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

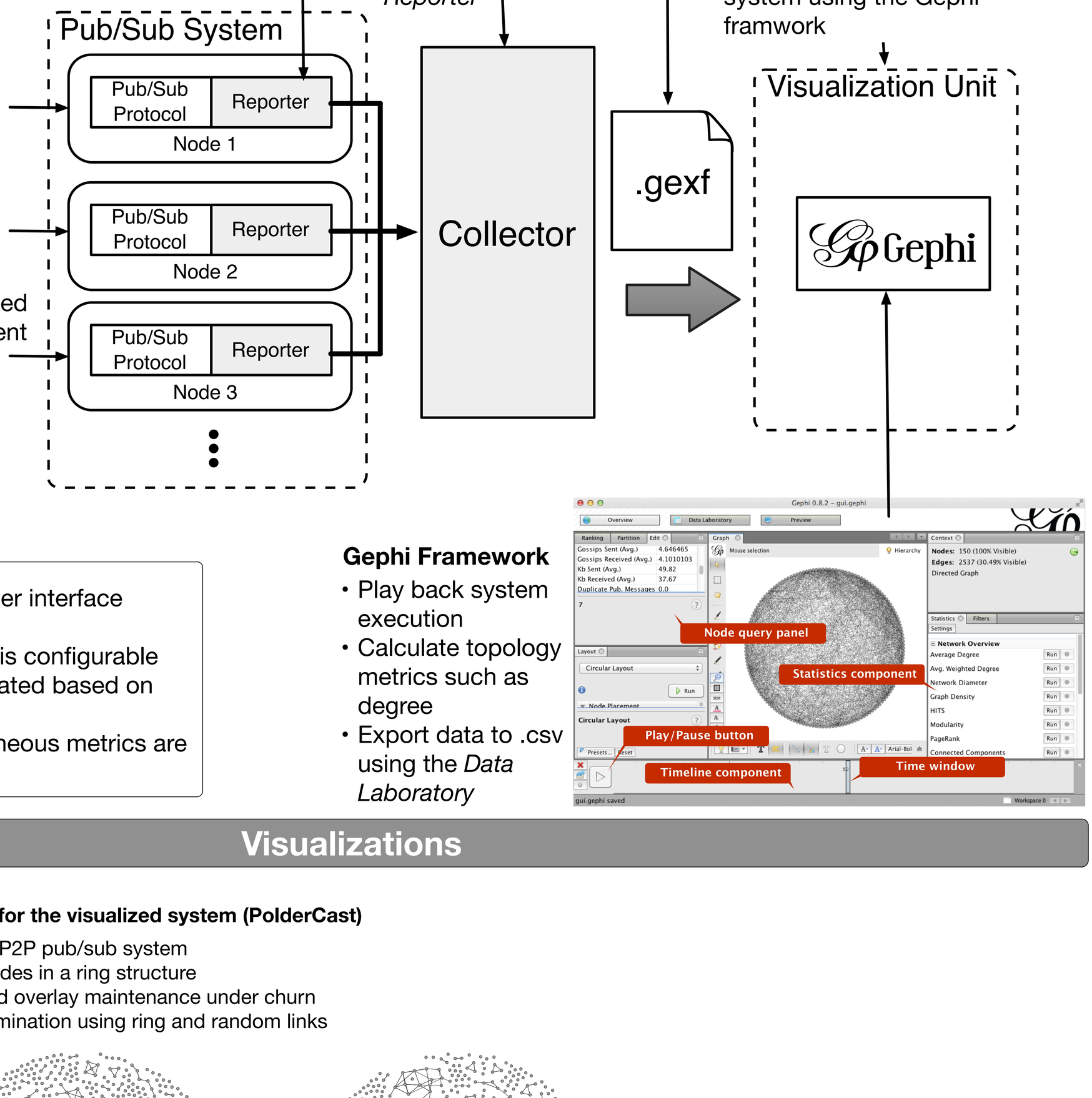
Architecture

1. The *Reporter* implements the *Reporter Interface*

2. The *Collector* pulls information from the *Reporter*

3. The Collector stores the final report in a .GEXF file

4. The *Visualization Unit* reads the gexf file and visualizes the system using the Gephi framwork



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

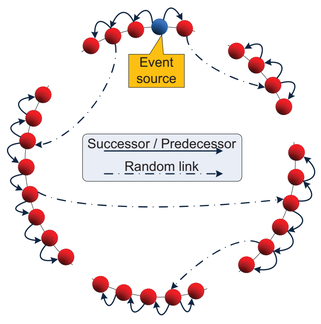
Key Points

- Generic tool, apart from reporter interface implementation
- The amount of repotable data is configurable
- Metrics are derived and calculated based on the reported information
- Both aggregated and instantaneous metrics are supported

Gephi Framework

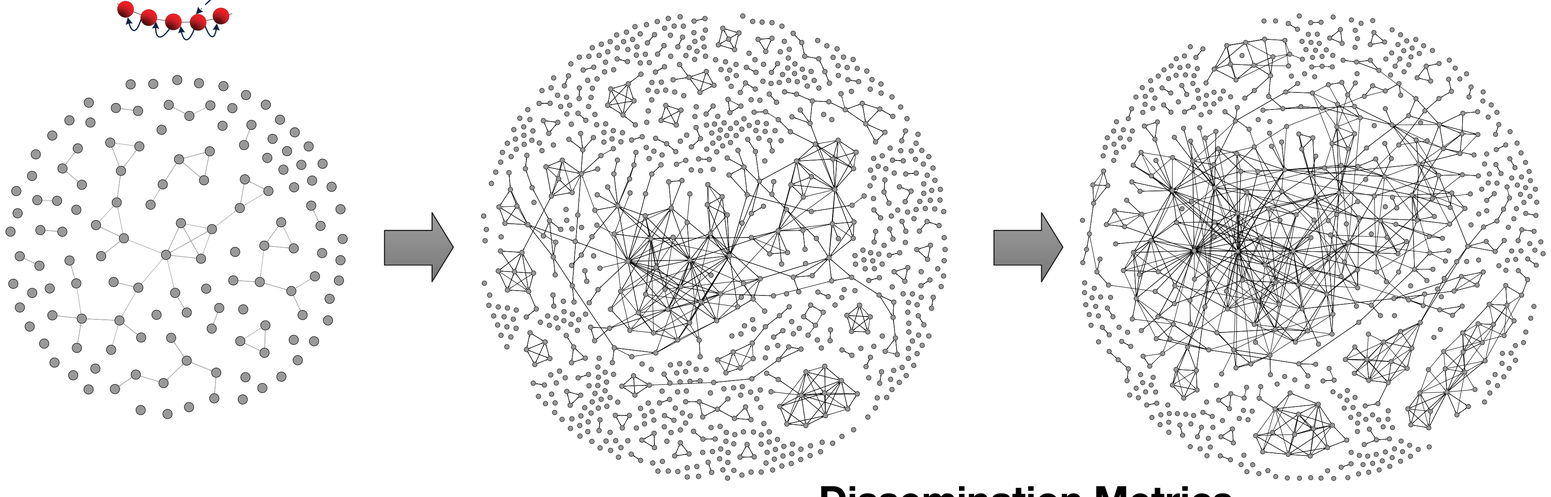
- Play back system execution
- Calculate topology metrics such as degree
- Export data to .csv using the *Data Laboratory*

Visualizations



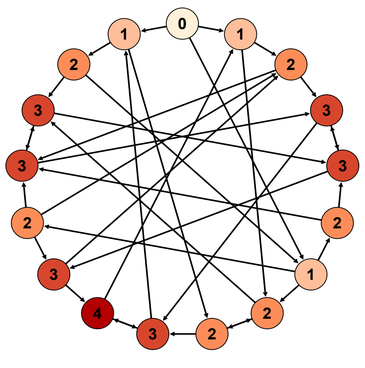
Background for the visualized system (PolderCast)

- 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

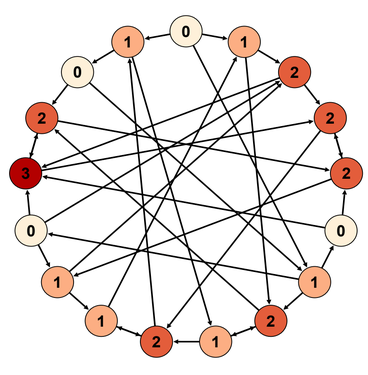


Visualization of overlay topology evolution during churn

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



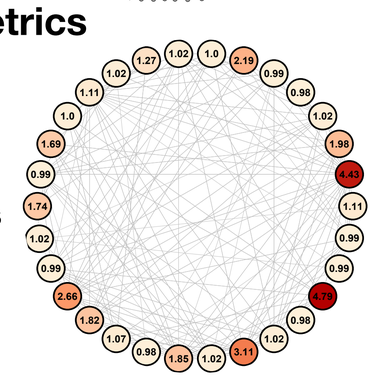
Path lengths *in PolderCast*



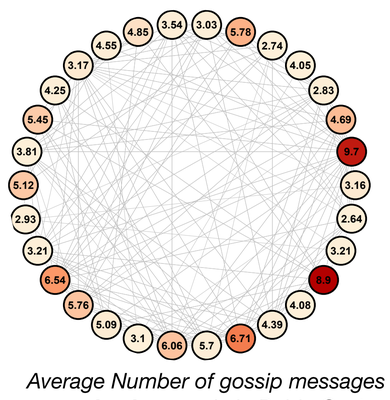
Duplicate message count *for PolderCast*

Dissemination Metrics

- Visualize publication message dissemination step-by-step
- Metrics represented as node labels
- Duplicate messages derived by calculating the in-degree of each node



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



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

Structural Metrics

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

Implementation code can be found at:
github.com/vizpub/vizpub

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