The Science, Engineering, and Business of Cyber Security

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Institute for Cyber Security

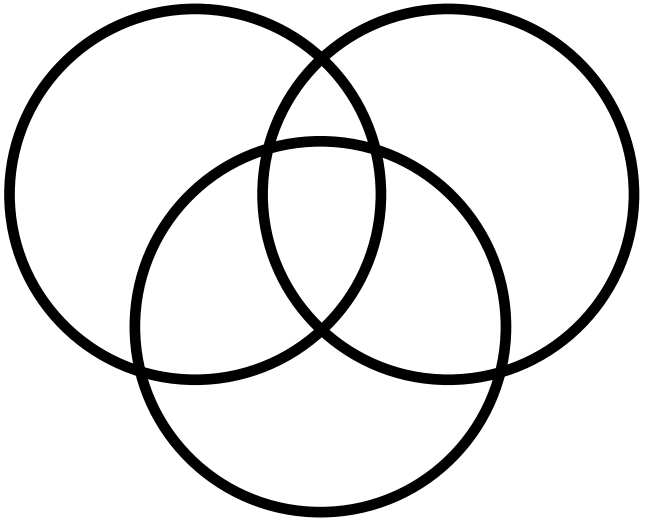
- Founded in 2007 to be a world leader in cyber security research
- A unit in the College of Sciences, with strong ties to the Department of Computer Science
- Cyber Security in UTSA started in 2000 and is well represented in the Colleges of Science, Engineering and Business

Cyberspace

≈ 2010 Department of Defense epiphanies

- Cyberspace is officially recognized by Department of Defense as a new warfare domain akin to land, sea, air and space
- Department of Defense officially admits having and using offensive cyber weapons
- Department of Defense officially admits malware penetrations in its classified networks

Cyber Security Objectives



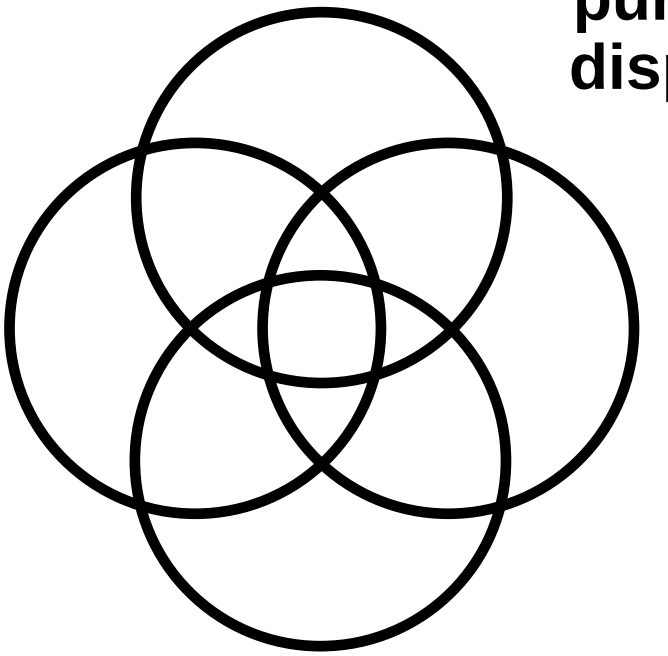
INTEGRITY
modification
misdirection

AVAILABILITY
access

CONFIDENTIALITY
disclosure

Cyber Security Objectives

USAGE
purpose
disposal



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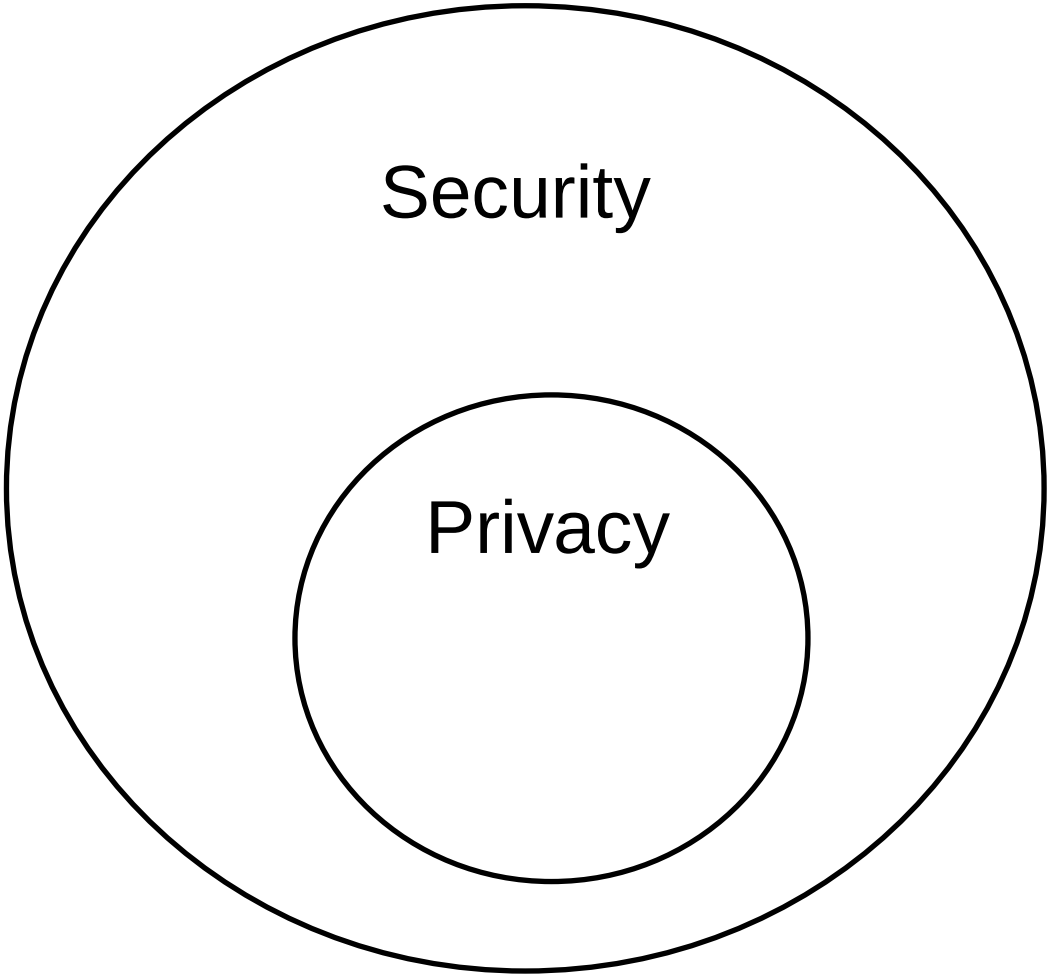
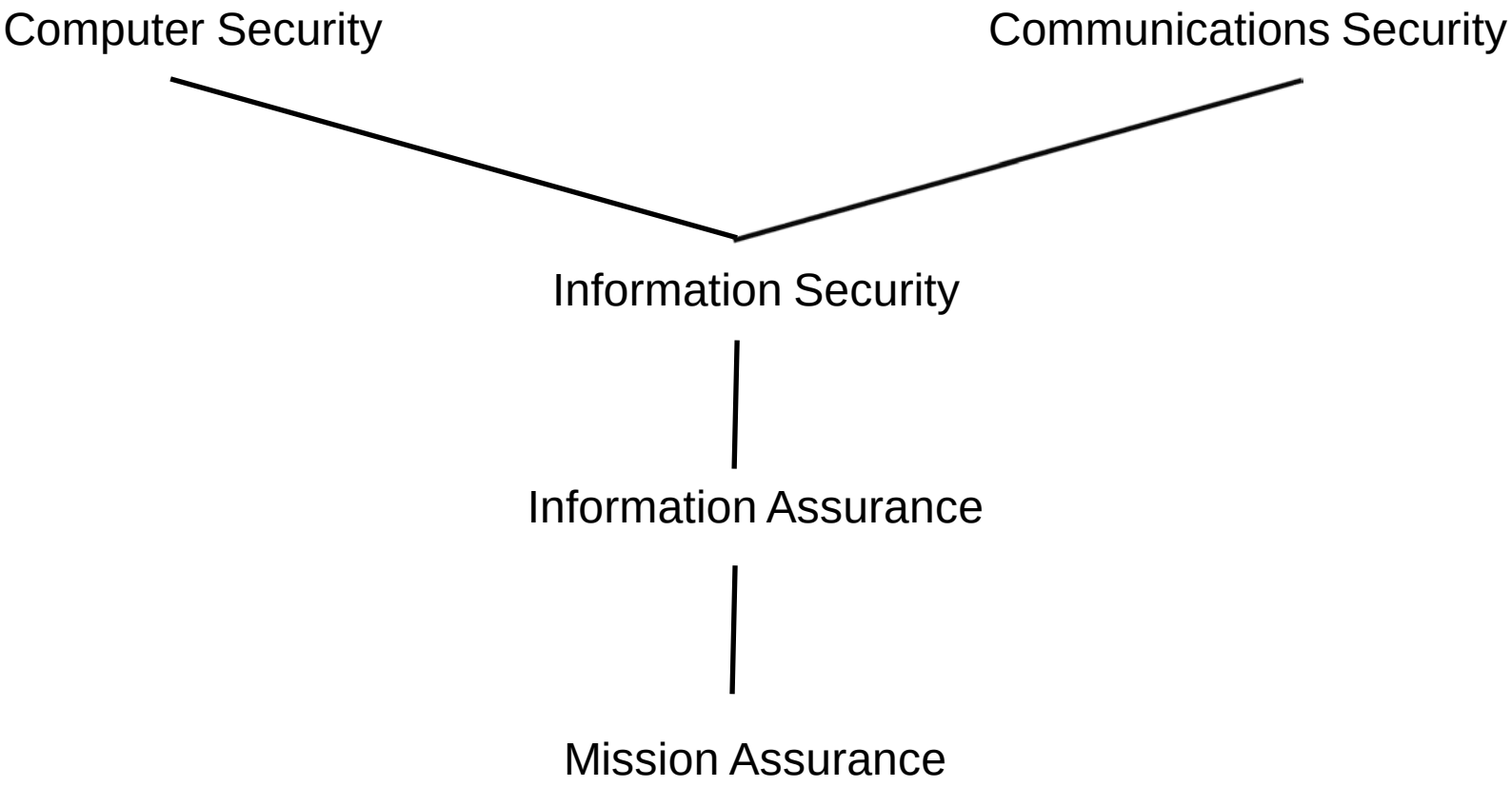
Security versus Privacy

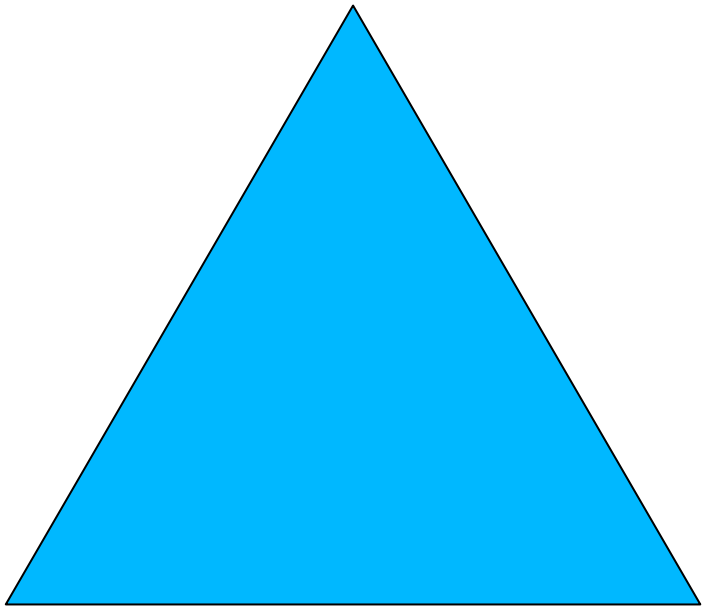


Cyber Security Evolution



Cyber Security Techniques

Prevent



Detect

Accept

Cyber Security Goal

- Enable system designers and operators to say:

  This system is secure

  Not attainable

- There is an infinite supply of attacks

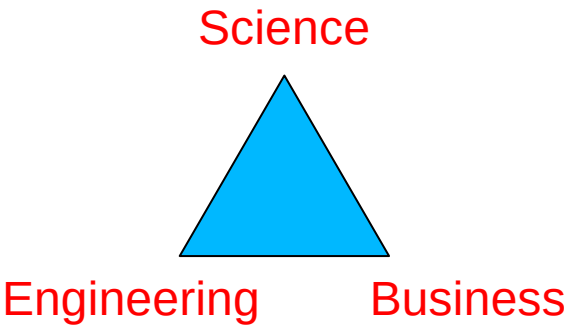
Cyber Security Goal

- Enable system designers and operators to say:

  This system is secure enough

  Many successful examples

- Mass scale, not very high assurance
  - ATM network
  - On-line banking
  - E-commerce



- One of a kind, extremely high assurance
  - US President's nuclear football

Why is Cyber Security so Hard?

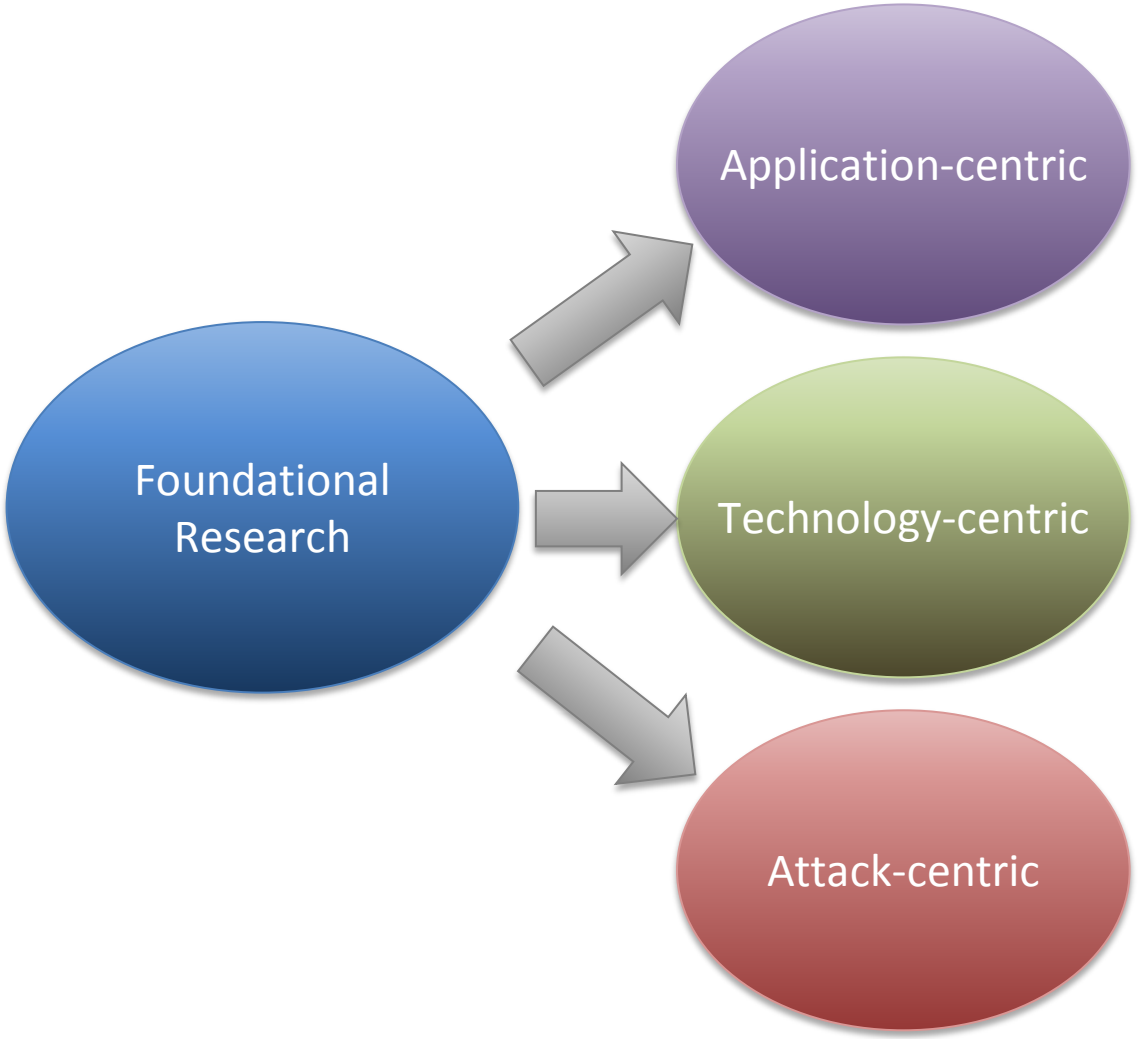
- Halting problem
- Inference
- Weakest link
- Analog hole
- Insider
- Human element
- Usability
- Cyber innovation
- Covert channels
- Side channels
- ……

Cyber Security Prognosis

- Not too bad
- About as good as it is going to get
- The criminal enterprise can only defraud so many
- Big government and big business are a real threat

- Highly asymmetric
- Offense component
- Clandestine
- Dual goals: strong offense, strong defense
- Mankind has somehow kept nuclear, chemical and biological in control. Cyber is different but should be controllable.

ICS Research Thrusts



- Secure Information Sharing
- Social Computing Security
- Secure Provenance-aware Systems
- Privacy Policies and Enforcement

- Trustworthy Cloud Computing
- Secure Multi-Tenants in Cloud
- Big Data Security and Privacy
- Security in Internet of Things

- Malware Detection and Analysis
- Botnet Analysis and Defense

ICS FlexCloud Lab