Intel® Trace Analyzer and Collector for Intel® oneAPI on Linux* OS

Get Started Guide

Introduction

Intel® Trace Analyzer and Collector is a graphical tool for understanding MPI application behavior, quickly finding bottlenecks, improving correctness, and achieving high performance for parallel cluster applications based on Intel® architecture.

Intel® Trace Collector enables you to collect statistics for your applications, while Intel® Trace Analyzer provides powerful capabilities for visualizing and analyzing the collected data.

Use Intel Trace Analyzer and Collector to:

- Evaluate profiling statistics and load balancing.
- Learn about communication patterns, parameters, and performance data.
- Identify communication hotspots.
- Decrease time to solution and increase application efficiency.

Intel Trace Analyzer and Collector is installed as part of the [Intel® oneAPI HPC Toolkit](#).

Prerequisites

Set up the environment by sourcing the `setvars.sh` script available in the installation directory (by default, `/opt/intel/oneapi`).

This sets the required environment variables for compilers, Intel® MPI Library, and Intel Trace Analyzer and Collector, and you are ready to trace your applications.

For system requirements, see the product [Release Notes](#).

Get Started

Trace Your Application

Run your MPI application using the `mpirun` command with the `-trace` option to generate a trace file:

```
$ mpirun -trace -n 4 ./myApp
```

A trace file `.stf` is generated, for example `myApp.stf`. For tracing details, see [Intel Trace Collector Help](#).

Analyze the Application Behavior

1. Open the generated `.stf` file in Intel Trace Analyzer:

```
$ traceanalyzer ./myApp.stf
```

1. Start analyzing your application using various charts and timelines. As a starting point, use the Summary Page to get the following information:
   o General information about your application
   o Recommendations on where to start the analysis

For detailed description of the available charts and diagrams, see [Intel Trace Analyzer Help](#).

Graphical User Interface

Hover over a GUI element for short description, or click for more details.

Trace Map

The Trace Map represents a miniature view of the MPI functions activity over time. It also enables you to zoom into relevant subsets of a trace file on all open charts.

Event Timeline

The Event Timeline is the most common chart, which provides a graphical display of individual process activities over time. It enables you to get detailed impression of the program structure, as well as retrieve detailed event information.

Horizontal bars represent processes with functions called in them.

Quantitative Timeline

The Quantitative Timeline shows how many processes are executing the same functions at a given point in time. It enables you to get the impression on parallelism and load balance in your application.

As in all other charts, MPI functions are represented in shades of red, serial code — in blue.

Time Scale

A time scale for the currently open timelines displays with the currently selected time interval.

Function Profile

The Function Profile provides an overview of all functions used in the application. It consists of four tabs:

- Flat Profile is a simple overview of all functions.

- Load Balance shows how long each function executed for *all* processes.
- Call Tree shows the call stack.
- Call Graph shows calling dependencies.

Message Profile

The Message Profile shows statistics about *point-to-point operations*.

It categorizes messages by groupings in a matrix, and shows values of the selected attribute in each cell. By default, the Message Profile shows how long messages took to send for each pair of sender/receiver processes. Cell colors represent the message send time, relative to other process pairs, red being the longest.

Collective Operations Profile

The Collective Operations Profile is similar to the Message Profile, but it shows statistics about *collective operations*.

As in the Message Profile, you can configure the columns, rows and attributes to show, and compare the attribute values for each pair. By default, this profile shows how long each operation took to complete for each process. Cell colors represent the operation execution time, relative to other processes/operations, red being the longest.

Toolbar

Use the toolbar to get easy access to the most frequently used Intel Trace Analyzer functionality.

Key Features

Interface and Displays

Intel Trace Analyzer and Collector has a full-color customizable GUI with charts and drill-down view options.

The analyzer is able to rapidly unwind the call stack and use debug information to map instruction addresses to source code.

With both command-line and GUI interfaces, you can additionally set up batch runs or do interactive debugging.

Learn more…

MPI Correctness Checking

The MPI Correctness Checker detects deadlocks, data corruption, and errors with MPI parameters, data types, buffers, communicators, point-to-point messages, and collective operations.

The Correctness Checker enables you to scale to large systems and detect errors even among a large number of processes.

[Learn more...](#)

Performance Assistant

Identify performance issues in your application using the Performance Assistant, which provides the following information:

- Detailed description of the issue and recommendations on how to resolve it
- Information about the affected processes
- Regions in the source code that caused the issue

[Learn more...](#)

Ideal Environment Simulation

Understand application imbalance and estimate a potential application speedup after MPI implementation tuning and/or network upgrades by using the Idealization capability.

[Learn more...](#)

User-Level Instrumentation

Control the profiling library and record user-defined activities, define groups of processes, define performance counters and record their values using the Intel Trace Collector API.

Automatically instrument all your application functions with the Intel® compilers to analyze them with Intel Trace Analyzer.

[Learn more...](#)

Training and Documentation Resources

Visit the [Intel Trace Analyzer and Collector page](#) on intel.com for training and documentation resources including user guides, videos, webinars, featured articles, and more.

Refer to the [Release Notes](#) for product updates and system requirements.

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