



Collaborative Community Resilience

Community Resilience Lab within C4I & Cyber Center

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- C4I & Cyber Center is incubating a Community Resilience Laboratory ("Lab")
 - Naturally multidisciplinary; plays to many strengths of Volgenau School of Engineering (VSE)
- Many synergies
 - Cybersecurity is resilience of networks and systems
 - Critical infrastructure protection is resilience of physical and economic underpinnings of society
 - Ideal place to grow partnership for new Laboratory



Lab Overview



- Lab will focus first in two areas:
 - Building sustainable resilience at the community level and
 - Addressing resilience within C4I & Cyber Center's charter
- Resilience is defined broadly: (1) pre-crisis preparations & risk mitigation, (2) incident management, (3) leveraging shocks and stresses to emerge stronger—
 - "Be prepared to bounce forward better"
 - Also examine growing infrastructure interdependencies
- Coordinating across stovepipes is not easy:
 - Difference among civilian govt & military, academics, NGOs, IOs, and business
 - Analyses must anticipate impending change: tech, socio-cultural, changing workforces and expanding cyber threats
 - Lab can encourage trans-disciplinary approaches

Velocity of Tech Change

If a factor, e.g. computing power/unit cost, doubles every 18 mo, 5 yr increase is 900%, 10 yr 10,000%, by 2030 ~100,000%



Growth in Computing Power per Unit Cost

Biotech even faster, robotics ubiquitous, nano poised breakout, energy impacts are global

 Think BRINE (bio-robo-info-nano-energy) + Additive Manufacturing Interactions complicate things Linear projections CAN'T work

Resilience & Mission Assurance

Profile of Resilience (Be Prepared to Bounce Forward Better)



Conceptual diagram for measuring vulnerability and resilience (based on <u>KANG Shian Chin, et. al. (2014</u>); expanded from Richards, Ross, Shah, & Hastings, 2009

Building Sustainable Resilience

C⁴I & CYBER CENTER

Two Complementary Efforts: STAR-TIDES and **Collaborative Community Resilience (CCR)**

Reduce Pressures for Migration & Marginalization





- (1) Community Focus: CCR focuses on specific, under-served *communities*
- Encourage people to stay, or return
- Change threats of job loss & other stresses into opportunities
- **Respect local concepts of dignity, justice & fairness**

(2) Knowledge Sharing: STAR-TIDES focuses on global knowledge-sharing



Public-Private, Whole-of-**Government**, Trans-National Annual Tech Demos since 2007 12th Demo at GMU Oct 1-3, 2018

Network has several thousand nodes—building resilience to emergencies 5/15/2018

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(3) Innovative Economics

- If entry-level jobs not available, look for alternatives, e.g. peering/sharing, barter, token-based, barter
- Communities can leverage "platforms" (technologies) to build excess capacity and innovate*--AirBnB, Uber each use two platforms
- There are many platforms, as shown at right

(4) Integrated Approaches:-

- Tailor projects to community needs
- Begin with NARRATIVE—<u>Listen</u> to community needs
- STAR-TIDES network feeds info on "platforms"
- Convert systems engineering into NARRATIVE that makes sense to community



*from Robin Chase, "Peers, Inc."



Building Sustainable Resilience (3)



Integrated CCR/STAR-TIDES Overview



Research-Related Opportunities

- Public Policy & Governance
- Conflict Resolution
- Resilience & Cybersecurity
- Systems Engineering & OR
- Info & Comms Technology (ICT)
- Civil & Infrastructure Engineering
- Mechanical Engineering & Robotics
- Economics, Business & Law
- Geospatial Info Systems
- Humanities & Social Science
- Advanced Manufacturing
- Health & Workforce
 Development
- International Development
- Nutrition & Food Security

Stability/Security <-> Sustainability



Appalachia Arising



Reduce Pressures for Displacement & Marginalization



Focused on West Virginia to Promote Capable Communities that are: Productive, Resilient to Emerging Challenges, and Sustainable by Local Resources Each Project has Unique Name

- Incorporated into partnership with Shepherd University
 - Also includes CCR-related projects in Southern WV coal counties
 - Student projects in McDowell County
 - Partnership with NGOs
 - Potential collaboration with WV National Guard



"Distributed Resilient Manufacturing" (DRM) designed to make trusted microelectronic (or other) components in separated facilities that enhance community resilience

- Derived from trusted microlectronics initiative in FY17 NDAA
 - Can increase supplier base for assured microelectronics
- Discussed with DoD managers and WV Congressional delegation
 - Focused on components--circuit boards, wire runs, connectors
 - Considering response to BAA for Assured and Trusted Microelectronics Solutions, FA8650-18-S-1201
- Incorporated into "Appalachia Advancing"



Digital Puerto Rico



People Centered Internet (PCI), co-founded by Vint Cerf and Mei Ling Fung, is participating in "Digital Puerto Rico" initiative

- How to use Info & Comms Technology (ICT) in areas like:
 - Expanding Info & Comms Tech Svcs in Puerto Rico
 - Expanding municipal WiFi hotspots and island-wide broadband
 - Establishing secure digital identity
 - Improving healthcare
 - Developing the workforce
 - Strengthening disaster preparedness
 - Promoting entrepreneurship and education



Partnering Opportunities



Potential Partners include:

- Multiple GMU schools, departments & centers, plus student orgs
- Other outside academic institutions like Shepherd University, San Diego State University, Keio University in Japan
- State, federal and other government efforts, e.g.:
 - Response to grant solicitations and BAAs
 - ICT applicable to rural areas, including cybersecurity, e.g. in West Virginia
 - Sandia National Laboratory's work on resilient cities and migration
 - Local community leadership
- Philanthropic institutions: Rockefeller and UPS Foundations
- Think tanks, e.g. RAND's & Atlantic Council's work on Resilience
- International organizations, e.g. World Bank, UN, WFP, etc.
- Tech-focused orgs such as energy, ICT, shelter, etc. 5/15/2018 Linton Wells II, linwells@gmail.com, 202.436.6354



Way Ahead



- Compete for grants:
 - Such as NSF, Appalachia Regional Commission, Tobacco Fund
 - Build coalitions within GMU
- Develop cadre of experienced personnel to get started
- Build on existing initiatives
 - Appalachia Advancing, including DRM
 - Puerto Rico
 - Cooperation with Japan
 - Local community emergency operations centers
- Extend to other regions: Europe, Philippines, Africa
- Expand to industry partners and philanthropy as appropriate

QUESTIONS?

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