Funded by
the European Union

DISSEMINATION AND EXPLOITATION PLAN

NETWORK QUANTUM-SAFE INTERNET (QSI)

Deliverable D6.3 / WP6

Index

This Project has received funding from the European Union's Horizon Europe research and innovation programme under the Project "Quantum Safe Internet" (QSI, grant agreement No101072637).

1. Objective

The main objective of this dissemination and exploitation plan is to specify the general strategy, as well as the actions and/or activities that will be undertaken within the QSI project to share the research results with potential users, and use them in public policy making and for commercial purposes, with the goal of maximising their impact and visibility, and promote awareness of quantum-safe technologies in general, and quantum and post-quantum cryptography in particular.

If necessary, this document will be reviewed and updated during the realization of the project, to reflect any potential change of the actions and/or activities planned.

To ensure an effective delivery of our dissemination and exploitation objectives, the project counts with two specific work packages dedicated to these issues: WP6 on Dissemination & Impact, led by Prof. Eleni Diamanti from Sorbonne Univ., which concerns about the organization of events, the participation in conferences, publishing in high-impact journals and conference proceedings, as well as securing other exploitation routes; and WP7 on Outreach activities, led by Profs. Nicola Dragoni and Christian Majenz, which concerns about the dissemination of scientific results to different target audiences including a non-specialist audience.

2. Dissemination Plan

We expect that the successful completion of the project objectives will lead to several high-profile results that will be duly published in high-impact peer reviewed international journals, like e.g. the family of Nature, Science & Physical Review, or high-ranked peer reviewed international conference proceedings like CRYPTO, EUROCRYPT, ASIACRYPT, or the IACR conferences. In addition, we plan to present the obtained results at prestigious international meetings like e.g. QCRYPT, PQCrypto, QIP, PKC or QCMC, *inter alia*. All our partners have previously published in such high-impact journals and proceedings of the conferences stated above.

Access: Importantly, QSI commits to providing open access to all its research results, data and tools as early as possible and no later than the publication date of the corresponding research articles, to ensure that third parties can verify, validate, and reproduce them with minimum effort of duplication, unless there is a well justified reason not to do so, e.g. IP or privacy concerns. In short, we will follow the principle of “as open as possible, but as closed as necessary”. Indeed, the publication of results in highly rated open access journals, like e.g. Science Advances, npj Quantum Information, Quantum, New Journal of Physics, or in the Open Research Europe (ORE) publishing platform will be pursued to ensure the high visibility of the scientific results. We will ensure that the EU policies on open-access are strictly followed and that all scientific publications will be available on open-access repositories, such as arXiv.org, eprint.iacr.org, or INVESTIGO (the institutional repository at UVIGO) at latest at the time of

This Project has received funding from the European Union´s Horizon Europe research and innovation programme under the Project “Quantum Safe Internet” (QSI, grant agreement No101072637).

publication. In addition, all research results and data will be hosted or linked to via the QSI web site.

In addition, we will deposit the research data needed to reproduce and validate the

p
u
h

Moreover, during the duration of the project, we will support the development of appropriate open science practices among the Doctoral Candidates by offering training opportunities and assisting them with their use. We will also envisage that such open science practices will result in increased research collaboration. During the recent pandemic, we have extensively used new digital platforms for information-sharing, and we will ensure that they are properly used throughout the project.

The Consortium Agreement (CA) signed by all the parties ensures that all beneficiaries will have sufficient time to review proposed submissions and identify possible IP issues or lost opportunities. The Supervisory Board (SB) and the Dissemination and Impact Committee (DIC) of the network will guarantee that this is conducted in a timely fashion to make sure that there

a
r

Other routes for dissemination: In addition to journal publications, conference papers, and conference presentations, we will pursue the following routes to maximize the dissemination of the results achieved by the QSI network:

u
n
r
e
a
s
o
n
a
b
l
e

b
a
r
r
i
e
r
s

t
o

h
a
v

- QSI web site: Within the QSI project we have developed, with the help of a professional team, a dedicated web page with an intranet facility and public pages. The web site will be used as a training and dissemination platform where the intranet area will contain student presentations, teaching materials, and other admin sections. The public area will provide space for the Doctoral Candidates to publicise themselves and their research to the European job market and the wider public. The web site includes sections related to different research strands present at QSI. We provide the Doctoral Candidates access to relevant parts of the web site for editing. From month 12, the Doctoral Candidates will take charge, each for a month in rotation, and write and highlight a first-page story on their own research for public audience. Each Doctoral Candidate will also be allocated space on the site for personal academic web pages, where they will be expected to provide regular updates for their part of the project, including formal (e.g., short scientific reports) and informal written postings (e.g., blogs) and interactive video broadcasts. All public web material will be linked to pre-existing web sites to maximise exposure of QSI's research and Doctoral Candidates, as well as our public outreach efforts, which are described below. More information about the structure and contents of the QSI web site has been provided in a deliverable already uploaded to the EC Portal.
- QSI workshop: A network-wide workshop to showcase the mid-term achievements of the programme will be organised by DTU with the support of all Doctoral Candidates, in which each of them will present his/her latest results. We will welcome participation from other related external research groups at a minimal fee. The meeting will fill in an

existing gap in the scientific community that studies quantum-safe technologies, and will also complement the Quantum Safe Cryptography workshop, which mainly targets a less technical audience in industry and policy making. The latter is currently organized on a yearly basis by the European Telecommunications Standards Institute (ETSI) and the Institute for Quantum Computing (IQC). If possible, we will try to align the two meetings. The QSI workshop (QSIW) will last over three days covering several technical tracks, and will attract a large group of researchers in the field.

- QSI conference: Towards the end of their terms, and, under the guidance of DIC, the Doctoral Candidates will jointly organise the final network conference at which they will give extended research presentations on their work. They will also select and invite appropriate external plenary speakers and will arrange the programme. If possible, the conference will be aligned with the Quantum Safe Cryptography workshop mentioned above, and will be open to researchers outside the network. Strong efforts will be made to encourage active participation from our collaborators and our professional bodies. In addition to providing our Doctoral Candidates with opportunities to disseminate their research through extended presentations, the conference will provide invaluable training in the organisation and budgeting of a scientific conference. Careful planning will be exercised to attract a large audience.

- Digital newsletter: To further disseminate the highlights of the programme to scientists, policy-makers and industrial players, the DIC will produce a digital newsletter every 6 months starting on month 18 with inputs from all partners. From month 24, two Doctoral Candidates in rotation will be in charge of this task under the guidance of DIC. The newsletter will be posted on the QSI web site and distributed to a mailing list of registered stakeholder contacts.

Public engagement strategy: Outreach and public engagement will be as well an important part of our dissemination plan. QSI partners have an outstanding track record and engagement in media coverage of their research, such as press releases, articles in public science magazines like e.g. Physics Today, Physics World, interviews and podcasts on public radio, and participation in public events like e.g. showcase events, general public conferences or career fairs. All Doctoral Candidates will be offered training in communicating their research to a broad audience via Complementary-Skill training, and we will offer them the opportunity to put this training into practice by engaging in outreach activities.

During their doctoral career, each Doctoral Candidate at QSI will be involved with at least one outreach activity per year. Some of these activities will occur at a regular frequency throughout the project. For instance, via the QSI web site, there will be regular story-of-the-month updates, posted by the Doctoral Candidates, pitched at the public audience. These public posts will benefit from all sorts of modern communication technology in the form of multi-media releases and interactive platforms. Also, via the regular digital newsletter, the Doctoral Candidates will have the opportunity to inform scientists, policymakers and industrial players on the scientific advances achieved in their projects.

This Project has received funding from the European Union´s Horizon Europe research and innovation programme under the Project “Quantum Safe Internet” (QSI, grant agreement No101072637).

Also, throughout their PhD, the Doctoral Candidates will be keen in using all communication means to engage with the public. In particular, they will take the opportunity to make press releases about the results of their projects and how these results could be relevant to the general public. They will be distributed worldwide in well-known and established media, such as CORDIS Wire as well as through each partner institution's press office, and will cultivate print and online coverage, television and radio interviews, and other publicity. A press release has been already launched after the start of the project by the coordinator, UVIGO. Additional press releases will be given on a regular basis aligned to the progress of the Doctoral Candidates' projects. The Doctoral Candidates will also engage in Open Day activities in their own Schools to publicise quantum-safe technologies to undergraduate and postgraduate students. In addition to the above continuous efforts, we will ensure that the Doctoral Candidates will deliver at least three outreach activities, which will all be overseen by WP7. This includes:

- Engaging in local science events (Outreach Day 1)**.** In their first year of study, Doctoral Candidates will partake in local science activities like e.g. Open Day events in their own Institution, or festivals and events in their regions, like e.g. the 'Be Curious' British Science Week, the Fête de la Science in Paris (http://www.fetedelascience.fr/), the "La note dei Ricercatori" in Padova (https://venetonightpadova.it), the "Pint of Science Festival" in the Netherlands (https://www.pintofscience.nl), and the Nuit de la Science Geneva, the UNIGE's Physiscope (http://www.physiscope.ch/), to attract a broad range of people to the fascinations of science. The main objective is to present basic scientific phenomena to an audience of different ages in a simple, exciting, and tangible way. To prepare for this event, Doctoral Candidates are encouraged to visit similar events throughout the year, and plan in advance for their role in and contribution to their local event.

- Science art contest (Outreach Day 2)**.** With the help of local Outreach Officers at each partner, in the second year of study, Doctoral Candidates will give a public talk (*e.g.* in secondary schools in and around their city of residence), and encourage participants to take part in a science art contest organized by QSI. Participants should submit, possibly in digital format, any art form (*e.g.*, poetry, music, design, painting, sculpture, and video) on a related scientific subject. All submissions will be shown throughout the week that QSIW holds, and based on the votes from the members of the public, the best three contributions will be awarded. This art competition will engage the public with the frontiers of science in an exciting and engaging way.

- QSI open day (Outreach Day 3)**.** In conjunction with the QSI conference, there will be an Open Day, where members of the public will be invited to public lectures, given by lead scientists in the field, demonstrations, and (virtual) laboratory tours based on the QSI's research and industrial partners. They will have the opportunity to talk one-on-one with all the Doctoral Candidates and scientists involved and learn about their work first hand.

EU Acknowledgements**:** For all materials and contents created by the QSI project (including media relations, conferences, seminars, information material, such as brochures, leaflets, posters, presentations, etc, in electronic form, via traditional or social media, etc) as well as for

This Project has received funding from the European Union´s Horizon Europe research and innovation programme under the Project "Quantum Safe Internet" (QSI, grant agreement No101072637).

any dissemination activity, the EU emblem will be displayed as funding organ together will the following disclaimer text to acknowledge the EU support (translated into local languages, where appropriate): “This Project has received funding from the European Union’s Horizon Europe Framework Programme under the Marie Sklodowska-Curie project “Quantum Safe Internet” (QSI, grant agreement Nº 101072637).”

In addition, any communication or dissemination activity related to the action will use factually accurate information and it will indicate the following disclaimer (translated into local languages where appropriate): “Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or [name of the granting authority]. Neither the European Union nor the granting authority can be held responsible for them.”

All dissemination activities described above shall be compatible with all legitimate interests and aligned with the exploitation strategy described in the next section.

3. Exploitation Plan

The QSI project will make an important contribution towards increasing the long-term security of data by developing cryptographic protocols and networks that meet this requirement. This has wide societal and economic impact, by protecting our critical national infrastructure such as energy supply networks, government communications, companies and private entities from data compromise. Quantum-safe technologies can reassure people that their personal data such as health records is safe, their government is operating more safely and securely against external threats, or online voting systems are fair and free from interference.

The value of personal privacy has become an important topic of public discussion partly due to some recent disclosures by whistle-blowers about mass surveillance programmes by various secret services. It is expected that privacy concerns to further intensify with the continuous digitalization of society. Innovative cryptographic solutions like those develop by QSI will become essential to address these concerns. Such considerations not only apply to individual persons, but also to companies. One of the main driving forces of the surveillance activities is industrial espionage. Protecting company secrets from foreign digital spying will become even more relevant in the future, and essential to ensure that they remain highly competitive globally.

Filing and licensing patents: We expect that the QSI project could lead to new protocols, devices, patents, and standards in connection to network architectures, their security, and applications therein. For example, the work by the Doctoral Candidates corresponding to the subprojects 1, 3, and 6-11 focuses on the development of new designs/prototypes for next-generation of fibre-based QKD systems, TF-QKD systems, satellite-QKD protocols and devices, advanced quantum-repeater networks, QKD systems robust against side-channels, and hybrid security architectures and devices combining quantum communication and post-quantum

This Project has received funding from the European Union´s Horizon Europe research and innovation programme under the Project “Quantum Safe Internet” (QSI, grant agreement No101072637).

cryptography techniques. For these, and all other projects, IP opportunities will be identified at the DIC as well as at the Industrial Advisory Board (IAB), and will be forwarded to relevant Patent Offices of the beneficiary partners for possible filing. Indeed, with major leading industry in quantum-safe technologies on-board, QSI will promote the direct exploitation of its results by its industry partners and other external organisations. In particular, IDQUANTIQUE SA will directly benefit from the work corresponding to the subproject 10 in its commercial products, and the Doctoral Candidate in subproject 6 will contribute to the forefront of research at TOSHEU. The feasibility, characterization, and security assessment of various quantum cryptography schemes will also influence the telecom industry, helping them to make informed decisions and appropriate investments. In this regard, the Consortium Agreement signed by all parties provides relevant guidelines and detailed procedures to disseminate, protect and exploit the IP generated by the network through filing and licensing patents, prior to presenting their results at international meetings, or any other publications, to maximise mutual benefits from collaborations with external partners. It also includes a procedure to be followed should disputes arise between any of the parties. This document details the ownership of background and foreground IP and outlines the procedures to go through for partners wishing to exploit any foreground IP generated by the project.

Development of standards**:** In addition to IP, we aim to also contribute to developing standards to facilitate the wide-spread use of the developed results via *e.g.* our involvement with NIST, ISO, ETSI, and IETF standardization groups. Our Associated Partners, TOSHEU and IDQUANTIQUE SA, are members of the Industry Specification Group (ISG) on QKD of ETSI, where TOSHEU is currently its chair. Current work focuses on developing standards that assure customers of the security of practical QKD systems. QSI, via its collaborative projects, addresses issues that directly affect the implementation of future quantum-classical networks and will contribute to the development of such standards.

In QSI, we will also take into account that many relevant standardization bodies for Internet cryptography (e.g. CFRG & NIST process) favour that modern cryptographic communication protocols are patent free or allow for royalty-free use to be considered for standardization. Therefore, we may not necessarily aim for IP for all our research outcomes, but they instead may be fed back into the ongoing international standardization processes of NIST, ISO, ETSI, and IETF, in each of which QSI partners are involved. The results will provide the involved industry partners with a knowledge advantage of the workings of these protocols and the ability to efficiently integrate these into their own higher level protocols. For example, the KE protocols developed by the Doctoral Candidate working on subproject 2 will enable the Associated Partners from classical IT security (NXP and Genua) as well as industry partners with a QKD background to provide secure communication protocols to their customers.

Moreover, to further enhance the impact of QSI and to directly exploit its outcomes, IDQUANTIQUE SA will share high-potential results with the industry working group on quantum-safe security (https://cloudsecurityalliance.org/group/quantum-safe-security/). This group belongs to the Cloud Security Alliance and has been set up by IDQUANTIQUE SA. This information sharing will be performed in ways that guarantee the protection of the IP developed within QSI. In addition, we will seek exploitation routes via the EuroQCI programme.

This Project has received funding from the European Union´s Horizon Europe research and innovation programme under the Project “Quantum Safe Internet” (QSI, grant agreement No101072637).

During DIC and IAB meetings, we will consider potential IP opportunities and exploitation routes arising from recent experimental and theoretical results. If necessary, appropriate representatives from IP-related UVIGO's offices, will attend and advise.

4. Supervision Committees

The Dissemination and Impact Committee (DIC) is the principal responsible for overseen that the dissemination and exploitation plan of the QSI project is implemented correctly, and update the plan if necessary, with the support of the - Industrial Advisory Board (IAB). In particular:

Dissemination & Impact Committee (DIC)**:** It is chaired by Prof. Mohsen Razavi from the Univ. of Leeds, with Dr. Rob Thew from the Univ. of Geneva as deputy chair. Other members of the DIC include the Director of Research (Prof Eleni Diamanti, from Sorbonne Univ.), the IAB Chair (Dr. Andrew Shields, from TOSHEU), the project manager (Lorena González-Curra), and representatives from the Associated Partners and the Doctoral Candidates (both by rotation). The principal goal of the DIC is to oversee the correct implementation of the dissemination and exploitation plan of the project. This includes the design and maintenance of the project's web site, planning and monitoring of outreach activities, monitoring IP issues, implementing publication policy and the data management plan (DMP) and updating it, and overseeing arrangements for network symposiums inter alia. It will keep in regular ongoing e-mail contact and will establish outreach/conference subcommittees if required, particularly during the later stages of the network.

Industrial Advisory Board (IAB): It is formed from key participants with strong industrial links (Dr. Andrew Shields from TOSHEU, Dr. Gianluca Boso from IDQUANTIQUE SA, Dr. Marc Kaplan from VERIQLOUD, Olivier Gudet from SIG, Dr. Joppe W. Bos from NXP, Dr. Alireza Shabani from CISCO, Dr. Koji Azuma from NTT, Dr. Simon Daum from Genua, and Dr. Daniele Finocchiaro from EUTELSAT), with Dr. Andrew Shields being the chair, and Dr. Gianluca Boso being the deputy chair. At each SB meeting, the IAB reviews and comments about the progress of each Doctoral Candidate, via the IAB Chair. Also, it reviews regularly the impact strategy of QSI network, by considering the scientific developments made on the programme as it progresses.

This Project has received funding from the European Union´s Horizon Europe research and innovation programme under the Project "Quantum Safe Internet" (QSI, grant agreement No101072637).