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Software and Strategy

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Software has scaled dramatically not only in functional capability, but also in its role in interlinking organizations and conferring agility in the enterprise. Technical advances in software have enabled diverse software supply chains and the development of rich socio-technical ecosystems such as for mobile devices (iOS, Android), web services (ASP.Net, Java EE, LAMP), cloud-based services (Google, Amazon, Facebook), and enterprise services (ERP, SCM, CRM), as well as infrastructural ecosystems such as for utilities, logistics, and transportation.

Although Moore's Law and the growth of the Internet have enabled this scaling, it is not a consequence of these things. The scaling derives from a rich and diverse set of deep technical advances in languages for writing software, in modeling and analysis techniques to support software creation, in the practices used by teams of developers, and in the tools used by individuals and teams to support these practices. Federal investments have been critical enablers of these advancements.

In the economy, software has a unique role, conferring competitive advantage in sectors ranging from financial services and health care to logistics, manufacturing, utilities, and transportation. The role of software capability as a competitive attribute will continue to increase. Indeed, ICT drives between 20 and 25 percent of economic growth in the U.S. and Europe, despite its smaller share of overall economic activity. In national security, the pivotal role of software capability is strongly asserted in studies from the Defense Science Board and the National Research Council.

In the cybersecurity landscape, software advances continually change the character of the engagement — as the technologies evolve, old vulnerabilities can be eliminated but, unfortunately, new ones often emerge. Regardless, software engineering capability strongly influences the nature and extent of vulnerability of systems, and the goal of designing systems with security “built in” is largely a challenge to our ability to improve technologies for software design and development.

Software, uniquely among building materials, has a symbolic nature that confers a characteristic “unboundedness.” There are, in other words, few limits going forward to continued rapid advancement of software capability, and the pace of this advancement is, if anything, increasing. As a consequence, staying ahead in software technology grows in significance as a national economic and security priority. Federal investment has been an historical driver of our technical leadership,



which derives from a unique partnership of industry, government, and academia. Looking ahead, the roles of Federal agencies and the coordination afforded through the Federal Networking and Information Technology Research and Development (NITRD) Program become even more important in the increasingly competitive international environment.