

# xMetrics

## Components

instrumentix  
the evolution of flow monitoring

### xMetrics® components

Data Capture and Decode  
xMetrics® consumes in real-time a copy of the network traffic being exchanged between the components involved in the client's trading activities or their dissemination/consumption of Market Data, for example Feed Handlers, Order Management Systems and Smart Order Routers. The xAgent is responsible for traffic acquisition and decoding and once the traffic has been acquired and filtered it is processed by a "stack" of one or more protocol decoders.

Four types of decoder are available:

- FIX - used to decode FIX execution and market data traffic.
- Fixed Width - used where a protocol obeys fixed width semantics; decoders can be created using XML configuration, requiring no development resources.
- Custom/Bespoke - requires C++ development resource and can be written by Instrumentix or the client.
- Hasher - allows clients to monitor traffic without decoding the application/business payload. Although the payload is not decoded it is hashed to create a

unique signature and hence latency can still be calculated, even where NATing is employed.

### Correlation

The xMaster is the highly powerful correlation engine at the heart of xMetrics®. It is configured to obey the complex, nonlinear relationships inherent in today's trading platforms and matches together the decoded events received from the xAgent to create transactions that model the performance of the environment, however complex.

### Summarisation

The xReporter consumes the transactions received from the xMaster and summarises/aggregates them over one or more configurable time periods (for example 60 seconds for execution and 5 seconds for market data). It does so by aggregating over multiple dimensions of interest such as gateway, trader, symbol, etc and in doing so creates a rich set of statistics such as min, mean, max, median, standard deviation (jitter; critical for measuring performance determinism) and arbitrary percentiles as well producing other measures such as message

rates and counts. The xReporter is also responsible for creating the rich network performance data mentioned below, which is summarized over a one second period to create metrics such as Mbbs/Gbps.

### Network Measurement

In addition to the creation of rich business information relating to application performance, xMetrics® also measures network performance. Each network conversation related to the client's trading and/or market data activities is measured in both directions in order to create metrics such as bandwidth, traffic rates, packet rates, and microbursts. Furthermore, the system also exposes TCP behavioral issues such as retransmission and zero-window.

### Enrichment and Transformation

xMetrics® was designed to facilitate powerful data enrichment and transformation by allowing the user to interact with the data it is creating using its unique Mutations Framework. This powerful feature allows external data to be used in enrichment, but more importantly allows for the introduction of User Defined Functions into the

instrumentation path that can be used to enrich and transform/mutate any and all data. For example, it is possible to rewrite symbology or perform mathematical calculations on data and write the results to new fields. This means that highly complex multi-hop instrumentation of distributed trading environments is easily achieved, something which is rarely possible with legacy solutions. Given the availability of this key feature, emerging and future requirements can be tackled with ease and hitherto unknown use cases simply addressed. Furthermore, it allows the user to integrate the rich data being created with external systems not yet currently supported; for example, although Apache Spark is not natively supported as a datastore by xMetrics® it is possible to write an export – which may leverage PySpark for example – in a few hours, allowing easy integration with the clients' other systems.

## Persistence

xMetrics® writes all business transactions, summary metrics, network detail and raw decoded events to one or more of its supported datastores : ElasticSearch, InfluxDB and TimescaleDB. Persistence is configurable, allowing data of different types to be persisted for differing periods of time, for example execution data may be stored for months or even years, whilst market data or network performance data may only be required for days or weeks. The data created can be accessed by the user in many ways, for example using JDBC, Elastic APIs, or InfluxQL.

## Alerting

xMetrics® delivers next-generation multi-factor adaptive alerting for business data (summaries or individual transactions or events), network behavior (microburst, bandwidth, traffic, retransmission etc) and combinations thereof; legacy SLA/ threshold base alerting is also

supported. Additionally, server health alerting (CPU load, memory and disk utilisation etc) is also provided when the server monitoring option is enabled. The powerful alerting available in xMetrics® allows clients to create alerts when, for example:

- The current mean value for latency on a monitored flow on a per-instrument basis exceeds the mean 95th percentile value for the last hour.
- The current number of packets in the ingress direction differs by more than two standard deviations from the same time period on the same day last week.
- There has been a packet or traffic microburst at the same time as there has been both TCP retransmission seen and a monitored flow has experienced a spike in latency.

## Visualisation

### xMetrics® Genesis

xMetrics®Genesis is an extremely flexible multi-tenanted visualisation framework allowing users complete control over the layout of their dashboards. Genesis is primarily intended to present timeseries-like data but also includes alert viewing and transaction search capabilities, allowing users to instantly find individual quotes or orders based on any search criteria. Whilst the Genesis GUI usually consumes data from the primary datastores supported by xMetrics® it is also possible for users to inject data from external data sources, and use this combined data to build powerful, user-defined dashboards.

## BI Reports & Report Editor

The BI Reporting option offered with xMetrics® allows users to generate rich, meaningful reports using all data being created by the platform. Custom reports can be parameterised, generated on both a intraday and end-of-day basis and formatted as images, PDFs or HTML; these reports can delivered automatically via email to key stakeholders or user groups. The reports are created using a rich BI Report editor client available for Microsoft Windows, Linux or Mac desktops.

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📧 [enquiries@instrumentix.co.uk](mailto:enquiries@instrumentix.co.uk)

☎ +44 (0)20 7030 3791  
✉ 20-22 Wenlock Road  
London N1 7GU

[www.instrumentix.co.uk](http://www.instrumentix.co.uk)