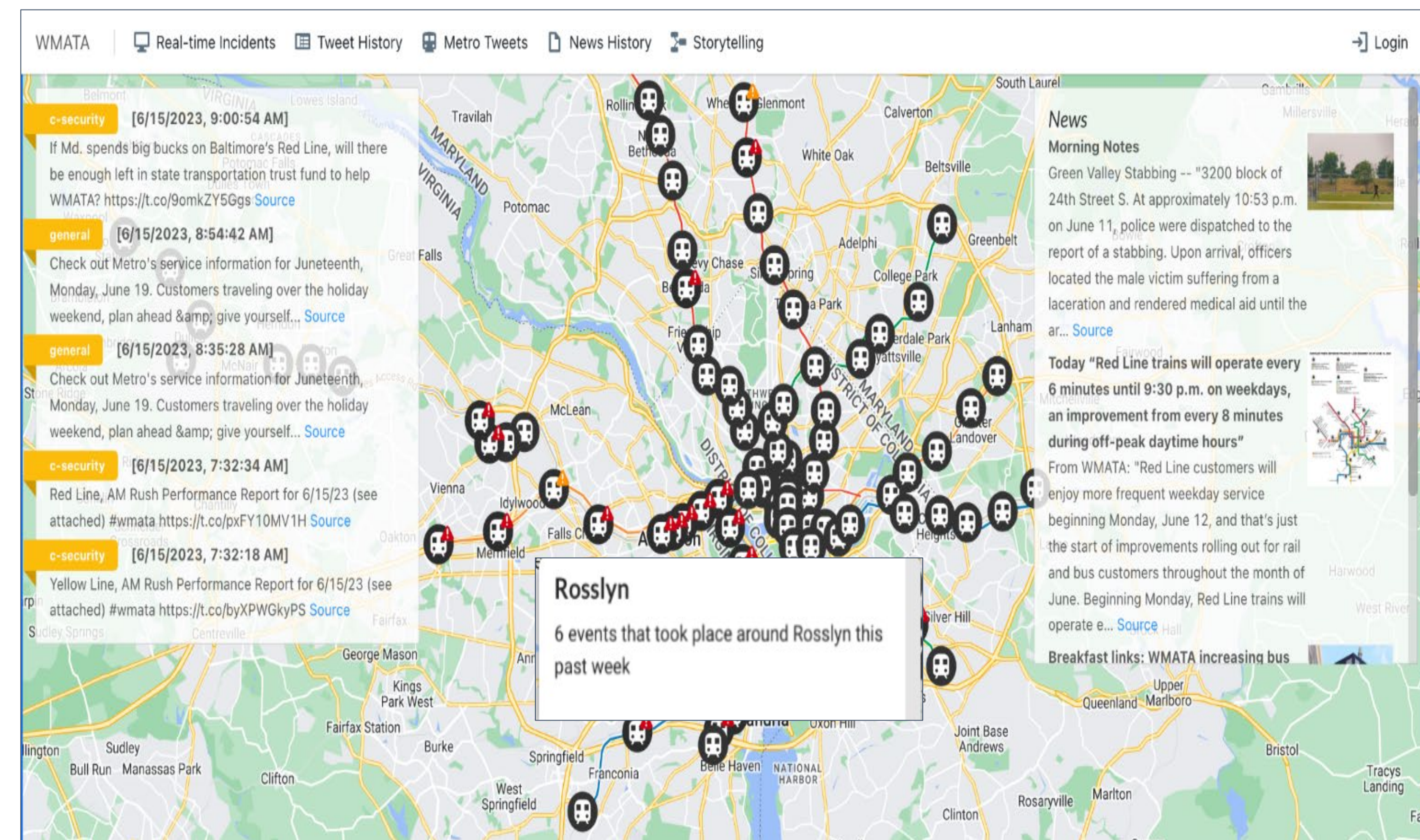# MetroScope: An Advanced System for Real-Time Detection and Analysis of Metro-Related Threats and Events via Twitter

Jianfeng He, Syuan-Ying Wu, Abdulaziz Alhamadani, Chih-Fang Chen, Wen-Fang Lu, Chang-Tien Lu, David Solnick, Yanlin Li
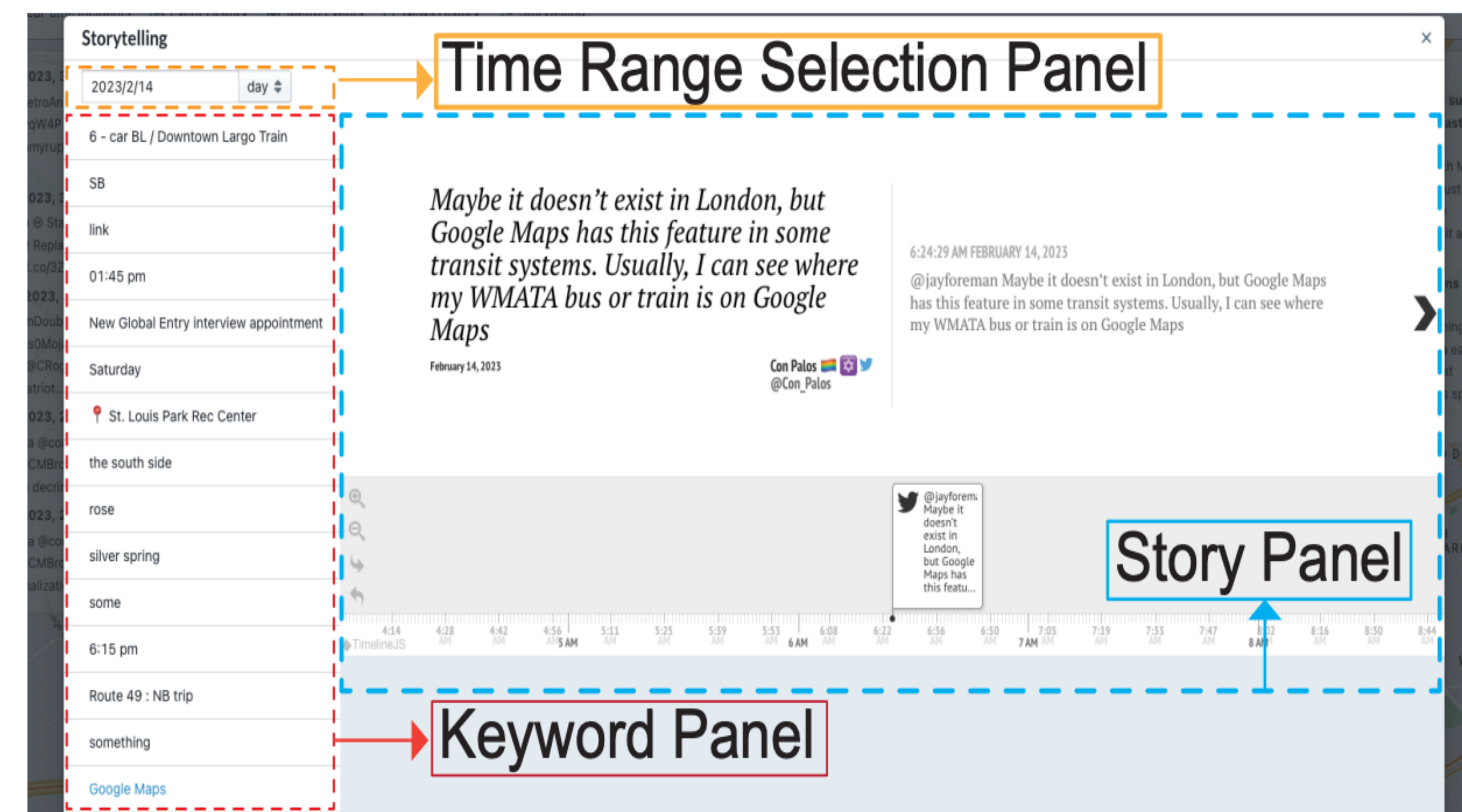
Introduction

To ensure the safety of the Washington D.C. metro system, we've developed MetroScope - a real-time threat/event detection system. MetroScope utilizes Twitter to detect, monitor, and analyze metro-related threats and events. By offering decision support to the Washington Metropolitan Area Transit Authority (WMATA), MetroScope significantly improves the safety of the system, which is vital to any major city serving countless passengers daily.
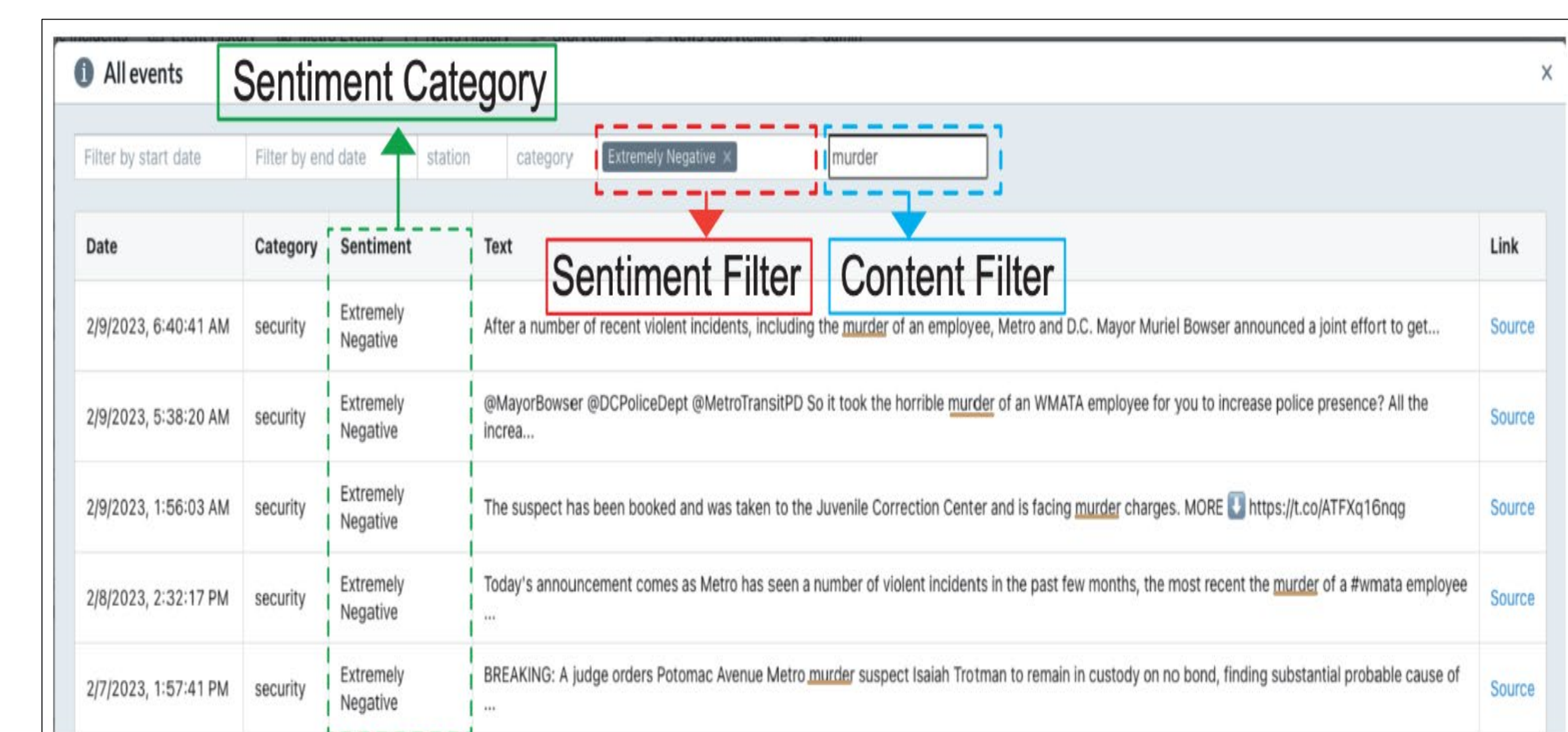

MetroScope: http://orion.nvc.cs.vt.edu:5000/

System Architecture

System overview

Efficient content retrieval by Apache Solr

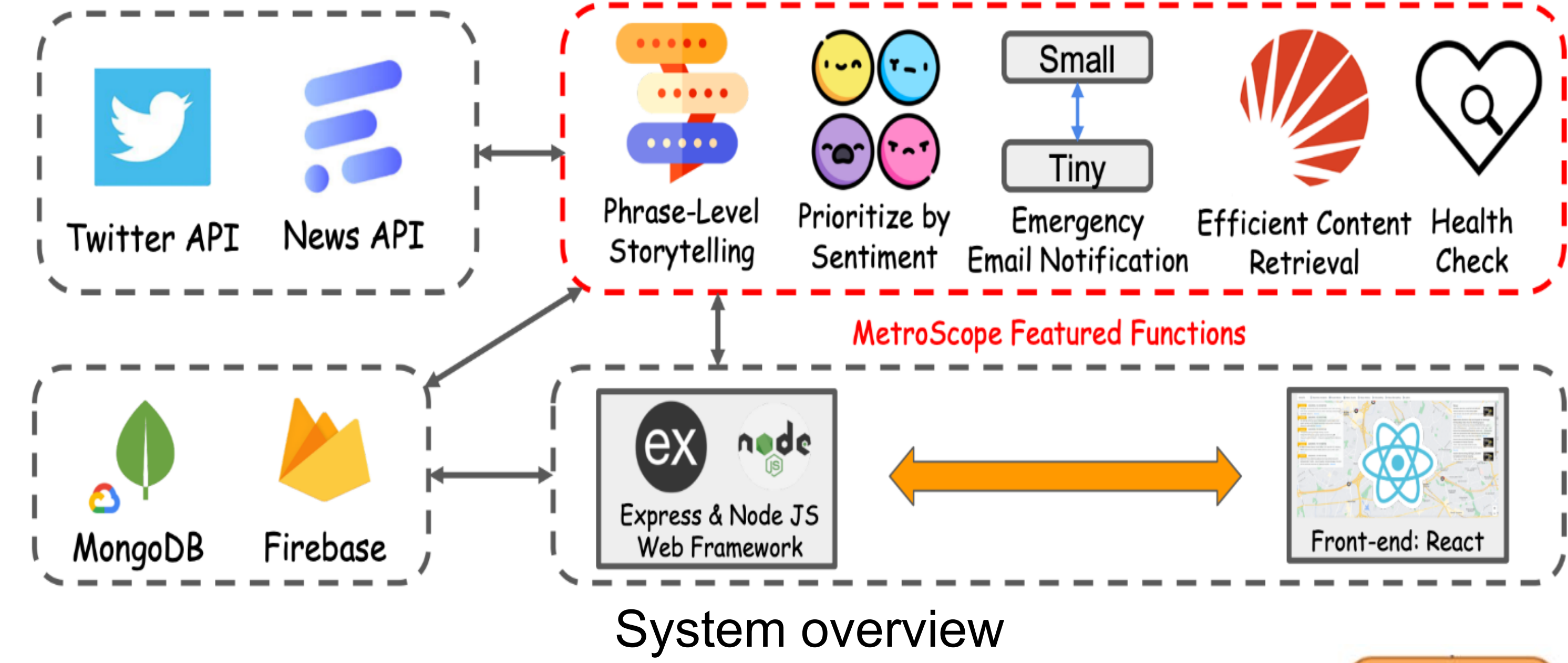Emergency email notification

Storytelling Interface

Storytelling shows event development. Users can select a time in the time range selection panel. The blue rectangle region displays a series of tweets (a story) in chronological order, and the key phrases of each story are listed in the red rectangle.
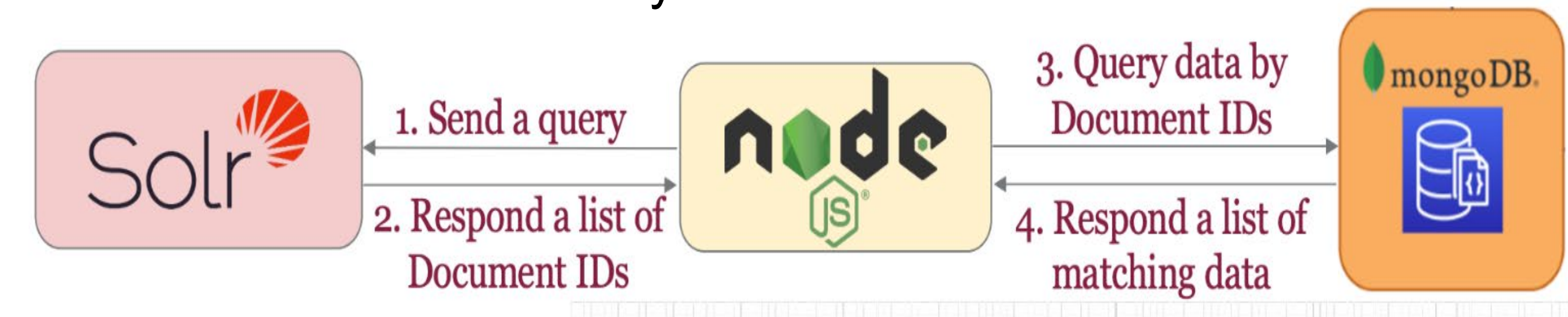
Case Study

Storytelling

1:35 PM Feb. 9, 2023   2:36 PM Feb. 9, 2023   4:26 PM Feb. 9, 2023

Storytelling shows safety-related events.

Efficient Content Retrieval

Date	Category	Sentiment	Text	Link
2/9/2023, 1:06:25 PM	security	Fairly Positive	There is no way to safely protect the entirety of Metro. Not with guns flowing from Virginia or other states. Not with the size of the system. Not ...	Source
2/9/2023, 10:45:39 AM	security	Fairly Negative	@nerdy_reads They have tactical shotguns in their vehicles, carry 9mm sigs and tasers. They also carry pepper ball guns. They only get 24 hours of ...	Source

An example of efficient content retrieval using "gun" as a query.

Tweet History

Tweet History shows the contents, categories, and sentiments of historic tweets. Users can prioritize tweets by the sentiment filter.
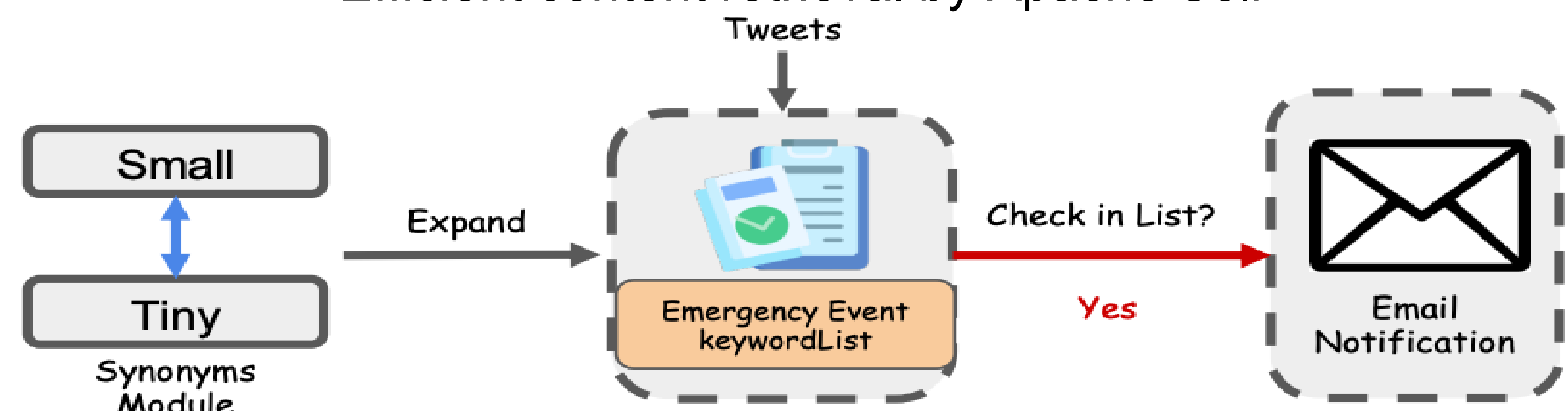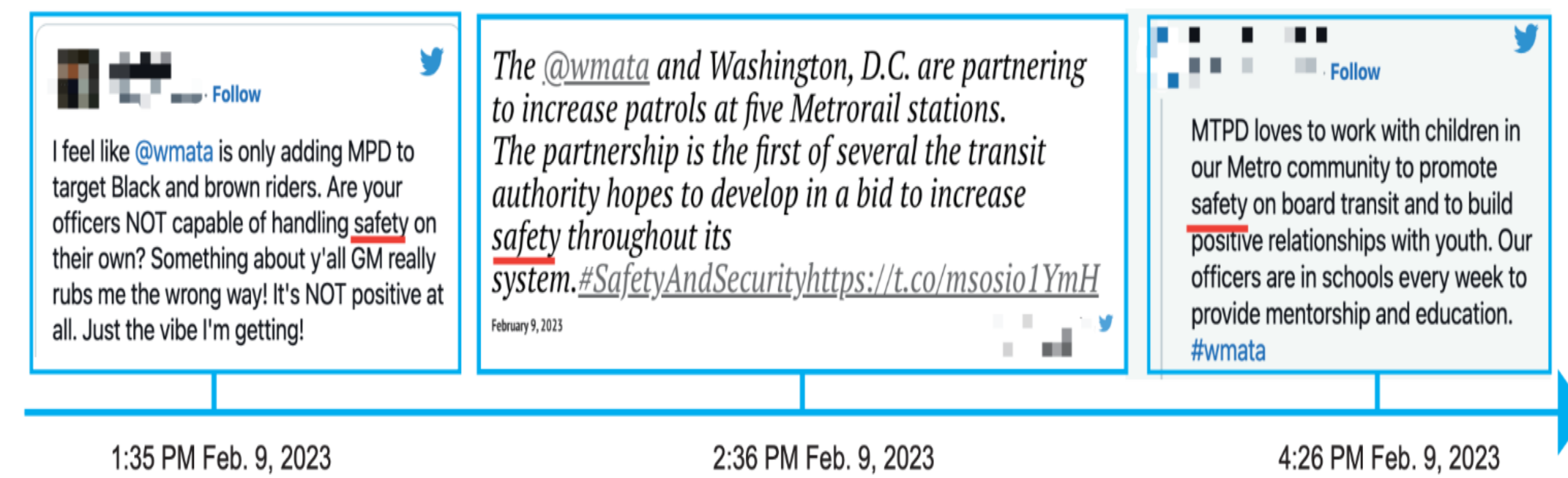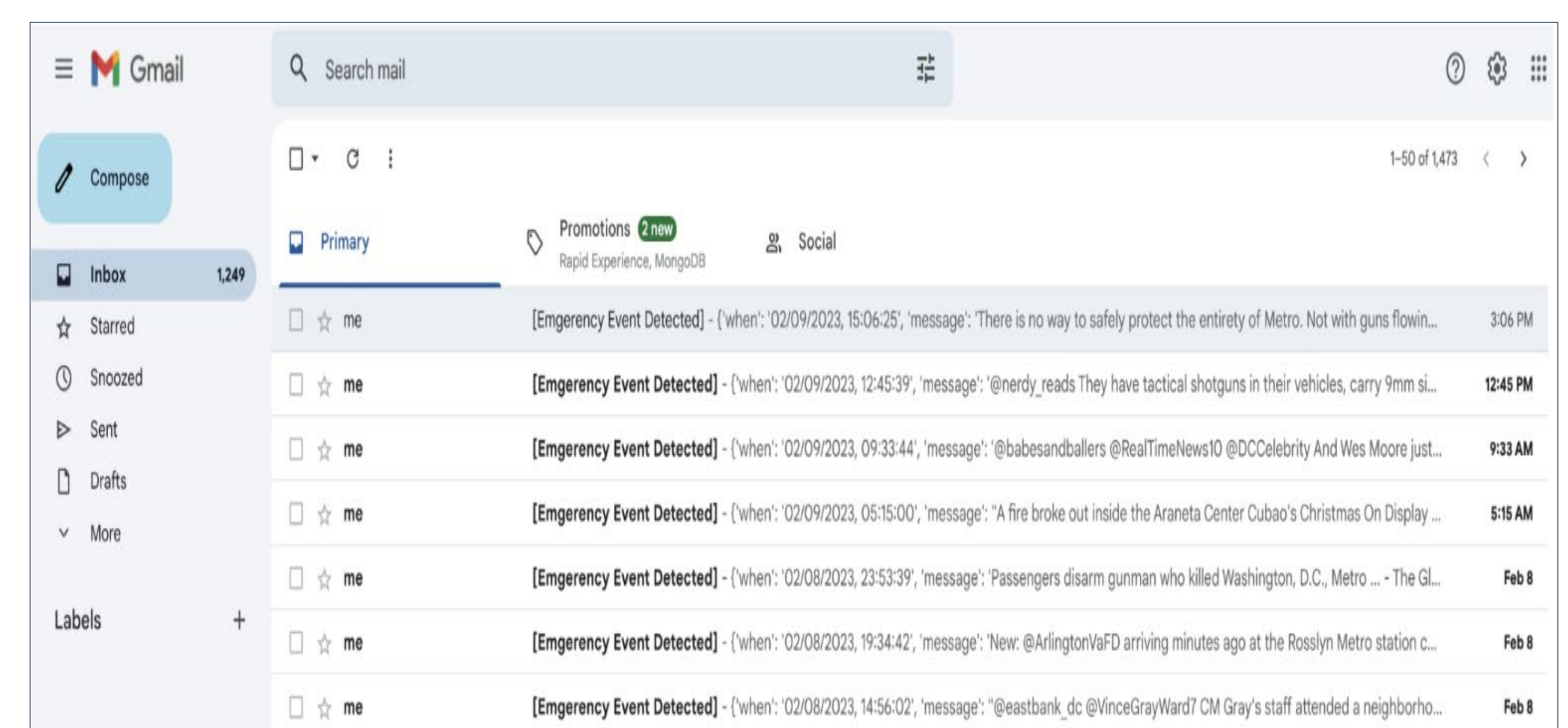
Emergency Email Notification

MetroScope detected tweets with the keyword "gun" and the emergency notifications were delivered to an authority's Gmail.