# ARCHIVED REPORT

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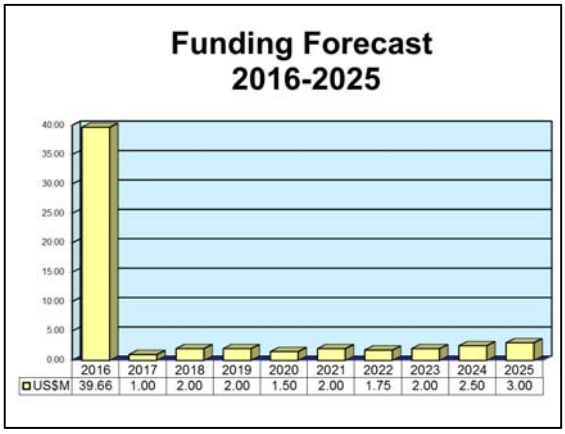
# Cyber Technology

## Outlook

- FI estimates that DARPA will spend some $57.41 million over the next decade on its Cyber Technology project
- The forecast is driven by the Pentagon's desire to increase the security of U.S. military information systems and enhance the effectiveness of U.S. cyber operations
- A DARPA FY17 budget document indicates there is no planned funding for the Cyber Technology project from FY17 onward. If no funding is indicated in FY18's budget document, this report will be archived




| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|---|---|---|---|---|---|---|---|---|---|---|
| US$M | 39.66 | 1.00 | 2.00 | 2.00 | 1.50 | 2.00 | 1.75 | 2.00 | 2.50 | 3.00 |

## Orientation

**Description.** The Cyber Technology project is an R&D effort of the U.S. Defense Advanced Research Projects Agency (DARPA). This project develops technology that will increase the security of U.S. military information systems and enhance the effectiveness of U.S. cyber operations.

**Sponsor**

U.S. Defense Advanced Research Projects Agency
3701 N Fairfax Dr
Arlington, VA 22203-1714

**Status.** Ongoing research and development.

**Application.** U.S. DoD cyber operations.

## Contractors

Contractor(s) not selected or not disclosed.

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Services; Companies, Contractors, Force Structures & Budgets) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

## Technical Data

The U.S. Department of Defense has embraced net-centric warfare by integrating people, platforms, weapons, sensors, and decision aids. Adversaries seek to limit this force multiplier through cyber attacks intended to degrade, disrupt, or deny military computing, communications, and networking systems. Technologies developed under the Cyber Technology project will ensure DoD net-centric capabilities survive adversary cyber attacks, and will enable new cyber-warfighting capabilities.

The Cyber Technology project is part of Program Element #0602303E (Information & Communications Technology). The project consists of the following subprojects:

## Cyber Technology

**Plan X.** The Plan X subproject develops technologies to enable awareness and understanding of the cyber battlespace, as required for visualizing, planning, and executing military cyber warfare operations. These efforts involve intelligence preparation of the cyber battlespace, developing ways to warn of adversary cyber actions, detect the onset of a cyber attack, identify a cyber attacker, and assess cyber battle damage. Plan X will also create new graphical interfaces that enable intuitive visualization of events on hosts and networks to aid in the planning and execution of cyber warfare. Plan X will also develop measures to project quantitatively the collateral damage of executed cyber warfare missions.

**Cyber Grand Challenge (CGC).** The Cyber Grand Challenge subproject will create automated defenses that can identify and respond to cyber attacks more rapidly than human operators can. CGC technology will monitor defended software and networks during operations, analyze flawed software, formulate effective defenses, and deploy defenses automatically. Technologies to be developed and integrated may include anomaly detection, Monte Carlo input generation, case-based reasoning, heuristics, game theory, and stochastic optimization. According to DARPA, CGC capability is needed because highly scripted, distributed cyber attacks exhibit a speed, complexity, and scale that exceed the capability of human cyber defenders to respond in a timely manner.

**Crowd Sourced Formal Verification (CSFV).** The Crowd Sourced Formal Verification subproject creates technologies that enable "crowd-sourced" approaches to securing software systems through formal verification. Formal software verification is a method for proving that software has specified properties. CSFV will enable non-specialists to participate in the formal verification process by transforming formal verification problems into user-driven simulations that are intuitively understandable.

Cyber Operations

Source: U.S. FBI

# Program Review

**Plan X.** In FY13, the Plan X subproject mapped network topologies consisting of thousands of nodes derived from millions of traceroute outputs. In FY14, the subproject worked on releasing Plan X 1.0, including product launch and the conduct of a developer workshop.

In FY15, the Plan X subproject worked on releasing Plan X 1.0 Alpha system and field test capabilities at military cyber exercises such as Cyber Flag and Red Flag.

In FY16, the Plan X subproject is releasing Plan X 2.0 system and field test capabilities at Cyber Flag 2016, and is initiating technology transition with USCYBERCOM and service components.

No Plan X subproject work is scheduled for FY17.

**Cyber Grand Challenge (CGC).** In FY14, the CGC subproject initiated the development of automated cyber defenders to identify flaws and formulate defenses. In FY15, the subproject released the first of two cyber research measurement and experimentation corpora, with associated competition results.

In FY16, the CGC subproject is conducting the world's first automated computer security contest, the Cyber Grand Challenge Final Event.

No CGC subproject work is scheduled for FY17.

**Crowd Sourced Formal Verification (CSFV).** In FY13, the CSFV subproject developed approaches for

mapping high-level formal software verification problems into user-driven simulations. In FY14, the subproject worked on launching and maintaining a public website to attract the widest possible base for crowd-sourcing formal verifications.

In FY15, the CSFV subproject refined simulations to make them accessible to a large set of non-specialists. Also, the subproject enhanced the public website to include these new simulations.

No work CSFV subproject work was scheduled for FY16 or FY17.

# Funding

**U.S. FUNDING**

| | FY15 QTY | FY15 AMT | FY16 QTY | FY16 AMT | FY17 QTY | FY17 AMT |
|---|---|---|---|---|---|---|
| **RDT&E (U.S. DARPA)** | | | | | | |
| PE#0602303E, Project 5 (Cyber Technology) | - | 63.89 | - | 39.66 | - | 0.00 |

| | FY18 QTY | FY18 AMT | FY19 QTY | FY19 AMT | FY20 QTY | FY20 AMT | FY21 QTY | FY21 AMT |
|---|---|---|---|---|---|---|---|---|
| **RDT&E (U.S. DARPA)** | | | | | | | | |
| PE#0602303E, Project 5 (Cyber Technology) | - | 0.00 | - | 0.00 | - | 0.00 | - | 0.00 |

All $ are in millions.

Source: U.S. Defense Advanced Research Projects Agency FY17 RDT&E Budget Document

# Contracts/Orders & Options

No contract information regarding the Cyber Technology project has been made public. Consequently, no recent contracts have been identified.

# Timetable

| Year | Major Development |
|---|---|
| FY13 | The Plan X subproject maps network topologies consisting of thousands of nodes |
| FY14 | CSFV subproject launches and maintains a public website to attract the widest possible base for crowd-sourcing formal verifications |
| FY15 | CGC subproject develops a cyber research corpus using techniques from game theory and other quantitative disciplines, and derived from a study of emergent behavior |
| FY16 | The Plan X subproject is releasing Plan X 2.0 system and field test capabilities at Cyber Flag 2016 |

# Worldwide Distribution/Inventories

Cyber Technology is a project of the **U.S. Defense Advanced Research Projects Agency**.

# Forecast Rationale

The Cyber Technology project is an R&D effort of the U.S. Defense Advanced Research Projects Agency (DARPA). This project develops technology that will increase the security of U.S. military information systems and enhance the effectiveness of U.S. cyber operations.

## Cyber Technology

Forecast International projects that DARPA will spend more than $50 million on its Cyber Technology project over the next 10-plus years.

Still, a DARPA FY17 budget document indicates that there is no planned funding for the Cyber Technology project from FY17 onward, so this project may be winding down. If no funding is indicated in FY18's budget document, this report will be archived.

# Ten-Year Outlook

| ESTIMATED CALENDAR YEAR RDT&E FUNDING (in millions US$) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Designation or Program** | | **High Confidence** | | | | **Good Confidence** | | | **Speculative** | | | |
| | **Thru 2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **2025** | **Total** |
| **MFR Not Selected** | | | | | | | | | | | | |
| **Cyber Technology** **Military <> United States <> Department of Defense** | | | | | | | | | | | | |
| | 179.89 | 39.66 | 1.00 | 2.00 | 2.00 | 1.50 | 2.00 | 1.75 | 2.00 | 2.50 | 3.00 | 57.41 |
| | | | | | | | | | | | | |
| **Total** | 179.89 | 39.66 | 1.00 | 2.00 | 2.00 | 1.50 | 2.00 | 1.75 | 2.00 | 2.50 | 3.00 | 57.41 |