Stuck in the Middle with You

Security in Communications Networks

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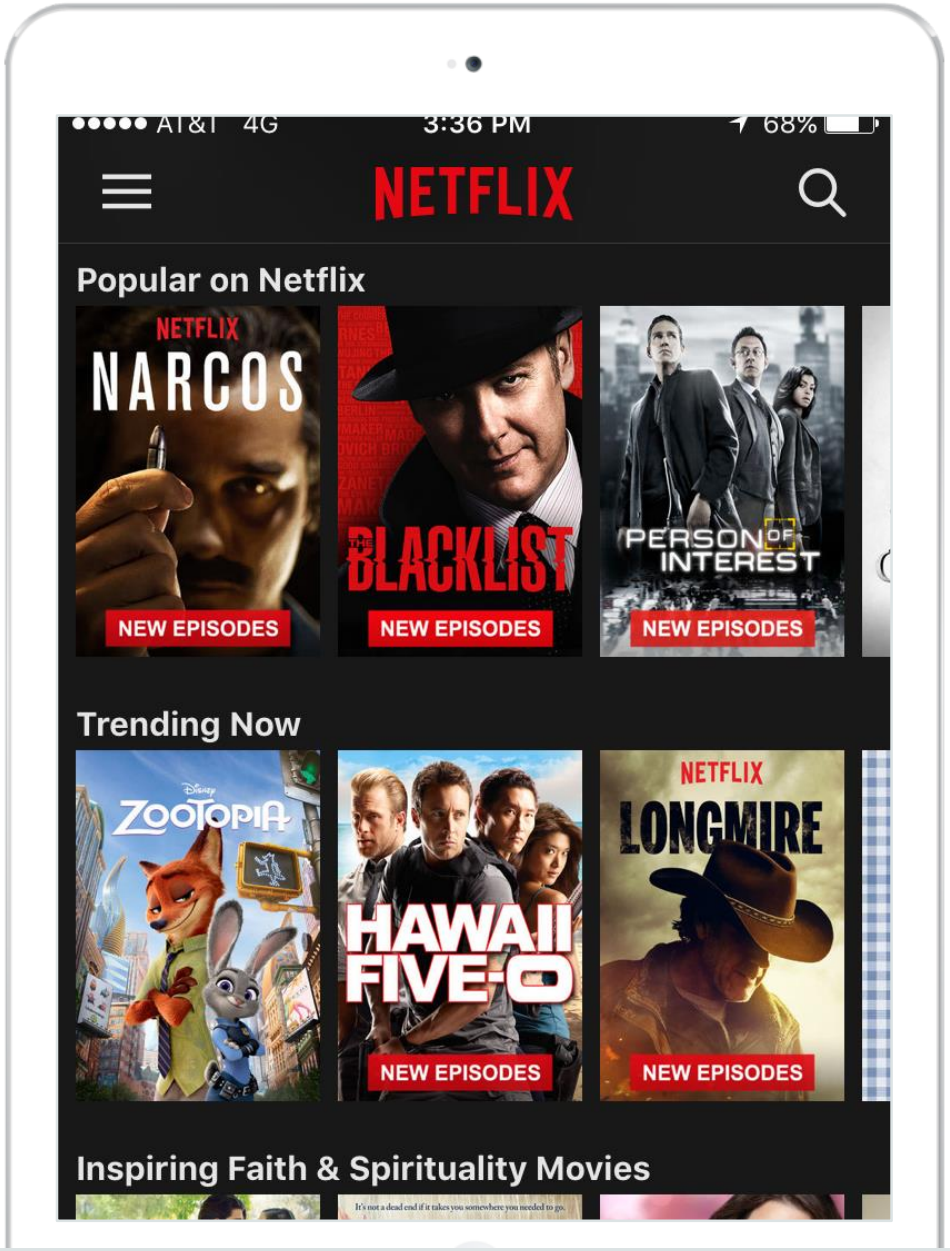
We view the world as a hyper connected network of people, applications, and devices.

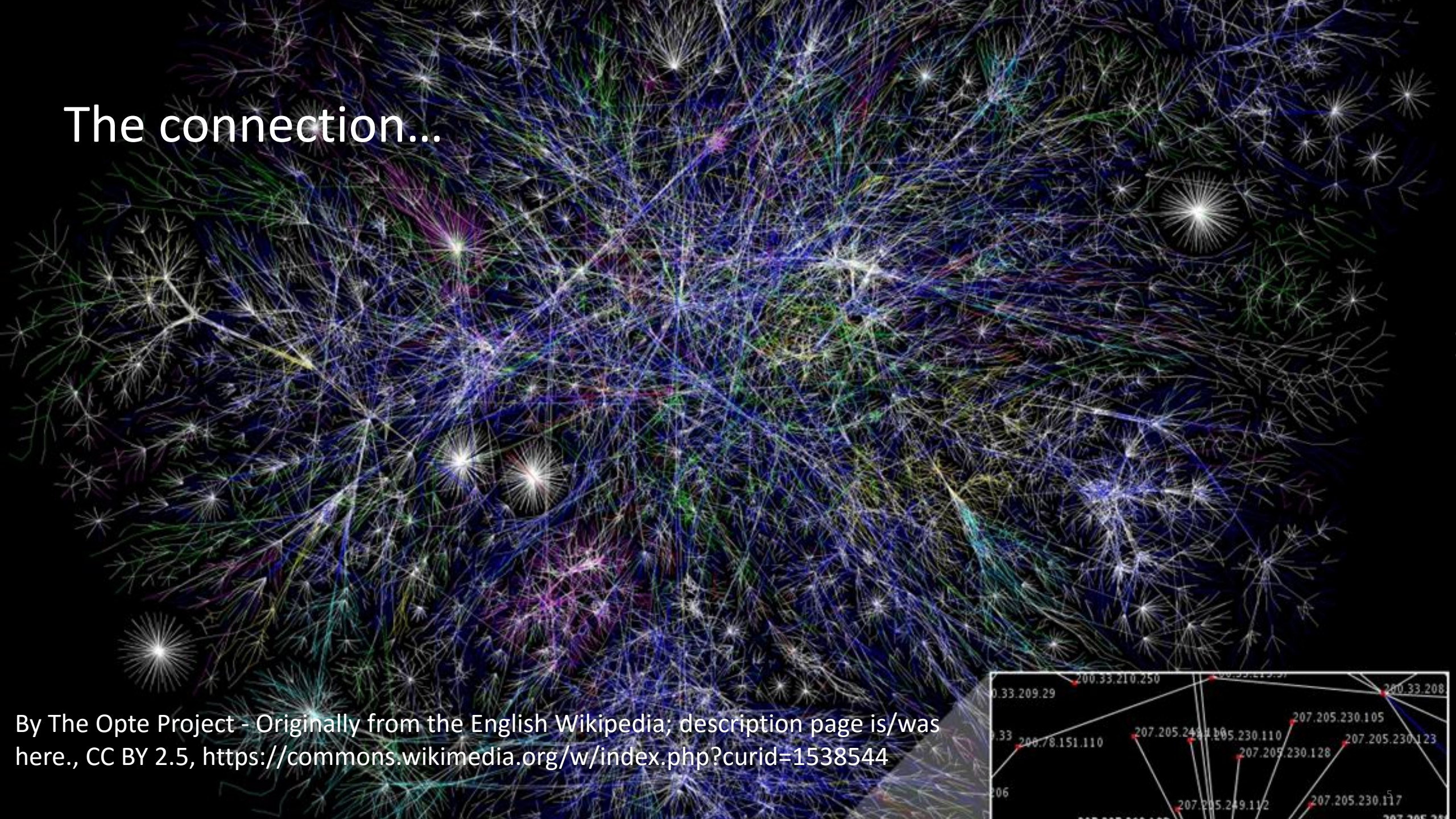
Connectivity…



User Expectations

- Confidentiality
  - "Need to know."
  - Secrecy and privacy is enforced to prevent unauthorized disclosure
- Integrity
  - "This must be right!"
  - Assurance of the accuracy and reliability of information and systems
  - Unauthorized modification is prevented
- Availability
  - "I need my data!"
  - Ensure reliability and timely access to data and resources to authorized individuals

The connection…



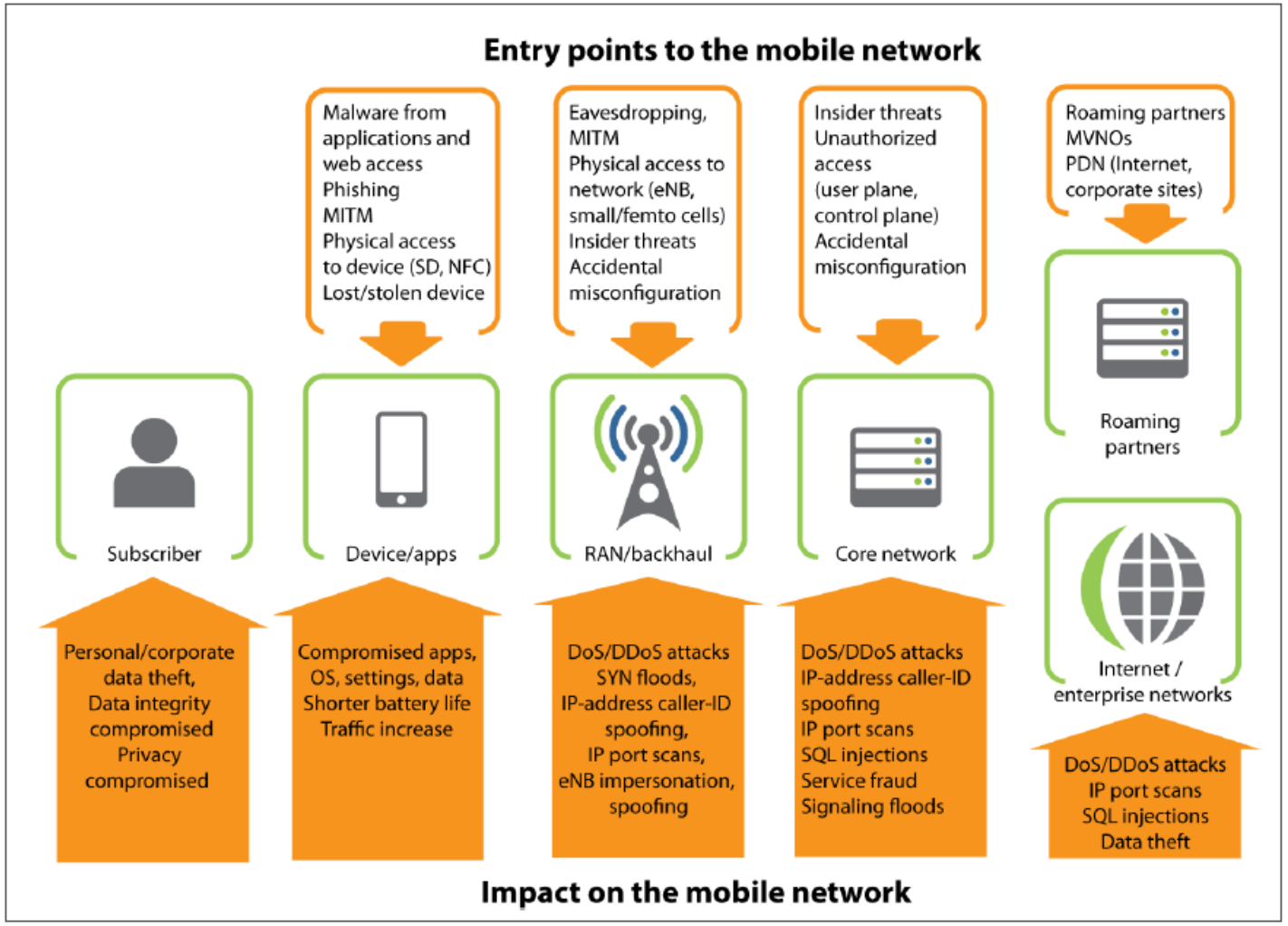
By The Opte Project - Originally from the English Wikipedia; description page is/was here., CC BY 2.5, https://commons.wikimedia.org/w/index.php?curid=1538544

The network in between…

- Attributes
  - Access control
  - Authentication
  - Session management
  - Secure transmission
  - Multi-session capability
  - Roaming
  - Accounting

- What makes it work?
  - Sophisticated SW controlled network elements
  - Complex comm protocols
  - Signaling protocols
  - Databases managing subscriber profiles
  - Policy engines
  - Interoperability among thousands of vendors

Network Threats



- Numerous entry points provide more opportunities for attackers.
  - Malware on handsets
  - Wi-fi alternate access methods
  - Roaming partner connections
  - End-to-end IP
    - DoS/DDoS
    - IP spoofing
    - IP port scanning

Note: Figure from Senza Fili Consulting

Critical Concerns…

- Attacks on networks and enterprises continue to escalate.
- Attacks are growing in frequency and sophistication.
- Addressing the attacks requires collaboration with suppliers.

The solution begins with…

…design; we must equip developers to write code securely.

Security In the Release Cycle

Security Release Criteria

Establish clear release criteria that drives OSSA compliance for:

- SCS adherence and validation
- Static Analysis
- Dynamic Analysis and Fuzzing

Bug backlog

- Review all open security vul'n and compliance bugs.
- Fix as many as possible in this release by severity and age.

3rd Party Management

- Uplift all 3rd party to latest release.
- Prioritize removal of unsupported items.

Architectural Risk Analysis

- Develop/maintain the ARA threat model.
- Assess threats and security controls across all I/Fs and assets.
- Carefully examine trust boundaries.
- Open bugs for any gaps where threats are not fully mitigated.
- Fix all critical/high findings

Apply Secure Coding Stds

- Follow all applicable SCS & validate via unit test and peer review.

Vulnerability Scans

- Routinely execute security vul'n scans & apply 3rd party security refreshes.

Static Code Analysis

- Apply static code analysis tools with each build, as practical, to improve code.

Update Security Guide

Code Analysis

- Complete static & dynamic analysis with approved tools such as HP Fortify and WebInspect.
- Assess findings and fix critical/high findings.

Fuzz Testing

- Test all exposed I/Fs & protocols identified in ARA

Other

- Assess/update TLS ciphers
- 3rd party security refresh

PSC
RSC
Bug status
3rd Party status

Legend
GA: release date
R-X: days prior to milestone

The solution ends with…

…partnership; suppliers and customers working together.

Customer – Supplier Partnership

- Clear communication
- Careful sharing of information
- Exchange of ideas
- Collaborative response

"It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness…"

– Charles Dickens, A Tale of Two Cities

By Jeremiah Gurney - Heritage Auction Gallery, Public Domain, https://commons.wikimedia.org/w/index.php?curid=8451549

Findings…

- Reduce security vulnerabilities in code
- Find security weaknesses and vulnerabilities internally
- Fix them before anyone else finds them.

From Strategy to Practice

The Customer's View

Who breaks into Telecom Systems?

- State-Funded Professionals
- Developers of "Hacker Toolkits"
- Insiders
- Security Researchers

No CVE ? No Problem.

- Malicious and "grey hat" hacker communities contain information on vulnerabilities; Some groups are focused specifically Telecom systems.
- Even worse: "0-Days" that are not patched and have no public disclosure.
- Useful to customers, but also to attackers.

NO NEWS ISN'T NECESSARILY GOOD NEWS

…In such an unforgiving threat landscape, Telecom customers *need* a partner in security.

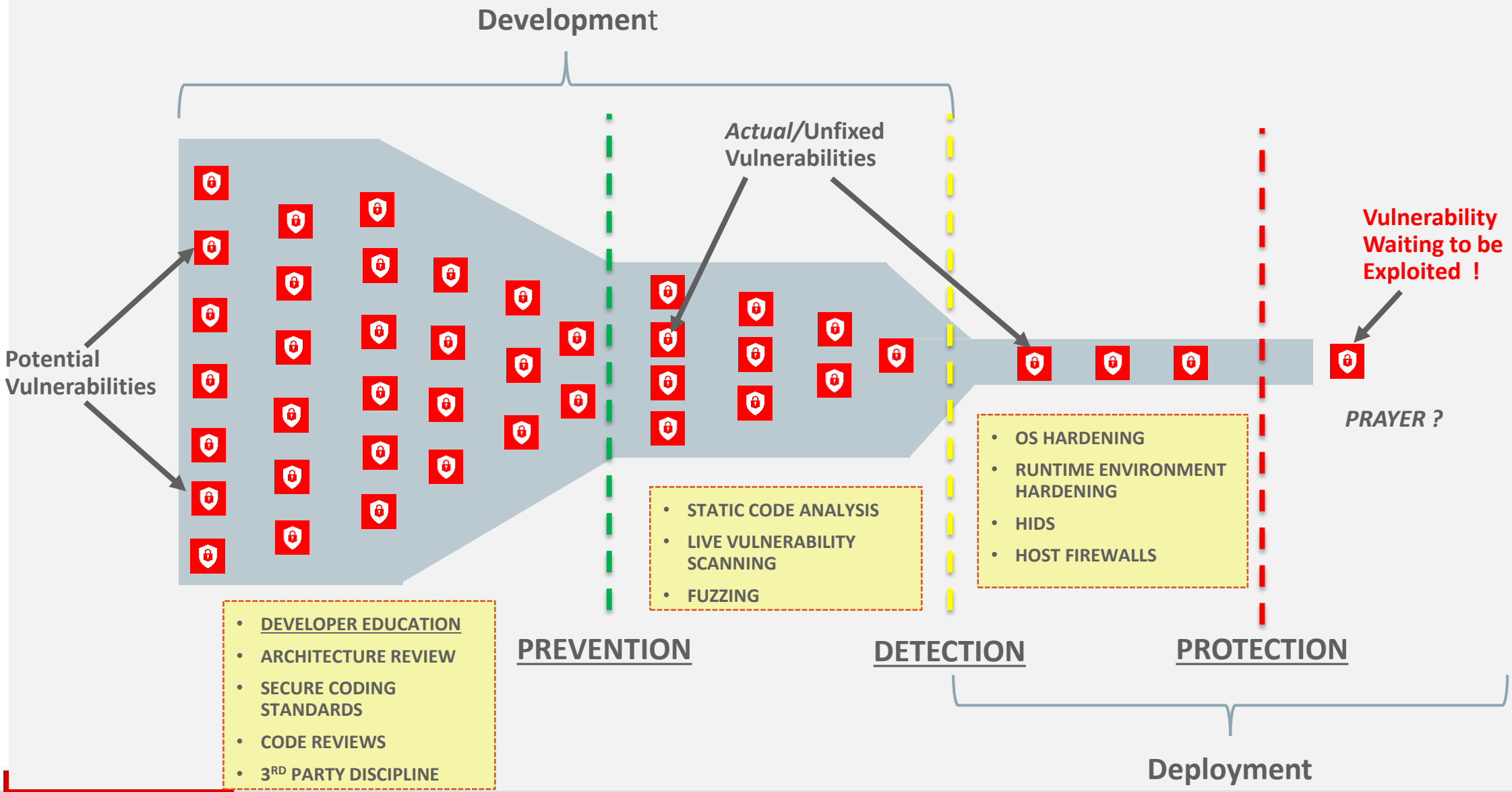
What customers expect of *us*

- Secure out of the box
- Flexible security configuration
- Ship code that is hardened and assumes it will be run in a "hostile" environment.
- Provide adequate logging of security-related events.
- Alert when product is configured in an insecure way.

You can trust products when …

- Product design incorporates security
- Developers comply with documented secure coding standards
- 3rd party software is carefully evaluated before being included into any release
- All source code (incl. 3rd party code) is run through static code analysis that focuses on security vulnerabilities.
- Security-focused dynamic testing such as fuzzing is applied to every release

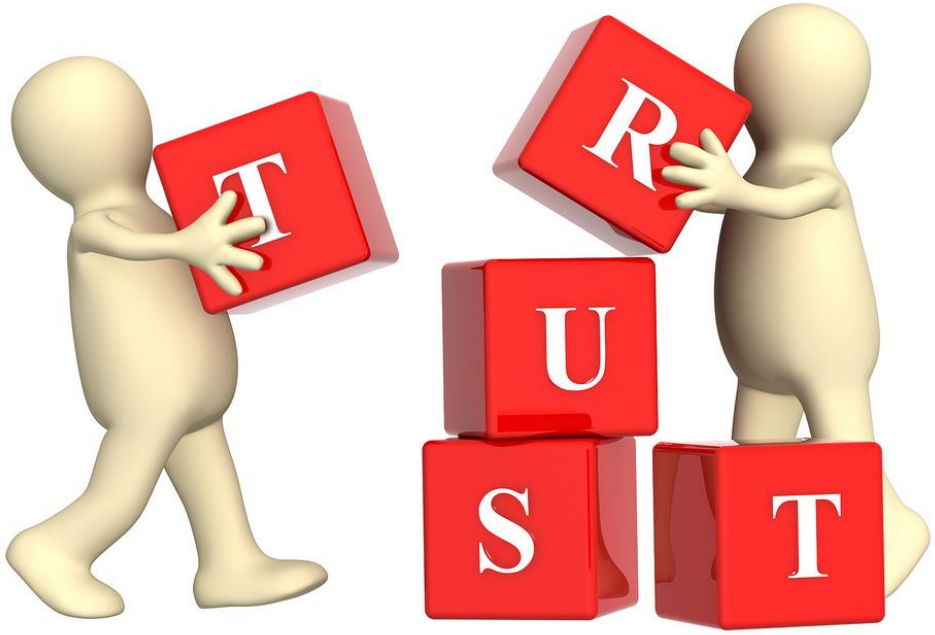
Software Vulnerability Prevention from Dev. to Live



Trust, but not blindly

Customers test too …

- Commercial fuzzing tools
  - Defensics, Peachfuzz
- Vulnerability scanners
  - Nessus, Qualys, Mcafee, Rapid7
- In-house penetration testing teams
- External pen-testing by 3rd parties



Real Life

What happens when…

- A major service provider customer call with an urgent finding.
- **Incident**: Internal penetration test reveals security vulnerability.
- Report shared privately with you (Responsible disclosure)
- Rollout of product halted until response is received.
- Customer deeply concerned since earlier version of product is deployed in network.

Case Study : Internal Response – Week 1

- Security Lead shares report with internal security research and ethical hacking team.
- Internal software security team digs through report:
  - Can issue be reproduced internally?
  - What is the root cause of the issue ?
  - Are earlier releases also vulnerable ?
  - Are there any workarounds or mitigations ?
  - Do we agree with the customer's assessment of the severity of the issue?
- Meanwhile, high-level management engage with customer via phone calls and email.

Case Study : Internal Response – Week 1 , Continued

- Within 48 hours, security team has released first technical response for internal use:
  - We'd seen this before :
    (Oh OK, It's THAT thing…… ☺)
  - Bug already discovered by the development team's early efforts at fuzzing.
  - Fix was already applied for a future release, but discovery was too late for product already out the door.
  - Severity at time not considered high enough for emergency patch.
  - Exploit of vulnerability as described by customer was possible, but only with additional private information . (A.C. was not as low as they claimed)
- Meetings scheduled for following week with customer IT officials and customer pen-test team.

Case Study : Customer Engagement - Week 2

- Management talks with customer network operations:
  - We acknowledge vulnerability, but disagree with the severity.
  - Plan is worked out for including fix in an emergency maintenance release.
  - Their pen-test team will conference with our product security team so we can describe justification for lowering CVSS.
  - On-site meeting at customer HQ is conducted.
- Product security team conferences with customer pen-test team
  - Technical details discussed and verified
  - We “haggle” over the CVSS score and agree on a lower rating.

Case Study : The Way Forward – Week2 and Beyond

- Timelines for patch are discussed
- Regular status meetings set up going forward to inform customer of our testing on fix.
- Details worked out on how and when to publicly disclose the vulnerability.
- Product security works with development team for product to verify fix for vulnerability.
- Customer receives maintenance release and eventually upgrades existing installations with patched code.

Takeaways

- Respond quickly and demonstrate competence and concern.
- Establish meeting of teams.
- Foster collaboration and open sharing of information.
- Apply comprehensive test techniques, such as fuzz testing.
- Recognize the gap between test environments and the real world.

"In today's complicated, cyber-security hyper-threatened environment – trust boundaries don't exist … but you must TRUST your supplier."

– James Peterman, Oracle

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