Municipal wireless network using mikrotik

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Municipal wireless

Introduction

Name : Mat Dawam Abas

Graduate : Telecommunication Engineer

Experience : Communication, Radar System, Oil Platform, Ship to Shore, Cellular Communication, Analogue/2G/ 3G

Mikrotik : Mikrotik Reseller since (end 2006), Mikrotik Certified Trainer. (2009)

WISP partner with local ISP
Agenda

- Malaysia – broadband scenario some background
  - Statistics
  - Broadband developments & players
  - Licensing - Regulatory Framework
- Municipal wireless
  - Services, Business Model
  - Network topology
  - Typical installation
  - RouterOS function used
- Challenges
Maps -> Malaysia
Malaysia Statistic

PENDUDUK MENGIKUT KUMPULAN UMUR

POPULATION BY AGE GROUP

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (Juta / Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>4.3% 63.1% 32.6%</td>
</tr>
<tr>
<td>2006</td>
<td>4.3% 63.3% 32.4%</td>
</tr>
<tr>
<td>2007</td>
<td>4.4% 63.4% 32.2%</td>
</tr>
<tr>
<td>2008</td>
<td>4.5% 63.5% 32.0%</td>
</tr>
<tr>
<td>2009</td>
<td>4.6% 63.0% 31.8%</td>
</tr>
</tbody>
</table>

Total Population: 28.31juta
broadband agenda

household broadband penetration

2010
- Plan – 50 % household broadband penetration.
- HSBB - High Speed Broadband
  - high impact areas (10 Mbps and 1 Gbps).
- BBGP - Broadband for General Population
  - (2 Mbps)
- Government + Telekom Malaysia - RM 11.3 billion

Early 2009
- 21.1% broadband penetration

2008
- Malaysia - 18 %
- Singapore - 78 %
- Hong Kong - 80 %
- Korea - 93 %
broadband player

**ISP’s**
- 20 + ISP’s

**ADSL wired technology**
- Telekom Malaysia Bhd (TM)
  - owns 95% of the existing fixed line infrastructure

**3G players**
- Maxis, Celcom, U Mobile and DiGi

**4 WiMAX (operator) License**
- Packet 1, Redtone, YTL and Asiaspace
## Regulatory Framework

<table>
<thead>
<tr>
<th>LICENSE</th>
<th>INDIVIDUAL</th>
<th>CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Facilities Provider (NFP)</td>
<td>88</td>
<td>12</td>
</tr>
<tr>
<td>Network Service Provider (NSP)</td>
<td>96</td>
<td>6</td>
</tr>
<tr>
<td>Application Service Provider (ASP)</td>
<td></td>
<td>255</td>
</tr>
<tr>
<td>Content Application Service Provider (CASP)</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>TOTAL</td>
<td>207</td>
<td>295</td>
</tr>
</tbody>
</table>

http://www.skmm.gov.my
Regulatory Framework
Licensing Structure

- Licence
  - Individual
    - 1. Network Facilities
    - 2. Network Services
    - 3. Content Application Services
    - 4. Application Services
  - Class
Regulatory Framework

Licensing Structure

Licence

Individual

Class

1. Network Facilities

- a) Earth Stations
- b) Fixed Links and Cables
- c) Radiocommunications Transmitters and Links
- d) Satellite Hubs; and
- e) Towers, Poles Ducts and Pits used in conjunction with other network facilities

2. Network Services
Regulatory Framework
Licensing Structure

Licence

Individual

Class

Terrestrial Free to Air TV
Terrestrial Radio Broadcasting
Subscription Broadcasting

3. Content Application Services
Regulatory Framework
Licensing Structure

- Licence
  - Individual
  - Class
    - 4. Application Services
      - PSTN, Public Cellular services, IP Telephony, PSDS, Audiotext Hosting Services, Internet Access Services and Messaging Services
municipal wireless network

- 40 sq km
- Population - 500k
- Traditional town
- College – ~ 6 colleges
municipal wireless network

- 100 % Mikrotik equipment
- 100 % wireless 5Ghz and 2.4 Ghz band
- Services
  - PPPoE : 1 Mbp/s , 2 Mbp/s
  - Hotspot : 384kbps.
- We build last mile network,
- Radius, Billing system by ISP
- ISP provide bandwidth
- Revenue share
Hotspot Service

Coverage
campus, student area, public area

- zero configuration
- captive portal
- external radius (AAA)
  - “roaming“

Payment
- online registration, reseller
- payment credit card, local bank, reseller
Hotspot Service

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Hotspot Service

- user connect to SSID
- open browser
- captive portal
- enter username & password
- **Authenticated** thru external radius
- start using if **Authorized**
- **Accounting** start
Hotspot Service

- Speed 384k/384k
- Rates:
  - 1 day ( $ 1.4 USD)
  - 1 month ($ 5.5 USD)
  - 3 month ($ 14 USD)
Hotspot Service

- Collaboration with campus
- We build hotspot infrastructure
- customized - Campus captive portal
- Campus user can roam using town hotspot service using same credential.
- Campus register and collect from student.
- Campus deposit $ top up.
- Revenue sharing with campus
PPPoE Service

Coverage
Office and home user

- 1 Mbps/1 Mbps, 2 Mbps/2 Mbps
- 1 month ($ 23/34 USD)
- CPE (RB 112/133c/411),
  - PPPoE client, DHCP server in CPE
- Online registration, credit card, online banking, local bank.
- Through reseller
QOS

- Standard limit for service, control by ISP
- Queue tree based on traffic type
  - http, https
  - dns,
  - P2P
  - download byte
  - youtube, etc..
Network Topology

- Internet
- ISP Backbone
- PPPoE Server
- HotSpot Server
- OSPF Backbone
- Residential Area
- Office Area

public internet
POP
coverage area
Using EoIP for PPoE & Hotspot

A good reference:
Scalable and Reliable WISP networks
http://mum.mikrotik.com/presentations/EG07/lutz_kleeman.pdf
Hotspot AP’s

- Routed network
- EOIP for Hotspot
- OSPF
- 3 radio

- 2.4Ghz hotspot
- 5 GHz backhaul
- 5 GHz next AP
- UTP for POE inside pole
Hotspot AP’s

- 2.4Ghz hotspot
- 5 GHz backhaul
- 5 GHz next AP
- UTP for POE inside pole
Hotspot AP’s

2.4Ghz hotspot

5 GHz backhaul
Hotspot AP’s

2.4Ghz hotspot

5 GHz backhaul
Client CPE’s

- CPE- to customer
- Station mode,
  - Access list on AP’s
  - TX limit
- PPPoE client, DHCP server on CPE.
- Client plug in Desktop/ Switch/Router direct to CPE
- Easy maintenance, eliminate client equipment troubleshooting.
Summary: Mikrotik solution we used

User manager
- Firewall
- QoS
- Hotspot
- PPPoE

DUDE
- OSPF
- NStreme
- 5 Ghz
- 2.4 Ghz
- EOIP

RouterOS 2.9.51
- RB52
- RB333
- RB433
- RB133
- RB532

RouterOS 3.28
- RB493
- R52

RouterOS 3.9
- RB411
- RB133c
- Rb112

dhcp server, ntp client ntp server usermanager

Mikrotik solution we used

- User manager
- Firewall
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dhcp server, ntp client ntp server usermanager
Mikrotik Solution – Dude
Mikrotik Solution – challenges

When we first started

- Mikrotik ??
  - reliability ?
  - Any local installation ??
  - Who is using it ??
  - Where is it from ??

Never heard before
Mikrotik Solution – today

After deployment

- Why, there’s no customer complain from your network??
- 8 university campuses
- 4 ISP’s
- 10 corporate offices
- Few more towns looking at the model
Terima Kasih
Thank you