

# RIPE



Keeping state election infrastructure safe: How Cloudflare and local IXP connectivity helped a small country in Europe

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# About me

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- Programmer by heart
- 7 years ago was asked to be part of the Computer center on the Faculty for Computer Science and Engineering (FCSE)
- Experience in networking for 10+ years
- Started exploring the RIPE Atlas project years ago – RIPE Atlas Ambassador
- Created IXP.mk last year (July 2018) as the first IXP in Macedonia



# The problem

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- Initial idea started before RIPE SEE4 (Belgrade 2015)
- Previous idea the “famous” MATRIX project – dead in the water for years.
- The faculty has good cooperation with major ISP
- December 2016 – FCSE starts the project “Research platform (testbed) for high availability internet connections”, - multy year project for cooperation and research of possible ways to improve connectivity to between major ISP and University networks
- December 2016 – First meeting with help from RIPE/ISOC for getting key players on board
- 2017 – Work on the initiative
- 2018 – IXP momentum emerges and IXP.mk is officially born



# Initial ideas for the Election Info system

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- Use IXP.mk to allow almost unlimited bandwidth for Macedonian ISPs (minimal connectivity is 1G per ISP) which will feed info into the Election system
- (Try to) Use Cloudflare for “international” access via a special dedicated link (initial link was 300Mbit and service was not stable)
- Virtualize all servers



# Cloudflare steps in

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- We contacted Cloudflare since they have project “Athenian” which allows election committees to use the service for free
- Although the service was designed for USA – we got on boarded in less than 24h
- We started to experiment and saw problem we need to resolve in the Election Information system with the vendor producing the system



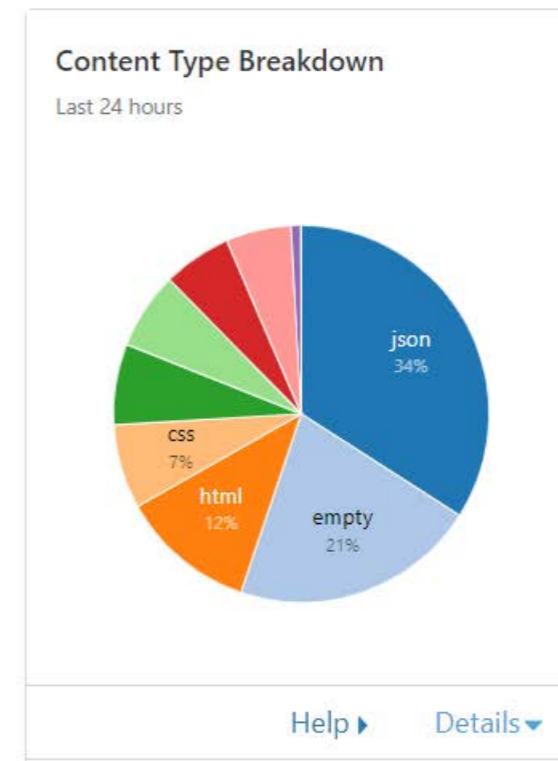
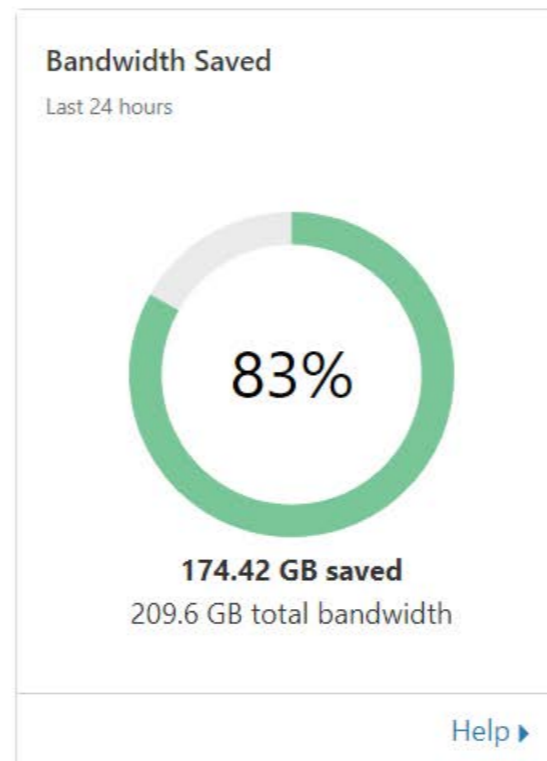
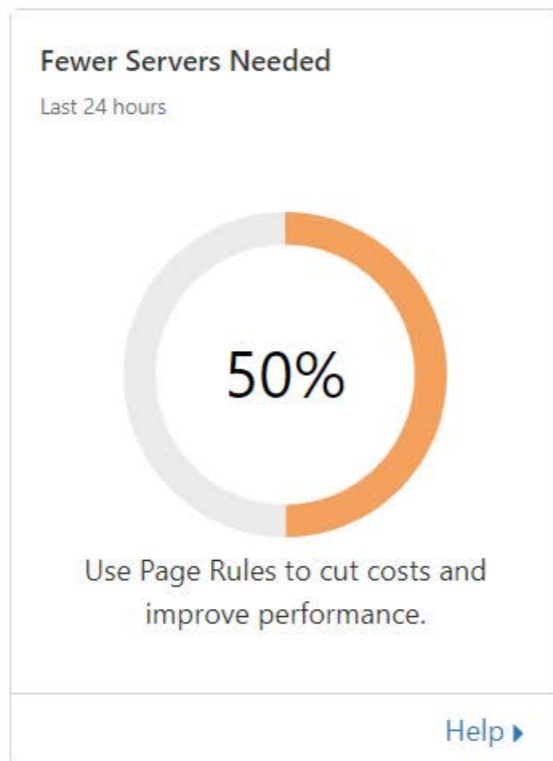
# Redesign of the Election Information system

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- Application was monolithic – One Application server and One Database server;
- Cloudflare caching was useless since the whole HTML needed to be rebuild every 5 minutes
- Application was split into modular architecture – with dynamic data as JSON file per electoral region (around 4000 JSON files)



# Results



# Results

| Type              | Requests  |
|-------------------|-----------|
| json              | 6,401,040 |
| empty             | 3,974,729 |
| html              | 2,182,641 |
| css               | 1,360,099 |
| javascript        | 1,302,801 |
| jpeg              | 1,243,632 |
| png               | 1,108,576 |
| other             | 1,055,482 |
| svg               | 158,764   |
| gif               | 1,847     |
| plain             | 968       |
| xml               | 19        |
| x-shockwave-flash | 5         |

## Top Traffic Countries / Regions

Last 24 hours

| Country / Region                           | Traffic    |
|--|------------|
| Macedonia, The Former Yugoslav Republic of | 16,842,095 |
| Germany                                    | 348,995    |
| United States                              | 156,869    |
| Switzerland                                | 154,875    |
| Slovenia                                   | 104,164    |





# Results

## Requests Through Cloudflare

### Total Requests

Last 24 hours

18,790,603

### Cached Requests

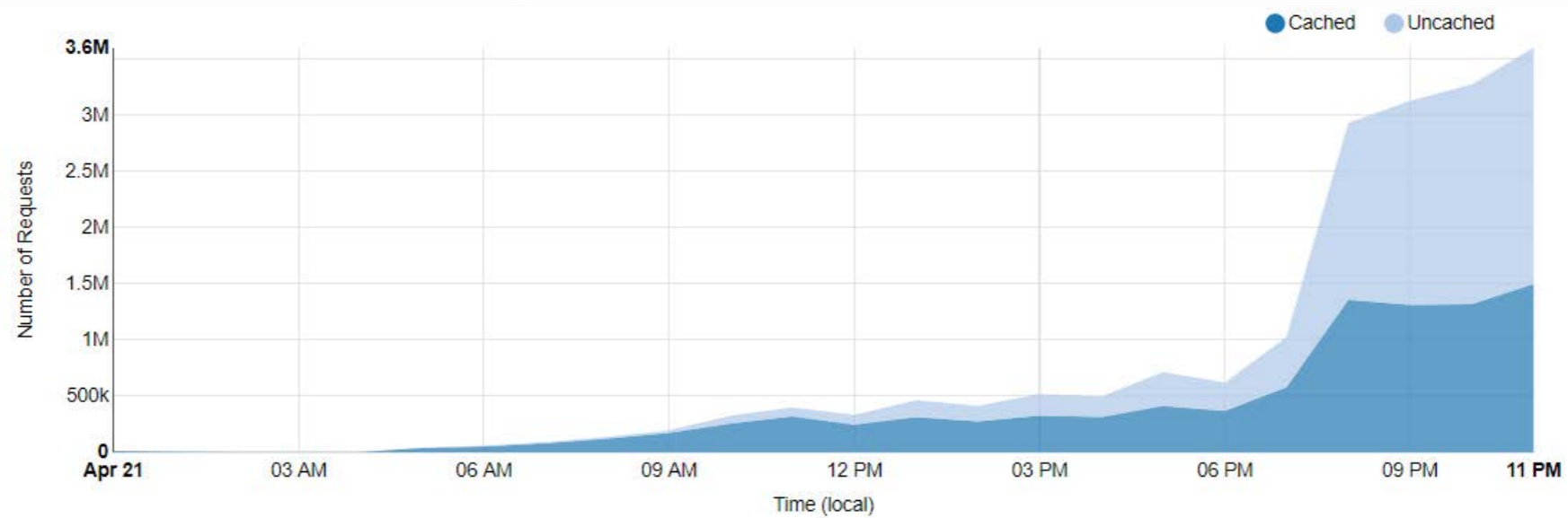
Last 24 hours

9,381,222

### Uncached Requests

Last 24 hours

9,409,381



# Results

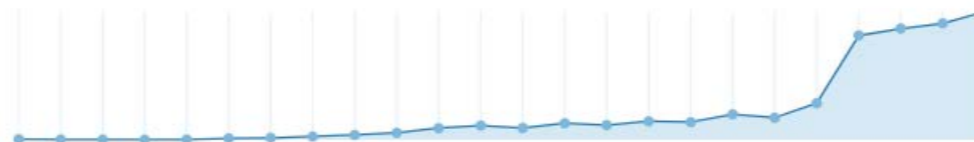
24 Hours 7 Days 30 Days

21 APRIL — 22 APRIL

Unique Visitors  
**83,447**



Total Requests  
**18,790,603**



Percent Cached  
**83.22%**



Total Data Served  
**210 GB**



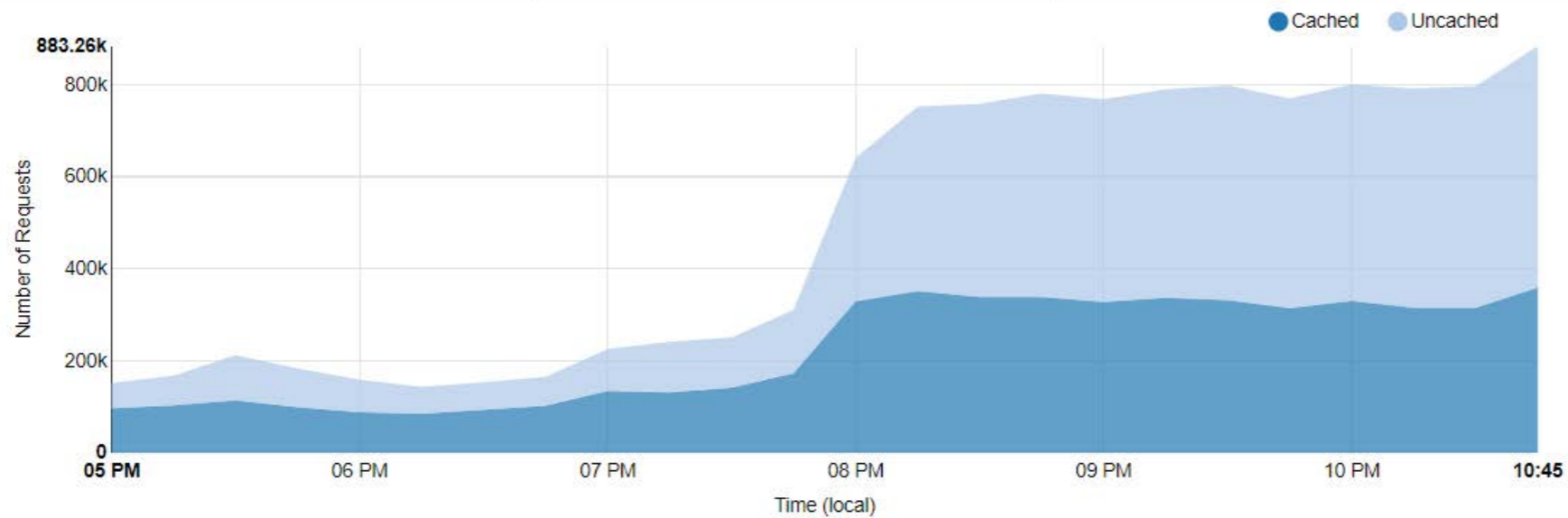
Data Cached  
**174 GB**



# Results (closure of polling booths)

## Requests Through Cloudflare

| Total Requests | Cached Requests | Uncached Requests |
|----------------|-----------------|-------------------|
| Last 6 hours   | Last 6 hours    | Last 6 hours      |
| 11,685,044     | 5,342,982       | 6,342,062         |



# Conclusion

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- Election system was online 100%
- Input od result data was going over the IXP so it was independent of ISP uplink and ISP connectivity
- All DDOS attacks where stopped by Cloudflare and the link never went over 100 Mbit
- Trust into the Election system



# Future work

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- Get more ISP to come to IXP.mk
- Get CDN into IXP.mk (Google? Facebook? Akamai? Others?)
- Get root dns server instances
- IXP.mk is ready – we have new Quanta switches (thanks ISOC) we have 10G and 40G optics (thanks Flexoptix) we are running Ixpmanager 5.3.0 (updated over the weekend)



Connect with us – <http://ixp.mk>

# Questions?



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