

Wireless Access System

Fateh Basic

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Overview

- Utilize RFID to allow access to workplace
- Automatically clock employees in or out
- Wirelessly control the door lock
- Timestamp all access in database
- Create UI for system configuration and reporting

RFID Reader & Tag(s)



L-RX201 RFID Reader



T501 RFID Tag

Implementation RFID

- Utilize polling method to read any available data
- Parse / Format Data
- State Machine / Decision Tree
- Reporting & Storing
- Parallel Processing
 - i.e. Polling, Gathering, Determining, Executing, Storing, etc

Implementation RFID

- Serial COM Implementation
- Will Implement in a Phases Strategy
- Example Phase 1
 - Basic Interface between Reader and CP
 - Listen for any tags (what are we seeing)
- Example Phase 2
 - Parse data
 - Make determination

Implementation (Cont.)

- Example Phase 3
 - Basic interface with microcontroller (Talk)
 - Send command, talk with microcontroller
- Example Phase 4
 - UI implementation, displaying, controlling
 - Reporting, Storing (DB)

Implementation (Cont.)

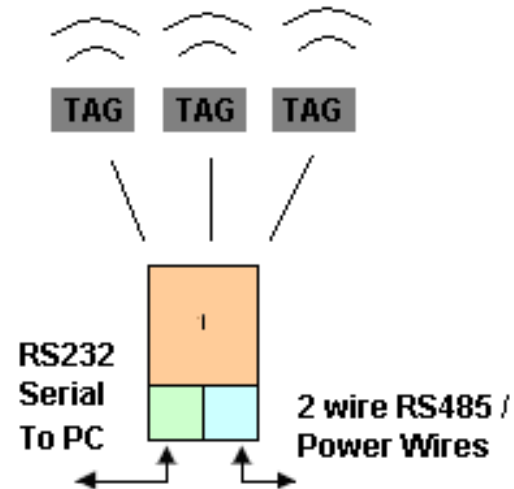
- Stored / Refreshed Data
 - Tag ID
 - Site Code
 - Signal Strength
 - Time / Duration seen
 - Movement Detected ?

Implementation (Cont.)

- Send Microcontroller Command to Unlock
 - Make Determination
 - Verify
 - Send via WIFI
 - Perform Handshake with Microcontroller (ACK,NCK)
 - Report, Reset

• RFID Reader Interfaces:

- **Interface** Serial RS232 or RS485
- **Baud** 115 kB/s, 57.6 kB/s, 38.4 kB/s, 19.2 kB/s, 9.6 kB/s
- **Parity** None
- **Start Bit** 1
- **Stop Bit** 1
- **Data Bits** 8



Command Short List

<i>Value</i>	<i>Function</i>	<i>Expect Response</i>
0x00	Reset Network	Reply Packet
0x01	Start/Enable Auto Polling	Continuous
0x02	Disable Auto Polling	Reply Packet
0x03	Ping Reader	Reply Packet + Error Number
0x04	Set Network ID	Reply Packet
0x05	Set Reader ID	Reply Packet
0x06	Get Tag Packet	Tag Packet
0x07	Get RSSI Value	Reply Packet + RSSI
0x08	Set RSSI Value	Reply Packet
0x09	Set Site Code	Reply Packet
0x0A	Get Site Code	Reply Packet + Site Code
0x0B	Set Receiver Gain	Reply Packet
0x0C	Get Receiver Gain	Reply Packet + Gain
0x0D	Set Alarm Filter	Reply Packet
0x0E	Get Alarm Filter	Reply Packet + Status
0x0F	Get Number of invalid Tags	Reply Packet + Counter
0x10	Get Supply Voltage	Reply Packet + Voltage
0x11	Start RF white noise calculation	Reply Packet
0x12	Get RF white noise result	Reply Packet + Result
0xFE	Set Baud Rate	No Reply – Broadcast only
0xFF	Get Version Information	Reply Packet + Version Data

Packet Data Field

Byte	Function / Value
1	!
2	*
3	*
4	Interval
5	Reed Switch Counter
6	Firmware version
7	B
8	C
9	Movement switch counter
10	Age byte MSB
11	Age byte
12	Age byte
13	Age byte LSB
14	Site code MSB
15	Site code
16	Site code LSB
17	Tag ID MSB
18	Tag ID
19	Tag ID
20	Tag ID LSB
21	Type of tag flag
22	Reader ID
23	RSSI signal strength
24	Checksum
25	20H (reserved)
26	Alarm byte
27	Node ID
28	Network ID
29	Reader Set RSSI Value
30	Firmware Version
31	LF
32	CR

UI

- Display both Current and Historic Data
- Management Ability
 - Employee, Tag ID, Site Code, etc
 - Configuration (i.e. Signal Strength, Time Duration, etc)
- Interactive
- Storing & Reporting (Disk or DB Extra)
- Testing/Debugging UI → Final Project Demo UI


UI

LAST ACCESS

Tag ID
555333

Date
04/08/2008 17:21:54

Name: Jon Doe



ID: 1234-567

Time Log:

→	Jon Doe	04/08/2008 17:21:54	Punch-In
←	Jane Doe	04/08/2008 16:55:21	Punch-Out

Microcontroller

Wireless ARMmite

- ARM7 CPU running at 60 Mhz
- Programmed via Serial interface over optional Zigbee, Bluetooth or USB
- BASIC or C compiler
- 32K Flash memory
- 8K SRAM
- 24 TTL compatible digital I/O
- 8 10-bit A/D converter channels

Wireless Connection

XBee® 802.15.4 OEM RF Modules

- ISM 2.4 GHz operating frequency
- 1 mW (0 dBm) power output (up to 100m range)
- RPSMA Connector, U.FL. Connector, Chip or Whip antenna options
- Industrial temperature rating (-40° C to 85° C)
- Approved for use in the United States, Canada, Australia and Europe
- Advanced networking & low-power modes supported

Solenoid

24VDC Continuous Tubular-Pull

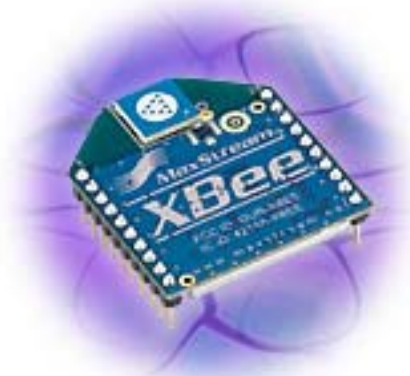
- Nominal voltage & current: 24VDC @ 333mA
- Coil resistance: 60 Ω (+10%)
- Power consumption: 10.0W
- Holding force: 4.00 lbs.
- Stroke: 1.00
- Size: 3.0"L x 1.0"Dia.
- Shaft Dia: 0.440
- Weight: 0.40 lbs.

Solenoid Driver

DRV101

- HIGH OUTPUT DRIVE: 2.3A
- WIDE SUPPLY RANGE: +9V to +60V
- COMPLETE FUNCTION PWM Output
 - Internal 24kHz Oscillator
 - Digital Control Input
 - Adjustable Delay and Duty Cycle
 - Over/Under Current Indicator
- FULLY PROTECTED
 - Thermal Shutdown with Indicator
 - Internal Current Limit
- PACKAGES: 7-Lead TO-220 and 7-Lead
- Surface-Mount DDPAK

Project Components



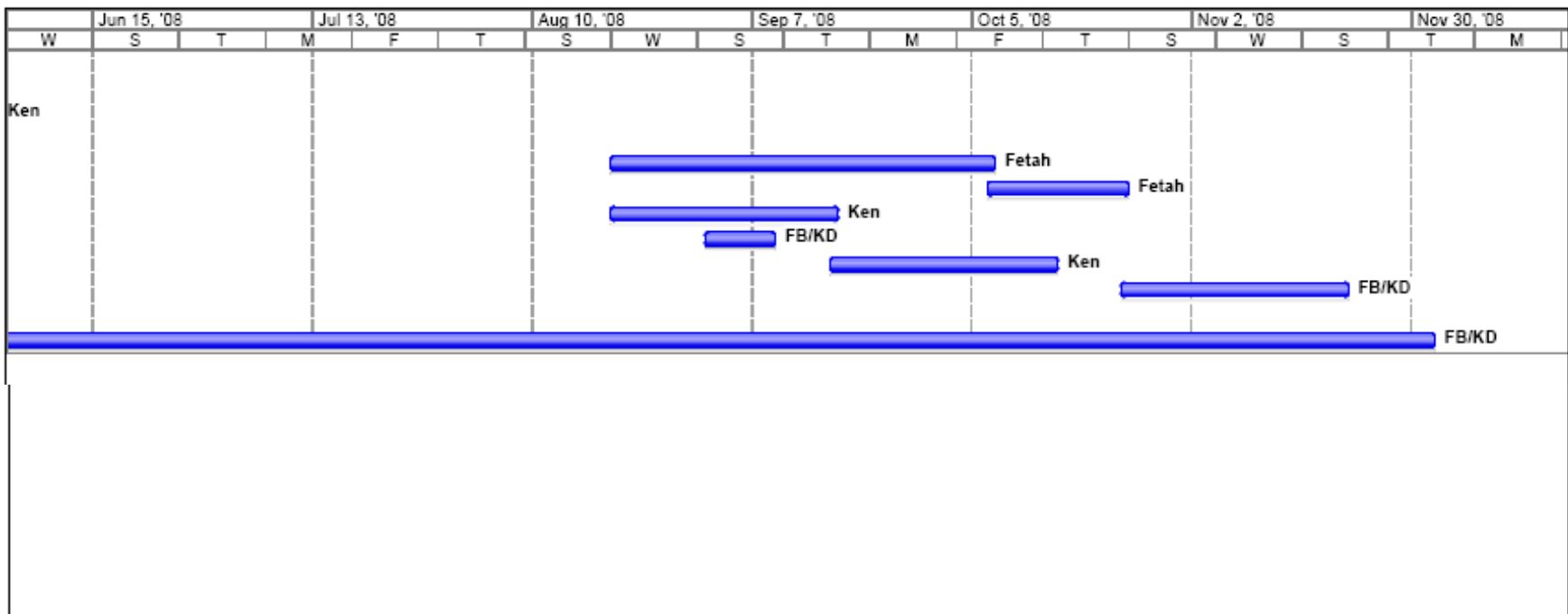
Implementation Strategy

- Connect the Xbee to the microcontroller
- Program the microcontroller
- Connect the solenoid driver to the microcontroller
- Verify the lock functionality
- Test the central processor to microcontroller link

Schedule & Tasking

- Acquire Equipment and Parts early on Spring/Summer
- Project Implementation and Documentation Summer/Fall

ID	Task Name	Duration	Start	Finish	Mar 23, '08			Apr 20, '08			May 18, '08		
					W	S	T	M	F	T	S		
1	Aquire RFID gear	7 days	Mon 5/5/08	Tue 5/13/08								Fetah	
2	Aquire Microcontroller/Wireless Adapter(Zigbee)	14 days	Thu 5/1/08	Tue 5/20/08								Ken	
3	Aquire Solinoid and Driver for Solinoid	14 days	Wed 5/14/08	Mon 6/2/08									
4													
5	RFID Implementation/Interface to Central Processor	35 days	Wed 8/20/08	Tue 10/7/08									
6	Build RFID UI	14 days	Tue 10/7/08	Fri 10/24/08									
7	Interface Microcontroller with Wireless Adapter(Zigbee)	21 days	Wed 8/20/08	Wed 9/17/08									
8	Build Door Lock Device	7 days	Mon 9/1/08	Tue 9/9/08									
9	Implement Interface Microcontroller to Door Lock Device	21 days	Wed 9/17/08	Wed 10/15/08									
10	Interface Microcontroller to Central Processor/RFID	21 days	Fri 10/24/08	Fri 11/21/08									
11													
12	Documentation/Report	130 days?	Thu 5/22/08	Tue 12/2/08									



Project: p1 Date: Tue 4/8/08	Task		Milestone		External Tasks	
	Split		Summary		External Milestone	
	Progress		Project Summary		Deadline	

Bill of Materials

Part	Part #	Supplier	Cost
24VDC Solenoid	SMT-2551L24AA	Jameco	\$11.99
Solenoid Driver	DRV101FKTWT	Digi-Key	\$7.70
Wireless ARMMite	AM-WL	Coridium Corporation	\$39.95
XBee Zigbee wireless	XB24-AWI-001	Digi-Key	\$19.00
RFID Reader	L-RX201	Wavetrend & Iautomate.com	\$499.95 (Free for us)
Antennas	AN100 Quarter Wave Whip Antenna	Wavetrend	Included in Reader package
Power Supply	PS300 power supply unit	Wavetrend	Included in Reader package
Power Supply	PS300 power supply unit cable connection cord	Wavetrend	Included in Reader package
Cables	AC501 power supply to PC serial port cable	Wavetrend	Included in Reader package
Cables	AC502 power supply to reader cable	Wavetrend	Included in Reader package
Tags	(2) T501 or others	Wavetrend	\$19.95 to \$39.95 (Free to us)
RFID Reader SDK and other software		Wavetrend	\$49 (Free to us if needed)
Total			\$79.49

Alternate suppliers

Part	Part #	Supplier	Cost
Wireless microcontroller	RCM4400W Development Kit	Rabbit Semiconductor	\$149.00
Rotary Solenoid	R-09-150-CCWM	Magnetic Sensor Systems	\$137.18
Solenoid Driver Module	PWM400	Magnetic Sensor Systems	\$78.34
RFID Reader	L-RX300	Wavetrend	\$69.95 (Free to us)
Total			\$364.52

Questions ?