Requirements of a Modern Database for Software Engineering

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Outline

- Basis – Software / Database

- Software Requirements for modern world

- Requirements of a database

- Requirements of a database in modern world

- Impact of requirements on database development

- Conclusion

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Basis - software

- **Computer software**, or simply **software**, is a collection of data or computer instructions that tell the computer how to work.

- Most of the software are modelled to handle influx of data, manage it and provide results as needed or required by users.

- In short – software is application + storage.

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Kinds of Storage - Databases vs File Storage

Image reference - http://www.isoftweb.website/database-system-vs-file-system/

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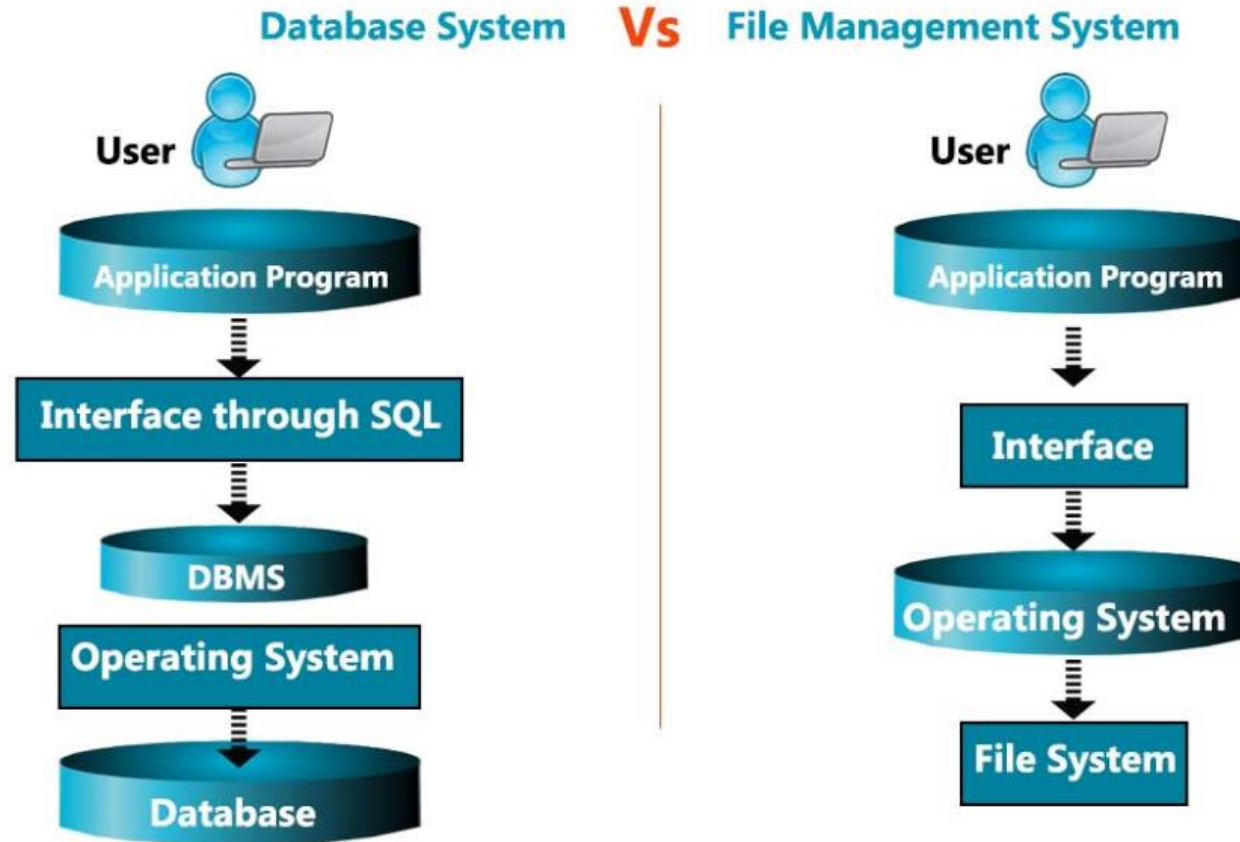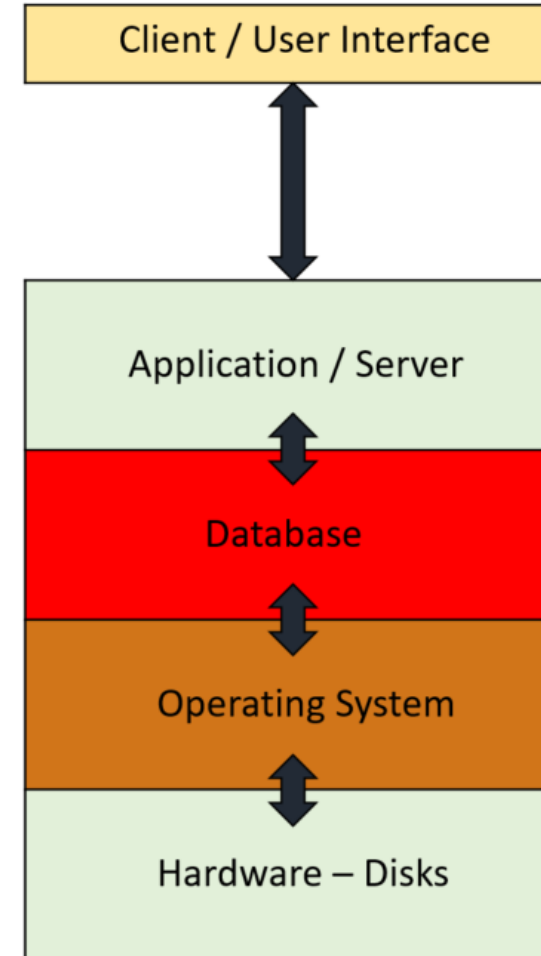WATERLOO

Basis – 1000 feet view of Software
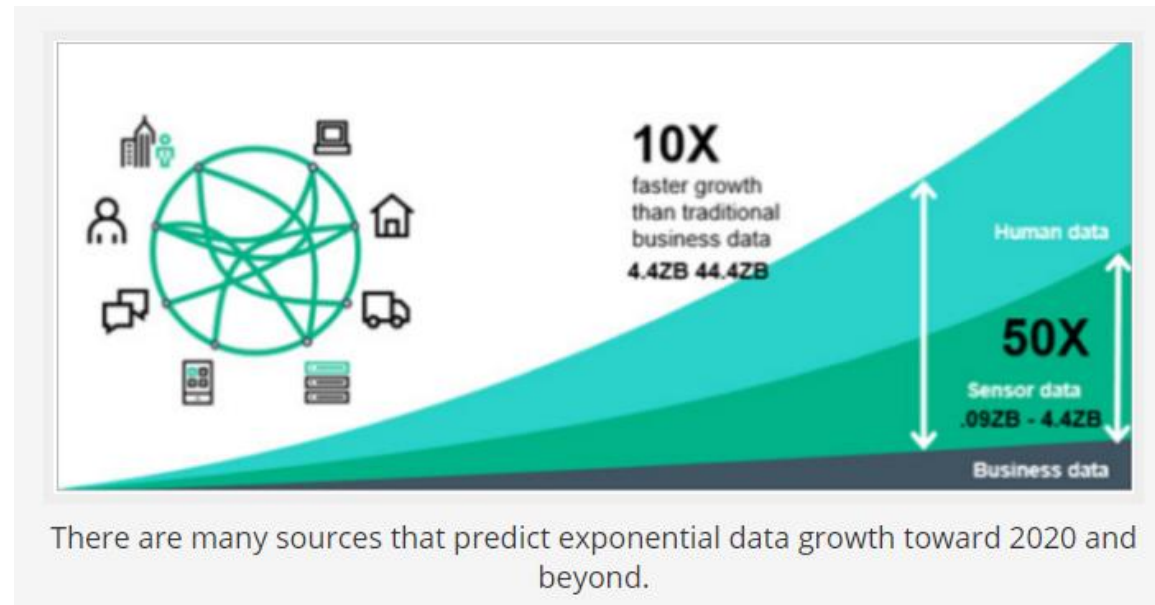
- User Interface
- Application

To sum up,

Get user input, store it and process it whenever required giving the user responses with the lowest latency.

Need of the Hour

- Data is everywhere and increasing day by day
- Increasing data size ∝ Increased complexity to handle it
- Changing data trends
- Changing volume of data
- Technology shift -> workload shift
- Higher impact on software and requirements will change with time to time.

- Time for agile to improve productivity and meet the ends

The above points are valid both for a flexible Software and emerging database

10X
faster growth than traditional business data
4.4ZB 44.4ZB

50X
Sensor data
.09ZB - 4.4ZB

Human data

Business data

There are many sources that predict exponential data growth toward 2020 and beyond.

*Reference - https://insidebigdata.com/2017/02/16/the-exponential-growth-of-data/*

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Software vs Database – Are their same ?

- Design evolve to meet performance needs.

- Kind of operations/workload

- Kind of data being handled

- Dynamics of data access

- Data Security

Requirements for a software product impacts

the underlying database technology.

Software development Engineering

Database Technology

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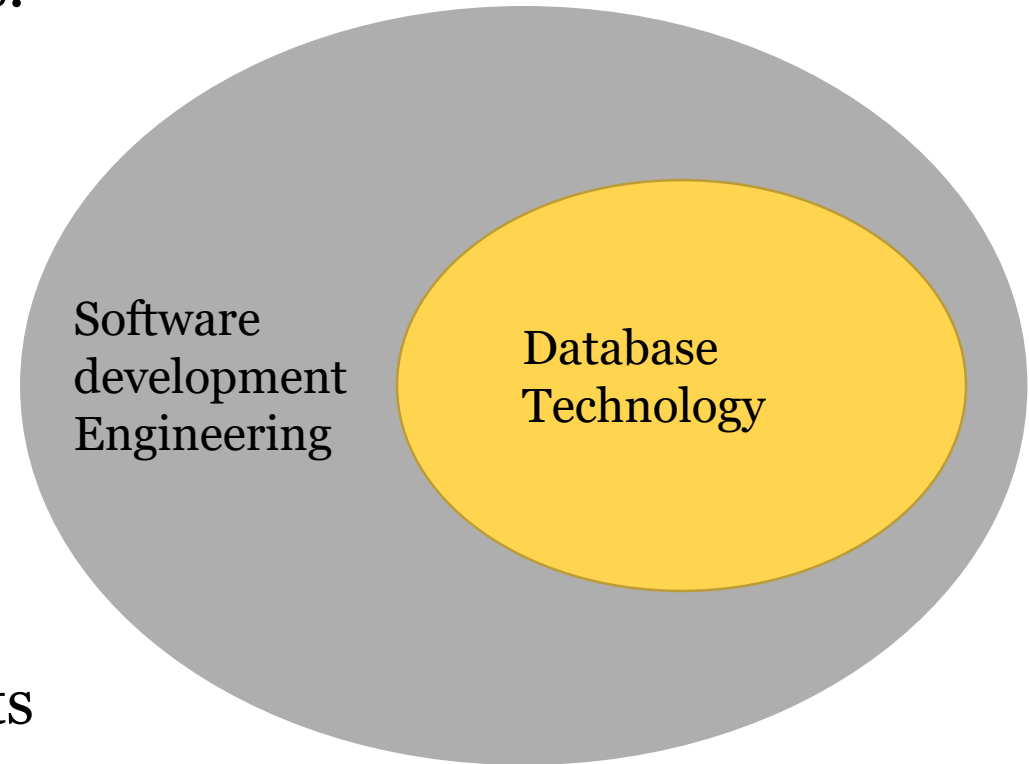
Requirements for a Database – Two sides of a coin

- Software engineering practices are used to develop database
- Databases make Software development easy and reliable.

Which is the head and tail ?

Head or Tail - Database technology
Tail or Head -Software engineering

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Requirements for an effective database

- Consistent data
    - At transaction level
    - At user level – multiple users
    - Hardware failures

- Data independence

- Integrity of data
    - At storage level – avoid corruption
    - At computation time – avoid illicit computation (semantic wise)

- Real world datatypes support
    - Support complex data types like – JSON, XML etc.,

Requirements for an effective database

- Data Modeling

- Persistence

- Standard Querying format

- Security

- Secondary Storage Management

- User defined function support – in native language

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Requirements for an effective database

- Distributed and heterogeneous data access

- Real world datatypes support
    - Support complex data types like – JSON, XML etc.,

Requirements for a Modern Day Database

- Today is a world of SCRUM!

- Faster development based upon flowing requirements

- Databases are built from scratch but cannot adapt with the speed of software requirements, leading to extra complexity of data handling on application layer (i.e., software).

- Requirements are different for a current day database i.e., database for agile process.

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Requirements for a Modern Day Database – Software Engineer Perspective

Pro Software Engineer

- Support Documentation
- Complex data type support
- Utility support – Data loaders, movers etc.,
- Easier configuration management
- Standard query language support
- Consistent behavior
- Online Community Support

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Requirements for a Modern Day Database – Scrum Master Perspective

- Support Documentation
- 24X7 database product support – Online and offline
- Ease of use
- Adaptive to software development needs

DB Administrator responsibilities are to be adjudged for a scrum master as its all about usability

- Automated backup support
- Automated Reconfiguration
- Flexible knob options

Pro Scrum Master

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Requirements for a Modern Day Database – Product Owner Perspective

- Elasticity
- Lower Maintenance cost
- Cloud Storage
- Security
- No downtime
- On demand feature support
- Adaptive to current day technology

- Cross platform or database support
- Easier Migration Costs (jeez)

Pro Product Owner

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Requirements for a Modern Day Database – User Perspective

- Faster Response Time
- Lower latency

- Lower the cost better it is.

User

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360 Degree view

Ease of Extensibility

Product Owner

Ease of Access

User

Database

Ease of Usability

Team Member

Ease of Adaptability

Scrum Master

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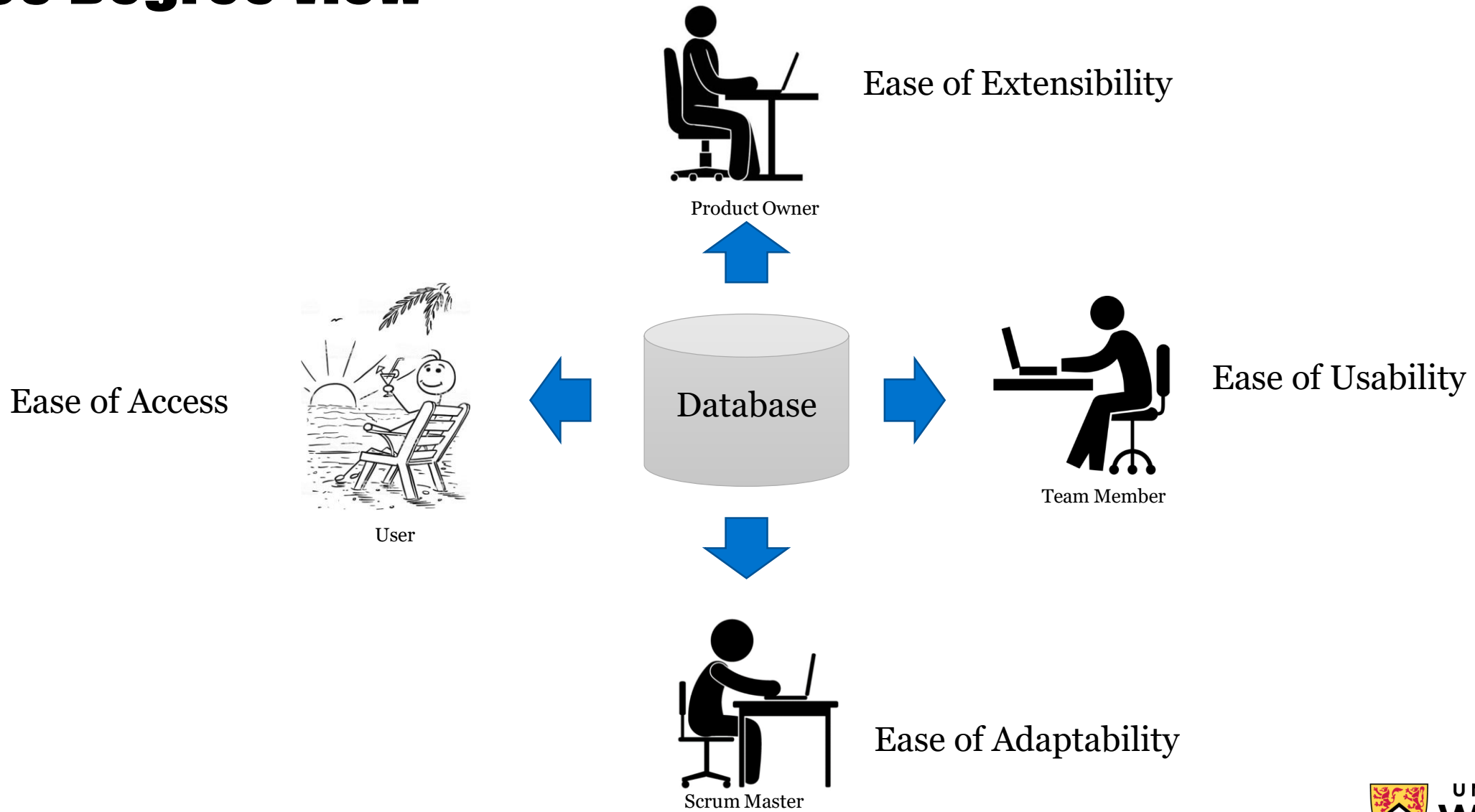
Impact of SE Requirements on Database Development

- Viable Software Requirements are addressed by databases

- Few trends –
  - Temporal support has become a standard feature
  - Columnar storage
  - Unstructured data handling
  - In-Memory databases – for cutting down I/O cost similar to caching results in software
  - External Table support – Data handling across platforms
  - User defined functions
  - Security features

Impact of SE Requirements on Database Development

- Current days – ML function support

- Data Analytics support

- Database as a Service

- Most of the databases catch up with requirements and evolve depending upon trends.

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Example of a modern day database – VoltDB

- VoltDB is an Inmemory database
- Voltdb was developed considering the requirements of present day workload and having everything in memory.
- Designed by Michael Stonebraker

Extensible features -

- Cloud Ready
- UDF support
- ML
- Continuous release

Highlights

- We intend to bridge the gap between software engineering and database ?

- We tried to ponder over the factors for selecting a database ?

- Analyzed the requirements for a database in an agile environment.

- Do software requirements have an impact on Database development ?

Conclusion

We come up with general requirements of a database for modern software development and stress on the point that requirements for software's have had an impact on databases and their development.

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References

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