Technology intelligence services of KISTI: TOD & COMPAS

March 2016

Department of Technology Intelligence Research
Future Information Research Center
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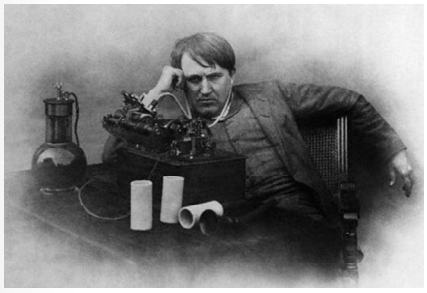
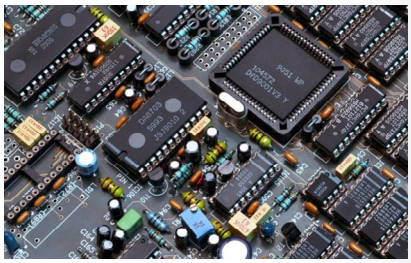
Korea Institute of Science and Technology Information

He (must have) thought we would be happy.

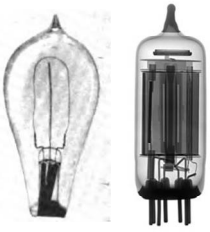


Thomas Edison

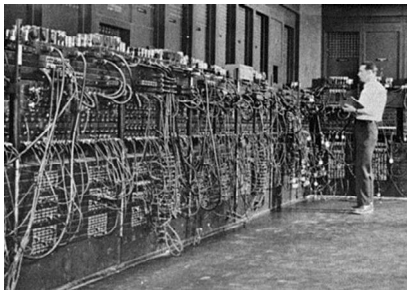
Semiconductor devices



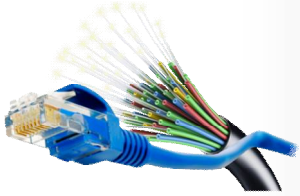
Integrated circuits



Glass tubes



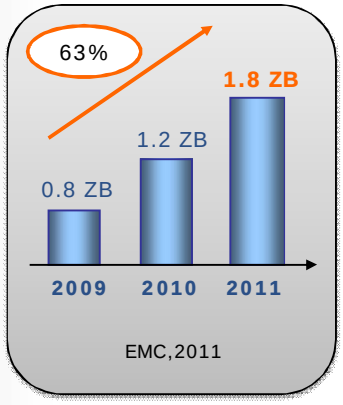
Eniac



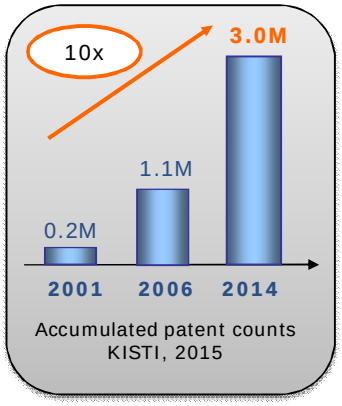
Internet (of things)

So, are we happy now?

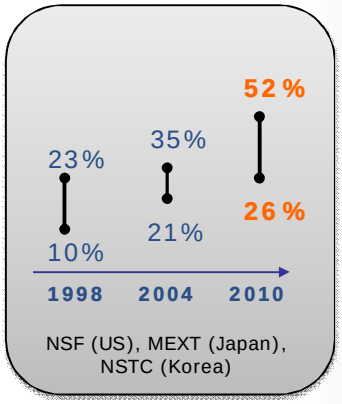
Amount of information created world-wide



15X increase of US patent grants in 14 years



Increasing R&D time spent for information analysis



- Searchers are successful in finding what they seek 50% of the time or less.
- More than 50% of people spend their time managing information overload.

How can we get intelligence out of information with ease?

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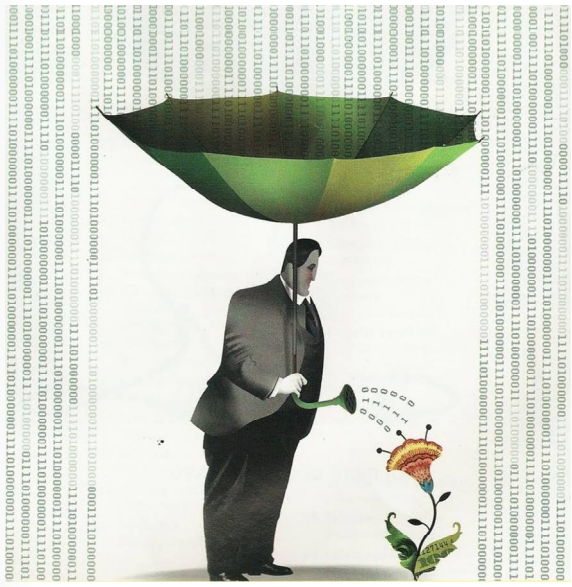
TOD & COMPAS



(Data deluge, Courtesy of Economist)

KISTI provides web-based **Technology Intelligence** service platforms:

TOD (**T**echnology **O**pportunity **D**iscovery)

To search **promising products and technologies** to offer R&D/business opportunities.

COMPAS (**COMP**etitive **A**nalysis **S**ervice)

To analyze **competitive environment** surrounding a specific technology of interest.

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Technology Opportunity Discovery

http: / / tod.kisti.re.kr

(Service available in Korean version only)

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What is TOD?

TOD

- An **on-line technology intelligence platform** to help users make informed decisions on their **new product development**
- Provides means to **search promising products and technologies** to offer R&D/business opportunities
- Navigates **P**roduct-**T**echnology-**C**ompany(Assignee) **relational network** starting from a product **currently owned** by a user

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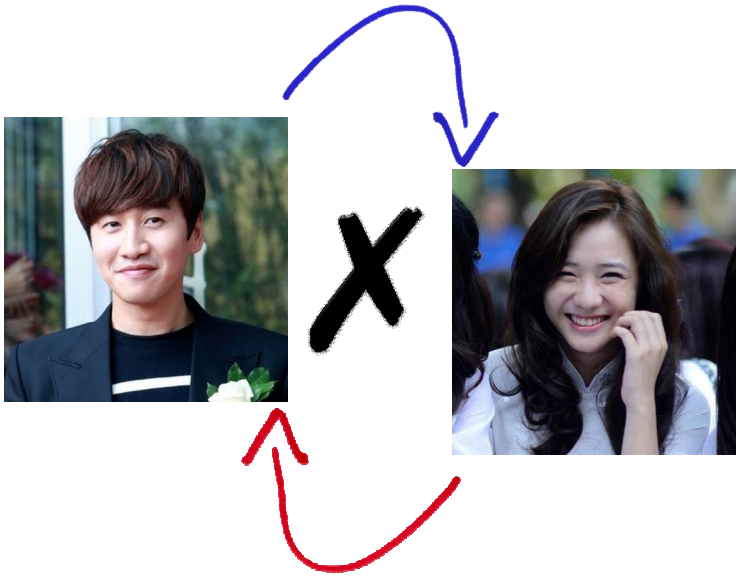
Relationship makes life easier



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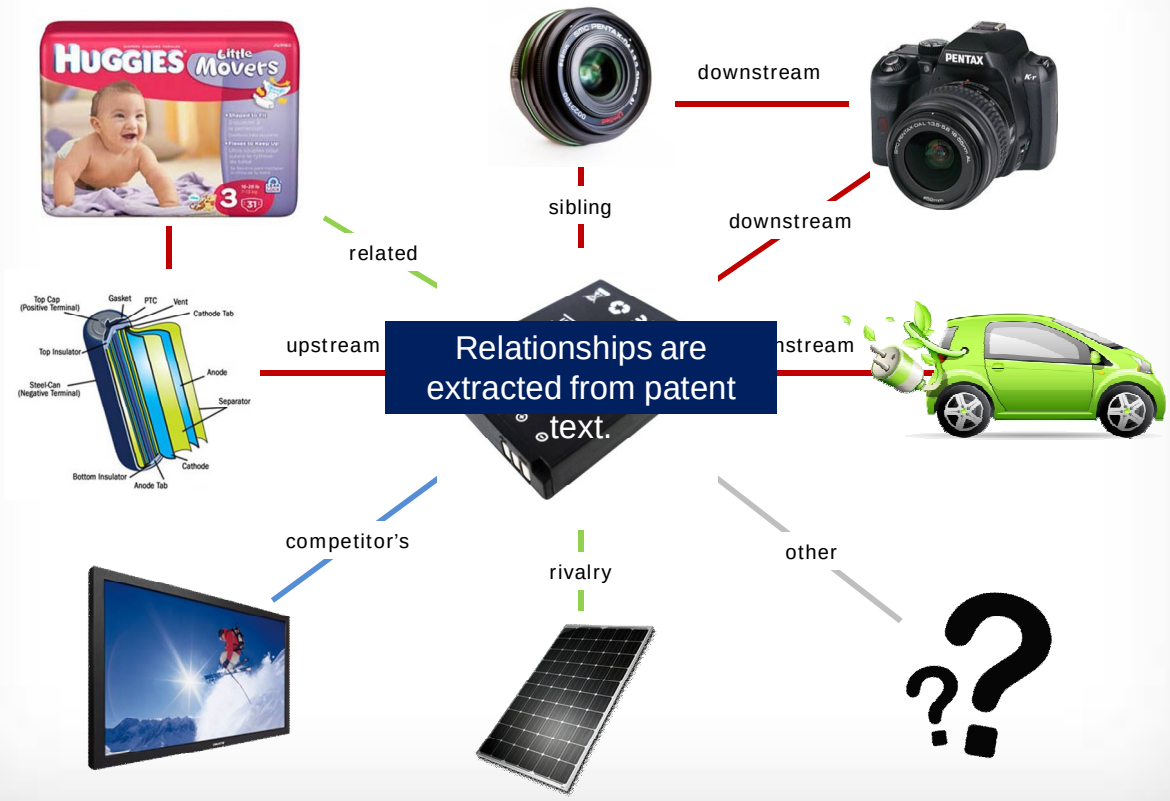
Relationships in products/technologies



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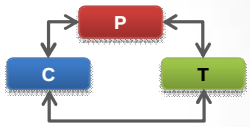
How TOD works

- US Patent & Trademark hybrid DB: **P**roduct-**T**echnology-**C**ompany(Assignee) network
- Coverage: ~200,000 products, ~300,000 companies(assignees)
- Services: three service modules



Service Name	Function	Scenario
S1 Owned Product - Based Opportunity Navigation	Provides opportunities related to the products currently owned by user	■ Search products owned by user ■ Search products of opportunity ■ Portfolio analysis ■ Attractiveness evaluation for products of opportunity
S2 Competitor Benchmarking	Provides opportunities by monitoring products of competitors	■ Search competitors (companies/assignees) ■ Search competitors' products ■ Network analysis on competitors ■ Product analysis of competitors ■ 1:1 competitor comparison
S3 Product-Technology Relation Analysis (under development)	Recommends applications and opportunities by analyzing functions and technologies of selected products	■ Search products of interest ■ Explore functions of the products ■ Explore technologies of the products ■ Recommend applications and opportunities

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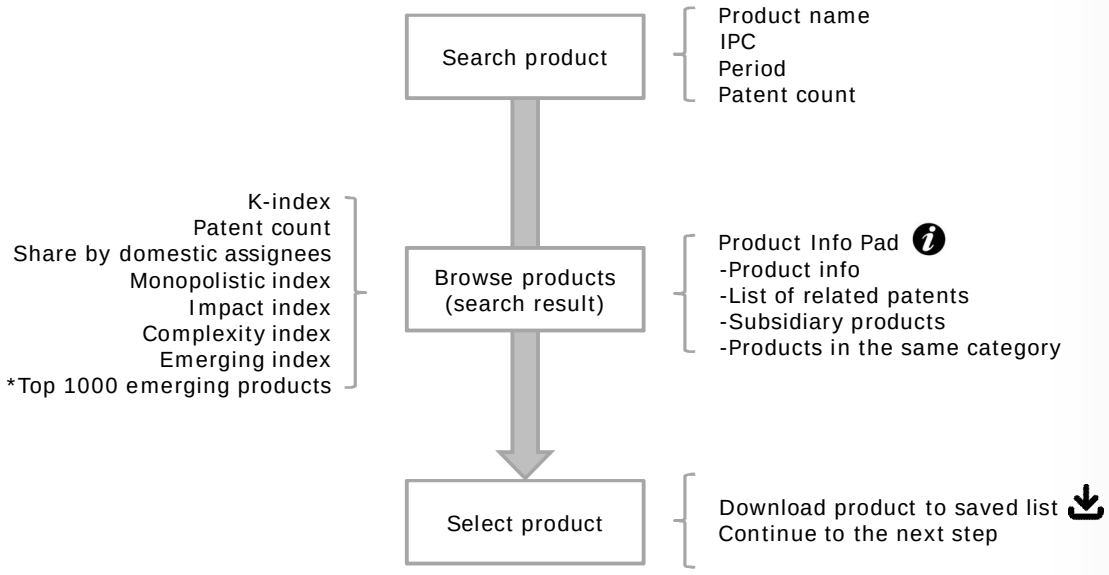
S1 (1/4): Search user's owned-product



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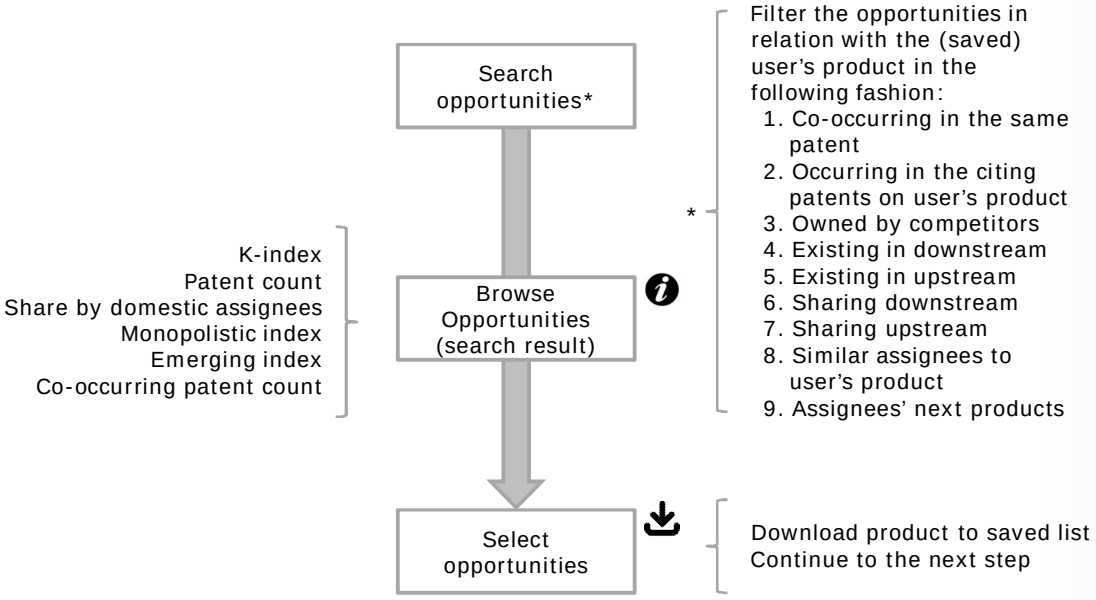
S1 (2/4): Search opportunities



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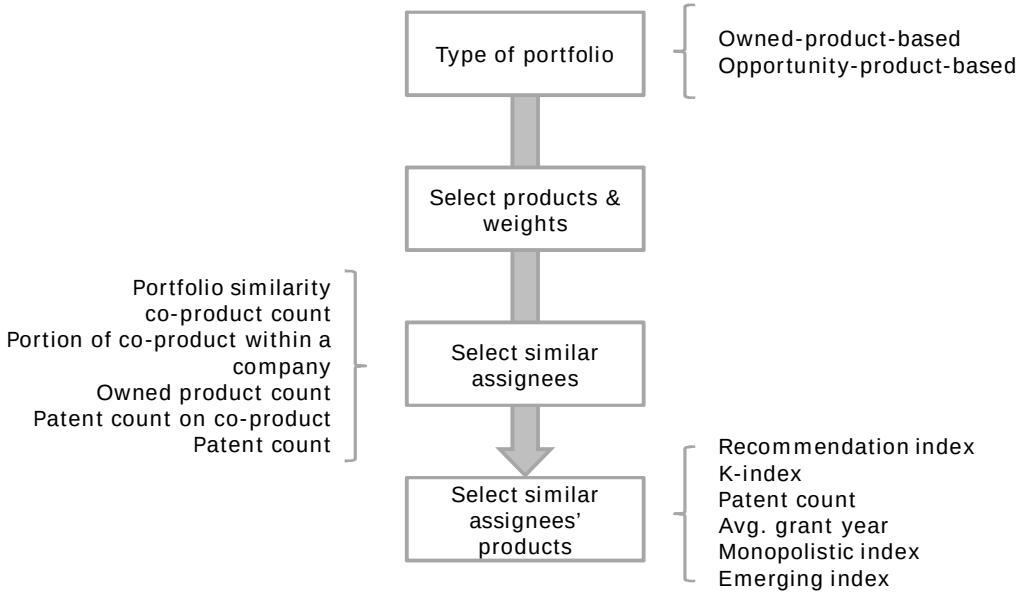
S1 (3/4): Portfolio analysis



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S1 (4/4): Attractiveness analysis

K-index
Patent count
Monopolistic index
Similarities (IPC, assignees, up/downstream)
Emerging index
Major assignees

Select opportunities

Attractiveness map

Automatic report

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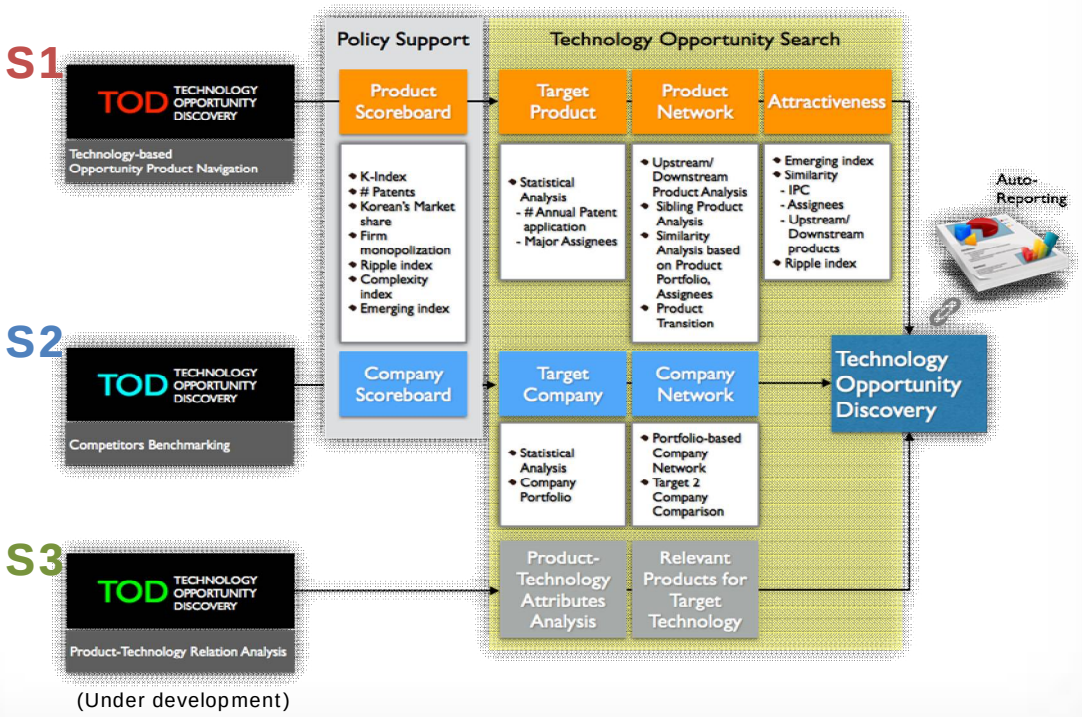
How TOD can be used



(Under development)

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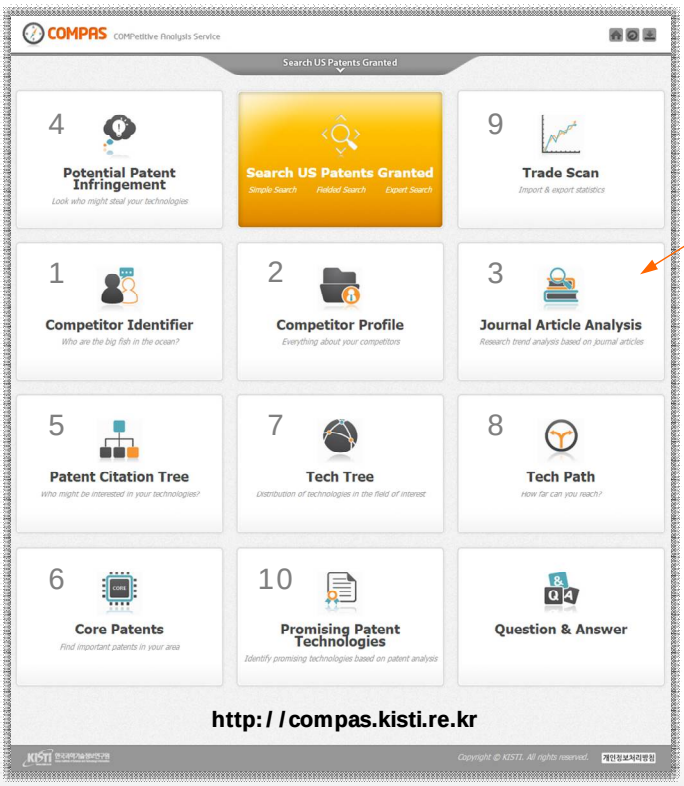
COMPetitive Analysis Service



English version available

What is COMPAS

COMPAS

- An **on-line analysis service** to help users make informed decisions on their R&D-related tasks
- Provides means to analyze the **competitive environment** (patents and journal articles) of a TOI (Technology of Interest)
- Conducts in-depth analysis on the most frequently asked **MOT (Management of Technology) questions**

What people can get from COMPAS

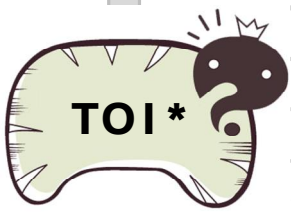
1.Who are the major players?

2.And what are they doing?

3.What happens in academic fields?

4.Who's doing something similar to me?

5.Who's interested in my technology?



6.What are the core patents?

7.What are the subsidiary technologies?

8.How far can I extend?

9.Is there new market opportunities?

10.What gets people's attentions?

* **T**echnology **O**f **I**nterest

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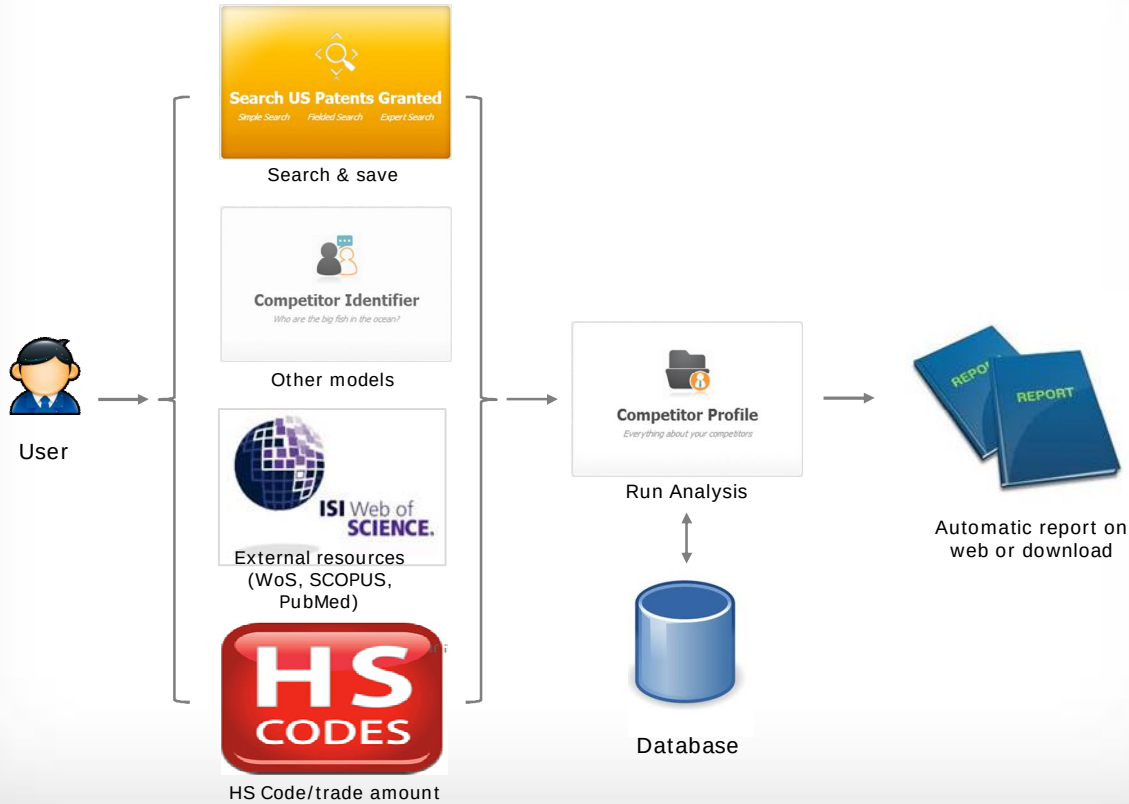
How COMPAS works



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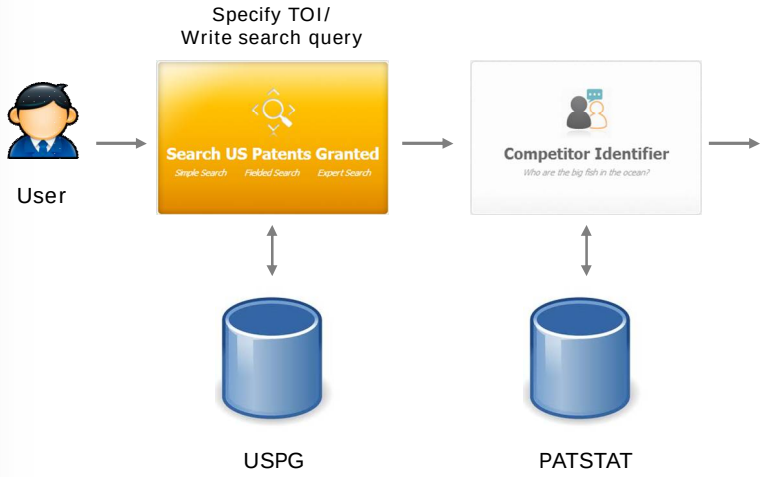
Competitor Identifier

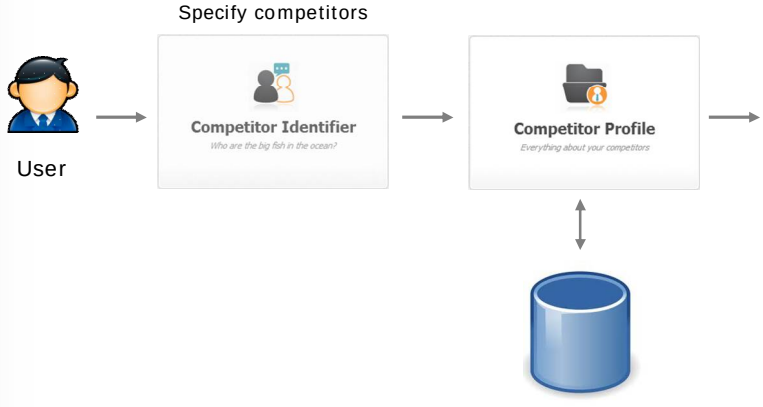


1. Patent count w/ pub yr
2. Competitor **countries**
  2-1. Patent count
  2-2. Patent count w/ pub yr
  2-3. Patent quality
  2-4. Family size
3. **International** competitors
  3-1. Patent count
  3-2. Patent count w/ pub yr
  3-3. Patent quality
  3-4. Family size
4. **Domestic** competitors
  4-1. Patent count
  4-2. Patent count w/ pub yr
  4-3. Patent quality
5. **Core competitors**
<Appendix> **HCPs**

Web/download

- To get an overall 'landscape' of a TOI to **identify major competitors** in it
- By analyzing patent count (w/ publication year), patent quality, family size WRT competitor country and assignee (international and Korean)

Competitor Profile

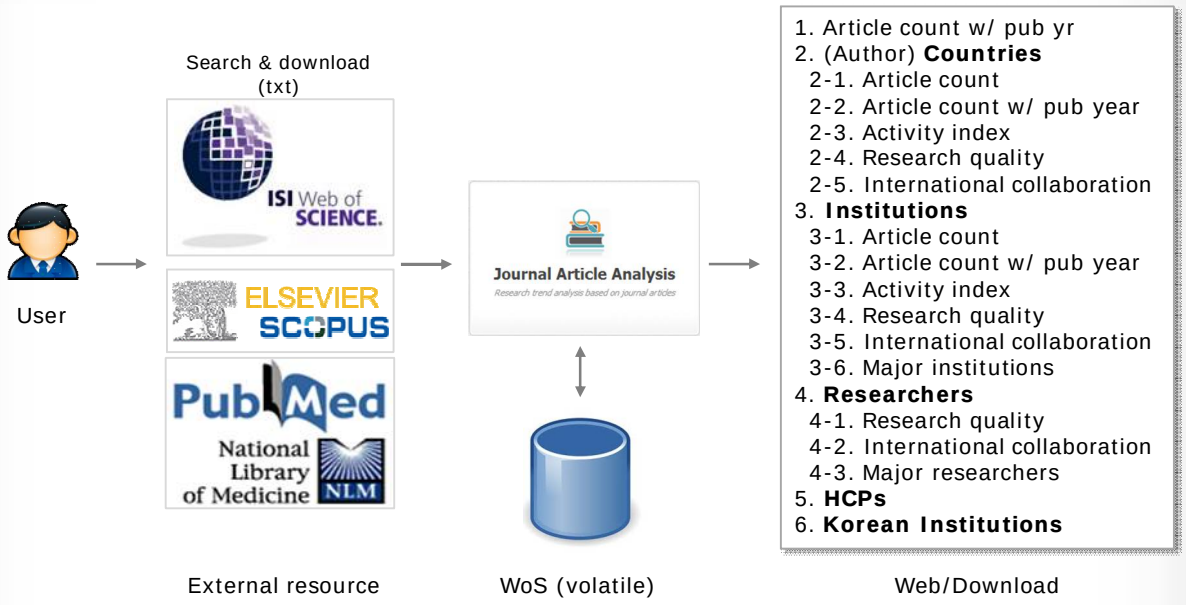


1. **IPC** analysis
  1-1. IPCs per competitors
  1-2. IPCs per competitors w/ pub yr
  1-3. Periodic distribution
2. **USPC** analysis
  2-1. USPCs per competitors
  2-2. USPCs per competitors w/ pub yr
  2-3. Periodic distribution
3. **Family patent** analysis
  3-1. Target countries
  3-2. Target countries w/ pub yr
  3-3. Periodic distribution
4. **Inventor** analysis
  4-1. Inventors w/ pub yr
  4-2. Periodic distribution
5. **HCPs** per competitor

Web/download

- To profile each of the **selected competitor's activity**
- By analyzing the distribution of IPCs, USPCs, target countries and inventors of each competitor

Journal Article Analysis



- To get an overall 'landscape' of a TOI to **identify major competitors** in **'science domain'**
- By analyzing the article count (w/ publication year), research quality, activity index WRT country, institution (international and Korean), and researcher

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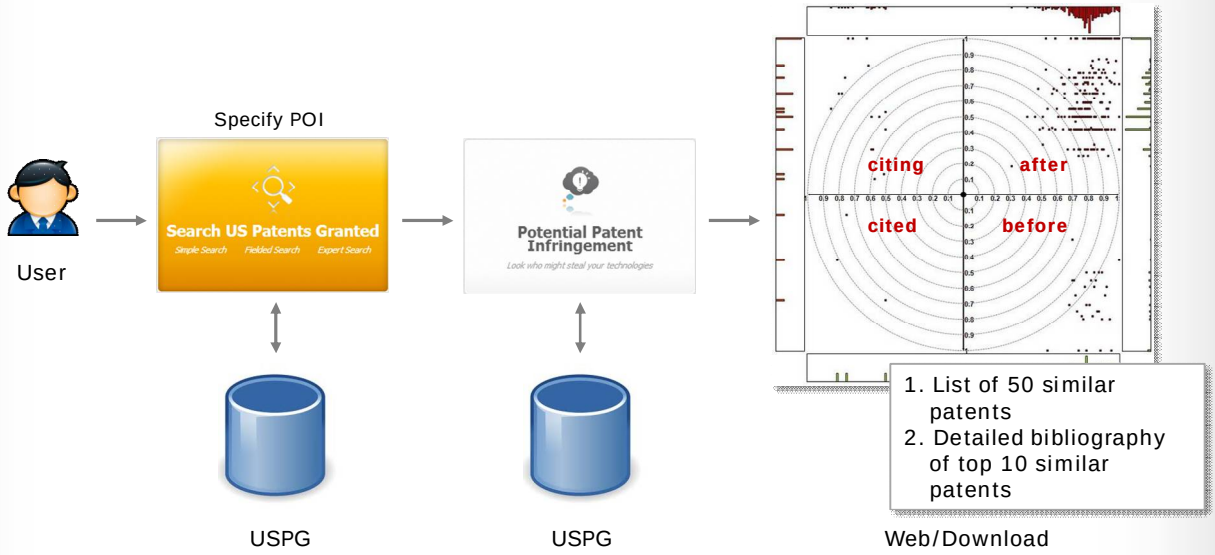
Potential Patent Infringement



- To **identify potential competitors** (or partners) to prepare future threat (or opportunity)
- By comparing a POI (Patent of Interest)with a set of patents in terms of the matching of claims and patent classifications

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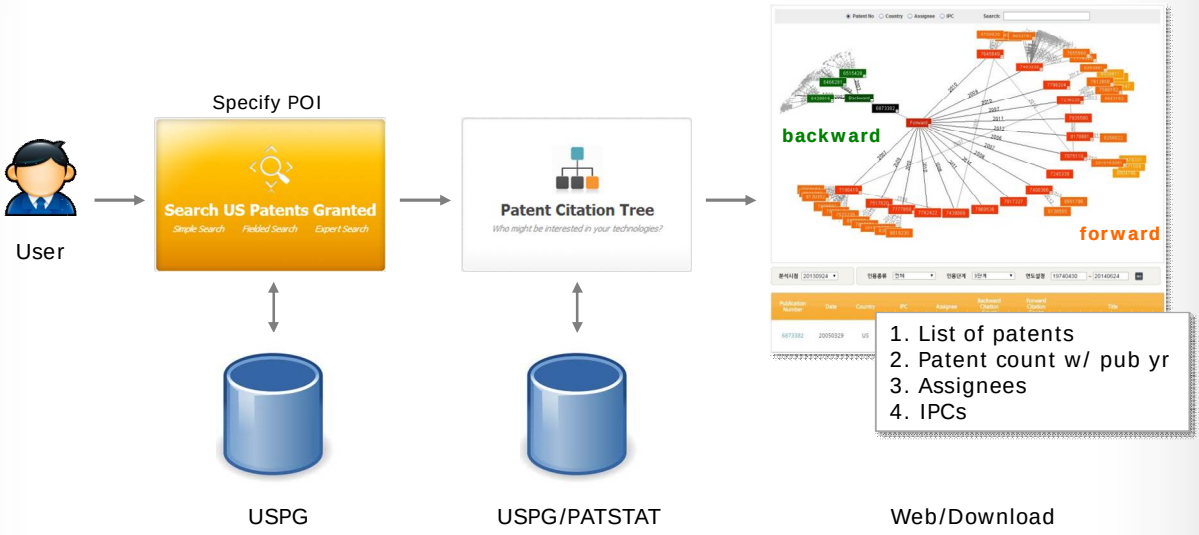
Patent Citation Tree



- To **trace the prior-art** of an invention or to **explore the attention** paid by the followers (competitor/collaborator)
- By navigating the citation tree both in backward and forward direction on a dynamic visualization page with control options

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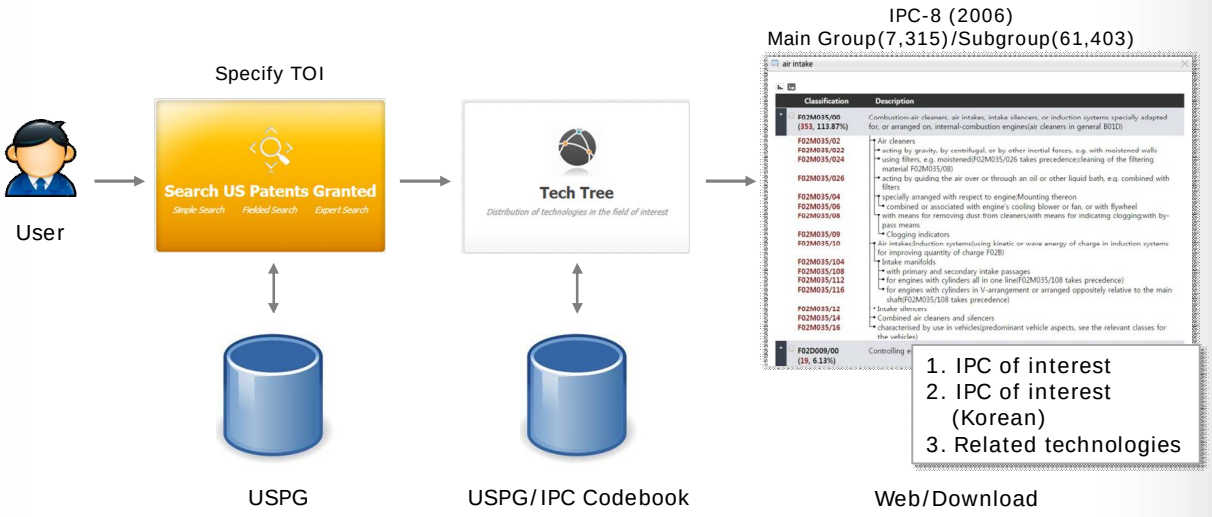
TechTree



- To **identify subsidiary technologies** consisting a TOI in terms of patent classification (IPC)
- By creating a 'tree' based on the IPCs extracted from all the patents consisting a TOI reflecting the hierarchy of IPCs

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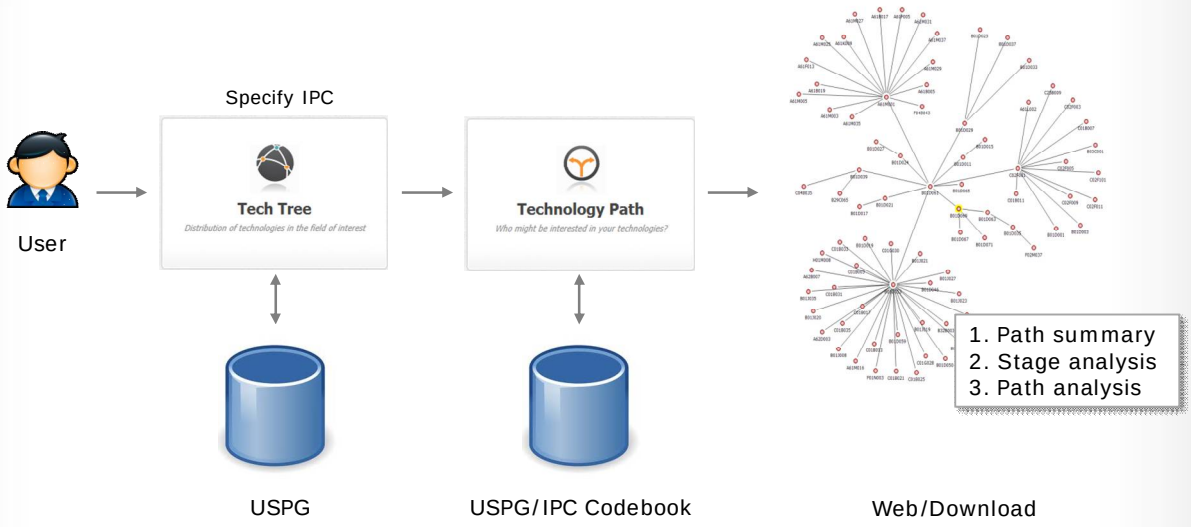
TechPath



- To find out **where a firm's R&D activity can be extended to** in terms of patent classification (IPC)
- By navigating the co-occurrence matrices of IPCs for pre-defined time periods (1/3/5 years)

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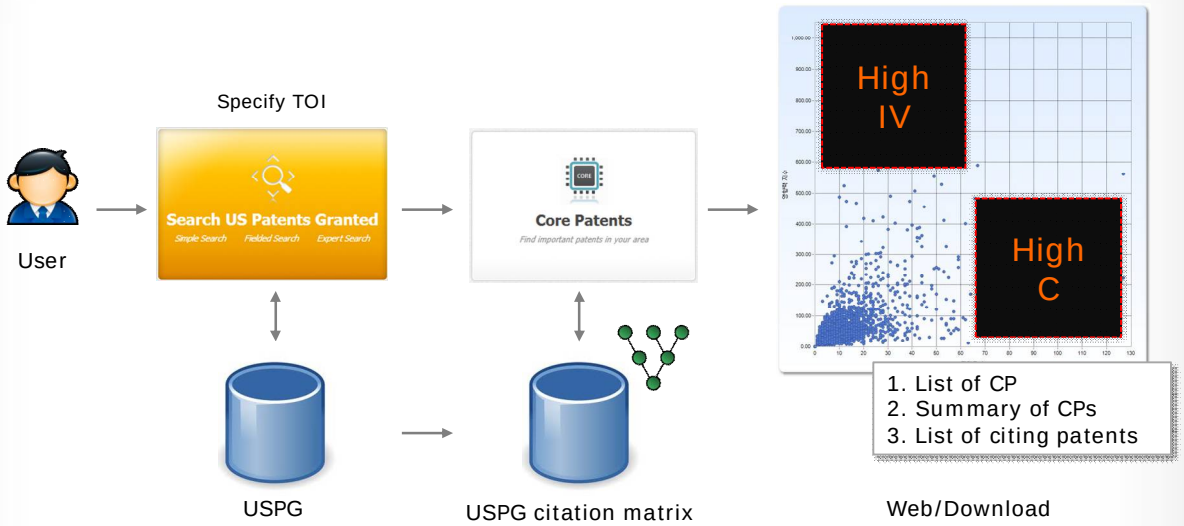
CorePatents



- To find out **'core patents (patents of high impact)'** from a large set of patents
- By considering two citation-based indicators: simple citation count and impact value (IV), the latter of which reflects the importance and age of citing patents

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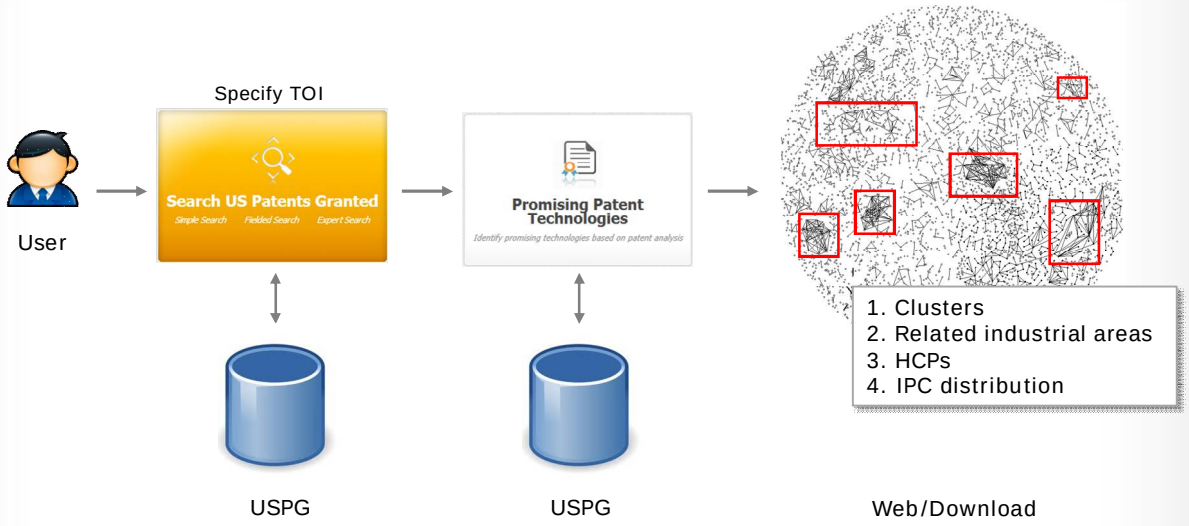
Promising Patent Technologies

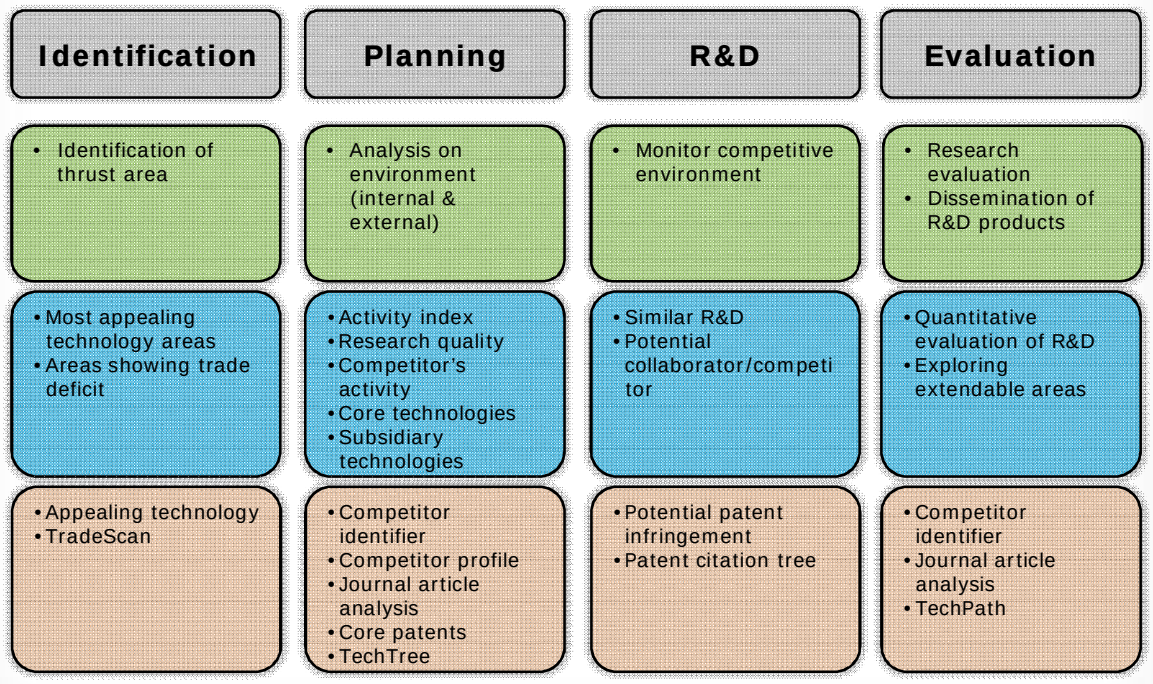


- To gain an insight for **identifying new opportunities surrounding a TOI**
- By clustering the highly cited patents in near-by technological areas to see what attracted the peers' attention the most

Trade Scan

- To find **new market opportunities in terms of trade imbalance** (different from conventional market analysis)
- By analyzing trade statistical data to examine the trade surplus/deficit condition of the goods which Korea has been involved in

Application scenario based on R&D stages*



* B.Y. Coh et al., "Strategic Technology Roadmap", KISTI, 2008.

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Applications – institution/program level

- COMPAS has been applied to many **government-funded institutions/R&D programs, by KISTI,** such as:

- Government research institutions under **National Research Council**
  - Planning of Collaborative Allied Projects (9 cases) and National Agenda Projects (6 cases)
- **Korea Technology and Information Promotion Agency for SMEs**
  - Identifying promising items for SMEs (62 cases)
- **Association of Science and Technology Information**
  - Planning R&D projects (47 cases)

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Comments
&
Questions

(hlee@kisti.re.kr)

Opinion Mining in Social Networks

March 2016

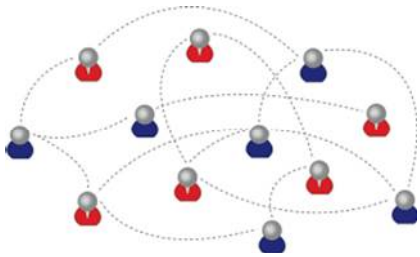
Department of Data Science and Applications
Nguyen Viet Anh, Ph.D.

Data Science

Introduction to Opinion Mining

Social Network

Information, thoughts and opinions are shared prolifically these days on the social network



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To much information

- ✓ It can be difficult to get the relevant information out of such large volumes of data in a useful way
- ✓ Social network analysis is all about the users who are actively engaged and generate content
- ✓ Social networks are pools of a wide range of articulation methods, from simple "I like it" buttons to complete articles

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Opinion Mining

People write blog posts, comments, reviews about all sorts of different topics

Opinion Mining: automatically extracting opinions, emotions and sentiments

We can track products, brands and people and determine whether they are viewed positively or negatively

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Why opinion mining?

It allows business to track:

- New product perception
- Brand perception
- Reputation management
- Flame detection

It allows individuals to get:

- An opinion on something (reviews) on a wide scale

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Opinions are not equal

- Opinion Mining needs to take into account how much influence any single opinion is worth
- This could depend on a variety of factors, such as how much trust we have in a person's opinion, and even what sort of person they are
- Need to account for:
  - ✓ experts vs non-experts
  - ✓ Spammers
  - ✓ frequent vs infrequent posters
  - ✓ “experts” in one area may not be expert in another how frequently do other people agree?

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How Sentiment Analysis works

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Several fields of computing merge

Natural language processing → It deals with the actual text element. It transforms it into a format that the machine can use

Artificial intelligence → It uses the information given by the NLP and uses a lot of maths to determine whether something is negative or positive

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The problem has several dimensions

How does a machine define subjectivity & sentiment?

How does a machine analyses polarity (negative/positive)?

How does a machine deal with subjective word senses?

How does a machine assign an opinion rating?

How does a machine know about sentiment intensity?

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What is an opinion to a machine?

It is a "quintuple", an object made up of 5 different things:

$$(o_j, f_{jk}, so_{ijkl}, h_i, t_l)$$

O_j = The thing in question (i.e product)

f_{jk} = a feature of Oj

SO_{ijkl} = the sentiment value of the opinion of the opinion holder h_i on feature f_{jk} of object o_j at time t_l

These 5 elements have to be identified by the machine

{defined by Bing Liu in the NLP handbook}

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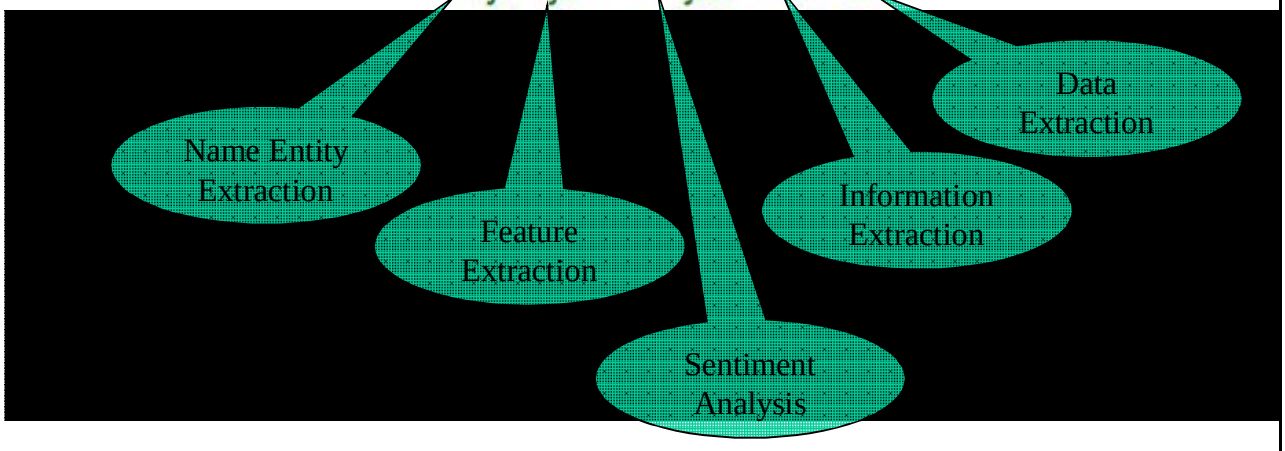
They are hard to resolve

It is a "quintuple", an object made up of 5 different things:

$$(o_j, f_{jk}, so_{ijkl}, h_i, t_l)$$



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Machine Learning for Sentiment Analysis

- ML is an effective way to classify opinionated texts
- We want to train a classifier to categorize free text according to the training data
- Good examples are consumers' reviews of films, products, and suppliers.
- We train the ML system on a set of reviews so it can learn good and bad reviews, and then test it on a new set of reviews to see how well it distinguishes between them

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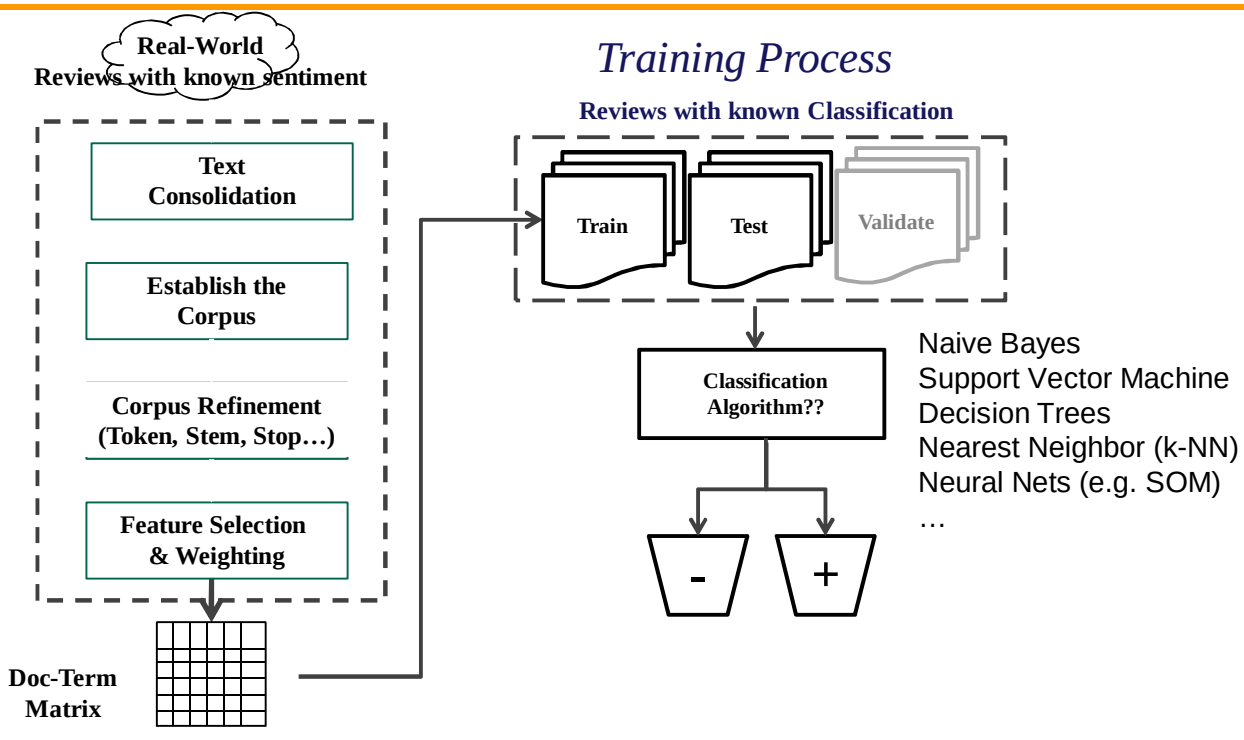
Sentiment Classification



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Rule-based techniques

These rely primarily on sentiment dictionaries, plus some rules to do things like attach sentiments to targets, or modify the sentiment scores

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The Case of Vietnam

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Digital in Vietnam

Jan 2015

Sources: Wikipedia; InternetLiveStats, InternetWorldStats; Facebook, Tencent, VKontakte, LiveInternet; GSMA Intelligence

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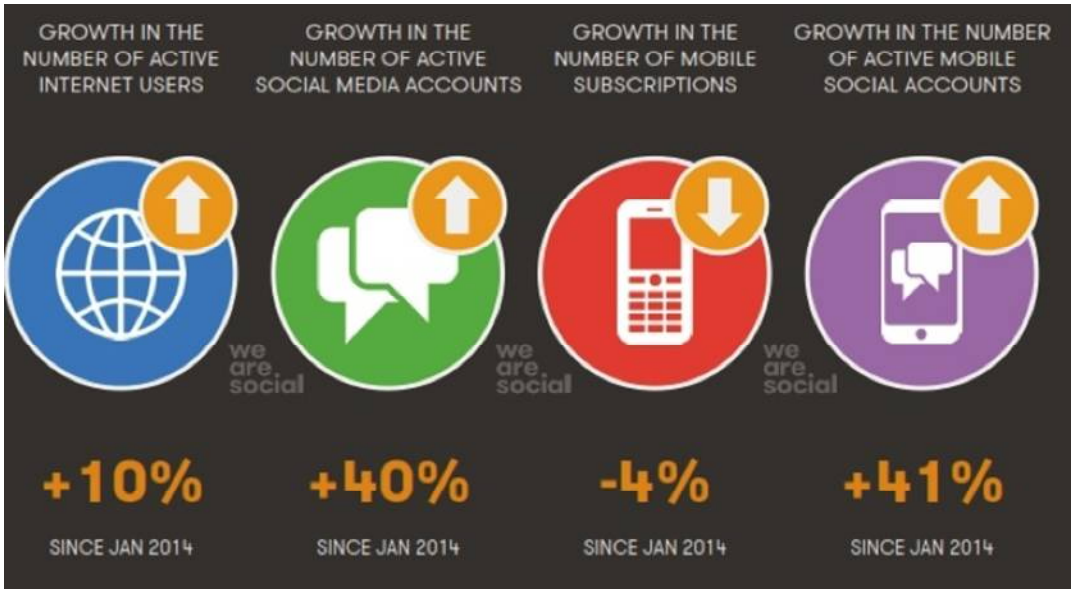
Annual Growth



Sources: Wikipedia; InternetLiveStats, InternetWorldStats; Facebook, Tencent, VKontakte, LiveInternet; GSMA Intelligence

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How consumers publish their opinions

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Social Networks in Vietnam

facebook
LinkedIn
twitter
Zing
tamtay.vn
Vòng tay lớn mãi
LinkHay.com
Mạng chia sẻ tin tức
mimo
YouTube
YuMe
cyvee
myworld
go.vn
Nối.vn

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Computing resources

- Sentiment analysis and opinion mining research has mainly concentrated on English and other important languages
  - Various commercial and open-source solutions exist mainly for English
  - Corpora of opinionated texts and databases of affective words (general or domain specific) also exist for these languages

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Vietnamese language

- Vietnamese is an analytic (words are composed of a single morpheme) language.
- Vietnamese does not use morphological marking of case, gender, number, and tense.
- Syntax conforms to Subject Verb Object word order
- The written language uses the Vietnamese alphabet ("national script"), based on the Latin alphabet.

Xin chào
Rất vui được gặp các bạn
Xin cảm ơn và hẹn gặp lại

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About Vietnamese Language Processing

- Work done in isolation, no inheritance people have to do their work from the scratch without sharing and collaboration
- Resources and tools:
  - Vietnamese Word Segmentation
  - Vietnamese Part-Of-Speech Tagger
  - Vietnamese Chunker
- Việt WordNet: Under Construction
- Việt SentiWordNet: Under Construction

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Opinion Mining in Gate

- GATE (General Architecture for Text Engineering) includes:
- **components** for language processing, e.g. parsers, machine learning tools, stemmers, IR tools, IE components for various languages...
- tools for **visualising** and **manipulating** text, annotations, ontologies, parse trees, etc.
- **various information extraction** tools
- **evaluation** and **benchmarking** tools

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Thank you for your attention!

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CREATING YOUR INNOVATIVE VALUE

KREONET : Korea Research Environment Open NETwork

KREONET activities for Data-Intensive Science

Min-Ki Noh (mknoh@kisti.re.kr)

KISTI 한국과학기술정보연구원

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1. Data-Intensive Science

Data Explosion

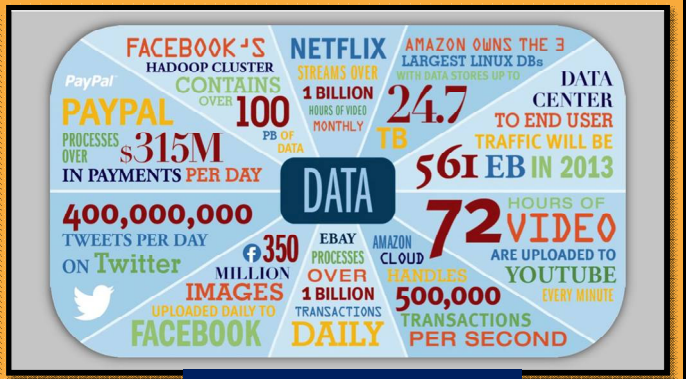
Zetta-bytes data's Generation

- ~2011, 0.8 zetta < 2011, 1.8 zetta
- Since 2015 data will be about 7,000 exabytes

Smart devices and Individual & unstructured information

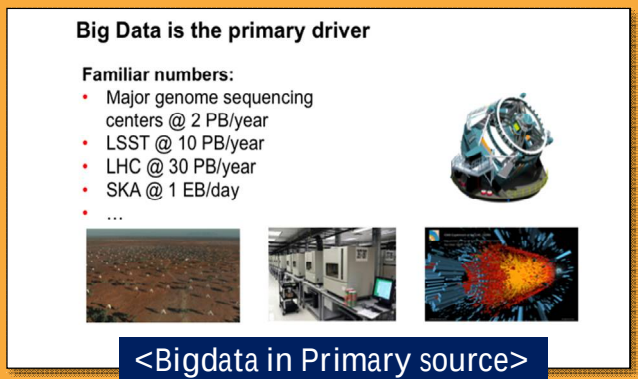
- Data→ Information → Knowledge → Intelligence, Valuable? Unstructured Data ?
- Big data include Unstructured data " Data is 21th's Oil"
- Small data grow as Big data, Key point is how to make valuable information

<Bigdata on internet>



<Bigdata on internet>

Scientific Big Data



<Bigdata in Primary source>

<Bigdata in Science field>

- **Experiments needs to transfer processing to Consumers with Huge size**
- **The data size scarcely decrease when Its arrive at Scientist sites**
- **Capture→Curation→Simulation→Consumer**
- **Build the environment for support the total process**

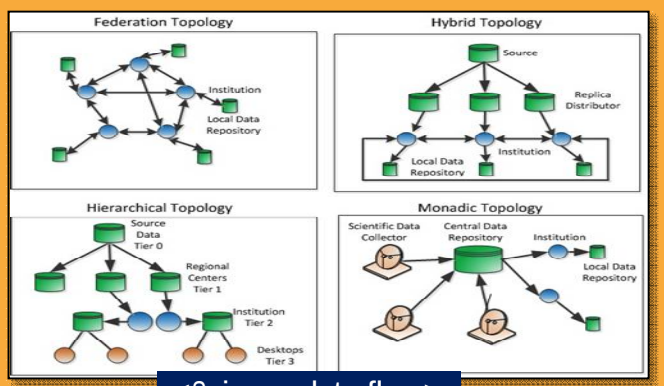
Big data of Science

Each science have special data Flow

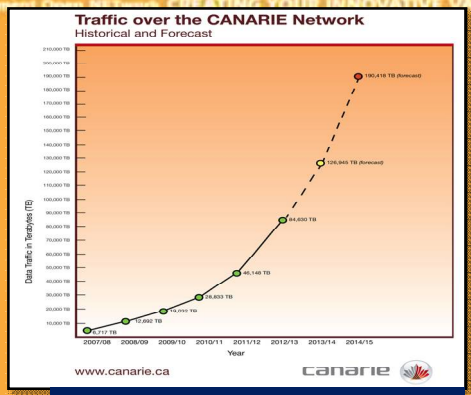
- Federation , Hybrid shared, Hierarchical and Monadic Source-Centric
- Define the flow what its optimized

Converge or Integrate to total Cloud? Or data center?

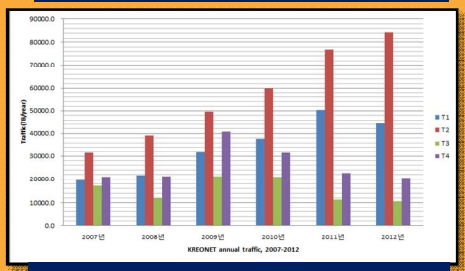
- Hard to store and calculate on specific IT resource
- Need the total Integrated environment experiment storage, HPC on network for enormous data



<Science data flow>



<Traffic glow of CANARIE>



<Traffic glow of KREONET>

The Fourth Paradigm

CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork CREATING YOUR INNOVATIVE VALUE

Complex models

- Multidisciplinary interactions
- Wide temporal and spatial scales

Large multidisciplinary data

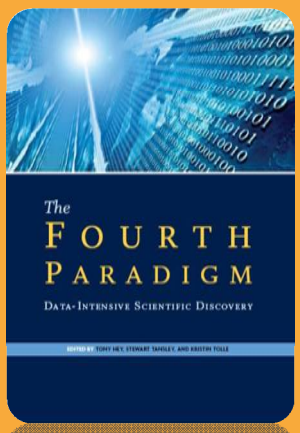
- Real-time streams
- Structured and unstructured

Distributed communities

- Virtual organizations
- Socialization and management

Diverse expectations

- Client-centric and infrastructure-centric



In *The Fourth Paradigm: Data-Intensive Scientific Discovery*, the collection of essays expands on the vision of pioneering computer scientist Jim Gray for a new, fourth paradigm of discovery based on data-intensive science and offers insights into how it can be fully realized

www.fourthparadigm.org

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Data-intensive Environment

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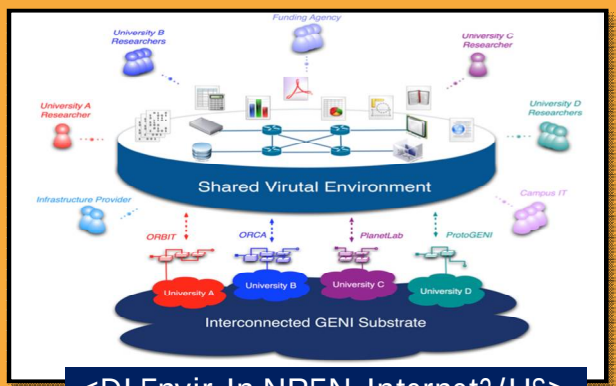
Support Complex model

- Specific flow path and Open data path for Multidisciplinary interactions
- Wide temporal and spatial scales

Realizing transmission of Large multidisciplinary data

- High performance for real-time stream
- Open data path for wide and spatial scales

<Components of DI Research>



<DI Envir. In NREN, Internet2/US>

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Data-intensive network

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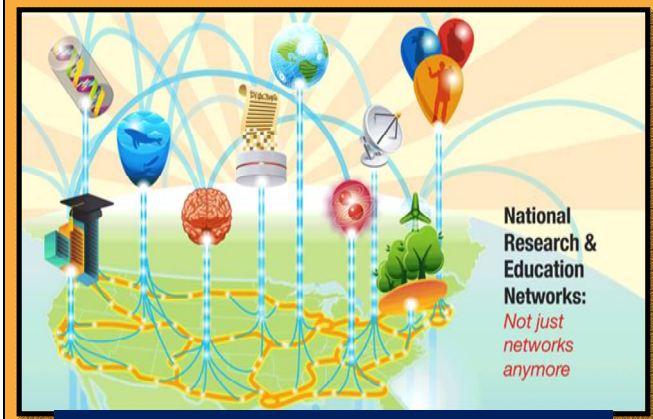
Support Complex model in Cyber-infrastructure

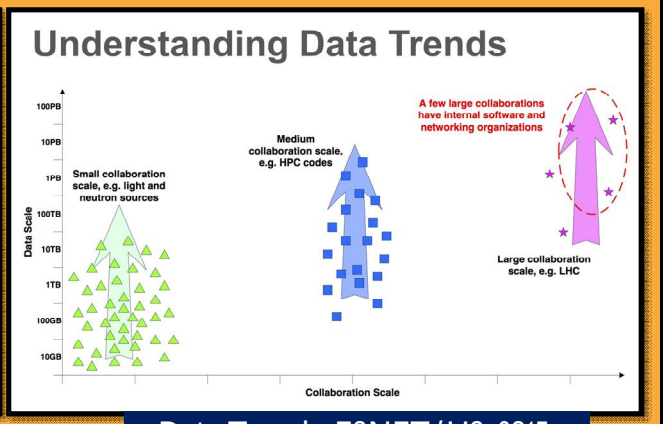
- Connecting not only sites but also applicati0ns
- Global scale support model for specific and various data trends

Realizing transmission of Large data

- High performance path between data source and consumer
- Open data path for principle applications, 'Not just connections anymore'



<Cyber infra in NREN, Internet2,2015>



<Data Trends, ESNET/US, 2015>

9

2-1. KREONET & Applications

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KREONET(National)

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- **K**orea **R**esearch **E**nvironment **O**pen **N**etwork
- **Korea's National Science & Research Network, since 1988**
- **Up to 200Gbps Backbone between Seoul and Daejeon**
- **Supports 1Gbps & 40Gbps User Connections**
- **About 200 connected R&E organizations in Korea**

<KREONET network diagram, 2015>

Network technologies

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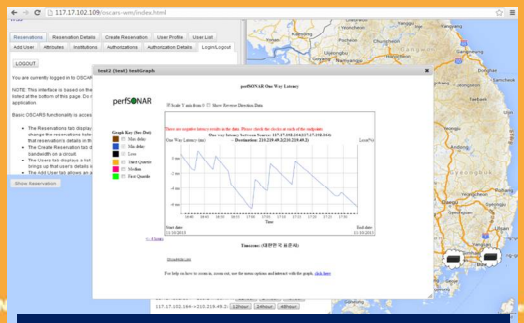
- **IP Networking Service**
  - Multiple upstream to several commercial Internet eXchanges (SK-IX, KT-IX, DIX, GIX) with about 10Gbps
- **KREONET DES (Dynamic Ethernet Service)**
  - Next Generation Carrier Ethernet Technology based on Point-to-Point and Multi-point Service (E-LINE, E-LAN, E-TREE) with bandwidth guaranteed: ~ 10Gbps
  - Standardized Services, Quality of Service, Scalability, Reliability, Service Management [MEF Carrier Ethernet]
  - Ciena MERS8610, MESU1850, CN5410, CN3960
- **Lambda/Lightpath Service and SDN Service, focus on Performance**
  - SDH/SONET channeling
  - VCAT, LCAS, GFP,OTN Switching, SDN VDN Service

<Logical network service, KREONET>



<Real-time performance service>

GLORIAD(Inter-national)

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The “GLORIAD” advanced science internet network was launched in January 2004 by the U.S., China and Russia, and expanded its reach in 2005 – to Korea, Canada and the Netherlands – and in 2006 to the five Nordic countries of Denmark, Finland, Iceland, Norway and Sweden.

<KRLight & GLORIAD, 2015>

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GLORIAD : Global Ring Network for Advanced Applications Development

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KREONET GLOBAL Links

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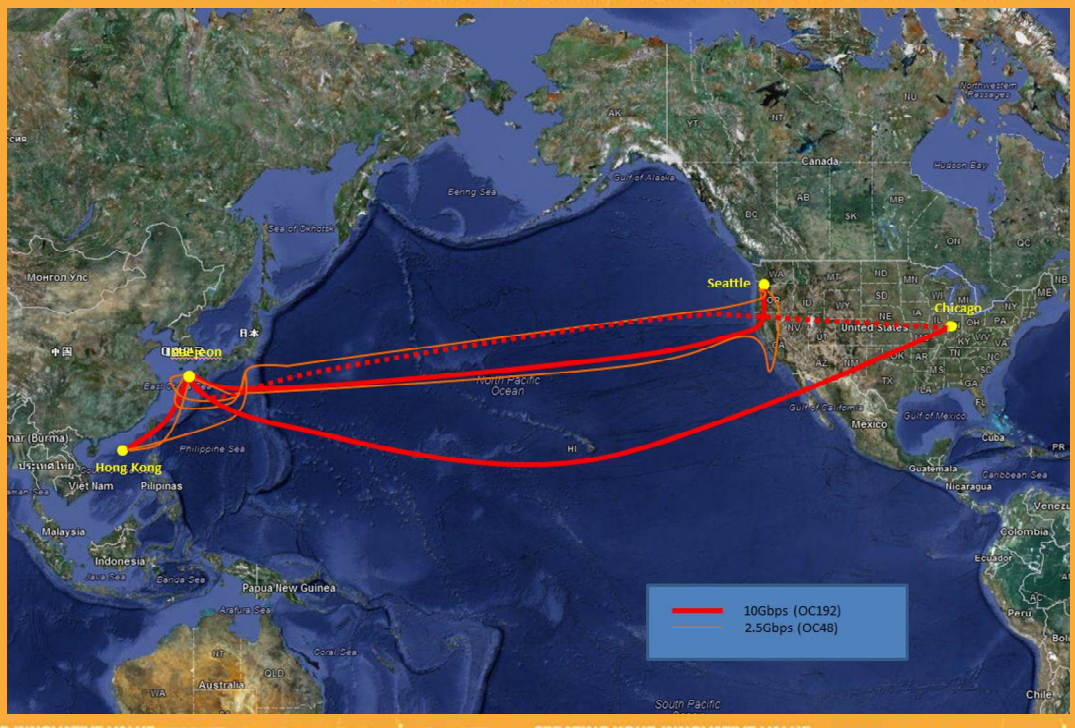

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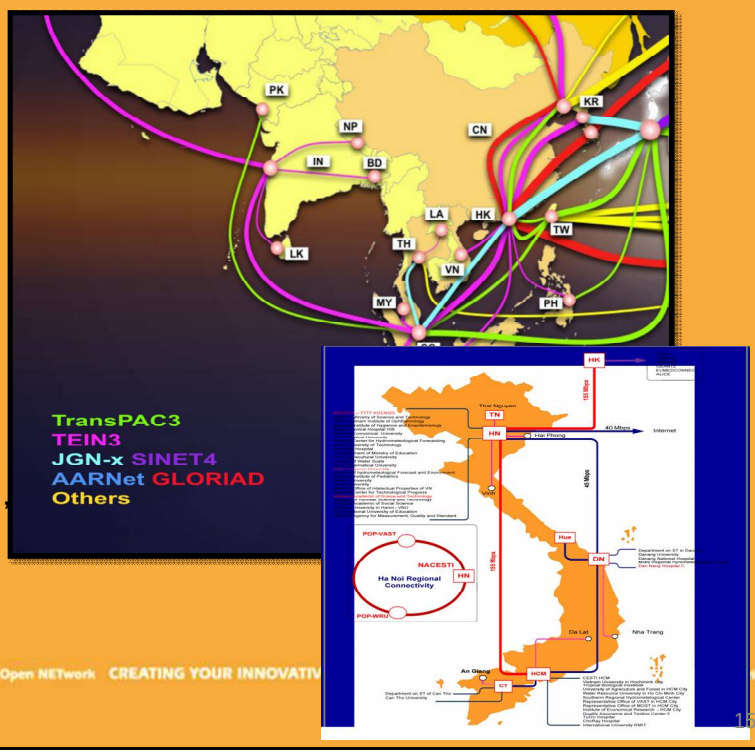
Asia-Pacific Links (APAN)

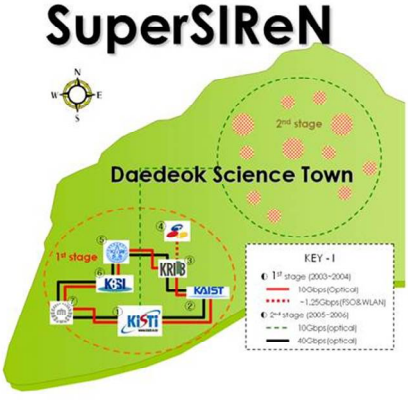
- APAN (the Asia Pacific Advanced Network) refers to both the organization representing its members, and to the backbone network that connects the research and education networks of its member countries/economies to each other and to other research networks around the world.

'KR –(GLORIAD) - HK-(TEIN3)-VN'



Specialized Area Network

The "SuperSIReN" is provided to Institutes located in Deaduck Science Town. SuperSIReN designed in 2002, Constructed the rich fiber among 7 number of Institutes such as KBSI, KARI, KISTI ..
Members of SuperSIReN are focus to advanced research activities, e-Science. SuperSIREN is installed first IPv6 working 10G network as well.



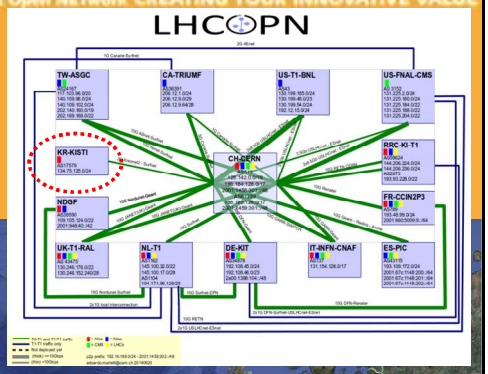
KISTI
KBSI 한국기초과학지원연구원 KOREA BASIC SCIENCE INSTITUTE
충남대학교 CHUNGNAM NATIONAL UNIVERSITY
KIGAM 한국지질자원연구원
KAIST

Others(Specific use)

LHCOPN (LHC Optical Private Network)

: Between CERN LHC Tier O LHC Tier 1 (KISTI)

10Gbps HEP specific network



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2-2. KREOET SERVICE

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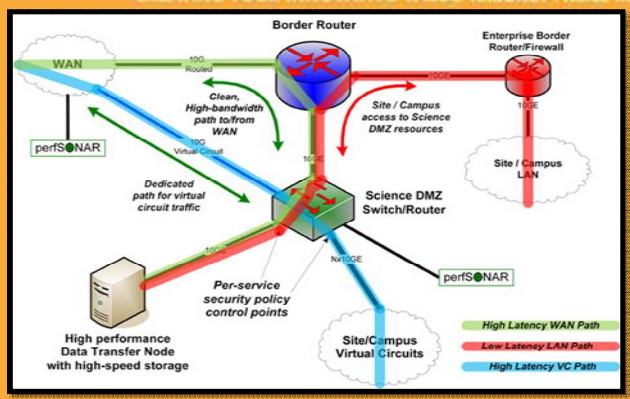
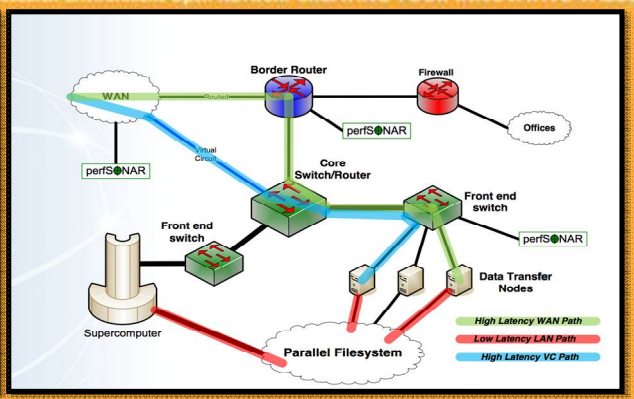
DATA-Intensive Service





Science DMZ integrates key concepts into a unified whole that together serve as a foundation for this model.

- A network architecture explicitly designed for high-performance applications, where the science network is distinct from the general-purpose network
- The use of dedicated systems for data transfer node
- Performance measurement and network testing systems that are regularly used to characterize the network and are available for troubleshooting

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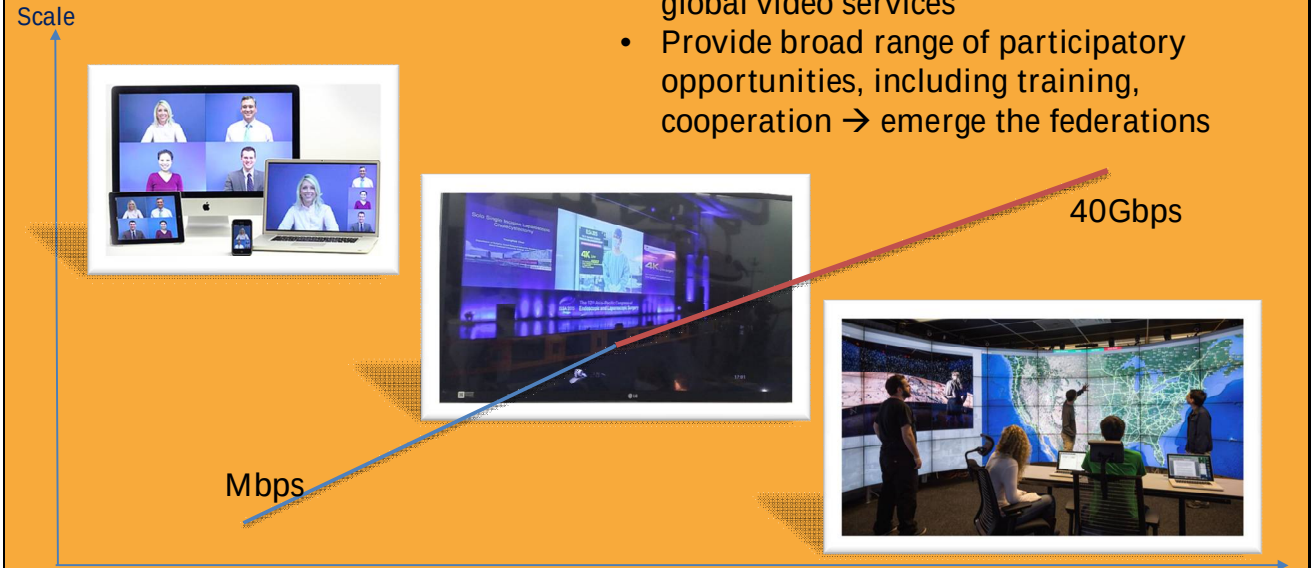
Remote Visualization Service

- **Vidyo, 4K, SAGE2**

Provides key enabling technologies, like global video services

- Provide broad range of participatory opportunities, including training, cooperation → emerge the federations



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SAGE2

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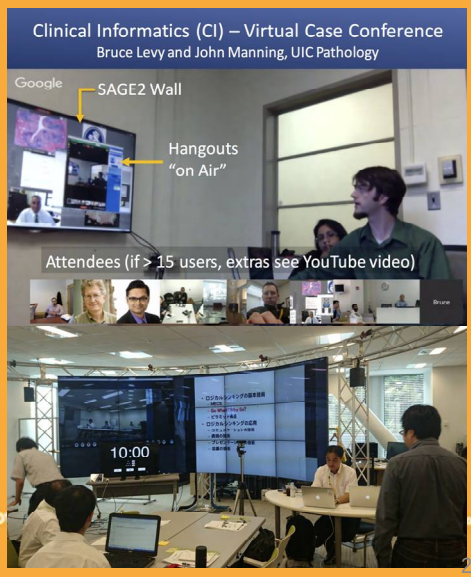
SAGE2 Scalable Amplified Group Environment

- Designed to enable groups to work in front of large shared displays in order to solve problems using cloud-based and web-browser technologies
- Enhance data intensive co-located and remote collaboration and the afforded benefits to data intensive collaboration.

<KREONET SAGE2 system>



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SDN (Software Defined Network)

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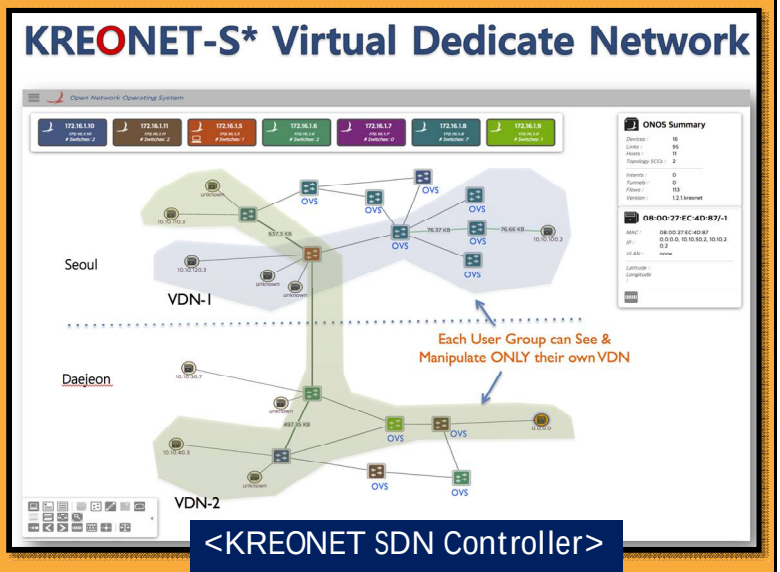
- SDN function is control the application flow
- The flow can be changed the path on real-time
- The control authority will be given to consumer
- VDN have functions of dedication, allocation, classification, security



<KREONET SDN Controller>

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2-3. Applications on KREONET

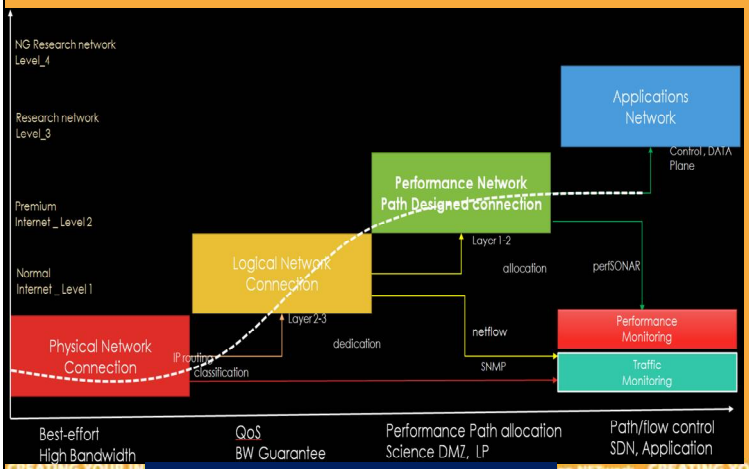
KREONET as an applications network

Network extend and upgrade for scientific applications

- Very wide physical connection + logical peering between community sites
- Enhance the bandwidth and Guarantee the Quality for Scientific data.

Performance for each applications and multidisciplinary data

- Allocate and control the optimal path and flow for data transmission



<KREONET network level>

<KREONET application network>

Applications on KREONET

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- Support application groups for share the data and cooperative work
- Scientific Communities have an equivalent goal and same condition.
- 10 of application groups, communities, composed of 80 applications sites.

HEP

Climate/Meteorology

Remote Education

Medical Science

Future Internet

Astronomy

Bio/Genome

CT/ UHD

Construct

Supercomputing network

Astronomy (e-KVN)

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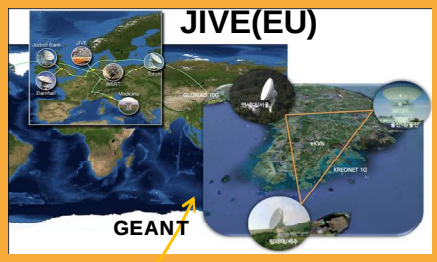
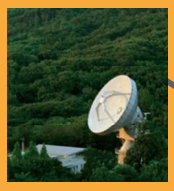
- e-VLBI, electronic Very Long Baseline Interferometry
- Research and test Remote radio astronomical observatory in Yensei, Ulsan and Tamra, operations center of KVN
- Construction of high speed network and internal network environment (Dynamic ethernet Service)





Yensei@Seuol

10G

Data center @KASI

10G

KREONET

C4506

Seoul

10G

KREONet2

Daejeon

GLORIAD

AARNet

JGN-X/SINET

10G

jeju

Ulsan

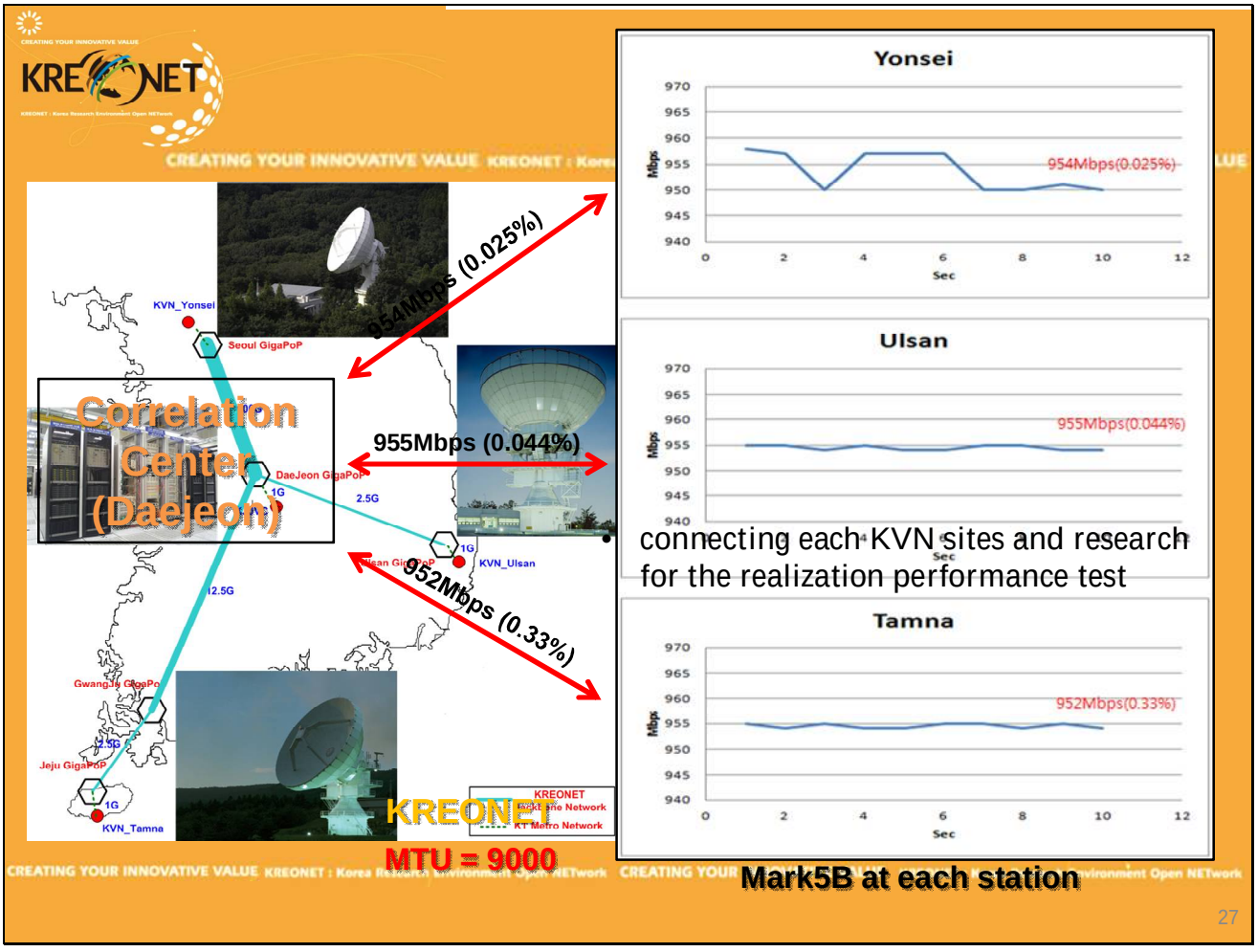
10G

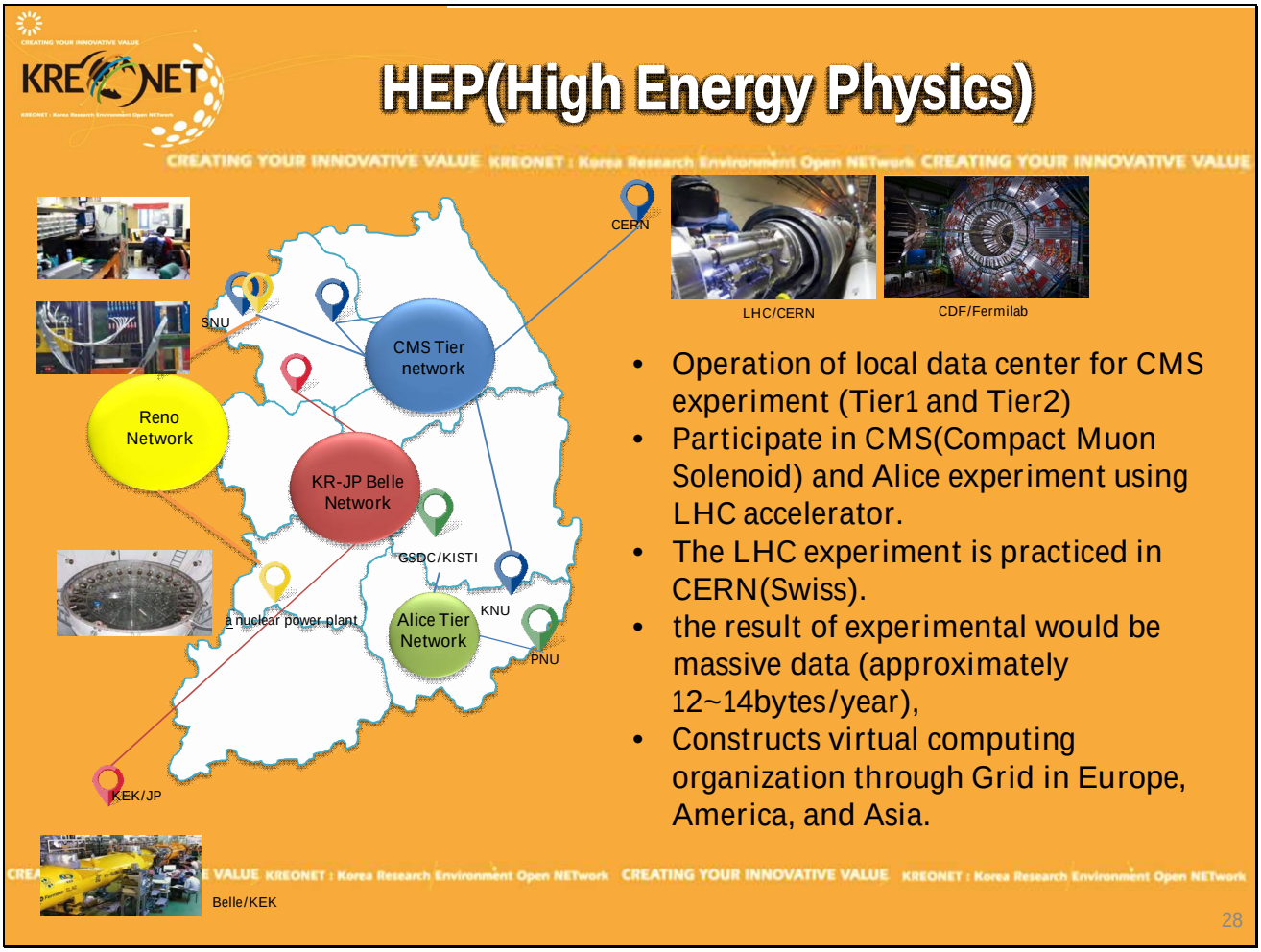
Tamra-Jeju

KREONET carrier ethernet

Ulsan

KREONET Dynamic ethernet service (E-tree)


KREONET
CREATING YOUR INNOVATIVE VALUE
KVN_Yonsei
Seoul GigaPoP
954Mbps (0.025%)
Correlation Center (Daejeon)
DaeJeon GigaPoP
955Mbps (0.044%)
2.5G
1G
KVN_Ulsan
952Mbps (0.33%)
12.5G
Gwangju GigaPoP
Jeju GigaPoP
KVN_Tamna
KREONET
MTU = 9000
Yonsei
954Mbps(0.025%)
Ulsan
955Mbps(0.044%)
Tamna
952Mbps(0.33%)
Mbps
Sec
connecting each KVN sites and research for the realization performance test
Mark5B at each station
27


KREONET
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HEP(High Energy Physics)
CERN
LHC/CERN
CDF/Fermilab
SNU
CMS Tier network
Reno Network
KR-JP Belle Network
GSDC/KISTI
KNU
a nuclear power plant
Alice Tier Network
PNU
KEK/JP
Belle/KEK
• Operation of local data center for CMS experiment (Tier1 and Tier2)
• Participate in CMS(Compact Muon Solenoid) and Alice experiment using LHC accelerator.
• The LHC experiment is practiced in CERN(Swiss).
• the result of experimental would be massive data (approximately 12~14bytes/year),
• Constructs virtual computing organization through Grid in Europe, America, and Asia.
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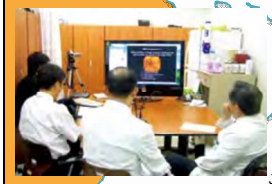
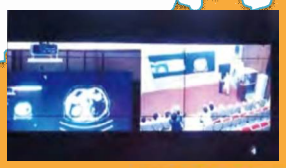
Medical Science



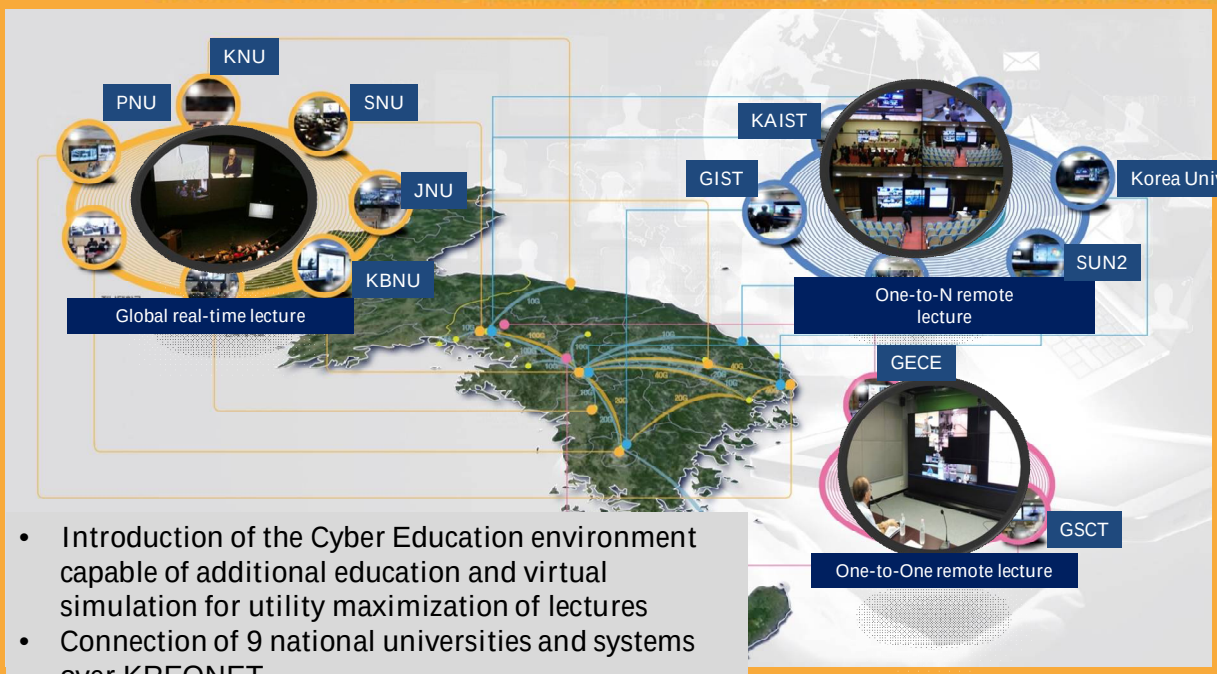


- Provide the real-time interactive environment for collaborative medical research and education
- Construction of virtual space and massive data transmission with other hospital

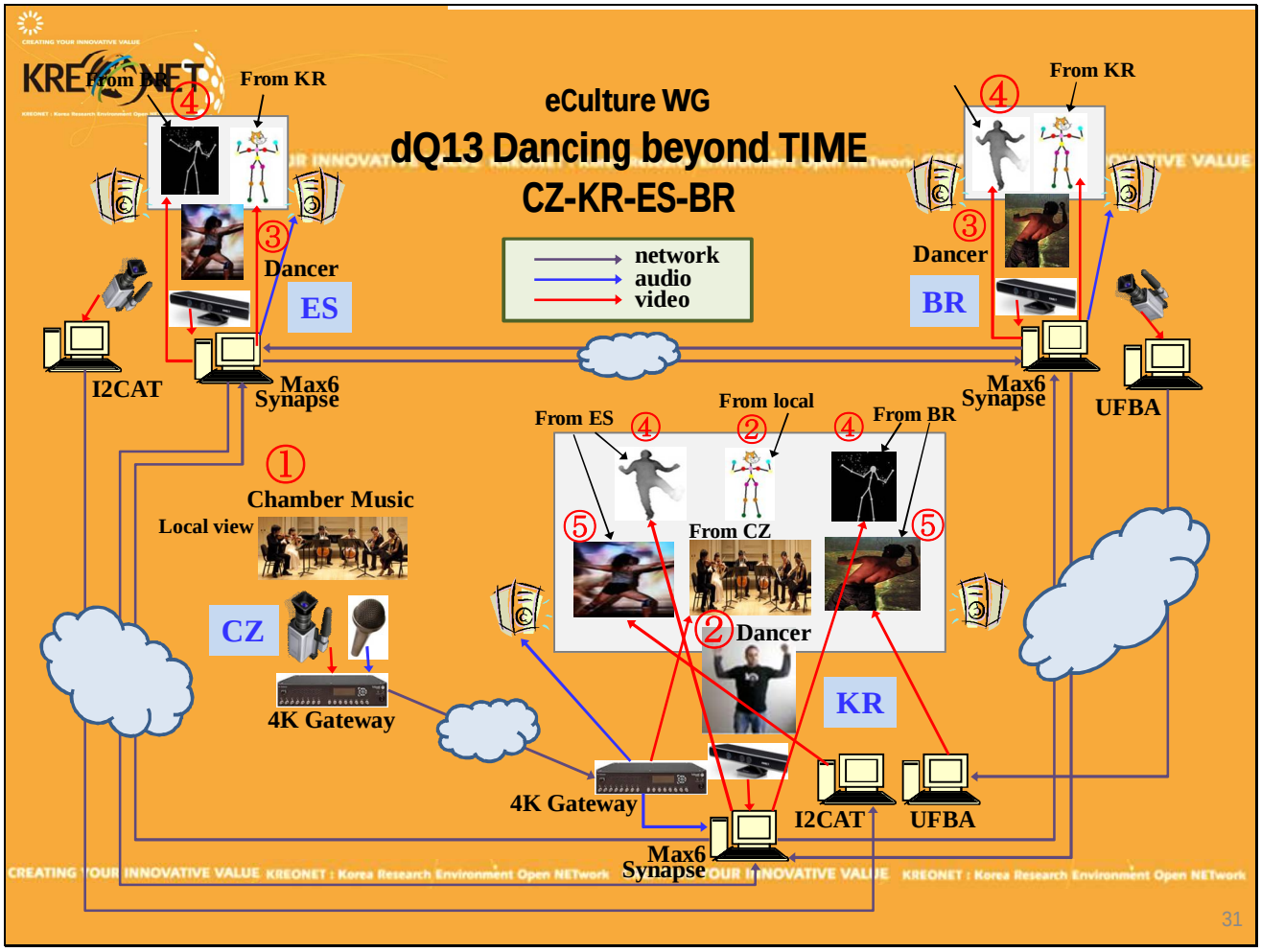
→ Cyber lab (3X3 tiled-display)

- Activation methods of live surgery system between other hospital over KREONET

Remote Education



- Introduction of the Cyber Education environment capable of additional education and virtual simulation for utility maximization of lectures
- Connection of 9 national universities and systems over KREONET
- HD system designed could separated speaker panel and lecture file panel → enhance the remote education efficiency


eCulture WG
dQ13 Dancing beyond TIME
CZ-KR-ES-BR
network
audio
video
From DR
From KR
Dancer
ES
I2CAT
Max6
Synapse
From KR
Dancer
BR
Max6
Synapse
UFBA
Chamber Music
Local view
CZ
4K Gateway
From ES
From local
From BR
From CZ
Dancer
KR
4K Gateway
I2CAT
UFBA
Max6
Synapse
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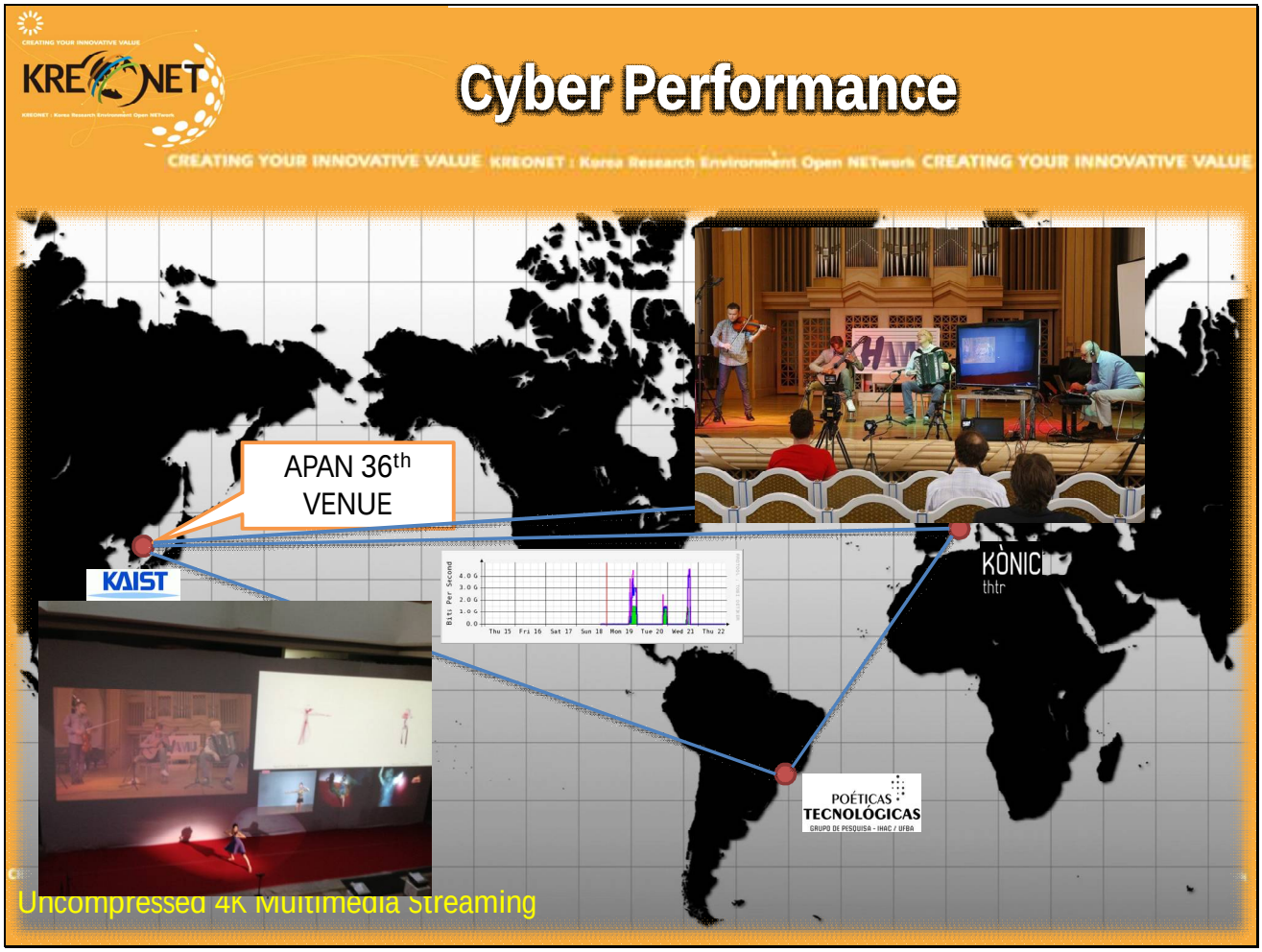
Cyber Performance
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APAN 36th
VENUE
KAIST
KONIC
thtr
POÉTICAS
TECNOLÓGICAS
Uncompressed 4K Multimedia Streaming

UHD/Cyber Performance

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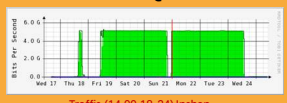
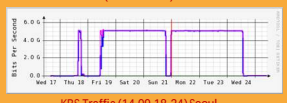
The Real-time uncompressed 4K media transmission for UHD broadcast, 3 cities

· KREONET 10G QoS Multicast network



Traffic (14.09.18-24) Inchen



KBS Traffic (14.09.18-24) Seoul

· 4K UHD uncompressed transmission (KREONET 4K Gateway

KREONET UHD 4K Gateway

KBS UHD Broadcast station (in-chen)

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Supercomputing Network

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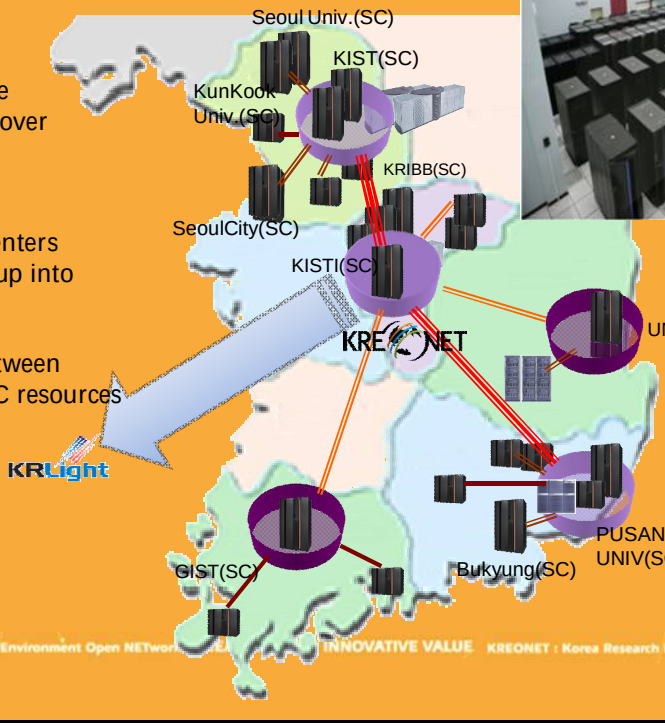
- Cooperative utilization and resource operation of Korea Supercomputer over KREONET
- Support R&D for utilization of supercomputers
- 5 core centers and 10 application centers Support realization of research group into experts forum over KREONET
- Construction of private network between specialized supercomputer and HPC resources



CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork

34

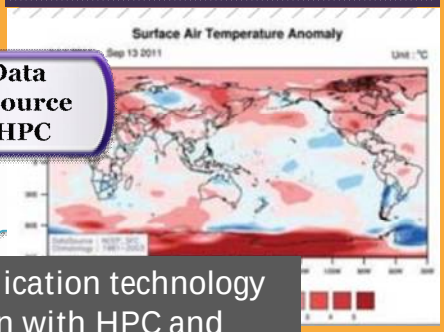
Climate/Weather

CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork CREATING YOUR INNOVATIVE VALUE

KBS

Disaster Broadcast

KMA

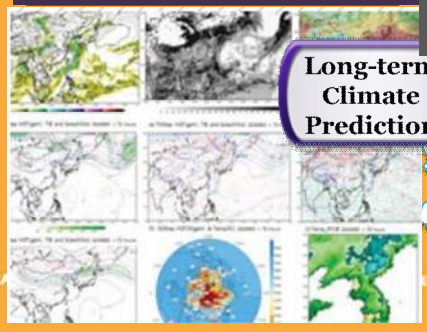


Data resource /HPC

KBS

- Development of application technology for climate prediction with HPC and Data
- Construction of long-term climate prediction system for Korea & AP

Universities



Long-term Climate Prediction

PNU

APCC

Asia Pacific Climate model

CREATING YOUR INNOVATIVE VALUE

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Experimental equipment

CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork CREATING YOUR INNOVATIVE VALUE

SDO

KSTAR

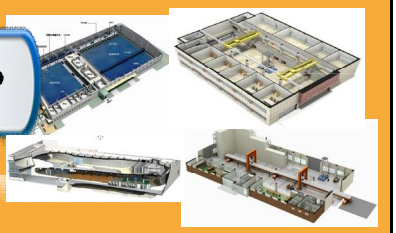
KREONET

KRLight

GLORIAD

HVEM

KOCED



- Many of national large research facilities connect with KREONET
- Remote control the facilities and Share the experimental data with collaborations via KREONET

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ecosystem of Science

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Future Works

CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork CREATING YOUR INNOVATIVE VALUE

1. Innovation of application network encourages science field
   - applications network involve infra, platform and services

2. S&T supported network mean easier solution and technologies
   - Collaborative environment for scientific challenges
   - Support and provide common solutions for consumers on network
   - Enhance monitoring and Prediction

3. Add link connections and peering for global collaborative applications and encourages collaborations between Asian-pacific regions
   - Expect enhanced performance owing to minimize hop and upgrade bandwidth on global communications
   - Total bandwidth between KO-US are over 200G
   - Full routing between TEIN3 and KREONET in late 2015
   → Expect that create the representative cooperative work between KR-VN

CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork

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Summary & Conclusion

1. Diverse applications sites→ Working Community → build the ecosystem of Science

2. Integrate Network Resource and Platform for Converge Service
- Application network level should be supported (focused on performance)
- Data transfer service (Science DMZ model is the best)
- Real-time media sharing system : any scale, any devices be available
- SDN make a path each application's flow

3.Engagement Collaborative work between Scientists
- Support viability of each Scientific Communities
- Create Scientific ecosystem with extended consolidation
- Organize representative Working Communities such as HEP, Medical, CT…

4. Security and Create add-value

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CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork CREATING YOUR INNOVATIVE VALUE

Thanks for kind attention

CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork CREATING YOUR INNOVATIVE VALUE KREONET : Korea Research Environment Open NETwork

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Tracking down the **KISTI's STI Services**

March 15, 2016

Ho Nam Choi
KISTI

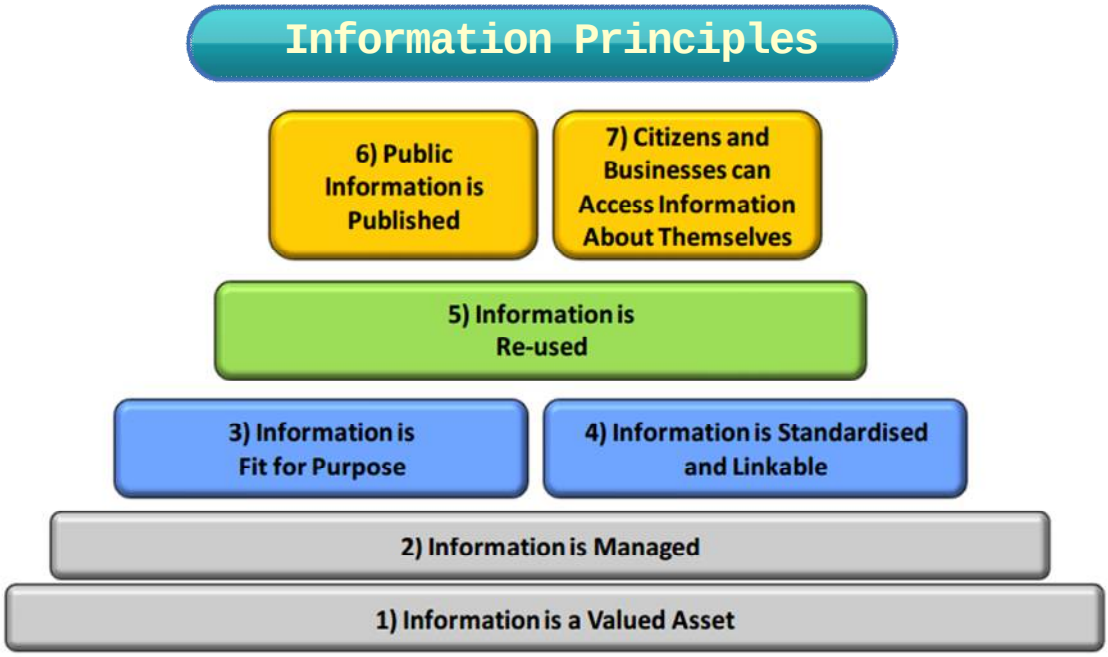
1

Agenda

- Prologue
- Looking back on the Past
  - Sprouting Era
  - Proliferating Era
  - Challenging Era with Digital
- Ongoing STI Services
  - KESLI(Korea Electronic Site License Initiative)
  - Academic Village
  - NDSL(National Digital Science Library)
  - Korea DOI Center
  - NTIS(National Technical Information Services)
  - Big Data
- Implications
- Issues and Problems
- Future Plan

2

Prologue



HM Gov., UK, 2011

3

Looking back on the Past

- Sprouting Era
- Proliferating Era
- Challenging Era with Digital

4

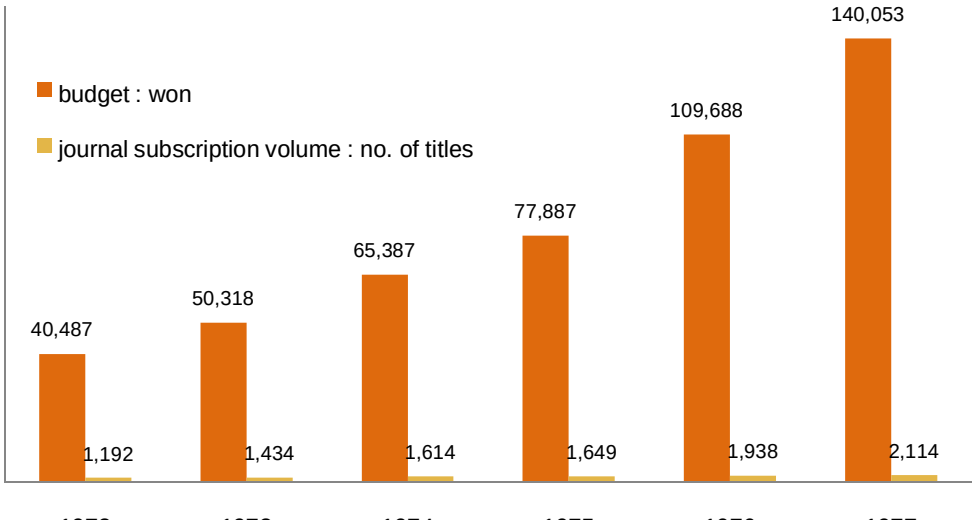
Sprouting Era(1962~1979)

- Bibliography Publication Services
  - Korean Scientific Abstracts(KOSAB) (1969~)
  - Korean Medical Abstracts(KOMAB) (1971~)
  - Current Bibliography on Science and Technology (1969~)
  - Current Bibliography on Foreign Patents (1971~)
  - Union Catalog of Foreign S&T Journals (1968~)
  - Foreign S&T Highlights (1969~)
  - List of Korean Scientists' Achievements (1971~)

5

Sprouting Era(1962~1979)

- **Acquisitions Trends of Paper Journals(~1977)**

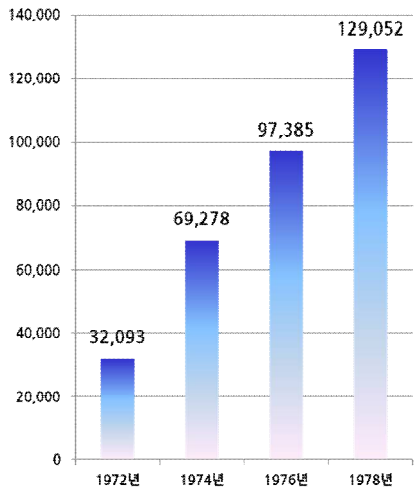


6

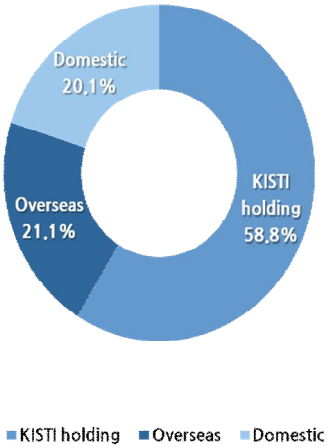
Sprouting Era(1962~1979)

- **Document Delivery Services(~1978)**

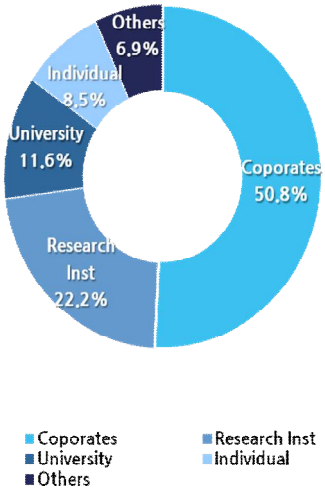
〈DDS Records〉
(1972-1978)



< DDS portion by suppliers >
(1972~1978)



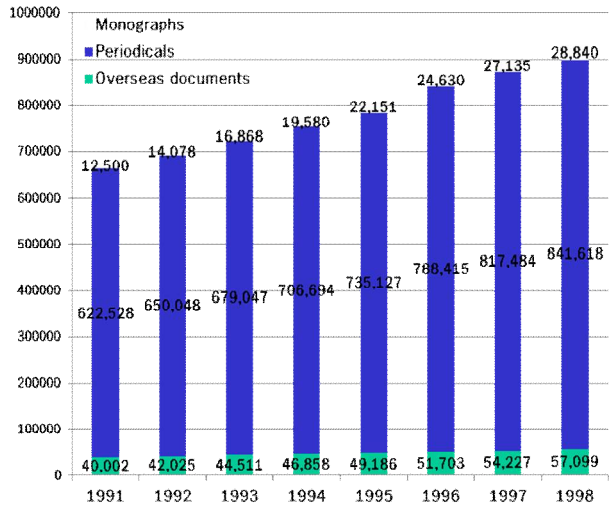
< DDS portion by requesters >
(1972~1978)



Proliferating Era(1980~1999)

- **KISTI's role diversified and expanded**
  - ➢ Collection of information resources expanded and diversified
  - ➢ Continuously increasing DDS

〈Collections of information materials〉



< DDS records >

Division	1984	1985	1986	1987	1988
KISTI holding	224,642	233,160	274,571	321,456	334,334
Overseas office	3,871	3,671	4,168	3,471	3,930
overseas partner	26,594	28,954	29,862	33,842	38,861
domestic partner	10,341	11,620	14,605	18,582	18,600
total	**265,448**	**277,405**	**323,206**	**378,251**	**395,728**

Challenging Era(2000~)

- **Paradigm shift**
  - Paper → Digital
  - Own → Access
  - One way service → Interactive both ways
    * Prosumers
  - Existing Role Players in Scholarly Communication Systems are changed: mixed and confused
    - Libraries, Publishers, Authors, Readers

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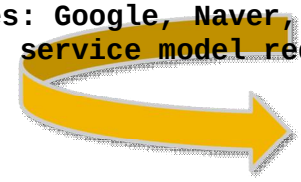
Challenging Era(2000~)

- **from Individual subscription to consortium licensing**
- **DDS is being drastically decreased due to proliferation of digitized documents and internet based IT evolution**
- **Digital library appeared**
- **STI services are all changed to web-based**
- **Both Integrated and Distributed STI service model co-existed in the country**
- **Specialized STI services provided by subject domain or by information type**
- **Academic and Research libraries played roles of important STI nodes. Most of STI service activities were carried out in collaboration with academic and research libraries**
- **Some private companies in Korea started involving in STI services: Google, Naver, DBPIA, KISS, etc.**
- **New STI service model required for coping with digital age**



NDSL

(National Digital Science Library)

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Ongoing STI Services of KISTI

- National Program for STI
  - **KESLI(Korea Electronic Site License Initiative)**
  - **Academic Village**
  - **NDSL(National Digital Science Library)**
  - **Korea DOI Center**
  - **NTIS(National Technical Information Services)**
  - **Big Data**

11

KESLI

- **A Nationwide Library Consortium for joint purchasing of e-journals**
  - ➔ **is a sort of Marketplace dealing with all kinds of digital content and solutions such as e-books, standards, databases, computer s/w, video lectures that are commercially available from overseas and domestically**
  - ➔ **Now has become a data collecting channel needed for global information services through NDSL**
- **Voluntarily sprouted, but now strongly supported by Government**
- **No legal or institutional apparatus supporting the organization and operations of this consortium, but**
- **Growing and developing on demand since the launch in 1999**

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KESLI

- A National Library Consortium managed by KISTI for both joint purchasing of e-publications and resource sharing
- The biggest library consortium in the world in terms of number of participating research libraries: 605 libraries
- Over 3,500 contracts made annually between 605 libraries and 125 worldwide suppliers dealing with over 200 e-content products
- Metadata for all of purchased e-content are incorporated in the NDSL database: 3.5m records collected annually
- With collected usage statistics of all participating libraries KISTI provide them with analytic information services for viewing research trends and supporting their decision making on collection development, etc.

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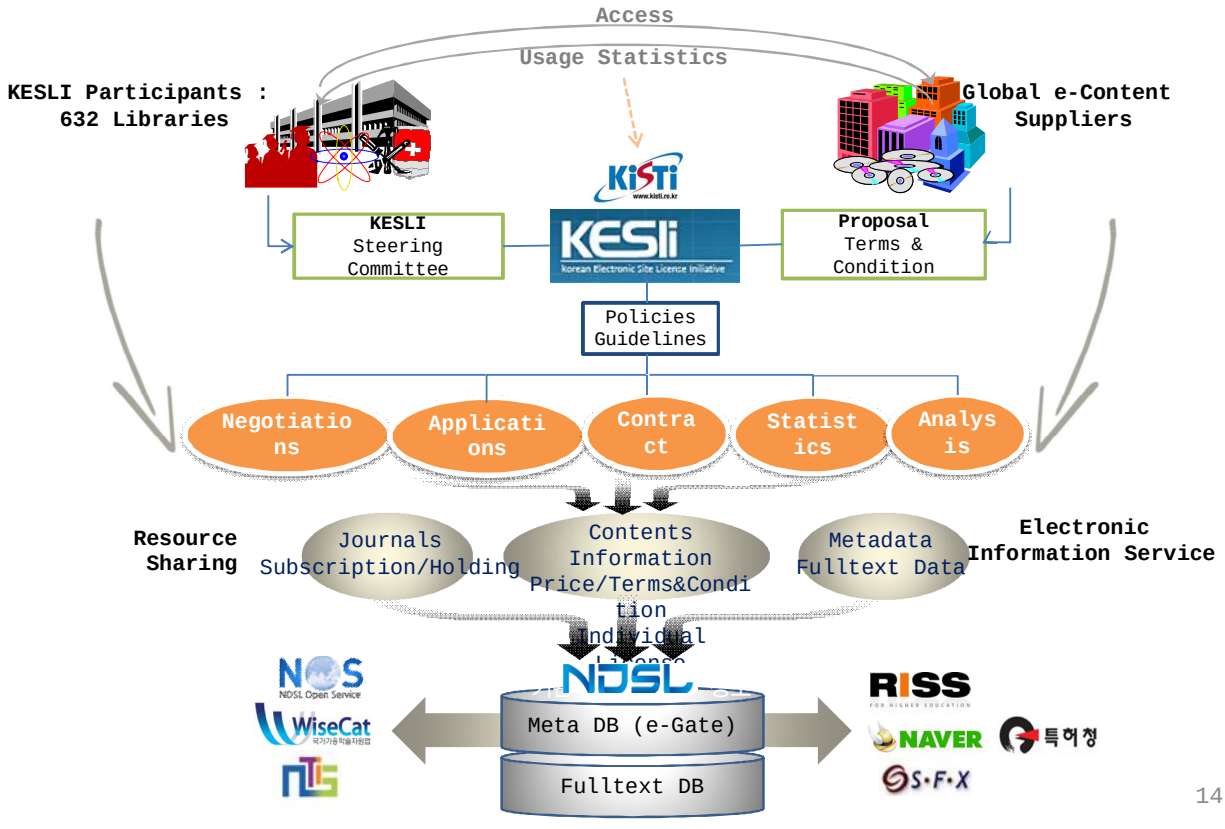
KESLI : Business Model



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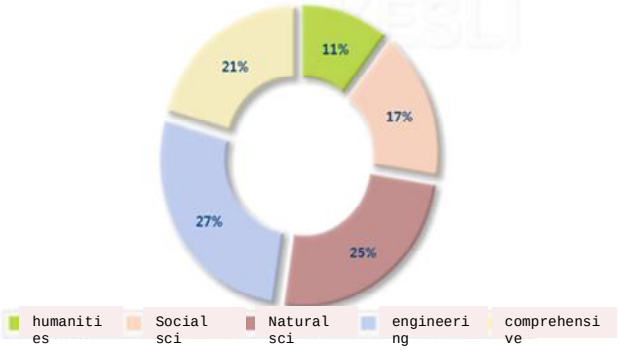
KESLI : Consortium Contents

<No. of supplying items by country>

1		미국	50	2		한국	40	9		스위스	3	10		일본	3
3		영국	30	4		중국	8	11		캐나다	2	12		프랑스	2
5		독일	6	6		이스라엘	5	13		홍콩	1	14		그리스	1
7		싱가포르	4	8		네덜란드	4	15		오스트레일리아	1				

<e-Resource items by subject>



<e-Resource items by type>

Type	Q'ty	Products
E-journal	47,579 종	80 개
E-book	60,712 권	21 개
Web DB	400 종	48 개
proceedings	36,619 건	8 개
standards	18,502 건	2 개
others	114,376 종	19 개

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Academic Village Program

- Since 1997
- To provide Various Domestic STI Services by digitizing publications, building bibliographic databases, enhancing their discoverability and providing technical supports for Societies & Associations

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Academic Village Program

- Meta and Fulltext DB construction (PDF or XML format)
- One-stop Search Services for all STI produced domestically
- Identifying and Linking Services by assigning DOI
- Manuscript Submission and Management Solution
- KPubS(XML-based Publishing Platform Services)
- Statistics including citing and cited count

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Academic Village Program

- Business Figures (as of 2015)
  - Participating Societies & Associations : 788
  - Supported Journals : 900 titles
  - DOI Supported Journals : 442 titles
  - Articles : 1,339,720
  - DOI registered Articles : 206,256

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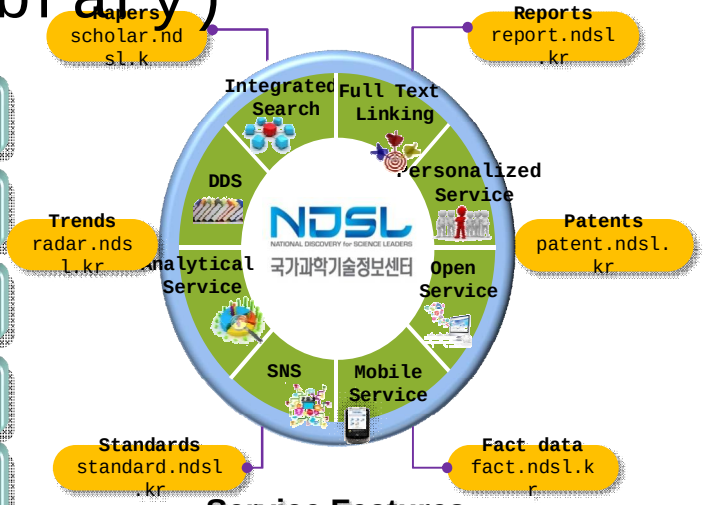
NDSL (National Digital Science Library)

Major Functions

- Integrated Search Service
- Smart Full Text Linking Service
- Personalized Service
- Mobile Service
- Social Network Service
- Analytical Service
- Document Delivery Service
- NDSL Open Service



Service Features

- Both integrated and DB specific search & browsing
- Smart linking to e-fulltext
- e-Commerce based online DDS
- Remote Access service
- API based Data Sharing
- User Centric Differentiated Interface
- Personalized service (My NDSL)
- Mobile NDSL service

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NDSL (National Digital Science Library)

Operations Figures

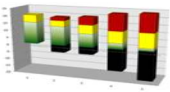
Registered users	Allerting service subscribers
742,648	97,381

Contents Volume
96M
Articles: 65M
Patents: 27M
Reports: 160,000

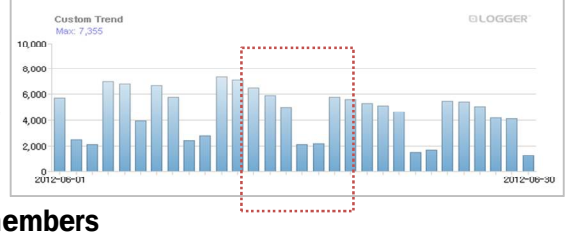
Rec Detail Views	Fulltext Views
1,630,246	2,463,000
12,540/Day	19,000/Day

Daily Usage Figures of NDSL(6,2012)

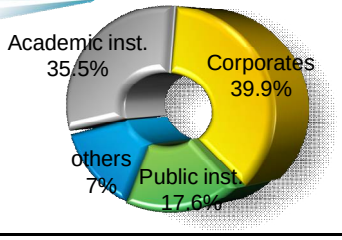
Page Views 615,000
Concurrent Accesses 525



NDSL Visitors (6.1~30, 2012)



NDSL members



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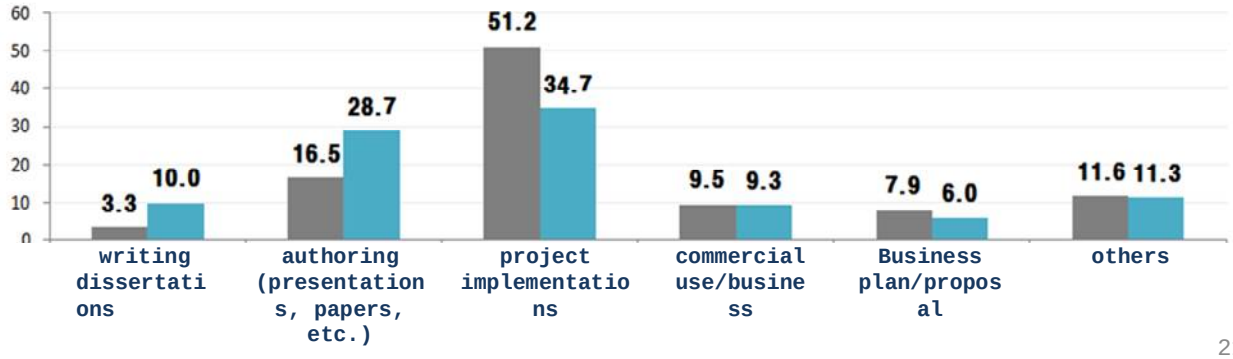
NDSL
(National Digital Science Library)

Purpose of NDSL use : 2011~2012 surveys

year		writing dissertations	authoring (presentations, papers, etc)	project implementations	Commercial use/business	Business plan/proposal	others	total
2011	frequency	22	111	344	64	53	78	672
	percentage(%)	3.3	16.5	51.2	9.5	7.9	11.6	100
2012	frequency	15	43	52	14	9	17	150
	percentage(%)	10.0	28.7	34.7	9.3	6.0	11.3	100.0



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NDSL
(National Digital Science Library)

Science Popularization

http://scent.ndsl.kr

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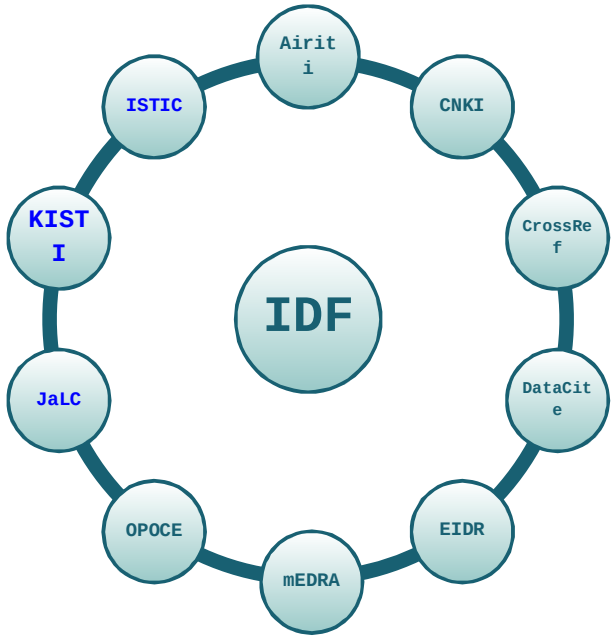
Korea DOI Center

❖ **KISTI officially approved to be a Korea DOI Center(DOI RA: Registration Agency) as of Jan 1, 2016**

CrossRef Sponsoring Members

- Airit, Inc.
- Inforang, Ltd.
- Informatcs Publishing
- ISTIC
- JST
- Korea Scholar
- KAMJE
- KISTI
- Korean Studies Info. (KSI)
- Kyobobook Center
- M2 Communications
- NRF of Korea
- Nurimedia Co., Ltd.



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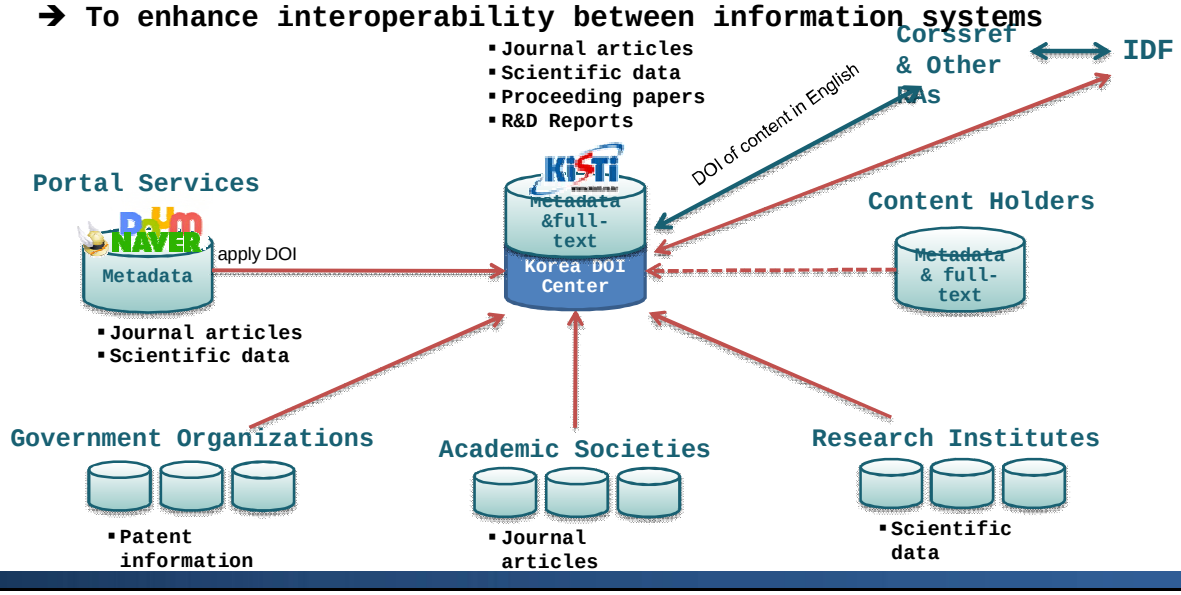
Korea DOI Center

❖ **DOI Registration & Management Services**
❖ **DOI Resolving Services**
❖ **Development of new value added services using DOI**

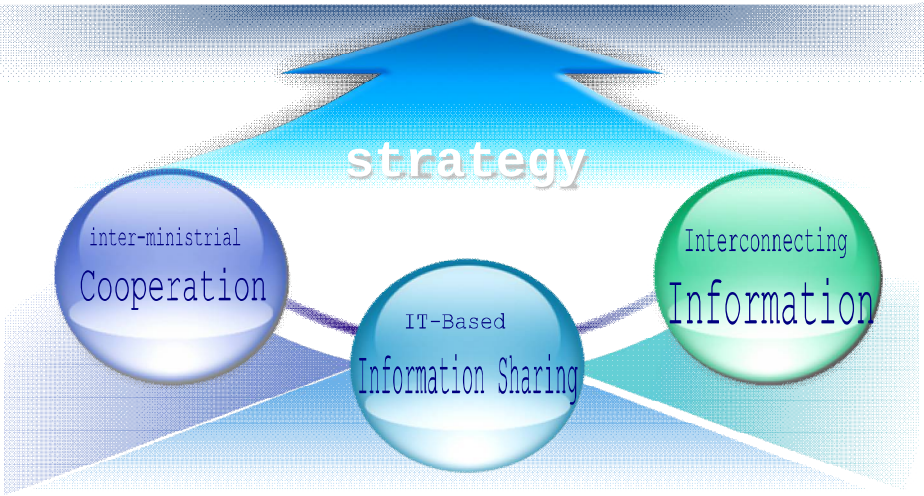
➔ **To gurantee persistent access to the digital content**
➔ **To accelerate global disseminations of Korean Domestic Research Outputs**
➔ **To enhance interoperability between information systems**



24

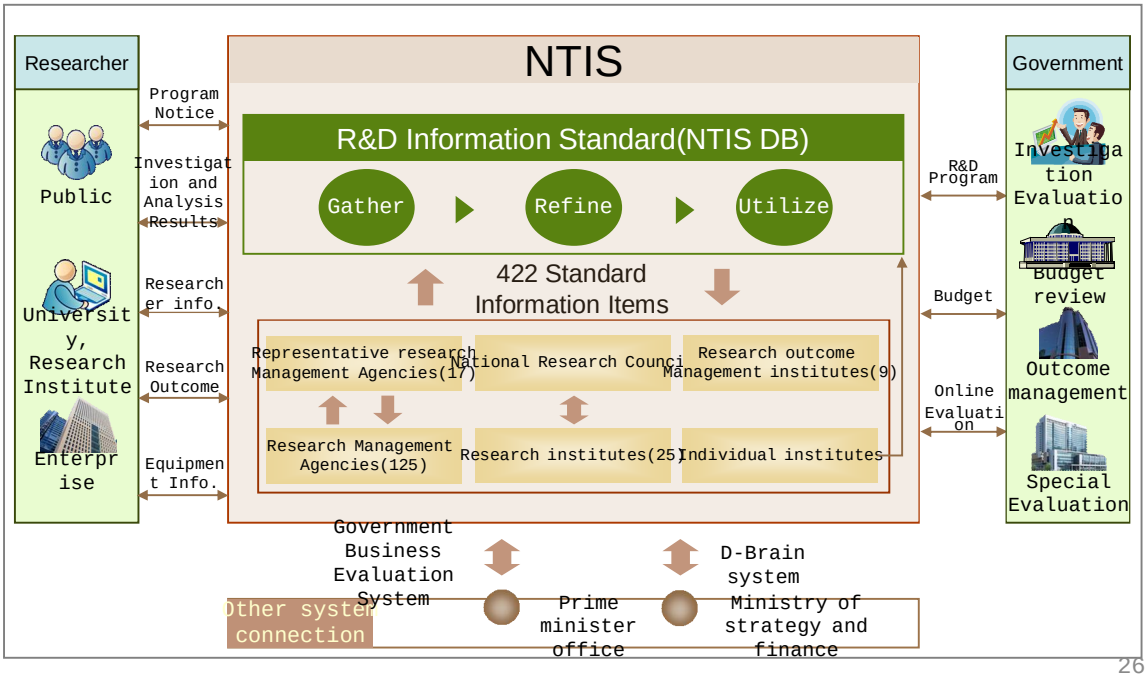
NTIS
(National Technical Information Services)
Goal and Strategies of NTIS

Promote National R&D Investment effectiveness, R&D Management transparency, and R&D Productivity



25

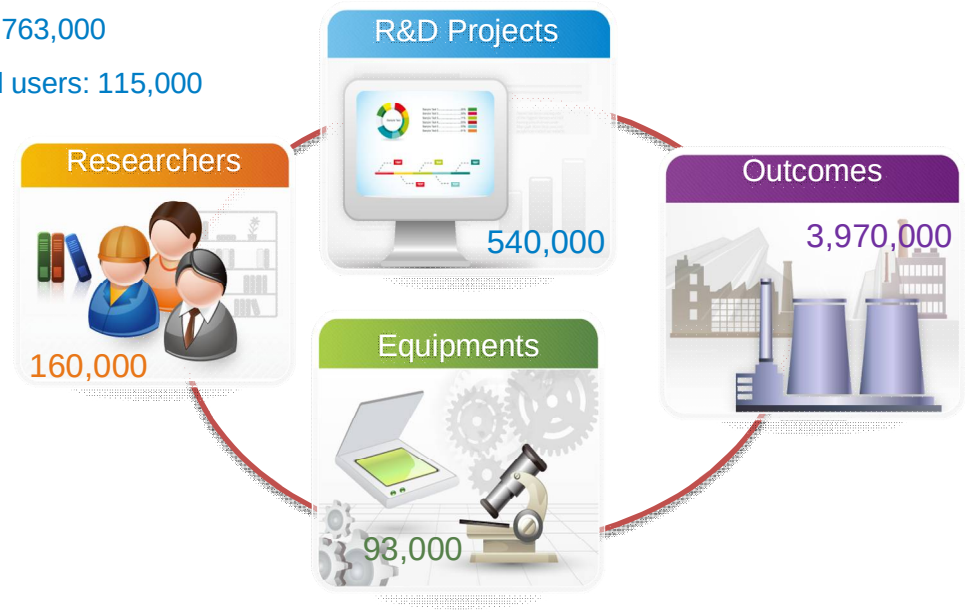
NTIS
(National Technical Information Services)
NTIS Overview



26

NTIS
(National Technical Information Services)
Operations Figures (Feb., 2016)

- Records in total : 4,763,000
- Number of affiliated users: 115,000



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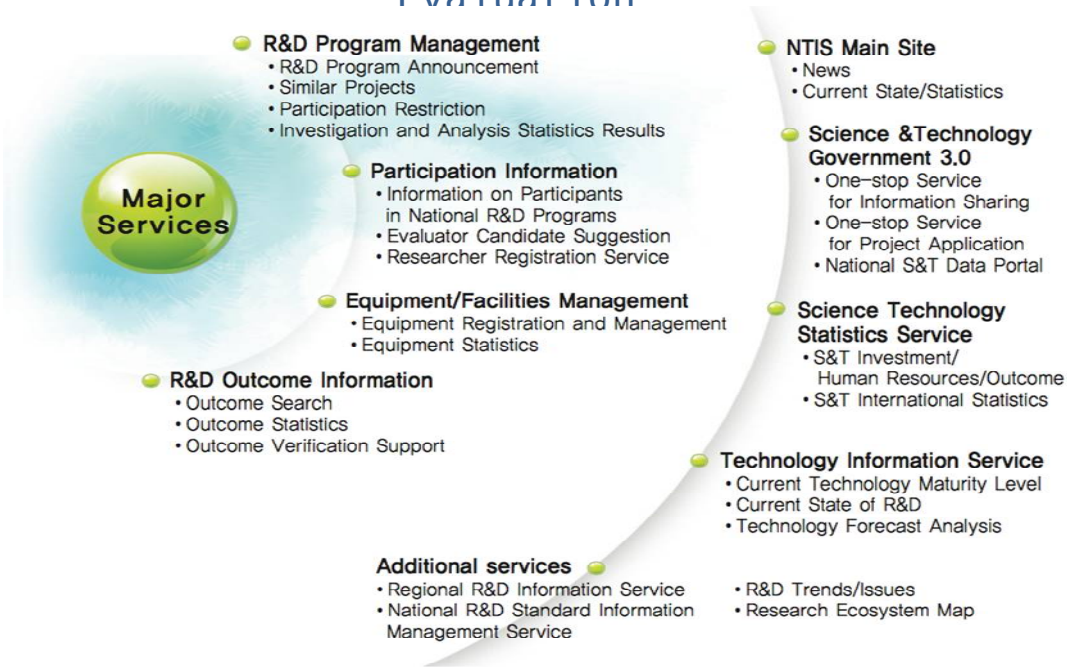
NTIS
(National Technical Information Services)
Functions : From R&D Planning to R&D Evaluation



28

NTIS
(National Technical Information Services)

Outstanding Features

- World's first e-Business portal of national R&D information that provides comprehensive information throughout the whole R&D process

- Open to user-suggestions and requirements via diverse channels including mobile applications and SNS.
- Provide service to ministry (G2G), corporate researcher (G2B) and the public (G2C) through a single, integrated channel

- Governance system based on global standards from the planning, execution and assessment
- Continuous efforts for optimizing the e-Business process to comply with international standards

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Big Data Research(2014~)

- **Big Data Platform Development for Library Data Sharing and Utilization**
- **Enhancement of Library Big Data Services**
- **Constructing Research Environment for Library Big Data**
- **Enhancing Efficiency of Library Decision Making by Library Big Data Analysis**
- **Development of Librarians' Task Supporting System for encouraging Analytics and Insights Capability**
- **Development of Issue responding Big Data Analysis System**
- **Training Library Big Data Experts**
- **Building Library Big Data Research Collaborating System**

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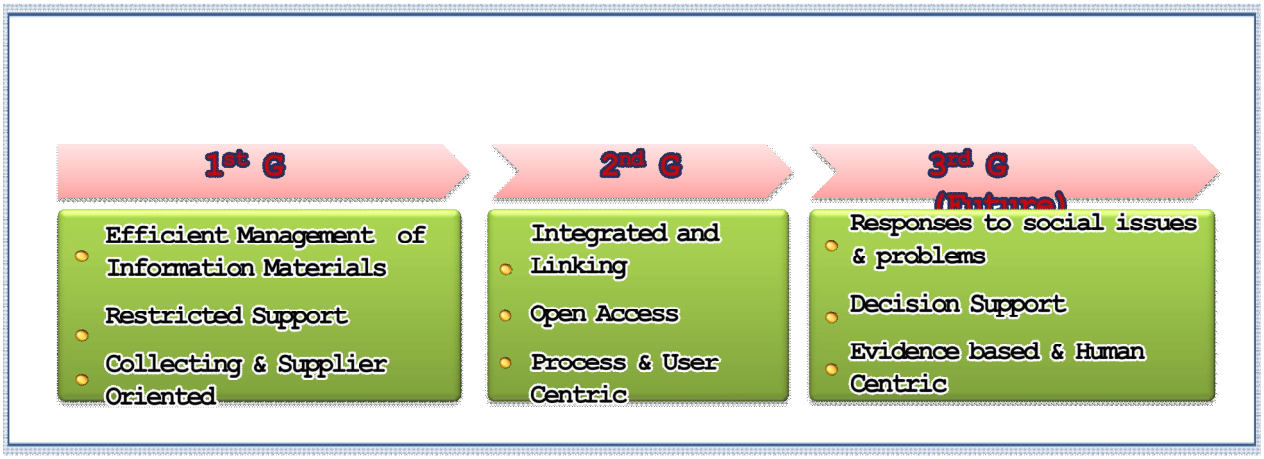
Implications



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Issues and Problems

- National Coordinating Agency or Policy for STI services NOT so well organized/defined(National CIO)
- Information Policies NOT including Social Issues
- Interrelations between STI related agencies are either weak or unreliable
- Differentiated S&T Information Services with high values NOT YET developed

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Future Plan

- Platform-based Data Services to be focused
- Analytical Information Services with Big Data Research will be highly strengthened
- Well preparing for Open Paradigm: Open Access, Open Data
- Social Issue & Problem Solving Approach
- Evidence based & Human Centric

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Thank you

Ho Nam Choi, Ph D
Research Fellow
KISTI
hnchoi@kisti.re.kr

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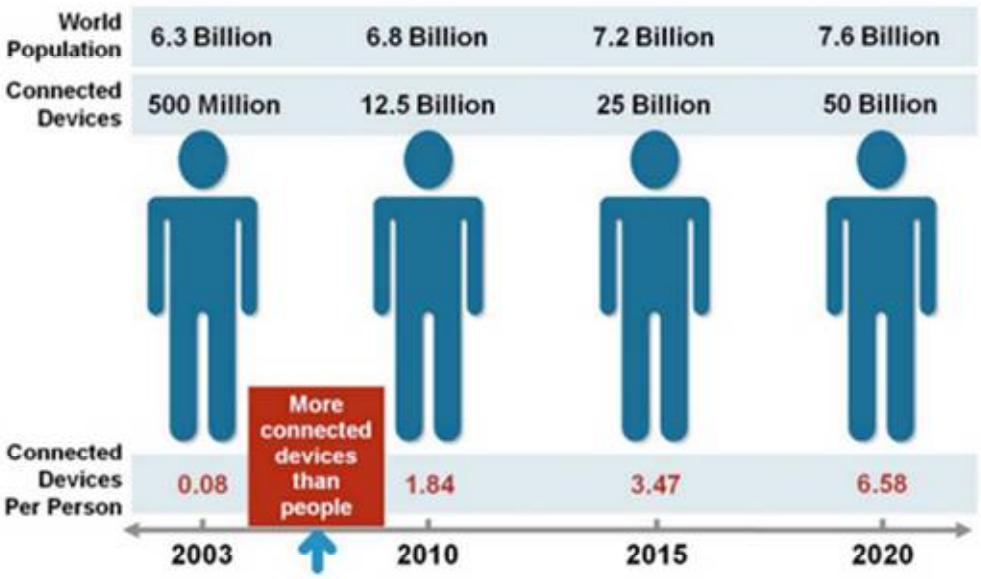
The Impact of Internet of Things on Big Data and Some Applications

NGUYEN LONG GIANG, NGUYEN QUANG HUY
INSTITUTE OF INFORMATION TECHNOLOGY (IOIT)

Agenda

- ✓ Introduction IOT
- ✓ Applications
- ✓ Advantages and disadvantages of Iot
- ✓ The Impact of Internet of Things on Big Data

Introduction

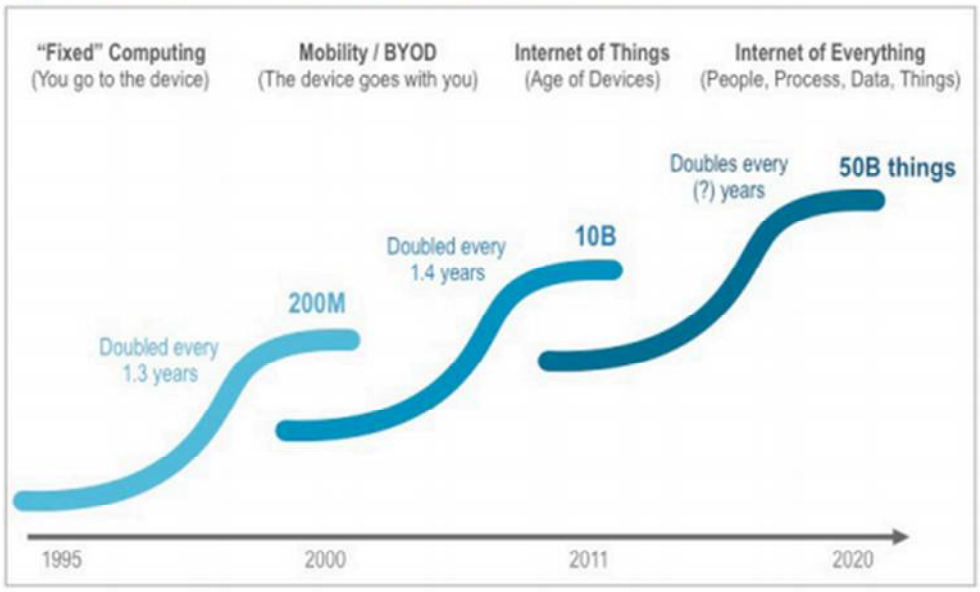


Source: Cisco IBSG, April 2011

Page 3

Introduction (2)

Figure 2. Internet Growth Is Occurring in Waves.



Source: Cisco IBSG, 2012

Page 4

Key Concepts

- **The Internet of Things (IoT): is the network of physical objects—devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity—that enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit**

-

Page 5

APPLICATIONS (1)

Smart refrigerator:

collaborate and recommend nutritious and delicious meal combinations with the available ingredient

Page 6

APPLICATIONS (2)

Cooking Gas Maintenance & Service IoT

Gas Service and Maintenance:

- Automatic booking of cylinder if level reaches below threshold
- Predicting requirement of number of cylinders in a region
-In case of any leakage, an engineer can be sent immediately
-Keep a track on legal/illegal usage of cylinder

Page 7

APPLICATIONS (3)

Page 8

The Advantages of IoT

- Information: it is obvious that having more information helps making better decisions. Whether it is mundane decisions as needing to know what to buy at the grocery store or if your company has enough widgets and supplies, knowledge is power and more knowledge is better.

- Time: The amount of time saved because of IoT could be quite large. And in today's modern life, we all could use more time.

Page 9

The Advantages of IoT

- Monitor: Knowing the exact quantity of supplies or the air quality in your home, can further provide more information that could not have previously been collected easily.

- Money: In my opinion, the biggest advantage of IoT is saving money. If the price of the tagging and monitoring equipment is less than the amount of money saved, then the Internet of Things will be very widely adopted.

Page 10

The Disadvantages of IoT

- Compatibility: I believe this disadvantage is the most easy to overcome. The manufacturing companies of these equipment just need to agree to a standard, such as Bluetooth, USB, etc. This is nothing new or innovative needed.

- Privacy/Security: With all of this IoT data being transmitted, the risk of losing privacy increases. For instance, how well encrypted will the data be kept and transmitted with? Do you want your neighbors or employers to know what medications that you are taking or your financial situation?

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Key Concepts(2)

- ***Big data:*** **is a term for data sets that are so large or complex that traditional data processing applications are inadequate. The term often refers simply to the use of predictive analytics or certain other advanced methods to extract value from data, and seldom to a particular size of data set. Accuracy in big data may lead to more confident decision making, and better decisions can result in greater operational efficiency, cost reduction and reduced risk. Four key dimension of big data are volume, veracity, variety and velocity**

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The Impact of Internet of Things on Big Data

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Data Storage

- one of the first things that comes to mind is a huge, continuous stream of data hitting companies' data storage. Data centers must be equipped to handle this additional load of heterogeneous data.

- In response to this direct impact on big data storage infrastructure, many organizations are moving toward the Platform as a Service (PaaS) model instead of keeping their own storage infrastructure, which would require continuous expansion to handle the load of big data. PaaS is a cloud-based, managed solution that provides scalability, flexibility, compliance, and a sophisticated architecture to store valuable IoT data.

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Data Storage(Con't)

- Cloud storage options include private, public, and hybrid models. If companies have sensitive data or data that is subject to regulatory compliance requirements that require heightened security, a private cloud model might be the best fit. Otherwise, a public or hybrid model can be chosen as storage for IoT data.

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Big Data Technology

- IoT brings an entirely fresh proposition to the table. The technology chosen to process and store big data must be appropriate and one that is effective.

- A number of technologies make up the big data platform, such as the likes of Hadoop, Map Reduce, HDFS and more. Thus, what organizations need to do is to ensure that these technologies can be adapted to IoT data and also their processing. As IoT data is another source of big data, the processing steps will remain the same. So the same big data platform can be used to process IoT data.

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Data Security

- With IoT too, it is no different. Usually, a large number of devices are known to contribute to data and it is no surprise that a number of security threats also arise from them. Also, the number of IoT related devices keep increasing every day. Thus, emissions from such devices are to change in due course of time, which will further impact big data storage and technologies.

- Organizations, as such, are sure to observe certain changes in the security sphere. One of the biggest risks lies with the number of interconnected devices, also something that happens to be the core of IoT services. Thus, any sort of attack would impact the physical world deeply.

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Big Data analytics

- The IoT data, which basically lies within big data, has a great impact on big data analytics. The data also needs to go through ingestion, phases of storage before reaching the analytics phase. The IoT data then needs to be managed by different frameworks. Managed Service Providers (MSPs) are also known to be working on frameworks that can handle big data.
- Both IoT and big data are two sides of the same coin. Keeping that in mind, organizations need to set up the right platforms for analytics, as well as infrastructure, for proper analysis of IoT data. Lastly, a point to note would be that IoT data is important only if it is well managed and if any value can be extracted from it.

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Big Data tools

- Before the arrival of IoT into the main frame, all tools and frameworks that deal with big data did not touch IoT. And now many of the providers of such tools are actually modifying their products so that they essentially work on IoT data. Also, as far as the storage side is concerned, there is impact on the side that has a number of No SQL database vendors. This impact is on all sorts of entities such as tools, framework, No SQL database and more.

- Organizations have already started to experiment with existing big data tools, in order to find earlier issues that are present.

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Key Concepts

- **Cloud computing:** a computing platform where users can have access to applications or computing resources, as services, from anywhere through their connected devices. A simplified user interface or application programming interface (API), or both, makes the infrastructure supporting such services transparent to users.

- **IoT platform:** Software component enabling interaction with resources through a well-defined interface. This can be orchestrated together with non-IoT services.

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Conclusion

- we have touched through all the major impacts that IoT is likely to have on big data. IoT is a completely new domain, and businesses have been exploring it so far, in order to get some useful value. However, the fact remains that it is still pretty unknown and that these unknown factors need to be considered, as they crop up with time, before moving forward.
- A number of solutions to impacts have also been referred to in the article. However, it is more likely that IoT will also present many more fresh challenges in the near future

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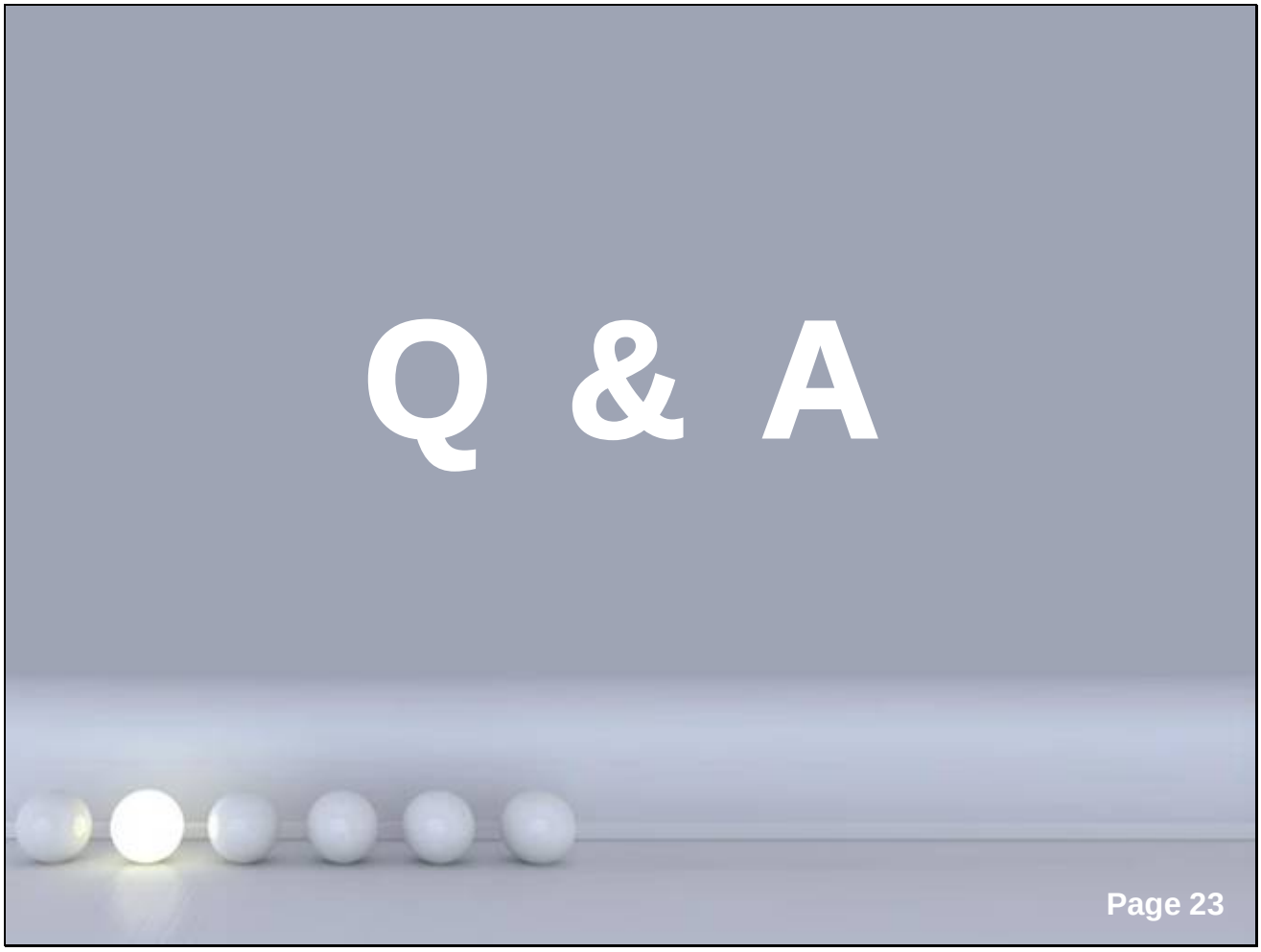
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