

A decorative graphic on the left side of the slide, consisting of three vertical bars of equal height. The first bar on the left is white, the middle bar is a thin red line, and the third bar on the right is a solid red block.

IoT & Smart Cities: Challenges and Opportunities for Regulators

Chng Ken-Wei
Centre Director (China)

1 Singapore's Smart Nation Initiatives

What are the Global Challenges?



Urban Density

Two-thirds of the world will live in cities by 2050.¹



Healthcare

By 2025, there will be 8 billion people, 800 million of whom will be over 65 with high health needs.³



Energy Sustainability

Global demand for energy will rise by up to 37% by 2035.⁵



Ageing Population

The world is ageing fast. By 2050, more than 2 billion people will be over 60.²



Mobility

People are moving more into congested centres, with urban travel to triple by 2050. Traffic congestion could bring cities to a standstill.⁴

Urban Density

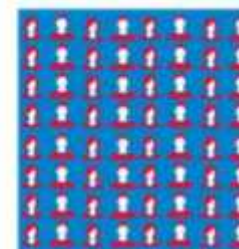
Singapore is the world's third most densely populated nation



USA
35 people per
square kilometre



UK
265 people per
square kilometre



Singapore
8,000 people per
square kilometre



Food for thought: How do we cope with the expected swell of new residents by 2050?

Ageing Population

The world population is rapidly ageing.



2015

**300,000 elderly citizens
in Singapore** (a 1 in 9 ratio)



2030

**900,000 elderly citizens
in Singapore** (a 1 in 5 ratio)

+ 30%



Past

Now

In Singapore,
seniors average
hospital stays
length

90%



Occupancy

Daily occupancy
rates at public
hospitals in
Singapore



By 2020, 11,000 more hospital
beds will be added

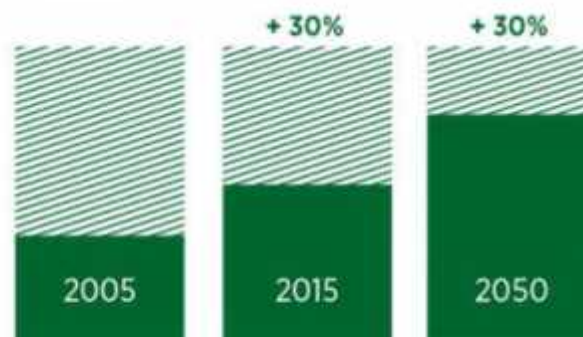


Food for thought: How will this shape costs and infrastructure when it comes to our future healthcare system?

Energy Sustainability



Food for thought: How do we keep up with energy demands without building more power plants?



Power Consumption in Singapore



Percentage of all travel made that is within urban environments



Total amount of urban kilometres travelled



Mobility

with limited land space, we can no longer increase the number of vehicles or add more roads.



1 million
cars on the road
in Singapore
(approximately)

12%
land space in
Singapore used
for roads



Food for thought: How do we improve traffic planning, faced with this resources challenge?

Singapore's Vision: Towards a Smart Nation

INFO-COMMUNICATIONS MEDIA
DEVELOPMENT AUTHORITY
OF SINGAPORE



"As our city becomes increasingly complex and diverse ... We will **make full use of new technologies to develop sustainable and innovative solutions**... We will make Singapore a **Smart Nation**."

- President's Address to Parliament, May 2014



"Our vision is for Singapore to be a **Smart Nation** . A nation where **people live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all.**"

- PM Lee Hsien Loong, Smart Nation Launch, Nov 2014

"Technologies are an important source of bringing to life Singapore's vision of a Smart Nation."

IDA Executive Deputy Chairman, Sheng Leonard

Smart Nation Strategic Framework

INFO-COMMUNICATIONS MEDIA
DEVELOPMENT AUTHORITY
OF SINGAPORE

Better Living

More
Opportunities

Opportunities
Stronger

Enhanced
mobility

Improved
Gov tops,
service
delivery

Stronger
businesses

Better
homes and
environment

Better
health,
successful
ageing

Private sector enterprise

R&D support

Human capital

Cybersec & resilience

Digital connectivity

Providing Pervasive Connectivity



Enhanced mobility

Aspiration

How can we allow our population to move around Singapore in the safest, most efficient, most cost-effective and most comfortable way possible?

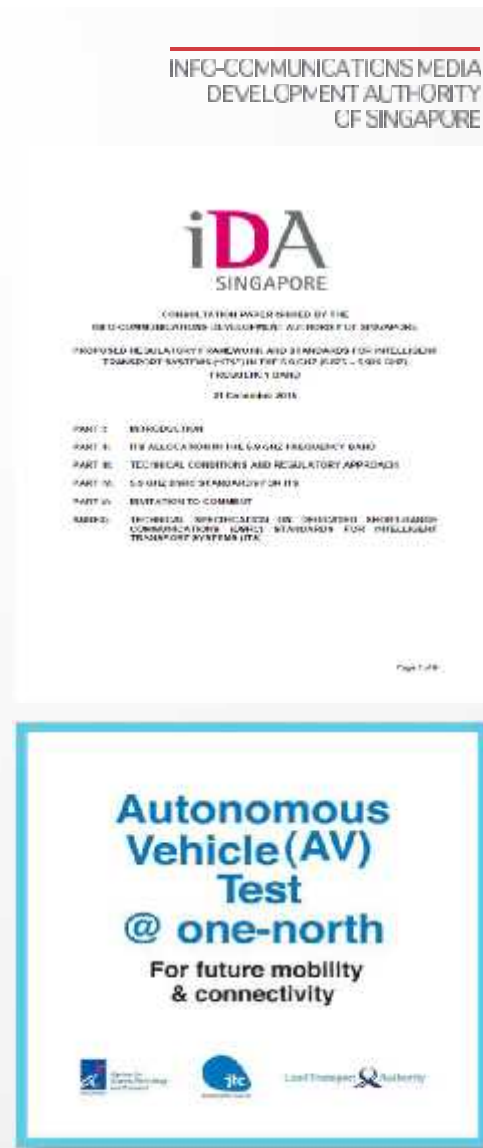
Things that we are working on

ITS framework and standards development

- IDA launched a public consultation on ITS Framework and ITS-DSRC Standards in Dec 2015
- Finalised ITS Framework and Standards will be used by Singapore's new electronic road pricing system

Self-driving vehicles to supplement our transport system

- One-North test site launched in Jan 2015
- LTA launched RFIs for AV solutions to meet future transport needs



Better homes and environment

Aspiration

How can we leverage technology to create homes and estates that are comfortable, convenient and safe for our residents to live in?

Things that we are working on

Launched Smart Yuhua as brownfield site

- HDB and IDA working on a large-scale smart home solutions (~3,200 households)
- Trial to be launched in 2016

Developing Punggol town as a Smart Nation greenfield precinct



B2 | HOME

HDB to launch high-tech flats in Punggol

Punggol Northshore estate to be a test bed for smart technologies

By JAMIE HENG

The first "smart" housing found flats will be launched tomorrow, with prices starting at \$18,000 for two-room flats after grants.

Buying a smart home

Prices of new HDB flats in Punggol Northshore Residences (and)

See [here](#) for more details.

centres, which respond to wind speed and temperature fluctuations, and sensor-controlled lighting in common areas.

A carpark management system will make more visitor spaces available during non-peak hours - when residents with season parking tickets are likely to be out and leave visitor spaces available in the evening.

Better Health, Successful Ageing

Aspiration

How can we leverage technology to improve healthcare outcomes, while keeping healthcare affordable, especially for our ageing population?

Things that we are working on

Tele-health trials underway

- Most recent trial being remote vital signs monitoring for hypertensive patients
- Learning points to contribute to national deployment

Massive undertaking for Successful Aging

- \$3b action plan



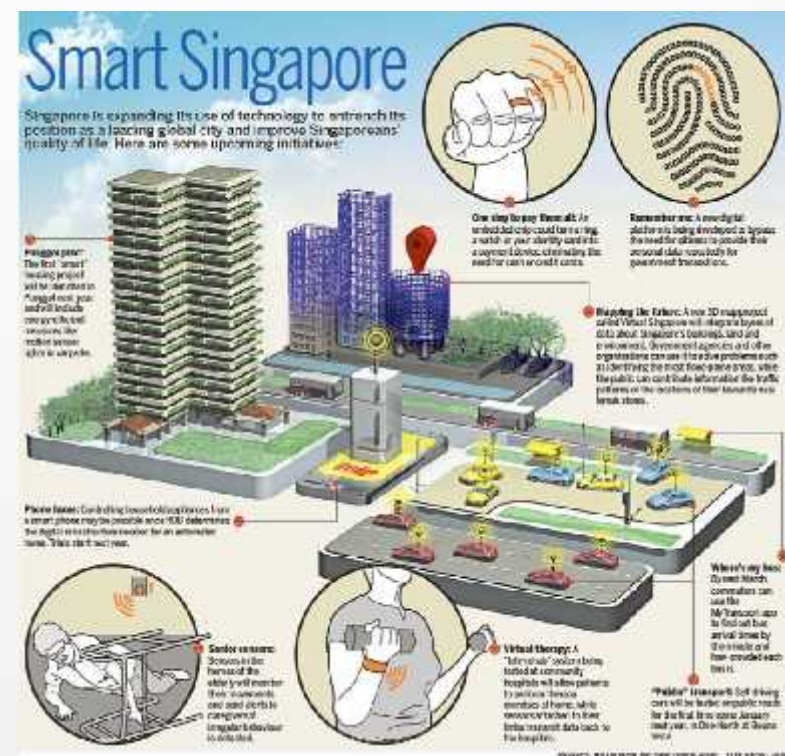
\$3b plan to help seniors stay active



IoT is a key enabler for Singapore's vision to be a Smart Nation

- Beyond economic opportunities, IoT can also enrich the quality of life for citizens

“Our bottom-up analysis for the applications we size estimates that IoT has a total potential economic impact of **\$3.9 trillion** to **\$11.1 trillion a year** by 2025”
McKinsey (2015).

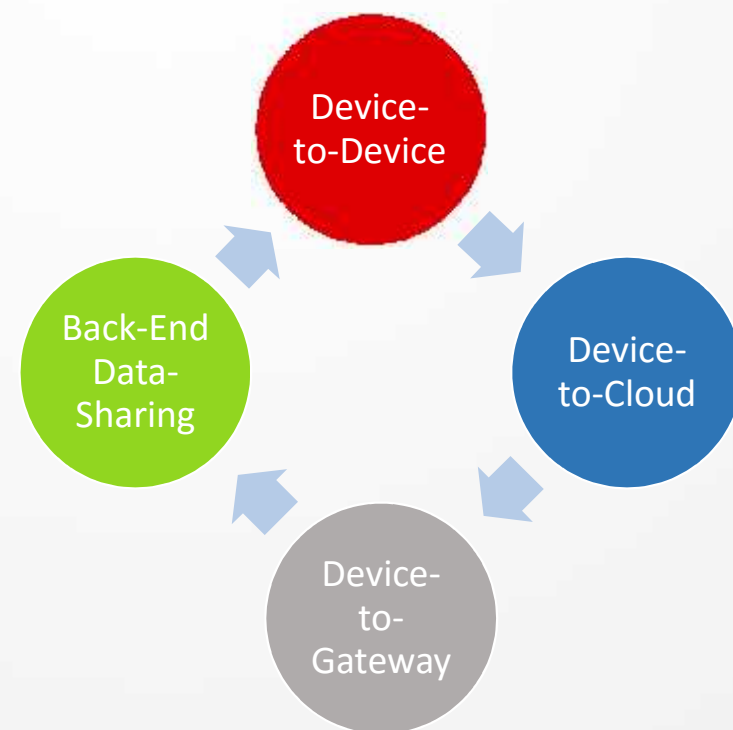


2

Regulatory Framework for IoT

Regulating IoT might not be straightforward

- Different scales of deployment
- Different communication models

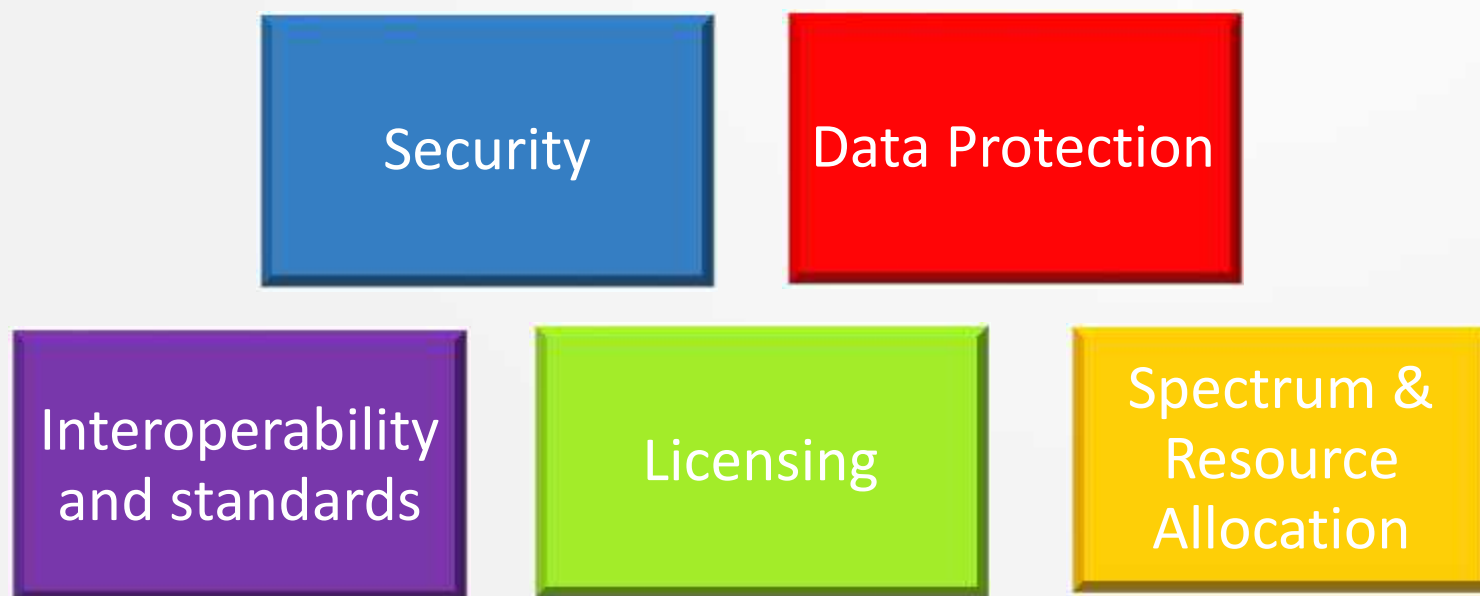


Four common communications models described by the Internet Architecture Board

Source: GSR Discussion Paper, "Regulation and the Internet of Things", Professor Ian Brown (2015)

Several regulators are looking at common challenges posed by IoT

- Five key IoT areas are examined to explore some of the most pressing challenges and questions related to IoT



Minimising cyber security breaches through close collaboration

- Multi-stakeholder approach will be key but need to manage consumer expectations

Security

Data Protection

Interoperability
and standards

Licensing

Spectrum &
Resource Allocation



Finding the vulnerabilities of smart devices at home

- Complex land scape—no one size fits all security policy for all IoT devices(e.g. Fitbit vs Smart Grid)
- Telecom regulators will have to work closely with cyber security agencies and industry players
- Companies should implement security by design(e.g., security to extend throughout life cycle of product; access controls)
- Consumer and business education on cyber security will be important(e.g. regular changing of passwords)

Protecting Personal Data to enhance consumer trust in IoT

- Regulation and public education will be key to safeguard consumer interest

Security

Data Protection

Interoperability
and standards

Licensing

Spectrum &
Resource
Allocation



- Companies will have to comply with Singapore's Personal Data Protection Act(2012),including those which are collecting personal data from IoT
- Companies should strive to adopt "data protection by design" as a default for all development
- Public education will be key to safe guard consumer interest

Singapore –On-going initiatives to ensure technical interoperability and standards

IDA's Telecommunications Standards Advisory Committee (TSAC) is working on various IoT-related standards in line with the ITU-T work programme.

Security

Data Protection

Interoperability
and standards

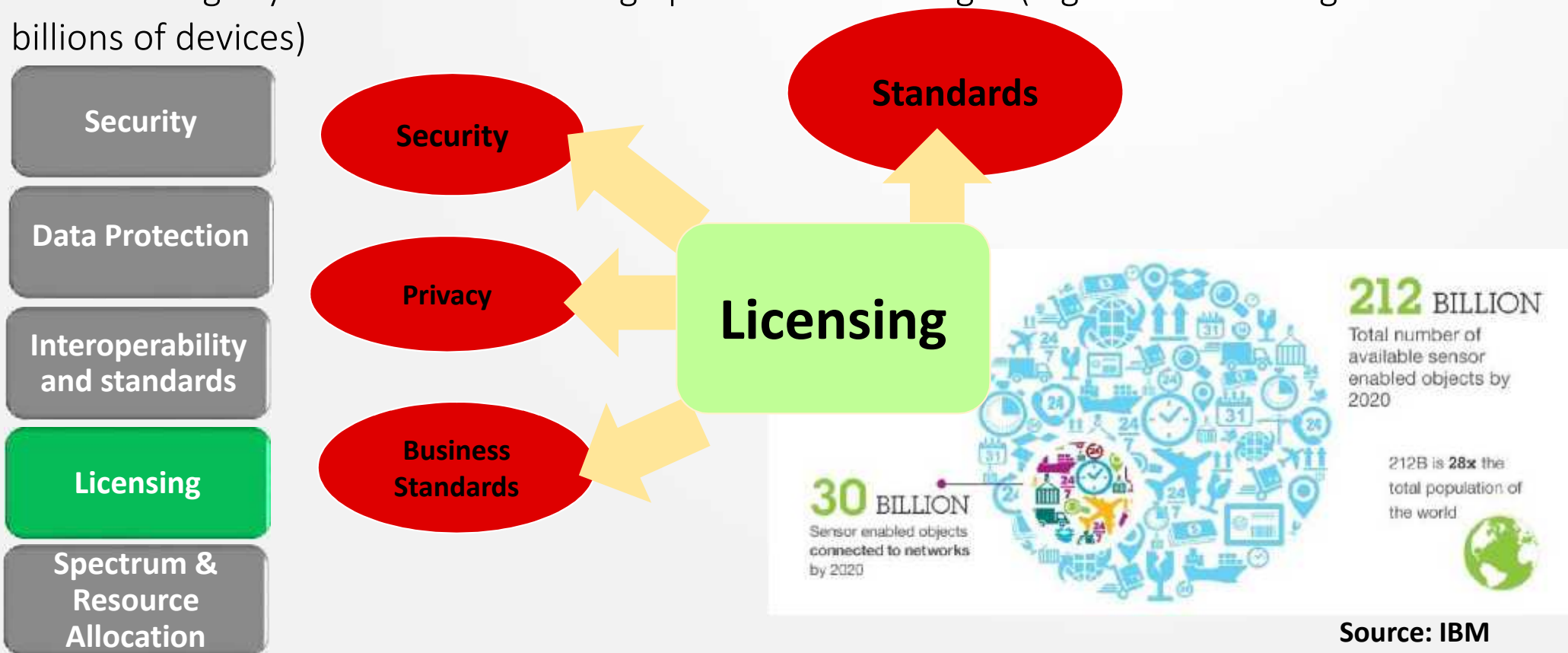
Licensing

Spectrum &
Resource
Allocation

ITU-T SG20	TSAC				
	WG1	WG2	WG3	WG6	WG7
Q2/20 –Integration of IoT	Future Networks IoT Device Management		Multimedia ITS, AV E-health	Wireless Smart Wearables	
Q3/20 – IoT Reference Architecture	Signaling and protocols	Smart Homes	Smart Phones		
Q4/20 – IoT Interworking		End-to-end services, performance	Directory services Middleware	M2M	Security
Q5/20 – IoT Ecosystem	IoT players engagement				
Q6/20 –Use of Infrastructure for IoT	Guidelines and best practices				

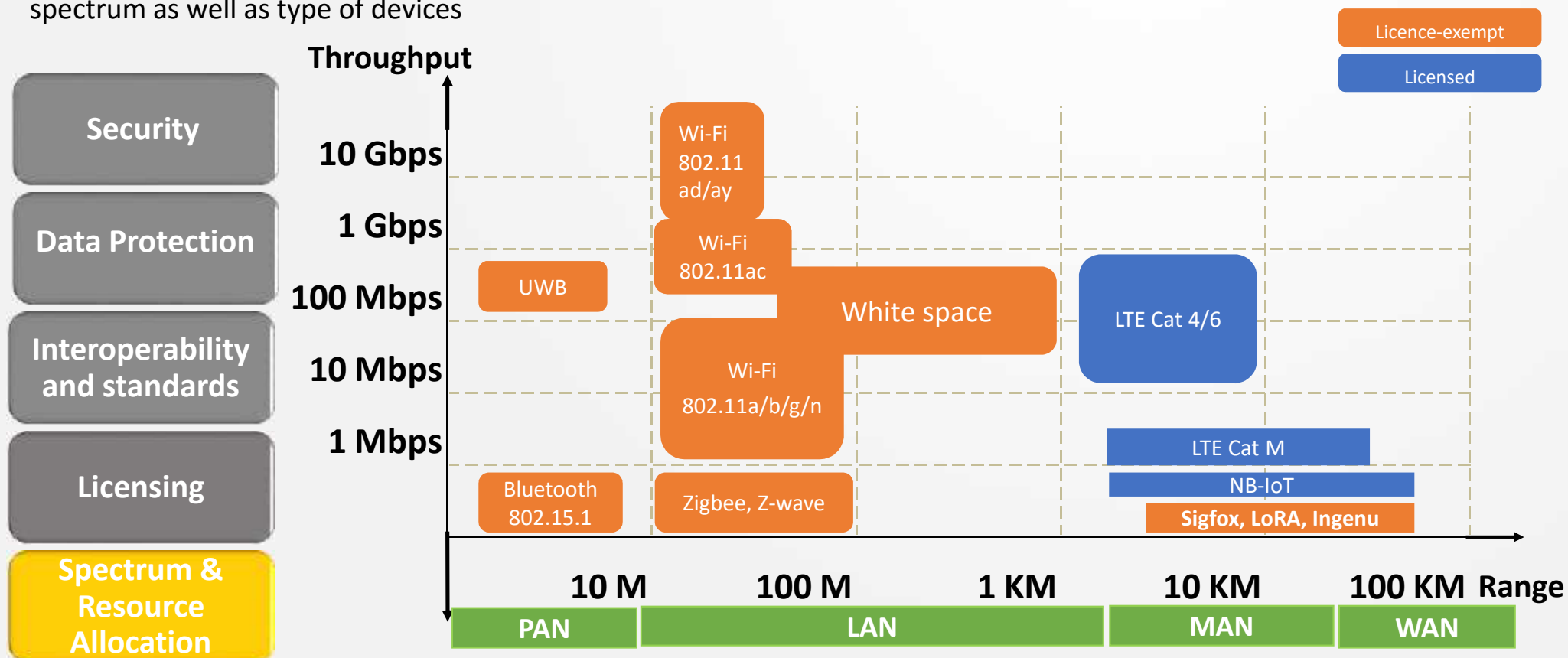
Licensing framework to evolve to meet the challenges of IoT

- Addressing key concerns while facing operational challenges (e.g. whether to register billions of devices)



Maintaining flexibility to ensure IoT devices can be supported with sufficient spectrum

- Currently unclear whether majority of IoT devices are going to ride on licensed or licence-exempt spectrum as well as type of devices



Monitor the availability of network addresses for IoTs

- IPv6 will be key to support billions of IoT devices

Security

Data Protection

Interoperability
and standards

Licensing

Spectrum &
Resource
Allocation



Telephone numbers

Today, IDA allocates number access code 144XX for M2M



Ensuring the ISPs are able to support IPv6

Internet Society (2015) –IPv6 will be a key enabler for IoT. IDA launched regulatory and industry initiatives to support IPv6 in Singapore (e.g., No-Islanding Principle)



Thank You