2019 S&T Cybersecurity and Innovation Showcase

Solutions Now I Innovations for the Future

Homeland Security

Science and Technology

HI-CUBE: Hub for Internet Incident Investigation

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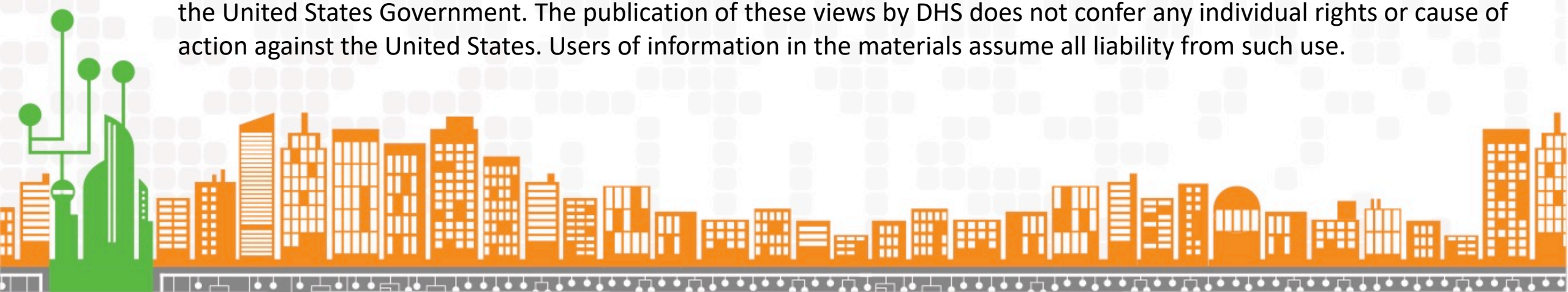
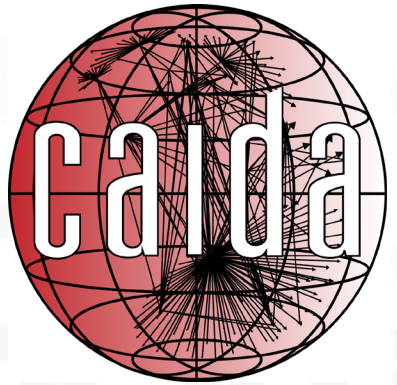


Team Profile

- PI: Dr. KC Claffy – Director
- CoPI: Dr. Alberto Dainotti – Research Scientist
- CAIDA – Center for Applied Internet Data Analysis
  University of California, San Diego



Customer Need

- Large-scale Internet incidents are a major threat to public safety and to both public and private strategic and financial assets
  - *E.g., hijacks, outages, spam and fishing campaigns, botnet activities, scanning, large-scale bug exploitation*
- They are often undetected and hard to understand (dynamics, motivation, infrastructure used, source, target)
- We need timely and effective detection and analysis

Approach - Overview

- A web-based collaborative environment
- with trusted groups of vetted experts
- producing analyses with interactive and visual tools
- based on diverse sets of streamed (and historical) data

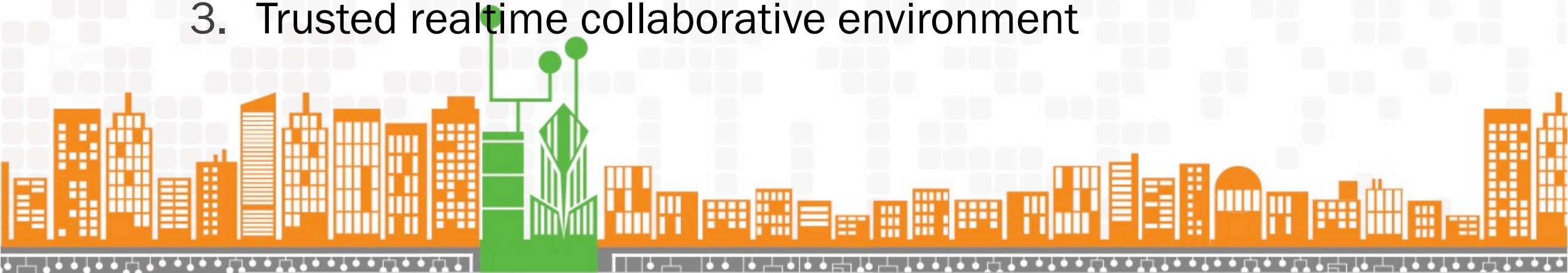
HUB Internet Incident for Investigation

Approach – Main Concepts

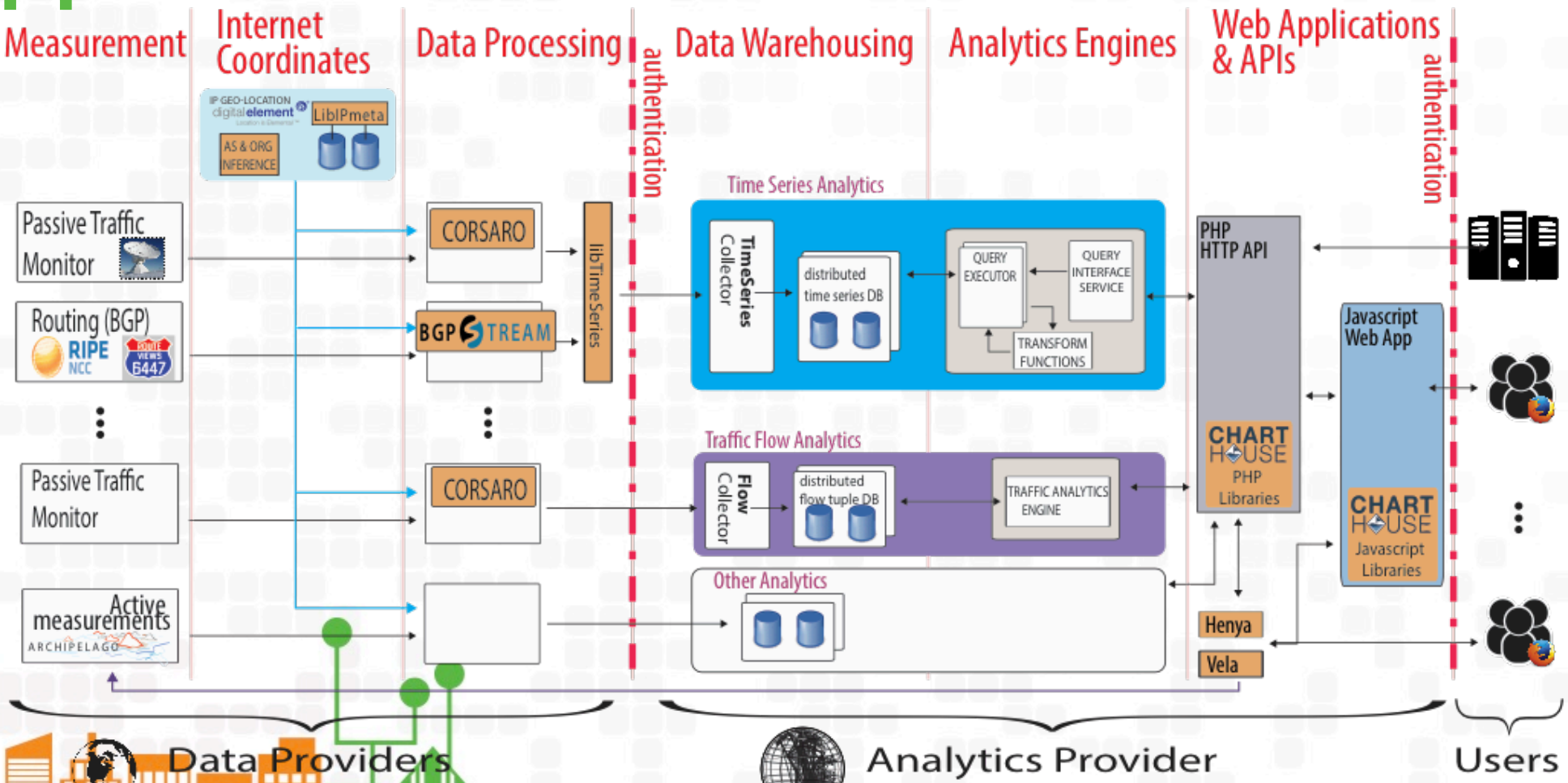
1. Combination and correlation of diverse Internet cyber-security data streams around a set of common dimensions: *time and Internet Coordinates*

2. Data analytics in the form of *interactive exploratory data analysis* and configurable event detection

3. Trusted realtime collaborative environment

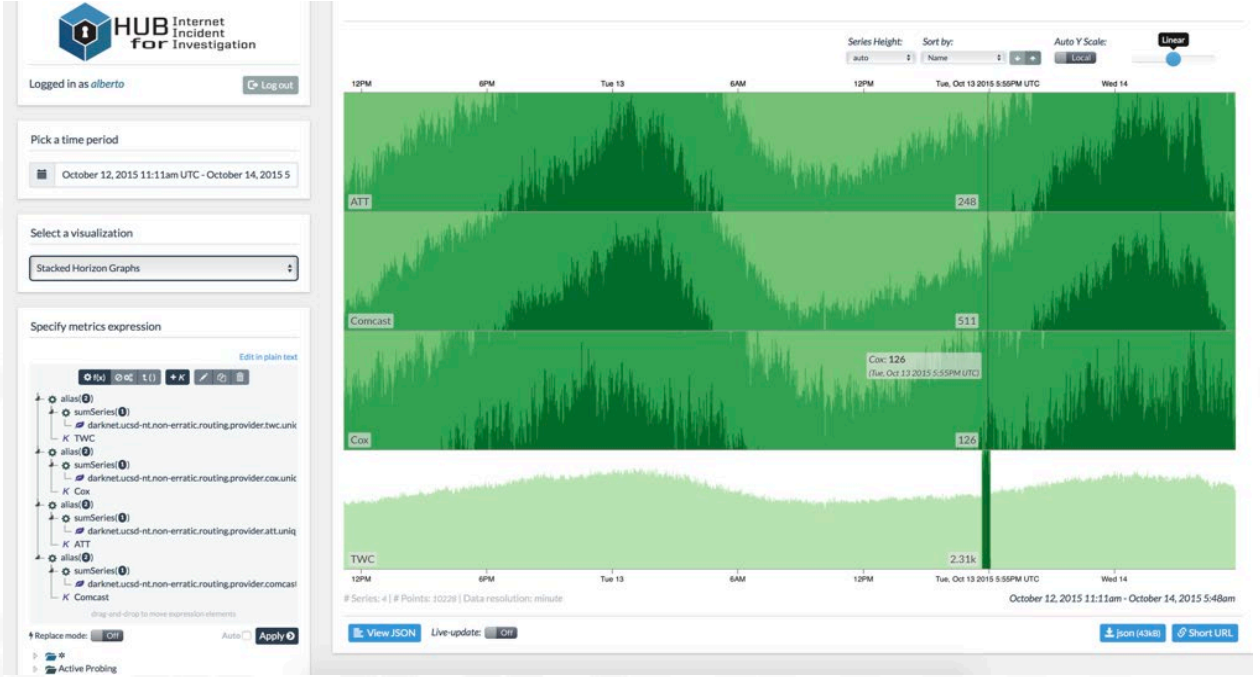


Approach - Architecture



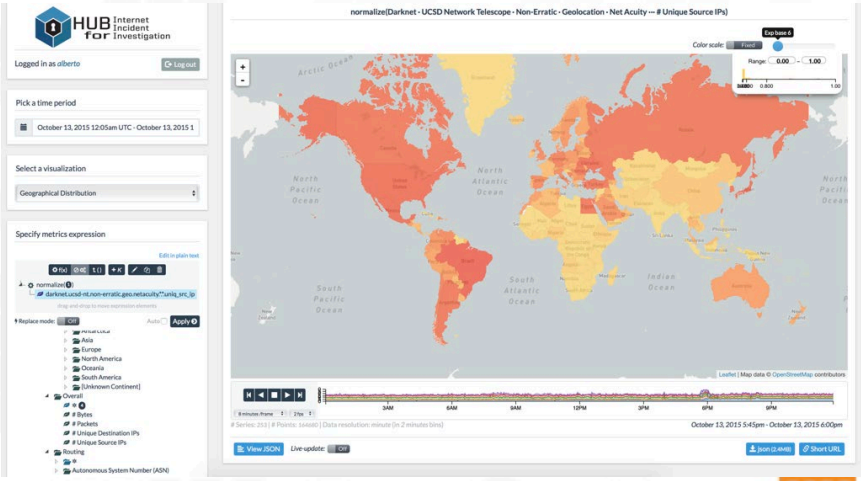
Benefits

- Enhances our ability to understand large-scale incidents
- Provides live streams of data
- Combines multi-source data
- Enables collaborative analysis
- Extensible
- Lowers the barrier for data provision/consumption



Investigation of a 25 min event: UDP port 1900 traffic reaching our Darknet and originating from every country except China. Among top 5 US providers, such traffic appears as originating only from TWC

(Oct 2015)



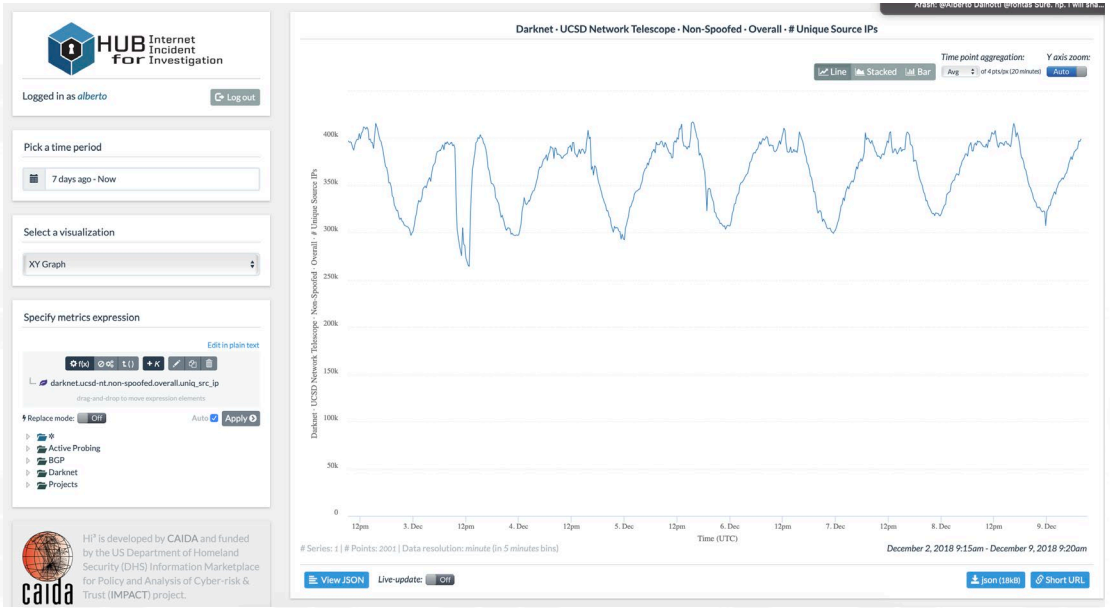
Competition/Alternatives

- Internet telemetry data analysis and event detection systems typically
  - focus on a single type of data or one class of events
  - are non collaborative
- Potential synergy with
  - DHS IMPACT performers
  - Threat intelligence platforms

Current Status 1/2

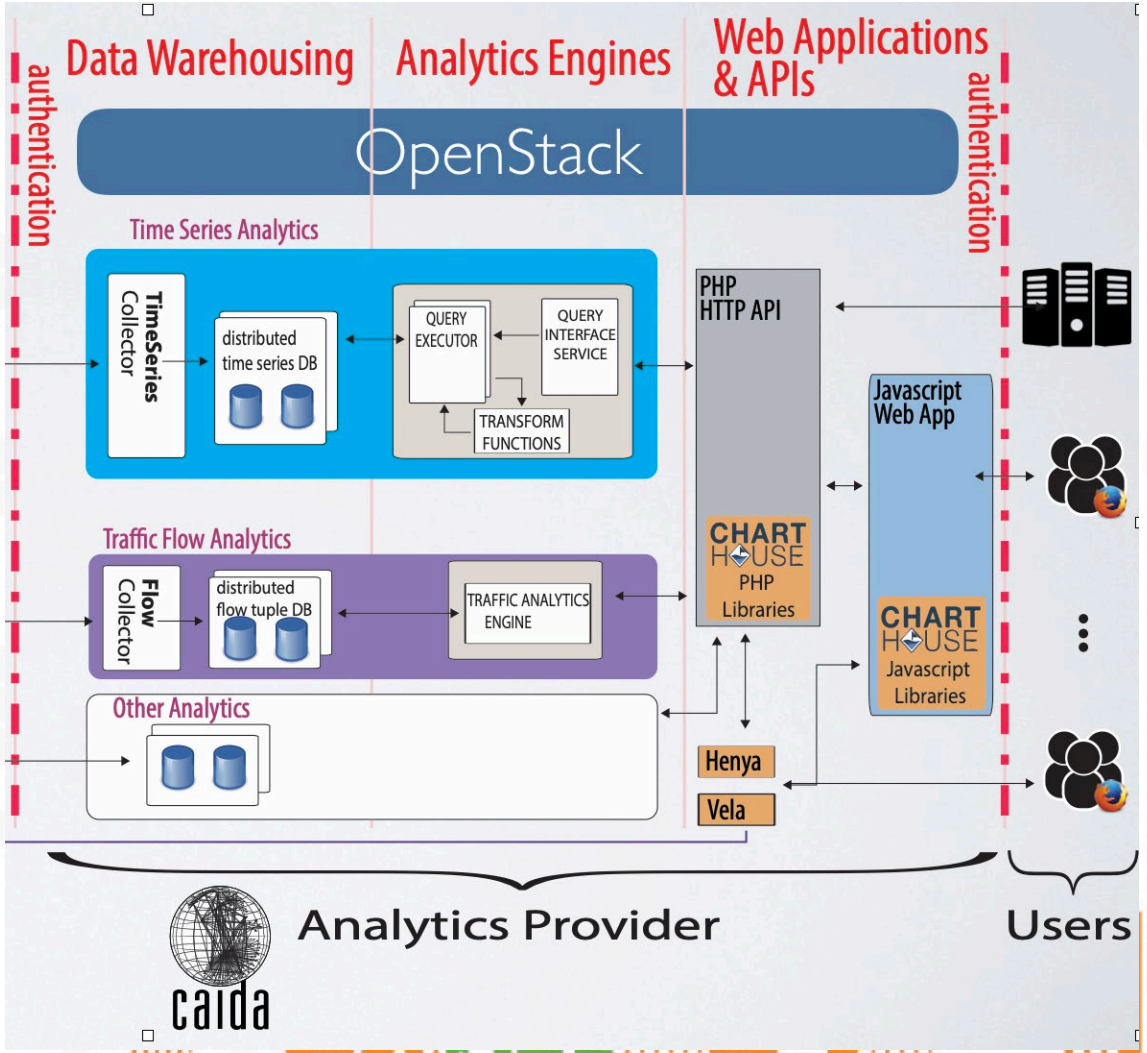
- Proof of concept is online!
  - Time-series exploration
  - Visualizations include geographic dimension
- Live streams + historical data:
  - Passive traffic from Network Telescopes
  - Internet outage alerts and raw signals
  - Denial of Service attack data
  - Global Internet routing data

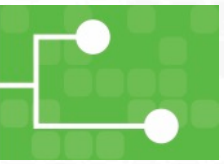
https://hicube.caida.org



Current Status 2/2

- Authentication and Authorization system
  - OAuth 2.0
  - OpenID Connect
- OpenStack-based private cloud
- Data Warehousing infrastructure
  - Distributed Object Storage (Swift)
    - HTTP API
    - High-throughput (> 20Gbps) + Large Capacity (1.2 PB)
    - Reliability + Scalability
  - SSD Cluster
    - Low latency + Reliability + Scalability





Next Steps

- Beta Users
- Case studies
- Time Series Analytics Engine
  - distributed database for time-series analytics
  - data analytics query engine
- Traffic Flow Analytics Engine (pending funding)
- More data sources
  - BGP Hijacking events, …

Potential Transition Activities

- USG situational awareness and decision support
- Industry consumption, quid pro quo
  - E.g. Internet security, threat intelligence, Internet telemetry, fusion centers, …
- Open source certain components
- Crowdsource analyses
- Education & training engagement

Contact Info

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