

Simplified Multicast Forwarding (SMF) Progress/Issues

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SMF Goal Review

- Provide a basic multicast packet forwarding function
- Simple baseline (all nodes receive)
- Target native IP multi-hop forwarding
 - Both IPv4 and IPv6 design
- Include dynamic optimized relay set function (e.g., MPRs, CDS variant)
 - Experience with MPR-variants. Other CDS algorithms of interest being considered
- Internet connectivity and interoperability
- Avoid encumbered protocol mechanisms in baseline

WG Approach

- Build off existing knowledge and work
 - Optimized MANET Flooding/Broadcast experience
 - MPR-F, other RFCs, IDs looked at in the past
 - Early implementations of concepts being tested
- Develop a specification targeting initial EXP RFC
 - Progress work to STD track later if positive experience using this protocol is gained

Key Design/Implementation Issues

- Forwarding Method
 - Initial design goal consensus on avoiding hop-by-hop encapsulation as an approach
- Duplicate Packet Detection Mechanism
 - MANET Interface Requirement
 - How? IPv4 id field, IPv6 header extension (unique sequence), passive detection (hashing).
- Maintenance of any applied optimized flooding or CDS algorithms
 - Neighborhood knowledge/ relay set election and sensing
 - Previous-hop vs no previous hop dependencies

SMF Duplicate Packet Detection Status/Issues

- Multi-hop broadcast wireless needs to forward out the upstream interface (MANET type interface)
- Initial design consensus is avoid hop-by-hop encapsulation methods (true native forwarding)
 - IPv4 Working Ideas
 - id field can help in detecting duplicate packets
 - working prototype across multiple OS systems
 - Prototype normalized behavior across OSES
 - IPv6 Working Ideas
 - header option with robust sequencing/uniqueness
 - work ongoing but initial proposal implemented
 - Investigated hashing methods for passive duplicate detection as mentioned in MPR-F ID
 - Implemented and initially tested by several parties
 - Number of false positives vary depending on type of traffic and other factors
- Issues and design still undergoing evaluation but running code is helping out

Forwarding Issues

- Initial goals
 - Avoid encapsulation
 - Work with native IP forwarding tables
- Possible varying behavior of forwarding set decisions

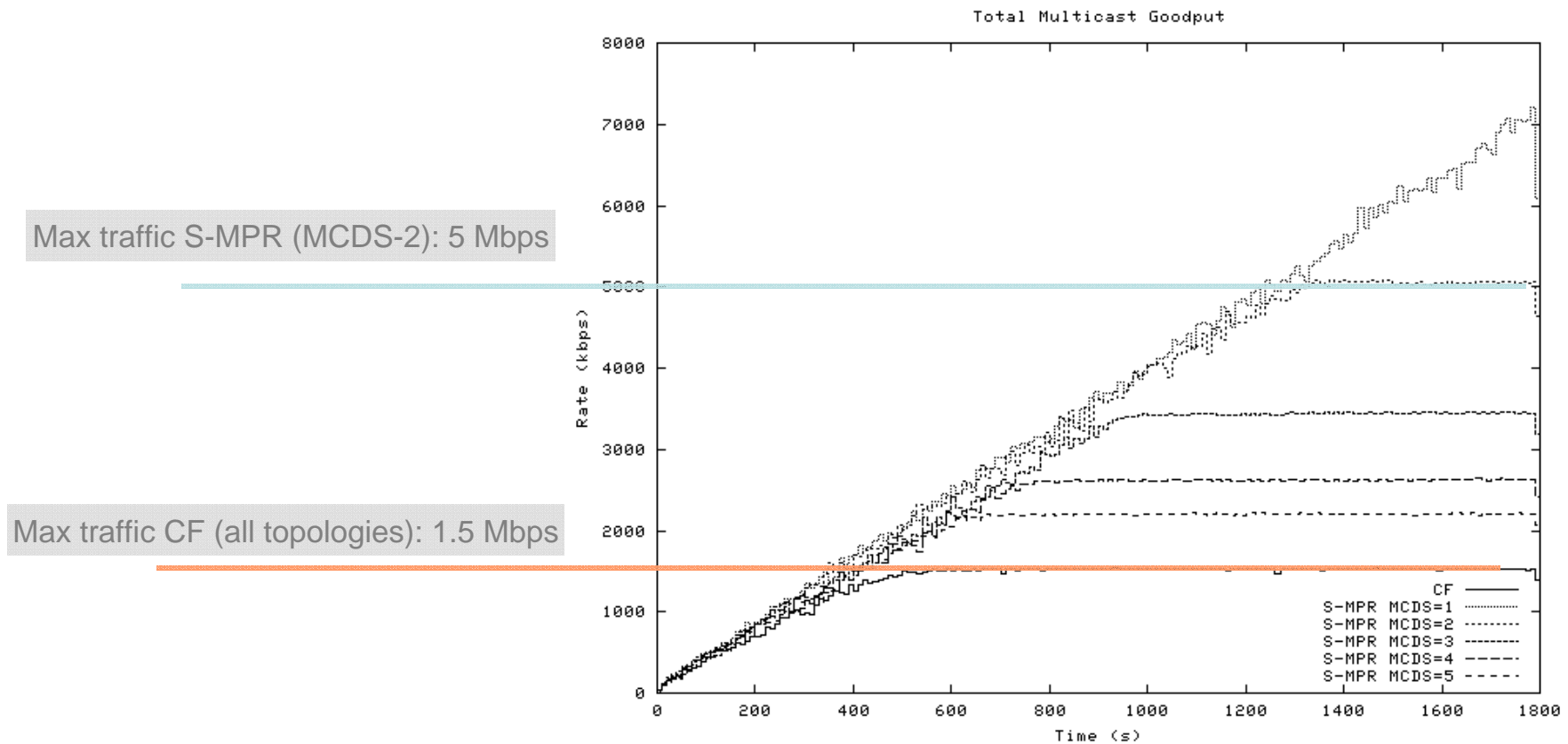
Forwarding set or CDS algorithm Issues

- Previous-hop vs no previous hop dependencies
 - Previous hop info may be needed in forwarding decision
 - Some algorithms do not require but may introduce other design and performance implications
- Neighborhood knowledge/ relay set election and sensing
 - Two-hop knowledge is required by many algorithms (e.g., MPR)
 - Information may be obtained in multiple ways
 - Possible Lower Layer interface
 - Provide L3 Method
 - Robustness vs Efficiency tradeoffs
 - Highly dynamic wireless nature

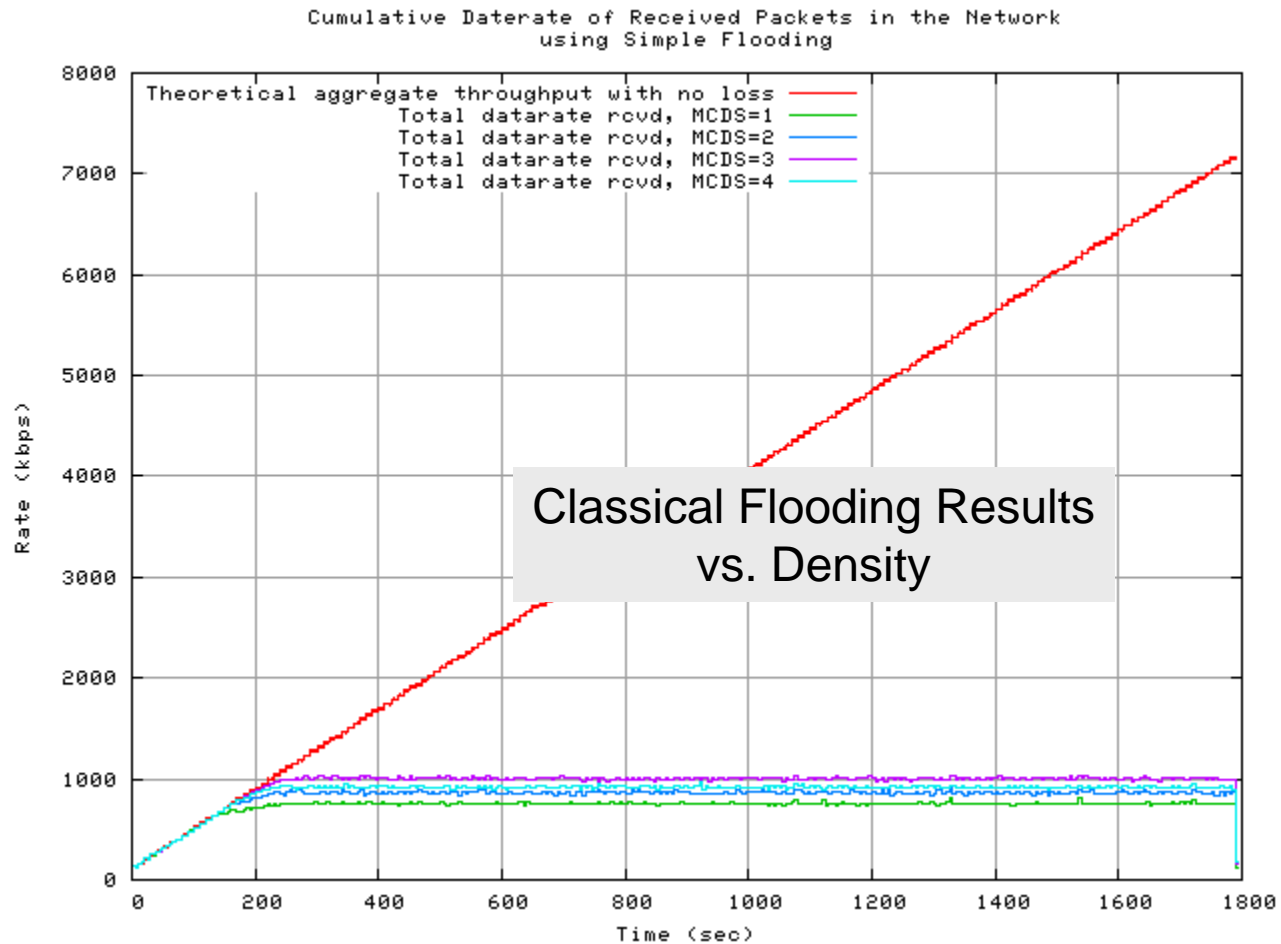
Running Code Prototype

- IPv4 code and early experience reported at Washington meeting (see previous slides from that meeting)
 - Independent implementation from unicast routing, but borrows existing OLSR maintained relay set information for convenience (API method)
 - Code is in the process of redesign to improve multiple platform portability (OS and simulation environments)
 - Initial testing of IPv6 version, using HBH extension header.
- Mechanisms Prototyped
 - Explicit Duplicate Packet Detection Mechanism via {source id} {sequence} combination
 - Passive DUP Detect also implemented and tested
 - Elegant but not as robust as explicit temporal identification
 - False Alarm Rate
 - May be suitable for some use cases
 - Simplified Multicast Forwarding Decision
 - Classical flooding supported as a baseline
 - Multiple optimized relay set algorithms supportable
 - At present source dependent MPR and non-source dependent MPR algorithms have been added for evaluation
 - Other relay set algorithms can be examined as well, this is not an exhaustive study in that sense

Maximum Observed Goodput vs. Flooding Mechanism and Density in 10 node Wireless Network (Running Code in Emulation Environment)



Newer Simulation Results



SMF using S-MPR Improvement

