



香港大學民意研究計劃

Public Opinion Programme, The University of Hong Kong



POPVote

Technical Sharing Seminar

Mr Jazz MA

IT Manager

Public Opinion Programme

The University of Hong Kong

September 2014

Agenda



- Overview of Civil Referendums
- Design of POPVote system
- Attacks timeline on 6.22 Civil Referendum
- Protections in place

- Voting platform for mass engagement
- To construct a civil society by promoting civil participation
- To demonstrate an electronic voting system

PopVote 普及投票

English | 中文

主頁 投票活動 捐助支持 民間全民投票研究 查詢

6.20-29 民間全民投票 Civil Referendum

焦點活動



PopVote
全民投票
Civil Referendum

最新消息

- 「6.22民間全民投票」結果 (30/6/2014)
- 「6.22民間全民投票」初步結果 (29/6/2014)
- 傳媒採訪邀請 (27/6/2014)
- 「6.22民間全民投票」公布6.29正規及附屬票站名單及初步結果發布安排 (26/6/2014)
- 「6.22民間全民投票」接近五萬市民到站投票 (22/6/2014)
- 「6.22民間全民投票」電子平台運作暢順 (21/6/2014)
- 「6.22民間全民投票」電子平台負隅頑抗 (20/6/2014)
- 「6.22民間全民投票」計劃最新進展 (19/6/2014)
- 「6.22民間全民投票」應變措施正式啟動

Voting Channels



Website

HKID number
SMS verification



Mobile App

HKID number
SMS verification



香港大學民意研究計劃
Public Opinion Programme
The University of Hong Kong

普及投票 PopVote



和平佔中
OCCUPY CENTRAL WITH
LOVE AND PEACE

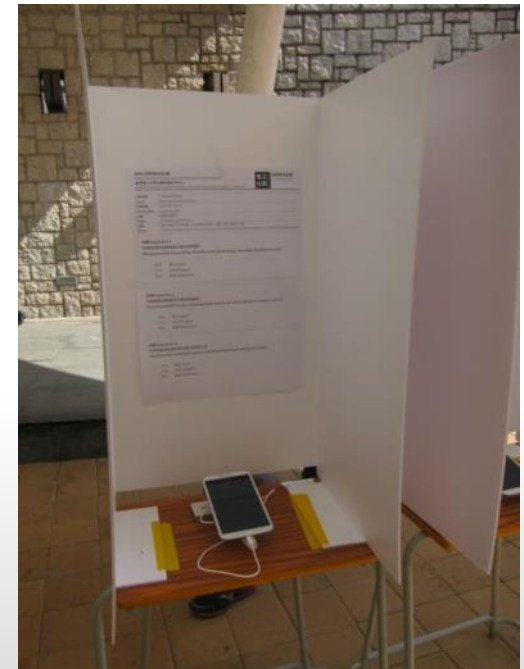
請選擇語言
Please select a language

中文

English

Polling Stations

HKID card verification
Tablets





香港大學民意研究計劃

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Civil Referendums

Three Large-Scale Events

3.23 Civil Referendum

March 23-24, 2012

Mock CE Election

Web	66,005
App	71,831
Station	85,154
Total	222K

New Year Civil Referendum

January 1, 2014

Express views on the principles of CE Election

Web	19,164
App	40,234
Station	2,771
Total	62K

6.22 Civil Referendum

June 20-29, 2014

Constitutional reform proposals

Web	235K
App	486K
Station	70K
Total	792K

「3·23 民間全民投票」結果

梁振英 何俊仁 唐英年 棄權

得票數字	39,614	25,452	36,226	121,580
得票率	17.8%	11.4%	16.3%	54.6%
票站投票人數	85,154		總投票人數	
網上投票人數	66,005		222,990	
流動應用程式 (Apps) 投票人數	71,831			

未列於數表廢票	已包於數表內
到站投票廢票： 125	已知重複到站投票但無法刪除：3,622 到站投票而無法測試有否重複投票：5,377
離站投票廢票： 118	手機及網上重複登入被拒次數：15,111 票站重複登入被拒次數：104 曾參與「學界 3·1 影子民間全民投票」的 18 歲以下用戶：28



Snapshots – 3.23 Civil Referendum



Snapshots – 3.23 Civil Referendum



Snapshots – New Year Civil Referendum



Snapshots – 6.22 Civil Referendum



Incidents – 3.23 Civil Referendum

普及
投票
POPVOTE

Public's view 'will count in CE poll'



A voter in the mock poll at Polytechnic University. Some disabled voters felt insulted after the organisers decided not to count their votes because of a change in the ballot's format. Photo: Edward Wong

Thousands queue to vote in mock election

Ada Lee
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Thousands stood in long queues to cast ballots in yesterday's mock election for the city's new leader.

They said the wait was worth the opportunity to express their political views. Some travelled for up to an hour to get to the main polling station at Polytechnic University, in Hung Hom, only to stand in line when the online voting system broke down.

Many cast blank ballots, saying none of the three candidates would make a suitable chief executive. Others said they cherished the chance to express their views since they had no say in the election on Sunday.

At the university, some people waited for as long as half an hour in the 200-strong queue before they could cast their votes.

A marketing lecturer at the university took the time to vote for Henry

Leung. He said a blank vote, saying none of the candidates had initiatives to narrow the wealth gap.

Of the 16 people the *South China Morning Post* talked to, five cast blank votes, four voted for Tang, one for Ho and another for Leung. The others refused to disclose their choice.

Separately, some disabled voters said they felt insulted after the mock election's organisers decided not to count their votes because of a change in the ballot's format. About 200 of them voted yesterday before the University of Hong Kong's public opinion programme announced that paper ballots should be placed into envelopes with the voters' identity card numbers written on them.

"That's just wrong," said Tony Shing Li-lim from the Hong Kong Federation of the Blind.

He also criticised the organisers for requiring voters to write their identity card numbers on the envelopes, saying that was against the

Opinion surveys and the exposure of scandals by media will be major factors in result, experts say

Colleen Lee
colleen.lee@scmp.com

Public opinion and the media's exposure of scandals have shaped the voting preference of the 1,193 Election Committee members like never before, experts say, with the decision on the next chief executive expected tomorrow.

The past months have seen the media expose everything from the illegal basement under a home owned by Henry Tang Ying-yen's wife to the notorious dinner attended by members of Leung Chun-ying's campaign team and a controversial businessman known as "Shanghai Boy". The dinner led to questions about "black gold politics", or collusion with triads.

Many stories were credited to unnamed sources – leading to suspicion that rival candidates or their supporters were behind the negative attacks.

Dr Chung Kim-wah, an assistant professor of applied social sciences at Polytechnic University, said: "[The scandals] had a certain impact on Leung and Tang. But [the question of] whether Election Committee members may change their voting preferences due to public opinion still hangs in the air."

He added: "In Hong Kong's small-circle election, most people cannot vote [for their chief executive]. Their views can only be expressed by opinion polls. So beating rivals in popularity polls has become a way for candidates to gain political capital."

The Liberal Party – originally a stronghold of support for its former member Tang, to whom it provided 62 nominations – said on Wednesday its members and allies would be given free choice between casting a blank vote or opting for Tang.

But the party's leaders said they would cast blank ballots to reflect the feelings of the public, party chairman Miriam Lau Kin-yea said.

Ocean Park boss Allan Zeman also

nominated Tang, but said he would have to close the gap to within 20 percentage points of Leung in the polls to justify voting for him.

Tang, once tipped as Beijing's favoured candidate, enjoyed a slight advantage over Leung in polls in the middle of last year.

But Tang's admission of an extramarital affair in October saw him fall behind Leung, who led by 30 percentage points at the height of Tang's illegal structure row in February.

Chung said the fact that revelations about the 2,200 sq ft basement at the house in Kowloon Tong dripped out in several big-circulation newspapers over a few days made it "obvious it was carefully plotted".

He said: "The revelation did affect the election, in particular hitting Tang's popularity."

Chung said the long-running story of Leung's failure to declare a conflict of interests while serving on the judging panel for a 2001 design competition for the West Kowloon arts hub may have raised questions about his integrity.

The row was first reported by *Eastweek* magazine, part of Sing Tao News Corporation, chaired by Tang nominator Charles Ho Tsu-kwok.

The government confirmed later that an entrant had suspected links with Leung, having named his company DTZ as its property adviser.

Professor Clement So York-kee, of the school of journalism and communication at Chinese University, said media coverage "probably indirectly affected" the public's perception of the candidates.

"The general public cannot take part in [the Election Committee] vote, but may reflect their views through opinion polls. The findings can be used for reference for the central government and various sectors," he said.

State leaders including Premier Wen Jiabao (温家宝) and Wang Guangya (王光亚), director of Beijing's Hong Kong and Macau Affairs Office, say the city's next leader would need a high degree of public acceptance.

CHIEF EXECUTIVE ELECTION

LEUNG ALMOST HOME AS PLEDGES ROLL IN



People queue to vote in the mock chief executive election at a polling station at Polytechnic University in Hung Hom. Photo: Jonathan Wong

Hackers fail to deter voters in mock CE poll

Ordinary Hongkongers queue patiently to have their

Ada Lee and Tanna Chong

Hackers' attacks on the online polling system for the simulated chief executive election yesterday failed to deter Hongkongers from queuing outside polling stations for the chance to cast their ballots, which they are entitled to in tomorrow's election.

Dr Robert Chung Ting-yiu, director of the Public Opinion Programme at the University of Hong Kong, said unusual activity had been noticed in the system shortly after 7am. Computers could not connect to the University of Hong Kong's server, and the main polling station at Polytechnic University switched from electronic to paper ballots at around 10.30am.

At one long queue at Polytechnic University last night, teacher Ted-man Chan said he was disappointed that the website was being hacked as it had undermined freedom of expression. "I want my voice heard, even though I have to wait for 30 minutes here after work," Chan said.

A 48-year-old man, who only identified himself as Chiu, said he queued to cast his vote after finishing working in Shenzhen.

"If I don't vote now, I'm afraid I won't have chance to express my choice in future," he said.

The pan-democrats' chief executive candidate, Albert Ho Chun-yan, arrived at a polling station at about 9.30am to find the system out of action. He used the occasion for a little

Former Executive Council convenor sees number of supporters swell, while Tang faces an uphill battle in gaining backers for him to become HK's next leader

Tanna Chong and Emily Tsang

Leung Chun-ying will probably secure at least the minimum 601 votes he needs to win the chief executive election tomorrow.

The ranks of his backers continued to increase yesterday, as several voting blocs declared all or some of their members on the Election Committee would cast their ballots for the former Executive Council convenor, now widely regarded as Beijing's preferred choice.

They included the Democratic Alliance for the Betterment and Progress of Hong Kong, and many in the religious and the cultural sectors. By day's end, Leung had secured between 563 and 643 votes, according to a count by the *Post*.

DAB chairman Tam Yiu-chung said the party had agreed to support Leung – during an hour-long central committee meeting – and to "advise" all 147 of its members on the Election Committee to vote accordingly.

When asked whether its members would be compelled to support Leung, and if there was a penalty for violators, Tam said: "We believe 'advise' is the best word to use, as the 147 members may be voting at different times, and only they will know who they voted for. I have full confidence that all 147 members will treasure the party's advice when they vote."

The party hoped to avoid an inconclusive election result, in which no candidate wins the minimum 601 votes, he said. That would bring uncertainty to the city and worsen its current sense of social disharmony. In explaining why Leung won the party's support, Tam said: "He left a



very good impression with all party members he met. We agree with his policy platform."

But uncertainties remain because some voters, including the Chinese medicine subsector, the 25-member engineering group and tycoon voters, have yet to decide who to support.

After learning about the DAB's support, Leung said he would seek further support "until the last moment".

Issuing a letter to Election Committee members for the third day in a row to convince them of his sincerity, Leung stressed he would work with all sectors to build a democratic election culture and strive to "reconcile the cracks caused by the election".

Forty of 600 elections from the religion subsector – with strong pro-Beijing backgrounds – decided to shift their support from Henry Tang Ying-yen to Leung.

Most of the members from Muslim, Taoist, Confucian and Buddhist groups were originally strong Tang supporters, since he was believed to be Beijing's favourite. Now some of these supporters acknowledge receiving what they called "a different message from officials in the central government" over the past few days.

"The message we received suggested we vote according to the popularity of the candidate," said Hau Wing-cheung, from the Hong Kong Taoist Association. "It is clearly a change of mind from the former favourite, and I think a majority will vote according to the will of those higher up."

Members of the four religious groups will have a final meeting tomorrow morning to decide on a united move.

The cultural subsector will give all its 14 votes to Leung, according to member Lee Kok-keung.

"We have reached a consensus to vote for Leung, including the six members who earlier nominated Tang," said Lee.

Tang called on voters to "cast their ballot according to their conscience".

Incidents – 3.23 Civil Referendum



Incidents – New Year Civil Referendum

普及
投票
POPVOTE


[The poll]
generated a
sudden surge of
text messages to
... one number

Images from SCMP

Friday, January 10, 2014 C3

CITY

TELECOMS

CSL, CITIC LINKED TO TROUBLED 'REFERENDUM'

Two companies identified by industry sources after voters in Occupy Central poll on electoral reform struggle to get text messages through

Phila Siu
phila.siu@scmp.com

CSL was the telecommunication company hired by the University of Hong Kong to support a New Year's Day "referendum" on electoral reform that was plagued by technical problems.

Three industry sources identified CSL as the company involved, while two of the sources said Citic Telecom International, which runs the server that acts as a gateway for text messages sent between different phone networks, may also have been responsible for some people being unable to cast votes.

"Too many [text] messages came in and Citic's gateway could not handle them in time," one source said.

Questioned about its involvement in the poll, CSL would not confirm that it was the company working with HKU, but said it had "prepared sufficient network bandwidth for the voting".

Citic said it had not been told the details of the poll in advance, meaning it was caught by surprise.

public opinion programme, refused to confirm or deny whether CSL was the company it worked with, citing a confidentiality agreement. But he reiterated that problems emerged even though the number of messages was well below the capacity of the telecommunications firm's server.

Ma met representatives of the company on Tuesday, who told him the problems were down to network "congestion".

Ma said he was aware that the errors affected text messages sent between different networks, supporting industry sources' claims that Citic may have played a role in the fiasco.

"One reason for the problems could be that Citic's gateway does not have enough bandwidth," the source said.

Sutton Cheung, Citic's chief technology officer, said: "The company was not made aware of the text application associated with the voting activities conducted by HKU's electoral reform poll, which generated a sudden surge of text messages towards one single recipient phone number. This resulted in a delay of text-message delivery." Citic refused to say directly whether that meant CSL had not informed it about the poll before it took place, as experts said CSL would have needed to do so to ensure

number. They then received a text message with an authentication code that they had to send by text to a CSL server.

An unknown number of vot-



HKU IT official Jazz Ma


[The poll]
generated a
sudden surge of
text messages to
... one number


SUTTON CHEUNG, CITIC

Incidents – 6.22 Civil Referendum



Matthew Prince
@eastdakota



 Segui

Battling 300Gbps+ attack right now. Knew it was coming so well prepared. Helluva story someday.



CLOUDFLARE

IT Advisory Group



Established since Jan 2013. 11 members now.

- Mr. S.C. Leung, Convenor of IT Advisory Group (Director, Internet Society Hong Kong)
- Dr. K.P. Chow (Department of Computer Science, The University of Hong Kong)
- Dr. Joe CK Yau (Department of Computer Science, Hong Kong Baptist University)
- Dr. Ricci Ieong (Director, Cloud Security Alliance HK & Macau Chapter)
- Mr. Henry Ng (Head of Consulting Service of an international consultancy firm)
- Mr. Vincent Ip (Council Member of Information Security and Forensics Society)
- Mr. Eric Fan (Vice Chairperson, Professional Information Security Association)
- Mr. Chester Soong (Chairperson, Internet Society Hong Kong)
- Mr. Ben Cheng (Vice Chairperson, Convenor, Startup Working Group, Internet Society Hong Kong)
- Mr. Sang Young (Director, Education; Convenor, Security & Privacy Working Group, Internet Society Hong Kong)
- Mr. Ken Lam (Director; Convenor, Internet Application Development Working Group, Internet Society Hong Kong)



香港大學民意研究計劃

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Design Principles

Design Principles



- Availability
- Uniqueness
- Fairness
- Privacy
- Eligibility
- Integrity

Availability

24/7

High availability

Handle high traffic during voting period



Scalable cloud server

Load balancer



Auto-scaling

Multi-availability zone

DDoS Protection



Uniqueness



Count only one vote for each voter



Information required

HKID

Mobile phone number

SMS



Fairness



Every eligible person can vote

Cater as many people as we can



On-Site & Off-Site voting channels

Website, Mobile App & Polling Station



Paper ballot as backup

Eligibility



Hong Kong Permanent Resident

Aged 18+

本人是年滿十八歲的香港永久性居民

 是 否

Voter to declare



Personal data

HKID & Mobile phone number

Sensitive data

Voting decision



Hashing

Encryption

Short Data Retention

Inform PCPD



High data integrity

Accurate



Protected by firewall

SSL connection

All personal data are hashed

Ballots are encrypted

Audit the counting process



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System Design

Interface of POPVote system



0. Download POPVote mobile app



1. Read the terms

2. Input HKID & mobile number

3. Send an SMS to POPVote system

4. Cast your vote

SMC HK 20:55 82%



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Public Opinion Programme
The University of Hong Kong

普及投票 PopVote



請選擇語言
Please select a language

中文

English

Interface of POPVote system



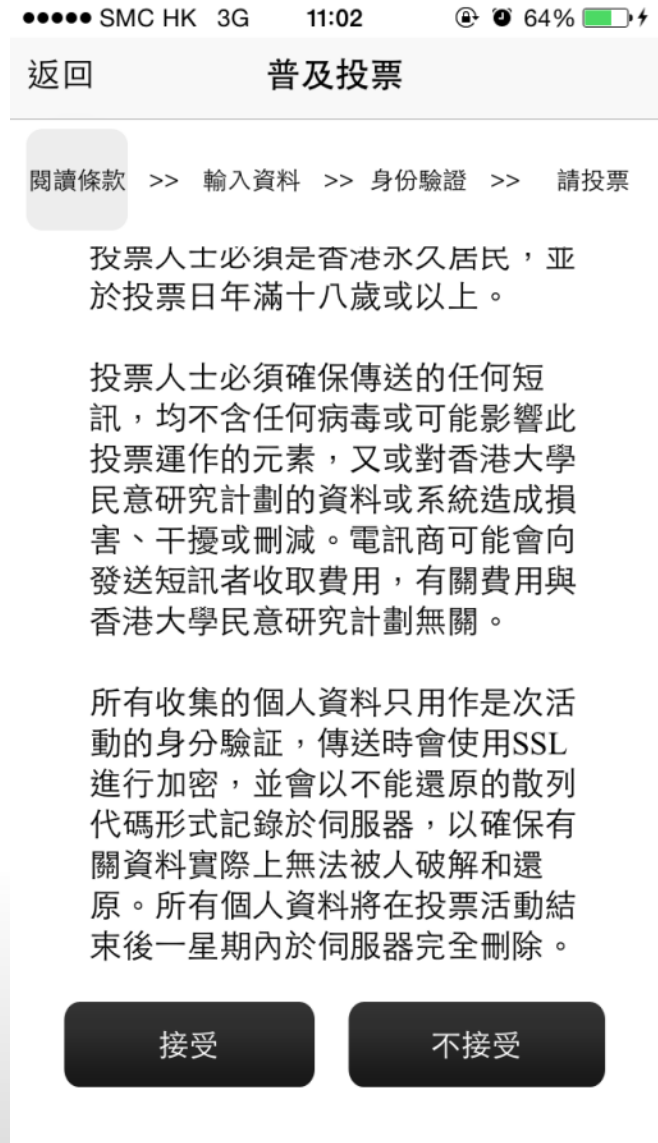
0. Download POPVote mobile app

1. Read the terms

2. Input HKID & mobile number

3. Send an SMS to POPVote system

4. Cast your vote



Interface of POPVote system



0. Download POPVote mobile app

1. Read the terms

2. Input HKID & mobile number

3. Send an SMS to POPVote system

4. Cast your vote

A screenshot of the POPVote mobile app interface. At the top, the status bar shows 'SMC HK', '20:55', and '82%' battery. The app header has '返回' (Return) and '普及投票' (Universal Voting). Below the header is a navigation bar with '閱讀條款 >>' (Read Terms >>), '輸入資料 >>' (Input Information >>), '身份驗證 >>' (Identity Verification >>), and '請投票' (Please Vote). The main form area has three sections: 1. '身份證號碼:' (ID Number) with three input boxes containing dots. 2. '手機號碼:' (Mobile Number) with one input box containing dots. 3. '年滿十八歲 香港永久性居民?' (Are you 18 years old and a permanent resident of Hong Kong?) with '是' (Yes) and '否' (No) buttons. At the bottom is a large black '提交' (Submit) button.

Interface of POPVote system



0. Download POPVote mobile app

1. Read the terms

2. Input HKID & mobile number

3. Send an SMS to POPVote system

4. Cast your vote



Interface of POPVote system



0. Download POPVote mobile app

1. Read the terms

2. Input HKID & mobile number

3. Send an SMS to POPVote system

4. Cast your vote



Interface of POPVote system



0. Download POPVote mobile app

1. Read the terms

2. Input HKID & mobile number

3. Send an SMS to POPVote system

4. Cast your vote

The screenshot shows the mobile app interface for casting a vote. At the top, the status bar displays 'SMC HK', the time '20:56', and a battery level of '81%'. The app header includes the title '普及投票' and a '取消' (Cancel) button. Below the header, a timer indicates '剩餘時間：09:52'. The main content area contains two questions with radio button options:

就2047財政預算，本人希望「有關人士」採用以下顏色作封面：

- 1. 橙紅似蛋黃顏色
- 2. 鮮黃檸檬顏色
- 3. 深藍顏色
- 棄權

如果有關財政預算不符市民在事先提出的要求，立法會應予否決。本人表示：

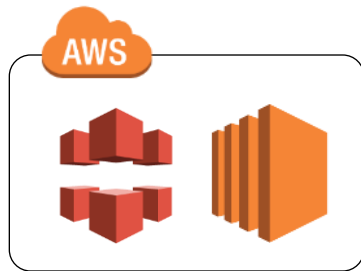
- 立法會應予否決
- 立法會不應否決
- 棄權

At the bottom, there is a '提交選票' (Submit Ballot) button.

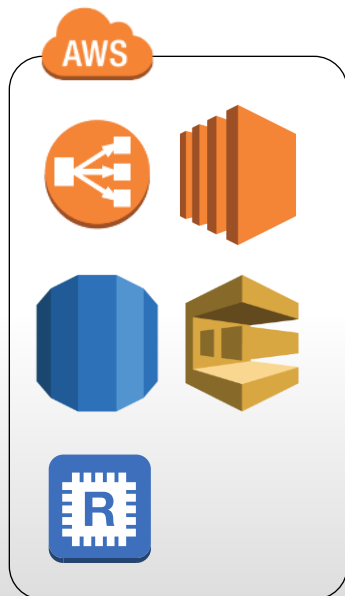
Websites & APIs



CloudFlare – DNS, Firewall, CDN



Project website - <https://popvote.hk>



Voting website
<https://secure.popvote.hk>

API requests
https://api-****.popvote.hk

Mobile App



Native iOS and Android apps



Manifest files hosted on AWS S3

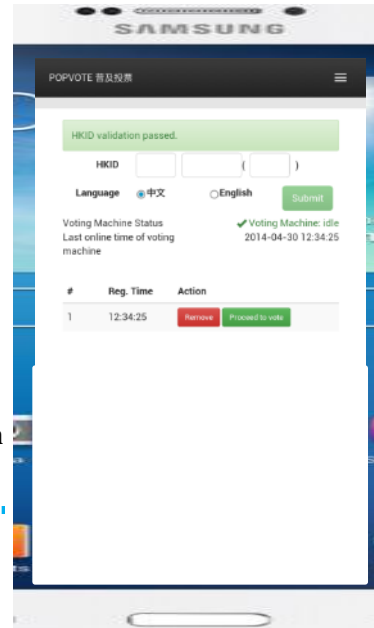
- API endpoints, text strings, voting hours, motions, etc.



Bring convenience to SMS verification

Polling Station

Local Area Network



WPA2 encryption



- Serving HTML files and handling API requests
- Hashing and encryption are done on the Station Server
- Can be offline (disconnected from Internet)
- Upload data to Central Server

AWS



Operating Machines



- Enter HKID card no.

Registration Machine

POPVOTE 普及投票 ☰

HKID ()

Language 中文 English

Voting Machine Status ✓ Voting Machine: idle
Last online time of voting machine 2014-04-30 12:52:12

#	Reg. Time	Action
---	-----------	--------

Voting Machine

POPVOTE 普及投票 ☰

PopVote 普及投票
請先登記後投票
Please register before voting

Operating Machines



- Validation passed. Tap “Proceed to vote”.

Registration Machine

POPVOTE 普及投票



HKID validation passed.

HKID

 ()

Language

中文

English

Submit

Voting Machine Status

✓ Voting Machine: idle

Last online time of voting machine

2014-04-30 12:34:25

#	Reg. Time	Action
---	-----------	--------

1	12:34:25	Remove Proceed to vote
---	----------	--

Voting Machine

POPVOTE 普及投票



PopVote 普及投票

請先登記後投票

Please register before voting

Operating Machines

Registration Machine

POPVOTE 普及投票



HKID

 ()

Language

中文

English

Submit

Voting Machine Status

Last online time of voting machine

✓ Voting Machine: voting

2014-04-30 12:38:25

#	Reg. Time	Action
---	-----------	--------

Voting Machine

POPVOTE 普及投票



剩餘時間: 09:51

取消投票

就2017特首選舉，本人支持「和平佔中」向政府提交以下方案：

- 1. 橙紅似蛋黃顏色
- 2. 鮮黃檸檬顏色
- 3. 深藍顏色
- 棄權

如果政府方案不符國際標準讓選民有真正選擇，立法會應予否決。本人表示：

- 立法會應予否決
- 立法會不應否決
- 棄權

提交選票

Operating Machines

Registration Machine

POPVOTE 普及投票 ☰

HKID ()

Language 中文 English

Voting Machine Status ✓ Voting Machine: voting
Last online time of voting machine 2014-04-30 12:38:25

#	Reg. Time	Action
---	-----------	--------

Voting Machine

就2017特首選舉，本人支持「和平佔中」向政府提交以下方案：

1. 橙紅似蛋黃顏色

The page at 175.159.167.181 says:


你的選擇 -
議題1: 1. 橙紅似蛋黃顏色
議題2: 立法會應予否決

如未政府方案不付國際標準讓選民有真正選擇，
立法會應予否決。本人表示：

Operating Machines



Registration Machine

POPVOTE 普及投票 

HKID ()

Language 中文 English

Voting Machine Status ✔ Voting Machine: idle
Last online time of voting machine 2014-04-30 12:52:42

#	Reg. Time	Action
1	12:52:39	<input type="button" value="Remove"/> <input type="button" value="Proceed to vote"/>

Voting Machine

POPVOTE 普及投票 

投票完成
投票已完成，請跟隨指示離開票站。

Duplicate Voting

Website & Mobile App

HKID number

Mobile number

Either one can only vote once

剩餘時間：09:48

就2017特首選舉，本人支持「和平佔中」向政府提交以下方案：

- 1. 真普選聯盟方案
- 2. 人民力量方案

重覆投票。此投票無效!

確定

如果政府方案不付國際標準，讓選民有真正選擇，立法會應予否決。本人表示：

Polling Stations

HKID number

Can only vote once at each Polling Station

POPVOTE 普及投票

HKID already used in voting.

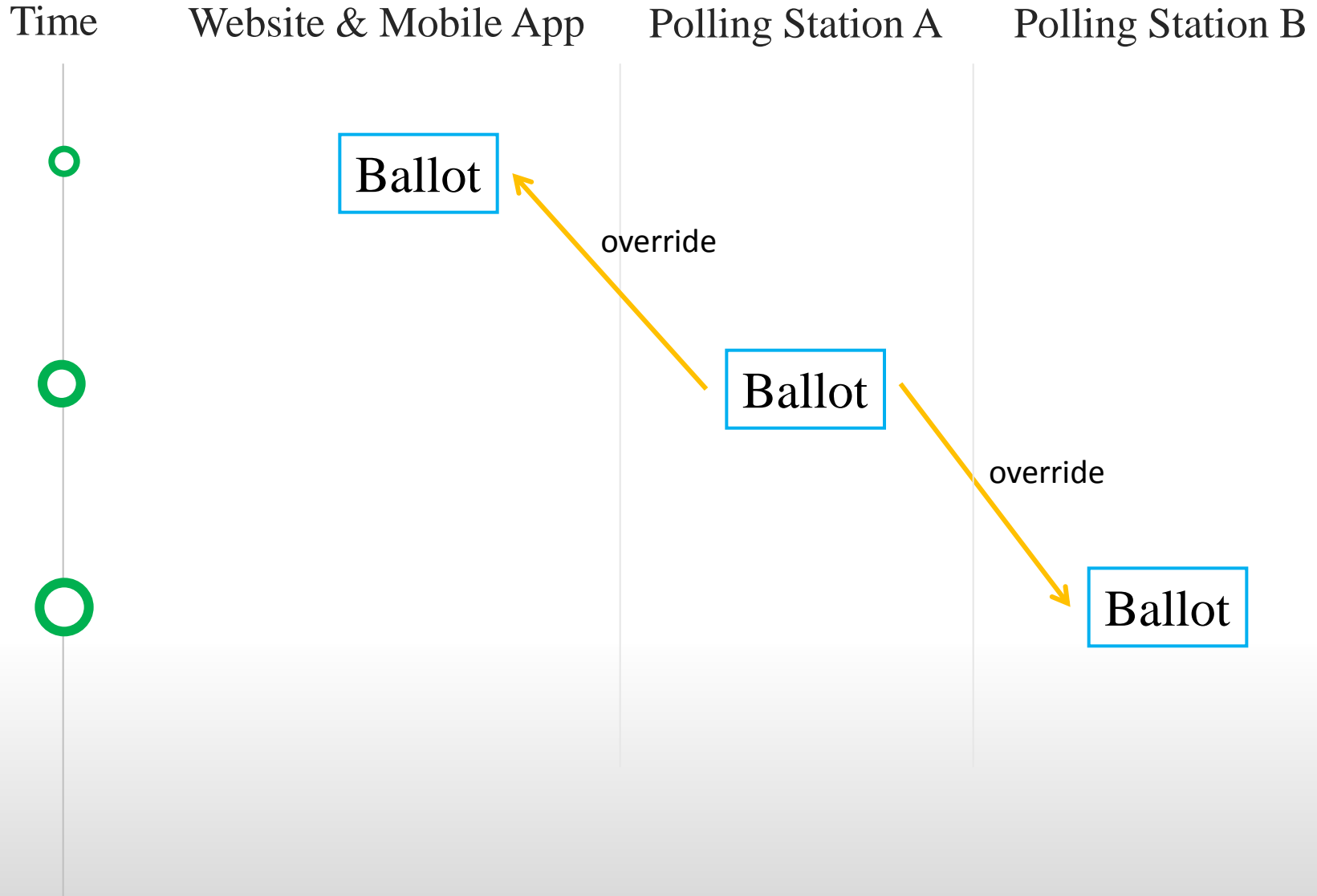
HKID ()

Language 中文 English

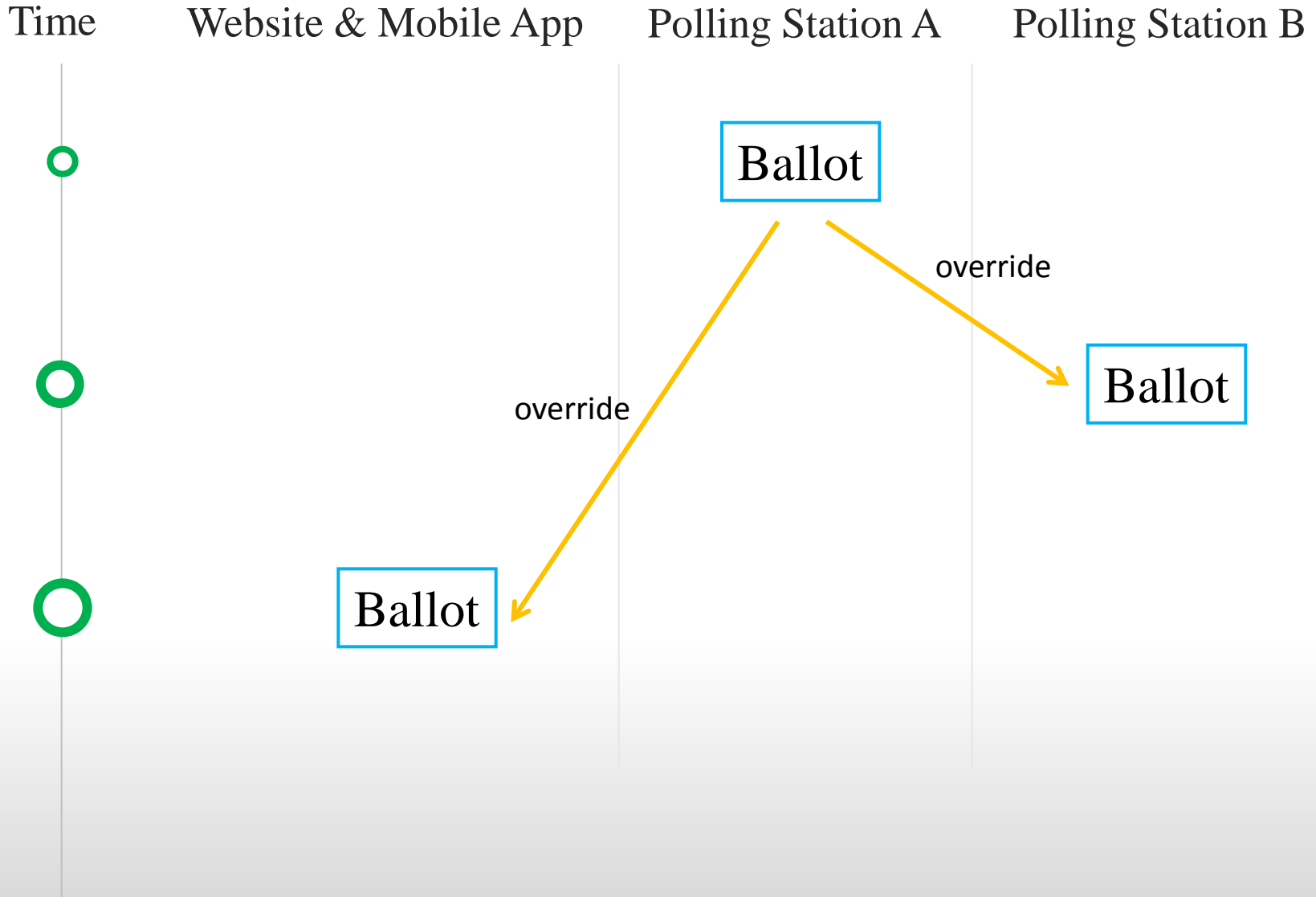
Voting Machine Status ✔ Voting Machine: idle
Last online time of voting machine 2014-04-30 12:37:03

#	Reg. Time	Action
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Ballot Counting – Scenario A



Ballot Counting – Scenario B



Ballot Counting



	境內離站投票 Local Off-site Voting		境內到站投票 Local On-site Voting	境外到站投票 Overseas On-site Voting
	流動程式 Mobile App	互聯網站 Website	實體票站 Polling Stations	實體票站 Polling Station
投票時間 Voting time	12:00, 2014.6.20 - 21:00, 2014.6.29		2014.6.22 - 2014.6.29	15:00 - 18:00 2014.6.14
電子選票 e-votes	495,797	239,303	63,857	--
紙張選票 p-votes	--	--	6,634	391
已剔除選票 Eliminated votes	- 9,655	- 3,406	- 113	
有效選票 Valid votes	792,808			



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Attacks Timeline

Attacks Timeline



Mock Voting & Pre-registration: 13th – 18th June 2014



13th

- Mock Voting & Pre-registration started smoothly



14th

- DDoS on DNS service provider CloudFlare

- CloudFlare added rate limit to popvote.hk

- Added Amazon Route 53 as another DNS service provider

Attacks Timeline



- 15th – 16th
 - More than 100 billion DNS queries in Amazon usage report
 - Amazon stopped providing Route 53 and CloudFront services
 - Protection service provider UDomain under DDoS attack
 - Peak traffic at 10Gbps, consumed most the bandwidth
 - UDomain stopped providing protection service
 - CloudFlare protection service turned on
- 17th
 - Reported to the Police

Attacks Timeline

○ 18th

- Mock voting and pre-registration ended
- More than 20K votes and registration

○ 19th

- Enrolled CloudFlare Project Galileo
- CloudFlare provided 4 dedicated name servers

6.22 Civil Referendum: 20th – 29th June

 20th

- CloudFlare mitigated 300Gbps DDoS attack right before the voting began
- Transferred zone files to some DNS service providers ('A' records to CloudFlare proxies)
- Large amount of random and non-existent sub-domain queries (e.g. aasj289.popvote.hk)
- Technique used to whitelist existent sub-domains
- Voting system smoothly rolled out
- Received 30K-50K votes per hour in the first day of voting

Attacks Timeline



- 23rd - Fake email received by SMS service provider to seek for SMS usage report
- 27th - Phishing websites were found
<http://popvotes.hk>
<http://secure.popsvote.hk>
- HKDNR turned them down
- 29th - Received about 800K votes
- 1st & 2nd July - Malicious calls to HKUPOP telephone numbers

Attacks Timeline



Others

- Rumours about duplicate votes
- Rumours about Data Leakage from Civil Referendum System



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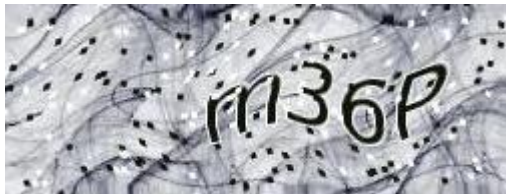
Protection

Protection



Shielded by CloudFlare Firewall

Whole AWS infrastructure is isolated from the public, using AWS Security Groups



Captcha to protect API endpoints



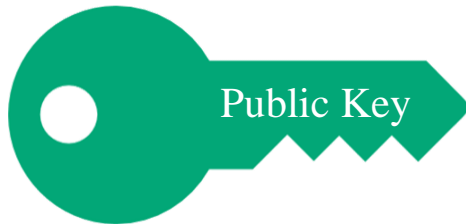
All transmitted data are SSL encrypted

Protection



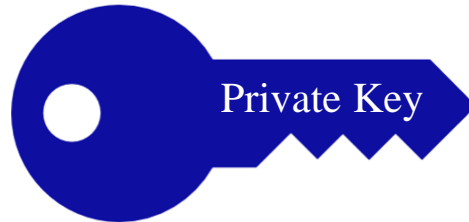
f12443ffa921ea97dca00811744
f8784f3e8b494736d1164b3898
c5892b0f6a27c9895b175e651d
8214c4825027f47e74ae422d80
e05c712bce18f0cda6d878c

All HKID and Phone numbers are hashed



All ballots are encrypted using PKI

Protection



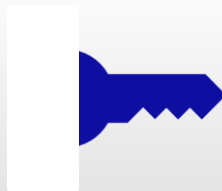
Private key is divided into 3 and held by 3 non-technical workers



Redundancy is added to avoid the corruption or loss of the key



Gathering the portion from at least 2 holders is required to merge a private key for decryption





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Thanks for listening.

more on

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