

Building Networks for the 21st Century

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Neal's Lecture Notes

Total Energy emitted by Dust at T_D

5/24/84

The total energy emitted by a collection of dust grains at T_D which emit according to ν^β and which cover an angular region in the sky Ω at a distance d .

The flux emitted is

$$F = \int_{\Omega} d\Omega \int_0^{\infty} d\nu B_{\nu}(T_D) (1 - e^{-\tau_{\nu}}) d$$

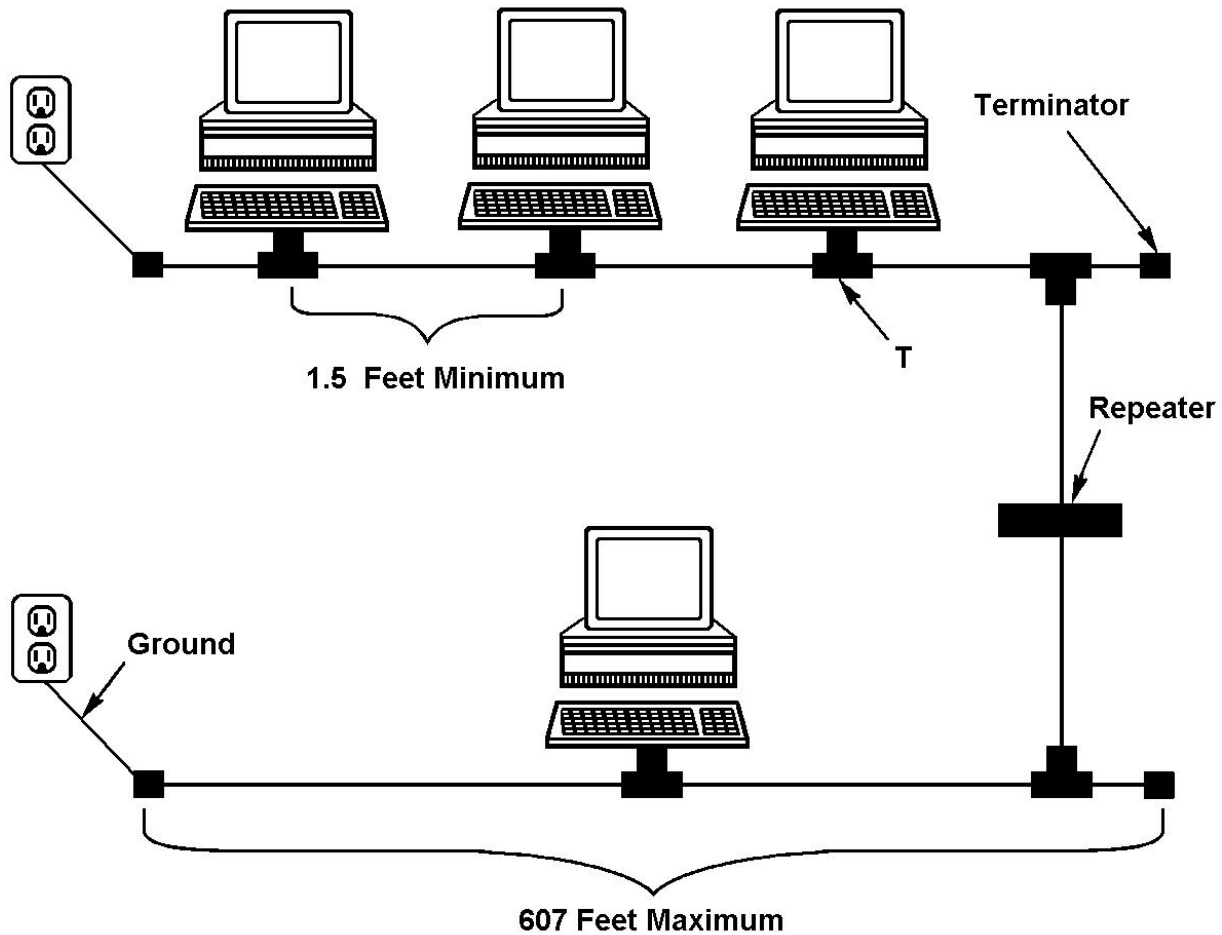
and we assume $1 - e^{-\tau_{\nu}} = \tau_{\nu} = \tau_0 \left(\frac{\nu}{\nu_0}\right)^{\beta}$ and τ_0 is determined by matching the observed flux density $S_{\nu_0} = \int_{\Omega} d\Omega B_{\nu_0}(T_D) \tau_{\nu_0}$ at frequency ν_0 .

$$\text{Then } F = \frac{\tau_0}{\nu_0^{\beta}} \int_{\Omega} d\Omega \int_0^{\infty} d\nu B_{\nu}(T_D) \nu^{\beta}$$

Agenda

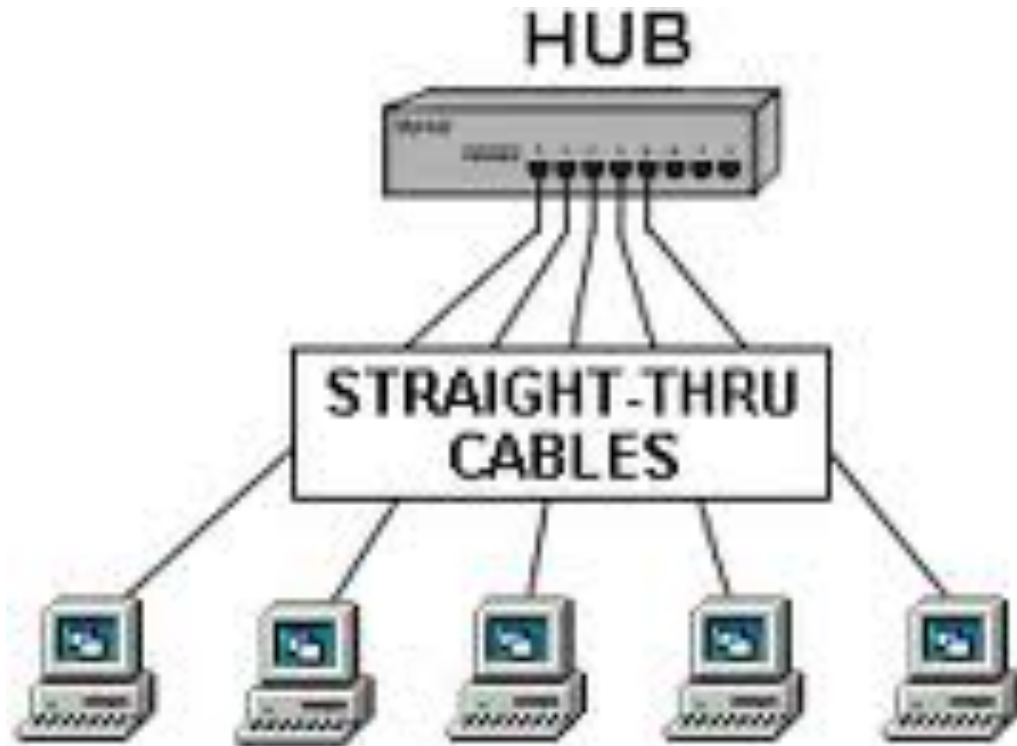
- Background on Computer Networks
- Software Defined Networking
- OpenFlow – Abstracting Hardware
- Big Switch Networks

Thin Ethernet



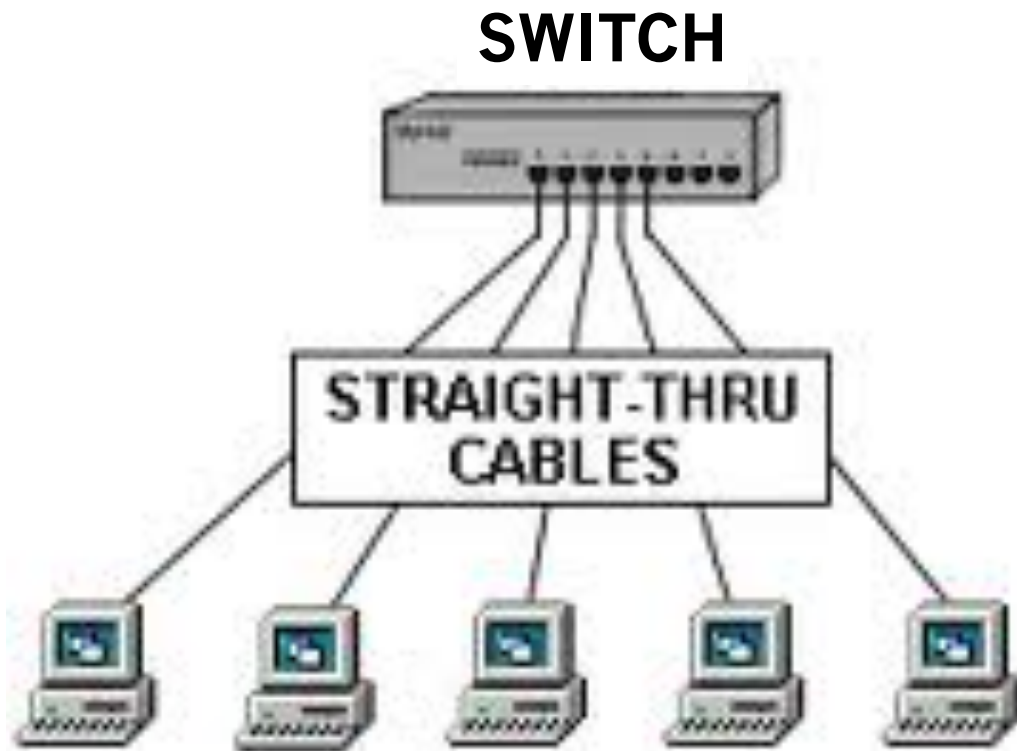
Cables are hard to manage

Ethernet Hub



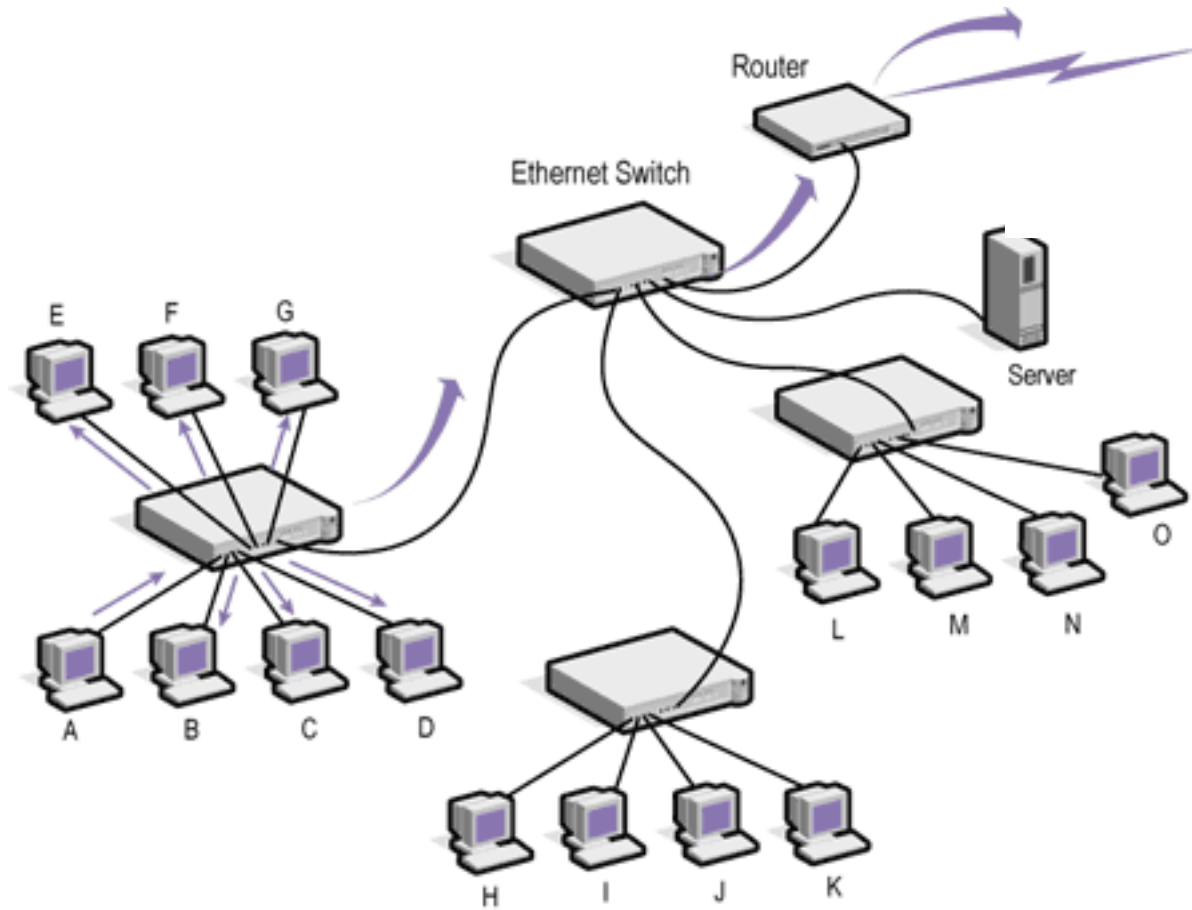
Every packet is seen by every computer

Learning Switch



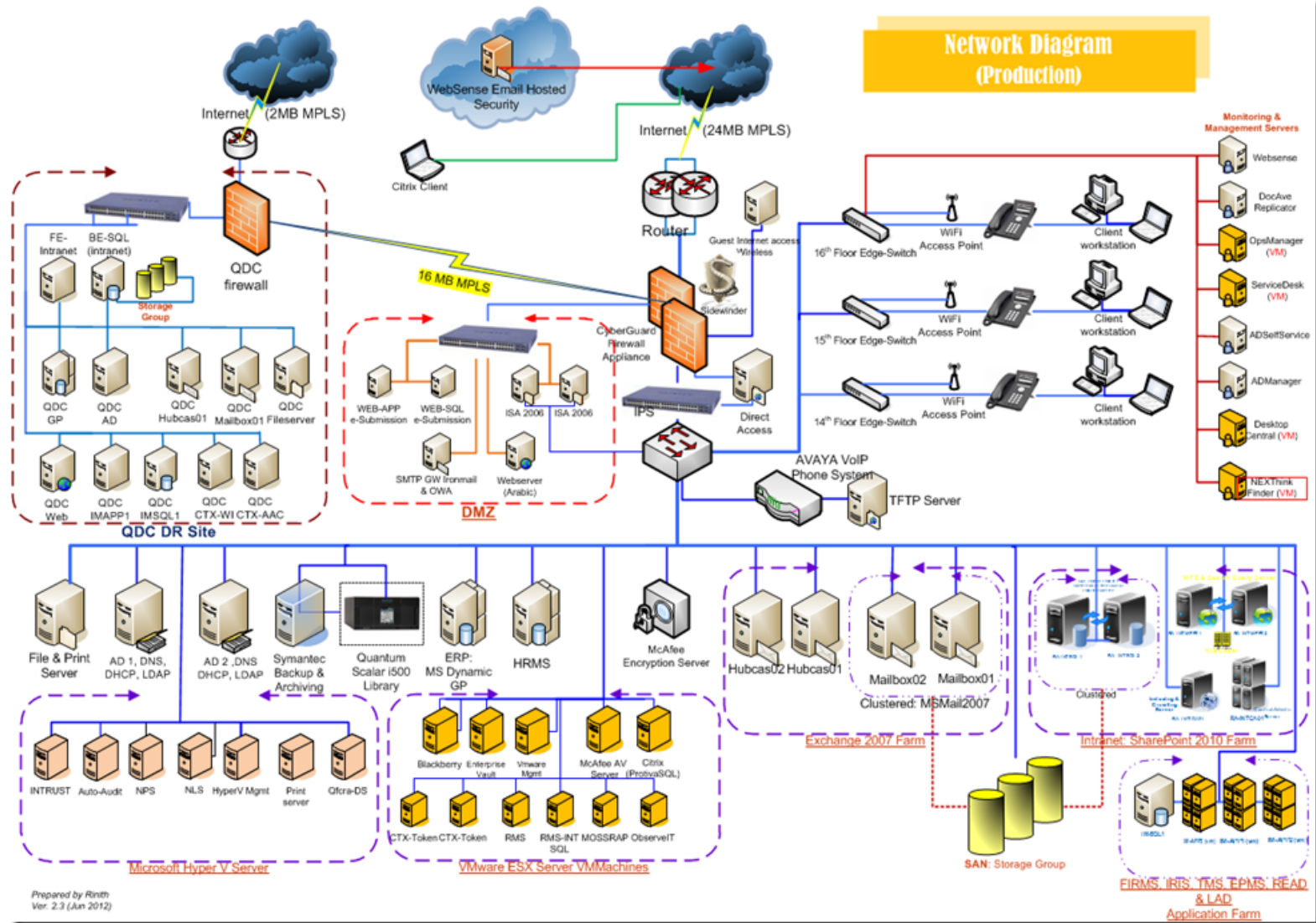
Packet is sent only to the intended computer

Ethernet Router



Connecting Networks Together

More Network Devices



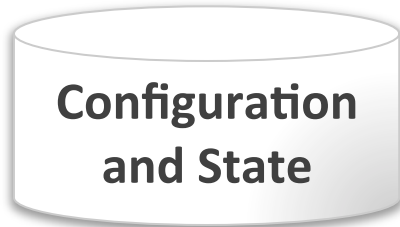
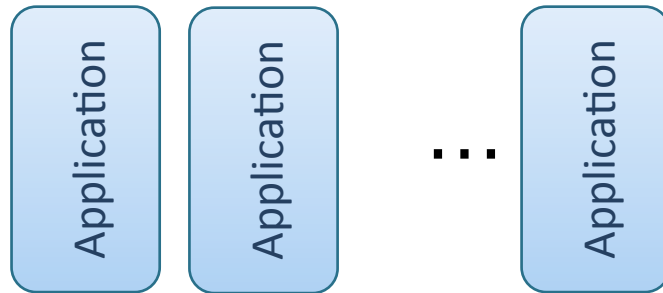
Network Is Changing

End points are not just computers

Workloads are moving around



Rethinking How to Build the Network



Software Defined Networking (SDN)

Abstracting Network Hardware

Controller



Physical switches and routers



Flow table

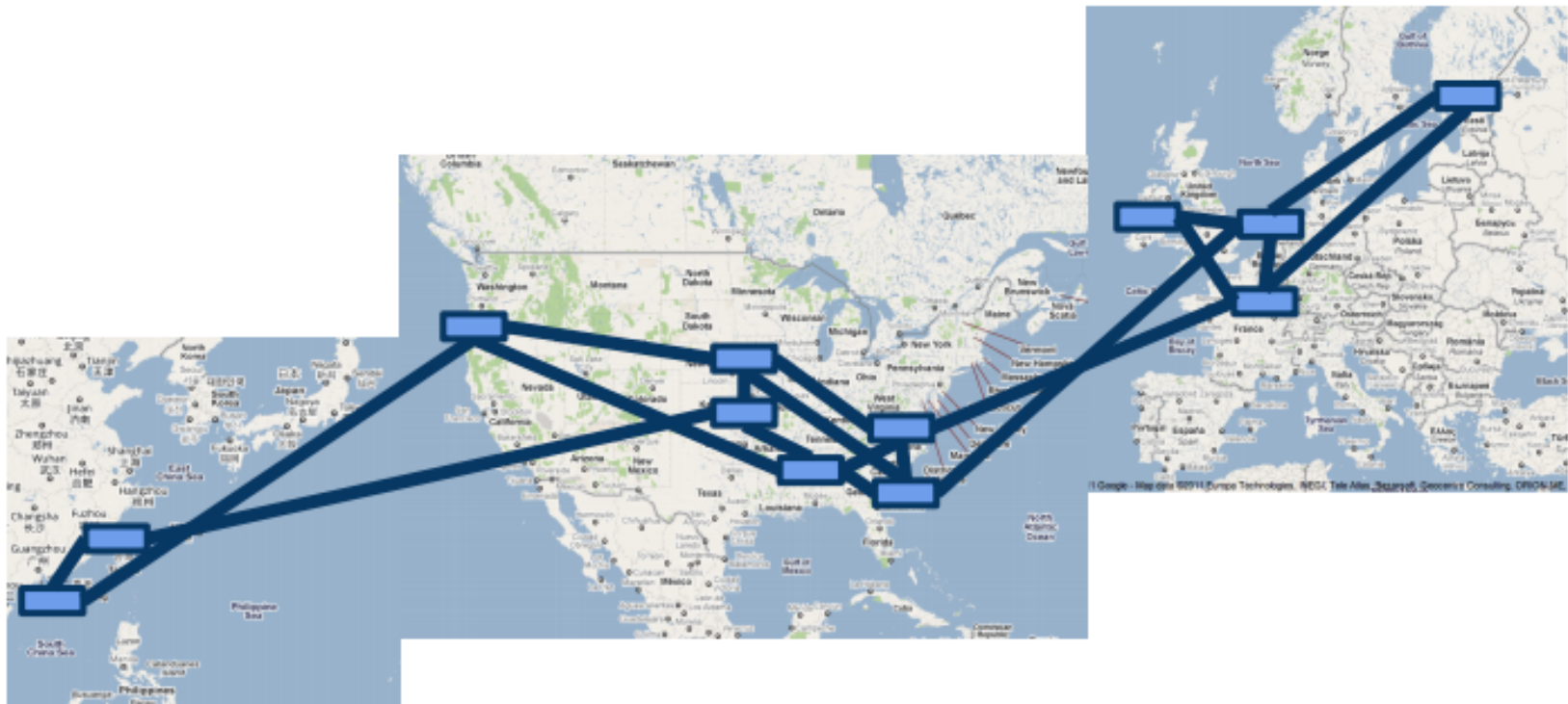
Pattern to Match	Action
00:50:3c:11:22:33	Output port 1
192.168.1.0	Drop
...	...

OpenFlow Protocol

Deploy SDN/OpenFlow Incrementally

“higher performance, more fault tolerant and cheaper”

Google's OpenFlow WAN



Big Switch Networks

The Leader in Software Defined Networking for the Enterprise

- Founded in 2010 by key members of Stanford SDN Team
- Currently at 60 employees
- Open Source controller platform
- Sells enterprise applications



Big Switch discussing LHC @CERN Project with researchers



Internet as a Big Switch



Big Switch

