Nepal Wireless Networking Project

Final Report of
APT ICT J3 Project in Nepal

Submitted by:
E- Networking Research and Development, Nepal

http://www.enrd.org

Project Supported By:

Asia Pacific Telecommunity

2009
Nepal Telecom
MOBILE COVERAGE
Covering 75 Districts of the country
• The first long range link testing (34 KM) was done in 2002
• from Mohare to Pokhara putting a dish on the ground
Beginning of Nepal Wireless in 2002 with dish antenna and Wi-fi radio on the tree.
Team members welcomed by the villagers with garlands and cup of local wine
Office of Mustang District Development Committee
Mr. Yasuhiko Kawasumi  
Mr. Naomi Fuke  
Mr. Izumi Aizu  
Photos of the Japanese Experts, who visited the project sites and gave their inputs
Assembling Grid Antenna at Mohare Relay
Mr. Kawasumi and Mr. Fuke at the office of Kaski Association of the Blinds
Primary Health Center Lete, Mustang
Dr. Saroj Dhital looking at the ultrasound image transmitted live from Mustang
Dr. Kiyoshi Honda and his team with the Weather Station at Khopra
Trainees from different villages
Sebastian Buttrich, the trainer from Denmark
Jomsom and Kali Valley as seen from Dhakarjung Relay station
Tukuche Village
Google Earth map of the network looking towards Jomsom from Pokhara area
- Table 1: Complete list of Network Nodes
  - From To Distance Means of travel
  - Pokhara Station Beni 3 hours By bus
  - Pokhara Jomson 22 minute By flight
  - Pokhara Chandrakot 2 hours By taxi (1 hour and walk)
  - Pokhara Bhuka 6 hours By taxi and walk (5 hours uphill)
  - Pokhara Sapet 5 hours By taxi and walk (4 hours uphill)
  - Pokhara Mohare Relay 2 days By Jeep and walk (7 hours uphill)
  - Pokhara Khopra 2 days By Jeep and walk (9 hours uphill)
  - Beni Jomsom 8 hours By Jeep or bus
  - Beni Kaphaldanda 4 hours By jeep (3 hours) and walk
  - Beni Todke Relay 5 hours By walk (Up hill)
  - Beni Jhin 4 hours By walk (Up hill and straight)
  - Beni Chimkhola 8 hours By walk (Up hill and straight)
  - Beni Aula 4 hours By Jeep and walk (3 hours up hill)
  - Jomsom Larke 5 hours By Jeep and walk (3 hours)
  - Jomsom Kobang 1 hours By Jeep
  - Jomsom Dhakarjung Relay 3 hous By walk (up hill)
  - Jomsom Muktinath 2 hours By Jeep
- Table 2: Walking distance in hours and days from the nearest highway
  - 1
Putting Alvarion radio at Kobang School
Conceptual Diagram of the Nepal Wireless Network

Connecting the districts of Kaski, Parbat, Myagdi, and Mustang.
Description of VLANs Used in the Nepal Wireless Network from Pokhara to Dhakarjong

VLAN 1 - Will be used for management of future Cisco equipment in the network.

VLAN 2 - Used for connecting to the Alvarion radios by telnet.

VLAN 252 - Carries all data for the new subnets between the backhauls (IP addresses 192.168.247-253.x).


To access the Alvarion radios by telnet when the Internet connection is down, your laptop must be connected to the VLAN 2 port on the VLAN switch.

New computers, radios, cameras, and other equipment should connect to the local VLAN. These devices will get an IP address automatically from the Soekris DHCP server.

The blue Soekris router connects both to the local VLAN and to VLAN 252. These two connections allow the router to send information from the local network (local VLAN) to Nadipur (on VLAN 252) and back.

The Cisco router in Nadipur is connected to every VLAN and can move information between them.
• S.N. Equipment Number
• 1 Alvarion radios of different capacity 28
• 2 5.7 GHz Motorola radio with reflectors 6
• 3 5 GHZ MikroTik APs and Client radios 18
• 4 2.4 GHZ EnGenius, and Deliberant 10
• 5 24dB Directional Antennas 4
• 6 15 dB Panel Antennas 13
• 7 14 dB Omni Directional Antennas 3
• 8 Cisco routers and switches 4
• 9 Soekris Routers 4
• 10 Linksys wireless routers 12
• 11 Linksys Wi-fi to PSTN Phone adaptors 5
• 12 Polycom IP phones 5

• Table 3: List of the main transport equipment used
Routers at Mohare Relay Station
Installing Antennas
Tower at Mohare
Web Site Nepal Wireless
Solar Paners at Mohare Relay Station
Power Generation and Backup Systems Used in the Relay Stations

- S.N. Item Quantity
- 1 50 W Solar Panels 6
- 2 80 W Solar Panels 24
- 3 120W Solar Panels 8
- 4 30 Amp rated Solar Charge Controllers 7
- 5 40 Amp rated Solar Charge Controllers 4
- 6 400W Air-403 Wind Generators 1
- 7 100 amp-hour rated Deep Cycle Batteries 30
- 8 12 VDC to 110VAC Inverter (250W) 14
- 9 600 VA Kerosene Generator 1
Wind Generator
Server room at Pokhara
Backup Batteries
Porters Carrying Equipment to Relay Stations
• S.N. Budget Headings Amount USD

• 1 Planning and Investigation 2,000
• 2 Equipment Procurement 122,400
• 3 Correspondence and Shipping fee 2,000
• 4 Business Trips 15,200
• 5 Miscellaneous 4,700
• Total Amount 146,300

• Table 5: Budget approved by APT for Nepal Wireless Networking Project
• S.N. Budget Headings Amount USD

• 1 Planning and Investigation 2,000
• 2 Equipment Procurement 122,400
• 3 Correspondence and Shipping fee 2,000
• 4 Business Trips 15,200
• 5 Miscellaneous 4,700
• Total Amount 146,300

• Table 5: Budget approved by APT for Nepal Wireless Networking Project
<table>
<thead>
<tr>
<th>S.N</th>
<th>Budget head</th>
<th>Amount Spent USD</th>
<th>% of the total Budget</th>
</tr>
</thead>
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<td>1</td>
<td>Planning and Investigation</td>
<td>2,444.75</td>
<td>1.7%</td>
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<td>2</td>
<td>Equipment Procurement</td>
<td>125,057.00</td>
<td>99.85%</td>
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<td></td>
<td>Wireless equipment and Accessories</td>
<td>63,930.06</td>
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<tr>
<td></td>
<td>Solar and backup power</td>
<td>18,747.78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer and telemedicine</td>
<td>35,741.53</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tower and miscellaneous expense</td>
<td>6,638.62</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Shipping and Correspondence</td>
<td>2,193.90</td>
<td>1.5%</td>
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<tr>
<td>4</td>
<td>Business Trip</td>
<td>13,967.41</td>
<td>9.5%</td>
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<tr>
<td>5</td>
<td>Miscellaneous (Handbook and workshop)</td>
<td>2,605.71</td>
<td>1.8%</td>
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<td></td>
<td>Total</td>
<td>146,269.76</td>
<td>100.0</td>
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Table 7: Percentage of the total APT budget spent on each budget head
Network Managers
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<th>Services</th>
<th>Mustang</th>
<th>Myagdi</th>
<th>Total Revenue in USD</th>
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<td>Government offices</td>
<td>7</td>
<td>8</td>
<td>175</td>
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<tr>
<td>Schools</td>
<td>8</td>
<td>6</td>
<td>200</td>
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<tr>
<td>Hotels</td>
<td>6</td>
<td>50</td>
<td>300</td>
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<tr>
<td>Hospital and health clinics</td>
<td>2</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Schools</td>
<td>6</td>
<td>25</td>
<td>150</td>
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<tr>
<td>Total Revenue in USD</td>
<td></td>
<td></td>
<td>855</td>
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</table>

**Table 10: Approximate monthly income for the network**
Team Members—Mostly Volunteers
Students at Kalopani Secondary School
Operator Handbook


Prepared and Edited by:
Mahabir Pun
Team Leader
Nepal Wireless Networking Project

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Mahabir Pun Presenting the Final Report