ISSA
Information Systems Security Association
Utah Chapter

The Security of Security

Information, Cyber, and Physical Security Convergence

2014 Fall Security Seminar

KRATOS
PUBLIC SAFETY & SECURITY SOLUTIONS

Agenda

- Information Security
- Cyber Security
- Embedded Systems
- Integrated Security
- Security Information Event Management (SIEM)
- Conclusions

The Evolving Threat

Hacking Then

- Individual or Computer Clubs/ Groups
- Manual efforts with Social Engineering
- Success = Badge Of Honor
- Personal Monetary Gain or to pay for / fund hacking activity
- War Protesting and Civil Disobedience
- Anti-Establishment Rhetoric
- Social Rebels and Misfits
- Initially viewed as mostly a nuisance growing into Criminal Acts
- Telco, University and some Government sites primary focus

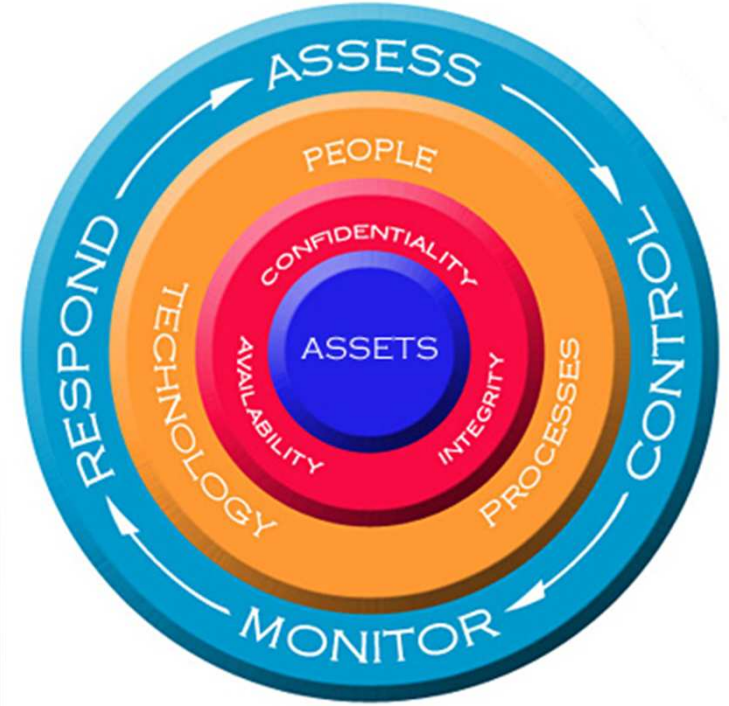
Hacking Now

- Automated / Sophisticated Malware
- **Hactivism** –Freedom of Speech, Statements to Influence Change, Sway Public Opinion and Publicize Views
- **Criminal** –Drug Cartels, Domestic and Foreign Organized Crime for Identity Theft and Financial Fraud
- **Espionage** –IP, Business Intelligence, Technology, Military / Political Secrets
- **Terrorism** –Sabotage, Disruption and Destruction
- **Nation-State** –Intelligence Gathering, Disruptive Tactics, Clandestine Ops, Misinformation, Warfare Strategies, and Infrastructure Destruction

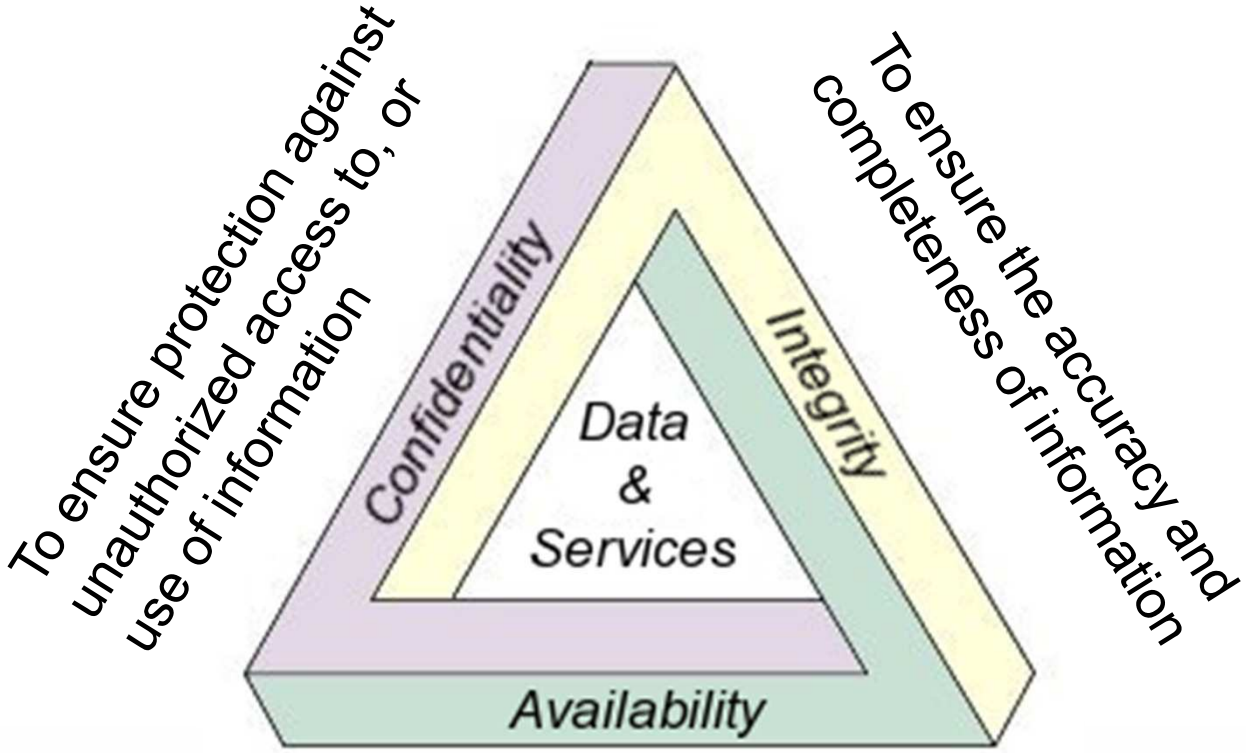
INFORMATION SECURITY

Information Security

- Programmatic Effort to Reduce Risks
- Ongoing Processes (not on project completion)
- Ever-changing Landscape
  - Threats (Agents/Actors)
  - Technologies
  - Countermeasures
- Never 100% Secure



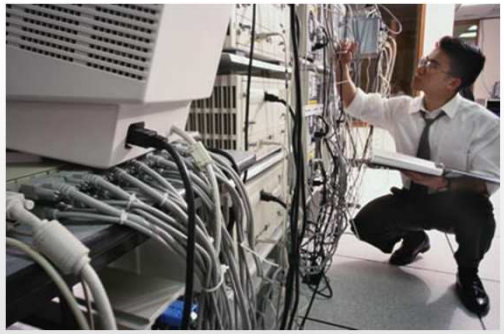
InfoSec Goals: The CIA Triad



To ensure that information and vital services are useable when required

ISO / IEC 27001

- Can be used by any organization
- Aids in securing information in an appropriate manner relevant to the business
- Monitor and control security, minimizing residual business risk
- Helps organization protect proprietary information, common basis for security standards development, enhances security management practice and increases confidence and trust in inter-organizational dealing



http://site.ul.com/asiaonthemark/as-en/2006-Issue17/page6.htm

Information Security Domains (27001:2005)

ISO 27001 Control Domain	Objectives	Controls
Security policy	1	2
Organization of informaiont security	2	11
Asset management	2	5
Human resources security	3	9
Physical and environmental security	2	13
Communication and operational management	10	33
Access control	7	25
Systems development and maintenance	6	16
Information security and incident management	2	5
Business Continuity Plan	1	5
Compliance	3	10
	39	134

http://site.ul.com/asiaonthemark/as-en/2006-Issue17/page6.htm

Regulatory Field

- PCI DSS – Payment Card Industry Data Security Standard
- HIPAA – Health Insurance Portability and Accountability Act
- GLBA – Gramm–Leach–Bliley Act
- SOX – Sarbanes–Oxley Act
- FERPA – Family Educational Rights and Privacy Act
- FISMA – Federal Information Security Management Act
- NERC – North American Electric Reliability Corp.

http://www.educause.edu/ero/article/unified-approach-information-security-compliance
http://www.csoonline.com/article/632218/the-security-laws-regulations-and-guidelines-directory

The Basics of Data Retention

- Types of companies
- Types of data retained
  - Retention of IP address allocations
  - Retention of traffic data
  - Retention of location data
  - Retention of the content of communications
- Length of retention period
- Financial burden
- Restrictions on access to retained data
- The volume of data mandated to be retained
- Disclosure rules

Additional Info: http://msdn.microsoft.com/en-us/library/aa480484.aspx

Data Retention Law

- Federal awards data “for three years”. Uhhhh…..
  - OMB Circular A-110: retention period is three years from the date the final financial report is submitted
  - NIH: Grants Policy Statement includes “three years"
  - NSF General Grant Conditions (2005) that records must be retained for three years after the submission of all required reports (research and other special reports)

- Retention Schedule for Records of Public Safety Agencies
  - https://www.tsl.state.tx.us/slrm/recordspubs/ps.html
    - 30 days, 90 days, 120 days, AV (as long as administratively valuable), 2 years

MDM – Mobile Device Management

- Mobile device security is an imperative
- IDC report from smart phone sales outpaced PC sales for first time in 2010
- BYOD polices will becomes norm as show business advantage
- Issues
  - Malware
  - Eavesdropping
  - Access
  - Theft and loss
  - Applications

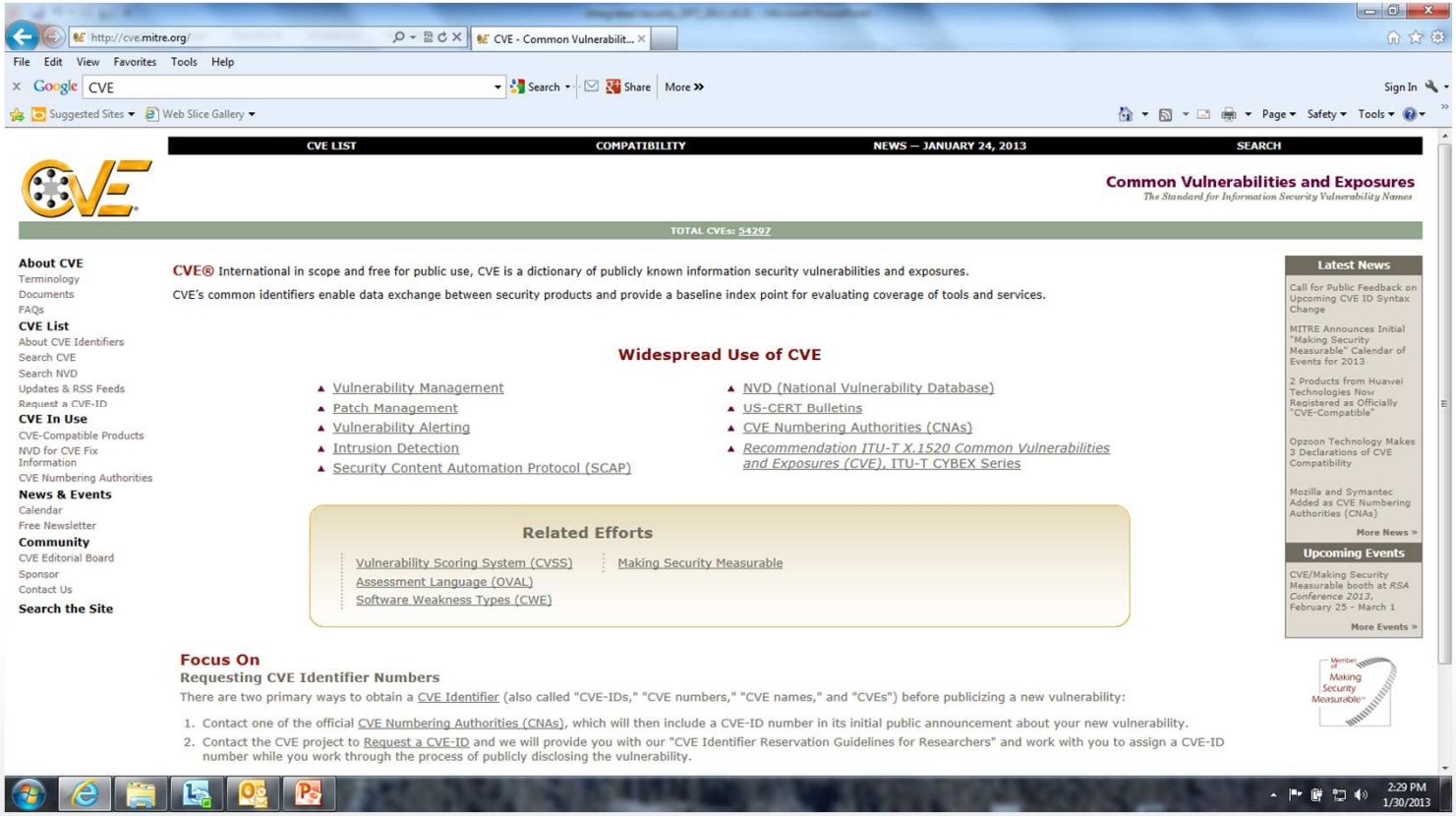
Learning guide: Mobile device protection
http://searchmobilecomputing.techtarget.com/guides/Mobile-device-protection-and-security-threat-measures

CYBER SECURITY

Vulnerabilities and Penetration Testing

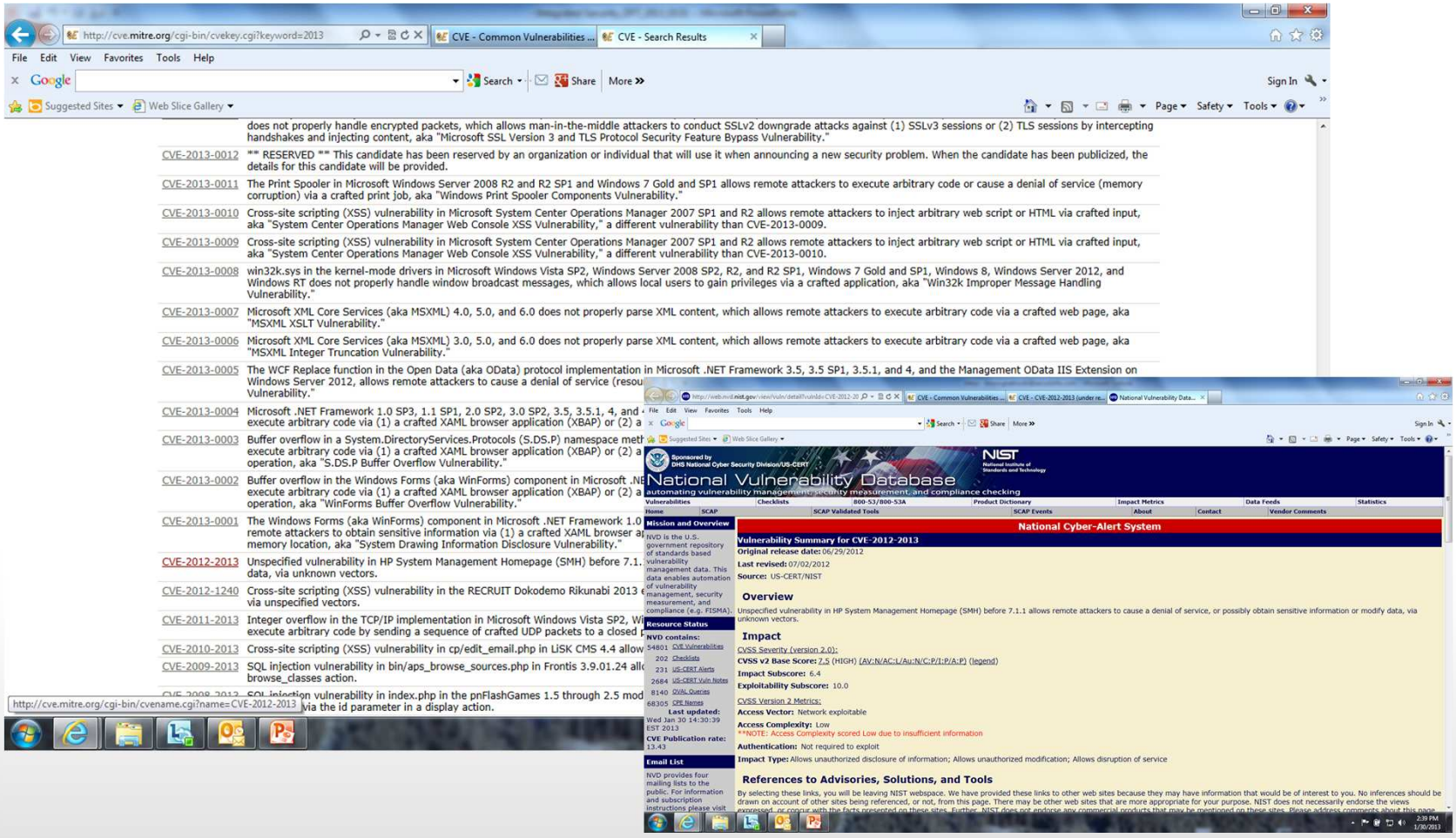
Understanding Vulnerabilities

Common Vulnerabilities and Exposures (CVE)
http://cve.mitre.org/



CVE LIST

64,267 entries on 25Sep2014
59,390 on 17Jan2014
58,306 on 08Nov2013



Computer Emergency Response Team and…

- http://www.cert.org/
- http://www.us-cert.gov/
  - DHS' National Cybersecurity and Communications Integration Center (NCCIC)
- http://nvd.nist.gov/home.cfm
- http://www.dhs.gov/office-cybersecurity-and-communications/
- The Common Vulnerability Reporting Framework (CVRF)
  - http://www.icasi.org/cvrf
- http://www.stopthinkconnect.org/
- https://buildsecurityin.us-cert.gov/
- https://ics-cert.us-cert.gov/Standards-and-References
- http://en.wikipedia.org/wiki/Cyber_security_standards
- DIACAP (Department of Defense Information Assurance Certification and Accreditation)
  - http://www.prim.osd.mil/Documents/DIACAP_Slick_Sheet.pdf

Types of Penetration Tests

- Social Engineering
- Application Security Testing
- Physical Penetration Test
- Penetration Testing Techniques
  - Manual penetration test
  - Using automated penetration test tools
  - Combination of both manual and automated process

http://www.softwaretestinghelp.com/penetration-testing-guide
hackersthirst.com
http://www.ipost.com/blog/data-breaches/social-engineering-how-a-simple-phone-call-can-ruin-your-business/
http://magazine.thehackernews.com/images/Social-Engineering.JPG

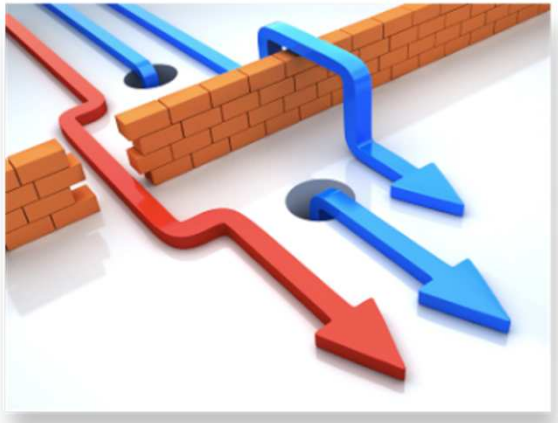
Penetration Testing

- Phase I – **Scanning** to determine the attack surface
- Phase II – **Vulnerability Assessment**, or verification of true weakness and selection of attack vectors
- Phase III – **Penetration Test**

- Methods:
  - Data collection
  - Vulnerability Assessment
  - Actual Exploit
  - Result analysis and report preparation

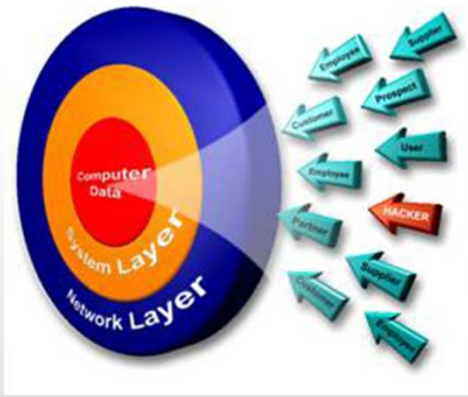
Causes of Vulnerabilities

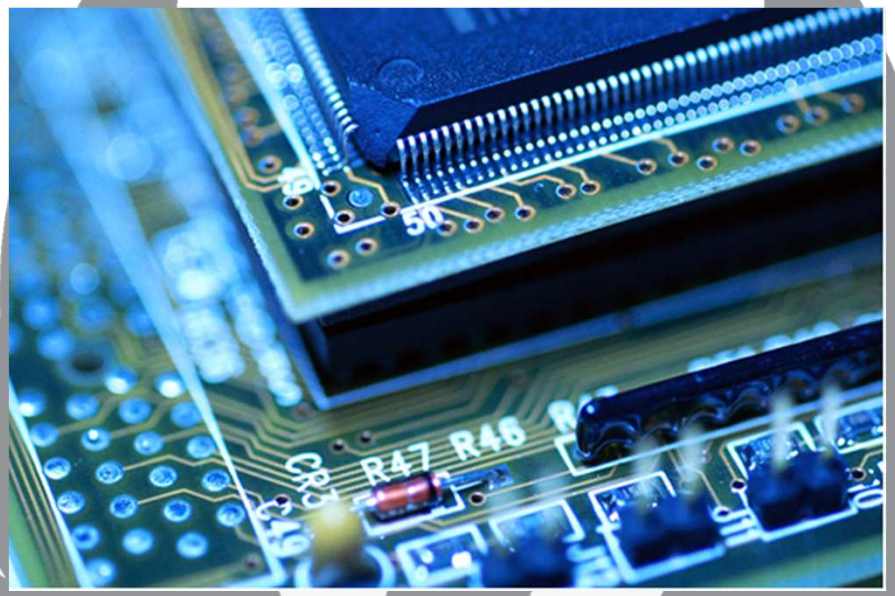
- Design and development error
- Poor system configuration
- Human errors



Pen Testing Standards

- PCI DSS (Payment Card Industry Data Security Standard)
  - https://www.pcisecuritystandards.org/security_standards/
- OWASP (Open Web Application Security Project)
  - https://www.owasp.org
- ISO/IEC 27002 (Information technology – Security techniques – Code of practice for information security management)
  - http://en.wikipedia.org/woiki/ISO/IEC_27002
- OSSTMM (The Open Source Security Testing Methodology Manual)
  - http://www.isecom.org/mirror/OSSTMM.3.pdf





EMBEDDED SYSTEMS

Why and How Attack?

- Why
  - Harder to perform forensics
  - Custom firmware can be developed
  - Host based IDS (intrusion detection system) does not usually exist
- How
  - No or simple default password
  - Classic Programming Mistakes
    - Input validation
    - Format strings
    - Buffer overflows
    - Cross Site / CSRF Scripting

Project SHINE (SHodan INtelligence Extraction)

- Development started mid-2008 and began ingesting raw data in mid-April 2012.
- Initiated to determine a baseline of just how many SCADA/ICS devices and software products are directly connected to the Internet

Medical devices	Power regulators/UPSs
Traffic management systems	Security/access control (includes CCTV and webcams)
Automotive control	Serial port servers
HVAC/environment control	Data radios (point-to-point 2.4/5.8/7.8 GHz direct-connected radios)

http://www.shodanhq.com/

http://www.tofinosecurity.com/blog/project-shine-1000000-internet-connected-scada-and-ics-systems-and-counting

Critical IO Project

- HD Moore's (Metasploit) Critical IO (Internet-Wide Scan Data Repository) project:
  - Little in the way of authentication
  - Critical infrastructure or corporate network
  - > 95,000 exposed over mobile connections (3G or GPRS)
  - 13,000 root shells, system consoles and admin interfaces that did not require authentication or were pre-authenticated
  - Undetectable access is able to capture or manipulate data moving through the serial port
  - Console connections, HVAC, SCADA, etc.
  - Project Sonar (NEWER): a community effort to improve security through the active analysis of public networks

Universal Plug and Play (UPnP) Protocol

- Numbers from January 2013
  - 40 and 50 million networked devices
  - > 81 million different IPs responded to UPnP discovery requests
- 6,900 different products from 1,500 vendors
- Enabled by default
  - printers, routers, network-attached storage, IP cameras, media players, smart TVs, etc.
- Open to attack over the Internet via flaws
- Portable UPnP SDK has been patched (> 1.6.18) and issue in question fixed more than two years ago: even so, some 330 vendors still run older versions of that software
- Embedded baseboard management controllers (BMCs) in June 2014 using Intelligent Platform Management Interface (IPMI)

https://community.rapid7.com/docs/DOC-2150

http://www.tripwire.com/state-of-security/vulnerability-management/supermicro-ipmibmc-vulnerability-analysis/

IP Cameras

- Default or no password
- Firmware bugs (authentication not needed)
- Issues:
  - Access to video stream
  - Access to network
  - Credentials (WiFi, ftp, email, etc)
  - Firmware exploits
  - CSRF (cross-site request forgery) exploits

“Hack of the Insulin Pump”

- A major problem with embedded devices
- Most were not designed to be easily updated
- Where is target?
  - A growing number of vulnerabilities being found
  - Fixing flaws in the field is not easy (no easy way to patch)

“Smart” Home Appliances

- Sent 750,000 malicious emails between December 23, 2013 and January 6, 2014
- No more than 10 messages sent from a single device
- 25% of those messages from appliances
- 100,000 gadgets (TV, multimedia center, router, refrigerator)
- Internet of Things
  - Nest (recent google acquisition for $3.2 B)
  - Large botnets
  - Embedded systems
- Gartner expects 26 billion Internet “things” by 2020 (was 2.5 B in 2009)

Even Toilets Aren't Safe

- Hijacked Robotoilet
  - Open or close the lid
  - Squirt a stream of water
- Where are we going? Your smartphone will be able to:
  - lock your house
  - turn on the air conditioning
  - check whether the milk is out of date
  - heat up your iron
  - What else?

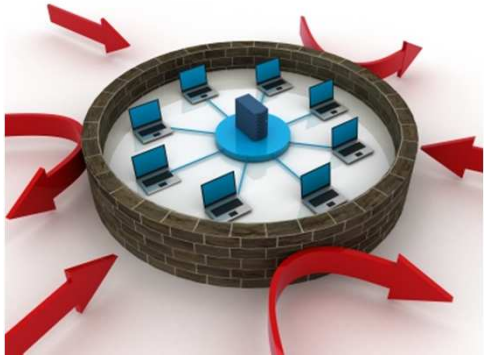
http://www.bloomberg.com/news/2014-06-10/even-toilets-aren-t-safe-as-hackers-target-home-devices.html

What can they do with access?

- Replace firmware
- Remote commands
- Remote management
- DNS
- Starting point on network
- DDoS (distributed denial-of-service) attack
- Brick device (printer exploit few years ago)
- Exploit video

http://rocketdock.com/images/screenshots/Hacker.png

What can you do?



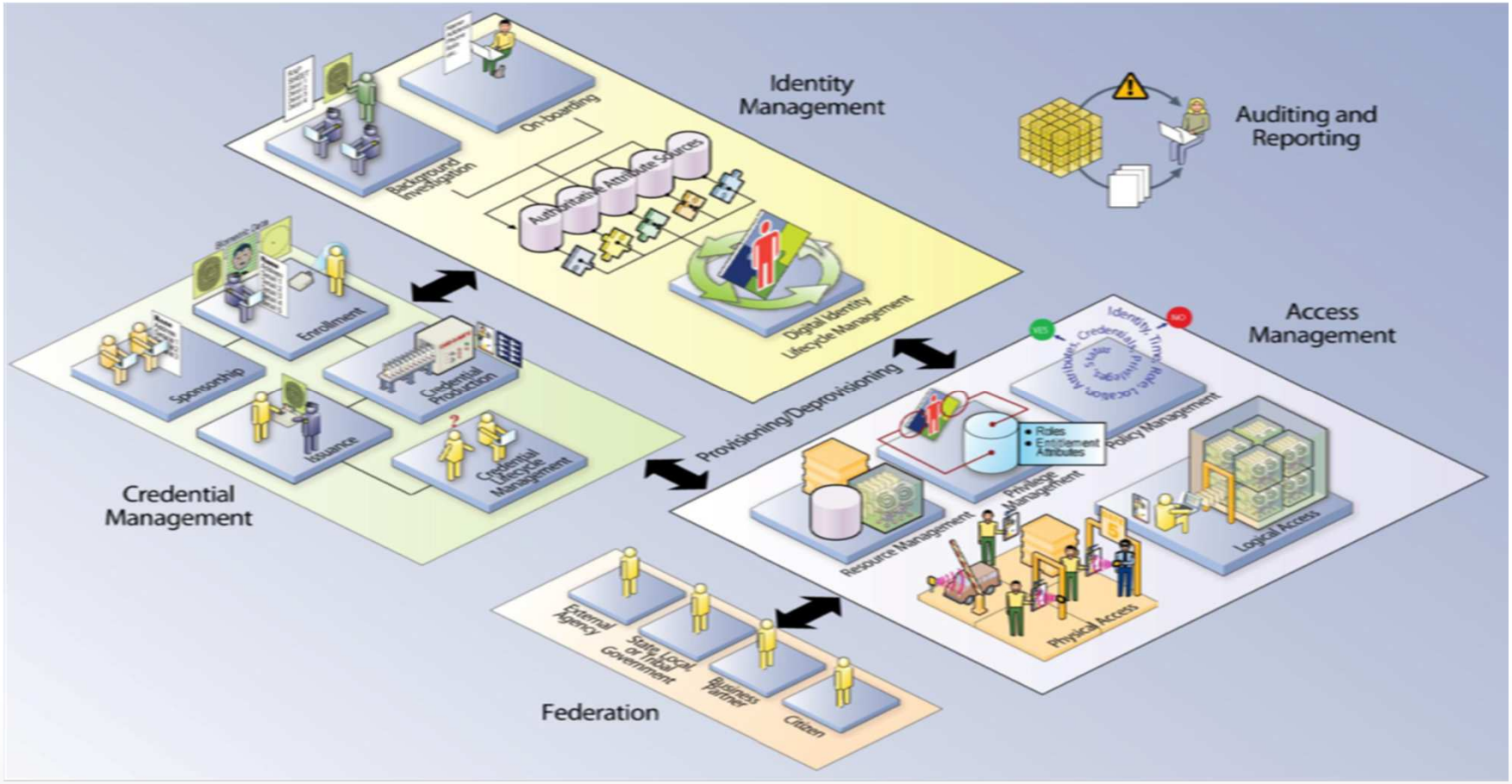
- Change default passwords
- Update firmware
- Disable services not in use
- Restrict access (login and ports) using ACL
- Use https/ssh
- Remote logging (and review)
- Network design (subnets for embedded devices)
- SNMP read/write communities
- Stay on top of vendors

http://techologic.com/images/security.jpg

INTEGRATED SECURITY

Convergence of PACS and LACS

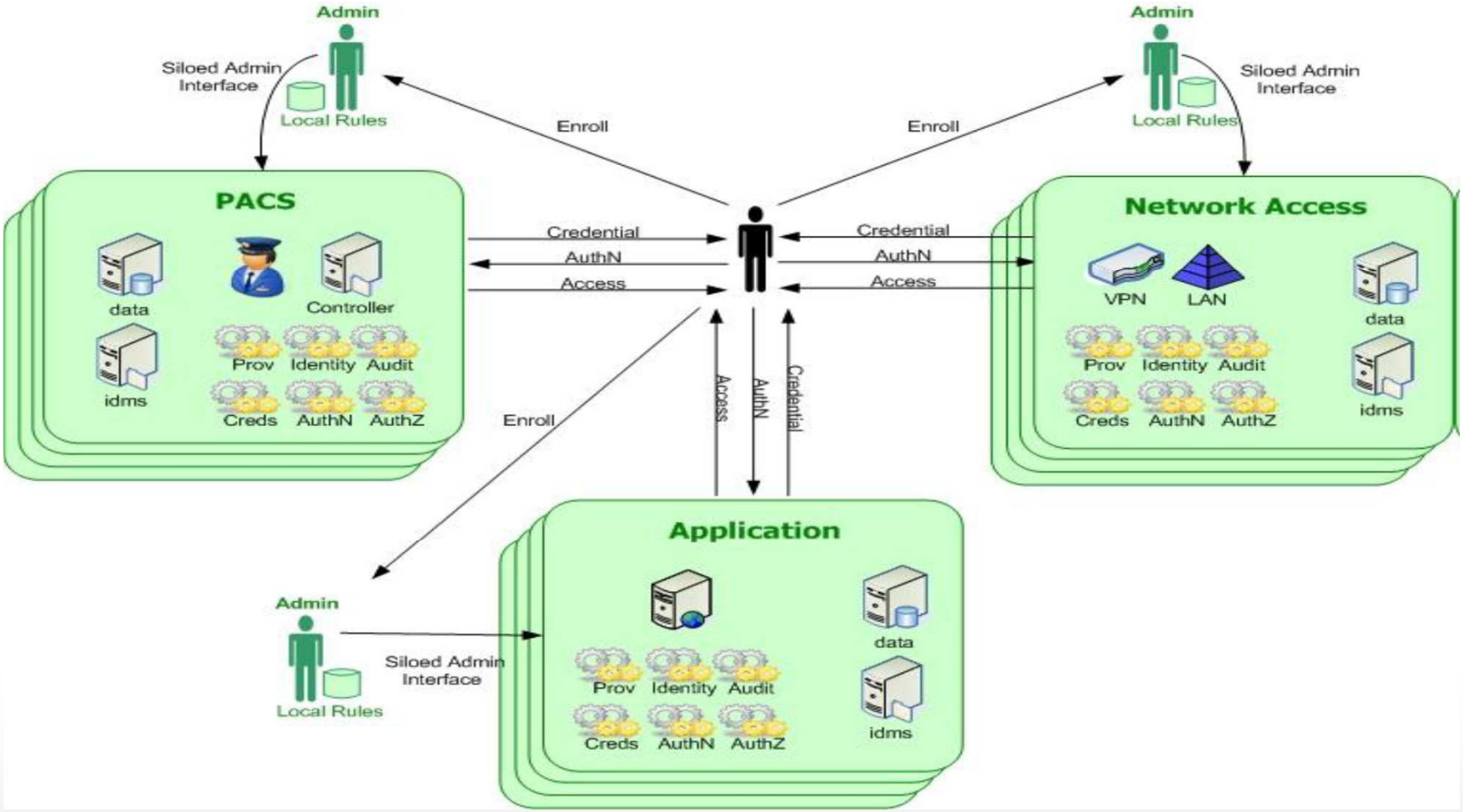
Conceptual View



www.idmanagement.gov

https://federation.nih.gov/ppt/JudySpenceriTrust20091210.ppt

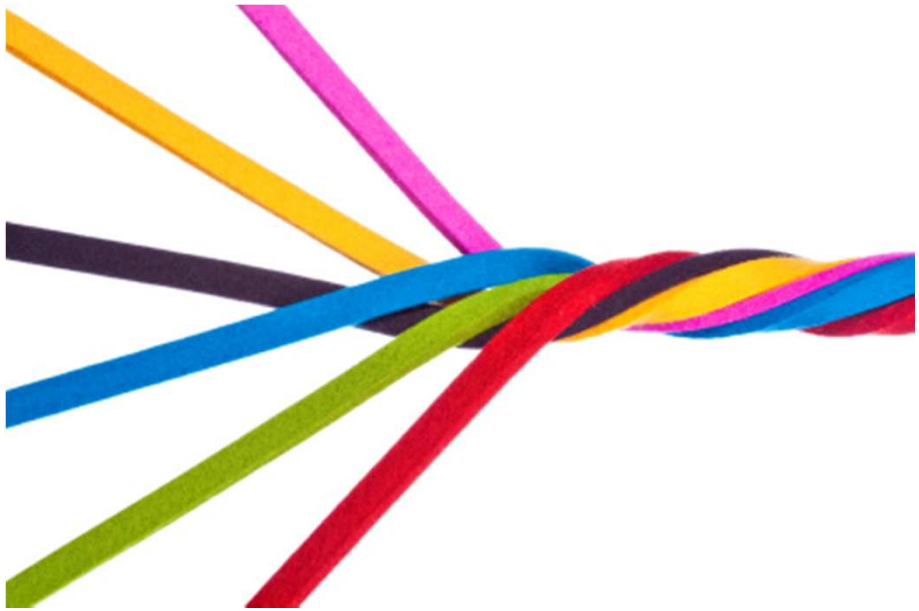
Current State – Parallel Systems



PACS and LACS operate in silos

Convergence

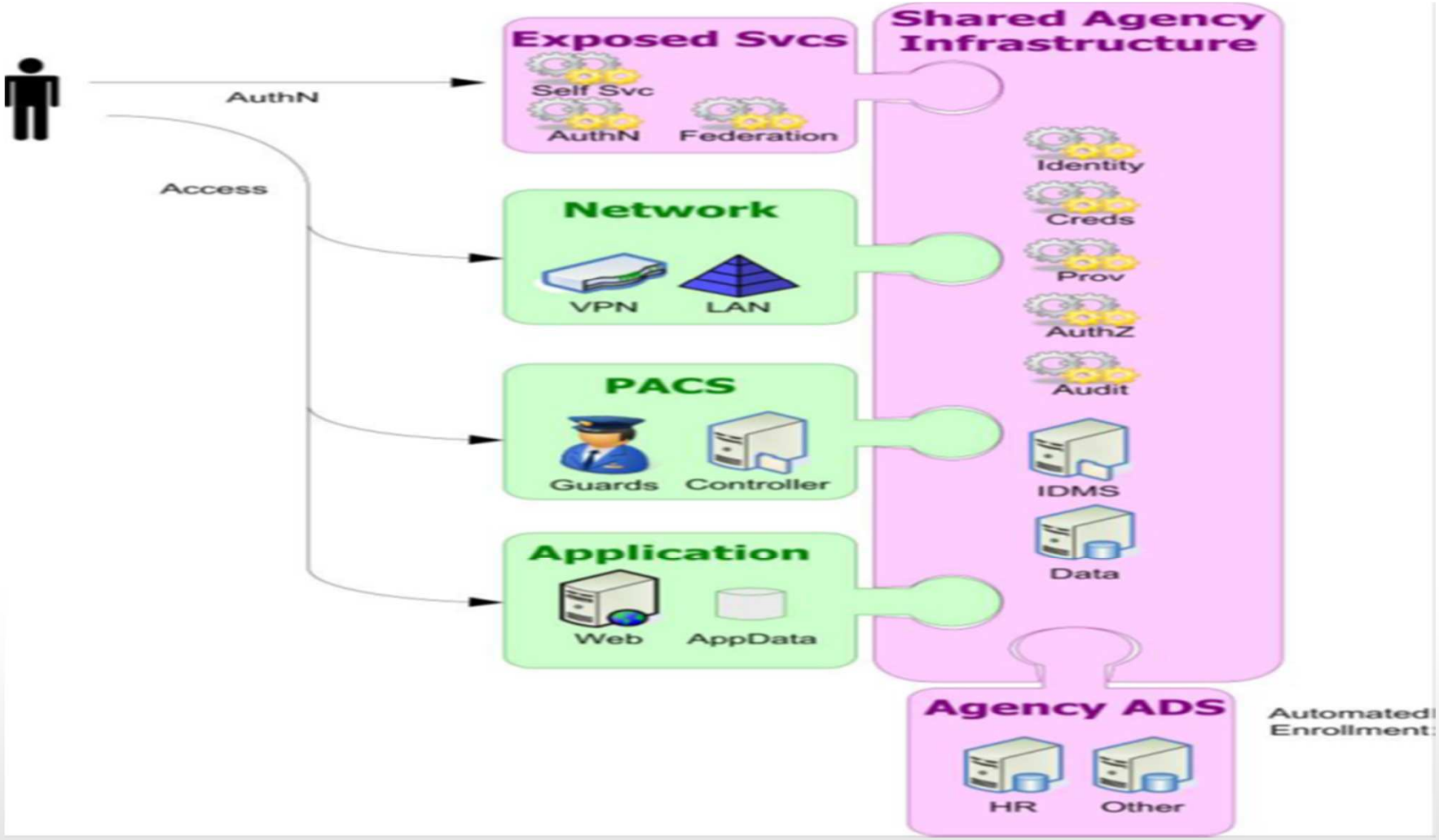
- Securing the Network
  - Outside–In
  - Inside–Out
  - Inside
- Protecting the People
- Securing the Data
- Securing the Facility



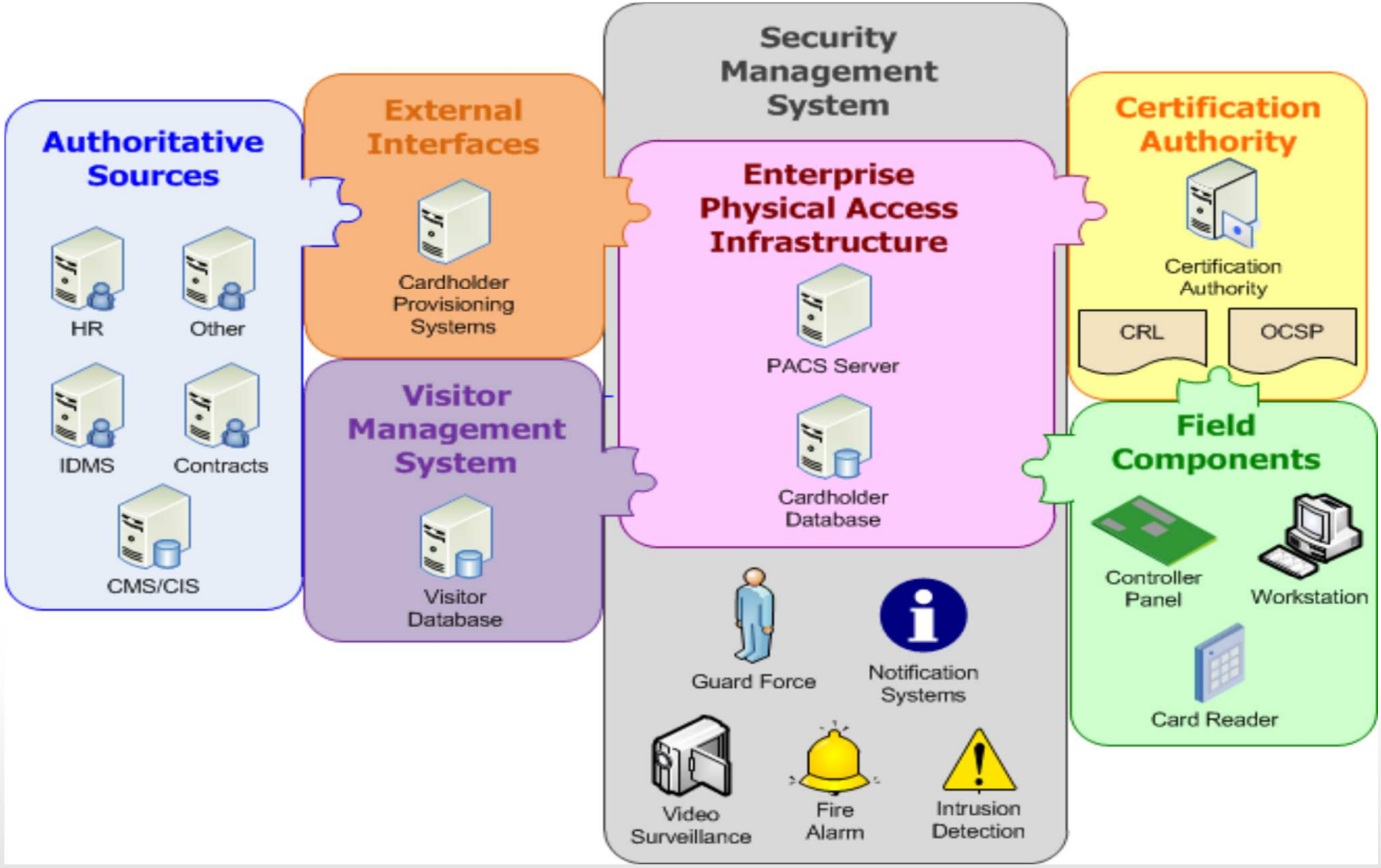
http://www.csrandthelaw.com/uploads/image/iStock_000014777263XSmall.jpg

Future State – Common Services

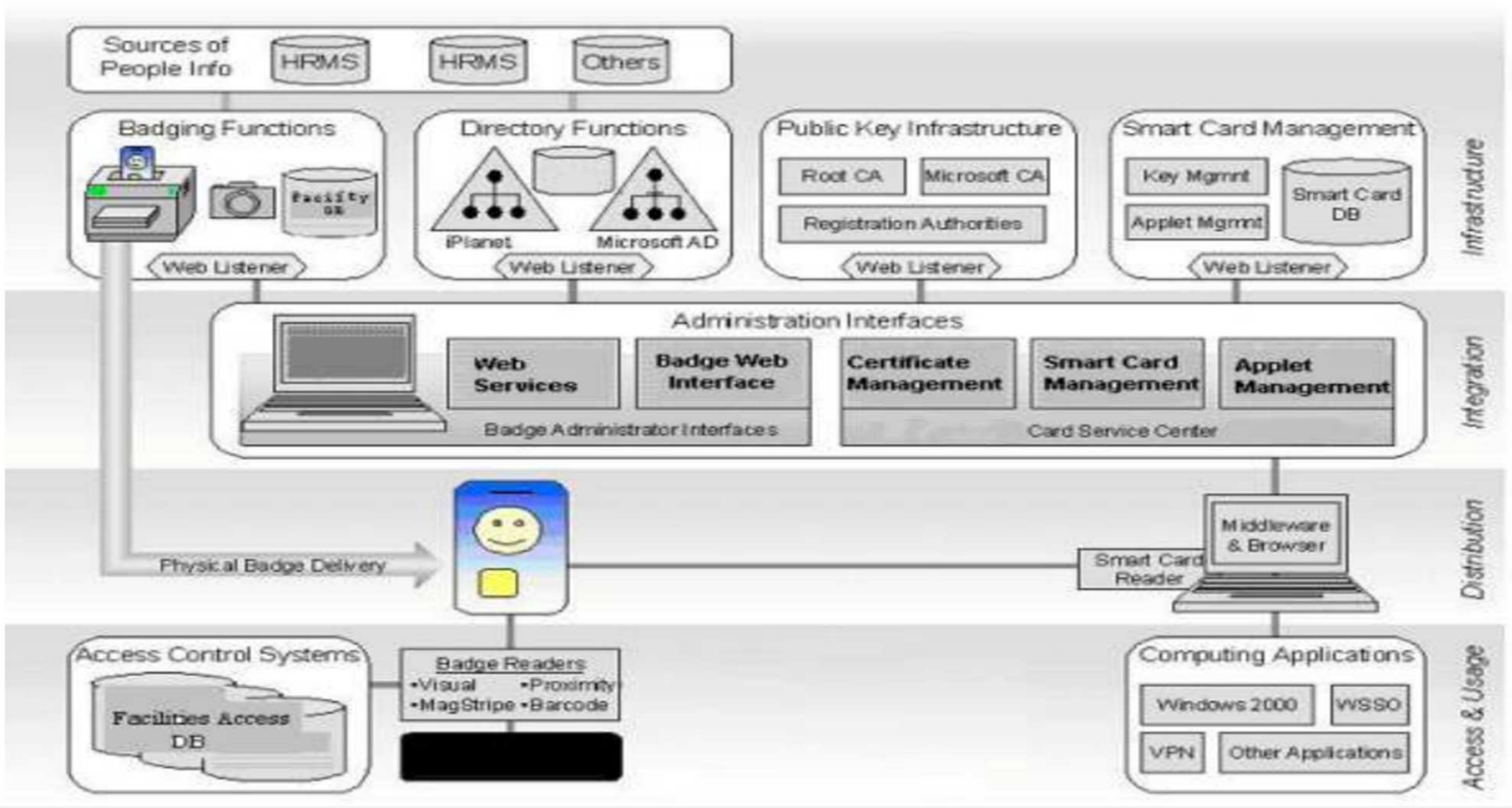
One Set of Services



Physical Security Context



Convergence of Logical and Physical Security



http://www.sans.org/reading-room/whitepapers/authentication/convergence-logical-physical-security-1308

SECURITY INFORMATION AND EVENT MANAGEMENT (SIEM)

What can be done to Protect Data?

- Review Access Policy
- Secure Perimeter
- Review Logs
- 2FA
- Data Masking
- Encryption
- Cloud Compliance Solutions
  - Governance, Risk and Compliance (GRC) framework
  - Secure bridge between cloud and enterprise
- USB device connectivity
- Systematic Approach

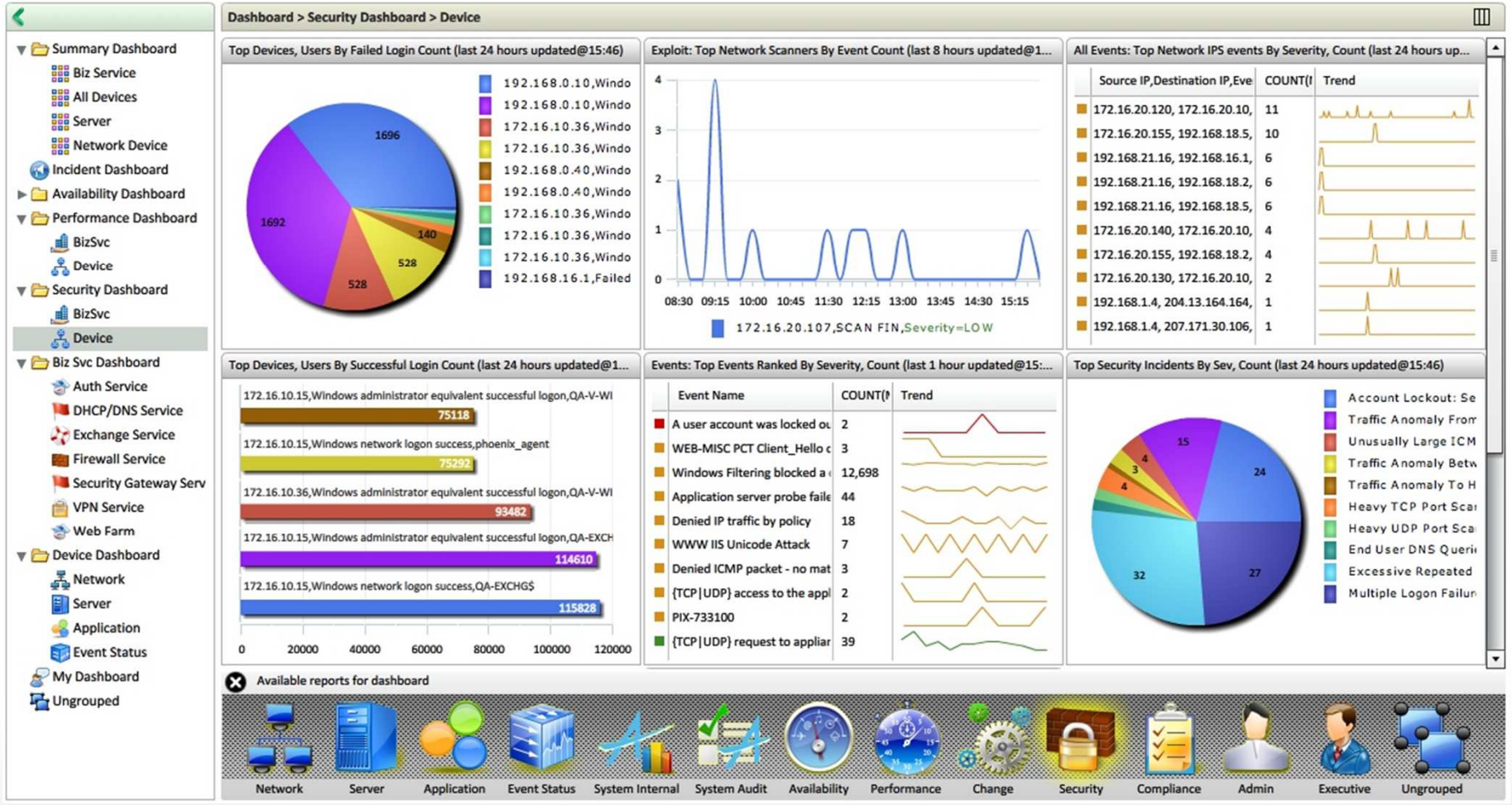
http://cdn.business2community.com/wp-content/uploads/2013/04/depositphotos_3622965_original.jpg

Security Information & Event Management (SIEM)

- Security information management (SIM)
- Security event manager (SEM)
- Real-time analysis of security alerts generated by network hardware and applications
  - Information from network and security devices
  - Identity and access management applications
  - Vulnerability management and policy compliance tools
  - Operating system, database and application logs
  - External threat data

http://en.wikipedia.org/wiki/Security_information_and_event_management

Sample SIEM Screen



http://www.accelops.com/images/product/siem-security-dashboard-full.jpg

CONCLUSIONS

Conclusions

- Information Security
- Cyber Security
- Embedded Systems
- Integrated Security
- Security Information Event Management (SIEM)

Discussion

Contact Information:

Chris Peckham, Ph.D., P.E.

Senior Vice President, Chief Technology Officer and Special Projects

chris.peckham@KratosPSS.com