A STUDY OF THE CHARACTERISTICS OF HYPER-CONNECTED SOCIETY AND THE CHANGE OF THE SECURITY

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ABSTRACT

Paradigm and analysis of the security paradigm change in regard to the recognition of hyper-connected society characteristics of information technology development. As a result, in hyper-connected society each part constitutes one device, and the combination of each device constitutes one individual, equipment, or infrastructure, and the network to which they are connected consists of a country, and such countries have a connection structure that forms a global network . Therefore, in order to secure overall reliability, the reliability of each component must be ensured, and for this a trust chain construction is required.

INTRODUCTION

Modern society is at the forefront of the Fourth Industrial Revolution, a time characterized by hyper-connectivity centered around the cyber-physical system and the Internet (IoT) (HP, 2014). Hyper-connectivity in this digital society has made strides toward improving productivity by connecting and executing tasks at high speed, but at the same time it is vulnerable to cyber attacks and there is a danger of serious confusion, respectively. As a result of these changes, cyber security previously only meant protection against website errors, denial of service attacks, and data breaches, but it has since expanded into the realm of threats to the physical assets and core infrastructures that they cause (HP, 2014). Therefore, in this paper we analyze the characteristics of hyper-connected society and analyze the changes of the security paradigm accordingly. To do this, we derive the concept and components of hyper-connected society, identify its characteristics, and analyze its security threats and paradigm shifts.

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The concept and characteristics of hyper-connected society

Hyper-connected society concept

Anabel Quan-Haase and Barry Wellman (2003), Canadian social scientists, have argued that hyper-connected society is a concept derived from an announcement in "Networks of distance and media: A case study of a high-tech firm" (Anabel Quan-Haase and Barry Wellman, 2003). It is a society in which people, people, and terminals are closely connected with each other through the development of IT technology and changes to the means of communication (Korea Information Society Agency, 2013b). Prior to that, Barry Wellman analyzed and predicted connectivity and its social changes in his 2001 paper "Physical Place and Cyberplace: The Rise of Personalized Networking" (Barry Wellman, 2001). Connectivity is a concept that encompasses all three connectivity features: place-to-place connectivity, person-to-person connectivity, and globalized connectivity.

- **Place-to-place connectivity:** Transforms from traditional door-to-door to interregional communities which are further consolidated through connection and communication via the internet.

- **Person-to-person connectivity:** Enables private communication anytime, anywhere without restrictions in space, resulting in a change across society as a whole.
- **Globalized connectivity:** With network connectivity, personal computers and servers are connected globally, and mobile phones and satellite communications accelerate this global increase in connectivity.

Secondly, connectivity was previously defined as an evolution of communication, but is now also defined as an increase in digital interconnection between people, people, and objects. It is being watched by evolution. For hyper-connected society, each subject has various definitions. There is no agreed definition of hyper-connected society, but generally people and things are connected to the network. In this process, the production and processing of new data, process innovation,

Table 1. Concept of Hyper-connected society

References	Concept
Barry Wellman, 2001	Evolution of social networks through diverse communication
CISCO, 2011	Where everything is connected to the network and massive amounts of information and knowledge are produced and exchanged, creating numerous business opportunities, reducing the gap between rich and poor, and enabling an efficient use of resources.
World Economic Forum, 2012	Which will strengthen the connectivity and networking ability of people and things and increase industrial value and change through new applications
Korea IT Promotion Agency, 2013	A society that enables people to create intelligent networks by connecting people, processes, data, and objects based on IT and create new values and innovations through them
Future Creation Science Department, 2014	An age when all people, things, and devices are connected through the internet

Table 2. Core technology of Hyper-connected society

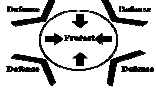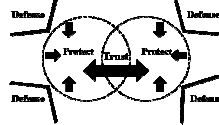| Technology	Explanation
Internet of things (IoT)	A network of networks that share connectivity to all things. In the past, network functions were added to objects that were not connected to the network, and environments in which people communicate with each other based on a network based on the internet
Big data	Data that is difficult to manage and analyze because of the variety of formats and rapid circulation. A variety of technology capable of processing and analyzing large volumes of data and various types that can not be processed by the existing information processing paradigm.
Machine-to-machine (M2M)	Communication between devices or between devices. It is a technology that means automated communication without human intervention between objects. It is a technology that is mainly used in closed network environments.
Cloud computing	The use of IT resources such as servers, storage, and SW through the internet as needed. Technology that utilizes virtualized infrastructure, platforms, and services through networks to utilize information and communication technology
Wearable device	Everything attached to the body to do computing
Context-aware computing	A technology that analyzes the behavior of users, vital signs, past life histories, etc., and automatically performs appropriate functions according to the situation

Note : Korea Information Society Agency, 2013a

Table 3. Key technologies and similar/related technologies for implementing hyper-connected society

Division	Information society	Hyper-connected society
Key elements of connectivity	Data, communication	Things, status, situation
Connection structure	Shipment, parallel connection	Multiple shipments.
Connection properties	Focus on network connections	Focus on interconnection after linking
The main value of the connection	Liquidity, reachability	Consistency, relationship
Configuring connectivity	Web-like configuration	Honeycomb configuration

Table 4. Key features of hyper-connected society

Key features	Explanation
Connectivity	All things are networked and connected to the internet, connected beyond traditional ICT domains
Globalness	Network connectivity, which is confined to information and communication technology domains, can be connected in all areas of society, thus giving global effects to influence and objects
Interrelation	Interconnected system configurations in which each device and system is linked and activity affects other systems, etc
Interoperability	Provides common communication standards and data standards so that different systems and devices can operate over the internet and used without any problems
Interdependence	One system is dependent on another system, using the information associated with each system

Table 5. Cyber security paradigm shift

Division	Information society	Hyper-connected society
Basic principle	Checking and blocking → Access management, introduction of security equipment. Internal and external boundaries are clear, allowing internal and external protection	Trust and management → Security design. The inner and outer boundaries are ambiguous and it is difficult to distinguish the scope of protection and defense, and therefore security should be premised.
Principle structure		
Prejudice Effect	Information disclosure · System infringement. Economy and convenience conflict	Object error · Data distortion. National collapse (national security). Life threat (national security)
Policy	Protecting and protecting infringement. Economy and industry> IT> Cyber security → Considered as one area	Design security · End point security · Reality - Cyber cooperation security. National society - Cyber sSecurity → The national agenda is required

and so on, are commonly referred to as a society where connectivity is enhanced.

Hyper-connected society configuration technology

Hyper-connected society is a social phenomenon rather than a technical concept. Hyper-connected society can be seen as a major technology in the internet of things, big data, and related technologies such as cloud computing and M2M.

Hyper-connected society connects all people, objects, and devices through the internet via the internet of things, converts information and phenomena generated during this process into meaningful information through data processing technology such as big data, and can be seen as a society that improves efficiency and linkage.

Key features of hyper-connected society

Hyper-connected society is expected to show a different pattern from existing information society due to the development and dissemination of related technologies such as the internet of things and big data. Social change due to the advent of hyper-connected society can predict the following factors.

Security THREATS of hyper-connected society

The cyber threat of hyper-connected society is a physical space collapse (Forrester Research, 14), which is a domino phenomenon of a single-object error or data distortion. Therefore, the control, safety, reliability, and systematic nature of key elements (objects, people, data, and processes) of hyper-connected society are required, and a systematic approach is needed to systematize them comprehensively. In terms of national and social safety, cyber attacks on national infrastructure facilities such as power, communications, transportation, and financial institutions threaten the safety of core areas of the nation and society.

In terms of personal safety, hyper-connected society core services (smart city, smart card, wearable device, smart medical, etc.) may seriously threaten personal safety including sensitive personal information.

Conclusion

Hyper-connected society cyber security policy should focus on the stability of the whole network, and it is necessary to establish a chain of trust in terms of security and safety management across the nation and among the people. Establishing a nationwide trust chain will lay a foundation for responding to the security threats of the hyper-connected society, strengthening overall security capabilities, and enabling international competitiveness in the formation of markets related to hyper-connected society. Hyper-connected society must establish national infrastructure and systems to secure each element and maintain security even in the process of organically connecting these elements. As a detailed policy for establishing the national trust chain, policies such as IoT device security guidelines, IoT device security certification systems, IoT environment-based security governance systems, legal system maintenance, manpower training, information sharing, and consumer protection are required.

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