Mobile 3G/WiFi Hotspot

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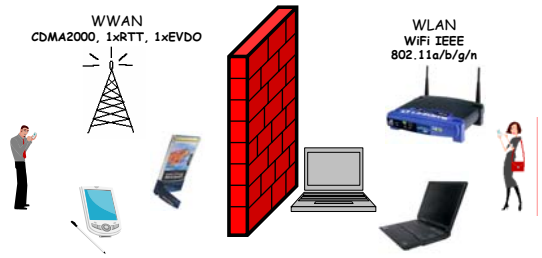
Wireless Networking

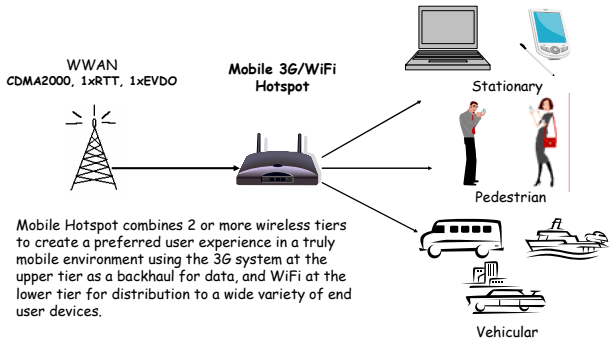
Network Tiers are Isolated



Higher tier data networks and lower tier data networks are incompatible in terms of devices that can connect to them. Often this means a device swap and possible other authentication procedures are necessary when switching between tiers.

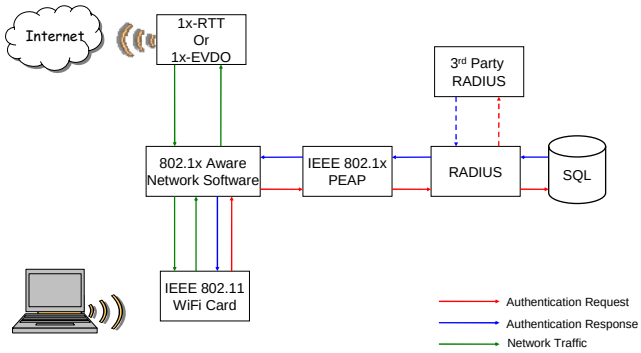
Integration of Wireless Networks

Network Tier Convergence



Mobile Hotspot combines 2 or more wireless tiers to create a preferred user experience in a truly mobile environment using the 3G system at the upper tier as a backhaul for data, and WiFi at the lower tier for distribution to a wide variety of end user devices.

Architecture

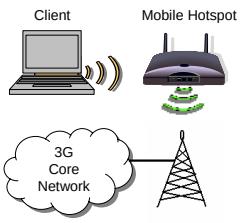


Properties

- **Wireless Interfaces at upper and lower tiers**
  Accommodates any wireless adapter with Linux drivers. Currently supports WWAN(CDMA2000, 1xRTT, 1xEVDO) and others as the upper tier, and WLAN(WiFi IEEE 802.11a/b/g/n), WPAN (BlueTooth IEEE 802.15.2) as the lower tier.
- **Authentication and Encryption**
  Lower tier uses various security mechanisms such as Open, WEP, or 802.1x PEAP with Dynamic WEP/WPA. Upper tier uses 3G security systems.
- **IEEE 802.1x Authentication and Accounting**
  Using 802.1x PEAP enables secure login with username and password combinations on a wireless interface. Encryption is enabled by a certificate located on the hotspot. Accounting packets are sent to an accounting server on a per user basis.
- **Certificates enable Mutual Authentication**
  The client authenticates the hotspot by the certificate, eliminating rogue access points.
- **Radius used for Local and Thru Authentication**
  A Radius server is located on the hotspot enabling it to act as a standalone authentication unit for local registration. The Radius server can also proxy requests to a centralized server for thru registration.
- **MySQL Database**
  Holds local authentication and accounting data. Usernames and passwords are stored to verify against those input to 802.1x PEAP. Accounting data is stored locally until processed.
- **DHCP and NAT**
  DHCP server is used to assign IP addresses to clients at the lower tier after authentication. Network Address Translation is currently used enabling the use of private IP addresses.
- **Clients are not Zero-Configuration**
  Each client must setup the device manually if IEEE 802.1x PEAP is to be used. Client certificates are not required.

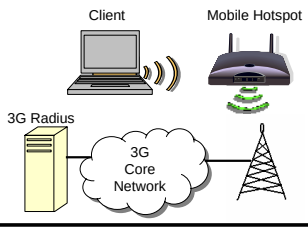
Scenario and Benefits

Local Registration



- Independent provider subscribes to upper-tier data service and redistributes over WiFi
- Local Registration and accounting allow the provider charge per user, amount of data, or amount of time
- Ideal in situations where walk-in customers are expected

Thru Registration

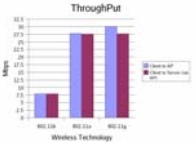


- End users access requests are passed through to the upper-tier where registration, authorization and accounting take place
- Ideal for users with subscriptions to upper-tier service but want to use devices without upper-tier connectivity
- Usually operated in this mode by the upper-tier service provider.

Performance

Current results on lower tier interfaces have held up to our expectations.

Field tests for the upper tier are expected to commence once 1x-EVDO is in service and equipment is available for testing purposes.



Tests on the lower tier were done using iperf with UDP. 802.1x was active, using Dynamic WEP.

Acknowledgments

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