OWASP
AppSec Europe
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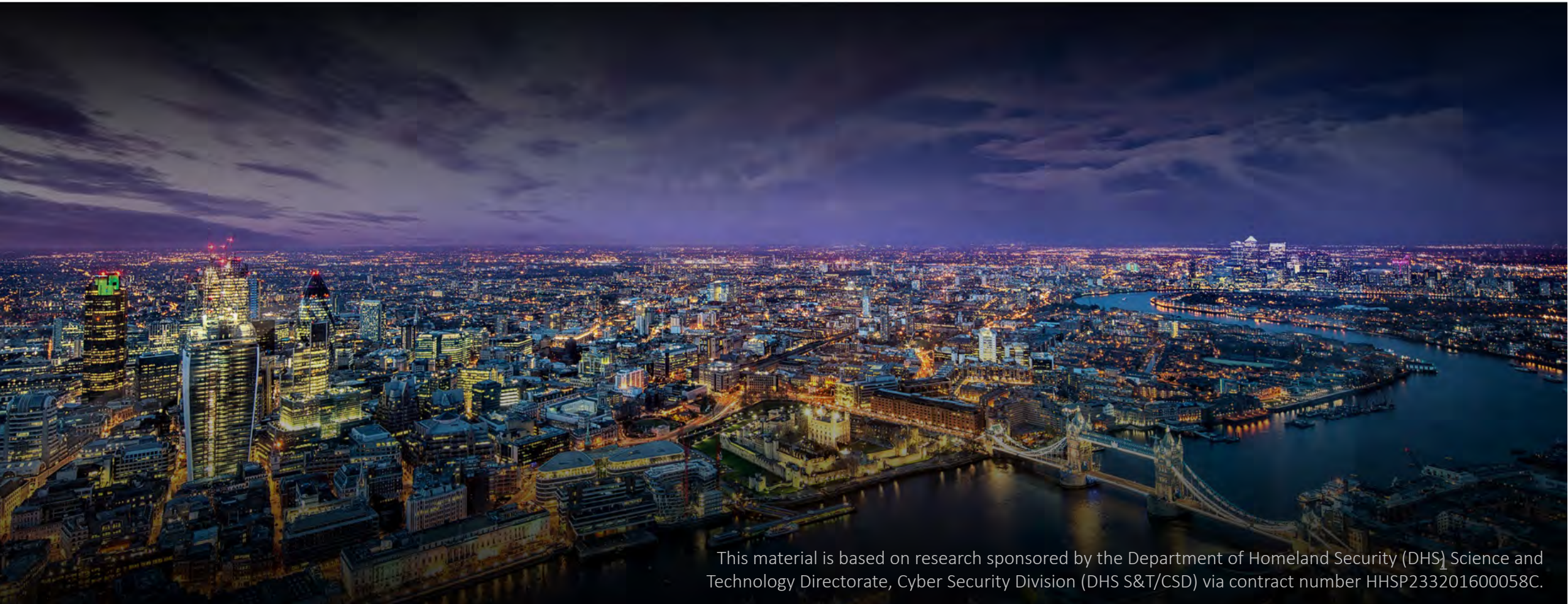
A View From Above

How organizations are managing their AppSec program

Chris Horn



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A view from above, AppSec mgmt.

Chris Horn

About Chris Horn

Product management at Code Dx

Researcher at Secure Decisions

- An R&D division of Applied Visions
- Birthplace of Code Dx

Experience

17 years in research, software systems, and new product development

- Focused on the developing technologies to improve application security

A view from above, AppSec mgmt.

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Outline of today's talk

PART I About our study

- Who we interviewed
  - Types of organizations
  - Roles of people

PART II Application security programs

- Purpose
- Boundaries
- Organizational structure

PART III What directors are paying attention to

- Goals, questions, metrics, and tools

About our study

Part I

A view from above, AppSec mgmt.

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Studied literature and spoke with AppSec practitioners

Literature review

- Read over 75 research papers, technical reports, books, magazine articles, blog posts, and presentations

Interviews

- Interviewed 13 people in application security roles
  - Commercial healthcare insurers, software producers, and military/defense contractors
  - Federal government independent verification & validation groups
  - Plus, one state agency IT group
- Spoke over voice & screen share Web conference, typically for 1 hour

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Spoke with two types of AppSec organizations

Internal department

- An application security group operating as a functional department in its parent organization

External reviewer

- An independent verification group, most commonly a legally separate third-party

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Interviewed people in one of two roles

	Director	Analyst
Internal department	Responsible for the AppSec program • Champions secure development practices with software development group • Establishes the structure, roles, and responsibilities of their team • Defines testing policies and processes • Selects testing tools • Hires analysts • Manages departmental budget	• Work directly with application security testing tools • Screen findings for review with development teams • Serve as security subject matter experts who answer questions that arise during design and development
External reviewer	Similar responsibilities as internal • But typically no software development organization with which to champion secure development practices	

Application Security Programs

Part II

A view from above, AppSec mgmt.

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Purpose of AppSec is risk management

Achieve the right balance of risk to remediation cost

- AppSec focuses on risks caused by undesirable behaviors of software applications

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Risks are uncertain events

A risk is a chance of gaining or losing something of value

Expected value of a risk:

cost of the event's outcome * probability of the event

Three ways to decrease risk:

1. Decrease the probability of the event (aka threat)
2. Decrease the probability of the event's success
3. Decrease the cost/severity of the outcome

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Examples of AppSec risks

Unauthorized disclosure of user credentials through man-in-the-middle attack on load balancer using captured TLS session data

Disclosure of sensitive data due to insecure configuration of cloud object store

Disclosure of database credentials due to remotely exploitable vulnerability in source code library

Loss of database contents due to inadequate sanitization of user input in application source code

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Where is the boundary for *application* security?

Where does AppSec jurisdiction stop?

- First-party source code
- Third-party library
- Third-party application (database, application server, OS)
- Infrastructure (hypervisor, load balancer, router, SAN)

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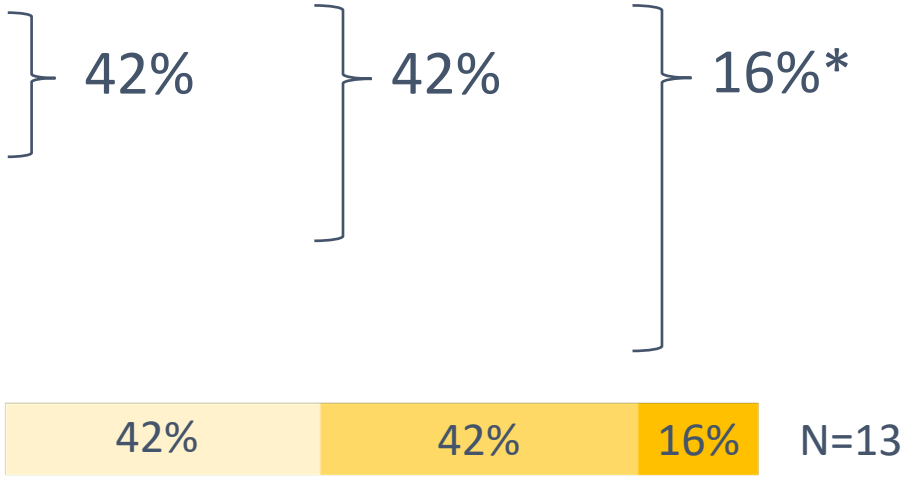
Most organizations leave infrastructure security to IT

First-party source code

Third-party library

Third-party application

Infrastructure



TREND
AppSec growing responsibility for ensuring security of *whole systems*

* Safety-critical systems are certified as a whole system

A view from above, AppSec mgmt.

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Service bureaus & champions all around

Internal departments almost exclusively organize AppSec analysts into a central "service bureau"

- Conduct testing & answer questions as a service to development teams

Almost every organization:

- Working to increase the security literacy of developers
- Aims to develop at least one strong security champion on each development team
- Growing practice of providing security input during the early, architecture-design phases of a project

What directors are paying attention to

Part III

A view from above, AppSec mgmt.

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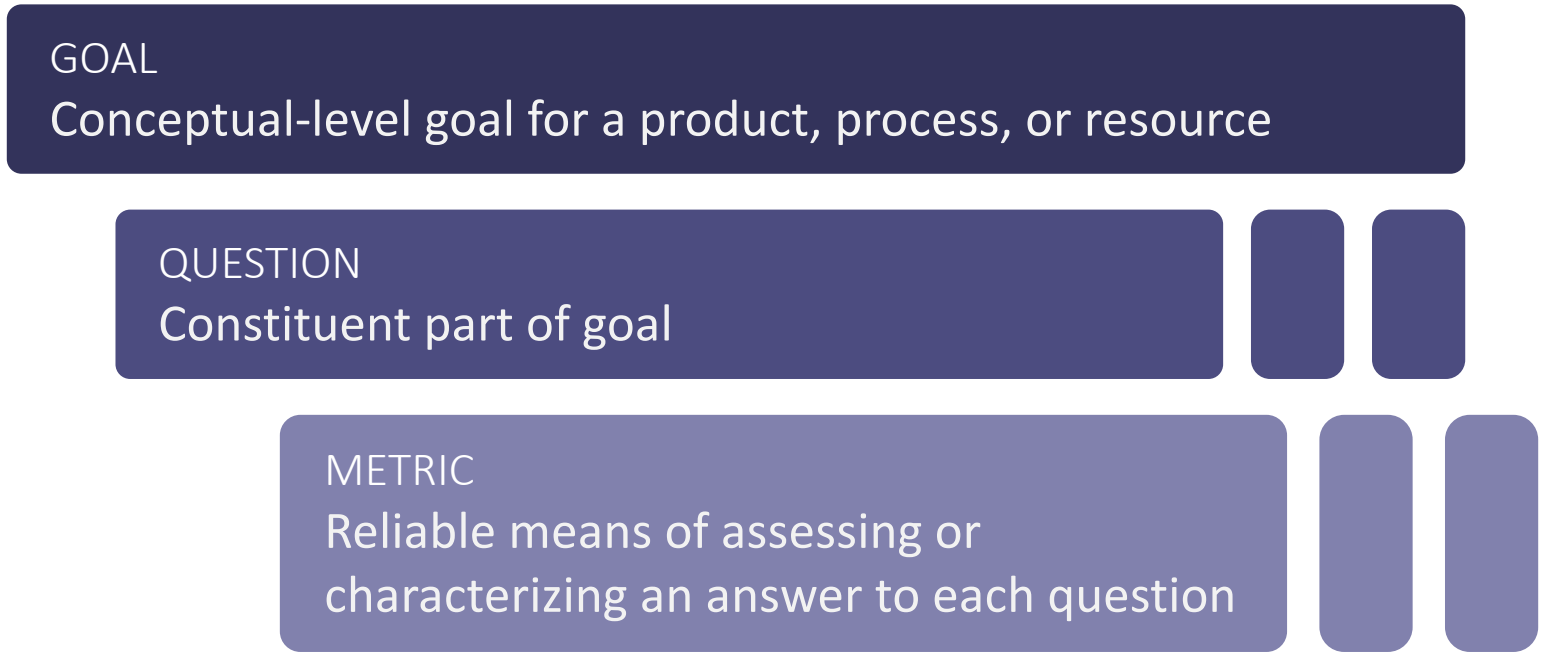
Goal, question, metric (GQM) method



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Sample GQM tree

GOAL
Reduce expected losses attributable to undesirable behaviors of software applications to an acceptable level

QUESTION
Where are the application vulnerabilities in my software?

METRIC
Number of defects detected by static analysis testing

Defect density (number of defects per SLOC)

Percent of systems under secure development lifecycle (SDL)

A view from above, AppSec mgmt.

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Seven top-level questions

1. Where are the application vulnerabilities in my software?
2. Where are my blind spots?
3. How do I communicate & demonstrate AppSec's value to my management?
4. Are we getting better at building in security over time?
5. Demonstrate compliance with requirements (e.g., internal commitments, external standards such as NIST 800-53, OWASP Top 10 or Application Security Verification Standard (ASVS), and DISA STIGs)
6. How do I make attacks/breaches more difficult for adversary?
7. What is the AppSec team's input to the broader organization's acquisition decisions?

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1. Where are the application vulns. in my software?

What should I fix first?

- What are the highest risk vulnerabilities?
  - What negative risk outcomes do I face?

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2. Where are my blind spots?

Is the AppSec program complete and meeting needs?

- Are policies and procedures documented?
- Are roles and responsibilities defined?
- Is AppSec group providing all relevant services and meeting needs (e.g., SAST & DAST tools, manual code review, penetration testing, architectural analysis, software composition analysis, security guidelines/requirements)
  - Does program need more/different staff/tools/procedures?
  - Does testing cover all relevant types of weakness/vulnerability?

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2. Where are my blind spots?

Have all teams/projects been onboarded to the SDL?

- Have all staff had required training?
- How do we persuade developers to adopt secure development practices?

Are all teams adopting/practicing the SDL?

- Are teams using the security resources provided by the AppSec group?
  - Are teams following security control requirements and guidelines?
  - Are teams consulting with AppSec analysts?
  - Are teams using the scanner tools that are provided?

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2. Where are my blind spots?

How much of a system is covered by testing?

Have as-built systems drifted from modeled designs (e.g., threat models)?

How is the attack surface changing?

How do I make attacks/breaches more visible (i.e. incr. probability of detection)?

Are the security controls being implemented effective?

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3. How do comm. & demonstrate AppSec's value to mgmt?

What does good performance look like (i.e. benchmark)?

Are we meeting the industry standard of care?

- Is risk decreasing?

How do we show that we react quickly to rapidly evolving needs?

What is AppSec's effect on release cadence, or time to market?

What are the financial costs of AppSec?

What is the cost of remediation?

- How many AppSec employees are employed?
- How much do AppSec testing tools cost?

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4. Are we getting better at building in security over time?

What percent of security requirements/controls are satisfied/implemented?

How long do findings/vulnerabilities take to resolve?

How long does it take to discover a vulnerability from its introduction?

What mistakes are developers making?

- Where is improvement needed?
  - On specific projects?
  - With certain teams/developers?
    - Which teams/developers are introducing defects?
    - Is each team/developer introducing fewer defects over time?
  - During specific phases of development?
  - With specific languages or technologies?

A view from above, AppSec mgmt.

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4. Are we getting better at building in security over time?

How much time is spent on security remediation?

How can software maintenance costs be reduced?

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5. Demonstrate compliance with requirements

Are all teams practicing the SDL?

What is the severity of the vulnerabilities in my software products?

Are vulnerabilities being resolved within required time periods?

6. How do I make attacks/breaches more difficult for adversary?

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7. What is the AppSec team's input to the broader organization's acquisition decisions of systems/capabilities?

Is it less expensive to assure the security of software that is built in-house versus acquired from a third party?

What are the expected ongoing costs of security remediation for a system?

- What system properties contribute most to the cost of maintaining the security of a system?

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Measure the application itself (or a portfolio of apps.)

Application software

EXAMPLES

Number of defects/vulnerabilities [by severity, type, ?]

Number of findings

Percent of findings deemed true

Percent of findings remediated

Percent of security requirements satisfied

Defect density (i.e., defects / source lines of code)

Difficulty to exploit

Estimated bug bounty value (dollars would pay)

Total defect age / lifetime

Number of compromise incidents

Code change / churn

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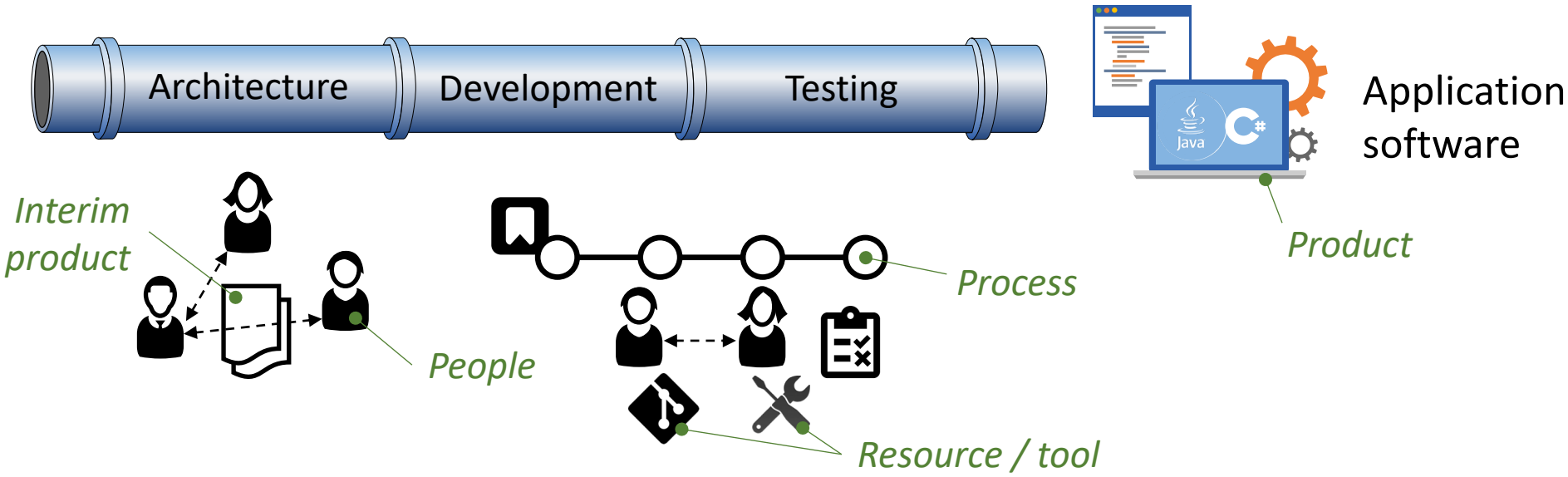
Measure the things that create an application



EXAMPLES

Number/percent of system in SDL	Code coverage of security testing	Presence of threat model
Time to detect	Percent of staff w/ sec. training	Person hours spent remediating
Time to remediate (calendar)	Scan frequency & duration	

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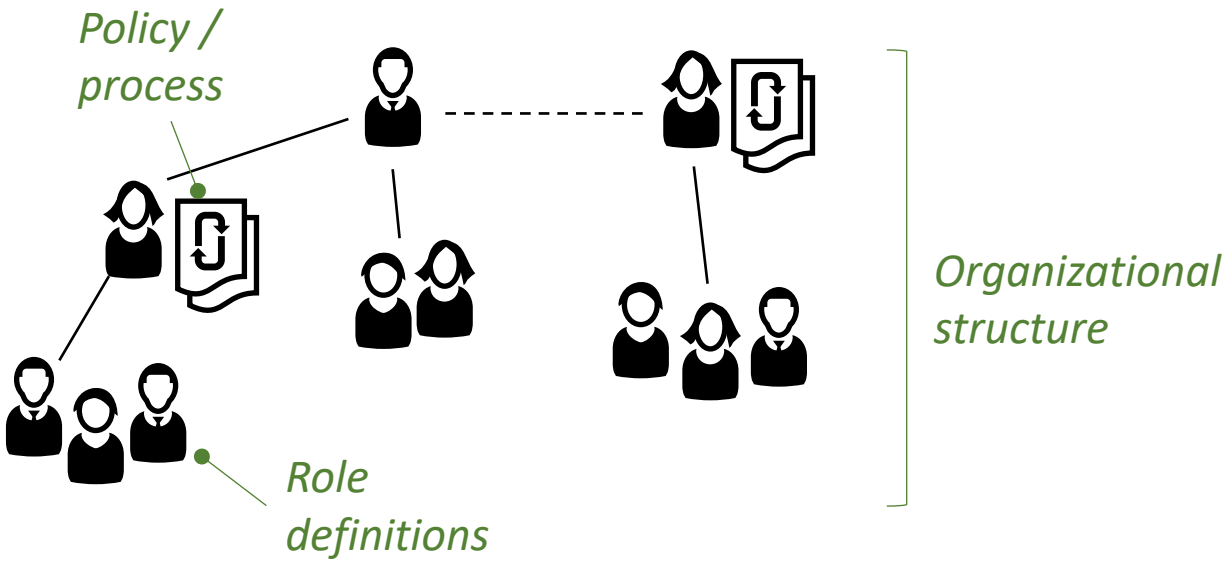
Measure the organization or policy level



EXAMPLES

Time since last contact with dev. team

Headcount

AppSec budget percent of dev. budget

Security testing tool budget

Presence of best practice checklist

Full range of services provided?

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Measuring risk is hard

Optimal information security investment strategy research discusses many practically infeasible ways to estimate the expected loss of risk

Acknowledged difficulties include:

- Insufficient data to estimate the probability of most events
- Modeling systems is complex and requires too much information
- Scope of outcome cost estimates (including things like liability, embarrassment, market share and productivity losses, extortion and remediation costs) is daunting

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Two workarounds to estimating risk

One organization has analysts fill out custom forms in Atlassian Jira

- 8 probability factors that model threat and vulnerability
- 6 outcome cost factors that model the financial and operational effects per defect finding
- Relies on human mental simulation of how a low-level problem would affect a large system

Another organization* models cost using would-be bug bounty payout

- Avoids expected loss estimation problem altogether
- Models risk associated with chained attacks that move between different micro-services
  - Have a system that records trust relationships between services
  - Can report threat-risks that are “inherited” from other services

* Held, G.: Measuring End-to-End Security. AppSecUSA 2017. , Orlando, FL (2017).

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Many systems for measuring & tracking metrics

Ad-hoc personal observations

Manual spreadsheets

Reporting features in commercial software security tools

Basic in-house solutions

- A relational database, sometimes with a Web interface

Elaborate in-house solutions

- Multiple systems and databases
- Automated extract transform and load (ETL) jobs
- One or more data warehouses
- Third-party governance risk and compliance (GRC) software

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You need to decide what to measure

Every organization is different

- Different risk tolerance
- Different technology systems
- Different challenges

Measuring security is a process

RECOMMENDED READING

Payne, Shirley. “A Guide to Security Metrics.” presented at the 2010 EDUCAUSE Security Conference, Atlanta, GA, April 2010. https://events.educause.edu/sites/default/files/library/presentations/SEC10/SESS05/2010+EDUCAUSE+Security+Conference+-+A+Guide+to+Security+Metrics+-Final.pdf.

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