EXPLORING EMERGING TECHNOLOGIES:
Radiation Hardened Technology

Electronics Division Panel Discussion
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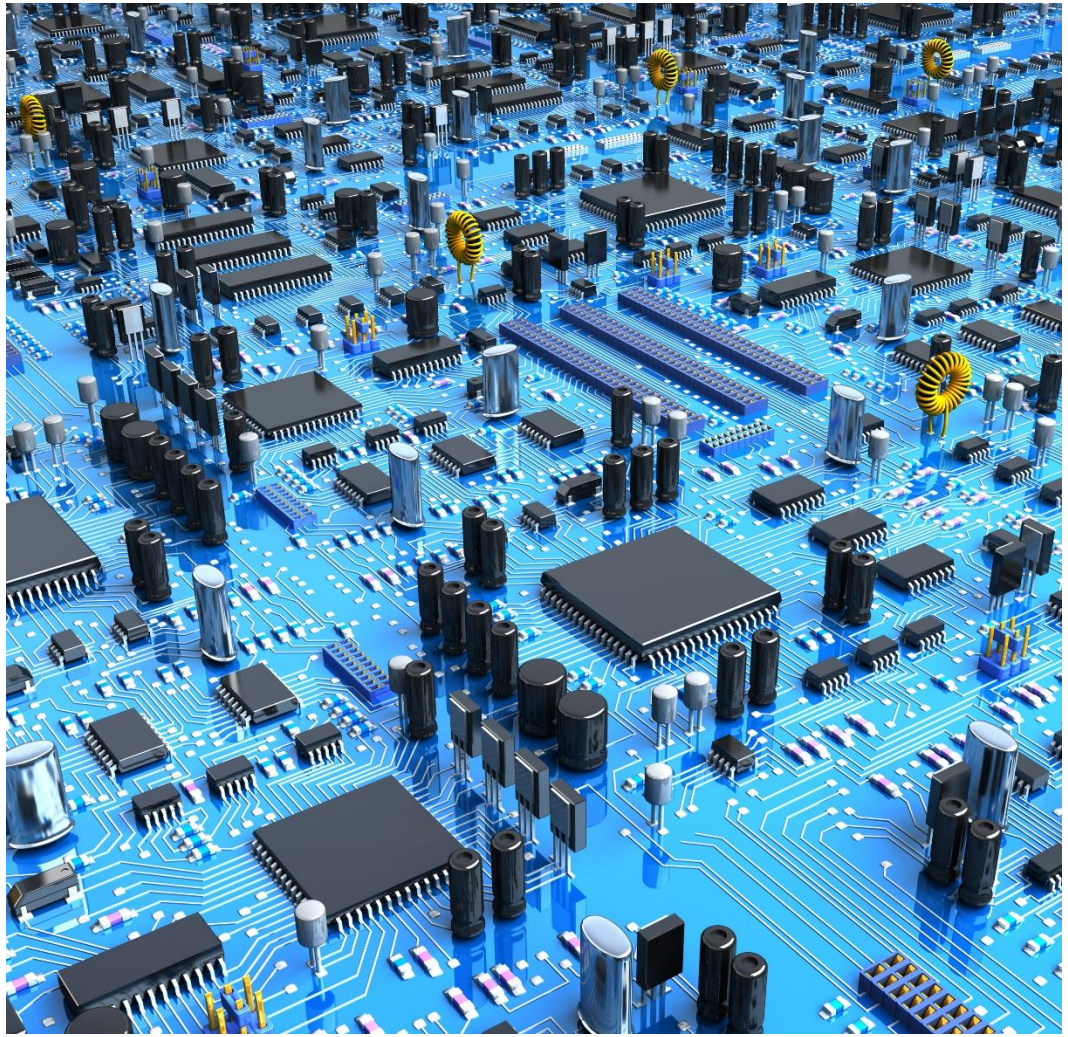
NDIA Electronics Division Webinar



Moderator:

Shawn Fetterolf

Synopsys, Inc.

Irene Lau

Intel Corporation

Panelists:

Todd Brusnighan

Export Compliance Manager

Intel Export Compliance

Tony Jordan

Business Development Site Lead – Senior Director Semiconductor and Space Solutions

Cobham Advanced Electronics Solution

David Rea

Director, Advanced technology, On-Board Processing, and Cyber Space Systems

BAE Systems

Dr. Warren P. Snapp

Manager, Solid-State Electronics Development Systems technology

Boeing Research & Technology

Chris Hart

Director, Marketing and Business Development

International Rectifier HiRel Products

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Unanswered Question & Answer

Question to Todd: Can you clarify how a strategically hardened design fabricated in an Intel process could affect export control of existing products. I'm not following how this could make Xeon processors export controlled since there is no expectation that they would also be strategically rad-hard.

Todd Brusnighan:

- Answer: A strict reading of the current regulations yields that if one 'designs' or 'rates' a product to or beyond the parameters in 3A001.a.1 that there may be something in the process that is 'required' (i.e. peculiarly responsible) technology for achieving the 3A001.a.1 parameters. Any other product based upon the same process technology could be implicated radiation hardened based upon the process technology. The concern would be two-fold: 1) how does one determine what is the peculiarly responsible aspect of the process (or is it design only). This is a cost that some offshore competitor's and adversaries do not have to bear since the regulation doe snot apply to them and 2) does the technology require licensing to be exported to the various other offshore fabs that a company operates. A clear decoupling of 3E001 radiation hardened technology from inadvertently being applied to a purely commercially developed manufacturing process is desired. The is very similar to why industry wanted rad hard out of the ITAR in years past.

What can the USG do to help address Industries export control concerns ?

Todd Brusnighan:

- Answer: The ecosystem has changed, and the regulations need to catch up to the new reality of multi-national companies and workforces being necessary for foundries to compete at SOTA nodes. Dialogue and understanding of the environment and appropriate export controls on the hardware and less control on technology may be what is necessary to balance national security with economic prosperity.

What can the USG do to help address Industries export control concerns ?

David Rea:

- Answer: I liked Tony's answer regarding dialog. There are probably some alternatives that would lighten the burden overall, but not increase risk. I'd even encourage an "approved list" of products. Discuss the product with the USG up front and mutually agree its OK to export or not. Self declaration and then securing a license case by case is very burdensome. Some products could remain on a "case by case" basis, but older products that are not best of breed based on what's globally available or products that pose no particular secuirty or IP risk could be adjudicated once.

How do other countries deal with these issues?

Todd Brusnighan:

- Answer: For export controls, many countries are part of the Wassenaar arrangement which is a multi-national agreement for controlling exports. Some countries are not signed on to that agreement and their export controls can vary considerably.

How do other countries deal with these issues?

David Rea:

- Answer: I'm not sure of the scope of this question (export or fab access). I also can't speak for other countries. However, I'd posit that given the historical advantage the US has gained in space, the downside risk is asymmetric. Loss of advantage through mis-export or lost of IP is a risk to the US, but perhaps not to a nation with no IP to lose. From a RH perspective, it seems that nations that are catching up are much more likely to use any capability available (foreign fabs, etc.) and may even fly components that may not survive long term to catch up. From a fab perspective, other nations are likely to be at an advantage if they can gain access. Many of the basic RHBD techniques are publicly discussed. It's always more expensive to be the initiator than the follower. The European Union has developed a market that favors EU content and participation. Many other nations wishing to have a space program for prestige or security are also pursing indigenous capability.

Where do you see the needs for microprocessors, volatile and non-volatile memory, GPU and AI processors for space?

David Rea:

- Answer: Every user in every environment wants more processing at lower power. The appetite is insatiable. That's a good thing as it pushes us improve capabilities in space systems. To prevent space from continually falling further behind terrestrial users, the nation would benefit from a wide range of fundamental building blocks. Today's purchasing structure is very program driven and not driven by broad applicability. If there were a low power, rad hard (or tolerant) GPU, it would find a use in many programs as would AI processors, multi-core GPPs, memories, networks, etc. I would not be so bold as to say "build it and they will come", but I would say that if a capability has mainstream adoption for terrestrial applications, it would be applicable to processing in space. I'd start with existing IP and then address unique processing needs in space (such as survival in a harsh environment at supportable power consumption).

Regarding Trust issues, are you and your companies looking into utilizing alternative methods such as partitioning the IC between two or more elements so that they can use different tech nodes and fabs, or adding IPs such as PUFs or PSFs, and last but not least split fabrication approaches by splitting front end line processing and back end line processing at two different fabs?

David Rea:

- Answer: These are related: An assurance solution will benefit from a rich toolset comprising design tools, methodologies, software, and hardware circuits/partitioning, including those suggested in the questions. As a community, we will need to agree on what is sufficient. Currently there are many options, but no clear standard for sufficiency. That's partially driven by the evolving and dynamic threat space. There is also an advantage from diversity here. A single approach provides a single target. Implementing a variety of approaches would minimize risk across the enterprise.

Question to Todd: Can you clarify how a strategically hardened design fabricated in a Intel process could affect export control of existing products. I'm not following how this could make Xeon processors export controlled since there is no expectation that they would also be strategically rad-hard.

- Tony Jordan:
  - Answer: Intel.

How closely are your orgs tracking digital engineering tools and standards from the various services, such as AFMC's Digital Campaign? Do you see this helping solve some of the data and trust challenges we've discussed thus far?

- Tony Jordan:
  - Answer: No comment.

What can the USG do to help address Industries export control concerns ?

- Tony Jordan:
  - Answer: Continue dialogue with companies, fast resolution of ideas and clear guidance.

Interested in Mobile Nuke Reactors (MNR) and the embedded HW RADHARD requirements for that kind of capability when compared to RADHARD requirements for space systems

- Tony Jordan:
  - Answer: I have limited experience in this area.

Where do other countries deal with these issues?

- Tony Jordan:
  - Answer: What issues?

Where do you see the needs for microprocessors, volatile and non-volatile memory, GPU and AI processors for space?

- Tony Jordan:
  - Answer: Edge computing. Returning the answer not the data. Distributed processing, autonomous operation. Faster control plane and data plane processing solutions. With advanced computing comes the need for increased memory storage, same or less area , faster access time, less power; along with faster means to move large data sets form point A to point B.

Regarding Trust issues, are you and your companies looking into utilizing alternative methods such as partitioning the IC between two or more elements so that they can use different tech nodes and fabs, or adding IPs such as PUFs or PSFs, and last but not least split fabrication approaches by splitting front end line processing and back end line processing at two different fabs?

- Tony Jordan:
  - Answer: Exploring design disaggregation via chiplets, IP vetting, design system vetting and protection, methods for design protection in a zero trust environment, design integrity analysis, and cyber security IP.