APPLICATION NOTE

melissa
GLOBAL INTELLIGENCE

Record Matching: Tackling® International Challenges with MatchUp

Balancing the process of selecting a matching criterion while achieving accurate results and performance.

Primary Issue: Deduplicating records in a varied format database.

Secondary Issue: Determining a strategy that will accurately identify duplicates (tight enough) but at the same time doesn't group false duplicates (too loose) or consume valuable resources (processing time and CPU usage).

Let's take a look at a few records that have entered a system with different formats and layouts.

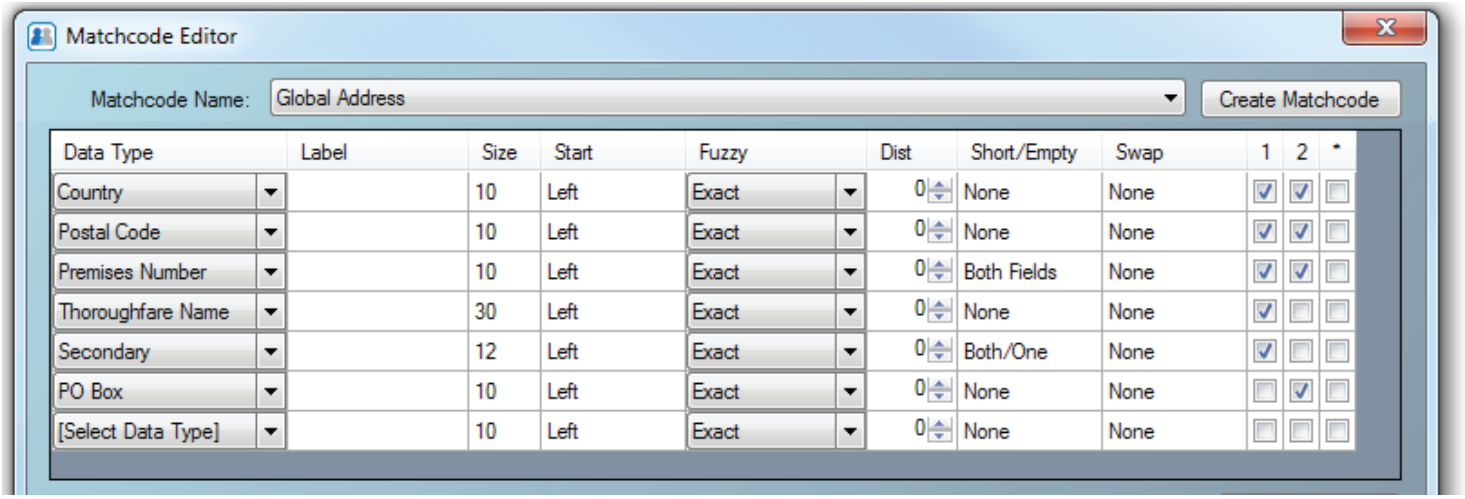
NAME	COMPANY	ADDRESS1	ADDRESS2	ADDRESS3	ADDRESS4	COUNTRY	ACCT	DATE
Ms. Anna Jones	AGT Healthcare	61 Wellfleet Road	Apartment 2	CF24 3DG	Cardiff	UK	400	13/2/2016
JOHN SMITH	First Bank Sussex	91 Western Road	Brighton	East Sussex	BN1 2NW	UK		20/7/2008
J. SMITH	First Bank	91 Western Rd.	Brighton	BN1 2NW	England	Great Britain	100	18/3/2012
Ms. A. Jones	AGT	61 Wellfleet	Cardiff	CF24 3DG		United Kingdom	200	1/12/2005
Anna Jones	AGT Healthcare Associates	Apartment 2	61 Wellfleet Road	Cardiff	CF24 3DG	England	700	
Dr. Grace Johnson		1001 High Street		London	England	UK	60	18/4/2014
Leslie Smith	RGNT Consulting	91 Western	BN1 2NW	England		United Kingdom	300	22/9/2014
Leslie Rogers	RGNT Consulting	91 Western Road	Brighton	BN1 2NW	East Sussex	United Kingdom	880	6/5/2011

International record matching presents a new set of challenges to MatchUp. Unlike domestic US / CAN, where Area Hierarchy and postal code data (City, State, and Zip) appear in separate predefined database fields, global address elements (such as thoroughfare, locality, and postal code) can appear in up to eight address columns. How do we ensure that we accurately identify and remove existing duplicate records?

First, we'll focus on the primary issue: identifying and removing duplicate records.

1. Select a matching strategy

MatchUp is distributed with the Matchcode Editor – a 'Graphical User Interface' that allows you to choose a pre-built ruleset called a matchcode, or create your own matchcode using a variety of input data types. Your business criteria will dictate the type of rulesets required to identify duplicate records in the database. We'll start with Global Address, a basic "Household" (address only) matching strategy that is distributed with Global MatchUp.



Data Type	Label	Size	Start	Fuzzy	Dist	Short/Empty	Swap	1	2	*
Country		10	Left	Exact	0	None	None	☑	☑	☐
Postal Code		10	Left	Exact	0	None	None	☑	☑	☐
Premises Number		10	Left	Exact	0	Both Fields	None	☑	☑	☐
Thoroughfare Name		30	Left	Exact	0	None	None	☑	☐	☐
Secondary		12	Left	Exact	0	Both/One	None	☑	☐	☐
PO Box		10	Left	Exact	0	None	None	☐	☑	☐
[Select Data Type]		10	Left	Exact	0	None	None	☐	☐	☐

Selecting this matchcode will evaluate the components listed in the Data Type column for each record in your database. You can use several different data type combinations at once—in this example, we are using two combinations, as seen in the far right columns 1 and 2. Although the first column may return a match, all used combinations are still evaluated simultaneously, allowing you to track records and counts to determine the effectiveness of a particular column strategy. More information about customizing your matchcode can be found here: http://wiki.melissa.com/index.php?title=Tutorial%3AMatchcode_Editor

The structure of our sample database is such that records with different layouts have found their way into the system. To account for these variations, MatchUp requires you to map in all columns that contribute to uniquely identifying records.

2. Field Mapping

Matchcode Data Type	Input Column	Input Data Type
Country	COUNTRY	Country
Address Line 1	ADDRESS1	Address
Address Line 2	ADDRESS2	Address
Address Line 3	ADDRESS3	Address
Address Line 4	[Select Ma...	[Select Data T...
Address Line 5	[Select Ma...	[Select Data T...
Address Line 6	[Select Ma...	[Select Data T...
Address Line 7	[Select Ma...	[Select Data T...
Address Line 8	[Select Ma...	[Select Data T...

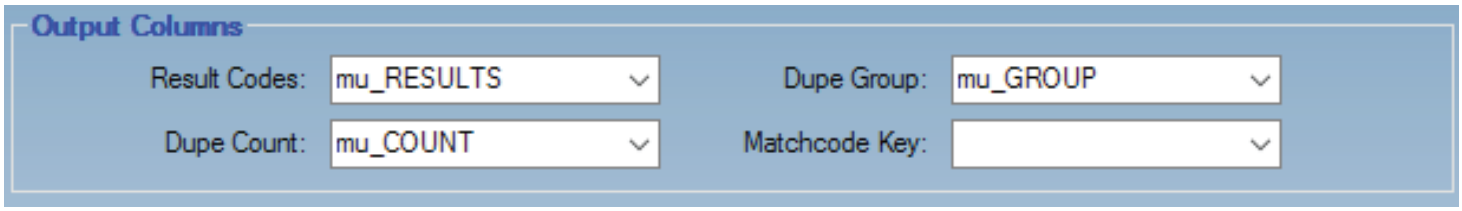
Map in your Country column and all columns that contain your address (including the Area Hierarchy) data.

For Global Matchcodes, MatchUp requires an input COUNTRY because it will tell MatchUp to recognize certain address tokens (Premises Number, Thoroughfare, and Post Box, for example), and therefore identify address patterns for that country.

Also, map in all columns that have address data. In this example, we only have 3 address lines, so we map those and leave the remaining available address lines unmapped.

You also have to tell MatchUp the 'Input Data Type,' or the format of the data your source file is in. Here, an Address Line contains an address, but for other Matchcode data types, like Names, the input data type may be any of various formats (like 'Smith, John,' which is an inverse format, or 'John Jr.,' which is a mixed first format). MatchUp needs this information in order to accurately build a representation for each record based on your matchcode. Store these matchkeys internally, and then compare these keys to each other when processed.

3. Configure Options



If we're processing millions of records, how do we output meaningful results? How does MatchUp determine which records to output and which ones to discard as duplicates? Before processing, create output columns for:

-Result Codes – this is a status marking that tells you if a record is unique or an output record of a duplicate group, or a duplicate.

-Dupe Count – this tells you how many records were matched into the same group of a particular record.

-Dupe Group – this is an assigned unique identifier for each matched group (whether the group has many records or just one) for the process.

4. Process

mu_RESULTS	mu_GROUP	mu_COUNT	NAME	COMPANY	ADDRESS1	ADDRESS2	ADDRESS3	ADDRESS4	COUNTRY	ACCT	DATE
MS01	1	1	Dr. Grace Johnson		1001 High Street		London	England	UK	60	18/4/2014
MS02,MS06	2	4	JOHN SMITH	First Bank Sussex	91 Western Road	Brighton	East Sussex	BN1 2NW	UK		20/7/2008
MS03,MS06	2	4	J. SMITH	First Bank	91 Western Rd.	Brighton	BN1 2NW	England	Great Britain	100	18/3/2012
MS03,MS06	2	4	Leslie Smith	RGNT Consulting	91 Western	BN1 2NW	England		United Kingdom	300	22/9/2014
MS03,MS06	2	4	Leslie Rogers	RGNT Consulting	91 Western Road	Brighton	BN1 2NW	East Sussex	United Kingdom	880	6/5/2011
MS02,MS06	3	3	Ms. Anna Jones	AGT Healthcare	61 Wellfleet Road	Apartment 2	CF24 3DG	Cardiff	UK	400	13/2/2016
MS03,MS06	3	3	Ms. A. Jones	AGT	61 Wellfleet	Cardiff	CF24 3DG		United Kingdom	200	1/12/2005
MS03,MS06	3	3	Anna Jones	AGT Healthcare Associates	Apartment 2	61 Wellfleet Road	Cardiff	CF24 3DG	England	700	

Now that MatchUp has linked our records into groups, it's time to evaluate those options using the result codes. Since 'MS01' represents a unique record, 'MSO2' represents the selected Output record from a group of duplicates, and 'MS03' represents a duplicate record, you can create a clean (deduped) output file by filtering MS01 and MS02 records. All possible returned Result Codes can be found here:

http://wiki.melissa.com/index.php?title=Result_Code_Details#MatchUp_Object

Since an actual process may contain millions of records, you can use the Dupe Group property to link matching records. After updating your master database with the output results, found matches aren't always easily identified – you're not going to visually analyze thousands of rows, so using the Dupe Group to create or help maintain a group identifier makes it easy to locate or sort records that match.

Furthermore, the Count property can tell you how many matched records there actually are in that database for a particular group. This can also be useful in determining how clean (of duplicates) your master database actually is. Large dupe groups under the right criteria can mean that system data entry rules need to be revisited.

5. Further: Optimizing and Troubleshooting Your Matching Strategy

Now let's look at some of the issues you may see with the results. You may say, "wait, I can identify records that were returned as matches, but clearly, they are different contacts." Yes, in this case, MatchUp placed different contacts in the same group - because we decided to use a "Householding" matchcode. Edit your matchcode by adding a Last Name component.

Data Type	Label	Size	1	2
Country		10	☑	☑
Last Name		10	☑	☑
Postal Code		10	☑	☑
Premises Number		10	☑	☐
Thoroughfare Name		30	☑	☐
Secondary	subpremise	12	☑	☐
Post Box		10	☐	☑
[Select Data Type]		10	☐	☐

Including the Last Name component will now give us a 'family level' matchcode strategy. And, thus, will require editing to our mappings…

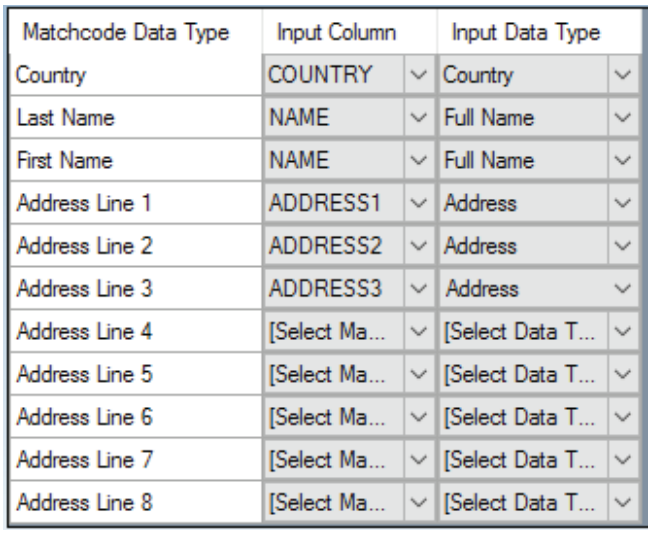
Matchcode Data Type	Input Column	Input Data Type
Country	COUNTRY	Country
Last Name	NAME	Full Name
First Name	NAME	Full Name
Address Line 1	ADDRESS1	Address
Address Line 2	ADDRESS2	Address
Address Line 3	ADDRESS3	Address
Address Line 4	[Select Ma...	[Select Data T...
Address Line 5	[Select Ma...	[Select Data T...
Address Line 6	[Select Ma...	[Select Data T...

Again, we see that for non-address components, there is a one-to-one mapping, but for our Address lines, we map in all columns that have address data.

MatchUp has internally parsed out the necessary parts and disregarded discrepancies like Name Prefix, First Name, Middle Name, and Name Suffix – all of which were not specified in the matchcode. This allows us to match DIFFERENTLY FORMATTED names that have different tokens but are clearly duplicates.

mu_RESULTS	mu_GROUP	mu_COUNT	NAME	COMPANY	ADDRESS1	ADDRESS2	ADDRESS3	ADDRESS4	COUNTRY	ACCT	DATE
MS01	1	1	Dr. Grace Johnson		1001 High Street		London	England	UK	60	18/4/2014
MS02,MS06	2	3	Ms. Anna Jones	AGT Healthcare	61 Wellfleet Road	Apartment 2	CF24 3DG	Cardiff	UK	400	13/2/2016
MS03,MS06	2	3	Ms. A. Jones	AGT	61 Wellfleet	Cardiff	CF24 3DG		United Kingdom	200	1/12/2005
MS03,MS06	2	3	Anna Jones	AGT Healthcare Associates	Apartment 2	61 Wellfleet Road	Cardiff	CF24 3DG	England	700	
MS01	3	1	Leslie Rogers	RGNT Consulting	91 Western Road	Brighton	BN1 2NW	East Sussex	United Kingdom	880	6/5/2011
MS02,MS06	4	3	JOHN SMITH	First Bank Sussex	91 Western Road	Brighton	East Sussex	BN1 2NW	UK		20/7/2008
MS03,MS06	4	3	J. SMITH	First Bank	91 Western Rd.	Brighton	BN1 2NW	England	Great Britain	100	18/3/2012
MS03,MS06	4	3	Leslie Smith	RGNT Consulting	91 Western	BN1 2NW	England		United Kingdom	300	22/9/2014

We've now placed different individuals in the same family (by last name) at the same address into different groups. We can take this one step further by changing the matchcode to include a First Name component.



mu_RESULTS	mu_GROUP	mu_COUNT	NAME	COMPANY	ADDRESS1	ADDRESS2	ADDRESS3	ADDRESS4	COUNTRY	ACCT	DATE
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MS01	3	1	Leslie Rogers	RGNT Consulting	91 Western Road	Brighton	BN1 2NW	East Sussex	United Kingdom	880	6/5/2011
MS02,MS06	4	2	JOHN SMITH	First Bank Sussex	91 Western Road	Brighton	East Sussex	BN1 2NW	UK		20/7/2008
MS03,MS06	4	2	J. SMITH	First Bank	91 Western Rd.	Brighton	BN1 2NW	England	Great Britain	100	18/3/2012
MS01	5	1	Leslie Smith	RGNT Consulting	91 Western	BN1 2NW	England		United Kingdom	300	22/9/2014

We've accurately put contacts with obvious differences in First Name into another group, but discrepancies in the First Name are placing true duplicates into different groups. MatchUp has advanced matchcode data type settings to catch these, so we'll make a few final changes.

Data Type	Label	Size	Short/Empty	1	2
Country		10	None	☑	☑
Last Name		10	None	☑	☑
First Nickname		4	Initial	☑	☑
Postal Code		10	None	☑	☑
Premises Number		10	Both Fields	☑	☐
Thoroughfare Name		30	None	☑	☐
Secondary		12	Both/One	☑	☐
Post Box		10	None	☐	☑
[Select Data Type]		10	None	☐	☐

By replacing the First Name with the First Nickname data type and allowing a spelled out First Name to match an initial, we can catch names like 'A. Roberts' to 'Amy Roberts,' and 'Bob Smith' to 'Robert Smith.'

mu_RESULTS	mu_GROUP	mu_COUNT	NAME	COMPANY	ADDRESS1	ADDRESS2	ADDRESS3	ADDRESS4	COUNTRY	ACCT	DATE
MS01	1	1	Dr. Grace Johnson		1001 High Street		London	England	UK	60	18/4/2014
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MS01	3	1	Leslie Rogers	RGNT Consulting	91 Western Road	Brighton	BN1 2NW	East Sussex	United Kingdom	880	6/5/2011
MS02,MS06	4	2	JOHN SMITH	First Bank Sussex	91 Western Road	Brighton	East Sussex	BN1 2NW	UK		20/7/2008
MS03,MS06	4	2	J. SMITH	First Bank	91 Western Rd.	Brighton	BN1 2NW	England	Great Britain	100	18/3/2012
MS01	5	1	Leslie Smith	RGNT Consulting	91 Western	BN1 2NW	England		United Kingdom	300	22/9/2014

Even further: What if we had typos or a need to apply different fuzzy logic to more accurately catch duplicates?

Example:

Annabelle Johnson and Annabell Johnson

By changing our matchcode to use a Fuzzy algorithm on the First Name component instead of an 'exact' setting, like this.

…you will now group these together (if the two strings are found to be 75% or more similar). Fuzzy algorithms can be used on many different data types.

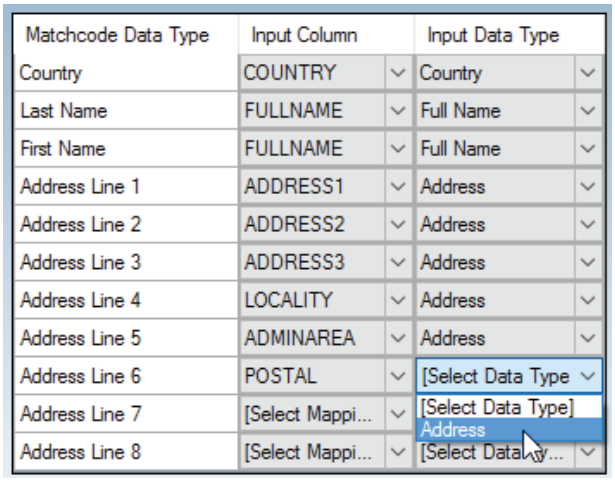
Considerations:

In some languages, it may be important to distinguish accented characters as distinct (for example, due to gender differentiation or databases with various country records where the diacritics represent completely different letters). In these cases, setting the proper source data encoding and using an 'Exact' setting may be proper configuration.

Also, keep in mind that when applying advanced matchcode settings (whether that may be fuzzy algorithms, multiple combinations of conditions, etc.), you are asking MatchUp to perform algorithmic computations for every key being compared. This can potentially return more duplicates, but can exponentially increase processing time for a particular job. Further Advanced Concepts discussions can be found here:

http://wiki.melissa.com/index.php?title=MatchUp_Object

Returning to our mappings: what if I am adding matching by name, but have already parsed Area Hierarchy data? In this case, MatchUp still requires all your address data mapped into the full address lines, so map them in as such:

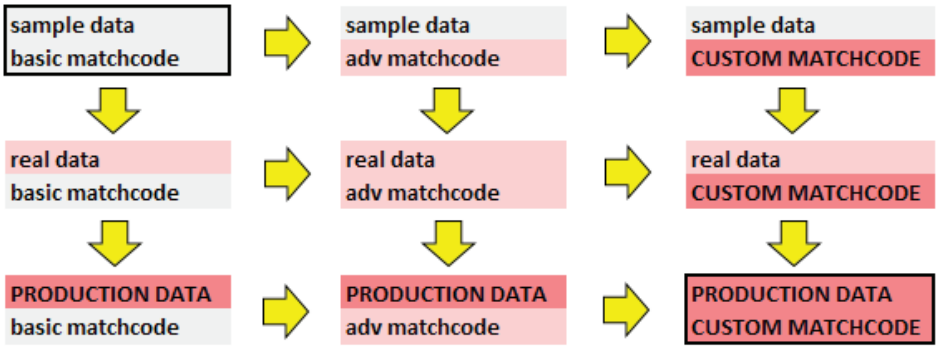


You'll notice that MatchUp will let you map in these distinct columns, but your only choice as input data type is 'Address.' In this example, notice we also mapped out Last Name and First Name components differently. This database didn't have parsed-out names, so we simply map in the FULLNAME source column and tell MatchUp, that this column contains Full Names – it will identify the Last and First names, and build the keys accordingly.

Conclusion:

Matching database records from a variety of countries requires an understanding of the different formats and postal standards. Fortunately, MatchUp and our underlying Global Address engine simply require an input country designator and all Address columns to return accurate record matching. But, to achieve the best level of record matching beyond the address requires identifying not only the format of the desired components, but also their quality. Here, for example, adding levels of name matching allowed us to break initial family groups into smaller individual level groups. Repeating the cycle of testing the matchcode, analyzing the results, and fine-tuning a strategy may, as shown, require you to implement other matching techniques (such as phone number, email address, or more than fifty other data type options) at the matchcode component level to arrive at the degree of matching accuracy required by your production environment.

For new MatchUp users (as well as those who simply want to refine their match rules) we always recommend this multi-step strategy.



Taking this approach of small steps over blindly trying many different options from the outset with a very advanced matchcode will not only save development time, but gives you a better understanding of how an implemented matching strategy relates to the returned process results.

NOTES:

For MatchUp Object users, the concepts and steps here are the same, but you will be programmatically calling the respective methods and retrieving output properties after processing.

In addition to the benefits of Domestic and/or International Record processing, the ETL solution can be easily configured to provide:

1. Golden Record (or Record Prioritization) based on a pecking order you provide).

This lets you determine which record to keep, and which to flag as duplicates.

2. Survivorship (or Record Rollup, or Data Gathering) in a variety of available methods.

This allows you to consolidate data from grouped records into that single output record.

3. ResultCode driven Output Streams,

This allows you to output and send processed records into different output streams based on our result codes, saving you from having to write custom queries.

ABOUT MELISSA

Melissa is a leader in data-driven solutions that help organizations leverage Big Data and People Data (name, address, phone and email) to unite customer insights, analytics, data quality, and cross-channel marketing. We profile, cleanse, verify, enrich, and consolidate data assets, providing more than 10,000 brands in over 20 countries with accurate, reliable, and trusted information that can be utilized throughout the enterprise. For more than thirty years, our extended legacy in data quality, ID verification, and data enhancements has earned the trust of organizations from around the world.

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