Oregon Cybersecurity Center of Excellence

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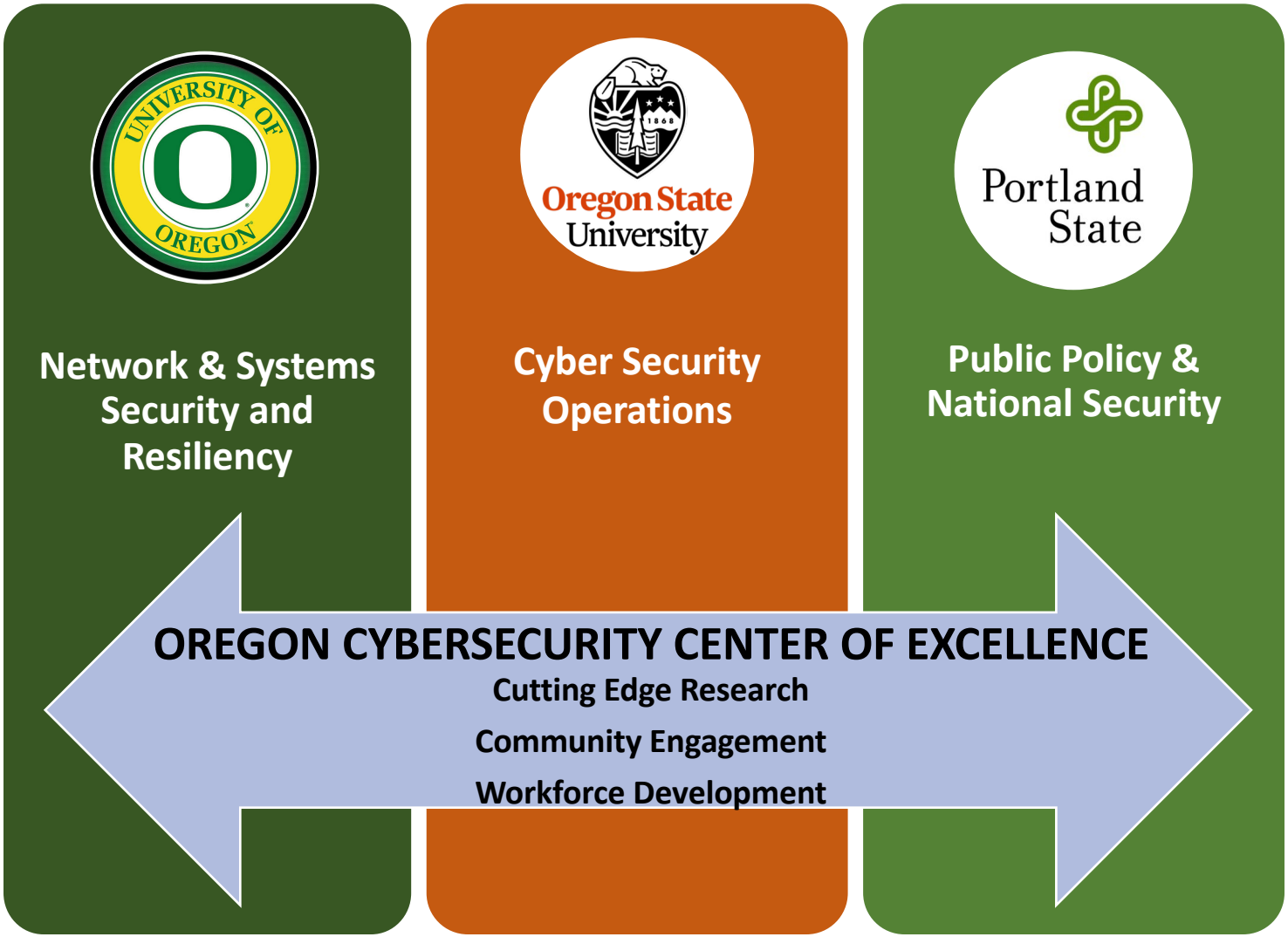

UNIVERSITY OF OREGON
Oregon State University
Portland State
Network & Systems Security and Resiliency
Cyber Security Operations
Public Policy & National Security
OREGON CYBERSECURITY CENTER OF EXCELLENCE
Cutting Edge Research
Community Engagement
Workforce Development

Enhancing
Security & Resiliency of Cyberspace
in Oregon [and more]

Reza Rejaie
Professor & Head
Department of Computer and Information Science
University of Oregon

CCSP

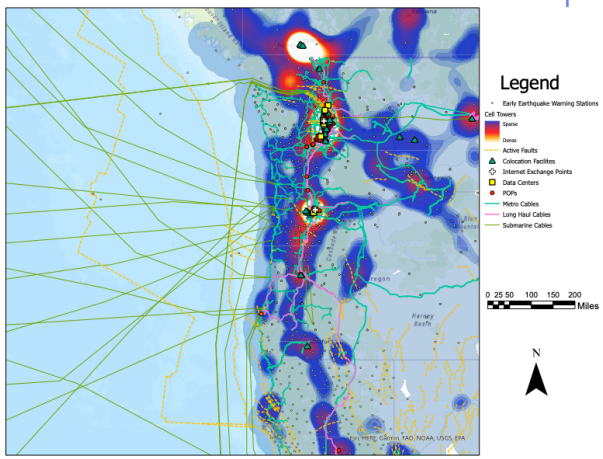
ONRG
Oregon Network Research Group

UNIVERSITY OF OREGON

Information Services

Resiliency of Cyberspace

- Can Oregon cyber infrastructure withstand a major earthquake?
- What major services, regions would be affected?
  - ShakeAlert, Power grid, …
  - Oregon connects US cyberspace to Asia, Australia, etc.



- Which one of the stakeholders should be responsible to assess and improve the resiliency of cyber infrastructure?

Stakeholders

NSP
NETWORK SERVICE PROVIDERS

CYBER INSURANCE

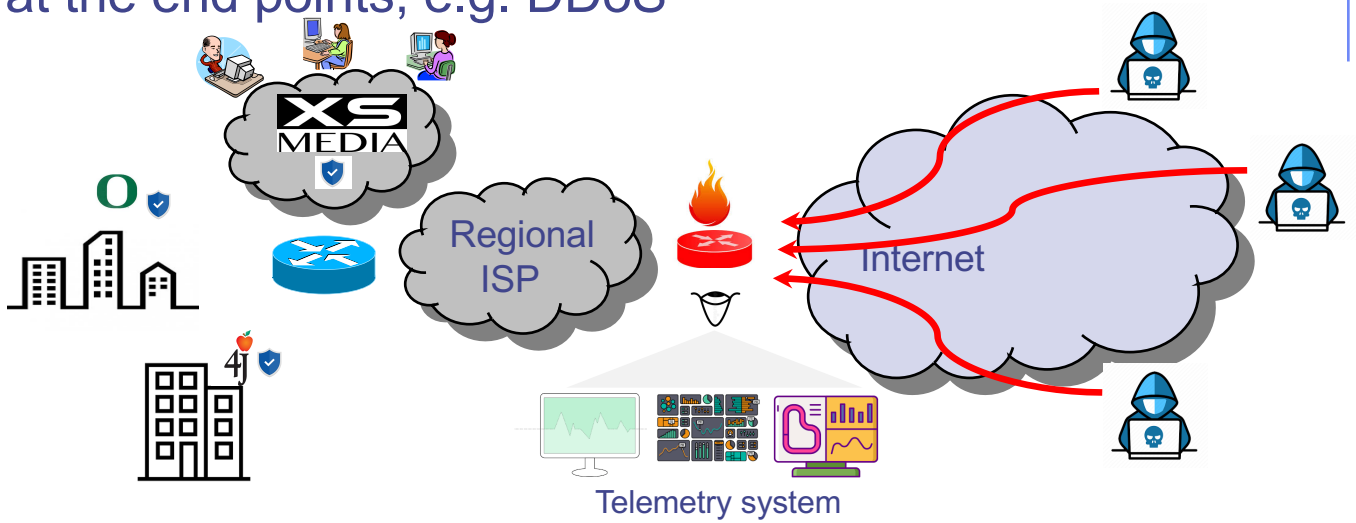
ISP
INTERNET SERVICE PROVIDER

Accurately assessing the resiliency of cyber infrastructure to major attacks and a natural disaster is critical and extremely difficult today

(FDD's Cyberspace Solarium Commission Report, 3/2020)

Visibility & Agility of Cybersecurity attacks

- A few classes of cybersecurity attacks are neither detectable nor defendable at the end points, e.g. DDoS



- End-point defense strategy is helpful but costly and not ***future-proof***
- Many other attacks can be detected in the middle of the network

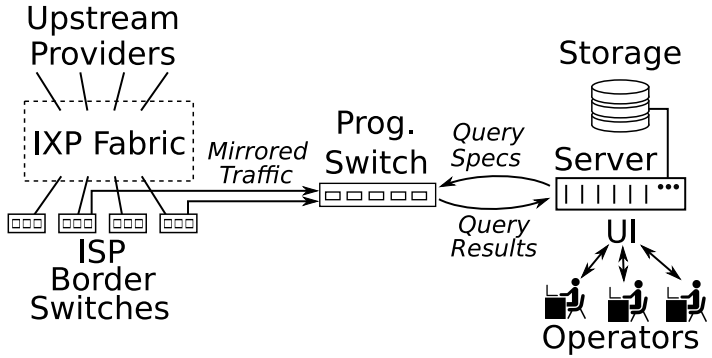
Cybersecurity solutions need to include in-network monitoring (i.e. network telemetry) and be agile to detect & mitigate future attacks

(FDD's Cyberspace Solarium Commission Report, 3/2020)

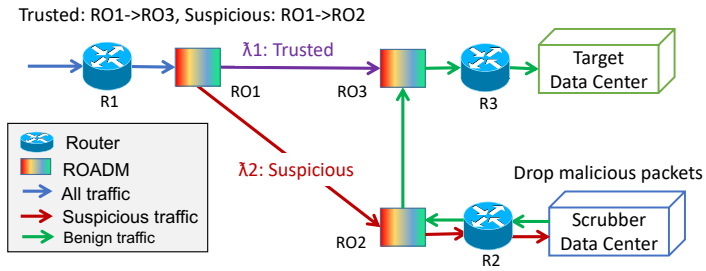
UO's Contributions to CCoE

Impactful Research Projects (I)

- An agile, network telemetry system to detect current and future cyber attacks
  - Any new cyber attack can be quickly identified and added to the system
  - Enabling the next generation of cybersecurity solutions that use machine learning and AI



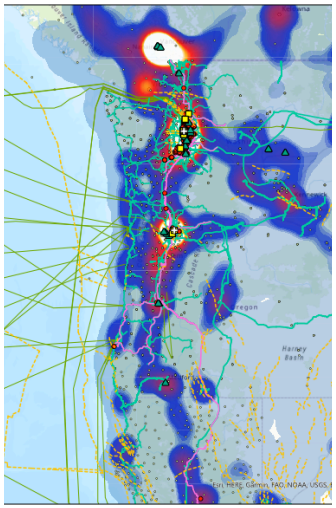
- Agile defense postures via optics-enabled cross-layer programmable defense



Impactful Research Projects (II)

- Assessing the resiliency of cyberinfrastructure across the state (and the US) to failure scenarios
  - Determining **NSPs' compliance** with best practices to enable enforcement by the state and federal government

- Assessing the vulnerabilities of each organization to different failure scenarios and cyber attacks
  - Informing **cyber-insurance companies** to incorporate these risks in their policies



- $1M NSF funding to build the state-of-the-art telemetry testbed that serves as a "learning playground"

Investing in these research projects can turn their outcomes into cutting-edge, cost-effective cybersecurity solutions for many stakeholders

Community Partnership

- Our network telemetry system has been deployed at UO campus network (40K users) and XS-Media (50K users) for more than a year
  - Helping these organizations detect and mitigate attacks, training network ops
  - Trying to secure federal funding to deploy the system at WIX
- Partnership with major colocation facilities in Oregon to deploy advanced traffic monitoring capabilities across the state
- Partnership with Network Service Providers across the state to help them incorporate advanced defense mechanisms
- Partnership with local professionals (through TAO) to teach hands-on courses

Investing in these partnerships will significantly enhance cyberattack detection and mitigation capabilities across the state

Service & Support

- Conducting annual resiliency assessment for Oregon cyber infrastructure, checking NSP compliance, offering recommendations
- Auditing and reporting the cybersecurity risks to individual stakeholders and cyber-insurance companies
- Offering expert advice on cybersecurity problems/incidents to different stakeholders across the state
  - Leveraging experienced network engineers & students at UO and LCC
- Public Awareness: Oregon Cyber Resilience Summit, Security Day, ..

Investing in these services enables the state to incentivize and coordinate among all stakeholders to improve cyber resiliency

Training Workforce

- Multi-disciplinary, research-informed BS and MS programs
  - Covering cyber law and ethics
  - Leveraging core competency in networking, systems, data science
  - Courses can be delivered online and over summer
- Emphasis on experiential learning
  - Access to state-of-the-art experimental testbed
  - UO-CSOC exposes students to real-world problem solving
  - Gamification of cybersecurity problems
  - Students engage in research projects and internship programs
- Seeking federal funds for cybersecurity education
- Research Experiences for Undergraduates (REU)

State investment in these activities helps UO improve, expand, support and update these educational programs

Related Projects & Resources

- Selected Research Projects
  - Programmable in-network defense
  - Routing and Infrastructure Security
  - IoT Security and Privacy
  - Privacy in Digital Age
  - Accountable Blockchain Rewriting
  - Android Malware Detection
  - Cryptocurrency Scams
  - Cloud Scrubbing to Mitigate DDoS Attacks
  - Online Social Networking Security
  - Construct a Knowledge Base for Attack Using NLP
  - Cross-layer Programmable Defense
  - Adversarial Analysis of Deceptive Text
- Funded by NSF, NSA, DoD, DARPA, ARO, ISOC, …

- Resources
  - Center for Cyber Security & Privacy
  - Oregon Network Research Group
  - Information Services
  - Oregon Cyber Security Operations Center
  - Oregon Advanced Computing Institute for Science & Society

Team Members at UO

- Prof. Ramon Alvarado
- Prof. Zena Ariola
- Jose Dominguez
- Prof. Ramakrishnan Durairajan
- Prof. Colin Koopman
- Prof. Lei Jiao
- Prof. Jun Li
- Prof. Yingjiu Li
- Prof. Daniel Lowd
- Prof. Allen Malony
- Prof. Bryce Newell
- Prof. Thanh H. Nguyen
- Prof. Thien Nguyen
- Prof. Boyana Norris
- Prof. Reza Rejaie
- David Teach