Delay Data Analysis on Event Activity Graph, by Examples.

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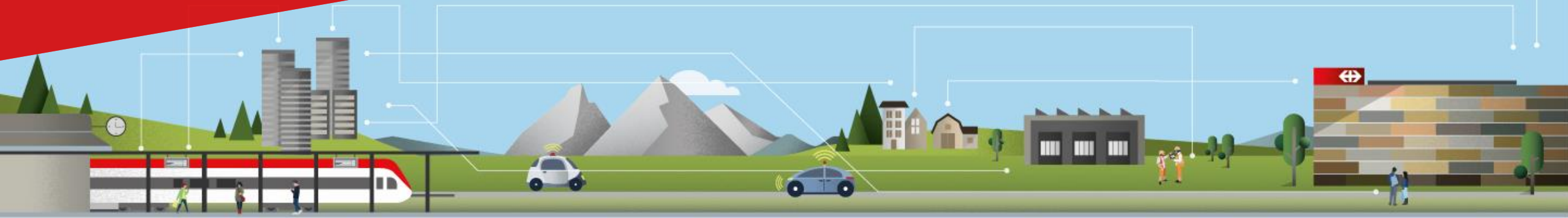


Agenda

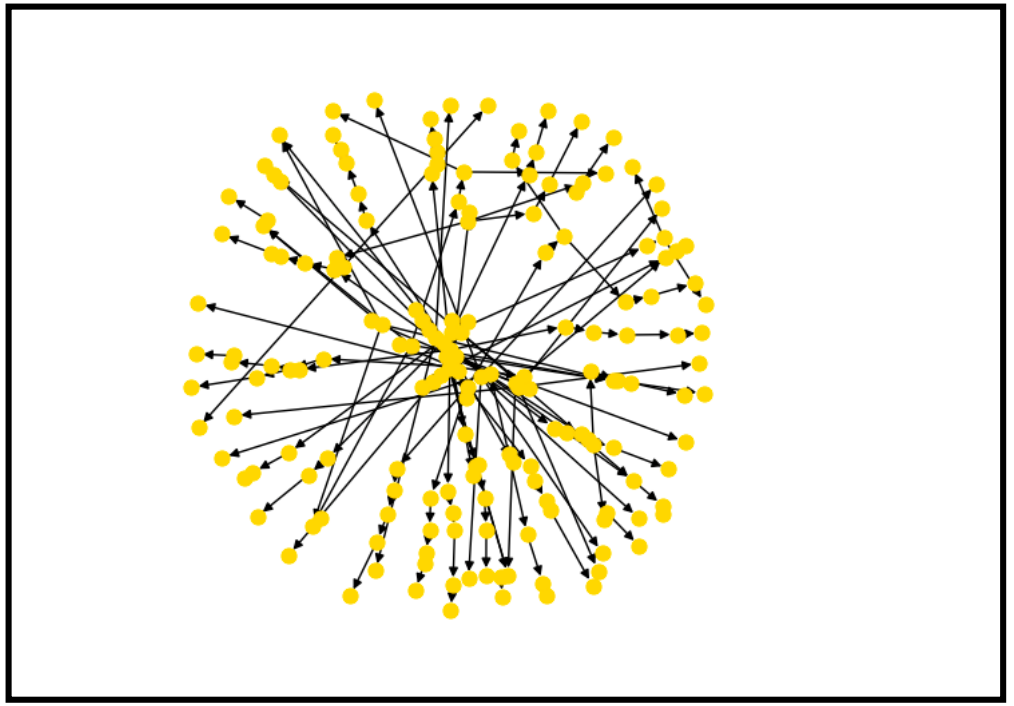
1. Introduction
2. Examples
   - Automatic detection of tipping points
   - Other activity types
   - Delay forecasting

Introduction

EAG definition

EAG Introduction

Time table



EAG Definition

- EAG = (V, E) is an acyclic directed graph.

- V is the set of train departure/arrival events:
  (train number, operation point, type event)

  Examples: (710, ZUE, dep), (710, ZUE, arr), (710, BN, arr), (18526, ZUE, dep).

EAG Definition

- E = Set of activities between events.

  Activities:
  - dwell
  - travel
  - change
  - circulation
  - conflict

  Example: ((710, ZUE, arr), (18526, ZUE, dep)))

EAG Definition

- Node attributes:
  - planed time
  - actual time
  - delays.

- Edge attributes:
  - edge type
  - hold
  - activity length.

SBB Graph

The graph corresponding to one SBB operation day, considering travel, dwell and change edges, has:

- 170000 nodes
- 250000 edges
- 80000 change edges
- 1200000 nodes with microscopic scale (signals)
- 1300000 edges considering signals.

Examples

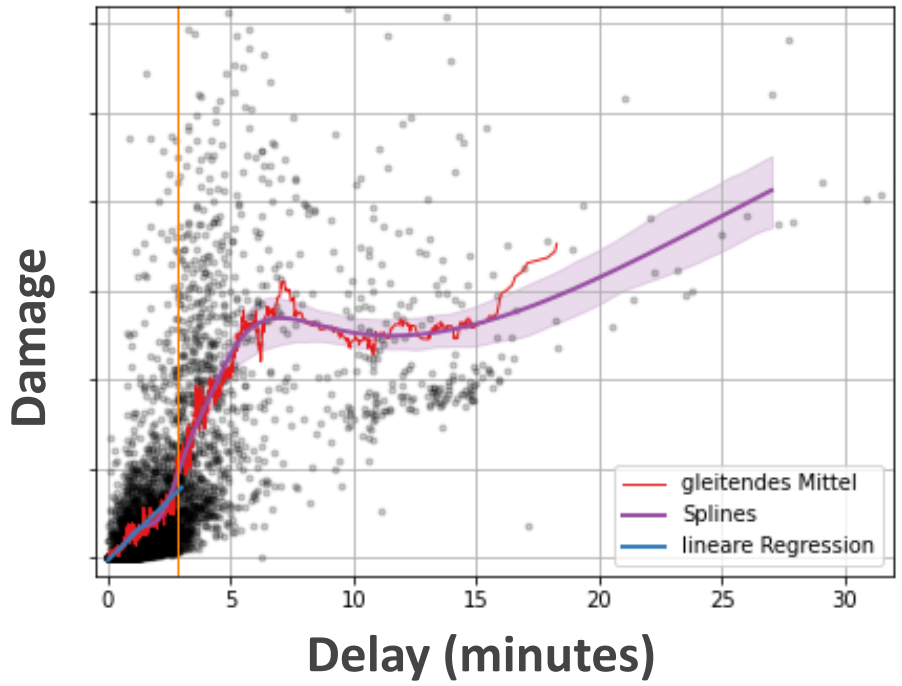
Examples

1. Automatic detection of tipping points.
   - Successor graphs
   - Damage propagation
   - Propagation stopping algorithms
   - Aggregation of graphs

2. Other activity types
3. Delay forecasting

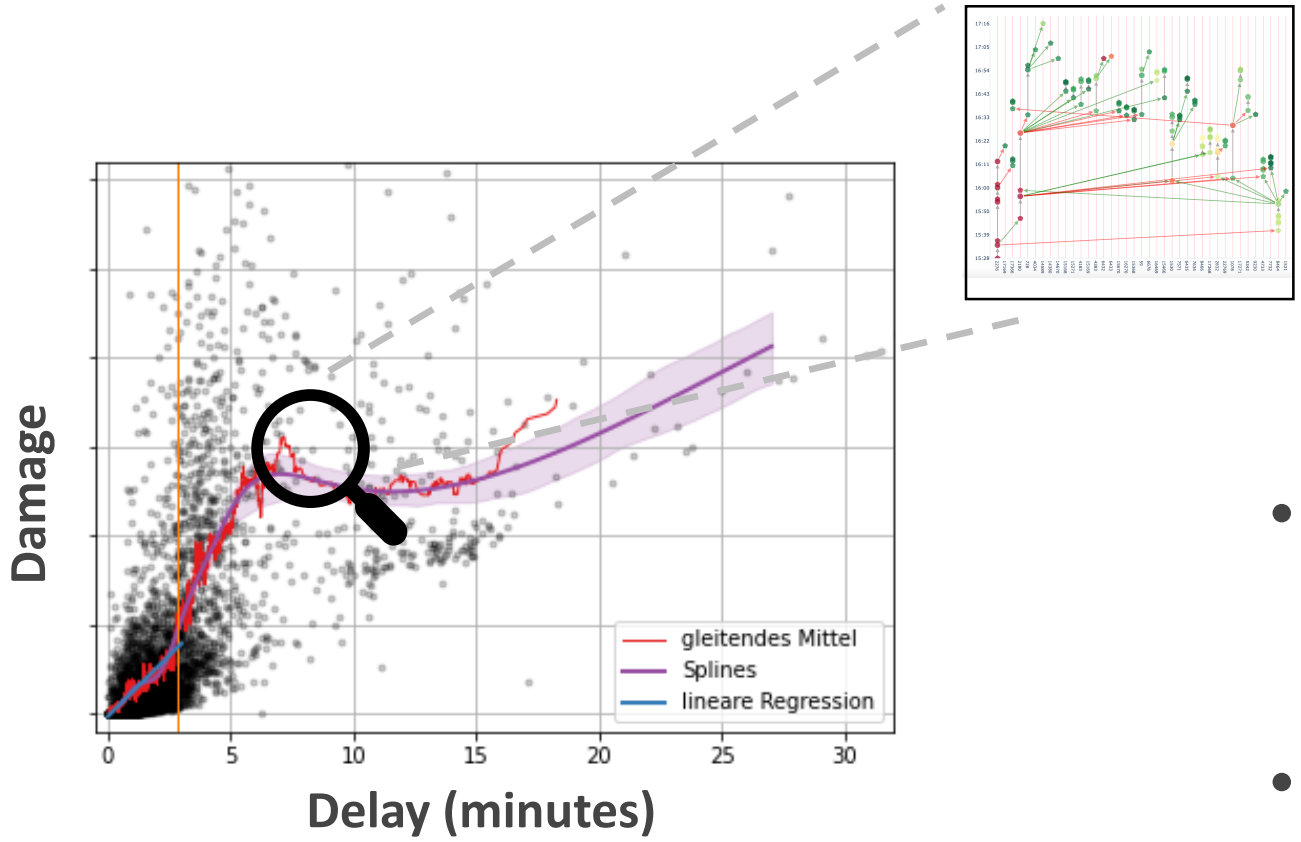
Automatic Detection of Tipping Points

Tipping Points and Damage Propagation



- How do we define damage propagation beyond the train run?
- How do we define the damage caused by a delay?
- How do we define rules for damage propagation?

Tipping Points and Damage Propagation



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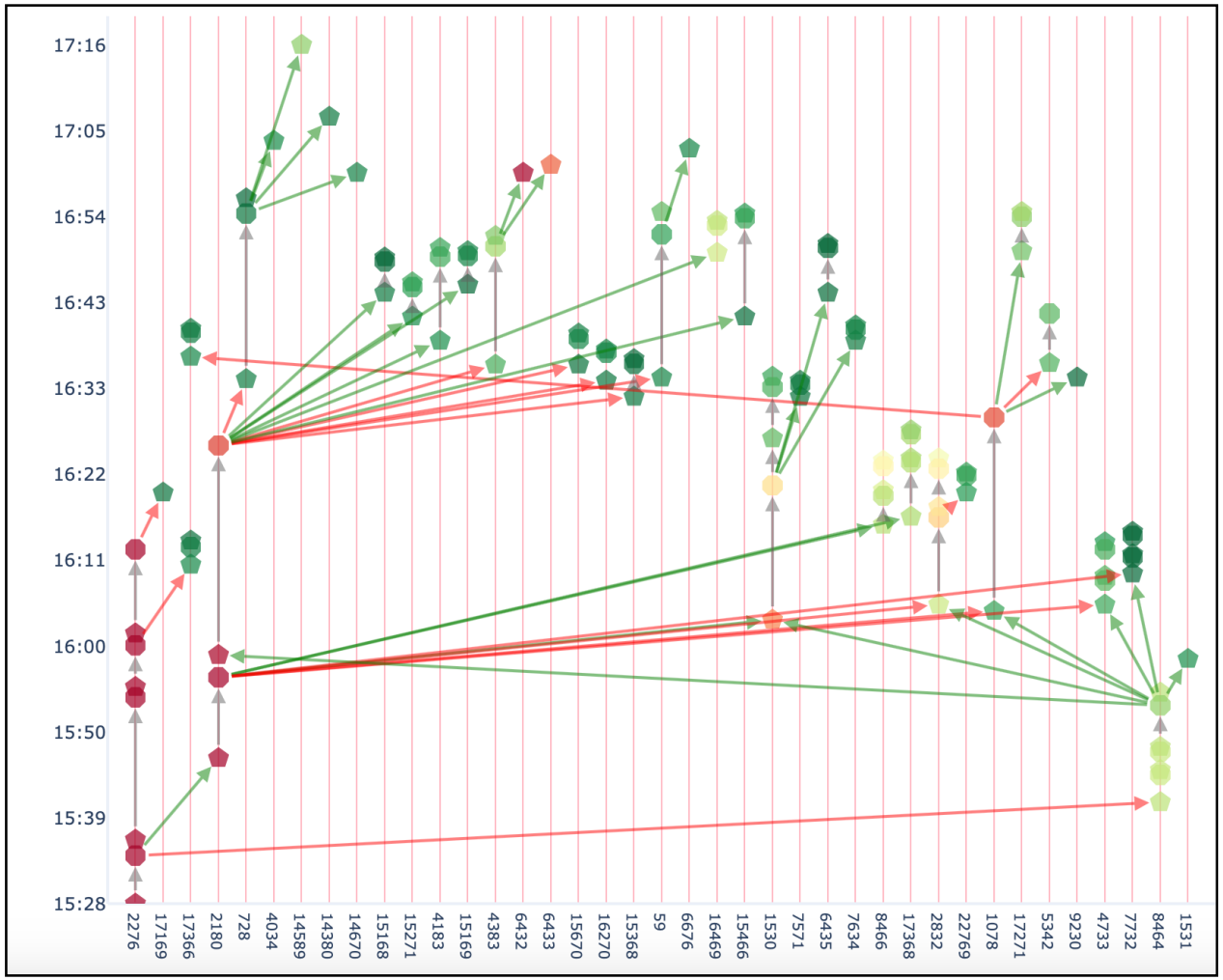
Successor Graphs



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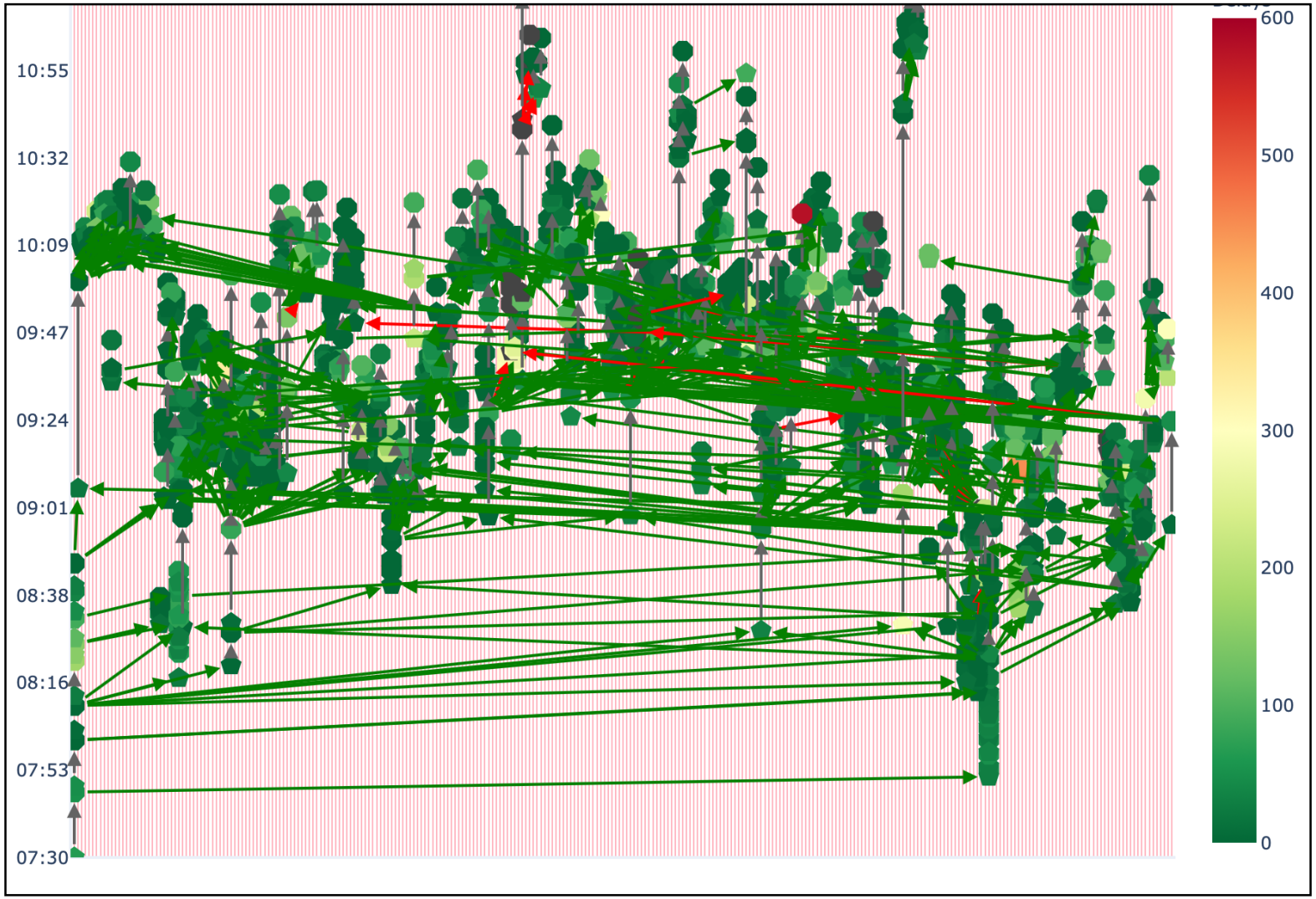
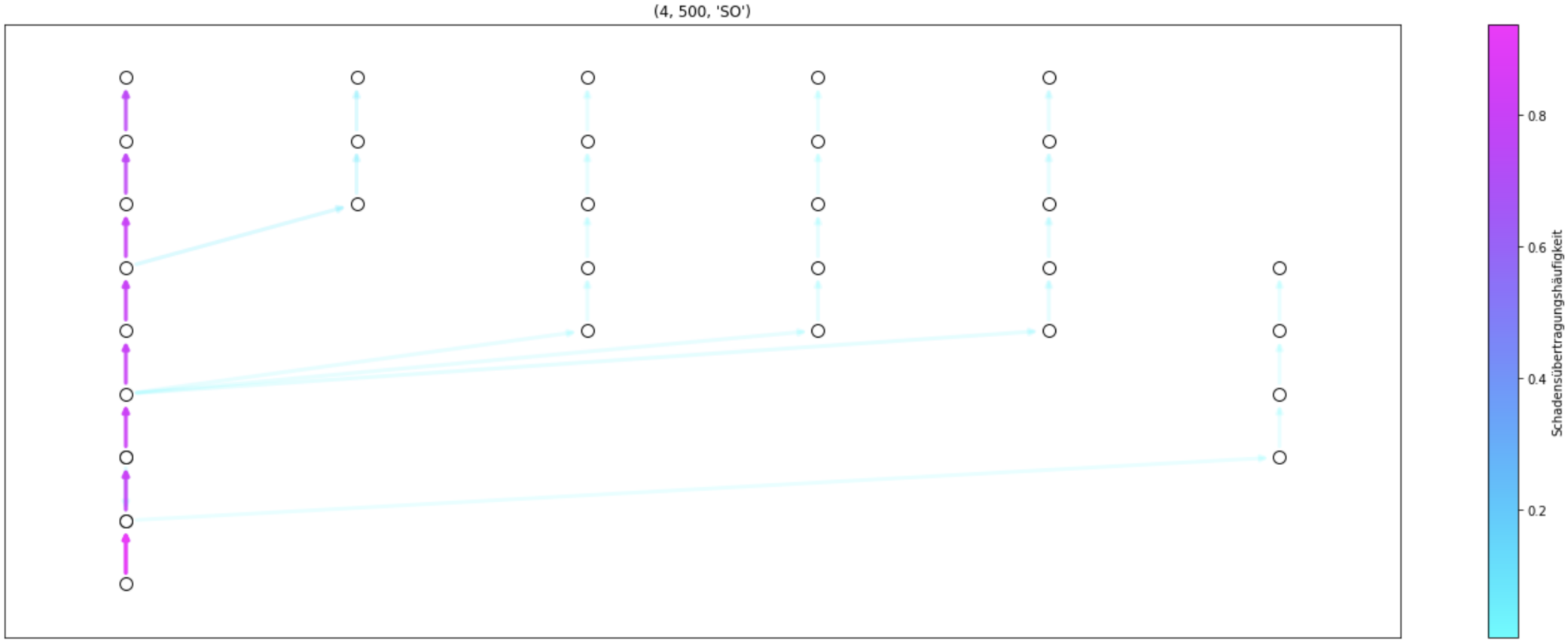
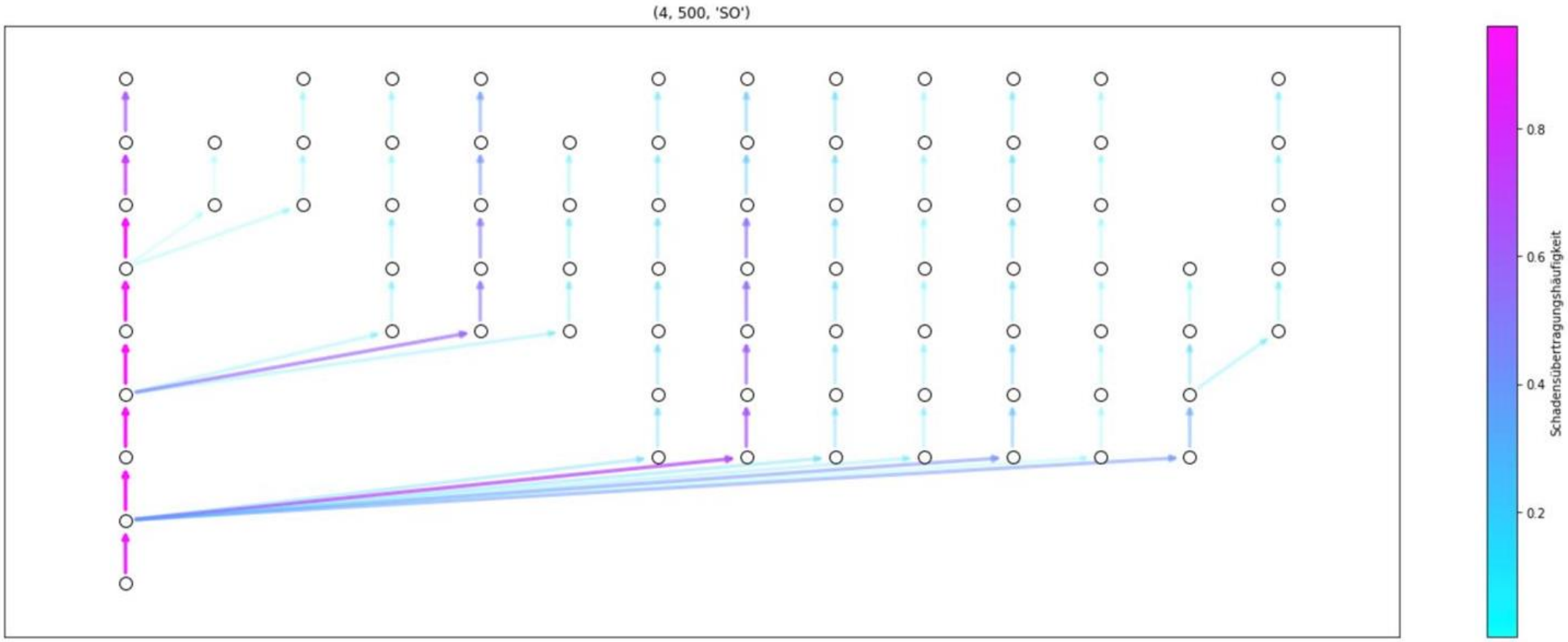
Succesor Graphs



Aggregation of Graphs

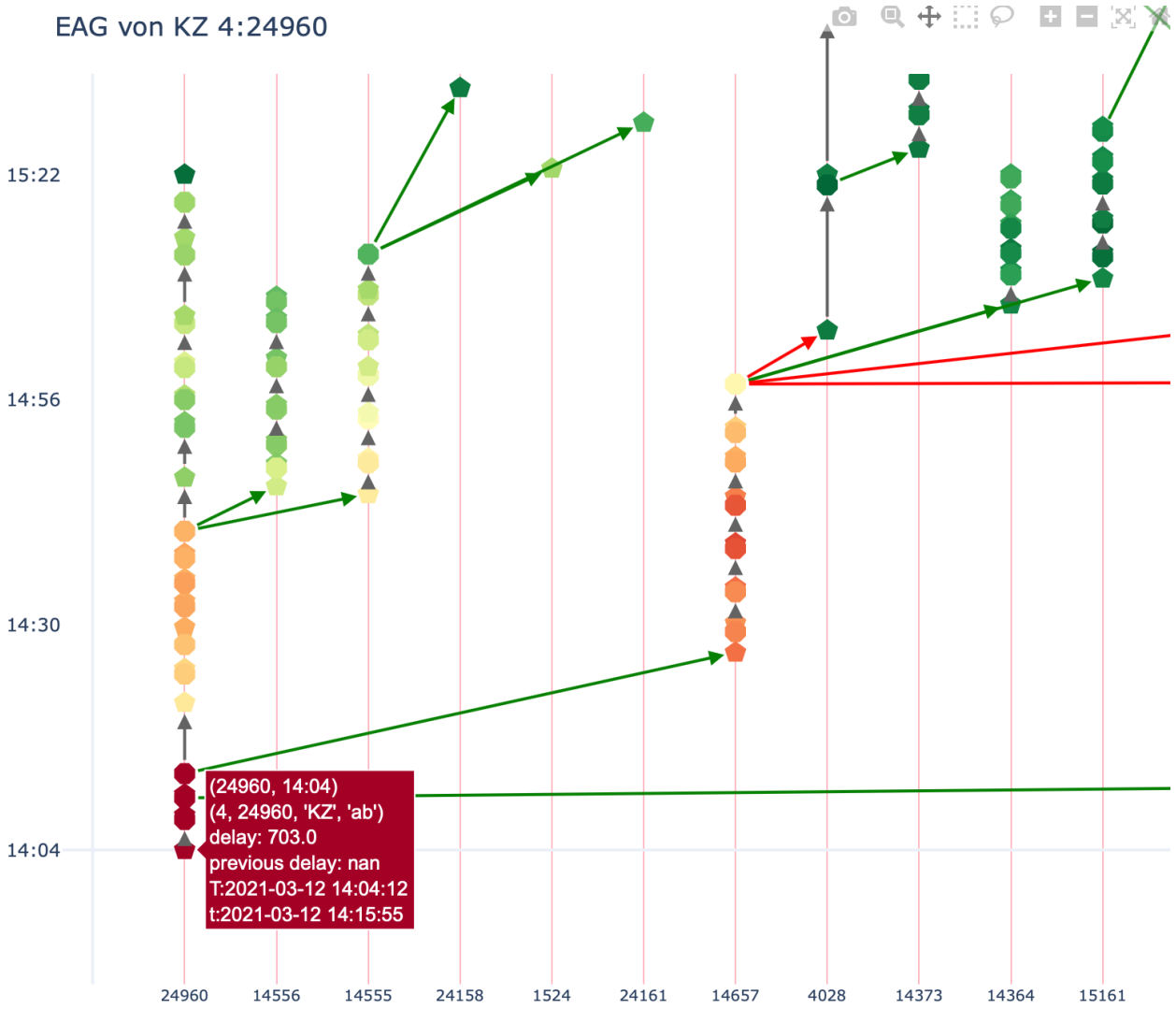


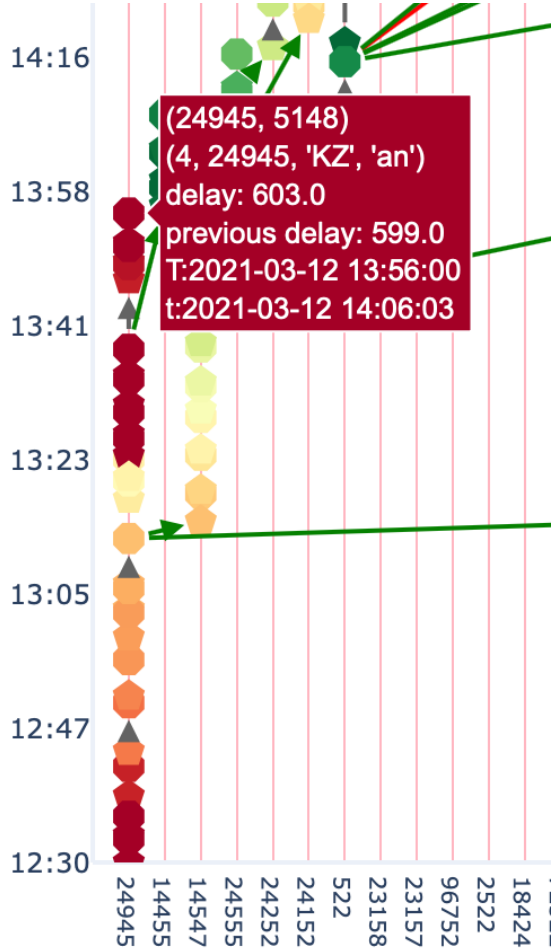
Aggregation Graphs



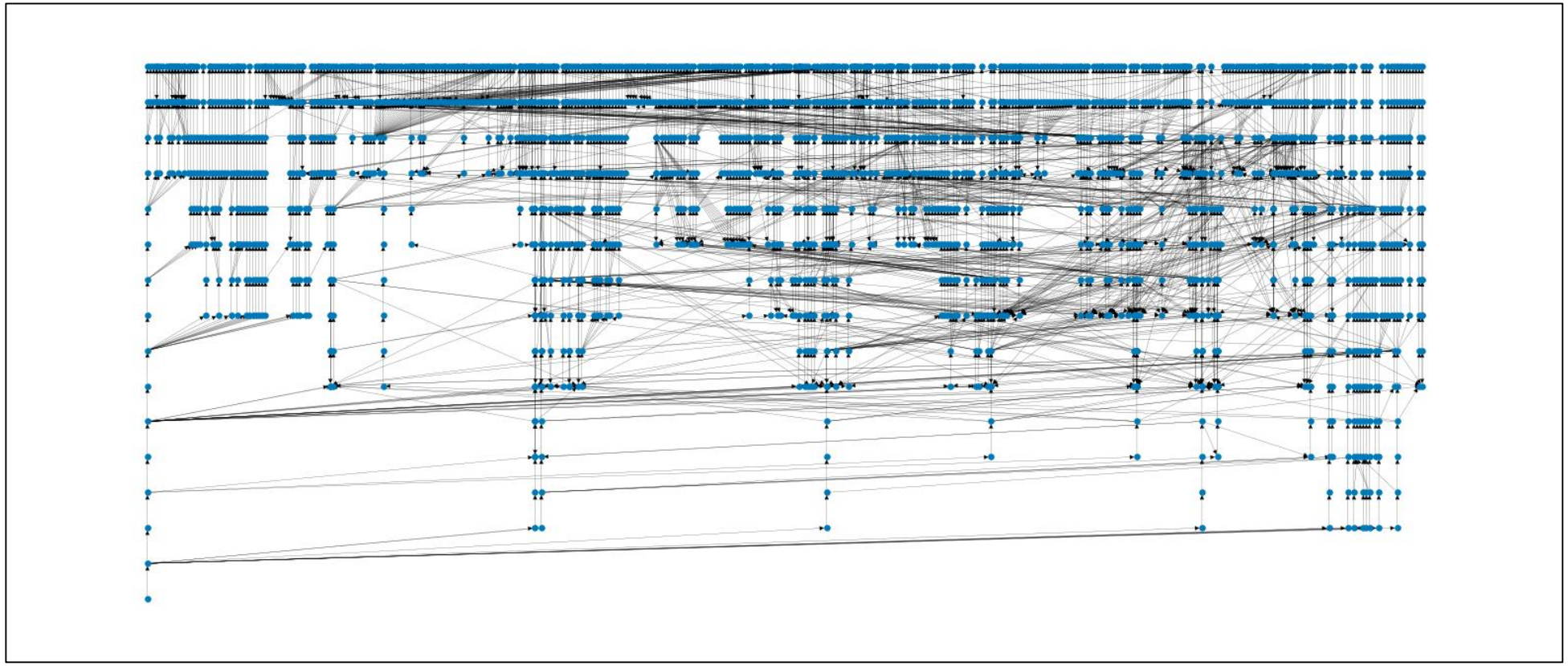
Other activity types

Circulation edges





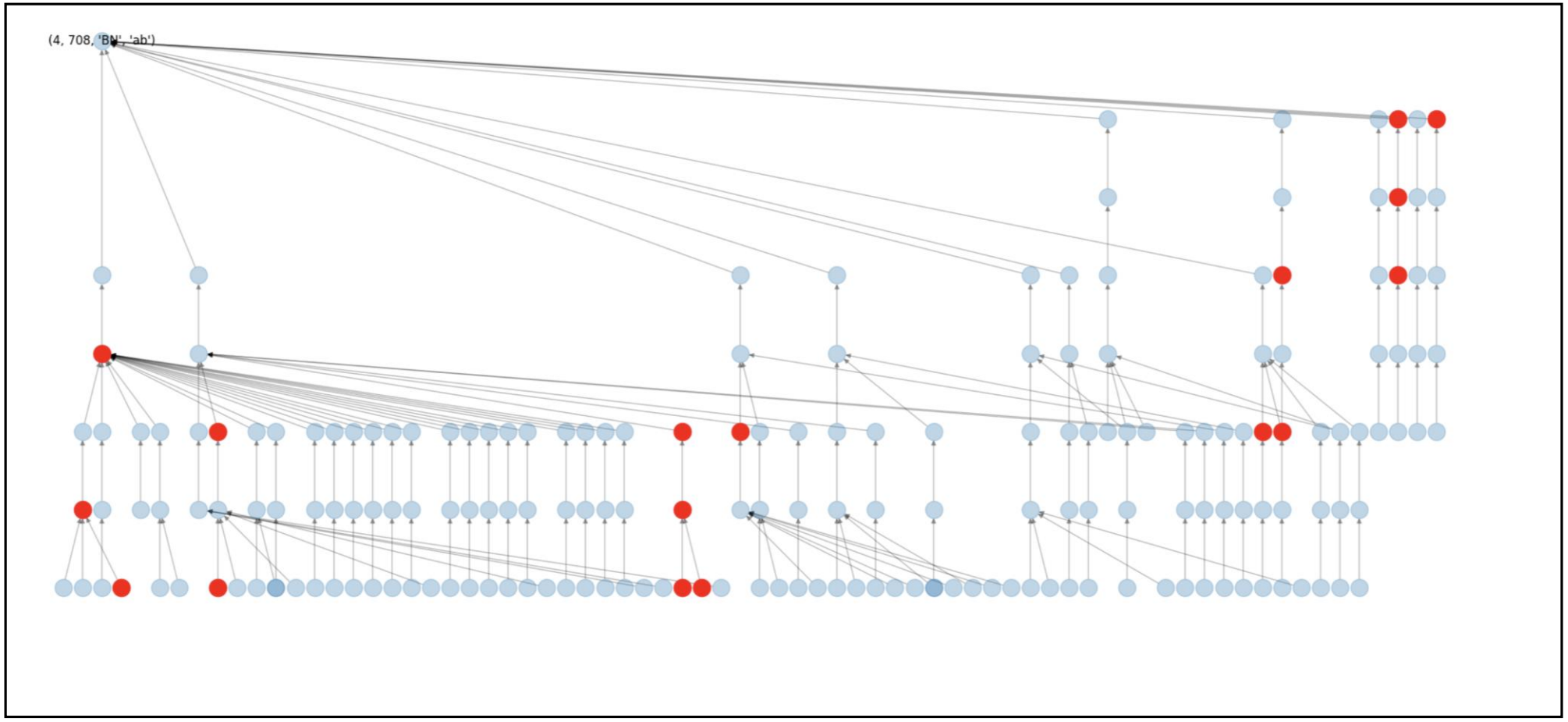
Conflict edges



Delay Forecasting

Ancestor Graph

Ancestor Graph



SBB CFF FFS
Danke, merci,
grazie, thank you.