BIG DATA

Introduction : Characteristics and Architecture

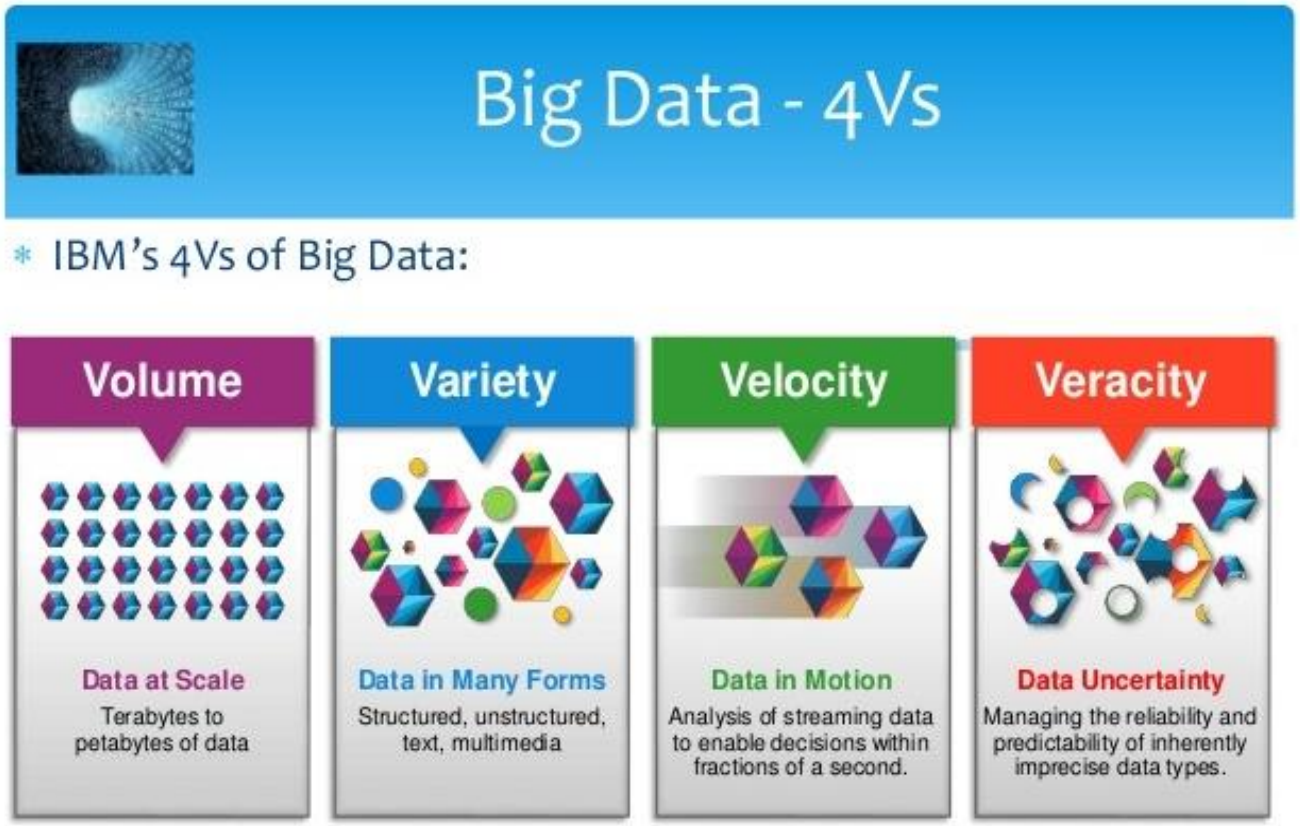
K V Subramaniam
Computer Science and Engineering
subramaniamkv@pes.edu

BIG DATA

Course Introduction Contd...

1. Big Data – Characteristics
2. Data Architecture Design
3. Data Format/Types
4. Big Data Platforms
5. Case Study - Google

BIG DATA
Characteristics – Quick Summary

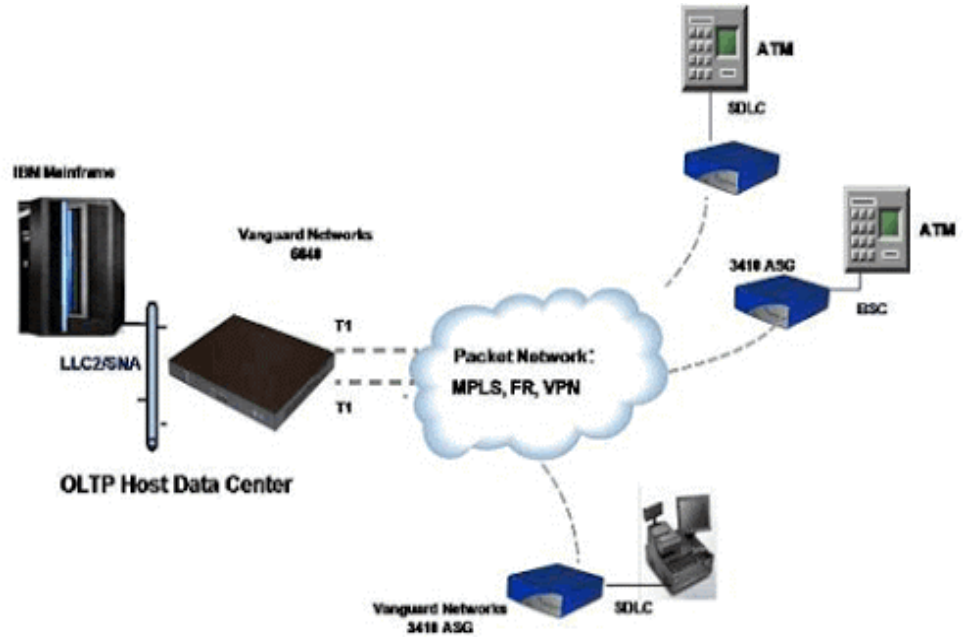


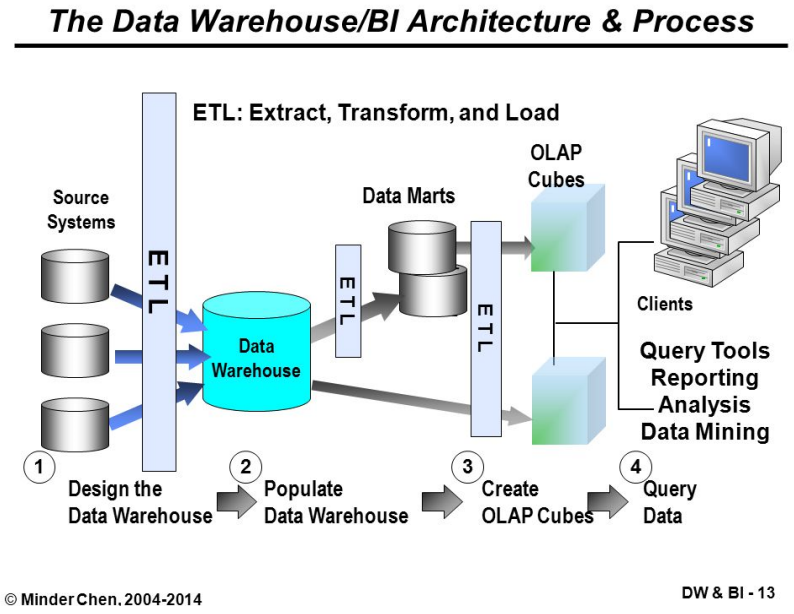
http://www.sliceofbi.com/2015/09/basics-of-big-data.html

Big Data: Characteristics - Volume

BIG DATA

Old Style Data





http://www.techbridge.solutions/home/solutions/solutions-ibm-applications/oltp-host-concentrator-solution/

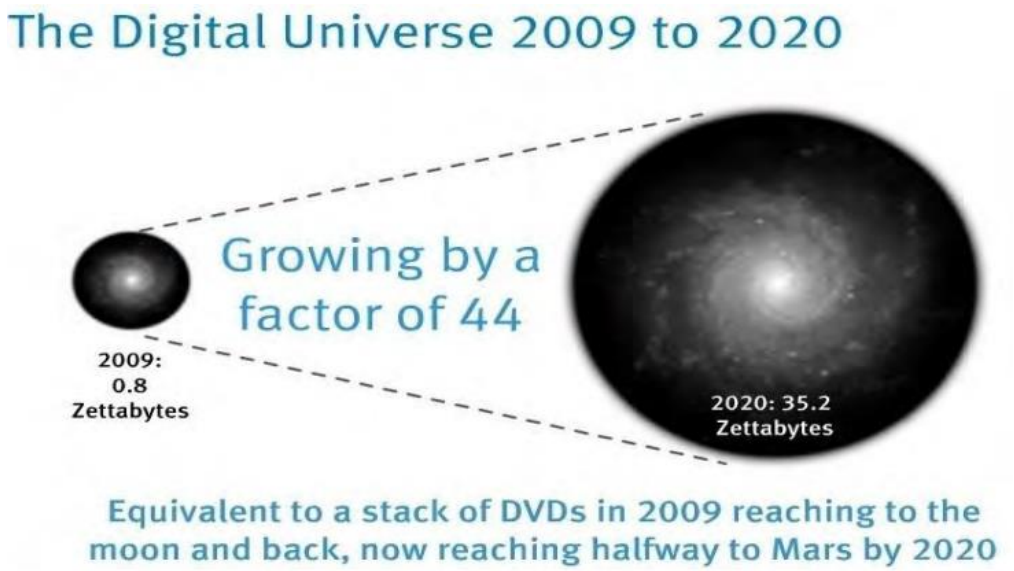
https://data-flair.training/blogs/business-intelligence-and-data-warehousing/

- Fixed schema and format
- Clean data
- Consistent
- Predictable data rates

- Elaborate ETL procedure (Not real time; once a day at best)
- Output mostly reports (Queries run in batches; take hours)

BIG DATA
Characteristics - Volume

- Old Style Data vs Big Data
  1-Scale (Volume)
  - 44x increase from 2009 2020
  - From 0.8 zetta bytes to 35zb
  - Data volume is increasing exponentially



http://www.egsa.org/Portals/7/Documents/CommitteeDocs/Misc/F15_Data_Center_Market.pdf

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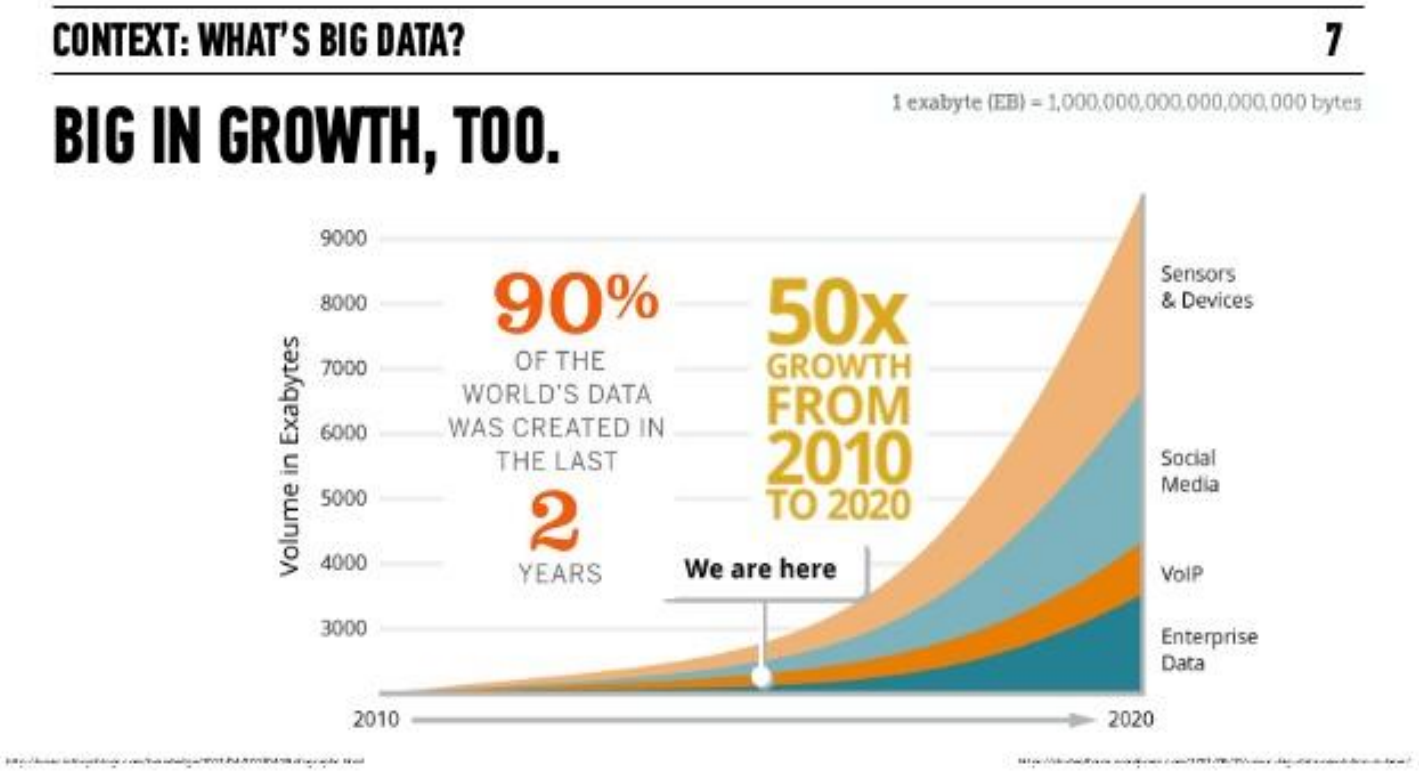
Characteristics - Volume

- Why is the volume so high? Who's Generating it?



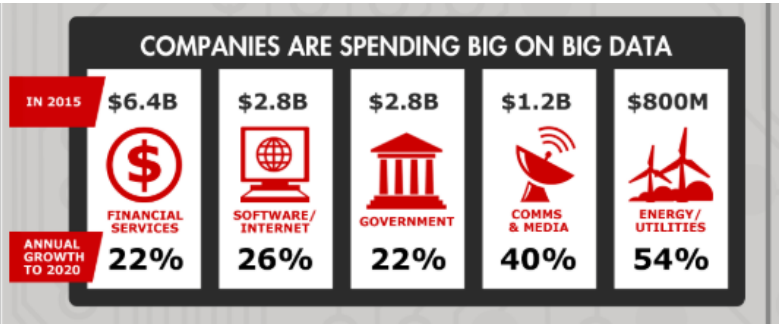
Old Style Data	Big Data
Enterprises only	Everybody

https://www.promptcloud.com/blog/want-to-ensure-business-growth-via-big-data-augment-enterprise-data-with-web-data/

BIG DATA
Characteristics - Volume

Old Style Data	Big Data
Manual entry	Automated

- How this VOLUME gets collected?
  - Financial Services
    - Stock trading, banking, financial services are all computerized (In India – no paper shares any more)
    - Every transaction is recorded
  - Energy / Utilities
    - Can put sensors in every home
    - Smart grid
  - Comms & media
    - Internet services



https://www.forbes.com/sites/louiscolumbus/2014/06/24/roundup-of-analytics-big-data-business-intelligence-forecasts-and-market-estimates-2014/#26c06d11388e

Big Data: Characteristics - Variety

BIG DATA
Characteristics - Variety

- Why is analyzing Big Data *complex*?
- Various formats, types, and structures
- Text, numerical, images, audio, video, sequences, time series, social media data, multi-dim arrays, etc…
- Static data vs. streaming data
- A single application can be generating/collecting many types of data

Old Style Data	Big Data
Fixed format / schema	Integrate Twitter, Maps, Facebook…

To extract knowledge ➔ all these types of data need to linked together

https://twitter.com/maritime_uk/status/1072159378931879937

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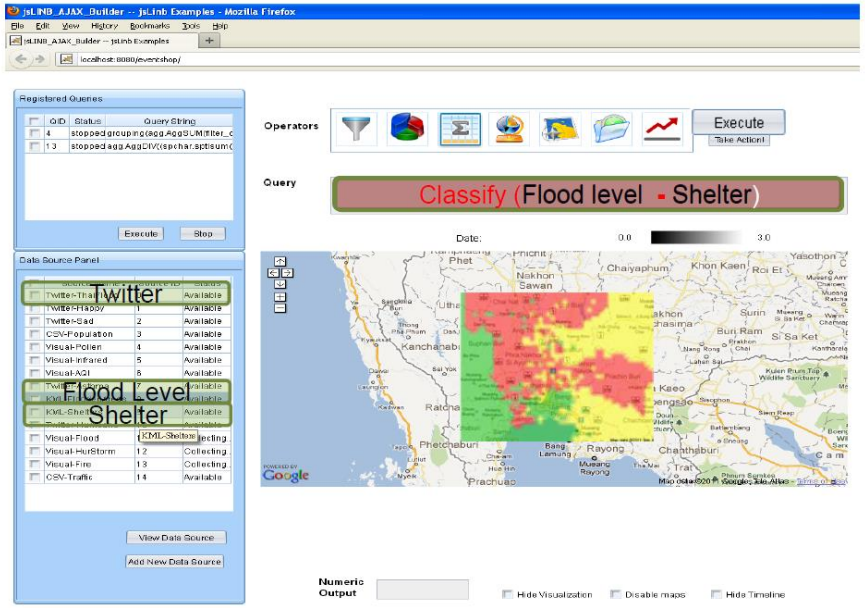
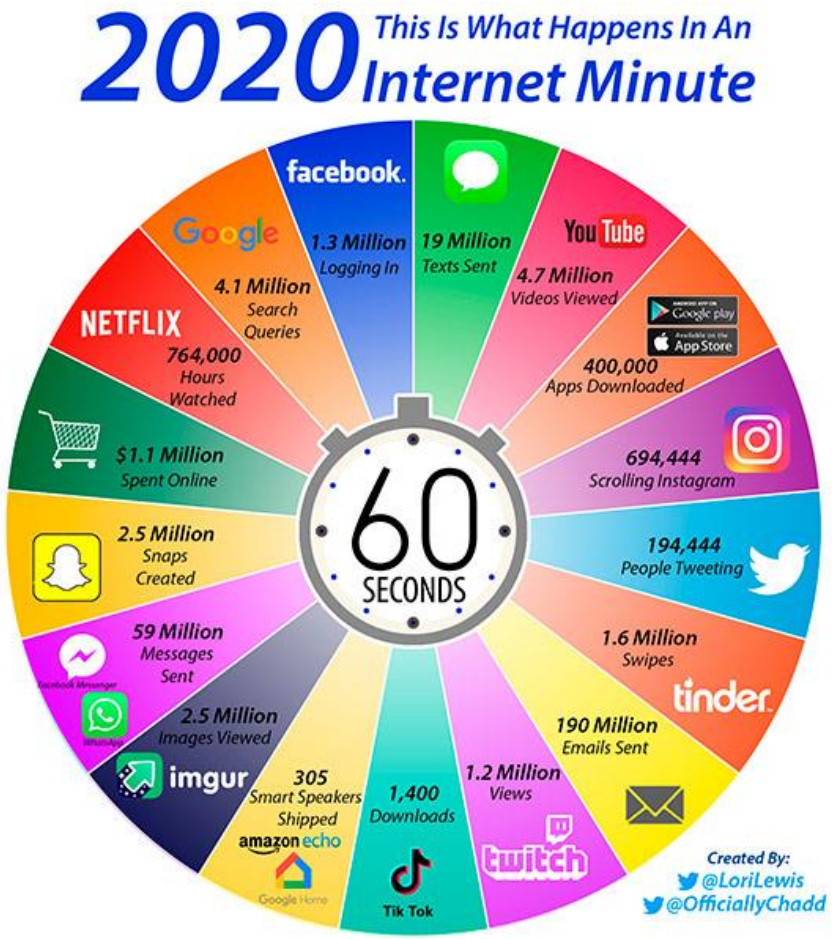
Characteristics - Variety

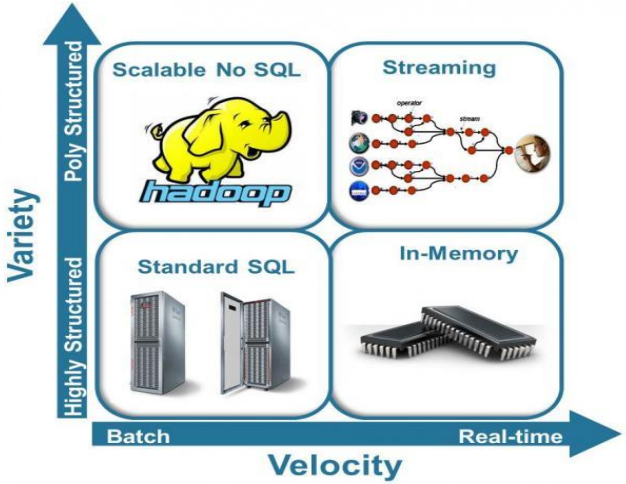
EventShop: Thai Floods



Big Data: Characteristics - Velocity

BIG DATA
Characteristics - Velocity





Source: Forrester Webinar: Big Data: Gold Rush or Illusion?, Sept 19, 2013

https://go.forrester.com/blogs/14-05-27-boost_your_digital_intelligence_with_big_data/

https://www.allaccess.com/merge/archive/31294/infographic-what-happens-in-an-internet-minute

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Characteristics - Velocity

Nokia launches real-time mobile network analytics platform

Staff writer | July 28, 2016 | Telco Analytics Asia

https://www.nokia.com/about-us/news/releases/2016/06/30/nokia-real-time-mobile-network-analytics-provides-instant-correlation-of-network-wide-data-and-its-impact-on-customer-experience/

The analytics link the performance of applications and devices to network issues in real-time, effectively making every mobile device part of a network test bed.

This enables operators to pinpoint potential causes of service degradation much more rapidly than they can today since they no longer need to consult a myriad of tools and correlate the data from them manually. It also offers engineering teams a proactive way to understand over the top (OTT) application impacts on the network and optimize opportunities.

Old Style Data	Big Data
Input data at night	Real-time input
Output daily report	Real-time response

Big Data: Characteristics - Veracity

Characteristics - Veracity

Veracity

refers to the messiness or trustworthiness of the data.

Accuracy cannot be controlled due to

- Hashtags
- Typos
- Abbreviations

Need to work with such data

Traditional: manually entered, fixed fields, less chance of error

Old Style Data	Big Data
Clean data	Inconsistent data

BIG DATA
Characteristics - Veracity

- How people get multiple PAN cards

- Slight changes in name and address
  PES University, 100 ft Road…
  PES university, BSK III stage...
  Pes University, Dwaraka Nagar...

- Names and addresses don't match

- But postman / courier will deliver to correct place!!!

Big Data: Data Architecture Design

BIG DATA
Data Formats / Types

Structured Data

0.103	0.176	0.387	0.300	0.379
0.333	0.384	0.564	0.587	0.857
0.421	0.309	0.654	0.729	0.228
0.266	0.750	1.056	0.936	0.911
0.225	0.326	0.643	0.337	0.721
0.187	0.586	0.529	0.340	0.829
0.153	0.485	0.560	0.428	0.628

Databases

Unstructured Data

Documents, Tweets, Videos

Semi Structured Data

Emails, XML

http://biisfun.blogspot.com/2016/03/big-unstructured-data-vs-structured.html

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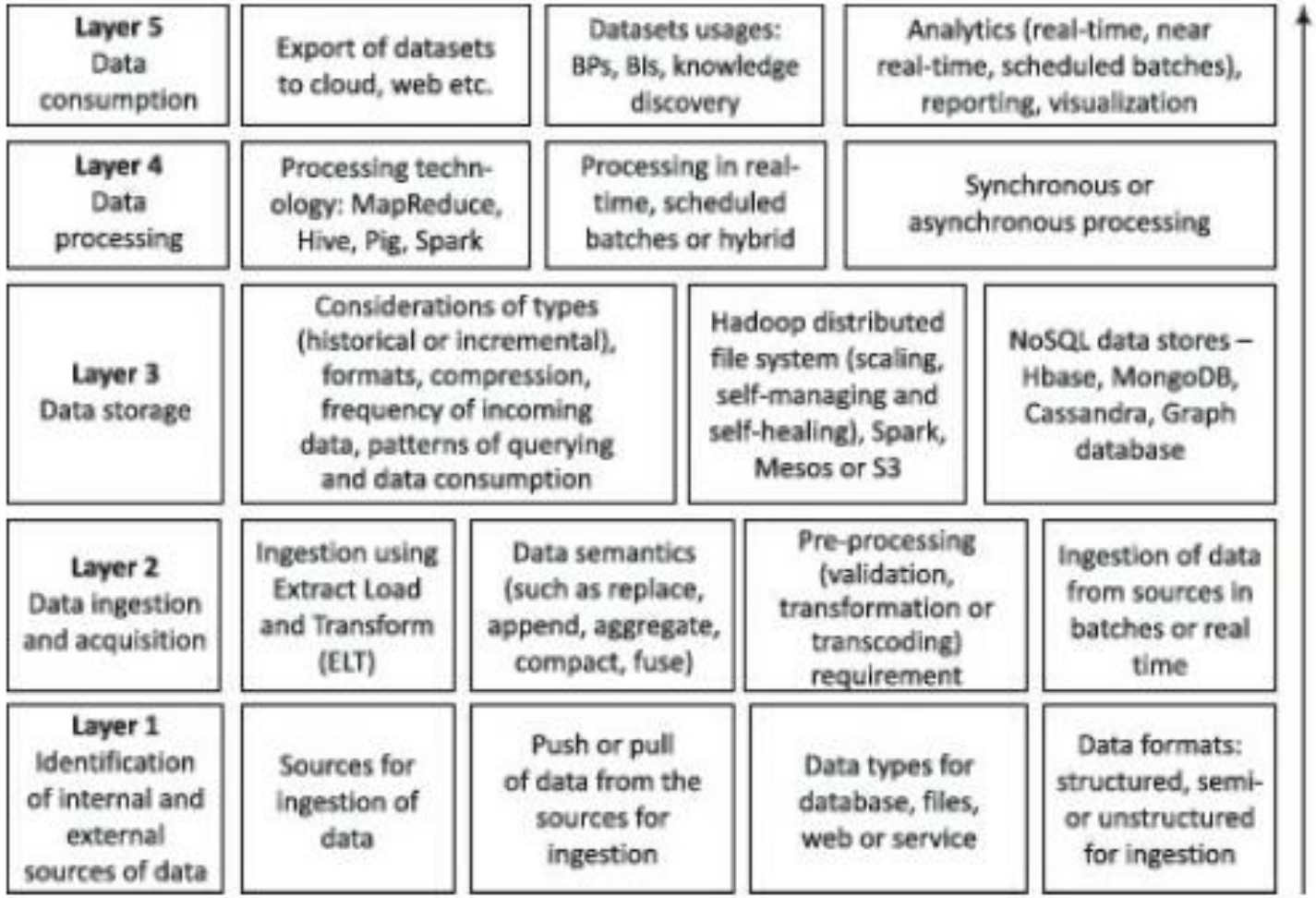
Data Architecture Design



T1: Fig 1.2 – Logical layers in data processing architecture and their functions.

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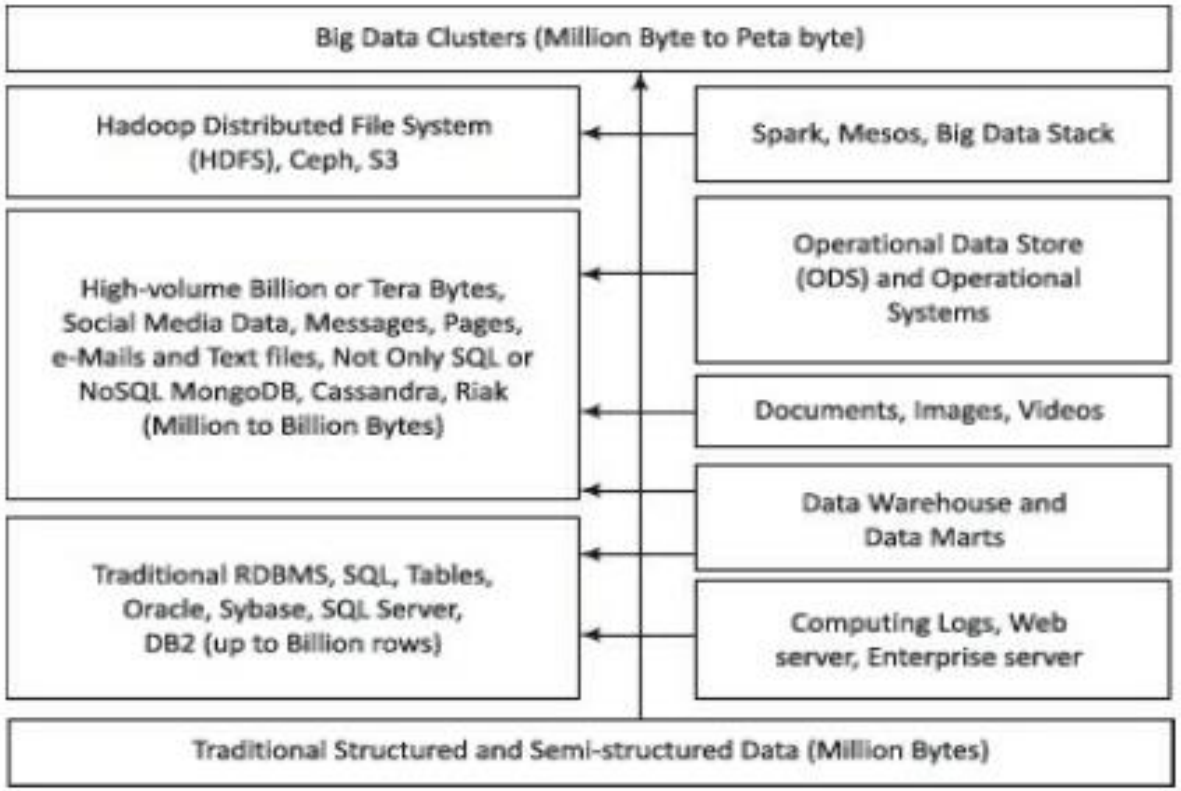
Data Formats / Types : Big Data Storage

- Data storage for traditional and Big Data



T1: Fig 1.7 – Big data storage plan – RDBMS and NoSQL together

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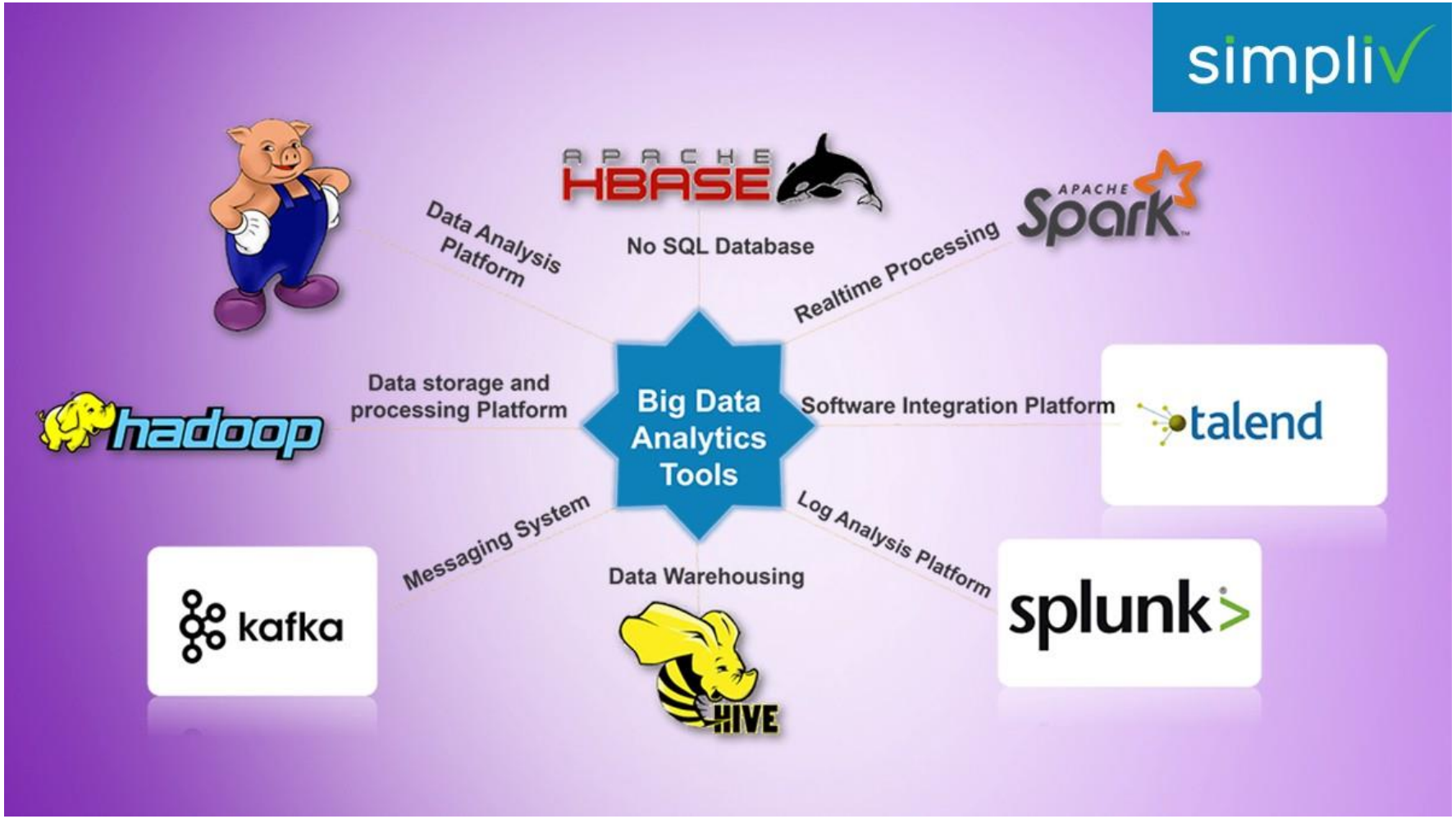
Big Data Platforms



https://medium.com/@satyanageshan8/5-prominent-big-data-analytics-tools-to-learn-in-2019-ee1d4f5b98ce

Big Data: Case Study – Google Search

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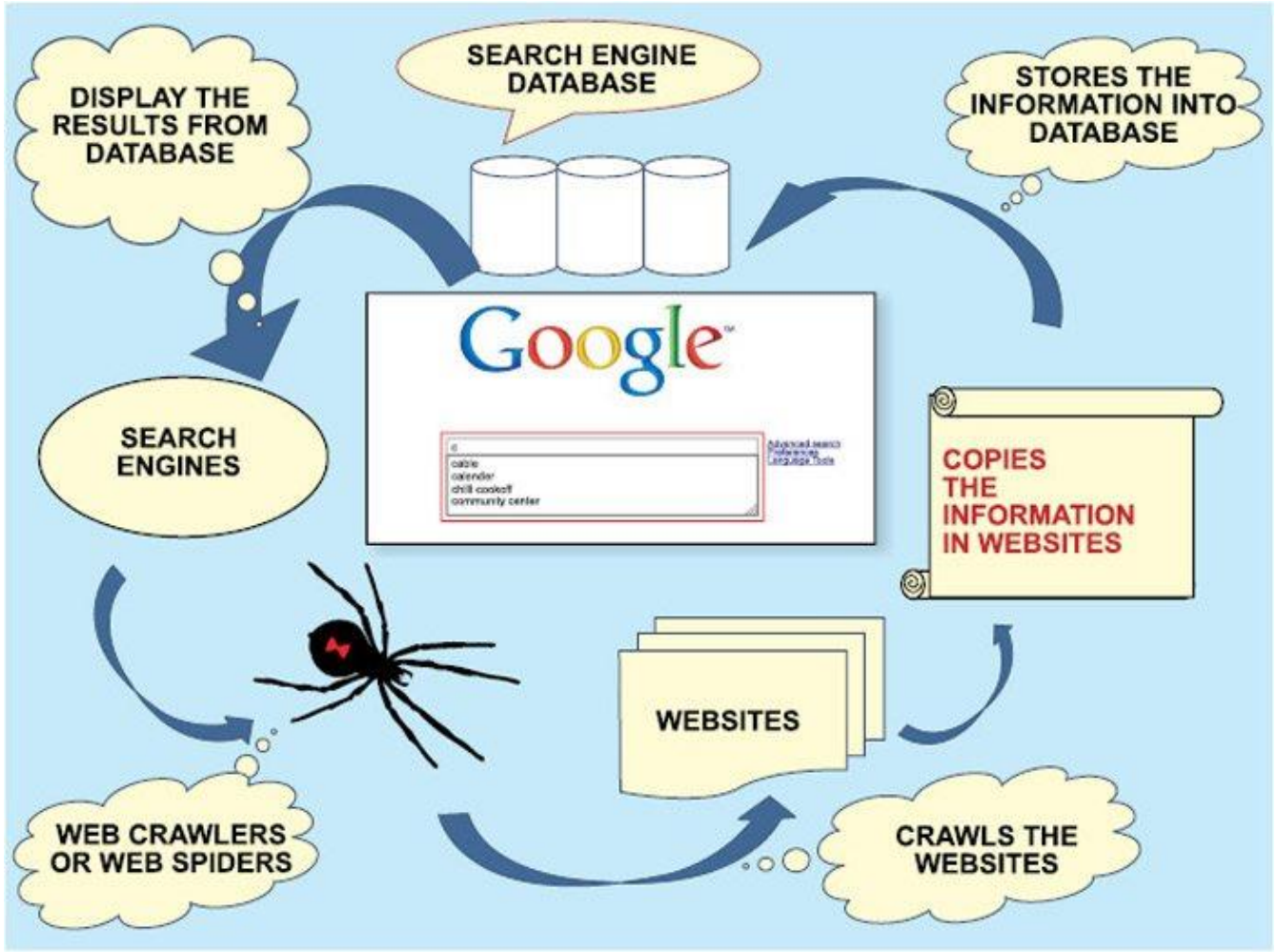
Case Study: How Google Search works?



https://www.electronicsforu.com/resources/how-google-search-engine-works

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Interesting facts about Google Search

https://en.wikipedia.org/wiki/PageRank

- Google initial implementation
  - 24 M web pages, 322 M links
  - 5 days to compute Page Rank
    - Page rank is proportional to the popularity of the page
    - If more links point to a page, that page will be more popular
- Page Rank – Treats the web as a graph
  - User -
    - Starts at a random page
    - Takes a random link
  - Page Rank Assumptions –
    - The more popular a page - The better is its quality

THANK YOU

K V Subramaniam
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subramaniamkv@pes.edu

+91 80 6666 3333 Extn 877