Exploring the CUE Continuum

Defining, Generating, and Validating Data with CUE and Go

John Gosset | 2022-07-07 | Golang Montreal

Overview

- Audience: Curious Go Devs, the JSON/YAML-demoralized
- Goal: Share my interest in CUE+Go, and maybe pique yours!
- Non-Goal: Comprehensive overview of CUE
- Topics:
  - Background
  - CUE Basics
  - CUE via Go
  - Going Further

The Landscape

- Configuration Languages (.rc, .ini, .env...)
- Serialization Languages (JSON, YAML, TOML)
- Markup Languages (XML)
- –> Structured Data

I Just Want to Code!

“Configure, Unify, Execute”

cuelang.org

CUE Use Cases

- Configuration
- Data Validation
- Schema Definition
- Code Generation and Extraction
- Querying (WIP)
- Scripting

About CUE

- Created by Marcel von Lohuizen (ex-Google, Go Team)
- 15 years experience on GCL
- Open Source
- NON-turing complete
- Superset of JSON
- Big Idea: Types are Values
- Main implementation in Go
- Heavily Go-inspired module system

Marcel van Lohuizen
@mpvl_

Guidelines for picking a language:

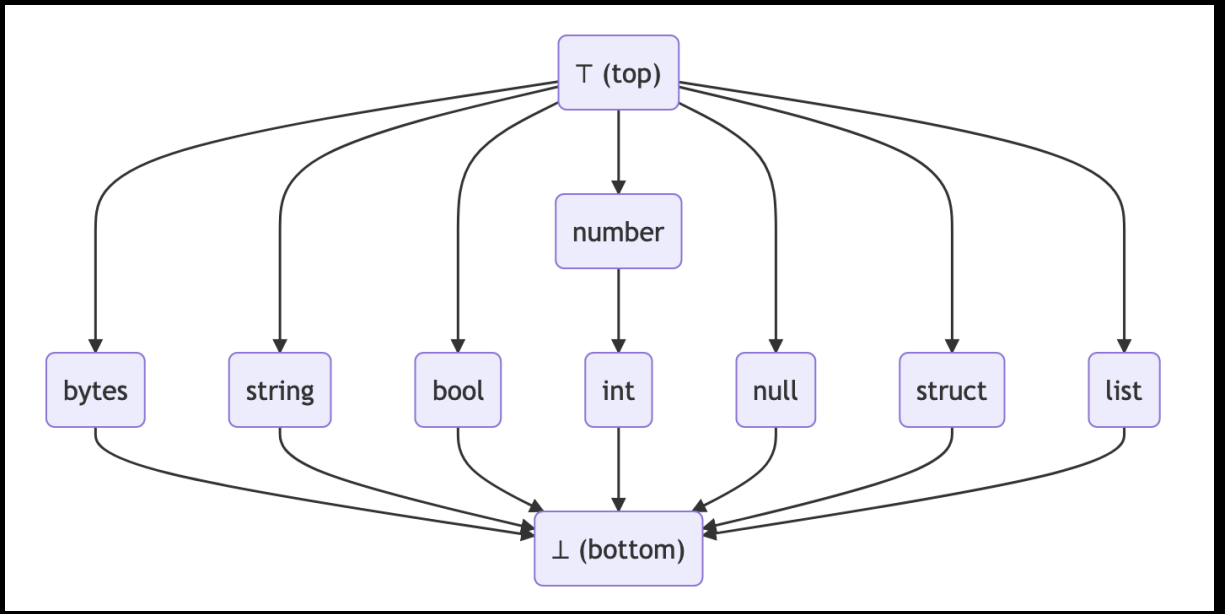
Programming: easy to read and maintain, but possibly harder to write.

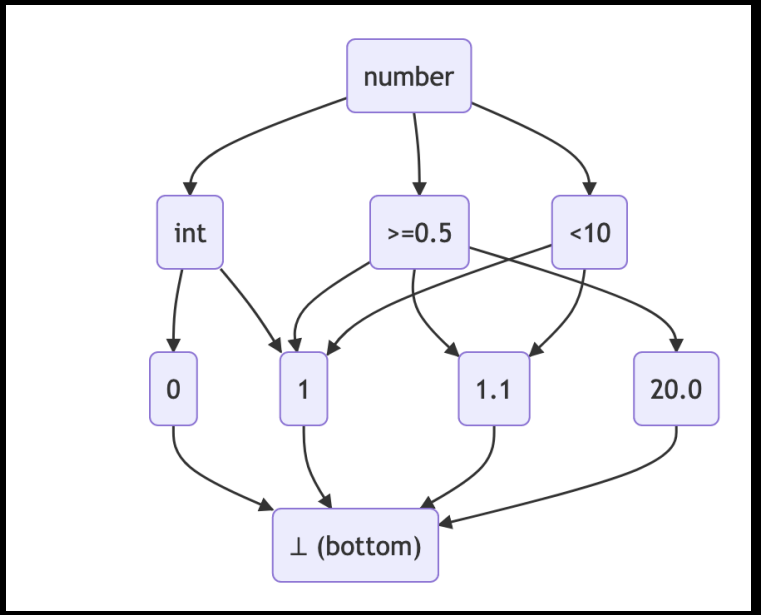
Scripting: easy to write at the expense of maintainability.

Configuration: easy to read and modify, even in the face of an emergency.

5:00 PM · Oct 22, 2020 · TweetDeck

"A lattice is a partially ordered set, in which every two elements have a unique least upper bound (join) and greatest lower bound (meet). By definition this means there is always a single root (top) and a single leaf (bottom)."
– *The Logic of CUE*


⊤ (top)
number
bytes
string
bool
int
null
struct
list
⊥ (bottom)


number
int
>=0.5
<10
0
1
1.1
20.0
⊥ (bottom)

CUE in the Wild

- Dagger: Portable DevKit for CI/CD Pipelines
- Kubevela: Deployment Plans as Workflow
- grafana/thema: CUE-based framework for portable, evolvable schema (WIP)
- nixago: Generate config files using Nix (CUE engine)
- cubectl: Truly declarative kubernetes manifests via cuelang
- cue-flux-controller: A Kubernetes controller for CUE via Flux

Solomon Hykes @solomonstre · Sep 18, 2019

When I first looked at cuelang.org, I didn't get it and moved on. But something drove me to take a second look, and I'm glad I did. I am thoroughly impressed. Cue has a lot of potential, especially combined with Go.

3 33 111

This Tweet was deleted by the Tweet author. Learn more

Solomon Hykes @solomonstre · Sep 18, 2019

At the very least it's a promising alternative to yaml templating, kustomize, jsonnet, etc. Two-way interop with other formats is excellent, so you can use it without forcing the world to also use it - a refreshing change from the usual "there can only be one" mentality.

1 6

Solomon Hykes @solomonstre · Sep 18, 2019

It's also a possible alternative to more recent "cloud-native" configuration languages such as starlark/skycfg or hcl.

2 4

Joe Beda @jbeda · Sep 21, 2019

Take a look at ytt also. It is a mix of YAML and starlark. get-ytt.io Pairs with kapp for application to k8s.

1 12

Florian Klein @docteur_klein · Feb 4, 2020

Also, dhall

1

Solomon Hykes
@solomonstre

Replying to @docteur_klein and @rawkode

More choice is always good. But so far Cue is my clear favorite. It is written by @mpvl_ who created BCL at Google. While everyone else is busy repeating the mistakes of BCL, he is pouring 15 years of that experience into Cue. And you can really tell the difference.

2:56 AM · Feb 4, 2020 · Twitter Web App

CUE Basics

Via cuetorials.com

- JSON Superset
- Definitions
- Conjunctions
- Disjunctions
- Defaults and Optionals
- Building Up Values

CUE via Go

- Load CUE code into CUE values
- Print CUE values with various options
- Extract CUE values, loop over fields and lists
- Extract and work with CUE attributes
- Unify and validate CUE and Go values
- Decode to, and encode from, CUE and Go values
- Validate, constrain, and complete Go values

Alternatives

- XML
- JSON
- YAML
- Jsonnet
- Dhall
- Nickel
- Terraform/HCL
- Pulumi
- ...

CUE Pros and Cons

- Pros
  - Mathmatically elegant big idea (value lattice) distinguishes from the pack
  - Excellent interop w/ Go
  - Familiar for Go devs
  - Emerging interest
- Cons
  - Pace of dev could be faster
  - Some features missing/roadmap (pkg management, query, testing, LSP)

Next Steps for the Curious

- cuelang.org/docs
- cuelang.org/play
- cuetorials.com
- cuetorials.com/go-api
- dagger.io: What is CUE?
- dagger.io: CUE Package Coding Style
- The Configuration Complexity Curse

Summary

- Background
- CUE Basics
- CUE via Go
- Going Further

"For that one fraction of a second you were open to options you never considered. That is the exploration that awaits you. Not mapping stars and studying nebulae, but charting the unknown possibilities of existance!"

– *John de Lancie speaking as 'Q'*

Thank You!