

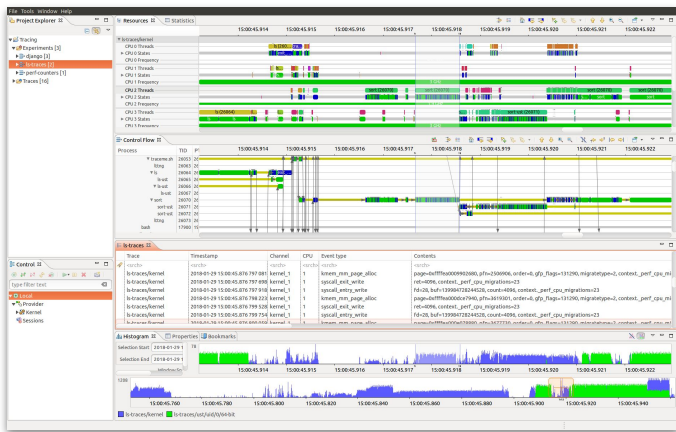


Theia Trace Viewer Design Improvements

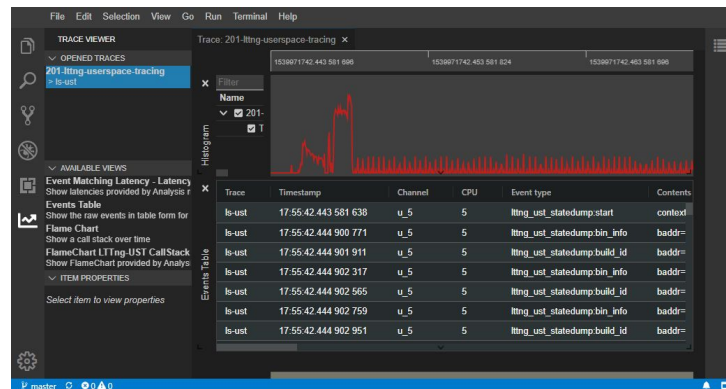
Erica Bugden
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January 2022

Trace Viewer: Theia-based front end

Before



After





Purpose of work

Improve the tool's user experience:

- Improve overall flow, intuitiveness (reduce learning curve)
- Improve view functionality



Outline

- Theia Trace Viewer - Minimum Viable Product
- User-centered development
 - User-centered planning
 - User survey results

Theia Trace Viewer

Minimum Viable Product



Theia Trace Viewer MVP

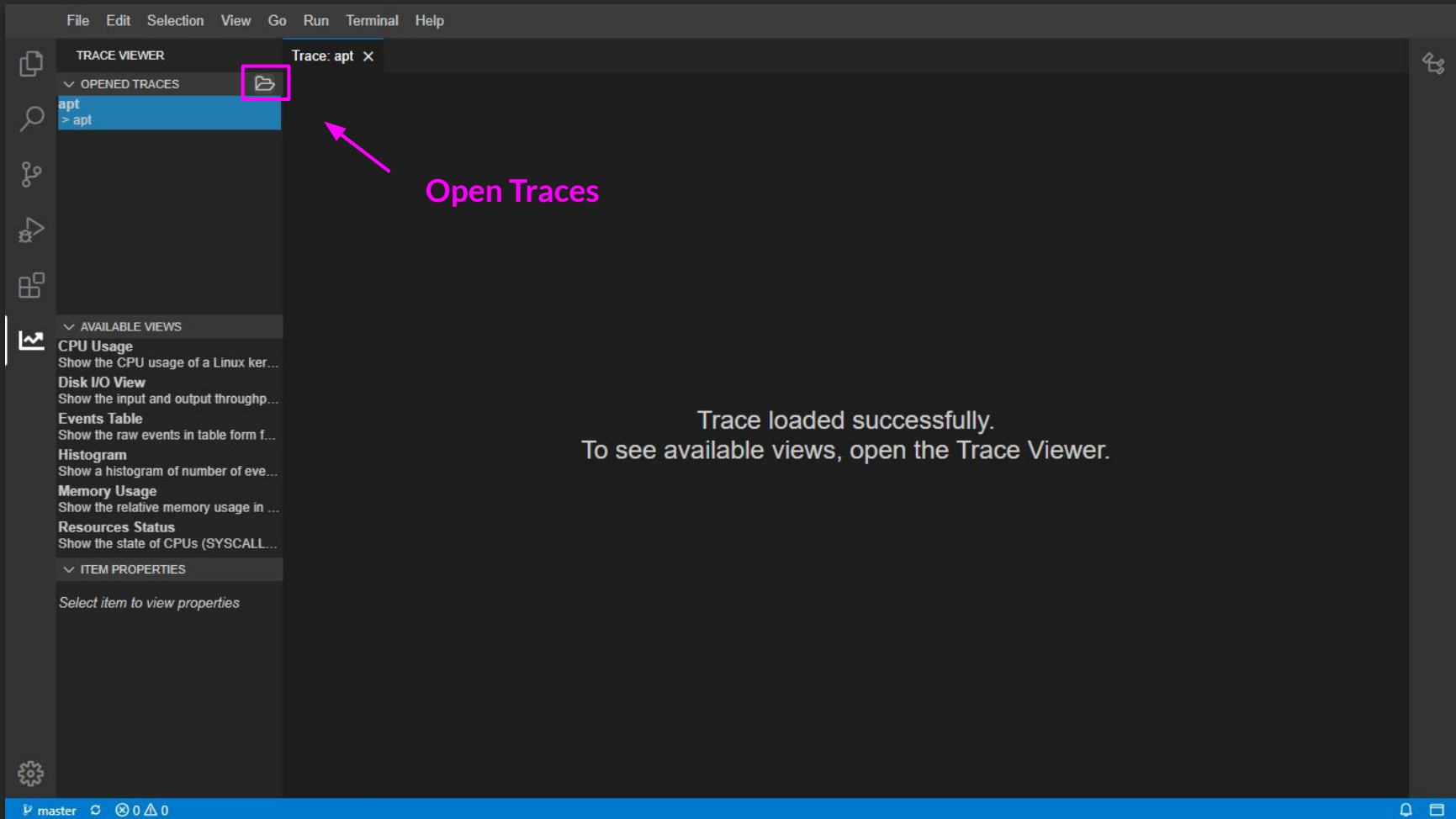
Goal: Allow basic trace analysis without running into features that don't work.

- ✓ Minimal set of trace visualisations (not at feature parity with Trace Compass)
- ✓ Consistent experience



UX Improvements (since June)

- Additional intuitive way to open traces
- Removing/fixing views that do not behave as expected
- Communicating more clearly with users through UI
 - Handling analysis errors (fails, missing events)
 - Displaying something by default in charts



Open Traces

Trace loaded successfully.
To see available views, open the Trace Viewer.

TRACE VIEWER

Trace: apt X

OPENED TRACES

- apt
- > apt

AVAILABLE VIEWS

- CPU Usage
Show the CPU usage of a Lin...
- Disk I/O View
Show the input and output thr...
- Events Table
Show the raw events in table f...
- Histogram
Show a histogram of number ...
- Memory Usage
Show the relative memory usa...
- Resources Status
Show the state of CPUs (SYS...

ITEM PROPERTIES

Select item to view properties

CPU Usage

Disk I/O View

Filter

Process

- apt
- man
- man
- man
- man
- man
- man
- man
- man
- man

Filter

Name

- apt
- sda
- rea
- wri
- loop0
- loop1
- loop2
- loop3
- loop4



Y-axis



MVP: Highly visible limitations

- XY charts: Navigation lag
- Low discoverability of some important features
 - Creation of trace groups
 - Zoom to a specific range (using mouse)



MVP: Give it a try!

Try it using either:

- Gitpod Live Demo, or
- Downloadable Application (If you want to analyze your own traces)

User-centered development

User-centered development

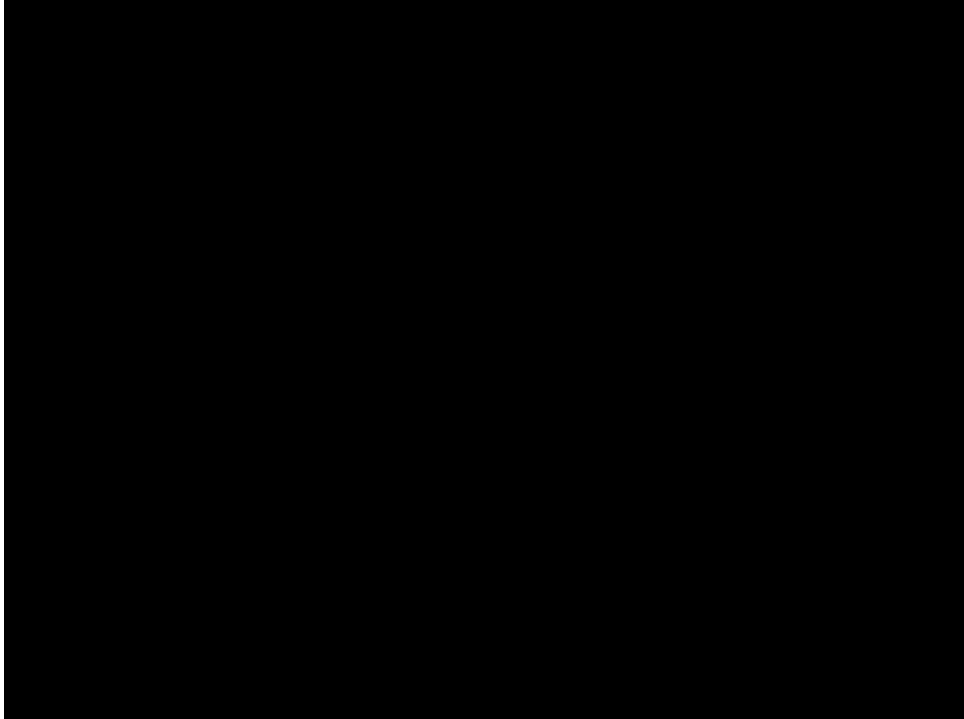
1. User-centered planning
2. User survey



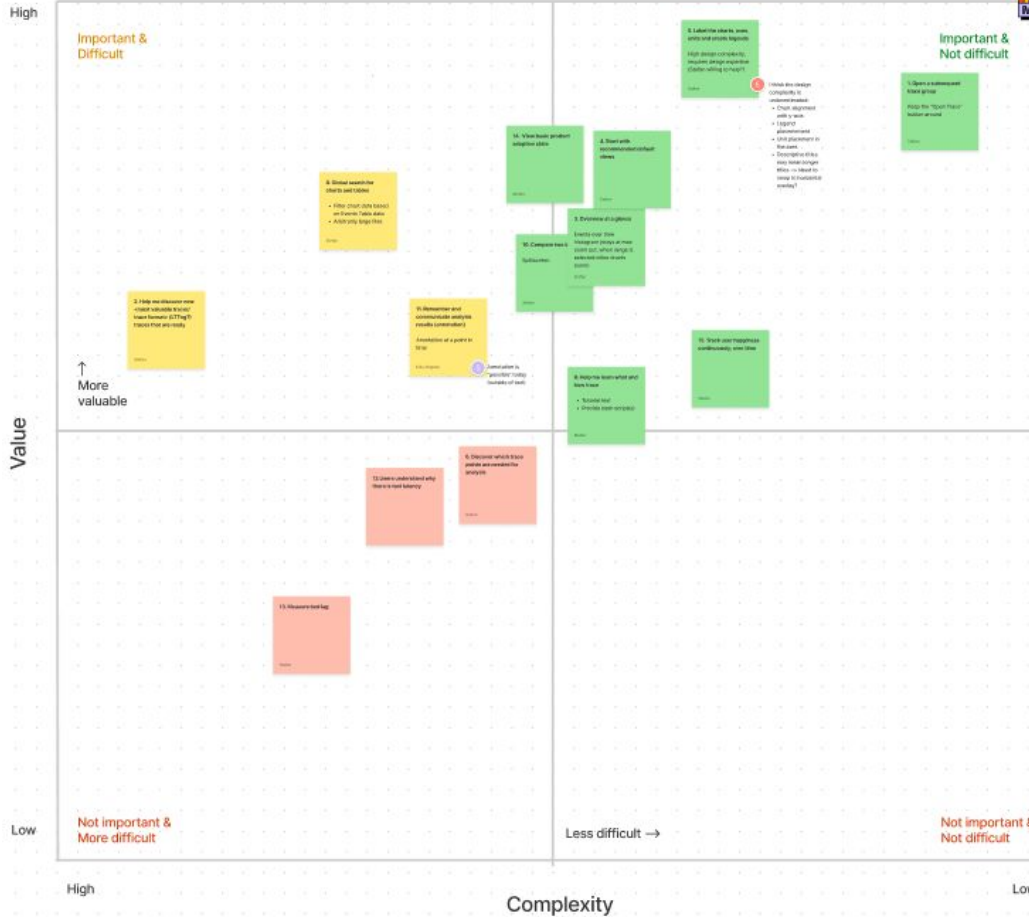
1. User-centered planning

Goal: Identify the most important issues affecting the user experience

- Temporary substitute for user feedback
- Planning participants: Developers and designers (Ericsson & Poly)
- Critique the tool while imagining the user's point of view



Summary Value to Complexity MATRIX



Important & Difficult

↑
More
valuable

Less difficult →

2. Help me discover new <most valuable tracer/trace format> (LITmg?) traces that are ready

Stefan

8. Global search for charts and tables

- Filter chart data based on Events Table data
- Arbitrarily large files

Stefan

11. Remember and communicate analysis results (annotation)

Annotation at a point in time

Erica Bugden

S Annotation is "possible" today (outside of tool)

14. View basic product adoption stats

Stefan

4. Start with recommended default views

Stefan

10. Compare two t

Splitscreen

Stefan

3. Overview at a glance

Events over time histogram (stays at max zoom out, when range is selected other charts zoom)

Stefan

9. Help me learn what and how trace

- Tutorial text
- Provide bash script(s)

5. Label the charts, axes, units and create legends

High design complexity, requires design expertise (Stefan willing to help?)

Stefan

E

I think the design complexity is underestimated:

- Chart alignment with y-axis
- Legend placement
- Unit placement in the axes
- Descriptive titles may mean longer titles → Need to swap to horizontal overlay?

15. Track user happiness continuously, over time

Stefan

1. Open a subsequent trace group

Keep the "Open Trace" button around

Stefan

Important & Not difficult



Impact: Ericsson 2022 Roadmap

New roadmap section specifically for tracking impact of user-centered tasks:

- Evaluate UX impact → If positive: Continue user-centered process shift



2. User Survey

12 survey responses

Participants:

- Dorsal (current members and alumni), Cienna, EfficiOS
- Not sent to Ericsson folks



Take the results with a grain of salt

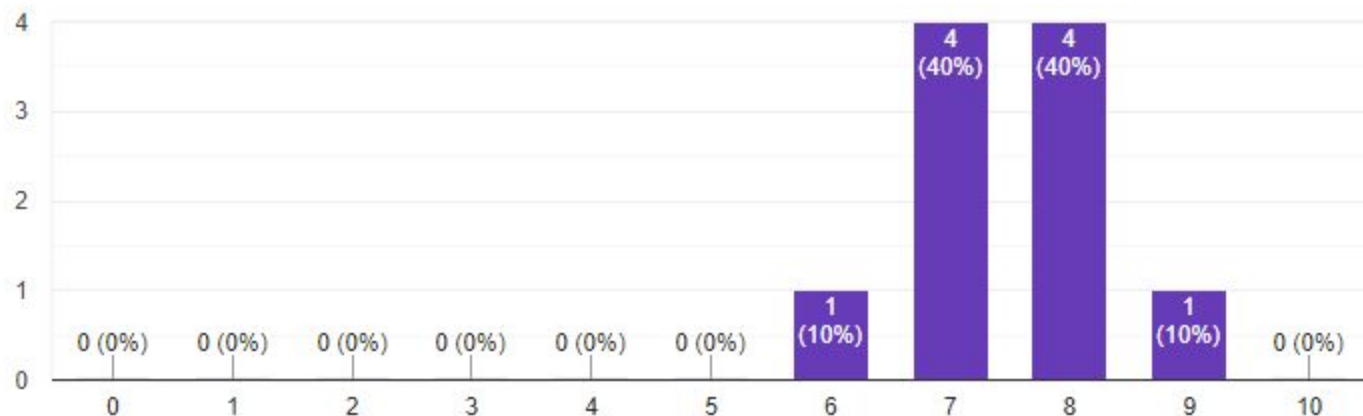
None of the survey respondents regularly use the Trace Viewer for trace analysis.

75% used the tool for less than an hour. The 25% who used the Trace Viewer for more than one hour are developers not users.

How likely are you to recommend?

Overall, how likely are you to recommend the Theia Trace Viewer extension to a friend or colleague who needs to perform trace analysis?

10 responses





Respondents were engaged

Unexpectedly, **most respondents gave** way more **detailed feedback** than the survey required of them.

6 out of 12 respondents are **interested in** participating in **future user research** sessions.

All recommendations (clustered)

Try the tool, install the tool		Discover and load compatible traces		Open relevant views		Navigate and read a chart		Select and filter data		General		New features (Scope enlarging)	
<p>Downloadable application ★</p> <p>Would be great if it were easy to download and launch.</p> <p>Also, downloading Trace Compass as a downloadable application (DCA) to relatively easy, distributed, executable, done. If there is the Trace viewer extension is eventually as easy to download and launch. It's going to be great. I'm not sure if the feature done is how people will end up using it, but that would be pretty cool.</p>	<p>Clarify name</p> <p>Clarify how to open the past 1000 with the browser view gliged</p> <p>This pop-up disappears after a few moments and then it's very difficult to figure out how to open the viewer.</p> <p>Since loading the ground control takes so much time it's common for folks to click away and then the next time to go by the time they check</p> <p>While there's nothing to download, there is a few steps to do to get to the actual trace viewer after clicking on the extension</p> <p>Inform the user that he may need to authorize the viewer to open a window on Firefox for example, otherwise, he risks to not be able to open the viewer.</p>	<p>Open additional traces ★</p> <p>When the Trace Viewer extension is selected, it sends files the only way to open another trace is to go to the Explorer, right click on a directory, click Open Menu > Trace Viewer. It's not sure what would be better though. Maybe right clicking on "OPENED TRACES" (on the empty space) under the list of traces could open a window with all the workshops in the workspace?</p> <p>It's probably interesting to make the "Trace Viewer" menu item as the first one that the user sees once he opens the browser. I think it's the first thing they may want to do. "Open a trace" is probably the second.</p> <p>It's probably interesting to make the "Trace Viewer" menu item as the first one that the user sees once he opens the browser. I think it's the first thing they may want to do. "Open a trace" is probably the second.</p>	<p>Star Discover and load compatible traces</p> <p>Clarify how to open traces, where in the file structure, all with icons grouping out the sub-features</p> <p>File-opens and double click on installable. That's how I would open the traces.</p> <p>Clicking on the open button opened the same file twice and reported that it was already open.</p> <p>The browser could perhaps go up the trace history to open the trace rather than breaking the user wants to open</p> <p>Users are used to clicking all installable to open trace files so that's what they often try to do.</p> <p>Need to make it more obvious that you click what you click to open a trace</p>	<p>Star Open relevant views</p> <p>This analyzes that don't work</p> <p>Analyses that aren't available are still disappoed.</p> <p>some analysis seems to not be available but users may request to display them and they all get a message indicating that the analysis is being processed.</p> <p>There are some views that are not available yet? Like memory usage, explicit. Fates. May be interesting the user somewhere to avoid any frustration will be a good idea.</p> <p>analyze being processed indefinitely I think those analyses are just not available.</p> <p>Memory usage keeps showing Analyze running.</p> <p>Memory usage spinning indefinitely</p>	<p>Star Open relevant views</p> <p>List events required for views</p> <p>for each view, list the expected kernel-space events or user-space events required to render the view.</p> <p>The second memory usage view could not be rendered because there were missing events. This second memory usage event appears to need to be added right so to its parent.</p> <p>None of the other available views were open on the right. Only the CPU usage view worked. If it was not available, then they should not be shown.</p> <p>When a view is presented after loading a trace, if not all event types required for the trace are present, tell the user which ones are missing</p> <p>When displaying the view list in alphabetical order some of the most relevant views (i.e., Thread, ThreadLocal) are at the bottom</p> <p>Some views have the same title</p>	<p>Star Navigate and read a chart</p> <p>Chart labelling ★</p> <p>Chart labelling</p> <p>For CPU and disk I/O usage charts, separate lines based on not time-based chart</p> <p>time scale being displayed at the top of the screen may be misleading when the event label is the first one you get when you open a trace (the reflex to open it first since I use more frequently TraceCompass and I do this by the way you get when you open a trace) since the other time scale will be at the top of the event Table.</p> <p>Chart labelling</p> <p>TimeStamps would gain from being formatted in a standard ISO format. https://en.wikipedia.org/wiki/ISO_8601</p> <p>Label the graph when hovering there, so we know what they correspond to</p> <p>Infinite scrolling is a bit weird with the mouse wheel since you have to be on top of the small scrolling bar on the right side. Not sure what could be done here considering we have to keep the scrolling control aware (sub-views).</p> <p>Discoverability of view adjustment icons</p> <p>It also took me a while to find how to make a view label. The little corner icon bottom left corner of a view and down arrow icon bottom of a view. In the mobile version touch into the background when using the dock.</p> <p>In the resource status view, there should be a legend that shows the meaning of those colors.</p> <p>I would prefer to see the Trace viewer table view if the first view is the table.</p> <p>Do this because it's what would historically be used for searching and filtering?</p> <p>CPU usage left pane contained 2 bars. They were highlighted in different colors but could not detect anything to figure out what color is for which trace.</p> <p>How users have no way to discover what the variable thickness means</p> <p>Also for the graph view, the thickness of bars where sometimes bigger and lower not sure if it's a feature, if it is then not problem but from a quick view I was not able to tell why it was thicker or not.</p>	<p>Star Navigate and read a chart</p> <p>Column width</p> <p>The column sizes should be auto-adjustable to the largest element. There is too much scrolling columns and no requirement to what the Y axis represents (table 7)</p> <p>CPU usage left pane to the small area can't see the SCPU left right away without scrolling.</p> <p>Users expect the chart box with all the details to be adjustable. Chromacity requires a lot of scrolling.</p> <p>Allow to scroll the event table laterally with shift+end</p> <p>Infinite scrolling is a bit weird with the mouse wheel since you have to be on top of the small scrolling bar on the right side. Not sure what could be done here considering we have to keep the scrolling control aware (sub-views).</p> <p>Discoverability of view adjustment icons</p> <p>It also took me a while to find how to make a view label. The little corner icon bottom left corner of a view and down arrow icon bottom of a view. In the mobile version touch into the background when using the dock.</p> <p>In the resource status view, there should be a legend that shows the meaning of those colors.</p> <p>I would prefer to see the Trace viewer table view if the first view is the table.</p> <p>Do this because it's what would historically be used for searching and filtering?</p> <p>CPU usage left pane contained 2 bars. They were highlighted in different colors but could not detect anything to figure out what color is for which trace.</p> <p>How users have no way to discover what the variable thickness means</p> <p>Also for the graph view, the thickness of bars where sometimes bigger and lower not sure if it's a feature, if it is then not problem but from a quick view I was not able to tell why it was thicker or not.</p>	<p>Star Select and filter data</p> <p>Filter events table</p> <p>Allow to use the search box as a filter on the TraceCompass</p> <p>In the events window, there is a missing option and event filter capability (on the right)</p> <p>(disappears when tab is unselected)</p> <p>(Add filtering)</p> <p>In this analysis, I have the search box per column and event. But there was no way to only show those searched view items. I could only use the left-down navigation arrow.</p> <p>CPU Usage: rows should be sorted first by highest CPU usage at the beginning.</p> <p>Highlighting top anomalies in the trace</p> <p>Obviously that they happen used the tool at the last 6 months)</p> <p>Just want to see the CPUs and the processors that are running. Having the the PID and CPU frequency always present without being able to remove them isn't often useful and I have a lot of vertical space.</p> <p>Events Table: When a single trace is loaded, the trace column is useless. It should only be shown when there are multiple traces being shown w/o expansion.</p>	<p>Star Select and filter data</p> <p>More advanced searching</p> <p>Also for the keyboard section, searching only with text seems limited (and so did work for me).</p> <p>New way to search for symbols by name and highlight them in the graph</p> <p>The payload is organized data, and it should be clear how to do more "advanced" search with fpc, e.g. <code>!threadName+log</code> and such (if it is available).</p> <p>The order of the columns is important. Left-hand columns should contain the most useful data e.g. ThreadName, Id, PID, CPU, event type and context.</p> <p>For the event table, the search box for matching text makes no sense for a time-stamp column: there you would want the user to allow selecting time ranges (e.g. days, hours, minutes, ...)</p> <p>The event table visible columns should be configurable.</p> <p>CPU Usage: rows should be sorted first by highest CPU usage at the beginning.</p> <p>Highlighting top anomalies in the trace</p> <p>Obviously that they happen used the tool at the last 6 months)</p> <p>Just want to see the CPUs and the processors that are running. Having the the PID and CPU frequency always present without being able to remove them isn't often useful and I have a lot of vertical space.</p> <p>Events Table: When a single trace is loaded, the trace column is useless. It should only be shown when there are multiple traces being shown w/o expansion.</p>	<p>Star General</p> <p>Push, usability</p> <p>There are still many rough edges as compared to Eclipse Trace Compass</p> <p>The product should be more stable</p> <p>Need a way to search for symbols by name and highlight them in the graph</p> <p>The payload is organized data, and it should be clear how to do more "advanced" search with fpc, e.g. <code>!threadName+log</code> and such (if it is available).</p> <p>In this analysis, I have the search box per column and event. But there was no way to only show those searched view items. I could only use the left-down navigation arrow.</p> <p>CPU Usage: rows should be sorted first by highest CPU usage at the beginning.</p> <p>Highlighting top anomalies in the trace</p> <p>Obviously that they happen used the tool at the last 6 months)</p> <p>Just want to see the CPUs and the processors that are running. Having the the PID and CPU frequency always present without being able to remove them isn't often useful and I have a lot of vertical space.</p> <p>Events Table: When a single trace is loaded, the trace column is useless. It should only be shown when there are multiple traces being shown w/o expansion.</p>	<p>Star General</p> <p>UI log</p> <p>Lack of usefulness</p> <p>It was a bit sluggish on my end but this is still that can be improved in time.</p> <p>Stability: Needs to be able to handle 10 traces no problem.</p> <p>Also responsiveness is a bit low (we keep traces > 20M events).</p> <p>Answered that they hadn't used the tool in the last 6 months)</p> <p>Answered that they hadn't used the tool in the last 6 months)</p> <p>Missing responsiveness</p> <p>I couldn't find how to make the sidebar left of the chart view (towards the left)</p>	<p>Star New features (Scope enlarging)</p> <p>Flame Graph View is missing. That is a must in addition to the Flame Chart view.</p> <p>No stack frame in the left pane.</p> <p>Why is not there a socket or socket view for a trace called "network" experiment?</p> <p>No way to load symbol file.</p> <p>To be able to use with TraceCompass for viewing user space and kernel space traces as well as experiments.</p> <p>Answered that they hadn't used the tool in the last 6 months)</p> <p>Have a stable product that uses 95% of the job and works in the browser</p> <p>Answered that they hadn't used the tool in the last 6 months)</p>	



Top issues

1. **Missing or unclear chart labelling** (11 comments)
2. **Lack of UI smoothness** (5 comments)
3. **Fix analyses that appear to not work** (5 comments)



Ongoing user-centered work

- 2022 Roadmap theme: User feedback (metrics, surveys)
- Internal user survey at Ericsson

A couple more things...




Hackathon: Come +1 your favourite issues!

Issues prioritized in:

- User-centered planning
- User survey



Thank you!



What do you think?

Trace Viewer UX Contact:

Stefan Smagula

stefan.smagula@ericsson.com

Presenter Contact:

Erica Bugden

erica.bugden@gmail.com

Annex



User-centered planning results

IMPORTANT & EASIER (MAGIC QUADRANT)

- Open subsequent trace group
- Label the charts, axes, units, create legends
- Start with recommended default views
- View basic product adoption stats
- Track user happiness
- Overview at a glance
- Compare two traces
- Help me learn what and how to trace

IMPORTANT & DIFFICULT

- Global search across charts and tables



Prospective User Survey - Recommendations

Try the tool, Install the tool

- Clarify how to open the port 3000 with the browser via gitpod - DONE
- Provide quick way for users to analyze their own traces ☆ - DONE

Discover and load compatible traces

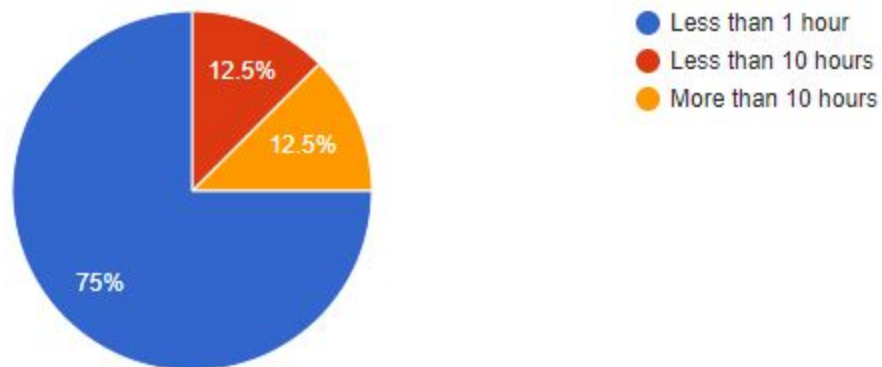
- Add intuitive way to open additional traces ☆ - DONE
- Start demo with Trace Viewer open ☆
- Clarify which file to select to open a trace
- Clarify when the trace server is offline
- Clarify trace set actions

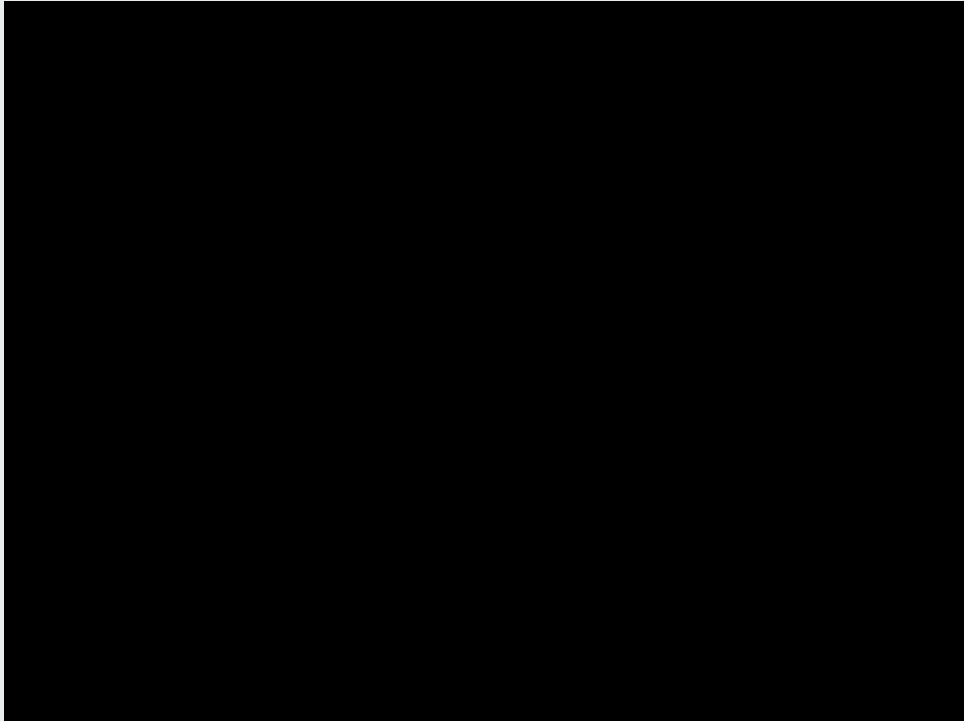
Open relevant views

Usage





In the past 6 months, how many hours have you spent using the Theia Trace Viewer extension?

8 responses





Recommendations

Try the tool, install the tool	Discover and load compatible traces	Open relevant views	Navigate and read a chart	Select and filter data	General
<p>Clarify how to open the port 3000 with the browser via gitpod</p> <p>This port 3000 disappears after the events and then the port 3000 is the view</p>  <p>Since every time the gitpod demo takes so much time it's common for folks to click away and then the port is gone by the time they come back</p> <p>Provide quick way for users to open their own traces</p> <p>ex. D, apply trace</p> 	<p>Add intuitive way to open add traces</p>  <p>Clarify which file to select to open a trace</p> <p>Ex. Special file icon for the root of a trace file, grey out sub-hidden files</p> <p>Some Trace Compass users are trying to click on the metadata file to open a trace.</p> <p>Clarify trace set actions</p> <p>Right click menu</p> <ul style="list-style-type: none"> Remove "Disable Trace" to "Remove-Trace"-DONE Remove "Open Trace" it's faster to just click on the trace Remove "Close Trace" to "Close Tab" or "Close Trace Tab" This option can be useful if you have many tabs open and don't want to hunt for the tab <p>Start demo with Trace Viewer open</p> <ul style="list-style-type: none"> New users aren't sure where to look for it. Old users miss the new way to open traces because they go straight to the File Explorer and use the old trace opening method <p>Clarify when the trace server is offline</p> <p>This is critical information because the Trace Viewer does not work without the Trace Server</p> <p>Users seem to not notice the bottom bar. Even if they did notice, they wouldn't be able to guess that "Offline" means "The trace server is offline".</p>	<p>Fl/Filter analyses that don't work properly</p> <p>Memory Usage still seems to spin infinitely often.</p> <p>List events required for views</p> <p>Can we know which events were analyzed?</p>	<p>Chart labelling</p> <p>Add units to charts</p> <p>Ideally in the axis labels</p> <p>Clarify explanations of chart contents</p> <p>ex. Improve chart titles and descriptions</p> <p>Only display the time scale for time-based charts</p> <p>This didn't happen in the five demo when I loaded it, but one user reported that when they opened the Events Table the time scale appeared.</p> <p>Visually show when data is still loading</p> <p>If data that should currently be visible to the user is still loading, show this visually so that users don't start interpreting what they see.</p> <p>ex. Grey out the view</p> <p>Display error data by default</p>  <p>Difficult to read detailed contents</p> <p>Right now lots of scrolling is required, lots of important details are hidden by default.</p> <p>Columns widths that adapt to content, adjustable column width</p> <p>Don't automatically reset manually resized views when a new view is opened</p> <p>Users were surprised (and some frustrated) when they opened a new view and manually resized views were reset back to the default size.</p> <p>Use standard ISO format for timestamps</p> <p>Time scale: Add units</p> <p>Time scale: Improve number formatting</p> <p>Separate time-based charts from others</p> <p>For example, if you open the Events Table first, as soon as you open a chart that is time-based the time scale will appear above the Events Table which is confusing.</p>	<p>Events Table: Add filter</p> <p>Allow filtering out all events that don't match the search criteria.</p> <p>Events Table: Only show trace columns when there is more than one trace in the set</p> <p>Displaying this information for one trace is not useful and a waste of space.</p> <p>Events Table: Use a different kind of search for timestamps</p> <p>Text matching search doesn't make sense for timestamps.</p> <p>CPU Usage: Sort rows from highest to lowest CPU usage</p> <p>Events Table: Allow configuring which columns are visible</p> <p>Events Table: Allow hiding IQs and CPU frequency</p> <p>Sometimes interesting, but most often take up a lot of vertical space</p>	<p>Improve view responsiveness</p> <p>All chart types need to be able to handle typically slow traces (ex. 1 GB) without stalling. Without this, we can't call the product viable.</p> <p>Currently the XY charts can't keep up with the Gantt charts at all. This looks empty to users and sometimes makes XY charts unusable.</p> <p>Caused by memory leaks?</p> <p>Clarify the overall transition from Trace Compass</p>

