Assigment #1

"A Survey of Network Design Problems and Joint Design Approaches in Wireless Mesh Networks" by Parth H. Pathak and Rudra Dutta discussed briefly the basics of Wireless Mesh Networks (WMNs) and goes directly into the design problems of such mobile networks. The paper is well crafted for someone who is interested in similar research topics and although it seems lacking in graphics, it tries to outline the basics of each problem design it addresses.

The paper discusses extensive research on various areas related to Wireless Mesh Networks such as design, deployment, protocols, performance, etc. With the design problems being at the centre of the discussion. We then look at WMN design problems of interference modelling, power control, topology control, link-scheduling, and routing, and provides brief overviews, with a survey of the recent research on these topics, with special stress on joint design methods.

According to the authors, wireless mesh network consists of wireless mesh routers and wired/wireless clients. Wireless mesh routers communicate in multi-hop fashion forming a relatively stable network. In the most common form of WMNs, every router performs relaying of data for other mesh routers. Some Characteristic differences between WMNs and others include:

- Unlike energy-constrained ad-hoc networks, mesh routers have no limitations regarding energy consumption.

- There can be pre-planned (usually centrally controlled) as well as comparatively unstructured and incremental deployment of nodes in WMNs.

The paper also mentions reasons for popularity of Wireless Mesh networks among researchers and solution providers. Two other fundamental benefits of WMNs are their ease of deployment and affordable cost. As a result, several research efforts are directed towards making community-based mesh networks more and more self-organizing and cooperative where every participant contributes to the network resources.

Few additional advantages of a mesh network are outlined oin the paper which are innovatibe and important from ecological perspective. Mesh networks can also serve the purpose of temporary infrastructure in disaster and emergency situations. Various control systems such as public area surveillance can also be operated using WMNs

The paper then analyses some design problems in detail. These include:

1. Interference measurement

    -Protocol Interference Model

    -Physical Interference Model

    -K hop model

2. Power control

-Static and dynamic

-topology control

3. Link Scheduling

4. Time division Multiplexing (TDMA) based

An inntersting point to read was about enhancing the performance of TDMA, by designing minimum delay schedules via intelligent ordering of link transmissions in TDMA MAC which ensures lower node-to-gateway delays. For example, if outgoing link is assigned the slot before the incoming link in a TDMA frame then end-to-end delay may become significantly high.

5. Chanel and Radio Assignment

    -Static

    -Dynamic

    -Hybrid Assignment

Onne proposed solution was to perform channel assignment modeled by edge-coloring of the network graph and related well-known heuristics or algorithms.

6. ROUTING

This is by far the most discussed issue in network domain and is significant for any network of any kind of topology. ETX(Expected transmission time), ETT(Expected transmission count) METX, MIC(Metric of Interference and channel switching) a few to mention.

a. Routing Protocols

Traditional routing protocols -ad hoc mobile wireless nodes and changing topologies- reactive and proactive

WMN joint design problems

Then some joint design problems are discussed. Joint design problems are basically two issues clubbed together and the solution attempts to solve both problems. These included:

1. Power control and scheduling
2. Routing and channel assignment
3. Routing, Scheduling and Channel assignment
4. Routing and channel assignment
5. Routing scheduling power control

The paper then concludes with an optimistic note about future research ideas and other things that we expect a research review to deliver. The design of wireless multi-hop mesh networks and problems to solve is one idea. These inspire simple, robust, easy networks with self-organizing nature.

Delving deep into the subject, we can infer that WMNs clearly have the potential to be integrated with other networks like sensor network, vehicular networks and can inspire future research into untapped domains.

***