Case Study: Connecting Vulns to Products

Beverly Miller | bmiller2@lenovo.com
Scott Kelso | skelso@Lenovo.com

Lenovo™

Your Presenters

Beverly Miller

PSIRT Principal Project Manager

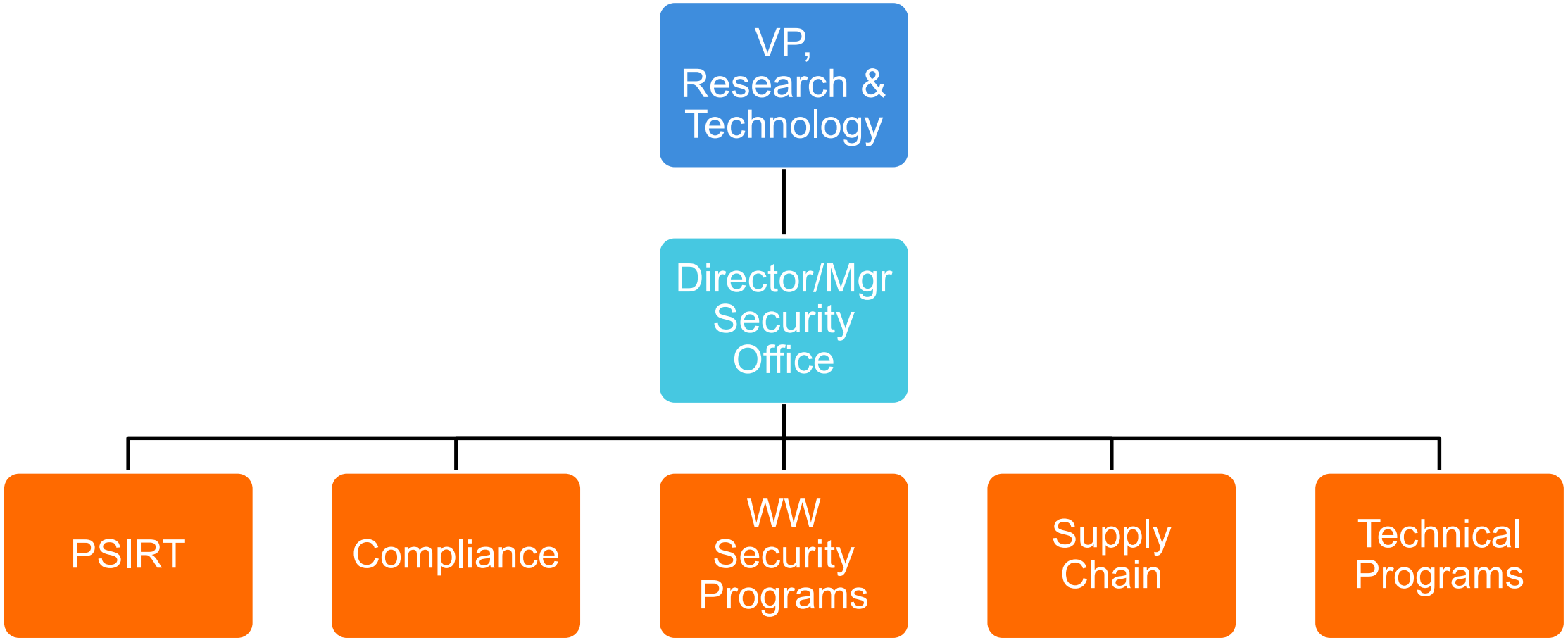
- 20+ years PMI Certified
- Lean Six Sigma
- Member of FIRST.org & MITRE CVE Board
- FIRST PSIRT Framework Working Group

Scott Kelso

Manager, Product Security Office

- 30 years PC industry HW & SW engineering
- 3 years product security
- Master Inventor with 82 patents issued
- Member of FIRST.org

Lenovo's Product Security Organization



PSIRT

- Contact: psirt@lenovo.com
- Advisories: https://support.lenovo.com/product_security/home

Introduction

- Problem Introduction
- Problem Solving Attempt
- Today’s Solution
- Lessons Learned
- Next Steps

The Problem

- Lenovo's PSIRT supports:
  - 500+ hardware products (notebook, desktop, tablet, server, storage, etc…)
  - 20000+ components (drivers, firmware, apps, utilities)
  - ?? Attributes (3rd party/open source code included in components)
- In one year, PSIRT tracked 402 vulnerabilities, resulting in 5590 development tasks. Nearly half rejected as 'not applicable' = WASTED TIME because
  - We don't know what components are affected by reported vulnerabilities
  - We don't know what components belong to what hardware products
  - We don't know what 3rd party/open source software is included in components
- Need to solve
  - How do we manage the complexity and volume we already have?
  - How do we scale for the future as more, faster, larger vulnerabilities are known?

First Attempt: Jira + Jira = Expensive Failure

- 2 linked Jira projects
  - Contracted out to ‘jira’ company who doesn’t fully understand our business
  - “Is this what you mean?”
- Project 1: Task assignment and workflow
  - Jira is GREAT at this!
- Project 2: ‘Database’ associating products, components and attributes
  - Jira is TERRIBLE at this!
  - Required use of spreadsheets for importing
  - Significant time to maintain spreadsheet
    - Adding new/removing end of life products
    - Adding new components and linking to products
    - Adding attributes and linking to components

RESULT: Did not resolve need for relational tracking of issues.

Second Attempt: Jira + Relational DB = Success!

- Bigger Picture: “What assets do we already have?”
  - Good Jira workflow and ticketing tool
  - eSupport knowledgebase containing products and component relationships
  - Relational database & web application coding skill
  - Composition analysis tools for identifying 3rd party code (Black Duck Binary Analysis/Protecode)

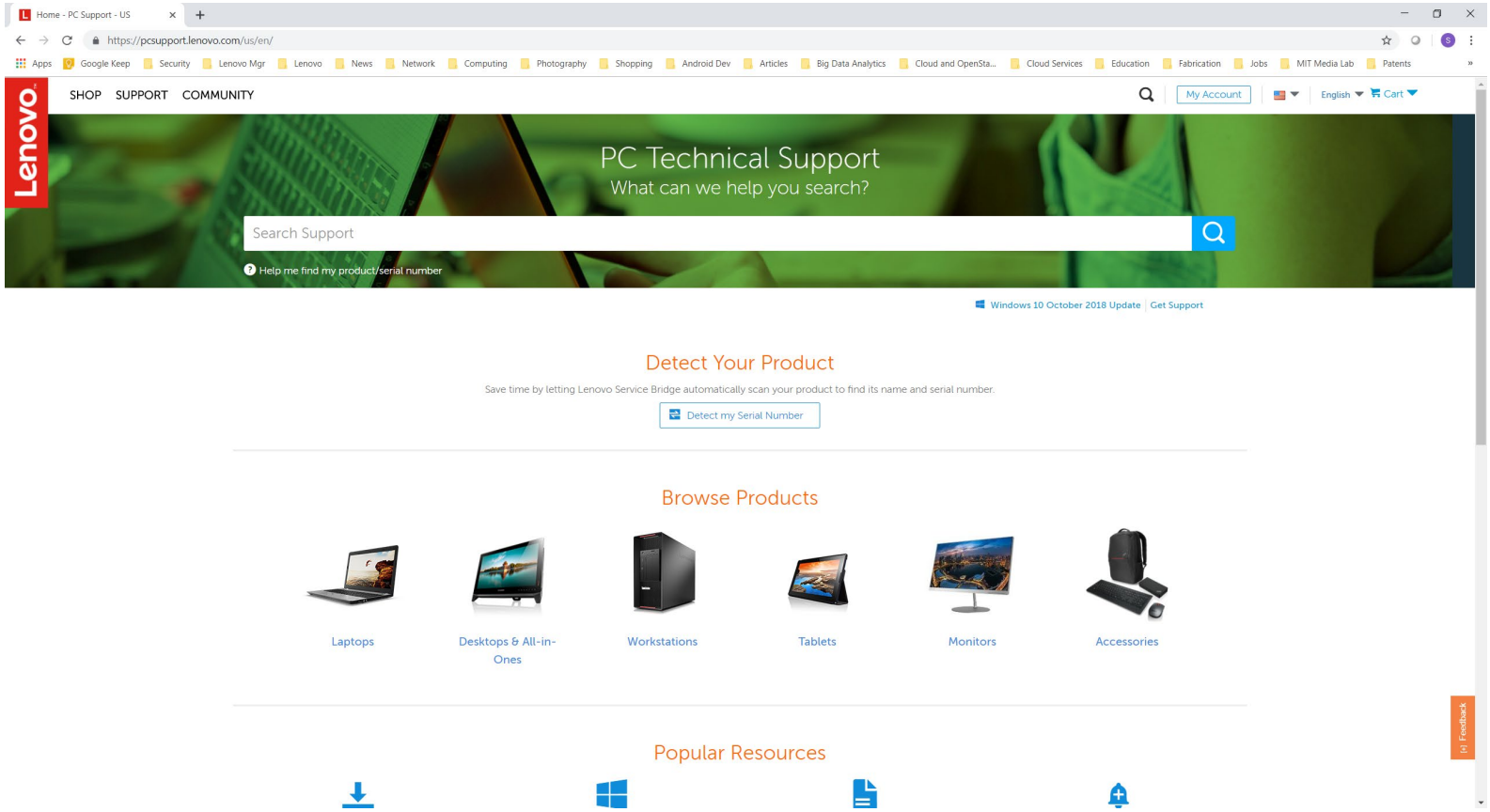
- eSupport Knowledge Management DB
  - Tells us what components are supported on hardware products and where they live (download URLs)

- Product Attribute Database (PAD) development
  - Leverages Knowledge Management DB
  - Relational; Connects products, components, and attributes

- Utilize composition analysis tools
  - Tells us what 3rd party code is included in each component

RESULT: Allows for simpler ‘one step’ opening/assignment of cases

Our Salvation: The eSupport Knowledge Base



They already model the product BOM

The development teams accept they have to populate it

And eSupport has an API. Woot!

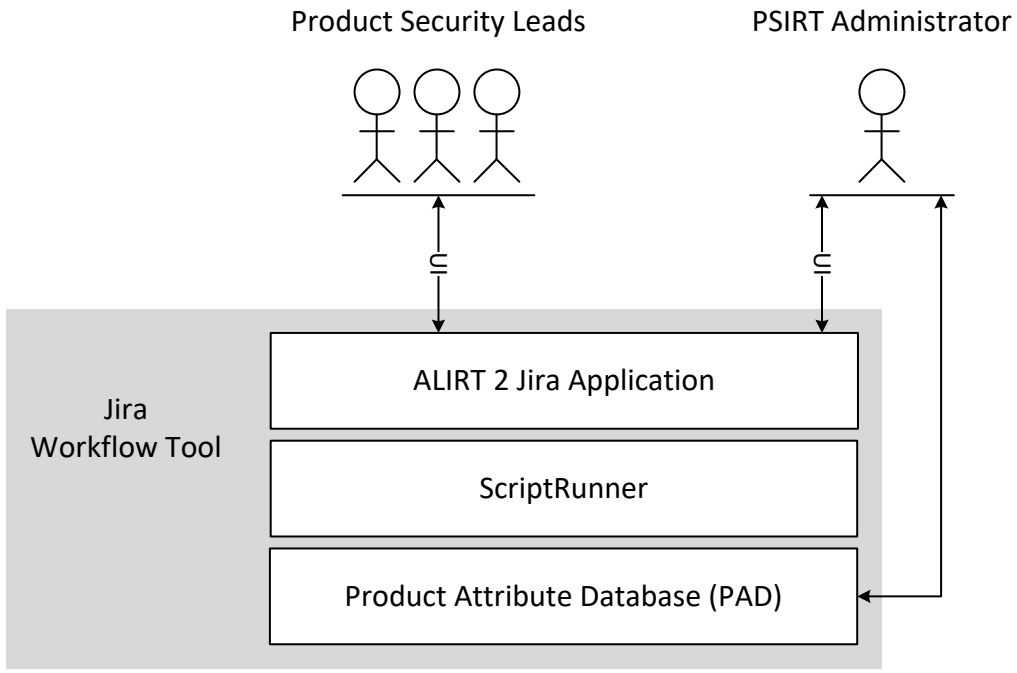
Product Attribute Database (PAD) – Data Model

- **Product**
  - **Component** (PSL assigned)
    - *Attribute*
    - *Attribute*
  - **Component** (PSL assigned)
    - *Attribute*
    - *Attribute*
  - **Component** (PSL assigned)
    - *Attribute*
    - *Attribute*
  - **Component** (PSL assigned)
    - *Attribute*
    - *Attribute*

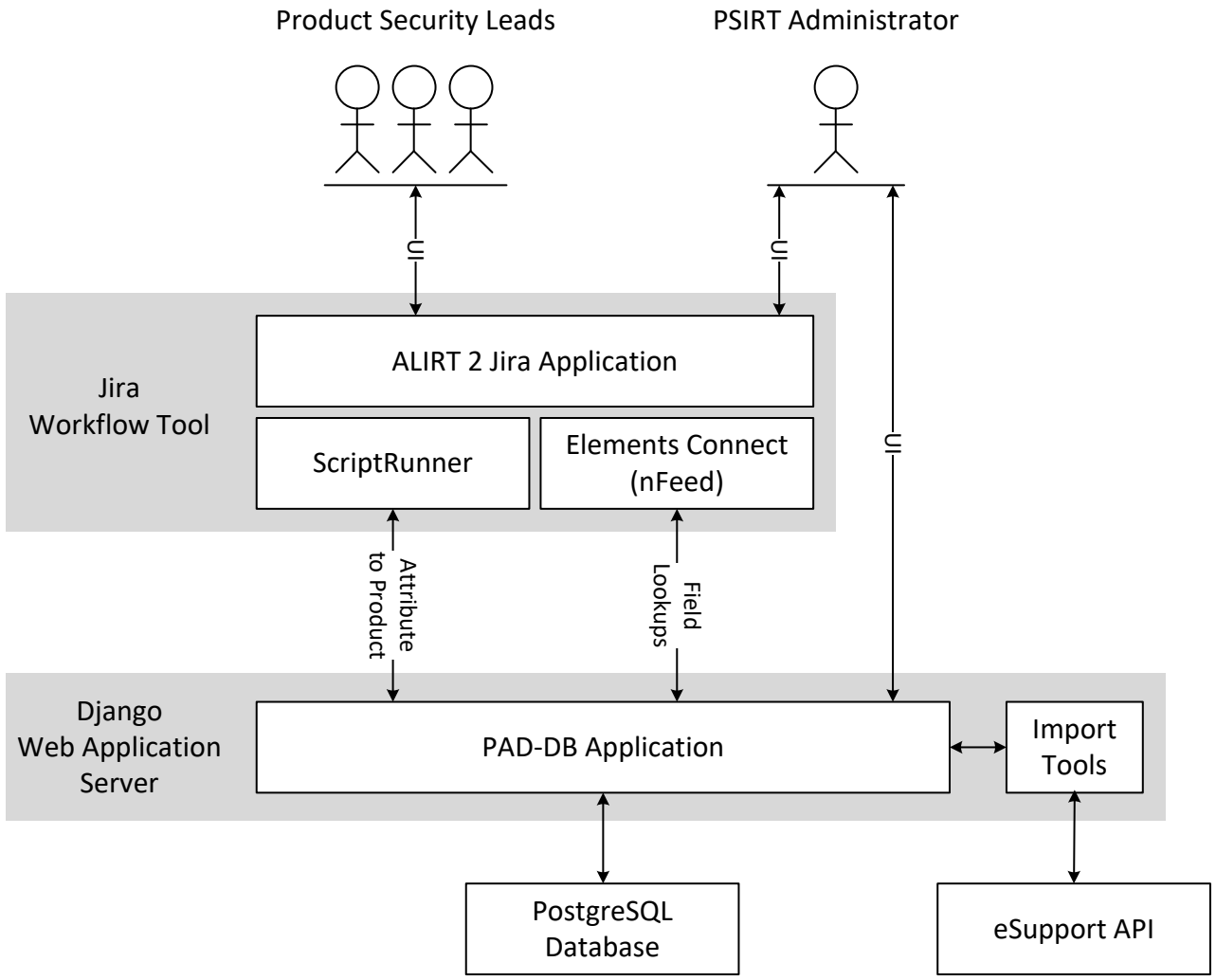
- **ThinkPad T460**
  - **BIOS** (PSL 1)
    - *BIOS*
    - *BIOS - Phoenix*
    - *EDKII*
    - *openssl*
  - **Realtek Audio driver** (PSL 2)
    - *Realtek Audio driver*
  - **Lenovo System Update** (PSL 3)
    - *Lenovo System Update*
    - *Antlr*
  - **Synaptics Touchpad driver** (PSL 4)
    - *libpng*
    - *zlib*

- **System x 3950 X5**
  - **BIOS** (PSL 5)
    - *BIOS*
    - *BIOS - Insyde*
    - *EDKII*
    - *openssl*
  - **IMM2** (PSL 6)
    - *IMM2*
    - *glibc*
    - *ntp*
  - **Lenovo GSS** (PSL 7)
    - *Lenovo GSS*
    - *ntp*
    - *openldap*

Integrating Issue Tracking & Product Structure Tools



Integrating Issue Tracking & Product Structure Tools



Why go outside Jira?

- Can implement a data model suitable for product structure
- Performance – Jira chokes on large datasets

What problems result?

- Now you're a developer too
- IT administration is harder
  - Two skillsets
  - Two user directories
- More middleware to license

Making eSupport Data Work for PSIRT

- Starts with synced copy of Knowledge Management DB
  - Houses all products and components, except JV and China-unique
  - Used to publish tips/KB articles and component updates/code to Lenovo Support site

- Modifications necessary
  - Remove unsupported products from view
  - Add product information such as code names, lifecycle dates
  - Assigned priorities at product/component levels (SLA)
  - Add and associate ‘attributes’
  - PSL assignment
  - nFeed fields

Demo

What We've Learned (so far)

- You probably can't describe everything you do in one go, and developers hate this
  - Learned: If possible, find developers with whom you can have a agile, long-term relationship
  - Learned: Contracted resource too inflexible…and thus will become costly

- Writing the application is more complicated than everyone thinks it will be
  - Learned: Don't try to be perfect – make something, demo, listen, adapt and make something more

- Tomorrow's problem will be different from today's problem
  - Learned: Extensibility – scale and complexity of vulnerabilities will grow (side-channel again!)
  - Learned: Speed – customers want answers NOW
  - Learned: Automation – design to integrate with other tools: Vulnogram, MITRE CVE git, …

- Your internal customers don't use your tools the way you think they do
  - Learned: For some teams, product volumes (and locked-in processes) still require…spreadsheets
  - Learned: Early User Acceptance Testing is critical! (earlier than we did it)

Next Steps

- More and more and more automation
  - Import & associate 3rd party components using composition analysis
  - Integrate with Vulnogram, CVE publishing (git), CERT/CC & other subscription-based info
- Enhance relational structures
  - More data attached to relationships between things
  - Expand the severity-risk model
- Improve user interface
  - Web 2.0 technologies – get UI in to the 2000s
- Give PSLs ownership of products in PAD
  - So. Many. Complications.
- Incorporate Threat Intelligence in to the tooling
  - Knowing what's in our products allows more targeted TI

Q&A

Definitions

- Product: The thing Lenovo sells; has a SKU, Part Number or Machine Type

- Component: The building blocks that make up the Product
  - Firmware (BIOS, Chipset, etc)
  - Drivers (graphics, audio, etc)
  - Applications (Lenovo System Update, xClarity products, etc)

- Attribute: Code that makes up the Component
  - 3rd party libraries
  - Open source libraries
  - Lenovo's special sauce

SLA: Service Level Adherence Proposal

RISK: (Asset Criticality)	Vulnerability Severity (CVSS3.0)			
	Critical/ Code Red	High	Medium	Low
	CVSS 9.0-10	CVSS 7-8.9	CVSS 4-6.9	CVSS .1-3.9
High	Priority 1	Priority 1	Priority 2	Priority 3
Medium	Priority 2	Priority 2	Priority 3	Priority 4
Low	Priority 3	Priority 3	Priority 4	Priority 5

Asset Criticality should be defined based on VOC and Lenovo reputational risk

Requirements:

- Support from ALIRT 2.0 PAD (SLA metrics)
- Brands/PSO(define asset criticality)

Different is better

Lenovo™