CONFIDENTIAL

Invention Disclosure Form

*The beginning of a conversation*

* This questionnaire is an easy way to let us know you made an invention and give us basic information. You don’t need to convince us of anything!
* We will contact you very soon after we receive your questionnaire to ask any further questions we may have, and to explain the next steps.
* Answer each question by selecting a radio button or by typing into the associated table or fillable box. For tables, please add rows as necessary.
* If you are unsure how to answer a question, just leave it blank and we’ll talk to you about it later. Or, email us at [tto@umass.edu](mailto:tto@umass.edu) and we’ll help you answer it.
* We will keep you informed as we evaluate patentability, market potential and licensability, and we will discuss any decisions with you before they are made.
* If we file a patent application, our patent attorney will speak to you directly to learn about the invention in more detail.

You can email us the completed and signed form using the TTO email address tto@umass.edu.

**For Internal Use**

**UMA \_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date Received \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Invention Disclosure Form**

Technology Transfer Office

University of Massachusetts Amherst

Telephone: 413-545-3606

Email: [tto@umass.edu](mailto:tto@umass.edu)

Website: [www.umass.edu/tto](http://www.umass.edu/tto)

Please Provide a Short Title for the Invention

|  |
| --- |
| A new method of managing heap memory for NUMA architecture |

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|  | **Inventor Name** | **Professional Title or Student Type** (e.g. graduate undergrad) | **Department Affiliation**  (Note: At time of invention. If not UMA, list employer) | **Email Address** |
| 1. | Tongping Liu | Professor | ECE | tongping@umass.edu |
| 2. | Xin Zhao | Grad | ECE | zhao@umass.edu |
| 3. |  |  |  |  |
| 4. |  |  |  |  |
| 5. |  |  |  |  |

1. **General Description.**

Please provide a description of the invention. If you have one, please attach a manuscript or other document that describes the invention in more detail.

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1. **Previous Invention Disclosure.**

Is this invention disclosure related to any earlier invention disclosure here or at another institution?



If **Yes**, please identify the UMA disclosure number, if known, or describe. If another institution, please state.

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1. **Improvements to the Art.**

How does the invention improve upon what was previously known in the field?

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| It significantly improves the performance of applications that are using the memory allocator. On a 8-node machine, it improves the performance up to 5.8 times by comparing the default linux allocator, and up to 4.7 times when comparing with the second best one. Based on our evaluation, it improves the performance by around 13% on average. This work proposes multiple novel methods as listed in the following: first, it proposes to combine the task management into the memory management; Second, it proposes an interleaved heap for potentially shared objects that are allocated in the main thread; Third, it proposes to integrate huge pages, a modern mechanism for the OS and the hardware. Fourth, it also proposes multiple methods to reduce the overhead of migrate objects between different freelists. |

1. **Products and Services.**

What products or services are made possible by the invention?

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| It will have a new library that people could use. |

1. **Competing Approaches.**

Please describe any competing approaches at any stage of development (e.g. existing commercial products or services, R&D, etc.) that your invention may compete with.

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| See the attached manuscript. |

1. **Potential Companies and Contacts for Licensing.**

Please list any companies you know of that might be interested in this invention.

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| There are many companies that may benefit from this tool, such as google, microsoft |

For the above companies, please list the name and contact information for any relevant contacts you may have that you’d like to share with us.

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Contact Information** |
|  |  |  |
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1. **Relevant References.**

Please list any publications or patents you know of that might be relevant to this invention. (Note: We will also do patent and literature searches.)

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1. **Previous Public Disclosure.**

Have you presented or published on the invention, or the research that led to it? Has any aspect of this invention been published or publicly disclosed?



Such publication and public disclosure include, but are not limited to, online abstracts or research papers, posters or oral presentations at a scientific conference, discussions with non-UMass individuals, inclusion in a student thesis or dissertation.

If the answer to the above is **Yes**, please describe the disclosure and include the publication date for each.

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1. **Upcoming Public Disclosure.**

Do you have any plans to make a public disclosure in the next 30 days?



If so, when and where?

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| I will send out the paper for review. The intended venue is OOPSLA 2020, with the deadline of May 15. |

1. **Funding for Invention.**

Has the research that led to the invention been sponsored or funded by industry, or funded by a grant(s) from a government agency or private foundation?



If **Yes**, please provide TTO with information on **all** funding sources for research that resulted in this invention.

|  |  |  |
| --- | --- | --- |
| **Sponsor Information**  (e.g. Gov’t Agency, Company, Foundation) | **Grant or Contract #**  ([Click Here for Examples of Funding Numbers](https://era.nih.gov/eraHelp/iEdison_User/Content/Create_Manage_Invention_Report/Add_Modifying_Invention_Reports/Grant_Contract_Number_Formats.htm)) | **UMA Kuali #** |
| UMASS Startup |  |  |
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PLEASE NOTE: UNDER THE BAYH-DOLE ACT, WE ARE REQUIRED TO REPORT ALL INVENTIONS THAT HAVE BEEN FEDERALLY FUNDED TO THOSE FUNDING AGENCIES. THIS INFORMATION IS VERY IMPORTANT AND CAN AFFECT FUTURE FUNDING.

1. **Third-party Materials or Confidential Information.**

In this research did you use any materials or confidential information provided by another institution or company?



If **Yes**, if a Material Transfer Agreement (MTA) or a Non-Disclosure Agreement (NDA) was used in connection with these materials, please state the name of the provider, their institutional affiliation, and attach a copy of the MTA or NDA if you have it.

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| We are using the machine of UTSA for the evaluation of the performance. |

1. **Continuing Research.**

Please describe your planned future research efforts, if any, and describe any funding you have or will receive that will allow you to pursue such efforts.

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| We will use UMass startup and an NSF grant (#[2024253](https://www.research.gov/gapps-web/gapps/viewDetail?agencyId=NSF&applicationId=2024253&grantsGovId=)) to further improve this. |

If you do not currently have funding, are you actively seeking it?



If No, please describe.

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1. **Point of Contact.**

Who should be our primary point of contact for discussing the invention?

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| --- |
| Tongping Liu |

1. **Additional Information.**

Is there anything else you think we should know?

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1. **Inventors’ Signatures.**

Please sign below, to indicate (i) you are the original inventors, (ii) you will help us in the patenting process, and (iii) you will sign documents that require your signatures.

Name Signature Date

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| --- | --- | --- | --- |
| 1. | Tongping Liu | Tongping liu | 04/30/2020 |
| 2. |  |  |  |
| 3. |  |  |  |
| 4. |  |  |  |
| 5. |  |  |  |