THOTCON 0x4 Badge

Design Proposal

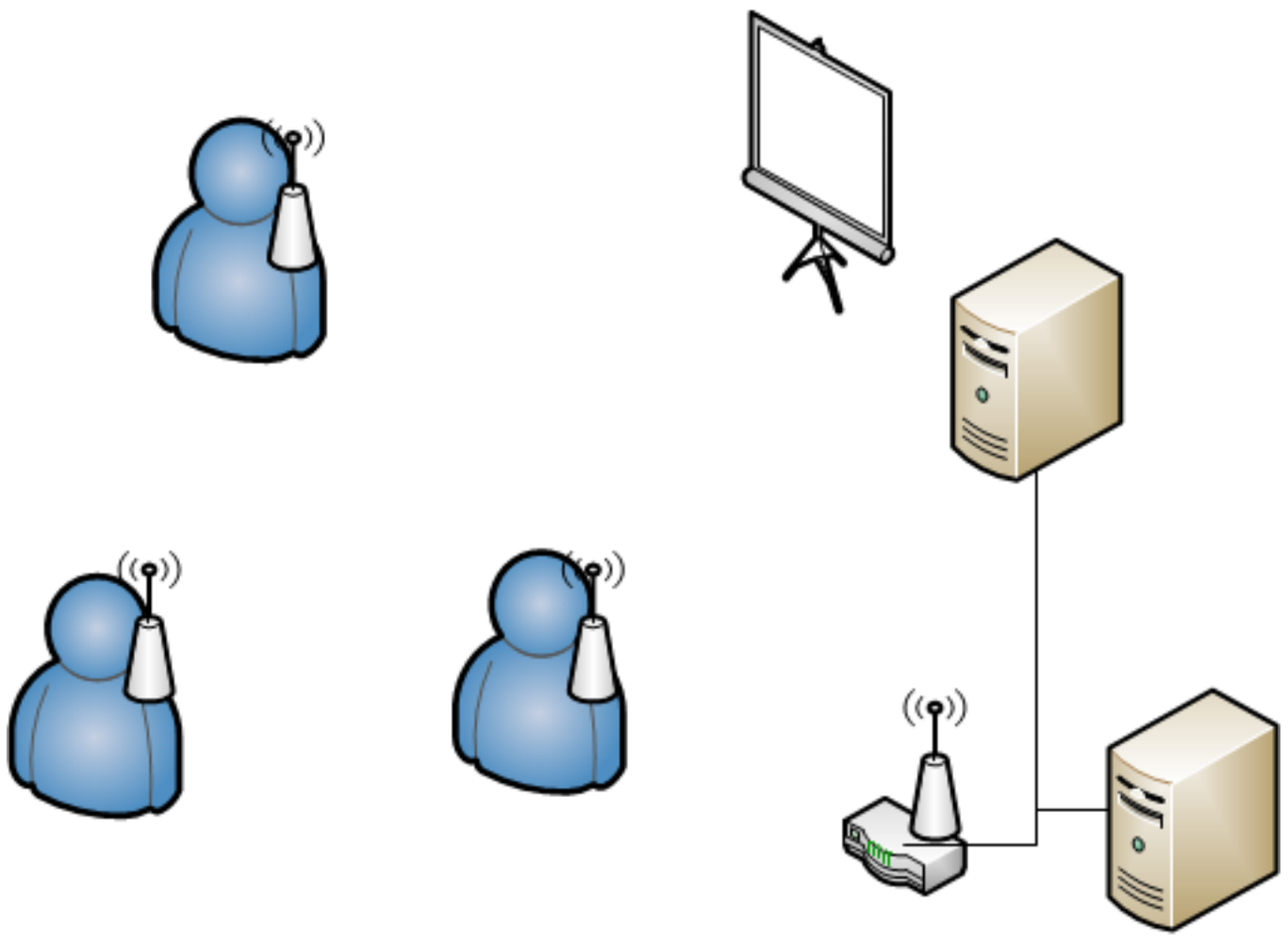
Design Requirements

- Interactive element
- Battery powered
- RF transmitter / communications w/ Unique Identifiers
- Scoreboard / wall element
- Mixed color theme (Black,green,blue,red,gold)
- ~30k sq. ft. facility
- ~$12k budgeted, ~700 qty
- Early April Delivery

Design Features

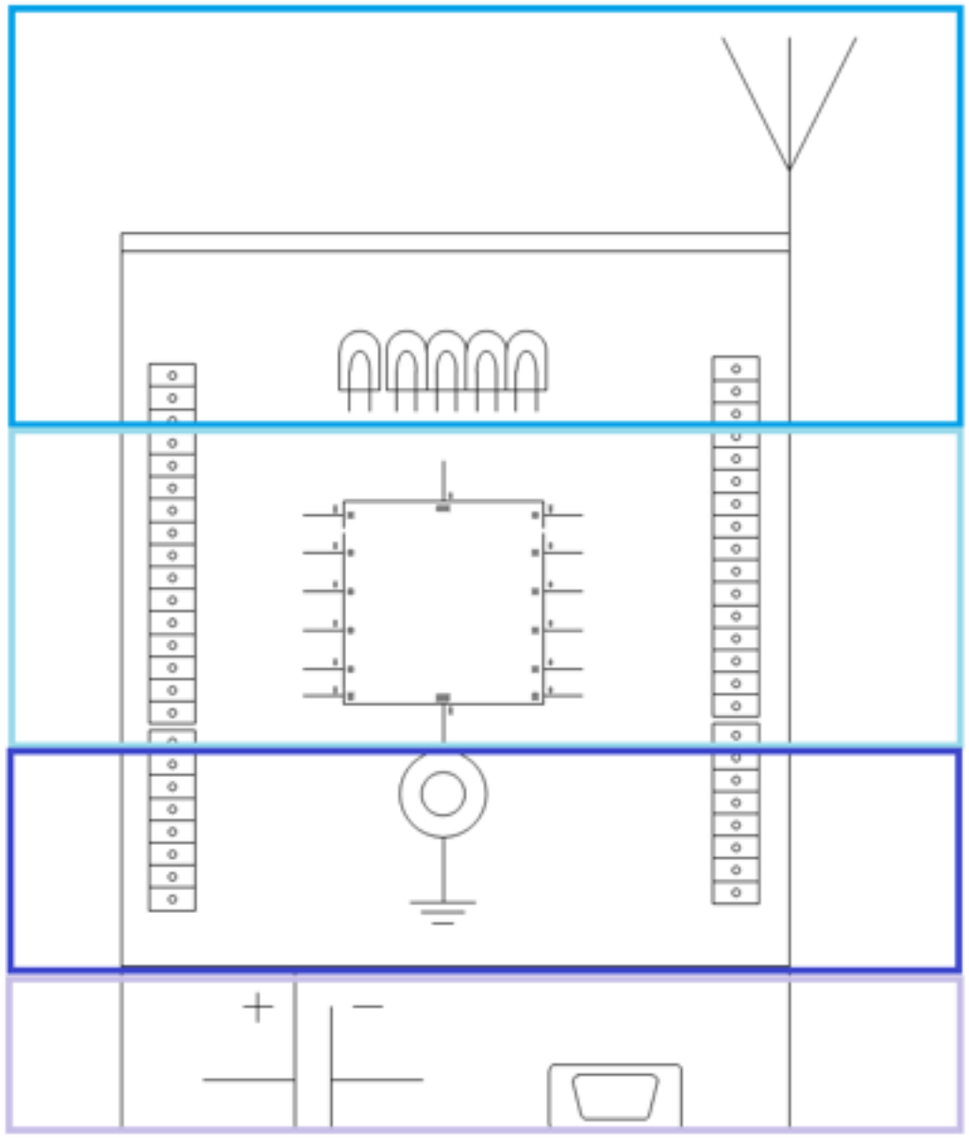
- Multiple levels of hackability
  - hardware
  - firmware serial access
  - backend system
- Useful after the con
- Tool oriented
- Explorative

System Considerations



Component Consideration

- Out:RF / LED
- uC
- In: Sensors
- Power



RF Technologies

- High Band AM
- Low Band FM
- IR
- Proximity Radios
- 802.11 - WiFi
- 802.16 - WiMax
- 802.15.4 - ZigBee

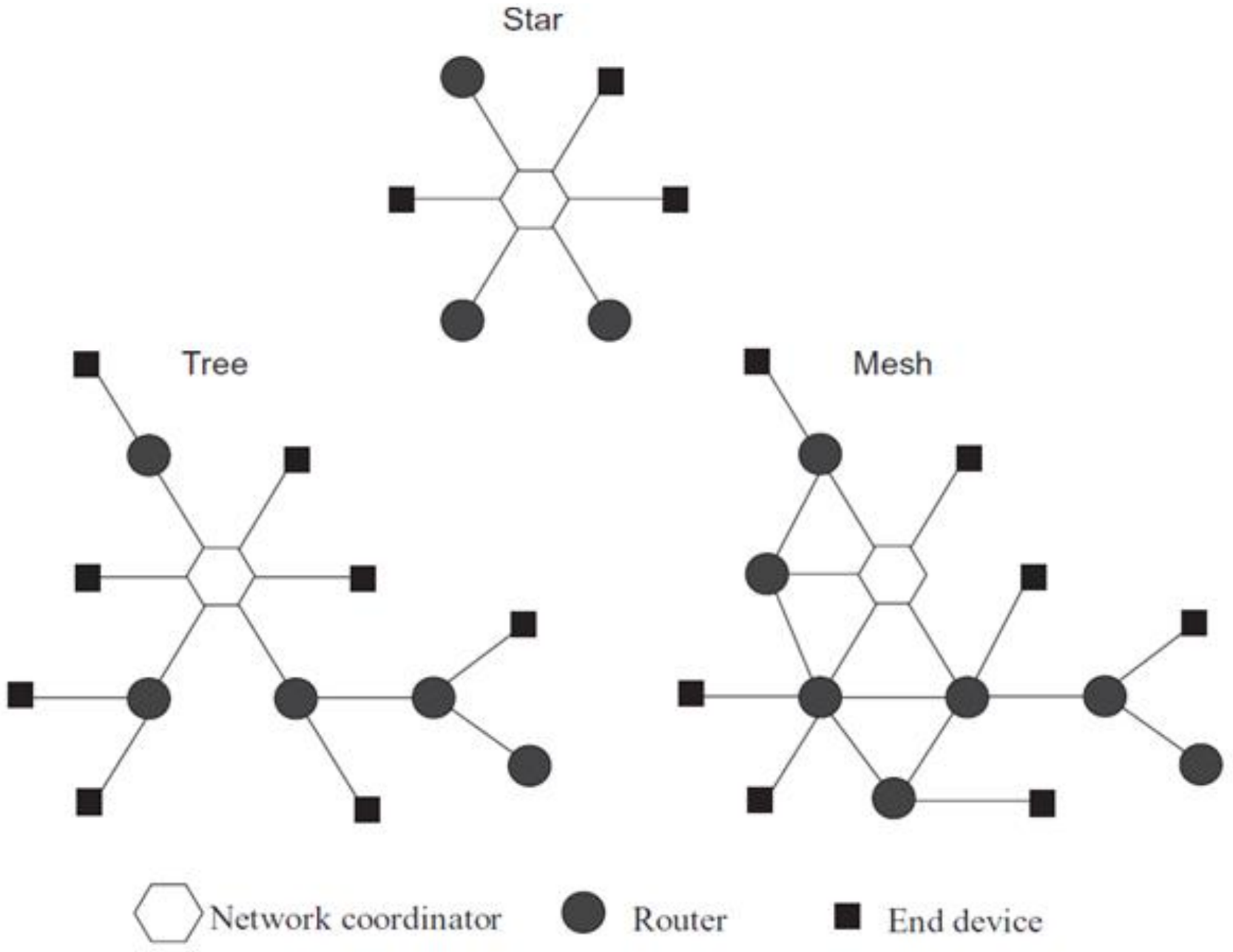
802.15.4

- Cost effective Radio
- Native protocols to manage base stations
  - CDMA , Error Control, Replay
- Architecture to manage density
- Wide range of protocols (ZigBee,Xbee, 6LoWPAN, OpenBeacon, etc)

Antenna Consideration

	Cost	Range	Durability	Size	Design
PCB	$10*	Variable	Highly Durable	PCB Based	Large PCB Aesthetics
Whip	$3	Directional	Connectors Break	Obtrusive	Wireless Mystique
Chip	$0.50	Moderate	Highly Durable	Component based	Contained to PCB

Network Topologies



Coverage Area

Sensor Analysis

- Easy to interface
- Interchangeable
- Power hungry
- Cost to accuracy ratio

Microcontroller Selection

- Multiple A/D Inputs
- Decent on chip Memory Footprint
- Standard Bus Protocols

Atmel	Rabbit	TI	Freescale
Large community	Popular hobbyist community	Widely used commercially	Widely used commercially
Several supported base languages	Difficult to program	Not much public code base	Open tools, but small public code base
ASM is most friendly	Free tools but not officially supported	Closed Tools	Fewer community users
Hobbiest Support	High Cost	Low Cost	Moderate Cost
Moderate Cost			

Scoreboard/Gameplay

- QR Code Based Reg / Portal
- Accessible from the THOTCON network
- Top Scorerboard / Wall of Shame
- Achievements

Artistic Aspect / Theme

- "Coaster" screen print
- "Crime Dog" throwback
- "Garbage Pail Kids"

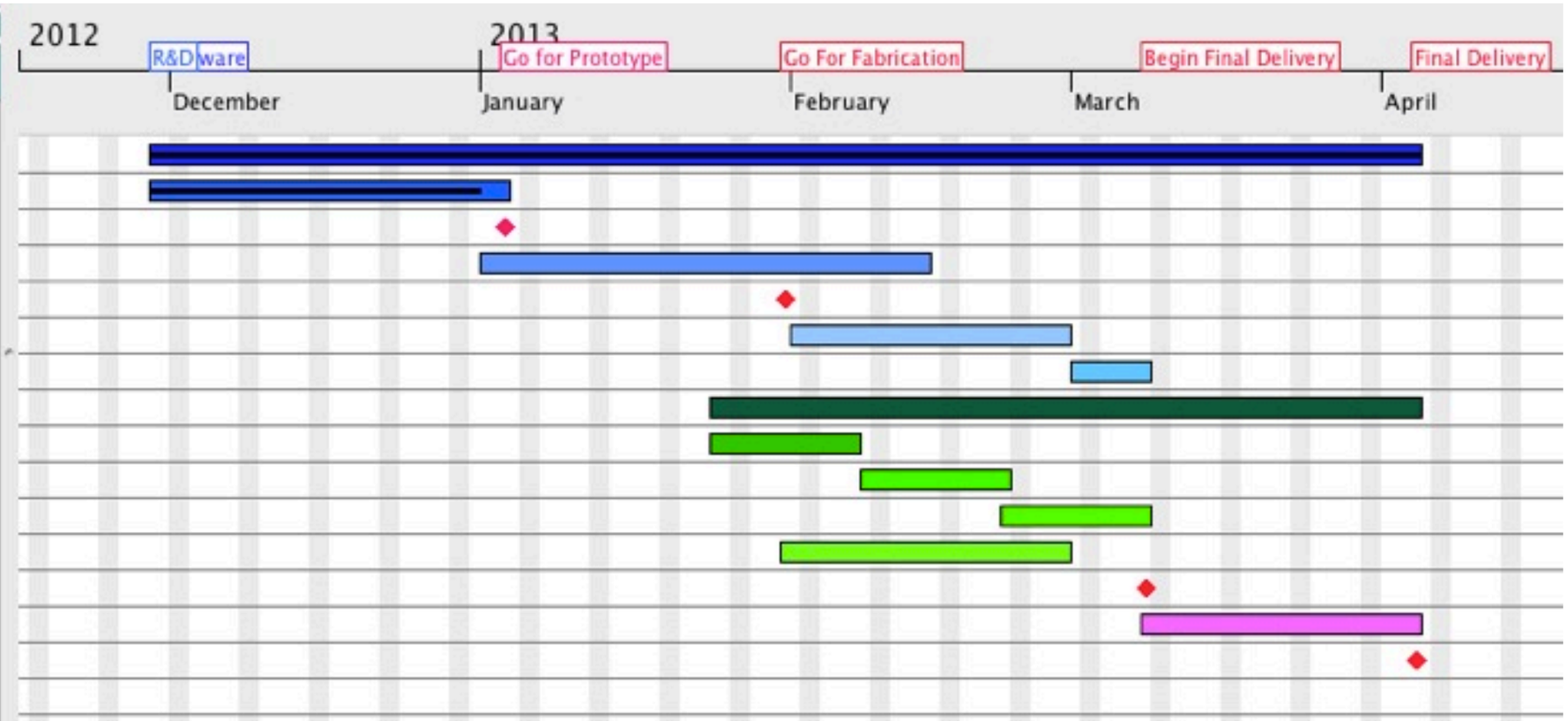
BoM Estimate

Component	Qty	Cost (@700 Units)
ATMEGA128RF	1	5.28
MQ - 3 Sensor	1	3.06
AT9520 Antenna	1	0.56
32kHz Crystal	1	0.18
16 mHz Crystal	1	0.21
LED Array	5	0.55
Battery	2	0.25
Passive Components	16	0.42
PCB Fab*		$3 - $6
PCB Assembly*		$6 - $10
Per Unit		-$18 - $26
Raw Cost		-$12,650 - $18,200

Milestones

GANTT project

Name	Begin date	End date
Hardware	11/29/12	4/4/13
R&D	11/29/12	1/3/13
Go for Prototype	1/3/13	1/3/13
Prototype/POC	1/1/13	2/14/13
Go For Fabrication	1/31/13	1/31/13
First run/ Test fab	2/1/13	2/28/13
Fabrication/ Verification	3/1/13	3/8/13
Software	1/24/13	4/4/13
AVR v0.1	1/24/13	2/7/13
AVR v0.8	2/8/13	2/22/13
AVR v1.0	2/22/13	3/8/13
Scorebaord/Gamification	1/31/13	2/28/13
Begin Final Delivery	3/8/13	3/8/13
Test/Stuff	3/8/13	4/4/13
Final Delivery	4/4/13	4/4/13
On Site Setup	4/25/13	4/25/13



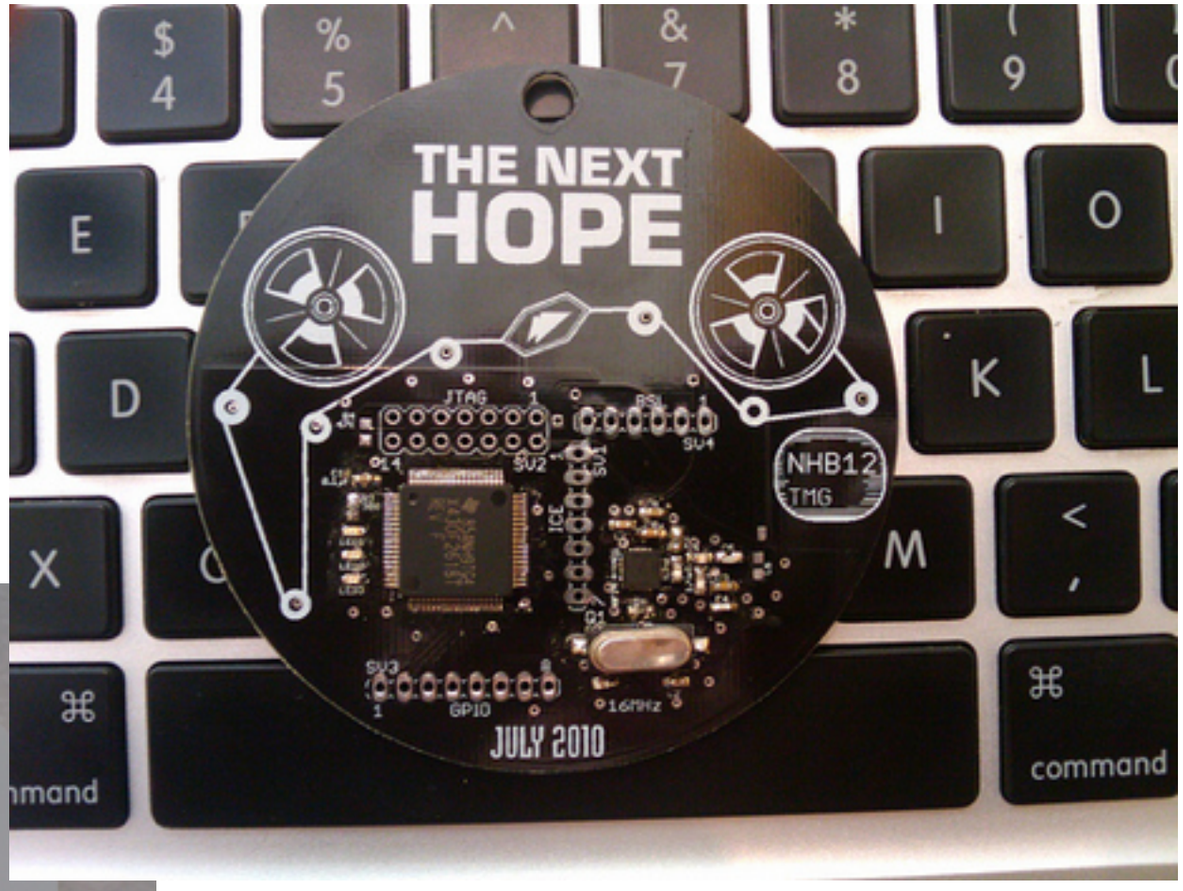
- Design Review
- Fab and assembly quote
- Fab Verification

Risks

- Lot size
- Lead times from Fab shops
- Component availability
- Budget skew

Prior Art


toorcon
P9
P1 EXPANSION
SW1
LED1
SK: 239
P8 GoodFET
LED2
LED3
P2 ANTENNA
Badge sponsored by
HAK5
Microsoft


THE NEXT
HOPE
JTAG
BSL
SV1
SV2
SV3
SV4
NHB12
TMG
GPIO
16MHz
JULY 2010
command


HOPE
1994 - 2008

Documentation / Publicity

- “Making of the Badge” blog series
- Open licensed schematics
- Attribution on PCB and firmware
- Github repo for documentations
- All released post-con