SNAPSHOT MODE

In this mode the data is not sent from the CSP unless specifically requested by the client application. On sending a command to the CSP the current values that are stored in the CSP database will be sent to the client application. This can be done for an entire exchange or an individual instrument.

WATCHLIST MODE

Watchlist mode has similarities with both Broadcast and Snapshot mode. It allows the client to gain the advantages of broadcast mode in that updates will be passed on when they are received by the CSP but allows this data to be filtered on individual exchanges and instruments. An application of this would be if the client wished to receive updates for a small set of instruments from an exchange, for example indices.

By combining the last two interface modes the client can create a 'Managed Datafeed' which allows a great deal of flexibility. By using Watchlist mode the client can limit the size of their own database to only the instruments and exchanges they wish to view and populate this database by using Snapshot mode to ensure that all relevant fields are updated.

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MESSAGE TYPES

The following general categories of messages are available from the CSP:

- Real-time message
- Delayed-data message
- Interrogation Response message
- Cycle message
- Delete message
- Status message

REAL-TIME MESSAGE

This is the standard message sent on the feed. It contains updates for trading information such as trade, bid / ask, open, settle as well as other fields.

DELAYED-DATA MESSAGE

These messages are similar to the Real-time messages above in terms of the data that is transmitted. The main difference is that a code is inserted in the message that indicates how many minutes the CSP has delayed the data for.

INTERROGATION RESPONSE MESSAGE

This is the response message that will be returned from the CSP when the CSP database is interrogated for the current values stored for an individual instrument or an exchange. A code inserted into the message identifies the message as a reply to a CSP database interrogation.

CYCLE MESSAGE (SUMMARY MESSAGE)

These messages are sent to refresh the information received in the real-time messages. As well as the trade information received in the real-time messages other information such as high / low and previous close will be included.

The real-time message will always take precedence over a cycle message. During times of high market activity, for example US market open, cycle messages may be suppressed until market activity drops.

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DELETE MESSAGE

Delete messages notify both the CSP and the client application that the instrument for which the delete message is received is no longer active. On receiving this message the CSP will remove this instrument from its internal database at approximately midnight local time when market activity is relatively low.

STATUS MESSAGE

The status message is generated internally by the CSP and is used to warn of potential problems. Under normal conditions it will be sent once per minute and gives the CSP processing conditions, for example number of messages processed since the CSP was started.

When there is a problem these messages will be sent approximately once per second with information indicating what type of problem is occurring in the CSP.

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DATAFEED FORMAT

The data on the ComStock datafeed is organised by exchange and identified by Hex code alone, or Hex code and sub market centre.

There are two data formats supported by the CSP, the choice of format depends upon what will be best for the clients application. These formats are:

- Digital Data Format (DDF)
- Generic Format

DIGITAL DATA FORMAT (DDF)

This is the mode that we recommend due to its flexibility. The data is transmitted in our custom format in which there are no fixed message lengths. The price data is separated by lower case characters, called bate codes.

For example: `<0x17>sUKXt644710f2<0x03>`

where

<code><0x17></code>	Hex code identifying Exchange Group
<code>s</code>	Market centre indicating specific exchange in exchange group.
<code>UKX</code>	Unique code (symbol) on specific exchange identifying instrument
<code>t644710</code>	First lower case character following symbol identifies field, trade in the example
<code>f2</code>	Next lower case character indicates end of previous data and identifies next field.
<code><0x03></code>	Hex code indicating end of message

In order to achieve a completely unique identifier for an instrument it is necessary to combine the Exchange group, Market centre (if present) and symbol, for example `<0x17>sUKX` taken as a whole uniquely identifies the instrument as the FTSE 100 Index on the London Stock Exchange.

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GENERIC FORMAT

Similar to the DDF mode in that there are no fixed message lengths the two main differences are that the data is delimited by the '{' or '}' symbols and that the client can limit the fields output to only the fields that they wish to receive in their application.

With Generic mode it is only possible to view fields that are held in the CSP database. Each field in the CSP database is assigned a 4 digit code called a 'Token'. By setting these tokens on the CSP the client can restrict the data coming from the CSP to only updates for specific fields.

The disadvantage to this is that the CSP will not database all the fields on the ComStock datafeed. This effectively means that not all data on the feed will be available using Generic Mode. An example of this is the dividend information on the Swiss stock exchange which is only available in DDF format.

For a list of the fields held on the CSP database please refer to the document 'MCSP Interface Command Language Programmer's Specification'.

An example message: `<0x01>{17s{UKX{2{6349.4}<0x03>`

where

<code><0x01></code>	Indicates Generic Format message
<code>{</code>	Delimiter
<code>17s</code>	Hex code identifying Exchange group and market centre
<code>{</code>	Delimiter
<code>UKX</code>	Unique code (symbol) on specific exchange identifying instrument
<code>{</code>	Delimiter
<code>2</code>	Number of decimal places
<code>{</code>	Delimiter
<code>6349.4</code>	Trade price (decimal point inserted by CSP)
<code>}</code>	Delimiter
<code><0x03></code>	Hex code indicating end of message

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OTHER SERVICES

There is a range of services to help with development to the ComStock datafeed, as well as additional services once development has been completed, as follows:

- Developer Support Services
 - Support Team specifically for development queries
 - Sample Code
 - Internet CSP Access (iCSP)
- Newsletter and Special Notifications
- Daily delivery of ComStock Symbol and Descriptions
- Corporate Actions Service

DEVELOPER SUPPORT SERVICES

There are several services available to make the process of developing as straightforward as possible. The Development Support team is available to help and advise customers throughout the development process.

In addition to this the Developer Support Team can supply sample C++ or Java Code to shortcut the development process. This sample code demonstrates how to connect to the CSP and will send through simple commands to the CSP. It is commented throughout to facilitate the development of more complex code for the final client application.

Finally, when a sales agreement has been signed and the customer is waiting for the ComStock CSP to be installed we can supply access to a CSP over the Internet (the iCSP). Although this can only be supplied for a limited time it enables the development process to be started without delay, as well as providing early 'hands on' experience with the ComStock datafeed.

NEWSLETTER AND SPECIAL NOTIFICATIONS

These e-mail based services are available to all customers. The Newsletter is sent every Monday and covers general changes on markets as well as information on amendments to Futures and Options contracts, indices etc.

In addition to the newsletter we also send through Special Notifications which notify customers of larger issues such as new exchanges being added to the datafeed or important changes to existing markets.

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Data Delivery Overview

DAILY DELIVERY OF COMSTOCK SYMBOL AND DESCRIPTIONS

Basic instrument information including Instrument description, ISIN, SEDOL and Instrument type is delivered over the datafeed each day. A separate document is available detailing the format of this data.

CORPORATE ACTIONS SERVICE

There are two types of Corporate Actions available, a daily e-mail service available for the European markets and a daily News service on the datafeed for US Equities.

Both services give notification of IPO's, deletes and will give information regarding amendments to a current instrument such as change of name and stock split / consolidation ratios.

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THE COMPANY

ComStock is a leading provider of real-time financial data from over 180 sources and exchanges worldwide, covering in excess of 1,5 million instruments. ComStock's extensive information coverage includes equities, derivatives, fixed-income, foreign exchange, commodities, funds, historical & fundamental data and financial news. ComStock has set a benchmark for providing solutions to the global financial community with superior financial products and services. We offer everything from a real-time datafeed, to a fully customisable and hosted solution for institutional investors, redistributors, online media portals, financial planners, and advisors worldwide.

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