Numeric Types

• Numeric types
  – SMALLINT
    • 2-byte signed integer
  – INTEGER
    • 4-byte signed integer
  – BIGINT
    • 8-byte signed integer
    • Not standard SQL
  – FLOAT / REAL
    • 4-byte floating-point
    • "FLOAT" keyword not supported by PostgreSQL
  – DOUBLE PRECISION
    • 8-byte floating-point
  – NUMERIC / DECIMAL
    • variable-size exact precision decimal
Numeric Types

- **NUMERIC / DECIMAL**
  - `NUMERIC(precision, scale)`
    - precision is the maximum number of digits
      - must be positive
    - scale is the number of fractional digits (digits after the decimal point)
      - must be zero or positive
  - e.g., `NUMERIC(5, 2)`
    - 5 digits total, 2 fractional
    - e.g., 123.45
  - PostgreSQL allows unlimited precision/scale
    - "NUMERIC" without qualifiers
String Types

- **Strings**
  - CHARACTER(n) / CHAR(n)
    - Fixed-size, n-character string, padded with spaces
  - CHARACTER VARYING(n) / VARCHAR(n)
    - Variable-size, n-character maximum string
  - NATIONAL CHARACTER(n) / NCHAR(n)
    - Unicode fixed-size string
  - NATIONAL CHARACTER VARYING(N) / NVARCHAR(n)
    - Unicode variable-size string
  - TEXT
    - Unlimited length string

- **In PostgreSQL**
  - CHAR, VARCHAR, and TEXT can hold Unicode if the server is configured to do so
  - No performance difference between these three types
Bit String Types

• Bit strings
  – BIT(n)
    • Fixed-size, n bits
  – BIT VARYING(n)
    • variable-size, n-bit maximum
  – BIT VARYING
    • PostgreSQL allows unlimited length bit strings
Date/Time Types

• Date types
  – DATE
    • Date only (no time), day resolution
  – TIME
    • Time only (no date), resolution is DBMS dependent
      – PostgreSQL goes to the microsecond
  – TIME WITH TIME ZONE
    • Same as time but includes a time zone specification
  – TIMESTAMP
    • Date and time
  – TIMESTAMP WITH TIME ZONE
    • Date and time with time zone specification

• Best to explicitly use "TIME WITHOUT TIME ZONE" and "TIMESTAMP WITHOUT TIME ZONE" than to depend on that being the default

• PostgreSQL includes an INTERVAL type which specifies a time interval
Non-Standard Types

- Non-standard types
  - MONEY
    - decimal value, exact, 2 fractional digits
  - BYTEA
    - variable-length string of bytes
  - ENUM
    - user-defined enumeration
- Geometric types
  - POINT, LINE, LSEG, PATH, POLYGON, CIRCLE
- Network address types
  - INET, CIDR, MACADDR
- UUID
- XML
- Arrays
Composite Types

• Composite types
  – PostgreSQL allows the creation of composite types
    • Groups a set of columns together

```
CREATE TYPE complex AS (
  r double precision,
  i double precision
);
```
Composite Types

CREATE TYPE complex AS (
  r double precision,
  i double precision
);

CREATE TABLE foo AS (
  foo_id bigserial primary key,
  name text,
  coord complex
);

INSERT INTO foo VALUES (default, 'abc', ROW(1.5, 3.7));

SELECT (coord).r FROM foo WHERE foo_id = 5;

UPDATE foo SET coord = ROW(6.75, 4.3) WHERE foo_id = 7;
UPDATE foo SET coord.i = (coord).i + 1;