

Secure cognitive radio based multihomed and mobile femtocells

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The current 3GPP femtocell architecture is capable of reducing packet loss during handover by buffering and forwarding data. On the other hand, the proposed approach enables this by simultaneously maintaining multiple connections with the correspondent node. Similar to cellular networks, secure communication is an essence with femtocell networks. Currently, as specified by 3GPP, authentication of femtocells towards the core network is performed with Internet Key Exchange protocol version 2 (IKEv2). According to 3GPP standards, secure connectivity between the femtocell and core network is IPsec based. To realize the proposed mobile femtocell scenario, femtocell operating system must recover the connectivity to the core network when it moves from one location to the other. It should be noted here, that these nodes could be located in open environments like buses, metros, flights, etc. Therefore, in one hand, frequently changing connectivity and repeating authentication procedures could be a security vulnerability since the knowledge about IP and network security is widely adopted by the society. On the other hand, frequently changing mobility tear-down already established associations in all layers of the network stack. According to our studies, an identity/locator separation is a potential solution to overcome this problem.

In this work, a secure backhauling and authentication mechanism for cognitive radio based femtocells were proposed. The current 3GPP femtocell architecture is capable of reducing packet loss during handover by buffering and forwarding data. Instead, multihoming capabilities on femtocells to enhance seamless mobility and availability were introduced. With mobility, throughput was hindered by authentication and connection establishment phase which is performed in order to negotiate keying materials and to establish a new secure association between the roaming femtocell and the secure gateway (SeGW). A novel mobility management approach for roaming cognitive radio based femtocells was presented in this study and further, their impact on throughput, especially in file transfer were investigated. This scenario was evaluated by mean of simulations. Cognitive radio based femtocells with seamless mobility were presented in results. This solution has a better throughput improvement compared to 3GPP femtocells for delivering small and medium size file contents.