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ripfix: Rapid Prototyping and Debugging of IPFIX Applications in Ruby

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The Problem

- IPFIX is based on a machine-efficient but not particularly human-manipulable or easily debuggable representation
  - AAoBp0wzRUMAAAAAADd1QACAKwE0gAOAUIABAAIAAQADAAEAAcAAgALAAKBmQAEAACK7
    oGSAAEAAIrugZP//wAAiu6Bnv//AACK7oGW//8AAIrugZf//wAAiu6BlP//AACK7oGV//
    8AAIrugZj//wAAiu4Q4QALAUIABAAIAAQADAAEAAcAAgALAAKBmQAEAACK7oGcAAIAAIr
    ugZIAAQAAiu6Bnf//AACK7oGW//8AAIrugZf//wAAiu4E0gCmS7PydMCoAAPAqAACl...
- IPFIX implementations often optimized for performance, not “tweakability”
- Lots of things that would lead to greater implementation, application, and adoption of IPFIX are harder than they should be:
  - Testing, debugging, disambiguating interoperability issues
  - Trying out new ideas, extensions, IEs, applications, etc…

The solution

- Need an IPFIX implementation optimized for development, as opposed to production use:
  - Ease of building new applications that use IPFIX → general “ease of (developer) use”
  - Ease of building new general IPFIX tools for debugging → applications with no internal data model
  - Ease of modifying the implementation itself → rapid prototyping of protocol extensions
- Support “rough consensus and (rapid) running code.”

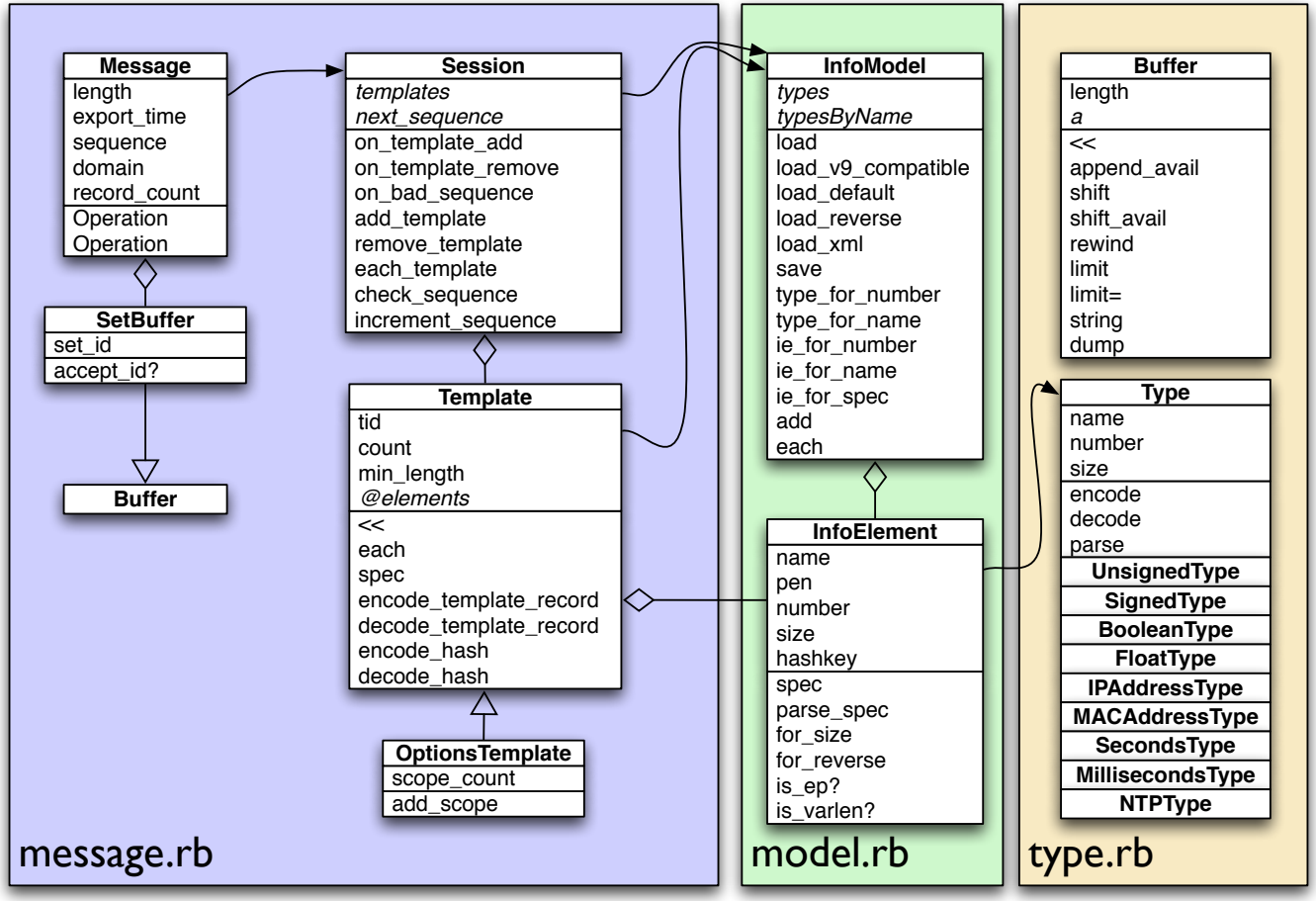
Ruby

- Duck-typed, object-oriented, interpreted* language
- Suited to rapid development, not rapid processing
- Relatively complete standard library
  - Socket interface easy to use → good for little network apps
- Simple to write methods/classes in C
  - No SCTP support, no problem → ripfix provides SCTP::Endpoint

Design

- Principle of Least Surprise
- Classes map to entities in the protocol
  - Message, Template, OptionsTemplate, InfoElement, etc.
- Data records written/read as Ruby Hashes of Symbols to native Ruby types
  - String, Fixnum, IPAddr, etc.
- Use of Ruby Enumerable idiom (each())
- Templates and Information Models specified as strings
  - defined in draft-trammell-ipfix-text-iespec-00
  - also supports IANA XML registry, but this is somewhat slow
- Type system for transcoding
  - Information Element has a type, which can encode/decode value

Design Details



Supports

- RFC 5101 (mostly, see next)
- TCP as transport
- RFC 5103 biflows
- RFC 5655 files (basic)
- draft-trammell-ipfix-text-iespec
- going and getting a cup of coffee while you wait for large data sets to process.

Future plans

- Complete IPFIX over SCTP support
- TLS/DTLS (need bindings)
- Template withdrawals
- Faster buffer and type implementation (in C)
- Metadata: 5610, 5655, ipfix-anon
- draft-ietf-ipfix-structured-data
- draft-ietf-ipfix-per-sctp-stream, better stream management
- More rigorous unit testing, resultant bugfixes
- UDP, template expiration and retransmission (messy)
- …

Experiences

- On-the-fly interop testing
  - rfdump tool used to track the at-fault implementation in an interop disagreement without having to drop to a hex editor.
- Slightly less boring demonstrations of IPFIX applications
  - Need to show someone what IPFIX looks like without walking them through a hexdump? rfcollect (rfdump over TCP).
- Generation of examples for SIPCLF
  - Initial requirement: Hacking up IPFIX stuff in WG meetings
- Quick and dirty analysis tools
  - select-and-project, aggregation for visualization, etc.

How to get it

- http://ripfix.rubyforge.net
- Under *active* development
  - Interfaces may change at any time for no reason at all
    - but since the design parallels the protocol, not in nonsensical ways
    - Watch out for any class not listed on Slide 6.
  - SCTP support included, but not yet integrated
  - We try to keep broken code out of the released gem, but…
- Please download, suggest, contribute!
  - trammell@tik.ee.ethz.ch

ADDITIONAL SLIDES

SCTP support for Ruby

SCTP::Endpoint

- Attempt to put a Ruby interface atop all features of SCTP.
  - An Endpoint is a 1-to-1 or 1-to-many socket
  - Sends and receives SCTP::Message objects
    - Encapsulates content, stream, remote endpoint
  - SCTP::Socket wraps Endpoint for a more Ruby Sockets-like interface
    - Direct extension would not be particularly clean.
- Interface even more experimental than ripfix (*will* change) and essentially undocumented.
  - Defined for multihoming, but not yet supported
- No interop testing yet.
- Requires (of course) working SCTP on host system.
  - Only tested on Mac OS X, some Linuxes.