



IBM Energy and Utilities industry

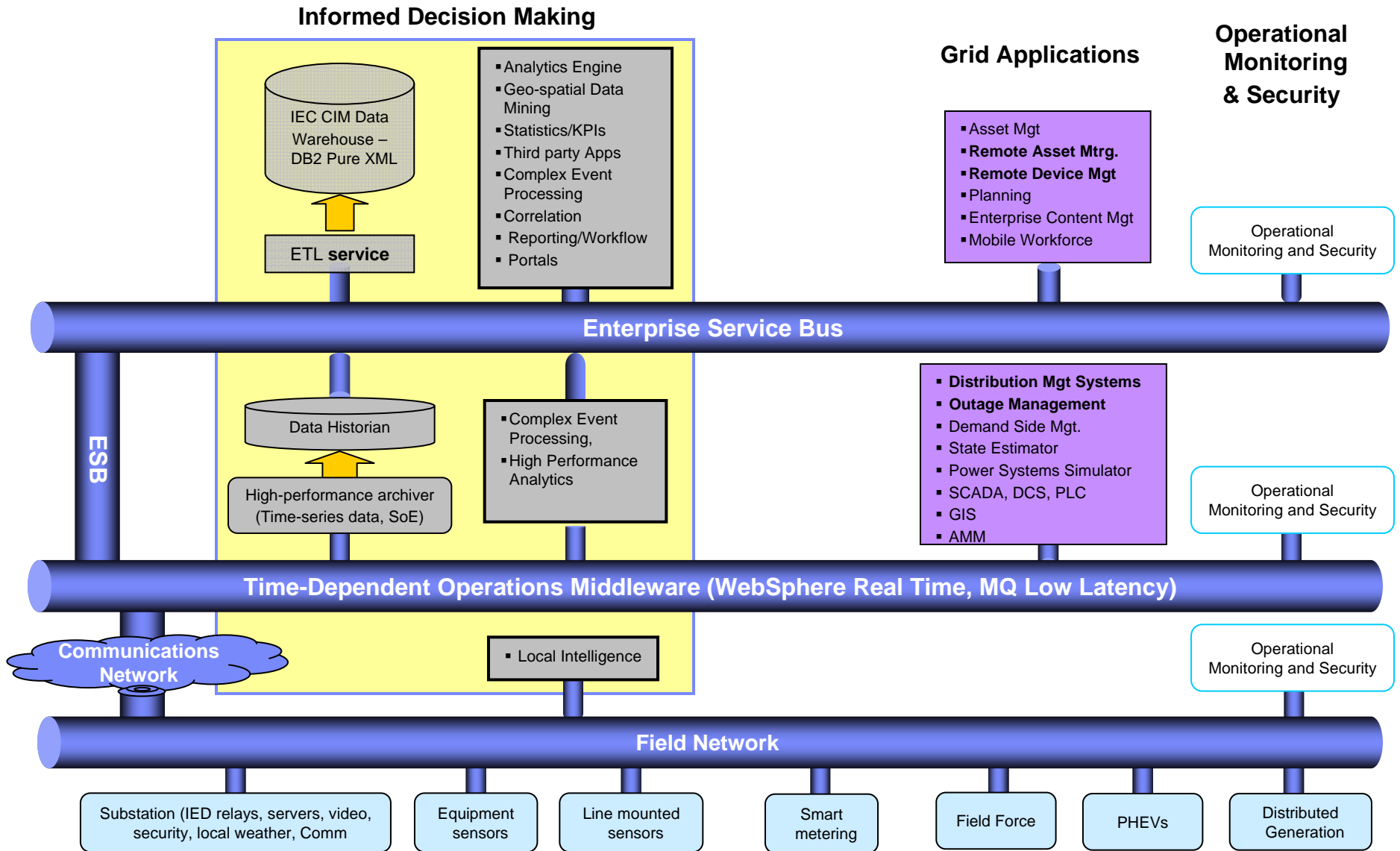
Topics in Smart Grid Telecommunications

NECPUC Annual Symposium

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Intelligent Utility Network Conceptual Solution Architecture

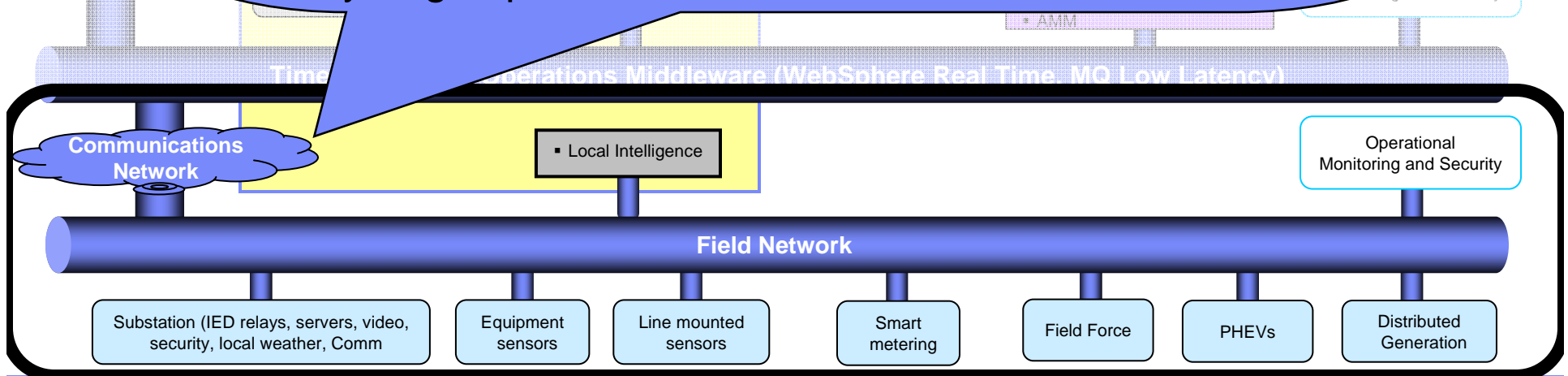




IUN Conceptual Solution Architecture

The IUN Reference Telecom Architecture must:

1. Address the interconnection of people, application systems, and edge devices located on the transmission and distribution grids, at data center, operations centers, and at work centers.
2. Address performance diversity (support time-dependent and non time-sensitive traffic).
3. Address connectivity diversity of users and devices across a very large spatial area.



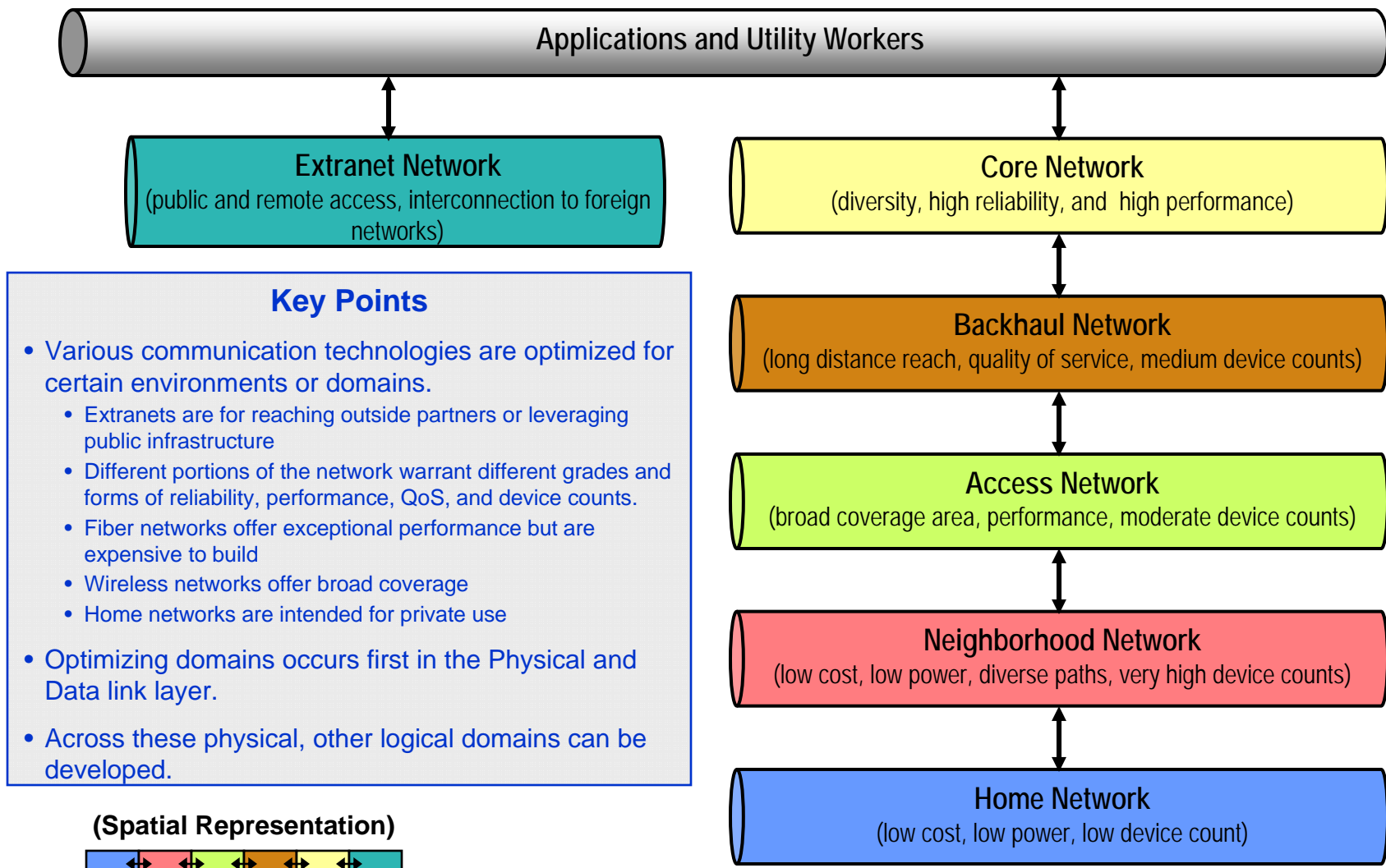


Guiding Principles for Implementing an IUN Reference Telecom Architecture

- **Support for convergence of diverse applications/systems**
- **Carrier class performance and reliability**
- **Autonomous operation of communication sub-systems (diverse sub-systems will not impact other)**
- **Provide for broadest coverage at the least cost**
- **Account for extreme device counts**
- **Seamless interworking between IP (v6/v4) and non-IP systems**
- **Re-use existing infrastructure where possible**
- **End-to-End security, reliability and availability**



IUN Reference Telecom Architecture is Conceptualized using Six Physical Networking Domains.





Distribution Grid Applications Drive Architecture and Decisions in the HAN, NAN and Access Domains

▪ Applications

- AMI
- Distribution automation
- Demand management
- Mobile worker
- Distributed generation

▪ Decisions

- NAN domain size (example ratios 15:1, 500:1, 5000:1, 20000:1)
 - AMI meter-to-concentrator ratio drives quantity of takeout points
 - Hop distance and hop count optimization
- Convergence of AMI and Demand management systems
- Convergence of AMI and DA NANs
 - Quantity of DA devices could be 20x substation count
- Licensed vs. license-exempt preference in the Access domain
- Coverage to support mobile workers with broadband connectivity
- Distributed generation comms connectivity requirements
 - Scope, performance, security schemas



Issues Beyond the Communications

- **Security**

- Managed risk
- Anomaly Detection and Intrusion Protection
- Extension of IP enabled security
- Pros and cons of IP all the way



Future Proofing

- **Standards as best hedge**
 - Standards also encourage innovation
- **Likely bet web technologies will persist**
- **Transformer with 30 year life may have 4 generations of monitoring equipment**
- **Communications equipment may also have improvements**
 - Speed
 - Frequency
 - Public/private network



Interoperability

- **Electrical power engineers are used to it**
- **Under Section 1305 of the act, this interoperability framework "shall be flexible, uniform, and technology neutral" and "align policy, business, and technology approaches in a manner that would enable all electric resources, including demand-side resources, to contribute to an efficient, reliable electricity network."**
- **NIST, Grid Wise Architecture Council, IEEE**
 - <http://www.grid-interop.com/2008/>
 - http://grouper.ieee.org/groups/scc21/dr_shared/2030/



All Data-ed Up and No Where to Go

- **Storage**

- Volume calculations, retention, failure-proofing

- **Processing**

- Level of Distributed Intelligence impacts communications design
- Ability of Enterprise Architecture to utilize data
- Admissibility of applications to absorb new data for better TCO
- Analytics to support operations, workforce
 - Mobile workforce
 - Ageing workforce/iPod enabled workforce
 - Build knowledge management
 - Links to Finance, Maintenance, Planning, Transmission, Generation
- Optimization of entire existing system is the goal
 - Including consumer awareness and energy management