

# Issues Related to the Use of Digits in IDN (Arabic Language/Script)

July 29, 2009, SaudiNIC

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## BACKGROUND:

- SaudiNIC shares this report with IETF IDN group after testing the latest version of IDNA200X/IDNA2008 demo implementation that are available on the following link (<http://unicode.org/cldr/utility/idna.jsp>).
- The test has been conducted in July 2009 by SaudiNIC staff.
- SaudiNIC is will to cooperate with the developing team, if they wish, to do more tests and discussions.
- All discussion here are with respect to Arabic language and script.
- Some of the issues presented here are will know to the IDNA's developer team and they are, intentionally by design, the output of the protocol. However, their acceptance by the user community is not easy. Also, the "strange" behavior or denial of normal input string will not be easy to understand and communicate particularly if they are part of their day-to-day language and writing.

## DIGITS IN DOMAIN NAMES:

- Users who use an Arabic script to write Arabic-based languages (e.g., Arabic, Urdu, Persian ...) are using one or more set of digits in their normal writing without mixing them together in writing numbers. These set are (according to Unicode terminologies):
  1. European digits U+0030 .. U+0039 (0123456789)
  2. Arabic-Indic digits U+0660 .. U0669 (٠١٢٣٤٥٦٧٨٩)
  3. Eastern Arabic-Indic digits U+06F0 .. U+06F9 (۰۱۲۳۴۵۶۷۸۹)
- Even in one language community such as the Arabic speaking community, users are using different digits. For example, eastern Arab region (e.g., Egypt, Syria, Sudan, Iraq, all GCC countries, Lebanon, Palestine, Jordan, ... ) are mainly using Arabic-Indic digits while the western Arab region (e.g., Libya, Tunis, Algeria, Morocco, Mauritania, ...) mainly using European digits.
- The three sets of digits mean the same (zero to nine) despite their differences in shape.
- There is no language community we know of, where numbers MUST be typed by mixing digits of the 3 sets or even 2 of them. Hence, with respect to domain names, mixing digit sets (i.e. European and Arabic-Indic) IS NOT applicable and not needed, and hence should be disallowed.
- Users type digits without knowing the internal coding used.


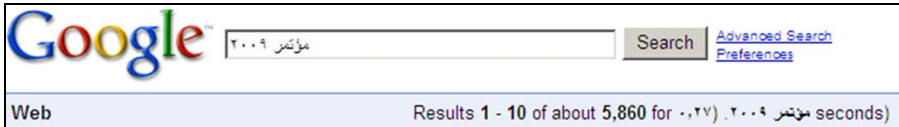
## ISSUES:

### Issue 1: Mixing Digits

Description	Users who use an Arabic script to write Arabic-based languages (e.g., Arabic, Urdu, Persian ...) are using one or more set of digits in their normal writing without mixing them together in writing numbers. Even in one language community such as the Arabic speaking community, users are using different digits. For example, eastern Arab region
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	(e.g., Egypt, Syria, Sudan, Iraq, all GCC countries, Lebanon, Palestine, Jordan, ... ) are mainly using Arabic-Indic digits while the western Arab region (e.g., Libya, Tunis, Algeria, Morocco, Mauritania, ...) mainly using European digits. But never mixing them together while writing numbers.																																																																																																																																																																					
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<b>Comments</b>	<p>It seems that this issue has been resolved in the current IDNA2008 implementation and it is a good practice since:</p> <ul style="list-style-type: none"> <li>• It ensures that non-mixing of digits is obligatory and not left to individual registry decisions.</li> <li>• Numbers are different from letters in this specific case. The 3 number sets are distinct and separation could be easily addressed on the protocol level, whereas in visual confusion of letters, there's no clear grouping for confusingly similar characters, the existing overlap between language tables makes it hard to separate, in addition, communities using the Arabic script have different needs and different user experiences.</li> <li>• Protocol-level solution would limit the maximum number of labels to be registered to 3, independent of the number of digits contained in a given label.</li> </ul> <p>See this <a href="#">link</a> to test the above examples</p>																																																																																																																																																																					
<b>Recommendations</b>	Continue disallowing digit mixing at the protocol level is strongly recommended.																																																																																																																																																																					

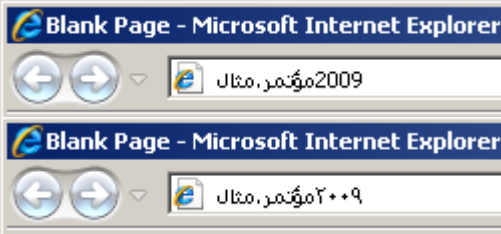
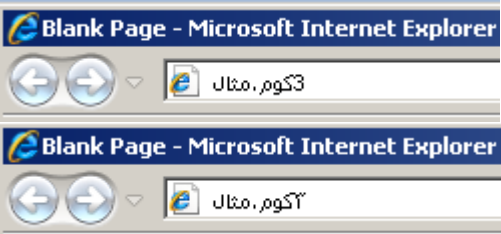
## Issue 2: Internal Representation of Digits

<p>Description</p>	<p>Some systems (notably Windows in at least some configurations) maps both types of Arabic digits (and other digits) onto European ones for internal storage and then renders them according to localization rules while other systems (notably MacOS, Linux and several Unix flavors, at least in their default configurations) store the digits with Unicode code points that match what the user types. That means that a user of one system keys in a label containing digits and gets a label coded with European digits while another types the same sequence of keys and gets a label coded with Arabic digits. Unless some variant or similar technique is used, neither can access a label created by the other, nor can an IRI typed by one access the same resource as an IRI typed by the other. This is a very serious issue since it does not require any ill-intent to be important and since it affects the basic usability of the names involved.</p> <p>According to Microsoft regarding “Number Substitutions in MS Operating Systems”:  <i>“Historically, Windows has supported number substitution by allowing the representation of different cultural shapes for the same digits while keeping the internal storage of these digits unified among different locales, for example numbers are stored in their well known hexadecimal values, 0x40, 0x41 [European digits], but displayed according to the selected language. This has allowed applications to process numerical values without the need to convert them from one language to another, for example a user can open an Microsoft Excel spreadsheet in a localized Arabic Windows and see the numbers shaped in Arabic, but open it in a European version of Windows and see European representation of the same numbers. This is also necessary for other symbols such as comma separators and percentage symbol because they usually accompany numbers in the same document.”</i>  Source: <a href="http://msdn.microsoft.com/en-us/library/aa350685(VS.85).aspx?PHPSSESSIONID=o1fb21liejulfgrptbmi9dec92#NumberSubstitution">http://msdn.microsoft.com/en-us/library/aa350685(VS.85).aspx?PHPSSESSIONID=o1fb21liejulfgrptbmi9dec92#NumberSubstitution</a></p>
<p>Examples</p>	<p>1- Searching for “مؤتمر 2009” (Using Pure European digits but displayed as Arabic-Indic digits) found 992,000 results</p>  <p>2- Searching for “مؤتمر ٢٠٠٩” (Using Pure Arabic-Indic digits) found only 5,860 results!!!</p>  <p>It give different A-Label</p>

	 <p>See this <a href="#">link</a> to test the above examples</p>
<p>Comments</p>	<p>The above examples try to illustrate the case when a user wants to register a U-label contains some Arabic-Indic digits, but instead he always gets the A-label of the corresponding U-label using the European digit, i.e., users in the Arab region who are using MS windows OSs will not be able to get A-Labels of any U-label that contains Arabic-Indic digits using their normal keyboard.</p> <p>Please note that, users in the Arab region type digits without knowing the actual internal coding, and hence they will get unexpected results.</p>
<p>Recommendations</p>	<p>IDNA2008 should take care of this issue by mapping(folding) the sets to one set, say the European for example.</p>

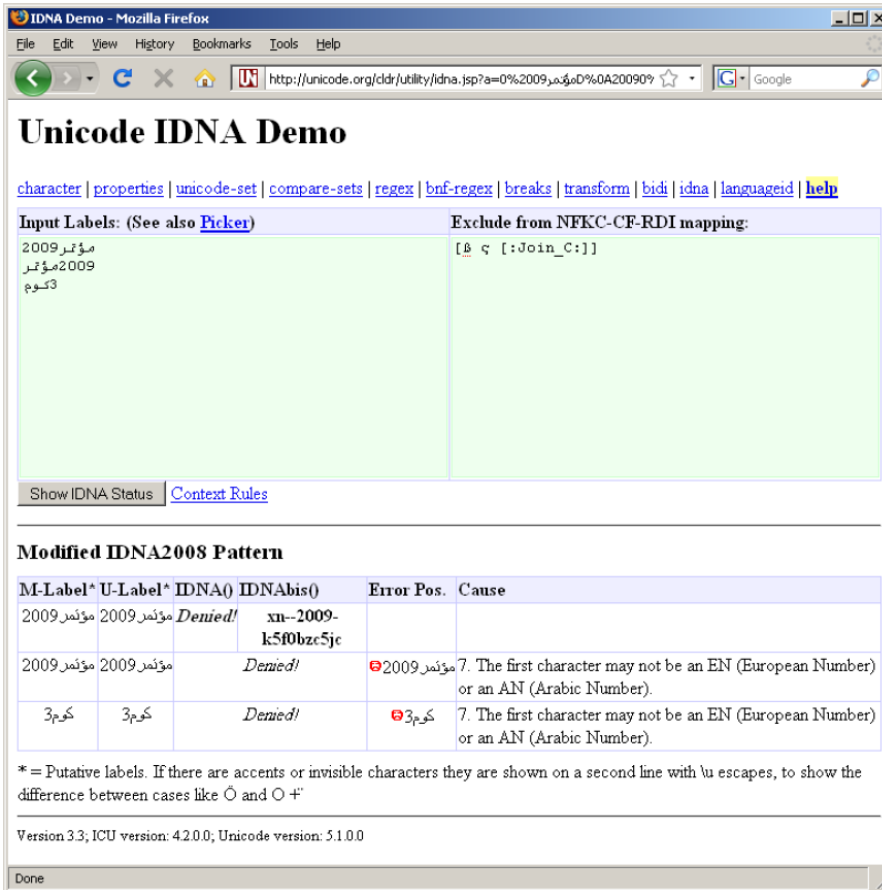
### Issue 3: Labels starting with Digits

<p>Description</p>	<p>We have noticed that some of the domain names that start with a Number (which of course always needed in domain labels) may be blocked from protocol level because of IDNA and/or IDNA-Bidi rules and the reason given was “<b>The first character may not be an EN (European Number) or an AN (Arabic Number)</b>”!</p>																																			
<p>Examples</p>	<table border="1"> <thead> <tr> <th>Input string</th> <th colspan="9">Display</th> <th>English translation</th> </tr> </thead> <tbody> <tr> <td>مؤتمر2009</td> <td><b>Memory Position</b></td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td rowspan="2">2009Confrances</td> </tr> <tr> <td></td> <td><b>Character</b></td> <td>2</td> <td>0</td> <td>0</td> <td>9</td> <td>م</td> <td>ؤ</td> <td>ت</td> <td>م</td> <td>ر</td> </tr> </tbody> </table>	Input string	Display									English translation	مؤتمر2009	<b>Memory Position</b>	0	1	2	3	4	5	6	7	8	2009Confrances		<b>Character</b>	2	0	0	9	م	ؤ	ت	م	ر	
Input string	Display									English translation																										
مؤتمر2009	<b>Memory Position</b>	0	1	2	3	4	5	6	7	8	2009Confrances																									
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3كوم	<table border="1"> <tr> <td>Memory Position</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>Character</td> <td>3</td> <td>ك</td> <td>و</td> <td>م</td> </tr> </table> 	Memory Position	0	1	2	3	Character	3	ك	و	م	3Com	
Memory Position	0	1	2	3									
Character	3	ك	و	م									

Comments

The next figure shows the results of the test for the above “input strings”. As it can be seen, the last two input strings (#2 and #3) are denied by the protocol.



M-Label* U-Label* IDNA() IDNAbis()	Error Pos.	Cause
2009 مؤتمري 2009 مؤتمري Denied! xn--2009-k5f0bzc5jc		
2009 مؤتمري 2009 مؤتمري Denied!	7 2009 مؤتمري	7. The first character may not be an EN (European Number) or an AN (Arabic Number).
3كوم 3كوم Denied!	7 3كوم	7. The first character may not be an EN (European Number) or an AN (Arabic Number).

\* = Putative labels. If there are accents or invisible characters they are shown on a second line with \u escapes, to show the difference between cases like Ö and O +

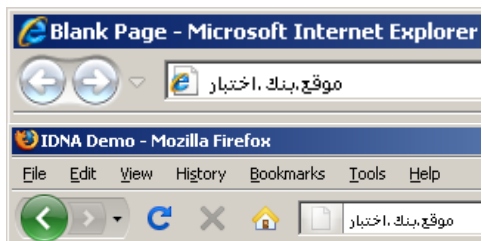
Version 3.3; ICU version: 4.2.0.0; Unicode version: 5.1.0.0

See this [link](#) to test the above examples


Recommendations

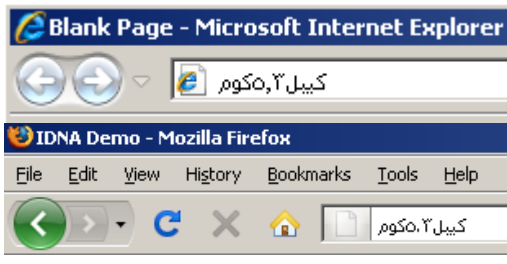
The new IDNA2008 should be revised to allow the use of digits at the beginning of a label considering issue # 5.

## Issue 4: Labels Arabic digit Zero vs. Dot

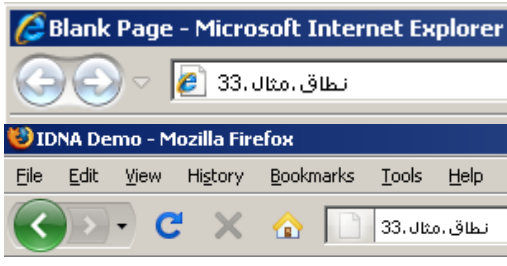
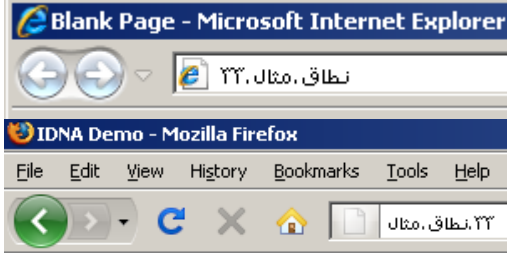
Description	The Arabic-Indic or the Eastern Arabic-Indic ZERO (0) is sometimes confused with the dot (.) particularly if they are separated by text.																																																				
Examples	<p>Input string</p> <p>موقع.بنك.اختبار (using Dot)</p> <p>Site.Bank.Test</p>	<p>Display</p> <table border="1"> <tr> <td>Memory Position</td> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td> </tr> <tr> <td>Character</td> <td></td><td>م</td><td>و</td><td>ق</td><td>ع</td><td>.</td><td>ب</td><td>ن</td><td>ك</td><td>.</td><td>ا</td><td>خ</td> </tr> <tr> <td>Memory Position</td> <td>11</td><td>12</td><td>13</td><td>14</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>Character</td> <td></td><td>ت</td><td>ب</td><td>ا</td><td>ر</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>  <p>Please note the above URL pictures have been enlarged for reading proposes.</p>	Memory Position	0	1	2	3	4	5	6	7	8	9	10	Character		م	و	ق	ع	.	ب	ن	ك	.	ا	خ	Memory Position	11	12	13	14									Character		ت	ب	ا	ر							
Memory Position	0	1	2	3	4	5	6	7	8	9	10																																										
Character		م	و	ق	ع	.	ب	ن	ك	.	ا	خ																																									
Memory Position	11	12	13	14																																																	
Character		ت	ب	ا	ر																																																
Comments	It is hard to differentiate between the DOT and the Arabic digit (Zero) in domain names especially when they are displayed in a URL in a browser's address bar as well as if they are separated by text																																																				
Recommendations	Disallow a single Arabic-Digit Zero to occur between two letters in a label																																																				

## Issue 5: Decimal Points in Arabic IDN

Description	When a label ends with a digit and the following label starts also with a digit then the label separator (the Dot ".") will be considered as a decimal point and the display order of the digits will be reversed.																								
Examples	<p>Input string</p> <p>كيبيل.3.كوم (using EN digits)</p> <p>Cable5.3.com</p>	<p>Display</p> <table border="1"> <tr> <td>Memory Position</td> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td> </tr> <tr> <td>Character</td> <td></td><td>ك</td><td>ي</td><td>ب</td><td>ل</td><td>5</td><td>.</td><td>3</td><td>ك</td><td>و</td><td>م</td> </tr> </table> 	Memory Position	0	1	2	3	4	5	6	7	8	9	Character		ك	ي	ب	ل	5	.	3	ك	و	م
Memory Position	0	1	2	3	4	5	6	7	8	9															
Character		ك	ي	ب	ل	5	.	3	ك	و	م														

	كيبيل ٥٠٣.كوم (using AR digits)  Cable5.3.com	<table border="1"> <tr> <th>Memory Position</th> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td> </tr> <tr> <th>Character</th> <td>ك</td><td>ي</td><td>ب</td><td>ل</td><td>٥</td><td>.</td><td>٣</td><td>ك</td><td>و</td><td>م</td> </tr> </table> 	Memory Position	0	1	2	3	4	5	6	7	8	9	Character	ك	ي	ب	ل	٥	.	٣	ك	و	م
Memory Position	0	1	2	3	4	5	6	7	8	9														
Character	ك	ي	ب	ل	٥	.	٣	ك	و	م														
<b>Comments</b>	<ul style="list-style-type: none"> <li>• In the context of Arabic IDN, the label separator (the Dot) will be considered as a decimal point when it is proceeded and followed by digits.</li> <li>• In this case, the display sequence of the digits get mixed up.</li> <li>• Also, some browsers (e.g., MS IE) replace the decimal point (“.”) with the decimal coma (“,”) in the URL.</li> </ul>																							
<b>Recommendations</b>	OS + Browsers: Fix the display problem IDNA2008/Registry?: Enable labels starts with digits provided that any sub-labels must not end with a digit.																							

## Issue 6: Swapping position for labels

<b>Description</b>	When a label consists of only digits, the whole display sequence of the other labels get mixed up.																											
<b>Examples</b>	33 نطاق.مثال (using EN digits)	<table border="1"> <tr> <th>Memory Position</th> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td> </tr> <tr> <th>Character</th> <td>3</td><td>3</td><td>.</td><td>ن</td><td>ط</td><td>ا</td><td>ق</td><td>.</td><td>م</td><td>ث</td><td>ا</td><td>ل</td> </tr> </table> 	Memory Position	0	1	2	3	4	5	6	7	8	9	10	11	Character	3	3	.	ن	ط	ا	ق	.	م	ث	ا	ل
Memory Position	0	1	2	3	4	5	6	7	8	9	10	11																
Character	3	3	.	ن	ط	ا	ق	.	م	ث	ا	ل																
	٣٣ نطاق.مثال (using AR digits)	<table border="1"> <tr> <th>Memory Position</th> <td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td> </tr> <tr> <th>Character</th> <td>٣</td><td>٣</td><td>.</td><td>ن</td><td>ط</td><td>ا</td><td>ق</td><td>.</td><td>م</td><td>ث</td><td>ا</td><td>ل</td> </tr> </table> 	Memory Position	0	1	2	3	4	5	6	7	8	9	10	11	Character	٣	٣	.	ن	ط	ا	ق	.	م	ث	ا	ل
Memory Position	0	1	2	3	4	5	6	7	8	9	10	11																
Character	٣	٣	.	ن	ط	ا	ق	.	م	ث	ا	ل																
<b>Comments</b>	In the examples above we have noticed different behavior in the browsers when using Arabic digits in the domain names!																											
<b>Recommendations</b>	Labels that consists of numbers is important and a valid option for Arabic users when comes to domain names (e.g: 911.IDNtld) So we believe further work is needed in the area of bi-directional.																											