Application-Level Multicast Using Content-Addressable Networks

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Application-Level Multicast Using Content-Addressable Networks

Motivation and Contribution

CAN Design

CAN-based Multicast

Evaluation

Future work

Motivation and Contribution

Other Application-Level Mutlicast Solutions

Application level mesh over routing protocols

- Limits scalability

Scale to large receivers

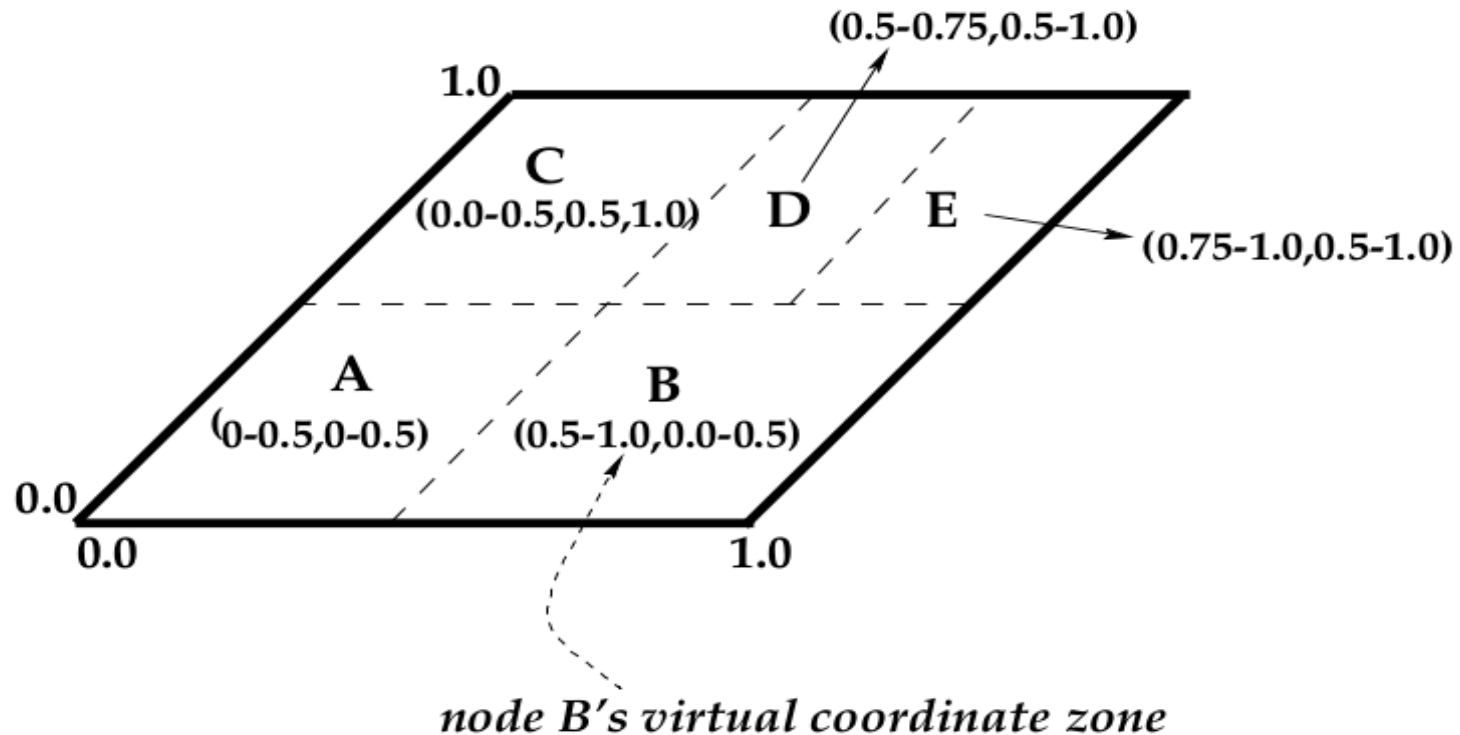- Restricts model to single-sourced

Contribution

Application-level multicast capable of scaling and not restrictive to being single-source

Extends the Content-Addressable Network framework

– No need for routing algorithms

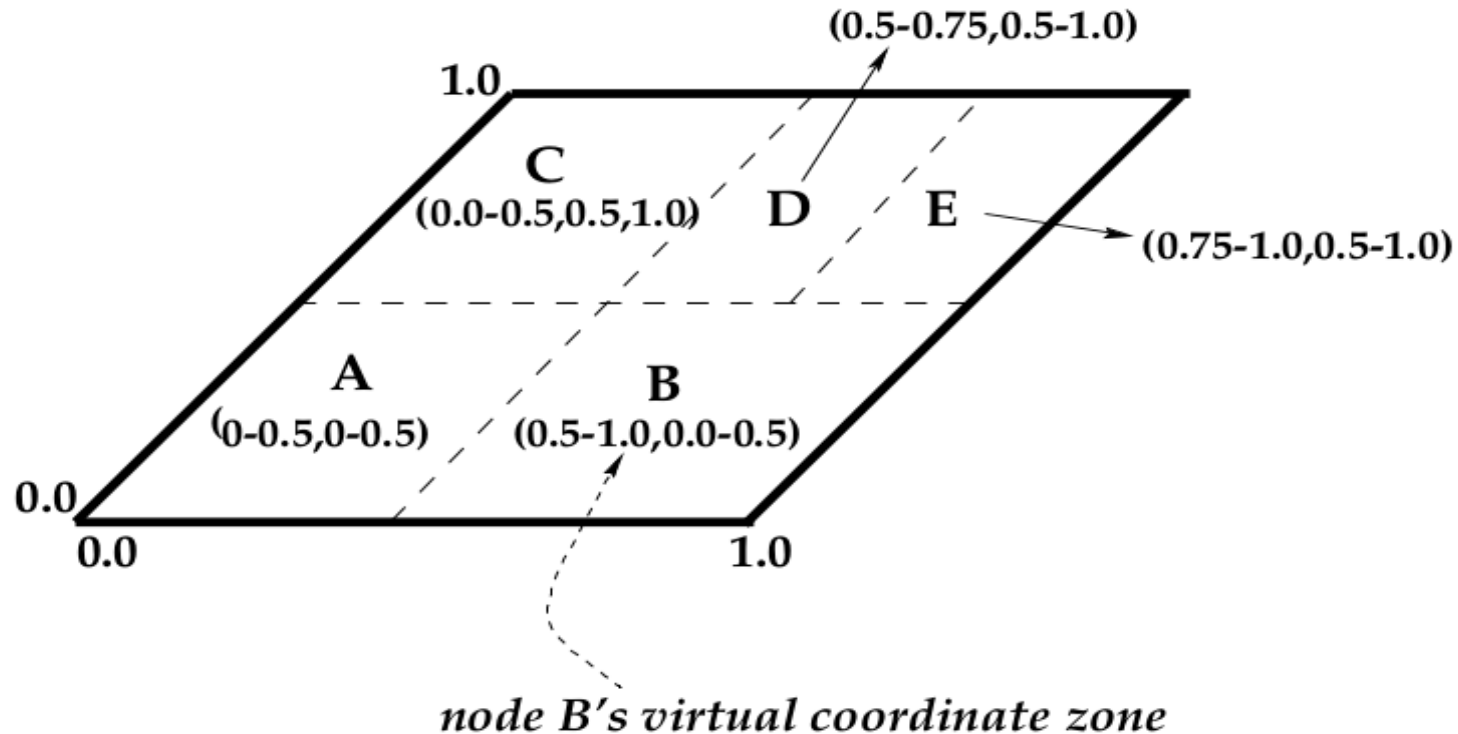– Easily extendible to multicast service

CAN Design

Content-Addressable Network

Virtual d-dimensional Cartesian coordinates

Logical, and dynamically partitioned
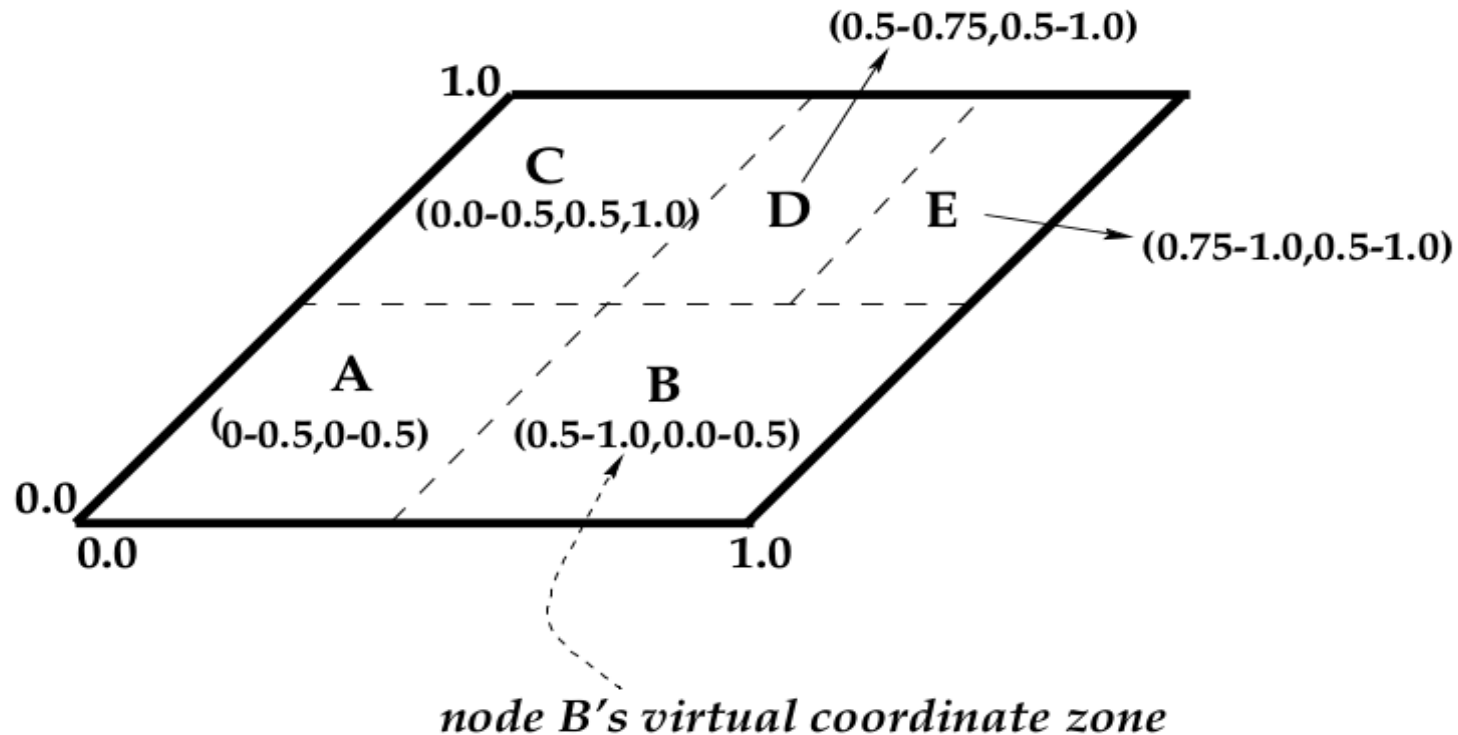
Content-Addressable Network

(0.5-0.75,0.5-1.0)

1.0

C
(0.0-0.5,0.5,1.0)   D   E
(0.75-1.0,0.5-1.0)

A
(0-0.5,0-0.5)   B
(0.5-1.0,0.0-0.5)

0.0

0.0   1.0

node B's virtual coordinate zone

Storing/retrieving a (Key, Value):

Hashing Key → (x, y)

Store/retrieve (Key, Value) at node that owns (x,y)

Content-Addressable Network

(0.5-0.75,0.5-1.0)

1.0

C
(0.0-0.5,0.5,1.0)   **D**   **E**

(0.75-1.0,0.5-1.0)

A
(0-0.5,0-0.5)   **B**
(0.5-1.0,0.0-0.5)

0.0

0.0   1.0

node B's virtual coordinate zone
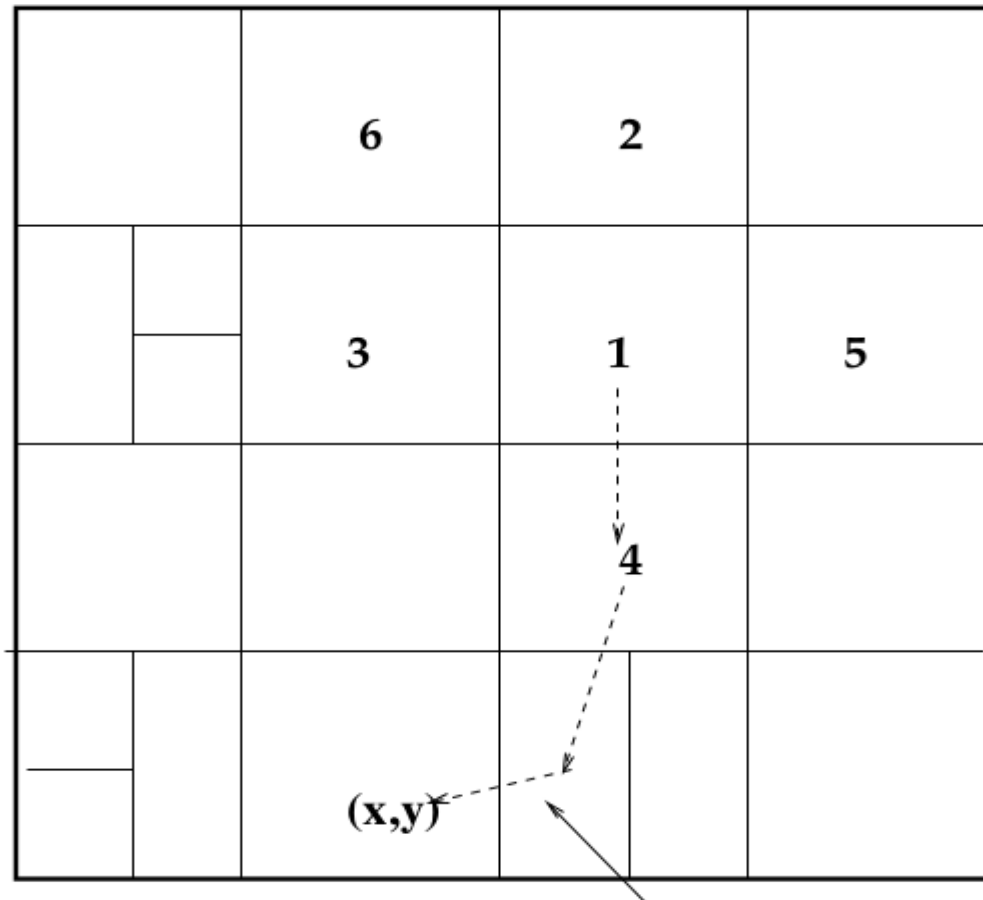
Retrieve (Key, Value) at (x,y):

- If node or neighbour owns the coordinate

- Else, request must be routed through CAN

CAN Routing

Routing follows a straight line through Cartesian space

Many paths may exist

CAN-based Multicast

CAN-based Multicast

If all nodes of CAN are multicast group

- Multicast by flooding message over CAN

If only subset of CAN are multicast group

- Form group-specific "mini" CAN

- Flood message over "mini" CAN
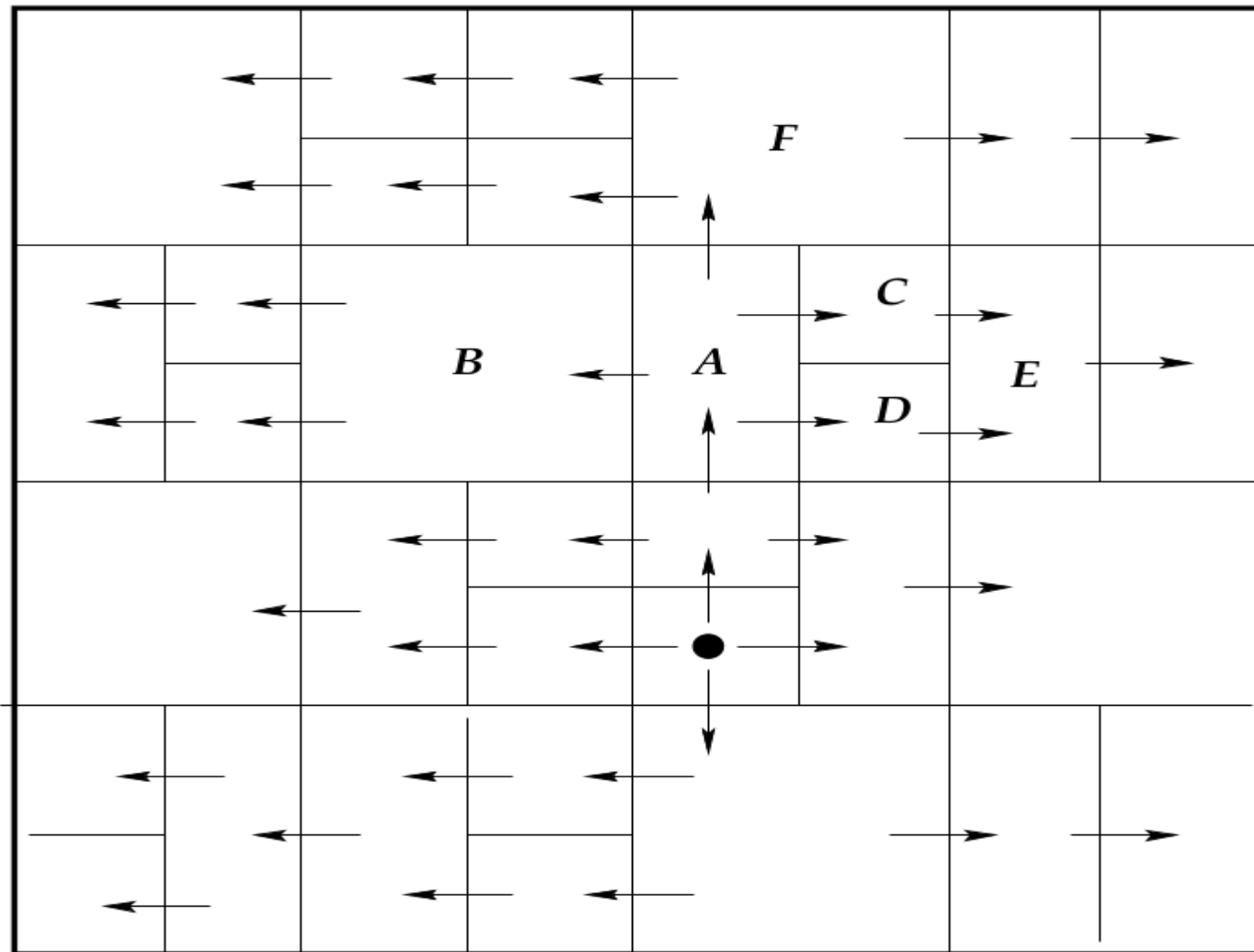
Multicast Forwarding

Naive Flooding algorithm

- On receiving new nodes,

  If message is not in cache: forward messages to all neighbours (except source), then cache the message

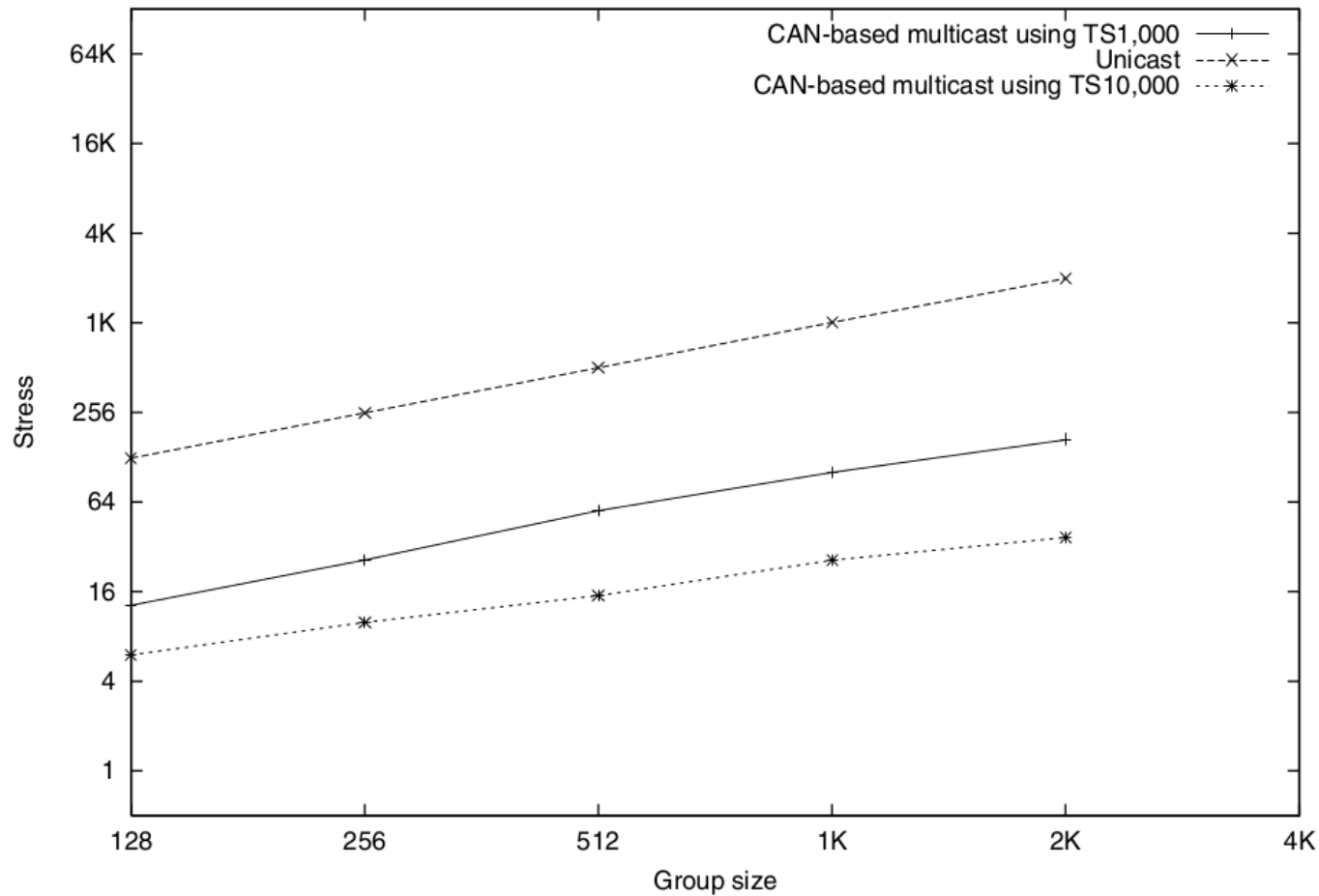*Problem: Large amount of duplication*

Multicast Forwarding
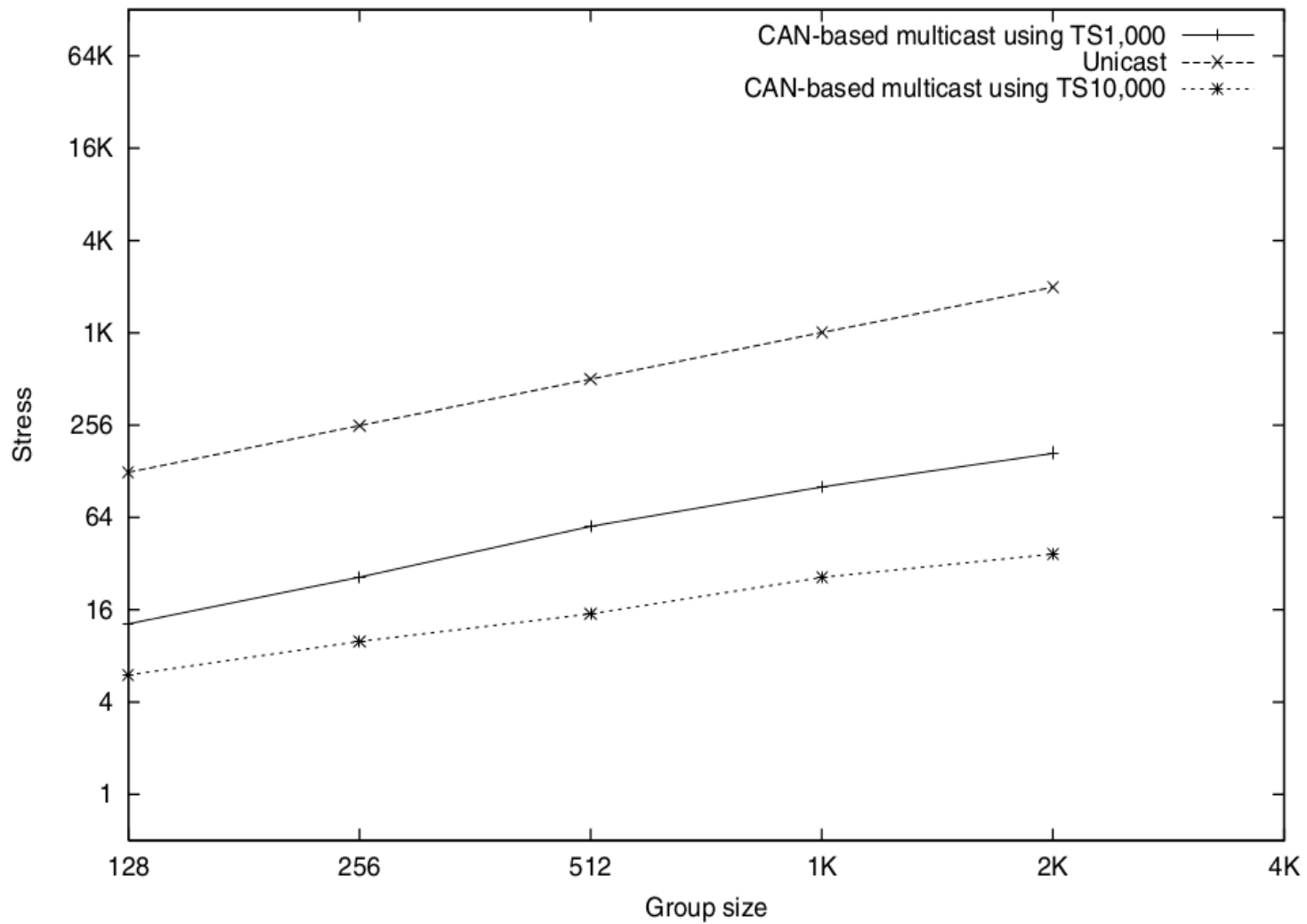
Directed Flooding over CAN

Evaluation

Evaluation

Link Stress versus Increasing Group Size

Evaluation

Topology density on link stress

Future Work

Future Work

Simple clustering techniques

Investigations on

- Security

- loss recovery

- congestion control

Criticism

Paper focused too much on CAN framework design and not enough on the extension design itself

Potential future work was not enough discussed

Thank You
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