

**Bout Master**  
**Homework 6 (Group Report):**  
**Engineering Principles**  
**Due: April 8th, 2014**

**“ I pledge my honor that I have abided by the Stevens Honor Code”**

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## **Introduction**

The functionality of a product is important when deciding its specifications and defining its goals and direction. Identification of the functional components and connections gives designers a better idea of the system's required specifications. Creating functional diagrams is the perfect way to visualize the system and present the concept to other designers and potential customers. This assignment highlights the process of creating functional diagrams and their significance when creating a product.

## **Research Topics**

**Black Box Diagram** - Jorge Rojas

**Transparent Box Diagram** - Gamal Mohamed

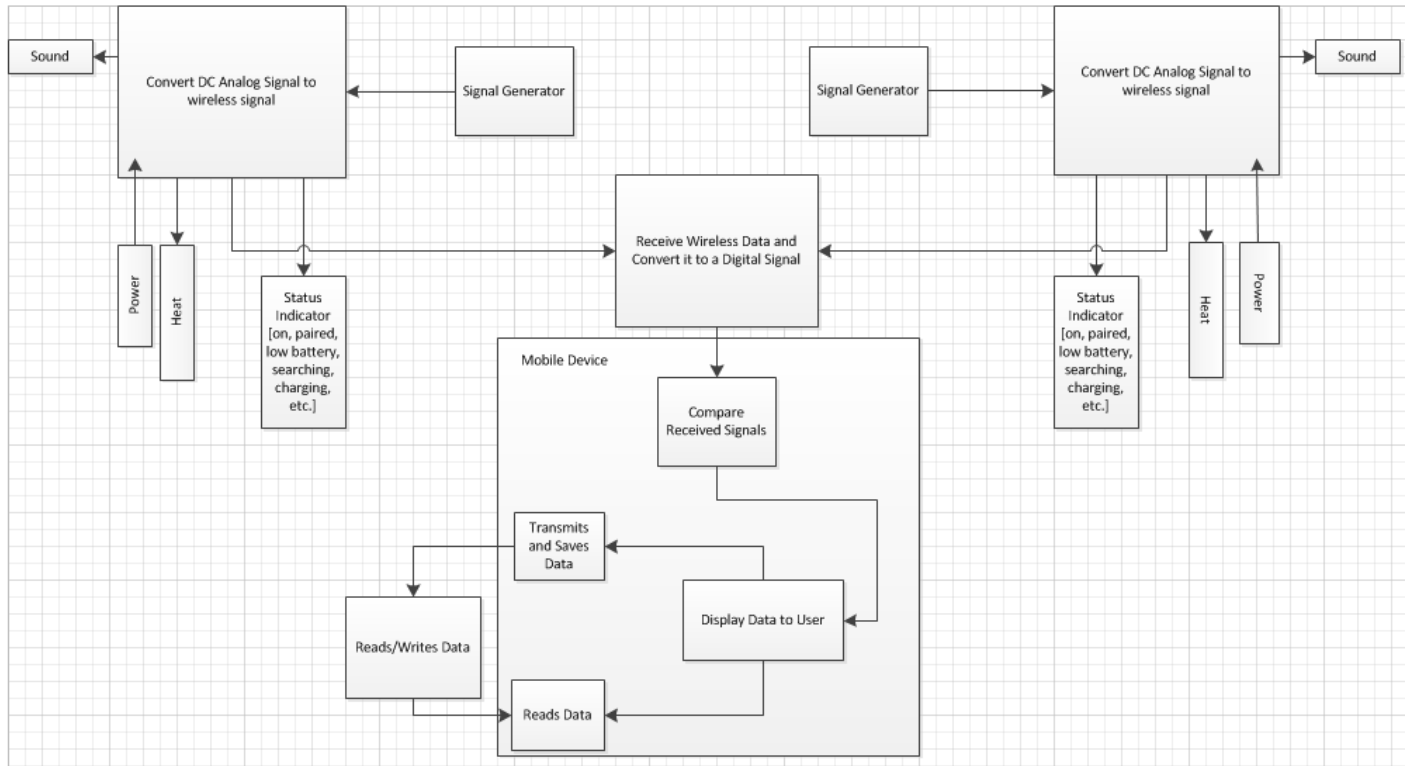
**Function-Means Diagram** - Jorge Rojas

**Diagram Description** - Gamal Mohamed, Robert Skowronski

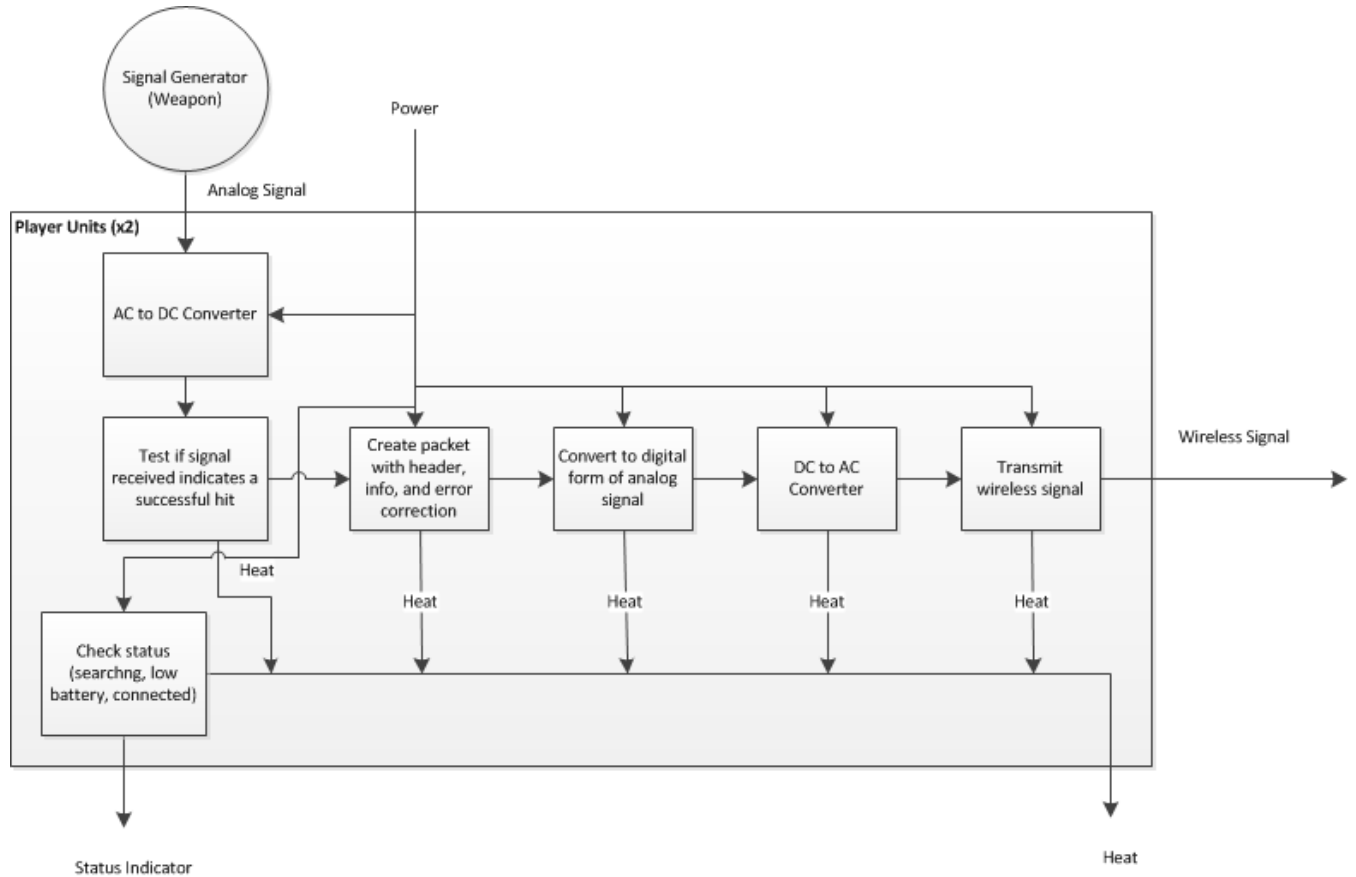
	Jorge Rojas	Robert Skowronski	Gamal Mohamed
Percentage of effort towards this assignment	50%	0 %	50%

## Section 2

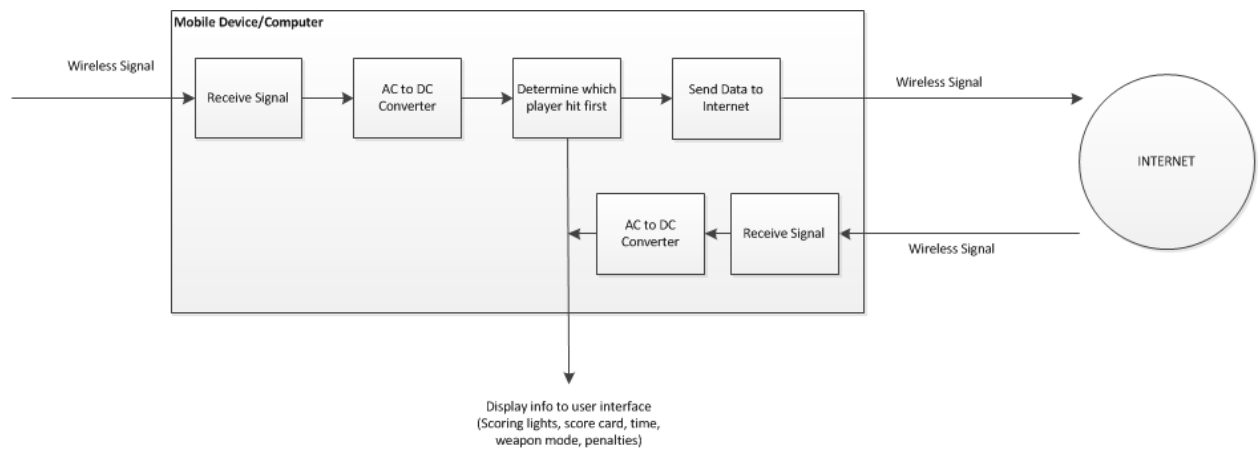
### Black Box Diagram



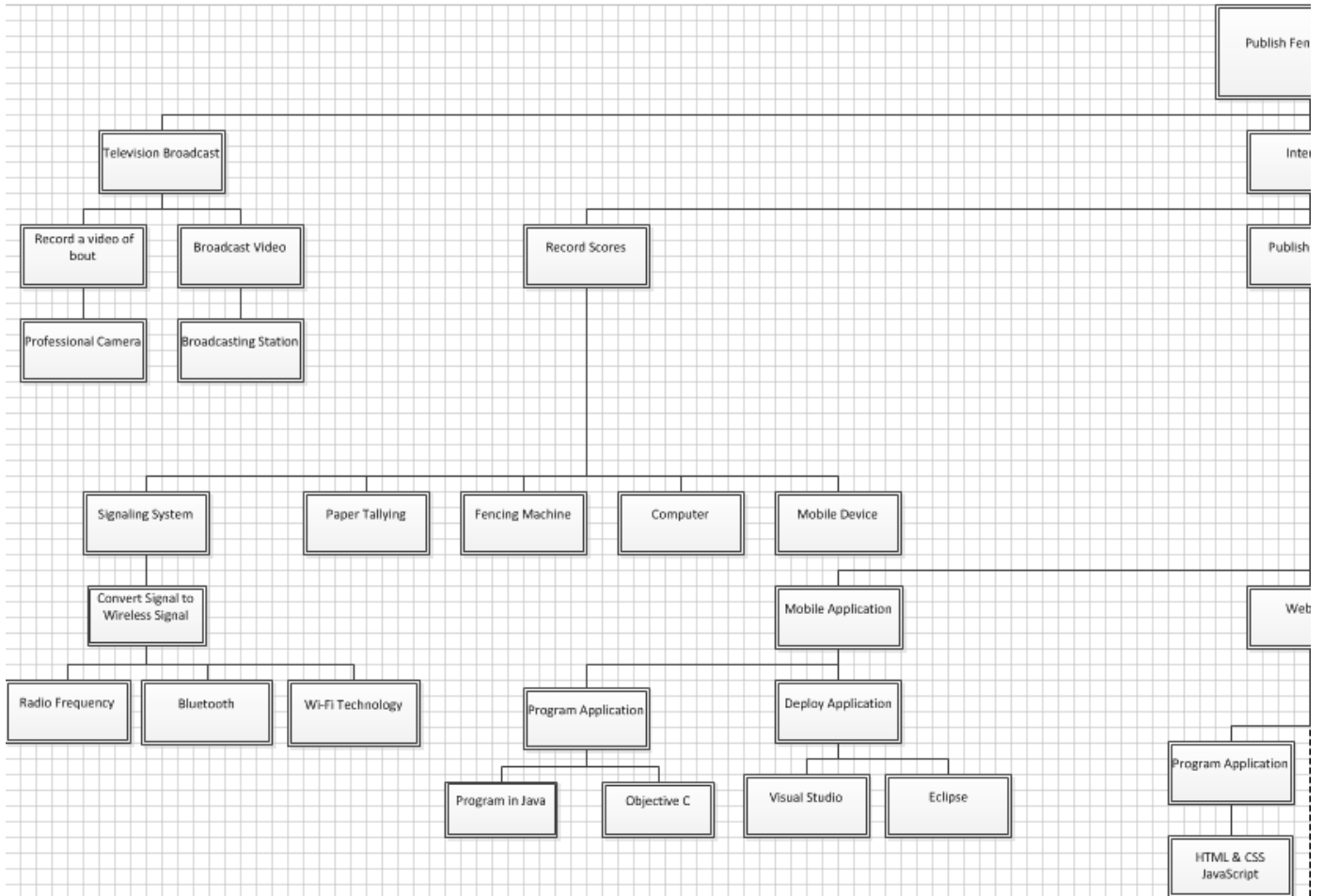
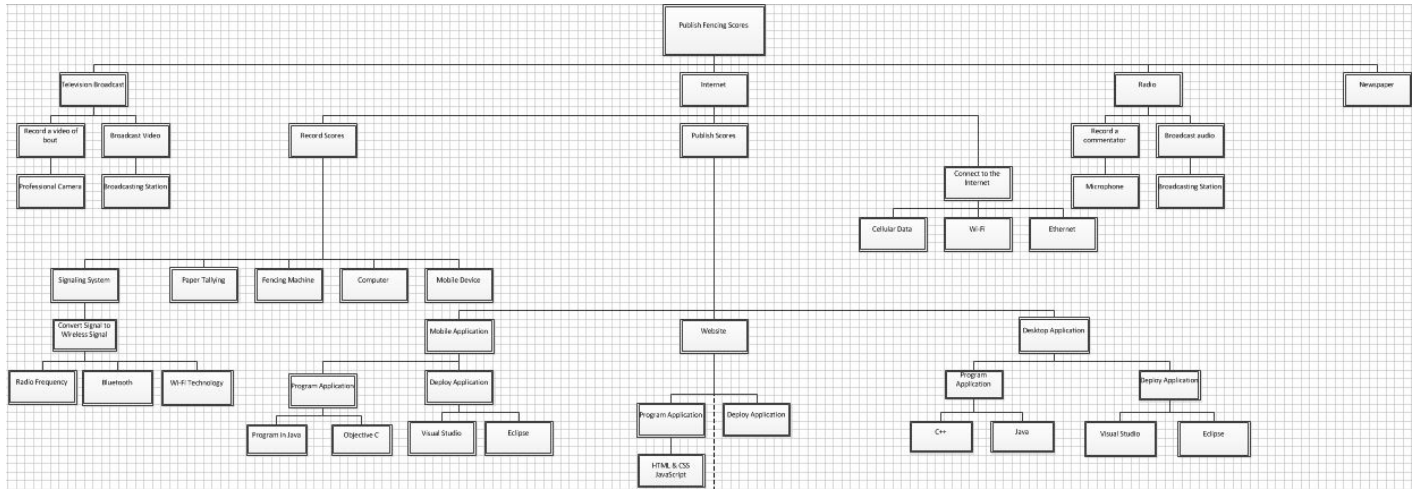
## Transparent Box Player Unit

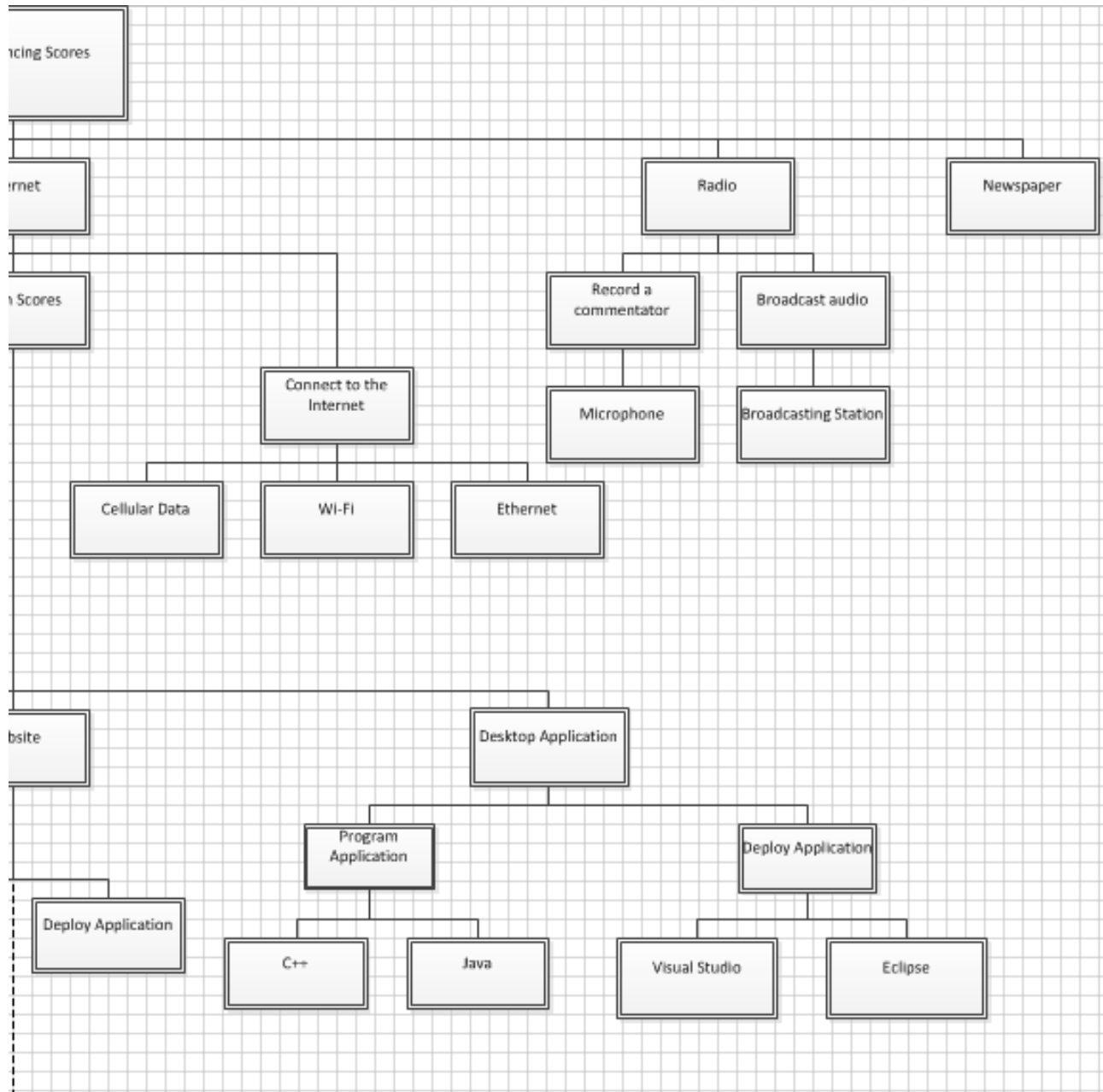


## Transparent Box Mobile Device/ Computer



# Function and Means Tree





## Description

### Overall

For the black box functional diagram, there are four major components: The two transmitters, the receiver, and the mobile device. This schematic shows the overall architecture of the wireless fencing system. The transmitters simply convert the signal coming from the fencing weapon and sends it wirelessly to the receiver. Also, a power source for said device is going to be required. The receiver does some preliminary processing along with the conversion

to a DC signal and sends the data to the mobile device for the software to display for the user.

The mobile device was added for demonstrative purposes. The team does not intend to design the functionality of any kind of mobile device or computer. It was included to show how the system interacts with such devices and get a bigger picture of how the overall system should behave. Ultimately, this product has two main functions: help referees direct bouts and publish scores to the internet. This will make the sport accessible for anyone with an internet connection.

### **Connections**

Connections in-between each of these devices are handled by wired and wireless means. Internal devices such as the microprocessor or AC to DC convertor use wired communication. Higher-level components such as the Boutmaster and player units communicate wirelessly. The player unit and mobile device/computer would use Bluetooth to communicate with each other, while the mobile device/computer would utilize WiFi to access the internet.

### **Performance**

Using the functional diagrams, further system specifications can be selected. By visualizing the individual entities and connections, system attributes can be better determined:

#### **Player unit:**

- Runs off of remote power source; battery must operate for at least a full day of use before requiring a recharge. Ideally, minimum battery lifetime is 9 hours before recharging.
- The player unit communicates with an external source wirelessly. By regulation, a fencing strip is 14 meters long, meaning the minimum communication length must be 7 meters. However, to give room for each player to move around without the units disconnecting, a range of at least 20 meters works better.
- The development platform must have both an A/D and D/A converter to sample sword hits and send signals wirelessly. The Arduino microprocessor can handle both, making it an attractive solution.

#### **Mobile Device/Computer:**

- Wireless signals are received from the player units on successful hits. For prototyping, simple radio modules work fine. However, to have high compatibility with other existing systems, Bluetooth would be a better option for the final design.
- The mobile device or computer must communicate with the internet to upload stats about each user. This can either be done with a wired or wireless connection. In addition, this information needs to be stored, managed, and distributed in a database; powerful web page and database languages are needed such as SQL, Javascript, HTML, and PHP.