IoT Advisory Board

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STRATEGY OF THINGS

IoT Technology Infrastructure Gaps Research

What

Economic Research and Analysis of the National Need for Technology Infrastructure to Support the Internet of Things (IOT)

NOFO 2019-NIST-TPO-IOT-01

Research grant awarded by NIST in October 2019

Scope

- Assess the current state of the IoT technology infrastructure
- Identify technology gaps across ten industries
- Calculate economic impact of closing the gaps
- Recommend areas of future federal IoT-related research investments
- Communicate these findings across government, academia and industry

Focus


Agriculture


Construction


Smart Cities


Insurance


Healthcare


Manufacturing


Renewable Energy


Retail


Transportation


Telecommunications

The Evolution of IoT

We see the evolution of IoT in five stages evolving from standalone applications today to a more advanced autonomous state in the near future

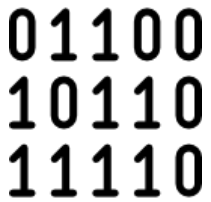
1

Things become "smart"

Now

2

Data of Things



Now

3

AI algorithms take action

5 – 10+ years

4

Utility and Outcomes

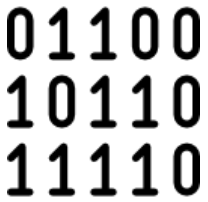
10 – 20 years

5

Hyperconnected Autonomy

30+ years

The Future of IoT Solutions and Services

Things become "smart"	Data of Things	AI algorithms take action	Utility and Outcomes	Hyperconnected Autonomy
				
Now	Now	5 – 10+ years	10 – 20 years	30+ years

Smart operations and processes

- Asset monitoring and management
- Operations monitoring
- Operational performance optimization
- Remote operations
- "Self service" analytics
- Predictive maintenance
- Precision operations
- Digital twin silos

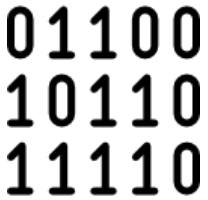
Smart "X"
Factories, buildings, cities, farms, highways, etc.

Integration of all operations with IoT, AI, data and algorithms, internal and external processes

"Plug and Play" Utilities
"X as a Service"

Fully Autonomous X

Accelerators for future IoT

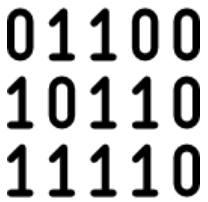
Things become "smart"	Data of Things	AI algorithms take action	Utility and Outcomes	Hyperconnected Autonomy
				
Now	Now	5 – 10+ years	10 – 20 years	30+ years

Accelerators

- Sensorization ⟷ Sensor/Actuator Densification
- Connected Devices ⟷ Massively connected devices and system of systems
- Vendor Ecosystems ⟷ Industry and extended ecosystems
- Analytics/Machine Learning ⟷ Artificial Intelligence ⟷ Ambient Intelligence
- Ubiquitous connectivity and computing
- New Business and Operation Models
- Policies and regulations
- Secure and Private ⟷ Trusted
- Ethical
- Testing

Source: Strategy of Things

Technology enabling the future IoT

Things get "sensorized"	Data of Things	AI algorithms take action	Utility and Outcomes	Hyperconnected Autonomy
				
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Future Technology Areas

- Edge Devices and Gateways – Processing capability, power efficiency, power management
- Distributed architectures – edge, mobile edge, cloud; interoperable system of systems
- Artificial and ambient Intelligence – autonomous intelligence, distributed collaborative intelligence
- Trust Architectures and Models (security, privacy, self defending, self-restoring, distributed ledger technology)
- Communications and networks at scale (stability, availability, reliability, context and data aware, SDN)
- Data Models, Marketplaces, and Ecosystems
- Ethical algorithms and governance
- Interoperability and standards
- Verification, testing, and simulation (algorithms, AI, systems)
- User experiences – interfaces, experience, man-machine interactions

Potential areas for future research

Edge and device capability
- Increase device processing
- Reduce processor power consumption
- Energy harvesting

Enhance sensors
- Low cost sensors
- Extreme low latency sensing
- Field reliable sensors

Standards and interoperability

Improve infrastructure to support massive IoT
- Device management at scale
- Optimize QoS at scale
- Fault tolerance and resilience
- Middleware for scaling

Hyperconnected networks
- Connectivity and spectrum management
- SDN

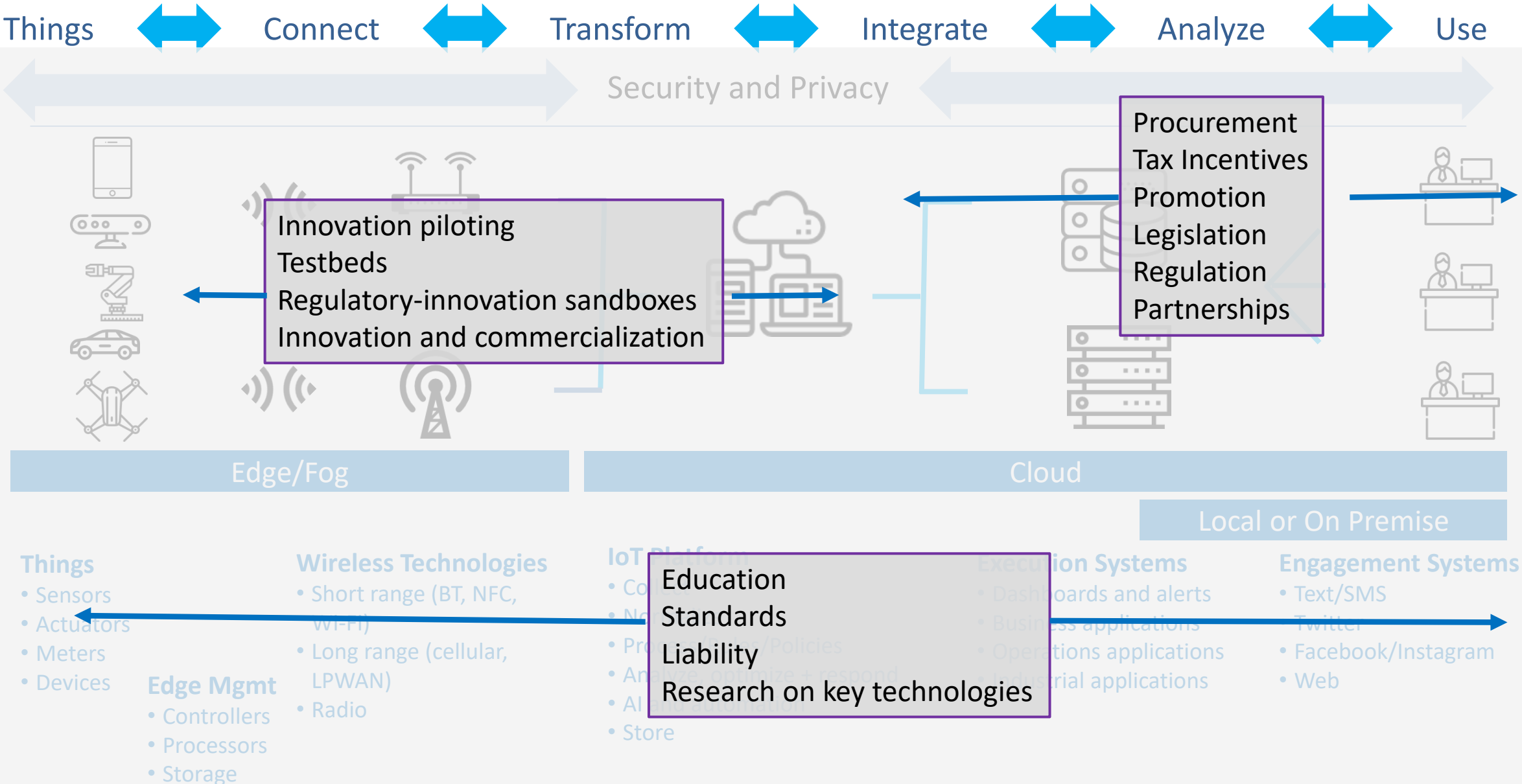
Human centric IoT
- Design for human-AI interaction
- AI trust
- Accessibility and inclusion IoT

Usable AI for IoT
- Ethical AI algorithms
- AI explanability tools and processes
- Collective intelligence IoT
- Human-AI collaboration

Data ecosystems

Trustworthy IoT

IoT: High level perspective and Public interventions



Questions?

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