

Topic: N171-083

## P&J Robinson Corporation d.b.a. PJR Corporation

Late-Stage Software Feature Reduction Tool for Security and Performance

ArtusJava is a software tool used to remove dead code and features without need to access source code or the original developers. Use of Java is pervasive due to its mature ecosystem, rich community resources, and quick development cycle. The vast majority of today's Java applications use only a fraction of their code and libraries causing the exploitable attack surface to be larger than necessary. PJR's ArtusJava is a software re-engineering system that uses binary and static analysis, slicing algorithms and cutting techniques to safely remove bloat and allow the user to selectively remove unwanted features from the compiled binaries. Results in a smaller, simplified application with less vulnerabilities.

### Technology Category Alignment:

Assuring Effective Missions

Resilient Infrastructure

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**SYSCOM:** ONR

**Contract:** N68335-18-C-0305

# Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-5915-19

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## WHO

**SYSCOM:** ONR

**Sponsoring Program:** ONR Code 31

**Transition Target:** TBD

**TPOC:**

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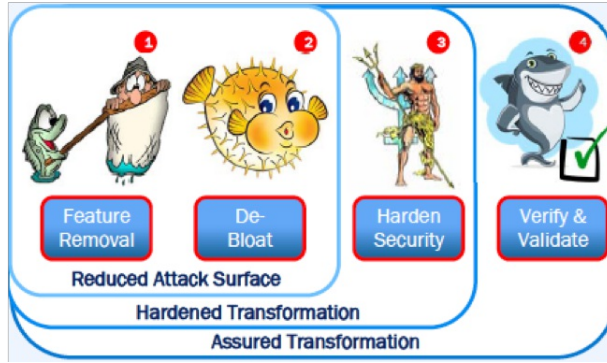
**Other transition opportunities:**

Transition opportunities include all Navy Government (GOTS) and Commercial Off-The-Shelf (COTS) standalone and enterprise java applications when security, efficiency and performance are key factors.

Legacy systems are high value targets, because in many cases the original developers are long gone, documentation is lacking, code reuse is common and it is difficult to know what else is affected when changes are made.

**Notes:** Artus is Latin for 'compaction', or 'to make smaller.' ArtusJava is part of a suite of products to remove bloat and unwanted features from software and protocols.

ONR also awarded a STTR Phase II to PJR to develop Artus Protocol. The STTR Topic number is N18A-T018.



## WHAT

**Operational Need and Improvement:** The Navy expressed a desire to develop an automated software tool for the discovery, detection, and removal of unwanted or unnecessary software code and features in any commonly used programming language. Java software programs are notoriously bloated containing only partially used code and libraries. The vast majority of today's Java applications use only a fraction of their code and libraries causing the exploitable attack surface to be larger than necessary. PJR's ArtusJava, an automated software reengineering tool, allows users to remove dead code, and selectively cut unwanted features from Java software. ArtusJava does not require access to source code or the developers.

**Specifications Required:** Fully functioning software toolset for removing dead code and cutting features in java software applications. Demonstrate and evaluate the tool on java software applications of varying complexity, along with demonstration of the continued correct and functional operation of the remaining application features. Software toolset does not require access to source code. Consultation with original software developers must not be required. Software tool shall produce call graph to illustrate interdependencies and changes made to underlying code.

**Technology Developed:** New static-analysis-enabled approach to trimming unused code from both Java applications and Java Runtime Environment (JRE) automatically. PJR's research partner's experimental results show that, Java application size can be reduced by 44.5% on average and the JRE code can be reduced by more than 82.5% on average. Trimming redundant code removed known security vulnerabilities in the JRE.

**Warfighter Value:** Warfighters' rely upon the accuracy and availability of information. Compromised software and data can be can adversely affect outcomes and even cost lives. Removing dead code, unwanted features, Cyber Vulnerabilities and Exposures (CVEs) and reducing available attack surface improves the simplicity, reliability and efficacy of software systems used by warfighters.

## WHEN

**Contract Number:** N68335-18-C-0305 **Ending on:** November 27, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
SBIR Phase I Base Prototype Demo to TPOC	N/A	Verified algorithms. Tested high risk disassembled and reassembled code. Initial cut at workflow for prototype demo.	3	2nd QTR FY18
Phase I Option Demo	N/A	Prototype - Tested/refined feature identification (ID), slicing algorithms, cutting techniques	4	3rd QTR FY18
Awarded Phase II A/B Base/Option Alpha/Beta Version Development	Med	Deeper binary static analysis, de-bloat, feature identification/removal, call graphing, dependency mapping, data flow analysis, slicing, and cutting tested at scale and complexity.	5 to 6	2nd QTR FY20
Subsequent Phase II or Phase III funding to facilitate transition to Program of Record	Med	Transition subject matter expertise to customers and partners, improvements to workflow/user experience, security improvements metrics, performance improvement metrics, integration with 3rd party regression testing software.	7 to 8	TBD

## HOW

**Projected Business Model:** PJR plans to target Navy customers by leveraging existing and developing new customer relationships and contract vehicles. PJR also intends to leverage existing partnerships with Large Systems Integrators (LSIs) to deliver on major programs. PJR also plans to develop delivery partners to rebadge/resell software licenses, and support agreements to their commercial and Government customers. PJR plans to offer ArtusJava licenses for sale or software as a service along with installation and configuration services ensure customer success. Customers can purchase a license outright or hire PJR or a delivery partner to use ArtusJava on new versions, and releases of software.

**Company Objectives:** Objectives for the FST event include: lead generation, competitive research, and partner development. Longer term goals for ArtusJava include: continue to build Artus product suite to include Artus C/C++ and Artus Protocol. File Patent on process, techniques, and/or algorithms. Artus will help PJR grow by contributing directly with additional revenue and indirectly by differentiating PJR from it's competitors.

**Potential Commercial Applications:** PJR intends to offer a version of ArtusJava with Application Programming Interfaces (API) so that software testing and instrumentation tool providers can add ArtusJava to their product offering and sell to their existing customers. PJR also has health care customers (e.g., Sharp Healthcare) that expressed interest in using Artus tools.

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