Phasor Gateways
Sooner better than later…

Grid Protection Alliance

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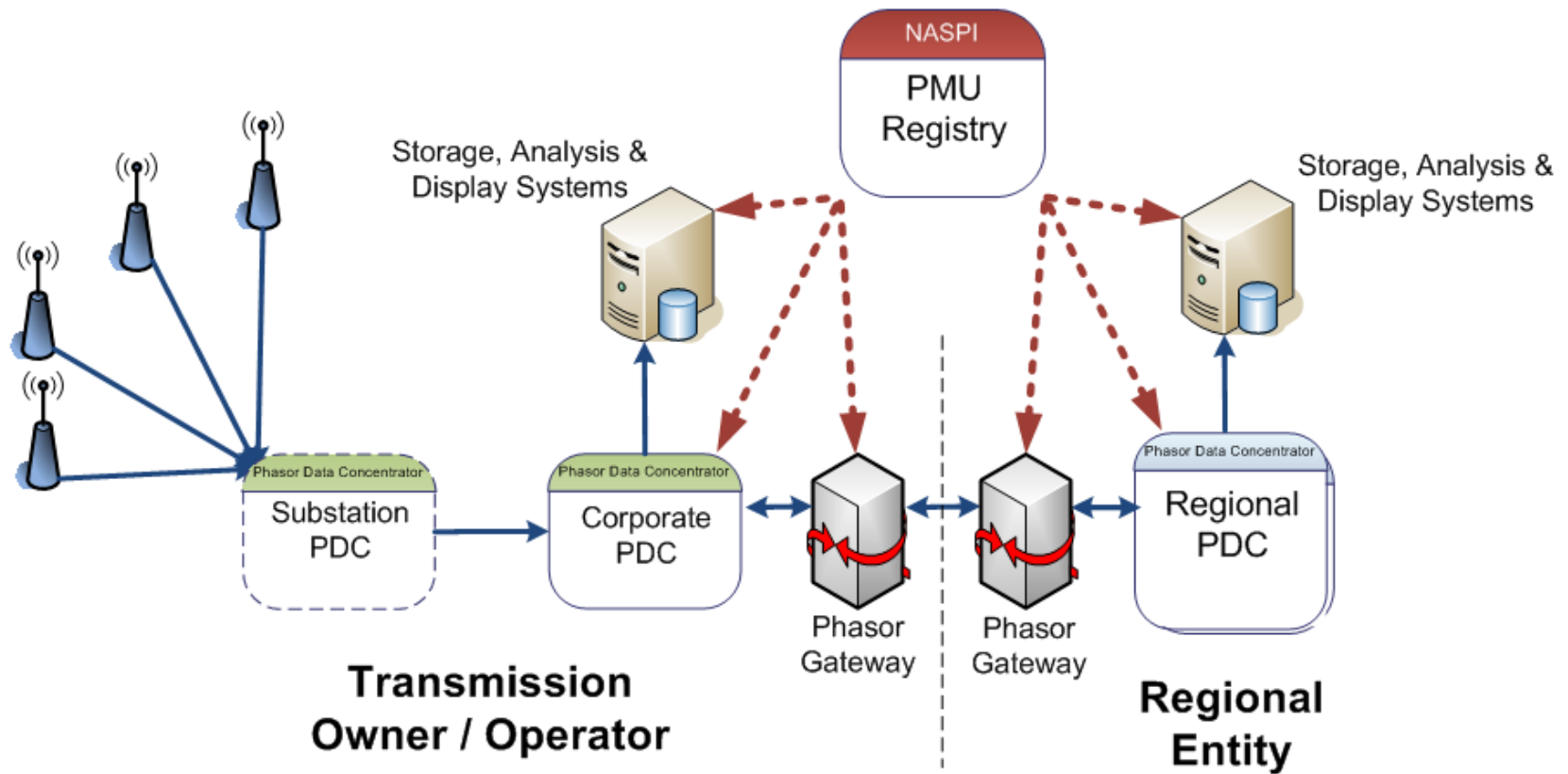
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Benefits of Phasor Gateways

- An edge devices to provided layered security protection for critical infrastructure

- Simplifies management of phasor data from external providers and reduces burden for PDC processing of this data.

- Enables monitoring and alarming of failed data exchange.

- Provides security and efficiency in distribution of phasor data to others

- Reduces external network transport layer loading by only moving the measurements needed

- Facilitates high-availability solutions

- Enables end-to-end latency reduction (no wait buffers)

- Allows external or internal use of new protocols or systems without impact to external data exchange – an isolation layer.
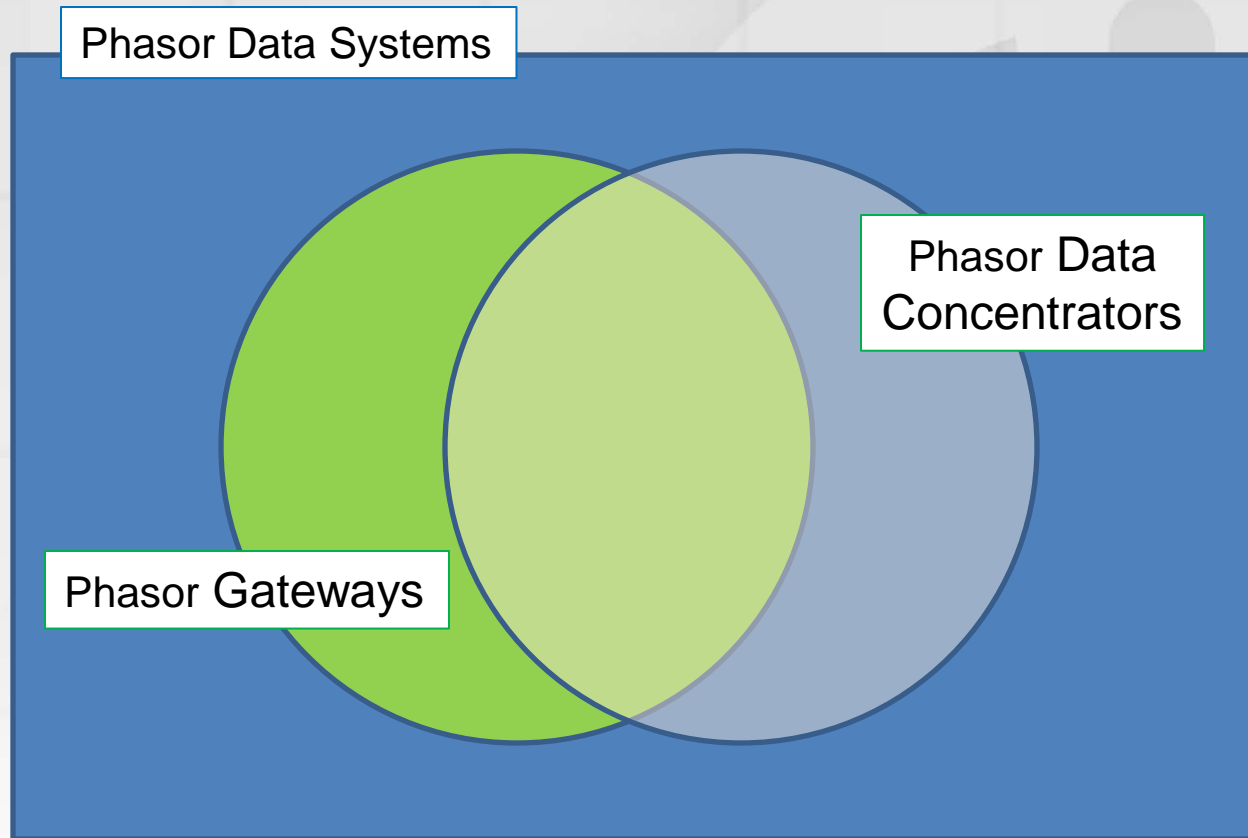
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Gateways are a needed component

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High Level Requirements

- Design will subscribe to NASPInet vision

- Design will be based on DNMTT use-case requirements

- Data will be exchanged at the "signal level"

- A simple, point-based protocol will be used – one that is optimized to minimize loading on communications systems

- Meta-data will be exchanged out-of-band (i.e., not over the data channel) using an information registry

- The data provider will be in complete control of data rates, signals available to publish and which consumers are allowed access signals

- For Version 1.0, security will be provided by the network layer

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Functional Separation
Phasor GW vs. PDC

Phasor Data Systems

Phasor Data Concentrators

Phasor Gateways

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Phasor Gateway vs. PDC
Common Features

- A high-performance real-time tool
- Leverages meta data – a registry – for configuration
- Accepts input from multiple devices that provides data in a standard format, e.g., IEEE C37.118
- Parses standard format streams to produce measurement-time value pairs
- Produces multiple outputs comprised of these value pairs
- A point of information interface implementation with other control room systems
- Produces logs on configuration, performance and security events

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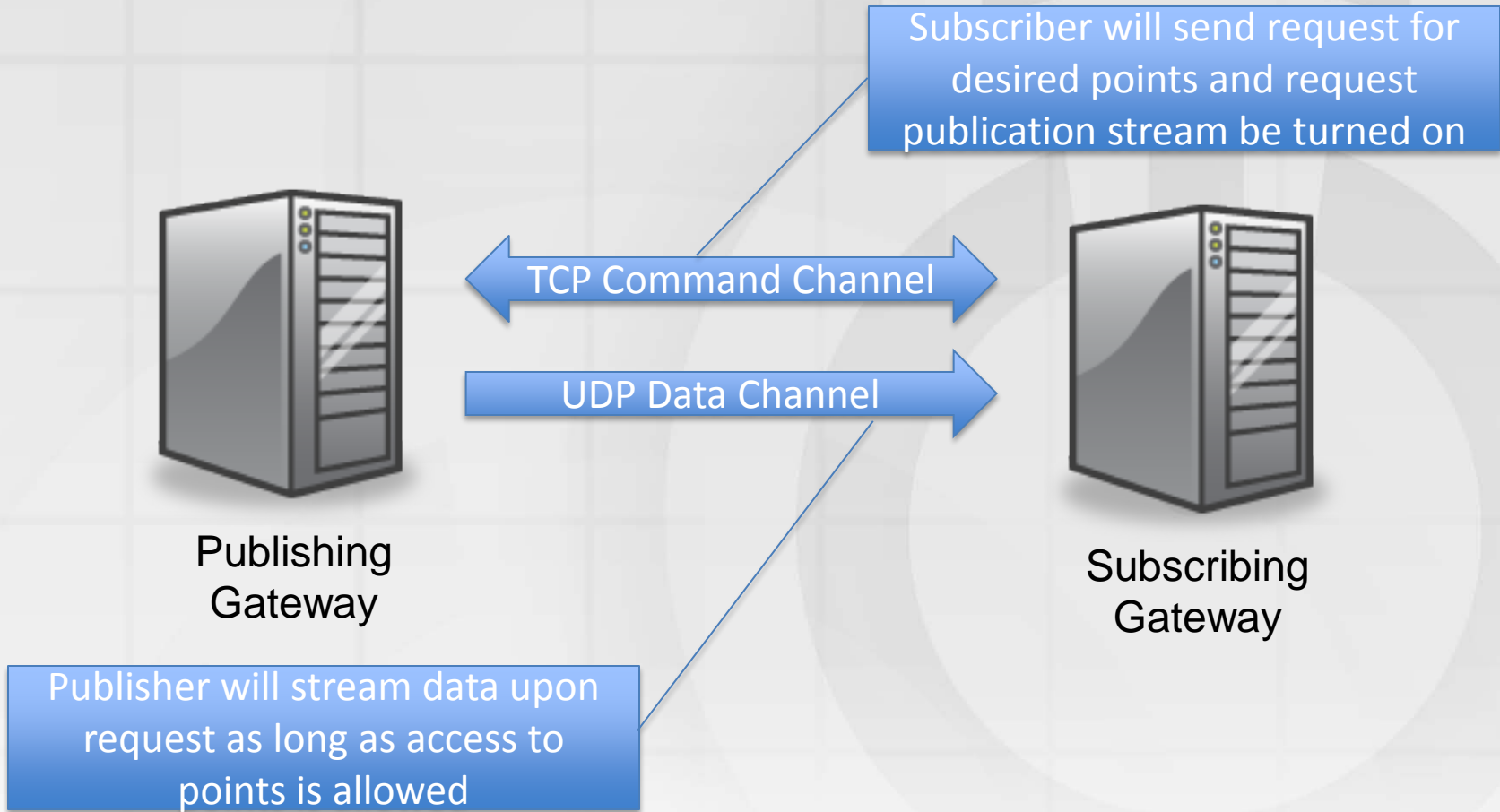# Phasor Gateway vs. PDC
Key Distinguishing Features

- **openPDC** – *optimized for time-alignment of many inputs*
  - Accepts inputs from PMUs and other IEDs using the broadest range of formats and protocols
  - Provides time-alignment of data
  - Allows implementation of adapters that require fast, low-latency analysis of time-aligned data
  - Publishes multiple time-concentrated output streams
  - Reports and alarms on quality of measurements (signals) and input device status

- **openPG** – *optimized for directed data transfer of granular information that facilitates a security-layered network design*
  - An edge device that can be hardened to protect critical systems
  - Manages asynchronous communication of specific measurements (signals) with other gateways
  - Reports and alarms on status of communication of data with other gateways

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openPG configuration is greatly simplified with a common registry

- To publish a signal, the openPG will:
  - Register the measurement (signal) with a signal registry infrastructure.
  - Be configured to designate the authorized receiving gateways (this configuration can be "all") for this signal.

- To subscribe to a signal, the openPG will:
  - Require knowledge of the measurement (signal) desired, queried via a signal registry.
  - Request authorization – *out-of-band* – to receive this signal from the publishing Phasor Gateway owner.

But, a common registry is not absolutely necessary.

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Gateway Pub / Sub Data Flow

Subscriber will send request for desired points and request publication stream be turned on

TCP Command Channel

UDP Data Channel

Publishing Gateway

Subscribing Gateway

Publisher will stream data upon request as long as access to points is allowed

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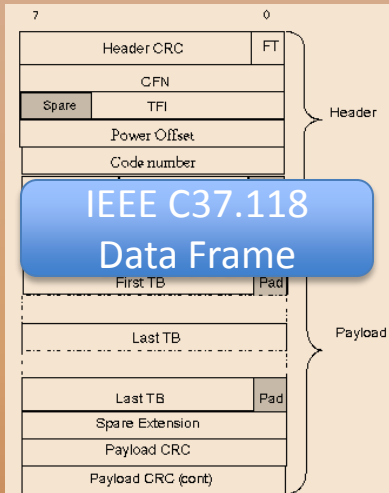
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Gateways use a "signal-based" protocol
Moving data over the openPG requires mapping IEEE C37.118 channels to signals
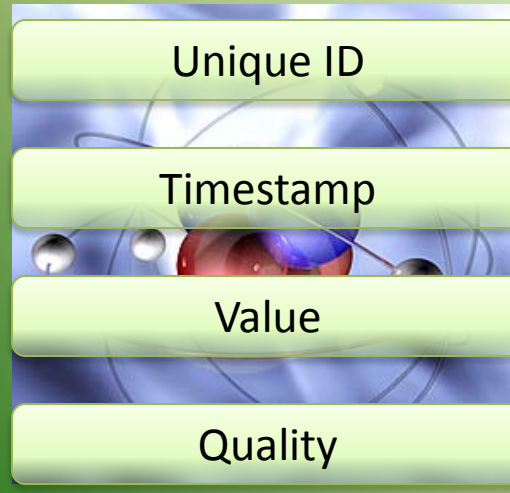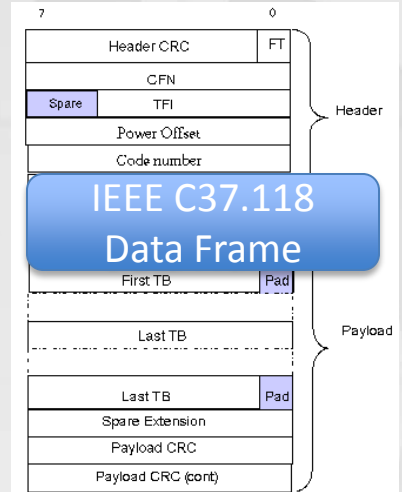
Gateway Functions

Decomposition

IEEE C37.118 Data Frame

Step 1

GPA TDTP Protocol

Fundamental Signals

- Unique ID
- Timestamp
- Value
- Quality

Step 2
Move to Destination

PDC Re-composition

IEEE C37.118 Data Frame

Step 3

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Gateway Information Flows

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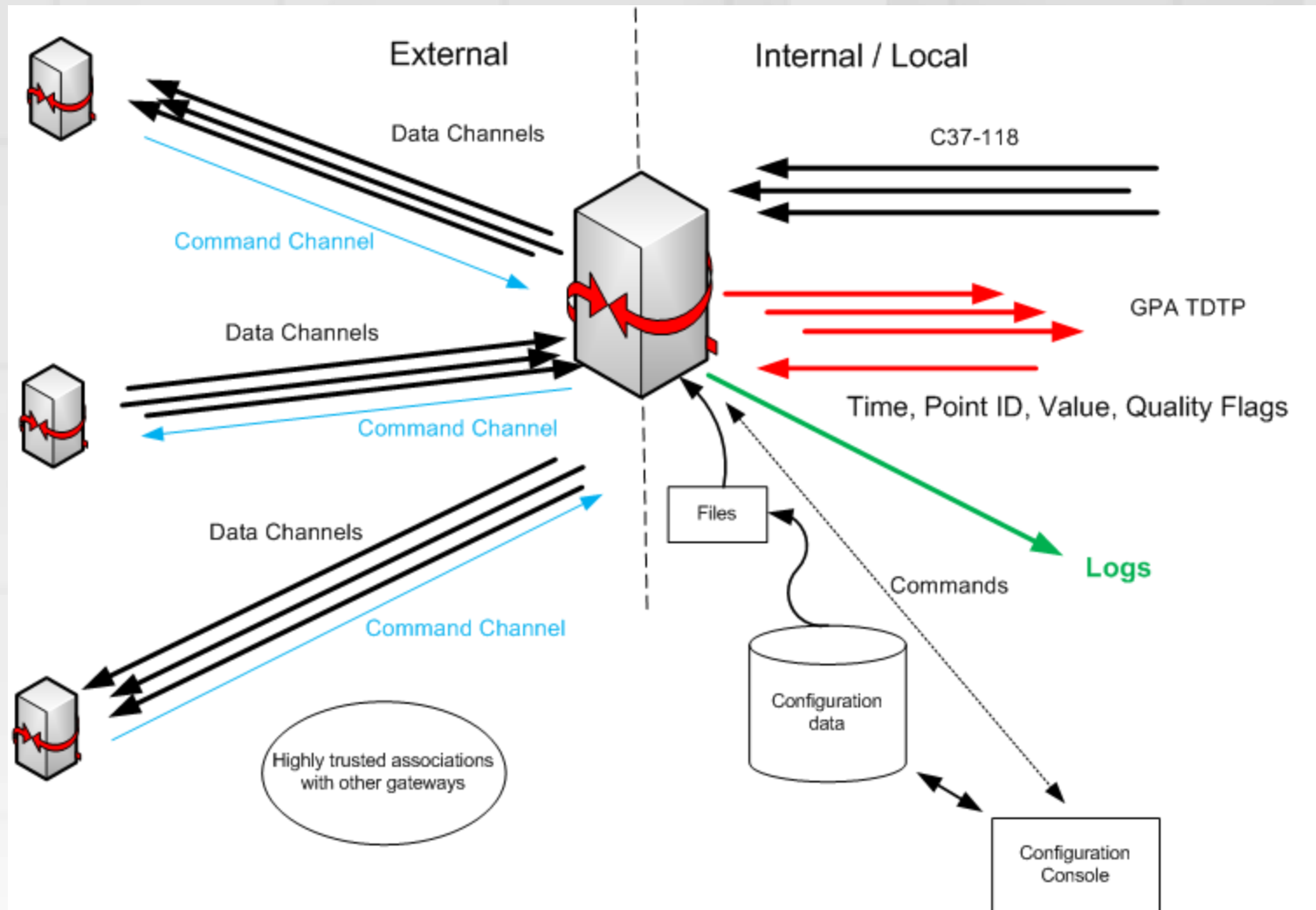
openPG – Version 1.0

A gateway architectural component that can be put in service as an element of SGIG project synchrophasor data architecture

- Available in June 2011
- Funded by NERC with help sought from SGIG projects

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openPG – Version 1.0

- A gateway optimized for phasor data exchange

- Simple point-based data exchange (single precision floating point values)

- The owner of the sending openPG can select points to be directed to specific receiving gateways. Points can be grouped into differing sample rates.

- Tightly integrated with the PMU Registry

- Security provided by the network layer

- Open source availability

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Phasor Gateway Plan Summary

- openPG Version 1.0 – late 2011

- Entergy PG Appliance – early 2012

- openPG Version 2.0 – late 2012

- SIEGate (Beta Software) – early 2013

- SIEGate Appliance – late 2013

The progression toward NASPInet.

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Value Summary

- Gateways provide an easy-to-configure point of interface of phasor information with other locations – external and internal.

- Gateways are an "edge device" to establish a secure electronic security perimeter

- Gateways allow easy detection and alarming of communications issues

- Gateways can significantly improve end-to-end latency of phasor data systems by only parsing phasor data streams once and time-aligning data only when needed

- Gateways reduce communication system loading by only moving the measurements needed

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