The Information Revolution has created a digital world where more data is created in a single second than existed on the entire planet 200 years ago. OpenText believes analytics is the key to meeting the most pressing needs of anyone deluged in data and trying to make sense of it all. You need to turn information into insight to deliver value through wiser decision-making, quicker actions, more accurate predictions, and better customer interactions.

The newest front in the Information Revolution is the Internet of Things, which increases the need for analytics because the data it generates breaks previous records in terms of size, speed, and complexity. In this paper, we will speak to the Internet of Things and what it means for your business. We will also provide context with our unique approach to analytics, which combines both understanding of data, as well as engagement with it, to help you derive more value from all the data the Internet of Things creates.
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The Internet of Things

The Internet of Things (IoT) is most commonly defined as the networking of physical devices that have been embedded with software, sensors, electronics etc., and have network connectivity that allows these objects to collect and exchange data. This type of data collection and exchange creates billions of records in just seconds. The vastness of the data now available is mindboggling and many businesses are wondering what, if anything, they can do with this data that will enable better, faster, smarter decisions at all levels of their organization. Collecting data is easy, making sense of it can be complex.
The IoT Technology Stack

The IoT depends on a multi-layered stack of technology, including simple sensors, computing hardware, software, and services.

The most basic components include specialized semiconductors and sensors to collect data. Next, are the IoT endpoints, which centralize the data, whether for consumer products, such as refrigerators and fitness trackers, or business-to-business channels, such as delivery trucks and flight performance engines.

A layer of functional software ties together all these data streams into a unified platform, supported by a rich network of infrastructure providers.

Topping the stack is analytics software that visualizes and makes sense of the terabytes of data generated by the IoT. The field of analytics software can be broken down into multiple functions:

- **Edge Analytics**, which sorts through many high-speed streams of data at the source to deliver only the data that needs analysis.
- **Advanced Analytics** sits on top of an IoT stack, filtering and centralizing the myriad data streams into a central data store from which it extracts information – and often enriches the IoT data streams with other key process data – to perform real-time, historical, and/or predictive analysis.
- **Interactive Analytics and data visualization** are the final steps, making the insights delivered by the analytics tool available for users to view, interact with, and from which to derive understanding and business value.

![FIGURE 1](image)

*The value in distributed analytics.*
IoT Data Types

In general, IoT can be broken down into three main types of data: metrics and measures, transactional and diagnostic.

One of the most marked characteristics of the IoT world is that a data standard has yet to be established.

This is not really surprising. First, the IoT field is relatively young, compared to databases, web page design, product codes, or other collective technological projects. It can take years or even decades for rival vendors and Fortune 500 customers to unite behind a single standard.

Second, IoT data itself is so varied, from so many different sources, that it is difficult for any one vendor to expertly handle all the different types. As yet, there are no standard formats or tags for IoT data, which means the market is still somewhat chaotic. Anyone undertaking an IoT project needs to consider the advantages of working with an open, flexible analytics vendor that can handle a wide variety of data standards.

IoT, Digital Disruption and Decision-Making

Digital technologies have been disrupting business activities since the first mainframe punch card. Millions of jobs have been made redundant, yet millions more have been created. Now we anticipate that the Internet of Things, as part of the digital revolution, will bring an increasing reliance on self-service technology, sensors, and machine-to-machine communication, among other things. These systems promise to make organizations more efficient and unlock new ways of doing business.

But that is only if you can keep your head amid an avalanche of data. It is difficult to pick out the signal from the noise if there are a million signals. What you need is analytic tools to support data-based decision-making – to sift out irrelevant information and deliver more targeted, personalized reports that enable better, faster, smarter decision-making.

IoT projects make more intense demands on their analytic tools than most other types of business intelligence projects. The challenges fall into three main areas:

- **Scale** – Handling millions of users and billions of records, often terabytes of data at a time
- **Speed** – Updating signals hundreds of times a second, and publishing results to self-service interfaces demanding near-real-time status
- **Openness** – Supporting a wide range of data types and platforms, reflecting the lack of data standards in the IoT world
Meeting Key IoT Requirements – What is There to Understand?

The growing interest in IoT is driven not just by smart devices and sensors becoming more affordable and abundant, but by the technology to analyze the huge datasets they generate far more quickly and at lower cost than seemed possible even a few years ago.

What anyone interested in IoT applications needs to keep in mind is that it is no more than a collection of sensors without tools to collect and analyze the vast streams of data from those sensors, and then present that information visually for easier understanding.

Are you considering adding analytics to your IoT project? You will want to think about the return on investment (ROI) and then the nuts and bolts. Our IoT clients and consultants have identified an assessment process that can guide you through the development and deployment of an IoT analytics solution.

The first step is to consider the business drivers. These include not only the tangible benefits—improved uptime and/or lower repair costs from monitoring components at risk of burnout—but also intangible benefits, such as a better sense of the failure points of your system or greater customer satisfaction due to improved uptime. Then you estimate the project’s lifespan and the costs over that span, to calculate the ROI.

Next, consider the key requirements. Each of these requirements can be an obstacle to success, so think them through carefully:

- **Data Integration:** Define incoming data, including current sources, formats, streams, and possible future sources.
- **Openness:** Consider the interfaces to other systems that will be needed. Will you be using APIs such as ODA or REST? Or connecting to data sources, such as Cloudera® and Apache Spark™?
- **Customizability:** You will want custom graphs and charts that reflect the variables in your project in an easy-to-understand way. Ideally, they should be available as APIs.
- **Security:** Does your project comply with security standards? If your sensors are installed in the outside world or carry sensitive data, do they need end-to-end encryption?
- **Scalability and Throughput:** Estimate the volume of data and the minimum processing speed and bandwidth required.
- **Performance Management:** You need a solution that handles performance management effectively. Does yours offer alerts and triggers based on KPIs and/or metrics?
- **Embedded Capabilities:** Your analytics solution may need to be embedded in an enterprise application, such as a financial or supply-chain planning solution, or in a web page. Your priorities should be ease of embedding and the functionalities offered by your solution’s APIs.
- **Languages:** If necessary, does your proposed system include double-byte support for Asian character sets?

Finally, once you’ve designed a solution that addresses all your business drivers and overcomes any challenges posed by the eight key requirements, you need to isolate the critical success factors and test them in a pilot project. Then you can evaluate and refine the parameters as needed before expanding to the full-sized project.
Powerful Visualization for Immediate Understanding and Faster Decision-Making

We can intuitively take in a situation as a visual image much faster than, say, reading a table of numbers. A well-designed visualization makes relationships among pieces of information stand out.

Visualization is especially important with IoT projects because they are often coordinating millions of data points each minute into a pattern whose overall shape or trend is a key factor or where outliers need to stand out in real time.

Some of the key requirements for effective IoT visualizations include:

- **High density of information.** IoT implementations often involve many data streams for a single parameter (say, intersections in a large city’s road grid, or amount of available volume in all of a transportation company’s trucks) – more than could be effectively displayed in a single chart without overwhelming the reader.

- **Interactivity.** The densely packed information mentioned above is often displayed via hierarchies, where a single high-level data point expands with a click or mouse-over to a full chart in its own right. Moreover, IoT users often want to seek out their own connections and comparisons.

- **Easy modeling.** Because IoT technology can be used in so many industries and organizational roles, the possibilities are endless for the relationships users might want to explore, and the data types they need to incorporate. An effective IoT visualization tool will smoothly ingest any data type or format you want to use, and offer a wide range of charts, dashboards, and other visualizations.

- **Both real-time and historical comparisons.** For example, the tool will report and graph engine temperatures not just in real time but over time (to show if they’re trending up or down, or fluctuating wildly), and can compare them to benchmarks from other engine models.
How OpenText Analytics Meets Key IoT Requirements

The requirements for Scale, Speed, and Openness are what make OpenText Analytics an ideal solution for IoT analytics projects. Our Analytics Suite meets those demands through our flexible, powerful, industry-leading architecture and features. It can access a wide range of IoT data types; cleanse, enrich and blend IoT streams with other data sources; apply a wide range of algorithms and analytical techniques; and create rich interactive and easily embedded visualizations that bring your data to life, allowing you to spot trends and anomalies instantly.

OpenText™ InformationHub (iHub) can scale up to millions of users and billions of lines of data, while OpenText™ Big Data Analytics easily digests large-scale transactional, social, web, and other data types both on-premise or in the cloud, with the speed to serve up the near real-time results required by live IoT monitoring. Meanwhile, our intuitively designed interactive reports and design tools, such as OpenText™ Analytics Designer, streamline the learning curve for users, just as our low-code approach does for developers.

The ability to leverage any chart type in iHub, even third-party charting libraries, means you can more efficiently and effectively summarize the immense volume of data coming from your IoT sources. iHub allows you to visualize your IoT data any way you choose and these reports and custom visuals can then be embedded into other applications or web pages for easy sharing.

OpenText offers the industry’s broadest set of integration APIs, including IDAPI, JSAPI, REST, and more, making it an effective analytics platform for any flavor of IoT data. We effectively handle not just classic structured data (i.e. neatly formatted in rows in a relational database) but unstructured data, such as e-mails or free-form customer comments on a social media platform such as Twitter.

FIGURE 2

OpenText Analytics meets the key IoT requirements.
OpenText Analytics is Ideally Positioned for IoT Adopters

Our main advantages – openness, scale, and speed – match up with the Internet of Things’ main characteristics: lack of standards, big data, and need for speed.

Our advantages include:

- Enormous scalability, to billions of rows of data, to cope with terabytes-per-minute data flow from IoT implementations
- Near real-time stream and batch processing because of our unique architecture, which gets data straight from the semantic layer
- We also enrich IoT implementations with the missing ingredient, historical data, so that your IoT system can see not just what is going on this instant but look at historical insights (e.g. to track performance against KPIs)
- With new cognitive capacities, our applications can help systems learn (e.g. when a violation from a desired data range should trigger an alert or shutdown)
- “Future-proof” platform – despite lack of data standards, we are open so we can integrate with all kinds of data formats and protocols, MQTT and the like
- Easy embedding of our tools in other applications
- World-class reporting and visualization tools for greater understanding and appeal
- Our architecture is open and flexible, easily extensible
- We are leaders in the field, with a long history of developing and implementing real-world solutions
The OpenText Analytics Suite enables the end-to-end IoT analytics process through thoughtful, open, extensible design. Our unique architecture can aggregate data over time to uncover trends and correlations, as well as handle streaming data for real-time analysis and alerting, enabling the speed to serve up the real-time results required by live IoT monitoring. OpenText Analytics easily accesses and combines large-scale transactional, social, web, and other data types on-premise or in the cloud, enabling users to create reports and dashboards or make advanced predictions, and share their insights all using a web-based interface.

OpenText Analytics supports even the most demanding and mission critical implementations with the scalability to serve millions of users and billions of rows of data. With features such as performance management dashboards, conditional alerting and auto-updating, key performance indicators can be managed and monitored, helping you react immediately to issues and maintain an optimal IoT environment.

OpenText Analytics allows users to connect directly to incoming IoT data; clean, enrich, and blend it with other data sources for a single view; apply a wide range of algorithms and analytical techniques; and then create reports or dashboards through a drag-and-drop visual interface. These reports, and many other custom visuals, can then be embedded into other applications or web pages leveraging powerful APIs including REST and JavaScript.

Here’s how it works:

1. Ingest data from any device over any network via any broker. We offer speed with scalability to process billions of rows of data from nearly any source. Our engine integrates with a wide range of devices, stream processors, and edge brokers.
2. Model, using Big Data Analytics to enrich, explore and analyze data
3. Design, using Analytics Designer to create content and set up access to any data
4. Deploy, using iHub to bring information designs to life (making them interactive, personalized, trackable)
5. Display, where our APIs make it easy to embed visualizations in any app or device

![OpenText Analytics architecture](FIGURE 3)
This is Your Internet of Things – Make It Work for You

Organizations need to process ever-larger, more complex, and more varied sources of data. They also face growing demands from employees, customers, and partners to engage with information on a self-service basis, quickly, easily, and on any device. Many organizations underestimate both the impact of presenting better intelligence and the effort required to deliver it in a scalable, secure, understandable manner to an ever growing user base. This can quickly lead to IT overload and reports that do not harness or provide deep insight to the large amounts of data that businesses need to make smart, agile decisions.

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Open Text Information Hub (iHub)
OpenText Analytics Designer
OpenText Big Data Analytics

About OpenText

OpenText enables the digital world, creating a better way for organizations to work with information, on premises or in the cloud. For more information about OpenText (NASDAQ: OTEX, TSX: OTC) visit opentext.com.

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