KernelShark 1.0
Transforming the GUI into a toolkit

Yordan Karadzhov

VMware Inc. - OSTC
What is KernelShark?

* Front end reader of Linux kernel tracing data (Ftrace)

* The original version - started in 2009.

* Written in Gtk+-2.0

* Main goal: analyse and fully understood the performance of the Real-time scheduler.
What is KernelShark?

* Front end reader of Linux kernel tracing data (Ftrace)

* New KernelShark: use all lessons learned from the old version.

* Completely rewritten to use Qt.

* But not only this ...
The New KernelShark is

a. Optimized for processing significantly larger amounts of data.

b. New scalable data model - \( \log(n) \) time complexity.

c. OpenGL-based visualization.

d. Preconfigurable - Json config I/O.

e. User modifiable - plugins.
* Nothing Revolutionary
* A number of small improvements.
Visualization model - How does it work?

a. Break the data-set into **time-bins** $\leftrightarrow$ like a histogram.

b. Check only the records at the beginning and at the end of each bin. $\leftrightarrow$ **constant time**.
Visualization model - How does it work?

c. Have the trace records, sorted in time.

d. Knowing the index of the first record in each Bin determines the state of the model.

e. But the first element can be found with a binary search $\Rightarrow \log(n)$ complexity.
Visualization model - How does it work?

Data Binning provides $O(\log_2(n))$ average time complexity of all operations of the model.
Visualization model & tracing data formats

- The KernelShark Visualization model is not coupled to a particular data format.
- Uses KernelShark-specific data structure.
- Contains only the absolute minimum of information need by the model.
- The rest of the information - available on demand (can be slow)
Visualization model & tracing data

- Only one model (data structure) for all graphs.
- Worst-case complexity becomes linear.
- Solution - Data collections.
Visualization model & Data collections.

- Only one model (data structure) for all graphs.
- Worst-case complexity becomes linear.
- Solution - Data collections.
DEMO
Plugins

- Very powerful.
- Can overwrite the content of the data.
- Can plot on top of the existing graphs.
KernelShark: current version 0.9

https://git.kernel.org/pub/scm/utils/trace-cmd/trace-cmd.git/

To build the code follow the instructions in

/trace-cmd/kernel-shark-qt/README

and

/trace-cmd/README
KernelShark is not a GUI. KernelShark is a toolkit.

What’s next after KernelShark 1.0?

a. KernelShark engine (libkshark.so)

b. Available under GNU LGPL v2.1

c. Highly customizable (via plugins)

d. Will read multiple data formats
KernelShark is not a GUI. KernelShark is a toolkit.

What’s next after KernelShark 1.0?

a. Any tool will be able to use the library
b. Available for Python applications (libkshark.py)
c. The KernelShark application is just a “shell”.