STREAMING TELEMETRY TRANSPORT PROTOCOL



Overview of IEEE Standard 2664

NASPI Work Group Meeting

Christoph Lackner April 16, 2025





IEEE Updates

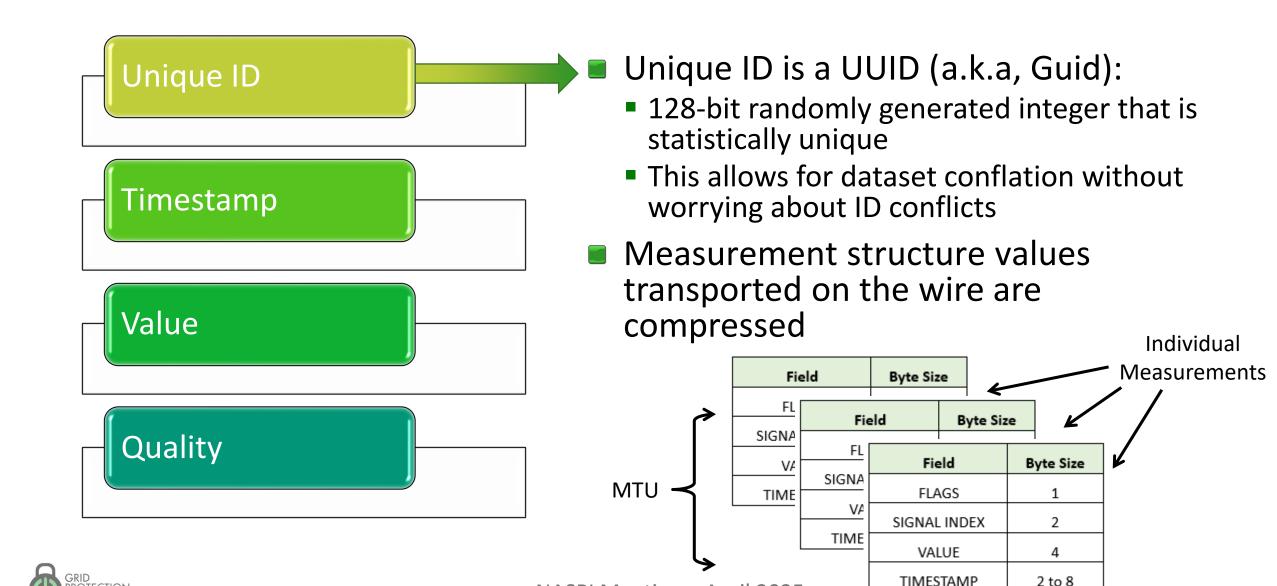


- Atomic Measurement Packets
- Reduced Data Loss
- Lossless Compression
- Scalability (to hardware limits)
- Publish / Subscribe Model
- Publisher Data Access Control
- IP Level Security
- Configurable Connection Origin

Standard published in 2024



STTP Difference: Measurement Focus



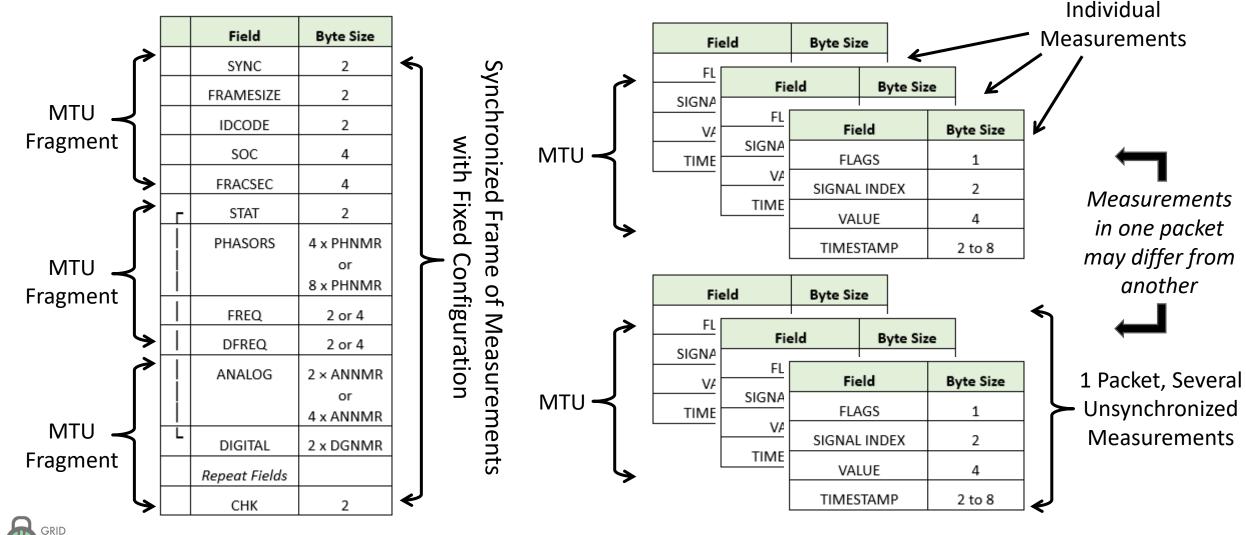
NASPI Meeting – April 2025

2 to 8

STTP Difference: Synchronized Frames vs Atomic Packets

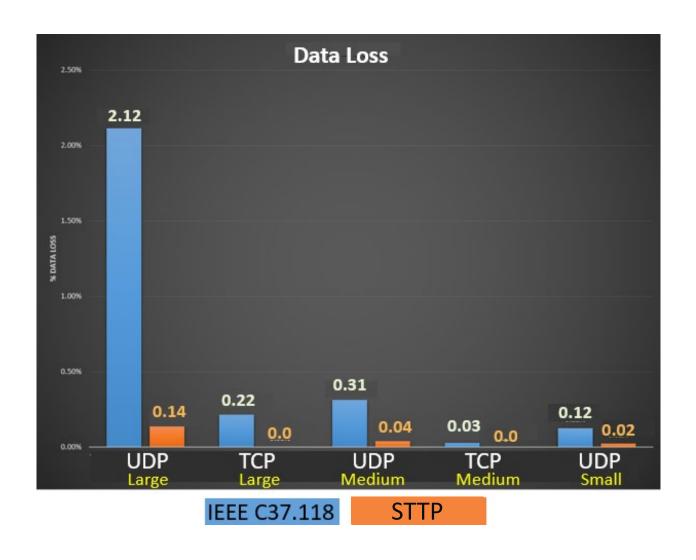
■ IEEE C37.118 / IEC 61850-90-5

STTP



STTP Difference: Lower Data Loss / Reduced Bandwidth

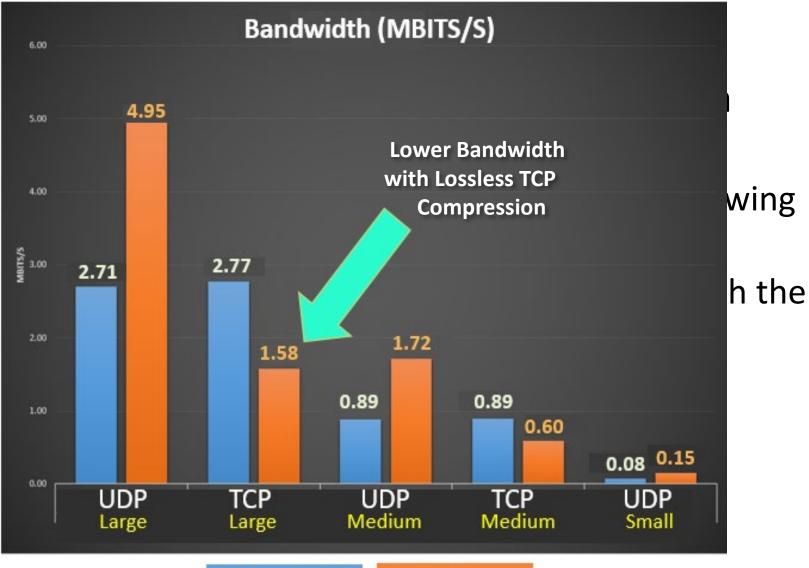






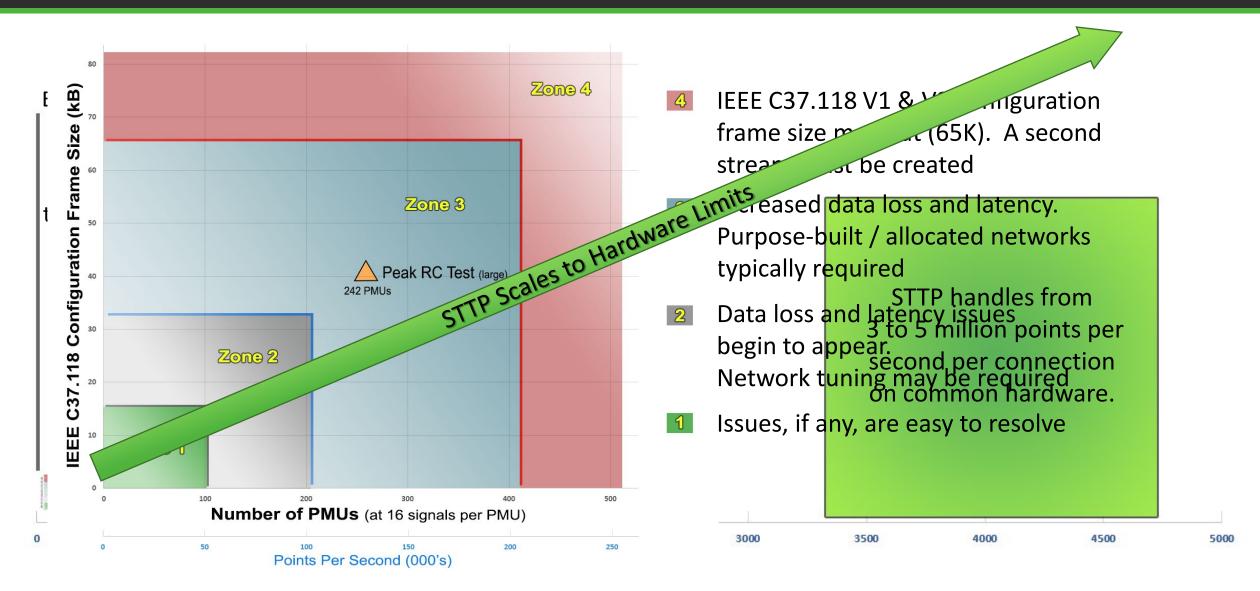
STTP Difference: Lossless Compression





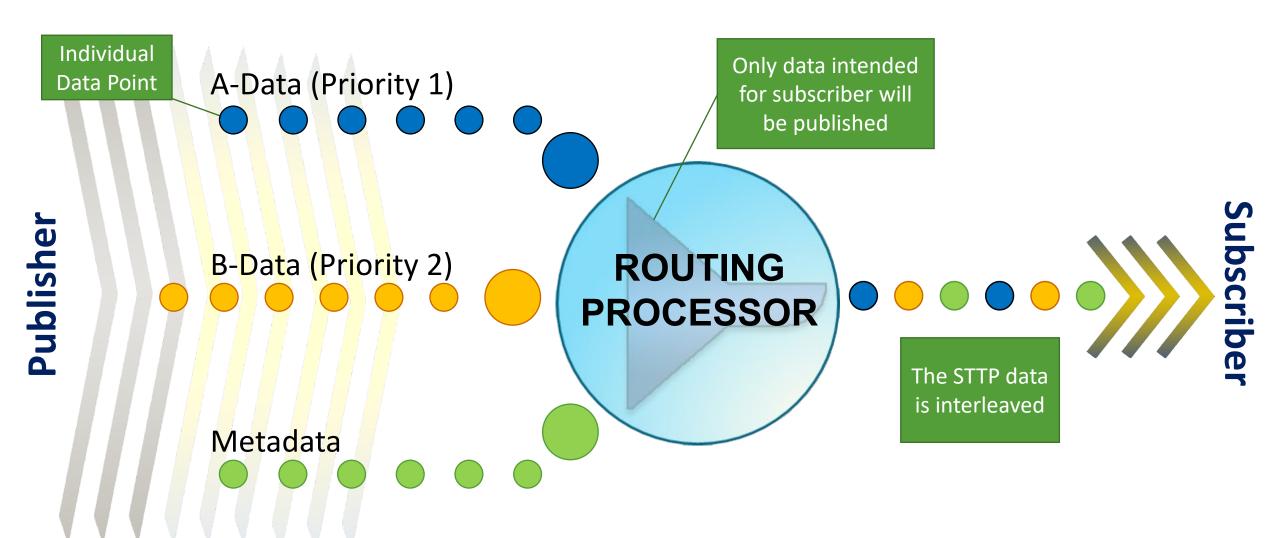


STTP Difference: Scalability





STTP Difference: Publish / Subscribe Model





STTP Difference: Publisher Data Access Control





STTP Difference: IP Level Security



Security at IP Layer

- *TCP*: Primary security is added at the socket using industry standard Transport Layer Security (TLS or SSL). X.509 certificates are used to authenticate connections and provide encryption through public key infrastructure.
- **UDP** (optional): When existing command channel is secured with TLS, UDP uses AES symmetric encryption with keys exchanged over the TLS secure channel.

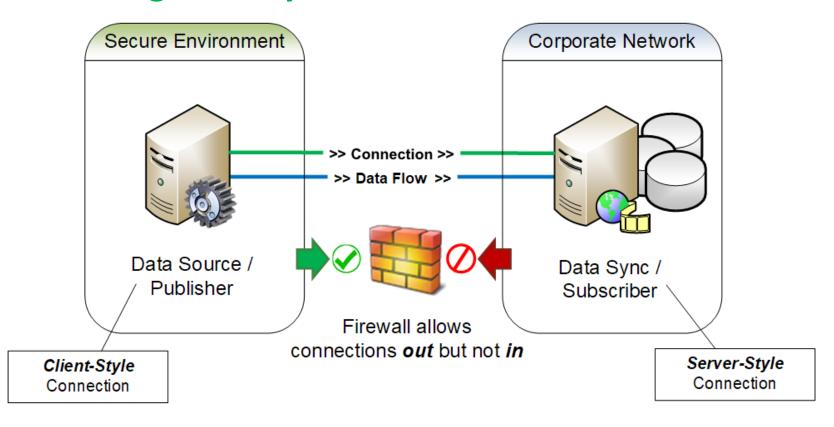


STTP Difference: Configurable Connection Origin

- Publisher and Subscriber operations are "functions" in STTP not "objects"
- As such, a publisher "sends" data, a subscriber "receives" data always

Crossing Security Zone with Reverse Connection







New Features from the IEEE Standards Process

- Added higher time precision options
- Some commands simplified / key words changed / unused options dropped
- Define Operational Modes now requires a publisher success response to accept proposed subscriber options. Options now include:
 - Custom compression algorithms selection for data packet, buffer block, signal index cache and metadata
 - Custom UDP cipher encryption algorithm selection
- New commands:
 - Get Primary Metadata Schema
 - Get Signal Selection Metadata Schema
 - Confirm Update Cipher Keys
- Suggested Metadata for synchrophasors has been improved / standardized.
- Includes a recommended Publisher and Subscriber API



Products are now Implementing STTP

New SynchroWAVe Platform Implements STTP



EPG Products, e.g., ePDC / RTDMS, Implement STTP (currently in testing)



GPA Products, e.g., openPDC / openHistorian, Implement STTP

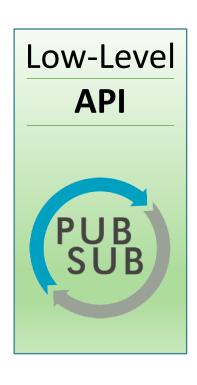


PingThings PredictiveGrid Platform Implements STTP for Ingestion





IEEE Standard Defines Common API Functions



- Publisher
 - Methods
 - Start
 - Stop
 - DefineMetadata
 - DisconnectSubscriber
 - PublishMeasurements
 - PublishBufferBlocks
 - Callbacks / Events
 - SubscriberConnected
 - SubscriberDisconnected

- Subscriber
 - Methods
 - Connect
 - Disconnect
 - RequestMetadata
 - Subscribe
 - Unsubscribe
 - Callbacks / Events
 - MetadataReceived
 - NewMeasurements
 - NewBufferBlocks



Open Source API Status -- see: https://sttp.info

	Subscriber	TSCC	Filter Expressions	Reverse Subscriber	Publisher	Reverse Publisher	TLS
GSF/Gemstone	Q	Q	\otimes	Q	Q	Q	\otimes
C++ / C#	Q	Q	Q	Q	Q	Q	
Go	Q	Q	Q	Q			
Python	Q	Q	Q			sttp.	info
Rust	Q	Ongo	oing progre	ss on STTP	API langua	ge targets	•

- All API language targets development is ongoing a various levels of IEEE functional completion
- APIs are ready for immediate use, integrate now!



API Implementations Available on GitHub

https://github.com/sttp

Streaming Telemetry Transport Protocol



Python STTP Implementation

https://github.com/sttp/pyapi



Go STTP Implementation

https://github.com/sttp/goapi



.NET STTP Implementation

https://github.com/sttp/dotnetapi



C++ STTP Implementation

https://github.com/sttp/cppapi



STTP Connection Tester

https://github.com/sttp/connection-tester

Open Source

All STTP reference implementations are Open Source Software (OSS) published on GitHub under the permissive MIT license.



