INTEL INTERNSHIP PROGRAM

Overview
Through the Center for Embedded Systems, Arizona State University and Intel Corporation offer an ongoing student internship program for students enrolled in computer systems engineering, computer science, electrical engineering, materials engineering, industrial engineering, or mechanical engineering programs. Students are hired to work part-time as Intel employees while completing coursework at ASU. The program is an ideal way for students to gain “real world” experience, while Intel has the opportunity to work with and train the brightest engineers coming out of ASU. The internship is a year-long program covering three semesters.

Application Process
Students interested in internship opportunities should refer to the Center for Embedded Systems’ website (http://embedded.engineering.asu.edu) for guidelines, application information, and deadlines, and follow these steps:
1. Determine that you are eligible to apply for the internship (see Student Eligibility Requirements in the next section)
2. Review Intel’s required skills and job descriptions (see charts at the end of this document)
3. Complete and create one pdf file containing the following three documents:
   - the application form (available on the website)
   - unofficial transcript
   - resume
4. Submit the pdf as an e-mail attachment on or before the deadline to embedded@asu.edu

NOTE: Incomplete applications will not be reviewed
5. Intel will directly contact prospective students for interviews. Notification will not come from ASU to student applicants.

6. UNDERGRAD STUDENTS ONLY: if you are selected for the internship and you wish to enroll for academic credit, please request an application for a CSE 484 override form from Lisa Christian (lisa.christian@asu.edu)

**Student Eligibility Requirements**

**All Students:**

1. Students may be undergraduate or graduate students and must be enrolled in one of the following degree programs: computer systems engineering, computer science, electrical engineering, materials engineering, industrial engineering, or mechanical engineering.

2. This internship is designed as a year-long program. Students may work as interns up to a maximum of three semesters and are encouraged to plan accordingly.

3. Students must work 20 hours per week at Intel during spring and fall semesters and 40 hours per week during summer session. Each student is expected to complete 340 hours during the spring and fall semester and 440 hours for the summer.

4. Students must also be enrolled full-time as undergraduates or graduates during the time of the internship.

5. Students (undergraduate or graduate) must have a minimum GPA of 3.0 at the time of application.

6. Students should have completed (or currently be completing) recommended courses in the Embedded Systems curriculum. For Arizona State University, these recommended courses are CSE 230 and CSE 325. Exceptions may be given for those students in degree programs outside of ASU’s School of Computing, Informatics, and Decision Systems Engineering; however, students with the recommended coursework are given preference in the selection process.

**Undergraduate Requirements:**

- CS/CSE students can use a total of 3 hours of CSE 484 towards their degrees, with a maximum of 6 hours of CSE 484, 499, 492 and 493.

- Undergraduate student interns may register for 3 credit hours of internship during any semester (spring, 8-week summer session, or fall).
• Students must work 20 hours/week during the spring and/or fall semester, and 40 hours/week
during the 8-week summer session. The summer work can (and normally will) extend beyond the 8-
week summer session to cover the entire 12 weeks of the summer break, but the requirement for
credit includes only the 8-week summer session.
• Students will receive a Y/E grade for the internship.

Graduate Requirements:
1. Graduate students must be registered as full-time students (9 credits) during the internship.
2. Graduate students cannot use this internship for their degree program or Plan of Study.

International Student Requirements:
International students may work as interns up to a maximum of two semesters. They must be eligible
for Curricular Practical Training (CPT) http://global.asu.edu/isso/cpt

Remuneration Rate:
Intel compensates students at competitive hourly rates. Undergraduate students will be paid
approximately $2000 per month (for 20 hours/week) and graduate students are expected to be paid at
$2500 per month (for 20 hours/week).

Skills and Job Descriptions
Intel looks for specific skills when hiring interns through this program. Please review the following pages
for skills and job descriptions.

Frequently Asked Questions

Question
I do not know what Curricular Practical Training is and if I am eligible.

Answer
Please click on this link which will help answer your question: http://global.asu.edu/isso/cpt

Question
I am curious about the requirements of the internship (what I should already know) and what tasks I will be asked
to perform (what I will need to know how to do). Is there any training that will occur?

Answer
Please take some time to open the link http://embedded.asu.edu and re-read this document, which will answer
your questions regarding requirements. As for training, Intel is well experienced in selecting and employing interns.
This program has employed more than 100 interns in the past five years with much success.
**Question**
I am a computer engineering grad student. In the "job- description" document for the Intel internships, SIX types of profiles are mentioned with requirements. Most of the requirements are overlapping. So, if I need to apply to more than one profile, can I do that? If yes then how do I go about it? Should I just send the application material as instructed in the instructions once or should I send the application packet for each of the profile I want to apply to?

**Answer**
Just apply one time. The Intel managers review the resumes and applications as a group, then individually pursue the students they think best fit with their group and their goals. So it is not uncommon for a student to interview with more than one Intel manager. Make sure your resume highlights your skills and apply as instructed, one time.

**Question**
Can freshman apply for the Intel internships? It is asking for classes that I have not taken, what does the idea candidate have for experience to get the internship

**Answer**
The ideal candidate will have the skills outlined in the Intel job description(s) (link below) and the recommended classes. [http://embedded.engineering.asu.edu/iucrc/images/0/05/Job-description-interns.pdf](http://embedded.engineering.asu.edu/iucrc/images/0/05/Job-description-interns.pdf)

**Question**
I am a computer engineering graduate student at Arizona State University and am interested in the Intel internship positions. The CPT site states the eligibility to apply for the program as having maintained full-time student status for one year. I shall be completing 10 credits in this semester and will be applying for 9 in spring, so will this be considered to be eligible for CPT?

**Answer**
NO. YOU must have completed two semesters to be eligible.

**Question**
I am a student in the Electrical and Energy Engineering School and am currently enrolled in EEE/CSE 120 and will be enrolling for the EEE/CSE230. I was quite interested in the Intel Intern Application and was wondering whether it was actually also required to complete CSE 325 also or does EEE230 is suffice alone since according to my major map, I do not take CSE 325 even in the upper division level. Since the internship also invited electrical engineering majors to apply I was a little confused by this.

**Answer**
While it is recommended that students of any major have taken the embedded systems courses, it is not a requirement to be hired as an Intel intern, and EE students have been hired in the past. On the application, please list courses you think are relevant to the job description and highlight any applicable skills in your resume.

**Question**
I applied for this internship and have not received a confirmation of my application or a call from Intel. What is the status of my application?

**Answer**
Prior to the published deadline, if you submitted a complete application in one pdf file that contained the following three documents: 1) the application form, 2) unofficial transcript, and 3) resume, then your application was received. A confirmation will not be sent. After applications are reviewed and sent to Intel, the process is out of ASU’s hands and Intel will contact you directly if you are chosen for an interview. If you have not heard from Intel within 4-6 weeks following the application close date, you were not selected for an interview.
Hardware Level Performance Analysis Intern

Skills

| Computer Architecture | • CPU cache hierarchy and pipeline.  
|                       | • Memory addressing schemes, bank and rank mapping.  
|                       | • PCI system architecture.  
|                       | • PCI-Express architecture |
| Programming           | • C programming, with inline assembly  
|                       | • Scripting |
| OS                    | • Linux, specifically experience configuring and recompiling kernels in addition to day to day usage of the OS. |
| Under grad recommended courses | • CSE 230 Computer Organization and Assembly Language Programming  
|                       | • CSE 325 Embedded Microprocessor Systems  
|                       | • CSE 420 Computer Architecture  
|                       | • CSE 430 Operating Systems |
| Graduate recommended courses: | • CSE 531 Distributed/Multi processor Operating Systems  
|                       | • CSE 536 Advanced Operating Systems  
|                       | • CSE 591 OS Internals Embedded Linux |

Job Description

Hardware level performance- benchmarking, analysis and recommendations. The objective of this internship is to measure the maximum sustainable performance for current and next generation Intel platforms, including but not limited to CPU performance, CPU to memory data path, IO to memory data path, as well as Graphics performance. The intern will measure the performance of systems in a lab environment and compare the observed performance with the expected performance, and optimize the platform as needed, as well as identifying bottlenecks. The intern needs to identify appropriate benchmarks and measurement tools; design and conduct the experiments; analyze the results and provide recommendations.
## Application Level Performance Analysis Intern

### Skills

| Computer Architecture | • CPU cache hierarchy and pipeline.  
|                        | • Memory addressing schemes, bank and rank mapping.  
|                        | • PCI system architecture.  
|                        | • PCI-Express architecture |
| Programming            | • C programming, with inline assembly  
|                        | • Scripting |
| OS                     | • Linux, specifically experience configuring and recompiling kernels in addition to day to day usage of the OS. |
| Networking Applications| • Specifically a sound understanding of the layers of the networking stack.  
|                        | • Packet routing/forwarding at layer 3.  
|                        | • Deep packet inspection for intrusion prevention/detection.  
|                        | • Working knowledge of the Intel Linux Network driver e1000 |

| Under grad recommended courses | • CSE 325 Embedded Microprocessor Systems  
|                                | • CSE 420 Computer Architecture  
|                                | • CSE 430 Operating Systems  
|                                | • CSE 434 Computer Networks |

| Graduate recommended courses: | • CSE 531 Distributed/Multi processor Operating Systems  
|                                | • CSE 536 Advanced Operating Systems  
|                                | • CSE 591 OS Internals Embedded Linux |

### Job Description

Networking application performance: benchmarking, analysis and recommendations. 

The objective of this internship is to measure the maximum sustainable packet rate for various networking applications including but not limited to packet routing, deep packet inspection, VOIP, and wireless applications. The intern will study the impact of various optimizations on device performance. The intern needs to identify appropriate benchmarks and measurement tools; design and conduct the experiments; analyze the results and provide recommendations.
### Storage Group Performance Measurement Intern

#### Skills

| Computer Architecture | • CPU cache hierarchy and pipeline.  
|                       | • Memory addressing schemes, bank and rank mapping.  
|                       | • PCI system architecture.  
|                       | • PCI-Express architecture  
| Programming           | • C programming, with inline assembly  
|                       | • Scripting  
| OS                    | • Linux, specifically experience installing and inserting kernel modules. Re-Compiling Linux kernels for tuning.  
|                       | • Installation of Microsoft Windows  
|                       | • Knowledge of PXE boot Server  
| Hardware              | • Experience building PCs, installing CPUs, upgrading memory ect.  
| Networking Applications| • Specifically a sound understanding of the layers of the networking stack.  
|                       | • Working knowledge of IP, subnets, and Samba  
|                       | • Knowledge of DNS, DHCP, and TC-IP a plus  
| Storage               | • Working knowledge of Fdisk, and volumes  
|                       | • Knowledge of RAID, NAS, iSCSI a plus  
| Under grad recommended courses | • CSE 325 Embedded Microprocessor Systems  
|                       | • CSE 420 Computer Architecture  
|                       | • CSE 430 Operating Systems  
|                       | • CSE 434 Computer Networks  
| Graduate recommended courses: | • CSE 531 Distributed/Multi processor Operating Systems  
|                       | • CSE 536 Advanced Operating Systems  
|                       | • CSE 591 OS Internals Embedded Linux  

#### Job Description

Storage application performance: benchmarking, analysis and recommendations.  
The objective of this internship is to measure the maximum sustainable rate for various local and network attached storage solutions including but not limited to Data read performance, Write performance, seek times, RAID calculations, and volume recovery. The intern will study the impact of various optimizations on device performance. The intern needs to identify appropriate benchmarks and measurement tools; design and conduct the experiments; analyze the results and provide recommendations.
## Software Applications Engineering Intern for Storage Group

### Skills

| Computer Architecture | • CPU cache hierarchy and pipeline.  
|                        | • Memory addressing schemes, bank and rank mapping.  
|                        | • PCI system architecture.  
|                        | • PCI-Express architecture  
| Programming            | • C programming, with inline assembly  
|                        | • Scripting  
| OS                     | • Linux, specifically experience installing and inserting kernel modules. Re-Compiling Linux kernels for tuning.  
|                        | • Installation of Microsoft Windows  
|                        | • Knowledge of PXE boot Server  
| Hardware               | • Experience building PCs, installing CPUs, upgrading memory ect.  
| Networking Applications| • Specifically a sound understanding of the layers of the networking stack.  
|                        | • Working knowledge of IP, subnets, and Samba  
|                        | • Knowledge of DNS, DHCP, and TC-IP a plus  
| Storage                | • Working knowledge of Fdisk, and volumes  
|                        | • Knowledge of RAID, NAS, iSCSI a plus  
| Under grad recommended courses | • CSE 230 Computer Organization and Assembly Language Programming  
|                        | • CSE 325 Embedded Microprocessor Systems  
|                        | • CSE 420 Computer Architecture  
|                        | • CSE 430 Operating Systems  
| Graduate recommended courses: | • CSE 531 Distributed/Multi processor Operating Systems  
|                        | • CSE 536 Advanced Operating Systems  
|                        | • CSE 591 OS Internals Embedded Linux  

### Job Description

Software and firmware development and debugging for world class storage solutions for enterprise and consumer markets. The responsibilities include development of Windows and Linux applications and scripts that allow standards compliances and validation for storage hardware. In addition, the responsibilities include develop and debug firmware, create and release Linux patches for storage platforms to Open Source community and develop collaterals that support new storage silicon and HW interface libraries.
Applications Power Analysis Intern

**Skills**

| Analog Circuits | • Basic understanding of buck regulators |
| Instrumentation | • Basic understanding of DC voltage of current measurements |
| OS | • Linux, specifically experience configuring and recompiling kernels in addition to day to day usage of the OS. |
| Programming | • C programming, with inline assembly |
| Under grad recommended courses | • EEE 335 - Analog and Digital Circuits |
| | • CSE 430 Operating Systems |
| | • CSE 434 Computer Networks |

**Job Description**

Hardware level power: benchmarking, analysis and recommendations.

The objective of this internship is to measure the power for current and next generation Intel platforms, including but not limited to CPU power, memory power and platform power. The intern will measure the power of systems in a lab environment, analyze the data and provide recommendations. The interns are expected to work on multiple Operating Systems and run various scripts/ benchmarks to determine the power consumption in the system. A basic understanding of voltage regulators and instrumentation is desired.
Software Applications Engineering Intern

Skills

| Computer Architecture | • CPU cache hierarchy and pipeline.
| • Memory addressing schemes, bank and rank mapping.
| • PCI system architecture.
| • PCI-Express architecture |

| Programming | • C programming, with inline assembly
| • Scripting |

| OS | • Linux, specifically experience installing and inserting kernel modules. Re-Compiling Linux kernels for tuning.
| • Installation of Microsoft Windows
| • Knowledge of PXE boot Server |

| Networking Applications | • Specifically a sound understanding of the layers of the networking stack.
| • Packet routing/forwarding at layer 3.
| • Deep packet inspection for intrusion prevention/detection.
| • Working knowledge of the Intel Linux Network driver e1000 |

| Linux expertise | • Configure, patch and compile kernel from source
| • Understand the components of a Linux distro
| • Understand processor specific optimizations |

| UI expertise | • Build sample UI using Qt/Gtk toolkit
| • C/C++ programming |

| Under grad recommended courses | • CSE 325 Embedded Microprocessor Systems
| • CSE 420 Computer Architecture
| • CSE 430 Operating Systems
| • CSE 434 Computer Networks |

| Graduate recommended courses: | • CSE 531 Distributed/Multi processor Operating Systems
| • CSE 536 Advanced Operating Systems
| • CSE 591 OS Internals Embedded Linux |

Job Description

The objective of this internship is to build Linux live images for RPM based (Moblin, MeeGo, Fedora, WR Linux) and Debian based (Ubuntu) distros. It will also focus on configuring the OS to enable Atom optimizations. This also consists of helping with distro comparison – file system, build systems, tools, footprint. You will also participate in the design of a sample UI using Qt/Gtk toolkit and help pull together demos for Atom based embedded designs.
**Network Security and Crypto Intern**

**Skills**

| Computer Architecture | • CPU cache hierarchy and pipeline.  
|                        | • Memory addressing schemes, bank and rank mapping.  
|                        | • PCI system architecture.  
|                        | • PCI-Express architecture  
| Programming            | • C programming, with inline assembly  
|                        | • Scripting  
| OS                     | • Linux, specifically experience installing and inserting kernel modules. Re-Compiling Linux kernels for tuning.  
|                        | • Installation of Microsoft Windows  
|                        | • Knowledge of PXE boot Server  
| Under grad recommended courses | • CSE 230 Computer Organization and Assembly  
|                        | • Language Programming  
|                        | • CSE 325 Embedded Microprocessor Systems  
|                        | • CSE 420 Computer Architecture  
|                        | • CSE 430 Operating Systems  
| Graduate recommended courses: | • CSE 531 Distributed/Multi processor Operating Systems  
|                        | • CSE 536 Advanced Operating Systems  
|                        | • CSE 591 OS Internals Embedded Linux  

**Job Description**

Analysis of network security protocols with special emphasis on crypto algorithms. The objective of this intern is to help develop new algorithms for crypto protocols that maybe implemented in hardware or software.

Strong back in cryptography is an absolute most and only graduate level students are encouraged to apply. Knowledge of network security protocols such as IPSec, SSL/TLS and C programing is a bonus.
Thermal/Mechanical Intern

Skills

<table>
<thead>
<tr>
<th>Mechanical Design</th>
<th>• Use of 2D and 3D CAD for design of fixtures, assemblies and proof-of-concept enclosures.</th>
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</thead>
<tbody>
<tr>
<td>Structural Analysis</td>
<td>• Fundamental understanding of stress/strain of linear systems. &lt;br&gt;• Familiarity with finite element modeling</td>
</tr>
<tr>
<td>Thermal Analysis</td>
<td>• Basic understanding of heat transfer principles. &lt;br&gt;• Simple modeling using resistor networks.</td>
</tr>
<tr>
<td>Programming</td>
<td>• Experience writing scripts in Excel (Visual Basic) or Python.</td>
</tr>
<tr>
<td>Lab</td>
<td>• Data collection, reduction and report creation. &lt;br&gt;• Set up and operation of data acquisition equipment &lt;br&gt;• Adept at mechanical assembly, thermocouple attach and soldering.</td>
</tr>
<tr>
<td>Undergrad Recommended Courses</td>
<td>• MAE 294: Intro to programming &lt;br&gt;• MAE 240/340: Thermofluids I &amp; II &lt;br&gt;• MAE 213: Solid Mechanics &lt;br&gt;• MAE 214/323: Computer-Aided Eng. I &amp; II &lt;br&gt;• MSE 250: Materials &lt;br&gt;• EEE 202: Circuits I &lt;br&gt;• MAE 394: Applied Exp. Statistics &lt;br&gt;• MAE 342: Principles of Mechanical Design</td>
</tr>
</tbody>
</table>

Job Description

This intern position is with the Intelligent Systems Group’s Thermal/Mechanical team. In this role the intern will aid the T/M engineers on various thermal and mechanical design tasks. Responsibilities include thermal test and data collection using various data acquisition equipment, data reduction using statistical techniques in Excel, report generation and presentation to the team. Additional responsibilities include mechanical design of test fixtures, shock and vibration testing of printed circuit boards and assisting hardware engineers with motherboard thermal/mechanical test apparatus.