Message Fabric for Cyber Defense

IACD / SCRE Focus Group
JHU/APL

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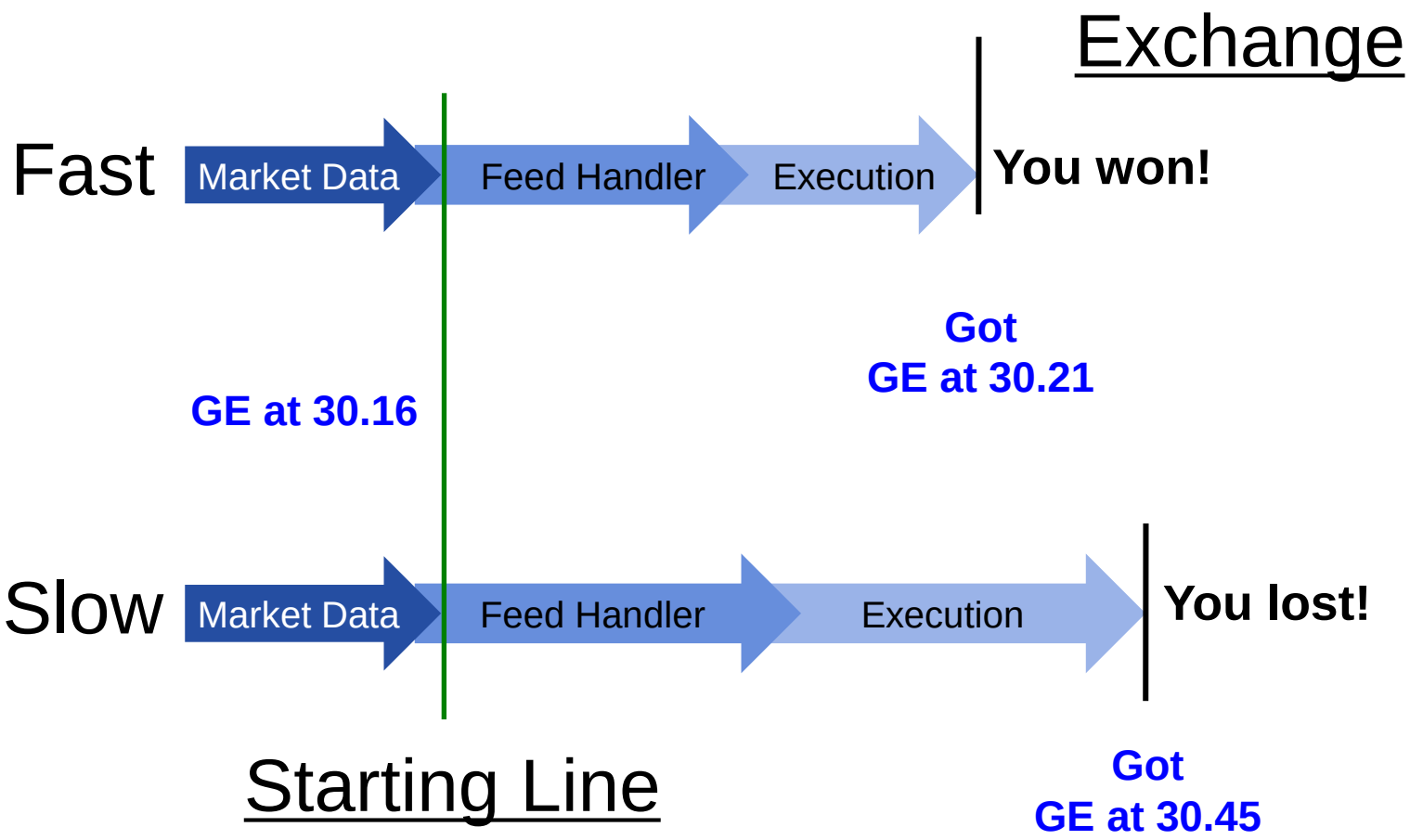
The Race to the Exchange

why speed is critical for Capital Markets



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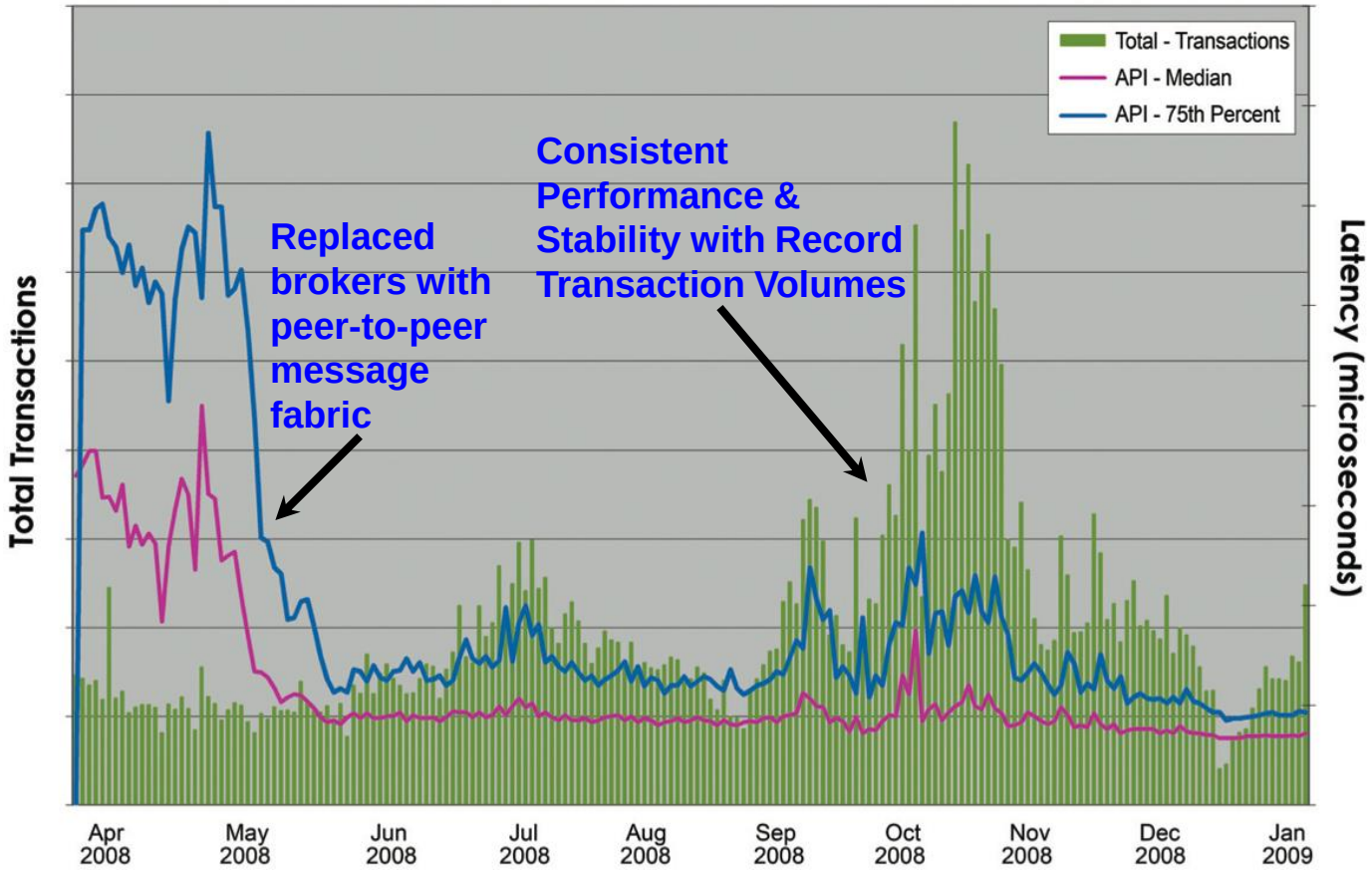
Case Study: Direct Edge

3rd Largest US Stock Exchange in 2008 (after NYSE and NASDAQ)



Source: Direct Edge 2008-2009

- ✓75% lower latency
- ✓50% reduction in hardware cost
- ✓Increased resiliency
- ✓Predictable performance

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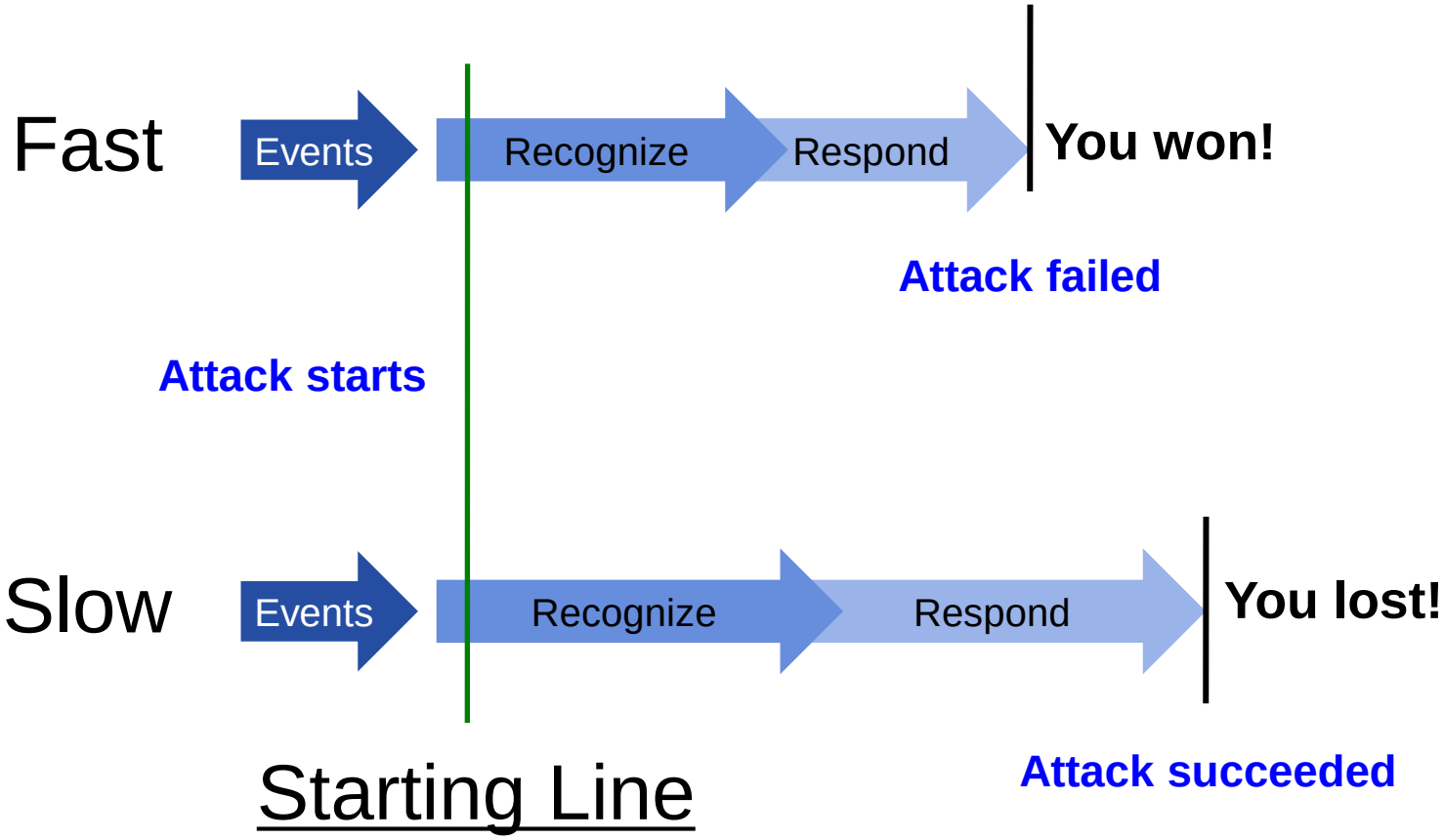
The Race to Respond

why speed is critical for Cyber Defense



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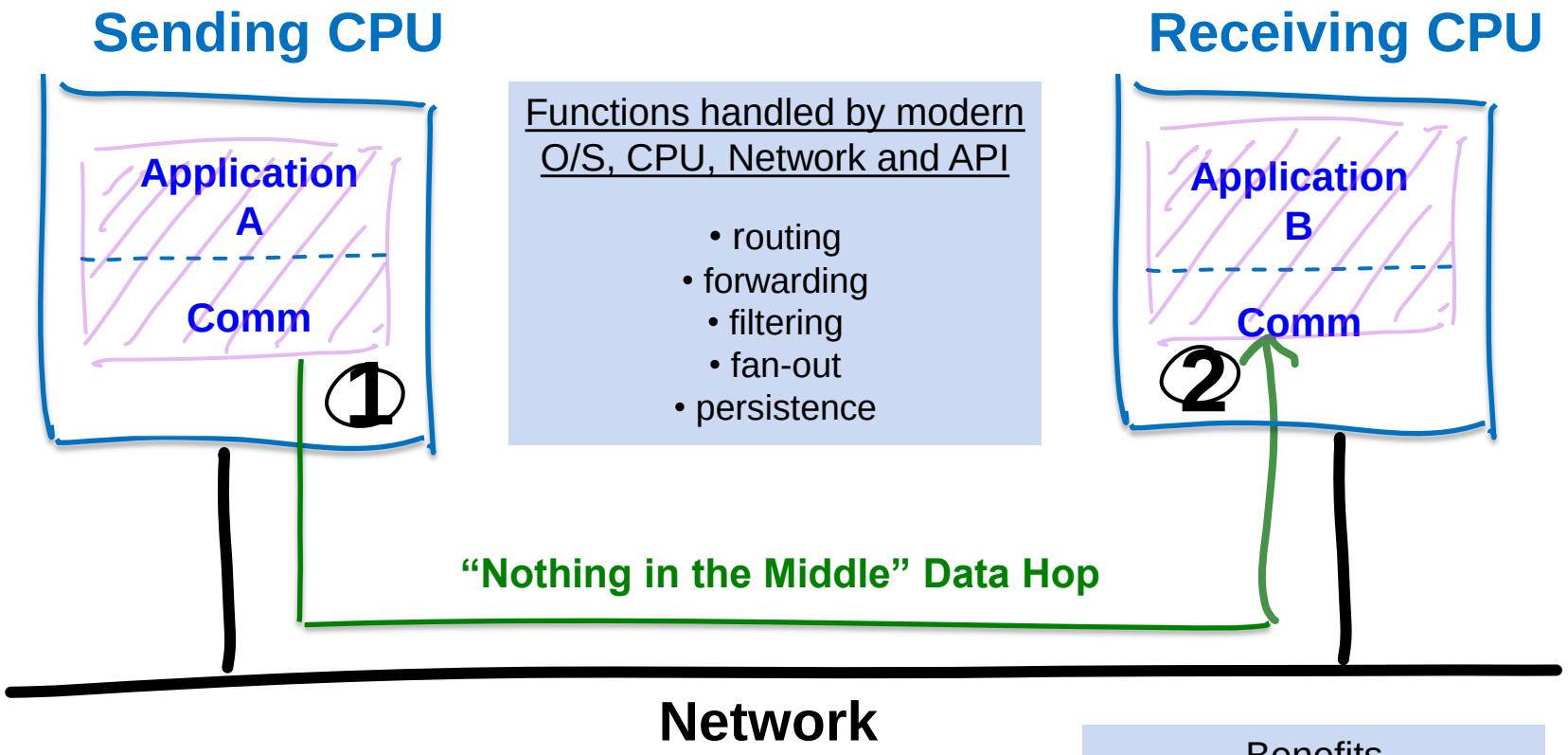
Why a Message Fabric?

- Agility, Adaptability, Reliability, Scalability, Modularity, Maintainability
- Different data, different requirements = **Use right tool for *each* job**
- "Get Left of Boom" = Detect and Respond faster = **Latency matters!**
- Better late than never or better never than late = **Choice of *quality of service***
  - e.g., only-latest-matters (no recovery), reliable (only recovery between active participants), guaranteed (keep data for offline participants too)
- Some data matters to one component; some data matters to all = **Choice of *patterns***
  - e.g., publish/subscribe, request/response, load-balanced, queuing
- Modularity
  - **Easily integrate new technologies and algorithms into existing system**
- Maintainability
  - Software on commodity hardware = **future proof and lowest O&M**
  - **Centralized control, distributed components (avoid bottlenecks)**
- Build vs. buy
  - **Focus on core competencies!**

Peer-to-Peer Message Fabric



Just 2 steps to move from A to B!!!
Less is more!!

Benefits

- efficient (single data hop)
- maximizes performance
- no single points of failure
- scalable and flexible
- easier to administer

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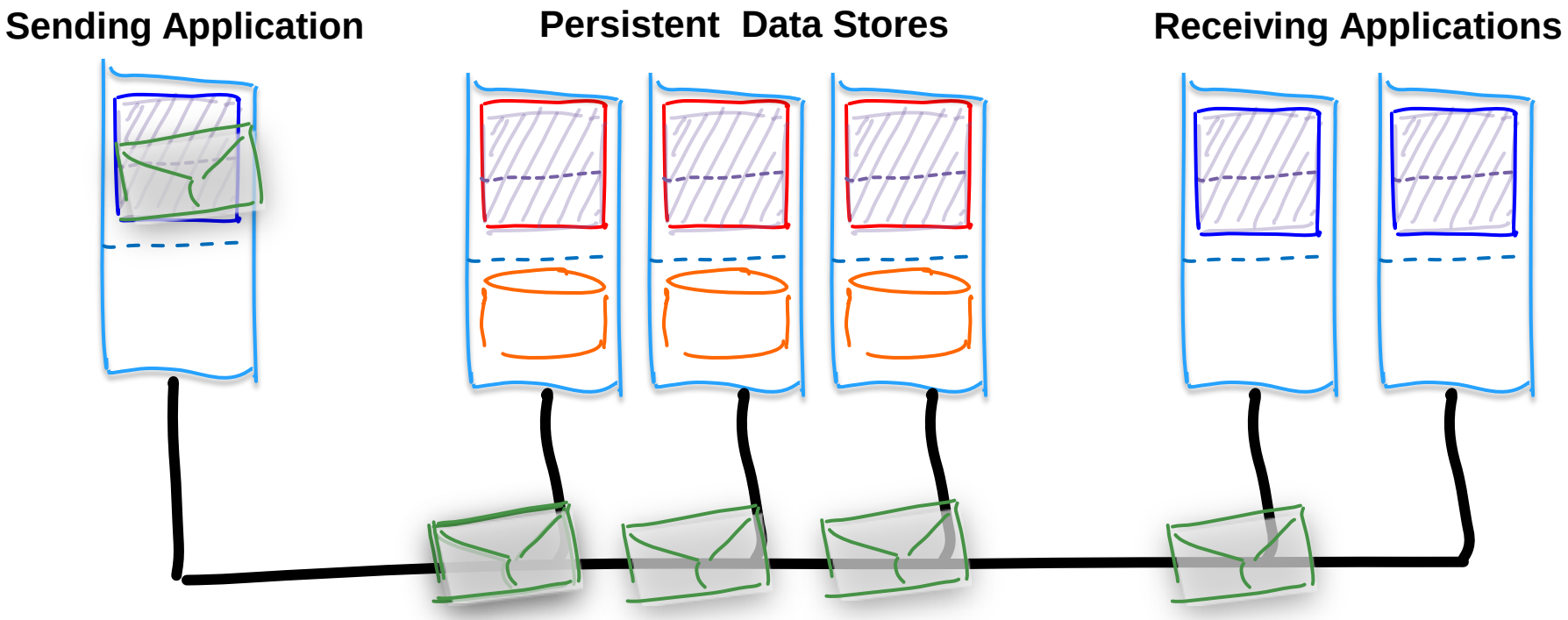
Parallel Persistence®



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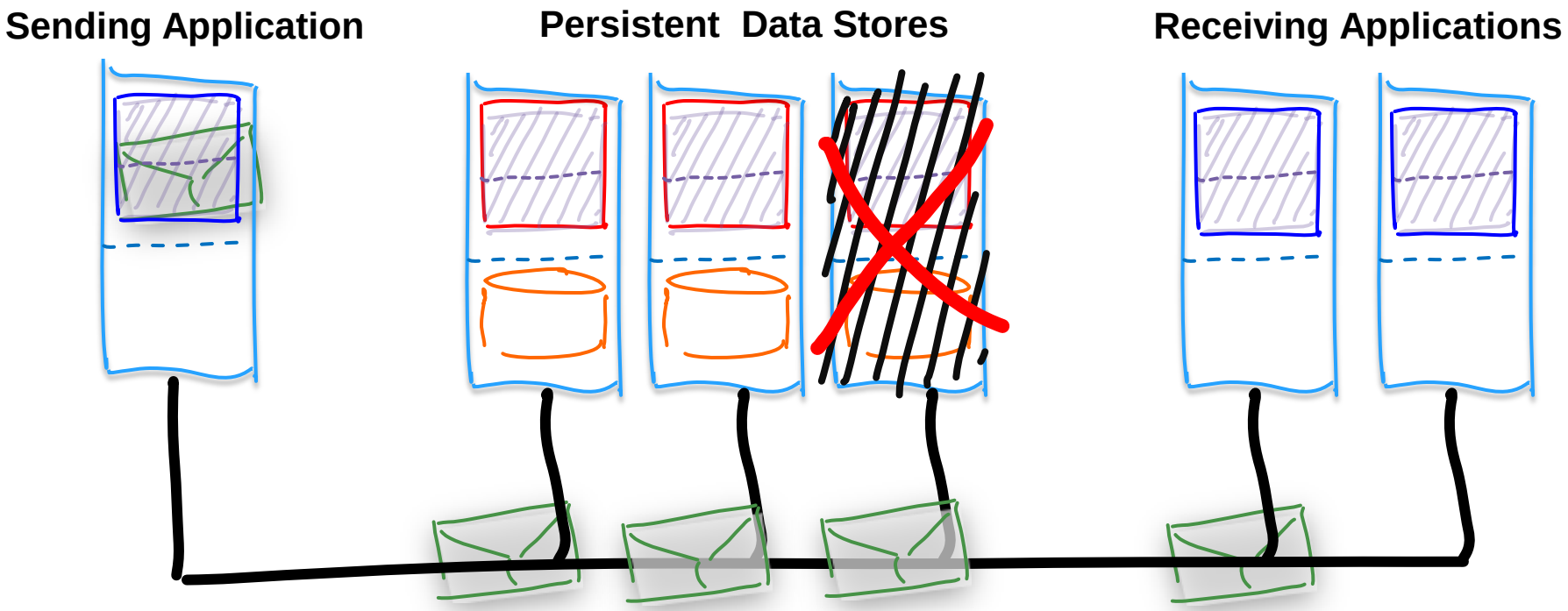
Parallel Persistence®

Zero System Downtime!
Zero Latency Failover!



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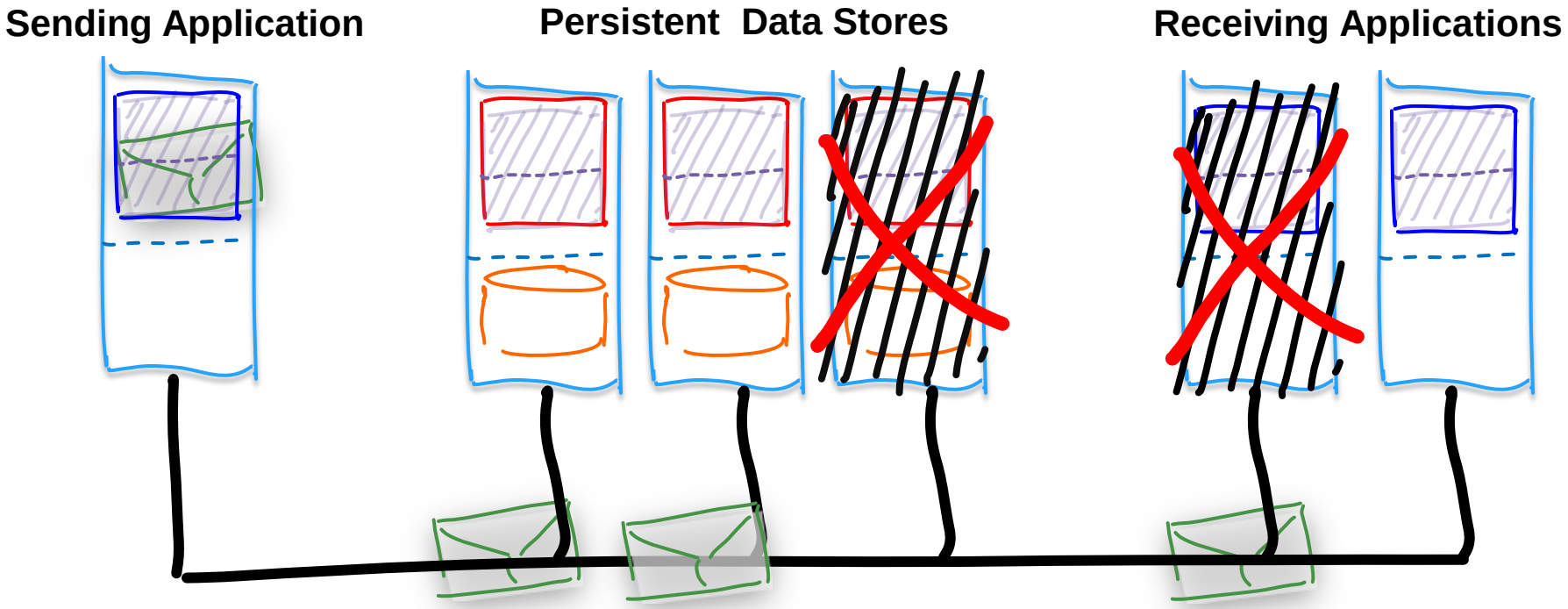
Parallel Persistence®



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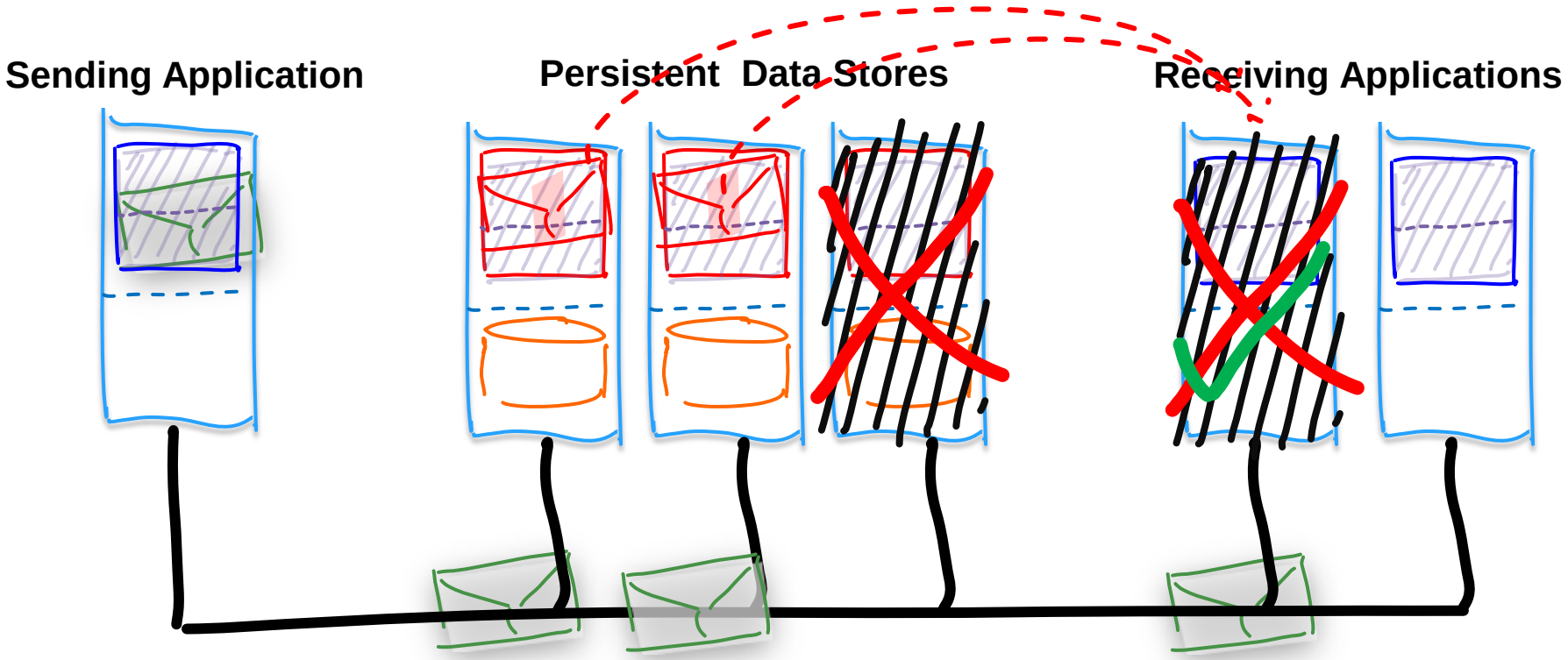
Parallel Persistence®

Receiver recovers with no impact to live message stream, then rejoins the live stream!



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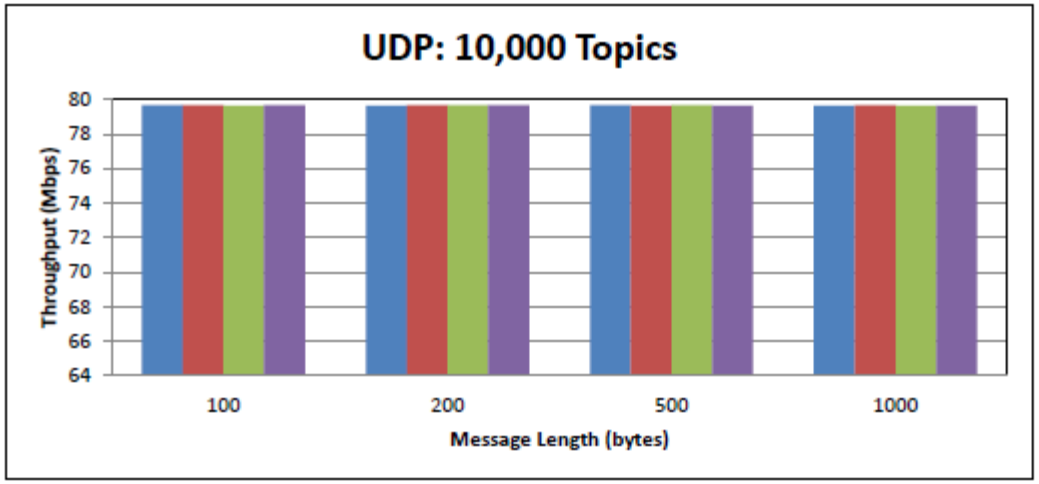
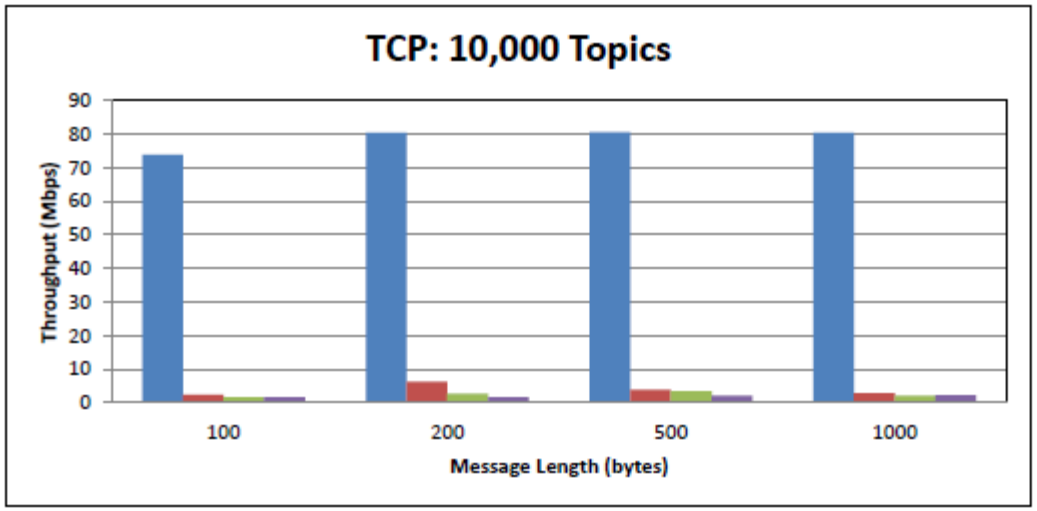
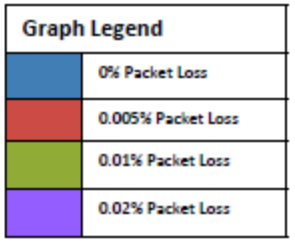
Why reliable UDP? Packet loss kills TCP

WAN Messaging Throughput: UDP vs. TCP (100 Mbps Link Speed)







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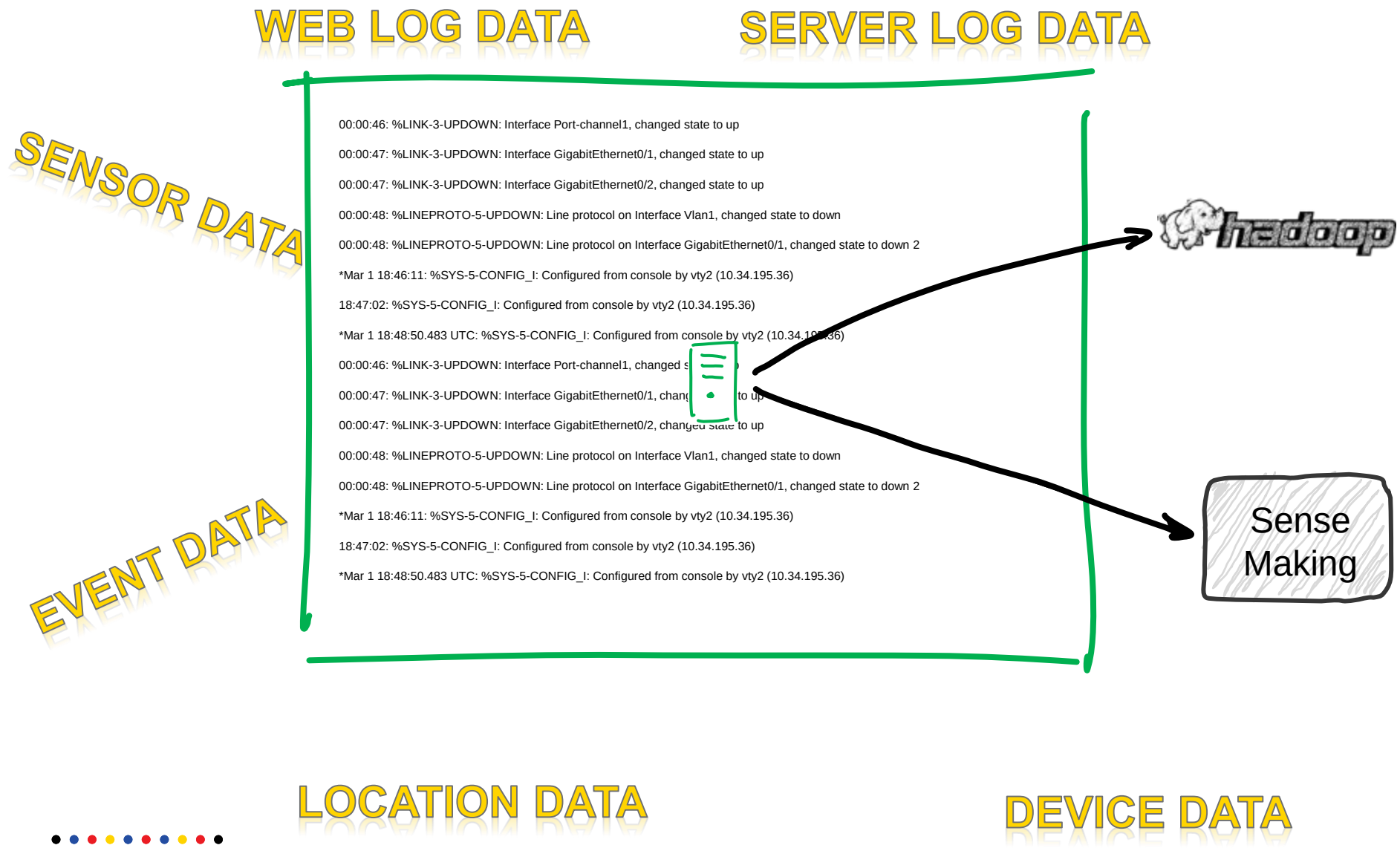
How can you combine a peer to peer message fabric with standardized interfaces and centralized management?

Streaming data collection…



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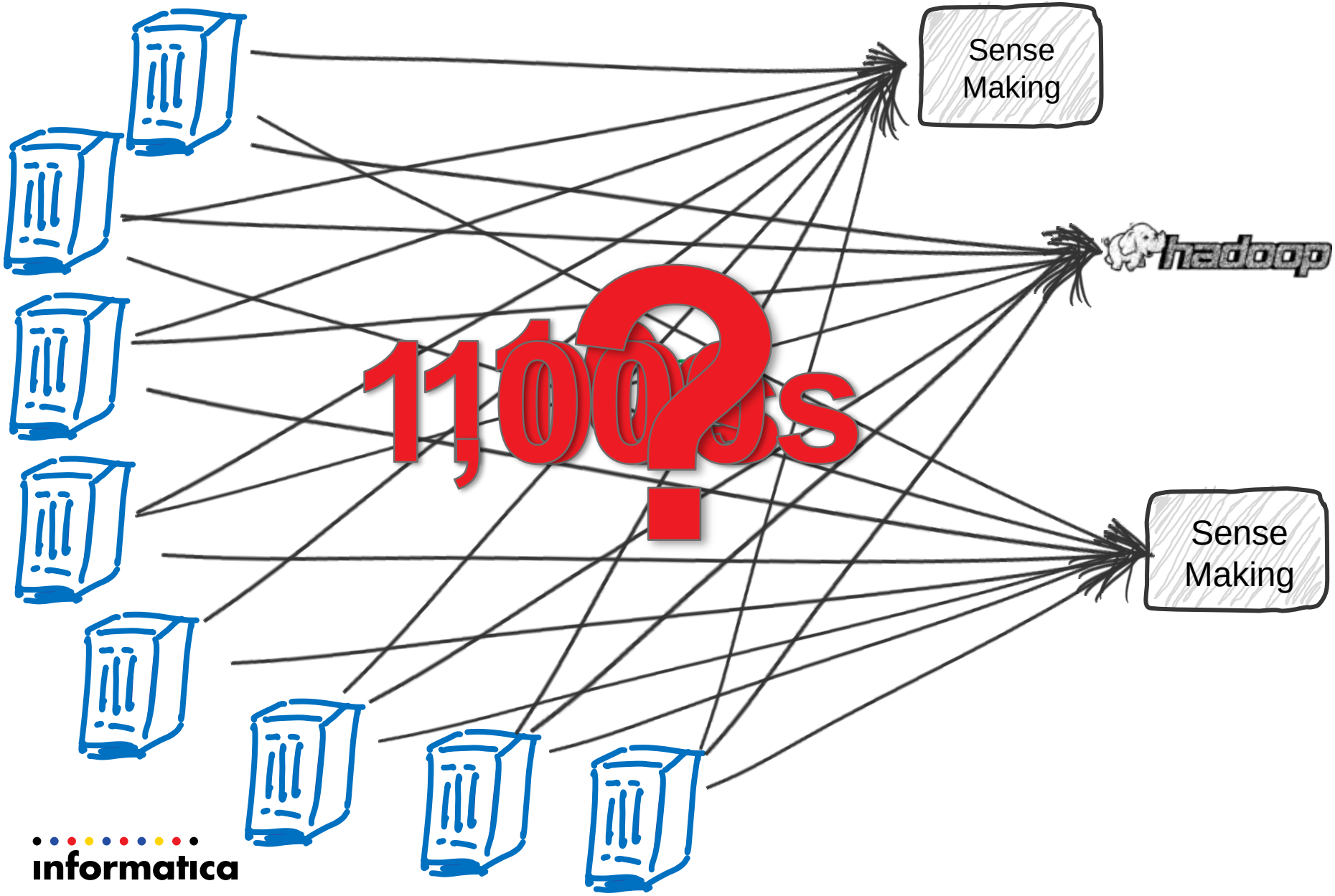
Collection at Scale and Processing at the Edge



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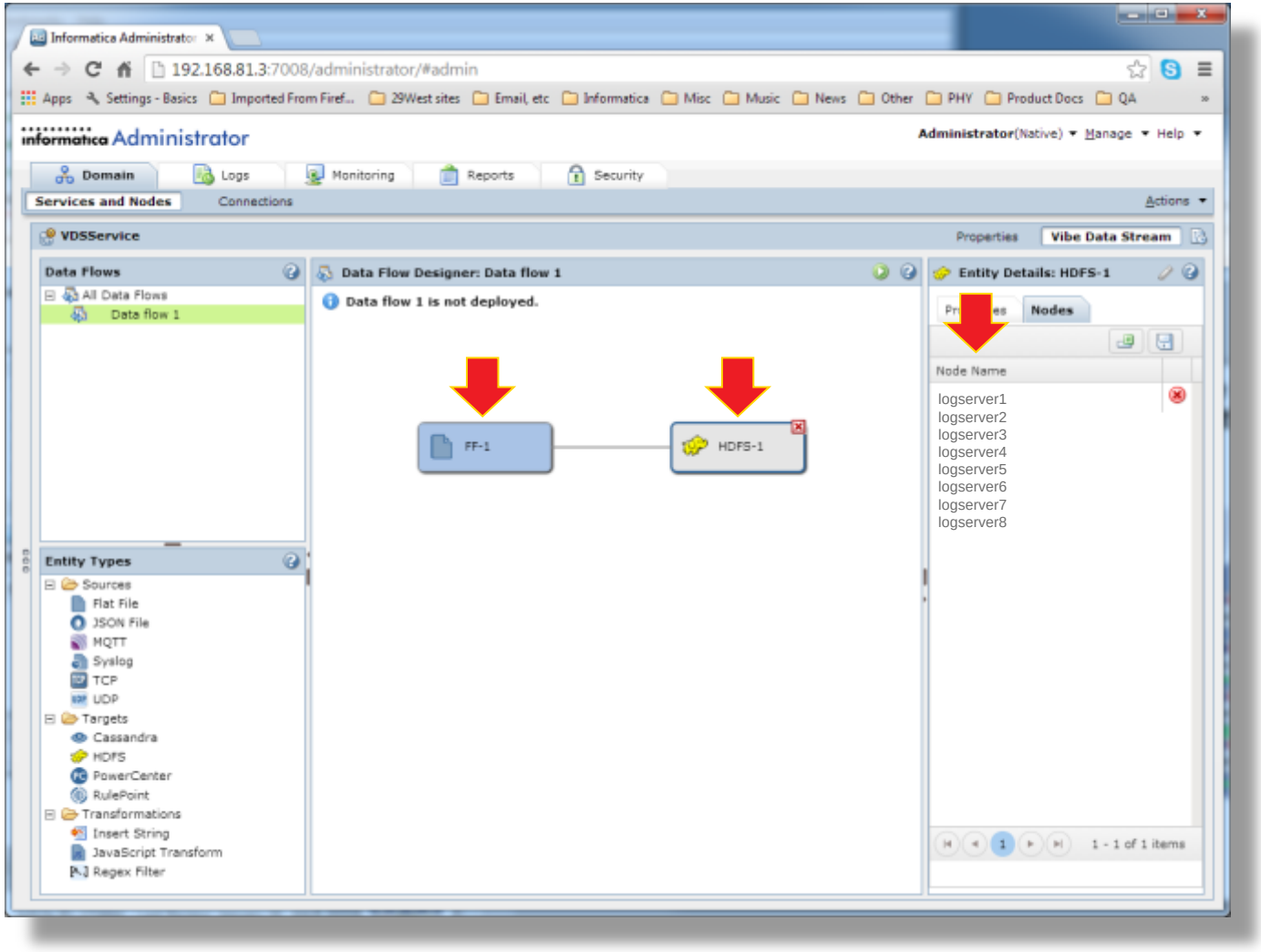
Logical data flows mapped to physical nodes



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Summary

- No daemons or servers in delivery path
  - Maximize speed and scalability
  - No single points of failure
- Choice of protocols (data “payload” agnostic)
  - TCP, UDP, AMQP, unicast, multicast, shared memory, etc.
- Secure transports, handshakes and storage
  - Integrity, with or without confidentiality
- Secure message routing for extended enterprise
  - Intelligently bridge segmented networks and applications
- Centralized monitoring (with API)
  - Integrated insight from every endpoint (other layers too!)

Summary (cont'd)

- Dynamic service and peer discovery
  - Move applications without changing configuration or code
  - Establish data flows out-of-band to minimize overhead
- Full range of qualities of service
  - From reliable (best-effort) to durable (guaranteed)
- Standards-based interfaces
  - Easily plug in third-party products and services
- Centralized management (with API)
  - Configure top-down; implement locally
- No custom hardware or storage required
  - Pure software to always run on best infrastructure

Thoughts

- Message fabric as a sensor – self awareness
- Encryption hides bad data from the good guys
- Latency, throughput, reliability trade-offs
  - Send more data at once = more throughput, less speed
  - If data is lost or delayed, how long to wait before giving up?
  - Better never than late or better late than never?
  - Reliability doesn't have to slow you down
- Processing at the edge (when can you afford XML?)

Thank You!

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