Productivity and Security in the Age of IoT
University of Maryland

Chi-Foon Chan, President and co-CEO
February 3, 2017
Synopsys: Silicon to Software

#1 in EDA

11,203 Employees

#2 in IP

7,026 R&D Engineers

#15 in Software

$2.423B FY16 Revenue

Synopsys USB Leadership

>3,000 Design Wins with Billions of Units Shipped

417M Lines of code in Synopsys products

500 Customer Logos
IoT
Innovation and Opportunity in Technology

- Hard Work
- Team
- Passion
Moore’s Law Continues

TSMC TALK ABOUT THE PROCESS OF 7 NM ALREADY IN 2017

TSMC announces first 16nm FinFET results, unveils 10nm roadmap

China’s SMIC, Q’comm, Huawei, Imec in 14nm Deal

Globalfoundries Begins Ramping 14nm Production For Customers

Why Intel’s 14-Nanometer Products Could Change the Game

Samsung Unveils The World’s First 10-nm FinFET Semiconductor Technology

Intel Opens Door on 7nm, Foundry

With IBM's Fancy 7-Nanometer Chip, Moore's Law (Kind Of) Continues
Technology Leader for Advanced Designs

Innovations benefit advanced designs on established nodes

Industry favorite at 28 nm

FinFET leadership
Power Performance Requirements Drive Node Migrations

Global Results

70% of “Next Designs” ≤ 32nm!

Source: 2015 Synopsys Global User Survey
<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Headquarters</th>
<th>2015 Sales*</th>
<th>2016F Sales*</th>
<th>2016/2015 Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intel*</td>
<td>U.S.</td>
<td>52,144</td>
<td>56,313</td>
<td>8%</td>
</tr>
<tr>
<td>2</td>
<td>Samsung</td>
<td>South Korea</td>
<td>42,043</td>
<td>43,535</td>
<td>4%</td>
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<tr>
<td>3</td>
<td>TSMC (1)</td>
<td>Taiwan</td>
<td>26,439</td>
<td>29,324</td>
<td>11%</td>
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<tr>
<td>4</td>
<td>Qualcomm (2)</td>
<td>U.S.</td>
<td>16,008</td>
<td>15,436</td>
<td>-4%</td>
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<tr>
<td>5</td>
<td>Broadcom Ltd.* (2)</td>
<td>Singapore</td>
<td>15,183</td>
<td>15,332</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>SK Hynix</td>
<td>South Korea</td>
<td>16,649</td>
<td>14,234</td>
<td>-15%</td>
</tr>
<tr>
<td>7</td>
<td>Micron</td>
<td>U.S.</td>
<td>14,483</td>
<td>12,842</td>
<td>-11%</td>
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<tr>
<td>8</td>
<td>TI</td>
<td>U.S.</td>
<td>12,112</td>
<td>12,349</td>
<td>2%</td>
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<tr>
<td>9</td>
<td>Toshiba</td>
<td>Japan</td>
<td>9,429</td>
<td>10,922</td>
<td>16%</td>
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<tr>
<td>10</td>
<td>NXP*</td>
<td>Europe</td>
<td>10,563</td>
<td>9,498</td>
<td>-10%</td>
</tr>
<tr>
<td>11</td>
<td>MediaTek (2)</td>
<td>Taiwan</td>
<td>6,699</td>
<td>8,610</td>
<td>29%</td>
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<tr>
<td>12</td>
<td>Infineon</td>
<td>Europe</td>
<td>6,916</td>
<td>7,343</td>
<td>6%</td>
</tr>
<tr>
<td>13</td>
<td>ST</td>
<td>Europe</td>
<td>6,873</td>
<td>6,944</td>
<td>1%</td>
</tr>
<tr>
<td>14</td>
<td>Apple (2,3)</td>
<td>U.S.</td>
<td>5,531</td>
<td>6,493</td>
<td>17%</td>
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<tr>
<td>15</td>
<td>Sony</td>
<td>Japan</td>
<td>6,263</td>
<td>6,466</td>
<td>3%</td>
</tr>
<tr>
<td>16</td>
<td>Nvidia (2)</td>
<td>U.S.</td>
<td>4,696</td>
<td>6,340</td>
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<tr>
<td>17</td>
<td>Renesas</td>
<td>Japan</td>
<td>5,682</td>
<td>5,751</td>
<td>1%</td>
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<tr>
<td>18</td>
<td>GlobalFoundries* (1)</td>
<td>U.S.</td>
<td>5,729</td>
<td>5,085</td>
<td>-11%</td>
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<tr>
<td>19</td>
<td>ON Semi*</td>
<td>U.S.</td>
<td>4,866</td>
<td>4,858</td>
<td>0%</td>
</tr>
<tr>
<td>20</td>
<td>UMC (1)</td>
<td>Taiwan</td>
<td>4,464</td>
<td>4,455</td>
<td>0%</td>
</tr>
</tbody>
</table>

Total Including Foundries: $272,772
Total Without Foundries: $236,140

2015 Value of Acquired Semi Companies: $100B
2016 Value of Acquired Semi Companies: $114B
Incredibly Optimistic Thinking
IoT Ecosystem: From Sensors to Servers

**IoT Edge Devices**

“Things” with sensors & actuators that monitor and control

**Aggregation Layers** (Hubs/Gateways)

Connectivity & Interfaces to aggregate the edge data to send to the cloud

**Remote Processing** (Cloud Based)

Applications to analyze the data and offer cloud services
Incredibly Optimistic Thinking

Semi Market for IoT Devices $91.9B by 2025

IoT Market to Double by 2019, 15.9% CAGR

IoT Patents Publications Exploding

WW Revenues for IoT-Specific Services

Source: IBS, IoT Technology and Market Analysis, July 2015

Source: IC Insights, 2015

Source: UK Government: Informatics-Internet

The Internet of “Very Different” Things

Highly Fragmented Market

- 10 billion shipments in 2020
- Many ‘smart versions’ of existing product markets
- By 2016, 50% of IoT devices will originate in startups less than 3 years old

Source: Gartner
DesignWare IP Portfolio

Digital IP
Physical IP
Verification IP

Trusted IP Supplier
#1 in Interface, Analog, Embedded Memories, Physical IP

Committed to Your Success
~2400 IP Engineers Worldwide

Fast IP Integration into SoCs
Integrated Subsystems
IP Prototyping Kits Software

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IoT

Internet Of Threats
Internet of Threats

This Is Why Half the Internet Shut Down Today

Major Cyber Attack on Dyn Causes Outages on Spotify, Twitter & Many Other Sites

Why Experts Are Sure Russia Hacked the DNC Emails

How Podesta became a cybersecurity poster child

US authority warns hospitals over use of hackable drug pump

IRS Revises Tax Returns Hack Numbers, Says Over 300,000 Accounts Were Hacked

AFTER JEEP HACK, CHRYSLER RECALLS 1.4M VEHICLES FOR BUG FIX

Banking hack heist yields up to $1 billion
What Threats Do You Face?

Network Level
• Communication attacks
• Software attacks

Device Level
• Software attacks
• Non-invasive hardware attacks

Chip Level
• Software attacks
• Invasive Hardware attacks


- Communication
- Software
- Hardware
AFTER JEEP HACK, CHRYSLER RECALLS 1.4M VEHICLES FOR BUG FIX

Cops pulls over Google self-driving car for traffic violation, but who gets the ticket?

By 2018
the Automotive IC Market will be 31.7B

8.2M Autonomous Cars by 2030

Source: IHS 2015
Rising Stakes in Software

Standalone SW Apps: Quality

Internet and WWW: Quality / Security

HW/SW Devices: Quality / Security / Safety & Privacy

Financial Liability
Introducing test gates in the SW development process

- Release criteria
- Agile feature acceptance
- Required for successful build
- Required for code check-in

Introducing test gates in the SW delivery process

- Legal compliance
- Regulatory compliance
- Industry compliance
- Best practices compliance
Purpose + Plan + Our Part

How Will We Impact the Future?

Economy
Technology
Environmental
Legal, Ethical
Responsibility

CITIZEN Engineer

A HANDBOOK FOR SOCIALLY RESPONSIBLE ENGINEERING

David Douglas and Greg Papadopoulos with John Boutilier