

# Schema.org

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## 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

## Basic information and usage

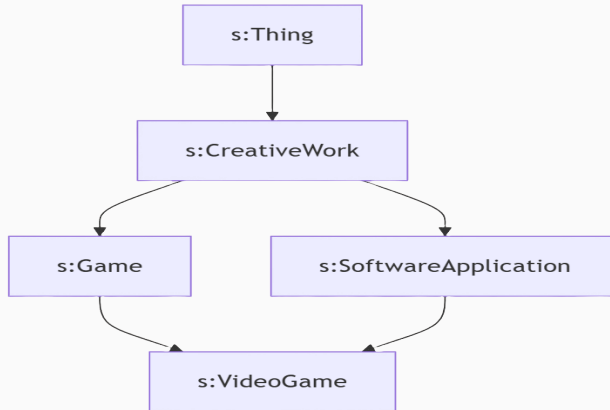
- Schema.org is a **vocabulary**, not an ontology
- Designed for **annotation of webpage content**
- Enables rich markup of search results
- Also used in emails, e. g. for reservations in restaurants
- Used by **embedding** Microdata or JSON-LD code in **HTML**
- JSON-LD syntax more popular
- In 2022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

## 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

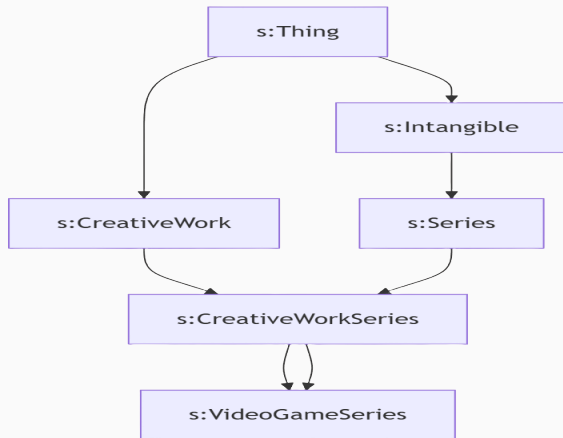
# Structure of the *s:Thing*-hierarchy

Not a tree structure!



**Figure 1:** Hierarchy of *s:VideoGame*

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



**Figure 2:** Hierarchy of *s:VideoGameSeries*

# Properties

- Link two types:
  1. Type and data type
  2. Type and another type
- Have domain and range definitions
- **Domain:** Types the property can be used on
- **Range:** Expected types of property values
- Subtypes can **extend range**
- Domain and range are **disjunctive**
- 1484 properties



## 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  $27 = 12 + 12 + 3$ )

# A real-world example (email)

**Screenshot from the Gmail web app**

Reservierung bei Ahoi Steffen Henssler Köln  
30. Aug., 18:15

Reservierungsdatum  
30. Aug., 18:15

Teilnehmerzahl  
2

Adresse  
Butzweilerstraße 35-39 Köln, NW 50829

Bestätigungsnummer  
61352

Telefonnummer  
+49 221 2225340

Auf den Namen  
Ole Julius Berg

**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

# Another real-world example (rich snippets)

 Google Play  
<https://play.google.com/store/apps/details?id=com...>

## X – Apps bei Google Play

Die X App ist der zentrale Platz für alle – vertrauenswürdig, global und digital. Mit X kannst du: - Inhalte posten, die für die ganze Welt sichtbar sind, ...

3,6 ★★★★★ (22.188.342) · Kostenlos · Android · Soziale Netzwerke ⓘ

<https://schema.org/SoftwareApplication>

Erkannte Elemente	
✓ X	
type	SoftwareApplication
name	X
url	<a href="https://play.google.com/store/apps/details?id=com.twitter.android&amp;hl=de">https://play.google.com/store/apps/details?id=com.twitter.android&amp;hl=de</a>
description	Ihre Quelle in den sozialen Medien für alle aktuelle Nachrichten auf einen Blick
operatingSystem	ANDROID
applicationCategory	SOCIAL
image	<a href="https://play-lh.googleusercontent.com/Xy6Hy29AFg7E_jsVzX2zh6CpWm9B2DG2Jz5meCPvm4-w1K1nHgm6mg2FKe4Gzco">https://play-lh.googleusercontent.com/Xy6Hy29AFg7E_jsVzX2zh6CpWm9B2DG2Jz5meCPvm4-w1K1nHgm6mg2FKe4Gzco</a>
contentRating	Altersfreigabe ab 12 Jahren
author	
type	Person
name	X Corp.
url	<a href="https://support.twitter.com/articles/20169915">https://support.twitter.com/articles/20169915</a>
aggregateRating	
type	AggregateRating
ratingValue	3.808324098587036
ratingCount	22188165
offers	
type	Offer
price	0
priceCurrency	USD
availability	<a href="http://schema.org/inStock">http://schema.org/inStock</a>

<https://search.google.com/test/rich-results/result?id=UtrvXcS6-Xqn7iYN4FG8JQ>

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

## Limitation 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

Thank you for attending my presentation!

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

- R. V. Guha, D. Brickley, und S. Macbeth, “Schema.org: evolution of structured data on the web”, *Commun. ACM*, Bd. 59, Nr. 2, S. 44–51, Jan. 2016, doi: 10.1145/2844544.
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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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- P. Hitzler, “A review of the semantic web field”, *Commun. ACM*, Bd. 64, Nr. 2, S. 76–83, Jan. 2021, doi: 10.1145/3397512.