HL7® FHIR® DevDays

JUNE | 2022

TypeScript SDK

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Microsoft

http://aka.ms/devdays-gino

firely HL7 International

About Me

- Principal Software Engineer @ Microsoft
  - MSR - Healthcare Standards and Interop
- Focused on FHIR since 2019
  - Infrastructure / Tooling
  - Code generation
  - Topic-Based Subscriptions
- DICOM-centric before
  - Apologies for the CDs!
  - They were a good idea at the time =)
- Contact
  - Gino.Canessa@microsoft.com
  - Zulip (chat.fhir.org)
  - YouTube (FHIR Educational Content)

Disclaimers

- Work in Progress
- Not to 1.0 – Potential for Breaking Changes
- Another tool in the box
- No plans to stop supporting @types/fhir

What and Why?

- A generic FHIR SDK that operates at runtime
- Parity with other development languages
- Separation of concerns
  - Repeated ‘boiler-plate’ code
  - Utility functions
  - “Tricky spots”

…Developer Experience!

Introducing fhir-typescript

- On GitHub
  - https://github.com/fhir-typescript/fhir-typescript
  - Core Packages (r4 first)
  - Examples
  - Eventually IG-specific packages
- Packages Published to NPM
  - @fhir-typescript/r4-core (first)
  - Use the @fhir-typescript org scope

Project / Packaging / Minutia

- Everything on GitHub
  - Monorepo
- Open License – MIT
- TypeScript Code
  - Generated (fhir-codegen) and hand-written
- Infrastructure groundwork
  - Rushjs.io, pnpm, tsc
- Compiled to ESM modules
  - *Can* make CommonJS builds – do we need them?
- Libraries packaged with NPM

In The Box

- TS/JS Classes
  - Primitives, Complex Types, Resources, Backbones
  - Parse/Serialize JSON
  - “Basic Validation”
- ValueSets
  - Codes, Codings, and CodeableConcepts
  - Const objects and Types
  - Links between resources and bound value sets
- JSON Definitions
  - Access properties on data before parsing

Example Projects

- In same repo
- Show various functionality
- Test build systems and flags
- Deno, Node, and React so far

“Tricky Spots”?

Primitives and extended properties	• Serialized as siblings, properties get a “_” prefix
Arrays of primitives and extended properties	• Any element can be null • Different lengths allowed • Need to managing offsets
FHIR+JSON vs the browser	• Numbers parsed as floats vs. trailing zeros in decimal values • Note: not addressed yet in current build

Choice Types

Mix structure and type info

- valueString vs. valueInteger

Overlap in types

- valueDate vs. valueDateTime
- valueCanonical vs. valueUri vs. valueUrl

Developer ‘bookkeeping’

- Changing from deceasedBoolean to deceasedDateTime

Validation is tedious

- E.g., need ‘one of’
- Discourages good practices

Extensions

Always choice types

Adding/removing values

Finding, filtering, nesting

Value Sets

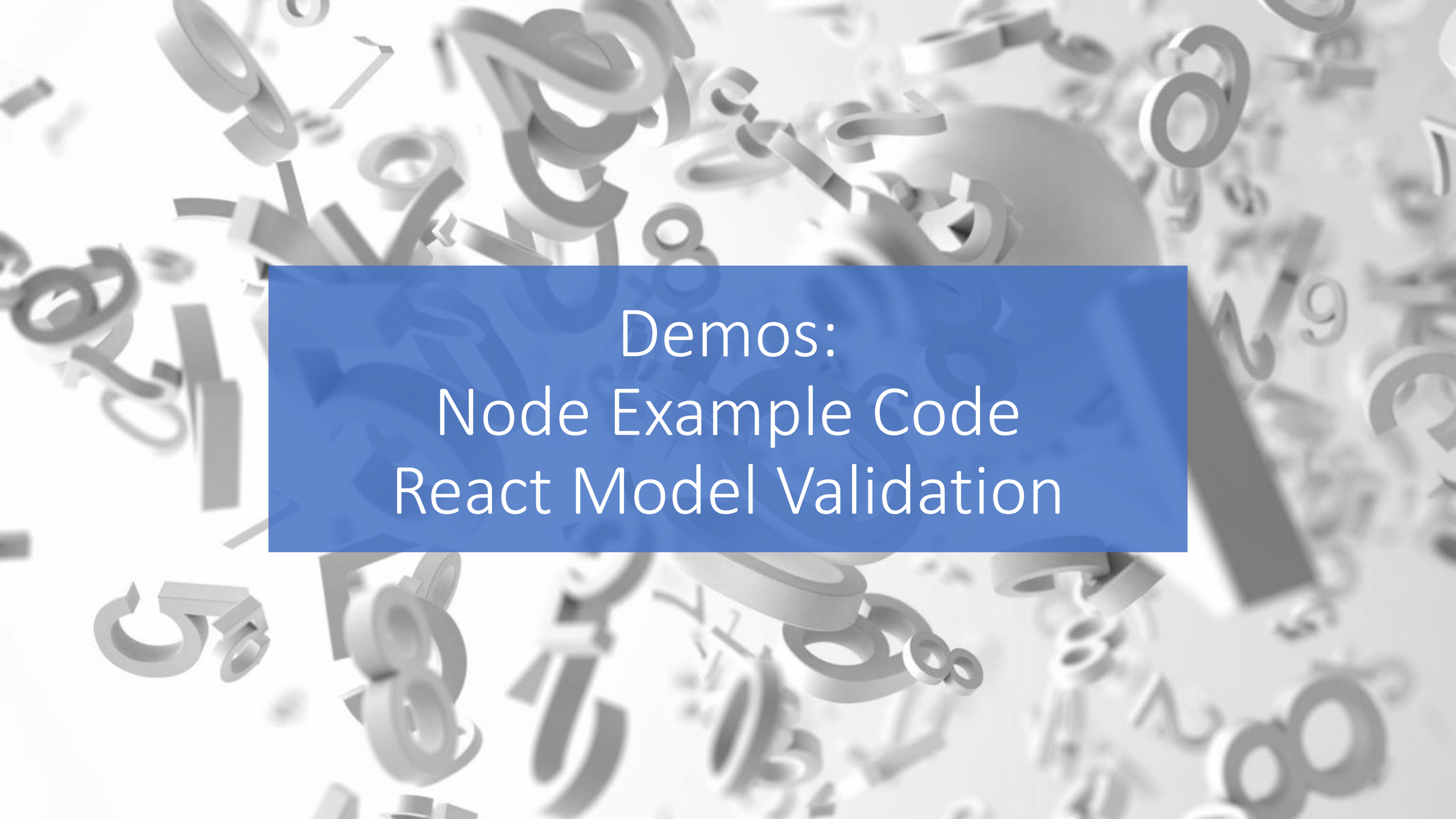
- Expansions where possible
- Required bindings use a type
- Extensible/Preferred use a type hint
- Accessible via the resource models
- CodeableConcepts, Codings, and Codes

What is Basic Validation?

- Upper bound is ‘what can be done without a terminology server’
- Current tests
  - Cardinality requirements (e.g., missing required element)
  - Value type-checking (e.g., string, number, etc.)
  - RegEx tests
  - ValueSet binding validation (required: error, extensible: warning)
- Coming Soon™
  - Invariant Testing

The Basics

- Install the package
  - `npm install @fhir-typescript/r4-core`
- Import (at least) ‘fhir’
  - `import { fhir } from '@fhir-typescript/r4-core';`
- Profit!
  - `let patient:fhir.Patient = new fhir.Patient({ ... });`



Demos:
Node Example Code
React Model Validation

To Do – A Short List =)

- Automatic build pipeline
  - Nightly CI builds (build.fhir.org)
- Expand ‘basic validation’ to test invariants
- More tests / test coverage
- IG-specific packages
- “Lean build” tool
- XML Support
- 64-Bit integer type
- Fetch Integration
- More utility functions
- Custom JSON serialization
  - Decimal trailing zeros
  - Better non-standard element
- Performance
- “Spec Info” Model Maps

Questions

Monday June 6	
3:00 PM - 3:45 PM - Room: 201	**Introduction to FHIR search** - Gino Canessa

Tuesday, June 7	
10:45 AM - 11:30 AM - Room: Ballroom A	**SMART on FHIR: Introduction** - Josh Mandel
1:20 PM - 1:50 PM - Room: 203	**Azure Health Data Services** - Doug Seven
2:55 PM - 3:40 PM - Room: 221	**Topic-based subscriptions** - Gino Canessa
4:10 PM - 4:55 PM - Room: 201	**SMART on FHIR: hands on** - Josh Mandel
6:00 PM - 8:00 PM - Room: 203	**Generating actionable insights from real world clinical and genomic data in FHIR** - Geralyn Miller
6:00 PM - 6:45 PM - Room: SpatialChat	**Pubtalk – JavaScript is for Uis** - Brian Postlethwaite - Gino Canessa
6:00 PM - 6:45 PM - Room: SpatialChat	**Pubtalk – Are we making this too complicated?** - Josh Mandel

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Wednesday, June 8	
11:45 AM - 12:05 PM - Room: 304	**SMART Health Cards - standard, testing & validation tools** - Christian Paquin
1:20 PM - 1:50 PM - Room: 203	**React to Events of Data Changes on FHIR Service** - Teng Li
4:10 PM - 4:30 PM - Room: Ballroom A	**TypeScript FHIR library** - Gino Canessa
5:00 PM - 5:45 PM - Room: 201	**FHIR Questionnaires and structured data capture with examples** - Brian Postlethwaite

Thursday, June 9	
11:10 AM - 11:30 AM - Room: 221	**FHIR Data Ingestion Tool: convert, anonymize, and publish** - Mr Ibrahim Kivanc
11:45 AM - 12:30 PM - Room: ABC	**Mapping FHIR data to parquet for analytics and machine learning** - Quan Wan
11:45 AM - 12:30 PM - Room: 201	**SMART on FHIR: what's new, what's next?** - Josh Mandel
2:00 PM - 2:45 PM - Room: 201	**FHIRPath by example** - Brian Postlethwaite
2:55 PM - 3:40 PM - Room: ABC	**SMART Health Links for verifiable clinical information - design discussion** - Josh Mandel

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THANK YOU!

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