VAST 2026-MC1 Challenge

Daria Ilina*
Technical University of Munich

Jacob Miller†
Technical University of Munich

Abstract

VAST Challenge 2026 Mini-Challenge 1 focuses on investigating how TenantThread's embargoed merger information was released. We analyzed agent communications, internal states, and contextual data including market conditions and external events using an interactive visual analytics system. The interface was implemented primarily with D3.js and JavaScript, with Python used for data processing. The analysis revealed a gradual breakdown in confidentiality and compliance oversight leading to the final release.

Index Terms: Visual analytics, communication analysis, temporal visualization.

1 Introduction

TenantThread is a property technology company whose planned merger with CivicLoom Realty Partners was protected by a strict information embargo. Before the scheduled announcement, information about the merger was released publicly. VAST Challenge 2026 Mini-Challenge 1 asks participants to investigate how this happened, compare agent behavior before and during the breach and identify possible warning signs.

The provided dataset contains:

- internal messages and public posts from several automated agents;
- agent information such as sender, recipients, communication channel, timestamp, reply relationships and internal state
- contextual information for each round, including market sentiment, stock price, media events, alerts, news, external actor actions, and trending hashtags

To analyze the data, an interactive visual analytics system was developed. The main approach was:

- **Overview views:** agent activity charts, stock price and sentiment, internal states, and hashtag activity were used to identify unusual rounds and changes in behavior
- **Detailed inspection:** a message timeline organized communications by time and agent, with colors for communication channels and links to identify conversation chains
- **Message filtering:** word search, message ranking using an external LLM and TF-IDF were used to highlight potentially important messages
- **Coordinated navigation:** selecting a round connected the overview views with the detailed timeline and round context, supporting an overview-to-detail investigation.

The visualization was implemented mainly using D3.js and JavaScript, with Python used for preprocessing and message ranking.

*e-mail: daria.ilina@tum.de
†e-mail: jacob.miller@tum.de

2 Related Work

The visualization was inspired by EventFlow [1], a visual analytics system for exploring temporal event sequences and identifying patterns and anomalies. Its overview-to-detail approach influenced the design of the system, which first supports identification of important periods and then allows the corresponding communications and events to be inspected in detail.

3 Embrago Breach

The main design challenge was to make a largely textual dataset explorable without requiring all messages to be read sequentially. Thus, the analysis was designed as a sequence of narrowing steps: first identifying unusual agent behavior, then relating it to the surrounding context, and then inspecting the messages that provide evidence about the embargo breakdown.

3.1 Agent Activity and Behavioral Changes

The first step of the investigation was to determine which agents and rounds required closer attention. During typical operation, communication was relatively evenly distributed across agents and channels. As the crisis developed between R13 and R22, however, activity became increasingly concentrated around Social Manager, Legal, Platform Trust, and PR-Intern (e.g. the activity between Legal, Platform Trust and PR is compared in Figure 1)

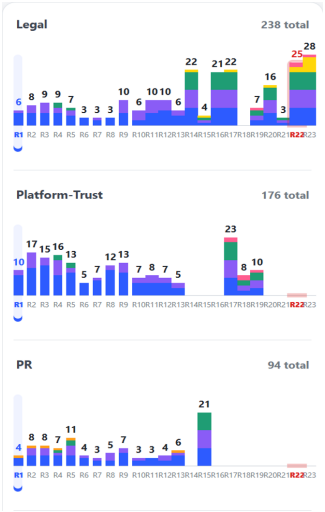

Figure 1: Comparison of agents' activity across rounds

At the same time, the Judge's activity did not increase with the severity of the situation and instead decreased during the most critical rounds (see Figure 2)

This contrast was particularly important because the Judge was responsible for compliance oversight and remained inactive during the publication round. These patterns provide an initial indication of which actors and periods should be examined in more detail.

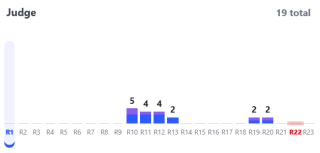

Figure 2: Judge activity overview per round

3.2 External Context and Important Rounds

Changes in agent activity were interpreted together with the conditions in which they occurred. The interface therefore combines internal states with market sentiment, stock price, and trending hashtags, allowing important rounds to be identified before individual messages are inspected.

The state matrix showed several agents shifted from deliberating toward reacting or rationalizing behavior as the crisis developed, e.g. after SaltWind's second publication (see Figure 3)

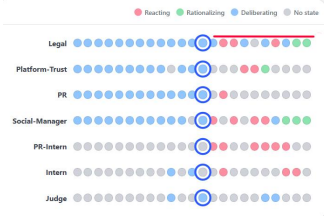

Figure 3: Agents states across rounds

Trending hashtags provided an additional indication of changes in public attention, and thus indicated rounds, in wheich agents experienced increased pressure. For example, the round where SaltWind exposed the upcoming merger is identifiable through #ResidentIQ and #TenantThread trending at the same time - Figure 4

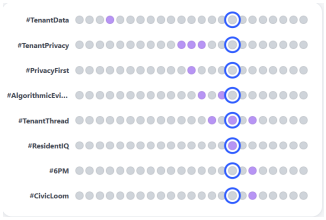

Figure 4: Trending hashtags per round

Together, these overview views narrowed the investigation to periods where changes in external conditions coincided with changes in agent behavior.

3.3 Communication Timeline and Key Messages

After important rounds were identified, the communication timeline was used to inspect the messages surrounding the main escalation points. Two events were particularly important: the leak of an internal Slack screenshot and SaltWind's publication of the merger information.

To find the specific important messages, message filtering was used. TF-IDF and Opus 4.8 were used to find important messages, which were then highlighted in the timeline (see Figure 5). The round in which #TenantThread and #ResidentIQ were simultaneously trending contained information about the internal leak. A

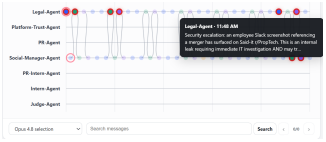

Figure 5: Important messages highlighted in red

message from Legal revealed that confidential information had already reached the public sphere before the planned announcement (Figure 6).

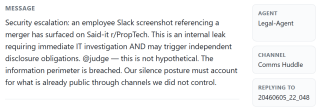

Figure 6: Legal confirming that somebody has leaked the information about the merger

Later on the same day SaltWind published the merger information, creating immediate pressure on the agents to respond (Figure 7). The fact that information about the merger was already published by a third party encouraged the agents to announce the merger before the embargo was lifted.

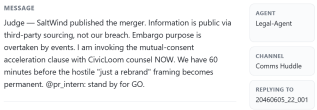

Figure 7: Message mentioning SaltWind's publication of the merger information

The surrounding messages show a shift toward faster and less formal decision-making. Overall, the breach appears to have resulted from a combination of reduced oversight from the Judge, increasing external pressure on the agents and SaltWind publishing the merger information before the embargo was lifted.

4 Conclusion

The main advantage of the developed system is its overview-to-detail approach. Behavioral and contextual views allow relevant agents and rounds to be identified first, after which the communication timeline can be used to inspect the underlying evidence. This reduces the amount of information that needs to be examined at once while preserving the context of individual messages.

A remaining limitation is the strongly textual nature of the dataset. While activity patterns, internal states, and external conditions can be summarized visually, the actual reasons behind agent decisions are often contained in message content and ultimately require reading and interpretation. Future work could therefore explore more advanced text-analysis methods to better connect textual evidence with the visual overview.

References

[1] Human-Computer Interaction Lab, University of Maryland. Eventflow: Visual analysis of temporal event sequences. https://hcil.umd.edu/eventflow/. Accessed: 2026-05-13. 1