

Cloud Computing 2021 Keynote Speaking

**ISO/IEC Joint Standards for Linux Standard Base
to Support Cloud Computing, IoT, Smart Cities
and 4th Industrial Revolution.**

Yong Woo LEE, Ph.D.

Professor, University of Seoul

Leader, ISO/IEC JTC1 SC22 WG24 World Linux Standard Group

Chairman, The Korean National Committee for ISO SC22

President, Smart City Consortium for Seoul, Korea

Chairman, Seoul Grid Center

2021.4.22, Porto, Portugal



About the keynote speaker



- ❖ Yong (Young) Woo Lee
- ❖ Ph.D. from University of Edinburgh, UK
- ❖ B.Sc from Seoul National University, Korea
- ❖ Best researcher awards in KIST, Korea
- ❖ Senior researcher, KIST, Korea
- ❖ Principle researcher, KERIS, Korea
- ❖ Professor, University of Seoul, Korea,
- ❖ Vice president, Korea Internet Society
- ❖ President, Institute of Information Tech. UOS
- ❖ A Steering Committee Member of “IARIA Cloud Computing Conference” from the first conference till now since 2010.

New ISO/IEC Joint Linux Standards (20) for the Linux Standard Base (LSB)

- ❖ **20 = Nineteen standards & One Technical Specification.**
- ❖ **Based on Linux Foundation (LF) 's LSB 5.0.**
- ❖ **Will be published soon.**
- ❖ **ISO = International Organization for Standardization**
- ❖ **IEC = International Electro-technical Commission**
- ❖ **JTC 1 = Joint Technical Committee 1**
- ❖ **SC22 = For Programming Language & Operating system**
- ❖ **WG24 = For Linux Standards**

New ISO/IEC Joint Linux Standards

- ❖ Linux can be divided into two parts. One is the Kernel and the other is user interface.
- ❖ There are more than three hundred Linux Distro. Their kernels are identical (same) but their user interfaces are different from each other. So, it was required to have a common standard user interface for compatibility.
- ❖ The user interface has been made into the Linux Standard Base(LSB) by Linux Foundation(LF).
- ❖ The nineteen ISO/IEC standards and one TS have been made based on LF's LSB.
- ❖ They will replace the old eight ISO/IEC LSB standards which were published in 2006.



New ISO/IEC Joint Linux Standards

- ❖ The standards will make many kinds of Linux distros compatible.
- ❖ Virtual Machine and Docker Container method can be alternative ways to use different Linux distros.



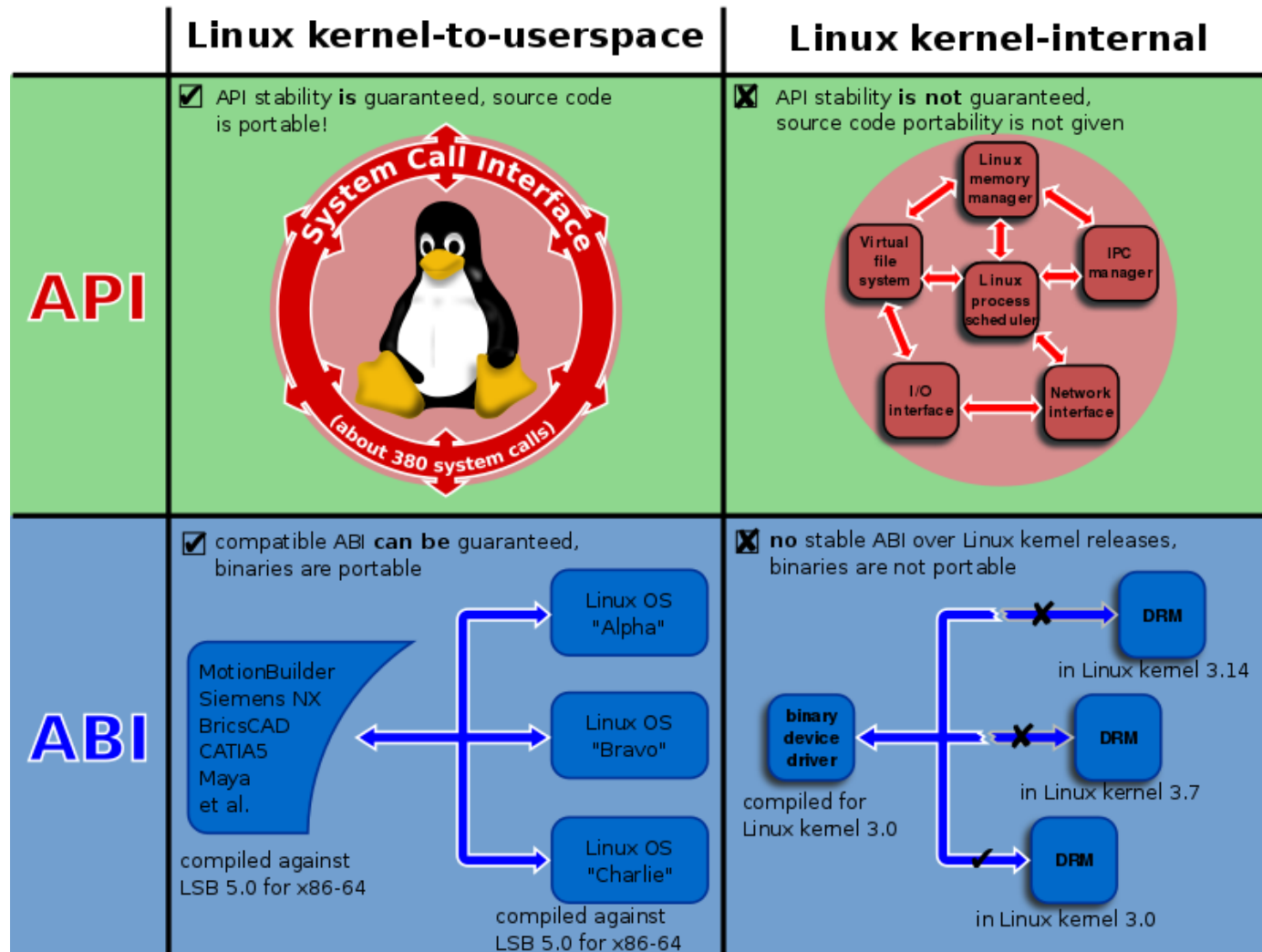
Linux Standard Base (LSB)

- ❖ **“The goal of the LSB is to develop and promote a set of open standards that will increase compatibility among Linux distributions and enable software applications to run on any compliant system even in binary form. ”**
- ❖ **“In addition, the LSB will help coordinate efforts to recruit software vendors to port and write products for Linux Operating Systems.”**

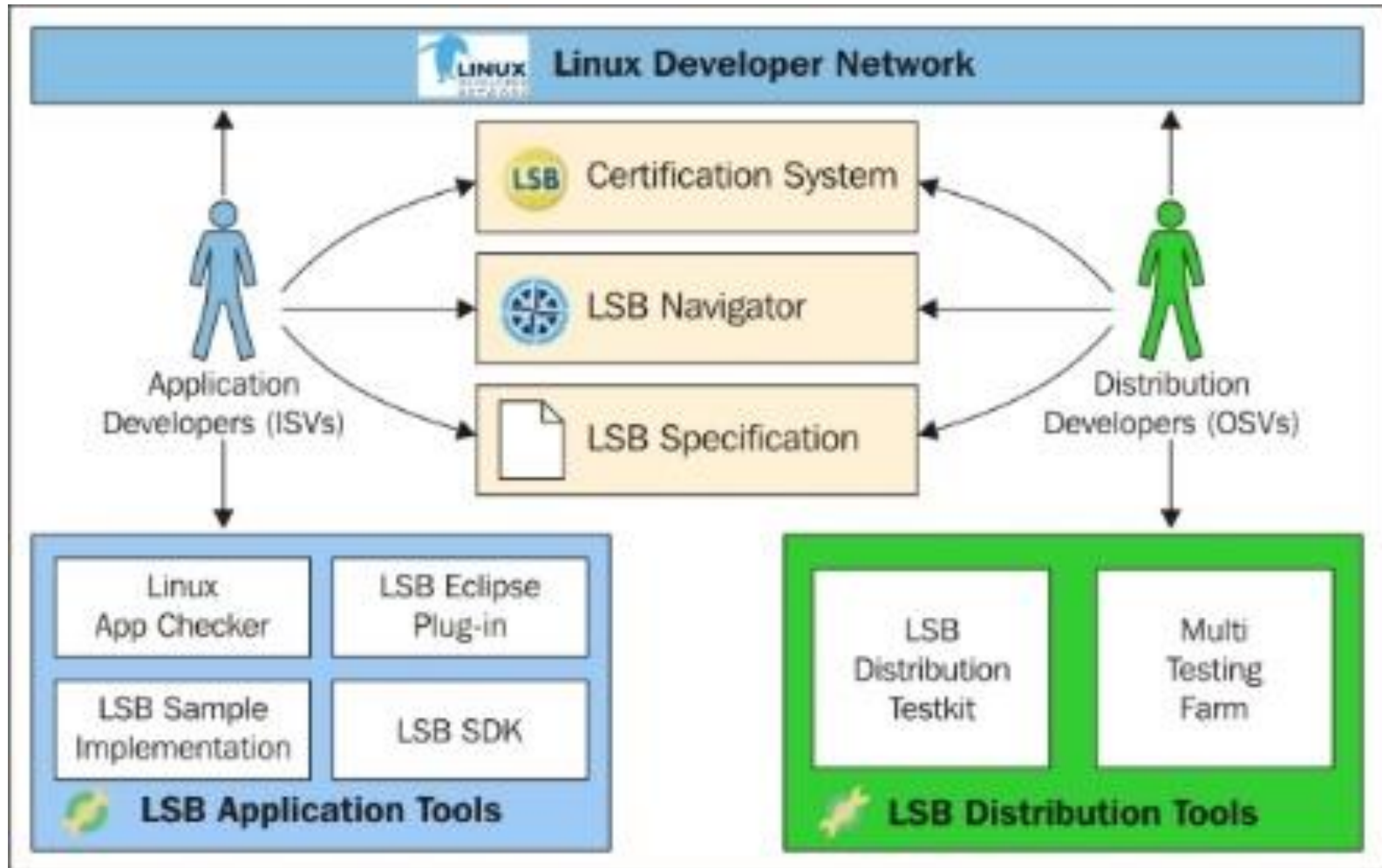
Linux Standard Base (LSB)

- ❖ **“The Linux Standard Base (LSB) is a joint project by several Linux distributions under the organizational structure of the Linux Foundation to standardize the software system structure, including the Filesystem Hierarchy Standard used in the Linux kernel.” - wiki**
- ❖ **“The LSB is based on the POSIX specification, the Single UNIX Specification (SUS), and several other open standards, but extends them in certain areas.” - wiki**
- ❖ **“The LSB compliance may be certified for a product by a certification procedure.” - wiki**

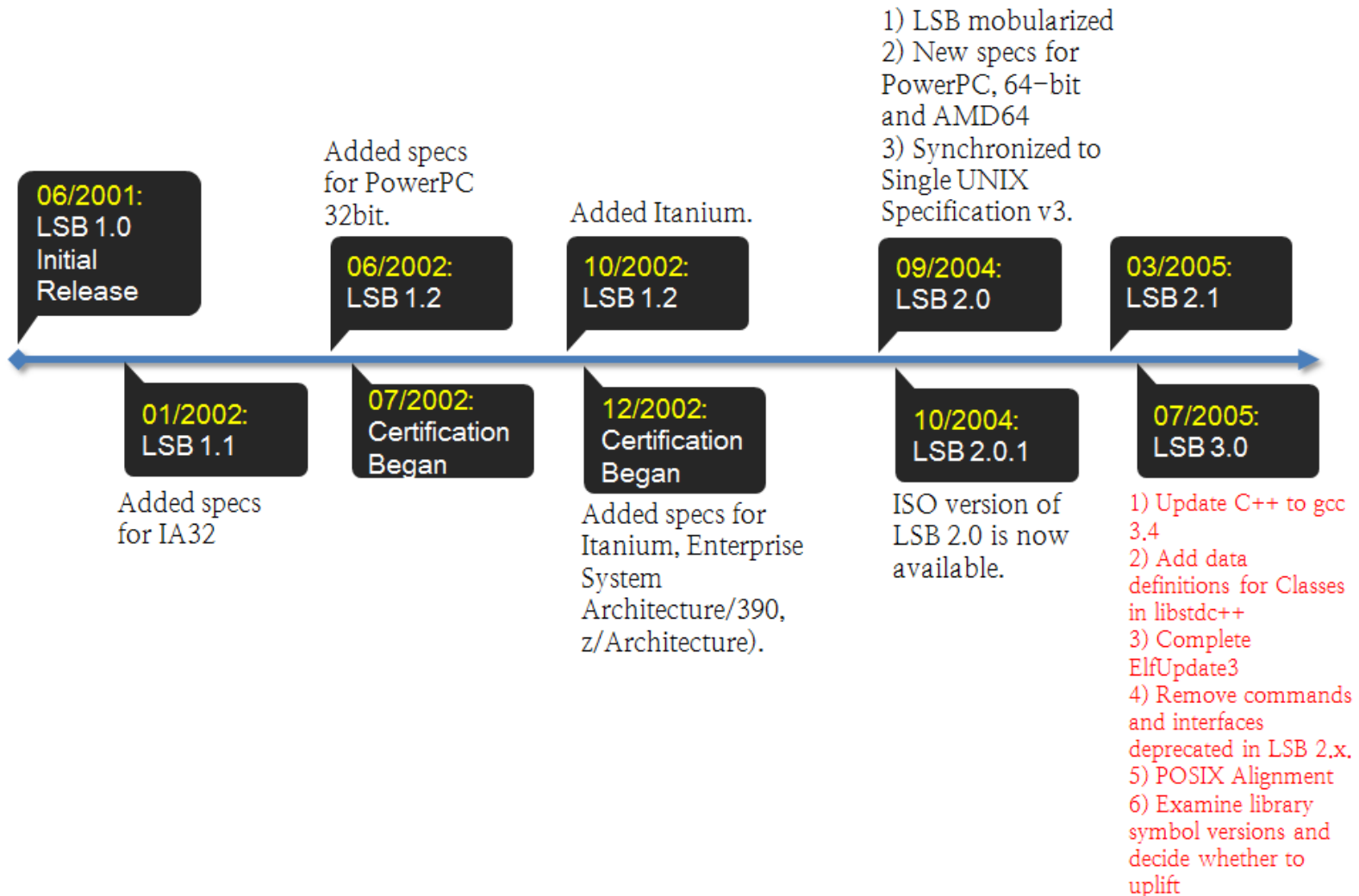
Linux Standard Base (LSB) -wiki



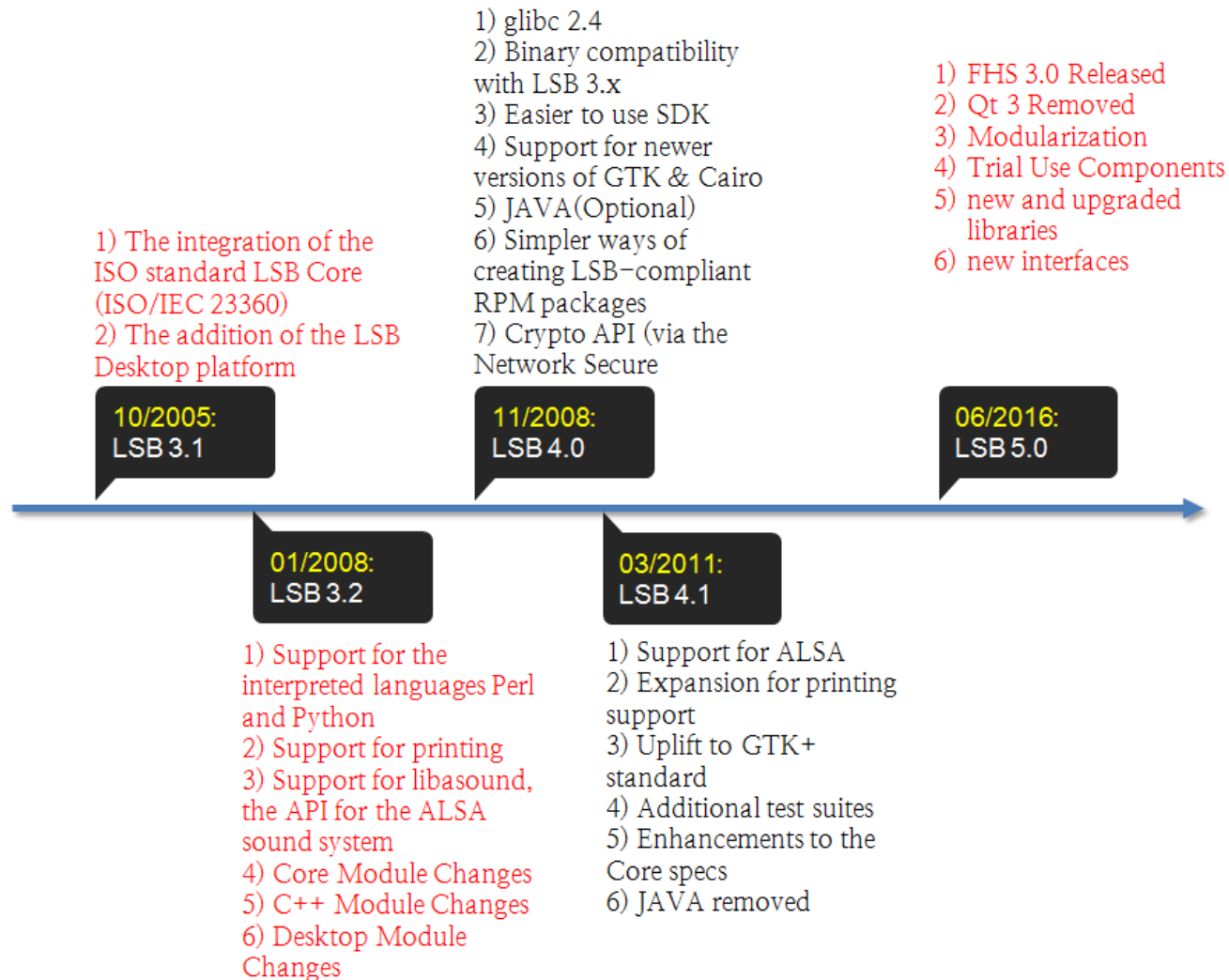
Linux Standard Base (LSB)



Linux Standard Base (LSB)



Linux Standard Base (LSB)



New ISO/IEC Joint Linux Standards

1. **ISO/IEC 23360-1-1 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base common definitions**
2. **ISO/IEC 23360-1-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification, generic part**
3. **ISO/IEC 23360-1-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification, generic part**
4. **ISO/IEC 23360-1-4 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base languages specification, generic part**
5. **ISO/IEC 23360-1-5 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base imaging specification, generic part**
6. **ISO/IEC 23360-1-6 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base graphics and Gtk3 specification (A technical Specification)**



New ISO/IEC Joint Linux Standards

7. **ISO/IEC 23360-2-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification for IA32**
8. **ISO/IEC 23360-2-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification for IA32**
9. **ISO/IEC 23360-3-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification for IA64**
10. **ISO/IEC 23360-3-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification for IA64**
11. **ISO/IEC 23360-4-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification for AMD64**
12. **ISO/IEC 23360-4-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification for AMD64**

New ISO/IEC Joint Linux Standards

13. ISO/IEC 23360-5-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification for PPC32
14. ISO/IEC 23360-5-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification for PPC32
15. ISO/IEC 23360-6-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification for PPC64
16. ISO/IEC 23360-6-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification for PPC64
17. ISO/IEC 23360-7-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification for S390
18. ISO/IEC 23360-7-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification for S390
19. ISO/IEC 23360-8-2 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base core specification for S390X
20. ISO/IEC 23360-8-3 Information technology — Programming languages and their environment — Operating systems — Linux Standard Base desktop specification for S390X

Why? => To support the following

- 1. Cloud Computing, Grid Computing.**
- 2. Smart Devices : Embedded system.**
- 3. Internet of Things (Internet of Everything).**
- 4. Mobile computing and systems**
- 5. The 4th Industrial Revolution**
- 6. Smart Society.**
 - ❖ Smart Home, Smart Building, Smart City.**

Consideration (1)

- ❖ There are explosive need for the open source free operating system to make the smart society, which has been and will be accelerated by cloud computing, smart devices, Internet of Things, the 4th industrial revolution, smart home, smart city, etc. toward the smart society.
- ❖ Thus, there has been strong thirstiness toward the free open source operating system and now we see many children of Linux for them.

Consideration (2)

- ❖ For example, when we see the case of smart phones, there are Google's Android which is based on Linux, yet we have Tizen and some others that are also based on Linux.
- ❖ What I want to say regarding the matter is "Let them go as they want. We will prepare proper and useful Linux standards as a minimal care to the children of Linux and Linux society."
- ❖ ISO and IEC standards in Linux can be the very attractive, reliable and useful to Linux end users, Linux industry, Linux market, Linux based convergence industry, and Linux based convergence market.

Current position of Linux

A market based analysis

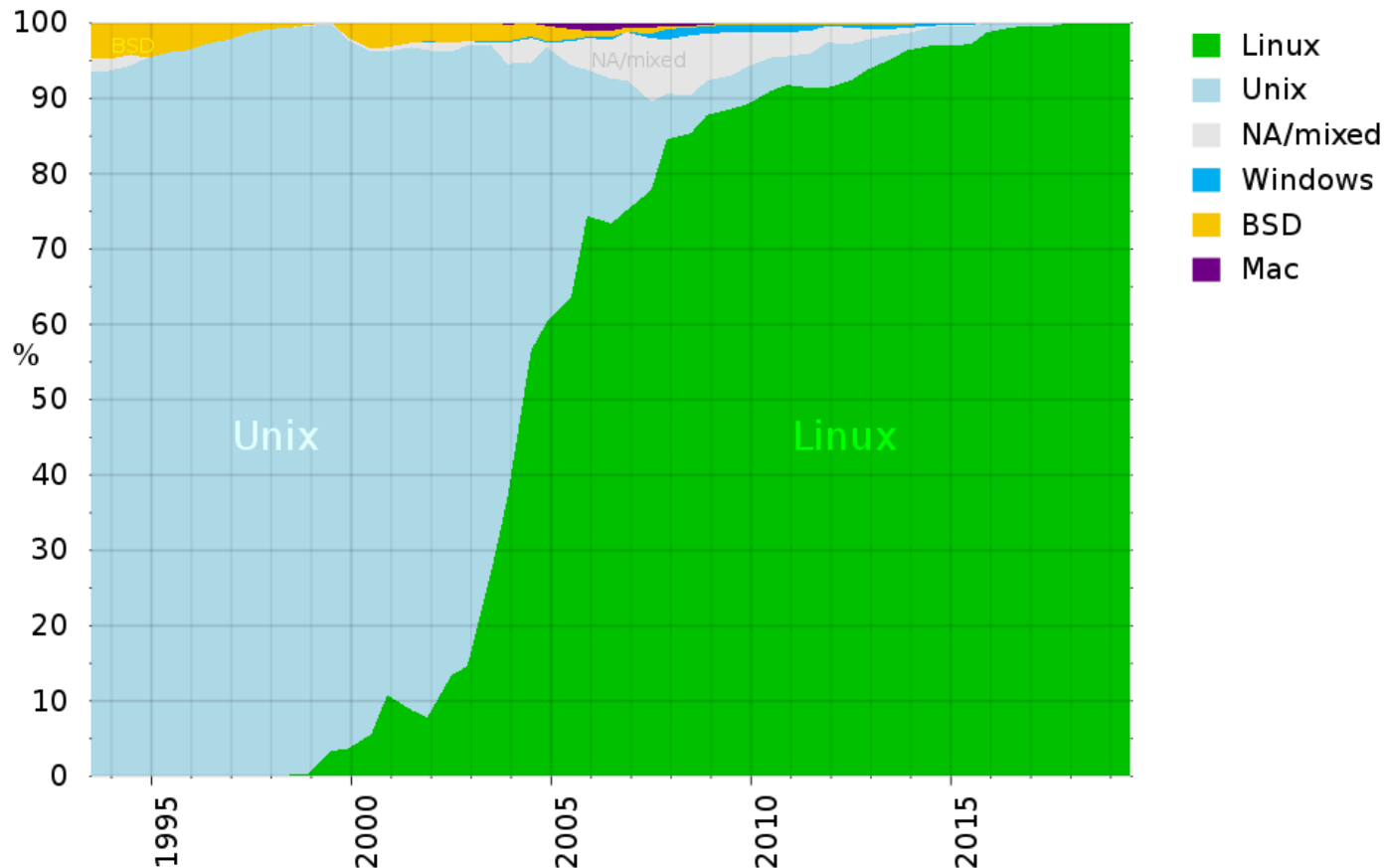
Cloud Computing

- ❖ The size of cloud market is larger than 100 billion US dollars now.
- ❖ More than 90% of cloud systems use Linux.
- ❖ We can say that all Clouds lead to Linux.

Supercomputers: wiki

Linux : 100%

Starting in 2017, every top 500 fastest supercomputer uses [Linux](#) as its [supercomputer operating system](#).



Top 500 supercomputers on 2003 June

<https://www.top500.org/system/169344/>

The screenshot shows a web browser with multiple tabs. The active tab is 'P4 Cluster 2.0 GHz - GIGE | TOP'. The address bar shows 'top500.org/system/169344/'. The website header features the 'TOP 500 The List.' logo and a navigation menu with links: HOME, LISTS, STATISTICS, RESOURCES, ABOUT, and MEDIA KIT. The breadcrumb trail reads: Home » University of Seoul - Seoul GRID Center » P4 Cluster 2.0 GHz - GIGE. The main title is 'P4 CLUSTER 2.0 GHZ - GIGE'. Below this is a table with the following specifications:

Site:	University of Seoul - Seoul GRID Center
Manufacturer:	Self-made
Cores:	224
Memory:	0 GB
Processor:	Pentium 4 2GHz
Interconnect:	Gigabit Ethernet
Performance	
Linpack Performance (Rmax)	0.3104 TFlop/s

On the right side of the page, there are four promotional tiles: 'TOP500 LIST' with a document icon, '25 YEARS ANNIVERSARY' with a laurel wreath icon, and 'NEWSLETTER SIGN UP' with an envelope icon. A fourth tile with a starburst graphic is partially visible.

Top 500 supercomputers on 2003 June

<https://www.top500.org/system/169344/>

operating system market - Google x University of Seoul - Seoul GRID x P4 Cluster 2.0 GHz - GigE | TOP x +

top500.org/system/169344/

Processor:

Pentium 4 2GHz

Interconnect:

Gigabit Ethernet

Performance

Linpack Performance (Rmax)

0.3104 TFlop/s

Theoretical Peak (Rpeak)

0.448 TFlop/s

Nmax

106,900

Nhalf

41,900

Software

Operating System:

Linux

RANKING

List	Rank	System	Vendor	Total Cores	Rmax (GFlops)	Rpeak (GFlops)	Power (kW)
06/2003	378	P4 Cluster 2.0 GHz - GigE	Self-made	224	310.40	448.00	

Tweets by @top500supercomp

TOP500

@top500supercomp

Don't forget to vote ...
Or it becomes "The Rise of Vectors"
<https://twitter.com/top500supercomp/status/1329560336614125568>

Nov 21, 2020

TOP500 Retweeted

SC21

@Supercomputing

Congratulations to the TOP500 Supercomputers as announced at #SC20! Other honors:

1 HPCG | HPL-AI: Fugako

2 HPCG | HPL-AI: Summit

3 HPCG: Sierra

Cloud Computing Conference 2021, April 18–22, Porto, Portugal, Young W. Lee, UOS, Seoul, Korea

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Mainframes : wiki

Linux distributions have become increasingly popular on mainframes in the last decade partly due to pricing and the open-source model. [2013 wiki]

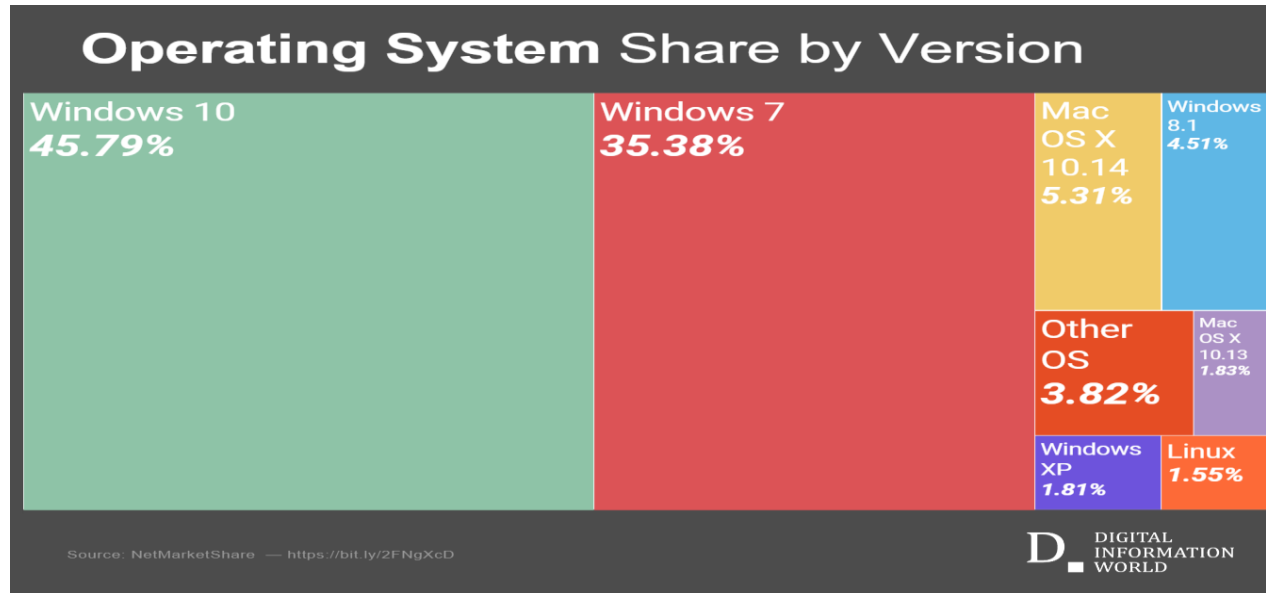
IBM announced its investment of one billion US dollars to Linux in 2000.

In December 2009, computer giant IBM reported that it would predominantly market and sell mainframe-based Enterprise Linux Server. [2013 wiki]

As of March 2016, Red Hat is the second largest corporate contributor to the Linux kernel version 4.14 after Intel. On October 28, 2018, IBM announced its intent to acquire Red Hat for \$34 billion. The acquisition closed on July 9, 2019.

The most common operating system for mainframes is IBM's [z/OS](#). Operating systems for [IBM Z](#) generation hardware include IBM's proprietary z/OS, [Linux on IBM Z](#), [z/TPF](#), [z/VSE](#) and [z/VM](#).

PCs and Laptops

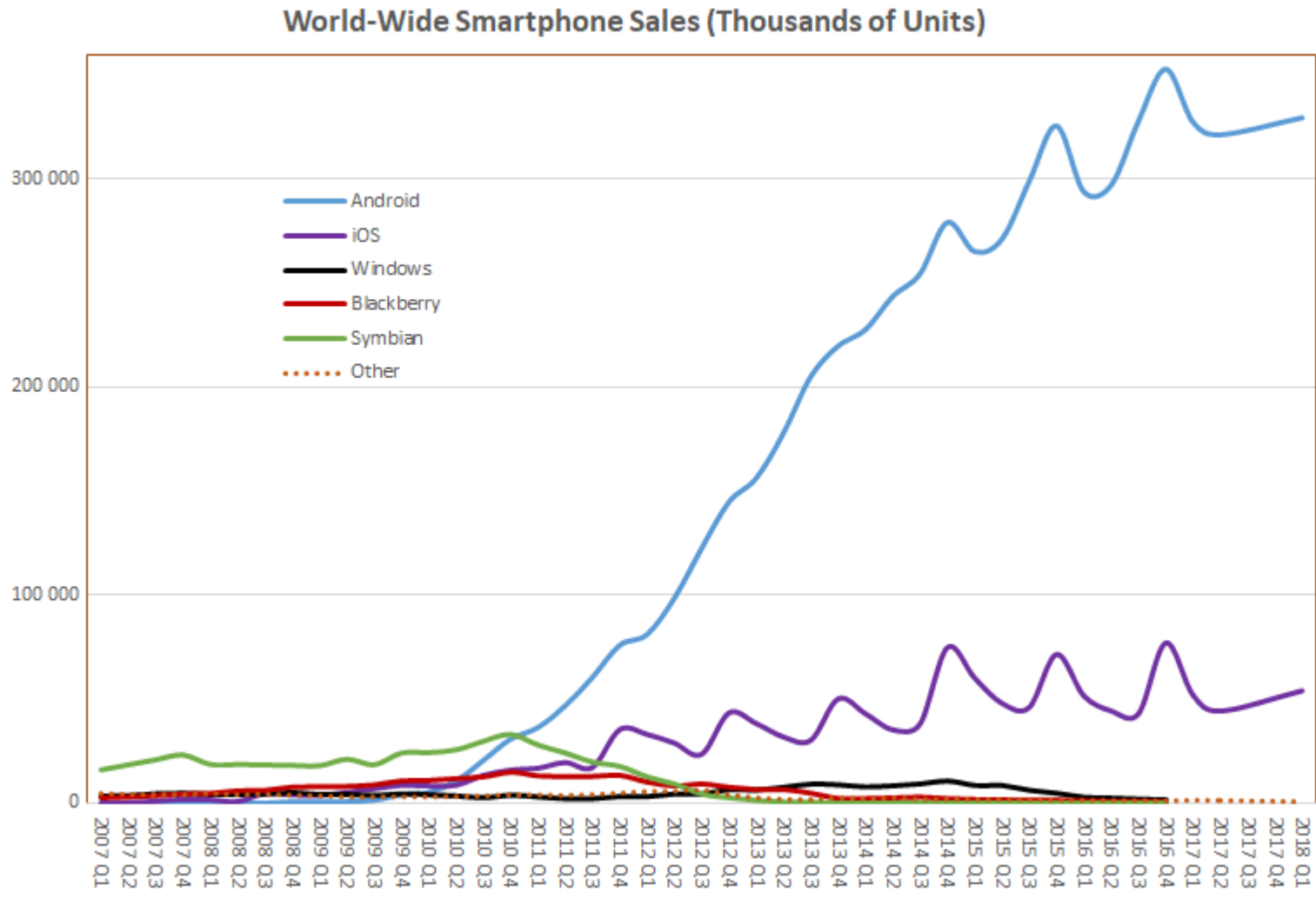


Market Share figures for May 2019 and June 2019

<https://www.digitalinformationworld.com/2019/07/global-operating-system-market-share.html>

- ❖ In 2019, Microsoft released Windows 10 Linux.
- ❖ Microsoft released its Windows 10 Update on May 2020.
 - A “major” update to Windows 10,
 - The biggest change to the May 2020 Update is that it includes the Windows Subsystem for Linux 2 (WSL 2), with a custom-built Linux kernel.

Smartphone OS : wiki.



Linux Based OS for Smart Devices

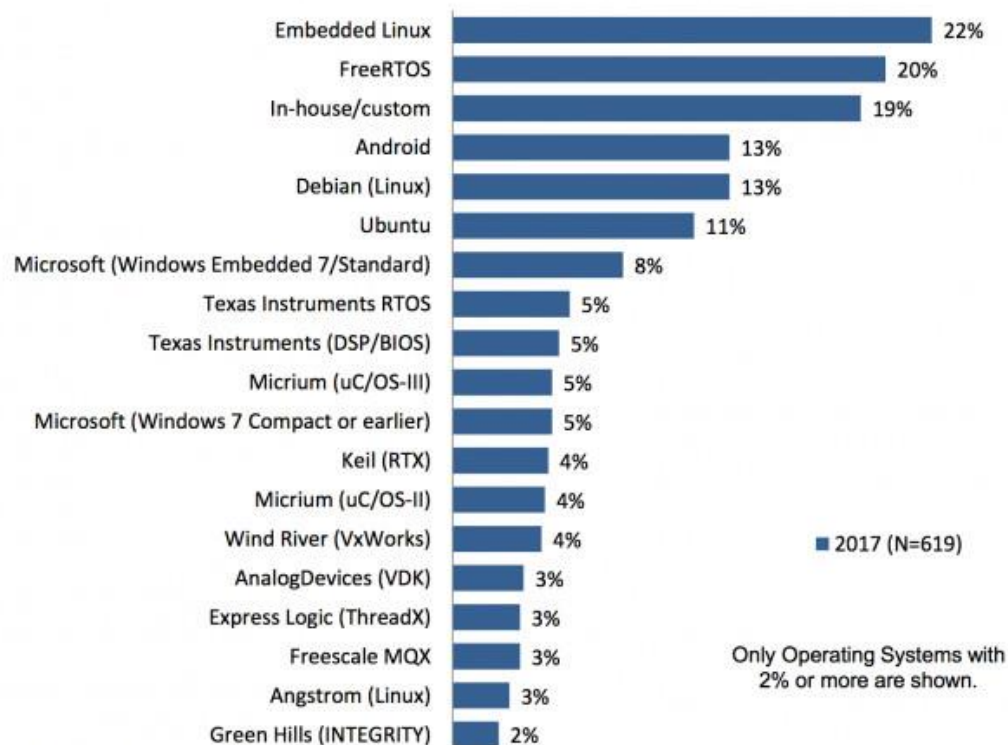
- ❖ **Android : Google**
- ❖ **Tizen : Samsung, Intel, ...**
- ❖ **WebOS : LG, ...**
- ❖ **.....**

Embedded System

62



Please select ALL of the operating systems you are currently using.



■ 2017 (N=619)

Only Operating Systems with 2% or more are shown.

Base: Currently using an operating system

EETimes embedded

2017 Embedded Markets Study

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http://linuxgizmos.com/files/aspencore_os.jpg

The ISO/IEC Standards for Linux Standard Base are to support the followings.

- 1. Cloud Computing**
- 2. Internet of Things (Everything).**
- 3. Smart Devices : Embedded system.**
- 4. Mobile Computing and Mobile Systems**
- 5. The 4th Industrial Revolution.**
- 6. Smart Society**
 - ❖ Smart Home, Smart Building, Smart City**

1. The New ISO/IEC standards for Linux standard base are to support cloud computing

Very Useful to Cloud Computing

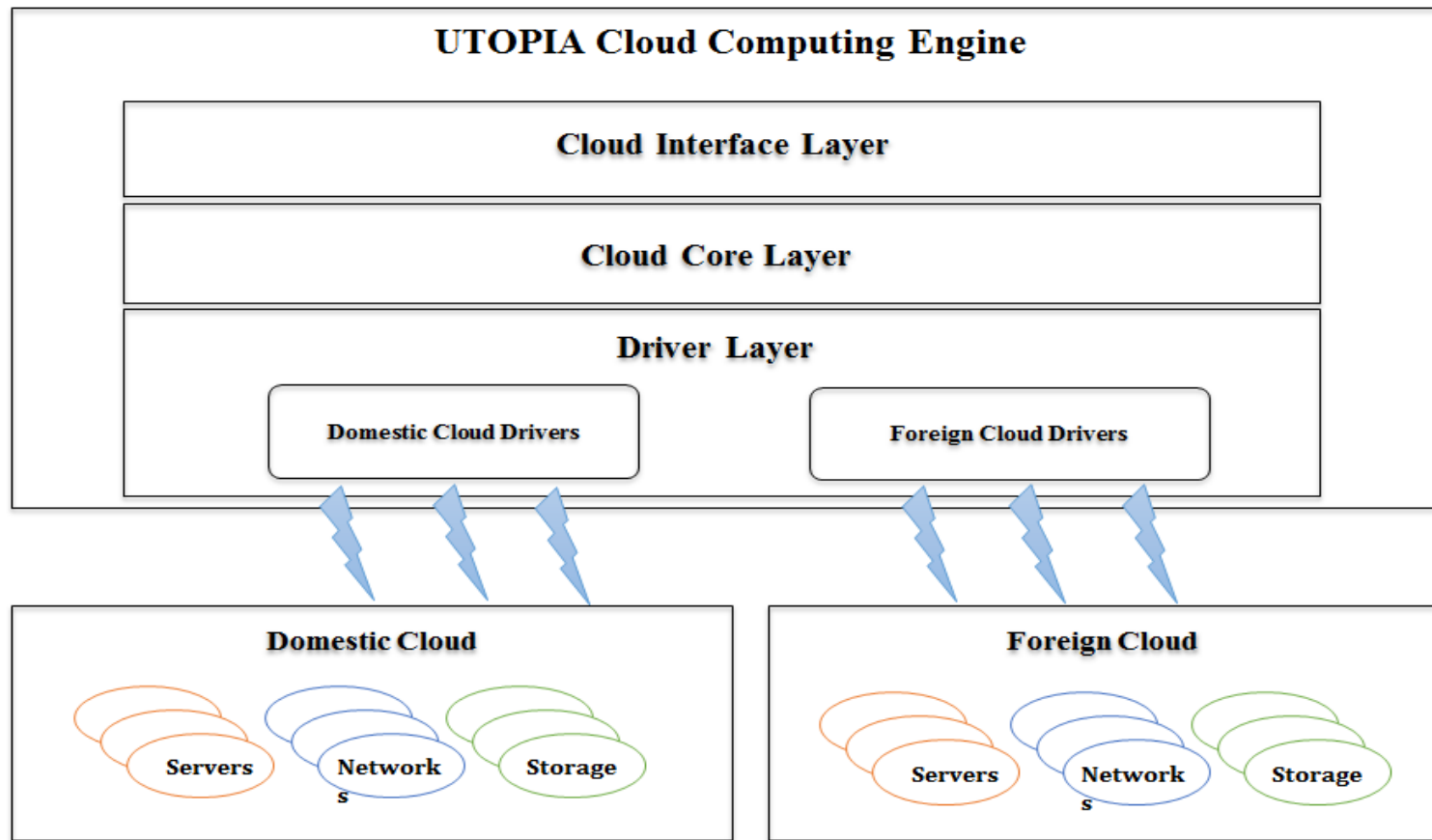
❖ For migration in clouds.

- Migration is moving from one cloud to another.
- Migration among different clouds.
- Migration in a hybrid cloud.

❖ For compatibility

❖ For portability

Very Useful to Cloud Computing



- **Domestic Cloud** = Cloud systems inside the smart city
- **Foreign Cloud** = Cloud systems outside the smart city

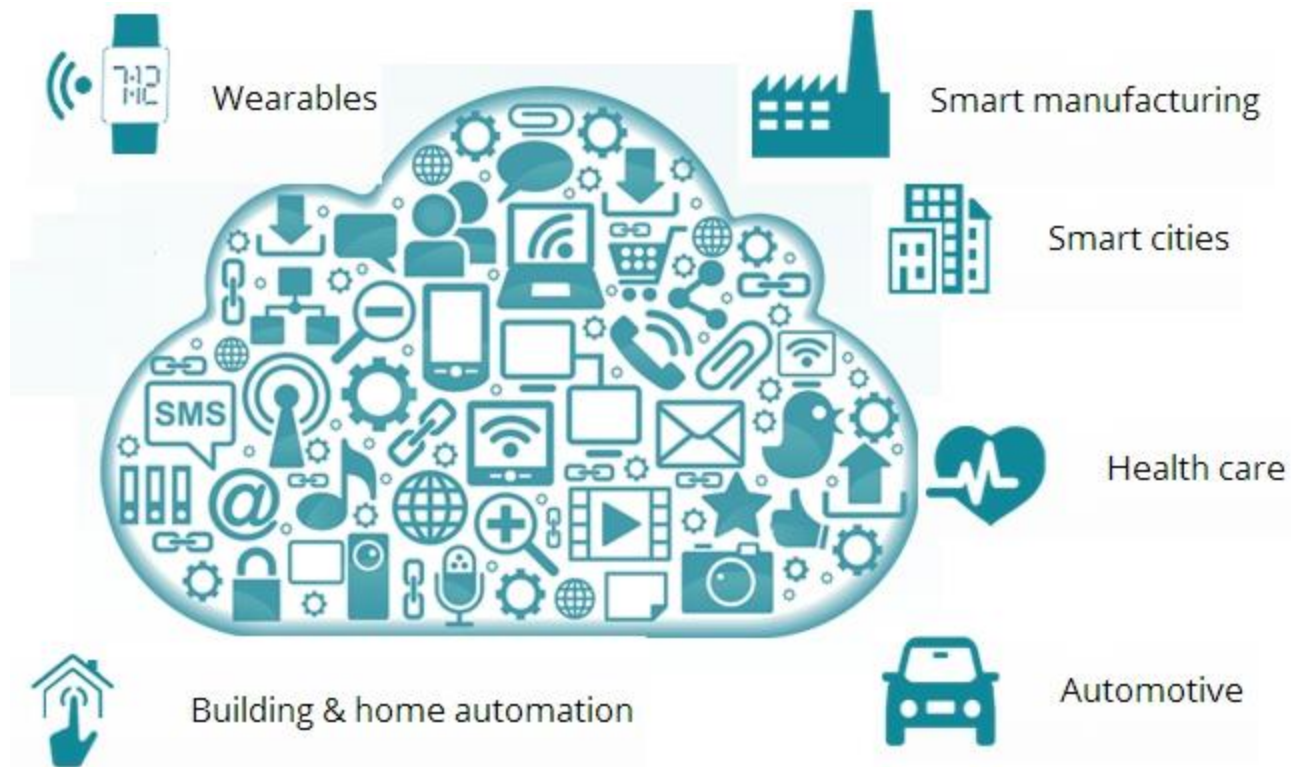
Who works for cloud standards?



Who works for cloud standards?

- https://cloud-standards.org/?title=Main_Page

Cloud Computing is essential for smart devices, IoT, mobile systems, the 4th industrial revolution, smart home, smart cities, and smart society.



<https://www.kipost.net/news/articleView.html?idxno=108210>

Cloud Computing is essential for the E-government.

Information systems of government agencies integrated and managed together



Seamless & Flawless Operation Achieved

- Stable integrated IT management for 24 / 7
- Monthly system failure time : 67min ► 1.15min



IT Management Improved

- 67% of employees licensed for ITIL (IT Infra. Lib.)
- Number of systems managed per person : 1.8 ► 13



Security Environment Consolidated

- 8-layer protection / 4-step analysis against intrusion
- Cyber attack / intrusion detection system equipped
- Dual system for natural disaster relief

※ NCIA: National Computing & Information Agency

Korea's E-government Best Practices

Cloud Computing is essential for mobile computing.



<http://aceadv.t.in/2018/10/23/5g-mobile-network/>

Cloud Computing is essential for mobile computing.



<http://aceadvn.in/2018/10/23/5g-mobile-network/>

Cloud Computing is essential for mobile computing.



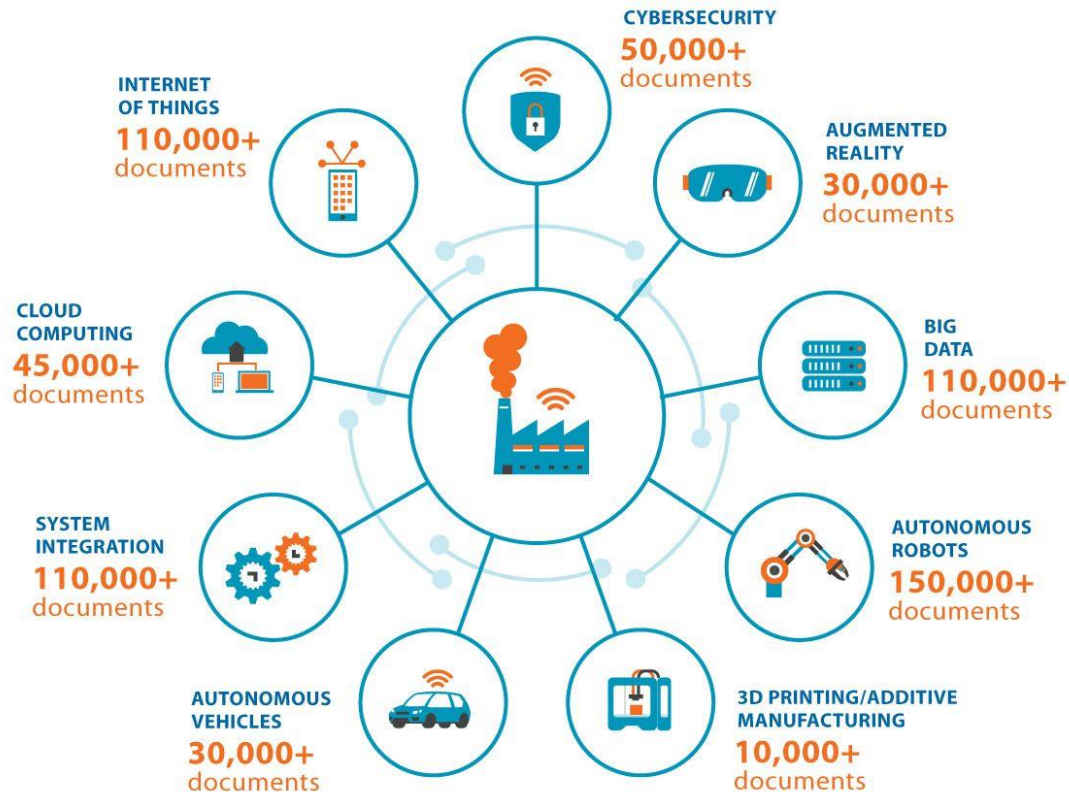
<https://5gmf.jp/en/about-5g/>

Cloud Computing is essential for smart cities



Cloud Computing is essential for the 4th Industrial Revolution.

Technologies Fueling 4IR in IEEE Xplore



<https://innovate.ieee.org/innovation-spotlight-ieee-fueling-fourth-industrial-revolution/>

2. The New ISO/IEC standards for Linux standard base are to support smart devices.

Linux Drives the Open Source Car



https://www.phoronix.com/scan.php?page=news_item&px=AGL-Linux-CES-2020

A Linux-powered smart truck by Tesla

“It's not just Tesla with Linux under the hood. Audi, Mercedes-Benz, Hyundai, and Toyota, to name a few, all rely on Linux.”



http://linuxgizmos.com/files/aspencore_os.jpg

Linux Drives Hyundai Smart Cars.

The screenshot shows a web browser with three tabs: 'smart linux car - Google 검색', 'Hyundai Joins AGL and Other A...', and 'Global IT Giants Eyeing Smart C...'. The address bar shows the URL 'linux.com/topic/embedded-iot/hyundai-joins-agl-and-other-automotive-news-ces/'. The Linux.com header is orange with the logo and navigation links: 'TOPIC', 'AUDIENCE', 'RESOURCES', and 'ABOUT US'. The breadcrumb trail is 'Home > Topic > Embedded/IoT > Hyundai Joins AGL and Other Automotive News from CES'. The article title is 'Hyundai Joins AGL and Other Automotive News from CES' by Eric Brown, dated January 10, 2019, with 662 views. Social media sharing icons for Facebook, Twitter, Pinterest, WhatsApp, LinkedIn, Reddit, and Email are present. The article text discusses the Consumer Electronics Show (CES) in Las Vegas, highlighting automotive news such as new in-vehicle development platforms, 5G services, self-driving concept cars, and electric vehicles. It mentions that the Linux Foundation's Automotive Grade Linux (AGL) project announced that South Korean automotive company Hyundai has joined the project. The article is partially visible, with the bottom showing the start of a section titled 'Hyundai jumps on AGL bandwagon'.

smart linux car - Google 검색 x Li Hyundai Joins AGL and Other A x BK Global IT Giants Eyeing Smart C x +

linux.com/topic/embedded-iot/hyundai-joins-agl-and-other-automotive-news-ces/

linux.com TOPIC v AUDIENCE v RESOURCES v ABOUT US Q

Home > Topic > Embedded/IoT > Hyundai Joins AGL and Other Automotive News from CES

Topic Embedded/IoT Training and Tutorials

Hyundai Joins AGL and Other Automotive News from CES

By Eric Brown - January 10, 2019 662

f t p w in r e

This week's Consumer Electronics Show (CES) in Las Vegas has been even more dominated by automotive news than last year, with scores of announcements of new in-vehicle development platforms, automotive 5G services, self-driving concept cars, automotive cockpit UIs, assisted driving systems, and a host of electric vehicles. We've also seen numerous systems that provide Google Assistant or Alexa-driven in-vehicle interfaces such as Anker's Google Assistant based **Roav Bolt**.

Here we take a brief look at some of the major development-focused CES automotive announcements to date. The mostly Linux-focused developments range from Hyundai joining the Automotive Grade Linux project to major self-driving or assisted ADAS platforms from Baidu, Intel, and Nvidia.

Hyundai jumps on AGL bandwagon

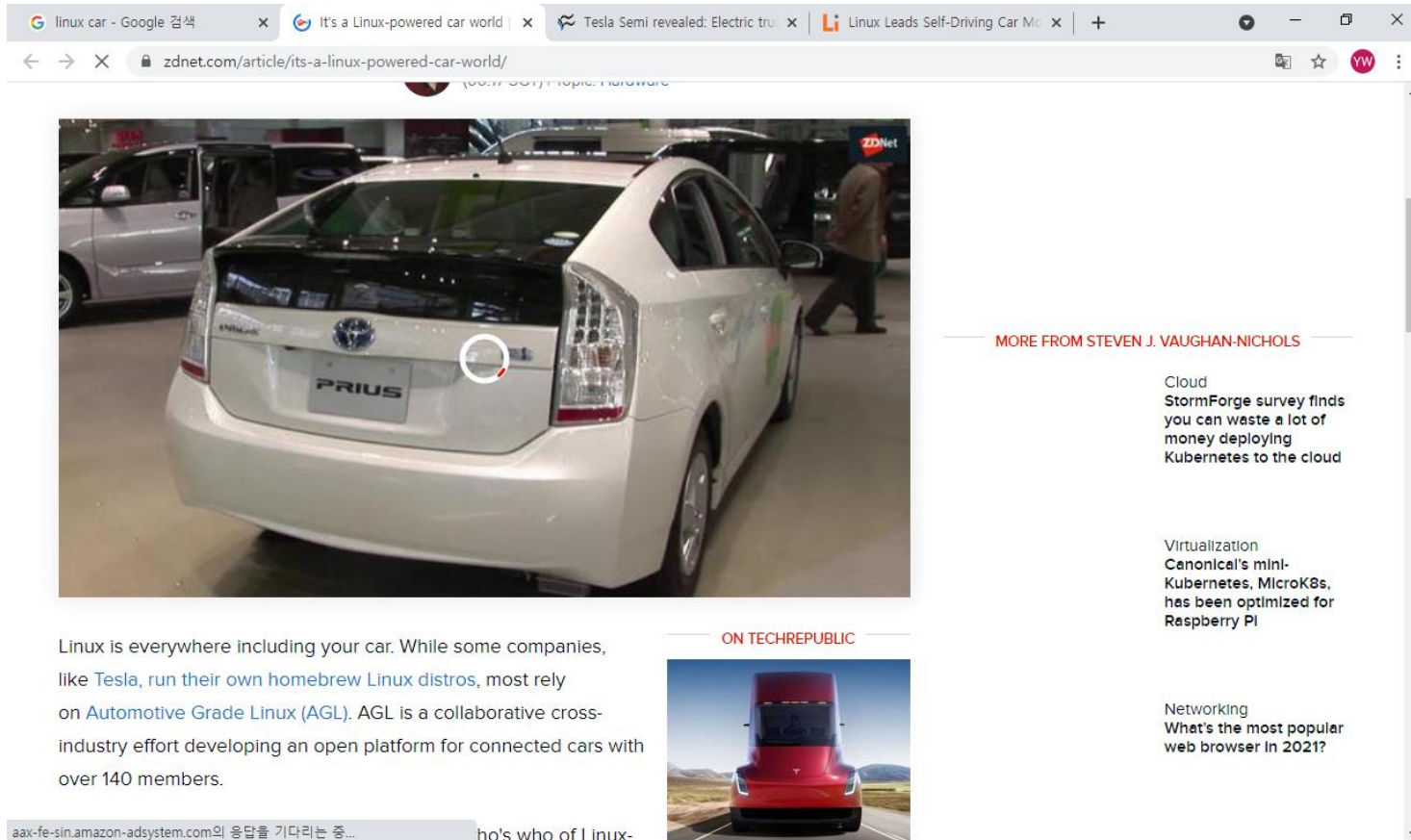
Just prior to the launch of CES, the Linux Foundation's **Automotive Grade Linux (AGL)** project **announced** that South Korean automotive

LF car 231.jpg ^ 1200px-Automoti....png ^ LF car 23.jpg ^ LF car 2.jpg ^ 모두 표시 x

<https://www.linux.com/topic/embedded-iot/hyundai-joins-agl-and-other-automotive-news-ces/>

It's a Linux-powered car world

By [Steven J. Vaughan-Nichols](#) | January 4, 2019



linux car - Google 검색 x It's a Linux-powered car world x Tesla Semi revealed: Electric tru x Linux Leads Self-Driving Car Mo x +

zdnnet.com/article/its-a-linux-powered-car-world/

PRIOUS

Linux is everywhere including your car. While some companies, like Tesla, run their own homebrew Linux distros, most rely on Automotive Grade Linux (AGL). AGL is a collaborative cross-industry effort developing an open platform for connected cars with over 140 members.

ON TECHREPUBLIC

MORE FROM STEVEN J. VAUGHAN-NICHOLS

Cloud
StormForge survey finds you can waste a lot of money deploying Kubernetes to the cloud

Virtualization
Canonical's mini-Kubernetes, MicroK8s, has been optimized for Raspberry Pi

Networking
What's the most popular web browser in 2021?

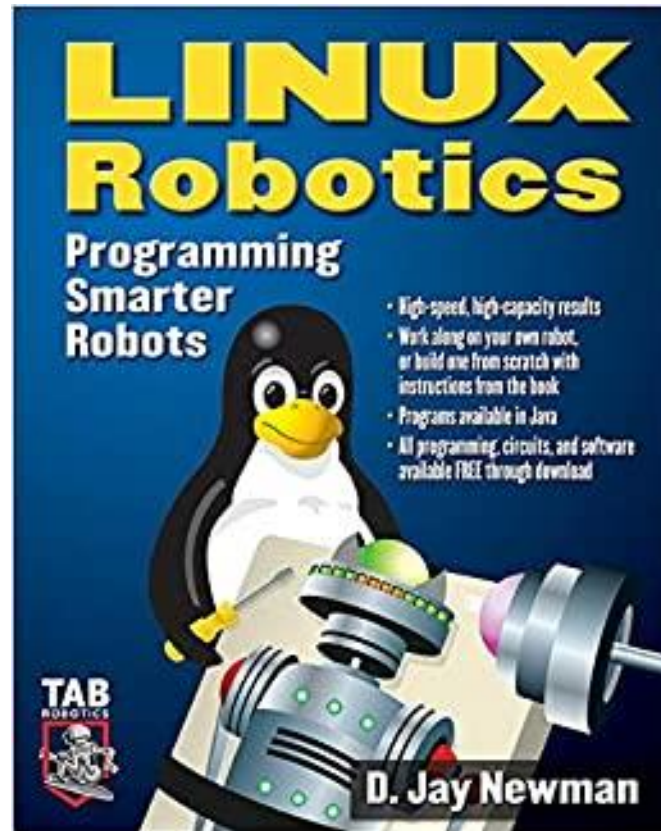
Figure from <https://www.zdnet.com/article/its-a-linux-powered-car-world/>

Drones and unmanned flights

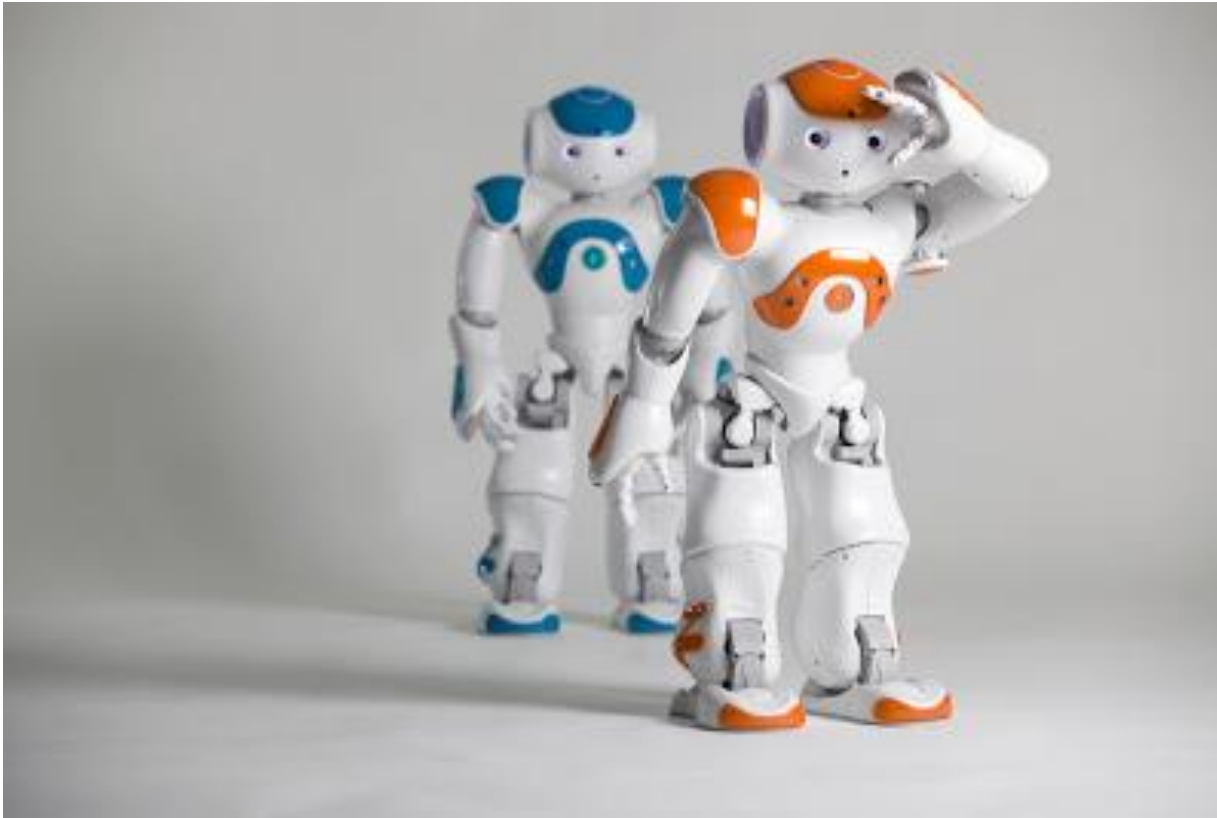


<https://www.ubuntupit.com/best-drone-and-robot-software-for-linux/>

Robots



Robots



<https://www.ubuntuvibes.com/2011/12/meet-nao-next-gen-new-linux-powered.html>

Smart Ships

Korea's Competition for Remote Technology of ships Development



5G Digital Transformation



- **Smart Ship Start-up Center in Ulsan**
 - Improved offshore start-up network
 - Securing Marine Communications Coverage
- **5G-based Smart Shipyard System**
 - Secure 360° Wearable Neckband
 - 5G based UHD CCTV
 - 5G based Large Crane Control
 - 5G Kiosk / Download 3D drawings

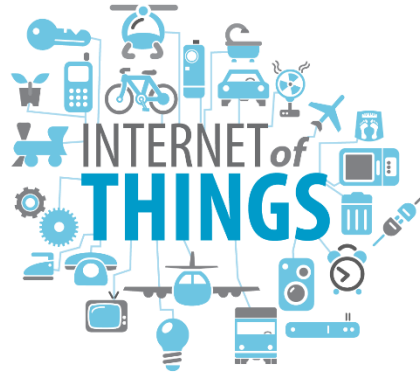
Remote Technology of ships Test Operation



- **Successful test operation 5G-based**
 - Construction of 5G Network in Geoje Shipyard
 - Operate from Daejeon Remote Control Center 250km away
- **Autonomous - remote Navigation Model Ship 'Easy go'**
 - SHI Independent Development
 - 5G based LiDAR
 - Video Control Solution 'T Live Castor'
 - Cloud based IoT solutions

<http://www.maritimekr.org/2020/03/30/korea-jumps-into-developing-the-remote-technology-of-ships/>





3. The New ISO/IEC standards for Linux standard base are to support Internet of Things (IoT)

Internet of Things (IoT)

- **The Internet of Things (IoT) refers to uniquely identifiable objects and their virtual representations in an Internet-like structure.**
- **Smart Devices + Virtual Representations**

Internet of Things (IoT)

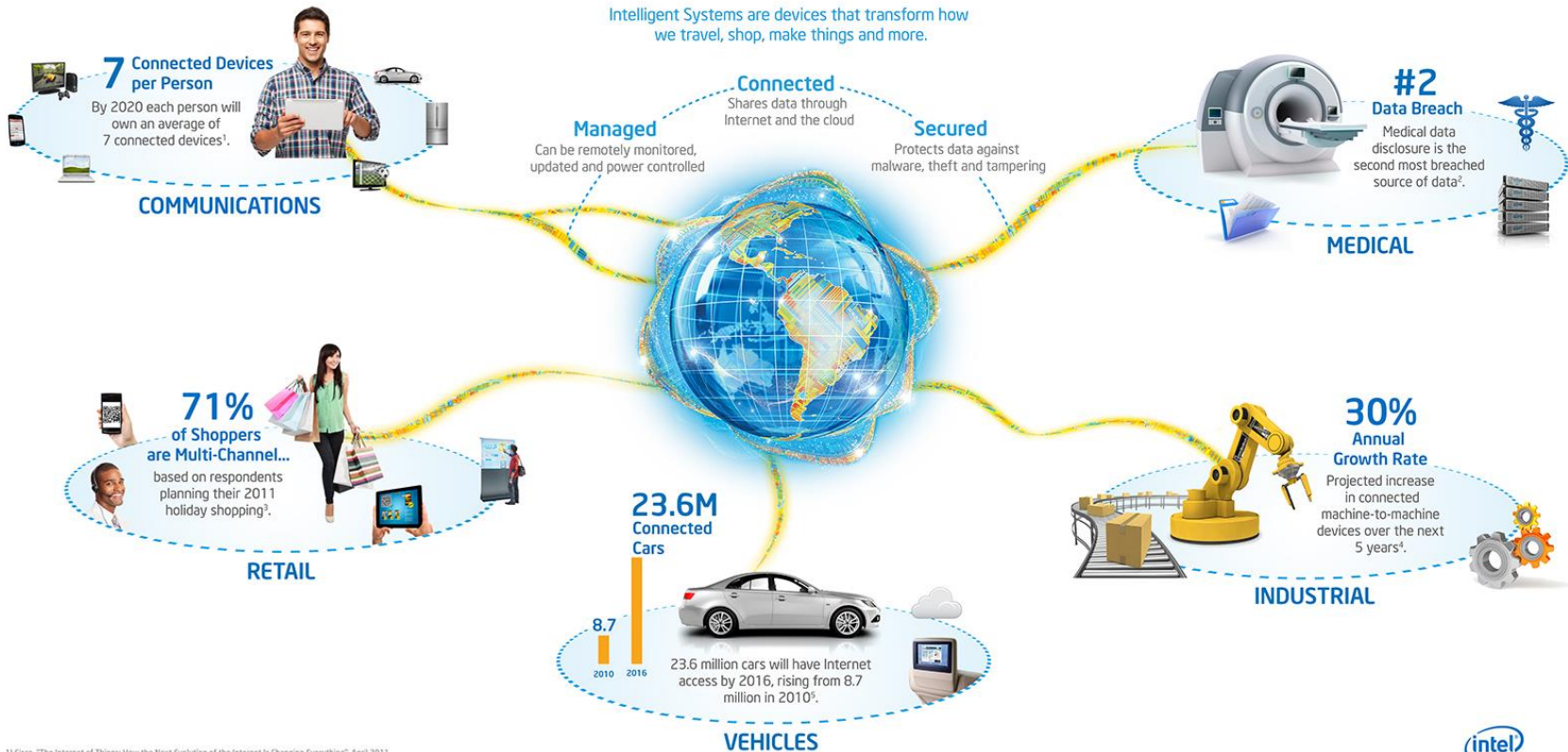
- Internet of things is connecting smart things through Internet and making them available through Internet.
- “Companies and organizations explain the Internet of Things in various ways, but the Internet of Things, or IoT, is most commonly described as an ecosystem of technologies monitoring the status of physical objects, capturing meaningful data, and communicating that information through IP networks to software applications.”
- “The recurring themes in all definitions of the Internet of Things include smart objects, machine to machine communication, RF technologies, and a central hub of information. ”
- See more at <http://blog.atlasrfidstore.com/internet-of-things-and-rfid#sthash.maX6z58Z.dpuf>

IoT by Intel

Intelligent Systems for a More Connected World

WHAT ARE INTELLIGENT SYSTEMS?

Intelligent Systems are devices that transform how we travel, shop, make things and more.



¹ Cisco, "The Internet of Things: How the Next Evolution of the Internet is Changing Everything", April 2011

² Bloor Research, "Security challenges in the US healthcare sector" White Paper, December 2010, <http://www.mcafee.com/us/resources/white-papers/wvp-bloor-healthcare-security.pdf>

³ Deloitte U.S., 2011 Annual Holiday Survey, http://www.deloitte.com/assets/Com-UnitedStates/Local/20Assets/Documents/Consumer%20Business/us_retail_AnnualHolidaySurvey_2011_pr_102611.pdf

⁴ McKinsey Global Institute analysis, "Big data: The next frontier for innovation, competition, and productivity", June 2011

⁵ Wall Street Journal, <http://online.wsj.com/article/SB10001424052702304066504576349763814933044.html>, estimate from research firm, Frost & Sullivan

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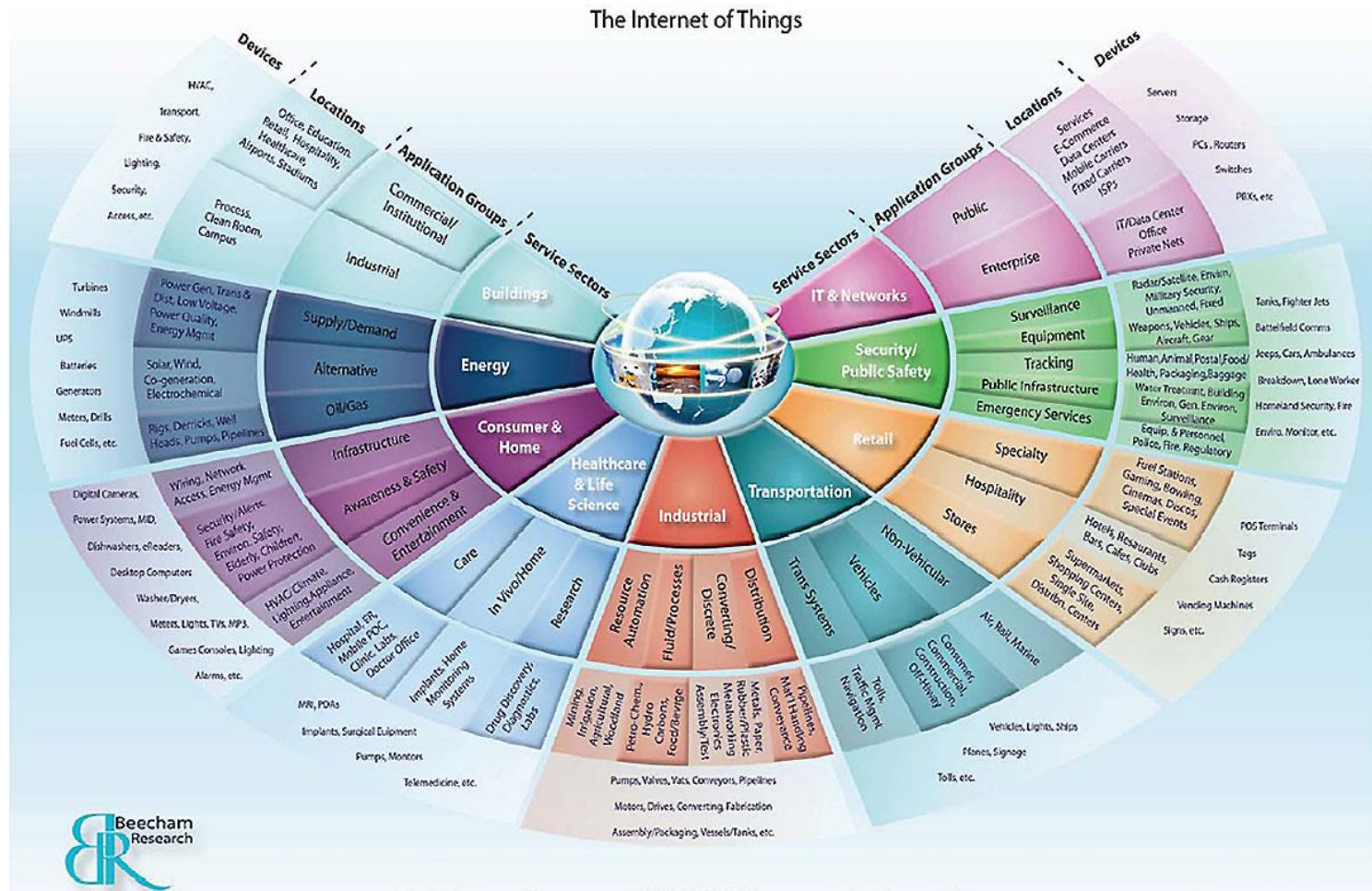


IoT by Intel



The figure: <https://www.intel.co.kr/content/www/kr/ko/policy/policy-internet-of-things-iot.html>

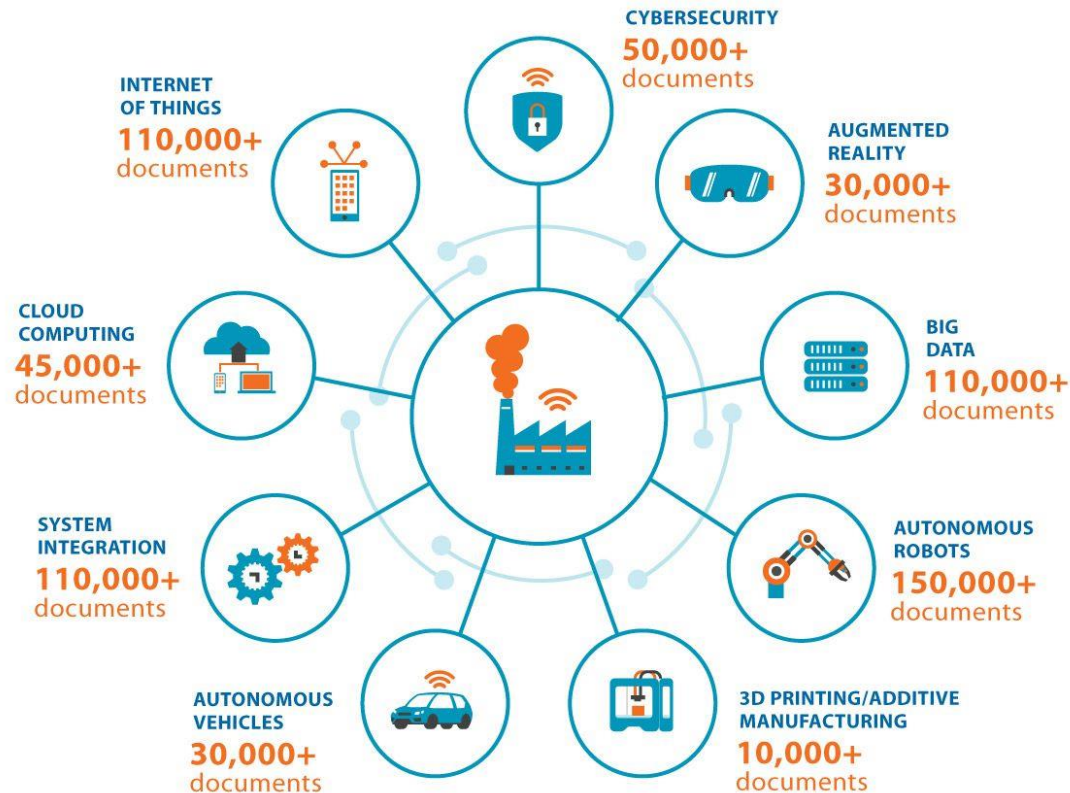
Cisco & Beecham Research



4. The New ISO/IEC standards for Linux standard base are to support the 4th Industrial Revolution.

The 4th Industrial Revolution

Technologies Fueling 4IR in IEEE Xplore



<https://innovate.ieee.org/innovation-spotlight-ieee-fueling-fourth-industrial-revolution/>

5.1 The New ISO/IEC standards for Linux standard base are to support Smart Home.

5.2 The New ISO/IEC standards for Linux standard base are to support Smart Buildings

Smart Building

IoT for Smart Buildings



Security



Fire Safety



Lighting



24/7 Monitoring



HVAC



Energy Management



HVAC(Heating, Ventilation, & Air Conditioning)

5.3 The New ISO/IEC standards for Linux standard base are to support Smart City

Smart City

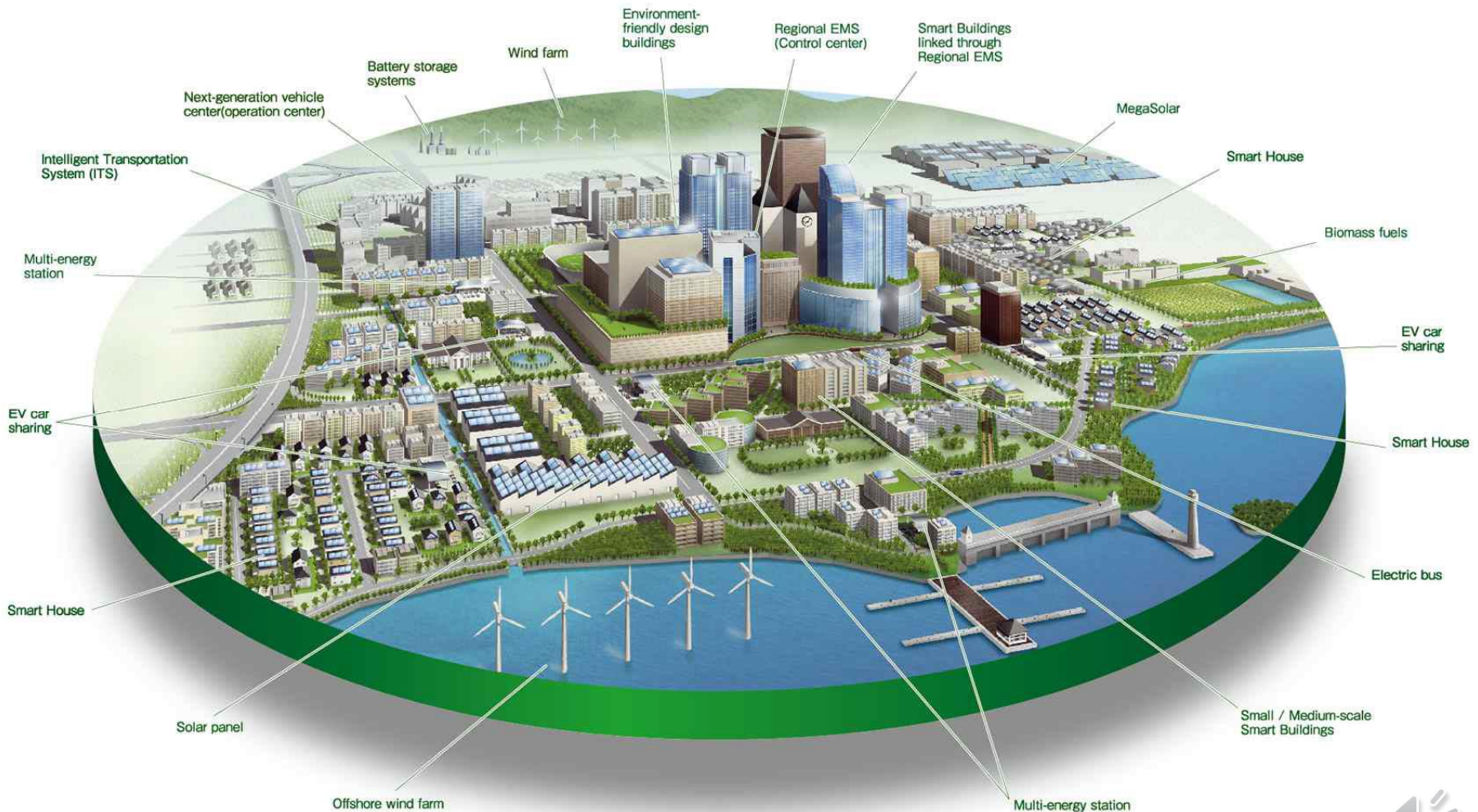


- is a future city,
- converges ICT & City,
- allows the citizens to use the services anytime, anywhere and with any accessing devices
- and includes smart factories.

Smart Cities

Conference will focus on Scotland's part in the smarter cities revolution

Posted on: January 8th, 2014 by Will Peakin

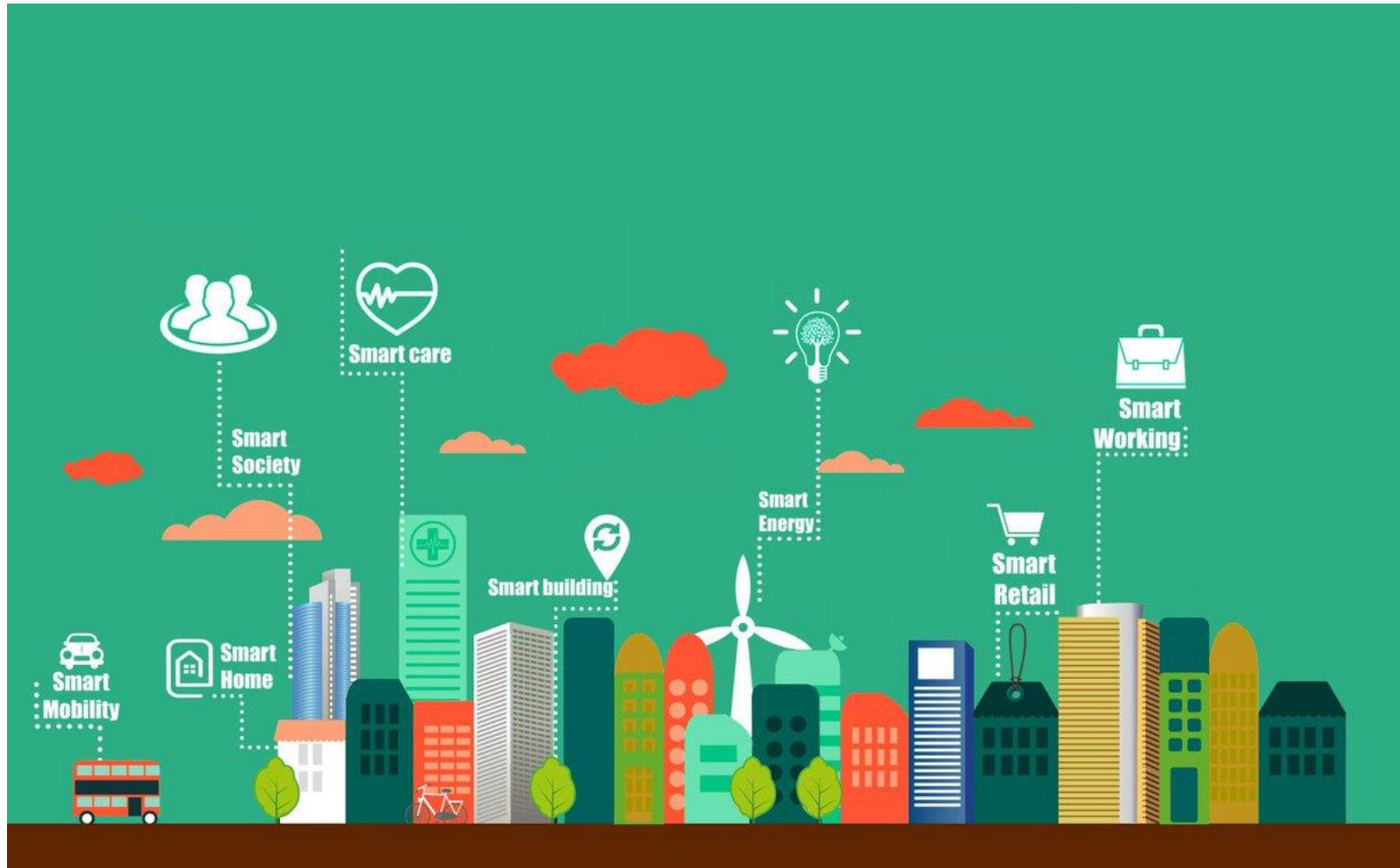


Smart Cities



6. The New ISO/IEC standards for Linux standard base are to support smart society

Smart Society



Conclusion

The ISO/IEC Standards for Linux Standard Base are to support the following.

- 1. Cloud Computing**
- 2. Smart Devices : Embedded system.**
- 3. Internet of Things (Everything).**
- 4. Mobile Computing and Mobile Systems**
- 5. The 4th Industrial Revolution**
- 6. Smart Society**
 - ❖ Smart Home, Smart Building, Smart City**

- ywlee@uos.ac.kr Professor Young W. Lee

