Proposal for a Kannada Script Root Zone Label Generation Ruleset (LGR)

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# General Information/ Overview/ Abstract

The purpose of this document is to give an overview of the proposed Kannada LGR in the XML format and the rationale behind the design decisions taken. It includes a discussion of relevant features of the script, the communities or languages using it, the process and methodology used and information on the contributors. The formal specification of the LGR can be found in the accompanying XML document:

 Proposed-LGR-knda2017MMDD.xml

Labels for testing can be found in the accompanying text document:

 Labels-knda-version-2017MMDD.txt

# Script for which the LGR is proposed

ISO 15924 Code: Knda

ISO 15924 N°: 345

ISO 15924 English Name: Kannada

Latin transliteration of the native script name:

Native name of the script: ಕನ್ನಡ

Maximal Starting Repertoire (MSR) version: MSR-2

Some languages using the script: Kannada, Tulu, Beary, Konkani, Havyaka, Kodava

Name of the language as per ISO 639-3 : Kannada

# Background on Script and Principal Languages Using It

## 3.1 Kannada language

Kannada is one of the scheduled languages of India. It is spoken predominantly by the people of Karnataka State of India. It is one of the major languages among the Dravidian languages. Kannada is also spoken by significant linguistic minorities in the states of Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra, Kerala, Goa and abroad. As per scholars, Kannada was a spoken language during the 3rd century B.C. Ptolemy, a scholar from Alexandria, in his The Geography written during the first half of the second century A.D mentions some Kannada words. Ptolemy speaks of many places in Karnataka such as Kalgeris (identified as Kalkeri), Modogoulla (Mudugal), Badamios (Badami) and so on. All these are not only places in Karnataka, but are also names of Kannada origin.

The famous Halmidi Record of the Kadambas which is an inscription of the 5th century AD, is the oldest available evidence of Kannada language written in the pre Old Kannada script. Kappe Arabhatta’s Record at Badami (700 A.D.) has the first Kannada poem in ತ್ರಿಪದಿ tripadi metre. The oldest available literary work in Kannada is ಕವಿರಾಜಮಾರ್ಗ – Kavirajamarga, a book on poetics belonging to 9th century. This work speaks of some earlier poets in Kannada. Hence, Kannada must have been a fully developed language by the 5th or the 6th century A.D and must have been a spoken language for at least a few centuries earlier. Kannada is attested epigraphically for about one and a half millennia, and literary Old Kannada flourished in the 6th-century Ganga dynasty and during the 9th-century Rashtrakuta Dynasty. Kannada has an unbroken literary history of over a thousand years.

## 3.2 Evolution of Kannada script

The Kannada language is written using the Kannada script, which evolved from the 5th-century Kadamba script. The oldest form of Kannada script begins in 3rd century B.C. The first popular and well known Kannada script was called Kadamba script used by the Kadamba dynasty during 5th century A.D. Buhler, the famous epigraphist says that the Kadamba script is the earliest form of the present day Kannada script. During Ganga dynasty, in the 6ht century A.D., the script used is known as Adi Ganga script, which resembles Kadamba script. During 6-7th century A.D., the Chalukyas of Badami used a script which is now called by historian as Badami Chalukya script.Rashtrakuta was the next famous dynasty which ruled during 8-10th century A.D. and the script used during those time is referred to as Rashtrakuta script. The script used by the Kalyana Chalukya rulers is called Kalyana Chalukya script. It can be seen in the records of 10-12 century AD. Cursive writing was started during the 13th century by Hoysala kings. They built the decorative cursive way of writing based on the script of Kalyana Chalukyas. Inscriptions at Beluru and Halebeedu have text written using this kind of script. The Vijaynagar kings ruled during the 14-16th century A.D. did not make any major modifications to the script. The last dynasty of Karnataka, the kings of Mysore developed what is known as Modi script. It is called Modi script or ಮೋಡಿ ಬರಹ (Modi baraha). Most of the public records were written during Mysore kings are in Modi script. No inscriptions were written in Modi script as this style is difficult to inscribe on a stone. This can easily be called the last developed script which taught even now in schools for cursive writing of Kannada.

*Evolution of Kannada script from 3rd century B.C. to 18th century A.D.*

(from <https://karnatakaitihasaacademy.org/karnataka-history/evolution-of-kannada-script/>)

## 3.3 Languages considered

Apart from the Kannada language, other languages that use the Kannada script are -Tulu, Kodava (Coorgi), Konkani, Havyaka, Sanketi, Beary (byaari), Arebaase, Koraga, etc. Tulu had its own script which is not in much use nowadays even though lot of efforts are being done of late to revive the Tulu script. The Konkani language is written in Devanagari, Roman, Malayalam scripts also.

## 3.4 Structure of written Kannada

The structure of Kannada is similar to other Indian languages, especially to Telugu. The heart of the writing system is the Akshar. The Kannada alphabet is known as aksharamale or varnamale. The modern alphabet contains 49 characters. This has been arrived at by removing two characters that are mainly used to write classical Kannada texts. These two characters were in use just about 50 years ago. Characters combine to form compound characters called as samyuktakshara (conjuncts). These compound characters have distinct display forms. The total number of such combinations will be about 650,000. The basic characters in varnamale are classified into three main categories. They are - swara (vowels), vyanjana (consonants) and yogavahas.

### 3.4.1 Swaras (vowels)

There are thirteen vowels

|  |  |  |
| --- | --- | --- |
| **Letter** | **Diacritic** | **ISO notation** |
| ಅ | N/A | a |
| ಆ | ಾ | ā |
| ಇ | ಿ | i |
| ಈ | ೀ | ī |
| ಉ | ು | u |
| ಊ | ೂ | ū |
| ಋ | ೃ | rū |
| ಎ | ೆ | e |
| ಏ | ೇ | ē |
| ಐ | ೈ | ai |
| ಒ | ೊ | o |
| ಓ | ೋ | ō |
| ಔ | ೌ | au |

(from <https://en.wikipedia.org/wiki/Kannada_alphabet>)

When a vowel follows a consonant, it is written with a diacritic rather than as a separate letter. Sometimes these are referred to as vowel signs or matras. Vowel signs or matras are attached only to consonants.

### 3.4.2 Yogavahas

The Yōgavāha (part-vowel, part consonant) include two letters:

1. The anusvara: ಅಂ (*aṁ*)
2. The visarga: ಅಃ (*aḥ*)

### 3.4.3. Vyanjanas (consonants)

Two categories of consonant characters (Vyan̄janas) are defined in Kannada: the structured consonants (Vargīya Vyañjana) and the unstructured consonants (Avargīya Vyañjana

The structured consonants are classified according to where the tongue touches the palate of the mouth and are classified accordingly into five structured groups. These consonants are shown here

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | voiceless | voiceless aspirate | voiced | voiced aspirate | nasal |
| Velars | ಕ (ka) | ಖ (kha) | ಗ (ga) | ಘ (gha) | ಙ (ṅa) |
| Palatals | ಚ (ca) | ಛ (cha) | ಜ (ja) | ಝ (jha) | ಞ (ña) |
| Retroflex | ಟ (ṭa) | ಠ (ṭha) | ಡ (ḍa) | ಢ (ḍha) | ಣ (ṇa) |
| Dentals | ತ (ta) | ಥ (tha) | ದ (da) | ಧ (dha) | ನ (na) |
| Labials | ಪ (pa) | ಫ (pha) | ಬ (ba) | ಭ (bha) | ಮ (ma) |

(from <https://en.wikipedia.org/wiki/Kannada_alphabet>)

The unstructured consonants are consonants that do not fall into any of the above structures:

ಯ (ya), ರ (ra), ಱ (ṟa) (obsolete), ಲ (la), ವ (va), ಶ (śa), ಷ (ṣa), ಸ (sa), ಹ (ha), ಳ (ḷa), ೞ (ḻ) (obsolete).

From this list the two obsolete characters (ಱ and ೞ) have been removed in modern varnamale bringing the total number of characters to 49.

### 3.4.4 Implicit vowel ಅ (a) in consonants

All consonants (vyanjanas) in Kannada when written as ಕ (ka), ಖ (kha), ಗ (ga), etc. actually have a built-in vowel sign (matra) of vowel ಅ (a) in them. These consonants are actually ಕ್, ಖ್, ಗ್, etc., shown after removing the implicit vowel ಅ (a). In fact many grammar books on Kannada list the consonants by removing the implicit ಅ (a). In Unicode the character U+0CCD, which is the Kannada equivalent of Devanagari’s Halant U+094D (or VIRAMA as Unicode calls it), follows consonants to remove the implicit ಅ (a). Halant can follow a consonant only and no other character.

### 3.4.5 Conjuncts

Kannada is known to have large number of conjuncts which are nothing but combination of consonants and vowel signs (matras). These are also known as syllables, sometimes referred to as akshara. Different types of consonants and vowel sign combinations possible. They are –

* Consonant + Vowel sign,
eg., ಕ (ka, U+0C95) + ೊ (U+0CCA, matra of vowel ಒ) = ಕೊ
* Consonant + Halant + Consonant,
eg., ಕ (ka, U+0C95) + Halant (U+0CCD) + ಕ (ka, U+0C95) = ಕ್ಕ
* Consonant + Halant + Consonant + Vowel sign,
eg. ಕ (ka, U+0C95) + Halant (U+0CCD) + ಕ (ka, U+0C95) + ೊ (U+0CCA, matra of vowel ಒ) = ಕ್ಕೊ
* Consonant + Halant + Consonant + Halant + Consonant
eg., ಷ (ṣa, U+0CB7) + Halant (U+0CCD) +ಟ (ṭa, U+0C9F) + Halant (U+0CCD) + ರ (ra, U+0CB0) = ಷ್ಟ್ರ
* Consonant + Halant + Consonant + Halant + Consonant + Vowel sign
eg., ಷ (ṣa, U+0CB7) + Halant (U+0CCD) + ಟ (ṭa, U+0C9F) + Halant (U+0CCD) + ರ (ra, U+0CB0) + ೊ (U+0CCA, matra of vowel ಒ) = ಷ್ಟ್ರೊ

Conjunct cluster having more than 3 consonants in one syllable are normally not seen in Kannada.

### 3.4.6 Pure vowels in the middle of a word

In Kannada, it is common to have words starting with a vowel. Sometimes, of late, people are writing words having pure vowels in the middle of a word. This kind of writing was originally normally not seen in Kannada. This kind of writing has been made a requirement to write the words imported from other languages, especially from English. Linguistically this is not invalid and hence can be allowed.

### 3.4.7 Illegal combinations

There are some combinations which are invalid as per Kannada grammar. They are listed below-

1. Having two or more consecutive vowel signs.
2. Having a vowel sign after a vowel.
3. Having a vowel sign after a Yōgavāha (anusvara or visarga).
4. Having a Halant after a vowel or vowel sign.
5. There can’t be a Yōgavāha after a Halant as per Kannada language.

# Overall Development Process and Methodology

Neo-Brahmi Generation Panel (NBGP) has been formed by members having experience in linguistics and computational linguistics. Under the Neo-Brahmi Generation Panel, there are nine scripts belonging to separate Unicode blocks. Each of these scripts will be assigned a separate LGR; however the Neo-Brahmi GP will ensure that the fundamental philosophy behind building those LGRs are all in sync with all other Brahmi-derived scripts.

NBGP considered all the languages with EGIDS scale 1 to 4 and found that Kannada script is being used in Kannada, Tulu, Beary, Konkani, Havyaka, Kodava, among other languages.

## 4.1 Guiding Principles

The NBGP adopts following broad principles for selection of code-points in the code-point repertoire across the board for all the scripts within its ambit.

### 4.1.1 Inclusion principles:

#### 4.1.1.1 Modern usage:

Every character proposed should be in the everyday usage of a particular linguistic community. The characters which have been encoded in the Unicode for transcription purposes only or for archival purposes will not be considered for inclusion in the code-point repertoire.

#### 4.1.1.2 Unambiguous use:

Every character proposed should have unambiguous understanding among the linguistic about its usage in the language.

###  4.1.2 Exclusion principles:

The main exclusion principle is that of Acknowledgement of Environmental Limitations. These comprise of protocols or standards which are pre-requisites to the Label Generation Rulesets. All further principles are in fact subsumed under these limitations but have been spelt out separately for the sake of clarity.

####  4.1.2.1 Acknowledgement of Environment Limitations:

The code point repertoire for root zone being a very special case, up the ladder in the protocol hierarchies, the canvas of available characters for selection as a part of the Root Zone code point repertoire is already constrained by various protocol layers beneath it. Following three main protocols/standards act as successive filters:

*i. The Unicode Chart:*

Out of all the characters that are needed by the given script, if the character in question is not encoded in Unicode, it cannot be incorporated in the code point repertoire. Such cases are quite rare, given the elaborate and exhaustive character inclusion efforts made by Unicode Consortium.

*ii. IDNA Protocol:*

Unicode being the character encoding standard for providing the maximum possible representation of a given script/language, it has encoded as far as possible all the possible characters needed by the script. However the Domain name being a specialized case, it is governed by an additional protocol known as IDNA (Internationalized Domain Names in Applications). The IDNA protocol introduces exclusion of some characters out of Unicode repertoire from being part of the domain names.

Example: Kannada sign CHANDRABINDU ಁ (U+0C81) is not allowed to be part of the domain name.

*iii. Maximal Starting Repertoire:*

The Root-zone LGR being a repertoire of the characters which are going to be used for creation of the root zone TLDs, which in turn are an even more specialized case of domain names, the ROOT LGR procedure introduces additional exclusions on IDNA allowed set of characters.

Example: Kannada Sign AVAGRAHA "ऽ" (U+0CBD) even if allowed by IDNA protocol, is not permitted in the Root Zone Repertoire as per the [MSR].

To sum up, the restrictions start off by admitting only such characters as are part of the code-block of the given script/language. This is further narrowed down by the IDNA 2008 Protocol and finally an additional filter in the form of Maximal Starting Repertoire restricts the character set associated with the given language even more.

#### 4.1.2.2 No Rare and Obsolete Characters:

There are characters which have been added to Unicode to accommodate rare forms especially like KANNADA LETTER VOCALIC L "ಌ" (U+0C8C) as well as its matra forms "ೢ" (U+0CE2). All such characters will not be included. This is in consonance with the Conservatism principle as laid down in the Root Zone LGR procedure.

# Repertoire

## 5.1 Unicode codepoints included

 Given below is the repertoire for Kannada based on Unicode character set.

| Sr. No. | Unicode Code Point | Glyph | Character Name | GC | Indic Syllabic Category | Reference |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | 0C82 | ಂ | KANNADA SIGN ANUSVARA | Mc | Anusvara |  110 |
| 2 | 0C83 | ಃ | KANNADA SIGN VISARGA | Mc | Visarga |  110 |
| 3 | 0C85 | ಅ | KANNADA LETTER A | Lo | Vowel |  110 |
| 4 | 0C86 | ಆ | KANNADA LETTER AA | Lo | Vowel |  110 |
| 5 | 0C87 | ಇ | KANNADA LETTER I | Lo | Vowel |  110 |
| 6 | 0C88 | ಈ | KANNADA LETTER II | Lo | Vowel |  110 |
| 7 | 0C89 | ಉ | KANNADA LETTER U | Lo | Vowel |  110 |
| 8 | 0C8A | ಊ | KANNADA LETTER UU | Lo | Vowel |  110 |
| 9 | 0C8B | ಋ | KANNADA LETTER VOCALIC R | Lo | Vowel |  110 |
| 10 | 0C8E | ಎ | KANNADA LETTER E | Lo | Vowel |  110 |
| 11 | 0C8F | ಏ | KANNADA LETTER EE | Lo | Vowel |  110 |
| 12 | 0C90 | ಐ | KANNADA LETTER AI | Lo | Vowel |  110 |
| 13 | 0C92 | ಒ | KANNADA LETTER O | Lo | Vowel |  110 |
| 14 | 0C93 | ಓ | KANNADA LETTER OO | Lo | Vowel |  110 |
| 15 | 0C94 | ಔ | KANNADA LETTER AU | Lo | Vowel |  110 |
| 16 | 0C95 | ಕ | KANNADA LETTER KA | Lo | Consonant |  110 |
| 17 | 0C96 | ಖ | KANNADA LETTER KHA | Lo | Consonant |  110 |
| 18 | 0C97 | ಗ | KANNADA LETTER GA | Lo | Consonant |  110 |
| 19 | 0C98 | ಘ | KANNADA LETTER GHA | Lo | Consonant |  110 |
| 20 | 0C99 | ಙ | KANNADA LETTER NGA | Lo | Consonant |  110 |
| 21 | 0C9A | ಚ | KANNADA LETTER CA | Lo | Consonant |  110 |
| 22 | 0C9B | ಛ | KANNADA LETTER CHA | Lo | Consonant |  110 |
| 23 | 0C9C | ಜ | KANNADA LETTER JA | Lo | Consonant |  110 |
| 24 | 0C9D | ಝ | KANNADA LETTER JHA | Lo | Consonant |  110 |
| 25 | 0C9E | ಞ | KANNADA LETTER NYA | Lo | Consonant |  110 |
| 26 | 0C9F | ಟ | KANNADA LETTER TTA | Lo | Consonant |  110 |
| 27 | 0CA0 | ಠ | KANNADA LETTER TTHA | Lo | Consonant |  110 |
| 28 | 0CA1 | ಡ | KANNADA LETTER DDA | Lo | Consonant |  110 |
| 29 | 0CA2 | ಢ | KANNADA LETTER DDHA | Lo | Consonant |  110 |
| 30 | 0CA3 | ಣ | KANNADA LETTER NNA | Lo | Consonant |  110 |
| 31 | 0CA4 | ತ | KANNADA LETTER TA | Lo | Consonant |  110 |
| 32 | 0CA5 | ಥ | KANNADA LETTER THA | Lo | Consonant |  110 |
| 33 | 0CA6 | ದ | KANNADA LETTER DA | Lo | Consonant |  110 |
| 34 | 0CA7 | ಧ | KANNADA LETTER DHA | Lo | Consonant |  110 |
| 35 | 0CA8 | ನ | KANNADA LETTER NA | Lo | Consonant |  110 |
| 36 | 0CAA | ಪ | KANNADA LETTER PA | Lo | Consonant |  110 |
| 37 | 0CAB | ಫ | KANNADA LETTER PHA | Lo | Consonant |  110 |
| 38 | 0CAC | ಬ | KANNADA LETTER BA | Lo | Consonant |  110 |
| 39 | 0CAD | ಭ | KANNADA LETTER BHA | Lo | Consonant |  110 |
| 40 | 0CAE | ಮ | KANNADA LETTER MA | Lo | Consonant |  110 |
| 41 | 0CAF | ಯ | KANNADA LETTER YA | Lo | Consonant |  110 |
| 42 | 0CB0 | ರ | KANNADA LETTER RA | Lo | Consonant |  110 |
| 43 | 0CB2 | ಲ | KANNADA LETTER LA | Lo | Consonant |  110 |
| 44 | 0CB3 | ಳ | KANNADA LETTER LLA | Lo | Consonant |  110 |
| 45 | 0CB5 | ವ | KANNADA LETTER VA | Lo | Consonant |  110 |
| 46 | 0CB6 | ಶ | KANNADA LETTER SHA | Lo | Consonant |  110 |
| 47 | 0CB7 | ಷ | KANNADA LETTER SSA | Lo | Consonant |  110 |
| 48 | 0CB8 | ಸ | KANNADA LETTER SA | Lo | Consonant |  110 |
| 49 | 0CB9 | ಹ | KANNADA LETTER HA | Lo | Consonant |  110 |
| 50 | 0CBE | ಾ | KANNADA VOWEL SIGN AA | Mc | Matra |  110 |
| 51 | 0CBF | ಿ | KANNADA VOWEL SIGN I | Mn | Matra |  110 |
| 52 | 0CC0 | ೀ | KANNADA VOWEL SIGN II | Mc | Matra |  110 |
| 53 | 0CC1 | ು | KANNADA VOWEL SIGN U | Mc | Matra |  110 |
| 54 | 0CC2 | ೂ | KANNADA VOWEL SIGN UU | Mc | Matra |  110 |
| 55 | 0CC3 | ೃ | KANNADA VOWEL SIGN VOCALIC R | Mc | Matra |  110 |
| 56 | 0CC6 | ೆ | KANNADA VOWEL SIGN E | Mn | Matra |  110 |
| 57 | 0CC7 | ೇ | KANNADA VOWEL SIGN EE | Mc | Matra |  110 |
| 58 | 0CC8 | ೈ | KANNADA VOWEL SIGN AI | Mc | Matra |  110 |
| 59 | 0CCA | ೊ | KANNADA VOWEL SIGN O | Mc | Matra |  110 |
| 60 | 0CCB | ೋ | KANNADA VOWEL SIGN OO | Mc | Matra |  110 |
| 61 | 0CCC | ೌ | KANNADA VOWEL SIGN AU | Mn | Matra |  110 |
| 62 | 0CCD | ್ | KANNADA SIGN VIRAMA | Mn | Halant / Virama |  110 |

## 5.2 Codepoints not included

Following code points have not been included in the repertoire.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sr. No. | Unicode Code Point | Glyph | Character Name | Reason for exclusion |
| 1. | 0C8C | ಌ | KANNADA LETTER VOCALIC L | Not used in Kannada |
| 2. | 0CB1 | ಱ | KANNADA LETTER RRA | Obsolete character, not used in modern Kannada |
| 3. | 0CBC | ಼ | KANNADA SIGN NUKTA | Does not belong to Kannada, not needed in LGR |
| 4. | 0CC4 | ೄ | KANNADA VOWEL SIGN VOCALIC RR | Not used in Kannada |
| 5. | 0CD5 | ೕ | KANNADA LENGTH MARK | Not in use |
| 6. | 0CD6 | ೖ | KANNADA AI LENGTH MARK | Not in use |

# Variants

## 6.1 In-script variants

There are no variants within Kannada script.

## 6.2 Cross-script variants

Some characters of Kannada look somewhat similar to some characters in Devanagari, Gujarati, Telugu, Malayalam and Sinhala. The tables below list them.

### 6.2.1 Cross-script variants for Kannada and Telugu

| **Variant Set**  | **Telugu Code Point**  | **Kannada Code Point** |
| --- | --- | --- |
| 1 | ం (0C02) | ಂ (0C82) |
| 2 | ః (0C03) | ಃ (0C83) |
| 3 | అ (0C05) | ಅ (0C85) |
| 4 | ఆ (0C06 ) | ಆ (0C86) |
| 5 | ఇ (0C07) | ಇ (0C87) |
| 6 | ఈ (0C08) | ಈ (0C88) |
| 7 | ఐ (0C10) | ಐ (0C90) |
| 8 | ఒ (0C12) | ಒ (0C92) |
| 9 | ఓ (0C13) | ಓ (0C93) |
| 10 | ఔ (0C14) | ಔ (0C94) |
| 11 | ఖ (0C16) | ಖ (0C96) |
| 12 | గ (0C17) | ಗ (0C97) |
| 13 | జ (0C1C) | ಜ (0C9C) |
| 14 | ఝ (0C1D) | ಝ (0C9D) |
| 15 | ఞ (0C1E) | ಞ (0C9E) |
| 16 | ట (0C1F) | ಟ (0C9F) |
| 17 | ఠ (0C20) | ಠ (0CA0) |
| 18 | డ (0C21) | ಡ (0CA1) |
| 19 | ఢ (0C22) | ಢ (0CA2) |
| 20 | ణ (0C23) | ಣ (0CA3) |
| 21 | థ (0C25) | ಥ (0CA5) |
| 22 | ద (0C26) | ದ (0CA6) |
| 23 | ధ (0C27) | ಧ (0CA7) |
| 24 | న (0C28) | ನ (0CA8) |
| 25 | బ (0C2C) | ಬ (0CAC) |
| 26 | భ (0C2D) | ಭ (0CAD) |
| 27 | మ (0C2E) | ಮ (0CAE) |
| 28 | య (0C2F) | ಯ (0CAF) |
| 29 | ర (0C30) | ರ (0CB0) |
| 30 | ల (0C32) | ಲ (0CB2) |
| 31 | ళ (0C33) | ಳ (0CB3) |
| 32 | ి (0C3F) | ಿ (0CBF) |
| 33 | ు (0C41) | ು (0CC1) |
| 34 | ృ (0C43) | ೃ (0CC3) |

### 6.2.2 Cross-script variants for Kannada and Devanagari

| **Devanagari Code Point**  | **Kannada Code Point** |
| --- | --- |
| ः (0903) | ಃ (0C83) |

They are identical but as there are not enough other variant code points to form two labels with each script that look the same. Therefore, these are not defined as variant code points.

### 6.2.3 Cross-script variants for Kannada and Gujarati

| **Gujarati Code Point**  | **Kannada Code Point** |
| --- | --- |
| ઃ (0A83) | ಃ (0C83) |

They are identical but as there are not enough other variant code points to form two labels with each script that look the same. Therefore, these are not defined as variant code points.

### 6.2.4 Cross-script variants for Kannada and Malayalam

| **Kannada Code Point**  | **Malayalam Code Point** |
| --- | --- |
| ಂ (0C82) | ം (0D02) |
| ಃ (0C83) | ഃ (0D03) |

They are identical but as there are not enough other variant codes point to form two labels with each script that look the same. Therefore, these are not defined as variant code points.

### 6.2.5 Cross-script variants for Kannada and Sinhala

| **Variant Set** | **Kannada Code Point**  | **Sinhala Code Point** |
| --- | --- | --- |
| 1 | ಂ (0C82) | ං (0D82) |
| 2 | ಃ (0C83) | ඃ (0D83) |
| 3 |  ರ (0CB0) | ර(0DBB) |

# Whole Label Evaluation Rules (WLE)

Variables or definitions -

V → Vowel

M → Matra

C → Consonant

H → Halant / Virama

B → Anusvara

X → Visarga

Rules for forming akshar or a cluster of one unit -

1. Rule 1: H must be preceded by C
2. Rule 2: M must be preceded by C
3. Rule 3: B must be preceded by C, V or M
4. Rule 4: X must be preceded by C, V or M

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# Appendix-I

Some cross-script variants for Kannada with Telugu script are listed below. Some characters of Kannada look somewhat similar to some characters in Telugu. This mostly dependent on the type of fonts used for both languages.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Ser. No.** | **Kannada Character** | **Unicode codepoint** | **Telugu character** | **Unicode codepoint** |
| 1 | ಎ | 0C8E | ఎ | 0C0E |
| 2 | ಘ | 0C98 | ఘ | 0C18 |
| 3 | ಙ | 0C99 | ఙ | 0C19 |
| 4 | ಚ | 0C9A | చ | 0C1A |
| 5 | ಛ | 0C9B | ఛ | 0C1B |
| 6 | ಪ | 0CAA | ప | 0C2A |
| 7 | ಫ | 0CAB | ఫ | 0C2B |
| 8 | ವ | 0CB5 | వ | 0C35 |
| 9 | ಶ | 0CB6 | శ | 0C36 |
| 110 | ಷ | 0CB7 | ష | 0C37 |
| 11 | ಸ | 0CB8 | స | 0C38 |
| 12 | ೌ  | 0CCC |  ౌ | 0C4C |

# Appendix-II

Zero Width Joiner and Zero Width Non Joiner in Kannada domain names

Zero Width Joiner (ZWJ) and Zero Width Non Joiner (ZWNJ) have special roles in Kannada.

ZWNJ is used in sequences like Consonant (C) + Halant (U+0CCD) + Consonant kind where the second C should not take the vattu form after (below) the first consonant.

Ex.

1.ಜ (U+0C9C) + ್ + (U+0CCD) + ಕ (U+0C95) = ಜ್ಕ – without using ZWNJ

2. ಜ (U+0C9C) + ್ + (U+0CCD) + ZWNJ (U+200C) + ಕ (U+0C95) = ಜ್‌ಕ – using ZWNJ

Example of the word not using ZWNJ – ರಾಜ್ಕುಮಾರ್ (Rajkumar)

Example of word using ZWNJ – ರಾಜ್‌ಕುಮಾರ್ (Rajkumar)

Both words mean the same. But their pronunciations are slightly different. The second form does not originally belong to Kannada, but nowadays due to the influence of English and Hindi, some people are using the form. But this form is needed to write many English words in Kannada like software (ಸಾಫ್ಟ್‌ವೇರ್, using ZWNJ). The word software will become ಸಾಫ್ಟ್ವೇರ್ if ZWNJ is not used.

ZWJ has a unique purpose in Kannada where conjuncts are formed with consonants where the first consonant is ರ (Ra) (U+0CB0). When conjunct is formed with Ra + Halant + <consonant>, the default form is second <consonant> followed by arkavattu, which is Kannada equivalent of the reph of Devanagari.

Ex. ರ (U+0CB0) + ್ (U+0CCD) + ಕ (U+0C95) = ರ್ಕ

Original Kannada did not have this arkavattu or reph. It was like any other C1+ Halant + C2 where the C2 takes the vattu form, even when C1 = ರ (Ra). To get the vattu form for ರ + Halant + <consonant>, ZWJ is used.

Ex.

ರ (U+0CB0) + ್ (U+0CCD) + ZWJ (U+200D) + ಕ (U+0C95) = ರ್‍ಕ –Microsoft’s implementation

ರ (U+0CB0) + ZWJ (U+200D) + ್ (U+0CCD) + ಕ (U+0C95) = ರ್‍ಕ – as per Unicode’s definition. Browsers Firefox and Chrome use this rendering rule.

The original Kannada form (not using arkavattu or reph) is needed when the first letter of the word itself is ರ (Ra, U+0CB0) followed by Halant and a consonant.

Example- ರ (U+0CB0) + Halant (U+0CCD) + ಯ (U+0CAF) = ರ್ಯ as in ರ್ಯಾಲಿ (rally written in Kannada). This is wrong as per the writing style followed in Kannada. Here the second consonant ಯ (Ya, U+0CAF) must take the vattu form. To get that one must use ZWJ as explained above. Correct form of rally written in Kannada will be ರ್‍ಯಾಲಿ making use of ZWJ. One such word I can think of will be the company Rallis India. When they go for registering domain name in Kannada, if ZWJ is not allowed in domain name, they will have to go for ರ್ಯಾಲೀಸ್.ಭಾರತ, which is the wrong form in Kannada. They should write it as ರ್‍ಯಾಲೀಸ್.ಭಾರತ by making use of ZWJ.

Thus both ZWJ and ZWNJ are needed for having proper domain names in Kannada.

**How to avoid duplicate domain names involving ZWJ and ZWNJ?**

ZWJ and ZWNJ are used mainly to have two display forms of linguistically same word or combination of characters in Kannada. When ZWJ and ZWNJs are allowed in domain names for Kannada, it will create two domain names which have two display forms but linguistically they are same. To make the browsers and DNSs to treat them as equal, we have to ignore ZWJ and ZWNJs for comparing two words. This methodology is followed by the spell-check used in Microsoft Word. Same philosophy can be applied here also.