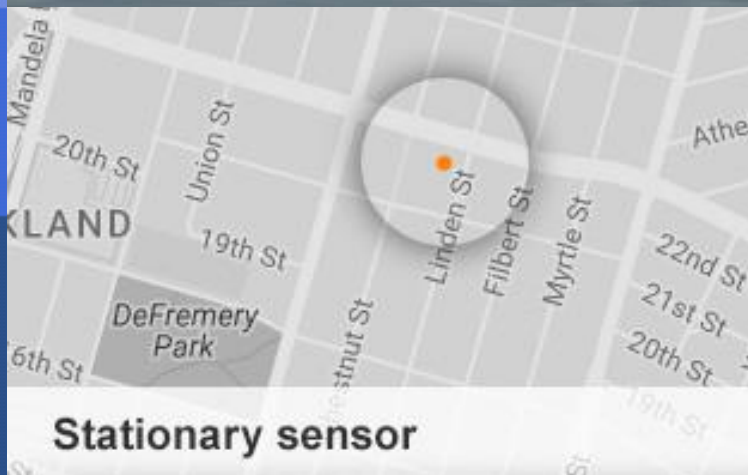# Feasibility Studies for Hyper-connected Intelligent Data Ecosystem

Hanmin Jung
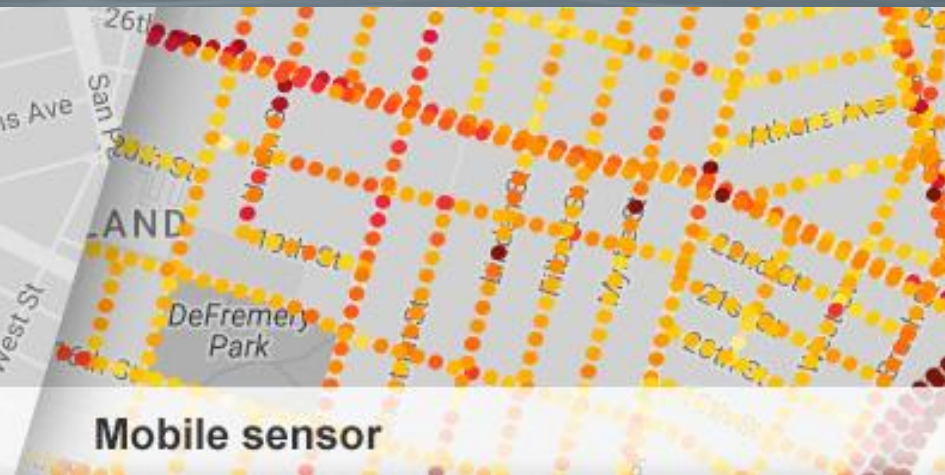
Head of Scientific Research Center
Korea Institute of Science & Technology Information

The 4th Industrial Revolution

Mobile sensing for Block-by-block Insight

Stationary sensor

Mobile sensor

Interactive Map and POI for Nitrogen Dioxide

This point has no obvious source of pollution nearby. The new data collection method reveals spots like this that wouldn't have caught attention before, but do warrant investigation.

ppb NO₂ — 0 6 12 18 24+

Air quality data from Google/Aclima; analysis by Apte et al / EDF. Colors on the map do not correlate to colors on the Air Quality Index.
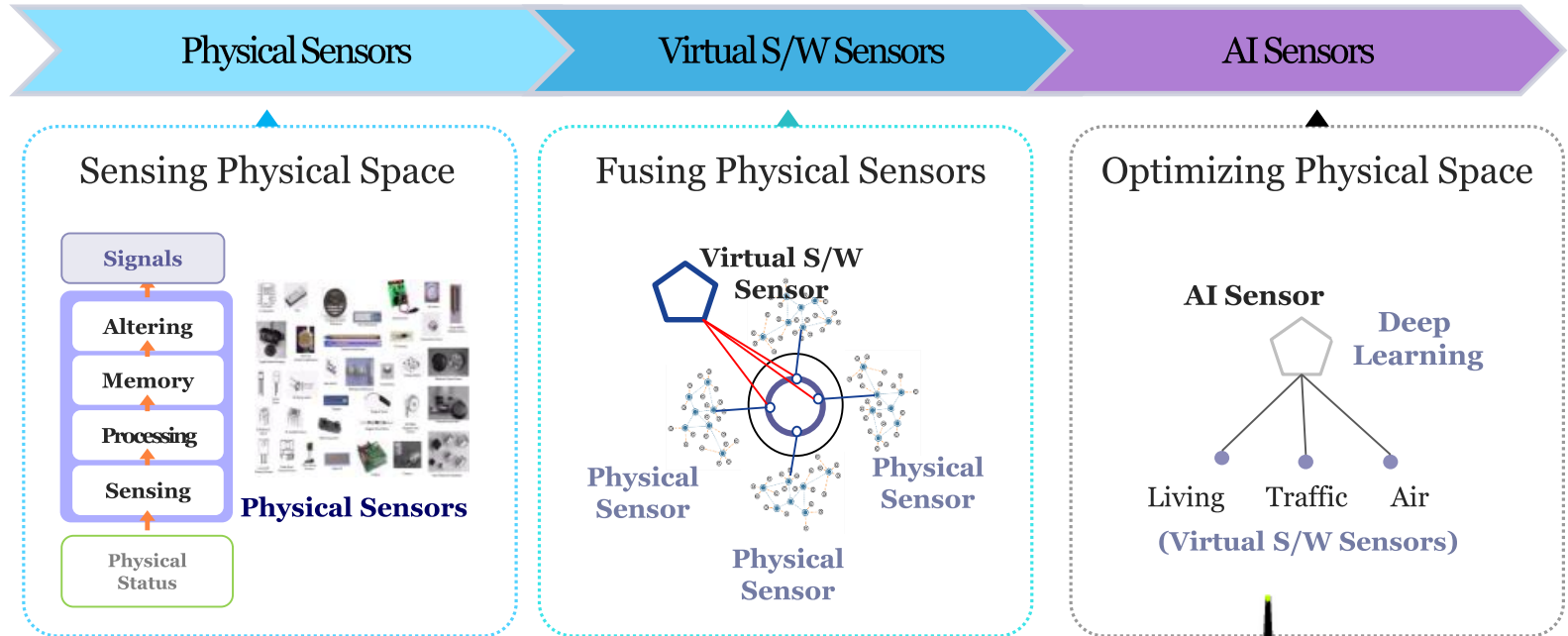
https://www.edf.org/airqualitymaps

Interactive Map and POI for Nitrogen Dioxide

A few blocks away from Howard Terminal, diesel trucks tend to idle while entering and exiting the Port of Oakland. Truck filters may be insufficient, especially as traffic increases.

Air quality data from Google/Aclima; analysis by Apte et al / EDF. Colors on the map do not correlate to colors on the Air Quality Index.

https://www.edf.org/airqualitymaps

Interactive Map and POI for Nitrogen Dioxide

Air quality data from Google/Aclima; analysis by Apte et al / EDF. Colors on the map do not correlate to colors on the Air Quality Index.
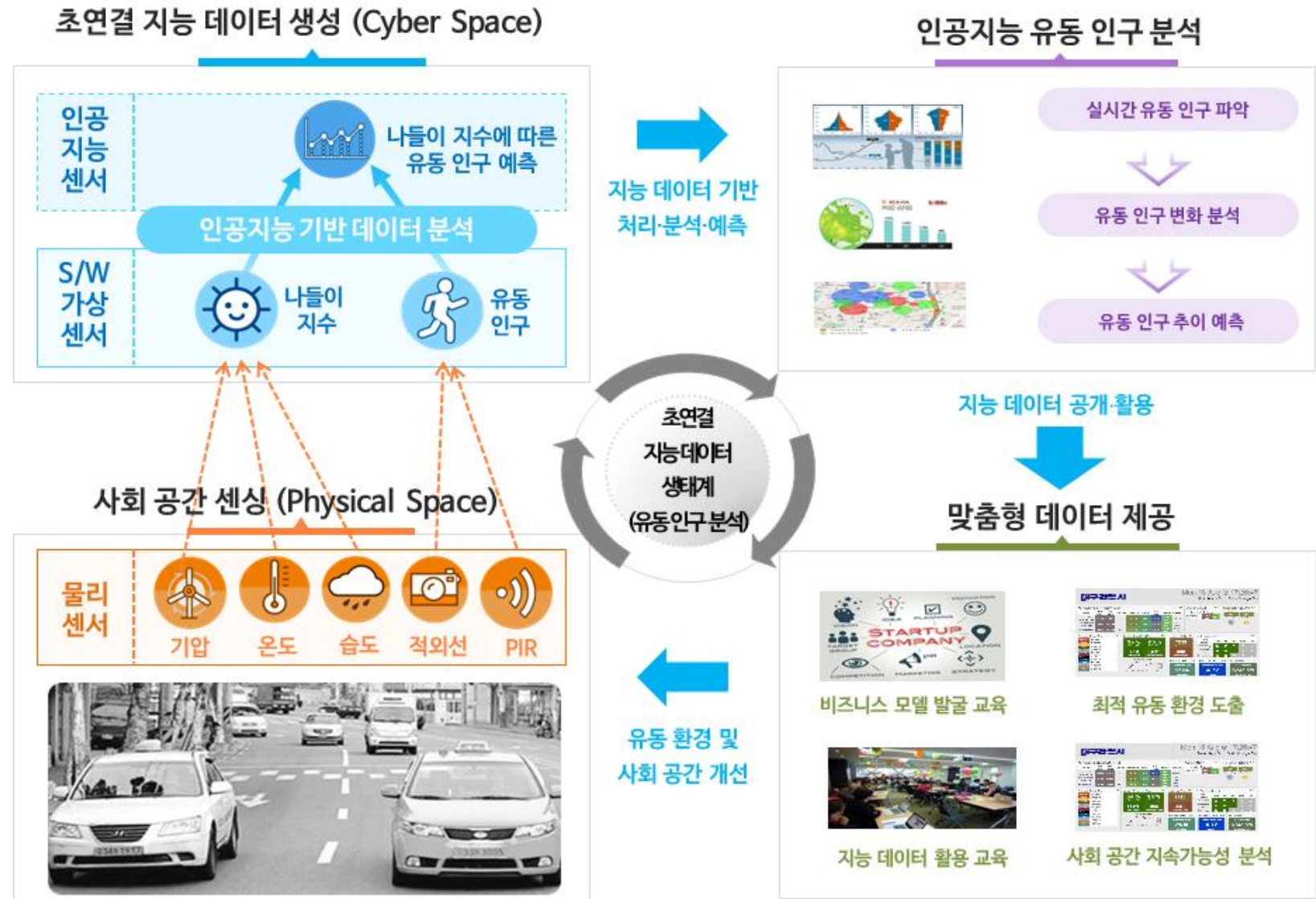
https://www.edf.org/airqualitymaps

Hyper-connected Intelligent Data Ecosystem
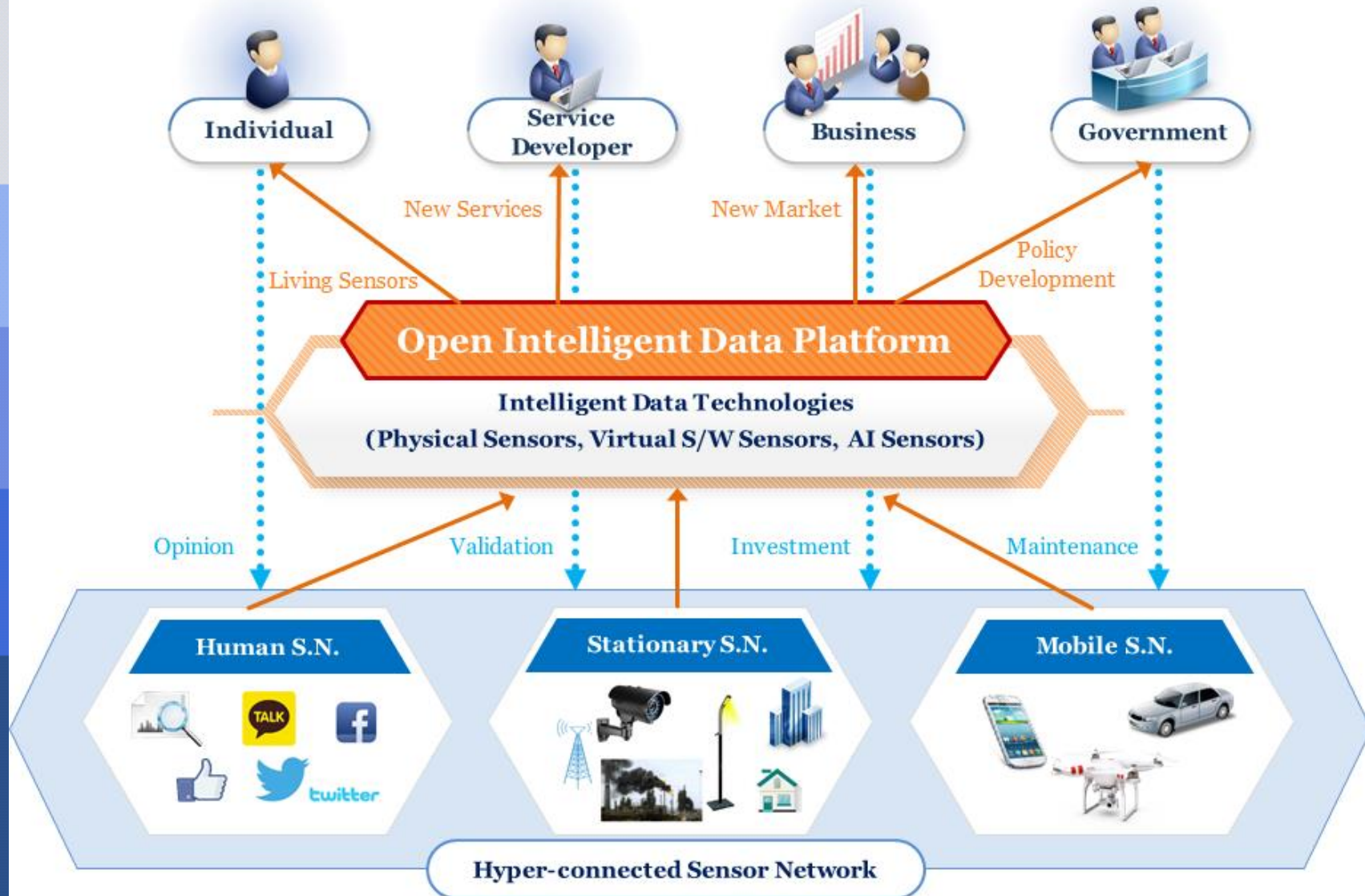
Physical, S/W, and AI-driven Intelligent Data

Physical Sensors → Virtual S/W Sensors → AI Sensors

Sensing Physical Space

Signals
↑
Altering
↑
Memory
↑
Processing
↑
Sensing
↑
Physical Status

Physical Sensors

Fusing Physical Sensors

Virtual S/W Sensor

Physical Sensor **Physical Sensor**

Physical Sensor

Optimizing Physical Space

AI Sensor

Deep Learning

Living   Traffic   Air

(Virtual S/W Sensors)

Application – Floating Population Analysis

Expected Benefits
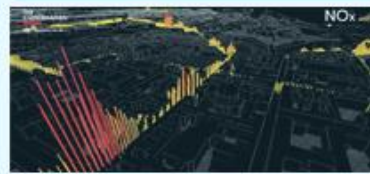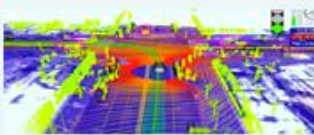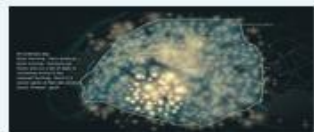
Mobile Sensor Network

Taxi-based Urban Air Quality Sensing

Public IP

LTE Network

KISTI Infrastructure

Computing Cluster (24 nodes)

10G Switch

Internet

Firewall (UTM Security)

1G Switch
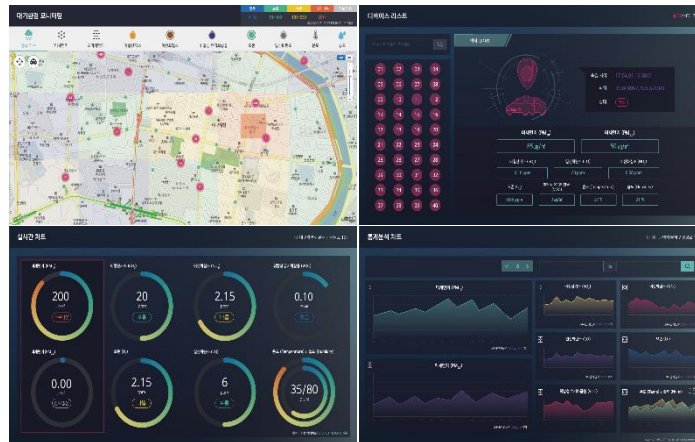
Gathering Server (1 node)
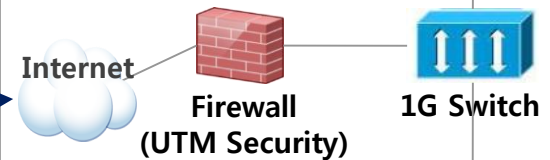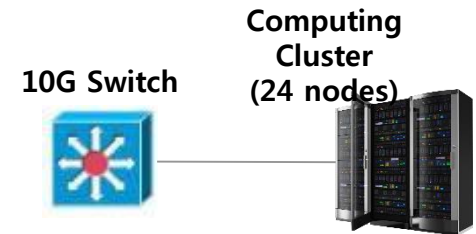
Office Network

Visualization Cluste (6 cluster)

Demonstration Indoor & Outdoor Testbeds (2017)

# Demonstration Indoor & Outdoor Testbeds (2017)

Testbed Comparison

	EDF	KISTI
Testbed Range	900 km² (3 areas of Oakland)	883.56 km² (Daegu City)
Measuring Period	2015~2016 (1 year)	6.2017~
Sensing Points	3 M / Year	1.1 M / Month
# of Sensors	3 (Black Carbon, NO, NO_2)	10*
Operation Time	6~8H / day (weekdays)	24H / day (7 days)
# of Vehicles	2	34**
Operation Distance	615 km / year	115,965 km / month

* PM_{10}, $PM_{2.5}$, CO , NO_2, SO_2 , VOC, Temperature, Humidity, Atmosphere, Gyro
** Up to 40

Demonstration Testbeds with Massive Sensors (2017)

http://map.naver.com/
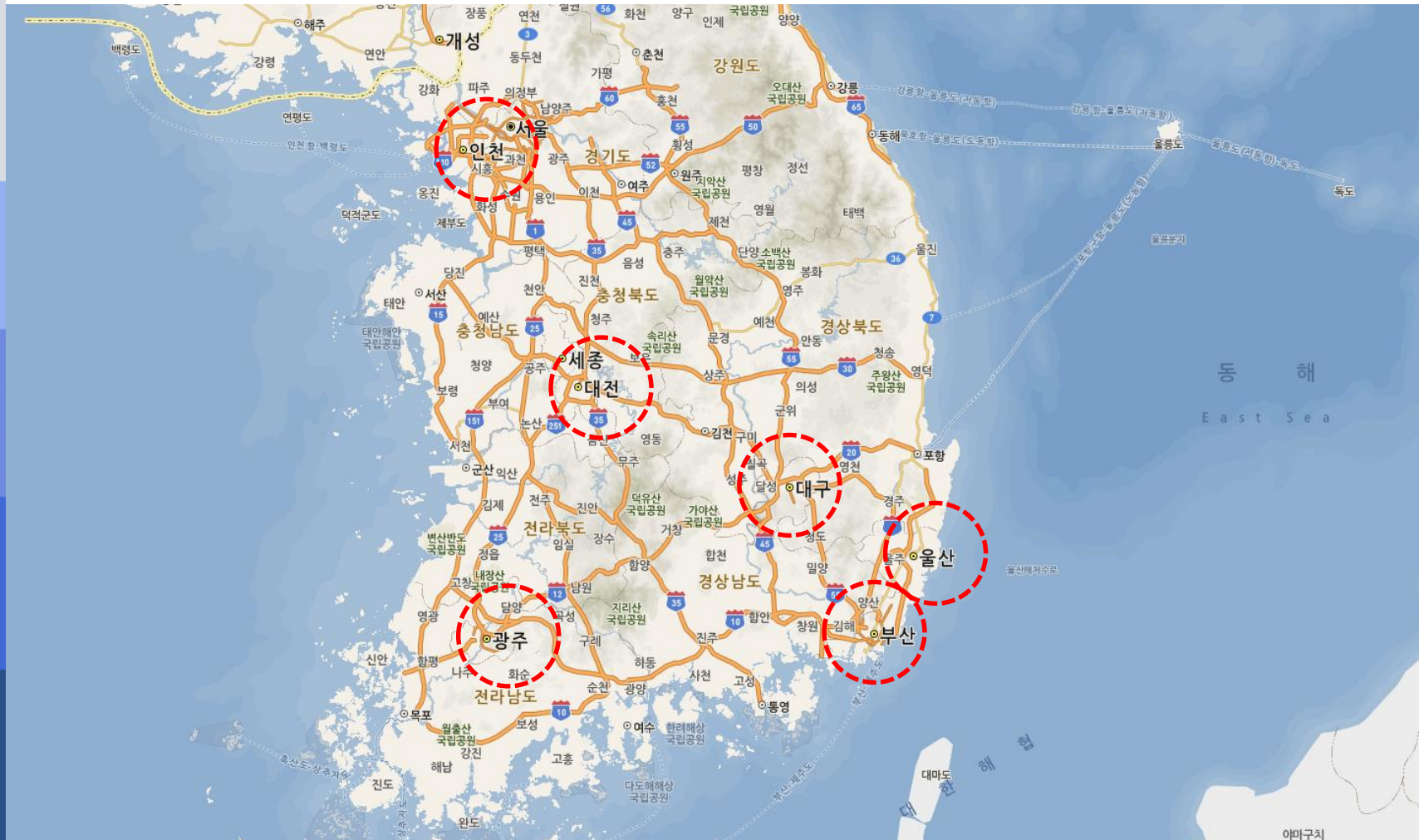
Physical Sensor Candidates

(**Air**) PM_{10}, $PM_{2.5}$, NO_x, CO, CO_2, O_3, Pressure, Temperature, Humidity, Rainfall, Wind speed, …

(**Traffic**) Parking, Vibration, Magnetic, Vehicle speed, OBD …

(**Living**) Noise, VOC, UV, Light, …

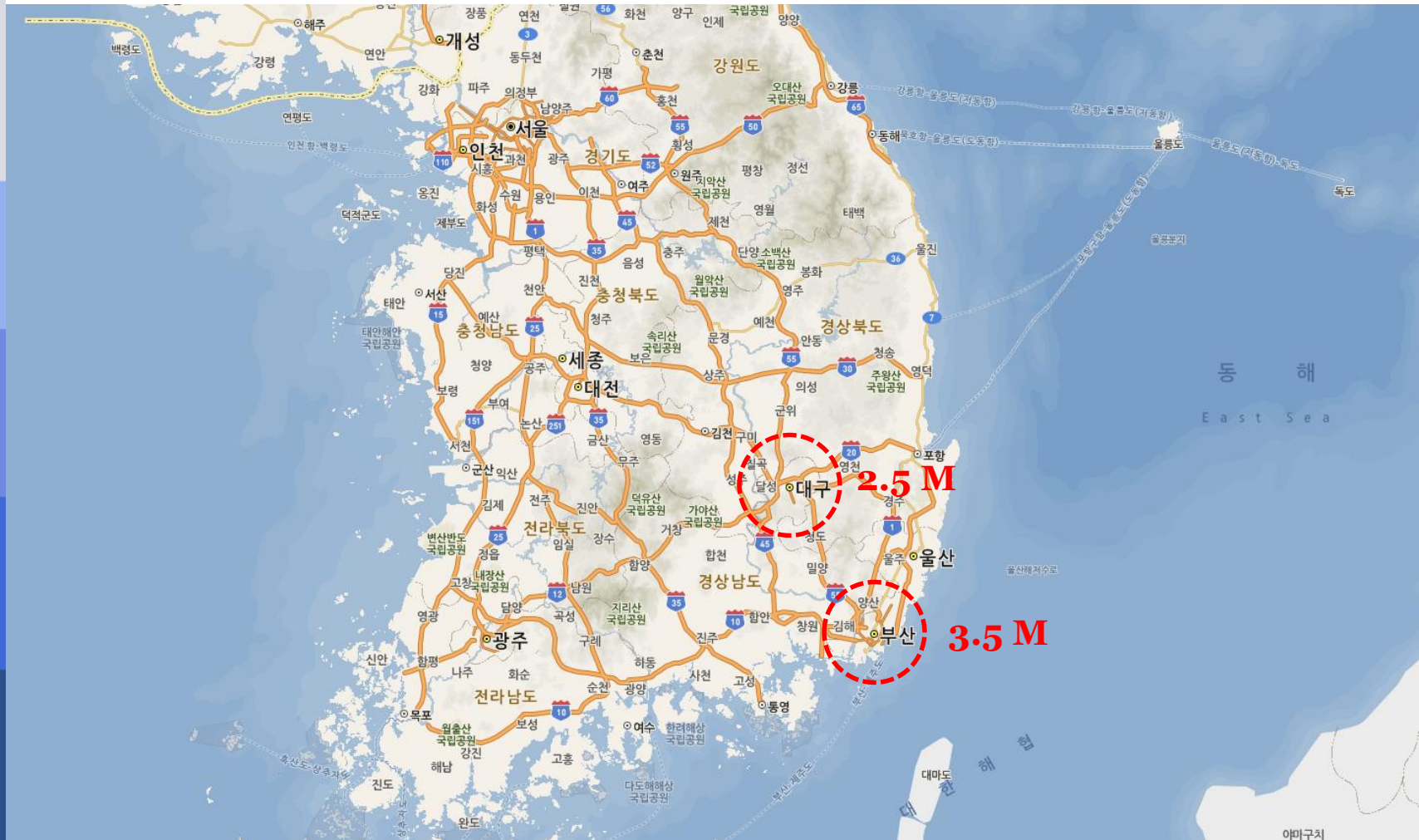(**Floating Population**) LIDAR, Image, PIR, Getting on/off, …

Domestic Collaboration (Pusan, Daegu)

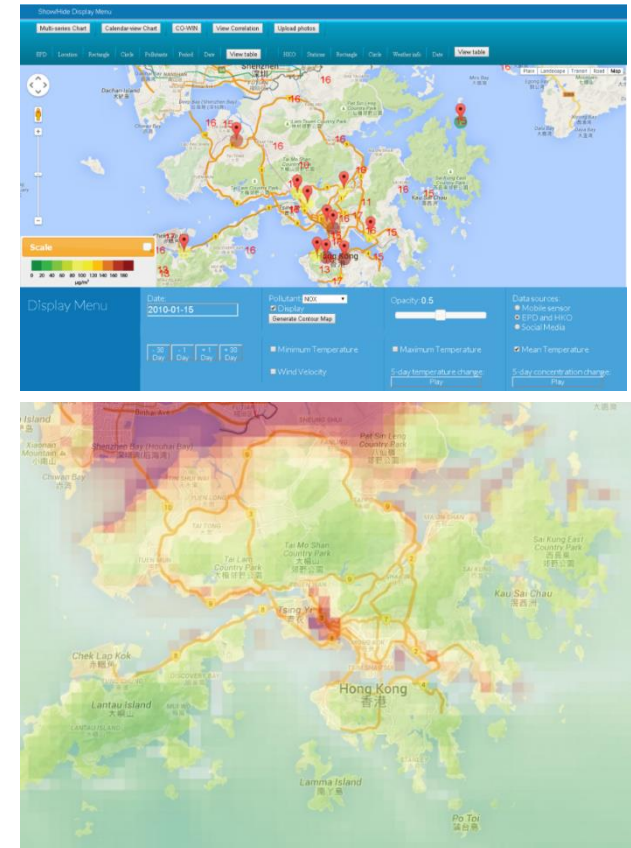# International Collaboration (CUHK, HCMUT, MU, INRIA)
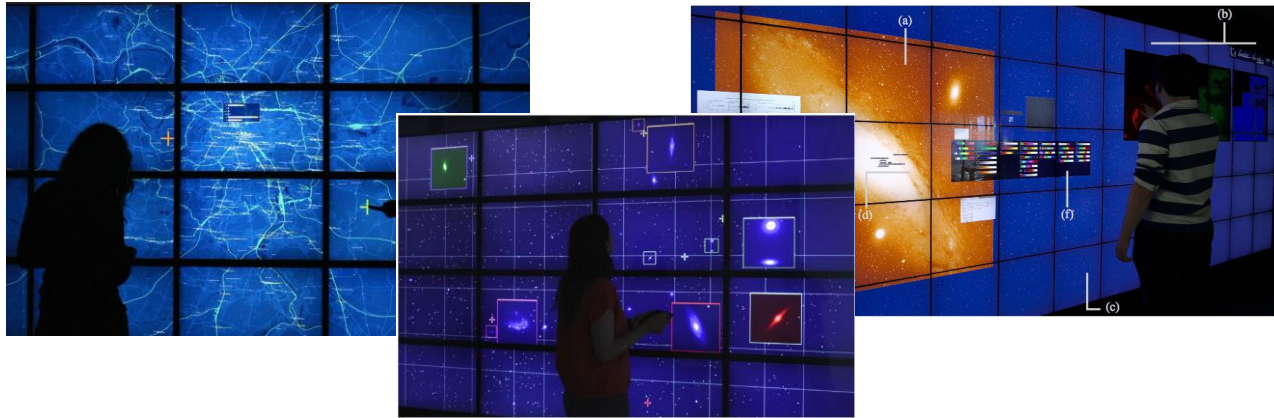
Demonstration Testbeds (2018~)

Joint Research with IOFC, HK – Sensor Calibration

Air Pollution Decision Support
System (APDSS)

Joint Project with INRIA, France – Interactive Wall-sized Display

http://asiadataweek.org/

Asia Data Week 2017 Program Overview

	20 (Mon)	21 (Tue)	22 (Wed)			23 (Thu)	24 (Fri)
7:30am		Doors Open + Registration 7:30am - 5:00pm					
8:30am			Opening Ceremony				
9:00am		H.b	W.1	W.3	S.1	C.1	C.1	Wrap-up meeting
12:00pm		Lunch Break	Lunch Break			Lunch Break	
1:00pm	M.1 / H.a	F.1	W.2	F.2		C.1	C.1
5:40pm			Keynote				
6:30pm			Banquet / H.c				

F.1	Exploration and Exploitation of Mobile Urban Sensing Data	Ryong Lee	Domestic	11 teams from domestic universities

The 4th Industrial Revolution

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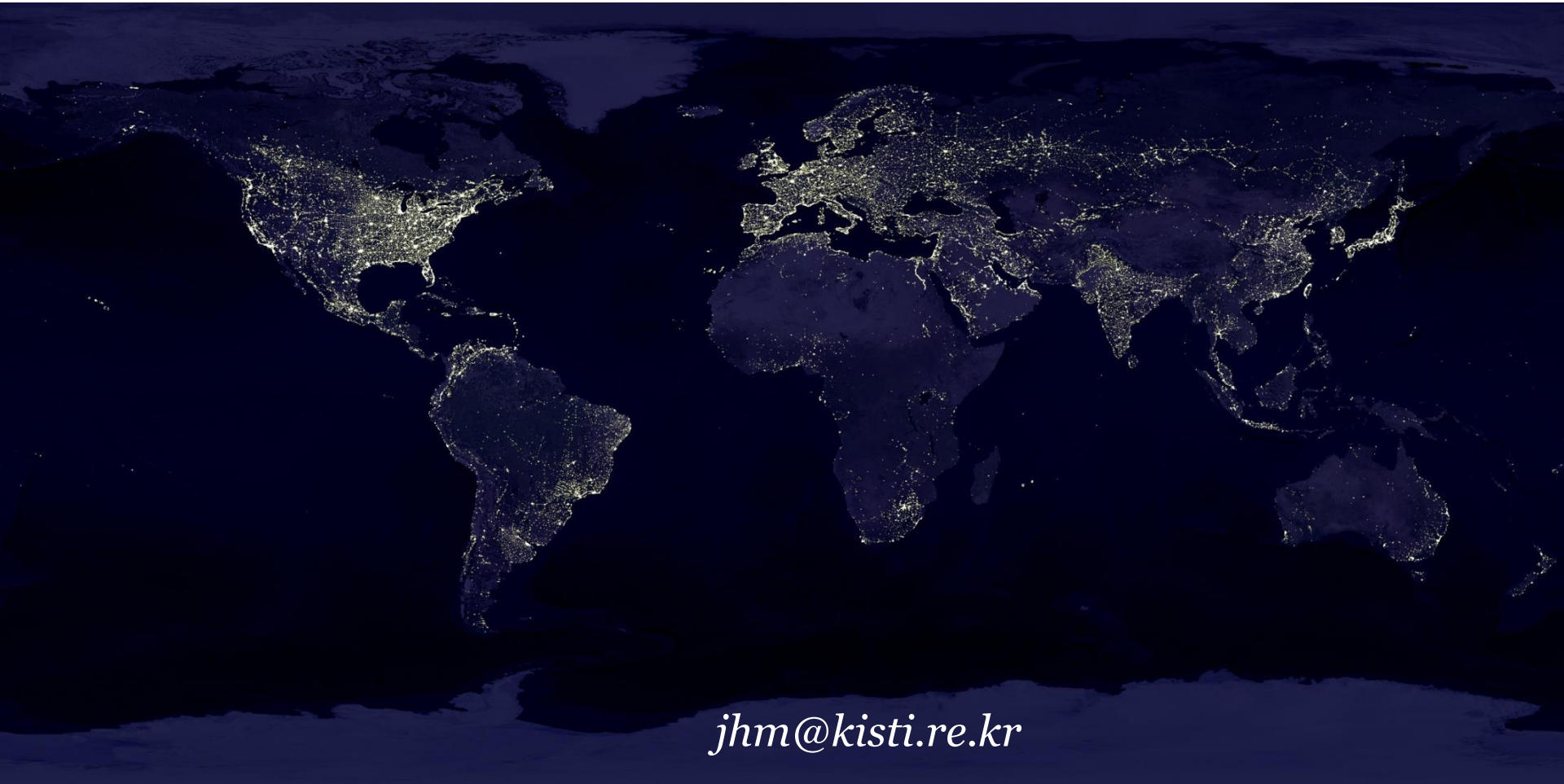
Possible Analysis Items

- 도시 간 대기 오염, 생활 환경 (소음, 진동 등) 수준 비교
- 도시 내 유동 인구 흐름 특성 파악
- 대기 오염에 따른 인체 영향 시뮬레이션
- 교통 상황에 따른 대기 오염 추이 분석
- 도시 내 세부 지역 간 대기/교통/생활 환경 편차 분석
- 도시 별 특이점 및 시사점 파악
- 도시 내 도로 상 Bumper, Pot Hole 현황 분석
- ......
- **흥미로운 주제는 모두 환영**

* 도시 간 비교 시 동일 환경 설정 필요

* 필요한 경우, KISTI가 해당 지역 드론, 카메라 촬영 지원

* 분석 주제 선정 및 진행 상황에 대해 KISTI와 지속적인 협의 필요

   (특정 도시 반발 가능성 대비)

"A lot of times, people don't know what they want until you show it to them."   *by Steve Jobs*

"Many people won't be convinced until they've seen it for themselves."   *by Jakob Nielsen*

jhm@kisti.re.kr