

# VizPub: Visualizing the Performance of Overlay-Based Pub/Sub Systems

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## Objectives

- A tool for visualizing overlay-based pub/sub systems
- Gain insight into system performance
- Compare different pub/sub systems visually
- Visualize metrics such as node degree and hit-ratio

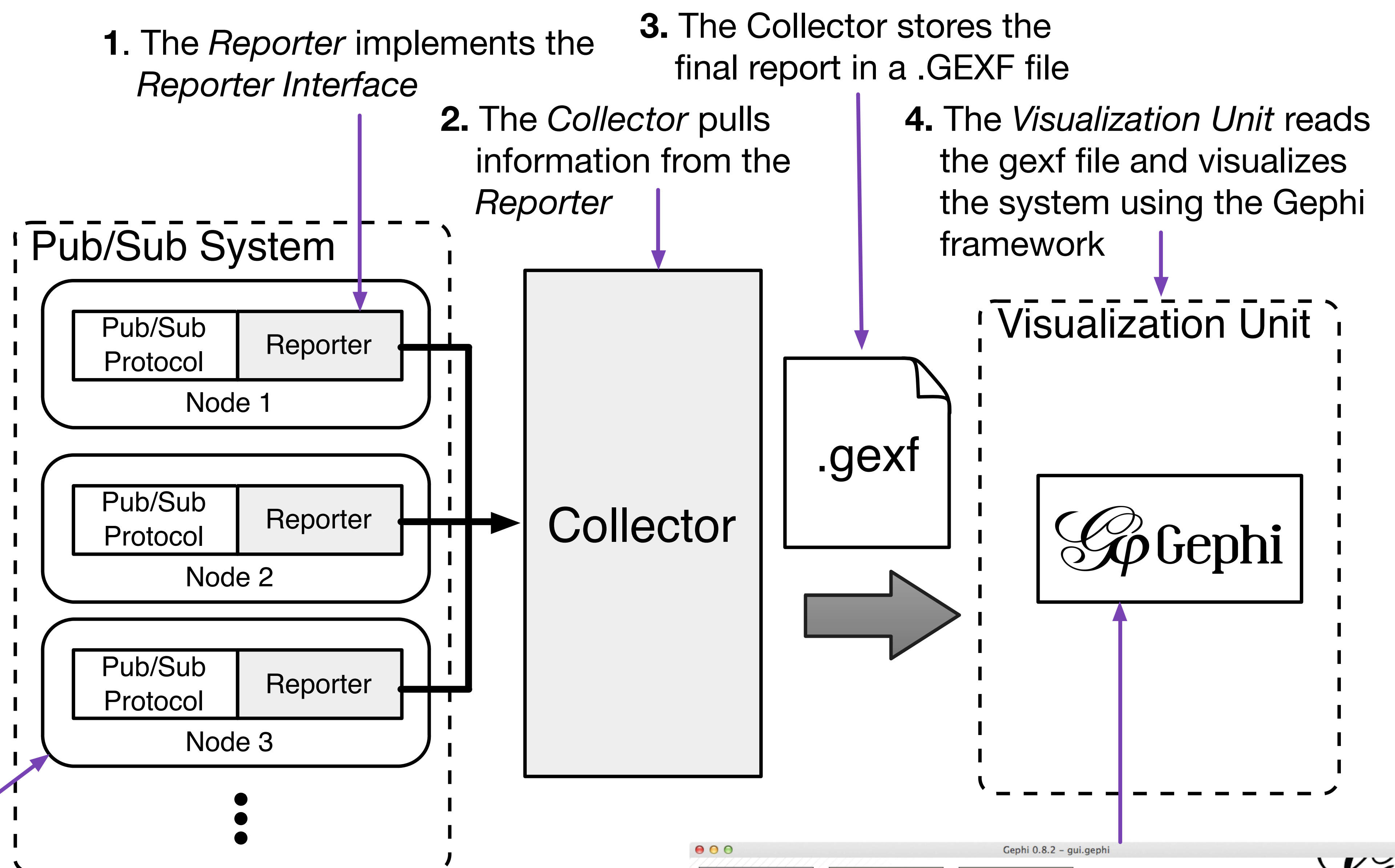
## Architecture

### Key Points

- Generic tool, apart from reporter interface implementation
- The amount of reportable data is configurable
- Metrics are derived and calculated based on the reported information
- Both aggregated and instantaneous metrics are supported
- Collection is done in online mode, but the computation and aggregation and derivation of various metrics can be done in offline mode

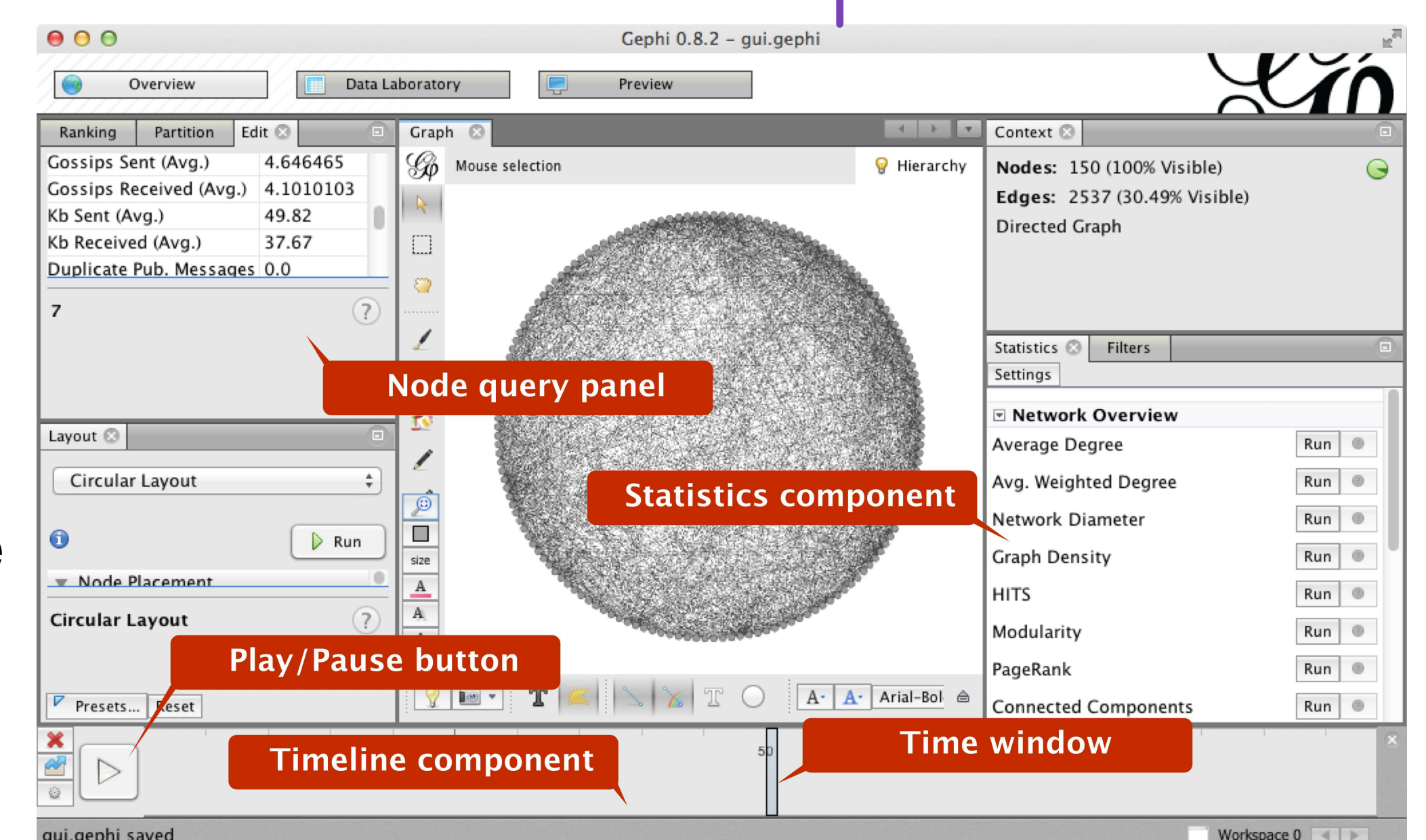
### Each node reports:

- The node id
- List of neighbor ids
- List of topic ids the node subscribes to
- Number of overlay control messages sent and received
- Number of overlay control message bytes sent and received
- List of publication messages sent and received

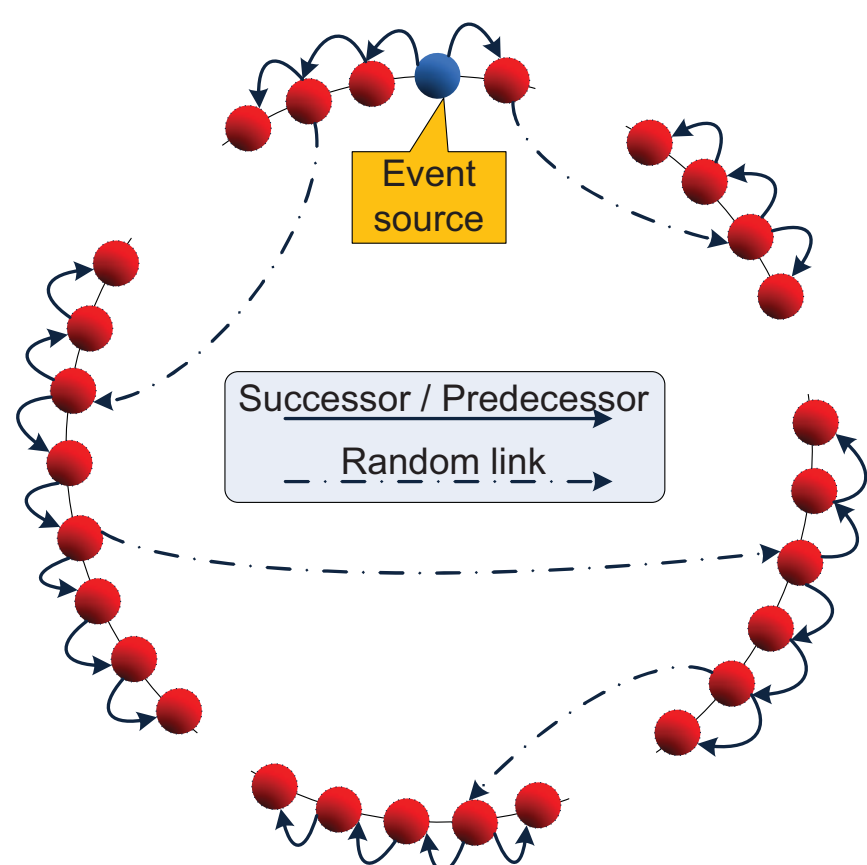


### Gephi Framework [1]

- Playback system execution
- Calculate topology metrics such as degree
- Export data to .csv using the *Data Laboratory*



## Examples of visualization for a specific system



### Background for the visualized system (PolderCast) [2]

- Topic-based P2P pub/sub system
- Organizes nodes in a ring structure
- Gossip-based overlay maintenance under churn
- Hybrid dissemination using ring and random links

### Data traces used in simulations

- Real world subscription traces from Facebook
- Churn traces from the Skype super-peer network
- Latencies using the King dataset

### Visualization of overlay topology evolution during churn

- Playback system execution during churn
- Observe the evolution of the overlay topology incrementally
- Nodes appear and disappear due to churn

### Structural Metrics

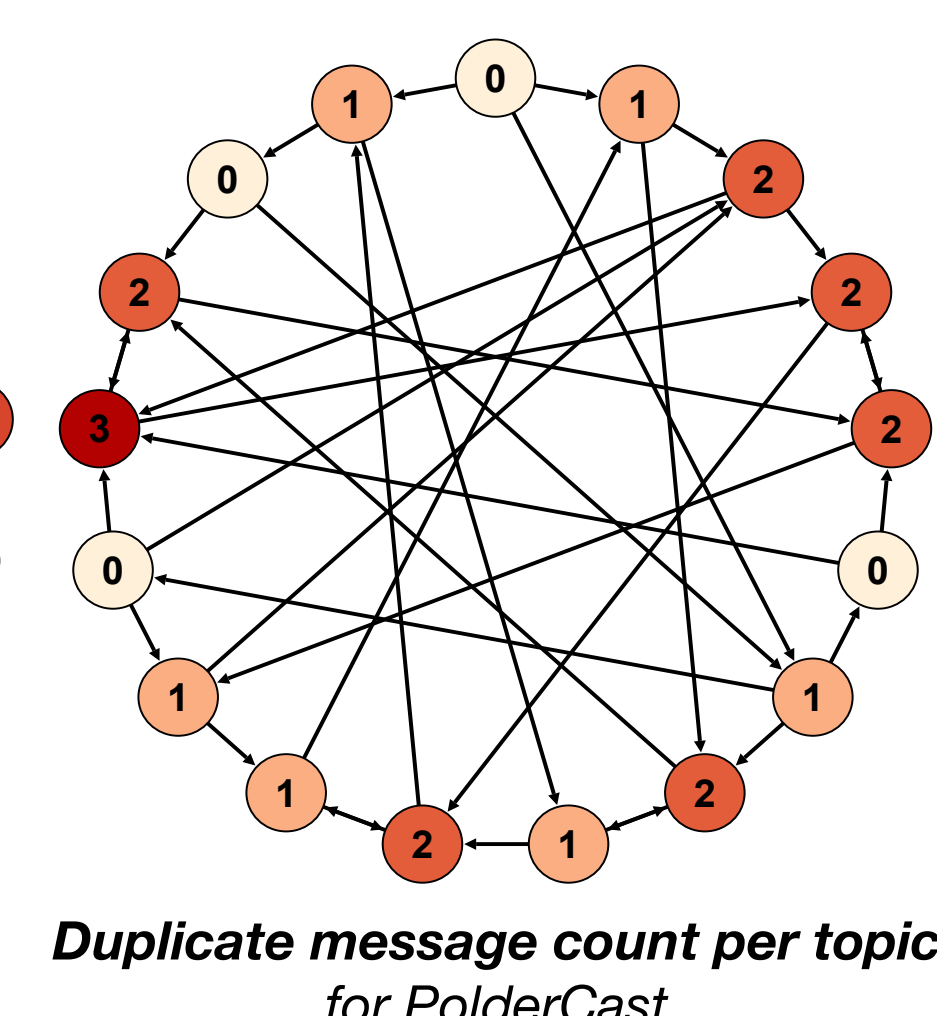
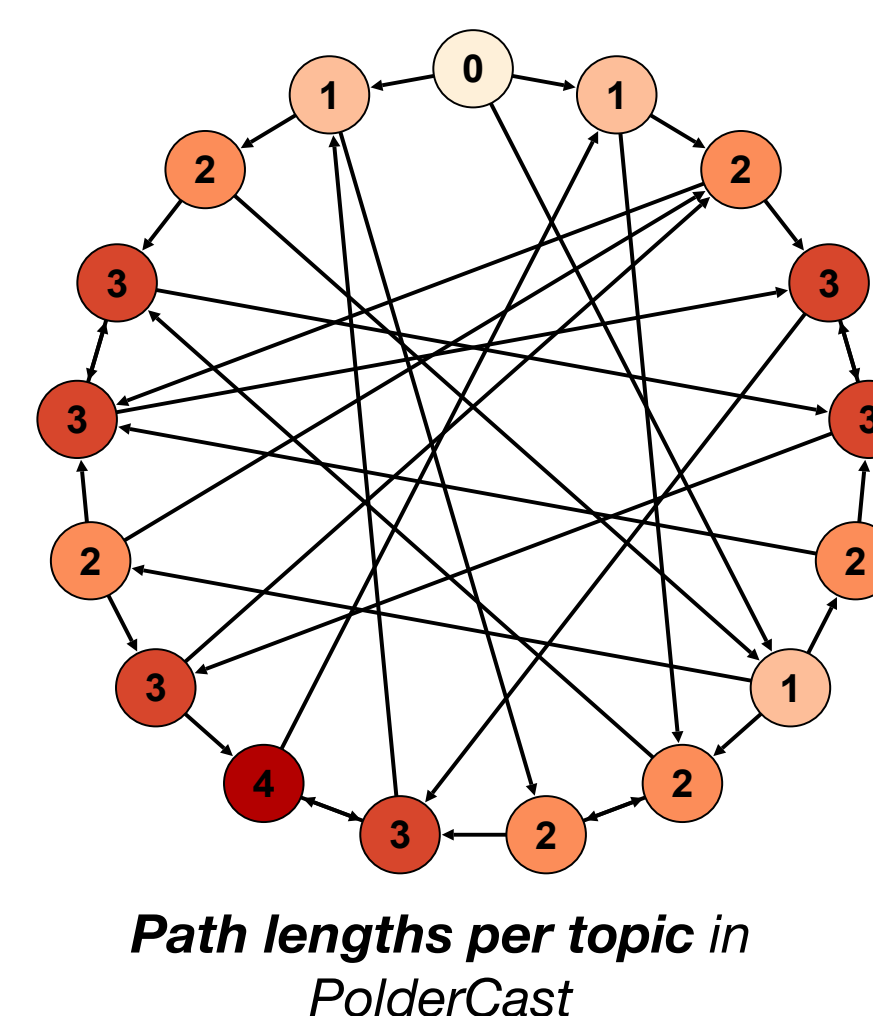
- Visualize structural properties of the overlay
- Use color to highlight overloaded nodes
- Labels update during playback of system execution

Average number of gossip messages sent per node per interval in PolderCast

Average Number of gossip messages received per node per interval in PolderCast

### Dissemination Metrics

- Visualize dissemination of publications step-by-step
- Metrics represented as node labels
- Directed edges represent message paths
- Duplicate message count calculated by in-degree



[1] M. Bastian, S. Heymann, and M. Jacomy, "Gephi: An open source software for exploring and manipulating networks," in ICWSM, 2009.

[2] V. Setty, M. van Steen, R. Vitenberg, and S. Voulgaris, "Poldercast: Fast, robust, and scalable architecture for P2P topic-based pub/sub," in Middleware, 2012.