

October 2022

# Internet Evolution Approaches at ITU-T - *why should we care?*



*NANOG86, Los Angeles, October 2022*

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# Topics

- Evolution of “*NewIP*” Proposal
- What is “*NewIP*”
- Key Concerns
- Related Proposals
- Vertical or Specialized Networks
- Recent Developments



# Terms and Acronyms

ITU-T: International Telecommunications Union – Telecomm. Standardization Sector

SG13: Study Group 13 - Future Networks

SG11: Study Group 11 - Signaling Requirements and Protocols

TSAG: Telecommunications Standardization Advisory Group

WTSA: World Telecommunications Standardization Assembly

SDO: Standards Development Organization

ETSI: European Telecommunications Standards Institute



# Key Steps in the Evolution of “*NewIP*” Proposal

ITU-T SG13 created Focus Group on Future Networks 2030 in Feb. 2018.

Final reports submitted in June 2020.

- Contribution C-83 (with presentation) to TSAG 9/2019 proposing a “New information and communications network with new protocol system” (*NewIP*).
- Change of terminology in July 2020 SG13 meeting, from “*NewIP*” to *Future Vertical Communications Networks (FVCN)*
  - Without modifications to questions’ text
- In Dec. 2020, SG13 and SG11 decided
  - Not to accept *NewIP* related questions as new work items
  - Stop discussing *NewIP* at least until WTSA in March 2022.



## Where are we?

- *New proposals of elements on NewIP are appearing.*
  - *New work proposal on “Polymorphic Networking” in SG13 – March2021.*
  - *New work proposal on “Immersive real-time communications” in SG13 – March2021.*
  - *Discussion on forming a Focus Group on “6G Networking Technologies” based on outcomes of FG FN2030, at SG13 Workshop for Africa – June2021.*
  - *New work proposal on “ Security guidelines of deterministic communication services for IMT-2020 networks and beyond” in SG17 – Sept 2021.*
- *Vigilance and close collaboration with partners is very critical.*



# ITU-T Focus Group on Future Network 2030

- Initiated by ITU SG 13 in Feb. 2018 and submitted final deliverables in June 2020.

Final outcomes:

- **Technical Report:** "Network 2030 - Gap Analysis of Network 2030 New Services, Capabilities and Use cases" (June 2020)
- **Technical Report:** "Network 2030- Additional representative use cases and key network requirements for Network 2030" (June 2020)
- **Technical Specification:** "Network 2030 Architecture Framework" (June 2020)

Key observations:

- Very high-level gap analysis.
- No formal engagements with other SDOs
  - No formal liaison requests
  - No formal meetings at IETF



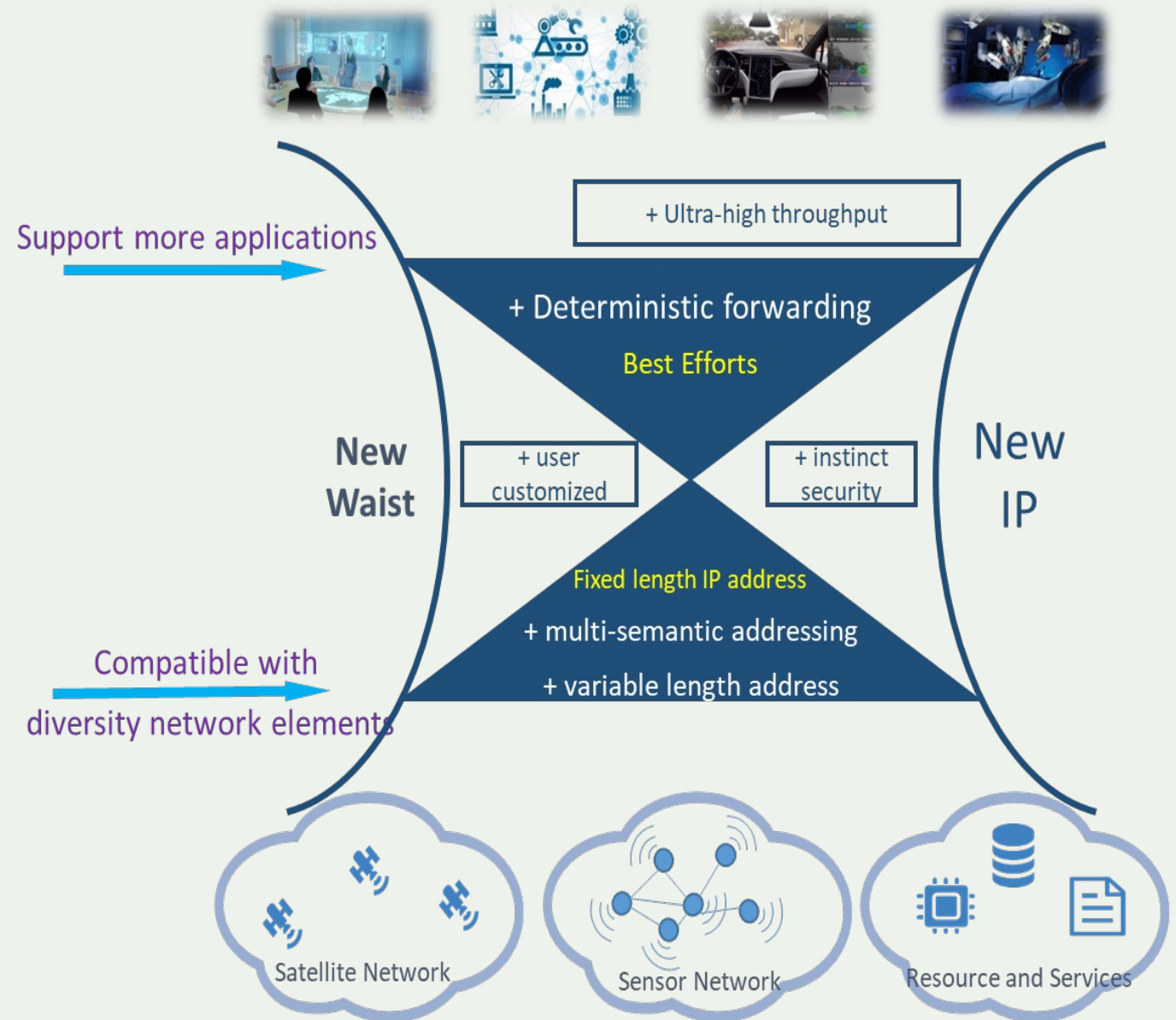
# *"NewIP"* – An Overview



# What is "NewIP" ?

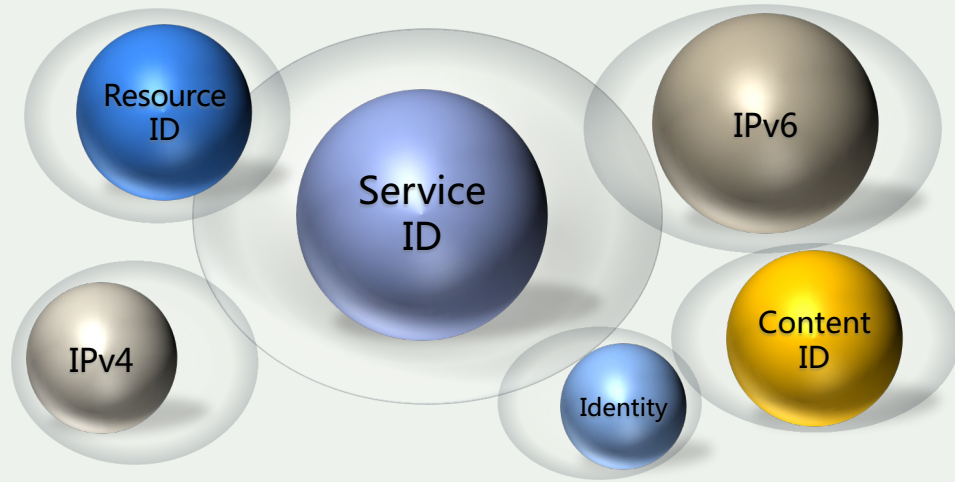
A set of proposals from *Huawei* to develop *new* network protocols and architectures "by extending and *redesigning* the traditional IP" supporting new services for a "*new Internet*" by 2030.

- *Semantic addressing*
- *Flexible length addressing*
- *Deterministic services*
- Intrinsic Security and Privacy
- High throughput



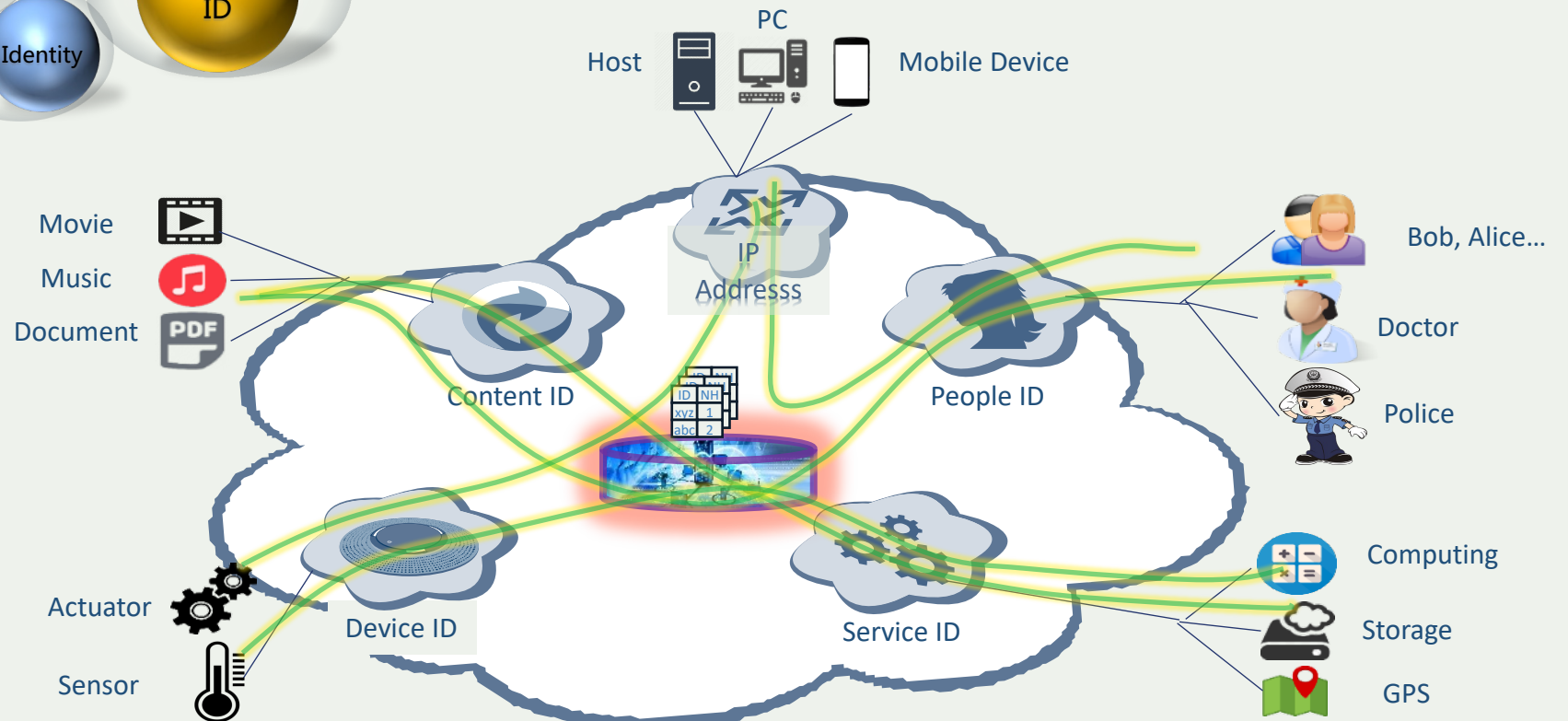


# Multi-Semantic Addressing



Heterogeneous address space should be able to communicate with each other

Instead of mapping all information into network address, the diverse IDs are used to indicate the destination, which improve routing capabilities.

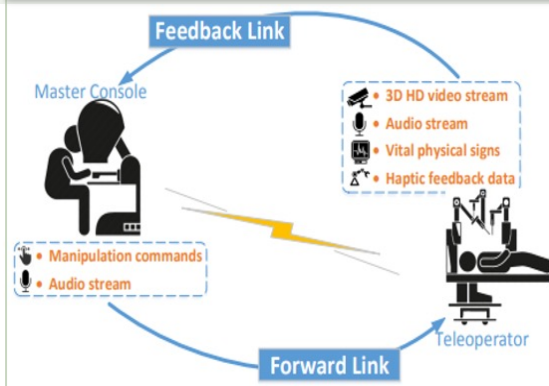


**Diversity Addressing and Forwarding**



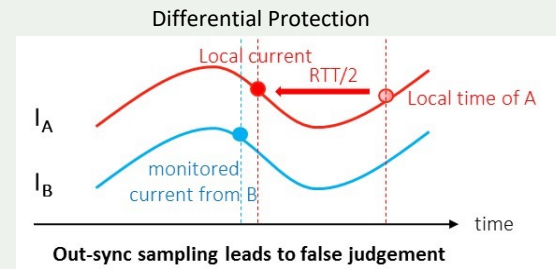
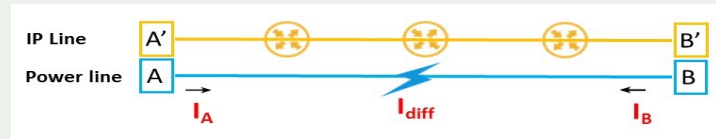
# Deterministic Forwarding

New applications require both "in-time" and "on-time"



- A doctor operate a console remotely
- For precise operation, E2E delay < 50 ms, jitter < 200us

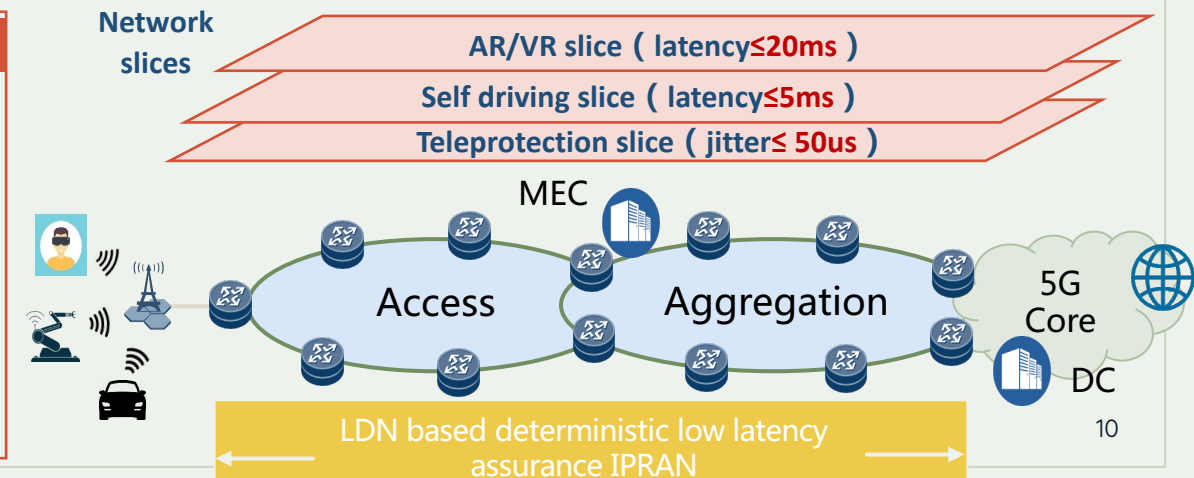
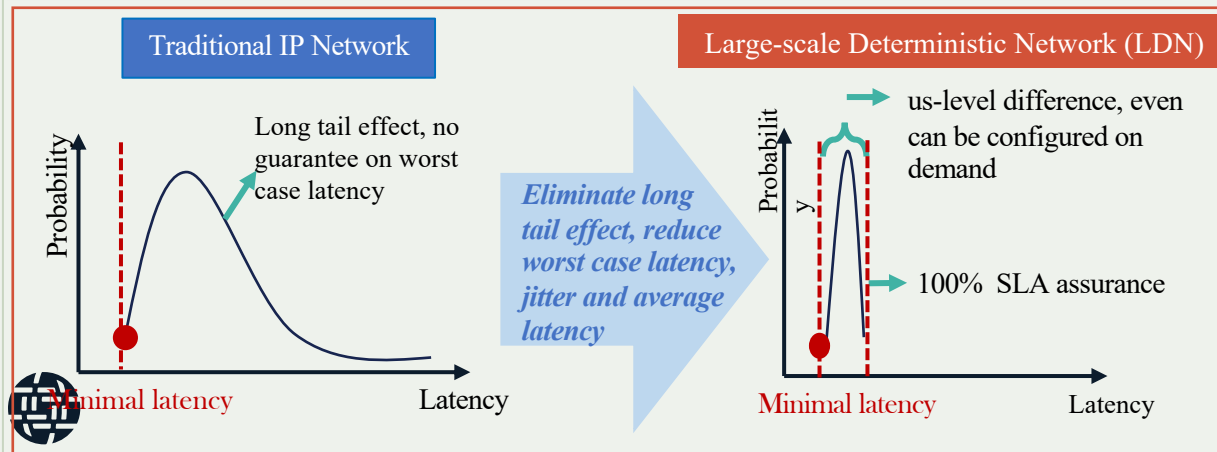
Remote Surgery: requires both "in-time" and "on-time" for the quality of surgery



- Pairing protective devices send the same amount of current to each other.
- In order to avoid error, the difference between two one-way latencies < 200us, jitter < 50us

IP-based smart grid: need to transmit electronic control message "in-time"

Enable network layer deterministic forwarding to satisfy future scenarios



# Key Concerns



## Key Concerns with “NewIP” Proposal

- *Lack of Interoperability* if the Internet architecture are redesigned outside the IETF
  - > Internet fragmentation
- *Innovation* and standards should be *incremental* – evolution not revolution.
- *Capital* investment required to migrate the current network to a new protocol



## Further Concerns

- Selling *future technologies* against current network architecture and services
- Lack of deployment in networks is not lack of *capability* – need market demand



# False Claims

- Claim: Current networking environment is only the Internet
- Claim: Current networking technologies can't handle heterogeneous networks (aka *ManyNets*)
- Claim: The Internet can't support ultra-high throughput.
- Claim: Extremely low latency is required globally



## Position of ETNO (European Telecom Network Operators)

1. The development of a new Internet Protocol (provided there is a real need for it) would put at risk the *high investments devoted to telecoms network infrastructures*, which might need to be replaced before being fully amortized, thus affecting the return on investment of the sector and putting their sustainability at significant risk;
2. To *avoid duplication of efforts*, there should be no (or minimal) overlap in work done in different SDOs: the ITU should not take on work on the IP architecture and the capacity of current transport networks being implemented by IETF and IEEE
3. Internet protocols and their architecture should continue to be developed in *open, multistakeholder, and bottom-up fashion* – such as those led by the IETF and IEEE – and not driven by top-down processes, as in ITU.



# Polymorphic Networking - *P/Net*





## Polymorphic Networking - *PINet*

- Submitted to ITU-T SG13 in March 2021:

“Polymorphic network (PINet) is a new type of network architecture and a potential network model for the future 6th generation mobile communication network.”

“ PINet intends to support the full-dimensional definition and polymorphic presentation of *addressing routing, switching modes, interconnection modes, network element forms, transmission protocols, etc.* It enables the network to support specialized and customized services, taking service quality and network security into account. Meanwhile, PINet can make full use of network resources and provide users with a better experience.”



# Paper in IEEE Transactions on Network Science

IEEE TRANSACTIONS ON NETWORK SCIENCE AND ENGINEERING, VOL. 7, NO. 4, OCTOBER-DECEMBER 2020

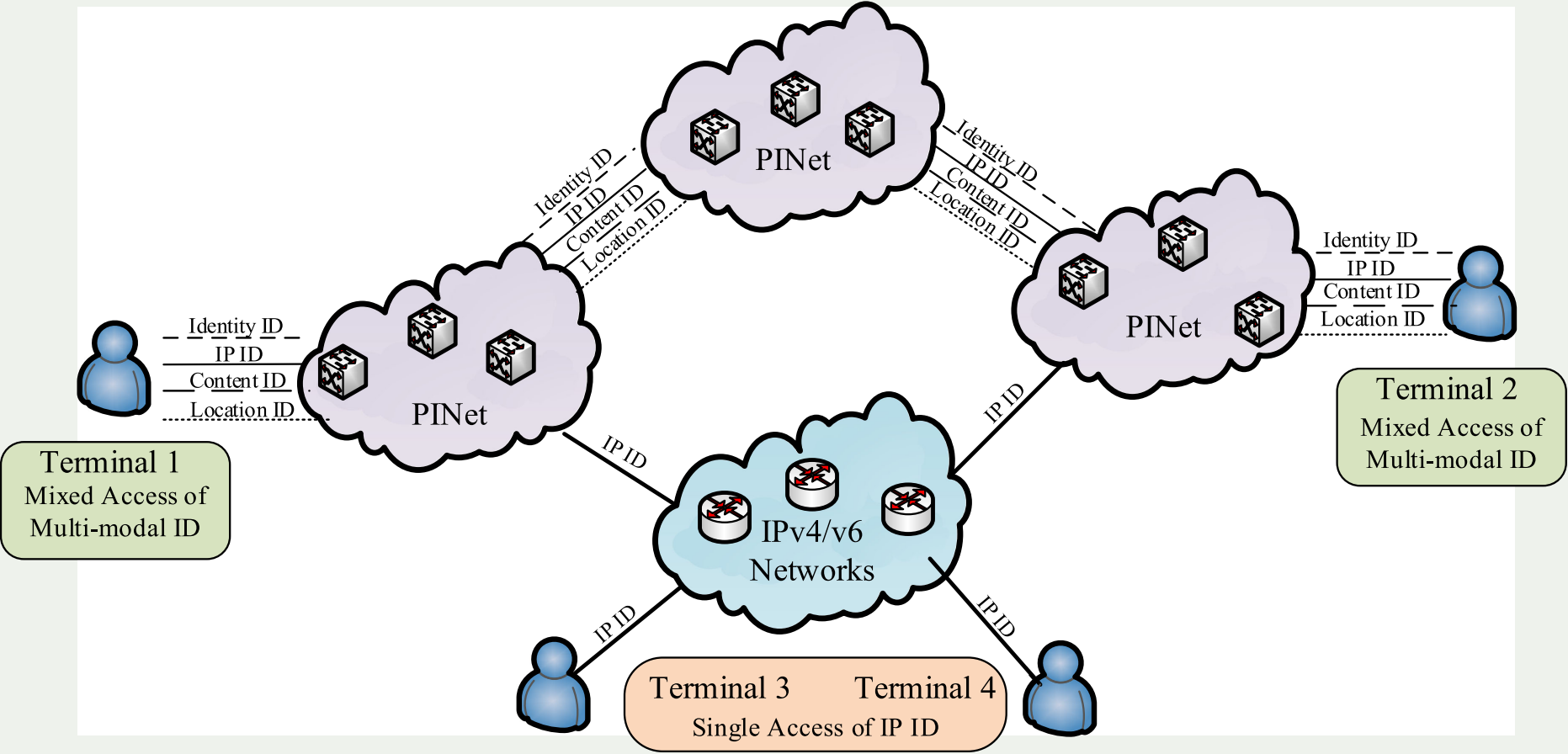
2515

## Polymorphic Smart Network: An Open, Flexible and Universal Architecture for Future Heterogeneous Networks

Yuxiang Hu, Dan Li , Penghao Sun, Peng Yi, and Jiangxing Wu 



# Polymorphic Addressing and Routing System



# Key Concerns

- This proposal is a research topic that is too early to seek international standardization
- Insufficient information on the need for such a new architecture, potential use cases and gap analysis with related work at other SDOs
- Discussion of proposals related to Internet architecture or the IP layer should take place in other SDOs (in this case the IETF).



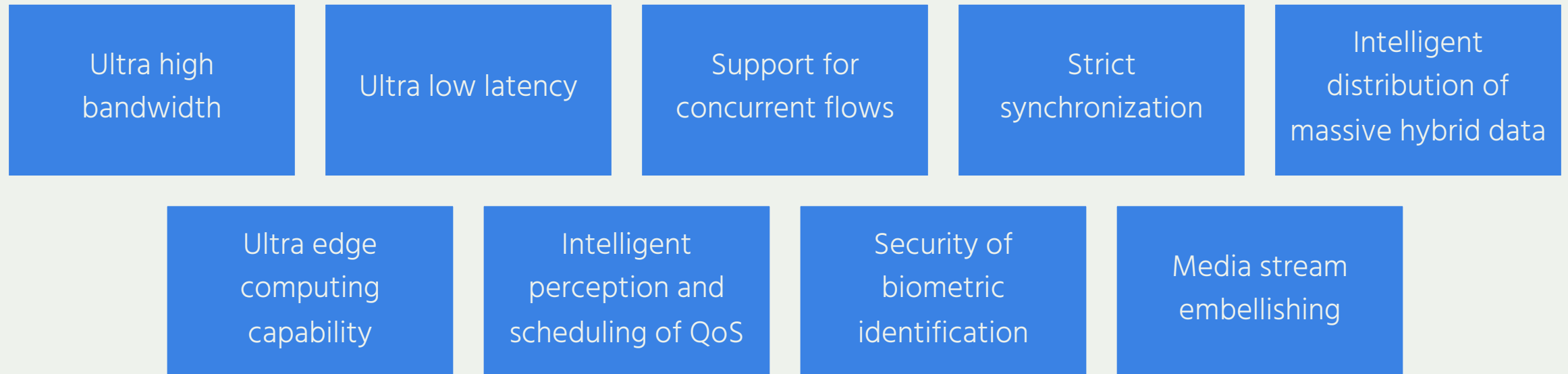
# Immersive Real-Time Communications



# Immersive Real-Time Communications (IRC)

- Submitted to ITU-T SG13 in March 2021

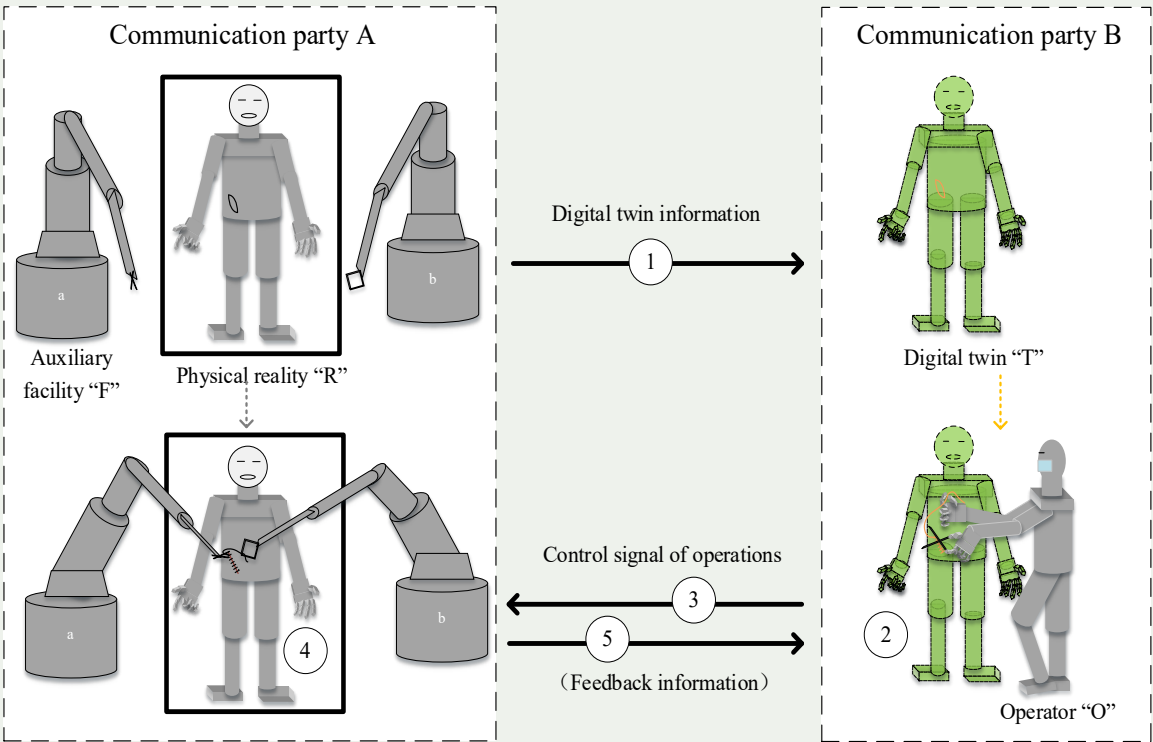
“The studies on HTC relevant use cases in ITU-T FG NET2030 provided a preliminary foundation of the IRC study”.



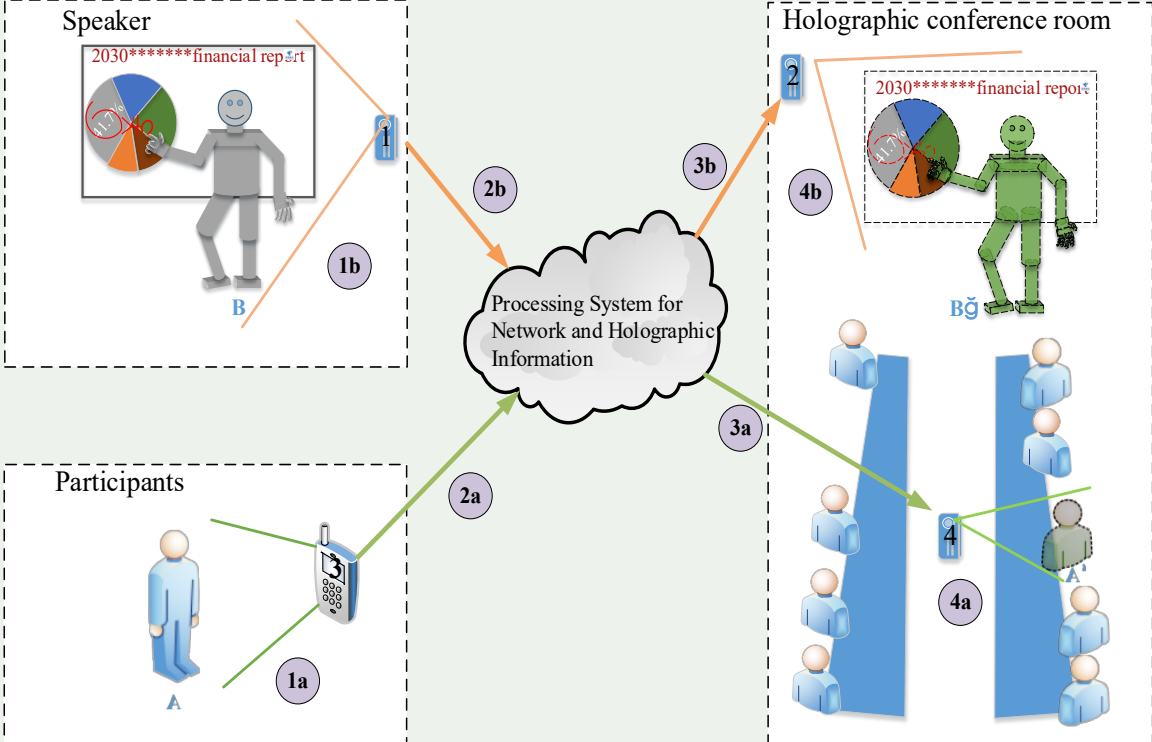
Holographic Type Communication (HTC)



# Two Main Use Cases



Twin Reality Service Or Digital Twins



Holographic Type Communication (HTC)



## Key Concerns

- This proposal is a research topic that is too early to seek international standardization.
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# Vertical/Specialized Networks



# Definition

1. Vertical or specialized networks typically use protocols that are **optimized** for the deployment scenario (manufacturing, agriculture, smart city, etc.).
2. Optimization targets **less overhead** (i.e. higher data rate/throughput) and higher speed.
  - operate at the **physical layer** (e.g. optical transport) and **data link layer** (e.g. MAC layer)
  - avoid complex routing decisions as they require processing of relatively long headers and reduce network throughput.
3. **Only the point** of the vertical network that **interfaces with the Internet** needs to incorporate routing information through the **IP header**.



# Use Case 1: Manufacturing - ETSI Non-IP Networking – NIN ISG



## Non-IP networking in production



Ocado Warehouse – Cambridge consultants radio design

TCP/IP over the air not considered practical:

- Requirement for real-time control (no retransmission)
- Large headers limit capacity

### Solution:

Simplified radio stack: non-IP time framed connection

Messages to/from **1000** robots every **100ms**

Scalable to 20 times number of movements

Real-time interface to backend IP network



# Efforts at ETSI NIN

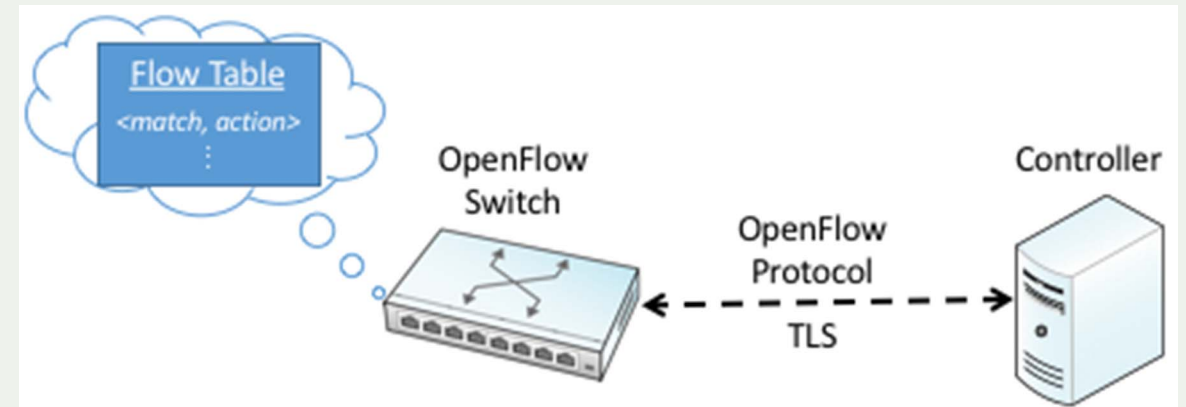
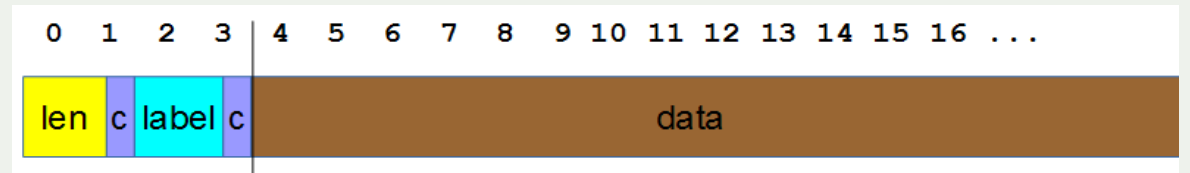
In March 2021 ETSI NIN published three reports:

- *Flexilink network model*

Two main components in *Flexilink* protocol

- connection-oriented paradigm
  - using a “flow” or virtual circuit label
- simplified packet header structure

-> *no specification of signalling protocol*

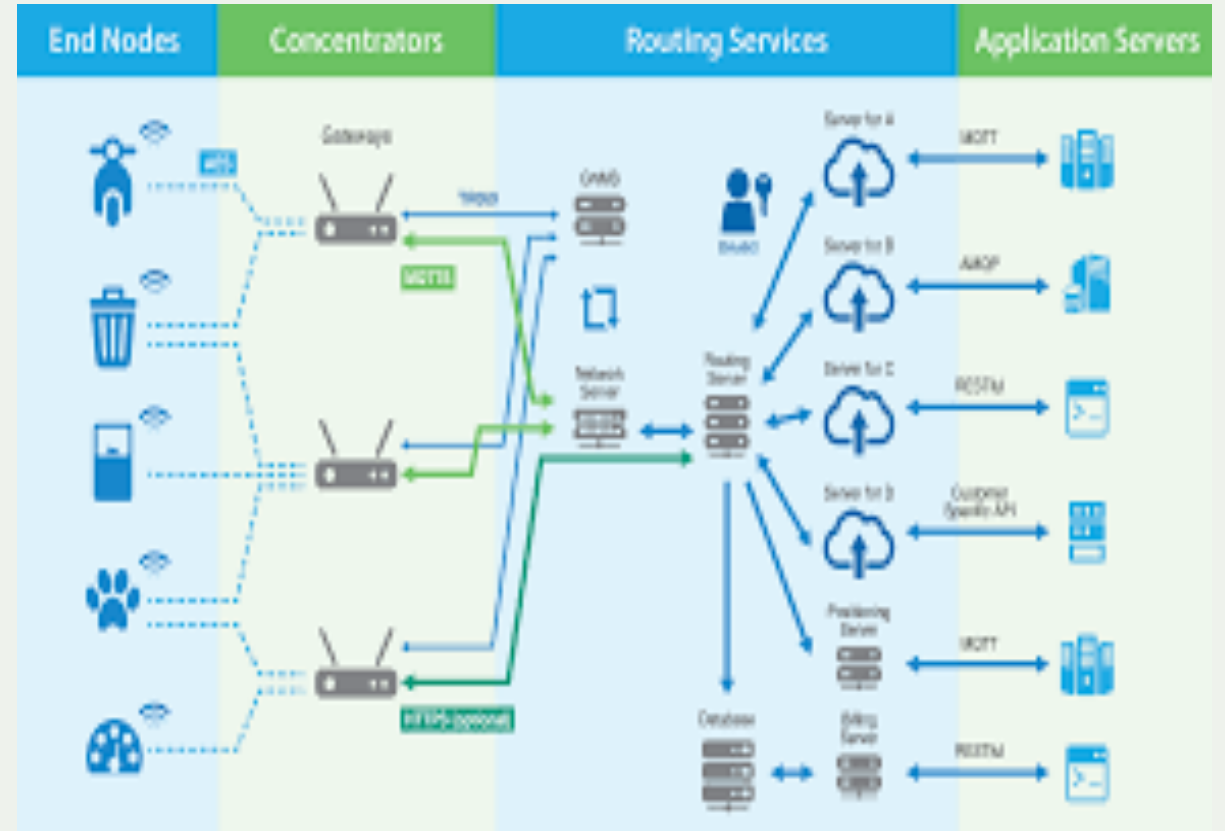
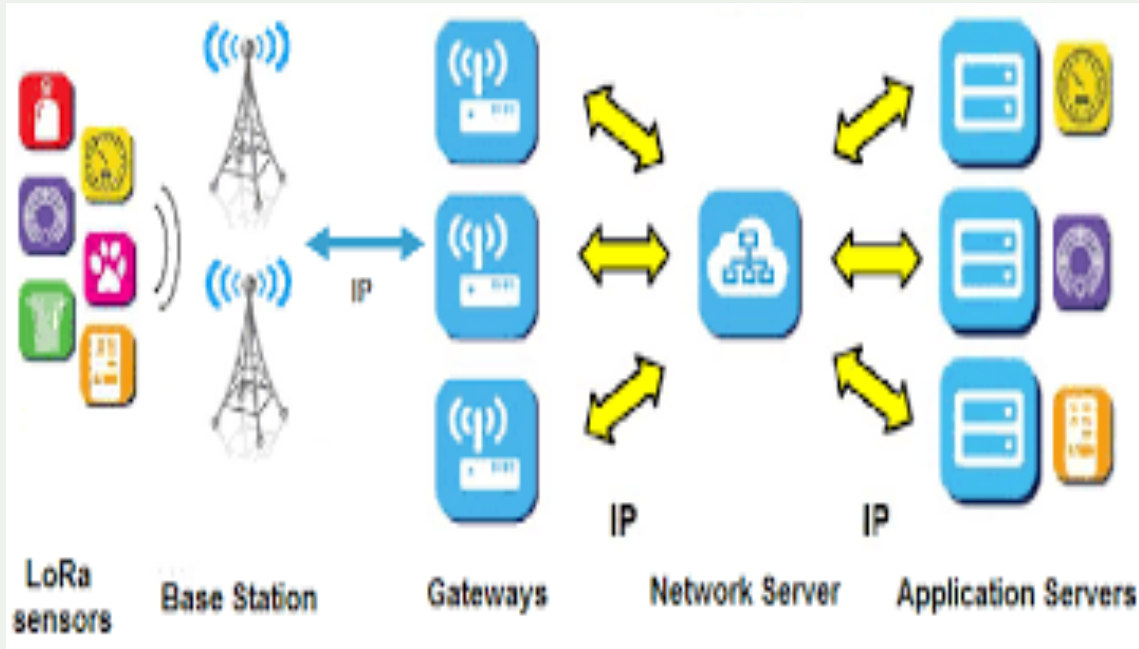


<https://www.etsi.org/committee/nin>



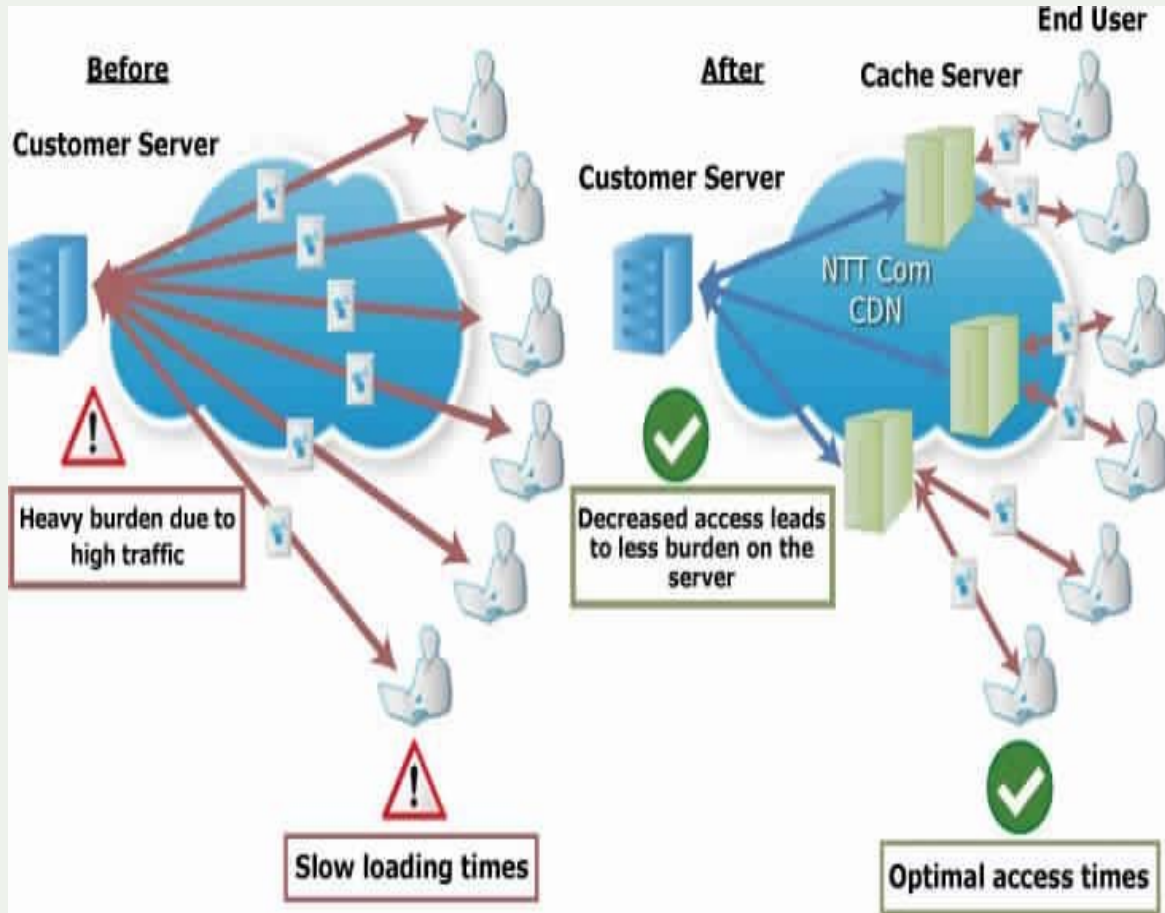
NIN = Non-IP Networking

# Use Case 2: LoRaWAN

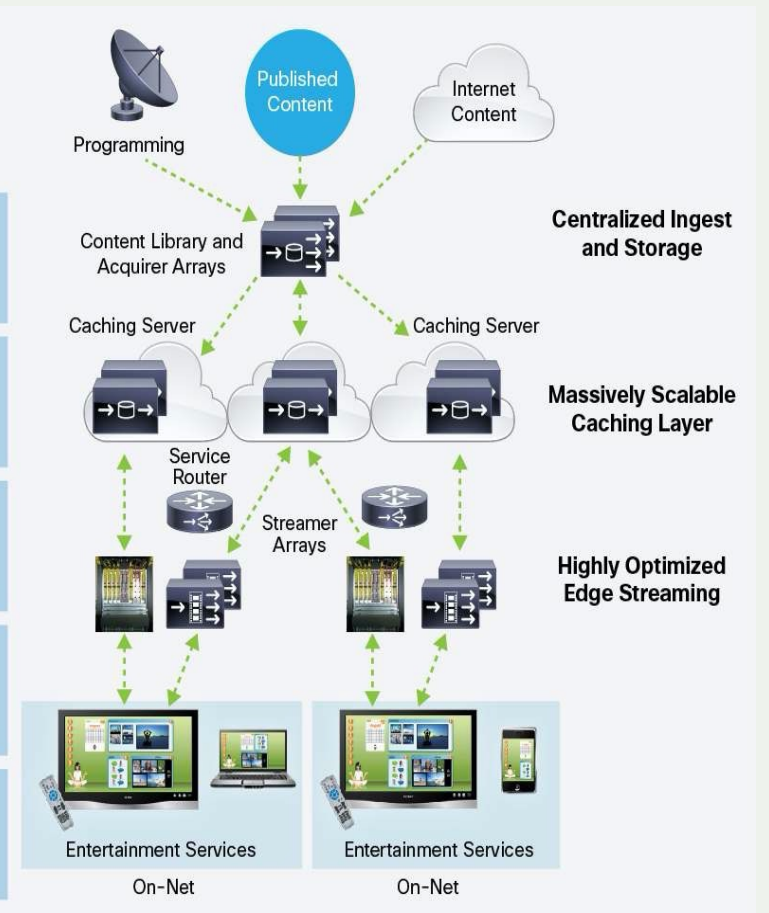




# Use Case 3: CDNs (Content Distribution Networks)



- Acquires Content in Multiple Formats From Multiple Sources, Live and On-Demand
- Independent Scalability of Content Delivery Functions - Adapts to Any Network Topology
- Very Low Latency Content Propagation for On-Demand and Real-Time Applications
- Guarantees Non-Stop Service Availability Through Advanced Resiliency Features
- Intelligent Service Routing for Global Network Routing and Service Extensions



NTT

Cisco

# Recent Developments



# Recent Developments

## *WTSA [World Telecommunications Standardization Assembly] – March 2022*

- Resolution 50 “Cybersecurity” – reference to “*intrinsic security*”
- Resolution 92 Standardization of non-radio aspects of international mobile telecommunications
  - Reference to ITU-T SG13 *Focus Group on Future Networks*

## *WTDC [World Telecommunications Development Conference] – June 2022*

- Resolution 130 “Deployment of IPv6” – Capacity building on *IPv6+*

## *ITU-T SG5 [Environmental Aspects] – Oct. 2022*

- New Question on: “Environmentally sustainable development and operation of ICT network “





## Proposed New Question to ITU-T SG5

*Environmentally sustainable development and operation of ICT network :*

“Study how the reduction of network layers and flatten the overall network architecture ..., new network architecture solutions to replace the traditional three-layer network topology, ....., reducing the number of node devices .....”



# Summary



# Summary

- Proposals like *NewIP* pose significant threat to the global Internet model and architecture.
- Although discussions on *NewIP* were stopped at SG13/SG11 in Dec. 2020, similar approaches are still being presented at various study groups of ITU-T.
- Innovations in Vertical Networks are useful to the evolution of the Internet.



# Thank you.

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# Additional Resources



# Resources

<https://www.internetsociety.org/events/un/wtsa-2020/isoc-at-wtsa/>

- WTSA-20 Resolution Matrix
- NewIP FAQ
- NewIP Analysis

<https://www.internetsociety.org/resources/doc/2020/discussion-paper-an-analysis-of-the-new-ip-proposal-to-the-itu-t/>



# Resolution Matrix

ITU-T WTSA 2020 – Issues Matrix as of 05 April 2022

Type	RES	Title	Contribution Origin Number & Key Points	Comments
<b>Key Resolutions dealing with Cybersecurity</b> ( <a href="#">top</a> )( <a href="#">index</a> )				
MOD	50	Cybersecurity	<p><b>WTSA-20 Outcome:</b> (from RCC/40A8/1, IAP/39A30/1, EUR/38A6/1, ARB/36A19/1, APT/37A8/1, AFCP/35A9/1)</p> <p>Summary:</p> <ul style="list-style-type: none"> <li>• Supports continued development of Recommendations, Supplements and technical reports to keep pace with emerging technologies and which "support cybersecurity procedures, technical policies and standards frameworks."</li> <li>• Supports work in Study Group 17 <ul style="list-style-type: none"> <li>○ "...to develop cooperative security analysis and incident management frameworks"</li> <li>○ to support the TSB Director in maintaining the ICT Security Standards Roadmap.</li> <li>○ to support joint coordination activities on security "among all relevant study groups and focus groups in ITU and other SDOs;"</li> </ul> </li> </ul>	<p>Organizations interested in cybersecurity should monitor work in SG17.</p> <p>Supports current work in SG17 as described in the modified charter (Res 2) and the Questions approved at WTSA-20. The actual work in SG17 will be driven by contributions and participation.</p>



# “NewIP” FAQ

## Huawei’s “New IP” Proposal

### Frequently Asked Questions

February 2022



**Q1:** What is the "New IP" proposal? Who is promoting it and supporting it?

**A:** Originally, "New IP" was a set of proposals that were submitted by Huawei to the ITU-T's Telecommunications Standardization Advisory Group (TSAG) in September 2019, to initiate an ITU-T-



<https://www.internetsociety.org/wp-content/uploads/2022/02/Huawei-New-IP-Proposal-FAQ-1.pdf>



# Additional Information

- IETF Liaison statement Response to "LS on New IP, Shaping Future Network:" <https://datatracker.ietf.org/liaison/1677/>
- RIPE NCC, Do We Need a New IP: [https://labs.ripe.net/author/marco\\_hogewoning/do-we-need-a-new-ip/](https://labs.ripe.net/author/marco_hogewoning/do-we-need-a-new-ip/)
- ICANN New IP Publication: <https://www.icann.org/en/system/files/files/octo-017-27oct20-en.pdf>
- Internet Impact Assessment Toolkit, <https://www.internetsociety.org/issues/internet-way-of-networking/internet-impact-assessment-toolkit/>
- IWN- Threats - Infographics, <https://www.internetsociety.org/wp-content/uploads/2020/09/IWN-IIAT-Threats-Info-Graphic.pdf>

