Schema.org

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Table of Contents

1 Motivation and history

- End of 2010s: **Augmentation of search** with structured data
- First focus on 10 verticals (e. g. recipes, events)
- Led to a **proliferation of formats** across search engines and prevented scaling
- In 2011 **joint initiative** by Bing, Google, and Yahoo (and later Yandex)
- **Goal**: *Single* schema across all topics; *single* vocabulary for webmasters
- **Result**: Schema.org

2 Basic information and usage

- Schema.org is a **vocabulary**, not an ontology
- Designed for **annotation of webpage content**
- Enables rich markup of search results
- Also used in emails, e. g. for reservations in restaurants
- Used by **embedding** Microdata or JSON-LD code in **HTML**
- JSON-LD syntax more popular
- In 2022 **38 % of PLDs** used Schema.org annotations
- Up from 3 % in 2013

3 Structure of Schema.org

3.1 Items and (data) types

- **Items** are things in the **real world**, we wish to describe
- Three hierarchies of types (classes)
  - s:Thing and its subtypes; e. g. s:Event
  - s:DataType and its subtypes; e. g. s:Date
  - s:Enumeration and its subtypes; e. g. s:DayOfWeek
- Types **inherit properties** from one or multiple supertypes
- 811 types, 14 data types, 89 enumerations, 495 enum members

3.2 Structure of the *s:Thing*-hierarchy

Not a tree structure!

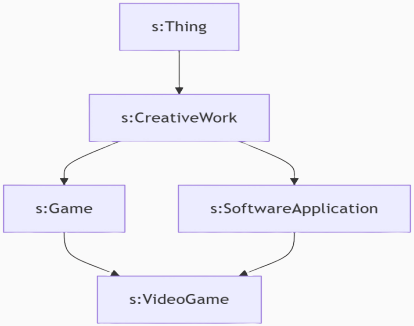


Figure 1: Hierarchy of s:VideoGame

3.2 Structure of the *s:Thing*-hierarchy (cont.)

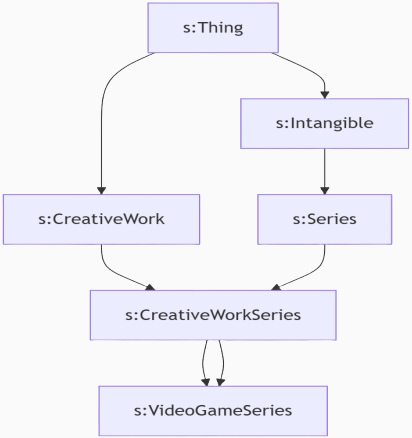


Figure 2: Hierarchy of s:VideoGameSeries

3.3 Properties

- Container for the attributes of an item
- Link two types:
  1. Type and data type
  2. Type and another type
- Have domain and range definitions
- 1484 properties

3.4 Domain and range of properties

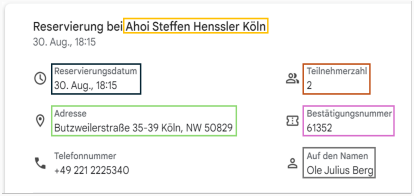
- **Domain**: Types the property can be used on
- **Range**: Expected types of property values
- Subtypes can **extend range**
- Domain and range are **disjunctive**

3.5 Example of the properties of a type

- s:FoodEstablishmentReservation
- s:Thing > s:Intangible > s:Reservation > s:FoodEstablishmentReservation
- Properties:
  - s:startTime | range: *s:Time* or *s:DateTime* | from s:FoodEstablishmentReservation
  - s:underName | range: s:Person or s:Organization | from s:Reservation
  - s:name | range: *s:Text* | from s:Thing
  - . . . many more. . . (in total $27 = 12 + 12 + 3$)

4.1 Schema.org in emails

Screenshot from the Gmail web app



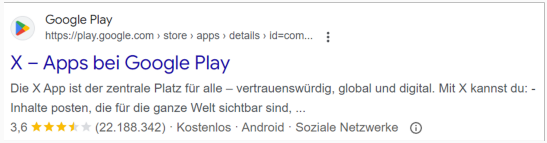
Extract from the HTML embedded in the confirmation email

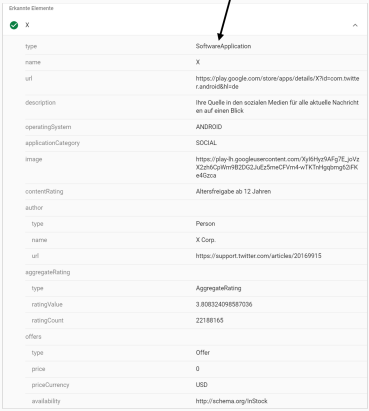
```
{
  "@context": "http://schema.org",
  "@type": "FoodEstablishmentReservation",
  "reservationNumber": "61352",
  "reservationStatus": "http://schema.org/ReservationConfirmed",
  "underName": {
    "@type": "Person",
    "name": "Ole Julius Berg"
  },
  "reservationFor": {
    "@type": "FoodEstablishment",
    "name": "Ahoi Steffen Henssler Köln",
    "address": {
      "@type": "PostalAddress",
      "streetAddress": "Butzweilerstraße 35-39",
      "addressLocality": "Köln",
      "addressRegion": "NW",
      "postalCode": "50829",
      "addressCountry": "Deutschland"
    }
  },
  "startTime": "2024-08-30T18:15:00+02:00",
  "partySize": "2",
  "modifiedTime": "2024-08-28T19:09:09.334Z",
  "modifyReservationUrl": "...",
  "cancelReservationUrl": "...",
  "url": "..."
}
```

Figure 3: Schema.org usage in an email confirmation of a reservation

4.2 Schema.org in rich snippets

https://schema.org/SoftwareApplication





https://search.google.com/test/rich-results/result?id=UtfvXcS6-Xqn7jYN4FG8JQ

Test for yourself: https://search.google.com/test/rich-results

5 Limitations and criticism

- **Explicit** design for **webpage content**
- **Limited transferability** to other domains
- Addressed by hosted and external **extensions**
- Adoption has **plateaued**
- Some criticism of missing local ranges

6 Conclusion

Thank you for attending my presentation!

Do you think that Schema.org still has **unused potential**? Or are the extensions all we can expect?

7 Sources I

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- P. F. Patel-Schneider, “Analyzing Schema.org”, in *The Semantic Web – ISWC 2014*, Bd. 8796, P. Mika, T. Tudorache, A. Bernstein, C. Welty, C. Knoblock, D. Vrandečić, P. Groth, N. Noy, K. Janowicz, und C. Goble, Hrsg., in Lecture Notes in Computer Science, vol. 8796., Cham: Springer International Publishing, 2014, S. 261–276. doi: 10.1007/978-3-319-11964-9_17.
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7 Sources II

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- P. Hitzler, “A review of the semantic web field”, *Commun. ACM*, Bd. 64, Nr. 2, S. 76–83, Jan. 2021, doi: 10.1145/3397512.