

Comments of AT&T Services Inc.
BUILDING FOUNDATIONS FOR QUANTUM INDUSTRY

AT&T appreciates the opportunity to comment on the National Institute of Standards and Technology (NIST) Request for Information (RFI) on building foundations for quantum industry.

NIST seeks “input from stakeholders regarding opportunities for research and development, emerging market areas, barriers to near-term and future applications, and workforce needs” with an objective to “assist NIST in the formation of recommendations for the development and coordination of U.S. Government policies, programs, and budgets to advance U.S. competitiveness in Quantum Information Science (QIS)”.

AT&T has a long history of innovation, including on quantum technology. We have recently launched a research program with the California Institute of Technology and the Jet Propulsion Laboratory in quantum networking and communication with an objective to develop technology that will bring quantum networks from physics labs to people’s homes, all within the next decade.

Quantum networking, which is the process of linking quantum computers and devices, constitutes a paradigm shift. Quantum networks and computers provide for exponentially improved scaling and efficiency and security over current networks. While the field is still in its early stages, we believe that it holds great potential to create fast, secure networks beyond that possible today.

In the RFI, NIST asks how to build collaborative structures that can help industry best address the challenges to QIS. At the NIST workshop held on October 6, 2017, there was lengthy discussion about many fractured collaborative efforts around QIS. And, in response, NIST explored the possibility of hosting future workshops or convening a consortium to help pull these efforts together so that all participating parties can advance QIS through mutual sharing.

AT&T agrees with this objective and believes that NIST can play a convening role building upon many efforts that are already underway. For example, as part of our partnership with the California Institute of Technology, through the AT&T Foundry innovation center in Palo Alto, California, we recently formed the Alliance for Quantum Technologies (AQT), with which we would welcome NIST’s participation.

The goal of AQT is to bring industry, government, and academia together to speed quantum technology development and emerging practice applications. AQT intends to pursue a research and development program called INQNet (INtelligent Quantum NETworks and Technologies) focused on quantum networking.

The AT&T Foundry will work with AQT and INQNet (AQT.INQNET) to test relevant technologies for commercial application. The research being conducted by these organizations is intended to be shared with other QIS researchers. AT&T and AQT.INQNet would welcome the opportunity to continue to collaborate with NIST within this ongoing organization.

The RFI also raises several questions in three fundamental areas: (1) Identification of Opportunities, (2) Surmounting Challenges and (3) Funding and Knowledge Considerations. We offer the following comments in each of these areas:

- **Identification of Opportunities.** NIST asks what areas of pre-competitive QIS research and development appear most promising, what areas should be the highest priorities for the Federal government, and what market areas are well-positioned to benefit from new developments in QIS. As noted above we believe that quantum networking should be a significant consideration as NIST identifies its priorities.
- **Surmounting Challenges.** NIST also raises questions about institutional boundaries, knowledge transfer, workforce needs, and potential collaborative structures. As noted above, AT&T is attempting to create a collaborative environment focused on quantum networking through its partnership with AQT.INQNet. There is a need for a consortium to develop a pool of knowledge on several issues related to quantum technology: engineering, physics, computer sciences, photonics, cryptography, and networks. The premise of AQT.INQNET is to provide a consortium for such integration and prototype design, focusing initially on quantum communications with a goal to build a prototype and scale the technology.

There is also the potential for government to play a greater role. For example, the national laboratory infrastructure can play a prominent role in collaborating with industry and academia. There is also clearly a need for a larger workforce in this area. Government help train individuals in new technologies. An analogy may be the National Initiative for Cybersecurity Education (NICE) that NIST has been running to build out curriculum and other resources for cybersecurity education. A similar initiative could be developed for QIS.

- **Funding and Knowledge Considerations.** Finally, NIST raises questions about what methods could be adopted to encourage both small and large efforts to provide a healthy industrial base, which areas are underfunded, and how to treat intellectual property while the technology itself is in its infancy. It is critical that both government and industry offer support to efforts both large and small. Entities like AQT.INQNET are collaborating with small hardware startups to help advance their efforts. These types of partnerships provide a valuable means for entities to continue research and development even if such work will not result in a commercially viable product for some time.

In conclusion, we believe that government can play a key role in advancing QIS in partnership with the private sector. We welcome the opportunity to continue the dialog with NIST.