



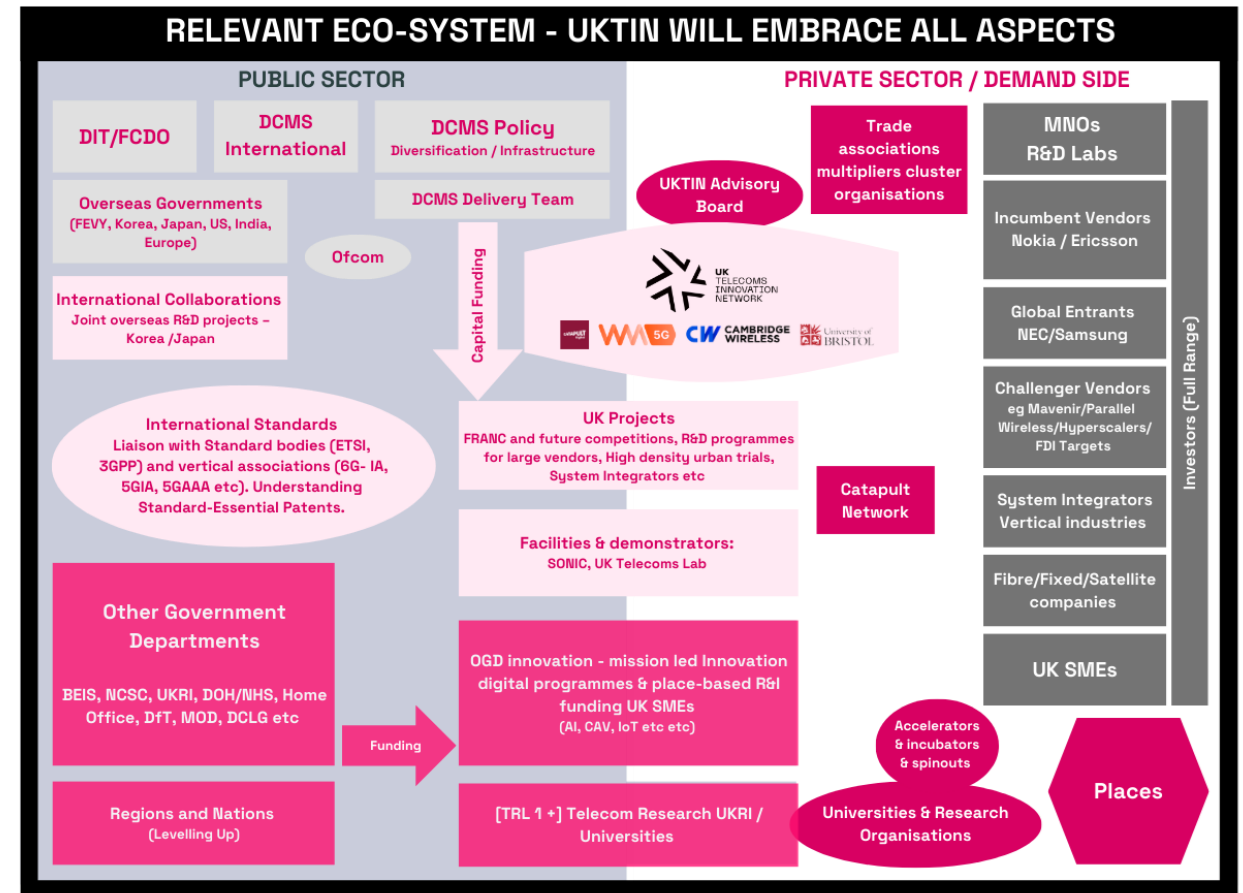
OVERVIEW
Summary of Findings
Spectrum Policy Forum July 2025
Paul Febvre, Cranfield University

1. CONTEXT



COMPLEX & FRAGMENTED ECOSYSTEM

- The global telco sector is potentially transforming from into a more open networking ecosystem
- An opportunity and challenge vital to the UK's Security and Economic interests
- A complex fragmented ecosystem that requires coordinated strategy led by experts



2. AIMS

- **VISION.** A thriving, resilient, and diversified UK telecoms ecosystem that attracts investment, and drives innovation and growth
- **MISSION.** Transform the UK telecoms innovation ecosystem, by forging connections and aligning the sector, enabling the UK to capitalise on its strengths as new opportunities emerge in telecoms.
- **PROPOSITION.** UKTIN is an inclusive and collaborative forum for the UK telecoms innovation ecosystem, bringing together industry, government, and academia to catalyse R&D investment, cooperation, and commercialisation

The Expert Working Groups (EWGs), Strategic Working Groups (SWGs) and Advisory Board (AB)

Strengths

Gaps

Overlaps

Roadmap

CROSS-GOVERNMENTAL GROUP

DISSEMINATION TO INDUSTRY



ADVISORY BOARD

Strategic Working Groups

R&D FUTURE CAPABILITY STRATEGIC LEADERSHIP

ACADEMIC COORDINATION

INDUSTRY COORDINATION

Expert Working Groups

WIRELESS NETWORKING TECHNOLOGIES

CORE NETWORKING TECHNOLOGIES

SECURITY

NETWORK MANAGEMENT

ARTIFICIAL INTELLIGENCE

OPTICAL COMMUNICATIONS & PHOTONICS

SEMICONDUCTOR MATERIALS & DEVICES

NON-TERRESTRIAL NETWORKS

STANDARDS

3. KEY OUTPUTS

- **TECHNOLOGY ROADMAP.**
 - Insights into the future of telecoms innovation in the UK
 - Potential for investment in UK industry
- **PRIORITIES.**
 - Sovereignty & Security of supply chain
 - Focus on resilience of critical infrastructure
 - Align with National Missions: Establish a National Institute
 - Synthesise & Harmonise priorities across DSIT, UKRI & MOD
- **RECOMMENDATIONS.**
 - Build Capacity by supporting innovation through a portfolio of interventions. Apply a portfolio approach.
 - Commit long term funding across government cycles.
 - Incentivise Cross-Sector Collaboration
 - Prioritise skills development and adoption
 - Strengthen Regional cluster implementation

1) Insights from the AI Experts Working Group

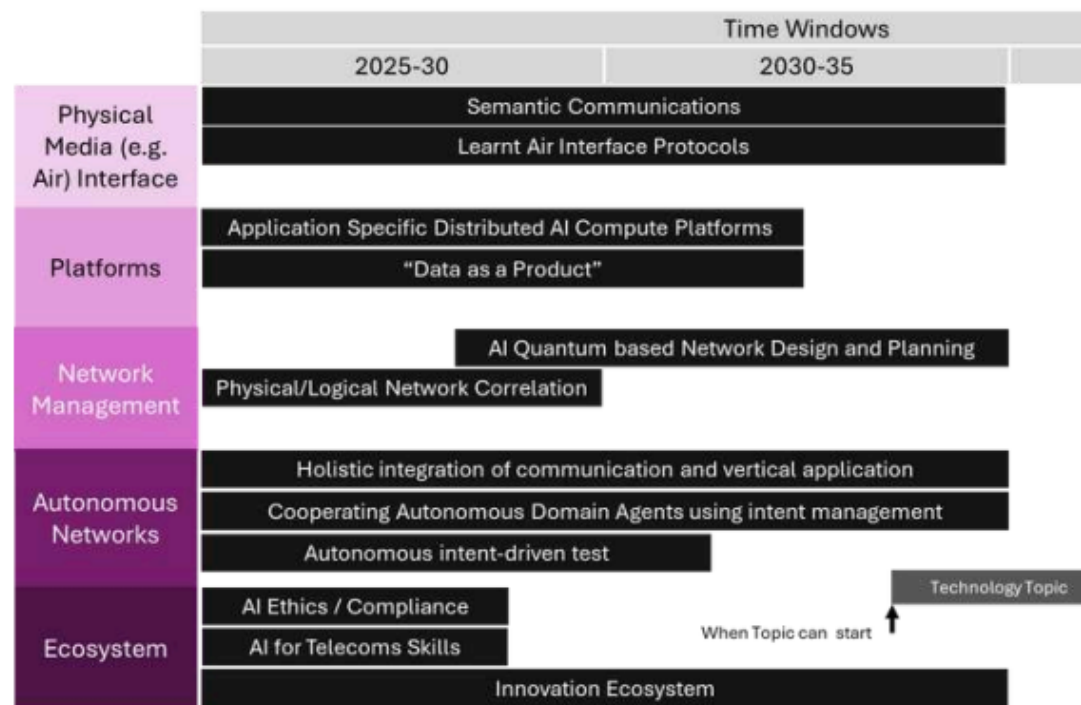


Figure 4: AI-EWG Roadmap for AI in Telecoms

| Technology Topic | Ranking | |
|---|----------|----------|
| | Average | Median |
| Cooperating Autonomous Domain Agents using intent management | 1 | 1 |
| Holistic integration of communication and vertical application | 2 | 4 |
| Efficient Application-Specific Distributed AI Compute Platform | 3 | 3 |
| Autonomous intent-driven test | 4 | 2 |
| Semantic Communications | 5 | 3 |
| Learnt Air Interface Protocols | 5 | 5 |
| Physical & Logical Network Correlation | 5 | 5 |
| Data as a Product | 6 | 6 |
| AI (Quantum) based Network Design and Planning | 7 | 7 |

Table : 1 Ranking of the technology topics based on AI-EWG expert opinion (BOLD = selected for consideration)

Key Requirements:

- Telecoms-specific AI Ethics & Regulatory Compliance resources and specialist support
- Assessment and planning of long-term telco-specific AI skills requirements for the UK
- Access to funding for telecom-specific AI innovation by entrepreneurs and startups

2) Insights from the Wireless Experts Working Group

Network of networks



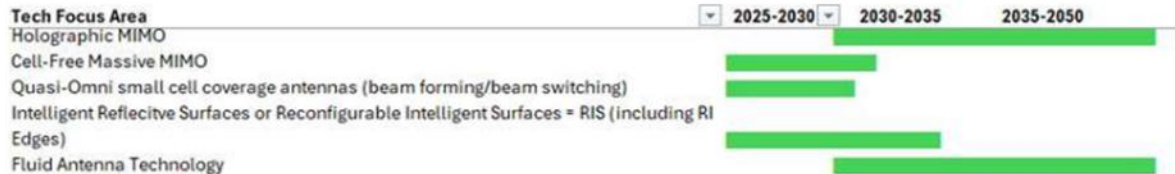
Future wireless access architectures



AI for wireless networks



Intelligent radiating systems



Radiofrequency (RF) devices and circuits



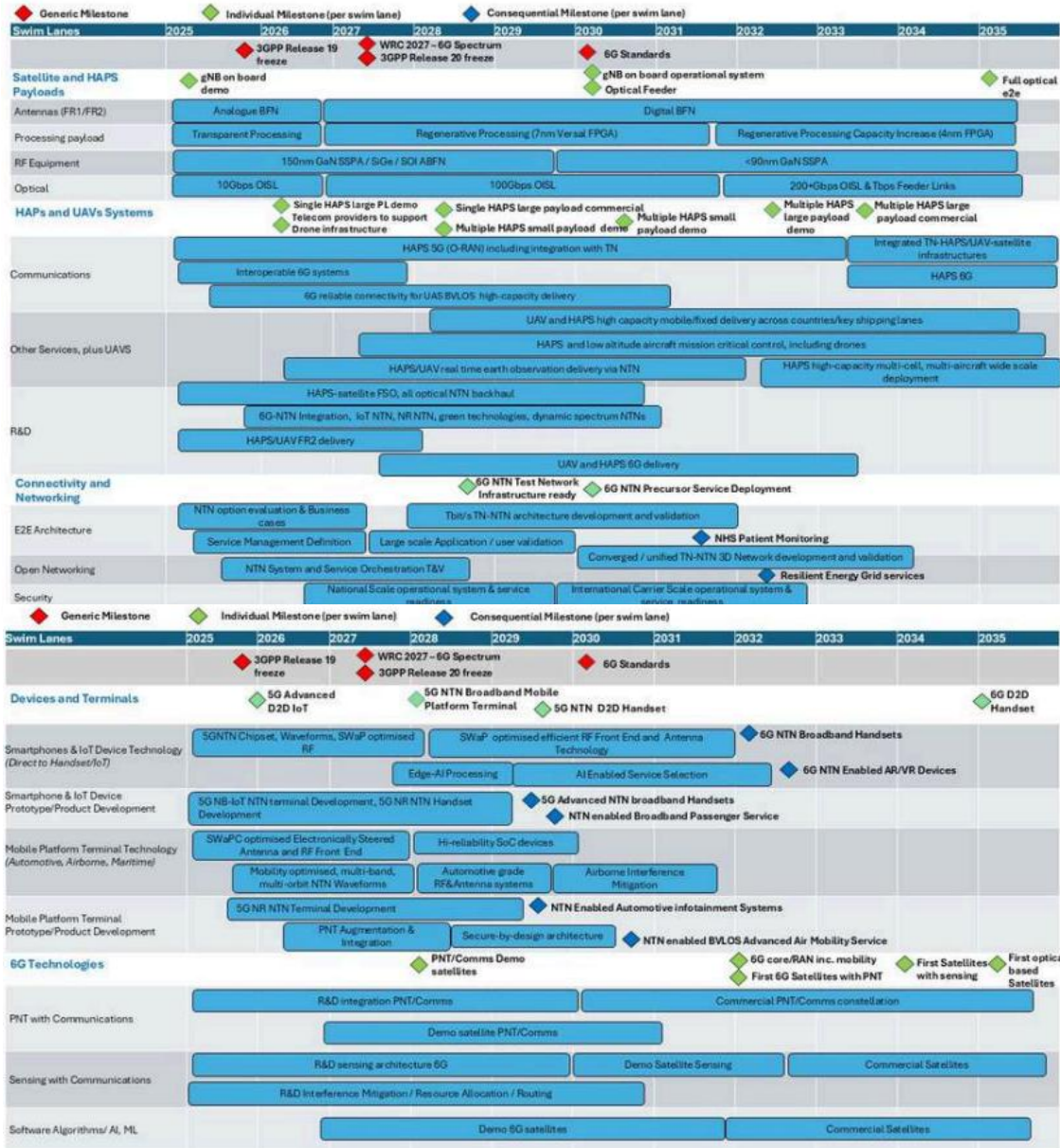
Highlighted Challenges:

- WiFi/ Fixed/ Mobile convergence
- Network Management, neutral hosting
- Wireless Planning (and Monitoring)
- TN+NTN integration
- Spectrum sharing
- UE Antenna systems
- Co-existence

Thematic Cross-cutting Requirements:

- Wireless security
- Resilience
- Sustainability

3) Insights from Non-Terrestrial Network Experts Working Group



High Level considerations

- HAPS and Satellites both have relevance
- Direct-Device generate opportunities for scale
- Services include from Comms, PNT & sensing
- AI integration and automation prevalent

Key Challenges:

- Disruption in business models
- Interoperability between TN & NTN systems
- Interference Mitigation Techniques
- Spectrum sharing policies

4) Insights from the Security Experts Working Group

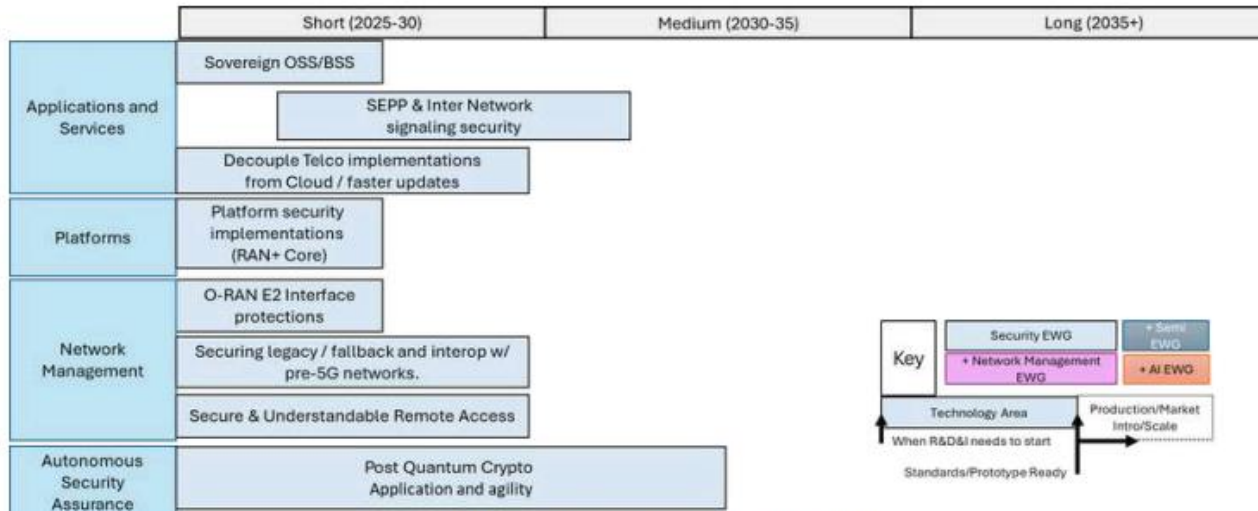


Figure 1: Security EWG Technology Roadmap

Top 5 Security related R&D topics:

- SEPP & Inter Network/ signalling security
- Platform security implementations
- RAN & Core Secure & Understandable remote access
- Securing legacy/ fallback and interop with pre-5G networks
- Decouple Telco implementations from Cloud / faster updates

Other considerations:

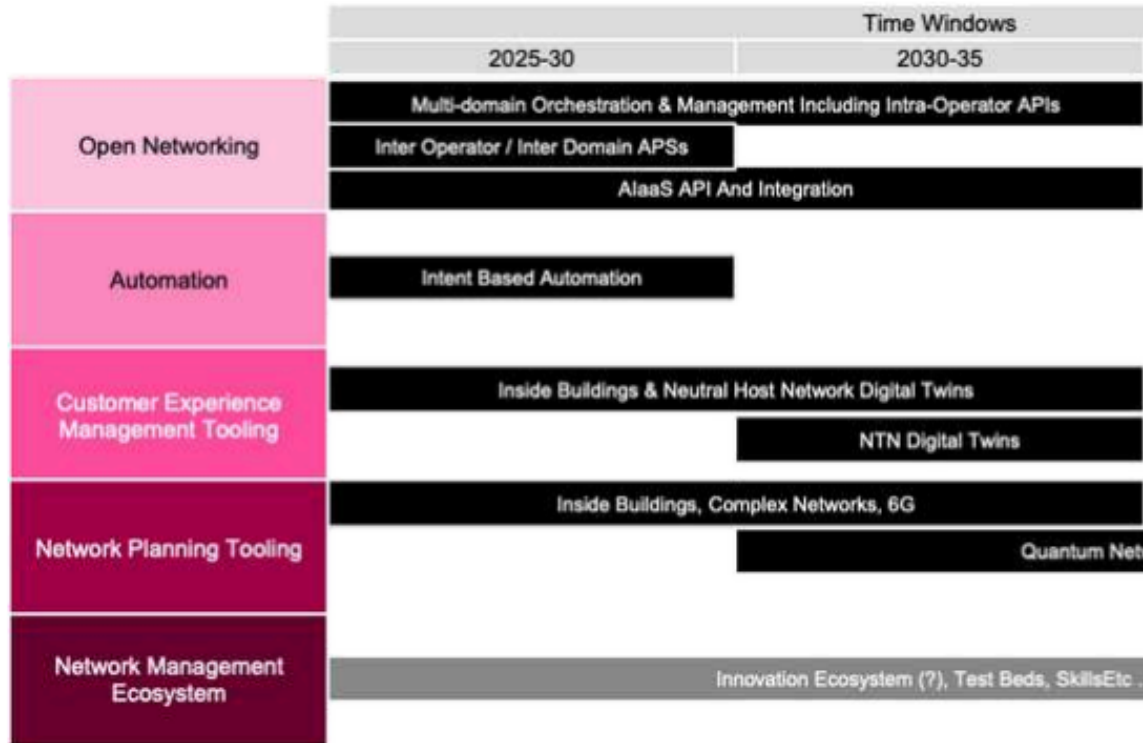
- Quantum-safe cryptography

| Technology Roadmap Focus Areas | Topic | EWG Synergy | | | | |
|--------------------------------|--|-------------|------|----|-------|----|
| | | WN | Semi | NM | Stand | AI |
| Applications and Services | Sovereign OSS / BSS | | (✓) | ✓ | ✓ | ✓ |
| | SEPP & Inter Network / signalling security | ✓ | | ✓ | ✓ | ✓ |
| | Decouple Telco implementations from Cloud / faster updates | ✓ | | ✓ | ✓ | ✓ |
| Platforms | Platform security implementations (RAN + Core) | | ✓ | ✓ | | ✓ |
| Network Management | O-RAN E2 Interface protections | | | ✓ | | ✓ |
| | Securing legacy / fallback and interop w/ pre-5G networks | | | ✓ | | |
| | Secure & Understandable Remote Access | | | ✓ | ✓ | ✓ |
| Autonomous Security Assurance | Post Quantum Crypto Application & Agility | | ✓ | ✓ | ✓ | ✓ |

Table 1 Topic TRL score and synergies with other EWGs

Security underpins all aspects of the systems

5) Insights from the Network Management Experts Working Group



Highlighted Challenges and Opportunities :

- Open Networking
- Automation (Zero-touch NM)
- Customer Experience
- Network Planning Tooling
- Network Management Ecosystems

Thematic Cross-cutting Challenges:

- Explainable/ Trustworthy AI for mission critical systems
- Seamless integration of AI into systems & workflows
- Transition from network management
→ service management paradigms

Figure 5: NM-EWG Roadmap for Network Management Technologies in Telecoms

6) Insights from the Core Network Tech Experts Working Group



Figure 6: Core-EWG Roadmap for Core Networking Technologies i

Highlighted Challenges and Opportunities :

- Quantum Networking & QKD
- 6G Core Technologies, Integrated AI/Edge, NTN
- Network Protocols for Security & Resilience
- Softwarisation and Programmability
- Future Telecoms Architecture

Thematic Cross-cutting Challenges:

- Software defined networks and systems
- Complexity derived cyber-vulnerabilities

7) Insights from the Optical Comms Experts Working Group

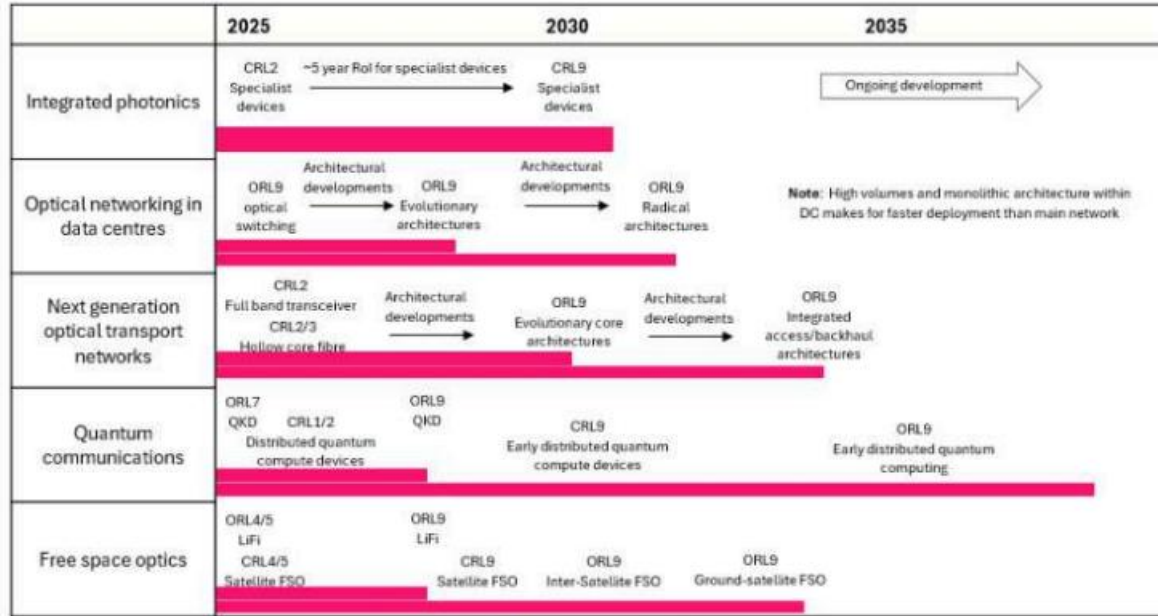


Figure 7: Development Timelines

Highlighted Challenges and Opportunities :

- Integrated Photonics
- Optical Networking in Data Centres
- Next Gen Optical Transport Networks
- Quantum Communications
- Free-Space Optics

Cross-cutting considerations

- Supply chain resilience (eg Semiconductor & fibre)
- Security architectures

Spectrum and regulatory considerations

- Free-space optics vs mmWave or sub-THz systems

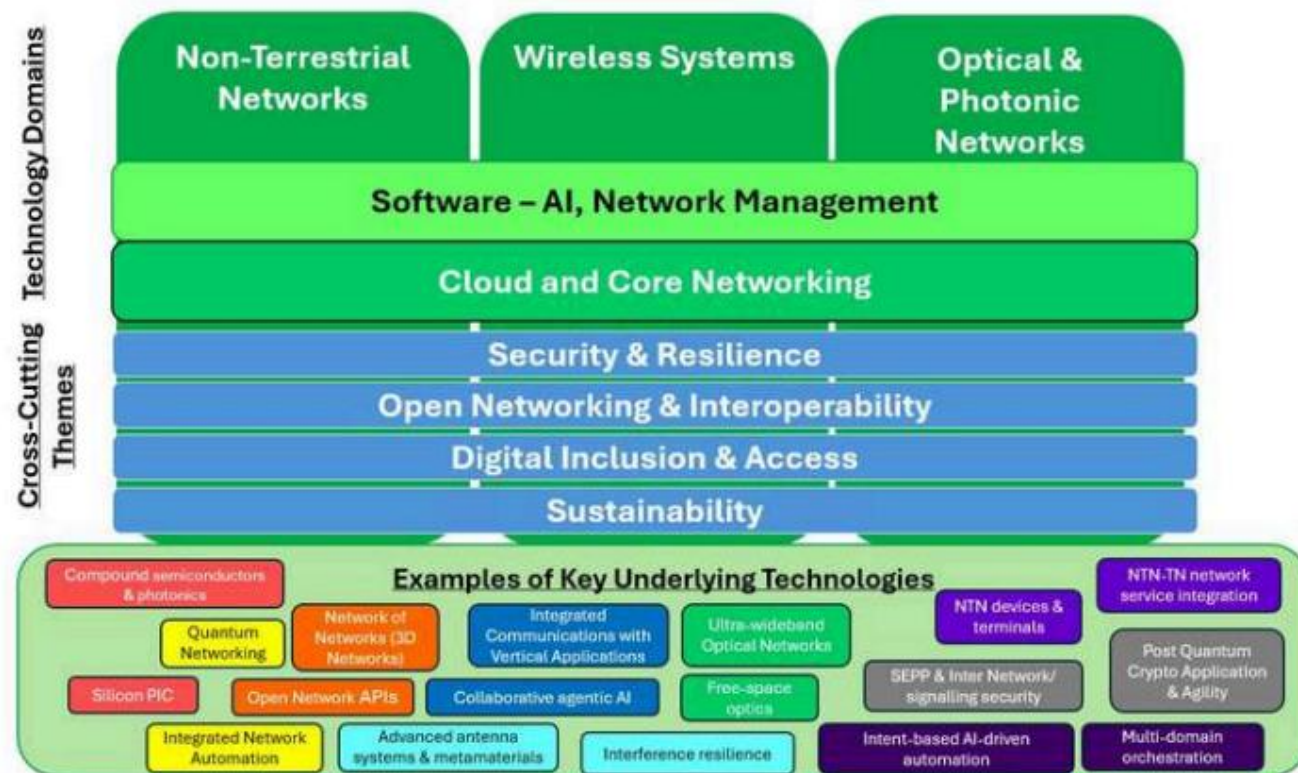
8) Insights from the Semiconductors Experts Working Group

| | | | | | | | | |
|---------------------|---|--|--|------|--|--|--|------|
| CS emitters | GaAs VCSELs..... Increasing size of wafer manufacturing platforms; new applications in sensing, LiFi and base station frequency tech | | | | | | | |
| | InP high transmission bandwidth comms Datacom lasers / detectors. Optical amplifiers and distributed feedback lasers for SI photonics..... Quantum dot active regions | | | | | | | |
| CS detectors | Thick-junction Si SPADs, Si/Ge SPADs..... nGaAs SPADs | | | | | | | |
| | InGaAs/InP APDs..... III-v Sb based SPADs, Si SPAD-CMOS integration, SiN PICs..... High b/w APCs for increasing transmission capacity optical Tx/Rx & datacom interconnects Room-temperature SPADs for free-space and fibre QKD Quantum internet applications | | | | | | | |
| CS RF devices | GaAs EML laser drivers for high-speed PAM4 transmission and data centre applications Low-noise amplifiers, mixers for 6G; monolithic radar, satcom and defence..... FinFET structures?..... | | | | | | | |
| | GaN Devices for mm-wave 5G/6G mobile RAN, backhaul, MIMO/massive MIMO, beamforming, satcom, IoT and other applications..... InP Ultra-low-noise amplifiers for mm-wave and sub-mm-wave (6G), high-speed digital, imaging, space comms, optoelectronics, G-band and THz.... Integration with CMOS Beamforming, power combining, match and efficiency, Front-end modules, antenna-in-package, system-in-package..... | | | | | | | |
| Si photonics / PICs | Silicon photonic transceivers Increasing performance and evolution of manufacturing techniques throughout time period..... Heterogeneous integration for: CS light sources, amplifiers, PIDs Evolution of die-to-wafer flip chip bonding (active to passive / automated alignment) | | | | | | | |
| | TFLN Multitransfer printing of multiple die in parallel Direct epitaxy of CS on Si..... BTO Polymers, co-packaged optics Graphene / 2D materials Phase change materials Advanced packaging: Fibre-to-PIC attach active -> passive alignment Low-loss glass interposers Low-loss PCB embedded waveguides Multicore fibre-to-PIC optical I/O | | | | | | | |
| NOW | | | | 2028 | | | | 2033 |

General Recommendations

- 1) Recognition
- 2) Coordination
- 3) Scale-Up
- 4) Resilience & Security
- 5) International Partnerships
- 6) Infrastructure Investments

9) Insights from the Standards Experts Working Group → Future Capabilities Leadership Forum



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Spectrum Policy Forum Considerations

- Q&A / Discussion on Implications and Next Steps

Thank you

