NDIA

Trusted Microelectronics

Joint Working Group

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Team 1 Summary

Future Needs & System Impact of Microelectronics Technologies

July 2017

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Team 1 - Future Needs & System Impact of Microelectronics Technologies

A diverse group of semiconductor industry, defense primes, USG (primarily DoD), and non-profit research institute professionals was assembled as a part of the Joint Working Group to look into the future of microelectronics and specifically how that future will impact the economic well-being and defense of our country. The combined members of this group had specific and deep understanding of semiconductor technology, including how it is specified, designed, manufactured, deployed, and managed within both DoD systems and commercial applications. The Team addressed both the demand side and the supply side of microelectronics for the Defense industry.

The Demand Side: The Team examined the likely future needs, specifically over the next 5-10 years, of end-user systems (both DoD and commercial but focusing on the former) that utilize microelectronics. We investigated and discussed a wide of a range of defense applications and future systems to guide our thoughts about current and future demand for semiconductor and microelectronic component technologies

The Supply Side: Then we reviewed the emerging supply issues of new semiconductor technologies that will enable, impact, and potentially dominate these systems, as well as some of the concerns as to trust and assurance of this supply. The group utilized its collective deep technical knowledge in the context of the demand side and looked for categories of emerging technologies that might benefit the entire spectrum of US defense, government and US commercial interests as well. The emerging technology categories included:

- *3D / Heterogeneous Integration*
- *Compound Semiconductor*
- *Deep Node CMOS*
- *Other Novel Technologies: Advanced Digital, Analog Computing, Neuromorphic and Quantum*

As we looked at the specifics of these technologies against the backdrop of today's known issues of assured secure access (concerns about the integrity and USG availability of commercially developed semiconductor products are well-documented), we identified a number of consistent themes. Moreover, as these themes were discussed by a focused group of experts – a single unifying recommendation emerged, along with a number of important sub-recommendations.

Summary of Findings and Recommendations

This team examined the four primary new and emerging technology categories listed above and discussed what concerns and challenges came to mind and what new mitigations to those challenges might be put in place. The team concluded that:

- *The agility and pace of USG efforts in future microelectronics technologies will be unlikely to match the accelerating pace of Industry. Methods for addressing this "cultural mismatch" must be developed.*

- *The proliferation of readily available commercial technology and the sophistication of adversaries will not decrease, it will dramatically increase. Threat vectors will numerically increase and attack surfaces will also multiply. Advanced commercial technologies will be available to all (including adversaries) so we must develop secure methods to extend/augment COTS' capabilities to ensure the DoD has differentiating capabilities to maintain superiority.*

- *A wide range of new technologies will be coming out of a broad set of international commercial players. Diversity of technology and sources of that technology will increase as scaling based progress is replaced by other innovative approaches (new designs, heterogeneous integration, architectures and devices). The DoD has a unique opportunity to influence the direction of key emerging technologies thereby helping assure a US Industrial base which provides future DoD access and benefits the US economy as a whole.*

Key Team recommendation: Create a U.S. National Semiconductor Strategy
While the US military global superiority and independence depends on eternal vigilance, our strength originates from constant technological innovation.

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