# TECHNOLOGY PARTNERSHIP OFFICE (TPO)

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# Technology Partnership Office (TPO)

## *What we do …*

- Implement the strategic vision of the Division's technology partnership enterprise

- Acting with CTO, enable undersea warfare technology development and innovation within Division through partnerships

- Continually monitor technology development - internal and external – for collaborative opportunities to maximize benefits to fleet/forces

- Facilitates use of Division Newport intellectual capital and assets including:
  - Facilities
  - Equipment
  - Expertise

> *Technology – Partnership – "Ways and Means"*
> *Through Technology Transfer (T2) and*
> *Industrial and Intergovernmental (I&I) Partnering*

# Technology Partnership Office (TPO)

## How we do it …

**Through Partnerships and Collaborations** – *TPO is <u>Office of Research and Technology Applications</u> (**ORTA**) for work with Non-Federal Entities (NFEs) **plus** enable working with other U.S. government entities*

- Cooperative Research and Development Agreement (CRADA)

- Work with Private Party (WPP) agreement

- Patent License Agreement (PLA)

- Education Partnership Agreement (EPA)

- Partnership Intermediary Agreement (PIA)


- Intergovernmental Support Agreements

- *Others (in T2 and I&I)*
  - *e.g. NAVY-NOAA Umbrella MOA-2014-009/8847*

TPO enables engagement both inside and outside Federal government

# Licensing Navy Technology

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# Technology Partnership Office

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**For TPO email correspondence: nuwc_npt_tpo.fct@navy.mil**

# The "*basic*" questions

## *What is Licensing?*

**Transfer of 'less-than-ownership rights' to another party** to use intellectual property or technology for their own use and/or further development.

Government may grant licenses to private sector, or industry, to use federally funded inventions, and industry may grant licenses to the government.

## *Why do it?*

Licensing of government-owned patents is one tool **to promote utilization and commercialization of inventions** that are developed in federal labs through agency-supported R&D.

## *How?*

*Enter into a **Patent Licensing Agreement** (PLA).*
*Submit an Application for License to Practice Invention **and have a Marketing Plan**!*

In *some* cases – PLAs may also be incorporated within other agreements – like Cooperative R&D Agreements (CRADAs) - to collaborate to further the technology application. (CRADA guidelines apply).

**Leverage Federal R&D paid for with tax dollars ~ Reduce tech development risk**

# What you need to know

- The Navy can license inventions *before* issuance or filing

- A Nondisclosure Agreement (NDA) is required before public release or to see the claims

- Export approval is necessary if:
  - ➢ the invention has military application
  - ➢ the product will be exported

- Licenses may be Exclusive or Nonexclusive

- Exclusive licenses give the licensee the right to sue others for infringement.
  - ➢ Exclusivity requires a publications and findings
  - ➢ Royalty rates are higher for exclusive licenses

- Licensees may enter into multiple nonexclusive licenses

- Navy posts "Notice of Availability" & "Notice of Intention to Grant an Exclusive License"

- A PATENT LICENSE AGREEMENT (PLA) is negotiated

  - ➢ Both Parties (Navy and Licensee) sign the PLA
  - ➢ Terms are dictated by the law
  - ➢ Royalties
    - ✓ Up front fee with minimum *annual royalties* keep Licensee progressing
    - ✓ *Running royalties* are usually based on sales
  - ➢ Termination - at license expiration *or* due to failure to follow terms

**Licenses are "walk away" agreements. Licensee can terminate without obligation.**

# Application for License to Practice Invention

- Fill out the 2-page application with standard information about your organization

- Provide the completed application and a Marketing plan to **nuwc_npt_tpo.fct@navy.mil**

- *Your marketing plan should …*

  - ## Discuss technology development requirements
  - ## Justify need for exclusivity (if that is requested)
  - ## Include realistic sales and time to
    ## market assumptions

- Information will be used in setting royalty rate
  and minimum annual royalties

- *All answers are proprietary and protected*

Applications may be requested via
Email to **nuwc_npt_tpo.fct@navy.mil**

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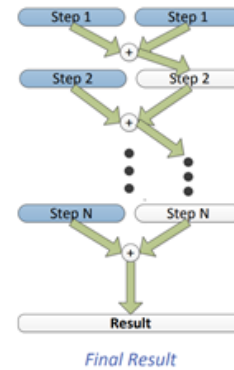**TECHNOLOGY PARTNERSHIP OFFICE**

**Description:** An ongoing issue in computer hardware design is the Design of floating point hardware which is both standard compliant (IEEE-754) and efficient in both size and speed while delivering the correct precision in results.

These digital design patent use a novel algorithmic process to result in floating Point designs which perform 30%-50% better in size and/or speed as compared to commercial IEEE-754 hardware. These designs were prototyped and implemented in FY14 and FY15 and tested against similar commercial hardware. Since the inventions use an algorithmic process, the results are relevant towards today's commercial hardware and scale up with hardware and fabrication design improvements.



**Before Optimization** (Sequential)

**After Optimization**
(Parallel Operations)

**Development Timeline:** In FY14 and F15 these designs were implemented on FPGA hardware for several mathematical operations including floating point addition, subtraction, multiplication and division according to the IEEE-754 Standard.

These initial prototypes were then tested against the present Xilinx and Altera floating-point FGPA designs and performed 30%-50% better in size and/or speed as compared to commercial IEEE-754 hardware and up to 50% smaller in size and/or 100% faster as compared to academic textbook implementations.

*PATENT NUMBER(S): 14/535384, 17/575703, and 17/123194*

**Potential Commercial Uses:** Since these designs rely upon an optimized algorithmic process to result in hardware speed and size improvements, the design applies to any floating point hardware whether implemented on FGPA or solid state device fabrication.

The inventions can be used to implement IEEE-754 compliant floating point units or hardware which uses floating point math.

Since the inventions use an algorithmic process, the results are relevant towards today's commercial hardware and scale up with hardware and fabrication design improvements.

**Partnering interest?** *Contact:*
**Technology Partnership Office**
nuwc_npt_tpo.fct@navy.mil

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**Technology Effort:**

# AI/ML-based Real-Time Network Intrusion Detection System

**Status of Availability**
As of *3/22/2023*: Initial Prototype

**Description:** The next generation architectures of Big Data and technologies such as 6G require novel approaches to prevent cybersecurity breaches which can negatively affect organizations and individual customers. According to a recent 2022 IEEE Industry Standards Report, as of 2021 the average cost of a corporate cybersecurity breach is $4.24 million US dollars, the number of current major breaches increase yearly (Malhotra et al., 2022). The proposed solution has been tested 96-98% accurate in identifying Cyberattacks with few features using Artificial Intelligence and Machine learning Techniques with high precision and low false positive rate, and was verified on two separate publicly available datasets over 15 Years apart (UNSW-NB15 and DARPA KDDCUP99). The features use data which can be processed in real time from the Zeek network suite.



Architecture Diagram
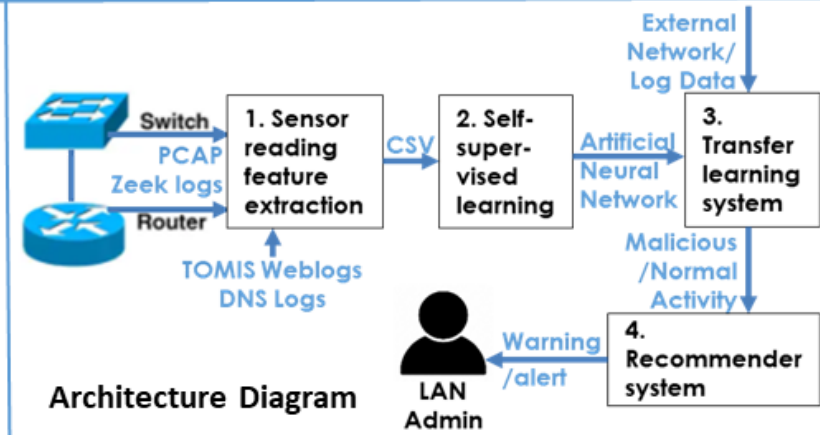
**Preliminary Results**
- 97% accuracy on UNSW-NB15
- 90% on zero-day attacks
- 98% on KDD CUP '99

**Development Timeline:** Domain Adaptation efforts have resulted in a new patent since the original features were transformed/linearized to result in higher accuracy due to removing some of the skewness/kurtosis of the original data fields. From source bytes and destination bytes, size features were transformed and derived and used on multiple network traffic flow datasets. These results held with two separate cybersecurity datasets, the UNSW-NB15 dataset and the DARPA KDDCUP99 dataset although the datasets are 16 years apart. When tested with the KDDCUP99 dataset, results were 98% accurate in predicting cyberattacks with high precision and low false positive rate. Detections include zero-day exploits.

*PATENT NUMBER(S): 17/900,982 and N.C. 211433*

**Potential Commercial Uses:** Recent advancements in artificial intelligence and machine learning have made it possible to detect anomalies in network traffic including **Zero Day exploits** or novel exploit detection using Deep Learning networks (Drozdenko & Powell, 2022). These new artificial intelligence and machine learning methods can be integrated into a novel architecture known as a Zero Trust architecture as part of its Intrusion Detection System (IDS) to proactively detect and take action against cybersecurity breaches before they traverse the network (Rose et al., 2020). Proactively preventing cybersecurity breaches using these novel techniques can result in financial benefits, improved operations and data protection, and improved customer experience.

Red – concept and initial prototype DESIGN

Orange – INITIAL PROTOTYPE available

Yellow – FULL PROTOTYPE available for testing

Green – technology READY for commercialization/use

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**Description:** The invention is novel in its use of segmented levers assembled as described above to articulate in both positive and negative symmetric cambers by means of the single degree of freedom rotary actuation shaft. There are no secondary actuators required as seen in state of the art cambered flaps for aircraft. Expected improvements in lift performance for a similarly sized symmetric foil are shown in the table.



FIG. 2A

FIG. 2B

FIG. 2C
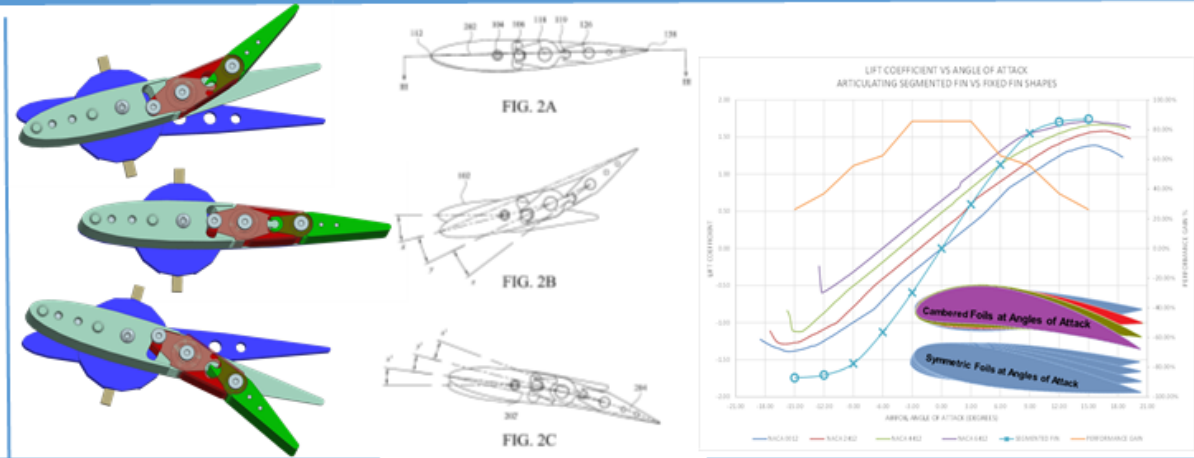
**Development Timeline:**

- Initial design and motion simulation verification completed.
- Working concept submitted for 3D printed prototyping.
- Verification and optimization of design hydrodynamics should be performed.
- Analysis of stresses and limits of mechanism in various fluids and velocities must be performed

**PATENT NUMBER:** US 11453475 B1 **PUBLISHED:** 2022-09-27

**APPLICATION NO:** 17/020872 **FILED:** 2020-09-15

**NUWC PATENT DISCLOSURE:** 2015-09-20

**Potential Commercial Uses:**

Applies to any small scale rotationally actuated control surface

- Boats
- UUVs
- Drones

*May have limited application in high speed highly loaded control surfaces*

**Partnering interest?** *Contact:* **Technology Partnership Office** nuwc_npt_tpo.fct@navy.mil

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**Description:** Compressed-size antennas find uses where space is at a premium. In vehicular applications, for example, such "small footprint" antennas offer a low-drag solution. In recent years, there has been interest in vehicular radio communication at low-VHF frequencies (below 300 MHz) where antennas tend to be large in size. The antenna presented here is smaller than the typical antenna used in that frequency range, with electrical performance comparable to its larger counterpart.
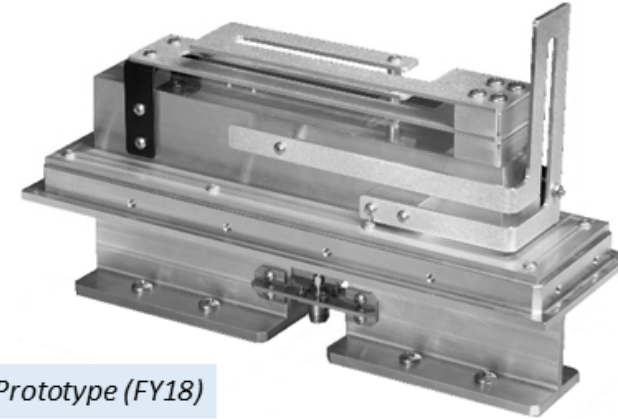


*Laboratory Prototype (FY18)*

**Development Timeline:** The initial prototype was developed in FY18 with an emphasis on -
- Electrical performance,
- Ease of fabrication and assembly, and
- Cost.

Electrical bench tests and radiation-beam patterns were recorded, validating the design.

*PATENT APPLICATION NUMBER: 16/550328*

**Potential Commercial Uses:** This small form-factor antenna can be employed on vehicles for any purpose including, but not limited to:
- Broadcast reception and transmission,
- Telemetry,
- Small satellites, and
- Unmanned (robotic) platforms.

**Red – concept and initial prototype DESIGN**

**Orange – INITIAL PROTOTYPE available**

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**Green – technology READY for commercialization/use**

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