

Overview

Linaro High Performance Computing Tools

Linaro High Performance Compute Tools deliver market leading tools for debugging, profiling, and optimization of software on any HPC platform, including x86 based platforms and Arm-based platforms as well as GPUs.

Linaro Forge Ultimate

Linaro Forge Ultimate brings everything software engineers need to build reliable and optimized code that creates the right results on multiple high performance computing (HPC) architectures. The suite allows users to debug, profile and tune for optimal performance—on everything from single threads to complex parallel HPC and scientific codes with MPI (message passing interface), OpenMP threads, NVIDIA CUDA or AMD ROCm. Linaro Forge Ultimate supports debugging and profiling for codes using the latest C, C++ and Fortran compilers on x86-64 (Intel and AMD) and 64-bit Arm hardware..

Linaro Forge Ultimate brings together Linaro DDT, Linaro MAP and Linaro Performance Reports into a single intuitive interface to provide the ideal package for software development and optimization:

- **Linaro DDT** is the No. 1 debugger in research, industry and academia for software engineers and scientists developing C++, C, or Fortran parallel and threaded applications on CPUs, GPUs, Intel, and Arm. Linaro DDT is a powerful tool for automatic detection of memory bugs. Different detection and insightful data view offer easy ways to understand and fix problems.
- **Linaro MAP** is a profiler helping to find bottlenecks in computation, communication, synchronization or I/O. Its high-speed, accurate low-overhead measurement and visual scalability tackle even the most challenging performance issues. Whether at one process or at scale, Linaro MAP is designed to work out-of-the-box with no need for instrumentation and no danger of creating large, unmanageable data files. Software engineers developing parallel and threaded applications on CPUs and GPUs rely on Linaro MAP's insight into optimization.
- **Linaro Performance Reports** is the first port of call for understanding application performance. See the type of activity in which your program is spending its time and infer how well it is mapping to your hardware and job configuration. Switch to more detailed tools (such as Linaro MAP) if and when needed.



Standard Features

Linaro DDT

Linaro DDT is a powerful graphical debugger suitable for many different development environments. Linaro DDT includes:

- Single process and multi-threaded software
- OpenMP
- Parallel (MPI) software
- Heterogeneous software, such as that written to use GPUs
- Hybrid codes mixing paradigms such as MPI with OpenMP, or MPI with CUDA
- Multi-process software of any form, including client-server applications

Linaro DDT helps you find and fix problems on a single thread or across hundreds of thousands of threads. It includes static analysis to highlight potential code problems, integrated memory debugging to identify reads and writes that are outside of array bounds, and integration with MPI message queues.

Linaro DDT supports all of the compiled languages that are found in mainstream and high-performance computing, including:

- C, C++, and all derivatives of Fortran, including Fortran 90
- Limited Python support (CPython 3.6 - 3.11)
- Parallel languages/ models including MPI, UPC and Fortran 2008 co-arrays
- GPU languages such as HMPP, OpenMP Accelerators, CUDA and CUDA Fortran and HIP

While many users choose Linaro DDT for desktop development or for debugging on small departmental parallel machines, it is also scalable and fast to beyond petascale, and is depended upon to debug hundreds of thousands of processes simultaneously.

Linaro MAP

Linaro MAP is a parallel profiler that shows you the longest running lines of code, and explains why. Linaro MAP does not require any complicated configuration, and you do not need to have experience with profiling tools to use it.

- MPI, OpenMP, and single-threaded programs.
- Small data files. All data is aggregated on the cluster and only a few megabytes written to disk, regardless of the size or duration of the run.
- Sophisticated source code view, enabling you to analyze performance across individual functions.
- Both interactive and batch modes for gathering profile data.
- A rich set of metrics, that show memory usage, floating-point calculations, and MPI usage across processes, including:
 - Percentage of vectorized instructions, including AVX extensions, used in each part of the code.
 - Time spent in memory operations, and how it varies over time and processes, to verify if there are any cache bottlenecks.
 - A visual overview across aggregated processes and cores that highlights any regions of imbalance in the code.

Performance Reports

Linaro Performance Reports are a non-intrusive performance tool for HPC and scientific software. They analyze the applications running on the system to seek inefficiencies and pinpoint exactly where to focus the optimization work.

A report measures overall information about the computation, communication and I/O providing detail for each of these areas, including:

- The time spent in various categories of instruction: memory access, numeric operations, floating point operations
- I/O – time and the effective performance (transfer rate) of read and write operations to storage
- Memory – the mean and peak usage of memory per node
- Communication – MPI time and performance for collective and point-to-point operations
- Threads – the time spent in computation and synchronization, the physical core utilization and system load
- GPUs – the utilization and memory use of GPUs
- Energy – the energy pack add-on reports energy usage and peak power – for system, CPU and GPUs



Standard Features

Operating System Compatibility:

https://docs.linaroforge.com/23.0.1/html/forge/supported_platforms/reference_table.html#forge

- Red Hat Enterprise Linux / CentOS 7, 8 and 9
- SuSE Linux Enterprise Server 15
- Ubuntu 20.04 and later

Message Passing Interface (MPI) Compatibility:

https://docs.linaroforge.com/23.0.1/html/forge/supported_platforms/reference_table.html#forge

Linaro Forge Professional is compatible with the following message passing interface (MPI) libraries:

- Cray MPT
- HPE MPT
- HPE Cray PALS
- Intel MPI
- MPICH
- MVAPICH2
- Open MPI
- IBM Spectrum MPI

HPE Performance Software - Message Passing Interface

Compiler Compatibility: https://docs.linaroforge.com/23.0.1/html/forge/supported_platforms/reference_table.html#forge

Linaro Forge is compatible with the following compilers:

- Cray Compiling Environment
- GNU C/C++/Fortran Compiler
- Arm® Compiler for Linux
- Intel Parallel Studio
- Intel oneAPI HPC Toolkit
- NVIDIA HPC (PGI) Compiler
- IBM XL Compiler

Hardware Compatibility

Linaro Forge is supported on the following HPE systems:

- HPE Apollo systems, including Apollo 2000, 6000 and 6500
- HPE ProLiant servers, including the DL server line
- HPE Cray EX and XD systems

For more information, please contact your Hewlett Packard Enterprise sales representative.

Useful links

- Product download, user & installation guide: <https://www.linaroforge.com/downloadForge/>



Service and Support

HPE Services

No matter where you are in your digital transformation journey, you can count on HPE Services to deliver the expertise you need when, where and how you need it. From planning to deployment, ongoing operations and beyond, our experts can help you realize your digital ambitions.

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HPE Complete Care Service is a modular, edge-to-cloud IT environment service designed to help optimize your entire IT environment and achieve agreed upon IT outcomes and business goals through a personalized experience. All delivered by an assigned team of HPE Services experts. HPE Complete Care Service provides:

- A complete coverage approach -- edge to cloud
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HPE Tech Care Service is the operational support service experience for HPE products. The service goes beyond traditional support by providing access to product specific experts, an AI driven digital experience, and general technical guidance to not only reduce risk but constantly search for ways to do things better. HPE Tech Care Service delivers a customer-centric, AI driven, and digitally enabled customer experience to move your business forward. HPE Tech Care Service is available in three response levels. Basic, which provides 9x5 business hour availability and a 2-hour response time. Essential which provides a 15-minute response time 24x7 for most enterprise level customers, and Critical which includes a 6-hour repair commitment where available and outage management response for severity 1 incidents.

<https://www.hpe.com/services/techcare>



Service and Support

HPE Lifecycle Services

HPE Lifecycle Services provide a variety of options to help maintain your HPE systems and solutions at all stages of the product lifecycle. A few popular examples include:

- Lifecycle Install and Startup Services: Various levels for physical installation and power on, remote access setup, installation and startup, and enhanced installation services with the operating system.
- HPE Firmware Update Analysis Service: Recommendations for firmware revision levels for selected HPE products, taking into account the relevant revision dependencies within your IT environment.
- HPE Firmware Update Implementation Service: Implementation of firmware updates for selected HPE server, storage, and solution products, taking into account the relevant revision dependencies within your IT environment.
- Implementation assistance services: Highly trained technical service specialists to assist you with a variety of activities, ranging from design, implementation, and platform deployment to consolidation, migration, project management, and onsite technical forums.
- HPE Service Credits: Access to prepaid services for flexibility to choose from a variety of specialized service activities, including assessments, performance maintenance reviews, firmware management, professional services, and operational best practices.

Notes: To review the list of Lifecycle Services available for your product go to:

<https://www.hpe.com/services/lifecycle>

For a list of the most frequently purchased services using service credits, see the [HPE Service Credits Menu](#)

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Training and certification designed for IT and business professionals across all industries. Broad catalogue of course offerings to expand skills and proficiencies in topics ranging from cloud and cybersecurity to AI and DevOps. Create learning paths to expand proficiency in a specific subject. Schedule training in a way that works best for your business with flexible continuous learning options.

<https://www.hpe.com/services/training>

Defective Media Retention

An option available with HPE Complete Care Service and HPE Tech Care Service and applies only to Disk or eligible SSD/Flash Drives replaced by HPE due to malfunction.

Consult your HPE Sales Representative or Authorized Channel Partner of choice for any additional questions and services options.

Parts and Materials

HPE will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.

Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.

How to Purchase Services

Services are sold by Hewlett Packard Enterprise and Hewlett Packard Enterprise Authorized Service Partners:

- Services for customers purchasing from HPE or an enterprise reseller are quoted using HPE order configuration tools.
- Customers purchasing from a commercial reseller can find services at <https://ssc.hpe.com/portal/site/ssc/>



Service and Support

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<https://support.hpe.com/hpesc/public/home/signin>

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HPE GreenLake edge-to-cloud platform brings the cloud experience directly to your apps and data wherever they are—the edge, colocations, or your data center. It delivers cloud services for on-premises IT infrastructure specifically tailored to your most demanding workloads. With a pay-per-use, scalable, point-and-click self-service experience that is managed for you, HPE GreenLake edge-to-cloud platform accelerates digital transformation in a distributed, edge-to-cloud world.

- Get faster time to market
- Save on TCO, align costs to business
- Scale quickly, meet unpredictable demand
- Simplify IT operations across your data centers and clouds

To learn more about HPE Services, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner. Contact information for a representative in your area can be found at "Contact HPE"

<https://www.hpe.com/us/en/contact-hpe.html>

For more information

<http://www.hpe.com/services>



Configuration Information

Linaro Forge Ultimate

Linaro Forge includes DDT, MAP and Performance Reporting. To configure DDT by itself see the next set of SKUs below.

Select the appropriate SKU by first estimating the total number of concurrent processes to test with the software. The SKUs are tiered at 32, 64, 256, 1024 and Unlimited number of processes.

Commercial Licenses are for sale through the SKUs below.

Educational Licenses, for degree-granting academic institutions, will need a custom quote from the vendor. Contact the Product Manager, Chris Wahrman, to get quotes for Educational Licenses.

Term lengths are available for one-year, three-year, four-year, and five-year time frames.

Description	SKU
Linaro Forge Ultimate 32 Processes 1-year Support E-LTU	S2H96AAE
Linaro Forge Ultimate 64 Processes 1-year Support E-LTU	S2H97AAE
Linaro Forge Ultimate 256 Processes 1-year Support E-LTU	S2H98AAE
Linaro Forge Ultimate 1024 Processes 1-year Support E-LTU	S2H99AAE
Linaro Forge Ultimate Unlimited Processes 1-year Support E-LTU	S2J00AAE
Linaro Forge Ultimate 32 Processes 3-year Support E-LTU	S2J01AAE
Linaro Forge Ultimate 64 Processes 3-year Support E-LTU	S2J02AAE
Linaro Forge Ultimate 256 Processes 3-year Support E-LTU	S2J03AAE
Linaro Forge Ultimate 1024 Processes 3-year Support E-LTU	S2J04AAE
Linaro Forge Ultimate Unlimited Processes 3-year Support E-LTU	S2J05AAE
Linaro Forge Ultimate 32 Processes 4-year Support E-LTU	S2J06AAE
Linaro Forge Ultimate 64 Processes 4-year Support E-LTU	S2J07AAE
Linaro Forge Ultimate 256 Processes 4-year Support E-LTU	S2J08AAE
Linaro Forge Ultimate 1024 Processes 4-year Support E-LTU	S2J09AAE
Linaro Forge Ultimate Unlimited Processes 4-year Support E-LTU	S2J10AAE
Linaro Forge Ultimate 32 Processes 5-year Support E-LTU	S2J11AAE
Linaro Forge Ultimate 64 Processes 5-year Support E-LTU	S2J12AAE
Linaro Forge Ultimate 256 Processes 5-year Support E-LTU	S2J13AAE
Linaro Forge Ultimate 1024 Processes 5-year Support E-LTU	S2J14AAE
Linaro Forge Ultimate Unlimited Processes 5-year Support E-LTU	S2J15AAE

Linaro DDT

Select the appropriate SKU by first estimating the total number of concurrent processes to test with the software. The SKUs are tiered at 32, 64, 256, 1024 and Unlimited number of processes.

Commercial Licenses are for sale through the SKUs below.

Educational Licenses, for degree-granting academic institutions, will need a custom quote from the vendor. Contact the Product Manager, Chris Wahrman, to get quotes for Educational Licenses.

Term lengths are available for one-year, three-year, four-year, and five-year time frames.

Linaro DDT 32 Processes 1-year Support E-LTU	S2J16AAE
Linaro DDT 64 Processes 1-year Support E-LTU	S2J17AAE
Linaro DDT 256 Processes 1-year Support E-LTU	S2J18AAE
Linaro DDT 1024 Processes 1-year Support E-LTU	S2J19AAE
Linaro DDT Unlimited Processes 1-year Support E-LTU	S2J20AAE
Linaro DDT 32 Processes 3-year Support E-LTU	S2J21AAE
Linaro DDT 64 Processes 3-year Support E-LTU	S2J22AAE



Configuration Information

Linaro DDT 256 Processes 3-year Support E-LTU	S2J23AAE
Linaro DDT 1024 Processes 3-year Support E-LTU	S2J24AAE
Linaro DDT Unlimited Processes 3-year Support E-LTU	S2J25AAE
Linaro DDT 32 Processes 4-year Support E-LTU	S2J26AAE
Linaro DDT 64 Processes 4-year Support E-LTU	S2J27AAE
Linaro DDT 256 Processes 4-year Support E-LTU	S2J28AAE
Linaro DDT 1024 Processes 4-year Support E-LTU	S2J29AAE
Linaro DDT Unlimited Processes 4-year Support E-LTU	S2J30AAE
Linaro DDT 32 Processes 5-year Support E-LTU	S2J31AAE
Linaro DDT 64 Processes 5-year Support E-LTU	S2J32AAE
Linaro DDT 256 Processes 5-year Support E-LTU	S2J33AAE
Linaro DDT 1024 Processes 5-year Support E-LTU	S2J34AAE
Linaro DDT Unlimited Processes 5-year Support E-LTU	S2J35AAE

Distribution

Media and Software Documentation

Linaro Forge Ultimate is available for download. Customers will receive an entitlement certificate via email. The entitlement certificate must be redeemed online in order to obtain a license key, to download the software, and to register for support.

Customers shall email sales@forge.linaro.com to activate their Linaro Forge license. Linaro requires the following details to be able to issue the license:

- First Name, Last Name
- Job Title
- Email Address
- Phone Number
- Company Name and Address
- Entitlement number

Customers may also download user guides and other documentation at

<https://www.linaroforge.com/downloadForge/>

Technical Specifications

Linaro Forge Ultimate

Installation

Linaro DDT, an industry-leading parallel debugger, and Linaro MAP, a low-overhead line-level profiler for MPI and OpenMP are now part of one common environment: Linaro Forge.

One installation provides everything needed to debug, fix, and profile programs at any scale, limited only by the license. This simplifies installation and maintenance overhead, as well as provides one common, familiar interface for all development tools, making it easy to move between them while working on a piece of code. Users may start Linaro Forge with DDT or MAP and can easily switch to the other tool with a single click while working.

Remote Clients

Linaro Forge has native remote clients for Windows, Mac OS X and Linux that can connect via SSH to any server or cluster using an existing login process. Users can then run, debug, profile, edit and compile files directly on the remote machine. The native remote client experience is superior to X forwarding or VNC-based solutions.

Arm Forge Ultimate- Technical Features at a Glance	
Features	Linaro Forge Ultimate
Scalable debugging	✓
Scalable profiling	✓
Memory debugging	✓
CPU, MPI and I/O profiling	✓
Native remote client	✓
Version control integration	✓
Python debugging and profiling for HPC	✓
Regional profiling with Caliper	✓
CPU hardware counters	✓
Full GPU profiling and debugging	✓
Energy performance metrics	✓
Custom metrics API	✓
Performance Report generation	✓
Application efficiency advice	✓



Summary of Changes

Date	Version History	Action	Description of Change
18-Dec-2023	Version 2	Changed	HPE Services Rebranding
02-Oct-2023	Version 1	New	New QuickSpecs



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