



Ghana's Election 2020

Understanding the need for a new Biometric Voter Management System and the Compilation of a new Voters Register

Importance of a Credible Voters' Register



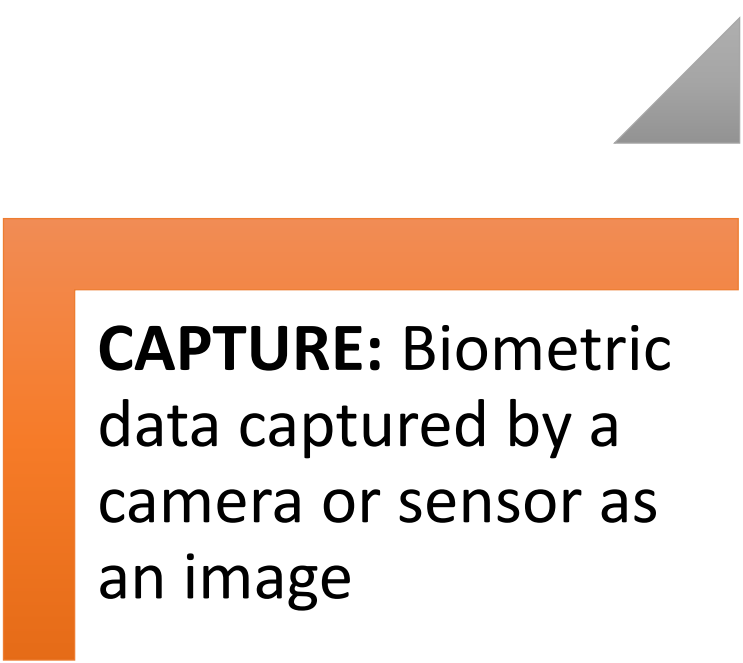
An ACCURATE Voters Register

- Legitimacy on the electoral process
- EVERY eligible voter can vote only ONCE
- Prevents electoral fraud

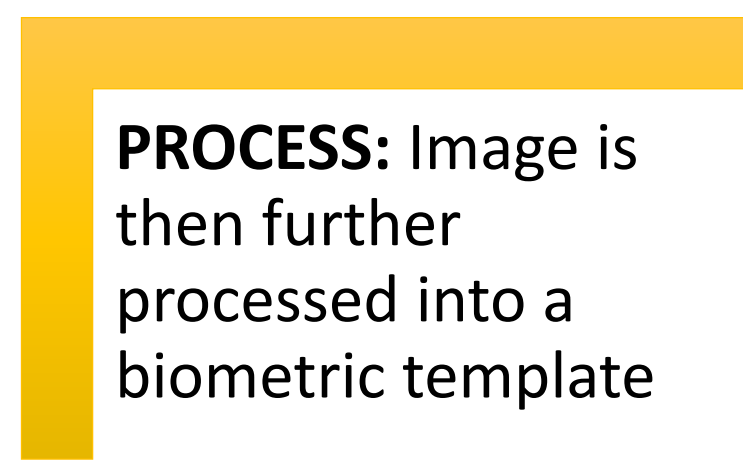
An INACCURATE voters Register

- Doubts about the election's inclusiveness
- Doubts about the election's outcome
- Creates avenues for fraud and manipulation

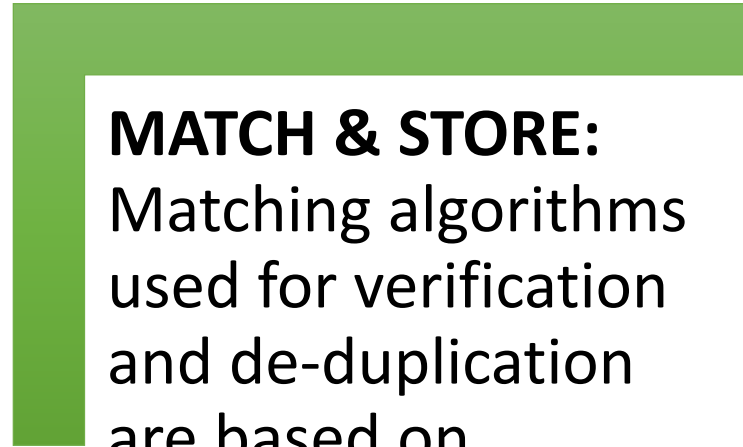
Capturing, Processing & Storing Biometric Data for Electoral Purposes



CAPTURE: Biometric data captured by a camera or sensor as an image



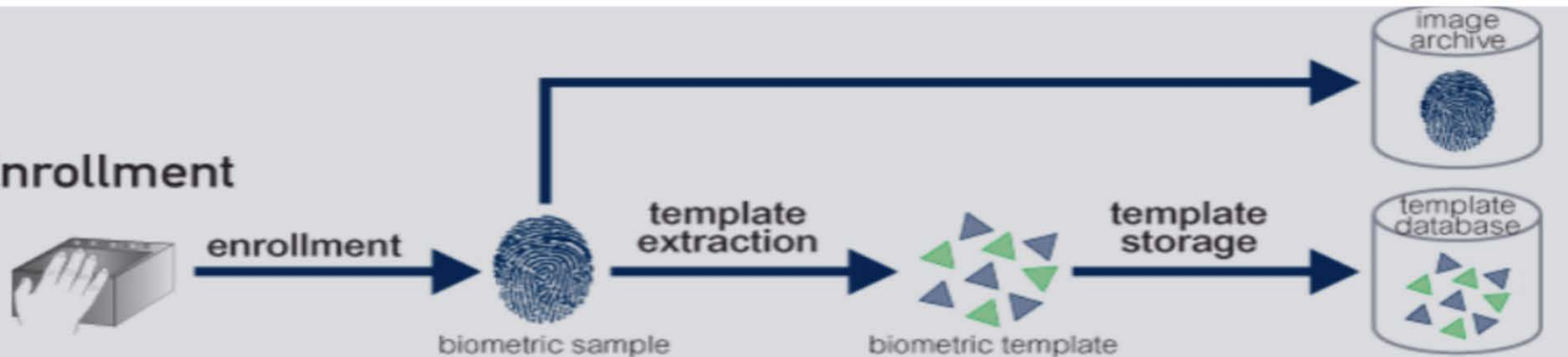
PROCESS: Image is then further processed into a biometric template



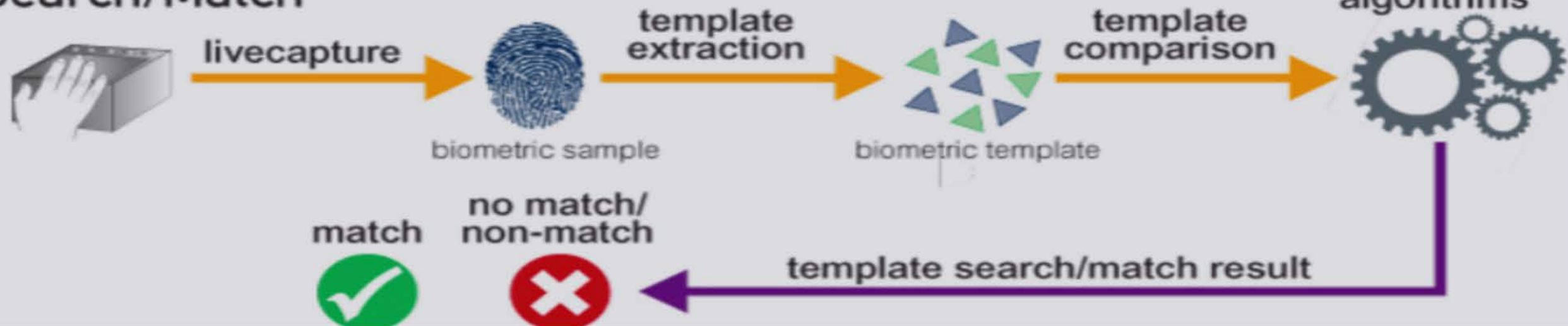
MATCH & STORE: Matching algorithms used for verification and de-duplication are based on comparing these biometric templates

Most commonly captured biometric features for electoral purposes are fingerprints for automatic fingerprint identification systems (AFISs), and Facial images of voters for facial recognition systems (FRSs)

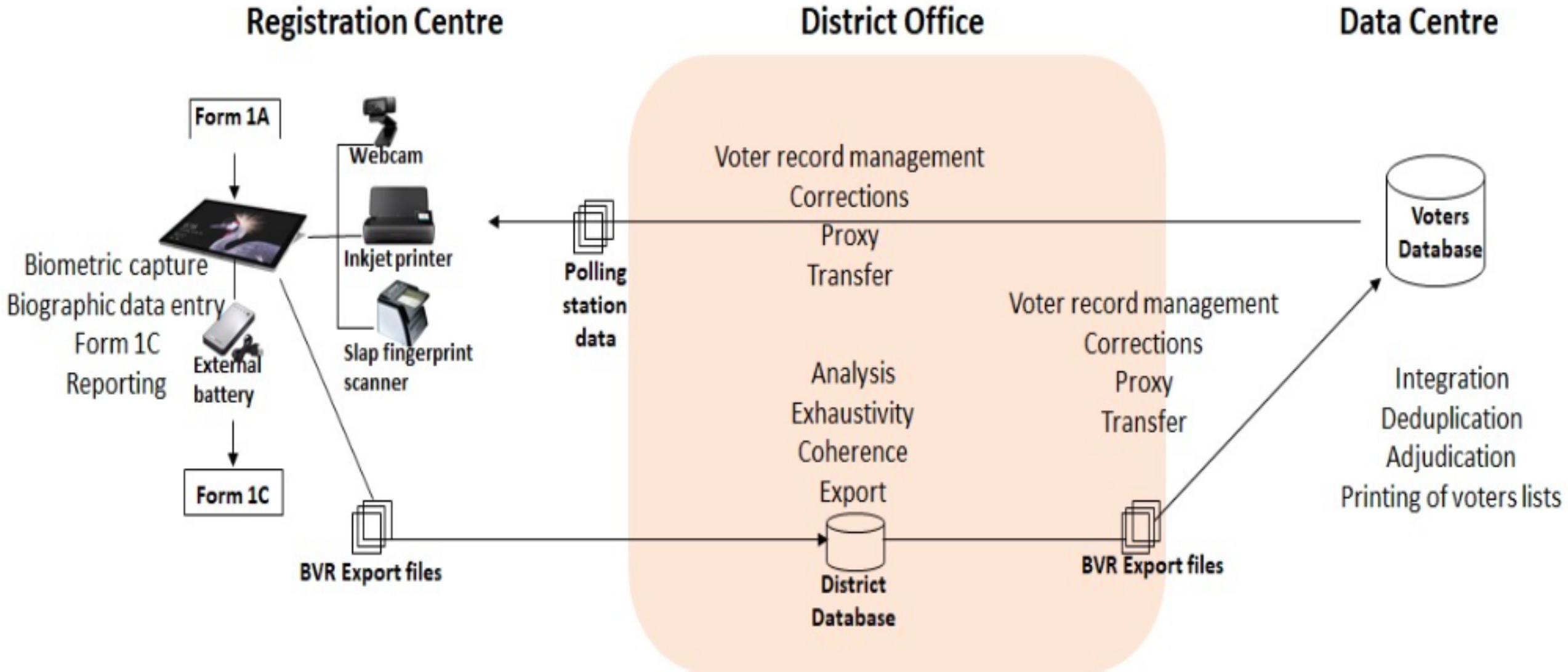
Enrollment



Search/Match



Registration & Creation of Voters List



Challenges with the Current System

Challenges of the Current System – BVR Kit

1. The Kit had been in use since 2011, last purchase was in 2013 (500)
2. All other costs associated with BVR kits was for refurbishment
3. A large quantity of the kits had many faulty component parts that were difficult to replace (keyboard, mouse, screen, camera).
4. For 2016 47% failure rate was noticed during preparation for registration
5. The battery packs had worn out and therefore the decreased battery autonomy could not guarantee continuous use of the BVR
6. The image quality obtained from the fingerprint scanner we increasing deteriorating leading to repeated image acquisition prolonging the registration process
7. The inkjet printers were failing at a frequent rate

Challenges of the Current System – BVD

1. Purpose built device for EC had been in operation since 2011
2. In 2013, an additional 500 of same BVD was purchased
3. Since then cost associated with BVD was for refurbishment
4. High failure rate of the BVDs
5. A lot of money had to be spent refurbishing them for use for the various elections
6. Worn out sensors meant poor image acquisition leading to repeated attempts on verification
7. Manual verification had been an increasing trend due to failure of the BVDs to electronically verify voters.

Network Challenges

Very Small Aperture Terminal (VSAT) technology

- Has low bandwidth, very high latency and was susceptible to changes in the weather such cloud cover and rain
- Limited Registration Exercise experienced low utilization rate of the online VMS

Network Design Limitations

- The network design is rigid and does not allow for integration of newer technologies
- The network design was poorly documented

Network not Secured

- Communication between nodes are not encrypted and in some instances microwave links were shared with other customers raising security concerns

Challenges of the Current System – Datacentre

1. Large number of equipment within the DC were either EOL or EOS
2. Some of the equipment did not have an active warranty since 2014
3. Most of the software licenses had expired
4. The Storage Array System were running on 1G iSCSI which made for very slow processing.
5. Disks in the array were a combination of 10K and 7.2K RPM HDD
6. The rest of the network within the DC were a mixture of 100Mbit/s and 1G connectivity
7. The Combination of the above could not deliver the performance that was required to meet the demands of the system.

Biometric Verification Management Systems(BVMS) Application Components Challenges

Source code challenges

- Source code is not available to EC
- Biometric templates is being kept in a proprietary format

Challenges with Vendors

- The BVMS application modules where built by different vendors and is poorly documented
- Troubleshooting and problem isolation takes days since it involves coordinating with several vendors located in different time zones
- Vendor never committed to any service level agreements

Operational Challenges

Lack of Training

- None of the EC IT Staff were trained on the BVMS.
- The EC was complete reliant on the vendor for the management of the system

Limited application server

- The application server used for the online VMS was limited by allowing only 200 concurrent connections.
- The EC has some 260 district offices nation wide each with at least 2 VMS machines

Operational Challenges continued

No Disaster Recovery Plan

- There was no business continuity
- There is no IT disaster recovery plan
- The backup strategy in place was such that the best recovery point objective (RPO) attainable was about 1 month and the best recovery time object (RTO) was about 1 week.
- Full backup of the Oracle DBMS took at least 72 hours and this is with the system quashed.
- Application system design was such that there was no insight into the quality of the data being egested

No checks and balances in the system

- No way to determine if some records were missing.
- This process had to be manually done and is susceptible to human error

Summary of System Challenges

System is a closed proprietary system that cannot be upgraded

The hardware equipment is obsolete, & no longer supported by manufacturer

Hardware is difficult and expensive to maintain

Vendors have locked-in the commission

EC IT Staff is shut out of system and cannot manage it

There is no backup or disaster recovery plan

Features of the New System

New System Features

An open system based on standard and open technology

System is hardware agnostic

Mechanisms in place to remove dead people and clean-up the register

System allow for continuous registration of voters

Allows use of facial recognition as an additional verification modality

Built-in IT business continuity and disaster recovery

Data security to preventing manipulation from external and internal sources

Cost implications

BVD Cost Comparison

Old System Upgrade		New Acquisition	
No of BVD Units Used	68,000	Number of BVR Required	80,000
Those in good condition	56,000	Unit cost of new BVD (USD)	\$400
Unit Cost of Refurbishment	\$ 244		
Total Cost of Refurbishment	\$13,664,000		
Additional BVD Required for 2020	24,000		
Unit cost for New BVD (USD)	917		
Total cost of additional BVDs required	22,008,000		
Total cost of BVDs for 2020 Election	\$35,672,000	Total Cost of new BVD	\$32,000,000

BVR Kits Cost Comparison

Old System Upgrade		New Acquisition	
No of BVR Kits used in 2016	5,500	Number of BVR Kits required	8,000
No of BVR Kits that can be refurbished	1,500	Unit Cost of BVR Kits (USD)	\$3,000
Unit cost of refurbishment	\$3,500		
Total cost of refurbishment for BVR	\$5,250,000		
Additional BVR Kits required for 2020	6,500		
Unit Cost of new BVR Kits	\$5,145		
Total cost of additional BVR Kits	\$33,442,500		
Total for BVR for 2020 Election	\$38,692,500	Total Cost of new BVR Kits	\$24,000,000

BRV & BVD Cost Savings

New System

- **New BVR + BVD
= \$56,000,000**

Old System Upgrade

- **Old BVR + BVD
= \$74,364,500**

New system savings = \$18,364,500 (GHS104,677,650)

Datacenter Cost Comparison

Old System Upgrade		New Acquisition	
Proposed cost of refurbishment of datacenters	\$15,000,000	Cost of new datacenter	\$6,000,000
Annual maintenance cost of datacenter	\$4,000,000	Maintenance cost of new datacenter	\$1,000,000
Total cost of datacenter with maintenance	\$19,000,000	Total cost of new datacenter with maintenance	\$7,000,000
Total cost of refurbishment of old datacenter	\$19,000,000	Total cost of new datacenter with maintenance (USD)	\$7,000,000
Saving on datacentre			\$12,000,000 (GHS68,400,00)

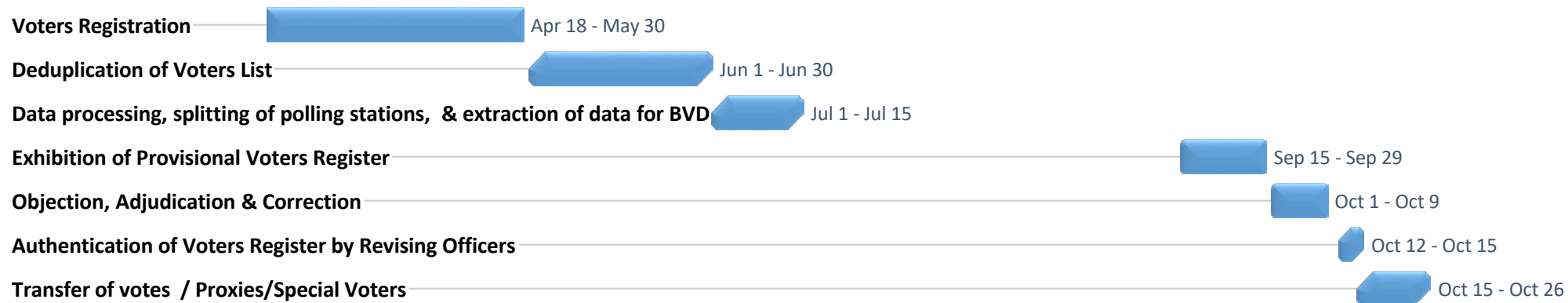
Grand Saving with Procurement of new equipment for 2020 (GHS)

New system savings =
GHS104,677,650.00

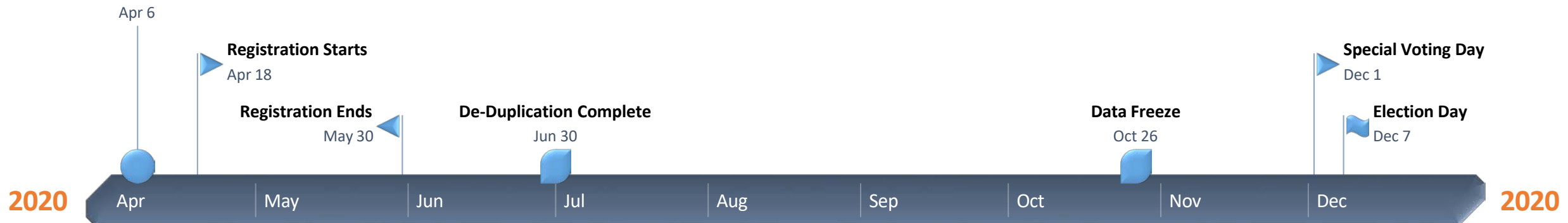
New datacentre savings =
GHS68,400,000.00

New system grand savings for
2020 = GHS173,077,650.00

Project Timelines



Receipt of Complete set of BVR Kits



Frequently Asked Questions (FAQ)

Why not simply upgrade the old system?

Trying to upgrade the old hardware with new components is like trying to upgrade 2011 Computer with 2019 components

Trying to upgrade a battery pack is like trying to upgrade a Samsung Galaxy S3 to S10?

Trying to upgrade the BVD sensor is like trying to upgrade a fixed port switch from 10/100 to 1G switch or 1G to 10G?

The Storage Array System cannot be upgraded because it is at the end of its serviceable life (EOS), which means it does not work anymore

The legacy operating systems will have to be upgraded in order for them to run on new hardware

The Java version that the application requires needs a new OS

How is buying a new system better than upgrading the old system?

New System

- 3-5 year warranty
- OEM support
- High system performance
- High memory capacity
- Newest technology
- Minimized hardware flaws
- Long life expectancy

Old System Upgrade

- No warranty
- No support
- Low system performance
- Low memory capacity
- Outmoded technology
- Ongoing hardware flaws
- End-Of-Life (EOL)

Is the EC discarding all previous data?

NO!!! The EC will use the existing data of voters during the registration of voters into the new voters register

Existing voters would not be required to go through the same process as new voters

To be registered into the new register, existing voters need to only present their existing voters' ID card to the registration officer

Their details will be retrieved from the existing database and their biometrics captured i.e. new facial image and 10 fingerprints

So if the data is usable why not migrate it?

The generated templates of the fingerprints in the existing database are stored in a proprietary format

The EC is not able to migrate those templates into a usable format.

There is a risk of potential data loss when converting from one template format to the other

This is why it is a requirement of the EC that the raw images of the captured biometrics are kept in ISO standard WSQ format and JPEG 2000 before templates are generated

Why build a datacentre? Why not use NITA?

The Commission appreciates the advantages of using government shared hosting services.

However in this instance the hosting is not a viable option because of the following

- There would be unnecessary suspicion of government control if the EC kept its application servers in the government managed cloud/facility.
- EC is not certain of the provision of disaster recovery services
- Saving citizens data in the public cloud is not an option for the Commission
- Our biometric matching servers are processor intensive and do not lend itself for being hosted in a virtualized environment
- We run process e.g. printing of the voters list that require industrial printers to be in close proximity to the servers.

Thank you

Questions & Answers