Introduction to Computer Science

Software Engineering and Databases

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Outline

0) Keeping Yourself Healthy!
1) Software Engineering
2) Databases
   - ❖In E-commerce
   - ❖In Mapping
   - ❖In Bioinformatics

Keep yourself healthy when working with computers esp. LAPTOPS!

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Workstation Setup

Set up your desk to position frequently used items within a forearm's length and less frequently used items within a stretched out arm's length

1. **Elbows**
   Above the desk, at 90-110 degrees
2. **Shoulders**
   Relaxed as opposed to hunched
3. **Wrists**
   In line with forearms
4. **Hips, Knees, Ankles**
   At 90 degrees whilst seated
5. **Feet**
   Flat on the ground or footrest
   For prolonged standing, consider a mat
6. **Head**
   Upright with ears aligned with shoulders
7. **Eyes**
   Looking at the top third of the screen. Consider the use of a laptop raiser with your laptop
8. **Seat length**
   Should be long enough to provide support beneath thighs
9. **Backrest**
   Angled at 90-110 degrees with adequate lumbar support in line with lower back
10. **Keyboard and Mouse**
    G and H of keyboard aligned with your nose. Mouse gripped loosely
11. **Laptop**
    Used with a riser, external keyboard and external mouse

Health Tips

- **20-20-20**
  Every 20 minutes, focus on an object 20 metres away, for 20 seconds
- **Take regular breaks**
- **Keep hydrated**
  Drink plenty of water and limit your caffeine intake
- **Avoid eating lunch at your desk**
- **Exercise regularly**
- **Stretch**
  Stretching classes can be organised for your work area by emailing **uwahealth-sseh@uwa.edu.au**

Further Assistance

Safety and Health provide ergonomic assessment and advice to UWA staff and post-graduate students with dedicated office space.

To book online: **safety.uwa.edu.au/forms/ergonomic_assessment**
or contact us on 6488 3938

Software Engineering

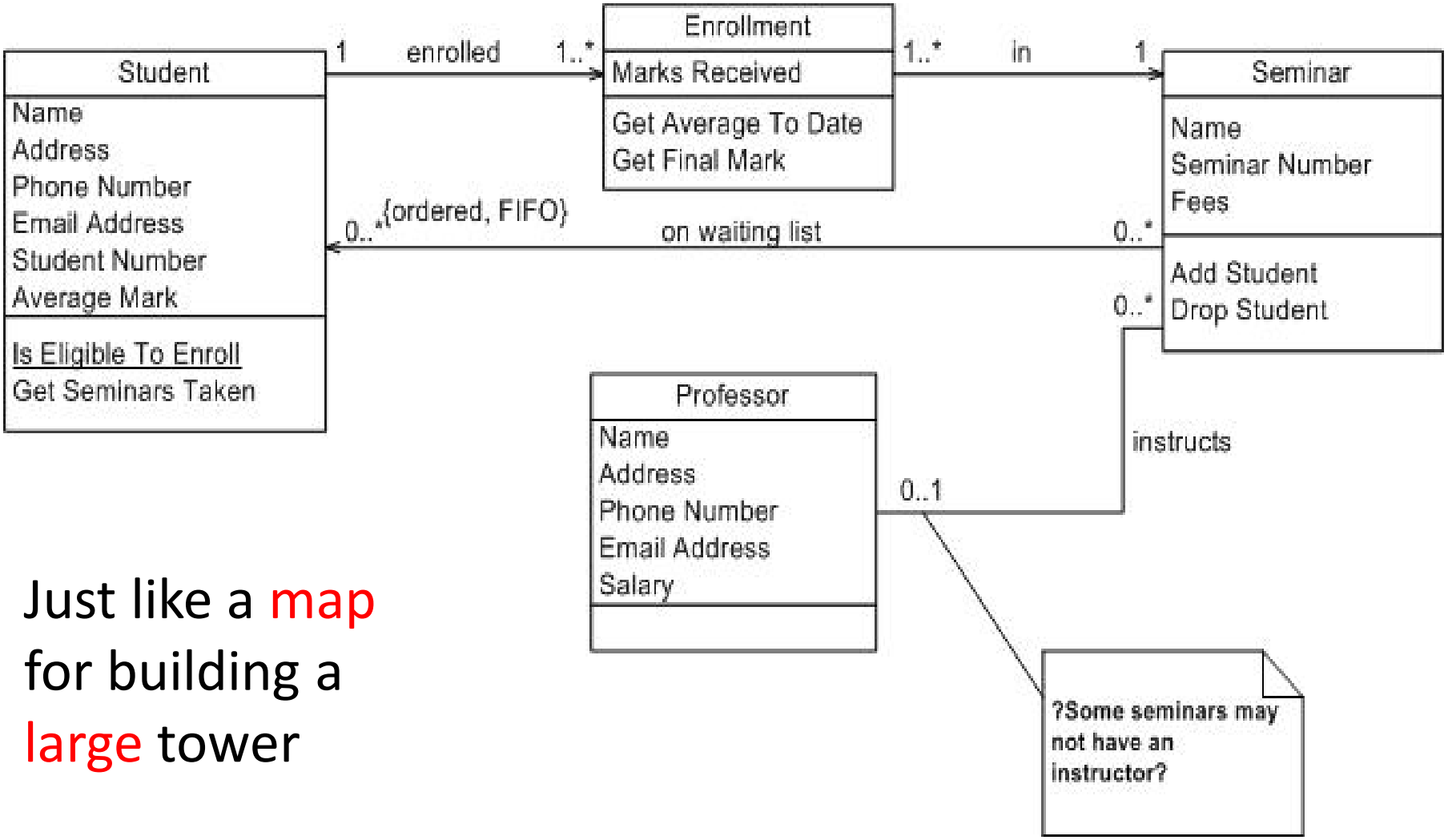
Size of software

Category	Typical Number of People	Typical Duration	Product Size in Lines of Code	Examples	Building Analogy
Trivial	1	1–2 weeks	< 500	Student homework assignments	Small home improvement
Small	1–3	a few weeks or months	500–2,000	Student team projects, advanced course assignments	Adding on a room
Medium	2–5	a few months to one year	2,000–10,000	Research projects, simple production software such as assemblers, editors, recreational and educational software	Single-family house
Large	5–25	1–3 years	10,000–100,000	Most current applications - word processors, spreadsheets, operating systems for small computers, compilers	Small shopping mall
Very Large	25–100	3–5 years	100,000–1 M	Airline reservations systems, inventory control systems for multinational companies	Large office building
Extremely Large	> 100	> 5 years	> 1 M	Large-scale real-time operating systems, advanced military work, international telecommunications networks	Massive skyscraper

Software Engineering

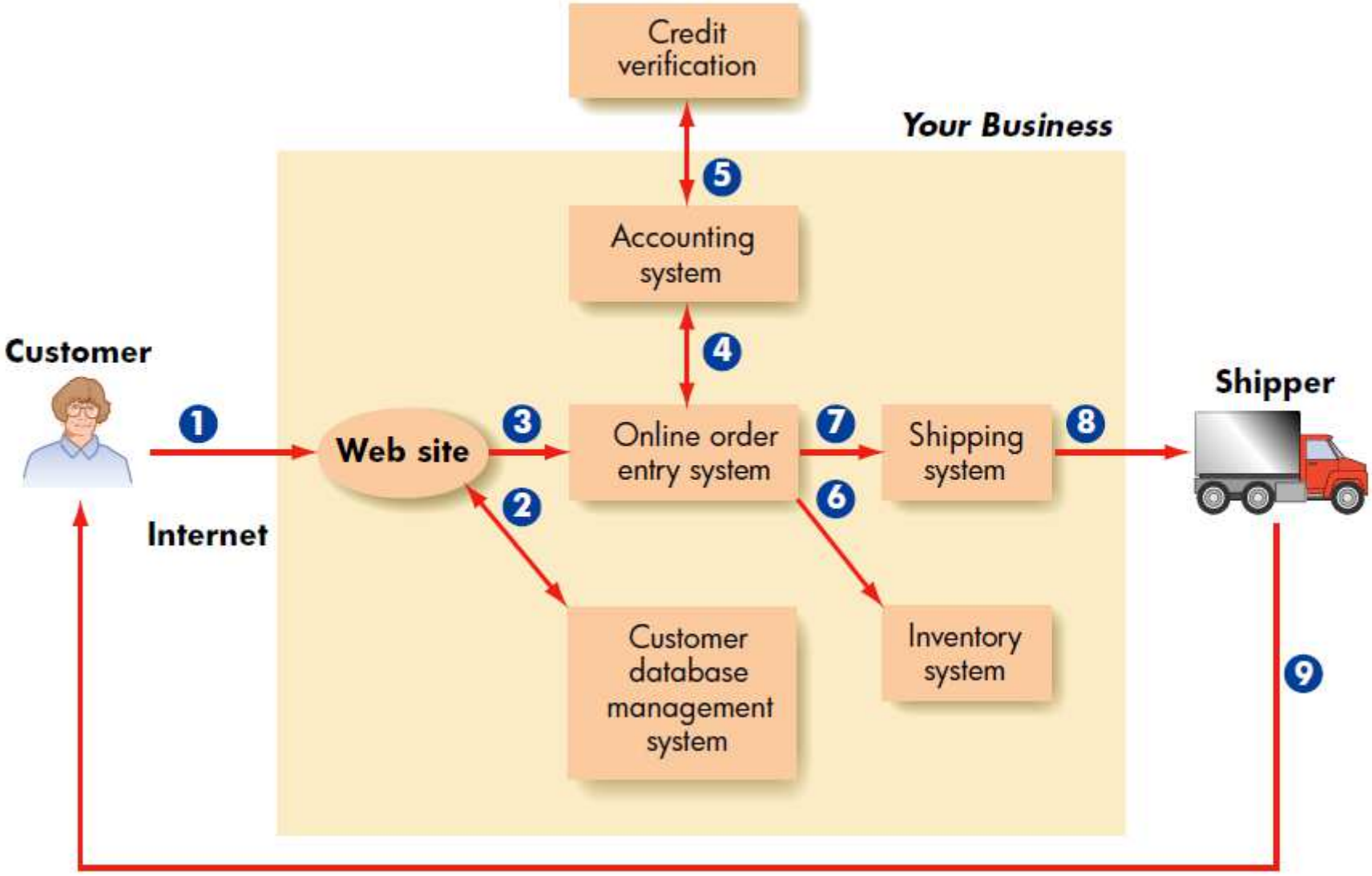
The need for modeling

Software engineering - Diagrams



Just like a map for building a large tower

Example : An E-Commerce System



A Table

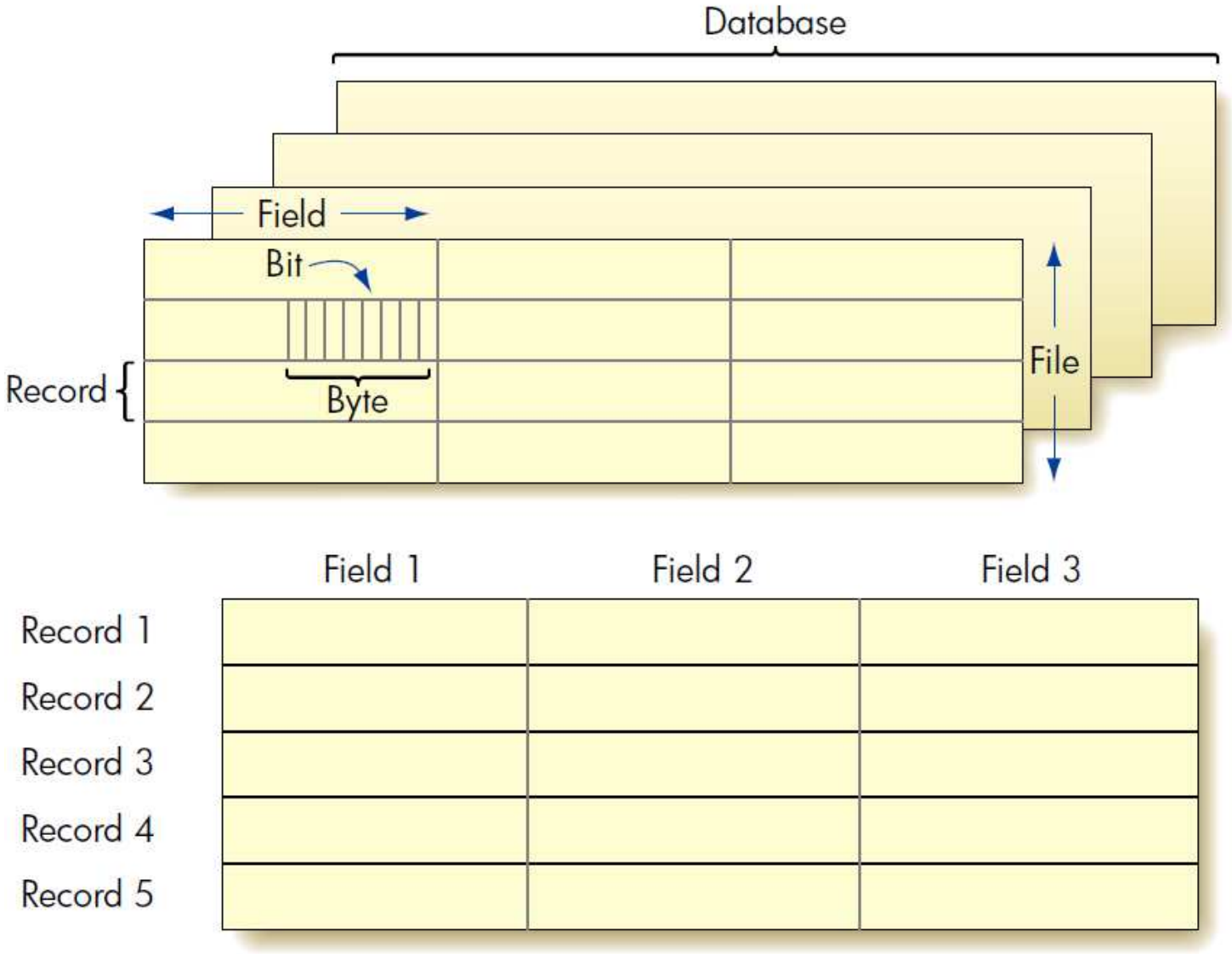
EMPLOYEES

ID	LastName	FirstName	Birthdate	PayRate	HoursWorked
116	Kay	Janet	3/29/1956	$16.60	94
123	Perreira	Francine	8/15/1987	$ 8.50	185
149	Takasano	Frederick	5/23/1966	$12.35	250
171	Kay	John	11/17/1954	$17.80	245
165	Honou	Morris	6/9/1988	$ 6.70	53

A Program Code for Query : SQL LanguageTable

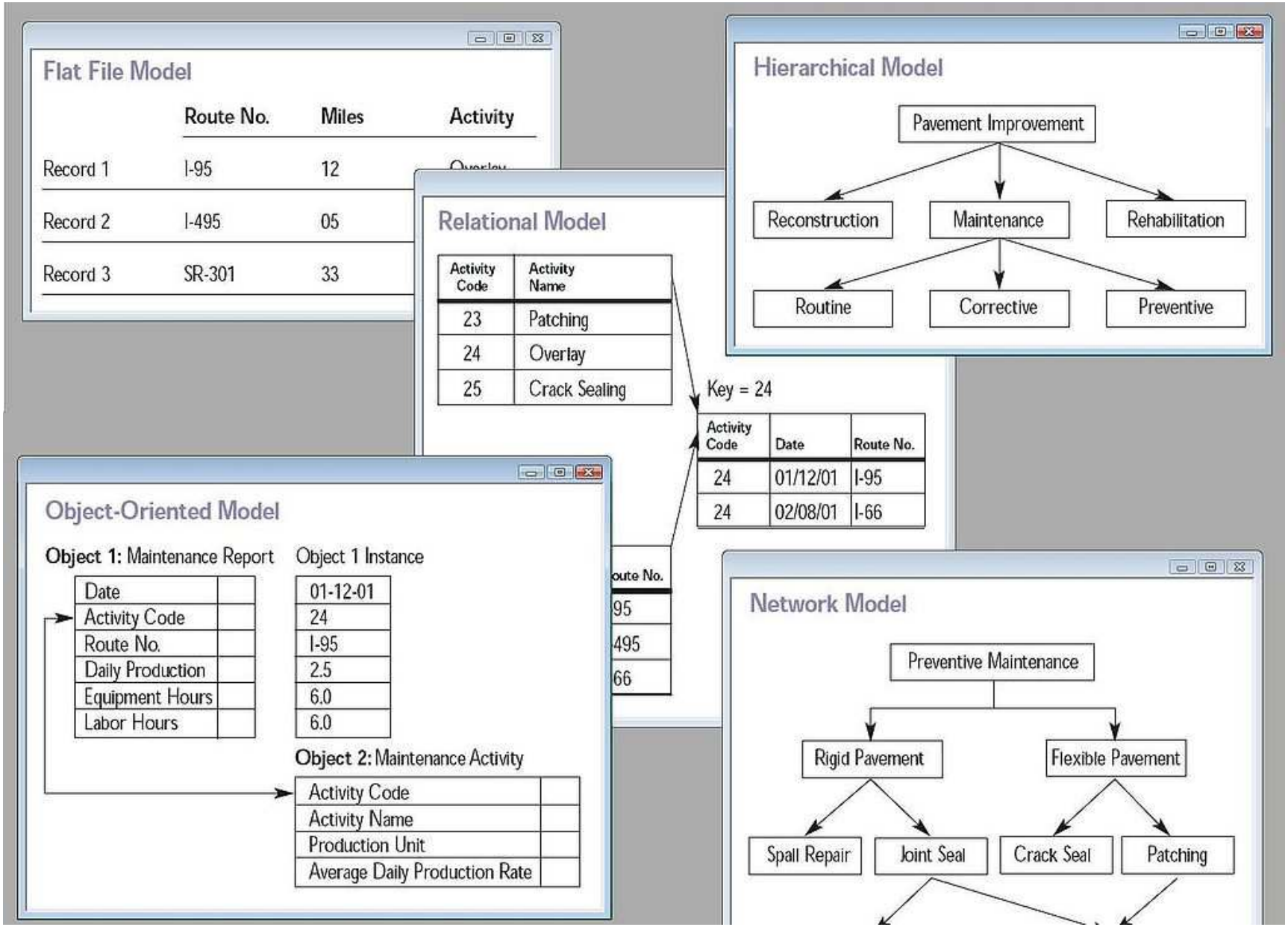
```
SELECT ID, LastName, FirstName, Birthdate, PayRate, HoursWorked
FROM Employees
WHERE ID = 123;
```

Behind the Scene : Database



WHAT ARE DATABASES?

- **Structured** collection of information.
- Consists of basic units called records or entries.
- Each record consists of fields, which hold **pre-defined** data related to the record.
- For example, a protein database would have protein entries as records and protein properties as fields (e.g., name of protein, length, amino-acid sequence)



Collage of five types of database models (Wikipedia/Database)

Database type examples : Spatial databases (for web mapping and GIS)

A spatial database can store the data with multidimensional features. The queries on such data include location based queries, like "Where is the closest hotel in my area?".

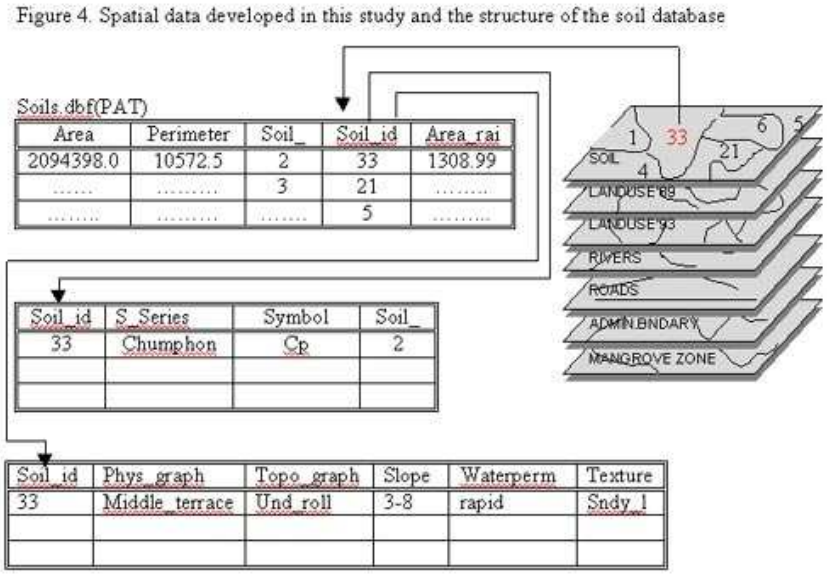


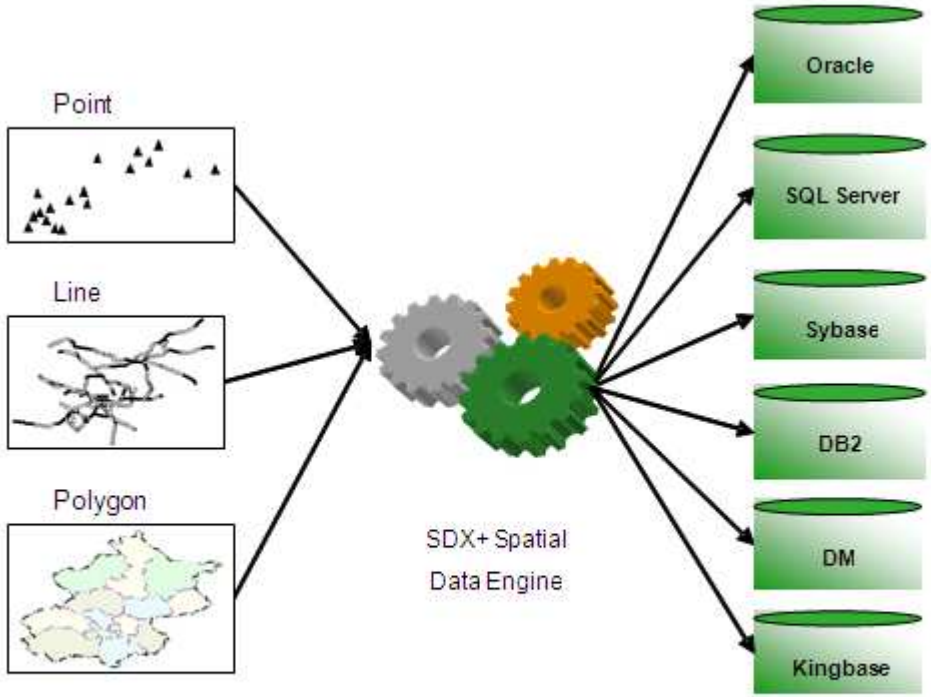
Figure 4. Spatial data developed in this study and the structure of the soil database

Soils.dbf(PAT)

Area	Perimeter	Soil_	Soil_id	Area_rai
2094398.0	10572.5	2	33	1308.99
.....	.....	3	21	.....
.....	.....	.....	5	.....

Soil_id	S_Series	Symbol	Soil_
33	Chumphon	Cp	2

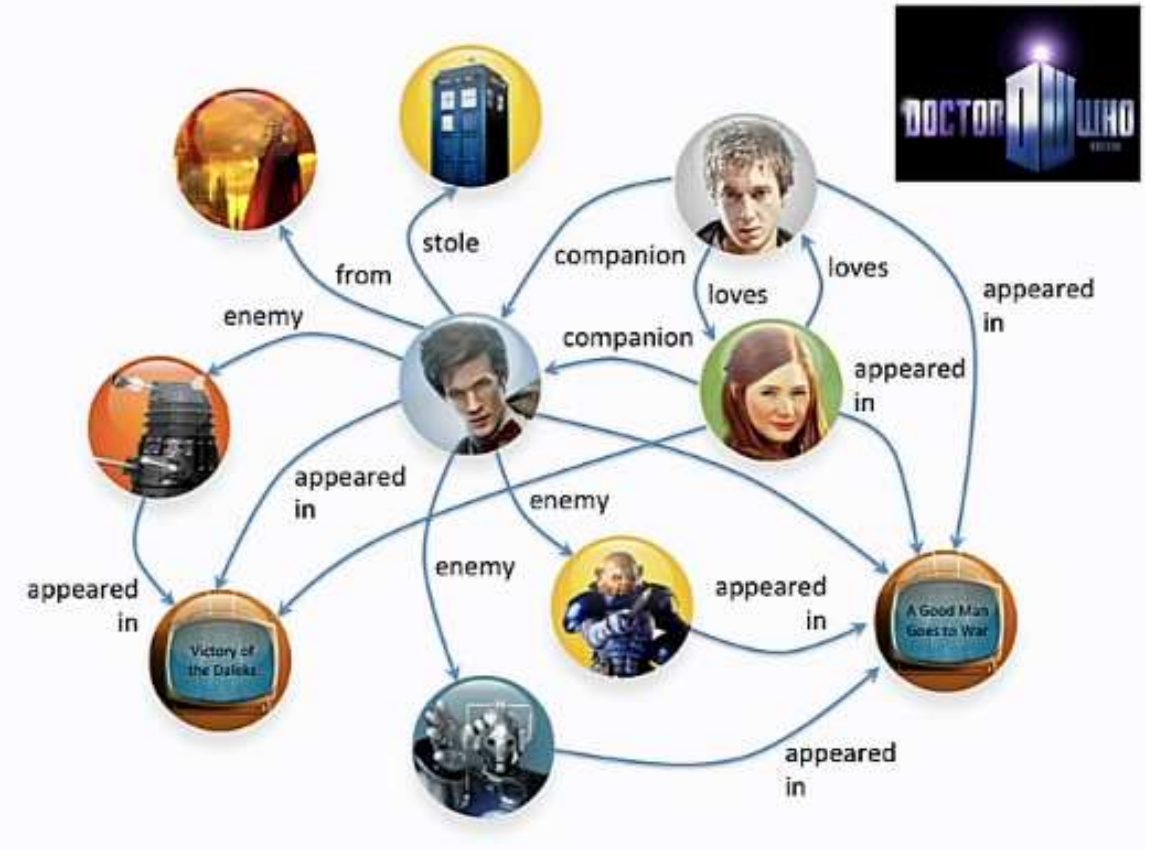
Soil_id	Phys_graph	Topo_graph	Slope	Waterperm	Texture
33	Middle_terrace	Und_roll	3-8	rapid	Sndy_l



Both the geometric objects and image data stored in various relational databases can be operated through SDX+ engine.

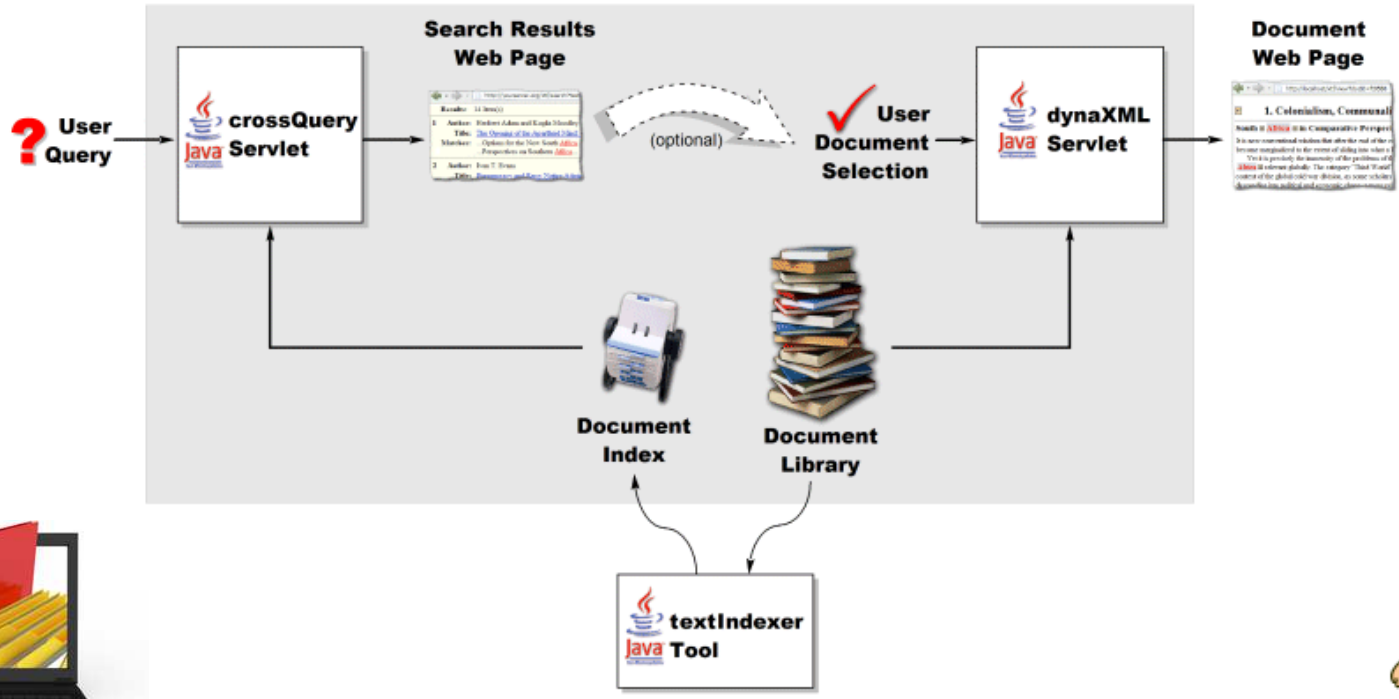
Database type examples : graph databases

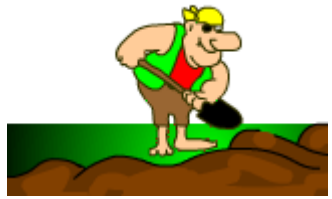
- A graph database is a kind of NoSQL database that uses graph structures with nodes, edges, and properties to represent and store information. General graph databases that can store any graph are distinct from specialized graph databases such as triplestores and network databases.



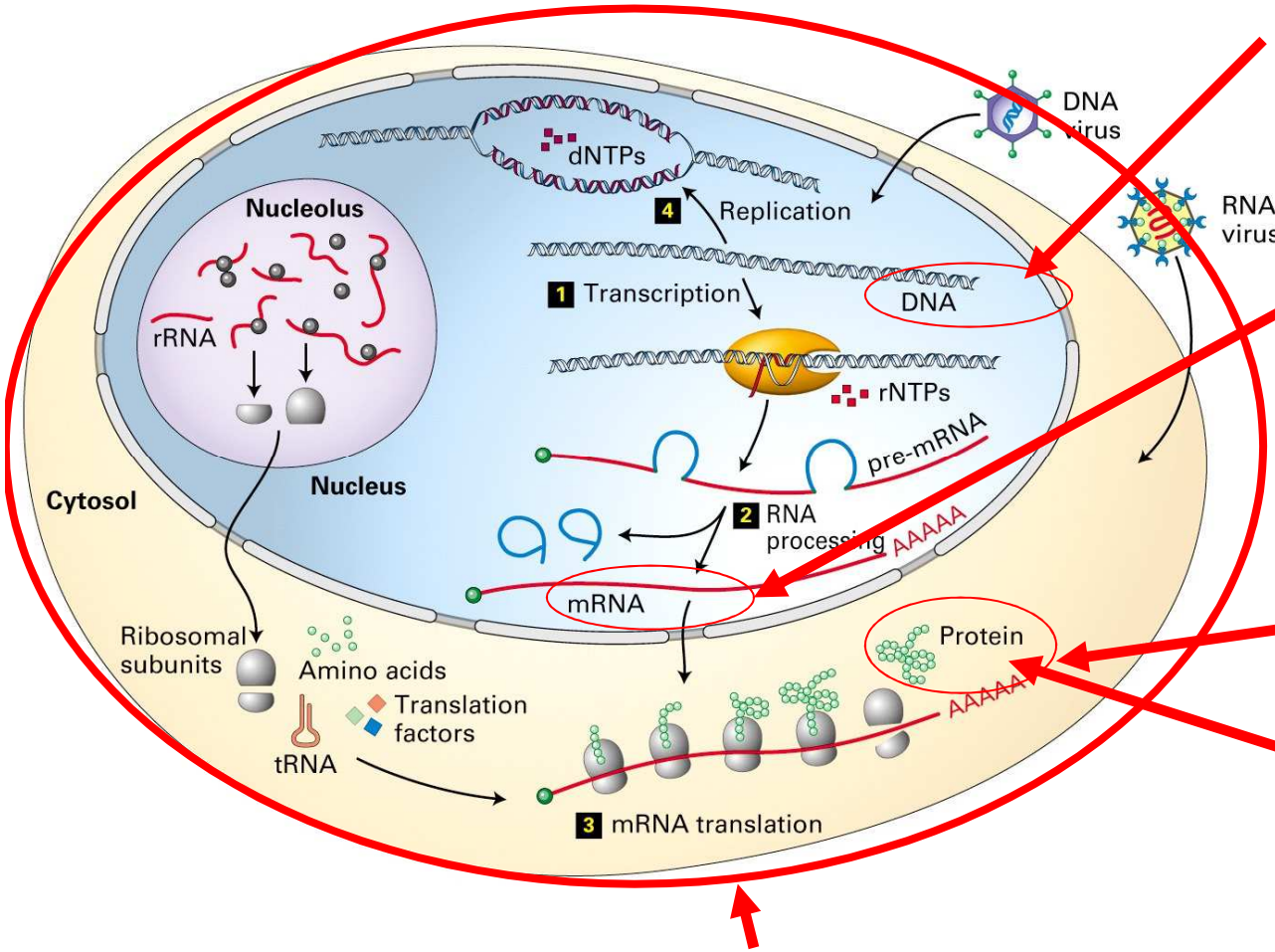
Database type examples : Document oriented databases

- A document-oriented database is designed for storing, retrieving, and managing document-oriented, or semi structured data, information. Document-oriented databases are one of the main categories of NoSQL databases.





Biological Data



Original DNA Sequences (Genomes)

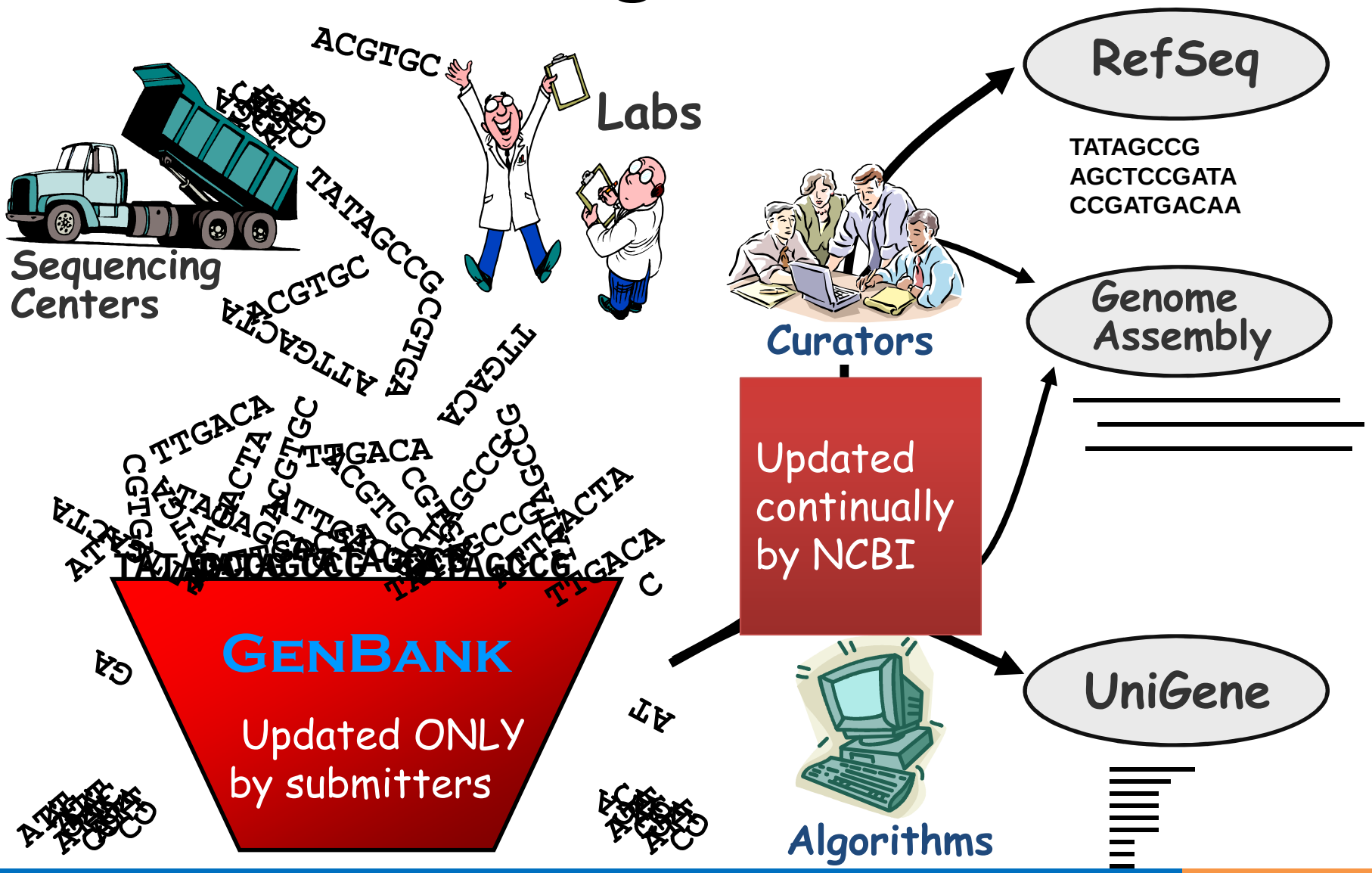
Expressed DNA sequence (= mRNA Sequences = cDNA sequences) Expressed Sequence Tag (ESTs)

Protein Sequences
-Inferred
-Direct sequencing

Protein structures
-Experiments
-Models (homologues)

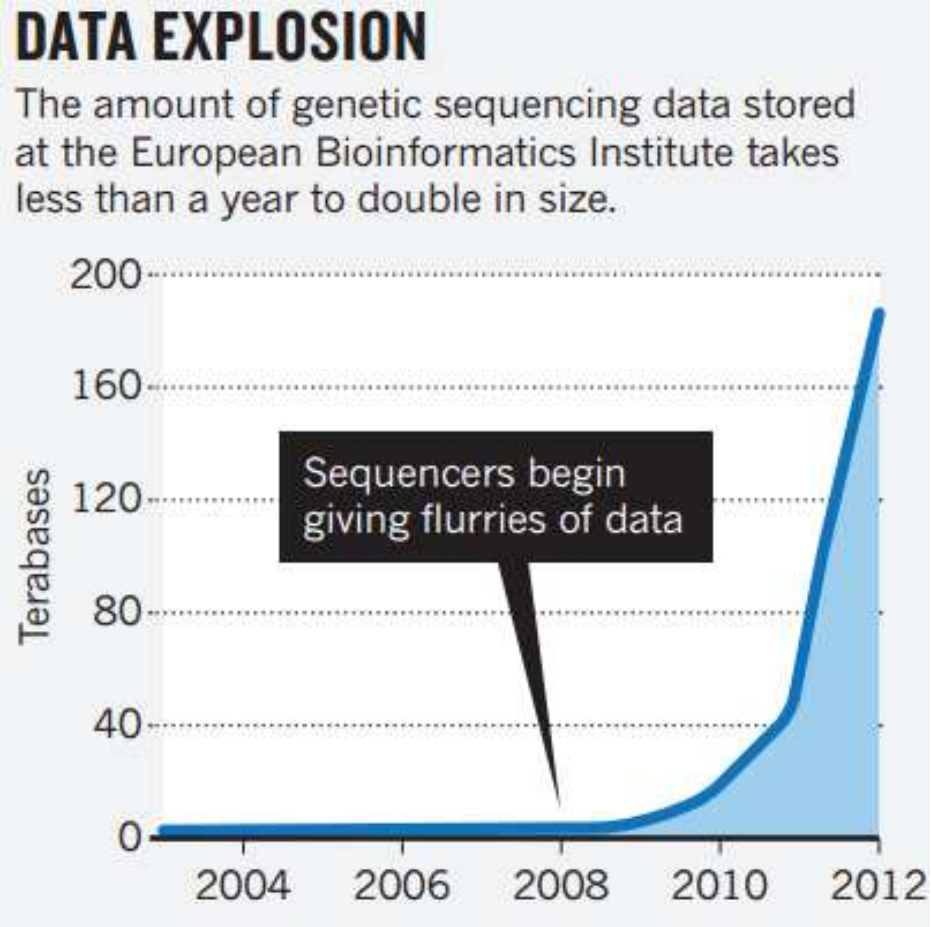
Literature information

Biological Data

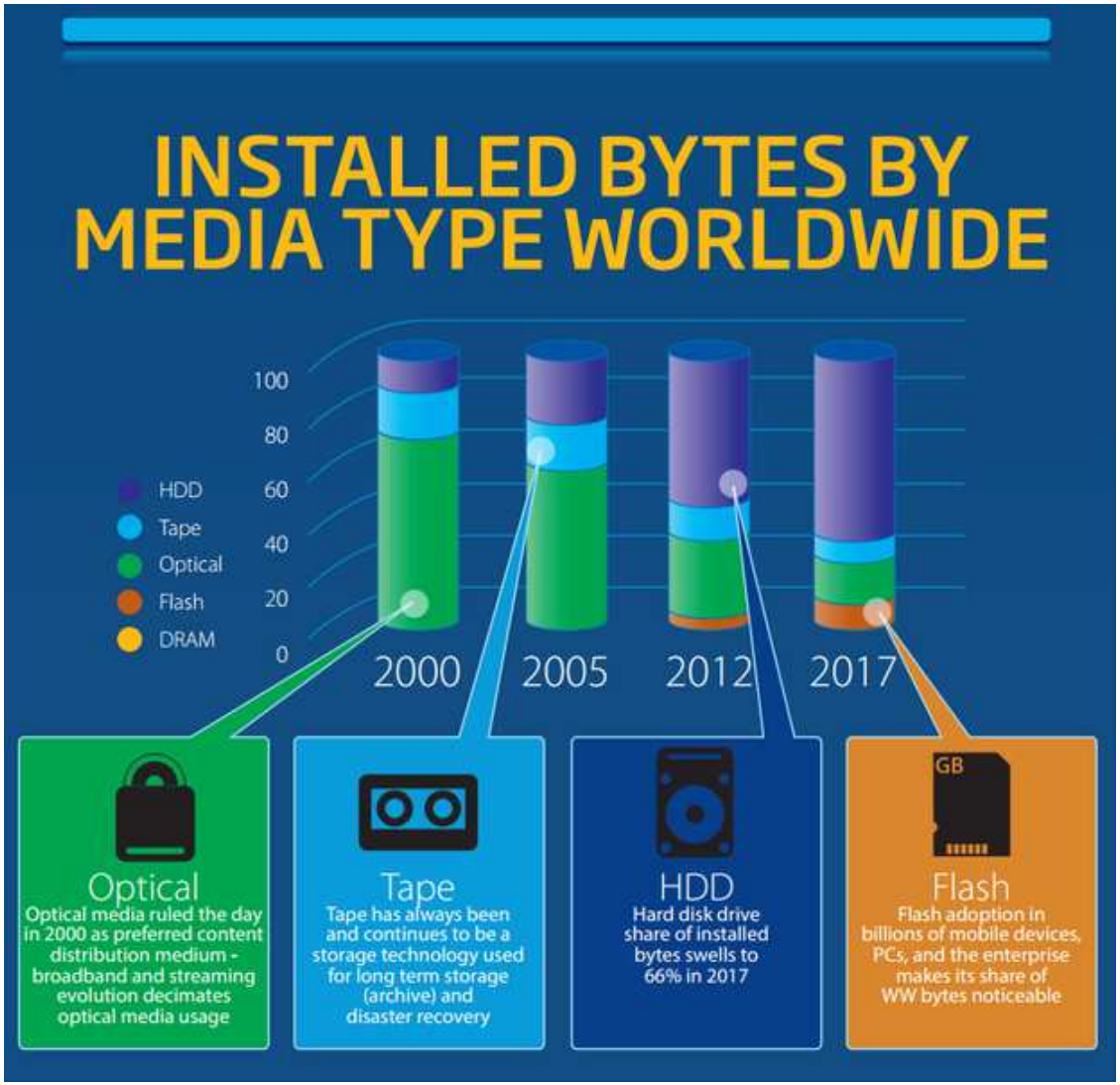


Biological Data Explosion

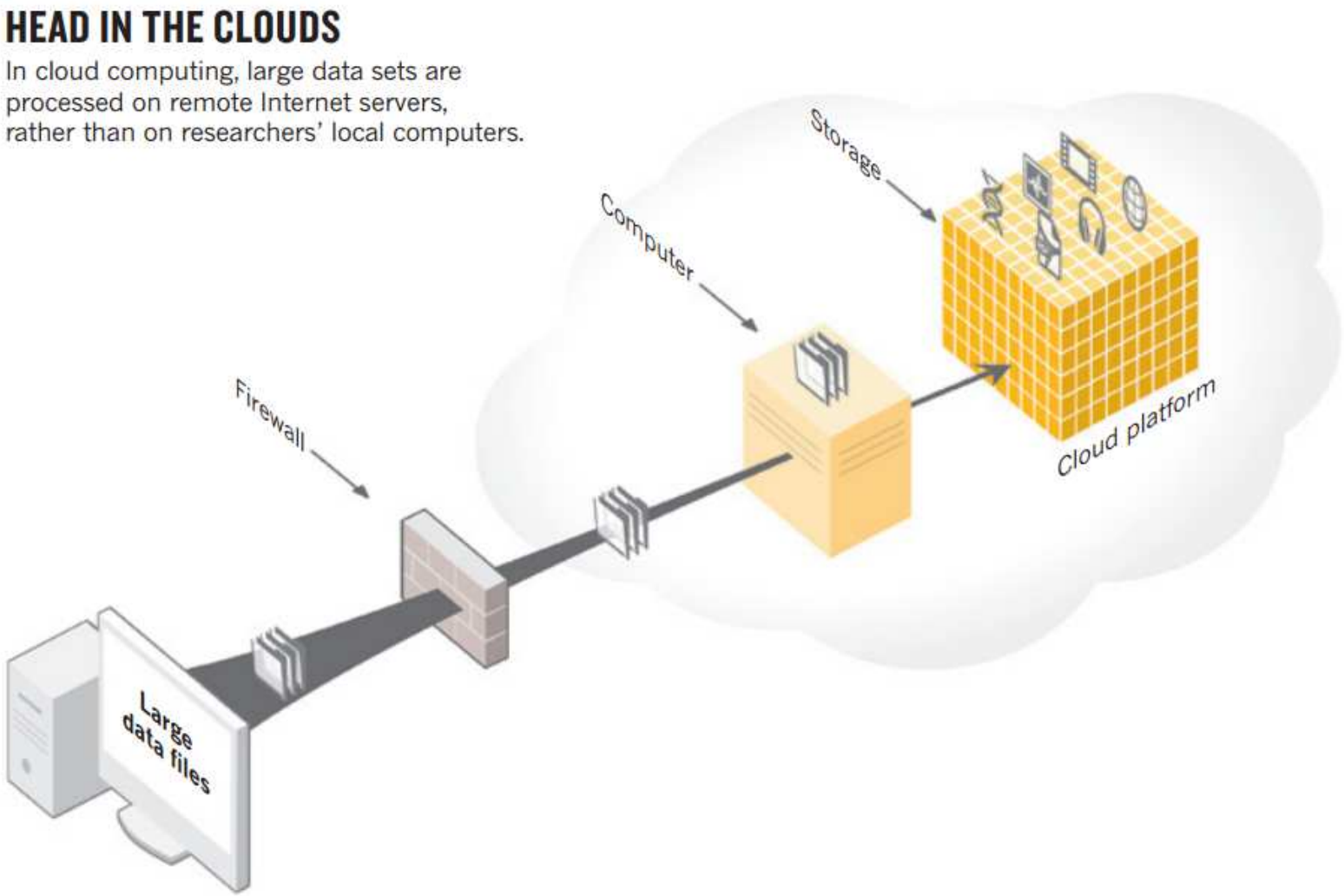
The need for efficient data management



Total data storage trends



Cloud Data : On the Internet



To read more

Software engineering
http://en.wikipedia.org/wiki/Software_engineering

IEEE Software Engineering Body of Knowledge
http://www.computer.org/portal/web/swebok

Databases
http://en.wikipedia.org/wiki/Database

A look at a 7,235 Exabyte world
http://www.zdnet.com/a-look-at-a-7235-exabyte-world-7000022200/

To learn more, use a new search tool: InstaGrok

Thank you!

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