An Architectural Framework for Ad-hoc Wireless Networks QoS Interaction with Access Domains

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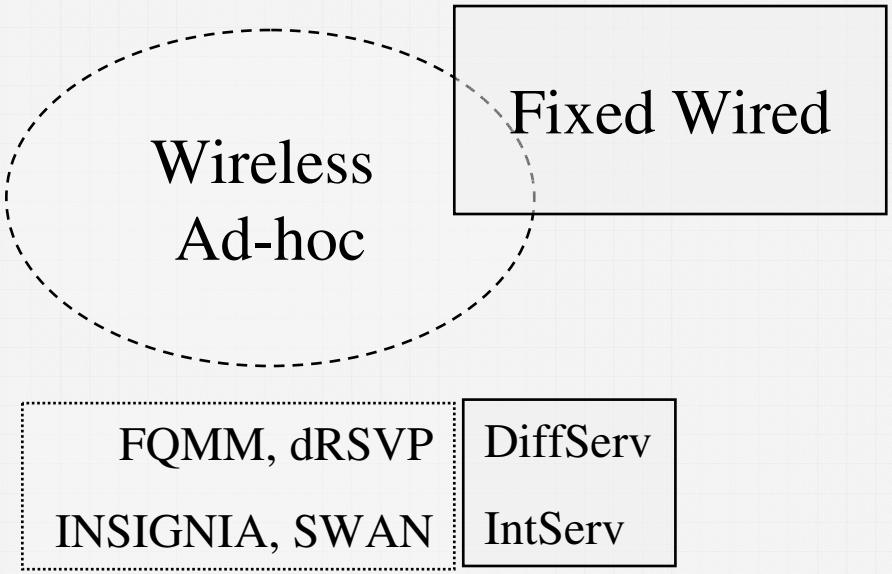
Motivation

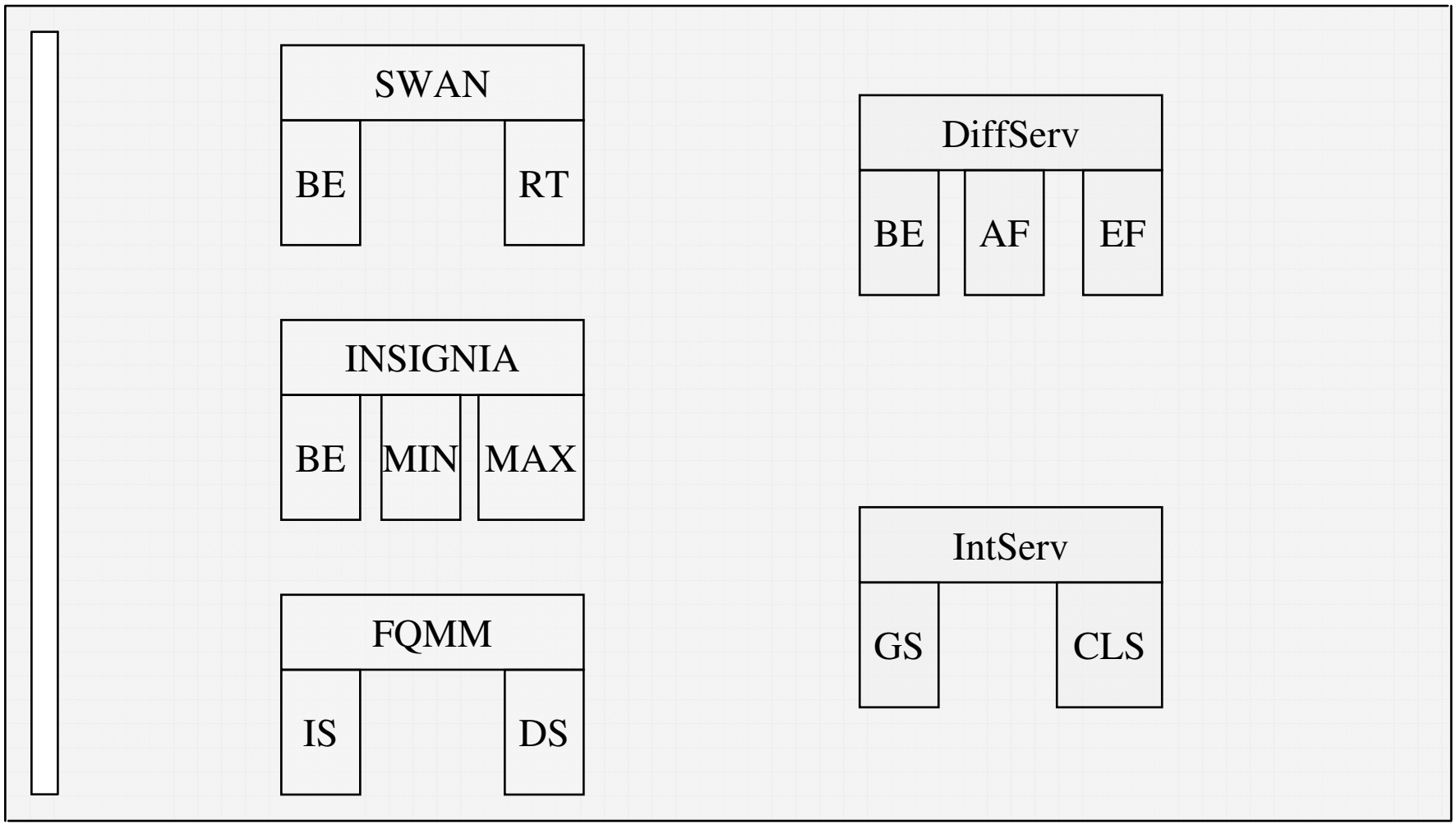
- Ad-hoc networks can form access part of end-to-end connections:
  - Bluetooth Access Points in conference rooms
  - Dial-up connection via cellphone for a group of remote explorers
  - Neighbourhood networks based on IEEE 802.11 with ADSL access
- Problem: what QoS support for end-to-end connections where part of connection is ad-hoc network?

Scope

- High level model.
- Interaction between two domains.
- Different QoS Models work on either sides.

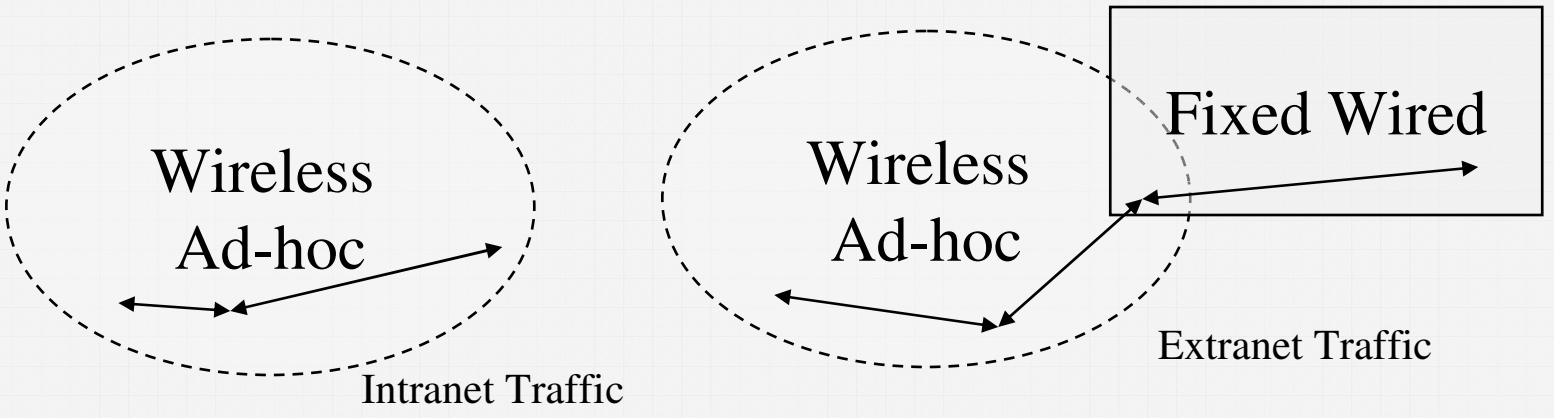


Review of QoS Models



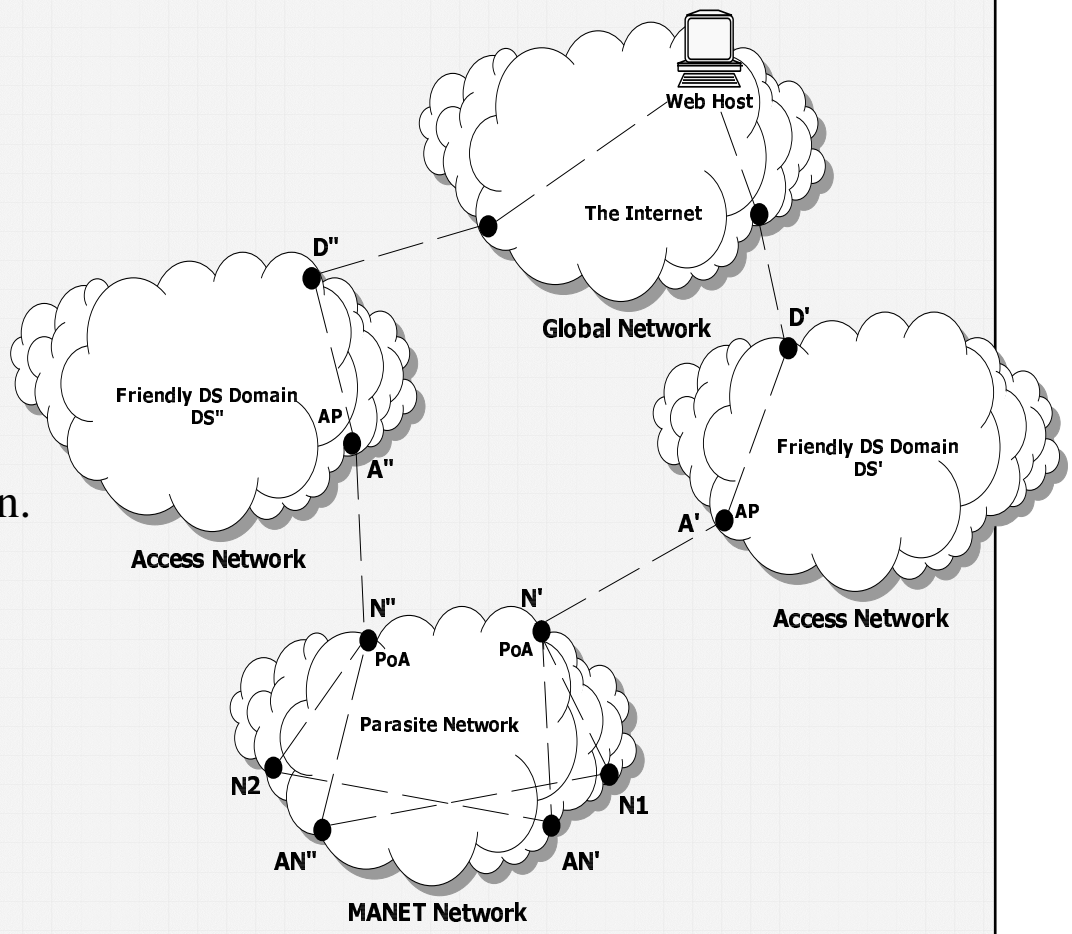
Problem & Motivation

- QoS models for different domains (fixed vs. ad-hoc) will not converge in foreseeable future.
- A model is needed to define interoperability between the two sides (ad-hoc and fixed domains).
- QoS requirements are likely to be more demanding for extranet traffic.



Basic Definitions

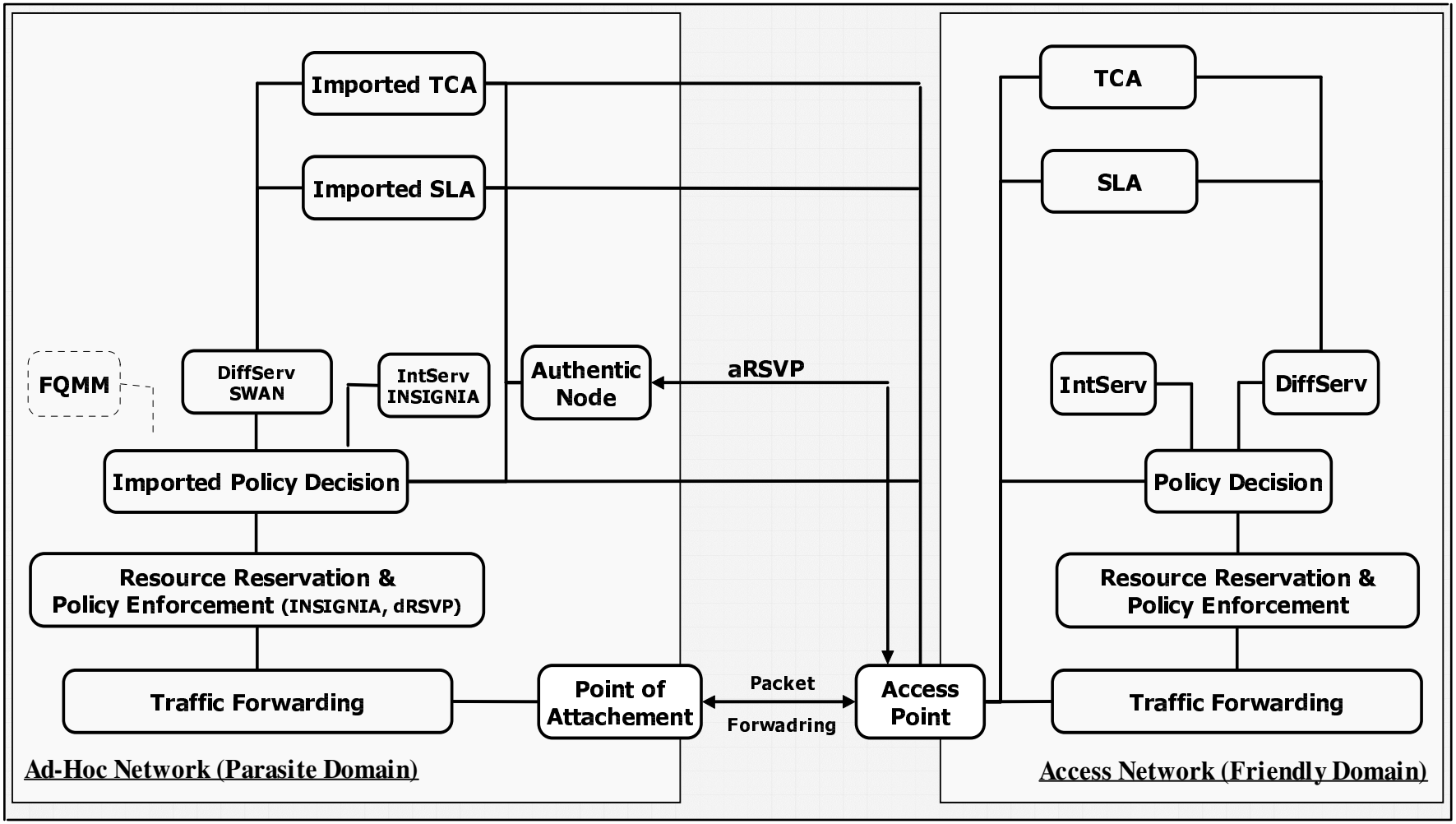
- Ad-hoc as a Parasite network.
- Domains
  - Un-Friendly Access Domain.
  - Friendly Access Domain.
    - Public (Basic) Domain.
    - Private Friendly Domain.
- (PoA) Point of Attachment.
- (AP) Access Point.
- (AN) Authentication Node.



Design Rational

- Parasite nature of ad-hoc domain.
  - Requires basic components like SLA, TCA, & Service Provisioning Policies.
  - Importing basic components.
- Use of aggregate RSVP to perform domain reservations.
- Importing QoS policies.
- Authentication Issues.

QoS Interaction Model



Typical Scenario

- **A. Domain Discovery**
  - **1- PoA**
    - Recognizes the existence of an AP, and access domain.
    - Verifies whether access domain requires authentication (basic vs. private domain).
    - Broadcasts message to all ad-hoc nodes.
  - **2- Ad-hoc Node**
    - Receives the gateway announcement. Registers the PoA as a possible gateway with expiry time and metric.
- **B. QoS Negotiation**
  - **3- Ad-hoc Node**
    - Selects best PoA to use as a gateway for its extranet traffic, could be biased towards most recent PoA, or to rely more on the cost / hop count.
    - If application decides to use IntServ, and full E2E reservation, it can send the E2E to the selected PoA. In this case reserving resources all the way to the other end is the responsibility of the MANET ad-hoc node.
    - Otherwise, it needs to submit the packets to the network. Packets will reach the PoA.
  - **4- PoA**
    - If PoA "knows" what to do with packet, forward the packets, else
    - broadcast (or send to a specific node) a solicit aRSVP request.
  - **5- AN**
    - Conducts aRSVP negotiation with AP on behalf of the network for the new DSCP.
    - Acknowledges PoA with the newly established connection with AP.
  - **6- PoA**
    - Receives acknowledgement from AN, and starts packet marking, and forwarding to AP.

Future Work: Working out Details of …

1. Obtaining aRSVP Size
2. Removal of aRSVP.
3. Security Issues.
4. Traffic Policing.
5. Accounting Policies.
6. IP Addressing Scheme.
7. Mapping Ad-hoc QoS service levels to DiffServ.
8. Selecting best AN to perform aRSVP.
9. Selecting best AN for actual traffic transmission.
10. Reactive vs proactive reservations.
11. Traffic data collection.
12. Storing traffic data.
13. Driving service provisioning from traffic data.

Conclusion

- Defined QoS interaction model between wireless ad-hoc and fixed domain.
- Model raised many concerns regarding interaction.
- Model solved some of the concerns and listed 13 points that need further investigation.