Knowledge Building and Sharing: A Metamodel for Guided Research, Learning, and Application

Kimberly Zeitz & Chris Frisina

Client: Randy Marchany
Director of the VT IT Security Lab
Prior Research Contact: Noha El Sherbiny

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Motivation

- Clarify scattered field concepts
- Guide decision making
- Knowledge sharing and reuse
- Teaching and learning
- Uniform knowledge format for use and comparison

Metamodel

What is it?

- Schema for data
- Construction and organization of domain concepts
- Frames, rules, and constraints for formatting and sharing knowledge

How was it developed?

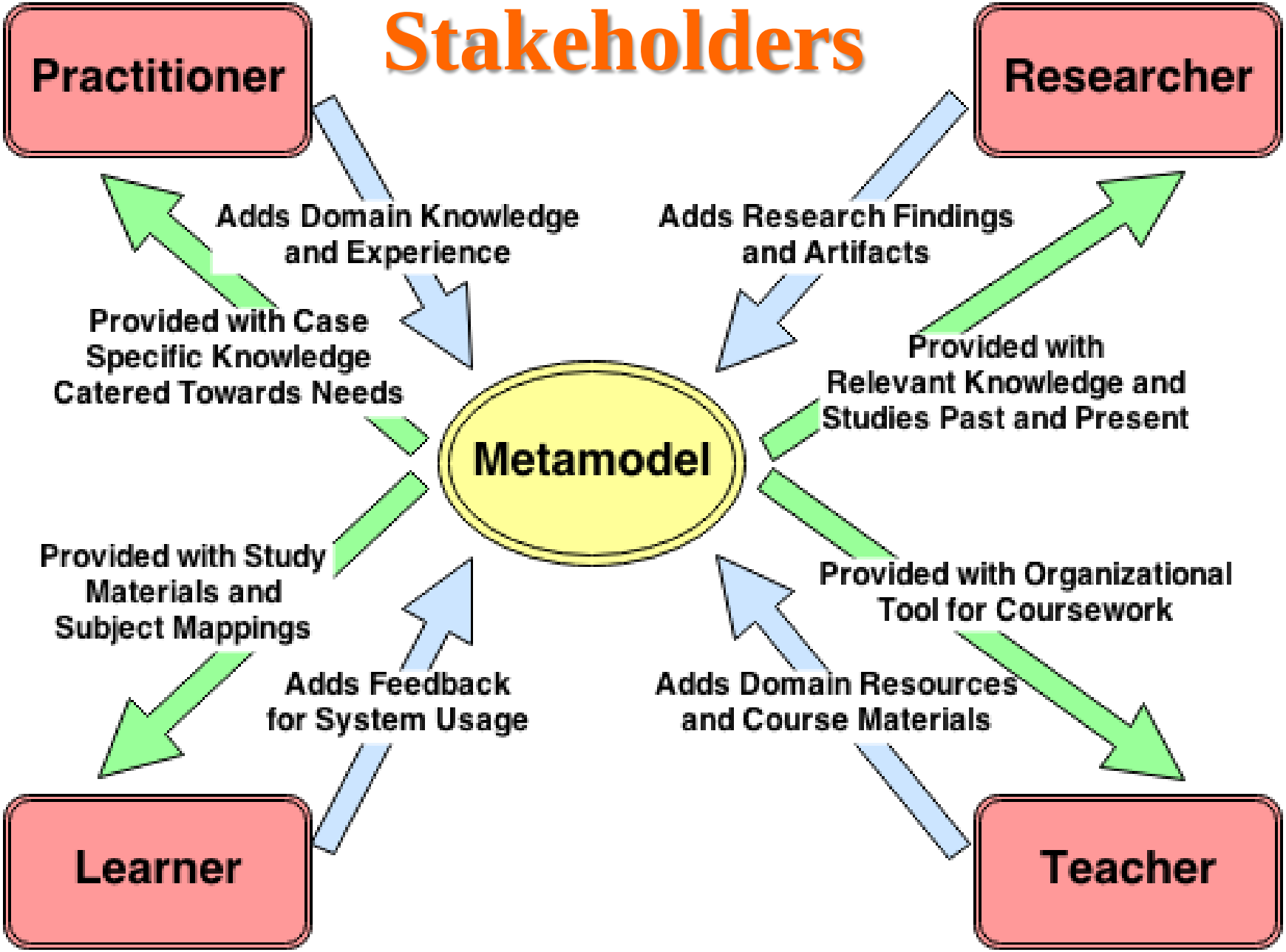
- Motivations and envisioned contributions
- Uniform Format for use with envisioned Digital Library System
- Preservation & Expansion

Metamodel

Utilization

- Organization of research for sharing knowledge
- Applications:
  - Industry application to needs
  - Academic course material organization for teachers and learning tool for students
- Stakeholders Model

Stakeholders



Metamodel

- Validation
  - Proof of Concept
  - Security domain concept overview
  - Preliminary Modeling with Co-occurrence Graph
  - Selected four sub areas
  - MOSAIC: Model of Securing Application Information Confidentiality
  - Further evaluation to be discussed later

Metamodel Format

Sample Format

Name:
Area:
Keywords:
Pros:
+
Cons:
-
Links:
Artifacts
Usage Scenario
Examples
Studies

Proof of Concept

- MOSAIC: Model of Securing Application Information Confidentiality
- Scenario: Sarah has been assigned to assess the security vulnerabilities of the company's internal digital library system and propose solutions

Metamodel Information Flow

Expert Knowledge

Sample Format

Name:
Area:
Keywords:
Pros:
+
Cons:
-
Links:
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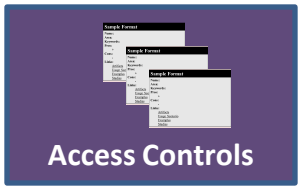
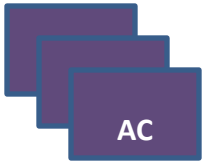
Domain link

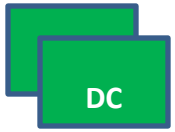


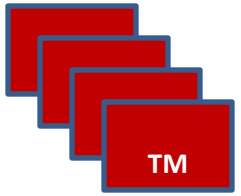
User Criteria

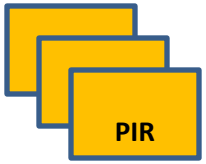
MOSAIC Guided Decision Flow

Pertinent Information

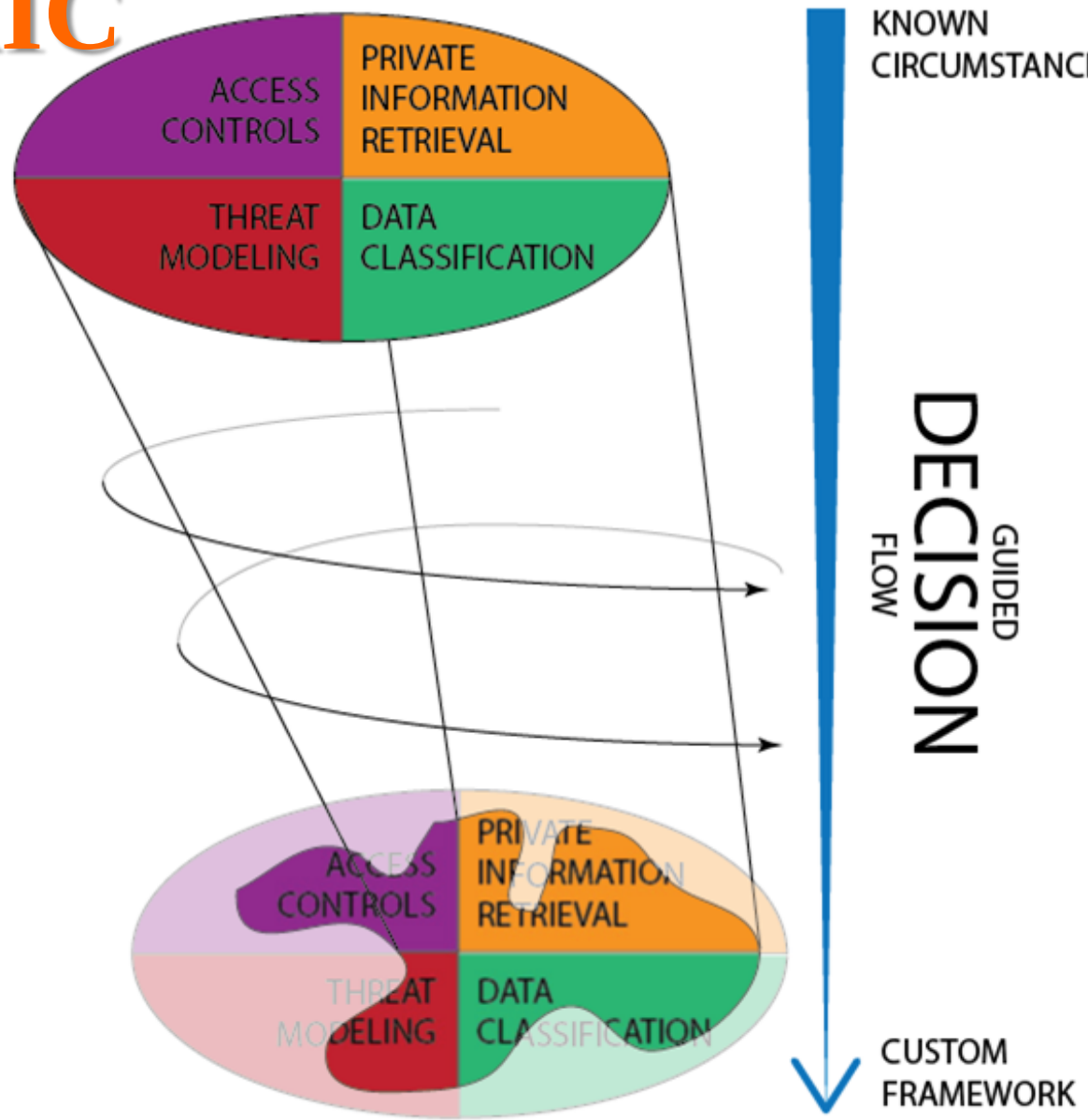








MOSAIC


ACCESS CONTROLS
PRIVATE INFORMATION RETRIEVAL
THREAT MODELING
DATA CLASSIFICATION
KNOWN CIRCUMSTANCES
GUIDED DECISION FLOW
CUSTOM FRAMEWORK

Threat Modeling: Asset-centric Perspective

Name: Asset-centric Perspective
Area: Security/MOSAIC/Threat Modeling
Keywords: Threat Modeling, security
Pros:

+ "Non-experts can typically contribute by identifying assets to focus on" -Adam Shostack
+ Helps identify things attackers want or things you want to protect. -Adam Shostack

Cons:

- "Only experts used to structuring their thinking around assets typically benefit from this type." -Adam Shostack.
- No direct line from assets to threats or security steps -Adam Shostack

Links:

Artifacts
Usage Scenario
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Threat Modeling: Attacker-centric Perspective

Name: Attacker-centric Perspective
Area: Security/MOSAIC/Threat Modeling
Keywords: Threat Modeling, security
Pros:

+ Generally helpful for experts, gathering less-technical input, and prioritizing efforts. -Adam Shostack
+ Useful for creating attacker personas to focus on human centered possibilities -Adam Shostack
+ Can aid in keeping track of expert knowledge gathered from experience -Adam Shostack
+ Help to make threats "real" with a who and why element -Adam Shostack

Cons:

- Hard to translate to what the threats mean for system security -Adam Shostack.
- Has a tendency to evoke "no one would ever do that" when you humanize an attack -Adam Shostack
- Can be swayed by bias of creators of personas and scenarios -Adam Shostack

Links:

Artifacts
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Threat Modeling: System-centric Perspective

Name: System-centric Perspective
Area: Security/MOSAIC/Threat Modeling
Keywords: Threat Modeling, security
Pros:

+ Considered the "best" structured threat modeling approach -Adam Shostack
+ Unique to the existing or envisioned software or system -Adam Shostack
+ Can utilize existing software modeling documentation such as architecture, UML diagrams, or APIs if they are available -Adam Shostack
+ Builds off of a common system understanding -Adam Shostack
+ Shows the accumulating complexity of projects -Adam Shostack

Cons:

- You have to hope that those involved, such as developers, understand the assets and potential attackers -Adam Shostack.

Links:

Artifacts
Usage Scenario
Examples
Studies

Evaluation

- Can conduct an IRB approved study
- Domain expert will organize course materials
- Students in class learn two units of equal difficulty
- Unit 1: Standard text and resources
- Unit 2: Our metamodel
- Look at student feedback and assess progress such as through student presentations or grades

Conclusion

- Metamodel for information sharing, collaboration, and learning
- Lookup and collaboration tool for researchers
- Reference and learning tool for practitioners
- Organization and modeling tool for teachers
- Learning and studying tool for students
- Need:
  - Digital Library for access and contributions
  - User participation both adding and receiving

Questions?

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