Measure More, Spend Less *ON THE WAY TO* Better Security

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Chief Information Security Officer
US Department of State
December 8, 2009

State Department IT Security Context

Projects

- Trusted Internet Connections multi-agency provider
- Einstein 2 pilot
- Center of Excellence – Awareness Training
- CNSS working group members – 45 people

➡ **FISMA Improvement initiatives**

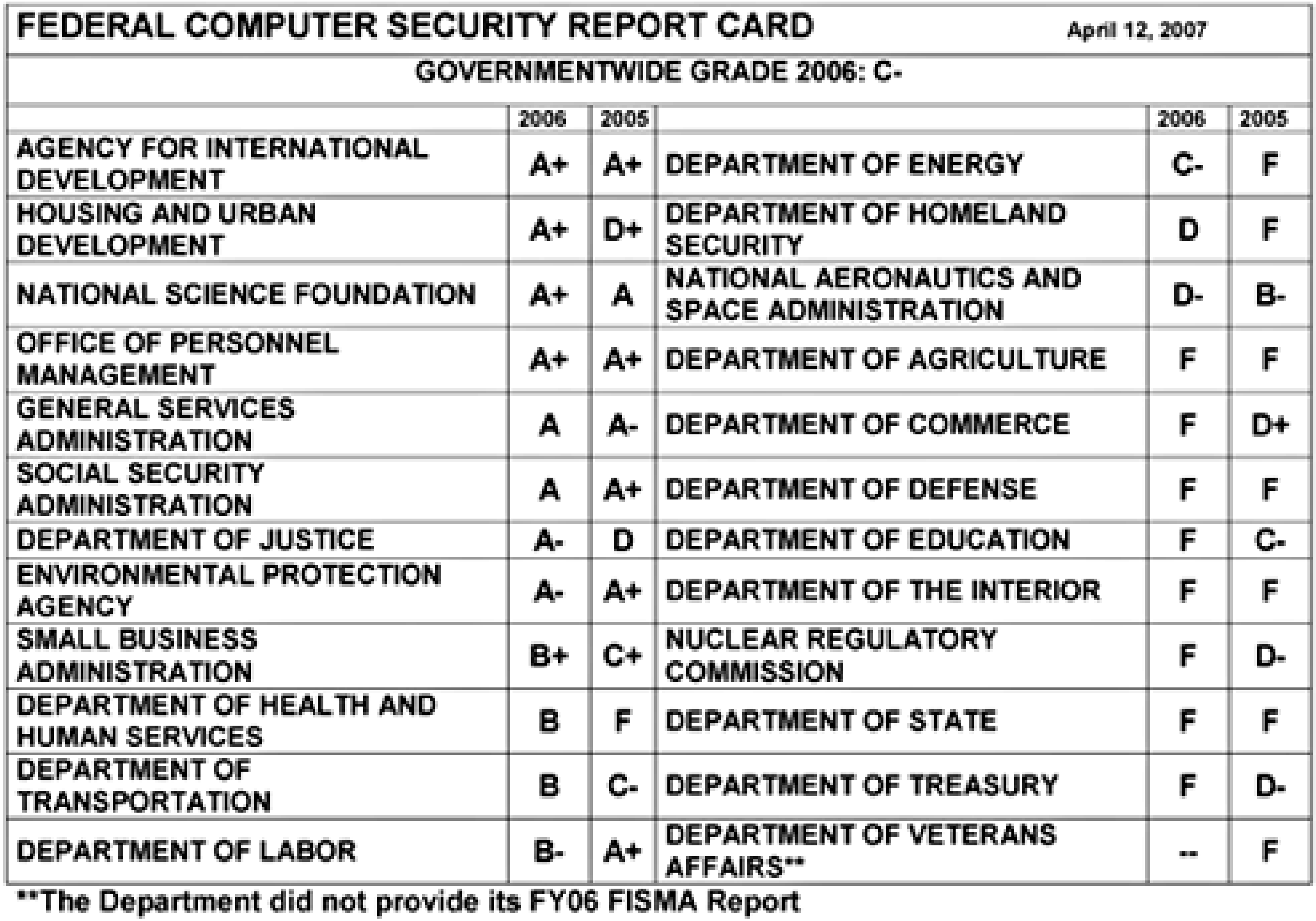
➡ **Risk Scoring**

OBSTACLE

CXOs are accountable for IT security

BUT

directly supervise only a small part of the technology actually in use.



FEDERAL COMPUTER SECURITY REPORT CARD April 12, 2007

GOVERNMENTWIDE GRADE 2006: C-

	2006	2005		2006	2005
AGENCY FOR INTERNATIONAL DEVELOPMENT	A+	A+	DEPARTMENT OF ENERGY	C-	F
HOUSING AND URBAN DEVELOPMENT	A+	D+	DEPARTMENT OF HOMELAND SECURITY	D	F
NATIONAL SCIENCE FOUNDATION	A+	A	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	D-	B-
OFFICE OF PERSONNEL MANAGEMENT	A+	A+	DEPARTMENT OF AGRICULTURE	F	F
GENERAL SERVICES ADMINISTRATION	A	A-	DEPARTMENT OF COMMERCE	F	D+
SOCIAL SECURITY ADMINISTRATION	A	A+	DEPARTMENT OF DEFENSE	F	F
DEPARTMENT OF JUSTICE	A-	D	DEPARTMENT OF EDUCATION	F	C-
ENVIRONMENTAL PROTECTION AGENCY	A-	A+	DEPARTMENT OF THE INTERIOR	F	F
SMALL BUSINESS ADMINISTRATION	B+	C+	NUCLEAR REGULATORY COMMISSION	F	D-
DEPARTMENT OF HEALTH AND HUMAN SERVICES	B	F	DEPARTMENT OF STATE	F	F
DEPARTMENT OF TRANSPORTATION	B	C-	DEPARTMENT OF TREASURY	F	D-
DEPARTMENT OF LABOR	B-	A+	DEPARTMENT OF VETERANS AFFAIRS**	--	F

**The Department did not provide its FY06 FISMA Report

CASE STUDY

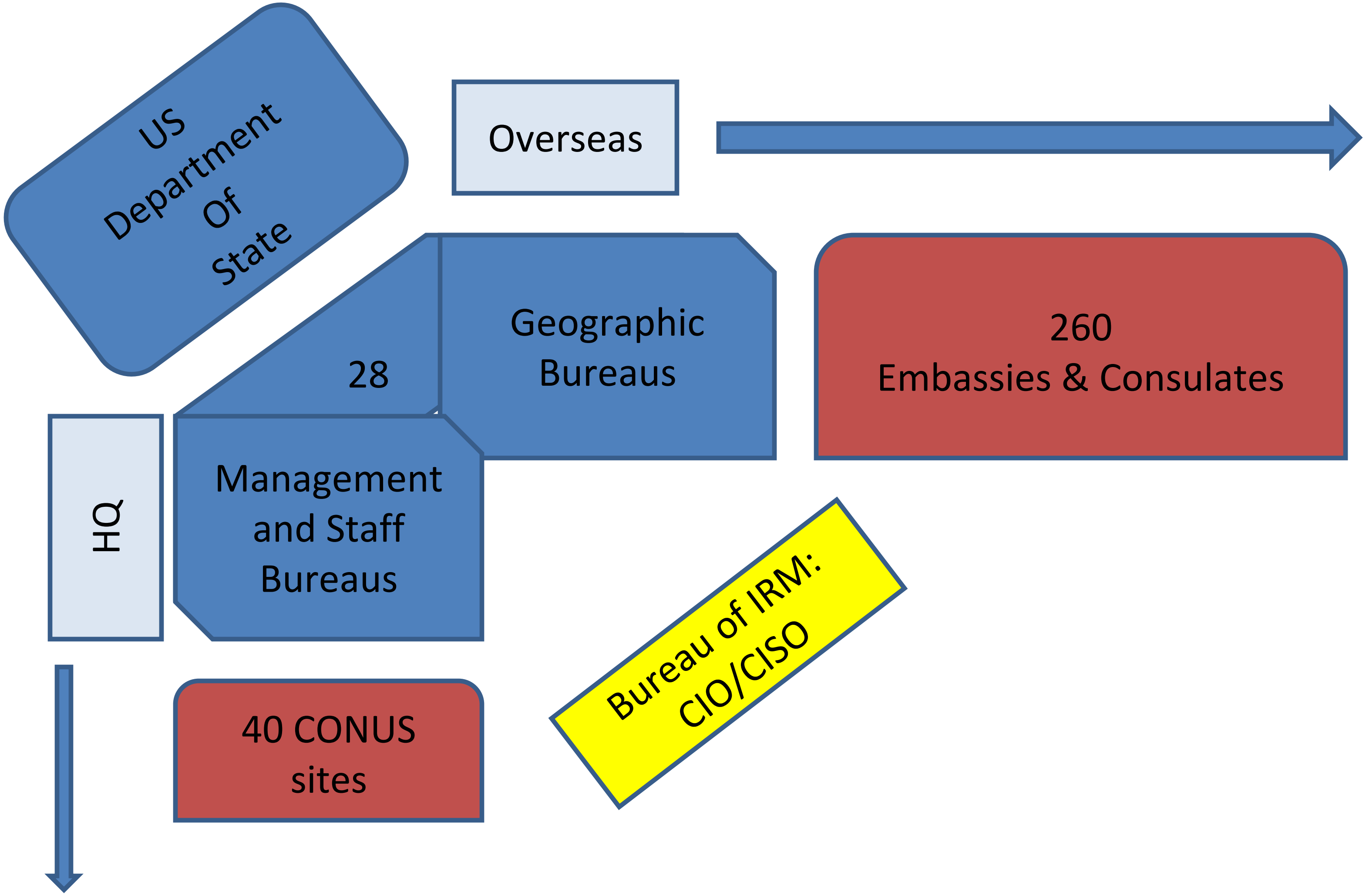
Department of State

- 70,000 people
- 260 overseas & 40 CONUS locations
- Staff with significant IT security responsibilities : **4135**
- Staff doing C&A: **60**

USAID (FY 2003 +)

- 8000 people
- 72 overseas locations

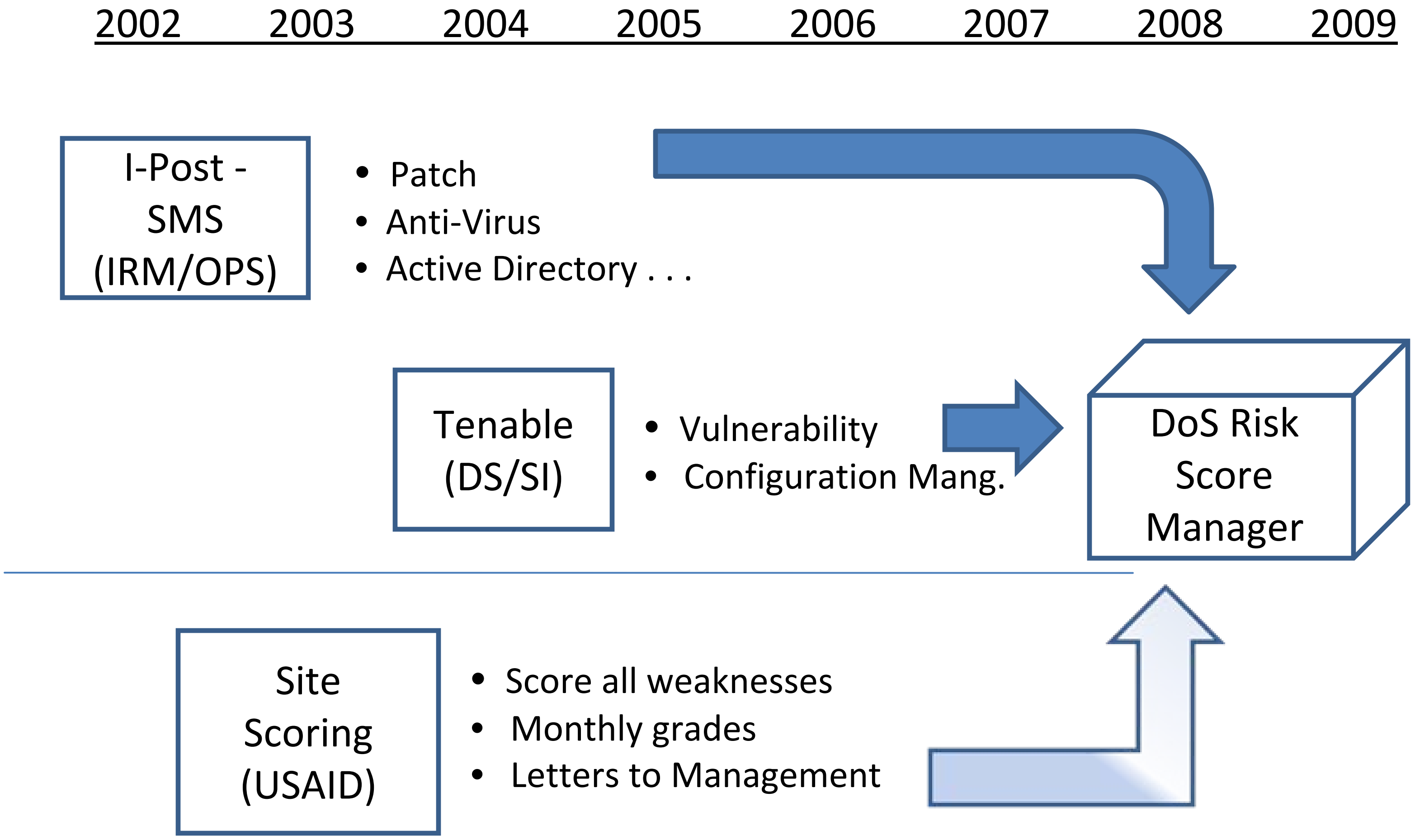
Decentralized Structure of DoS



Concerns: FY2007

- **Material weakness: Teaming**
- **Cost of compliance program**
- **FISMA: Four F's , One D Minus**
- **Large numbers of vulnerabilities**

Origins of DoS Continuous Monitoring



2002 2003 2004 2005 2006 2007 2008 2009

I-Post - SMS (IRM/OPS)

- Patch
- Anti-Virus
- Active Directory . . .

Tenable (DS/SI)

- Vulnerability
- Configuration Mang.

DoS Risk Score Manager

Site Scoring (USAID)

- Score all weaknesses
- Monthly grades
- Letters to Management

Themes

Case study:

- Targeting risk reduction
- How to reduce C&A Cost
- Greater efficiency in defensive cyber security

Attacks Increasing

Increase & Shift

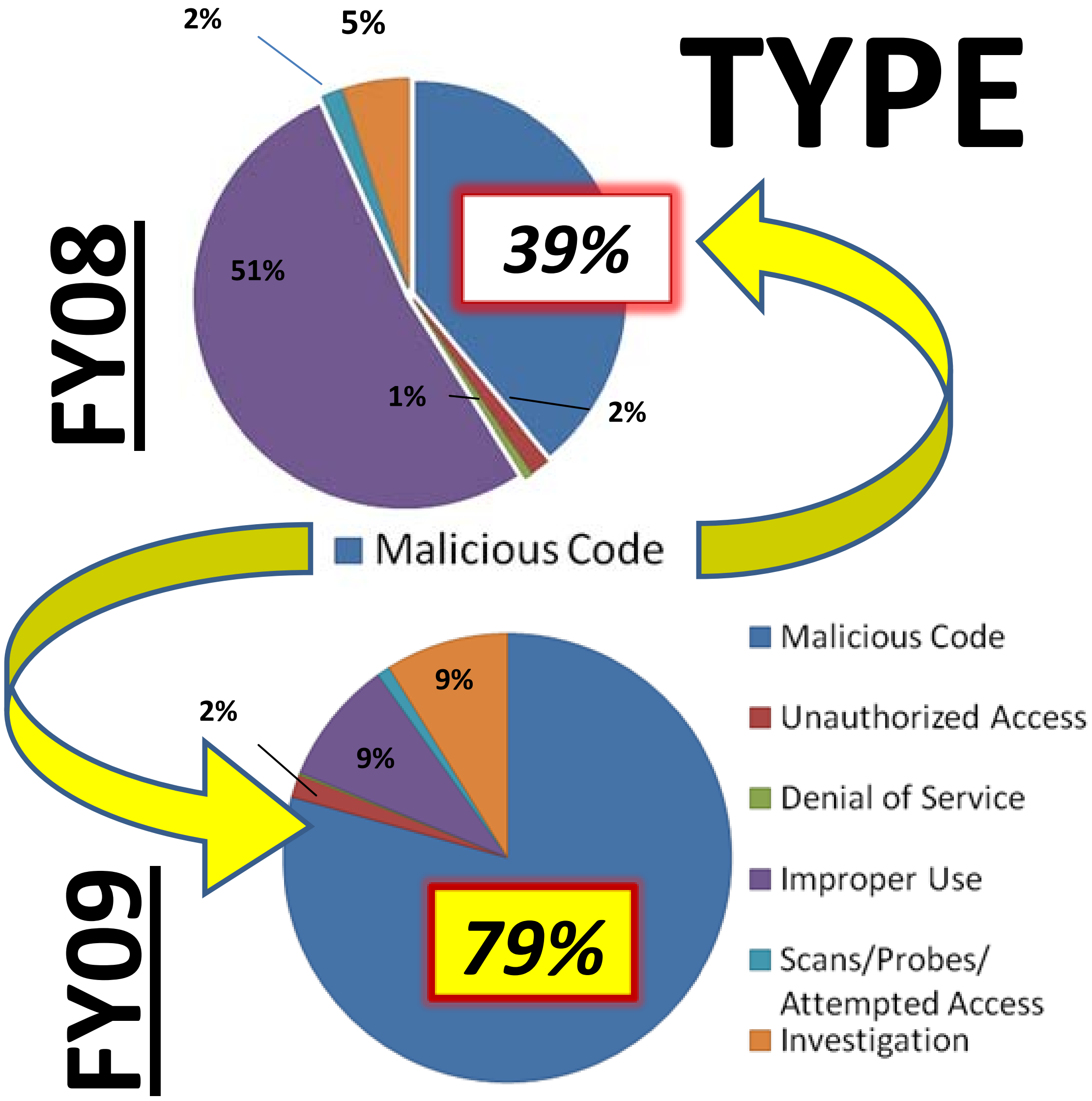
TICKETS

Years Compared	
FY 08	***FY 09***
2104	**3085**

FY 09 Quarters	
Quarters	*Tickets*
Oct-Dec 08	560
Jan-Mar 09	555
Apr-Jun 09	639
July-Aug 09 *(Partial)*	805

Months Compared		
	2008 - Tickets	*2009- Tickets*
June	**154**	**300**
July	**183**	**352**
August	**250**	**453**

TYPE



Targets:

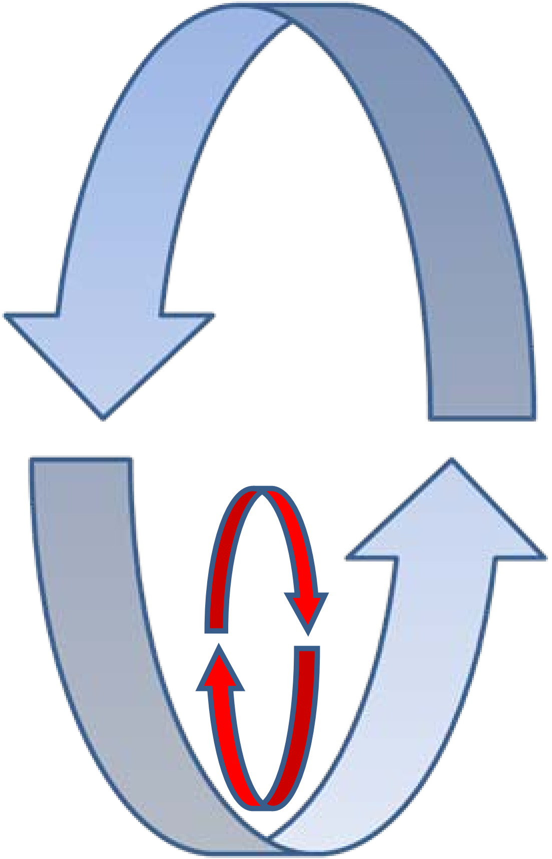
[11 months before Feb 09]

CAG ID	Consensus Audit Guideline	NIST-800-53	US CERT Report
1	Inventory of authorized and unauthorized hardware	CM-1, CM-2, CM-3, CM-4, CM-5, CM-8, CM-9	+ 6 %
2	Inventory of authorized and unauthorized software	CM-1, CM-2, CM-3, CM-5, CM-7, CM-8, CM-9, SA-7	+ 22 %
5	Boundary Defense	AC-17, RA-5, SC-7, SI-4	+ 7 %
9	Controlled access based on need to know	AC-1, AC-2, AC-3, AC-6, AC-13	1 %
12	Anti-malware defenses	AC-3, AC-4, AC-6, AC-17, AC-19, AC-20, AT-2, AT-3, CM-5, MA-3, MA-4, MA-5, MP-2, MP-4, PE-3, PE-4, PL-4, PS-6, RA-5, SA-7, SA-12, SA-13, SC-3, SC-7, SC-11, SC-20, SC-21, SC-22, SC-23, SC-25, SC-26, SC-27, SC-29, SC-30, SC-31, SI-3, SI-8	+ 60%

Penetration Tests

80% of the successful attacks used known vulnerabilities

Why Shift Strategy?



- combatants with the fastest "Observe – Orient – Decide – Act" cycle win.[1]
- Organized crime and adversaries can adapt cyber threats faster than U.S. government and businesses can counteract them
- **Most attacks on the Department of State were on known risks**

[2] 'OODA' loops described in Boyd , The Fighter Pilot Who Changed the Art of War, by Robert Coram

New Defensive strategy

a. **Remove all threatening digital foot-holds and cracks** used to attack the Department of State **beginning with** the **greatest risks first**.

b. **Track progress**

Law and Regulation

One Word

On December 17, 2002, the President signed into law the Electronic Government Act. Title III of that Act is FISMA, which *lays out the framework for ?**annual**?IT security reviews, reporting, and remediation planning at federal agencies.* It requires that agency heads and IGs evaluate their agencies’ computer security programs and report the results of those evaluations to OMB, Congress, and the GAO.

[1] House Oversight and Government Reform website

FISMA 1.0

Compliance “*SNAPSHOTS*”

1. “**Annual**” awareness course
2. “**Annual**” systems inventory
3. “**Annual**” testing
4. C&A¤ every “**three**” years
5. Weaknesses “**Quarterly**”
6. **Configuration Management**
7. **Incident Reporting**

¤ Certification and Accreditation studies

C&A PROCESS

Issues

C&A Concerns

a. Once in 3 year study of 110 technical, managerial and operational controls (NIST 800-53)
   - 25-2000 pages; $30K - $+2.5M

b. Library cost: $130M in 6 years
   - 95,000 pages @ $1400 per page

c. Changes: 150 -200 a week;
   - 24,000 programs changed in 3 years

Issues

C&A Concerns

d. Technical control sections are out of date rapidly

e. CISO’s control few systems directly, but are accountable.

f. C&A’s focus on individual systems. Enterprise faces risk.

g. Many attacks focus on subset of controls (CAG)

FISMA + Pilot

Targeted Gains

C&A cost down 56% then 62% ¤

➢ Invest in tool kits for everything

  ¤ Certification & Accreditation decentralized, just in time

Technical control data efficiency:

➢ Every **2-15 days** not **3 years**

Assemble accountable tiger teams:

➢ inventory and to reduce site risks

FISMA + Pilot

Continuous:

7. **Incident Reporting**
6. **Configuration Management**
5. Weakness updated “**daily**”
4. C&A technical control **(x72)** ¤
3. **Daily** not “**Annual**” testing
2. **Inventory** improvements
1. “**Daily**” awareness training

¤ Certification and Accreditation study of technical controls

Risk Scoring Initiative

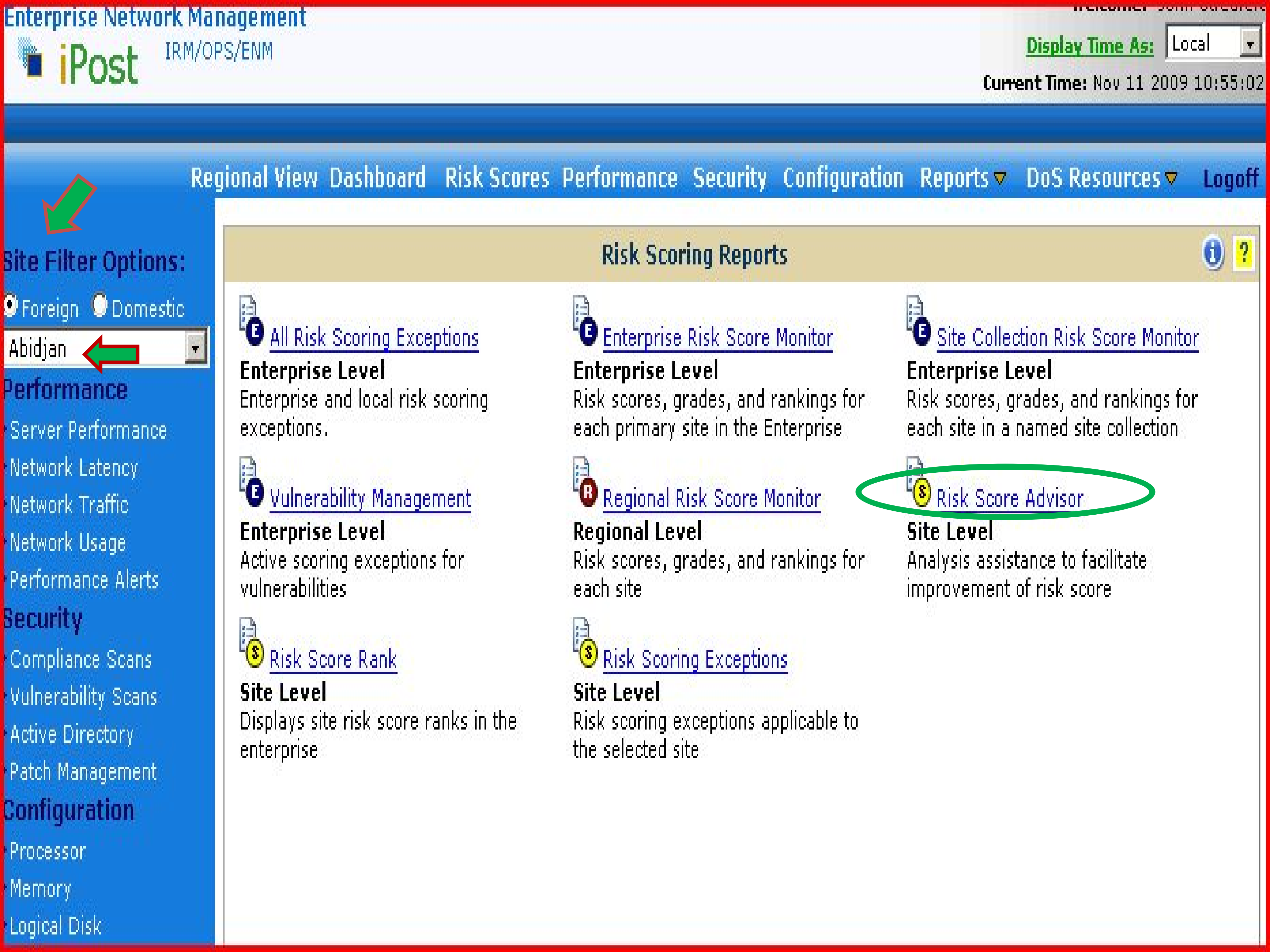
SOLUTION

Information & Tools

Timely – Targeted[2] – Prioritized

"Metrics with the Most Meaning"

[3] The One to One Fieldbook: The Complete Toolkit for Implementing a 1 to 1 Marketing Program *by Don Peppers, Martha Rogers, and Bob Dorf*



Display Time As: Local

Current Time: Nov 11 2009 10:55:02

● Foreign ○ Domestic

Abidjan

Risk Scoring Reports

All Risk Scoring Exceptions
Enterprise Level
Enterprise and local risk scoring exceptions.

Enterprise Risk Score Monitor
Enterprise Level
Risk scores, grades, and rankings for each primary site in the Enterprise

Site Collection Risk Score Monitor
Enterprise Level
Risk scores, grades, and rankings for each site in a named site collection

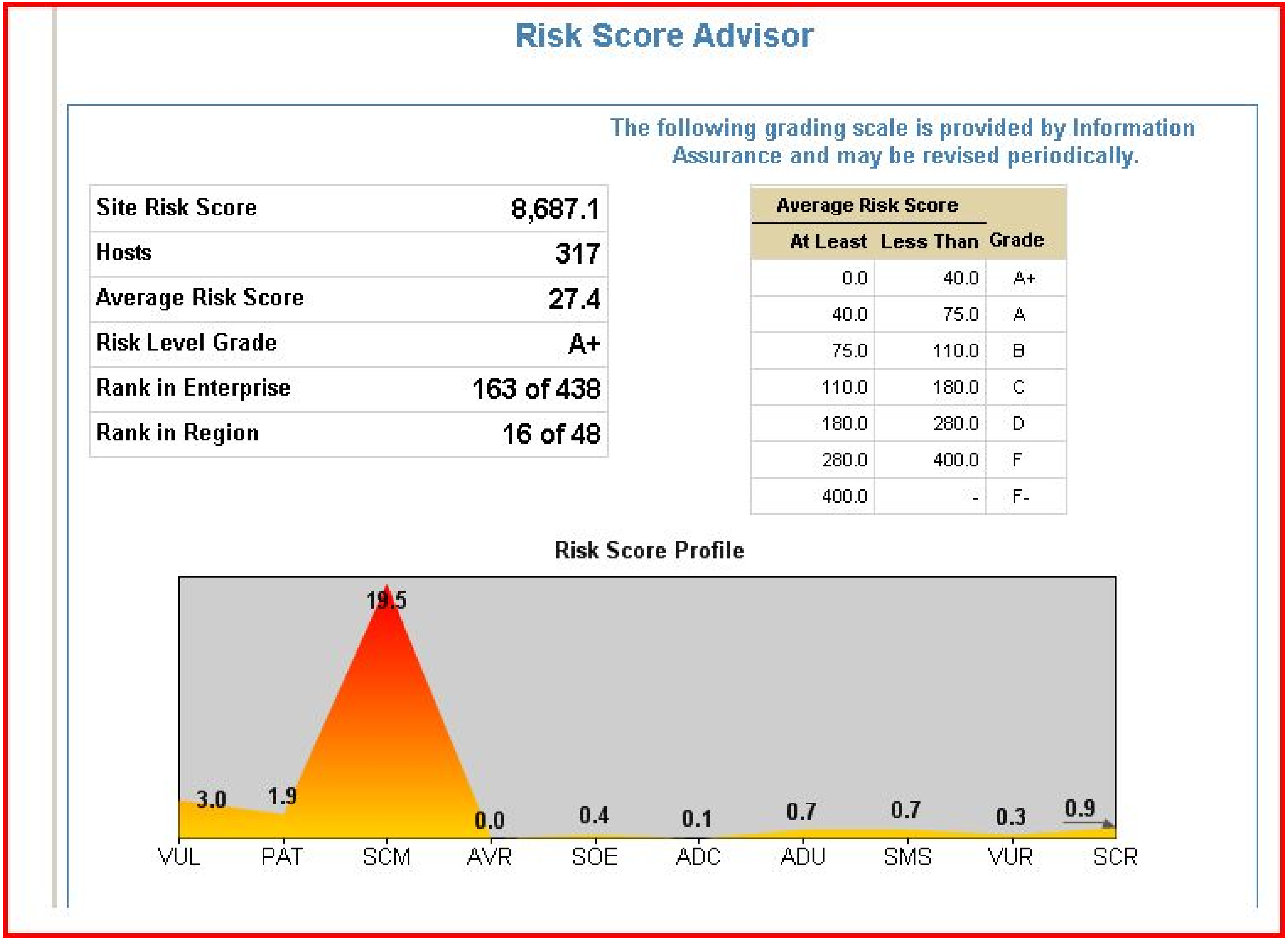
Vulnerability Management
Enterprise Level
Active scoring exceptions for vulnerabilities

Regional Risk Score Monitor
Regional Level
Risk scores, grades, and rankings for each site

Risk Score Advisor
Site Level
Analysis assistance to facilitate improvement of risk score

Risk Score Rank
Site Level
Displays site risk score ranks in the enterprise

Risk Scoring Exceptions
Site Level
Risk scoring exceptions applicable to the selected site



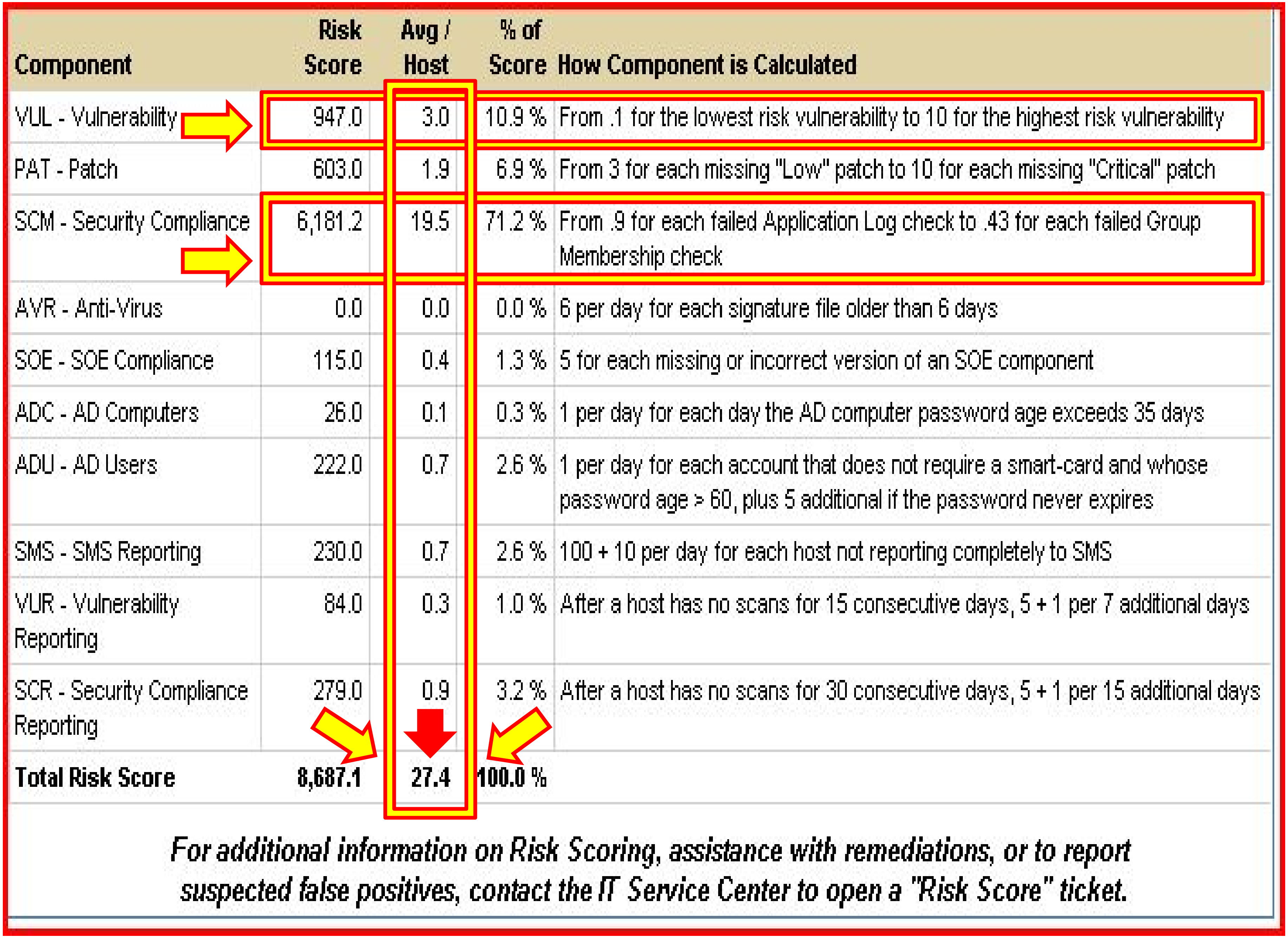
Risk Score Advisor

The following grading scale is provided by Information Assurance and may be revised periodically.

Site Risk Score	8,687.1
Hosts	317
Average Risk Score	27.4
Risk Level Grade	A+
Rank in Enterprise	163 of 438
Rank in Region	16 of 48

Average Risk Score		
At Least	Less Than	Grade
0.0	40.0	A+
40.0	75.0	A
75.0	110.0	B
110.0	180.0	C
180.0	280.0	D
280.0	400.0	F
400.0	-	F-

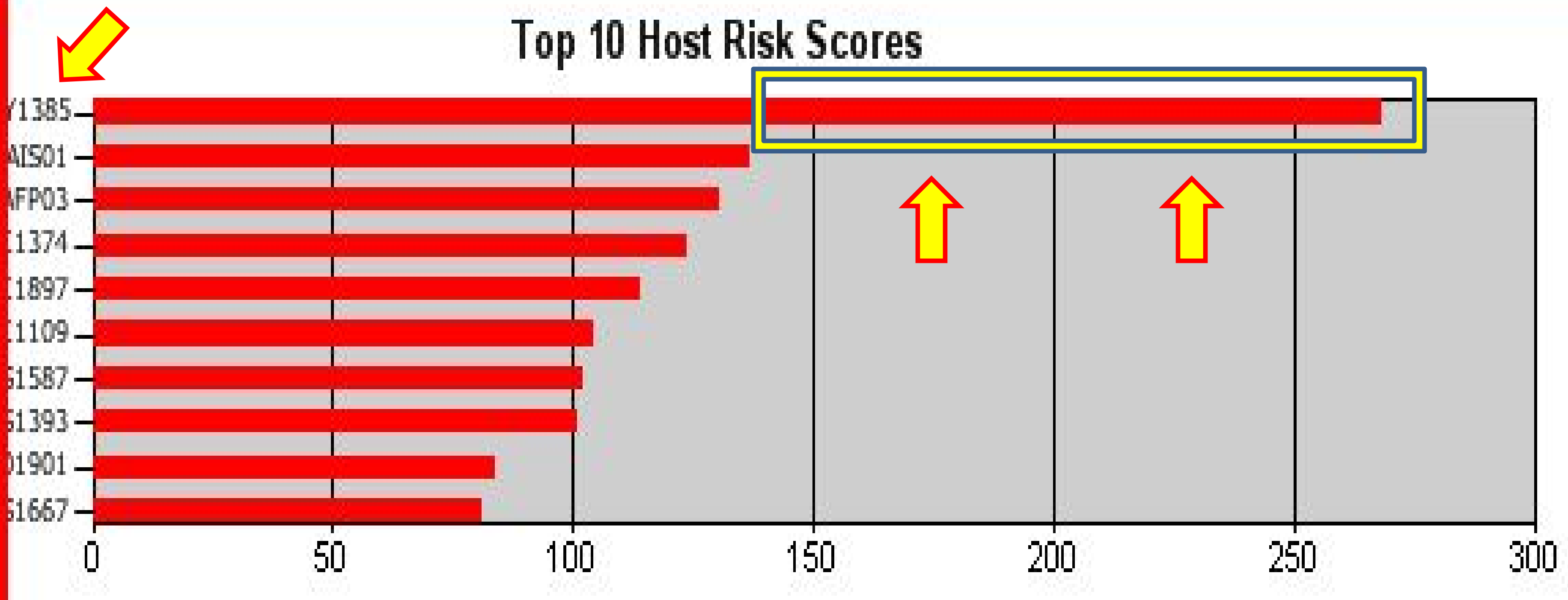
Risk Score Profile



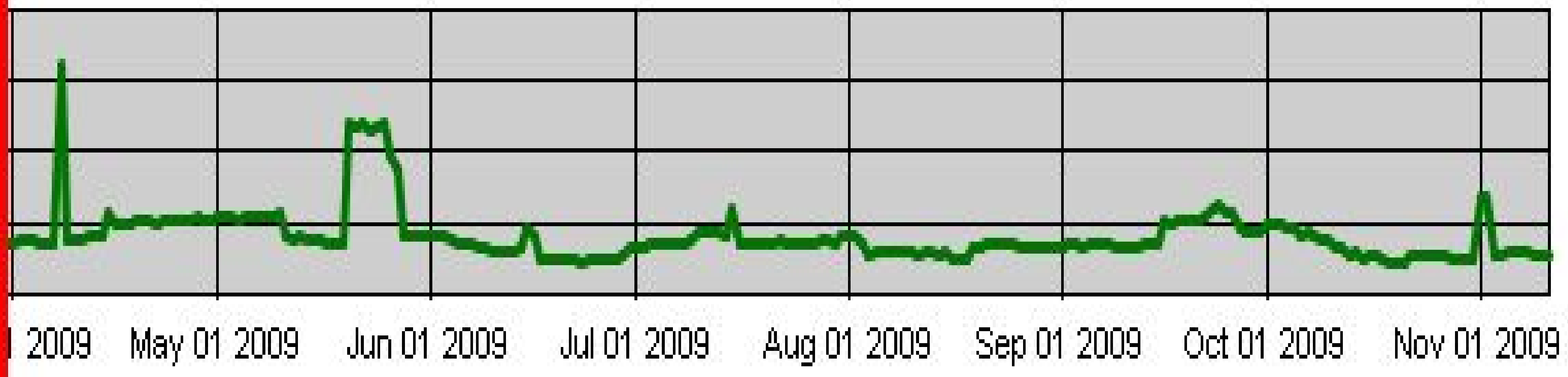
Component	Risk Score	Avg / Host	% of Score	How Component is Calculated
VUL - Vulnerability	947.0	3.0	10.9 %	From .1 for the lowest risk vulnerability to 10 for the highest risk vulnerability
PAT - Patch	603.0	1.9	6.9 %	From 3 for each missing "Low" patch to 10 for each missing "Critical" patch
SCM - Security Compliance	6,181.2	19.5	71.2 %	From .9 for each failed Application Log check to .43 for each failed Group Membership check
AVR - Anti-Virus	0.0	0.0	0.0 %	6 per day for each signature file older than 6 days
SOE - SOE Compliance	115.0	0.4	1.3 %	5 for each missing or incorrect version of an SOE component
ADC - AD Computers	26.0	0.1	0.3 %	1 per day for each day the AD computer password age exceeds 35 days
ADU - AD Users	222.0	0.7	2.6 %	1 per day for each account that does not require a smart-card and whose password age > 60, plus 5 additional if the password never expires
SMS - SMS Reporting	230.0	0.7	2.6 %	100 + 10 per day for each host not reporting completely to SMS
VUR - Vulnerability Reporting	84.0	0.3	1.0 %	After a host has no scans for 15 consecutive days, 5 + 1 per 7 additional days
SCR - Security Compliance Reporting	279.0	0.9	3.2 %	After a host has no scans for 30 consecutive days, 5 + 1 per 15 additional days
Total Risk Score	**8,687.1**	**27.4**	**100.0 %**	

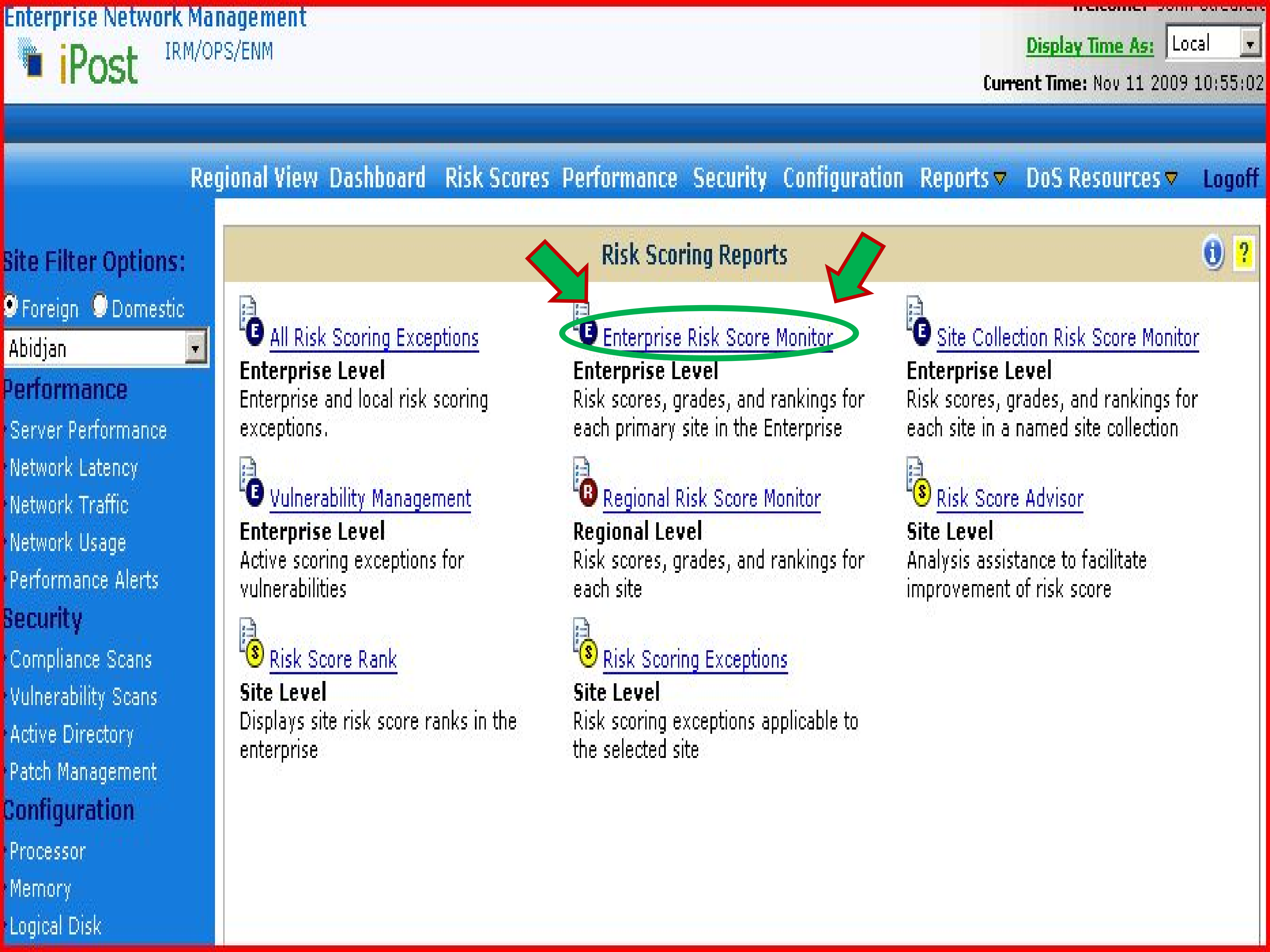
For additional information on Risk Scoring, assistance with remediations, or to report suspected false positives, contact the IT Service Center to open a "Risk Score" ticket.

Top 10 Host Risk Scores



Risk Score History





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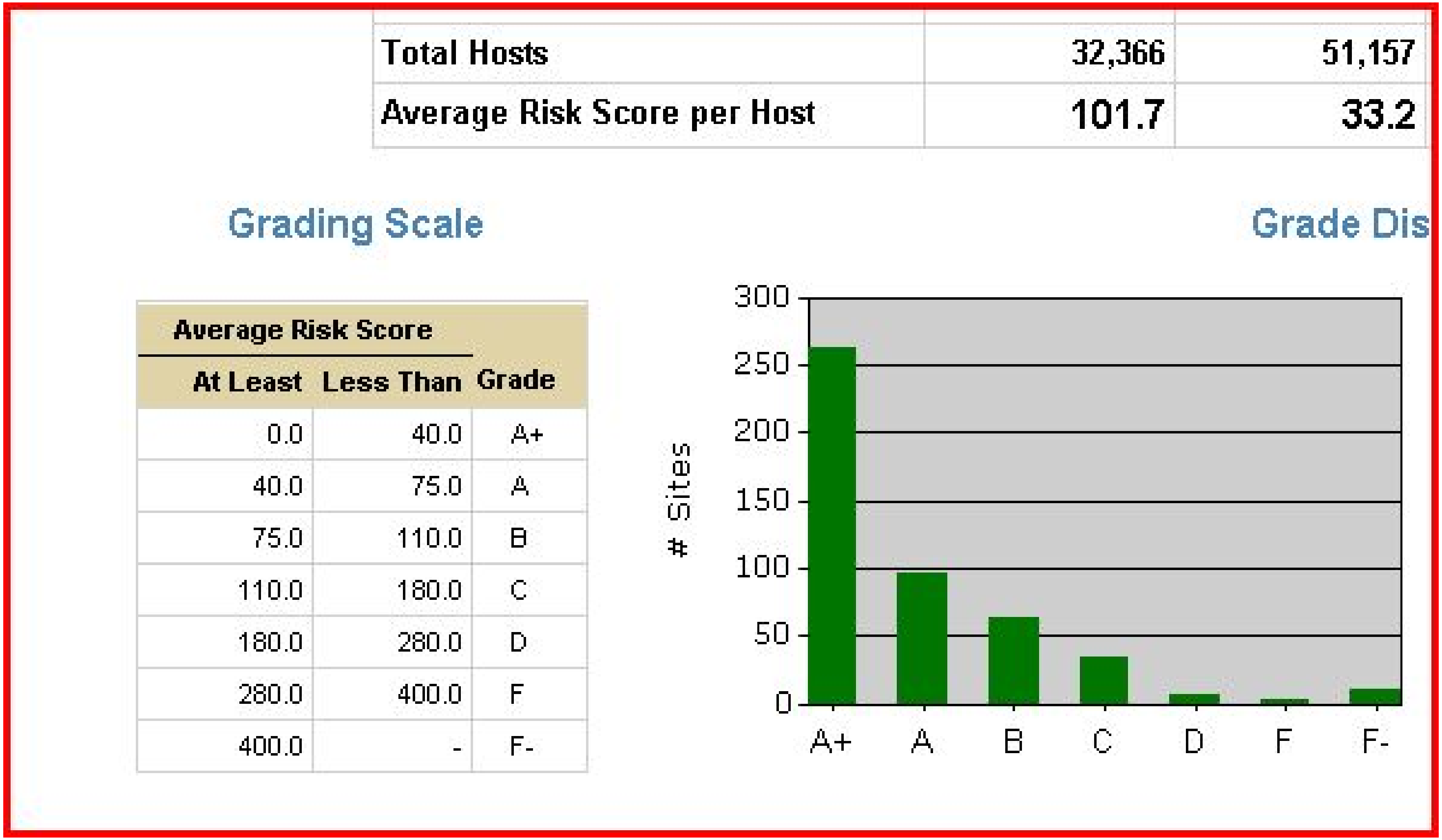
Risk Score Monitor Enterprise



Total Hosts	32,366	51,157
Average Risk Score per Host	101.7	33.2

Grading Scale

Average Risk Score		
At Least	Less Than	Grade
0.0	40.0	A+
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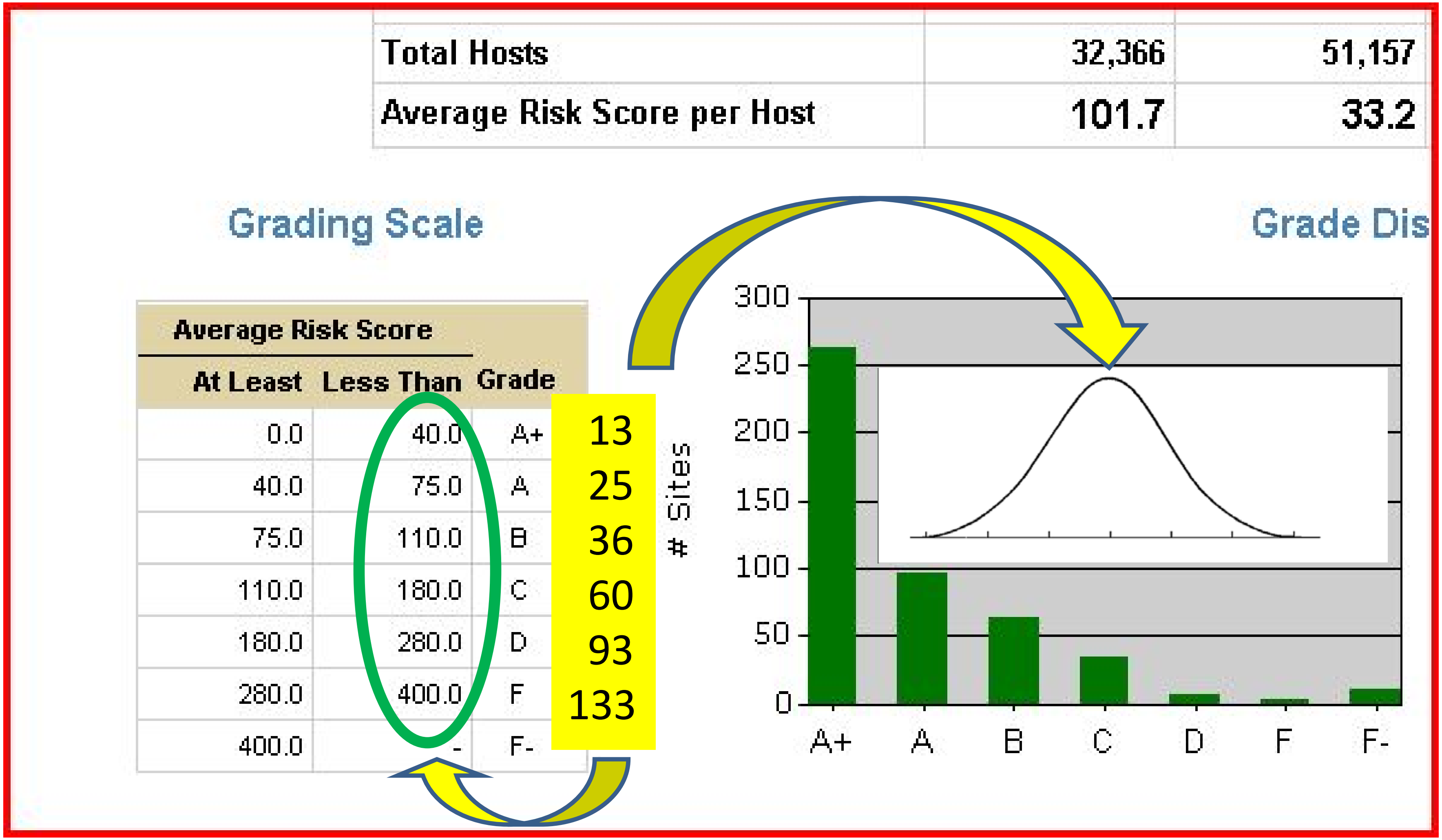
Grade Dis

Risk Score Monitor Enterprise



Total Hosts	32,366	51,157
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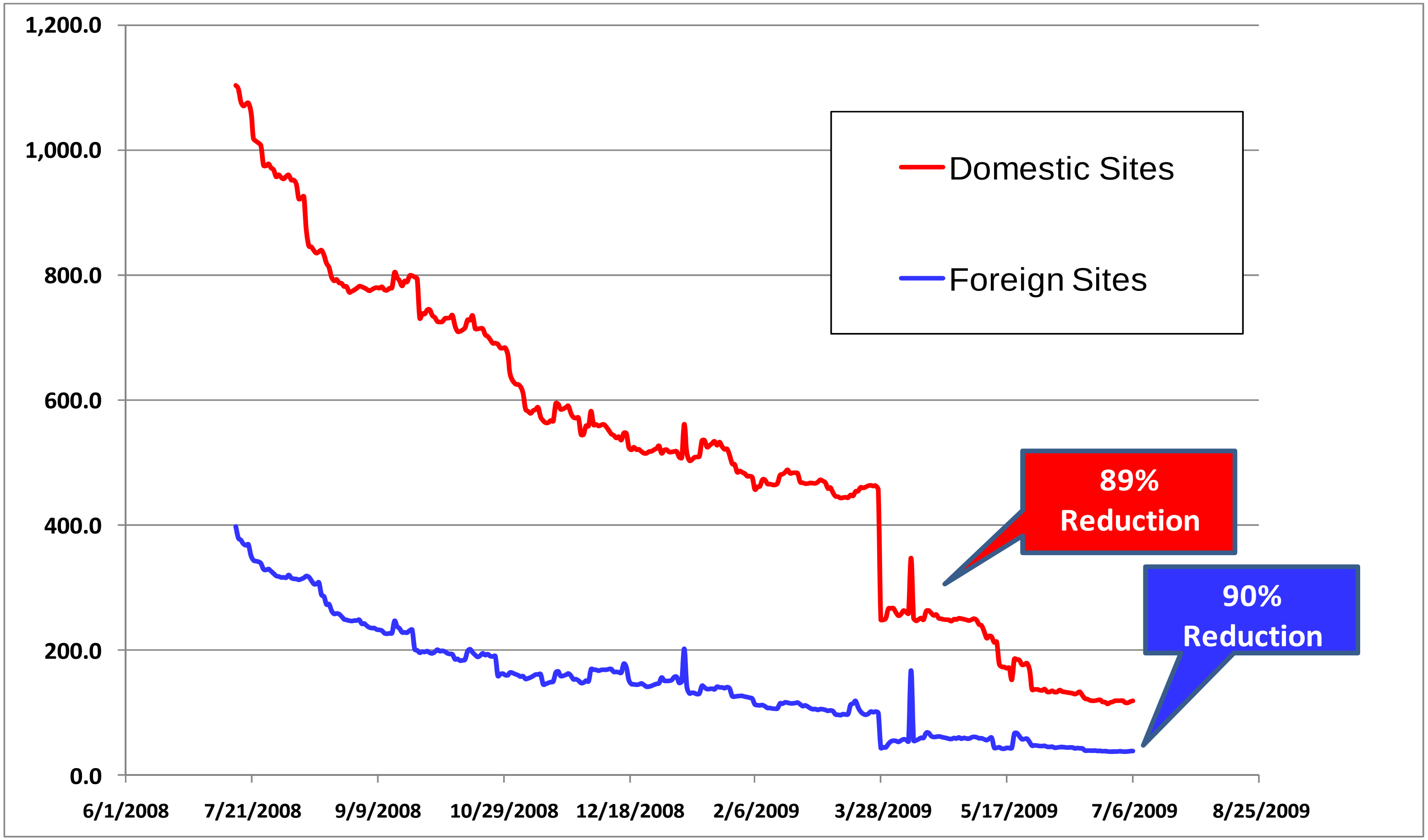
Grading Scale

Average Risk Score			
At Least	Less Than	Grade	
0.0	40.0	A+	13
40.0	75.0	A	25
75.0	110.0	B	36
110.0	180.0	C	60
180.0	280.0	D	93
280.0	400.0	F	133
400.0	-	F-	

Grade Dis

Results in 12 Months



89% Reduction

90% Reduction

Finding

Details empower technical managers

FOR TARGETED, DAILY ATTENTION TO REMEDIATION

Summaries empower executives

TO OVERSEE CORRECTION OF MOST SERIOUS PROBLEMS

Lessons Learned

- When **continuous monitoring** augments snapshots required by FISMA:
  - Mobilizing to lower risk is feasible & fast (11 mo)
  - Changes in 24 time zones with no direct contact
  - Cost: 15 FTE above technical management base
- This approach leverages the wider workforce
- Security culture gains are grounded in fairness, commitment and personal accountability for improvement

Federal issues

1. Exceptions impacting risk across Cabinet Departments
   - Personnel applications
   - Passport and visa information sharing
2. Studies by group of IP addresses for OIG, GAO and Independent Auditor

Federal conclusions

- Concepts are scalable to large complex public (and possibly) private sector organizations
- Spending of $1.3 billion estimated for federal C&A cycle:
  - Higher ROI for continuous monitoring of technical controls as a substitute for paper reports
- Progress in reducing vulnerabilities on a summary level could be fed to Cyber Scope

Additional slides

Essential Elements to Begin

Key Pieces:

1. CAG Directed Toolset – baseline growing to 15 control families. Status now:
    a. SMS (Systems Management Server – Microsoft)
    b. Vulnerability/Configuration Management
        - N-Circle, Tenable, McAfee
2. Data warehouse to store enterprise risk information securely (GOTS)
3. Risk Scoring Dashboard (GOTS)

Wider Implementation

<u>Recommended Model:</u>

- Multiple award contract from GSA
  - Dashboard, 15 tool groups, data integration
  - Continuous update of scanner technology
- OMB, DHS, NIST guidance to protect .gov
  - Yardsticks needed for each of 20 CAG elements
  - Public-private FDCC model achieved the most, the fastest;
- Federal level interdisciplinary support team
- DHS/DoD provide protection for data

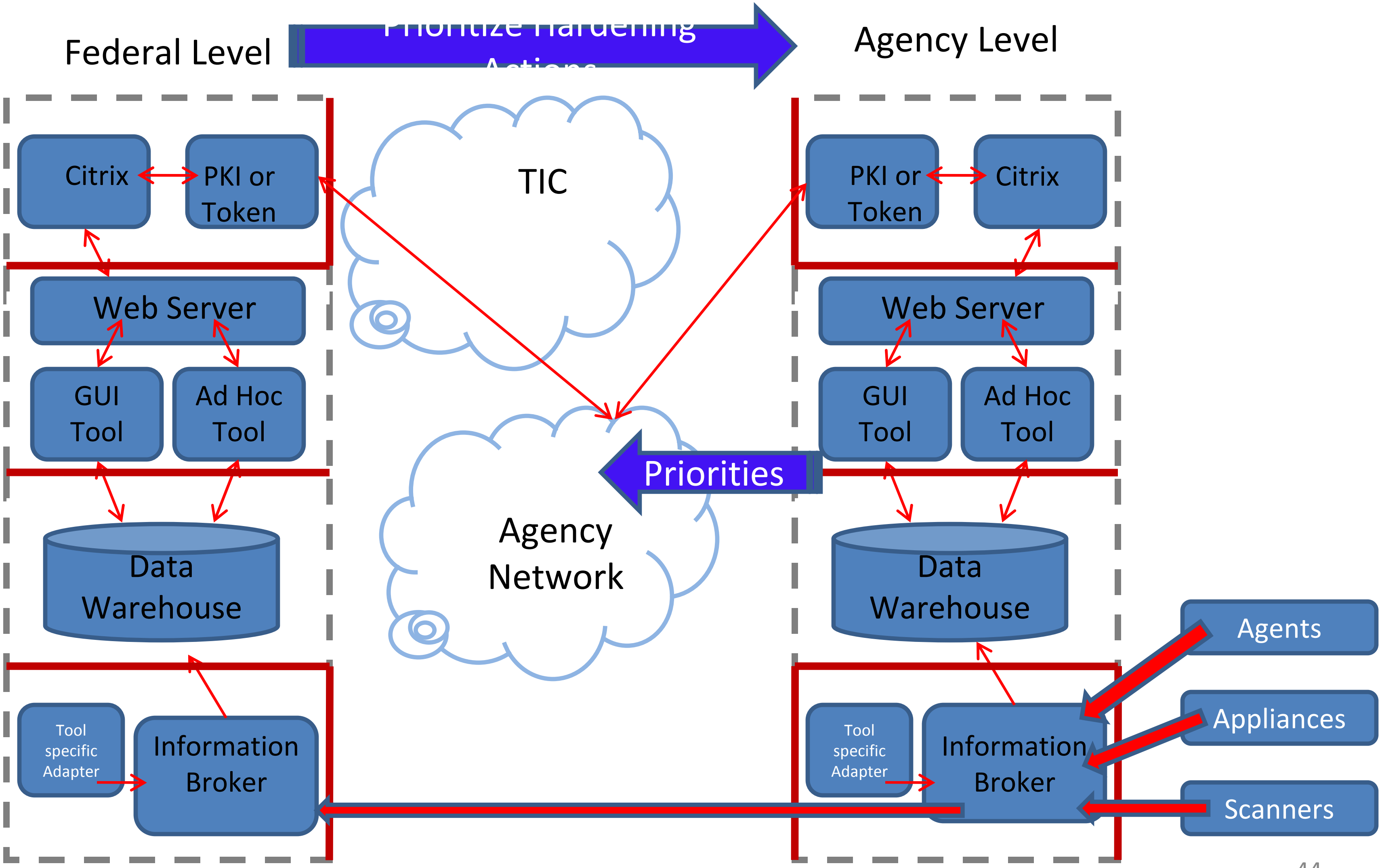
Security Dashboard Skill Requirements

- Business/Organization critical success factors:
  - Business Change Management
  - Communications
  - Culture of Cost Effectiveness
  - Negotiation
  - Security Risk/Threat Analysis
  - Performance Measurement
  - Data Analysis

Security Dashboard Requirements

- Critical Success Factors (Technical):
  - Data Enclave Protection
  - ID & Authentication
  - Data Mining Tools: Interface Design and Construction
  - Database design/administration/hardening
  - Information Broker management
  - System Administration

Security Dashboard Architecture



Federal Level

Prioritize Hardening Actions

Agency Level

Citrix

PKI or Token

Web Server

GUI Tool

Ad Hoc Tool

Data Warehouse

Tool specific Adapter

Information Broker

TIC

Agency Network

Priorities

PKI or Token

Citrix

Web Server

GUI Tool

Ad Hoc Tool

Data Warehouse

Tool specific Adapter

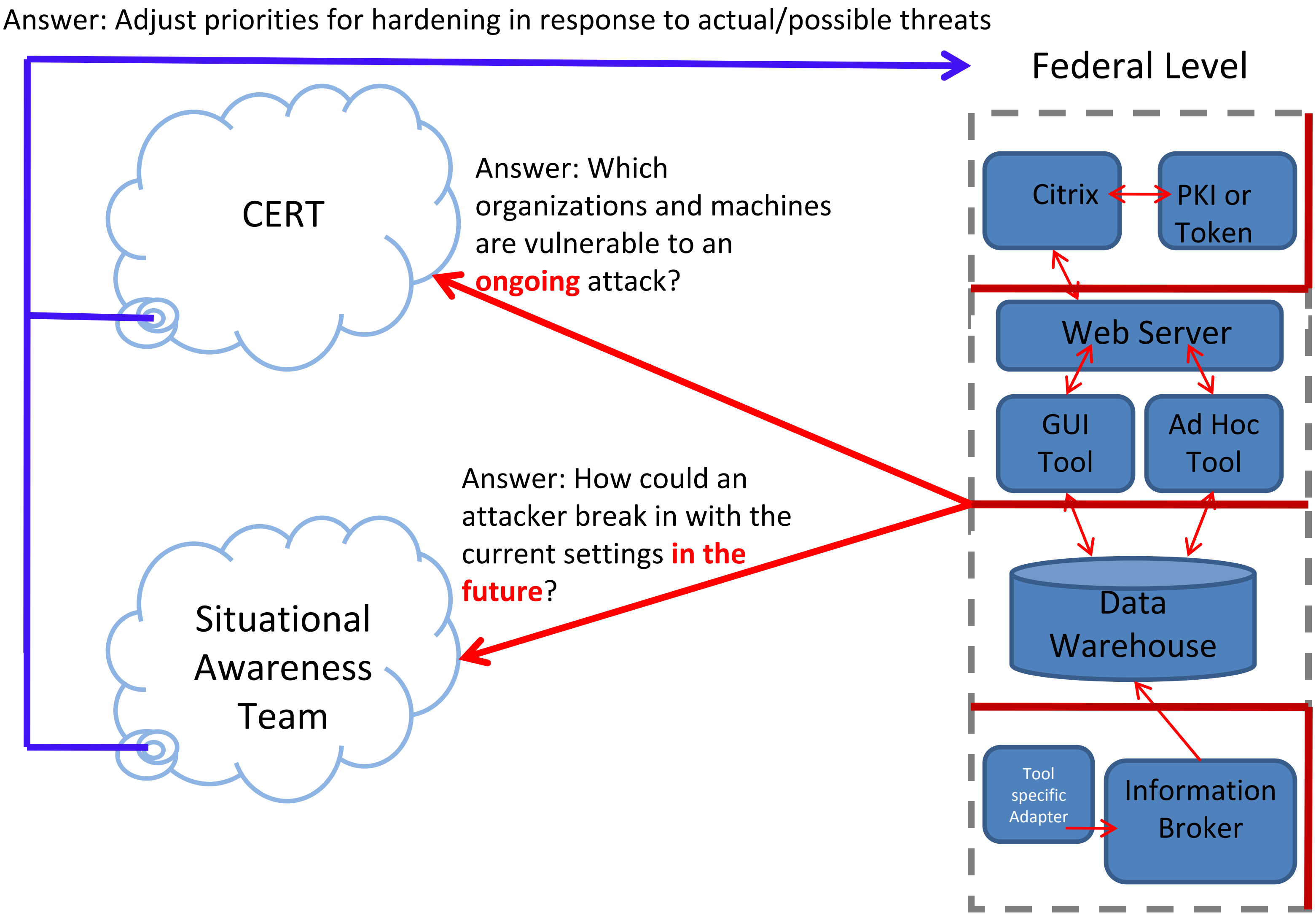
Information Broker

Agents

Appliances

Scanners

Security Dashboard: Other Uses of Data


Answer: Adjust priorities for hardening in response to actual/possible threats

Answer: Which organizations and machines are vulnerable to an **ongoing** attack?

Answer: How could an attacker break in with the current settings **in the future**?