Towards a comprehensive proposal for Thai Noi / Lao Buhan script

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This is a response to the 'request to add Thai characters to ISO/IEC 10646/Unicode document L2/18-041' [pdf ⧉]. This present document is not intended to be authoritative, but merely prompt further analysis and discussion of the script with a view to establishing the best approach for encoding the script. Further consultation with user communities and academics is recommended.

Context

Further information is needed to explain how and where the script is used, and for which languages. This will help settle which Unicode block the script should be encoded in.

Users of the script

Thai Noi script is also known in Laos, where it is known as Lao Buhan[1]. Though not in widespread current use, Lao Buhan is the proximate source of modern Lao script. Analysis and comparisons should be made between Thai Noi and Lao Buhan, to ensure consistency in encoding characters and a robust mechanism for their composing behaviour(s) that accommodates both orthographies and any language differences.

The number of users of the Thai Noi / Lao Buhan script should be estimated; a large majority of Standard Thai users do not know Thai Noi.

These two factors indicate that the user groups for Thai Noi / Lao Buhan, Standard Lao and Standard Thai are quite different.

Languages and scripts

Hand in hand with the user groups, the proposal should state which languages the script is used for, and how the script may be used differently for each (for example, Thai Isaan language and Lao language written in the script may have different requirements). It should also be discussed the extent to which standard Thai language could be written in Thai Noi / Lao Buhan script. Use of the Thai Noi / Lao Buhan script for Pali–Sanskrit and any minority languages should also be documented, as different characters may be needed, they may combine in different ways, or have different sound values.

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[1] **Choice of which name to call the script conveys a cultural bias. The Thai name is** ไทยน้อย /tʰaːj nɔ́ːi/ **meaning 'lesser Thai'. The Lao name** ລາວບູຮານ [ບູຮານ] /laːw būːhǎn/ **or Thai equivalent** ลาวโบราณ **means 'ancient Lao'; in this document neither name is preferred, and the script is called by both. Buhan can alternatively be spelt 'buhane' or 'bouhane'. Occasionally the term 'Lao Buhan' is also applied to the Tham Lao / Isaan script.**

Equally, the relationships of Thai Noi / Lao Buhan to Lao, Khmer, Myanmar and Tham scripts should be explored to ensure a) difficulties that were encountered in encoding those scripts are learned from and b) consistency of encoding where appropriate.

To ensure the widest possible applicability, historical sub-genres of Thai Noi / Lao Buhan script should be identified, such as Lao Chiang (ลาวเฉียง). Study of the Nithet (อักษร นิเทศ) and Fakkham (อักษรฝักขาม) scripts may also reveal instructive overlaps. (As a parallel example, four main sub-genres are discernible for Tham script: Tham Lanna, Tham Isaan/Lao, Tham Lue and Tham Khuen, and their differing behaviours should all be accommodated by the Tham encoding). All this is to say: given the transnational and historic significance of the script, like with Tham script, efforts to encode Thai Noi / Lao Buhan should not be based around a single user-group, and need to be a non-partisan, language-agnostic international collaboration.

Not an extension to the Thai alphabet[2]

Thai Noi / Lao Buhan letters are not part of the Thai alphabet, nor are they an extension to it. The two scripts do not interact: there are no words that contain letters of Thai and letters of Thai Noi / Lao Buhan, and they are used for different languages. This means Thai Noi / Lao Buhan is unlike the Khmu example in the Lao block, where the Khmu letters extend the Lao alphabet to produce sounds not found in Standard Lao, and they would be used as part of the Lao alphabet. This is not to say that Thai and Thai Noi / Lao Buhan could not occur side by side: a dictionary of Isaan language using Thai Noi / Lao Buhan script may very well need the two scripts typeset together.

Instead, Thai Noi / Lao Buhan seems to require a different character set from Thai. Indeed, the proposal lists many characters that are found already in the Lao Unicode block, and some that are glyph variants of Thai characters. The cleanest way to avoid this muddle would be by encoding separately. If encoding in the Thai or Lao blocks, it should be explained why these characters should be encoded again.

Two further factors that suggest separate encoding are that the behaviour of the script is different from Thai, which does not have any mechanism for stacking consonants[3], ligatures and other consonant forms as described below; and that the proposal does not use Thai letter names: instead of NO NU or MO MA, it calls the letters NA and MA.

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2 As in footnote 1, care should be taken not to inadvertently reinforce cultural bias by allocating Thai Noi / Lao Buhan letters to the existing Thai or Lao Unicode blocks; or by using a partisan pronunciation scheme or nomenclature.

3 Though differing morpho-syntactic behaviour alone is not enough to warrant separate encoding, revising the current Thai (or Lao) implementation to accommodate stacking would mean the full established encoding schema would need to be completely re-architectured, impacting the current active user base of an extremely digital language/writing system.

Character repertoire

Every character that is used in Thai Noi / Lao Buhan should be evidenced with attestations[4] and descriptions explaining function, behaviour and any variant forms found. It is essential to have an exhaustive list. See Appendix B for a proposed format.

Because Thai Noi / Lao Buhan is a historical script, using modern pronunciation values is fraught with inconsistencies between the varieties of spoken languages. As such, the inventory should name consonants according to their original Brahmic varga position using proto-Taiic sound values[5]: a suggested scheme is presented in the appendices. For vowels it should specify where the signs sit in relation to base consonants (above, below, left, right), and which signs can be used together. The numerals in the character names (e.g. LA2, KHA1) should be explained; or a different naming system should be adopted (see appendix A). Care should be taken to talk about glyphs and characters distinctly: some are base consonants, some are so-called sub-consonants, and some are semivowels, ligatures or conjuncts. The following sections aim to list the proposed characters by categorising them this way, but much more study is needed to be certain.

Theppitak Karoonbanyanan has done a lot of work to document the characters: see **https://linux.thai.net/~thep/esaan-scripts/tn-issues/tn-encoding.html** for a more comprehensive list with attestations. A full proposal will need to include numerals, punctuation and other symbols along with consonants and vowels.

Consonants

It is unclear why **0E63** THA, **0E67** LA3, and **0E68** SA6 would be required, if this is intended as an extension to the Thai block, since these appear to be mere typographic/glyph variants of **0E16** THO THUNG, **0E25** LO LING and **0E2A** SO SUA. In Thai Noi / Lao Buhan, these letters, and some others, have different forms than in standard Thai or Lao (often � and ຂ/ວ/ຊ instead of ລ and ສ)[6]; this is another factor that suggests separate encoding.

Proposed **0E6C** O+YA (ຍ) is a character that can be found historically in some writing systems of northern Thailand/. While in modern Thai it would be considered a ligature or digraph[7], this character is not a ligature in Tham or Lao, where it is encoded at 1A40 and 0EA2 respectively, and should not be named as a ligature in the Thai Noi / Lao Buhan encoding.

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4   The reader will note the lack of attestations in this document; this is due to a lack of time to locate and scour the required resources.
5   Reflexes in Thai, Lao and other languages can then be annotated in the character descriptions.
6   Other differences generally include variants of ປຝຟ in the forms ປ໌ຕ໌ຟ໌; and the numerals ໔໕໖໗ which can be ໖໖໔ and ໖໌. Appendix A contrasts each consonant with its counterpart in sibling scripts.
7   In modern Thai, ອຍ as a consonant cluster represents a mid-class YA, where the ອ effectively converts the ຍ from a low tone to a mid tone consonant. Historically it represented a glottalised palatal continuant, and in a standard Thai font could be potentially accessed with a discretionary <hlig> digraph glyph.

Conjunct mechanism

Thai Noi / Lao Buhan, like many other Southeast Asian and Indic scripts, uses various consonant forms (above-base, below-base and post-base glyph alternates) of consonants to indicate conjuncts. Whether these forms are also used to indicate medial consonants[8] (as in Burmese) and/or final consonants[9] (as in Tham and some orthographies of Khmer) should be documented.

In Thai Noi / Lao Buhan, many consonants, for example ລ, have both below-base (◌ຼ) and post-base (◌ຽ) forms[10] for use in different contexts[11]. It will be necessary to distinguish between these, and establish a mechanism to select the appropriate glyph. Unusually, in Thai Noi / Lao Buhan, consonant forms may also employed in polysyllabic words to indicate word-internal syllable onsets (such as ພຽຽຯ /phāːsǎː/ = language).

Conjunct forms are not found in Thai, and in other Indic scripts are generally not encoded, but accessed by contextual substitution. For example, Khmer and Myanmar encodings operate on a virama model, which could be suitable, as this allows any arbitrary sequence of consonants to be clustered using a control character. However, Tibetan provides an alternative model, in which conjunct forms are explicitly encoded. This would more easily allow consonants to have more than one alternate glyph, as well as determining their above-base, below-base or post-base status[12]. One of these two possible approaches should be chosen[13].

Conjunct forms

Proposed **0E3C** LA2 would be cognate with **0EBC** LAO SEMIVOWEL SIGN LO, and is a combining mark that attaches below the baseline (◌ຼ). As mentioned above, it should be explained whether this represents the second part of a consonant cluster, as in Lao, or a medial or final consonant. Note also the post-base form of LO (◌ຽ) is not mentioned.

Proposed **0E3D** YA2 is a spacing, post-base form of the consonant Ya. As such, it would be cognate with **0EBD** LAO SEMIVOWEL SIGN NYO (◌ຽ), or with the **103B** MYANMAR CONSONANT SIGN MEDIAL YA (◌ျ). Whether it is used as a vowel/semivowel, a medial or a

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8 Medial consonants in Burmese inflect a syllable-initial consonant or subsequent vowel, without initiating a new syllable.

9 Syllable-final (coda) consonants in Tham or Khmer may follow an inherent or explicit vowel; this necessitates an implementation in which vowel glyphs can carry consonant forms. This has been a difficulty with the Universal Shaping Engine (USE), which does not currently allow consonants to operate on vowels.

10 Suggested terminology: ຕົວເຟື້ອງຫອຍ take different forms below the baseline while ຕົວຊ້ອນ take the same form as the base consonant, but sit below the baseline. ຕົວເຟື້ອງຂ້າງ are the post-base forms. Proper terms should be discussed and agreed.

11 For example ປຽຯ vs ເອຽຯ.

12 Transferring user choice of positioning into the input method is likely to be easier than getting locale-specific or time-period-specific font positioning rules to operate without issue. It also makes text exchange fully transparent: if positioning is left to the font, users with different fonts or different versions of fonts may not see the same displayed text.

13 Tham script mixes both approaches, which is also possible, though not so streamlined.

final consonant should be explained[14]. At any rate, it is not a consonant in its own right, and it should be encoded the same way as the proposed **0E3C**, as a combining sign.

Proposed **0E65** YA3 (ⓞ} is another spacing, post-base form of the consonant Ya, though here it is used either as a vowel sign, used to represent the diphthong -ia- (Thai เอีย or Lao ເ◌ັຽ), or as the second component in a consonant cluster. Other uses may be possible and should be documented. In Thai Noi / Lao Buhan the sign is called YO FEUANG (ย เฟื้อง) and it contrasts with proposed **0E3D**.

Proposed **0E66** RA2 appears to be a consonant form of Ra, though its position relative to the base consonant is not made clear in this proposal. Repha (above-base) forms of Ra are common in Indian, Tham and Old Burmese orthographies, and seem to be attested in at least one Lao Buhane inscription from 1569, where it takes the form ◌ั. If it is a repha form, the encoding method and typing order will need to be established. (In Tham **1A7A** RA HAAM is encoded atomically and typed after the base, but in Old Burmese the kinzi-ra would be encoded as **101B** RA **103A** ASAT **1039** VIRAMA and typed before the base.) It's possible the proposed RA2 is a below-base form, with potential attestations in the forms ◌ and ◌.

Proposed **0E69** SA7 (ⓞ◌) is a post-base form of Sa, and again its function (conjunct form or final form) should be explained to allow appropriate encoding.

Ligatures

It should be discussed how ligatures are best formed. As with the conjuncts above, alternative approaches are possible. Each known ligatures could be encoded directly as a unit, as proposed. The drawbacks of this method are that each combination would require a separate codepoint, only those ligatures encoded could be typed, and any so-far undocumented ligatures would have to be proposed for inclusion at a later date. A different approach would be to use ZWJ between two consonants to form a ligature and let the font select which glyphs to use: this method would not require any extra characters to be encoded. Alternatively, the second, joining part of each ligature could be encoded, allowing it to connect to any preceding glyph. Both of the latter approaches would allow arbitrary combinations of consonants to form ligatures.

The first two proposed ligatures are inline ligatures: **0E5C** HA1+NA and **0E5D** HA1+MA exist in Lao as **0EDC** LAO HO NO (ໜ) and **0EDD** LAO HO MO (ໝ). These are ligatures in which the consonant HO (ຫ) is joined to the NO (ນ) and MO (ມ) to change the tone class. As in Lao, these could be encoded as ligatures for Thai Noi / Lao Buhan.

In the proposed ligatures **0E60** KHA1+NA2 (ຂຸ), **0E62** KHA3+NA2 (ຄຸ), **0E64** THA1+NA (ຖຸ), and **0E6A** SA3+NA (ຨຸ) the first part (KHA1/KHA3/THA1/SA3) is the base consonant, and the NA2 (◌ຸ) is a post-base form of NA, which can sit on the baseline, or append below as a

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14 An underlying difficulty with the Taiic languages is their propensity to reuse glyphs in several categories (as consonants, vowels, medial or final consonants).

post-form, depending on the font style.

A post-base form of MA (ຼຸ) is found in proposed **0E61** KHA1+MA (ຊຸ) and **0E6B** SA3+MA (ຣຸ); these should follow the same encoding principle. Below-base forms of NA ຼ/ຸ and MA ຸ, borrowed from Tham script also exist in Thai Noi / Lao Buhan, and should be discussed[15].

Other ligatures are possible: one source about the Fakkham script attests a combining version of ຎ nya with the form ຼ, to make ligatures such as ຊຸ (ชญ) and ຫຼ (หญ). Although perhaps rather rare, an encoding should aim to provide maximum flexibility for transcribing different kinds of texts.

Vowel signs

0E3B MAI KONG is cognate with **0EBB** LAO MAI KON(G), an above-base combining mark of the form ◌ົ. Its sound value, and valid combinations should be described.

0E6E SARA A2 appears to be a glyph variant[16] of **0EB0** LAO VOWEL SIGN A (◌ະ) or **0E30** THAI CHARACTER SARA A (◌ะ), rather than a separate character. (If it is a separate character from the normal sara A, it would need to be shown contrastively).

Proposed **0E6D** O+YA (◌ʼ or ◌ʻ) is not a glyph variant (allograph) of **0E6C** O+YA (ອ໌) mentioned above, and should be contrasted with it. In fact, although Thai represents both characters homographically with the letter pair อย[17], here it represents the vowel -oy- and is the same character as **1A6D** VOWEL SIGN OY in Tham script. In Thai Noi / Lao Buhan the sign is called YO YAT NAM (หยอหยาดน้ำ).

Other conjunct forms

As shown in Appendix B, we can also find:
  ‣ subjoined CA (◌ຸ)
  ‣ subjoined DDA (◌ຸ)
  ‣ subjoined DXA (◌ຸ or ◌ຸ)
  ‣ subjoined TA (◌ຸ)
  ‣ subjoined DHA (◌ຸ or ◌ຸ)
  ‣ subjoined NA (◌ຸ or ◌ຸ)
  ‣ subjoined BXA (◌ຸ)
  ‣ subjoined BA (◌ຸ)

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15 **Because of the way computers process text, using actual characters encoded in the Tham block as the subjoined components in Thai Noi / Lao Buhan is not possible: this would break script runs meaning Tham marks could not attach to Thai Noi / Lao Buhan bases. It would also mean that fonts supporting Thai Noi / Lao Buhan would also have to support (a subset of) Tham characters.**

16 **Various forms of Sara A are found in Thai Noi / Lao Buhan, such as ◌ະ and ◌ຯ. These, however, are not contrastive — they are merely stylistic and do not serve different functions from ◌ະ.**

17 **The letter pair อย in Thai can act as a consonant cluster or a diphthong.**

- ‣ subjoined MA (◌ၟ)
- ‣ subjoined SSA (◌ၞ)
- ‣ subjoined SA (◌ၠ)
- ‣ subjoined QA (◌ၞ or ◌ၟ), as in Tham script, this is a subjoined form of consonant ຂ used in its vowel capacity.

The presence of all these conjunct forms, and potentially other undocumented ones, suggests a virama model might be most appropriate[18]. The Myanmar model would be a useful point of reference here.

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18 Following the Tibetan model would require each subjoined form to be attested and given a separate codepoint; because of potential undocumented subjoined forms, following the Myanmar virama model may be better.

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Consonants by varga, compared to sibling scripts

	glottalised	unvoiced unaspirated	unvoiced aspirated	unvoiced other	voiced unaspirated	voiced other	voiced aspirated	nasal
velar		KA	KHA	KXA	GA	GXA*	GHA	NGA
palatal		CA	CHA*		JA	ZA	JHA*	NYA
retroflex	QDDA*	TTA	TTHA		DDA*		DDHA*	NNA
dental	QDA	TA	THA		DA		DHA	NA
labial	QBA	PA	PHA	FA	BA	VA	BHA	MA
non-varga	QYA	SHA	RA	VOCALIC R †	VOCALIC RR †	LA	VOCALIC L †	VOCALIC LL †
	YA		SSA	SA	HA	LLA ‡	QA	HHA
	WA							

▸ Top left of each cell shows Thai, top right is Lao (including Pali letters), bottom left is Myanmar and bottom right is Tham Isaan/Lao.

▸ In the letter names, X represents frication (reconstructions vary by scholar, e.g. KXA = *xa/*kha etc and GXA = *ɣ/*gh etc) and Q represents glottality in the proto-Thai sound values.

▸ Thai Noi / Lao Buhaan glyphs are indicative only — several forms are attested for some characters. See Appendix B for allographs.

* Absence of Thai Noi glyphs should not be construed as evidence these letters do not exist. It is suggested codepoints are reserved for empty slots in case / until attestations are found.

† Many different glyphs are found to represent vocalic consonants in Thai Noi, Tham Lao and Lao Pali; there are also inconsistencies in which glyphs are used for which letters.

‡ In different sources, ຫຼ is transcribed as ພຣ /pʰr/ and sometimes as ຫ /la/. More research required.

Appendix B

Consonant list with allographs and suggested names

Base form*	Allographs	Suggested name	Conjunct forms
ກ	�	**THAI NOI / LAO BUHAN LETTER KA**	
ຂ	ຂ	THAI NOI / LAO BUHAN LETTER KHA	
ຈ		**THAI NOI / LAO BUHAN LETTER KXA**	
ຄ		THAI NOI / LAO BUHAN LETTER GA	
		THAI NOI / LAO BUHAN LETTER GXA	
ຆ		THAI NOI / LAO BUHAN LETTER GHA	
ງ		**THAI NOI / LAO BUHAN LETTER NGA**	
ຈ		THAI NOI / LAO BUHAN LETTER CA	◌ຸ
ຉ		**THAI NOI / LAO BUHAN LETTER CHA**	
ຊ	ຊ	THAI NOI / LAO BUHAN LETTER JA	
ຎ	ຎ	**THAI NOI / LAO BUHAN LETTER ZA**	
		THAI NOI / LAO BUHAN LETTER JHA	
ຎ	ຎ	**THAI NOI / LAO BUHAN LETTER NYA**	
		THAI NOI / LAO BUHAN LETTER QDDA	(◌ຸ)
ຏ		**THAI NOI / LAO BUHAN LETTER TTA**	
ຐ	ຳ ຳ ຳ	THAI NOI / LAO BUHAN LETTER TTHA	◌ຸ
		THAI NOI / LAO BUHAN LETTER DDA	(◌ຸ)
		THAI NOI / LAO BUHAN LETTER DDHA	
ຓ		**THAI NOI / LAO BUHAN LETTER NNA**	
ດ		THAI NOI / LAO BUHAN LETTER QDA	(◌ຸ) ◌ຸ† ◌ຸ†
ຕ		**THAI NOI / LAO BUHAN LETTER TA**	◌ຸ
ຖ		THAI NOI / LAO BUHAN LETTER THA	◌ຸ
ທ		**THAI NOI / LAO BUHAN LETTER DA**	
ຘ		THAI NOI / LAO BUHAN LETTER DHA	◌ຸ ◌ຸ
ນ		**THAI NOI / LAO BUHAN LETTER NA**	◌ຸ ◌ຸ ◌ຸ
ບ		THAI NOI / LAO BUHAN LETTER QBA	◌ຸ
ປ	ປ	**THAI NOI / LAO BUHAN LETTER PA**	
ຜ	ຜ	THAI NOI / LAO BUHAN LETTER PHA	
ຝ	ຝ	**THAI NOI / LAO BUHAN LETTER FA**	
ພ	ພ	THAI NOI / LAO BUHAN LETTER BA	
ຟ	ຟ ຟ	**THAI NOI / LAO BUHAN LETTER VA**	◌ຸ
ກ		THAI NOI / LAO BUHAN LETTER BHA	◌ຸ
ມ	ມ	**THAI NOI / LAO BUHAN LETTER MA**	◌ຸ ◌ຸ
ຍ		THAI NOI / LAO BUHAN LETTER YA	
ຢ	ຢ	**THAI NOI / LAO BUHAN LETTER QYA**	
ຣ		THAI NOI / LAO BUHAN LETTER RA	◌ຸ ◌ຸ ◌ຸ
ຄ	ຄ ຄ ຄ	**THAI NOI / LAO BUHAN LETTER RY / VOCALIC R**	
ຄ	ຄ	THAI NOI / LAO BUHAN LETTER RRY / VOCALIC RR	
ລ	ລ	**THAI NOI / LAO BUHAN LETTER LA**	◌ຸ ◌ຸ

* Further sources and experts should be consulted to ensure the presented forms are as representative as they can be. The vocalic consonants especially should be disentangled.

† As Theppitak Karoonbanyanan notes, these forms of subjoined Da derive from the original subjoined Sa.

ຄ	ౄ ఴ	**THAI NOI / LAO BUHAN LETTER LY / VOCALIC L**	
ຌ	ౠ	**THAI NOI / LAO BUHAN LETTER LLY / VOCALIC LL**	
ວ		**THAI NOI / LAO BUHAN LETTER WA**	
ຨ	ಷ	**THAI NOI / LAO BUHAN LETTER SHA**	
ຩ		**THAI NOI / LAO BUHAN LETTER SSA**	ౄ ౄ
ສ	ವ న ష	**THAI NOI / LAO BUHAN LETTER SA**	ౄ
ຫ		**THAI NOI / LAO BUHAN LETTER HA**	
ຬ		**THAI NOI / LAO BUHAN LETTER LLA**	
ອ		**THAI NOI / LAO BUHAN LETTER QA**	ౖ ౖ
ຮ		**THAI NOI / LAO BUHAN LETTER HHA**	