

# Growing your network with “Jugaad”



*DILEEP AGRAWAL*

*MANAGING DIRECTOR  
WORLDLINK COMMUNICATIONS*

# What is “Jugaad”?

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**Jugaad** \jü-'gäd\  
○

Hindi word meaning an innovative fix; an improvised solution born from ingenuity and cleverness; resourceful. Also known as *zizhu chuangxin* in China, *gambiarra* in Brazil, D-I-Y in the United States, *jua kali* in Africa, and *système D* in France.

**JUGAAD**  
**INNOVATION**

THINK FRUGAL,  
BE FLEXIBLE,  
GENERATE BREAKTHROUGH GROWTH

NAVI RADJOU JAIDEEP PRABHU SIMONE AHUJA

- An innovative, frugal fix for challenging problems and resource constraints.
- Increasingly accepted as a management technique for fostering innovation

# Case 1: Email server on a PC



- 1994
- **Hardware components:**
  - digital DECpc 486 PC
  - Telebit WorldBlazer modem
  - Phone line
  - USRobotics Courier V.34 modem
- **Software components:**
  - PCBoard BBS software
  - IBM OS/2 multitasking operating system
  - Blast for bidirectional file transfer over dial-up modem
  - ZIP for file compression
- **Identical setup in Nepal and USA.**

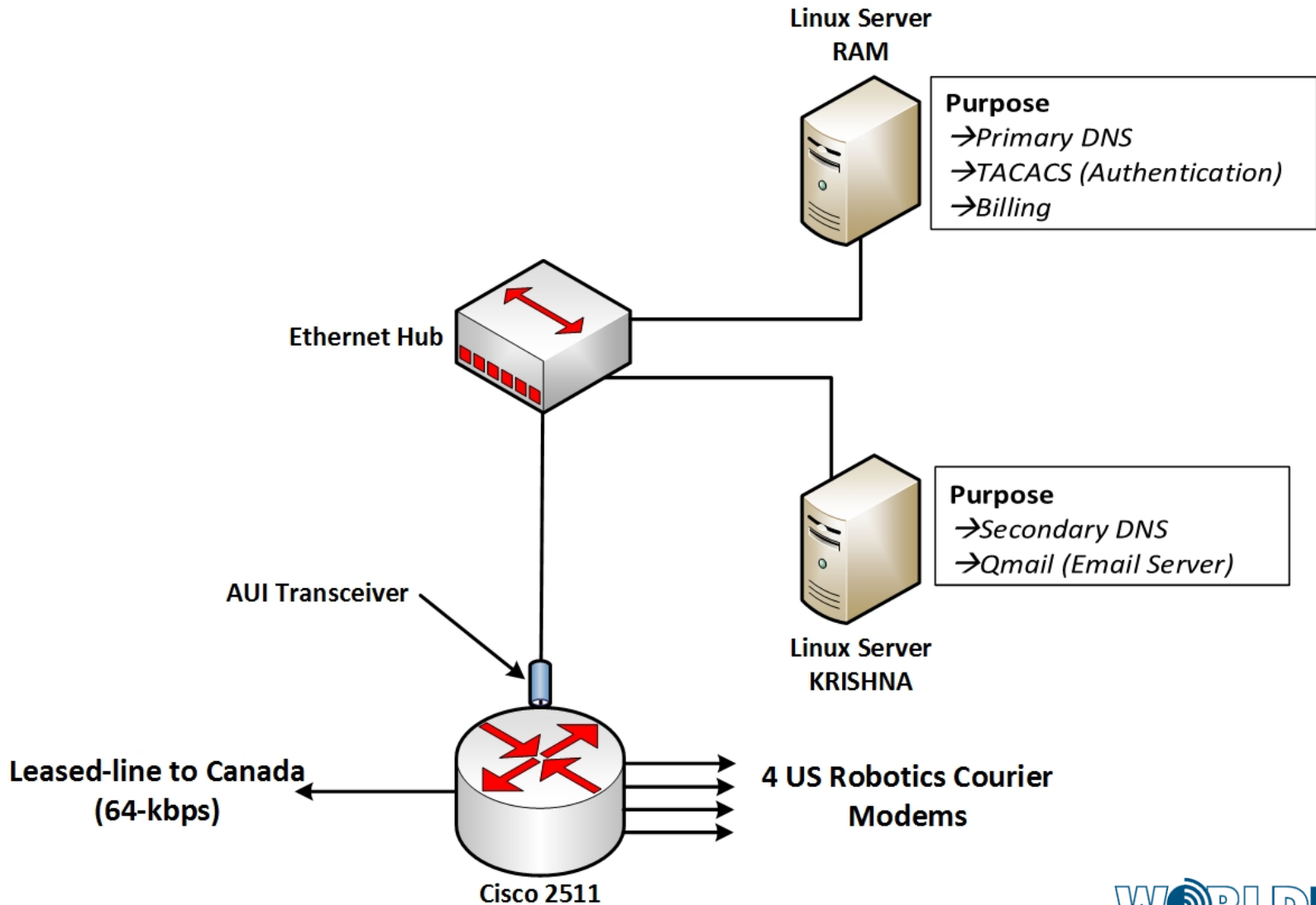


## Case 2: Linux on an assembled PC as server



- 1996
- Not hard to believe today, but uncommon in 1996.
- Most service providers were using Solaris on SUN servers or UNIX on IBM AIX servers, costing 100x more.
- Ordinary assembled Pentium PCs running Linux.
- **Allowed us to provide Internet connectivity at low cost.**

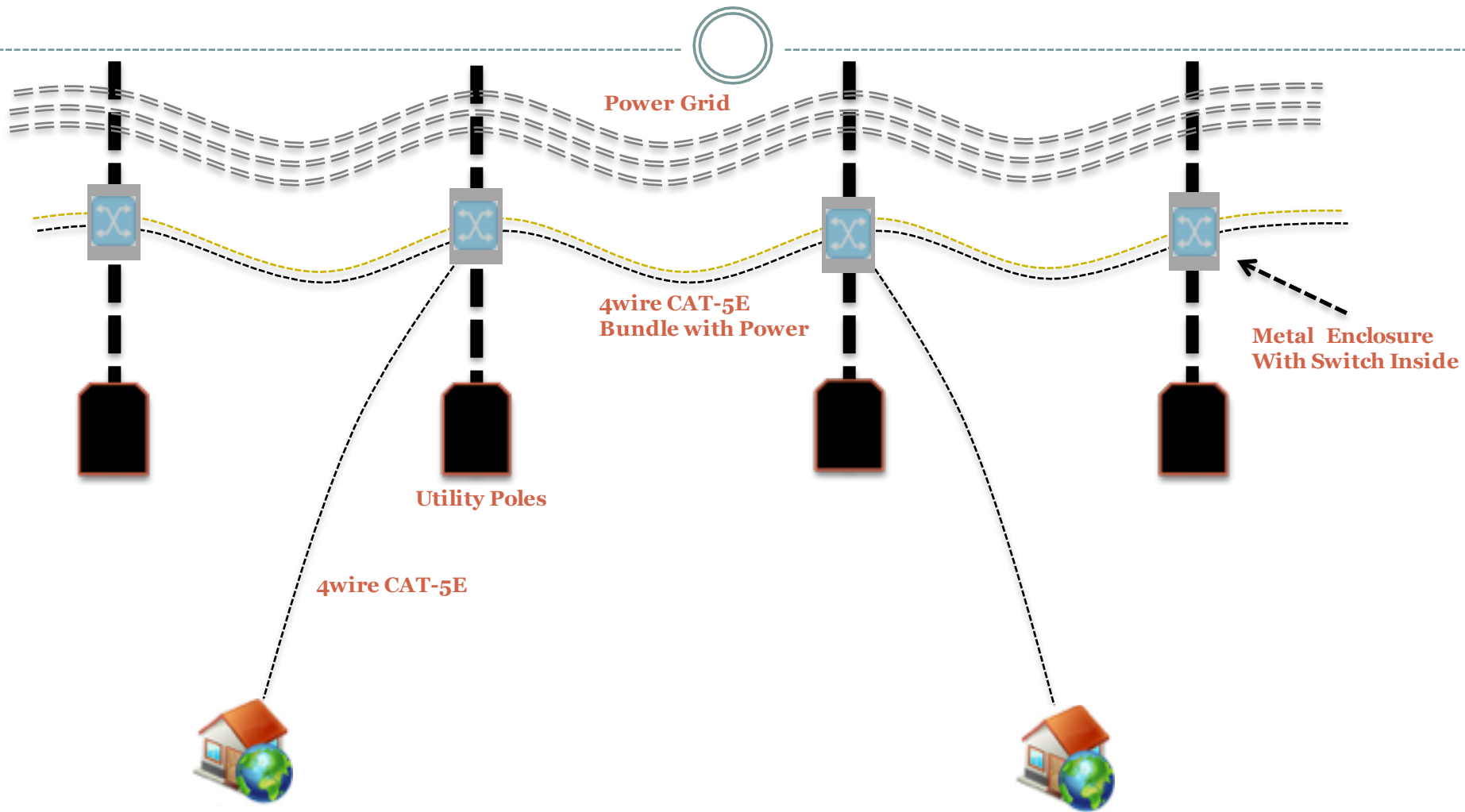
# Network Connectivity Diagram



# Case 3: City-wide Outdoor Ethernet network for Broadband Services



- 2003
- NTC unwilling to lease out its last mile copper for ADSL
- Coaxial cable networks monopolized by cable operators.
- Wireless CPE from Motorola Canopy prohibitively expensive.
- **Allowed us to provide wired broadband in the absence of any other option.**

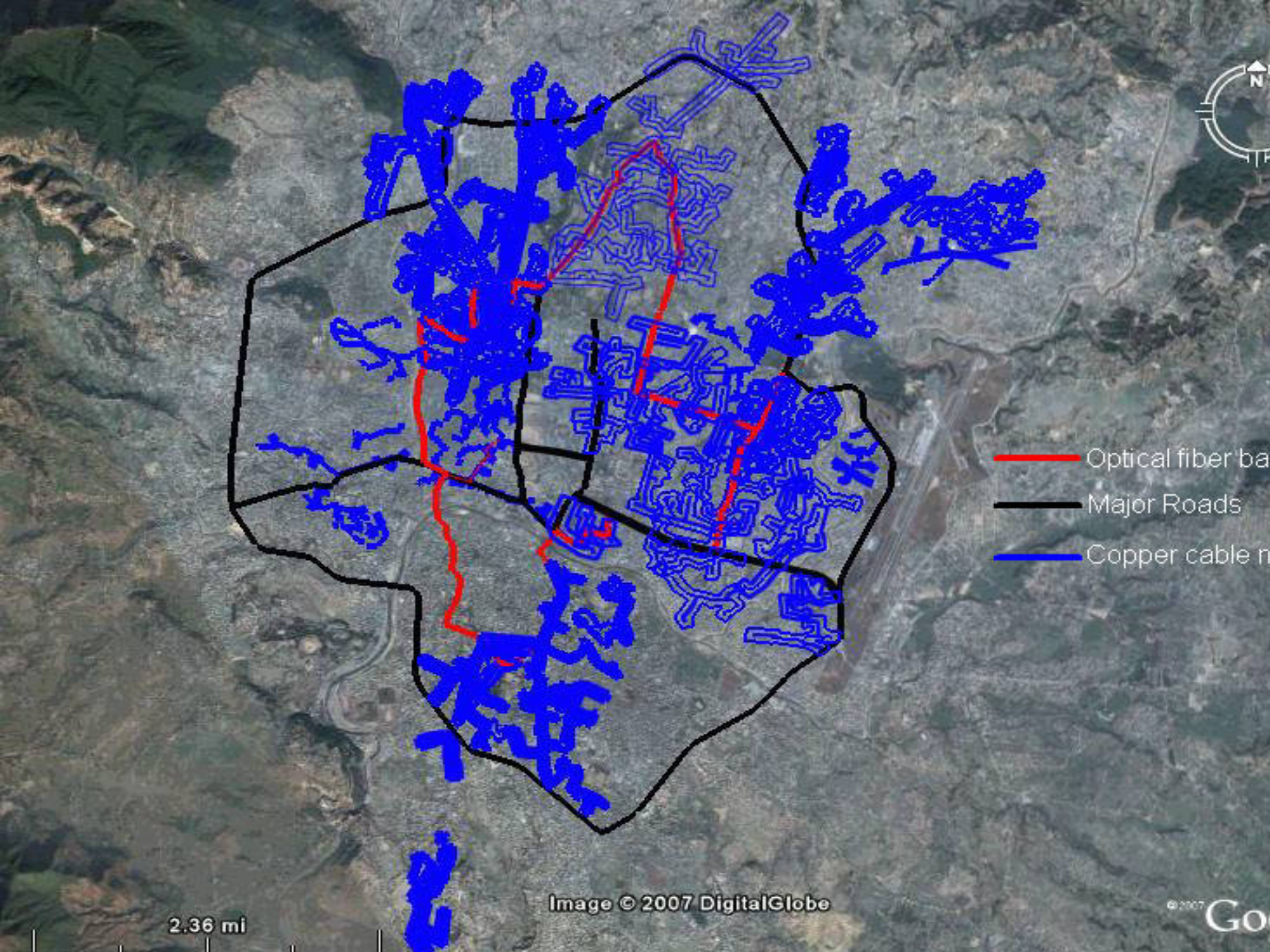




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CE<sup>2</sup> MEF  
CERTIFIED



- Optical fiber backbone
- Major Roads
- Copper cable network

2.36 mi

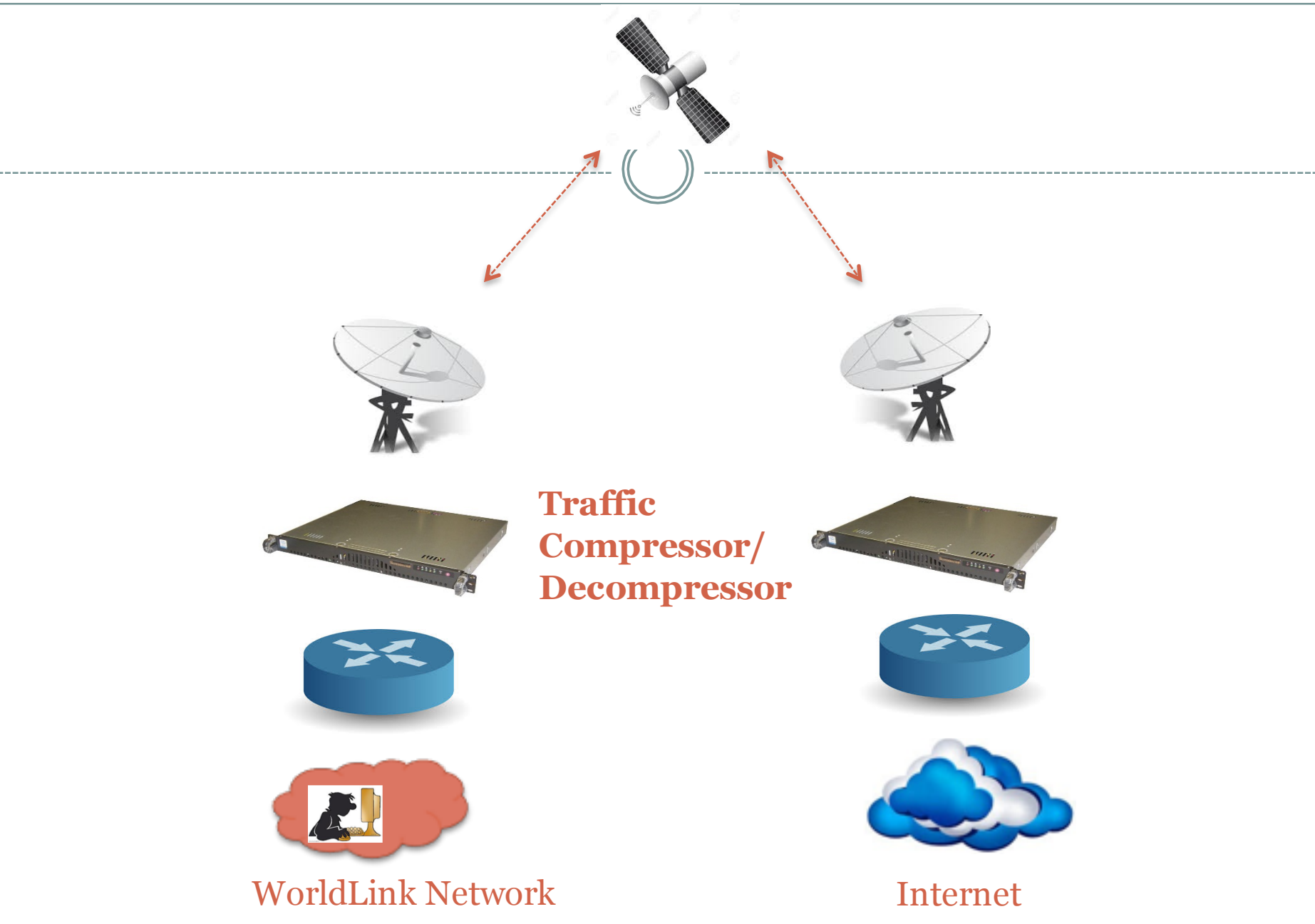
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# Case 4: LZW data compression on high-speed satellite trunk links



- 2006
- Connected to Internet backbone via a 32Mbps satellite link to Hawaii
- Paying around USD1,800 per Mbps.
- **Saved us lots of money!**



**Traffic  
Compressor/  
Decompressor**

**WorldLink Network**

**Internet**

# Case 5: PPPoE BRAS w/ Contention



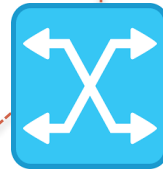
- 2007
- Needed to implement bandwidth contention ratio based on service package subscribed by customer. E.g. premium package 1:4; economy 1:8 contention.
- Could not achieve this with existing BRAS solutions, unless assigned separate IP pools to every package.
- **Enabled us to provide differentiated services targeting different market segments.**

**Internet**



**Linux Bandwidth Manager  
Running HTB**

**Rules  
added and removed  
dynamically for  
Contention**



**BRAS Servers running  
RP PPPoE**

**WorldLink Network**



*Think “Jugaad”*

**THANK YOU!**