

A decorative graphic on the left side of the slide, consisting of a dense cluster of small, multi-colored squares (red, blue, orange, black, white) that tapers off into a few scattered squares as they move towards the right.

# PowerLink Data Management Framework

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from DATA to ACTION

Design, Develop and Deploy digital transformation solutions for the InterConnected World.

- Power system and industrial automation
- Business Analytics, Data Warehousing and Big Data
- Information Security and Compliance



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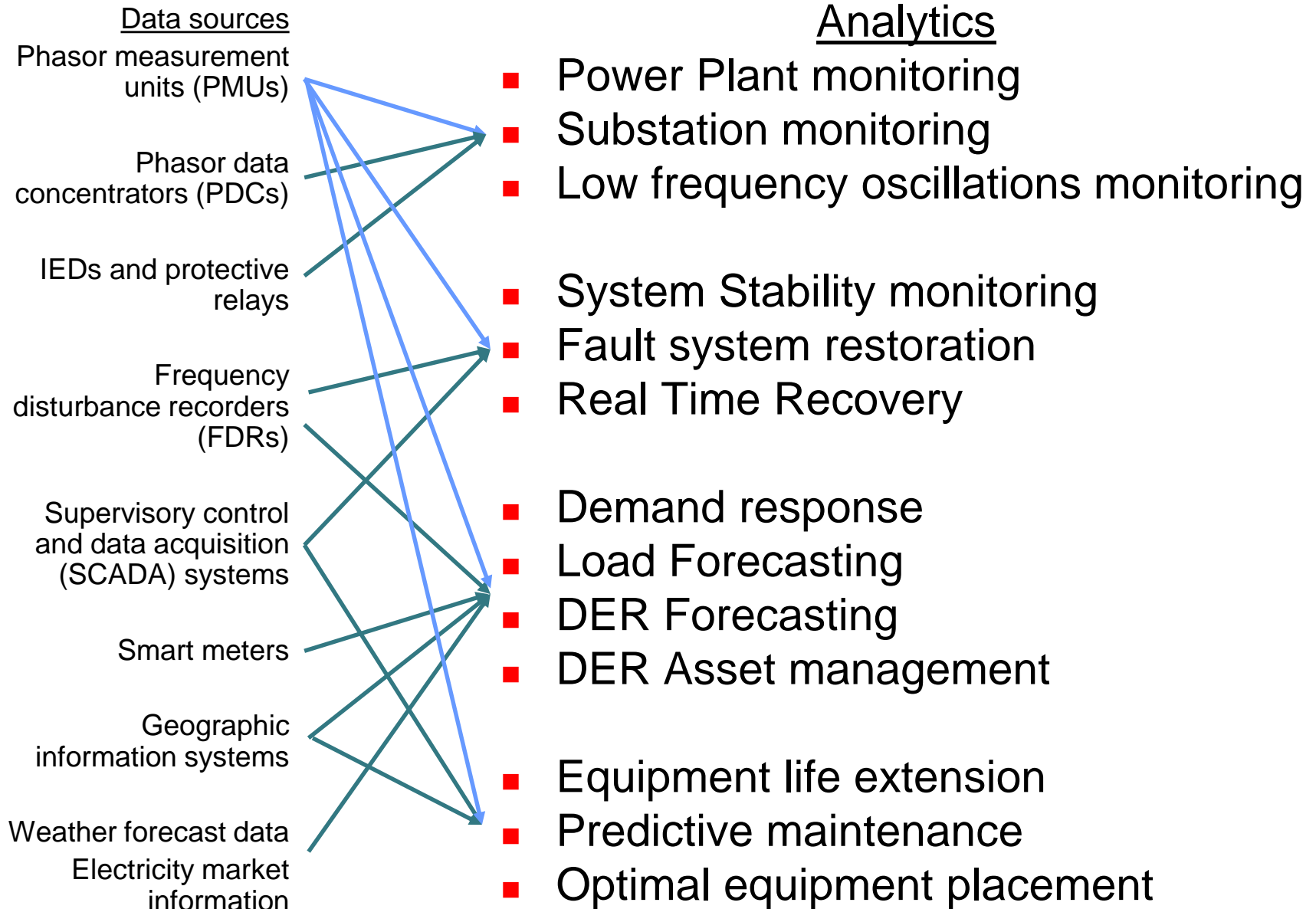


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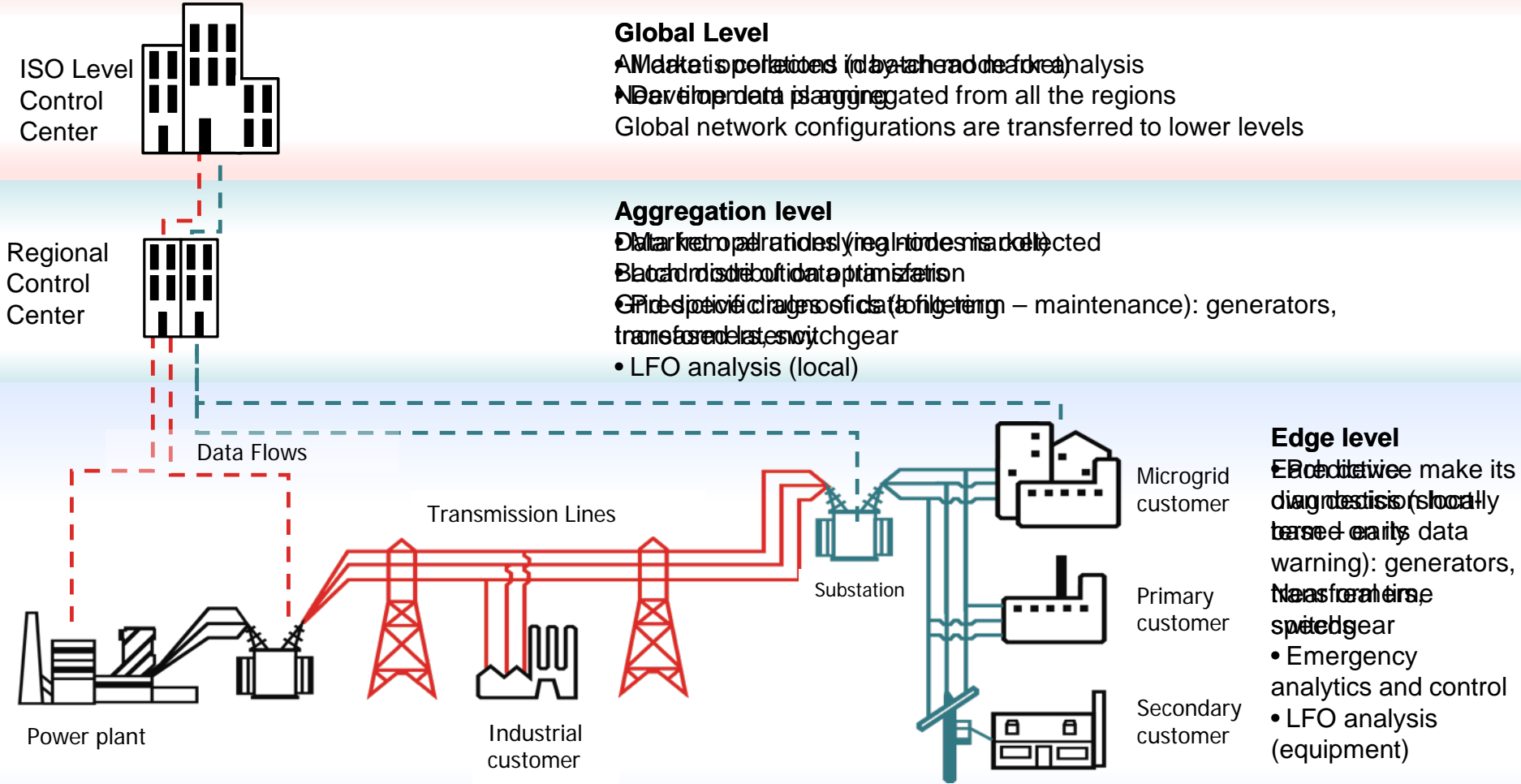
# Data Driven Analytics



# Distributed Layered Data Management



- At each level decisions are made on the basis of the data available at this level.
- Data required at higher levels is transmitted: only the minimal required amounts and granularity
- Higher levels distribute global updates to lower levels



### Global Level

Market operations (day-ahead, real-time)  
 Develop data planning  
 Global network configurations are transferred to lower levels

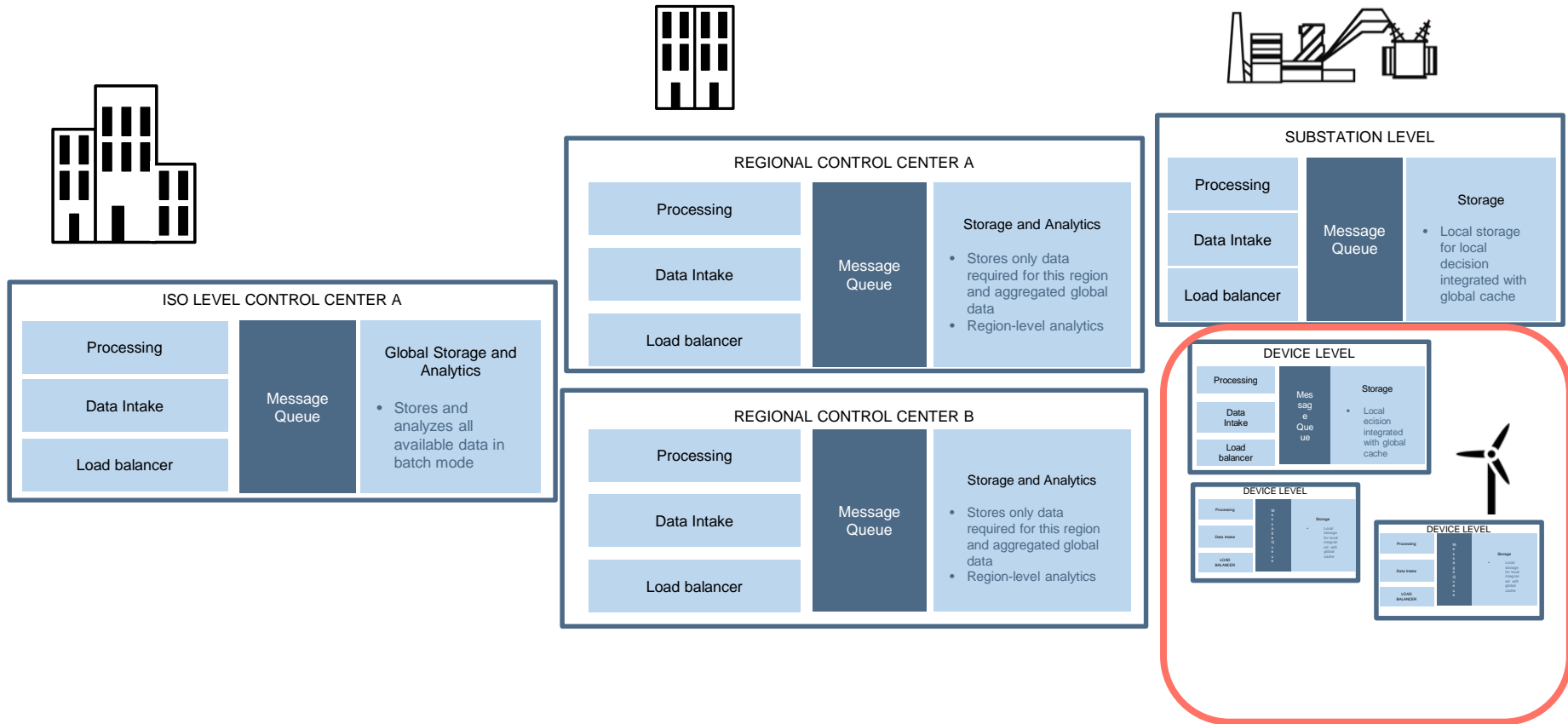
### Aggregation level

Market operations (intra-day, real-time)  
 Batch distribution optimization  
 Specific classes of equipment (e.g. – maintenance): generators, transformers, switchgear  
 • LFO analysis (local)

### Edge level

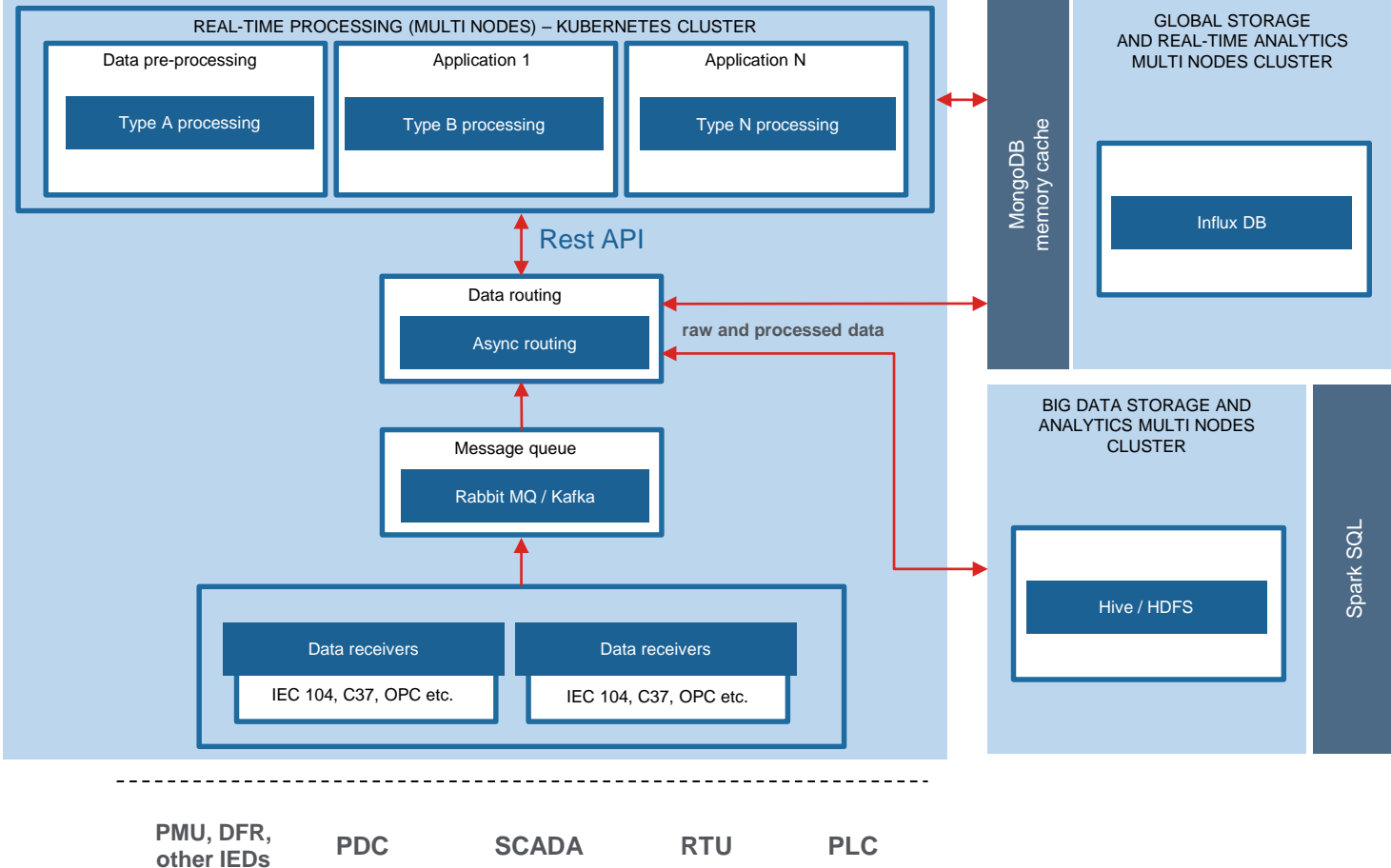
Equipment make its diagnostic (locally based on its data warning): generators, transformers, switchgear  
 • Emergency analytics and control  
 • LFO analysis (equipment)

# Data Partitioning – Distributed Multi-node



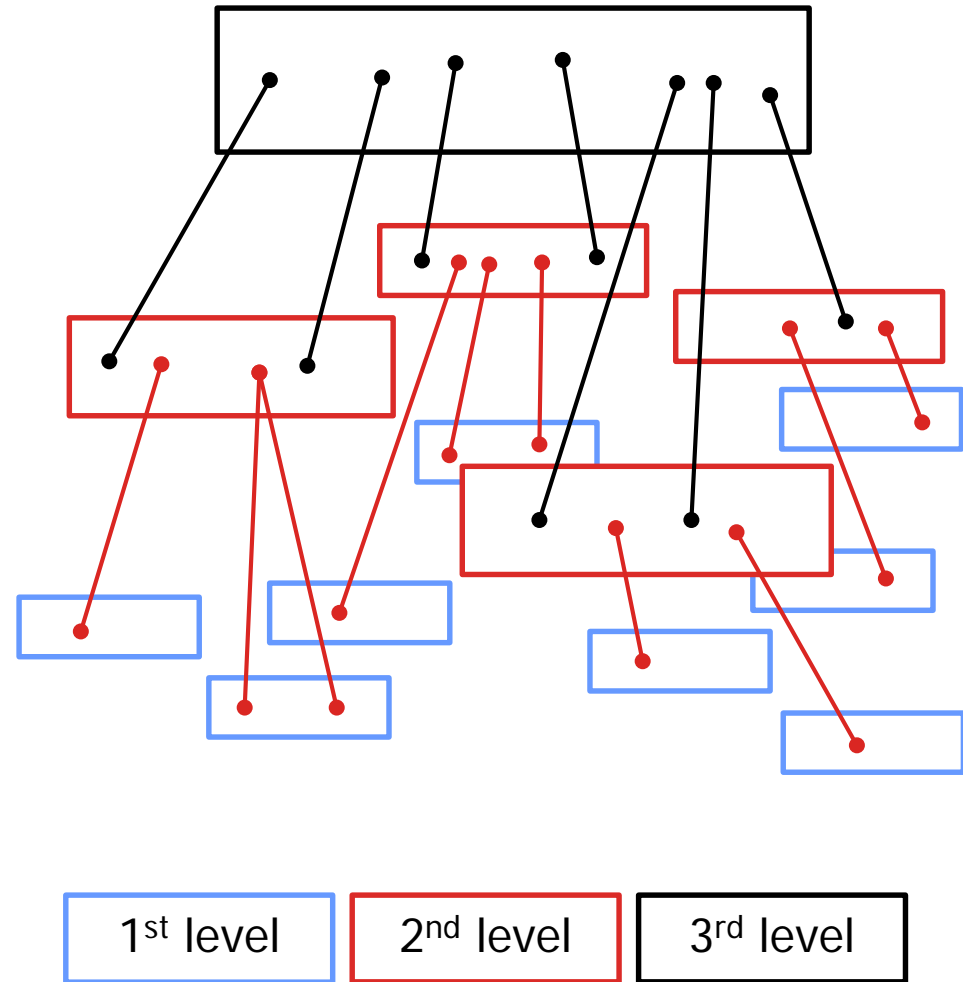
- Using new techniques of data exchange the data flows have been optimized over 5 times
- Combining **REST API (web-services)** and **RabbitMQ messaging middleware** we provide on-line and off-line data exchange between PowerLink nodes

# Flexible archiving – Node Structure



# Data Quality Assurance

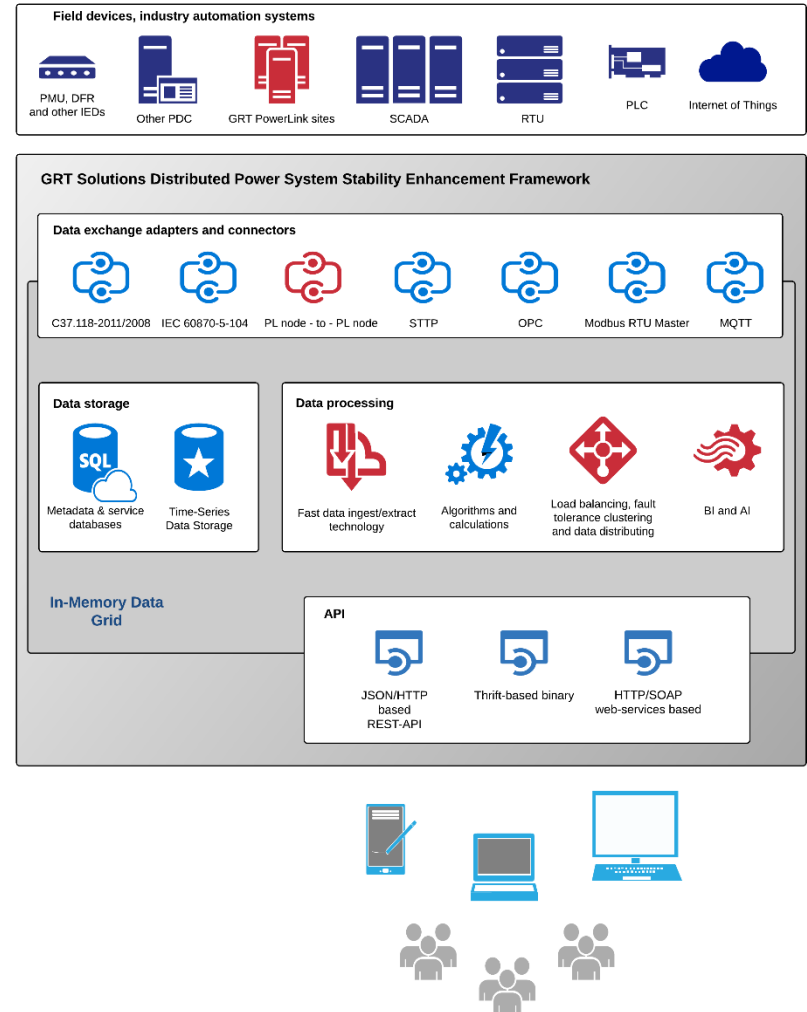
- **Object level:** raw 10+ kHz sampling rate data for protection and relay due to the transient (at the substation or power plant). Hardware solutions (IED, protection and relay)
- **Region level:** time synchronized data exchange between neighboring objects
- **Interconnection level:** “conventional” telemetry and PMU data validation at Control Centers with advanced algorithms





# PowerLink highlights

- Scalable platform for building WAMPACS using multi stream technology
- EDGE Architecture, supports IIoT and classical SCADA/PLC/DCS data sources
- Distributed historian with very fast search and data export capabilities
- High performance (sampling rate of 50–200 measurements per second for one channel)
- Unlimited scalability in tags - over billion tags/columns address database space available
- Advanced visualization
- Proven data and information security
- Implemented in geographically distributed system spanning more than 2000 miles with 100ms data latency



# GRT Sample Clients



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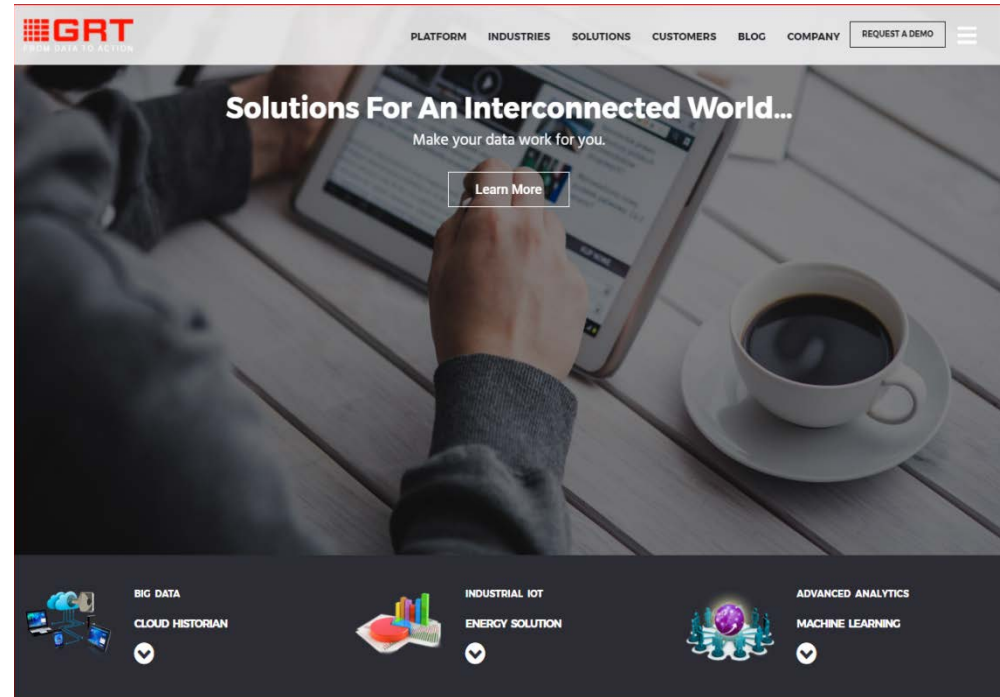


**synapse**



# Q&A

**Thank You**  
**GRT Corporation**



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