Applications of a Surveillance Database and Server

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Detect the Difference

Credits

- Greg Berkebile
- Todd Pittman
- USAF 84th RADES

Overview

Surveillance Data Networks, seem to make sense but how do I use them?

What does Network Enabled Operations mean to me?

Is there any practical use of SDN, or is it just a science project?

Case Study

- Customer Motivation
- Networks of Real-Time Surveillance Data
- Architecture of the Database and Server
- Examples
- Conclusion

A Real-world application of a networked surveillance data

Customer Motivation

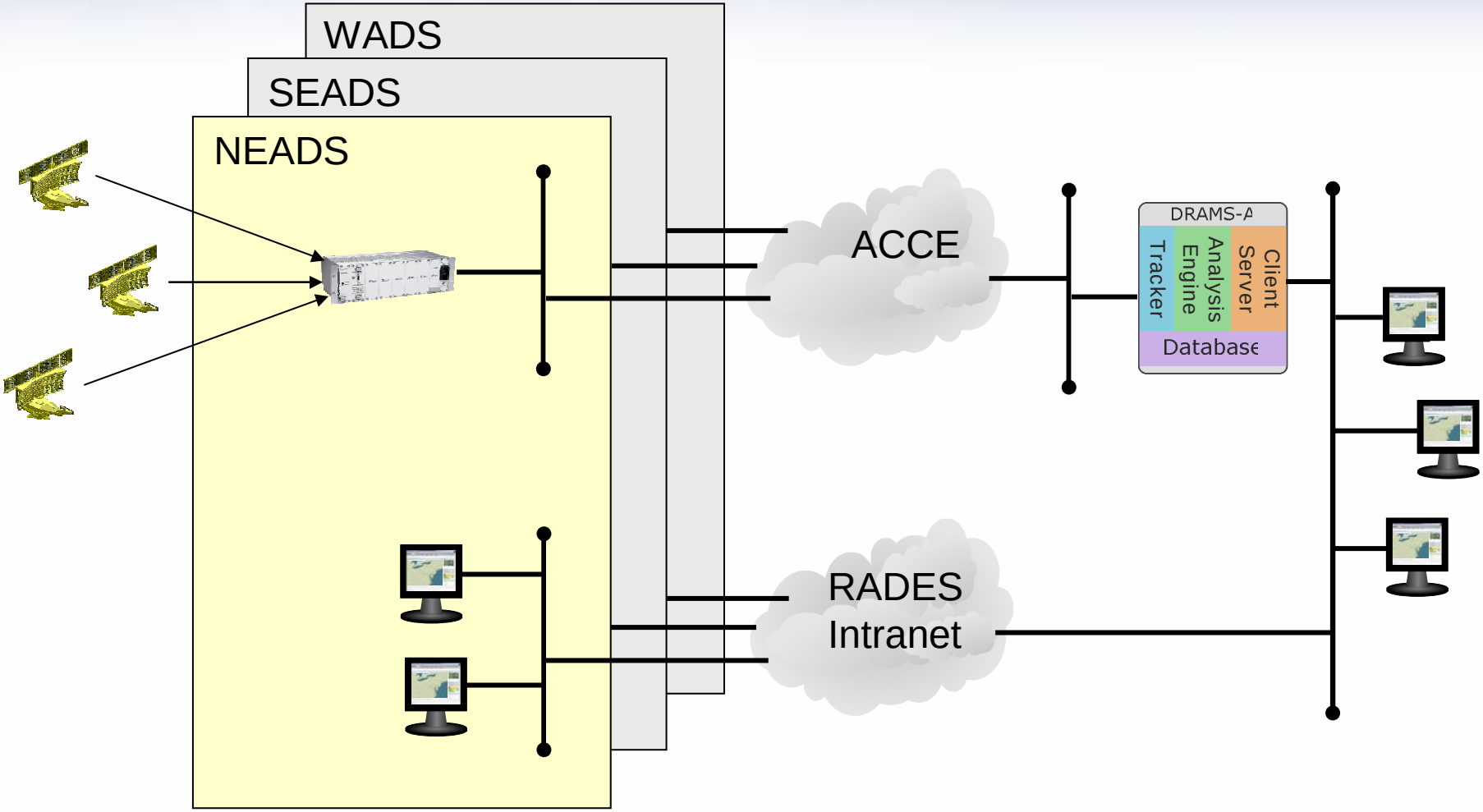
- Customer: 84th Radar Evaluation Squadron (USAF/ACC)
- Charged with monitoring, evaluating, and optimizing performance of all U.S. ground based air surveillance resources
- Desire: Develop an automated tool to keep tabs on performance of (eventually) over 200 radar sites

Manpower
Down
60%

Radars
Up
300%

They built a network of Surveillance Data and an application that resides on the network

Network of Surveillance Data



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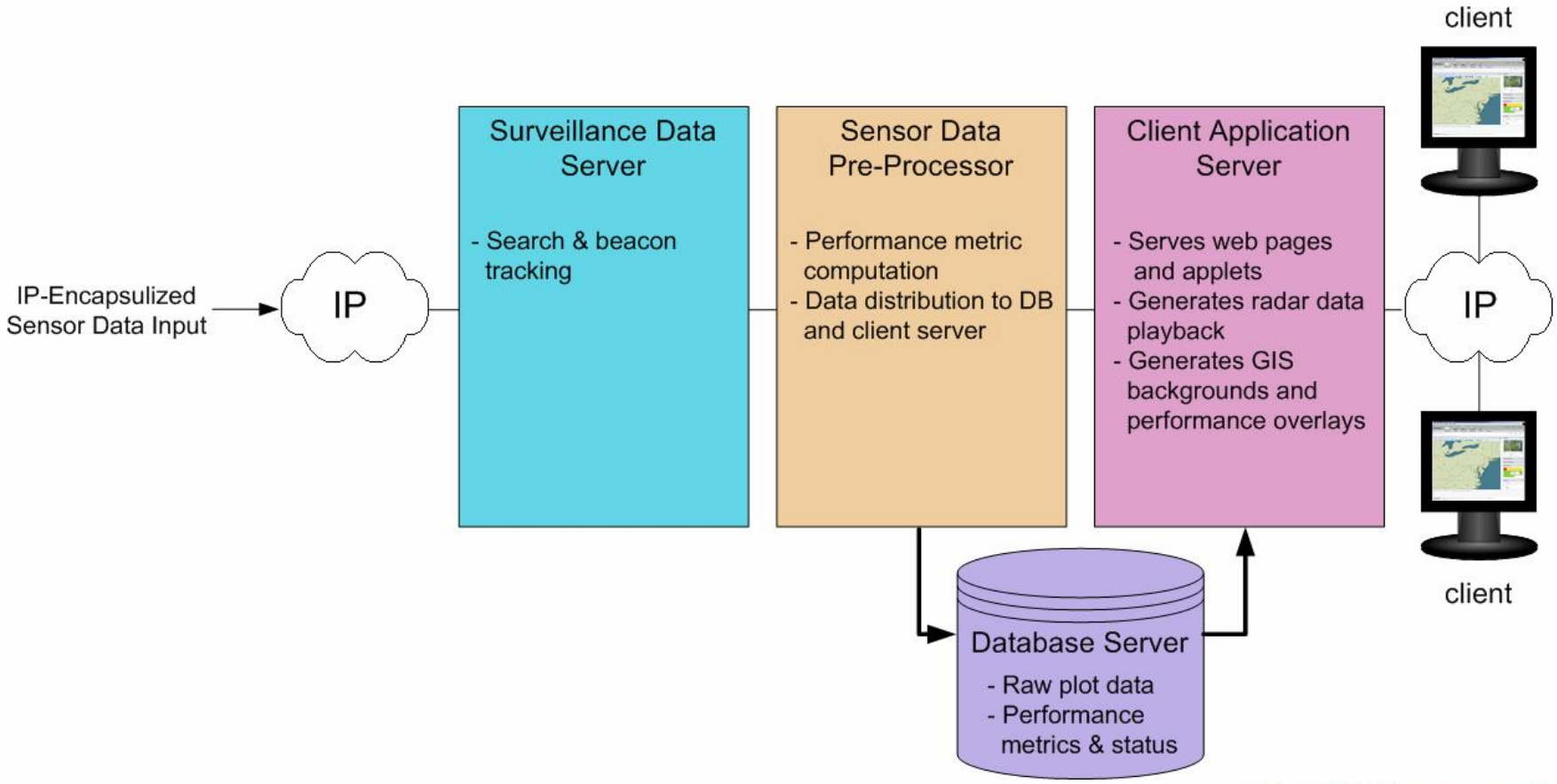
Application Architecture



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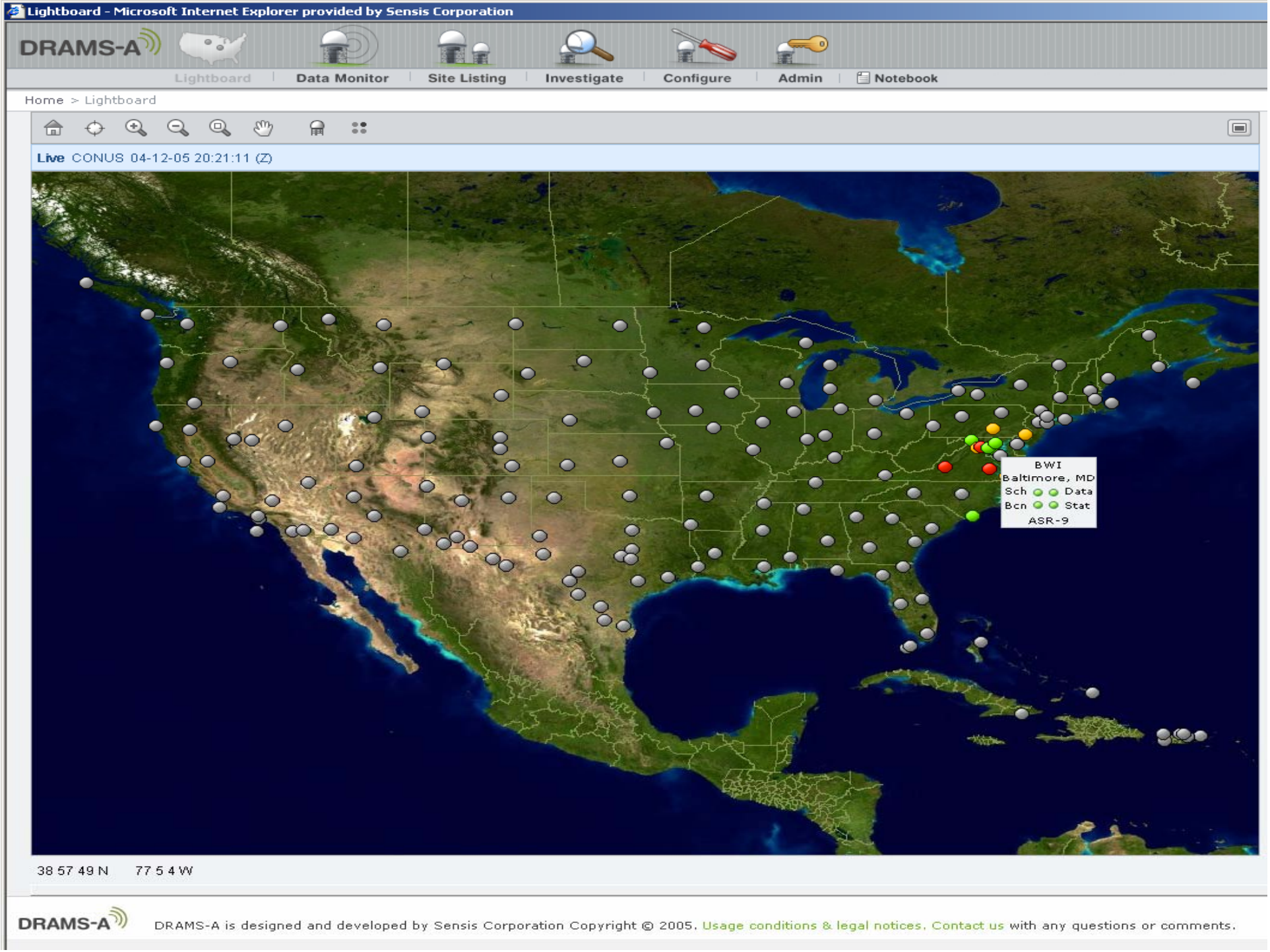
Achieved Benefits

Requirement	How Achieved	Benefit	Example
The ability to view a region of interest and radar performance using both search and beacon data	Multiple instances of single sensor tracker driving radar analysis algorithms that are databased and displayed in a web browser light board	Data that is generated with no manpower expended; and displayed to multiple entities	


Lightboard - Microsoft Internet Explorer provided by Sensis Corporation
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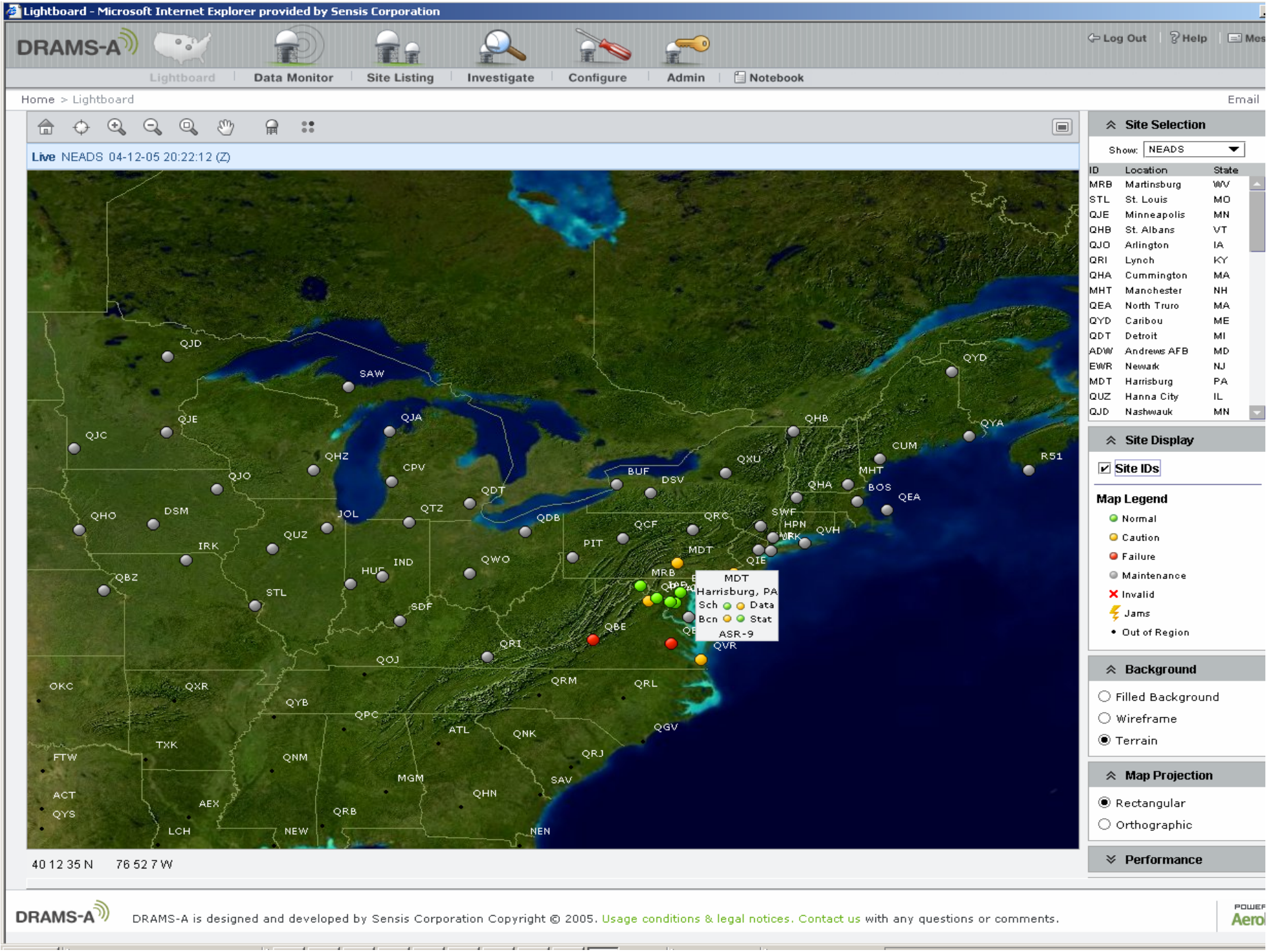
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Site Selection
Show: NEADS
ID Location State
MRB Martinsburg WV
STL St. Louis MO
QJE Minneapolis MN
QHB St. Albans VT
QJO Arlington IA
QRI Lynch KY
QHA Cummington MA
MHT Manchester NH
QEA North Truro MA
QYD Caribou ME
QDT Detroit MI
ADW Andrews AFB MD
EWR Newark NJ
MDT Harrisburg PA
QUZ Hanna City IL
QJD Nashwauk MN
Site Display
Site IDs
Map Legend
Normal
Caution
Failure
Maintenance
Invalid
Jams
Out of Region
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Filled Background
Wireframe
Terrain
Map Projection
Rectangular
Orthographic
Performance
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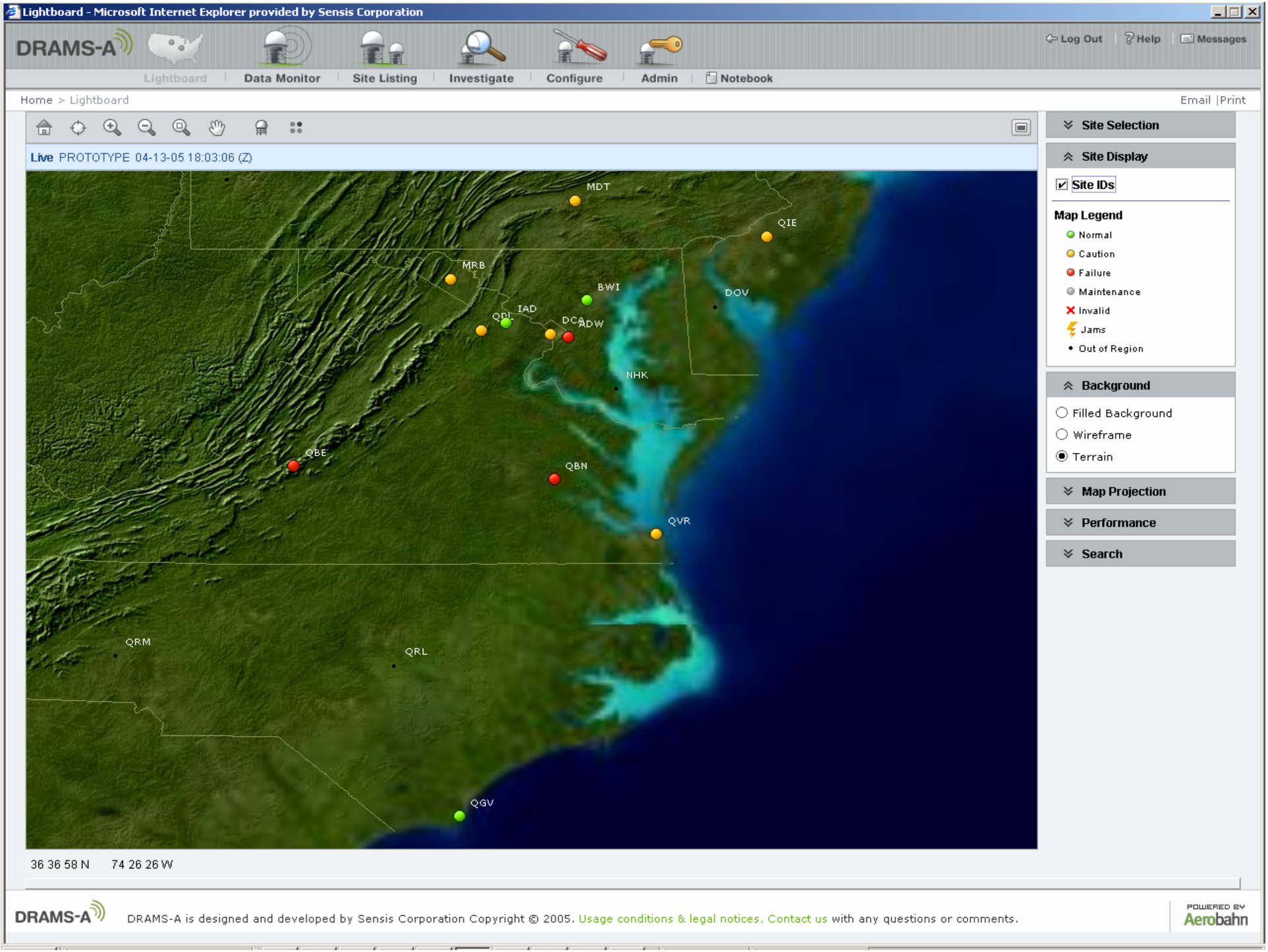
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Map Projection
Performance
Search
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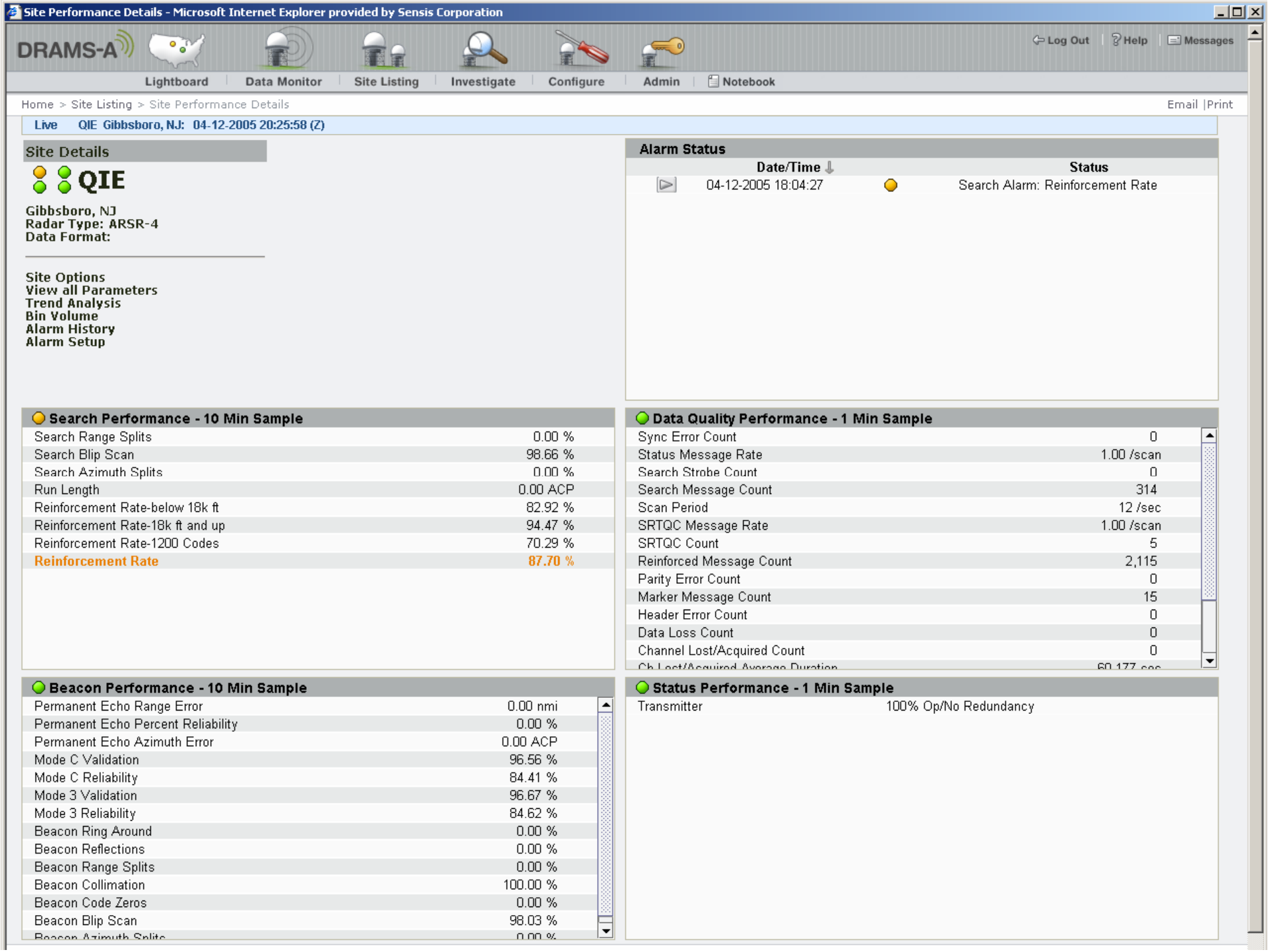
The ability to view individual radar performance details for fault isolation	Display Search, Beacon, Data Quality, and Status indications in a simple intuitive manner	The user can isolate a performance problem in significantly less time.	


Site Performance Details - Microsoft Internet Explorer provided by Sensis Corporation
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Notebook
Home > Site Listing > Site Performance Details
Email |Print
Live QIE Gibbsboro, NJ: 04-12-2005 20:25:58 (Z)
Site Details
QIE
Gibbsboro, NJ
Radar Type: ARSR-4
Data Format:
Site Options
View all Parameters
Trend Analysis
Bin Volume
Alarm History
Alarm Setup
Alarm Status
Date/Time
Status
04-12-2005 18:04:27
Search Alarm: Reinforcement Rate
Search Performance - 10 Min Sample
Search Range Splits 0.00 %
Search Blip Scan 98.66 %
Search Azimuth Splits 0.00 %
Run Length 0.00 ACP
Reinforcement Rate-below 18k ft 82.92 %
Reinforcement Rate-18k ft and up 94.47 %
Reinforcement Rate-1200 Codes 70.29 %
Reinforcement Rate 87.70 %
Data Quality Performance - 1 Min Sample
Sync Error Count 0
Status Message Rate 1.00 /scan
Search Strobe Count 0
Search Message Count 314
Scan Period 12 /sec
SRTQC Message Rate 1.00 /scan
SRTQC Count 5
Reinforced Message Count 2,115
Parity Error Count 0
Marker Message Count 15
Header Error Count 0
Data Loss Count 0
Channel Lost/Acquired Count 0
Beacon Performance - 10 Min Sample
Permanent Echo Range Error 0.00 nmi
Permanent Echo Percent Reliability 0.00 %
Permanent Echo Azimuth Error 0.00 ACP
Mode C Validation 96.56 %
Mode C Reliability 84.41 %
Mode 3 Validation 96.67 %
Mode 3 Reliability 84.62 %
Beacon Ring Around 0.00 %
Beacon Reflections 0.00 %
Beacon Range Splits 0.00 %
Beacon Collimation 100.00 %
Beacon Code Zeros 0.00 %
Beacon Blip Scan 98.03 %
Status Performance - 1 Min Sample
Transmitter 100% Op/No Redundancy

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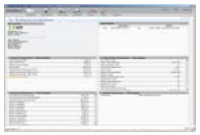
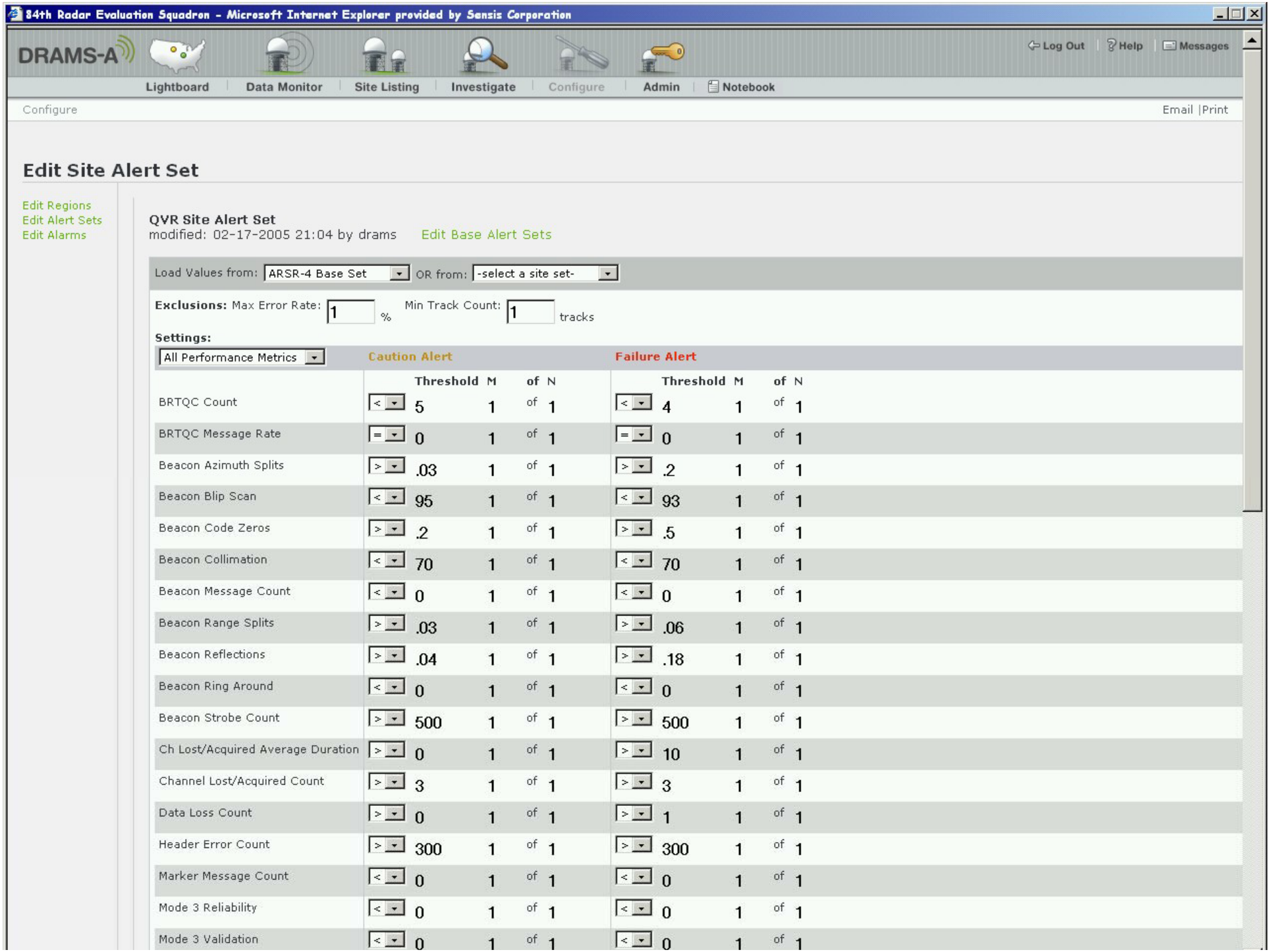
The ability to view individual radar performance details for fault isolation	Display Search, Beacon, Data Quality, and Status indications in a simple intuitive manner	The user can isolate a performance problem in significantly less time.	
The ability to set Alarm/Alert thresholds individually by site	Site specific performance thresholding	Real-time and accurate alarming of radar performance changes without human intervention	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Configure
Email |Print
Edit Site Alert Set
Edit Regions
Edit Alert Sets
Edit Alarms
QVR Site Alert Set
modified: 02-17-2005 21:04 by drams
Edit Base Alert Sets
Load Values from: ARSR-4 Base Set
OR from: -select a site set-
Exclusions: Max Error Rate: 1 %
Min Track Count: 1 tracks
Settings:
All Performance Metrics
Caution Alert
Failure Alert
Threshold M of N
BRTQC Count < 5 1 of 1 < 4 1 of 1
BRTQC Message Rate = 0 1 of 1 = 0 1 of 1
Beacon Azimuth Splits > .03 1 of 1 > .2 1 of 1
Beacon Blip Scan < 95 1 of 1 < 93 1 of 1
Beacon Code Zeros > .2 1 of 1 > .5 1 of 1
Beacon Collimation < 70 1 of 1 < 70 1 of 1
Beacon Message Count < 0 1 of 1 < 0 1 of 1
Beacon Range Splits > .03 1 of 1 > .06 1 of 1
Beacon Reflections > .04 1 of 1 > .18 1 of 1
Beacon Ring Around < 0 1 of 1 < 0 1 of 1
Beacon Strobe Count > 500 1 of 1 > 500 1 of 1
Ch Lost/Acquired Average Duration > 0 1 of 1 > 10 1 of 1
Channel Lost/Acquired Count > 3 1 of 1 > 3 1 of 1
Data Loss Count > 0 1 of 1 > 1 1 of 1
Header Error Count > 300 1 of 1 > 300 1 of 1
Marker Message Count < 0 1 of 1 < 0 1 of 1
Mode 3 Reliability < 0 1 of 1 < 0 1 of 1
Mode 3 Validation < 0 1 of 1 < 0 1 of 1

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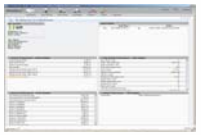
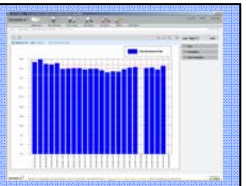
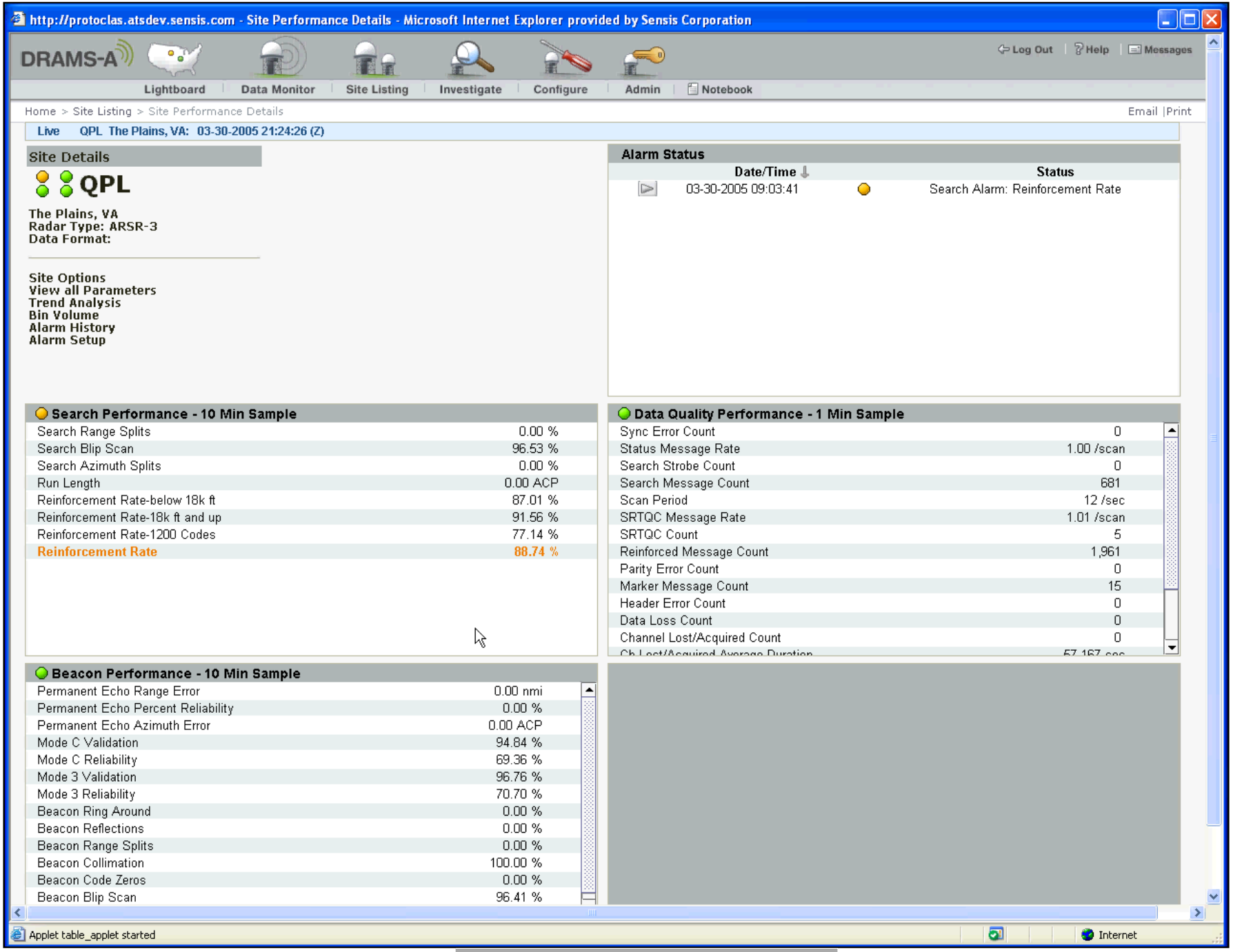
The ability to view individual radar performance details for fault isolation	Display Search, Beacon, Data Quality, and Status indications in a simple intuitive manner	The user can isolate a performance problem in significantly less time.	
The ability to set Alarm/Alert thresholds individually by site	Site specific performance thresholding	Real-time and accurate alarming of radar performance changes without human intervention	
The ability to proactively identify performance degradation based on historical performance measurements	Trending of performance metrics over time	Instead of sending teams out to evaluate radars on a periodic basis, the government can send teams on an as needed basis	



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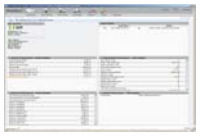
The ability to view individual radar performance details for fault isolation	Display Search, Beacon, Data Quality, and Status indications in a simple intuitive manner	The user can isolate a performance problem in significantly less time.	
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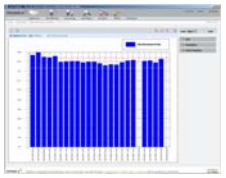
The ability to proactively identify performance degradation based on historical performance measurements	Trending of performance metrics over time	Instead of sending teams out to evaluate radars on a periodic basis, the government can send teams on an as needed basis	
The ability to view targets from a single radar and/or groups of radars and compare to theoretical coverage	Real Time Display with robust set of filters and overlays	Allows an analyst to determine a radar's actual performance quicker and more accurately than before.	

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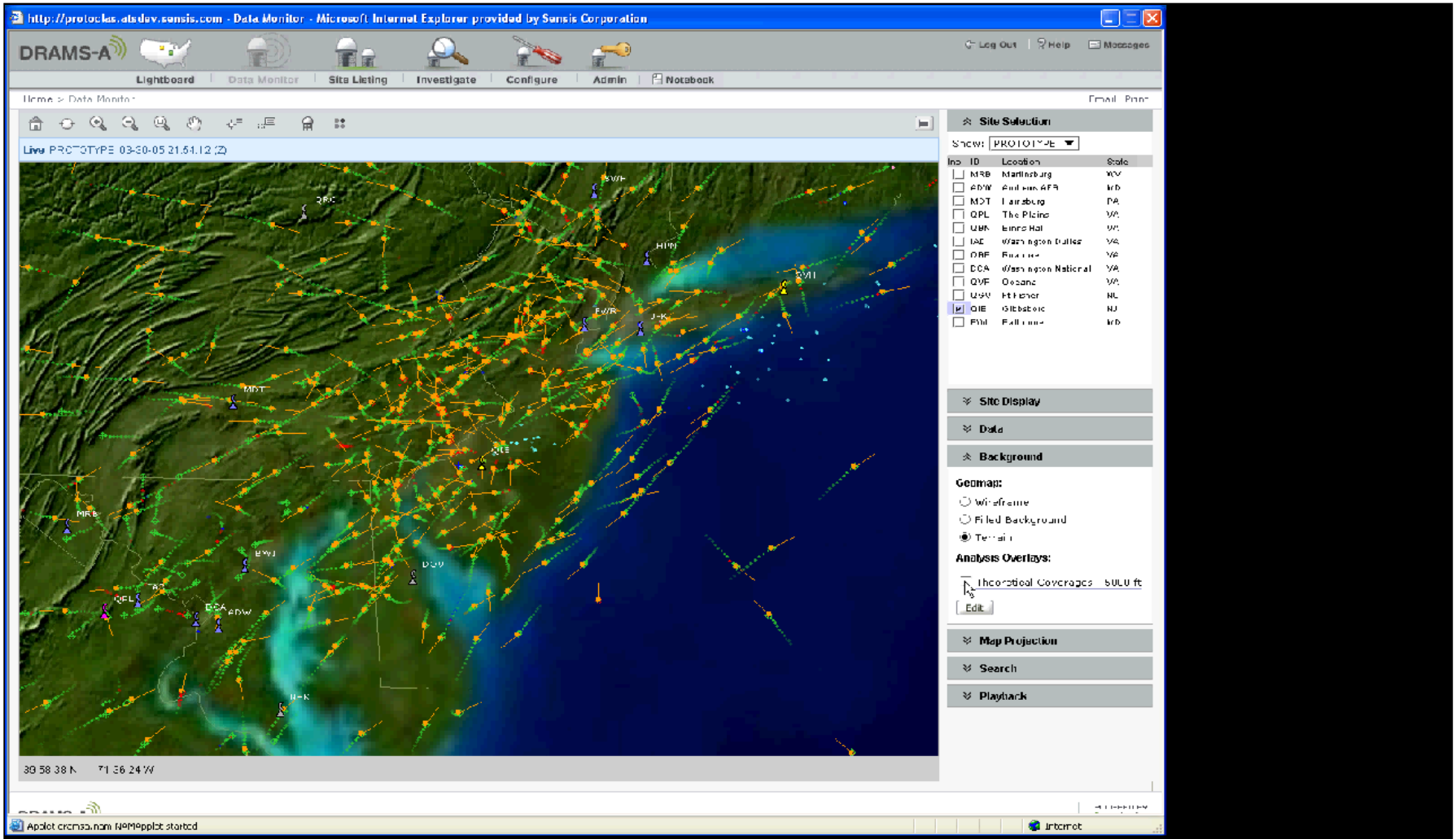

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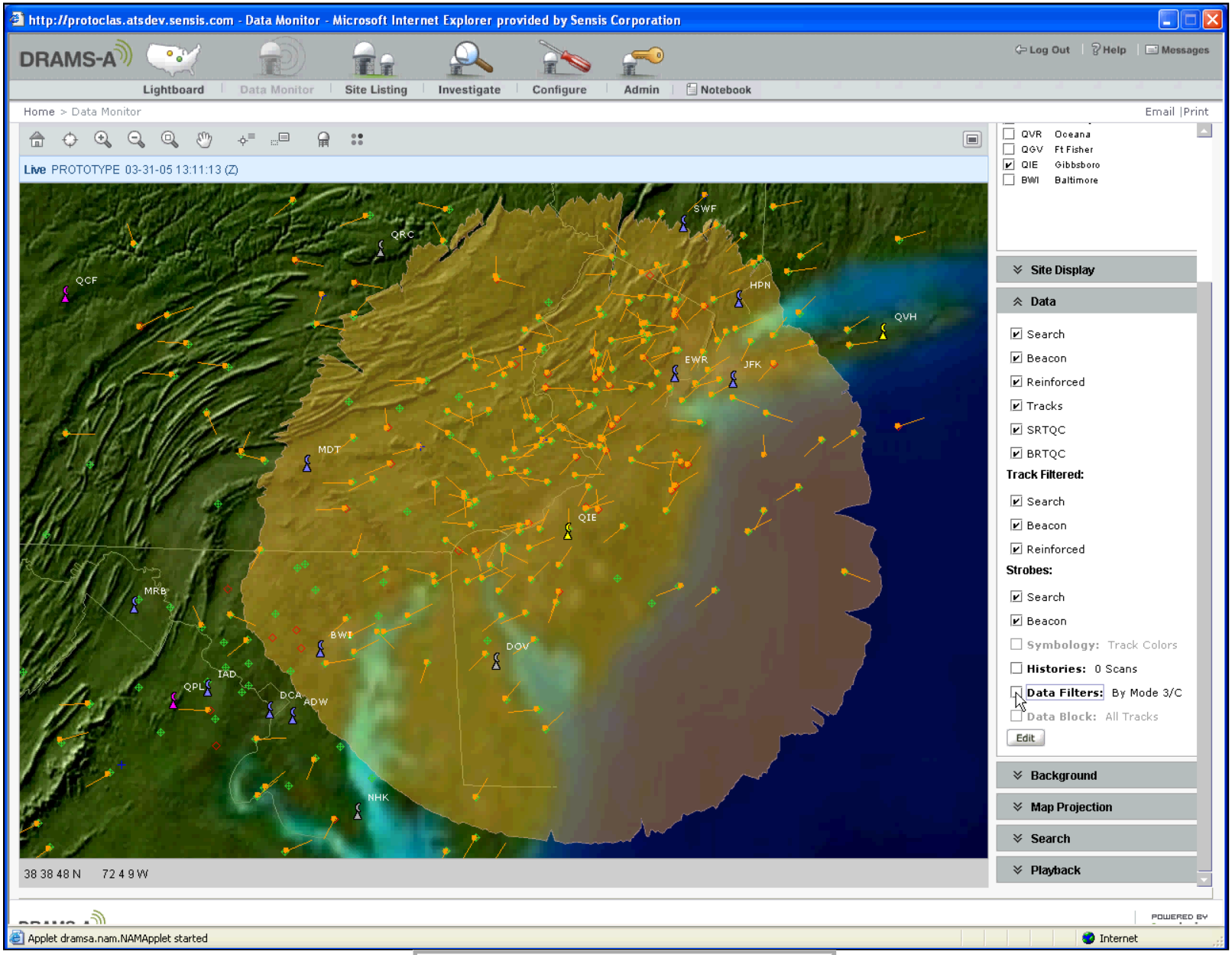

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Conclusion

- This is not a research project – It is a planned deployment to provide operational benefits
- This tool will save the USAF 24-30 FTEs and a return on investment in about 12 months while increasing the number of radars they monitor by a factor of 3
  - Approx 10:1 increase in efficiency
- This project represents only a tiny fraction of the functionality possible
  - Data Mining
  - Portable Situational Awareness Stations
  - Tying to Air Space Design and Operational Impacts
  - Realizing “Al Gore’s Dream”
- Benefits ↑ and Costs ↓ in Cost-Benefit analysis made available by Network Centric Operations