

**Director, Critical Infrastructure Resilience Institute**

Director, Information Trust Institute

# Building a Legacy

CIRI Annual Meeting  
December 2022

First some stats...

57

...the total number of projects executed (including those underway)

More stats...

22

...the total number of unique partners – academic + private sector

## More stats...

71

...the total number of “product” outputs

- Data sets, models, prototypes, software

More stats...

55

...the total number of academic papers & publications

More stats...

13/25/70

...the total number of unique MSIs/MSI faculty/MSI students supported

- 12 Summer Research Teams
- 5 Scientific Leadership Awards

More stats...

> 100

...the total number of students *directly* engaged

# Our main challenges

- Identify key research needed for infrastructure resilience
- Execute impactful research possible at scale of CoE
- Make results useable --- **distill complexity** so that user can benefit w/o expert training



“We’re surrounded.  
That simplifies our problem...”  
- Col. Chesty Puller, USMC  
(Battle of Chosin Reservoir)

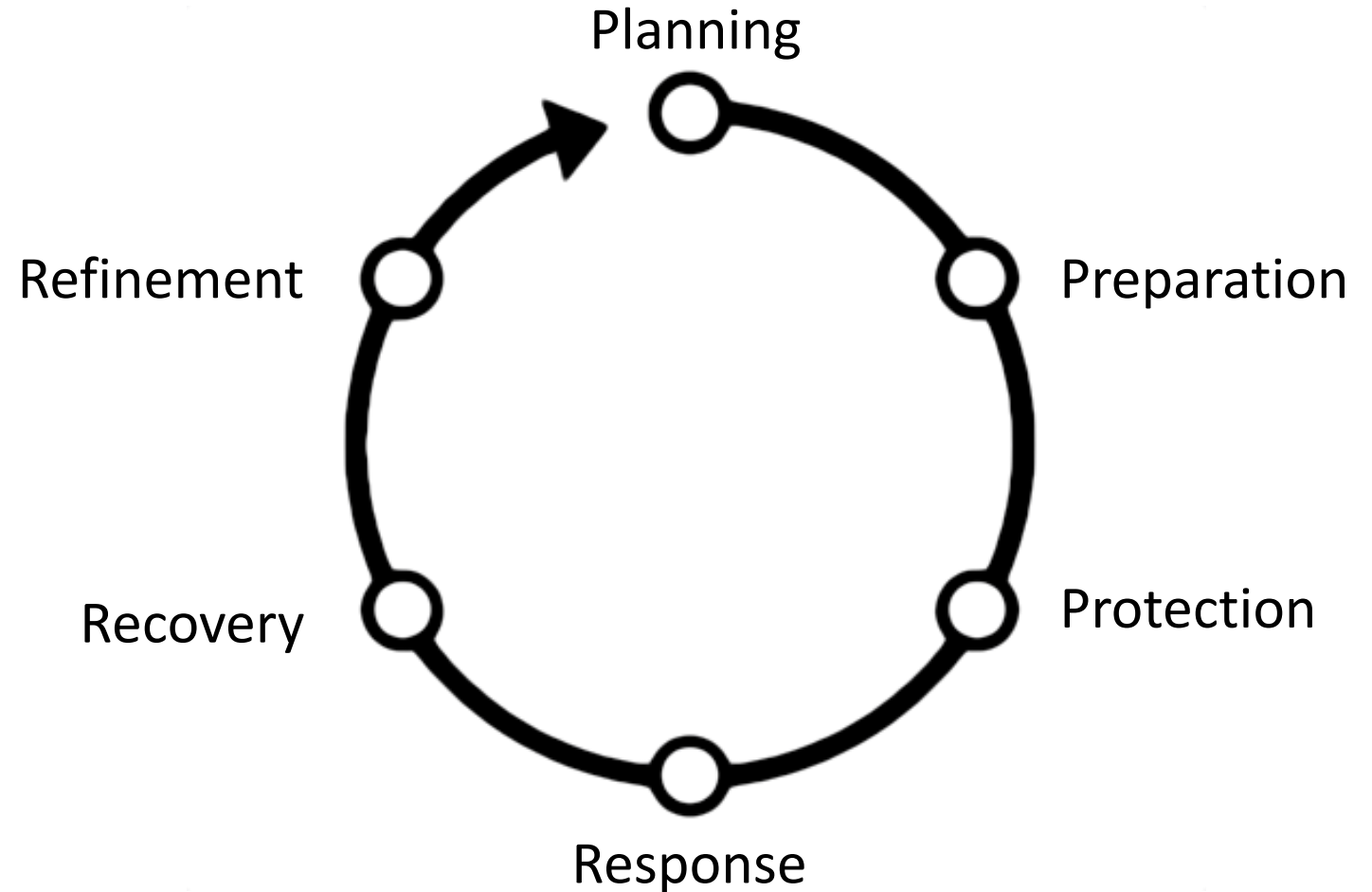


## CIRI has

Developed understanding  
of resiliency lifecycle

Applied each phase to  
efforts in

- Research
- Tech transition
- Education and Workforce  
Development



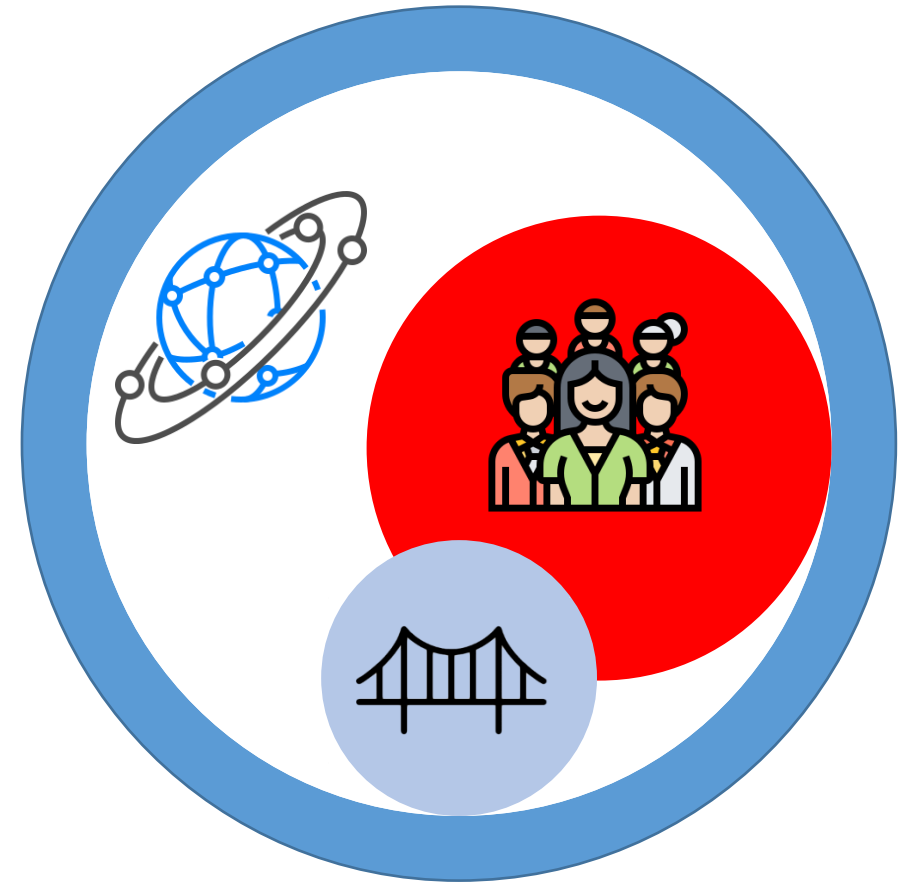
## CIRI has

Developed a solid understanding of

- scope
- interconnectedness
- interdependence

of critical infrastructure

- physical, cyber, and human/social



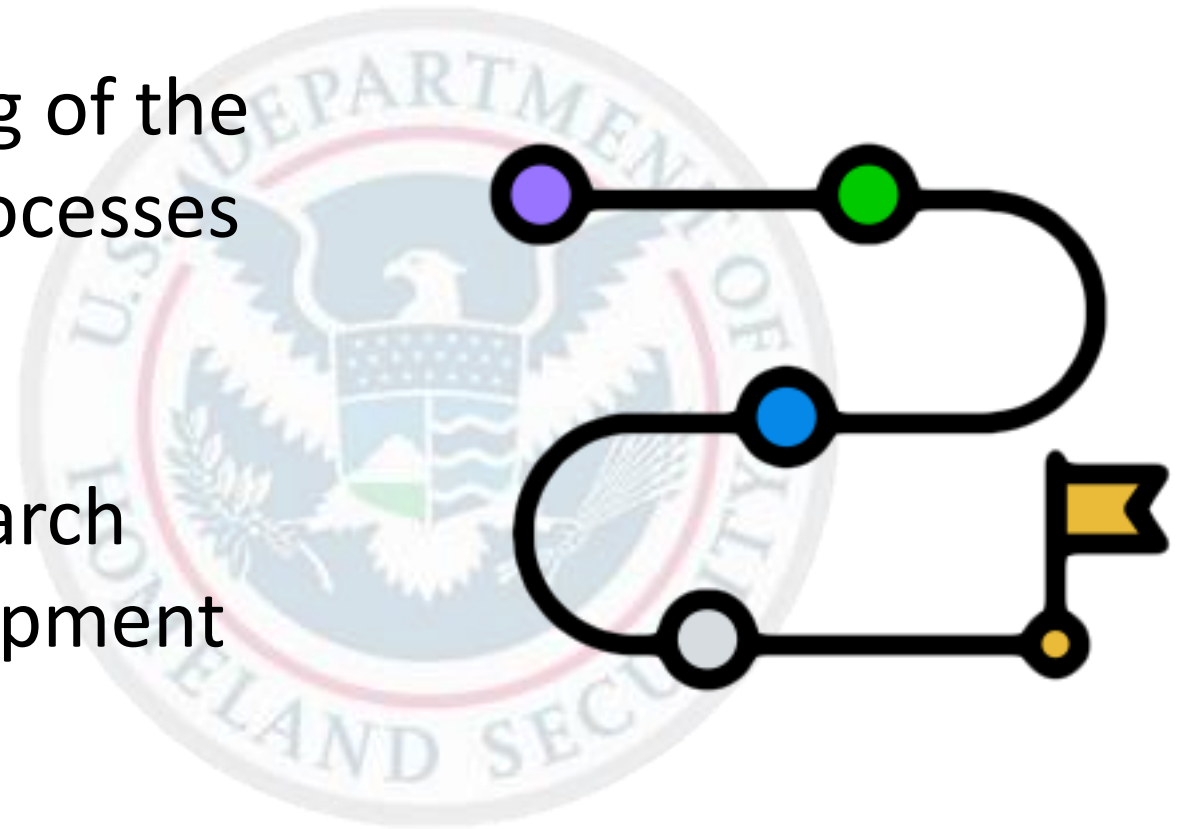
# Examples

- Resilience Governance for Infrastructure Dependencies and Interdependencies; Flynn, NEU
- Identifying and Reducing Barriers to Infrastructure Insurance; Kunreuther, Wharton School, UPenn
- Regulatory Options for Managing Systemic Risks; Slayton, Cornell
- Scenario-based Flood Risk Mapping; Freitag, UW
- Community Resilience and Disaster Costs; McConkey, UIUC

## CIRI has

Developed a solid understanding of the mission, strategic objectives, processes and culture of DHS

Appropriately mapped our research portfolio and technology development roadmap to DHS mission



# Examples

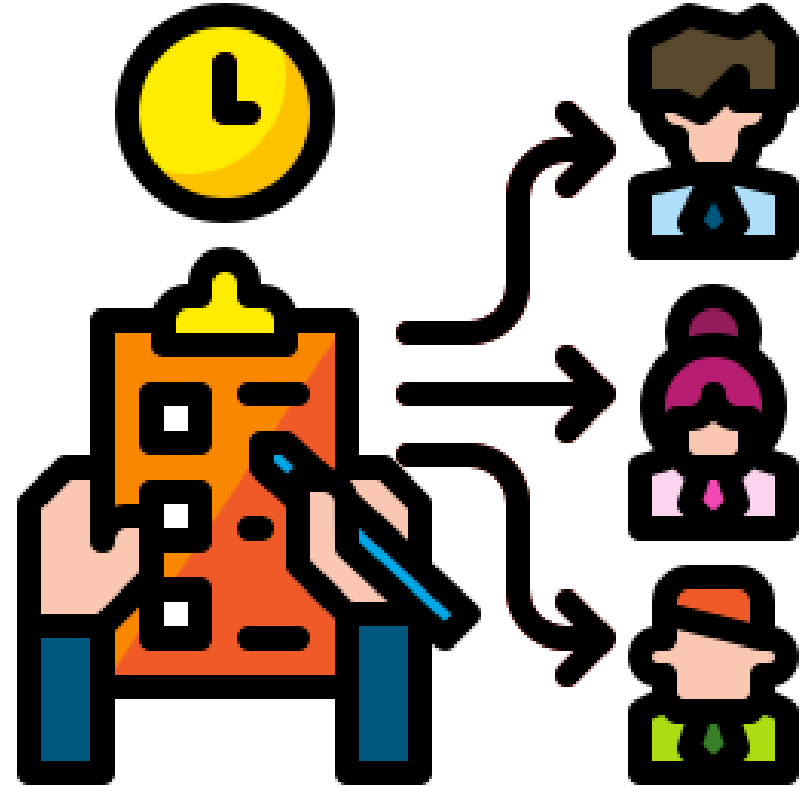
- Protecting the Nation's 911 System from Cyber Attacks (UIUC, Karthik Consulting)
  - Researched requirements for PSAP cybersecurity
  - Developed & published NIST CSF-based PSAP Profile
  - Integrated Profile into Cyber Secure Dashboard
- NG911 Interoperability Testing (UIUC, TAMU)
  - Researched requirements for end-to-end testing of NG911 systems and components
  - Published recommendations for national interoperability testing framework
- Characterizing End-to-End Risks to 5G (GaTech)
  - Researched the end-to-end risks of 5G telecommunications infrastructure
  - How attacks on 5G can impact dependent infrastructure (i.e., connected autonomous vehicles)
  - Developed quantitative risk metrics

# More Examples

- Safety & Security of Remote Bridge Operations (ABS Consulting)
  - Researched the cybersecurity risks to remote bridges
  - Developed & delivered Google Earth-based taxonomy of nations bridges
  - Developed & published NIST CSF-based Remote Bridges Profile
- Empirical Security Analysis of Wireless Emergency Alert System (Colorado Boulder)
  - Researched specific risk of spoofed message broadcast
  - Identified and tested mitigations to eliminate the risk
- EMP Risk Assessment & Mitigation (Synclesis, UIUC)
  - Researched EMP risk to 5G cell tower
  - Identifying mitigations to reduce risk

## CIRI has

Demonstrated capability to successfully organize, scope, and manage multi-disciplinary, multi-institutional projects





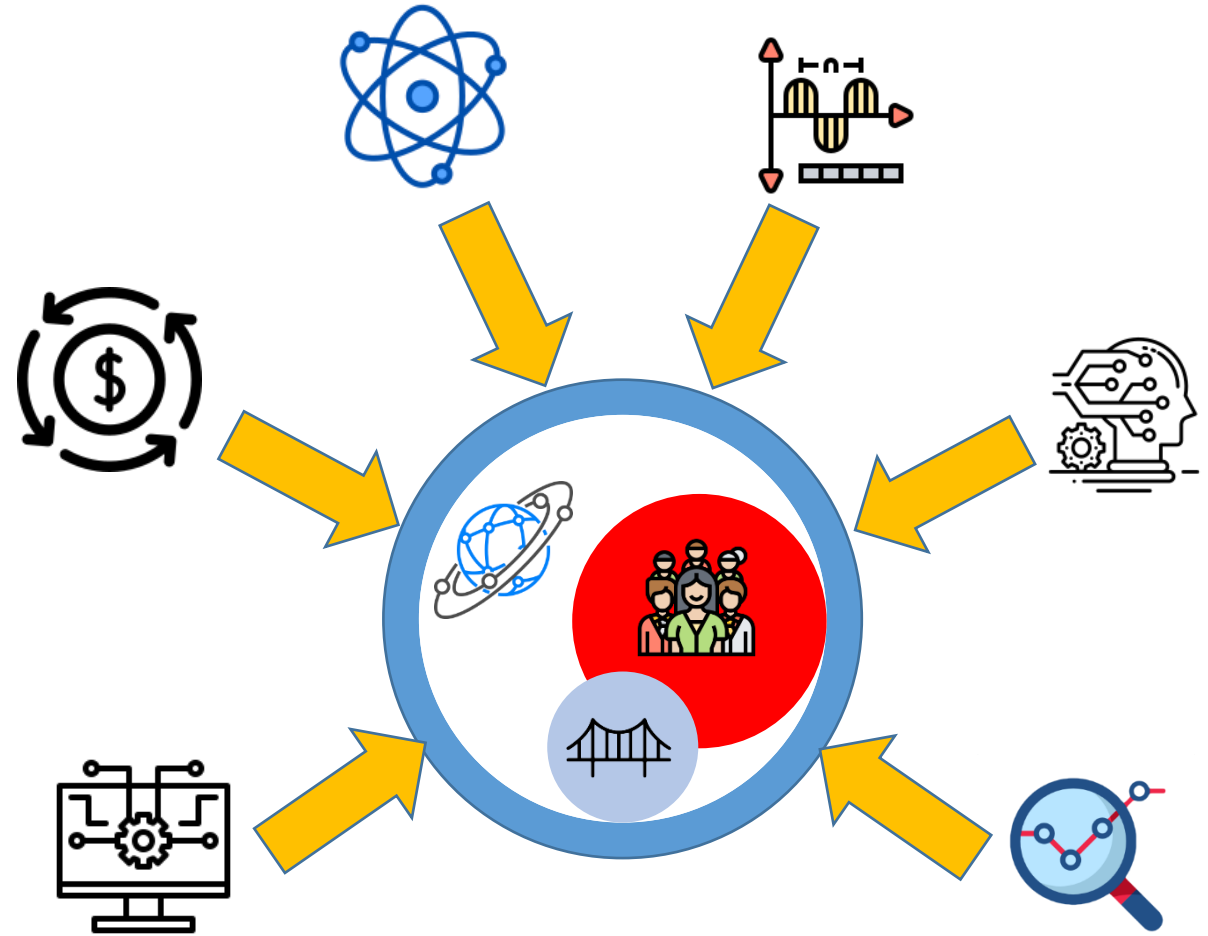
# Examples

- Toward Community Resilience through Comprehensive Risk Assessment, USC, UIUC
- Hybrid Quantum-Classical Reinforcement Learning in Controlled Quantum Networks, UTenn, Ucalgary
- Leveraging AI for Disaster Response, USC, UIUC
- Interoperability Testing Program, Texas A&M, U. Washington, UIUC
- Multi-Layer Cyber-Physical Supply Chain Risk Analysis, NYU, U. Michigan
- Research and Deliverables on Utilizing an Academic Hub and Spoke Model for Education, UIUC, Purdue, U. Tulsa, Auburn Univ.
- Quantifying Interdependence of the Logical-Physical Internet Topologies, UIUC, UC San Diego
- Measuring Business and Economic Resilience in Disasters-Business Resilience Calculator, USC, Ohio State
- Cybersecurity Assurance for Critical Infrastructure, UCLA, Carleton Univ.
- Review and Assessment of the Usage of Computational Methods for Humanitarian Assistance and Disaster, UIUC, USC, Harvard

## CIRI has

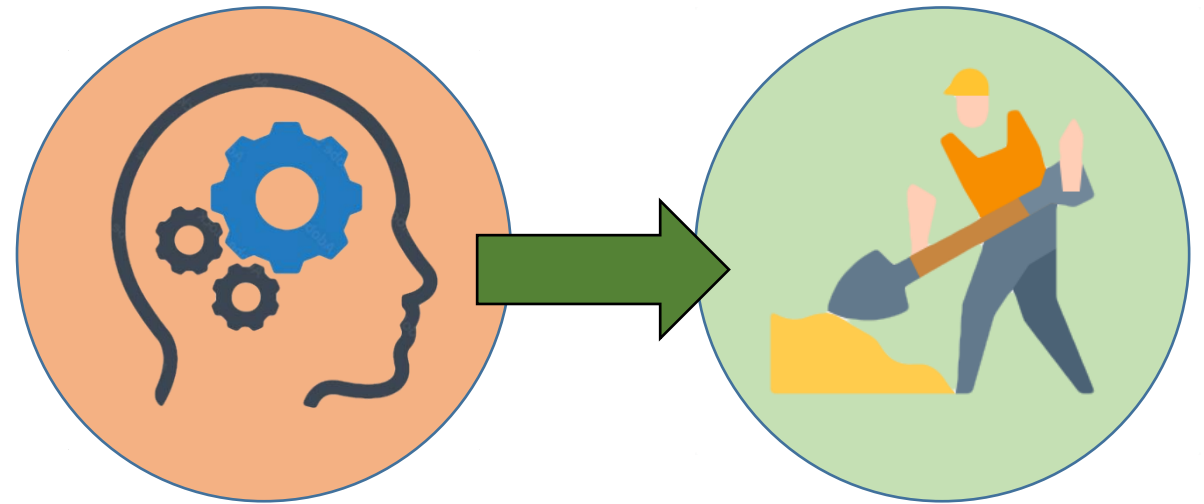
Brought cutting edge technologies to critical infrastructure resilience

- Software engineering
- Economics
- quantum information
- Electromagnetics
- Data analytics, AI, ML/DL
- Operations analysis



## CIRI has

Demonstrated capability to  
transition research outputs  
to the field/market

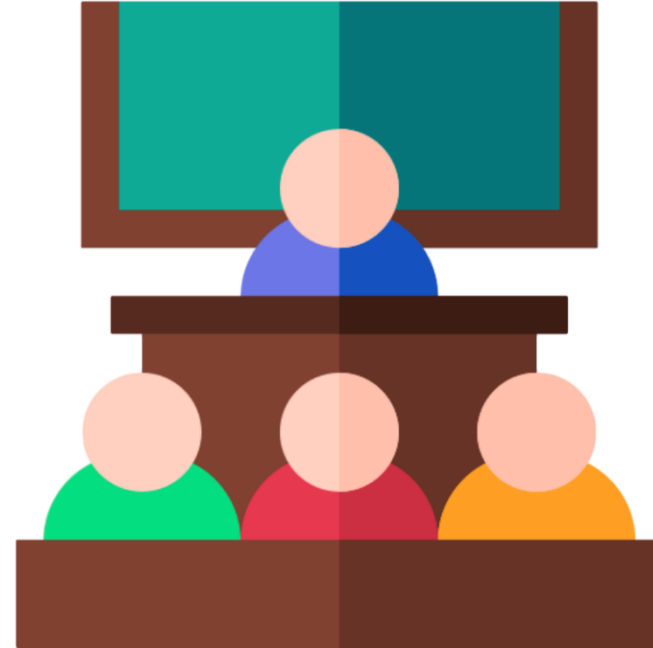


# Sample Tech Transition Efforts

Project/Product	Status
CRISM (Cyber Risk Scoring & Mitigation)	Licensed to commercial company
Cyber Secure Dashboard	Pilot tests underway with PSAPs
Business Resilience Calculator	Completed RTI engagement Provisional Patent application filed Discussions with potential licensees underway
Port Disruptions Tool	Provisional Patent application filed NSF iCORPs completed RTI engagement completed HSSS engagement completed Discussions with potential licensees underway

## CIRI has

Led significant efforts to enhance education and workforce development for the Homeland Enterprise



# Examples

- Federal Law Enforcement Training Center (FLETC)
  - Researched requirements
  - Delivered recommendations for next-generation law enforcement education and training infrastructure
- Cybersecurity and Infrastructure Security Agency (CISA)
  - Completed research and developed requirements for a nationwide cybersecurity education and training network
  - Completed research and developed scalable cybersecurity curricula
    - 17 courses (credit-bearing and non-credit professional development)
    - 136 discreet training modules (“stackable”, for repurposing)
    - Cybersecurity fundamentals through advanced topics (ICS cybersecurity)

We're looking forward to showing you examples of current accomplishments over the course of the next two days