TOWARD A MODERNIZED CITY

With the rise of smart cities, municipal government has been able to tap into an ever-increasing field of valuable intelligence. Sensor-driven IoT, paired with powerful computing technologies, is delivering the data needed to make cities more efficient while driving enhanced citizen service.

The modernized infrastructure is empowering civic leaders to take a fresh look at issues ranging from traffic congestion to crime to climate change. With the coming of 5G networks, even more data will be available in the coming years.

Data generated by people, machines, and other connected things—the IoT infrastructure that supports the modernized city—is expected to reach 850 zettabytes (that's 270 bytes) by 2021, compared to 220 ZB in 2016. This rising tide of data presents not only a vast opportunity but also a new set of challenges for cities seeking an IT-driven route to improved citizen service.

THE FUTURE OF CITIES LIES IN DATA

Increased urbanization puts pressure on civic resources. In response, cities already are leveraging the Internet of Things, tapping new data sources to gain efficiencies and streamline operations. Emerging 5G capabilities promise to drive the trend further.

Data will disrupt and revolutionize civic government — whether generated by cars, parking meters, surveillance cameras, traffic lights or utility infrastructure.

65% of the world's population expected to be **living in cities** by 2040.

66% of cities that have invested in **smart technology.**

$223.3 BILLION

Predicted global market for smart city platforms by 2023.

THE DATA-DRIVEN VISION

A sensor-driven city, supported by AI capabilities and connected by 5G networks, will deliver a range of benefits. In this data-driven environment, civic leaders can:

1 Take multiple large data sets and analyze the relationships between organizational observations, for example by correlating traffic injuries to peak travel times

2 Produce actionable insights in order to better organize and manage resources, for instance by situating social service resources nearer those in need

3 Add context to the data by combining sensor data from devices with other internal and external data sources, for example tracking utility usage to temperature patterns

WHAT THE FUTURE HOLDS

Cities are embracing IoT, AI and other data-based solutions today, and are looking to build on that investment for the future, in order to:

More closely monitor, in real time, traffic and parking in high-volume areas

Better manage utilities including power and water infrastructures

Enhance security with real-time monitoring and surveillance capabilities

Promote economic development by identifying key population trends

COLLECTING, MANAGING AND ANALYZING DATA IS CORE TO MODERNIZATION

The average city already has to deal with terabytes of data produced by traffic sensors, cameras and, increasingly, municipal infrastructure such as water meters. That volume and variety of data — comprising telemetry, video/still picture and audio — will increase exponentially as IoT adoption and AI-informed implementations continue to accelerate, supported by 5G connectivity. To garner value from all that structured and unstructured data, cities will need an IT infrastructure that can:

COLLECT, process, and store the data as it lands in real time

SCALE easily in order to match the growth in data

SUPPORT multiple data types and data structures

PROCESS and analyze data to derive real-time operational insights

ENABLE machine learning and intelligence to detect anomalies and predict outcomes

DATA SILOS POSE A CHALLENGE TO BECOMING SMART…..

While cities are increasingly reliant on data, much of that critical information still resides in siloes and is not readily available across departments. Geospatial data that drives planning processes, for example, may not be accessible by public works. In order to take full advantage of their data-driven investments, cities need to better integrate data that has been collected in multiple silos and spread across diverse disconnected systems, such as:

Real-time traffic data, collected from in-road sensors and smart cameras, aimed at improving vehicle, bike and pedestrian flows	**Traffic pollution information, which could aid planners in their efforts to convert public buses and other vehicles to electric**	**Parking metrics that enable cities to effectively allocate parking in order to accommodate daily needs, and to better align parking with public transportation facilities**	**Data from utilities, both private and city-owned, which can help cities to strategize for peaks in usage or anticipated shortfalls in supply**	**Security cameras and surveillance systems, an increasingly important part of city policing**

In a modernized city all of these have to operate cohesively. The best approach is based on a unified stack that can operate anywhere, either on-premise or in the cloud to avoid vendor lock-in. Cities that implement modernized devices and systems without considering where the data will land and be analyzed will likely not be able to solve their data silo problems.

….AS DOES SECURITY AND DATA GOVERNANCE

As a city or public entity adds more devices and systems, and the sensors to go along with them, opportunities arise to use data in new and more beneficial ways. But potential vulnerabilities also increase. A ransomware attack froze Baltimore's civic IT infrastructure for more than two weeks in mid-2019, a reminder of what can happen when modernization lags. Data security, compliance, and governance — particularly governance — are essential in the data-centric urban model.

Municipalities may face the risk of increased potential liability, particularly if data is sensitive in nature. Cities or public entities must have well defined rules about what data can be handled, by whom, when, and in which way.

Even more than security — though that's always a first requirement — good data governance and the controls that go along with that are the essential table stakes for cities looking to leverage data as the starting point for civic improvement.

SO WHAT DOES
SMART
LOOK LIKE?

AIR QUALITY AND
POLLUTION MONITORING

SMART
PARKING

SMART SURVEILLANCE /
SECURITY MONITORING

SMART WATER
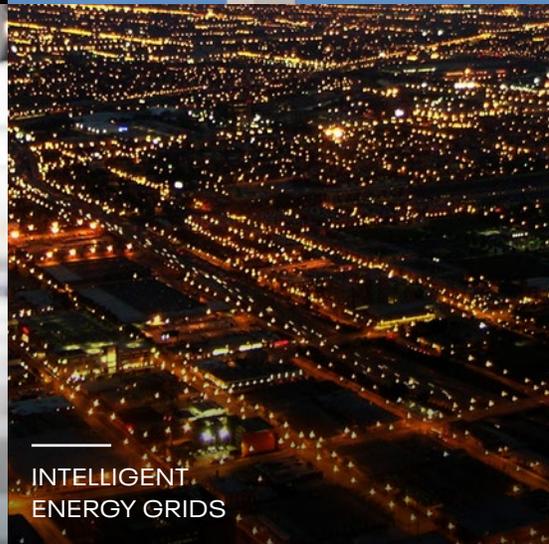MANAGEMENT

INTELLIGENT TRAFFIC
MONITORING & ROUTING

SMART
LIGHTING

SMART TRASH
PICKUPS

SMART
TRANSPORTATION

INTELLIGENT
ENERGY GRIDS

IF YOU WANT TO BE DATA DRIVEN….

Data has enormous potential to makes cities more efficient and effective. to take best advantage of the opportunities presented by modernization, civic leaders will need to…

1 Implement key technologies, especially the IoT devices and edge sensors that generate critical data. Many cities already are on the road to doing this.

2 Invest in analytics, working hand in glove with industry to leverage emerging tools that will help to vast volumes of information into actionable intelligence.

3 Develop an infrastructure to support the ready accessibility and shareability of this new knowledge store. Given its intrinsic speed and scalability, cloud is a natural fit for this role.

…FOCUS ON DATA SHARING

Whether a city will succeed or fail in its modernization efforts depends not just on the volume of new data generated, by also on municipal authorities' ability to readily disseminate the resulting intelligence to all relevant stakeholders, including public agencies, non-profit service providers and relevant private-sector partners.

Lacking the ability to share key information in real time, a municipality may put in place the mechanisms of a "smart city," without getting any smarter. Key infrastructure elements are required to ensure data does not get trapped in siloes or go overlooked at vital moments. Cloud offers the means to open up public data in a way that is at once readily accessible and securely controlled.
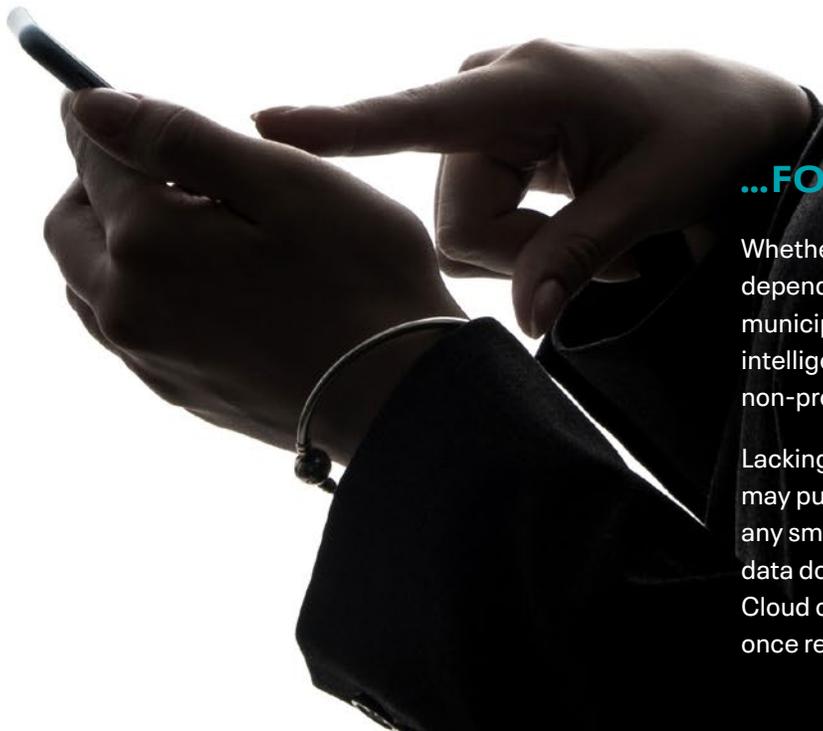
AN ENTERPRISE DATA CLOUD FOR ANY DATA, ANYWHERE, FROM THE EDGE TO AI

An enterprise data cloud unlocks the power of your data to serve customers better, operate with greater efficiency and strengthen security to protect your business. We use the cloud to make machine learning and analytics easier, faster and safer. With an enterprise data cloud you control your data and your future.

WHY CLOUDERA?

1 Hybrid and Multi-Cloud

Control, analyze and experiment with data wherever it lives. Run your analytics on the clouds you choose. Easily and securely move data and metadata between on-premises file systems and cloud object stores.

2 Analytics from Edge to AI

Solve demanding business use cases. Apply real-time stream processing, data warehousing, data science and iterative machine learning across shared data, securely, at scale on data anywhere from the Edge to AI.

3 Security and Governance

Simplify data privacy and compliance for diverse enterprise data. Use a common security model, role and attribute based access policies and sophisticated schema, lineage and provenance controls on any cloud.

4 100% Open

We empower customers with the freedom to choose — open source, open compute, open storage, open architecture and open clouds. Open for developers, partners, and open for business. No lock-in. Ever.

ABOUT CLOUDERA

At Cloudera, we believe that data can make what is impossible today, possible tomorrow. We empower people to transform complex data into clear and actionable insights. We deliver the modern platform for machine learning and analytics optimized for the cloud. The world's largest enterprises trust Cloudera to help solve their most challenging business problems.

Learn more at cloudera.com.

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