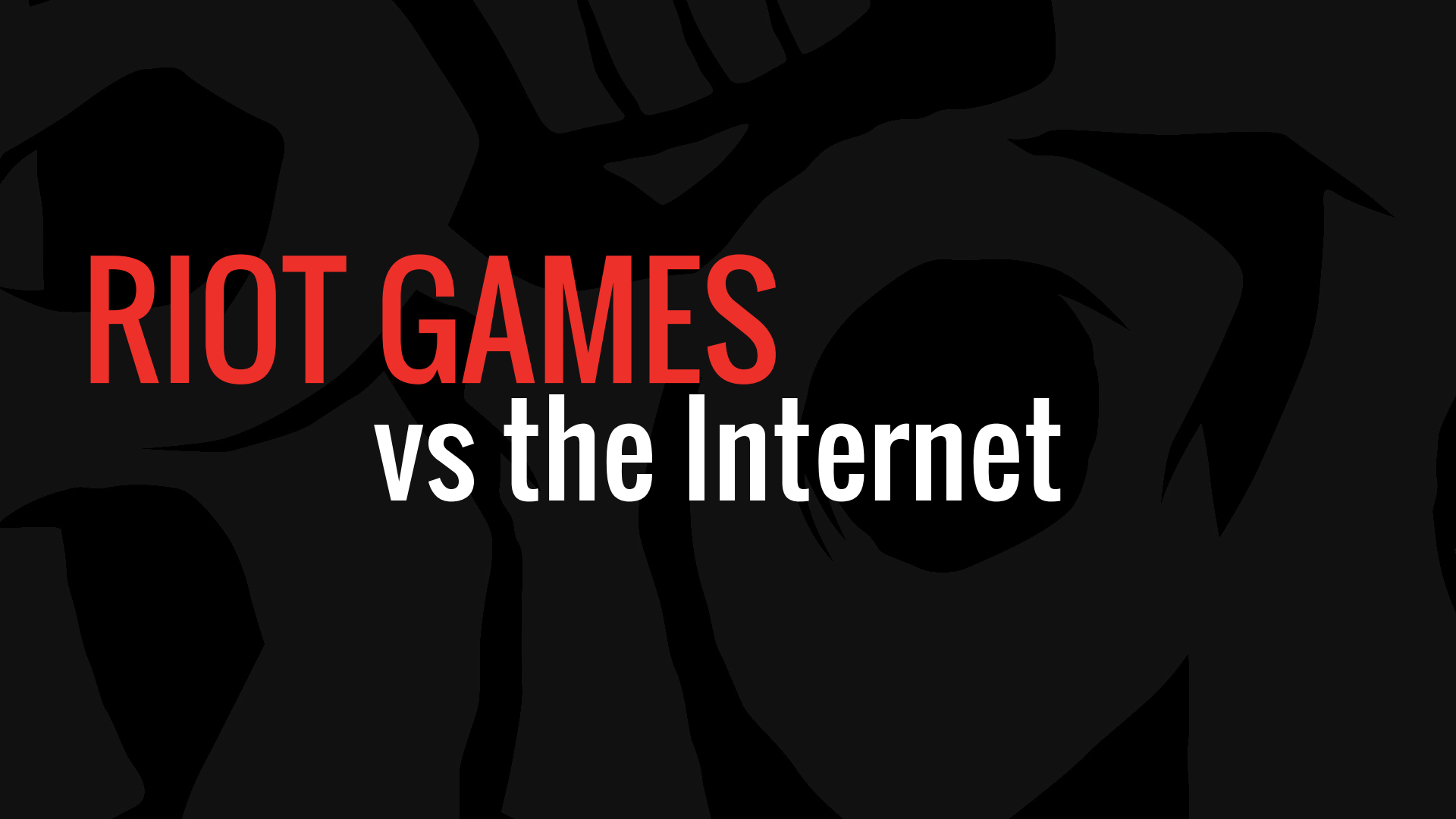
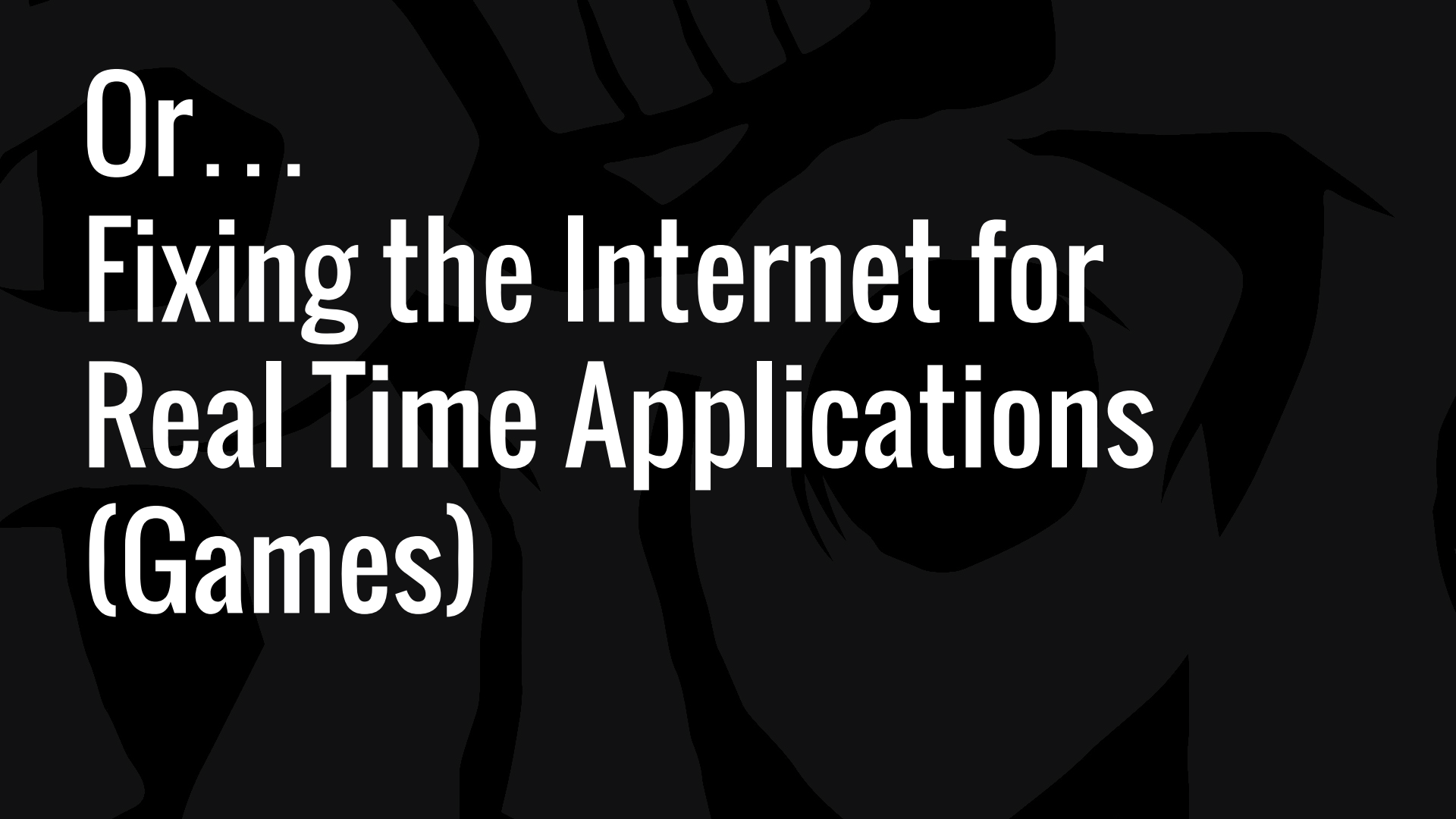

RIOT GAMES
vs the Internet


Or…
Fixing the Internet for
Real Time Applications
(Games)

WHO IS RIOT GAMES


LEAGUE OF LEGENDS

OUR MISSION

WE ASPIRE TO BE THE MOST PLAYER FOCUSED GAME COMPANY IN THE WORLD



THE RIOT MANIFESTO

- PLAYER EXPERIENCE FIRST
- CHALLENGE CONVENTION
- FOCUS ON TALENT AND TEAM
- TAKE PLAY SERIOUSLY
- STAY HUNGRY, STAY HUMBLE

What is the Problem?

For players it’s all about:

Consistency and Fairness

Internet Treatment of Game Traffic

Standard Web Packet - 1500 bytes





Standard Game Packets - 50 bytes (approx)





Latency matters, Jitter matters

- In real time latency is key, buffering is not an option
  - Higher latency (up to a point) is manageable
  - Break points at 60/80/100ms (for example)

- Jitter is a huge problem
  - Varying latency is unplayable
  - Always seems to happen at worst time possible

The Real Problem?

The Rest of the Internet



Riot versus the Internet?

- Internet traffic is dominated by:
  - Netflix, YouTube
  - Facebook, Instagram
  - Google, etc.
- Throughput and bandwidth is key rather than latency
- ISPs and network providers optimize appropriately

Conclusion: key needs of real time applications are almost incidental


What's a Riot Engineer to do?

Riot Direct

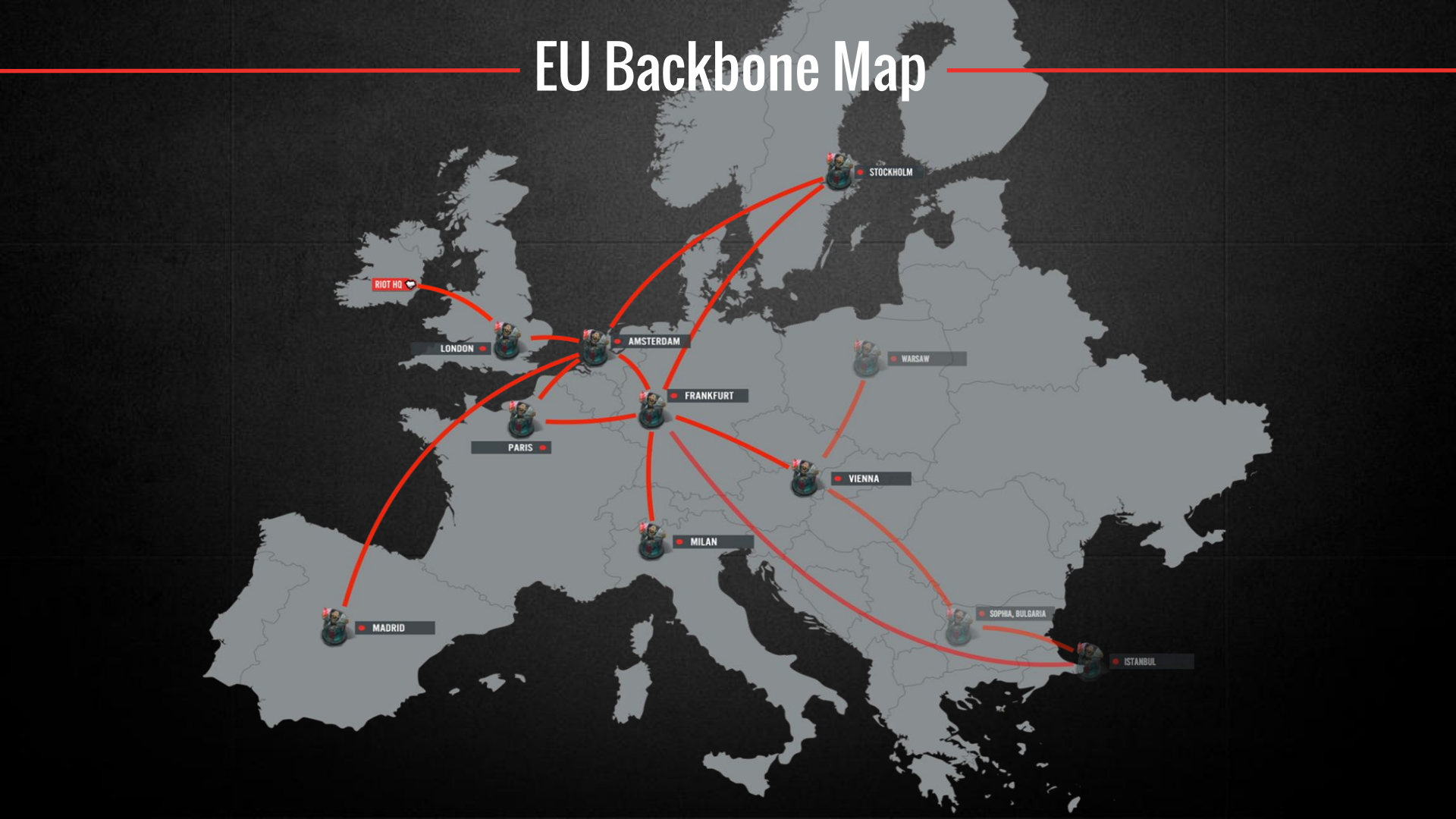
Riot Direct Objectives for Players

- Reduce Latency
- Minimize Jitter
- Minimize Packet Loss
- Mitigate DDoS attacks

Riot Direct Approach

- Server location (EUW and NA moves)
- Build out physical infrastructure (backbone)
- Optimize Traffic Routing
- Peer with ISPs and Transit Providers directly

EU Backbone Map





How does all that happen?

Lots of:

- Phone calls
- Analysis
- Negotiation
- Configuration
- Tuning

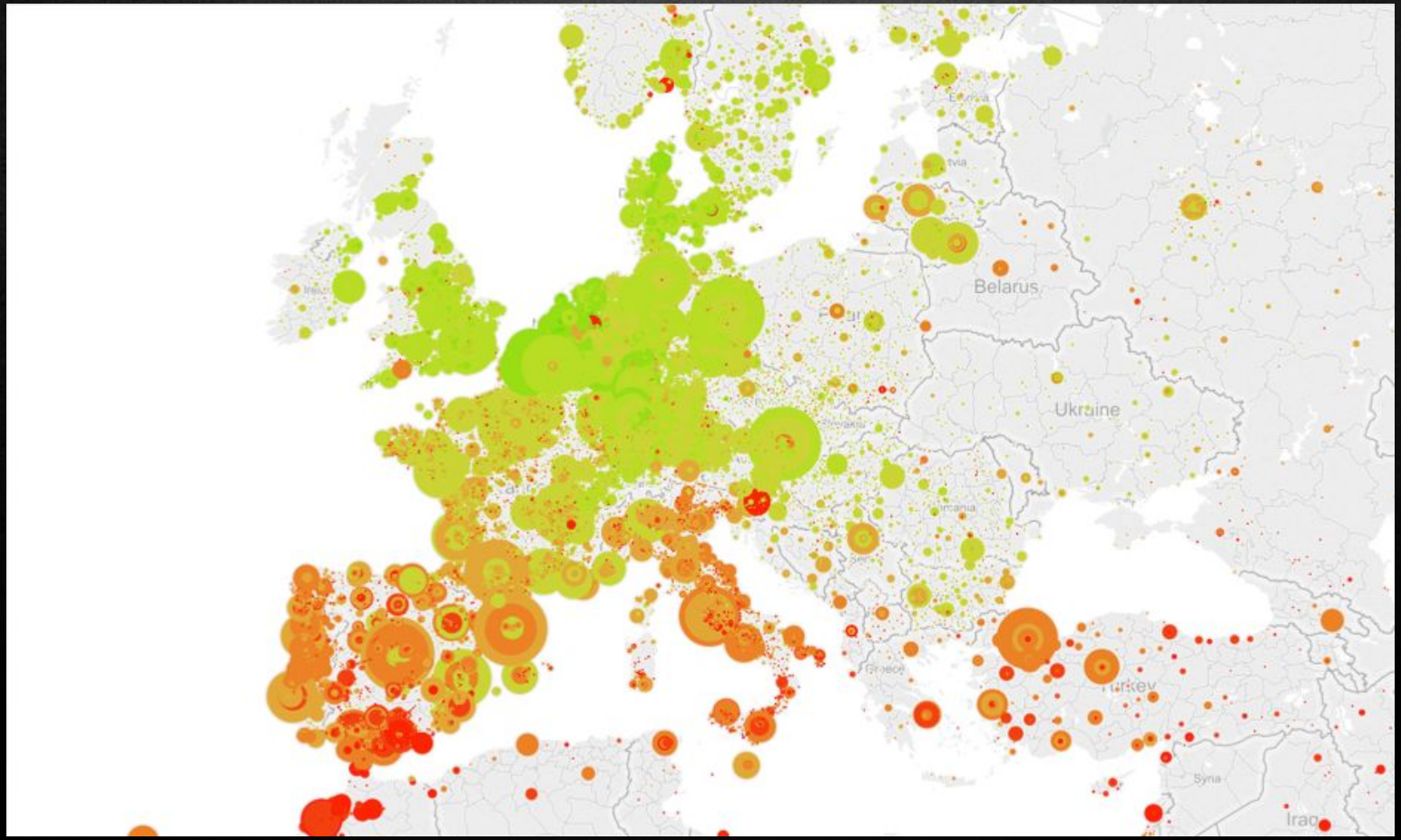
Worldwide Backbone Map



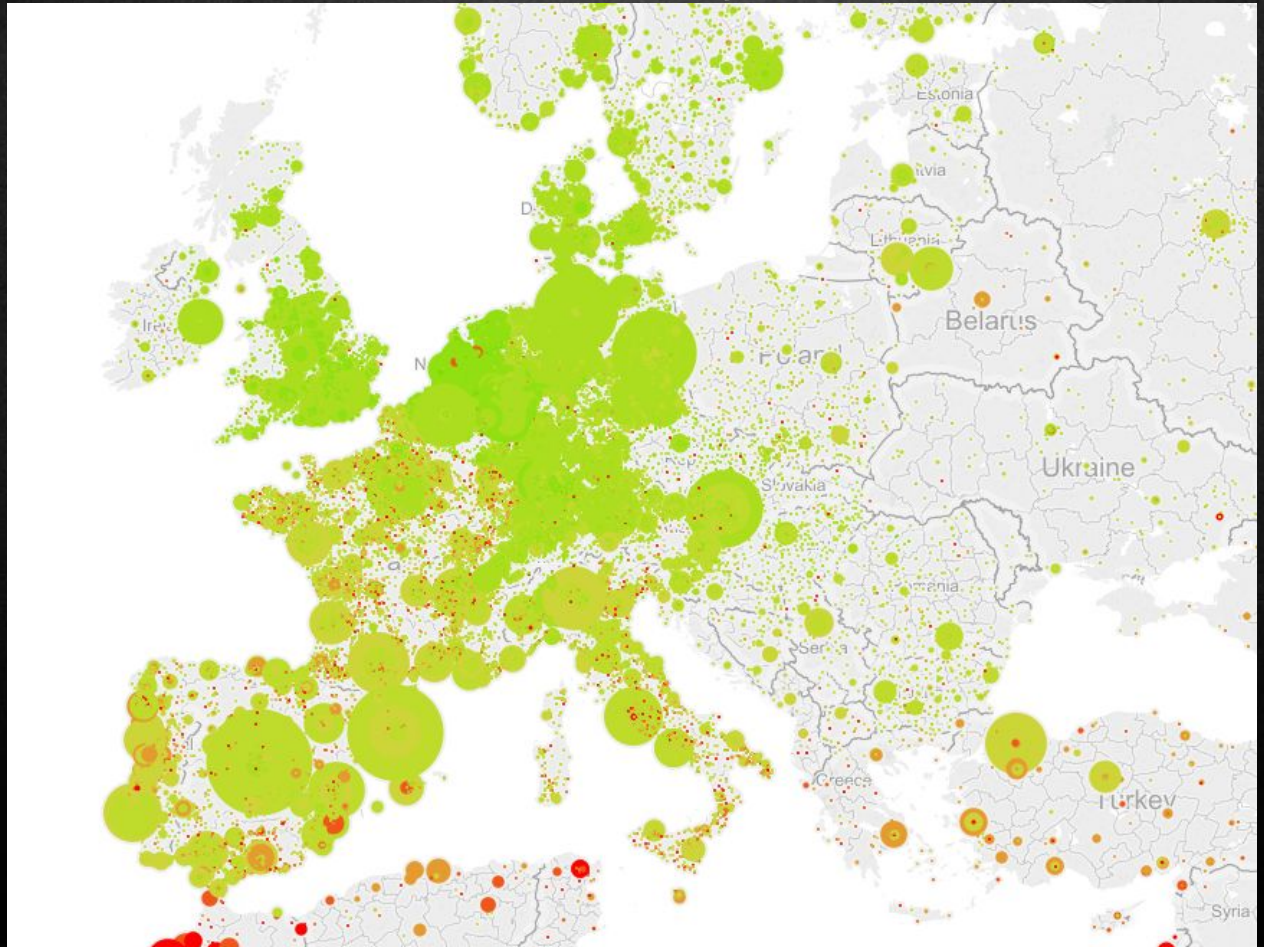


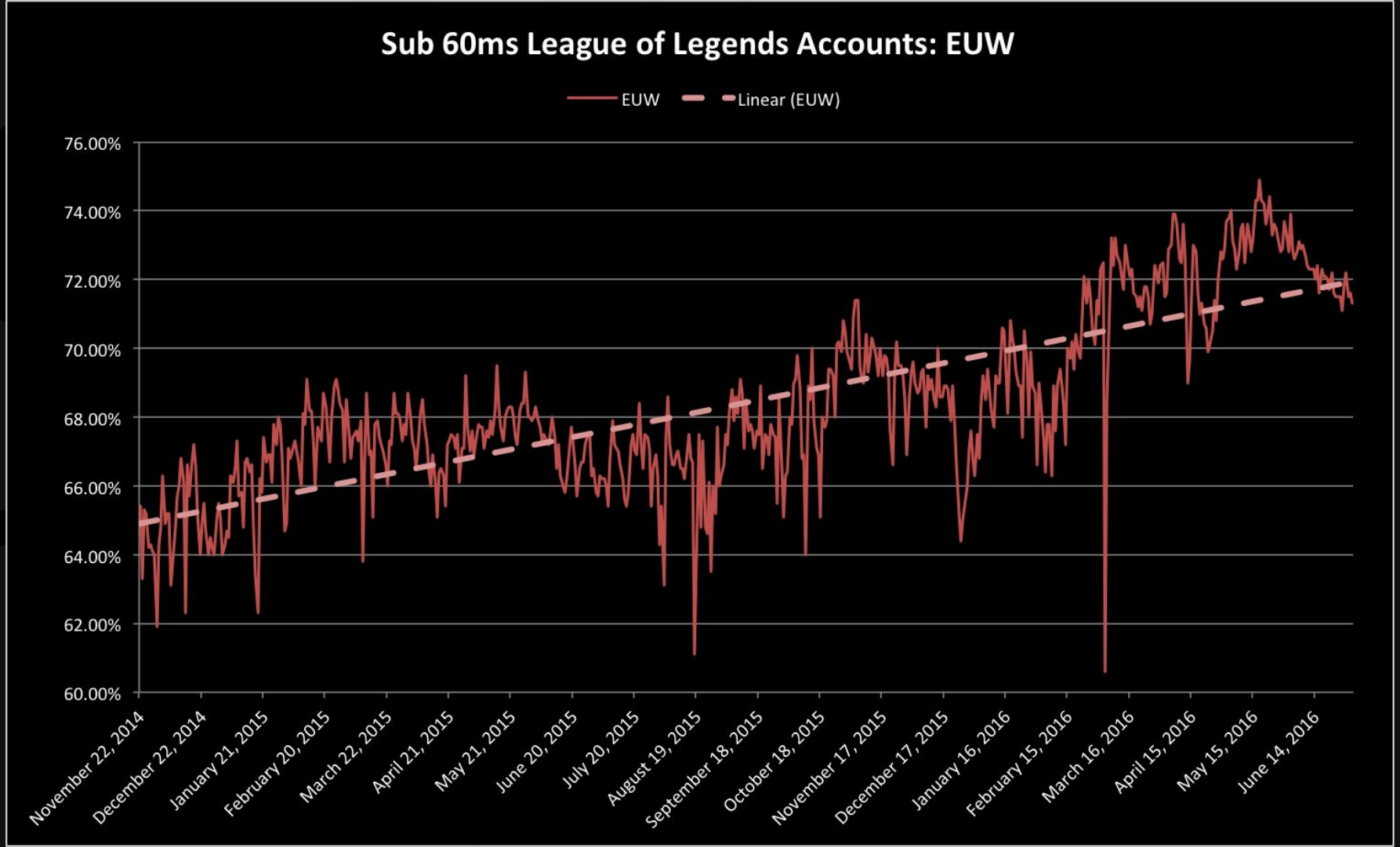
The Impact in Europe

EUW Circa 2014

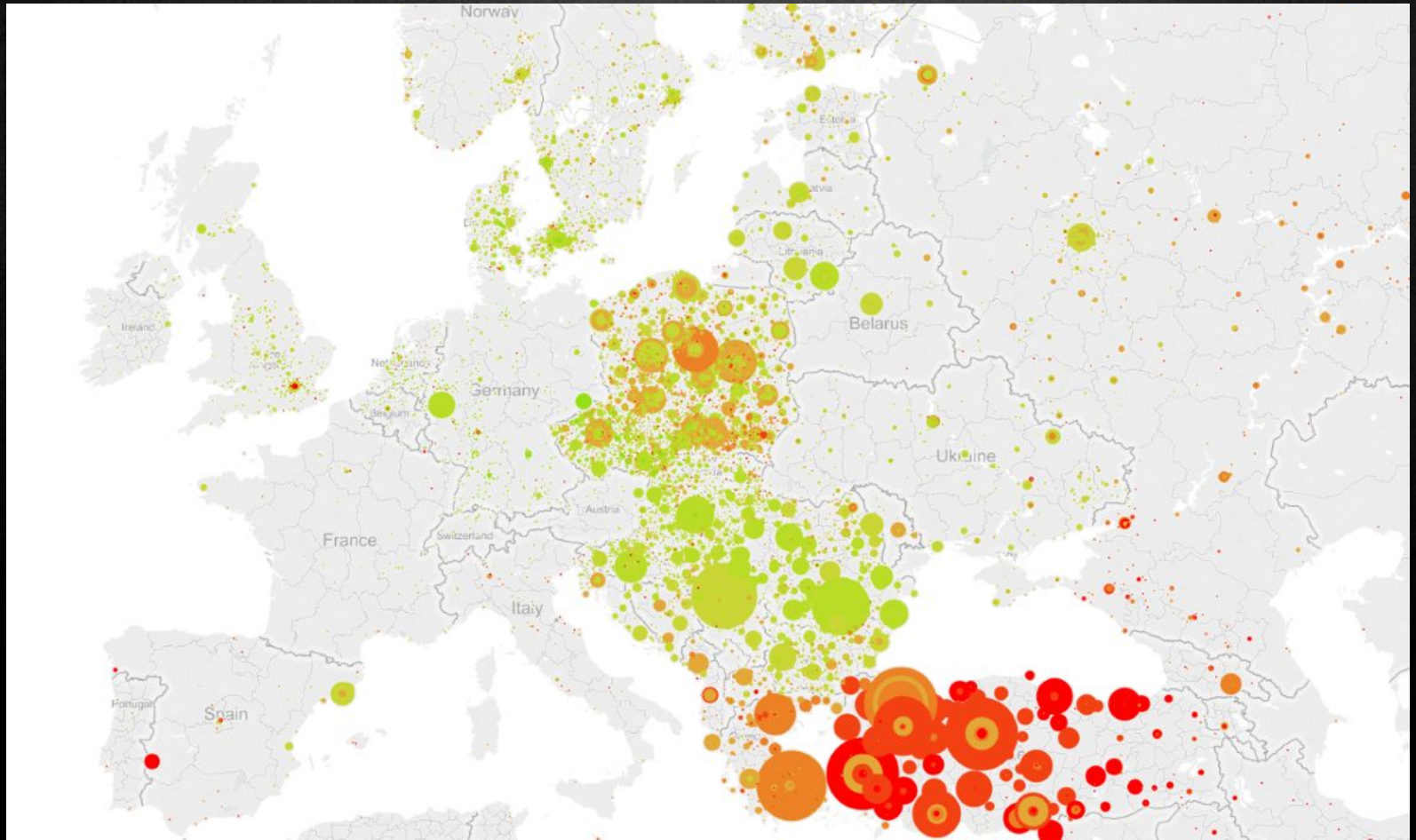


EUW Now (May 2016)

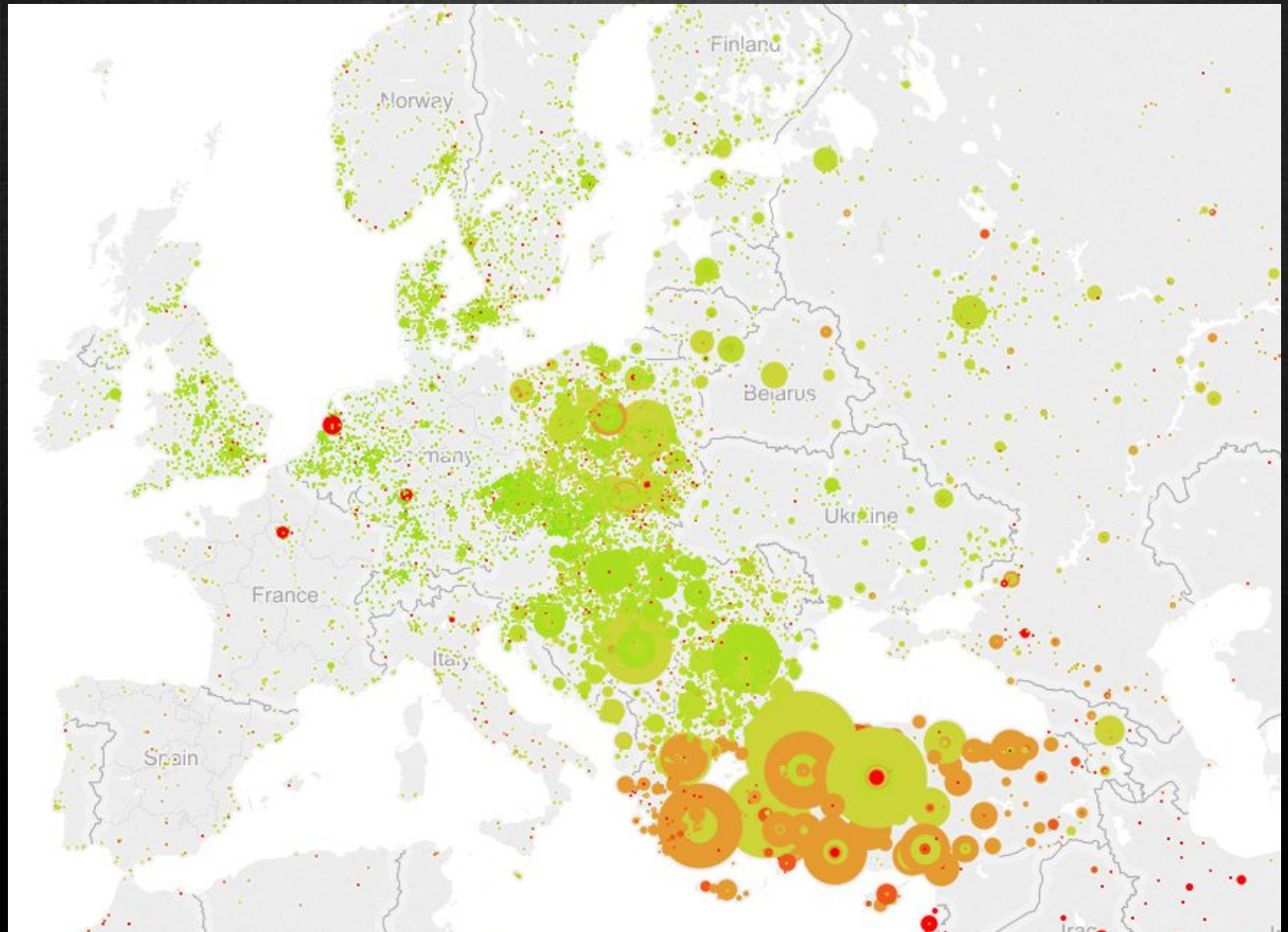



Sub 60ms League of Legends Accounts: EUW
EUW
Linear (EUW)
76.00%
74.00%
72.00%
70.00%
68.00%
66.00%
64.00%
62.00%
60.00%
November 22, 2014
December 22, 2014
January 21, 2015
February 20, 2015
March 22, 2015
April 21, 2015
May 21, 2015
June 20, 2015
July 20, 2015
August 19, 2015
September 18, 2015
October 18, 2015
November 17, 2015
December 17, 2015
January 16, 2016
February 15, 2016
March 16, 2016
April 15, 2016
May 15, 2016
June 14, 2016

EUNE Circa 2014

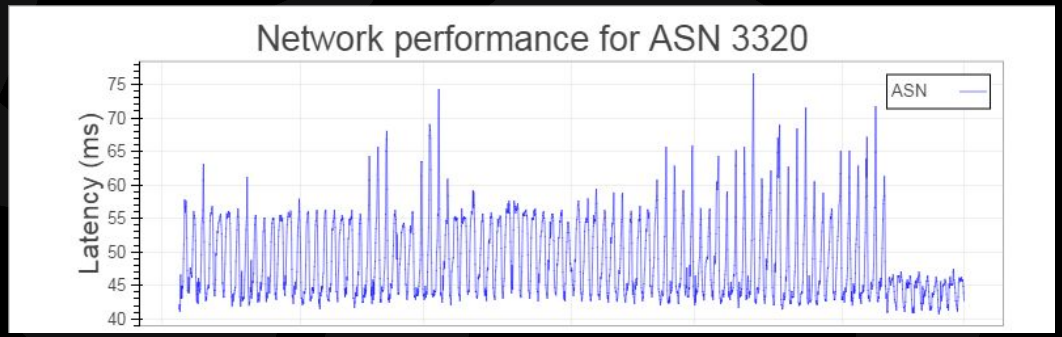


EUNE Now (May 2016)

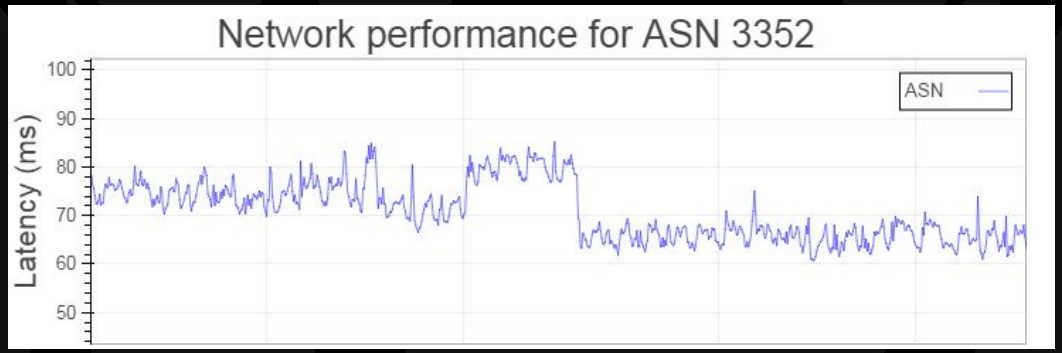


DTAG and Telefonica

Deutsche Telekom (ASN:3320)

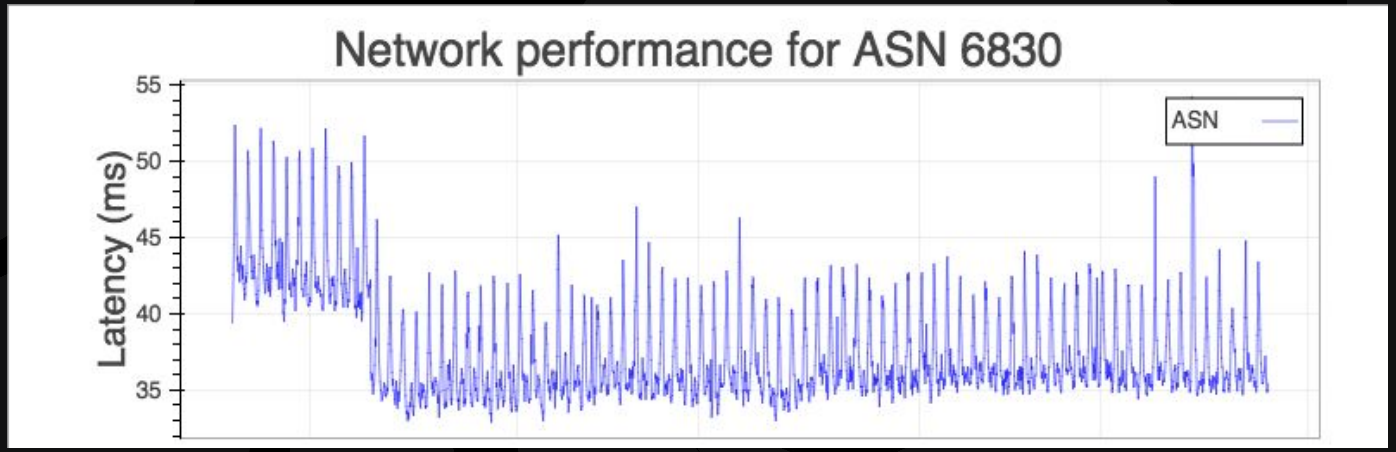


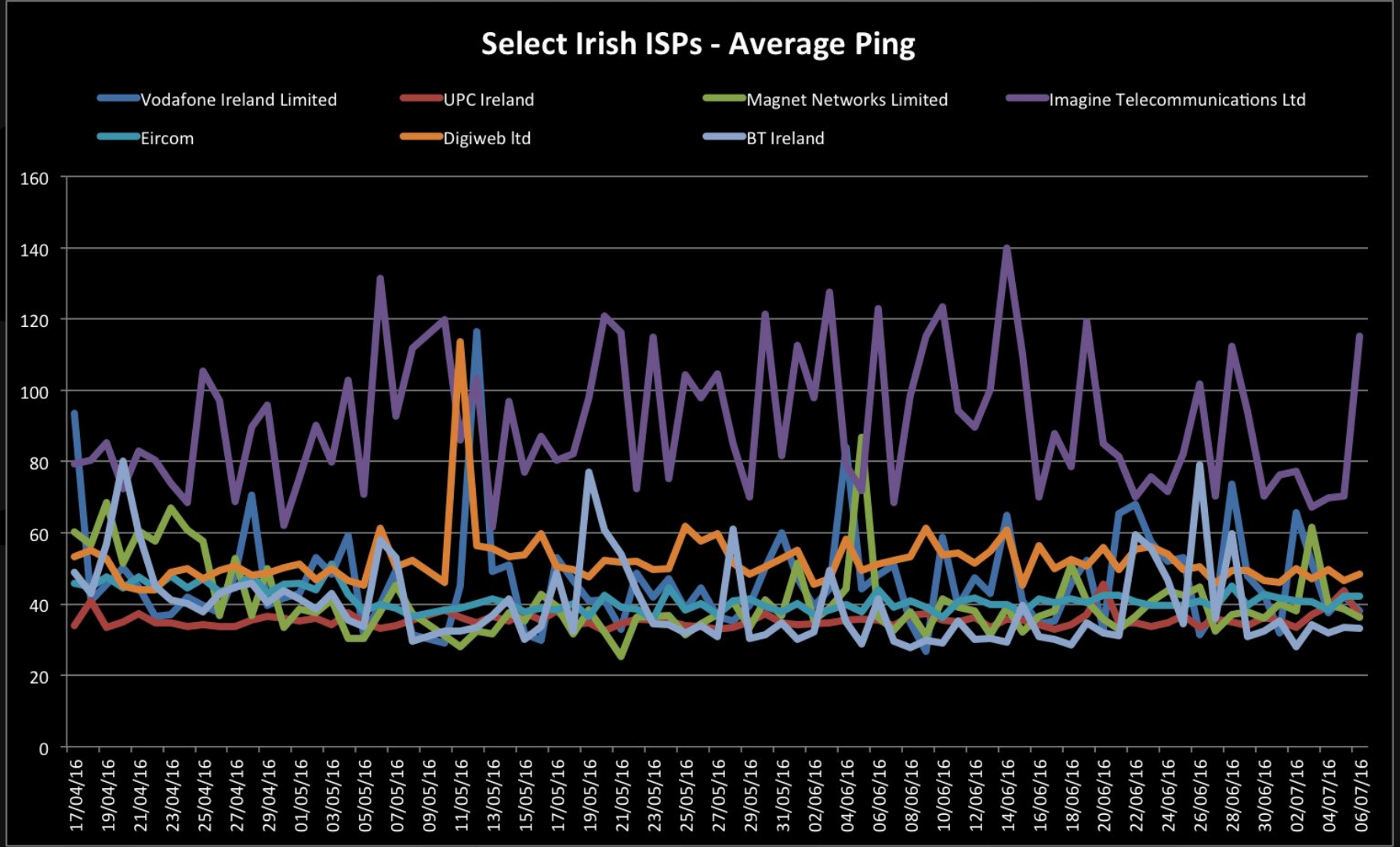
Telefonica Espana (ASN:3352)



Really Local - My ISP

UPC Ireland (ASN:6830)




Select Irish ISPs - Average Ping
Vodafone Ireland Limited
UPC Ireland
Magnet Networks Limited
Imagine Telecommunications Ltd
Eircom
Digiweb ltd
BT Ireland
160
140
120
100
80
60
40
20
0
17/04/16
19/04/16
21/04/16
23/04/16
25/04/16
27/04/16
29/04/16
01/05/16
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06/07/16

The Future

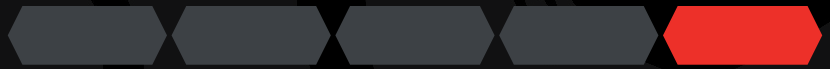
MOAR!

- More interconnect
- More analysis
- More peering
- More tuning

Innovation

- Software Defined Networking (SDN)
- Better equipment, better data insights
- More games
- Open platform?

Q&A




PC방!
We're
Hiring!