Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP)

at the National Science Foundation (NSF)

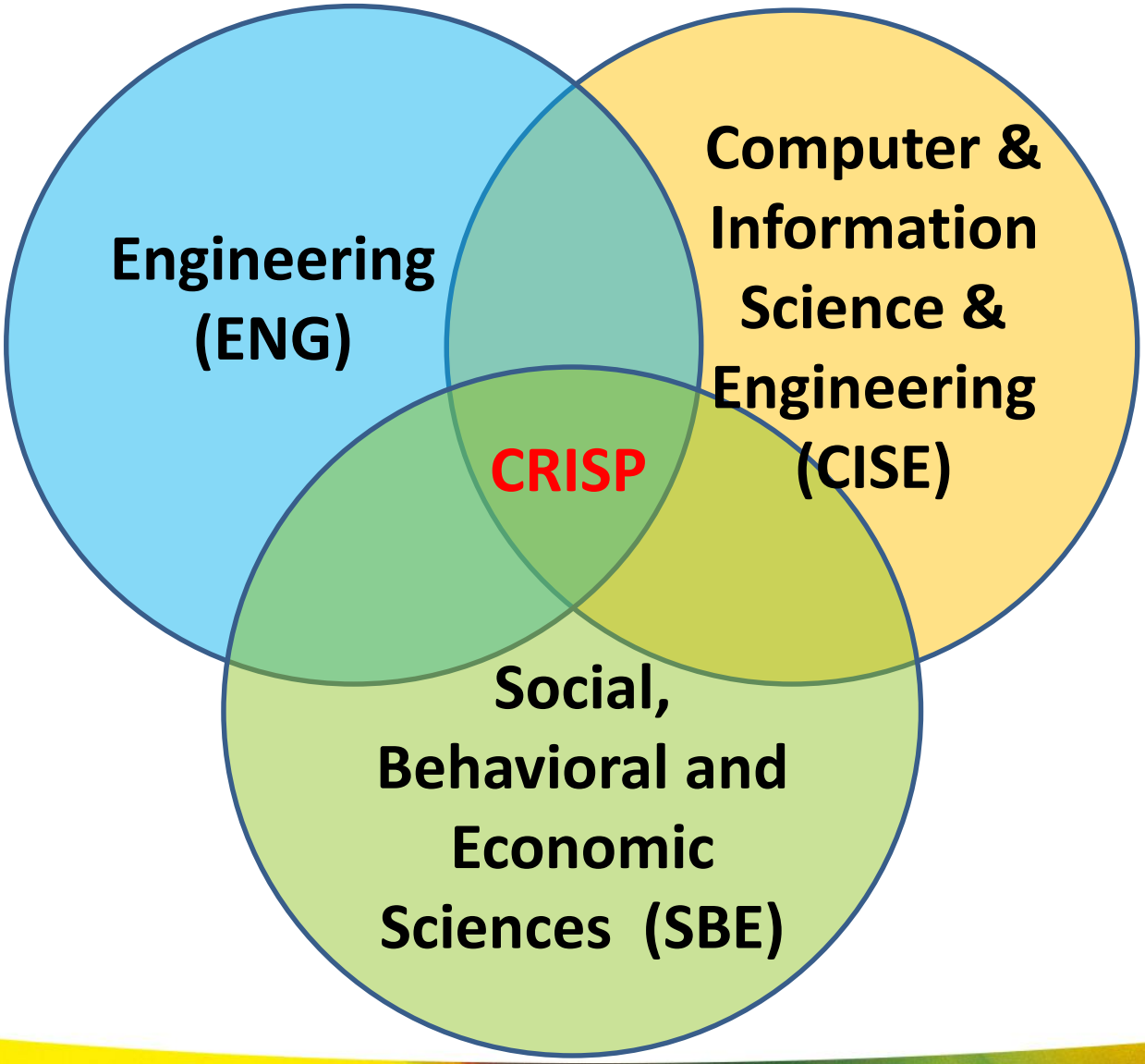
Directorates for: (1) Computer & Information Systems & Engineering; (2) Engineering; (3) Social, Behavioral & Economic Sciences

Solicitation: NSF 15-531

Subcommittee on Disaster Reduction

White House Conference Center
Washington, D.C., USA
April 2, 2015

Participating Directorates



Background

- March 20, 2015 Upcoming proposal deadline
- Anticipated Funding Amount: $20 million
  - *Type 1 Awards*: Projects will be of 3 years in duration with a maximum total budget of $500,000
  - *Type 2 Awards*: Projects will be of 3-4 years in duration with a total budget ranging from $1 million - $2.5 million
- Distinguishing Requirement:
  - at least one PI or co-PI who is an ***engineer***
  - at least one PI or co-PI who is a ***computer, information or computational scientist***
  - at least one PI or co-PI who is a ***social, economic or behavioral scientist***

Type 1 Awards

- Theory, modeling, data collection and metrics projects that create:
  - knowledge, representations, methodologies, case studies, approaches

  to conceptualize and study interdependent infrastructures as processes, services and systems
- Objective of team building to help clarify
  - basic terminology
  - assumptions and premises that enable theories
  - model and metric formalizations

  for interdependent infrastructures as processes and services
- Not intended for empirical testing of models/theories

Type 2 Awards

- Interdisciplinary research to conduct:
  - major new interdependent infrastructure research using empirical data
- Expected to include creation of knowledge, representations, methodologies and approaches to
  - conceptualize and study interdependent infrastructures as processes, services and systems

Critical Infrastructures

Critical infrastructures mainstay of national economy, security and health

Broad perspective

- Not only a collection of discrete components, but an ecosystem of interconnected and interdependent physical, cyber & human components
- Infrastructures seen broadly as processes delivering services

Critical Infrastructure Sectors


Food and Agriculture


Banking and Finance


Chemical


Commercial Facilities


Communications


Critical Manufacturing


Dams


Defense Industrial Base


Emergency Services


Energy


Government Facilities


Healthcare and Public Health


Information Technology


National Monuments and Icons


Nuclear Reactors, Materials and Waste


Postal and Shipping


Transportation Systems


Water

US DHS: National Infrastructure Protection Program (NIPP)

http://testdhsgov.edgesuite.net/files/programs/gc_1189168948944.shtm

Interdependent Critical Infrastructure Systems (ICIs)

- Infrastructures are generally conceived here:
  - as networks of systems and processes
  - that function collaboratively and synergistically
  - that produce & distribute continuous flow of essential goods & services
  - as interdependent and connected
- Examples of interdependencies

  (1) In a hazard event, emergency services (response/repair) required for restoration of critical services (power/transportation/healthcare…), and critical services enable emergency response/repair activities

  (2) Manufacturing-Banking/Finance: Demand by manufacturing sector for financing depends on economy which affects loan rates, and economy depends on goods production from manufacturing sector

Overarching Goals

1. Create new approaches/solutions for design/operation of infrastructures as processes/services
2. Enhance understanding/design of interdependent critical infrastructure systems (ICIs) and processes that provide essential goods and services despite disruptions/failures/disturbances from any cause
   - natural, technological, organizational or malicious
   - various timescales and intensities
3. Create knowledge for innovation in ICIs to safely, securely, and effectively expand range of goods and services they enable
4. Improve effectiveness, efficiency, dependability with which they deliver existing goods and services

Research Objectives

1. Create new knowledge, approaches, solutions to:
   - increase resilience, performance, readiness in ICIs
2. Create frameworks/multidisciplinary models of ICIs, processes and services:
   - capable of analytical prediction of complex behaviors
   - capable of real-time control and dynamic adaptation/reconfiguration
   - responsive to system and policy changes
3. Develop frameworks to understand interdependencies created by interactions between:
   - physical, cyber, social, behavioral and economic ICI elements
4. Understand organizational, social, psychological, legal, economic, technical obstacles to:
   - improving ICIs, identifying strategies for overcoming obstacles

Predecessor RIPS: Awards Made

More info on current RIPS awards

http://www.nsf.gov/news/news_summ.jsp?cntn_id=132852

RIPS Type I

(1) The Interdependent Criticality of Built, Social, and Information Infrastructures in Community Resilience: A New Framework and Participatory Process – *Lead: University of Colorado Boulder*

(2) Human Geography Motifs to Evaluate Infrastructure Resilience – *Lead: University of Maryland*

(3) A Meta-Network Systems Framework for Resilient Analysis and Design of Modern Interdependent Critical Infrastructures – *Lead: New York University*

RIPS: Awards Made

RIPS Type II

(1) Quantifying Disaster Resilience of Critical Infrastructure-based Societal Systems with Emergent Behavior and Dynamic Interdependencies – *Lead: University of Maryland*

(2) Towards Resilient Computational Models of Electricity – *Gas ICI – Lead: MIT*

(3) Strategic Analysis and Design of Robust and Resilient Interdependent Power and Communication Networks – *Lead: Washington State University*

(4) Vulnerability Assessment and Resilient Design – *Lead: University of Florida*

(5) Resilience Simulation for Water, Power and Road Networks – *Lead: Arizona State University*

(6) Participatory Modeling of Complex Urban Infrastructure Systems – *Lead: Georgia Tech*

(7) Water and Electricity Infrastructure in the Southeast (WEIS) Approaches to Resilient and Interdependent Systems under Climate Change – *Lead: Carnegie Mellon University*

Solicitation

Solicitation URL

http://www.nsf.gov/mobile/publications/pub_summ.jsp?WT.z_pims_id=505180&ods_key=nsf15531

Cognizant Program Officers

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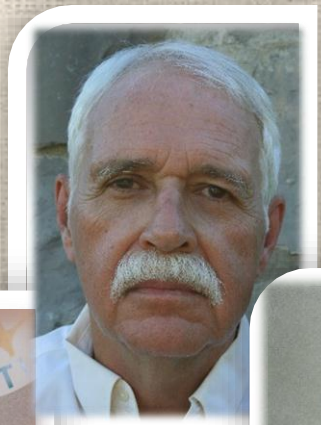

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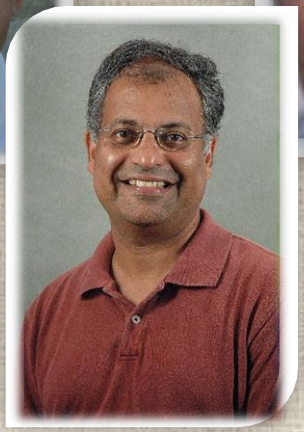

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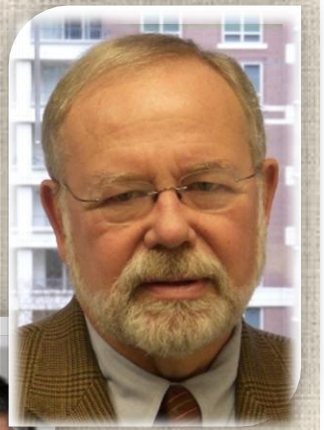

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