Real-time visualizer and history browser for IPOP Network Overlay

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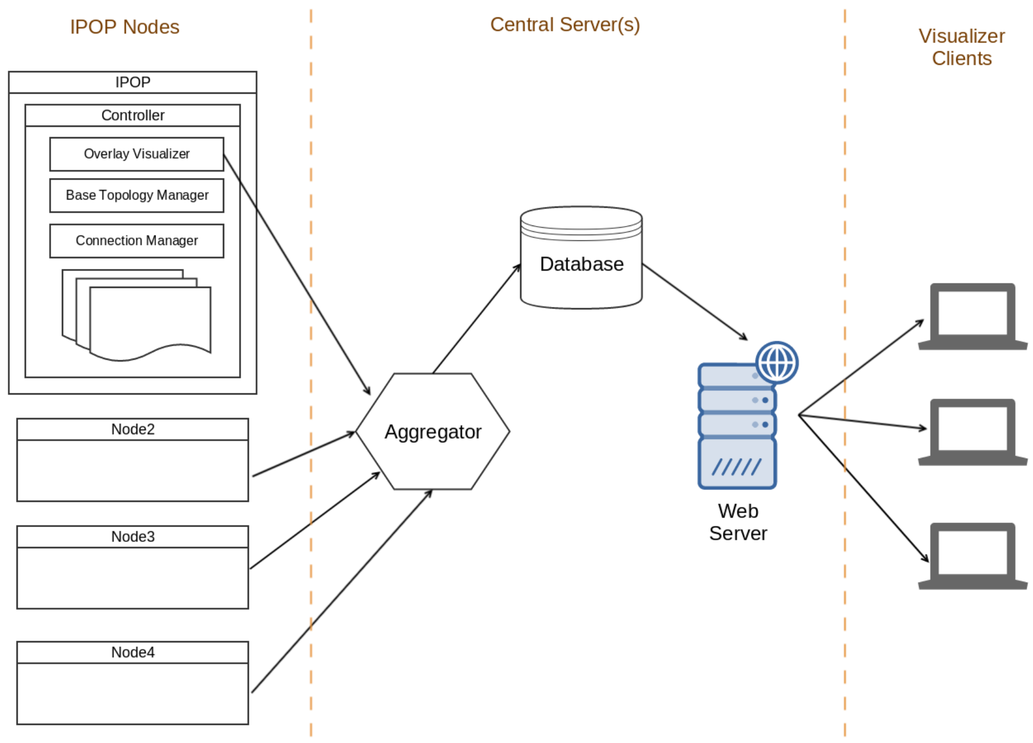
http://ipop-project.org

Background and Motivation

- IPOP is an open-source P2P network overlay that provides a transparent VPN with user-defined network configuration.
- Controller module allows for extensions through modules that can be enabled optionally.
- Nodes can be made to communicate with a centralized visualization endpoint to report information about their state.
- Can solve several issues without the need for complicated administration tools.
- A web interface is desired to be universally compatible.
- Ability to browse through the history is helpful for logging and debugging purposes.

System Architecture

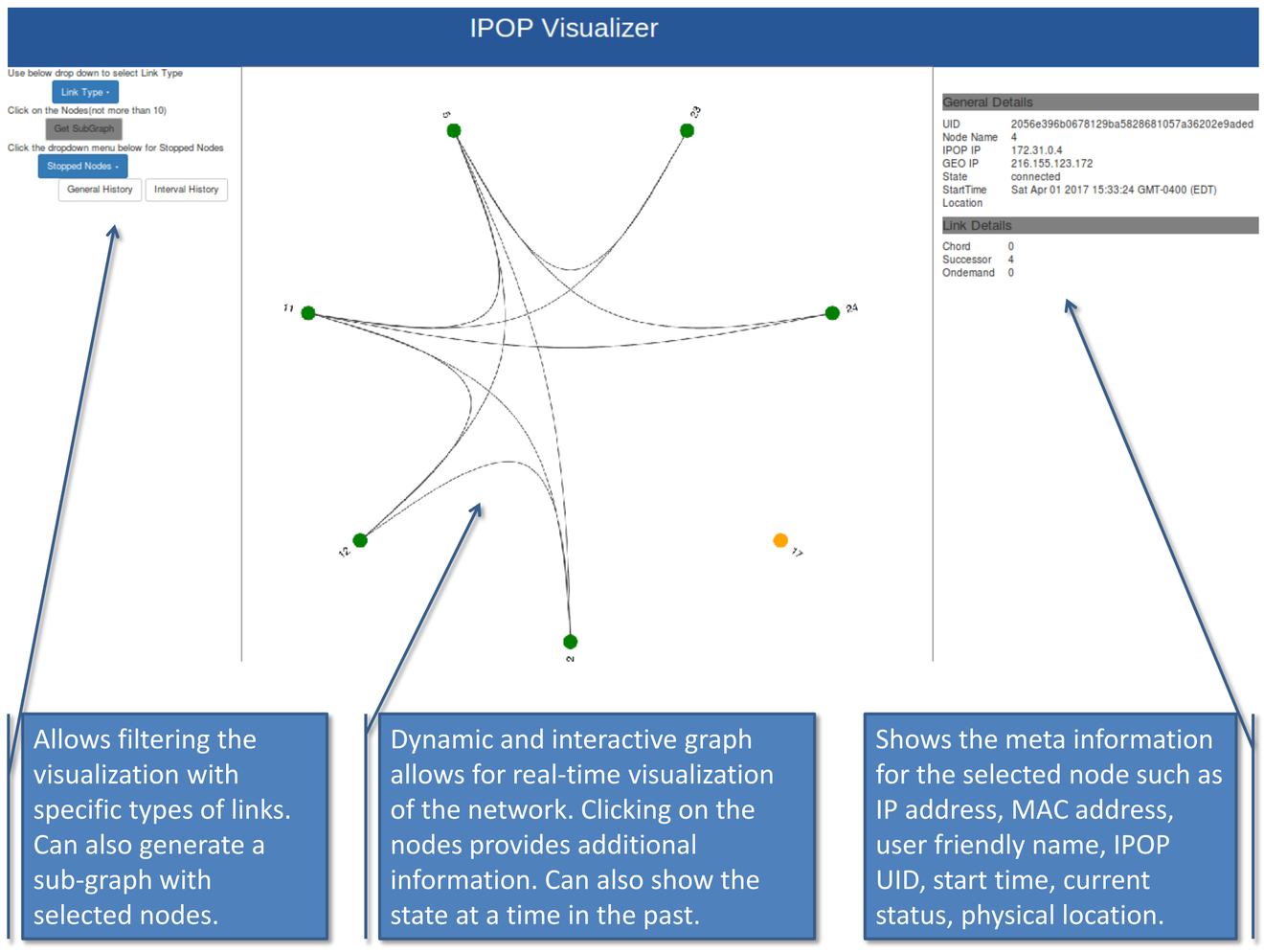


References

[1] Cisco, *LiveAction: GUI-Based Management & Visualization*, 2014

[2] Florian S. Gysin, *VPN Visualization: Visualization of Virtual Private Networks in Network Management Systems*, 2013

Sample Network Visualization & Interface features

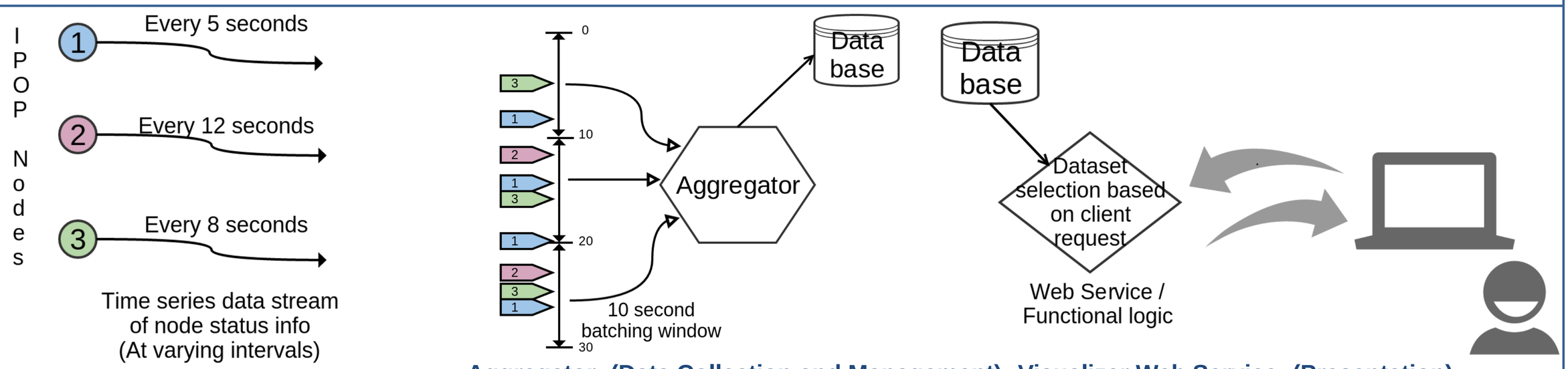


Prospective Use Cases

The visualization system can be applied towards a variety of applications such as:

- Network Administrators can use the visualizer as a verification and troubleshooting tool by check if the IP addresses and node status.
- The Visualizer can aid IPOP development by presenting the entire state of the network. This can help debug the issues faster and easier.
- The Logs can help monitor the users of the network. With possible extensions, additional information about the communication with peers can be selectively logged and this can be used for monitoring.
- The interface can be extended to support advanced features such as changing IP addresses, links and other kind of administration tasks.

System Overview



Overlay Visualizer module: (State Information)

- The Overlay Visualizer module needs to be configured and enabled in IPOP Controller. The configuration parameters determine how often the nodes send updates to the central server, the user friendly name & address of Aggregator.
- The Overlay Visualizer gets its information from other controller modules such as Base Topology Manager and Connection Manager which store and control the network topology and links.
- The state information is sent via HTTP to the Aggregator at central server.
- The central server address could also be an IPOP address (for privacy concerns), but with a compromise in observability in certain states of the node.

Aggregator: (Data Collection and Management)

- The Aggregator runs on the central server and listens for incoming data from the overlay visualizer module through an open HTTP port.
- To smoothen and compress the state information, the aggregator batches a set of updates from a node during a configurable time interval.
- The batched data is updated/inserted into a NoSQL database running either locally or in remote.
- The aggregator is also responsible for recording information such as the start time and location of a node. The location is resolved through a GeoIP mechanism by using the node's public endpoint address.

Visualizer Web Service: (Presentation)

- The data from the database is presented to the end-user by means of a web server which hosts the HTML, JavaScript and other static files as required.
- The dynamic information (such as nodes and links) is retrieved from the JavaScript functions by means of HTTP requests to the web service.
- The web service handles dynamic information requests by querying the database and filtering out data as necessary before giving out the response.

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