

# Using EAN Database to solve Geography

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*How-To resolve properties location using the EAN database files Stored Procedures*

## Overview

As part Expedia Affiliate Network API offering to partners we create and maintain a full set of relational files (34 in total), as well as custom scripts to manage the database creation and keep them up to date. However we have enhanced the functionality of the Database including a set of extra tables and Stored Procedures that will allow you to cross search using the Latitude & Longitude (GeoPoint) stored in various tables. This will allow you, not only to search for any hotel, but to use other publicly available databases to search for Point Of Interests (POI's) like airports, train stations and similar.

We manage to create a process that use built it database functions and traditional indexes, avoiding the need for geospatial extras, and making for a more portable system.

On this paper we will focus more on the stored procedure and how to get benefits out of it.

## Hotels GeoPoint

All our subscribed hotel properties has the given Latitude & Longitude (GeoPoint), those location use the GPS84 standard, and are stored in the fields with the same name on the `ActivePropertyList` table.

The `ActivePropertyList` is the main hotel database table for all Expedia properties, it include more than 160K records, as part of the structure you have the basic address information and other important fields.

### QUERY:

*USE eanprod;*

*SELECT EANHotelID, Name, Address1, Address2, City, StateProvince, PostalCode, Country, Latitude, Longitude, AirportCode, RegionID  
FROM activepropertylist;*

### RESULTS:

EANHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	Latitude	Longitude	AirportCode	RegionID
118583	Circus Circus Hotel & Casino	2880 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.13636	-115.16225	LAS	2008
342258	Best Western Plus Casino Royal	3411 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.12073	-115.17208	HSH	2008
135542	Excalibur Hotel Casino	3850 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.09921	-115.1731	LAS	2008
118903	Stratosphere Hotel - Casino &	2000 Las Vegas Blvd S		Las Vegas	NV	89104	US	36.14699	-115.1553	LAS	2008
123792	Monte Carlo Resort and Casino	3770 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.10384	-115.17604	LAS	2008
121569	Tropicana Las Vegas - A Double	3801 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.10077	-115.17138	LAS	2008
122212	Luxor Hotel and Casino	3900 S. Las Vegas Blvd		Las Vegas	NV	89119	US	36.09659	-115.17309	LAS	2008
115163	The Quad Resort & Casino	3535 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.11794	-115.17277	LAS	2008
152625	Golden Nugget Hotel & Casino	129 Fremont St		Las Vegas	NV	89101	US	36.16996	-115.14461	LAS	2008
161293	Paris Las Vegas	3655 Las Vegas Blvd S		Las Vegas	NV	89109	US	36.11153	-115.17274	LAS	2008

This allows for the usual search by address or at least filter by hotels address like: “Las Vegas, NV, USA” or by their Postal Code “89109”. Now, using their GeoPoint (Latitude, Longitude) we calculate the distance to another GeoPoint that you pass to the Stored Procedure, and add the maximum distance to search. All we do in the Stored Procedures is based on the calculated distance of the Hotel Latitude & Longitude to the other GeoPoint passed.

The **Haversine formula** is an equation used in navigation, giving great-circle distances between two points on a sphere from their longitudes and latitudes. That’s is just what we need to implement in our stored procedure to enable GeoPoint distance search.

For more information on the math behind this powerful formulas and algorithms visit this page:

<http://www.movable-type.co.uk/scripts/latlong.html>

What we implement in the database is this same formula, you can see its source on the `my_sql_create_eanprod.sql`. On the table we want to search, we add a compound indexes base on Latitude + Longitude, as it will be used for this searches.

## Stored Procedure (Hotels Near GeoPoint)

Lets start by looking at a famous location that lies between two countries; in this case we are looking at Niagara Falls. Niagara Falls is the collective name for three waterfalls that straddle the international border between Canada and the United States; more specifically, between the province of Ontario and the state of New York.



On the USA side you can see the nearby city of Buffalo, on the Canada side you can see the city of St. Catharines also close.

Using this landmark GeoPoint (latitude: 43.08, longitude: -79.071) location as we discover it on the Public Map site of OpenStreetMap (<http://www.openstreetmap.org/#map=9/43.08/-79.071>), we use the Stored Procedure with the following parameters:

```
sp_hotels_from_point(latitude,longitude,radius as miles)
```

If you want to use kilometers instead of miles, do the conversion prior to sending the parameter, or alter the stored procedure to do so internally. Following our example the call will be:

```
use eanprod;
call sp_hotels_from_point(43.08, -79.071, 5);
```

RESULTS (128 records / .217 sec):

EanHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
197260	Thriftlodge Niagar...	4945 Clifton Hill		Niagara Falls	ON	L2G3N5	CA	1.5	54.1100	55.1100	43.09152	-79.07511	1
260275	President Motor Inn	6503 Stanley...		Niagara Falls	ON	L2G 7L2	CA	1.5	182.4900	183.4900	43.08045	-79.08419	1
440484	All Star Inn	5384 Kitchen...		Niagara Falls	ON	L2G 1B7	CA	2.0	0.0000	0.0000	43.09538	-79.08369	1
440463	Rainbow Bed & Br...	4436-8 John St		Niagara Falls	ON	L2E 1A5	CA	3.0	0.0000	0.0000	43.09463	-79.06868	1
440578	Villa Alexandra B...	5287 River Road		Niagara Falls	ON	I2E3G9	CA	3.5	0.0000	0.0000	43.09783	-79.06575	1
231394	Holiday Inn Niagar...	114 Buffalo Ave		Niagara Falls	NY	14303	US	3.0	80.0000	154.0000	43.08330	-79.06119	1
447201	Cozy Inn Bed & Br...	5725 Robinso...		Niagara Falls	ON	L2G 2B3	CA	3.5	0.0000	0.0000	43.08651	-79.08821	1
325783	Absolute Elegance...	6023 Culp Street		Niagara Falls	ON	L2G 2B6	CA	3.0	153.3434	194.7446	43.08614	-79.09343	1
376020	SHERATON AT TH...	300 Third Street		Niagara Falls	NY	14303	US	3.0	95.0000	199.0000	43.08616	-79.05912	1
152241	HAMPTON INN NI...	501 RAINBOW...		Niagara Falls	NY	14303	US	2.0	209.0000	279.7200	43.08348	-79.05587	1
267439	RODEWAY INN NIA...	492 Main Street		Niagara Falls	NY	14301	US	1.0	59.0000	60.0000	43.09067	-79.06107	1
222067	KINGS INN NEAR T...	5525 FERRY ST		Niagara Falls	ON	L2G153	CA	0.0	61.9309	152.4593	43.08965	-79.08719	1
248351	WALDORF MOTEL	5384 Kitchen...		Niagara Falls	ON	L2G1B7	CA	1.0	42.0270	93.4047	43.09538	-79.08369	1
325880	A Night to Remem...	6161 Main Street		Niagara Falls	ON	L2G 6A3	CA	3.5	146.6971	180.0419	43.08600	-79.09111	1

You can see that it returns 128 records in .217 sec in my test Server, so it is very fast. The records are sorted by distance. Notice distance is of integer type, as we do not really care exactly how far the hotel is but for them to be properly sorted by distance. If you want you can change the stored procedure to return the real value of the distance (again it is in miles). The interpretation for the distance parameter will be: if the value is 0 the hotel is 0 to 1 mile away from the GeoPoint. A value of 2 will mean 1 to 2 miles range.



So we are looking for all hotels inside the circle. This stored procedure will be better used for destination like cities and landmarks that are NOT close to international borders.

## Stored Procedure (Hotels Near GeoPoint-filter by City Name)

As you can tell from our example there maybe a need to filter the returned data to show only a given city or country. That is what the next stored procedure is design to do:

```
sp_hotels_from_point_restrict(latitude,longitude,radius as miles, country, city)
```

So to filter the Canadian side on the Niagara Falls city we use:

```
use eanprod;
call sp_hotels_from_point(43.08,-79.071,5,'CA','Niagara Falls');
```

RESULTS (109 records / .150 sec):

EanHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
240338	Quality Hotel Fallsview Cascade	5305 Murray St		Niagara Falls	ON	L2G2J3	CA	2.5	53.2200	71.2500	43.08389	-79.07873	0
434967	Stardust Inn	5528 Buchana...		Niagara Falls	ON	L2G3T8	CA	2.0	0.0000	0.0000	43.09448	-79.08391	1
268376	Diplomat Inn	5983 Stanley Ave		Niagara Falls	ON	L2G3Y2	CA	2.0	89.2900	90.2900	43.08813	-79.08484	1
204293	Canuck Inn and Suites	5334 Kitchen...		Niagara Falls	ON	L2G1B5	CA	2.0	49.6034	99.2068	43.09541	-79.08229	1
216780	Niagara Plaza by FairBridge...	5807 Ferry St		Niagara Falls	ON	L2G1S8	CA	2.5	129.3700	155.2500	43.08963	-79.09123	1
197260	Thriftlodge Niagara Falls at...	4945 Clifton Hill		Niagara Falls	ON	L2G3N5	CA	1.5	54.1100	55.1100	43.09152	-79.07511	1
260275	President Motor Inn	6503 Stanley...		Niagara Falls	ON	L2G 7L2	CA	1.5	182.4900	183.4900	43.08045	-79.08419	1
191644	Travelodge At the Falls	4943 Clifton Hill		Niagara Falls	ON	L2G3N5	CA	2.5	53.6600	63.1300	43.09110	-79.07406	1
202666	Knights Inn by the Falls	6276 Main St		Niagara Falls	ON	L2G6A4	CA	1.5	28.1400	29.1400	43.08372	-79.08624	1
219222	Americas Best Value Chalet...	5577 Ellen Av...		Niagara Falls	ON	L2G3P5	CA	2.0	62.2400	188.5100	43.09355	-79.07575	1
267302	Ritz Inn Niagara	5630 Dunn St...		Niagara Falls	ON	L2G2N7	CA	1.5	44.2000	76.6700	43.07912	-79.08594	1
124485	Baymont Inn & Suites Niagar...	5234 Ferry Str...		Niagara Falls	ON	L2G1R5	CA	3.0	44.2900	66.8200	43.08958	-79.08077	1
271886	Inn By The Falls	5525 Victoria...		Niagara Falls	ON	L2G 3L3	CA	2.0	244.8300	245.8300	43.09436	-79.07275	1
381454	Victoria Motor Inn	5869 Victoria...		Niagara Falls	ON	L2G 3L6	CA	2.0	54.8400	55.8400	43.09044	-79.07887	1

You can see ONLY Canadian hotels listed in the City of Niagara Falls. If we do the same, for the also called Niagara Falls city but in USA side.

```
use eanprod;
call sp_hotels_from_point(43.08,-79.071,5,'US','Niagara Falls');
```

RESULTS (19 records / .152 sec):

EanHotelID	Name	Address1	Add...	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
432521	The Red Coach Inn	2 Buffalo Ave		Niagara Falls	NY	14303	US	3.0	111.0000	439.0000	43.08417	-79.06336	0
276049	Seneca Niagara Casino & Hotel	310 4th St		Niagara Falls	NY	14303	US	3.5	95.4900	245.4900	43.08578	-79.05778	1
152241	HAMPTON INN NIAGARA FA...	501 RAINBOW BLVD		Niagara Falls	NY	14303	US	2.0	209.0000	279.7200	43.08348	-79.05587	1
376020	SHERATON AT THE FALLS H...	300 Third Street		Niagara Falls	NY	14303	US	3.0	95.0000	199.0000	43.08616	-79.05912	1
231394	Holiday Inn Niagara Falls Sc...	114 Buffalo Ave		Niagara Falls	NY	14303	US	3.0	80.0000	154.0000	43.08330	-79.06119	1
150311	Days Inn Niagara At The Falls	443 Main St		Niagara Falls	NY	14301	US	2.0	47.2000	79.0000	43.08946	-79.06266	1
267439	RODEWAY INN NIAGARA FALLS	492 Main Street		Niagara Falls	NY	14301	US	1.0	59.0000	60.0000	43.09067	-79.06107	1
118411	Comfort Inn The Pointe	1 Prospect Pointe		Niagara Falls	NY	14303	US	2.0	79.0000	99.0000	43.08706	-79.06313	1
114073	Quality Hotel & Suites At Th...	240 1st Street		Niagara Falls	NY	14303	US	3.0	69.0000	79.0000	43.08572	-79.06174	1
326420	The Giacomo	222 First Street		Niagara Falls	NY	14303	US	3.0	179.0000	180.0000	43.08526	-79.06170	1
191625	Econo Lodge at the Falls	200 Rainbow Blvd		Niagara Falls	NY	14303	US	2.0	54.9500	55.9500	43.08428	-79.06027	1
217550	Super 8 Niagara Falls	795 Rainbow Blvd		Niagara Falls	NY	14303	US	2.0	50.9900	69.9900	43.08359	-79.05287	1
161746	Sheraton at the Falls	300 3rd St		Niagara Falls	NY	14303	US	3.5	149.0000	150.0000	43.08616	-79.05912	1
108928	Howard Johnson Closest to...	454 Main St		Niagara Falls	NY	14301	US	2.0	135.1500	169.0000	43.08968	-79.06236	1

This time you get ONLY the City of Niagara Falls in New York, USA. Notice that the City name been the same is just a coincidence for this particular example.

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191644	Travelodge At the Falls	4943 Clifton Hill	Niagara Falls	ON	L2G3N5	CA	2.5	53.6600	63.1300	43.09110	-79.07406	1
202666	Knights Inn by the Falls	6276 Main St	Niagara Falls	ON	L2G6A4	CA	1.5	28.1400	29.1400	43.08372	-79.08624	1
219222	Americas Best Value Chalet...	5577 Ellen Av...	Niagara Falls	ON	L2G3P5	CA	2.0	62.2400	188.5100	43.09355	-79.07575	1
267302	Ritz Inn Niagara	5630 Dunn St...	Niagara Falls	ON	L2G2N7	CA	1.5	44.2000	76.6700	43.07912	-79.08594	1
124485	Baymont Inn & Suites Niagar...	5234 Ferry Str...	Niagara Falls	ON	L2G1R5	CA	3.0	44.2900	66.8200	43.08958	-79.08077	1
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276049	Seneca Niagara Casino & Hotel	310 4th St	Niagara Falls	NY	14303	US	3.5	95.4900	245.4900	43.08578	-79.05778	1
152241	HAMPTON INN NIAGARA FA...	501 RAINBOW BLVD	Niagara Falls	NY	14303	US	2.0	209.0000	279.7200	43.08348	-79.05587	1
376020	SHERATON AT THE FALLS H...	300 Third Street	Niagara Falls	NY	14303	US	3.0	95.0000	199.0000	43.08616	-79.05912	1
231394	Holiday Inn Niagara Falls Sc...	114 Buffalo Ave	Niagara Falls	NY	14303	US	3.0	80.0000	154.0000	43.08330	-79.06119	1
150311	Days Inn Niagara At The Falls	443 Main St	Niagara Falls	NY	14301	US	2.0	47.2000	79.0000	43.08946	-79.06266	1
267439	RODEWAY INN NIAGARA FALLS	492 Main Street	Niagara Falls	NY	14301	US	1.0	59.0000	60.0000	43.09067	-79.06107	1
118411	Comfort Inn The Pointe	1 Prospect Pointe	Niagara Falls	NY	14303	US	2.0	79.0000	99.0000	43.08706	-79.06313	1
114073	Quality Hotel & Suites At Th...	240 1st Street	Niagara Falls	NY	14303	US	3.0	69.0000	79.0000	43.08572	-79.06174	1
326420	The Giacomo	222 First Street	Niagara Falls	NY	14303	US	3.0	179.0000	180.0000	43.08526	-79.06170	1
191625	Econo Lodge at the Falls	200 Rainbow Blvd	Niagara Falls	NY	14303	US	2.0	54.9500	55.9500	43.08428	-79.06027	1
217550	Super 8 Niagara Falls	795 Rainbow Blvd	Niagara Falls	NY	14303	US	2.0	50.9900	69.9900	43.08359	-79.05287	1

## Stored Procedure (Hotels Near GeoPoint-filter by Postal Code)

As you can tell from our example there maybe a need to filter the returned data to show only a given city or country. That is what the next stored procedure is design to do:

```
sp_hotels_from_point_restrict_postal(latitude,longitude,radius as miles, postalcode as string)
```

So to filter the Canadian side on the Niagara Falls city we use:

```
use eanprod;
call sp_hotels_from_point_postal(43.08,-79.071,5,'L2H1H1');
```

RESULTS (109 records / .150 sec):

EanHotelID	Name	Address1	Address2	City	StateProvince	PostalCode	Country	StarRating	LowRate	HighRate	Latitude	Longitude	distance
117789	Niagara Lodge & Suites	7720 Lundy's Lane		Niagara Falls	ON	L2H1H1	CA	2.0	31.9300	56.6900	43.08898	-79.12526	3
127069	Howard Johnson Expres...	8100 Lundy's Lane		Niagara Falls	ON	L2H1H1	CA	2.0	28.8600	45.1000	43.08887	-79.13365	3
193313	Villager Lodge	8054 Lundy's Lane		Niagara Falls	ON	L2H1H1	CA	2.0	44.2000	62.2400	43.08890	-79.13260	3
440579	Maplehaven Motel	7770 Lundy's Lane		Niagara Falls	ON	L2H1H1	CA	2.0	0.0000	0.0000	43.08898	-79.12656	3

Notice that the postal code data sometimes will include a space between the data, but the stored procedure takes care of that by eliminating all whitespaces. This probably is better suited when travelers need to stay in certain location or to filter out locations.

## Stored Procedure (Airport Near GeoPoint)

Using the same distance technique that we been using to locate hotels, we have the possibility of relating to other data as well. In this case it is to find the nearby Airport. The stored works this way:

```
sp_airport_from_point(IN lat double,lon double,countrycode VARCHAR(2),maxrec
INT)
```

So to find the nearby Airport from an hotel located in Spain (near the Santiago Bernabeu Stadium), we use:

```
use eanprod;
call sp_airport_from_point(40.451585,-3.690375,'ES',2);
```

RESULTS (109 records / .150 sec):

AirportID	AirportCode	AirportName	CountryCode	Latitude	Longitude	distance
6000387	MAD	Madrid, Spain (MAD-Barajas)	ES	40.468064	-3.568577	7
6031954	SLM	Salamanca, Spain (SLM-Matacan)	ES	40.940301	-5.502291	102

For example VENERE properties does NOT have an assigned airport you can use this process to discover that information or to present a more complete information for travelers.

For example VENERE properties does NOT have an assigned airport you can use this process to discover that information, using the our-airports-data we filter for the Internationals and largest regional airports to get that info, so a search for:

```
## 286020 - Carin Hotel (London) GPSPoint ( 51.51274,-0.18305)
```

```
use eanextras;
```

```
call sp_airport_from_ourairports(51.51274,-0.18305,"GB",2);
```

Will return:

LCY London City Airport (13 miles)

LHR London Heathrow Airport (15 miles)

## **Conclusion**

As we have presented in this paper you can rely on the Distance calculation to find hotels given any other point, but you can also reverse the logic to search the other way around like hotels close to an Airport.

In our next paper we will discuss using this same technique to find data supplied by many other public database to find nearby locations like: restaurants and train stations.

Stay tuned!