Smart Ballot Box 2

To,

Mr. Joseph Kiniry, Daniel Zimmerman and Joey Dodds

Free & Fair

Dear Mr. Kiniry, Zimmerman, Dodds,

Describe motivation/background:

The majority of our voters are questioning the voting system as they don't trust that the elections have been done fairly over the years. Whether it's due to mis-counting, fraud or manipulation. The majority of voters are looking for a new and secure way to vote because the delegation of trust to both people and computers, voters have little basis beyond blind faith upon which to trust that their personal vote was counted correctly, let alone being counted. Free & Fair believes that transparency and collaboration are vital to the evolution of democratic elections, which is why we are being proposed to create an alternative cost-beneficial solution.

This smart ballot box powered by an arduino uno will help answer voter's questions by providing the correct count of legitimate votes, securing against tampering, affordable, and trustworthy,. That way the election's results will not be called into question and our democracy will not be at risk.

Formulate problem statement:

The current FPGA powering the Smart Ballot Box (SBB) is worth $9,000 which makes it an unaffordable system for most voting centers. We have been proposed a task to find a more cost-beneficial chip solution which would make the overall system cost between $400 to $500. Hence, why we have proposed to use the arduino uno.

Identify requirements:

Already provided/included in SBB2019:

This box is composed of rescuing a variety of components from miscellaneous commercial-off-the-shelf (COTS) hardware which is available at the bottom of the report provided in the bill of materials.

Exterior Hardware:

- File Cabinet Shelves
- Printer lid
- Interactive dual button interface to either cast or spoil ballot
- Arduino Uno

Software:

We will be reusing the software already created and modifying it to function properly with the board of our choosing which in this case is the Arduino Uno. We will be using the same bitstream, firewall, and RTOS code provided and any additional code required. Modifying the code as necessary to provide the same functionality as the SBB2019.

Identify constraints:

Free & Fair won't allow us access to the SBB outside their workspace. We will be working in their working/testing environment once we get access to the building and can walk in regularly without having to sign in as guests. Limited hours to walk-in between 9 to 5 as well as limited days with the office only being available Monday through Friday.

Identify deliverables:

1. The system will have the same functionality of the SBB2019 as described in the github BVS2019 project.
2. The Arduino Uno will allow the board to be used and function identically like the FPGA currently used and the SBB2019 will function just like it currently is but the boards will just be swapped out.'
3. The system will be easy to replicate and build long-term, widely available COTS part with minimal modification if needed.
4. Cost will be minimized to allow others to replicate our work exactly
5. The overall design will allow for easy exploration, debugging, modification and experimentation. The system is not a final product but a part for more widespread interaction and experimentation for your voting system technology.

Propose solution:

The goal of this project is to make a cheaper version of the smart ballot box on an Arduino platform. This is a vital part which will make the SBB more cost-beneficial, which is needed to win over our voters and provide them with a more accurate and trustworthy system. This box will allow voters to either cast or spoil their ballot as well as securely recording the choices they make. Taking the existing SBB2019 implementation and making it more cost-beneficial and providing widely available COTS platforms with the arduino uno used with it. As part of a larger effort to enable more widespread to allow more experimentation on Free & Fair voting system technologies.

Describes plan of action, timetable:

The goal is to provide you a board that can drive the components in the ballot box. The end result will be a fully functional, low-cost and secure system featuring all the deliverables stated above and replicate the functionality of the SBB2019 by June 1st. For more on the plan of action and time table please look at the proposed project schedule provided with this proposal.

Criteria for success:

We would like to go off the resources provided from your first prototype and make it more cost beneficial for voters everywhere which includes using the design and software already created. These resources will be modified to the parts we select. This proposal may be altered down the stretch of this project with agreement of both parties.

Sincerely,

Ali Saad, Jonathan Christian, Jiaqi Liu, Nick Long
Electrical and Computer Engineering Students at Portland State University

Included in the SBB as stated in the Bill Of Materials:

Qty	Value	Device	Package
1	YELLOW	LEDCHIP-LED0603	CHIP-LED0603
1	RED	LEDCHIP-LED0603	CHIP-LED0603
2	BLUE	LEDCHIP-LED0603	CHIP-LED0603
3	GREEN	LEDCHIP-LED0603	CHIP-LED0603
2	.1"	PINHD-2X6	2X06 Standard 2.54mm pitch header
1	.1"	PINHD-1x16	1x16 Female Pin header 2.54mm
2	Adjustable	V_REG_LM1117SOT223	SOT223
2	.1uf	C-USC0603K	C0603K
1	.1uf/50V	C-USC0805K	C0805K
1	1.5k	R-US_R0603	R0603
20	10k	R-US_R0603	R0603
2	10pf	C-USC0603K	C0603K
2	10uf	C-USC1206K	C1206K
2	1uf	C-USC0603K	C0603K
2	2.2k	R-US_R0603	R0603
2	220R	R-US_R0603	R0603
1	22uF / 63V	CPOL-USD	PANASONIC_D
1	33k	R-US_R0603	R0603
7	470R	R-US_R0603	R0603
2	4.7k	R-US_R0603	R0603
1	32.768khz	ABS07W-32.768KHZ-D-1-T	ABS07AIG32768KHZ71T
1	10MM_SM_COIN_CELL_CLIP	10MM_SM_COIN_CELL_CLIP	10MM_SM_COIN_CELL_CLIP
1	DRV8871DDA	DRV8871DDA	SOIC127P600X170-9N
1	DS1338-33	IC_RTC_DS1307	SO-8
1	LM393D	LM393D	SO08
1	MICROSD	MICROSD	MICROSD
4	PMV65UNEAR	NMOSSOT23	SOT-23
1	POWER_JACKSLT	POWER_JACKSLT	POWER_JACK_SLOT
2	SPDT_TOGGLE_BUTTONMICRO	SPDT_TOGGLE_BUTTONMICRO	BTN-PUSH-PUSH-PS-2214-L
1	ARDUINO-NOHOLE	ARDUINO-NOHOLE	ARDUINO-NOHOLE
1	OLED	1X4-CLEANBIG	1X04-CLEANBIG
1	RED	MOMENTARY-SWITCH-SPST-LED-PTH-12MM	TACTILE_SWITCH_LED_PTH_12MM
1	GREEN	MOMENTARY-SWITCH-SPST-LED-PTH-12MM	TACTILE_SWITCH_LED_PTH_12MM
2		CONN_02POLAR_LOCK	JST-XH 2in 2.54mm pitch
1		CONN_03POLAR_LOCK	JST-XH 3in 2.54mm pitch

Parts	Description	MPN
LED1	LED	
LED2	LED	
LED5, LED6	LED	
LED3, LED4, LED7	LED	
PMOD0, PMOD1	2x6 Pin header, through hole	
U$1	1x16 Female Pin header 2.54mm	
U2, U3	Voltage Regulator LM1117	
C9, C12, C1, C2, C13	CAPACITOR, American symbol	
C7	CAPACITOR, American symbol	
R30	RESISTOR, American symbol	
R2, R4, R5, R6, R7, R8, R9, R13, R15, R16, R17, R19, R20, R21, R22, R23, R27, R28	RESISTOR, American symbol	
C4, C5	CAPACITOR, American symbol	
C8, C11	CAPACITOR, American symbol	
C3, C10	CAPACITOR, American symbol	
R1, R3	RESISTOR, American symbol	
R11, R14	RESISTOR, American symbol	
C6	POLARIZED CAPACITOR, American symbol	
R18	RESISTOR, American symbol	
R12, R10, R26, R29, R31, R32, R35, R36, R37, R38	RESISTOR, American symbol	
R24, R25, R34, R35	RESISTOR, American symbol	
Y1	Abracon 32.768kHz Crystal 2-SMD, No Lead 3.2 x1.5 x 0.9mm	815-ABS07W32.768KD1T
G1	Battery cell clip for CR927	3030
IC4	3.6A Brushed DC Motor Driver	595-DRV8871DDA
IC1	Real Time Clock	DS1338-33
IC2	Dual Comparator	LM393DR
U1	Micro-SD / Transflash card holder with SPI pinout	2908-05WB-M
T3, T4, T5, T6	MOS FET	PMV65UNEAR
J2	Power Jack Connector 2.1x5.5mm	PJ-202A
S3, S4	Toggle button push/push	PS-2214-L NS PA
U$2	Arduino Diecimila/Duemilanove	
OLED	4-pin connector	
S1	Momentary Switch (Pushbutton) - SPST - w/ LED	
S2	Momentary Switch (Pushbutton) - SPST - w/ LED	
MOTOR, PWR		
SENSE1, SENSE0		