بسم اللہ الرحمن الرحیم

# پاکستانی زبانوں میں انٹرنیٹ کا پتہ ۔

# Domain Name in Pakistani Languages

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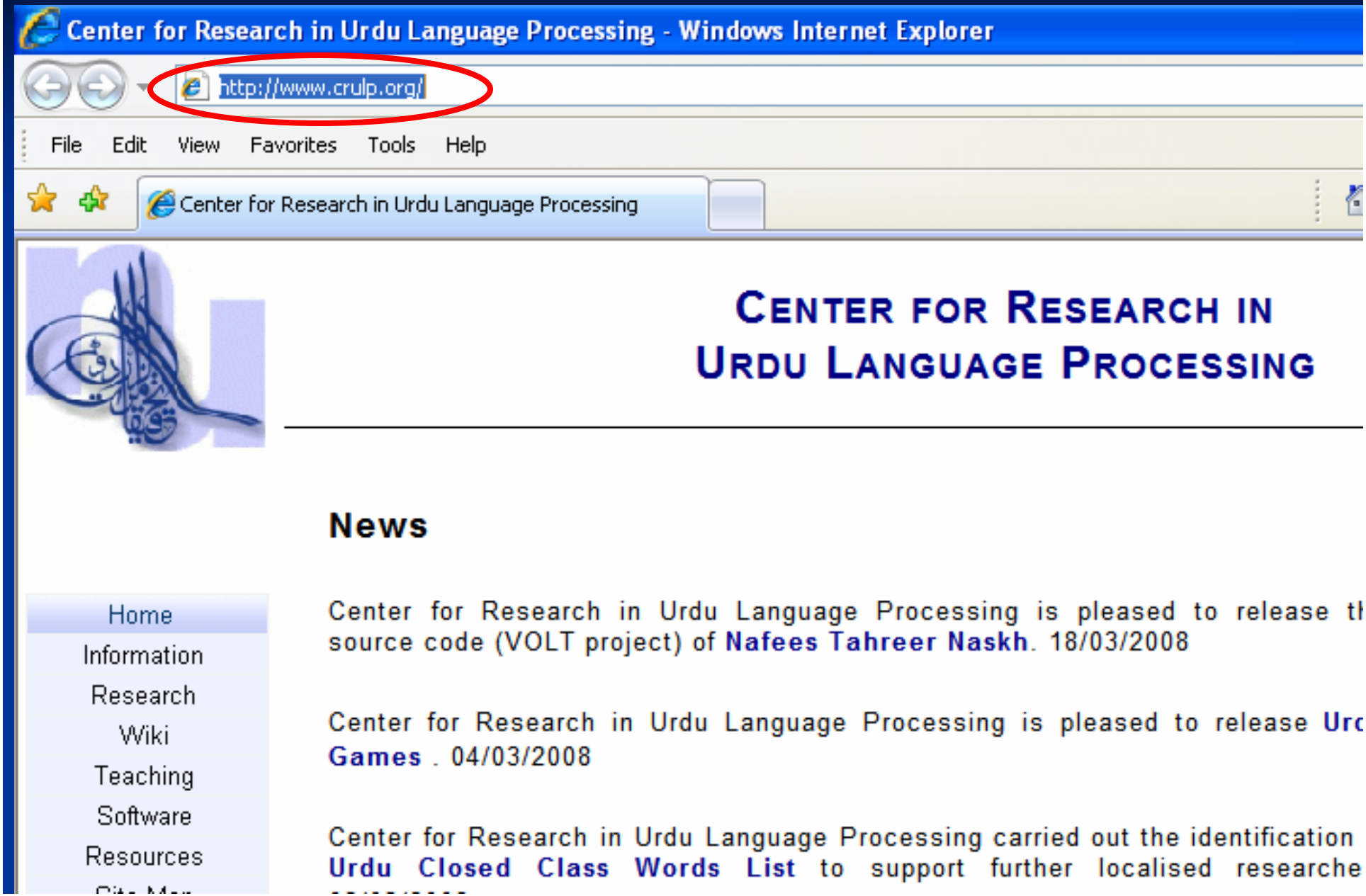
نیشنل یونیورسٹی آف کمپیوٹر اینڈ ایمرجنگ سائنسز، فاسٹ

# Domain Name


Center for Research in Urdu Language Processing - Windows Internet Explorer
http://www.crulp.org/
File Edit View Favorites Tools Help
Center for Research in Urdu Language Processing
CENTER FOR RESEARCH IN
URDU LANGUAGE PROCESSING
News
Home
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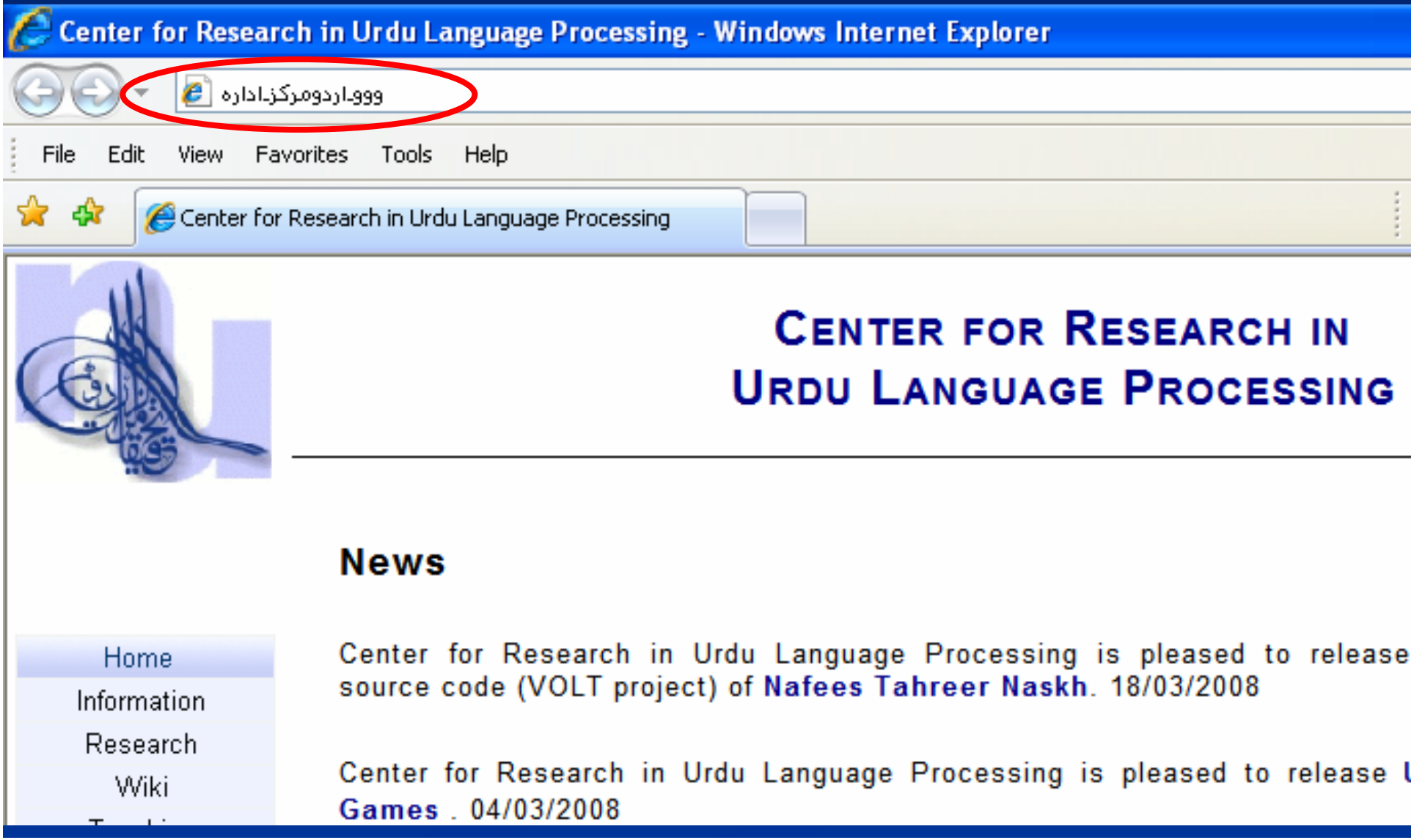
Center for Research in Urdu Language Processing is pleased to release th
source code (VOLT project) of Nafees Tahreer Naskh. 18/03/2008
Center for Research in Urdu Language Processing is pleased to release Urc
Games . 04/03/2008
Center for Research in Urdu Language Processing carried out the identification
Urdu Closed Class Words List to support further localised researche

# Internationalized Domain Name



# What letters of Pakistani Languages should be allowed in the Internationalized Domain Names (IDNs)?

- For each language?
- Collectively?

# Morning Session

- Background: Unicode
- Internationalized Domain Names (IDNs)
- Issues and challenges related to Arabic IDNs
- Sample (tentative) solution for Urdu language

# Afternoon Session

- Sample language tables for the following languages
  - Balochi
  - Pashto
  - Punjabi
  - Seraiki
  - Sindhi
  - Torwali
- Collective Issues for multiple languages

# Background: Unicode

- Everything in the computers is represented as numbers
- Initially ASCII encoding:
  - A → 65
  - B → 66 …
- Only supported Latin script, primarily English
- Other encodings developed for other languages, but cumbersome to develop separate encoding for each language of the world

# Unicode

- Thus effort started to develop Universal encoding or **UNIcode**
- Unicode Consortium develops the Unicode standard
- Covers almost all writing systems in current use today
- First version '*The Unicode Standard 1.0*' published in 1991
- Current version '*The Unicode Standard 5.1*' published in April 2008

# Unicode

- European scripts
  - Latin, Greek, Cyrillic, Armenian, Georgian, IPA
- Bidirectional (Middle Eastern) scripts
  - Hebrew, Arabic, Syriac, Thaana
- Indic (Indian and Southeast Asian) scripts
  - Devanagari, Bengali, Gurmukhi, Gujarati, Oriya, Tamil, Telugu, Kannada, Malayalam, Sinhala, Thai, Lao, Khmer, Myanmar, Tibetan, Philippine
- East Asian scripts
  - Chinese (Han) characters, Japanese (Hiragana and Katakana), Korean (Hangul), Yi

# Unicode

- Other modern scripts
  - Mongolian, Ethiopic, Cherokee, Canadian Aboriginal
- Historical scripts
  - Runic, Ogham, Old Italic, Gothic, Deseret
- Punctuation and symbols
  - Numerals, math symbols, scientific symbols, arrows, blocks, geometric shapes, Braille, musical notation, etc.

# Unicode is SCRIPT based

- One code per character per script
  - To avoid duplication of codes of same letter used by multiple scripts
  - For example:
    - The character code U+06A9 ک is same in Urdu, Sindhi, Pashto, Punjabi, Farsi, …
- Different code blocks reserved for different scripts
- For Arabic script 0600, 0601, …, 06FE, 06FF

# Characters Semantics

- The Unicode standard includes an extensive database that specifies a large number of *character properties*, including:
  - Name
  - Type (e.g., letter, digit, punctuation mark)
  - Decomposition
  - Case and case mappings (for cased letters)
  - Numeric value (for digits and numerals)
  - Combining class (for combining characters)
  - Cursive joining behavior

# Unicode

- Adopted by industry leaders as Apple, HP, IBM, Microsoft, etc.
- Supported in many platforms including Java, Linux and Microsoft Windows, etc.
- Supported by many internationalized applications including Open Office, Firefox, Thunderbird, Microsoft Office, etc.

# Unicode is the basis for Internationalized Domain Names

# Morning Session

- ✓ Background: Unicode
- Internationalized Domain Names (IDNs)
- Issues and challenges related to Arabic IDNs
- Sample (tentative solution) for Urdu language

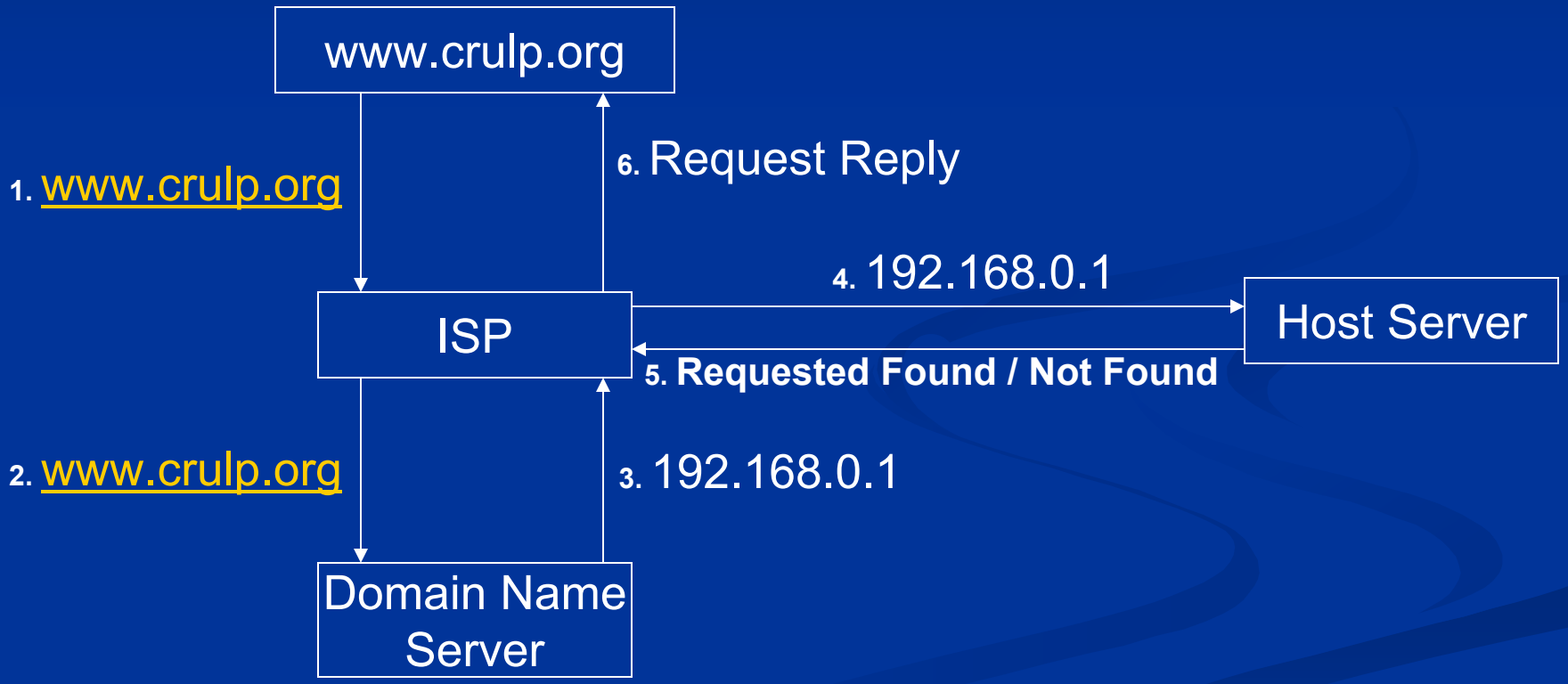
# Domain Name System (DNS)

# Domain Name System (DNS)

- Domain name is the address of a website which is used to access it

  e.g. www.crulp.org

# Domain Name System (DNS)




www.crulp.org = 192.168.0.1

# Need of IDNs

- Domain name system (DNS) is in ASCII, i.e. Latin script
- Makes it difficult to access internet for people who do not understand English or Latin script

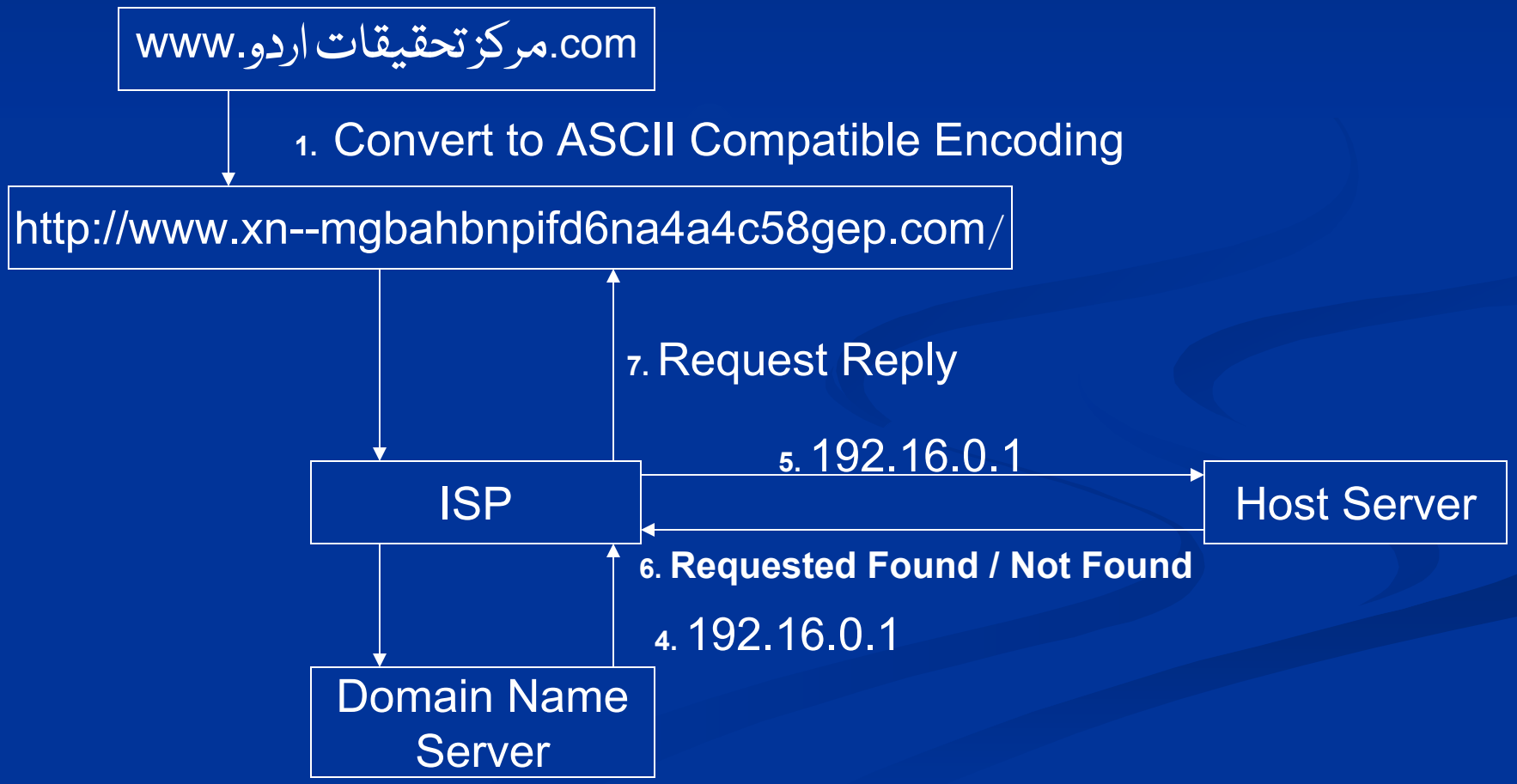
# IDNs

- Basic reason for that is the internet addresses map into 7-bit ASCII standard
- We can not change the overall existing system.
- The solution is to add layer that works on top of existing system
- IDN is any domain name consisting of labels which can be converted to ASCII format
- Initial set of protocols defined in 2003

# IDNs

- A layer that takes the address in local languages and converts that into ASCII format
- DNS continues to resolve ASCII format addresses
- IDNs may be resolved at the User's computer

# International Domain Name in Applications (IDNA)



# IDNA 200X

- Some Issues observed in the original IDNA2003 protocol
  - Dependence on Unicode ver. 3.2
  - Hardcoded language specific separators
  - …
- Decision to revise the original standard taken in 2006
- New standard, IDNA 200X currently under development

# IDNA 200X

- Assigns values to all Unicode Character Database (UCD) on the basis of Unicode properties
  - VALID (or allowed)
  - DISALLOWED
  - CONTEXTO or CONTEXTJ (depends on the context)

# Morning Session

- ✓ Background: Unicode
- ✓ Internationalized Domain Names (IDNs)
- Arabic IDNs
- Sample (tentative) solution for Urdu language

# Arabic Script

- Arabic script is the second largest script after Latin script.
- It is used for writing Arabic, Urdu, Persian, Baluchi, Pashto, Sindhi and many other languages across Pakistan and the world

# Arabic Script

- Arabic script is defined from:
  - U+0600 to U+06FF
  - U+0750 to U+077F
  - U+FB50 to U+FDFF (Obsolete presentation forms)
  - U+FE70 to U+FEFF (Obsolete presentation forms except U+FDFx sequence)

# Arabic Script

- Cursive script
  - Shape of each letter may have four different shapes depending on its position (isolated, initial, medial or final)
- Written from right to left
  - But Numerals written left to right

# Arabic Script

- Diacritics (optionally) used for vowels
- Stretched shapes used for text justification
- Shapes of letters highly context sensitive

# Positional Shapes of Different Letters

| Isolated | Initial | Medial | Final |
|---|---|---|---|
| ب | با | کبا | کب |
| چ | چا | کچا | کچ |
| و | NA | NA | کو |

# Issues in Arabic Script Encoding

- Similar character shapes across the languages that creates confusions e.g. Urdu character ی and Pashto character ی have similar shapes
- These different shapes are used as distinct letters in different languages. In Sindhi these are two different characters: ک (U+06AA), and ک (U+06A9)

# Confusable Variants of Different Characters

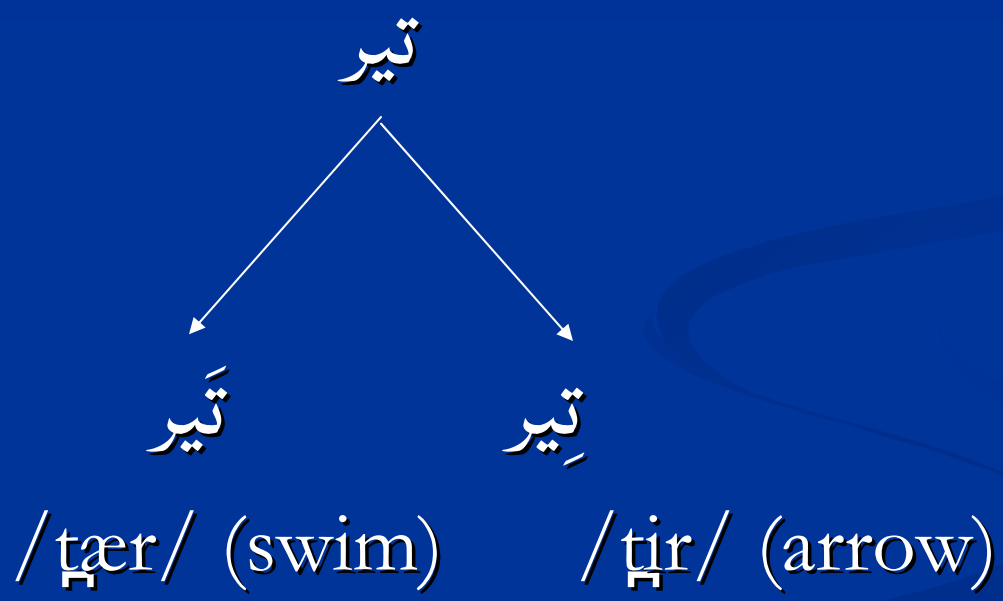
| Unicode | Isolated form | Initial form | Medial form | Final form | Remarks |
|---|---|---|---|---|---|
| U+0643 | ك | كـ | ـكـ | ـك | ARABIC LETTER KAF |
| U+06A9 | ک | کـ | ـکـ | ـک | ARABIC LETTER KEHEH (used for Persian and Urdu) |
| U+06AA | ڪ | ڪـ | ـڪـ ـا | ـڪ | ARABIC LETTER SWASH KAF (used for Sindhi) |

# Confusable Variants of Different Characters

| Unicode | Isolated form | Initial form | Medial form | Final form | Remarks |
|---|---|---|---|---|---|
| U+064A | ي | يـ | ـيـ | ـي | ARABIC LETTER YEH |
| U+06CC | ی | یـ | ـیـ | ـی | ARABIC LETTER FARSI YEH (Arabic, Persian, Urdu) |
| U+0649 | ى | | ـىـ | ى | ARABIC LETTER ALEF MAKSURA |

# Optional Diacritics

- Words normally written without diacritics, e.g. in Urdu:



# Space

- No concept of space between words in Urdu
- Need a separator character
  - words may assume wrong shapes without a separator e.g. دس دن will be displayed erroneously دسدن without separator
- One solution is Zero With Non Joiner (ZWNJ) but users unfamiliar with it.

# Bidirectionality

- مرکز تحقیقات اردو کی بنیاد مارچ 2001 کو رکھی گئی۔

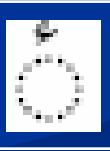
# Normalization

- There are characters that can be typed in more than one way, e.g.

  U+0622 (آ) = U+0627 (ا) + U+0653

- We have to normalize these characters

# Normalization

| Composed Form | Decomposed Form |
|---|---|
| U+0622 (آ) | U+0627 (ا) + U+0653 |
| U+0623 (أ) | U+0627 (ا) + U+0654 |
| U+0624 (ؤ) | U+0648 (و) + U+0653 |
| U+0625 (إ) | U+0627 (ا) + U+0655 |
| U+0626 (ئ) | U+064A (ي) + U+0654  |
| U+0675 (ٵ) | U+0627 (ا) + U+0674 |

# Normalization

| Composed Form | Decomposed Form |
|---|---|
| U+0676 (ٶ) | U+0648 (و) + U+0674 |
| U+0677 (ٷ) | U+06C7 (ۇ) + U+0674 |
| U+0678 (ٸ) | U+064A (ي) +U+0674 |
| U+06C0 (ۀ) | U+06D5 (ە ) + U+0654 |
| U+06C2 (ۂ) | U+06C1 (ہ) + U+0654 |
| U+06D3 (ۓ) | U+06D2 (ے) + U+0654 |

# Confusable Characters

| | | |
|---|---|---|
| ك (U+0643) | ک (U+06A9) | ک (U+06AA) |
| ی (U+06CC) | ی (U+0649) | ۍ (U+06CD) |
| ه (U+0647) | ہ (U+06C1) | ە (U+06D5) |

# Confusable Characters…

| | |
|---|---|
| ٠ (U+0660) | ۰ (U+06F0) |
| ١ (U+0661) | ۱ (U+06F1) |
| ٢ (U+0662) | ۲ (U+06F2) |
| ٣ (U+0663) | ۳ (U+06F3) |
| ٥ (U+0665) | ۵ (U+06F5) |
| ٧ (U+0667) | ۷ (U+06F7) |
| ٨ (U+0668) | ۸ (U+06F8) |
| ٩ (U+0669) | ۹ (U+06F9) |
| أ (U+0623) | ٱ (U+0672) |
| إ (U+0625) | ٳ (U+0673) |

# Morning Session

- ✓ Background: Unicode
- ✓ Internationalized Domain Names (IDNs)
- ✓ Arabic IDNs
- ■ Sample (tentative) solution for Urdu language

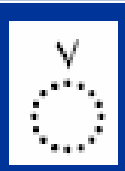
# Urdu IDNs

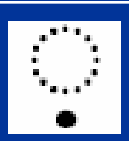
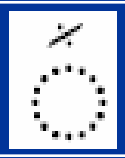
- The following are CONTEXTO by IDNA200X but are not recommended for Urdu

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 0600 | ARABIC NUMBER SIGN | CONTEXTO | NO |
| | 0601 | ARABIC SIGN SANAH | CONTEXTO | NO |
| | 0602 | ARABIC FOOTNOTE MARKER | CONTEXTO | NO |
| | 0603 | ARABIC SIGN SAFHA | CONTEXTO | NO |
| | 06DD | END OF AYAH | CONTEXTO | NO |

# Urdu IDNs

- The following are PVALID by IDNA200X but these are not recommended for Urdu

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ٱ | 0615 | ARABIC SMALL HIGH TAH | PVALID | NO |
| ـ | 0640 | ARABIC TATWEEL | PVALID | NO |
| ٗ | 0657 | ARABIC INVERTED DAMMA | PVALID | NO |
| | 0659 | ARABIC ZWARAKAY | PVALID | NO |
|  | 065A | ARABIC VOWEL SIGN SMALL V ABOVE | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 065B | ARABIC VOWEL SIGN INVERTED SMALL V ABOVE | PVALID | NO |
|  | 065C | ARABIC VOWEL SIGN DOT BELOW | PVALID | NO |
| | 065D | ARABIC REVERSED DAMMA | PVALID | NO |
|  | 065E | ARABIC FATHA WITH TWO DOTS | PVALID | NO |
| ٱ | 0671 | ARABIC LETTER ALEF WASLA | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| أ | 0672 | ARABIC LETTER ALEF WITH WAVY HAMZA ABOVE | PVALID | NO |
| إ | 0673 | ARABIC LETTER ALEF WITH WAVY HAMZA BELOW | PVALID | NO |
| ء | 0674 | ARABIC LETTER HIGH HAMZA | PVALID | NO |
| ٹ | 067A | ARABIC LETTER TTEHEH | PVALID | NO |
| ٻ | 067B | ARABIC LETTER BEEH | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ٹ | 067C | ARABIC LETTER TEH WITH RING | PVALID | NO |
| ٹ | 067D | ARABIC LETTER TEH WITH THREE DOTS ABOVE DOWN | PVALID | NO |
| ٹ | 067F | ARABIC LETTER TEHEH | PVALID | NO |
| ٹ | 0680 | ARABIC LETTER BEHEH | PVALID | NO |
| ٹ | 0681 | ARABIC LETTER HAH WITH HAMZA ABOVE | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڂ | 0682 | ARABIC LETTER HAH WITH TWO DOTS VERTICAL ABO | PVALID | NO |
| ڃ | 0683 | ARABIC LETTER NYEH | PVALID | NO |
| ڄ | 0684 | ARABIC LETTER DYEH | PVALID | NO |
| څ | 0685 | ARABIC LETTER HAH WITH THREE DOTS ABOVE | PVALID | NO |
| ڇ | 0687 | ARABIC LETTER TCHEHEH | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڈ | 0689 | ARABIC LETTER DAL WITH RING | PVALID | NO |
| ڊ | 068A | ARABIC LETTER DAL WITH DOT BELOW | PVALID | NO |
| ڋ | 068B | ARABIC LETTER DAL WITH DOT BELOW AND SMALL T | PVALID | NO |
| ڌ | 068C | ARABIC LETTER DAHAL | PVALID | NO |
| ڍ | 068D | ARABIC LETTER DDAHAL | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڈ | 068E | ARABIC LETTER DUL | PVALID | NO |
| ډ | 068F | ARABIC LETTER DAL WITH THREE DOTS ABOVE DOWN | PVALID | NO |
| ڊ | 0690 | ARABIC LETTER DAL WITH FOUR DOTS ABOVE | PVALID | NO |
| ڑ | 0692 | ARABIC LETTER REH WITH SMALL V | PVALID | NO |
| ړ | 0693 | ARABIC LETTER REH WITH RING | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڔ | 0694 | ARABIC LETTER REH WITH DOT BELOW | PVALID | NO |
| ڕ | 0695 | ARABIC LETTER REH WITH SMALL V BELOW | PVALID | NO |
| ږ | 0696 | ARABIC LETTER REH WITH DOT BELOW AND DOT ABO | PVALID | NO |
| ڗ | 0697 | ARABIC LETTER REH WITH TWO DOTS ABOVE | PVALID | NO |
| ڙ | 0699 | ARABIC LETTER REH WITH FOUR DOTS ABOVE | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ښ | 069A | ARABIC LETTER SEEN WITH DOT BELOW AND DOT AB | PVALID | NO |
| ڀ | 069B | ARABIC LETTER SEEN WITH THREE DOTS BELOW | PVALID | NO |
| ڃ | 069C | ARABIC LETTER SEEN WITH THREE DOTS BELOW AND | PVALID | NO |
| ڇ | 069D | ARABIC LETTER SAD WITH TWO DOTS BELOW | PVALID | NO |
| ڈ | 069E | ARABIC LETTER SAD WITH THREE DOTS ABOVE | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ظ | 069F | ARABIC LETTER TAH WITH THREE DOTS ABOVE | PVALID | NO |
| ۼ | 06A0 | ARABIC LETTER AIN WITH THREE DOTS ABOVE | PVALID | NO |
| ف | 06A1 | ARABIC LETTER DOTLESS FEH | PVALID | NO |
| ڤ | 06A2 | ARABIC LETTER FEH WITH DOT MOVED BELOW | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڤ | 06A3 | ARABIC LETTER FEH WITH DOT BELOW | PVALID | NO |
| ڤ | 06A4 | ARABIC LETTER VEH | PVALID | NO |
| ڥ | 06A5 | ARABIC LETTER FEH WITH THREE DOTS BELOW | PVALID | NO |
| ڦ | 06A6 | ARABIC LETTER PEHEH | PVALID | NO |
| ڧ | 06A7 | ARABIC LETTER QAF WITH DOT ABOVE | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڧ | 06A8 | ARABIC LETTER QAF WITH THREE DOTS ABOVE | PVALID | NO |
| ک | 06AA | ARABIC LETTER SWASH KAF | PVALID | NO |
| ګ | 06AB | ARABIC LETTER KAF WITH RING | PVALID | NO |
| ڭ | 06AC | ARABIC LETTER KAF WITH DOT ABOVE | PVALID | NO |
| ڮ | 06AD | ARABIC LETTER NG | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڭ | 06AE | ARABIC LETTER KAF WITH THREE DOTS BELOW | PVALID | NO |
| گ | 06B0 | ARABIC LETTER GAF WITH RING | PVALID | NO |
| گ | 06B1 | ARABIC LETTER NGOEH | PVALID | NO |
| گ | 06B2 | ARABIC LETTER GAF WITH TWO DOTS BELOW | PVALID | NO |

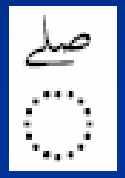
| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڳ | 06B3 | ARABIC LETTER GUEH | PVALID | NO |
| ڴ | 06B4 | ARABIC LETTER GAF WITH THREE DOTS ABOVE | PVALID | NO |
| ڵ | 06B5 | ARABIC LETTER LAM WITH SMALL V | PVALID | NO |
| ڶ | 06B6 | ARABIC LETTER LAM WITH DOT ABOVE | PVALID | NO |
| ڷ | 06B7 | ARABIC LETTER LAM WITH THREE DOTS ABOVE | PVALID | NO |

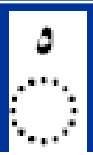
| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڀ | 06B8 | ARABIC LETTER LAM WITH THREE DOTS BELOW | PVALID | NO |
| ڹ | 06B9 | ARABIC LETTER NOON WITH DOT BELOW | PVALID | NO |
| ڻ | 06BB | ARABIC LETTER RNOON | PVALID | NO |
| ڼ | 06BC | ARABIC LETTER NOON WITH RING | PVALID | NO |

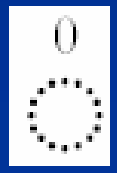
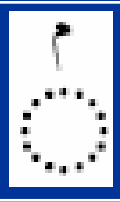
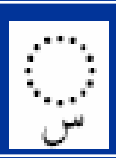
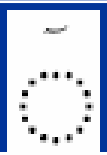
| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ں | 06BD | ARABIC LETTER NOON WITH THREE DOTS ABOVE | PVALID | NO |
| ڿ | 06BF | ARABIC LETTER TCHEH WITH DOT ABOVE | PVALID | NO |
| ۄ | 06C4 | ARABIC LETTER WAW WITH RING | PVALID | NO |
| ۅ | 06C5 | ARABIC LETTER KIRGHIZ OE | PVALID | NO |
| ۆ | 06C6 | ARABIC LETTER OE | PVALID | NO |

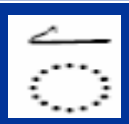
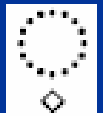
| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ۇ | 06C7 | ARABIC LETTER U | PVALID | NO |
| ۈ | 06C8 | ARABIC LETTER YU | PVALID | NO |
| ۉ | 06C9 | ARABIC LETTER KIRGHIZ YU | PVALID | NO |
| ۊ | 06CA | ARABIC LETTER WAW WITH TWO DOTS ABOVE | PVALID | NO |
| ۋ | 06CB | ARABIC LETTER VE | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ۍ | 06CD | ARABIC LETTER YEH WITH TAIL | PVALID | NO |
| ێ | 06CE | ARABIC LETTER YEH WITH SMALL V | PVALID | NO |
| ۏ | 06CF | ARABIC LETTER WAW WITH DOT ABOVE | PVALID | NO |
| ې | 06D0 | ARABIC LETTER E | PVALID | NO |
| ۑ | 06D1 | ARABIC LETTER YEH WITH THREE DOTS BELOW | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ە | 06D5 | ARABIC LETTER AE | PVALID | NO |
|  | 06D6 | ARABIC SMALL HIGH LIGATURE SAD WITH LAM WITH | PVALID | NO |
| | 06D7 | ARABIC SMALL HIGH LIGATURE QAF WITH LAM WITH | PVALID | NO |
| | 06D8 | ARABIC SMALL HIGH MEEM INITIAL FORM | PVALID | NO |
| | 06D9 | ARABIC SMALL HIGH LAM ALEF | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 06DA | ARABIC SMALL HIGH JEEM | PVALID | NO |
| | 06DB | ARABIC SMALL HIGH THREE DOTS | PVALID | NO |
| | 06DC | ARABIC SMALL HIGH SEEN | PVALID | NO |
|  | 06DF | ARABIC SMALL HIGH ROUNDED ZERO | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
|  | 06E0 | ARABIC SMALL HIGH UPRIGHT RECTANGULAR ZERO | PVALID | NO |
| | 06E1 | ARABIC SMALL HIGH DOTLESS HEAD OF KHAH | PVALID | NO |
|  | 06E2 | ARABIC SMALL HIGH MEEM ISOLATED FORM | PVALID | NO |
|  | 06E3 | ARABIC SMALL LOW SEEN | PVALID | NO |
|  | 06E4 | ARABIC SMALL HIGH MADDA | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 06E5 | ARABIC SMALL WAW | PVALID | NO |
| | 06E6 | ARABIC SMALL YEH | PVALID | NO |
|  | 06E7 | ARABIC SMALL HIGH YEH | PVALID | NO |
| | 06E8 | ARABIC SMALL HIGH NOON | PVALID | NO |
|  | 06EA | ARABIC EMPTY CENTRE LOW STOP | PVALID | NO |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 06EB | ARABIC EMPTY CENTRE HIGH STOP | PVALID | NO |
| | 06EC | ARABIC ROUNDED HIGH STOP WITH FILLED CENTRE | PVALID | NO |
| | 06ED | ARABIC SMALL LOW MEEM | PVALID | NO |
| | 06EE | ARABIC LETTER DAL WITH INVERTED V | PVALID | NO |
| | 06EF | ARABIC LETTER REH WITH | PVALID | NO |
| | 06FF | ARABIC LETTER HEH WITH INVERTED V | PVALID | NO |

# Urdu Language Table For IDNs

- Following characters are DISALLOWED by IDNA 200X and are not required

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 060B | AFGHANI SIGN | DISALLOWED | N0 |
| | 060C | ARABIC COMMA | DISALLOWED | N0 |
| | 060D | ARABIC DATE SEPARATOR | DISALLOWED | N0 |
| | 060E | ARABIC POETIC VERSE SIGN | DISALLOWED | N0 |
| | 060F | ARABIC SIGN MISRA | DISALLOWED | N0 |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 061B | ARABIC SEMICOLON | DISALLOWED | N0 |
| | 061E | ARABIC TRIPLE DOT PUNCTUATION MARK | DISALLOWED | N0 |
| | 061F | ARABIC QUESTION MARK | DISALLOWED | N0 |
| | 066A | ARABIC PERCENT SIGN | DISALLOWED | N0 |
| | 066B | ARABIC DECIMAL SEPARATOR | DISALLOWED | N0 |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ٬ | 066C | ARABIC THOUSANDS SEPARATOR | DISALLOWED | N0 |
| ٭ | 066D | ARABIC FIVE POINTED STAR | DISALLOWED | N0 |
| | 0675 | ARABIC LETTER HIGH HAMZA ALEF | DISALLOWED | N0 |
| | 0676 | ARABIC LETTER HIGH HAMZA WAW | DISALLOWED | N0 |
| | 0677 | ARABIC LETTER U WITH HAMZA ABOVE | DISALLOWED | N0 |
| | 0678 | ARABIC LETTER HIGH HAMZA YEH | DISALLOWED | N0 |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ۔ | 06D4 | ARABIC LETTER HAH WITH HAMZA ABOVE | DISALLOWED | N0 |
| | 06DE | ARABIC START OF RUB EL HIZB | DISALLOWED | N0 |
| | 06E9 | ARABIC PLACE OF SAJDAH | DISALLOWED | N0 |
| ؏ | 06FD | ARABIC SIGN SINDHI AMPERSAND | DISALLOWED | N0 |
| ﷲ | FDF2 | ARABIC LIGATURE ALLAH ISOLATED FORM | DISALLOWED | N0 |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| اكبر | FDF3 | ARABIC LIGATURE AKBAR ISOLATED FORM | DISALLOWED | N0 |
| محمد | FDF4 | ARABIC LIGATURE MOHAMMAD ISOLATED FORM | DISALLOWED | N0 |
| | FDF5 | ARABIC LIGATURE SALAM ISOLATED FORM | DISALLOWED | N0 |
| رسول | FDF6 | ARABIC LIGATURE RASOUL ISOLATED FORM | DISALLOWED | N0 |
| عليه | FDF7 | ARABIC LIGATURE ALAYHE ISOLATED FORM | DISALLOWED | N0 |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | FDF8 | ARABIC LIGATURE WASALLAM<br>ISOLATED FORM | DISALLOWED | N0 |
| | FDF9 | ARABIC LIGATURE SALLA ISOLATED<br>FORM | DISALLOWED | N0 |
| | FDFA | ARABIC LIGATURE SALLALLAHOU ALAYHE<br>WASALLAM | DISALLOWED | N0 |
| ﷻ | FDFB | ARABIC LIGATURE<br>JALLAJALALOUHOU | DISALLOWED | N0 |

# Urdu IDNs

- Following are PVALID characters by IDNA200X decision and are required for Urdu

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 0610 | ARABIC SIGN SALLALLAHOU ALAYHE WASSALLAM | PVALID | YES |
| | 0611 | ARABIC SIGN ALAYHE ASSALLAM | PVALID | YES |
| | 0612 | ARABIC SIGN RAHMATULLAH ALAYHE | PVALID | YES |
| | 0613 | ARABIC SIGN RADI ALLAHOU ANHU | PVALID | YES |
| | 0614 | ARABIC SIGN TAKHALLUS | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ء | 0621 | ARABIC LETTER HAMZA | PVALID | YES |
| آ | 0622 | ARABIC LETTER ALEF WITH MADDA ABOVE | PVALID | YES |
| أ | 0623 | ARABIC LETTER ALEF WITH HAMZA ABOVE | PVALID | YES |
| ؤ | 0624 | ARABIC LETTER WAW WITH HAMZA ABOVE | PVALID | YES |
| إ | 0625 | ARABIC LETTER ALEF WITH HAMZA BELOW | PVALID | YES (Variant of Base Character) |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ئ | 0626 | ARABIC LETTER YEH WITH HAMZA ABOVE | PVALID | YES (Variant of Base Character) |
| ا | 0627 | ARABIC LETTER ALEF | PVALID | YES |
| ب | 0628 | ARABIC LETTER BEH | PVALID | YES |
| ة | 0629 | ARABIC LETTER TEH MARBUTA | PVALID | YES (Variant of Base Character) |
| ت | 062A | ARABIC LETTER TEH | PVALID | YES |
| ث | 062B | ARABIC LETTER THEH | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ج | 062C | ARABIC LETTER JEEM | PVALID | YES |
| ح | 062D | ARABIC LETTER HAH | PVALID | YES |
| خ | 062E | ARABIC LETTER KHAH | PVALID | YES |
| د | 062F | ARABIC LETTER DAL | PVALID | YES |
| ذ | 0630 | ARABIC LETTER THAL | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ر | 0631 | ARABIC LETTER REH | PVALID | YES |
| ز | 0632 | ARABIC LETTER ZAIN | PVALID | YES |
| س | 0633 | ARABIC LETTER SEEN | PVALID | YES |
| ش | 0634 | ARABIC LETTER SHEEN | PVALID | YES |
| ص | 0635 | ARABIC LETTER SAD | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ض | 0636 | ARABIC LETTER DAD | PVALID | YES |
| ط | 0637 | ARABIC LETTER TAH | PVALID | YES |
| ظ | 0638 | ARABIC LETTER ZAH | PVALID | YES |
| ع | 0639 | ARABIC LETTER AIN | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| غ | 063A | ARABIC LETTER GHAIN | PVALID | YES |
| ف | 0641 | ARABIC LETTER FEH | PVALID | YES |
| ق | 0642 | ARABIC LETTER QAF | PVALID | YES |
| ك | 0643 | ARABIC LETTER KAF | PVALID | YES (Variant of Base Character) |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ل | 0644 | ARABIC LETTER LAM | PVALID | YES |
| م | 0645 | ARABIC LETTER MEEM | PVALID | YES |
| ن | 0646 | ARABIC LETTER NOON | PVALID | YES |
| ه | 0647 | ARABIC LETTER HEH | PVALID | YES (Variant of Base Character) |
| و | 0648 | ARABIC LETTER WAW | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ى | 0649 | ARABIC LETTER ALEF MAKSURA | PVALID | YES (Variant of Base Character) |
| ي | 064A | ARABIC LETTER YEH | PVALID | YES (Variant of Base Character) |
| | 064B | ARABIC FATHATAN | PVALID | YES |
| | 064C | ARABIC DAMMATAN | PVALID | YES |
| | 064D | ARABIC KASRATAN | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 064E | ARABIC FATHA | PVALID | YES |
| | 064F | ARABIC DAMMA | PVALID | YES |
| | 0650 | ARABIC KASRA | PVALID | YES |
| | 0651 | ARABIC SHADDA | PVALID | YES |
| | 0652 | ARABIC SUKUN | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| | 0653 | ARABIC MADDAH ABOVE | PVALID | YES |
| | 0654 | ARABIC HAMZA ABOVE | PVALID | YES |
| | 0655 | ARABIC HAMZA BELOW | PVALID | YES |
| | 0656 | ARABIC SUBSCRIPT ALEF | PVALID | YES |
| | 0658 | ARABIC MARK NOON GHUNNA | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ٠ | 0660 | ARABIC-INDIC DIGIT ZERO | PVALID | YES (Variant of Base Character) |
| ١ | 0661 | ARABIC-INDIC DIGIT ONE | PVALID | YES (Variant of Base Character) |
| ٢ | 0662 | ARABIC-INDIC DIGIT TWO | PVALID | YES (Variant of Base Character) |
| ٣ | 0663 | ARABIC-INDIC DIGIT THREE | PVALID | YES (Variant of Base Character) |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ٤ | 0664 | ARABIC-INDIC DIGIT FOUR | PVALID | YES (Variant of Base Character) |
| ٥ | 0665 | ARABIC-INDIC DIGIT FIVE | PVALID | YES (Variant of Base Character) |
| ٦ | 0666 | ARABIC-INDIC DIGIT SIX | PVALID | YES (Variant of Base Character) |
| ٧ | 0667 | ARABIC-INDIC DIGIT SEVEN | PVALID | YES (Variant of Base Character) |
| ٨ | 0668 | ARABIC-INDIC DIGIT EIGHT | PVALID | YES (Variant of Base Character) |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ٩ | 0669 | ARABIC-INDIC DIGIT NINE | PVALID | YES (Variant of Base Character) |
| | 0670 | ARABIC LETTER SUPERSCRIPT ALEF | PVALID | YES |
| ٹ | 0679 | ARABIC LETTER TTEH | PVALID | YES |
| پ | 067E | ARABIC LETTER PEH | PVALID | YES |
| چ | 0686 | ARABIC LETTER TCHEH | PVALID | YES |
| ڈ | 0688 | ARABIC LETTER DDAL | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ڑ | 0691 | ARABIC LETTER RREH | PVALID | YES |
| ژ | 0698 | ARABIC LETTER JEH | PVALID | YES |
| ک | 06A9 | ARABIC LETTER KEHEH | PVALID | YES |
| گ | 06AF | ARABIC LETTER GAF | PVALID | YES |
| ں | 06BA | ARABIC LETTER NOON GHUNNA | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ھ | 06BE | ARABIC LETTER HEH DOACHASHMEE | PVALID | YES |
| ۃ | 06C0 | ARABIC LETTER HEH WITH YEH ABOVE | PVALID | YES (Variant of Base character) |
| ہ | 06C1 | ARABIC LETTER HEH GOA | PVALID | YES |
| ۂ | 06C2 | ARABIC LETTER HEH GOAL WITH HAMZA ABOVE | PVALID | YES |
| ۃ | 06C3 | ARABIC LETTER TEH MARBUTA GOAL | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ی | 06CC | ARABIC LETTER FARSI YEH | PVALID | YES |
| ے | 06D2 | ARABIC LETTER YEH BARREE | PVALID | YES |
| ۓ | 06D3 | ARABIC LETTER YEH BARREE WITH HAMZA ABOVE | PVALID | YES |
| ۰ | 06F0 | EXTENDED ARABIC-INDIC DIGIT ZERO | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ۱ | 06F1 | EXTENDED ARABIC-INDIC DIGIT ONE | PVALID | YES |
| ۲ | 06F2 | EXTENDED ARABIC-INDIC DIGIT TWO | PVALID | YES |
| ۳ | 06F3 | EXTENDED ARABIC-INDIC DIGIT THREE | PVALID | YES |
| ۴ | 06F4 | EXTENDED ARABIC-INDIC DIGIT FOUR | PVALID | YES |
| ۵ | 06F5 | EXTENDED ARABIC-INDIC DIGIT FIVE | PVALID | YES |

| Character | Unicode | Description | Current status in IDNA 200x | Recommen-dation |
|---|---|---|---|---|
| ۶ | 06F6 | EXTENDED ARABIC-INDIC DIGIT SIX | PVALID | YES |
| ۷ | 06F7 | EXTENDED ARABIC-INDIC DIGIT SEVEN | PVALID | YES |
| ۸ | 06F8 | EXTENDED ARABIC-INDIC DIGIT EIGHT | PVALID | YES |
| ۹ | 06F9 | EXTENDED ARABIC-INDIC DIGIT NINE | PVALID | YES |

# Afternoon Session

- Sample language tables for the following languages
  - Balochi
  - Pashto
  - Punjabi
  - Seraiki
  - Sindhi
  - Urdu
  - Torwali
- Collective Issues for multiple languages

# Collective Issues

- Separator
- Diacritics
- Honorifics
- Confusable characters
  - Kaf
  - Yay
  - Hay
  - Gol Tay
  - Others?
- Digits
- Space/ZWNJ
- Blocking vs. Bundling