SCALING TO 12K LIVE STREAMS

Or how **evideo.bg** was born

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$ ID

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- Sysadmin / DevOps / Sec
- Automation / Tooling
- Architecture
- everything in between

FOSDEM 2025 / 2025.02.02

I make pancakes

INFORMATION SERIVCES JSC

- National Integrator of the Republic of Bulgaria
- eIDAS Qualified Services Provider
- Euritas member
- PaaS / IaaS / onprem / cloud
- SOCaaS for public institutions
- Healthcare / Transportation
- Financial / Judiciary

THE PROBLEM

Any and all Ballot Counting Activities should be streamed/recorded

THE REQUIREMENTS

LEGISLATION

- Live video streaming of the ballot counting and filling of the results forms
- Online access to the recordings
- Archival of recordings from such streaming
- Mandatory for every (with exceptions) polling station in Bulgaria
- Comes into force immediately, just before the early parliamentary elections in April 2023
- The device will be operated by polling station chairman.
- No rewards or penalties if he/she don’t start the video at all.

SCOPE

- ~12 000 polling stations in Bulgaria
- All will stream in parallel for about 2 - 6 hours on the E-day
- An audio channel is also mandatory
- A parallel local recording is required
- Be live and fully operational in less than 2 months

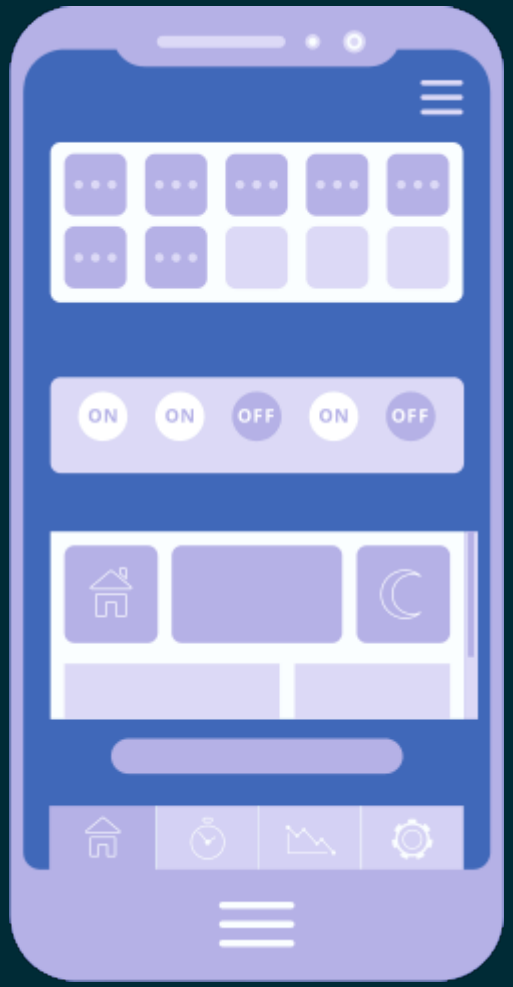
THE SOLUTION

A CAMERA^W MOBILE PHONE

- Has builtin UPS
- Has decent Camera
- Has Monitor
- Has Microphone
- Multiple connectivity options
- Hardware accelerated Codecs
- Simple to handle
- Can be Managed
- RFID tags for inventory management

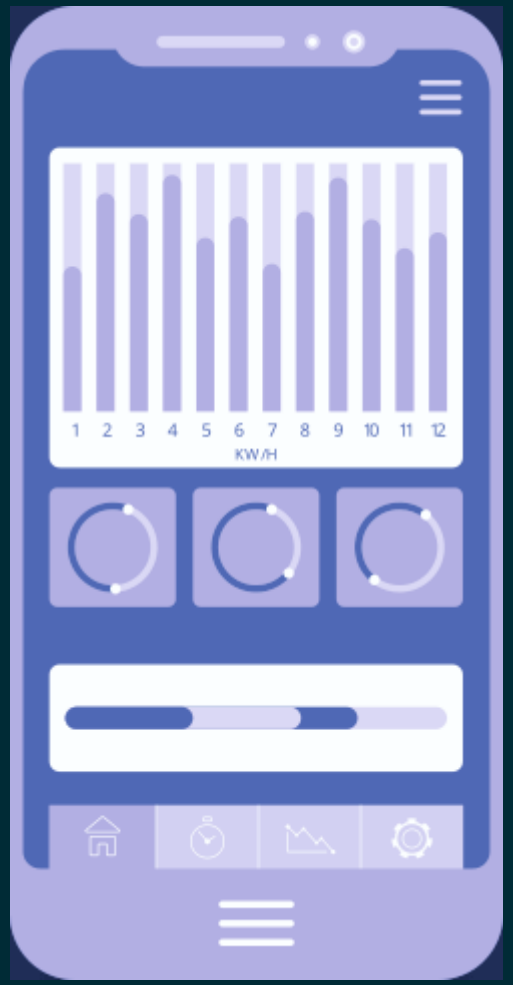
Based on Android GO 13

APPS ARE NEEDED



- Streaming App
- Does Recordings too
- Can be remotely configured via MDM
- Streaming starts with QR code (encrypted)

APPS ARE EVOLVING

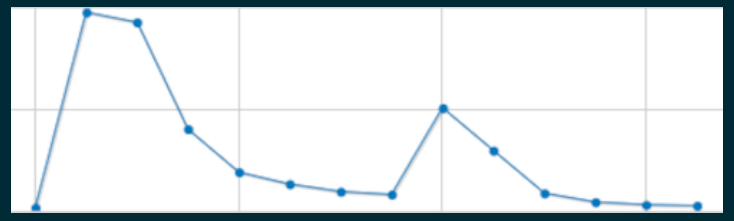


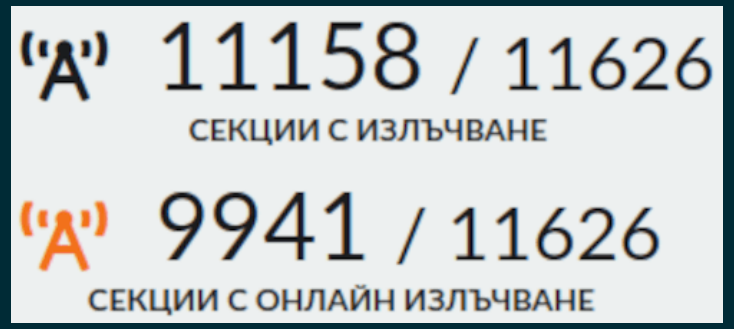
- Under constant improvement
- Self health monitoring
- More logging
- More information for operators
- Better encoding profiles
- Improved performance

MOBILE DEVICE MANAGEMENT

- Open Source
- Monitoring and logging
- Profiles
- Stores configuration
- Messaging

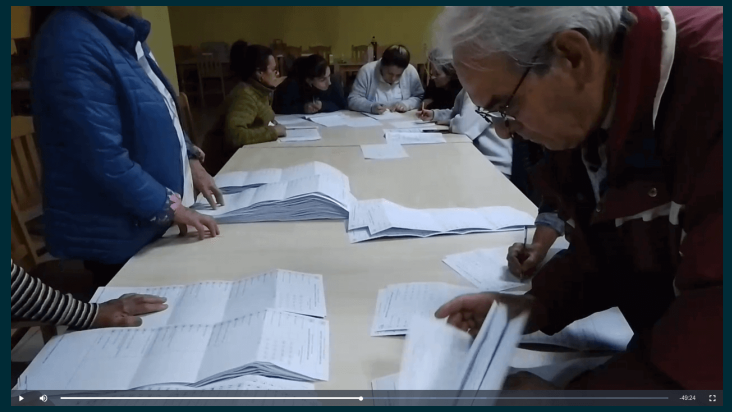
RESULTS AND STATS





- 8 Different elections
- Local
- Parliamentary
- European
- Combined
- 120+ TB of recordings
- 21+ Years of video to watch
- Citizens engagement

PUBLIC RECEPTION



- Stricter processess control
- 50+ official complaints in the court
- One case of court declined results, based on the video recordings
- Many cases still in investigation phase

TESTING TESTING TESTING

- Lots and lots and lots of it
- In the dev process
- In clean room env
- In the polling places
- Performance tuning/testing

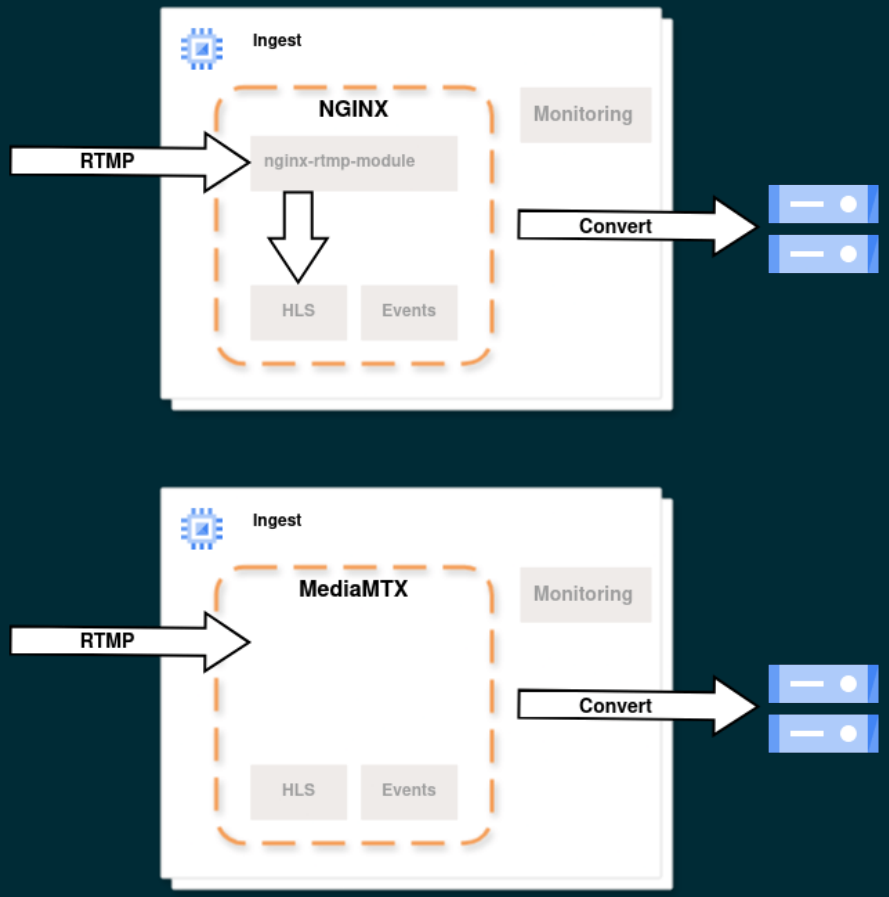
THE INFRASTRUCTURE

- 12K streams * 1.5 Mbit/s = 18 Gbit/s
- Bandwidth for thousands of online viewers
- ~20-40 TB for online video recordings storage
- Sufficient connectivity to Bulgarian telco providers
- Outstanding performance to process and store the streams
- Large-scale infrastructure
- Ability to do quick scale-outs
- Excellent support
- Multiple locations with large capacities
- Security and DDoS protection

INFRASTRUCTURE COMPONENTS

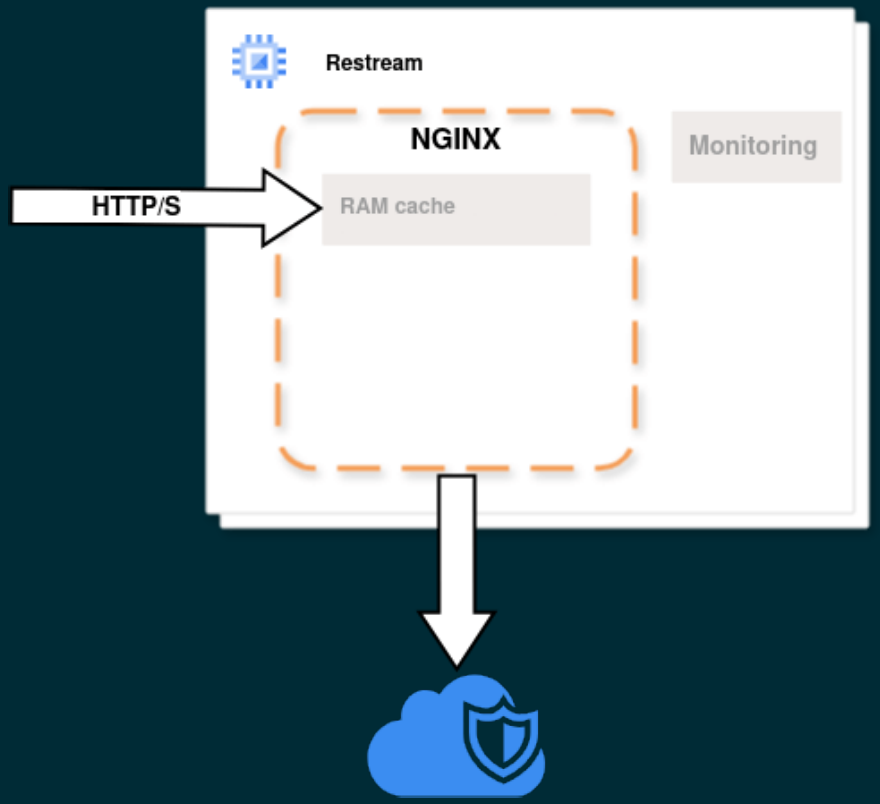

Watch
Stream
Cloud Armor
Cloud
Firewall Rules
Restream Cluster
Compute Engine
Ingest Cluster
Compute Engine
Cloud
Memorystore
Storage
Persistent
Disk
Google
Network W/
Edge Cache
VOD
Cloud Storage
Control Plane
Compute Engine
PostgreSQL
Cloud SQL

INGEST NODE



- Open Source
- App Server - **NGINX, OpenResty**
- RTMP Ingest - **nginx-mod-rtmp, MediaMTX**
- Processing - **Redis, Celery, ffmpeg**

RESTREAM NODE



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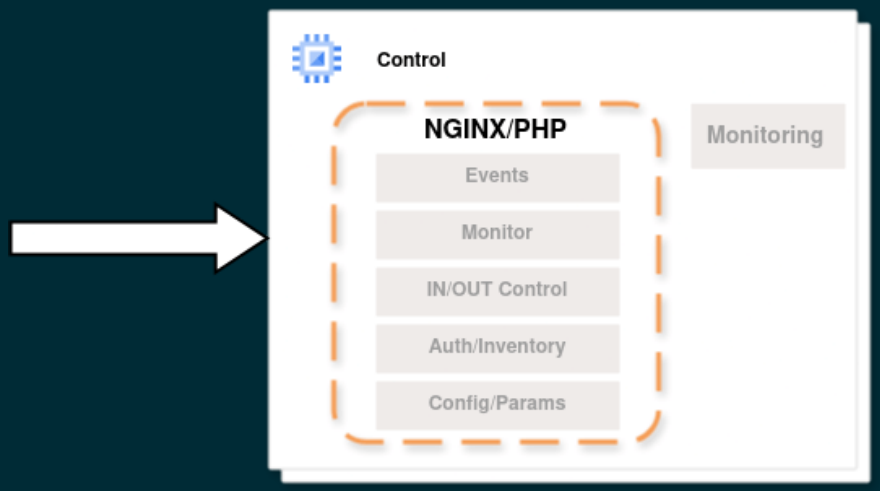
CONTROL PLANE



- Inhouse developed
- App Server - **NGINX**
- PHP
- Control/config/parametrisation
- Asset/Inventory management
- Monitoring
- Control of ingest/restream

DEVICE DATA RETRIEVAL

- Mostly manual process
- Multiple interconnected pieces
- Python, Celery, Redis, Pascal
- Lots of checks
- Thank god for RFID

OTHER NOTABLES

- Don’t reinvent the wheel
- Use platform services with SLA
- Do test and verify performance
- Automate
- Have a backup plan
- KISS
- Pre-Flight Checklist

THE PROCESS

- Infra with terraform (and a bit of manual)
- Instalation, setup and config by ansible
- Services from Google Cloud Platform
- Cloudflare for DDoS, domain and others

ISSUES

- Manual provisioning and upgrade
- 12K devices in one place may bring down some APs/mobile cells
- People don’t read instructions/watch training video and do awkward things
- People like the devices and “forget” to return phones, chargers, stands, cables or all above
- The stands require deep knowledge to “operate” and often break
- Choose high quality USB cables to download local device recordings
- Choose RFID stickers with large antenna, since device suppresses the signal

WHAT NEXT

- 120+TB of videos
- AI models?
- Voice models?
- People detection?
- Comparisons?
- Others?

Come talk with us

THE PROJECT

- https://evideo.bg/
- Is OpenSource
- Available in GIT

https://git.egov.bg/meu/videonabludenie/3-01.03.2023

Q/A?

Feedback Please ;)

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Come have fun with us