

# History of Internet

# History of Internet

- Animation

- <https://www.youtube.com/watch?v=9hIQjrMHTv4>

- Narrated version

- <https://www.youtube.com/watch?v=1UStbvRnwmQ> (part 1)
  - <https://www.youtube.com/watch?v=1CsPHKJWiw0> (part 2)
  - [https://www.youtube.com/watch?v=eYkXD\\_cGUYU](https://www.youtube.com/watch?v=eYkXD_cGUYU) (part 3)

- Text version

- <https://www.internetsociety.org/internet/history-internet/brief-history-internet-related-networks>
  - <https://www.internetsociety.org/internet/history-internet/brief-history-internet/>

# Internet Timeline

- 1969 : first ARPANET connection
  - UCLA, SRI, UCSB, Utah
- 1972 : CYCLADES (France)
- 1974 : V. Cerf : TCP
- 1977 : e-mail over Telenet
- 1980 : IBM : Bitnet

# Internet Timeline

- 1984 : Domain Name System
- 1988 : Morris : Worm, and CERT
- 1989 : number of hosts exceeds 100,000
- 1991 : Al Gore : High Performance Computing Act
- 1991 : Tim Berners-Lee : WWW
- 1992 : Internet Society
- 1993 : Andreessen : Mosaic
- 1994 : Yahoo !

# 한국 인터넷 역사

1982년 SDN(System Development Network) 구축으로 첫 선을 보인 한국 인터넷은 1994년 상용서비스를 시작하면서 급속히 성장하였다. 2013년 인터넷 이용자 4,000만 명을 돌파하였고, 세계 최초로 WiBro HSDPA 상용화 서비스를 시작하였다. 2016년 제4차 산업혁명에 대응하기 위한 지능정보사회 중장기 대책을 발표하며, 세계 최고의 지능정보 강국으로 도약하고 있다.

## 인프라

1982

- SDN (TCP/IP) 구축  
(서울대 - 한국전자기술연구소)

1983

- SDN - EUNET/UUCPNET  
(기술, 학술정보교환망) 연결
- 공중전화망(PSTN) 데이터 서비스 개시
- 해외공중통신망(Public Data Network) 개통

1984

- SDN - CSNET(정보과학연구망) 연결
- 공중정보통신망(PSDN) DACOM - Net  
최초 개통

1985

- SDN - PACNET(아태지역 학술연구망) 연결

1986

- IP주소(128.134.0.0) 국내 최초 배정
- 국기도메인(.kr) 도입



1988

- SDN - MHSNET(학술용망) 연결

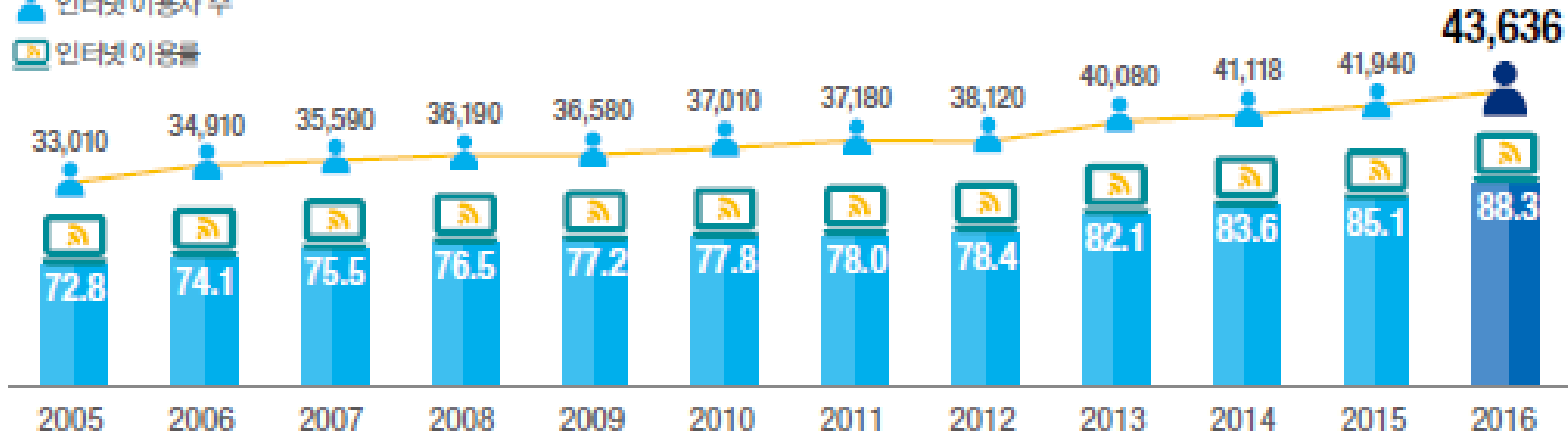
1989

- 교육망(KREN), 연구망(KREONet) 탄생
- SDN - HANA망 구축(한국통신)

## 국내 인터넷 이용 현황

(단위: %, 천 명)

인ترنت 이용자 수  
인ترنت 이용률

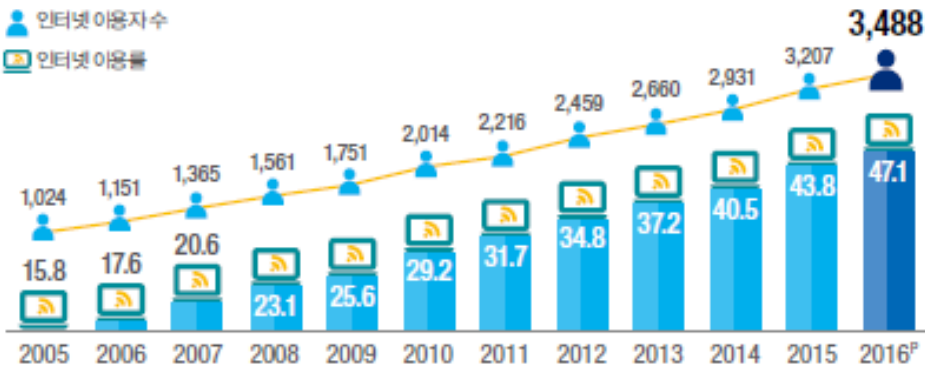


\*만 3세 이상

(단위: %, 백만 명)

전 세계 인터넷  
이용 현황

인ترنت 이용자 수  
인ترنت 이용률



p: 추정치

# 국가별 인터넷 이용 현황

본문 620p

이용률 ▼ (단위: %)

96.8



노르웨이

96.3



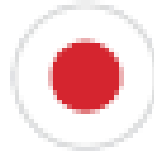
덴마크

93.5



바레인

93.3



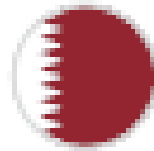
일본

93.1



네덜란드

92.9



카타르

92.7



핀란드

92.0



영국

91.2



아랍에미리트연합

90.6



스웨덴

89.9



한국

88.5



캐나다

88.4



에스토니아

88.2



뉴질랜드

\*ITU 기준 16~74세

[표 4-1-4-6] ICT 관련 국제지수에서 한국 순위

발표 기관	지수명	한국 순위										비고
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
UN	전자정부 발전지수	—	6	—	1	—	1	—	1	—	3	영국 1위 호주 2위
ITU	ICT 발전지수	1	—	2	1	1	1	1	2	1	1	아이슬란드 2위 덴마크 3위
WEF	네트워크 준비지수	19	9	11	15	10	12	11	10	12	13	싱가포르 1위 핀란드 2위
	글로벌 경쟁력 지수 기술준비도 부문	7	13	15	19	18	18	22	26	27	28	스위스 1위 싱가포르 2위
IMD	세계 경쟁력 지수 기술 인프라 부문	6	14	14	18	14	14	11	8	13	15	싱가포르 1위 스웨덴 2위

[한국인터넷진흥원]



## '2018 세계 속의 대한민국' 주요순위

정보통신기술(ICT) 발전지수	2위	인터넷 속도	1위
전자정부지수	3위	반도체매출액	1위
휴대폰출하량	1위	조강생산량	6위
산학협력지수 (5년 전보다 2위↓)	29위	기업혁신역량 (5년 전보다 12위↓)	31위
환경오염 영향도 (미국 38위, 일본 56위)			9위
대기오염도 (일본 103위, 미국 117위)			41위

자료: 한국무역협회

# 인터넷 등장 배경

- 미 국방성의 요구: 많은 통신 시설이 파괴되더라도 계속 살아 남는 통신 네트워크를 고안할 것. 다양한 통신기술을 활용할 수 있을 것.
- 과학기술계의 결론
  - 패킷 (packet) 방식의 통신네트워크
  - 연결을 만들지 않음
- 전체의 70% 이상이 파괴되어도 계속 생존하여 통신기능 유지함



"All the News  
That's Fit to Print"

# The New York Times.

**LATE CITY EDITION**  
U. S. Weather Bureau Report: (For N. Y. area.)  
Cloudy and cool today and tonight.  
Mostly fair tomorrow.  
Temp. range: 65-75. Yesterday: 62-68.

VOL. CIVIL, No. 36,434. © 1957, by The New York Times Company. NEW YORK, SATURDAY, OCTOBER 5, 1957. FIVE CENTS

## SOVIET FIRES EARTH SATELLITE INTO SPACE; IT IS CIRCLING THE GLOBE AT 18,000 M. P. H.; SPHERE TRACKED IN 4 CROSSINGS OVER U. S.

### HOFFA IS ELECTED TEAMSTERS' HEAD; WARNS OF BATTLE

Defeats Two Foes 3 to 1  
—Says Union Will Fight  
'With Every Gunce'

**Text of the Hoffa address is printed on Page 6.**  
**By A. H. RABIN**  
Special to The New York Times.  
MIAMI BEACH, Oct. 4.—The annual, so-called International Brotherhood of Teamsters elected James R. Hoffa as its president today.  
He won by a margin of nearly 3 to 1 over the combined vote of two rivals who campaigned as pledges to clean up the nation's biggest union.  
Senate racketeers and Hoffa critics in the union rank-and-file immediately opened actions to strip the 44-year-old former warehouseman from Detroit of his election victory.  
A jubilant Hoffa exhibited

**IN TOKEN OF VICTORY:** Dave Beck, retiring head of the Teamsters Union, raises hand of James R. Hoffa upon his election as union's president. At right is Mrs. Hoffa.

### COURSE RECORDED

Navy Picks Up Radio  
Signals—4 Report  
Sighting Device

**By WALTER SULLIVAN**  
Special to The New York Times.  
WASHINGTON, Saturday, Oct. 5.—The Naval Research Laboratory announced early today that it had recorded four crossings of the Soviet earth satellite over the United States.  
It said that one had passed near Washington. Two crossings were farther to the west. The location of the fourth was not made available immediately.  
It said that tracking would be continued in an attempt to pin down the orbit sufficiently to obtain scientific information of the type sought in the International Geophysical Year.  
[Four visual sightings, one of which was in conjunction with a radio contact, were reported by early Saturday morning. Two sightings were made at Columbus, Ohio, and one each from Terre Haute, Ind., and Whittier, Calif.]  
**Press Reports Noted**

The approximate orbit of the Russian earth satellite is shown by black line. The rotation of the earth will bring the United States under the orbit of Soviet-made moon.

### Device Is 8 Times Heavier Than One Planned by U.S.

Special to The New York Times.  
BY A. H. RABIN

### 560 MILES HIGH

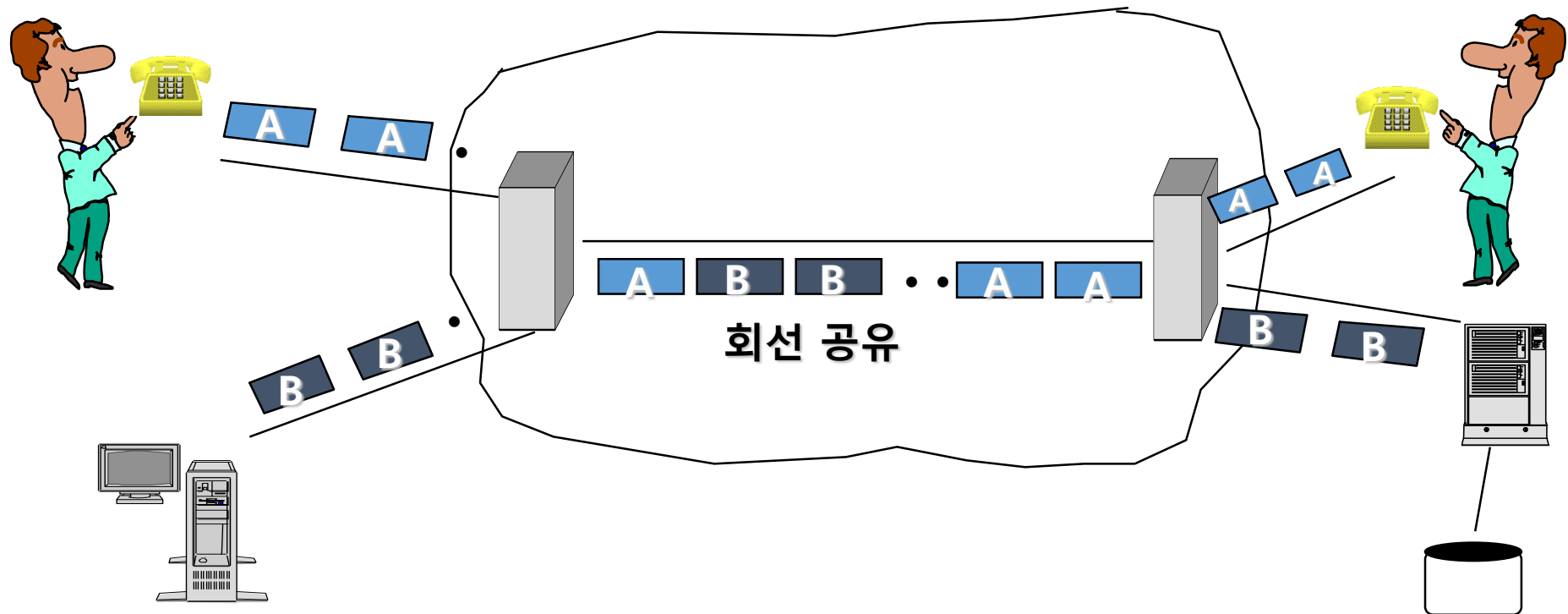
Visible With Simple  
Binoculars, Moscow  
Statement Says

**Text of Tass announcement appears on Page 2.**  
**By WILLIAM A. JORDEN**  
Special to The New York Times.  
MOSCOW, Saturday, Oct. 5.—The Russian Tass news agency this morning said it successfully launched a man-made earth satellite into space yesterday.  
The Russians calculated the satellite's orbit as a maximum of 560 miles above the earth and its speed at 18,000 miles a hour.  
The official Soviet news agency Tass said the artificial moon, with a diameter of twenty-two inches and a weight of 184 pounds, was circling the earth once every hour and thirty-five minutes. This means more than fifteen times a day.  
Two radio transmitters, Tass said, are sending signals continuously on frequencies of 20,000 and 40,000 megacycles.

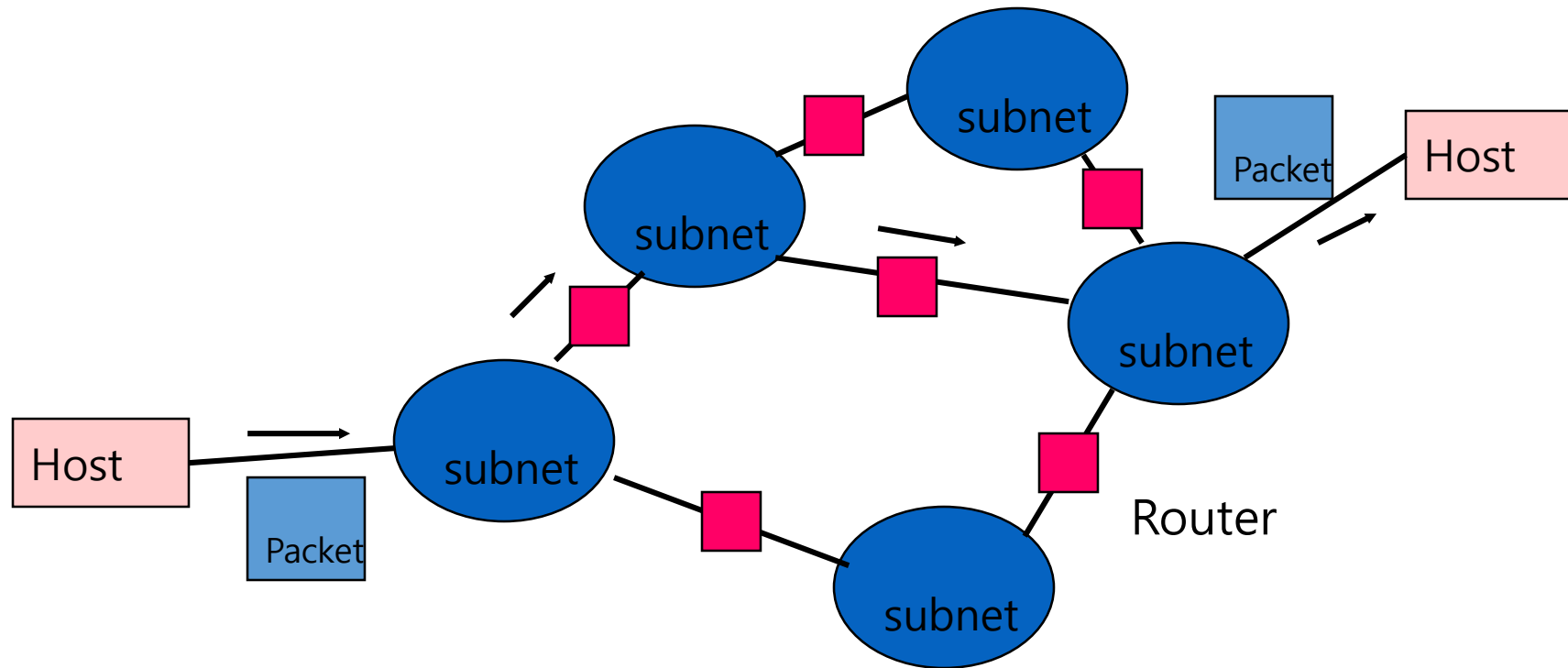
# 패킷이란 ?

- Packet  $\leftrightarrow$  Circuit 대응개념
- 보내야 할 정보를 취급하기 쉬운 작은 단위 (패킷이라 부름)로 쪼갬
  - 예 : 소설을 엽서로 옮겨 적어 보낸다.
  - 예 : 많은 화물은 여러 대의 트럭에 나누어 실어 보낸다
- 통신망은 패킷을 일일이 따로 구분하여 처리
  - 엽서마다 보내는 이, 받는 이의 주소를 반복하여 적고 우체국은 엽서마다 이를 확인한다
- 받는 쪽에서 정보를 모아서 원래대로 재생
- 왜 패킷인가 ?
  - 전송효율/ 네트워크 구축비용 절감 : 화물회사마다 전용차선이 있다면 낭비
  - 다양한 트래픽을 쉽게 지원 : 전보, 편지, 음성, 영상, 컴퓨터 데이터

# 패킷 통신의 예

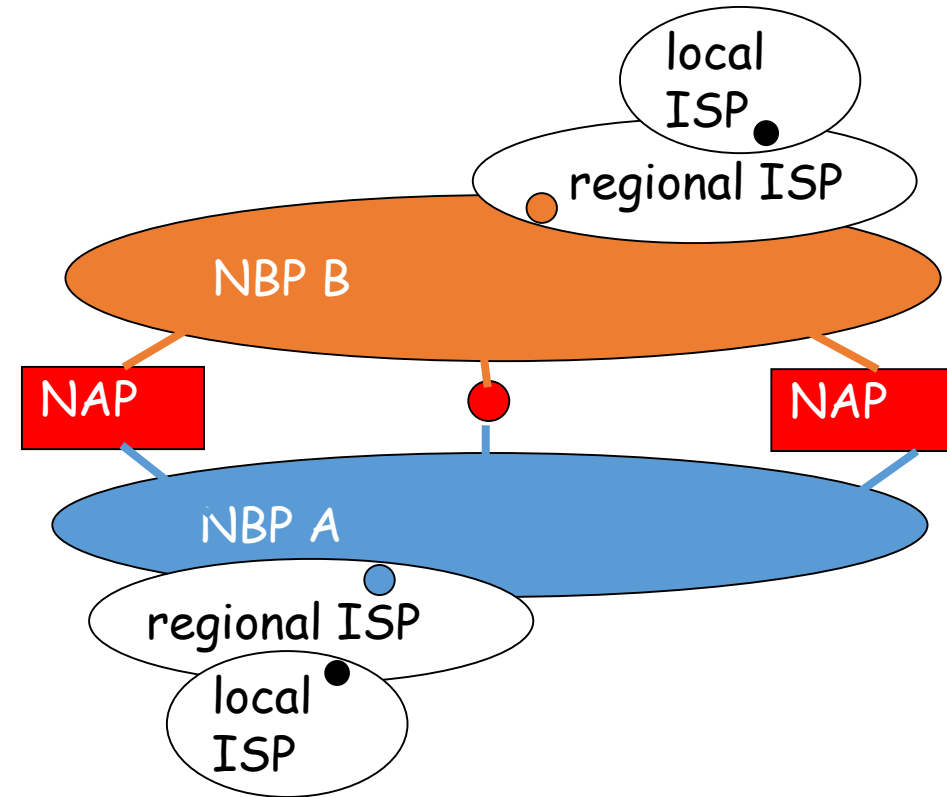


# Internet Configuration

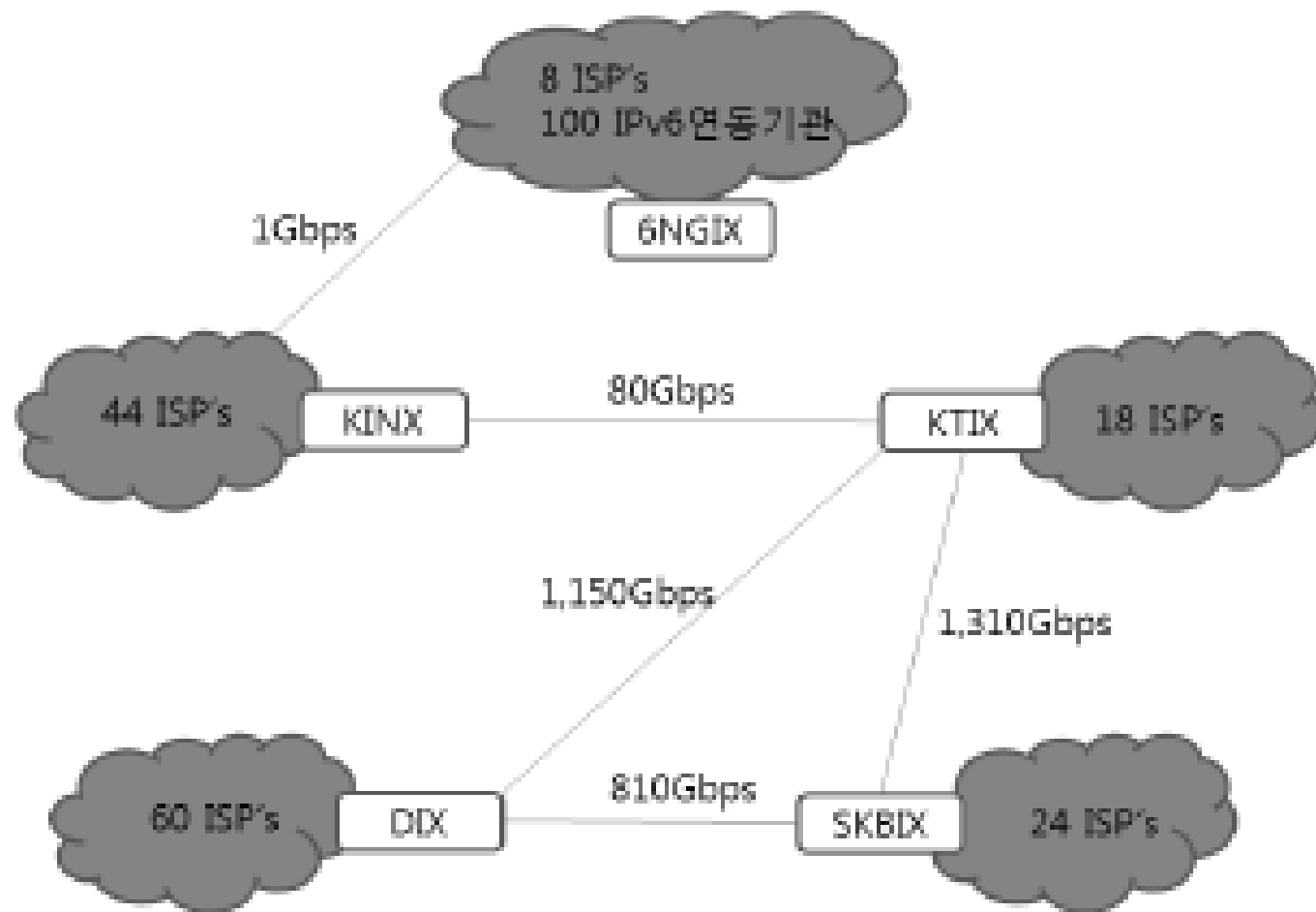


# Internet structure: network of networks

- roughly hierarchical
- national/international backbone providers (NBPs)
  - e.g. BBN/GTE, Sprint, AT&T, IBM, UUNet
  - interconnect (peer) with each other privately, or at public Network Access Point (NAPs)
- regional ISPs
  - connect into NBPs
- local ISP, company
  - connect into regional ISPs



[그림 3-1-1-1] IX별 연동망 회선 연결 구조(2017. 5 기준)



[한국인터넷진흥원, 2017]

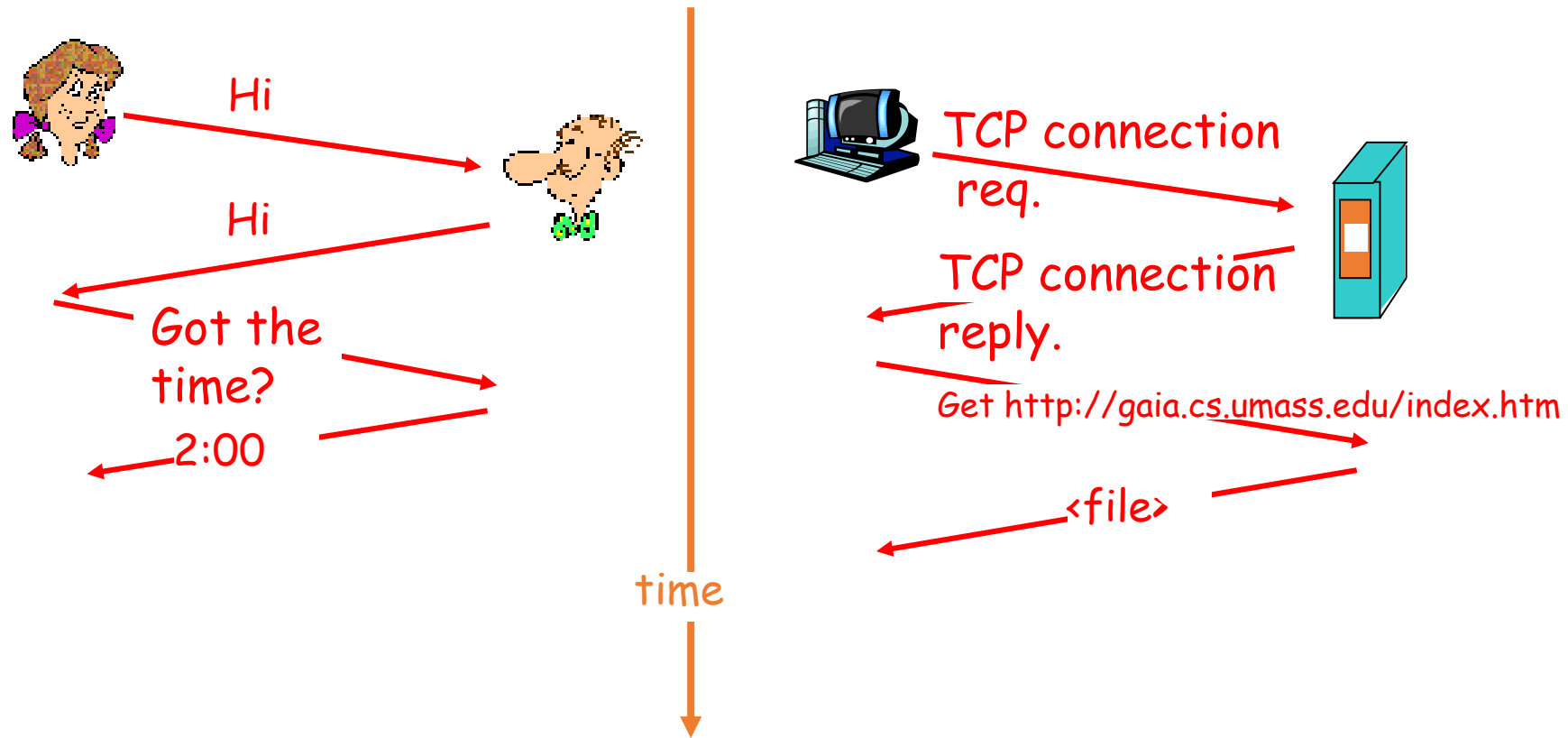


# Protocols

- Protocol: rules for communication
  - Message formats, timing
  - Describes how a computer responds when a message arrives
  - Specifies how a computer handles errors or other abnormal conditions
- All network services are described by protocols

# What's a protocol?

a human protocol and a computer network protocol:



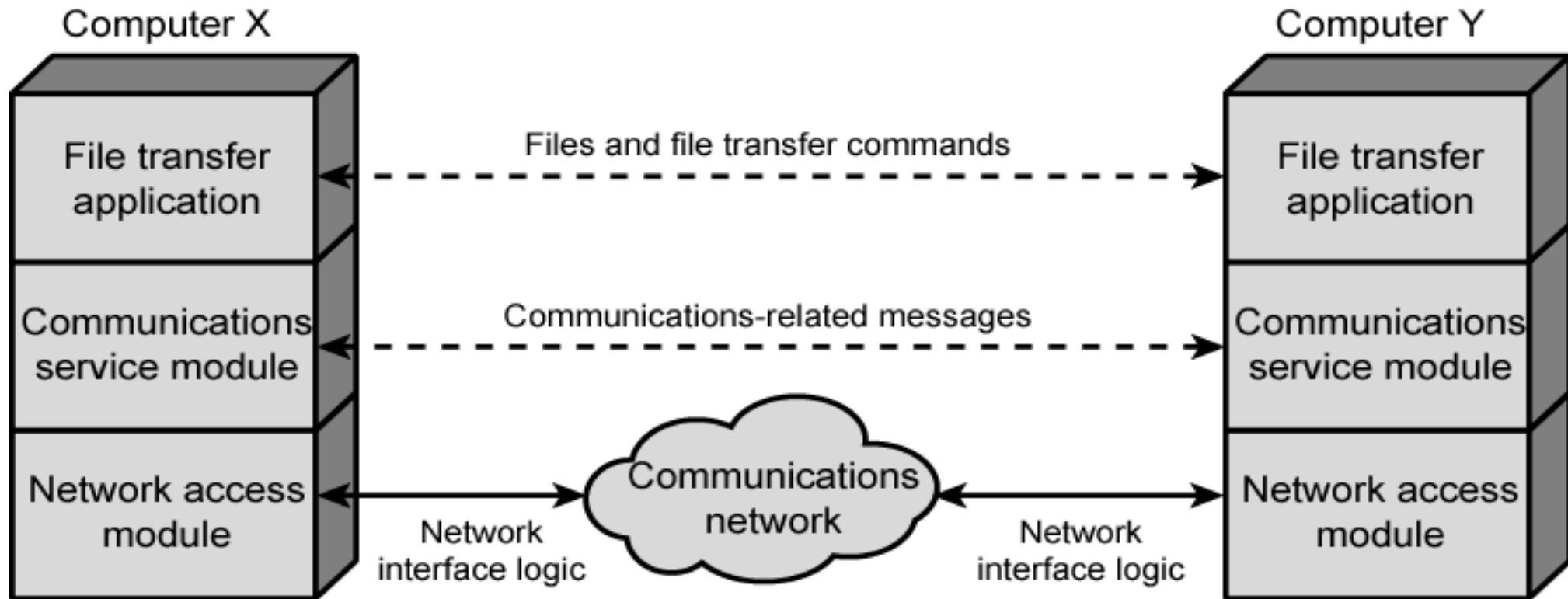
# Key Elements of a Protocol

- Syntax
  - Data formats
  - Signal levels
- Semantics
  - Control information
  - Error handling
- Timing
  - Speed matching
  - Sequencing

# A Three Layer Model

- Network Access Layer
- Transport Layer
- Application Layer

# Simplified File Transfer Architecture



# Network Access Layer

- Exchange of data between the computer and the network
- Sending computer provides address of destination
- May invoke levels of service
- Dependent on type of network used
- IP

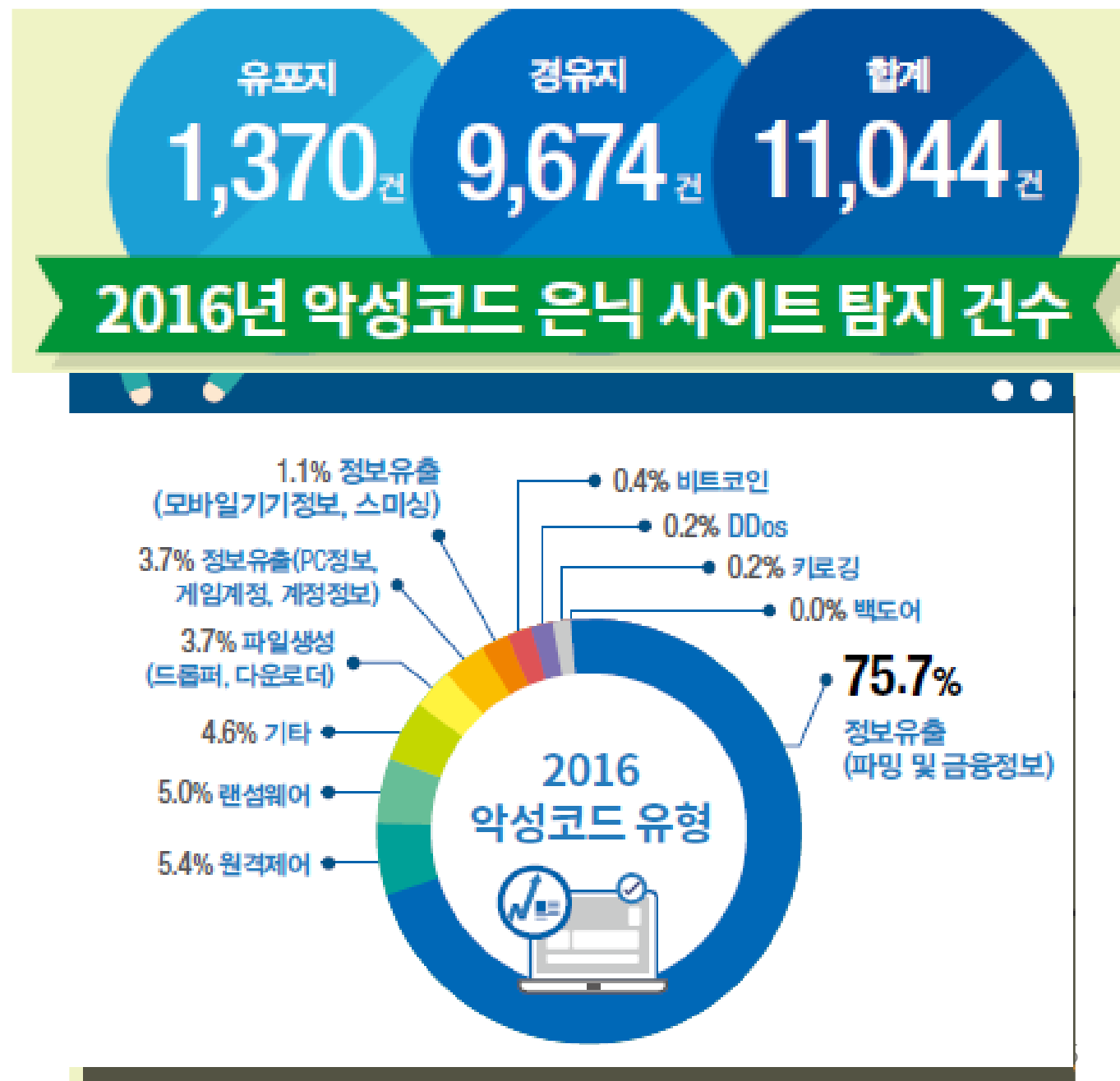
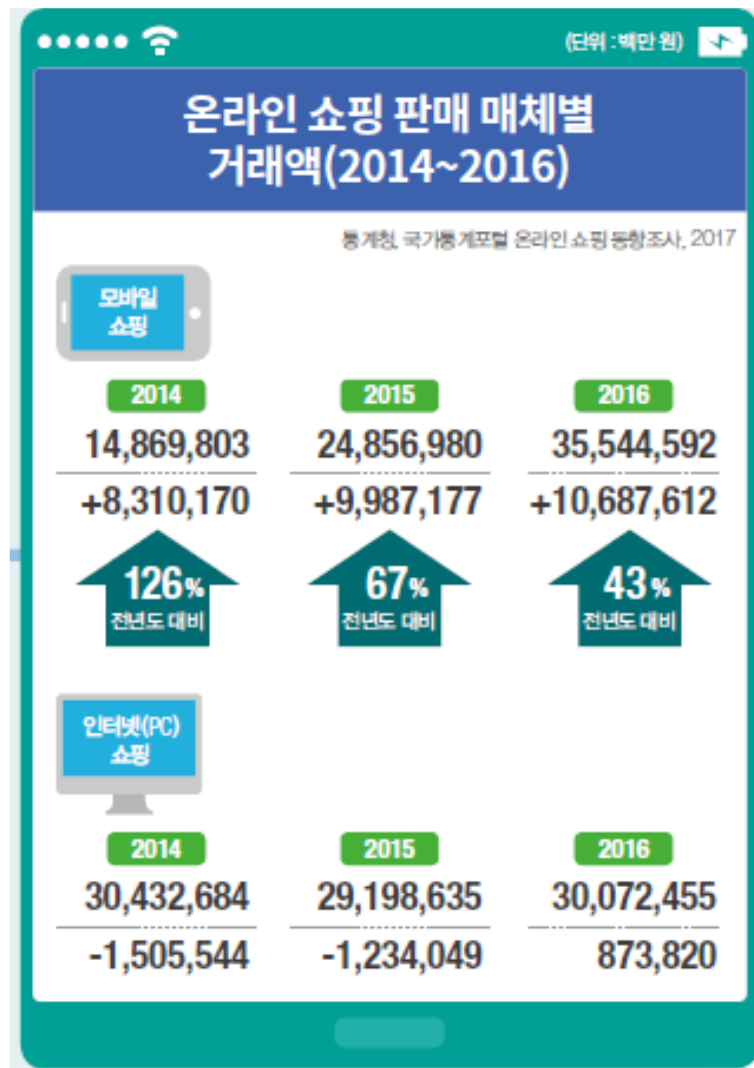
# Transport Layer

- (un)Reliable data exchange
- Independent of network being used
- Independent of application
- TCP, UDP

# Application Layer

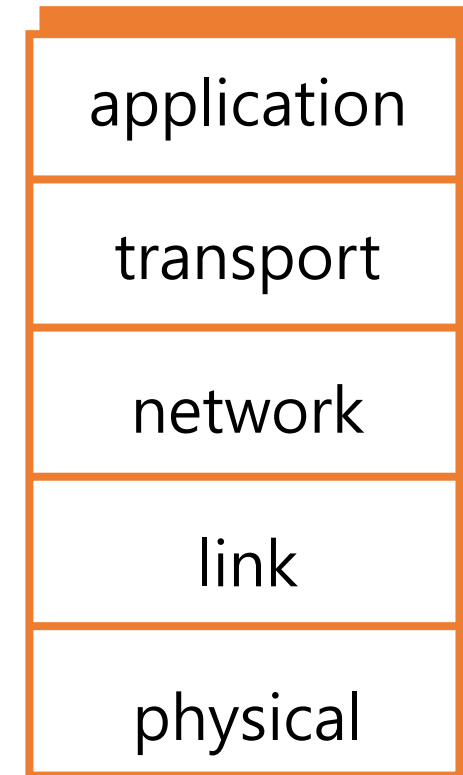
- Support for different user applications
- e-mail, file transfer, video, SNS





# Internet protocol stack

- **application:** supporting network applications
  - ftp, smtp, http
- **transport:** host-host data transfer
  - tcp, udp
- **network:** routing of packets from source to destination
  - ip, routing protocols
- **link:** data transfer between neighboring network elements
  - ppp, Ethernet
- **physical:** bits on the wire

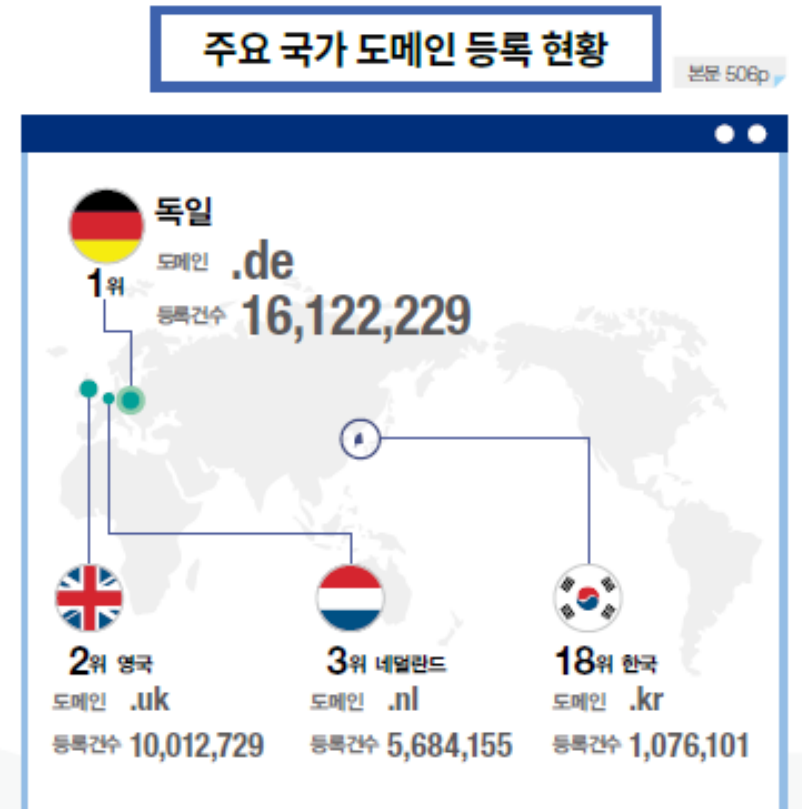
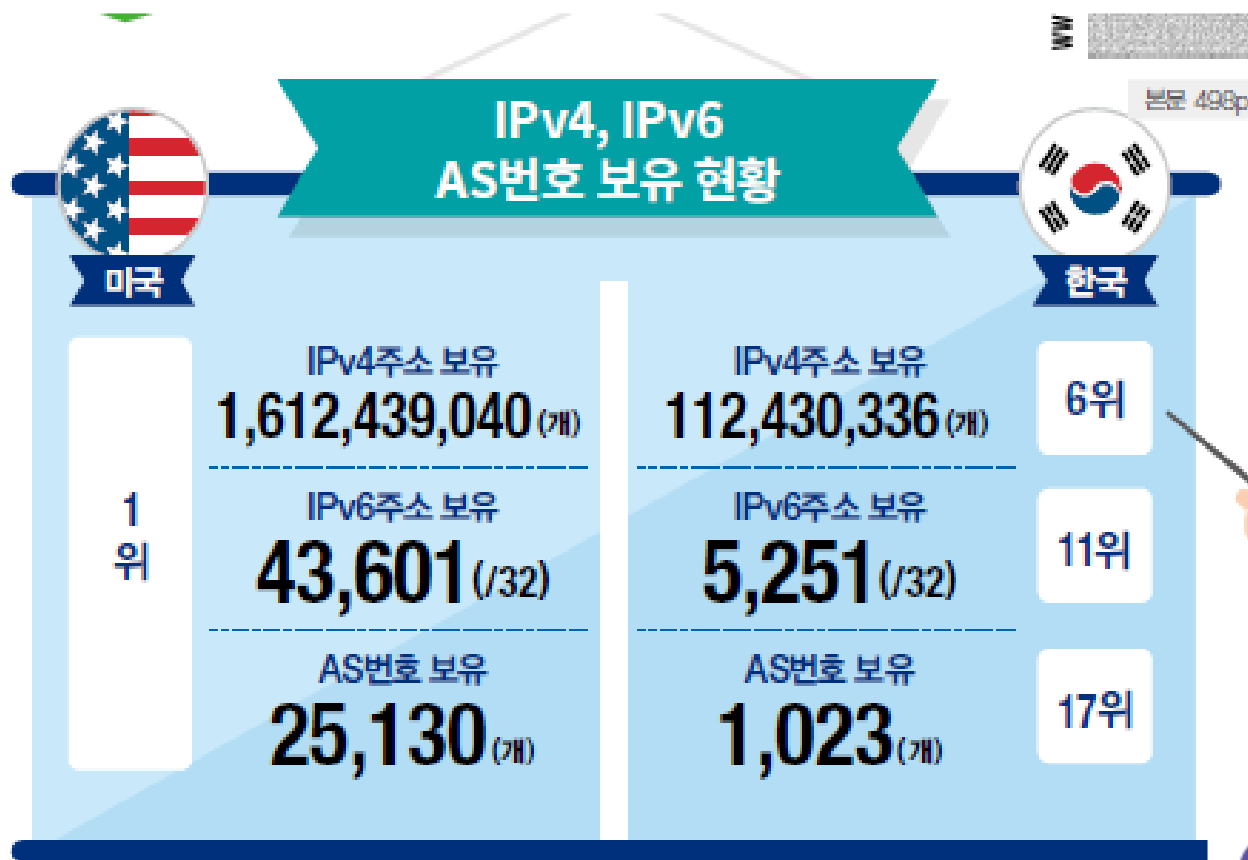


# Access Technologies

- DSL: digital subscriber line
- Cable Modem
- LAN (wired, wireless : IEEE 802)
- Bluetooth, Zigbee
- Satellite
- Cellular (2, 3, 4, 5G)
- Fiber
- IoT, Sensor network
- Vehicular network, drones

# Internet Address

- Host identifier : interface identifier
  - Name
  - Address
  - Route
- IPv4 : 32 bit address
- IPv6 : 128 bits
- Identifier vs. locator
- Internet, Intranet



# IP (Internet Protocol) packet delivery service

- Unreliable: lost, duplicated, delayed, or delivered out of order
- Best-effort
- Connectionless
- Variable size datagrams
- Data forwarding only (routing, error, and control by other protocols)

# TCP

## (Transmission Control Protocol)

- Connection-oriented (virtual circuit)
- Reliable Transfer
- Buffered Transfer
- Unstructured Stream
- Full Duplex Point-to-point Connection
- End-to-end service

# More Protocols of Interest

- OSPF, BGP
- UDP
- RTP
- HTTP
- SMTP
- 802.11

- IETF



IEEE

- 3GPP
- ITU