Risks Threats and Vulnerabilities

The Fundamentals of R-T-A

Agenda

- Analysis vs. Assessment
- Risks
- Threats
- Vulnerability
- The Flow of R-T-A

Analysis vs. Assessment

- An assessment is more of a general comparison of something to a standard, or between two something; which is better, more correct, which is closer to the color teal.
- An analysis requires deep scrutiny and calculated measuring and recording of criteria.
- An assessment is not exact, an analysis is more precise and less general than an assessment.

HAZARDS

- Existing condition or possible (under current conditions) situation that **has the potential to generate a disaster**
- Natural hazards – naturally occurring phenomena – weather, topographic, geological, hydrological, etc.
- Human systems developed – caused by human activity, infrastructure, transportation, etc.
- Conflict based – civil war, terrorism, nuclear war, etc.

HAZARDS - Examples

- Hurricanes and tornadoes during their seasons
- Earthquakes
- High hazard, poorly maintained dams
- Airlines with abysmal safety records
- Power production systems with either dangerous technologies or poorly maintained transmission systems

Disasters

- The Highest DEGREE of any HAZARD…

Risk

- The probability that a particular threat will exploit a particular vulnerability
- Need to systematically understand risks to a system and decide how to control them.
- **Risk = Probability x Impact**

Examples of Risk

- Overreliance on security monitoring software
- Inadequate system logging
- Technology innovations that outpace security
- Outdated operating systems
- Lack of encryption
- Data on user-owned mobile devices
- IT “diplomatic immunity” within your organization
- Lack of management support
- Challenges recruiting and retaining qualified IT staff
- Segregation of duties

Threat

- An expression of intention to inflict evil injury or damage
- Attacks against key security services
  - Confidentiality, integrity, availability
- The operationalization of vulnerability, expected impact of a developing hazard, and the probability that impact will work against your vulnerabilities
- Threat means something bad is coming your way – high threat means it is highly likely to hit you and it will be very bad

Example Threat List

- T01 Access (Unauthorized to System - logical)
- T02 Access (Unauthorized to Area - physical)
- T03 Airborne Particles (Dust)
- T04 Air Conditioning Failure
- T05 Application Program Change (Unauthorized)
- T06 Bomb Threat
- T07 Chemical Spill
- T08 Civil Disturbance
- T09 Communications Failure
- T10 Data Alteration (Error)
- T11 Data Alteration (Deliberate)
- T12 Data Destruction (Error)
- T13 Data Destruction (Deliberate)
- T14 Data Disclosure (Unauthorized)
- T15 Disgruntled Employee
- T16 Earthquakes
- T17 Errors (All Types)
- T18 Electro-Magnetic Interference
- T19 Emanations Detection
- T20 Explosion (Internal)
- T21 Fire, Catastrophic
- T22 Fire, Major
- T23 Fire, Minor
- T24 Floods/Water Damage
- T25 Fraud/Embezzlement
- T26 Hardware Failure/Malfunction
- T27 Hurricanes
- T28 Injury/Illness (Personal)
- T29 Lightning Storm
- T30 Liquid Leaking (Any)
- T31 Loss of Data/Software
- T32 Marking of Data/Media Improperly
- T33 Misuse of Computer/Resource
- T34 Nuclear Mishap
- T35 Operating System Penetration/Alteration
- T36 Operator Error
- T37 Power Fluctuation (Brown/Transients)
- T38 Power Loss
- T39 Programming Error/Bug
- T40 Sabotage
- T41 Static Electricity
- T42 Storms (Snow/Ice/Wind)
- T43 System Software Alteration
- T44 Terrorist Actions
- T45 Theft (Data/Hardware/Software)
- T46 Tornado
- T47 Tsunami (Pacific area only)
- T48 Vandalism
- T49 Virus/Worm (Computer)
- T50 Volcanic Eruption

Characterize Threat-Sources

Threat-source	Motivation	Threat Actions
Hacker	Challenge, ego, rebellion	Hacking Social engineering System intrusion Unauthorized access
Terrorist	Blackmail, Destruction, Revenge	Information warfare System attack System tampering
Insider	Ego, Revenge, Monetary gain	Blackmail Malicious code Input of falsified data System bugs

VULNERABILITIES

- If you have a hazard you may or may not be vulnerable to it
  - Live in the flood plain – vulnerable to floods
  - Live on high ground – not vulnerable to floods
- Vulnerability is an assessment of how well or how poorly protected you are against an event
- Vulnerabilities are flaws / weaknesses in any system which can be utilized to generate **“Threat”**

Vulnerabilities

- Flaw or weakness in system that can be exploited to violate system integrity.
  - Security Procedures
  - Design
  - Implementation
- Threats trigger vulnerabilities
  - Accidental
  - Malicious

VULNERABILITIES

- Vulnerabilities may be reduced by mitigation measures (building construction, land use control, maintenance, etc.)
- Or by the level of preparedness you have achieved (well trained and equipped emergency teams, plans, exercises, etc.)

Factors influencing VULNERABILITY

- Three factors may influence the determination of vulnerability
  - Criticality – how important is the asset or function that is subject to impact
  - Exposure – to how much of the force of the event is the resource exposed
  - Time – does vulnerability fluctuate over time of day, month, season?

Examples of Vulnerabilities

- *Physical*
- *V01 Susceptible to unauthorized building access*
- *V02 Computer Room susceptible to unauthorized*

access

- *V03 Media Library susceptible to unauthorized*

access

- *V04 Inadequate visitor control procedures*
- *(and 36 more)*
- *Administrative*
- *V41 Lack of management support for security*
- *V42 No separation of duties policy*
- *V43 Inadequate/no computer security plan policy*
- *V47 Inadequate/no emergency action plan*
- *(and 7 more)*
- *Personnel*
- *V56 Inadequate personnel screening*
- *V57 Personnel not adequately trained in job*
- *...*
- *Software*
- *V62 Inadequate/missing audit trail capability*
- *V63 Audit trail log not reviewed weekly*
- *V64 Inadequate control over application/program*

changes

Communications

- *V87 Inadequate communications system*
- *V88 Lack of encryption*
- *V89 Potential for disruptions*
- *...*
- *Hardware*
- *V92 Lack of hardware inventory*
- *V93 Inadequate monitoring of maintenance*

personnel

- *V94 No preventive maintenance program*
- *…*
- *V100 Susceptible to electronic emanations*

IMPACT

- Assessment of interaction of hazard effects with your vulnerabilities
- Scalar based on the two key variables – hazard strength and vulnerability level
- Will be hazard specific in aggregate (hurricane impacts), but may be functionally common to a variety of hazards in the specific (power loss)

IMPACT

MODERATE Strong Hazard Low Vulnerability	**HIGH** Strong Hazard High Vulnerability
LOW Weak Hazard Low Vulnerability	**MODERATE** Weak Hazard High Vulnerability

Factors influencing IMPACT

- Two other factors are related to impact
  - Magnitude – the absolute size and power of the event
  - Intensity – the measurement of the effects of the event – how it is felt
- All else being equal an event with greater magnitude will tend to be a more intense event and generate greater impacts

CONSEQUENCES

- Result of the interaction of the Impact of the event with other systems
  - Political,
  - Social and cultural,
  - Economic, etc.
- May set the stage for either:
  - Future events, or
  - Vulnerability reduction through mitigation and preparedness

CONSEQUENCES

- The border between consequence and impact is fuzzy, but
  - Impacts tend to be directly related to the effects of the event, consequences more second order
  - Impacts tend to be shorter term (hours to decades), consequences longer term (weeks to centuries)
  - Although coupled to impacts, consequences are neither automatic nor irreversible
  - Consequences tend to be more human-centric, impacts more event-centric – we make the consequences, the event makes the impact

PROBABILITY

- A mathematical assessment of how likely it is that a specific event will occur
- Based on a wide variety of factors – history, global warming, infrastructure and demographic changes, new industries, changes in your activities and processes, etc.

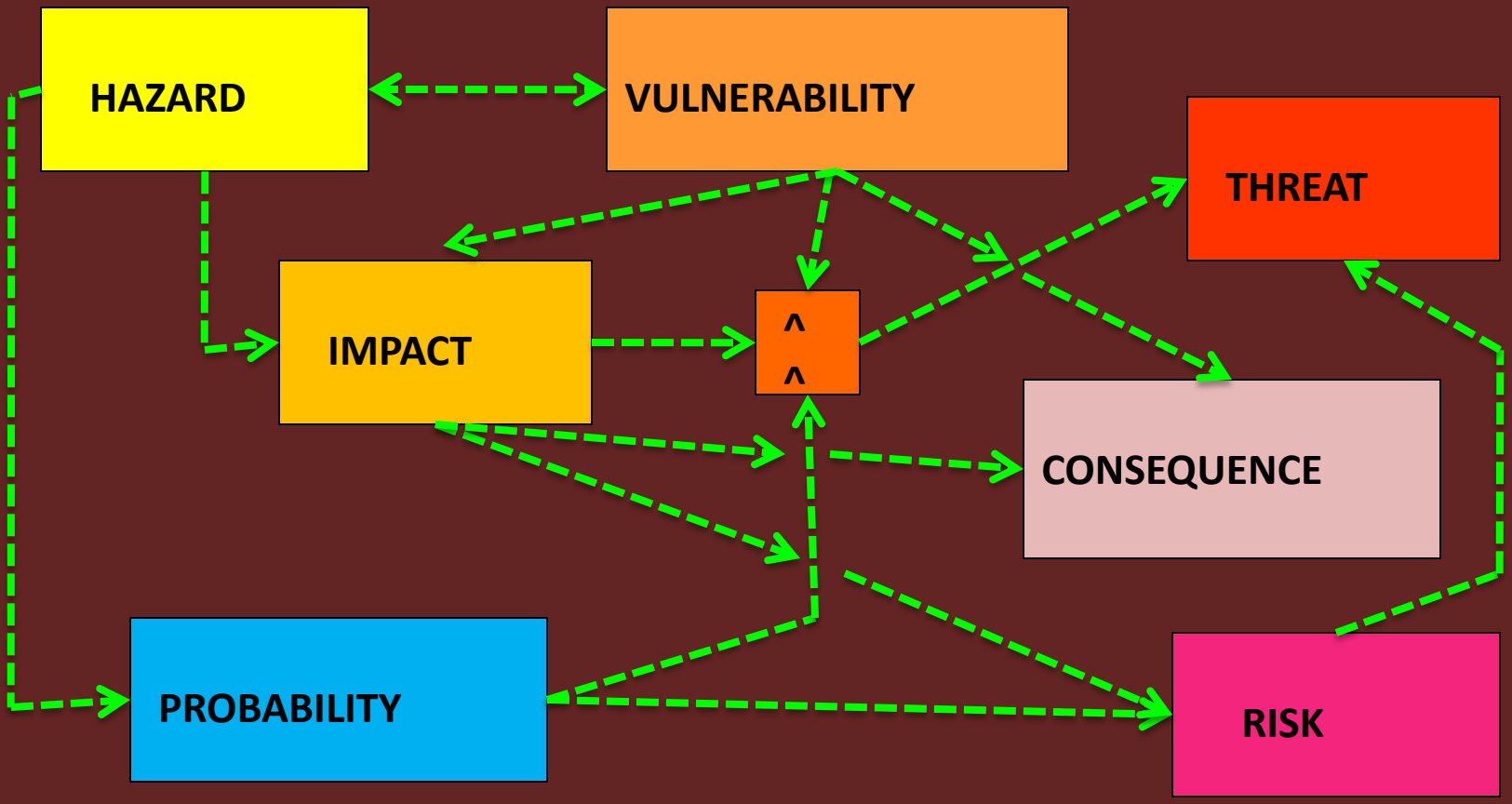
PROBABILITY

- Expressed in a variety of ways:
  - This year we expect 14 named tropical storms, 8 hurricanes, 3 great hurricanes … (an assessment of general level)
  - There is a 45% chance of … (a numerical assessment)
  - A 500 year flood … (a statement of cycles)
  - And then there is likelihood: “I think it is highly likely that …” (a qualitative assessment)

LIKELIHOOD

- An inexact, qualitative statement of how one assesses probability
- Generally expressed in broad bands that cover a range of probability values
  - High – “likely”
  - Low – “unlikely”
- Easily understood, but also misleading – likely is interpreted as “yes, it will,” unlikely as “no, it will not”

THE FLOW


HAZARD
VULNERABILITY
THREAT
IMPACT
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CONSEQUENCE
PROBABILITY
RISK

Asset, Vulnerability, Threat, Risk & Control

- **Asset**= anything has value to the organization
- **Vulnerability**= any Weakness of Asset
- **Threat**= any possible Danger
- **Risk**= Vulnerability exposed to Threat

  Risk= Vulnerability X Threat
- **Control**= Countermeasure to reduce Risk

Here are some important characteristics of the three components:

- **Threats (effects) generally can NOT be controlled.**

One can't stop the efforts of an international terrorist group, prevent a hurricane, or tame a tsunami in advance. Threats need to be identified, but they often remain outside of your control.

- **Risk CAN be mitigated**

Risk can be managed to either lower vulnerability or the overall impact on the business.

- **Vulnerability CAN be treated**

Weaknesses should be identified and proactive measures taken to correct identified vulnerabilities.


Thanks