Sandia National Laboratories

Exceptional service in the national interest

Cybersecurity Research at SNL

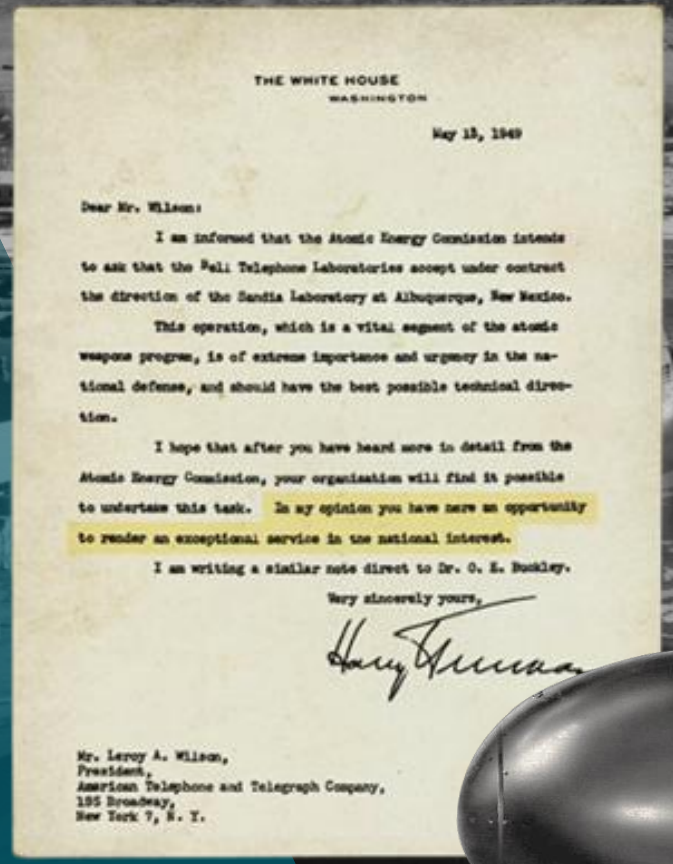
Will Zortman

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.
SAND 2018-4900 PE

SANDIA'S HISTORY IS TRACED TO THE MANHATTAN PROJECT

…In my opinion you have here an opportunity to render an exceptional service in the national interest.

- July 1945
  Los Alamos creates Z Division
- Nonnuclear component engineering
- November 1, 1949
  Sandia Laboratory established
- AT&T: 1949–1993
- Martin Marietta: 1993–1995
- Lockheed Martin: 1995–2017
- Honeywell: 2017–present



THE WHITE HOUSE
WASHINGTON

May 13, 1949

Dear Mr. Wilson:

I am informed that the Atomic Energy Commission intends to ask that the Bell Telephone Laboratories accept under contract the direction of the Sandia Laboratory at Albuquerque, New Mexico.

This operation, which is a vital segment of the atomic weapons program, is of extreme importance and urgency in the national defense, and should have the best possible technical direction.

I hope that after you have heard more in detail from the Atomic Energy Commission, your organization will find it possible to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.

I am writing a similar note direct to Dr. O. E. Buckley.

Very sincerely yours,

Harry Truman

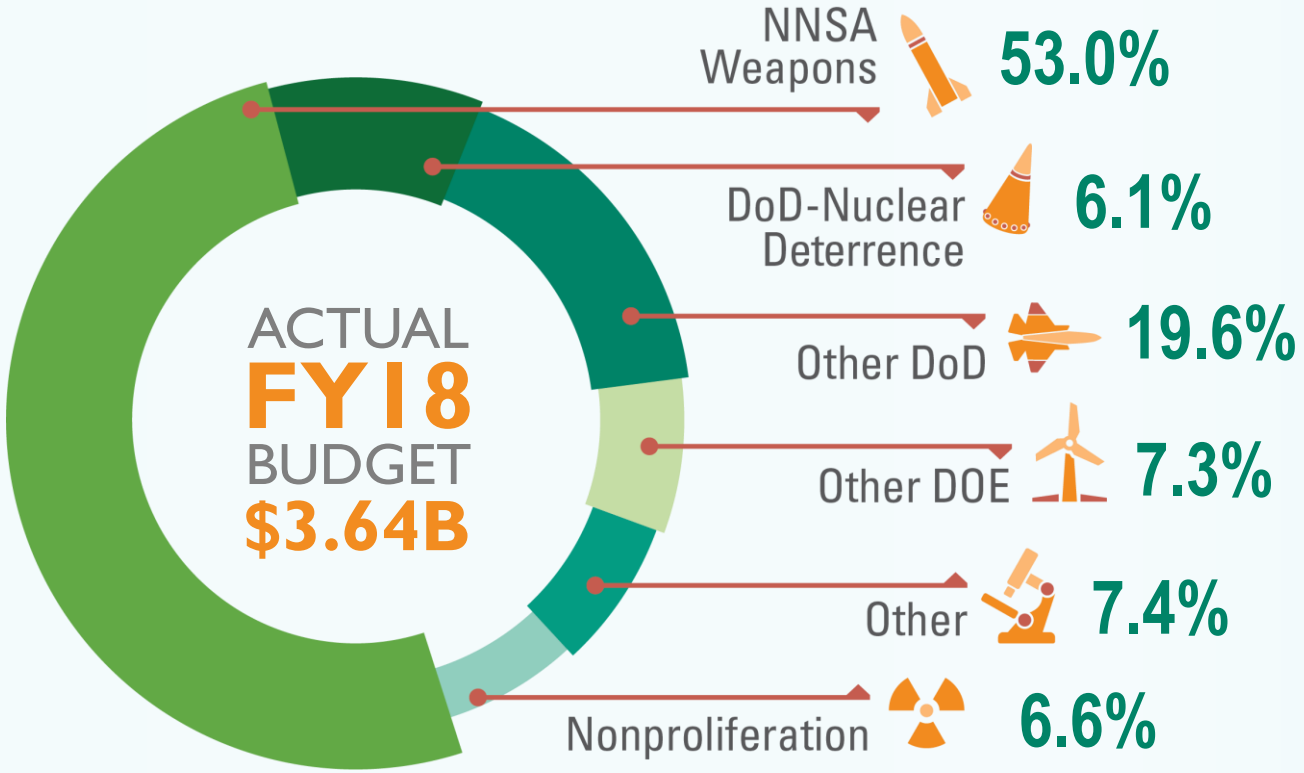
Mr. Leroy A. Wilson,
President,
American Telephone and Telegraph Company,
195 Broadway,
New York 7, N. Y.

SANDIA IS A FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTER MANAGED AND OPERATED BY

National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc.: 2017 – present

Government owned, contractor operated

SANDIA'S BUDGET COVERS A BROAD RANGE OF WORK



DoD

Air Force | Army | Navy
Defense Threat Reduction Agency
Ballistic Missile Defense Organization
Office of the Secretary of Defense
Defense Advanced Research Projects Agency
Intelligence Community

OTHER DOE

Science
Energy Efficiency and Renewable Energy
Nuclear Energy
Environmental Management
Electricity Delivery and Energy Reliability
Other DOE

OTHER

Department of Homeland Security
Other federal agencies | Nonfederal entities
CRADAs, licenses, royalties | Inter-entity work

NONPROLIFERATION

NNSA/NA20 | State Department

TECHNOLOGY-BASED ECONOMIC DEVELOPMENT

Helping New Mexico companies start up and grow

New Mexico Small Business Assistance (NMSBA)

6,858 new jobs created and retained; all **33** New Mexico counties supported
$57.9M in technical assistance to **2,797** New Mexico small businesses
2017: **$2.4M** in assistance provided by Sandia alone, **188** small businesses in **21** counties

Sandia Science & Technology Park (SSTP)

47 companies and organizations employing **2,059** people
$384.8M of investment
$98K average annual salary, **$5.4B** wages and salaries generated
2018: **3** new companies

Entrepreneurial Separation to Transfer Technology (ESTT)

162 Sandia entrepreneurs have left the Labs
113 companies started up or expanded
2018: **5** entrepreneurs left to start **4** companies and expand **1** company

Center for Collaboration and Commercialization (C3) Entrepreneur Exploration (EEx)

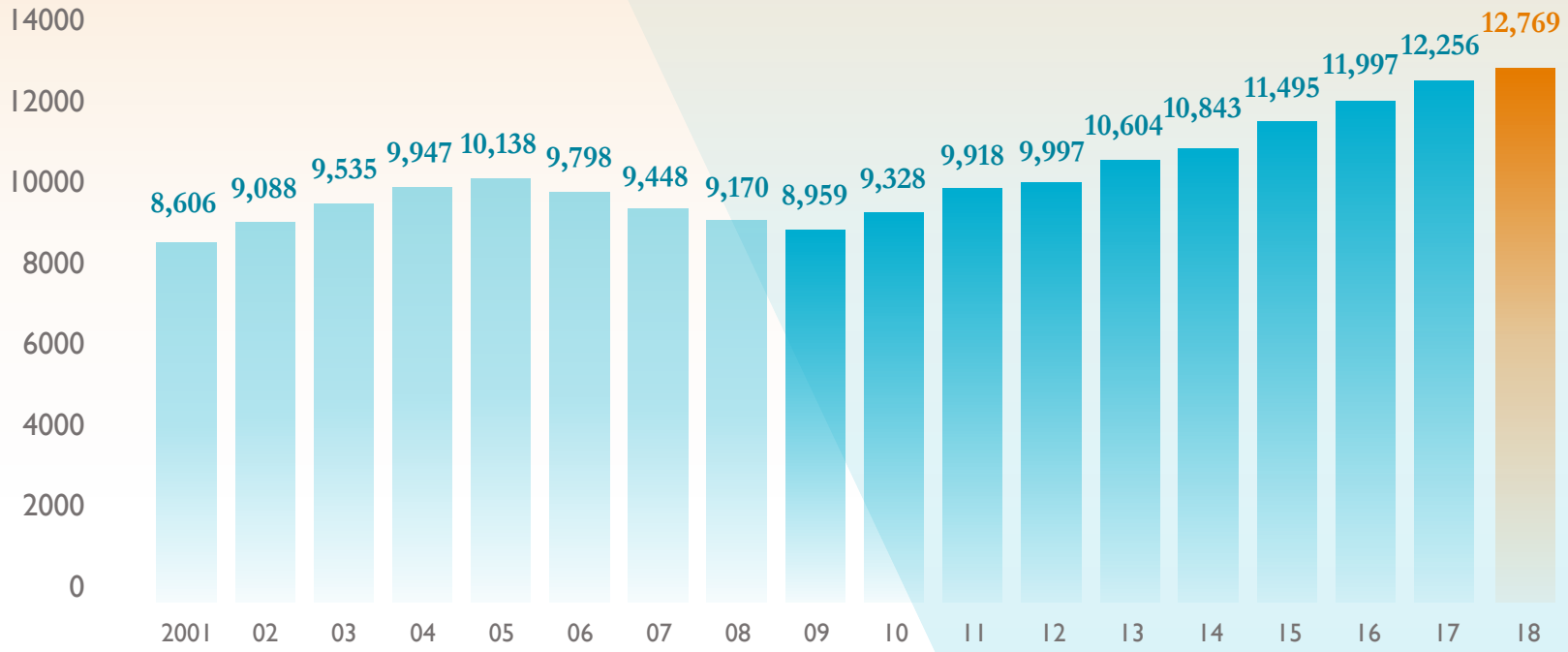
68 entrepreneur events, **3,319** participants including both Sandians and community members
C3 location at the University of New Mexico Lobo Rainforest building fosters collaboration with UNM
2018: EEx had **22** entrepreneur events with **1,256** participants

SANDIA'S WORKFORCE IS GROWING

Staff has grown by over 3,800 since 2009 to meet all mission needs

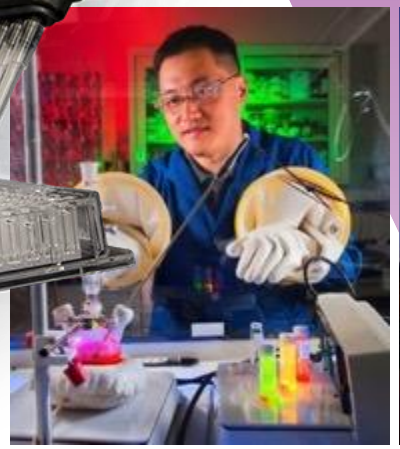
11,341 New Mexico

1,428 California

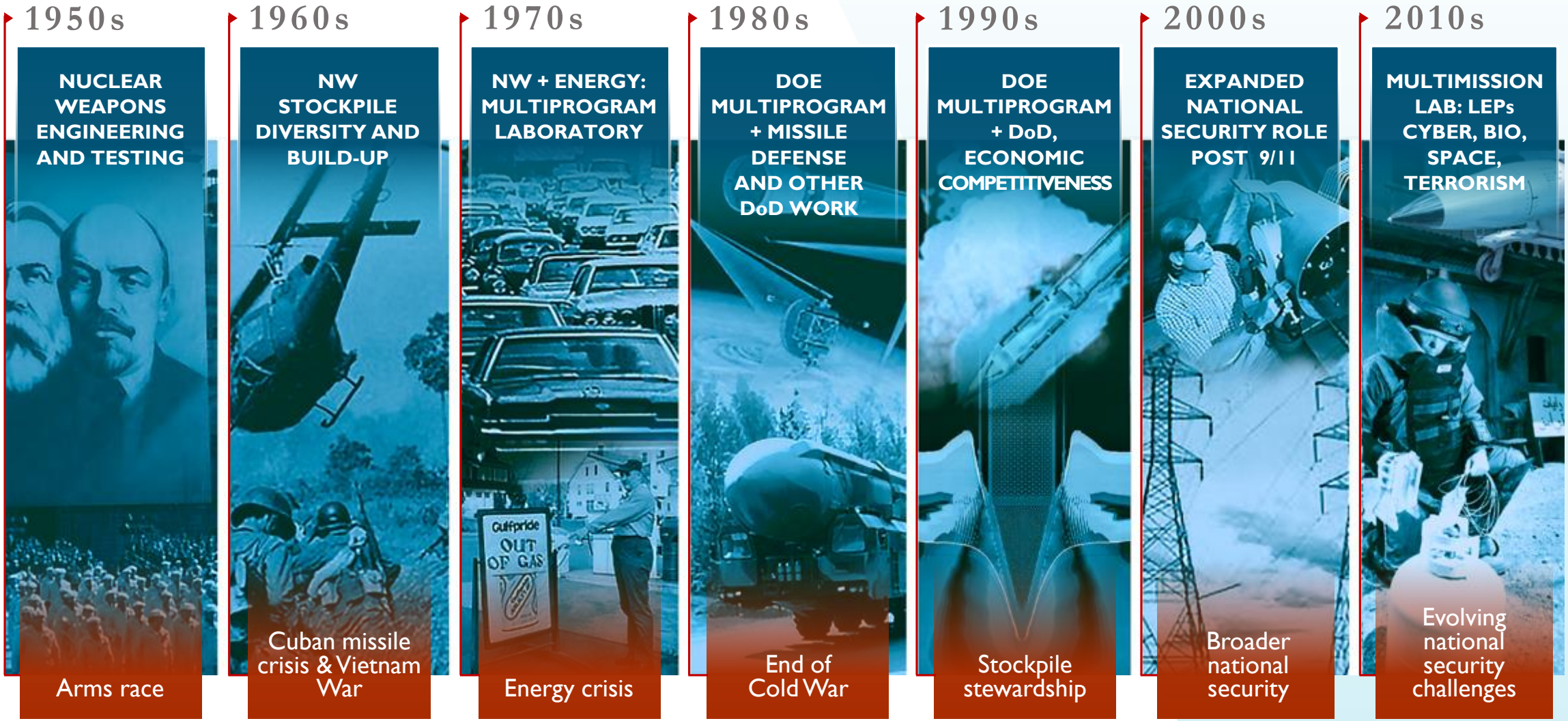


OUR PRIORITIES CREATE A VISION FOR THE FUTURE

- Deliver **quality engineering, science, and technology** in the most efficient way possible
- **Safety and security** are top of mind
- **Collaboration** is vital – inside and outside the Labs
- Sustain a **diverse and inclusive** Laboratories culture
- **Think strategically:** What might the world look like in 20 to 30 years?



SANDIA ADDRESSES NATIONAL SECURITY CHALLENGES



SANDIA HAS FIVE MAJOR PROGRAM PORTFOLIOS

Sandia Cyber Centers of Excellence

Enterprise Cybersecurity Defense

- Protecting the Enterprise Network

Civilian Cyber

- Leading critical public-private partnerships

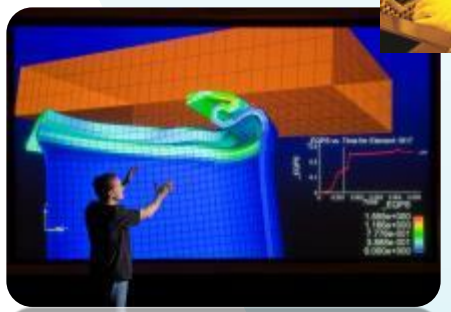
Other US Government Cyber

- Supporting the other government agencies in cyber research

Foundational Infrastructure/Tools

Foundational

- Microsystems and Engineering Sciences Applications (MESA) Facilities
- Center for Integrated Nanotechnologies (CINT)
- National Infrastructure Simulation & Analysis Center (NISAC)
- Modeling, simulation & visualization
- Center for Cyber Defenders Student Internship program



Cyber Research Focus Areas

Microelectronic Design and Analysis

Industrial Control System Security

Network Defense

Autonomous Cyber

Big Data and Data Analytics

Software Understanding

Embedded Systems Research

Cyber Modeling and Simulation

Back-Up Slides

Institute Internships

Institute Programs Website

- AutonomyNM
- Center for Computing Research (CCR)
- Interns for Security, Arms Control, and Force Protection Engineering (iSAFE)
- Mathematics & Analytics Research Technical Internship for Advanced National Security (MARTIANS)
- Mission Services Talent Acquisition Team (MSTAT)
- Nonlinear Mechanics and Dynamics (NOMAD)
- Nuclear Weapons Summer Product Realization Institute (NWSPRINT)
- Research and Applications of Mechanics of Structures (RAMS)
- Science of Extreme Environments Research Institute (SEERI)
- SENTINL: Energy Surety Incubator (ESI)
- TITANS: Center for Analysis Systems and Applications (CASA)
- TITANS: Center for Cyber Defenders (CCD)
- TITANS: Interdisciplinary Design, Engineering, and Assurance Students (IDEAS)
- TITANS: Monitoring Systems and Technology Intern Center (MSTIC)
- TITANS: RISE

Post-doc Opportunities

Key areas for post-docs at Sandia:

- Computer science/Computer Engineering
- Electrical Engineering
- Mechanical Engineering
- High-performance computing
- Microelectronics and microfluidics
- Nanotechnology
- Physics
- Chemistry/ Electro Chem
- Biosciences and biotechnology
- Radiation & electrical sciences
- Engineering sciences
- Pulsed power sciences
- Materials science & engineering

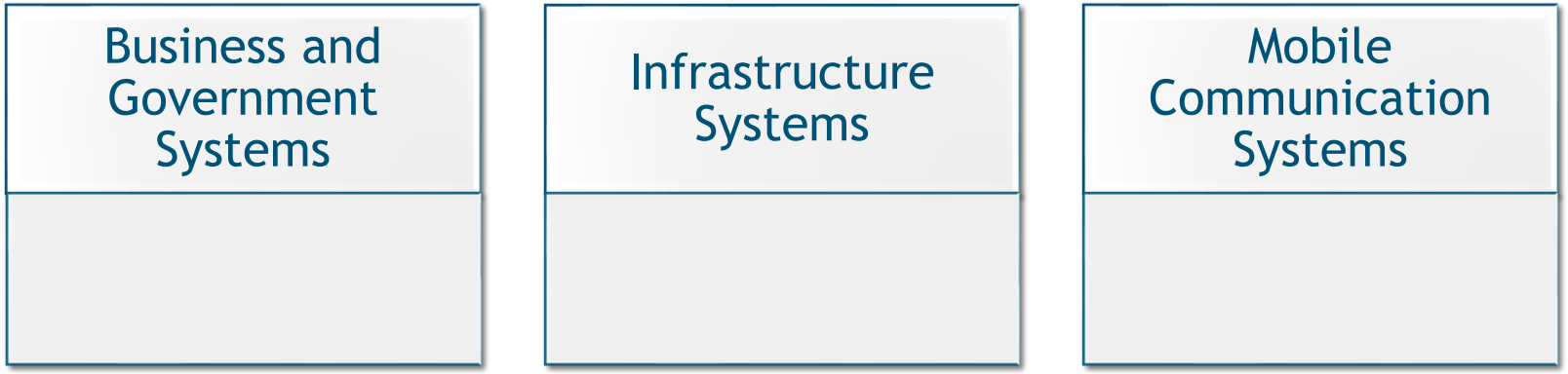
Eligibility Criteria

- A recent PhD (conferred 5 years prior to employment) or the ability to complete all PhD requirements before hire date.

What is Emulytics?

Capability to:

- Create model of system of interest (operational or conceptual)
- Create scenarios that transition modeled system into states of interest
  - Architecture, devices, configuration (correct/incorrect), traffic, …
  - Cyber defender scenarios
- Extensive instrumentation for data collection
- Perform analytics on resulting data
- Answer questions about system



Sandia's Control System Security Research

Provide decision makers with actionable information

- Red Team Assessments
- Field Device Analysis
  - PLC monitoring and forensics
  - PLC firmware forensics
  - ICS network detection for ICS traffic
- Emulytics
- Exercise/Test Bed support

Design resilient systems to withstand cyber-attacks

- Research next generation security solutions
- Partner with industry to "push" solutions to market

Mission: To reduce the risk of critical infrastructure disruptions due to cyber attacks on control systems.