



PingThings



Lessons Learned at Scale with the World's Largest STTP Deployment for Synchrophasors

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Streaming Telemetry Transport Protocol

Advanced Synchrophasor Protocol Project

sttp

Streaming Telemetry Transport Protocol



DOE FOA 1492
DE-OE0000859

ASP

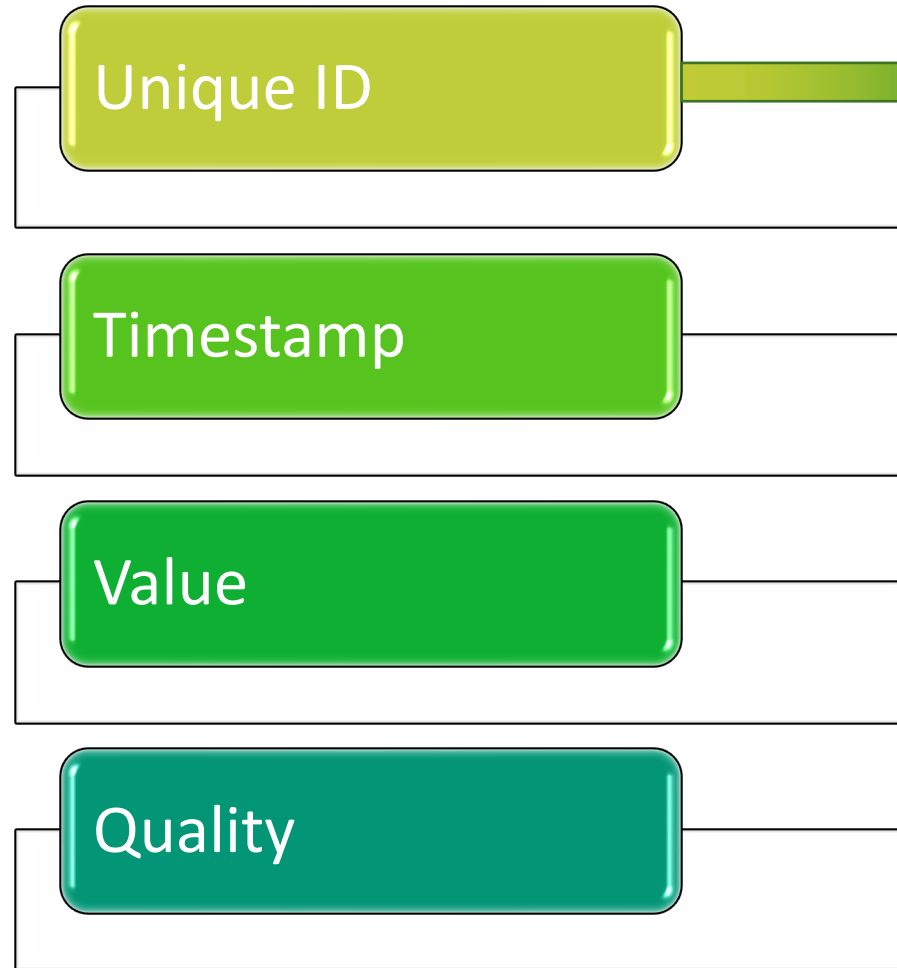
- US DOE Project
- Intrinsically reduces losses and latency compared to frame-based protocols
- Allows the safe co-mingling of phasor data with other

STTP Initially DOE Funded

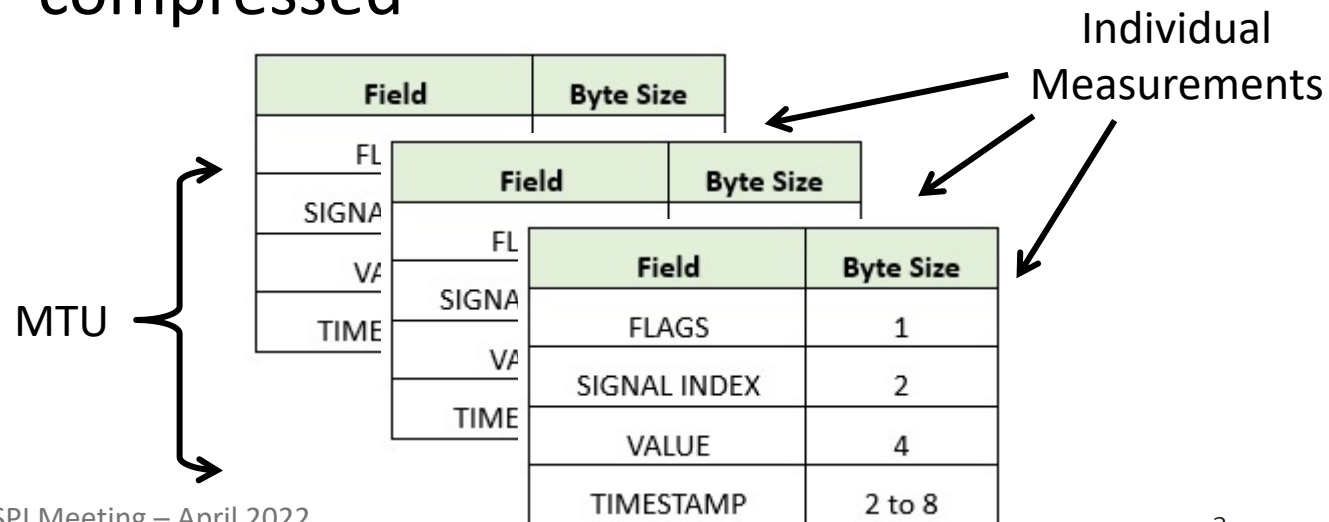
- Includes lossless compression to reduce bandwidth utilization
- Security-first design with strong authentication and option for encryption



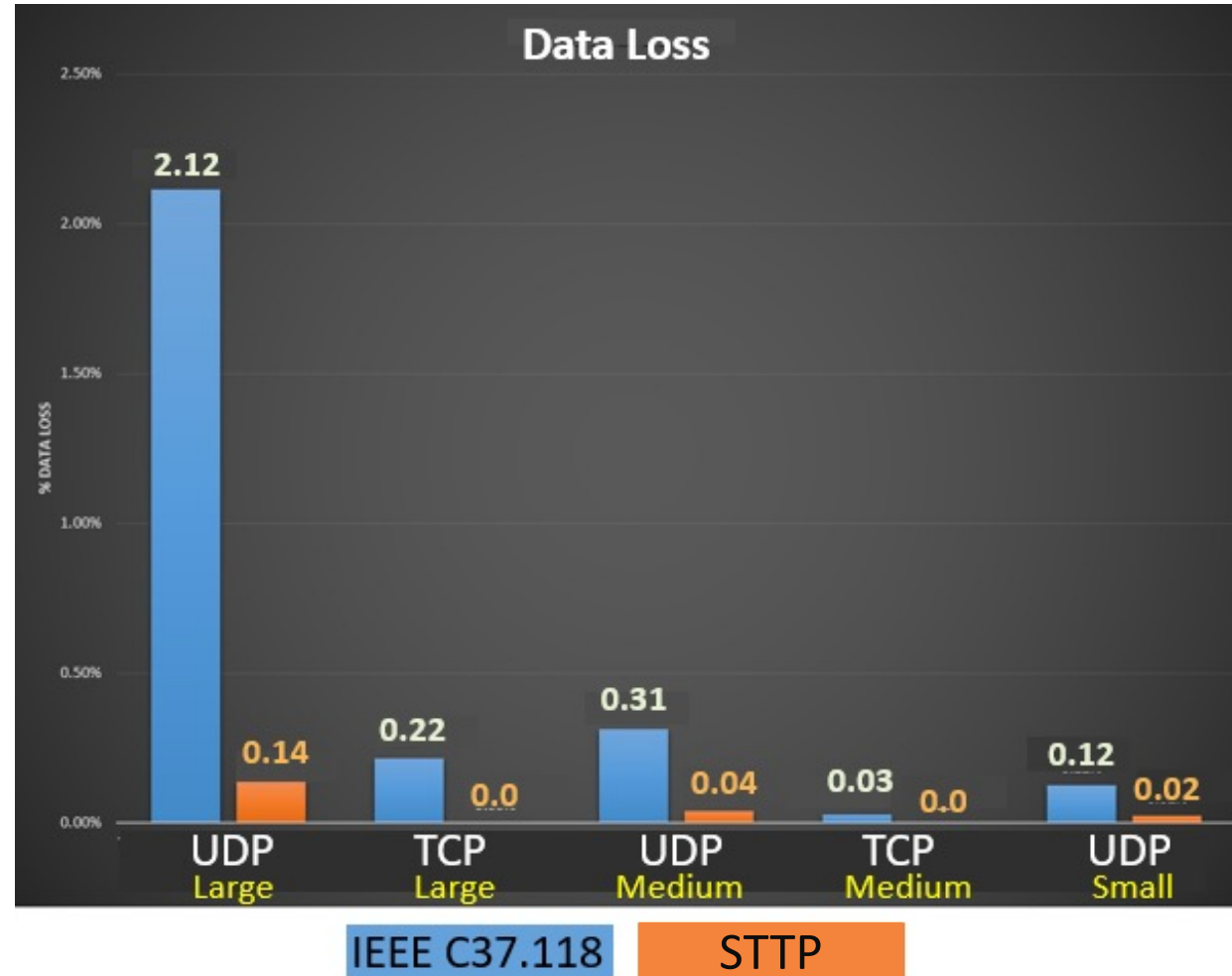
STTP Measurement Structure




- Unique ID is a UUID (a.k.a, Guid):
 - 128-bit randomly generated integer that is statistically unique
 - This allows for dataset conflation without worrying about ID conflicts
- Measurement structure values transported on the wire are compressed



Benefits: Lower Data Loss / Reduced Bandwidth



IEEE Standardization Progress

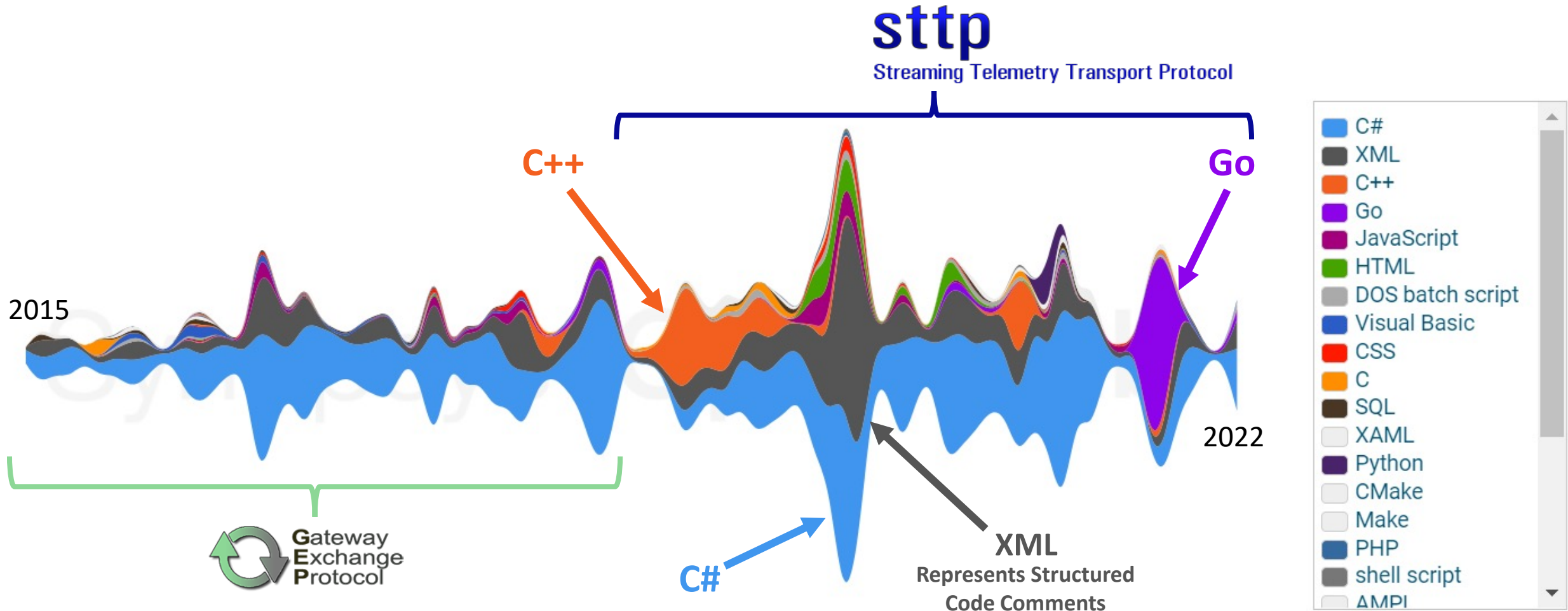
sttp →  IEEE

STTP on track to become:

IEEE 2664

- Draft is nearly complete!
 - Most remaining work is in appendices
- Standard planning to go to ballot in May

Major STTP Source Code Commits by Language



Source: <https://www.openhub.net/>

STTP Reference Implementations

All implementations are open source and MIT licensed for easy, immediate industry implementation:

Target Platform	Funding Source	Subscriber	Publisher
C++	DOE	Yes	Yes

STTP Now Industry Funded

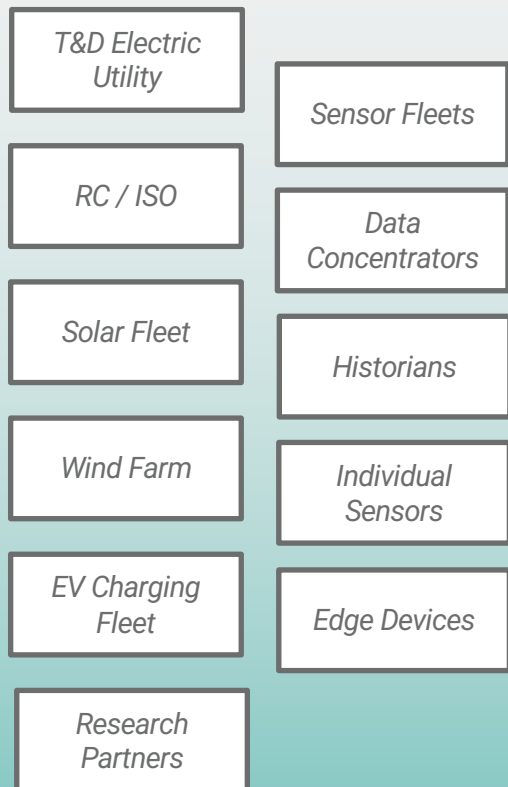
Thank you to Dominion!

Rust	?	Planned	Planned
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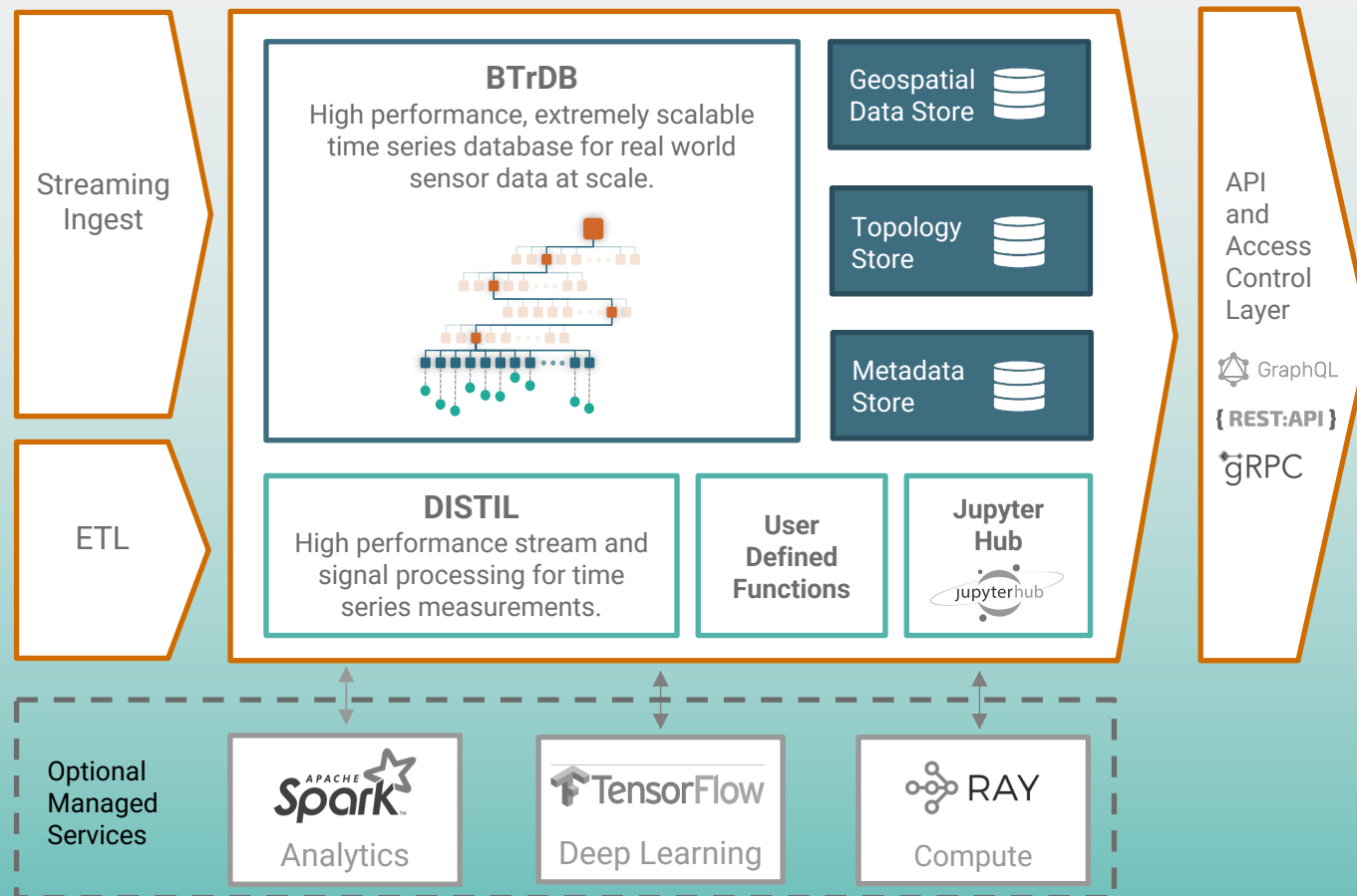
<https://github.com/sttp>

The PredictiveGrid Platform

Data Sources



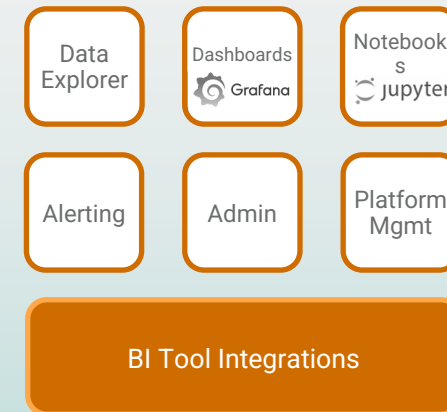
PredictiveGrid™



Secure, Scalable, and Reliable Infrastructure

Applications

General Purpose



Industry-Specific



Vanity Platform Metrics

- 53 trillion points under management
- 200,000 streams or time series 24/7/365
- >1M points per second streaming
- Additional points processed in batch (mostly Comtrade files)
- Too many use cases
- Rolling out ~10 CPOW @ 10KHz

Drivers for Update

- Desire for Golang-native ingress
- Enhanced stability of stream
- Reduced resource utilization
 - Bandwidth
 - Memory
 - Compute

Single Stream Benchmarks

- 53% decrease in CPU utilization
- 7% memory reduction
- 10% increase in startup time, however STTP has notably more robust metadata processing

At Scale Snapshot

PingThings

	Points Per Second	Memory	CPU	Network
GEP	425,000	1300MB	1.35 CPU	~900kB/s
STTP	575,000	220MB	1.5 CPU	~650kB/s

At Scale Benchmarks

- 87% reduction in memory
- 18% reduction in processing
- 47% reduction in bandwidth

Key Findings

- Simpler, smaller code base
 - Easier to maintain
 - Easier to find bugs
 - Easier to update and optimize
- Obvious resource savings
- Substantial “stability” increase

Operational Takeaways

- A data platform is only as good as the data that it can ingest
- Many problems only emerge at scale
- Resource consumption matters more at scale as well



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