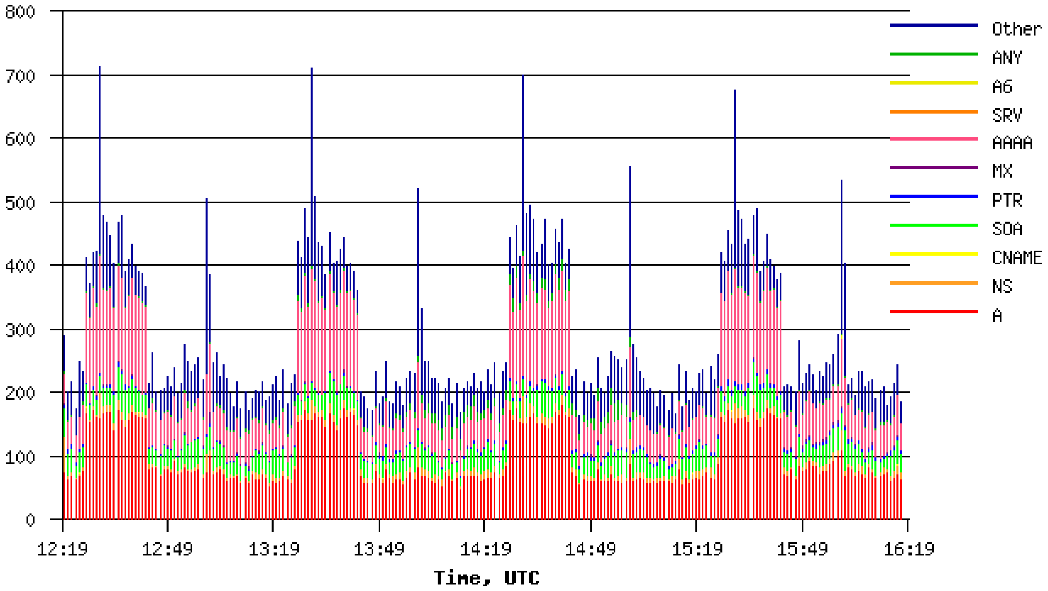
Monitoring DNS with open-source solutions

Felipe Espinoza - Javier Bustos-Jiménez
NIC Chile Research Labs

How is DNS Monitored?

- Pre-Aggregated Data:
  - DNS Statistics Collector (DSC)
    - QTYPE
    - OPCODE
    - RCODE
    - …
  - DNS-STATS
- Disaggregated Data:
  - ENTRADA
    - Transfer pcap files
    - Hadoop Cluster for processing



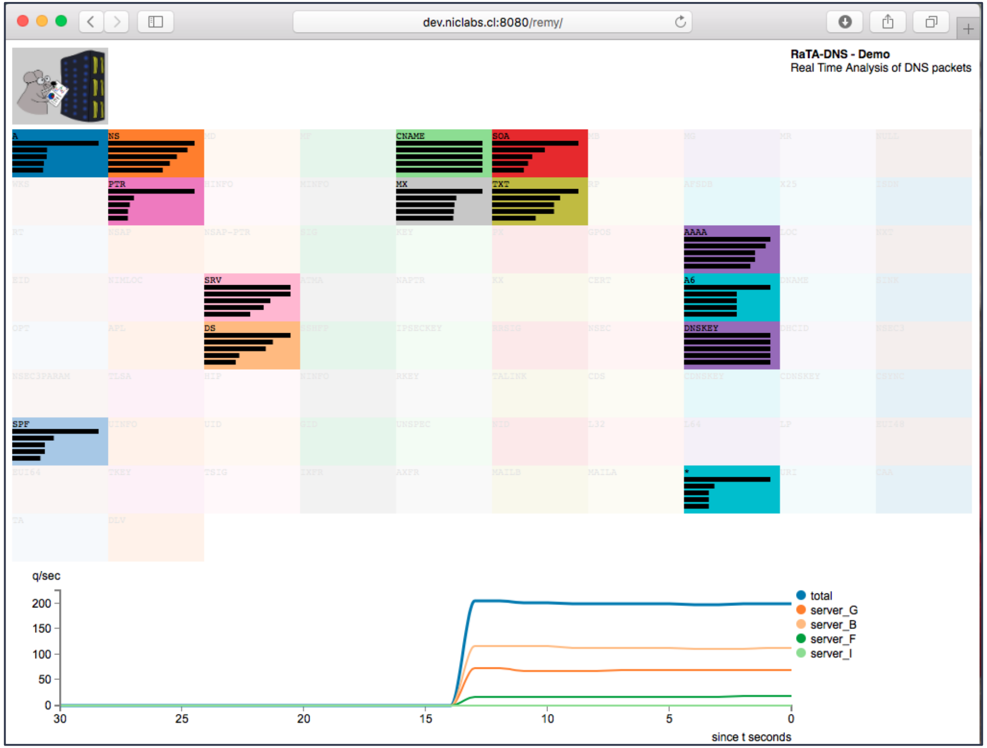
First Try: Develop our own solution

We developed RaTA DNS (Real Time Analysis of DNS packets)

- Capture and reduce information.
- Transfer results over REDIS Queue.
- Show the information on our own presenter.

Were we reinventing the wheel?

Fun fact: dnsadmins didn't liked it because the visual interface was too much white and clean.



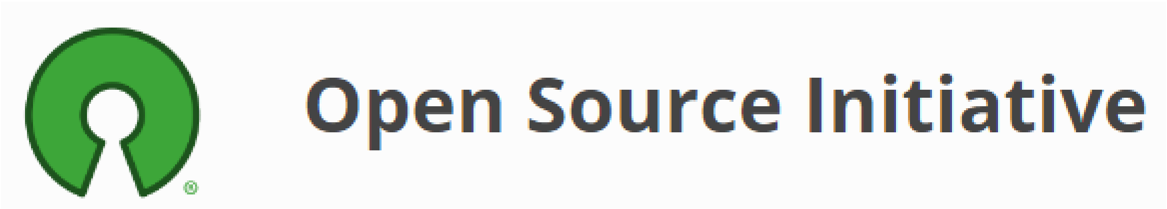
dev.niclabs.cl:8080/remy/

RaTA-DNS - Demo
Real Time Analysis of DNS packets

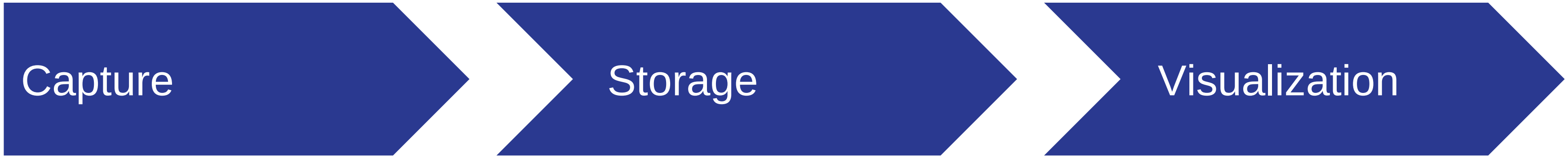
A	NS	MD	MF	CNAME	SOA	MB	MG	MR	NULL
WKS	PTR	HINFO	MINFO	MX	TXT	RP	AFSDB	X25	ISDN
RT	NSAP	NSAP-PTR	SIG	KEY	PX	GPOS	AAAA	LOC	NXT
EID	NIMLOC	SRV	ATMA	NAPTR	KX	CERT	A6	DNAME	SINK
OPT	APL	DS	SSHFP	IPSECKEY	RRSIG	NSEC	DNSKEY	DHCID	NSEC3
NSEC3PARAM	TLSA	HIP	NINFO	RKEY	TALINK	CDS	CDNSKEY	CDNSKEY	CSYNC
SPF	UINFO	UID	GID	UNSPEC	NID	L32	L64	LP	EUI48
EUI64	TKEY	TSIG	IXFR	AXFR	MAILB	MAILA	*	URI	CAA
TA	DLV								

Second Try: Use Open Source Software

- Instead of developing everything, integrate different open source software.
- Many parts of a monitoring system have already been developed.
- Many of them are used in production.



Tested Software



Capture

- PacketBeat
- Collectd
- Fievel
- DSC
- gopassivedns
- DnsZeppelin

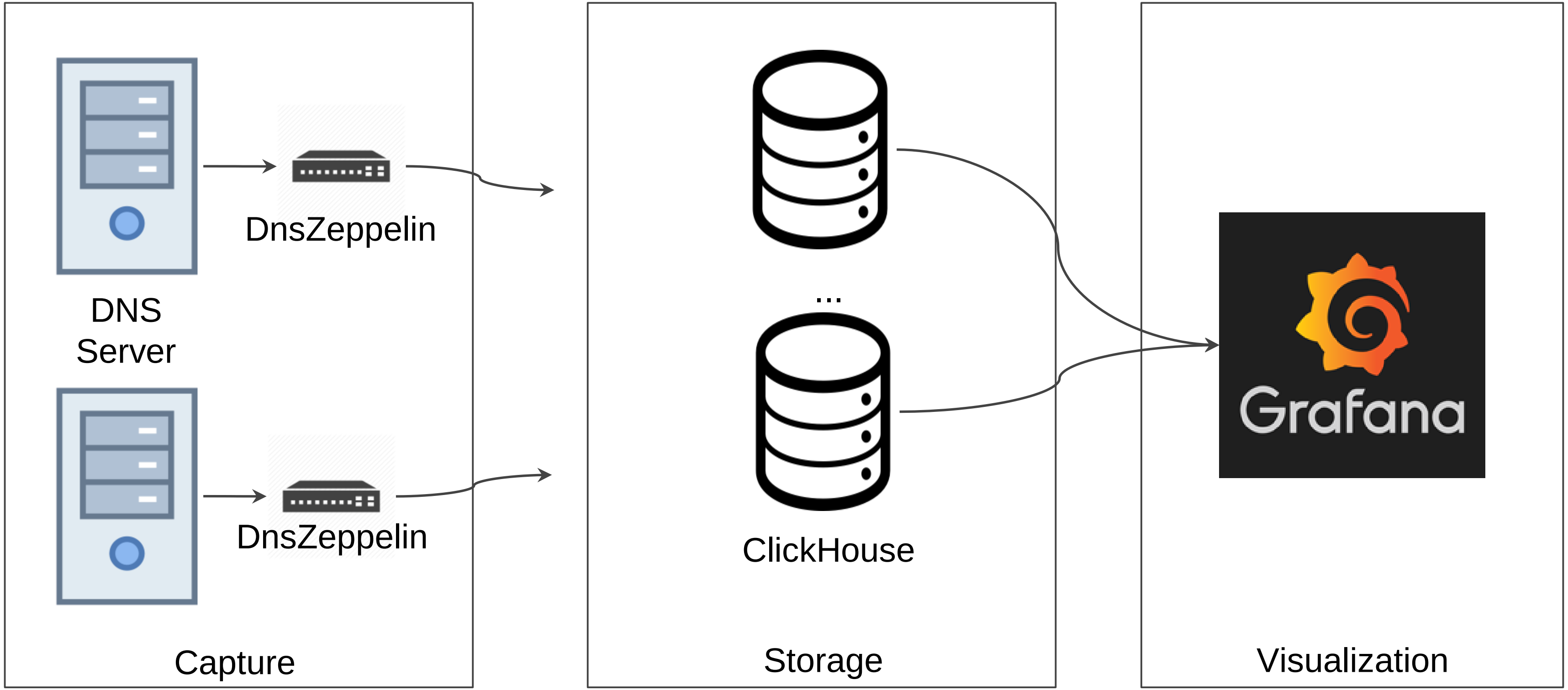
Storage

- Prometheus
- Druid
- ClickHouse
- InfluxDB
- ElasticSearch
- OpenTSDB

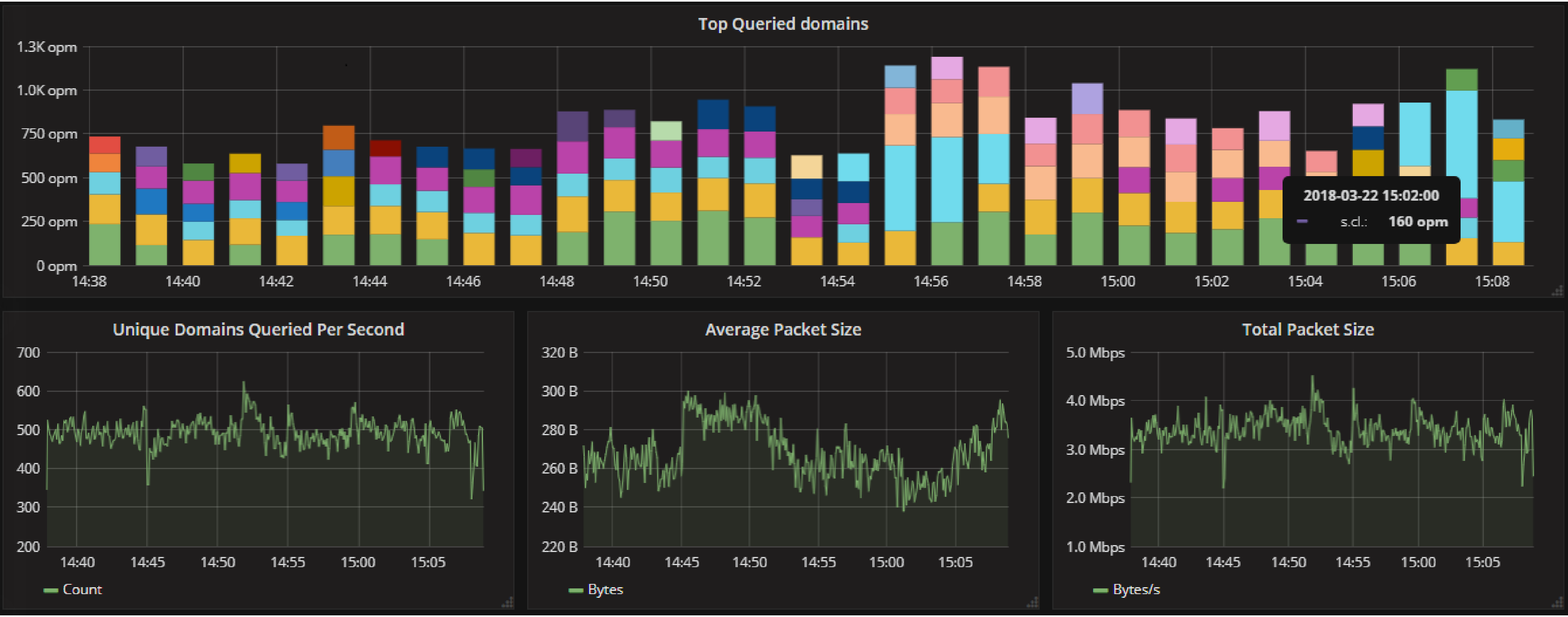
Visualization

- Kibana
- Grafana
- Graphite

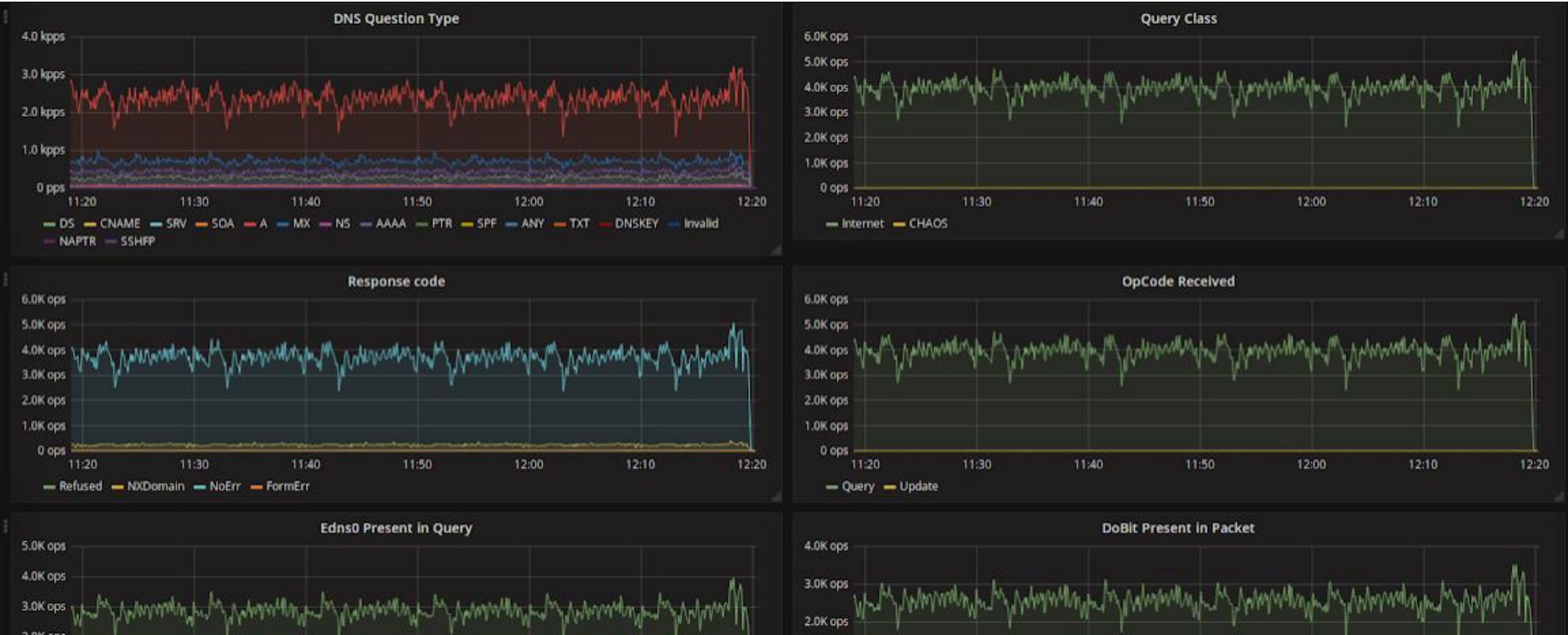
Architecture



Grafana Panel



Grafana Panel



DNS Question Type

Query Class

Response code

OpCode Received

Edns0 Present in Query

DoBit Present in Packet

Performance

- Single Server Setup:
  - Packets/Second: ~7,000 pps
  - Time running: 24 Hours
  - Total packet count: ~618,000,000
  - Total uncompressed data: 34 GB
  - Total compressed data: 4.7 GB
  - Compressed packet size: ~8.3 Bytes

- Packet Flood:
  - Packets/Second: 120,000 pps
  - Average Database CPU Usage: 30%

Monitoring DNS with open-source solutions

Source code:
https://github.com/niclabs/dnszeppelin-clickhouse

Felipe Espinoza - fdns@niclabs.cl
Javier Bustos - jbustos@niclabs.cl