Abstract:
In power controlled CDMA systems soft handoff is preferred over hard handoff strategies. This is more pronounced when the IS-95 standard is considered wherein the transmitter power is adjusted dynamically during the operation. The previous and the new wide band channels occupy the same frequency band in order to make an efficient use of bandwidth, which makes the use of soft handoff very important. Our main aim is to maintain a continuous link with the strongest signal base station otherwise a positive power control feedback would result in system problems. Soft handoff ensures a continuous link to the base station from which the strongest signal is issued. In this paper we are presenting a brief overview of the subject and some elementary concepts.

Introduction:
Mobility is the most important feature of a wireless cellular communication system. Usually, continuous service is achieved by supporting handoff (or handover) from one cell to another. Handoff is the process of changing the channel (frequency, time slot, spreading code, or combination of them) associated with the current connection while a call is in progress. It is often initiated either by crossing a cell boundary or by a deterioration in quality of the signal in the current channel. Handoff is divided into two broad categories—hard and soft handoffs. They are also characterized by “break before make” and “make before break.” In hard handoffs, current resources are released before new resources are used; in soft handoffs, both existing and new resources are used during the handoff process. Poorly designed handoff schemes tend to generate very heavy signaling traffic and, thereby, a dramatic decrease in quality of service.

The act of transferring support of a mobile from one base station to another is termed handoff. Handoff occurs when a call has to be handed off from one cell to another as the user moves between cells. In a traditional "hard" handoff, the connection to the current cell is broken, and then the connection to the new cell is made. This is known as a “break-before-make” handoff. Since all cells in CDMA use the same frequency, it is possible to make the connection to the new cell before leaving the current cell. This is known as a “make-before-break” or "soft" handoff. Soft handoff requires less power, which reduces interference and increases capacity. The implementation of handoff is different between the narrow band and the CDMA standards. This is an effort to analyze a soft handoff strategy, taking into consideration the trade-offs between selecting system parameters and the performance benefits. We consider a scenario involving two base stations and a single mobile, where the changes in the pilot signal strength are tracked and a conditional decision is made allowing communication with only one base station. This results as an outcome of simple measurements, which determine the strongest signal and results in handover to the corresponding base station. In a CDMA system the same frequency band is shared between all the cells. Thus there is well-defined efficient bandwidth utilization. Though there is frequency reuse the orthogonal nature of the waveforms serves to distinguish between the signals that occupy the same frequency band. A typical handoff scenario is taken into account wherein the need for a mobile to alter its frequency or rather to switch its carrier frequency is negated. The main idea of a soft handoff scheme is to ensure that there is connectivity with the old base station while the new base station has been assigned to take control over the communication link. This way at a given instant of time we have the mobile maintaining a constant communication link with at least one base station simultaneously ensuring a non disrupted call activity. The algorithm may be designed in such a way as to ensure that as soon as the mobile is within the range of the new cell, the old base station releases the

Related work:
In summary, even though the capacity and outage of forward link has been studied [1] [27], the current research on the CDMA forward link is far from enough due to the neglecting of the soft handoff threshold and multipath fading. Furthermore, the 3G CDMA systems are designed to support both the high data rate and voice services after the successfully deployment of the 2G CDMA systems, such as IS-95, to support mainly the voice service. The high data rate services embody the property of asymmetry, that is, the forward link is capacity-limited due to its high-volume traffic. The forward link performance of a CDMA system has been analyzed by treating the SIR $E_b/N_0$ as a random parameter taking all possible values in [1]. However, the SIR is considered to be affixed
value in a perfect power-controlled CDMA system or a random variable with a small variance in the presence of the power-control error [24]. Since the power allocated from the base station (BS) connected to the mobile station (MS) decides the amount of SIR achieved at the MS, it is more appropriate to evaluate the system performance from the viewpoint of the fraction of BS power allocated to a MS, which is the essence of the SIR-based fast power control in the forward link. The SIR-based fast power control in the forward link is quite different from that in the reverse link. In the reverse link, the other cell interference can be well approximated by a Gaussian variable [19] [31]. However, in the forward link, the interference at the output of each branch of the rake receiver was shown to be approximated by a Gamma variable by using the channel-gain-matched combining and assuming a perfect slow power control [27]. But the statistical property of the interference in a SIR-based fast power control is still unavailable for the maximum ratio combining (MRC). The MRC is optimal in the sense of maximizing the total SIR at the output of the rake receiver and the total SIR is the summation of the individual SIR’s at the output of each branch of the rake receiver. The analytical expression of the total SIR is complicated by using the MRC, since the signal term in one branch of the rake receiver is treated as the interference in another branch. It was reported in the literature that when the MS is connected to only a single BS in the non-soft handoff mode (NSHM), the concept of the orthogonality factor (OF) can be used to simplify the total SIR expression into one term [30]. However, it is very complex to simplify the total SIR expression into one term for the MS communicating with multiple BS’s in the soft handoff mode (SHM), since the soft handoff threshold (SHT) truncates the strengths of both the signal and interference as discussed later. However, an exact closed-form expression of the blocking probability is still not available. In addition, for simplicity, majority of the previous work studying the forward link performance assumes equal BS powers throughout the system [1], [24] and a static capacity is obtained without considering the time-variant property of the interference caused by other cells.

Handoff Architecture for 4G Technology: In this paper, an IP-based handoff architecture using mobile IP is used. The mobile host has a multi-mode card that can access the WLAN and cellular networks. Their hierarchical foreign agents and multi-path structure used. For conventional handoff techniques, the criteria that select the initial mode in mobile host are the radio link quality, data rate, service type, speed of mobile host, and capacity of cellular network. If its data rate is low and fast moving, then the mobile host can select the CDMA network. For high data rates, then the WLAN is selected. For accessing the internet, we know that the uplink and downlink traffics are not balance. Normally, user prefers a wider downlink frequency than the uplink. Here our goal is to use the combination of cellular network for uplink traffic services and WLAN network for downlink traffic services to provide an efficient application for mobile user to access the internet. Structured mobility anchor point can offer a mobile node seamless mobility when it moves from MAP2 to MAP3 while communicating with a corresponding node. In this approach, different mechanisms and protocols can handle authentication, billing and mobility management in the cellular and 802.11 portions of the network [4-7]. When an MN enters a new foreign sub network, it first acquires a new physical care-of address (PCoA) by means of address auto configuration, in which the MN uses it as the source address for all datagrams that it sends. The MN will also register a unique virtual care-of address with a home agent and CN for each level of the hierarchy. It all starts when the MN receives a router advertisement with the mobility information option that contains a new hierarchy, in which it will send a binding update. That binding update binds its PCoA to its lowest VCoA. After that the lowest MAP will send a surrogate binding update to the next higher MAP. That binding forms a binding between the VCoAs of the mobile node in the MAPs hierarchy. This continues until the highest MAP receives a surrogate binding update when it will check whether that MN is allowed to use the network and finally sends a binding acknowledgement to the next lower MAP. These surrogate acknowledgements are sent until the lowest MAP receives one. Then the lowest MAP sends acknowledgement to the MN. In figure 2, mobile node sends binding update to the MAP2, which is the lowest MAP. MAP2 sends a surrogate binding update to MAP1. MAP1 is the highest MAP and it processes the authentication header of the original binding update and authenticates the mobile node. Multiple paths are maintained while mobile node transits the overlapping area of two adjacent cells, keeping connections for both cells. To avoid drastic quality degradation and stream disruptions, [9] proposed a scheme that reduces packet loss and maintains high throughput during handoffs by transmitting packets on multiple paths. Meanwhile, high throughput is maintained by exploiting all the available bandwidth on multiple paths. To allow a source node to be able to maintain multiple paths simultaneously, mobile IP simultaneous binding [10,
11] and route optimization option [12] are used. Simultaneous binding option allows a mobile node to simultaneously register multiple CoAs, and route optimization option allows the sender to be always informed of the CoA registration directly form the receiver.

References:


[8] “3g and umts frequently asked questions” online available: http://www.umtsworld.com/umts/faq.htm


