
Asset Centric Threat Modeling
ISSA-Utah Fall Seminar 2016
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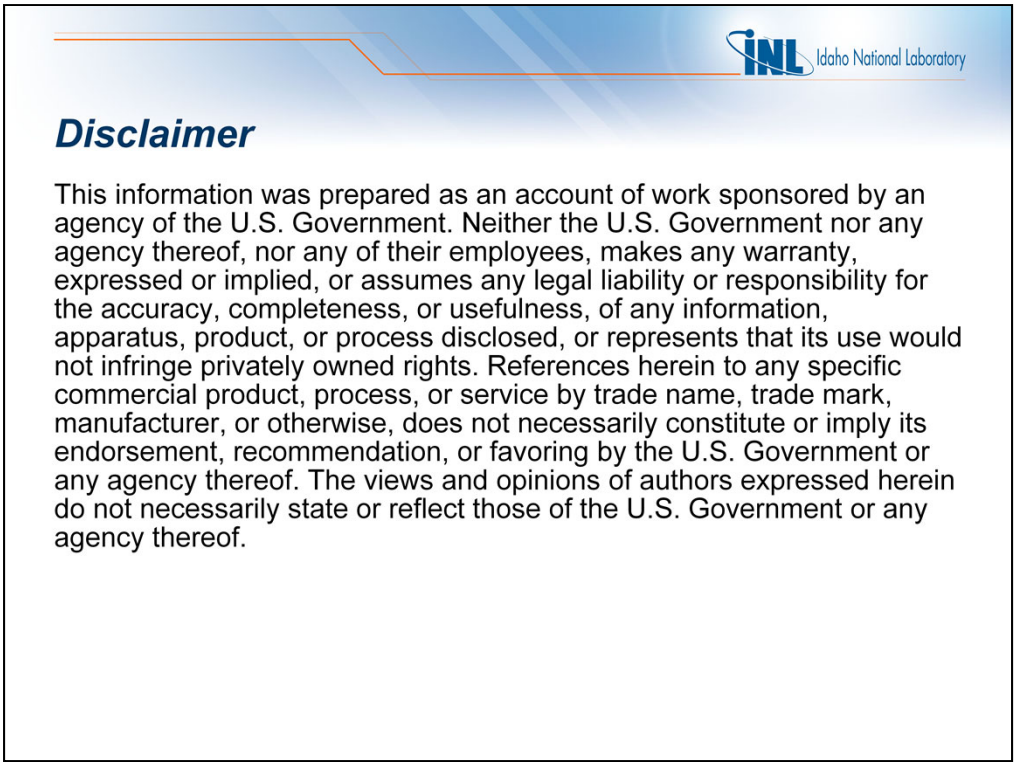

This is for entertainment only. I am just up here vibrating air molecules. If they happen to have any meaning to you it is merely a coincidence. Ok, perhaps I am not that disowning of my ideas; bust seriously folks these are my ideas and not an endorsement of them by the US government or my employer. I reserve the right to change my mind as well.

I recently revisited the Strengths Finder by Tom Rath. I think sharing my results will help you understand the perspective from which I came at the threat modeling problem. Learning excites me. For me it is about the journey not the destination. The entire process is fantastic, when I struggle to understand a new or foreign idea I experience great and rewarding growth. Along with that I love highly technical and precise language of the intellectuals, the more in over my head the better. To facilitate my learning I gather all types of data. Exploring these repositories is like finding a new world with interesting things around every corner. In my mind nearly all things are related. Ideas, concepts, and principles have relationships, understanding these relationships how they work, how they are broken, how compatible or at odds they are with each other facilitates my learning. There are few coincidences in life.

I have a hard time when things are broken or incompatible. I have this drive to fix things, particularly with things of the mind, from intellectual concerns to health, I am one who performs rescue.

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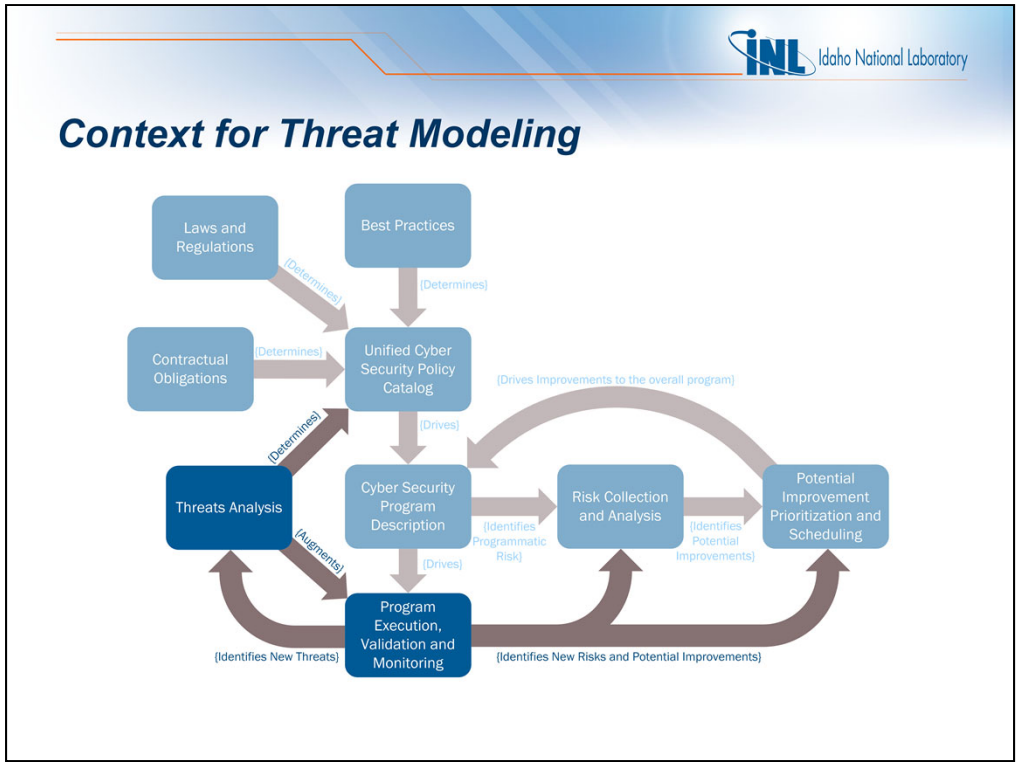
Overview

- Context
  - Where Threat Modeling Fits
  - Disparate Models and Ad Hoc Collections
- Examining the Asset/Understanding Data
- Using the Data landscape Model
- Down the Rabbit Hole
- Take away
- Future Work



There is a lot to unpack on this slide. Threat modeling is a high maturity process. If you have an established cyber security program, you are in the continuous improvement phase and you want to take your risk assessments and system security baselines to the next level it is time to consider it.

Cyber Security Program overview:

On the far left and top are the four external feeders to a cyber security program: *Best Practices*, *Laws and Regulations*, *Contractual Obligations*, and Threats with associated mitigations from *Threat Analysis*.

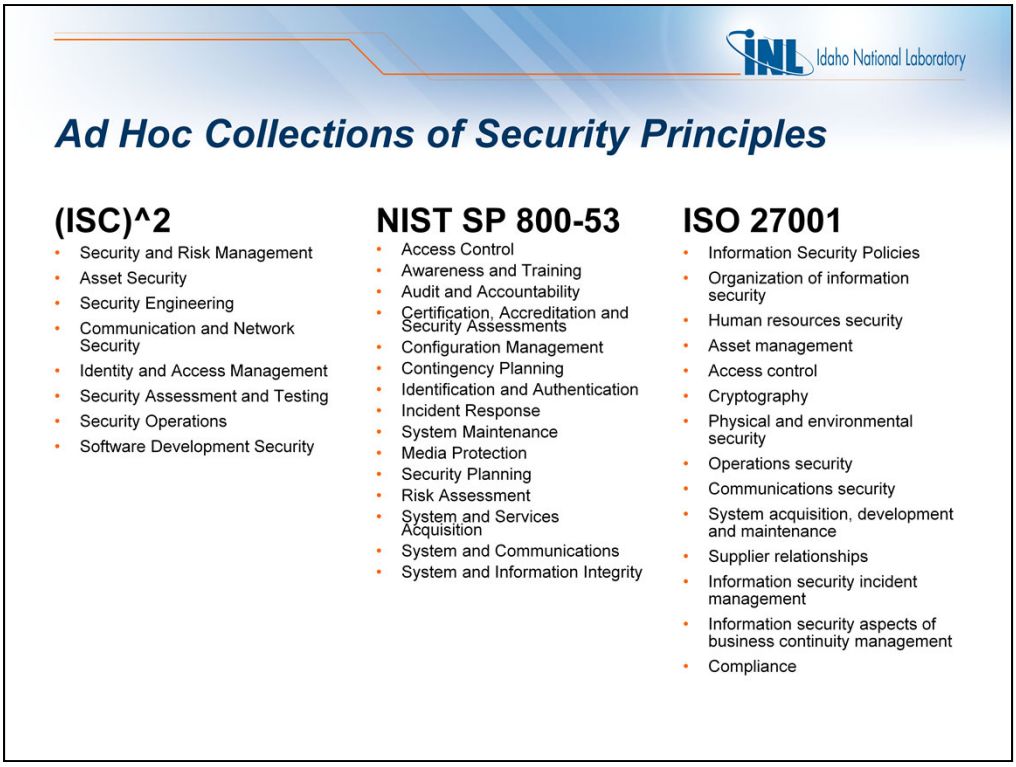
These feed in to a catalog (*Unified Cyber Security Policy Catalog*) of all the things a cyber security program **could** do.

From this list of all the things a cyber security program could do a subset is selected as those things your cyber security program **will** do (*Cyber Security Program Description*) items not selected become accepted programmatic risk.

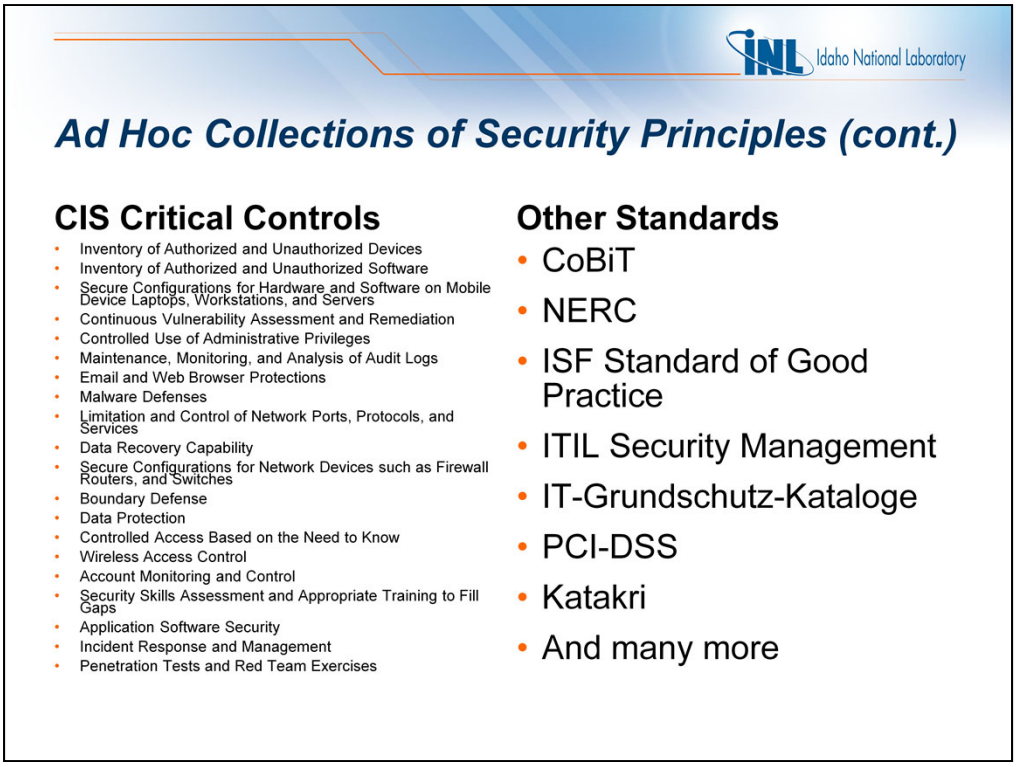
This cyber security program is then executed and monitored with deltas between what you intend to do and reality being identified as risks. During the process of performing risk analysis new previously unidentified threat actions and potential mitigations or other improvements may be identified.

Risk Collection and Analysis and *Potential Improvement Prioritization and Scheduling* close the feedback loop by incorporating improvements into the cyber security program.

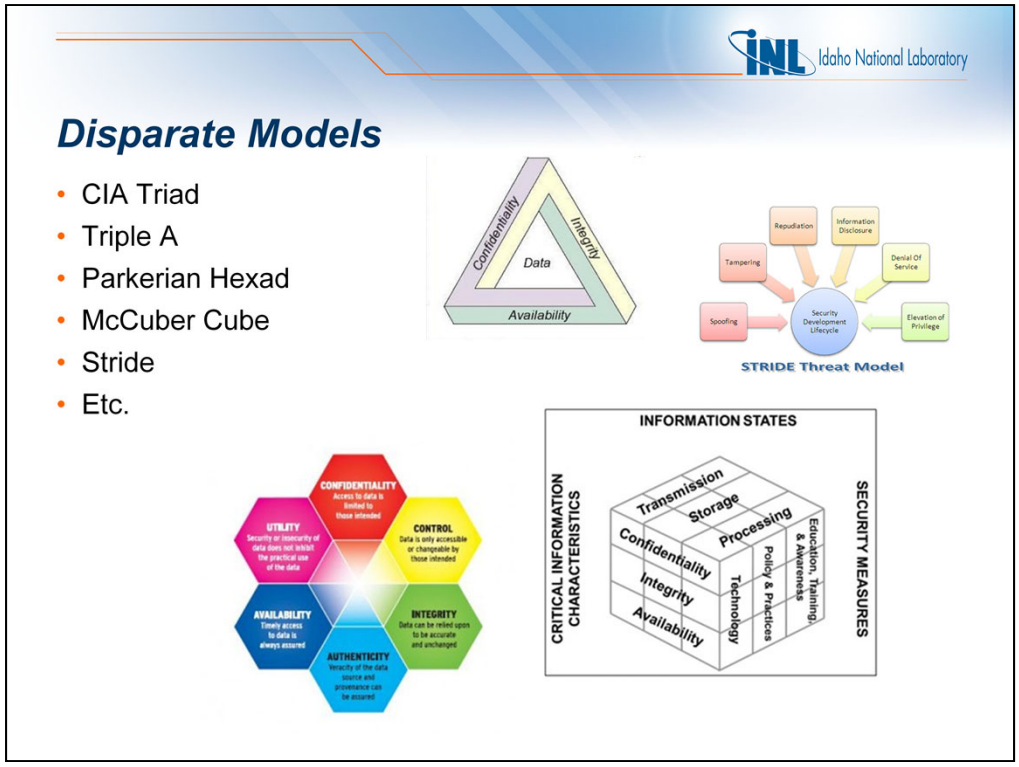
Threat Modeling is not an essential part of a basic risk assessment but is used to provide an additional level of assurance to the rigor of the assessments. Threat modeling is done in addition to the more essential gap analysis between the evaluated target and applicable components within the *Cyber Security Program Description.*



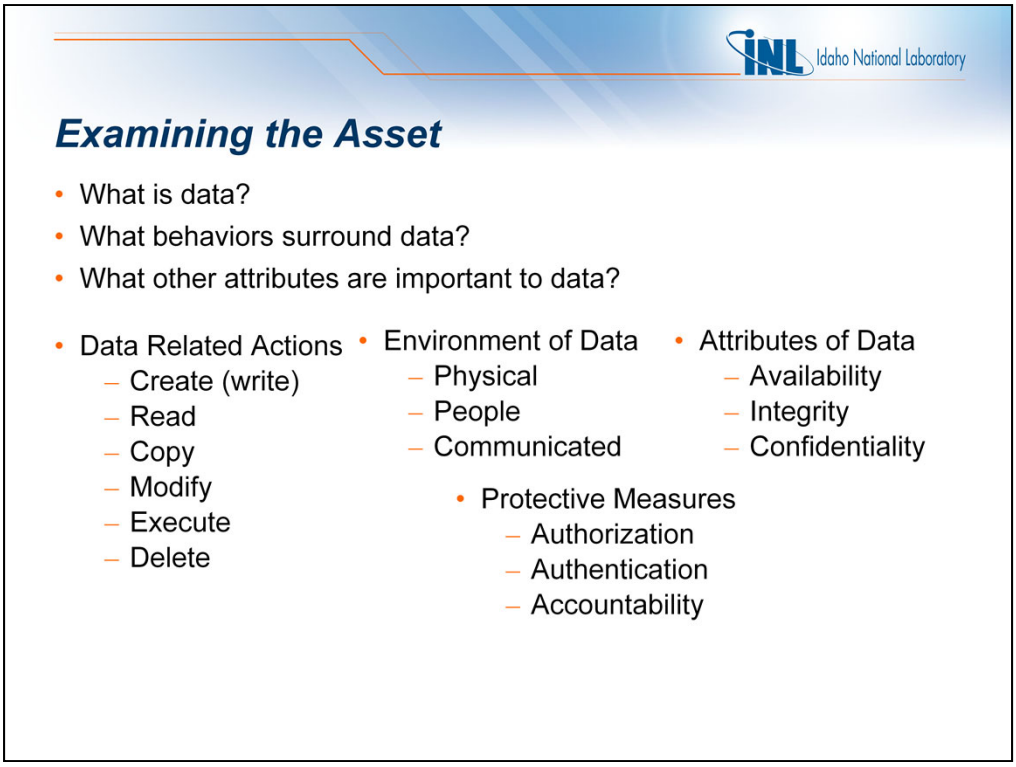
Efforts to identify fundamental aspects of information security have been to collect best practices and security principles and to assign them to groups of similar items. While helpful the wide range of separate methods.



Examples of other collections



Many Information security models exist as well. While most are very solid, they are separate, existing on their own, lacking connectedness and relations to other models.

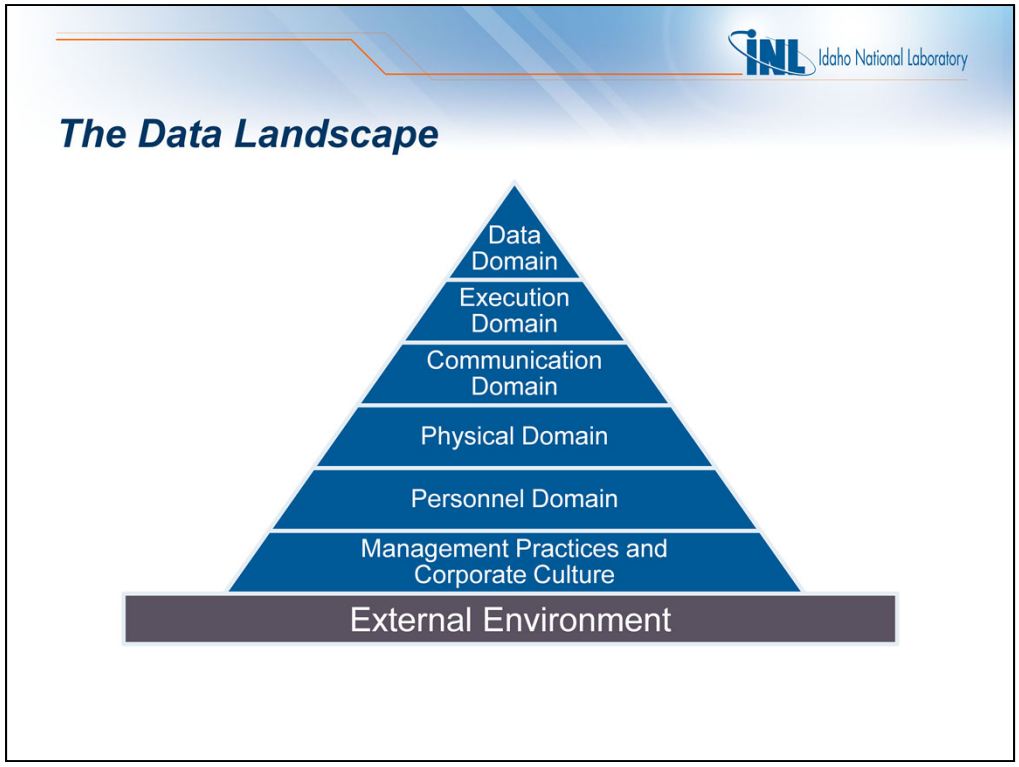


Is there a better way to organize and align both controls and models? In physical security we look at our protected asset, say a building and identify its attributes, behaviors, and all the ways it is interacted with (entry and exit points, etc.). If there is an underlying structure we need to look at the asset we wish to protect (data) and Identify its attributes, behaviors, and interactions.

Data can exist as inactive data to maintain a record or can be of an executable type to perform actions.

It can be communicated, interacts with people and exists in some physical form.

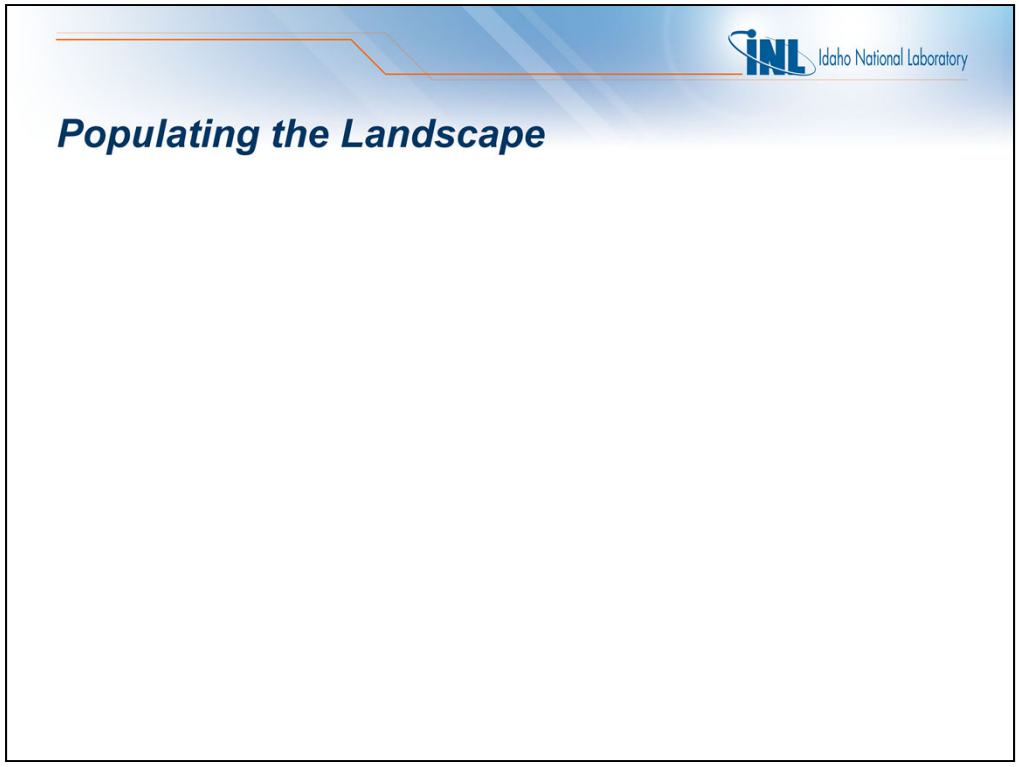
It has the attributes of CIA and is protected by AAA.



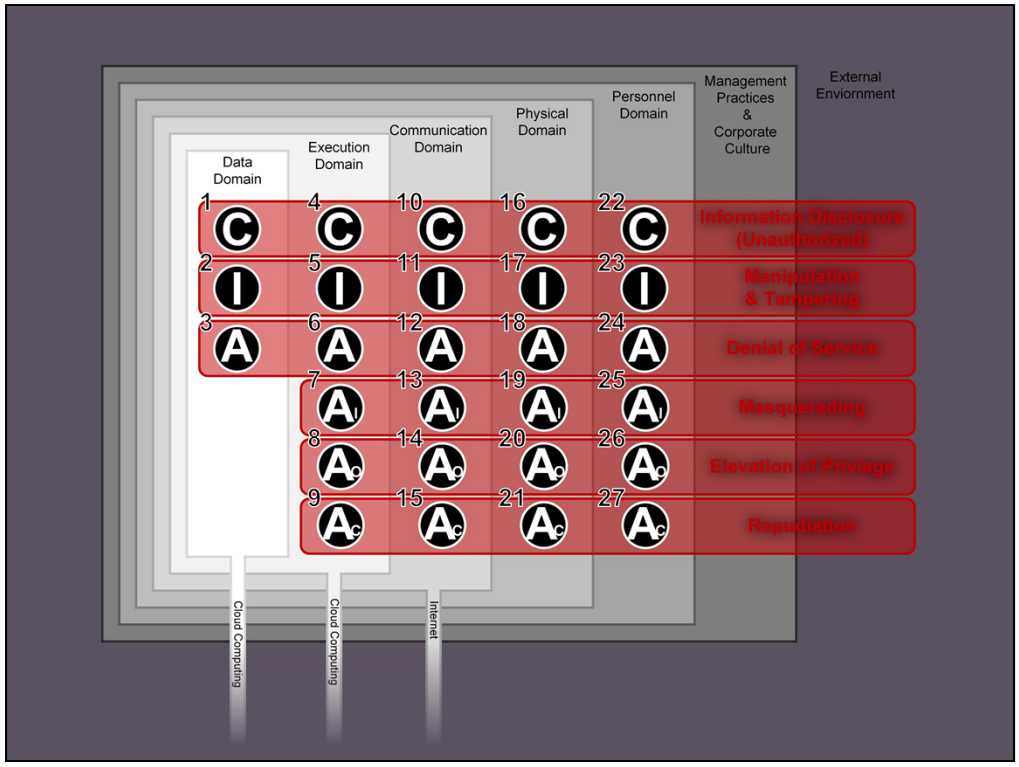
Viewing the environment of data pictorially looks like this.

There is a dependency like nature that exists between each layer In information systems it is seldom that data is interacted without some executable program mediating that action. In order for an executable object to mediate an action it must be communicated with. These will all to exist physically and be accessible to authorized personnel.

While managers are persons too (and thus are firmly in the Personnel Domain) There actions that set the tone for corporate culture are distinctly different from personnel security concerns. It is this corporate culture that insulates your environment from the rest of the world.



Populating starts on next slide



1. Here we see the same pyramid shaped model looking down from the top.
2. CIA is of course applicable to data.
3. CIA is also applicable to these other domains.
4. After we start talking about execution we are talking about interactions. These interactions are controlled using AAA and while ,yes, these each have a dependency on the data domain these dependencies only relate to CIA within that domain (i.e. the data domain)
5. AAA also has its analogs in the other domains. This is the computing environment prior to the internet.
6. With the addition of internet connectivity we put in place a way to circumvent our physical and personnel controls while at the same time enabling business transactions like never before.
7. Cloud commuting is much closer to our protected asset (data) circumventing almost all of our own controls. While this further enables business transactions we have to be aware of the risk this presents.
8. Each attribute can be attacked. If we number each attack we find there are 27 basic threats.

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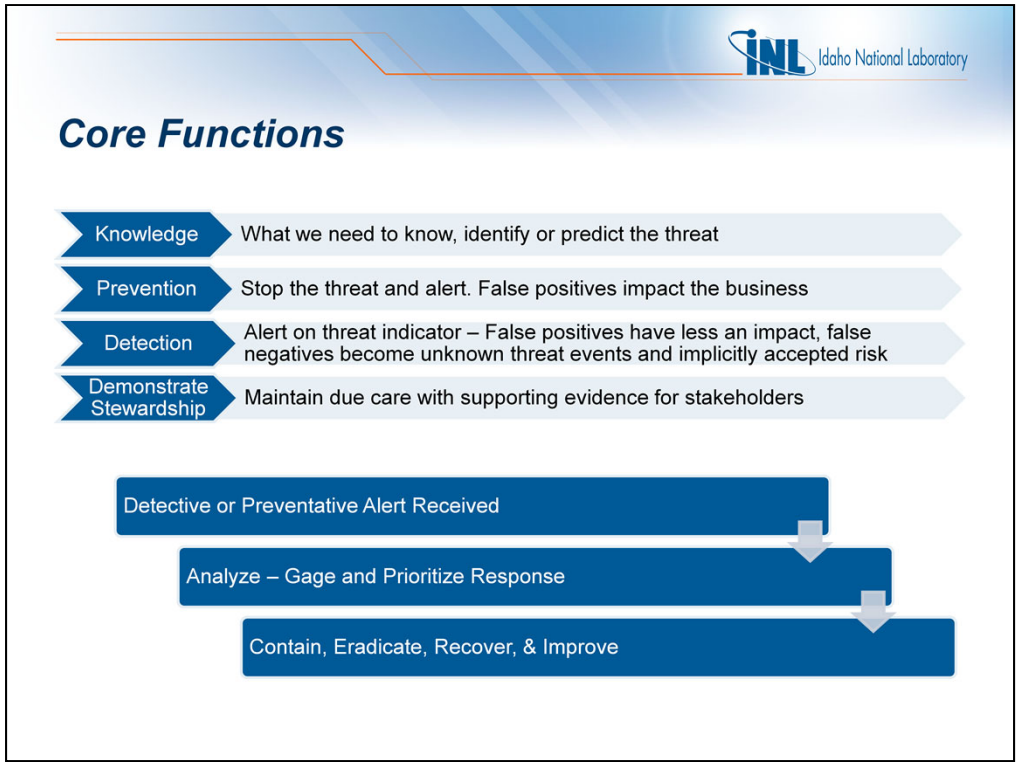
27 Basic Threats

Index #	Description	Security Domain	Compromise Type	Data Attribute
1	Loss or destruction of data	Data	DoS	Availability
2	Data leaked or disclosed	Data	Disclosure	Confidentiality
3	Data corruption (including introduction of unauthorized or falsified data)	Data	Manipulation	Integrity
4	Information system outage or degradation of service	Execution	DoS	Availability
5	Unauthorized access to software or system	Execution	Disclosure	Confidentiality
6	Misuse of software functions	Execution	Manipulation	Integrity
7	Bypass software authentication functions	Execution	Masquerading	Authentication
8	Bypass software authorization functions	Execution	EoP	Authorization
9	Bypass software accountability functions	Execution	Repudiation	Accountability
10	Degradation or disruption of communications	Communication	DoS	Availability
11	Interception or monitoring of communications	Communication	Disclosure	Confidentiality
12	Corruption or falsification of communications	Communication	Manipulation	Integrity
13	Bypass communication authentication methods	Communication	Masquerading	Authentication
14	Bypass communication authorization methods	Communication	EoP	Authorization
15	Bypass communication accountability methods	Communication	Repudiation	Accountability
16	Degradation or disruption of authorized physical access or functions (e.g. facilities, HVAC, power, media, hardware)	Physical	DoS	Availability
17	Unauthorized access to physical assets including information system hardware and media	Physical	Disclosure	Confidentiality
18	Corruption or manipulation of physical assets	Physical	Manipulation	Integrity
19	Bypass physical authentication methods	Physical	Masquerading	Authentication
20	Bypass physical authorizations or introduce unauthorized physical assets	Physical	EoP	Authorization
21	Dispute, avoid or destroy physical accountability controls and records	Physical	Repudiation	Accountability
22	Personnel unable to perform job functions	Personnel	DoS	Availability
23	Insider personnel are known, monitored, and targeted	Personnel	Disclosure	Confidentiality
24	Personnel are manipulated, coerced, recruited or make unintentional errors	Personnel	Manipulation	Integrity
25	Bypass or compromise personnel identity proofing, back ground check, ID check etc.	Personnel	Masquerading	Authentication
26	Bypass personnel authorization controls	Personnel	EoP	Authorization
27	Claim untrue intentions and/or motives	Personnel	Repudiation	Accountability



These core functions have been identified for some time but their relationships have not been well understood.

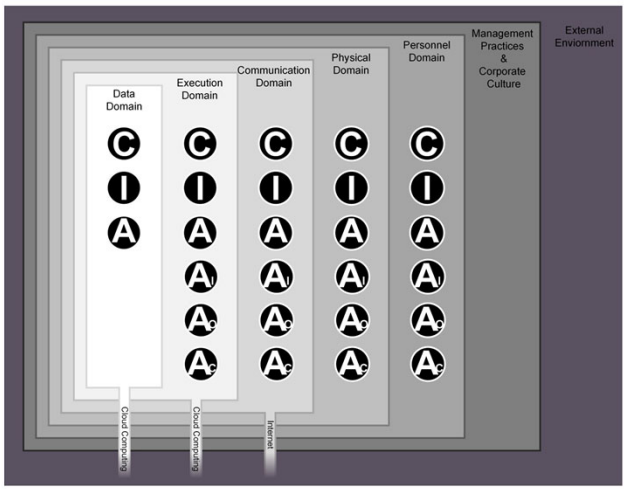
NIST defines the cyber core functions as Know, prevent, detect, respond, and recover. It does not address demonstrating stewardship to stakeholders nor does it close the feedback loop for continual improvement.

My view differs from NIST by not including response and recovery as core functions. While these are essential they are follow on activities to the core functions of prevention and detection.

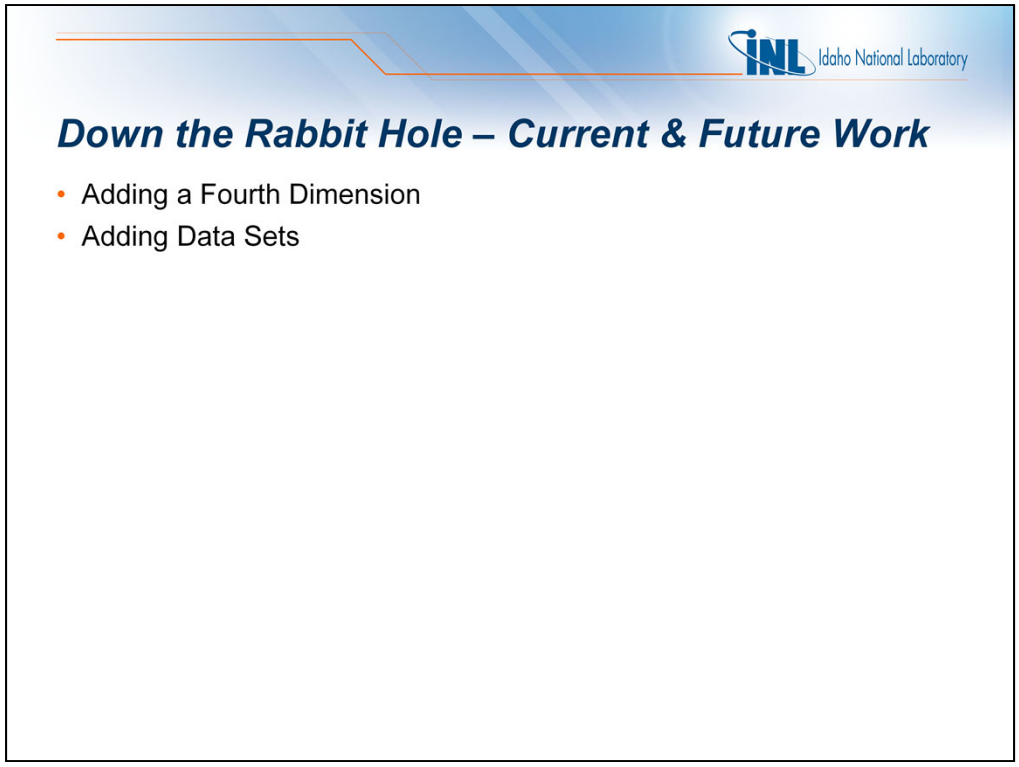
Data Landscape Model Use Case

- USB Flash Drive

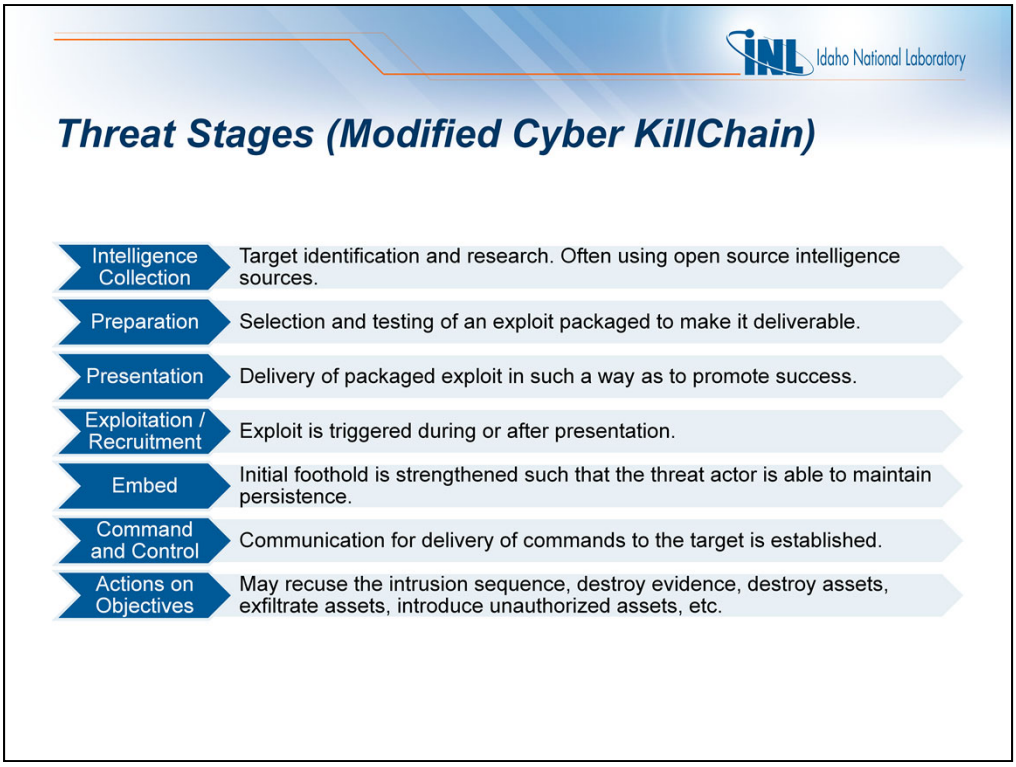
See File: "DLM Use Case Example USB Flash Drive.xlsx"



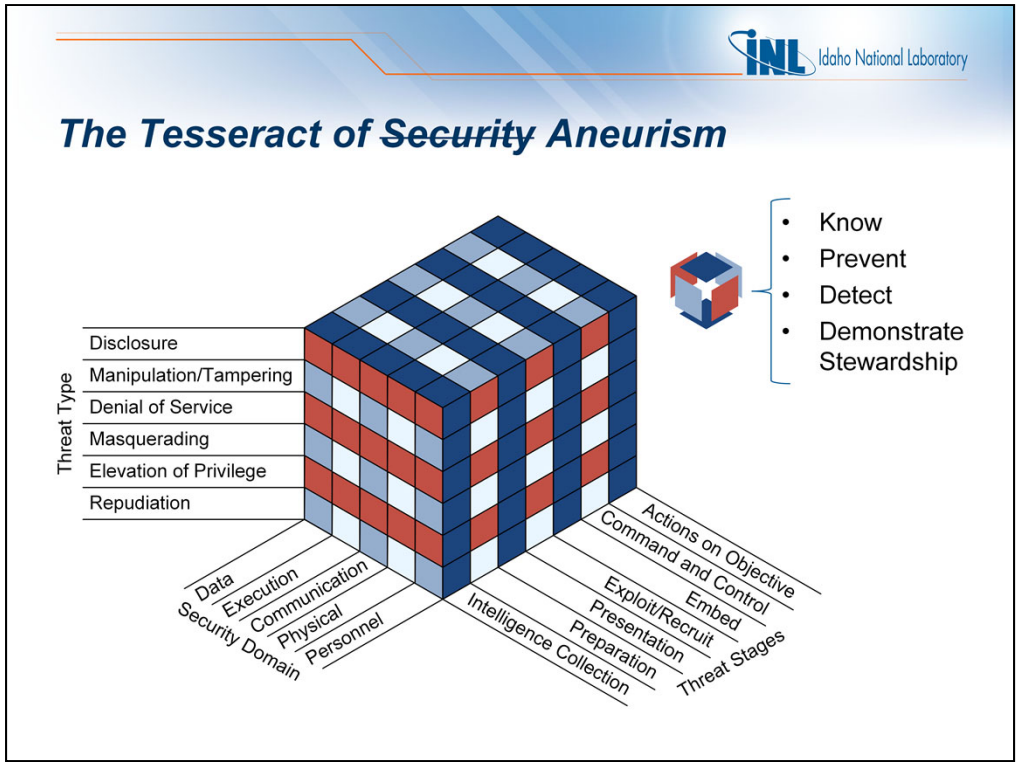
Walkthrough of identifying threat actions and posable mitigations involving USB flash media.



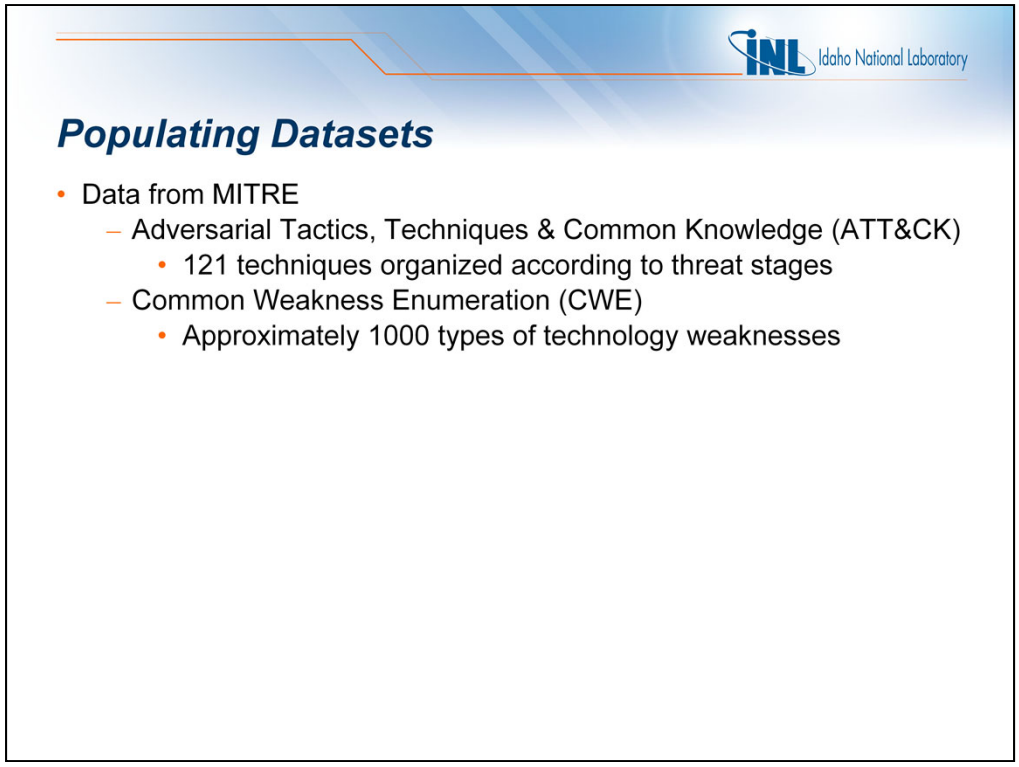
Taking the model much further than we have already is not recommended for day to day threat analysis. It is useful to stress the model as it can provide interesting data that will help us learn about how to best use it. Voids, overlaps, duplication and empty cells will teach us both new things about the model and about our current knowledge. Taking it further may also be useful for the development of security standards.



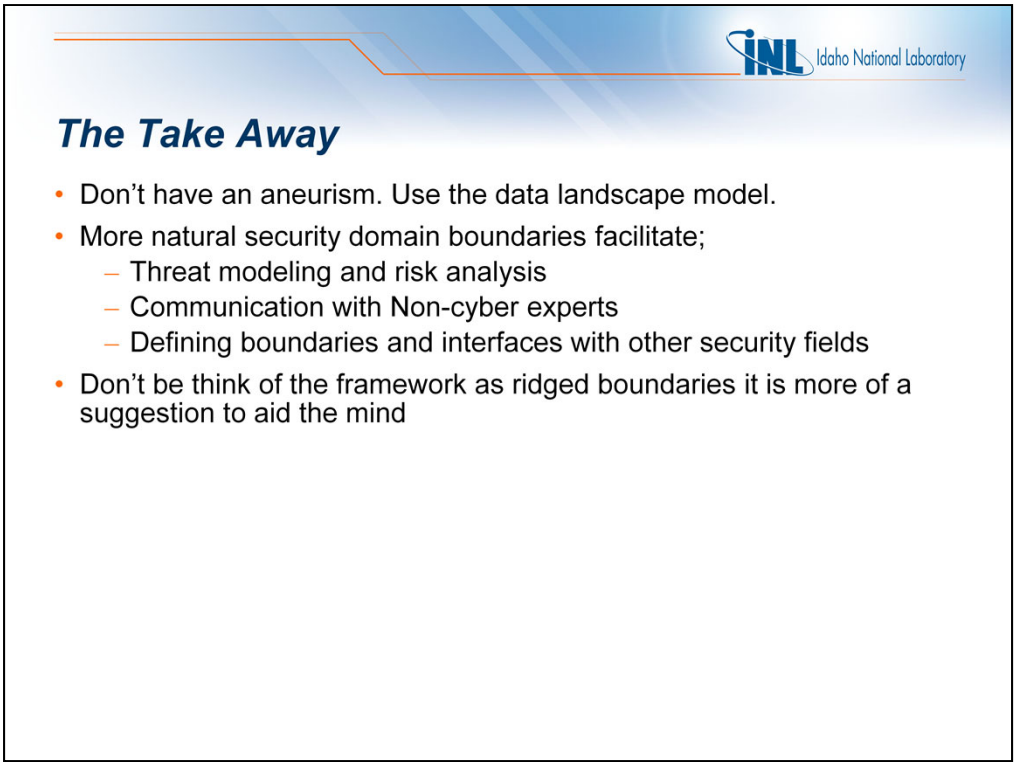
Kill chain developed by Lockheed Martin was taken and adjusted slightly to be more accommodating to the personnel and physical security domains.



Each of the 27 Basic Threats can be broken down further in to Threat Stages. These in turn can be analyzed to identify specific threat actions, related preventative and detective controls along with measures to gauge their efficacy and continued relevance. As a four dimensional model it is a bit more difficult to navigate and thus is not recommended for daily use but it does provide a more fine grained framework that would be beneficial for standards development. Something I am currently working on.



This is something I have slated to do in my free time. I have meet with Sean Barnum, the MITRE architect behind CWE and ATT&CK. He is currently working on merging these two datasets and, I believe, is going to reflect the attack side of each weakness. My work should compliment this quite nicely. Time will tell.



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Questions?