Know thyself
then patch thyself

OpenStack Forum
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LUNDS UNIVERSITET

#OpenStack
#Docker Swarm
#Kubernetes
#Micado-Scale (H2020 COLA)
SE-OvS (H2020 ASCLEPIOS)
#SMARTY (SSF, Firmware updates)
#IETF TEEP, SUIT

RI.SE

RISE North Research Datacenter (Luleå)

Topics and Non-Topics

✔ Vulnerability Ecosystem
✔ Example Vulnerability Management Process: OpenStack
✔ Do's and do not's
✔ "The Future"

✘ How do I secure my [insert technology stack] deployment?
✘ Choosing a vulnerability management system

Why “Know thyself”?

The unexamined life is not worth living.
(Socrates)

The unexamined deployment is not worth patching.
(made up for this presentation)

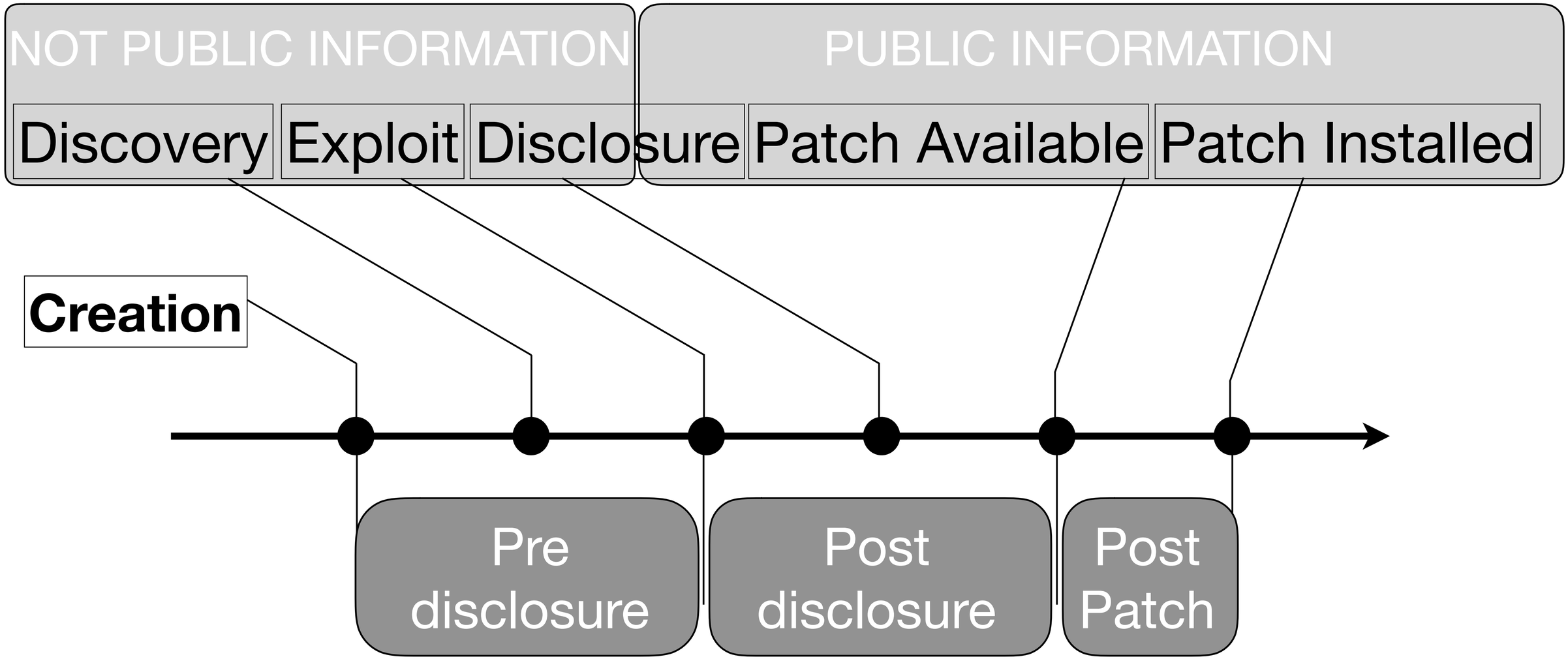
Why “patch thyself”?

- New vulnerabilities are disclosed daily
- Unpatched vulnerabilities are a threat to tenant and operator alike
- Regular release cycles are too long
- Cloud deployments include many, many third-party libraries not maintained by the cloud platform itself
- Vulnerabilities in hypervisors or container management systems can compromise the entire deployment.

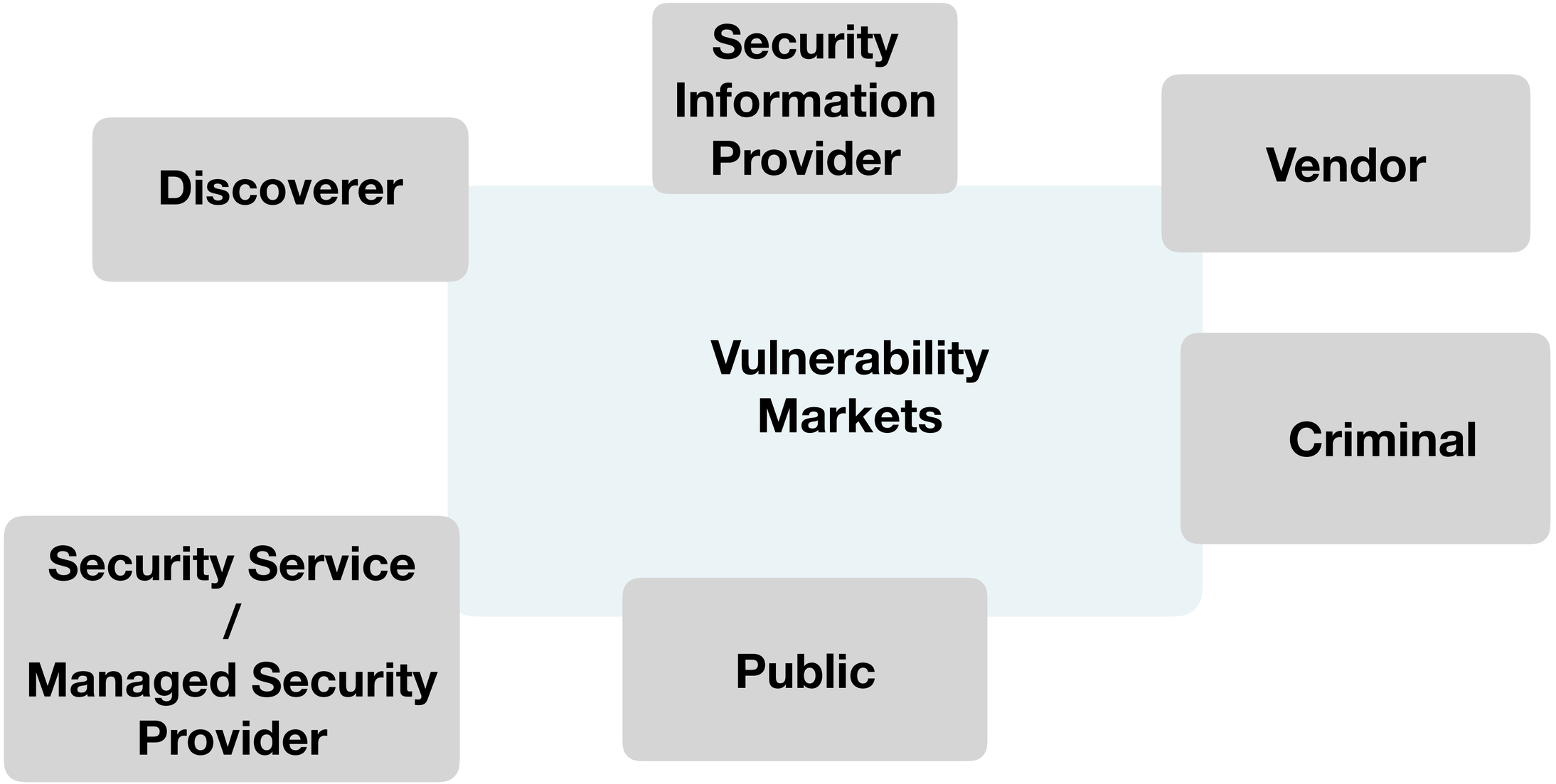
What is a vulnerability?

A security issue with an assigned CVE identifier

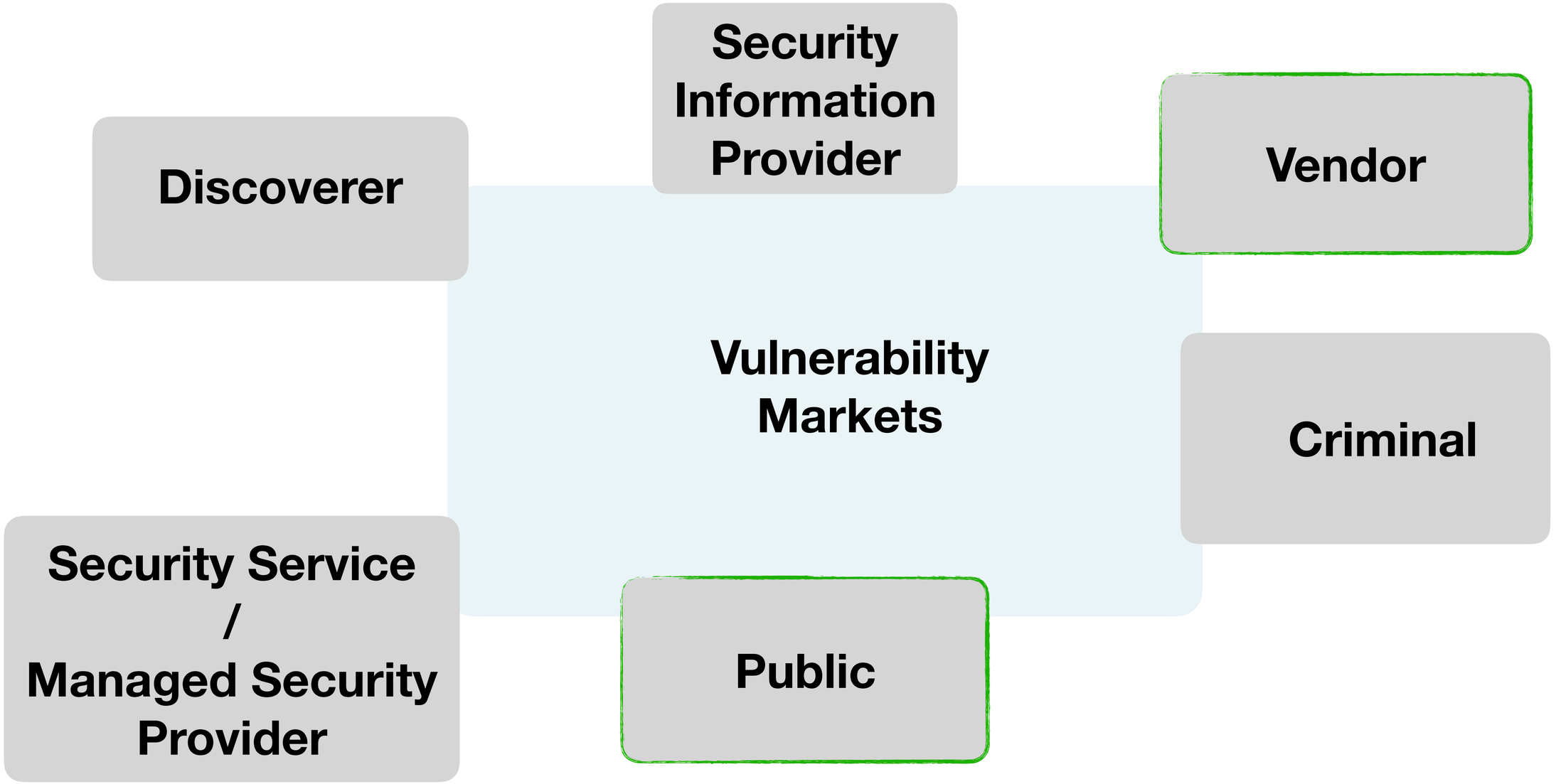
Vulnerability lifecycle



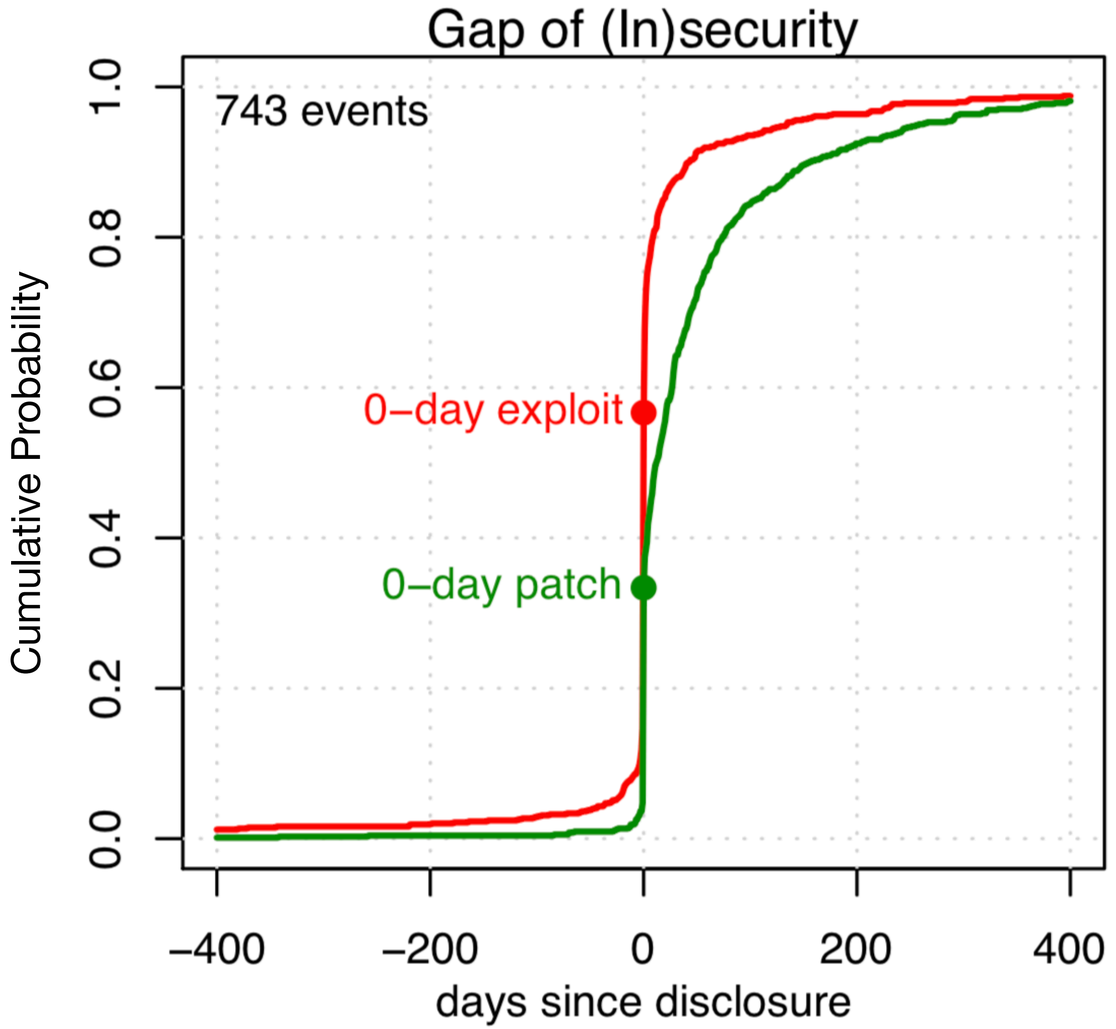
The (in) security ecosystem



The (in) security ecosystem



Patch Availability vs Exploit Availability



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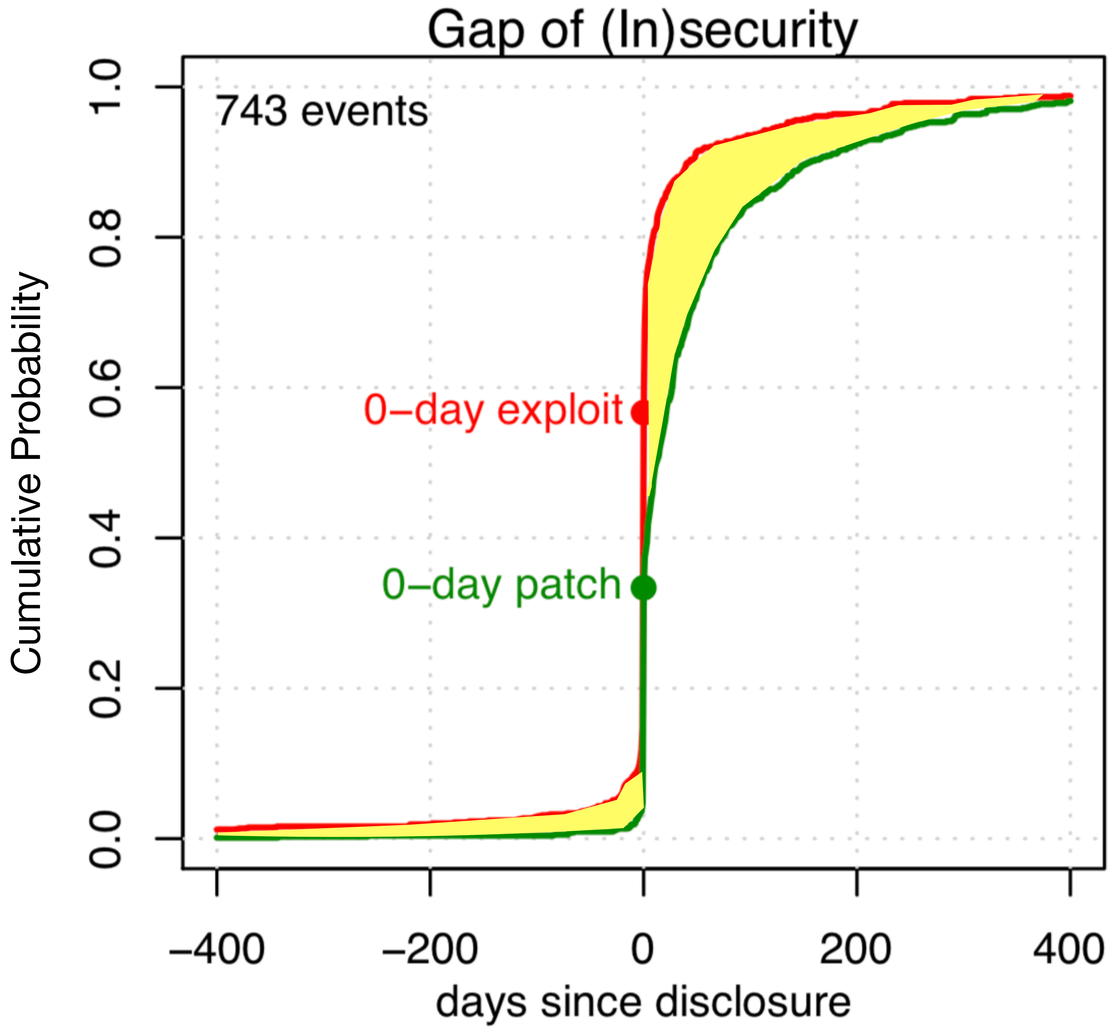


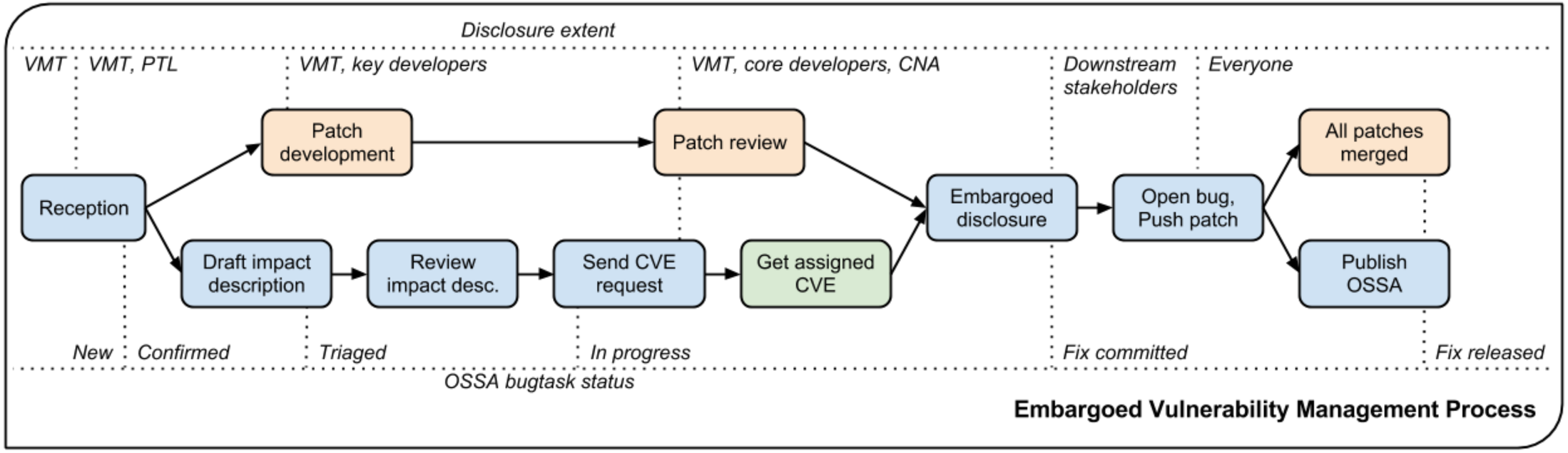
Why not (yet) patched?

- **cost** – plain and simple
- **disruption** – upgrades disrupt business and “steal” resources
- **compatibility/dependencies** – specialist applications may not operate reliably on newer operating systems
- **operations** – major software upgrades are inherently risky, and user tools may work differently

Vulnerability assessment in OpenStack

- OpenStack vulnerability management team
- OpenStack Security Notes (OSSNs)
- OpenStack-discuss mailing list

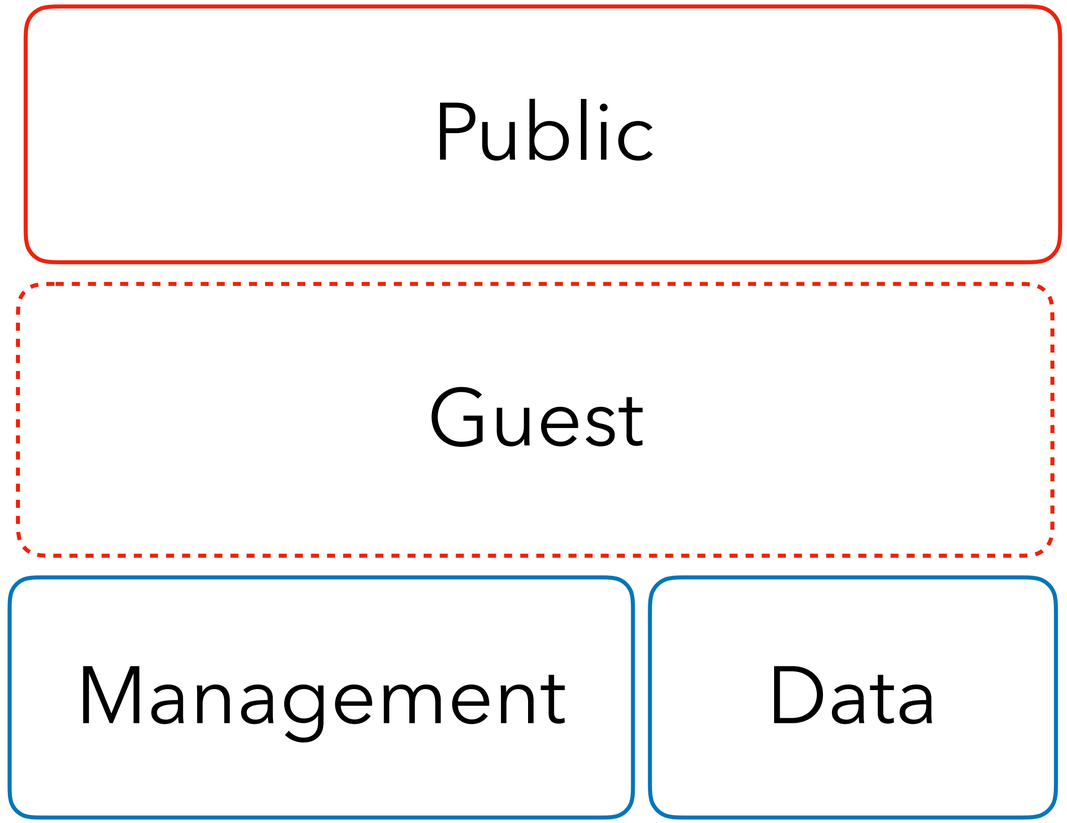
OpenStack Vulnerability Management Process



Security information for OpenStack deployers

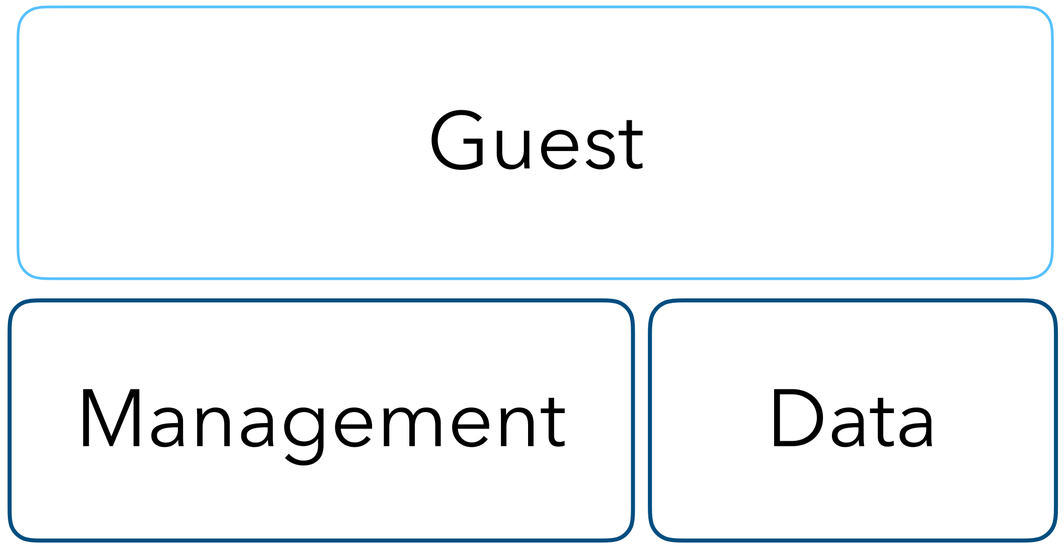
- OpenStack Security Advisories (OSSA)
- OpenStack Security Notes (OSSN)
- OpenStack Security Guide
- OpenStack Security Project blog

Security Domains in OpenStack



Source: https://docs.openstack.org/security-guide/introduction/security-boundaries-and-threats.html#

Security Domains in OpenStack



Source: https://docs.openstack.org/security-guide/introduction/security-boundaries-and-threats.html#

Vulnerability and patch selection

Assess

Triage

Prioritize

Vulnerability and patch selection

Assess

Automated vulnerability assessment tools?...

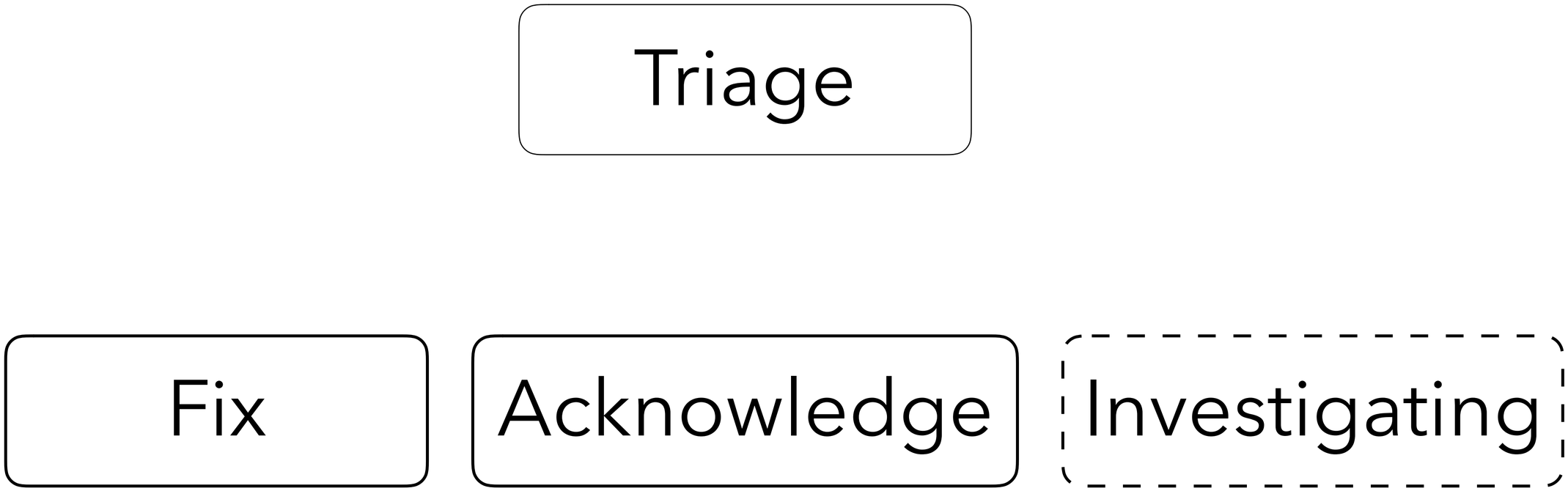
Vulnerability and patch selection

Triage

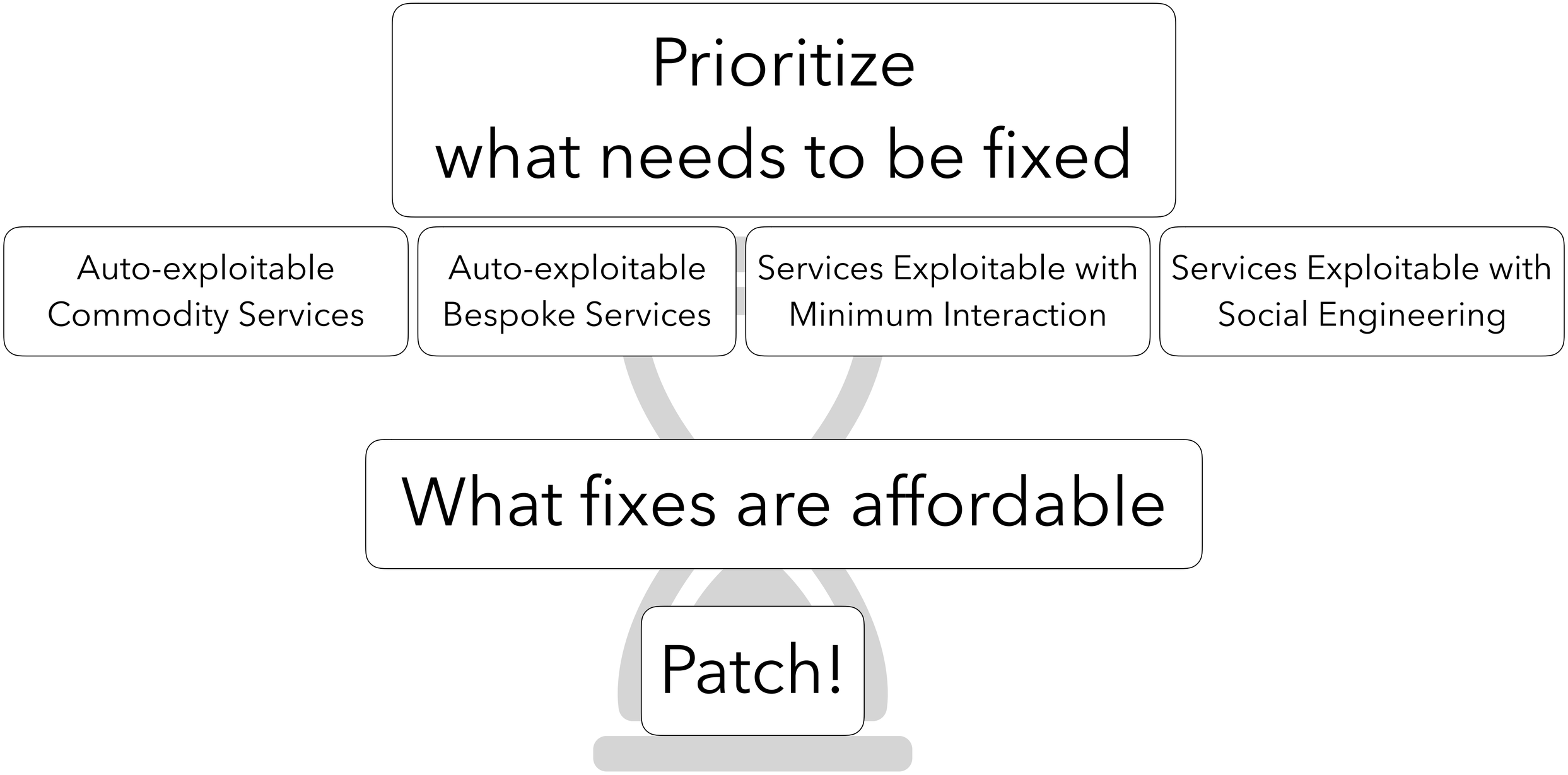
✗ select an arbitrary score above which vulnerabilities must be fixed, ignoring all issues below that level

✗ take raw CVSS scores without taking into account organisation specific mitigations or priorities

Vulnerability and patch selection



Vulnerability and patch selection



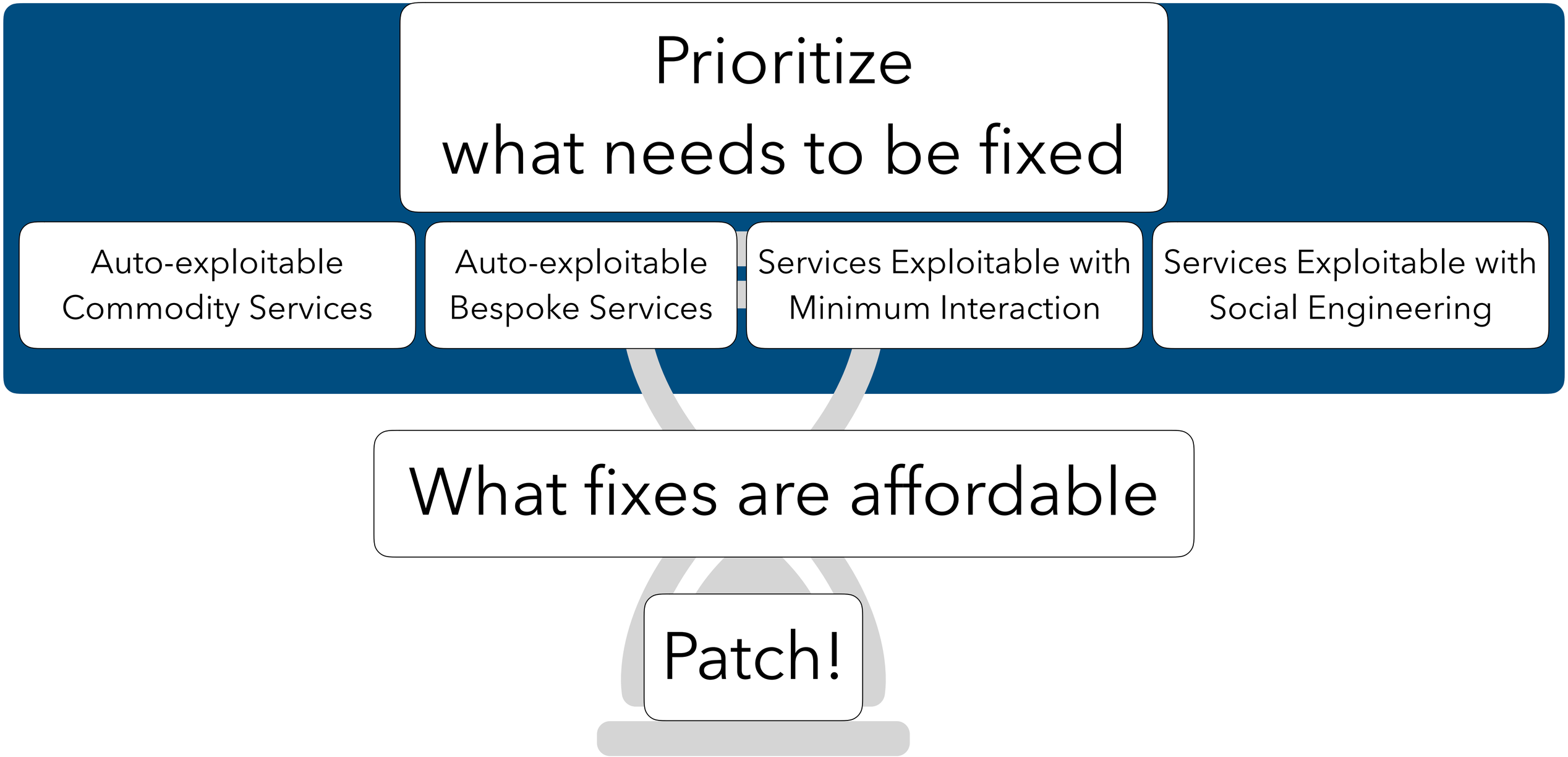
Automated patch selection

…is in its early infancy…

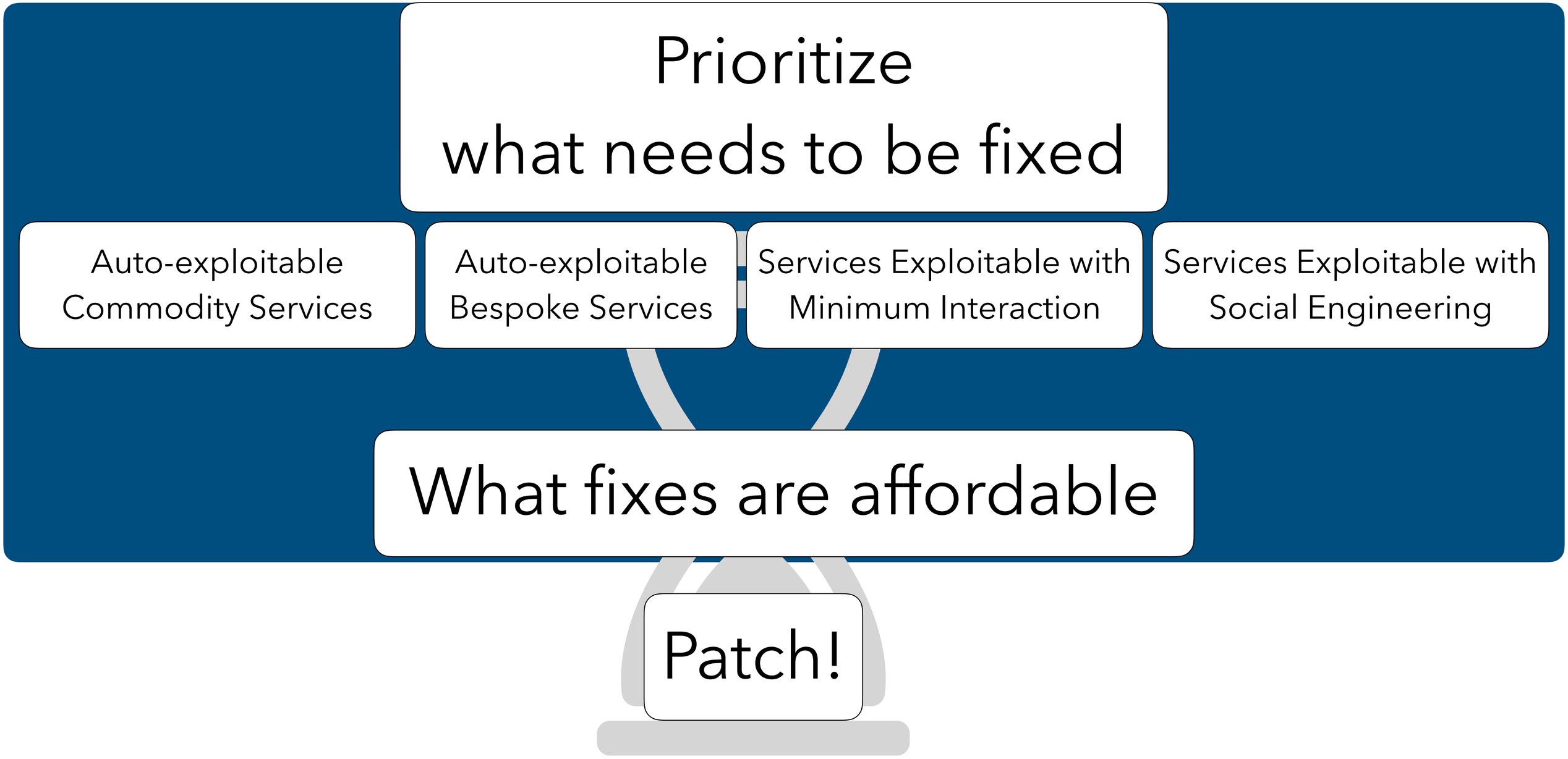
- Farris, Katheryn A., et al. "Vulcon: A system for vulnerability prioritization, mitigation, and management." *ACM Transactions on Privacy and Security (TOPS)* 21.4 (2018): 16.

- **SMARTY** (Säkra mjukvaruuppdateringar för den smarta staden)
  - Cobleigh, Alexander, et al. "Identifying, Prioritizing and Evaluating Vulnerabilities in Third Party Code." *2018 IEEE 22nd International Enterprise Distributed Object Computing Workshop (EDOCW)*. IEEE, 2018.

Vulnerability and patch selection



Vulnerability and patch selection



References

- Vulnerability management Guidance to help organisations assess and prioritise vulnerabilities. https://www.ncsc.gov.uk/guidance/vulnerability-management
- Application Container Security Guide https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-190.pdf
- Markets for Cybercrime Tools and Stolen Data https://www.rand.org/content/dam/rand/pubs/research_reports/RR600/RR610/RAND_RR610.pdf
- Stefan Frei, Martin May, Ulrich Fiedler, and Bernhard Plattner. 2006. Large-scale vulnerability analysis. In Proceedings of the 2006 SIGCOMM workshop on Large-scale attack defence (LSAD '06). ACM, New York, NY, USA, 131-138. DOI=http://dx.doi.org/10.1145/1162666.1162671
- OpenStack Vulnerability Management Process https://security.openstack.org/vmt-process.html#ossa-task-status
- Vulnerability awareness in OpenStack https://docs.openstack.org/security-guide/compute/vulnerability-awareness.html
- Identifying, Prioritizing and Evaluating Vulnerabilities in Third Party Code https://ieeexplore.ieee.org/abstract/document/8536124
- MiCADO - autoscaling framework for Docker services https://github.com/micado-scale/
- Säkra mjukvaruuppdateringar för den smarta staden **https://portal.research.lu.se/portal/en/projects/sakra-mjukvaruuppdateringar-foer-den-smarta-staden(d81348d8-c491-440c-af06-7bc563b3538a).html**

Questions