ACR 2 Solutions, Inc.

Automated Risk Management Using NIST Standards

The management of risks to the security and availability of private information is a key element of privacy legislation under the Federal Information Security Management Act (FISMA), the Gramm Leach Bliley Act (GLBA), the Health Insurance Portability and Accountability Act (HIPAA) and the Payment Card Industry Data Security Standard (PCI DSS). In the case of FISMA, the information security responsibilities of agency heads are summarized as follows:

> H. R. 2458
> § 3544. Federal agency responsibilities
> (a) IN GENERAL.—The head of each agency shall...
> (2) ensure that senior agency officials provide information security ... through—
> (A) **assessing the risk** [emphasis added]
> (B) determining the...information security [that is] appropriate
> (C) implementing policies and procedures...
> (D) periodically testing...security controls

Similar language is present in the other privacy legislation. In each case, the process begins with risk assessment, and then moves on to management of the assessed risk.

Technical risk assessment is a relatively recent art that grew out of the environmental remediation industry in the 1980s. It was not until 2002 that the National Institute of Standards and Technology (NIST) produced a protocol detailing risk assessment for information security, although it was alluded to in earlier documents.

Since the Clinger-Cohen Act of 1996, the National Institute of Standards and Technology has been required to set the standards for information security. The publication of the risk assessment procedure NIST 800-30 in 2002 both eased and complicated the burden on organizations required to complete risk assessments. Although it established the procedure for assessing risk, the standards are both voluminous and complex. Conducting a NIST compliant risk assessment remains problematic for many organizations. A single copy of the applicable NIST references as of mid-2007 is shown at right.

The documentation, while detailed, is well written. On page 8, the protocol states that "The risk assessment methodology encompasses nine primary steps…

Step 1 System Characterization (Section 3.1)
Step 2 Threat Identification (Section 3.2)
Step 3 Vulnerability Identification (Section 3.3)
Step 4 Control Analysis (Section 3.4)
Step 5 Likelihood Determination (Section 3.5)

Step 6 Impact Analysis (Section 3.6)
Step 7 Risk Determination (Section 3.7)
Step 8 Control Recommendations (Section 3.8)
Step 9 Results Documentation (Section 3.9)."

1. System Characterization (3.1)

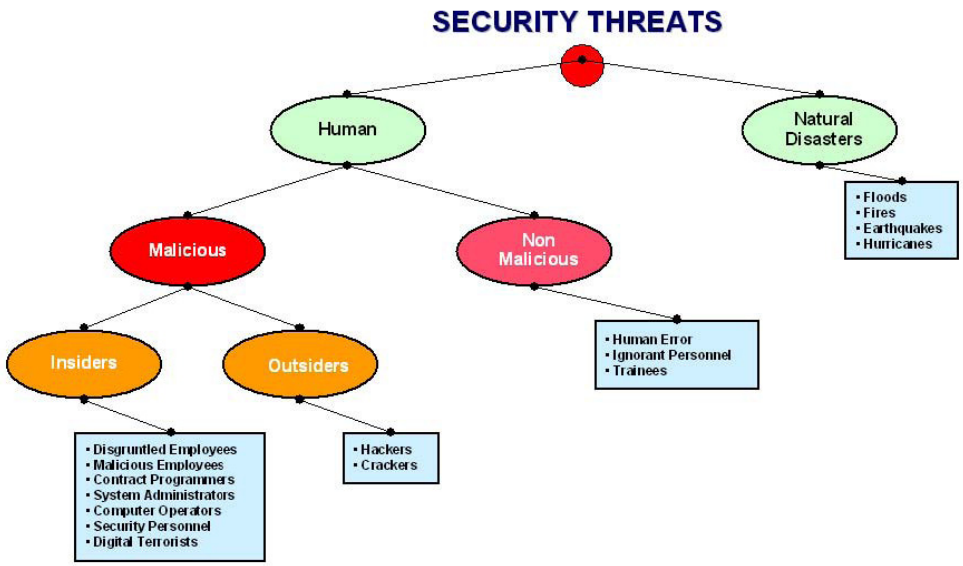
Page 12 of 800-30 requires questionnaires, document review, and automated scanning tools for system characterization. The Security Content Automation Program (SCAP), started in 2005, calls for the use of SCAP validated scanners to confirm continued compliance with security guidelines.

The Automated Risk Management program from ACR features a variety of scanning engines, including Secutor Magnus, a SCAP validated scanner. An extensive policy questionnaire is also used, keyed to the requirements of NIST 800-53.

2. Threat Identification (3.2)

Page 13 of 800-30 lists natural threats, human threats, and environmental threats. An early 2000 information security paper by Jaisingh and Rees refers to the Microsoft classification of threats as being divided into natural disasters, Human Error, Malicious Insiders and Malicious Outsiders. Later papers, by Mintaka (2003) and Altoros (2007), include a more elaborate version of the Rees diagram.

While there are other acceptable ways to identify threats, the dominance of Microsoft products in the Federal space indicates that the use of the Microsoft division of threats into Environmental, Human Error, Malicious Insiders and Malicious Outsiders is both useful and widely acceptable. The Rees diagram is shown below.



3. Vulnerability Sources (3.3)

In 2005, the NIST created the National Vulnerability Database (NVD), which superseded the I-CAT database referred to on page 16 of 800-30. The NVD is incorporated into the SCAP validated scanner that is part of the Automated Risk Management program from ACR.

Page 18 of 800-30 notes that vulnerabilities in management, operational, and technical areas all need to be considered.

The Automated Risk Management program from ACR system further divides vulnerable areas into management (Procedure implementation and Internal controls), operational (Data acquisition, Data storage, Data retrieval, Data modification, Data transmission) and technical (System design). In addition, the environmental vulnerabilities of Wind (roof damage), Fire (and smoke) damage, Flood, Power loss (loss of operations), Power loss (Damage to building), and Vehicle collision are included. It is believed that this division was taken from an early risk assessment draft, but the original source has been lost.

Other division of areas of vulnerability could be made, but these are reasonably comprehensive and are easily assigned to particular 800-53 safeguards.

4. Control analysis (3.4)

The utility of the 800-30 process was greatly enhanced by the 2005 publication of 800-53, "Recommended Security Controls for Federal Systems." For the first time, a listing of adequate safeguards to achieve an acceptable level of risk was made explicit by an authoritative source.

This frequently updated list, in conjunction with the SCAP validated scan engine, is the basis for much of the Automated Risk Management program from ACR process.

Two key elements in control analysis are anti-virus protection and intrusion protection. Both are highly important precautions, and the volume of virus and intrusion traffic is closely associated with the current security level of a network. A badly infected network will be both compromised and slow, as more and more network resources are misapplied by unauthorized uses.

5. Likelihood determination (3.5)

For an 800-30 risk assessment, likelihood has a specific legal meaning, as follows;

> *High* - The threat-source is highly motivated and sufficiently capable, and controls to prevent the vulnerability from being exercised are ineffective.

Medium - The threat-source is motivated and capable, but controls are in place that may impede successful exercise of the vulnerability.

Low - The threat-source lacks motivation or capability, or controls are in place to prevent, or at least significantly impede, the vulnerability from being exercised.

Since the publication of 800-30 in 2002, cybercrime has exceeded illegal drugs as the leading criminal activity worldwide. Threat source motivation and capability can reasonably be assumed.

The Automated Risk Management program from ACR reviews all of the recommended safeguards of 800-53. Mapping of these safeguards to the four threat sources (Environmental, Human Error, Malicious Insider and Malicious Outsider) is done by inspection. For each threat source, the vulnerable areas of management (Procedure implementation and Internal controls), operations (Data acquisition, Data storage, Data retrieval, Data modification, Data transmission), and technology (System Design) are straightforward.

The translation of the safeguards map into an expert system computer program was done by observing experienced risk assessment consultants and tweaking the calculation engine to produce the same results using either a human expert or the expert system computer program. This makes the program useful, but risk assessment using this procedure, or any procedure, has limited precision and granularity. As noted in 800-39, the "flagship document" of the NIST 800 series, "Managing risk is not an exact science".

Information security risk assessments produced with this system have been audited by both OCC and FDIC experts.

6. Impact analysis (3.6)

Impact levels under 800-30 have very specific definitions.

High - Exercise of the vulnerability (1) may result in the highly costly loss of major tangible assets or resources; (2) may significantly violate, harm, or impede an organization's mission, reputation, or interest; or (3) may result in human death or serious injury.

Medium - Exercise of the vulnerability (1) may result in the costly loss of tangible assets or resources; (2) may violate, harm, or impede an organization's mission, reputation, or interest; or (3) may result in human injury.

Low - Exercise of the vulnerability (1) may result in the loss of some tangible assets or resources or (2) may noticeably affect an organization's mission, reputation, or interest.

The calculation of impact levels is also mapped to 800-53 safeguards in a direct fashion. For example, a system that does not meet the requirements of safeguard CP-9, Information System Backup, will be much more impacted by Fire than a system which is compliant with CP-9 and has a well written contingency plan (CP-2) that includes training (CP-3) and testing (CP-4).

7. Risk determination (3.7)

The calculation algorithm for the risk assessment is given on page 25 of 800-30. Low, Medium, and High likelihoods of adverse events are scored at 0.1, 0.5 or 1.0, respectively. In the same manner, Low, Medium, and High impacts are scored at 10, 50 and 100 respectively. By multiplying the likelihood score and the impact score, a risk score from 1 (low) to 100 (high) is calculated.

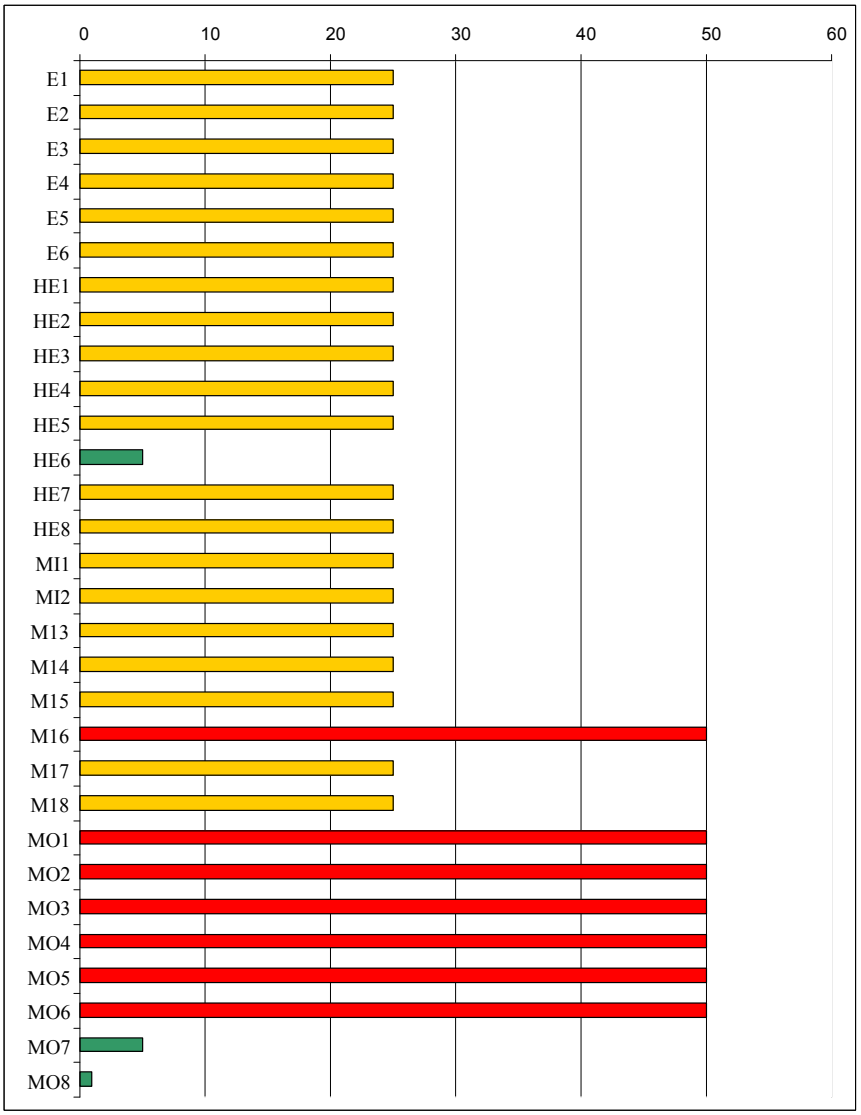
8. Control recommendation (3.8)

These reports give a mapping of the featured safeguards which are missing, against the identified risks in order of impact. These reports should be used to determine which safeguards need to be changed or updated.

9. Results documentation

Upon completion of the Automated Risk Management program from ACR risk assessment, the initial set of data will produce two reports, a "Baseline Report" showing the risk scores ordered by threat source and a "Risk Assessment Chart."with the same risk scores shown in graphical form. A sample is shown below.

	Threat Source	Vulnerability	Likelihood	Impact	Baseline Score
E1	Wind	Roof damage	M	M	25
E2	Fire	Smoke damage	M	M	25
E3	Flood	Facility damage	M	M	25
E4	Power loss	Loss of operations	M	M	25
E5	Power loss	Damage to building	M	M	25
E6	Vehicle collision	Facility damage	M	M	25
HE1	Human error	Data acquisition	M	M	25
HE2	Human error	Data storage	M	M	25
HE3	Human error	Data retrieval	M	M	25
HE4	Human error	Data modification	M	M	25
HE5	Human error	Data transmission	M	L	25
HE6	Human error	System design	M	M	5
HE7	Human error	Procedure implementation	M	M	25
HE8	Human error	Internal controls	M	M	25
MI1	Malicious insider	Data acquisition	M	M	25
MI2	Malicious insider	Data storage	M	M	25
M13	Malicious insider	Data retrieval	M	M	25
M14	Malicious insider	Data modification	M	M	25
M15	Malicious insider	Data transmission	M	H	25
M16	Malicious insider	System design	M	M	50
M17	Malicious insider	Procedure implementation	M	M	25
M18	Malicious insider	Internal controls	M	H	25
MO1	Malicious outsider	Data acquisition	M	H	50
MO2	Malicious outsider	Data storage	M	H	50
MO3	Malicious outsider	Data retrieval	M	H	50
MO4	Malicious outsider	Data modification	M	H	50
MO5	Malicious outsider	Data transmission	M	H	50
MO6	Malicious outsider	System design	M	L	50
MO7	Malicious outsider	Procedure implementation	M	L	5
MO8	Malicious outsider	Internal controls	L	L	1

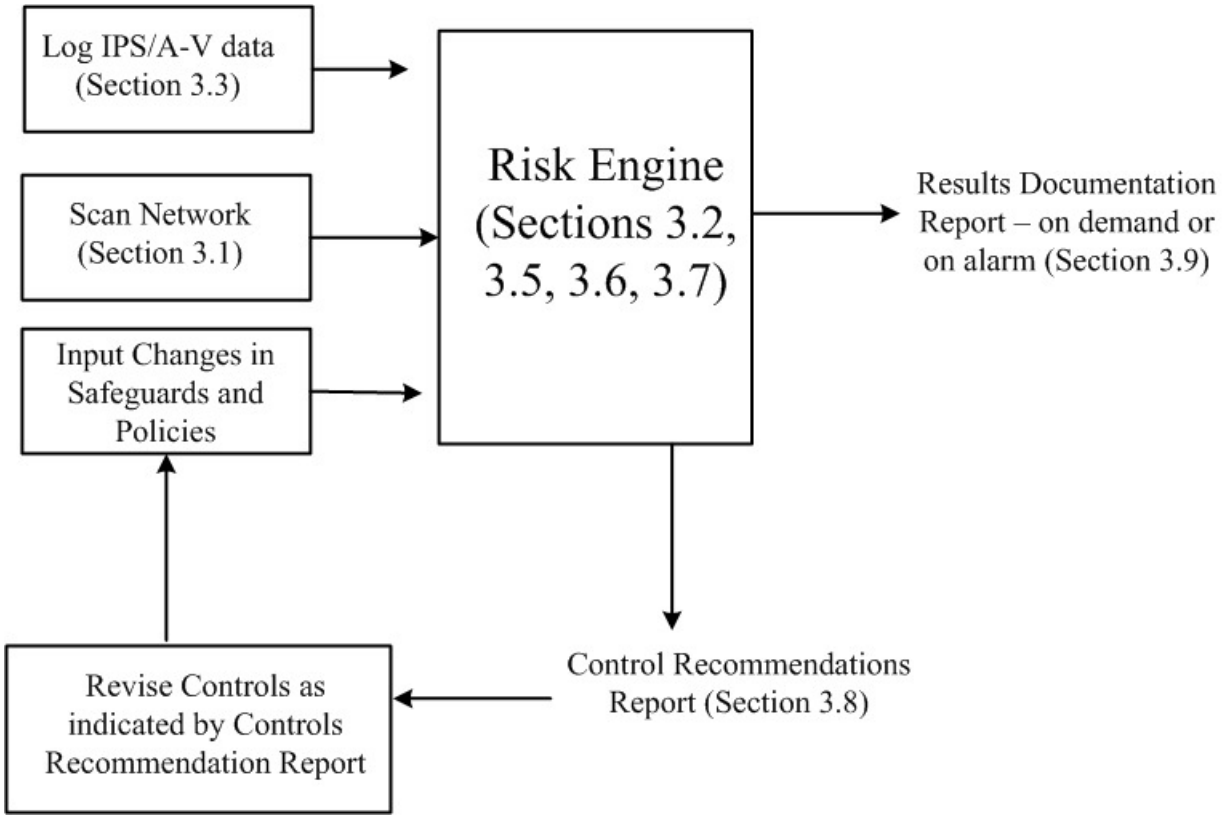


An annual NIST 800-30 compliant risk assessment is required under several sets of regulations, but is likely to be far outside the experience of most security officers who do not have extensive risk assessment experience. The burden these regulations place on organizations can be eased by the use of Automated Risk Management program from ACR. This regulatory burden will only be increased by the adoption of 800-39 later this year. The new "flagship document" in the FISMA compliance series requires "near real-time" management and assessment of risk.

Overall Risk Management Process

The overall risk management process is shown below in graphical form. Data from a network scan (800-30 section 3.1), IPS and AntiVirus data (Section 3.3) and policy data are input into the

Risk Engine. This creates Results Documentation (Section 3.9) and recommendations for change.



The changes in Controls are implemented and the changes added to the risk engine, along with updated Scan and IPS/A-V data. This cycle can be easily done as often as daily, with reports on demand, on schedule or on alarm.

While the Automated Risk Management System from ACR is designed to be implemented as a whole system, organizations that have recently upgraded portions of their safeguards may be understandably reluctant to discard newly installed equipment that is functioning effectively. Therefore, ACR offers several layers of products, ranging from simple scanning tools to full Automation Risk Management programs.

ACR Product Offerings

ACR products include scanning only, risk assessment only, and integrated scanning, IPS and risk assessment.

Scanning Only

ACR and its affiliates offer two scanner only options;

1. Secutor Prime Professional is offered in two versions. The 50 seat maximum program is $5,000 and outputs data from the network in both SCAP and OMB formats. The unlimited version is identical except for scope (>50) and pricing ($10,000).

2. Secutor Magnus is an unlimited seat SCAP validated scanner. It is priced by seat. For OMB output, it must be combined with Secutor Prime Professional. For a quote, contact sales@ACR2solutions.com

Risk Assessment Only

ACR offers four versions of risk assessment only programs.

1. ACR 2 Basic Business version is $995 for a one year license and provides an encrypted PDF output suitable for auditing.

2. ACR 2 Basic MSP version is identical to ACR 2 Basic Business except that it allows data extraction to meet the needs of Managed Service Providers who use the software on behalf of their clients.

3. ACR 2 Basic for PCI is a special edition ($595) to meet the needs of retailers under the Payment Card Industry Data Security Standard (PCI DSS).

4. ACR 2 Enterprise allows review and management of multiple risk assessments from a single location, automatically updating as new risk assessments are created. The 50 seat version, which includes 10 Basic licenses, is $8995 for the PCI version and $12,995 for the Business version. The 256 seat version, which includes 50 Basic licenses, is $29,995 for PCI and $39,995 for Business versions.

Fully Integrated Automated Risk Management Programs

The integrated NIST 800-30 programs combine IPS, A-V, scanning and risk assessment data to meet the complete needs of a risk management program. There are two versions of this program commercially available, with others under development.

1. Risk Reporter for Fortinet Lite – this combines SCAP validated scan data with a reduced version of the ACR 2 Basic Risk Assessment. It accepts data from any Fortinet IPS, and is available free at www.riskreporterforfortinetlite.com. Persons completing the Lite program currently receive an email coupon for a one month free trial of ACR2Basic.

2. Risk Reporter For Fortinet – This combines a SCAP validated scanner with a NIAP certified IPS and a full risk assessment to meet the complete requirements of NIST 800-39 for "near real time" assessment of risk. A press release about this system is available on the Fortinet website located here.

   The system is available in two versions.

a. The Onsite version combines a Fortinet IPS with a SCAP validated scan server and an ACR 2 risk assessment server. All data transfer is therefore completely local. The servers may be either separate hardware devices or virtual machines within the client's network. Working versions of both types of installation are available for review.

b. The Software as a Service (SaaS) version combines a Fortinet IPS with a SCAP validated scan server. The risk assessment is done using an encrypted upload to a remote server.

Installation and training services are available for either type of installation. Call for pricing.

Automated Risk Management

Information security risk management has become so complex that only automation will make it possible to enjoy a reasonable degree of information security. The products from ACR, including scanning, risk assessment and integrated risk management, can help deal with the ever-increasing threats to information security. The NIST protocols define "appropriate safeguards" for information security. The ACR automation of the NIST protocols makes the appropriate safeguards usable and affordable.