Assured Autonomy:

Path Toward Living With Autonomous Systems We Can Trust

Ufuk Topcu

The University of Texas at Austin

**Assured Autonomy:
Path Toward Living With
Autonomous Systems We Can Trust**

Organizers

Nadya Bliss
Nancy Cooke
Missy Cummings
Ashley Llorens
Howard Shrobe
Ufuk Topcu
Lenore Zuck

CCC
Computing Community Consortium
Catalyst

Scan me!

Background

A series of workshops on assured autonomy

- October 2019 — Arlington, VA

- February 2020 — Phoenix, AZ

- July 2020 — Virtual

    + Several separate panels and expert inputs
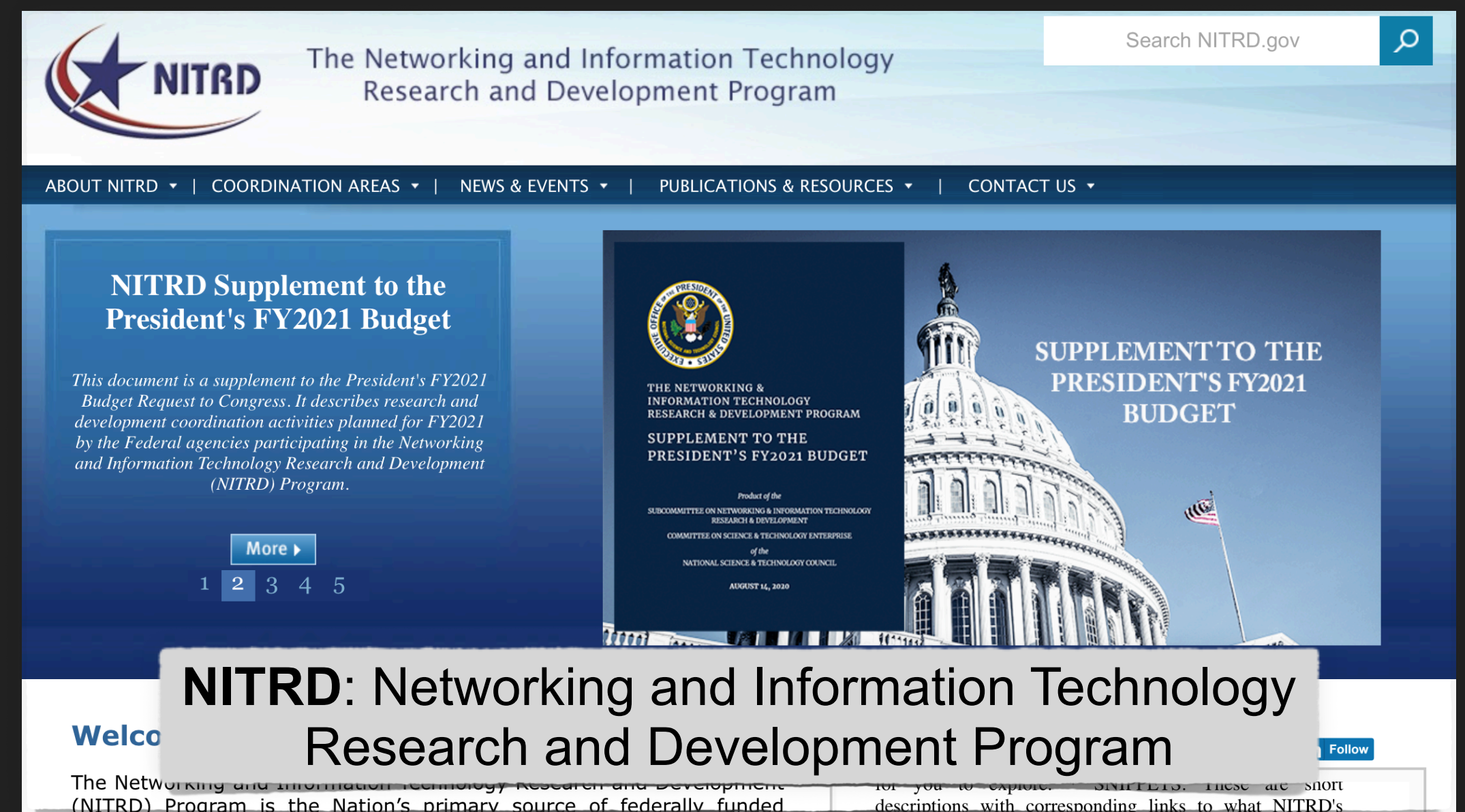
- Published the report in October 2020

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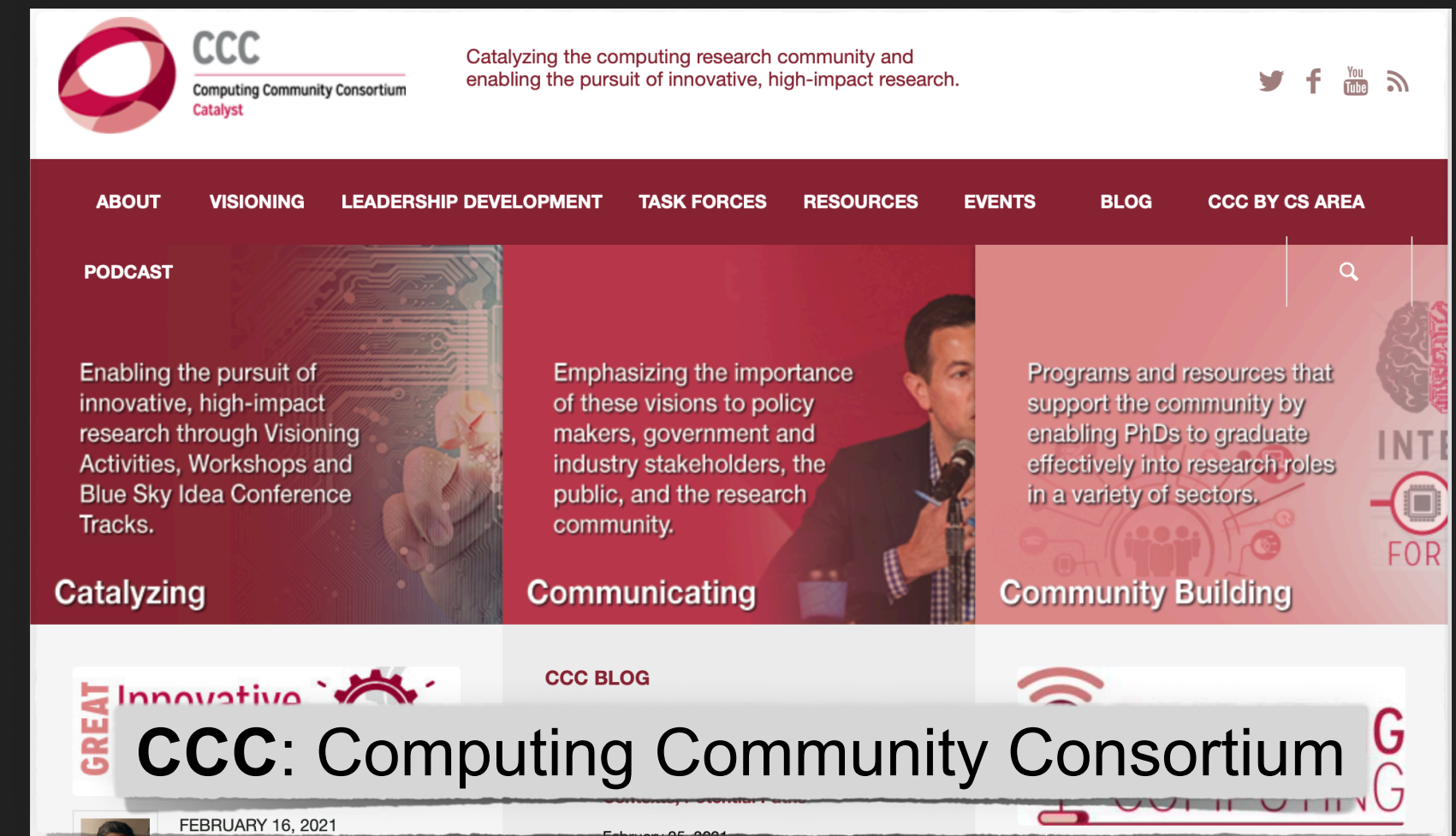**A series of workshops on assured autonomy**

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Requested by two Interagency Working Groups of NITRD

- Intelligent Robotics and Autonomous Systems
- Computer-Enabled Networked Physical Systems

Sponsored by the CCC

CCC: Computing Community Consortium

NITRD: Networking and Information Technology Research and Development Program

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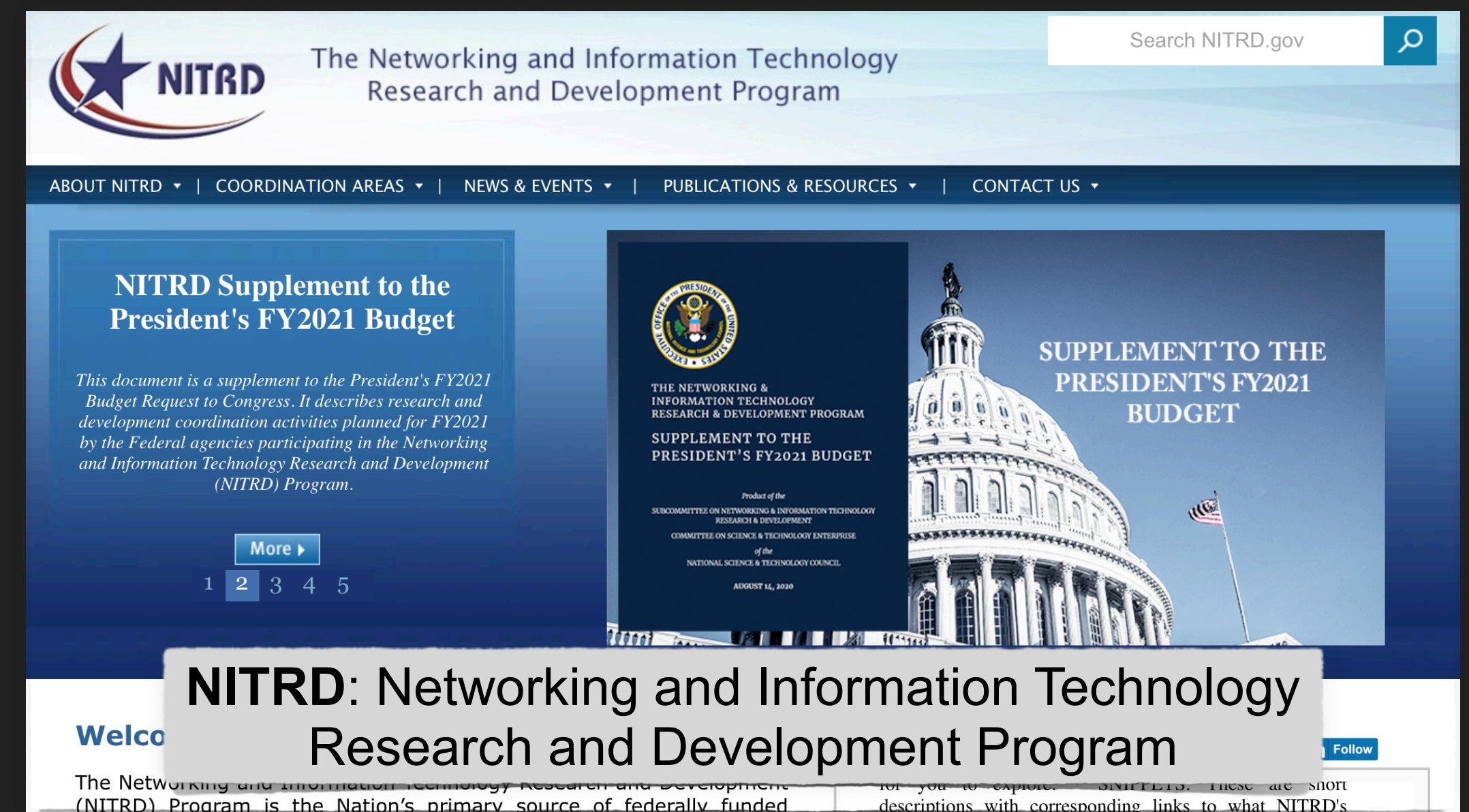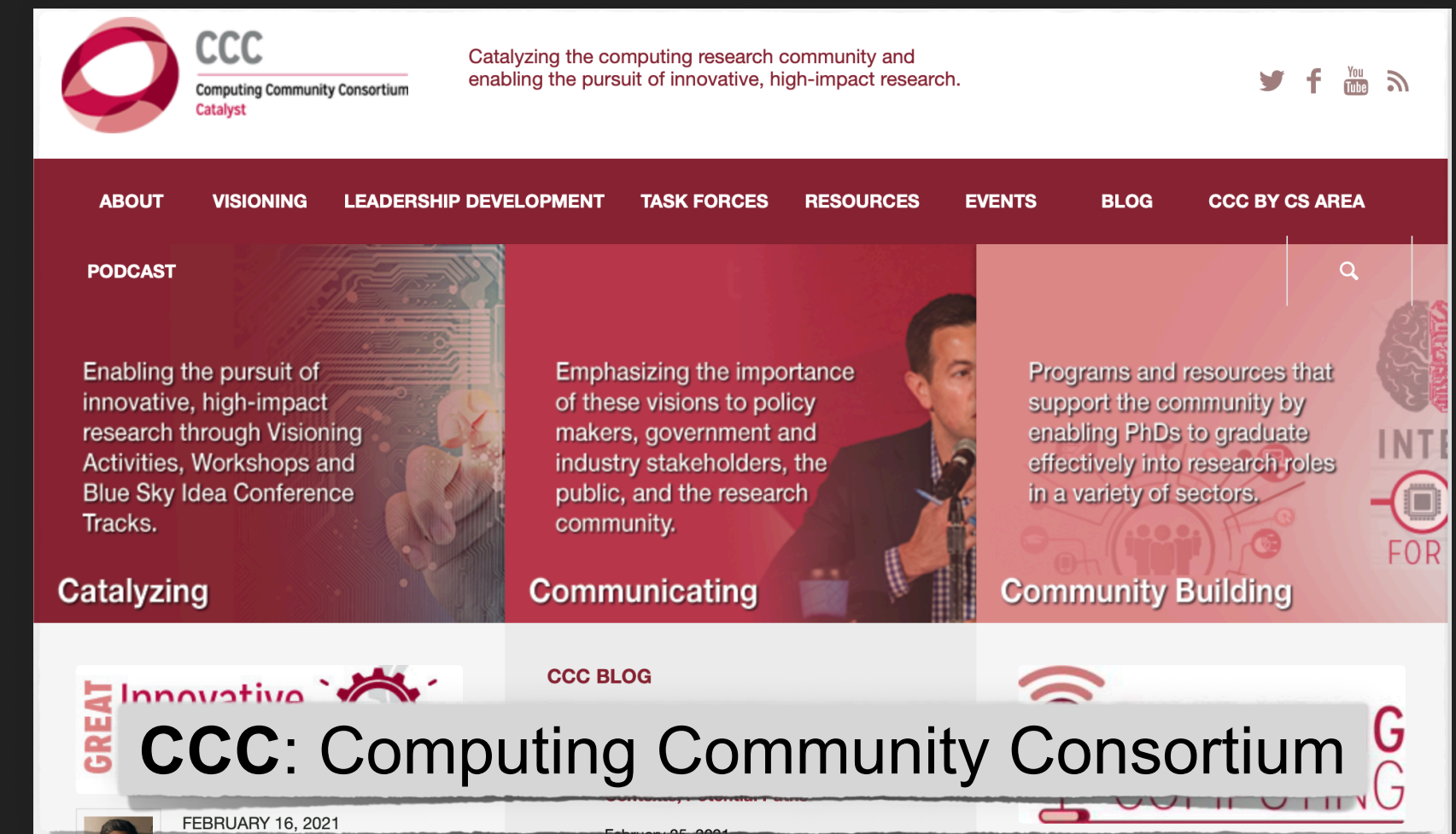- Published the report in October 2020

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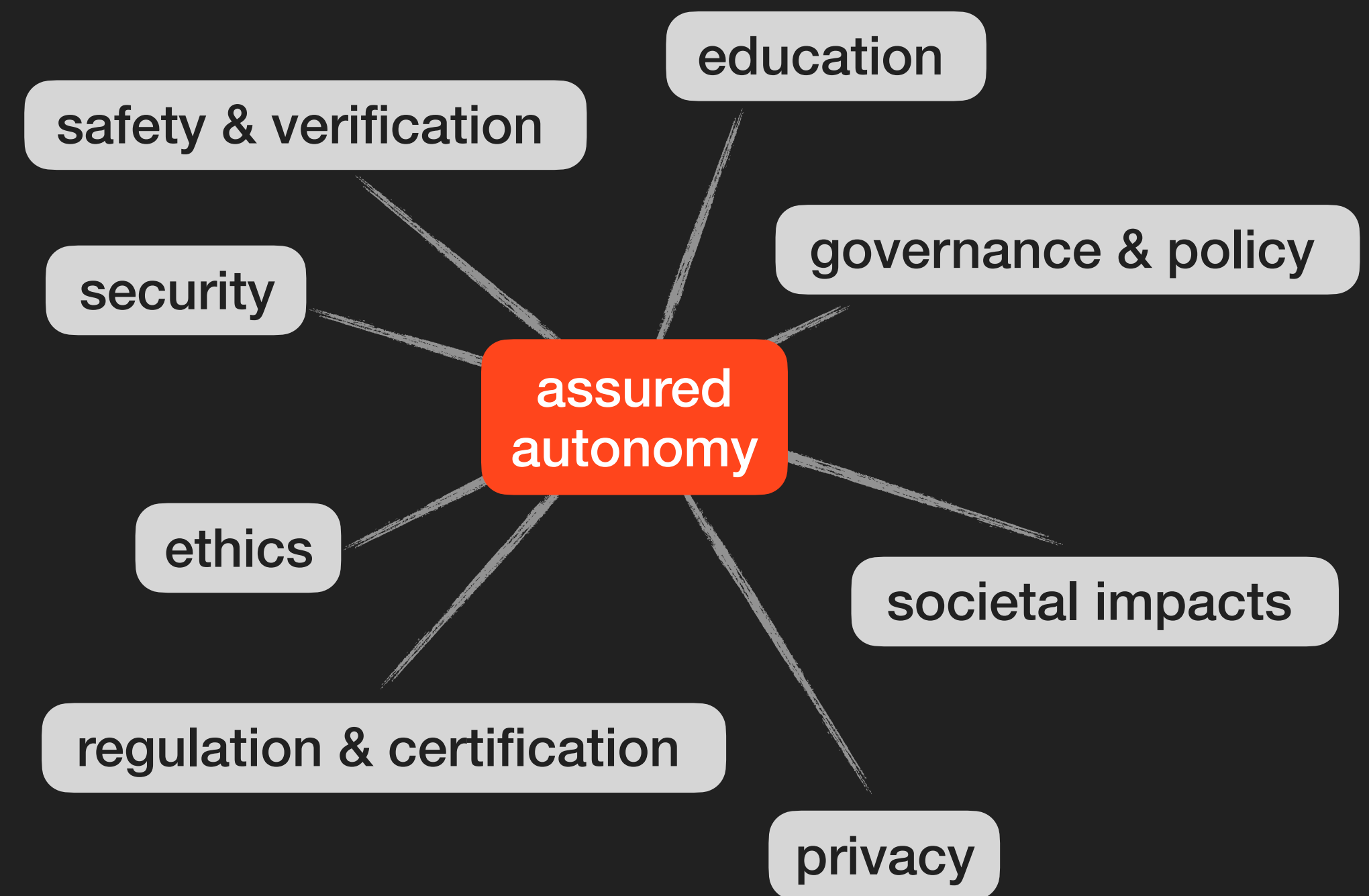**Sponsored** by the CCC

Diverse participation

- More than 100 participants
- Academia, industry, government and non-profits
- Broad range of expertise from engineering and computer science to social sciences

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NITRD: Networking and Information Technology Research and Development Program

Overview of the report

The future has arrived—what do we want the future to be?

Proper assurances that autonomous systems are safe, secure, dependable, privacy-preserving, fair, equitable, accountable, and ethical are key for **positive impact at scale**.

safety & verification

education

governance & policy

security

assured autonomy

ethics

societal impacts

regulation & certification

privacy

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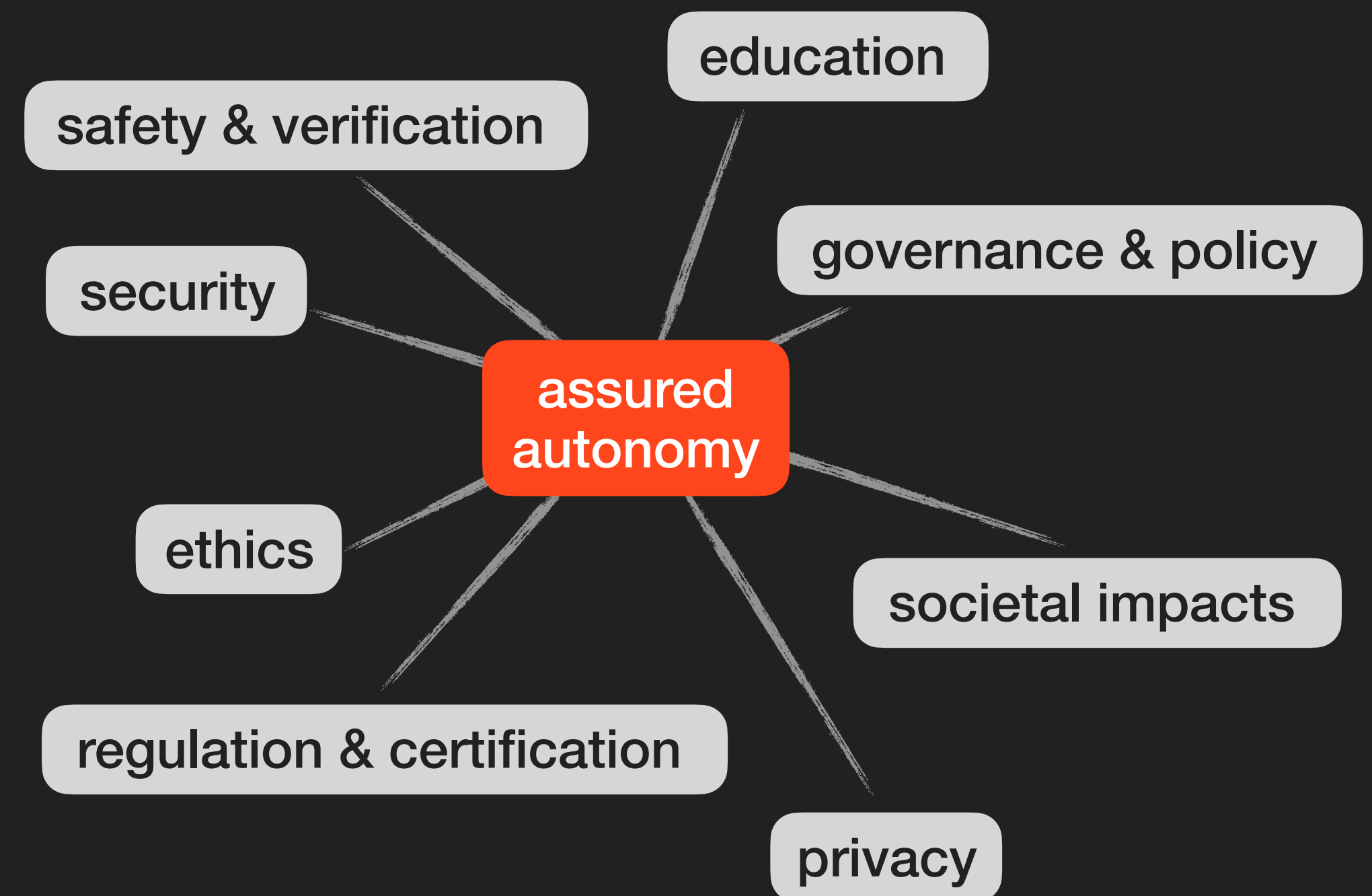
Assured autonomy is about **understanding and mitigating risks** of operating autonomous systems in our society.

- **Too little assurance —** places the public at risk today with little protection from future shocks.

- **Too much assurance —** may stifle innovation while keeping the public safe today but exposing society to future shocks.

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safety & verification

governance & policy

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assured autonomy

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societal impacts

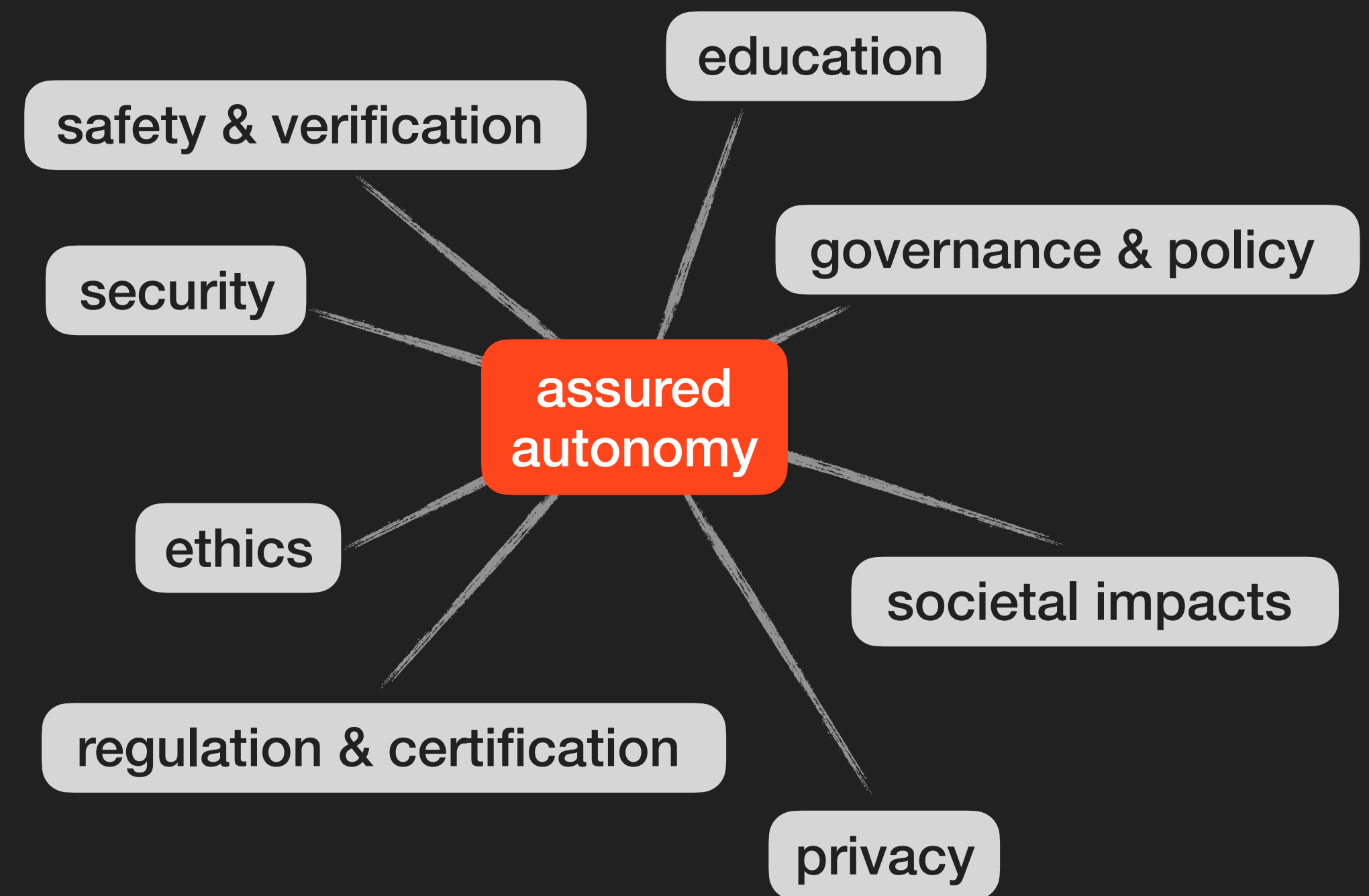regulation & certification

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How autonomous systems will be managed is **at the crossing of science, technology, society, policy, and governance**.

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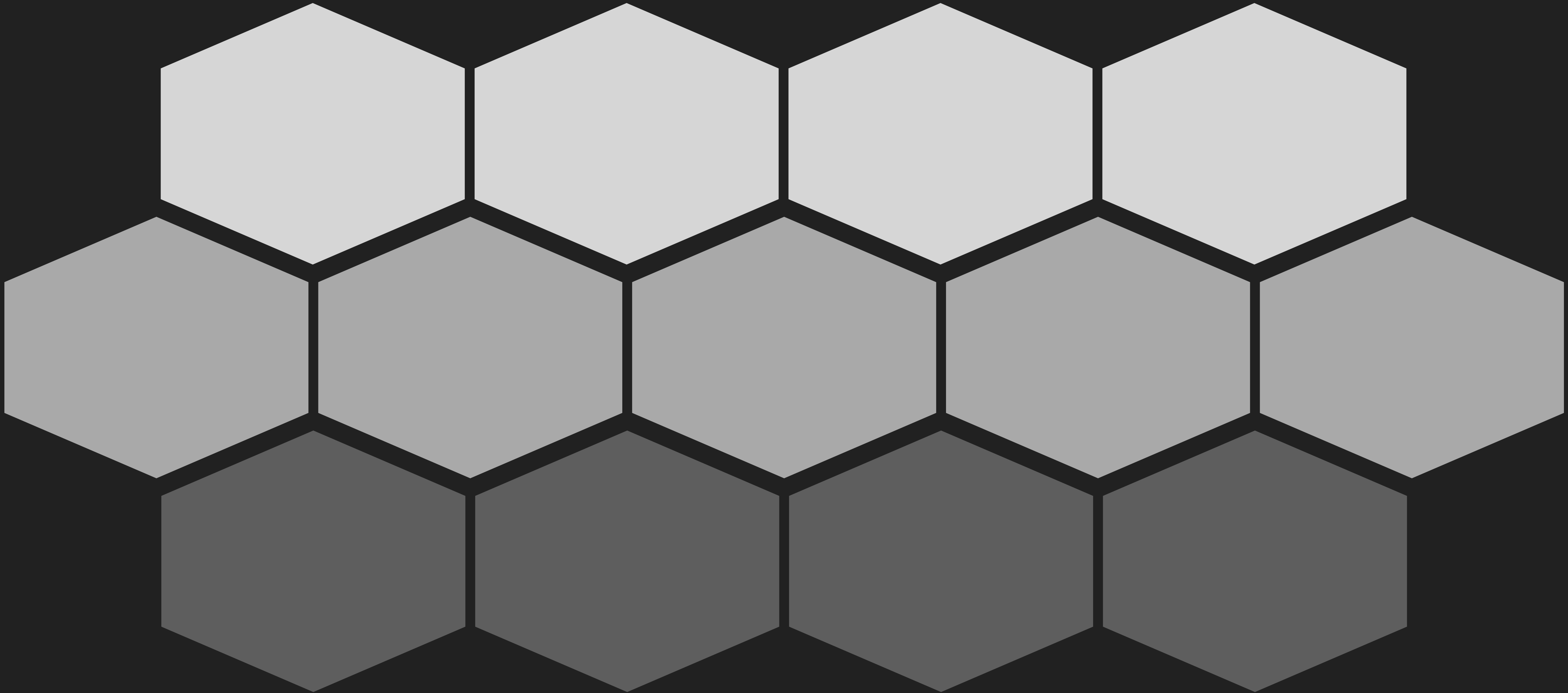
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Assurance is context-dependent and not once and for all.

Autonomous systems have a diverse set of vulnerabilities.

Open operation environments amplify the technical challenges.

Means for characterizing the progress and the gaps is needed.

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Assurance for autonomy requires a major re-think.

The challenges require interdisciplinary approaches.

A coordinated national research strategy is needed.

Better connections between the stakeholders will accelerate progress.

Re-envisioning education and workforce is part of the path forward.

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Recommendations

Establish a **"network of institutes on autonomy"**
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Research

- Embrace the interdependency between the challenges.

- Develop a holistic view of these interdependent challenges.

Education and workforce development

- Align priorities with the needs of the industry and government.

- Focus on enabling the students to acquire interdisciplinary skills.

- Broaden and diversify the basis for qualified workforce in autonomy.

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Potential roles for the network

- Enable interdisciplinary collaboration beyond what is possible today, including the disciplines that are currently considered to be peripheral.

- Strengthen the cultural and organizational connections between the academia, industry, and government agencies.

- Serve as an objective source of information to the public and the policymakers.

Some steps from here

- Nurture grassroots advocacy for assured autonomy across the R&D landscape.

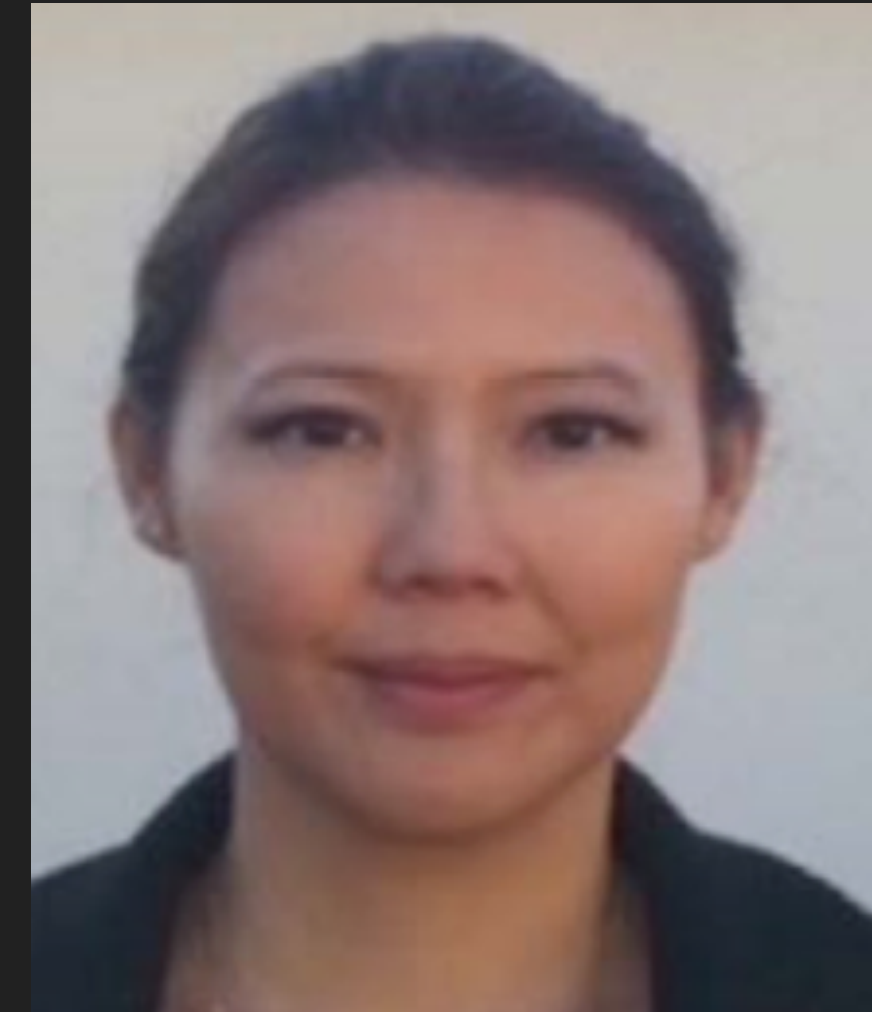- **Assured autonomy in NRI 4.0?**

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Panel Discussion: Assured Autonomy

Heather Roff
JHU Applied
Physics Laboratory

Moshe Vardi
Rice University

Kymie Tan
Jet Propulsion
Laboratory

Missy Cummings
Duke University