

Wirlab has several focuses in technical research:

- * WLAN (Wireless Local Area Network)
- * RADIUS (Remote Access Dial In User Service)
- * EAP (Extensible Authentication Protocol)
- * VoIP (Voice over IP)
- * SIP (Session Initiation Protocol)
- * GPRS (General Packet Radio Service)

Each of these topics build on other technical issues, for example WLAN on roaming, mobility, modulation and authentication. Authentication focus is on the EAP. RADIUS is the protocol to handle the authentication with. VoIP provides cost-free telephone calls when used over the Internet, using SIP as the protocol that handles the call registering, invites and other signalling needs. SS7 is a protocol to enhance telephone networks to work more efficiently and flexibly. GPRS will provide mobile networks with more efficient data transfer rates using the packet-mode technique.

The goal of Wirlab is to achieve a secure, easily managed and cost effective wireless environment that can handle multiple services, including Internet access and VoIP. Secure means user identification and strong encryption of the transferred data. Easily managed means user interfaces that combine RADIUS and different kinds of databases e.g. MySQL and LDAP. Cost effective means roaming between different network architectures. For example, using WLAN at the office and GPRS while on the road or at home. The upcoming mobile phones have both WLAN and GPRS chips installed, so a user can easily move around and stay connected.

An important issue is the user authentication. At present, different WLAN vendors offer the basic authentication with static WEP-keys. WEP means Wired Equivalent Privacy thus having a way to provide same kind of security as in traditional Ethernet environments. This kind of static WEP-based authentication can easily be broken by man-in-the-middle attacks. The IEEE-group has a new draft that strives to standardize the session based user authentication. The draft is called 802.1x (includes EAP). Wirlab has this upcoming standard under surveillance and will implement it in the test environments. RADIUS is an important part of the authentication, providing the protocol for the authentication process. Wirlab is at the moment using Perl-based, open-source RADIUS server named Radiator. Together with the Radiator developers, the 802.1x draft has been implemented to the server. A Cisco Access Control Server has also been tested. The new Windows XP operating system natively supports MD5-based 802.1x authentication and other user clients are also being developed, so the required functionality will be available on various platforms.

Wirlab's goal is also to become an appreciated technical advisor for service providers, network planners and such, providing the facilities and means needed to test hardware and software. Voice over IP testing, modulation and frequency testing and different kinds of efficiency tests being the main subjects.

In phase one the basic hardware infrastructure and services are constructed. After the infrastructure is ready we are able to start different kinds of tests including QoS (Quality of Service) over WLAN and VoIP, SIP versus H.323 protocol analysis, and the possible SS7 telephony gateway and service testing. At the same time, new service concepts are developed. These actions will mainly take place in the phase two.

In phase two Wirlab will also concentrate more on the city/rural research, and start examining which modulations and frequencies could and should be used. The main issue there is the density of wireless nodes that should be served. In cities Wirlab is going to use the traditional 2,4 GHz frequency and 802.11b DSSS based hardware. Building of the Wireless LAN's will be on the "hot-spot" basis, meaning that the WLAN's will be strictly limited to a certain small geographic area. However in the rural parts of the testing a 3,5 GHz or equivalent frequency will be used, along with OFDM modulation. It is probable that with the 3,5 GHz hardware we can reach over a 10 mile radius from the serving access-point with relatively small signal-loss. GPRS can also be of service in rural areas, for mobile operators are swiftly changing their GSM infrastructure to support GPRS.