WRC-15 and the road to WRC-19

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Intelsat is the Pioneer and Leader in Satellite Communications

Intelsat is the largest satellite-based operator in terms of capacity and geographic reach.

Intelsat launched the first commercial global satellite communications system in 1965, and has been transmitting the biggest moments in the world for everyone to share, ever since.

Today, we maintain a global fleet of 50 in-service satellites covering 99% of the earth's populated regions.

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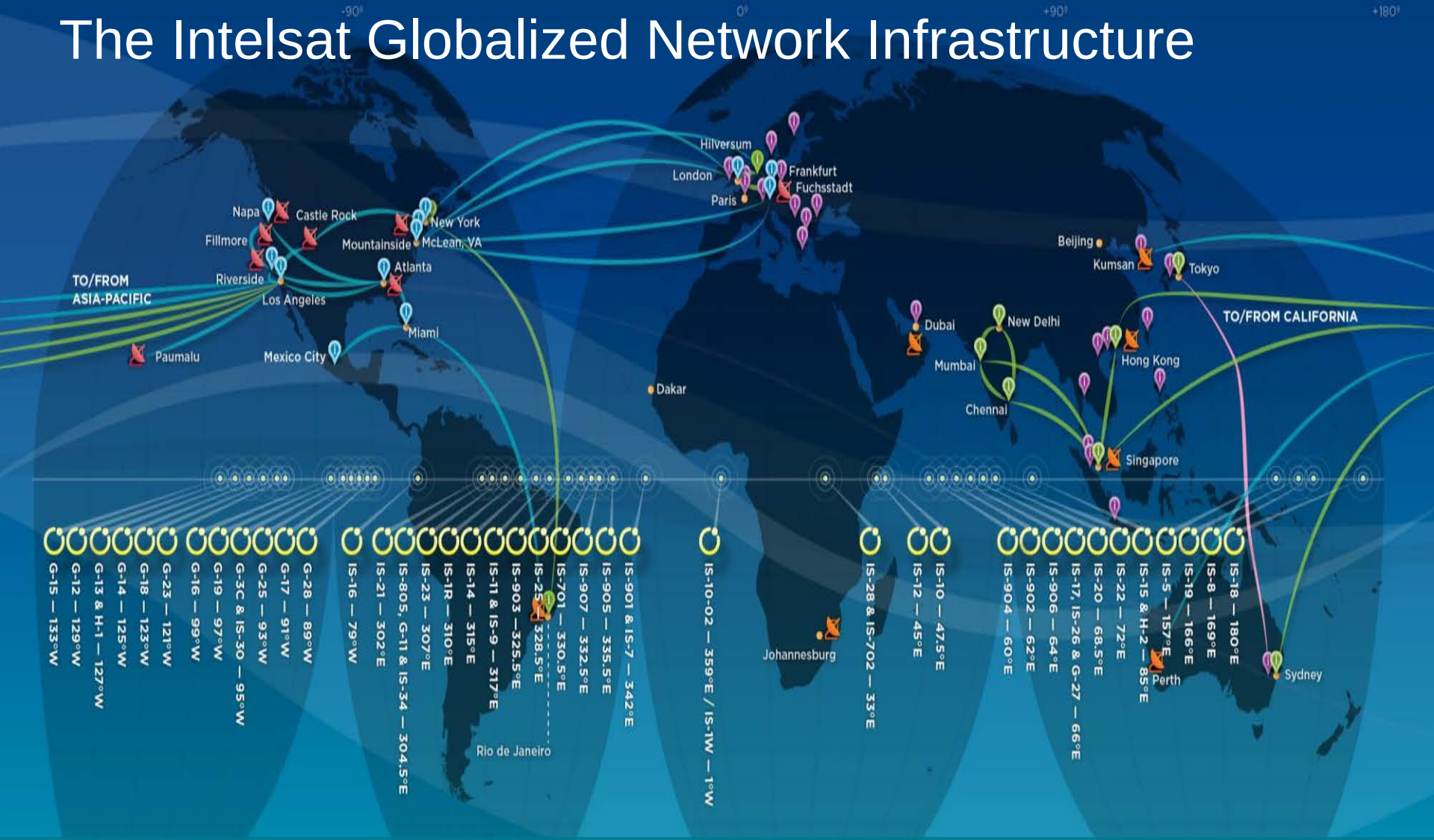
The Intelsat Globalized Network Infrastructure



Approximately 50 satellites plus IntelsatOne, a fully-integrated ground infrastructure incorporating teleports, points of presence and IP/MPLS fiber network

GEO

- Wide beams
- HTS overlay for high density areas
- Global Coverage

Premium Spectrum

Ku-band

Flexible high-performance Interoperable User terminals

- Additional capacity
- High look angle
- Low latency
- Pole-to-pole coverage

LEO

Ku band provides as much spectrum as Ka band

How do non-GEO and GEO satellites coexist in the same spacetrum?

- The ITU Radio Regulations have established rules to ensure protection of GEO satellites from non-GEOs
- In particular, Article 22 of the ITU RR specify "**Equivalent Power Flux Density Limits**", or **EPFD**, that non-GEOs must comply with in order to ensure that GEOs are protected from interference
- Non-GEOs that comply with EPFD limits do not need to coordinate with GEO satellites
- These EPFD limits have been vetted by all member countries of the ITU and are an integral part of the ITY Radio Regulations

EPFD limits ensure the protection of GEOs from non-GEOs

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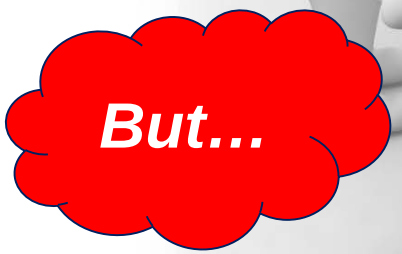
Key outcomes of WRC-15

Why do we go to WRC?

1. ***Harmonize Global Spectrum: to create economies of scale, efficiencies, and interoperability;***
2. ***Achieve regulatory certainty for the telecommunications industry to grow and flourish;***
3. ***Understand the broader spectrum needs of other regions and how it all comes together***



Everybody favors spectrum harmonization but someone always wants his own way!

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WRC-15 Outcome: Identification of frequency bands for IMT (AI 1.1)

Outcome:

- 3400 - 3600 MHz has a nearly global identification for IMT
- 3600 - 3700 MHz identified for IMT in 4 countries only
- **3700 - 4200 MHz is preserved for FSS globally**
- Mobile services remains secondary in the band 3600 - 4200 MHz

- The mobile industry now has at 200 MHz of globally identified for IMT
- **The Asia Pacific Region was *instrumental* in preserving this band, ensuring the continued investment in C-band**

WRC-15 re-confirmed the need to protect critical C-band spectrum for satellite

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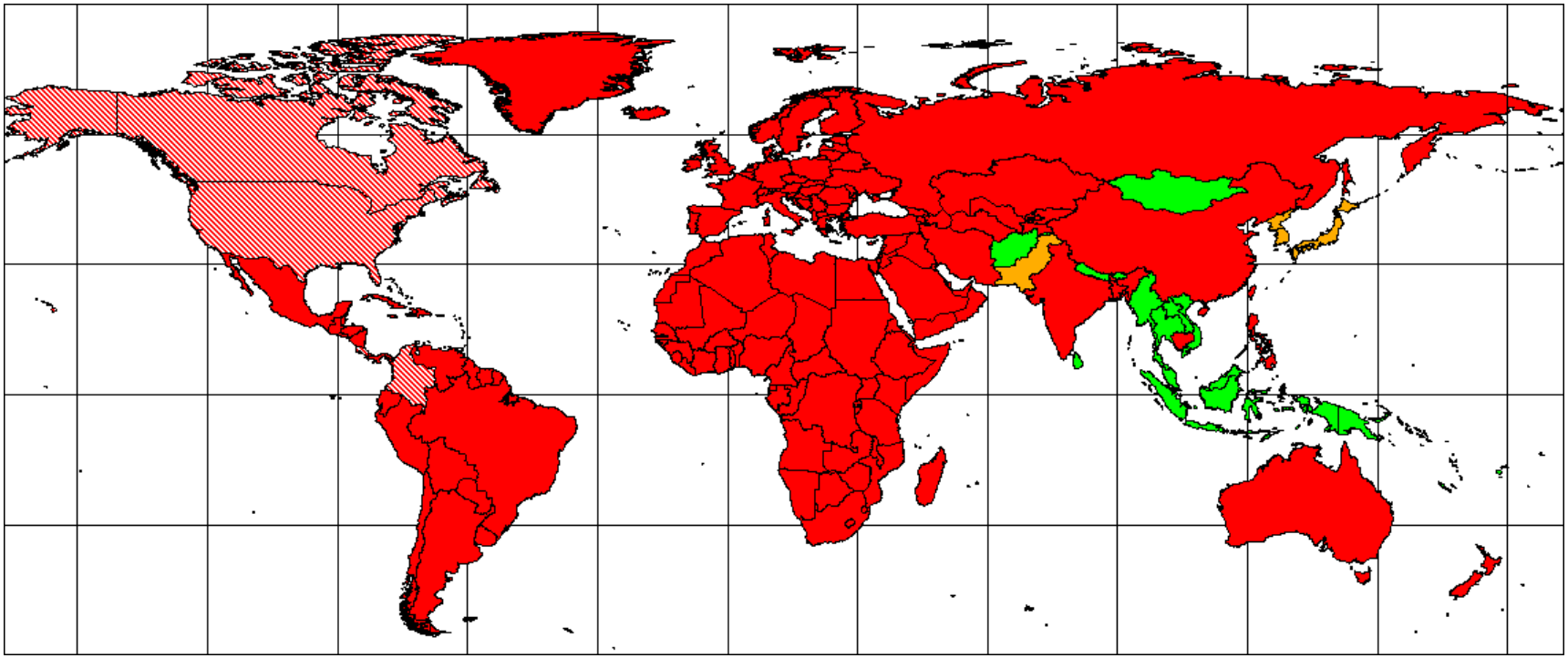
WRC-15 AI 1.1: IMT Identification in 3.4-3.7 GHz



3400 – 3600 MHz IMT Identification

3400 – 3700 MHz IMT Identification

3500 – 3600 MHz IMT Identification

No IMT Identification 3400 – 3700 MHz

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What did the News Say After WRC-15?

Via Satellite — Integrating SatelliteToday.com

Satellite Industry Fares Better Than Expected at WRC-15

"… Regarding Earth Stations in Motion (ESIMs), the conference adopted new regulations in part of the Ka-band satellite spectrum ranging from 19.7 to 20.2 GHz and 29.5 to 30 GHz. The new regulations are to facilitate the global roaming of such terminals, which are used for satellite broadband connectivity to mobile terminals, while preventing interference with other services and applications. WRC-15 also adopted several agenda items for future conferences regarding additional spectrum for satellite, and regarding frequency bands for 5G. The conference rejected proposals to consider globally harmonized 5G spectrum in C-, Ku- or Ka-band at WRC-19, instead agreeing to evaluate high-frequency bands above 24 GHz for 5G mobile services. …"

SPACENEWS

Satellite Industry Held its Ground at Global Spectrum Conclave

"… Just as important to the satellite industry was whether WRC-15's 3,300 delegates would permit detailed studies of the use of Ka-band by terrestrial networks, with decisions to be made at WRC-19. WRC-15 ultimately decided that satellite Ka-band frequencies would be removed from the list of potential terrestrial network use. …"

Business Wire — A Berkshire Hathaway Company

World Radiocommunication Conference 2015 Decides Satellite Spectrum is Central to Future Vision for Global Connectivity

Long-term Delivery of Innovative Satellite Services Are Assured a Pivotal Role Alongside Wireless and Other Complementary Technologies

"… Throughout the deliberations, multiple administrations in every world region expressed strong opposition to studying the Ka band for IMT/5G, again confirming the Conference's confidence in satellite being a key player in the future digital eco-system. …"

techUK representing the future

WRC-2015 and the impossible task of achieving a delicate balance

"… The **satellite** industry saw the outcome of the WRC-15 as successful. … The 27.5-29.5 GHz range was hotly debated and the conference eventually decided not to include it for study (even though this range already has a co-primary mobile allocation in the ITU Radio Regulations). …"

tele.síntese — Portal de Telecomunicações, Internet e TICs

SATÉLITES DE BANDA KA TÊM ESPECTRO PRESERVADO E INVESTIMENTOS GARANTIDOS

The Asia-Pacific Region was instrumental to this success

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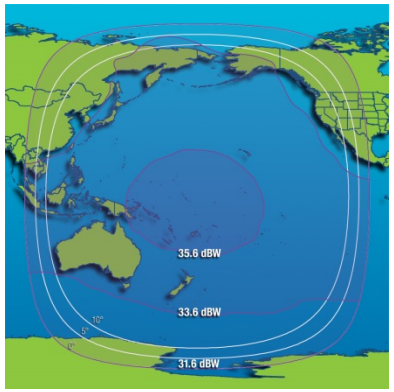
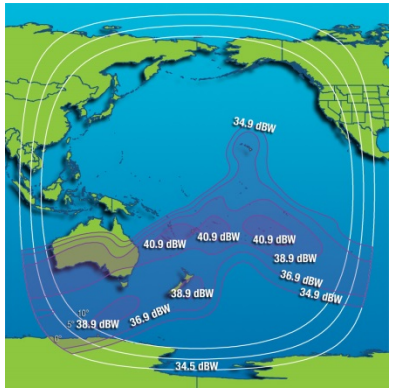
Why C-Band Remains Important for Asia Pacific?



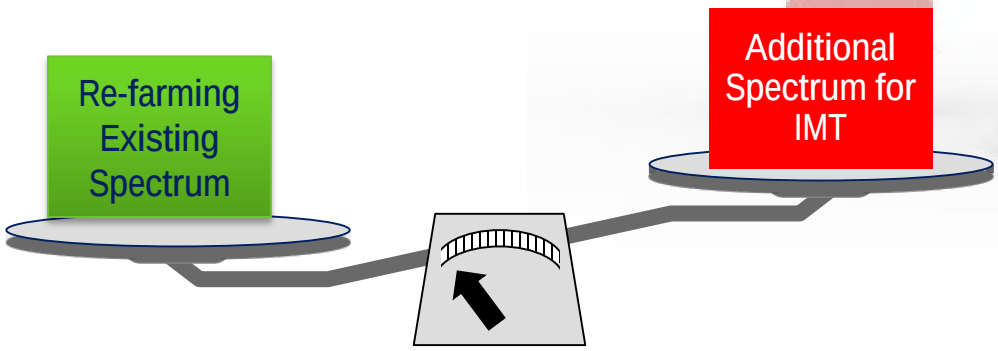


- ✓ Wide coverage
  - ✓ Large beams allow for economically viable coverage in low density areas and facilitate intercontinental and global communications
- ✓ Propagation characteristics
  - ✓ Not susceptible to rain fade
- ✓ Availability
  - ✓ Over 180 satellite deployed globally and NextGen satellites
- ✓ Reliability
  - ✓ Proven technology used time and again

The unique advantages of C-band cannot be replicated in other satellite bands or via terrestrial means

Is More C-band spectrum really needed for IMT?

- Considerable potential still remains for increasing 4G spectrum adoption in many countries, 4G network is expected to account for much of the $1.7 trillion of investment by MNO between now and 2020. (GSMA)
- MNOs will continue to focus on generating a return on investment from 4G (and 3G) networks, whilst expansion of WiFi/ WiGi and integration with cellular will be key in supporting greater data rates of the 5G ecosystem.
- Not all of the spectrum licensed to mobile operators is actually used to provide services to users. IMT can still grow using existing spectrum!



We need to look at future spectrum use based on not only the demand for spectrum but also on economic & social value

Agenda Item 1.6 - New Ku-Band FSS Allocations

Outcome:

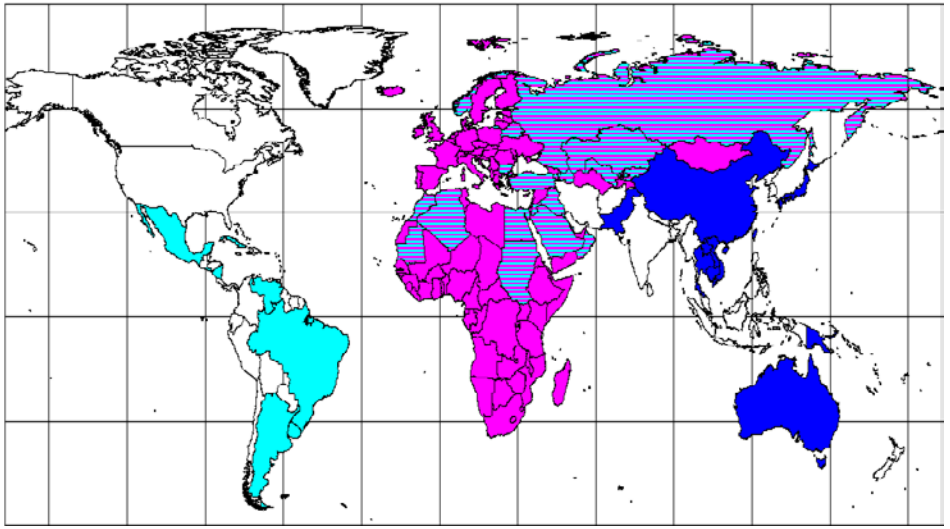
- A new downlink allocation in the 13.4-13.65 GHz band was established;
- A new uplink allocation in the 14.5-14.75/14.8 GHz band was established for 39 countries;
- The new downlink allocation creates additional spectrum over the Asia Pacific.

13.4-13.65 GHz Downlink Allocation

13.4-13.6 GHz Downlink + 14.5-14.75 GHz Uplink Allocation

14.5-14.75 GHz Uplink Allocation

14.5-14.8 GHz Uplink Allocation



It is important for administrations to update their radio regulations reflect this new allocation

Agenda Item 10 / IMT - 5G Development above 6 GHz

2 to conduct and complete in time for WRC-19 the appropriate sharing and compatibility studies[1], taking into account the protection of services to which the band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz[2], 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis

Ka band was NOT among the bands identified for IMT studies

1 Including studies with respect to services in adjacent bands, as appropriate.

2 When conducting studies in the 24.5–27.5GHz band, there is a need to ensure the protection of existing earth stations and the deployment of future receiving earth stations under the allocation to the Earth Exploration Satellite Service (EESS) and Space Research Service (SRS)

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Looking ahead to WRC-19

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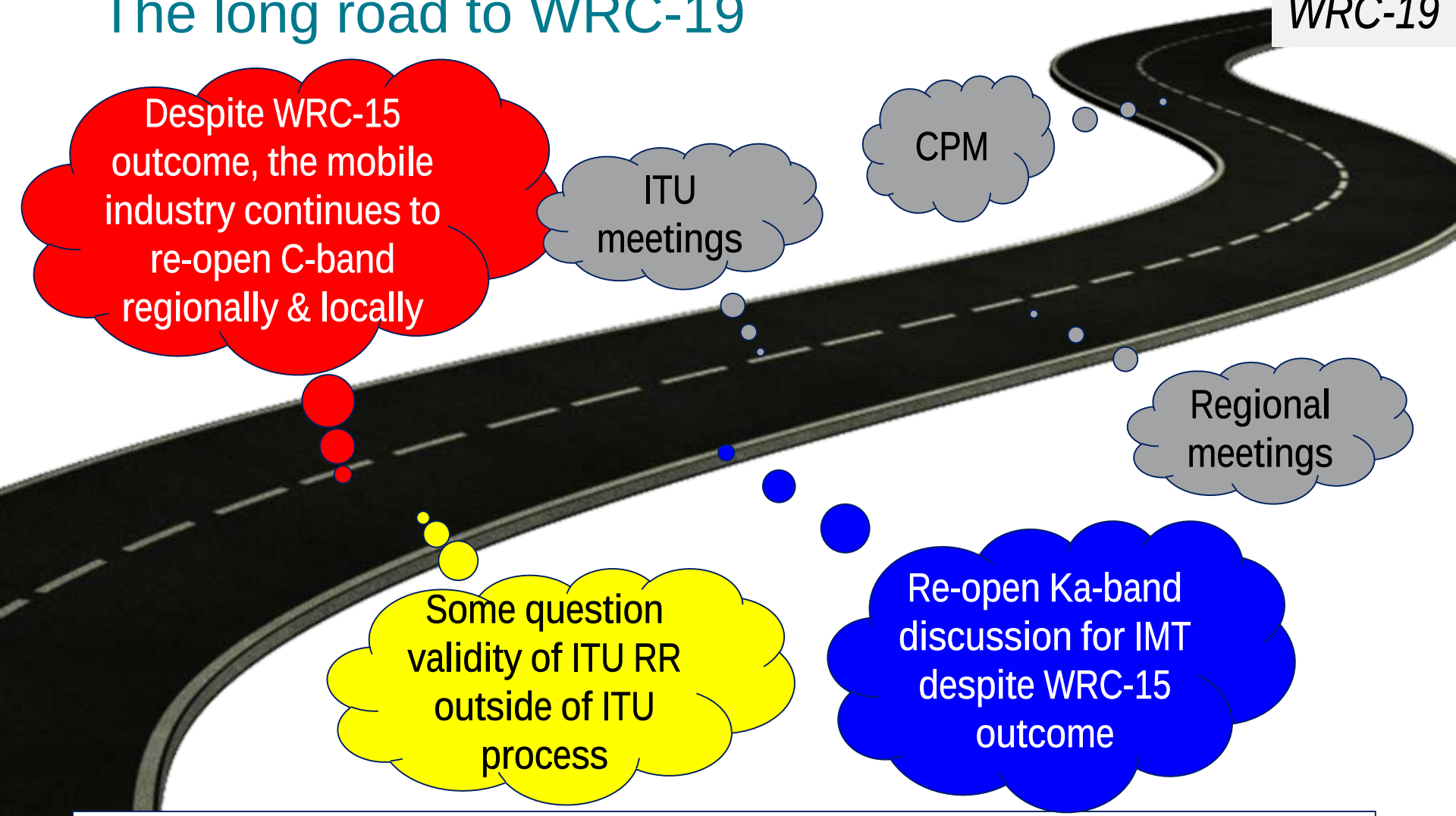
The long road to WRC-19



Despite the consensus reached in WRC-15 and before, attempts to circumvent the ITU process continue

Protection of Satellite Spectrum in Support of Growth & Innovation

Three categories of ITU WRC-19 Agenda Items require the attention of Asia Pacific countries:

Defend Existing Satellite Spectrum

- AI 1.14: HAPS
- AI 1.13: New spectrum for IMT/5G
- AI 1.16: More C-and spectrum for RLAN

Study Regulatory Flexibility

- AI 1.4: Review Ku-band (BSS) orbital position restrictions
- AI 1.5: ESIMs in Ka-band
- AI 1.6: NGSOs in Q/V bands
- AI 7: Coordination procedures

Obtain Satellite Spectrum

- AI 9.1.9: More FSS spectrum

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Guiding principles towards WRC-19

- Spectrum is a **rare and valuable resource** – allocating it must be done carefully
- All spectrum allocation discussions must **stay within the remit of the ITU:**
  - No C-band for IMT discussions outside the ITU
  - No Ka band for IMT discussions outside the ITU
- Staying within the ITU remit provides **regulatory certainty** for all telecommunication industry to grow and flourish
- **Growth** of one segment cannot be **at the expense of another**

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Thank you!

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