

Cyber-Hardware Forensics & Assurance Evaluation R&D Programme – Grant Call 2 (August 2021)

Overview of Programme

The Cyber-Hardware Forensics & Assurance Evaluation R&D Programme (CHFA) is funded by National Cybersecurity R&D Programme (NCR) under National Research Foundation Singapore. Starting from May 2019 and ending in April 2024, this programme aims to explore and research on new methods in digital forensics to enable both investigative and counteractive abilities.

The techniques to be explored in this programme will be anchored at the hardware level, rather than pure software, as product hardware has a much longer lifetime, spanning several years. The goal of this programme would be to translate the research output into both techniques and technology and should contribute to investigative capabilities and for industrial R&D.

This Grant Call focuses on seeking complementary and synergistic research to existing projects in its respective thrusts, which are as follows:

- **Thrust (i): Data Recovery via Advanced Failure Analysis Technique**
- **Thrust (ii): Computer Aided Data Analysis of Recovered Data**

In Thrusts (i) and (ii), the main activities are to conduct research to forensically analyse and recover data from physically damaged hardware in a time-efficient manner.

- **Thrust (iii): Research for Advanced Hardware Evaluation Techniques for Modern Systems with Security and Privacy Features**
- **Thrust (iv): Advanced Side-Channels to Evaluate Security and Privacy Features of Modern Processors**

In Thrusts (iii) and (iv), the main activities are towards developing methods to evaluate modern processors for security and privacy where the research in these thrusts will produce advanced hardware evaluation techniques to evaluate hardware for assurance.

To know more about each thrust, please visit the website <https://www.ntu.edu.sg/ortds/research-focus/cyber-hardware-forensics-assurance-evaluation-r-d-programme>

Potential Topics for CHFA Grant Call 2

The topics of interests include:

- Investigation of non-volatile memory for data interpretation (non-destructive and semi-destructive approaches)
- Data decryption for digital forensics
- Advanced image processing tools and software for 3D X-ray and CT based PCB images (for applications such as inspection, schematic extraction and alteration detection)
- Feasibility study on configuration read and forced write operations on eFuses in microcontrollers and FPGA
- Automation of security evaluation against debug channel and bootloader vulnerabilities at the hardware level
- Study on vulnerabilities, through passive and active side-channel attacks, of commercial security building blocks, e.g., TRNG, PUF
- Passive side-channel attacks for reverse engineering Neural Hardware Accelerators, including neuromorphic circuits
- Analysis on Singapore Cybersecurity Certification Flow for IoT devices
- Security attack analysis for Internet-of-Things (IoT)
- Use of side channel to discover undocumented instructions in CPU
- Use of side channel by virtual machine to detect hypervisor and host machine configuration

Please note that the list is non-exhaustive and PIs may propose other topics which could be relevant to the programme.

This Grant Call is open to proposals at lower Technology Readiness Level (TRL), as well as proposals that aim to translate the research output for industrial R&D or in actual use cases. TRL of the proposals will be taken into consideration in the evaluation process, with priority given to translational ones. For translational proposals, please include a commercial partner as a collaborator who understands the commercial value of the product and has agreed to spend the necessary effort to commercialize it, or a relevant government agency who has agreed to spend the necessary effort to evaluate and adopt the proposed research outcome.

A product could be a standalone software application or a system consisting of hardware and software. It could be a significant upgrade of a research prototype or an integrated system created by combining multiple existing prototypes. A research outcome could be an evaluation of a forensics technique or an approach. It is preferred, though not required, that the research outcomes or the research prototypes used in the creation of the product have been created by the PI, and any Co-PIs, in the proposal.

Project Funding Specifications

Duration

1. The duration of each project is up to **18 months**.

Quantum

2. This grant will provide **10% IRC/overheads** above direct research costs for Singapore-based Institutes of Higher Learning and Research Institutions. The total quantum will not exceed **\$500,000 (inclusive of 10% IRC/Overheads)**.

Expenditure Guidelines

3. Please refer to the 'Annex A – Terms and Conditions of CHFA Grant' and 'Annex B – CHFA Funding Guidelines' in the submission package.

Eligibility

4. The grant call is open to all **Faculty and Principal Investigators (PIs)** from a publicly-funded Singaporean Institute of Higher Learning (IHL) or Research Institution (RI). Private sector and other entities can participate as collaborators.

Only research conducted in Singapore may be funded under the CHFA Programme. Collaborators are not restricted to any category but are not eligible to receive any funding.

5. PI and Co-PIs at the point of application must fulfil the following requirements:
 - Hold a primary (Minimum of 9 months employment with a local Singapore Institution) appointment in a local publicly funded institution;
 - Have a laboratory or research program that carries out research in Singapore;
 - Be an independent PI with a track record of leadership ability in coordinating research programs and providing mentorship to research team, as well as having productive research outcomes; and
 - No outstanding reports from other national grants.
6. Proposals already funded by other funding agencies are not eligible for funding under this Grant Call.

Application for Funding

Submission

1. The documents to be submitted are:
 - I. Annex C – Full Proposal (signed copy in pdf format)
 - II. Annex C – Full Proposal (editable copy in docx format)
 - III. Annex D – Project Budget (editable in xlsx format)
 - IV. Annex E – Project Performance Indicators (editable copy in docx format)
 - V. 2-page CVs of PI and all Co-PIs (in pdf format)
 - VI. Letter of support from Collaborator - Applicable for all applications with Collaborator's participation. It should include the endorsement from the management of the company/entity to participate in this grant call.
 - VII. Summary of Full Proposals – To be prepared by the Research Offices

All templates can be found in the submission package. The documents must be completed; and where applicable, signed with relevant supporting documents attached.

The 'Proposal ID' shall be filled by the Research Offices, according to the labelling in the 'Summary of Full Proposals'.

2. All applications must be submitted to CHFA ***through the Research Office of the PI host institution.*** Any direct submissions will not be considered.

All submitted proposals by the Research Offices are deemed to have its contents verified and the submissions supported by the PI's organizations. Please ensure the internal processes are followed.

3. For Research Offices, please upload all the required documents onto this link:

<https://justattach.ntu.edu.sg/upload.php?A=vO1Vj6NT9ru29x0o60vvKv2DD9eaPzNNOV4Oxtex3aE>
(Please refer to the steps of uploading the files in the submission package)

Please upload the documents in this format:

- 1 zip folder per Institute (name as: CHFA-GC2-'IHL')
- The zip folder shall include - 1 folder for 1 proposal (name as: CHFA-GC2-'IHL'-'PI's initial') + Summary of Full Proposals

Deadlines

4. All endorsed proposals must reach CHFA by **15 Oct 2021 (1200 hrs, Friday, Singapore Time)**

Please abide to the ***internal submission deadline*** determined by the respective Research Offices of the PI host institution.

Timelines

5. Grant Call opens: **2 Aug 2021**
Grant Call closes: **15 Oct 2021**
Award announcement: **No later than 29 Apr 2022**
Tentatively project starts on: **1 May 2022**

Evaluation Criteria

Criteria & Scoring

- Potential Impact & Application Significance
- Comparative Advantage
- Rigour of Approach
- Novelty
- Technology Readiness Level (TRL)
- PI Track Record
- Budget & Utilization

Evaluation Panel

- Representatives from CSA, MHA/HTX, MINDEF/DSO
- PIs from CHFA core research projects (if no conflict of interest)
- External reviewers

Enquires

For any enquiry, please email NCR_CHFA@ntu.edu.sg.