Powering up Industry 4.0 with a 5G M2M SIM

How to accelerate IIoT (Industrial IoT) transformation with a dedicated 5G M2M SIM
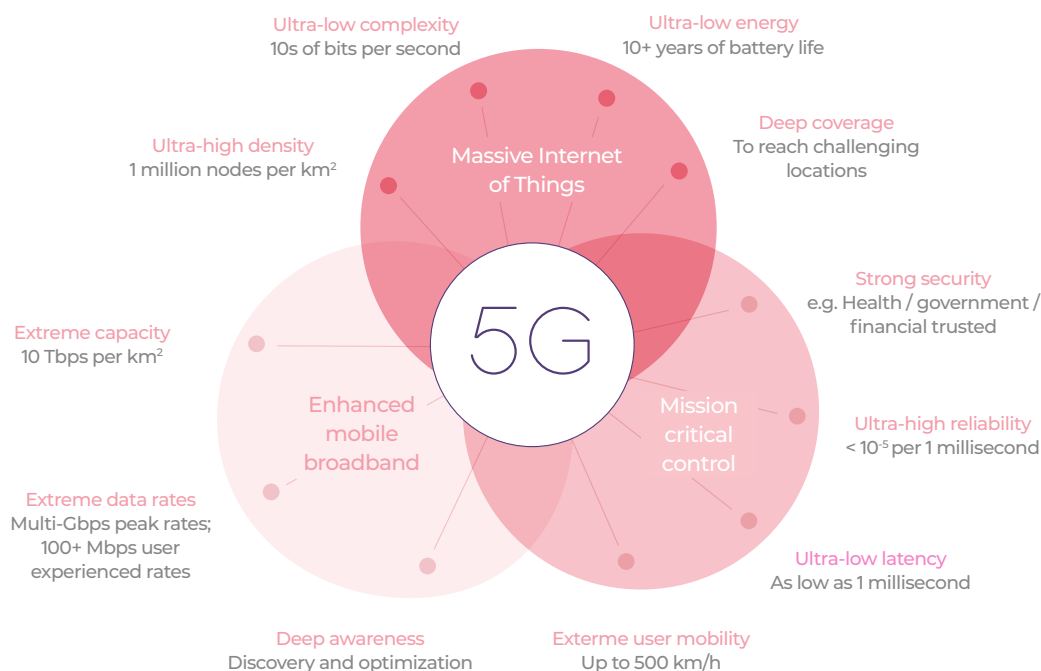
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Executive summary

Amid the pandemic and constant disruption to global supply chains, manufacturing is back in the spotlight. In a move to digitally transform manufacturing to become more agile and smart using new technologies such as artificial intelligence, the adoption of Edge and cloud computing is being adopted at a faster pace. Cellular IoT is essential in "connecting the dots" to harness the power of these new technologies which has now evolved into what is known as Industry 4.0.
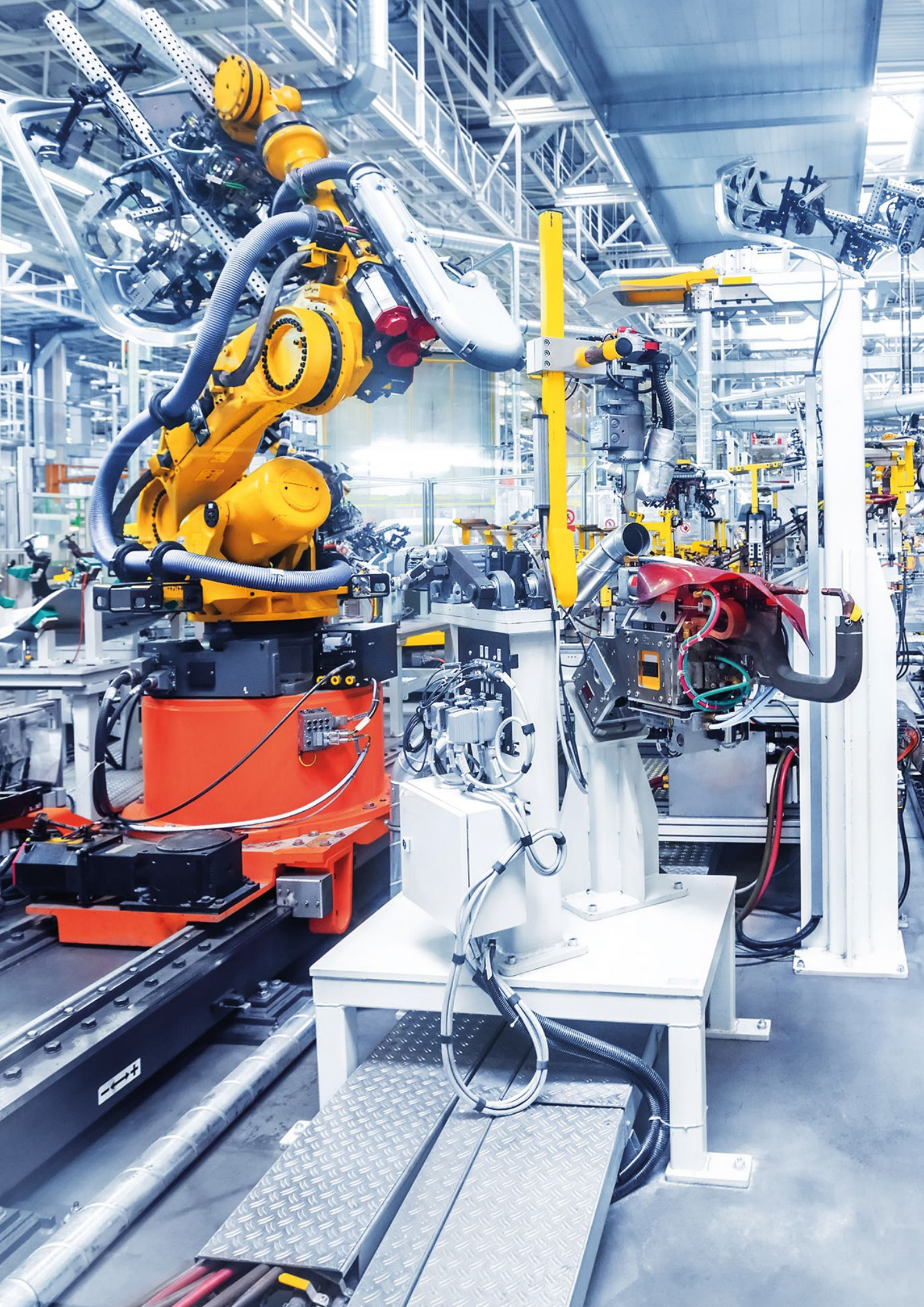
According to ABI, bringing cellular IoT to the manufacturing floor will save 8.5% in operational costs over the next five years, with an expected ROI (return on investment) of over 9 times. According to McKinsey,* companies that have implemented digital transformation have seen a 30 to 50% reduction in machine downtime and 20% cost savings.

Next-generation 5G wireless technology has emerged as Industry 4.0's connectivity enabler. Building on the previous generation of wireless technologies, 5G provides a platform that not only enhances existing services but also allows for massive asset connections at a low cost, as well as high-speed, ultra-reliable, and low latency communication (URLLC) features for the entire range of technologies across the spectrum of Industry 4.0 environments. The latest 3GPP specification formalizes the standardization of private networks via slicing technology, a game changer that allows mobile carriers or Hyperscalers to scale up private network deployment.

Ultra-low complexity
10s of bits per second

Ultra-low energy
10+ years of battery life

Ultra-high density
1 million nodes per km^2

Deep coverage
To reach challenging locations

Massive Internet of Things

Strong security
e.g. Health / government / financial trusted

Extreme capacity
10 Tbps per km^2

5G

Enhanced mobile broadband

Mission critical control

Ultra-high reliability
< 10^{-5} per 1 millisecond

Extreme data rates
Multi-Gbps peak rates; 100+ Mbps user experienced rates

Ultra-low latency
As low as 1 millisecond

Deep awareness
Discovery and optimization

Exterme user mobility
Up to 500 km/h

This white paper details how the 5G M2M SIM adds value and scalability to Industry 4.0 use cases in 5G IoT networks.

* https://www.mckinsey.com/business-functions/operations/our-insights/preparing-for-the-next-normal-via-digital-manufacturings-scaling-potential

1 > **5G M2M SIM Standards**

3GPP (the standardization body of the cellular world) began working on 5G 3PP standardizations in 2015. The 3GPP release 15 in 2018 was the first to lay the foundation for massive 5G IoT deployment.

The latest 5G industry standard implemented in June 2020 includes new capabilities that allow private networks to be tailored to enterprise needs. For example, the 3GPP release 16 formalized network slicing implementation, allowing for large-scale deployment of private networks for Industry 4.0 use cases.

Network Slicing

Multi-Device
& Multi identity

5G

Private Networks
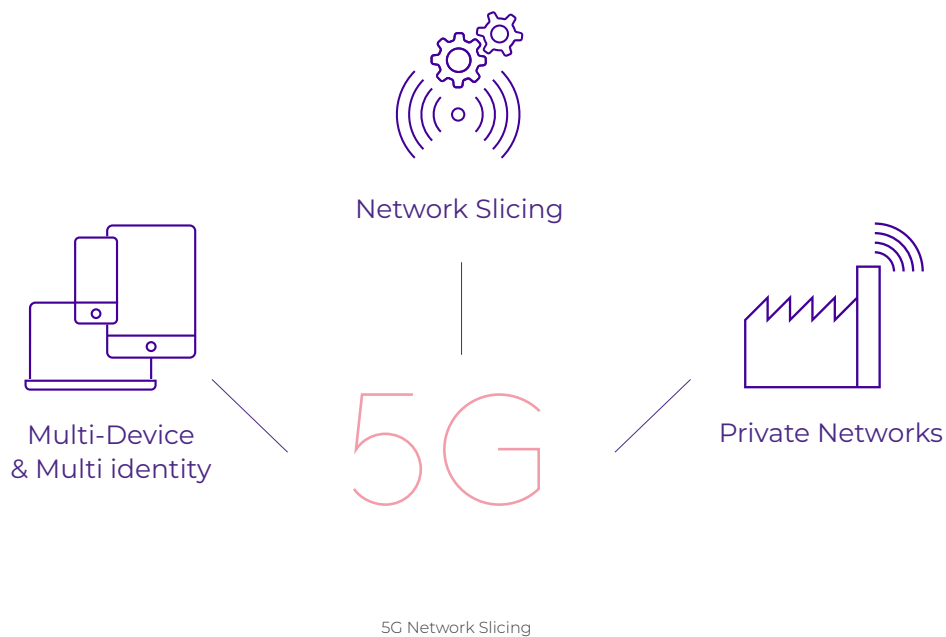
5G Network Slicing

5G network slicing is a network architecture that allows for easy virtualization that is tailored according to business needs. Each network slice is an isolated end-to-end network designed to meet a variety of needs, such as those expressed by mobile operators, MVNOs, and enterprises.
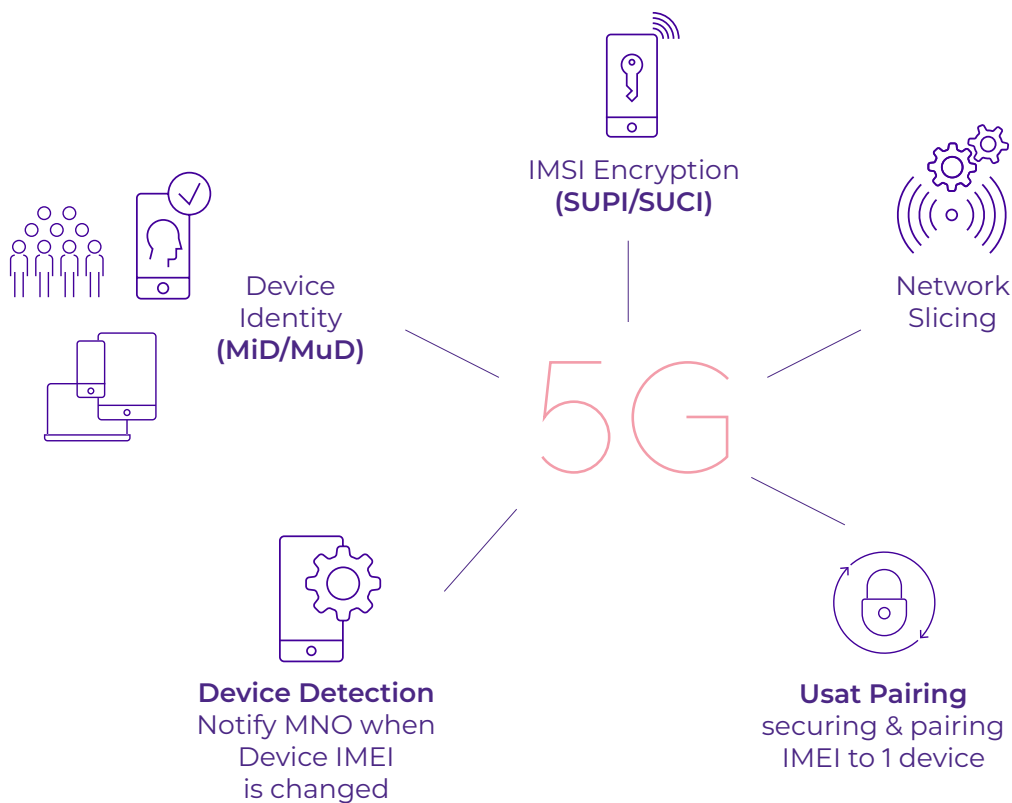
Private networks are non-public networks that let organizations or groups of organizations use virtualized 5G core networks to guarantee coverage and maintain network control. **Multi-Device** enables a user to use different devices that are registered under the same user identity, while **Multi-Identity** enables a user to use different identities on a single device to receive and make calls using any of its identities.

2 ⟩ Role of 5G M2M SIM

M2M 5G SIM is based on prior UICC connectivity technologies which are still evolving to play a vital part in 5G IoT networks.

Unlike consumer SIMs, M2M 5G SIMs are designed to withstand extreme environments, low power needs and support 3GPP's newest technology advancement to facilitate connectivity for Industry 4.0 use cases (Figure 3).

IMSI Encryption
(SUPI/SUCI)

Network
Slicing

Device
Identity
(MiD/MuD)

5G

Device Detection
Notify MNO when
Device IMEI
is changed

Usat Pairing
securing & pairing
IMEI to 1 device

IDEMIA's M2M 5G SIM includes **IMSI encryption** (subscriber concealed identity), a feature that is dedicated to providing increased subscriber privacy by concealing the user's identification for both IMSI (international mobile subscriber identity) and non-IMSI credentials. This functionality allows MNOs to manage SUPI (subscription permanent identifier) concealment for private network usage while ensuring 5G network authentication.

When an industrial organization switches from a wired to a wireless connection setup, IMSI encryption provides crucial security against potential **Cyber Security Attacks** via Device Identities Management, ensuring that the true identity cannot be stolen.

With the introduction of network slicing, a dedicated M2M 5G SIM is ideal. **Network slicing** runs multiple logical networks as virtually independent operations on a shared physical network efficiently via the user equipment route selection policy (URSP). This is appropriate for use cases like industrial networks with separate resources and security criteria that can be segmented to serve particular purposes.

An M2M SIM with 5G capabilities also has USAT pairing, which prevents fraud by securing and pairing the IMEI (International Mobile Equipment Identity) to a single device, while Device Detection detects fraud by alerting the MNO when the device IMEI changes.

With the use of an M2M 5G SIM, there is a benefit from better IoT device identity by providing the flexibility to enable multiple users on a single device and a single user across multiple devices with the below two solutions as global connectivity increases:

Multi-Device (MuD) allows a to user to access system information across many devices such as an office computer system, mobile phone, or a tablet. This is beneficial for tracking and monitoring vital assets as well as sending warning messages to employees' computers and mobile phones rapidly, even when outside factory premises.

Multi-Identity (MiD) allows a user to receive and make calls using any of their identities on a single device, allowing them to differentiate their identities for private or work or group use.

MuD and MiD are important features defined by 3GPP to cater to identity management of Industry 4.0 use cases.

Conclusion

Industry 4.0 smart manufacturing will disrupt traditional manufacturing and, in the long run, bring major change to the industry.

Because of its low latency and high connection features, 5G Cellular IoT (CIoT) is playing a pivotal role in the evolution of Industry 4.0 as it can further automate tracking, monitoring, and maintenance processes to improve operational efficiency. Lastly, the low-power IoT connectivity feature is an important step towards decarbonization and will be the focus of an upcoming whitepaper dedicated to sustainability in the IoT ecosystem.

By enabling devices' 5G connectivity, application routing policy (for private networks), enhanced security, and ruggedized hardware and software capabilities to support harsh environments, 5G M2M SIM technology plays a crucial role. When implementing Cellular IoT on Industry 4.0 use cases, we recommend that mobile network operators use 5G M2M SIM technology.

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Acronyms

IoT:	Internet of things
IIoT:	Industry IoT
URLLC:	Ultra-reliable and low latency communication
IMSI:	International mobile subscriber identity
SUPI:	Subscription permanent identifier
URSP:	User equipment route selection policy
IMEI:	International Mobile Equipment Identity
MuD:	Multi-Device
MiD:	Multi-Identity
CIoT:	Cellular IoT

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