Overview

HPE Swarm Learning

HPE Swarm Learning provides decentralized privacy-preserving, edge machine learning at the data source without sharing raw data. The blockchain network provides the ability to collaboratively share the learnings of the models with participating ML Nodes in the HPE Swarm Learning peer network for insights at the data source, tremendously enhancing data privacy and improving insights. HPE Swarm Learning obviates the need for a central server. A decentralized, ML framework utilizes the computing power at, or near, the distributed data sources to run the ML algorithms that train the models. Training the model occurs at the edge where data is most recent, where accurate and data-driven decisions are necessary.

In this completely decentralized architecture, only insights learned are shared with the collaborating ML peers, not the raw data. This tremendously enhances data privacy.

What's New

- Decentralized privacy-preserving distributed machine learning software.
- Alleviate inside attack on model by Blockchain-based smart contract between participants merging.
- Fully supported containerized software.
- Three 5, 10 and 20 nodes software SKUs with a 1-yr subscription license:

Models

Description	SKU
HPE Swarm Learning Software 5 Containers 1-year Subscription E-LTU	R8S85AAE
HPE Swarm Learning Software 10 Containers 1-year Subscription E-LTU	R8S86AAE
HPE Swarm Learning Software 20 Containers 1-year Subscription E-LTU	R8S87AAE

Standard Features

Privacy Preserved Machine Learning

One fundamental motivation for decentralized learning is to provide better data privacy by reducing the movement of raw data across networks. HPE Swarm Learning decentralized ML gives data owners better control over access to their sensitive information and extracts insight from their source data without invading data privacy. Data does not leave the source. HPE Swarm learning enables this by sharing only ML Model learning, without sharing any user data, thus alleviating privacy issues.

Decentralized Machine Learning

Instead of merging parameters to a central network, dynamic leader election uses a blockchain network for merging parameters, fostering collaborative learning.

To facilitate the integration of any data from any data source worldwide without sharing raw data, HPE Swarm Learning introduces a decentralized, machine learning approach uniting edge computing, blockchain-based peer-to-peer networking, and coordination as well as privacy without the need for a central coordinator, thereby going beyond federated learning.

Collaborative Machine Learning at edge or data sources improves models by leveraging larger data sets and generating a with global state model.

Blockchain Network Enables Collaboration and Security

HPE Swarm Learning utilized blockchain to establish confidence that the results of the shared learning at the edge can be distributed and exchanged securely. Each member can add data if it is a trusted participant. Blockchain is simply a distributed ledger, each of whose pages produces a distinct number, or hash. Any change to the input changes the hash, providing a secure mechanism for contents and changes that are both transparent and difficult to hack preventing inside attack on model merging.

Improved Efficiency as Data is not transferred to a central location

HPE Swarm Learning pools the data resources of geographically-dispersed systems to gain better insights. Individual datasets may not be as powerful when siloed across various locations of an organization, but when combined with learnings from other datasets available within the organization, you have more powerful machine learning model providing improved insights.

And since data is not transferred – only the learnings are shared between participating nodes, helping reduce network traffic and avoid data duplication.

Fault-tolerant

Although not subject to risk, decentralized learning needs features to enhance robustness when there is a node failure due to the hardware or intermittent bandwidth, and needs to handle the potential dynamic joining and leaving of distributed data resources during model training. Once it is up or has connectivity, any node in the HPE Swarm Learning network that fails joins the network and continues participating from where it left off.

High Availability

In Swarm 2.0.0, following new features have been introduced that can detect and recover from:

- Swarm Leader node failure
- SN node failure

HPE Swarm Learning Web User Interface

HPE Swarm Learning comes with easy-to-use Web UI that enables intuitive and simple steps for easy installation and use of the application. Web UI can be launched from Linux, Windows and MacOS.

HPE Swarm Learning community license

HPE Swarm Learning has a community license available that supports up to 5 nodes to help customers evaluate the technology and its benefits in their environment

Standard Features

Packaged as containers with 3 SKU's of 5, 10, 20 containers

Each 5-pack container can be configured. Larger packs can be configured accordingly:

- 5 HPE Swarm Learning servers optionally GPU based
- 1 Management Server (non-GPU based)

HPE Swarm Learning Software Container Contents

- HPE Swarm Learning – for running user-defined machine learning algorithm
- Swarm Network - the blockchain network
- SWOP (Swarm Operator) – for command-line management
- Web UI – interface for ease of installation
- SWCI – Command Line interface
- Swarm Learning Management UI (SLM UI)
- SLM UI Postgress Database

Supported Hardware

HPE Swarm Learning can run on any hardware* that supports executing container software.

Hardware

- Any x86-64 hardware
- System memory of 32 GB or more
- Hard disk space of 200 GB or more
- Qualified with HPE Edgeline, Proliant DL380, and Apollo 6500

Notes: HPE Swarm Learning can be deployed with Nvidia GPUs (accelerator cards) and AMD GPUS (accelerator cards) in the 2.0.0 . release. Support for other GPUs will be enabled in subsequent releases.

Supported Operating Systems and Platforms

- HPE recommends that you run each Swarm Network node, and Swarm Learning node on dedicated systems to get the best performance from the platform.
- The recommended requirements for each system are as follows:

Notes: The requirements of system running the user ML node is driven by the complexity of the ML algorithm. GPUs may also be needed.

Network

- A minimum of one or a maximum four open TCP/IP ports in each node. All swarm nodes **must be able to access** the ports of every other node. For more information on port details that must be opened, see **Exposed ports**.
- Stable internet connectivity to download Swarm Learning package and Docker images.

Operating Systems

- Linux - Qualified on Ubuntu 22.04 RHEL 8.5. and SLES 15.0
- For Swarm Web UI installer, any x86-64 hardware running Linux, Windows, or Mac.

Container Hosting Platform

- HPE Swarm Learning is qualified with Docker 20.10.5.
- Configure Docker to run as a non-root user. For more details, see **Manage Docker as a non-root user**.
- Configure network proxy settings for Docker. For more details, see **Http/https proxy.**
- Configure Docker to use IPv4.

Machine Learning Framework

- Qualified with Keras (TensorFlow 2 backend) and PyTorch 1.5 based Machine Learning models implemented using Python3.

Multi System Cluster Requirements

- Synchronized time across all systems using NTP.

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.

https://www.hpe.com/services

Consulting Services

No matter where you are in your journey to hybrid cloud, experts can help you map out your next steps. From determining what workloads should live where, to handling governance and compliance, to managing costs, our experts can help you optimize your operations.

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HPE Managed Services

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Operational services

Optimize your entire IT environment and drive innovation. Manage day-to-day IT operational tasks while freeing up valuable time and resources. Meet service-level targets and business objectives with features designed to drive better business outcomes.

https://www.hpe.com/services/operational

HPE Complete Care Service

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
- An assigned HPE team
- Modular and fully personalized engagement
- Enhanced Incident Management experience with priority access
- Digitally enabled and AI driven customer experience

https://www.hpe.com/services/completecare

HPE Tech Care Service

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**

Other Related Services from HPE Services:

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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

AI Powered and Digitally Enabled Support Experience

Achieve faster time to resolution with access to product-specific resources and expertise through a digital and data driven customer experience

Sign into the HPE Support Center experience, featuring streamlined self-serve case creation and management capabilities with inline knowledge recommendations. You will also find personalized task alerts and powerful troubleshooting support through an intelligent virtual agent with seamless transition when needed to a live support agent.
https://support.hpe.com/hpesc/public/home/signin

Consume IT On Your Terms

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

Summary of Changes

Date	Version History	Action	Description of Change
18-Dec-2023	Version 4	Changed	HPE Services Rebranding
17-Apr-2023	Version 3	Changed	Added 2.0 Features. Also added product SKUs. Overview and Standard Features sections were updated.
01-Aug-2022	Version 2	Changed	Standard Features Section was updated
27-Apr-2022	Version 1	New	New QuickSpecs

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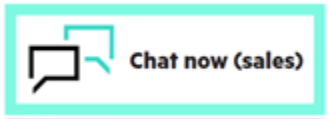

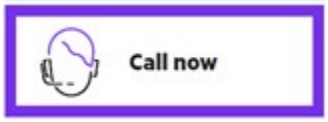

For hard drives, 1GB = 1 billion bytes. Actual formatted capacity is less.

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