

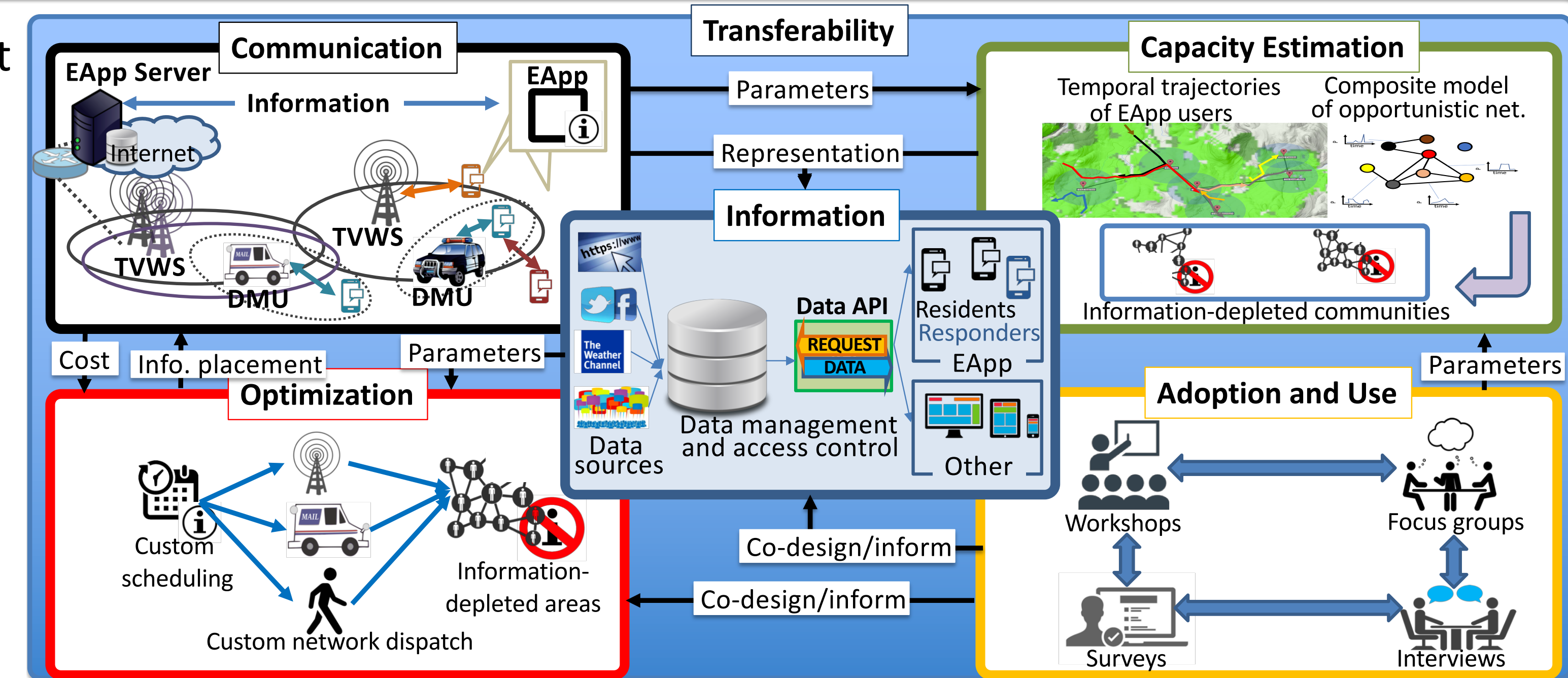
SCC: Integrating heterogeneous wireless networks and advanced data science to bridge the digital divide in rural emergency preparedness and response, NSF Award #1831547

Mariya Zheleva, Petko Bogdanov, Mila Gasco, Ramon Gil-Garcia, Town of Thurman, Warren County Emergency Services
IRG FY2018

Community-identified problem: Emergency preparedness and response in mountainous rural areas without commercial mobile broadband is a critical societal issue.

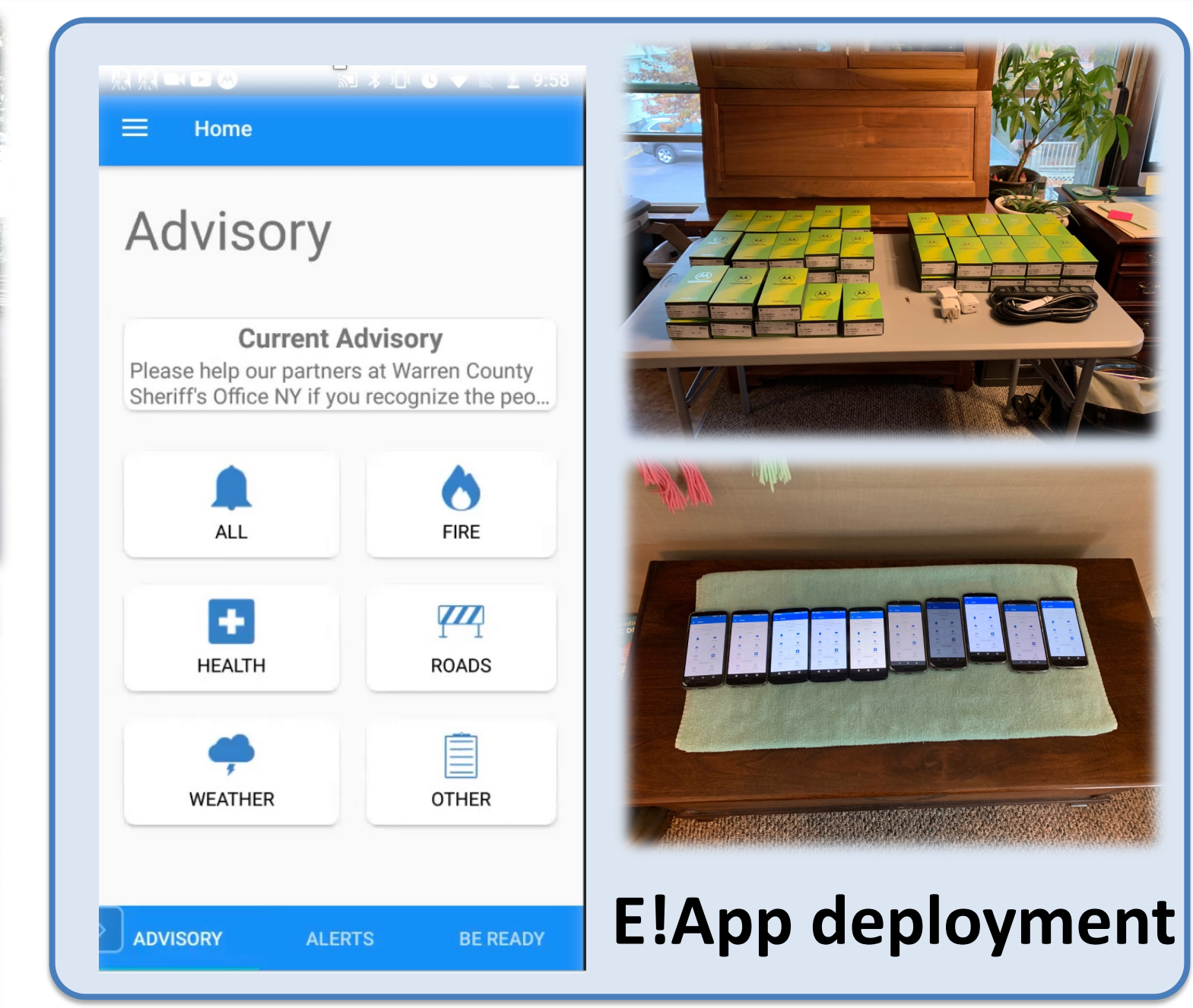
- Systems and protocols for heterogeneous wide-area networks with infrastructure mobility.
- Framework for emergency information integration, presentation and exchange.
- Algorithms for improved information exchange in rural socio-physical networks.
- Investigating co-design, adoption and use of information technologies for rural emergency preparedness and response.

Intellectual merit: The project integrates new technologies, including the **E!App** and the **Data Mule Unit** with **existing communications infrastructure** to improve the **safety and social well-being** of those who live, work and travel in rural communities. Application domains that may benefit from the research outcomes include remote healthcare, environmental monitoring and others.



Community-informed project activities

- **Beta version of the E!App developed and deployed.**
 - Deployed to 21 users in partner community and growing
 - Effects of co-creation on rural emergency ICT adoption [HICSS'23]
 - Energy-efficient P2P communications [IEEE SECON'21]
 - Interviews with community members on EApp adoption and use
- **Fundamental data science for mobility and information dissemination.**
 - Modeling communities based on non-stationary interactions [CIKM'21]
 - Improved forecasting and link prediction towards efficient P2P networks [SDM'22]
- **Understanding the dynamics and challenges of multi-actor collaborations in the co-creation of public value [HICSS'22].**
- **A conceptual framework for cross-boundary information sharing in emergency management. [DG.O'22]**
- **Performance and adoption of TVWS for rural areas.**
- **TVWS Data Mule Unit built and field-tested**
 - Rate adaptation for wide area TVWS networks with mobility
 - Non-cooperative secondary coexistence in TVWS networks



Immediate impact

- Design and develop E!App and the DMU for better rural EPR information access.
- Study the adoption and applicability of socio-technical frameworks to rural residents and first responders.
- Engage and empower the community through direct participation in research activities.
- Train students from high school to doctoral level in cross-disciplinary fundamental research with real impact.

Long-term impact

- A novel framework for information distribution in rural areas through socio-physical networks with applicability beyond EPR.
- Algorithms for analysis and mining of spatio-temporal and dynamic graph data.
- Insights into the impact of socio-technological frameworks on the well-being of rural residents and first responders.

Next steps

Technological outcomes

- The E!App and the Data Mule Unit (DMU)
- **Exploring avenues to sustain the E!App**
 - **Generalizability** – making the E!App relevant to other communities
 - **Transferability** – explore transfer to public/private organizations for long-term sustainability and use
 - Under-resources rural agencies and counties unlikely to have the resources to sustain the technology
 - State/federal agencies or the industry more likely candidate for long-term sustainability
- Interested in adopting our technology? Talk to us at the meeting!