

Letter of Appreciation for Contribution to Technical Cooperation Project

To whom it may concern,

I, on behalf of the Theory Lab, Huawei Technologies Co., Ltd, am writing to show our commercialization acknowledgement of UTEE (Ubiquitous Trusted Execution Environments): a secure, efficient, and portable distributed big-data computing system based on advanced CPU secure hardware components (e.g., ARM TrustZone and Intel SGX). UTEE is a novel eco-system combining the complementary security advantages of these hardware components and high-level programming languages (e.g., Java and Scala). UTEE can effectively prevent the computations and queries on plaintext data being peeked by diverse malicious parties on public clouds, including operating systems, hypervisors, and malicious/careless cloud administrators.

My research team in the Huawei Theory Lab has been looking for solutions of secure big-data computing systems built by world-wide leading universities and industries. In 2018, we offered a two-year flagship research fund of HK \$2,189,450 to Dr. Heming Cui on jointly developing such systems. From this research fund, we have conducted substantial collaborations with Dr. Cui and produced diverse research achievements, including jointly publishing a series of research papers in international top journals/conferences (e.g., TDSC, TPDS, EuroSys, DSN, SRDS, and Asia CCS) and applying for seven patents. Below are three selected papers and two selected patents relevant to secure big-data computing systems. UTEE is most relevant to the last patent.

- Uranus: Simple, Efficient SGX Programming and Its Applications, 15th ACM ASIA Conference on Computer and Communications Security (ASIACCS 2020).
- DAENet: Making Strong Anonymity Scale in a Fully Decentralized Network, IEEE Transactions on Dependable and Secure Computing (TDSC 2021).
- UPA: An Automated, Accurate and Efficient Differentially Private Big-data Mining System, 50th IEEE/IFIP International Conference on Dependable Systems and Networks (DSN 2020).
- An Automated, Accurate and Efficient Differentially Private Big-data Mining System, submitted to CNIPA, Ref. CN 202010506698.X.
- An Efficient, Secure Big-data Processing and Programming System based on Trusted Execution Environment, submitted to CNIPA, Ref. CN 202010366539.4.

UTEE is one major resultant system developed from our collaborations. Compared to UTEE's worldwide competitors (e.g., Alibaba, Baidu and Microsoft), we appreciate several unique novel techniques in UTEE, including its low trusted computing base, big-data aware high-performance processing, and portability across heterogenous CPU vendors. These unique techniques of UTEE make it not only be suitable to deploy on clouds, but also on personal computers and mobile phones. In April 2021, our Huawei Clouds CEO announced the release of Trusted and Intelligent Cloud Services (TICS, see <https://www.huaweicloud.com/product/tics.html>), and UTEE has been successfully deployed in TICS as a core system component. This means that UTEE is usable by the 3 million Huawei Clouds customers (enterprises and individuals) located in 170 countries.

Overall, we believe the recognition of Dr. Cui's achievements on your side will be a major encouragement of his future research on developing secure systems that are both academically innovative and commercially practical. These developments can contribute to the effective protection of data for many entities, including individuals, enterprises, organizations, and governments.

Bo Bai
Sincerely,

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Certificate of UTEE Project's Application

This is to certify that Huawei Technologies Co., Ltd. (hereinafter referred to as "Huawei") and the University of Hong Kong have conducted a technical collaboration (Contract Number: HF2018095238) in the field of "inventing UTEE (Ubiquitous Trusted Execution Environments), a big-data secure computing software systems in public clouds, for the business of Trusted and Intelligent Cloud Services (TICS)". The specific research and development work was undertaken by the team led by Professor Cui Heming of the University of Hong Kong.

During the project collaboration, we have conducted substantial collaborations with Professor Cui and produced diverse research achievements, including jointly publishing a series of research papers in international top journals and conferences (e.g., TDSC, MICRO, DSN, and AsiaCCS), and we have jointly applied for several patents. In TICS, UTEE is invoked to protect the confidentiality of every big-data (Map/Reduce, written in Java) computing task on plaintext user data. Before the UTEE project, users' plaintext big-data computing tasks on public clouds face high risks on data breaches (e.g., by the 1500 organizations on jointly developing the Linux OS). Since the UTEE project, these risks are effectively tackled for the users.

This certificate is solely for Professor Cui Heming's application for HK government's Research Assessment Exercise in the 2026 year. It shall not be used for any other purpose without Huawei's written consent. This certificate does not constitute confirmation of the contractual acceptance criteria and application standards of the corresponding project under this collaboration, nor does it constitute any interpretation of the contractual obligations under this collaboration project.

Hereby certified.

(No further text below)

