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# IMPLEMENTATION & ENHANCEMENT OF DESIGN PARAMETERS IN HANDOFF ALGORITHM

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**ABSTRACT:**

**The challenge in the next generation (4G) of wireless networks include the provisioning of seamless mobility across heterogeneous wireless networks, the improvement of end-to-end Quality of Service (QoS) and enabling users to specify their personal preferences. A new design provides context-awareness, smart handoff and mobility control in heterogeneous wireless IP networks. This implementation is mainly focused on Transport and Application Layer for vertical Mobility with Context-awareness. The vertical handoff decision is not only based on network characteristics but also on parameters which fall in the application and transport layers. Tramcar is tailored for a variety of different network technologies with different characteristics and has the ability of adapting to changing environment conditions and unpredictable background traffic also Tramcar allows users to identify and prioritize their preferences.**

**INTRODUCTION:**

Mobile technology brought many more progress especially in the wireless systems which includes, for example, second, third and fourth generation (2G, 3G, and 4G), satellite systems, WLANs (802.11) etc. Thus, it is a challenging issue for the next generation wireless networks to integrate the existing and eventually coming systems for managing user mobility among heterogeneous networks. Interest in the fourth generation (4G) of wireless communications is continuously increasing as wireless networks grow at an astonishing rate [1]. 4G will integrate homogeneous technologies. This would result in broader coverage areas, lower access costs, the convenience of using a single "all-in-one" mobile device, and more dependable wireless access even with the loss or failure of one or more networks. 4G will offer user involvement and context-awareness as well. The future of wireless communications is very exciting and promises to bring about many enhancements and enrichments into our daily lives. Improvements in hardware and software are making mobility less of an option and more of a necessity for even the most basic computing users.

Criterion of a vertical handoff is one of the major challenges for seamless mobility. Traditional handoff detection operations and policies, decision metrics, radio link transfer and channel assignment are not able to acclimatize to dynamic vertical handoff conditions or varying network availabilities. Furthermore, traditional handoff does not allow for device selection of networks since it assumes that there is only one type of network. In a mixed networking environment, user choice is a desirable enhancement.

**SYSTEM DESIGN AND IMPLEMENTATION:**

The architecture of the system is as shown in figure1.

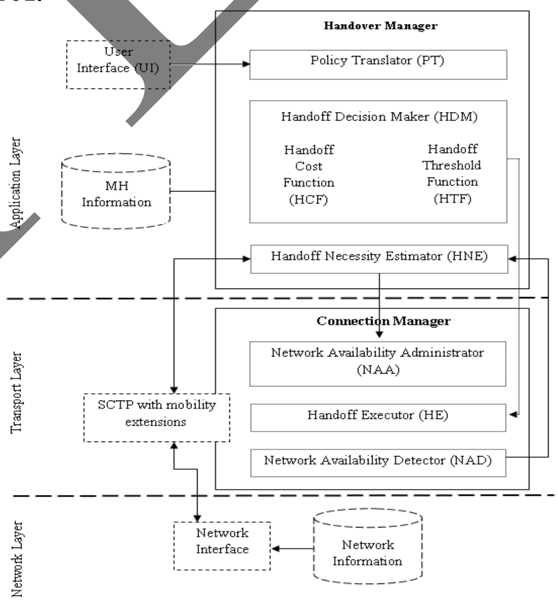


Figure 1. System architecture

**CONNECTION MANAGER:** The Connection Manager operates in the transport layer and is responsible for the Mobile Host's (MH) connectivity through a Stream Control Transmission Protocol (SCTP). As a MH moves across different networks, its IP will most likely change resulting in connection breakdown. For example, suppose that a MH with IP address 192.168.0.1(IP-1) is communicating with a server. The server uses the MH's IP address in order to communicate and identify that host. When the MH roams into a new network it will get assigned a new IP address 192.168.1.3(IP-2). Hence several problems may occur like when the MH uses IP-2 to send packets to the server, that server cannot identify the sender and therefore does not accept the packet. Also, when the server sends a packet to the MH, it will use the old IP address IP-1, and therefore the packet will not be delivered. The technique used to solve these problems is multi-homing. By means of multi-homing, hosts can be reached through multiple IP addresses. Multi-homing permits an association between two end points.

- **Network Availability Detector (NAD):** NAD is responsible for the detection of the availability or unavailability of different networks. NAD lies in the transport layer. It acts as a middleware between the application and network layers. It obtains information from the network layer, processes it and forwards relevant information to the upper layer (application layer). When the MH moves into the coverage of a new network it detects the availability of that network and obtains a new IP address. This new IP address however has no effect on the routing of the data. Once the new network is realized by the system, NAD then notifies to HNE.
- **Network Availability Administrator (NAA):** NAA is responsible for executing the addition and deletion of IP addresses and report to the server of these changes. Once a new network is detected by NAD and then it is approved for handoff by HNE and this information is forwarded to NAA. NAA is then includes the network's information in the MH's address list and informs the server of its existence. NAA is also responsible for removing networks. When NAA needs to include a new network for handoff, it uses multi-homing and starts the process of acquiring a new IP address. When the server receives the message it will add the new IP address to its local network information but will not set as its primary address. At this point the newly added network is ready to exchange messages with the server.
- **Handoff Executor (HE):** Once a decision to handoff is made HM sends a handoff trigger message to the Handoff Executor (HE). When HE receives a handoff trigger it completes the vertical handoff process. When HE receives acknowledgment from the server, the messages between the MH and server are exchanged though the new network.

**3.3.2 Handover Manager (HM):** The HM is responsible for mobility and location management. It makes handoff decisions.

- **User Interface (UI)**: The UI is part of the HM and through which the user interacts with the handset. The user defines simple preferences which are then used by the Policy Translator (PT). The user has an option of entering up to ten different inputs for making a handoff decision. Five values consist of the priority of each of Cost, Security, Power, Network Condition and Network Performance; the user is allowed to enter each value as a percentage. UI ensures that the total percentage must be 100%. The other five inputs consist of predefined threshold values for each of the parameters.
- **Policy Translator (PT):** Once the user finishes inputting new values through the UI, these values are interpreted by the PT. PT uses these input values to generate weights for the Handoff Cost Function (HCF) and threshold values for the Handoff Threshold Function (HTF). Each of the network parameters is given a weight $\omega_c$, $\omega_s$, $\omega_p$, $\omega_d$, $\omega_f$ and a threshold value $\tau_c$, $\tau_s$, $\tau_p$, $\tau_d$, $\tau_f$.
- **Handoff Decision Maker (HDM):** The HDM decides that which the best candidate suitable for handoff is. HDM is a main contributor to context-awareness and user satisfaction. Handoff Decision Maker (HDM) consists of two main functions: Handoff Cost Function (HCF) and Handoff Threshold Function (HTF). Handoff Cost Function (HCF) is a measurement of the improvement gained by handing over to a particular network n. Handoff Threshold Function (HTF) aims at controlling user budgets or other requirements. HCF is evaluated for any network that has been approved for consideration by the HNE. The network with the highest calculated value for
- **Handoff Necessity Estimator (HNE)**: It helps in providing context-awareness. The aim of context-awareness is to acquire and utilize MH and network information. That is adapting to the user's current position or environment will make the MH more intelligent and will give better results. HNE communicates with the transport layer and add networks to the multi-homing network list.

**SIMULATION:**

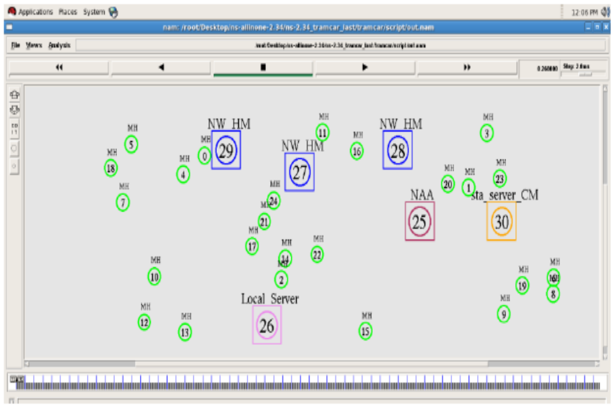


Figure 2. Topology in NS-2

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A simulation model is developed in Network Simulator (NS-2)[7] is as shown in figure 2. This network topology is setup such that the Mobile Handset and stationary server are both wirelessly connected via heterogeneous network interfaces. Total 31 nodes are used out of which 25 nodes are assigned as Mobile Handset. A multi-homed SCTP association is setup between the Mobile Handset and networks. One network represents WiMax (IEEE802.16) network on the other hand other network represents a WLAN (IEEE802.11) network. Each connection is independent of the other. Initially, all Mobile Handsets (MH) are connected to WiMax. At the time instant 1.0 Sec all Mobile Handsets will acquire connection with nearest Handoff Manager.

**RESULTS:**

Delay: In our simulation, the delay is measured by taking the time difference between when a packet is sent from the source node, and when it reaches its destination.

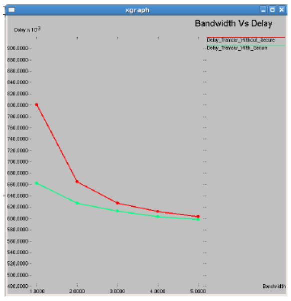


**Figure 3.** Bandwidth Vs Delay

| Bandwidth (Mbps) | Dealy without secure (Sec) | Dealy with secure (Sec) |
|---|---|---|
| 1 | 0.801357 | 0.662571 |
| 2 | 0.664426 | 0.627235 |
| 3 | 0.626761 | 0.612972 |
| 4 | 0.612053 | 0.60351 |
| 5 | 0.603205 | 0.59843 |

**Table 1.** Bandwidth Vs Delay

**ENERGY MODEL:** The energy model represents level of energy in a mobile host. The energy model in a node has a initial value which is the level of energy the node has at the beginning of the simulation. This is known as initial Energy_. It also has a given energy usage for every packet it transmits and receives. At the beginning of simulation, energy_ is set initial Energy_ which is then decremented for every transmission and reception of packets at the node [6].

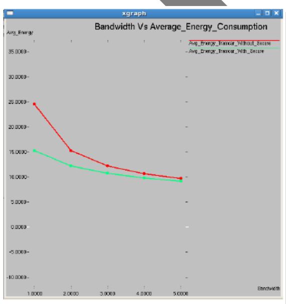


**Figure 4.** Bandwidth Vs Average Energy Consumption

| Bandwidth (Mbps) | Average Energy Consumption without secure | Average Energy Consumption with secure |
|---|---|---|
| 1 | 24.4946 | 15.312 |
| 2 | 15.2485 | 12.2561 |
| 3 | 12.2157 | 10.7169 |
| 4 | 10.666 | 9.7852 |
| 5 | 9.74779 | 9.15056 |

**Table 2.** Bandwidth Vs Average Energy Consumption

**THROUGHPUT**: Throughput is the average rate of successful data pass over a communication channel. It is measured in bytes/sec.

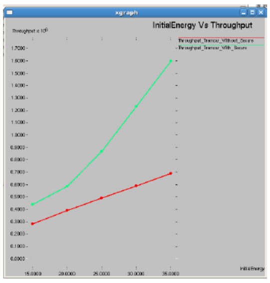


**Figure 5.** Initial Energy Vs Throughput

| Initial Energy (Joules) | Throughput without secure | Throughput with secure |
|---|---|---|
| 15 | 281280 | 437280 |
| 20 | 388640 | 585440 |
| 25 | 489920 | 868640 |
| 30 | 588320 | 1231840 |
| 35 | 688320 | 1596160 |

**Table 3.** Initial Energy Vs Throughput

**CONCLUSION:**

This architecture allows adaptation of handoff mechanisms to specified user preferences and Quality of Service (QoS) requirements. To support this system, simulation model Network Simulator-2 is used. Using the presented context-aware technique it is possible to overcome the inadequacies, limitations and weaknesses of non context-aware mechanisms.

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