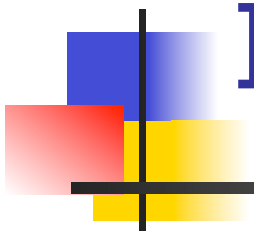


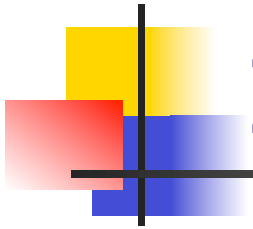
Internet in Bhutan

Philip Smith

BTNOG 1

Phuentsholing

17th November 2014



1998

- In 1998, the 4th King decided that the Internet should be available in the country for the 25th anniversary of his coronation (2nd June 1999)
  - Technical staff from Druknet came to an ISP/IXP Workshop I ran with the UNDP in Malaysia in 1998
  - In March 1999 I received the call from UNDP in Bhutan asking for help provide training for the Government's ISP
  - There followed frantic activity in April before my trip there in early May

Reply

From Henrik Holde <henrik.holde@undp.org>
Subject **Bhutan: ISP setup**
To Philip Smith <pfs@cisco.com>
User agent Mozilla 4.04 [en] (Win95; I)

Philip - it was nice meeting you (although briefly) again at APRICOT in Singapore.

As you may be aware, Bhutan is about to make its way to the Internet and the first ISP in Bhutan will be funded jointly by UNDP Bhutan and APDIP. I am currently trying to identify means of providing training in various aspects of ISP management, routing, local access etc.

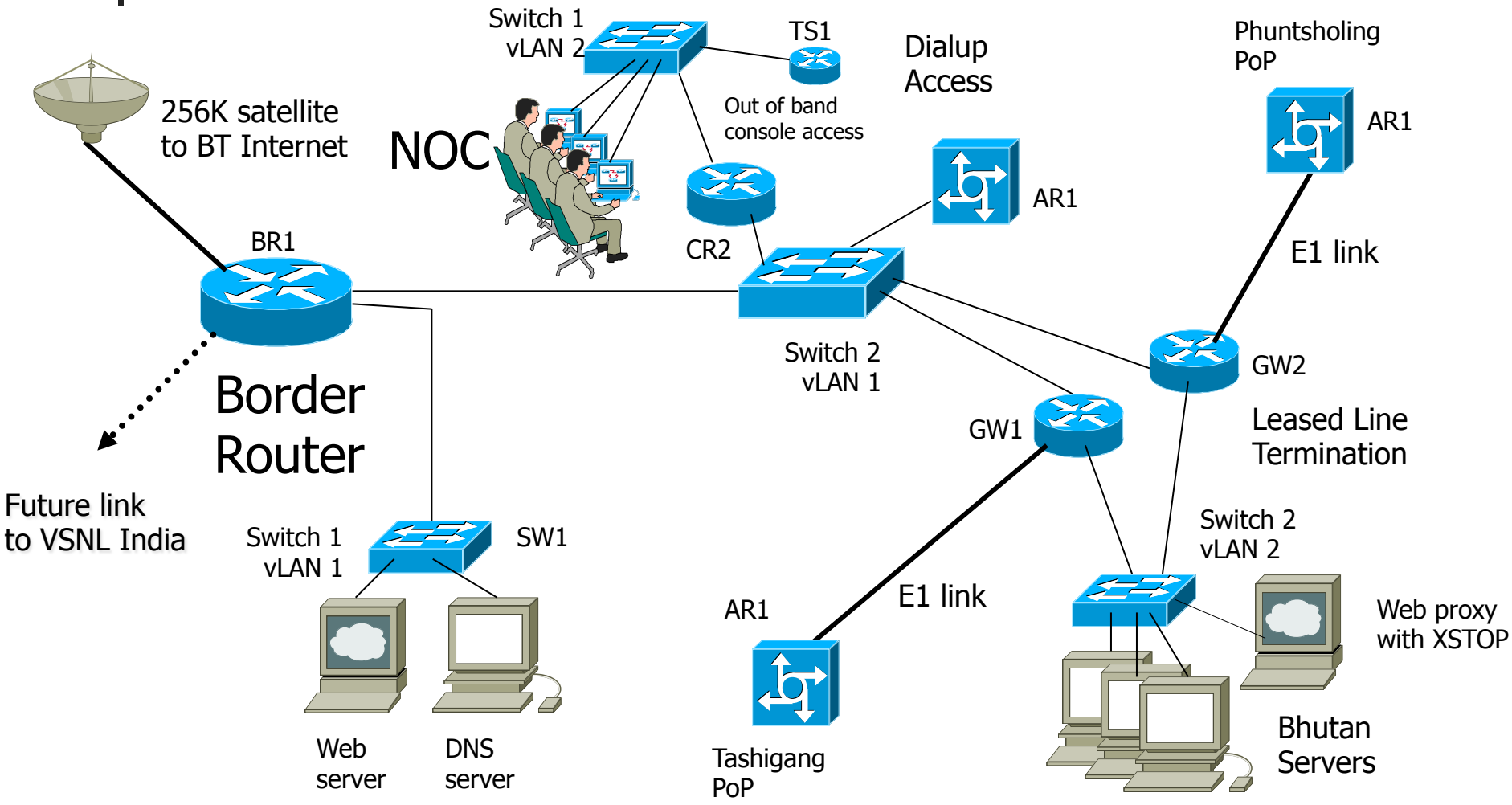
When we first spoke in November in Kuala Lumpur, you mentioned that you would be interested in visiting Bhutan. I was wondering if you would be able to combine a visit with providing some hands-on training in configuring and setting up the routing and local access equipment together with the Telecom/ISP staff here. We would obviously pay for your travel etc - unless Cisco would be interested in sponsoring your visit :-)~

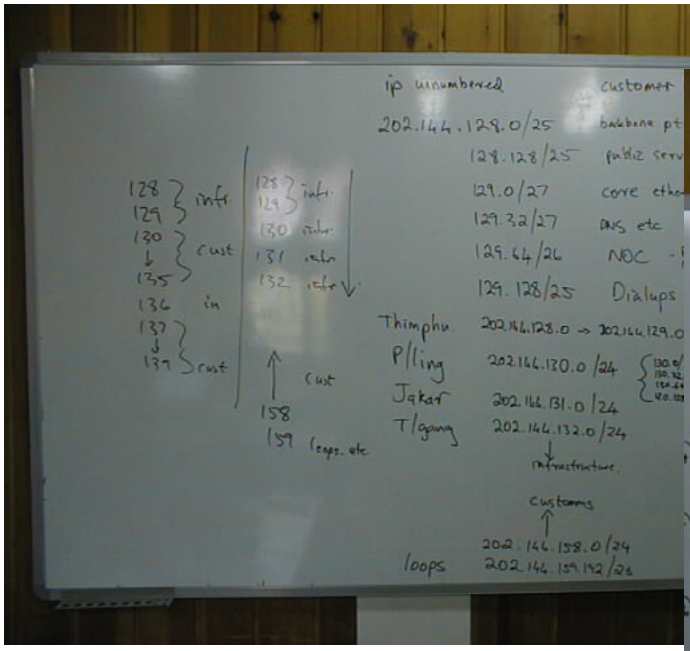
I look forward to hearing from you - if you are interested in the above, the most likely time for the installation of the internet would be sometimes late April/early May.

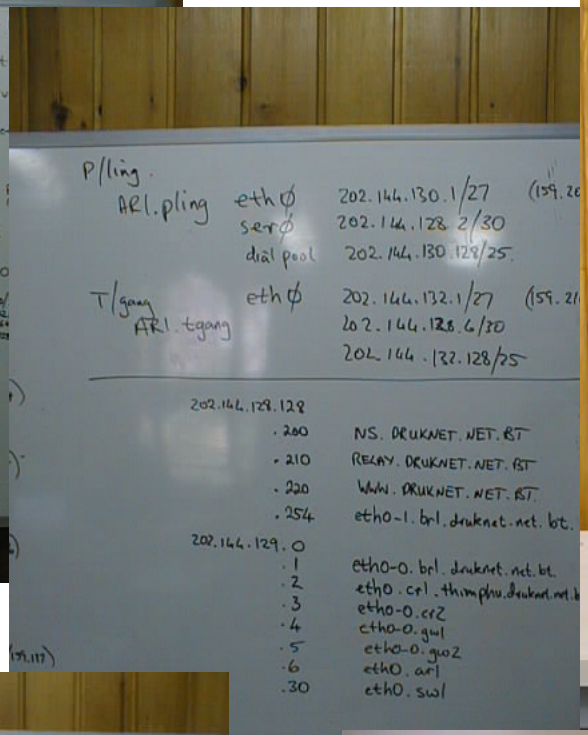
Best regards,
Henrik

PS. There are literally no airconditioners in Bhutan!!

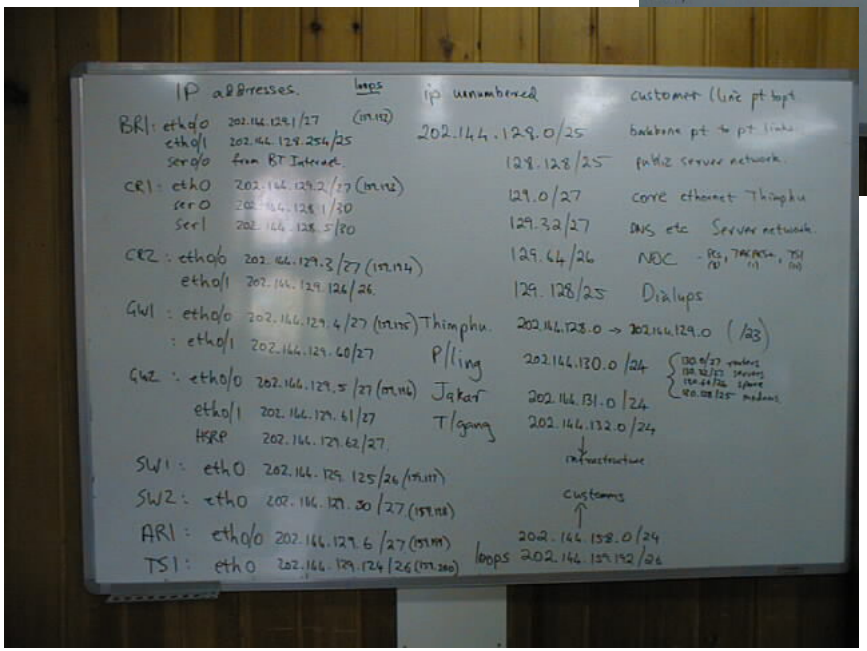
Network Diagram

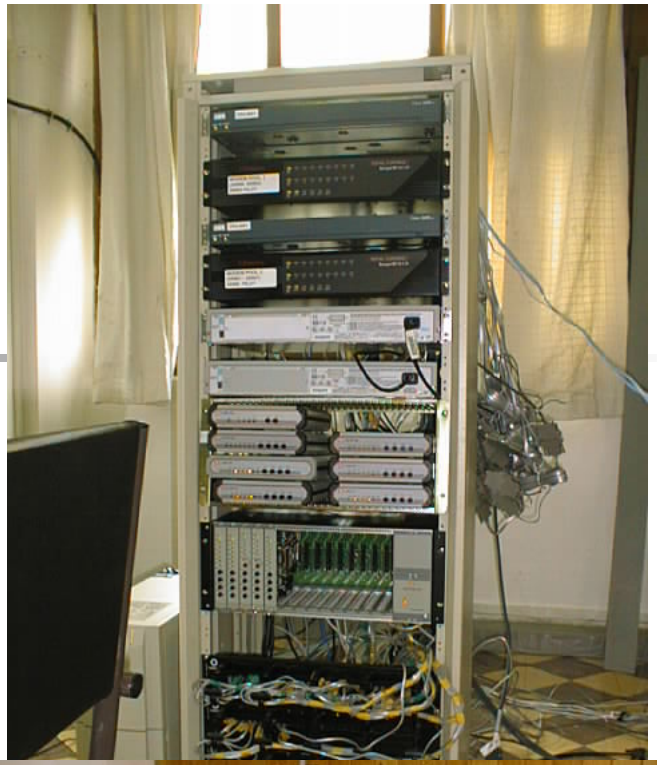


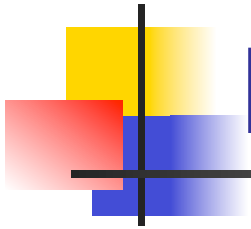

ip unnumbered
customer
202.144.128.0/25
128.128/25
129.0/27
129.32/27
129.64/26
129.128/25
Dialups
Thimphu
P/ling
Jakar
T/gang
loops
202.144.158.0/24
202.144.159.192/26


P/ling.
ARI.pling
eth0
ser0
dial pool
202.144.130.1/27
202.144.128.2/30
202.144.130.128/25
T/gang
ARI.tgang
eth0
202.144.132.1/27
202.144.128.6/30
202.144.132.128/25
202.144.128.128
.200 NS.DRUKNET.NET.BT
.210 RELAY.DRUKNET.NET.BT
.220 WWW.DRUKNET.NET.BT
.254 eth0-1.brl.druknet.net.bt.
202.144.129.0
.1 eth0-0.brl.druknet.net.bt.
.2 eth0.crl.thimphu.druknet.net.b
.3 eth0-0.cr2
.4 eth0-0.gw1
.5 eth0-0.gw2
.6 eth0.ar1
.30 eth0.sw1


TPU-SW2
TPU-SW1
TPU-GW1


IP addresses.
loops
ip unnumbered
customer (line pt to pt
BR1: eth0/0 202.144.129.1/27
eth0/1 202.144.128.254/25
ser0/0 from BT Internet.
CR1: eth0 202.144.129.2/27
ser0
ser1
CR2: eth0/0 202.144.129.3/27 (.194)
eth0/1 202.144.129.126/26
GW1: eth0/0 202.144.129.4/27 (.196)
: eth0/1 202.144.129.60/27
GW2: eth0/0 202.144.129.5/27 (.198)
eth0/1 202.144.129.61/27
HSRP 202.144.129.62/27
SW1: eth0 202.144.129.125/26 (.197)
SW2: eth0 202.144.129.30/27 (.158)
AR1: eth0/0 202.144.129.6/27 (.199)
TS1: eth0 202.144.129.124/26 (.200)
202.144.128.0/25
128.128/25
129.0/27
129.32/27
129.64/26
129.128/25
Dialups
202.144.128.0 → 202.144.129.0 (/23)
Thimphu.
P/ling
Jakar
T/gang
202.144.130.0/24
202.144.131.0/24
202.144.132.0/24
infrastructure
customers
202.144.158.0/24
loops 202.144.159.192/26

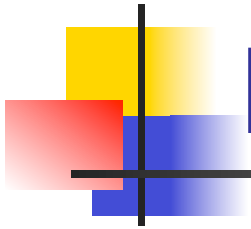




Bhutan in 1999

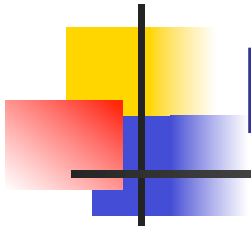
- Network looks a bit messy in retrospect:
  - But this was a rescue job
  - Used whatever equipment had already been delivered
    - (Cisco 2511 access servers, IBM AIX Servers)
  - Plus Cisco routers/switches specially purchased for this job
  - No time for refinements!
- Designed and built as an ISP
  - 256kbps satellite link to UK
  - Dialup via Cisco 2511 and modems
  - Leased line access via Cisco 3640
  - Border router was Cisco 2611
  - Replaced previous “Internet Café” design proposal


Cisco 2500
MODEM POOL 1
(26996- 26982)
26965 PILOT
TOTAL CONTROL
TPU-AR1
MODEM POOL 2
(26981 – 26967)
26966 PILOT
TOTAL CONTROL



Bhutan in 2004

- DrukNet Border routers now Cisco 3725 x2
  - 1Mbps to London (British Telecom)
  - 640kbps to Germany (Intelsat)
  - 1Mbps to Japan (KDDI)
  - 3Mbps to Hawaii (Loral Skynet)
  - Growing domestic Internet backbone with PoPs in Thimphu, Paro, Phuentsholing and Tashigang



Bhutan in 2008

- Tashi Infocomm & Drukcom now operational
- DrukNet London PoP opened
  - 2x Cisco 7301 routers
  - Peering at LINX (two LANs, two routers) – 100Mbps
  - 45Mbps to Phuentsholing PoP
- Phuentsholing PoP now core of backbone, not leaf
- DrukNet Thimphu PoP
  - 12Mbps Satellite to Loral Skynet (backup)
  - 8Mbps British Telecom Satellite link (backup)
  - 1Mbps link to KDDI (backup!)
  - Transit to Tashi Infocomm & Drukcom
- Many new PoPs across the country!

Bhutan in 2014

- International fibre:
  - Over 5Gbps to SE Asia, S Asia and Europe
- National IPv6/IPv4 backbone
- Redundant fibre and radio links
- Redundant and scalable PoP architecture
- Wide roll out of broadband and mobile data access
- Coverage in most districts (even though many don't have road access)
- 4 competing ISPs
- Local Google Global Cache and I-root instance
- ***Still no IXP – sigh!***