

Network R&D Status and Planning Direction

Institute for Information & Communication Technology Promotion(IITP)
will lead in realizing national welfare as the world's Best R&D institute
in ICT technologies through promotion of creative economy

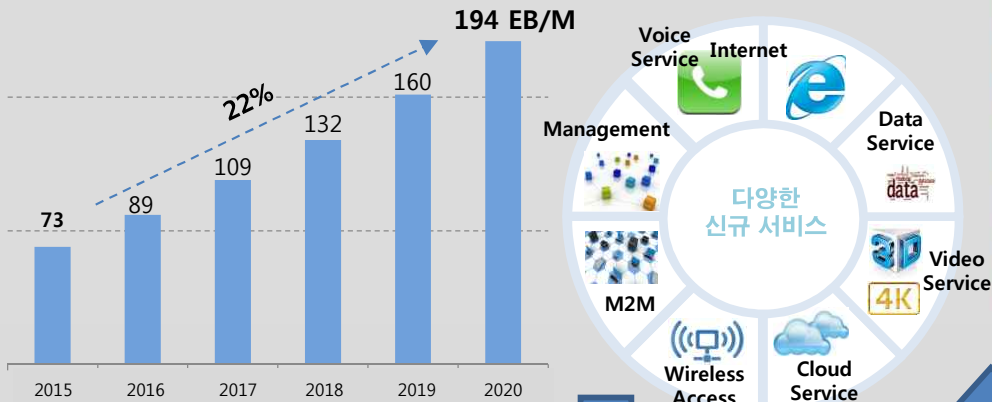
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Network R&D PM

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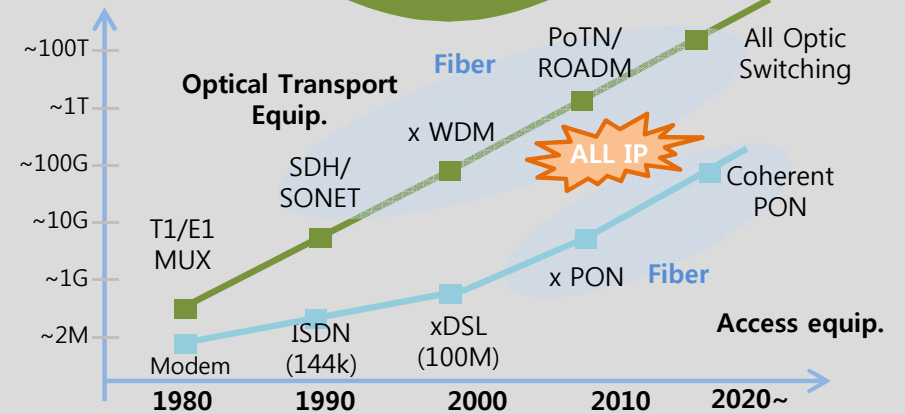
1. Network Technology Development
2. Quantum Cryptography
3. SDN/NFV: Network Virtualization
4. SDN/NFV: Machine Learning
5. R&D Projects planning process

1. Network Technology Development

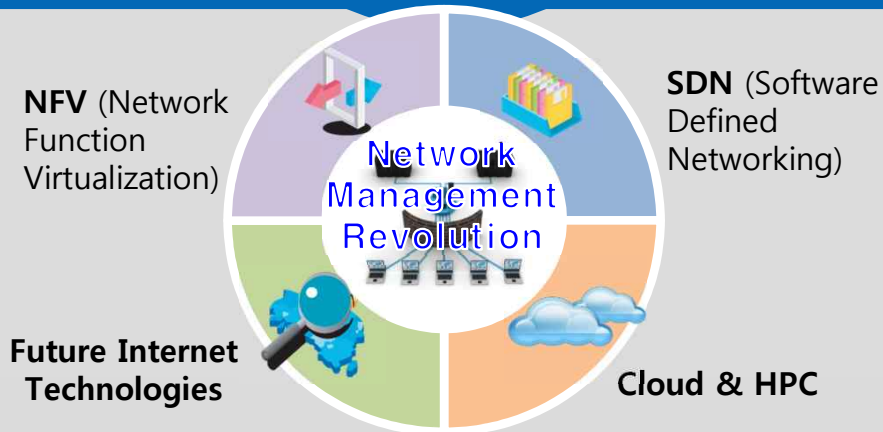
Responding to rapid increase in Traffic



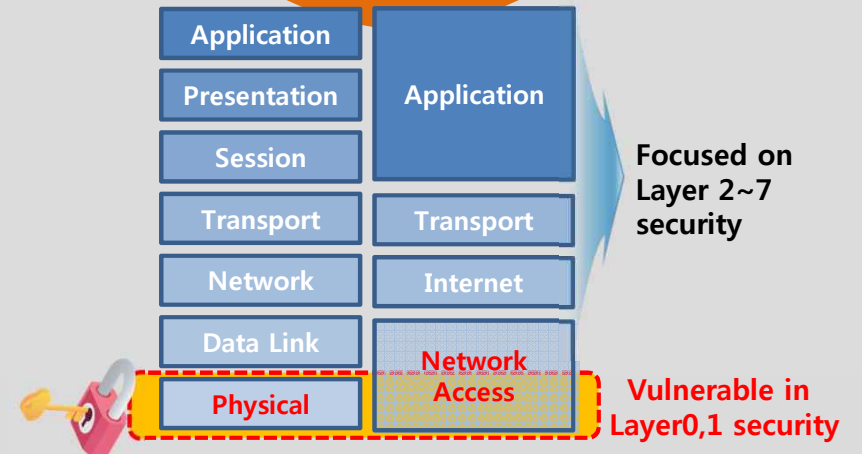
All Optic, large capacity, low power & low cost Products



Network Virtualization and Automation




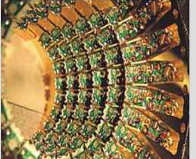
Network Infra Security



2. Quantum Cryptography

◆ When quantum computers emerge

	DES	3DES	AES
Year developed	1977	1978	2000
Key length	56 bits	112, 168 bits	128, 192, 256 bits
Maximum inspection time at inspection speed of 50 B key / sec	400 days (Expected to take more than 2,000 years to decipher at the time of development)	800 days in case of 112 bits	5×10^{21} year in case of 128 bits
In real world	In 1999, DES Challenge III , paralleled 10,000 computers decrypted in 22 hours and 15 minutes (KISA)		???
Reference	"New comparative study between DES, 3DES and AES", Journal of Computing, Vol2., Issue3, Mar. 2010		

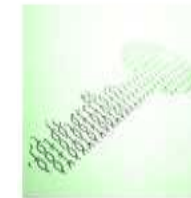
Super Computer (Bit)	Quantum Computer (Qubit)
	
Time to factorize 300 digit prime number	
> 365 days	30 min
> 17,520 times faster	



InfoWorld

Quantum computers pose a huge threat to security, and the NIST wants your help

An upcoming competition will invite the public to propose and test 'quantum-resistant' encryption schemes

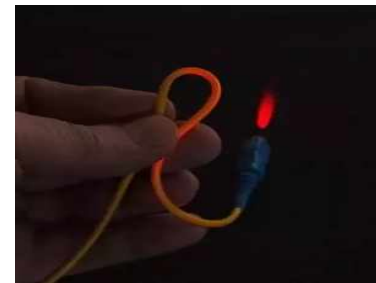
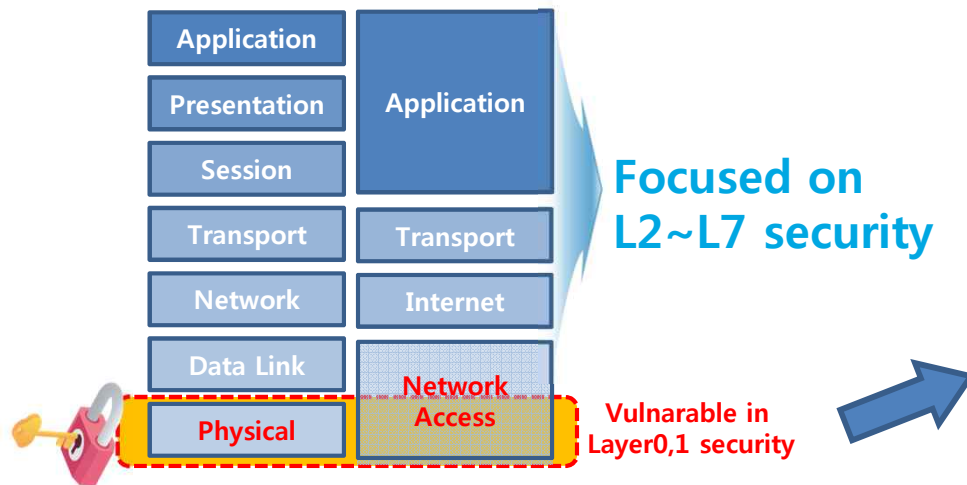


1024 Qbits Quantum Computer, Canada D-Wave

2. Quantum Cryptography

◆ Evolution of NW attack and defense technologies

Hacking/Phishing/Ransomware/Botnet/DDoS



◆ 2013, Snowden case

- ❖ USA NSA's indiscriminate wiretapping
- ❖ Hacking servers and fiber optics

the guardian

미국 국가안보국 '첩보감시 세계지도' 21

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News / World news / The NSA files

Series: Glenn Greenwald on security and liberty

Edward Snowden: the whistleblower behind revelations of NSA surveillance

The 29-year-old source behind the biggest intelligence leak in the NSA's history explains his motives, his uncertain future and why he never intended on hiding in the shadows

NSA whistleblower Edward Snowden: 'I do not expect to see home again'

Glenn Greenwald, Ewen MacAskill and Laura Poitras in Hong Kong

guardian.co.uk, Sunday 9 June 2013 14:27 EDT

출처: 영국가디언지, 번역 및 Edit: 연합뉴스

2. Quantum Cryptography

◆ F/O cable security measures

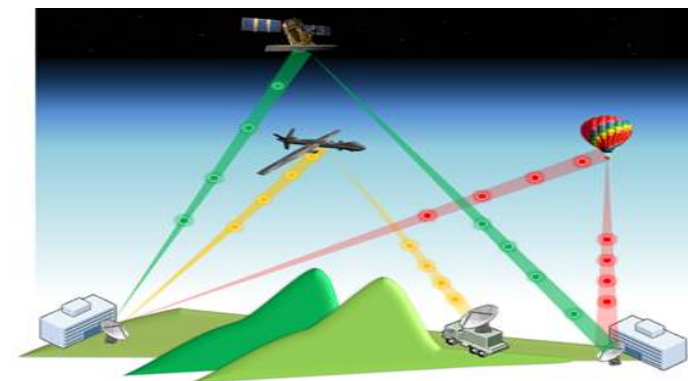
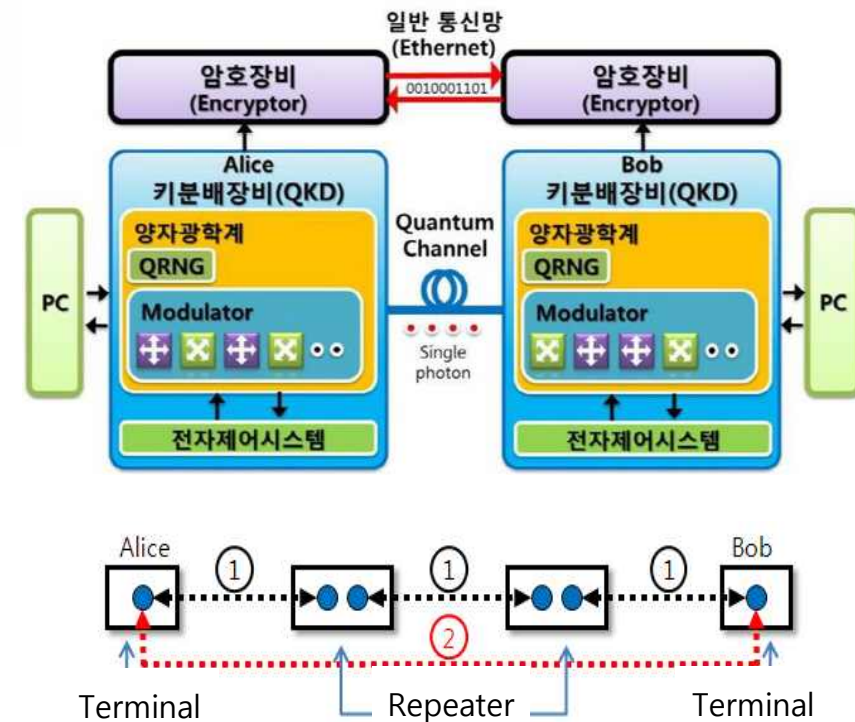
- ❖ Information transmission after encryption
- ❖ **Using quantum cryptography technology**

◆ Development Status of Quantum Cryptography

- ❖ Near completion of development of wired technology
- ❖ 2018, Plan to demonstrate long distance transmission between Seoul-Daejeon
- ❖ Problem: High cost

◆ Development Plan

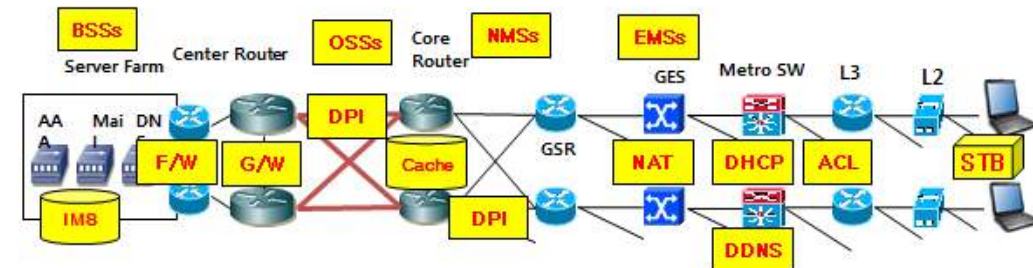
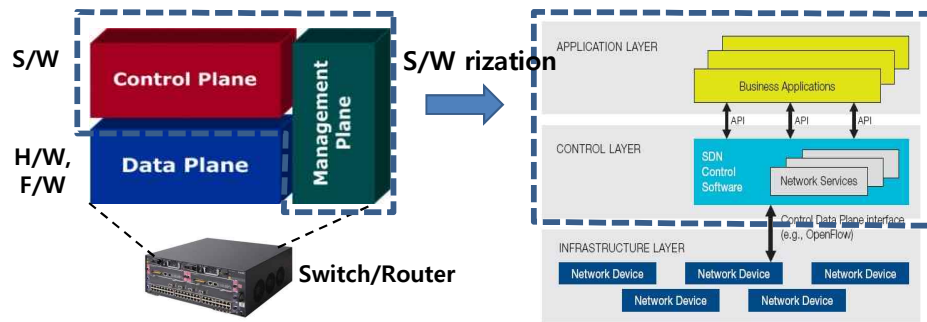
- ❖ Quantum Repeater
- ❖ Free space laser technology
 - Satellite, air balloon, base station & mobile (vehicle, ship)
- ❖ Parts and optical module miniaturization



3. SDN/NFV: Network Virtualization

◆ SDN/NFV

- ❖ SDN : Network Virtualization and Control
- ❖ NFV : Softwarization of Network Functions



NFV: Softwarization of Network functions

◆ Current status of SDN/NFV

- ❖ Open and Distributed SDN controller and Network virtualization platforms
- ❖ Open NFV platform
- ❖ AT&T and ONLab's CORD
 - Central Office Rearchitected as a Data Center
- ❖ ONAP(Open Network Automation Platform)
- ❖ Programmable switch etc...



P4
(Programmable,
Protocol-independent
Packet Processor)

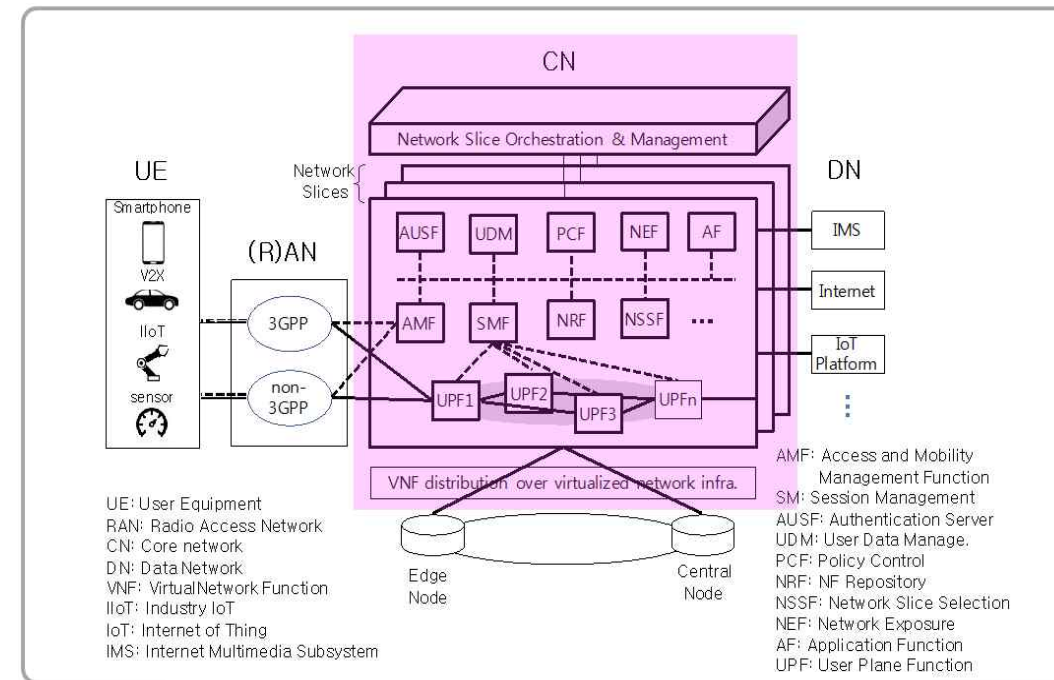
3. SDN/NFV: Network Virtualization

◆ Current status of SDN/NFV

- ❖ Current **SDN** technology is being applied to large-scale **Cloud Data Center** deployments (e.g. Google)
- ❖ **Telcos** are introducing **NFV** technologies to **Wired/Wireless networks**
- ❖ SDN/NFV was adopted as a **5G core network technology**

◆ Development plan in Korea

- ❖ **Telcos** are developing **CORD**
 - Virtualization of Router, OLT, ROADM etc...
- ❖ **5G Core Network platforms**
 - 5G core network equipment
 - Mobile Edge Computing platform
- ❖ **Programmable switch etc....**

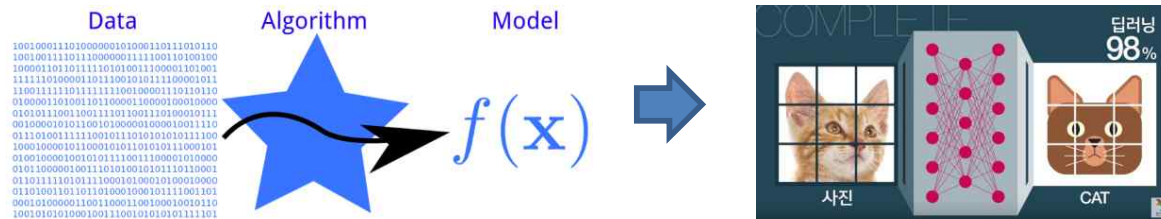


5G Access and Core Network Architecture

4. SDN/NFV : Machine Learning

◆ Machine Learning

- ❖ Machine Learning=Mathematics → needs Mathematical model
- ❖ Successful in signal processing(image, handwriting, speech recognition...)

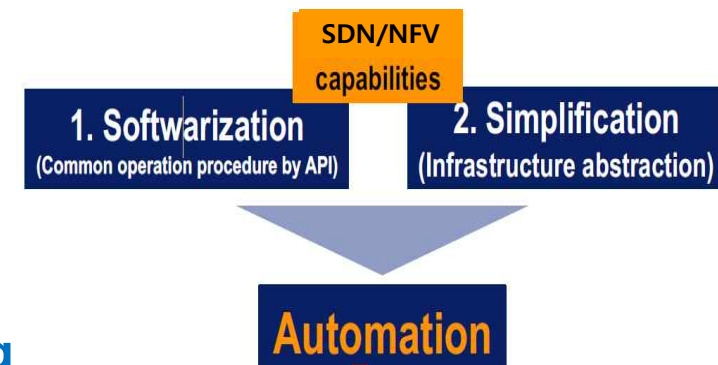


◆ Current Internet → Difficult to apply Machine Learning

- ❖ No unified model of network operations
 - Protocol---- created by several engineers' idea and design
 - Switch/Router--- Vendor dependent
 - Data format---- Vendor dependent

◆ If all the network is unified with SDN/NFV ...

- ❖ Standard Data format
- ❖ Standardization of operation procedure with Standard APIs → Easy to apply Machine Learning

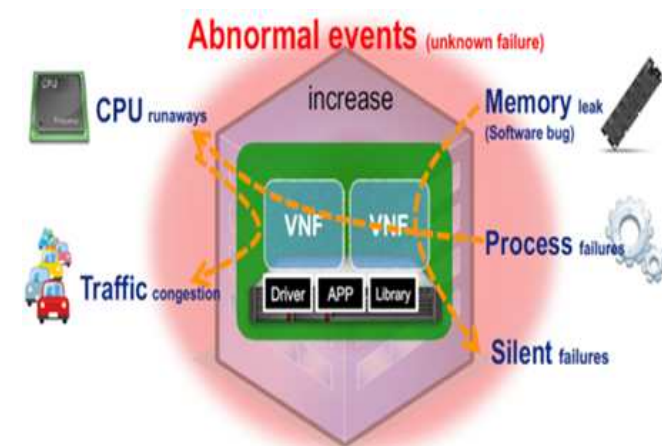


4. SDN/NFV and Machine Learning

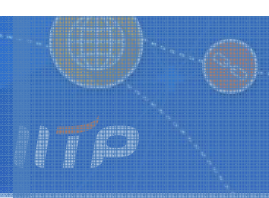
- ◆ In SDN/NFV environments, abnormal events increase
 - ← **Current N/W outputs event message as designed in advance**
 - ❖ Machine learning is effective in SDN/NFV security analysis
 - Proactively detect and respond to software vulnerabilities
 - Analysis of encrypted packets (behavior analysis)
 - Detection and removal of malicious codes distributed via e-mail attachments

◆ Network security R&D needs to evolve to fit new technologies

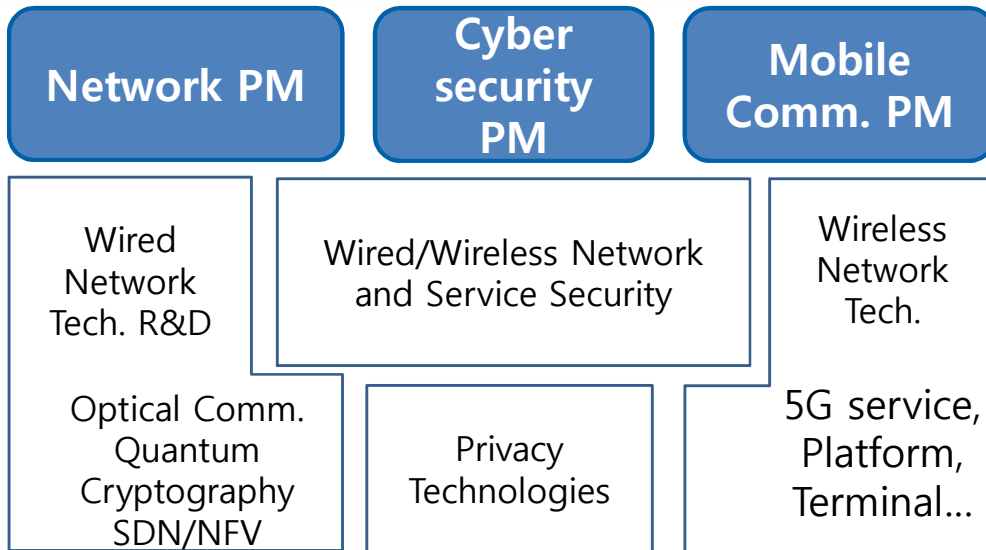
- ❖ (Ex) SDN/NFV provide...
 - Scale-in/out -- Easily respond to traffic fluctuations(DDoS attack)
 - VM, VN migration --- DDoS and hacking avoidable
 - ID/Locator separation, Virtual IP address
 - Scan attack disabling, confidential address of attack target
 - In-net telemetry ---- can extract arbitrary performance data from network devices



5. R&D Projects planning process



◆ Internet related PMs



◆ R&D Projects planning process

- ❖ Demand survey for projects
- ❖ Planning
- ❖ Analysis and prioritization
- ❖ Public hearing and verification...
- ❖ Projects selection



감사합니다