



News Release

Defense Advanced Research Projects Agency

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IMMEDIATE RELEASE

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DARPA Aims to Revolutionize Defense Manufacturing

Approach may compress systems delivery times by at least a factor of five

Agile and flexible design and manufacturing approaches are needed to meet the demands of rapidly changing threats to national security, declining defense budgets and the increasing complexity of systems. Current approaches to the development of defense systems and vehicles have proven inadequate for the timely delivery of much needed capability for the warfighter. The Defense Advanced Research Projects Agency (DARPA) launched a portfolio of programs aimed at dramatically compressing development timelines for complex defense systems. DARPA's Adaptive Vehicle Make (AVM) portfolio will fundamentally alter the way systems are designed, built and verified, significantly improving the capacity to handle complexity—which has been rapidly outpacing existing 1960s-vintage approaches to managing it.

According to Paul Eremenko, DARPA program manager, "DARPA's goal is to replicate the success of the integrated circuit industry in coping with rapidly growing product complexity by moving to higher levels of abstraction in design, introducing design automation and model-based verification and decoupling the design and build phases of the development process."

The AVM portfolio is composed of four synergistic efforts: META, Instant Foundry Adaptive through Bits (iFAB), Fast Adaptive Next-Generation Ground Combat Vehicle (FANG) and Manufacturing Experimentation and Outreach (MENTOR), which will culminate in the development of a next generation infantry fighting vehicle. "The aggregate aim is to compress development timelines by at least 5X, shift the product value chain toward high-value-added design activities drastically democratize the innovation process and build the next generation cadre of manufacturing innovators—starting at the high school level," said Eremenko.

Earlier this year, DARPA launched the first of the AVM efforts—META—a program to develop metrics, a representation metalanguage, design tools, and verification techniques to enable the synthesis of vehicle designs that are correct-by-construction. "META will create a toolset that enables the development of complex military vehicles and avoids the design-build-test-redesign loop that tends to lead to cost and schedule growth as we chase unanticipated interactions within the system," said Eremenko.

iFAB complements META's "fab-less" design capability with a "foundry-style" manufacturing approach. "The ultimate vision," explained Eremenko, "is for a bitstream-programmable manufacturing facility that can be rapidly configured to produce a new design or design variation with nearly zero learning curve," adding: "We call this large-scale manufacturing in quantities of one." An iFAB-style facility is the defense industry's analog to modern integrated circuit manufacturing plants, which are automated, adaptable and capable of producing a broad spectrum of products.

The culmination of AVM is the FANG program which will leverage the META and iFAB capabilities to produce an infantry fighting vehicle. But FANG has yet another objective in mind. "We are looking to expand the number of contributors in the design process by orders of magnitude—we call this 'democratizing innovation'," said Eremenko. To that end, DARPA will develop a collaborative infrastructure for crowd-sourcing vehicle designs, called *vehicleforge.mil*. DARPA expects that the site will employ the META

metalanguage to represent designs and will include version control and “branching” features similar to those found in open-source software forge sites—all in an effort to enable thousands across the globe to contribute to vehicle designs. “Naturally, we are also investigating novel mechanisms for credentialing users and for ensuring the integrity of the final design,” Eremenko noted. After *vehicleforge.mil* goes operational in 2011-12, DARPA envisions a series of Adaptive Make Challenges—prize-based competitions of increasing complexity with winning designs manufactured in iFAB—the output of which may ultimately be evaluated against Army prototypes.

As AVM engages non-traditional participants in the making of defense vehicles, DARPA hopes to generate a renewed interest in the manufacturing field and foster the next generation cadre of innovators. “DARPA will deploy a variety of 3D printers to high schools across the country,” said Eremenko, “our goal is a thousand schools within three years.” Under the MENTOR effort, students will engage in a distributed design and manufacturing experiment using conventional social media to collaborate across schools to develop and build vehicles such as mobile robots, go carts, etc.

Eremenko is under no illusion that the leap from integrated circuits to an infantry fighting vehicle is an easy one. “The diversity of components and interactions among them is much richer and much more dynamic, and the environment context in which vehicles operate is also significantly more complex—there is no doubt that this is a DARPA-hard problem, but the pay-off for success would be immense,” he said.

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Interested parties may attend the virtual Adaptive Vehicle Make Proposers’ Day. Additional information and registration instructions are available at:

<https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-SN-10-67/listing.html>

Draft versions of the iFAB and vehicleforge.mil solicitations may be found at:

iFAB: <https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-SN-10-65/listing.html>

vehicleforge.mil: <https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-SN-10-64/listing.html>

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