



NETSENSE: a big data software system to improve Vietnam state authorities performance towards sustainability

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Institute of Information Technology (IOIT)

- IOIT - largest and pre-eminent IT research institution in Vietnam
 - One of 30 national member institutes of VAST
 - Leading institution for IT R&D activities
- Brief history: established in 1976
 - Institute of Computer Science and Cybernetics (ICSC), 1976; Institute of Informatics (IOI), 1989; **Institute of Information Technology (IOIT)**, 1993
- Human resources: organized in 17 research departments
 - 150 permanent members (titled as **public officers**) including ~40 Dr. Sc., PhDs and ~10 Prof, A/Prof; Respective leading experts in various IT fields in Vietnam; Plus about 40 contract-based members
- Notable achievements:
 - Assembling the first PC in Vietnam (1979)
 - The first to introduce Internet to Vietnam (early 1990s)
- NetN@m: a spin-off company (early 2000s)
 - One of the first four ISPs in Vietnam



Institute of Information Technology (IoIT)

www.ioit.ac.vn

**Department of
Administration**

**Key Lab for Networking
Technology & Multimedia**

Departments

1. Integrated Software Systems
2. Data Science and Application
3. Software Engineering in Management
4. Software Engineering and IT Solution
5. Geographical Information Systems
6. Pattern Recognition and Knowledge Engineering
7. Management Information Systems
8. Computer Networking and IT Infrastructure

9. Telematics
10. Mathematical Aspects of IT
11. Computational Statistics
12. Automation Technology
13. Applications of IT to Control
14. Expert Systems and Soft Computing
15. Systems and Management Research
16. Virtual Reality Systems
17. Natural Language Processing



Industrial Revolution 4.0 and Big data analytics

- Industrial Revolution 4.0 in Vietnam:
 - Technologies: AI, Cloud computing, IOT, Robotics, **Big Data**, 3D Printing, Block Chain, etc. → benefited to SMART topics
 - Attracts much attention from government organizations and private sector
 - **Directive 16/CT-TTg of Vietnam PM on enhancing access to the fourth industrial revolution (May 2017)**
 - Talk to Actions: Smart cities, IR 4.0 technology application
- Big data could be defined via 4 V's: Volume (large amounts of data), Variety (the data comes in different forms), Velocity (the content of the data is constantly changing) and Veracity (statistical errors and misinterpretation of the collected information).
- Big data analytics and business worldwide revenues are growing: \$122 billion (2015) → \$187 billion (2019)
- In Vietnam: 50 million Vietnamese users on Facebook, 100 million 3G/4G mobile subscribers → large opportunity to a variety of applications including SMART topics

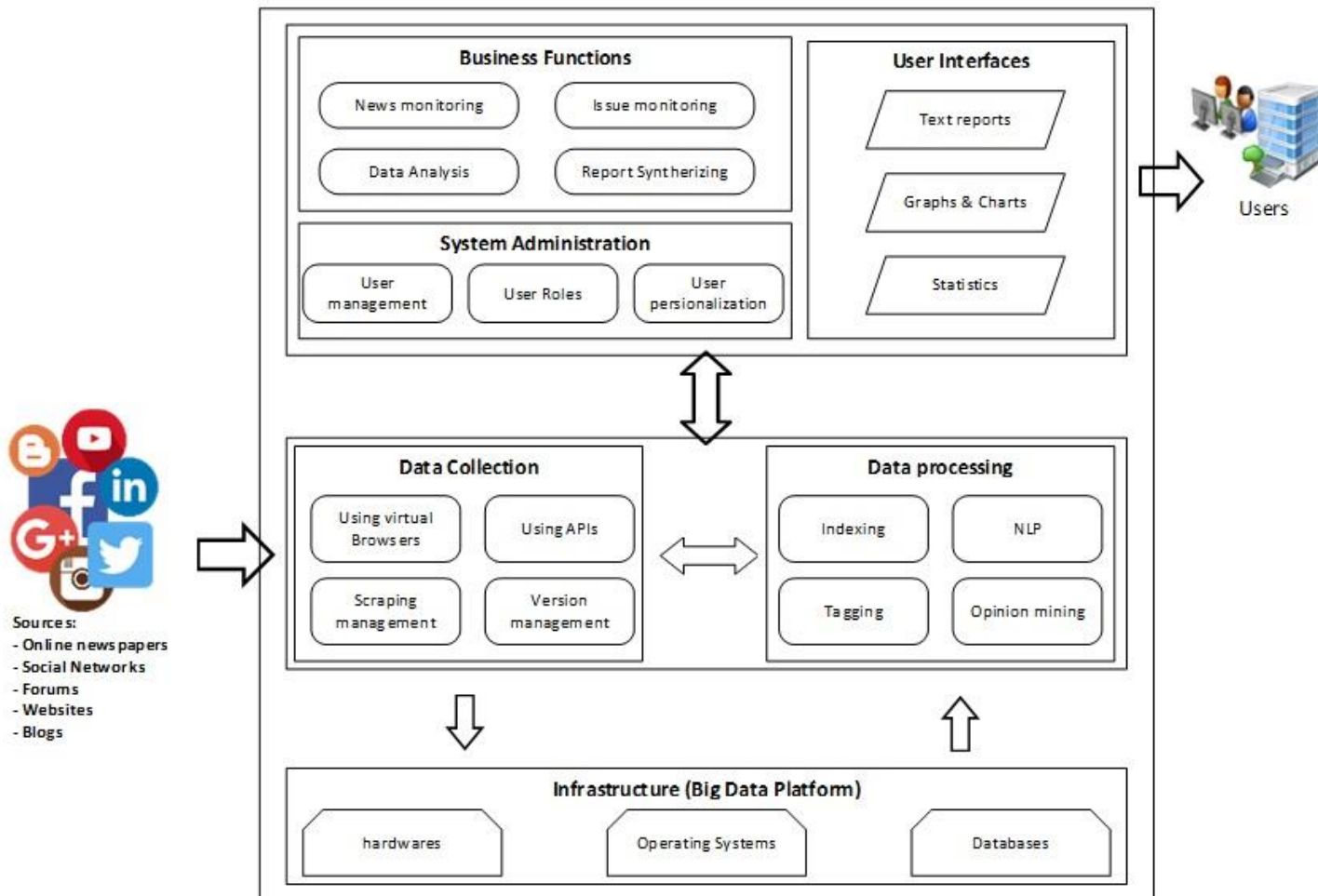


NETSENSE: a big data software system to improve state authorities performance towards sustainability

- NETSENSE for public organizations can aggregate and analyze online data such as newspaper, forum, social network. The output from NETSENSE is used to evaluate, to monitor the social interest trends or **special events** in several sectors such as politic, economy, education, transport, healthcare, natural resource, food hygiene etc.
- Techniques utilized in this software, including information retrieval, information extraction; big data storage and processing technologies such as Hadoop, Spark, MongoDB, ElasticSearch, Cassandra, Apache Phoenix; natural language processing techniques for English and Vietnamese, later the system can be extended to other languages, if needed; statistical analysis techniques, data mining and machine learning for text mining, clustering and classification etc.;
- NETSENSE current deployment: public organizations such as Ministry of Public Security and some provinces, e.g. Thai Nguyen, Ninh Thuan. Recently, many organizations show their interest to this software



NETSENSE Architecture





NETSENSE practical use Scenarios

Scenario 1: Collect and analyze weather data in a long period (50-100 years) to make prediction on potential flood/ drought and disaster.

Scenario 2: Provide report and data analysis on people evacuation, water level to assist state authority to plan storm evacuation plan, close/open hydro power reservoir

Scenario 3: People opinion mining on hot environmental events → to support state authorities to take proper actions at right time:

- Formosa steel companies (2017)
- Dead fishes in West lake of Hanoi (10/2016):
 - 200 tons of dead fish
 - People are panic
- Tree cut in Hanoi (3/2015)
 - Replace 6.700 old trees by new trees in 190 streets
 - Objection from Hanoians → project is stopped

Thank you!