Multiple Backhaul Mobile Access Router
Yan Sun, Fangfei Chen, Thomas F. La Porta

Group Mobility and Multiple Backhauls

Group Mobility and Multiple Backhauls:
- Mobile access routers allow groups of users to connect to the Internet and remain connected as the router moves.
- With multiple wireless backhauls MAR has a better chance of maintaining Internet connectivity as it moves.

Efficient Handover Algorithm:
- To maintain high availability when switching between backhauls.
- Need thorough study of different link parameters and a common interface cross different wireless links.

APIs for 802.11 cards:
- GetNoise(char* InterfaceName);
- GetBitRate(char* InterfaceName);
- GetMTU(char* InterfaceName);
- GetRSSI(char* InterfaceName);
- GetBitErrorRate(char* InterfaceName);
- GetRxPacketLossRate(char* InterfaceName);

Next is summary of major functions. If it starts with 'Get', the value is obtained from device; Otherwise, if it starts with 'Cal', it means the value is calculated.

Common APIs:
- int GetBIT(char* InterfaceName);
- long GetBitRate(char* InterfaceName);
- double GetNoiseRate(char* InterfaceName);
- double GetFrameErrorRate(char* InterfaceName);
- double GetRxPacketLossRate(char* InterfaceName);

For 802.11 cards:
- int GetNoise(char* InterfaceName);
- long GetBitRate(char* InterfaceName);
- double GetBitErrorRate(char* InterfaceName);
- double GetFrameErrorRate(char* InterfaceName);

Threshold based handover policy utilizing network access APIs:
- Define primary link $p$ and secondary link $s$.
- Define SNR threshold $T_{p_{SNR}}, T_{s_{SNR}}$, and $T_{SNR}$.
- Define measured parameter $SNR_p$ and $SNR_s$.

Algorithm:
- If primary in service, remains same as $T_{p_{SNR}}$.
- If it is below $T_{p_{SNR}}$ and $SNR_p \leq T_{SNR},$ switch to secondary link;
- Returns to the primary if $SNR_p > T_{p_{SNR}}$.

Vertical Handover Policy:
- Persistent Policy: set $T_{p_{SNR}}$ to mininal and $T_{p_{SNR}}$ also to a value close to $T_{SNR}$.
- Aggressive Policy: set $T_{p_{SNR}}$ and $T_{SNR}$ to relative high values and set $T_{p_{SNR}}$ close to $T_{SNR}$.
- Predictive Policy: set $T_{p_{SNR}}$ above the minimum needs, set $T_{SNR}$ to relative high value.
- Combined Policy: add new thresholds for transmission rate, remain on the link with the highest rate but also avoid outages.

Summary:
- A flexible framework and the implementation of a Multiple Backhauls Mobile Access Router
- A set of backhaul interface monitoring APIs
- Enhanced handover policies utilizing the APIs based on different requirements
- Experiments for basic MIP and Simple IP vertical handover.

Future work:
- Evaluate the performance for Mobile IP vertical handover across different wireless links
- Extend the handover policies to more sophisticated decision model.