A SECURE, ANONYMOUS AND VERIFIABLE E-VOTING SYSTEM

BY

OOI ELYNN

A REPORT

SUBMITTED TO

Universiti Tunku Abdul Rahman

in partial fulfillment of the requirements

for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

INFORMATION SYSTEMS ENGINEERING

Faculty of Information and Communication Technology

(Kampar Campus)

JAN 2019

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DECLARATION OF ORIGINALITY

I declare that this report entitled "**A SECURE, ANONYMOUS AND VERIFIABLE E-VOTING SYSTEM**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

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Date : 02/04/2020

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I would like to express my sincere thanks and appreciation to my supervisors, Dr. Gan Ming Lee who has given me this bright opportunity to engage in online voting project which involving the network security. Dr. Gan has guided and motivated me throughout the whole process. His guidance has widened my knowledges in the network security field.

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Nevertheless, I would like to take this opportunity to highlight the contribution of my family as I would not be able to go this far without their consistent support. A million thanks to my family who supported and encouraged me throughout my studies.

ABSTRACT

This project is an online voting system that involve some network security which ensure a more secure, anonymous and verifiable E-Voting System. Readers will be able to gain some knowledges regarding the types of existing voting system and their vulnerabilities. The problem being emphasized in this project is regarding the security, anonymity and verification issues in an E-Voting System. These issues are serious security threat during the election process as it may affect the accuracy and reliability of the election result. Therefore, this paper studies the disadvantages of the existing voting system by looking through the method used by the society. Furthermore, this paper also proposes a more secure voting system which uses some encryption and hashing algorithms in order to solve the negative impacts of the existing voting systems. Besides that, it will also ensure that the identity of the voters is not traceable and the votes casted are verifiable by the voters themselves to prevent bogus votes. In short, a more accurate and reliable election result can be produced by the implementation of proposed solution.

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LIST OF ABBREVIATIONS

AES	Advanced Encryption Standard
BMD	Ballot Marking Device
DRE	Direct-Recording Electronic
EBM	Electronic Ballot Marker
ID	Identity Document
MD5	Message Digest Algorithm 5
NRIC	National Registration Identity Card
PC	Personal Computer
PIN	Personal Identification Number
PVS	Paper-based Voting System
RAM	Random Access Memory
SSL	Secure Sockets Layer
VVPAT	Voter-Verified Paper Audit Trail

CHAPTER 1: INTRODUCTION

1.1 Problem Statement

The main problem faced when using the traditional voting system is the voters need to go to their respective polling station personally then only, they can cast their votes. Voters need to arrange their time and transport in order to vote for their candidates. Since most of the polling stations are placed in the city, hence people who live in the rural areas will need to spend some time travelling to their respective polling stations. Thus, by developing the E-Voting System, voters get to cast their votes anywhere and anytime as long as they have a PC and there is an access to the Internet.

Moreover, the traditional voting method is time consuming as voters need to spend a lot of time queuing up at the polling station to wait for their turn in order to cast their votes. For instance, some voters have started queuing up before sunrise to avoid the crowd although the polling stations opened at 8am (John & Kumaran 2018). Some voters mentioned that they have to arrive at the polling centre as early as possible because they are still working during the election day and their company only give them two hours exemption. Some of the voters even turn out to vote after seeing the long queue. Therefore, E-Voting System is designed in order to make the casting process to be easier and more convenient as voters can cast their votes by using their own devices.

In addition, the use of traditional voting system unable to ensure the anonymity of voters. People who are physically challenged or living abroad may need someone to cast their vote on behalf. The privacy is breached in such cases as the person who help to cast the votes able to know the voter's identity and their choices of candidate. The proposed E-Voting System allows the voters to cast the votes using voters' own PC, therefore they do not actually need to get someone to vote on behalf of them. Hence, the others will not get to know which candidates they have voted for.

The votes casted using the PVS are not secure and verifiable. People can easily place few bogus paper votes into the ballot box. In this case, it becomes impossible to track the honest votes because no names will be written on the ballot papers due to the voter's privacy. There is also no way for the voters to check and verify whether their ballot has been casted correctly. Melati (2018) stated that voters who live abroad would rather vote themselves because they lack faith in the integrity of the postal voting process. In this E-Voting System, only the verified voters with E-ballot ID get to cast their votes and there will be also a hash ID generated to the users after they successfully

casted their votes so that they can use it to check and verify their votes during the announcement of the vote results.

1.2 Background and Motivation

An individual or body of individuals able to express their opinions or choices formally, either positive or negative through voting (Dictionary.com, n.d.). Voting often happens when there is an election or a referendum. Voters or electors have to register themselves before participating the voting process. However, not all people are eligible to register as a voter, only people that fulfil the qualification criteria can. For instance, Malaysian citizens need to be at least 21 years old in order to vote during the general election.

Paper-based voting system also known as the traditional form of voting. During the voting process, a ballot paper or election paper containing a list of candidates running for an election will be prepared for the voters so that they can mark their preferences accordingly (GOV.UK, n.d.). The creation and distribution of ballot papers must satisfy certain requirements as it considered as the official documents (POLYAS, n.d.).

There are various voting methods like voting in person, voting by post and voting by proxy. The registered voters will need to go to their respective polling station in person. After arrive to the destination, voters will need to queue and wait for their turn. They will be given a ballot paper after their identity has been identified. Voters need to follow the instructions given at the polling station strictly and place their votes into the ballot box prepared after marking down the choice privately.

For voters who are abroad and wish to participate in the voting process, they can choose to vote by post as long as they are eligible voters. Posting vote is a way of voting through the postal system. Gabriel (2018) mentioned that the purpose of having this voting system is to help the absent voters like full-time student, police officer, military officer or government servant to get their votes in. Ballots will be mailed directly to the eligible voters at their overseas address. Voters need to make sure that there are no marks, misprints or defects on the ballot paper before marking the vote and lodge a report to get a replacement ballot paper if there are any. After marking down the choice, voters will need to fold and put the ballot back into the envelopes provided. Voters need to take note that the vote will not be counted if the paper ballots were

placed in a wrong envelope. After sealing the envelope, voters can then deliver the marked ballot back as quickly as possible before the deadline.

The word proxy means that an authority is given to a person to act for someone else (Cambridge Dictionary, n.d.). An individual who may not be able to vote in person can get someone to vote on their behalf through voting by proxy but the they can only apply for a proxy vote under some circumstances (Investopedia, n.d.). Most investors choose to elect a professional to vote in their place or vote by proxy rather than physically attending the shareholder meeting. The shareholders will receive a proxy ballot and an information booklet known as a proxy statement mentioning the issues to be voted on. Proxy votes may be cast by either phone, mail or internet before the deadline or the cut-off time which is normally 24 hours before the shareholder meeting.

Along with the advancing technology, people have developed innovative methods or gadgets to make their life easier but PVS is still one of the most trusted methods used for vote counting. Based on Hina (2017), the traditional method ensures that people with low literacy level or people who are not technology savvy such as senior citizens can also cast their votes. Moreover, the paper ballot is effective in decreasing fake and bogus votes because it is a manual voting form which cannot be manipulated with malicious malware. Each voter gets only one slip to cast their votes so changing votes in the paper ballot is not easy.

However, the PVS also comes with some downsides. Firstly, the ballot paper is a flammable substance, therefore the ballot papers may get damaged under certain circumstances then become impossible to get the records of the votes. Furthermore, the ballot papers used during the voting process need to be printed and mailed in a large amount. Thus, the cost of expenditure using the traditional voting is high and expensive (Sarah 2018). If the voters choose to vote by post, the waiting time for mail-in paper ballots can be time-consuming and inefficient. During post-election, it often takes more time to count the votes before announcing the results and there is no way to audit the system unless the responsible people re-count the votes.

1.3 Project Scope

This project aims to create and design an E-Voting System that is secure, anonymous and verifiable. The E-Voting System will be design with the aim of solving the problems faced using the existing systems.

E-Voting System is an online voting system that enables the voters to cast their votes securely and anonymously. It also ensures that the ballot casted is verifiable by the voters in order to prevent fake and bogus votes. As long as an individual owns a PC and can access to the Internet, he or she can easily cast their votes anywhere and anytime without wasting their time queuing up at the polling station. However, the proposed system unable to ensure the ballots are not transferrable.

The way of using such system is easy. First, an individual will need to register for an E-ballot ID using his or her NRIC. Since everyone only contains only one NRIC, everyone will obtain only an E-ballot ID, duplicate votes can be prevented. Only the eligible voters are able to get the E-ballot ID. Next, voters need to cast their votes using the E-ballot ID. Every E-ballot ID is unique and assigned randomly by the system, thus each individual will only know their own ID. This helps to maintain the anonymity of the voters. Others are unable to trace the voters' identity. However, the voters will need to ensure that their ID is not known by others because an individual can actually cast on behalf of the eligible voters if he or she knows the ID.

After casting the votes, the ballot will be encrypted and a hash ID will be generated. The hash ID is again randomly assigned by the voting system to let the voters to verify their votes during the result announcement. Having the hash ID helps to prevent any middle man attack during the voting process. If the hash ID value assigned after the casting votes is different with the hash ID value during the vote results announcement, it means that the votes have been altered by someone. Voters can report this issue to the election officials.

By developing and implementing this system, voters do not need to worry about the security and privacy issues while casting their votes anymore. They also do not need to spend too much of their precious time while participating in the voting process as the casting process can be done in just few minutes using few simple clicks.

1.4 Project Objectives

i. Ensure that only eligible person could participate in the voting process.

   The E-Voting System will verify the identity of an individual first before issuing a unique E-ballot ID to that person. An individual need to register themselves as a voter using their NRIC. After receiving NRIC, the system will verify whether the person is qualified and eligible. Only people who owns the E-ballot ID can participate in the voting process. People who do not fulfil the

basic requirements of the election are unable to register themselves as voters. For instance, only Malaysians are eligible to vote for the Malaysia election, hence people from other countries unable to get the unique E-ballot ID from the E-Voting System.

ii. Ensure the authenticity of submitted voters.

As NRIC is needed during the registration of becoming as a voter in E-Voting System, thus people who do not own a NRIC unable to register themselves successfully. This ensures that only citizens of that particular country able to vote. Furthermore, the system ensures that each voter will only obtain one unique E-ballot ID in order to prevent any duplicate and bogus votes. In this way, the vote results will be more accurate and reliable.

iii. To ensure votes cannot be trace to a voter's identity.

By using the E-Voting System, voters will cast their votes using the E-ballot ID instead of their own NRIC. Every voter will only know their own E-ballot ID but not other's ID. This is because the IDs are uniquely and randomly assigned by the E-Voting System. This ensures that the choices of candidate chosen by each voter are not traceable by the others.

iv. Voters are able to anonymously verify their selection.

After casting the votes, the E-ballot will be encrypted using the MD5 Hashing Algorithm before submitting to the E-Voting System. The hashing algorithm will provide a unique Hash ID to the voters for further verification. At the end of the voting process, all votes results will be posted at the E-Voting System together with the Hash ID. If the Hash ID have the same value before and after submission of votes, this means that the E-ballot was not been altered by the others. On the other hand, if there is a middle man attack, the encrypted ballot will contain different Hash ID.

1.5 Proposed Approach/Study

In this project, the E-Voting System will be implemented using the waterfall model as shown in Figure 1.1 because the system needs to be planned and executed carefully. The life cycle of the waterfall model is developed into 5 phases which are

requirements definition, system and software design, implementation and unit testing, integration and system testing as well as operation and maintenance.

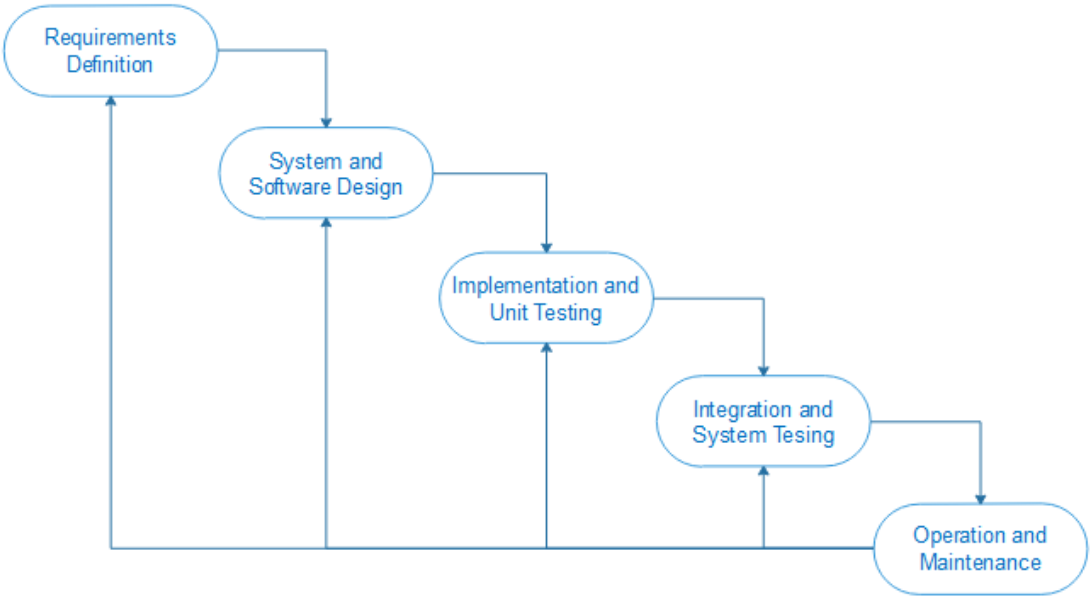

Figure 1.1: The waterfall model.

1.5.1 Requirements Definition

The waterfall model begins by defining the requirements of the E-Voting System. In this phase, detailed project scope, objectives, documentations and schedule should be identified and well-defined. In order to gather information for this project, some research will be done.

At the end of this phase, system requirements and project timeline will be generated. The development of the E-Voting System will progress according to the schedule as planned on the project timeline to ensure that every task defined will be accomplished on time.

1.5.2 System and Software Design

This phase focus on the design of important functionalities for the E-Voting System. Some use cases and specific criteria will be defined and created. The functionalities will be prioritised across the use cases and the criteria. Furthermore, system requirements including the necessary hardware and software will be configured and tested by replicating the real environment.

At the end of this phase, the design of the system will be delivered and a prototype of the E-Voting System should be worked out as soon as possible.

1.5.3 Implementation and Unit Testing

Each functionality modules of the E-Voting System will be implemented and tested as scheduled. During the execution, each modules of the system have been tested independently using different test cases including positive and negative test cases. Test scripts will be run and all the results of the test are recorded.

At the end of this phase, a complete set of test cases and test results for each independent module will be generated.

1.5.4 Integration and System Testing

After making sure the previous phase contains no errors and bugs, all the modules of the E-Voting System will be implemented and tested together as a system. The system will be tested using various test cases to ensure that the modules able to perform in a proper way. The system test results will be recorded.

At the end of this phase, a complete set of test cases and test results for the E-Voting System will be generated.

1.5.5 Operation and Maintenance

During this phase, the results are reviewed and validated. The results generated will be used to compare with the project adjectives as it can be used to determine the achievement of the project.

At the end of this phase, the finding summary will be delivered.

1.6 Highlight of What Have Been Achieved

Firstly, by developing the E-Voting System, it saves the precious time of all voters as they do not need to go to their respective polling station and queue up personally in order to cast their votes anymore. With the access to the Internet and a PC, they can easily choose their options anywhere and anytime. Voters no longer need to arrange their time and transport in order to arrive to the destination and also do not need to spend time queuing up at the polling station. As long as an individual has a valid NRIC and fulfil the requirements of being an eligible voter, they can cast their

votes using the system. This probably will ease the citizens that are working or living abroad.

Other than that, the E-Voting System able to hide the identity of the voters. This is because the voters will cast their votes using the randomly assigned E-ballot ID instead of their NRIC. The E-ballot ID will not be known by the others including the election officials. In this way, nobody will actually know who you are voting for. The system will also be designed to let the people who are physically challenged to make their votes. For instance, voters who have vision impaired can enlarge the font size on the system's interface to ensure that they can see the words clearly. They no longer need someone to cast vote on behalf of them and thus the privacy can be ensured.

After the votes have been casted successfully, voters will receive a unique hash ID that was randomly assigned by the system. The purpose of having the hash ID is to let the voters to check and verify their votes during the announcement of the vote results and also prevent the votes from being modified by the hackers. If there is a middle man attack during the voting process, the hash ID value received after voting and during the announcement of the results will not be the same. If this situation happens, the voters will get to know that their votes have been altered and they can simply report this case to the election officers. By implementing this system, it can used to prevent most of the bogus ballots and hence it will be more secure.

Last but not least, since the E-Voting System is a system that will be implemented online, the development and maintenance cost will be low. The election officers will only need to ensure that the system is maintain up to date and can be used during the election day. No human needed to carry out the calculating and result tabulating process so the labour costs will be reduced and human errors can be prevented.

1.7 Report Organization

Chapter 1 is the introduction of the project which consist of the problem statement, background and motivation, project scope, objectives, proposed approach or study and highlight of what have been achieved. This section will provide a brief idea of the whole project.

Chapter 2 is the literature review of several existing voting systems. There are 6 different types of voting systems being chose to discuss in this section. Both of the

pros and cons have been listed down in this section. Besides that, this chapter also include the comparison of the proposed study and previous works.

Chapter 3 shows the system design of this project. In this section, the flow of the project will be included together with the flowchart of each different modules.

Chapter 4 includes the methodology and tools, requirement as well as the methodology implementation of this project. This section will explain the tools needed and the methodology of the voting system.

Chapter 5 covers the implementation and testing of the E-Voting System. There are few screenshots have been attached in this section to indicate how the voting system works from the beginning stage to the end stage.

Last but not least, chapter 6 is the conclusion part of this project.

CHAPTER 2: LITERATURE REVIEW

2.1 Types of Voting System

2.1.1 Gear and Lever Voting System

The gear and lever voting machine was developed in the late 19th century. It does not require any paper ballots as the votes can be casted straightaway on the machine. By referring to Figure 2.1, there is a rectangular array of small levers on the face of the machine and each of these levers were identified through its label. Therefore, each row or column will indicate the candidate's name or symbol associated with a lever. Behind the face of the machine, there is a set of counters or odometers that able to record voters' preferences up to three decimal digits which allow a maximum vote of 999 for a candidate (Smithsonian National Museum of American History 2004).

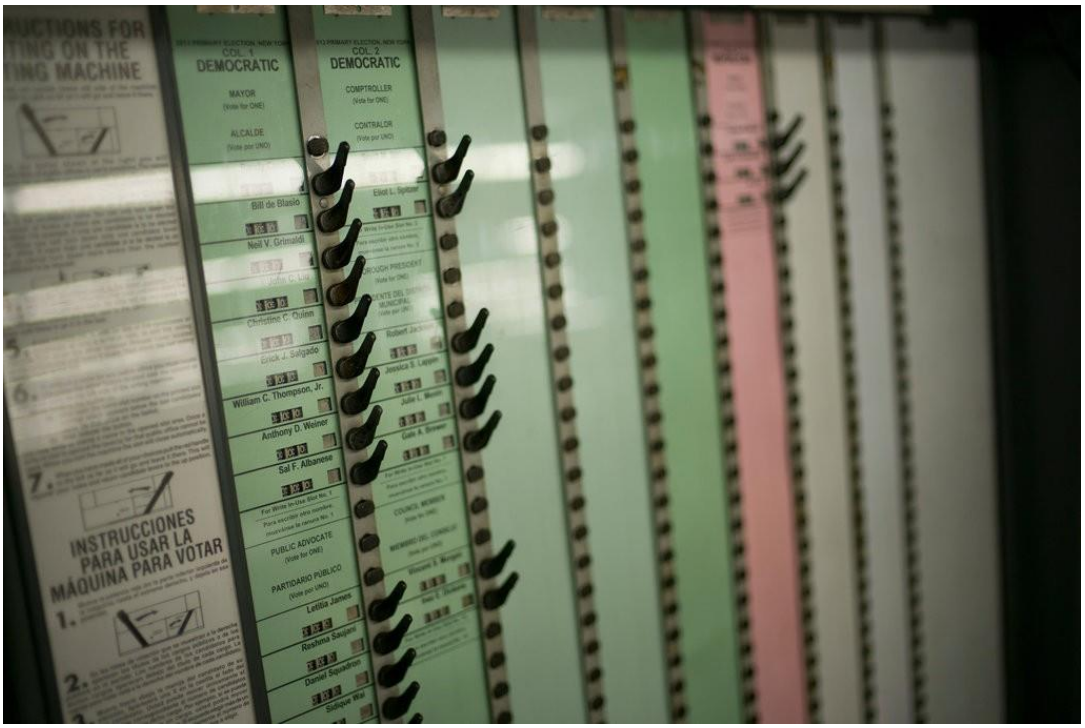

Figure 2.1: An example showing the face of the gear and lever voting machine (Thomas 2013).

Before casting the votes, voters need to unlock the gear and lever voting machine by pulling a large lever closing the curtain like the one showing in Figure 2.2. The machine will be unlocked by the movement of the lever when closing the curtain and privacy will be ensured. Voters need to pull down the levers of the desired parties in order to cast their votes. Moreover, this voting machine also able to ensure a more

accurate voting process as it is able to prevent the over vote issue. For instance, if the voters are required to vote for only a candidate, only one lever can be turned. If the voters have already casted their votes for a candidate, the remaining levers will be locked in place.

After finish voting for the desired candidates, voters need to open the curtain. The movement of the curtain will then cause the levers that have been pulled down to return to their original position and the reading of each associated odometer will increase by one when there is a return of lever. Hence, the election officials will only need to view and record the values from the odometers unlike the paper ballots where they need to count the votes one by one.

Figure 2.2: An example of gear and lever voting machine (Owen 2004).

Advantages	Disadvantages
• Reduce time consumption There are counters or odometers on the voting machine that able to records the number of votes. Hence, the election officials do not need to spend time counting the votes one by one.	• Difficult to use Voters with physical disabilities may find it difficult when operating the voting machine. For example, the voters with vision impaired may not know whether each lever is indicating which candidate when the labels were not clearly written or written in a small font size.
• Prevent over vote issue This system able to prevent the voters from casting multiple votes as the voters cannot cast their votes once the levers are being locked in place. So, the result produced will be more accurate.	• Maintenance cost The voting machine needs to be maintained from time to time as it contains an immense number of moving parts. Since each polling station will contains more than 1 gear and lever voting machine, the maintenance cost will be expensive.

Table 2.1: Advantages and disadvantages of gear and lever voting system.

2.1.2 Punch Card Voting System

This system is considered as a paper-based electronic voting system where the electronic mean of tabulation is used to count the ballots. Based on Ford (2000), the first punch card voting system has been developed and used since 1964. An example of punch card voting system was shown in Figure 2.3. The ballot is a card that allows the voters to punch holes next to their choice using a supplied punch device. After that, voters may need to place the ballot card into a ballot box or an electronic vote tabulating machine at the polling station.

Figure 2.3: An example of punch card voting system (Lori 2016).

Two types of punch card voting systems which are the "Votomatic" card and the "Datavote" card are commonly used (ACE Electoral Knowledge Network, n.d.). For the "Votomatic" card in Figure 2.4, the only information printed on the card are numbers indicating each hole. The choices or list of candidates are not printed on the card but rather on the pages of ballot holder and the voters can punch the card according to the number that corresponds to their choice. During the voting process, voters need to slip the ballot card into the holder (Verified Voting Foundation 2017). When the ballot card is inserted in the holder, it was actually placed between a plastic template with holes to help to center the stylus on the relevant position and a system of slotted rubber strips through which chad are punched. After finish voting, voters remove the ballot card from the holder and place into a ballot box. The votes may be tabulated using card readers and attached computers that able to sense which position on the ballot card contains holes. These locations are then collected and summarized in the software of the computer.

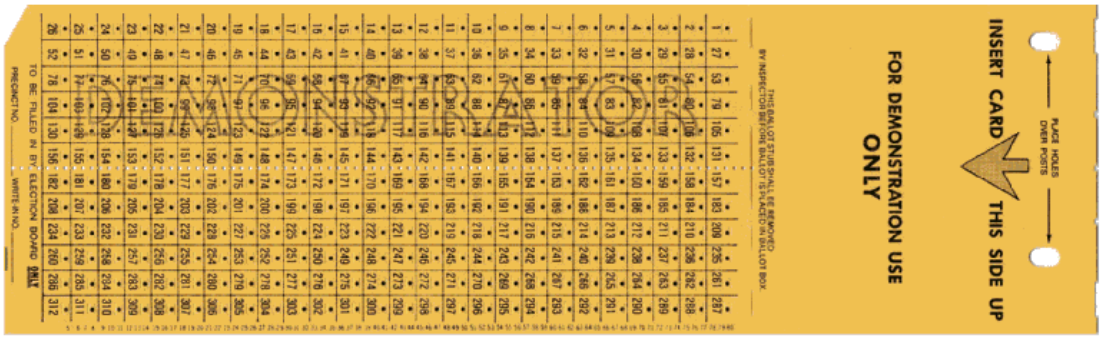

Figure 2.4: An example of "Votomatic" card (Douglas, n.d.).

For the "Datavote" card as shown in Figure 2.5, the name of the candidates and some description are printed on the ballot next to the location of the hole to be punched (Smithsonian National Museum of American History 2004). The voting process is similar to the "Votomatic" card voting system. When the ballot card is inserted in the holder, voters can use the lever of the punching device in Figure 2.6 to punch through the ballot card at the holes of the chosen candidate. After that, the ballot card will be removed and carried to the respective card reader. The reader will then sense the location of the hole and report to the computer software. The vote results will be produced by the computer and summarized after taken to a central counting station.

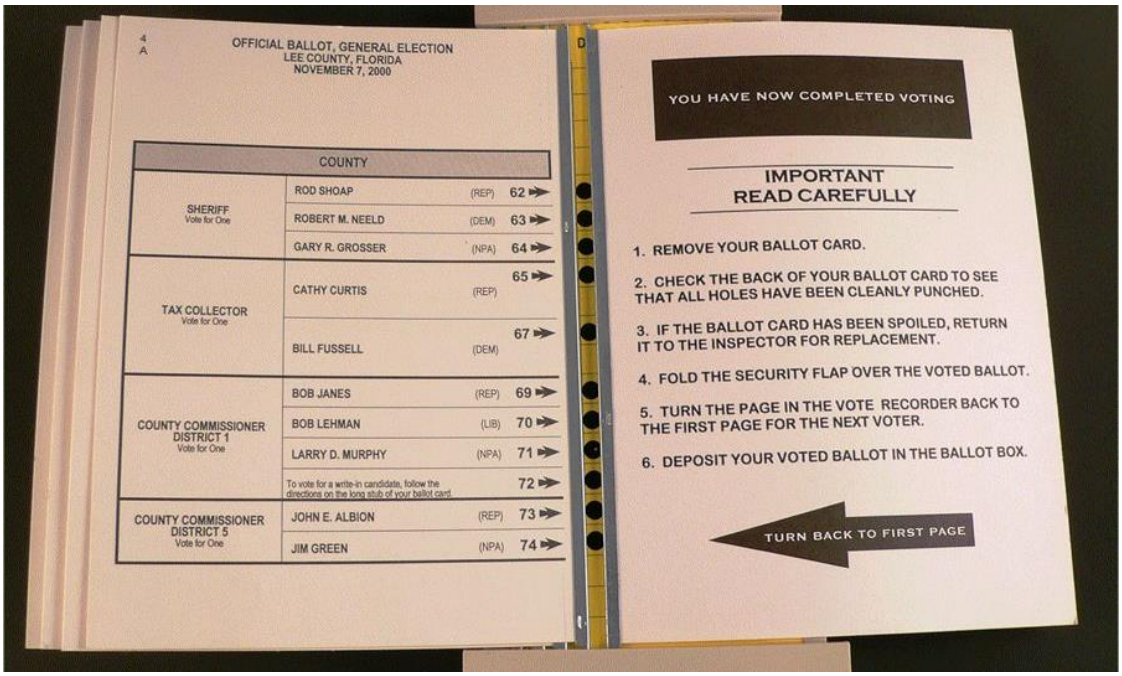

Figure 2.5: An example of "Datavote" card (United States Presidential Election 2018).

Figure 2.6: The punching device used to punch through the ballot (Smithsonian National Museum of American History 2004).

Advantages	Disadvantages
• Reduce time consumption Card readers are used to count the votes thus it speeds up the process of counting as thousands number of votes can be calculated in mere minutes.	• Unreliable result Voters need to cast their vote using a stylus to punch through the ballot card. The chad or the leftover paper that is not fully punched will cause hanging chad. The votes results will be calculated incorrectly if this situation happens (David 2018).
• Reduce human error Since the votes are counted using an electronic device, people do not need to count the votes manually and hence it reduces the calculation error caused by human.	• Difficult to use Most of the citizens found it difficult to place the ballot card into the ballot holder, aligning the names of the candidates to the appropriate locations and using the stylus to detach the chads (Harvey 2002).

Table 2.2: Advantages and disadvantages of punch card voting system.

2.1.3 Optical Scan Voting System

This system combines the paper ballots with the electronic devices. It allows an individual to record votes by making marks directly on a paper ballot which serves as a tangible record for each voter at the polling station (Brian, n.d.). Voters cast their votes on a paper ballot prepared at the polling station using only pencil or marker provided. After finish the voting process, voters need to insert the paper ballot into the optical scanner as shown in Figure 2.7 to read and count the marked ballot papers. After that, the paper ballot will be placed into a ballot box prepared at the polling station (Texas Secretary of State 2012).

Figure 2.7: An optical scanner that used to read and count the casted ballot papers (James 2012).

The common optical scan voting systems used is the mark sense system. When using the mark sense system, the vote casted on the ballot paper using a graphite pencil was known as an optical mark which can be recognized by a scanner. The mark sense system was first developed for education testing and further being proposed to mark sense ballot in 1953 (Keith 1956). Most of the mark sense ballots requires voters to use oval or elliptical shape to cast their votes. Voters need to be careful of the sensitive area of the ballot, where marks will be sensed as votes, does not need to be similar as the area outlined by the voting target. Rather, the sensitive area is defined by the geometry of the sensor itself and the positions of the index marks. The ballot in Figure 2.8 has

index marks defining 8 rows and 6 columns which consists total of 48 sensitive areas. Among all these areas, only 7 have an assigned meaning on this ballot.

Figure 2.8: An example of mark sense ballot with a total of 48 sensitive areas (Semantic Scholar, n.d.).

Some of the optical scan voting system consists of electronic ballot markers which is also known as ballot marking devices to assist the disabled voters in marking the paper ballot like in Figure 2.9. The ballot marking device enables the disabled people to vote independently as it provides accessibility features for standard optical scan ballots such as supporting multiple foreign languages, touchscreen with magnified font option for vision-impaired voters, slip and puff interface for quadriplegic voters as well as audio ballots for blind and language impaired voters (New Yorkers for Verified Voting 2009). For example, the audio interface can read the ballot to a blind voter and print the person's choices on the optical scan ballot. The BMDs do not record or count votes electronically, they only mark a paper ballot for the voters which essentially replace a human assistant. The votes are then read by the optical scanner.

Figure 2.9: An example of BMD that assists disabled people to cast their votes (Verified Voting Foundation 2017).

Advantages	Disadvantages
• Reduce time consumption The vote counting process is much faster as all votes casted are recorded using the optical scanner. The election staffs do not need to count all the votes manually.	• Security issue If an individual able to obtain a blank ballot, he or she can then mark the ballot for their chosen candidate.
• Reliable result This system allow manual recount of ballots as all the paper ballots are collected in the ballot box prepared. If the optic scanning system fails to work, the paper ballots can still be counted manually.	• Maintenance cost All optical scanning systems and EBMs need to be maintained over some time. It is costly as there are many optical scanning systems and EBMs needed to be maintained.

Table 2.3: Advantages and disadvantages of optical scan voting system.

2.1.4 Direct-Recording Electronic Voting Machine

This machine is designed to allow the voters to cast their vote directly on the machine. Voters can view their ballots on the screen and make choices using input devices like buttons or a touchscreen. This machine records all the individual votes and stores all records directly into a memory card, compact disc or other memory devices without using any paper ballot (National Conference of State Legislatures 2018). After that, the election officials will transport these memory devices to a centralized location for tabulation.

Some DREs come with a Voter-Verified Paper Audit Trail like Figure 2.10, a physical paper record showing all voters' ballots in order to provide a supporting record (ProCon.org 2008). Voters able to verify the choices marked on the paper record correspond to the choices made in the ballot. Once an individual cast his or her choice on the DRE, a paper containing the name of candidate, voter serial number and poll symbol will be printed out (People's Campaign for Resurgent Manipur, n.d.). Voter can see the printout to verify his or her vote was registered correctly without taking it out. The printout can be accessed only by the polling officers and can be used during a recount.

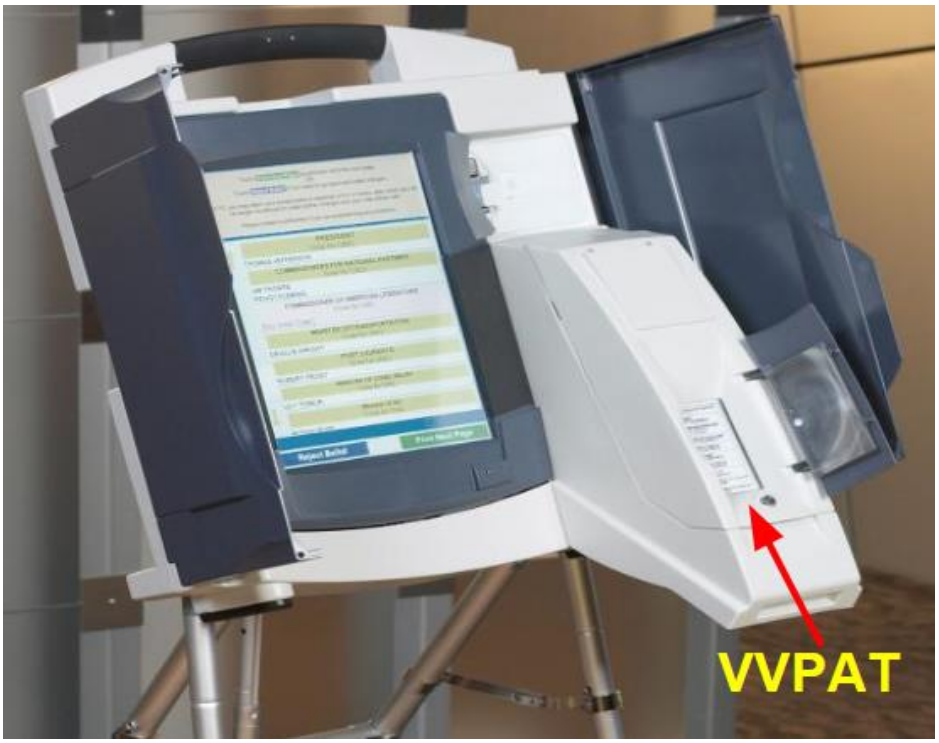

Figure 2.10: An example of DRE Voting Machine with VVPAT (Jennifer 2018).

Advantages	Disadvantages
• Convenient The election officials do not need to estimate the number of ballots needed to prepared for each possibility. They only need to ensure that there is always enough memory space to store all votes.	• Unable to ensure voter anonymity DRE voting machine that comes with VVPAT will create a physical record of each voter's choice. A voter's ballot may be linked back to a specific voter.
• Reduce time consumption Since every vote are recorded on a memory device, the tabulation of votes will take lesser time.	• Unreliable result The votes will only be stored in the memory device if DRE voting machine does not have VVPAT. A programmer may alter the electronic record of ballots casted because the votes cannot be linked back to particular voter for verification.
• Prevent human error Since the votes are recorded in a memory device, the votes need not be calculated manually. Thus, human error can be reduced.	• Multiple sources There are many DRE vendors that develop various software. Connecting different systems together may make the systems behave in unintended ways.

Table 2.4: Advantages and disadvantages of DRE voting machine.

2.1.5 On-Site Internet Voting System

Internet voting system is a system that allows voters to cast their votes from any internet-connected computer. The internet voting can further be divided into on-site internet voting and remote internet voting. On-site internet voting system is used in a controlled environment. Some instances for the controlled settings are voting places or kiosks that available in high-traffic areas where election officials are available.

For on-site internet voting system, voters are able to cast their ballots through the client machines that being distributed in the public places such as shopping malls where the hardware and software are controlled by the election officials. However, the physical environment and the voters' authentication are not directly under official control. Figure 2.11 shows an example of the on-site internet voting system using a kiosk machine.

Figure 2.11: An example of on-site internet voting system using kiosk machine (Marco 2011).

Advantages	Disadvantages
• Convenient Voters do not necessarily need to go to the assigned polling station to cast their votes. Instead, they can just go to the nearest public areas that contains the client machine in order to vote for their desire candidates.	• Vote more than once As the voters' authentication are not directly under the official control, it is hard to prevent the voters' from voting more than once because the system does not actually have the records of the voters who voted earlier.
• Reduce time consumption Since the whole voting process is carry out using the kiosk system, therefore the tabulation of votes is easier and consume lesser time.	• Result Tampering According to Hans (2015), some destructive viruses may be created by the potential criminals to attack the computer software in order to alter the result of the election through internet. Thus,

	the vote results may not be accurate.

Table 2.5: Advantages and disadvantages of on-site internet voting system.

2.1.6 Remote Internet Voting System

Remote internet voting system is used in uncontrolled environments. In remote internet voting, neither the voters' devices nor the physical environments are under the control of the election officials. Voters can cast their vote at any places such as home, workplace and public Internet terminals then the votes are transmitted over the Internet.

The first use of remote Internet voting system for a binding political election took place in the United State in 2000 (National Democratic Institute 2013). Many nations have now implemented the remote Internet voting for binding political elections or referenda only whereas Estonia is the only country that offers Internet voting to the entire electorate.

By referring the i-Voting introduced by Estonia in Figure 2.12 as an example of remote internet voting system, the internet voting system is simple and elegant (e-Estonia, n.d.). During the pre-voting period, voters need to log onto the system using their national ID card which is a smart card equipped with a computer-readable microchip to function as an electronic identity. The electronic identity enables voters to get access to the online ballot in an election and their identity will be removed from the ballot before reaching the National Electoral Commission for vote counting in order to ensure anonymity. During the voting process, voters need to insert their ID card into their computer in order to be allowed to authenticate to the i-Voting system over an SSL-encrypted channel. A voting individual will be authenticated using PIN1 whereas PIN2 will be used to confirm the voter's choice.

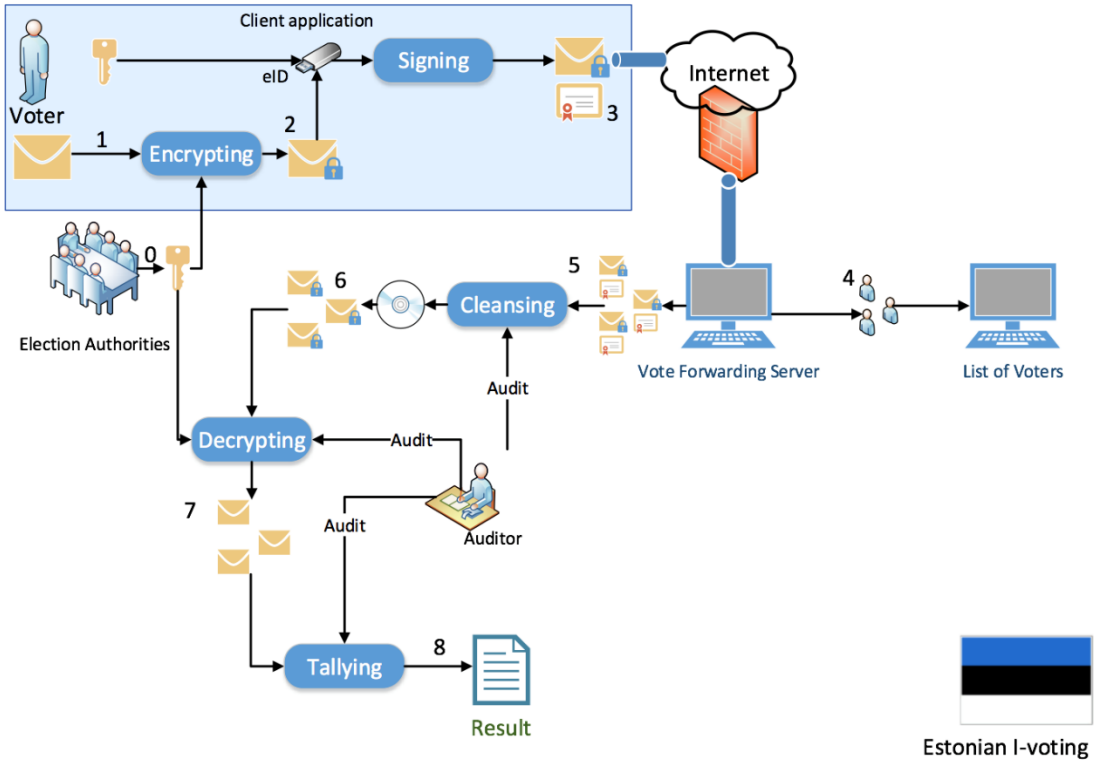

Figure 2.12: How the i-Voting introduced by Estonia actually works (Verbij 2014).

Advantages	Disadvantages
• Convenient As long as the voters have a computer and the access to the Internet, they can cast their votes at anytime and anywhere.	• Election Tampering Some savvy hackers may find ways to rig the outcome of the elections like casting votes for people who did not actually intend to vote (Lillian, 2017).
• Reduce time consumption Since the whole voting process is carry out using the system, therefore the tabulation of votes is easier and consume lesser time because the system can generate the vote results itself.	• Socio-economic issue People who live in the rural areas will face difficulties in casting a vote because there may be no Internet access at their areas (Kathleen, 2018).

Table 2.6: Advantages and disadvantages of remote internet voting system.

2.2 Comparison between Existing and Proposed E-Voting System

Most of the existing voting systems require the voters to go to their respective polling station only they can cast their votes. It is very time consuming as they need to spend their precious time travelling to the destinated station and queue up for their turn. However, for the proposed E-Voting System, as long as the voters have the access to the Internet and a device, they can cast their votes in just a few minutes in anytime and at anywhere.

Not only that, the proposed E-Voting System able to solve the anonymity of the voters. Based on the research found, the existing voting system such as the DRE voting machine which consists of VVPAT unable to hide the identity of the voters. This is because a physical record of every voter's option will be created and the physical record can be traced back to the voter. The election officials will know who does the voters vote for. The proposed E-Voting System will ensure the identity of the voters are not traceable by the others by allowing the voters to cast their votes using the randomly assigned E-ballot ID instead of their NRIC.

In addition, most of the existing voting methods are not secure and the votes unable to be verified by the voters themselves. They will not be able to check whether someone has actually modified their votes during the election process when election tampering happens where some hackers actually find various ways to rig the outcome of the elections such as alter the votes casted by the valid voters. This may cause the election results to be unreliable and inaccurate and it often happens in internet voting. In order to solve this issue, after the voters successfully casted their votes, the ballots will be encrypted and hash ID will be generated. Since the ballots are encrypted, therefore others will not be able to know the content of the ballot. If someone able to decrypt the ballots, they are also unable to edit or modify the votes casted since the hash ID are uniquely and randomly generated by the system. Once someone changes the votes, the hash ID value will as not the same as the original value generated by the system and it is hard to make the value same as the original value. Hence, voters can verify their votes by comparing the value of the hash ID during the announcement of the election results.

CHAPTER 3: SYSTEM DESIGN

In this project, the E-Voting System is divided into 3 main modules which will be implemented in 3 different pages. Module 1 will perform the verification process as shown in Figure 3.1 which validate whether an individual meets the requirements to become an eligible voter. The system will prompt the user to key in his or her NRIC. After that, the system will check whether the NRIC entered exists in the Voter Database. If the NRIC exists in the database, an error message showing "You had registered earlier" will be displayed and the process ends immediately. Otherwise, the system will continue to check whether the user is an eligible voter which aged 21 years old or above. An error message showing "You are not eligible to vote" will be displayed and process end immediately if the user is under age. Else, the system will append the security key with a string value "SALT" and encrypt using password entered and an E-ballot ID will be assigned to the. The NRIC will be stored in the Voter Database whereas the E-ballot ID will be stored in the E-BallotID Database together with the encrypted security key and E-ballot ID status.

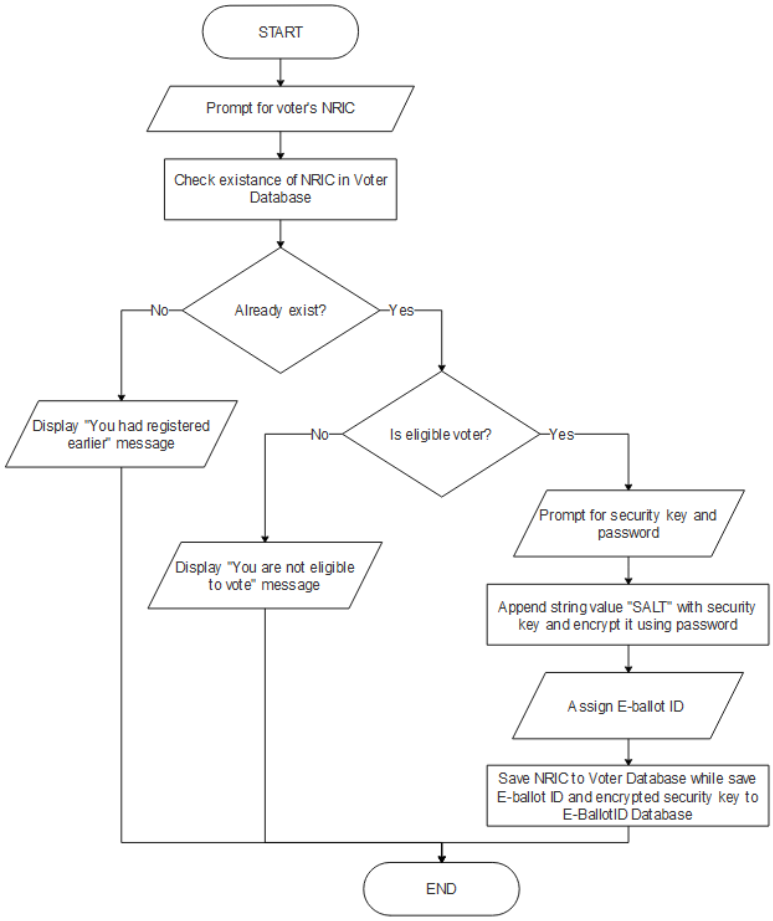

Figure 3.1: Flowchart of Module 1 which is the verification process.

In the second module, voting process will be performed. The voters are required to key in their E-ballot ID that assigned randomly by the system early so that the anonymity of the voters is able to be ensured. The system will check the existence of E-ballot ID in E-BallotID Database. An error message showing "Invalid E-ballot ID" will be displayed to the user if the E-ballot ID does not exist in the database. Otherwise, system will continue to check the status of E-ballot ID. If the status is "Done", the system will display a "You had voted earlier" message. Else, system will continue to prompt for password.

System will get the encrypted security key from the E-BallotID Database and decrypt using the password. After that, system will compare the first four character of the decrypted security key with string value "SALT". If both of the values are the different, a message showing "Invalid password" will be displayed to the voters. Otherwise, system will continue to prompt for voter's choice.

After the voters successfully casted their votes, their choices will be encrypted and a Hash ID will be generated and stored in the Vote Database for checking purpose during the release of vote result. After that, the E-ballot ID status will change from "NA" to "Done" in E-BallotID Database. The whole voting process is shown in Figure 3.2.

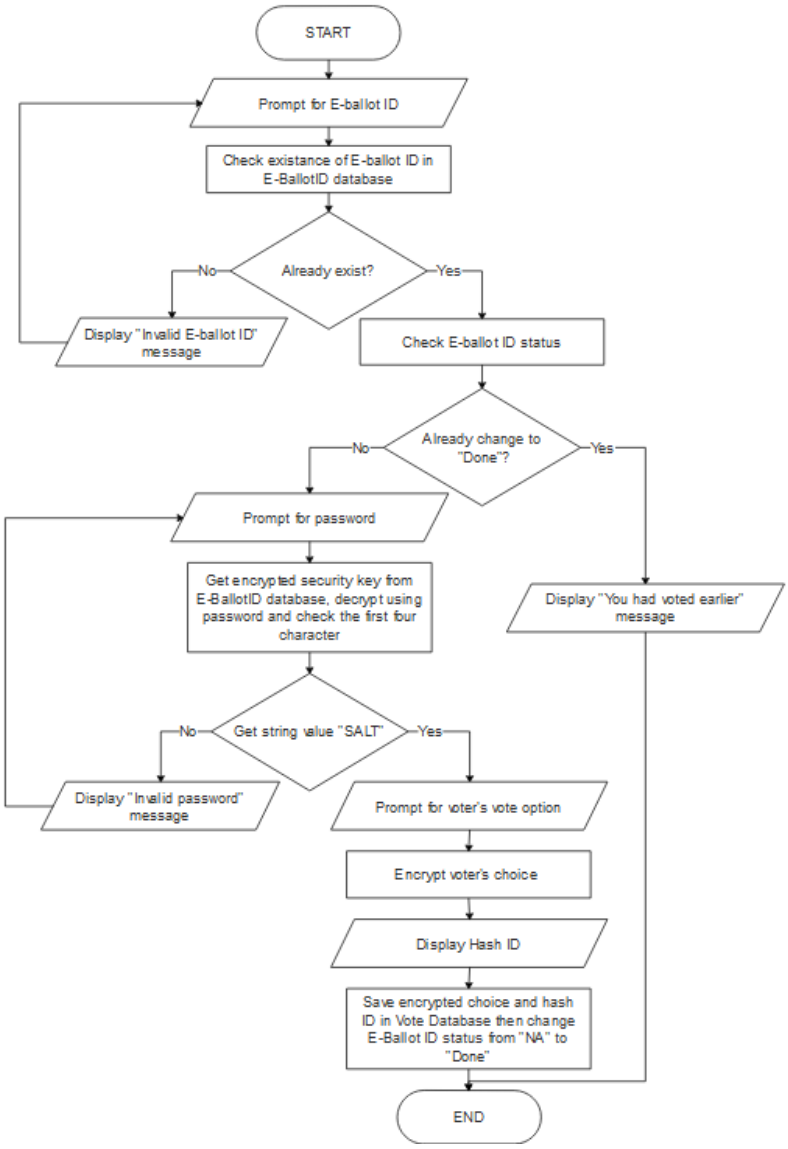

Figure 3.2: Flowchart of Module 2 which is the voting process.

Module 3 will display the final vote results and the process will be performed as shown in Figure 3.3. All of the votes will be retrieved from the Vote Database and will be decrypted in order to get the choice of candidate. After that, total votes for each candidate will be calculated. The total vote results of each candidate will be displayed in Result page whereas each voter's Hash ID and their choice will be shown in Hash Value page so that the voters can verify whether their votes are correctly casted and ensure that their votes are not being modified by the others by comparing the Hash ID value. This is because when there are changes made, Hash ID will be different.

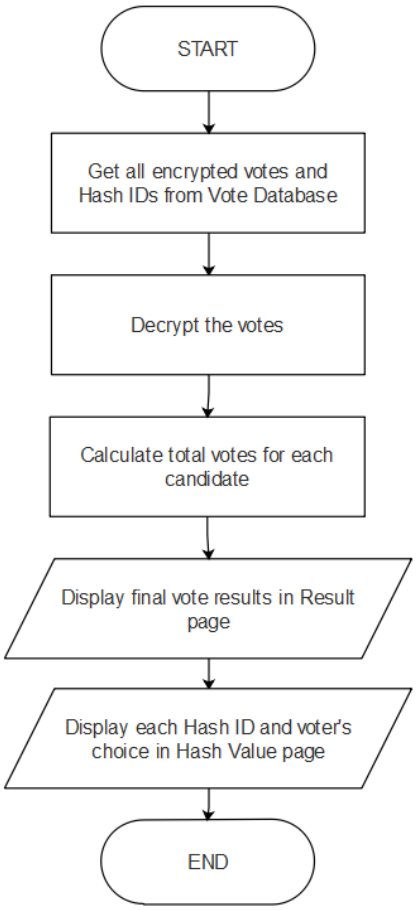

Figure 3.3: Flowchart of Module 3 which is the process showing the final vote results.

CHAPTER 4: METHODOLOGY AND TOOLS

4.1 System Requirements

4.1.1 Hardware

Laptop

Laptop is mainly used to configure and execute the E-Voting System. Table 4.1 shows the specifications of the laptop. 3 PCs are needed while configuring and executing this E-Voting System.

Operating System	Windows 8.1
System Manufacturer	ASUS
System Model	ASUS Notebook
System Type	x64-based PC
Processor	Intel® Core™ i5-4210U CPU @ 2.70GHz, 2 Core(s), 4 Logical Processor(s)
Install Physical Memory (RAM)	8.00 GB

Table 4.1: Laptop specifications.

4.1.2 Software

Atom

HTML5, CSS, JavaScript and jQuery will be used for the E-Voting System. Therefore, Atom will be used to compile the codes as it offers a variety of encryption and hashing algorithm that may be used in this project. Figure 4.1 shows a screenshot of the programming codes.

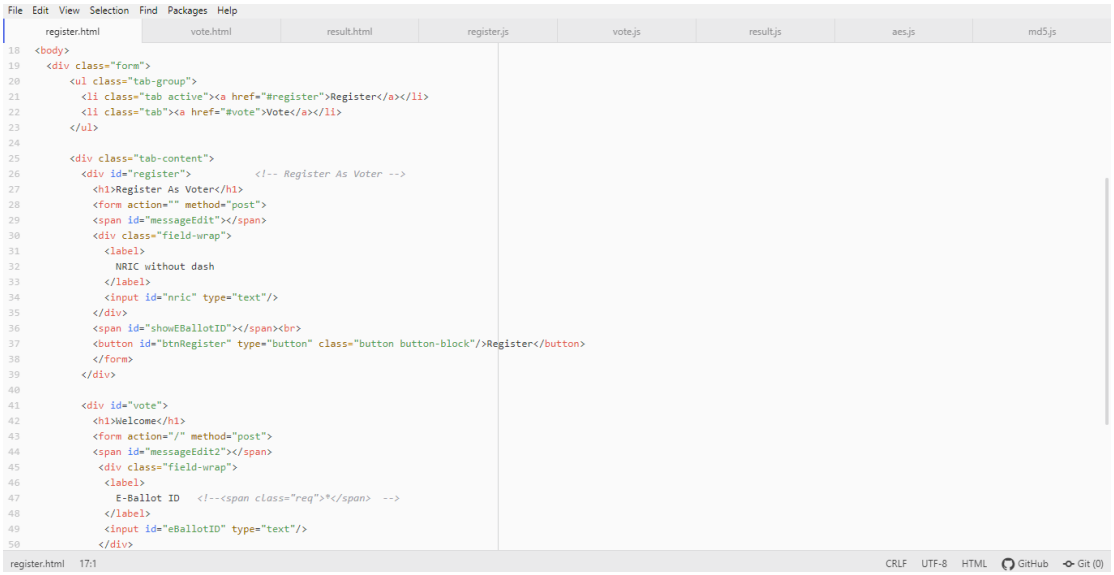

Figure 4.1: A screenshot of HTML5 codes in Atom.

Firebase Realtime Database

The voters' data such as the E-ballot ID, votes and the hash ID will be stored in the database separately for record purpose as shown in Figure 4.2. Firebase is a cloud-hosting platform that enable all the data to be saved across the voters in real-time. It automatically stores updates with the newest data.

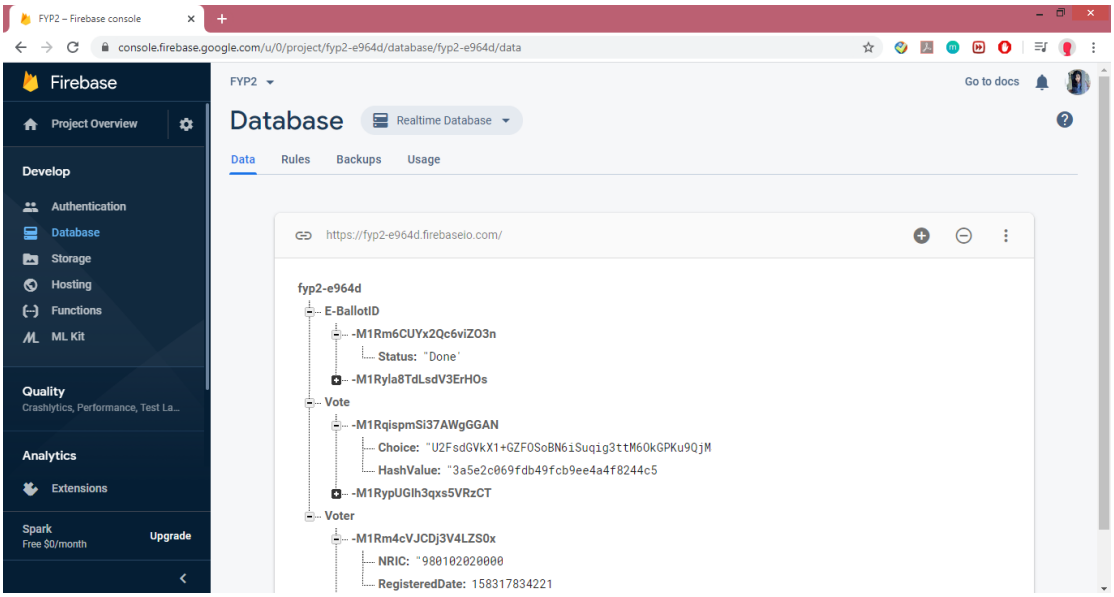

Figure 4.2: A screenshot of Firebase Realtime Database.

4.2 Methodology Implementation

4.2.1 AES Encryption

According to Figure 4.3, AES is one of the symmetric block ciphers which is used to protect classified information. It is normally used in both software and hardware to encrypt sensitive data in order to ensure cybersecurity and electronic data protection. It uses the same key to encrypt and decrypt the data, therefore the sender and receiver must both know and use the same secret key. In this project, AES encryption is used to encrypt the security key and the vote casted by the users. An example of the implementation of AES encryption was shown in Figure 4.4.

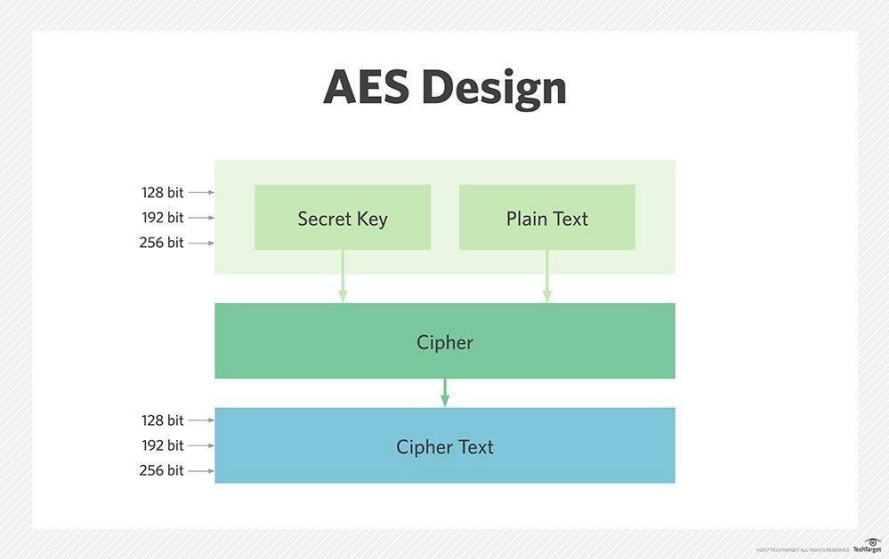

Figure 4.3: AES design (Margaret 2020).

```
firebase.database().ref().update(updates).then(function()
{
  // -------------------- Assign E-Ballot ID --------------------
  var randomSalt = "SALT";
  var appendSecureKey = randomSalt.concat(securityKey);
  var encryptSecurity = CryptoJS.AES.encrypt(appendSecureKey, encryptKey, "{ mode: CryptoJS.mode.CBC, padding: CryptoJS.pad.Pkcs7 }");

  obj1 = new Object();
  obj1.SecurityKey = encryptSecurity.toString();
  obj1.Status = status;

  var eBallotID = firebase.database().ref().child('E-BallotID').push().key;

  var updates1 = {};
  updates1['/E-BallotID/' + eBallotID] = obj1;
```

Figure 4.4: The implementation of AES encryption to encrypt the security key.

4.2.2 MD5 Hashing Algorithm

MD5 is a widely used hash function which made up of 128-bit hash value like in Figure 4.5. It has been employed in various security application and is commonly used to check the integrity of files. MD5 hashing algorithm has been used in this project in generating the unique Hash ID after voters casted their votes. Voters can use the Hash ID to verify whether someone has altered their votes in the middle of the election process by comparing the Hash ID displayed during the end of the election to ensure the integrity of the votes. If the Hash ID values are the same, this means that there is no middleman attack during the voting process. Hence, the election result will be more accurate.

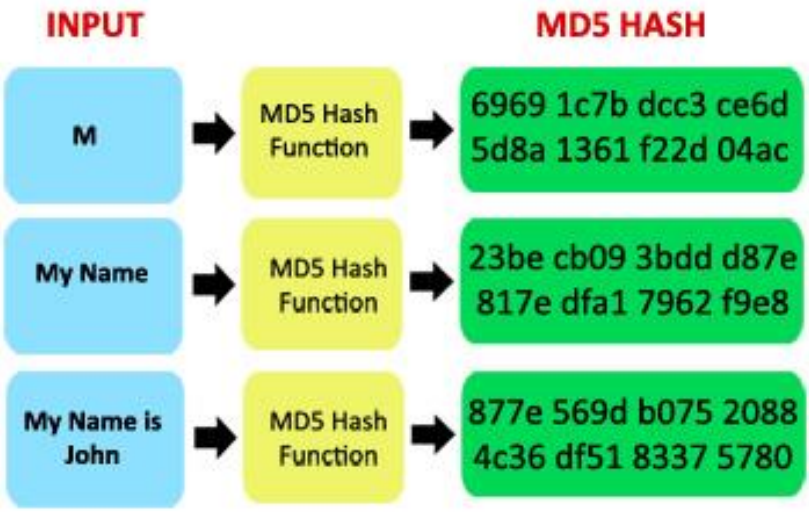

Figure 4.5: An example of MD5 hashing algorithm (Gurinder 2015).

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Verification Process

In Figure 5.1, users will need to register themselves as a voter by entering their own NRIC without dash. The NRIC should only consist of 12 numeric values. For instance, 980523064728.

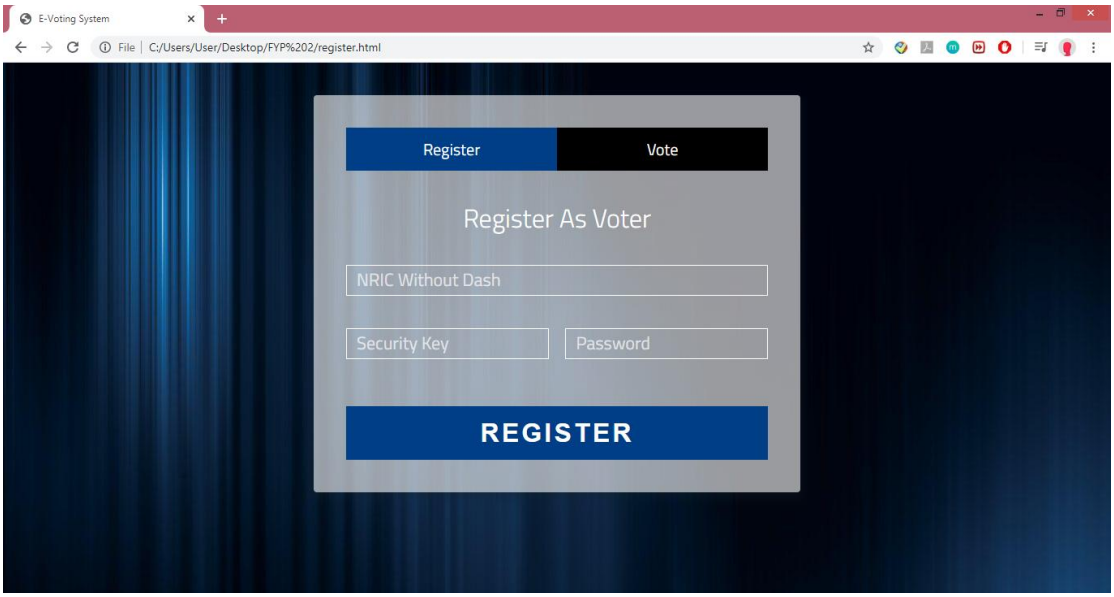

Figure 5.1: The registration page of E-Voting System.

If the voters entered an incorrect NRIC format, the system will display an error message showing “Invalid NRIC” like in Figure 5.2. Besides that, the system will also check the NRIC date format. For example, January contains only 31 days. Thus, if voters enter any number more than 31, the system will display an error message showing “Invalid NRIC date format” as shown in Figure 5.3. Furthermore, the system will also check the age of the users. Users will need to be 21 years old or above in order to successfully register themselves as eligible voter. Otherwise, the system will display an error message showing “You are not eligible to register” as in Figure 5.4.

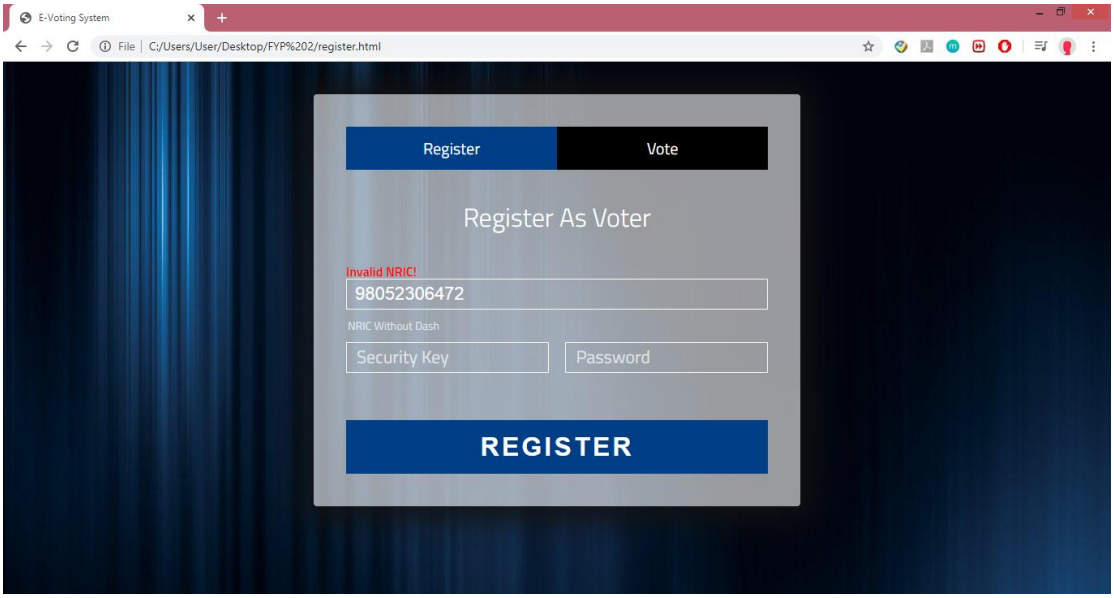

Figure 5.2: An example of "Invalid NRIC" error message.

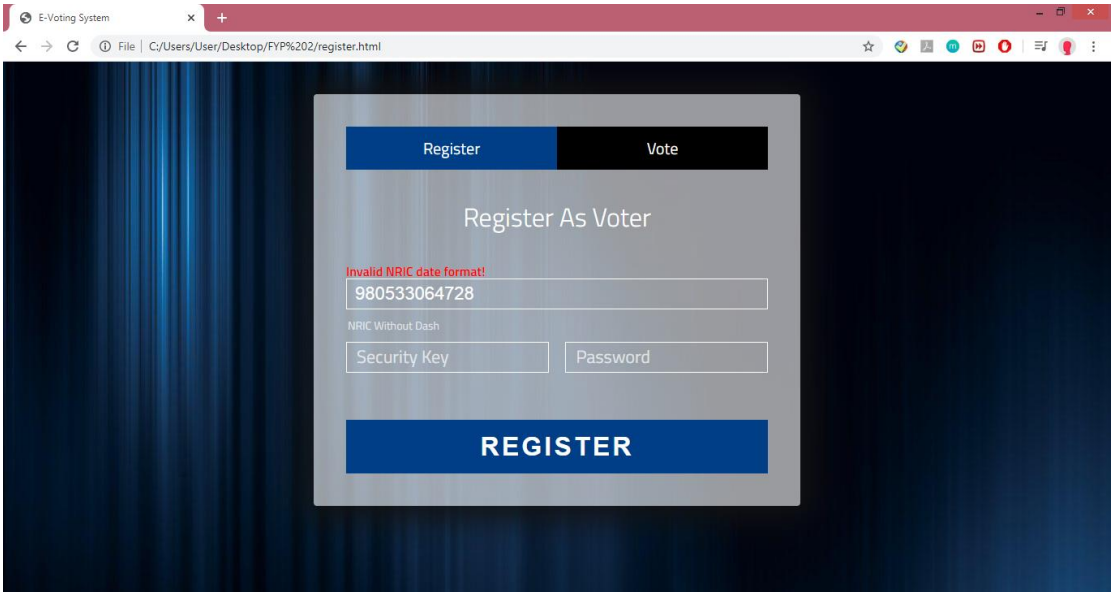

Figure 5.3: An example of "Invalid NRIC date format" error message.

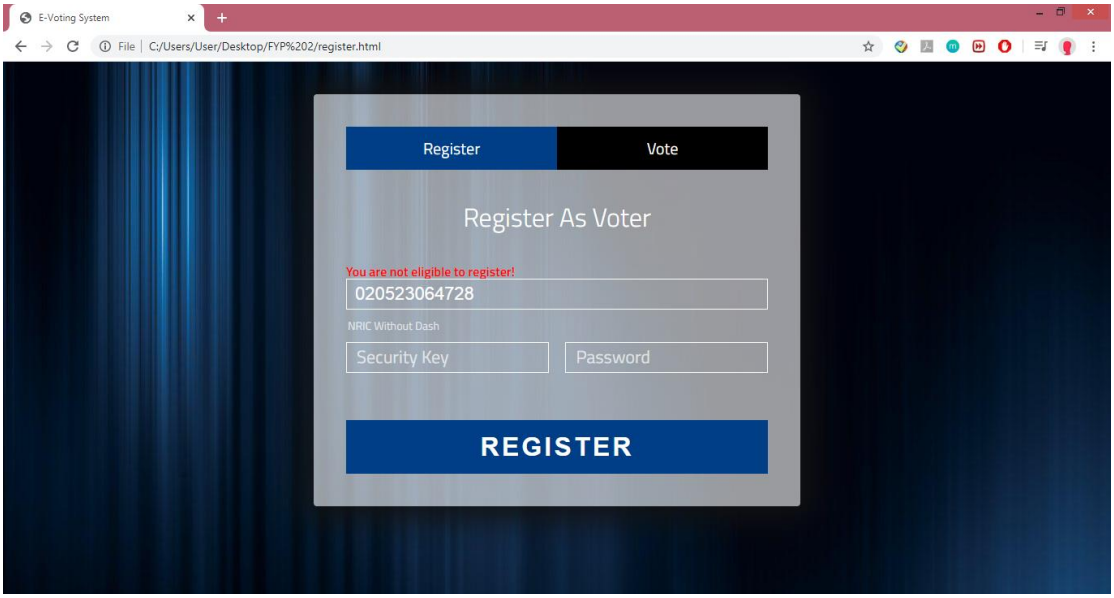

Figure 5.4: An example of "You are not eligible to register" error message.

Apart from that, voters will also need to enter the security key and password that will be used as a verification purpose during the voting process. Voters will need to remember their password as the values will not be stored in the database. If there are any blanks for the register page, the system will display an error message showing "Please fill in the blanks" as shown in Figure 5.5.

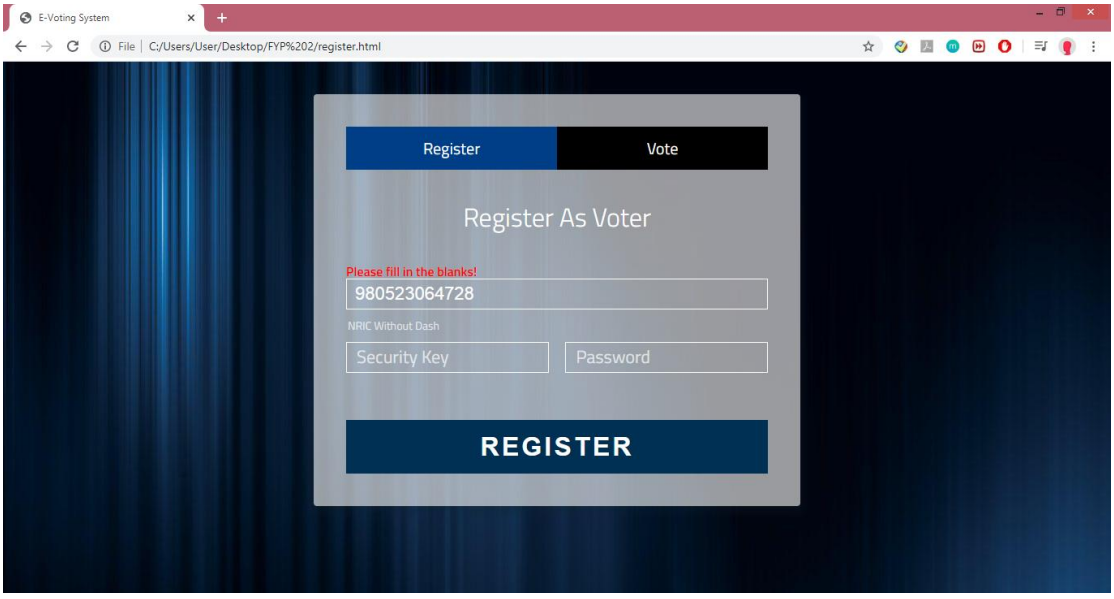

Figure 5.5: An example of "Please fill in the blanks" error message.

Each NRIC is only allowed to register once. If the users had registered themselves as voter earlier, the system will display an error message showing "You had registered earlier" like in Figure 5.6.

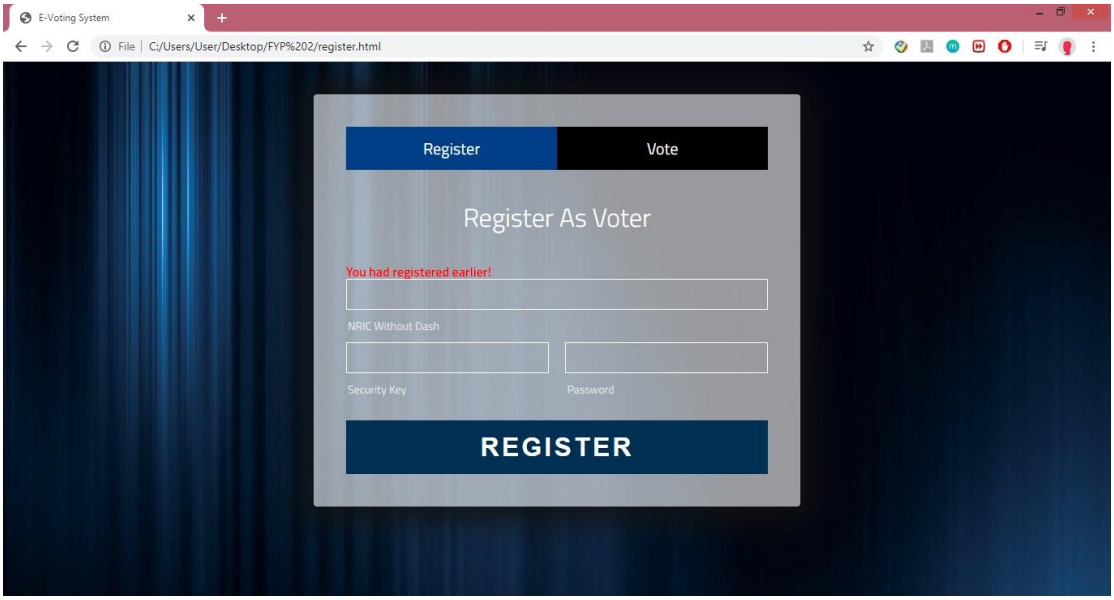

Figure 5.6: An example of "You had registered earlier" error message.

After users have successfully entered the particulars needed and clicked the register button, they will receive a "Register successfully" message and an E-ballot ID which generated randomly by Firebase. The E-ballot ID is a string value with random length that have a combination of numbers, uppercase letters, lowercase letters and special characters. This will increase the time for an individual who try to perform brute force attack which trying out various possible combinations of characters in order to get the correct E-ballot ID. Figure 5.7 shows an example of the E-ballot ID generated. There are 10 different numbers, 52 different letters for both lowercase and uppercase and special characters, hence there are more than 62^{20} possible combinations of E-ballot ID. An individual will need to spend for a longer period of time to decrypt the E-ballot ID in this case.

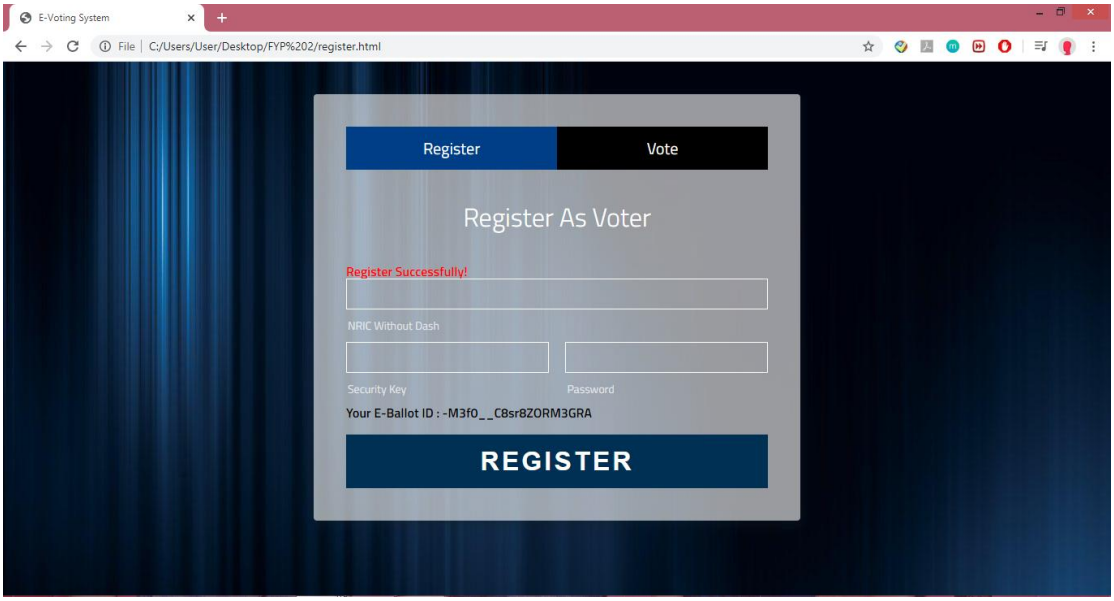

Figure 5.7: An example of E-ballot ID.

Voters' NRIC value will be stored in the Voter database. On the other hand, the security key will first be appended with a string value "SALT" and encrypted using the password before being stored in the E-BallotID database together with the default "NA" E-ballot ID status like in Figure 5.8. The E-ballot ID status is to check whether the voter who owned the E-ballot ID has casted their vote or not. The purpose of separating the databases is to ensure the anonymity of voters. Each data will be assigned to a random key generated by Firebase before being stored. The random key does not link to each other and will be arranged according to alphabetical order, therefore once more users registered themselves as voters, nobody can trace whether which E-ballot ID owned by which NRIC.

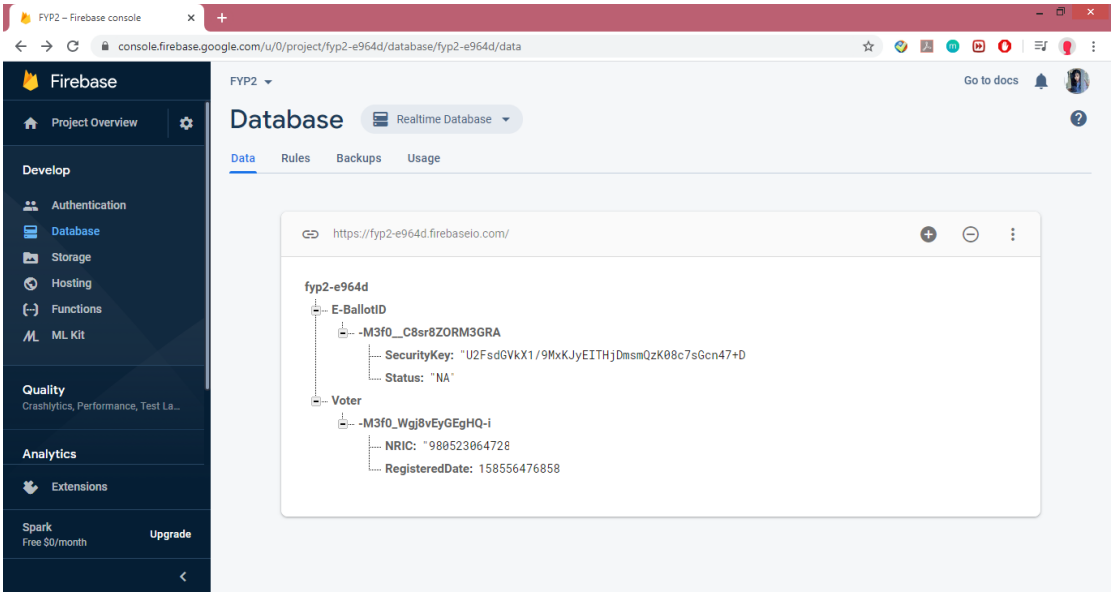

Figure 5.8: An example of Voter database and E-BallotID database.

5.2 Voting Process

Based on Figure 5.9, voters need to enter the E-ballot ID and password before casting the vote.

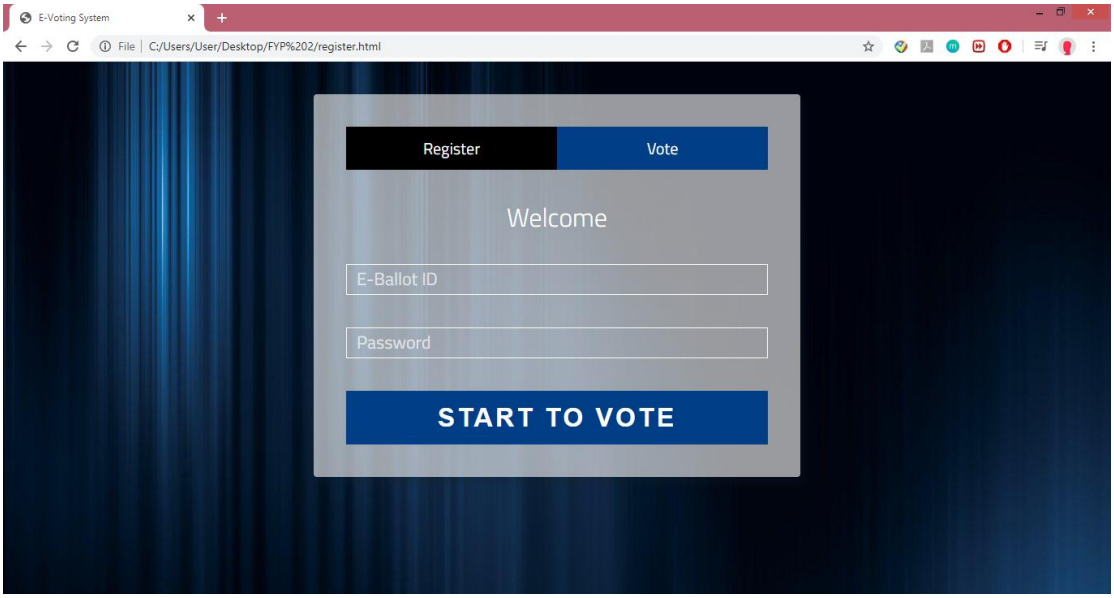

Figure 5.9: The registration page of E-Voting System.

If the voters entered an invalid E-Ballot ID, the system will display an error message showing “Invalid E-Ballot ID” like in Figure 5.10.

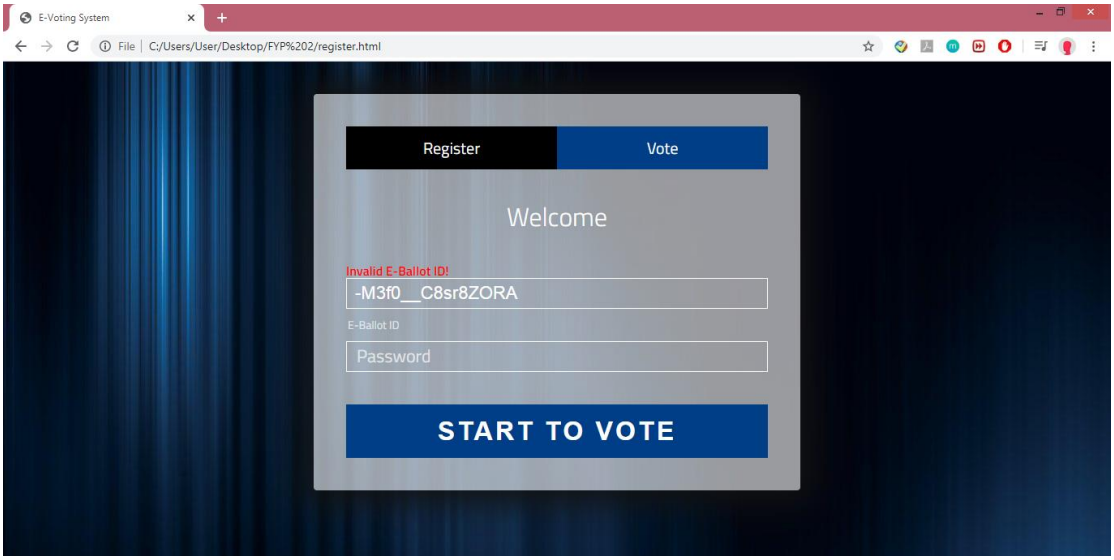

Figure 5.10: An example of "Invalid E-Ballot ID" error message.

If the voters entered a valid E-ballot ID, the system will decrypt the security key stored in the database earlier using password entered. After that, the system will check whether the first four value is value "SALT". If the value is not "SALT", the system will display an error message showing "Invalid password" as shown in Figure 5.11. The purpose of having the password is to ensure that if somebody get the E-ballot ID, they unable to cast the vote if they do not know the correct password. This is because only the correct password will get the correct string value. Moreover, it will be more secure as the database admin will not know about the password. However, voters will need to remember their password because it was not being stored in the database.

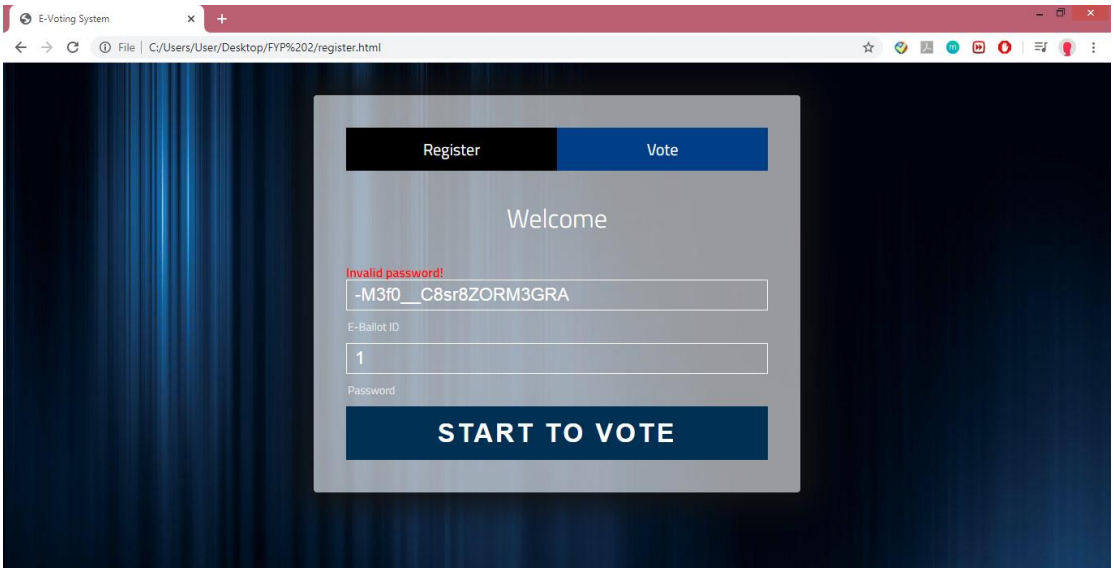

Figure 5.11: An example of "Invalid password" error message.

If there are any blanks for the voting page, the system will display an error message showing “Please fill in the blanks” as shown in Figure 5.12.

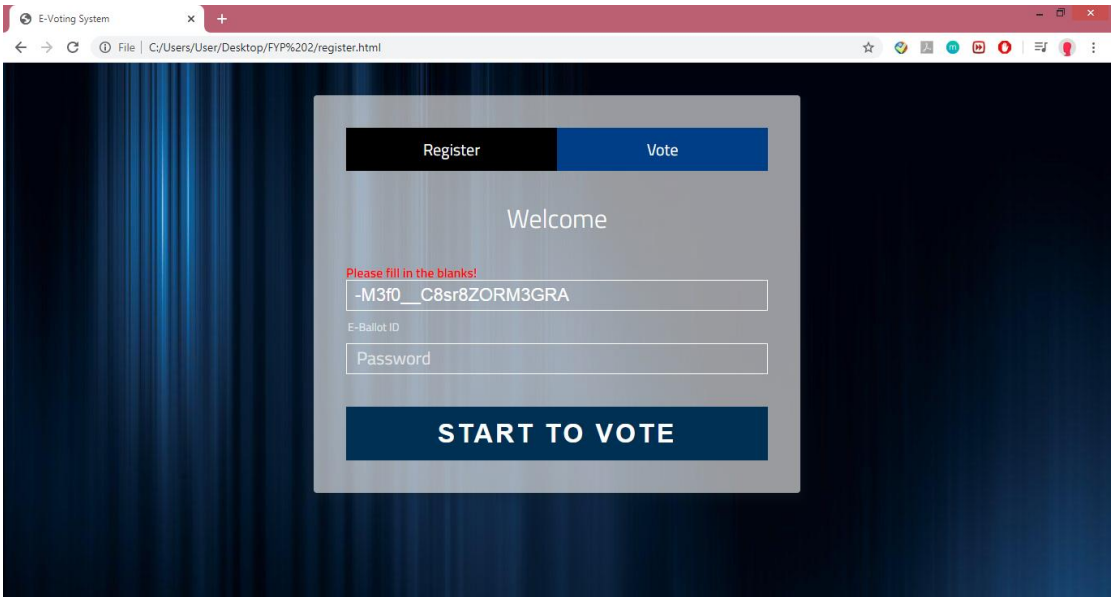

Figure 5.12: An example of “Please fill in the blanks” error message.

If the voters had casted their votes earlier, the system will display an error message showing “You had voted earlier” like in Figure 5.13.

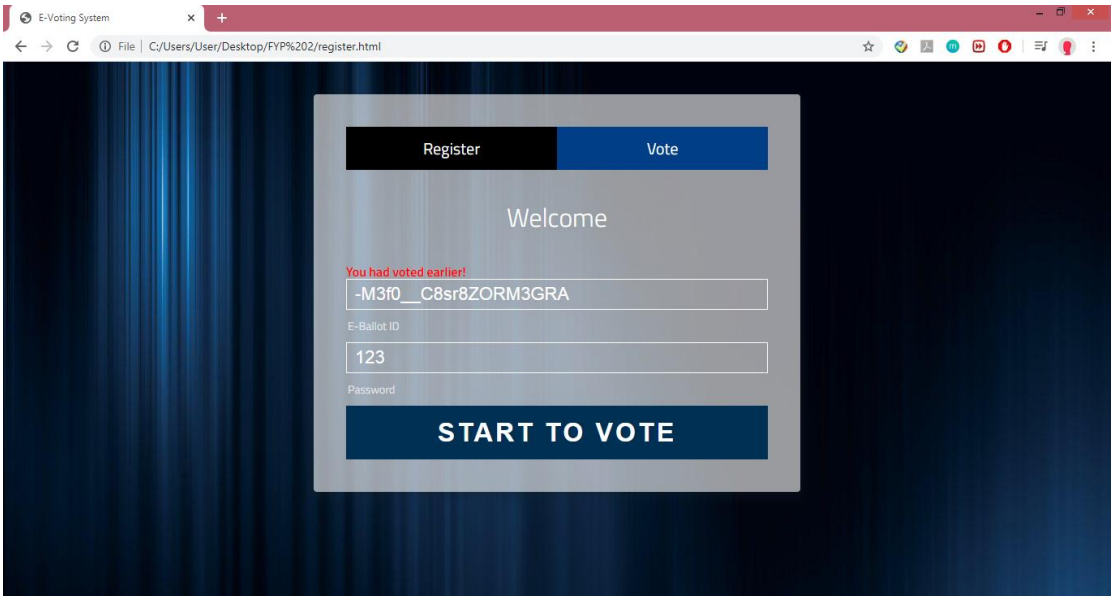

Figure 5.13: An example of “You had voted earlier” error message.

After voters enter all the particulars correctly and click the start to vote button, the system will redirect the voter to the following page that contains the candidate list as shown in Figure 5.14. Voters can either choose to vote for their candidate and submit or back to the earlier page.

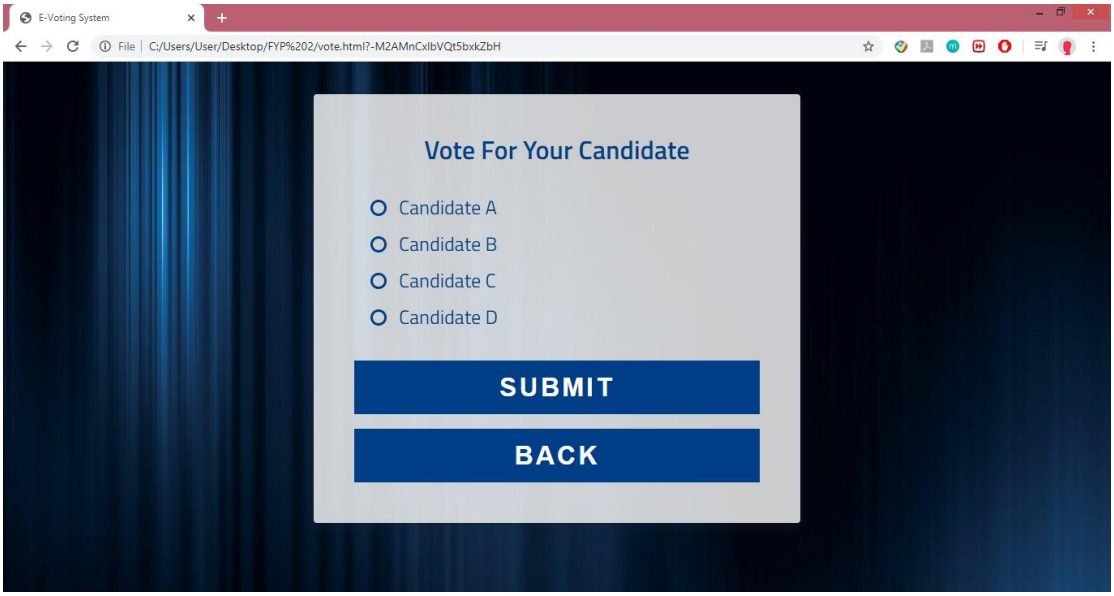

Figure 5.14: Page showing the candidate list.

After users have successfully casted their vote and clicked the submit button, they will receive a "Vote successfully" message and a Hash ID as shown in Figure 5.15.

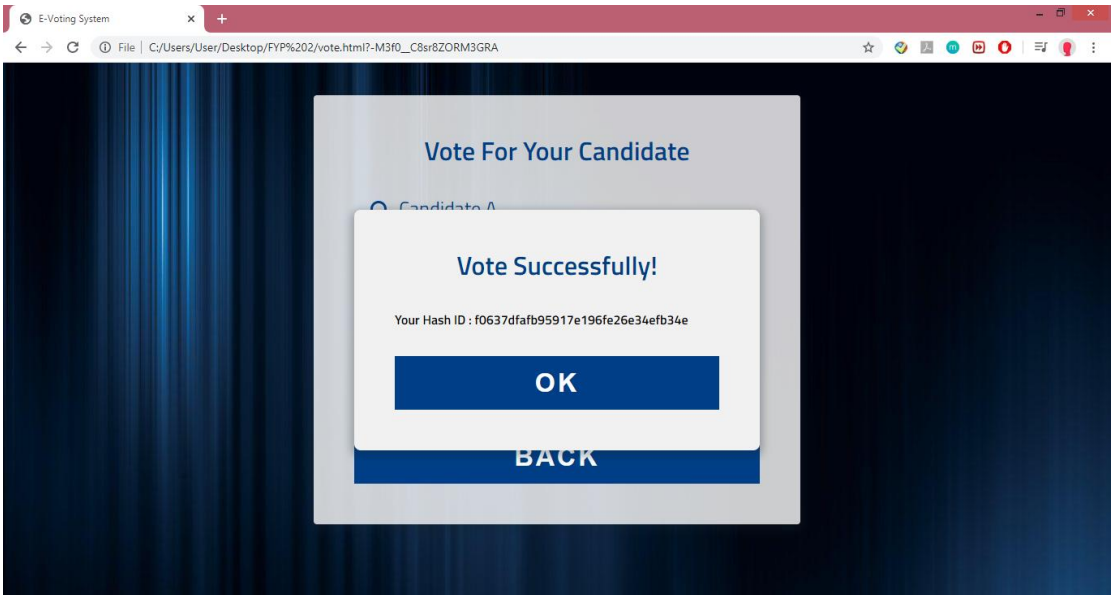

Figure 5.15: An example of Hash ID.

The casted vote will then be encrypted and store in the Vote database together with the Hash ID as shown in Figure 5.16. Other than that, the E-ballot ID status will change from “NA” to “Done”. This indicates that the owner of the E-ballot ID has casted the vote and is not allow to cast the vote again.

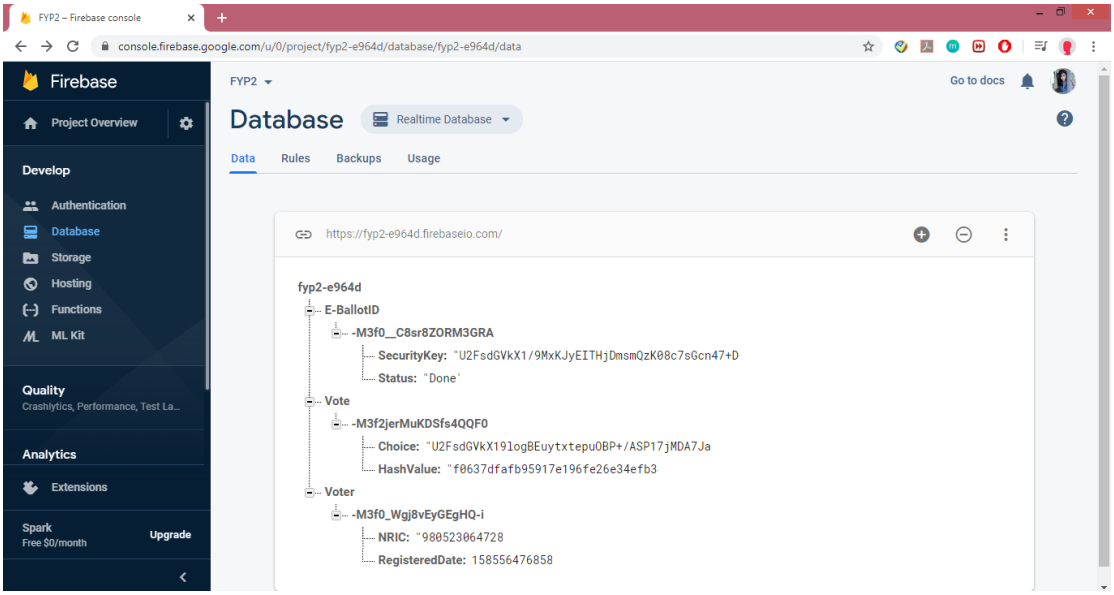

Figure 5.16: An example of Vote database.

5.3 Display Result Process

As shown in Figure 5.17, all the vote results will be show in this page by showing the total votes for each candidate.

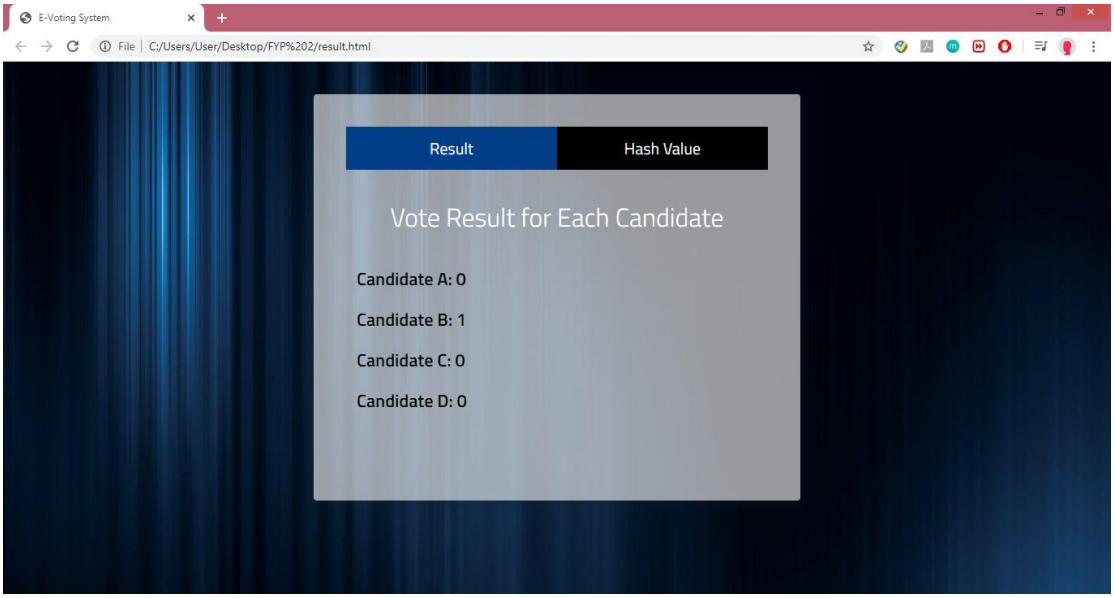

Figure 5.17: Vote results of the election.

Voters can check whether their votes have been casted correctly by clicking the Hash Value page based on Figure 5.18.

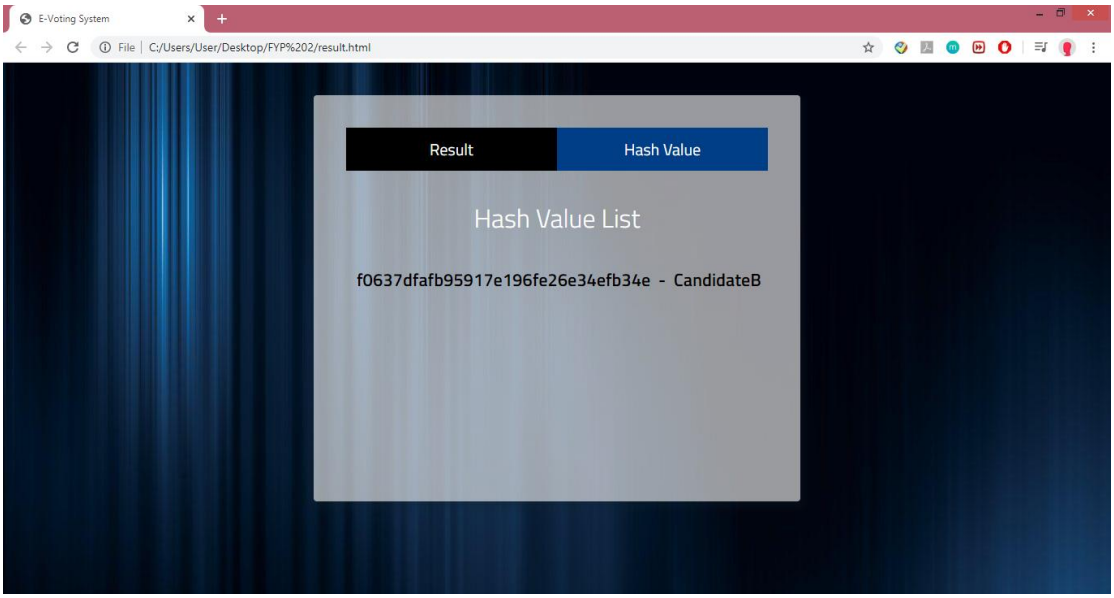

Figure 5.18: Hash Value page.

CHAPTER 6: CONCLUSION

Many researches had been done before working on this project in order to get a deeper understanding on the existing voting methods that available in the market including both electronic voting systems and internet voting systems. The pros and cons of these systems had been compared.

This project strives to produce a secure, anonymous and verifiable E-Voting System which can be done using various encryptions and hashing algorithms. The whole voting process will be more secure due to the division of voting process into 3 independent parts which is the verification, vote casting and vote calculation. Hence, the voters' identities and choices are not traceable and votes casted are verifiable by the voters themselves.

There are some achievements made in this project. Firstly, by developing the E-Voting System, the voters do not actually need to spend time queuing up at the polling stations to cast their votes anymore. They can vote for the candidates chosen in anywhere and at any time using their own devices provided that there is an excess to the Internet. Other than that, this E-Voting System able to ensure the only eligible voters able to cast their votes. It also ensures the anonymity of the voters since the voters will cast their votes using the randomly assigned E-ballot ID instead of their own NRIC. After that, the choices will be encrypted using AES encryption and hash ID is generated using MD5 hashing algorithm so that voters can use the it to verify their votes after the announcement of the election results. By having this system, middleman attacks can be prevented by comparing the hash values.

In a nutshell, an E-Voting System that is more secure, anonymous and verifiable that produced at the end of this project should be able to solve the vulnerabilities found from the existing voting systems in the market. However, due to the time constraint, there are still some improvements can be made in the future. In this project, it is difficult to ensure that the E-ballot ID is not transferrable to the others. If someone get to know the E-ballot ID together with the security key as well as the encryption and decryption key, they can still cast the vote on behalf of the owner of the E-ballot ID. This will cause the owner of the E-ballot ID unable to cast their votes. In order to prevent the happening of this situation, two-factor-authentication can be added to the system. Hence, the owner of the E-ballot ID will be notified before and after they cast their votes.

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APPENDIX A

A.1 HTML5

A.1.1 Register

```
<!DOCTYPE html>
<html>
<head>
  <title>E-Voting System</title>
  <meta charset="utf-8" />
  <script src="jquery-3.3.1.min.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-app.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-auth.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-database.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-storage.js"></script>
  <script src="AccountFirebase.js"></script>
  <link href='https://fonts.googleapis.com/css?family=Titillium+Web:400,300,600'
rel='stylesheet' type='text/css'>
  <link rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/normalize/5.0.0/normalize.min.css">
  <link rel="stylesheet" href="css/style.css">
</head>
<body>
  <div class="form">
     <ul class="tab-group">
       <li class="tab active"><a href="#register">Register</a></li>
       <li class="tab"><a href="#vote">Vote</a></li>
     </ul>
     <div class="tab-content">
       <div id="register">          <!-- Register As Voter -->
         <h1>Register As Voter</h1>
         <form action="" method="post">
         <span id="messageEdit"></span>
```

```
<div class="field-wrap">
  <label>
    NRIC Without Dash
  </label>
  <input id="nric" type="text"/>
</div>
<!-- _____Not Transferrable_____ -->
<div class="top-row">
  <div class="field-wrap">
    <label>
      Security Key
    </label>
    <input id="securityKey" type="text"/>
  </div>
  <div class="field-wrap">
    <label>
      Password
    </label>
    <input id="encryptKey" type="text"/>
  </div>
</div>
  <!-- _____Not Transferrable_____ -->
  <span id="showEBallotID"></span><br>
  <button id="btnRegister" type="button" class="button button-
block"/>Register</button>
  </form>
</div>
<div id="vote">
  <h1>Welcome</h1>
  <form action="/" method="post">
  <span id="messageEdit2"></span>
   <div class="field-wrap">
```

```
          <label>
            E-Ballot ID
          </label>
          <input id="eBallotID" type="text"/>
        </div>
        <div class="field-wrap">
          <label>
            Password
          </label>
          <input id="decryptKey" type="text"/>
        </div>
      <button id="btnVote" type="button" class="button button-block"/>Start to Vote</button>
      </form>
    </div>
  </div><!-- tab-content -->
</div> <!-- /form -->
<script src='http://cdnjs.cloudflare.com/ajax/libs/jquery/2.1.3/jquery.min.js'></script>
<script src="js/index.js"></script>
<script src="js/register.js"></script>
<script src="js/aes.js"></script>
</body>
</html>
```

A.1.2 Vote

```
<!DOCTYPE html>
<html>
<head>
  <title>E-Voting System</title>
  <meta charset="utf-8" />
  <script src="jquery-3.3.1.min.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-app.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-auth.js"></script>
```

```
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-database.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-storage.js"></script>
  <script src="AccountFirebase.js"></script>
  <link href='https://fonts.googleapis.com/css?family=Titillium+Web:400,300,600'
rel='stylesheet' type='text/css'>
  <link rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/normalize/5.0.0/normalize.min.css">
  <link rel="stylesheet" href="css/style1.css">
</head>
<body>
  <div class="form">
      <div id="register">          <!-- Register As Voter -->
        <h1>Vote For Your Candidate</h1>
        <form action="" method="post">
        <span id="messageEdit"></span>
        <div class="field-wrap">
          <div class="radio-container">
            <label class="radio">
              <input type="radio" id="a" name="option" value="CandidateA" />
              Candidate A
              <span></span>
            </label><br><br>
            <label class="radio">
              <input type="radio" id="b" name="option" value="CandidateB" />
              Candidate B
              <span></span>
            </label><br><br>
            <label class="radio">
              <input type="radio" id="c" name="option" value="CandidateC" />
              Candidate C
              <span></span>
            </label><br><br>
            <label class="radio">
              <input type="radio" id="d" name="option" value="CandidateD" />
```

```
            Candidate D
            <span></span>
          </label>
        </div>
      </div>
      <button id="btnSubmit" type="button" class="button button-
block">Submit</button><br>
      <button id="btnBack" type="button" class="button button-
block">Back</button>
      <div id="popUp">
        <h1>Vote Successfully!</h1>
        <span id="hashValue"></span><br><br>
        <button id="btnOk" type="button" class="button button-block">OK</button>
        <!--<a class="ok">OK</a>-->
      </div>
      </form>
    </div>
</div> <!-- /form -->
<script src='http://cdnjs.cloudflare.com/ajax/libs/jquery/2.1.3/jquery.min.js'></script>
<script src="js/index.js"></script>
<script src="js/vote.js"></script>
<script src="js/md5.js"></script>
<script src="js/aes.js"></script>
</body>
</html>
```

A.1.3 Result

```
<!DOCTYPE html>
<html>
<head>
  <title>E-Voting System</title>
  <meta charset="utf-8" />
  <script src="jquery-3.3.1.min.js"></script>
```

```
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-app.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-auth.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-database.js"></script>
  <script src="https://www.gstatic.com/firebasejs/7.8.0/firebase-storage.js"></script>
  <script src="AccountFirebase.js"></script>
  <link href='https://fonts.googleapis.com/css?family=Titillium+Web:400,300,600'
rel='stylesheet' type='text/css'>
  <link rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/normalize/5.0.0/normalize.min.css">
  <link rel="stylesheet" href="css/result.css">
</head>
<body>
  <div class="form">                    <!-- Change Height -->
    <ul class="tab-group">
      <li class="tab active"><a href="#result">Result</a></li>
      <li class="tab"><a href="#hash">Hash Value</a></li>
    </ul>
    <div class="tab-content">
      <div id="result">                 <!-- Vote Result -->
        <h1>Vote Result for Each Candidate</h1>
        <form action="" method="post">
        <div class="field-wrap">
          <label id="showResult">       <!-- Show Result -->
            <span id="child"></span><br>
          </label>
        </div>
        </form>
      </div>
      <div id="hash">
        <h1>Hash Value List</h1>
        <form action="/" method="post">
         <div class="field-wrap">
          <label id="showHash">
          </label>
```

```
        </div>
       </form>
      </div>
    </div>                          <!-- tab-content -->
</div>                              <!-- /form -->
<script src='http://cdnjs.cloudflare.com/ajax/libs/jquery/2.1.3/jquery.min.js'></script>
<script src="js/index.js"></script>
<script src="js/result.js"></script>
<script src="js/md5.js"></script>
<script src="js/aes.js"></script>
</body>
</html>
```

A.2 JavaScript

A.2.1 AES Encryption Code

```
var CryptoJS = CryptoJS || function(u, p) {
   var d = {}
    , l = d.lib = {}
    , s = function() {}
    , t = l.Base = {
      extend: function(a) {
          s.prototype = this;
          var c = new s;
          a && c.mixIn(a);
          c.hasOwnProperty("init") || (c.init = function() {
              c.$super.init.apply(this, arguments)
          }
          );
          c.init.prototype = c;
          c.$super = this;
          return c
      },
      create: function() {
```

```
            var a = this.extend();
            a.init.apply(a, arguments);
            return a
        },
        init: function() {},
        mixIn: function(a) {
            for (var c in a)
                a.hasOwnProperty(c) && (this[c] = a[c]);
            a.hasOwnProperty("toString") && (this.toString = a.toString)
        },
        clone: function() {
            return this.init.prototype.extend(this)
        }
    }
     , r = l.WordArray = t.extend({
        init: function(a, c) {
            a = this.words = a || [];
            this.sigBytes = c != p ? c : 4 * a.length
        },
        toString: function(a) {
            return (a || v).stringify(this)
        },
        concat: function(a) {
            var c = this.words
              , e = a.words
              , j = this.sigBytes;
            a = a.sigBytes;
            this.clamp();
            if (j % 4)
                for (var k = 0; k < a; k++)
                    c[j + k >>> 2] |= (e[k >>> 2] >>> 24 - 8 * (k % 4) & 255) << 24 - 8 * ((j
+ k) % 4);
            else if (65535 < e.length)
                for (k = 0; k < a; k += 4)
```

```
                c[j + k >>> 2] = e[k >>> 2];
            else
                c.push.apply(c, e);
            this.sigBytes += a;
            return this
        },
        clamp: function() {
            var a = this.words
              , c = this.sigBytes;
            a[c >>> 2] &= 4294967295 << 32 - 8 * (c % 4);
            a.length = u.ceil(c / 4)
        },
        clone: function() {
            var a = t.clone.call(this);
            a.words = this.words.slice(0);
            return a
        },
        random: function(a) {
            for (var c = [], e = 0; e < a; e += 4)
                c.push(4294967296 * u.random() | 0);
            return new r.init(c,a)
        }
    })
      , w = d.enc = {}
      , v = w.Hex = {
        stringify: function(a) {
            var c = a.words;
            a = a.sigBytes;
            for (var e = [], j = 0; j < a; j++) {
                var k = c[j >>> 2] >>> 24 - 8 * (j % 4) & 255;
                e.push((k >>> 4).toString(16));
                e.push((k & 15).toString(16))
            }
            return e.join("")
```

```
    },
    parse: function(a) {
        for (var c = a.length, e = [], j = 0; j < c; j += 2)
            e[j >>> 3] |= parseInt(a.substr(j, 2), 16) << 24 - 4 * (j % 8);
        return new r.init(e,c / 2)
    }
}
  , b = w.Latin1 = {
    stringify: function(a) {
        var c = a.words;
        a = a.sigBytes;
        for (var e = [], j = 0; j < a; j++)
            e.push(String.fromCharCode(c[j >>> 2] >>> 24 - 8 * (j % 4) & 255));
        return e.join("")
    },
    parse: function(a) {
        for (var c = a.length, e = [], j = 0; j < c; j++)
            e[j >>> 2] |= (a.charCodeAt(j) & 255) << 24 - 8 * (j % 4);
        return new r.init(e,c)
    }
}
  , x = w.Utf8 = {
    stringify: function(a) {
        try {
            return decodeURIComponent(escape(b.stringify(a)))
        } catch (c) {
            throw Error("Malformed UTF-8 data");
        }
    },
    parse: function(a) {
        return b.parse(unescape(encodeURIComponent(a)))
    }
}
  , q = l.BufferedBlockAlgorithm = t.extend({
```

```
    reset: function() {
        this._data = new r.init;
        this._nDataBytes = 0
    },
    _append: function(a) {
        "string" == typeof a && (a = x.parse(a));
        this._data.concat(a);
        this._nDataBytes += a.sigBytes
    },
    _process: function(a) {
        var c = this._data
          , e = c.words
          , j = c.sigBytes
          , k = this.blockSize
          , b = j / (4 * k)
          , b = a ? u.ceil(b) : u.max((b | 0) - this._minBufferSize, 0);
        a = b * k;
        j = u.min(4 * a, j);
        if (a) {
            for (var q = 0; q < a; q += k)
                this._doProcessBlock(e, q);
            q = e.splice(0, a);
            c.sigBytes -= j
        }
        return new r.init(q,j)
    },
    clone: function() {
        var a = t.clone.call(this);
        a._data = this._data.clone();
        return a
    },
    _minBufferSize: 0
});
l.Hasher = q.extend({
```

```
        cfg: t.extend(),
        init: function(a) {
            this.cfg = this.cfg.extend(a);
            this.reset()
        },
        reset: function() {
            q.reset.call(this);
            this._doReset()
        },
        update: function(a) {
            this._append(a);
            this._process();
            return this
        },
        finalize: function(a) {
            a && this._append(a);
            return this._doFinalize()
        },
        blockSize: 16,
        _createHelper: function(a) {
            return function(b, e) {
                return (new a.init(e)).finalize(b)
            }
        },
        _createHmacHelper: function(a) {
            return function(b, e) {
                return (new n.HMAC.init(a,e)).finalize(b)
            }
        }
    });
    var n = d.algo = {};
    return d
}(Math);
(function() {
```

```
    var u = CryptoJS
      , p = u.lib.WordArray;
    u.enc.Base64 = {
        stringify: function(d) {
            var l = d.words
              , p = d.sigBytes
              , t = this._map;
            d.clamp();
            d = [];
            for (var r = 0; r < p; r += 3)
                for (var w = (l[r >>> 2] >>> 24 - 8 * (r % 4) & 255) << 16 | (l[r + 1 >>>
2] >>> 24 - 8 * ((r + 1) % 4) & 255) << 8 | l[r + 2 >>> 2] >>> 24 - 8 * ((r + 2) % 4) &
255, v = 0; 4 > v && r + 0.75 * v < p; v++)
                    d.push(t.charAt(w >>> 6 * (3 - v) & 63));
            if (l = t.charAt(64))
                for (; d.length % 4; )
                    d.push(l);
            return d.join("")
        },
        parse: function(d) {
            var l = d.length
              , s = this._map
              , t = s.charAt(64);
            t && (t = d.indexOf(t),
            -1 != t && (l = t));
            for (var t = [], r = 0, w = 0; w < l; w++)
                if (w % 4) {
                    var v = s.indexOf(d.charAt(w - 1)) << 2 * (w % 4)
                      , b = s.indexOf(d.charAt(w)) >>> 6 - 2 * (w % 4);
                    t[r >>> 2] |= (v | b) << 24 - 8 * (r % 4);
                    r++
                }
            return p.create(t, r)
        },
```

```
        _map:
"ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz012345678
9+/="
    }
}
)();
(function(u) {
    function p(b, n, a, c, e, j, k) {
        b = b + (n & a | ~n & c) + e + k;
        return (b << j | b >>> 32 - j) + n
    }
    function d(b, n, a, c, e, j, k) {
        b = b + (n & c | a & ~c) + e + k;
        return (b << j | b >>> 32 - j) + n
    }
    function l(b, n, a, c, e, j, k) {
        b = b + (n ^ a ^ c) + e + k;
        return (b << j | b >>> 32 - j) + n
    }
    function s(b, n, a, c, e, j, k) {
        b = b + (a ^ (n | ~c)) + e + k;
        return (b << j | b >>> 32 - j) + n
    }
    for (var t = CryptoJS, r = t.lib, w = r.WordArray, v = r.Hasher, r = t.algo, b = [], x =
0; 64 > x; x++)
        b[x] = 4294967296 * u.abs(u.sin(x + 1)) | 0;
    r = r.MD5 = v.extend({
        _doReset: function() {
            this._hash = new w.init([1732584193, 4023233417, 2562383102, 271733878])
        },
        _doProcessBlock: function(q, n) {
            for (var a = 0; 16 > a; a++) {
                var c = n + a
                  , e = q[c];
```

```
    q[c] = (e << 8 | e >>> 24) & 16711935 | (e << 24 | e >>> 8) & 4278255360
}
var a = this._hash.words
  , c = q[n + 0]
  , e = q[n + 1]
  , j = q[n + 2]
  , k = q[n + 3]
  , z = q[n + 4]
  , r = q[n + 5]
  , t = q[n + 6]
  , w = q[n + 7]
  , v = q[n + 8]
  , A = q[n + 9]
  , B = q[n + 10]
  , C = q[n + 11]
  , u = q[n + 12]
  , D = q[n + 13]
  , E = q[n + 14]
  , x = q[n + 15]
  , f = a[0]
  , m = a[1]
  , g = a[2]
  , h = a[3]
  , f = p(f, m, g, h, c, 7, b[0])
  , h = p(h, f, m, g, e, 12, b[1])
  , g = p(g, h, f, m, j, 17, b[2])
  , m = p(m, g, h, f, k, 22, b[3])
  , f = p(f, m, g, h, z, 7, b[4])
  , h = p(h, f, m, g, r, 12, b[5])
  , g = p(g, h, f, m, t, 17, b[6])
  , m = p(m, g, h, f, w, 22, b[7])
  , f = p(f, m, g, h, v, 7, b[8])
  , h = p(h, f, m, g, A, 12, b[9])
  , g = p(g, h, f, m, B, 17, b[10])
```

, m = p(m, g, h, f, C, 22, b[11])
, f = p(f, m, g, h, u, 7, b[12])
, h = p(h, f, m, g, D, 12, b[13])
, g = p(g, h, f, m, E, 17, b[14])
, m = p(m, g, h, f, x, 22, b[15])
, f = d(f, m, g, h, e, 5, b[16])
, h = d(h, f, m, g, t, 9, b[17])
, g = d(g, h, f, m, C, 14, b[18])
, m = d(m, g, h, f, c, 20, b[19])
, f = d(f, m, g, h, r, 5, b[20])
, h = d(h, f, m, g, B, 9, b[21])
, g = d(g, h, f, m, x, 14, b[22])
, m = d(m, g, h, f, z, 20, b[23])
, f = d(f, m, g, h, A, 5, b[24])
, h = d(h, f, m, g, E, 9, b[25])
, g = d(g, h, f, m, k, 14, b[26])
, m = d(m, g, h, f, v, 20, b[27])
, f = d(f, m, g, h, D, 5, b[28])
, h = d(h, f, m, g, j, 9, b[29])
, g = d(g, h, f, m, w, 14, b[30])
, m = d(m, g, h, f, u, 20, b[31])
, f = l(f, m, g, h, r, 4, b[32])
, h = l(h, f, m, g, v, 11, b[33])
, g = l(g, h, f, m, C, 16, b[34])
, m = l(m, g, h, f, E, 23, b[35])
, f = l(f, m, g, h, e, 4, b[36])
, h = l(h, f, m, g, z, 11, b[37])
, g = l(g, h, f, m, w, 16, b[38])
, m = l(m, g, h, f, B, 23, b[39])
, f = l(f, m, g, h, D, 4, b[40])
, h = l(h, f, m, g, c, 11, b[41])
, g = l(g, h, f, m, k, 16, b[42])
, m = l(m, g, h, f, t, 23, b[43])
, f = l(f, m, g, h, A, 4, b[44])

```
            , h = l(h, f, m, g, u, 11, b[45])
            , g = l(g, h, f, m, x, 16, b[46])
            , m = l(m, g, h, f, j, 23, b[47])
            , f = s(f, m, g, h, c, 6, b[48])
            , h = s(h, f, m, g, w, 10, b[49])
            , g = s(g, h, f, m, E, 15, b[50])
            , m = s(m, g, h, f, r, 21, b[51])
            , f = s(f, m, g, h, u, 6, b[52])
            , h = s(h, f, m, g, k, 10, b[53])
            , g = s(g, h, f, m, B, 15, b[54])
            , m = s(m, g, h, f, e, 21, b[55])
            , f = s(f, m, g, h, v, 6, b[56])
            , h = s(h, f, m, g, x, 10, b[57])
            , g = s(g, h, f, m, t, 15, b[58])
            , m = s(m, g, h, f, D, 21, b[59])
            , f = s(f, m, g, h, z, 6, b[60])
            , h = s(h, f, m, g, C, 10, b[61])
            , g = s(g, h, f, m, j, 15, b[62])
            , m = s(m, g, h, f, A, 21, b[63]);
        a[0] = a[0] + f | 0;
        a[1] = a[1] + m | 0;
        a[2] = a[2] + g | 0;
        a[3] = a[3] + h | 0
    },
    _doFinalize: function() {
        var b = this._data
          , n = b.words
          , a = 8 * this._nDataBytes
          , c = 8 * b.sigBytes;
        n[c >>> 5] |= 128 << 24 - c % 32;
        var e = u.floor(a / 4294967296);
        n[(c + 64 >>> 9 << 4) + 15] = (e << 8 | e >>> 24) & 16711935 | (e << 24 | e >>>
8) & 4278255360;
```

```
            n[(c + 64 >>> 9 << 4) + 14] = (a << 8 | a >>> 24) & 16711935 | (a << 24 | a >>>
8) & 4278255360;
            b.sigBytes = 4 * (n.length + 1);
            this._process();
            b = this._hash;
            n = b.words;
            for (a = 0; 4 > a; a++)
                c = n[a],
                n[a] = (c << 8 | c >>> 24) & 16711935 | (c << 24 | c >>> 8) & 4278255360;
            return b
        },
        clone: function() {
            var b = v.clone.call(this);
            b._hash = this._hash.clone();
            return b
        }
    });
    t.MD5 = v._createHelper(r);
    t.HmacMD5 = v._createHmacHelper(r)
}
)(Math);
(function() {
    var u = CryptoJS
      , p = u.lib
      , d = p.Base
      , l = p.WordArray
      , p = u.algo
      , s = p.EvpKDF = d.extend({
        cfg: d.extend({
            keySize: 4,
            hasher: p.MD5,
            iterations: 1
        }),
        init: function(d) {
```

```
            this.cfg = this.cfg.extend(d)
        },
        compute: function(d, r) {
            for (var p = this.cfg, s = p.hasher.create(), b = l.create(), u = b.words, q =
p.keySize, p = p.iterations; u.length < q; ) {
                n && s.update(n);
                var n = s.update(d).finalize(r);
                s.reset();
                for (var a = 1; a < p; a++)
                    n = s.finalize(n),
                    s.reset();
                b.concat(n)
            }
            b.sigBytes = 4 * q;
            return b
        }
    });
    u.EvpKDF = function(d, l, p) {
        return s.create(p).compute(d, l)
    }
}
)();
CryptoJS.lib.Cipher || function(u) {
    var p = CryptoJS
      , d = p.lib
      , l = d.Base
      , s = d.WordArray
      , t = d.BufferedBlockAlgorithm
      , r = p.enc.Base64
      , w = p.algo.EvpKDF
      , v = d.Cipher = t.extend({
        cfg: l.extend(),
        createEncryptor: function(e, a) {
            return this.create(this._ENC_XFORM_MODE, e, a)
```

```
},
createDecryptor: function(e, a) {
    return this.create(this._DEC_XFORM_MODE, e, a)
},
init: function(e, a, b) {
    this.cfg = this.cfg.extend(b);
    this._xformMode = e;
    this._key = a;
    this.reset()
},
reset: function() {
    t.reset.call(this);
    this._doReset()
},
process: function(e) {
    this._append(e);
    return this._process()
},
finalize: function(e) {
    e && this._append(e);
    return this._doFinalize()
},
keySize: 4,
ivSize: 4,
_ENC_XFORM_MODE: 1,
_DEC_XFORM_MODE: 2,
_createHelper: function(e) {
    return {
        encrypt: function(b, k, d) {
            return ("string" == typeof k ? c : a).encrypt(e, b, k, d)
        },
        decrypt: function(b, k, d) {
            return ("string" == typeof k ? c : a).decrypt(e, b, k, d)
        }
```

```
            }
        }
    });
    d.StreamCipher = v.extend({
        _doFinalize: function() {
            return this._process(!0)
        },
        blockSize: 1
    });
    var b = p.mode = {}
      , x = function(e, a, b) {
        var c = this._iv;
        c ? this._iv = u : c = this._prevBlock;
        for (var d = 0; d < b; d++)
            e[a + d] ^= c[d]
    }
      , q = (d.BlockCipherMode = l.extend({
        createEncryptor: function(e, a) {
            return this.Encryptor.create(e, a)
        },
        createDecryptor: function(e, a) {
            return this.Decryptor.create(e, a)
        },
        init: function(e, a) {
            this._cipher = e;
            this._iv = a
        }
    })).extend();
    q.Encryptor = q.extend({
        processBlock: function(e, a) {
            var b = this._cipher
              , c = b.blockSize;
            x.call(this, e, a, c);
            b.encryptBlock(e, a);
```

```
            this._prevBlock = e.slice(a, a + c)
        }
    });
    q.Decryptor = q.extend({
        processBlock: function(e, a) {
            var b = this._cipher
              , c = b.blockSize
              , d = e.slice(a, a + c);
            b.decryptBlock(e, a);
            x.call(this, e, a, c);
            this._prevBlock = d
        }
    });
    b = b.CBC = q;
    q = (p.pad = {}).Pkcs7 = {
        pad: function(a, b) {
            for (var c = 4 * b, c = c - a.sigBytes % c, d = c << 24 | c << 16 | c << 8 | c, l =
[], n = 0; n < c; n += 4)
                l.push(d);
            c = s.create(l, c);
            a.concat(c)
        },
        unpad: function(a) {
            a.sigBytes -= a.words[a.sigBytes - 1 >>> 2] & 255
        }
    };
    d.BlockCipher = v.extend({
        cfg: v.cfg.extend({
            mode: b,
            padding: q
        }),
        reset: function() {
            v.reset.call(this);
            var a = this.cfg
```

```
            , b = a.iv
            , a = a.mode;
        if (this._xformMode == this._ENC_XFORM_MODE)
            var c = a.createEncryptor;
        else
            c = a.createDecryptor,
            this._minBufferSize = 1;
        this._mode = c.call(a, this, b && b.words)
    },
    _doProcessBlock: function(a, b) {
        this._mode.processBlock(a, b)
    },
    _doFinalize: function() {
        var a = this.cfg.padding;
        if (this._xformMode == this._ENC_XFORM_MODE) {
            a.pad(this._data, this.blockSize);
            var b = this._process(!0)
        } else
            b = this._process(!0),
            a.unpad(b);
        return b
    },
    blockSize: 4
});
var n = d.CipherParams = l.extend({
    init: function(a) {
        this.mixIn(a)
    },
    toString: function(a) {
        return (a || this.formatter).stringify(this)
    }
})
  , b = (p.format = {}).OpenSSL = {
    stringify: function(a) {
```

```
            var b = a.ciphertext;
            a = a.salt;
            return (a ? s.create([1398893684, 1701076831]).concat(a).concat(b) :
b).toString(r)
        },
        parse: function(a) {
            a = r.parse(a);
            var b = a.words;
            if (1398893684 == b[0] && 1701076831 == b[1]) {
                var c = s.create(b.slice(2, 4));
                b.splice(0, 4);
                a.sigBytes -= 16
            }
            return n.create({
                ciphertext: a,
                salt: c
            })
        }
    }
     , a = d.SerializableCipher = l.extend({
        cfg: l.extend({
            format: b
        }),
        encrypt: function(a, b, c, d) {
            d = this.cfg.extend(d);
            var l = a.createEncryptor(c, d);
            b = l.finalize(b);
            l = l.cfg;
            return n.create({
                ciphertext: b,
                key: c,
                iv: l.iv,
                algorithm: a,
                mode: l.mode,
```

```
            padding: l.padding,
            blockSize: a.blockSize,
            formatter: d.format
        })
    },
    decrypt: function(a, b, c, d) {
        d = this.cfg.extend(d);
        b = this._parse(b, d.format);
        return a.createDecryptor(c, d).finalize(b.ciphertext)
    },
    _parse: function(a, b) {
        return "string" == typeof a ? b.parse(a, this) : a
    }
})
  , p = (p.kdf = {}).OpenSSL = {
    execute: function(a, b, c, d) {
        d || (d = s.random(8));
        a = w.create({
            keySize: b + c
        }).compute(a, d);
        c = s.create(a.words.slice(b), 4 * c);
        a.sigBytes = 4 * b;
        return n.create({
            key: a,
            iv: c,
            salt: d
        })
    }
}
  , c = d.PasswordBasedCipher = a.extend({
    cfg: a.cfg.extend({
        kdf: p
    }),
    encrypt: function(b, c, d, l) {
```

```
            l = this.cfg.extend(l);
            d = l.kdf.execute(d, b.keySize, b.ivSize);
            l.iv = d.iv;
            b = a.encrypt.call(this, b, c, d.key, l);
            b.mixIn(d);
            return b
        },
        decrypt: function(b, c, d, l) {
            l = this.cfg.extend(l);
            c = this._parse(c, l.format);
            d = l.kdf.execute(d, b.keySize, b.ivSize, c.salt);
            l.iv = d.iv;
            return a.decrypt.call(this, b, c, d.key, l)
        }
    })
}();
(function() {
    for (var u = CryptoJS, p = u.lib.BlockCipher, d = u.algo, l = [], s = [], t = [], r = [], w
= [], v = [], b = [], x = [], q = [], n = [], a = [], c = 0; 256 > c; c++)
        a[c] = 128 > c ? c << 1 : c << 1 ^ 283;
    for (var e = 0, j = 0, c = 0; 256 > c; c++) {
        var k = j ^ j << 1 ^ j << 2 ^ j << 3 ^ j << 4
          , k = k >>> 8 ^ k & 255 ^ 99;
        l[e] = k;
        s[k] = e;
        var z = a[e]
          , F = a[z]
          , G = a[F]
          , y = 257 * a[k] ^ 16843008 * k;
        t[e] = y << 24 | y >>> 8;
        r[e] = y << 16 | y >>> 16;
        w[e] = y << 8 | y >>> 24;
        v[e] = y;
        y = 16843009 * G ^ 65537 * F ^ 257 * z ^ 16843008 * e;
```

```
        b[k] = y << 24 | y >>> 8;
        x[k] = y << 16 | y >>> 16;
        q[k] = y << 8 | y >>> 24;
        n[k] = y;
        e ? (e = z ^ a[a[a[G ^ z]]],
        j ^= a[a[j]]) : e = j = 1
    }
    var H = [0, 1, 2, 4, 8, 16, 32, 64, 128, 27, 54]
      , d = d.AES = p.extend({
        _doReset: function() {
            for (var a = this._key, c = a.words, d = a.sigBytes / 4, a = 4 * ((this._nRounds =
d + 6) + 1), e = this._keySchedule = [], j = 0; j < a; j++)
                if (j < d)
                    e[j] = c[j];
                else {
                    var k = e[j - 1];
                    j % d ? 6 < d && 4 == j % d && (k = l[k >>> 24] << 24 | l[k >>> 16 &
255] << 16 | l[k >>> 8 & 255] << 8 | l[k & 255]) : (k = k << 8 | k >>> 24,
                    k = l[k >>> 24] << 24 | l[k >>> 16 & 255] << 16 | l[k >>> 8 & 255] << 8 |
l[k & 255],
                    k ^= H[j / d | 0] << 24);
                    e[j] = e[j - d] ^ k
                }
            c = this._invKeySchedule = [];
            for (d = 0; d < a; d++)
                j = a - d,
                k = d % 4 ? e[j] : e[j - 4],
                c[d] = 4 > d || 4 >= j ? k : b[l[k >>> 24]] ^ x[l[k >>> 16 & 255]] ^ q[l[k >>>
8 & 255]] ^ n[l[k & 255]]
        },
        encryptBlock: function(a, b) {
            this._doCryptBlock(a, b, this._keySchedule, t, r, w, v, l)
        },
        decryptBlock: function(a, c) {
```

```
            var d = a[c + 1];
            a[c + 1] = a[c + 3];
            a[c + 3] = d;
            this._doCryptBlock(a, c, this._invKeySchedule, b, x, q, n, s);
            d = a[c + 1];
            a[c + 1] = a[c + 3];
            a[c + 3] = d
        },
        _doCryptBlock: function(a, b, c, d, e, j, l, f) {
            for (var m = this._nRounds, g = a[b] ^ c[0], h = a[b + 1] ^ c[1], k = a[b + 2] ^
c[2], n = a[b + 3] ^ c[3], p = 4, r = 1; r < m; r++)
                var q = d[g >>> 24] ^ e[h >>> 16 & 255] ^ j[k >>> 8 & 255] ^ l[n & 255] ^
c[p++]
                  , s = d[h >>> 24] ^ e[k >>> 16 & 255] ^ j[n >>> 8 & 255] ^ l[g & 255] ^
c[p++]
                  , t = d[k >>> 24] ^ e[n >>> 16 & 255] ^ j[g >>> 8 & 255] ^ l[h & 255] ^
c[p++]
                  , n = d[n >>> 24] ^ e[g >>> 16 & 255] ^ j[h >>> 8 & 255] ^ l[k & 255] ^
c[p++]
                  , g = q
                  , h = s
                  , k = t;
            q = (f[g >>> 24] << 24 | f[h >>> 16 & 255] << 16 | f[k >>> 8 & 255] << 8 | f[n
& 255]) ^ c[p++];
            s = (f[h >>> 24] << 24 | f[k >>> 16 & 255] << 16 | f[n >>> 8 & 255] << 8 | f[g
& 255]) ^ c[p++];
            t = (f[k >>> 24] << 24 | f[n >>> 16 & 255] << 16 | f[g >>> 8 & 255] << 8 | f[h
& 255]) ^ c[p++];
            n = (f[n >>> 24] << 24 | f[g >>> 16 & 255] << 16 | f[h >>> 8 & 255] << 8 | f[k
& 255]) ^ c[p++];
            a[b] = q;
            a[b + 1] = s;
            a[b + 2] = t;
            a[b + 3] = n
```

```
        },
        keySize: 8
    });
    u.AES = p._createHelper(d)
}
)();
```

A.2.2 MD5 Hashing Algorithm Code

```
var CryptoJS = CryptoJS || function(s, p) {
    var m = {}
      , l = m.lib = {}
      , n = function() {}
      , r = l.Base = {
        extend: function(b) {
            n.prototype = this;
            var h = new n;
            b && h.mixIn(b);
            h.hasOwnProperty("init") || (h.init = function() {
                h.$super.init.apply(this, arguments)
            }
            );
            h.init.prototype = h;
            h.$super = this;
            return h
        },
        create: function() {
            var b = this.extend();
            b.init.apply(b, arguments);
            return b
        },
        init: function() {},
        mixIn: function(b) {
            for (var h in b)
```

```
            b.hasOwnProperty(h) && (this[h] = b[h]);
        b.hasOwnProperty("toString") && (this.toString = b.toString)
    },
    clone: function() {
        return this.init.prototype.extend(this)
    }
}
 , q = l.WordArray = r.extend({
    init: function(b, h) {
        b = this.words = b || [];
        this.sigBytes = h != p ? h : 4 * b.length
    },
    toString: function(b) {
        return (b || t).stringify(this)
    },
    concat: function(b) {
        var h = this.words
          , a = b.words
          , j = this.sigBytes;
        b = b.sigBytes;
        this.clamp();
        if (j % 4)
            for (var g = 0; g < b; g++)
                h[j + g >>> 2] |= (a[g >>> 2] >>> 24 - 8 * (g % 4) & 255) << 24 - 8 * ((j
+ g) % 4);
        else if (65535 < a.length)
            for (g = 0; g < b; g += 4)
                h[j + g >>> 2] = a[g >>> 2];
        else
            h.push.apply(h, a);
        this.sigBytes += b;
        return this
    },
    clamp: function() {
```

```
        var b = this.words
          , h = this.sigBytes;
        b[h >>> 2] &= 4294967295 << 32 - 8 * (h % 4);
        b.length = s.ceil(h / 4)
    },
    clone: function() {
        var b = r.clone.call(this);
        b.words = this.words.slice(0);
        return b
    },
    random: function(b) {
        for (var h = [], a = 0; a < b; a += 4)
            h.push(4294967296 * s.random() | 0);
        return new q.init(h,b)
    }
})
  , v = m.enc = {}
  , t = v.Hex = {
    stringify: function(b) {
        var a = b.words;
        b = b.sigBytes;
        for (var g = [], j = 0; j < b; j++) {
            var k = a[j >>> 2] >>> 24 - 8 * (j % 4) & 255;
            g.push((k >>> 4).toString(16));
            g.push((k & 15).toString(16))
        }
        return g.join("")
    },
    parse: function(b) {
        for (var a = b.length, g = [], j = 0; j < a; j += 2)
            g[j >>> 3] |= parseInt(b.substr(j, 2), 16) << 24 - 4 * (j % 8);
        return new q.init(g,a / 2)
    }
}
```

```
  , a = v.Latin1 = {
    stringify: function(b) {
        var a = b.words;
        b = b.sigBytes;
        for (var g = [], j = 0; j < b; j++)
            g.push(String.fromCharCode(a[j >>> 2] >>> 24 - 8 * (j % 4) & 255));
        return g.join("")
    },
    parse: function(b) {
        for (var a = b.length, g = [], j = 0; j < a; j++)
            g[j >>> 2] |= (b.charCodeAt(j) & 255) << 24 - 8 * (j % 4);
        return new q.init(g,a)
    }
}
  , u = v.Utf8 = {
    stringify: function(b) {
        try {
            return decodeURIComponent(escape(a.stringify(b)))
        } catch (g) {
            throw Error("Malformed UTF-8 data");
        }
    },
    parse: function(b) {
        return a.parse(unescape(encodeURIComponent(b)))
    }
}
  , g = l.BufferedBlockAlgorithm = r.extend({
    reset: function() {
        this._data = new q.init;
        this._nDataBytes = 0
    },
    _append: function(b) {
        "string" == typeof b && (b = u.parse(b));
        this._data.concat(b);
```

```
            this._nDataBytes += b.sigBytes
        },
        _process: function(b) {
            var a = this._data
              , g = a.words
              , j = a.sigBytes
              , k = this.blockSize
              , m = j / (4 * k)
              , m = b ? s.ceil(m) : s.max((m | 0) - this._minBufferSize, 0);
            b = m * k;
            j = s.min(4 * b, j);
            if (b) {
                for (var l = 0; l < b; l += k)
                    this._doProcessBlock(g, l);
                l = g.splice(0, b);
                a.sigBytes -= j
            }
            return new q.init(l,j)
        },
        clone: function() {
            var b = r.clone.call(this);
            b._data = this._data.clone();
            return b
        },
        _minBufferSize: 0
    });
    l.Hasher = g.extend({
        cfg: r.extend(),
        init: function(b) {
            this.cfg = this.cfg.extend(b);
            this.reset()
        },
        reset: function() {
            g.reset.call(this);
```

```
            this._doReset()
        },
        update: function(b) {
            this._append(b);
            this._process();
            return this
        },
        finalize: function(b) {
            b && this._append(b);
            return this._doFinalize()
        },
        blockSize: 16,
        _createHelper: function(b) {
            return function(a, g) {
                return (new b.init(g)).finalize(a)
            }
        },
        _createHmacHelper: function(b) {
            return function(a, g) {
                return (new k.HMAC.init(b,g)).finalize(a)
            }
        }
    });
    var k = m.algo = {};
    return m
}(Math);
(function(s) {
    function p(a, k, b, h, l, j, m) {
        a = a + (k & b | ~k & h) + l + m;
        return (a << j | a >>> 32 - j) + k
    }
    function m(a, k, b, h, l, j, m) {
        a = a + (k & h | b & ~h) + l + m;
        return (a << j | a >>> 32 - j) + k
```

```
    }
    function l(a, k, b, h, l, j, m) {
        a = a + (k ^ b ^ h) + l + m;
        return (a << j | a >>> 32 - j) + k
    }
    function n(a, k, b, h, l, j, m) {
        a = a + (b ^ (k | ~h)) + l + m;
        return (a << j | a >>> 32 - j) + k
    }
    for (var r = CryptoJS, q = r.lib, v = q.WordArray, t = q.Hasher, q = r.algo, a = [], u
= 0; 64 > u; u++)
        a[u] = 4294967296 * s.abs(s.sin(u + 1)) | 0;
    q = q.MD5 = t.extend({
        _doReset: function() {
            this._hash = new v.init([1732584193, 4023233417, 2562383102, 271733878])
        },
        _doProcessBlock: function(g, k) {
            for (var b = 0; 16 > b; b++) {
                var h = k + b
                  , w = g[h];
                g[h] = (w << 8 | w >>> 24) & 16711935 | (w << 24 | w >>> 8) &
4278255360
            }
            var b = this._hash.words
              , h = g[k + 0]
              , w = g[k + 1]
              , j = g[k + 2]
              , q = g[k + 3]
              , r = g[k + 4]
              , s = g[k + 5]
              , t = g[k + 6]
              , u = g[k + 7]
              , v = g[k + 8]
              , x = g[k + 9]
```

```
, y = g[k + 10]
, z = g[k + 11]
, A = g[k + 12]
, B = g[k + 13]
, C = g[k + 14]
, D = g[k + 15]
, c = b[0]
, d = b[1]
, e = b[2]
, f = b[3]
, c = p(c, d, e, f, h, 7, a[0])
, f = p(f, c, d, e, w, 12, a[1])
, e = p(e, f, c, d, j, 17, a[2])
, d = p(d, e, f, c, q, 22, a[3])
, c = p(c, d, e, f, r, 7, a[4])
, f = p(f, c, d, e, s, 12, a[5])
, e = p(e, f, c, d, t, 17, a[6])
, d = p(d, e, f, c, u, 22, a[7])
, c = p(c, d, e, f, v, 7, a[8])
, f = p(f, c, d, e, x, 12, a[9])
, e = p(e, f, c, d, y, 17, a[10])
, d = p(d, e, f, c, z, 22, a[11])
, c = p(c, d, e, f, A, 7, a[12])
, f = p(f, c, d, e, B, 12, a[13])
, e = p(e, f, c, d, C, 17, a[14])
, d = p(d, e, f, c, D, 22, a[15])
, c = m(c, d, e, f, w, 5, a[16])
, f = m(f, c, d, e, t, 9, a[17])
, e = m(e, f, c, d, z, 14, a[18])
, d = m(d, e, f, c, h, 20, a[19])
, c = m(c, d, e, f, s, 5, a[20])
, f = m(f, c, d, e, y, 9, a[21])
, e = m(e, f, c, d, D, 14, a[22])
, d = m(d, e, f, c, r, 20, a[23])
```

, c = m(c, d, e, f, x, 5, a[24])

, f = m(f, c, d, e, C, 9, a[25])

, e = m(e, f, c, d, q, 14, a[26])

, d = m(d, e, f, c, v, 20, a[27])

, c = m(c, d, e, f, B, 5, a[28])

, f = m(f, c, d, e, j, 9, a[29])

, e = m(e, f, c, d, u, 14, a[30])

, d = m(d, e, f, c, A, 20, a[31])

, c = l(c, d, e, f, s, 4, a[32])

, f = l(f, c, d, e, v, 11, a[33])

, e = l(e, f, c, d, z, 16, a[34])

, d = l(d, e, f, c, C, 23, a[35])

, c = l(c, d, e, f, w, 4, a[36])

, f = l(f, c, d, e, r, 11, a[37])

, e = l(e, f, c, d, u, 16, a[38])

, d = l(d, e, f, c, y, 23, a[39])

, c = l(c, d, e, f, B, 4, a[40])

, f = l(f, c, d, e, h, 11, a[41])

, e = l(e, f, c, d, q, 16, a[42])

, d = l(d, e, f, c, t, 23, a[43])

, c = l(c, d, e, f, x, 4, a[44])

, f = l(f, c, d, e, A, 11, a[45])

, e = l(e, f, c, d, D, 16, a[46])

, d = l(d, e, f, c, j, 23, a[47])

, c = n(c, d, e, f, h, 6, a[48])

, f = n(f, c, d, e, u, 10, a[49])

, e = n(e, f, c, d, C, 15, a[50])

, d = n(d, e, f, c, s, 21, a[51])

, c = n(c, d, e, f, A, 6, a[52])

, f = n(f, c, d, e, q, 10, a[53])

, e = n(e, f, c, d, y, 15, a[54])

, d = n(d, e, f, c, w, 21, a[55])

, c = n(c, d, e, f, v, 6, a[56])

, f = n(f, c, d, e, D, 10, a[57])

```
            , e = n(e, f, c, d, t, 15, a[58])
            , d = n(d, e, f, c, B, 21, a[59])
            , c = n(c, d, e, f, r, 6, a[60])
            , f = n(f, c, d, e, z, 10, a[61])
            , e = n(e, f, c, d, j, 15, a[62])
            , d = n(d, e, f, c, x, 21, a[63]);
            b[0] = b[0] + c | 0;
            b[1] = b[1] + d | 0;
            b[2] = b[2] + e | 0;
            b[3] = b[3] + f | 0
        },
        _doFinalize: function() {
            var a = this._data
              , k = a.words
              , b = 8 * this._nDataBytes
              , h = 8 * a.sigBytes;
            k[h >>> 5] |= 128 << 24 - h % 32;
            var l = s.floor(b / 4294967296);
            k[(h + 64 >>> 9 << 4) + 15] = (l << 8 | l >>> 24) & 16711935 | (l << 24 |
l >>> 8) & 4278255360;
            k[(h + 64 >>> 9 << 4) + 14] = (b << 8 | b >>> 24) & 16711935 | (b << 24 |
b >>> 8) & 4278255360;
            a.sigBytes = 4 * (k.length + 1);
            this._process();
            a = this._hash;
            k = a.words;
            for (b = 0; 4 > b; b++)
                h = k[b],
                k[b] = (h << 8 | h >>> 24) & 16711935 | (h << 24 | h >>> 8) &
4278255360;
            return a
        },
        clone: function() {
            var a = t.clone.call(this);
```

```
            a._hash = this._hash.clone();
            return a
        }
    });
    r.MD5 = t._createHelper(q);
    r.HmacMD5 = t._createHmacHelper(q)
}
)(Math);
```

A.2.3 Firebase Code

```
var firebaseConfig = {
    apiKey: "AIzaSyDfTwxjqDf6aU7r6s7_u6W7D2MYiSNk0CE",
    authDomain: "fyp2-e964d.firebaseapp.com",
    databaseURL: "https://fyp2-e964d.firebaseio.com",
    projectId: "fyp2-e964d",
    storageBucket: "fyp2-e964d.appspot.com",
    messagingSenderId: "893388715658",
    appId: "1:893388715658:web:923d09e146bcc3be385f73",
    measurementId: "G-GDFDVHGR43"
  };
  // Initialize Firebase
  firebase.initializeApp(firebaseConfig);
```

A.2.4 jQuery 3.3.1 Code

```
/*! jQuery v3.3.1 | (c) JS Foundation and other contributors | jquery.org/license */
!function(e,t){"use strict";"object"==typeof module&&"object"==typeof
module.exports?module.exports=e.document?t(e,!0):function(e){if(!e.document)thro
w new Error("jQuery requires a window with a document");return
t(e)}:t(e)}("undefined"!=typeof window?window:this,function(e,t){"use strict";var
n=[],r=e.document,i=Object.getPrototypeOf,o=n.slice,a=n.concat,s=n.push,u=n.index
Of,l={},c=l.toString,f=l.hasOwnProperty,p=f.toString,d=p.call(Object),h={},g=functi
on e(t){return"function"==typeof t&&"number"!=typeof t.nodeType},y=function
e(t){return null!=t&&t===t.window},v={type:!0,src:!0,noModule:!0};function
```

m(e,t,n){var i,o=(t=t||r).createElement("script");if(o.text=e,n)for(i in v)n[i]&&(o[i]=n[i]);t.head.appendChild(o).parentNode.removeChild(o)}function x(e){return null==e?e+"":"object"==typeof e||"function"==typeof e?l[c.call(e)]||"object":typeof e}var b="3.3.1",w=function(e,t){return new w.fn.init(e,t)},T=/^[\s\uFEFF\xA0]+|[\s\uFEFF\xA0]+$/g;w.fn=w.prototype={jquery:"3.3.1",constructor:w,length:0,toArray:function(){return o.call(this)},get:function(e){return null==e?o.call(this):e<0?this[e+this.length]:this[e]},pushStack:function(e){var t=w.merge(this.constructor(),e);return t.prevObject=this,t},each:function(e){return w.each(this,e)},map:function(e){return this.pushStack(w.map(this,function(t,n){return e.call(t,n,t)}))},slice:function(){return this.pushStack(o.apply(this,arguments))},first:function(){return this.eq(0)},last:function(){return this.eq(-1)},eq:function(e){var t=this.length,n=+e+(e<0?t:0);return this.pushStack(n>=0&&n<t?[this[n]]:[])},end:function(){return this.prevObject||this.constructor()},push:s,sort:n.sort,splice:n.splice},w.extend=w.fn.extend=function(){var e,t,n,r,i,o,a=arguments[0]||{},s=1,u=arguments.length,l=!1;for("boolean"==typeof a&&(l=a,a=arguments[s]||{},s++),"object"==typeof a||g(a)||(a={}),s===u&&(a=this,s--);s<u;s++)if(null!=(e=arguments[s]))for(t in e)n=a[t],a!==(r=e[t])&&(l&&r&&(w.isPlainObject(r)||(i=Array.isArray(r)))?(i?(i=!1,o=n&&Array.isArray(n)?n:[]):o=n&&w.isPlainObject(n)?n:{},a[t]=w.extend(l,o,r)):void 0!==r&&(a[t]=r));return a},w.extend({expando:"jQuery"+("3.3.1"+Math.random()).replace(/\D/g,""),isReady:!0,error:function(e){throw new Error(e)},noop:function(){},isPlainObject:function(e){var t,n;return!(!e||"[object Object]"!==c.call(e))&&(!(t=i(e))||"function"==typeof(n=f.call(t,"constructor")&&t.constructor)&&p.call(n)===d)},isEmptyObject:function(e){var t;for(t in e)return!1;return!0},globalEval:function(e){m(e)},each:function(e,t){var n,r=0;if(C(e)){for(n=e.length;r<n;r++)if(!1===t.call(e[r],r,e[r]))break}else for(r in e)if(!1===t.call(e[r],r,e[r]))break;return e},trim:function(e){return null==e?"":(e+"").replace(T,"")},makeArray:function(e,t){var n=t||[];return null!=e&&(C(Object(e))?w.merge(n,"string"==typeof e?[e]:e):s.call(n,e)),n},inArray:function(e,t,n){return null==t?-

1:u.call(t,e,n)},merge:function(e,t){for(var
n=+t.length,r=0,i=e.length;r<n;r++)e[i++]=t[r];return
e.length=i,e},grep:function(e,t,n){for(var
r,i=[],o=0,a=e.length,s=!n;o<a;o++)(r=!t(e[o],o))!==s&&i.push(e[o]);return
i},map:function(e,t,n){var
r,i,o=0,s=[];if(C(e))for(r=e.length;o<r;o++)null!=(i=t(e[o],o,n))&&s.push(i);else for(o
in e)null!=(i=t(e[o],o,n))&&s.push(i);return
a.apply([],s)},guid:1,support:h}),"function"==typeof
Symbol&&(w.fn[Symbol.iterator]=n[Symbol.iterator]),w.each("Boolean Number
String Function Array Date RegExp Object Error Symbol".split("
"),function(e,t){l["[object "+t+"]"]=t.toLowerCase()});function C(e){var
t=!!e&&"length"in
e&&e.length,n=x(e);return!g(e)&&!y(e)&&("array"===n||0===t||"number"==typeof
t&&t>0&&t-1 in e)}var E=function(e){var
t,n,r,i,o,a,s,u,l,c,f,p,d,h,g,y,v,m,x,b="sizzle"+1*new
Date,w=e.document,T=0,C=0,E=ae(),k=ae(),S=ae(),D=function(e,t){return
e===t&&(f=!0),0},N={}.hasOwnProperty,A=[],j=A.pop,q=A.push,L=A.push,H=A.sl
ice,O=function(e,t){for(var n=0,r=e.length;n<r;n++)if(e[n]===t)return n;return-
1},P="checked|selected|async|autofocus|autoplay|controls|defer|disabled|hidden|ismap|
loop|multiple|open|readonly|required|scoped",M="[\\x20\\t\\r\\n\\f]",R="(?:\\\\.|[\\w-]|[
^\\0-
\\xa0])+",I="\\["+M+"*("+R+")(?:"+M+"*([*^$|!~]?=)"+M+"*(?:'((?:\\\\.|[^\\\\']
)*)'|\"((?:\\\\.|[^\\\\\"])*)\"|("+R+"))|)"+M+"*\\]",W=":("+R+")(?:\\(('((?:\\\\.|[^\\\\']
)*)'|\"((?:\\\\.|[^\\\\\"])*)\")|((?:\\\\.|[^\\\\()[\\]]|"+I+")*)|.*)\\)|)",$=new
RegExp(M+"+","g"),B=new
RegExp("^"+M+"+|((?:^|[^\\\\])(?:\\\\.)*)"+M+"+$","g"),F=new
RegExp("^"+M+"*,"+M+"*"),_=new
RegExp("^"+M+"*([>+~]|"+M+")"+M+"*"),z=new
RegExp("="+M+"*([^\\]'\"]*?)"+M+"*\\]","g"),X=new RegExp(W),U=new
RegExp("^"+R+"$"),V={ID:new RegExp("^#("+R+")"),CLASS:new
RegExp("^\\.("+R+")"),TAG:new RegExp("^("+R+"|[*])"),ATTR:new
RegExp("^"+I),PSEUDO:new RegExp("^"+W),CHILD:new
RegExp("^:(only|first|last|nth|nth-last)-(child|of-
type)(?:\\("+M+"*(even|odd|(([+-]|)(\\d*)n|)"+M+"*(?:([+-]|)"+M+"*(\\d+)|))"+M+"*\

\)|)","i"),bool:new RegExp("^(?:"+P+")$","i"),needsContext:new RegExp("^"+M+"*[>+~]|:(even|odd|eq|gt|lt|nth|first|last)(?:\\("+M+"*((?:-\\d)?\\d*)"+M+"*\\)|)(?=[^-]|$)","i")},G=/^(?:input|select|textarea|button)$/i,Y=/^h\d$/i,Q=/^[^{]+\{\s*\[native \w/,J=/^(?:#([\w-]+)|(\w+)|\.([\w-]+))$/,K=/[+~]/,Z=new RegExp("\\\\([\\da-f]{1,6}"+M+"?|("+M+")|.)","ig"),ee=function(e,t,n){var r="0x"+t-65536;return r!==r||n?t:r<0?String.fromCharCode(r+65536):String.fromCharCode(r>>10|55296,1023&r|56320)},te=/([\0-\x1f\x7f]|^-?\d)|^-$|[^\0-\x1f\x7f-\uFFFF\w-]/g,ne=function(e,t){return t?"\0"===e?"\ufffd":e.slice(0,-1)+"\\"+e.charCodeAt(e.length-1).toString(16)+" ":"\\"+e},re=function(){p()},ie=me(function(e){return!0===e.disabled&&("form"in e||"label"in e)},{dir:"parentNode",next:"legend"});try{L.apply(A=H.call(w.childNodes),w.childNodes),A[w.childNodes.length].nodeType}catch(e){L={apply:A.length?function(e,t){q.apply(e,H.call(t))}:function(e,t){var n=e.length,r=0;while(e[n++]=t[r++]);e.length=n-1}}}function oe(e,t,r,i){var o,s,l,c,f,h,v,m=t&&t.ownerDocument,T=t?t.nodeType:9;if(r=r||[],"string"!=typeof e||!e||1!==T&&9!==T&&11!==T)return r;if(!i&&((t?t.ownerDocument||t:w)!==d&&p(t),t=t||d,g)){if(11!==T&&(f=J.exec(e)))if(o=f[1]){if(9===T){if(!(l=t.getElementById(o)))return r;if(l.id===o)return r.push(l),r}else if(m&&(l=m.getElementById(o))&&x(t,l)&&l.id===o)return r.push(l),r}else{if(f[2])return L.apply(r,t.getElementsByTagName(e)),r;if((o=f[3])&&n.getElementsByClassName&&t.getElementsByClassName)return L.apply(r,t.getElementsByClassName(o)),r}if(n.qsa&&!S[e+" "]&&(!y||!y.test(e))){if(1!==T)m=t,v=e;else if("object"!==t.nodeName.toLowerCase()){(c=t.getAttribute("id"))?c=c.replace(te,ne):t.setAttribute("id",c=b),s=(h=a(e)).length;while(s--)h[s]="#"+c+" "+ve(h[s]);v=h.join(","),m=K.test(e)&&ge(t.parentNode)||t}if(v)try{return L.apply(r,m.querySelectorAll(v)),r}catch(e){}finally{c===b&&t.removeAttribute("id")}}}return u(e.replace(B,"$1"),t,r,i)}function ae(){var e=[];function t(n,i){return e.push(n+" ")>r.cacheLength&&delete t[e.shift()],t[n+" "]=i}return t}function se(e){return e[b]=!0,e}function ue(e){var t=d.createElement("fieldset");try{return!!e(t)}catch(e){return!1}finally{t.parentNode

&&t.parentNode.removeChild(t),t=null}}function le(e,t){var
n=e.split("|"),i=n.length;while(i--)r.attrHandle[n[i]]=t}function ce(e,t){var
n=t&&e,r=n&&1===e.nodeType&&1===t.nodeType&&e.sourceIndex-
t.sourceIndex;if(r)return r;if(n)while(n=n.nextSibling)if(n===t)return-1;return e?1:-
1}function fe(e){return
function(t){return"input"===t.nodeName.toLowerCase()&&t.type===e}}function
pe(e){return function(t){var
n=t.nodeName.toLowerCase();return("input"===n||"button"===n)&&t.type===e}}fu
nction de(e){return function(t){return"form"in
t?t.parentNode&&!1===t.disabled?"label"in t?"label"in
t.parentNode?t.parentNode.disabled===e:t.disabled===e:t.isDisabled===e||t.isDisabl
ed!==!e&&ie(t)===e:t.disabled===e:"label"in t&&t.disabled===e}}function
he(e){return se(function(t){return t=+t,se(function(n,r){var
i,o=e([],n.length,t),a=o.length;while(a--)n[i=o[a]]&&(n[i]=!(r[i]=n[i]))})})}function
ge(e){return e&&"undefined"!=typeof
e.getElementsByTagName&&e}n=oe.support={},o=oe.isXML=function(e){var
t=e&&(e.ownerDocument||e).documentElement;return!!t&&"HTML"!==t.nodeName
},p=oe.setDocument=function(e){var t,i,a=e?e.ownerDocument||e:w;return
a!==d&&9===a.nodeType&&a.documentElement?(d=a,h=d.documentElement,g=!o(
d),w!==d&&(i=d.defaultView)&&i.top!==i&&(i.addEventListener?i.addEventListen
er("unload",re,!1):i.attachEvent&&i.attachEvent("onunload",re)),n.attributes=ue(funct
ion(e){return
e.className="i",!e.getAttribute("className")}),n.getElementsByTagName=ue(funct
ion(e){return
e.appendChild(d.createComment("")),!e.getElementsByTagName("*").length}),n.get
ElementsByClassName=Q.test(d.getElementsByClassName),n.getById=ue(function(
e){return
h.appendChild(e).id=b,!d.getElementsByName||!d.getElementsByName(b).length}),n.
getById?(r.filter.ID=function(e){var t=e.replace(Z,ee);return function(e){return
e.getAttribute("id")===t}},r.find.ID=function(e,t){if("undefined"!=typeof
t.getElementById&&g){var n=t.getElementById(e);return
n?[n]:[]}}):(r.filter.ID=function(e){var t=e.replace(Z,ee);return function(e){var
n="undefined"!=typeof e.getAttributeNode&&e.getAttributeNode("id");return
n&&n.value===t}},r.find.ID=function(e,t){if("undefined"!=typeof

t.getElementById&&g){var
n,r,i,o=t.getElementById(e);if(o){if((n=o.getAttributeNode("id"))&&n.value===e)ret
urn[o];i=t.getElementsByName(e),r=0;while(o=i[r++])if((n=o.getAttributeNode("id")
)&&n.value===e)return[o]}return[]}}),r.find.TAG=n.getElementsByTagName?functi
on(e,t){return"undefined"!=typeof
t.getElementsByTagName?t.getElementsByTagName(e):n.qsa?t.querySelectorAll(e):
void 0}:function(e,t){var
n,r=[],i=0,o=t.getElementsByTagName(e);if("*"===e){while(n=o[i++])1===n.nodeT
ype&&r.push(n);return r}return
o},r.find.CLASS=n.getElementsByClassName&&function(e,t){if("undefined"!=type
of t.getElementsByClassName&&g)return
t.getElementsByClassName(e)},v=[],y=[],(n.qsa=Q.test(d.querySelectorAll))&&(ue(f
unction(e){h.appendChild(e).innerHTML="<select id='"+b+"-\r\\'
msallowcapture=''><option
selected=''></option></select>",e.querySelectorAll("[msallowcapture^='']").length&
&y.push("[*^$]="+M+"*(?:''|\"\")"),e.querySelectorAll("[selected]").length||y.push("\\
["+M+"*(?:value|"+P+")"),e.querySelectorAll("[id~="+b+"-]").length||y.push("~="),e.
querySelectorAll(":checked").length||y.push(":checked"),e.querySelectorAll("a#"+b+"
+*").length||y.push(".#.+[+~]")}),ue(function(e){e.innerHTML="<a href=''
disabled='disabled'><select disabled='disabled'><option/></select>";var
t=d.createElement("input");t.setAttribute("type","hidden"),e.appendChild(t).setAttrib
ute("name","D"),e.querySelectorAll("[name=d]").length&&y.push("name"+M+"*[*^
$|!~]?="),2!==e.querySelectorAll(":enabled").length&&y.push(":enabled",":disabled"
),h.appendChild(e).disabled=!0,2!==e.querySelectorAll(":disabled").length&&y.push
(":enabled",":disabled"),e.querySelectorAll("*,:x"),y.push(",.*:")})),(n.matchesSelect
or=Q.test(m=h.matches||h.webkitMatchesSelector||h.mozMatchesSelector||h.oMatches
Selector||h.msMatchesSelector))&&ue(function(e){n.disconnectedMatch=m.call(e,"*"
),m.call(e,"[s!='']:x"),v.push("!=",W)}),y=y.length&&new
RegExp(y.join("|")),v=v.length&&new
RegExp(v.join("|")),t=Q.test(h.compareDocumentPosition),x=t||Q.test(h.contains)?fun
ction(e,t){var n=9===e.nodeType?e.documentElement:e,r=t&&t.parentNode;return
e===r||!(!r||1!==r.nodeType||!(n.contains?n.contains(r):e.compareDocumentPosition&
&16&e.compareDocumentPosition(r)))}:function(e,t){if(t)while(t=t.parentNode)if(t=
==e)return!0;return!1},D=t?function(e,t){if(e===t)return f=!0,0;var

r=!e.compareDocumentPosition-!t.compareDocumentPosition;return r||(1&(r=(e.ownerDocument||e)===(t.ownerDocument||t)?e.compareDocumentPositio n(t):1)||!n.sortDetached&&t.compareDocumentPosition(e)===r?e===d||e.ownerDocu ment===w&&x(w,e)?-1:t===d||t.ownerDocument===w&&x(w,t)?1:c?O(c,e)-O(c,t):0:4&r?-1:1)}:function(e,t){if(e===t)return f=!0,0;var n,r=0,i=e.parentNode,o=t.parentNode,a=[e],s=[t];if(!i||!o)return e===d?-1:t===d?1:i?-1:o?1:c?O(c,e)-O(c,t):0;if(i===o)return ce(e,t);n=e;while(n=n.parentNode)a.unshift(n);n=t;while(n=n.parentNode)s.unshift(n);while(a[r]===s[r])r++;return r?ce(a[r],s[r]):a[r]===w?-1:s[r]===w?1:0},d):d},oe.matches=function(e,t){return oe(e,null,null,t)},oe.matchesSelector=function(e,t){if((e.ownerDocument||e)!==d&&p(e),t=t.replace(z,"='$1']"),n.matchesSelector&&g&&!S[t+"]&&(!v||!v.test(t))&&(!y||!y.test(t)))try{var r=m.call(e,t);if(r||n.disconnectedMatch||e.document&&11!==e.document.nodeType)return r}catch(e){}return oe(t,d,null,[e]).length>0},oe.contains=function(e,t){return(e.ownerDocument||e)!==d&&p(e),x(e,t)},oe.attr=function(e,t){(e.ownerDocument||e)!==d&&p(e);var i=r.attrHandle[t.toLowerCase()],o=i&&N.call(r.attrHandle,t.toLowerCase())?i(e,t,!g):void 0;return void 0!==o?o:n.attributes||!g?e.getAttribute(t):(o=e.getAttributeNode(t))&&o.specified?o.value:null},oe.escape=function(e){return(e+"").replace(te,ne)},oe.error=function(e){throw new Error("Syntax error, unrecognized expression: "+e)},oe.uniqueSort=function(e){var t,r=[],i=0,o=0;if(f=!n.detectDuplicates,c=!n.sortStable&&e.slice(0),e.sort(D),f){while(t=e[o++])t===e[o]&&(i=r.push(o));while(i--)e.splice(r[i],1)}return c=null,e},i=oe.getText=function(e){var t,n="",r=0,o=e.nodeType;if(o){if(1===o||9===o||11===o){if("string"==typeof e.textContent)return e.textContent;for(e=e.firstChild;e;e=e.nextSibling)n+=i(e)}else if(3===o||4===o)return e.nodeValue}else while(t=e[r++])n+=i(t);return n},(r=oe.selectors={cacheLength:50,createPseudo:se,match:V,attrHandle:{},find:{},relative:{">":{dir:"parentNode",first:!0}," ":{dir:"parentNode"},"+":{dir:"previousSibling",first:!0},"~":{dir:"previousSibling"}},preFilter:{ATTR:function(e){return e[1]=e[1].replace(Z,ee),e[3]=(e[3]||e[4]||e[5]||"").replace(Z,ee),"~="===e[2]&&(e[3]=

" "+e[3]+" "),e.slice(0,4)},CHILD:function(e){return
e[1]=e[1].toLowerCase(),"nth"===e[1].slice(0,3)?(e[3]||oe.error(e[0]),e[4]=+(e[4]?e[5
]+(e[6]||1):2*("even"===e[3]||"odd"===e[3])),e[5]=+(e[7]+e[8]||"odd"===e[3])):e[3]
&&oe.error(e[0]),e},PSEUDO:function(e){var t,n=!e[6]&&e[2];return
V.CHILD.test(e[0])?null:(e[3]?e[2]=e[4]||e[5]||"":n&&X.test(n)&&(t=a(n,!0))&&(t=n
.indexOf(")",n.length-t)-
n.length)&&(e[0]=e[0].slice(0,t),e[2]=n.slice(0,t)),e.slice(0,3))}},filter:{TAG:functio
n(e){var
t=e.replace(Z,ee).toLowerCase();return"*"===e?function(){return!0}:function(e){retu
rn e.nodeName&&e.nodeName.toLowerCase()===t}},CLASS:function(e){var
t=E[e+" "];return t||(t=new
RegExp("(^|"+M+")"+e+"("+M+"|$)"))&&E(e,function(e){return
t.test("string"==typeof e.className&&e.className||"undefined"!=typeof
e.getAttribute&&e.getAttribute("class")||"")})},ATTR:function(e,t,n){return
function(r){var i=oe.attr(r,e);return
null==i?"!="===t:!t||(i+="","="===t?i===n:"!="===t?i!==n:"^="===t?n&&0===i.in
dexOf(n):"*="===t?n&&i.indexOf(n)>-1:"$="===t?n&&i.slice(-
n.length)===n:"~="===t?(" "+i.replace($," ")+" ").indexOf(n)>-
1:"|="===t&&(i===n||i.slice(0,n.length+1)===n+"-
"))}},CHILD:function(e,t,n,r,i){var o="nth"!==e.slice(0,3),a="last"!==e.slice(-
4),s="of-type"===t;return
1===r&&0===i?function(e){return!!e.parentNode}:function(t,n,u){var
l,c,f,p,d,h,g=o!==a?"nextSibling":"previousSibling",y=t.parentNode,v=s&&t.nodeNa
me.toLowerCase(),m=!u&&!s,x=!1;if(y){if(o){while(g){p=t;while(p=p[g])if(s?p.nod
eName.toLowerCase()===v:1===p.nodeType)return!1;h=g="only"===e&&!h&&"ne
xtSibling"}return!0}if(h=[a?y.firstChild:y.lastChild],a&&m){x=(d=(l=(c=(f=(p=y)[b]
||(p[b]={}))[p.uniqueID]||(f[p.uniqueID]={}))[e]||[])[0]===T&&l[1])&&l[2],p=d&&y
.childNodes[d];while(p=++d&&p&&p[g]||(x=d=0)||h.pop())if(1===p.nodeType&&+
+x&&p===t){c[e]=[T,d,x];break}}else
if(m&&(x=d=(l=(c=(f=(p=t)[b]||(p[b]={}))[p.uniqueID]||(f[p.uniqueID]={}))[e]||[])[0]
===T&&l[1]),!1===x)while(p=++d&&p&&p[g]||(x=d=0)||h.pop())if((s?p.nodeName.
toLowerCase()===v:1===p.nodeType)&&++x&&(m&&((c=(f=p[b]||(p[b]={}))[p.un
iqueID]||(f[p.uniqueID]={}))[e]=[T,x]),p===t))break;return(x-
=i)===r||x%r==0&&x/r>=0}}},PSEUDO:function(e,t){var

n,i=r.pseudos[e]||r.setFilters[e.toLowerCase()]||oe.error("unsupported pseudo:
"+e);return
i[b]?i(t):i.length>1?(n=[e,e,"",t],r.setFilters.hasOwnProperty(e.toLowerCase())?se(fun
ction(e,n){var r,o=i(e,t),a=o.length;while(a-
-)e[r=O(e,o[a])]=!(n[r]=o[a])}):function(e){return
i(e,0,n)}):i}},pseudos:{not:se(function(e){var t=[],n=[],r=s(e.replace(B,"$1"));return
r[b]?se(function(e,t,n,i){var o,a=r(e,null,i,[]),s=e.length;while(s-
-)(o=a[s])&&(e[s]=!(t[s]=o))}):function(e,i,o){return
t[0]=e,r(t,null,o,n),t[0]=null,!n.pop()}}),has:se(function(e){return function(t){return
oe(e,t).length>0}}),contains:se(function(e){return
e=e.replace(Z,ee),function(t){return(t.textContent||t.innerText||i(t)).indexOf(e)>-
1}}),lang:se(function(e){return U.test(e||"")||oe.error("unsupported lang:
"+e),e=e.replace(Z,ee).toLowerCase(),function(t){var
n;do{if(n=g?t.lang:t.getAttribute("xml:lang")||t.getAttribute("lang"))return(n=n.toLow
erCase())===e||0===n.indexOf(e+"-
")}while((t=t.parentNode)&&1===t.nodeType);return!1}}),target:function(t){var
n=e.location&&e.location.hash;return n&&n.slice(1)===t.id},root:function(e){return
e===h},focus:function(e){return
e===d.activeElement&&(!d.hasFocus||d.hasFocus())&&!!(e.type||e.href||~e.tabIndex)
},enabled:de(!1),disabled:de(!0),checked:function(e){var
t=e.nodeName.toLowerCase();return"input"===t&&!!e.checked||"option"===t&&!!e.
selected},selected:function(e){return
e.parentNode&&e.parentNode.selectedIndex,!0===e.selected},empty:function(e){for
(e=e.firstChild;e;e=e.nextSibling)if(e.nodeType<6)return!1;return!0},parent:function(
e){return!r.pseudos.empty(e)},header:function(e){return
Y.test(e.nodeName)},input:function(e){return
G.test(e.nodeName)},button:function(e){var
t=e.nodeName.toLowerCase();return"input"===t&&"button"===e.type||"button"===t
},text:function(e){var
t;return"input"===e.nodeName.toLowerCase()&&"text"===e.type&&(null==(t=e.get
Attribute("type"))||"text"===t.toLowerCase())},first:he(function(){return[0]}),last:he(
function(e,t){return[t-
1]}),eq:he(function(e,t,n){return[n<0?n+t:n]}),even:he(function(e,t){for(var
n=0;n<t;n+=2)e.push(n);return e}),odd:he(function(e,t){for(var

n=1;n<t;n+=2)e.push(n);return e}),lt:he(function(e,t,n){for(var r=n<0?n+t:n;--r>=0;)e.push(r);return e}),gt:he(function(e,t,n){for(var r=n<0?n+t:n;++r<t;)e.push(r);return e})}}).pseudos.nth=r.pseudos.eq;for(t in{radio:!0,checkbox:!0,file:!0,password:!0,image:!0})r.pseudos[t]=fe(t);for(t in{submit:!0,reset:!0})r.pseudos[t]=pe(t);function ye(){}ye.prototype=r.filters=r.pseudos,r.setFilters=new ye,a=oe.tokenize=function(e,t){var n,i,o,a,s,u,l,c=k[e+" "];if(c)return t?0:c.slice(0);s=e,u=[],l=r.preFilter;while(s){n&&!(i=F.exec(s))||(i&&(s=s.slice(i[0].length)||s),u.push(o=[])),n=!1,(i=_.exec(s))&&(n=i.shift(),o.push({value:n,type:i[0].replace(B," ")}),s=s.slice(n.length));for(a in r.filter)!(i=V[a].exec(s))||l[a]&&!(i=l[a](i))||(n=i.shift(),o.push({value:n,type:a,matches:i}),s=s.slice(n.length));if(!n)break}return t?s.length:s?oe.error(e):k(e,u).slice(0)};function ve(e){for(var t=0,n=e.length,r="";t<n;t++)r+=e[t].value;return r}function me(e,t,n){var r=t.dir,i=t.next,o=i||r,a=n&&"parentNode"===o,s=C++;return t.first?function(t,n,i){while(t=t[r])if(1===t.nodeType||a)return e(t,n,i);return!1}:function(t,n,u){var l,c,f,p=[T,s];if(u){while(t=t[r])if((1===t.nodeType||a)&&e(t,n,u))return!0}else while(t=t[r])if(1===t.nodeType||a)if(f=t[b]||(t[b]={}),c=f[t.uniqueID]||(f[t.uniqueID]={}),i&&i===t.nodeName.toLowerCase())t=t[r]||t;else{if((l=c[o])&&l[0]===T&&l[1]===s)return p[2]=l[2];if(c[o]=p,p[2]=e(t,n,u))return!0}return!1}}function xe(e){return e.length>1?function(t,n,r){var i=e.length;while(i--)if(!e[i](t,n,r))return!1;return!0}:e[0]}function be(e,t,n){for(var r=0,i=t.length;r<i;r++)oe(e,t[r],n);return n}function we(e,t,n,r,i){for(var o,a=[],s=0,u=e.length,l=null!=t;s<u;s++)(o=e[s])&&(n&&!n(o,r,i)||(a.push(o),l&&t.push(s)));return a}function Te(e,t,n,r,i,o){return r&&!r[b]&&(r=Te(r)),i&&!i[b]&&(i=Te(i,o)),se(function(o,a,s,u){var l,c,f,p=[],d=[],h=a.length,g=o||be(t||"*",s.nodeType?[s]:s,[]),y=!e||!o&&t?g:we(g,p,e,s,u),v=n?i||(o?e:h||r)?[]:a:y;if(n&&n(y,v,s,u),r){l=we(v,d),r(l,[],s,u),c=l.length;while(c--)(f=l[c])&&(v[d[c]]=!(y[d[c]]=f))}if(o){if(i||e){if(i){l=[],c=v.length;while(c--)(f=v[c])&&l.push(y[c]=f);i(null,v=[],l,u)}c=v.length;while(c--)(f=v[c])&&(l=i?O(o,f):p[c])>-1&&(o[l]=!(a[l]=f))}}else v=we(v===a?v.splice(h,v.length):v),i?i(null,a,v,u):L.apply(a,v)})}function Ce(e){for(var t,n,i,o=e.length,a=r.relative[e[0].type],s=a||r.relative["

"],u=a?1:0,c=me(function(e){return e===t},s,!0),f=me(function(e){return O(t,e)>-1},s,!0),p=[function(e,n,r){var i=!a&&(r||n!==l)||((t=n).nodeType?c(e,n,r):f(e,n,r));return t=null,i}];u<o;u++)if(n=r.relative[e[u].type])p=[me(xe(p),n)];else{if((n=r.filter[e[u].type].apply(null,e[u].matches))[b]){for(i=++u;i<o;i++)if(r.relative[e[i].type])break;return Te(u>1&&xe(p),u>1&&ve(e.slice(0,u-1).concat({value:" "===e[u-2].type?"*":""})).replace(B,"$1"),n,u<i&&Ce(e.slice(u,i)),i<o&&Ce(e=e.slice(i)),i<o&&ve(e))}p.push(n)}return xe(p)}function Ee(e,t){var n=t.length>0,i=e.length>0,o=function(o,a,s,u,c){var f,h,y,v=0,m="0",x=o&&[],b=[],w=l,C=o||i&&r.find.TAG("*",c),E=T+=null==w?1:Math.random()||.1,k=C.length;for(c&&(l=a===d||a||c);m!==k&&null!=(f=C[m]);m++){if(i&&f){h=0,a||f.ownerDocument===d||(p(f),s=!g);while(y=e[h++])if(y(f,a||d,s)){u.push(f);break}c&&(T=E)}n&&((f=!y&&f)&&v--,o&&x.push(f))}if(v+=m,n&&m!==v){h=0;while(y=t[h++])y(x,b,a,s);if(o){if(v>0)while(m--)x[m]||b[m]||(b[m]=j.call(u));b=we(b)}L.apply(u,b),c&&!o&&b.length>0&&v+t.length>1&&oe.uniqueSort(u)}return c&&(T=E,l=w),x};return n?se(o):o}return s=oe.compile=function(e,t){var n,r=[],i=[],o=S[e+" "];if(!o){t||(t=a(e)),n=t.length;while(n--)(o=Ce(t[n]))[b]?r.push(o):i.push(o);(o=S(e,Ee(i,r))).selector=e}return o},u=oe.select=function(e,t,n,i){var o,u,l,c,f,p="function"==typeof e&&e,d=!i&&a(e=p.selector||e);if(n=n||[],1===d.length){if((u=d[0]=d[0].slice(0)).length>2&&"ID"===(l=u[0]).type&&9===t.nodeType&&g&&r.relative[u[1].type]){if(!(t=(r.find.ID(l.matches[0].replace(Z,ee),t)||[])[0]))return n;p&&(t=t.parentNode),e=e.slice(u.shift().value.length)}o=V.needsContext.test(e)?0:u.length;while(o--){if(l=u[o],r.relative[c=l.type])break;if((f=r.find[c])&&(i=f(l.matches[0].replace(Z,ee),K.test(u[0].type)&&ge(t.parentNode)||t))){if(u.splice(o,1),!(e=i.length&&ve(u)))return L.apply(n,i),n;break}}}return(p||s(e,d))(i,t,!g,n,!t||K.test(e)&&ge(t.parentNode)||t),n},n.sortStable=b.split("").sort(D).join("")===b,n.detectDuplicates=!!f,p(),n.sortDetached=ue(function(e){return 1&e.compareDocumentPosition(d.createElement("fieldset"))}),ue(function(e){return e.innerHTML="<a

href='#'>","#"===e.firstChild.getAttribute("href")})||le("type|href|height|width",f
unction(e,t,n){if(!n)return
e.getAttribute(t,"type"===t.toLowerCase()?1:2)}),n.attributes&&ue(function(e){retur
n
e.innerHTML="<input/>",e.firstChild.setAttribute("value",""),""===e.firstChild.getA
ttribute("value")})||le("value",function(e,t,n){if(!n&&"input"===e.nodeName.toLowe
rCase())return e.defaultValue}),ue(function(e){return
null==e.getAttribute("disabled")})||le(P,function(e,t,n){var
r;if(!n)return!0===e[t]?t.toLowerCase():(r=e.getAttributeNode(t))&&r.specified?r.val
ue:null}),oe}(e);w.find=E,w.expr=E.selectors,w.expr[":"]=w.expr.pseudos,w.uniqueS
ort=w.unique=E.uniqueSort,w.text=E.getText,w.isXMLDoc=E.isXML,w.contains=E.
contains,w.escapeSelector=E.escape;var k=function(e,t,n){var r=[],i=void
0!==n;while((e=e[t])&&9!==e.nodeType)if(1===e.nodeType){if(i&&w(e).is(n))brea
k;r.push(e)}return r},S=function(e,t){for(var
n=[];e;e=e.nextSibling)1===e.nodeType&&e!==t&&n.push(e);return
n},D=w.expr.match.needsContext;function N(e,t){return
e.nodeName&&e.nodeName.toLowerCase()===t.toLowerCase()}var A=/^<([a-
z][^\/\0>:\x20\t\r\n\f]*)[\x20\t\r\n\f]*\/?>(?:<\/\1>|)$/i;function j(e,t,n){return
g(t)?w.grep(e,function(e,r){return!!t.call(e,r,e)!==n}):t.nodeType?w.grep(e,function(e
){return e===t!==n}):"string"!=typeof t?w.grep(e,function(e){return u.call(t,e)>-
1!==n}):w.filter(t,e,n)}w.filter=function(e,t,n){var r=t[0];return
n&&(e=":not("+e+")"),1===t.length&&1===r.nodeType?w.find.matchesSelector(r,e)
?[r]:[]:w.find.matches(e,w.grep(t,function(e){return
1===e.nodeType}))},w.fn.extend({find:function(e){var
t,n,r=this.length,i=this;if("string"!=typeof e)return
this.pushStack(w(e).filter(function(){for(t=0;t<r;t++)if(w.contains(i[t],this))return!0})
);for(n=this.pushStack([]),t=0;t<r;t++)w.find(e,i[t],n);return
r>1?w.uniqueSort(n):n},filter:function(e){return
this.pushStack(j(this,e||[],!1))},not:function(e){return
this.pushStack(j(this,e||[],!0))},is:function(e){return!!j(this,"string"==typeof
e&&D.test(e)?w(e):e||[],!1).length}});var
q,L=/^(?:\s*(<[\w\W]+>)[^>]*|#([\w-]+))$/;(w.fn.init=function(e,t,n){var
i,o;if(!e)return this;if(n=n||q,"string"==typeof
e){if(!(i="<"===e[0]&&">"===e[e.length-

1]&&e.length>=3?[null,e,null]:L.exec(e))||!i[1]&&t)return!t||t.jquery?(t||n).find(e):this
.constructor(t).find(e);if(i[1]){if(t=t instanceof
w?t[0]:t,w.merge(this,w.parseHTML(i[1],t&&t.nodeType?t.ownerDocument||t:r,!0)),
A.test(i[1])&&w.isPlainObject(t))for(i in t)g(this[i])?this[i](t[i]):this.attr(i,t[i]);return
this}return(o=r.getElementById(i[2]))&&(this[0]=o,this.length=1),this}return
e.nodeType?(this[0]=e,this.length=1,this):g(e)?void
0!==n.ready?n.ready(e):e(w):w.makeArray(e,this)}).prototype=w.fn,q=w(r);var
H=/^(?:parents|prev(?:Until|All))/,O={children:!0,contents:!0,next:!0,prev:!0};w.fn.ex
tend({has:function(e){var t=w(e,this),n=t.length;return this.filter(function(){for(var
e=0;e<n;e++)if(w.contains(this,t[e]))return!0})},closest:function(e,t){var
n,r=0,i=this.length,o=[],a="string"!=typeof
e&&w(e);if(!D.test(e))for(;r<i;r++)for(n=this[r];n&&n!==t;n=n.parentNode)if(n.node
Type<11&&(a?a.index(n)>-
1:1===n.nodeType&&w.find.matchesSelector(n,e))){o.push(n);break}return
this.pushStack(o.length>1?w.uniqueSort(o):o)},index:function(e){return
e?"string"==typeof
e?u.call(w(e),this[0]):u.call(this,e.jquery?e[0]:e):this[0]&&this[0].parentNode?this.fir
st().prevAll().length:-1},add:function(e,t){return
this.pushStack(w.uniqueSort(w.merge(this.get(),w(e,t))))},addBack:function(e){retur
n this.add(null==e?this.prevObject:this.prevObject.filter(e))}});function
P(e,t){while((e=e[t])&&1!==e.nodeType);return e}w.each({parent:function(e){var
t=e.parentNode;return t&&11!==t.nodeType?t:null},parents:function(e){return
k(e,"parentNode")},parentsUntil:function(e,t,n){return
k(e,"parentNode",n)},next:function(e){return
P(e,"nextSibling")},prev:function(e){return
P(e,"previousSibling")},nextAll:function(e){return
k(e,"nextSibling")},prevAll:function(e){return
k(e,"previousSibling")},nextUntil:function(e,t,n){return
k(e,"nextSibling",n)},prevUntil:function(e,t,n){return
k(e,"previousSibling",n)},siblings:function(e){return
S((e.parentNode||{}).firstChild,e)},children:function(e){return
S(e.firstChild)},contents:function(e){return
N(e,"iframe")?e.contentDocument:(N(e,"template")&&(e=e.content||e),w.merge([],e.c
hildNodes))}},function(e,t){w.fn[e]=function(n,r){var

i=w.map(this,t,n);return"Until"!==e.slice(-5)&&(r=n),r&&"string"==typeof r&&(i=w.filter(r,i)),this.length>1&&(O[e]||w.uniqueSort(i),H.test(e)&&i.reverse()),this.pushStack(i)}});var M=/[^\x20\t\r\n\f]+/g;function R(e){var t={};return w.each(e.match(M)||[],function(e,n){t[n]=!0}),t}w.Callbacks=function(e){e="string"==typeof e?R(e):w.extend({},e);var t,n,r,i,o=[],a=[],s=-1,u=function(){for(i=i||e.once,r=t=!0;a.length;s=-1){n=a.shift();while(++s<o.length)!1===o[s].apply(n[0],n[1])&&e.stopOnFalse&&(s=o.length,n=!1)}e.memory||(n=!1),t=!1,i&&(o=n?[]:"")},l={add:function(){return o&&(n&&!t&&(s=o.length-1,a.push(n)),function t(n){w.each(n,function(n,r){g(r)?e.unique&&l.has(r)||o.push(r):r&&r.length&&"string"!==x(r)&&t(r)})}(arguments),n&&!t&&u()),this},remove:function(){return w.each(arguments,function(e,t){var n;while((n=w.inArray(t,o,n))>-1)o.splice(n,1),n<=s&&s--}),this},has:function(e){return e?w.inArray(e,o)>-1:o.length>0},empty:function(){return o&&(o=[]),this},disable:function(){return i=a=[],o=n="",this},disabled:function(){return!o},lock:function(){return i=a=[],n||t||(o=n=""),this},locked:function(){return!!i},fireWith:function(e,n){return i||(n=[e,(n=n||[]).slice?n.slice():n],a.push(n),t||u()),this},fire:function(){return l.fireWith(this,arguments),this},fired:function(){return!!r}};return l};function I(e){return e}function W(e){throw e}function $(e,t,n,r){var i;try{e&&g(i=e.promise)?i.call(e).done(t).fail(n):e&&g(i=e.then)?i.call(e,t,n):t.apply(void 0,[e].slice(r))}catch(e){n.apply(void 0,[e])}}w.extend({Deferred:function(t){var n=[["notify","progress",w.Callbacks("memory"),w.Callbacks("memory"),2],["resolve","done",w.Callbacks("once memory"),w.Callbacks("once memory"),0,"resolved"],["reject","fail",w.Callbacks("once memory"),w.Callbacks("once memory"),1,"rejected"]],r="pending",i={state:function(){return r},always:function(){return o.done(arguments).fail(arguments),this},"catch":function(e){return i.then(null,e)},pipe:function(){var e=arguments;return w.Deferred(function(t){w.each(n,function(n,r){var i=g(e[r[4]])&&e[r[4]];o[r[1]](function(){var e=i&&i.apply(this,arguments);e&&g(e.promise)?e.promise().progress(t.notify).done(t.resolve).fail(t.reject):t[r[0]+"With"](this,i?[e]:arguments)})}),e=null}).promise()},then:function(t,r,i){var o=0;function a(t,n,r,i){return function(){var

s=this,u=arguments,l=function(){var
e,l;if(!(t<o)){if((e=r.apply(s,u))===n.promise())throw new TypeError("Thenable self-resolution");l=e&&("object"==typeof e||"function"==typeof
e)&&e.then,g(l)?i?l.call(e,a(o,n,I,i),a(o,n,W,i)):(o++,l.call(e,a(o,n,I,i),a(o,n,W,i),a(o,n,I,n.notifyWith))):(r!==I&&(s=void
0,u=[e]),(i||n.resolveWith)(s,u))}},c=i?l:function(){try{l()}catch(e){w.Deferred.exceptionHook&&w.Deferred.exceptionHook(e,c.stackTrace),t+1>=o&&(r!==W&&(s=void
0,u=[e]),n.rejectWith(s,u))};t?c():(w.Deferred.getStackHook&&(c.stackTrace=w.Deferred.getStackHook()),e.setTimeout(c))}}return
w.Deferred(function(e){n[0][3].add(a(0,e,g(i)?i:I,e.notifyWith)),n[1][3].add(a(0,e,g(t)?t:I)),n[2][3].add(a(0,e,g(r)?r:W))}).promise()},promise:function(e){return
null!=e?w.extend(e,i):i}},o={};return w.each(n,function(e,t){var
a=t[2],s=t[5];i[t[1]]=a.add,s&&a.add(function(){r=s},n[3-e][2].disable,n[3-e][3].disable,n[0][2].lock,n[0][3].lock),a.add(t[3].fire),o[t[0]]=function(){return
o[t[0]+"With"](this===o?void
0:this,arguments),this},o[t[0]+"With"]=a.fireWith}),i.promise(o),t&&t.call(o,o),o},when:function(e){var
t=arguments.length,n=t,r=Array(n),i=o.call(arguments),a=w.Deferred(),s=function(e){return function(n){r[e]=this,i[e]=arguments.length>1?o.call(arguments):n,--t||a.resolveWith(r,i)}};if(t<=1&&($(e,a.done(s(n)).resolve,a.reject,!t),"pending"===a.state()||g(i[n]&&i[n].then)))return a.then();while(n--)$(i[n],s(n),a.reject);return
a.promise()}});var
B=/^(Eval|Internal|Range|Reference|Syntax|Type|URI)Error$/;w.Deferred.exceptionHook=function(t,n){e.console&&e.console.warn&&t&&B.test(t.name)&&e.console.warn("jQuery.Deferred exception:
"+t.message,t.stack,n)},w.readyException=function(t){e.setTimeout(function(){throw t})};var F=w.Deferred();w.fn.ready=function(e){return
F.then(e)["catch"](function(e){w.readyException(e)}),this},w.extend({isReady:!1,readyWait:1,ready:function(e){(!0===e?--
w.readyWait:w.isReady)||(w.isReady=!0,!0!==e&&--
w.readyWait>0||F.resolveWith(r,[w]))}}),w.ready.then=F.then;function
(){r.removeEventListener("DOMContentLoaded",),e.removeEventListener("load",_),w.ready()}"complete"===r.readyState||"loading"!==r.readyState&&!r.documentEl

ement.doScroll?e.setTimeout(w.ready):(r.addEventListener("DOMContentLoaded",_)
,e.addEventListener("load",_));var z=function(e,t,n,r,i,o,a){var
s=0,u=e.length,l=null==n;if("object"===x(n)){i=!0;for(s in n)z(e,t,s,n[s],!0,o,a)}else
if(void
0!==r&&(i=!0,g(r)||(a=!0),l&&(a?(t.call(e,r),t=null):(l=t,t=function(e,t,n){return
l.call(w(e),n)})),t))for(;s<u;s++)t(e[s],n,a?r:r.call(e[s],s,t(e[s],n)));return
i?e:l?t.call(e):u?t(e[0],n):o},X=/^-ms-/,U=/-([a-z])/g;function V(e,t){return
t.toUpperCase()}function G(e){return e.replace(X,"ms-").replace(U,V)}var
Y=function(e){return 1===e.nodeType||9===e.nodeType||!+e.nodeType};function
Q(){this.expando=w.expando+Q.uid++}Q.uid=1,Q.prototype={cache:function(e){var
t=e[this.expando];return
t||(t={},Y(e)&&(e.nodeType?e[this.expando]=t:Object.defineProperty(e,this.expando,
{value:t,configurable:!0}))),t},set:function(e,t,n){var
r,i=this.cache(e);if("string"==typeof t)i[G(t)]=n;else for(r in t)i[G(r)]=t[r];return
i},get:function(e,t){return void
0===t?this.cache(e):e[this.expando]&&e[this.expando][G(t)]},access:function(e,t,n){
return void 0===t||t&&"string"==typeof t&&void
0===n?this.get(e,t):(this.set(e,t,n),void 0!==n?n:t)},remove:function(e,t){var
n,r=e[this.expando];if(void 0!==r){if(void
0!==t){n=(t=Array.isArray(t)?t.map(G):(t=G(t))in
r?[t]:t.match(M)||[]).length;while(n--)delete r[t[n]]}(void
0===t||w.isEmptyObject(r))&&(e.nodeType?e[this.expando]=void 0:delete
e[this.expando])}},hasData:function(e){var t=e[this.expando];return void
0!==t&&!w.isEmptyObject(t)}};var J=new Q,K=new
Q,Z=/^(?:\{[\w\W]*\}|\[[\w\W]*\])$/,ee=/[A-Z]/g;function
te(e){return"true"===e||"false"!==e&&("null"===e?null:e===+e+""?+e:Z.test(e)?JS
ON.parse(e):e)}function ne(e,t,n){var r;if(void
0===n&&1===e.nodeType)if(r="data-"+t.replace(ee,"-
$&").toLowerCase(),"string"==typeof(n=e.getAttribute(r))){try{n=te(n)}catch(e){}K.
set(e,t,n)}else n=void 0;return n}w.extend({hasData:function(e){return
K.hasData(e)||J.hasData(e)},data:function(e,t,n){return
K.access(e,t,n)},removeData:function(e,t){K.remove(e,t)},_data:function(e,t,n){retur
n
J.access(e,t,n)},_removeData:function(e,t){J.remove(e,t)}}),w.fn.extend({data:functio

n(e,t){var n,r,i,o=this[0],a=o&&o.attributes;if(void
0===e){if(this.length&&(i=K.get(o),1===o.nodeType&&!J.get(o,"hasDataAttrs"))){
n=a.length;while(n--)a[n]&&0===(r=a[n].name).indexOf("data-
")&&(r=G(r.slice(5)),ne(o,r,i[r]));J.set(o,"hasDataAttrs",!0)}return
i}return"object"==typeof e?this.each(function(){K.set(this,e)}):z(this,function(t){var
n;if(o&&void 0===t){if(void 0!==(n=K.get(o,e)))return n;if(void
0!==(n=ne(o,e)))return n}else
this.each(function(){K.set(this,e,t)})},null,t,arguments.length>1,null,!0)},removeData
:function(e){return
this.each(function(){K.remove(this,e)})}}),w.extend({queue:function(e,t,n){var
r;if(e)return
t=(t||"fx")+"queue",r=J.get(e,t),n&&(!r||Array.isArray(n)?r=J.access(e,t,w.makeArray(
n)):r.push(n)),r||[]},dequeue:function(e,t){t=t||"fx";var
n=w.queue(e,t),r=n.length,i=n.shift(),o=w._queueHooks(e,t),a=function(){w.dequeue(
e,t)};"inprogress"===i&&(i=n.shift(),r-
-),i&&("fx"===t&&n.unshift("inprogress"),delete
o.stop,i.call(e,a,o)),!r&&o&&o.empty.fire()},_queueHooks:function(e,t){var
n=t+"queueHooks";return J.get(e,n)||J.access(e,n,{empty:w.Callbacks("once
memory").add(function(){J.remove(e,[t+"queue",n])})})}}),w.fn.extend({queue:funct
ion(e,t){var n=2;return"string"!=typeof e&&(t=e,e="fx",n-
-),arguments.length<n?w.queue(this[0],e):void 0===t?this:this.each(function(){var
n=w.queue(this,e,t);w._queueHooks(this,e),"fx"===e&&"inprogress"!==n[0]&&w.de
queue(this,e)})},dequeue:function(e){return
this.each(function(){w.dequeue(this,e)})},clearQueue:function(e){return
this.queue(e||"fx",[])},promise:function(e,t){var
n,r=1,i=w.Deferred(),o=this,a=this.length,s=function(){--
r||i.resolveWith(o,[o])};"string"!=typeof e&&(t=e,e=void 0),e=e||"fx";while(a-
-)(n=J.get(o[a],e+"queueHooks"))&&n.empty&&(r++,n.empty.add(s));return
s(),i.promise(t)}});var re=/[+-]?(?:\d*\.|)\d+(?:[eE][+-]?\d+|)/.source,ie=new
RegExp("^(?:([+-])=|)("+re+")([a-
z%]*)$","i"),oe=["Top","Right","Bottom","Left"],ae=function(e,t){return"none"===(
e=t||e).style.display||""===e.style.display&&w.contains(e.ownerDocument,e)&&"non
e"===w.css(e,"display")},se=function(e,t,n,r){var i,o,a={};for(o in
t)a[o]=e.style[o],e.style[o]=t[o];i=n.apply(e,r||[]);for(o in t)e.style[o]=a[o];return

i};function ue(e,t,n,r){var i,o,a=20,s=r?function(){return r.cur()}:function(){return w.css(e,t,"")},u=s(),l=n&&n[3]||(w.cssNumber[t]?"":"px"),c=(w.cssNumber[t]||"px"!==l&&+u)&&ie.exec(w.css(e,t));if(c&&c[3]!==l){u/=2,l=l||c[3],c=+u||1;while(a--)w.style(e,t,c+l),(1-o)*(1-(o=s()/u||.5))<=0&&(a=0),c/=o;c*=2,w.style(e,t,c+l),n=n||[]}return n&&(c=+c||+u||0,i=n[1]?c+(n[1]+1)*n[2]:+n[2],r&&(r.unit=l,r.start=c,r.end=i)),i}var le={};function ce(e){var t,n=e.ownerDocument,r=e.nodeName,i=le[r];return i||(t=n.body.appendChild(n.createElement(r)),i=w.css(t,"display"),t.parentNode.removeChild(t),"none"===i&&(i="block"),le[r]=i,i)}function fe(e,t){for(var n,r,i=[],o=0,a=e.length;o<a;o++)(r=e[o]).style&&(n=r.style.display,t?("none"===n&&(i[o]=J.get(r,"display")||null,i[o]||(r.style.display="")),""===r.style.display&&ae(r)&&(i[o]=ce(r))):"none"!==n&&(i[o]="none",J.set(r,"display",n)));for(o=0;o<a;o++)null!=i[o]&&(e[o].style.display=i[o]);return e}w.fn.extend({show:function(){return fe(this,!0)},hide:function(){return fe(this)},toggle:function(e){return"boolean"==typeof e?e?this.show():this.hide():this.each(function(){ae(this)?w(this).show():w(this).hide()})}});var pe=/^(?:checkbox|radio)$/i,de=/<([a-z][^\/\0>\x20\t\r\n\f]+)/i,he=/^$|^module$|\/(?:java|ecma)script/i,ge={option:[1,"<select multiple='multiple'>","</select>"],thead:[1,"<table>","</table>"],col:[2,"<table><colgroup>","</colgroup></table>"],tr:[2,"<table><tbody>","</tbody></table>"],td:[3,"<table><tbody><tr>","</tr></tbody></table>"],_default:[0,"",""]};ge.optgroup=ge.option,ge.tbody=ge.tfoot=ge.colgroup=ge.caption=ge.thead,ge.th=ge.td;function ye(e,t){var n;return n="undefined"!=typeof e.getElementsByTagName?e.getElementsByTagName(t||"*"):"undefined"!=typeof e.querySelectorAll?e.querySelectorAll(t||"*"):[],void 0===t||t&&N(e,t)?w.merge([e],n):n}function ve(e,t){for(var n=0,r=e.length;n<r;n++)J.set(e[n],"globalEval",!t||J.get(t[n],"globalEval"))}var me=/<|&#?\w+;/;function xe(e,t,n,r,i){for(var o,a,s,u,l,c,f=t.createDocumentFragment(),p=[],d=0,h=e.length;d<h;d++)if((o=e[d])||0===o)if("object"===x(o))w.merge(p,o.nodeType?[o]:o);else if(me.test(o)){a=a||f.appendChild(t.createElement("div")),s=(de.exec(o)||["",""])[1].toLowerCase(),u=ge[s]||ge._default,a.innerHTML=u[1]+w.htmlPrefilter(o)+u[2],c=u[0];while(c-

-)a=a.lastChild;w.merge(p,a.childNodes),(a=f.firstChild).textContent=""}else p.push(t.createTextNode(o));f.textContent="",d=0;while(o=p[d++])if(r&&w.inArray(o,r)>-1)i&&i.push(o);else if(l=w.contains(o.ownerDocument,o),a=ye(f.appendChild(o),"script"),l&&ve(a),n){c=0;while(o=a[c++])he.test(o.type||"")&&n.push(o)}return f}!function(){var e=r.createDocumentFragment().appendChild(r.createElement("div")),t=r.createElement("input");t.setAttribute("type","radio"),t.setAttribute("checked","checked"),t.setAttribute("name","t"),e.appendChild(t),h.checkClone=e.cloneNode(!0).cloneNode(!0).lastChild.checked,e.innerHTML="<textarea>x</textarea>",h.noCloneChecked=!!e.cloneNode(!0).lastChild.defaultValue}();var be=r.documentElement,we=/^key/,Te=/^(?:mouse|pointer|contextmenu|drag|drop)|click/,Ce=/^([^.]*)(?:\.(.+)|)/;function Ee(){return!0}function ke(){return!1}function Se(){try{return r.activeElement}catch(e){}}function De(e,t,n,r,i,o){var a,s;if("object"==typeof t){"string"!=typeof n&&(r=r||n,n=void 0);for(s in t)De(e,s,n,r,t[s],o);return e}if(null==r&&null==i?(i=n,r=n=void 0):null==i&&("string"==typeof n?(i=r,r=void 0):(i=r,r=n,n=void 0)),!1===i)i=ke;else if(!i)return e;return 1===o&&(a=i,(i=function(e){return w().off(e),a.apply(this,arguments)}).guid=a.guid||(a.guid=w.guid++)),e.each(function(){w.event.add(this,t,i,r,n)})}w.event={global:{},add:function(e,t,n,r,i){var o,a,s,u,l,c,f,p,d,h,g,y=J.get(e);if(y){n.handler&&(n=(o=n).handler,i=o.selector),i&&w.find.matchesSelector(be,i),n.guid||(n.guid=w.guid++),(u=y.events)||(u=y.events={}),(a=y.handle)||(a=y.handle=function(t){return"undefined"!=typeof w&&w.event.triggered!==t.type?w.event.dispatch.apply(e,arguments):void 0}),l=(t=(t||"").match(M)||[""]).length;while(l-)d=g=(s=Ce.exec(t[l])||[])[1],h=(s[2]||"").split(".").sort(),d&&(f=w.event.special[d]||{},d=(i?f.delegateType:f.bindType)||d,f=w.event.special[d]||{},c=w.extend({type:d,origType:g,data:r,handler:n,guid:n.guid,selector:i,needsContext:i&&w.expr.match.needsContext.test(i),namespace:h.join(".")},o),(p=u[d])||((p=u[d]=[]).delegateCount=0,f.setup&&!1!==f.setup.call(e,r,h,a)||e.addEventListener&&e.addEventListener(d,a)),f.add&&(f.add.call(e,c),c.handler.guid||(c.handler.guid=n.guid)),i?p.splice(p.delegateCount++,0,c):p.push(c),w.event.global[d]=!0)},remove:function(e,t,n,r,i){var o,a,s,u,l,c,f,p,d,h,g,y=J.hasData(e)&&J.get(e);if(y&&(u=y.events)){l=(t=(t||"").match(M)||[""]).length;while(l-)if(s=Ce.exec(t[l])||[],d=g=s[1],h=(s[2]||"").split(".").sort(),d){f=w.event.special[d]||{

},p=u[d=(r?f.delegateType:f.bindType)||d]||[],s=s[2]&&new
RegExp("(^|\\.)"+h.join("\\.(?:.*\\.|)")+"(\\.|$)"),a=o=p.length;while(o-
-)c=p[o],!i&&g!==c.origType||n&&n.guid!==c.guid||s&&!s.test(c.namespace)||r&&r!
==c.selector&&("**"!==r||!c.selector)||(p.splice(o,1),c.selector&&p.delegateCount-
-,f.remove&&f.remove.call(e,c));a&&!p.length&&(f.teardown&&!1!==f.teardown.ca
ll(e,h,y.handle)||w.removeEvent(e,d,y.handle),delete u[d])}else for(d in
u)w.event.remove(e,d+t[l],n,r,!0);w.isEmptyObject(u)&&J.remove(e,"handle
events")}},dispatch:function(e){var t=w.event.fix(e),n,r,i,o,a,s,u=new
Array(arguments.length),l=(J.get(this,"events")||{})[t.type]||[],c=w.event.special[t.typ
e]||{};for(u[0]=t,n=1;n<arguments.length;n++)u[n]=arguments[n];if(t.delegateTarget=
this,!c.preDispatch||!1!==c.preDispatch.call(this,t)){s=w.event.handlers.call(this,t,l),n
=0;while((o=s[n++])&&!t.isPropagationStopped()){t.currentTarget=o.elem,r=0;while
((a=o.handlers[r++])&&!t.isImmediatePropagationStopped())t.rnamespace&&!t.rnam
espace.test(a.namespace)||(t.handleObj=a,t.data=a.data,void
0!==(i=((w.event.special[a.origType]||{}).handle||a.handler).apply(o.elem,u))&&!1==
=(t.result=i)&&(t.preventDefault(),t.stopPropagation()))}return
c.postDispatch&&c.postDispatch.call(this,t),t.result}},handlers:function(e,t){var
n,r,i,o,a,s=[],u=t.delegateCount,l=e.target;if(u&&l.nodeType&&!("click"===e.type&
&e.button>=1))for(;l!==this;l=l.parentNode||this)if(1===l.nodeType&&("click"!==e.t
ype||!0!==l.disabled)){for(o=[],a={},n=0;n<u;n++)void 0===a[i=(r=t[n]).selector+"
"]&&(a[i]=r.needsContext?w(i,this).index(l)>-
1:w.find(i,this,null,[l]).length),a[i]&&o.push(r);o.length&&s.push({elem:l,handlers:o
})}return
l=this,u<t.length&&s.push({elem:l,handlers:t.slice(u)}),s},addProp:function(e,t){Obj
ect.defineProperty(w.Event.prototype,e,{enumerable:!0,configurable:!0,get:g(t)?funct
ion(){if(this.originalEvent)return
t(this.originalEvent)}:function(){if(this.originalEvent)return
this.originalEvent[e]},set:function(t){Object.defineProperty(this,e,{enumerable:!0,co
nfigurable:!0,writable:!0,value:t})}})},fix:function(e){return e[w.expando]?e:new
w.Event(e)},special:{load:{noBubble:!0},focus:{trigger:function(){if(this!==Se()&&t
his.focus)return
this.focus(),!1},delegateType:"focusin"},blur:{trigger:function(){if(this===Se()&&th
is.blur)return
this.blur(),!1},delegateType:"focusout"},click:{trigger:function(){if("checkbox"===t

his.type&&this.click&&N(this,"input"))return
this.click(),!1},_default:function(e){return
N(e.target,"a")}},beforeunload:{postDispatch:function(e){void
0!==e.result&&e.originalEvent&&(e.originalEvent.returnValue=e.result)}}},w.rem
oveEvent=function(e,t,n){e.removeEventListener&&e.removeEventListener(t,n)},w.
Event=function(e,t){if(!(this instanceof w.Event))return new
w.Event(e,t);e&&e.type?(this.originalEvent=e,this.type=e.type,this.isDefaultPrevente
d=e.defaultPrevented||void
0===e.defaultPrevented&&!1===e.returnValue?Ee:ke,this.target=e.target&&3===e.t
arget.nodeType?e.target.parentNode:e.target,this.currentTarget=e.currentTarget,this.r
elatedTarget=e.relatedTarget):this.type=e,t&&w.extend(this,t),this.timeStamp=e&&e.
timeStamp||Date.now(),this[w.expando]=!0},w.Event.prototype={constructor:w.Even
t,isDefaultPrevented:ke,isPropagationStopped:ke,isImmediatePropagationStopped:ke,
isSimulated:!1,preventDefault:function(){var
e=this.originalEvent;this.isDefaultPrevented=Ee,e&&!this.isSimulated&&e.preventD
efault()},stopPropagation:function(){var
e=this.originalEvent;this.isPropagationStopped=Ee,e&&!this.isSimulated&&e.stopPr
opagation()},stopImmediatePropagation:function(){var
e=this.originalEvent;this.isImmediatePropagationStopped=Ee,e&&!this.isSimulated&
&e.stopImmediatePropagation(),this.stopPropagation()}},w.each({altKey:!0,bubbles:!
0,cancelable:!0,changedTouches:!0,ctrlKey:!0,detail:!0,eventPhase:!0,metaKey:!0,pa
geX:!0,pageY:!0,shiftKey:!0,view:!0,"char":!0,charCode:!0,key:!0,keyCode:!0,button
:!0,buttons:!0,clientX:!0,clientY:!0,offsetX:!0,offsetY:!0,pointerId:!0,pointerType:!0,
screenX:!0,screenY:!0,targetTouches:!0,toElement:!0,touches:!0,which:function(e){v
ar t=e.button;return
null==e.which&&we.test(e.type)?null!=e.charCode?e.charCode:e.keyCode:!e.which
&&void
0!==t&&Te.test(e.type)?1&t?1:2&t?3:4&t?2:0:e.which}},w.event.addProp),w.each({
mouseenter:"mouseover",mouseleave:"mouseout",pointerenter:"pointerover",pointerl
eave:"pointerout"},function(e,t){w.event.special[e]={delegateType:t,bindType:t,handl
e:function(e){var n,r=this,i=e.relatedTarget,o=e.handleObj;return
i&&(i===r||w.contains(r,i))||(e.type=o.origType,n=o.handler.apply(this,arguments),e.t
ype=t),n}}}),w.fn.extend({on:function(e,t,n,r){return
De(this,e,t,n,r)},one:function(e,t,n,r){return De(this,e,t,n,r,1)},off:function(e,t,n){var

r,i;if(e&&e.preventDefault&&e.handleObj)return
r=e.handleObj,w(e.delegateTarget).off(r.namespace?r.origType+"."+r.namespace:r.origType,r.selector,r.handler),this;if("object"==typeof e){for(i in e)this.off(i,t,e[i]);return this}return!1!==t&&"function"!=typeof t||(n=t,t=void
0),!1===n&&(n=ke),this.each(function(){w.event.remove(this,e,n,t)})}});var
Ne=/<(?!area|br|col|embed|hr|img|input|link|meta|param)(([a-z][^\/\0>\x20\t\r\n\f]*)[^>]*)\/>/gi,Ae=/<script|<style|<link/i,je=/checked\s*(?:[^=]|=\s*.checked.)/i,qe=/^\s*<!(?:\[CDATA\[|--)|(?:\]\]|--)>\s*$/g;function Le(e,t){return
N(e,"table")&&N(11!==t.nodeType?t:t.firstChild,"tr")?w(e).children("tbody")[0]||e:e}
function He(e){return e.type=(null!==e.getAttribute("type"))+"/"+e.type,e}function
Oe(e){return"true/"===(e.type||"").slice(0,5)?e.type=e.type.slice(5):e.removeAttribute("type"),e}function Pe(e,t){var
n,r,i,o,a,s,u,l;if(1===t.nodeType){if(J.hasData(e)&&(o=J.access(e),a=J.set(t,o),l=o.events)){delete a.handle,a.events={};for(i in
l)for(n=0,r=l[i].length;n<r;n++)w.event.add(t,i,l[i][n])}K.hasData(e)&&(s=K.access(e),u=w.extend({},s),K.set(t,u))}}function Me(e,t){var
n=t.nodeName.toLowerCase();"input"===n&&pe.test(e.type)?t.checked=e.checked:"input"!==n&&"textarea"!==n||(t.defaultValue=e.defaultValue)}function
Re(e,t,n,r){t=a.apply([],t);var i,o,s,u,l,c,f=0,p=e.length,d=p-1,y=t[0],v=g(y);if(v||p>1&&"string"==typeof y&&!h.checkClone&&je.test(y))return
e.each(function(i){var
o=e.eq(i);v&&(t[0]=y.call(this,i,o.html())),Re(o,t,n,r)});if(p&&(i=xe(t,e[0].ownerDocument,!1,e,r),o=i.firstChild,1===i.childNodes.length&&(i=o),o||r)){for(u=(s=w.map(ye(i,"script"),He)).length;f<p;f++)l=i,f!==d&&(l=w.clone(l,!0,!0),u&&w.merge(s,ye(l,"script"))),n.call(e[f],l,f);if(u)for(c=s[s.length-1].ownerDocument,w.map(s,Oe),f=0;f<u;f++)l=s[f],he.test(l.type||"")&&!J.access(l,"globalEval")&&w.contains(c,l)&&(l.src&&"module"!==(l.type||"").toLowerCase()?w._evalUrl&&w._evalUrl(l.src):m(l.textContent.replace(qe,""),c,l))}return e}function
Ie(e,t,n){for(var
r,i=t?w.filter(t,e):e,o=0;null!=(r=i[o]);o++)n||1!==r.nodeType||w.cleanData(ye(r)),r.parentNode&&(n&&w.contains(r.ownerDocument,r)&&ve(ye(r,"script")),r.parentNode.removeChild(r));return e}w.extend({htmlPrefilter:function(e){return
e.replace(Ne,"<$1></$2>")},clone:function(e,t,n){var
r,i,o,a,s=e.cloneNode(!0),u=w.contains(e.ownerDocument,e);if(!(h.noCloneChecked||

1!==e.nodeType&&11!==e.nodeType||w.isXMLDoc(e)))for(a=ye(s),r=0,i=(o=ye(e)).length;r<i;r++)Me(o[r],a[r]);if(t)if(n)for(o=o||ye(e),a=a||ye(s),r=0,i=o.length;r<i;r++)Pe(o[r],a[r]);else Pe(e,s);return(a=ye(s,"script")).length>0&&ve(a,!u&&ye(e,"script")),s},cleanData:function(e){for(var t,n,r,i=w.event.special,o=0;void 0!==(n=e[o]);o++)if(Y(n)){if(t=n[J.expando]){if(t.events)for(r in t.events)i[r]?w.event.remove(n,r):w.removeEvent(n,r,t.handle);n[J.expando]=void 0}n[K.expando]&&(n[K.expando]=void 0)}}}),w.fn.extend({detach:function(e){return Ie(this,e,!0)},remove:function(e){return Ie(this,e)},text:function(e){return z(this,function(e){return void 0===e?w.text(this):this.empty().each(function(){1!==this.nodeType&&11!==this.nodeType&&9!==this.nodeType||(this.textContent=e)})},null,e,arguments.length)},append:function(){return Re(this,arguments,function(e){1!==this.nodeType&&11!==this.nodeType&&9!==this.nodeType||Le(this,e).appendChild(e)})},prepend:function(){return Re(this,arguments,function(e){if(1===this.nodeType||11===this.nodeType||9===this.nodeType){var t=Le(this,e);t.insertBefore(e,t.firstChild)}})},before:function(){return Re(this,arguments,function(e){this.parentNode&&this.parentNode.insertBefore(e,this)})},after:function(){return Re(this,arguments,function(e){this.parentNode&&this.parentNode.insertBefore(e,this.nextSibling)})},empty:function(){for(var e,t=0;null!=(e=this[t]);t++)1===e.nodeType&&(w.cleanData(ye(e,!1)),e.textContent="");return this},clone:function(e,t){return e=null!=e&&e,t=null==t?e:t,this.map(function(){return w.clone(this,e,t)})},html:function(e){return z(this,function(e){var t=this[0]||{},n=0,r=this.length;if(void 0===e&&1===t.nodeType)return t.innerHTML;if("string"==typeof e&&!Ae.test(e)&&!ge[(de.exec(e)||["",""])[1].toLowerCase()]){e=w.htmlPrefilter(e);try{for(;n<r;n++)1===(t=this[n]||{}).nodeType&&(w.cleanData(ye(t,!1)),t.innerHTML=e);t=0}catch(e){}}t&&this.empty().append(e)},null,e,arguments.length)},replaceWith:function(){var e=[];return Re(this,arguments,function(t){var n=this.parentNode;w.inArray(this,e)<0&&(w.cleanData(ye(this)),n&&n.replaceChild(t,this))},e)}}),w.each({appendTo:"append",prependTo:"prepend",insertBefore:"befor

e",insertAfter:"after",replaceAll:"replaceWith"},function(e,t){w.fn[e]=function(e){for (var n,r=[],i=w(e),o=i.length-
1,a=0;a<=o;a++)n=a===o?this:this.clone(!0),w(i[a])[t](n),s.apply(r,n.get());return this.pushStack(r)}});var We=new RegExp("^("+re+")(?!px)[a-z%]+$","i"),$e=function(t){var n=t.ownerDocument.defaultView;return n&&n.opener||(n=e),n.getComputedStyle(t)},Be=new RegExp(oe.join("|"),"i");!function(){function t(){if(c){l.style.cssText="position:absolute;left:-11111px;width:60px;margin-top:1px;padding:0;border:0",c.style.cssText="position:relative;display:block;box-sizing:border-box;overflow:scroll;margin:auto;border:1px;padding:1px;width:60%;top:1%",be.appendChild(l).appendChild(c);var t=e.getComputedStyle(c);i="1%"!==t.top,u=12===n(t.marginLeft),c.style.right="60%",s=36===n(t.right),o=36===n(t.width),c.style.position="absolute",a=36===c.offsetWidth||"absolute",be.removeChild(l),c=null}}function n(e){return Math.round(parseFloat(e))}var i,o,a,s,u,l=r.createElement("div"),c=r.createElement("div");c.style&&(c.style.backgroundClip="content-box",c.cloneNode(!0).style.backgroundClip="",h.clearCloneStyle="content-box"===c.style.backgroundClip,w.extend(h,{boxSizingReliable:function(){return t(),o},pixelBoxStyles:function(){return t(),s},pixelPosition:function(){return t(),i},reliableMarginLeft:function(){return t(),u},scrollboxSize:function(){return t(),a}}))}();function Fe(e,t,n){var r,i,o,a,s=e.style;return(n=n||$e(e))&&(""!==(a=n.getPropertyValue(t)||n[t])||w.contains(e.ownerDocument,e)||(a=w.style(e,t)),!h.pixelBoxStyles()&&We.test(a)&&Be.test(t)&&(r=s.width,i=s.minWidth,o=s.maxWidth,s.minWidth=s.maxWidth=s.width=a,a=n.width,s.width=r,s.minWidth=i,s.maxWidth=o)),void 0!==a?a+"":a}function _e(e,t){return{get:function(){if(!e())return(this.get=t).apply(this,arguments);delete this.get}}}var ze=/^(none|table(?!-c[ea]).+)/,Xe=/^--/,Ue={position:"absolute",visibility:"hidden",display:"block"},Ve={letterSpacing:"0",fontWeight:"400"},Ge=["Webkit","Moz","ms"],Ye=r.createElement("div").style;function Qe(e){if(e in Ye)return e;var t=e[0].toUpperCase()+e.slice(1),n=Ge.length;while(n--)if((e=Ge[n]+t)in Ye)return e}function Je(e){var t=w.cssProps[e];return t||(t=w.cssProps[e]=Qe(e)||e),t}function

Ke(e,t,n){var r=ie.exec(t);return r?Math.max(0,r[2]-(n||0))+(r[3]||"px"):t}function Ze(e,t,n,r,i,o){var a="width"===t?1:0,s=0,u=0;if(n===(r?"border":"content"))return 0;for(;a<4;a+=2)"margin"===n&&(u+=w.css(e,n+oe[a],!0,i)),r?("content"===n&&(u-=w.css(e,"padding"+oe[a],!0,i)),"margin"!==n&&(u-=w.css(e,"border"+oe[a]+"Width",!0,i))):(u+=w.css(e,"padding"+oe[a],!0,i),"padding"!==n?u+=w.css(e,"border"+oe[a]+"Width",!0,i):s+=w.css(e,"border"+oe[a]+"Width",!0,i));return!r&&o>=0&&(u+=Math.max(0,Math.ceil(e["offset"+t[0].toUpperCase()+t.slice(1)]-o-u-s-.5))),u}function et(e,t,n){var r=$e(e),i=Fe(e,t,r),o="border-box"===w.css(e,"boxSizing",!1,r),a=o;if(We.test(i)){if(!n)return i;i="auto"}return a=a&&(h.boxSizingReliable()||i===e.style[t]),("auto"===i||!parseFloat(i)&&"inline"===w.css(e,"display",!1,r))&&(i=e["offset"+t[0].toUpperCase()+t.slice(1)],a=!0),(i=parseFloat(i)||0)+Ze(e,t,n||(o?"border":"content"),a,r,i)+"px"}w.extend({cssHooks:{opacity:{get:function(e,t){if(t){var n=Fe(e,"opacity");return""===n?"1":n}}}},cssNumber:{animationIterationCount:!0,columnCount:!0,fillOpacity:!0,flexGrow:!0,flexShrink:!0,fontWeight:!0,lineHeight:!0,opacity:!0,order:!0,orphans:!0,widows:!0,zIndex:!0,zoom:!0},cssProps:{},style:function(e,t,n,r){if(e&&3!==e.nodeType&&8!==e.nodeType&&e.style){var i,o,a,s=G(t),u=Xe.test(t),l=e.style;if(u||(t=Je(s)),a=w.cssHooks[t]||w.cssHooks[s],void 0===n)return a&&"get"in a&&void 0!==(i=a.get(e,!1,r))?i:l[t];"string"==(o=typeof n)&&(i=ie.exec(n))&&i[1]&&(n=ue(e,t,i),o="number"),null!=n&&n===n&&("number"===o&&(n+=i&&i[3]||(w.cssNumber[s]?"":"px")),h.clearCloneStyle||""!==n||0!==t.indexOf("background")||(l[t]="inherit"),a&&"set"in a&&void 0===(n=a.set(e,n,r))||(u?l.setProperty(t,n):l[t]=n))}},css:function(e,t,n,r){var i,o,a,s=G(t);return Xe.test(t)||(t=Je(s)),(a=w.cssHooks[t]||w.cssHooks[s])&&"get"in a&&(i=a.get(e,!0,n)),void 0===i&&(i=Fe(e,t,r)),"normal"===i&&t in Ve&&(i=Ve[t]),""===n||n?(o=parseFloat(i),!0===n||isFinite(o)?o||0:i):i}}),w.each(["height","width"],function(e,t){w.cssHooks[t]={get:function(e,n,r){if(n)return!ze.test(w.css(e,"display"))||e.getClientRects().length&&e.getBoundingClientRect().width?et(e,t,r):se(e,Ue,function(){return et(e,t,r)})},set:function(e,n,r){var i,o=$e(e),a="border-box"===w.css(e,"boxSizing",!1,o),s=r&&Ze(e,t,r,a,o);return a&&h.scrollboxSize()===o.position&&(s-=Math.ceil(e["offset"+t[0].toUpperCase()+t.slice(1)]-parseFloat(o[t])-Ze(e,t,"border",!1,o)-.5)),s&&(i=ie.exec(n))&&"px"!==(i[3]||"px")&&(e.style[t]=n,n=w.css(e,t)),Ke(e,n,s)}}}),w.cssHooks.marginLeft=_e(h.reliableMarginLeft,function(e,

t){if(t)return(parseFloat(Fe(e,"marginLeft"))||e.getBoundingClientRect().left-se(e,{marginLeft:0},function(){return e.getBoundingClientRect().left}))+"px"}),w.each({margin:"",padding:"",border:"Width"},function(e,t){w.cssHooks[e+t]={expand:function(n){for(var r=0,i={},o="string"==typeof n?n.split(" "):[n];r<4;r++)i[e+oe[r]+t]=o[r]||o[r-2]||o[0];return i}},"margin"!==e&&(w.cssHooks[e+t].set=Ke)}),w.fn.extend({css:function(e,t){return z(this,function(e,t,n){var r,i,o={},a=0;if(Array.isArray(t)){for(r=$e(e),i=t.length;a<i;a++)o[t[a]]=w.css(e,t[a],!1,r);return o}return void 0!==n?w.style(e,t,n):w.css(e,t)},e,t,arguments.length>1)}});function tt(e,t,n,r,i){return new tt.prototype.init(e,t,n,r,i)}w.Tween=tt,tt.prototype={constructor:tt,init:function(e,t,n,r,i,o){this.elem=e,this.prop=n,this.easing=i||w.easing._default,this.options=t,this.start=this.now=this.cur(),this.end=r,this.unit=o||(w.cssNumber[n]?"":"px")},cur:function(){var e=tt.propHooks[this.prop];return e&&e.get?e.get(this):tt.propHooks._default.get(this)},run:function(e){var t,n=tt.propHooks[this.prop];return this.options.duration?this.pos=t=w.easing[this.easing](e,this.options.duration*e,0,1,this.options.duration):this.pos=t=e,this.now=(this.end-this.start)*t+this.start,this.options.step&&this.options.step.call(this.elem,this.now,this),n&&n.set?n.set(this):tt.propHooks._default.set(this),this}},tt.prototype.init.prototype=tt.prototype,tt.propHooks={_default:{get:function(e){var t;return 1!==e.elem.nodeType||null!=e.elem[e.prop]&&null==e.elem.style[e.prop]?e.elem[e.prop]:(t=w.css(e.elem,e.prop,""))&&"auto"!==t?t:0},set:function(e){w.fx.step[e.prop]?w.fx.step[e.prop](e):1!==e.elem.nodeType||null==e.elem.style[w.cssProps[e.prop]]&&!w.cssHooks[e.prop]?e.elem[e.prop]=e.now:w.style(e.elem,e.prop,e.now+e.unit)}}},tt.propHooks.scrollTop=tt.propHooks.scrollLeft={set:function(e){e.elem.nodeType&&e.elem.parentNode&&(e.elem[e.prop]=e.now)}},w.easing={linear:function(e){return e},swing:function(e){return.5-Math.cos(e*Math.PI)/2},_default:"swing"},w.fx=tt.prototype.init,w.fx.step={};var nt,rt,it=/^(?:toggle|show|hide)$/,ot=/queueHooks$/;function at(){rt&&(!1===r.hidden&&e.requestAnimationFrame?e.requestAnimationFrame(at):e.setTimeout(at,w.fx.interval),w.fx.tick())}function st(){return

e.setTimeout(function(){nt=void 0}),nt=Date.now()}function ut(e,t){var n,r=0,i={height:e};for(t=t?1:0;r<4;r+=2-t)i["margin"+(n=oe[r])]=i["padding"+n]=e;return t&&(i.opacity=i.width=e),i}function lt(e,t,n){for(var r,i=(pt.tweeners[t]||[]).concat(pt.tweeners["*"]),o=0,a=i.length;o<a;o++)if(r=i[o].call(n,t,e))return r}function ct(e,t,n){var r,i,o,a,s,u,l,c,f="width"in t||"height"in t,p=this,d={},h=e.style,g=e.nodeType&&ae(e),y=J.get(e,"fxshow");n.queue||(null==(a=w._queueHooks(e,"fx")).unqueued&&(a.unqueued=0,s=a.empty.fire,a.empty.fire=function(){a.unqueued||s()}),a.unqueued++,p.always(function(){p.always(function(){a.unqueued--,w.queue(e,"fx").length||a.empty.fire()})}));for(r in t)if(i=t[r],it.test(i)){if(delete t[r],o=o||"toggle"===i,i===(g?"hide":"show")){if("show"!==i||!y||void 0===y[r])continue;g=!0}d[r]=y&&y[r]||w.style(e,r)}if((u=!w.isEmptyObject(t))||!w.isEmptyObject(d)){f&&1===e.nodeType&&(n.overflow=[h.overflow,h.overflowX,h.overflowY],null==(l=y&&y.display)&&(l=J.get(e,"display")),"none"===(c=w.css(e,"display"))&&(l?c=l:(fe([e],!0),l=e.style.display||l,c=w.css(e,"display"),fe([e]))),("inline"===c||"inline-block"===c&&null!=l)&&"none"===w.css(e,"float")&&(u||(p.done(function(){h.display=l}),null==l&&(c=h.display,l="none"===c?"":c)),h.display="inline-block")),n.overflow&&(h.overflow="hidden",p.always(function(){h.overflow=n.overflow[0],h.overflowX=n.overflow[1],h.overflowY=n.overflow[2]})),u=!1;for(r in d)u||(y?"hidden"in y&&(g=y.hidden):y=J.access(e,"fxshow",{display:l}),o&&(y.hidden=!g),g&&fe([e],!0),p.done(function(){g||fe([e]),J.remove(e,"fxshow");for(r in d)w.style(e,r,d[r])})),u=lt(g?y[r]:0,r,p),r in y||(y[r]=u.start,g&&(u.end=u.start,u.start=0))}}function ft(e,t){var n,r,i,o,a;for(n in e)if(r=G(n),i=t[r],o=e[n],Array.isArray(o)&&(i=o[1],o=e[n]=o[0]),n!==r&&(e[r]=o,delete e[n]),(a=w.cssHooks[r])&&"expand"in a){o=a.expand(o),delete e[r];for(n in o)n in e||(e[n]=o[n],t[n]=i)}else t[r]=i}function pt(e,t,n){var r,i,o=0,a=pt.prefilters.length,s=w.Deferred().always(function(){delete u.elem}),u=function(){if(i)return!1;for(var t=nt||st(),n=Math.max(0,l.startTime+l.duration-t),r=1-(n/l.duration||0),o=0,a=l.tweens.length;o<a;o++)l.tweens[o].run(r);return s.notifyWith(e,[l,r,n]),r<1&&a?n:(a||s.notifyWith(e,[l,1,0]),s.resolveWith(e,[l]),!1)},l

=s.promise({elem:e,props:w.extend({},t),opts:w.extend(!0,{specialEasing:{},easing:
w.easing._default},n),originalProperties:t,originalOptions:n,startTime:nt||st(),duration
:n.duration,tweens:[],createTween:function(t,n){var
r=w.Tween(e,l.opts,t,n,l.opts.specialEasing[t]||l.opts.easing);return
l.tweens.push(r),r},stop:function(t){var n=0,r=t?l.tweens.length:0;if(i)return
this;for(i=!0;n<r;n++)l.tweens[n].run(1);return
t?(s.notifyWith(e,[l,1,0]),s.resolveWith(e,[l,t])):s.rejectWith(e,[l,t]),this}}),c=l.props;f
or(ft(c,l.opts.specialEasing);o<a;o++)if(r=pt.prefilters[o].call(l,e,c,l.opts))return
g(r.stop)&&(w._queueHooks(l.elem,l.opts.queue).stop=r.stop.bind(r)),r;return
w.map(c,lt,l),g(l.opts.start)&&l.opts.start.call(e,l),l.progress(l.opts.progress).done(l.op
ts.done,l.opts.complete).fail(l.opts.fail).always(l.opts.always),w.fx.timer(w.extend(u,{
elem:e,anim:l,queue:l.opts.queue})),l}w.Animation=w.extend(pt,{tweeners:{"*":[fun
ction(e,t){var n=this.createTween(e,t);return
ue(n.elem,e,ie.exec(t),n),n}]},tweener:function(e,t){g(e)?(t=e,e=["*"]):e=e.match(M);
for(var
n,r=0,i=e.length;r<i;r++)n=e[r],pt.tweeners[n]=pt.tweeners[n]||[],pt.tweeners[n].unshif
t(t)},prefilters:[ct],prefilter:function(e,t){t?pt.prefilters.unshift(e):pt.prefilters.push(e)}
}),w.speed=function(e,t,n){var r=e&&"object"==typeof
e?w.extend({},e):{complete:n||!n&&t||g(e)&&e,duration:e,easing:n&&t||t&&!g(t)&&
t};return w.fx.off?r.duration=0:"number"!=typeof r.duration&&(r.duration in
w.fx.speeds?r.duration=w.fx.speeds[r.duration]:r.duration=w.fx.speeds._default),null!
=r.queue&&!0!==r.queue||(r.queue="fx"),r.old=r.complete,r.complete=function(){g(r.
old)&&r.old.call(this),r.queue&&w.dequeue(this,r.queue)},r},w.fn.extend({fadeTo:fu
nction(e,t,n,r){return
this.filter(ae).css("opacity",0).show().end().animate({opacity:t},e,n,r)},animate:functi
on(e,t,n,r){var i=w.isEmptyObject(e),o=w.speed(t,n,r),a=function(){var
t=pt(this,w.extend({},e),o);(i||J.get(this,"finish"))&&t.stop(!0)};return
a.finish=a,i||!1===o.queue?this.each(a):this.queue(o.queue,a)},stop:function(e,t,n){va
r r=function(e){var t=e.stop;delete e.stop,t(n)};return"string"!=typeof
e&&(n=t,t=e,e=void 0),t&&!1!==e&&this.queue(e||"fx",[]),this.each(function(){var
t=!0,i=null!=e&&e+"queueHooks",o=w.timers,a=J.get(this);if(i)a[i]&&a[i].stop&&r(
a[i]);else for(i in a)a[i]&&a[i].stop&&ot.test(i)&&r(a[i]);for(i=o.length;i-
-;)o[i].elem!==this||null!=e&&o[i].queue!==e||(o[i].anim.stop(n),t=!1,o.splice(i,1));!t
&&n||w.dequeue(this,e)})},finish:function(e){return!1!==e&&(e=e||"fx"),this.each(fu

nction(){var
t,n=J.get(this),r=n[e+"queue"],i=n[e+"queueHooks"],o=w.timers,a=r?r.length:0;for(n.
finish=!0,w.queue(this,e,[]),i&&i.stop&&i.stop.call(this,!0),t=o.length;t-
-;)o[t].elem===this&&o[t].queue===e&&(o[t].anim.stop(!0),o.splice(t,1));for(t=0;t<a
;t++)r[t]&&r[t].finish&&r[t].finish.call(this);delete
n.finish})}}),w.each(["toggle","show","hide"],function(e,t){var
n=w.fn[t];w.fn[t]=function(e,r,i){return null==e||"boolean"==typeof
e?n.apply(this,arguments):this.animate(ut(t,!0),e,r,i)}}),w.each({slideDown:ut("show"
),slideUp:ut("hide"),slideToggle:ut("toggle"),fadeIn:{opacity:"show"},fadeOut:{opaci
ty:"hide"},fadeToggle:{opacity:"toggle"}},function(e,t){w.fn[e]=function(e,n,r){retur
n this.animate(t,e,n,r)}}),w.timers=[],w.fx.tick=function(){var
e,t=0,n=w.timers;for(nt=Date.now();t<n.length;t++)(e=n[t])()||n[t]!==e||n.splice(t-
-,1);n.length||w.fx.stop(),nt=void
0},w.fx.timer=function(e){w.timers.push(e),w.fx.start()},w.fx.interval=13,w.fx.start=
function(){rt||(rt=!0,at())},w.fx.stop=function(){rt=null},w.fx.speeds={slow:600,fast:
200,_default:400},w.fn.delay=function(t,n){return
t=w.fx?w.fx.speeds[t]||t:t,n=n||"fx",this.queue(n,function(n,r){var
i=e.setTimeout(n,t);r.stop=function(){e.clearTimeout(i)}})},function(){var
e=r.createElement("input"),t=r.createElement("select").appendChild(r.createElement(
"option"));e.type="checkbox",h.checkOn=""!==e.value,h.optSelected=t.selected,(e=r.
createElement("input")).value="t",e.type="radio",h.radioValue="t"===e.value}();var
dt,ht=w.expr.attrHandle;w.fn.extend({attr:function(e,t){return
z(this,w.attr,e,t,arguments.length>1)},removeAttr:function(e){return
this.each(function(){w.removeAttr(this,e)})}}),w.extend({attr:function(e,t,n){var
r,i,o=e.nodeType;if(3!==o&&8!==o&&2!==o)return"undefined"==typeof
e.getAttribute?w.prop(e,t,n):(1===o&&w.isXMLDoc(e)||(i=w.attrHooks[t.toLowerCa
se()]||(w.expr.match.bool.test(t)?dt:void 0)),void 0!==n?null===n?void
w.removeAttr(e,t):i&&"set"in i&&void
0!==(r=i.set(e,n,t))?r:(e.setAttribute(t,n+""),n):i&&"get"in
i&&null!==(r=i.get(e,t))?r:null==(r=w.find.attr(e,t))?void
0:r)},attrHooks:{type:{set:function(e,t){if(!h.radioValue&&"radio"===t&&N(e,"inpu
t")){var n=e.value;return
e.setAttribute("type",t),n&&(e.value=n),t}}}},removeAttr:function(e,t){var
n,r=0,i=t&&t.match(M);if(i&&1===e.nodeType)while(n=i[r++])e.removeAttribute(n

)}}),dt={set:function(e,t,n){return!1===t?w.removeAttr(e,n):e.setAttribute(n,n),n}},
w.each(w.expr.match.bool.source.match(/\w+/g),function(e,t){var
n=ht[t]||w.find.attr;ht[t]=function(e,t,r){var i,o,a=t.toLowerCase();return
r||(o=ht[a],ht[a]=i,i=null!=n(e,t,r)?a:null,ht[a]=o),i}});var
gt=/^(?:input|select|textarea|button)$/i,yt=/^(?:a|area)$/i;w.fn.extend({prop:function(e,
t){return z(this,w.prop,e,t,arguments.length>1)},removeProp:function(e){return
this.each(function(){delete
this[w.propFix[e]||e]})}}),w.extend({prop:function(e,t,n){var
r,i,o=e.nodeType;if(3!==o&&8!==o&&2!==o)return
1===o&&w.isXMLDoc(e)||(t=w.propFix[t]||t,i=w.propHooks[t]),void
0!==n?i&&"set"in i&&void 0!==(r=i.set(e,n,t))?r:e[t]=n:i&&"get"in
i&&null!==(r=i.get(e,t))?r:e[t]},propHooks:{tabIndex:{get:function(e){var
t=w.find.attr(e,"tabindex");return
t?parseInt(t,10):gt.test(e.nodeName)||yt.test(e.nodeName)&&e.href?0:-
1}}},propFix:{"for":"htmlFor","class":"className"}}),h.optSelected||(w.propHooks.s
elected={get:function(e){var t=e.parentNode;return
t&&t.parentNode&&t.parentNode.selectedIndex,null},set:function(e){var
t=e.parentNode;t&&(t.selectedIndex,t.parentNode&&t.parentNode.selectedIndex)}}),
w.each(["tabIndex","readOnly","maxLength","cellSpacing","cellPadding","rowSpan",
"colSpan","useMap","frameBorder","contentEditable"],function(){w.propFix[this.toL
owerCase()]=this});function vt(e){return(e.match(M)||[]).join(" ")}function
mt(e){return e.getAttribute&&e.getAttribute("class")||""}function xt(e){return
Array.isArray(e)?e:"string"==typeof
e?e.match(M)||[]:[]}w.fn.extend({addClass:function(e){var
t,n,r,i,o,a,s,u=0;if(g(e))return
this.each(function(t){w(this).addClass(e.call(this,t,mt(this)))});if((t=xt(e)).length)whil
e(n=this[u++])if(i=mt(n),r=1===n.nodeType&&" "+vt(i)+"
"){a=0;while(o=t[a++])r.indexOf(" "+o+" ")<0&&(r+=o+"
");i!==(s=vt(r))&&n.setAttribute("class",s)}return this},removeClass:function(e){var
t,n,r,i,o,a,s,u=0;if(g(e))return
this.each(function(t){w(this).removeClass(e.call(this,t,mt(this)))});if(!arguments.lengt
h)return
this.attr("class","");if((t=xt(e)).length)while(n=this[u++])if(i=mt(n),r=1===n.nodeTyp
e&&" "+vt(i)+" "){a=0;while(o=t[a++])while(r.indexOf(" "+o+" ")>-1)r=r.replace("

"+o+" "," ");i!==(s=vt(r))&&n.setAttribute("class",s)}return this},toggleClass:function(e,t){var n=typeof e,r="string"===n||Array.isArray(e);return"boolean"==typeof t&&r?t?this.addClass(e):this.removeClass(e):g(e)?this.each(function(n){w(this).toggleClass(e.call(this,n,mt(this),t),t)}):this.each(function(){var t,i,o,a;if(r){i=0,o=w(this),a=xt(e);while(t=a[i++])o.hasClass(t)?o.removeClass(t):o.addClass(t)}else void 0!==e&&"boolean"!==n||((t=mt(this))&&J.set(this,"__className__",t),this.setAttribute&&this.setAttribute("class",t||!1===e?"":J.get(this,"__className__")||""))})},hasClass:function(e){var t,n,r=0;t=" "+e+" ";while(n=this[r++])if(1===n.nodeType&&(" "+vt(mt(n))+" ").indexOf(t)>-1)return!0;return!1}});var bt=/\r/g;w.fn.extend({val:function(e){var t,n,r,i=this[0];{if(arguments.length)return r=g(e),this.each(function(n){var i;1===this.nodeType&&(null==(i=r?e.call(this,n,w(this).val()):e)?i="":"number"==typeof i?i+="":Array.isArray(i)&&(i=w.map(i,function(e){return null==e?"":e+""})),(t=w.valHooks[this.type]||w.valHooks[this.nodeName.toLowerCase()])&&"set"in t&&void 0!==t.set(this,i,"value")||(this.value=i))});if(i)return(t=w.valHooks[i.type]||w.valHooks[i.nodeName.toLowerCase()])&&"get"in t&&void 0!==(n=t.get(i,"value"))?n:"string"==typeof(n=i.value)?n.replace(bt,""):null==n?"":n}}}),w.extend({valHooks:{option:{get:function(e){var t=w.find.attr(e,"value");return null!=t?t:vt(w.text(e))}},select:{get:function(e){var t,n,r,i=e.options,o=e.selectedIndex,a="select-one"===e.type,s=a?null:[],u=a?o+1:i.length;for(r=o<0?u:a?o:0;r<u;r++)if(((n=i[r]).selected||r===o)&&!n.disabled&&(!n.parentNode.disabled||!N(n.parentNode,"optgroup"))){if(t=w(n).val(),a)return t;s.push(t)}return s},set:function(e,t){var n,r,i=e.options,o=w.makeArray(t),a=i.length;while(a--)((r=i[a]).selected=w.inArray(w.valHooks.option.get(r),o)>-1)&&(n=!0);return n||(e.selectedIndex=-1),o}}}}),w.each(["radio","checkbox"],function(){w.valHooks[this]={set:function(e,t){if(Array.isArray(t))return e.checked=w.inArray(w(e).val(),t)>-1}},h.checkOn||(w.valHooks[this].get=function(e){return null===e.getAttribute("value")?"on":e.value})}),h.focusin="onfocusin"in e;var wt=/^(?:focusinfocus|focusoutblur)$/,Tt=function(e){e.stopPropagation()};w.extend(

w.event,{trigger:function(t,n,i,o){var
a,s,u,l,c,p,d,h,v=[i||r],m=f.call(t,"type")?t.type:t,x=f.call(t,"namespace")?t.namespace.
split("."):[];if(s=h=u=i=i||r,3!==i.nodeType&&8!==i.nodeType&&!wt.test(m+w.even
t.triggered)&&(m.indexOf(".")>-
1&&(m=(x=m.split(".")).shift(),x.sort()),c=m.indexOf(":")<0&&"on"+m,t=t[w.expan
do]?t:new w.Event(m,"object"==typeof
t&&t),t.isTrigger=o?2:3,t.namespace=x.join("."),t.rnamespace=t.namespace?new
RegExp("(^|\\.)"+x.join("\\.(?:.*\\.|)")+"(\\.|$)"):null,t.result=void
0,t.target||(t.target=i),n=null==n?[t]:w.makeArray(n,[t]),d=w.event.special[m]||{},o||!d
.trigger||!1!==d.trigger.apply(i,n))){if(!o&&!d.noBubble&&!y(i)){for(l=d.delegateTy
pe||m,wt.test(l+m)||(s=s.parentNode);s;s=s.parentNode)v.push(s),u=s;u===(i.ownerDo
cument||r)&&v.push(u.defaultView||u.parentWindow||e)}a=0;while((s=v[a++])&&!t.i
sPropagationStopped())h=s,t.type=a>1?l:d.bindType||m,(p=(J.get(s,"events")||{})[t.ty
pe]&&J.get(s,"handle"))&&p.apply(s,n),(p=c&&s[c])&&p.apply&&Y(s)&&(t.result
=p.apply(s,n),!1===t.result&&t.preventDefault());return
t.type=m,o||t.isDefaultPrevented()||d._default&&!1!==d._default.apply(v.pop(),n)||!Y(
i)||c&&g(i[m])&&!y(i)&&((u=i[c])&&(i[c]=null),w.event.triggered=m,t.isPropagatio
nStopped()&&h.addEventListener(m,Tt),i[m](),t.isPropagationStopped()&&h.remove
EventListener(m,Tt),w.event.triggered=void
0,u&&(i[c]=u)),t.result}},simulate:function(e,t,n){var r=w.extend(new
w.Event,n,{type:e,isSimulated:!0});w.event.trigger(r,null,t)}}),w.fn.extend({trigger:f
unction(e,t){return
this.each(function(){w.event.trigger(e,t,this)})},triggerHandler:function(e,t){var
n=this[0];if(n)return
w.event.trigger(e,t,n,!0)}}),h.focusin||w.each({focus:"focusin",blur:"focusout"},functi
on(e,t){var
n=function(e){w.event.simulate(t,e.target,w.event.fix(e))};w.event.special[t]={setup:f
unction(){var
r=this.ownerDocument||this,i=J.access(r,t);i||r.addEventListener(e,n,!0),J.access(r,t,(i||
0)+1)},teardown:function(){var r=this.ownerDocument||this,i=J.access(r,t)-
1;i?J.access(r,t,i):(r.removeEventListener(e,n,!0),J.remove(r,t))}}});var
Ct=e.location,Et=Date.now(),kt=/\?/;w.parseXML=function(t){var
n;if(!t||"string"!=typeof t)return null;try{n=(new
e.DOMParser).parseFromString(t,"text/xml")}catch(e){n=void 0}return

n&&!n.getElementsByTagName("parsererror").length||w.error("Invalid XML: "+t),n};var St=/\[\]$/,Dt=/\r?\n/g,Nt=/^(?:submit|button|image|reset|file)$/i,At=/^(?:input|select|textarea|keygen)/i;function jt(e,t,n,r){var i;if(Array.isArray(t))w.each(t,function(t,i){n||St.test(e)?r(e,i):jt(e+"["+("object"==typeof i&&null!=i?t:"")+"]",i,n,r)});else if(n||"object"!==x(t))r(e,t);else for(i in t)jt(e+"["+i+"]",t[i],n,r)}w.param=function(e,t){var n,r=[],i=function(e,t){var n=g(t)?t():t;r[r.length]=encodeURIComponent(e)+"="+encodeURIComponent(null==n?"":n)};if(Array.isArray(e)||e.jquery&&!w.isPlainObject(e))w.each(e,function(){i(this.name,this.value)});else for(n in e)jt(n,e[n],t,i);return r.join("&")},w.fn.extend({serialize:function(){return w.param(this.serializeArray())},serializeArray:function(){return this.map(function(){var e=w.prop(this,"elements");return e?w.makeArray(e):this}).filter(function(){var e=this.type;return this.name&&!w(this).is(":disabled")&&At.test(this.nodeName)&&!Nt.test(e)&&(this.checked||!pe.test(e))}).map(function(e,t){var n=w(this).val();return null==n?null:Array.isArray(n)?w.map(n,function(e){return{name:t.name,value:e.replace(Dt,"\r\n")}}):{name:t.name,value:n.replace(Dt,"\r\n")}}).get()}});var qt=/%20/g,Lt=/#.*$/,Ht=/([?&])_=[^&]*/,Ot=/^(.*?):[\t]*([^\r\n]*)$/gm,Pt=/^(?:about|app|app-storage|.+-extension|file|res|widget):$/,Mt=/^(?:GET|HEAD)$/,Rt=/^\/\//,It={},Wt={},$t="*/".concat("*"),Bt=r.createElement("a");Bt.href=Ct.href;function Ft(e){return function(t,n){"string"!=typeof t&&(n=t,t="*");var r,i=0,o=t.toLowerCase().match(M)||[];if(g(n))while(r=o[i++])"+"===r[0]?(r=r.slice(1)||"*",(e[r]=e[r]||[]).unshift(n)):(e[r]=e[r]||[]).push(n)}}function _t(e,t,n,r){var i={},o=e===Wt;function a(s){var u;return i[s]=!0,w.each(e[s]||[],function(e,s){var l=s(t,n,r);return"string"!=typeof l||o||i[l]?o?!(u=l):void 0:(t.dataTypes.unshift(l),a(l),!1)}),u}return a(t.dataTypes[0])||!i["*"]&&a("*")}function zt(e,t){var n,r,i=w.ajaxSettings.flatOptions||{};for(n in t)void 0!==t[n]&&((i[n]?e:r||(r={}))[n]=t[n]);return r&&w.extend(!0,e,r),e}function Xt(e,t,n){var r,i,o,a,s=e.contents,u=e.dataTypes;while("*"===u[0])u.shift(),void 0===r&&(r=e.mimeType||t.getResponseHeader("Content-Type"));if(r)for(i in s)if(s[i]&&s[i].test(r)){u.unshift(i);break}if(u[0]in n)o=u[0];else{for(i in

n){if(!u[0]||e.converters[i+" "+u[0]]){o=i;break}a||(a=i)}o=o||a}if(o)return o!==u[0]&&u.unshift(o),n[o]}function Ut(e,t,n,r){var i,o,a,s,u,l={},c=e.dataTypes.slice();if(c[1])for(a in e.converters)l[a.toLowerCase()]=e.converters[a];o=c.shift();while(o)if(e.responseFields[o]&&(n[e.responseFields[o]]=t),!u&&r&&e.dataFilter&&(t=e.dataFilter(t,e.dataType)),u=o,o=c.shift())if("*"===o)o=u;else if("*"!==u&&u!==o){if(!(a=l[u+" "+o]||l["* "+o]))for(i in l)if((s=i.split(" "))[1]===o&&(a=l[u+" "+s[0]]||l["* "+s[0]])){!0===a?a=l[i]:!0!==l[i]&&(o=s[0],c.unshift(s[1]));break}if(!0!==a)if(a&&e["throws"])t=a(t);else try{t=a(t)}catch(e){return{state:"parsererror",error:a?e:"No conversion from "+u+" to "+o}}}return{state:"success",data:t}}w.extend({active:0,lastModified:{},etag:{},ajaxSettings:{url:Ct.href,type:"GET",isLocal:Pt.test(Ct.protocol),global:!0,processData:!0,async:!0,contentType:"application/x-www-form-urlencoded; charset=UTF-8",accepts:{"*":$t,text:"text/plain",html:"text/html",xml:"application/xml, text/xml",json:"application/json, text/javascript"},contents:{xml:/\bxml\b/,html:/\bhtml/,json:/\bjson\b/},responseFields:{xml:"responseXML",text:"responseText",json:"responseJSON"},converters:{"* text":String,"text html":!0,"text json":JSON.parse,"text xml":w.parseXML},flatOptions:{url:!0,context:!0}},ajaxSetup:function(e,t){return t?zt(zt(e,w.ajaxSettings),t):zt(w.ajaxSettings,e)},ajaxPrefilter:Ft(It),ajaxTransport:Ft(Wt),ajax:function(t,n){"object"==typeof t&&(n=t,t=void 0),n=n||{};var i,o,a,s,u,l,c,f,p,d,h=w.ajaxSetup({},n),g=h.context||h,y=h.context&&(g.nodeType||g.jquery)?w(g):w.event,v=w.Deferred(),m=w.Callbacks("once memory"),x=h.statusCode||{},b={},T={},C="canceled",E={readyState:0,getResponseHeader:function(e){var t;if(c){if(!s){s={};while(t=Ot.exec(a))s[t[1].toLowerCase()]=t[2]}t=s[e.toLowerCase()]}return null==t?null:t},getAllResponseHeaders:function(){return c?a:null},setRequestHeader:function(e,t){return null==c&&(e=T[e.toLowerCase()]=T[e.toLowerCase()]||e,b[e]=t),this},overrideMimeType:function(e){return null==c&&(h.mimeType=e),this},statusCode:function(e){var t;if(e)if(c)E.always(e[E.status]);else for(t in e)x[t]=[x[t],e[t]];return this},abort:function(e){var t=e||C;return i&&i.abort(t),k(0,t),this}};if(v.promise(E),h.url=((t||h.url||Ct.href)+"").replace(Rt,Ct.p

rotocol+"//"),h.type=n.method||n.type||h.method||h.type,h.dataTypes=(h.dataType||"*")
.toLowerCase().match(M)||[""],null==h.crossDomain){l=r.createElement("a");try{l.hr
ef=h.url,l.href=l.href,h.crossDomain=Bt.protocol+"//"+Bt.host!=l.protocol+"//"+l.host
}catch(e){h.crossDomain=!0}}if(h.data&&h.processData&&"string"!=typeof
h.data&&(h.data=w.param(h.data,h.traditional)),_t(It,h,n,E),c)return
E;(f=w.event&&h.global)&&0==w.active++&&w.event.trigger("ajaxStart"),h.type=h
.type.toUpperCase(),h.hasContent=!Mt.test(h.type),o=h.url.replace(Lt,""),h.hasConten
t?h.data&&h.processData&&0===(h.contentType||"").indexOf("application/x-www-
form-
urlencoded")&&(h.data=h.data.replace(qt,"+")):(d=h.url.slice(o.length),h.data&&(h.p
rocessData||"string"==typeof h.data)&&(o+=(kt.test(o)?"&":"?")+h.data,delete
h.data),!1===h.cache&&(o=o.replace(Ht,"$1"),d=(kt.test(o)?"&":"?")+"_="+Et+++d)
,h.url=o+d),h.ifModified&&(w.lastModified[o]&&E.setRequestHeader("If-Modified-
Since",w.lastModified[o]),w.etag[o]&&E.setRequestHeader("If-None-
Match",w.etag[o])),(h.data&&h.hasContent&&!1!==h.contentType||n.contentType)&
&E.setRequestHeader("Content-
Type",h.contentType),E.setRequestHeader("Accept",h.dataTypes[0]&&h.accepts[h.d
ataTypes[0]]?h.accepts[h.dataTypes[0]]+("*"!==h.dataTypes[0]?", "+$t+";
q=0.01":""):h.accepts["*"]);for(p in
h.headers)E.setRequestHeader(p,h.headers[p]);if(h.beforeSend&&(!1===h.beforeSen
d.call(g,E,h)||c))return
E.abort();if(C="abort",m.add(h.complete),E.done(h.success),E.fail(h.error),i=_t(Wt,h,
n,E)){if(E.readyState=1,f&&y.trigger("ajaxSend",[E,h]),c)return
E;h.async&&h.timeout>0&&(u=e.setTimeout(function(){E.abort("timeout")},h.timeo
ut));try{c=!1,i.send(b,k)}catch(e){if(c)throw e;k(-1,e)}}else k(-1,"No
Transport");function k(t,n,r,s){var
l,p,d,b,T,C=n;c||(c=!0,u&&e.clearTimeout(u),i=void
0,a=s||"",E.readyState=t>0?4:0,l=t>=200&&t<300||304===t,r&&(b=Xt(h,E,r)),b=Ut(
h,b,E,l),l?(h.ifModified&&((T=E.getResponseHeader("Last-
Modified"))&&(w.lastModified[o]=T),(T=E.getResponseHeader("etag"))&&(w.etag[
o]=T)),204===t||"HEAD"===h.type?C="nocontent":304===t?C="notmodified":(C=b
.state,p=b.data,l=!(d=b.error))):(d=C,!t&&C||(C="error",t<0&&(t=0))),E.status=t,E.st
atusText=(n||C)+"",l?v.resolveWith(g,[p,C,E]):v.rejectWith(g,[E,C,d]),E.statusCode(x
),x=void

0,f&&y.trigger(l?"ajaxSuccess":"ajaxError",[E,h,l?p:d]),m.fireWith(g,[E,C]),f&&(y.trigger("ajaxComplete",[E,h]),--w.active||w.event.trigger("ajaxStop")))}return E},getJSON:function(e,t,n){return w.get(e,t,n,"json")},getScript:function(e,t){return w.get(e,void 0,t,"script")}}),w.each(["get","post"],function(e,t){w[t]=function(e,n,r,i){return g(n)&&(i=i||r,r=n,n=void 0),w.ajax(w.extend({url:e,type:t,dataType:i,data:n,success:r},w.isPlainObject(e)&&e))}}),w._evalUrl=function(e){return w.ajax({url:e,type:"GET",dataType:"script",cache:!0,async:!1,global:!1,"throws":!0})},w.fn.extend({wrapAll:function(e){var t;return this[0]&&(g(e)&&(e=e.call(this[0])),t=w(e,this[0].ownerDocument).eq(0).clone(!0),this[0].parentNode&&t.insertBefore(this[0]),t.map(function(){var e=this;while(e.firstElementChild)e=e.firstElementChild;return e}).append(this)),this},wrapInner:function(e){return g(e)?this.each(function(t){w(this).wrapInner(e.call(this,t))}):this.each(function(){var t=w(this),n=t.contents();n.length?n.wrapAll(e):t.append(e)})},wrap:function(e){var t=g(e);return this.each(function(n){w(this).wrapAll(t?e.call(this,n):e)})},unwrap:function(e){return this.parent(e).not("body").each(function(){w(this).replaceWith(this.childNodes)}),this}}),w.expr.pseudos.hidden=function(e){return!w.expr.pseudos.visible(e)},w.expr.pseudos.visible=function(e){return!!(e.offsetWidth||e.offsetHeight||e.getClientRects().length)},w.ajaxSettings.xhr=function(){try{return new e.XMLHttpRequest}catch(e){}};var Vt={0:200,1223:204},Gt=w.ajaxSettings.xhr();h.cors=!!Gt&&"withCredentials"in Gt,h.ajax=Gt=!!Gt,w.ajaxTransport(function(t){var n,r;if(h.cors||Gt&&!t.crossDomain)return{send:function(i,o){var a,s=t.xhr();if(s.open(t.type,t.url,t.async,t.username,t.password),t.xhrFields)for(a in t.xhrFields)s[a]=t.xhrFields[a];t.mimeType&&s.overrideMimeType&&s.overrideMimeType(t.mimeType),t.crossDomain||i["X-Requested-With"]||(i["X-Requested-With"]="XMLHttpRequest");for(a in i)s.setRequestHeader(a,i[a]);n=function(e){return function(){n&&(n=r=s.onload=s.onerror=s.onabort=s.ontimeout=s.onreadystatechange=null,"abort"===e?s.abort():"error"===e?"number"!=typeof s.status?o(0,"error"):o(s.status,s.statusText):o(Vt[s.status]||s.status,s.statusText,"text"!

==(s.responseType||"text")||"string"!=typeof
s.responseText?{binary:s.response}:{text:s.responseText},s.getAllResponseHeaders()
))}},s.onload=n(),r=s.onerror=s.ontimeout=n("error"),void
0!==s.onabort?s.onabort=r:s.onreadystatechange=function(){4===s.readyState&&e.s
etTimeout(function(){n&&r()})},n=n("abort");try{s.send(t.hasContent&&t.data||null)
}catch(e){if(n)throw
e}},abort:function(){n&&n()}}}),w.ajaxPrefilter(function(e){e.crossDomain&&(e.co
ntents.script=!1)}),w.ajaxSetup({accepts:{script:"text/javascript,
application/javascript, application/ecmascript, application/x-
ecmascript"},contents:{script:/\b(?:java|ecma)script\b/},converters:{"text
script":function(e){return
w.globalEval(e),e}}}),w.ajaxPrefilter("script",function(e){void
0===e.cache&&(e.cache=!1),e.crossDomain&&(e.type="GET")}),w.ajaxTransport("
script",function(e){if(e.crossDomain){var
t,n;return{send:function(i,o){t=w("<script>").prop({charset:e.scriptCharset,src:e.url})
.on("load
error",n=function(e){t.remove(),n=null,e&&o("error"===e.type?404:200,e.type)}),r.h
ead.appendChild(t[0])},abort:function(){n&&n()}}}});var
Yt=[],Qt=/(=)\?(?=&|$)|\?\?/;w.ajaxSetup({jsonp:"callback",jsonpCallback:function()
{var e=Yt.pop()||w.expando+"_"+Et++;return this[e]=!0,e}}),w.ajaxPrefilter("json
jsonp",function(t,n,r){var
i,o,a,s=!1!==t.jsonp&&(Qt.test(t.url)?"url":"string"==typeof
t.data&&0===(t.contentType||"").indexOf("application/x-www-form-
urlencoded")&&Qt.test(t.data)&&"data");if(s||"jsonp"===t.dataTypes[0])return
i=t.jsonpCallback=g(t.jsonpCallback)?t.jsonpCallback():t.jsonpCallback,s?t[s]=t[s].re
place(Qt,"$1"+i):!1!==t.jsonp&&(t.url+=(kt.test(t.url)?"&":"?")+t.jsonp+"="+i),t.con
verters["script json"]=function(){return a||w.error(i+" was not
called"),a[0]},t.dataTypes[0]="json",o=e[i],e[i]=function(){a=arguments},r.always(fu
nction(){void
0===o?w(e).removeProp(i):e[i]=o,t[i]&&(t.jsonpCallback=n.jsonpCallback,Yt.push(i
)),a&&g(o)&&o(a[0]),a=o=void
0}),"script"}),h.createHTMLDocument=function(){var
e=r.implementation.createHTMLDocument("").body;return
e.innerHTML="<form></form><form></form>",2===e.childNodes.length}(),w.pars

eHTML=function(e,t,n){if("string"!=typeof e)return[];"boolean"==typeof t&&(n=t,t=!1);var i,o,a;return t||(h.createHTMLDocument?((i=(t=r.implementation.createHTMLDocument("")).createElement("base")).href=r.location.href,t.head.appendChild(i)):t=r),o=A.exec(e),a=!n&&[],o?[t.createElement(o[1])]:(o=xe([e],t,a),a&&a.length&&w(a).remove(),w.merge([],o.childNodes))},w.fn.load=function(e,t,n){var r,i,o,a=this,s=e.indexOf(" ");return s>-1&&(r=vt(e.slice(s)),e=e.slice(0,s)),g(t)?(n=t,t=void 0):t&&"object"==typeof t&&(i="POST"),a.length>0&&w.ajax({url:e,type:i||"GET",dataType:"html",data:t}).done(function(e){o=arguments,a.html(r?w(" ").append(w.parseHTML(e)).find(r):e)}).always(n&&function(e,t){a.each(function(){n.apply(this,o||[e.responseText,t,e])})}),this},w.each(["ajaxStart","ajaxStop","ajaxComplete","ajaxError","ajaxSuccess","ajaxSend"],function(e,t){w.fn[t]=function(e){return this.on(t,e)}}),w.expr.pseudos.animated=function(e){return w.grep(w.timers,function(t){return e===t.elem}).length},w.offset={setOffset:function(e,t,n){var r,i,o,a,s,u,l,c=w.css(e,"position"),f=w(e),p={};"static"===c&&(e.style.position="relative"),s=f.offset(),o=w.css(e,"top"),u=w.css(e,"left"),(l=("absolute"===c||"fixed"===c)&&(o+u).indexOf("auto")>-1)?(a=(r=f.position()).top,i=r.left):(a=parseFloat(o)||0,i=parseFloat(u)||0),g(t)&&(t=t.call(e,n,w.extend({},s))),null!=t.top&&(p.top=t.top-s.top+a),null!=t.left&&(p.left=t.left-s.left+i),"using"in t?t.using.call(e,p):f.css(p)}},w.fn.extend({offset:function(e){if(arguments.length)return void 0===e?this:this.each(function(t){w.offset.setOffset(this,e,t)});var t,n,r=this[0];if(r)return r.getClientRects().length?(t=r.getBoundingClientRect(),n=r.ownerDocument.defaultView,{top:t.top+n.pageYOffset,left:t.left+n.pageXOffset}):{top:0,left:0}},position:function(){if(this[0]){var e,t,n,r=this[0],i={top:0,left:0};if("fixed"===w.css(r,"position"))t=r.getBoundingClientRect();else{t=this.offset(),n=r.ownerDocument,e=r.offsetParent||n.documentElement;while(e&&(e===n.body||e===n.documentElement)&&"static"===w.css(e,"position"))e=e.parentNode;e&&e!==r&&1===e.nodeType&&((i=w(e).offset()).top+=w.css(e,"borderTopWidth",!0),i.left+=w.css(e,"borderLeftWidth",!0))}return{top:t.top-i.top-w.css(r,"marginTop",!0),left:t.left-i.left-w.css(r,"marginLeft",!0)}}},offsetParent:function(){return this.map(function(){var

e=this.offsetParent;while(e&&"static"===w.css(e,"position"))e=e.offsetParent;return e||be})}}),w.each({scrollLeft:"pageXOffset",scrollTop:"pageYOffset"},function(e,t){var n="pageYOffset"===t;w.fn[e]=function(r){return z(this,function(e,r,i){var o;if(y(e)?o=e:9===e.nodeType&&(o=e.defaultView),void 0===i)return o?o[t]:e[r];o?o.scrollTo(n?o.pageXOffset:i,n?i:o.pageYOffset):e[r]=i},e,r,arguments.length)}}),w.each(["top","left"],function(e,t){w.cssHooks[t]=_e(h.pixelPosition,function(e,n){if(n)return n=Fe(e,t),We.test(n)?w(e).position()[t]+"px":n})}),w.each({Height:"height",Width:"width"},function(e,t){w.each({padding:"inner"+e,content:t,"":"outer"+e},function(n,r){w.fn[r]=function(i,o){var a=arguments.length&&(n||"boolean"!=typeof i),s=n||(!0===i||!0===o?"margin":"border");return z(this,function(t,n,i){var o;return y(t)?0===r.indexOf("outer")?t["inner"+e]:t.document.documentElement["client"+e]:9===t.nodeType?(o=t.documentElement,Math.max(t.body["scroll"+e],o["scroll"+e],t.body["offset"+e],o["offset"+e],o["client"+e])):void 0===i?w.css(t,n,s):w.style(t,n,i,s)},t,a?i:void 0,a)}})}),w.each("blur focus focusin focusout resize scroll click dblclick mousedown mouseup mousemove mouseover mouseout mouseenter mouseleave change select submit keydown keypress keyup contextmenu".split(" "),function(e,t){w.fn[t]=function(e,n){return arguments.length>0?this.on(t,null,e,n):this.trigger(t)}}),w.fn.extend({hover:function(e,t){return this.mouseenter(e).mouseleave(t||e)}}),w.fn.extend({bind:function(e,t,n){return this.on(e,null,t,n)},unbind:function(e,t){return this.off(e,null,t)},delegate:function(e,t,n,r){return this.on(t,e,n,r)},undelegate:function(e,t,n){return 1===arguments.length?this.off(e,"**"):this.off(t,e||"**",n)}}),w.proxy=function(e,t){var n,r,i;if("string"==typeof t&&(n=e[t],t=e,e=n),g(e))return r=o.call(arguments,2),i=function(){return e.apply(t||this,r.concat(o.call(arguments)))},i.guid=e.guid=e.guid||w.guid++,i},w.holdReady=function(e){e?w.readyWait++:w.ready(!0)},w.isArray=Array.isArray,w.parseJSON=JSON.parse,w.nodeName=N,w.isFunction=g,w.isWindow=y,w.camelCase=G,w.type=x,w.now=Date.now,w.isNumeric=function(e){var t=w.type(e);return("number"===t||"string"===t)&&!isNaN(e-parseFloat(e))},"function"==typeof define&&define.amd&&define("jquery",[],function(){return w});var

```
Jt=e.jQuery,Kt=e.$;return w.noConflict=function(t){return
e.$===w&&(e.$=Kt),t&&e.jQuery===w&&(e.jQuery=Jt),w},t||(e.jQuery=e.$=w),w}
);
```

A.2.5 Register JavaScript Code

```
var obj = null;
var obj1 = null;
var voterIC = "";
var securityKey = "";
var encryptKey = "";
var status = "NA";
var current = new Date();
var cYear = current.getFullYear();
var cMonth = current.getMonth() + 1;
var cDay = current.getDate();
var obj2 = null;
var ballotID = "";
var securityKey2 = "";
var decryptKey = "";

$(function ()
{
 // ------------------------------------------------- REGISTRATION -------------------------
-----------------------
 $("#btnRegister").click(function (e)
 {
   voterIC = $("#nric").val();
   securityKey = $("#securityKey").val();
   encryptKey = $("#encryptKey").val();    // Password
   var year = parseInt(String(voterIC).substr(0, 2));
   var month = parseInt(String(voterIC).substr(2, 2));
   var day = parseInt(String(voterIC).substr(4, 2));

   if (year > 20)
```

```
        year += 1900;
    else
        year += 2000;

    var age = cYear - year;
    if ((cMonth - month < 0) || ((cMonth - month) == 0 && cDay < day))
        age--;

    if (voterIC == "" | securityKey == "" | encryptKey == "")
    {
        $("#messageEdit").html("<h4 style=\"color:red\">Please fill in the
blanks!</h4>");
        $("#showEBallotID").html('<h4 style=\"color:black\"><b></b></h4>');
    }
    else if (voterIC.length != 12 || $.isNumeric(voterIC) == false)
    {
        $("#messageEdit").html("<h4 style=\"color:red\">Invalid NRIC!</h4>");
        $("#showEBallotID").html('<h4 style=\"color:black\"><b></b></h4>');
    }
    else if (month > 12 || (month == 01 && day > 31) || (month == 02 && (year % 4
== 0) && day > 29) || (month == 02 && (year % 4 != 0) && day > 28) ||
            (month == 03 && day > 31) || (month == 04 && day > 30) || (month == 05
&& day > 31) || (month == 06 && day > 30) || (month == 07 && day > 31) ||
            (month == 08 && day > 31) || (month == 09 && day > 30) || (month == 10
&& day > 31) || (month == 11 && day > 30) || (month == 12 && day > 31))
    {
        $("#messageEdit").html("<h4 style=\"color:red\">Invalid NRIC date
format!</h4>");
        $("#showEBallotID").html('<h4 style=\"color:black\"><b></b></h4>');
    }
    else if (age < 21)
    {
        $("#messageEdit").html("<h4 style=\"color:red\">You are not eligible to
register!</h4>");
```

```
        $("#showEBallotID").html('<h4 style=\"color:black\"><b></b></h4>');
    }
    else
    {
        var checkExist =
firebase.database().ref('Voter').orderByChild('NRIC').equalTo(voterIC).once("value",
snapshot => {
          if (snapshot.exists())
          {
            $("#messageEdit").html("<h4 style=\"color:red\">You had registered
earlier!</h4>");
            $("#showEBallotID").html('<h4 style=\"color:black\"><b></b></h4>');
            $("#nric").val("");
            $("#securityKey").val("");
            $("#encryptKey").val("");
          }
          else
          {
            // ---------- Register As Voter ----------
            obj = new Object();
            obj.NRIC = voterIC;
            obj.RegisteredDate = firebase.database.ServerValue.TIMESTAMP;

            var newPostKey = firebase.database().ref().child('Voter').push().key;

            var updates = {};
            updates['/Voter/' + newPostKey] = obj;

            firebase.database().ref().update(updates).then(function()
            {
              // ---------- Assign E-Ballot ID ----------
              var randomSalt = "SALT";
              var appendSecureKey = randomSalt.concat(securityKey);
```

```
            var encryptSecurity = CryptoJS.AES.encrypt(appendSecureKey,
encryptKey, "{ mode: CryptoJS.mode.CBC, padding: CryptoJS.pad.Pkcs7 }");

            obj1 = new Object();
            obj1.SecurityKey = encryptSecurity.toString();
            obj1.Status = status;

            var eBallotID = firebase.database().ref().child('E-BallotID').push().key;

            var updates1 = {};
            updates1['/E-BallotID/' + eBallotID] = obj1;

            firebase.database().ref().update(updates1).then(function()
            {
              $("#messageEdit").html("<h4 style=\"color:red\">Register
Successfully!</h4>");
              $("#showEBallotID").html('<h4 style=\"color:black\"><b>Your E-Ballot
ID : ' + eBallotID + '</b></h4>');

              $("#nric").val("");
              $("#securityKey").val("");
              $("#encryptKey").val("");
            });
          });
        }
      });
   }
 });

 // ------------------------------------------------ START TO VOTE ------------------------
------------------------
 $("#btnVote").click(function (e)
 {
   ballotID = $("#eBallotID").val();
```

```
//    securityKey2 = $("#securityKey2").val();
    decryptKey = $("#decryptKey").val();

    if (ballotID == "" | decryptKey == "")
        $("#messageEdit2").html("<h4 style=\"color:red\">Please fill in the
blanks!</h4>");
    else
    {
        var checkExist = firebase.database().ref('E-
BallotID').orderByKey().equalTo(ballotID).once("value", snapshot => {
          if (snapshot.exists())
          {
             var snap = snapshot.val();
             var voterStatus = snap[Object.keys(snap)].Status;
             var voterSecurity = snap[Object.keys(snap)].SecurityKey;

             var decryptSecurity = CryptoJS.AES.decrypt(voterSecurity, decryptKey,
"{ mode: CryptoJS.mode.CBC, padding: CryptoJS.pad.Pkcs7 }");
             var password = decryptSecurity.toString(CryptoJS.enc.Utf8);

             if (voterStatus == "Done")
               $("#messageEdit2").html("<h4 style=\"color:red\">You had voted
earlier!</h4>");
             else if (password.substr(0, 4) != "SALT")
               $("#messageEdit2").html("<h4 style=\"color:red\">Invalid
password!</h4>");
             else
             {
               window.location.href = 'vote.html?' + ballotID
               $("#eBallotID").val("");
             }
          }
          else
```

```
            $("#messageEdit2").html("<h4 style=\"color:red\">Invalid E-Ballot
ID!</h4>");
        });
    }
  });
});
```

A.2.6 Vote JavaScript Code

```
var choice = "";
var digest = "";
var ballotID = location.search.substring(1);
var voterSecurity = "";
var obj3 = null;
var obj4 = null;

$(function ()
{
  function ShowPopUp(modal)
  {
     $("#popUp").fadeIn(300);
     $("#hashValue").html('<h4 style=\"color:black\"><b>Your Hash ID : ' + digest +
'</b></h4>');

     $("#btnOk").click(function (e)
     {
       HidePopUp();
       window.location.href = 'register.html'
     });
  }

  function HidePopUp()
  {
    $("#popUp").fadeOut(300);
  }
```

```
 $("#btnSubmit").click(function (e)
 {
  if ($("input[name='option']:checked").is(':checked') == true)
  {
    var newPostKey = firebase.database().ref().child('Vote').push().key;

    choice = $("input[name='option']:checked").val();

    var encryptVote = CryptoJS.AES.encrypt(choice, newPostKey, "{ mode:
CryptoJS.mode.CBC, padding: CryptoJS.pad.Pkcs7 }");
    var saltHex = encryptVote.salt.toString();     // random salt
    var ivHex = encryptVote.iv.toString();
    var key = encryptVote.key.toString();

    digest = CryptoJS.MD5(choice + ballotID);

    var checkExist = firebase.database().ref('E-
BallotID').orderByKey().equalTo(ballotID).once("value", snapshot => {
      if (snapshot.exists())
      {
         var snap = snapshot.val();
         voterSecurity = snap[Object.keys(snap)].SecurityKey;

         obj3 = new Object();
         obj3.Status = "Done"
         obj3.SecurityKey = voterSecurity;

         var updates3 = {};
         updates3['/E-BallotID/' + ballotID] = obj3;

         firebase.database().ref().update(updates3).then(function()
         {
           obj4 = new Object();
           obj4.Choice = encryptVote.toString();
```

```
            obj4.HashValue = digest.toString();

            var updates4 = {};
            updates4['/Vote/' + newPostKey] = obj4;

            firebase.database().ref().update(updates4).then(function()
            {
              ShowPopUp(true);
            });
          });
       }
     });
   }
   else
     $("#error").html("<h4 style=\"color:red\">Please choose a candidate!</h4>");
   $("input[name='option']:checked").prop('checked', false);
 });
 $("#btnBack").click(function (e)
 {
   window.location.href = 'register.html'
 });
});
```

A.2.7 Result JavaScript Code

```
var choice = "";
var newPostKey = "";
var encryptVote = "";
var decryptVote = "";
var saltHex = "";
var ivHex = "";
var key = "";
var countA = 0;
var countB = 0;
```

```
var countC = 0;
var countD = 0;

$(function ()
{
   ShowResult();
});

function ShowResult()
{
   var count = firebase.database().ref('Vote').orderByKey().once("value").then(function(snapshot)
   {
     snapshot.forEach(function(childSnapshot)
     {
       newPostKey = childSnapshot.key;
       encryptVote = childSnapshot.val().Choice;
       decryptVote = CryptoJS.AES.decrypt(encryptVote, newPostKey, "{ mode: CryptoJS.mode.CBC, padding: CryptoJS.pad.Pkcs7 }");

       if (decryptVote.toString(CryptoJS.enc.Utf8) == "CandidateA")
         countA++;
       else if (decryptVote.toString(CryptoJS.enc.Utf8) == "CandidateB")
         countB++;
       else if (decryptVote.toString(CryptoJS.enc.Utf8) == "CandidateC")
         countC++;
       else
         countD++;

       $("#child").html('<h4 style=\"color:black\"><b>Candidate A: ' + countA + '</b></h4><br>' +
```

```
                '<h4 style=\"color:black\"><b>Candidate B: ' + countB + '</b></h4><br>' +
                '<h4 style=\"color:black\"><b>Candidate C: ' + countC + '</b></h4><br>' +
                '<h4 style=\"color:black\"><b>Candidate D: ' + countD + '</b></h4><br>');
     });
   });
}
$(function ()
{
   ShowHash();
});
function ShowHash()
{
  var hash = firebase.database().ref('Vote').orderByChild("HashValue");

   hash.on('child_added', function (data)
   {
    decryptVote = CryptoJS.AES.decrypt(data.val().Choice, data.key, "{ mode: CryptoJS.mode.CBC, padding: CryptoJS.pad.Pkcs7 }");

    $("#showHash").append('<h4 style=\"color:black\">' + data.val().HashValue + '  -  ' + decryptVote.toString(CryptoJS.enc.Utf8) + '</h4>');
   });
}
```

A.3 CSS

A.3.1 Register GUI

```
*{
  box-sizing: border-box;
  margin:0px;
  padding:0px;
```

```
}

body {
  background:url(../images/registerBackground.jpg);
  font-family: 'Titillium Web', sans-serif;
  background-size:auto;
}

a {
  text-decoration: none;
  color: #fff;
  transition: .5s ease;
}
a:hover {
  color: #179b77;
}

.form {
  background:rgba(255,255,255,0.6);
  padding: 40px;
  max-width: 600px;
  margin: 40px auto;
  border-radius: 4px;
  box-shadow: 0 4px 10px 4px rgba(19, 35, 47, 0.3);
  transition: .5s ease;
}

.form:hover {
        box-shadow: 0px 0px 40px 16px rgba(18,18,18,1.00);
        }

.tab-group {
  list-style: none;
  padding: 0;
```

```
  margin: 0 0 40px 0;
}
.tab-group:after {
  content: "";
  display: table;
  clear: both;
}
.tab-group li a {
  display: block;
  text-decoration: none;
  padding: 15px;
  background: #000;
  color: #fff;
  font-size: 20px;
  float: left;
  width: 50%;
  text-align: center;
  cursor: pointer;
  transition: .5s ease;
}
.tab-group li a:hover {
  background: #003155;
  color: #ffffff;
}
.tab-group .active a {
  background: #003f87;
  color: #ffffff;
}

.tab-content > div:last-child {
  display: none;
}

h1 {
```

```
  text-align: center;
  color: #fff;
  font-weight: 300;
  margin: 0 0 40px;
}

label {
  position: absolute;
  transform: translateY(6px);
  left: 13px;
  color: rgba(255,255,255,0.7);
  transition: all 0.25s ease;
  pointer-events: none;
  font-size: 22px;
}
label .req {
  margin: 2px;
  color: red;
}

label.active {
  transform: translateY(50px);
  left: 2px;
  font-size: 14px;
}
label.active .req {
  opacity: 0;
}

label.highlight {
  color: #000;
  margin-top:-10px;
}
```

```
input {
  font-size: 22px;
  display: block;
  width: 100%;
  height: 100%;
  padding: 5px 10px;
  background: none;
  background-image: none;
  border: 1px solid #fff;
  color: #fff;
  border-radius: 0;
  transition: border-color .25s ease, box-shadow .25s ease;
}
input:focus{
  outline: 0;
  border-color: #000;
}

.field-wrap {
  position: relative;
  margin-bottom: 40px;
}

.top-row:after {
  content: "";
  display: table;
  clear: both;
}
.top-row > div {
  float: left;
  width: 48%;
  margin-right: 4%;
}
.top-row > div:last-child {
```

```
  margin: 0;
}

.button {
  border: 0;
  outline: none;
  border-radius: 0;
  padding: 15px 0;
  font-size: 2rem;
  font-weight: 600;
  text-transform: uppercase;
  letter-spacing: .1em;
  background: #003f87;
  color: #ffffff;
  transition: all 0.5s ease;
}
.button:hover, .button:focus {
  background: #003155;
}

.button-block {
  display: block;
  width: 100%;
}

.forgot {
  margin-top: -20px;
  text-align: right;
  margin-bottom:10px;
}
```

A.3.2 Vote GUI

```
*{
```

```
 box-sizing: border-box;
 margin:0px;
 padding:0px;
}

body {
 background:url(../images/registerBackground.jpg);
 font-family: 'Titillium Web', sans-serif;
 background-size:auto;
}

a {
 text-decoration: none;
 color: #fff;
 transition: .5s ease;
}
a:hover {
 color: #179b77;
}

.form {
 background:rgba(255,255,255,0.8);
 padding: 50px;
 max-width: 600px;
 margin: 40px auto;
 border-radius: 4px;
 box-shadow: 0 4px 10px 4px rgba(19, 35, 47, 0.3);
 transition: .5s ease;
}

.form:hover {
        box-shadow: 0px 0px 40px 16px rgba(18,18,18,1.00);
        }
```

```
h1 {
  text-align: center;
  color: #003f87;
  font-weight: 600;
  margin: 0 0 40px;
}

.field-wrap {
  position: relative;
  margin-bottom: 40px;
}

.button {
  border: 0;
  outline: none;
  border-radius: 0;
  padding: 15px 0;
  font-size: 2rem;
  font-weight: 600;
  text-transform: uppercase;
  letter-spacing: .1em;
  background: #003f87;
  color: #ffffff;
  transition: all 0.5s ease;
}
.button:hover, .button:focus {
  background: #003155;
}

.button-block {
  display: block;
  width: 100%;
}
```

```
.radio {
  font-size: 24px;
  font-weight: 500;
  text-transform: capitalize;
  display: inline-block;
  vertical-align: middle;
  color: #003f87;
  position: relative;
  padding-left: 35px;
  margin-left: 20px;
}

.radio + .radio {
  margin-left: 20px;
}

.radio input[type="radio"] {
  display: none;
}

.radio span {
  height: 20px;
  width: 20px;
  border-radius: 50%;
  border: 3px solid #003f87;
  display: block;
  position: absolute;
  left: 0;
  top: 4px;
}

.radio span::after {
  content: "";
  height: 8px;
```

```
  width: 8px;
  background: #003f87;
  display: block;
  position: absolute;
  left: 50%;
  top: 50%;
  transform: translate(-50%, -50%) scale(0);
  border-radius: 50%;
  transition: 300ms ease-in-out 0s;
}

.radio input[type="radio"]:checked ~ span:after {
  transform: translate(-50%, -50%) scale(1);
}

#popUp {
  background:rgba(255,255,255,0.8);
  width: 500px;
  overflow: hidden;
  background: #f1f1f1;
  box-shadow: 0 4px 10px 4px rgba(19, 35, 47, 0.3);
  transition: .5s ease;
  border-radius: 8px;
  position: absolute;
  top: 50%;
  left: 50%;
  transform: translate(-50%, -50%);
  z-index: 9999;
  padding: 50px;
  text-align: center;
  display: none;
}

#popUp h1 {
```

```
  text-align: center;
  color: #003f87;
  font-weight: 600;
  margin: 0 0 40px;
}

#popUp span {
  text-align: left;
  font-weight: 600;
  margin: 0 0 40px;
}
```

A.3.3 Result GUI

```
*{
  box-sizing: border-box;
  margin:0px;
  padding:0px;
}

body {
  background:url(../images/registerBackground.jpg);
  font-family: 'Titillium Web', sans-serif;
  background-size:auto;
}

a {
  text-decoration: none;
  color: #fff;
  transition: .5s ease;
}
a:hover {
  color: #179b77;
}
```

```
.form {
  background:rgba(255,255,255,0.6);
  padding: 40px;
  max-width: 600px;
  height: 500px;
  margin: 40px auto;
  border-radius: 4px;
  box-shadow: 0 4px 10px 4px rgba(19, 35, 47, 0.3);
  transition: .5s ease;
}

.form:hover {
        box-shadow: 0px 0px 40px 16px rgba(18,18,18,1.00);
        }

.tab-group {
  list-style: none;
  padding: 0;
  margin: 0 0 40px 0;
}
.tab-group:after {
  content: "";
  display: table;
  clear: both;
}
.tab-group li a {
  display: block;
  text-decoration: none;
  padding: 15px;
  background: #000;
  color: #fff;
  font-size: 20px;
  float: left;
```

```
  width: 50%;
  text-align: center;
  cursor: pointer;
  transition: .5s ease;
}
.tab-group li a:hover {
  background: #003155;
  color: #ffffff;
}
.tab-group .active a {
  background: #003f87;
  color: #ffffff;
}

.tab-content > div:last-child {
  display: none;
}

h1 {
  text-align: center;
  color: #fff;
  font-weight: 300;
  margin: 0 0 40px;
}

label {
  position: absolute;
  transform: translateY(6px);
  left: 13px;
  color: rgba(255,255,255,0.7);
  transition: all 0.25s ease;
  pointer-events: none;
  font-size: 22px;
}
```

```
label .req {
  margin: 2px;
  color: red;
}

label.active {
  transform: translateY(50px);
  left: 2px;
  font-size: 14px;
}
label.active .req {
  opacity: 0;
}

label.highlight {
  color: #000;
  margin-top:-10px;
}

input {
  font-size: 22px;
  display: block;
  width: 100%;
  height: 100%;
  padding: 5px 10px;
  background: none;
  background-image: none;
  border: 1px solid #fff;
  color: #fff;
  border-radius: 0;
  transition: border-color .25s ease, box-shadow .25s ease;
}
input:focus{
  outline: 0;
```

```
  border-color: #000;
}

.field-wrap {
  position: relative;
  margin-bottom: 40px;
}

.top-row:after {
  content: "";
  display: table;
  clear: both;
}
.top-row > div {
  float: left;
  width: 48%;
  margin-right: 4%;
}
.top-row > div:last-child {
  margin: 0;
}

.button {
  border: 0;
  outline: none;
  border-radius: 0;
  padding: 15px 0;
  font-size: 2rem;
  font-weight: 600;
  text-transform: uppercase;
  letter-spacing: .1em;
  background: #003f87;
  color: #ffffff;
  transition: all 0.5s ease;
```

```
}
.button:hover, .button:focus {
  background: #003155;
}

.button-block {
  display: block;
  width: 100%;
}
```

APPENDIX B

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	**Study week no.:** 2
Student Name & ID: Ooi Elynn 1502615	
Supervisor: Dr. Gan Ming Lee	
Project Title: A Secure, Anonymous and Verifiable E-Voting System	

1. WORK DONE

The report for this project has been refined.

2. WORK TO BE DONE

Continue to complete module 1.

3. PROBLEMS ENCOUNTERED

Need to spend some time in revising the work done for module 1 and enhance the codes for module 1 further.

4. SELF EVALUATION OF THE PROGRESS

Need to complete module 1 and start to develop module 2 as soon as possible.

GMLC

Supervisor's signature

Elynn

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	**Study week no.:** 4
Student Name & ID: Ooi Elynn 1502615	
Supervisor: Dr. Gan Ming Lee	
Project Title: A Secure, Anonymous and Verifiable E-Voting System	

1. WORK DONE

Module 1 has been done.

2. WORK TO BE DONE

Continue to develop module 2.

3. PROBLEMS ENCOUNTERED

Need to spend time to study the types of hashing algorithms that suitable to be used in this project.

4. SELF EVALUATION OF THE PROGRESS

Need to complete module 2 as soon as possible.

GML

Supervisor's signature

Elynn

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	**Study week no.:** 6
Student Name & ID: Ooi Elynn 1502615	
Supervisor: Dr. Gan Ming Lee	
Project Title: A Secure, Anonymous and Verifiable E-Voting System	

1. WORK DONE

Module 2 has been completed.

2. WORK TO BE DONE

Continue to develop module 3.

3. PROBLEMS ENCOUNTERED

Unable to total the vote counts for each candidate and display at the Result page.

4. SELF EVALUATION OF THE PROGRESS

Need to spend more time in finding solution to get all the vote counts from Firebase.

GML

Supervisor's signature

Elynn

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	**Study week no.:** 8
Student Name & ID: Ooi Elynn 1502615	
Supervisor: Dr. Gan Ming Lee	
Project Title: A Secure, Anonymous and Verifiable E-Voting System	

1. WORK DONE

Completed module 3.

2. WORK TO BE DONE

Refine FYP 1 report, run and test the codes of the E-Voting System with various test cases.

3. PROBLEMS ENCOUNTERED

Some bugs and errors found after tested the system.

4. SELF EVALUATION OF THE PROGRESS

Need to fix the bugs and enhance the codes of the voting system further.

GML

Supervisor's signature

Elynn

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	**Study week no.:** 10
Student Name & ID: Ooi Elynn 1502615	
Supervisor: Dr. Gan Ming Lee	
Project Title: A Secure, Anonymous and Verifiable E-Voting System	

1. WORK DONE

Enhancements have been made to the E-Voting System.

2. WORK TO BE DONE

Complete FYP 2 report.

3. PROBLEMS ENCOUNTERED

N/A

4. SELF EVALUATION OF THE PROGRESS

Complete FYP 2 report as soon as possible and submit to Turnitin.

GMLG

Supervisor's signature

Elynn

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Trimester 3, Year 3	**Study week no.:** 12
Student Name & ID: Ooi Elynn 1502615	
Supervisor: Dr. Gan Ming Lee	
Project Title: A Secure, Anonymous and Verifiable E-Voting System	

1. WORK DONE

Submit FYP 2 report to Turnitin and finalise FYP 2 report.

2. WORK TO BE DONE

Print out 2 hardcopies of FYP 2 report and prepare for presentation.

3. PROBLEMS ENCOUNTERED

N/A

4. SELF EVALUATION OF THE PROGRESS

FYP 2 report has been completed and need to prepare for presentation.

GMLO

Supervisor's signature

Elynn

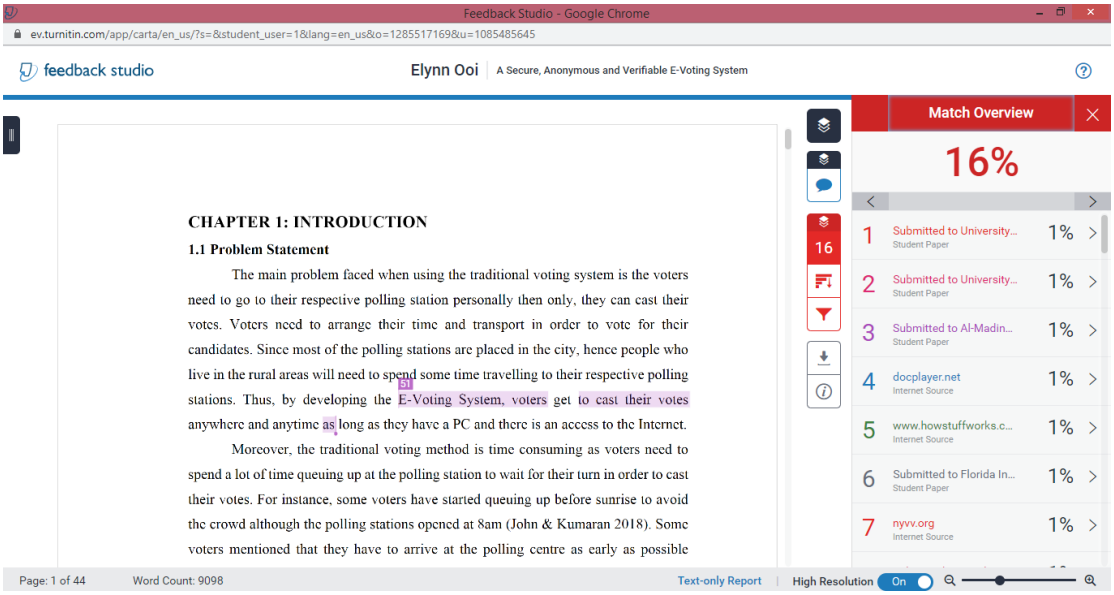
Student's signature

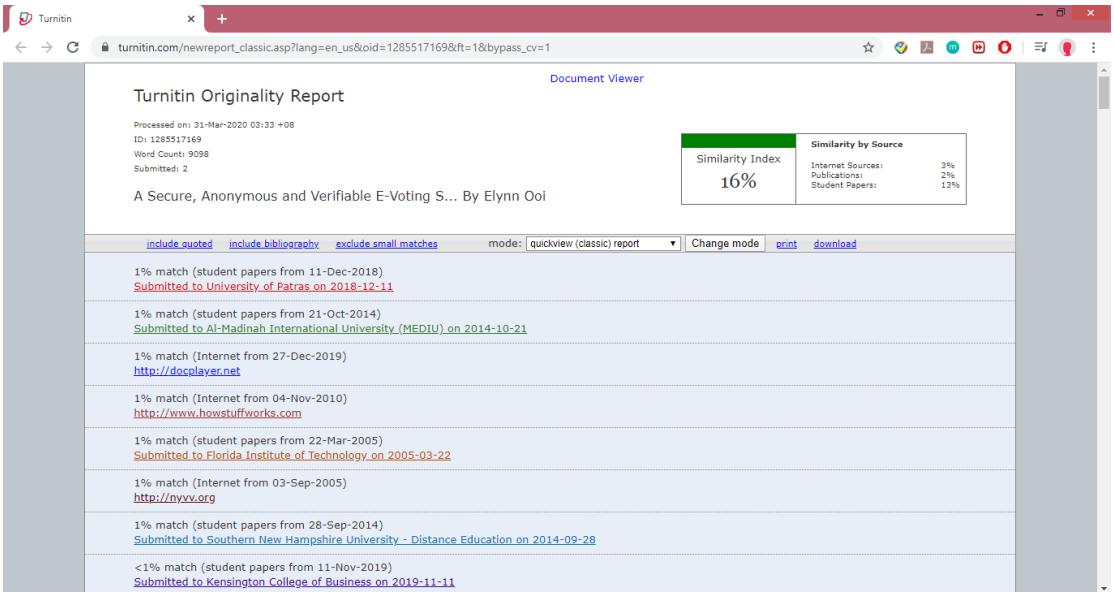
APPENDIX C

POSTER

APPENDIX D

PLAGIARISM CHECK SUMMARY





Universiti Tunku Abdul Rahman			
Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	Ooi Elynn
ID Number(s)	1502615
Programme / Course	Bachelor of Information System (HONS) Information Systems Engineering
Title of Final Year Project	A Secure, Anonymous and Verifiable E-Voting System

Similarity	**Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)**
Overall similarity index: 16 % **Similarity by source** Internet Sources: 3 % Publications: 2 % Student Paper: 13 %	
Number of individual sources listed of more than 3% similarity: -	
Parameters of originality required and limits approved by UTAR are as Follows: **(i) Overall similarity index is 20% and below, and** **(ii) Matching of individual sources listed must be less than 3% each, and** **(iii) Matching texts in continuous block must not exceed 8 words** ***Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.***	

Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

GMLee

Signature of Supervisor

Name: Gan Ming Lee

Date: 3/4/2020

Signature of Co-Supervisor

Name: _____

Date: _____

APPENDIX E

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	1502615
Student Name	Ooi Elynn
Supervisor Name	Dr. Gan Ming Lee

TICK (√)	DOCUMENT ITEMS Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
/	Front Cover
/	Signed Report Status Declaration Form
/	Title Page
/	Signed form of the Declaration of Originality
/	Acknowledgement
/	Abstract
/	Table of Contents
/	List of Figures (if applicable)
/	List of Tables (if applicable)
	List of Symbols (if applicable)
/	List of Abbreviations (if applicable)
/	Chapters / Content
/	Bibliography (or References)
/	All references in bibliography are cited in the thesis, especially in the chapter of literature review
/	Appendices (if applicable)
/	Poster
/	Signed Turnitin Report (Plagiarism Check Result – Form Number: FM-IAD-005)

*Include this form (checklist) in the thesis (Bind together as the last page)

I, the author, have checked and confirmed all the items listed in the table are included in my report. Elynn (Signature of Student) Date: 02/04/2020	Supervisor verification. Report with incorrect format can get 5 mark (1 grade) reduction. GML (Signature of Supervisor) Date: 3/4/2020