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Response to Extreme Events

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Critical Properties of Networks

- Rich Connectivity (Speed, Reach, Multi-nodal)
- Many points of entry and egress
- There are many types; they are dynamic and richly interconnected
 - Logical (Data, Information, Intelligence)
 - Human (Cognitive, Emotional, Perceptual)
 - Linguistic (Descriptive, Contextual, Semiotic)
 - Physical (Terrain, Environment, Platform)
 - Technological (Point to point, Satellite, LAN/WAN)
- Many topologies (Hierarchical, Meshed, Domain)
- Various propagation characteristics (Point to point, Broadcast, Community, Push versus Pull)
- Will be dynamically changing (Peer to peer, Learning, Effects driven)
- All properties are inter-related
- Only when all the information that is available in all networks is exploited optimally will the picture be an excellent fit to reality



Types of extreme events

- Physical
- Human
- Logical
- Information
- Technological
- Concurrent
- Sequential



Physical

- Man made
 - Sabotage
 - Suicidal
 - Remote
- Natural disaster
 - Predicted
 - Sudden
- Failure and accident



Human

- Physiological
 - Natural v man-made
- Mental
 - Chemically induced
 - Belief driven
- Collective
- Individual



Logical

- Design
- Acquisition
- Validation and verification
- Implementation
- Operation



Information

- Confidentiality
- Integrity
- Availability
- Provenance
- Metadata



Technological

- Faults
- Failures
- Common mode
- Replacement
- Legacy



Concurrency

- Architectural
- Arranged
- Physically distributed
- Causality
- Common mode
- Evidence



Sequential

- Domino effect - inevitable
- Sequential by design
- Protocol driven
- Lemming phenomena
- Time constants



Conclusions

- Man made events to disrupt and destroy are being thought about using similar analysis
- Natural events will have more impact as we build society on complex structures which have unexpected emergent properties when damaged
- More holistic thinking about and simulation of responses of complex networks to extreme events is needed to mitigate risks and focus investment