News Flash: DESIRE6G First 18 Months: Key Innovations and Standardization Efforts

DESIRE6G Key Innovations

The DESIRE6G project has made significant strides in its first reporting period (Jan 2023 - June 2024), working on innovations aimed at revolutionizing 6G networks. Here's a snapshot of the major advances:

1. The **Infrastructure Management Layer (IML)** in the DESIRE6G project is a key component designed to support the deployment of mobile network functions across heterogeneous hardware and software targets within the 6G network infrastructure. It is an integral part of the project's aim to unify programmable data planes and hardware accelerators. IML hides the implementation details of the underlying packet processing hardware and software components from the control and management layers. It autonomously selects the software and/or hardware target(s) running the data plane function. It enables the multitenant usage of data plane hardware resources through compiler-based aggregation and the seamless run-time optimization of the data plane resources. This innovation allows tenants to customize data planes, ensuring ultra-low latency and high throughput for demanding 6G use cases.

2. The DESIRE6G telemetry system introduces a real-time, fine-grained monitoring framework that leverages **In-Band Network Telemetry (INT)** to collect detailed network performance data from the data plane. This system enables ultra-fast detection of network anomalies, such as congestion or failures. The system's **pervasive monitoring** stretches up to the user equipment, ensuring end-to-end network visibility.

3. DESIRE6G has designed an "AI-native architecture" that natively integrates artificial intelligence into network operations, enabling adaptive decision-making for energy efficiency and performance gains. This system leverages **Multi-Agent Systems (MAS) for autonomous service and resource management,** features decision making and optimizations for closed-loop automations over different timescales, with AI/ML - executed across different types of hardware - distributed edge intelligence and real-time telemetry. Early PoCs demonstrated dynamic network optimization with AI-driven decision-making, meeting stringent 6G KPIs.

4. DESIRE6G enables a **cloud-native approach for the deployment of mobile network services and applications** across heterogeneous resources over the Edge-Cloud continuum; it extends serverless frameworks to support workloads in various execution enclaves such as unikernels, microVMs and sanboxed containers; and supports pure cloud-native deployment and multi-tenancy at the data plane though the Infrastructure Management Layer.

5. A **Distributed Ledger Technology- Security as a Service (DLT-SECaaS) framework** is introduced, enabling secure, cross-domain software execution through executable rewriting and lightweight permissioned DLT. This allows for **infrastructure-independent security, ensuring remote attestation and permanent integrity verification** across edge and cloud platforms with reduced runtime overhead.

6. The DESIRE6G platform supports the dynamic, on-demand orchestration of network services, leveraging **blockchain-based DLT for secure cross-domain federation of services** in under 30 seconds.

7. A **blueprint of the DESIRE6G architecture**, which integrates the above innovations to support ultra-reliable low-latency communications (URLLC). This architecture enables seamless deployment and secure management of network services, ensuring flexibility, scalability, and enhanced performance for diverse 6G use cases, in a cost-efficient manner.

More information regarding the respective innovations is available in DESIRE6G's technical deliverables (https://desire6g.eu/deliverables/)

Standardization Efforts

Standardization is one of the main channels of impact of research and innovation projects as DESIRE6G. It allows transferring to the industry the technical novelties developed during the project execution as consequence of the gaps identified in the evolution of existing state of the art. Confronting ideas and concepts investigated in the project with a broader ecosystem enriches the industrial community in both directions: from DESIRE6G towards the standardization fora and vice versa. Moreover, it is a vehicle for strengthening the overall European position in relevant technological areas as 6G. In the case of DESIRE6G, the project has produced contributions so far touching specific aspects of relevance for future 6G systems.

The conceptualization of the DESIRE6G architecture together with the goal of satisfying reliable and low latency services has set the scenes for the proposition of novel approaches subject to potential adoption in standardization. Topics like the architectural integration of service, compute and connectivity strata, or the implications of deterministic networking scenarios, among others, have been contributed, discussed, and in many cases adopted as valuable inputs agreed by industry.

During its first execution period, bodies like IETF, 3GPP and O-RAN have been identified as the proper venues for the kind of contributions proposed. As the project progresses, further areas of interest can emerge so that the project can influence from its multiple facets. As a summary of the contributions done so far, the following table presents the specific working group within each standardization body as long as the synopsis of each of them.

SDO	Type of Document (Contribution / Dissemination)
IETF (DetNet WG)	Contribution (adopted)
IETF (DetNet WG)	Contribution on multidomain support
O-RAN (WG9)	Contribution on DetNet overview as discussion input for the Xhaul packet switching specification
3GPP (SA5)	Contribution to improve EP_Transport model of TS 28.541 in Release 18 to clarify connection point for network slicing when interworking with transport networks
IETF (DetNet WG)	An Evolution of Cooperating Layered Architecture for SDN (CLAS) for Compute and Data Awareness
IETF (DetNet WG)	Contribution on relevant use cases (adopted)
3GPP SA2	FS_eEDGE_5GC_Ph3 / Rel-19
O-RAN (WG1 – WG9)	WG9-2024.001 Work Item Proposal – Inclusion of Transport in SMO (accepted and created)