INTRODUCTION

Technology is already creating significant new economic opportunities for city-dwellers living in informal settlements. Whether they're shack-dwellers, slum-dwellers, or otherwise housed, a growing majority in the Global South have access to cell phones. And that means that they have access to a multiplicity of tools which enable them to connect with family, friends, co-workers and access real-time pricing information for every conceivable personal expense (from finding commuting schedules and commuting alternatives to finding lower cost housing).

These emerging uses for cell phones are an early taste of the potential transformative effect of **The Internet of Everything (IoE)—the networked connection of people, process, data, and things**. IoE creates the basis for a whole set of new urban economic opportunities, well beyond those presented by increased revenues and lower costs. Technology trends (including cloud and mobile computing, Big Data, increased processing power, and many others) and business economics (such as Metcalfe's law) are making it increasingly feasible to connect the previously unconnected. Currently, more than ninety-nine percent of physical objects that may one day be part of the IoE are still unconnnected. But that will soon change.

IOE has four key components:

— **People**: Today, most people connect to the Internet through their devices (such as PCs, tablets, TVs, and smartphones) and social networks (such as Facebook, Twitter, LinkedIn, and Pinterest). As the Internet evolves toward IoE, we will be connected in more relevant and valuable ways. For example, people will be able to swallow a pill that senses and reports the health of their digestive tract to a doctor over a secure Internet connection.

— **Process**: Process plays an important role in how each of these entities—people, data, and things—works with the others to deliver value in the connected world of IoE. With the correct process, connections become relevant and add value because the right information is delivered to the right person at the right time in the right way.

— **Data**: Today, devices typically gather raw data and stream it over the Internet to a central source, where it is analyzed and processed. In the future, connected things will soon send higher-level information back to machines, computers, and people for further evaluation, allowing us to make faster, more intelligent decisions.

— **Things**: In IoE, sensors, consumer devices, and enterprise assets will sense more data, become context aware, and provide more experiential information to people and machines. Smart sensors will be integrated into structures like bridges, and disposable sensors will be placed on everyday items such as milk cartons.

When these four components work in concert, they produce more relevant and valuable information than ever before. The information can then be used in innovative and transformative ways.

Consider **power grids**. Utilities today typically operate on a "best effort" infrastructure: they generate and place energy on the electrical grid without taking full advantage of their assets. This makes the grid vulnerable to faults and allows only for a one-way flow of electricity—from producers to consumers. In addition, the system is inefficient because power generation cannot be easily adapted to fast-changing energy usage cycles.

IoE will improve the electric grid by automatically detecting and repairing problems, controlling electrical flows based on real-time demand, improving generator utilization, and enabling more sustainable energy sources, like wind and solar. Connection sensing, measurement, and real-time controls will improve supply and demand alignment, increase reliability, and lower costs, benefitting all stakeholders.

Consider also the **management of municipal government-owned buildings**. Solutions are now available which allow owners, managers, and tenants to leverage their wired and wireless networks to facilitate efficiency and productivity. For instance, integrated management of building processes over a network can help minimize energy waste. Other technologies allow employees to freely access people and data, irrespective of location. In this way, personal 'empires' of office space can be transformed into collaborative 'team space'—allowing adaptation to changing business needs while reducing the total amount of office space required.

These are just two examples. Those city leaders who pioneer the adoption of IoE are creating a world of new opportunities. But it will not be easy to bring together people, process, data, and things to make connectivity more relevant and valuable. **City governments alone will not be able to drive cities into the future**. Encouragingly, a growing number of companies, foundations, academic institutions, government agencies are standing up and announcing their interest in helping to achieve greater urban sustainability through connectivity. Most importantly, unconnected communities themselves are increasingly demanding progress.

75

petabytes/
month
Total global
internet traffic
in 2000

885

petabytes/
month
Global mobile
data traffic
in 2012

10,000

petabytes/
month
Estimated
global mobile
traffic in 2017

200

(million)
Estimated
number
of devices
and objected
connected
to the internet
in 2000

10

(billion)
Estimated
number of
devices and
objected
connected to
the internet in
2010

50

(billion)
Estimated
number
of devices
and objects
that will be
connected to
the internet by
2020

TYPES OF CONNECTIONS IN THE IoE

M2M
Machine-to-machine connections (e.g. sensors, remote monitoring)
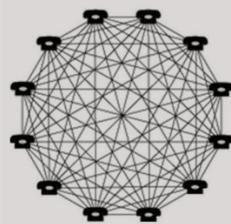
P2P
People-to-people connections (e.g. video conferencing, collaborative tools)

M2P
Machine-to-people connections (e.g. big data/ analytics, information dashboards)

CONCLUSION

Those who made the Internet what it is today are the same people who are taking IoE to the next step, delivering intelligent networks that will listen, learn, and respond the needs of real people living in real cities. Challenges abound for the city leaders of today. The rapid pace of change spawns confusion and misinformation, often leading to poor decision-making or, worse, inaction.

The good news is this: we can address these challenges on a scale like never before.

INTERNET OF THINGS VS INTERNET OF EVERYTHING

The Internet of Everything shifts the discussion from just *things* to people, data and things, all enabled by process. IoE changes the focus from the number of *things* that are connected to the Internet to the *connections* themselves. It is the connections that matter most.
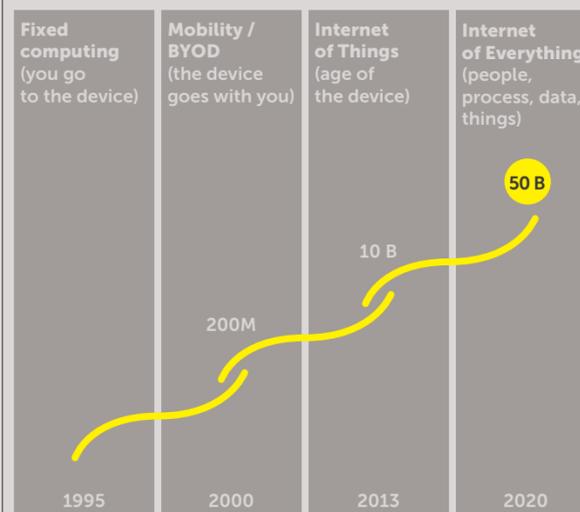

intelligence
convergence
visibility
security

#InternetOfEverything
#IoE

CISCO

INTERNET OF THINGS   >   INTERNET OF EVERYTHING

THE INTERNET IS EVOLVING IN ACCELERATING WAVES

Fixed computing (you go to the device)	Mobility / BYOD (the device goes with you)	Internet of Things (age of the device)	Internet of Everything (people, process, data, things)
			50 B
		10 B	
	200M		
1995	2000	2013	2020

SOURCES

Cisco, IBSG, 2013

Gordon Feller

OPINION PIECE

THE NEXT BIG THING

How smart city initiatives can use advanced technology to meet basic needs

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD