Midterm: Embedded computing technologies

For the midterm, each team of students must report on one of the myriad technologies available for embedded computing, and must undertake the process of locating information about these technologies. Two questions must be addressed:

1. What is the niche of the technology?
   Example: Bluetooth enables short range wireless communication between base stations and mobile devices. Common devices are wearables (e.g. headsets) and peripherals (e.g. printers). Common base stations include desktop and laptop computers, smartphones, and media devices (e.g. televisions).
2. What features enable or support this niche?
   Example: Bluetooth typically ranges 0.5 m to 10 m. Power consumption is 0.5 to 2.5 mW enabling it to run on small batteries. Bandwidth is up to 800 Kbps which is plenty for audio streams but not video, and is not intended for large data transfers.
   Note that for some technologies it may be appropriate to go into more technical detail. For example, for a presentation on low-power Bluetooth, it would be important to describe the details of how it saves power.

Additionally, you will also be graded on the quality of your presentation. This includes the clarity of explanations, graphics to help explain concepts, proper font sizes, and good slide design. It includes sticking to the allotted time and avoiding unnecessarily large text blocks and tables (unless they are absolutely needed to help the explanation).

Your mindset should be as follows: Imagine you have been hired by a company that is considering building a new widget. Your boss heard something about this technology and asked you to investigate it and prepare a small report for your team. Your team consists of computer engineers with similar background to yourself. You want to convey to the team your best understanding of what the technology is targeting (niche), and what features help it target that niche.

Comparisons of the niche of your technology to related technologies can be helpful. For example, a presentation on Bluetooth could compare it to Wi-Fi to help further clarify its intended niche.

Additional questions that may be addressed may include:

- What is the history of the technology?

Example: ARM is both a company and a technology. The company started in 1985, and saw enormous growth in the late 90's and early 2000's.

- What is special (different from general purpose technology) about that niche?
  Example: ARM microcontrollers are more complex than typical low-end microcontrollers, and are targeted towards handheld consumer electronics.
- What companies and products use or incorporate the technology?
  Example: ARM has been licensed by Atmel, Cirrus, Samsung, Ericsson, Intel, Motorola, Qualcomm, Texas Instruments, among others. The Intel StrongARM SA-111x microcontroller chips use an ARM core, and sold for $15-28 in 2000. The Compaq iPAQ PC 3760 (a handheld computer) uses an Intel StrongARM chip, and sells for $500 in 2003.
- How much does it cost?
  Example: ARM licensing costs are not publicly available.
- What are the competitor technologies?
  Example: The older, more established microcontroller families like 8051, Z80, and 68HC11 are the primary competitors. ARM is the most successful modern (2000's) microcontroller technology.

Note that you are not expected to answer all these questions. It depends on the technology. You must also stay within the time constraints.

Students are to work in the teams assigned in class. Each team is to research information about the technology. The team must prepare a report, not to exceed three pages, and give a presentation to the class, not to exceed 5 minutes.

The report must **clearly** address the prime 2 questions. Some technical detail should be included, such as data size, but uninteresting detail (such as an entire instruction set) should be avoided. A bibliography must be included, but keep it concise.

Searching the web will be the primary source for information. Remember that companies want to sell their technologies to everyone, so they might not make it easy for you to determine the real niche. This is your engineering challenge!

The presentation must use the computer projector. Live projections (e.g. Powerpoint, PDF, etc.) must be on a USB drive and ready to go before class starts.

The entire class will be providing anonymous feedback on the presentations. Everyone will watch all the presentations and provide anonymous scores for each of the main 3 points (niche, features, quality of presentation).

Topics may be suggested by each team, and must be finalized by the due date given at the course website. Dates may also be suggested by each team. Topics and dates will be provided on a first-come first-served basis. During the next class I will show a schedule of the topics and dates.

Presentations will be on the dates given at the course website. Reports are due by the end of class of the second day of presentations.

Here are a small number of suggested topics including many that have been shown in previous years. Note that I encourage new and emerging technologies!

PIC
Stamp
PowerNP
I2C
GPIO
VMEbus
Multibus
PCMCIA
VDSL
RSA
SSH
Fujitsu FR processors
Fibre channel
Speex
Qualcomm's Snapdragon
DisplayPort
Intel Atom processors
CAN bus
AMD Fusion processors
Zigbee
Texas Instruments DaVinci processors
MOST bus
Android O/S
PowerVR
802.11ac
PIC microcontrollers
NVidia CUDA parallel programming
Near field communication (NFC)
TI MSP430 processors
Apple’s A4 processor

Bluetooth
OLED
Freescale's Coldfire
802.11
TI's DaVinci Digital Media Processor
Gidel Proc board FPGAs
SGX Series5XT Graphics IP Core Family
DisplayPort interface
Freescale HC11 ucontroller
Android O/S
Qualcomm's Snapdragon family
Atmel AVR family
Sandy Bridge architecture
Freescale's Xtrinsic sensor family
Samsung Hummingbird processors