



Electronic system Group

Associate Professor Hann-Tzong Chern

Ph.D., University of Southern California, U.S.A.

Field of study: computer system (wired & wireless), mobile communication

Key words: WLAN, IEEE802.11, AP, MS, Ad Hoc network, TCP, PPP/IP, FA, HA, Uu interface, RRC, IEEE802.2

URL: <http://homepage.ntust.edu.tw/HANN/>

Email: chern@mail.ntust.edu.tw

Phone: 886-2-27376364(voice), 886-2-27376424(Fax)

The Subject and Aims of Research: Main research directions are computer network and mobile communication. In the field of computer network, the research is focused on the physical layer, data link and network layer. Except these, the security of computer network is also a main topic. Recent research topics are aimed at main problems in wireless networks like "Routing in Ad Hoc network", "How to improve the performance of mobile IP", "The integration of 3G mobile network and WLAN".

Related Recent Research Topics

1. The integration of data link layer of mobile communication system and WLAN: The integration of 3G mobile system and WLAN implies PPP/IP must choose one data link layer from RRC in Uu interface of mobile communication and data link layer of WLAN(IEEE802.2, IEEE802.11). This will make PPP/IP can use the interface card of 3G mobile system or WLA. Therefore, it is necessary to set up a new protocol under PPP/IP. When the data link layers under it report a new found link, it will contact its peer according the connection profile built by the user. From the result of negotiation, it will decide if the old link is released and a new link is set up. When the new link is set up, it will also notify its upper layer to set up a new connection (Ex: Find a new IP through PPP/IP and use tunneling to transfer packets temporarily).
2. How to improve the loss of packets during handoff in WLAN: With mobile IP, the MS may change its link to a new AP (probably in a new domain) during hand off. When the new link is set up, MS need to acquire a new IP and do authentication with the HA (home agent). Before this is completed, the first AP must hold the packets for this MS temporarily. If this period last too long, the packets may be time out by the TCP and the retransmission may be result under this situation. To prevent this period is too large, it may be possible for the MS get a new IP through the first AP before hand off. This means the first AP must predict the possible domains MS may enter and acquire a new IP for each of these domains. In case the propagation delay between HA and MS is too long, the first AP may built an authentication method with MS before it enters the new domain (Ex: Give a temporary private key). It must be security process. In this way, the first AP can do all the authentications for the HA. After the new link is set up, the new IP will be decided in the same time and the first AP will report the unused IPs to all the related servers.
3. How to improve the protocol of AODV: ADOV is a routing protocol in MANET (Ad Hoc network). It is a protocol which routing is triggered by demand. This can reduce the load of routing and prevent too much power of MS is wasted on it. An obvious deficiency of this protocol is path maintenance. Link broken is happened frequently in Ad Hoc network. One broken link along a path will trigger the source to find a new path through AODV. This new

searching period may result too many time out for TCP. Therefore, we want to build a path maintenance method through the sending of data packet. In other word, all sending data will leave “footprint” along the path when it goes from source to destination. This will reduce the number of new searches for AODV.

4. How to improve the transmission of VOIP traffic in WLAN: The VOIP packets need real time transmission. Therefore, contentionless period in IEEE802.11 (a,b,g) can be used on this traffic. However, an important characteristic of voice traffic is a bundle of idle periods are interleaved in the talking time. It is a waste of resource to poll an idle MS in contentionless period. This waste means less MS can register in the contentionless period. Therefore, the AP should stop polling idle MS temporally until it goes busy again. When the MS goes busy again, there must be some mechanism to let them enter contentionless period in time.
5. Use email address instead of IP address to track to mobile station: When user leaves its home location, he may arrive at another corner of the earth. The mobile IP through the cooperation of HA and FA may need a long propagation time in authentication and tunneling. This may result too many time out by TCP protocol. Furthermore, MS may also move quickly among APs. From other respect, the user is more familiar with email address than IP address of the called user. This is an adequate direction to consider email address as a sign to track the mobile user. When a user move to a new region (Ex: from Los Angels to Tokyo), he may notify the HA in its home location. When he arrives his destination (Ex; Tokyo), he can register in a local trusted server with his email address and local IP address. The local server can authenticate this user with his email address. After authentication, the trusted server will notify HA to tunnel all his packet to the new IP address. Then, HA can notify the sender about the new IP address. All the local trusted servers can be built architecturally. In this way, a program in MS may contact these groups of servers to acquire the new IP of another MS. In this way, two mobile stations can contact directly. The problem is left about the mechanism to maintain connection when the MS moves during connection.
6. How can cryptography be used in the daily life: Information system has penetrate to the daily life of every one. People with this information knowledge may use it as a tool to take advantage of those without this knowledge. It may be necessary to let information security be prevailed in our daily life.

Selected Publications and Projects

- a. Patent : Hann-Tzong Chern, The cipher calendar and permutation-combination code, Invention patent no.148018, R.O.C. ◦
- b. Patent : Hann-Tzong Chern, A security combination card for credit card and cashier card, Invention patent no. 169915, R.O.C. ◦**