WEEKLY REPORT

TRANQUILLUM

22/10/2012

According to the task segmentation we decided last week, every group member had a certain area to research. These specifications are listed below:

* Abdullah Hasan Taher Bayrakdar (1702299) - PIC and Web Services
* Şerafettin Öztürk (1679513) - BeagleBoard and supported services
* Zeynep Mavuş (1670157) - Current Market of Home Automation Systems
* Anıl Ulutürk (1746437)- Zigbee Wireless Communication and Related Documentation

During previous week, every member collected information about their responsibilities of research and submitted 2,3 pages long summary about them.

Brief versions of these summaries are given below, for weekly reporting purpose:

**Anıl Ulutürk – Zigbee Wireless Communication**

According to general wikipedia info; a Zigbee compatible device network shall use 3 main devices to provide wireless communication;

Coordinator (every network must have one), Router (Can be used as an itermediate device to pass data for longer distances – Won’t be necessary for now), End device ( Every embedded device to be monitored must have one)

According to these details, a network can be star or tree type, and we will probably use star type network for our prototype. In star type network, there stands a coordinator device at center, sending and receiving data from end devices around it. Data consistency, security and routing of data from coordinator to end device (and vice versa) is not our responsibility at this point, we’ll have to use just program an MCU device to carry out communication protocols accordingly.

Many Zigbee compatible device vendors such as Texas Instruments, Freescale etc. Use a type of embedded C to control their devices. Although they don’t use any general and well managed API, logic behind their system is quite similar. Certain function calls are os kip request/send protocols between devices, with predetermined device id parameters applied due to the network preferences.

We may need to consult some hard copy documents for a quickstart in this business. Few books exist in our library as an electronic resource as well. One of them is “Zigbee Wireless Networking”:

<https://library.metu.edu.tr/search~S4?/Xzigbee&searchscope=4&SORT=D/Xzigbee&searchscope=4&SORT=D&SUBKEY=zigbee/1%2C18%2C18%2CB/frameset&FF=Xzigbee&searchscope=4&SORT=D&5%2C5%2C>

Note: As details of these devices are quite huge, os ki need os kip getting into too much detail in proposal report –due date is on Tuesday-.

**Şerafettin Öztürk - BeagleBoard and supported services**

Firstly, I collected information about how BeagleBoard works, which interfaces it uses and what its limits are.

“This is the brainchild of a small group of volunteers (many of whom are Texas Instruments employees – TI’s chips are used in the design) who were frustrated at the lack of affordable development boards, and with the kinds of concerns faced by those seeking to get involved with embedded development. Their attempt to remove these barriers led to a small, (relatively) low-cost, durable (hard to ‘brick’) ARM-based development platform that couples an open source hardware design that anyone can look at with open source software.”

Afterwards, I checked for possible operating systems applicable for BeagleBoard. The most popular ones were Ubuntu and Angström Linux. While searching for tutorials on how to port and install these Linux derivatives on BeagleBoard, I also checked for applicable frameworks we may use on this ARM architecture device. Java SE 6.0 is implemented to work on such devices, therefore Web Services part can be implemented on Java programming language solely.

“Linux has been available for the ARM architecture for many years now. The original ‘port’ was done by Russell King, and he is still the maintainer through whom all ARM kernel patches generally must pass. The work was much harder then than it would be now, since at the time the Linux kernel was still very Intel-centric. In fact, modern Linux kernels come with a handy reference example called asm-generic that shows all of the header files and kernel interfaces that a new architecture port should provide. Once the kernel has been ported to a given architecture, it is necessary to implement support for a specific platform based upon that architecture.”

**Abdullah Hasan Taher Bayrakdar - PIC and Web Services**

PIC board provided by the department will be used. Different sensors could be connected to the board. Types and numbers of required sensors could be specifed after writing the SRS document.

According to the project description, the data collected by the master controller (beagleboard in our case) should be stored in a web based database.

The following are some suitable options for storing data:

1) Web Servers

An Apache HTTP Server could be run on the beagleboard with a MySQL/Oracle DBMS. For this purpose there are software bundles that can be installed on the beagleboard and one of these is LAMP which refers to the first letters of Linux, Apache HTTP Server, MySQL and Perl. Step by step explanations exist online for how to install Lamp.

Although the beagleboard has only 4 GB of memory it is possible to have additional storage by connecting a hard disk to the board.

2) Web Hosting Services

Buying a domain name and web hosting service to install a DBMS. CEng department servers could also be used for this purpose.

3) Web Cloud Servers

Oracle cloud or windows azure (both are expensive).

In my opinion, LAMP installed on the beagle board could be used for storing data (if we success to increase the storage of the beagleboard). Web hosting is also a good alternative.

**Zeynep Mavuş - Current Market of Home Automation Systems**

Home automation systems technology has been existing for many years, but it has just recently started to enter to the main scope. The top five brands contributing to the home automation technology are mControl, HomeSeer, PowerHome, Control4, Vivint.

With the help of mHome products (by mControl), customer's home becomes more than a digital home. Because the product also provides energy efficiency property. With the user-friendly interfaces, mHome products lets their users learn how much energy is being consumed in real time and make adjustments by manipulating thermostats, lighting systems and other appliances and devices within their home. Mobile applications for iPhone and smartphones using the Windows mobile operating system are provided. The simplified interface is so functional that gives the user accessibility to all connected appliances and devices from anywhere. X10, INSTEON and Z-wave are supported by the system. These are the essential modules of mConrol Home Automation System, meaning that all appliances and devices bought will operate with the system.

The second top brand of home automation technology is HomeSeer. The remote access, voice recognition, basic triggers (sunset/sunrise) and macro creation properties are also available in this system. The system released by HomeSeer is compatible with the widespread used programs. For instance iTunes, Windows Media Player and Windows Media Center are all supported by the system. Actually, the presented features of the system needs that you embed the software with Windows Media Center. X10, INSTEON and Z-Wave transmission technologies are also provided by the system. The basic working principle is like that; in order to control the device, the user should plug it into the right module, which is then placed into a wall socket. The modules accept signals sent by the base station of the system, which transmits signals via the existing wire connections in the house to the devices connected to module.

The third top brand of home automation technology is PowerHome. The voice recognition, remote access via an internet browser and macro creation technologies also exist in this system. However, the compatibility of this system is not as good as the mentioned ones. Because the user can not make the modules work by using Z-Wave technology. The system supports the devices having the X10 transmission technology and INSTEON communication protocols.

The fourth top brand is Control4. This system supports the basic needs(remote access, macros…) for an automation system as above ones. However this system suffers from incompatibility significantly. It is difficult to adapt the system on your own. The only compatible devices are Z-Wave and ZigBee supported ones.

The fifth top brand is Vivint. Its most important distinctive feature is its integration with the highly improved security systems. Control panel refers to the center of the system. More manipulation over the user’s devices is provided by their online control panel. Vivint’s web based applications allow the user to create and modify triggers, although this is not the case for its mobile applications. This system supports the Z-Wave communication technology compatible devices. Another drawback of the system is the system does not provide any software integration.