HellasQCI

Deploying advanced national QCI systems and networks in Greece

Request for information (RFI)

Invitation for a trial Proof of Concept (PoC) for research purposes on Quantum Encrypted Optical Network

Lead beneficiary(s): GRNET, NKUA
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Dissemination Level: Public

Abstract:
Invitation for a trial Proof of Concept (PoC) for research purposes of Quantum Encrypted Optical Network. The aim is to identify suitable technical solutions for the implementation of the HellasQCI networks. Vendors or vendors consortium are kindly requested to forward their input by email to hellasqci-technicalboard@lists.grnet.gr until Friday, July 7th 2023.

Co-funded by the European Union

The HellasQCI Project has received funding under the Grant Agreement No. 101091504

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1. List of Acronyms

QCI	Quantum Communication Infrastructure
EuroQCI	European Initiative for safe Quantum Communication Infrastructures
DV- QKD	Discrete Variable Quantum Key Distribution
QKD	Quantum Key Distribution
ETSI	European Telecommunications Standards Institute
KMS	Key Management system
OTN	Optical Transport Network
SKR	Secret key rate
GS	Group Specification
RFI	Request for information
BB84	Quantum key distribution protocol developed by Charles Bennett and Gilles Brassard in 1984

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2. Introduction

HellasQCI project aims to deploy advanced National QCI systems and networks in Greece. Its architecture comprises of three metropolitan test-sites located at major cities of Greece namely: HellasQCI-Central (Athens), HellasQCI-North (Thessaloniki) and HellasQCI-South (Heraklion-Crete).

Each test-site is divided into Governmental and Industrial testbeds, which allow the project to investigate the field-deployment of QKD technologies in a plethora of realistic scenarios and use cases addressing National Security, Public Health, Critical Infrastructure and ICT sector. An additional Educational testbed will allow the development of new quantum technologies, provide a sandpit for SME innovation, and offer Greece a futureproof extension towards Quantum Internet.

The objective of the HellasQCI project, which is part of the EuroQCI European network, is to contribute to the safe-keeping of critical data and infrastructures, in domains such as e-government, healthcare, and many more critical areas. This will be achieved by incorporating systems and technologies based on principles of quantum technology, more specifically by the distribution of quantum keys (QKD) to existing communication infrastructures, which will offer an exceptionally secure form of encryption, offering an extra layer of security.

The National Infrastructures for Research and Technology (GRNET SA), operating under the auspices of the Ministry of Digital Governance, is the coordinator for the HellasQCI project, and in collaboration with 13 partners, launches this Request for information (RFI) to identify suitable technical solutions for the implementation of the HellasQCI networks and use cases.

At this phase, any cost occurred for the PoC implementation should be undertaken by the vendors or the vendors consortium.

Based on the results of the PoC that is foreseen to be executed from September 2023 to December 2023, the final specifications of the systems may be included in a forthcoming procurement by HellasQCI.

The present Invitation for PoC is meant for information and planning purposes only and it is not a call to tender. Any information and/or data received in response to this invitation, designated as “Confidential”, shall be treated as such. Your input to the present, shall not be returned, shall not constitute an offer, shall not be binding nor may it lead to a binding contract.

Vendors or leading beneficiaries of vendors consortiums are kindly requested to forward your input by email to hellasqci-technicalboard@lists.grnet.gr until Friday, July 7th, 2023.

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3. Technical specifications

In order to verify the field operation of a Quantum encrypted optical network, we foresee the following PoC demo with at least three network nodes between GRNET and the National Kapodistrian University of Athens (NKUA), where each node implements:

1. an optical data layer with capacity for encrypted OTN and ethernet connectivity;
2. a QKD layer for generating a distributing quantum keys;
3. a KMS layer for handling the QKD keys and interfacing with the encryptors;
4. an encryption layer to consume the QKD keys.

In particular, the three nodes are connected in a physical ring fashion and should employ two DV-QKD pairs with the middle node performing a key-relayed function. The distance between the nodes is less than 50kms in each case. The specifications for the DV-QKD are in Table 1.

The nodes should support OTN connectivity with up 400Gbps and/or 4x100Gbps ethernet connectivity. Moreover, the nodes should employ an encryption system (e.g. L1 and/or L2) to consume the QKD keys at a variable rate. Encryption schemes should include AES 256.

The Key Management system should be able to interface the encryptors with the QKD layer (i.e. using ETSI QKD 14 standard) and should efficiently handle the QKD keys (i.e. performing the relay function and the key exchange, managing the pool of keys at every node, and also stress the demo in switching to non-QKD encryption in the case one or more QKD systems fail (e.g. induce too much attenuation in one line).

Description	Requirements
Duration and dates of the PoC	September 2023 – December 2023
Number of nodes	3
Optical data layer	Encrypted OTN and ethernet connectivity 400Gbps OTN and/or 4x100Gbps ethernet per node
Encryption	OTNsec, MACsec, AES 256
DV-QKD Protocol	Decoy state BB84
Range between nodes	<50kms
Secret key rate (SKR)	>1kb/s
Key Management system (KMS)	ETSI QKD 014 GS KMS software QKD Management and Monitoring software
Quantum Channel Wavelength	C-band

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