Survey of IP address autoconfiguration mechanisms for MANETs

draft-bernardos-manet-autoconf-survey-01

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Outline

- Draft History
- Introduction and motivation
- Classification properties
- Solutions analysed
- Classification results
- Next Steps

Draft History

- Version -00: July 2005
- Changes from -00 to -01
  - Added classification properties, considering
    - Autoconf Problem Statement I-D
    - MANET Architecture I-D
  - Autoconf proposals analysed based on these classification properties
  - More solutions have been added to the I-D

Introduction and motivation

- Provide a survey covering IP autoconf proposals
- Provide a context for understanding the solution space
- Analyse and classify similar proposed solutions

Classification Properties (I)

- MANET Scenario
  - Pure MANETs
    - Standalone MANETs
    - MANET-local IP addresses
  - Hybrid MANETs
    - Connected MANETs
    - Global IP addresses (in addition to local ones)
    - Gateway involvement
      - Connectivity to the fixed infrastructure
      - Involvement in IP address assignment

Classification Properties (II)

- DAD-based or DAD-free
  - Merging / partitioning
  - Pre-service DAD / DAD-free
  - In-service DAD
- Routing Protocol Dependency
  - Dependent
  - Utilise information from routing protocol
  - Independent

Classification Properties (III)

- Distributed/centralised approach
- Partitioning/Merging support
  - Detect MANETs' partitioning
  - Detect MANETs' merging
  - Avoid IP address conflicts in such cases
- Prefix delegation support
  - Address assignment
  - Prefix delegation

Classification Properties (IV)

- Protocol overhead
  - Additional message flooding
  - Local signalling
  - Piggybacking of messages into routing protocol
  - Passive behaviour

Solutions analysed (I)

- IP address Autoconfiguration for Ad Hoc Networks (Perkins et al.)
- IPv6 Autoconfiguration in Large Scale Mobile Ad-Hoc Networks (Weniger et al.)
- Ad Hoc IP Address Autoconfiguration (Jeong et al.)
- IP Address Assignment in a Mobile Ad Hoc Network (Mohsin et al.)
- An Address Assignment for the Automatic Configuration of Mobile Ad Hoc Networks (Tayal et al.)
- No Overhead Autoconfiguration OLSR (Mase et al.)
- PDAD-OLSR: Passive Duplicate Address Detection for OLSR (Weniger et al.)
- Passive Duplicate Address Detection for On-demand Routing Protocols (Jeong et al.)
- Prophet Address Allocation for Large Scale MANETs (Zhou et al.)
- Automatic Configuration of IPv6 Addresses for Nodes in a MANET with Multiple Gateways (Ruffino et al.)

Solutions analysed (II)

- Simple MANET Address Autoconfiguration (Clausen et al.)
- Extensible MANET Auto-configuration Protocol (EMAP) (Ros et al.)
- Global Connectivity for IPv6 Mobile Ad Hoc Networks (Wakikawa et al.)
- Multihop Radio Access Network (MRAN) Protocol Specification (Hofmann)
- Automatic IP Address Configuration in VANETs (Fazio et al.)
- Address Autoconfiguration in Optimized Link State Routing Protocol (Adjih et al.)
- Extended Support for Global Connectivity for IPv6 Mobile Ad Hoc Networks (Cha et al.)
- Gateway and Address Autoconfiguration for IPv6 Adhoc Networks (Jelger et al.)
- MANET Autoconfiguration using DHCP (Templin et al.)

Classification results (I)

- MANET Scenario
  - Pure MANETs: 9/19 → 47%
  - Hybrid MANETs: 10/19 → 53%
    - Gateway involvement
      - IGW involved: 8/10 → 80%
      - IGW not involved: 2/10 → 20%
- DAD-based or DAD-free
  - Pre-service DAD: 6/19 → 32%
  - In-service DAD: 6/19 → 32%
  - DAD-free: 7/19 → 36%

Classification results (II)

- Routing Protocol Dependency
  - Independent: 11/19 → 58%
  - Dependent: 8/19 → 42%
- Distributed/centralised approach
  - Centralised: 2/19 → 10%
  - Fully distributed: 12/19 → 64%
  - Partially distributed: 5/19 → 26%
- Partitioning/Merging support
  - Yes: 12/19 → 64%
  - No: 7/19 → 36%

Classification results (III)

- Prefix assignment support
  - Yes: 3/19 → 16%
  - No: 16/19 → 84%
- Protocol overhead
  - Message flooding: 7/19 → 37%
  - Local signalling/piggybacking: 9/19 → 47%
  - Passive: 3/19 → 16%

Next Steps

- Comments are welcome
- Complete/refine analysed proposals
- Work on evaluation considerations for autoconf solutions
- Work on a general IP autoconf solution space analysis