Introduzione al database

Mondial

Mondial

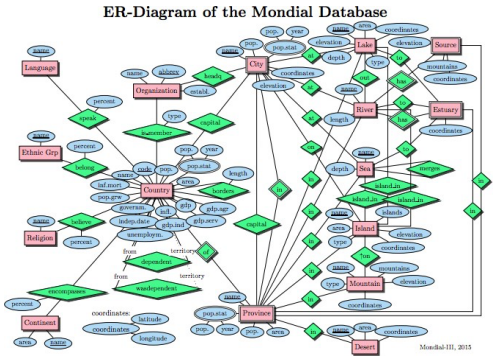
- Database che contiene dati geografici/politici.
- Nasce dalla fusione di dati provenienti da 4 sorgenti diverse:
  - TERRA: database geografico sviluppato alla Karlsruhe University alla fine degli anni '80, che contiene informazioni su nazioni, confini, divisioni amministrative, città, fiumi, montagne, deserti, etc…
    È il nucleo originario del DB.

Mondial

- Le altre sorgenti di dati aggiungono informazioni al DB:
  - CIA World Factbook: informazioni politico-economico-sociali sulle nazioni: organizzazioni politiche, religioni, gruppi etnici, lingue, etc…
  - Global Statistics: Cities and Provinces
    Dati sulla popolazione nelle città e nelle unità amministrative di tutte le nazioni.
  - Qiblih: coordinate geografiche delle città.

Lo schema ER di Mondial

- Nella cartella "MondialDB" si trova il file mondial-ER.pdf



Descrizione di Mondial

- File "mondial-RS.pdf": documento di descrizione delle tabelle SQL del DB.
- File "mondial-refdep.pdf": descrizione delle chiavi esterne.
- File SQL del DB da importare in PostGreSQL:
  - mondial-schema.sql (41 tabelle SQL)
  - mondial-inputs.sql (~43K linee)
  - mondial-drop-tables.sql

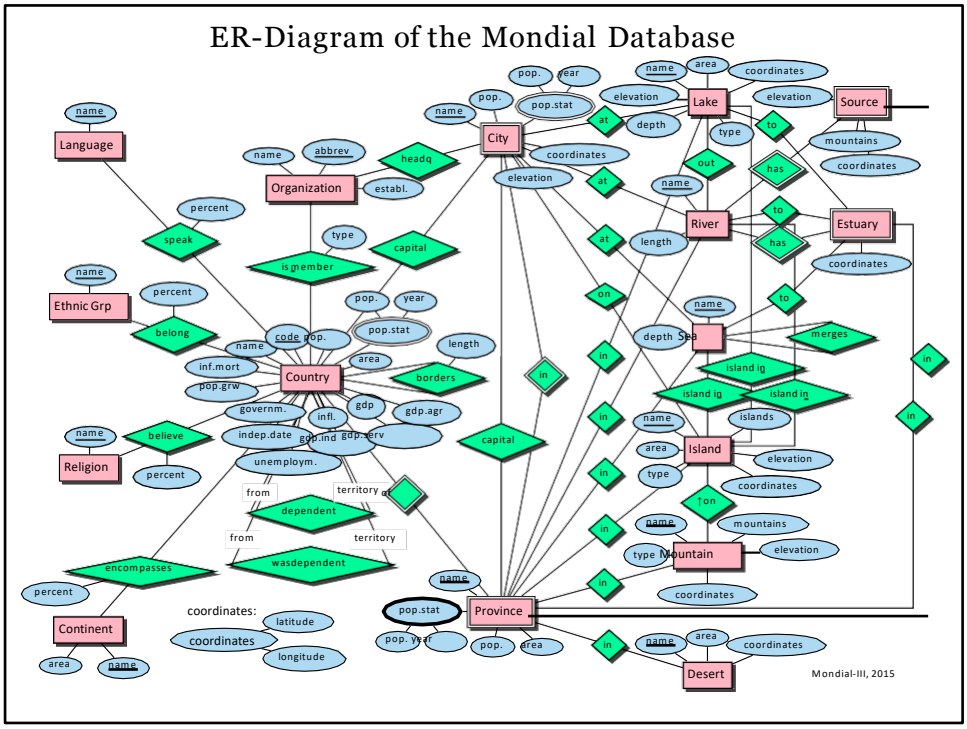
Come importare un file .sql in PostgreSQL

- Aprire **psql** da terminale, oppure da pgAdmin usare: **Plugins > PSQL Console**
- Per importare il codice SQL presente in un file usare il comando:

  user=# \i *nome-del-file.sql*

- Per terminare la sessione, usare il comando:

  user=# \q



Entità principali

- **Country**: nazioni del mondo con alcuni dati.
  - name: the country name
  - code: the unique country code
  - capital: the name of the capital
  - province: the province where the capital belongs to
  - area: the total area
  - population: the population number
- SELECT * FROM Country WHERE name = 'Italy'

Organizzazione amministrativa

- **Province**: information about administrative divisions.
  - name: the name of the administrative division
  - country: the country code where it belongs to
  - area: the total area of the province
  - population: the population of the province
  - capital: the name of the capital
  - capprov: the name of the province where the capital belongs to

  Note: that capprov is not necessarily equal to name. E.g., the municipality of Bogota (Columbia) is a province of its own, and Bogota is the capital of the surrounding province Cundinamarca.

  Attenzione: Province è da intendere come organizzazione amministrativa di primo livello, che ha un nome diverso a seconda della nazione. Ad esempio, per l'Italia sono le regioni.

SELECT * FROM Province WHERE country= 'I'

Città

- **City**: information about cities.
  - name: the name of the city
  - country: the code of the country where it belongs to
  - province: the name of the province where it belongs to
  - population: population of the city
  - elevation: the elevation (above sea level) of the city
  - latitude: geographic latitude
  - longitude: geographic longitude

Selezionare le città memorizzate nel DB in Italia, e nella regione Piemonte.

Storico Popolazione dellenazioni

- **Countrypops**: information about the population number of the countries in different years.
  - country: the country code
  - population: number ofinhabitants
  - year: in which year

Selezionare lo storico della popolazione di una nazione.

Storico Popolazione delle città e delle province

- **Citypops**: information about the population number of the cities in different years.
  - city: the name of the city
  - province: the name of the province
  - country: the code of the country where it belongs to
  - population: number of inhabitants
  - year: in which year
- **Provpops**: information about the population number of the provinces in different years.
  - province: the name of the province
  - country: the code of the country where it belongs to
  - population: number of inhabitants
  - year: in which year

Statistiche nazioni

- **Population**: information about the populationof the countries.
  - country: the country code
  - population growth: population growth rate (per annum)
  - infant mortality: infant mortality (perthousand)
- **Language**: infomation about the languages spoken in a country
  - country: the country code
  - name: name of the language
  - percentage: percentage of the language in this country
- **Religion**: information about the religions in a country
  - country: the country code
  - name: name of the religion
  - percentage: percentage of the religion in this country
- **EthnicGroup**: informationabout the ethnic groups in a country
  - country: the country code
  - name: name of ethnic group
  - percentage: percentage of the ethnic group in this country

Dati politico/economici

- **Economy**: economical information about the countries.
  - country: the country code
  - GDP: gross domestic product (in million $)
  - agriculture: percentage of agriculture of the GDP
  - service: percentage of services of the GDP
  - industry: percentage of industry of the GDP
  - inflation: inflation rate (per annum)
  - unemployment: unemployment rate
- **Politics**: political information about the countries.
  - country: the country code
  - independence: date of independence (if independent)
  - wasdependent: the political body where the area was dependent of; usually a country (but not always).
  - dependent: the country code where the area belongs to
  - government: type of government

Organizzazioni Internazionali

- **Organization**: political and economical organizations.
  - name: the full name of the organization
  - abbreviation: its abbreviation
  - city: the city where the headquarter is located
  - country: the code of the country where the headquarter is located
  - province: the name of the province where the headquarter is located
  - established: date of establishment
- **isMember**: memberships of countries in organizations.
  - organization: the abbreviation of the organization
  - country: the code of the member country
  - type: the type of membership

Associazioni tra le nazioni

- **borders**: informations about neighboring countries. Note that in this relation, for every pair of neighboring countries (A,B), only one tuple is given – thus, the relation is not symmetric.
  - country1: a country code
  - country2: a country code
- **Continent**: Information about continents.
  - name: name of the continent
  - area: total area of the continent
- **encompasses**: information to which continents a country belongs.
  - country: the country code
  - continent: the continent name
  - percentage: percentage, how much of the area of a country belongs to the continent

Aeroporti

- Non riportato nello schema ER.
- Airport:
  - IATACode: codice a tre lettere dell'aeroporto
  - Name: nome esteso
  - country: nazione dove si trova
  - city: città dove si trova
  - province: area amministrativa dov si trova
  - island: isola dove si trova (può essere NULL).
  - latitude, longitude: coordinate geografiche
  - elevation: m sul livello del mare
  - gmtoffset: differenza fuso orario da Greenwich

Coordinate nei dati geografici

- Le coordinate sono espresse con un tipo user-defined:

```
CREATE TYPE GeoCoord AS
    (Latitude DECIMAL,
     Longitude DECIMAL);
```

- Una volta definiti, i tipi user-defined possono essere usati nelle operazioni DDL come CREATE TABLE.

```
CREATE TABLE Island (
    ...
    Coordinates GeoCoord
);
```

- I sotto-campi si specificano con la dot-notation:

```
WHERE (Coordinates).Latitude > 50;
```

Entità geografiche

- **Sea**:
  - name: the name of the sea
  - depth: the maximal depth of the sea
- **Lake**:
  - name: the name of the lake
  - area: the total area of the lake
  - depth: the depth of the lake
  - elevation: the elevation (above sea level) of the lake
  - river: the river that flows out of the lake (may be null)
  - type: the type of the lake, e.g., salt, caldera, ...
  - coordinates: its geographical coordinates as GeoCoord

Entità geografiche

- **River**:
  - name: the name of the river
  - length: the length of the river
  - river: the river where it finally flows to
  - lake: the lake where it finally flows to
  - sea: the sea where it finally flows to;
    (note that at most one out of {river,lake,sea} can be non-null)
  - source: the coordinates of its source
  - sourceElevation: the elevation (above sea level) of its source
  - mountains: the montains where its source is located
  - estuary: the coordinates of its estuary
- **Mountain**:
  - name: the name of the mountain
  - mountains: the montains where the it belongs to
  - elevation: the maximal elevation of the summit of the mountain
  - type: the type of the mountain, e.g. volcanic, (active) volcano, ...
  - coordinates: its geographical coordinates as GeoCoord

Entità geografiche

- **Island**:
  - name: the name of the island
  - islands: the group of islands where it belongs to
  - area: the area of the island
  - elevation: the maximal elevation of the island
  - type: the type of the island, e.g. volcanic, coral, atoll, …
  - coordinates: its geographical coordinates as GeoCoord
- **Desert**:
  - name: the name of the desert
  - area: the total area of the desert
  - coordinates: its geographical coordinates as GeoCoord

Associazioni

- **RiverThrough**: information about rivers flowing through lakes.
  - river: the name of the river
  - lake: the lake where it flows through
- **mergesWith**: information about neighboring seas. Note that in this relation, for every pair of neighboring seas (A,B), only one tuple is given – thus, the relation is not symmetric.
  - sea1: a sea
  - sea2: a sea

Associazioni

- **MountainOnIsland**: information which mountains are located on islands.
  - mountain: the name of the mountain
  - island: the name of the island
- **islandIn**: information the waters where the islands are located in.
  - island: the name of the island
  - sea: the sea where the island is located in
  - lake: the lake where the island is located in
  - river: the river where the island is located in
- Note that an island can have coasts to several seas.
- Nota 2: la tabella non ha una chiave primaria.

Associazioni tra gli elementi geografici e le nazioni

- **geo_Mountain**:
  - mountain: the name of the mountain
  - country: the country code where it is located
  - province: the province of this country
- Note that for a country there can be several provinces where the mountain is located in.
- Associazioni analoghe:
  geo_island, geo_desert, geo_river, geo_lake, geo_sea, geo_source e geo_estuary.

Associazioni con le città

- **locatedOn**: information about cities located in islands.
  - city: the name of the city
  - country: the country code where the city belongs to
  - province: the province where the city belongs to
  - island: the island it is (maybe only partially) located on
- Note that for a given city, there can be several islands where it is located on.
- **located**: informationabout cities located at rivers, lakes, and seas.
  - city: the name of the city
  - country: the country code where the city belongs to
  - province: the province where the city belongs to
  - river: the river where it is located at
  - lake: the lake where it is located at
  - sea: the sea where it is located at
- Note that for a given city, there can be several lakes/seas/rivers where it is located at. No primary key.

Esercizi su Mondial (1)

- Trovare **i nomi** delle nazioni con % di economia agricola maggiore di % economia in industria.
- Trovare i nomi delle nazioni che ospitano la sede di un'organizzazione internazionale in una delle loro città.
- Ottenere per ogni nazione il numero di organizzazioni internazionali che hanno sede nelle città di quella nazione.

Esercizi su Mondial (2)

- Ottenere la lista delle nazioni in cui si parlano almeno 4 lingue. (24 nazioni)
- Selezionare tutti i gruppi etnici, ordinati secondo il numero di nazioni in cui si trovano (discendente).
- Verificare che la relazione Borders non è simmetrica (se c'è A,B allora non c'è B,A)
- Ottenere il simmetrico della relazione Borders.

Esercizi su Mondial (3)

- Ottenere per ogni nazione la lunghezza dei totale dei suoi confini, ed ordinarle secondo tale lunghezza dalla maggiore alla minore.

- Trovare le montagne alte tra 5000 e 6000 metri.
- Trovare tutti i laghi il cui nome inizia con la 'S'.
- Trovare tutte le nazioni la cui capitale si trova nella fascia tropicale (assumere che la fascia tropicale sia +/- 23.5 gradi di latitudine)

- select C.Name, C.Code, sum(length) from
  (select country1 as C1, country2 as C2, length
  from borders union
  select country2 as C1, country1 as C2, length
  from borders) AS U
  join Country as C on (C.Code = U.C1)
  group by 1, 2 order by 3 desc
- select * from country C join city T on (C.Code=T.Country and C.capital=T.name and C.province=T.province)
  where T.Latitude between -23.5 and +23.5

Esercizi su Mondial (4)

- Trovare il fiume che attraversa il maggior numero di nazioni.
- Trovare tutte le isole vulcaniche che hanno almeno una città con più di un milione di abitanti.
- Elencare le nazioni che non sono direttamente confinanti ma sono separati da un unico paese (il risultato deve comprendere i nomi delle coppie di paesi).

- select distinct I.* from island I join locatedOn L on (I.Name = L.Island) join City C on (C.name = L.city and C.province=L.province and C.country=L.country) where type = 'volcanic' and C.population > 1000000