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# Introduction & Product Updates

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# Products Impacted by GSF Q1 & Q2 Improvements

- **openPDC**
- **SIEGate** (*replaced the openPG*)

# Detailed List of GSF Improvements

- Added code to take privileges into account when listing commands that are available to remote console clients
- Abstracted sub-second distribution and alignment functions used throughout system
- Updated OSI-PI output adapter with enhanced feedback for exceptions and long running processes, e.g., meta-data synchronization
- Updated local group enumerations to apply a schema filter to help with children enumeration of root DirectoryEntry on Windows 8 systems
- Fixed installer action for user authentication when authenticating a managed service account
- Improved password input for remote console applications to support backspace and escape keys for correcting mistakes when typing passwords
- Fixed issue writing COMTRADE FRACSEC values when no subsequent digitals are being exported
- Made COMTRADE export change start-time to start with first data sample
- Modified export and trend functions to "re-open" archive on operation such that latest point data can be loaded (basically forcing a data-block allocation table reload)
- Fixed various minor timebase issues in IEEE C37.118 and IEC 61850-90-5 protocols
- Updated the Historian Trending Tool to fix bugs, provide more configuration options, and improve the usability of certain features (e.g., opening archive with an alternate offload location)
- Updated DNP3 adapter for latest build of openDNP3
- Updated data quality reporting screen to list all cached reports and better manage pending reports
- Added DNP3ConfigGenerator to help setup DNP3 adapter
- Fixed timestamp alignment in COMTRADE export to fill gaps where data may be missing
- New reporting engine for generating daily data quality reports
- Fixed COMTRADE dependencies and Historian Trending Tool crash on export
- Added logic to grant permissions to existing users when migrating databases using the Configuration Setup Utility
- Added additional security to certain remote console commands
- Improved feedback and logging in the OSI-PI output adapter
- Minor performance improvements for alarming

# Detailed List of GSF Improvements

## (Continued)

- Fixed an issue in FramedImageParserBase that was pooling objects in memory which were no longer in use (major issue correction)
- Modified users of the AsyncDoubleBufferedQueue to use the new signaling mechanism of the DoubleBufferedQueue rather than polling (faster)
- Updated to dnp3 adapter to proxy log messages from the IDNP3Manager singleton to laon session through one of the adapter instances
- Implemented DoubleBufferedQueueManager in the RoutingTables (optimization)
- Eliminated race condition between Initialize and RefreshMetadata in OutputAdapterBase
- Modified processing queues to work with simple locks and List<T> instead of ConcurrentQueue<T> since this is faster when dealing with groups of items (most common use case)
- Fixed ConcentratorBase so it would work at extremely high frame rates.
- Eliminated a race condition that caused regular adapters to be treated as broadcast adapters at startup, before adapter initialization.
- In ServiceHostBase, modified actions that cause system configuration to be reloaded. Instead of queuing up several requests to be executed one at a time, requests are instead queued up to be executed once for all matching requests
- Implemented configuration augmentation and conditional data operations for database configurations to speed up ReloadConfig for large databases (major optimization)
- On configuration load, modified the routine to load from cached configuration so that it checks for the existence of the cache file before attempting to load it
- Fixed the Output Device Wizard in the Manager so that removing devices from an output stream does not take an unreasonably long amount of time (Manager scalability)
- Added time-quality flags measurement, for phasor protocols that support this, that is associated with a connection (e.g., directly connected device or concentrator). Quality flags can then archived and/or applied to an output stream. Output stream time-quality can be a measurement derived from a hardware clock
- Updated initial data set schemas to include new "Quality Flags" signal type
- Added feature to update signal reference of quality flags when the acronym of an output stream is changed
- Fixed the issue on page load for the Output Streams page where the config frame size calculation was not properly resolving to the size of the selected item

# Detailed List of GSF Improvements

## (Continued)

- Converted MeasurementKey to a class and provided more explicit factory functions for creating and/or looking up measurement keys (major optimization)
- Fixed issues with device updates related to renaming, changing historian and changing company with associated measurement information roll down (edge case fixes)
- Throttled messages in local output adapter related to possible out-of-sequence data
- Improved the performance of RuntimeID lookups in the SignalIndexCache
- Disabled payload compression by default in pub/sub communications since this is time consuming and only needed when bandwidth is at a premium
- Updated high-volume status message suppression logic to work better under load
- Fixed a bug that was causing the historian to attempt to offload the active file when offloading is enabled
- Updated configuration caching to be on an independent thread instead of being tossed on the thread pool to reduce thread pool thrashing at startup with lots of devices
- Fixed possible "null reference" exceptions and "an item with the same key has already been added" exceptions that can occur during stress or with malformed configurations
- Synchronized configuration file operations to help avoid possible race conditions when dealing with new configurations
- Added GuidGuidExtensions to allow serializing a GUID to conform to RFC 4122

# Q1 & Q2 GSF Improvements

- **Optimization / Performance**
  - Double-buffered async-queuing
  - Optimized measurement identity keys to require less memory
  - Improved DNP3 parser / adapter
- **Scaling**
  - High stability at 100% CPU use
  - Throttled messages to the console to prevent flooding
- **Security**
  - Active directory SIDs replaced plain-text user names
  - Improved configuration data base security
- **Configuration**
  - Incremental configuration loading (much quicker restart following change)
  - SIEGate Manager wizard improvements
- **Numerous Bug Fixes**

# Phasor Products Under Development

- Substation Secure Buffered Gateway
- Phasor Data Quality Tracker
- NSF – RTPSE
- Burns & McDonald FOA 970



*substation***SBG**

SECURE BUFFERED GATEWAY



1306 Broad Street, Chattanooga, TN 37402 423-702-8136

The *Substation Secure Buffered Gateway* couples the high-performance phasor data processing features of the openPDC and the security features of SIEGate into a purpose-built system that is both a substation PDC and a gateway for the secure, reliable communication of synchrophasor data from a substation to the control center.

#### Application Profile

Optimized and tested for use in the field, the *substationSBG* is a back office system designed to consume all standard PMU input protocols and securely transfer this data with extremely low latency to the control center. By use of a local data archive, the *substationSBG* automatically fills any data gaps in the central data archive that could have been created by communication system outages.

#### Required Hardware

The *substationSBG* executes on ruggedized, fanless substation 64-bit computers like the SEL 3333.

#### Required OS and Services

The *substationSBG* is intended for deployment using Windows Server 2008 (or later). However, the *substationSBG* will run under other Windows operating systems. Automated gap filling and some security features requires use of a centrally hosted openPDC, SIEGate node or *substationSBG*.

#### Current Release

*substationSBG* v 0.9  
Under development

#### Free Download at:

<http://www.substationSBG.com>

## FEATURES

### Inputs

Comprehensive phasor input protocol support including IEEE C37.118, IEEE 1344, IEC 61850-90, Macrodyne, SEL Fast Message and F-Net protocols. A growing library of other substation protocols is supported including DNP3.

### Security

The *substationSBG* can be configured so that gateway-to-gateway communications can be initiated only from the higher security zone (typically the control center) and it is designed for deployment on dual-NIC'ed hardware so that it can be a boundary appliance to form an ESP.

All communications between gateways is encrypted using industry best Transport Layer Security.

### Data Quality Monitoring

Performance statistics are logged every 10 seconds and include latency, availability, data quality, and time errors as well statistics on gateway input and output streams. Data quality alarms can be embedded in real-time gateway output streams.

### Fully Automated Gap Filling

All data that moves through the *substationSBG* is persisted locally in a short-term rolling archive. After a communications outage between the substation and control center, data archived locally during the outage can be transmitted (at lower priority than real-time data) back to the control center to ensure that the central archive-of-record is complete.

### Local Data Re-Formatting

All input sources can be converted into multiple standard phasor outputs for use in the substation. Down-sampling is supported.

### Setup and Configuration

Setup is optimized and simplified for use in highly proceduralized substation settings — including simplification of processes to establish secure connections.

The *substationSBG* provides comprehensive logging services to improve security and meet regulatory compliance requirements.

Setup can be pre-configured and secured without the ability for local modification.

### Why use the *substationSBG*?

As synchrophasor data becomes more important to planning and real-time operations, an interposing device between the PMU and the control center PDC improves real-time data reliability, allows phasor to be used for NERC PRC-002 disturbance monitoring and significantly improves security and reduces the risk of non-compliance with NERC security requirements. In addition, the *substationSBG* is a full-featured, low-latency substation PDC that, from an information architecture perspective, adds a layer of "compute power" at the substation level. This power can be used, for example, to sample and locally store phasor measurements at high sample rates (120 samples/sec) and send down-sampled to the control center; or for example to perform local computations for local control.

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