Evolutionary Path of a Surveillance Data Network

Outline

- Preface
- Motivation
- Difficulty with current approaches
- Benefits
- Issues with Equipment within Facilities
- Inter-facility communication
- Rapid Expansion to a “pseudo” national SDN
- Policy Issues
- Conclusion

Preface

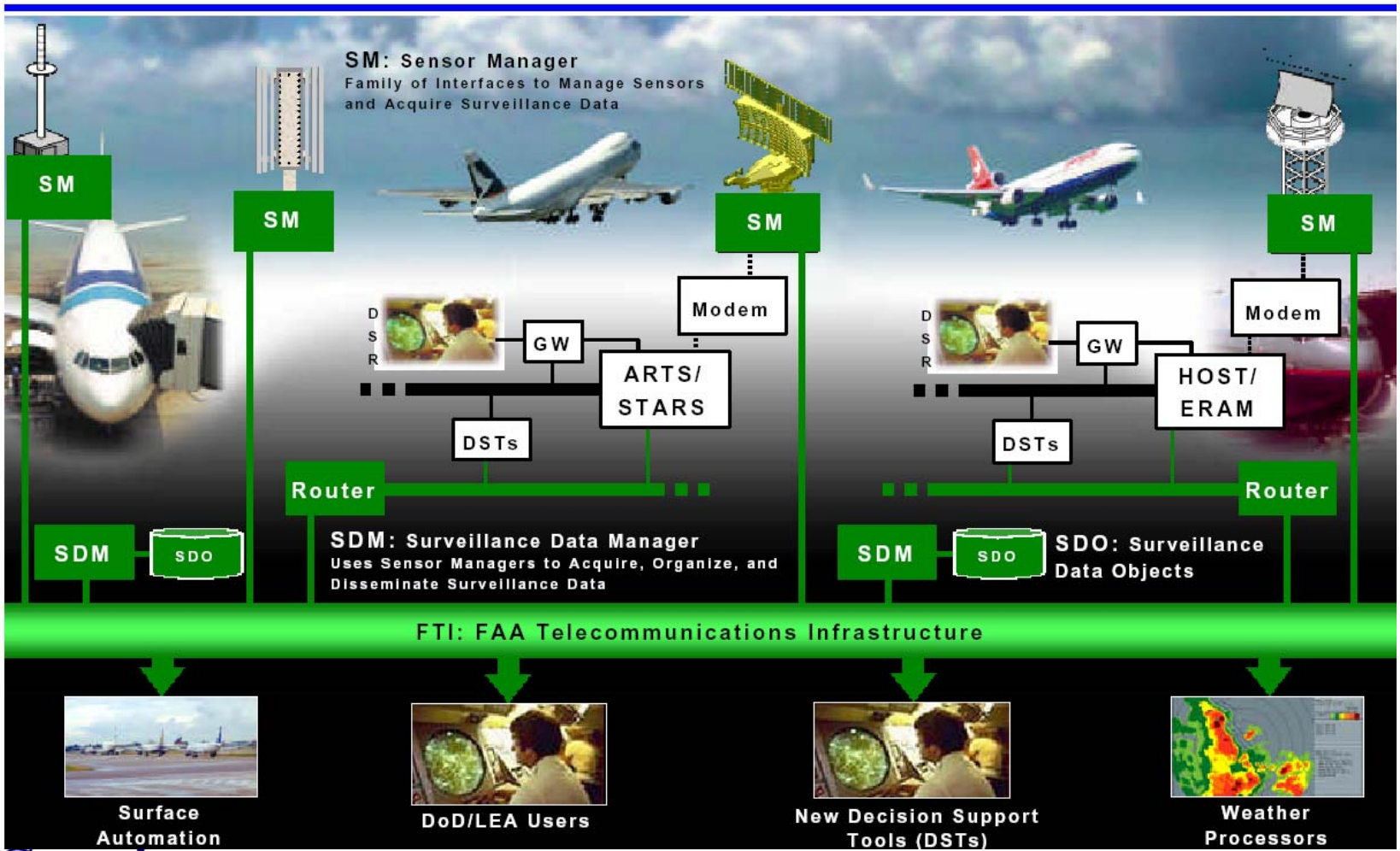
- SDN or Surveillance Data Networking is the hot buzz word of today
- There is a great deal of relevant research being done on the subject
  - MIT/LL
  - MITRE/CAASD
  - Boeing GCNSS
- This presentation is a modest approach on how a portion of the SDN will be implemented

Final SDN Vision

- Publish and Subscribe Architecture
- Common Format
- Common Coordinates
- Linking with Flight Plans and Other data bases to form Surveillance Data Objects
- Differing Levels of data privileges

All needed concepts that will take time to flush out…..

SDN General Architecture



Slide Courtesy of MIT/ Lincoln Laboratory

Motivation for More Radar Feeds

- Post 9/11 Demand for more sensors
  - USAF Monitoring the area vs. perimeter
  - USCS's AMICC Facility growing to "all" available sensors
  - Other organizations seeking to set-up their own "C2" nodes
- FAA Modernization
  - Terminal - Super TRACONS
  - EnRoute Upgrades

Need exists to transport surveillance data in a more efficient manner today…….

Difficulties with Current Approaches

- Mutliplicative Effect of Sensors x C2 Nodes
  - C2 Nodes often don't have the space to accommodate the equipment
- Communications Circuit Costs
  - Wasted Bandwidth
  - DMM Equipment soon to be tossed out with FTI
- Difficult to manage equipment within a facility
- Error Detection and Fault Location
  - Systems often average and throw out erroneous data
- Proprietary Interfaces

Benefits of Network Centric Comms

- Standards and Rule Bases Systems vs. Proprietary Technologies
  - Hedges against obsolescence
  - Opens up to industry wide competition
- Facilitates the deployment of other systems and future technologies
  - ADS-B
  - Military Range Control
- Other Benefits:
  - Supports Terminalization of Airspace
  - Supports collaborative decision making
  - Virtualization of C2 Nodes
  - Lower Communications Costs
  - Better Utilization of Current Assets

A SDN will evolve in phases

- Convert Serial Data to a “useful” IP format and manage a SDN Intranet within C2 Facilities.
- Expand Intranet to form aggregated IP feeds to external users
- Allow facilities to accept serial data feeds, aggregated IP feeds with similar IP wrappers and aggregated IP feeds with dissimilar wrappers
- Push the facility gateways as close to the edge as economically feasible

A SDN will evolve out of communication circuits costs savings

Convert Serial Data to a “useful” IP format and manage a SDN Intranet within C2 Facilities.

Useful Serial to IP Characteristics

Item	What it is?	Why is this needed?
Time Tag	An accurate time tag that indicates the time of applicability	An indication of what point in time the position measurement was taken to facilitate sensor-to-sensor correlation
Data Integrity Messages	Messages to indicate that a properly formatted message has been received by the device	Confidence by external systems that the sensor message has been received properly by the device and re-transmitted in IP
Message Statistics	Counts of message traffic	Real-time status monitoring of sensor
Stripping of Idles	Removal of non-essential data from serial message streams	Bandwidth reduction
Sensor Configuration	Re-broadcast of sensor specific parameters	Allows the command and control system to “know” the data source
UDP Port Numbers	Ability to map a unique UDP port per sensor	A unique port number is needed for routers to act as a data filters in cases where sensors have multiple channels of data
Heartbeats	An indication that the conversion device is working properly	Real-time status monitoring of conversion device
Flexible Clocking Parameter	The ability to source or sync a clock in any phase needed	Creates integration flexibility

For Example USAF ADS

Source

Serial
Radar
Feeds

200

Comms

Rooms of Telecommunications Gear
- *200 Modems*
- *200 Splitters*
- *600 Serial Cables*
- *Cable Trays*
- *Racks of Equipment*

Conversion **Users**

200	*SIS*	→	*NCS*
200	*Network Adapter*	→	*BCS-F*
200	*TBD*	→	*Other Internal*
200		→	*RADES RDIS*
200	*TBD*	→	*Other External*

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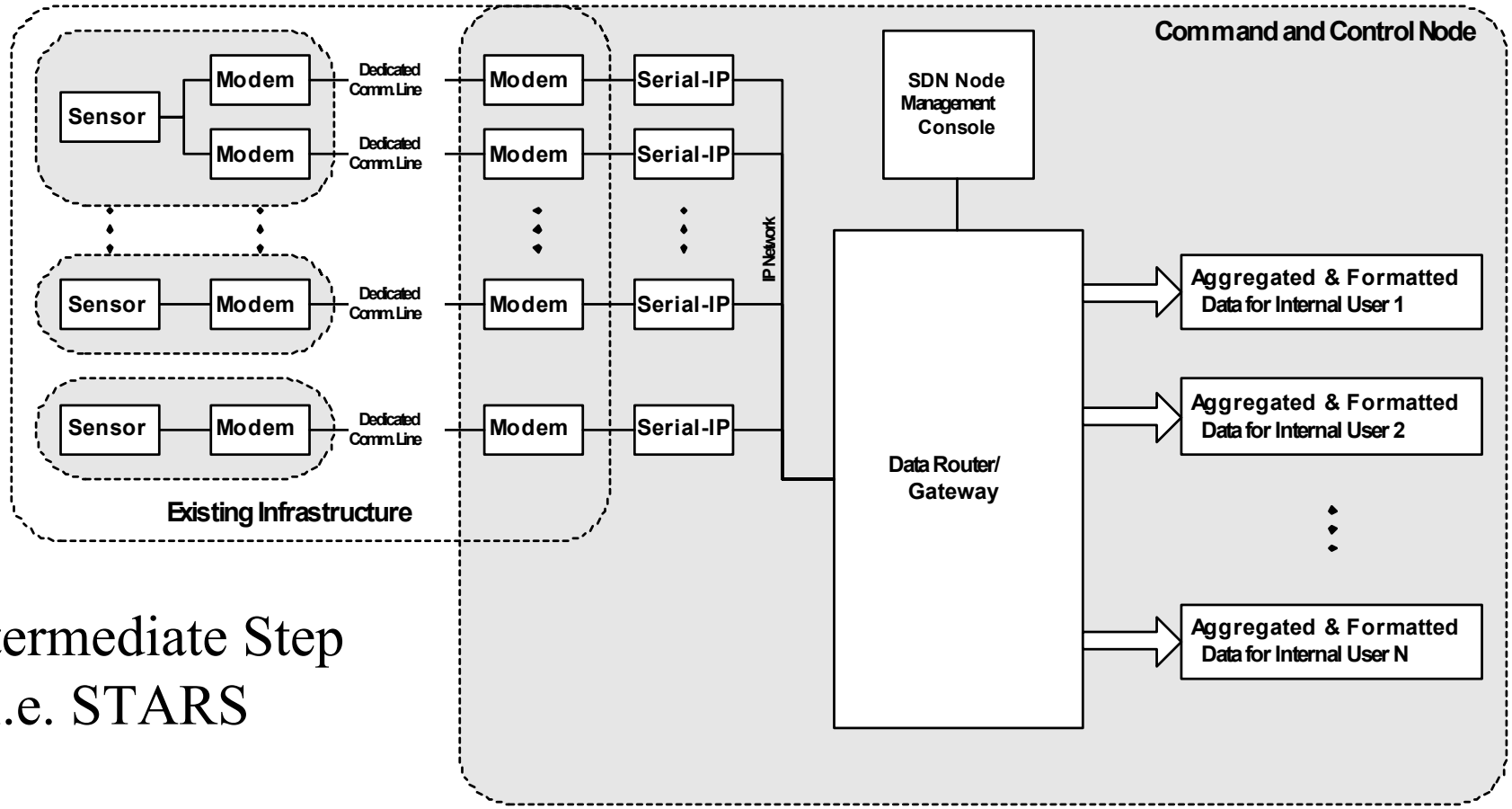
Detect the Difference

….Desirable to Share an Aggregated IP Feed

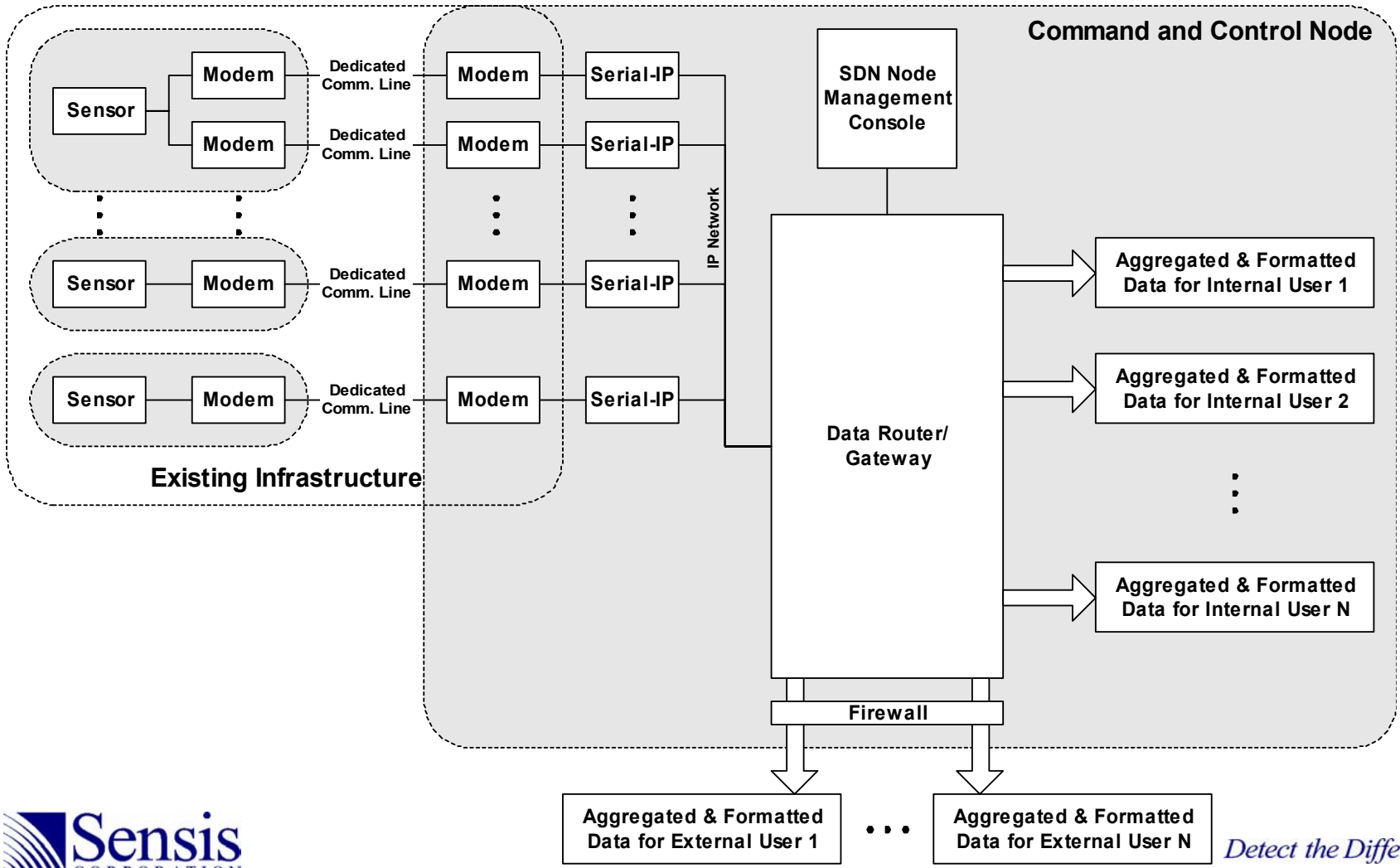
General SDN Intranet Architecture



Intermediate Step
- i.e. STARS

Expand Intranet to form aggregated IP feeds to external users

Intranet Architecture with External Feeds



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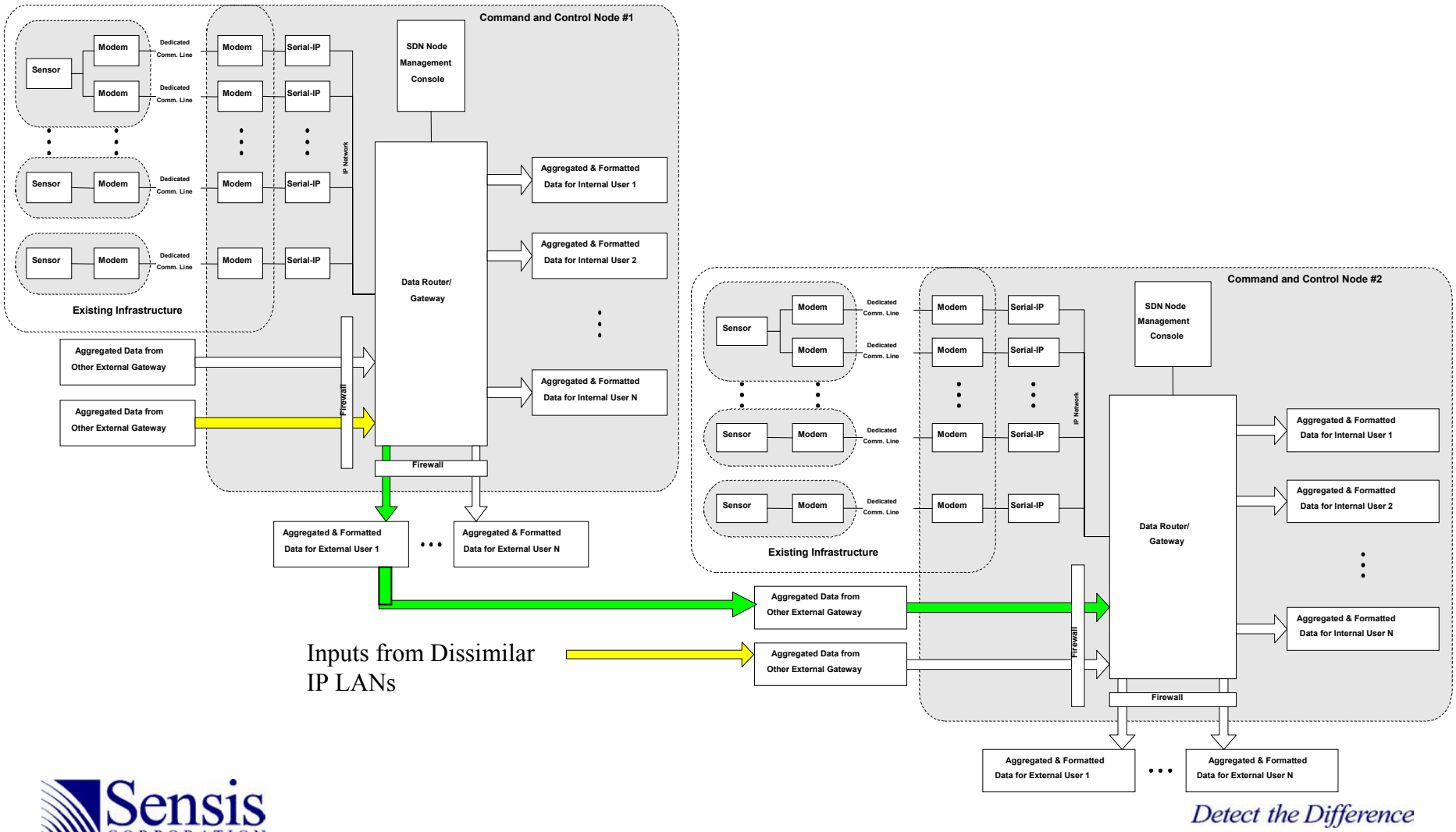
Detect the Difference

Allow facilities to accept serial data feeds, aggregated IP feeds with similar IP wrappers and aggregated IP feeds with dissimilar wrappers

Combining Two Nodes Together



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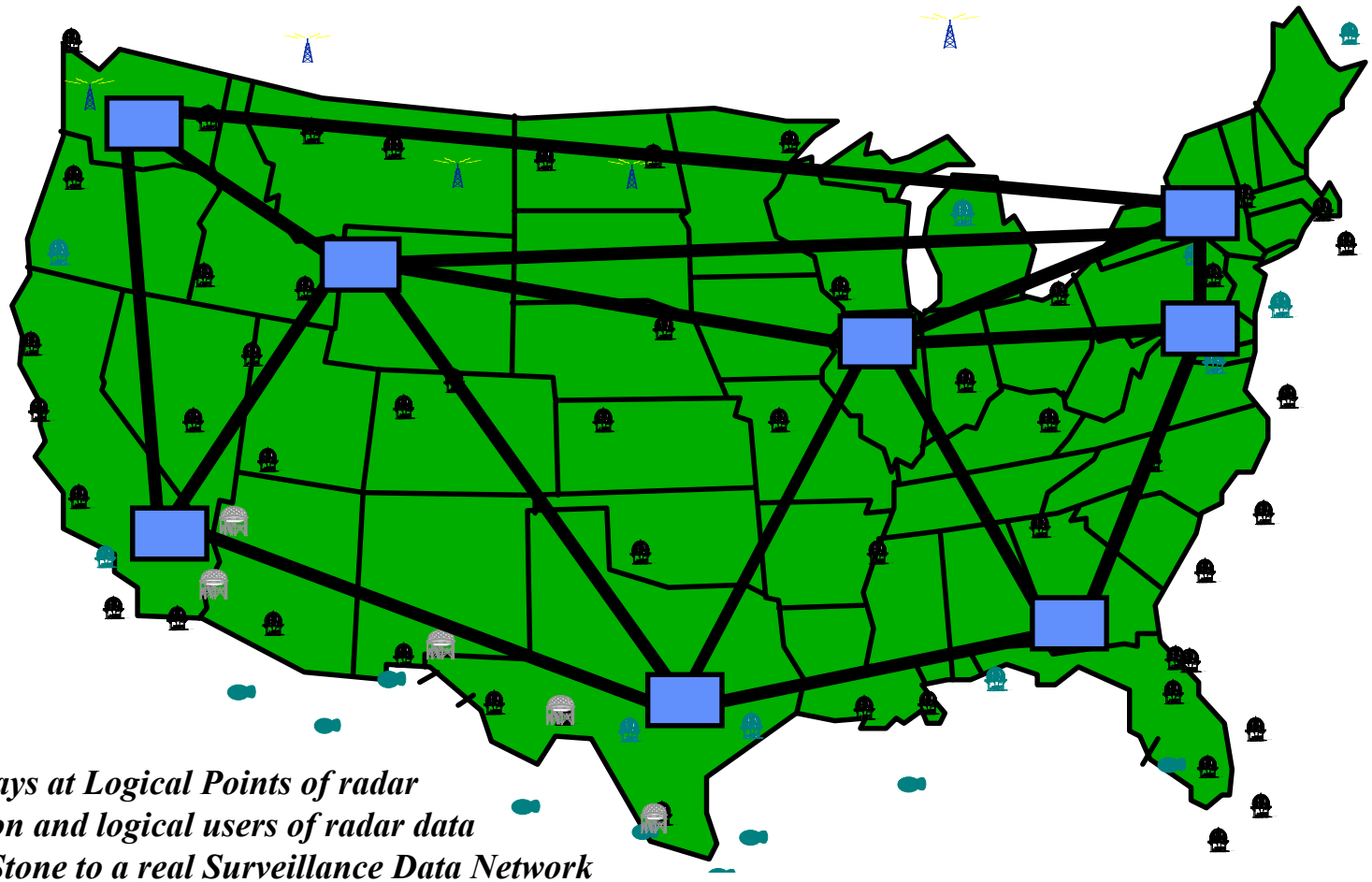
Leads to National Connectivity



-Put Gateways at Logical Points of radar consolidation and logical users of radar data
- Stepping Stone to a real Surveillance Data Network

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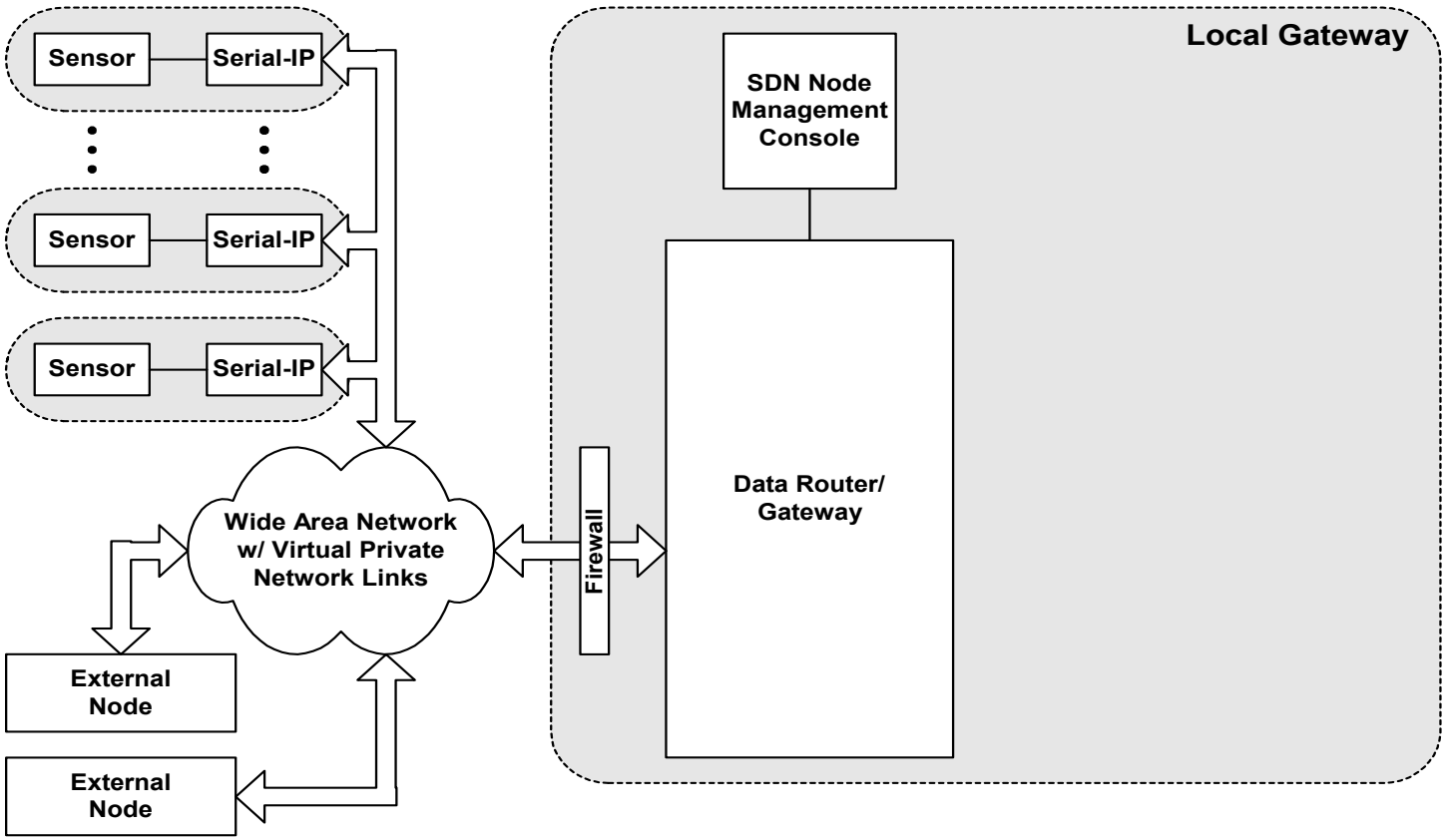
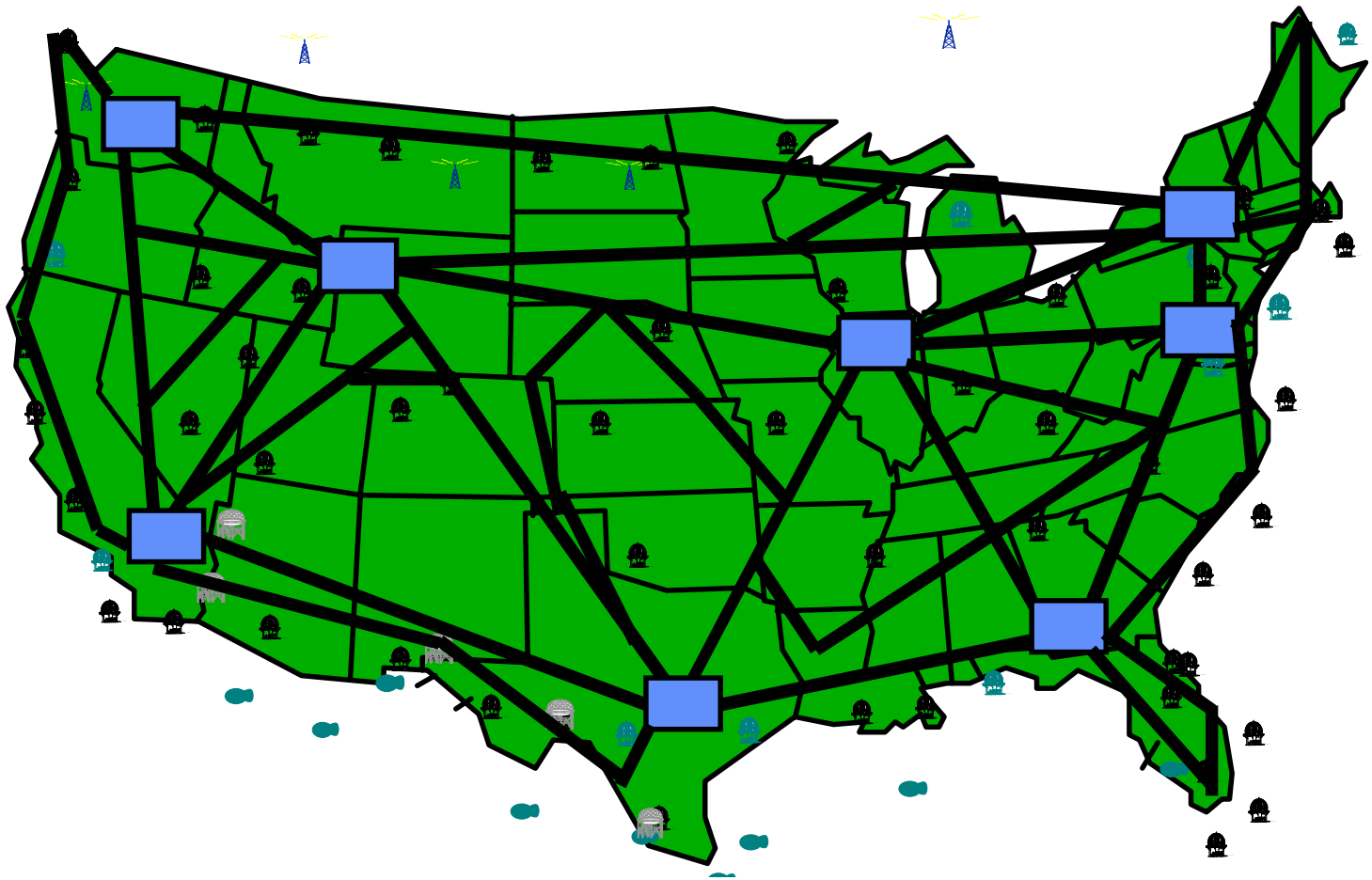
Detect the Difference

Push the facility gateways as close to the edge as economically feasible

Equipment at Sensor Site(s)



Connectivity to all Sensors



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Detect the Difference

Policy Issues.. How is the SDN created?

- Who is responsible for building and specifying a SDN?
- Who Pays?
- Will there be a SDN in a single large procurement?
- How is data controlled, what permissions are required?

The Internet grew out of economic necessity, not a major procurement. Some form of a SDN will do the same…..

Conclusions

- An Implementation of a National Network of Surveillance Data will evolve from a basic need to receive data in a more economical fashion
- As research evolves on SDN on a national level, a great deal of infrastructure will already be in place
- This evolution is already taking place
- This evolution is consistent with all existing SDN work