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Table of Contents

1. Introduction .................................................................................................................................................. 1
   1.1. 2022 Edition Update ............................................................................................................................ 1

2. Working Group Vision .................................................................................................................................. 3
   2.1. Scope of Working Group Effort .............................................................................................................. 6
   2.2. Linkages and Stakeholders ..................................................................................................................... 7

3. Current Landscape ...................................................................................................................................... 9
   3.1. Current State of Technology and Research ............................................................................................ 9

4. Future State (2032) ................................................................................................................................. 10
   4.1. Vision of Future Technology ................................................................................................................. 10

4.2. Transdisciplinary Framework ........................................................................................................... 11

4.2.1. Ecosystem of Ecosystems .................................................................................................................. 13
   4.2.1.1. Single Ecosystem View - Develop/Align Ecosystem Stages ......................................................... 13
   4.2.1.2. Multiple Ecosystems View - Define Cross-Ecosystem Functions ........................................... 13
   4.2.1.3. Localized View – Local capabilities and constraints ................................................................. 14

4.2.2. Network of Networks .................................................................................................................... 15
   4.2.2.1. Technology and Networks View - Technological Convergence ................................................ 15
   4.2.2.2. Functional Requirements View - Use Case Categories and Deployment Assumptions ........... 15

4.2.2.3. Network Convergence, Key Network Components, and Deployment Drivers ............................ 25
   4.2.2.3.1. Enhanced Mobile Broadband (eMBB) .................................................................................. 25
   4.2.2.3.2. Ultra-Reliable Low Latency Communications for Critical Communications .................. 25
   4.2.2.3.3. Network Slicing ..................................................................................................................... 26

4.2.2.4. Key Network Components ......................................................................................................... 28

4.2.2.4.1. Network Convergence .......................................................................................................... 28

4.2.2.4.2. Network Deployment Drivers ............................................................................................... 28

4.2.2.4.3. Ultra-Reliable Low Latency Communications for Critical Communications .................. 28

4.2.3. Governance Function of Functions .................................................................................................. 29
   4.2.3.1. Strategic Functions ................................................................................................................... 31
   4.2.3.2. Tactical Functions .................................................................................................................. 32

4.2.3.3. Operations Functions .................................................................................................................. 32

4.3. Ecosystems and Contextualized Applications and Services ............................................................... 32

4.3.1. Agriculture ........................................................................................................................................... 32

4.3.2. Education .......................................................................................................................................... 36

4.3.3. Electrical Power ................................................................................................................................. 38

4.3.4. Health Care ....................................................................................................................................... 42

4.3.5. Media & Entertainment ..................................................................................................................... 43

4.3.5.1. 5G and Smart Cities as key disruptors for Media & Entertainment ............................................... 45

4.3.6. Public Safety .................................................................................................................................... 47

4.3.6.1. Border Security .......................................................................................................................... 48

4.3.7. Transportation .................................................................................................................................. 49

4.3.8. Water Distribution and Wastewater Treatment ................................................................................ 50

4.3.9. Other Ecosystems ............................................................................................................................. 50

4.4. Inter-Ecosystem Touchpoints ............................................................................................................. 51

4.4.1. Roadmap Dependencies .................................................................................................................. 51

4.5. Applications and Services Framework and Scenarios ........................................................................... 52
5. Needs, Challenges, and Enablers and Potential Solutions

5.1. Summary

5.2. Sustainable Interconnected Ecosystem of Ecosystems

5.3. Ecosystems

5.4. Health Care

5.5. Media and Entertainment

5.6. Public Safety

5.7. Transportation
Tables

Table 1. Selected 5G network operations enhancements 20
Table 2 PPFST WG Challenges and Recommendations 70
Table 3. Consolidated Applications and Services Roadmap Outlook and Supporting Ecosystems 72
Table 4. Smart City Needs, Challenges, and Enablers and Potential Solutions 74
Table 5 Agriculture Ecosystem Stages and Overall Needs 76
Table 6. Challenges Associated with Agriculture Ecosystem 76
Table 7. Potential Solutions for Agriculture Ecosystem 77
Table 8 Education Ecosystem Stages and Overall Needs 79
Table 9. Challenges Associated with Agriculture Ecosystem 80
Table 10. Potential Solutions for Agriculture Ecosystem 80
Table 11. Overall Needs for Electrical Power (Supply Chain Management Framework/Smart Grid) 83
Table 12. Challenges Associated with Electrical Power 83
Table 13. Potential Solutions 84
Table 14. Overall Needs for Health Care Ecosystem (Continuum of Care) 87
Table 15. Challenges Associated with Health Care Ecosystem 87
Table 16. Potential Solutions for the Health Care Ecosystem across the Continuum of Care 88
Table 17. Potential Solutions 90
Table 18. Overall Needs for Media and Entertainment (M&E) 92
Table 19. Overall Needs for Media and Entertainment 93
Table 20. Challenges Associated with Media and Entertainment 94
Table 21. Potential Solutions to Address Needs and Challenges 94
Table 22. 97
Table 23. Overall Needs for Public Safety 100
Table 24. Challenges 100
Table 25. Potential Solutions 103
Table 26. Overall Needs for Electrical Power (Supply Chain Management Framework/Smart Grid) 112
ABSTRACT

The Institute of Electrical and Electronic Engineers (IEEE) Future Networks International Network Generations Roadmap (INGR) Applications and Services Working Group developed a Transdisciplinary Framework that is sustainable, structured, flexible, adaptable, and scalable framework that extends across end-to-end ecosystems, and caters to different stages of priorities, resources, and technologies. The framework may be used by academic stakeholders for new research topics of interest, industry stakeholders to develop solutions for roadmap identified opportunities while minimizing negative risks, and government stakeholders for governance and policy development.

The 2022 edition provides additional details on the Applications and Services Transdisciplinary Framework from Smart Cities, developed in the 1st edition, and was extended towards Smart Communities that include both urban and non-urban areas in the 2021 edition. This edition of the IEEE INGR Application and Services roadmap chapter includes:

- **Applications and Services Framework**: a dynamic sustainable framework for applications and services that extends across end-to-end ecosystems, and caters to the priorities, resources, and technologies for local urban and non-urban areas.
  - **Ecosystem of Ecosystems**: intra-ecosystem and inter-ecosystem alignments for agriculture, education, electrical power, health care, media and entertainment, public safety, transportation, and water distribution and wastewater treatment ecosystems.
  - **Network of Networks**: Future networks components (access, service delivery, operations and service management, and network extensions), use case categories and network operations enhancements.
  - **Governance Function of Functions**: strategic and governance related functions to support local area objectives that include economic development, quality of life, stakeholder attraction and retention, and policy development.

- **Transdisciplinary Framework Scenarios and Use Cases**: smart cities, smart regions, and pandemic planning scenarios

The Applications and Services working group will extend the reach and depth of this framework to add new ecosystems and enhance the existing ecosystems already addressed for future INGR editions.

**Key words:**
Transdisciplinary Framework, The fifth generation (5G), beyond 5G (B5G), smart cities, smart areas, pandemic, coronavirus disease of 2019 (COVID-19), future networks, roadmap, strategy, ecosystems, framework, governance, enhanced mobile broadband (eMBB), critical communications, ultra-reliable low latency communications (URLLC), massive machine-type communication (mMTC), agriculture, education, media and entertainment, public safety, transportation, health care, telehealth, electrical power, water distribution, wastewater treatment
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