

Adopting e-vote: **innovation, risks, and lawsuits**

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臺灣大學開源社

NTU Open Source Community

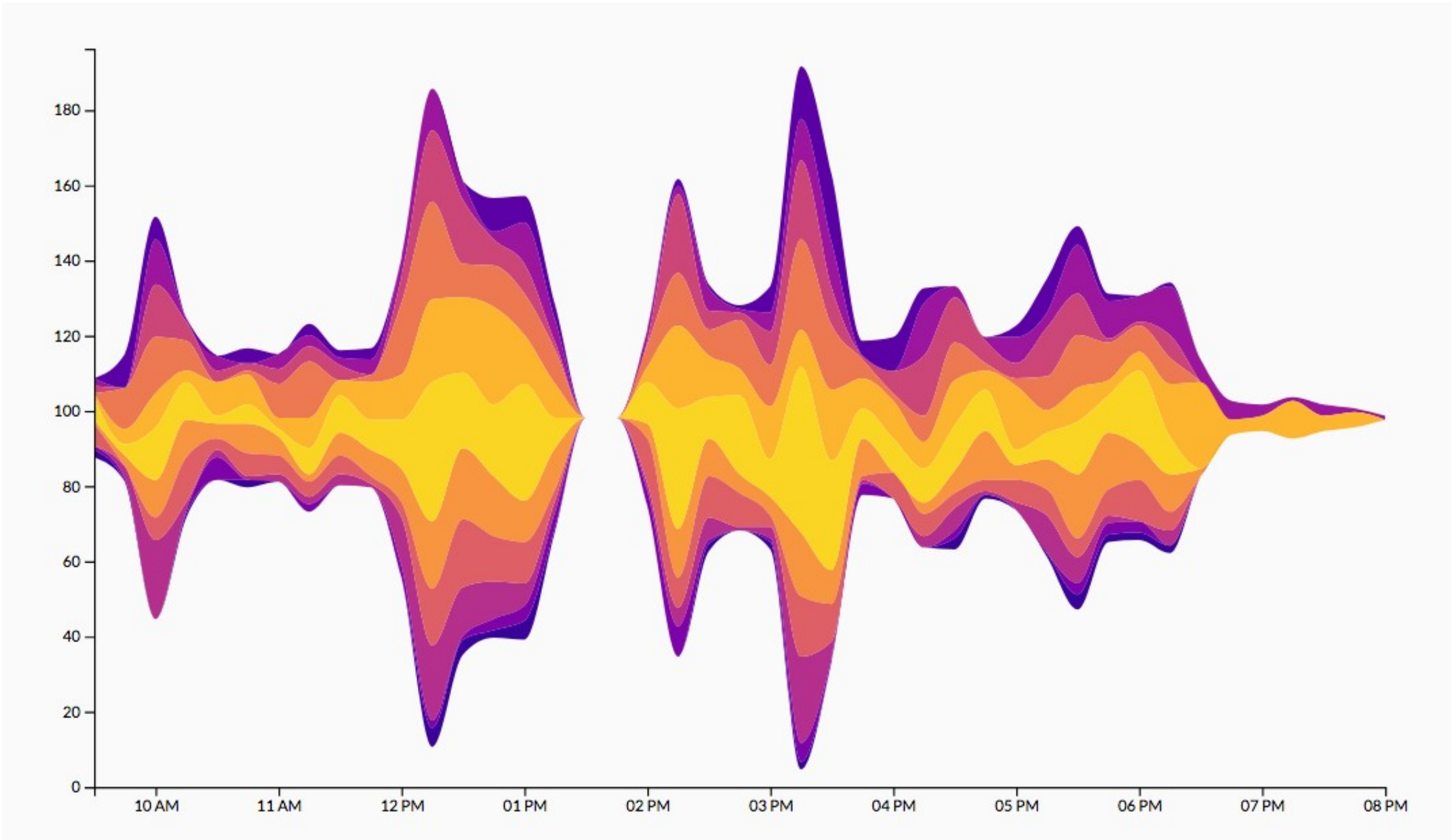


選舉,
超潮的!

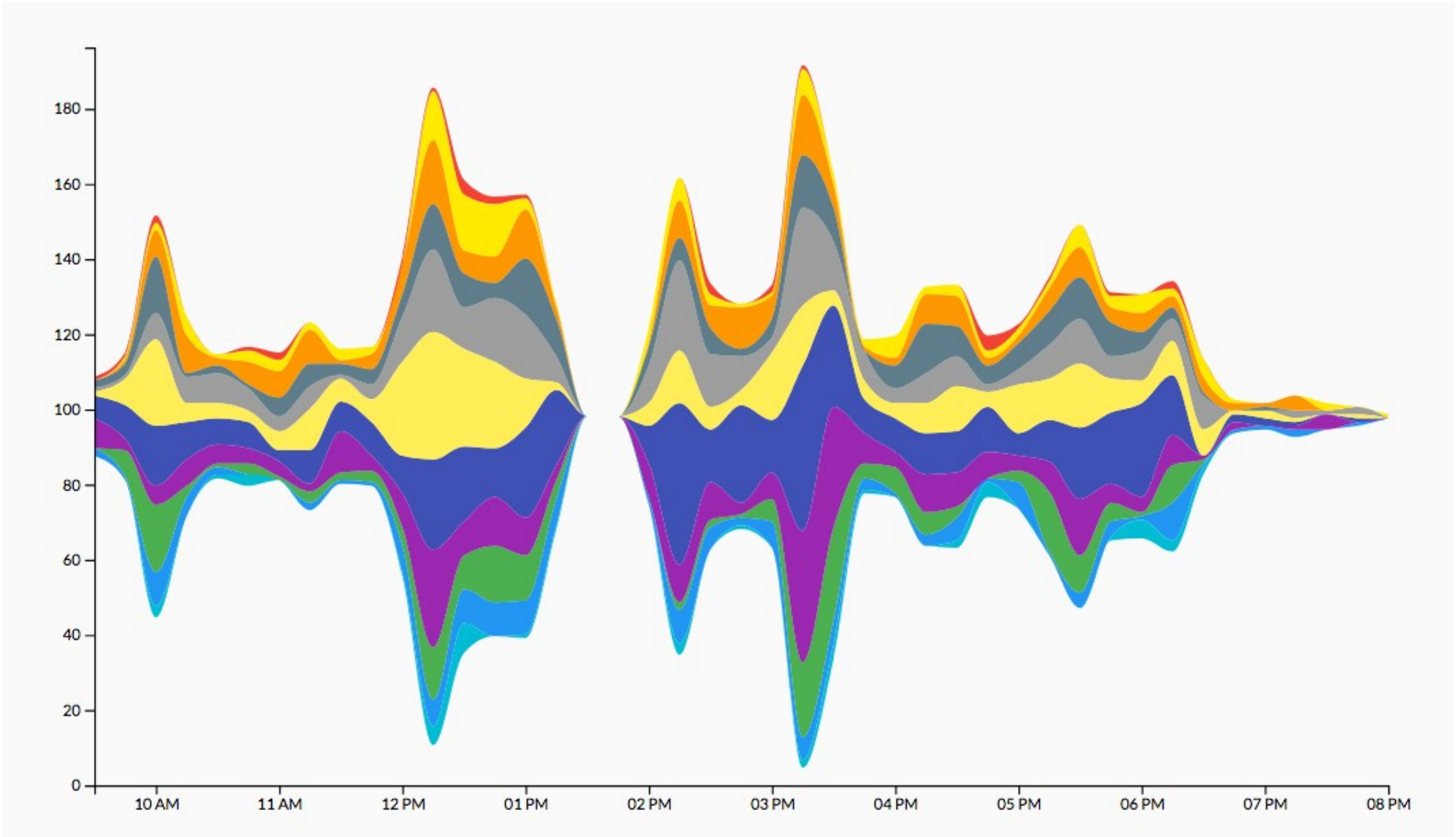
3437pauf9818eqtu

Elections in NTU

- The 30,000-elector event drew significant influence to the society, almost a democracy sandbox by itself.
- Even before martial law was lifted in Taiwan, Student Association in NTU adapted a new constitution in 1988, with separation of powers and direct presidential election.
- With a rich history of electoral suit, NTU bears an extremely detailed voting regulations in a nationwide scale.

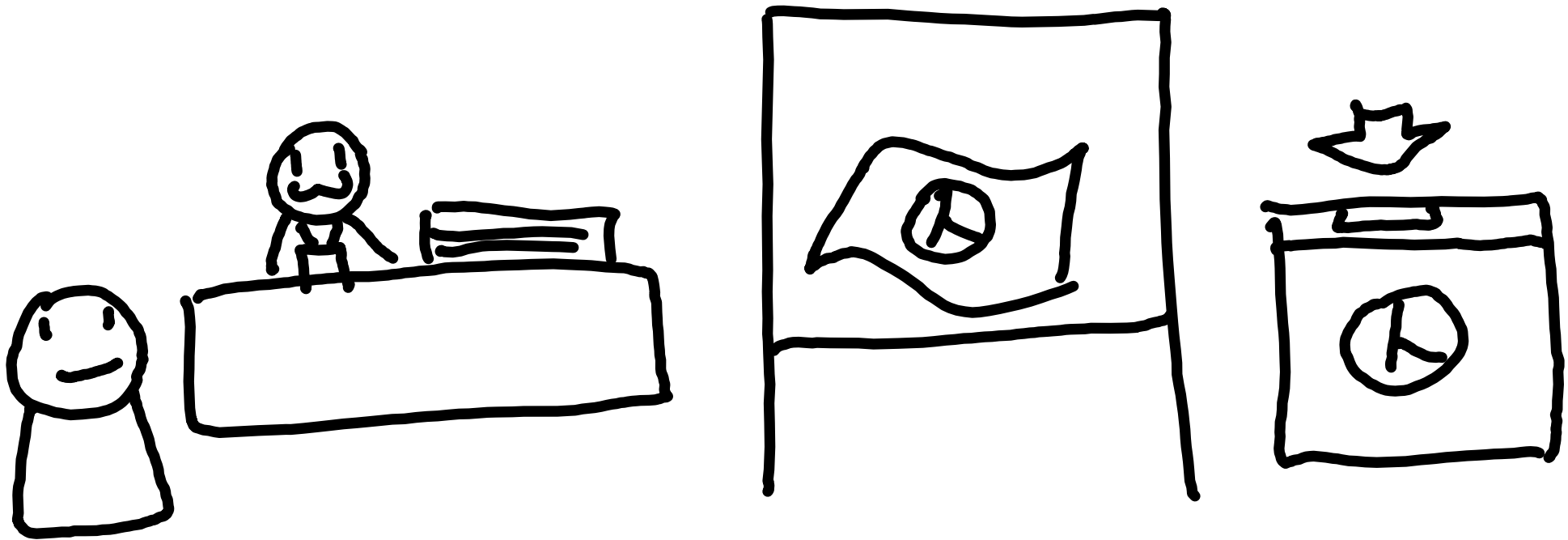


Electoral–Time stream graph of 2017 Spring NTUSA Joint Election, colored by voting station



Elector–Time stream graph of 2017 Spring NTUSA Joint Election, colored by college

Traditional vote



① Examine student ID and current registration stamp



③ Mark the ballot



④ Cast the vote

② Sign for the ballot

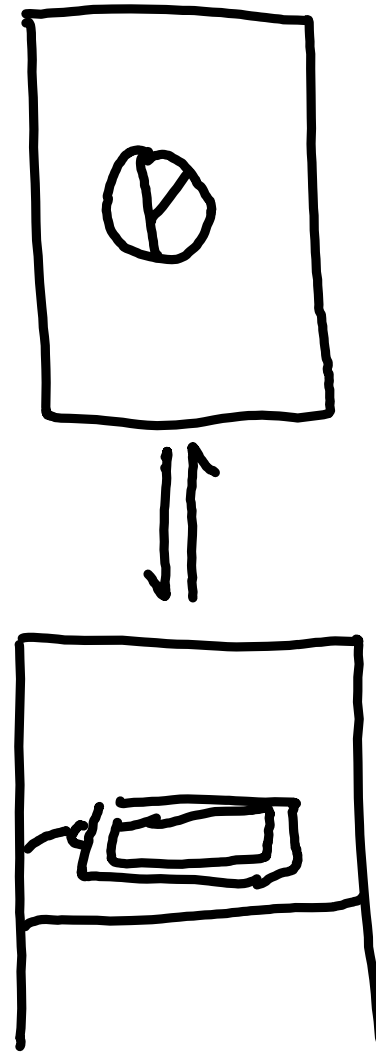
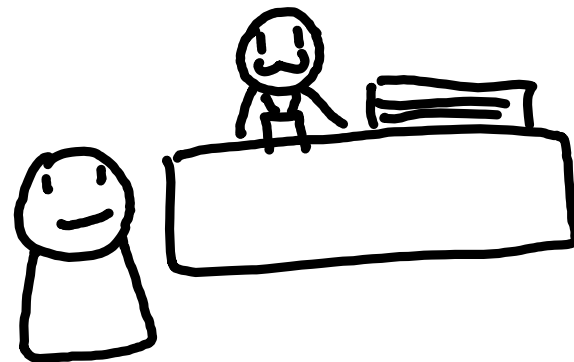
Labor costs

Printing ballots, shipping voting boxes, counting

Experimental e-vote

① Examine student ID and current registration stamp

② Sign for the auth code



③ Vote through tablet



2014/5/25

“Why aren’t you sleeping?”

**“I was called to do a vote system
for your school’s election next week”**

visible confusion

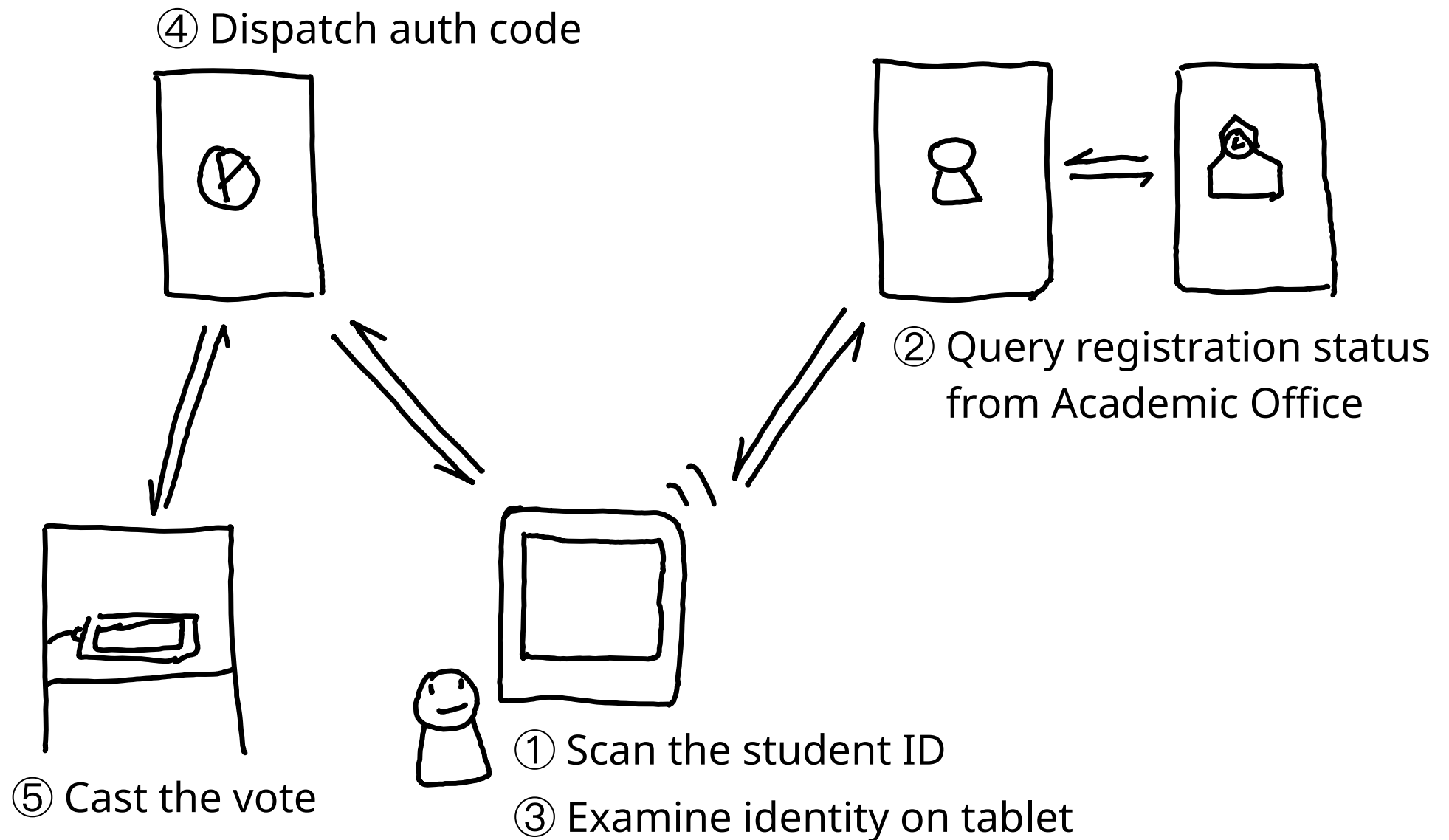
102-2 NTU Voting

Password - -

Proceed ›

Rethinking the Architecture

Remodeled e-vote





Improvements

- Student IDs are Mifare-based Taipei Metro EasyCards with additional sector information; ID numbers could be extracted from a genuine card.
- Incorporating with Academic Office records eliminates the need of examining the then-obsolete registration stamps.
- Programmatically dispatching authorization codes eliminates manual typos and the risk of leakage.

Auditing process

- Authorization codes are counted after election
- Every piece of log is retained
 - Server side: Authorization and dispatch requests
 - Voting station: network issues, abandoned votes
 - Numbers of used auth codes should match after calibration
- Prefile standard procedures to reduce risks

Challenges & Adaptations

下排照片取自臺大學生會選委會粉專，原文於 2014/12/17 發佈。



誰可以投嗎?
戶籍六都任你投
一票嗎?
普通、秘密原則!
要多久啊?
權碼:D 約2min完成!
會開票嗎!!!
3 19:00 @高海拔的...
新生502!!



- Step 1 拿出臺大學生證。
- Step 2 選務人員確認你跟學生證上長的一模一樣樣! 然後用小平板“嗶嗶”!
- Step 3 選務人員會告訴你該走去哪一個票亭
- Step 4 進票亭, 摸摸螢幕... 按下開始!
- Step 5 噓...投票中。
- Step 6 噢 投成功了XD 登出後離開~~



用自己的選票 投自己的民主



不可取代的小事
假票真投 六都選舉大預測



團票處

Double A
我曾在...投票!

在電子投票

在臺大投票

3-0-10-0-10-0

新世代

方便

省時

公平

省事

校園民主再進化!

安全!

省錢!

國立臺灣大學學生會
National Taiwan University Student Association

Intelligence

看看NEW AGE·臺大電子投票是如何運作的吧!

身分驗證系統

1. 確認是本人投票，防止他人假冒。
2. 確認選舉人沒有重複投票。
3. 確認選舉人是在學學生。
4. 依選舉人的身分，核對適當選票種類。

投票系統

1. 選舉人可完成投票。
2. 已完成的選票妥善保存。
3. 開票時可以成功讀取選票。

註冊組伺服器

雙系統獨立運作
不記名授權碼串聯其中

匿名投票Super Safe!

全螢幕介面 × 防誤觸按鍵
× 防斷電備用防替APP
× 直立式UI設計

平板圈選So Easy!

沒選票怎麼換選票怎麼辦?
不在學校及遠距投票Get!

投票即時PUSH投票結果
開票結果隨時免煩惱

電子投票No Worry!

石碇臺大電子投票的六大特色。

Recommendation

難以置信! NEW AGE·臺大電子投票功能強大!

省時

常常有人抱怨，下課只有10分鐘，卻有那麼多人排隊，到底還要等多久? 臺大電子投票替您節省超過5倍以上的時間。以前，紙本投票每人必須花上3分鐘的時間；現在，只要30秒! 時間節省150秒，省時率20%! 「採用電子投票後，上課再也不會遲到，也不用匆匆忙忙趕到投票所了!」管理學院楊同學說。

臺大電子投票，省時省最大!

180秒 vs 30秒

激省! 80% off

省事

院系學生會每年都得改選，只是規定那麼繁瑣，還要辦登記、政見發表、投票、誰有那麼多時間? 如果辦不好傷了系上感情怎麼辦? 採用電子投票後，選委會更有更多時間可以為你服務了! 從登記到開票一手包辦。全臺唯一幫您選舉辦到好! 「自從把選舉委託學生會辦後，整個系學會有更多時間可以辦活動了!」工學院王同學說。

臺大電子投票，省事省最大!

麻煩OUT!

省錢

選舉要印選票，要借教室辦政見發表會，要登記候選人，要投票要開票……要做那麼多事，錢從哪裡來? 要打工、要唸書、要討論報告、要參加社團、要玩，人力成本到底值多少? 於是來了! 臺大電子投票建置完成，回饋大降價。以前，平均每500人要1,500元；現在只要1,000元! 花費節省超過1/3! 「給選委會代辦後，省下超多經費，經費運用更有彈性了!」社會科學院陳同學說。

臺大電子投票，省錢省最大!

狂降! 33% off

方便

臺大這麼大，我還要特地跑回系館投票? 如果沒選怎麼辦? 臺大電子投票採跨校區多點不在籍投票設計，下雨外系課難得出宿舍，也不用再跑回系館了。還有全校設有超過10個投票所，就算在水遊醫公衛也能投。即使沒課去玩交換留學，遠距投票讓你電腦手機平板—Online，投票「一網」打盡不錯過! 「上學期我到歐洲交換，我只要上網就可以投給支持的人呢!」法律學院何同學說。

臺大電子投票，方便Level Up!

全世界都是我的投票所

公平

電子化的目的之一，就是提升選舉公平性。選票由電腦發送，選票人員無法作弊；選票即時PUSH到GitHub投票區，只有上線以時間一會，就投票紀錄有沒有。擔心選舉不公平? 當委會嚴守「普遍、平等、互換、無記名」選舉四大原則，代辦選舉免煩惱! 「臺大電子投票沒有作弊的可能，讓我對選舉更有信心了!」生農學院林同學說。

臺大電子投票，公平Level Up!

公平性大增!

安全

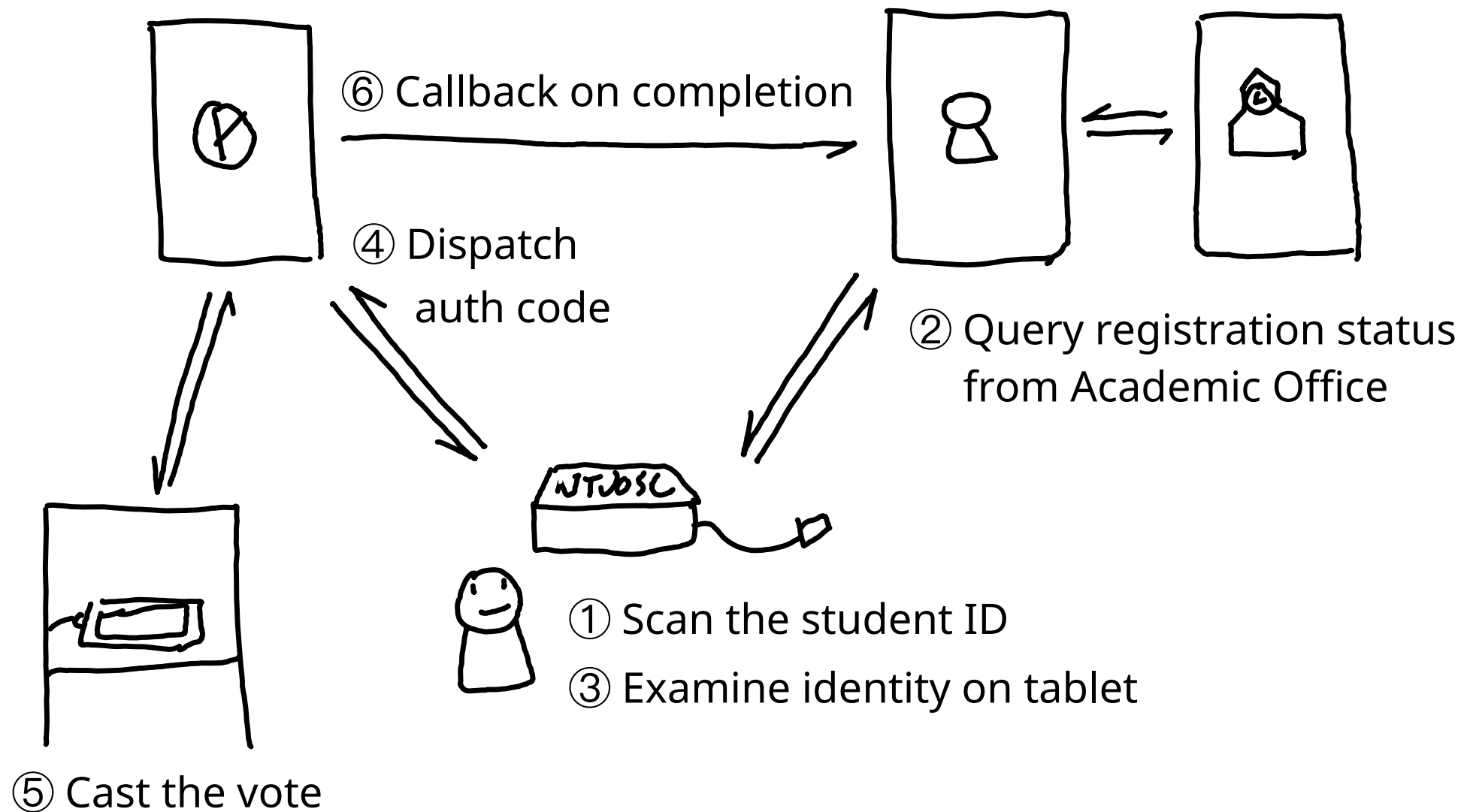
獨步全球採用「身分驗證、投票、雙系統設計、獨立運作」確保每一張選票都是不記名! 與計中及註冊組合作，沒有種資訊就沒有外洩的危險。以NFC感應取得唯一卡號，卡片遺失也不怕。防斷電偵測防替APP監測平板狀態，當意攻擊Go Away! PUSH投票畫面保存選票，開票不用再擔心。「臺大電子投票的安全性很高，讓我非常放心!」理學院郭同學說。

臺大電子投票，安全Level Up!

保護力No.1

照片取自臺大學生會選委會粉專，原文於 2015/4/3 發佈。

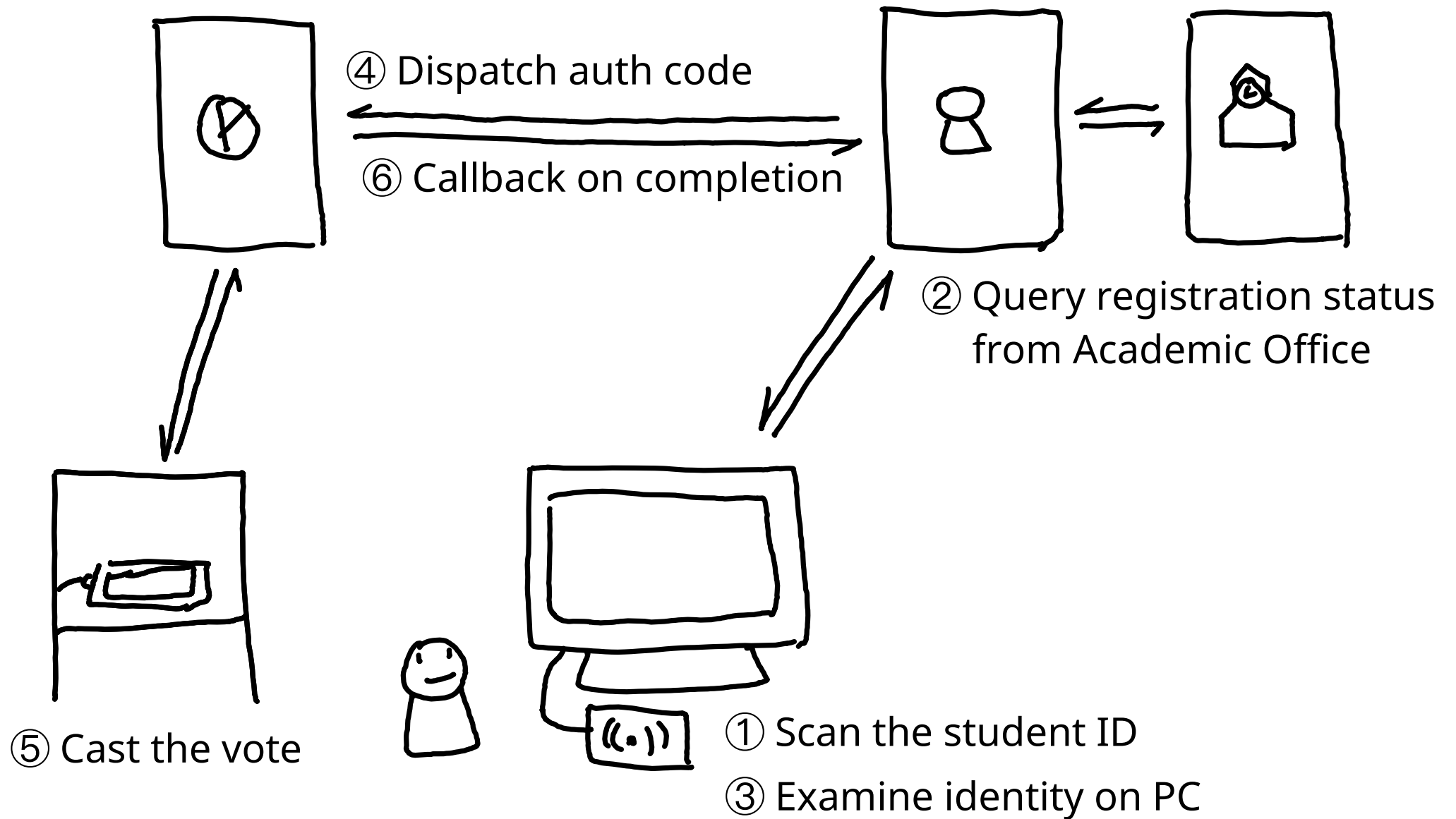
Homebuilt hardware



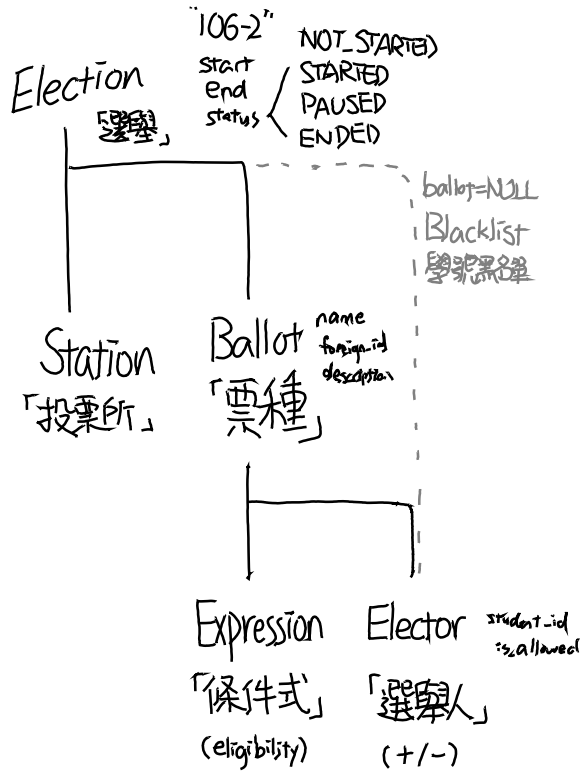


照片取自選務人員 Facebook，原文於 2017/5/17 發佈。

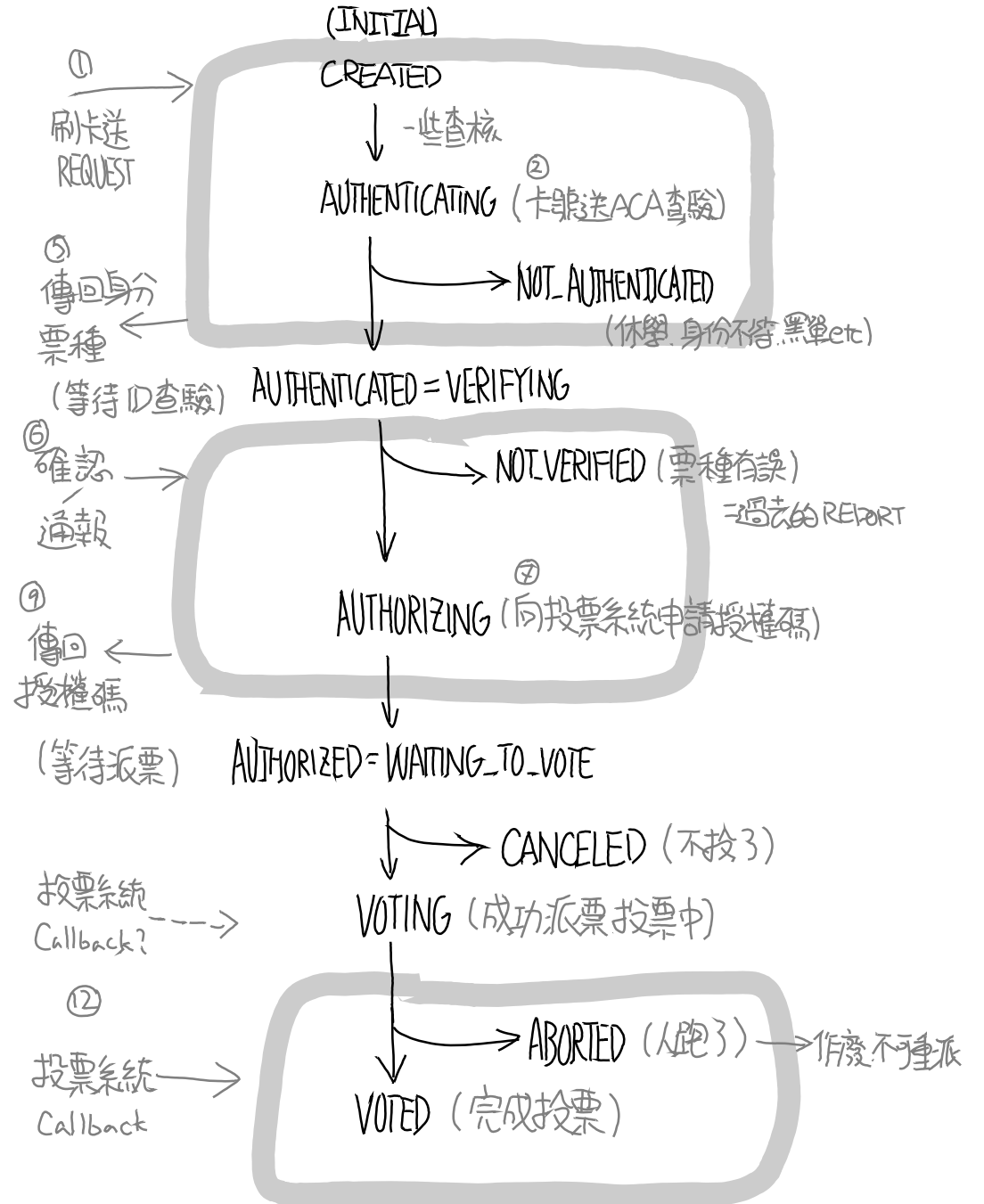
Architecture shift



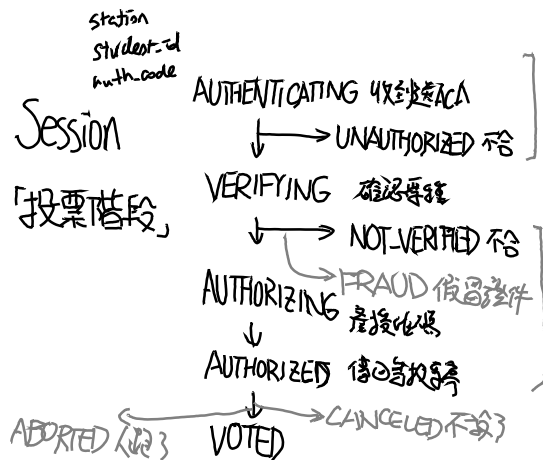
身分驗證系統



Session lifecycle



Telemetry
 station heartbeat
 session status change
 audit log



資訊組 - Google 雲端硬碟 x
安全 | https://drive.

電腦 > 本機磁碟 (D:) 搜尋本機磁碟 (D:)

- Releasev2.zip
- 我的雲端硬碟
- 電腦
- 與我共用
- 近期存取
- 已加星號
- 垃圾桶
- 備份
- 儲存空間
- 目前備用組: 4.1 TB / 5 TB
- 取得 Backup and Sync Windows 版

NTUVote 選務系統

活大

106-2 臺大十合一學生選舉

結束投票
線上

1 335 票總	2 138 票總
3 320 票總	4 票總

派票紀錄

- R 2號平社
- B 1號平社
- B 3號平社
- B 2號平社
- B 2號平社
- R 1號平社
- R 2號平社

將票三種放在圖卡機上，再按下(驗證)

驗證

NTUVoteClient 修改日期: 2018/5/31 上午 10:21 建立日期: 2018/5/31 上午 10:26
應用程式 大小: 34.0 KB

Findings

- Electronic voting greatly reduced the burden of establishing new voting stations – scaling become a matter of available budgets; skilled electoral staff could instruct and diagnose most of the issues.
- Pressure shifted toward development and operation end.
- Change of factors would induce risks and unwanted disturbances, especially when replacing working codes; yet stability is difficult to achieve without fully owning involving hardware and systems.

Making things complex

- *Election and Recall Act* allows casting vote remotely through preauthorized links; these applications are manually validated and processed.
- Unless fully automate the whole process, the distribution of such ballot is prone to error, and opens up potential electoral suit.
- The irreversible nature of election system make disaster recovery difficult if not impossible; only a margin of error could be calculated for court defense.

Legal challenges

- In the first hour of Spring 2017 election, about 20% of the electors' IDs were rejected. The problem was quickly identified as a regression of sector format by subcontractor, and patch was issued before noon.
- EREC board decided to extend voting period for a day, which was later rejected by court decision.
- The court found that election administration were **not** entitled to pause, postpone, or extend election periods even under technical disturbances under current regulations.

Future development?

- Improving resilience
 - Hybrid (e-authentication) voting
 - Paper trail verification
 - Refer from academic papers
 - Better training, stabilize version, docker-ize?
- Thinking out of the box
 - Problem of regulation density
 - Technological due process

ASKING AIRCRAFT DESIGNERS ABOUT AIRPLANE SAFETY:

NOTHING IS EVER FOOLPROOF, BUT MODERN AIRLINERS ARE INCREDIBLY RESILIENT. FLYING IS THE SAFEST WAY TO TRAVEL.




ASKING BUILDING ENGINEERS ABOUT ELEVATOR SAFETY:

ELEVATORS ARE PROTECTED BY MULTIPLE TRIED-AND-TESTED FAILSAFE MECHANISMS. THEY'RE NEARLY INCAPABLE OF FALLING.



ASKING SOFTWARE ENGINEERS ABOUT COMPUTERIZED VOTING:

THAT'S TERRIFYING.



WAIT, REALLY?

DON'T TRUST VOTING SOFTWARE AND DON'T LISTEN TO ANYONE WHO TELLS YOU IT'S SAFE. WHY?

I DON'T QUITE KNOW HOW TO PUT THIS, BUT OUR ENTIRE FIELD IS BAD AT WHAT WE DO, AND IF YOU RELY ON US, EVERYONE WILL DIE.



THEY SAY THEY'VE FIXED IT WITH SOMETHING CALLED "BLOCKCHAIN."

AAAAA!!!

WHATEVER THEY SOLD YOU, DON'T TOUCH IT. BURY IT IN THE DESERT. WEAR GLOVES.



xkcd: Voting Software by Randall Munroe. CC BY-NC 2.5.

**“We devote this university
to the spirit of universe”**



Join the discussion
on GitHub!

**rschiang/ntu-
vote-auth-server**

Thanks!

RSChiang 2018.12.19 @ Cambodia ICT Camp / CC BY-SA 4.0