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The testing challenges of a bigdata product integrated in a IOT project

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Agenda

- Big Data and IoT definitions
- Internet of Things (IoT) and Big Data Testing Approaches and Challenges
- Conclusion
- How Can you create tests and automate your business?

Big Data Definition

"data sets are generally quite large, taxing the capacities of main memory, local disk, and even remote disk. We call this the problem of big data. When data sets do not fit in main memory (in core), or when they do not fit even on local disk, the most common solution is to acquire more resources. "

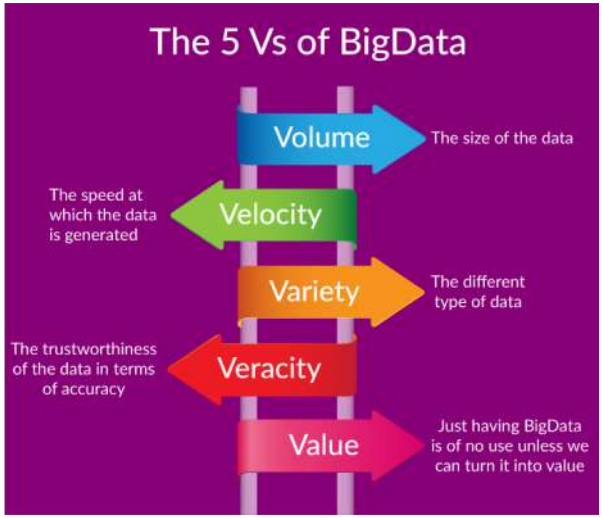
1997, scientist at NASA

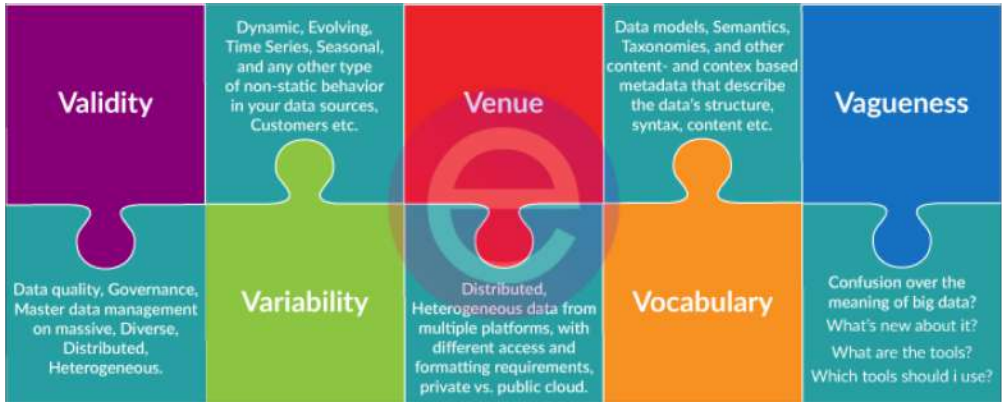
"data sets so large and complex that traditional data-processing application software are inadequate to deal with them. "

Wikipedia

In a narrow definition, Big Data is a term for a collection of datasets, that is so large and complex where existing tools and programs are no longer suitable to be used to process it at the moment.

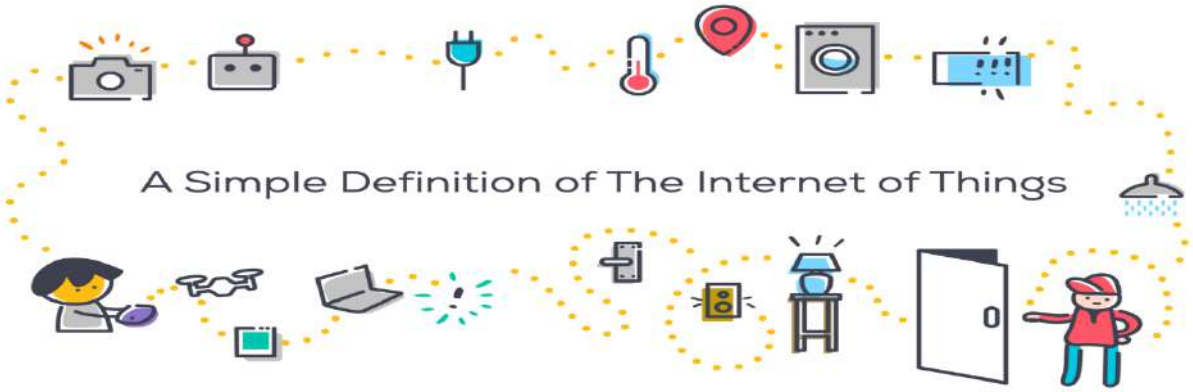
Big Data Definition (cont.)





Internet of Things

This is the concept of basically connecting any device with an on and off switch to the Internet (and/or to each other). This includes everything from cellphones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. This also applies to components of machines, for example a jet engine of an airplane or the drill of an oil rig. If it has an on and off switch then chances are it can be a part of the IoT. The IoT is a giant network of connected "things" (which also includes people). The relationship will be between people-people, people-things, and things-things.



Big Data Integration and Analytics in Hitachi Vantara

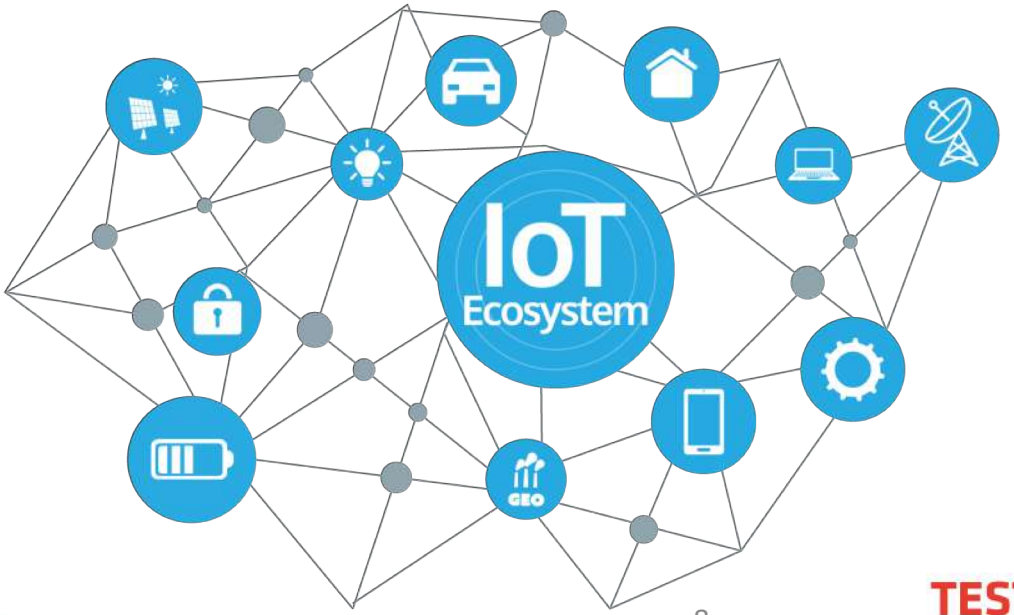
- Community Edition

- Eliminate IT complexity and delays so users can quickly get down to business. Adopt big data technologies that seamlessly integrate into your existing infrastructure.
- One of the major advantage of the community is to get answers from technical experts, discover insights from IoT thought leaders, and make connections with industry peers.
- Develop a simpler product easy to understand and get inputs of the community to create a powerful tool that can help clients to improve their business

Big Data Integration and Analytics in Hitachi Vantara

- Enterprise Edition
- Dynamic and reusable data integration templates enable users to create transformations on the fly.
- Enable users to ingest, blend, cleanse and prepare diverse data from any source. With visual tools to eliminate coding and complexity, Hitachi puts the best quality data at the fingertips of IT and the business.
- Accelerate time to value by uncovering real-time insights into a wide range of use cases, modernizing processing, and gaining control of the increasing volume of data

Internet of Things (IoT) and Big Data Testing



Challenges, Tools and Testing Approach

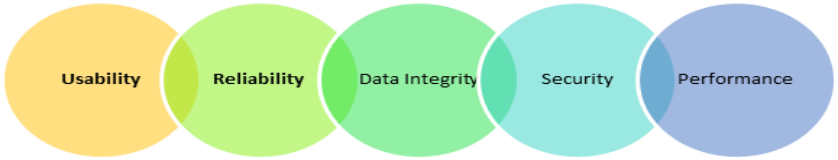
- When a question such as “What are the basic necessities of life” is thrown at people, most of them would answer, “Food, Shelter, Clothing”.
- But, that was the case before a century. Human beings have evolved to develop a handful of extra necessities for living. We have evolved to make our life, simpler, better, easier.
- We have stopped using switches to control lights, have stopped paying at kiosks to submit toll charges, we have been monitoring our health status smartly, tracking vehicular movements more efficiently and a lot in the list.
- How do we do it now? How is it so different? We need to understand these first after which we can learn how to test them.

Testing Challenges

Approach	Challenges	Tools
		

Testing Approach

- **Usability:** Usability in terms of displaying data, processing data, pushing job tasks from the devices should be tested thoroughly.
- **Compatibility Testing:** Testing items such as, multiple operating system versions, browser types and respective versions, generations of devices, communication modes is necessary for IoT compatibility testing
- **Reliability Testing:** Reliability and Scalability is important for building an IOT test environment which involves simulation of sensors by utilizing virtualization tools and technologies.
- **Connectivity and Data Integrity :** The system has to be available all the time and should have seamless connectivity with the stakeholders and It's important to check the Data integrity in IOT testing as it involves large amount of data
- **Security:** IoT is data centric where all the devices/system connected operate based on the data that is available.
- **Performance:** As testers, we need to make sure the system performs the same even though the added data is propagated



Testing Approach (cont.)

- **Pilot Testing:** During pilot testing, the system is exposed to a limited number of users in the real field. They use the application and give feedbacks on the system.
- **Regulatory Testing:** It is a better practice to get the regulatory requirements in the starting of the development cycle itself. The same should be made part of the testing checklist. By doing that, we make sure the product is certified for the regulatory checklist as well.
- **Upgrade testing:** IoT is a combination of multiple protocols, devices, operating systems, firmware, hardware, networking layers etc. When an upgrade is performed, be it for the system or for any of the involved items as stated above, thorough regression testing should be carried out/strategy should be adopted so as overcome upgrade related issues

Testing Elements

IOT elements Testing Types	Sensor	Application	Network	Backend (Data Center)
Functional Testing	True	True	False	False
Usability Testing	True	True	False	False
Security Testing	True	True	True	True
Performance Testing	False	True	True	True
Compatibility Testing	True	True	False	False
Services Testing	False	True	True	True
Operational Testing	True	True	False	False

Testing Challenges

- **Hardware-Software Mesh:** It is not only the software applications that makes the system but also the hardware ones, sensors, communication gateways etc. too play a vital role.
- **Device Interaction module:** As this is an architecture between different set(s) of hardware and software, it becomes mandatory that they talk to each other in real time/near real time.
- **Real-time data testing:** Pilot testing/regulatory testing is mandatory for a system such as this, it also becomes very tough to get such data.
- **UI:** We cannot omit the possibility of the UI being accessed from a device which we don't possess or simulate.
- **Network availability:** Network connection plays a vital role as IoT is all about the data being communicated in faster speeds all the time. IoT architecture has to be tested in all kinds of network connectivity/speeds.

Testing Challenges (cont.)

- **Volume:** The definition of big is not restricted to a specific number. Without parallel processing, it would be impossible to go through the entire set.
- **Velocity:** It's not only a matter of volume but also of speed. This pain point can also be addressed by distributed computing and parallelization. The methods used should focus on increasing performance.
- **Variety & Variability:** Big Data can't be put in a data frame. Its lack of homogeneity and standardization requires designing new ways of retrieving, querying and testing it.
- **Value:** Evaluating the potential applications of data is necessary to plan out investments in it. The same data can be used differently and combined with other sets to get new patterns and insights.

Testing Tools

Two most effective IOT testing tools are:

1.Shodan

- Shodan is an IOT testing tool which you can use to discover which of your devices are connected to the Internet. It allows you to keep track of all the computers which are directly accessible from the Internet.

Download link: https://www.shodan.io/

2. Thingful

- Thingful is a search engine for the Internet of Things. It allows secure interoperability between millions of objects via the Internet. This IOT testing tool also to control how data is used and empowers to take more decisive and valuable decisions.

Download link: https://www.thingful.net

Best practices for effective IOT software testing

- Gray Box testing should be used with IOT testing as it allows to design effective test case. This allows you to know the OS, the architecture, third-party hardware, new connectivity and hardware device limitation.
- Real Time Operating System is vital to delivering the scalability, modularity, connectivity, security, which is important for IOT
- IoT Testing should be automated.

Conclusion

- Testing approach can be different based on the system/architecture involved. Testers should concentrate more on the Test-As-A-User [TAAS] approach rather than testing based on the requirements.
- One more major player in IoT and big data testing is the Integration testing. IoT and big data is successful if the Integration test plan is accurate and robust enough to catch flaws in the system.
- IOT and big data testing may be a tough/challenging job but, it is also very exciting as well for the testing team to certify such a complicated mesh of devices, protocols, hardware, operation systems, firmware etc.



How you can create tests to improve your business?




Automate your business

- The created tests must evolve integrations between systems and describe a full scenario
- Try to multiply that created tests to every similar scenarios
- Try to create huge integrity data to do testing scenarios with that volume of data
- Create testing scenarios for all different entry and exit points of the software
- Automate as much as possible all these actions to guarantee the software stability


THANK
YOU