Triangle: Empowering Incident Triage with Multi-Agent

A Multi-Agent System Reducing Incident Engagement Time by up to 91

Zhaoyang Yu[1] • Aoyang Fang[5] • Minghua Ma[2] • Jaskaran Singh Walia[3] • Chaoyun Zhang[3] • Shu Chi[1]
Ze Li[2] • Murali Chintalapati[2] • Xuchao Zhang[2] • Rujia Wang[2] • Chetan Bansal[2] • Saravan Rajmohan[2]
Qingwei Lin[3] • Shenglin Zhang[4] • Dan Pei[1] • Pinjia He[5]

[1]Tsinghua University • [2]Microsoft • [3]Microsoft, Beijing

[4]Nankai University • [5]The Chinese University of Hong Kong, Shenzhen

Multi-Agent System   Incident Management   Cloud Operations
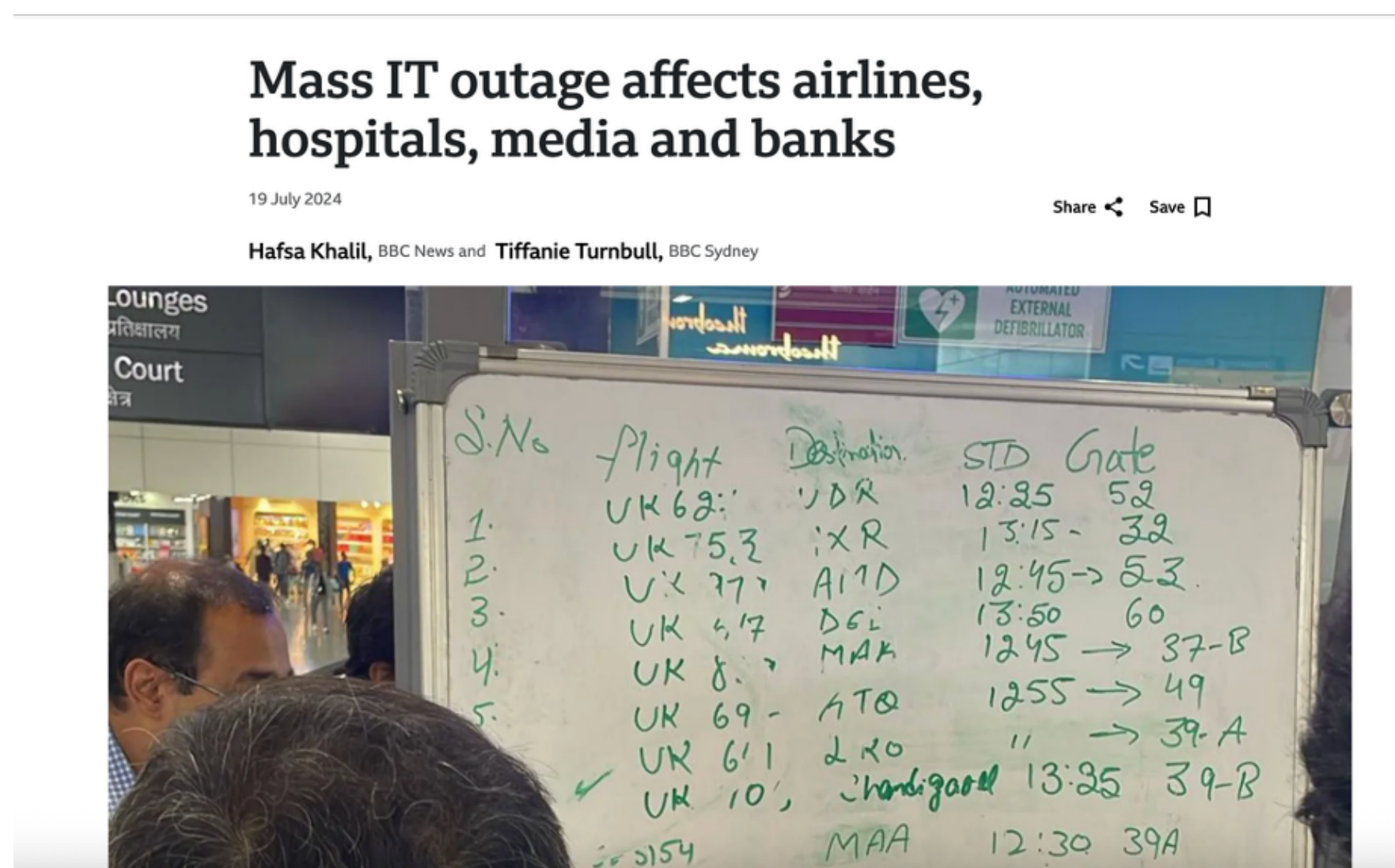
The Chinese University of Hong Kong, Shenzhen   Microsoft   Nankai University

1. Why Incident Triage Matters

High-profile outages demonstrate the critical importance of rapid incident response:

Mass IT outage affects airlines, hospitals, media and banks

Hafsa Khalil, BBC News and Tiffanie Turnbull, BBC Sydney

CrowdStrike and Windows Outage (July 19, 2024): Caused massive global service disruptions and economic losses.

Amazon apologises to customers impacted by huge AWS outage

Liv McMahon, Technology reporter

Amazon Web Services (AWS) has apologised to customers impacted by Monday's massive outage, after it knocked some of the world's largest platforms offline.

Snapchat, Reddit and Lloyds Bank were among more than 1,000 sites and services reported to have gone down as a result of issues at the heart of the cloud computing giant's operations in North Virginia, US on 20 October.

In a detailed summary of what caused the outage, Amazon said it occurred as a result of errors which meant its internal systems could not connect websites with the IP addresses computers use to find them.

"We apologise for the impact this event caused our customers," the company said.

"We know how critical our services are to our customers, their applications and end users, and their businesses."

Amazon Web Services Outage (Oct 19, 2025): Impacted millions of users and businesses worldwide.

Even minutes of downtime translate to millions in revenue loss and severe customer impact.

2. The Core Challenge: Triage Cycles

At the heart of incident management lies **Incident Triage**: assigning incidents to the correct team. A wrong assignment triggers costly "triage cycles" where incidents bounce between teams.
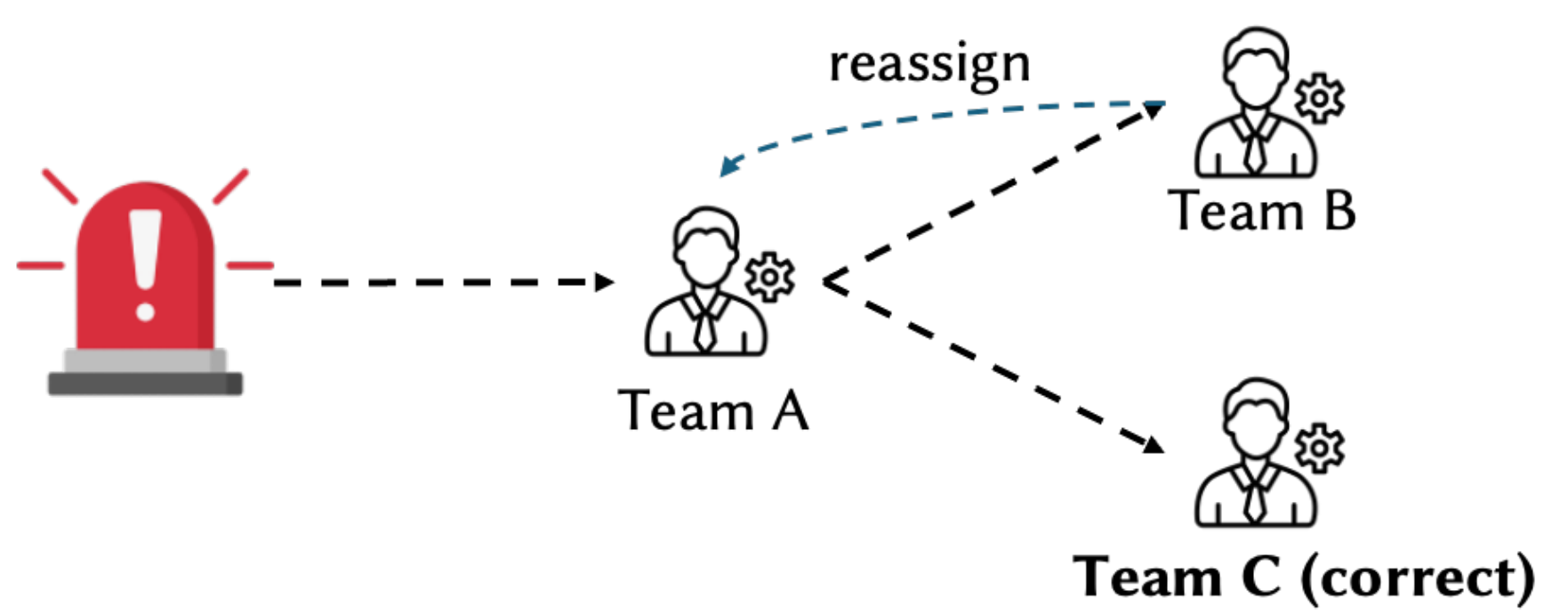
The triage process relies on slow man-

Incident metadata: Customers are encountering a sign-in issue with the *** desktop client on Mac

Team A: Clearing the cache didn't resolve the issue. Testing on both Mac and Windows shows that works fine on Windows..

Team B: Confirm the prerequisites MacOS and perform the keychain clean up. The customer is still having issues...

Team C: Collect a HAR file while the client is starting. Identify the issue ***, apply a hot fix, and resolve the problem

Real incident that manually escalated across teams

Real example: A Mac sign-in issue escalated across Teams A, B, and C before reaching the team with correct expertise.
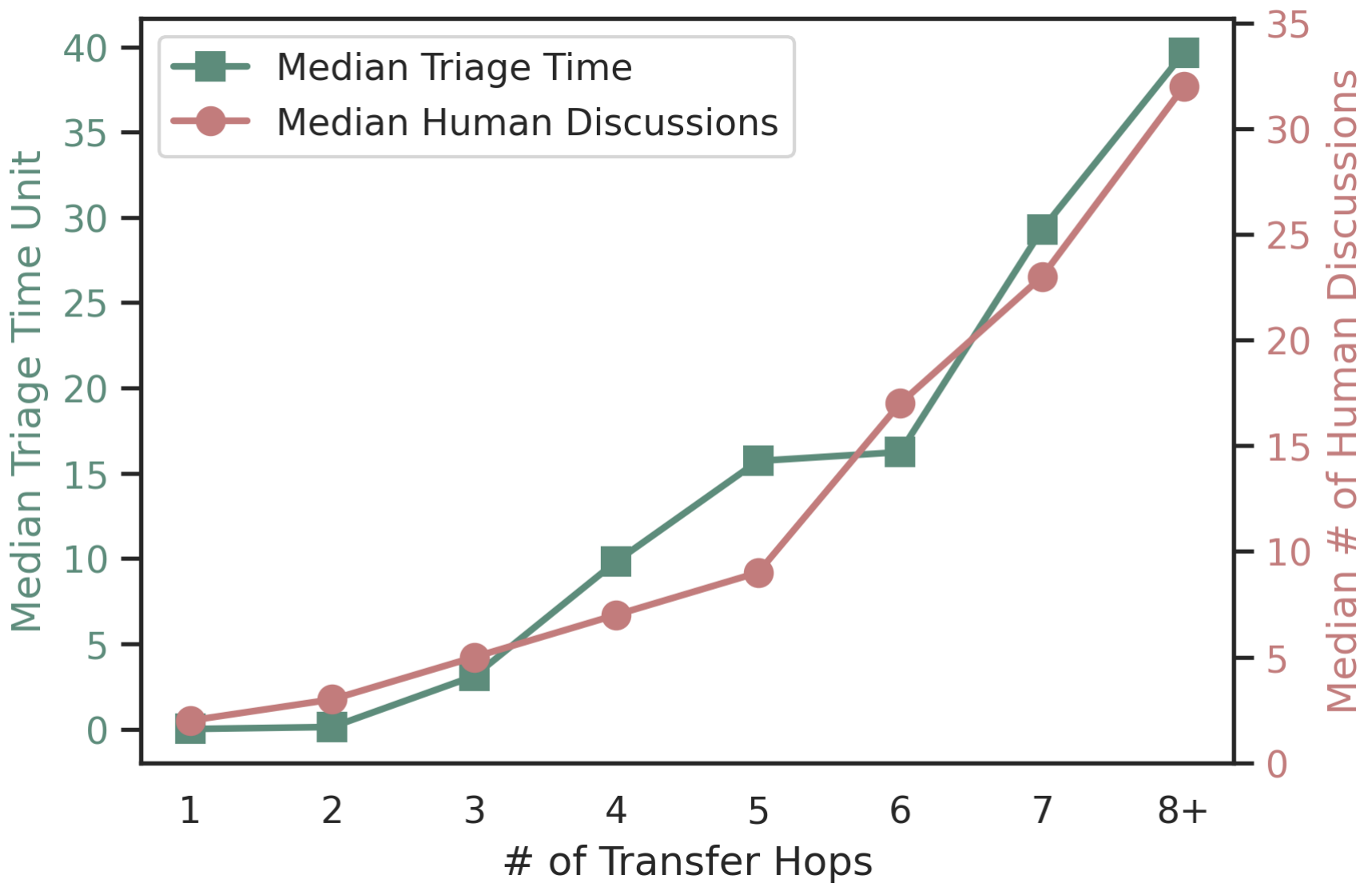
Our study of 3,000+ teams: Each hop exponentially increases triage time and communication overhead.

3. Our Solution: Triangle

Triangle is a multi-agent system that automates triage by simulating expert team collaboration:

- ► **Semantic Distillation:** Analyzer Agent extracts key information from noisy data.
- ► **Collaborative Negotiation:** Team Manager Agents discuss, enrich with tools, and vote.
- ► **Automated Enrichment:** Agents query logs and monitoring systems automatically.

4. How It Works

Triangle employs a three-phase workflow that mirrors expert-level diagnostics and decision-making.

1. **Analyze:** The *Analyzer Agent* distills the core issue from the raw incident alert.
2. **Propose:** The *Decider Agent* uses historical data and team documentation to identify a set of candidate teams.
3. **Negotiate:** *Team Manager Agents* for candidate

---
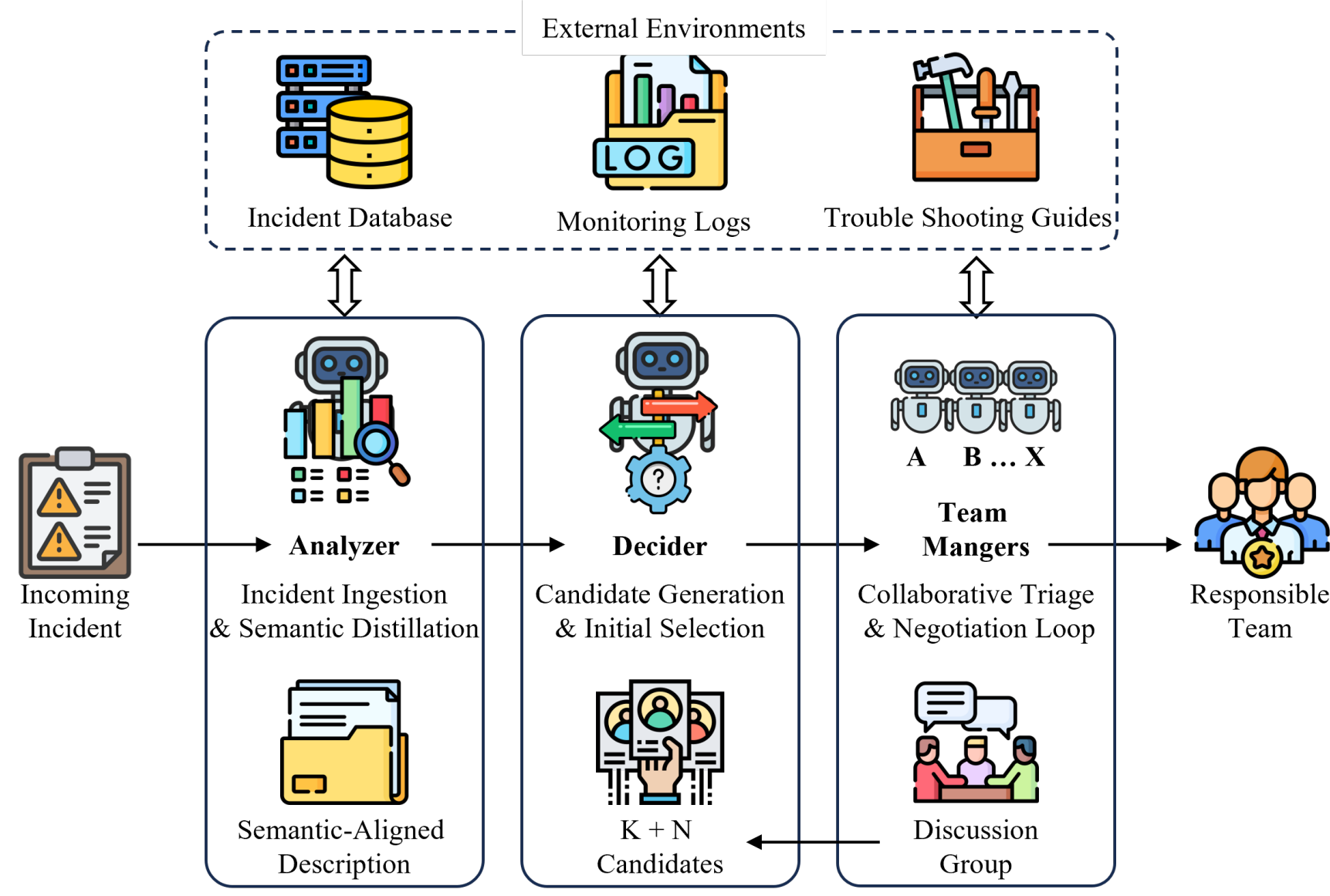
The Triangle Framework: Agents collaborate to analyze, propose, and negotiate the correct team assignment.

This iterative process allows Triangle to solve complex cases that would require multiple manual reassignments.

5. Key Results

We evaluated Triangle on real-world incident data from a large-scale cloud provider.

- ► Outperforms the state-of-the-art (DeepCT) by a relative margin of **26-42%**.
- ► Achieves **91.7%** accuracy after 5 hops, without relying on manual discussion data.
- ► Generalizes to other tasks, outperforming baselines on the MSR 2013 Bug Dataset by an average of **51%**.
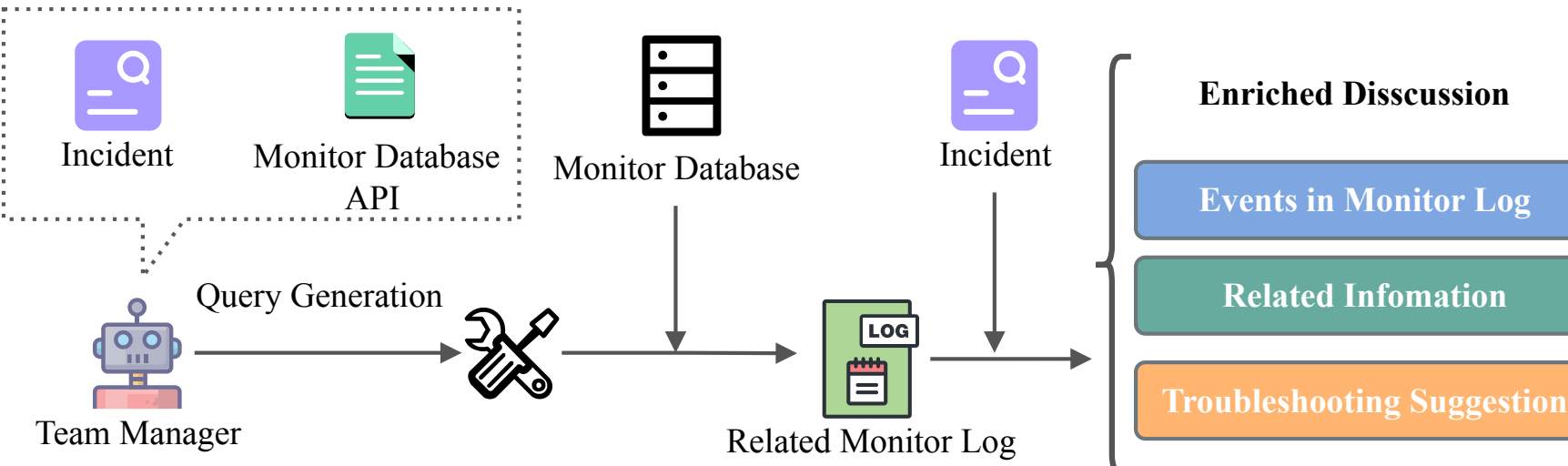
Team Manager Agents use tools to automatically enrich incidents with log data and analysis.

6. Real-World Business Impact

Triangle is deployed in production, serving tens of millions of users. Across six major services, it has delivered significant operational improvements.

97%
Peak Triage Accuracy

91%
Max TTE Reduction

20TB+
Data Processed Daily

7. Conclusion

By automating triage with a collaborative multi-agent system, Triangle not only improves accuracy but fundamentally changes the

---