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Web10G: Stack Metrics for the Rest of Us

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Why Stack Metrics Matter

- All performance problems look the same
  - Which complicates diagnosis considerably
    - This imparts a significant impediment to workflow
  - However, the TCP stack ‘knows’ quite a lot
    - It has to in order to respond to events properly
  - Getting what the stack knows to the user can help identify the cause of poor performance
    - Sadly, the stack isn’t instrumented. All we really have is a ‘check engine’ light.

Why Stack Metrics Matter 2

- Poor performance increases costs and decreases productivity
  - Resolution of performance problems takes time
    - Often because each problem has to be addressed from a position of no information
    - The interactive cycle with the user can take days if not weeks to resolve the problem
- Stack metrics can give engineers real time real world insight.
  - This can reduce user downtime and support staff effort

How To Get The Metrics

- Instrument the stack
- Bring the metrics out of the kernel
- Provide an API
- Build tools
- Simple!

Web10G: Making it Happen

- Instrumentation
  - RFC 4898 provides the basis of the KIS
    - 127+ different metrics based on known and inferred events in the TCP stack.
    - Duplicate acks, spurious retransmissions, timeouts, congestion window, sack blocks, congestion events, etc.
  - Currently supports Reno, BIC, CUBIC, & HTCP.
  - Each connection is maintained in a persistent yet stateless struct in kernel memory
    - Each instrument contains the *current* value and nothing more. No lifespan data in the kernel.
  - Relatively lightweight
    - Can support millions of connections

Web10G: Getting to the Data

- Need to move the data out of the kernel
  - Normally kernel memory is siloed from userland
    - However, there are methods to access some data
  - Proc is slow. Netlink (nl) is much faster and very well supported in the Linux kernel
- Web10g binary interface developed as DLKM.
  - Provides wrappers and entry points into KIS memory structs via a generic netlink (nl) family
- Other access methods can be built around nl using the Web10G nl family.

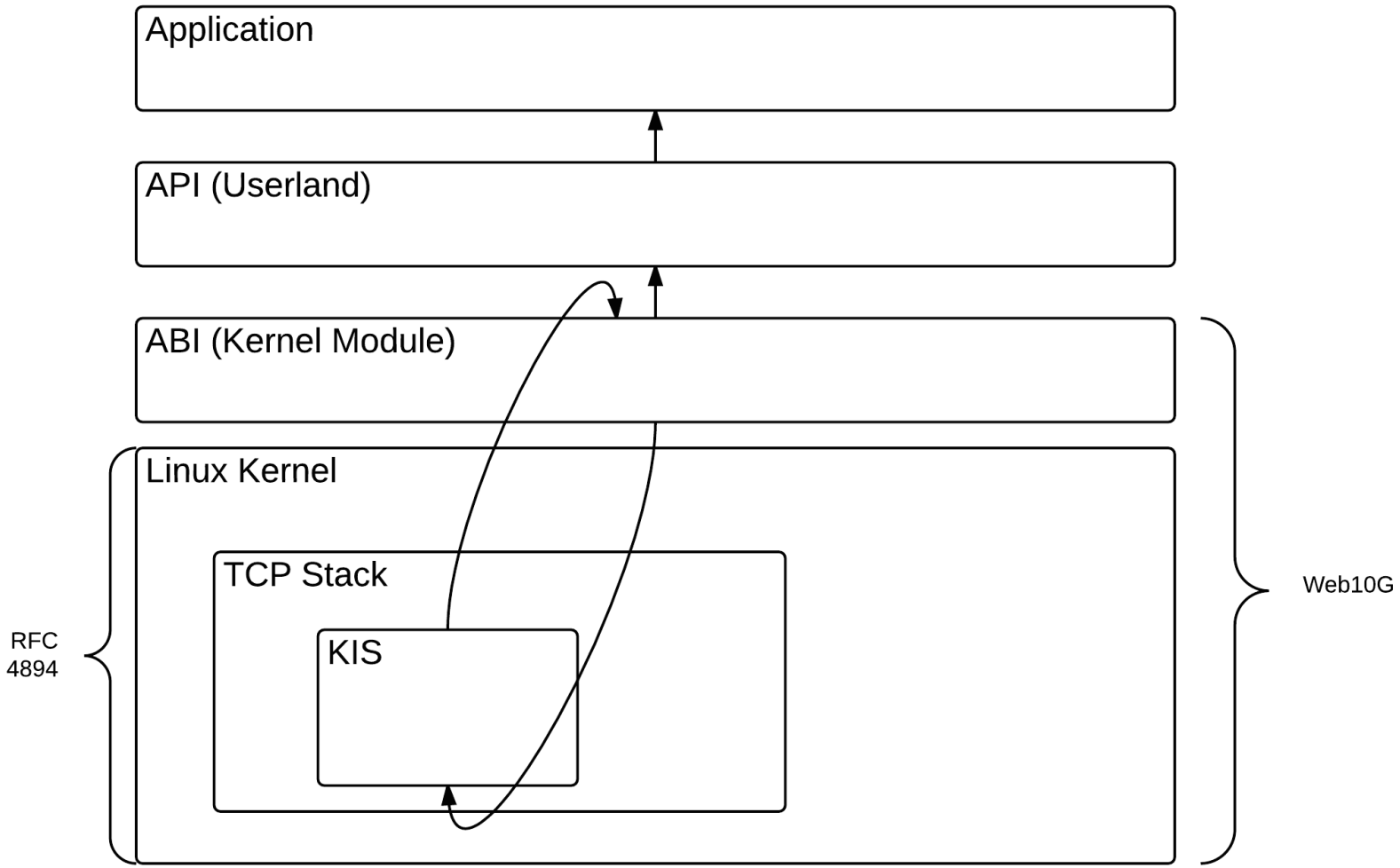
Web10g: Using the Data

- User side API developed to interact with netlink and process results
  - Relatively simple with a small number of calls.
    - Example code

```
Estats_nl_client_init (&client_list);
Estats_val_data_new(&tcp_data);
Estats_read_vars(tcp_data, cid, client_list);
{…do stuff with tcp_data…}
Estats_val_data_free(&tcp_data);
Estats_nl_client_destroy(&client_list);
```

  - Can be incorporated into almost any existing application or build new tools easily
  - User only has access to their own connections

Web10g in Pictures



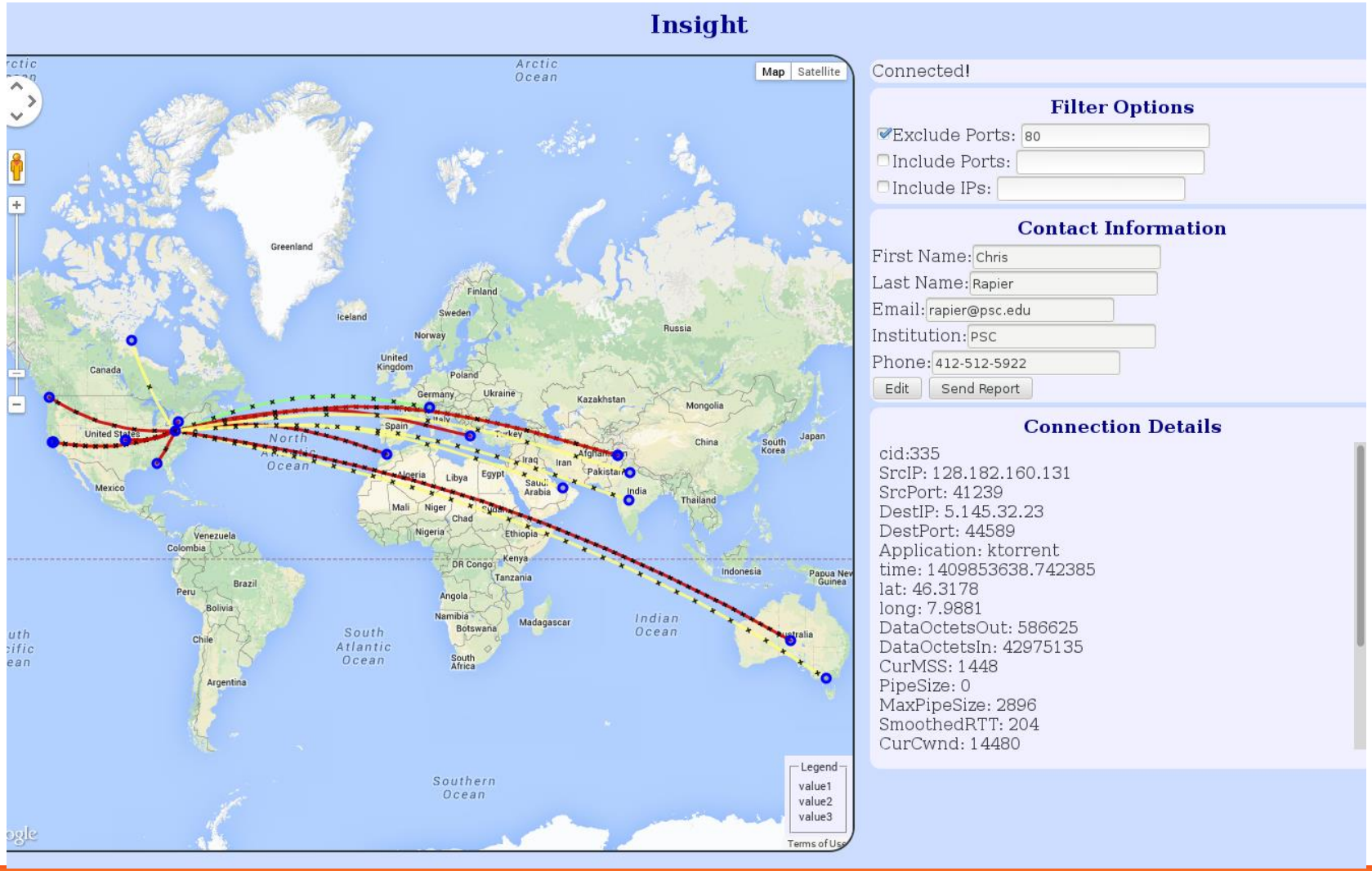
Why Bother?

- More information
- Better tools
- Deeper insight into usage

The Insight Tool

- Three different types of network users
  - Those who know, those who expect too much, those who expect too little
  - Underutilization is a *real* problem
- How do we help those who don't expect enough?
  - Give them a tool to visualize their flows
  - Point out poorly performing flows
    - Which is a *hard* problem
  - Let them easily report problems to the NOC
  - Teach them what to expect

The Insight UI



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The Insight client

- Simple websocket server that monitors flows
- Accepts commands in JSON format
  - Stacked filters allow for fine tuning of the returned data
    - Filter on destination IP/mask, ports, and applications
    - Metric mask to limit results to specific data points
- Reports returned in JSON format
- Not tied to a specific UI.
  - Can be used as a base for other monitoring projects
- Can return reports directly to a RDBMS

The Insight NOC Tool

- Give NOCs an easy entry point into reported flow data
- Still barebones at the moment
  - Currently can find a view data in a table format
  - Hoping to add:
    - Reporting
    - Advanced search
    - Some level of data visualization
      - Particularly to show change over life of flow

Insight in Action

- Your patience please while we load the demo

Next Steps for Insight

- Insight tool is still too limited for most users
  - Dependencies create large barriers to entry
  - Cannot monitor 3rd party transfers
  - Still requires users to *watch* the flow
- Solution: Install in DMZs to monitor scheduled transfers
  - Provide a UI to the NOC with better alarming
    - This would include reporting and analysis to find trends
  - Give users access to real time visualization or post transfer reports in plain language
    - Authorization is going to be hard but doable.

Status of Web10g

- Core code is stable and deployable
- Working with teams at Google to prepare for submission to Linux kernel
- Tool development is on going

- http://www.web10g.org
- http://github.com/rapier1/web10g
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