Introduction

The City and County of San Francisco (City) is considering the feasibility of its options for developing a highly accessible, open source voting system (System), and the costs and time frames associated with those options.

- A feasibility assessment was conducted by Slalom – a consulting firm based out of San Francisco. The purpose of this assessment is to inform the City of the feasibility of its options.

The assessment intended to:

- Lay out the scope of voting system to help frame the assessment and create cost estimates

- Explain the assumptions and considerations relative to Open Source software development, program delivery, system build, certification, run, and maintain phases

- Explain the required capability model required to successfully execute this project

- Confirm the options that were assessed, the methodology of assessment, and the evidence-based approach to evaluating those options

- Summarize the costs, timelines, and risks associated with each option

- Provide a set of actionable next steps for the project sponsor

The assessment did not intend to:

- Be a detailed design document for a voting system

- Make recommendations on specific partners, vendors, or technologies

- Provide a definitive option recommendation to the City and County of San Francisco

- Discuss the possibility of legislative change at the state or federal level

Summary of Options Assessment

A number of delivery options were evaluated during this assessment. We believe that the highest likelihood of project success, from a balance of cost, time to market, and risk, is to...

- Have this program be owned by the city, specifically the **Department of Technology**. Hire or reassign the required expertise to administer and guide this project.

- Enlist **multiple vendors** for the entire build phase and contract them for ongoing operational support.

- Commit to building the **Open Source community** and only start relying on the community for delivery of new features once it has been proven to be engaged and reliable.

- **Partner with LA County** that has developed human-centered/accessibly designed furniture and electronic voting devices already.

- **Partner with a jurisdiction**, ideally within California, so that the certification is only with one body - the Secretary of State of California. This will allow for sharing of costs.

- **Partner with existing open source voting group(s)** like (but not limited to) OSET Institute to learn from and possibly build upon the assets that they have already created.

- Approach the project in an **agile manner** aiming to provide value as soon as its developed.

- Conduct an in-depth assessment of **Open Source licensing models** and only proceed with an Open Source license when the implications are understood by key city stakeholders such as IT and the legal department.

Cost Elements of System

Contingency % reduces as the uncertainty reduced (i.e. better understanding of scope, confirmation of certification process, identification and confirmation of vendors, establishing partnership with other CA-based jurisdictions etc.)

Discovery and System Development* ($11.5 - 26.2m)

Discovery $1.1-1.3m		
	$1.2-2.9m	Ballot Creation System
	$1.0-2.4m	Remote Accessible Vote By Mail System
	$4.5-10.7m	Accessible Voting Device System
	$1.1-2.7m	Precinct Ballot Counting System
	$0.9-2.2m	Central Ballot Counting System
	$0.8-2.0m	Vote Tabulator System
	$0.8-2.0m	Vote Reporting System

Certification Deposit* ($0.4m)

Hardware ($6.3 - 16.2m)

$3.1-9.8m	Ballot marking device
$0.3-0.6m	Scanners
$2.9-5.9m	Precinct scanners

Ongoing Annual ($3.3 - 6.5m)

$1.0-2.0m	Hardware Storage (Accessible Voting Device)
$0.5-1.0m	Application Hosting
$1.8-3.5m	Professional Services Roles

Per Election ($3.4 - 4.8m)

$1.0-2.0m	Support
$0.5-0.9m	Maintenance & Licensing
$1.9m	Paper Ballots and Poll Workers

*The State of California certification process represents a significant cost to the project. The professional services cost already includes the consulting costs required (approximately 15% of the professional services costs) to oversee the process.

In addition, there is a deposit cost paid to the State for certification. It is estimated this number will be **$360k** for the overall system/solution.

Discovery and System Development ($11.5-26.2m)

The estimates themselves have a range of effort/time/cost in addition to the 100% contingency applied

System Build Phase	From	To	Inc 100% Contingency	Basis
Discovery	$ 1.12	$ 1.34	$ 1.34*	4 month duration with 7 resources (full and partially engaged) at an average rate of ~ $263/hr. *No additional contingency required.
Ballot Creation (Build)	$ 1.20	$ 1.45	$ 2.89	Cost basis: Average rate of $237/hr **Build** -- 5 month duration with 8 resources (full and partially engaged) **Certification** – 5 month duration with 4 resources (partially engaged only)
Remote Accessible Vote By Mail	$ 0.98	$ 1.18	$ 2.36	Cost basis: Average rate of $238/hr. Requires Ballot Creation work to be completed first **Build** -- 4 month duration with 7 resources (full and partially engaged) **Certification** – 4 month duration with 4 resources (partially engaged only)
Accessible Voting Device System	$ 4.45	$ 5.34	$ 10.68	Cost basis: Average rate of $245/hr. Largest most complex component **Build** -- 8 month duration with 14 resources (full and partially engaged) **Certification** – 8 month duration with 7 resources (partially engaged only
Precinct Ballot Counting	$ 1.12	$ 1.34	$ 2.68	Cost basis: Average rate of $238/hr. Slightly less on certification costs past this point since the certification process should be well understood by this point in development. **Build** -- 5 month duration with 7 resources (full and partially engaged) **Certification** – 4 month duration with 4 resources (partially engaged only
Central Ballot Counting	$ 0.91	$ 1.09	$ 2.18	Cost basis: Average rate of $238/hr. Assumes Precinct Ballot Counting System is done first. **Build** -- 4 month duration with 7 resources (full and partially engaged) **Certification** – 4 month duration with 4 resources (partially engaged only
Vote Tabulator	$ 0.83	$ 1.00	$ 2.00	Cost basis: Average rate of $243/hr **Build** -- 3 month duration with 8 resources (full and partially engaged) **Certification** – 3 month duration with 4 resources (partially engaged only
Vote Reporting	$ 0.85	$ 1.02	$ 2.04	Cost basis: Average rate of $237/hr **Build** -- 3 month duration with 8 resources (full and partially engaged) **Certification** – 3 month duration with 4 resources (partially engaged only
Build Total (Baseline option)	**$ 11.46**	**$ 13.75**	**$ 26.16**	
Build Total (Opt 4 = less 40%)	$ 6.88	$ 8.25	$ 15.70	Building upon existing assets results in a lower cost due to shorter time to completion.

Resource Mix – Discovery, Build/Test, Certify, and Run

The project is set up to be run in an agile manner, but there is a procurement and scoping/discovery phase to take into account
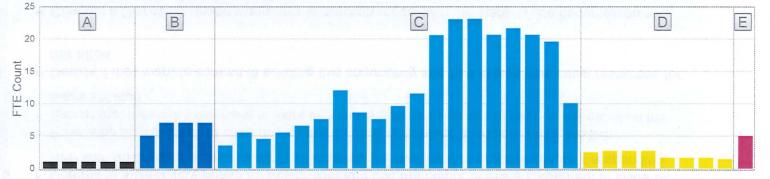
No	Tasks	Dur. (mo)	Phase	Year 1												Year 2												Year 3											
				1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	Discovery / Requirements Gathering	3	1																																				
2	Central Ballot Counting	8	2																																				
3	Vote Tabulation	7	2																																				
4	Vote Reporting	7	2																																				
5	Precinct Ballot Counting	9	3																																				
6	Vote by Mail System	8	3																																				
7	Ballot Creation System	10	4																																				
8	Accessible Voting Device System	16	4																																				

A. Procurement (1FTE)
- 1x Technical Project Manager

B. Discovery Phase (4 months, 7FTE)
- 1x Product Manager
- 1x Project Manager
- 1x Software Architect
- 1x Software Architect
- 1x Security Architect
- 2x User Experience

C. Build, Test, Certify Phase

Build (~19months, ~15FTE)
- 1-2 Project Managers
- 1-2x QA Engineer
- 1x Data Engineer (first 3months of build phase)
- 1x Furniture Designer (last 8months of build phase)
- 1x Mobile Software Engineer (last 6months of build phase)
- 1x Peripheral Engineer (last 8months of build phase)
- 1-2x Software Engineer
- 1-2x Software Architect
- 1-2x Security Architect
- 2x User Experience
- 1x Data Architect

Throughout latter part of Build, and all of Test, Certify (24months total)
- 1x Certification PM

D. Support through final system certification (8months) 3FTE
- Part Time Data Architect
- Part Time Furniture Designer
- Part Time Mobile Software Engineer
- Part Time Peripheral Engineer
- Part Time Security Architect
- Part Time Software Architect
- Part Time Software Engineer

E. Ongoing
- 1x Yearly Program Management
- 1x Product Owner
- 1x Community Manager
- 1x Yearly Software Architect
- 1x Yearly Software Engineer

Key Risks and Mitigation Actions (1/2)

For a project of this nature to be successful, the following risk must be considered with regards to developing, sustaining and securing the system.

	Risk	Mitigation / Decision to make
1	Fundamental Change to Current Solution Delivery Model	▪ Determine if they are willing to make this shift and if so commit to develop this capability and position this capability in the Department of Technology
2	No Specific Requirements for a Voting System	▪ Commit to a Discovery phase for this project and use the output of this engagement to issue an RFP with an amount of detail which will increase the likelihood of multiple vendor's responding.
3	Ability to attract and engage multiple vendors	▪ Have a backup solution in case this approach does not deliver a reliable voting system. ▪ Expect that they will likely have to work with many different vendors to deliver and maintain the entire solution.
4	Ability to establish a healthy, functional, and reliable O/S Community	▪ Decide if they want to commit to building this community and hire at least two initial resources for this effort
5	Certification of the system(s) with the Secretary of State	▪ Conduct a Discovery phase where this interaction model with the state will be documented and negotiated with the Secretary of State. ▪ In addition, the Discovery phase should define a specific phased approach to implementation examining the existing system and the constraints it will impose. This will better define the requirements of how the City of SF and the State will need to work together.
6	Choice of open source license type	▪ Align and agree on the license with which the city is most comfortable and engage key project stakeholders and the legal department for the city to do a full analysis of licensing models and the implications of each.

Key Risks and Mitigation Actions (2/2)

For a project of this nature to be successful, the following risk must be considered with regards to developing, sustaining and securing the system.

	Risk	Mitigation / Decision to make
7	Partnerships effect on delivery timeline (collaborating with other jurisdictions)	▪ Evaluate these partnership options and determine what mitigations can be put in place to maintain control of the requirements and timeline.
8	Legislative constraints of SF being a paper-based jurisdiction	▪ Conduct an analysis of the cost and value trade off to change the legislative constraints.
9	Transfer of Security Risk	▪ If the City develops a new system from scratch they need to be comfortable with the transfer of responsibility for security from a shared responsibility (vendor and City) today to a complete responsibility. Alternatively, they need to find a build and run partner who is willing to assume this responsibility with them. ▪ Consider if this risk is one it is willing to assume. If not, then look for partners who can share the responsibility and clearly define the liability assumed by each party or parties.
10	Quantifying value of the program	▪ Conduct an assessment and comparison of the alternatives uses for this capital should be conducted to ensure that this investment is appropriately prioritized against the City's portfolio of needs.
11	Complexity of souring vendor support and managing multiple concurrent RFPs	▪ Determine which office within the city has the capacity and capability to run the RFP process(es) ▪ Commit to finding a single vendor for the design phase in order to reduce the overall program risk ▪ Limit the number of RFPs to a the smallest possible number to decrease complexity. A strategy for doing this should be developed in the discovery phase. ▪ Evaluate the optionality for vendors to bid on more than one sub-system so as to generate economies of scale in their detailed design and development

Appendix

Critical Project Initiation Criteria

There are a number of milestones that must be reached or actions that need to be undertaken before we can assume that the project has officially started and the overall project timeline can commence.

Obtain a Memorandum of Understanding from the Secretary of State

- To confirm that the modular nature and agile production process of the system design and build can be certified in a timely manner and that a service level agreement can be established, or at the very least written assurances of the ability to meet certain timelines for certification given agreed upon criteria.

Finalize Budget and Funding

- Define Budget: Define total amount of financial resources that needs to be allocated for this project, including YoY costs, capital/operating expenses, etc.

- Determine Funding Allocation: Allocate funding per department resources needed, and see if there are gaps that need addressing.

- Plan and Estimate Spending: Within each category of spend, determine the forecast of costs over time and the means by which each will be tracked. Allow for cost contingency on any external contracts, and time contingency on internal spend.

Open Source License Legal Review

- Complete the legal review of the open source license type (GNU Public License, version 3) that the City has identified as their preference to confirm any issues throughout the product lifecycle

Prepare For and Officially Initiate a Project

- Select a proposed option: Based on the evaluated options, determine which options makes most sense to move forward with project.

- Determine Project Leadership: Define requirements for leaders (e.g. project owner, product owner, budget manager, program manager).

- Build Project Operating Model: Understand and build out a model for what the organizational structure will look like to run the project, and how they will deliver value.

- Define Roles & Responsibilities: Define requirements for what each team member must do to be successful.

Hardware, Ongoing Annual, and Per Election Costs

Hardware	From	To	Inc 100% Contingency	Basis
Accessible Voting Device units	$ 3.05	$ 4.88	$ 9.76	Includes peripherals for accessibility, scanning/printing and furniture. Assuming 1220 units at $2500-$4,000 per unit. (LA county's project which is ready for manufacturing has a per unit cost of 4k per unit. This forms the higher end of the estimate.)
In Precinct Scanners	$ 2.93		$ 5.86	Assuming 610 scanners at $4,800 per unit. This is the same as is in use today.
Scanners	$ 0.30		$ 0.60	Industrial High Speed Scanners - deliver and setup
Hardware Total	$ 3.35		$ 16.22	

Ongoing Annual	From	To	Inc 100% Contingency	Basis
Hardware Storage	$ 1.00		$ 2.00	Assumes the continued usage of Pier 48 as is being used today.
Application Hosting	$ 0.50		$ 1.00	It is expected that where possible cloud-based hosting will be used.
Professional Services Roles	$ 1.77		$ 3.54	The roles expected from professional services would therefore be: Program Management (1), Product Ownership (1), Open Source Community Management (1), Software Architecture (1) and Software Engineering (1). Hourly costs for these roles are expected to be slightly less than the rates in the build phase due to the full year commitment.
Ongoing Annual Total	$ 3.27		$ 6.54	

Per Election	From	To	Inc 100% Contingency	Basis
Support	$ 0.98		$ 1.97	Support of the technology and machines used during elections.
Paper Ballot Costs*	$ 1.39		$ 1.39	Paper ballot costs are not expected to change. Accessible Voting Devices will support the existing paper-based process instead of replacing it.
Poll workers for day of election*	$ 0.51		$ 0.51	$142 to $195 stipend for 3k workers.
Poll worker training*	$ 0.02		$ 0.02	10 people by 16 hours at 85/hr rounded up to 15k
Maintenance and Licensing	$ 0.47		$ 0.94	Current Dominion system cost for this line item is $483K. The licensing fee is eliminated by an open source system but offset by the maintenance costs of doubling Accessible Voting Devices from 610 today to 1220 in the new system.
Per Election Total	$ 3.36		$ 4.81	

* These costs are the same as those incurred presently and thus represent no change from the current state. They are included here to confirm that there is no additional costs in these categories.