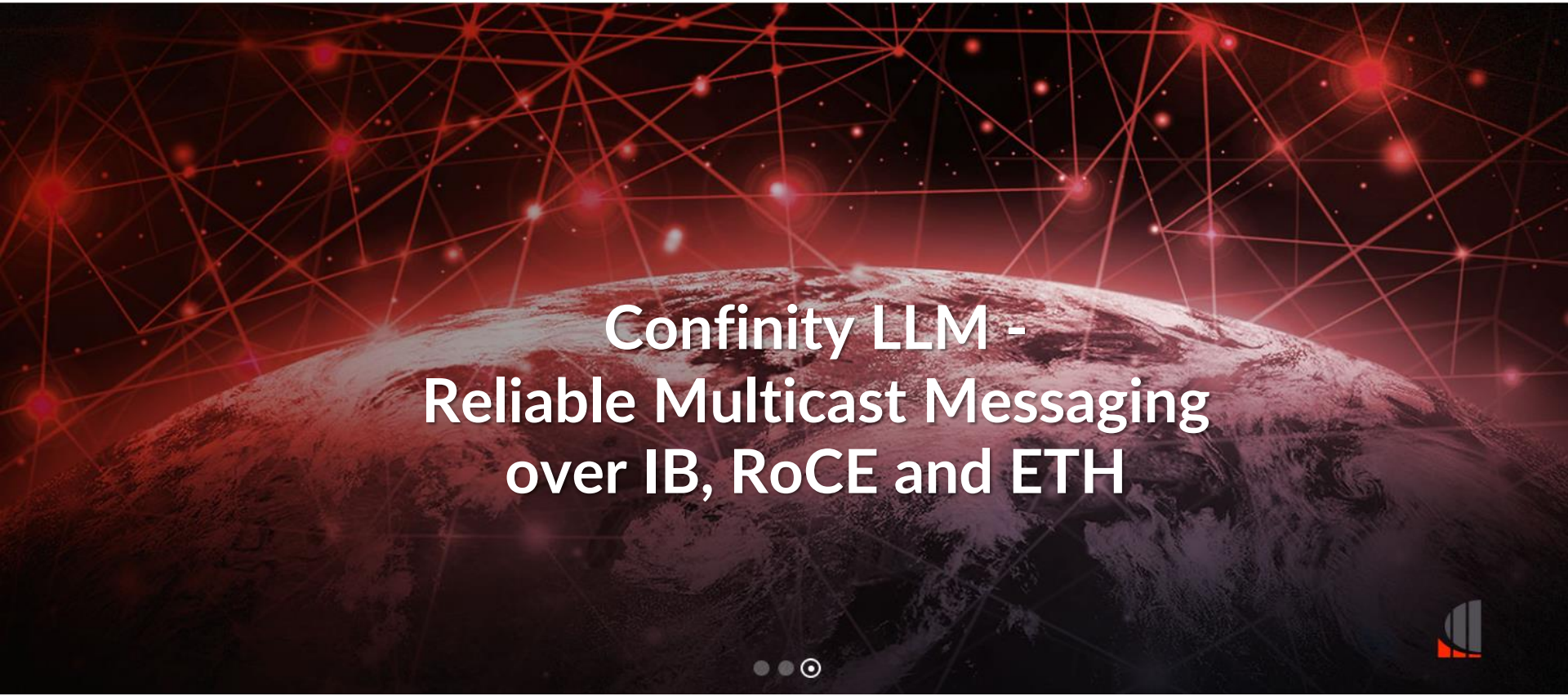

Confinity LLM -
Reliable Multicast Messaging
over IB, RoCE and ETH

CONFINITY LOW LATENCY MESSAGING (CLLM)

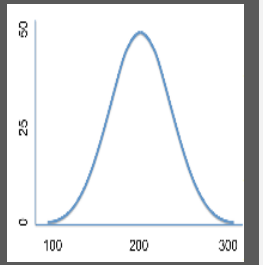
Confinity LLM is the successor product for IBM® WebSphere® MQ Low Latency Messaging.

“It is designed for financial institutions and other organizations that require near instantaneous and **reliable delivery of (extremely large volumes) of data.**

CLLM provides flexible message delivery options like RDMA, MBU, IPoIB and RoCE combined with high system availability and congestion control.”

Based on **Publish / Subscribe** paradigm, no queuing mechanism, no broker / dispatcher

Key differentiator in low latency messaging is the **predictability of latency** (steep Gauss curve)



Unique features for **reliable unicast and multicast** messaging (RUM/RMM) allow to create deterministic, stateful applications in distributed environments

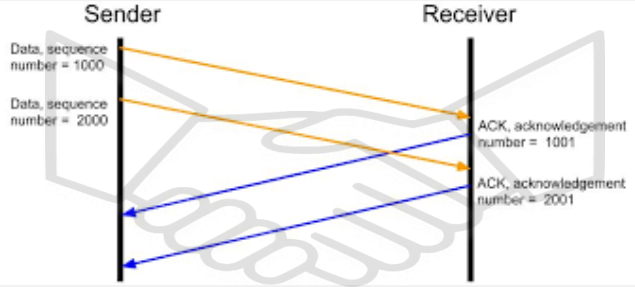
High performance and availability that help maintain high-quality service levels and protect the integrity of the data stream

Message control and filtering that make efficient use of system resources.

System monitoring and congestion controls that deliver messages with improved speed and reliability.

CLLM – Reliable TCP/UDP Messaging

- **RUM (Reliable Unicast Messaging) –** Utilizes Ethernet's TCP protocol and its ACK/NACK handshaking features



One to One

One to Many

- **RMM (Reliable Multicast Messaging) –** Enhances Ethernet's UDP protocol to provide a highly reliable, fault taulerant multicast, i.e. one to many messaging

Until mid 1980s „Open Outcry" was used at trading floors of stock exchanges

CLLM - Features

1. PGM-Protocol extension
2. Reliability
   a. Negative Acknowledgement (NAK)
   b. Positive Acknowledgement (ACK)
   c. Transmitter ACK Notification
3. Message Processing with
   a. Flow-Control / Back-pressure
   b. Message Announcer (MA) Thread
4. Slow Receiver Handling (“Cry-Baby Syndrom”)
5. Congestion Management
6. Limiting Transmission Rate
7. Filtering / Turboflow
8. Total ordering (real / virtual synchrony)
9. Late join / Replay
10. Persistent Message Store
11. Coordination Mgr / Arbitrator

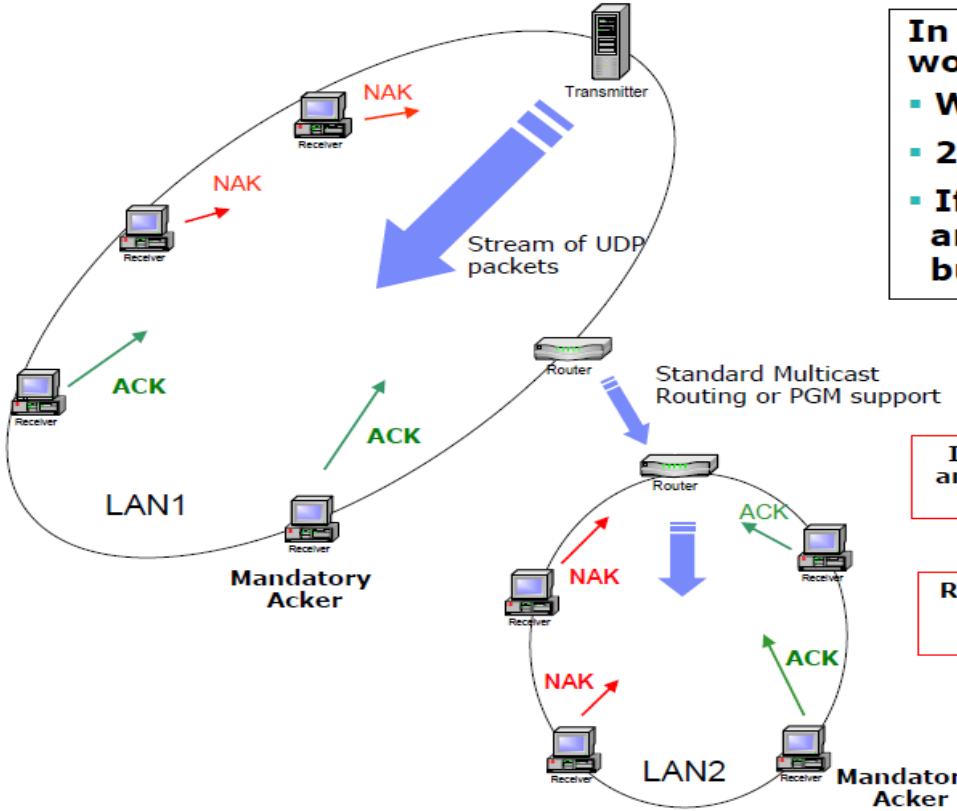
Negative Acknowledgement (NAK)

- Supported on both mulitcast and unicast topics
- All sent messages are placed in the transmitter‘s „**history buffer**“
- Older messages are removed to make room for new messages when the buffer is full.
- Receivers may request a retransmission of missed data from the transmitter‘s history buffer.
- If the receiver requests a message that is no longer in the history buffer, an „**unrecoverable packet loss**“ event is raised.
- In this mode the topic is only as reliable as the transmitter‘s buffer; which should be configured to keep data for a specified time at a specified rate for a given message size.

Positive Acknowledgement (ACK reliability)

- Full support on unicast topics.
  WAIT-1 ad WAIT-N support on **multicast** topics.
- All sent data is placed in teh transmitter‘s istory buffer“
- Older messages are removed when an ACK of the packet is received from the receiver.
- Tis requires more transmitter and network resource but can ensure no (or minimized) message loss in the case of application failure.
- In WAIT-1 ACK mode, the transmitter waits for the first ACK from **any** of the receivers.
- WAIT-N ACK ensures that **at least N** application instances have received the message
  - Puts back-pressure on the transmitter when all receivers have failed.
  - Receiver set can have **required** ACK‘ers.
- Application-level ACK – packets ACK‘d only after being completely processed by the application.

ACK/NAK Scenario



In this scenario, the transmitter would define:

- **Wait for up to 8 ACKs**
- **2 Mandatory ACKers.**
- **If the required number of ACKs are not received, the history buffer cannot be trimmed.**

If RmmTxTopicParameters.numAckers=8, and one of the receivers fails, history buffer will fill!

RmmTxTopicParameters.numMandatoryAckers=2 If one of the mandatory receivers fails, history buffer will fill!

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