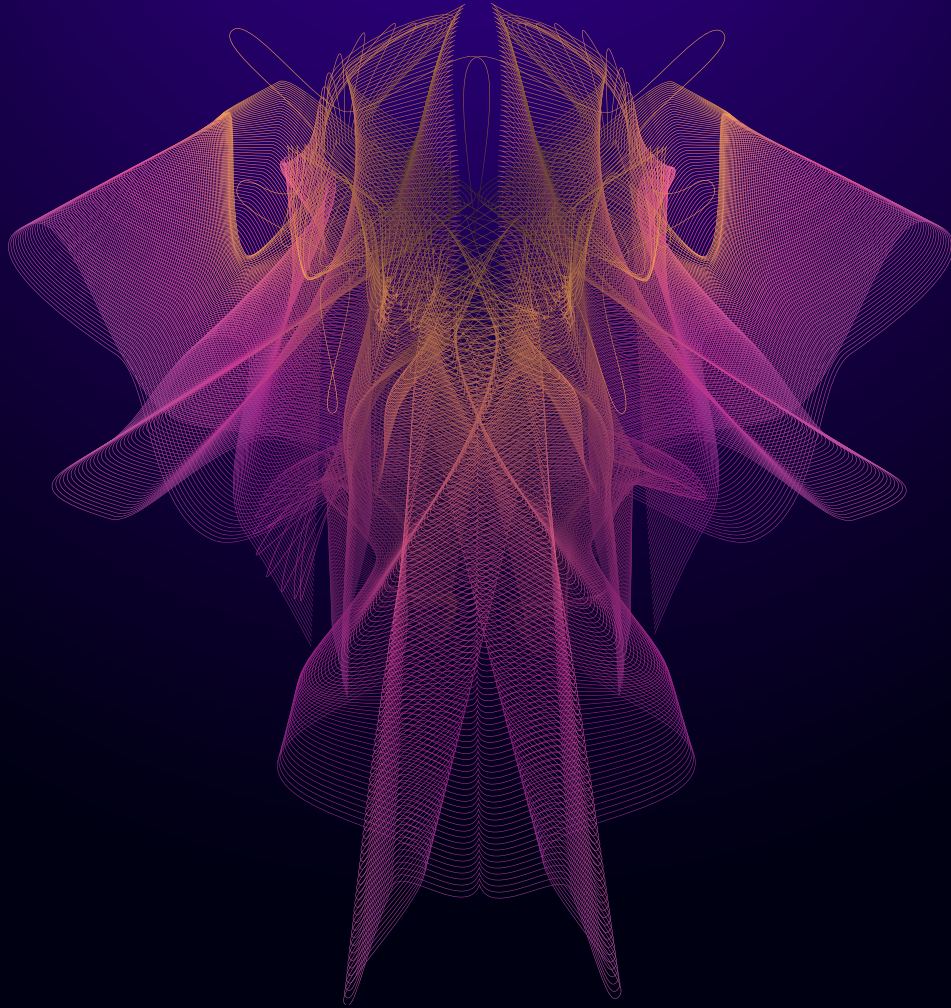


**WELCOME TO THE COGNITIVE AREA**



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**THE NEW GENERATION  
OF  
COMPUTING**

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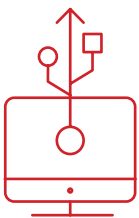
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# Welcome to the Cognitive Era:

## The New Generation of Computing

In the programming era, the time period we know best in computing, powerful computing systems became widely available, and they themselves could be reprogrammed to solve different business problems and calculations. Though they've completely changed the world around us, their capabilities are still constrained by their human operators. They can only carry out what we tell them to.

Cognitive computing evolved from this. It does not replace the human, but rather extends their capabilities. As we saw with the programming era, humans can think deeply and critically, and use reason to solve complex problems. However, humans lack the ability to analyze and process massive data sets, whether they are structured or unstructured.



The cognitive era is just that, a merger of the immense strengths of computers with the current capabilities of their human operators. It's a collaboration between man and machine to solve the next generation of challenges, from how we communicate, to business, to the natural world around us.

# How We Got Here

We're putting more and more reliance on computers, but we've hit a barrier. We're creating massive amounts of data every minute, yet we continue to use archaic ways of processing, analyzing, and acting on that data.



**We want to get more out of our data. It's not just the contents of the data itself, but the patterns and actionable insights derived from it. The natural next iteration of computing is implementing the functionality to do just this: make sense of the massive amounts of data created, and taking action based on it.**

We also want to create a more meaningful dialogue with our computers. Instead of us speaking their language, we want them to speak our

language. We want them to learn and adapt over time, being able to know and understand us better. From there, they can make educated decisions influenced by prior experiences and analysis without human involvement.

And lastly we want to continue to use computing systems to work smarter and better, enabling apps, businesses, and organizations to work more efficiently, sustainably, and safer. And that's why we're moving from the programming era we've been in for decades to the cognitive era, combining the strengths of computers and humans to continue to push technology and what we do with it forward.

# Structured vs. Unstructured Data

*Structured data* would be something like the information collected by a weather station. It can collect temperature, humidity, and wind speed. The system on receiving end knows exactly what types of data are being collected, and the system can easily be built in a way to utilize that data, like plotting the temperature changes over time and using that data to predict future forecasts. The data type never changes. We know how to deal with structured data.

It's the *unstructured data*, information that doesn't have a pre-defined data model, that's the real challenge, and utilizing it has massive benefits. Cognitive computing is the answer.

As previously stated, cognitive services extend the capabilities of humans. They allow us to process, analyze, and act on massive amounts of data, light years faster than a human could manually do the same job.



By 2025, it's estimated that there will be 163 zettabytes of data in the world, and 80% of that data will be unstructured. Documents, social feeds and messaging platforms, IoT data, video feeds, audio transmissions, and all the content that lives on the Internet from its origins are just a few sources of unstructured data. This is the data we continue to create more and more of as the world becomes more connected.



**It's not just understanding the unstructured data itself, but also connecting it to other sources of data and deriving patterns and insights from it.**

Cognitive services is the key technology to better understanding this data and taking action on it.

## **HOW COGNITIVE SERVICES MAKE SENSE OF UNSTRUCTURED DATA**

Let's walkthrough a couple examples of how cognitive services can take advantage of the massive amounts of unstructured data being created every minute across the globe.

### **NATURAL LANGUAGE PROCESSING**

Natural language processing functionality allows businesses to understand written, audio, and video data at massive scale. It empowers systems to analyze a massive set of data, draw patterns, and truly connect unconnected data.

In the academic world, a cognitive system could be used to analyze the vast number of related historical texts to a subject, both first and secondhand accounts (in a number of different languages), and plot out a timeline of events and rank them in terms of importance. From there, the system can act as a resource for students and researchers, and can recommend resources based on questions.

## **INSIGHT ENGINES**

Insight engines derive value from data to track trends and surface patterns. They automate ingestion of data, then converts, normalizes, and enriches the data. A brand might use an insight engine to monitor the public's perception of their brand, but can go deeper beyond sentiment analysis as well. They can compare their perception to the competition, match initiatives and campaigns they've done against public perception, compare news stories, and even predict future reception.



# The 3 Pillars of Cognition for Businesses



Cognitive businesses use cognitive services to create new types of customer engagement, build smarter products, improve internal operations, and make smarter decisions. There are three large areas of business that cognitive services are impacting right now.

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## DISCOVERY

Using the vast amounts of data and information available, systems can utilize cognitive services to find patterns, insights and connections that might never be identified by the hardest-working human beings. And having found patterns once, they can create new and unanticipated ways to adapt and grow, making discovery a more accurate and efficient proposition.

## ENGAGEMENT

Create new engaging experiences for users, customers, and the organization itself, empowering businesses to see, hear, speak, understand, and interpret natural language and information sets. By understanding, and responding to, the ways in which users interact with apps and each other, cognitive systems are changing the way humans and systems interact with one another.

## DECISIONS

Though cognitive services impact how we process data and engage with users and systems, the most challenging but potentially revolutionary result of cognitive services is decision making. Intelligent systems give businesses the ability to have their systems weigh evidence and analyze data, then make a decision based on that data that is unsullied by human emotional input. These services can consider complex sets of information and act on them, whether to do something as simple as making a product recommendation on an e-commerce site, to way more advanced actions, such as optimizing smart devices in an industrial setting.

# Consumers in the Cognitive Era

## **BENEFITS TO BUSINESSES**

Advertising and customer acquisition has made giant strides in understanding the market and individual consumers. Businesses can track activity, target based on demographics and identity, and automate marketing messages based on basic parameters.

Businesses today have a wealth of data at their fingertips, but it's unstructured, making it incredibly challenging to make sense of. Cognitive services opens up the doors to understand their customers at a much deeper level and makes data-driven decisions based on that data. They can predict and forecast with much greater accuracy and track trends from any number of data sources spread across the organization.



But it's not just the capabilities of the cognitive systems, but also their relation to realtime data streaming, which delivers the data as events occur, whether it be an order being placed, a change in temperature, or a new customer coming on board. Businesses can now gain immediate insight into customer action and their own performance, and can make fast, in-the-moment decisions to capitalize and beat the competition.

## BENEFITS TO END USERS

The cognitive era isn't just ushering in a new way to understand customers and the business itself. It's also creating value for the end users by delivering more enhanced experiences for them.



**This is where helpful, intelligent automated bots will make recommendations and answer questions at any time, anywhere. Wearables will deliver curated offers based on proximity. Voice-controlled personal assistant products can be the gateway to ordering products, controlling your home, making plans, and finding out important information.**

Conversational interfaces are already becoming a mission-critical gateway for end users to engage with businesses and organizations.

Think of an end user interacting with a business that sells car parts. It's incredibly powerful that a chatbot can continue to build a relationship with an end user based on prior conversations and factoring in historic activity and demographic information. At the chatbots beck and call is the entire businesses database of products, stock data, other customer data, and more—all that can be used to tailor targeted responses to the end user. This creates an experience more tailored and faster than any human service agent could provide (not to mention, no worry about headcount. The bot is always available!)



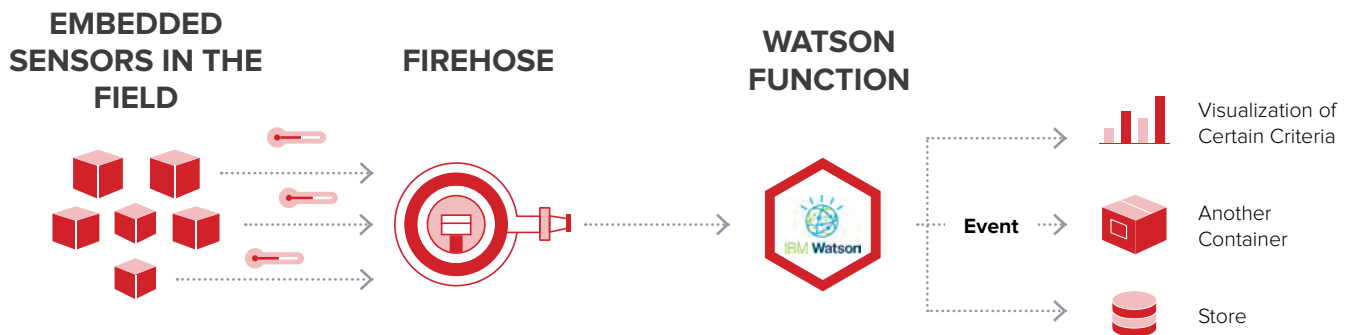
**For consumers, cognitive services will power the everyday experiences of how we use apps. They'll grow smarter, deliver more value, and grow better relationships between businesses and the end users.**

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# Implementation

## BIG DATA INGESTION AND PROCESSING

For businesses that create massive amounts of data, for example home automation companies or financial firms, we currently have great technology for ingesting and processing the data generated by huge deployments of connected devices. Cognitive services sit in the middle, before the data is stored, and not only analyze the data for your use case, but can also create events if you're using an event-driven architecture.

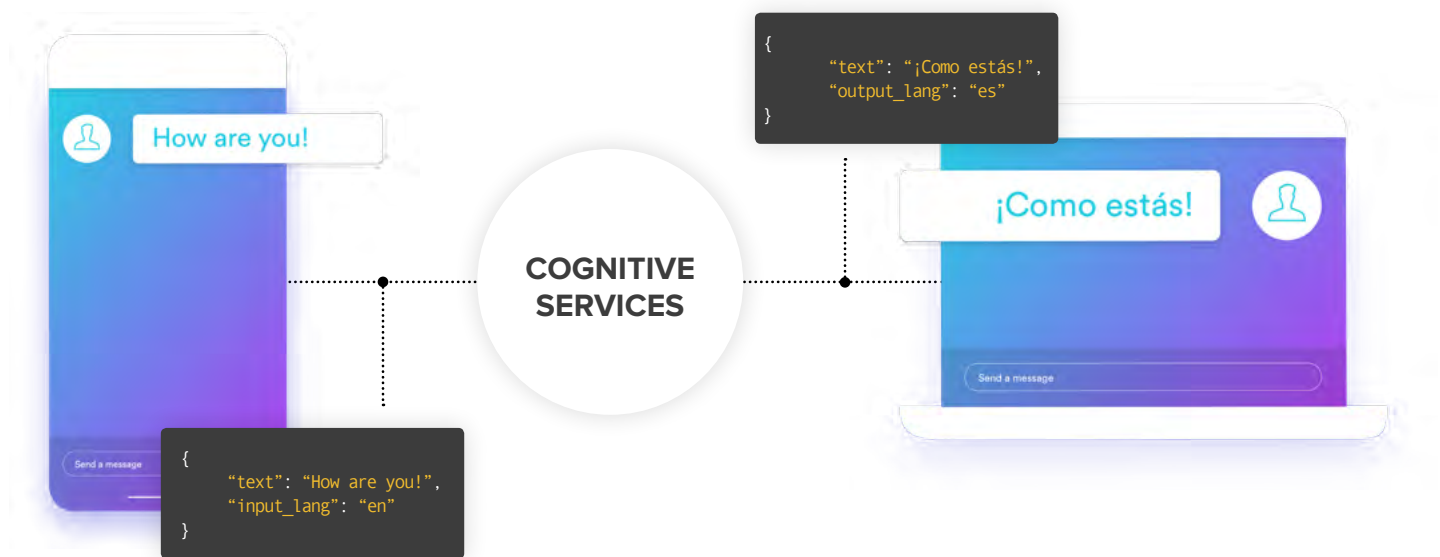


**Diagram explanation:** In a big data use case, the cognitive service, in this case Watson, processes the data coming through the firehose. The service is able to reroute the processed data while it's in-motion, delivering certain analysis to a visualization, an event to any number of other containers, and other data to store.

## REALTIME DATA STREAMS

For applications allowing users to communicate in realtime, or any deployment where small amounts of data are streamed in sub-second deliveries, cognitive services will make a massive impact. This enables businesses to execute business logic, in this case, trigger their cognitive services, directly in the data stream, manipulating, filtering, and analyzing that data, and delivering a transformed version of the data to an end user.

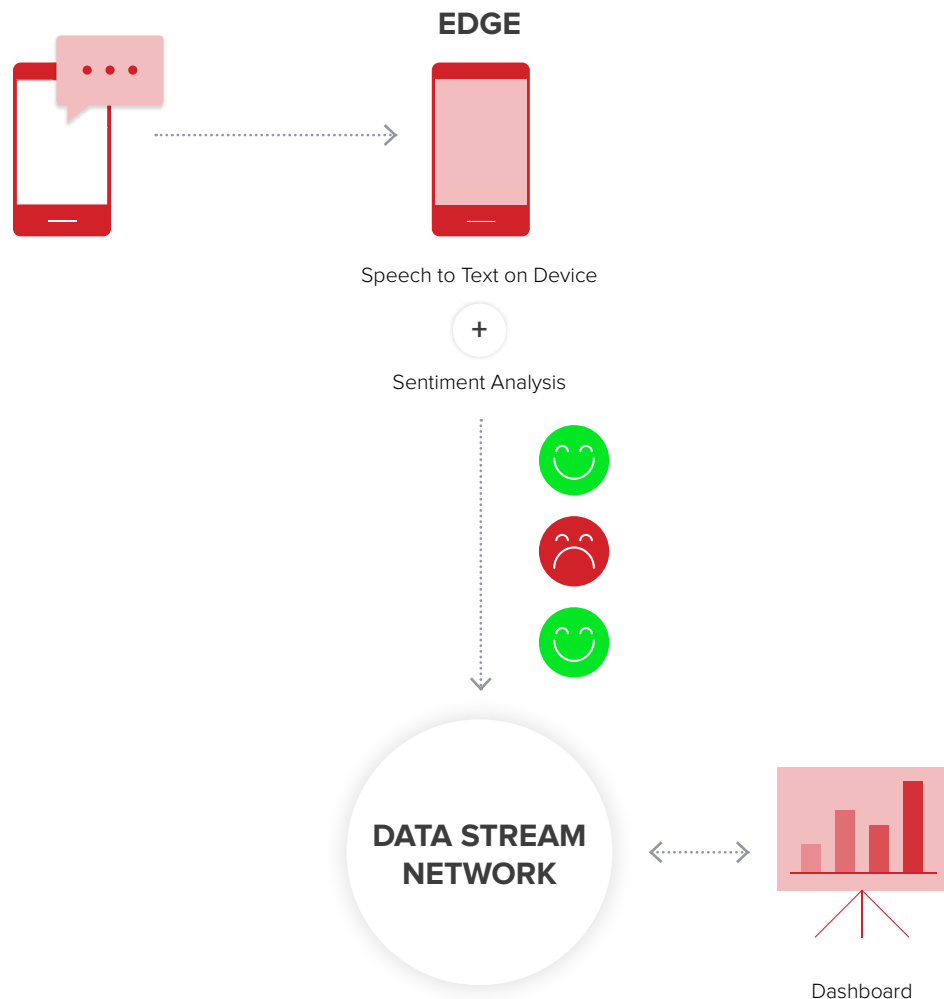
Take chat. We know that [chat is transforming](#), and that cognitive services will play a massive role in that evolution. Integrating cognitive services into messaging feeds allows you to do some pretty amazing things with the data. You can translate any language into any language, turn text into natural speech (or vice versa), or even analyze the sentiment of messages coming through a chat feed.



**Diagram explanation:** In this use case, the cognitive service sits between the chat users. Instead of sending the raw message to an external server, having it translate the message, and send the processed message to the recipient, the translation takes place directly in the middle, decreasing latency and reducing unnecessary infrastructure.

## AT THE EDGE

Edge computing is compute taking place as close to the data source as possible, providing an incredibly fast and efficient way to take action on data. Instead of streaming all data to a central data center (i.e. 'the cloud'), edge computing alleviates the network of potential bandwidth bottlenecks, and processes the data that matters, keeping it close to the source.



**Diagram explanation:** In this use case, the cognitive service sits on the device, where all processing takes place. The end device takes the speech, converts it to text, and analyzes the sentiment of the message. This way, the device on the edge only has to send the sentiment data to the dashboard, and doesn't have to send the actual contents of the message.



# A World Transformed



Apps and businesses alike will be transformed by cognitive services. They will work more efficiently, safely, and more sustainably, and deliver more engaging and immersive experiences to their customers. From the way we buy goods, to the way our children learn, to the food we eat, cognitive services will drive the innovation of industries and organizations into the future.

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