Energy Productivity x00% for carbon neutral with Public Core of the Internet*

https://www.youtube.com/watch?v=DSJLk4XgJw4

https://www.intgovforum.org/en/filedepot_download/5065/757

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Conclusio

- {Hardware “infrastructure” and system “architecture” of Public Core of the Internet} + {modern computing platform} and {digitalized functions} shall dynamically change local and global structure and topology of power consuming networks triggered by carbon neutral requirement.
- Interoperability and data transparency to every”one” and every”thing” can deliver four goals/benefit simultaneously by single Public Core of the Internet.
  1. New function (=Innovative use of existing system)
  2. Efficiency improvement
  3. Power saving (➔cost reduction)
  4. Security improvement

➔ We need better Public Core of the Internet for the Earth

Approaches toward EP-x00

	Of IT	By IT
AS IS	• Virtual Machine • Huge Memory & Processor	**Digital Twin** (CPS; Cyber Physical System) with LoD
TO BE	Electron → Photon → Quantum	Cyber First

Approaches toward EP

Our territory

	Of IT	By IT
AS IS	• Virtual Machine • Huge Memory & Processor	Digital Twin (CPS; Cyber Physical System) with LoD
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The University of Tokyo in Summer of **2011**

Hacking building/campus facilities with IP

	Peak (2010)	Peak (2011)	Total (2011)	RoI
Major 5 campuses	66 MW	69% (△31%)	75%-78% (22%-25%)	less than 1 month
Eng. No2 Bldg.	1 MW	56% (△44%)	69% (△31%)	2 years

【Contributions】

1. **Multi-Vender for sustainability by TCP/IP**
2. **Global standard for interoperability**

Green university of Tokyo Project

The University of Tokyo in Summer of 2011

Hacking building/campus facilities with IP

One-Way (Uni-Directional) Supply System

Bi-Directional Demand Response & Control

-- Important rule --

Capacity of power network is determined by peak power demand !!
Reduction of demand at peak time contribute to the reduction of the cost for capacity of power supply network.

2. Global Standard for Interoperability

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Why we started to worked on smart building ?
-- Amazing/disappointed Facts….. -- , this is still somehow true

- Facilities in the building/campus
  - ✓ were isolated and separated.
  - ✓ never cooperated together.
  - ✓ Bad communication quality ➔ Need DTN !!
  - ✓could not be replaced by the other vendor's equipment, i.e., lock-on. If we asked new function, vendor asks large bills.

“Open-Data” for buildings, i.e., let building like Internet

1. **End-User** (not vender) can **to access and to use** the data, with the same way.
2. **End-User** (not vender) can **connect/put the sensor**, that does not harm the network, with their choice, with the same way.
3. **End-User** (not vender) can **provide service** using the open-data.

System Architecture

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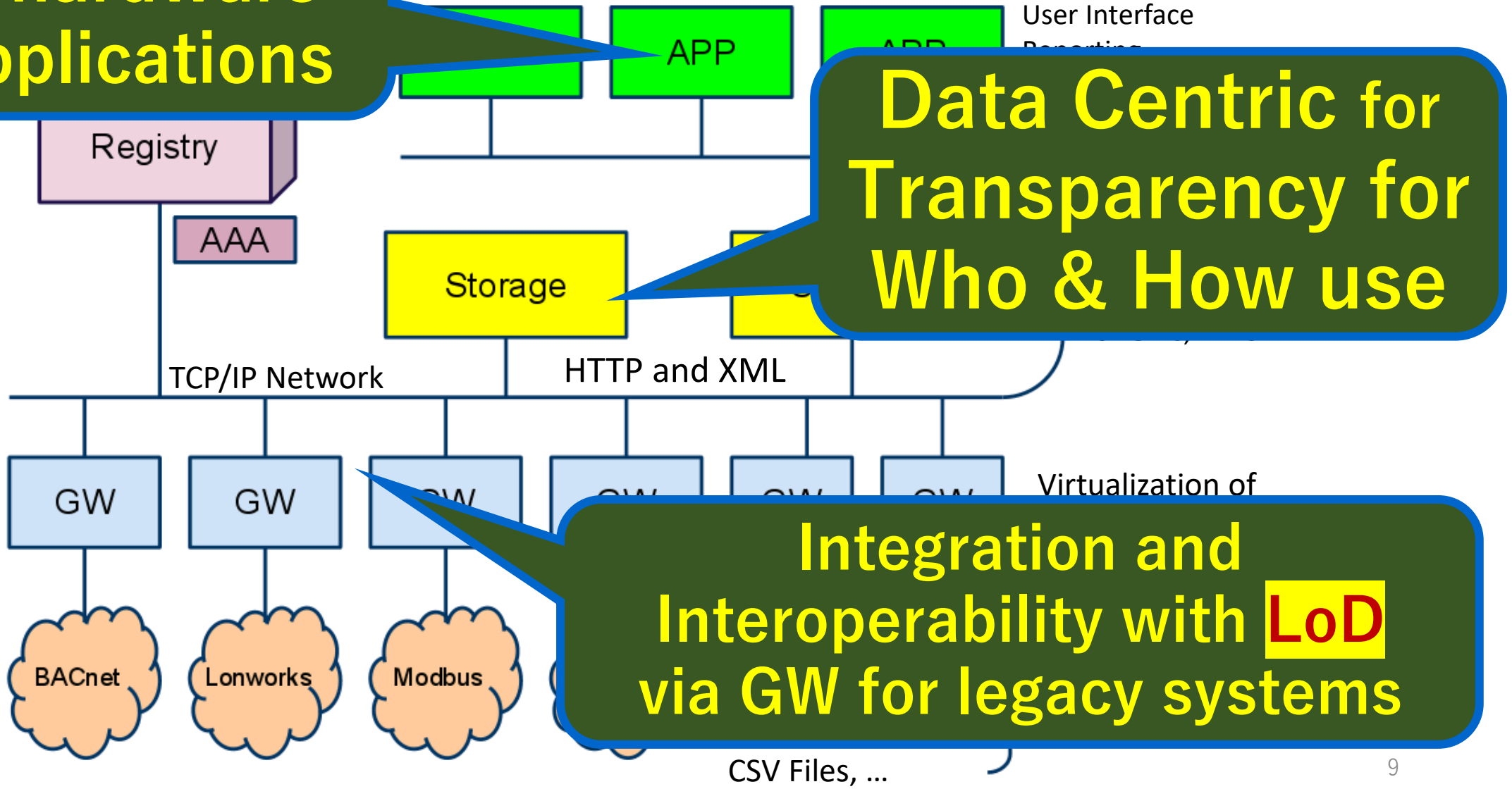
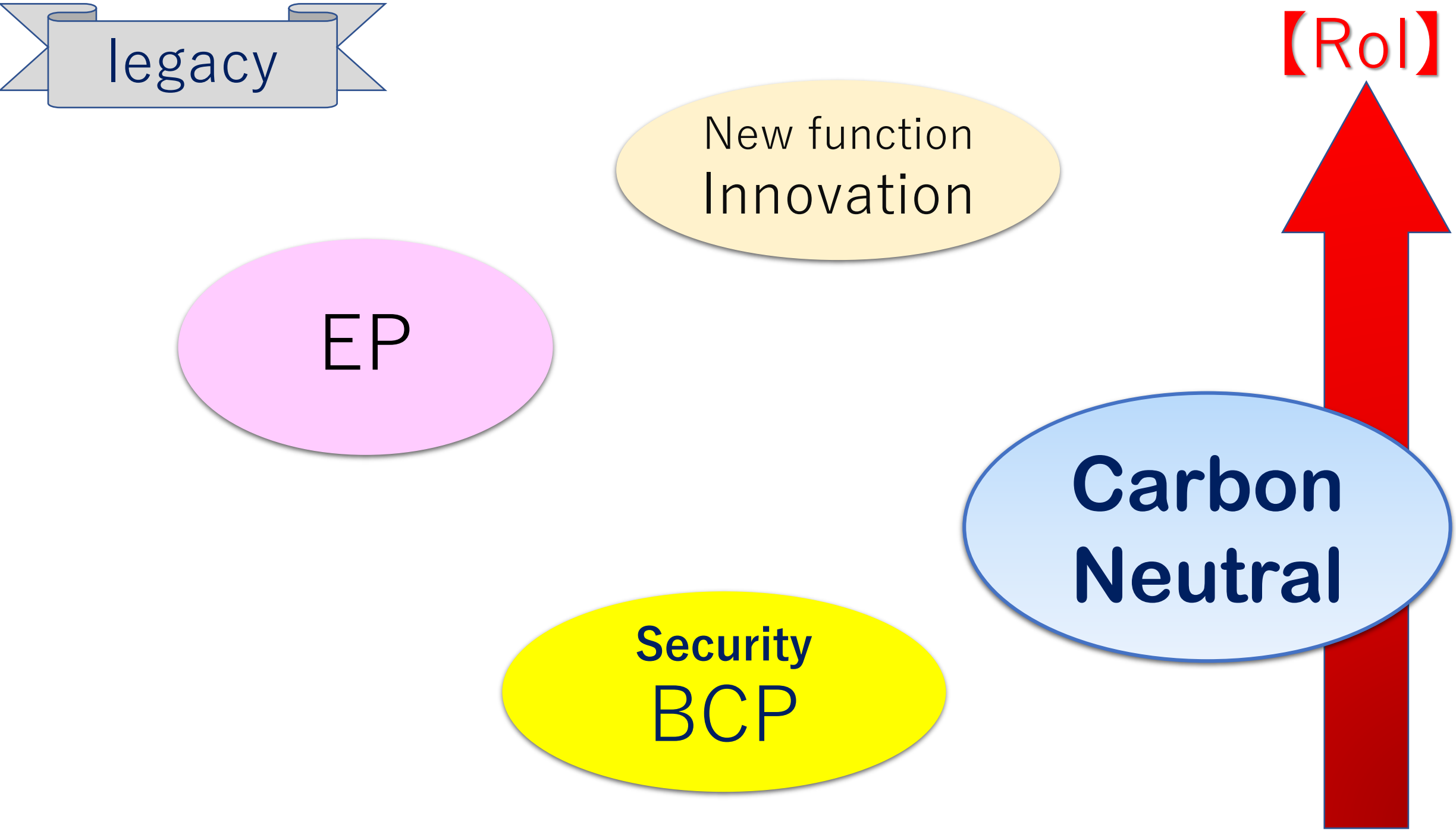
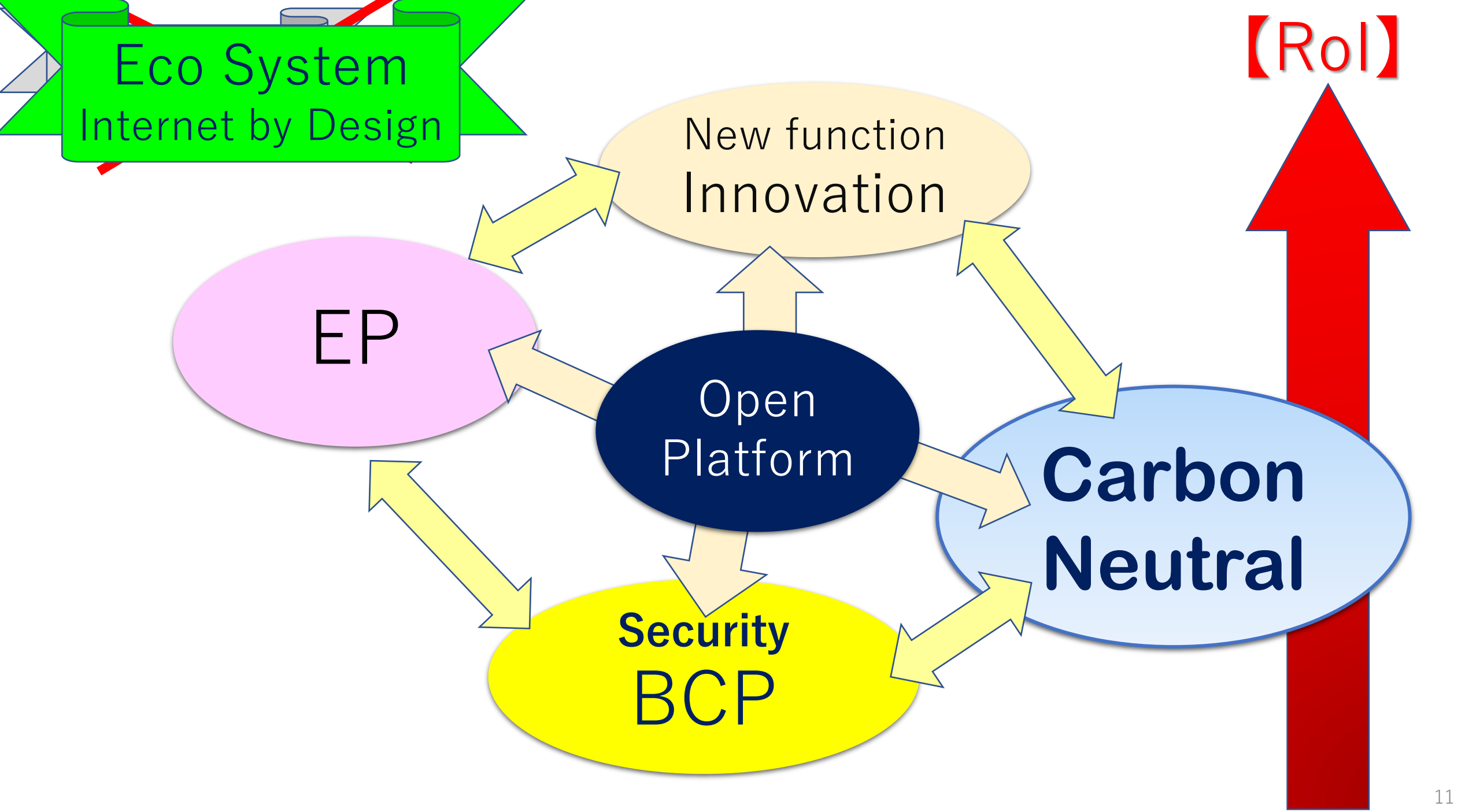
Independency from hardware for applications

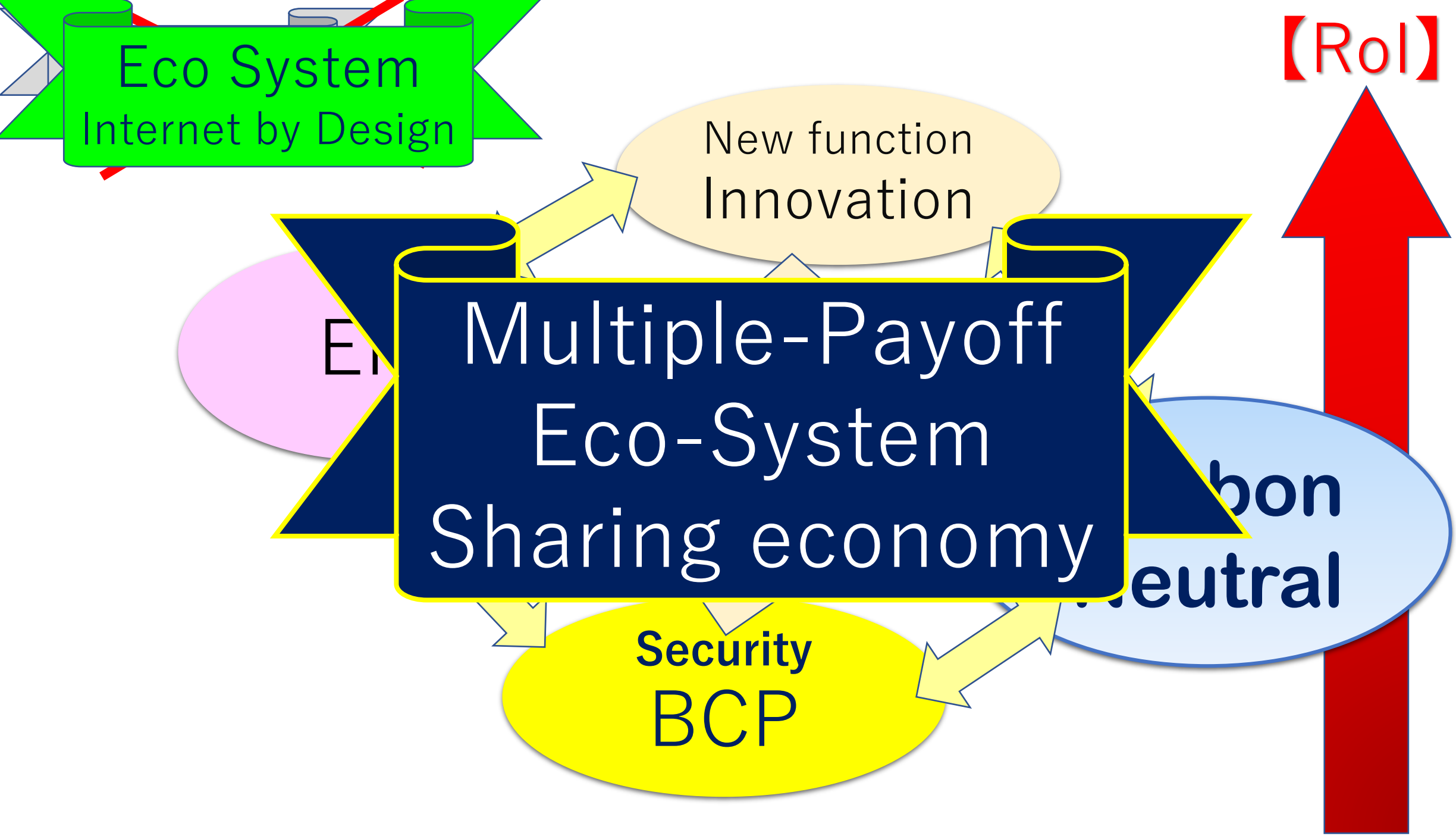


Data Centric for Transparency for Who & How use

Integration and Interoperability with LoD via GW for legacy systems


legacy
【RoI】
New function
Innovation
EP
Carbon
Neutral
Security
BCP


Eco System
Internet by Design
【RoI】
New function
Innovation
EP
Open
Platform
Carbon
Neutral
Security
BCP


Eco System
Internet by Design
【RoI】
New function
Innovation
Multiple-Payoff
Eco-System
Sharing economy
Security
BCP

Approaches toward EP

Our territory

	Of IT	By IT
AS IS	Virtual Machine (i.e., cloud)	Digital Twin (CPS; Cyber Physical System)
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Innovation in Logistics

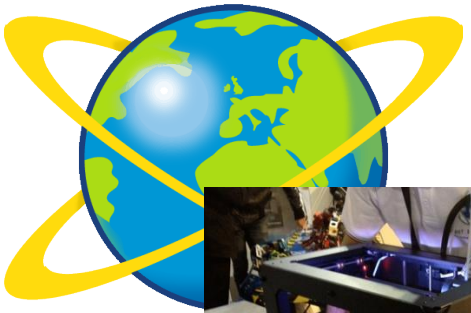
19th century = exclusive separated system

Containe
Parrett
(1956)

20th century
(1) Physical Sharing Economy

Late 20th century
(2) Sharing Economy
in cyber space

2020s =Cyber-First Sharing Economy



General printer
e.g., 3D printer

Digital package
(=IP Packet)

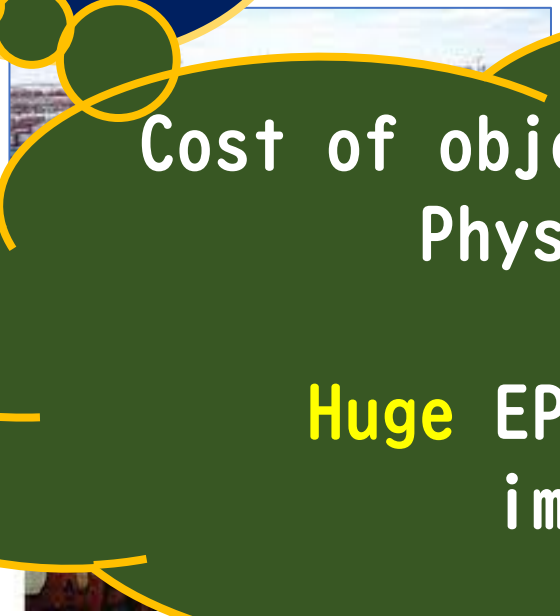
Innovation in Logistics

=Cyber-First Sharing Economy

19th century =

Object transfer/mobility
over sharing platform !!
1. Physical object
2. Digital object

Sharing Economy



Cost of object transfer/mobility?
Physical >> Digital

Huge EP(Energy Productivity)
improvement !!!

Containe
Parrett
(1956)

Transfer cost … …
= Energy Productivity…

Electricity >> Digital bits

x00	:	1

～We should Think about the Earth～

① Speed of light is **not fast**….

Inter-Continent: 200-300 msec.

Domestic: 30- 50 msec.

Intra-facility: 2- 3 msec.

② Mal-distribution of Energy

Far North/South Cold!!

rural area Carbon Negative

Business case

BMW in Germany

Before

Germany

100%

of IT Load

Tier III

5 MW

200万ユーロ

200万ユーロ

After

Germany

20%

of IT Load

Tier III

1MW

Iceland

50%

of IT Load

New standard

2.5 MW

Sweden

30%

of IT Load

New standard

Small latency
&
Critical data
at {dark-side}DC

Allowing large latency
&
Non-Critical data
at cheap and green DC

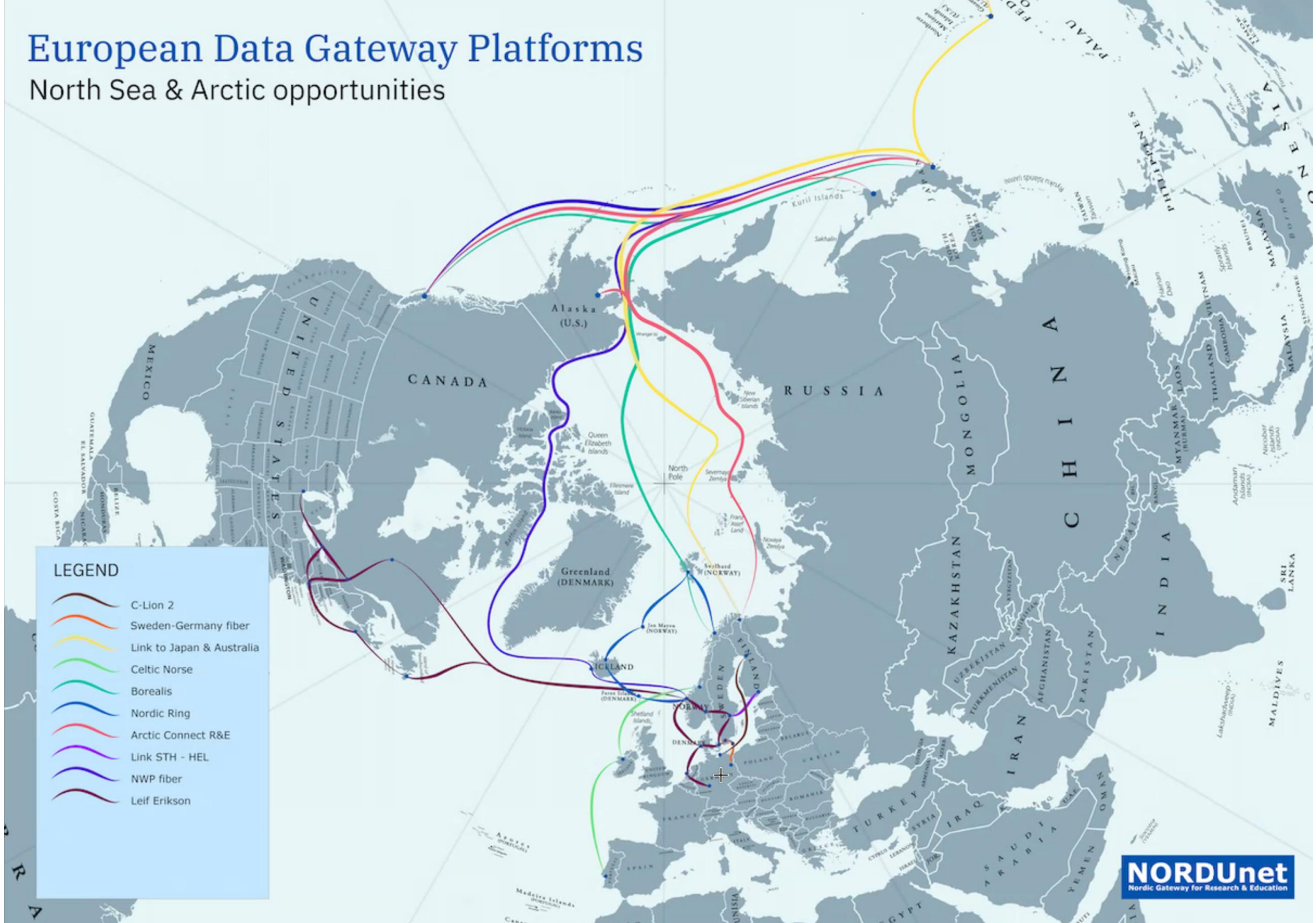
Transfer DCs to clean sites (Iceland & Sweden)

- ✓100% Renewal Energy (Hydrogen & Geothermal)
- ✓There are a lot of non-real time processes

1. Gentle to Earth
   - ✓ by use of renewal energy (RE-100)
   - ✓ by use of cool air (EP-100)
2. Cost reduction (EP-x000)
   - ✓ Replacing power cable (copper) to communication cable (glass)

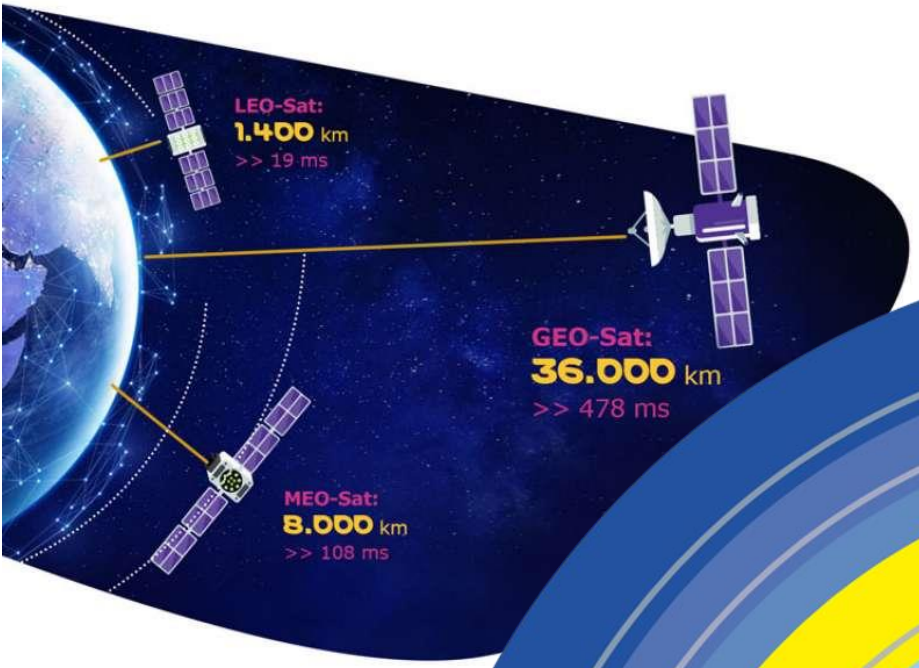
European Data Gateway Platforms

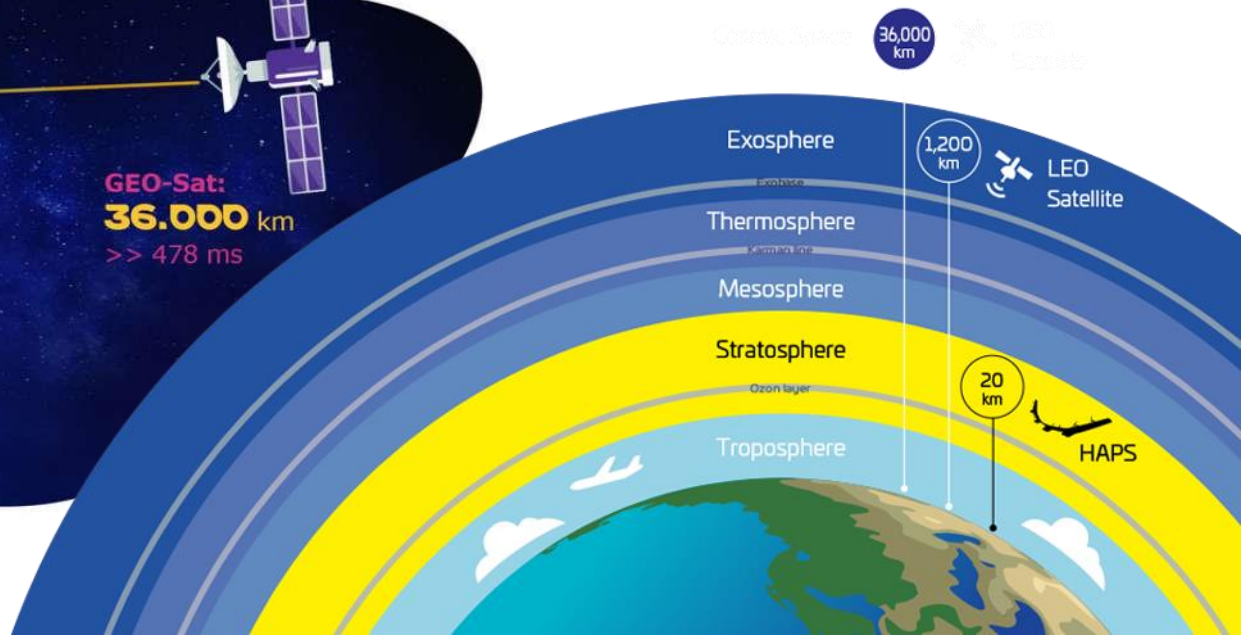
North Sea & Arctic opportunities



include moon !!!

need new DTN,
transport & routing





Conclusion

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