

SAMSUNG
VISION
for
TOMORROW

Internet of Things: Transforming the Future

Samsung Framework Paper
June 2016

TRANSFORMING

w i t h a p u r p o s e

Introduction

The Internet of Things (IoT) has quickly become one of the most important technology trends of the digital era. It already touches almost every industry and will increasingly transform our lives and societies for the better.

For policymakers, IoT offers opportunities to deliver vastly better policy outcomes, more efficiently and at much lower cost. Many of these transformations are already under way, but many are just beginning.

With IoT at this pivotal juncture, Samsung, along with co-founding partners Intel and the Information Technology Industry Council (ITI), is bringing together key US policymakers, IoT innovators and thought leaders to map out the road ahead through the National IoT Strategy Dialogue. To help inform that discussion, this Framework Paper sets out Samsung's vision for an IoT based on universal principles of a human-centered approach, openness, and collaboration.

We hope you will join with us on this exciting journey, so we can all build an IoT that delivers safer, more efficient, and more sustainable societies, with a better quality of life for all.

Executive Summary

Vision & Principles:

Samsung's vision is for an Internet of Things delivered at scale and with a clear purpose: to deliver safer, more efficient, more sustainable societies with higher quality of life for all.

Realizing this vision will require an IoT based on three universal principles:

- **Human-Centered:** Designed with people at its core so IoT is useful, accessible and of value to both individuals and society
- **Open:** Welcoming innovation from all corners and enabling IoT technologies to connect with each other
- **Collaborative:** Bringing together all sectors to foster innovation and address the challenges of bringing IoT to scale

Public Policy Considerations:

- Passage of the *Developing Innovation and Growing the Internet of Things (DIGIT) Act* to:
 - Provide a framework for effective public-private collaboration on national IoT policy
 - Avoid policy fragmentation caused by uncoordinated adoption of policies by various government actors
- Provision of sufficient additional licensed and unlicensed spectrum allocations to support IoT growth
- Early adoption of IoT by federal, state, and local governments to improve government services such as protection of public safety, the environment, infrastructure, transportation, education, and public health
- Collaboration between government and the private sector to develop, promote and use voluntary consensus standards, guidelines, and practices (while avoiding sector-specific regulation) such as those developed by the National Institute of Standards & Technology (NIST):
 - Cybersecurity Framework
 - Draft Framework for Cyber-Physical Systems
- Investment in science, technology, engineering, and mathematics (STEM) education for the current and future workforce
- Meaningful patent policy discussion, including design patents for a digital world, to encourage an open playing field and foster innovation at all levels

The Path Forward | National IoT Strategy Dialogue

In June 2016 Samsung – along with co-founding partners Intel and ITI – launched a new National IoT Strategy Dialogue to:

Foster public-private dialogue on the benefits and challenges of bringing IoT to scale

Develop an industry proposal for a National IoT Strategy to inform IoT public policymaking

Ensure IoT delivers benefits for individuals, families, businesses, innovators, communities, policymakers, and the economy

“Conversations about IoT are already happening from kitchen tables to boardroom tables around the world. The National IoT Strategy Dialogue is about helping to bring those conversations to Cabinet tables as well.”

Oh-Hyun Kwon
Vice Chairman and CEO
Samsung Electronics
June 2016

Human-Centered IoT

A New Definition

There are many technical definitions of IoT, but all tend to have three components in common:

- Sensors to gather data from the physical world
- Processing power to make sense of that data
- The Internet to transfer that data and put it to practical uses

These definitions all help to explain what IoT consists of, but they do little to explain the purpose and significance of IoT. Samsung has built on this common understanding of IoT's core components to develop a more holistic definition, including not just the *what* and the *how* of IoT, but also – the *why*.

We believe IoT is the connective tissue that brings the physical and digital world together to improve quality of life.

Samsung's IoT Leadership

Samsung has been at the leading edge of IoT's development around the world and in the United States, including by:

- Currently employing over 15,000 people in the United States
- Investing approximately \$15 billion since 1997 in its Austin, TX, semiconductor manufacturing facility - one of the largest direct foreign investments in US history
- Committing \$1.2 Billion in US-centered IoT investments and R&D over the next 4 years
 - Centered in Samsung Strategy and Innovation Center, Global Innovation Center, and Samsung Research America, all of which are US-based
 - Focused on IoT innovations such as health, infrastructure, energy efficiency, safety, and more
- Developing key IoT hardware and data capabilities:
 - ARTIK: Samsung's IoT platform, interoperable across common operating systems and wireless standards, openly available to innovators large and small as a tool for IoT innovation
 - KNOX: Samsung's defense-grade mobile security platform, which safeguards enterprise data by building a hardware-rooted trusted environment, now protecting millions of Samsung mobile devices including Samsung Connect Auto
- Investing in the 2014 acquisition of SmartThings, an IoT company established in Washington, DC, whose platform is compatible with hundreds of products from a wide range of manufacturers



IoT Now: Smarter Homes, Offices, Factories

IoT technology is already delivering major improvements at an individual and enterprise level, for example:

Health and Safety

- Through fitness and wellness devices that help people maintain a healthy lifestyle
- For seniors living independently, by using connected sensors to help family members monitor and respond to problems
- By connecting home sensors to residents' smartphones, neighbors and police

Environmental Sustainability

- By powering down lights and appliances based on real-time usage
- By adjusting building temperature based on changing weather

Efficient Government Services

- By equipping dumpsters with sensors, saving fuel and other resources, as garbage trucks only collect when necessary
- By collecting data shared by smartphone users to reveal the location of potholes and enable more efficient road repairs

Real People. Real Solutions.

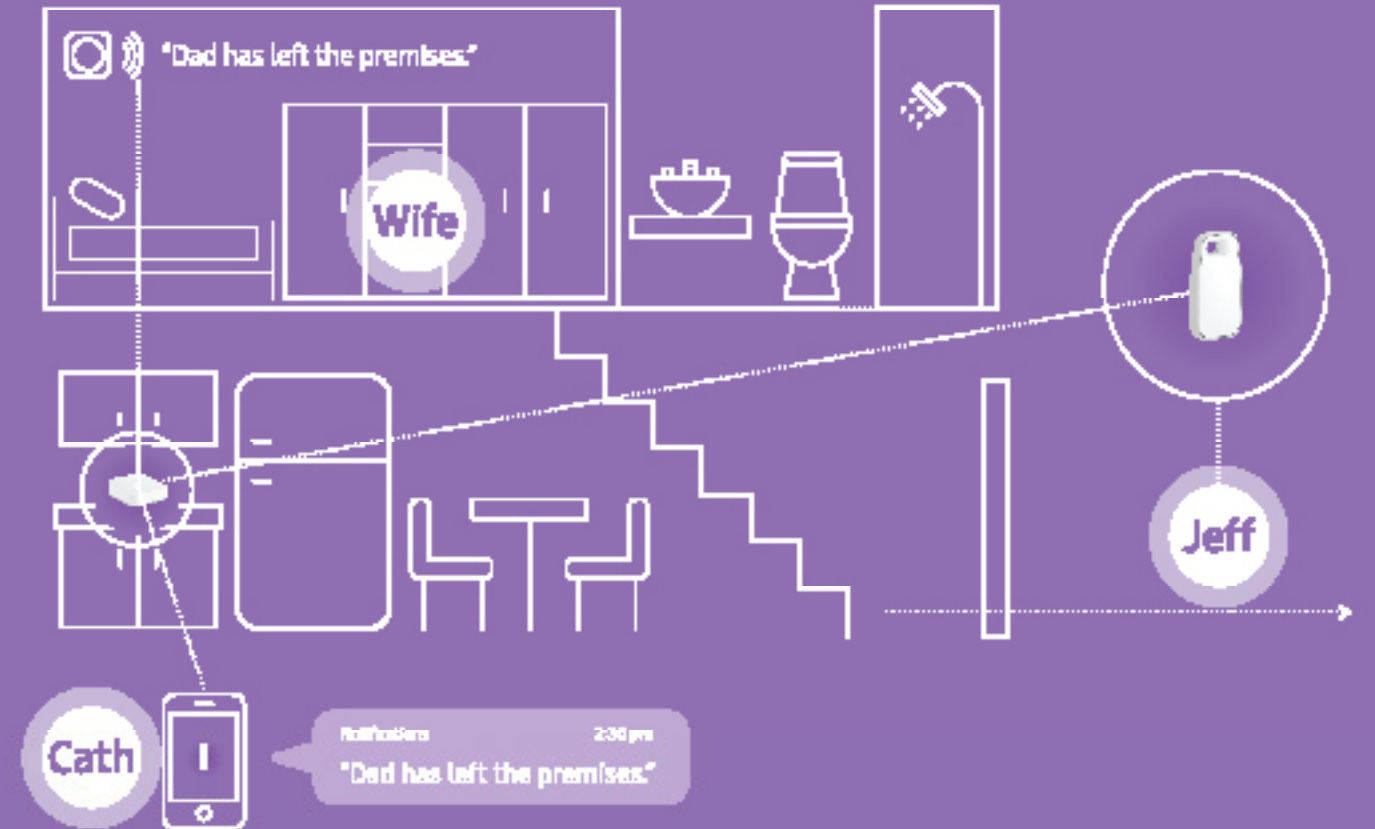
(Based on a real story submitted by a SmartThings user)

Jeff has Lewy Body Dementia. This causes him to leave his property inadvertently, sometimes without telling his family. Jeff's daughter Cath configured his home with IoT sensors and an IoT SmartThings hub. If Jeff leaves his property, Cath receives an alert on her smartphone, and a voice message plays over speakers inside the house to alert Jeff's wife: "Dad has left the premises."

These simple IoT solutions have allowed Jeff to stay in his family home instead of moving into an assisted living facility. They have maintained Jeff's quality of life and given his family peace of mind.

To take this capability to the next level, Samsung is now collaborating with Deakin University in Australia to explore using pattern recognition and IoT to monitor seniors' daily habits and provide alerts automatically if the resident is having problems, such as falls, trouble sleeping, or leaving home unexpectedly.

According to Deakin University, for each year that a person remains in their own home the savings to the government are between AUD \$100,000 and \$300,000 (US \$75,000 and \$225,000).



Real People, Real Solutions: Jeff with Lewy Body Dementia
A home configured with IoT sensors and an IoT SmartThings hub means Jeff's family knows when he's left the premises.

IoT Soon: Smarter Cities, Nations, World

IoT technology can deliver society-wide benefits at scale, for example:

Health and Safety

- By helping healthcare providers monitor people with chronic illnesses continuously without visits to a clinic or hospital
- By empowering people with disabilities, through sensors that make the world more accessible
- By crowd-sourcing data in real time from sensors in smartphones, homes and public utilities to monitor for natural disasters, activate early warning systems, and trigger public safety responses

Environmental Sustainability

- By gathering data from sensors on street lights to map air quality and inform policy responses
- By using floating sensors to track water evaporation and salinity levels to trigger drought remediation

Efficient Government Services

- By using sensors attached to public vehicles to gather data on public infrastructure (e.g., roads, bridges) and monitor for public safety risks

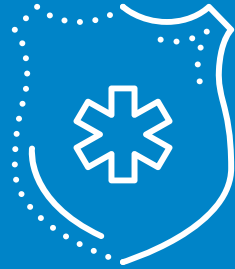
Our challenge is to unlock these benefits by bringing IoT to scale

I O T C A N H A V E A
GLOBAL ECONOMIC IMPACT OF MORE THAN
\$11 TRILLION
ANNUALLY BY 2025

A recent study by McKinsey Global Institute mapped the real economic value of IoT, based on 150 key use cases and found:

- Potential global economic impact of \$3.9 trillion to \$11.1 trillion annually by 2025
- At the high end, this is equivalent to 11 percent of world economic activity annually
- IoT users (businesses, consumers and other organizations) could capture 90% of total value – for example, in 2025 remote monitoring could create as much as \$1.1 trillion a year in value by improving the health of chronic-disease patients
- A dynamic new industry is growing rapidly around IoT, creating new jobs

IoT at Work



Public Safety:

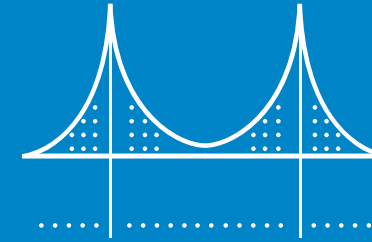
Crowd-sourced data from IoT platforms such as SmartThings could be used to detect earthquakes and trigger precautionary shutdowns of at-risk utilities like gas services.



Sustainability:

As drought worsens in the United States and many other countries, Samsung's Makers Against Drought Challenge invited innovators around the world to develop practical, scalable IoT solutions.

As an example, one of this year's finalists, Electro Dialysis Desalinator for Irrigation (EDDI), used IoT to remove salt-water effects of drought.



Infrastructure:

IoT researchers at Carnegie Mellon University are exploring how vibration sensors can be attached to public vehicles – like postal trucks or police cars – to monitor the health of bridges that they drive across.

Government engineers could receive alerts automatically when bridges are unsafe. All of this data could help to maintain and repair our bridges before they fail, at a fraction of the cost of attaching sensors or sending inspectors to all of America's 600,000 bridges.



Human-Centered, Open, Collaborative: The Principles in Practice

	What the Private Sector is Doing	What Government Can Do	Benefits for People and Society	
Human-Centered	<ul style="list-style-type: none"> Innovation & devices made for people Technology to solve significant human challenges <p>For example:</p> <ul style="list-style-type: none"> Samsung Makers Against Drought Challenge 	<ul style="list-style-type: none"> Use IoT to improve policy evidence-base, design, implementation & measurement Use IoT to better protect health, safety & the environment <p>Recommendation:</p> <ul style="list-style-type: none"> Passage of the DIGIT Act by Congress 	<ul style="list-style-type: none"> Relevance Practicality & functionality Accessibility Improved services & quality of life 	<ul style="list-style-type: none"> Business productivity Environmental sustainability Lower cost of public policy to taxpayers
Open	<ul style="list-style-type: none"> Open platforms Interoperability Open-source tech <p>For example:</p> <ul style="list-style-type: none"> ARTIK Module & Cloud SmartThings IoT platform 	<ul style="list-style-type: none"> Foster innovation Open playing field <p>Recommendation:</p> <ul style="list-style-type: none"> FCC to proceed with millimeter wave spectrum allocation 	<ul style="list-style-type: none"> Enables innovation by multiple parties, including consumers Scale 	<ul style="list-style-type: none"> Affordability & accessibility Functionality Productivity, growth & jobs
Collaborative	<ul style="list-style-type: none"> Partnerships for innovation Developing consensus voluntary standards and guidelines <p>For example:</p> <ul style="list-style-type: none"> National IoT Strategy Dialogue Open Connectivity Foundation* 	<ul style="list-style-type: none"> Partner with private sector on IoT pilot projects & standards <p>Recommendation:</p> <ul style="list-style-type: none"> Showcase IoT in Smart Cities initiatives NIST to finalize 2015 Draft Framework for Cyber-Physical Systems 	<ul style="list-style-type: none"> Innovation, optimal product quality & relevance Leverage market forces Regulatory flexibility 	<ul style="list-style-type: none"> Scale Safety & security Efficiency Accessibility & affordability

*Creates voluntary specifications to connect devices regardless of manufacturer, operating system, chipset or physical transport



IoT's Public Policy Implications

What Federal, State and Local Government Can Do to Protect Consumers:

- Recognize the key role that industry collaboration and leadership in self-regulation – as opposed to rigid technology mandates – plays in US economic growth in the Internet age of rapid technological innovation
- Convene and collaborate with industry on codes of good practice and other self-regulatory frameworks for privacy and security
- Allow IoT ecosystems to develop, subject to existing consumer protection safeguards for Internet-connected products and services (e.g., Section 5 of the Federal Trade Commission Act) – as opposed to adding IoT-specific regulations
- Avoid and, where possible, reduce sector-specific regulations that can impede the interoperability of devices and data underpinning IoT's transformative potential
- Continue to educate consumers and businesses about security and privacy through guidelines and references such as the Federal Trade Commission's "Start with Security" and "Careful Connections" IoT guidance

What Federal, State and Local Governments Can Do to Enhance Societal Benefits of IoT:

- Increase coordination between government bodies with authority over aspects of IoT privacy and security, in order to prevent policy fragmentation. In particular:
 - Passage of the DIGIT Act (S 2607, HR 5117) to improve interagency and public-private communication and support a comprehensive national approach to IoT policy
 - Complete the National Telecommunications & Information Administration's IoT green paper with a comprehensive view of IoT policy
 - Collaborate with the private sector through the National IoT Strategy Dialogue
- Compile and disseminate IoT standards, guidelines, and practices for interoperability and security:
 - Complete the draft Framework for Cyber-Physical Systems (CPS) developed in partnership with industry, academic and government experts in the NIST CPS Public Working Group
- Engage in meaningful patent policy discussion to encourage an open playing field and foster innovation
 - For example, revisit "total profit" disgorgement for infringement of a single design patent in digital products
- Become early adopters of IoT to improve government services, both as sponsors of pilot programs and in full-scale implementations, in order to:
 - Make government services such as protection of public safety and the environment, infrastructure, transportation, education, and public health more efficient
 - Support IoT demand, driving economic growth and job creation
 - Seek opportunities to trial and adopt innovative uses of IoT, such as the Smart Cities Initiative
- Allocate sufficient additional licensed and unlicensed spectrum for IoT growth, including high and low data rate, indoor and outdoor, fixed and mobile services:
 - For example, the Federal Communications Commission should proceed with its proposal to adopt rules in its millimeter wave proceeding, "Use of Spectrum Bands Above 24 GHz For Mobile Radio Services"
- Invest in science, technology, engineering, and mathematics (STEM) education for the current and future workforce

Samsung's Vision for Tomorrow is to help enable a world where technology brings people everywhere a better quality of life



HUMAN CENTRIC



OPENNESS



COLLABORATION

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