



Emerging Information Infrastructures: Cooperation in Disasters

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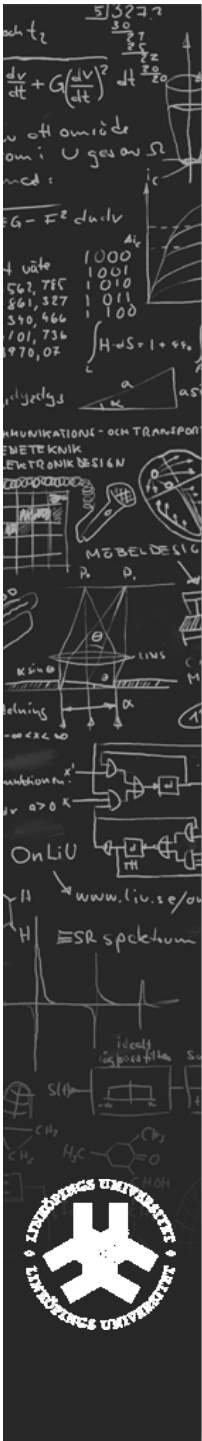
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What does disaster have to do with CI?

A disaster scenario represents the extreme case of many critical infrastructures broken!



Two different worlds?



Handwritten mathematical notes and diagrams on a chalkboard background. The notes include:

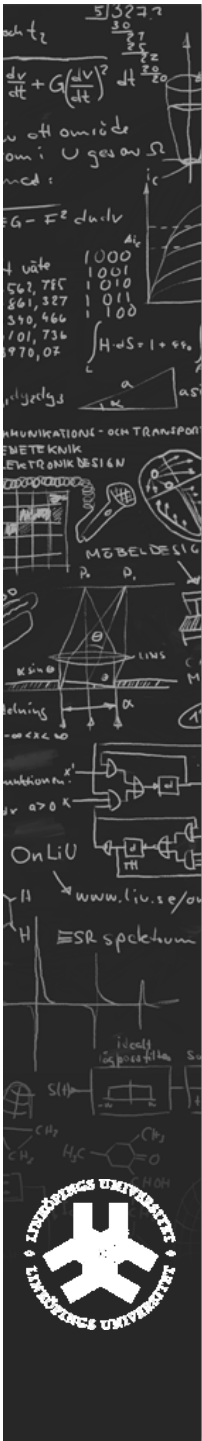
- $\frac{dv}{dt} + G\left(\frac{dv}{dt}\right)^2 dt$
- $G = F^2 da \cdot dv$
- Hand-drawn graphs and diagrams.
- Text: "Kommunikations- och Transportteknik Elektronisk Design"
- Text: "Möbeldesign"
- Text: "OnLiU" and "www.liu.se/ov"
- Text: "ESR spektrom"
- Chemical structures: CH_2 , $H_2C=CH_2$, CH_3 , $CH_2=O$



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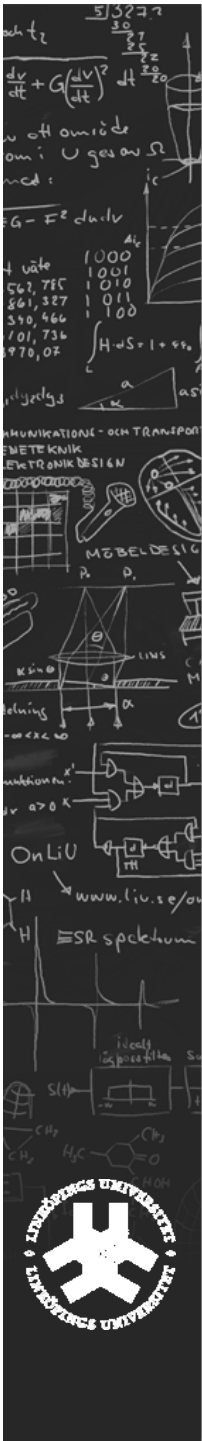
Existing Infrastructures

- Characteristics
 - Correctly functioning most of the time
 - Information infrastructures: Large scale and resilience built in
 - Power and telecom: Well-managed and partially contained subsystems
- Things are changing...



Existing Infrastructures: challenges and outlook

Challenge	Emerging solution
Complexity and interdependencies	Modelling and risk analysis
Transition from managed to unmanaged	Peer-to-peer technologies, self-managing systems
Heterogeneity	Standardised protocols, overlay networks, software defined radio
Organised threats with economic motives or adversary disruptions	Hardening, intrusion tolerance, diversity, partial rejuvenation



Existing infrastructure collapses

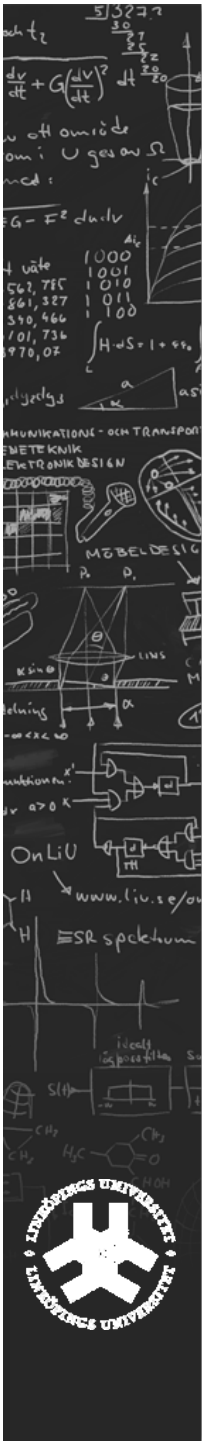
- Existing infrastructure collapses



Chaotic & surprising
Network: lack of
resources

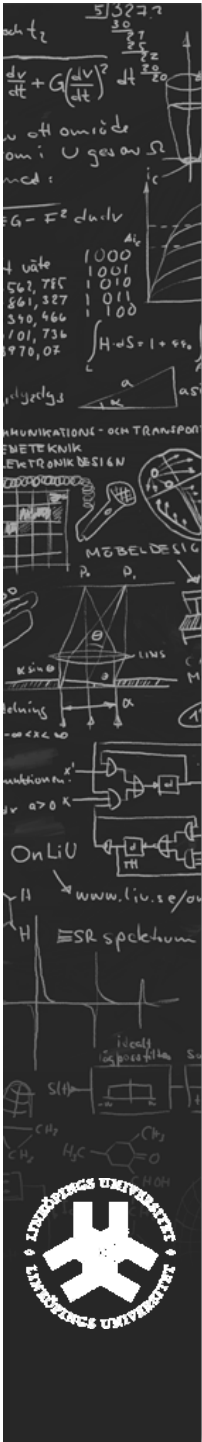


- Actors are spread out and mobile
- Communication culture clashes



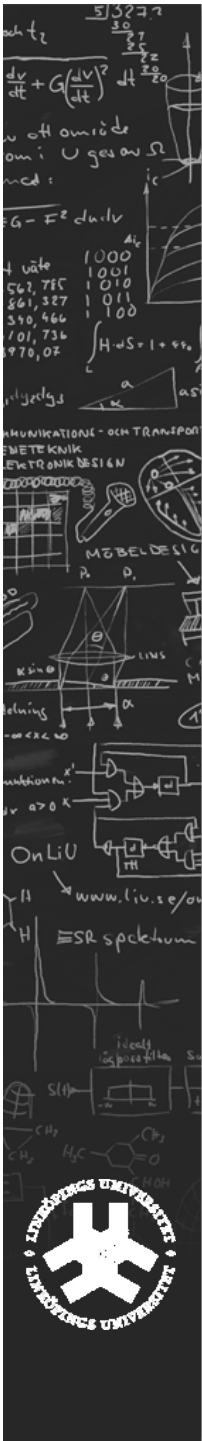
Disaster Response Infrastructure Role

- Provide common operational picture
- Support matching needs and resources



Our Hypothesis

- Hastily formed networks can have a role to play
- Use commodity hardware and massively distributed software
- Have built-in mechanisms for
 - When batteries are in short supply
 - Mobility changes connectivity
 - Dealing with overload and urgency
 - Detecting and responding to abuse



Disaster Response Networks: Challenges

Challenge	Emerging solution
Disconnectivity as a norm	Store-and-forward techniques, delay-tolerant networks (DTN)
Resource constraints	Quality-of-service techniques, prioritisation, optimisation
Infeasibility to centrally manage	Distributed gossip-style protocols
Heterogeneity	Overlay networks, DTN bundles
Security: less organised opportunistic threats or adversary disruptions	Reputation-based systems, selfish-resistant protocols, intrusion detection



Ongoing Project

- Hastily Formed Networks with Heterogeneous Users
 - Financed by Swedish Emergency Management Agency (2008-2011)
- <http://www.ida.liu.se/~rtslab/HFN>



Welcome to next CRIS conference!

CRIS 2009

28-30 April

Linköping Sweden



Theme

Critical infrastructures: Migration from existing technologies to future platforms

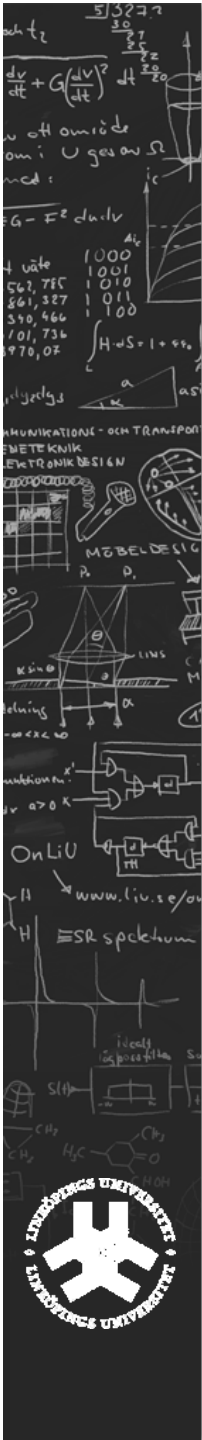
Check the CFP!

www.ida.liu.se/conferences/CRIS2009



Important dates

- Deadline for submission: 1 January 2009
- Notification of results: 15th February



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