CELTIC-NEXT PROPOSERS DAY
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Pitch of the Project Proposal

Networking resilience transformation

CRL
Communications Research Ltd

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Teaser

- Climate change is increasing the frequency and severity of disruptions to communications infrastructure. Recent experience has demonstrated the fragility of the network edge. The UK Government recognised that Critical National Infrastructure vulnerabilities are a major national security risk in the 2021 Integrated Review,

- Additional intrinsic challenges include: the removal of line-power feeding for emergency service provision due to the optical network transformation, the need to adapt networks to 3-D (fixed-mobile-satellite) operation as on-demand and broadcast 'linear' TV services evolve in an uncertain regulatory environment, and lack of standardisation for satellite broadband interfaces,

- The main project benefits will be influence and acceleration of a standards architecture for 3-D networking, improved connectivity resilience with integration of 3D NTN , and technologies for ultra low power operation,

- The added value is increased service resilience exploiting diversity across terrestrial and non-terrestrial communications paths, heterogeneous energy storage in the residence and neighbourhood domains, the creation of a resilience plane based on new ultra low power communications access modes and integration of domestic energy storage in network resliance

Imperatives

CELTIC-NEXT

House of Commons - House of Lords
Joint Committee on the National Security

Report:
"Readiness for storms ahead?   Critical national infrastructure in an age of climate change"

*[Beyond direct effects]"cascading" risks—spreading from one CNI sector to
another, magnifying the impact of an event—were demonstrated vividly by the effects of
Storm Arwen in late 2021, which led to extended power and communication outages"*

*"Storm Arwen in November 2021 exposed a key interdependency between energy and
communications providers." ….. "Almost a million customers lost power, with nearly 4,000 suffering outages
for over a week;" BT's ongoing transition to digital phone
lines, which are reliant on electricity, meant that some customers were left without access to communication,
even for calls to the emergency services"*

*"Phone companies intend to withdraw the existing analogue telephone system—the Public Switched Telephone
Network (PSTN)—by 2025. By that date, landline telephone services should be provided by a digital network,
and calls should be transmitted as data over the internet using "Voice over Internet Protocol (VoIP)"
technology."*

Σ!
EUREKA

Background

- *This proposal is a revision to a proposal raised for 2022 autumn call , The text of that original proposal is attached, but work is needed to set the old proposal in the broader context of joint optimisation of power and communications distribution in emergencies.*

- *A key feature of the revised proposal is that energy resilience and communications resilience measures should be part of an integrated system to minimise the impacts of severe infrastructure disruptions on safety of life while sustaining economic activity*

- *As background, we see an ever increasing number of instances of energy storage in the home. Obiously in electric vehicles, but also in domestic equipment from vaccumn cleaners to tooth brushes, not to mention phones and computers, as well as batteries which enable the import of low cost electricity to exploit renewable sources when the grid is over supplied.*

- *Further resouces of note are the multiple conducting infrastructures in the home, which already include high voltage power and low voltage lighting circuits, telephone and data connectivity, and which in time will encompasse regulated DC powering for improved efficiency. A key challenge is how to evolve architecture and interface stadards to support innovation in future.*

Organisation Profile

Communications Research Ltd is a start-up specialising in modelling and simulations of cross domain resource management (wired / wireless), access standards and architectures over the 3 domains, remote powering,
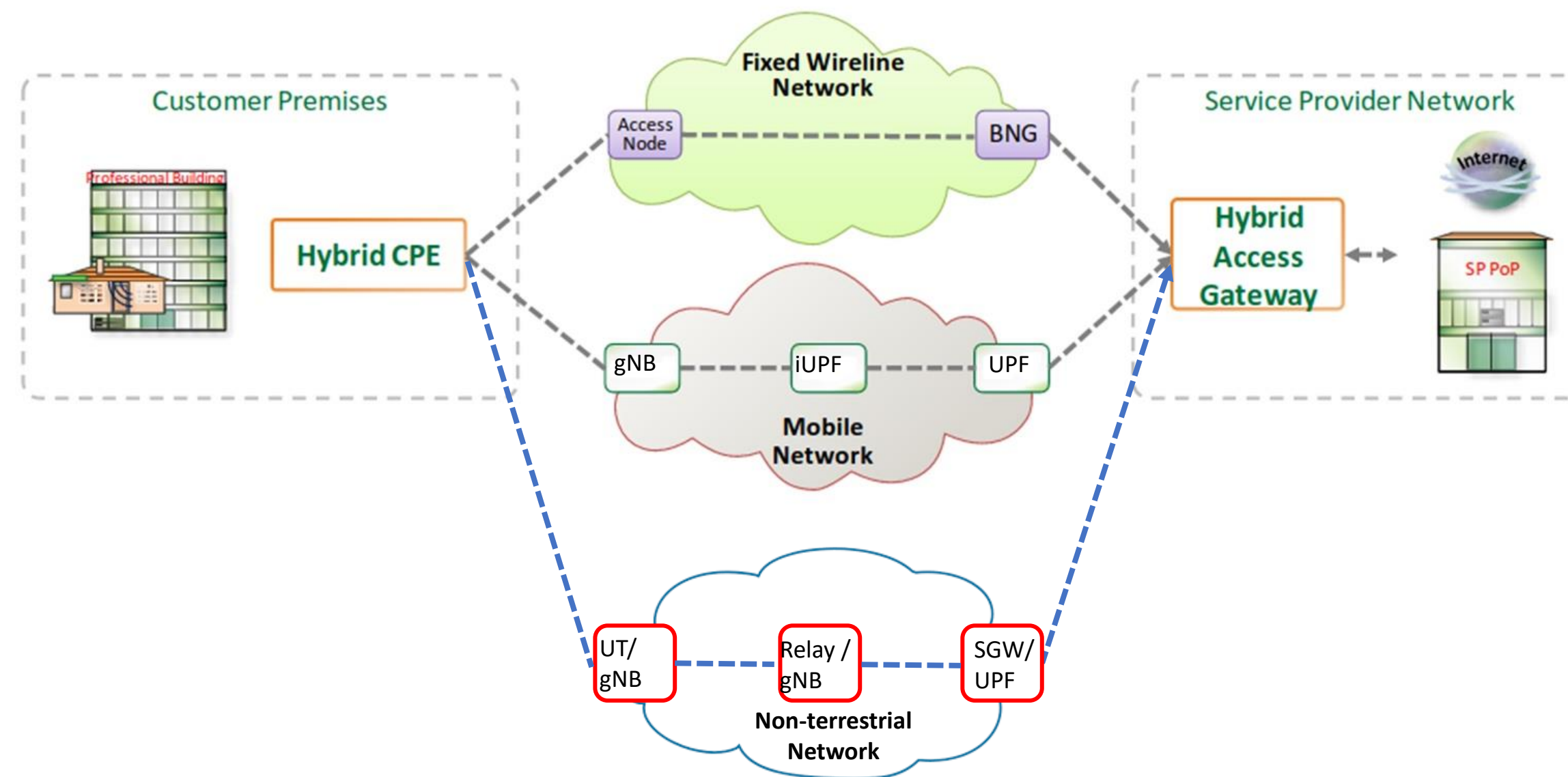
Proposal Introduction (1 of 2)

3-D Access and Networking
fixed – mobile - satellite

- The focus of this proposal is extension of the unfinished work to develop 2-D Hybrid Access and Networking, to add interoperability with future satellite access modes to create 3-D networks adding satellite channels to the mix.
- As well as conventional internet connectivity the service mix is complicated by adding a mix of high bandwidth interactive, on-demand streaming, and linear broadcast service elements.
- The issues go far beyond adapting satellite practices for compatibility with 5G, but needs co-adaptation of terrestrial networks as well.
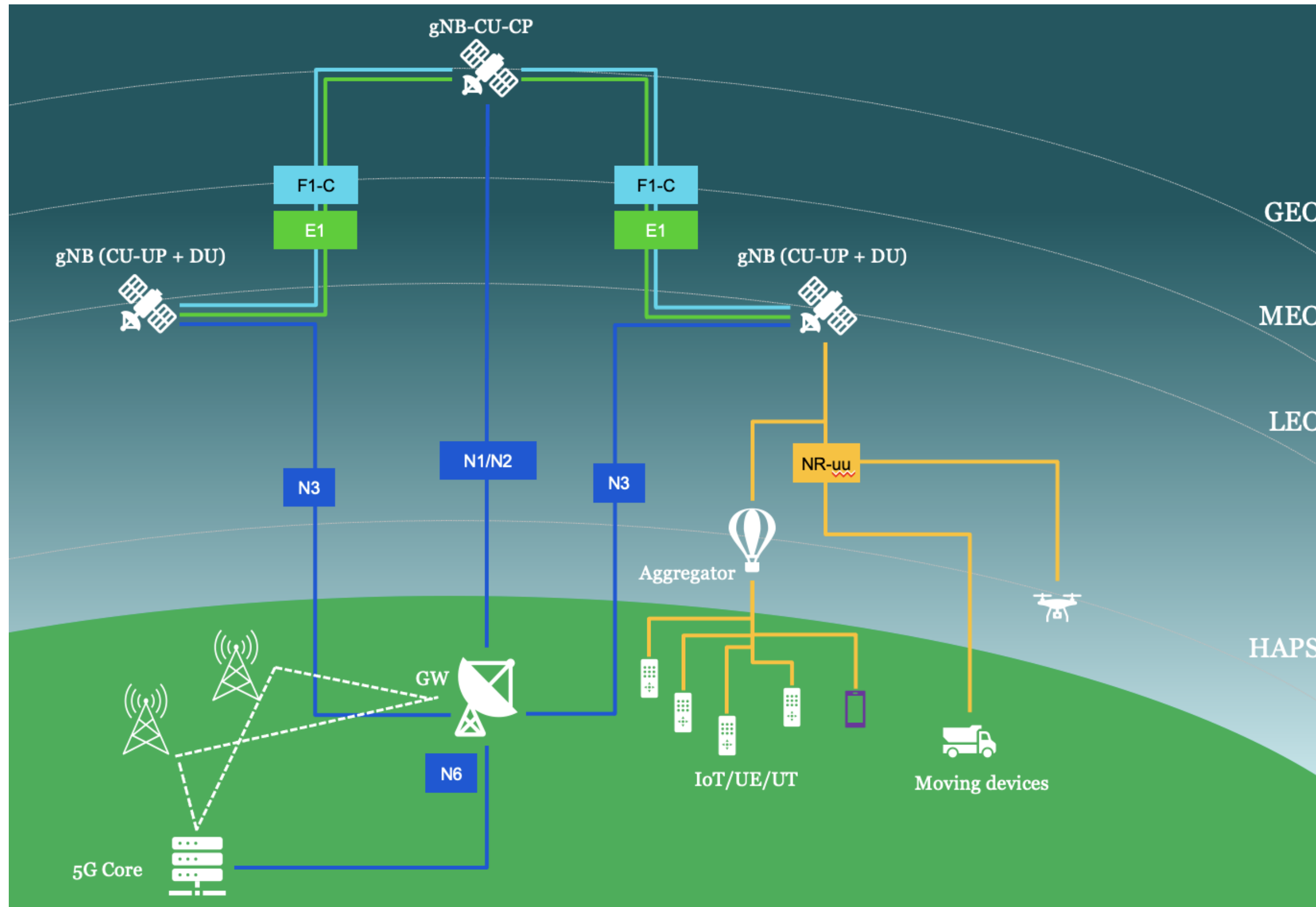
The Resilience Plane

- Resilience to severe infrastructure disruption requires emergency specific functionality, in particular ultra low power access solutions, to provide life critical connectivity with affordable batteries, while requiring minimal adaptation of existing technologies.

Proposal Introduction (2 of 2)

Example of 3D NTN providing 5G connectivity to areas where infrastructure is disabled

Proposal Introduction

Expected outcome is improved resilience and scalable, viable multi-service slice management across multiple hybrid network path segments and ultra low-power solutions for a Resilience Plane

Month 1 – 11: Use-case analysis and architecture design with learning and engagement with BBF and ITU to promote standardisation

Month 8 – 24: Modelling of traffic and resource management algorithms and ULP access technologies

Month 25 – 36: Verification through test-beds

Partners

We are interested to participate in consortia, and would like to work with content providers including broadcasters and on-demand sides of the business, systems integrators, in-home terminal vendors, chip designers, and academics.

Contact Info

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