YAML Ain't Markup Language (YAML™) Version 1.2

3rd Edition, Patched at 2009-10-01

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Latest (patched) version:
HTML: http://yaml.org/spec/1.2/spec.html
PDF: http://yaml.org/spec/1.2/spec.pdf
PS: http://yaml.org/spec/1.2/spec.ps
Errata: http://yaml.org/spec/1.2/errata.html
Previous (original) version: http://yaml.org/spec/1.2/2009-07-21/spec.html

Status of this Document

This document reflects the third version of YAML data serialization language. The content of the specification was arrived at by consensus of its authors and through user feedback on the yaml-core mailing list. We encourage implementers to please update their software with support for this version.

The primary objective of this revision is to bring YAML into compliance with JSON as an official subset. YAML 1.2 is compatible with 1.1 for most practical applications - this is a minor revision. An expected source of incompatibility with prior versions of YAML, especially the syck implementation, is the change in implicit typing rules. We have removed unique implicit typing rules and have updated these rules to align them with JSON's productions. In this version of YAML, boolean values may be serialized as "`true`" or "`false`"; the empty scalar as "`null`". Unquoted numeric values are a superset of JSON's numeric production. Other changes in the specification were the removal of the Unicode line breaks and production bug fixes. We also define 3 built-in implicit typing rule sets: untyped, strict JSON, and a more flexible YAML rule set that extends JSON typing.

The difference between late 1.0 drafts which syck 0.55 implements and the 1.1 revision of this specification is much more extensive. We fixed usability issues with the tagging syntax. In particular, the single exclamation was re-defined for private types and a simple prefixing mechanism was introduced. This revision also fixed many production edge cases and introduced a type repository. Therefore, there are several incompatibilities between syck and this revision as well.

The list of known errors in this specification is available at http://yaml.org/spec/1.2/errata.html. Please report errors in this document to the yaml-core mailing list. This revision contains fixes for all errors known as of 2009-10-01.

We wish to thank implementers who have tirelessly tracked earlier versions of this specification, and our fabulous user community whose feedback has both validated and clarified our direction.

Abstract

YAML™ (rhymes with "camel") is a human-friendly, cross language, Unicode based data serialization language designed around the common native data types of agile programming languages. It is broadly useful for programming needs ranging from configuration files to Internet messaging to object persistence to data auditing. Together with the Unicode standard for characters, this specification provides all the information necessary to understand YAML Version 1.2 and to create programs that process YAML information.

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Chapter 1. Introduction

"YAML Ain't Markup Language" (abbreviated YAML) is a data serialization language designed to be human-friendly and work well with modern programming languages for common everyday tasks. This specification is both an introduction to the YAML language and the concepts supporting it, and also a complete specification of the information needed to develop applications for processing YAML.

Open, interoperable and readily understandable tools have advanced computing immensely. YAML was designed from the start to be useful and friendly to people working with data. It uses Unicode printable characters, some of which provide structural information and the rest containing the data itself. YAML achieves a unique cleanness by minimizing the amount of structural characters and allowing the data to show itself in a natural and meaningful way. For example, indentation may be used for structure, colons separate key: value pairs, and dashes are used to create "bullet" lists.

There are myriad flavors of data structures, but they can all be adequately represented with three basic primitives: mappings (hashes/dictionaries), sequences (arrays/lists) and scalars (strings/numbers). YAML leverages these primitives, and adds a simple typing system and aliasing mechanism to form a complete language for serializing any native data structure. While most programming languages can use YAML for data serialization, YAML excels in working with those languages that are fundamentally built around the three basic primitives. These include the new wave of agile languages such as Perl, Python, PHP, Ruby, and Javascript.

There are hundreds of different languages for programming, but only a handful of languages for storing and transferring data. Even though its potential is virtually boundless, YAML was specifically created to work well for common use cases such as: configuration files, log files, interprocess messaging, cross-language data sharing, object persistence, and debugging of complex data structures. When data is easy to view and understand, programming becomes a simpler task.

1.1. Goals

The design goals for YAML are, in decreasing priority:

1. YAML is easily readable by humans.
2. YAML data is portable between programming languages.
3. YAML matches the native data structures of agile languages.
4. YAML has a consistent model to support generic tools.
5. YAML supports one-pass processing.
6. YAML is expressive and extensible.
7. YAML is easy to implement and use.

1.2. Prior Art

YAML's initial direction was set by the data serialization and markup language discussions among SML-DEV members. Later on, it directly incorporated experience from Ingy döt Net's Perl module Data::Denter. Since then, YAML has matured through ideas and support from its user community.

YAML integrates and builds upon concepts described by C, Java, Perl, Python, Ruby, RFC0822 (MAIL), RFC1866 (HTML), RFC2045 (MIME), RFC2396 (URI), XML, SAX, SOAP, and JSON.

The syntax of YAML was motivated by Internet Mail (RFC0822) and remains partially compatible with that standard. Further, borrowing from MIME (RFC2045), YAML's top-level production is a stream of independent documents, ideal for message-based distributed processing systems.

YAML's indentation-based scoping is similar to Python's (without the ambiguities caused by tabs). Indented blocks facilitate easy inspection of the data's structure. YAML's literal style leverages this by enabling formatted text to be cleanly mixed within an indented structure without troublesome escaping. YAML also

allows the use of traditional indicator-based scoping similar to JSON's and Perl's. Such flow content can be freely nested inside indented blocks.

YAML's double-quoted style uses familiar C-style escape sequences. This enables ASCII encoding of non-printable or 8-bit (ISO 8859-1) characters such as "`\x3B`". Non-printable 16-bit Unicode and 32-bit (ISO/IEC 10646) characters are supported with escape sequences such as "`\u003B`" and "`\U0000003B`".

Motivated by HTML's end-of-line normalization, YAML's line folding employs an intuitive method of handling line breaks. A single line break is folded into a single space, while empty lines are interpreted as line break characters. This technique allows for paragraphs to be word-wrapped without affecting the canonical form of the scalar content.

YAML's core type system is based on the requirements of agile languages such as Perl, Python, and Ruby. YAML directly supports both collections (mappings, sequences) and scalars. Support for these common types enables programmers to use their language's native data structures for YAML manipulation, instead of requiring a special document object model (DOM).

Like XML's SOAP, YAML supports serializing a graph of native data structures through an aliasing mechanism. Also like SOAP, YAML provides for application-defined types. This allows YAML to represent rich data structures required for modern distributed computing. YAML provides globally unique type names using a namespace mechanism inspired by Java's DNS-based package naming convention and XML's URI-based namespaces. In addition, YAML allows for private types specific to a single application.

YAML was designed to support incremental interfaces that include both input ("`getNextEvent()`") and output ("`sendNextEvent()`") one-pass interfaces. Together, these enable YAML to support the processing of large documents (e.g. transaction logs) or continuous streams (e.g. feeds from a production machine).

1.3. Relation to JSON

Both JSON and YAML aim to be human readable data interchange formats. However, JSON and YAML have different priorities. JSON's foremost design goal is simplicity and universality. Thus, JSON is trivial to generate and parse, at the cost of reduced human readability. It also uses a lowest common denominator information model, ensuring any JSON data can be easily processed by every modern programming environment.

In contrast, YAML's foremost design goals are human readability and support for serializing arbitrary native data structures. Thus, YAML allows for extremely readable files, but is more complex to generate and parse. In addition, YAML ventures beyond the lowest common denominator data types, requiring more complex processing when crossing between different programming environments.

YAML can therefore be viewed as a natural superset of JSON, offering improved human readability and a more complete information model. This is also the case in practice; every JSON file is also a valid YAML file. This makes it easy to migrate from JSON to YAML if/when the additional features are required.

JSON's RFC4627 requires that mappings keys merely "SHOULD" be unique, while YAML insists they "MUST" be. Technically, YAML therefore complies with the JSON spec, choosing to treat duplicates as an error. In practice, since JSON is silent on the semantics of such duplicates, the only portable JSON files are those with unique keys, which are therefore valid YAML files.

It may be useful to define a intermediate format between YAML and JSON. Such a format would be trivial to parse (but not very human readable), like JSON. At the same time, it would allow for serializing arbitrary native data structures, like YAML. Such a format might also serve as YAML's "canonical format". Defining such a "YSON" format (YSON is a Serialized Object Notation) can be done either by enhancing the JSON specification or by restricting the YAML specification. Such a definition is beyond the scope of this specification.

1.4. Relation to XML

Newcomers to YAML often search for its correlation to the eXtensible Markup Language (XML). Although the two languages may actually compete in several application domains, there is no direct correlation between them.

YAML is primarily a data serialization language. XML was designed to be backwards compatible with the Standard Generalized Markup Language (SGML), which was designed to support structured documentation. XML therefore had many design constraints placed on it that YAML does not share. XML is a pioneer in many domains, YAML is the result of lessons learned from XML and other technologies.

It should be mentioned that there are ongoing efforts to define standard XML/YAML mappings. This generally requires that a subset of each language be used. For more information on using both XML and YAML, please visit http://yaml.org/xml.

1.5. Terminology

This specification uses key words based on RFC2119 to indicate requirement level. In particular, the following words are used to describe the actions of a YAML processor:

May
: The word *may*, or the adjective *optional*, mean that conforming YAML processors are permitted to, but *need not* behave as described.

Should
: The word *should*, or the adjective *recommended*, mean that there could be reasons for a YAML processor to deviate from the behavior described, but that such deviation could hurt interoperability and should therefore be advertised with appropriate notice.

Must
: The word *must*, or the term *required* or *shall*, mean that the behavior described is an absolute requirement of the specification.

The rest of this document is arranged as follows. Chapter 2 provides a short preview of the main YAML features. Chapter 3 describes the YAML information model, and the processes for converting from and to this model and the YAML text format. The bulk of the document, chapters 4 through 9, formally define this text format. Finally, chapter 10 recommends basic YAML schemas.

Chapter 2. Preview

This section provides a quick glimpse into the expressive power of YAML. It is not expected that the first-time reader grok all of the examples. Rather, these selections are used as motivation for the remainder of the specification.

2.1. Collections

YAML's block collections use indentation for scope and begin each entry on its own line. Block sequences indicate each entry with a dash and space ("- "). Mappings use a colon and space (": ") to mark each key: value pair. Comments begin with an octothorpe (also called a "hash", "sharp", "pound", or "number sign" - "#").

Example 2.1. Sequence of Scalars (ball players)

```
- Mark McGwire
- Sammy Sosa
- Ken Griffey
```

Example 2.2. Mapping Scalars to Scalars (player statistics)

```
hr:  65    # Home runs
avg: 0.278 # Batting average
rbi: 147   # Runs Batted In
```

Example 2.3. Mapping Scalars to Sequences (ball clubs in each league)

```
american:
  - Boston Red Sox
  - Detroit Tigers
  - New York Yankees
national:
  - New York Mets
  - Chicago Cubs
  - Atlanta Braves
```

Example 2.4. Sequence of Mappings (players' statistics)

```
-
  name: Mark McGwire
  hr:   65
  avg:  0.278
-
  name: Sammy Sosa
  hr:   63
  avg:  0.288
```

YAML also has flow styles, using explicit indicators rather than indentation to denote scope. The flow sequence is written as a comma separated list within square brackets. In a similar manner, the flow mapping uses curly braces.

Example 2.5. Sequence of Sequences

```
- [name        , hr, avg  ]
- [Mark McGwire, 65, 0.278]
- [Sammy Sosa  , 63, 0.288]
```

Example 2.6. Mapping of Mappings

```
Mark McGwire: {hr: 65, avg: 0.278}
Sammy Sosa: {
    hr: 63,
    avg: 0.288
  }
```

2.2. Structures

YAML uses three dashes ("---") to separate directives from document content. This also serves to signal the start of a document if no directives are present. Three dots ("...") indicate the end of a document without starting a new one, for use in communication channels.

Example 2.7. Two Documents in a Stream (each with a leading comment)

```
# Ranking of 1998 home runs
---
- Mark McGwire
- Sammy Sosa
- Ken Griffey

# Team ranking
---
- Chicago Cubs
- St Louis Cardinals
```

Example 2.8. Play by Play Feed from a Game

```
---
time: 20:03:20
player: Sammy Sosa
action: strike (miss)
...
---
time: 20:03:47
player: Sammy Sosa
action: grand slam
...
```

Repeated nodes (objects) are first identified by an anchor (marked with the ampersand - "&"), and are then aliased (referenced with an asterisk - "*") thereafter.

Example 2.9. Single Document with Two Comments

Example 2.10. Node for "Sammy Sosa" appears twice in this document

```
---
hr: # 1998 hr ranking
  - Mark McGwire
  - Sammy Sosa
rbi:
  # 1998 rbi ranking
  - Sammy Sosa
  - Ken Griffey
```

```
---
hr:
  - Mark McGwire
  # Following node labeled SS
  - &SS Sammy Sosa
rbi:
  - *SS # Subsequent occurrence
  - Ken Griffey
```

A question mark and space ("? ") indicate a complex mapping key. Within a block collection, key: value pairs can start immediately following the dash, colon, or question mark.

Example 2.11. Mapping between Sequences

```
? - Detroit Tigers
  - Chicago cubs
:
  - 2001-07-23

? [ New York Yankees,
    Atlanta Braves ]
: [ 2001-07-02, 2001-08-12,
    2001-08-14 ]
```

Example 2.12. Compact Nested Mapping

```
---
# Products purchased
- item    : Super Hoop
  quantity: 1
- item    : Basketball
  quantity: 4
- item    : Big Shoes
  quantity: 1
```

2.3. Scalars

Scalar content can be written in block notation, using a literal style (indicated by "|") where all line breaks are significant. Alternatively, they can be written with the folded style (denoted by ">") where each line break is folded to a space unless it ends an empty or a more-indented line.

Example 2.13. In literals, newlines are preserved

```
# ASCII Art
--- |
  \//||\/||
  // ||  ||__
```

Example 2.14. In the folded scalars, newlines become spaces

```
--- >
  Mark McGwire's
  year was crippled
  by a knee injury.
```

Example 2.15. Folded newlines are preserved for "more indented" and blank lines

```
>
 Sammy Sosa completed another
 fine season with great stats.

   63 Home Runs
   0.288 Batting Average

 What a year!
```

Example 2.16. Indentation determines scope

```
name: Mark McGwire
accomplishment: >
  Mark set a major league
  home run record in 1998.
stats: |
  65 Home Runs
  0.278 Batting Average
```

YAML's flow scalars include the plain style (most examples thus far) and two quoted styles. The double-quoted style provides escape sequences. The single-quoted style is useful when escaping is not needed. All flow scalars can span multiple lines; line breaks are always folded.

Example 2.17. Quoted Scalars

```
unicode: "Sosa did fine.\u263A"
control: "\b1998\t1999\t2000\n"
hex esc: "\x0d\x0a is \r\n"

single: '"Howdy!" he cried.'
quoted: ' # Not a ''comment''.'
tie-fighter: '|\-*-/|'
```

Example 2.18. Multi-line Flow Scalars

```
plain:
  This unquoted scalar
  spans many lines.

quoted: "So does this
  quoted scalar.\n"
```

2.4. Tags

In YAML, untagged nodes are given a type depending on the application. The examples in this specification generally use the **`seq`**, **`map`** and **`str`** types from the fail safe schema. A few examples also use the **`int`**, **`float`**, and **`null`** types from the JSON schema. The repository includes additional types such as **`binary`**, **`omap`**, **`set`** and others.

Example 2.19. Integers

```
canonical: 12345
decimal: +12345
octal: 0o14
hexadecimal: 0xC
```

Example 2.20. Floating Point

```
canonical: 1.23015e+3
exponential: 12.3015e+02
fixed: 1230.15
negative infinity: -.inf
not a number: .NaN
```

Example 2.21. Miscellaneous

```
null:
booleans: [ true, false ]
string: '012345'
```

Example 2.22. Timestamps

```
canonical: 2001-12-15T02:59:43.1Z
iso8601: 2001-12-14t21:59:43.10-05:00
spaced: 2001-12-14 21:59:43.10 -5
date: 2002-12-14
```

Explicit typing is denoted with a tag using the exclamation point ("**`!`**") symbol. Global tags are URIs and may be specified in a tag shorthand notation using a handle. Application-specific local tags may also be used.

Example 2.23. Various Explicit Tags

```
---
not-date: !!str 2002-04-28

picture: !!binary |
 R0lGODlhDAAMAIQAAP//9/X
 17unp5WZmZgAAAOfn515eXv
 Pz7Y6OjuDg4J+fn5OTk6enp
 56enmleECcgggoBADs=

application specific tag: !something |
 The semantics of the tag
 above may be different for
```

Example 2.24. Global Tags

```
%TAG ! tag:clarkevans.com,2002:
--- !shape
  # Use the ! handle for presenting
  # tag:clarkevans.com,2002:circle
- !circle
  center: &ORIGIN {x: 73, y: 129}
  radius: 7
- !line
  start: *ORIGIN
  finish: { x: 89, y: 102 }
- !label
  start: *ORIGIN
```

```
different documents.
```

```
  color: 0xFFEEBB
  text: Pretty vector drawing.
```

Example 2.25. Unordered Sets

```
# Sets are represented as a
# Mapping where each key is
# associated with a null value
--- !!set
? Mark McGwire
? Sammy Sosa
? Ken Griff
```

Example 2.26. Ordered Mappings

```
# Ordered maps are represented as
# A sequence of mappings, with
# each mapping having one key
--- !!omap
- Mark McGwire: 65
- Sammy Sosa: 63
- Ken Griffy: 58
```

2.5. Full Length Example

Below are two full-length examples of YAML. On the left is a sample invoice; on the right is a sample log file.

Example 2.27. Invoice

```
--- !<tag:clarkevans.com,2002:invoice>
invoice: 34843
date   : 2001-01-23
bill-to: &id001
    given  : Chris
    family : Dumars
    address:
        lines: |
            458 Walkman Dr.
            Suite #292
        city    : Royal Oak
        state   : MI
        postal  : 48046
ship-to: *id001
product:
    - sku         : BL394D
      quantity    : 4
      description : Basketball
      price       : 450.00
    - sku         : BL4438H
      quantity    : 1
      description : Super Hoop
      price       : 2392.00
tax  : 251.42
total: 4443.52
comments:
    Late afternoon is best.
    Backup contact is Nancy
    Billsmer @ 338-4338.
```

Example 2.28. Log File

```
---
Time: 2001-11-23 15:01:42 -5
User: ed
Warning:
  This is an error message
  for the log file
---
Time: 2001-11-23 15:02:31 -5
User: ed
Warning:
  A slightly different error
  message.
---
Date: 2001-11-23 15:03:17 -5
User: ed
Fatal:
  Unknown variable "bar"
Stack:
  - file: TopClass.py
    line: 23
    code: |
      x = MoreObject("345\n")
  - file: MoreClass.py
    line: 58
    code: |-
      foo = bar
```

Chapter 3. Processing YAML Information

YAML is both a text format and a method for presenting any native data structure in this format. Therefore, this specification defines two concepts: a class of data objects called YAML representations, and a syntax for presenting YAML representations as a series of characters, called a YAML stream. A YAML *processor* is

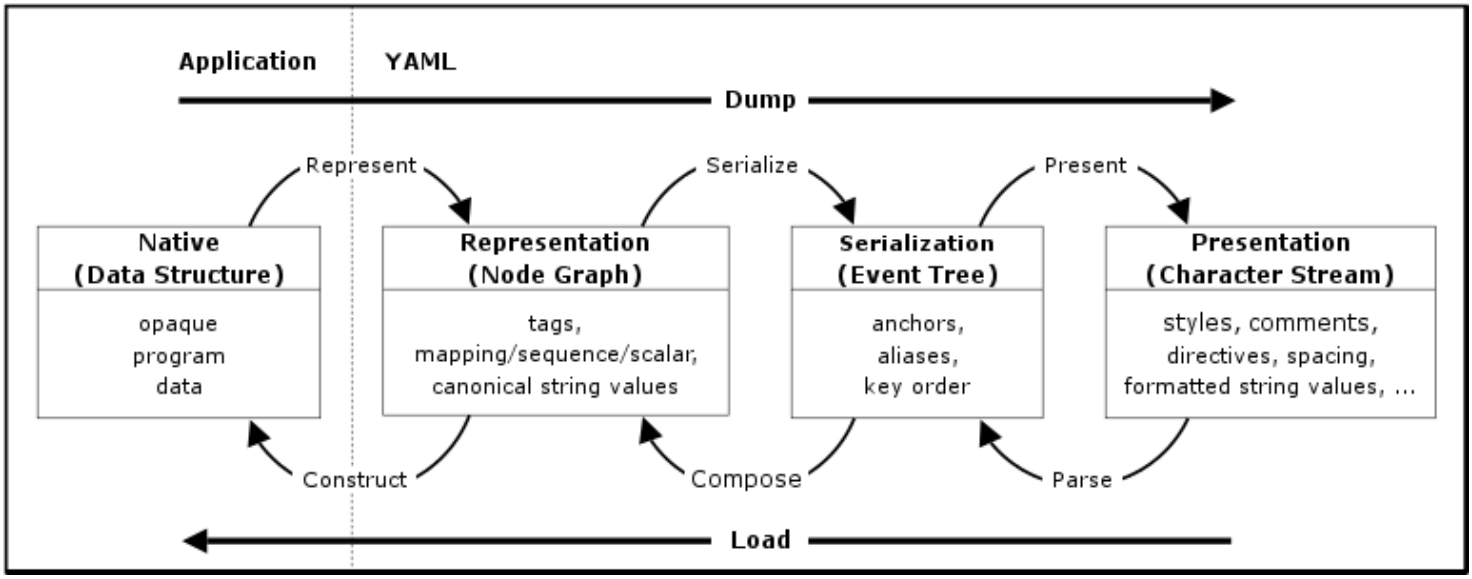
a tool for converting information between these complementary views. It is assumed that a YAML processor does its work on behalf of another module, called an *application*. This chapter describes the information structures a YAML processor must provide to or obtain from the application.

YAML information is used in two ways: for machine processing, and for human consumption. The challenge of reconciling these two perspectives is best done in three distinct translation stages: representation, serialization, and presentation. Representation addresses how YAML views native data structures to achieve portability between programming environments. Serialization concerns itself with turning a YAML representation into a serial form, that is, a form with sequential access constraints. Presentation deals with the formatting of a YAML serialization as a series of characters in a human-friendly manner.

3.1. Processes

Translating between native data structures and a character stream is done in several logically distinct stages, each with a well defined input and output data model, as shown in the following diagram:

Figure 3.1. Processing Overview



A YAML processor need not expose the serialization or representation stages. It may translate directly between native data structures and a character stream (dump and load in the diagram above). However, such a direct translation should take place so that the native data structures are constructed only from information available in the representation. In particular, mapping key order, comments, and tag handles should not be referenced during composition.

3.1.1. Dump

Dumping native data structures to a character stream is done using the following three stages:

Representing Native Data Structures

YAML *represents* any *native data structure* using three node kinds: sequence - an ordered series of entries; mapping - an unordered association of unique keys to values; and scalar - any datum with opaque structure presentable as a series of Unicode characters. Combined, these primitives generate directed graph structures. These primitives were chosen because they are both powerful and familiar: the sequence corresponds to a Perl array and a Python list, the mapping corresponds to a Perl hash table and a Python dictionary. The scalar represents strings, integers, dates, and other atomic data types.

Each YAML node requires, in addition to its kind and content, a tag specifying its data type. Type specifiers are either global URIs, or are local in scope to a single application. For example, an integer is represented in YAML with a scalar plus the global tag "`tag:yaml.org,2002:int`". Similarly, an invoice object, particular to a given organization, could be represented as a mapping together with the local tag "`!invoice`". This simple model can represent any data structure independent of programming language.

Serializing the Representation Graph

For sequential access mediums, such as an event callback API, a YAML representation must be *serialized* to an ordered tree. Since in a YAML representation, mapping keys are unordered and nodes may be referenced more than once (have more than one incoming "arrow"), the serialization process is required to impose an ordering on the mapping keys and to replace the second and subsequent references to a given node with place holders called aliases. YAML does not specify how these *serialization details* are chosen. It is up to the YAML processor to come up with human-friendly key order and anchor names, possibly with the help of the application. The result of this process, a YAML serialization tree, can then be traversed to produce a series of event calls for one-pass processing of YAML data.

Presenting the Serialization Tree

The final output process is *presenting* the YAML serializations as a character stream in a human-friendly manner. To maximize human readability, YAML offers a rich set of stylistic options which go far beyond the minimal functional needs of simple data storage. Therefore the YAML processor is required to introduce various *presentation details* when creating the stream, such as the choice of node styles, how to format scalar content, the amount of indentation, which tag handles to use, the node tags to leave unspecified, the set of directives to provide and possibly even what comments to add. While some of this can be done with the help of the application, in general this process should be guided by the preferences of the user.

3.1.2. Load

Loading native data structures from a character stream is done using the following three stages:

Parsing the Presentation Stream

Parsing is the inverse process of presentation, it takes a stream of characters and produces a series of events. Parsing discards all the details introduced in the presentation process, reporting only the serialization events. Parsing can fail due to ill-formed input.

Composing the Representation Graph

Composing takes a series of serialization events and produces a representation graph. Composing discards all the details introduced in the serialization process, producing only the representation graph. Composing can fail due to any of several reasons, detailed below.

Constructing Native Data Structures

The final input process is *constructing* native data structures from the YAML representation. Construction must be based only on the information available in the representation, and not on additional serialization or presentation details such as comments, directives, mapping key order, node styles, scalar content format, indentation levels etc. Construction can fail due to the unavailability of the required native data types.

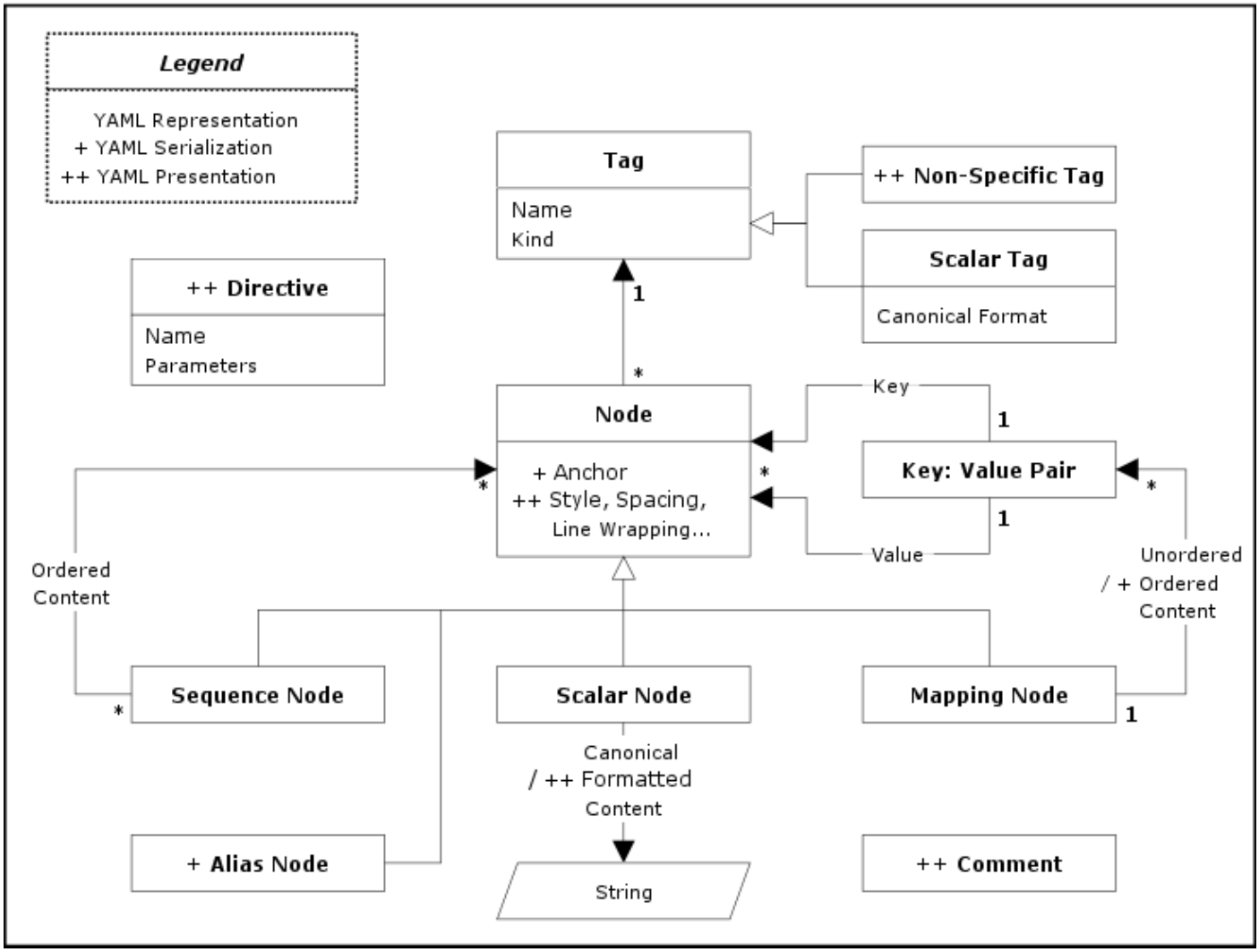
3.2. Information Models

This section specifies the formal details of the results of the above processes. To maximize data portability between programming languages and implementations, users of YAML should be mindful of the distinction between serialization or presentation properties and those which are part of the YAML representation. Thus, while imposing a order on mapping keys is necessary for flattening YAML representations to a sequential access medium, this serialization detail must not be used to convey application level information. In a similar manner, while indentation technique and a choice of a node style are needed for the human

readability, these presentation details are neither part of the YAML serialization nor the YAML representation. By carefully separating properties needed for serialization and presentation, YAML representations of application information will be consistent and portable between various programming environments.

The following diagram summarizes the three *information models*. Full arrows denote composition, hollow arrows denote inheritance, "**1**" and "*****" denote "one" and "many" relationships. A single "**+**" denotes serialization details, a double "**++**" denotes presentation details.

Figure 3.2. Information Models

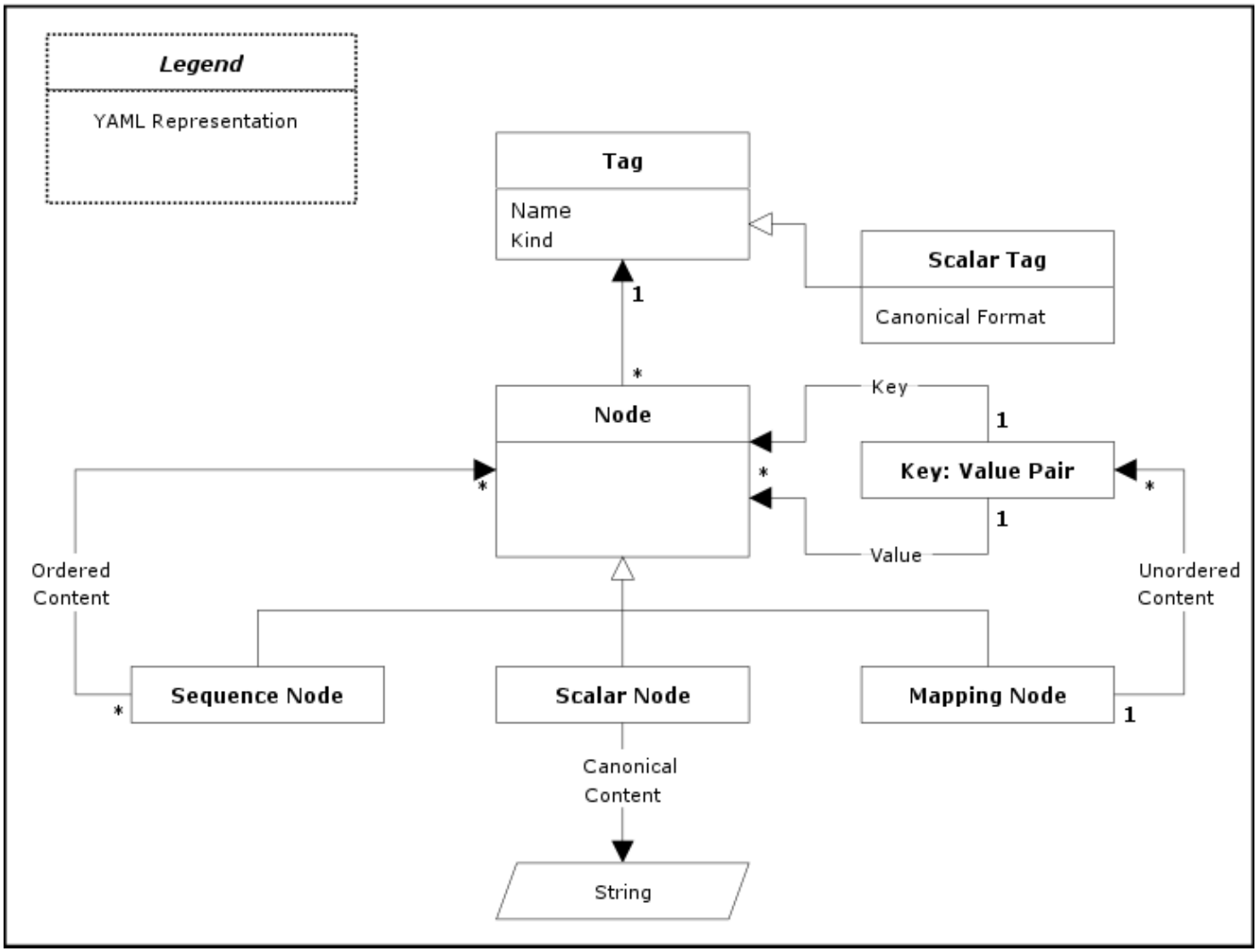


3.2.1. Representation Graph

YAML's *representation* of native data structure is a rooted, connected, directed graph of tagged nodes. By "directed graph" we mean a set of nodes and directed edges ("arrows"), where each edge connects one node to another (see a formal definition). All the nodes must be reachable from the *root node* via such edges. Note that the YAML graph may include cycles, and a node may have more than one incoming edge.

Nodes that are defined in terms of other nodes are collections; nodes that are independent of any other nodes are scalars. YAML supports two kinds of collection nodes: sequences and mappings. Mapping nodes are somewhat tricky because their keys are unordered and must be unique.

Figure 3.3. Representation Model



3.2.1.1. Nodes

A YAML *node* represents a single native data structure. Such nodes have *content* of one of three *kinds*: scalar, sequence, or mapping. In addition, each node has a tag which serves to restrict the set of possible values the content can have.

Scalar
The content of a *scalar* node is an opaque datum that can be presented as a series of zero or more Unicode characters.

Sequence
The content of a *sequence* node is an ordered series of zero or more nodes. In particular, a sequence may contain the same node more than once. It could even contain itself (directly or indirectly).

Mapping
The content of a *mapping* node is an unordered set of *key: value* node *pairs*, with the restriction that each of the keys is unique. YAML places no further restrictions on the nodes. In particular, keys may be arbitrary nodes, the same node may be used as the value of several key: value pairs, and a mapping could even contain itself as a key or a value (directly or indirectly).

When appropriate, it is convenient to consider sequences and mappings together, as *collections*. In this view, sequences are treated as mappings with integer keys starting at zero. Having a unified collections view for sequences and mappings is helpful both for theoretical analysis and for creating practical YAML tools and APIs. This strategy is also used by the Javascript programming language.

3.2.1.2. Tags

YAML represents type information of native data structures with a simple identifier, called a *tag*. *Global tags* are URIs and hence globally unique across all applications. The "`tag:`" URI scheme is recommended for all global YAML tags. In contrast, *local tags* are specific to a single application. Local tags start with *"`!`"*, are not URIs and are not expected to be globally unique. YAML provides a "`TAG`" directive to make tag notation less verbose; it also offers easy migration from local to global tags. To ensure this, local tags are restricted to the URI character set and use URI character escaping.

YAML does not mandate any special relationship between different tags that begin with the same substring. Tags ending with URI fragments (containing "`#`") are no exception; tags that share the same base URI but differ in their fragment part are considered to be different, independent tags. By convention, fragments are used to identify different "variants" of a tag, while "`/`" is used to define nested tag "namespace" hierarchies. However, this is merely a convention, and each tag may employ its own rules. For example, Perl tags may use "`::`" to express namespace hierarchies, Java tags may use "`.`", etc.

YAML tags are used to associate meta information with each node. In particular, each tag must specify the expected node kind (scalar, sequence, or mapping). Scalar tags must also provide a mechanism for converting formatted content to a canonical form for supporting equality testing. Furthermore, a tag may provide additional information such as the set of allowed content values for validation, a mechanism for tag resolution, or any other data that is applicable to all of the tag's nodes.

3.2.1.3. Node Comparison

Since YAML mappings require key uniqueness, representations must include a mechanism for testing the equality of nodes. This is non-trivial since YAML allows various ways to format scalar content. For example, the integer eleven can be written as "`0o13`" (octal) or "`0xB`" (hexadecimal). If both notations are used as keys in the same mapping, only a YAML processor which recognizes integer formats would correctly flag the duplicate key as an error.

Canonical Form

YAML supports the need for scalar equality by requiring that every scalar tag must specify a mechanism for producing the *canonical form* of any formatted content. This form is a Unicode character string which also presents the same content, and can be used for equality testing. While this requirement is stronger than a well defined equality operator, it has other uses, such as the production of digital signatures.

Equality

Two nodes must have the same tag and content to be *equal*. Since each tag applies to exactly one kind, this implies that the two nodes must have the same kind to be equal. Two scalars are equal only when their tags and canonical forms are equal character-by-character. Equality of collections is defined recursively. Two sequences are equal only when they have the same tag and length, and each node in one sequence is equal to the corresponding node in the other sequence. Two mappings are equal only when they have the same tag and an equal set of keys, and each key in this set is associated with equal values in both mappings.

Different URI schemes may define different rules for testing the equality of URIs. Since a YAML processor cannot be reasonably expected to be aware of them all, it must resort to a simple character-by-character comparison of tags to ensure consistency. This also happens to be the comparison method defined by the "`tag:`" URI scheme. Tags in a YAML stream must therefore be presented in a canonical way so that such comparison would yield the correct results.

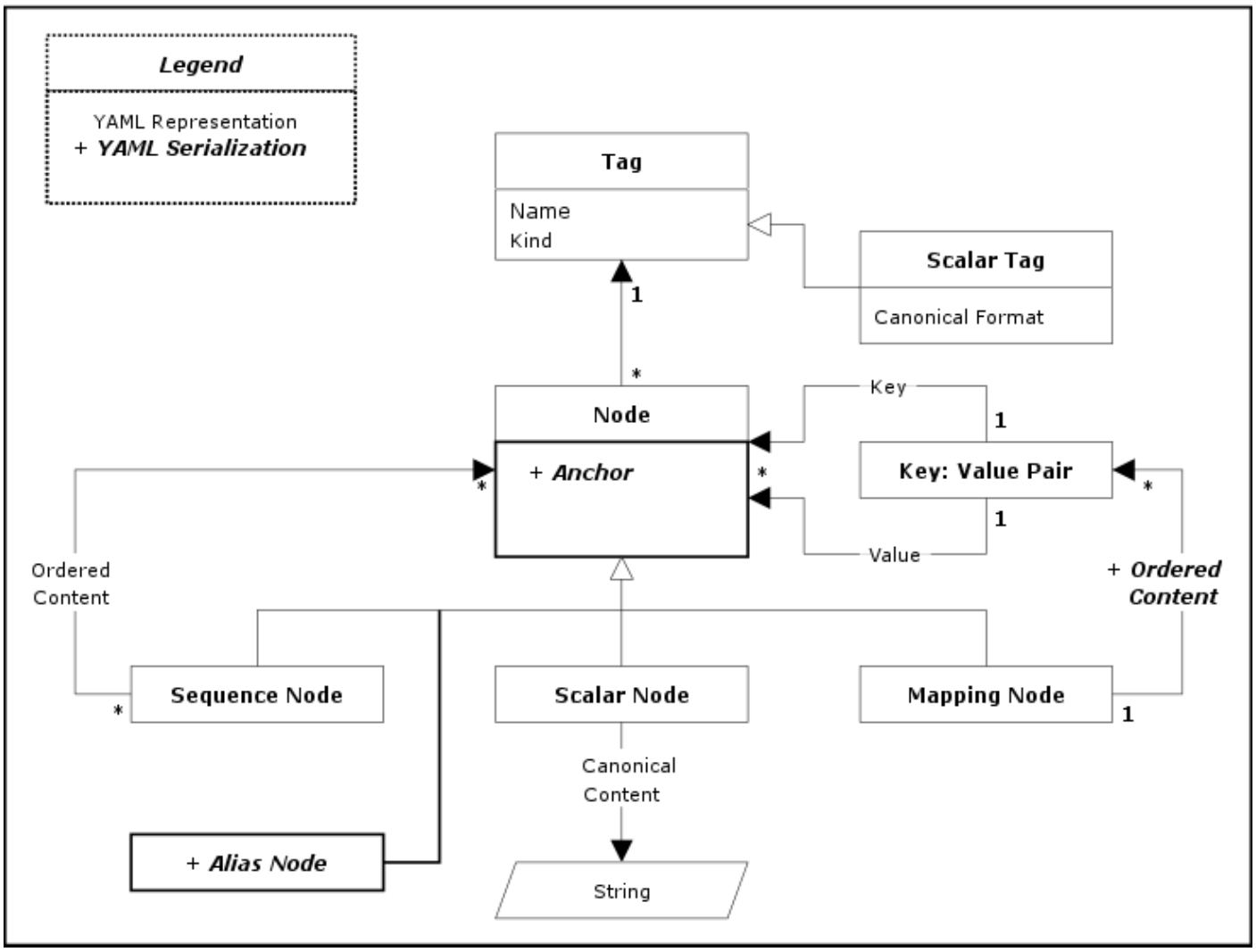
Identity

Two nodes are *identical* only when they represent the same native data structure. Typically, this corresponds to a single memory address. Identity should not be confused with equality; two equal nodes need not have the same identity. A YAML processor may treat equal scalars as if they were identical. In contrast, the separate identity of two distinct but equal collections must be preserved.

3.2.2. Serialization Tree

To express a YAML representation using a serial API, it is necessary to impose an order on mapping keys and employ alias nodes to indicate a subsequent occurrence of a previously encountered node. The result of this process is a *serialization tree*, where each node has an ordered set of children. This tree can be traversed for a serial event-based API. Construction of native data structures from the serial interface should not use key order or anchor names for the preservation of application data.

Figure 3.4. Serialization Model



3.2.2.1. Keys Order

In the representation model, mapping keys do not have an order. To serialize a mapping, it is necessary to impose an *ordering* on its keys. This order is a serialization detail and should not be used when composing the representation graph (and hence for the preservation of application data). In every case where node order is significant, a sequence must be used. For example, an ordered mapping can be represented as a sequence of mappings, where each mapping is a single key: value pair. YAML provides convenient compact notation for this case.

3.2.2.2. Anchors and Aliases

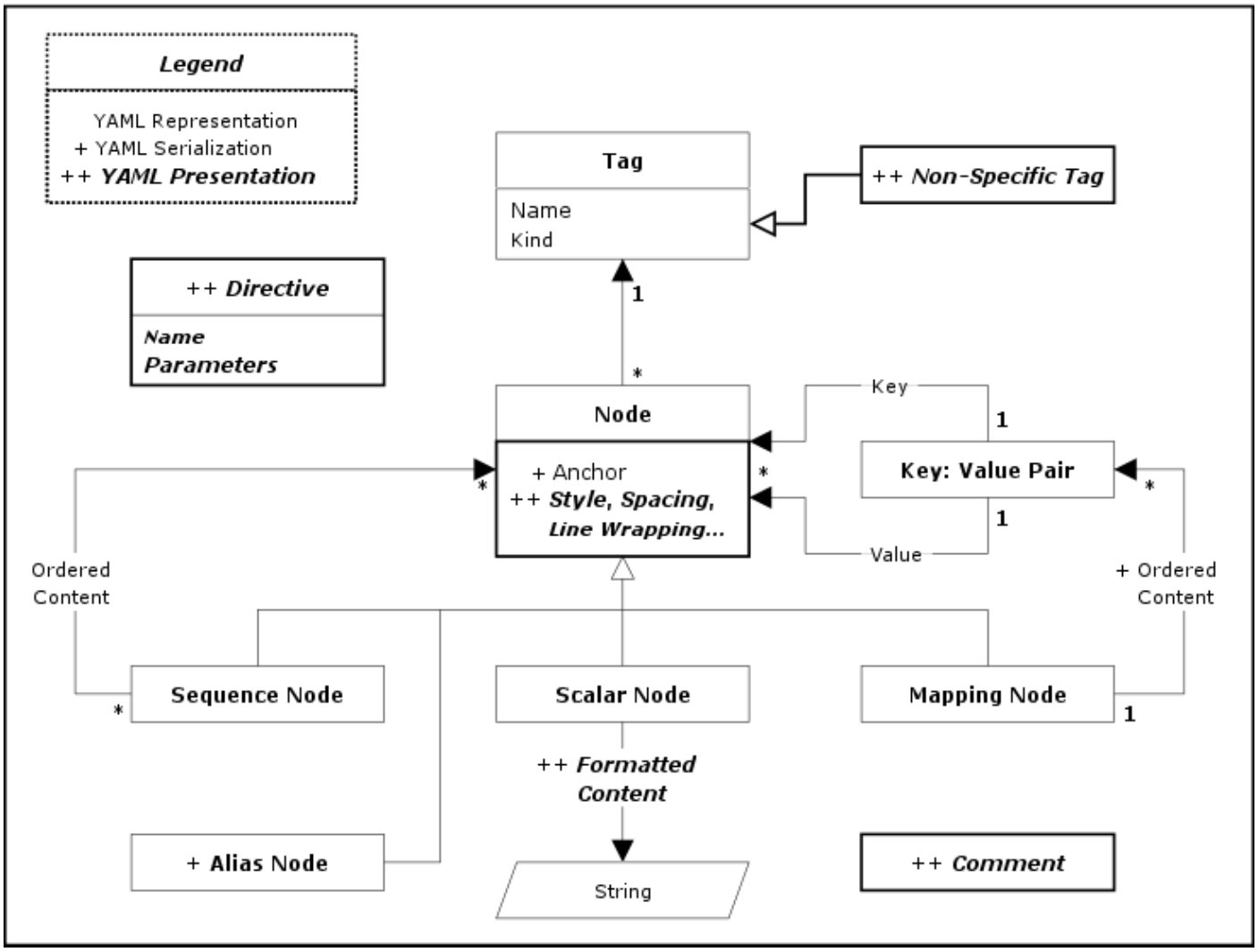
In the representation graph, a node may appear in more than one collection. When serializing such data, the first occurrence of the node is *identified* by an *anchor*. Each subsequent occurrence is serialized as an

alias node which refers back to this anchor. Otherwise, anchor names are a serialization detail and are discarded once composing is completed. When composing a representation graph from serialized events, an alias node refers to the most recent node in the serialization having the specified anchor. Therefore, anchors need not be unique within a serialization. In addition, an anchor need not have an alias node referring to it. It is therefore possible to provide an anchor for all nodes in serialization.

3.2.3. Presentation Stream

A YAML *presentation* is a stream of Unicode characters making use of of styles, scalar content formats, comments, directives and other presentation details to present a YAML serialization in a human readable way. Although a YAML processor may provide these details when parsing, they should not be reflected in the resulting serialization. YAML allows several serialization trees to be contained in the same YAML character stream, as a series of documents separated by markers. Documents appearing in the same stream are independent; that is, a node must not appear in more than one serialization tree or representation graph.

Figure 3.5. Presentation Model



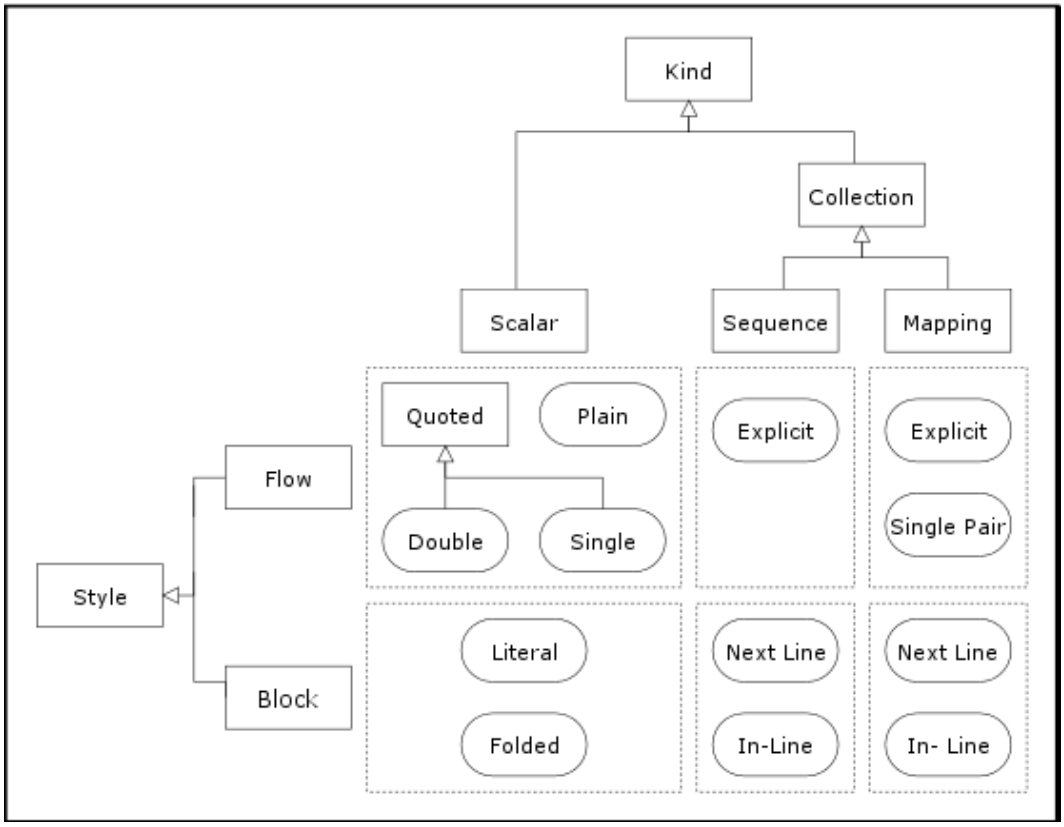
3.2.3.1. Node Styles

Each node is presented in some *style*, depending on its kind. The node style is a presentation detail and is not reflected in the serialization tree or representation graph. There are two groups of styles. Block styles use indentation to denote structure; In contrast, flow styles styles rely on explicit indicators.

YAML provides a rich set of *scalar styles*. Block scalar styles include the literal style and the folded style. Flow scalar styles include the plain style and two quoted styles, the single-quoted style and the double-quoted style. These styles offer a range of trade-offs between expressive power and readability.

Normally, block sequences and mappings begin on the next line. In some cases, YAML also allows nested block collections to start in-line for a more compact notation. In addition, YAML provides a compact notation for flow mappings with a single key: value pair, nested inside a flow sequence. These allow for a natural "ordered mapping" notation.

Figure 3.6. Kind/Style Combinations



3.2.3.2. Scalar Formats

YAML allows scalars to be presented in several *formats*. For example, the integer "`11`" might also be written as "`0xB`". Tags must specify a mechanism for converting the formatted content to a canonical form for use in equality testing. Like node style, the format is a presentation detail and is not reflected in the serialization tree and representation graph.

3.2.3.3. Comments

Comments are a presentation detail and must not have any effect on the serialization tree or representation graph. In particular, comments are not associated with a particular node. The usual purpose of a comment is to communicate between the human maintainers of a file. A typical example is comments in a configuration file. Comments must not appear inside scalars, but may be interleaved with such scalars inside collections.

3.2.3.4. Directives

Each document may be associated with a set of directives. A directive has a name and an optional sequence of parameters. Directives are instructions to the YAML processor, and like all other presentation

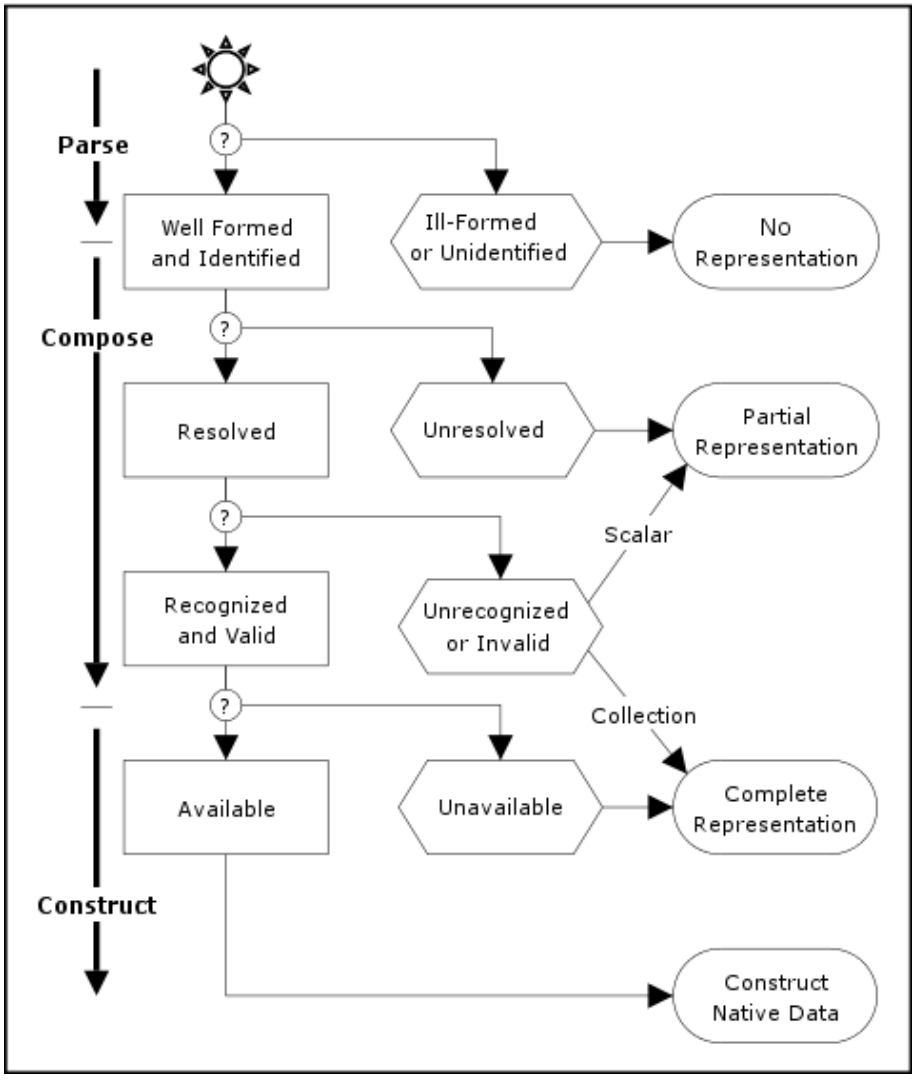
details are not reflected in the YAML serialization tree or representation graph. This version of YAML defines a two directives, "`YAML`" and "`TAG`". All other directives are reserved for future versions of YAML.

3.3. Loading Failure Points

The process of loading native data structures from a YAML stream has several potential *failure points*. The character stream may be ill-formed, aliases may be unidentified, unspecified tags may be unresolvable, tags may be unrecognized, the content may be invalid, and a native type may be unavailable. Each of these failures results with an incomplete loading.

A *partial representation* need not resolve the tag of each node, and the canonical form of formatted scalar content need not be available. This weaker representation is useful for cases of incomplete knowledge of the types used in the document. In contrast, a *complete representation* specifies the tag of each node, and provides the canonical form of formatted scalar content, allowing for equality testing. A complete representation is required in order to construct native data structures.

Figure 3.7. Loading Failure Points



3.3.1. Well-Formed Streams and Identified Aliases

A well-formed character stream must match the BNF productions specified in the following chapters. Successful loading also requires that each alias shall refer to a previous node identified by the anchor. A YAML processor should reject *ill-formed streams* and *unidentified aliases*. A YAML processor may recover

from syntax errors, possibly by ignoring certain parts of the input, but it must provide a mechanism for reporting such errors.

3.3.2. Resolved Tags

Typically, most tags are not explicitly specified in the character stream. During parsing, nodes lacking an explicit tag are given a *non-specific tag*: *"!"* for non-plain scalars, and *"?"* for all other nodes. Composing a complete representation requires each such non-specific tag to be *resolved* to a *specific tag*, be it a global tag or a local tag.

Resolving the tag of a node must only depend on the following three parameters: (1) the non-specific tag of the node, (2) the path leading from the root to the node, and (3) the content (and hence the kind) of the node. When a node has more than one occurrence (using aliases), tag resolution must depend only on the path to the first (anchored) occurrence of the node.

Note that resolution must not consider presentation details such as comments, indentation and node style. Also, resolution must not consider the content of any other node, except for the content of the key nodes directly along the path leading from the root to the resolved node. Finally, resolution must not consider the content of a sibling node in a collection, or the content of the value node associated with a key node being resolved.

These rules ensure that tag resolution can be performed as soon as a node is first encountered in the stream, typically before its content is parsed. Also, tag resolution only requires referring to a relatively small number of previously parsed nodes. Thus, in most cases, tag resolution in one-pass processors is both possible and practical.

YAML processors should resolve nodes having the "`!`" non-specific tag as "`tag:yaml.org,2002:seq`", "`tag:yaml.org,2002:map`" or "`tag:yaml.org,2002:str`" depending on their kind. This *tag resolution convention* allows the author of a YAML character stream to effectively "disable" the tag resolution process. By explicitly specifying a "`!`" non-specific tag property, the node would then be resolved to a "vanilla" sequence, mapping, or string, according to its kind.

Application specific tag resolution rules should be restricted to resolving the "`?`" non-specific tag, most commonly to resolving plain scalars. These may be matched against a set of regular expressions to provide automatic resolution of integers, floats, timestamps, and similar types. An application may also match the content of mapping nodes against sets of expected keys to automatically resolve points, complex numbers, and similar types. Resolved sequence node types such as the "ordered mapping" are also possible.

That said, tag resolution is specific to the application. YAML processors should therefore provide a mechanism allowing the application to override and expand these default tag resolution rules.

If a document contains *unresolved tags*, the YAML processor is unable to compose a complete representation graph. In such a case, the YAML processor may compose a partial representation, based on each node's kind and allowing for non-specific tags.

3.3.3. Recognized and Valid Tags

To be *valid*, a node must have a tag which is *recognized* by the YAML processor and its content must satisfy the constraints imposed by this tag. If a document contains a scalar node with an *unrecognized tag* or *invalid content*, only a partial representation may be composed. In contrast, a YAML processor can always compose a complete representation for an unrecognized or an invalid collection, since collection equality does not depend upon knowledge of the collection's data type. However, such a complete representation cannot be used to construct a native data structure.

3.3.4. Available Tags

In a given processing environment, there need not be an *available* native type corresponding to a given tag. If a node's tag is *unavailable*, a YAML processor will not be able to construct a native data structure for it. In this case, a complete representation may still be composed, and an application may wish to use this representation directly.

Chapter 4. Syntax Conventions

The following chapters formally define the syntax of YAML character streams, using parameterized BNF productions. Each BNF production is both named and numbered for easy reference. Whenever possible, basic structures are specified before the more complex structures using them in a "bottom up" fashion.

The order of alternatives inside a production is significant. Subsequent alternatives are only considered when previous ones fails. See for example the `b-break` production. In addition, production matching is expected to be greedy. Optional (`?`), zero-or-more (`*`) and one-or-more (`+`) patterns are always expected to match as much of the input as possible.

The productions are accompanied by examples, which are given side-by-side next to equivalent YAML text in an explanatory format. This format uses only flow collections, double-quoted scalars, and explicit tags for each node.

A reference implementation using the productions is available as the YamlReference Haskell package. This reference implementation is also available as an interactive web application at http://dev.yaml.org/ypaste.

4.1. Production Parameters

YAML's syntax is designed for maximal human readability. This requires parsing to depend on the surrounding text. For notational compactness, this dependency is expressed using parameterized BNF productions.

This context sensitivity is the cause of most of the complexity of the YAML syntax definition. It is further complicated by struggling with the human tendency to look ahead when interpreting text. These complications are of course the source of most of YAML's power to present data in a very human readable way.

Productions use any of the following parameters:

Indentation: `n` or `m`

Many productions use an explicit indentation level parameter. This is less elegant than Python's "indent" and "undent" conceptual tokens. However it is required to formally express YAML's indentation rules.

Context: `c`

This parameter allows productions to tweak their behavior according to their surrounding. YAML supports two groups of *contexts*, distinguishing between block styles and flow styles.

In block styles, indentation is used to delineate structure. To capture human perception of indentation the rules require special treatment of the "-" character, used in block sequences. Hence in some cases productions need to behave differently inside block sequences (*block-in context*) and outside them (*block-out context*).

In flow styles, explicit indicators are used to delineate structure. These styles can be viewed as the natural extension of JSON to cover tagged, single-quoted and plain scalars. Since the latter have no delineating indicators, they are subject to some restrictions to avoid ambiguities. These restrictions depend on where they appear: as implicit keys directly inside a block mapping (*block-key*); as implicit keys inside a flow mapping (*flow-key*); as values inside a flow collection (*flow-in*); or as values outside one (*flow-out*).

(Block) Chomping: `t`
: Block scalars offer three possible mechanisms for chomping any trailing line breaks: strip, clip and keep. Unlike the previous parameters, this only controls interpretation; the line breaks are valid in all cases.

4.2. Production Naming Conventions

To make it easier to follow production combinations, production names use a Hungarian-style naming convention. Each production is given a prefix based on the type of characters it begins and ends with.

`e-`
: A production matching no characters.

`c-`
: A production starting and ending with a special character.

`b-`
: A production matching a single line break.

`nb-`
: A production starting and ending with a non-break character.

`s-`
: A production starting and ending with a white space character.

`ns-`
: A production starting and ending with a non-space character.

`l-`
: A production matching complete line(s).

`X-Y-`
: A production starting with an `X-` character and ending with a `Y-` character, where `X-` and `Y-` are any of the above prefixes.

`X+, X-Y+`
: A production as above, with the additional property that the matched content indentation level is greater than the specified `n` parameter.

Chapter 5. Characters

5.1. Character Set

To ensure readability, YAML streams use only the *printable* subset of the Unicode character set. The allowed character range explicitly excludes the C0 control block **`#x0-#x1F`** (except for TAB **`#x9`**, LF **`#xA`**, and CR **`#xD`** which are allowed), DEL **`#x7F`**, the C1 control block **`#x80-#x9F`** (except for NEL **`#x85`** which is allowed), the surrogate block **`#xD800-#xDFFF`**, **`#xFFFE`**, and **`#xFFFF`**.

On input, a YAML processor must accept all Unicode characters except those explicitly excluded above.

On output, a YAML processor must only produce acceptable characters. Any excluded characters must be presented using escape sequences. In addition, any allowed characters known to be non-printable should also be escaped. This isn't mandatory since a full implementation would require extensive character property tables.

```
[1] c-printable ::=   #x9 | #xA | #xD | [#x20-#x7E]          /* 8 bit */
                    | #x85 | [#xA0-#xD7FF] | [#xE000-#xFFFD] /* 16 bit */
                    | [#x10000-#x10FFFF]                     /* 32 bit */
```

To ensure JSON compatibility, YAML processors must allow all non-control characters inside quoted scalars. To ensure readability, non-printable characters should be escaped on output, even inside such scalars. Note that JSON quoted scalars cannot span multiple lines or contain tabs, but YAML quoted scalars can.

```
[2] nb-json ::= #x9 | [#x20-#x10FFFF]
```

5.2. Character Encodings

All characters mentioned in this specification are Unicode code points. Each such code point is written as one or more bytes depending on the *character encoding* used. Note that in UTF-16, characters above `#xFFFF` are written as four bytes, using a surrogate pair.

The character encoding is a presentation detail and must not be used to convey content information.

On input, a YAML processor must support the UTF-8 and UTF-16 character encodings. For JSON compatibility, the UTF-32 encodings must also be supported.

If a character stream begins with a *byte order mark*, the character encoding will be taken to be as as indicated by the byte order mark. Otherwise, the stream must begin with an ASCII character. This allows the encoding to be deduced by the pattern of null (`#x00`) characters.

To make it easier to concatenate streams, byte order marks may appear at the start of any document. However all documents in the same stream must use the same character encoding.

To allow for JSON compatibility, byte order marks are also allowed inside quoted scalars. For readability, such content byte order marks should be escaped on output.

The encoding can therefore be deduced by matching the first few bytes of the stream with the following table rows (in order):

	Byte0	**Byte1**	**Byte2**	**Byte3**	**Encoding**
Explicit BOM	`#x00`	`#x00`	`#xFE`	`#xFF`	UTF-32BE
ASCII first character	`#x00`	`#x00`	`#x00`	*any*	UTF-32BE
Explicit BOM	`#xFF`	`#xFE`	`#x00`	`#x00`	UTF-32LE
ASCII first character	*any*	`#x00`	`#x00`	`#x00`	UTF-32LE
Explicit BOM	`#xFE`	`#xFF`			UTF-16BE
ASCII first character	`#x00`	*any*			UTF-16BE
Explicit BOM	`#xFF`	`#xFE`			UTF-16LE
ASCII first character	*any*	`#x00`			UTF-16LE
Explicit BOM	`#xEF`	`#xBB`	`#xBF`		UTF-8
Default					UTF-8

The recommended output encoding is UTF-8. If another encoding is used, it is recommended that an explicit byte order mark be used, even if the first stream character is ASCII.

For more information about the byte order mark and the Unicode character encoding schemes see the Unicode FAQ.

```
[3] c-byte-order-mark ::= #xFEFF
```

In the examples, byte order mark characters are displayed as "⇔".

Example 5.1. Byte Order Mark

```
⇔# Comment only.
```

```
# This stream contains no
# documents, only comments.
```

```
Legend:
  c-byte-order-mark
```

Example 5.2. Invalid Byte Order Mark

```
- Invalid use of BOM
⇔
- Inside a document.
```

```
ERROR:
 A BOM must not appear
 inside a document.
```

5.3. Indicator Characters

Indicators are characters that have special semantics.

```
[4] c-sequence-entry ::= "-"
```

A "**-**" (**#x2D**, hyphen) denotes a block sequence entry.

```
[5] c-mapping-key ::= "?"
```

A "**?**" (**#x3F**, question mark) denotes a mapping key.

```
[6] c-mapping-value ::= ":"
```

A "**:**" (**#x3A**, colon) denotes a mapping value.

Example 5.3. Block Structure Indicators

```
sequence:
- one
- two
mapping:
  ? sky
  : blue
  sea : green
```

```
%YAML 1.2
---
!!map {
  ? !!str "sequence"
  : !!seq [ !!str "one", !!str "two" ],
  ? !!str "mapping"
  : !!map {
    ? !!str "sky" : !!str "blue",
    ? !!str "sea" : !!str "green",
  },
}
```

```
Legend:
  c-sequence-entry
  c-mapping-key  c-mapping-value
```

```
[7] c-collect-entry ::= ","
```

A "**,**" (**#x2C**, comma) ends a flow collection entry.

```
[8] c-sequence-start ::= “[”
```

A “`[`” (`#x5B`, left bracket) starts a flow sequence.

```
[9] c-sequence-end ::= “]”
```

A “`]`” (`#x5D`, right bracket) ends a flow sequence.

```
[10] c-mapping-start ::= “{”
```

A “`{`” (`#x7B`, left brace) starts a flow mapping.

```
[11] c-mapping-end ::= “}”
```

A “`}`” (`#x7D`, right brace) ends a flow mapping.

Example 5.4. Flow Collection Indicators

```
sequence: [ one, two, ]
mapping: { sky: blue, sea: green }
```

Legend:
`c-sequence-start` `c-sequence-end`
`c-mapping-start` `c-mapping-end`
`c-collect-entry`

```
%YAML 1.2
---
!!map {
  ? !!str "sequence"
  : !!seq [ !!str "one", !!str "two" ],
  ? !!str "mapping"
  : !!map {
    ? !!str "sky" : !!str "blue",
    ? !!str "sea" : !!str "green",
  },
}
```

```
[12] c-comment ::= “#”
```

An “`#`” (`#x23`, octothorpe, hash, sharp, pound, number sign) denotes a comment.

Example 5.5. Comment Indicator

```
# Comment only.
```

Legend:
`c-comment`

```
# This stream contains no
# documents, only comments.
```

```
[13] c-anchor ::= “&”
```

An “`&`” (`#x26`, ampersand) denotes a node's anchor property.

```
[14] c-alias ::= “*”
```

An “`*`” (`#x2A`, asterisk) denotes an alias node.

```
[15] c-tag ::= “!”
```

The “`!`” (`#x21`, exclamation) is heavily overloaded for specifying node tags. It is used to denote tag handles used in tag directives and tag properties; to denote local tags; and as the non-specific tag for non-plain scalars.

Example 5.6. Node Property Indicators

```
anchored: !local &anchor value
alias: *anchor
```

Legend:
`c-tag` `c-anchor` `c-alias`

```
%YAML 1.2
---
!!map {
  ? !!str "anchored"
  : !local &A1 "value",
  ? !!str "alias"
```

```
  : *A1,
}
```

```
[16] c-literal ::= “|”
```

A “|” (**7C**, vertical bar) denotes a literal block scalar.

```
[17] c-folded ::= “>”
```

A “>” (**#x3E**, greater than) denotes a folded block scalar.

Example 5.7. Block Scalar Indicators

```
literal: |
  some
  text
folded: >
  some
  text
```

```
%YAML 1.2
---
!!map {
  ? !!str "literal"
  : !!str "some\ntext\n",
  ? !!str "folded"
  : !!str "some text\n",
}
```

```
Legend:
  c-literal c-folded
```

```
[18] c-single-quote ::= “'”
```

An “'” (**#x27**, apostrophe, single quote) surrounds a single-quoted flow scalar.

```
[19] c-double-quote ::= “"”
```

A “"” (**#x22**, double quote) surrounds a double-quoted flow scalar.

Example 5.8. Quoted Scalar Indicators

```
single: 'text'
double: "text"
```

```
%YAML 1.2
---
!!map {
  ? !!str "single"
  : !!str "text",
  ? !!str "double"
  : !!str "text",
}
```

```
Legend:
  c-single-quote c-double-quote
```

```
[20] c-directive ::= “%”
```

A “%” (**#x25**, percent) denotes a directive line.

Example 5.9. Directive Indicator

```
%YAML 1.2
--- text
```

```
%YAML 1.2
---
!!str "text"
```

```
Legend:
  c-directive
```

```
[21] c-reserved ::= “@” | “`”
```

The *“@”* (**#x40**, at) and *“`”* (**#x60**, grave accent) are *reserved* for future use.

Example 5.10. Invalid use of Reserved Indicators

```
commercial-at: @text
grave-accent: `text
```

```
ERROR:
 Reserved indicators can't
 start a plain scalar.
```

Any indicator character:

```
[22] c-indicator ::=   “-” | “?” | “:” | “,” | “[” | “]” | “{” | “}”
                     | “#” | “&” | “*” | “!” | “|” | “>” | “'” | “"”
                     | “%” | “@” | “`”
```

The “`[`”, “`]`”, “`{`”, “`}`” and “`,`” indicators denote structure in flow collections. They are therefore forbidden in some cases, to avoid ambiguity in several constructs. This is handled on a case-by-case basis by the relevant productions.

```
[23] c-flow-indicator ::= “,” | “[” | “]” | “{” | “}”
```

5.4. Line Break Characters

YAML recognizes the following ASCII *line break* characters.

```
[24]       b-line-feed ::= #xA    /* LF */
[25] b-carriage-return ::= #xD    /* CR */
[26]            b-char ::= b-line-feed | b-carriage-return
```

All other characters, including the form feed (**`#x0C`**), are considered to be non-break characters. Note that these include the *non-ASCII line breaks*: next line (**`#x85`**), line separator (**`#x2028`**) and paragraph separator (**`#x2029`**).

YAML version 1.1 did support the above non-ASCII line break characters; however, JSON does not. Hence, to ensure JSON compatibility, YAML treats them as non-break characters as of version 1.2. In theory this would cause incompatibility with version 1.1; in practice these characters were rarely (if ever) used. YAML 1.2 processors parsing a version 1.1 document should therefore treat these line breaks as non-break characters, with an appropriate warning.

```
[27] nb-char ::= c-printable - b-char - c-byte-order-mark
```

Line breaks are interpreted differently by different systems, and have several widely used formats.

```
[28] b-break ::=   ( b-carriage-return b-line-feed ) /* DOS, Windows */
                 | b-carriage-return                 /* MacOS upto 9.x */
                 | b-line-feed                       /* UNIX, MacOS X */
```

Line breaks inside scalar content must be *normalized* by the YAML processor. Each such line break must be parsed into a single line feed character. The original line break format is a presentation detail and must not be used to convey content information.

```
[29] b-as-line-feed ::= b-break
```

Outside scalar content, YAML allows any line break to be used to terminate lines.

```
[30] b-non-content ::= b-break
```

On output, a YAML processor is free to emit line breaks using whatever convention is most appropriate.

In the examples, line breaks are sometimes displayed using the "↓" glyph for clarity.

Example 5.11. Line Break Characters

```
|
  Line break (no glyph)
  Line break (glyphed)↓
```

```
%YAML 1.2
---
!!str "line break (no glyph)\n\
      line break (glyphed)\n"
```

```
Legend:
  b-break
```

5.5. White Space Characters

YAML recognizes two *white space* characters: *space* and *tab*.

```
[31] s-space ::= #x20 /* SP */
[32]   s-tab ::= #x9  /* TAB */
[33] s-white ::= s-space | s-tab
```

The rest of the (printable) non-break characters are considered to be non-space characters.

```
[34] ns-char ::= nb-char - s-white
```

In the examples, tab characters are displayed as the glyph "→". Space characters are sometimes displayed as the glyph "·" for clarity.

Example 5.12. Tabs and Spaces

```
# Tabs and spaces
quoted:·"Quoted →"
block:→|
··void main() {
··→printf("Hello, world!\n");
··}
```

```
%YAML 1.2
---
!!map {
  ? !!str "quoted"
  : "Quoted \t",
  ? !!str "block"
  : "void main() {\n\
    \tprintf(\"Hello, world!\\n\");\n\
    }\n",
}
```

```
Legend:
  s-space  s-tab
```

5.6. Miscellaneous Characters

The YAML syntax productions make use of the following additional character classes:

- A decimal digit for numbers:

```
[35] ns-dec-digit ::= [#x30-#x39] /* 0-9 */
```

- A hexadecimal digit for escape sequences:

```
[36] ns-hex-digit ::=   ns-dec-digit
                      | [#x41-#x46] /* A-F */ | [#x61-#x66] /* a-f */
```

- ASCII letter (alphabetic) characters:

```
[37] ns-ascii-letter ::= [#x41-#x5A] /* A-Z */ | [#x61-#x7A] /* a-z */
```

- Word (alphanumeric) characters for identifiers:

```
[38] ns-word-char ::= ns-dec-digit | ns-ascii-letter | "-"
```

- URI characters for tags, as specified in RFC2396, with the addition of the "[" and "]" for presenting IPv6 addresses as proposed in RFC2732.

  By convention, any URI characters other than the allowed printable ASCII characters are first *encoded* in UTF-8, and then each byte is *escaped* using the *"%"* character. The YAML processor must not expand such escaped characters. Tag characters must be preserved and compared exactly as presented in the YAML stream, without any processing.

```
[39] ns-uri-char ::=   "%" ns-hex-digit ns-hex-digit | ns-word-char | "#"
                     | ";" | "/" | "?" | ":" | "@" | "&" | "=" | "+" | "$" | ","
                     | "_" | "." | "!" | "~" | "*" | "'" | "(" | ")" | "[" | "]"
```

- The "!" character is used to indicate the end of a named tag handle; hence its use in tag shorthands is restricted. In addition, such shorthands must not contain the "[", "]", "{", "}" and "," characters. These characters would cause ambiguity with flow collection structures.

```
[40] ns-tag-char ::= ns-uri-char - "!" - c-flow-indicator
```

5.7. Escaped Characters

All non-printable characters must be *escaped*. YAML escape sequences use the *"\"* notation common to most modern computer languages. Each escape sequence must be parsed into the appropriate Unicode character. The original escape sequence is a presentation detail and must not be used to convey content information.

Note that escape sequences are only interpreted in double-quoted scalars. In all other scalar styles, the "\" character has no special meaning and non-printable characters are not available.

```
[41] c-escape ::= "\"
```

YAML escape sequences are a superset of C's escape sequences:

`[42] ns-esc-null ::= "0"`	Escaped ASCII null (**#x0**) character.
`[43] ns-esc-bell ::= "a"`	Escaped ASCII bell (**#x7**) character.
`[44] ns-esc-backspace ::= "b"`	Escaped ASCII backspace (**#x8**) character.
`[45] ns-esc-horizontal-tab ::= "t" | #x9`	Escaped ASCII horizontal tab (**#x9**) character. This is useful at the start or the end of a line to force a leading or trailing tab to become part of the content.
`[46] ns-esc-line-feed ::= "n"`	Escaped ASCII line feed (**#xA**) character.
`[47] ns-esc-vertical-tab ::= "v"`	Escaped ASCII vertical tab (**#xB**) character.
`[48] ns-esc-form-feed ::= "f"`	Escaped ASCII form feed (**#xC**) character.
`[49] ns-esc-carriage-return ::= "r"`	Escaped ASCII carriage return (**#xD**) character.
`[50] ns-esc-escape ::= "e"`	Escaped ASCII escape (**#x1B**) character.
`[51] ns-esc-space ::= #x20`	Escaped ASCII space (**#x20**) character. This is useful at the start or the end of a line to force a leading or trailing space to become part of the content.
`[52] ns-esc-double-quote ::= """`	Escaped ASCII double quote (**#x22**).
`[53] ns-esc-slash ::= "/"`	Escaped ASCII slash (**#x2F**), for JSON compatibility.
`[54] ns-esc-backslash ::= "\"`	Escaped ASCII back slash (**#x5C**).
`[55] ns-esc-next-line ::= "N"`	Escaped Unicode next line (**#x85**) character.
`[56] ns-esc-non-breaking-space ::= "_"`	Escaped Unicode non-breaking space (**#xA0**) character.
`[57] ns-esc-line-separator ::= "L"`	Escaped Unicode line separator (**#x2028**) character.
`[58] ns-esc-paragraph-separator ::= "P"`	Escaped Unicode paragraph separator (**#x2029**) character.
`[59] ns-esc-8-bit ::= "x" ( ns-hex-digit × 2 )`	Escaped 8-bit Unicode character.
`[60] ns-esc-16-bit ::= "u" ( ns-hex-digit × 4 )`	Escaped 16-bit Unicode character.
`[61] ns-esc-32-bit ::= "U"`	Escaped 32-bit Unicode character.

```
                        ( ns-hex-digit × 8 )
```

Any escaped character:

```
[62] c-ns-esc-char ::= "\"
                       ( ns-esc-null | ns-esc-bell | ns-esc-backspace
                       | ns-esc-horizontal-tab | ns-esc-line-feed
                       | ns-esc-vertical-tab | ns-esc-form-feed
                       | ns-esc-carriage-return | ns-esc-escape | ns-esc-space
                       | ns-esc-double-quote | ns-esc-slash | ns-esc-backslash
                       | ns-esc-next-line | ns-esc-non-breaking-space
                       | ns-esc-line-separator | ns-esc-paragraph-separator
                       | ns-esc-8-bit | ns-esc-16-bit | ns-esc-32-bit )
```

Example 5.13. Escaped Characters

```
"Fun with \\
\" \a \b \e \f \↓
\n \r \t \v \0 \↓
\  \_ \N \L \P \↓
\x41 \u0041 \U00000041"
```

```
%YAML 1.2
---
"Fun with \x5C
\x22 \x07 \x08 \x1B \x0C
\x0A \x0D \x09 \x0B \x00
\x20 \xA0 \x85 \u2028 \u2029
A A A"
```

```
Legend:
  c-ns-esc-char
```

Example 5.14. Invalid Escaped Characters

```
Bad escapes:
  "\c
  \xq-"
```

```
ERROR:
- c is an invalid escaped character.
- q and - are invalid hex digits.
```

Chapter 6. Basic Structures

6.1. Indentation Spaces

In YAML block styles, structure is determined by *indentation*. In general, indentation is defined as a zero or more space characters at the start of a line.

To maintain portability, tab characters must not be used in indentation, since different systems treat tabs differently. Note that most modern editors may be configured so that pressing the tab key results in the insertion of an appropriate number of spaces.

The amount of indentation is a presentation detail and must not be used to convey content information.

```
[63] s-indent(n) ::= s-space × n
```

A block style construct is terminated when encountering a line which is less indented than the construct. The productions use the notation "**s-indent(<n)**" and "**s-indent(≤n)**" to express this.

```
[64] s-indent(<n) ::= s-space × m /* Where m < n */
```

```
[65] s-indent(≤n) ::= s-space × m /* Where m ≤ n */
```

Each node must be indented further than its parent node. All sibling nodes must use the exact same indentation level. However the content of each sibling node may be further indented independently.

Example 6.1. Indentation Spaces

```
··# Leading comment line spaces are
···# neither content nor indentation.
····
Not indented:
·By one space: |
····By four
····  ··spaces
·Flow style: [    # Leading spaces
··  ·By two,        # in flow style
··Also by two,    # are neither
··→Still by two   # content nor
··  ··]             # indentation.
```

Legend:
s-indent(n) Content
Neither content nor indentation

```
%YAML 1.2
- - -
!!map {
  ? !!str "Not indented"
  : !!map {
      ? !!str "By one space"
      : !!str "By four\n  spaces\n",
      ? !!str "Flow style"
      : !!seq [
          !!str "By two",
          !!str "Also by two",
          !!str "Still by two",
        ]
    }
}
```

The "-", "?" and ":" characters used to denote block collection entries are perceived by people to be part of the indentation. This is handled on a case-by-case basis by the relevant productions.

Example 6.2. Indentation Indicators

```
?·a
:·-→b
··-··-→c
·····-·d
```

Legend:
Total Indentation
s-indent(n) Indicator as indentation

```
%YAML 1.2
---
!!map {
  ? !!str "a"
  : !!seq [
    !!str "b",
    !!seq [ !!str "c", !!str "d" ]
  ],
}
```

6.2. Separation Spaces

Outside indentation and scalar content, YAML uses white space characters for *separation* between tokens within a line. Note that such white space may safely include tab characters.

Separation spaces are a presentation detail and must not be used to convey content information.

```
[66] s-separate-in-line ::= s-white+ | /* Start of line */
```

Example 6.3. Separation Spaces

```
-·foo:·→·bar
- -·baz
  -→baz
```

Legend:
s-separate-in-line

```
%YAML 1.2
---
!!seq [
  !!map {
    ? !!str "foo" : !!str "bar",
  },
  !!seq [ !!str "baz", !!str "baz" ],
]
```

6.3. Line Prefixes

Inside scalar content, each line begins with a non-content *line prefix*. This prefix always includes the indentation. For flow scalar styles it additionally includes all leading white space, which may contain tab characters.

Line prefixes are a presentation detail and must not be used to convey content information.

```
[67]     s-line-prefix(n,c) ::= c = block-out ⇒ s-block-line-prefix(n)
                                c = block-in  ⇒ s-block-line-prefix(n)
                                c = flow-out  ⇒ s-flow-line-prefix(n)
                                c = flow-in   ⇒ s-flow-line-prefix(n)
[68] s-block-line-prefix(n) ::= s-indent(n)
[69]  s-flow-line-prefix(n) ::= s-indent(n) s-separate-in-line?
```

Example 6.4. Line Prefixes

```
plain: text
··lines
quoted: "text
··→lines"
block: |
··text
···→lines
```

```
%YAML 1.2
---
!!map {
  ? !!str "plain"
  : !!str "text lines",
  ? !!str "quoted"
  : !!str "text lines",
  ? !!str "block"
  : !!str "text\n·→lines\n",
}
```

Legend:
s-flow-line-prefix(n) s-block-line-prefix(n) s-indent(n)

6.4. Empty Lines

An *empty line* line consists of the non-content prefix followed by a line break.

```
[70] l-empty(n,c) ::= ( s-line-prefix(n,c) | s-indent(<n) )
                      b-as-line-feed
```

The semantics of empty lines depend on the scalar style they appear in. This is handled on a case-by-case basis by the relevant productions.

Example 6.5. Empty Lines

```
Folding:
  "Empty line
···→
  as a line feed"
Chomping: |
  Clipped empty lines
·
```

```
%YAML 1.2
---
!!map {
  ? !!str "Folding"
  : !!str "Empty line\nas a line feed",
  ? !!str "Chomping"
  : !!str "Clipped empty lines\n",
}
```

Legend:
l-empty(n,c)

6.5. Line Folding

Line folding allows long lines to be broken for readability, while retaining the semantics of the original long line. If a line break is followed by an empty line, it is *trimmed*; the first line break is discarded and the rest are retained as content.

```
[71] b-l-trimmed(n,c) ::= b-non-content l-empty(n,c)+
```

Otherwise (the following line is not empty), the line break is converted to a single space (**#x20**).

```
[72] b-as-space ::= b-break
```

A folded non-empty line may end with either of the above line breaks.

```
[73] b-l-folded(n,c) ::= b-l-trimmed(n,c) | b-as-space
```

Example 6.6. Line Folding

```
>-
  trimmed↓
··↓
·↓
↓
  as↓
  space
```

```
%YAML 1.2
---
!!str "trimmed\n\n\nas space"
```

Legend:
b-l-trimmed(n,c)
b-as-space

The above rules are common to both the folded block style and the scalar flow styles. Folding does distinguish between these cases in the following way:

Block Folding

In the folded block style, the final line break and trailing empty lines are subject to chomping, and are never folded. In addition, folding does not apply to line breaks surrounding text lines that contain leading white space. Note that such a more-indented line may consist only of such leading white space.

The combined effect of the *block line folding* rules is that each "paragraph" is interpreted as a line, empty lines are interpreted as a line feed, and the formatting of more-indented lines is preserved.

Example 6.7. Block Folding


```
%YAML 1.2
--- !!str
"foo \n\n\t bar\n\nbaz\n"
```

```
Legend:
  b-l-folded(n,c)
  Non-content spaces  Content spaces
```

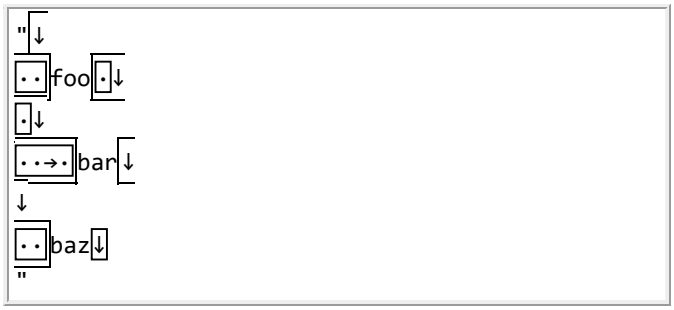
Flow Folding

Folding in flow styles provides more relaxed semantics. Flow styles typically depend on explicit indicators rather than indentation to convey structure. Hence spaces preceding or following the text in a line are a presentation detail and must not be used to convey content information. Once all such spaces have been discarded, all line breaks are folded, without exception.

The combined effect of the *flow line folding* rules is that each "paragraph" is interpreted as a line, empty lines are interpreted as line feeds, and text can be freely more-indented without affecting the content information.

```
[74] s-flow-folded(n) ::= s-separate-in-line? b-l-folded(n,flow-in)
                          s-flow-line-prefix(n)
```

Example 6.8. Flow Folding




```
%YAML 1.2
--- !!str
" foo\nbar\nbaz "
```

```
Legend:
  s-flow-folded(n)
  Non-content spaces
```

6.6. Comments

An explicit *comment* is marked by a *"#" indicator*. Comments are a presentation detail and must not be used to convey content information.

Comments must be separated from other tokens by white space characters. To ensure JSON compatibility, YAML processors must allow for the omission of the final comment line break of the input stream. However, as this confuses many tools, YAML processors should terminate the stream with an explicit line break on output.

```
[75] c-nb-comment-text ::= "#" nb-char*
[76]         b-comment ::= b-non-content | /* End of file */
[77]       s-b-comment ::= ( s-separate-in-line c-nb-comment-text? )?
                           b-comment
```

Example 6.9. Separated Comment


```
%YAML 1.2
---
!!map {
  ? !!str "key"
  : !!str "value",
}
```

Legend:
c-nb-comment-text b-comment
s-b-comment

Outside scalar content, comments may appear on a line of their own, independent of the indentation level. Note that outside scalar content, a line containing only white space characters is taken to be a comment line.

```
[78] l-comment ::= s-separate-in-line c-nb-comment-text? b-comment
```

Example 6.10. Comment Lines

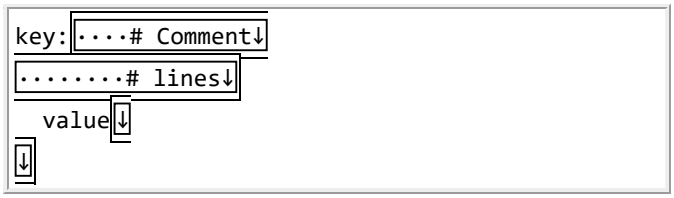

```
# This stream contains no
# documents, only comments.
```

Legend:
s-b-comment l-comment

In most cases, when a line may end with a comment, YAML allows it to be followed by additional comment lines. The only exception is a comment ending a block scalar header.

```
[79] s-l-comments ::= ( s-b-comment | /* Start of line */ )
                      l-comment*
```

Example 6.11. Multi-Line Comments




```
%YAML 1.2
---
!!map {
  ? !!str "key"
  : !!str "value",
}
```

Legend:
s-b-comment l-comment s-l-comments

6.7. Separation Lines

Implicit keys are restricted to a single line. In all other cases, YAML allows tokens to be separated by multi-line (possibly empty) comments.

Note that structures following multi-line comment separation must be properly indented, even though there is no such restriction on the separation comment lines themselves.

```
[80]     s-separate(n,c) ::= c = block-out ⇒ s-separate-lines(n)
                             c = block-in  ⇒ s-separate-lines(n)
                             c = flow-out  ⇒ s-separate-lines(n)
                             c = flow-in   ⇒ s-separate-lines(n)
                             c = block-key ⇒ s-separate-in-line
                             c = flow-key  ⇒ s-separate-in-line
[81] s-separate-lines(n) ::=   ( s-l-comments s-flow-line-prefix(n) )
                             | s-separate-in-line
```

Example 6.12. Separation Spaces

```
{·first:·Sammy,·last:·Sosa·}:↓
# Statistics:
··hr:··# Home runs
·····65
··avg:·# Average
·····0.278
```

Legend:
- s-separate-in-line
- s-separate-lines(n)
- s-indent(n)

```
%YAML 1.2
---
!!map {
  ? !!map {
    ? !!str "first"
    : !!str "Sammy",
    ? !!str "last"
    : !!str "Sosa",
  }
  : !!map {
    ? !!str "hr"
    : !!int "65",
    ? !!str "avg"
    : !!float "0.278",
  },
}
```

6.8. Directives

Directives are instructions to the YAML processor. This specification defines two directives, "**YAML**" and "**TAG**", and *reserves* all other directives for future use. There is no way to define private directives. This is intentional.

Directives are a presentation detail and must not be used to convey content information.

```
[82] l-directive ::= "%"
                     ( ns-yaml-directive
                     | ns-tag-directive
                     | ns-reserved-directive )
                     s-l-comments
```

Each directive is specified on a separate non-indented line starting with the *"%" indicator*, followed by the directive name and a list of parameters. The semantics of these parameters depends on the specific directive. A YAML processor should ignore unknown directives with an appropriate warning.

```
[83]  ns-reserved-directive ::= ns-directive-name
                                ( s-separate-in-line ns-directive-parameter )*
[84]      ns-directive-name ::= ns-char+
[85] ns-directive-parameter ::= ns-char+
```

Example 6.13. Reserved Directives

```
%YAML 1.2
--- !!str
```

```
%FOO  bar baz # Should be ignored
              # with a warning.
--- "foo"
```

```
"foo"
```

```
Legend:
  ns-reserved-directive  ns-directive-name  ns-directive-parameter
```

6.8.1. "YAML" Directives

The *"YAML" directive* specifies the version of YAML the document conforms to. This specification defines version "1.2", including recommendations for *YAML 1.1 processing*.

A version 1.2 YAML processor must accept documents with an explicit "%YAML 1.2" directive, as well as documents lacking a "YAML" directive. Such documents are assumed to conform to the 1.2 version specification. Documents with a "YAML" directive specifying a higher minor version (e.g. "%YAML 1.3") should be processed with an appropriate warning. Documents with a "YAML" directive specifying a higher major version (e.g. "%YAML 2.0") should be rejected with an appropriate error message.

A version 1.2 YAML processor must also accept documents with an explicit "%YAML 1.1" directive. Note that version 1.2 is mostly a superset of version 1.1, defined for the purpose of ensuring *JSON compatibility*. Hence a version 1.2 processor should process version 1.1 documents as if they were version 1.2, giving a warning on points of incompatibility (handling of non-ASCII line breaks, as described above).

```
[86] ns-yaml-directive ::= “Y” “A” “M” “L”
                           s-separate-in-line ns-yaml-version
[87]   ns-yaml-version ::= ns-dec-digit+ “.” ns-dec-digit+
```

Example 6.14. "YAML" directive

```
%YAML 1.3 # Attempt parsing
          # with a warning
---
"foo"
```

```
%YAML 1.2
---
!!str "foo"
```

```
Legend:
  ns-yaml-directive  ns-yaml-version
```

It is an error to specify more than one "YAML" directive for the same document, even if both occurrences give the same version number.

Example 6.15. Invalid Repeated YAML directive

```
%YAML 1.2
%YAML 1.1
foo
```

```
ERROR:
The YAML directive must only be
given at most once per document.
```

6.8.2. "TAG" Directives

The *"TAG" directive* establishes a tag shorthand notation for specifying node tags. Each "TAG" directive associates a handle with a prefix. This allows for compact and readable tag notation.

```
[88] ns-tag-directive ::= "T" "A" "G"
                          s-separate-in-line c-tag-handle
                          s-separate-in-line ns-tag-prefix
```

Example 6.16. "TAG" directive

```
%TAG !yaml! tag:yaml.org,2002:
---
!yaml!str "foo"
```

```
%YAML 1.2
---
!!str "foo"
```

```
Legend:
  ns-tag-directive  c-tag-handle  ns-tag-prefix
```

It is an error to specify more than one "TAG" directive for the same handle in the same document, even if both occurrences give the same prefix.

Example 6.17. Invalid Repeated TAG directive

```
%TAG ! !foo
%TAG ! !foo
bar
```

```
ERROR:
The TAG directive must only
be given at most once per
handle in the same document.
```

6.8.2.1. Tag Handles

The *tag handle* exactly matches the prefix of the affected tag shorthand. There are three tag handle variants:

```
[89] c-tag-handle ::=   c-named-tag-handle
                      | c-secondary-tag-handle
                      | c-primary-tag-handle
```

Primary Handle

The *primary tag handle* is a single *"!"* character. This allows using the most compact possible notation for a single "primary" name space. By default, the prefix associated with this handle is "!". Thus, by default, shorthands using this handle are interpreted as local tags.

It is possible to override the default behavior by providing an explicit "TAG" directive, associating a different prefix for this handle. This provides smooth migration from using local tags to using global tags, by the simple addition of a single "TAG" directive.

```
[90] c-primary-tag-handle ::= "!"
```

Example 6.18. Primary Tag Handle

```
# Private
!foo "bar"
...
# Global
%TAG ! tag:example.com,2000:app/
---
!foo "bar"
```

```
%YAML 1.2
---
!<!foo> "bar"
...
---
!<tag:example.com,2000:app/foo> "bar"
```

```
Legend:
  c-primary-tag-handle
```

Secondary Handle

The *secondary tag handle* is written as *"!!"*. This allows using a compact notation for a single "secondary" name space. By default, the prefix associated with this handle is "**tag:yaml.org,2002:**". This prefix is used by the YAML tag repository.

It is possible to override this default behavior by providing an explicit "**TAG**" directive associating a different prefix for this handle.

```
[91] c-secondary-tag-handle ::= "!" "!"
```

Example 6.19. Secondary Tag Handle

```
%TAG !! tag:example.com,2000:app/
---
!!int 1 - 3 # Interval, not integer
```

```
%YAML 1.2
---
!<tag:example.com,2000:app/int> "1 - 3"
```

```
Legend:
  c-secondary-tag-handle
```

Named Handles

A *named tag handle* surrounds a non-empty name with *"!"* characters. A handle name must not be used in a tag shorthand unless an explicit "**TAG**" directive has associated some prefix with it.

The name of the handle is a presentation detail and must not be used to convey content information. In particular, the YAML processor need not preserve the handle name once parsing is completed.

```
[92] c-named-tag-handle ::= "!" ns-word-char+ "!"
```

Example 6.20. Tag Handles

```
%TAG !e! tag:example.com,2000:app/
---
!e!foo "bar"
```

```
%YAML 1.2
---
!<tag:example.com,2000:app/foo> "bar"
```

```
Legend:
  c-named-tag-handle
```

6.8.2.2. Tag Prefixes

There are two *tag prefix* variants:

```
[93] ns-tag-prefix ::= c-ns-local-tag-prefix | ns-global-tag-prefix
```

Local Tag Prefix

If the prefix begins with a "`!`" character, shorthands using the handle are expanded to a local tag. Note that such a tag is intentionally not a valid URI, and its semantics are specific to the application. In particular, two documents in the same stream may assign different semantics to the same local tag.

```
[94] c-ns-local-tag-prefix ::= “!” ns-uri-char*
```

Example 6.21. Local Tag Prefix

```
%TAG !m! !my-
--- # Bulb here
!m!light fluorescent
...
%TAG !m! !my-
--- # Color here
!m!light green
```

```
%YAML 1.2
---
!<!my-light> "fluorescent"
...
%YAML 1.2
---
!<!my-light> "green"
```

```
Legend:
  c-ns-local-tag-prefix
```

Global Tag Prefix

If the prefix begins with a character other than "`!`", it must to be a valid URI prefix, and should contain at least the scheme and the authority. Shorthands using the associated handle are expanded to globally unique URI tags, and their semantics is consistent across applications. In particular, every documents in every stream must assign the same semantics to the same global tag.

```
[95] ns-global-tag-prefix ::= ns-tag-char ns-uri-char*
```

Example 6.22. Global Tag Prefix

```
%TAG !e! tag:example.com,2000:app/
---
- !e!foo "bar"
```

```
%YAML 1.2
---
!<tag:example.com,2000:app/foo> "bar"
```

```
Legend:
  ns-global-tag-prefix
```

6.9. Node Properties

Each node may have two optional *properties*, anchor and tag, in addition to its content. Node properties may be specified in any order before the node's content. Either or both may be omitted.

```
[96] c-ns-properties(n,c) ::=   ( c-ns-tag-property
                                  ( s-separate(n,c) c-ns-anchor-property )? )
                              | ( c-ns-anchor-property
                                  ( s-separate(n,c) c-ns-tag-property )? )
```

Example 6.23. Node Properties

```
!!str &a1 "foo":
  !!str bar
&a2 baz : *a1
```

```
Legend:
  c-ns-properties(n,c)
  c-ns-anchor-property
  c-ns-tag-property
```

```
%YAML 1.2
---
!!map {
  ? &B1 !!str "foo"
  : !!str "bar",
  ? !!str "baz"
  : *B1,
}
```

6.9.1. Node Tags

The *tag property* identifies the type of the native data structure presented by the node. A tag is denoted by the *"!" indicator*.

```
[97] c-ns-tag-property ::=   c-verbatim-tag
                           | c-ns-shorthand-tag
                           | c-non-specific-tag
```

Verbatim Tags

A tag may be written *verbatim* by surrounding it with the *"<" and ">"* characters. In this case, the YAML processor must deliver the verbatim tag as-is to the application. In particular, verbatim tags are not subject to tag resolution. A verbatim tag must either begin with a "!" (a local tag) or be a valid URI (a global tag).

```
[98] c-verbatim-tag ::= "!" "<" ns-uri-char+ ">"
```

Example 6.24. Verbatim Tags

```
!<tag:yaml.org,2002:str> foo :
  !<!bar> baz
```

```
Legend:
  c-verbatim-tag
```

```
%YAML 1.2
---
!!map {
  ? !<tag:yaml.org,2002:str> "foo"
  : !<!bar> "baz",
}
```

Example 6.25. Invalid Verbatim Tags

```
- !<!> foo
- !<$:?> bar
```

```
ERROR:
- Verbatim tags aren't resolved,
  so ! is invalid.
- The $:? tag is neither a global
  URI tag nor a local tag starting
  with "!".
```

Tag Shorthands

A *tag shorthand* consists of a valid tag handle followed by a non-empty suffix. The tag handle must be associated with a prefix, either by default or by using a "`TAG`" directive. The resulting parsed tag is the concatenation of the prefix and the suffix, and must either begin with "`!`" (a local tag) or be a valid URI (a global tag).

The choice of tag handle is a presentation detail and must not be used to convey content information. In particular, the tag handle may be discarded once parsing is completed.

The suffix must not contain any "`!`" character. This would cause the tag shorthand to be interpreted as having a named tag handle. In addition, the suffix must not contain the "`[`", "`]`", "`{`", "`}`" and "`,`" characters. These characters would cause ambiguity with flow collection structures. If the suffix needs to specify any of the above restricted characters, they must be escaped using the "`%`" character. This behavior is consistent with the URI character escaping rules (specifically, section 2.3 of RFC2396).

```
[99] c-ns-shorthand-tag ::= c-tag-handle ns-tag-char+
```

Example 6.26. Tag Shorthands

```
%TAG !e! tag:example.com,2000:app/
---
- !local foo
- !!str bar
- !e!tag%21 baz
```

```
%YAML 1.2
---
!!seq [
  !<!local> "foo",
  !<tag:yaml.org,2002:str> "bar",
  !<tag:example.com,2000:app/tag!> "baz"
]
```

```
Legend:
  c-ns-shorthand-tag
```

Example 6.27. Invalid Tag Shorthands

```
%TAG !e! tag:example,2000:app/
---
- !e! foo
- !h!bar baz
```

```
ERROR:
- The !o! handle has no suffix.
- The !h! handle wasn't declared.
```

Non-Specific Tags

If a node has no tag property, it is assigned a non-specific tag that needs to be resolved to a specific one. This non-specific tag is "`!`" for non-plain scalars and "`?`" for all other nodes. This is the only case where the node style has any effect on the content information.

It is possible for the tag property to be explicitly set to the "`!`" non-specific tag. By convention, this "disables" tag resolution, forcing the node to be interpreted as "`tag:yaml.org,2002:seq`", "`tag:yaml.org,2002:map`", or "`tag:yaml.org,2002:str`", according to its kind.

There is no way to explicitly specify the "`?`" non-specific tag. This is intentional.

```
[100] c-non-specific-tag ::= "!"
```

Example 6.28. Non-Specific Tags

```
# Assuming conventional resolution:
- "12"
```

```
%YAML 1.2
---
```

```
- 12
- ! 12
```

Legend:
c-non-specific-tag

```
!!seq [
  !<tag:yaml.org,2002:str> "12",
  !<tag:yaml.org,2002:int> "12",
  !<tag:yaml.org,2002:str> "12",
]
```

6.9.2. Node Anchors

An anchor is denoted by the *"&" indicator*. It marks a node for future reference. An alias node can then be used to indicate additional inclusions of the anchored node. An anchored node need not be referenced by any alias nodes; in particular, it is valid for all nodes to be anchored.

```
[101] c-ns-anchor-property ::= "&" ns-anchor-name
```

Note that as a serialization detail, the anchor name is preserved in the serialization tree. However, it is not reflected in the representation graph and must not be used to convey content information. In particular, the YAML processor need not preserve the anchor name once the representation is composed.

Anchor names must not contain the "[", "]", "{", "}" and "," characters. These characters would cause ambiguity with flow collection structures.

```
[102] ns-anchor-char ::= ns-char - c-flow-indicator
[103] ns-anchor-name ::= ns-anchor-char+
```

Example 6.29. Node Anchors

```
First occurrence: &anchor Value
Second occurrence: *anchor
```

Legend:
c-ns-anchor-property ns-anchor-name

```
%YAML 1.2
---
!!map {
  ? !!str "First occurrence"
  : &A !!str "Value",
  ? !!str "Second occurrence"
  : *A,
}
```

Chapter 7. Flow Styles

YAML's *flow styles* can be thought of as the natural extension of JSON to cover folding long content lines for readability, tagging nodes to control construction of native data structures, and using anchors and aliases to reuse constructed object instances.

7.1. Alias Nodes

Subsequent occurrences of a previously serialized node are presented as *alias nodes*. The first occurrence of the node must be marked by an anchor to allow subsequent occurrences to be presented as alias nodes.

An alias node is denoted by the *"*" indicator*. The alias refers to the most recent preceding node having the same anchor. It is an error for an alias node to use an anchor that does not previously occur in the document. It is not an error to specify an anchor that is not used by any alias node.

Note that an alias node must not specify any properties or content, as these were already specified at the first occurrence of the node.

```
[104] c-ns-alias-node ::= “*” ns-anchor-name
```

Example 7.1. Alias Nodes

```
First occurrence: &anchor Foo
Second occurrence: *anchor
Override anchor: &anchor Bar
Reuse anchor: *anchor
```

Legend:
`c-ns-alias-node` `ns-anchor-name`

```
%YAML 1.2
---
!!map {
  ? !!str "First occurrence"
  : &A !!str "Foo",
  ? !!str "Override anchor"
  : &B !!str "Bar",
  ? !!str "Second occurrence"
  : *A,
  ? !!str "Reuse anchor"
  : *B,
}
```

7.2. Empty Nodes

YAML allows the node content to be omitted in many cases. Nodes with empty content are interpreted as if they were plain scalars with an empty value. Such nodes are commonly resolved to a “`null`” value.

```
[105] e-scalar ::= /* Empty */
```

In the examples, empty scalars are sometimes displayed as the glyph “°” for clarity. Note that this glyph corresponds to a position in the characters stream rather than to an actual character.

Example 7.2. Empty Content

```
{
  foo : !!str°,
  !!str° : bar,
}
```

Legend:
`e-scalar`

```
%YAML 1.2
---
!!map {
  ? !!str "foo" : !!str "",
  ? !!str ""    : !!str "bar",
}
```

Both the node's properties and node content are optional. This allows for a *completely empty node*. Completely empty nodes are only valid when following some explicit indication for their existence.

```
[106] e-node ::= e-scalar
```

Example 7.3. Completely Empty Flow Nodes

```
{
  ? foo :°,
  ?
```

```
%YAML 1.2
---
!!map {
```

```
  °: bar,
}
```

```
  ? !!str "foo" : !!null "",
  ? !!null ""   : !!str "bar",
}
```

```
Legend:
  e-node
```

7.3. Flow Scalar Styles

YAML provides three *flow scalar styles*: double-quoted, single-quoted and plain (unquoted). Each provides a different trade-off between readability and expressive power.

The scalar style is a presentation detail and must not be used to convey content information, with the exception that plain scalars are distinguished for the purpose of tag resolution.

7.3.1. Double-Quoted Style

The *double-quoted style* is specified by surrounding *“"” indicators*. This is the only style capable of expressing arbitrary strings, by using “\” escape sequences. This comes at the cost of having to escape the “\” and “"” characters.

```
[107] nb-double-char ::= c-ns-esc-char | ( nb-json - “\” - “"” )
[108] ns-double-char ::= nb-double-char - s-white
```

Double-quoted scalars are restricted to a single line when contained inside an implicit key.

```
[109] c-double-quoted(n,c) ::= “"” nb-double-text(n,c) “"”
[110]  nb-double-text(n,c) ::= c = flow-out  ⇒ nb-double-multi-line(n)
                               c = flow-in   ⇒ nb-double-multi-line(n)
                               c = block-key ⇒ nb-double-one-line
                               c = flow-key  ⇒ nb-double-one-line
[111]   nb-double-one-line ::= nb-double-char*
```

Example 7.4. Double Quoted Implicit Keys

```
"implicit block key" : [
  "implicit flow key" : value,
 ]
```

```
Legend:
  nb-double-one-line
  c-double-quoted(n,c)
```

```
%YAML 1.2
---
!!map {
  ? !!str "implicit block key"
  : !!seq [
    !!map {
      ? !!str "implicit flow key"
      : !!str "value",
    }
  ]
}
```

In a multi-line double-quoted scalar, line breaks are are subject to flow line folding, which discards any trailing white space characters. It is also possible to *escape* the line break character. In this case, the line break is excluded from the content, and the trailing white space characters are preserved. Combined with the ability to escape white space characters, this allows double-quoted lines to be broken at arbitrary positions.

```
[112] s-double-escaped(n) ::= s-white* "\" b-non-content
                              l-empty(n,flow-in)* s-flow-line-prefix(n)
[113]   s-double-break(n) ::= s-double-escaped(n) | s-flow-folded(n)
```

Example 7.5. Double Quoted Line Breaks

```
"folded·↓
to a space,→↓
·↓
to a line feed, or·→\↓
·\·→non-content"
```

```
%YAML 1.2
---
!!str "folded to a space,\n\
      to a line feed, \
      or \t \tnon-content"
```

```
Legend:
  s-flow-folded(n)  s-double-escaped(n)
```

All leading and trailing white space characters are excluded from the content. Each continuation line must therefore contain at least one non-space character. Empty lines, if any, are consumed as part of the line folding.

```
[114]    nb-ns-double-in-line ::= ( s-white* ns-double-char )*
[115]   s-double-next-line(n) ::= s-double-break(n)
                                  ( ns-double-char nb-ns-double-in-line
                                    ( s-double-next-line(n) | s-white* ) )?
[116] nb-double-multi-line(n) ::= nb-ns-double-in-line
                                  ( s-double-next-line(n) | s-white* )
```

Example 7.6. Double Quoted Lines

```
"·1st non-empty↓
↓
·2nd non-empty·
→3rd non-empty·"
```

```
%YAML 1.2
---
!!str " 1st non-empty\n\
      2nd non-empty \
      3rd non-empty "
```

```
Legend:
  nb-ns-double-in-line  s-double-next-line(n)
```

7.3.2. Single-Quoted Style

The *single-quoted style* is specified by surrounding *"'" indicators*. Therefore, within a single-quoted scalar, such characters need to be repeated. This is the only form of *escaping* performed in single-quoted scalars. In particular, the "\" and "" characters may be freely used. This restricts single-quoted scalars to printable characters. In addition, it is only possible to break a long single-quoted line where a space character is surrounded by non-spaces.

```
[117] c-quoted-quote ::= "'" "'"
[118] nb-single-char ::= c-quoted-quote | ( nb-json - "'" )
[119] ns-single-char ::= nb-single-char - s-white
```

Example 7.7. Single Quoted Characters

```
 'here''s to "quotes"'
```

Legend:
  c-quoted-quote

```
%YAML 1.2
---
!!str "here's to \"quotes\""
```

Single-quoted scalars are restricted to a single line when contained inside a implicit key.

```
[120] c-single-quoted(n,c) ::= “'” nb-single-text(n,c) “'”
[121]  nb-single-text(n,c) ::= c = flow-out  ⇒ nb-single-multi-line(n)
                               c = flow-in   ⇒ nb-single-multi-line(n)
                               c = block-key ⇒ nb-single-one-line
                               c = flow-key  ⇒ nb-single-one-line
[122]   nb-single-one-line ::= nb-single-char*
```

Example 7.8. Single Quoted Implicit Keys

```
'implicit block key' : [
  'implicit flow key' : value,
 ]
```

Legend:
  nb-single-one-line
  c-single-quoted(n,c)

```
%YAML 1.2
---
!!map {
  ? !!str "implicit block key"
  : !!seq [
    !!map {
      ? !!str "implicit flow key"
      : !!str "value",
    }
  ]
}
```

All leading and trailing white space characters are excluded from the content. Each continuation line must therefore contain at least one non-space character. Empty lines, if any, are consumed as part of the line folding.

```
[123]    nb-ns-single-in-line ::= ( s-white* ns-single-char )*
[124]   s-single-next-line(n) ::= s-flow-folded(n)
                                  ( ns-single-char nb-ns-single-in-line
                                    ( s-single-next-line(n) | s-white* ) )?
[125] nb-single-multi-line(n) ::= nb-ns-single-in-line
                                  ( s-single-next-line(n) | s-white* )
```

Example 7.9. Single Quoted Lines

```
'·1st non-empty↓
↓
·2nd non-empty·
→3rd non-empty·'
```

```
%YAML 1.2
---
!!str " 1st non-empty\n\
      2nd non-empty \
      3rd non-empty "
```

```
Legend:
  nb-ns-single-in-line(n)  s-single-next-line(n)
```

7.3.3. Plain Style

The *plain* (unquoted) style has no identifying indicators and provides no form of escaping. It is therefore the most readable, most limited and most context sensitive style. In addition to a restricted character set, a plain scalar must not be empty, or contain leading or trailing white space characters. It is only possible to break a long plain line where a space character is surrounded by non-spaces.

Plain scalars must not begin with most indicators, as this would cause ambiguity with other YAML constructs. However, the "`:`", "`?`" and "`-`" indicators may be used as the first character if followed by a non-space "safe" character, as this causes no ambiguity.

```
[126] ns-plain-first(c) ::=   ( ns-char - c-indicator )
                            | ( ( “?” | “:” | “-” )
                                /* Followed by an ns-plain-safe(c)) */ )
```

Plain scalars must never contain the "`: `" and "` #`" character combinations. Such combinations would cause ambiguity with mapping key: value pairs and comments. In addition, inside flow collections, or when used as implicit keys, plain scalars must not contain the "`[`", "`]`", "`{`", "`}`" and "`,`" characters. These characters would cause ambiguity with flow collection structures.

```
[127]  ns-plain-safe(c) ::= c = flow-out  ⇒ ns-plain-safe-out
                            c = flow-in   ⇒ ns-plain-safe-in
                            c = block-key ⇒ ns-plain-safe-out
                            c = flow-key  ⇒ ns-plain-safe-in
[128] ns-plain-safe-out ::= ns-char
[129]  ns-plain-safe-in ::= ns-char - c-flow-indicator
[130]  ns-plain-char(c) ::=   ( ns-plain-safe(c) - “:” - “#” )
                            | ( /* An ns-char preceding */ “#” )
                            | ( “:” /* Followed by an ns-plain-safe(c) */ )
```

Example 7.10. Plain Characters

```
# Outside flow collection:
- ::vector
- ": - ()"
- Up, up, and away!
- -123
- http://example.com/foo#bar
# Inside flow collection:
- [ ::vector,
  ": - ()",
  "Up, up and away!",
  -123,
  http://example.com/foo#bar ]
```

```
%YAML 1.2
---
!!seq [
  !!str "::vector",
  !!str ": - ()",
  !!str "Up, up, and away!",
  !!int "-123",
  !!str "http://example.com/foo#bar",
  !!seq [
    !!str "::vector",
    !!str ": - ()",
    !!str "Up, up, and away!",
    !!int "-123",
    !!str "http://example.com/foo#bar",
  ],
]
```

```
Legend:
  ns-plain-first(c)  Not ns-plain-first(c)  ns-plain-char(c)  Not ns-plain-char(c)
```

Plain scalars are further restricted to a single line when contained inside an implicit key.

```
[131]          ns-plain(n,c) ::= c = flow-out  ⇒ ns-plain-multi-line(n,c)
                                 c = flow-in   ⇒ ns-plain-multi-line(n,c)
                                 c = block-key ⇒ ns-plain-one-line(c)
                                 c = flow-key  ⇒ ns-plain-one-line(c)
[132] nb-ns-plain-in-line(c) ::= ( s-white* ns-plain-char(c) )*
[133]   ns-plain-one-line(c) ::= ns-plain-first(c) nb-ns-plain-in-line(c)
```

Example 7.11. Plain Implicit Keys

```
implicit block key : [
  implicit flow key : value,
 ]
```

Legend:
ns-plain-one-line(c)

```
%YAML 1.2
---
!!map {
  ? !!str "implicit block key"
  : !!seq [
    !!map {
      ? !!str "implicit flow key"
      : !!str "value",
    }
  ]
}
```

All leading and trailing white space characters are excluded from the content. Each continuation line must therefore contain at least one non-space character. Empty lines, if any, are consumed as part of the line folding.

```
[134] s-ns-plain-next-line(n,c) ::= s-flow-folded(n)
                                    ns-plain-char(c) nb-ns-plain-in-line(c)
[135]  ns-plain-multi-line(n,c) ::= ns-plain-one-line(c)
                                    s-ns-plain-next-line(n,c)*
```

Example 7.12. Plain Lines

```
1st non-empty↓
↓
·2nd non-empty·
→3rd non-empty
```

```
%YAML 1.2
---
!!str "1st non-empty\n\
      2nd non-empty \
      3rd non-empty"
```

Legend:
nb-ns-plain-in-line(c) s-ns-plain-next-line(n,c)

7.4. Flow Collection Styles

A *flow collection* may be nested within a block collection (**`flow-out`** context), nested within another flow collection (**`flow-in`** context), or be a part of an implicit key (**`flow-key`** context or **`block-key`** context). Flow collection entries are terminated by the *"`,`" indicator*. The final "`,`" may be omitted. This does not cause ambiguity because flow collection entries can never be completely empty.

```
[136] in-flow(c) ::= c = flow-out  ⇒ flow-in
                     c = flow-in   ⇒ flow-in
                     c = block-key ⇒ flow-key
                     c = flow-key  ⇒ flow-key
```

7.4.1. Flow Sequences

Flow sequence content is denoted by surrounding *"["* and *"]"* characters.

```
[137] c-flow-sequence(n,c) ::= "[" s-separate(n,c)?
                               ns-s-flow-seq-entries(n,in-flow(c))? "]"
```

Sequence entries are separated by a "," character.

```
[138] ns-s-flow-seq-entries(n,c) ::= ns-flow-seq-entry(n,c) s-separate(n,c)?
                                     ( "," s-separate(n,c)?
                                       ns-s-flow-seq-entries(n,c)? )?
```

Example 7.13. Flow Sequence

```
- [ one, two, ]
- [three ,four]
```

Legend:
c-sequence-start c-sequence-end
ns-flow-seq-entry(n,c)

```
%YAML 1.2
---
!!seq [
  !!seq [
    !!str "one",
    !!str "two",
  ],
  !!seq [
    !!str "three",
    !!str "four",
  ],
]
```

Any flow node may be used as a flow sequence entry. In addition, YAML provides a compact notation for the case where a flow sequence entry is a mapping with a single key: value pair.

```
[139] ns-flow-seq-entry(n,c) ::= ns-flow-pair(n,c) | ns-flow-node(n,c)
```

Example 7.14. Flow Sequence Entries

```
[
"double
 quoted", 'single
           quoted',
plain
 text, [ nested ],
single: pair,
]
```

Legend:
ns-flow-node(n,c) ns-flow-pair(n,c)

```
%YAML 1.2
---
!!seq [
  !!str "double quoted",
  !!str "single quoted",
  !!str "plain text",
  !!seq [
    !!str "nested",
  ],
  !!map {
    ? !!str "single"
    : !!str "pair",
  },
]
```

7.4.2. Flow Mappings

Flow mappings are denoted by surrounding *"{"* and *"}"* characters.

```
[140] c-flow-mapping(n,c) ::= "{" s-separate(n,c)?
                              ns-s-flow-map-entries(n,in-flow(c))? "}"
```

Mapping entries are separated by a ",," character.

```
[141] ns-s-flow-map-entries(n,c) ::= ns-flow-map-entry(n,c) s-separate(n,c)?
                                     ( "," s-separate(n,c)?
                                       ns-s-flow-map-entries(n,c)? )?
```

Example 7.15. Flow Mappings

```
- { one : two , three: four , }
- {five: six,seven : eight}
```

Legend:
- c-mapping-start
- c-mapping-end
- ns-flow-map-entry(n,c)

```
%YAML 1.2
---
!!seq [
  !!map {
    ? !!str "one"   : !!str "two",
    ? !!str "three" : !!str "four",
  },
  !!map {
    ? !!str "five"  : !!str "six",
    ? !!str "seven" : !!str "eight",
  },
]
```

If the optional *"?" mapping key indicator* is specified, the rest of the entry may be completely empty.

```
[142]          ns-flow-map-entry(n,c) ::=   ( "?" s-separate(n,c)
                                              ns-flow-map-explicit-entry(n,c) )
                                          | ns-flow-map-implicit-entry(n,c)
[143] ns-flow-map-explicit-entry(n,c) ::=   ns-flow-map-implicit-entry(n,c)
                                          | ( e-node /* Key */
                                              e-node /* Value */ )
```

Example 7.16. Flow Mapping Entries

```
{
? explicit: entry,
implicit: entry,
?°°
}
```

Legend:
- ns-flow-map-explicit-entry(n,c)
- ns-flow-map-implicit-entry(n,c)
- e-node

```
%YAML 1.2
---
!!map {
  ? !!str "explicit" : !!str "entry",
  ? !!str "implicit" : !!str "entry",
  ? !!null "" : !!null "",
}
```

Normally, YAML insists the *":" mapping value indicator* be separated from the value by white space. A benefit of this restriction is that the "`:`" character can be used inside plain scalars, as long as it is not followed by white space. This allows for unquoted URLs and timestamps. It is also a potential source for confusion as "`a:1`" is a plain scalar and not a key: value pair.

Note that the value may be completely empty since its existence is indicated by the "`:`".

```
[144]    ns-flow-map-implicit-entry(n,c) ::=   ns-flow-map-yaml-key-entry(n,c)
                                             | c-ns-flow-map-empty-key-entry(n,c)
                                             | c-ns-flow-map-json-key-entry(n,c)
[145]    ns-flow-map-yaml-key-entry(n,c) ::= ns-flow-yaml-node(n,c)
                                             ( ( s-separate(n,c)?
                                                 c-ns-flow-map-separate-value(n,c) )
                                             | e-node )
[146] c-ns-flow-map-empty-key-entry(n,c) ::= e-node /* Key */
                                             c-ns-flow-map-separate-value(n,c)
[147]  c-ns-flow-map-separate-value(n,c) ::= ":" /* Not followed by an
                                                    ns-plain-safe(c) */
                                             ( ( s-separate(n,c) ns-flow-node(n,c) )
                                             | e-node /* Value */ )
```

Example 7.17. Flow Mapping Separate Values

```
{
unquoted·:·"separate",
http://foo.com,
omitted value:°,
°:·omitted key,
}
```

```
%YAML 1.2
---
!!map {
  ? !!str "unquoted" : !!str "separate",
  ? !!str "http://foo.com" : !!null "",
  ? !!str "omitted value" : !!null "",
  ? !!null "" : !!str "omitted key",
}
```

```
Legend:
  ns-flow-yaml-node(n,c)  e-node
  c-ns-flow-map-separate-value(n,c)
```

To ensure JSON compatibility, if a key inside a flow mapping is JSON-like, YAML allows the following value to be specified adjacent to the "`:`". This causes no ambiguity, as all JSON-like keys are surrounded by indicators. However, as this greatly reduces readability, YAML processors should separate the value from the "`:`" on output, even in this case.

```
[148] c-ns-flow-map-json-key-entry(n,c) ::= c-flow-json-node(n,c)
                                            ( ( s-separate(n,c)?
                                                c-ns-flow-map-adjacent-value(n,c) )
                                            | e-node )
[149] c-ns-flow-map-adjacent-value(n,c) ::= ":" ( ( s-separate(n,c)?
                                                    ns-flow-node(n,c) )
                                                | e-node ) /* Value */
```

Example 7.18. Flow Mapping Adjacent Values

```
{
"adjacent":value,
"readable":·value,
"empty":°
}
```

```
%YAML 1.2
---
!!map {
  ? !!str "adjacent" : !!str "value",
  ? !!str "readable" : !!str "value",
  ? !!str "empty"    : !!null "",
}
```

```
Legend:
  c-flow-json-node(n,c)  e-node
  c-ns-flow-map-adjacent-value(n,c)
```

A more compact notation is usable inside flow sequences, if the mapping contains a *single key: value pair*. This notation does not require the surrounding "{" and "}" characters. Note that it is not possible to specify any node properties for the mapping in this case.

Example 7.19. Single Pair Flow Mappings

```
[
foo: bar
]
```

```
%YAML 1.2
---
!!seq [
  !!map { ? !!str "foo" : !!str "bar" }
]
```

```
Legend:
  ns-flow-pair(n,c)
```

If the "?" indicator is explicitly specified, parsing is unambiguous, and the syntax is identical to the general case.

```
[150] ns-flow-pair(n,c) ::=   ( "?" s-separate(n,c)
                                ns-flow-map-explicit-entry(n,c) )
                            | ns-flow-pair-entry(n,c)
```

Example 7.20. Single Pair Explicit Entry

```
[
? foo
 bar : baz
]
```

```
%YAML 1.2
---
!!seq [
  !!map {
    ? !!str "foo bar"
    : !!str "baz",
  },
]
```

```
Legend:
  ns-flow-map-explicit-entry(n,c)
```

If the "?" indicator is omitted, parsing needs to see past the *implicit key* to recognize it as such. To limit the amount of lookahead required, the ":" indicator must appear at most 1024 Unicode characters beyond the start of the key. In addition, the key is restricted to a single line.

Note that YAML allows arbitrary nodes to be used as keys. In particular, a key may be a sequence or a mapping. Thus, without the above restrictions, practical one-pass parsing would have been impossible to implement.

```
[151]            ns-flow-pair-entry(n,c) ::=   ns-flow-pair-yaml-key-entry(n,c)
                                             | c-ns-flow-map-empty-key-entry(n,c)
                                             | c-ns-flow-pair-json-key-entry(n,c)
[152]   ns-flow-pair-yaml-key-entry(n,c) ::= ns-s-implicit-yaml-key(flow-key)
                                             c-ns-flow-map-separate-value(n,c)
[153] c-ns-flow-pair-json-key-entry(n,c) ::= c-s-implicit-json-key(flow-key)
                                             c-ns-flow-map-adjacent-value(n,c)
[154]          ns-s-implicit-yaml-key(c) ::= ns-flow-yaml-node(n/a,c) s-separate-in-line?
```

```
                                                /* At most 1024 characters altogether */
[155]           c-s-implicit-json-key(c) ::= c-flow-json-node(n/a,c) s-separate-in-line?
                                                /* At most 1024 characters altogether */
```

Example 7.21. Single Pair Implicit Entries

```
- [ YAML·: separate ]
- [ °: empty key entry ]
- [ {JSON: like}:adjacent ]
```

Legend:
ns-s-implicit-yaml-key
c-s-implicit-json-key
e-node Value

```
%YAML 1.2
---
!!seq [
  !!seq [
    !!map {
      ? !!str "YAML"
      : !!str "separate"
    },
  ],
  !!seq [
    !!map {
      ? !!null ""
      : !!str "empty key entry"
    },
  ],
  !!seq [
    !!map {
      ? !!map {
        ? !!str "JSON"
        : !!str "like"
      } : "adjacent",
    },
  ],
]
```

Example 7.22. Invalid Implicit Keys

```
[ foo
 bar: invalid,
 "foo...>1K characters...bar": invalid ]
```

```
ERROR:
- The foo bar key spans multiple lines
- The foo...bar key is too long
```

7.5. Flow Nodes

JSON-like flow styles all have explicit start and end indicators. The only flow style that does not have this property is the plain scalar. Note that none of the "JSON-like" styles is actually acceptable by JSON. Even the double-quoted style is a superset of the JSON string format.

```
[156] ns-flow-yaml-content(n,c) ::= ns-plain(n,c)
[157]  c-flow-json-content(n,c) ::=   c-flow-sequence(n,c) | c-flow-mapping(n,c)
                                    | c-single-quoted(n,c) | c-double-quoted(n,c)
[158]      ns-flow-content(n,c) ::= ns-flow-yaml-content(n,c) | c-flow-json-content(n,c)
```

Example 7.23. Flow Content

```
- [ a, b ]
- { a: b }
- "a"
```

```
%YAML 1.2
---
!!seq [
  !!seq [ !!str "a", !!str "b" ],
```

```
- 'b'
- c
```

```
Legend:
  c-flow-json-content(n,c)
  ns-flow-yaml-content(n,c)
```

```
  !!map { ? !!str "a" : !!str "b" },
  !!str "a",
  !!str "b",
  !!str "c",
]
```

A complete flow node also has optional node properties, except for alias nodes which refer to the anchored node properties.

```
[159] ns-flow-yaml-node(n,c) ::=   c-ns-alias-node
                                 | ns-flow-yaml-content(n,c)
                                 | ( c-ns-properties(n,c)
                                     ( ( s-separate(n,c)
                                         ns-flow-yaml-content(n,c) )
                                       | e-scalar ) )
[160]  c-flow-json-node(n,c) ::= ( c-ns-properties(n,c) s-separate(n,c) )?
                                 c-flow-json-content(n,c)
[161]      ns-flow-node(n,c) ::=   c-ns-alias-node
                                 | ns-flow-content(n,c)
                                 | ( c-ns-properties(n,c)
                                     ( ( s-separate(n,c)
                                         ns-flow-content(n,c) )
                                       | e-scalar ) )
```

Example 7.24. Flow Nodes

```
- !!str "a"
- 'b'
- &anchor "c"
- *anchor
- !!str°
```

```
Legend:
  c-flow-json-node(n,c)
  ns-flow-yaml-node(n,c)
```

```
%YAML 1.2
---
!!seq [
  !!str "a",
  !!str "b",
  &A !!str "c",
  *A,
  !!str "",
]
```

Chapter 8. Block Styles

YAML's *block styles* employ indentation rather than indicators to denote structure. This results in a more human readable (though less compact) notation.

8.1. Block Scalar Styles

YAML provides two *block scalar styles*, literal and folded. Each provides a different trade-off between readability and expressive power.

8.1.1. Block Scalar Headers

Block scalars are controlled by a few indicators given in a *header* preceding the content itself. This header is followed by a non-content line break with an optional comment. This is the only case where a comment must not be followed by additional comment lines.

```
[162] c-b-block-header(m,t) ::= ( ( c-indentation-indicator(m)
                                    c-chomping-indicator(t) )
                                  | ( c-chomping-indicator(t)
                                    c-indentation-indicator(m) ) )
                                s-b-comment
```

Example 8.1. Block Scalar Header

```
- | # Empty header↓
 literal
- >1 # Indentation indicator↓
 ·folded
- |+ # Chomping indicator↓
 keep

- >1- # Both indicators↓
 ·strip
```

```
%YAML 1.2
---
!!seq [
  !!str "literal\n",
  !!str "·folded\n",
  !!str "keep\n\n",
  !!str "·strip",
]
```

Legend:
  c-b-block-header(m,t)

8.1.1.1. Block Indentation Indicator

Typically, the indentation level of a block scalar is detected from its first non-empty line. It is an error for any of the leading empty lines to contain more spaces than the first non-empty line.

Detection fails when the first non-empty line contains leading content space characters. Content may safely start with a tab or a "#" character.

When detection would fail, YAML requires that the indentation level for the content be given using an explicit *indentation indicator*. This level is specified as the integer number of the additional indentation spaces used for the content, relative to its parent node.

It is always valid to specify an indentation indicator for a block scalar node, though a YAML processor should only emit an explicit indentation indicator for cases where detection will fail.

```
[163] c-indentation-indicator(m) ::= ns-dec-digit ⇒ m = ns-dec-digit - #x30
                                     /* Empty */  ⇒ m = auto-detect()
```

Example 8.2. Block Indentation Indicator

```
- |°
·detected
- >°
·
··
··# detected
- |1
·· explicit
- >°
·→
·detected
```

```
%YAML 1.2
---
!!seq [
  !!str "detected\n",
  !!str "\n\n# detected\n",
  !!str "·explicit\n",
  !!str "\t·detected\n",
]
```

Legend:
  c-indentation-indicator(m)
  s-indent(n)

Example 8.3. Invalid Block Scalar Indentation Indicators

```
- |
 ·
·text
- >
 ··text
 text
- |2
 text
```

```
ERROR:
- A leading all-space line must
  not have too many spaces.
- A following text line must
  not be less indented.
- The text is less indented
  than the indicated level.
```

8.1.1.2. Block Chomping Indicator

Chomping controls how final line breaks and trailing empty lines are interpreted. YAML provides three chomping methods:

Strip
: *Stripping* is specified by the *"-" chomping indicator*. In this case, the final line break and any trailing empty lines are excluded from the scalar's content.

Clip
: *Clipping* is the default behavior used if no explicit chomping indicator is specified. In this case, the final line break character is preserved in the scalar's content. However, any trailing empty lines are excluded from the scalar's content.

Keep
: *Keeping* is specified by the *"+" chomping indicator*. In this case, the final line break and any trailing empty lines are considered to be part of the scalar's content. These additional lines are not subject to folding.

The chomping method used is a presentation detail and must not be used to convey content information.

```
[164] c-chomping-indicator(t) ::= "-"         ⇒ t = strip
                                  "+"         ⇒ t = keep
                                  /* Empty */ ⇒ t = clip
```

The interpretation of the final line break of a block scalar is controlled by the chomping indicator specified in the block scalar header.

```
[165] b-chomped-last(t) ::= t = strip ⇒ b-non-content | /* End of file */
                            t = clip  ⇒ b-as-line-feed | /* End of file */
                            t = keep  ⇒ b-as-line-feed | /* End of file */
```

Example 8.4. Chomping Final Line Break

```
strip: |-
  text↓
clip: |
  text↓
keep: |+
  text↓
```

```
Legend:
  b-non-content  b-as-line-feed
```

```
%YAML 1.2
---
!!map {
  ? !!str "strip"
  : !!str "text",
  ? !!str "clip"
  : !!str "text\n",
  ? !!str "keep"
  : !!str "text\n",
}
```

The interpretation of the trailing empty lines following a block scalar is also controlled by the chomping indicator specified in the block scalar header.

```
[166] l-chomped-empty(n,t) ::= t = strip ⇒ l-strip-empty(n)
                               t = clip  ⇒ l-strip-empty(n)
                               t = keep  ⇒ l-keep-empty(n)
[167]     l-strip-empty(n) ::= ( s-indent(≤n) b-non-content )*
                               l-trail-comments(n)?
[168]      l-keep-empty(n) ::= l-empty(n,block-in)*
                               l-trail-comments(n)?
```

Explicit comment lines may follow the trailing empty lines. To prevent ambiguity, the first such comment line must be less indented than the block scalar content. Additional comment lines, if any, are not so restricted. This is the only case where the indentation of comment lines is constrained.

```
[169] l-trail-comments(n) ::= s-indent(<n) c-nb-comment-text b-comment
                              l-comment*
```

Example 8.5. Chomping Trailing Lines

```
 # Strip
  # Comments:
strip: |-
  # text↓
··⇓
·# Clip
··# comments:
↓
clip: |
  # text↓
·↓
·# Keep
··# comments:
↓
keep: |+
  # text↓
↓
·# Trail
··# comments.
```

```
%YAML 1.2
---
!!map {
  ? !!str "strip"
  : !!str "# text",
  ? !!str "clip"
  : !!str "# text\n",
  ? !!str "keep"
  : !!str "# text\n",
}
```

```
Legend:
  l-strip-empty(n)
  l-keep-empty(n)
  l-trail-comments(n)
```

If a block scalar consists only of empty lines, then these lines are considered as trailing lines and hence are affected by chomping.

Example 8.6. Empty Scalar Chomping

```
strip: >-
↓
clip: >
↓
```

```
%YAML 1.2
---
!!map {
  ? !!str "strip"
```

```
keep: |+
↓
```

```
Legend:
  l-strip-empty(n) l-keep-empty(n)
```

```
  : !!str "",
  ? !!str "clip"
  : !!str "",
  ? !!str "keep"
  : !!str "\n",
}
```

8.1.2. Literal Style

The *literal style* is denoted by the *"|" indicator*. It is the simplest, most restricted, and most readable scalar style.

```
[170] c-l+literal(n) ::= "|" c-b-block-header(m,t)
                         l-literal-content(n+m,t)
```

Example 8.7. Literal Scalar

```
||↓
·literal↓
·→text↓
↓
```

```
%YAML 1.2
---
!!str "literal\n\ttext\n"
```

```
Legend:
  c-l+literal(n)
```

Inside literal scalars, all (indented) characters are considered to be content, including white space characters. Note that all line break characters are normalized. In addition, empty lines are not folded, though final line breaks and trailing empty lines are chomped.

There is no way to escape characters inside literal scalars. This restricts them to printable characters. In addition, there is no way to break a long literal line.

```
[171]    l-nb-literal-text(n) ::= l-empty(n,block-in)*
                                  s-indent(n) nb-char+
[172]    b-nb-literal-next(n) ::= b-as-line-feed
                                  l-nb-literal-text(n)
[173] l-literal-content(n,t) ::= ( l-nb-literal-text(n) b-nb-literal-next(n)*
                                   b-chomped-last(t) )?
                                  l-chomped-empty(n,t)
```

Example 8.8. Literal Content

```
|
·
··
··literal↓
···↓
··
··text↓
↓
·# Comment
```

```
%YAML 1.2
---
!!str "\n\nliteral\n·\n\ntext\n"
```

```
Legend:
  l-nb-literal-text(n)
  b-nb-literal-next(n)
  b-chomped-last(t)
  l-chomped-empty(n,t)
```

8.1.3. Folded Style

The *folded style* is denoted by the *">" indicator*. It is similar to the literal style; however, folded scalars are subject to line folding.

```
[174] c-l+folded(n) ::= ">" c-b-block-header(m,t)
                        l-folded-content(n+m,t)
```

Example 8.9. Folded Scalar

```
>↓
·folded↓
·text↓
↓
```

```
%YAML 1.2
---
!!str "folded text\n"
```

Legend:
c-l+folded(n)

Folding allows long lines to be broken anywhere a single space character separates two non-space characters.

```
[175]  s-nb-folded-text(n) ::= s-indent(n) ns-char nb-char*
[176] l-nb-folded-lines(n) ::= s-nb-folded-text(n)
                               ( b-l-folded(n,block-in) s-nb-folded-text(n) )*
```

Example 8.10. Folded Lines

```
>

·folded↓
·line↓
↓
·next
·line↓
   * bullet

   * list
   * lines

·last↓
·line↓

# Comment
```

```
%YAML 1.2
---
!!str "\n\
      folded line\n\
      next line\n\
      \  * bullet\n
      \n\
      \  * list\n\
      \  * lines\n\
      \n\
      last line\n"
```

Legend:
s-nb-folded-text(n)
l-nb-folded-lines(n)

(The following three examples duplicate this example, each highlighting different productions.)

Lines starting with white space characters (*more-indented* lines) are not folded.

```
[177]  s-nb-spaced-text(n) ::= s-indent(n) s-white nb-char*
[178]        b-l-spaced(n) ::= b-as-line-feed
                               l-empty(n,block-in)*
[179] l-nb-spaced-lines(n) ::= s-nb-spaced-text(n)
                               ( b-l-spaced(n) s-nb-spaced-text(n) )*
```

Example 8.11. More Indented Lines

```
>

 folded
 line

 next
 line
   * bullet

 * list
 * lines

 last
 line

# Comment
```

```
%YAML 1.2
---
!!str "\n\
      folded line\n\
      next line\n\
      \  * bullet\n
      \n\
      \  * list\n\
      \  * lines\n\
      \n\
      last line\n"
```

Legend:
- s-nb-spaced-text(n)
- l-nb-spaced-lines(n)

Line breaks and empty lines separating folded and more-indented lines are also not folded.

```
[180] l-nb-same-lines(n) ::= l-empty(n,block-in)*
                             ( l-nb-folded-lines(n) | l-nb-spaced-lines(n) )
[181] l-nb-diff-lines(n) ::= l-nb-same-lines(n)
                             ( b-as-line-feed l-nb-same-lines(n) )*
```

Example 8.12. Empty Separation Lines

```
>
↓
 folded
 line↓
↓
 next
 line↓
   * bullet

   * list
   * line↓
↓
 last
 line

# Comment
```

```
%YAML 1.2
---
!!str "\n\
      folded line\n\
      next line\n\
      \  * bullet\n
      \n\
      \  * list\n\
      \  * lines\n\
      \n\
      last line\n"
```

Legend:
- b-as-line-feed
- (separation) l-empty(n,c)

The final line break, and trailing empty lines if any, are subject to chomping and are never folded.

```
[182] l-folded-content(n,t) ::= ( l-nb-diff-lines(n) b-chomped-last(t) )?
```

```
l-chomped-empty(n,t)
```

Example 8.13. Final Empty Lines

```
>
 folded
 line

 next
 line
   * bullet

   * list
   * line

 last
 line↓
↓
# Comment
```

```
%YAML 1.2
---
!!str "\n\
      folded line\n\
      next line\n\
      \  * bullet\n
      \n\
      \  * list\n\
      \  * lines\n\
      \n\
      last line\n"
```

```
Legend:
  b-chomped-last(t) l-chomped-empty(n,t)
```

8.2. Block Collection Styles

For readability, *block collections styles* are not denoted by any indicator. Instead, YAML uses a lookahead method, where a block collection is distinguished from a plain scalar only when a key: value pair or a sequence entry is seen.

8.2.1. Block Sequences

A *block sequence* is simply a series of nodes, each denoted by a leading *"-" indicator*. The "-" indicator must be separated from the node by white space. This allows "-" to be used as the first character in a plain scalar if followed by a non-space character (e.g. "**-1**").

```
[183]    l+block-sequence(n) ::= ( s-indent(n+m) c-l-block-seq-entry(n+m) )+
                                 /* For some fixed auto-detected m > 0 */
[184] c-l-block-seq-entry(n) ::= "-" /* Not followed by an ns-char */
                                 s-l+block-indented(n,block-in)
```

Example 8.14. Block Sequence

```
block sequence:
··- one↓
  - two : three↓
```

```
Legend:
  c-l-block-seq-entry(n)
  auto-detected s-indent(n)
```

```
%YAML 1.2
---
!!map {
  ? !!str "block sequence"
  : !!seq [
    !!str "one",
    !!map {
      ? !!str "two"
      : !!str "three"
    },
  ],
}
```

The entry node may be either completely empty, be a nested block node, or use a *compact in-line notation*. The compact notation may be used when the entry is itself a nested block collection. In this case, both the

"-" indicator and the following spaces are considered to be part of the indentation of the nested collection. Note that it is not possible to specify node properties for such a collection.

```
[185]  s-l+block-indented(n,c) ::=   ( s-indent(m)
                                       ( ns-l-compact-sequence(n+1+m)
                                       | ns-l-compact-mapping(n+1+m) ) )
                                   | s-l+block-node(n,c)
                                   | ( e-node s-l-comments )
[186] ns-l-compact-sequence(n) ::= c-l-block-seq-entry(n)
                                   ( s-indent(n) c-l-block-seq-entry(n) )*
```

Example 8.15. Block Sequence Entry Types

```
-° # Empty
- |
 block node
-·- one # Compact
··- two # sequence
- one: two # Compact mapping
```

Legend:
- Empty
- s-l+block-node(n,c)
- ns-l-compact-sequence(n)
- ns-l-compact-mapping(n)

```
%YAML 1.2
---
!!seq [
  !!null "",
  !!str "block node\n",
  !!seq [
    !!str "one"
    !!str "two",
  ],
  !!map {
    ? !!str "one"
    : !!str "two",
  },
]
```

8.2.2. Block Mappings

A *Block mapping* is a series of entries, each presenting a key: value pair.

```
[187] l+block-mapping(n) ::= ( s-indent(n+m) ns-l-block-map-entry(n+m) )+
                             /* For some fixed auto-detected m > 0 */
```

Example 8.16. Block Mappings

```
block mapping:
·key: value↓
```

Legend:
- ns-l-block-map-entry(n)
- auto-detected s-indent(n)

```
%YAML 1.2
---
!!map {
  ? !!str "block mapping"
  : !!map {
    ? !!str "key"
    : !!str "value",
  },
}
```

If the "?" indicator is specified, the optional value node must be specified on a separate line, denoted by the ":" indicator. Note that YAML allows here the same compact in-line notation described above for block sequence entries.

```
[188]         ns-l-block-map-entry(n) ::=   c-l-block-map-explicit-entry(n)
                                          | ns-l-block-map-implicit-entry(n)
[189] c-l-block-map-explicit-entry(n) ::= c-l-block-map-explicit-key(n)
```

```
                                        ( l-block-map-explicit-value(n)
                                        | e-node )
[190]   c-l-block-map-explicit-key(n) ::= “?” s-l+block-indented(n,block-out)
[191]   l-block-map-explicit-value(n) ::= s-indent(n)
                                          “:” s-l+block-indented(n,block-out)
```

Example 8.17. Explicit Block Mapping Entries

```
? explicit key # Empty value↓°
? |
  block key↓
:·· one # Explicit compact
··· two # block value↓
```

Legend:
- c-l-block-map-explicit-key(n)
- l-block-map-explicit-value(n)
- e-node

```
%YAML 1.2
---
!!map {
  ? !!str "explicit key"
  : !!str "",
  ? !!str "block key\n"
  : !!seq [
    !!str "one",
    !!str "two",
  ],
}
```

If the “?” indicator is omitted, parsing needs to see past the implicit key, in the same way as in the single key: value pair flow mapping. Hence, such keys are subject to the same restrictions; they are limited to a single line and must not span more than 1024 Unicode characters.

```
[192] ns-l-block-map-implicit-entry(n) ::= ( ns-s-block-map-implicit-key
                                           | e-node )
                                           c-l-block-map-implicit-value(n)
[193]      ns-s-block-map-implicit-key ::=   c-s-implicit-json-key(block-key)
                                           | ns-s-implicit-yaml-key(block-key)
```

In this case, the value may be specified on the same line as the implicit key. Note however that in block mappings the value must never be adjacent to the “:”, as this greatly reduces readability and is not required for JSON compatibility (unlike the case in flow mappings).

There is no compact notation for in-line values. Also, while both the implicit key and the value following it may be empty, the “:” indicator is mandatory. This prevents a potential ambiguity with multi-line plain scalars.

```
[194] c-l-block-map-implicit-value(n) ::= “:” ( s-l+block-node(n,block-out)
                                              | ( e-node s-l-comments ) )
```

Example 8.18. Implicit Block Mapping Entries

```
plain key: in-line value
°:° # Both empty
"quoted key":
- entry
```

Legend:
- ns-s-block-map-implicit-key
- c-l-block-map-implicit-value(n)

```
%YAML 1.2
---
!!map {
  ? !!str "plain key"
  : !!str "in-line value",
  ? !!null ""
  : !!null "",
  ? !!str "quoted key"
  : !!seq [ !!str "entry" ],
}
```

A compact in-line notation is also available. This compact notation may be nested inside block sequences and explicit block mapping entries. Note that it is not possible to specify node properties for such a nested mapping.

```
[195] ns-l-compact-mapping(n) ::= ns-l-block-map-entry(n)
                                  ( s-indent(n) ns-l-block-map-entry(n) )*
```

Example 8.19. Compact Block Mappings

```
- sun: yellow↓
- ? earth: blue↓
  : moon: white↓
```

Legend:
ns-l-compact-mapping(n)

```
%YAML 1.2
---
!!seq [
  !!map {
    !!str "sun" : !!str "yellow",
  },
  !!map {
    ? !!map {
      ? !!str "earth"
      : !!str "blue"
    },
    : !!map {
      ? !!str "moon"
      : !!str "white"
    },
  }
]
```

8.2.3. Block Nodes

YAML allows flow nodes to be embedded inside block collections (but not vice-versa). Flow nodes must be indented by at least one more space than the parent block collection. Note that flow nodes may begin on a following line.

It is at this point that parsing needs to distinguish between a plain scalar and an implicit key starting a nested block mapping.

```
[196]  s-l+block-node(n,c) ::= s-l+block-in-block(n,c) | s-l+flow-in-block(n)
[197] s-l+flow-in-block(n) ::= s-separate(n+1,flow-out)
                               ns-flow-node(n+1,flow-out) s-l-comments
```

Example 8.20. Block Node Types

```
-↓
··"flow in block"↓
-·>
 Block scalar↓
-·!!map # Block collection
  foo : bar↓
```

Legend:
s-l+flow-in-block(n)
s-l+block-in-block(n,c)

```
%YAML 1.2
---
!!seq [
  !!str "flow in block",
  !!str "Block scalar\n",
  !!map {
    ? !!str "foo"
    : !!str "bar",
  },
]
```

The block node's properties may span across several lines. In this case, they must be indented by at least one more space than the block collection, regardless of the indentation of the block collection entries.

```
[198] s-l+block-in-block(n,c) ::= s-l+block-scalar(n,c) | s-l+block-collection(n,c)
[199]   s-l+block-scalar(n,c) ::= s-separate(n+1,c)
                                  ( c-ns-properties(n+1,c) s-separate(n+1,c) )?
                                  ( c-l+literal(n) | c-l+folded(n) )
```

Example 8.21. Block Scalar Nodes

```
literal: |2
··value
folded:↓
···!foo
··>1
·value
```

```
%YAML 1.2
---
!!map {
  ? !!str "literal"
  : !!str "value",
  ? !!str "folded"
  : !<!foo> "value",
}
```

Legend:
`c-l+literal(n)` `c-l+folded(n)`

Since people perceive the "-" indicator as indentation, nested block sequences may be indented by one less space to compensate, except, of course, if nested inside another block sequence (**`block-out`** context vs. **`block-in`** context).

```
[200] s-l+block-collection(n,c) ::= ( s-separate(n+1,c) c-ns-properties(n+1,c) )?
                                    s-l-comments
                                    ( l+block-sequence(seq-spaces(n,c))
                                    | l+block-mapping(n) )
[201]           seq-spaces(n,c) ::= c = block-out ⇒ n-1
                                    c = block-in  ⇒ n
```

Example 8.22. Block Collection Nodes

```
sequence: !!seq
- entry
- !!seq
 - nested
mapping: !!map
 foo: bar
```

```
%YAML 1.2
---
!!map {
  ? !!str "sequence"
  : !!seq [
    !!str "entry",
    !!seq [ !!str "nested" ],
  ],
  ? !!str "mapping"
  : !!map {
    ? !!str "foo" : !!str "bar",
  },
}
```

Legend:
`l+block-sequence(n)`
`l+block-mapping(n)`
`s-l+block-collection(n,c)`

Chapter 9. YAML Character Stream

9.1. Documents

A YAML character stream may contain several *documents*. Each document is completely independent from the rest.

9.1.1. Document Prefix

A document may be preceded by a *prefix* specifying the character encoding, and optional comment lines. Note that all documents in a stream must use the same character encoding. However it is valid to re-specify the encoding using a byte order mark for each document in the stream. This makes it easier to concatenate streams.

The existence of the optional prefix does not necessarily indicate the existence of an actual document.

```
[202] l-document-prefix ::= c-byte-order-mark? l-comment*
```

Example 9.1. Document Prefix

```
⇔# Comment
# lines
Document
```

```
%YAML 1.2
---
!!str "Document"
```

```
Legend:
  l-document-prefix
```

9.1.2. Document Markers

Using directives creates a potential ambiguity. It is valid to have a "%" character at the start of a line (e.g. as the first character of the second line of a plain scalar). How, then, to distinguish between an actual directive and a content line that happens to start with a "%" character?

The solution is the use of two special *marker* lines to control the processing of directives, one at the start of a document and one at the end.

At the start of a document, lines beginning with a "%" character are assumed to be directives. The (possibly empty) list of directives is terminated by a *directives end marker* line. Lines following this marker can safely use "%" as the first character.

At the end of a document, a *document end marker* line is used to signal the parser to begin scanning for directives again.

The existence of this optional *document suffix* does not necessarily indicate the existence of an actual following document.

Obviously, the actual content lines are therefore forbidden to begin with either of these markers.

```
[203]  c-directives-end ::= "-" "-" "-"
[204]    c-document-end ::= "." "." "."
[205] l-document-suffix ::= c-document-end s-l-comments
[206]       c-forbidden ::= /* Start of line */
                            ( c-directives-end | c-document-end )
                            ( b-char | s-white | /* End of file */ )
```

Example 9.2. Document Markers

```
%YAML 1.2
---
Document
... # Suffix
```

```
%YAML 1.2
---
!!str "Document"
```

```
Legend:
  c-directives-end  c-document-end
  l-document-suffix
```

9.1.3. Bare Documents

A *bare document* does not begin with any directives or marker lines. Such documents are very "clean" as they contain nothing other than the content. In this case, the first non-comment line may not start with a "`%`" first character.

Document nodes are indented as if they have a parent indented at -1 spaces. Since a node must be more indented than its parent node, this allows the document's node to be indented at zero or more spaces.

```
[207] l-bare-document ::= s-l+block-node(-1,block-in)
                          /* Excluding c-forbidden content */
```

Example 9.3. Bare Documents

```
Bare
document
...
# No document
...
|
%!PS-Adobe-2.0 # Not the first line
```

```
%YAML 1.2
---
!!str "Bare document"
%YAML 1.2
---
!!str "%!PS-Adobe-2.0\n"
```

```
Legend:
  l-bare-document
```

9.1.4. Explicit Documents

An *explicit document* begins with an explicit directives end marker line but no directives. Since the existence of the document is indicated by this marker, the document itself may be completely empty.

```
[208] l-explicit-document ::= c-directives-end
                              ( l-bare-document
                              | ( e-node s-l-comments ) )
```

Example 9.4. Explicit Documents

```
---
{ matches
% : 20 }
...
---
# Empty
...
```

```
%YAML 1.2
---
!!map {
  !!str "matches %": !!int "20"
}
...
%YAML 1.2
---
!!null ""
```

Legend:
l-explicit-document

9.1.5. Directives Documents

A *directives document* begins with some directives followed by an explicit directives end marker line.

```
[209] l-directive-document ::= l-directive+
                               l-explicit-document
```

Example 9.5. Directives Documents

```
%YAML 1.2
--- |
%!PS-Adobe-2.0
...
%YAML1.2
---
# Empty
...
```

```
%YAML 1.2
---
!!str "%!PS-Adobe-2.0\n"
...
%YAML 1.2
---
!!null ""
```

Legend:
l-explicit-document

9.2. Streams

A YAML *stream* consists of zero or more documents. Subsequent documents require some sort of separation marker line. If a document is not terminated by a document end marker line, then the following document must begin with a directives end marker line.

The stream format is intentionally "sloppy" to better support common use cases, such as stream concatenation.

```
[210] l-any-document ::=   l-directive-document
                         | l-explicit-document
                         | l-bare-document
[211]  l-yaml-stream ::= l-document-prefix* l-any-document?
                         ( l-document-suffix+ l-document-prefix* l-any-document?
                         | l-document-prefix* l-explicit-document? )*
```

Example 9.6. Stream

```
Document
---
# Empty
...
%YAML 1.2
---
matches %: 20
```

```
%YAML 1.2
---
!!str "Document"
...
%YAML 1.2
---
!!null ""
...
%YAML 1.2
---
!!map {
```

Legend:
l-any-document

`l-document-suffix`
`l-explicit-document`

```
  !!str "matches %": !!int "20"
}
```

A sequence of bytes is a *well-formed stream* if, taken as a whole, it complies with the above `l-yaml-stream` production.

Some common use case that can take advantage of the YAML stream structure are:

Appending to Streams

Allowing multiple documents in a single stream makes YAML suitable for log files and similar applications. Note that each document is independent of the rest, allowing for heterogeneous log file entries.

Concatenating Streams

Concatenating two YAML streams requires both to use the same character encoding. In addition, it is necessary to separate the last document of the first stream and the first document of the second stream. This is easily ensured by inserting a document end marker between the two streams. Note that this is safe regardless of the content of either stream. In particular, either or both may be empty, and the first stream may or may not already contain such a marker.

Communication Streams

The document end marker allows signaling the end of a document without closing the stream or starting the next document. This allows the receiver to complete processing a document without having to wait for the next one to arrive. The sender may also transmit "keep-alive" messages in the form of comment lines or repeated document end markers without signalling the start of the next document.

Chapter 10. Recommended Schemas

A YAML *schema* is a combination of a set of tags and a mechanism for resolving non-specific tags.

10.1. Failsafe Schema

The *failsafe schema* is guaranteed to work with any YAML document. It is therefore the recommended schema for generic YAML tools. A YAML processor should therefore support this schema, at least as an option.

10.1.1. Tags

10.1.1.1. Generic Mapping

URI:

`tag:yaml.org,2002:map`

Kind:

Mapping.

Definition:

Represents an associative container, where each key is unique in the association and mapped to exactly one value. YAML places no restrictions on the type of keys; in particular, they are not restricted to being scalars. Example bindings to native types include Perl's hash, Python's dictionary, and Java's Hashtable.

Example 10.1. `!!map` Examples

```
Block style: !!map
  Clark : Evans
  Ingy  : döt Net
  Oren  : Ben-Kiki

Flow style: !!map { Clark: Evans, Ingy: döt Net, Oren: Ben-Kiki }
```

10.1.1.2. Generic Sequence

URI:

`tag:yaml.org,2002:seq`

Kind:

Sequence.

Definition:

Represents a collection indexed by sequential integers starting with zero. Example bindings to native types include Perl's array, Python's list or tuple, and Java's array or Vector.

Example 10.2. `!!seq` Examples

```
Block style: !!seq
- Clark Evans
- Ingy döt Net
- Oren Ben-Kiki

Flow style: !!seq [ Clark Evans, Ingy döt Net, Oren Ben-Kiki ]
```

10.1.1.3. Generic String

URI:

`tag:yaml.org,2002:str`

Kind:

Scalar.

Definition:

Represents a Unicode string, a sequence of zero or more Unicode characters. This type is usually bound to the native language's string type, or, for languages lacking one (such as C), to a character array.

Canonical Form:

The obvious.

Example 10.3. `!!str` Examples

```
Block style: !!str |-
  String: just a theory.

Flow style: !!str "String: just a theory."
```

10.1.2. Tag Resolution

All nodes with the "`!`" non-specific tag are resolved, by the standard convention, to "`tag:yaml.org,2002:seq`", "`tag:yaml.org,2002:map`", or "`tag:yaml.org,2002:str`", according to their kind.

All nodes with the "`?`" non-specific tag are left unresolved. This constrains the application to deal with a partial representation.

10.2. JSON Schema

The *JSON schema* is the lowest common denominator of most modern computer languages, and allows parsing JSON files. A YAML processor should therefore support this schema, at least as an option. It is also strongly recommended that other schemas should be based on it.

10.2.1. Tags

The JSON schema uses the following tags in addition to those defined by the failsafe schema:

10.2.1.1. Null

URI:

`tag:yaml.org,2002:null`

Kind:

Scalar.

Definition:

Represents the lack of a value. This is typically bound to a native null-like value (e.g., `undef` in Perl, `None` in Python). Note that a null is different from an empty string. Also, a mapping entry with some key and a null value is valid, and different from not having that key in the mapping.

Canonical Form:

`null`.

Example 10.4. `!!null` Examples

```
!!null null: value for null key
key with null value: !!null null
```

10.2.1.2. Boolean

URI:

`tag:yaml.org,2002:bool`

Kind:

Scalar.

Definition:

Represents a true/false value. In languages without a native Boolean type (such as C), is usually bound to a native integer type, using one for true and zero for false.

Canonical Form:

Either `true` or `false`.

Example 10.5. `!!bool` Examples

```
YAML is a superset of JSON: !!bool true
Pluto is a planet: !!bool false
```

10.2.1.3. Integer

URI:

`tag:yaml.org,2002:int`

Kind:

Scalar.

Definition:

Represents arbitrary sized finite mathematical integers. Scalars of this type should be bound to a native integer data type, if possible.

Some languages (such as Perl) provide only a "number" type that allows for both integer and floating-point values. A YAML processor may use such a type for integers, as long as they round-trip properly.

In some languages (such as C), an integer may overflow the native type's storage capability. A YAML processor may reject such a value as an error, truncate it with a warning, or find some other manner to round-trip it. In general, integers representable using 32 binary digits should safely round-trip through most systems.

Canonical Form:

Decimal integer notation, with a leading "-" character for negative values, matching the regular expression `0 | -? [1-9] [0-9]*`

Example 10.6. `!!int` Examples

```
negative: !!int -12
zero: !!int 0
positive: !!int 34
```

10.2.1.4. Floating Point

URI:

`tag:yaml.org,2002:float`

Kind:

Scalar.

Definition:

Represents an approximation to real numbers, including three special values (positive and negative infinity, and "not a number").

Some languages (such as Perl) provide only a "number" type that allows for both integer and floating-point values. A YAML processor may use such a type for floating-point numbers, as long as they round-trip properly.

Not all floating-point values can be stored exactly in any given native type. Hence a float value may change by "a small amount" when round-tripped. The supported range and accuracy depends on the implementation, though 32 bit IEEE floats should be safe. Since YAML does not specify a particular accuracy, using floating-point mapping keys requires great care and is not recommended.

Canonical Form:

Either `0`, `.inf`, `-.inf`, `.nan`, or scientific notation matching the regular expression `-? [1-9] ( \. [0-9]* [1-9] )? ( e [-+] [1-9] [0-9]* )?`.

Example 10.7. `!!float` Examples

```
negative: !!float -1
zero: !!float 0
positive: !!float 2.3e4
infinity: !!float .inf
not a number: !!float .nan
```

10.2.2. Tag Resolution

The JSON schema tag resolution is an extension of the failsafe schema tag resolution.

All nodes with the "`!`" non-specific tag are resolved, by the standard convention, to "`tag:yaml.org,2002:seq`", "`tag:yaml.org,2002:map`", or "`tag:yaml.org,2002:str`", according to their kind.

Collections with the "`?`" non-specific tag (that is, untagged collections) are resolved to "`tag:yaml.org,2002:seq`" or "`tag:yaml.org,2002:map`" according to their kind.

Scalars with the "`?`" non-specific tag (that is, plain scalars) are matched with a list of regular expressions (first match wins, e.g. `0` is resolved as `!!int`). In principle, JSON files should not contain any scalars that do not match at least one of these. Hence the YAML processor should consider them to be an error.

Regular expression	*Resolved to tag*
`null`	`tag:yaml.org,2002:null`
`true | false`	`tag:yaml.org,2002:bool`
`-? ( 0 | [1-9] [0-9]* )`	`tag:yaml.org,2002:int`
`-? ( 0 | [1-9] [0-9]* ) ( \. [0-9]* )? ( [eE] [-+]? [0-9]+ )?`	`tag:yaml.org,2002:float`
`*`	Error

Example 10.8. JSON Tag Resolution

```
A null: null
Booleans: [ true, false ]
Integers: [ 0, -0, 3, -19 ]
Floats: [ 0., -0.0, 12e03, -2E+05 ]
Invalid: [ True, Null, 0o7, 0x3A, +12.3 ]
```

```
%YAML 1.2
---
!!map {
  !!str "A null" : !!null "null",
  !!str "Booleans: !!seq [
    !!bool "true", !!bool "false"
  ],
  !!str "Integers": !!seq [
    !!int "0", !!int "-0",
    !!int "3", !!int "-19"
  ],
  !!str "Floats": !!seq [
    !!float "0.", !!float "-0.0",
    !!float "12e03", !!float "-2E+05"
  ],
  !!str "Invalid": !!seq [
    # Rejected by the schema
    True, Null, 0o7, 0x3A, +12.3,
  ],
}
...
```

10.3. Core Schema

The *Core schema* is an extension of the JSON schema, allowing for more human-readable presentation of the same types. This is the recommended default schema that YAML processor should use unless instructed otherwise. It is also strongly recommended that other schemas should be based on it.

10.3.1. Tags

The core schema uses the same tags as the JSON schema.

10.3.2. Tag Resolution

The core schema tag resolution is an extension of the JSON schema tag resolution.

All nodes with the "`!`" non-specific tag are resolved, by the standard convention, to "`tag:yaml.org,2002:seq`", "`tag:yaml.org,2002:map`", or "`tag:yaml.org,2002:str`", according to their kind.

Collections with the "`?`" non-specific tag (that is, untagged collections) are resolved to "`tag:yaml.org,2002:seq`" or "`tag:yaml.org,2002:map`" according to their kind.

Scalars with the "`?`" non-specific tag (that is, plain scalars) are matched with an extended list of regular expressions. However, in this case, if none of the regular expressions matches, the scalar is resolved to `tag:yaml.org,2002:str` (that is, considered to be a string).

Regular expression	*Resolved to tag*
`null | Null | NULL | ~`	`tag:yaml.org,2002:null`
`/* Empty */`	`tag:yaml.org,2002:null`
`true | True | TRUE | false | False | FALSE`	`tag:yaml.org,2002:bool`
`[-+]? [0-9]+`	`tag:yaml.org,2002:int` *(Base 10)*
`0o [0-7]+`	`tag:yaml.org,2002:int` *(Base 8)*
`0x [0-9a-fA-F]+`	`tag:yaml.org,2002:int` *(Base 16)*
`[-+]? ( \. [0-9]+ | [0-9]+ ( \. [0-`	

`9]* )? ) ( [eE] [-+]? [0-9]+ )?`	`tag:yaml.org,2002:float` *(Number)*
`[-+]? ( \.inf | \.Inf | \.INF )`	`tag:yaml.org,2002:float` *(Infinity)*
`\.nan | \.NaN | \.NAN`	`tag:yaml.org,2002:float` *(Not a number)*
`*`	`tag:yaml.org,2002:str` *(Default)*

Example 10.9. Core Tag Resolution

```
A null: null
Also a null: # Empty
Not a null: ""
Booleans: [ true, True, false, FALSE ]
Integers: [ 0, 0o7, 0x3A, -19 ]
Floats: [ 0., -0.0, .5, +12e03, -2E+05 ]
Also floats: [ .inf, -.Inf, +.INF, .NAN ]
```

```
%YAML 1.2
---
!!map {
  !!str "A null" : !!null "null",
  !!str "Also a null" : !!null "",
  !!str "Not a null" : !!str "",
  !!str "Booleans: !!seq [
    !!bool "true", !!bool "True",
    !!bool "false", !!bool "FALSE",
  ],
  !!str "Integers": !!seq [
    !!int "0", !!int "0o7",
    !!int "0x3A", !!int "-19",
  ],
  !!str "Floats": !!seq [
    !!float "0.", !!float "-0.0", !!float ".5",
    !!float "+12e03", !!float "-2E+05"
  ],
  !!str "Also floats": !!seq [
    !!float ".inf", !!float "-.Inf",
    !!float "+.INF", !!float ".NAN",
  ],
}
...
```

10.4. Other Schemas

None of the above recommended schemas preclude the use of arbitrary explicit tags. Hence YAML processors for a particular programming language typically provide some form of local tags that map directly to the language's native data structures (e.g., `!ruby/object:Set`).

While such local tags are useful for ad-hoc applications, they do not suffice for stable, interoperable cross-application or cross-platform data exchange.

Interoperable schemas make use of global tags (URIs) that represent the same data across different programming languages. In addition, an interoperable schema may provide additional tag resolution rules. Such rules may provide additional regular expressions, as well as consider the path to the node. This allows interoperable schemas to use untagged nodes.

It is strongly recommended that such schemas be based on the core schema defined above. In addition, it is strongly recommended that such schemas make as much use as possible of the the *YAML tag repository* at http://yaml.org/type/. This repository provides recommended global tags for increasing the portability of YAML documents between different applications.

The tag repository is intentionally left out of the scope of this specification. This allows it to evolve to better support YAML applications. Hence, developers are encouraged to submit new "universal" types to the repository. The yaml-core mailing list at http://lists.sourceforge.net/lists/listinfo/yaml-core is the preferred method for such submissions, as well as raising any questions regarding this draft.

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