Numbers Game

The Case for Quantifying Cyber Threats

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Career in intelligence research & analysis

Early work in physical security

- Importance of “actionable” intel (tuning defenses to the “local” threat landscape)

Quantifying complex security topics

	Theft	Tampering	Smuggling	Disruption	Reputation	Reputation
Country A						
Country B						
Country C						
Country D						
Country E						
Country F						

Realities of Today's Landscape

Growing Landscape: By the Numbers

Mandiant (2023): 3,500 threat groups (+900)

Microsoft (2023): 300 actors (160 nation-state, 50 ransomware)

Google TAG (2021): 270 state-sponsored groups (50 countries)

Tidal Cyber (2024): 98 ransom groups with extortion sites (+78% since '22)

ATT&CK (2023): 600+ (Sub-) Techniques

Fact: Landscape is growing – more threats are identified each year

Fact: CTI resources are limited – no team can track & address every threat at all times

Prioritization is a **must**

- But there is little consensus on how to prioritize (rank order) amongst complex threats
- A methodology for structured prioritization is needed

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Comparing Complex Threats

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https://www.crowdstrike.jp/adversaries/wizard-spider/

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Comparing Complex Threats

Tools

Intent

Proximity

Likelihood

TTPs

Sophistication

Capability

Impact

Resources

Opportunity

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Case Study from the Physical Realm

Ongoing cargo security program launched in 2001

Overwhelming shipment volumes = unacceptable exposure

Prioritization of security validations based on **structured "risk assessments"**

- Incentives for cooperating partners

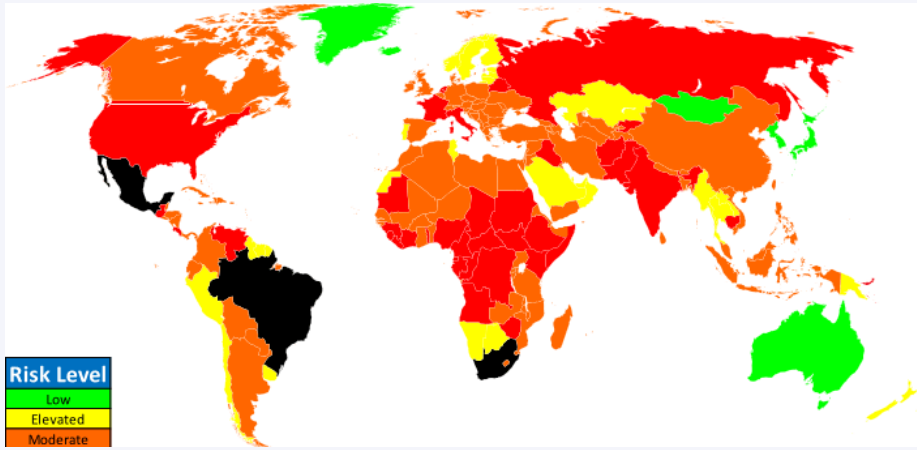
Step 2: Structured Threat Assessment

- 5 key threat areas, 3-point rating scale, **~190 countries**

C-TPAT Customs-Trade Partnership Against Terrorism

C-TPAT Risk Assessment Guide

Location: Country XYZ			
Region: Region JK	Overall Threat Rating High		
Threat Risk Factor	**Risk Rating**	**Activity**	**Source**
Terrorism (Political, Bio, Agro, Cyber)	3	2019, 2020—Recent domestic bombings and violence against U.S. based interests	Name of news publication, government site, open source information, Intel service, etc.
Contraband Smuggling	3	2019, to present— location known for narcotics exports and weapons smuggling	Name of news publication, government site, open-source information, Intel service, etc.
Human Smuggling	1	2000 to 2018— numerous incidents of human smuggling; none since 2018	Name of news publication, government site, open-source information, Intel service, etc.



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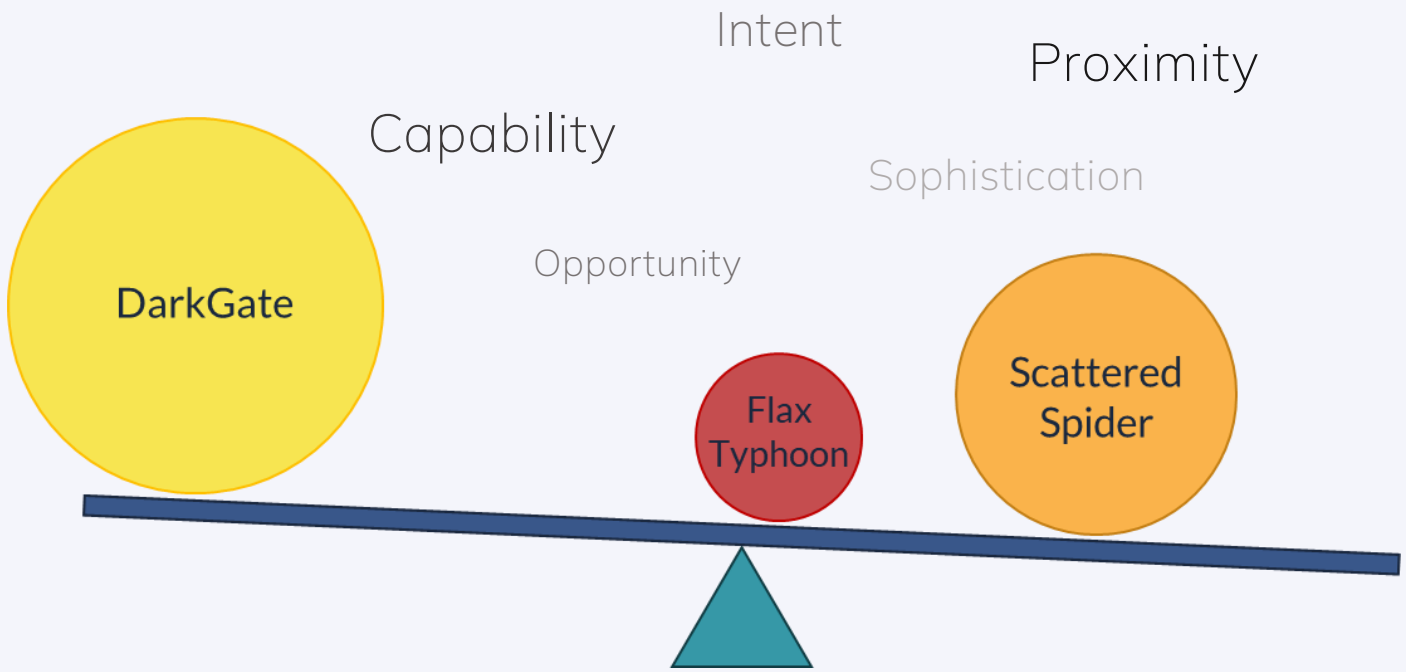
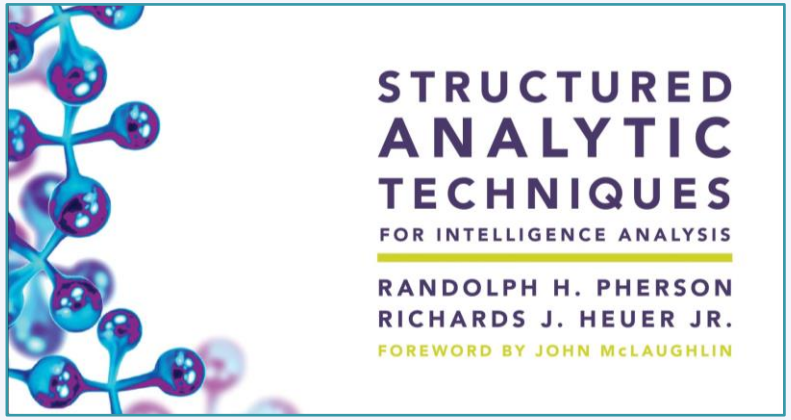
Prioritization via “Quantification”

“Threats” is an extremely complex topic…

Threat information must be **normalized** in order to make **fair** comparisons

- Check assumptions, limit bias
- Consistency
- Repeatability





“SAT for Tactical Intel”

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Decomposing “Threat”: Quantification Criteria

- Threat
  - Intent
  - Capability / Sophistication / Capacity
  - Opportunity

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Decomposing “Threat”: Quantification Criteria

- Threat
  - Intent
    - Proximity
      - Direct, Proximate (Industry/Peers), Indiscriminate
    - Prevalence
      - Volume, Recency, Victimology, Relationships, Reporting Attention
  - Capability / Sophistication / Capacity
    - Resources
      - State-backing? Exploits?
    - Tools
      - Type, Number/Variety, Availability
    - TTPs
      - Technique Importance

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Popular Sources for “Normalized” CTI Data

“Intent” / “Proximity”

ETDA/ThaiCERT: Threat Encyclopedia

AlienVault OTX

MISP Threat Actor Galaxy

SecureWorks Cyber Threat Group Profiles

Palo Alto Unit42 Playbooks

CrowdStrike Threat Landscape

APT Groups & Operations (public Google Sheet)

“Capability” / “Capacity”

MITRE ATT&CK®

Ransomware victim claims (Ransomwatch/look/.live)

Malware sandbox trends (MalwareBazaar, Any.Run, etc)

Red Canary Intelligence Insights

Email security trends (e.g. Hornet Security Monthly Threat Roundup)

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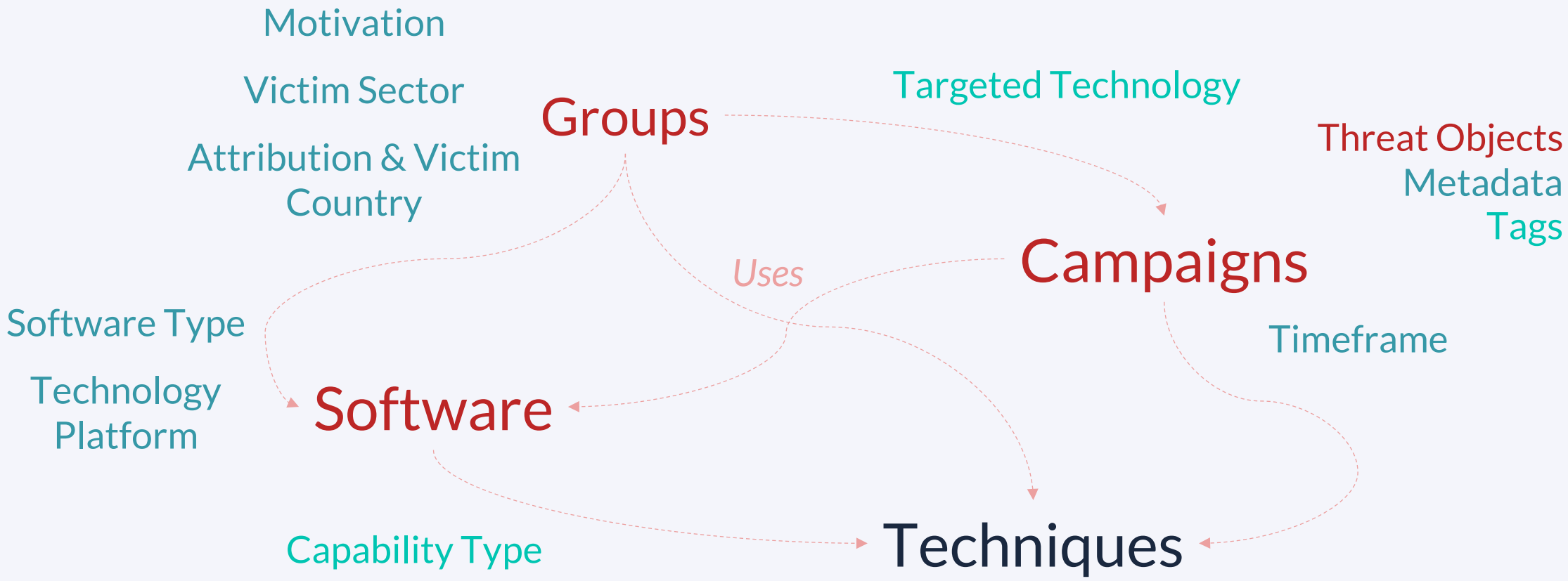
ATT&CK Elements + Extensions



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Weighting	Level	Criteria	Representative Examples
5	Superior	Characterized by groups suspected of possessing near-unlimited or very large supplies of resources. Groups often consist of many operators who generally possess high levels of skill and OPSEC. Funding is typically high and provided by a state, but may be supplemented with illicit sources. Often uses custom, sophisticated tooling (alongside existing tools) and has usually been associated with multiple novel techniques or exploits.	The most advanced/prolific APTs (e.g. APT28, Lazaurs Group)
4	High	Characterized by groups suspected of possessing very large resource supplies. Group members generally possess high levels of skill and OPSEC. Funding is relatively high and may be provided by a state or illicit sources. May use custom, sophisticated tooling alongside existing tools, and might be known to periodically use novel techniques or exploits.	-Major/well-known APTs supporting major adversarial nations (e.g. APT41, Fox Kitten) -The most advanced/prolific ransomware-as-a-service operations (e.g. LockBit, ALPHV/BlackCat)
3	Moderate	Characterized by possessing access to many resources, including funding which may come from a nation-state or illicit means. These groups may be linked to a considerable volume of attacks but may also have mixed levels of success and/or periodic OPSEC blunders. May use custom tooling, but it typically does not display extreme sophistication. (This is also a common assignment for APTs and major crimeware operations when knowledge gaps remain.)	-Many APTs -Many prolific initial access threats (e.g. QakBot, SocGholish, Emotet)
1-2	Low/Limited	May be individual actors or groups, generally smaller and/or loosely organized ones. Adversaries here may claim or threaten attacks often but do not consistently follow through, at least successfully. Funding is usually limited and not at nation-state scale. Operators and their tools are usually not highly sophisticated, although some successful attacks may have occurred. Custom tools and novel exploits are uncommon. This is also a common assignment when significant knowledge gaps remain.	-Hacktivists -Lower-tier APTs & ransomware groups (including where knowledge is limited) -Infostealer campaigns

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https://www.tidalcyber.com/threatpebookasset *(ungated)*

Methodology in Practice

Threat = Intent x Capability x Opportunity

Most practical for quantifying

Threat Profile Inputs	Intent (Proximity) Score	Capacity (Capability) Score	Final Score (Average)
APT28	5		
Andariel	5		
TA1337	5		
Wicked Panda	4		
BlackCat	3		
BumbleBee	2		
Raccoon Stealer	1		
	...		

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Methodology in Practice

Threat = Intent x Capability x Opportunity

Most practical for quantifying

Threat Profile Inputs	Intent (Proximity) Score	Capacity (Capability) Score	Final Score (Average)*
APT28	5	5	5
Andariel	5	4	4.5
BlackCat	3	5	4*
Wicked Panda	4	4	4
TA1337	5	2	3.5
BumbleBee	2	3	2.5
Raccoon Stealer	1	2	1.5
...			

*Leave room for expert analyst judgement!

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Pro Tips / Wrapping Up

Best Practices

- Weighting guidance
  - Leave room for expert analyst judgement
  - 1-5 is common, but narrower (and much wider) approaches exist
  - It’s ok to assign low scores!
- Recency advice
- Profile update cadence

Common Criticisms

- Aren’t most threats ultimately “the same”?

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