

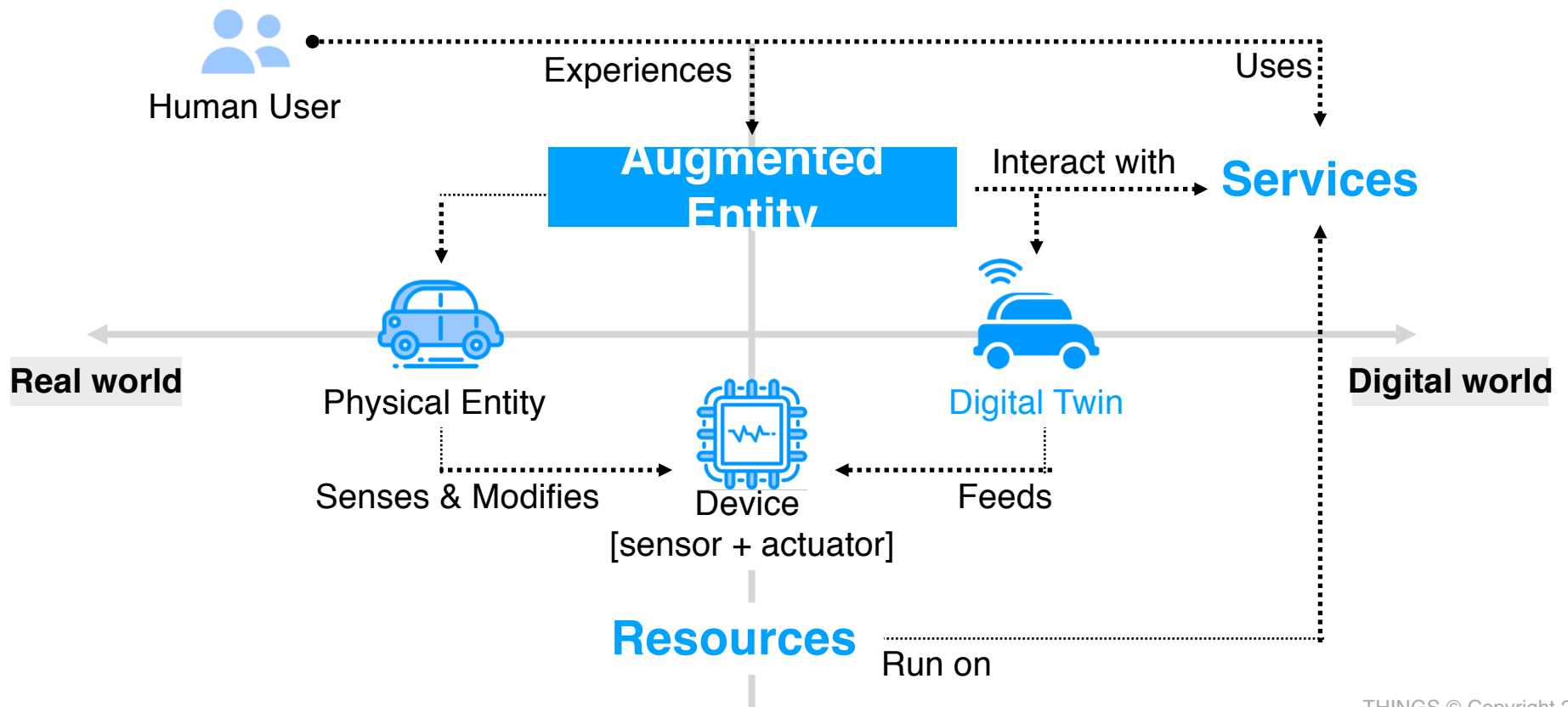
Reference Architecture for Vertical Agriculture

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Photo Courtesy of farm.one

Generic IoT problem modelling



Reference Architecture

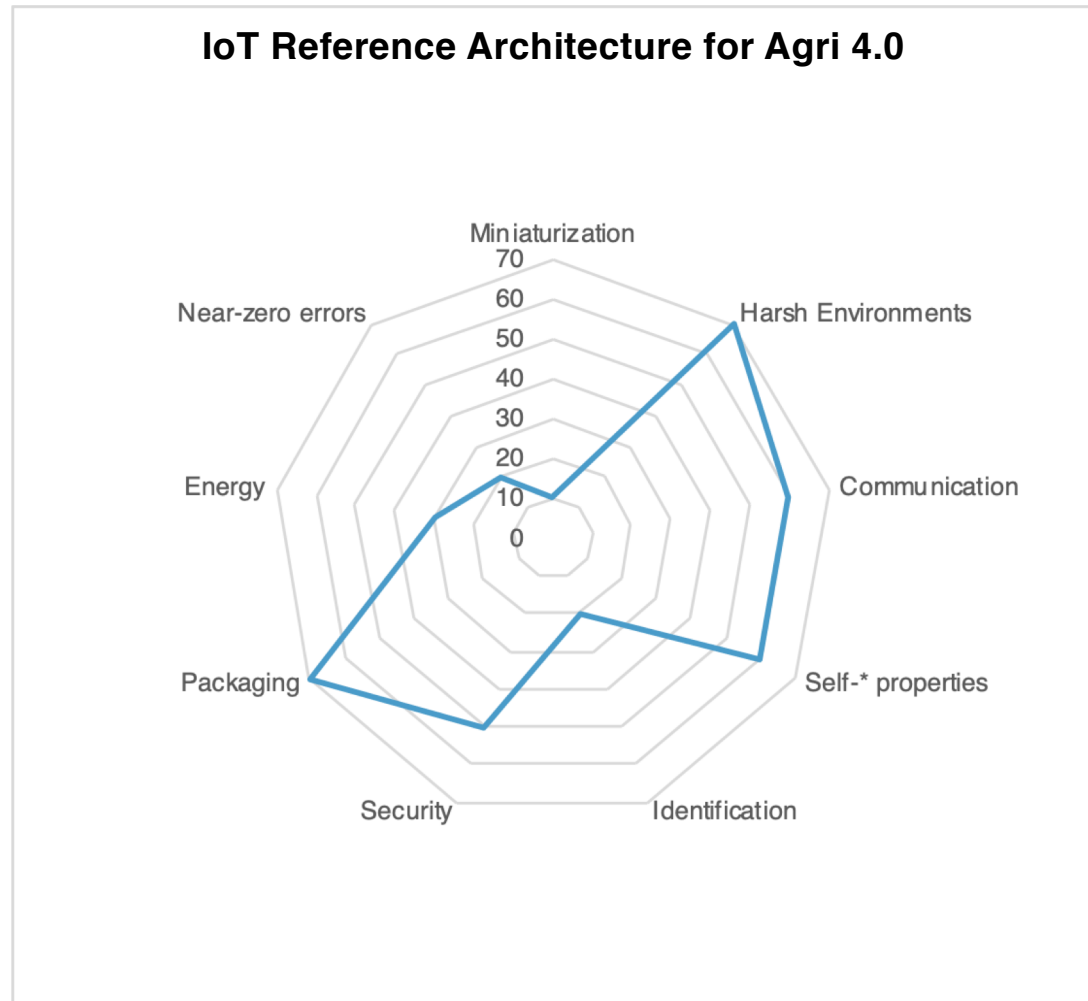
Reference Architecture: An IoT Reference Architecture is the reference for building compliant IoT architectures. As such, it provides views and perspectives on different architectural aspects that are of concern to stakeholders of the IoT. The terms “view” and “perspectives” are used according to the general literature and standards.

Agriculture 4.0 and Vertical Agriculture

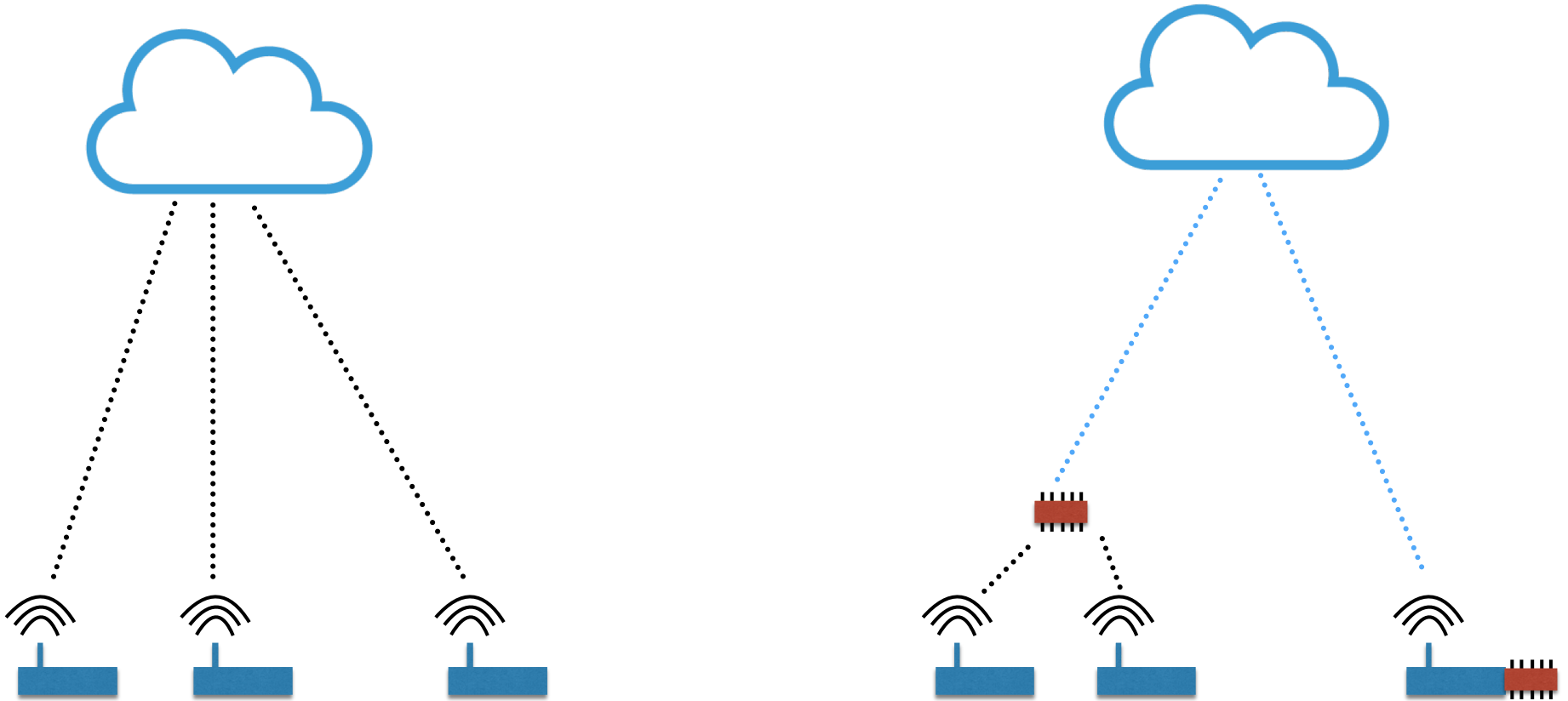
- Agriculture 4.0:
 - Instrumented and automated
 - Includes hydroponic and aquaponic production in addition to soil-based
 - Targets chemical free and ecological food production: no chemical pesticides and better management of water and electricity
- Vertical farming is the latest embodiment of Agriculture 4.0
 - Enable year-long farming
 - Enclosed growth chambers with artificial lighting to simulate solar illumination
 - Better management of growth parameters leading to consistent yields
 - Dependence on automation, computer vision and AI/remote decision making
- Sustainability goals:
 - “Internet of fruits”
- Montreal Start-up on vertical strawberry production: Nova Farming
 - Developing a reference platform for integrated production management across farm locations (urban, suburban and remote)

Vertical Agriculture in IoT's: 9 challenges

- Miniaturisation
- **Harsh Environments**
- **Communication**
- **Self-* properties**
- Identification
- **Security**
- Packaging
- **Energy**
- **Quality**



Centralised vs Edge Architecture



Hardware Architecture

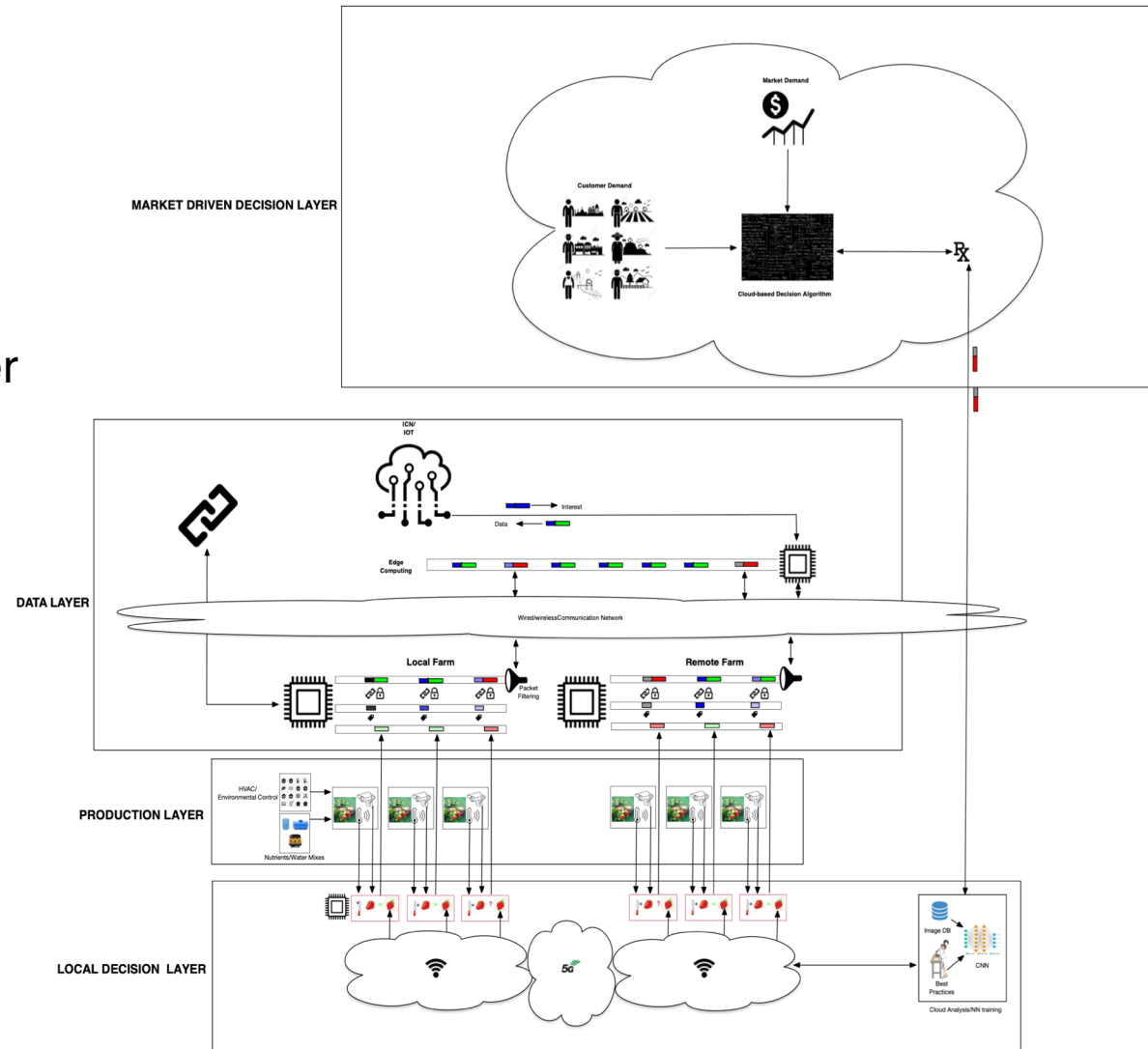
- Use of a programmable and flexible data plane enables:
 - Line speed data filtering for management
 - Content-based routing for decision making
 - Telemetry and real-time analytics
- Filtered information can be transmitted or sent to a GPU/CPU for processing:
 - Data analysis
 - Mission critical messaging

Vertical Agriculture uses Network Enabled AI

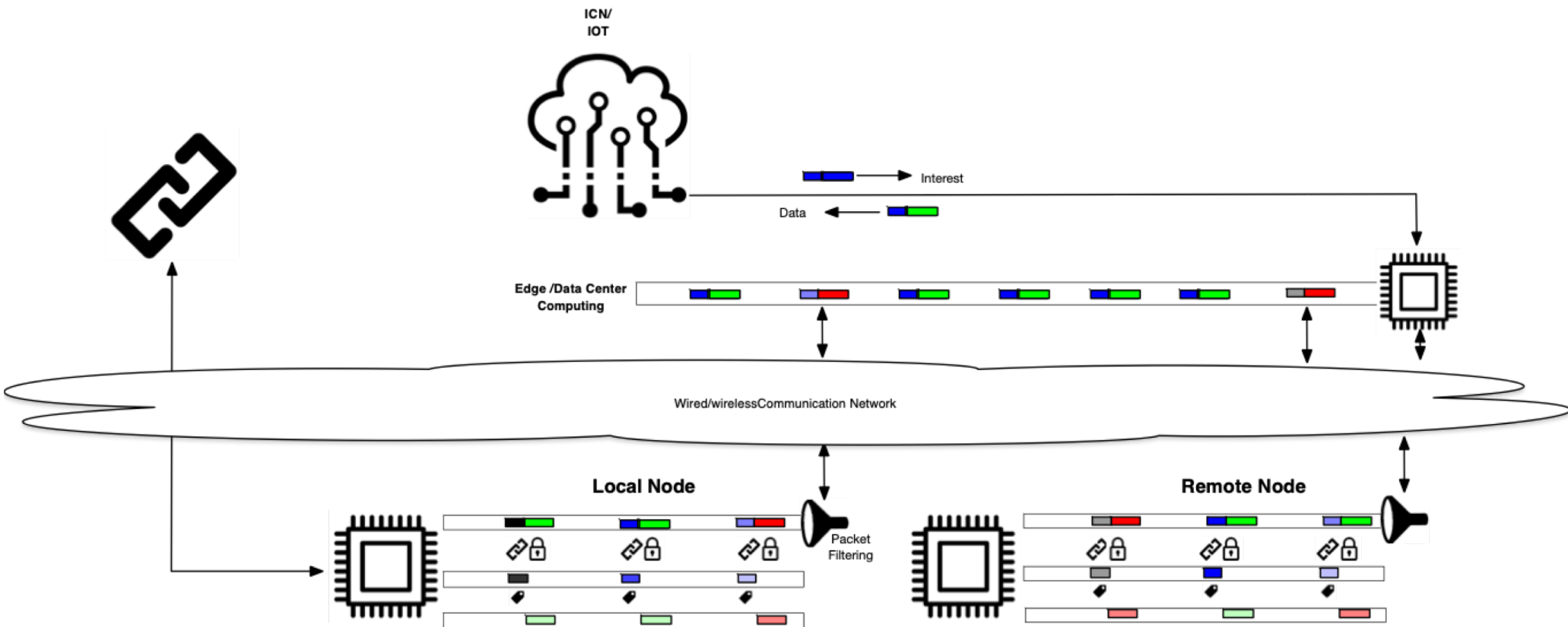
- Use a common computing-enabled data layer based on distributed computing
- In turn see how the AI algorithms influence the performance of the computing element (and vice versa)
- Common issue: centralized vs. decentralized approaches
federation/synchronization

Decision System Architecture: 4 layers

- Market Driven Decision Layer:
 - AI-based production decisions based on market and consumer demand
- Data Layer:
 - Edge/cloud facility for analysis, management and algorithm training
- Production Layer
 - Automated and monitored growth chambers
- Local Decision Layer
 - Image processing and critical event detection



Common Distributed Data Layer



Next Steps

- IPR disclosures as needed.
- Finalizing a draft before Vancouver.

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