



Skyler C3 Tick Analytics Solution

Analyze tick data with micro second latency with Skyler's C3 Tick Analytics Solution

Key features

- Intra day time series caching of tick data
- Per venue and cross venue tick data analytics
- Integrated aggregations (volume, price*volume)
- Reordering of data according to exchange timestamp
- Automatically manages corrections
- Support of subscription and request – response queries
- Support of “time window” based subscriptions
- Window length configurable at query time
- Uses embedded C3 Level I feed handlers and adapters
- Quote and NBBO caching can be added

Skyler introduces the C3 Tick Analytics Solution – the solution for real-time analytics of intra-day tick data. Receive, capture, analyze, aggregate, and replay tick data at unprecedented speeds and trigger smarter trading decisions. Utilize the comprehensive and highly specialized trade data store provided by the solution to act on the data and its aggregations. The benefits for the customer include:

- Faster insights into and access to tick data
- A variety of different real-time tick data views
- Built-in logic to handle tick data and exchange specific messages
- Embedded standard tick data aggregations
- Openness to embed custom tick data indicators
- Ease of integration with pre-built adapters and feed handlers
- Lower total cost of ownership due to solutions approach

The Need

The insurgence of algorithmic trading and the explosion of market data update rates have changed the technical landscape of electronic trading platforms. In order to thrive in such an environment, firms require technology that allows them to receive, capture, analyze, aggregate, and replay real-time tick data within a low latency framework. The goal is to access tick data information to:

- support price discovery
- deliver trading benchmarks (e.g. VWAP)
- support trade forecasting
- run volume and price based analytics
- derive tick data specific indicators
- run pre- and post trade analytics
- retrieve execution quality measurements
- verify liquidity information
- support position keeping
- conduct exposure measurements
- run portfolio valuations
- calculate derivatives valuation
- etc.

In response to such needs, firms turn to either in-house solutions or out-source the project to technology vendors. While both in-house and out-sourced ventures attempt to offer useful trade information, only the Skyler C3 Tick Analytics Solution provides the speed for data analysis, all-inclusive features set, openness for customization, and flexibility necessary for simple integration that a complete solution requires.

In-house developments for such systems often lack the flexibility that is provided by out-sourced vendors. For example, rigid trading infrastructures will require a complete overhaul in order to implement the tick analytics functionality. This yields significant costs and time to the firm. With strong awareness of this problem, Skyler focuses on ease of integration as a key feature of the solution. Particularly with the Skyler C3 Tick Analytics Solution, firms are able to overcome the obstacle of integration due to the flexible nature of the solution.

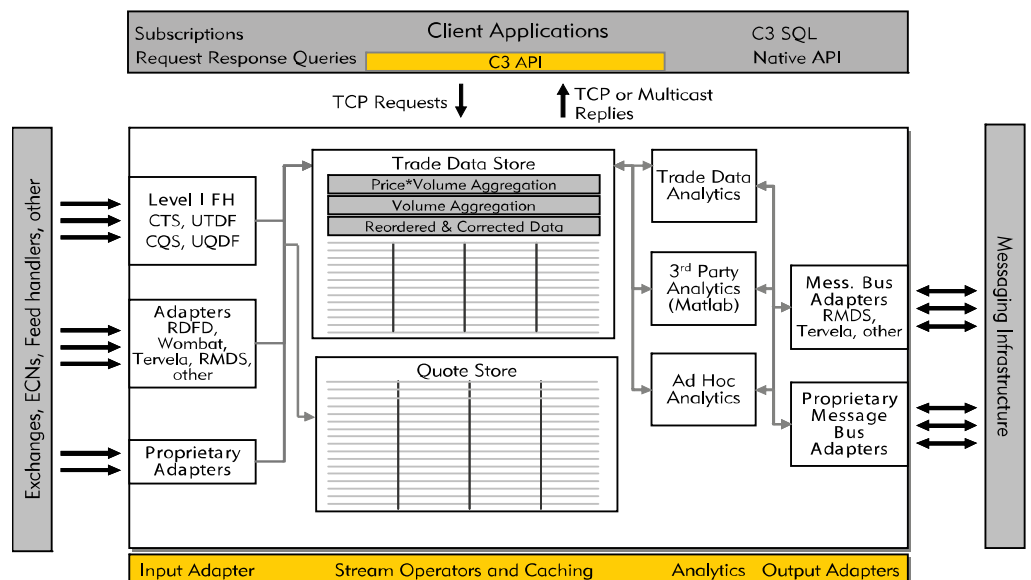
While technology vendors provide systems for tick capture, the Skyler C3 Tick Analytics Solution provides a sophisticated feature set that achieves more than other competitive offerings. Features such as aggregation update rates of over 250,000 updates per second in addition to per- and cross-venue analytics are standard with the Skyler C3 Solution. Furthermore, Skyler abides by the

80/20 Rule, which provides an 80% complete solution and leaves 20% open for customization so that the solution can attack the exact problem the customer is facing.

The Skyler C3 Tick Analytics Solution

The Skyler C3 Tick Analytics Solution aims to provide a sophisticated framework for trade data analysis. It allows you to:

- Capture real-time intra-day tick data
- Access streaming or time series tick data
- Automatically reorder tick data according to exchange timestamp
- Automatically manage corrections
- Run per-venue and cross-venue tick data analytics
- Leverage cache embedded aggregations by volume and price* volume
- Conduct subscription and request-response queries
- Conduct "window" based subscriptions
- Configure window length at run time
- Use embedded feed handlers or adapters
- Add quote and NBBO caching if desired



Data Input

The Skyler C3 Tick Analytics Solution is equipped with a number of feed handlers and adapters to existing feed handling infrastructure to take in tick data.

C3 provides feed handlers to the main North American Level I feeds. These include:

- SIAC CTS/CQS
- NASDAQ UQDF/UTDF
- Consolidated feeds: Reuters RDF, Comstock IDC Plus Feed
- Other consolidated and direct Level I feeds

The Skyler C3 feed handlers, as listed above, manage the communication with the data provider, receive the tick data and insert them into the trade data store. The Skyler C3 feed handlers support the UDP transmission protocol, manage feed arbitration, offer the ability to persist raw data for replay, and intelligently manage out of band messages as well as the staleness of data.

Skyler C3 can interface to existing or proprietary feed handling infrastructure including systems like Wombat, Reuters RDFD, InfoDyne, and others.



Skyler C3 can also accept raw or normalized Level I tick data from messaging infrastructure including RMDS, Tervela, 29West, and others.

In addition to the pre-built adapters, the Skyler C3 SDK provides a framework to add new feed handlers or adapters. The SDK includes sample code for customers to develop their own input adapters, or Skyler can develop custom modules if desired.

Trade Data Store

The trade data store is a specialized in-memory caching entity that is optimized for the capture, aggregation and analysis of real-time trade data.

The trade data store captures the incoming tick data on a per venue basis and reorders the time series of the tick data based on the time stamp within the message. This time stamp typically is the exchange time stamp but it can also be overwritten to represent the arrival time. In addition, the trade store deals with all the exchange-specific messages including add, modify, delete and out of band messages. Corrections are applied to the tick data to ensure that aggregations are conducted on the most up-to-date information.

Besides storing the tick data in a per venue time series, the trade data cache also embeds the aggregated information of the tick data. Thus the total volume and the price*volume aggregations are stored with the raw data and don't need to be calculated as part of the analytics. This allows the user to run extremely fast VWAP calculations over the tick data. Any analytics can be conducted on a per-venue or cross-venue basis.

The trade store supports request-response queries as well as subscription. The queries or subscriptions can be conducted on the real-time tick data stream or on the cached tick data. The store supports window based queries and subscriptions to retrieve the raw data or its aggregations. The window lengths can be specified on a per-query or per-subscription basis.

In order to submit the queries, the client side application can access the Skyler C3 Tick Analytics Solution via the Skyler C3 client side API or via messaging infrastructure. The Skyler C3 client side API is available in Java and C++. The Skyler C3 message bus adapters include off-the-shelf interfaces to the Reuters RMDS and the Tervela messaging systems. Skyler is currently expanding this set of adapters to also include interfaces to other standard messaging infrastructure including LBM by 29West.

Skyler C3 Tick Analytics Solution is also open to interface to proprietary messaging infrastructure. The Skyler C3 SDK can be used to develop these adapters or the customer can work with Skyler to build these interfaces.

Integration into trading infrastructure

The Skyler C3 Tick Analytics Solution can run as a standalone application or can be embedded into trading applications as a third party library. The system is released on 32bit and 64bit Linux. It is a multi-threaded application which exploits available CPU's, both in terms of number of CPU's and speed of the CPUs provided.

About Skyler

Skyler is an enterprise software company delivering ultra low latency trading solutions to the financial services industry. The Skyler C3 Solutions source liquidity, analyze tick data, trigger smarter trading decisions, and achieve higher fill rates at better prices. Skyler's customers benefit from faster insights into activities in the market, the ability to deploy innovative new trading strategies, and faster access to the market and therefore higher trading efficiency. The Skyler C3 Liquidity Discovery, Tick Analytics, Algorithmic Container, Order Routing, and Compliance Solutions are focused on specific customer needs and emphasize flexibility, ease of use, and simplicity of integration. They combine powerful, low-latency in-memory data processing technologies with market specific business logic modules. To test drive the Skyler C3 solutions, contact 925.689.9814 or contact@skylertech.com. Please visit us at www.skylertech.com.