Institute for the Wireless Internet of Things at Northeastern

“An interdisciplinary engineering Institute to shape the untethered, ubiquitous, transparent, zero-power, and tactile Internet of the future”

Pathways to Partnership – IoT + 5G

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Institute for the Wireless Internet of Things

6 Sponsoring Agencies

National Science Foundation
Air Force Research Laboratory
Office of Naval Research

7+28 Industry Partners

DARPA
Department of Homeland Security

National Leadership with ~$20M in new grants in past 18 months
Applications enabled by core research
- Multiple current and emerging verticals
- Interconnected and reliant on common foundations
- Joint work on multiple core areas necessary to enable a seamless vertical application

Wireless Internet of the Future

Core Foundational Areas

- Smart Communities
- Smart Oceans
- Connected Vehicles
- Connected Drones
- Internet of Medical Things
- Industry 4.0

- Sensors and Energy Harvesting
- Communication and Networking
- Data Analytics Machine Learning
- Security and Blockchains
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- Digital Health
- Industrial IoT
- Smart Agriculture
- Maritime IoT
- Blockchain

- 5G, 6G Wireless
- Spectrum Sharing
- Software-defined networks
- Underwater Networks

- Tactical Networks
- Secure Wireless Networking
- Resilient and elastic networking

- Cognitive Wireless Networks
- Connected Vehicles
- Deep Learning for IoT
What is the Internet of Things?

The IoT is
New Ways to Wirelessly Connect
Things
Through low-power circuits. *Even in harsh environments…*

- Digital Health and Connected Smart Implantable Devices
- New communication paradigms for wireless implantable medical devices

“Internet” inside the body!

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The Internet of Underwater Things. *Sometimes very harsh…*

Profs. T. Melodia, M. Rinaldi, S. Basagni, M. Stojanovic
SEANet – Experiments at Marine Science Center, Nahant, MA

(Inter)national leadership in underwater and maritime IoT
Smart Maritime Communities
Seaport Economic Council Grand Challenge

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What is the Internet of Things?

The IoT is Secure Hardware and Systems
Cybersecurity and Privacy

Secure-by-design Polymorphic IoT Platforms

Physical-layer Wireless Steganography for Private Communications
What is the Internet of Things?

The IoT is New Wireless Networking Paradigms
A look into the future: 5G networks

Dynamic and real-time network sharing through network slicing

- Network is **shared** among multiple tenants
- Generation of **on-demand** network slices
- **Real-time** deployment of network slices through **optimal** resource allocation
Software-Defined 5G Networks

Optimization-based cellular network operating system

- WNOS: A network operating system to automatically configure operator networks
- Maximize network performance metrics
  - Throughput
  - Fairness

Allocate virtual resources to mobile users

Mobile Virtual Network Operators (MVNOs)

Base Stations (BSs)

Resource Blocks (RBs)
Software Defined Tactical Networks

Wireless Network Operating System

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mmWave and Terahertz wireless

mmWave technologies for IoT and 5G applications

- MIMO data transmission
- Beamforming and target tracking
- Accurate Sensing
- Radar and detection
- High rate communications
- Short-range IoT coordination

mmWave SDR testbed

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What is the Internet of Things?

The IoT is new applications and innovative business ideas.
Smart Cities and Communities

Industry Consortium
Cash, equipment & services, engineering, marketing, & R&D support

NSF and Research Community
Grants, experimental spectrum licenses, research agenda

$100M Program, public-private partnership co-led by W-IoT

PAWR Project Office

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SwarmControl
“Software-Defined Wireless Networks in the Sky”
Industry Affiliate Program

Institute for the

Wireless Internet of Things
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<tr>
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<th>Member Benefits</th>
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<tr>
<td>1</td>
<td><strong>Sponsored Research</strong></td>
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<td>Fast-track sponsored proprietary research agreements with access to multidisciplinary teams of researchers</td>
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<td>2</td>
<td><strong>Join Research</strong></td>
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<td>Facilitation of joint proposal opportunities</td>
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<td>3</td>
<td><strong>Institute Research Summits</strong></td>
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<td>Free registration for Institute Research Summits (2 per year)</td>
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<td>4</td>
<td><strong>Priority in Recruitment</strong></td>
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<td>Recruit our top students (BS, MS, PhD) - undergraduate and graduate, coop assignments, internships and fellowships</td>
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<td>5</td>
<td><strong>Intellectual Property</strong></td>
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<td>Priority access to IP and commercialization structure with lab-to-market focus</td>
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<td>6</td>
<td><strong>PAWR and Industry Advisory Board</strong></td>
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<td>Seat in Industry Advisory Board and visibility on PAWR Developments</td>
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Industry Engagement Process

W-IoT Business Development

- Initial Meeting
- Scope Project

W-IoT Project Management

- Collaborative Research Agreement
- Project Agreement(s)
- Recruit Researchers
- Project Start

W-IoT IP team

- Costs
- Funding sources
- Tasks
- Deliverables

- IP agreement
- Terms of project types
More Information?

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IoT+5G @ Northeastern  DECEMBER 4, 2018

GET CONNECTED.