What is DDlog? Why does OVN need it?

Differential Datalog (DDlog)

- **bottom-up, incremental, in-memory, typed Datalog engine** [1]
- automatic incremental behavior
- compiles into Rust
- uses Rust for utility functions and standard library

OVN (ovn-northd) processes NB/SB databases completely (with every change!)

- does this scale (lots of recomputation without changing outputs)?
- can we replace the DB processing with DDlog? Yes, we could [2]

Dev story #1 - IP Multicast in ovn-northd-ddlog

The “good”:

- resulting code is more concise, the developer can focus on the functionality. Basic metric (LoC): ~650 LoC in DDlog vs ~1778 LoC in C
- (some) things are easier to implement: e.g., stable ID allocation for multicast groups
  - no need for IDL lookups and such.. it’s incremental, right?
- DDlog feature requests/bug reports get immediate attention from DDlog maintainers: e.g., debug options to dump intermediate relations, ovsdb2ddlog enhancements

The “bad”:

- new language, different programming paradigm. Good topic coverage in documentation [1]. Some hard-to-spot bottlenecks for DDlog beginners [2].
- debugging is mainly offline; analyzing DDlog relations (tables) dumps.

Dev story #2 - Dynamic MAC for static IPv6

The “good”:

▸ DDlog tutorials were enough to get the job done
▸ error messages for DDlog were clear and made it easy fix mistakes

The “bad”:

▸ the feature implementation involved writing more Rust code vs DDlog.
▸ ended up not really getting to see the benefits of DDlog
▸ compilation takes long
▸ never managed to get the ovn-northd-cli to compile properly; a unit test still failing
▸ therefore, the change never got to be submitted for review
Highlights/Lowlights

The “good”:

▶ simple translation of input to output relations; focus is on the data itself
▶ automatic incremental updates
▶ stronger type system than C; safer memory usage
▶ ovn-northd-ddlog performs better than the C version [1] [2]

The “bad”:

▶ “unproven” new language
▶ tooling is minimal, especially for debugging (a live DDlog debugger would be great)
▶ standard library is ad-hoc and quite minimal
▶ no DDlog v1.0/stable release yet

Challenges for conversion to DDlog

- ovn-northd (C) is a moving target that often gets new features/patches; these should also be ported to ovn-northd-ddlog!
- who does the porting?
- the contributor must learn DDlog on top of understanding the rest of OVN code
- ovn-northd-ddlog uses a custom ovsdb client to push updates from DDlog to the NB/SB databases; code duplication and missed edge cases (e.g., transaction failure reporting). Should we use IDL instead?
- is ovn-northd the only bottleneck?
  - ovn-controller also has incremental processing (C)
  - maintain two incremental processing approaches or choose one?
Thanks!