



ERI

HARDWARE EMULATION WORKSHOP

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WORKSHOP AGENDA

- Problem Statement
- My view of emulation
- Presentations by industry experts
- Q&A followed by discussion

F35: ILLUSTRATING THE DOD COMPLEXITY CHALLENGE

F35 Value:

Arguably the most sophisticated machine on the planet
(control systems, stealth, lethal force, navigation, ISR, EW, COMMS, HMD,...)

Time:

20+ years from start to production

Complexity:

>20M Lines of Code
300,000 parts
1,600 suppliers
3,500 ICs
200 Unique Chips

R&D Cost:

\$55B



FUNDEMENTAL WORKSHOP QUESTIONS

- What is SOTA in emulation?
- Can we emulate complete complex DoD system?
- Can system emulation significantly reduce development time/cost?
- What are some "DARPA hard" emulation challenges?



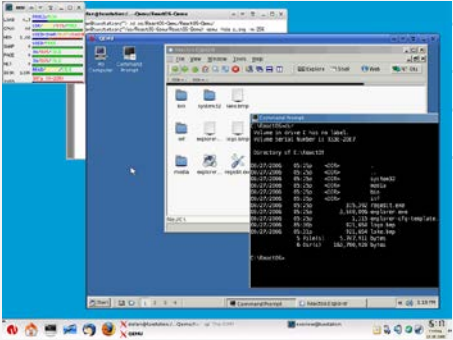
EMULATION VS SIMULATION

Simulation = For *analysis* and *study*

Emulation = For usage as a *substitute*

....but let's not get caught up in semantics

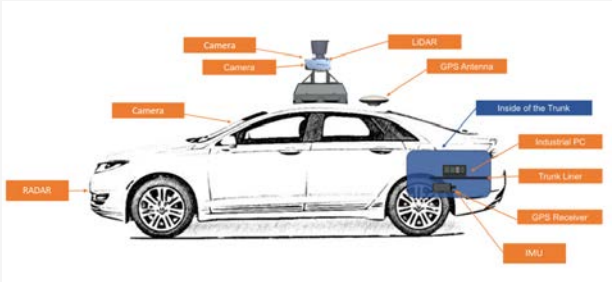
WHAT DO WE MEAN BY EMULATION?



Virtual Models (eg QEMU, etc)



Digital Circuit Emulation (acceleration)



Rate Adapting HW In the Loop



Scenario Simulation



FPGA Prototyping

Image Sources: Synopsys, Mentor, Cadence, Github (apollo), Waymo

FUNDEMENTAL BENEFITS OF EMULATION

- Improve pre-production validation quality (“first time success”)
- Collapse the serial development pipeline (“shift left”)
- Speed up verification run times (“faster TTM”)
- Software easier to distribute than hardware (“QEMU”)
- Better to crash in a simulator (“carcraft, nuclear testing”)

QUESTION #1: IS REAL TIME EMULATION POSSIBLE?

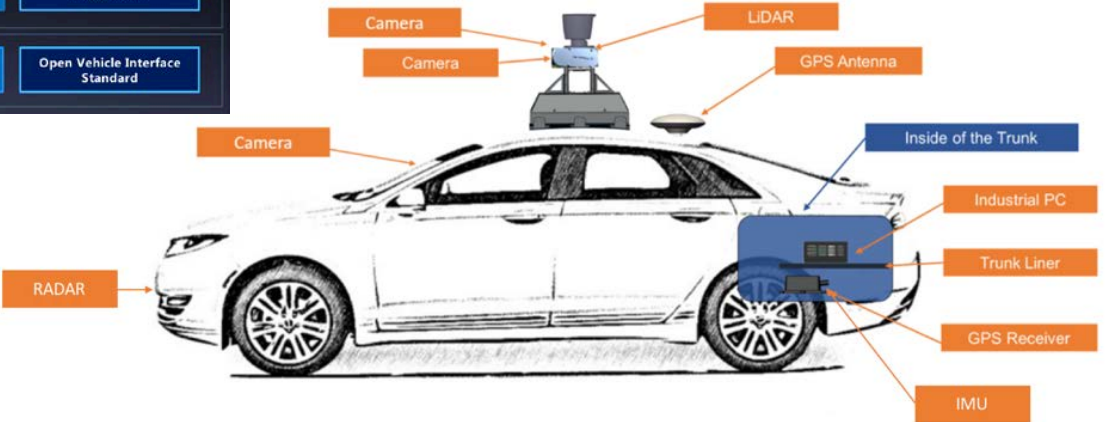
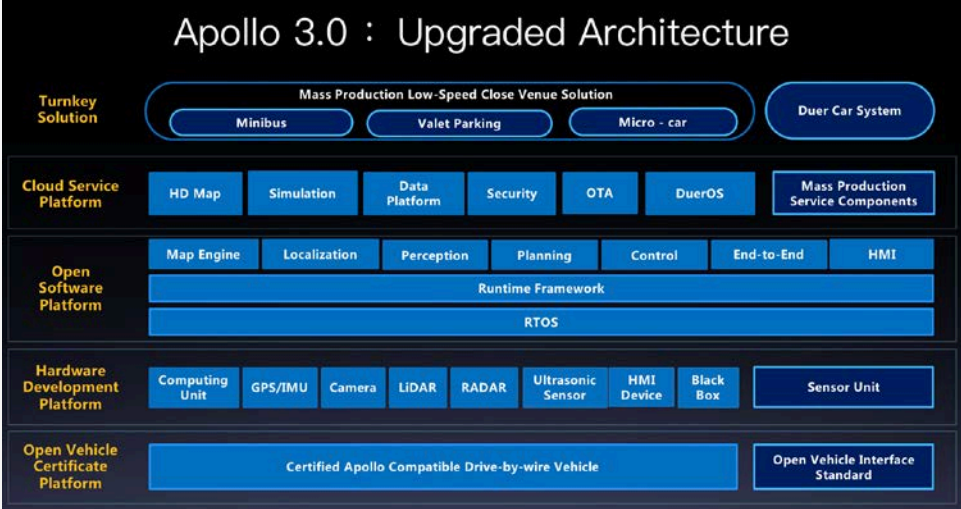


QUESTION #2: IS IN THE FIELD EMULATION POSSIBLE?

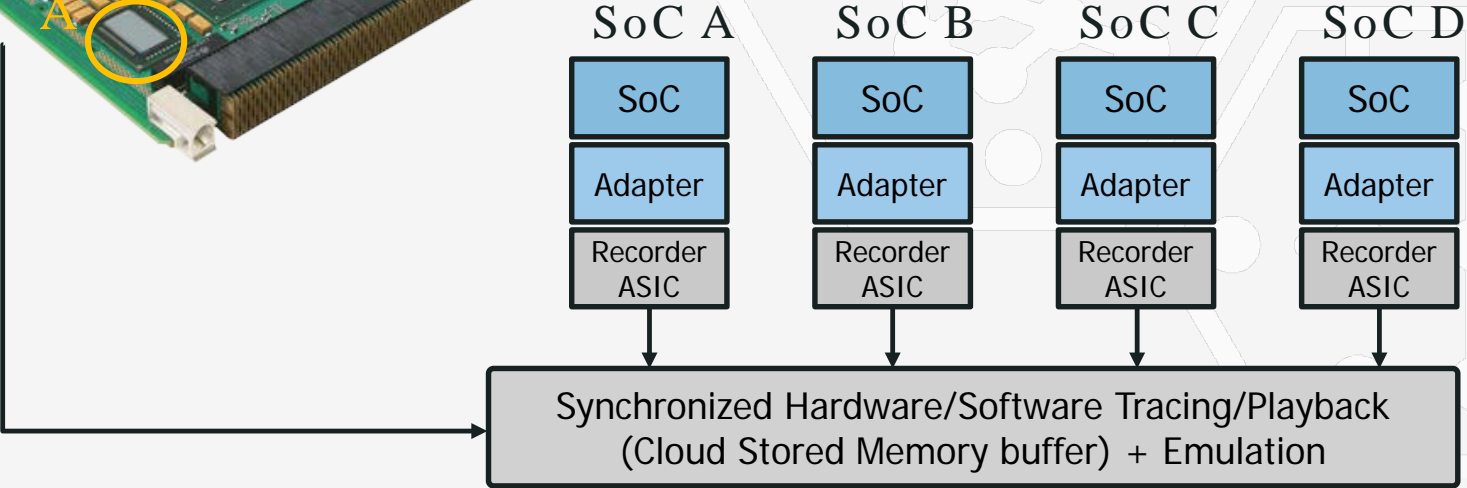
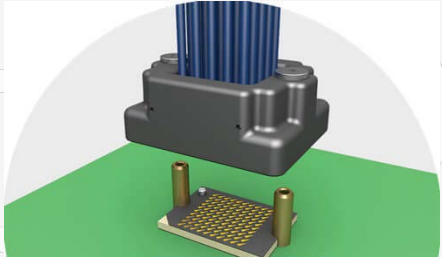
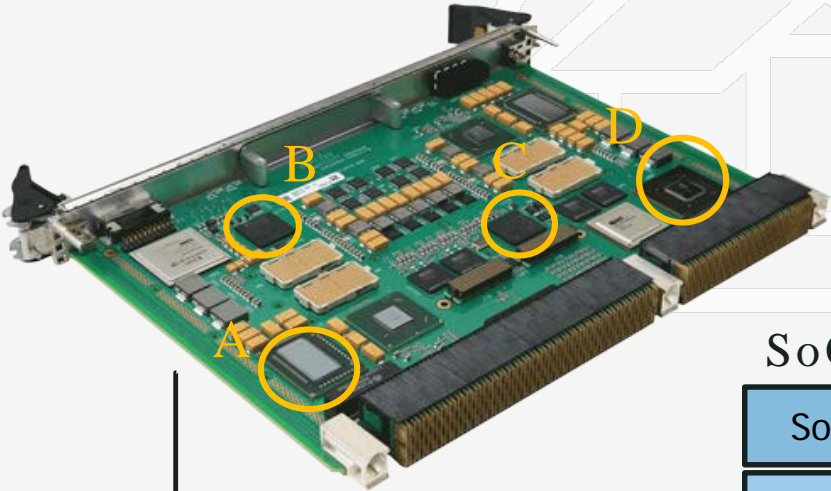
- Fixed :
 - Mechanical
 - Analog Interfaces
- Configurable:
 - Everything digital
 - Direct path to custom ASICs



QUESTION #3: ARE STANDARD INTERFACE REQUIRED?



QUESTION #4: IS VIRTUAL QUALIFICATION POSSIBLE?



SPEAKERS

Start	End	Organization	Speaker
7:30	8:30	Registration & Breakfast	
8:30	8:45	DARPA/MTO	Andreas Olofsson
8:45 AM	9:00 AM	NXP	Jan-philipp Gehrmann
9:00 AM	9:15 AM	Waymo	Simon Verghese
9:15 AM	9:30 AM	National Instruments	George Zafiroopoulos
9:30 AM	9:45 AM	Break	
9:45 AM	10:00 AM	Boeing	John Ballast
10:00 AM	10:15 AM	Lockheed Martin	Rick Stevens
10:15 AM	10:30 AM	Raytheon	Ken Prager
10:30 AM	10:45 AM	Break	
10:45 AM	11:00 AM	Cadence	Frank Schirrmeister
11:00 AM	11:15 AM	Mentor	Charley Selvidge
11:15 AM	11:30 AM	Synopsys	Mike Bershteyn
11:30 AM	12:30 AM	Q&A + Roundtable Discussion	All