AFRL

Information Directorate

FACILITIES

RIT Computing and Communications
RIS Information Systems
RIG Information Exploitation and Operations
RIE Intelligence Systems
RIO Integration and Operations

CONTENTS

Mission

To explore, prototype and demonstrate high-impact, game changing technologies that enable the Air Force and Nation to maintain its superior technical advantage.

Vision

To lead the Air Force and Nation in Command, Control, Communications, Computers, and Intelligence (C4I) and cyber science, technology, research and development.

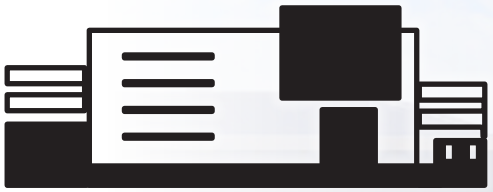
Information Directorate

CAMPUS

$1.2B FACILITY NET ASSETS

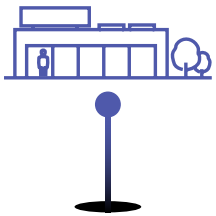
30 LABORATORIES

within the main campus and off-site facilities



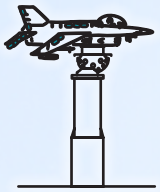
ROME RESEARCH SITE MAIN CAMPUS

4 BUILDINGS



65 ACRE CAMPUS

882,000 SQ FT BUILDING AREA



NEWPORT OFF-SITE FACILITIES

2 MAIN BUILDINGS

with small support structures

58 ACRES

23,800 SQ FT BUILDING AREA

STOCKBRIDGE OFF-SITE FACILITIES

2 MAIN BUILDINGS

with small support structures

295 ACRES

12,943 SQ FT BUILDING AREA

INNOVARE ADVANCEMENT CENTER

A front door to the Air Force Research Laboratory, Information Directorate | Rome, NY

The Innovare Advancement Center is a collaboration environment to foster the discovery and technology advancement of scientific research through synergistic partnerships with researchers, academics, entrepreneurs and innovators.

Within walking distance of the Air Force Research Laboratory's Information Directorate in Rome, NY; the heart of New York State's Mohawk Valley.

AN OPEN AND COLLABORATIVE BUSINESS MODEL FACILITATING:

- Basic Research for Command, Control, Communications, Computers, Intelligence and Cyber Technologies
- Rapid Prototyping
- Commercialization & Technology Transfer
- Workforce Development Small Business Outreach
- Science, Technology, Engineering and Mathematics (STEM) Youth Development
- Collaboration and Event Space
- Innovation Incubation

- ☑ An agile and transformative ecosystem that connects global technology leaders to collaborate and solve complex Air Force computing challenges.
- ☑ Single location, robust environment co-locating partners, offices, labs, and event spaces

INNOVARE ADVANCEMENT CENTER ECOSYSTEM

- Academia
- Non-Traditional Industry
- Corporate Entities
- International Partners
- Partnership Intermediaries
- Local Cohorts

STATE-OF-THE-ART RESEARCH AND DEVELOPMENT ENABLERS:

- Quantum Information Science Laboratories and Facilities
- Small Unmanned Aerial Systems Testing
- Neuromorphic Computing Facilities
- Electronics Laboratories
- DevSecOps Software Development Pipelines
- Artificial Intelligence Incubation
- Rapid Test Cell for Processing and Exploitation

Let's Innovate Together!

JOIN THE INNOVARE ADVANCEMENT CENTER ECOSYSTEM

CONTACT Karen E. Roth, Chief Engineer
AFRL Information Directorate

p: 315-330-7704
e: karen.roth@us.af.mil

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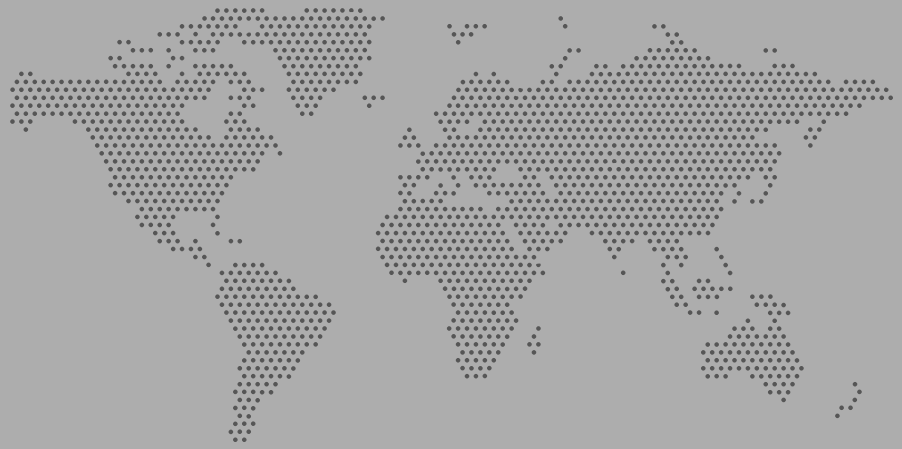

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Computing and Communications

Putting the right information into the right hands at the right time.

MISSION STATEMENT: To lead the discovery, development and integration of affordable computing, networking, and communications technologies for our air, space and cyberspace forces.

Chief.....Mr. Greg Zagar

Deputy Chief.....Mr. Mike Hartnett

Technical Advisor.....Dr. Lauren Huie-Seversky

RIT Division Office Phone.....315.330.3011

ADVANCE COMPUTING LABORATORY (ACL)

Support various in-house projects using non-traditional computing technologies (Neuromorphic and Edge Computing)

DESCRIPTION. The ACL Laboratory supports various in-house projects within the High-Performance Systems Branch and RIT division.

EQUIPMENT/RESOURCES. Various types of computer hardware from small single board embedded systems to high end workstations, including remote connections to the Air Force Research Laboratory Information Directorate, Affiliated Resource Center, and High Performance Computers.

CAPABILITIES. The types of capabilities in the ACL Laboratory include the following:

- Research, develop, and test specialized HPC technologies included Neuromorphic Computing (TrueNorth and Loihi) and Edge processing (Agile Condor)
- Electrical and mechanical integration of components and hardware into working systems or sub-systems
- Emulation and testing for field experiments
- Software Development
- Configuration and management of the computer system administration (including systems in other facilities)

EXAMPLES OF CURRENT/PAST PROGRAMS. In-house accomplishments in this facility have supported various Office of the Secretary of Defense, Defense Advanced Research Projects Agency, Air Force Office of Scientific Research, and AFRL programs.

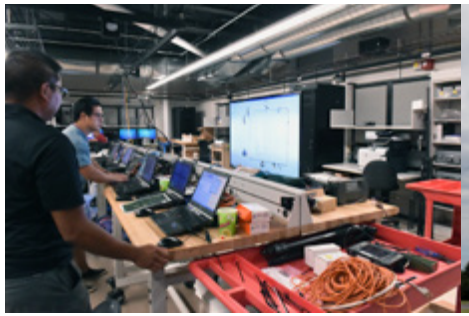
CONTROLLABLE CONTESTED ENVIRONMENT AT STOCKBRIDGE

Multiple capabilities exist at this site including the Controllable Contested Environment (CCE) and the small Unmanned Aerial System Experimental Capability (sUAS-EC).

DESCRIPTION. The Stockbridge Experimental Facility is situated on 300 acres located 18 miles southwest of Rome. The CCE consists of 25 remote locations, or "pads", spread across Stockbridge's 300 acres which are configured to form a flexible outdoor "real world" experimental facility.

EQUIPMENT/RESOURCES. The 25 pads spread across Stockbridge's 300 acres provide shelter, power, antenna/towers, and fiber optic/network connectivity to a central building. Each pad consists of an S-280 shelter, two towers, and a variety of ancillary gear including antennas, power control, Internet protocol network gear, Universal Software Radio Peripheral (USRP). Additional capabilities available within the environment include a wide variety of radio frequency (RF) signal generation as well as spectrum analysis. Future plans will augment those capabilities with additional resources. Reconfigurable laboratory space in the central building supports a wide range of experiments.

CAPABILITIES. The CCE provides a truly unique capability to support real world, outdoor and tactical edge experimentation for a wide range of information technologies. This flexible infrastructure supports the cost effective, rapid performance of experiments and tests in multiple technology areas, including RF communications, networking, cyber, and information. The environment includes the creation of a controllable contested environment where RF transmissions and



receptions are completely controlled and measured. This enables research and development on the effects of dynamic spectrum access techniques, policy-based routing approaches, and cognitive network node performance in challenging environments.

- 120 Foot Walk Up Tower: Located adjacent to the Main building, this large tower provides line of sight capability to the Information Directorate main campus in Rome, NY, and the Newport site. Equipped with enclosed workspace, power, network connectivity and flexible equipment mounting, the tower provides elevated experimentation with an easy walk up configuration.
- Small Unmanned Aerial System (SUAS) Airfield: Two – 60 foot x 600 foot runways and a wide variety of fixed wing and vertical take-off and landing (VTOL) platforms enable airborne testing of payloads up to fifteen pounds. Current flight approvals enable testing within a sixteen square mile area surrounding the site.
- RF Control: An evolving distributed management and control architecture enables flexible, repeatable and configurable RF and spectrum assets. Using a combination of equipment, including signal generators, commercial and military radios, and the electromagnetically quiet environment provides signal sources over a wide range of frequencies to support and control a variety of RF testing.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Dynamic Spectrum Access (DSA) Policy Development Phase 2 Milestone Demonstration: One of 33 projects under the OSD-led Spectrum Access Research & Development Program (SARDP). In a recent compelling over-the-air demonstration using DSAs technology, DSA-capable radios were able to operate on a non-interference basis in shared spectrum scenarios to enable more efficient utilization of the electromagnetic spectrum, whether congested or contested.
- Large-scale Joint Aerial Layer Network (JALN) Scenario Capstone Demonstration: The Next Generation Software Defined Radio Frequency (SDRF++) program demonstrated their true software radio

prototypes executing Common Data Link (CDL) at data rates from 10-200 Mbps on 14 radio channels interconnecting three test sites at Rome, Stockbridge, and Newport. In addition to CDL, other waveforms included Digital Data Link (DDL), SATURN Enhanced Data Rate (SEDR), 4G & 2G cellular, Push-to-talk voice radios with Voice-over-internet-protocol (VOIP) bridging, and Blue Force Tracking.

- Hybrid Radio Frequency (RF)/Optical Communications Capstone Demonstration: This demonstration utilized a hybrid RF-optical link and custom modem to 'fail over' to RF as the optical link becomes unavailable in order to maintain communications. The hybrid link interfaced the Rome to Stockbridge facilities and used the C-band RF link.
- Advanced Course in Engineering Research and Capstone Exercise. In 2019, for the ACE Capstone Project, teams deployed across the 300 acre Stockbridge UAS test site in fiber connected, military grade shelters. Communications, command and control depends on network services (VoIP, SSH, http, ftp) constructed and installed by the teams. In addition to their core responsibility to execute/disrupt missions, participants attempted to exploit pre-built network targets to obtain intelligence, steal credentials, subvert SCADA systems and earn other operationally relevant advantages. The exercise demonstrated the asymmetric nature of cyber conflict and provides data on the physical stresses manifestations of stress on cyber operators.
- HF high frequency Mission-Oriented Investigation and Experimentation support. Remote testing location utilizing the CCE to experiment with HF frequencies to include multiple users: L3/Harries Corporation, MITRE, MIT/LL and AFRL/RITF.

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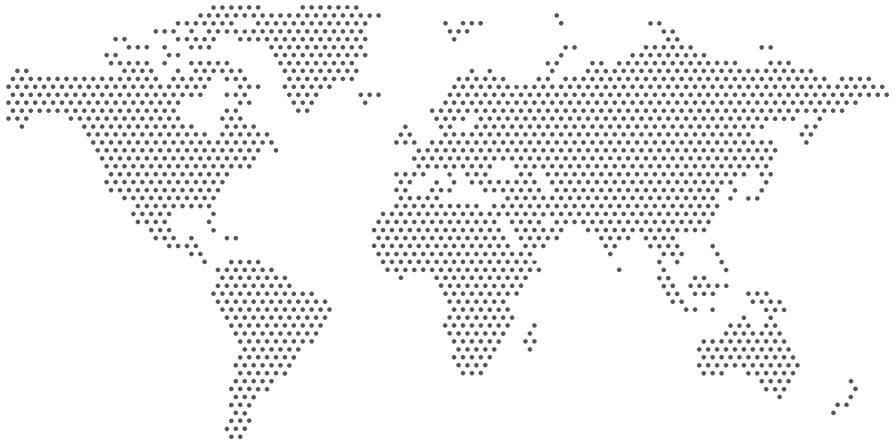

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CORPORATE RESEARCH AND DEVELOPMENT SERVER FACILITY (CRDSF)

Logical and physical connectivity requirements.

DESCRIPTION. The CRDSF is an access controlled unclassified space hosting 63 racks in an American Society of Heating Refrigerating and Air-Conditioning Engineers Class I environment. The CRDSF connectivity infrastructure addresses logical and physical connectivity requirements such as isolation of VLANs.

CAPABILITIES.

- An unclassified controlled access server environment for the Air Force Research Laboratory programs to expand capabilities and enhance applied technologies
- ASHRAE Class I environment
- Conditioned and protected electrical service

EXAMPLES OF CURRENT PROGRAMS.

- After Burner
- Collaboration Gateway
- Command and Control Concept Center
- Cyber Command and Control Test bed
- Open Architecture Distributed Common Ground System
- Exploitation of Audio
- High Performance Computing Affiliated Resource Center clusters
- Independent Testing and Evaluation Center
- Secure View
- Trusted Network Environment
- Vanguard
- Web Enabled Temporal Analysis System-Tool Kit

HIGH PERFORMANCE COMPUTING-AFFILIATED RESOURCE CENTER (HPC-ARC)

Provides tomorrow's Air Force with massively scalable HPC applications and connectivity to the Secret Defense Research Network.

DESCRIPTION. Affiliated Resource Centers (ARCs) are Department of Defense (DoD) laboratories and test centers that acquire and manage HPC resources as a part of their local infrastructure. ARCs share their HPC resources with the broader DoD HPC user community via a High Performance Computing Modernization Program (HPCMP) through coordinated allocation of their HPC resources. In order to provide tomorrow's Air Force with massively scalable HPC applications, the software must be developed on large clusters. Unlike typical HPC clusters, all Air Force Research Laboratory Information Directorate clusters allow for interactive development and testing.

EQUIPMENT/RESOURCES. The HPC-ARC has several super computers that have been designed, integrated and are operational.

- **CONDOR Cluster.** Interactive Super Computer: 36 Servers (2U Dual six-core Intel Westmere 5660, 48Gb RAM) each with 2GPGPUs (NVIDIA C2075s). The network consists of dual 10GbE and 20Gb/s infiniband, for enhanced I/O capabilities.
- **OFFSPRING Cluster.** 100Tflop/s (Dense Heterogeneous Computing): 22 Servers (1U – Xeon E5-2660 and E5v2690, (dual) NVIDIA Tesla P100s GPUs, 128GB RAM, 40GbE (Lustre 480TB), 56Gb/s FDR Infiniband). Supports the Neuromorphic applications and runs the TrueNorth software development suite and compass emulator.
- **ASID.** 48 node blade server HPC, heterogeneous dense computing, the blade servers each have Intel Xeon dual socket 8core E5-2670V2, with 128GB of Ram. The network and file system has Dual 10GbE.
- **Blue Raven.** World's largest Neuro-Synaptic supercomputer enabling large-scale AI/ML applications: 64M Neurons and 16.3 Billion Synapses, Max 67 Watts (15 Watts per NS16e), 4 x PCIe optical connector - 500 Mbytes/s, 4 x 1 Gb/s Ethernet.
- **Minerva.** OUSD funded GPGPU cluster to support large scale AI/ML applications from hundreds of data sources. The system has 8 large HPC nodes each with 8 Nvidia GPUs, able to ingest hundreds of 4K data streams, the system combines large memory and dual rail 10GbE to scale/fan out the data and processing in parallel.

  CAPABILITIES. HPC-ARC(2). Authorization to Operate which will include the Owl Technology DIODE, allowing file transfers and streaming of User Datagram Protocol packets into the HPC-ARC real-time from Stockbridge Facility.
- **Visual Media Reasoning (VMR).** Supported the development and integration of the VMR Defense Advanced Research Projects Agency program, and hosted the system in the HPC-ARC.

  Defense Research and Engineering Network (DREN) Internet Service Provider (ISP) Benefit ($200K/yr), the HPC-ARC DREN connection/ DREN III (1000Mb/s) and security assessment is covered by the HPCMP. The total benefit since 1995 to the laboratory ~$4.0M.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Advanced Computing at the Edge (ACE+)
- Visual Media Reasoning
- Neuromorphic Fusion for Timely Intelligence and FuelAI
- Airborne Wide Area Synthetic Aperture Radar Processing
- Computational Intelligence and Neuromorphic Computing
- Several of the Commander's Research and Development Fund (CRDF) projects including Robust ML.
- Stockbridge (High-Bay) Rapid-Link to HPC Experiments

MICROWAVE AND OPTICAL COMMUNICATION RANGES (ROME – STOCKBRIDGE – NEWPORT)

Multiple line of sight experimentation ranges for RF communications and optical over-the-air experimentation:

- 18 miles, between AFRL/RI Rome and AFRL Stockbridge Research Facility.
- 32 Miles, between AFRL Stockbridge Research Facility and AFRL Newport Research Facility (Irish Hill)
- 19 miles between AFRL/RI Rome and AFRL Newport Research Facility (Tanner Hill)

DESCRIPTION. The Microwave and Optical Communication Range has walk-up towers on each end of the link with heated and cooled experimentation rooms that provide hands-on access to- equipment and antennas. The first tower in Rome, NY provides antenna mounting and workspace at 100 feet above ground level (AGL), while the second tower in Stockbridge, NY provides working levels at 60 and 120 feet AGL. Additionally, fiber connectivity to the ground provides remote control of equipment for long-term data gathering.

EQUIPMENT/RESOURCES.

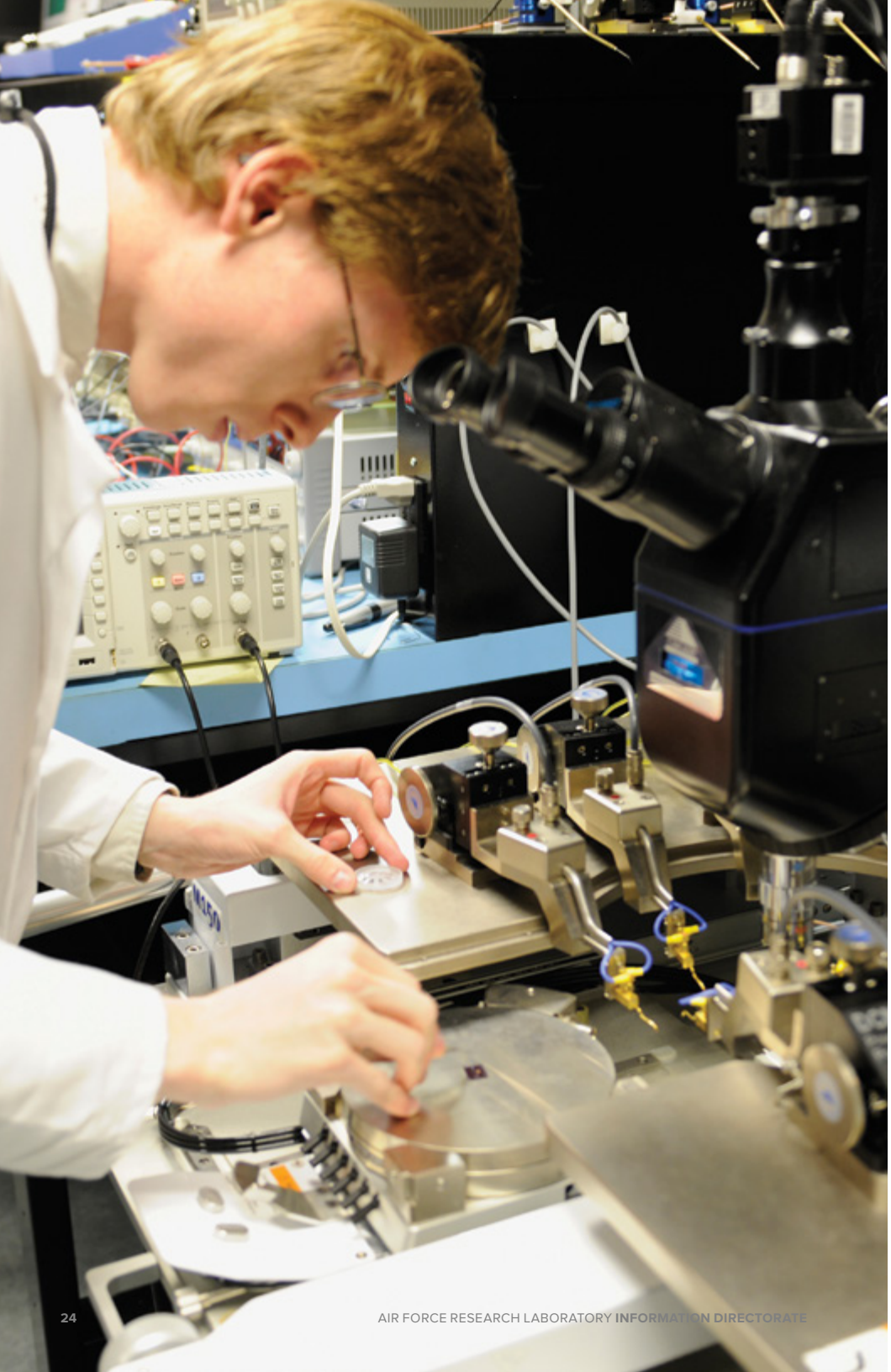
- 100+ feet walk-up towers located in Rome, NY and Stockbridge, NY
- 50 feet heated and cooled Building Newport Tanner Hill
- Heated and cooled experimentation rooms with direct access to equipment and antennas
- Spectrally quiet radio frequency environment for low-noise experimentation

CAPABILITIES.

- Long term data gathering
- Weather and atmospheric related analysis
- Far-field wireless communication link verification
- Flexible experimentation environment

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- RF Adaptive Persistent, intelligence surveillance and reconnaissance Data Link high-bandwidth backhaul
- Optical communication experimentation
- E-band long-term atmospheric analysis



NANOTECHNOLOGY AND COMPUTATIONAL INTELLIGENCE LABORATORY

Research and development of unconventional computing architectures and paradigms.

DESCRIPTION. The Nanotechnology and Computational Intelligence Laboratory focuses on research and development of unconventional computing architectures and paradigms.

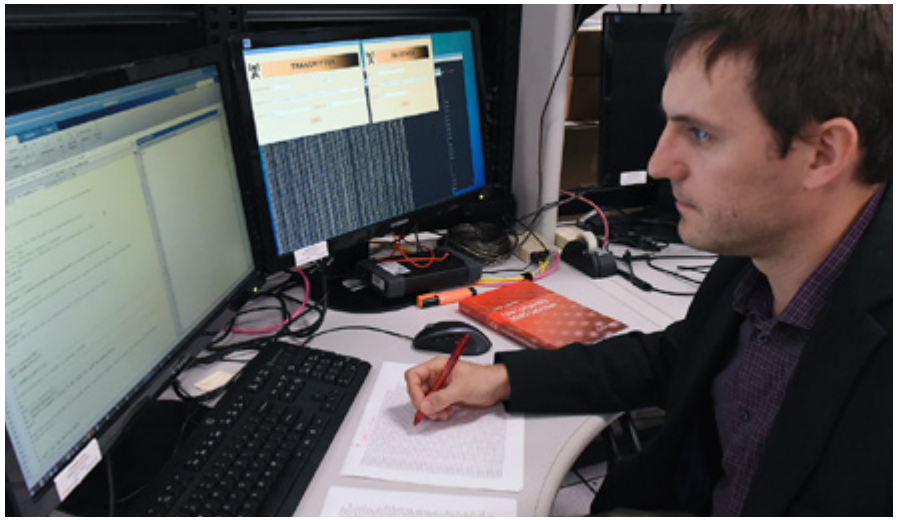
EQUIPMENT/RESOURCES. $1.5 Million laboratory possesses world class capabilities in nanodevice and neuromorphic based hardware characterization and testing.

CAPABILITIES.

- Semi-automatic probe station, variable temperature stage, and device analyzer
- Circuit design, test, and evaluation
- Neuromorphic computing architecture test and evaluation
- Semi-automatic wire bonder
- Digital microscope, up to 5,000x magnification
- Laser scanning microscope, up to 28,000x magnification

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Laboratory Research Initiation Request reservoir computing for process perception, prediction, and control
- LRIR understanding and analyzing entropy sources in metal oxide memristive devices for use in security primitives
- LRIR methods for developing secure nonlinear computer architectures
- In-house neuromorphic computing for very large test and evaluation data analysis
- Computational Diversity for Cyber Security-Physically Unclonable Functions measurements



NETWORK CENTRIC INTEGRATION AND INTEROPERABILITY FACILITY (NCIIF)

The NCIIF includes network capabilities, computing platforms, network emulation and simulation, and radio frequency (RF) and optical communications capabilities.

DESCRIPTION. The NCIIF supports research and development, analysis, and integration of a wide range of communications and networking technologies. It provides a flexible environment for a variety of work in emerging network centric capabilities. In conjunction with remote facilities at the Stockbridge test site, the NCIIF supports state of the art research, development and experimentation with network and communications related technologies.

EQUIPMENT/RESOURCES. The approximately 4,600 square foot facility is comprised of a main lab and an adjoining facility which is utilized for research and development in various radio spectrum technologies and network connectivity. To support experiments and demonstrations requiring communications with remote locations, there is an antenna field on the roof above the facility.

CAPABILITIES. The NCIIF includes network capabilities, computing platforms, network emulation and simulation, and RF and optical communications capabilities.

The facility has capabilities for test, evaluation, and development of communications networking, architectures and protocols. This includes real-time traffic generation, network monitoring, interface testing, and performance analysis capabilities for serial, T1, local area network, and Internet communications; both wired and wireless.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Tactical Wireless Connectivity
- Heterogeneous Operationally Responsive Networks
- Policy Enabled Coalition Communications
- Advanced Network Computing Laboratory laboratory space
- Heterogeneous Integrated Network Technologies
- Dynamically Self Tuned Performance Enhancing Proxy
- Signals intelligence Experimentation
- Video Experimentation
- Integrated Netops situational awareness at the Tactical Edge Office of the Secretary of Defense (OSD)
- Tactical Targeting Network Technologies Defense Advanced Research Projects Agency (DARPA)
- Dynamic Transport Protocols (OSD)
- Wireless Network after Next (DARPA)

NEWPORT RESEARCH FACILITY

Newport Antenna Measurement Facility provides the Air Force a unique far field, elevated outdoor antenna test range.

DESCRIPTION. Newport Antenna Measurement Facility is located 30 miles southeast of Rome, NY. The facility is split between two hilltops, Irish Hill and Tanner Hill. The hilltops are separated by a distance of 1.5 miles with a 400 foot deep valley. These hilltops and the facilities on them provide the Air Force a unique far field, elevated outdoor antenna test range. The total facility consists of 78 acres with over 24,000 square feet of laboratory, office, maintenance, and aircraft modification space.

The facility is used to develop state-of-the-art antenna measurement technologies. Specifically, techniques for measuring the effects of airframe features including external weapons, pods and tanks, on aircraft antenna radiation patterns in a simulated flight environment. The data obtained can be used to characterize antenna performance of various aircraft configurations or to optimize the antenna to achieve specific performance levels.

Data collected at the Newport Facility can be done for a fraction of the cost of data collected via flight testing, and because these tests are repeatable to a very high level of accuracy, comparative testing between aircraft configurations or antenna designs can easily be accomplished. The airframes which are currently available for use at the Newport site include A-10, F-16 (A/C), F-15E, F-18 (A/C/E/F), F-22, F-35, SH-60, and sections of the B-1, KC-135, and C-130. Five foot, 14 foot, and 40 foot ground planes are available and may be installed as required.

The Newport facility is comprised of five independent data acquisition facilities and eight measurement ranges. All ranges and both hills are interconnected with a multi-fiber optic network which interfaces to instrumentation and a high data rate link to a wide area network to the Information Directorate main campus.

EQUIPMENT/RESOURCES. Eight measurement ranges are fully instrumented with signal source, antenna, amplifiers, receivers, computers, displays, recording systems, fiber optic interfaces, positioner controllers, and high-speed multiplex systems covering the frequency ranges of 50 MHz to 60 GHz. The ranges are typically operated with full-size airframes installed on special heavy-duty, high angular accuracy (+/- 0.05 degrees), 3-axis positioners to accurately simulate all possible flight attitudes. Measurements of antenna radiation patterns are accomplished by illuminating the airframe with a uniform radio frequency (RF) field at frequencies of interest. The airframe, with the test antennas installed, is then rotated to produce patterns of amplitude or phase versus azimuth angle or elevation angle:

Range 1. The Irish Range is situated across Tanner and Irish Hills. This range is 7,520 feet long with a 400 foot valley in between. The primary transmit antenna sources located on Tanner Hill include four, six, eight, ten and twenty eight foot parabolic dish reflectors. The receiver location is a 50 foot tower on Irish Hill. The receiver tower has a 3-axis positioner capable of holding full size vehicles weighing up to 50,000 pounds with an overturning moment of 300,000 ft-lbs. This Irish Range is operated over a frequency range of 0.5-60 GHz.

Range 2. The Tanner Range is a 6,700 foot range situated across Tanner and Irish Hills (with the 400 foot valley in between) and is utilized to obtain precision amplitude and phase patterns in the 0.5 to 18 GHz range with the added capability of very high frequency and millimeter wave measurements. The primary transmit antennas for this range are located at the transmit tower building on Irish Hill and consist of four, six, eight, ten, fifteen, and twenty eight foot parabolic reflectors. The test airframes are mounted 60-foot above ground on Tanner Hill. This tower is capable of supporting full size test beds up to 10,000 pounds with an overturning moment of 75,000 ft-lbs.

Range 3. The Site "X" Long Range is the primary F-35 range and is situated across Tanner and Irish Hills. This 5,500 foot range has a 400 foot valley between transmit and receive locations. This range is used to obtain antenna gain/amplitude and phase patterns on full size vehicles mounted on a 3-axis positioner capable of rotating up to 50,000 pound loads with an overturning moment of 300,000 foot pounds, in the frequency range of two to 18 GHz.

Range 4. The Site "X" Intermediate Range is set up for 1,400 foot lengths with a 30 foot valley located on Irish Hill. The receive facility is remotely operated from Irish Hill. The transmit antenna consist of eight and 15 foot parabolic reflectors, optimized for low side lobes, to cover the 0.5 to 2.0 GHz frequency range. The receive tower is 50 foot high with a SA Model 55850 3-axis positioner capable of rotating up to 50,000 pounds with an overturning moment of 300,000 ft-lbs. Control of the positioner and receiver is remote via fiber optic cable to the Control Room. This range is used to obtain precise amplitude/gain or highly precise amplitude/gain and phase patterns of antennas mounted on the various airframes at Newport.

Range 5. The Tanner Hill Short Range is a 750 foot flat range located on Tanner Hill. The transmit and receive facilities are collocated on the same hilltop. Transmit antennas, located in the short-range facility, consists of two, four, six, eight, and ten foot reflectors mounted up to 30 foot above range level. This range has two, 3-axis positioners with a 10,000 pound capacity, one at each end of the range. This allows the range to be operated in both directions to accommodate special test requirements. This range is operated as both an elevated and a ground reflection range, as required, over the frequency range of 0.1 to 60 GHz.

Range 6. The Irish Isolation Range consists of a 20 foot tower with a 3-axis positioner capable of rotating 50,000 pound loads with a 300,000 ft-lb overturning moment. The facility is used to mount full size vehicles for the purpose of measuring inter/intra system antenna isolation and coupling data. Although isolation measurements can be conducted at all locations, this range was specifically set up to allow the conduct of isolation measurement programs and free up the other ranges for pattern measurements, thus allowing more flexibility and productivity.

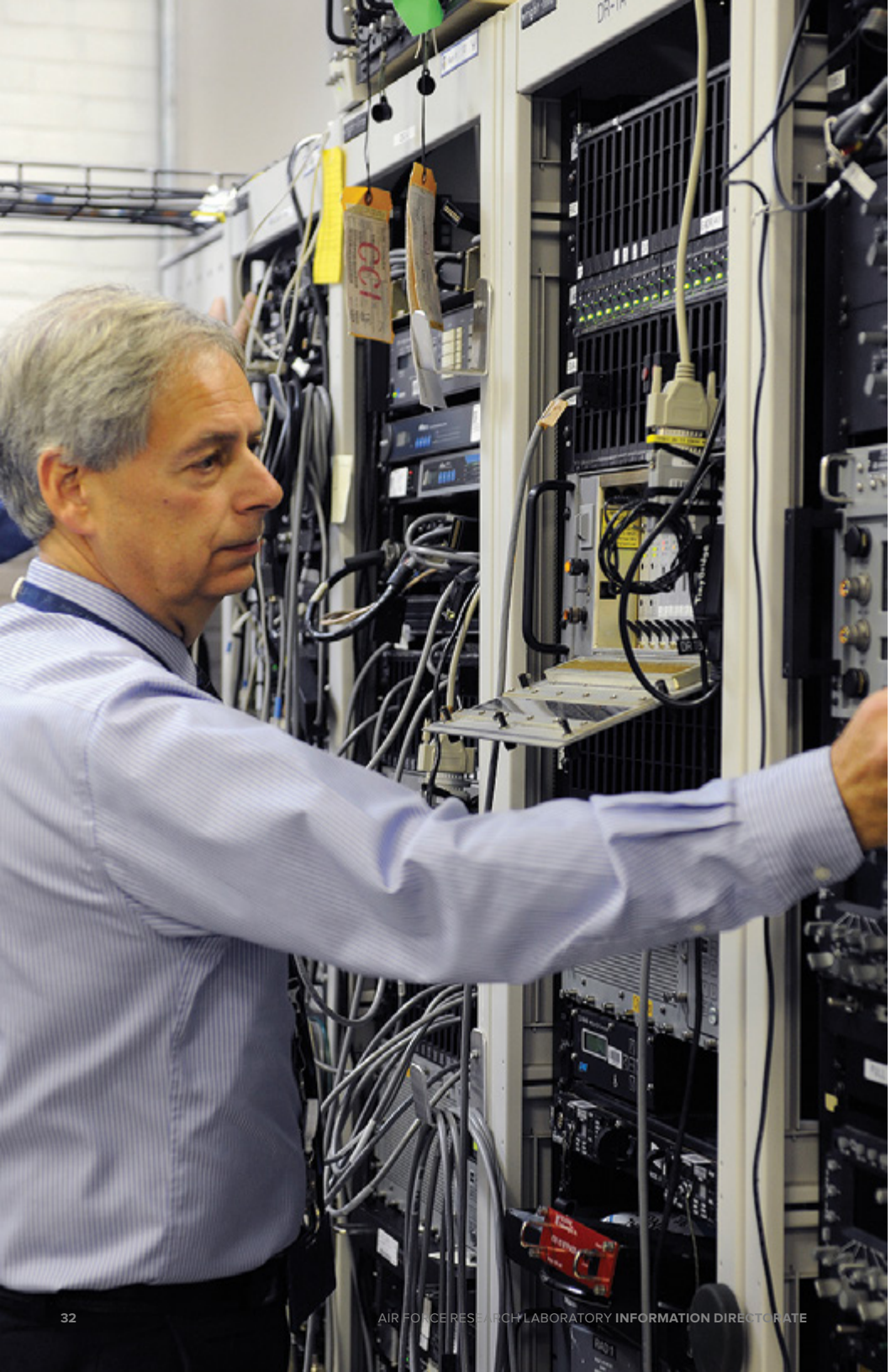
Range 7. Ground Reflection Range, 400 foot, 30-500 MHz.

Range 8. Ground Reflection Range, 372 foot, 30-500 MHz.

CAPABILITIES. Each range operates with a state-of-the-art automated RF measurement system. Three networked and distributed computer systems based on the Linux operating system are used for real-time data acquisition, real-time operator graphical data visualization and RF transmitter control. The system provides extremely efficient and accurate RF measurements by providing high speed switching and multiplexing of antenna elements, RF frequency, transmit polarization and other parameters that may be required for the specific test program. Locally developed and maintained measurement system software provides the flexibility required for the measurement, control and monitoring of modern antenna systems. Data quality control is maintained with real-time and off-line graphical data visualization tools and anomaly detection software.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Terahertz Experimentation
- SPARX
- NC3- HF Experimentation
- JSF – F-35 Development since 2003 and Block Upgrades
- F-22 Development
- Multiple-input multiple-output MIMO Experiments
- AN/ALQ-184 and 131 ECM Pods AFMC AFLCMC/WNYEC
- Ground-to-Air Transmit and Receive
- B1-B
- A-10
- AH-1
- F-16
- F-15
- F-18



RADIO FREQUENCY TECHNOLOGY CENTER (RFTC)

A unique Electromagnetic (EM) environment to conduct radio frequency (RF) systems and antenna systems integration, demonstration, test and evaluations.

DESCRIPTION. The RFTC provides a unique EM environment to conduct RF systems and antenna systems integration, demonstration, test, and evaluations. The facilities supplement and support measurement activities at the remote Newport and Stockbridge Research Facilities.

The facilities consist of two EM anechoic chambers and associated RF sources, instrumentation, and support equipment and a SATCOM walk up tower with transmit and receive capabilities with RF, fiber optics and copper links through the RFTC and main campus. The two anechoic chambers (40 x 32 x 48 and 12 x 12 x 36) provide a free space EM for detailed antenna pattern measurements and evaluation of RF systems and interfaces. Systems as large as an air launched cruise missile (16 foot long) can be accommodated in the large anechoic chamber. The nearby Systems Demonstration Laboratory is available to be used in conjunction with the anechoic chamber facilities.

The Systems Demonstration Laboratory located in the RFTC is an RF and general purpose, multi-use, 5,628 square foot laboratory with electronic prototyping/repair benches, test equipment, instrumentation, network analyzer calibration area, software/hardware development area, equipment storage areas. The laboratory supports the development, integration and installation, test, evaluation, and analysis of breadboards, prototypes, and/or advanced development models (hardware/software) required to support various technical tasks. Furthermore, it supplements and supports measurement activities at the High Bay Anechoic Chamber Facilities and is used as a staging area to support demonstrations and field exercises at other locations. The laboratory has fiber optic connectivity to the inter-site microwave radio system from the main campus to the Stockbridge Research Facility and Newport Research Facility.

CAPABILITIES. High average power densities of +21 dBm/cm2 (700 V/m), fully automated data acquisition and control systems, 50 MHz-18 GHz.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

Remote Radio, Network Modeling and Simulation Environment, Tactical Targeting Network Technology, Rapid Link, distributed signals

intelligence, wireless comm network architectures, network-centric exploitation and tracking, Quint [5] Network Technology, multiple-input multiple-output antennas. Innovative Multi-Mission Agile RF capabilities, Electronically Steerable Antenna for Wireless Network after Next, Drone Research and Development Area, Audio matrix testing booths, Secure Processor.

EQUIPMENT/RESOURCES.

- RF synthesizers/generators
- Spectrum analyzers
- Network analyzers
- Power meters (pulsed and continuous)
- Automated Data Acquisition System
- Antenna positioner system
- Communications/radio sets
- Infrared Thermal Imaging System
- RF and microwave signal sources
- Very High Frequency/Ultra High Frequency, microwave, and millimeter wave antennas
- Video cameras/monitoring equipment
- Oscilloscopes
- Variable frequency “S” parameter vector network analyzer
- Frequency, voltage, current and resistance instrumentation
- Fiber optic telemetry equipment
- Pick-N-Place machine
- Re-flow oven
- SMD rework station
- PCB milling machine
- Environmental chamber
- Electrostatic discharge approved work area
- 3D Plastic printing

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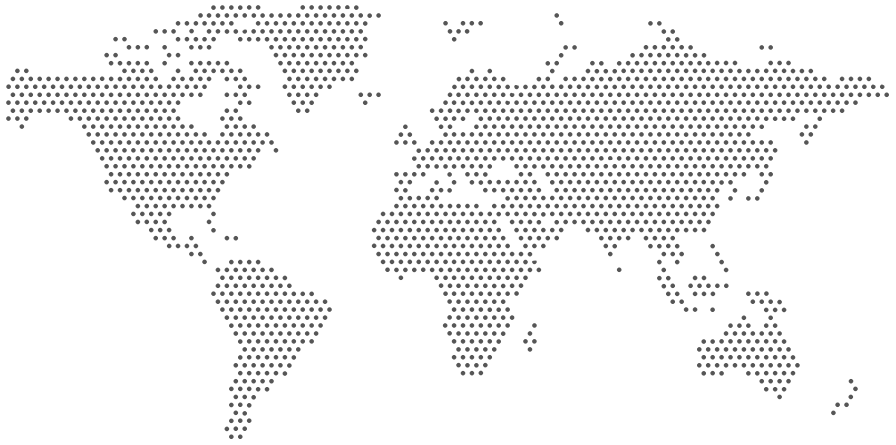
LEAD | DISCOVER | DEVELOP | DELIVER

Information Directorate



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SATELLITE COMMUNICATIONS (SATCOM) FACILITY

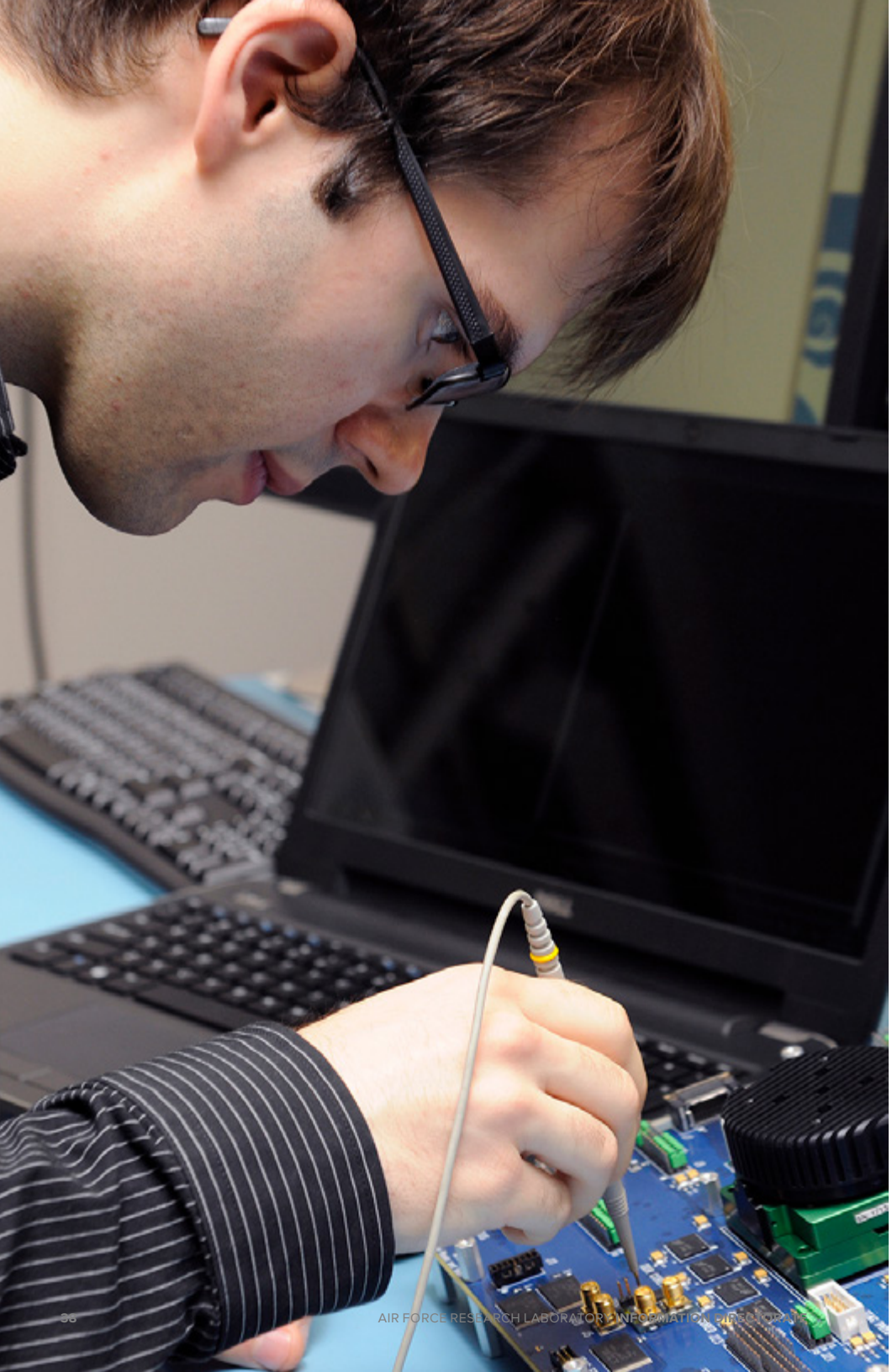
The SATCOM facility supports the development and field testing of communications technologies.

DESCRIPTION. Because of its outdoor location and virtually unobstructed view of the southern horizon, this area is optimally positioned to provide for convenient geosynchronous satellite access, as well as an uninterrupted, all season view of the solar arc. The latter is required for passive radiometric measurements of solar radiation through the atmosphere in support of the development of atmospheric propagation models for future satellite communications at very high radio frequencies, such as V/W band. (71 GHz to 86 GHz). This facility also provides test bed support for atmospheric propagation testing for the development of free-space optical communications technologies.

EQUIPMENT/RESOURCES. Transmitters, receivers, radiometers, for Ka, X, V/W band, optical, and Long Wavelength Infrared. Recently added a multiband (X, Ku, Ka band) Ground Terminal and ground station SATCOM terminals which will allow new terminal technology testing, evaluation, and exercise support over operational Department of Defense SATCOM networks.

CAPABILITIES. Testing of both RF satellite and optical communications technologies.

EXAMPLES OF CURRENT AND PAST PROGRAMS. A number of satellite terminal in-house products have been developed in this facility. These include the Ka-Band suitcase terminal, self-acquiring Ka-Band portable terminal for Federal Emergency Management Agency, High Mobility Multipurpose Wheeled Vehicle mounted Ka-Band Comm-on-the-move Terminal, and X-Band manpack terminals for United States Special Operations Command. A sun-tracking radiometer, V/W band slant-path radio link, and weather data collection equipment are also on site to support V/W band atmospheric propagation studies for future SATCOM systems. Atmospheric propagation experiments at the short and long-wave infrared bands are also being conducted at this site to develop future high-availability optical communication systems.



SECURE EMBEDDED HIGH-PERFORMANCE COMPUTING

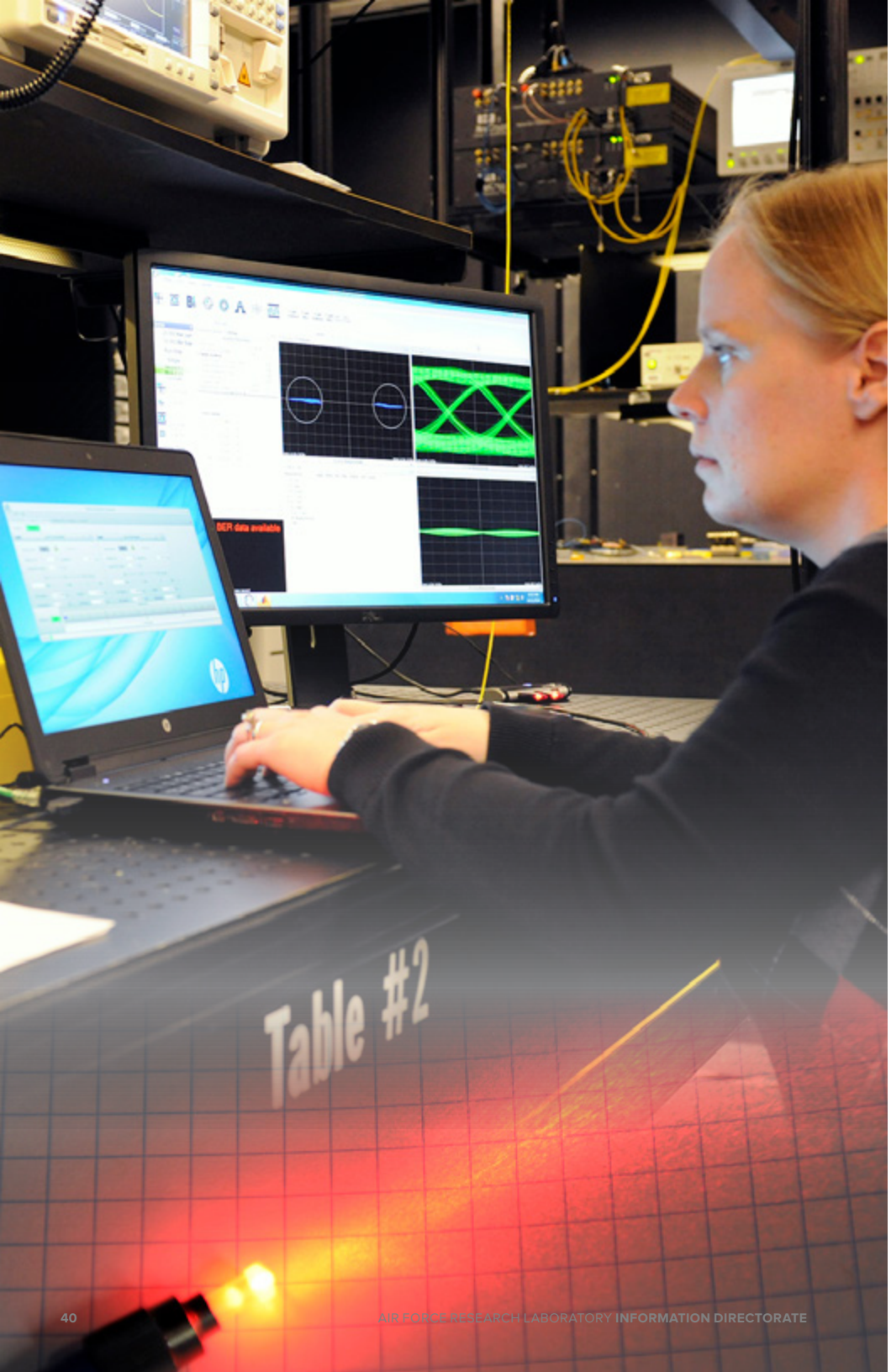
This facility is used for testing custom processor chips.

DESCRIPTION. 20' x 20' electrostatic discharge (ESD) restricted area with three ESD benches, computer benches, and a conference table. It is used for testing custom processor chips.

EQUIPMENT/RESOURCES. Power supplies, 8 GHz digital oscilloscope, field-effect transistor (FET) probes, standalone computers running Linux, custom processor chips, packages, and boards.

CAPABILITIES. Testing of ESD sensitive components using standard interfaces such as XAUI (10 Gigabit Ethernet Attachment Unit Interface), and Joint Test Action Group test equipment.

EXAMPLES OF CURRENT/PAST PROGRAMS. The AFRL T-CORE Secure Processor Version 1 chip as well as its package and board were debugged and demonstrated in this facility. The 3UVPX T-CORE prototype board will also undergo testing and demonstration in this facility.



QUANTUM COMMUNICATIONS LABORATORY (QCL)

Focused on integrating quantum data encryption and quantum key distribution with high data rate. Focused on integrating quantum and classical channels to determine how best to transmit quantum information over a standard network link.

DESCRIPTION. The QCL is focused on integrating quantum data encryption and quantum key distribution with high data rate, free space optical communications to reduce size, weight and power for secure, high capacity communication links. The atmospheric distortion inherent in the free space channel is compensated by the use of adaptive optics. The laboratory supports a stationary link from the main campus to the test site at the Stockbridge Research Facility, a 30km straight line distance. This link is used to characterize the atmospheric effects on the optical channel and correlate the environmental conditions with link performance. A scintillometer is collocated at the main campus with a transmitter positioned at the nearby high school, which serves as a convenient path given the scintillometer short range of operation. This convenience supplies high school students at Rome Free Academy access to current research and weather measurements. The link also serves as a test bed for varying modulation schemes.

EQUIPMENT/RESOURCES.

- Tektronix OM4106D Coherent Lightwave Signal Analyzer
- High speed oscilloscopes
- Arbitrary waveform generation
- NuCrypt Alpha-Eta optical encoding system
- AOptix free space optical communication terminals with adaptive optics

CAPABILITIES.

- Coherent signal analysis
- Secure optical communications testing over a 30km free space optical range

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Secure high capacity information transport via optical wireless links
- Measuring quantum data encrypted modulation states

QUANTUM NETWORKING LABORATORY

Connecting trapped-ion based quantum memory nodes with photon-based interconnects for quantum networking and distributed quantum information processing.

DESCRIPTION. The Quantum Networking Laboratory research focuses on interfacing trapped-ion based quantum memory nodes with photon-based interconnects to realize communication protocols over a quantum network. The quantum memory nodes consist of linear arrays of trapped-ion quantum bits (qubits) that are manipulated with laser and microwave fields. Remote memory nodes are connected via photon-based interconnects through remote entangling schemes and/or entanglement swapping techniques. Within the memory nodes, quantum information processing tasks are carried out using phonon-mediated entangling protocols. Extending the size and number of these network nodes enables distributed quantum information processing capabilities.

EQUIPMENT/RESOURCES. This state-of-the-art laboratory includes multiple frequencies of continuous wave lasers for ion trapping, manipulation, entanglement, and detection for both ytterbium and barium atoms; the accompanying acousto- and electro-optic modulators for frequency shifting; a pulsed laser system for remote-ion entangling operations and multiple radio frequency and microwave sources. The laboratory also includes the other experimental infrastructure needed for the research including oscilloscopes, network analyzer, spectrum analyzer, computers, custom-electronics for trapped ion experimental control, electron-multiplying charge coupled device (EMCCD) camera, photon multiplier tubes, wavemeter, fiber optics, various optical components, and ultrahigh vacuum chambers with the necessary ion pump and getter technologies.

A clean room/bake-out facility contains a Class 100 clean room for ultrahigh vacuum component cleaning, surface ion trap installation, and final vacuum chamber assembly. A modified computer-controlled bake-out oven with a pumping manifold allows preparation of the ultrahigh (10-12 Torr) vacuum environment. In addition, the clean room/bake-out facility includes ultrasonic cleaners, storage cabinets, soldering tools, and a spot welder.

CAPABILITIES.

- Ultrahigh vacuum chambers
- Trapping ions in surface electrode ion traps
- Photon-mediated entanglement in a trapped ion system
- Phonon-mediated entanglement in a trapped ion system
- Entanglement mapping/swapping for quantum networking protocols
- PC board processing
- 3D printing

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Connecting Quantum Capabilities
- Quantum Information Science
- Established trapped-ion memory node capability

QUANTUM INFORMATION SCIENCE LABORATORY

The goal is to construct systems that can perform secure high-speed quantum information processing and distributed computation that can, in many cases, outperform classical computing capabilities.

DESCRIPTION. This one-of-a-kind-in-the-Air Force laboratory supports research and development in the emergent field of quantum information processing, distributed computing, and quantum networking. The Information Directorate Quantum Information Processing group focuses on research in linear optics quantum computing, quantum gates and circuits, implementation of quantum algorithms on photon-based hardware, quantum processor architectures, entangled photon generation, quantum cluster state generation, continuous variable cluster state generation, and efficient quantification of quantum states. This research encompasses both bulk optics, fiber-optics, and integrated photonic circuitry. The overarching goal of all these research areas is to construct systems that can perform secure quantum information processing and distributed computation.

EQUIPMENT/RESOURCES. The 600 sqft. Class 4 laser facility contains continuous wave and pulsed lasers for conducting photon-based quantum experimental research implemented in bulk and integrated optics. The facility spans the gamut of photon-based quantum information processing with the ability to create photon quantum bits (qubits), entangle these qubits into larger quantum states, quantify the quantum state, and perform quantum state manipulation/information processing on the state. The Quantum Information Processing Laboratory has the capability to characterize and incorporate quantum waveguide integrated circuits into existing test beds as well as a complete set of classical (photon number >>1) and quantum (photon number ~1) measurement tools for these circuits.

CAPABILITIES.

- Single and entangled photon generation
- Single and entangled photon detection and measurements
- Optical/Electrical chip probing
- Multi-wavelength photon analysis
- Quantum circuit testing and analysis
- PC board processing
- 3-D printing of components

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Connecting Quantum Capabilities
- Quantum Information Technologies
- Quantum Compressed Sensing
- Integrated Quantum Photonic Circuits
- Quantum Entanglement Witnesses
- Cluster State Quantum Computing
- Advanced Quantum Test bed

SUPERCONDUCTING AND HYBRID QUANTUM SYSTEMS LABORATORY

The goal is to develop superconducting and heterogeneous quantum hardware for (1) utilizing entanglement as a resource for quantum networking and distributed quantum information processing; and (2) interfacing different qubit modalities to maximize quantum information systems' functionality and efficiency.

DESCRIPTION. This one-of-a-kind-in-the-Air Force laboratory supports research and development in the emergent field of quantum information science, particularly quantum networking and distributed quantum information processing. The Superconducting and Hybrid Quantum Systems Group focuses on designing, characterizing, and investigating the properties of novel superconducting circuitry, quantum electromechanical and optomechanical devices, microwave-optical converters, and quantum interfaces between trapped-ions, integrated photonics, and superconducting circuits. As well, the group aims to investigate 3D-integrated heterogeneous quantum architectures; modular superconducting qubit architectures; and approaches to implementing quantum interfaces across large temperature gradients – such as between milli-Kelvin and Kelvin or ambient temperatures. The overarching goal of this research is to develop the building blocks for field-deployable quantum networking and information processing technology

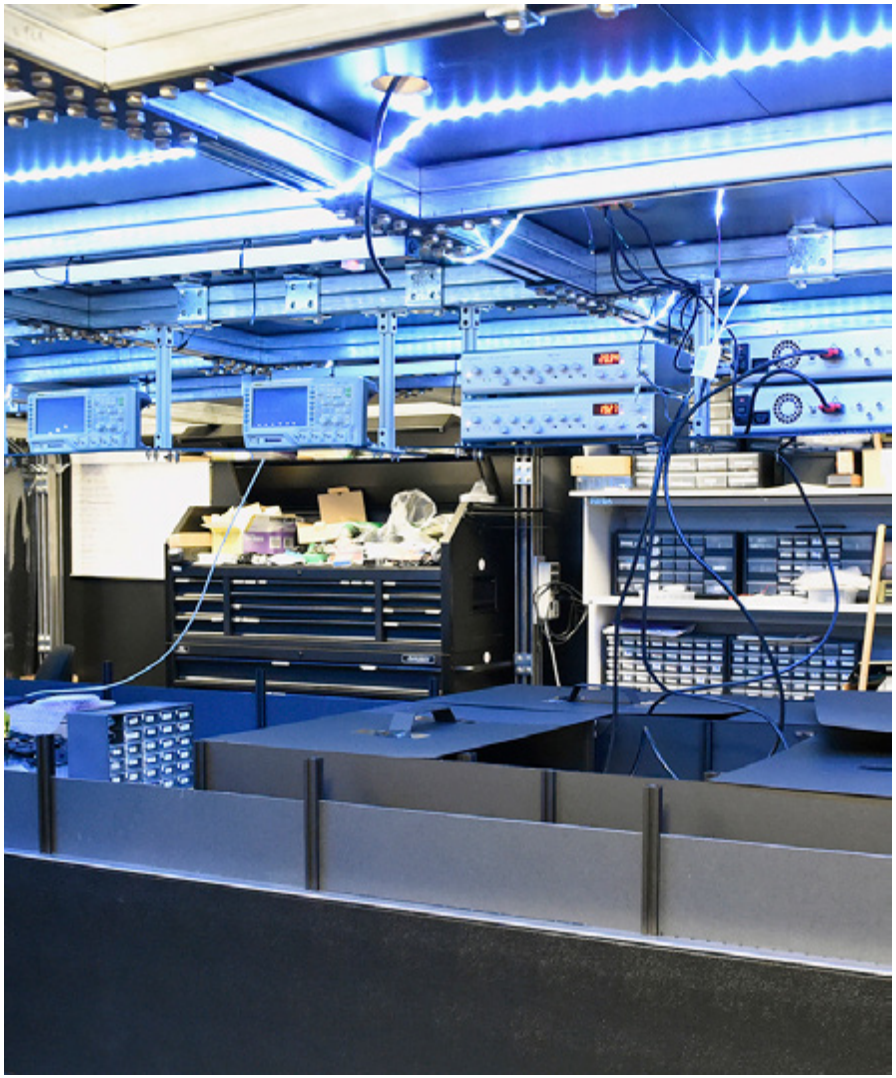
EQUIPMENT/RESOURCES. This state of the art facility includes multiple cryogen-free refrigerators for performing low frequency, microwave, and optical measurements at milli-Kelvin temperatures; vacuum equipment including turbo pumps and helium leak detectors; FPGA-based data acquisition and quantum measurement control hardware, including arbitrary waveform generators and digitizers; baseband generators and IQ mixing hardware; ultra-low phase noise analog and vector microwave generators; precision lock-in amplifiers; vector network analyzers; spectrum analyzers; ultra-low noise cryogenic amplifiers; and cryogenic microwave filters, circulators, isolators, switches and attenuators.

CAPABILITIES.

- Quantum measurement of superconducting qubits, superconducting circuitry, electromechanical and optomechanical systems, trapped-ion systems (future), and integrated photonic systems (future)
- Milli-Kelvin electronic measurements of thin films and novel materials
- Finite element simulation of microwave and electromechanical systems
- Open-quantum systems simulation of quantum devices

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Connecting Quantum Capabilities
- Entrepreneurial Research Fund – Development of Superconducting Metamaterials for Quantum Networking



INNOVARE ADVANCEMENT CENTER QUANTUM LABORATORIES

The goal is to foster world-wide fundamental research collaborations between academia, government, and industry in a single location with a focus on quantum networking and quantum computing investigations.

DESCRIPTION. This joint facility between Oneida County, the Griffiss Institute, SUNY, and the Air Force Research Laboratory will house numerous laboratories and collaboration spaces to foster this joint research. The first floor will house 2000 sq ft of laboratory space dedicated towards quantum research (ions, photons, superconductors, user-provided technologies) with an additional space on the third floor dedicated to quantum algorithms. The facility will be a joint research space for both foreign and domestic academia, government, and industry partners to carry out fundamental scientific quantum research in fully outfitted laboratories. These laboratories will also serve as a user-facility testbed for heterogeneous quantum networks, where visiting researchers can bring a qubit or related enabling technology to test on the AFRL Innovare Advancement Center Testbed. This facility will also house the IBM Hub where collaborators and partners can access the IBM device to explore quantum algorithms and related applications.

EQUIPMENT/RESOURCES. The facility will house complete setups for trapped ions, photon, and superconducting experiments on the hardware side. Included as well will be access to commercial quantum computers and simulators to conduct research on algorithms.

CAPABILITIES.

- Quantum labs for:
  - Trapped Ions
  - Photonics
  - Superconducting
- Electronic Laboratory facilities
- Commercial Quantum Computer access
- UAV/Drone facility
- Testbed for user-provided technology research demonstrations

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- New, slated to open summer of 2020

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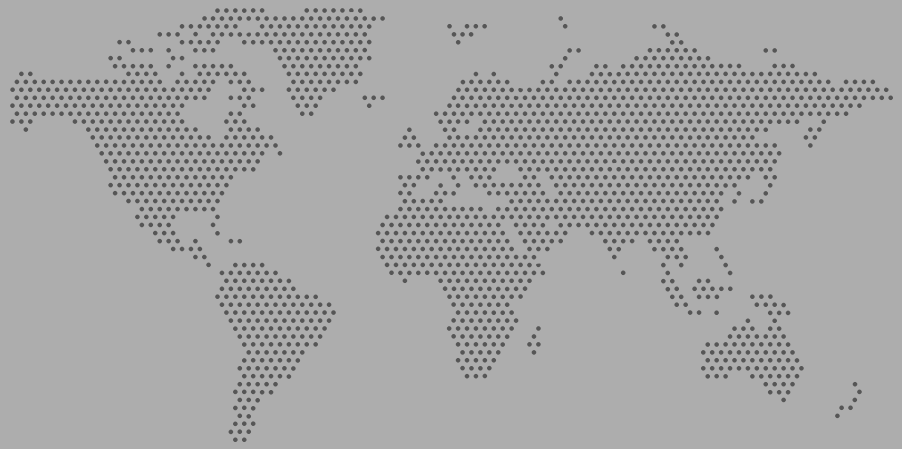

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Information Systems

Inventing technologies to realize truly integrated, resilient, and robust command and control systems.

MISSION STATEMENT: To lead the discovery, development, and integration of innovative technologies and systems that provide state-of-the-art, integrated command and control and information management technologies for Air Force and joint war fighters.

Chief.....Ms. Julie Brichacek

Deputy Chief .....Mr. Steven Farr

Technical Advisor.....Mr. Richard Metzger

RIS Division Office Phone 315.330.4175

BLACK ROOM

Next-generation multi-purpose facility for research, demonstrations, and presentations.

DESCRIPTION. The Black Room represents a next-generation multi-purpose facility for research, demonstrations, and presentations. The facility offers a unique opportunity to bring high-end computer graphics resources and high-resolution displays into a shared and interactive space. It supports many demonstrations of Information Directorate technologies in a consolidated fashion and can provide a place and means for tight development integration with projects spanning many divisions and directorates.

EQUIPMENT/RESOURCES.

- Planar Clarity Matrix Video Wall with fourteen 55 inch 1920 x 1080 LCDs in a 7 x 2 matrix
- Two Planar 55 inch 1920 x 1080 LCDs; one on each side of the video wall to display additional content
- Height-adjustable operator console with four 32 inch 3840 x 2160 LCDs
- Four height-adjustable Ergonomic Workstations each with a 65 inch 3840 x 2160 multi-touch LCD
- Microsoft 84 inch 3840 x 2160 Surface Hub multi-touch LCD digital whiteboard
- Planar 98 inch 3840 x 2160 multi-touch LCD with passive stereoscopic 3D and electric height adjustment
- 16 core server-class computer w/four NVIDIA Quadro K5000 graphics cards
- Evertz EQX Video Router configured w/90 inputs x 268 outputs; combination of fiber, coax, and Evertz X-Link high density interconnects; expandable to 576 x 864
- Evertz VIP Multi-Image Display Processor
- 5.1 channel audio system, table and lapel microphones, and audio mixer

CAPABILITIES. This cutting-edge environment currently integrates multiple technologies including high-end computer graphics workstations, video router with dynamically switchable hardware via fiber and copper interconnections, audio system, multi-screen operator console, a mobile 98 inch quad-HD multi-touch screen that supports 3D viewing with passive stereoscopic glasses, and a high-resolution 27 foot wide video wall with 14 times the resolution of a conventional 1080P HD screen. The facility also includes ergonomic workstations, in-house developed, mobile, adjustable, large-screen workstations to provide an unprecedented level of flexibility and reconfigurability.

EXAMPLES OF CURRENT AND PAST PROGRAMS. Currently supports the Joint Effects Operations, Cyber Planalytics, and Multi-Domain Command & Control Execution Management Workflows "Flyleaf" Programs. Also used throughout the directorate for a variety of presentations and demonstrations.

COMMAND AND CONTROL TECHNOLOGY CENTER (C2TC)

Develops advanced visualization and interactive displays.

DESCRIPTION. The C2TC supports research and development of advanced visualization and interactive displays, agents and machine-learning technologies, modeling and simulation including tools for managing uncertainty in causal models to achieve mission assurance in joint and combined military operations.

EQUIPMENT/RESOURCES.

- Data Wall: a 12 foot rear-projected system creating a seamless display surface of over 19.6M pixels
- 98 inch quad HD passive 3D multi-touch screen
- 84 inch 4K Microsoft Surface HUB digital whiteboard and collaboration device
- Real-time feeds of the National Air Space and Automatic ID System (water surface traffic)
- High end multi-core workstations with dual 4K displays
- Developer workspace with access to Defense Research and Engineering Network and office automation networks

CAPABILITIES. A modern software development environment with tools, data, computation and displays that provide a state-of-the-art set of capabilities and data for information visualization, modeling and simulation.

EXAMPLES OF CURRENT/PAST PROGRAMS.

- Research on graph visualization techniques
- Information discovery and exploration
- Research in storage, analysis, and dissemination of massive point cloud data
- Research on massive point cloud level-of-detail and visualization
- Web based and thick client point visualization techniques
- Composable visualization research
- Cross-domain relaxed What You See Is What I See visualization
- Semantic Web information exploration, processing, analytics and visualization

COMMAND AND CONTROL CONCEPT CENTER (C2CC)

Provides an environment to conduct system-level experimentation on information systems.

DESCRIPTION. The Command and Control Concept Center (C2CC) is a foundational capability for the Information Directorate, providing risk mitigation and developmental test capabilities for Advanced Technology Demonstrations, critical experiments, and demonstrations. The C2CC provides an environment (emulated and/or simulated) to conduct system-level experimentation on information systems for not only C2, but also connectivity and dissemination, and intelligence processing and experimentation.

EQUIPMENT/RESOURCES.

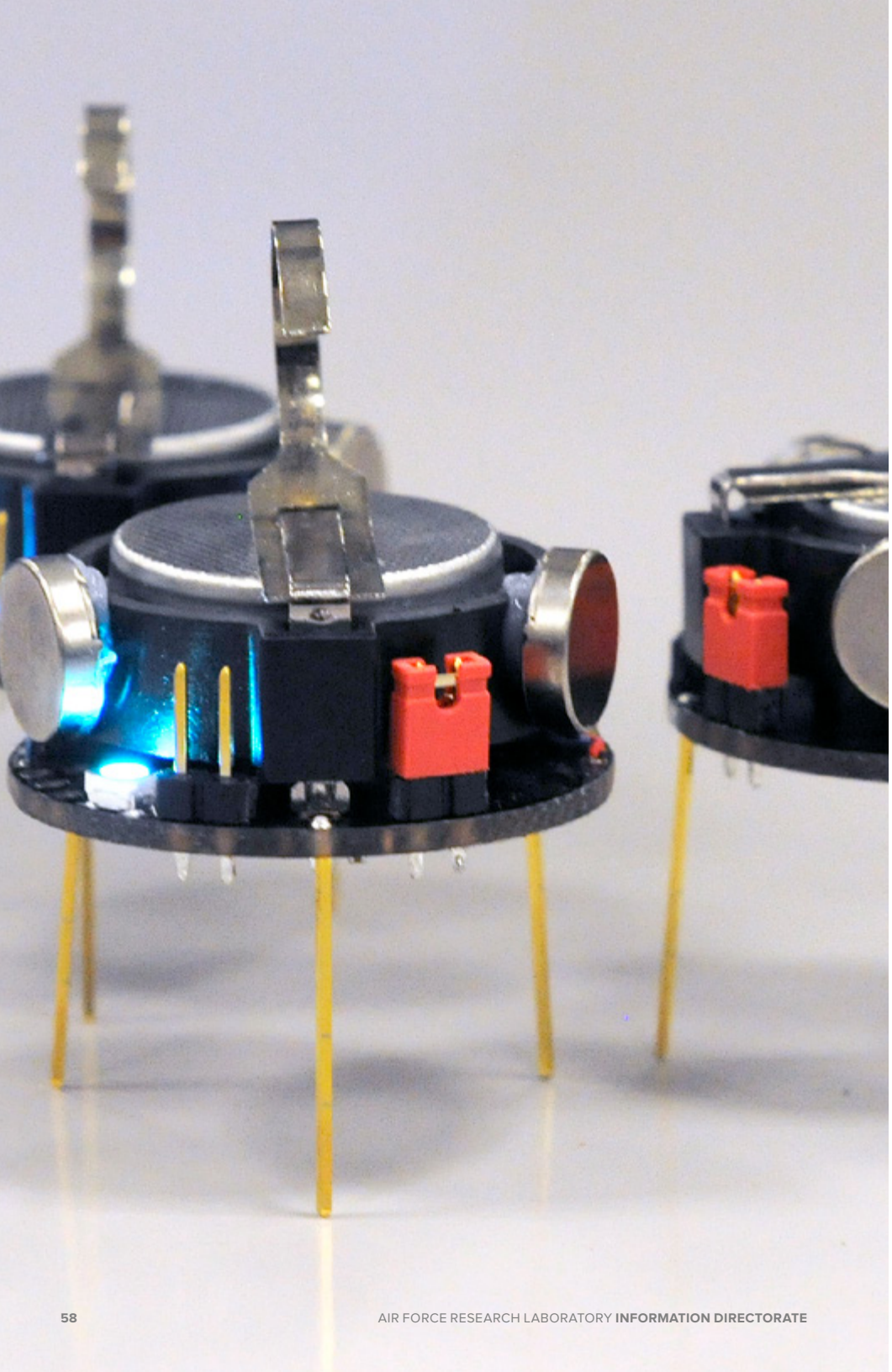
- Almost 1,000 computers (laptops, desktops, and servers)

- Unclassified and classified research networks
- Classified computer laboratory (Secret Internet Protocol Router Network (SIPRNet), classified communications, safes, and crytography)
- The following systems of record with accompanying data sets:
- Theater Battle Management Core Systems Force Level
- Global Command and Control System
- North Atlantic Treaty Organization Integrated Command and Control
- Global Command and Control System-I3
- Command and Control System Part Task Trainer (C2WSPTT)
- Air Warfare Simulation Model (AWSIM)

CAPABILITIES. The C2CC provides AFRL/RI many research and development opportunities, including an evaluation laboratory used for fielding C2 systems of record and their related data sets. This facility is cleared to SECRET with access to SIPRNet.

EXAMPLES OF CURRENT AND PAST PROGRAMS. Supported transitions of:

- Cyber Technology Maturation Framework
- Joint Effects Operations
- Cyber Quantification Framework
- Space C2 demonstrations
- Trusted Network Environment
- SecureView
- Information Support Server Environment
- Air Force Satellite Control Network
- Trusted Gateway System
- Tactical intelligence, surveillance, and reconnaissance, Processing, Exploitation, Dissemination system
- Multi-level Thin Client
- AFRL/RI Mission Infrastructure (ARMI)
- Operationaling ML for C2 (OPMLC2)
- Distributed Operations (DistrO)
- Simulator Common Architecture Requirements and Standards (SCARS)
- Visual Interpretation of Variegated Data (VIVD)
- Joint Emergent Operational Need (JEON)



K-5 LABORATORY

Supports unclassified research and provides space, network infrastructure, and laboratory support.

DESCRIPTION. This laboratory is shared across the Information Directorate and supports the Information Systems (RIS), Information Exploitation and Operations (RIG), and Information Intelligence Systems and Analysis (RIE) work units for research and development. The K-5 Laboratory supports unclassified research and provides space, network infrastructure, and laboratory support.

EQUIPMENT/RESOURCES. The facility supports desktop computing research with network connections to server capabilities via Defense Research and Engineering Network (DREN) or Private Research Domain (PRD). Groups that work in the facility provide their own computers and software to conduct R&D.

The facility provides basic office infrastructure such as phones, two conference rooms, office automation, and DREN printers, storage, etc.

CAPABILITIES. The facility provides ten areas of space for unclassified in-house research to be conducted with seating for around 200 people. The space can be utilized to access networks such as PRD, DREN, or setup as standalone.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Integrated Information Management Systems
- Synchronized Operations Demonstration Support
- Mission-Aware Cyber Command and Control/Cyber Integration and Transition Environment Laboratory
- Machine Intelligence for Mission-focused Autonomy (MIMFA) in-house research
- Space Operations Initiative (SOI) Command and Control (C2) Environment (Codex) Research
- Stratagem Wargame Development and In-house Research
- Basic Research in Artificial Intelligence (BRAIN) In-house Research
- Adapting Cross-domain Kill-webs (ACK) Research
- Distributed Information Services for Tactical Resilience in Contested Theaters (DISTRICT) Research
- Command and Control of Proactive Defense (C2PD) in-house Research
- RIE R&D in audio processing and text extraction

OPERATIONAL INFORMATION MANAGEMENT (OIM) FACILITY — RESEARCH DEVELOPMENT TEST AND EVALUATION ENCLAVE

Capabilities to research, develop, prototype, experiment, and demonstrate advanced Multi-Domain C2, mobile application development, and Information Management technologies.

DESCRIPTION. The OIM Facility addresses current and future Air Force Net-Centric information interoperability requirements to maximize the effectiveness of joint and combined military operations in both enterprise and tactical operational environments.

EQUIPMENT/RESOURCES. The 30+ workstation laboratory has various development environments including cloud-processing emulation.

CAPABILITIES. Research, develop, and prototype advanced Multi-Domain C2, mobile application development, and Information Management technologies. Devices in this space can be utilized to access networks such as DREN, NIPR, TID, or set up as standalone.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- FLYLEAF
- ATAK: Android Tactical Assault Kit
- RESTORE: Robust Evasion and Search Technologies for Orchestration of Rescue and Escape
- Phoenix Prime Information Management Middleware
- Tactical Information Broker
- Open Pod Broker
- AMMO: Application of Managed Mission Orientation
- UNITY: Command and Control Synergy for Combined Operations
- GOT-IT: Global Operational Tactical Information Technology
- BANDIT: Bridging Across Network Domains Information Technology

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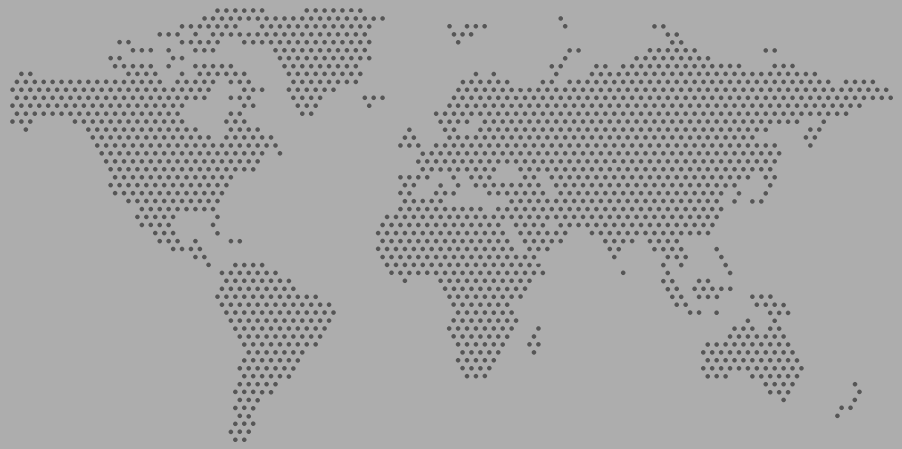

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Information Exploitation and Operations

Leveraging and shaping the cyber domain to the nation's advantage.

MISSION STATEMENT: To lead research, development and integration of affordable information exploitation and cyber technologies for transition to our air, space and cyberspace forces.

Chief.....Mr. Scott Shyne

Deputy Chief.....Mr. James Perretta

Technical Advisor.....Dr. Paul Ratazzi

RIG Division Office Phone.....315.330.2165

AUDIO PROCESSING LABORATORY

Conduct audio processing research and development initiatives from technology readiness level (TRL) 2-TRL 7.

DESCRIPTION. The Information Directorate provides the Audio Processing Group with laboratory areas at various classification levels to support research and development efforts in the tactical audio processing arena. The government and contractor team is co-located together to foster communication and seamless development. Research and development initiatives are conducted from TRL 2-TRL 7. The group works to provide algorithmic and software solutions that support operational requirements for off-line-based processing (pre-mission preparation and post-mission production needs), bulk processing (larger repositories of data), and real-time processing for streaming audio.

EQUIPMENT/RESOURCES. The unclassified laboratory is outfitted with Defense Research and Engineering Network, Air Force Network and a standalone network to support algorithm and software development. The laboratory includes several servers with multiple multi-core processors, a Graphical Processing Unit server for testing GPU-based algorithms, and a single-core system for benchmarking algorithm performance. These servers are housed in a large server facility managed by the Computing and Communications (RIT) division.

Numerous pieces of collection equipment exist in the laboratories to support data requirements for algorithm testing. This includes two audiometric rooms, various types and styles of microphones, transmitters, receivers and analysis equipment.

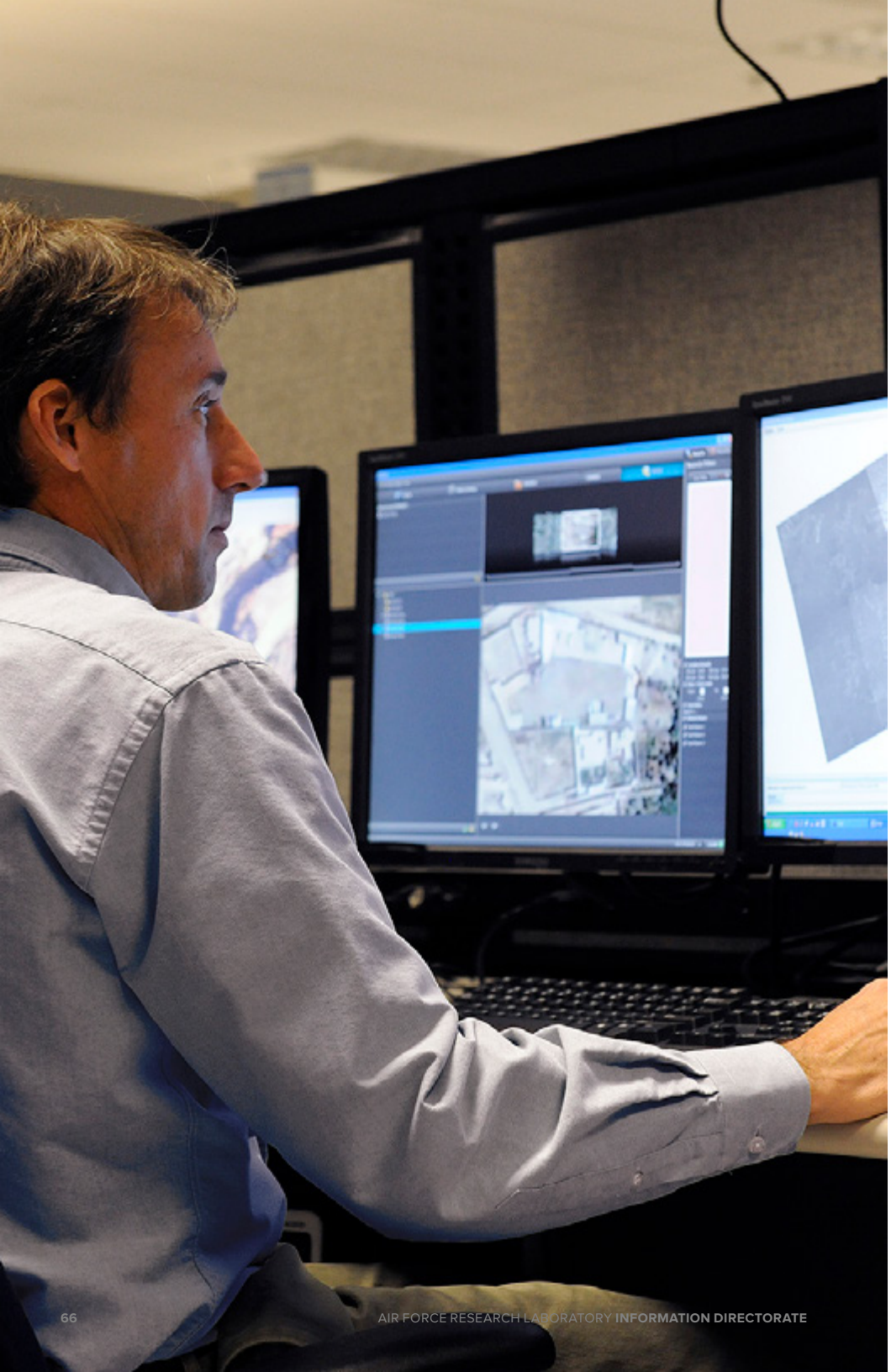
The laboratories each support various development environments for cross-platform software solutions. Replicas of various operational environments are housed in the laboratories in order to support customer work.

The laboratory's test equipment allows the verification of the integrity of collection configurations, as well as producing analysis of audio streams in real time. A large collection of audio data is maintained that can be modified to fit the needs of most audio processing projects. The laboratory also hosts team collaboration and communication software such as JIRA and Confluence to document meetings, schedules, findings and documentation.

CAPABILITIES. An audio processing test bed was created to support the creation and evaluation of our algorithms as they progress through TRL levels.

EXAMPLES OF CURRENT AND PAST PROGRAMS. Algorithmic developments and software demonstration deliveries have been delivered under the Military Intelligence Program, Tactical signals intelligence (SIGINT) technology program, Air Force Compass Bright program, The FAVOR-DLIPS-IDEAS* program, and the Forensic Audio, Video, and Image Analysis Unit program. Featured algorithm development has consisted of work on speaker and language identification, speech enhancement and detection of signals of interest.

- FAVOR-Foreign Audio and Video Operations
- LIPS-Digital Language and Image Processing System
- IDEAS-Integrated Discovery, Exploitation and Analysis Services



CORPORATE COLLATERAL FACILITY (CCF)

A secure facility for Air, Space and Intelligence, Surveillance, and Reconnaissance advanced research and development.

DESCRIPTION: A secure facility for classified briefing, secure video teleconferences, testing, document creation (editing), experimentation concept development, data analysis, software development, and exercises as well as associated information systems use. The CCF is used by all Directorate personnel, as well as remote users. The CCF is managed and maintained by the Information Exploitation and Operations (RIG) Division.

EQUIPMENT/RESOURCES: Non-Secure Internet Protocol Router Network, Secure Internet Protocol Router Network, Defense Research and Engineering Network, Standalone enclaves, as well as mixed-mode one off custom workstations. Complete information systems support, software management, access control, secure voice communications, secure video communications, secure e-mail, web browsing, Test Bed calendar scheduling. Auditorium (70 seat capacity); secure conference (meeting spaces).

CAPABILITIES: The CCF provides Directorate personnel a dynamic environment for collaborative research and development activities.

EXAMPLES OF CURRENT AND PAST PROGRAMS:

- Audio exploitation technology
- Intelligence, surveillance, and reconnaissance technology
- Signals exploitation technology
- High Performance Computing technology
- Communications Intelligence technology
- Information Management technology
- Imagery Intelligence technology
- Embedded systems technology
- Core Configuration Management Joint Reserve Intelligence Program

CYBER EXPERIMENTATION ENVIRONMENT (CEE)

Fosters technology transition to the war fighter and conducts research associated with experiment automation.

DESCRIPTION. The CEE is a Cyberspace research and development (R&D) environment that enables Information Operations experimentation, fosters technology transition to the war fighter, and supports research associated with experiment automation. The Information Directorate uses it for Independent Validation and Verification of emerging cyber technologies. Advances in automated experimentation have been directly applied to a large number of non-trivial classified experiments; these experiments rest on a scientific method that applies practical metrics in the context of a carefully constructed, automatically generated, ground truth. As Department of Defense cyberspace operations converge towards full spectrum (i.e. leveraging electro-magnetic capabilities), CEE will evolve its own experimentation capabilities and testing methodologies to incorporate these advances.

EQUIPMENT/RESOURCES. The CEE consists of a hardware and software framework that rapidly configures large-scale and distributed range architectures that facilitate experimentation with both offensive and defensive cyber technology in representative commercial and military settings. CEE leverages existing AFRL investments through co-location and use of other facilities such as the Cyber Integration and Transition Environment, Corporate R&D Server Facility and Stockbridge/Newport test sites.

CAPABILITIES. CEE has established secure connectivity with external mission partners and military organizations. Through a combination of AFRL/RI and customer-funded R&D efforts, CEE has produced a suite of software comprised of best-of-breed technologies to enable large-scale experimentation of cyber effects. This includes Lockheed Martin ATL Dynamic Automated Range Technology (DART), MIT Lincoln Laboratory's Lincoln Adaptable Real-time Information Assurance Test bed, AFRL/RI's Java Viewer and Range Automation Configuration Engine (RACE) technology. RACE in and of itself is a culmination of over a dozen custom in-house tools that enables seamless integration of the entire toolkit and one-click experiment execution.

CEE has expanded its user and customer base by relocating its RACE development to an unclassified lab space adjacent to the Cyber Integration and Transition Environment. This enables greater

collaboration amongst external partners, as well as increasing the pace of tool development due to additional unclassified resources. Additionally, in order to scale resource management and provide experimentation capabilities concurrently to multiple programs, CEE was re-established as a notional hardware/software framework and architecture that is distributed and deployable.

CEE technological advances enable offense-on-defense experimentation, using practical metrics, with the heavy use of automation to provide scalability, realism (hardware-in the-loop), situational awareness, network complexity, diversity, measurement, and analytics. Steady investments and improvements to range automation tools have sharply reduced the labor required to conduct experiments; the minimum essential staff needed to stage and execute an experiment is one system administrator and one programmer. Improved automation techniques also drastically reduced range build times for large-scale complex experiments from months to days.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

Large-scale experiments combining diverse, virtual, and bare-metal systems that provide technology evaluations and performer feedback leading to enhanced cyber technologies in the following areas (most recent, Fiscal Year 2014-Present):

- Cyber Agility Program: In-house developmental testing and experimentation into large-scale
- Moving Target Defense deployments and interoperability
- Scalability testing of steganalysis techniques
- Metasponse Scalability Testing: Developmental testing in support of Firestarter funded
- Metasponse toolkit used by Blue forces
- Cyber Mission Effect Chain experimentation – automating cyber capability pairing
- Cyber Quantification Framework scalability testing, integrations with Cyber Mission Effect Chain

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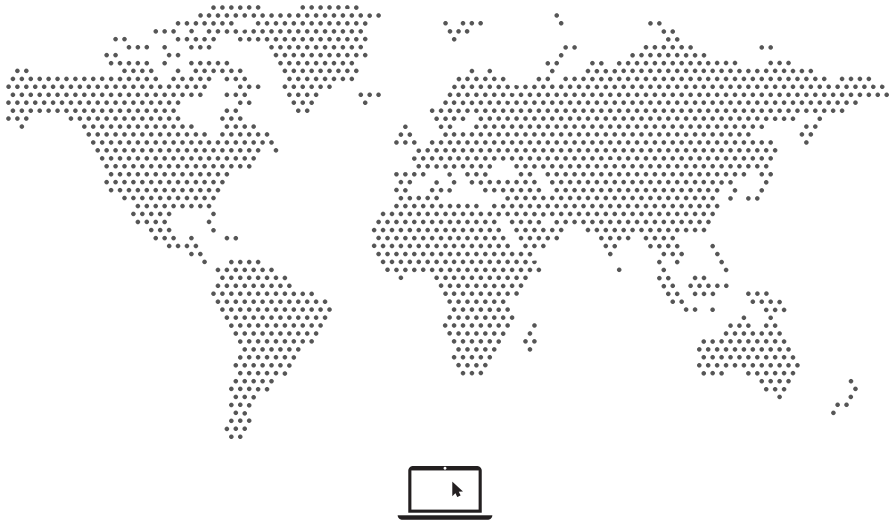

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CYBER INTEGRATION AND TRANSITION ENVIRONMENT (CITE)

A collaborative workspace leveraging reusable and scalable computing resources for conducting rapid cyber-related research and development enabling technology transition to operational users.

DESCRIPTION. CITE is an unclassified standalone collaborative workspace for conducting cyber-related Research and Development (R&D), from basic research through advanced technology development. The core focus of CITE is to provide a targetable transition platform for technology maturation and operational acceptance by leveraging partnerships with key agencies that support Air Force Network Operations.

Representing the Air Force network at the appropriate level of fidelity is challenging and deciding what can be emulated, simulated, virtualized, or requires actual hardware is an ongoing effort. Along with focus on discovering, developing, and maturing defensive cyber technologies, CITE is used to address test and evaluation methods. As a workspace focused on Cyber Defense, the laboratory must represent real world Air Force systems without requiring the manpower and resources necessary for an actual real world system. This challenge is also faced by Life Cycle Management Centers and test and evaluation (T&E) organizations. CITE supports multiple operating systems, high technology readiness level (TRL) systems, representation of multiple Air Force enclaves and the network between those enclaves.

CITE provides a low cost and rapid environment for early T&E of defensive cyber capabilities in preparation for more extensive evaluations with the T&E community, mitigating the risk of innovative cyber technology falling into the “valley of death”.

EQUIPMENT/RESOURCES. Scalable and feature-rich environment consisting of isolated and interconnected test beds, configuration management, and enterprise services. This includes:

- 2.7+ THz CPU bandwidth
- 10+ TB Memory
- 860+ TB Disk Storage
- 20 Gbps Network
- VMware ESXi Virtualization

CAPABILITIES. CITE provides the ability for collaborative R&D and T&E of cyber technologies on an unclassified stand-alone environment and provides projects significant computing resources and virtualization capabilities to adequately test and evaluate before being transitioned to the war fighter.

CITE is also partnered with the Cyber Experimentation Environment (CEE), a classified environment for cyber capability testing and evaluation. Leveraging the collaboration with CEE, the technical overhead of transitioning projects from an unclassified to classified environment is significantly reduced.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- FIRESTARTER Technology Projects:
  - Stegoanalysis Application Development and Testing
  - Mockingbird: Dynamic Virtual Analysis Scalability Testing
  - Metasponse: Malware Hunting Application Testing
  - CAMEL Malware Analysis: Development and Testing
- Automated Cyber Survivability (ACS) Development and Testing
- Independent Testing and Evaluation (ITEC) Rapid Cyber Analysis (RCA)
- Cyber Quantification Framework (CQF) Scalability Testing

CYBER OPERATIONS TECHNOLOGY FACILITY (COTF)

A secure facility for Cyber Operations, technology advancement, demonstration and experimentation.

DESCRIPTION: A secure facility for classified briefing, secure video teleconferences, testing, document creation (editing), experimentation concept development, data analysis, software development, and exercises as well as associated information systems use. The COTF is used by all Directorate personnel. The COTF is managed and maintained by the Information Exploitation and Operations (RIG) Division.

EQUIPMENT/RESOURCES: Non-Secure Internet Protocol Router Network, Secure Internet Protocol Router Network, Defense Research and Engineering Network, standalone enclaves, as well as mixed-mode, one-off custom workstations. Complete information systems support, software management, access control, secure voice communications, secure video communications, secure e-mail, web browsing, test bed calendar scheduling, conference room (10 seat capability), and secure meeting spaces.

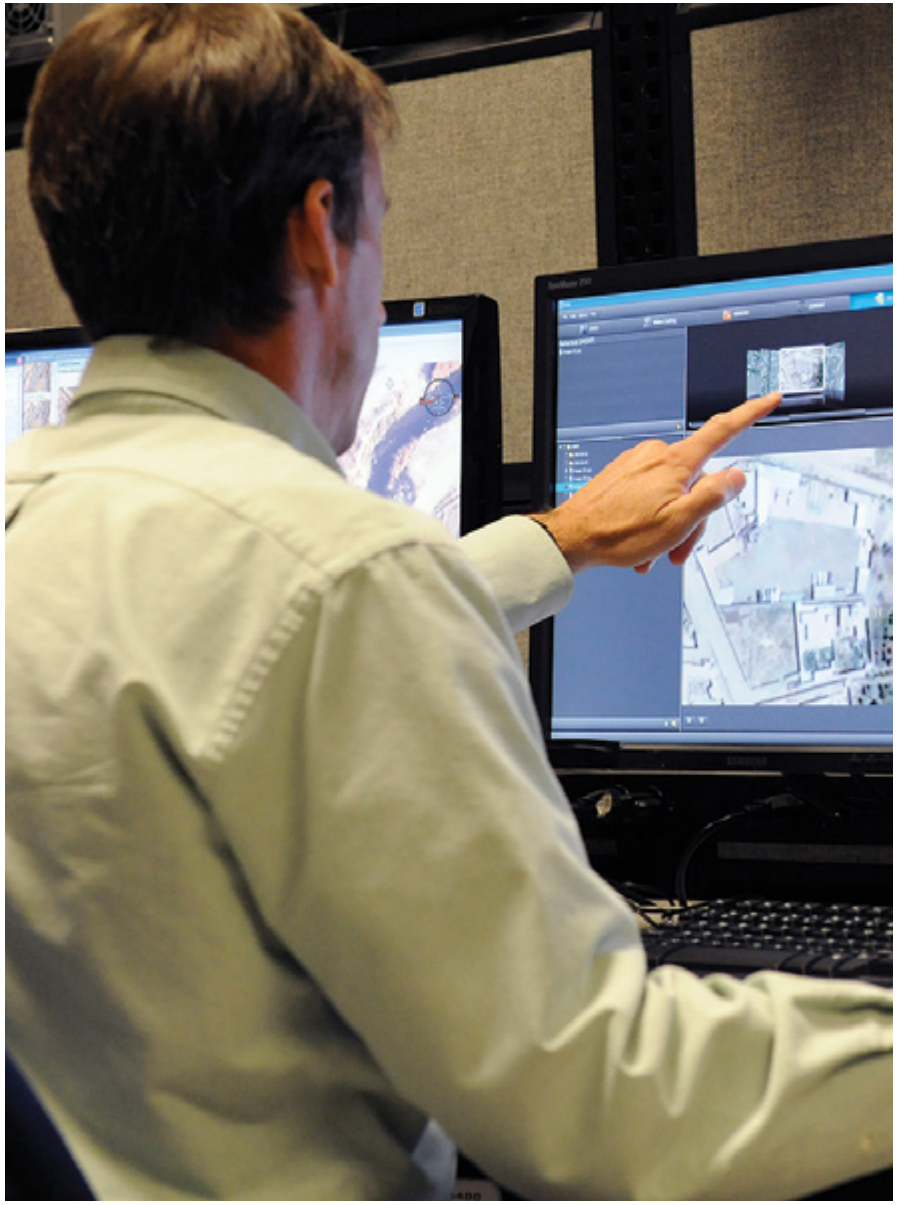
CAPABILITIES: The COTF provides Directorate personnel a dynamic environment for collaborative research and development activities. The core focus of this facility is Advanced Cyber Operations as well as associated technologies.

EXAMPLES OF CURRENT AND PAST PROGRAMS:

- Mission Centric Cyber Assurance
- Cyber Agility
- Cyber Survivability and Recovery
- Mission Aware Cyber Command and Control
- Ruby Slipper “Cyber Mission Framework”
- Cyber Experimentation Enclave
- Cyber intelligence, surveillance, and reconnaissance,
- Stenographic technology
- Heterogeneous Operationally Responsive Networks

IMAGERY EXPLOITATION FACILITY

Experimentation and evaluation of large-scale data exploitation and correlation techniques.



DESCRIPTION. The Imagery Exploitation facility supports experimentation and evaluation of large-scale data exploitation and correlation techniques with a focus on the needs of the Department of Defense (DoD) and Intelligence Community (IC). DoD and IC software architectures and standards are maintained as integral parts of the environment. Large data holdings are maintained as part of this facility, including National Geospatial-Intelligence Agency (NGA) reference products, operational Full Motion Video (FMV) data, truth data, and intelligence products. Various software applications and services are maintained. Internally and externally developed software is tested and evaluated in this operationally relevant environment. A current focus is the testing and evaluation of integrity analytics using manipulated media products.

EQUIPMENT/RESOURCES. A standalone network that provides desktop workstations for testing and evaluating exploitation software. Currently there are four desktop workstations, three high-end workstations and a high end laptop. Some workstations are connected via gigabit Ethernet in a standalone network configuration and others are stand alone workstations. In addition there is a collection of NGA standard geospatial data product CDs.

CAPABILITIES. Test bed and demonstration environment for imagery and multi intelligence (multi-INT) exploitation tools. Under a Persistent Surveillance project, a FMV object search test bed was stood up, which includes operational FMV, a truthing tool, and vendor software including the CCRi VLADE software. VLADE uses deep learning to automatically output text descriptions of the scene. In addition synthetic video generation software is included in the CCRI suite. Recent focus has been on creating a manipulated media testbed with archives of manipulated media products from simple splicing edits to complex Deepfakes. An archive of performer developed state of the art detection algorithms (MediFor Demonstration System) is also being maintained.

EXAMPLES OF CURRENT/PAST PROGRAMS.

- Signatures Exploitation
- Persistent Surveillance Signatures Analysis
- Motion Imagery Visualization
- Integrated Exploitation
- Cyber Physical Information & Intelligence

SMALL UNMANNED AERIAL SYSTEM EXPERIMENTAL CAPABILITY (SUAS-EC)

The sUAS-EC provides a baseline centralized capability to operate a fleet of assorted, small Unmanned Aerial System (sUAS) platforms.

DESCRIPTION. This capability supports research and development by providing multiple, flight ready airframes, equipped with autopilot control and all equipment necessary for flight test. The facility also provides trained personnel capable of performing flight test operations with these aircraft, and support to keep all aspects of the program compliant with flight test regulations. A flexible flight test/safety plan and approvals enables quick turn and cost-effective experimentation for a multitude of Air Force Research Laboratory and customer programs.

EQUIPMENT/RESOURCES. Current inventory includes approximately 17 fixed wing sUAS platforms capable of carrying payloads up to 15 pounds, 12 vertical takeoff and landing (VTOL) platforms (payloads up to 2.5 pounds), ground infrastructure and equipment to support airborne experiments with up to four platforms simultaneously. As well as trained personnel qualified to perform the duties of pilot, observer, ground station operator, and payload operator, along with qualified flight instructors, and a flight examiner to maintain qualified and trained aircrews.

CAPABILITIES.

- Support a variety of sUAS flight experimentation, including fixed wing and VTOL
- A 16 square mile area surrounding the Stockbridge Test Site for flying at maximum altitudes of 2000 foot above ground level, and mobile capabilities to support testing in other locations
- Support for a wide range of experimental payloads, up to approximately 15 pounds maximum (payload capabilities vary by platform)
- Trained operators for a wide range of sUAS platforms
- Capabilities to perform integration of payloads, and all aspects of a flight test program
- Collocated with the Controllable Contested Environment

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- **Defence Science and Technology Organisation Australia Opal Experiment.** Multiple VTOL UAS to validate semi-autonomous (user-on-the-loop) enhancement of a distributed ground network.

- **Symbol-Level Link Prediction Experiment.** Fixed-wing UAS to collect link statistics during repetitive UAS flight by transmitting symbol-sized link probes from multiple transmitters on-board the UAS to receivers on the ground.
- **Sylvus StreamCaster Order Wire Experiment.** Two fixed-wing UAS and single ground node to validate SC Order Wire performance.
- **TCP Stockbridge Experiments.** Fixed-wing UAS to characterize/validate performance of Transmission Control Protocol Stockbridge (in-House developed) algorithm.
- **Wireless Network after Next Flight Experiments.** Multiple fixed-wing UASs to validate function and behavior of networked radios.

CYBER VULNERABILITY ASSESSMENT TEAM LABORATORY

The Cyber Vulnerability Assessment Team Laboratory is used to conduct vulnerability assessments for systems and products being developed.

DESCRIPTION.

The Cyber Vulnerability Assessment Team Laboratory provides the environment to execute a formal Early-cycle Cyber Vulnerability Assessment (eCVA) process on key capabilities from selected Air Force programs. Cyber Vulnerability Assessments enable identification of security weaknesses within a system and may include proposing mitigations. Cyber vulnerability assessments should occur early and repeatedly during the software development life cycle. The Cyber Vulnerability Assessment Team Laboratory provides a safe environment to perform the Early-cycle Cyber Vulnerability Assessment process for identifying vulnerabilities and recommending mitigations that cover the early system development lifecycle. In addition, the lab allows for the assessment of technical requirements, architectures, designs, interfaces and data flows.

EQUIPMENT/RESOURCES.

Scalable environment consisting of an isolated test bed for systems under test, including fully featured deployable equipment for offsite assessments. Resources include:

- JTAGulator®
- HackRF
- Protocol analyzer
- Spectrum analyzer
- Deployable field kits
- Static and Dynamic Code Analysis (SAST/DAST) tools
- Vulnerability scanning tools
- Specialized/customized hardware and software penetration testing tools
- Software compliance testing
- Virtualization environment

CAPABILITIES.

- Vulnerability discovery and analysis
- Static and dynamic code analysis
- Communication path and packet analysis
- Software development pipeline analysis
- Requirements Analysis

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Air Force Vanguards
- SPARX/SDRF++
- NINJA
- EL8
- FireFly
- HADES
- CHEMISTRI
- JEO
- ATAK
- LINK360
- XCYTE

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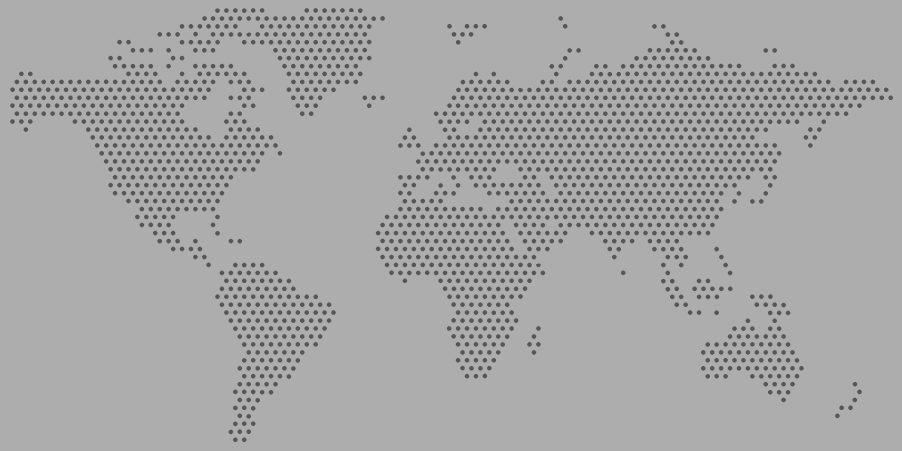

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Intelligence Systems

Operational focused information technology driven by innovation.

MISSION STATEMENT: To lead the discovery, development, and integration of affordable products addressing intelligence community technology requirements for our air, space, and cyberspace force. The division also conducts selected acquisition programs for low-volume, limited quantity systems for the intelligence community.

Chief.....Col Richard Kieffer

Deputy Chief .....Mr. Scott Patrick

Technical Advisor.....Mr. Matthew Kochan

RIE Division Office Phone.....315.330.2976

AUTOMATED PROCESSING AND EXPLOITATION (APEX) CENTER

Understand, measure, and advance state-of-the-art with sensor data exploitation technology.

DESCRIPTION. Established in 1996, the overall mission for the APEX Center is to understand, measure, and advance the state-of-the-art primarily with Processing and Exploitation (PEX) technology. The current focus is on Motion Exploitation and Activity Based Intelligence. The facility is also used to perform analysis for seedling and AoA efforts, baseline tool development for major programs, and to provide realistic operational systems, networks, and databases for integration efforts. The APEX Center can act as an Intelligence Systems Integration Laboratory (ISIL) and is currently being established to address current and future challenges in the following areas: Machine Learning, Artificial Intelligence, interactive question answering, multiphase PED in denied environments, assessment (fusion), tactical reporting from ISR, and the Air Force Distributed Common Ground System (AF DCGS).

EQUIPMENT/RESOURCES. With over 200 computers, including two large compute clusters, the APEX Center resources are substantial. These systems operate a myriad of operating systems and software, from the AF standard desktop to the Tactical Tomahawk-specific Linux kernel. It is primarily operating at a classified level on multiple networks, but includes systems, capabilities, and development environments on unclassified systems too, including Defense Research and Engineering Network (DREN). The Center also includes connectivity to coalition partners. The equipment in the facility has a value of $2.8 Million, and is 3,240 square feet in size. It holds over 56,000 operational mission data sets from various Intelligence, Surveillance, and Reconnaissance (ISR) platforms, including over two years of video (24 X 7) and global Situational Awareness data (Force XXI Battle Command, Brigade and Below (FBCB2), Electronic Intelligence (ELINT), Federal Aviation Administration (FAA), etc.) live data is available from a myriad of operational sensors.

CAPABILITIES. The area includes test beds (classified, unclassified, coalition) within which Air Force Research Laboratory (AFRL) can define metrics, develop standards, integrate, evaluate, and demonstrate technologies to support and facilitate the processing, exploitation and dissemination of data from a variety of sensors. The capability is used to support analytical studies, on-site and network distributed simulation exercises, and the processing of real-world, Multi-Intelligence (multi-INT) data. The APEX Center efforts facilitate research and development (R&D) across a broad area of Command and Control (C2) as well as ISR. All applicable INTs are investigated with emphasis on Ground Moving Target Indicator (GMTI), ELINT, Signals Intelligence (SIGINT) and Measurement and Signatures Intelligence (MASINT).

EXAMPLES OF CURRENT/PAST PROGRAMS. OA-DCGS, Neuromorphic Fusion of Timely Intel (NFTI), Autonomous Swarms for Information-aware Mission Operations with Verification (ASIMOV), Multi-Source Exploitation Assistant for the Digital Enterprise (MEADE), and Semi-Automated GMTI Exploitation (SAGE), Transparent, Integrated, Autonomous, Multi-level Access and Transfer (TIAMAT), and Multi-Domain Dynamic Targeting

INTEGRATED INTELLIGENCE INNOVATION FACILITY (I3F)

Provides end users hard hitting future technology to meet war fighter requirements.

DESCRIPTION. The I3F enables information handling research, development, integration, test and evaluation of solutions for Air Force, Department of Defense and Intelligence Community secure information sharing and analytic requirements. This facility enables delivery of Cross Domain Information Sharing solutions science and technology programs and operational cross domain information sharing and analytic capabilities that are currently deployed across the Air Force, DoD and the Intelligence Community. Additionally, Operational Information Handling (RIEB) branch programs are supported with integrated organic product support functions (e.g. incident reporting management, software configuration management) delivered from the facility.

EQUIPMENT/RESOURCES. The facility contains a direct attached 300 ft2 unclassified mini data center with dedicated cooling and power. Additional connectivity to the Air Force Research Laboratory/ Information Directorate corporate consolidated server environment that enables the rapid horizontal scalability to address wide ranging and complex operationally relevant environments. The laboratory area contains hundreds of compute endpoints deployed on a wide variety of heterogeneous platforms;

- Virtual Desktop Infrastructures
- Wired
- Wireless and tunneled networking
- Various monitor setups to emulate operations center configurations
- High performance teaming room to support technology planning, integration and test and evaluation (T&E)

CAPABILITIES. The I3F enables RIEB research, development, integration and T&E of solutions for Air Force, Department of Defense and Intelligence Community secure information sharing and analytic requirements. It's capability to emulate operational environments at simulated multiple levels of security is critical to delivering real technology capability on-time to our customers.

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- SecureView multi-level access system
- Information Support Server Environment cross domain transfer system
- Collaboration Gateway (cross domain chat system)
- Voice and Video Cross Domain Solution
- Cross Domain Innovation and Science research projects
- Core Configuration Management (CCM)

INTELLIGENCE COMMUNITY, AUTOMATED INFORMATION SYSTEMS (IC AIS) LABORATORY

The IC AIS Laboratory is a Sensitive Compartmented Information Facility (SCIF) that supports classified research as well as associated information system(s) use.

DESCRIPTION. The IC AIS laboratory delivers sensitive compartmented information (SCI) video teleconferencing (VTC), telecommunications, briefings and presentations, desktop processing, data search and retrieval, document creation, software development, testing, and operations support to the Information Directorate. Facility access is granted to cleared AFRL scientists and engineers and contractors who conduct research and development activities with the intelligence community.

The Special Security Office (SSO) delivers a rich and collaborative environment for classified research and development and assures highly available and robust network and communications connectivity with various intelligence community agencies.

EQUIPMENT/RESOURCES. The facility houses hardware, software and data at the SCI level.

CAPABILITIES.

- AFRL scientists, engineers, managers and government contractors utilize the SCIF for various functions; access to computer or network resources; briefing systems, secure VTCs, and Voice over Internet Protocol telephones.
- The AFRL/RI Final Technical Report Repository provides researchers, scientists, and engineers timely access to restricted SCI publications covering several collection subject areas.
- Research and development for new and existing intelligence community systems, as well as technology conferences, are hosted within the facility to foster classified collaboration among AFRL researchers and intelligence organizations.

SITUATION AWARENESS (SA) LABORATORY

Perform research and development of technologies for Text Analysis and Network Discovery technology products and resources.

DESCRIPTION. The Situation Awareness Laboratory area provides an environment for research scientists and engineers to evaluate, demonstrate, and develop software-based capabilities and perform basic research. The In-House Research Team (iHURT) and support contractors perform research and development of technologies utilizing a suite of in-house hardware/software tools. This includes existing Information Intelligence System and Analysis (RIE) contractor products as well as outside commercial applications. This corporate in-house capability is vital in providing functional and valuable products to the Department of Defense and Air Force intelligence communities. Collaborators from other Information Directorate divisions and branches as well as summer students use the facility to conduct research.

EQUIPMENT/RESOURCES.

- Windows desktop computers
- Flat panel monitors
- Laptop computers
- Big screen LCD/LED TV's
- Windows Computer Servers

CAPABILITIES.

- Technology and application evaluations and experimentation
- Data and scenario generation
- Technology integration
- System administration

EXAMPLES OF CURRENT AND PAST PROGRAMS.

DARPA's DEFT Program: The Deep Exploration and Filtering of Text (DEFT) program harnesses the power of natural language processing. Sophisticated artificial intelligence of this nature has the potential to enable defense analysts to efficiently investigate many more orders of magnitude of documents so they may discover implicitly expressed, actionable information contained within them. DEFT addressed remaining capability gaps related to inference, causal relationships and anomaly detection.

DARPA's XDATA – Scalable Analytics program to develop technology to leverage large volumes of DoD-data at all stages from analysis to operations.

iHURT: The in-house research team is composed of early-career scientists and engineers, and has the goal of exposing team members to the AFRL/RI mission. The team obtains this exposure by immersing themselves into ongoing projects with the objective of rapidly prototyping new capabilities or investigating interesting research questions. To date, the team has completed projects for Space Situational Awareness, the Moving Intelligence Client, the Visual Media Reasoning system, and more including:

1. Capability enabling AFRL to train Semantex Statistical Models -The proposed task was to gain knowledge and insight into how to train Semantex Statistical Models, verify that existing software/resources are sufficient to train/re-train the models, and learn how to affect certain aspects of training (manipulating performance parameters, and augmenting lexicons) to enhance model performance.
2. Publicly Available Information Exploitation - Determine how AFRL's PAI related software tools (and potentially other GOTS or open source software) can be used with PAI and other exquisite sources to provide a greater situational awareness about particular scenarios. By addressing this, the IHURT team will be able to identify capability gaps in current PAI tools while demonstrating the existing ones and contributing to the overall vision of an integrated Processing and Exploitation (PEX) demo.

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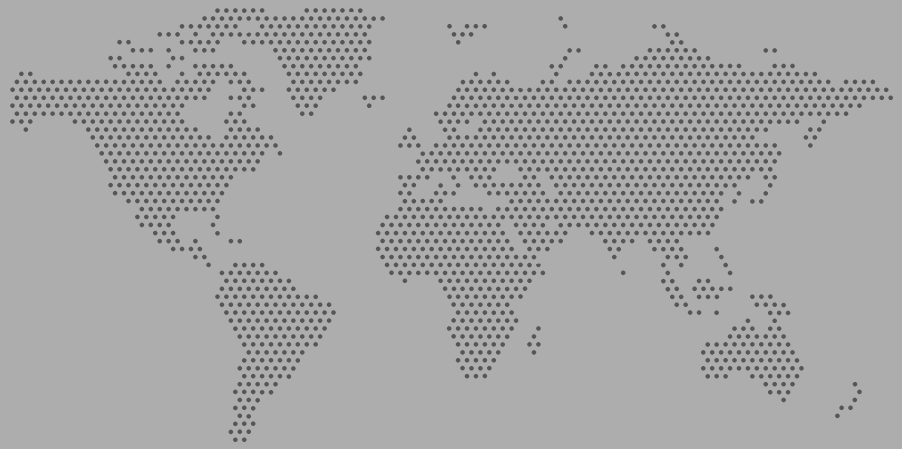

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Integration and Operations

Providing facilities and services to deliver effective operation support.

MISSION STATEMENT: Sustain and support installation operations for the Rome Research Site community by delivering quality facilities, environmental services, communication and information systems, logistics activities, force protection, and human resource services, enabling the Air Force Research Laboratory Information Directorate to develop, field, facilitate and sustain war-winning capabilities and provide effective mission support.

Chief.....Mr. Gabe Sbarglia

Deputy Chief.....Mr. Scott Podkowka

RIO Division Office Phone.....315.330.4321

Supervisor for Fabrication.....Mr. Frank Giardino

RIOLF Fabrication Phone.....315.330.2881

AIR FORCE RESEARCH LABORATORY MODELING AND FABRICATION SHOPS

Comprised of seven specialty areas and 19 multi-disciplined craftsmen.

DESCRIPTION. The Fabrication Shop produces high quality modifications, fabrications and components to support all facets of research and development and concurrent engineering efforts undertaken by the Information Directorate.

EQUIPMENT/RESOURCES. The Fabrication facility has complete shops of various trades as well as an expansive high bay and open area to facilitate numerous projects of all sizes and duration. Each trade has a full shop of the latest equipment to handle most any project.

CAPABILITIES. The Fabrication facility has the following capabilities:

- Pattern making
- Woodworking
- Paint
- Plastic fabrication
- Metal machining
- Welding
- Sheet metal work
- Full electric shop

EXAMPLES OF CURRENT AND PAST PROGRAMS.

- Rebuilding of a crashed F-22 used for testing purposes
- Joint Strike Fighter
- Predator work
- Replicated various versions of bombs and missiles used in test projects
- Built numerous laboratory spaces for different projects
- Fabricated research test beds using Humvees and trailers
- Numerous machining projects for laser and camera mounted experiments

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