NNTSC: A Storage Backend for Network Measurements

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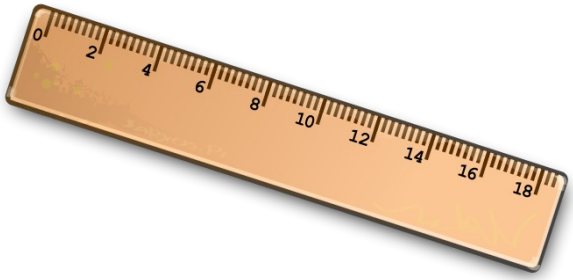
Network Measurement Eco-System

My cool new measurement tool



Network Measurement Eco-System

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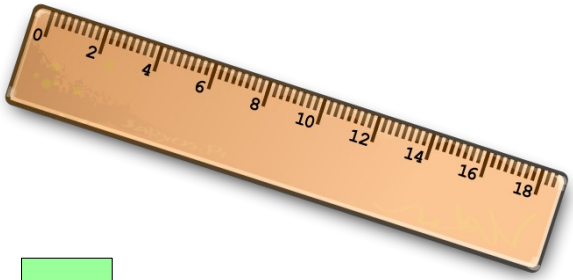
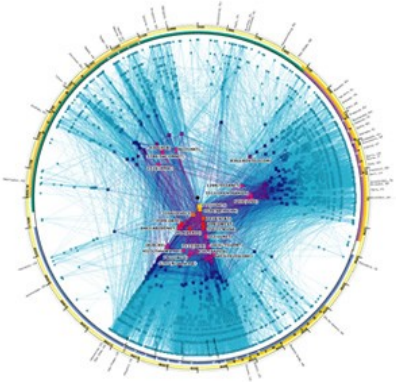


Scheduling

Data Storage

Accessibility

Visualisation



Motivation

- Creating the whole eco-system takes time and skill

- Instead, prototypes get released so we end up with:
  - User-unfriendly tools
  - Lack of scalability
  - No maintainability

Motivation

- Stop rewriting the whole eco-system from scratch
  - Design systems that we can reuse and extend
  - Refined implementation
  - Standardised deployment
  - Spend more of our time on cool new tools!

- For this talk, I'm only going to focus on storage

The Idea

- Many network measurements are time series
  - Set of common defining parameters
    - Source, target, packet size, protocol, port
  - Regular frequency
  - Result is a series ID + timestamp + value

- Can we build a unified system to store and access any type of time series data?

Design

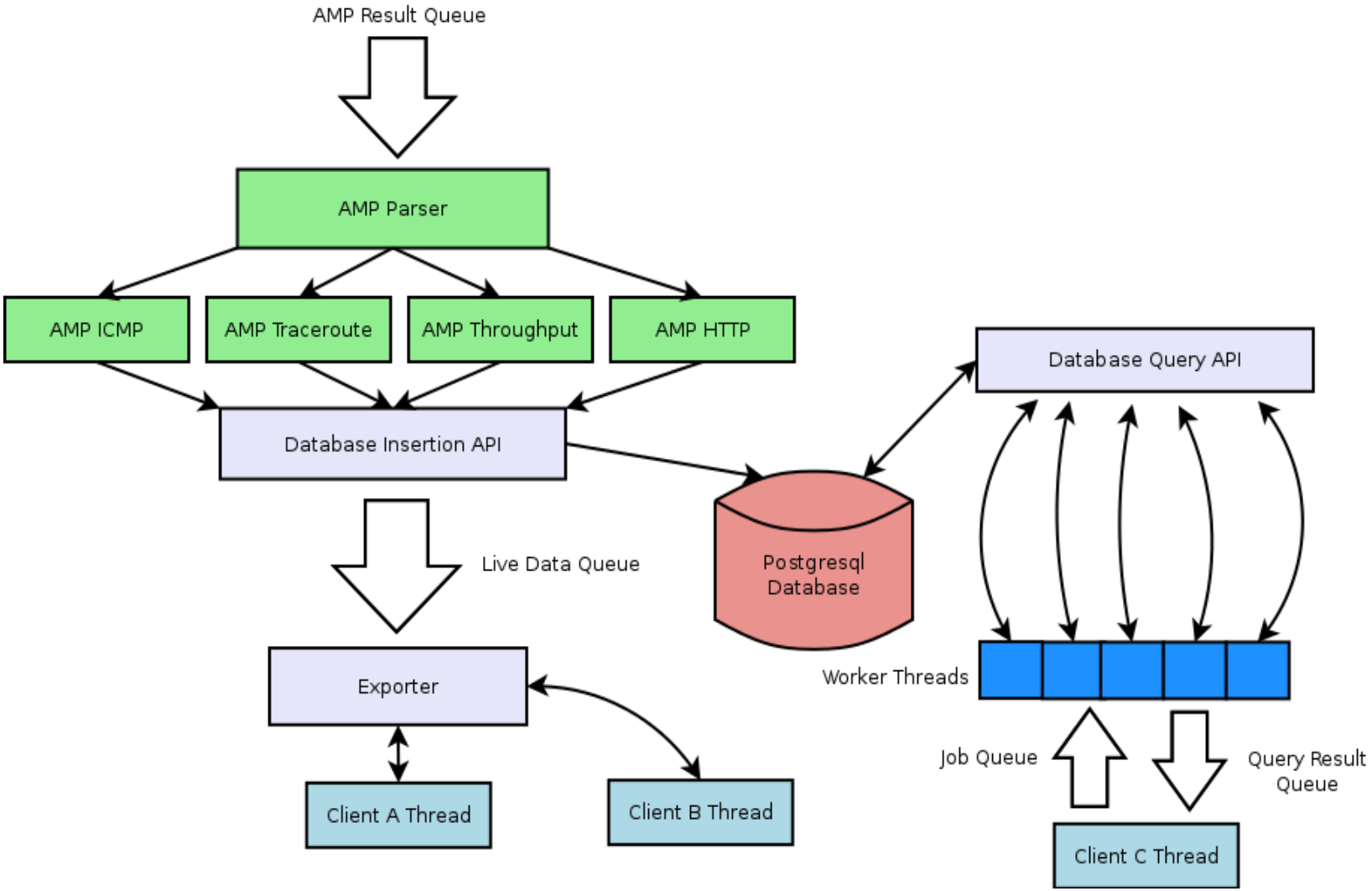
- Develop generic core to handle all common actions
  - Database inserts and queries, client management
  - Wrap around an existing database system
- Modules to define behaviour for specific collections
  - Table structure, result parsing

Design

- Historical data access
  - Static graphs, repeatable analysis, data download
  - Aggregated data vs full resolution data

- Live data access
  - Anomaly detection, streaming graphs
  - Often an afterthought

NNTSC


AMP Result Queue
AMP Parser
AMP ICMP
AMP Traceroute
AMP Throughput
AMP HTTP
Database Insertion API
Database Query API
Live Data Queue
Postgresql Database
Exporter
Worker Threads
Job Queue
Query Result Queue
Client A Thread
Client B Thread
Client C Thread

Databases are Hard

- Important to choose the database backend carefully!
  - We sank a lot of time in solving performance issues
  - Happy to share some war stories later :)

- Better options are available today (probably)
  - Research, don't just fall back to what you know
  - Beware the hype, run your own tests

“Disk Space is Cheap”

- Aim was to store full unaggregated data
  - Contrast with RRD – low resolution historic data
- Buying TBs of new disk space was not the problem
  - Adding more disk to a running system, however...
- Estimate your future disk usage
  - Small storage savings add up over months

Make Sure You Can Scale

- Test and evaluate at scale
  - Many systems look great when you prototype
  - Fall apart as soon as you scale up to production
  - Testing with 1000s of series, months of results

Keep Everything Moving

- Component independence
  - Delays in one component shouldn't block others
  - Think parallel from the start
    - Split tasks amongst CPU cores
  - Use message queues for buffering
    - RabbitMQ is great
    - Python multiprocessing Queues for small jobs

The Best Lesson

- NNTSC works as intended!
  - Easy to extend by adding new collections
  - A core part of our ongoing research projects
    - AMP
    - Network anomaly detection
    - Passive layer-7 statistics
    - Cloud security monitoring