



Projects in Electrical & Computer Engineering 2007-2008



Naval Architecture Tow Tank Redesign

1/c Lauren Power

Project Advisor: LCDR Pickles

Sponsor: Naval Architecture and Marine
Engineering Section (NA&ME)

Outline of Talk

- ◆ The project

- ◆ Tow tank update

- ◆ Purpose

- ◆ Benefit NA&ME cadets and faculty
- ◆ Benefit CGA by improving NA&ME facilities and program

- ◆ Design Solution

- ◆ Wireless data transfer
- ◆ Video recording and display

- ◆ Results

Overall Tow Tank Project

- ◆ Last upgrade 1985

- ◆ NA&ME

1. Fix leaks
2. New carriage drive system
3. New heave and pitch sensors.

- ◆ EE

1. A wireless real-time data acquisition system
2. Video recording and display system

Purpose

- Enhance the Education of NA&ME Students and Faculty
- Expose students to newer technology
- Make the NA&ME program more competitive
 - With other colleges
 - For CG contract work
 - For research opportunities for faculty

Ship Model Towing Tank

- ◆ Analyze hull designs
- ◆ 100 ft long
- ◆ Carriage pulls hull models through water
- ◆ Sensors attached to carriage collect heave, pitch, and resistance data.
- ◆ Computer on carriage
- ◆ Computer and Control station next to tow tank.



<http://www.uscga.edu/display.aspx?id=507>

Previous Limitations

Data transfer System

- ◆ Not real-time
- ◆ Impact of delay
 - ◆ Can't immediately determine if test is running correctly
 - ◆ Can't compare data with what they are seeing

Video System

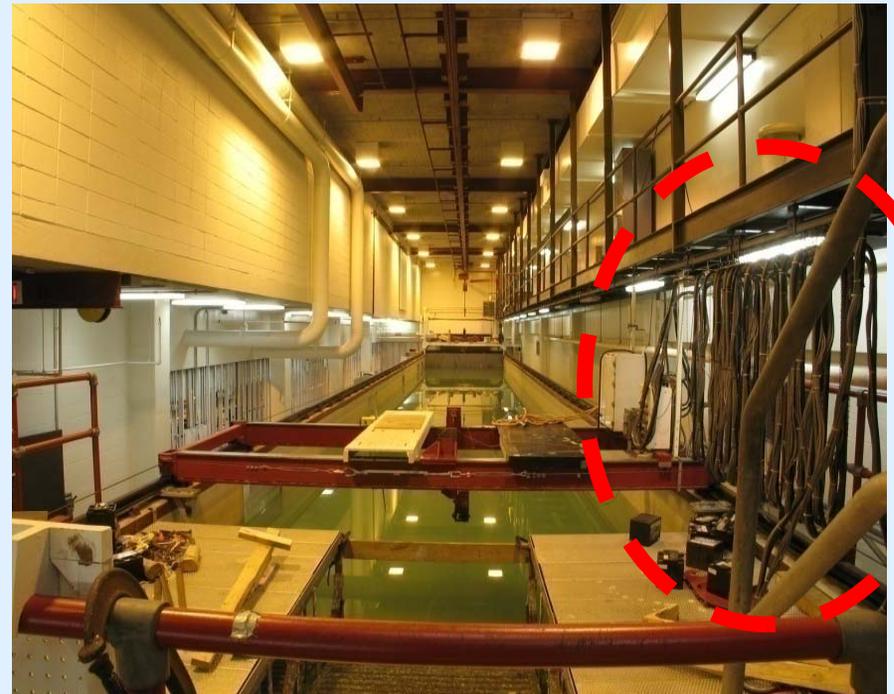
- ◆ No video recording or display
 - ◆ Must look into tow tank to compare numbers to image
 - ◆ Must repeat experiment for additional evaluation



Alternative Method

Communication System

- ◆ Have tried the “umbilical” cord method
- ◆ Provided real-time data transfer
- ◆ Unsuccessful, data was incorrectly received at workstation.
- ◆ Removed cord.



<http://www.name.uno.edu/towtank/towtank.aspx>

Sponsor Requirements

- ◆ Wireless data transfer
 - ◆ Real time
 - ◆ coverage for 100 ft tow tank
- ◆ Video recording and display system
 - ◆ 3 cameras mounted on carriage
 - ◆ Real time
 - ◆ Display on wall-mounted flat screen

Constraints

- ◆ Computer must be on .edu network
 - ◆ .edu network is the Academy's network
 - ◆ Primarily used by cadets and faculty for academic studies.
 - ◆ Information Services regulates .edu network
 - ◆ Specify hardware/software
 - ◆ Specify policy

System Design

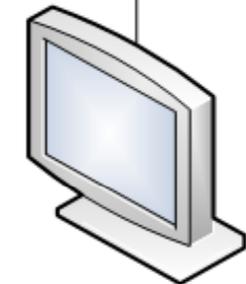
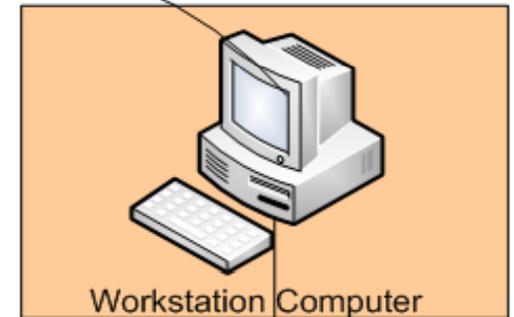
- ◆ Chose wireless access point over point-to-point connection
 - ◆ Decision based on IS requirements.
 - ◆ Cisco Aironet IOS 1231
 - ◆ Communicates with IEEE 802.11g
 - ◆ Rate: 54Mb/s on the 2.4 GHz band

Tow Tank

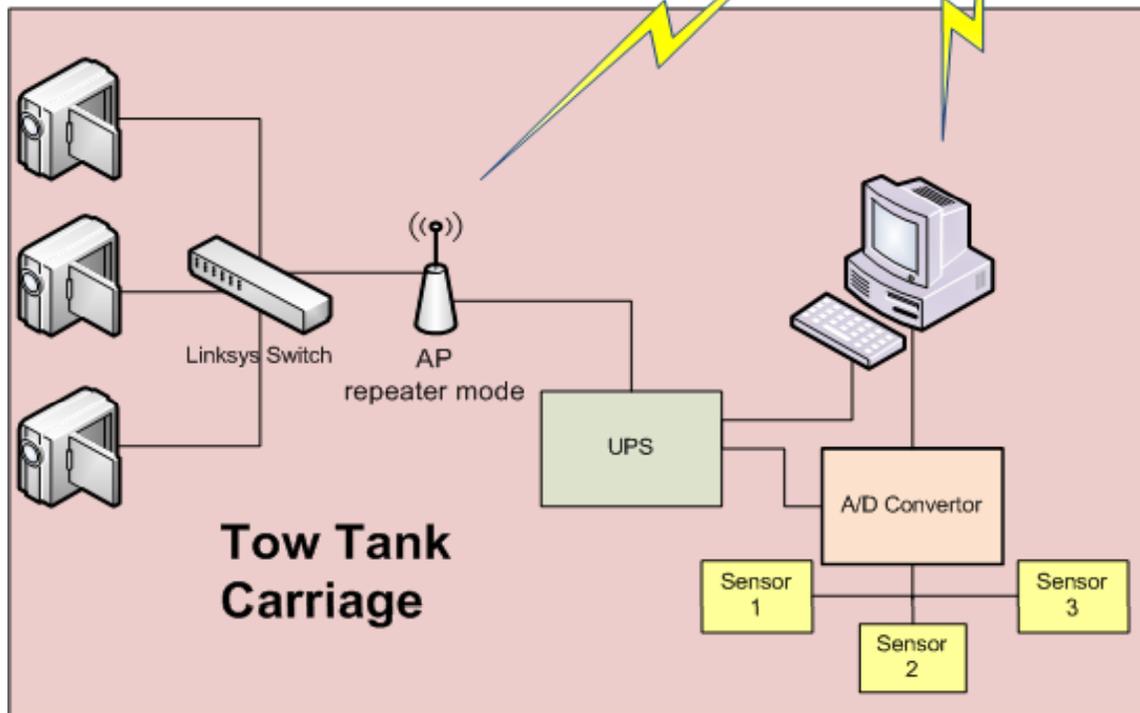
Design Solution Diagram
Wednesday, April 30, 2008



Wireless Access Point
In Tow Tank Lab



Wall Mounted Display Monitor





17 December 2007

USCGA Electrical & Computer Engineering

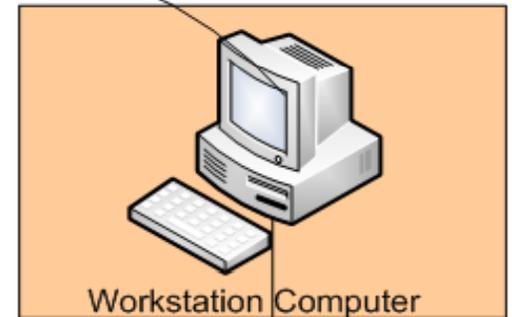
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Tow Tank

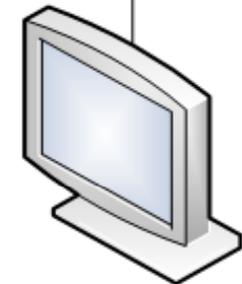
Design Solution Diagram
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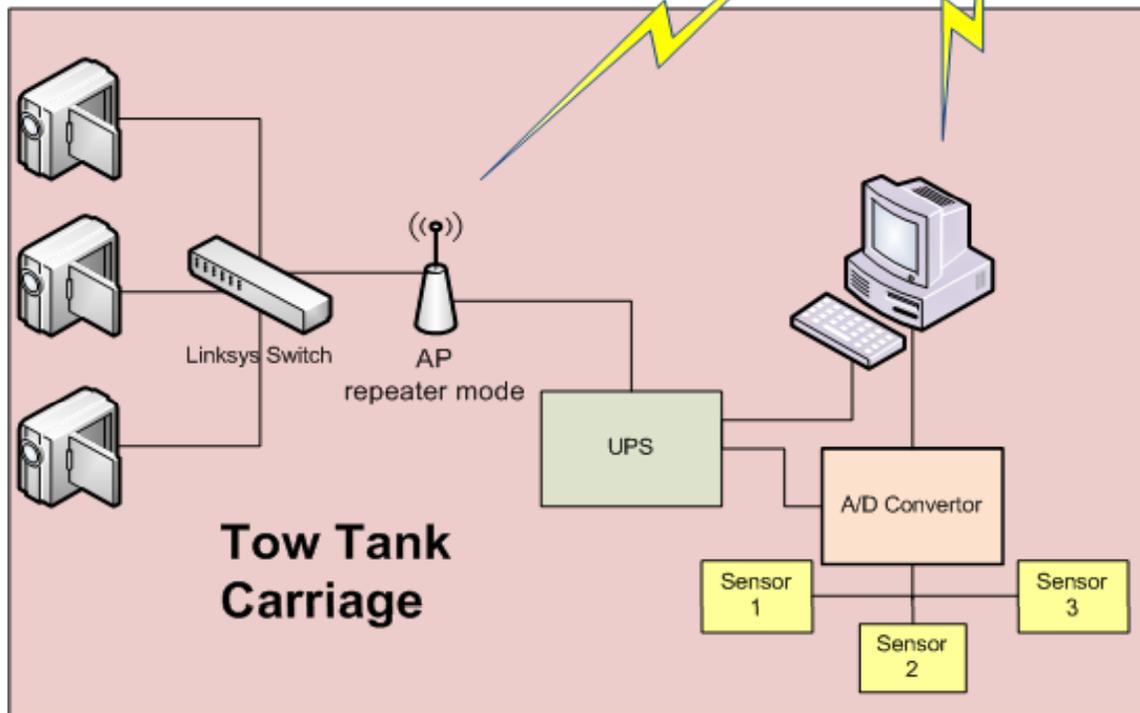
Wireless Access Point
In Tow Tank Lab



Workstation Computer



Wall Mounted Display Monitor



**Tow Tank
Carriage**

System Design Bandwidth

	# Cameras	FPS	Hres	Vres	ColorDepth	BW
Raw	3	24	1280	720	24	1.6 Gbps
H.264/MPEG-4 HD Mode	3	24	1280	720	24	15-18 Mbps
Raw	3	24	640	480	24	221 Mbps
H.264/MPEG-4 HD Mode	3	24	640	480	24	6 Mbps

Results

- ◆ Provides wireless data transfer
 - ◆ Remote log-in
 - ◆ Real time
 - ◆ coverage for 100 ft tow tank
- ◆ Video recording and display system
 - ◆ 3 cameras
 - ◆ Real time
 - ◆ Display on wall-mounted flat screen

Conclusions

- ◆ What the project/problem was
 - ◆ Tow tank update
- ◆ Why the project was being done
 - ◆ Benefit NA&ME cadets and faculty
 - ◆ Benefit CGA by improving NA&ME facilities and program
- ◆ How the problem was solved
 - ◆ Design solution
 - ◆ Wireless data transfer
 - ◆ Video recording and display

Questions



Technology

Wireless Communication

- ◆ Access Point
 - ◆ Wireless communication over a network via the access point.
- ◆ Point-to-Point
 - ◆ Communication from one wireless device directly to another

Cisco Wireless Access Points



<http://www.cisco.com/>