Argus Project http://qosient.com/argus

- Argus is a network activity audit system
- The first real-time network flow monitor
  - First developed at Georgia Tech (Enslow, 1983)
  - Applied to cyber security at CMU/SEI CERT (1989)
  - Engineered for HPC at the Naval Research Lab (Dardy, 2000)
- Network activity/usage data models and analytics
  - Generates detailed data network metadata (CDR equivalent)
  - Source of near real-time and historical network awareness info
  - Supports the complete incident response life cycle
- Designed to support network situtation awareness
  - Operations - Service availability and operational status
  - Performance - End-to-end assessment of network traffic
  - Security - Audit / Non-Repudiation / Anomaly Detection
- Top 100 security tool used in the Internet today

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Argus Users

- Cyber Security Awareness
  - Defense Information Systems Agency
    - Standard for network forensics data generation Joint Regional Security Stack JRSS
  - Department of Homeland Security
    - Cyber Mitigation and Course of Action (COA) Development
  - National Security Agency
    - CYBERPILOT
- Network Situational Awareness
  - GLORIAD – INSIGHT (Cole)
  - NASA Ames HPC (Boscia, Shaw)
    - E2E QoS Analysis and Performance Assurance
- Network Research – Open Source
  - National Science Foundation AMI (Cole, Gregor)
  - Stanford Univ (McKeown, Gerth, van Reijendam)
    - SDN Dev Ops and Cyber Security Awareness

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Argus Approach

- Advanced Sensors for Network MetaData Origination
  - Comprehensive accountability for all network activity
  - Ubiquitously deployable to enable a uniform sensing fabric
  - Mature data models to track all network strategies
    - Bi-directional flow tracking for tunneled, unicast, multicast, broadcast, connection-oriented and connection-less network transactions.
    - Control, Management and User plane traffic awareness
      - Ethernet, Infiniband, ATM, PPP, ARP, DHCP, VLANs, LDP, LLC, MPLS, RSVP, OSI IS-IS, SDN encapsulations, IPv4, IPv6, ESP, RTP, RDP, and general support for any/every other protocol.
  - Reporting conventional and novel network attributes
    - Multi-layer flow specs, content, flow disposition, behavioral metrics (PCR, Laterality), Packet Dynamics (keystroke reporting, burst behavior, queuing, load balancing)
  - Real-time sensing and reporting to enable active response
  - Designed for a large number of awareness applications

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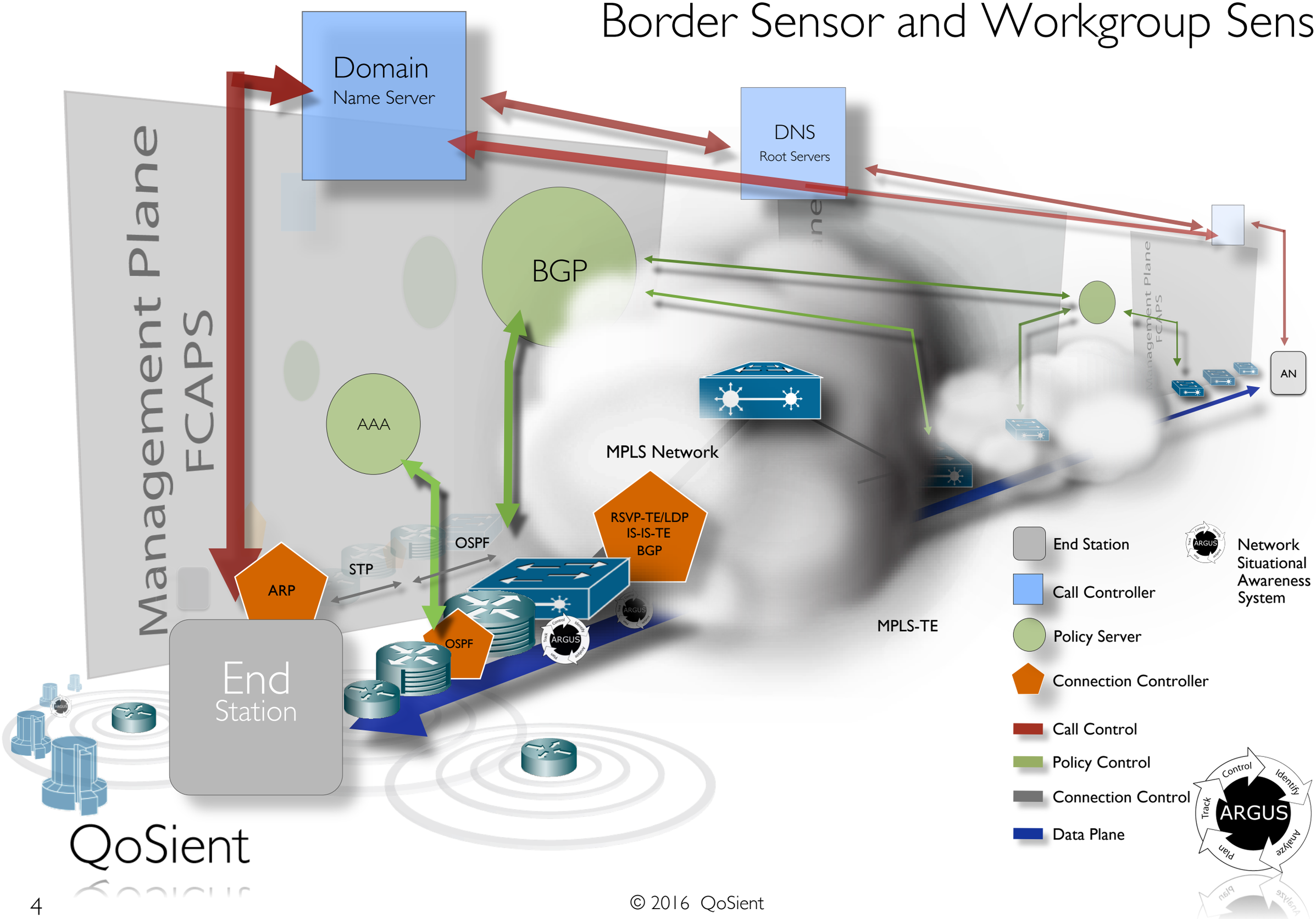
Traditional Visibility Deployment Strategies

Border Sensor and Workgroup Sensor



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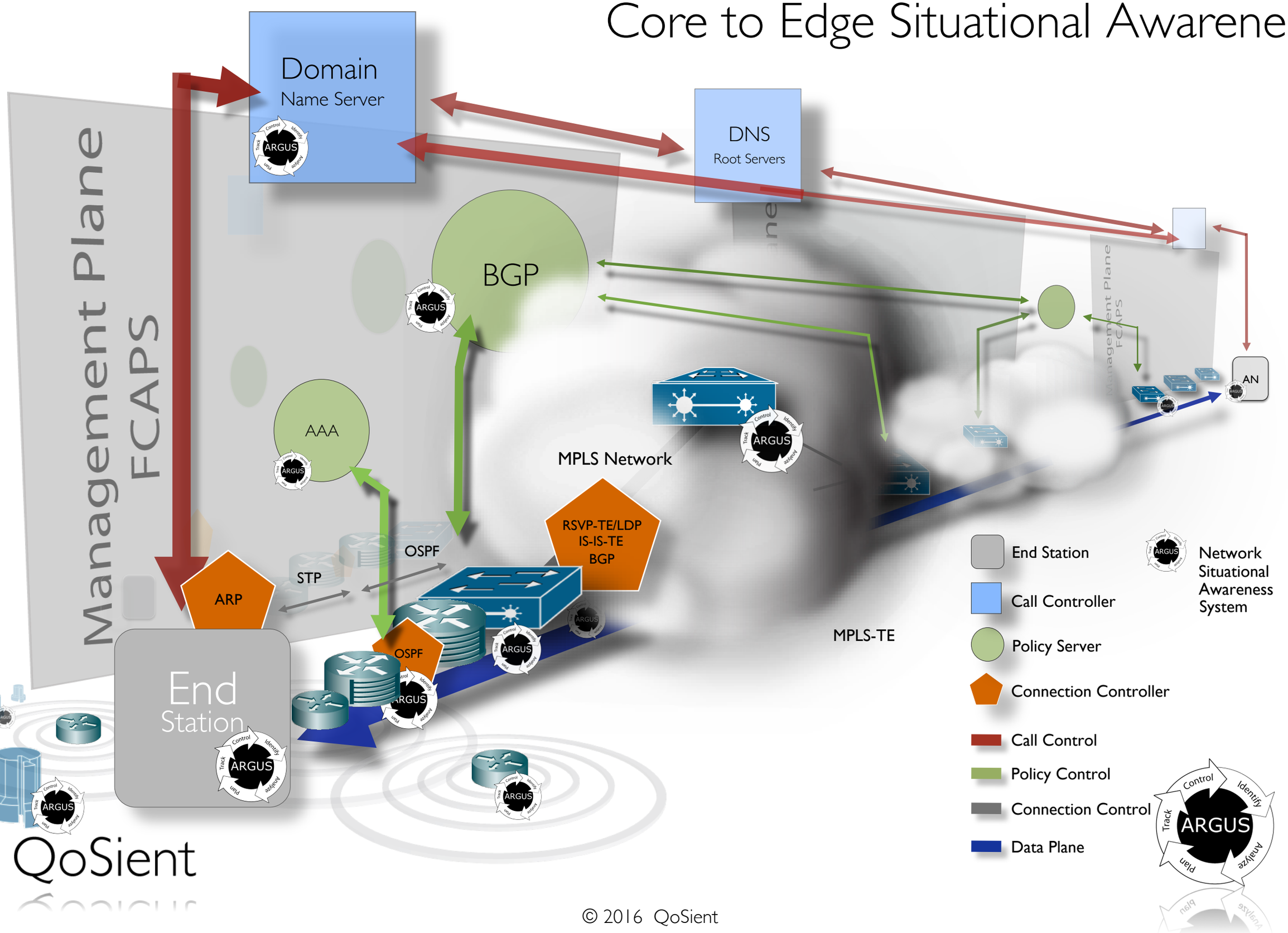
Comprehensive Deployment Strategies

Core to Edge Situational Awareness



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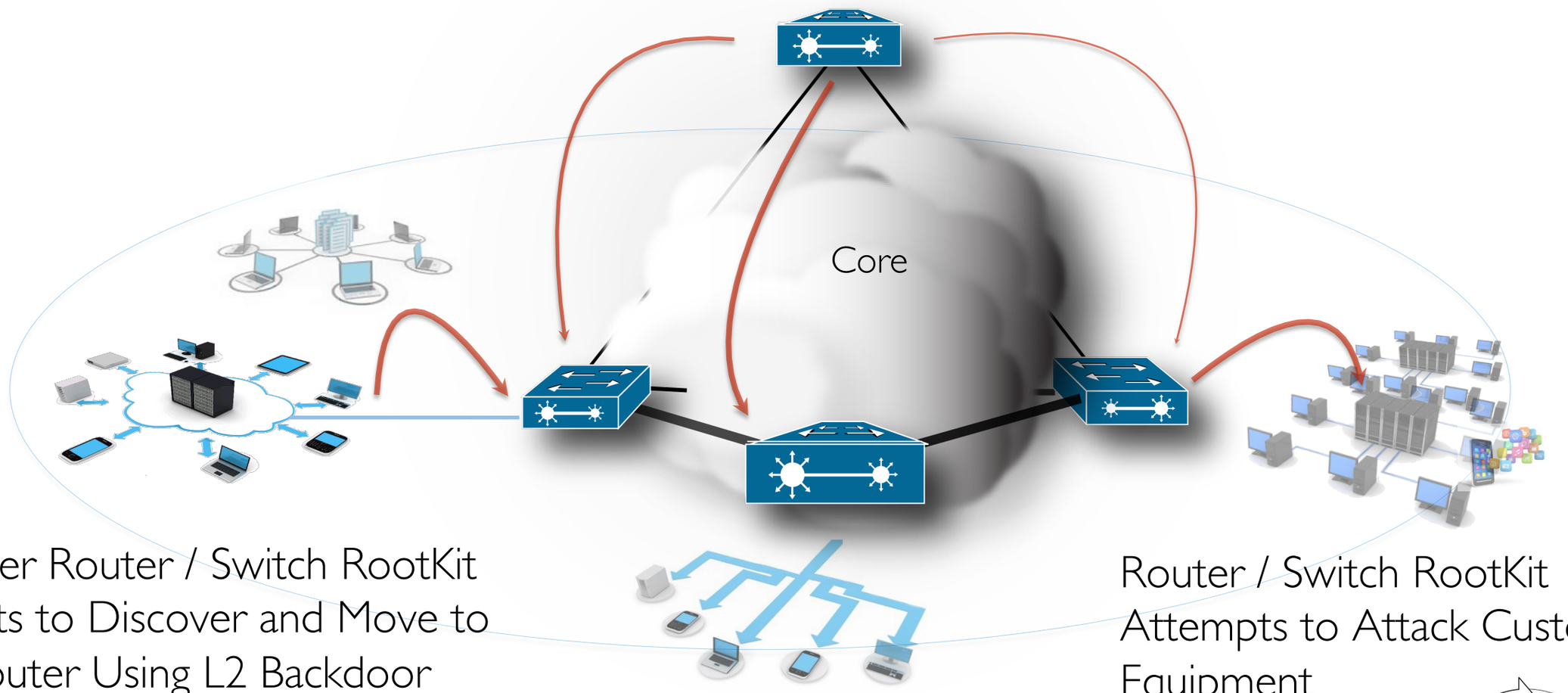
Core Control Situational Awareness

ISP Rootkit Lateral Movement Scenario

Core RootKit Activates and Laterally Moves Within the Core
Using L2 Proprietary Covert Channels or Existing Embedded Agents



Customer Router / Switch RootKit
Attempts to Discover and Move to
Edge Router Using L2 Backdoor
Protocols

Router / Switch RootKit
Attempts to Attack Customer
Equipment

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Stanford / NASA 100Gbps Argus

- 100G SDN Control Demonstration for SC'16
  - Near real-time traffic identification and management with wire-line verification for traffic engineering
  - Demo moving big elephants between 10G and 100G services using Openflow and Argus
  - Combines sensing, sense-making, decision making and action to provide near-time active networking
- Dell, Mellanox, Napatech and QoSient technology
- Cooperative between Stanford, CENIC and NASA
  - Testing sensing and sense-making components today
  - Opportunity to test advanced packet dynamics monitoring at 100G over CENIC.

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