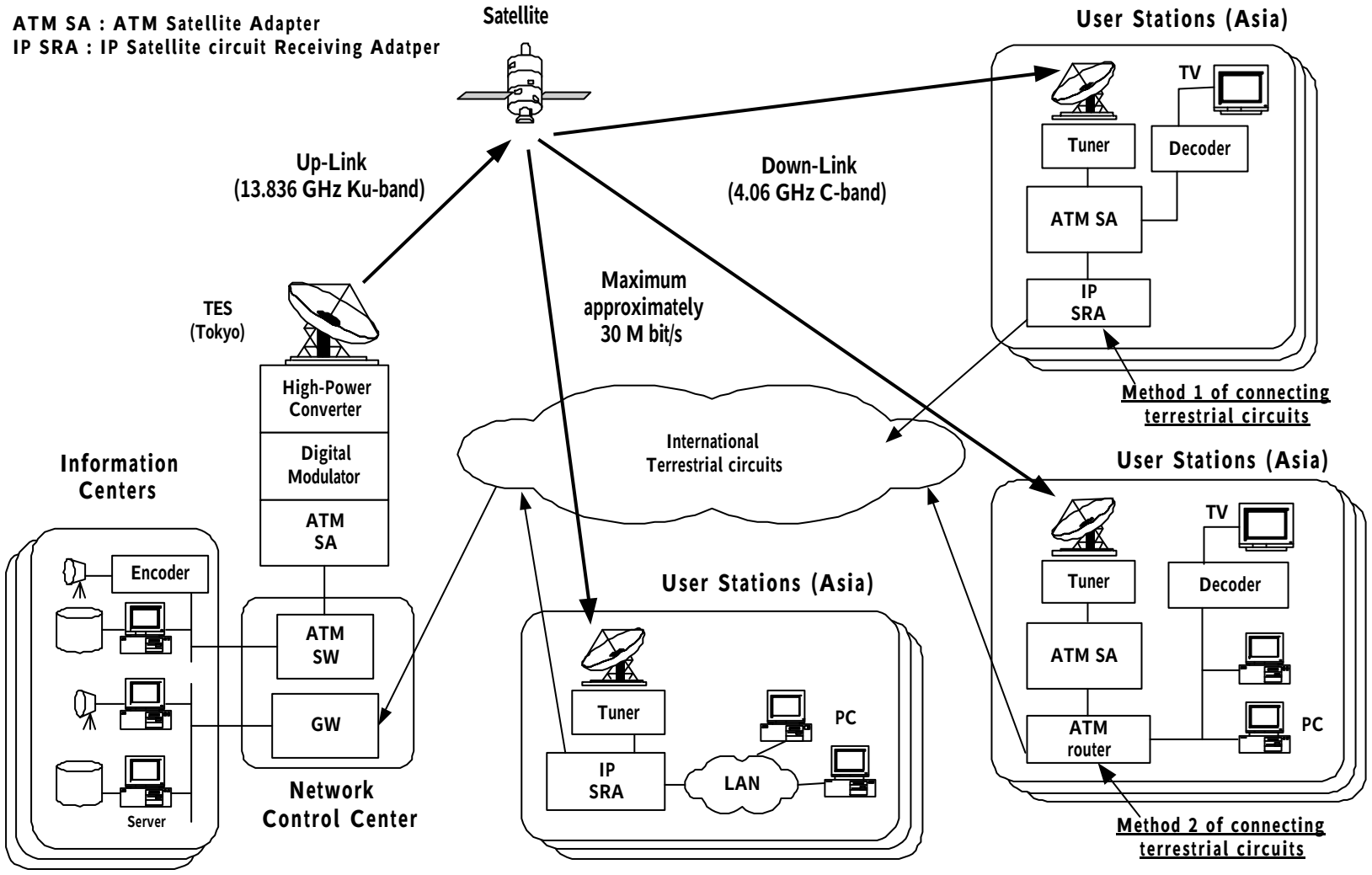
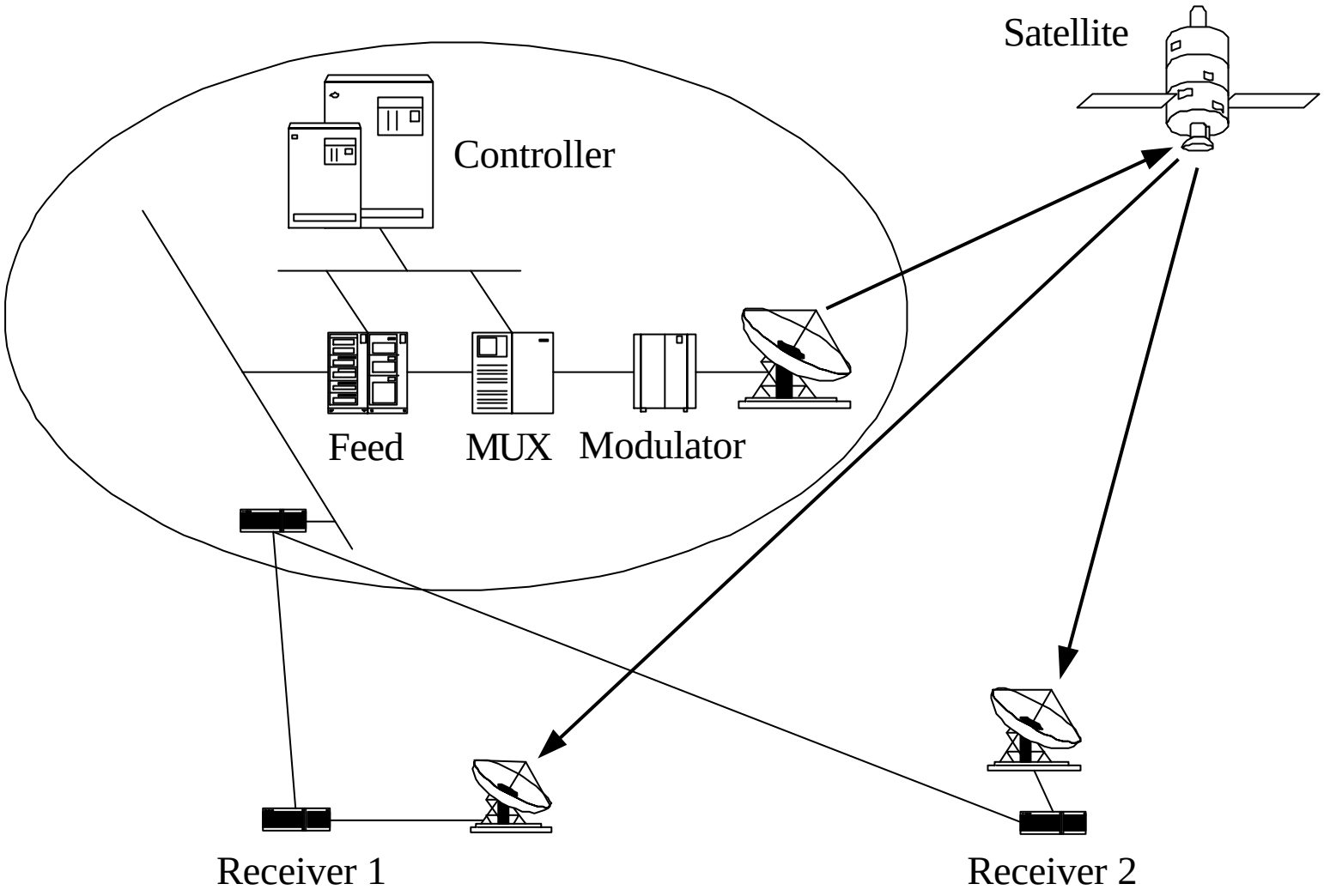
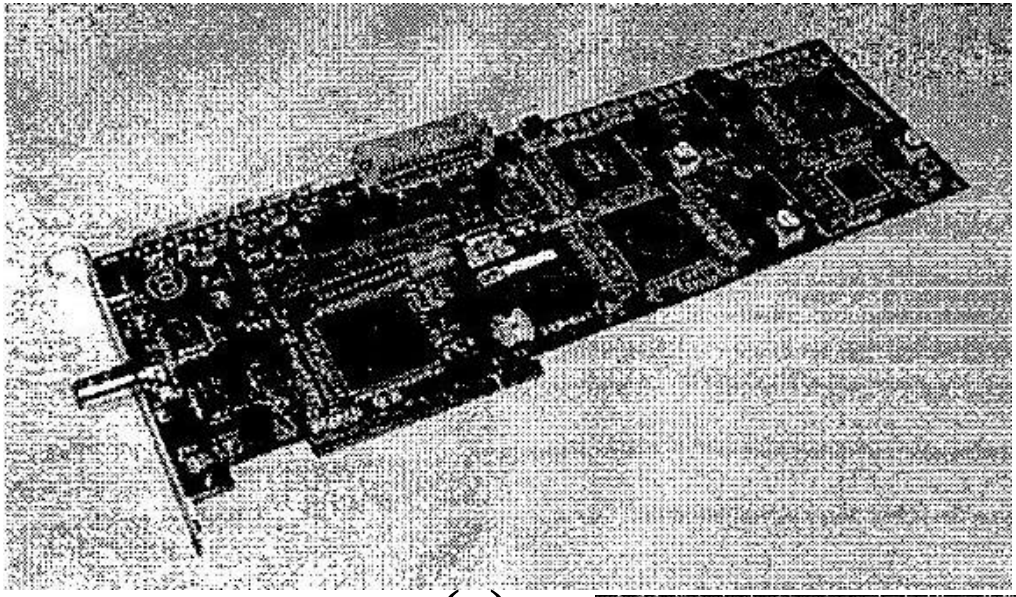
# AMF Satellite communications Sys.

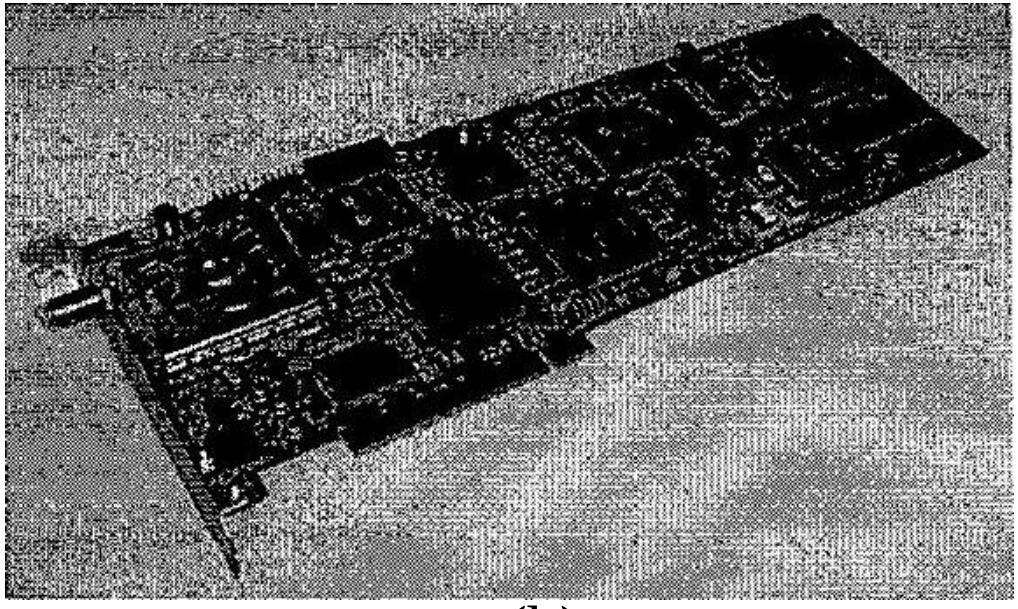





Composition of system for evaluation



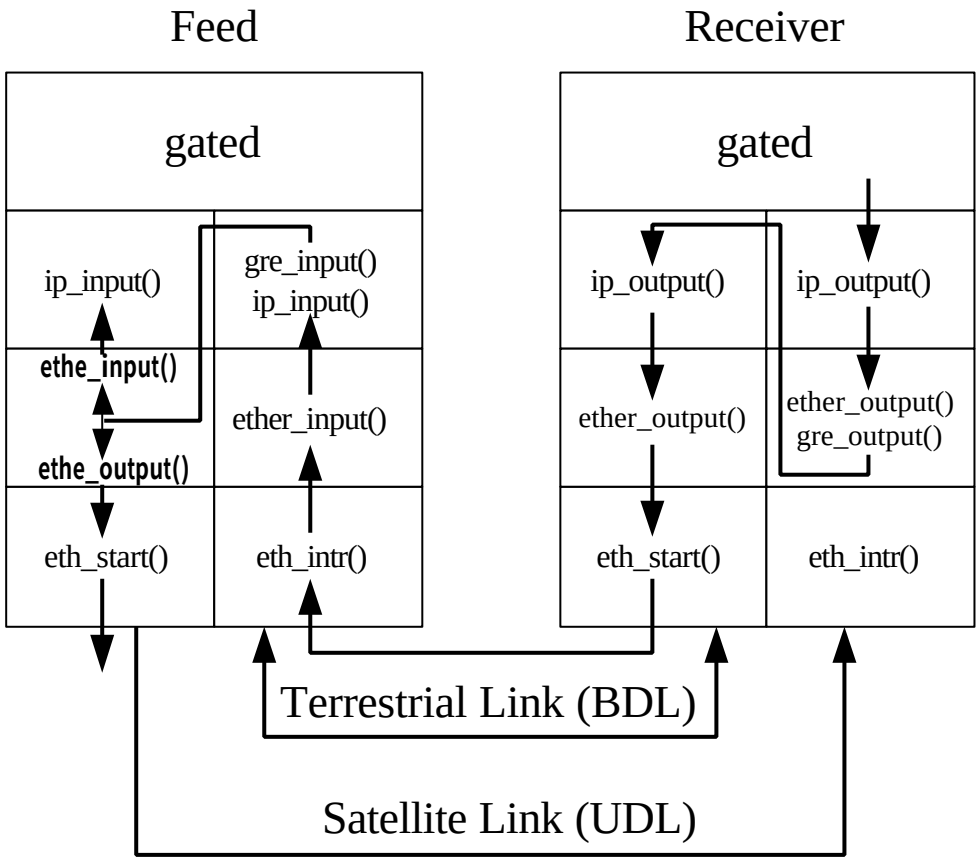
(a)



(b)

Encoder Board and (b)Reception board

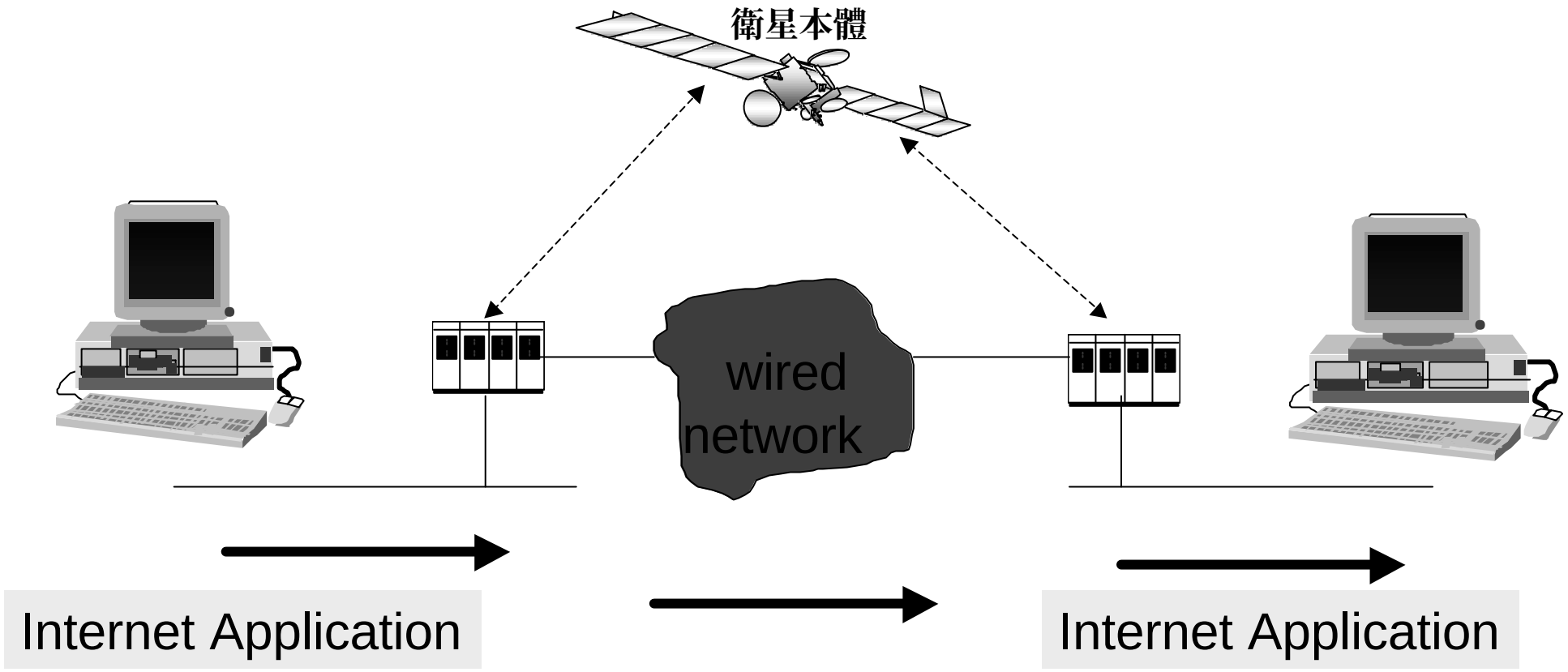
# Implementation of UDLR




Implementation of BCE layer on FreeBSD-2.2.6

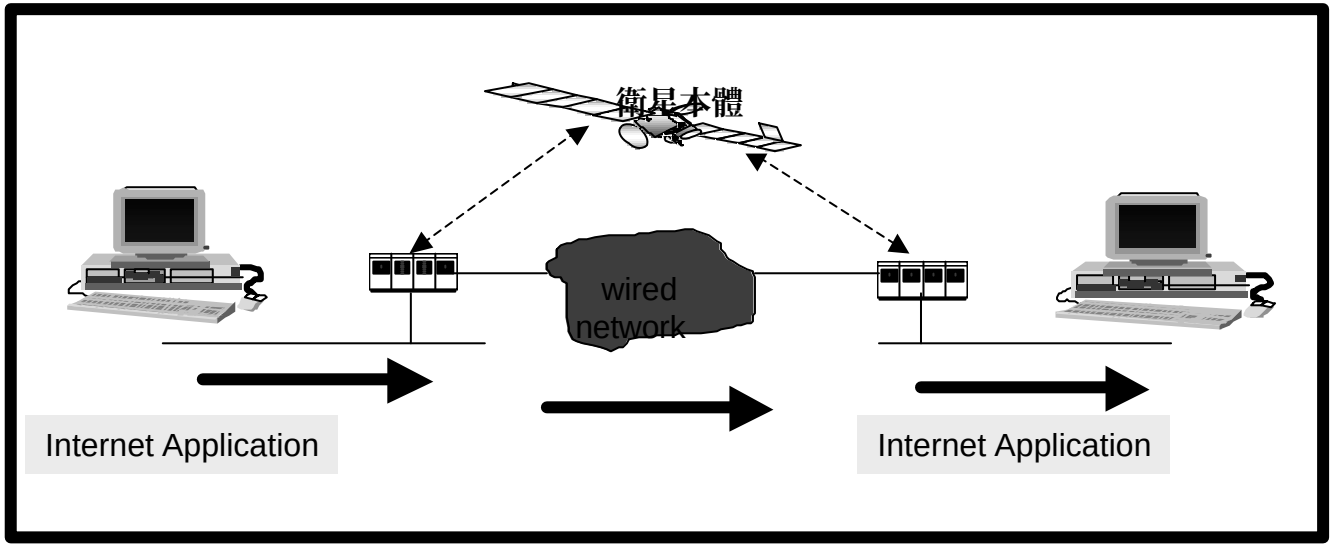
# NCU Test Bench

- From LAN to Satellite to LAN

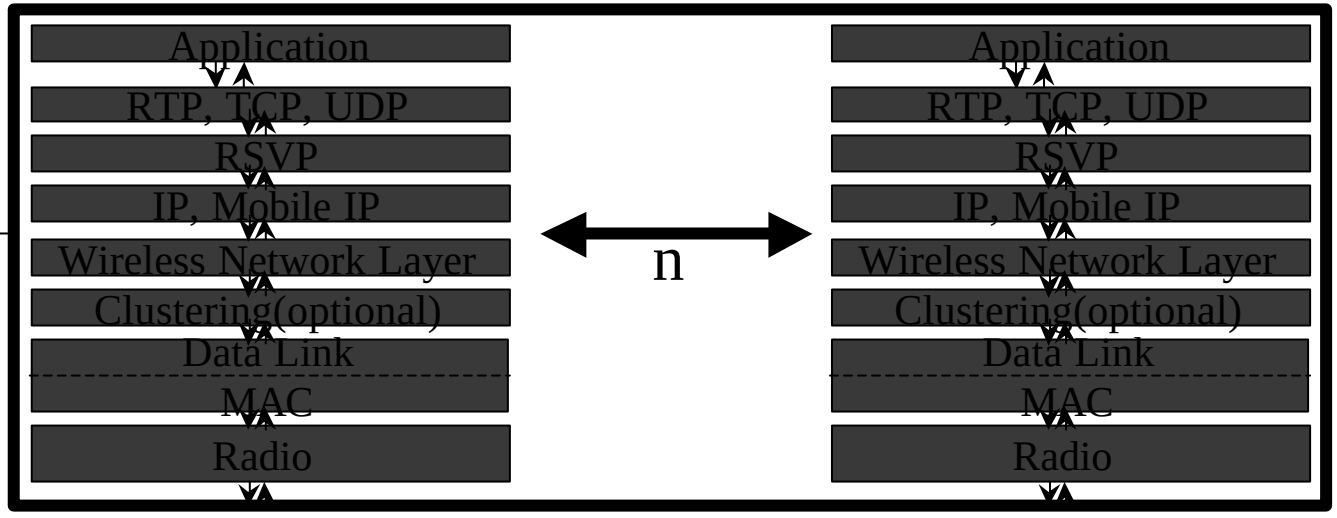


# Research Test bench

Experiment Test bench




Simulation Test bench



# Characteristics of the test bench

- Flexible and dynamic topology
- Ubiquitous installation
- Multicast transmission
- to promote related efforts towards achievement of the international information infrastructure

# Bandwidth Efficiency

- Information Sharing through :
  - WWW, USENET news, teleconferencing
- Efficiency of Bandwidth
  - National cached servers
  - data links with data compression
  - alternative link installations
  - install testbed network to evaluate different approach

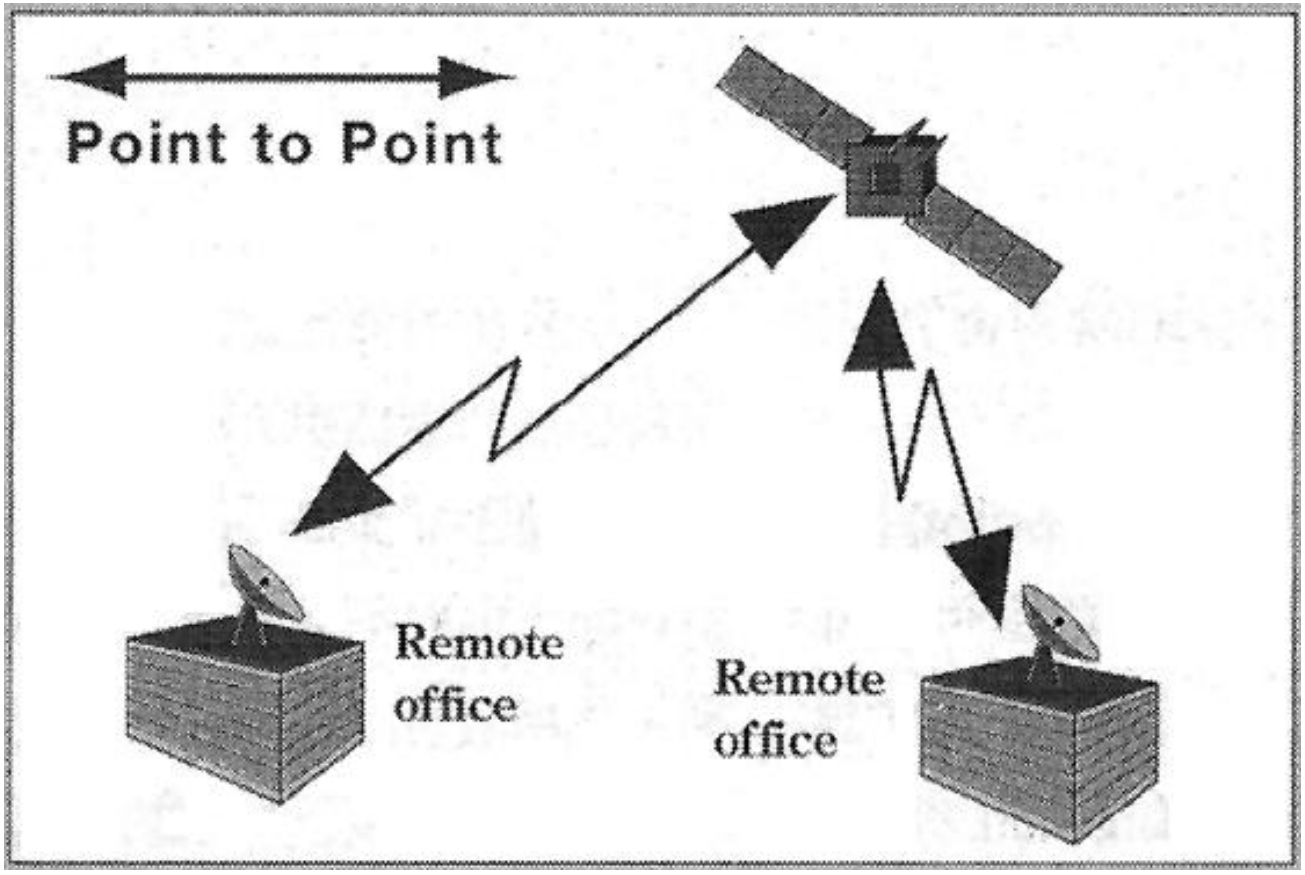
# Research Topics

- Infrastructure Research
- TCP Application Solution
- Link Backup Coordination
- Application Based Routing
- Weather Monitoring and Link Bit Rate Control
- Global Testbed
- Multicasting

# Research Topics

- Long round-trip delay (hop)
  - from 250 ms(GEO) to 5 ms(LEO)
- Application aware
  - datagram
  - phone, real time video
- Ubiquitous
  - interconnect with wired and wireless LAN
- Internet Connection
- GPS, Location Management

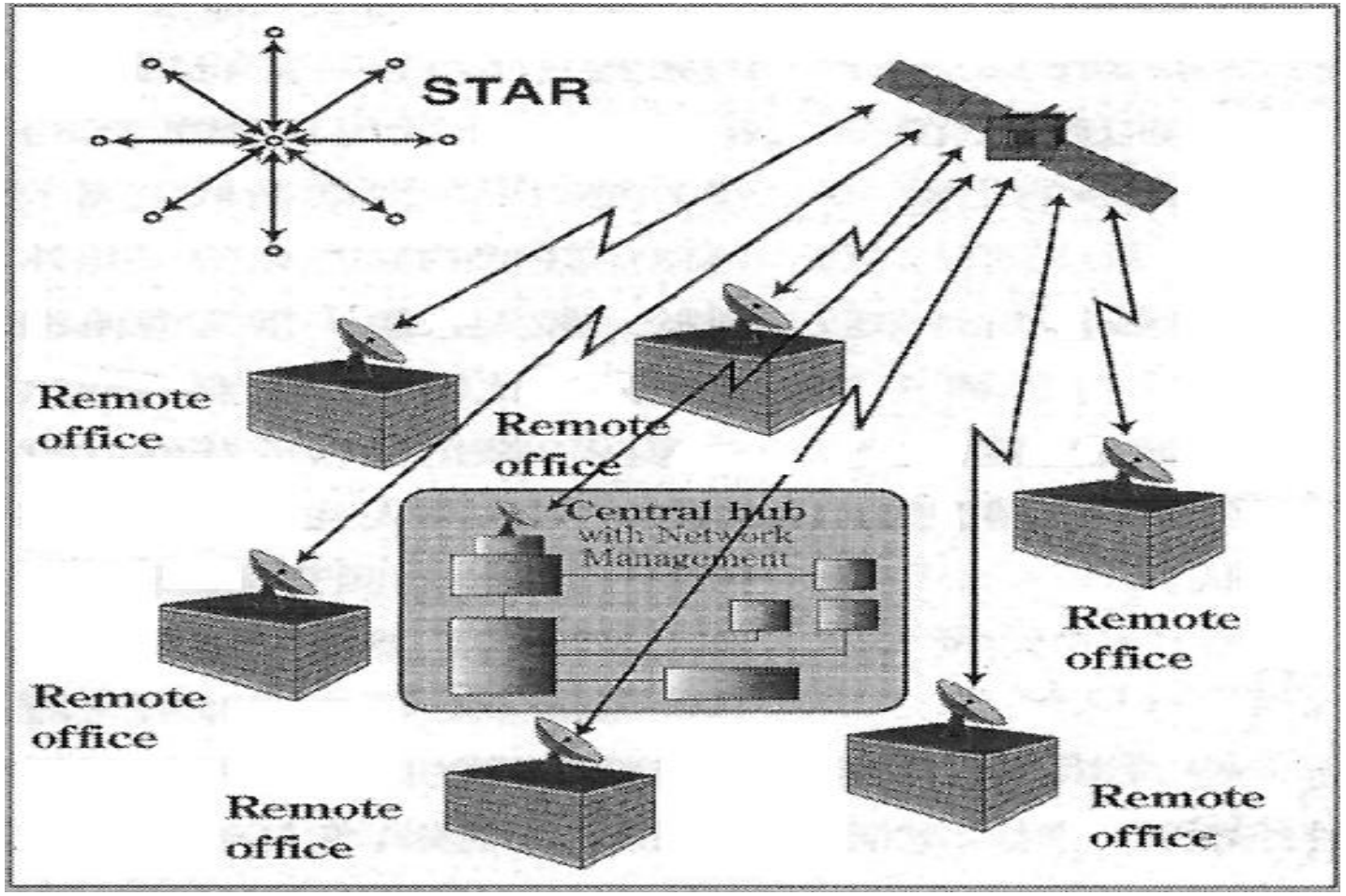
# Point-to-point Architecture



# Point-to-point Architecture

- suitable for point to point connection with a long distance
- use MCPC (Multiple Channel Per Carrier )
- Fixing trunk

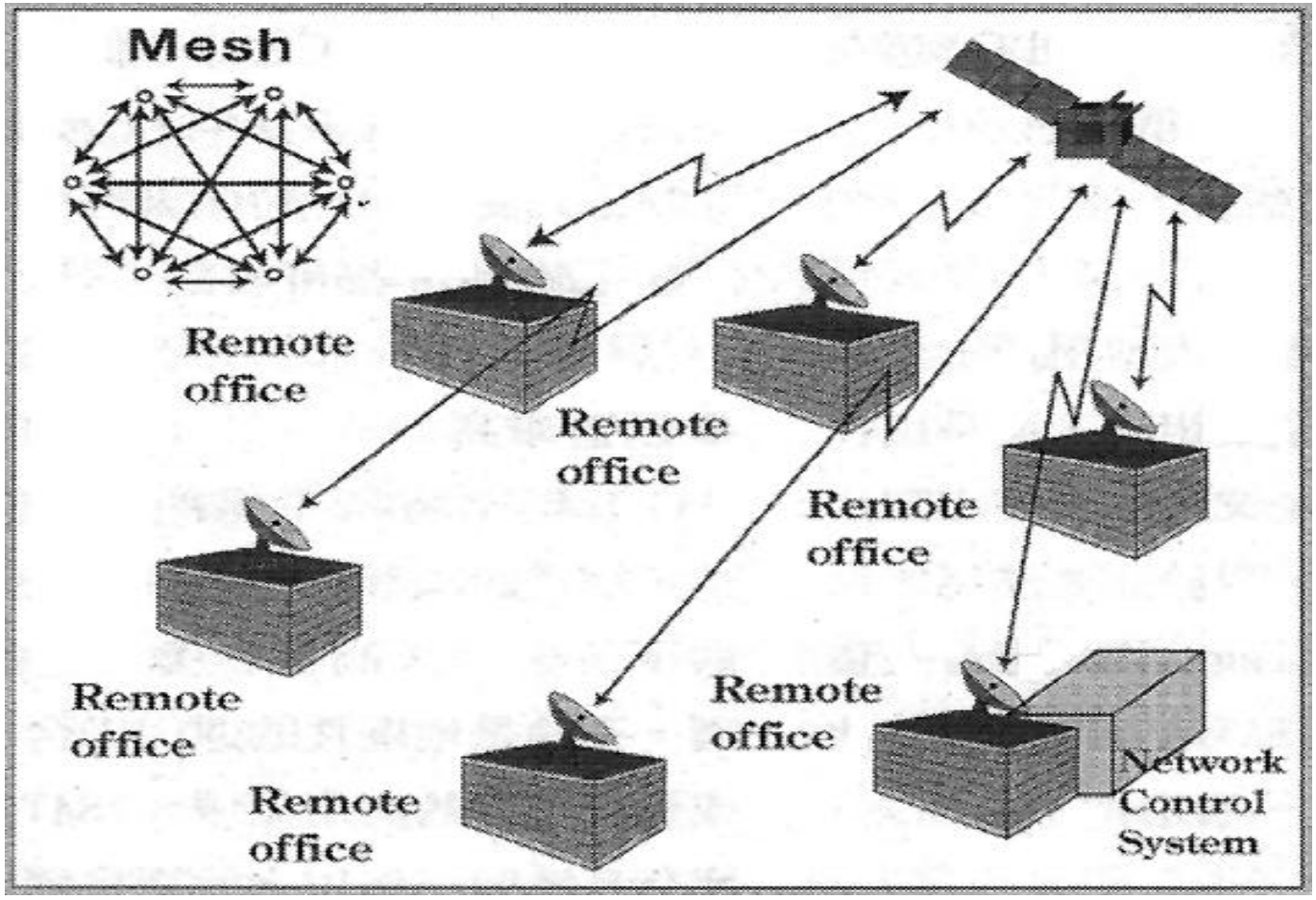
# Star Architecture



# Star Architecture

- use Control Hub to be the system control center
- Use TDM & TDMA

# Mesh Architecture



# Mesh Architecture

- take the Center Hub and Terminals to be the same
- fully Meshed
  - SCPC : Single Channel Per Carrier
- use DAMA(Demand Assigned Multiple Access)

# TCP Solutions

- Adapt a version of TCP
  - TCP-SACK, Persistent TCP connections
- Gateway ~ Special function
  - Split-TCP
  - TCP spoofing
- Application
  - open more than one TCP connections
  - Cache

# TCP/IP Throughput on Satellite Link

- TCP throughput

$$\text{Throughput}\,[\text{Byte/s}] = \frac{\text{TCP Window Size}\,[\text{Byte}]}{\text{RTT (Round Trip Time)}\,[\text{s}]}$$

# TCP/IP Throughput (cont.)

- Evaluation of TCP performance
  - FreeBSD-2.2.6 platform for both server and client
  - Fig. 3 show the measurement result

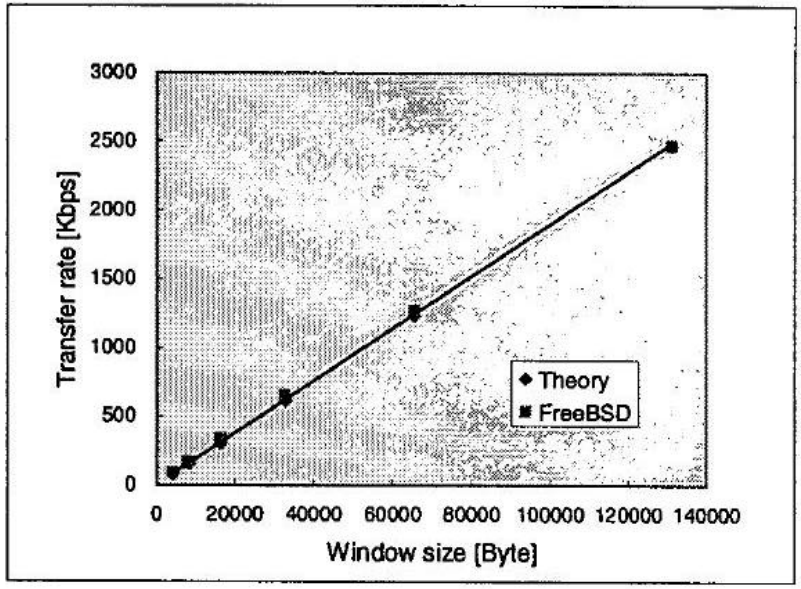



Fig. 3: Throughput of File Transfer

# Application Based Routing

- Applications with bulk data transfer could be used effectively
- Interactive operation might be suitable for Satellite
- RTT (Round Trip Time) makes significant impact on operation of application
- Client Server Analysis
  - most of the traffic is from server to client
  - short request message
  - via terrestrial links with short delay
- Application based routing

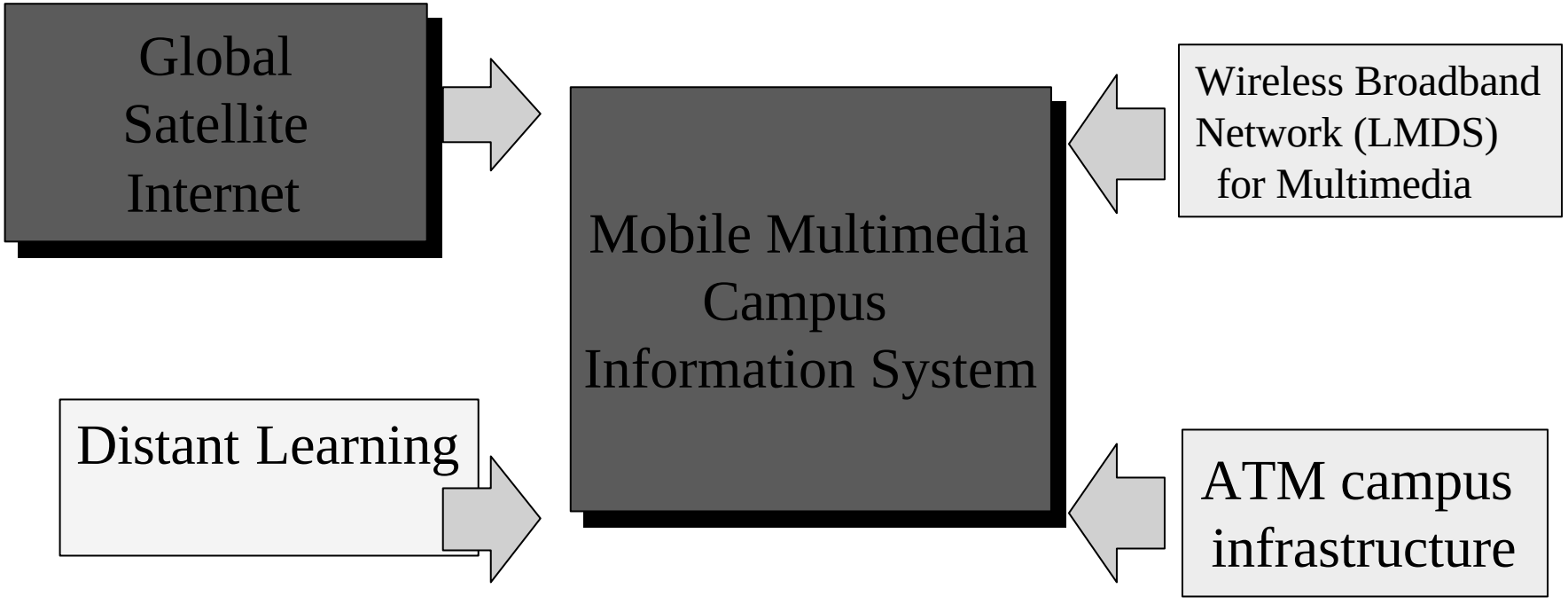
# Weather Monitoring and Link Bit Rate Control

- Ku band compared with C-band
  - less interference
  - more rain attenuation
  - may be down in case of heavy rain
    - 3 DB, 20 mm/hour rain
    - we could decrease 2 Mbps to slower rate (256kbops)
    - the more rain, the slower link bit rate
    - avoid connectivity loss
    - automatic bit rate controller

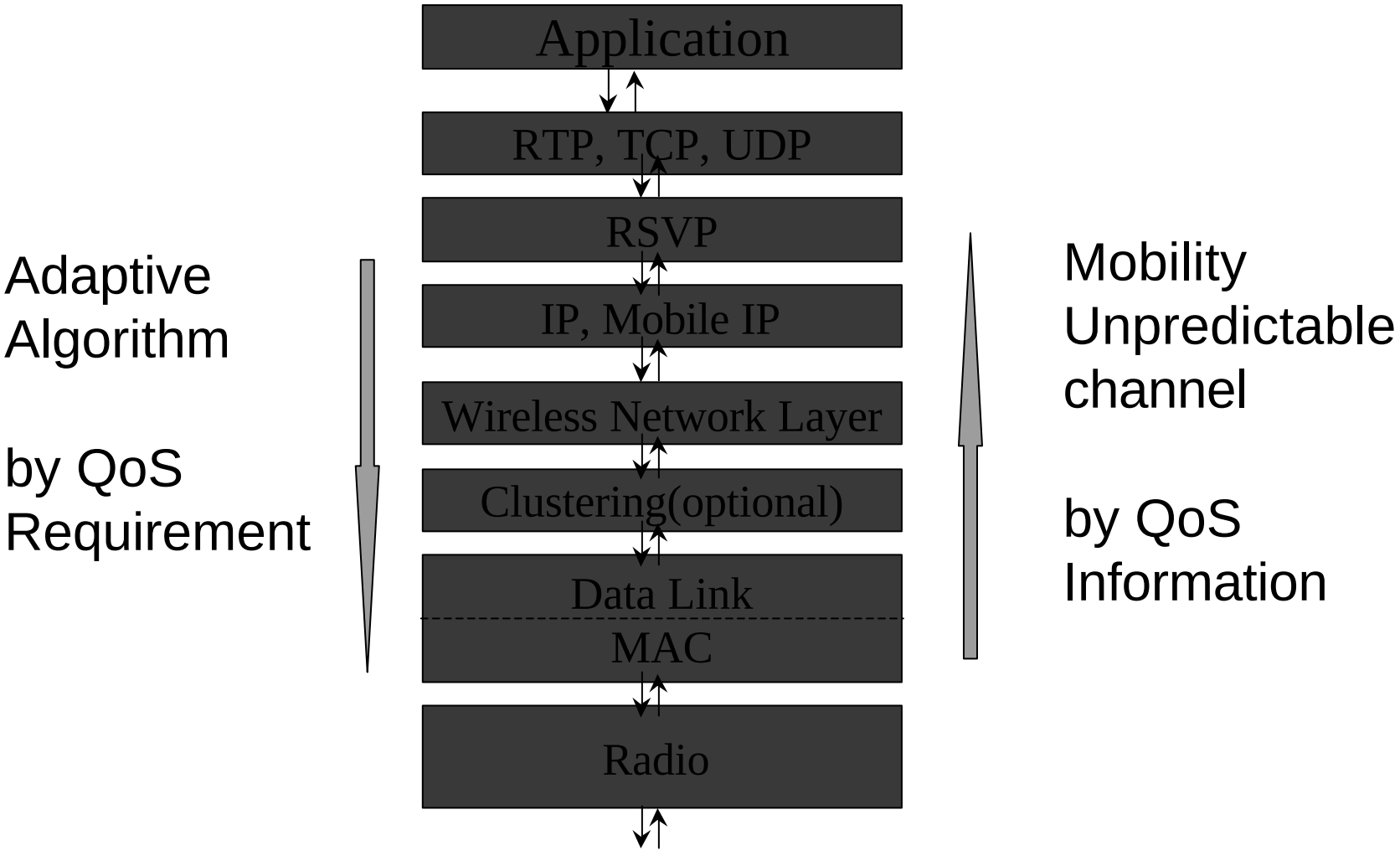
# Link Backup Coordination

- If the connection to Gateway in U.S. is down ?
  - Will lose the Internet connection
  - for backup connectivity through Satellite
  - strategies and requirements are not clear
  - design experiments

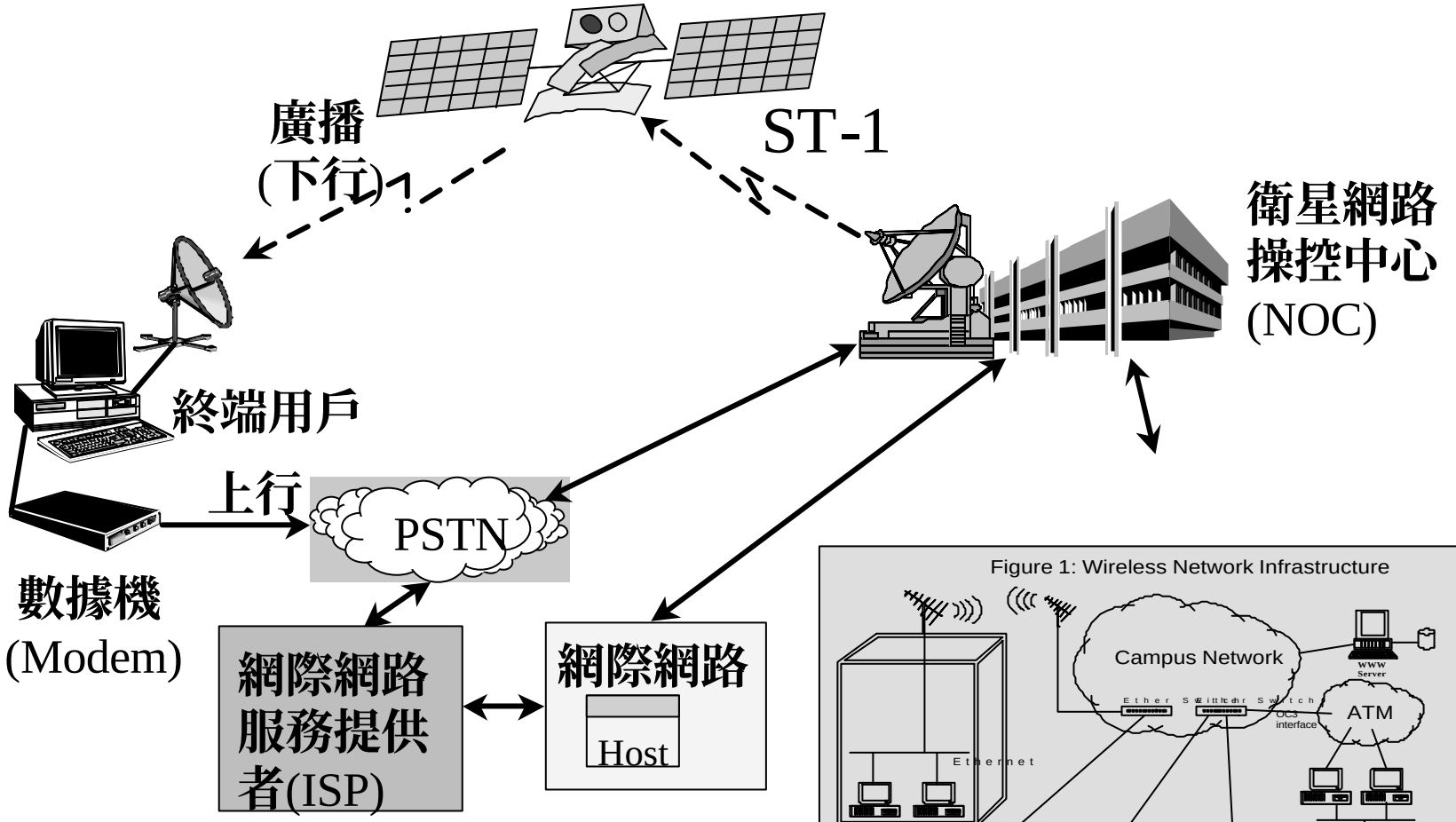
# NCU Integration Plan



# QoS and Multimedia Traffic Support



# 中新衛星(ST-1)應用: 衛星直播網際網路



# 中央大學 Satellite Research

1. Intelligent Router
2. Re-Multicast Server
3. Reservation Protocol
4. Audio Broadcasting System
5. Dif-Serve and In-Serve
6. Direct PC Experiments