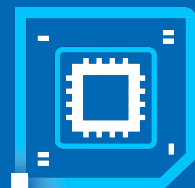NSF Workshop 2021

Chip Design Talents Development

Hui Fu
Senior Principal Technologist
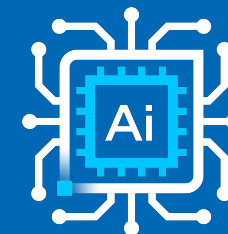
intel.

The Entire World is Becoming
Digital

Ubiquitous Compute

Pervasive Connectivity
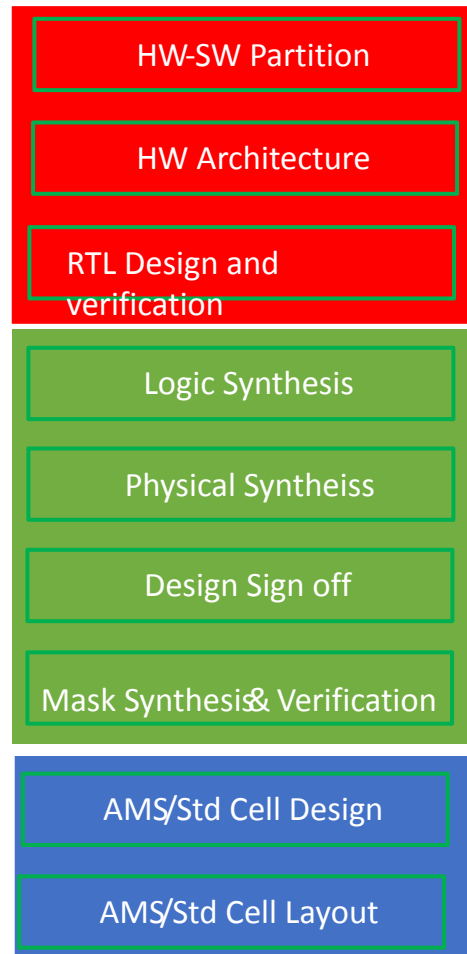
Cloud to Edge Infrastructure

Artificial Intelligence

Semiconductors are the underlying technology empowering developers and powering our customers' innovations

IC Development process and Required Skills

| HW-SW Partition |
| HW Architecture |
| RTL Design and verification |

- System architecture
- Hardware architecture
- Programming/Modeling skills: C/C++, Matlab, HDL, Python
- Hand off: HDL

| Logic Synthesis |
| Physical Syntheiss |
| Design Sign off |
| Mask Synthesis& Verification |

- Hardware architecture
- Semiconductor basics
- Programing skills: Tcl, Python
- Hand off: GDS/OASIS, bitstream(FPGA)

| AMS/Std Cell Design |
| AMS/Std Cell Layout |

- Transistor physics
- Programing skills: Python, tcl, Skill
- Hand off: Hard or Soft IP

The most effective designer is either an excellent hardware engineers with good programing skills
Or excellent software engineer with good hardware understanding

Successes	Areas for Improvement
- Improved software programming skills from an implementation perspective. - Good at doing what they have been asked to do, following instructions. - On a given subject, good at gathering information from different sources. - Good at stating what their career goals are, what they want to achieve in 5 10 years. - Verbal communication is good. They can articulate their thoughts well. - Generally good on collaboration	- Improve debugging/hacking engineering skills. - Overcome obstacles and roadblocks by taking initiatives, rather than directives from others. - Synthesizing the information into a recommendation for actionable items. - Lack of an understanding/patience to get to their goals. - Written communication (importance and style of writing in an organized manner) is an area of improvement.

*: Discussion on Texas State University
Ingram Engineering School Industry Advisory Board

Proposed Ideas for exploration 1/2

- Key educational focus
  - Understand the fundamentals
  - Better Programing skills
  - Hands on training (outcome) to developing engineering skills:
    - Simulated system performance
    - Verified design
    - Sign-off clean design
    - Implement in FPGA
    - Tapeout

Proposed Ideas for exploration 2/2

- Revive HW start-up
  - Reduce capital entry barriers
    - Government sponsored shuttle seats
    - Government sponsored EDA cloud design/development environment
    - Training credit

Intel Corporate University Research Engagements	Intel Technologies Intel 16	Intel University Shuttle	Research Funding Partnerships (SRC, DARPA, NSF, …)

Intel's University Shuttle Program

Broaden Intel's reach across academia and strengthen partnerships

Intel 16 is a versatile technology for varied number of applications

It has both digital, analog, and RF features

Simple design rules, 3rd Gen FINFET technology

Optimize more than

100

different operating systems

#1

contributor

to the Linux kernel

Top-3

contributor to

Chromium OS

Top-10

contributor to

OpenStack

Deliver open & secure software and hardware platforms with industry-defining standards

Floating Point Standard

HI-SPEED CERTIFIED **USB**

Wi Fi

DDRx

PCI EXPRESS

THUNDERBOLT

5G Standards

RSS Responsibility Sensitive Safety

CXL Compute Express Link

6G Network/Edge

"In our new reality where the pace of change is so rapid that people are required to learn in the moment, the ability to gain new knowledge is becoming more valuable than the knowledge itself."

Pat Gelsinger's Commencement Address: Congratulations Class of 2021 June 28, 2021

intel.