

# Visualizing & Hiding Latency

Where did that latency go ?

Michael Meeks

CEO

michael.meeks@collabora.com



Collabora  
Online



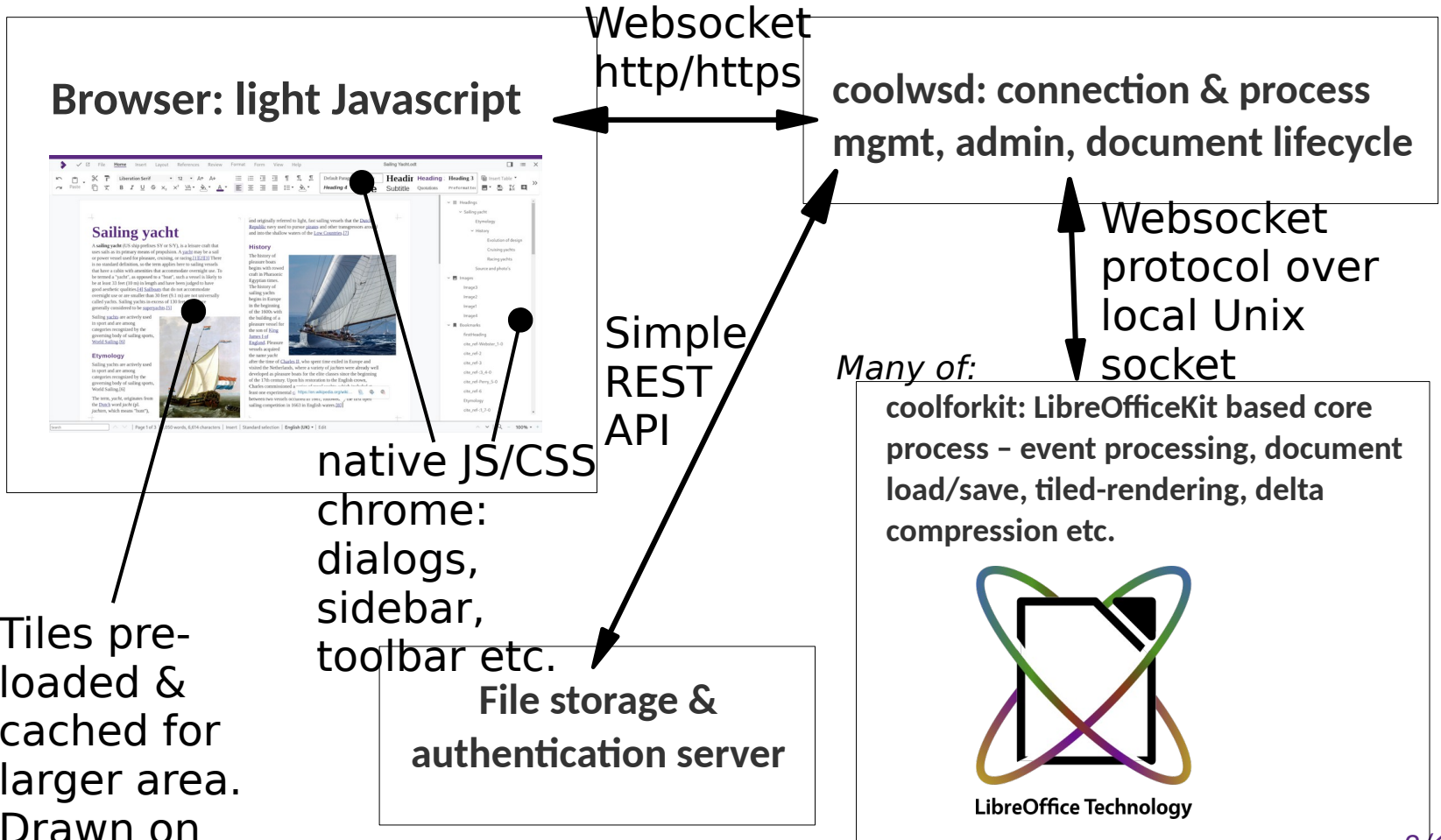
Technical Day  
COOL  
days



**Always profile  
before optimizing !**

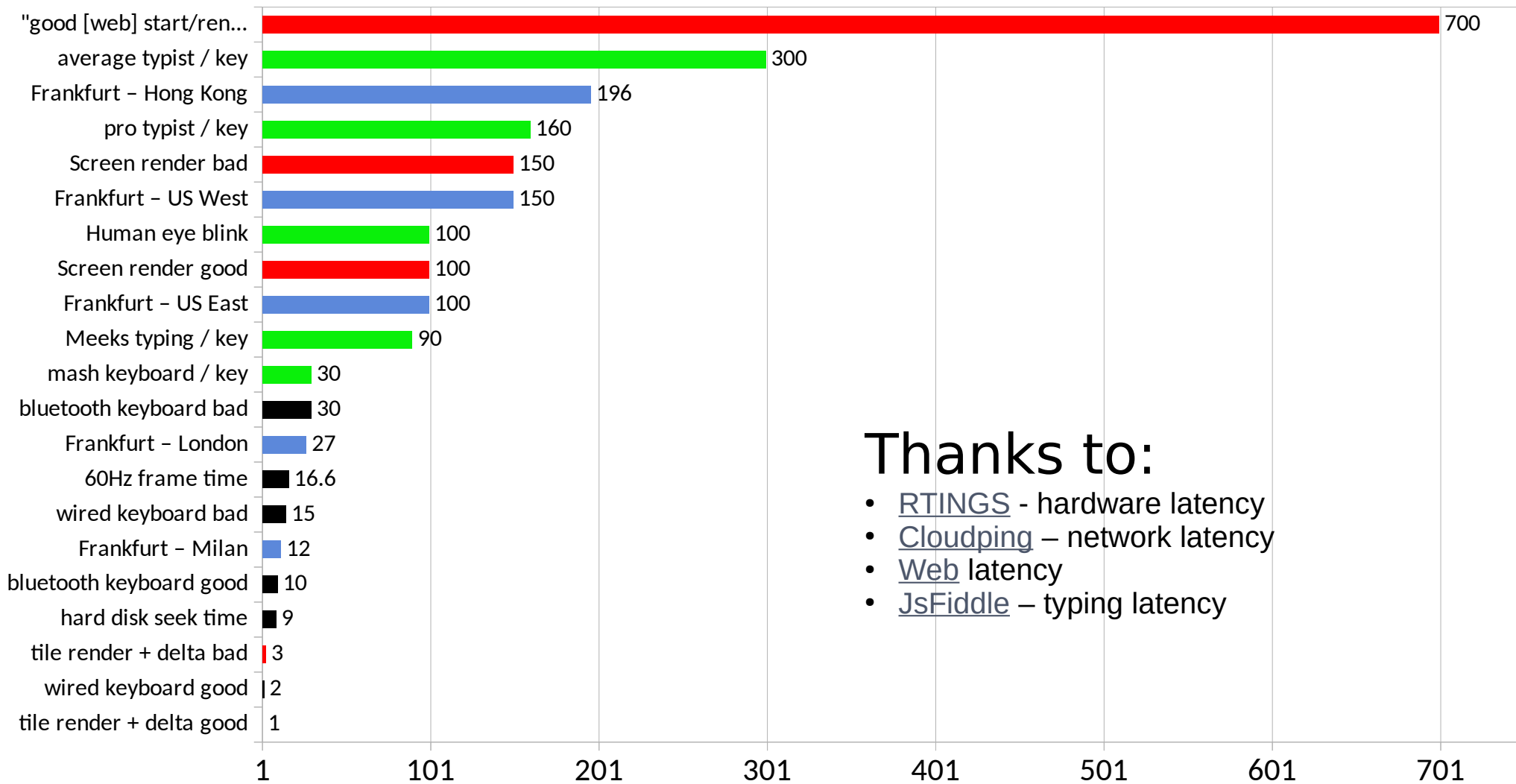


# The various pieces:



Tiles pre-loaded & cached for larger area. Drawn on canvas

## Sample latencies - Milliseconds - linear plot



Thanks to:

- [RTINGS](#) - hardware latency
- [Cloudping](#) – network latency
- [Web](#) latency
- [JsFiddle](#) – typing latency

**Lets measure you !**



**Start counting blinks  
when you see green**

**...**

**Stop when you see  
red.**

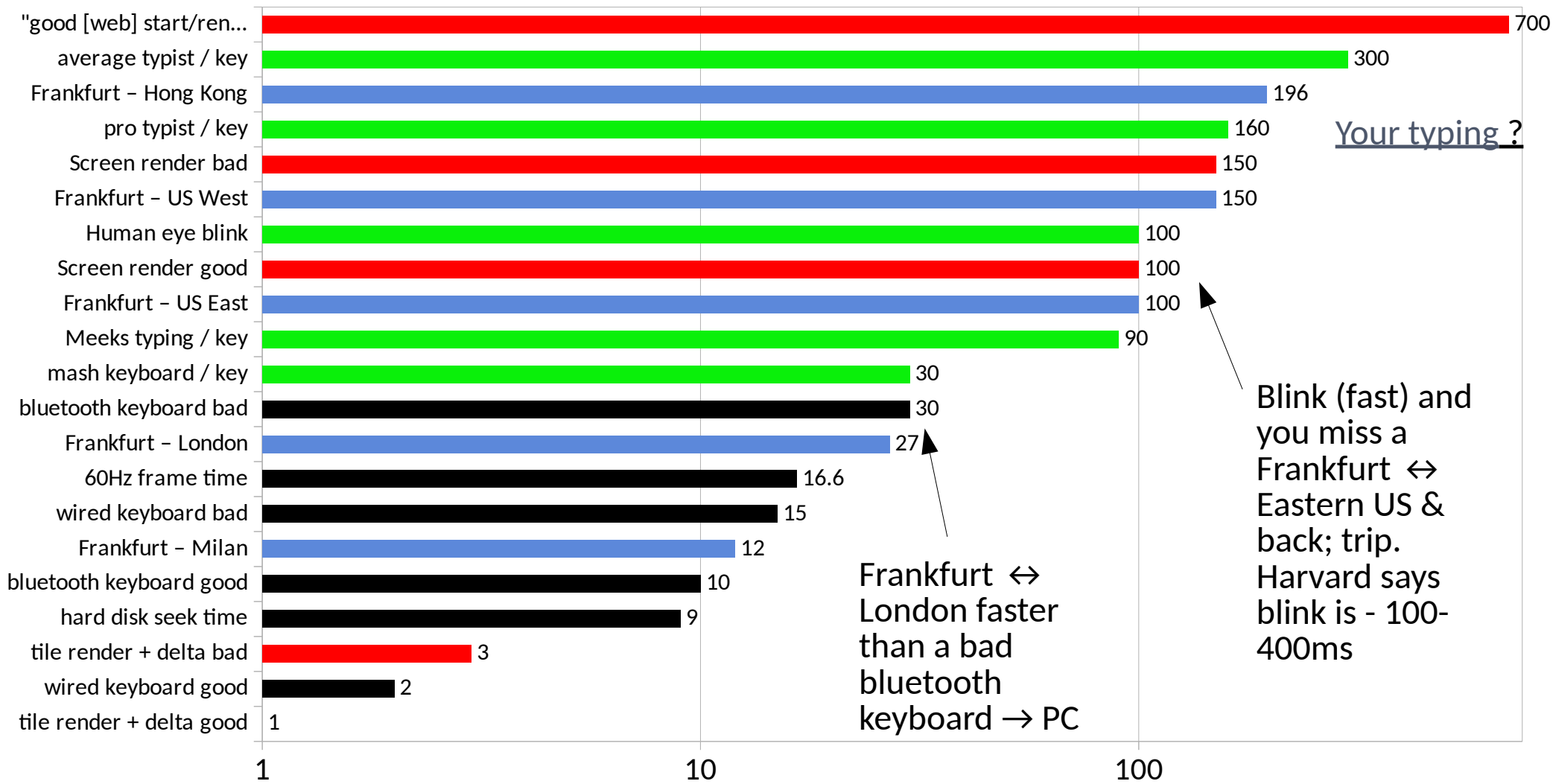


# How did you score ?

## Reciprocation for beginners:

- 1 → 1000ms per blink
- 2 → 500ms per blink
- 5 → 200ms per blink
- 6 → 167ms per blink
- 7 → 143ms per blink
- 10 → 100ms per blink
- ~130 → ~7.7ms (peregrine falcon)

Sample latencies - Milliseconds - log plot





# Measuring Performance

Don't optimize before profiling



# Profiling & testing

## Perception != Performance

- Making things slower can make them seem faster:
  - Better not to 'tear'
  - Wait for more data before re-rendering.
- Do we see lots of flashing red invalidation rectangles ?
- How does it “feel” in our community call with ~20 people.

## CPU sample is not everything.

- Demo + Internal daily real-world use
- slow burn + flame-graph
- Profiling interactive stress testing.

## End to end tracing tooling

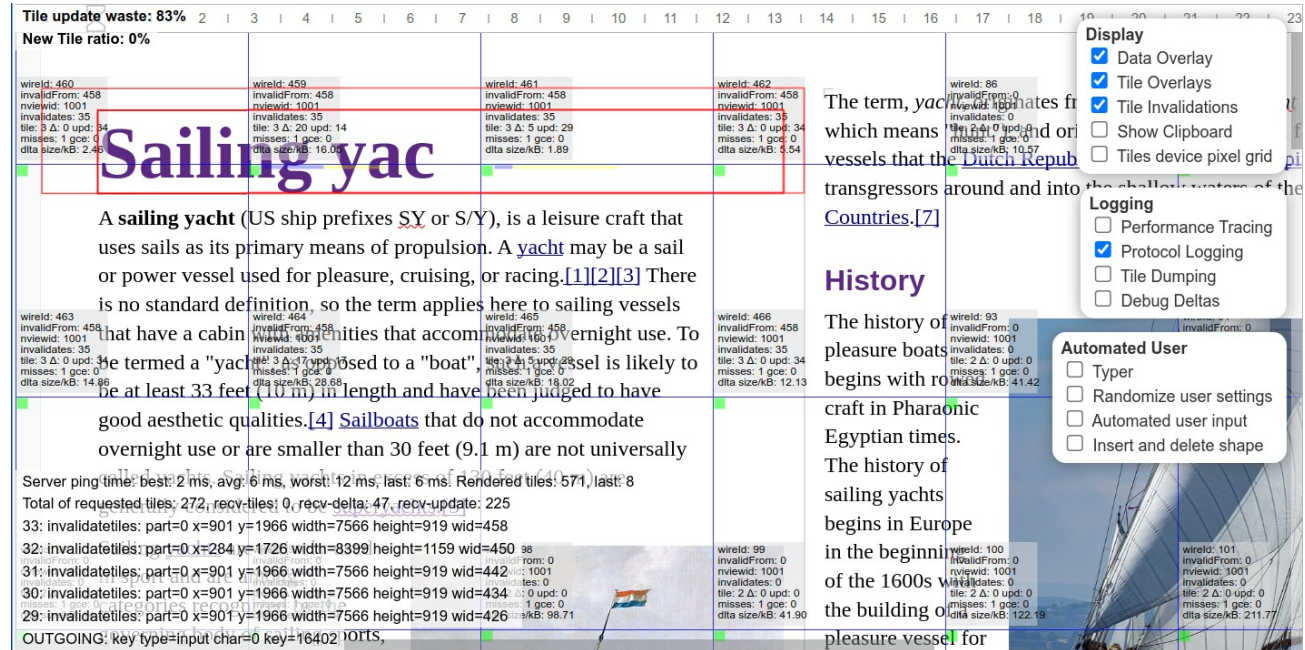
- Tracking & aligning times from the three involved processes ...



# Interactive debugging & visualization

Help → About → Triple click.

- Lots more useful data
- Invalidation areas linger as red surrounds after a block red flash.
- If the screen flashes red:
  - Something is wrong



**Status**

Green:

valid

Yellow:

pending

Red:

invalid

In-tile transparent graph of recent history

Deltas

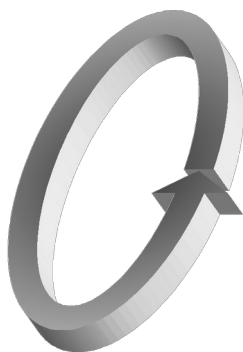
Zero size updates



# Chasing / tracing 'hangs' ...

## Watchdog profiling

- Export COOL\_WATCHDOG=1
  - adds a hook for perf. triggered every 10ms after 100ms out of Poll
  - “watchdog\_probe” function for **perf** to hook



VCL's Scheduler  
VCL callbacks

Yield:  
Kit – SocketPoll::poll  
*waits for work*

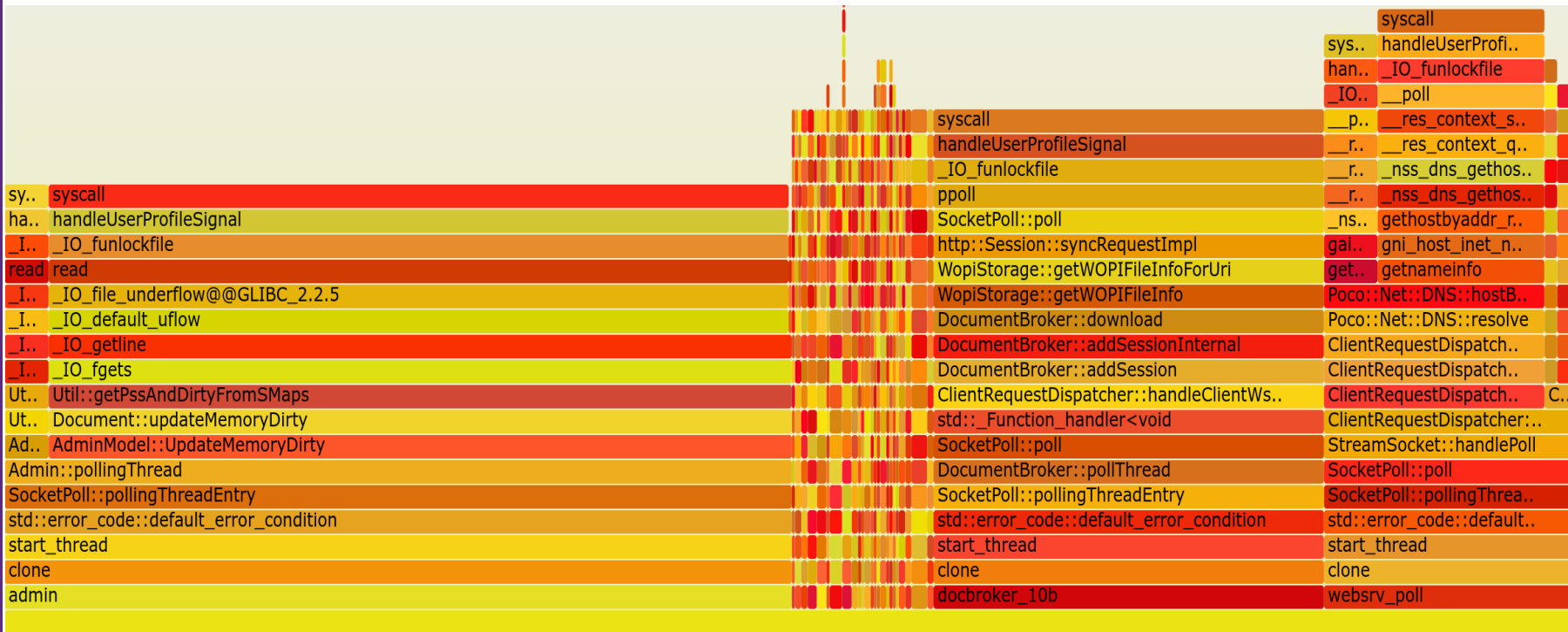
handleIncomingMessage  
→ paint / keypress etc.



+ > 100ms ?



# Initial results – promising:



Admin console memory polling

New user joins!

convert-to

# End to end tracing tool

Following events from  
kit ↔ coolwsd ↔ browser



# Better Latency Hiding – more cache

## More aggressive Javascript tile caching

- An old tile is better than nothing
  - 150 - 250 tiles as canvases (30-60Mb)
  - Shepherd canvas memory better
  - JS 'GC' is not your friend; need to explicitly memory manage these.

## Store & manage zstd compressed tiles

- 1000 – 2000 tiles zstd compressed
  - Keyframes + Deltas

## Retaining tile cache for other 'parts'

- Keeping cache for previous / next sheets
- Keeping cache for other slides

## Tracking global invalidations

- To manage caching of not shown parts.



# Better Latency Hiding – pre-fetching

## More aggressive pre-fetching

- **Impress:**
  - Next Previous / Next Slide in direction of movement – 100ms after switch
- **Calc:**
  - Fetching and caching around the view area.
  - Helps accelerate scrolling.





# Better Latency Hiding – other

## Continual style re-thumbailing redux

- Cache of generated JSON
- Send after a delay not at start ...

## Other pieces:

- Load time interleaving (Ash talk)
- Background save (more later)

## Less bandwidth

- jsdialog → deltas - smaller changes
- Smaller / leaner Javascript ...



# Future / Ongoing work:

## Watchdog profile chewing

- Catching the worst culprits.

## End to end trace reading

- Diving into these ...

## More UX tracing / reading traces ...

- We can see slow user-commands in the flamegraph but:
- **UX:** eg. log each user / UNO command eg
  - .uno:Copy, .uno:InsertPivotTable ... popular things to do by component.



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**COOL**  
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# Thank you!

*By Michael Meeks*



@CollaboraOffice  
hello@collaboraoffice.com  
www.collaboraoffice.com