Project Overview

Using Cyber-Physical Systems (CPS) to ensure safety and tight security and create a stress-free environment

Social Landscape / Social Agenda

As society becomes increasingly globalized and information-based, Japan needs to take transdisciplinary initiatives, making science and technology more "connected" to create world-leading innovations.

Long-term Vision

Creating a Cyber Physical Systems (CPS) platform to provide added value to services

Establishing a CPS platform that utilizes big data acquired from sensing and monitoring the physical world. The aim is to enable efficient and eco-friendly town construction, high-quality services through improved logistics and human-resource allocation, safe evacuation control in the event of natural disasters, and anti-terrorism measures. These will lead to new industries, improved safety, and a highly streamlined, innovative social system.

During the Tokyo Games

Connecting and analyzing big data acquired from sensing and monitoring people and things, to facilitate their movement, ensure safety, and improve comfort and convenience.

Three Priorities

1 Social Impact

Using science and technology to establish thorough safety and anti-congestion measures. Creating innovative frameworks for services related to the running of the Games.

2 Hospitality during the Games

Providing impressive, stress-free services and ensuring the safety of participants, spectators, and all visitors.
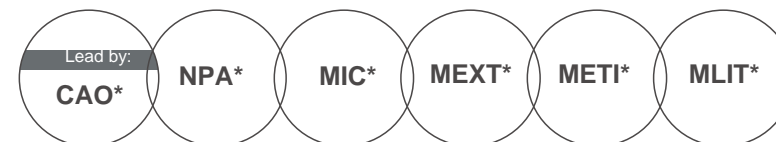
3 Shared Value

Extending knowledge and expertise on safe town-building and streamlined urban structures to other areas for local development and revitalization.

Concept for 2020

Big Data & Sensing Innovation 2020

Movement Optimization System

Using big data to enable a smooth flow of people in crowded places, to ensure their safety and comfort

Lead by:
CAO* NPA* MIC* MEXT* METI* MLIT*

* CAO : Cabinet Office
* NPA : National Police Agency
* MIC : Ministry of Internal Affairs and Communications
* MEXT : Ministry of Education, Culture, Sports, Science and Technology
* METI : Ministry of Economy, Trade and Industry
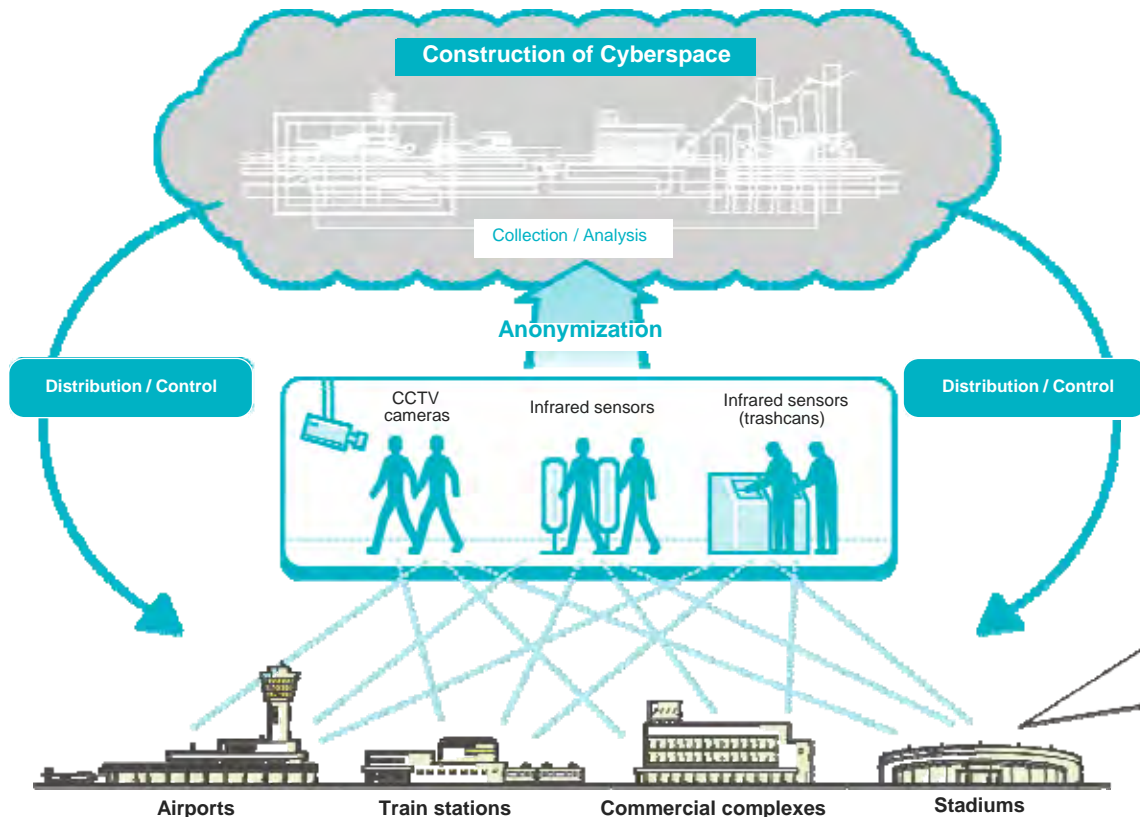* MLIT : Ministry of Land, Infrastructure, Transport and Tourism

Objective and Conceptualization

Connecting and analyzing big data acquired from sensing and monitoring people and things, to ensure safety and provide comfort and convenience during the Games

Technical Outline

Cyber-Physical Systems collect and analyze data on the movement of people and things in urban areas to help streamline the physical world and create new value.

Construction of Cyberspace

Collection / Analysis

Anonymization

Distribution / Control

Distribution / Control

CCTV cameras

Infrared sensors

Infrared sensors (trashcans)

Airports

Train stations

Commercial complexes

Stadiums

Information gathered through sensing and monitoring will be utilized in the physical world to implement measures and create services such as:

Scenario 1 **International Airports / Public Transportation Systems**

Enabling the immediate aid of the sick and injured

Quickly detecting suspicious persons and objects

Providing assistance to people with disabilities

Cyberspace

Cyberspace

Cyberspace

Someone help!

Scenario 2 **In Town**

Providing directions and sightseeing tips
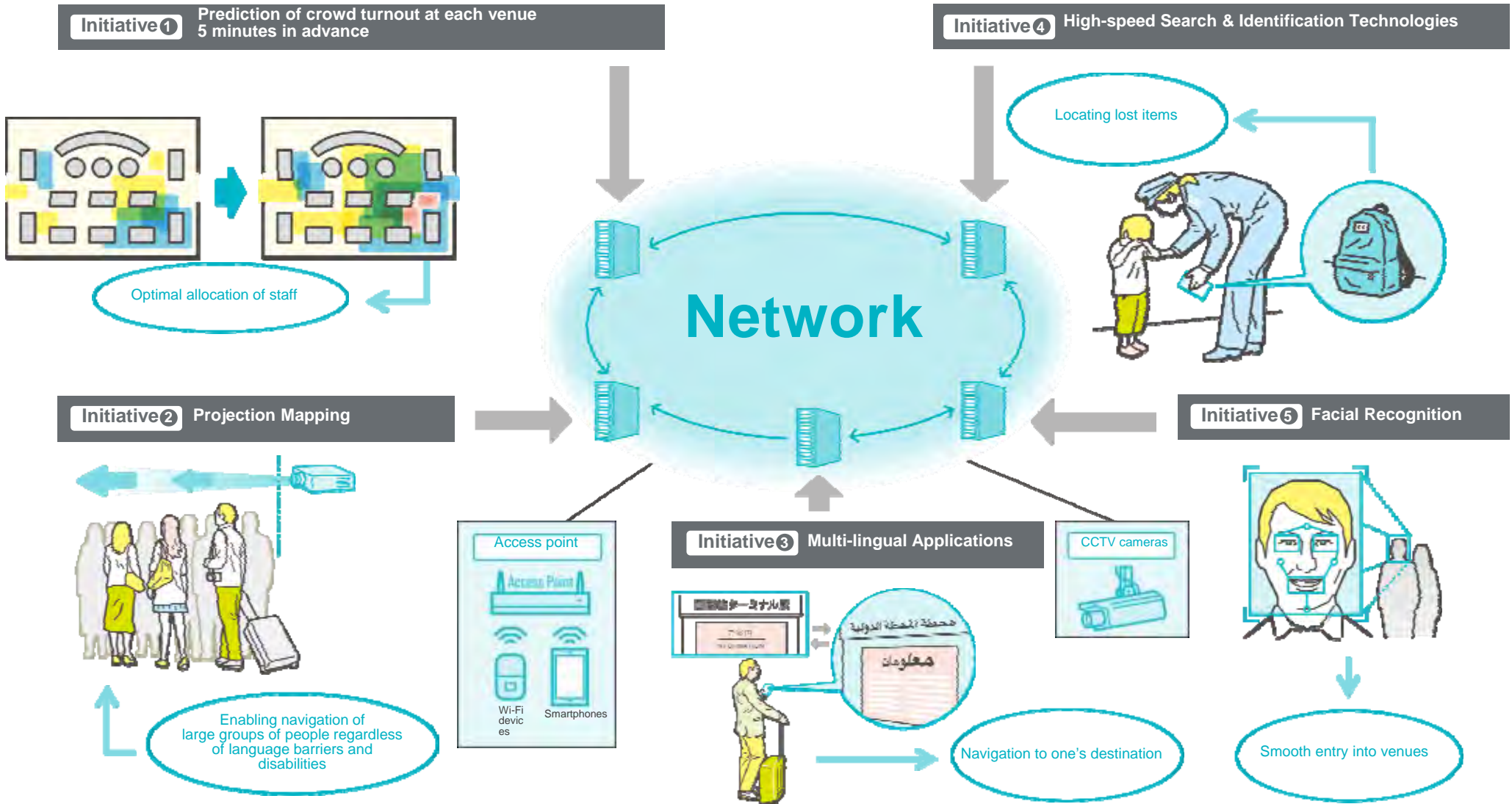
Cyberspace

Scenario 3 **At the Games**

Ensuring efficient and safe operation of the Games through optimal staff allocation

Cyberspace

Course of Action Toward 2020

Employing CPS platforms that integrate various sensors in venues and conduct big-data analysis to guide staff and security personnel efficiently while protecting privacy of visitors.
Providing organizers, authorities, and public services with sufficient information for the smooth operation of the Games.

Initiative ❶ Prediction of crowd turnout at each venue 5 minutes in advance

Optimal allocation of staff

Initiative ❹ High-speed Search & Identification Technologies

Locating lost items

Network

Initiative ❷ Projection Mapping

Enabling navigation of large groups of people regardless of language barriers and disabilities

Access point

Wi-Fi devices

Smartphones

Initiative ❸ Multi-lingual Applications

Navigation to one's destination

CCTV cameras

Initiative ❺ Facial Recognition

Smooth entry into venues

Initiatives and Partners

Initiatives	Cooperating Organizations	Details
Research and Development		
Predicting number of people on pedestrian routes Using sensing infrastructures and big data analysis to predict how crowded pedestrian routes will be.	Private sector (manufacturers)	Using big data to analyze location data from GPS, Wi-Fi, and beacons, as well as images from CCTV cameras to predict crowd turnout and movement, and to allocate staff and security personnel accordingly.
Enabling multi-lingual comprehension Providing smartphone solutions to enable visitors to understand signs and verbal announcements in their own languages.	Private sector (manufacturers)	Using high-speed search technologies to identify and translate signs based on a limited amount of learned data. Using speech synthesis and audio optimization technologies to ensure clarity of translations for automatic audio guidance.
Using projection mapping to provide everyone in large crowds with information	Private sector (manufacturers)	Utilizing Wi-Fi, beacons, and image analysis to detect people with disabilities or language differences, to provide guidance through projection mapping on the optimal course of movement or other information in different languages.
Helping to quickly locate lost property Recording and analyzing vast amount of video data from wearable cameras on staff to help solve problems.	Private sector (manufacturers)	Recording and analyzing vast amount of video data from the perspective of area, zone, and public security, to utilize in the event of trouble. Using object search/recognition technologies to quickly locate lost property.
Facial "fastpass" system for smooth entry into venues	Private sector (manufacturers)	Helping prevent congestion at venue entry gates by using facial recognition technology, which takes only a few seconds to identify people based on registered facial images.

Initiatives	Cooperating Organizations
Regulatory and Systems Reform	
Assisting the development of guidelines regarding the use of personal data in this project	Relevant ministries and agencies, Tokyo Metropolitan government, Relevant organizations
Assisting the development of guidelines regarding data management in this project	Relevant ministries and agencies, Tokyo Metropolitan government, Relevant organizations
Developing guidelines for providing information and reporting problems to public organizations and the organizers of the Games	Relevant ministries and agencies, Tokyo Metropolitan government, Relevant organizations

Initiatives	Cooperating Organizations
System Design	
Each manufacturer will promote the above R&D initiatives in coordination with relevant organizations. The system design will aim to integrate the initiatives to form the basis for future developments.	Relevant ministries and agencies, Tokyo Metropolitan government, Relevant organizations

Timeline

Agenda	2015 (FY)	2016	2017	2018	2019	2020	Legacy of Tokyo 2020
System Design	Each manufacturer will promote the above R&D initiatives in coordination with relevant organizations. The system design will aim to integrate the initiatives to form the basis for future developments.		Prototyping Small-scale experiments	Operational rehearsal		Tokyo 2020 Olympic And Paralympic Games	○ Creating a comprehensive platform to provide various services
Research and Development		Predicting crowd size on pedestrian routes Automatic, multi-lingual assistance with understanding signs and announcements Projection mapping providing information to big crowds Quickly locating lost property Facial "fastpass" system for smooth entry into venues					○ Creating various services using the comprehensive platform
Regulatory and Systems Reform		Assisting the development of guidelines regarding the use of personal data Assisting the development of guidelines regarding data management Developing guidelines on providing information and reporting problems					○ Establishing various guidelines regarding data