

## Economics of the Internet

### EE/W1 (No.2E)

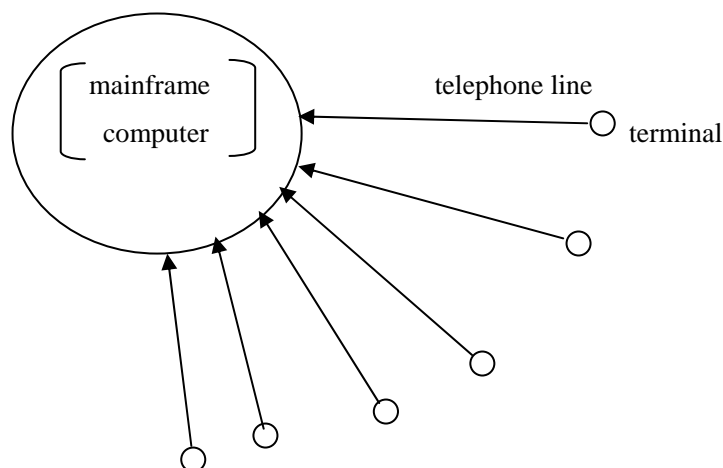
#### E. History of the Internet

##### 1. Networks before the Internet

###### a. The beginning : TSS ( 1960s ~ 1980s )

- (1) “star-shaped” network with main framers
- (2) computer communications  
< JR ticket counters、 airline reservation systems >  
< bank ATMs >

TSS ( time-sharing system )



###### b. Personal computer communications(1970s ~ 2000)

network with telephone lines  
< CompuServe ( US ) >  
< Nifty-service ( Japan ) >  
absorbed later into the Internet

###### c. Other networks

defeated by the Internet

- (1) networks with proprietary specifications of computer producers  
~ 1990  
< IBM, FACOM, NEC >

- (2) distributed networks
  - comprised of mainframers, workstations, PC's
  - < Netware ( US: Novell ) >
  - < BitNet ( US: IBM ) >
  - < N1 Net ( Japan, inter-university network ) >

## 2. ARPANET ( 1960s )

### a. The beginning of packet transmission

- (1) J. C. R. Licklider : Galactic Network ( 1962 )
- (2) L. Kleinrock : packet transmissions ( 1961、 1964 )

### b. US Department Defense

DARPA ( Advanced Research Projects Administration, U.S. Department of Defense, APANET construction started ( 1967 )

US-Soviet confrontation (the cold war)

military networks

demand for a flexible network

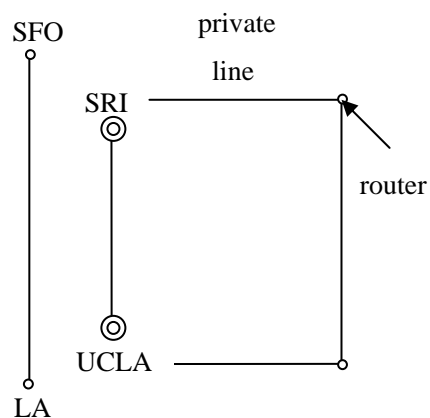
which can survive and function even if destructed in part



a distributed network with packet transmission

( US )

California State



**An Experiment with 4 Routers( 1969 )**

### 3. Academic networks (1970s-1980s)

#### a. 1970s ( US )

(1) Expansion of the ARPANET

- ARPANET is used in universities  
as a network for research

increase in the number of subscribing universities

↳ the origin of the Internet

(2) E-mails started ( 1972 )

The main application of the Internet for 20 years until the emergence of WWW

#### b. The emergence of the Internet concept

(1) R. Kahn: open-network architecture ( 1972 )

networks interconnected on an equal basis

TCP/IP specifications

(2) The Internet principles

an open system

4 principles : each member-network functions independently

no operation center (a distributed network)

uses gateway routers (no flow memory)

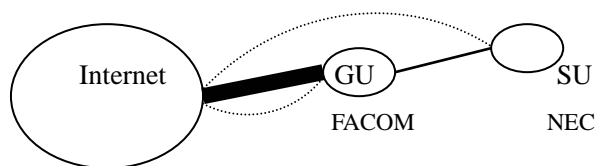
best-effort transmission

(possible congestion and loss of packets)

other principles : uses a global addressing system

data flows controlled by routers

users may log-in via OS on PC



TCP/IP system:

V. Cerf : TCP/IP system

“Father of the Internet”