Graph properties of a telecommunication network

Students

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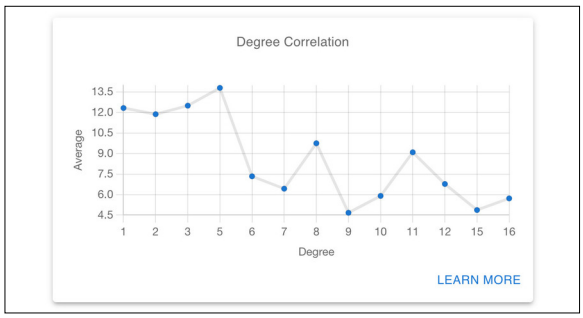
Objective: Every telecommunication network has a different topology. Additionally, the topology is often complex and unstructured. In the current telecommunications industry, graph properties are not broadly used for network capacity planning or network comparisons. The goal of this thesis is to create a system that conveys the structure of a graph in an understandable way. This is achieved through the visualization of a multitude of graph properties. Included explanations provide context and link to additional sources. Furthermore, it should be possible to obtain network topology data from the Jalapeño API Gateway, which is an ongoing project by the INS.

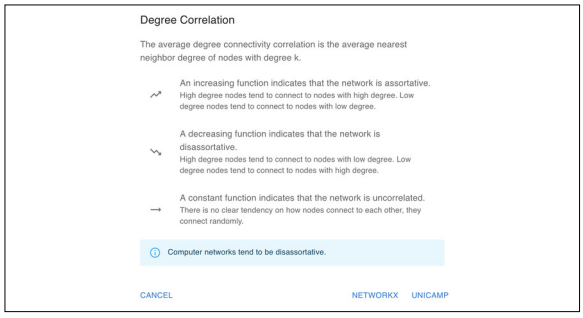
Approach: The system is composed of three separate applications that interact with each other. The Data Collector is responsible for reading network topology data, be it from the Jalapeño API Gateway via gRPC or from an alternative source. The read data is persisted in a graph database. Calculations of the graph properties are triggered by requests to the API. These calculations are performed based on the graph that is kept in the graph database, the results are exposed via a REST API. The Frontend consumes data from the API and displays the various graph properties. In order to provide context, explanations are provided for each property.

Conclusion: A system composed of multiple applications was created that allows network administrators to analyze a provided network based on graph properties. Additional features like querying for cut edges and vertices have also been implemented. The system is developed in a cloud-native way in order to achieve a high scalability and availability. It currently supports the import of network topology data from the Jalapeño API Gateway and files in the GEXF format. The system is designed in an extensible way so that other data sources can be added in the future. It also acts as a platform for future works in the area of network topology analysis.

Degree Correlation Graph Property
Own presentment



Degree Correlation Explanation
Own presentment



Dashboard
Own presentment

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Subject Area
Networks, Security & Cloud Infrastructure, Software, Internet Technologies and Applications

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