NRENs in the Dissemination of Innovative Low Cost Global Solutions: From Universities to the World - SCIFI
A Software-Based Controller for Efficient Wireless Networks - SCIFI

- Funded by RNP for three years as part of the WG (GT) call
- An open source software for controlling large scale wireless networks.
On the shoulder of giants...

HTTP://XKCD.COM/1228/
SCIFI (Sistema de Controle Inteligente para rede sem FIo) is an open platform for the centralized control of wireless networks.

It has gone through three one-year long development phases (following the WG model):
1. the kernel, which comprises the controller and the changes to APs running OpenWRT - prototype
2. the graphical interface and reports - pilot
3. the monitoring system – service (?)
OpenWRT

It is a Linux for embedded systems

Allows customizing the Access Points.

Opens the possibility of hardware independence (many vendors)

www.openwrt.org
Wireless Network Evolution

Hotspots
Corporate Networks
The Problem with Scale

• For large networks
  • Centralized management
  • Automatic/centralized configuration
  • Monitoring

• Solutions
  • Proprietary enterprise networks
    ▪ Cisco, Aruba, Xirrus, Motorola
  ▪ SCIFI
    ▪ Open software
    ▪ Low-cost SOHO APs
    ▪ Automatic and dynamic configuration
Paradigm shift

- Open source software – allows cooperative development, adapting to local needs
- Commodity hardware – low cost, many vendors, choice of best cost/benefit
- Easy to install - no site-survey
  - Maximize the number of APs – Low cost HW makes that feasible and increases the bandwidth available
  - Low cost APs do not support a large number of users. Thirty is a good compromise
  - Thirty users per AP allows 2Mbps for each – that is true even for expensive (single antenna) access points
Architecture
Improvements

Throughput per access point without SCIFI

Throughput per access point with SCIFI
Good Neighbor

- Aggregate throughput (respectively: all APs, controlled APs, not controlled APs, each graph showing throughput without and with SCIFI)

<table>
<thead>
<tr>
<th>(a) Vazão Agregada Média da rede incluindo seus sete pontos de acesso.</th>
<th>(b) Vazão Agregada Média dos três pontos de acesso controlados (C01, C02, C03)</th>
<th>(c) Vazão Agregada Média dos quatro pontos de acesso não controlados (04, 05, 06 e 07)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
<td><img src="image3.png" alt="Graph" /></td>
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</table>
Power Control
Management Interface

Bem Vindo - ATENÇÃO: Há 3 pontos de acesso incommunicaçãois

Bem vindo à sessão administrativa do Sistema de Controle Inteligente para Rodes Sem Fio (Scifi).
Utilize as linhas contidas na barra esquerda para realizar ações.

Antes de adicionar Pontos de Acesso, adicione uma Região de Controle. Todo Ponto de Acesso deverá estar contido em uma Região de Controle.

O controlador funciona automaticamente, entretanto, se desejar forçar a execução de comandos utilize o link "Executar Comandos do Controlador".

Alterar parâmetros do controlador através do link "Editar Configurações do Controlador".
Management Interface
Management Interface

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<tr>
<th>MAC</th>
<th>IP</th>
<th>Localização</th>
<th>Região</th>
<th>Canal</th>
<th>Lista de Potências</th>
<th>Potência Atual</th>
<th>Número de Usuários</th>
<th>Status</th>
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Production

- UFF uses SCIFI for wireless coverage on its campuses
  - Managed network
  - Less expensive than other similar solutions
  - More configurable than other software controller solutions
- Allows expansions
- Access control
- Security cameras
- Pilot at Praia Vermelha campus
  - Engineering, CS, Architecture, Physics
Indoor Network
Photos
Outdoor Nework
Photos
Software available at GitHub

https://github.com/Sci-Fi

We will be redesign SCIFI to make it more streamlined.

Help is welcome!
Conclusions

• SCIFI is a low cost solution for large scale wireless networks.
• Hardware independent (Ubiquiti, DLink, Linksys, TPlink) – many Aps are compatible with OpenWRT
• Easy to install
  ◦ Number of APs is calculated from the number of simultaneous users divided by 30
  ◦ Areas for escalability
  ◦ Automatic and dynamic configuration
Thank you!
¡Gracias!
Obrigada!

www.midiacom.uff.br/scifi

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MidiaCom Lab, UFF

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