Cellular IoT Nodes Application deck

Infineon’s virtual show 2020

Agenda

1. Cellular connectivity – Market trends & opportunities
2. Why an eSIM
3. The Infineon OPTIGA™ Connect IoT
4. Our eSIM Platform partner – Tata communications

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Cellular connectivity – Market trends & opportunities

20 billion interconnected devices by 2020 (Source: Gartner)
41 billion IoT devices by 2025 (Source: IDC)

Cellular connectivity allows to easily deploy and manage devices at scale worldwide

70%

of wide-area **IoT devices** will use **cellular technology** in 2022.

(Source: Ericsson)

Mobile connectivity for logistics

Cellular connectivity makes it **easier** and **less costly** to track large numbers of assets.

Mobile connectivity for telehealth

Cellular connectivity enables the **collection** of **highly sensitive data** from patients **wherever they are.**

Remote maintenance for wind power stations

Cellular connectivity enables **reliable remote maintenance in whichever** region wind power stations will operate.

Remote control for drones

Cellular connectivity enables **out-of-sight flight control** and takes **no-fly zones** into account.

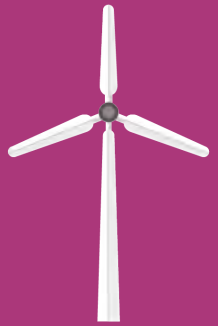
Every IoT solution has its own specific needs

Asset tracking

High interoperability

Telehealth/ Mobile health

Smallest size



Remote Maintenance

Robustness

Remote Control

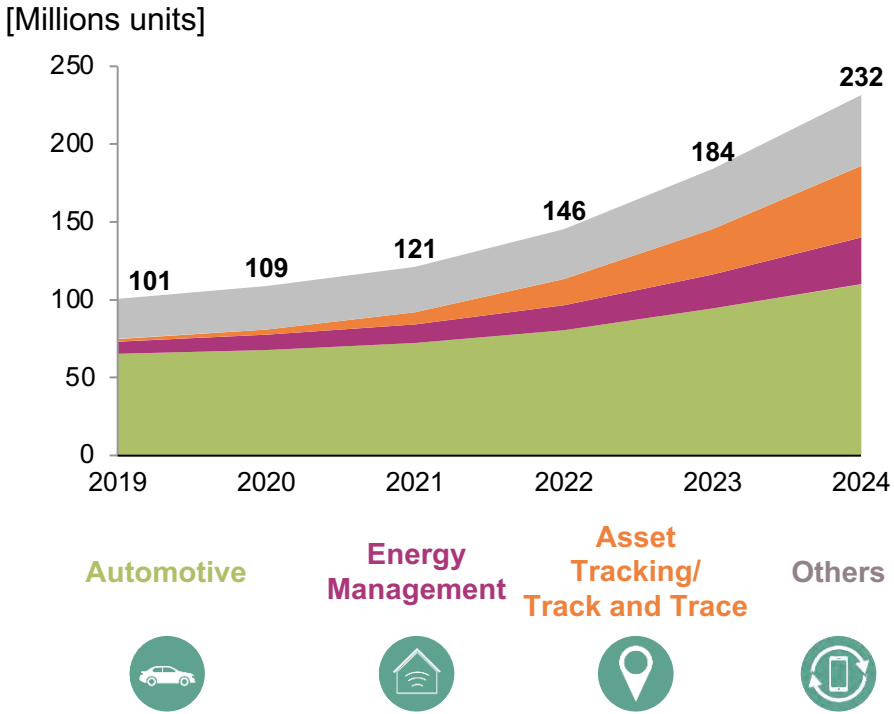
Reliability

eSIM provides new opportunities for IoT applications

M2M / IoT

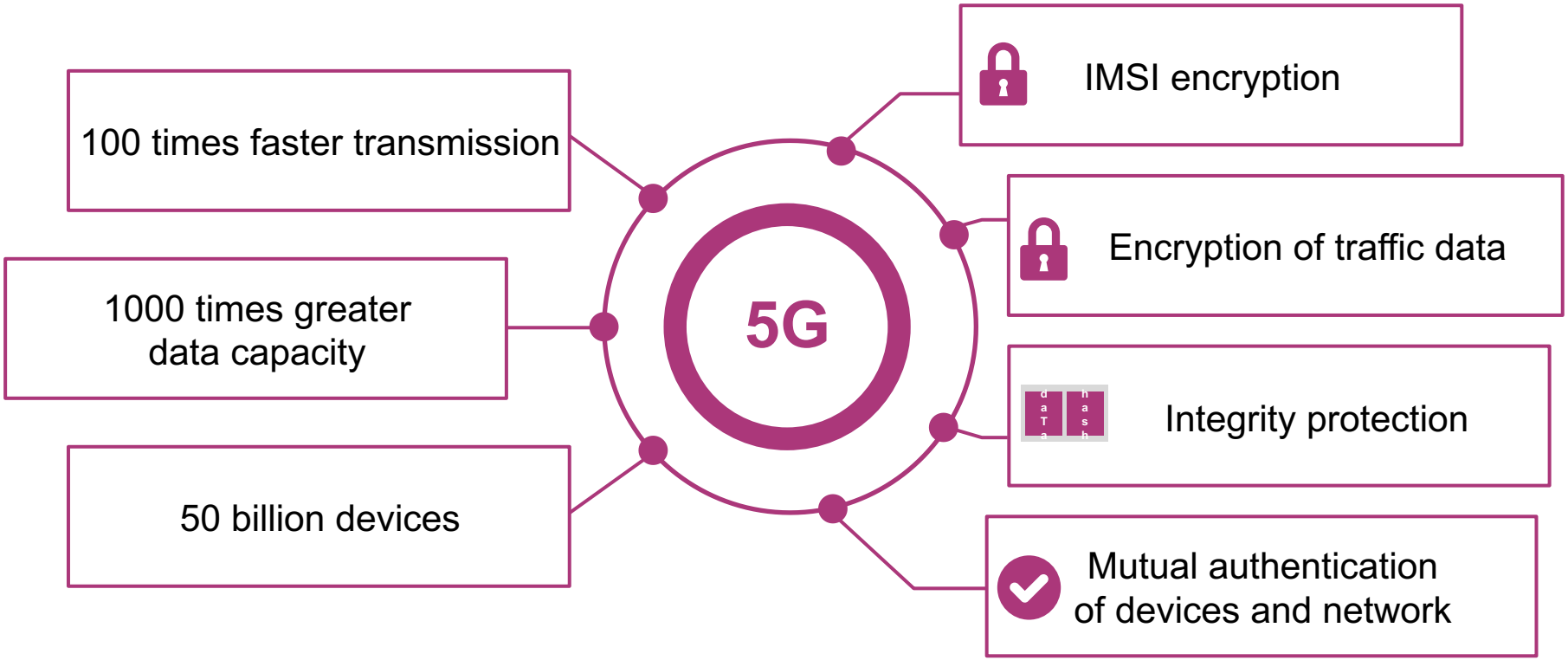
- Safety & Autonomy
- Energy Management
- Track & Trace
- Others

M2M / IoT eSIM Enabled Device Shipments



Source: ABI Research, https://go.abiresearch.com/lp-the-true-value-proposition-of-the-esim; ABI Research, eSIM in the Consumer and M2M Markets Q1-2020

5G boosts cellular connectivity and is a huge step forward in terms of security



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The SIM Card (Subscriber Identity Module)

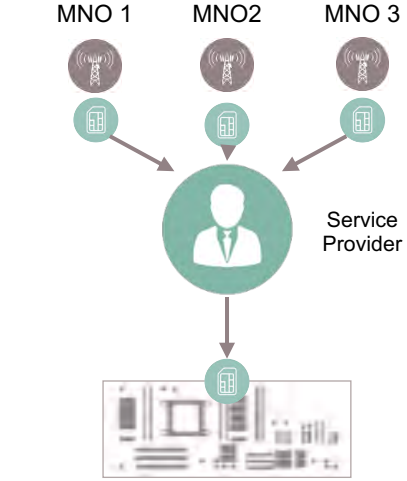
Why a SIM Card

- **Stores an operator defined profile**
- Identification and authentication with the selected mobile network
- Soldered (MFF2) or removable

Limitations of the Classic SIM

- Need to contract with multiple MNO*s for multi-national coverage
- Maintenance, supply chain management, risk of theft
- Robustness and Interoperability
- Cost of SIM switch when change of Operator contract

Classic SIM
Removable or Soldered



- Legacy SIM
- Service Provider selects new operator
- New SIMs are inserted into every device

*MNO: Mobile Network Operator

The Soft SIM and integrated SIM

Soft SIM / iSIM

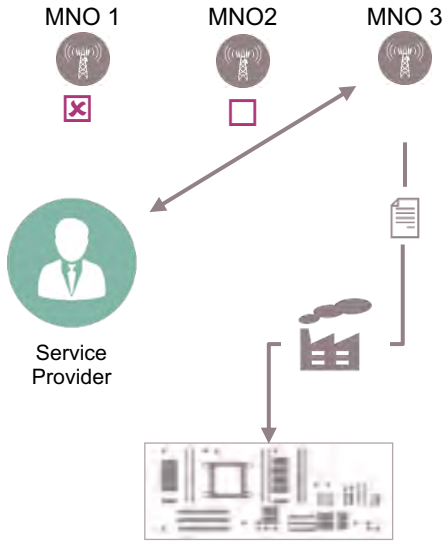
- Proprietary SIM Solutions
- Suitable for closed loop systems with one or very few MNO

Limitations of the Soft SIM and iSIM

- Not standardized
- Complex supply chain management
- Limited Security and no interoperability
- Very low acceptance at MNO

*MNO: Mobile Network Operator

Soft SIM/iSIM



- End customer selects one operator among the few eligible
- SIM profile is programmed during device manufacturing

eSIM, SoftSIM or iSIM?

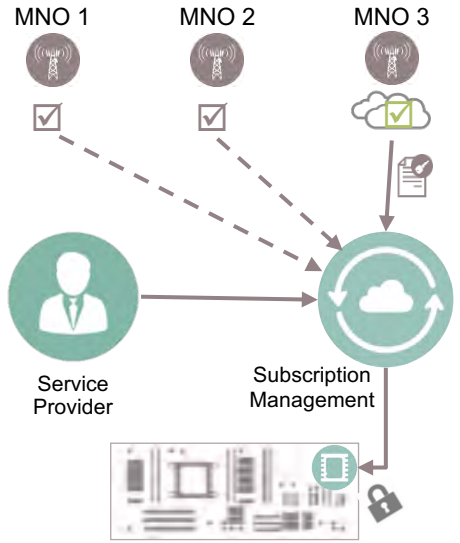
eSIM with Remote Sim Provisioning

- True SIM with Remote Provisioning Over The Air through a subscription management portal
- GSMA Standard
- 2G/3G/4G/LPWA/5G Compliant
- Removable or solderable

Benefits of eSIM

- One SKU can be used all over the world
- Can hold multiple MNO Profiles
- Interoperability, Security
- Ideal for tiny modules, ruggedized devices and rough conditions
- Anti-Theft (can be soldered on the Circuit Board)
- Offers an increased Life Span

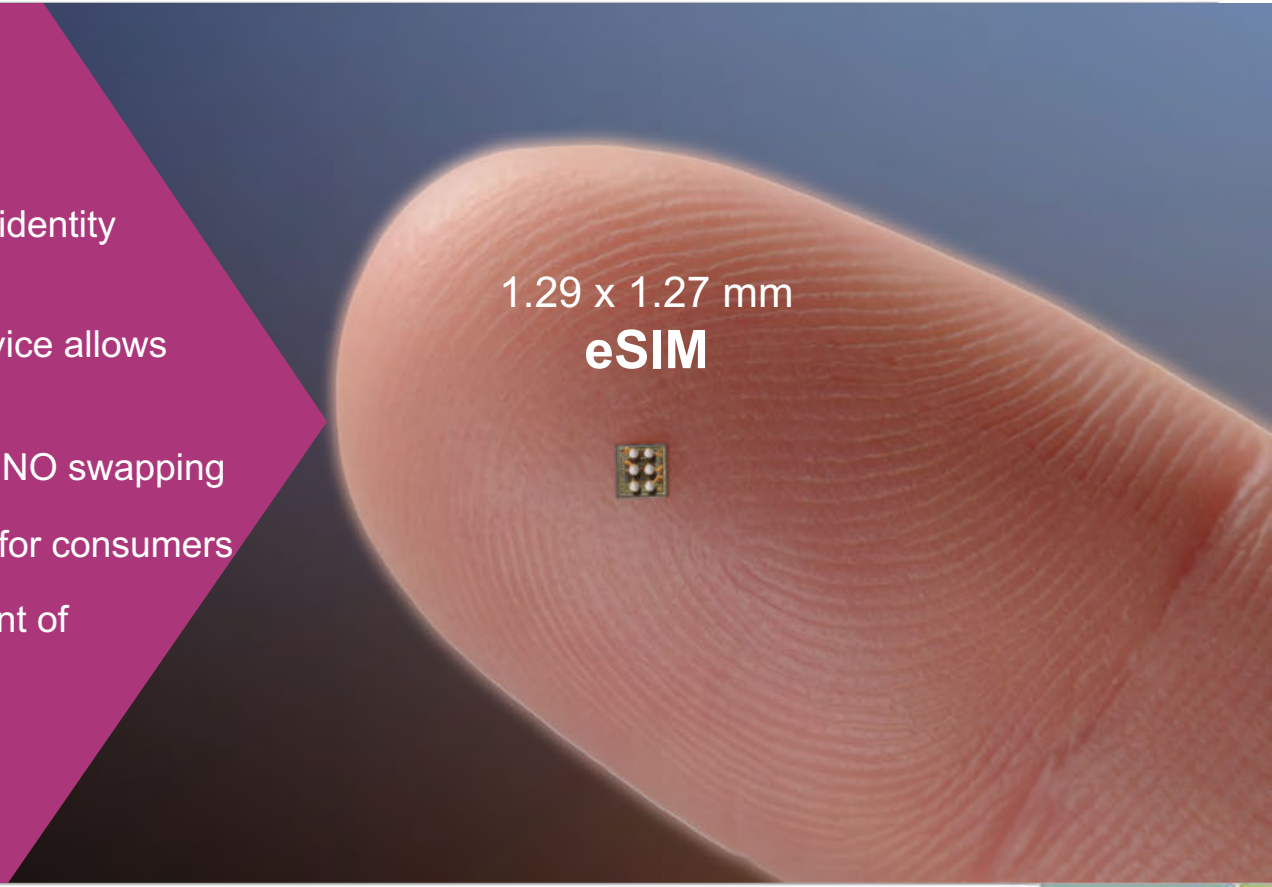
eSIM with Remote SIM Provisioning



- eSIM comes with a pre-installed Profile for out of the box connectivity
- Service provider triggers MNO change
- New profile is pushed to the device

eSIM to replace traditional SIM solutions in the long run

- ✓ Evolution of the physical subscriber identity module (SIM) cards
- ✓ Fixed module integrated into the device allows full design flexibility
- ✓ Over-the-air SIM provisioning and MNO swapping
- ✓ More flexibility in choice of operator for consumers
- ✓ Facilitating supply chain management of IoT devices



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Infineon offers a broad portfolio of eSIM solutions

Security Controllers

State-of-the-art 32-bit security controllers in 40nm technology

Personalization

Simple and highly optimized wafer-level personalization process

New

OPTIGA™ Connect

eSIM turnkey solution for cellular-connected IoT devices

OPTIGA™ Connect
Combining key components to provide a turnkey eSIM solution

Packaging
Standardized form factors

Technology
State-of-the-art security controller technology

Connectivity
Global coverage & Easy management

Operating system
Performance, Security & GSMA compliance

News OPTIGA™ Connect IoT to connect IoT devices globally

OPTIGA™ Connect IoT

- Simplified supply chain and personalization with pre-loaded worldwide bootstrap connectivity
- Easy integration & management: one eSIM solution for multiple use cases and global deployment
- Flexible selection out of > 640 Mobile Network Operators
- GSMA specified Remote SIM Provisioning architecture
- Security evaluated, meeting GSMA requirements
- Industrial quality with an operating temperature range of -40 ºC to +105 ºC
- Choice of packages meeting the major application needs: size & robustness

OPTIGA™ Connect IOT OC2321 – Product Brief
Cellular Connectivity drop-in for IoT devices

Extensive Set of Use Cases
- Out-of-the-box connectivity
- Worldwide single Stock-keeping-unit
- Lifecycle Management

Easy to Integrate
- Full turnkey solution
- Bootstrap for global coverage
- Connectivity management via MOVE
- Adjustable data plan

Future proof
- GSMA compliant
- Interoperability allows new MNO onboarding & change of Subscription Management platform
- Certified against CC EAL 5+ (exceeded today's required security level)
- Open for integration of additional applets

GSMA eSIM compliance	SGP.02 version 3.2	Temperature Range	-40 to +105°C
Java Card	3.0.5 classic	Interface	ISO7816
GlobalPlatform	2.2.1	Operating Supply Voltage	1.62 to 5.5 V
Bootstrap connectivity	Tata Communications	Package	MFF2

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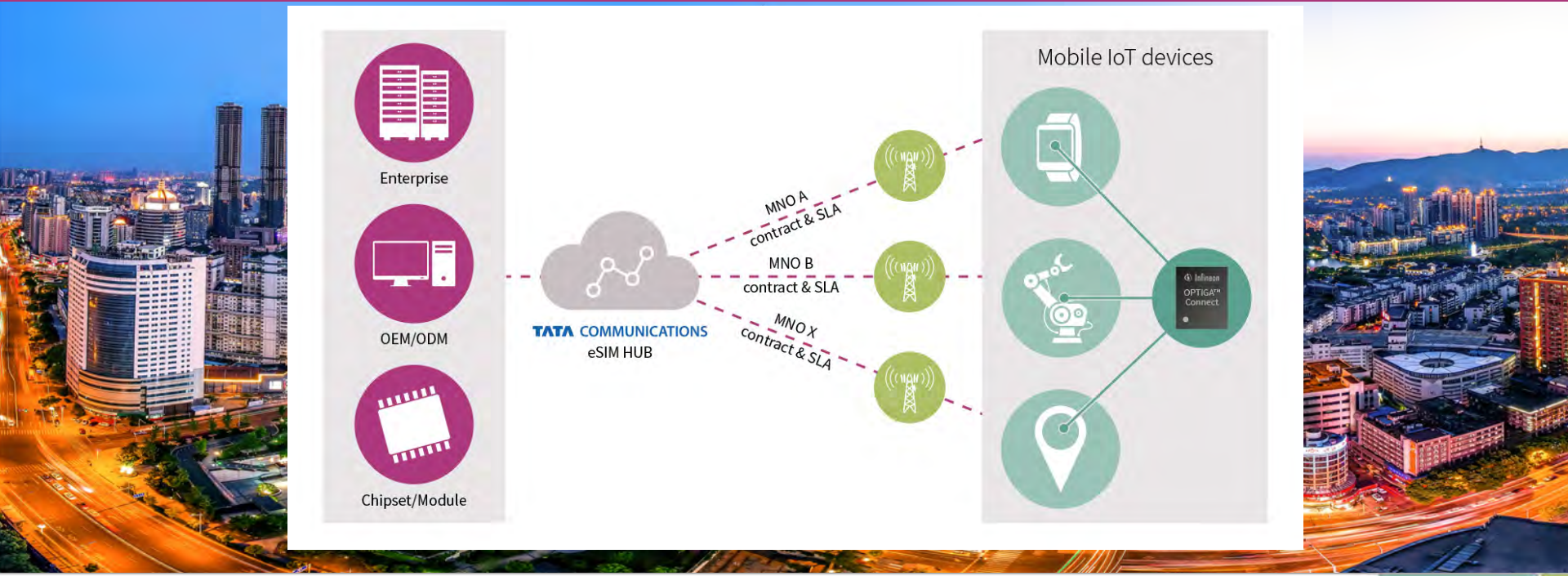
OPTIGA™ Connect IOT OC2321
A different approach to deploy industrial IoT at scale

Bringing eSIMs and Management Platforms together

Combine eSIM technology with a single contract, and single interface to manage connected services globally during the various stages of the hardware lifecycle.



Tata Communications & Infineon – Joint Value Proposition

Simplified hardware BOM, optimized design & TCO

- Reduced footprint with increased level of embedded functionality
- Single SKU for global out-of-the box cellular service personalization, regardless of market segment / vertical
- Comprehensive access to an evolving partner eco-system, global & local, for evolving support of new, fit for purpose, business models & revenue streams

Operational efficiency

- No disruption to the current logistics or procurement process
- Global cellular enablement & operational connectivity management, including "last mile" management
- Automated service provisioning in the relevant cloud, for application optimization
- Automated business rules for relevant service localization, relevant updates & vendor / service provider interoperability management, post deployment

No compromise on security

- Best of breed hardware combined with multi-layered connectivity management, from silicon over edge to cloud

Cellular IoT offers clear advantages for M2M connectivity

But it also requires some though choices

While cellular IoT offers clear advantages as the connectivity enabler for M2M, including cost effective, pervasive and secured connectivity, it also requires choices to be made which will impact the way a device is connected over a lifetime that could be measured in decades…

Difficulty Selecting Connectivity Provider

At the point of device or module manufacture, it is not known yet where or how the device will be deployed or used

Flexibility of change

Once deployed in different countries, changing connectivity provider becomes a logistical and operational challenge

Compliance with Global Telecom Policies

It becomes a significant undertaking to comply with regional or national regulatory frameworks at the point of manufacture

Consistent user experience

Becomes challenging in an environment where multiple service providers may provide connectivity for services that cross borders

OPTIGA™ Connect OC2321 for large-scale IoT deployments

An easy way to benefit from cellular IoT

Simplification and security of all process steps give customers the satisfaction that their main problematics have been considered before, during and after deployment of its IoT devices.

Easy to buy

OC2321 turnkey solution allows for a simplification of the supply chain (reduced interfaces, contracts, cost)

Easy to design

OC2321 is delivered in MFF2 package industry standard to ensure easy design-in and possible multi-sourcing.

Easy to deploy

OC2321 has a single SKU for all regions (230+ territories coverage). No specific set-up to implement per regions of deployment.

Easy to connect

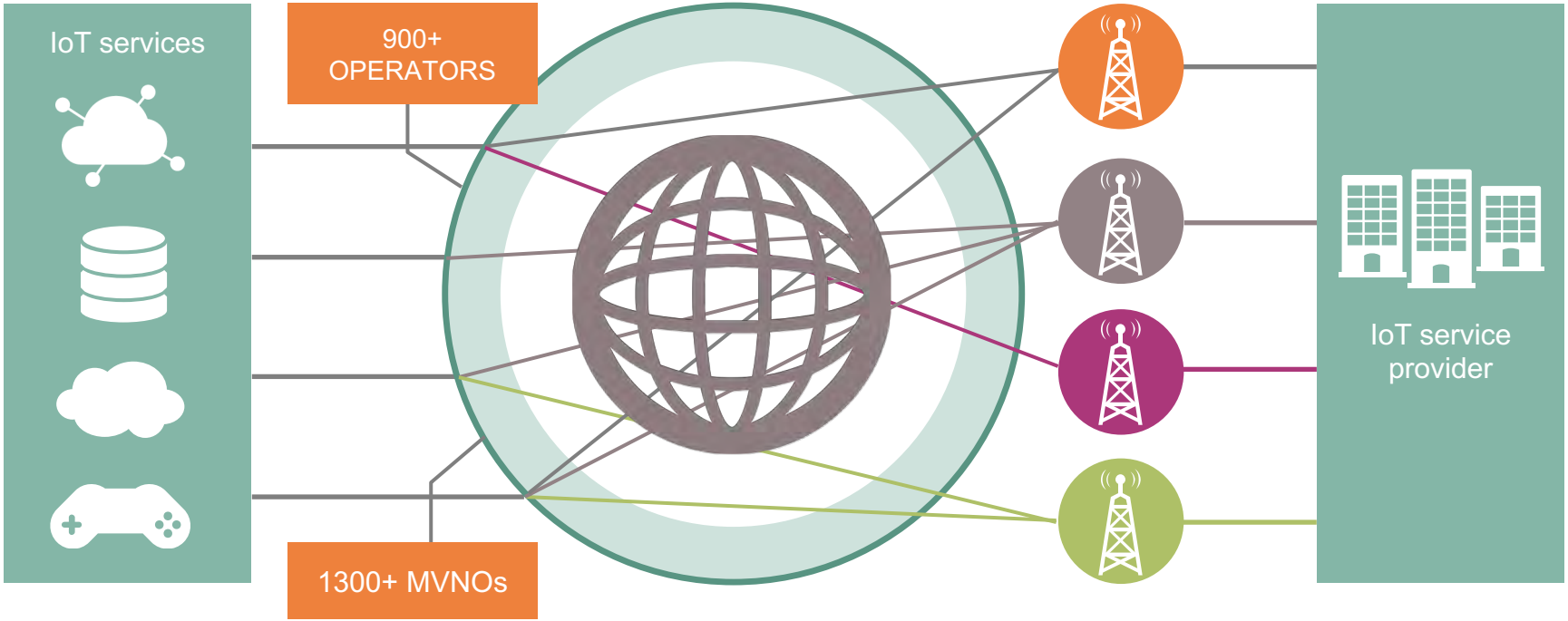
Infineon partners with Tata Communications which offers dedicated connectivity data plan acc. to customer, application and use case requirements.

Easy to manage

Tata MOVE™ platform allows for a centralized management of connectivity and other IoT services (e.g. Cloud service)

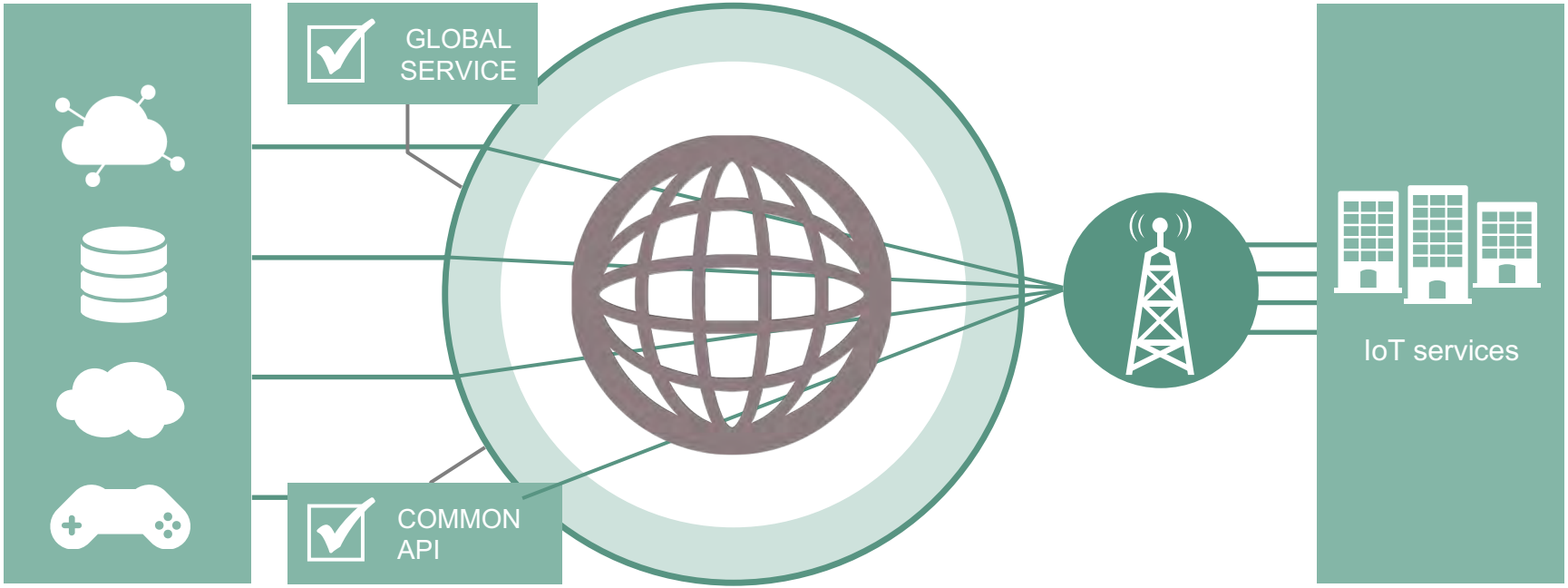
Tata Communications
Complex operator agreements and relationships

How to deal with multiple mobile network operators and interfaces to maintain service continuity



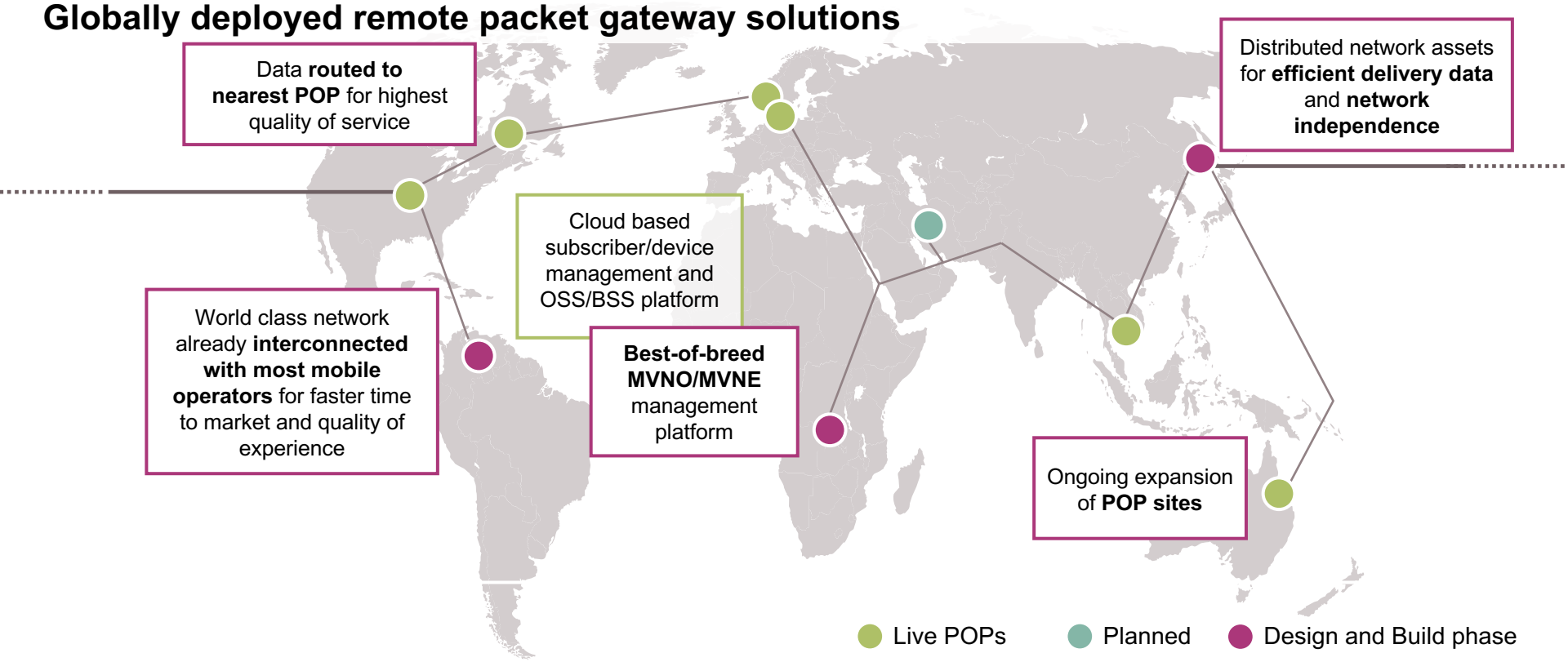
Tata Communications
A new approach: Tata communications MOVE

Single relationship to manage globally deployed IoT services (including byod)

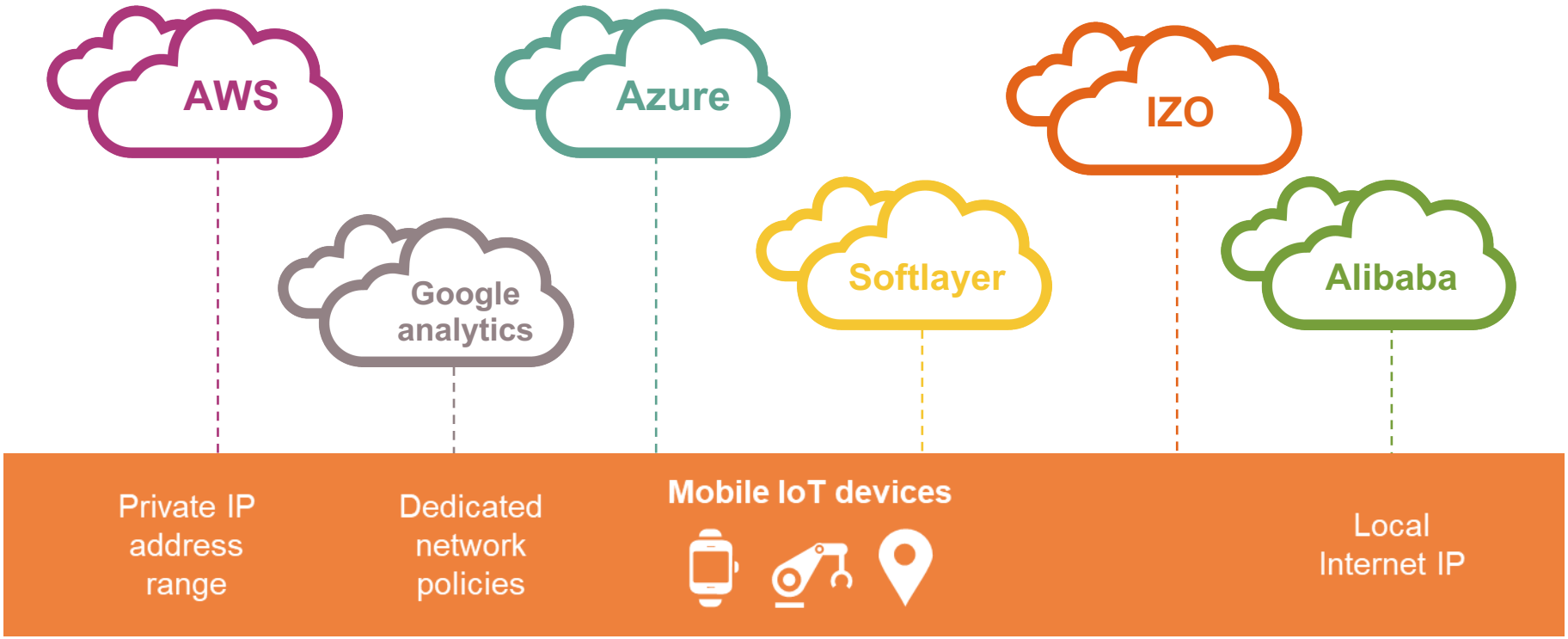


Tata Communications
Fully owned global MOBILE infrastructure

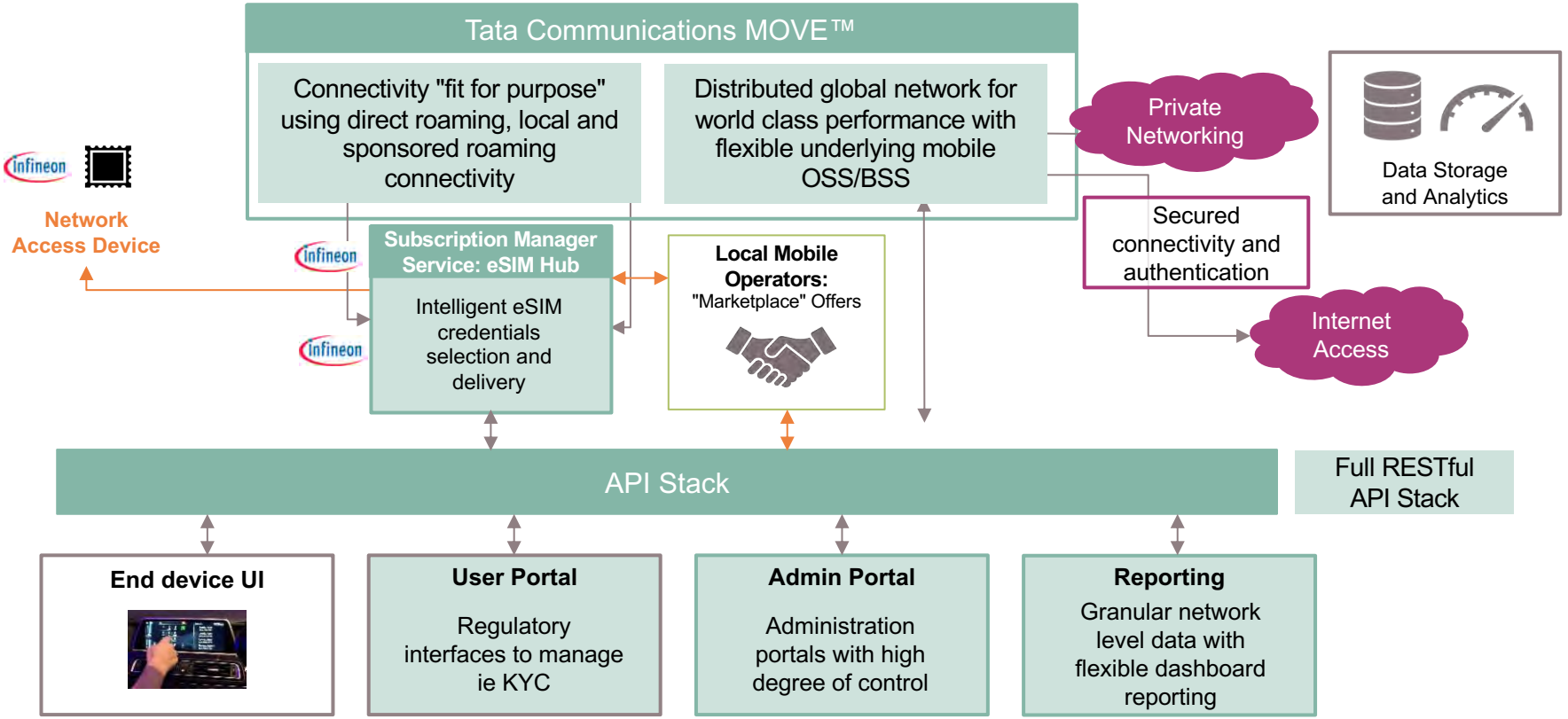
Globally deployed remote packet gateway solutions



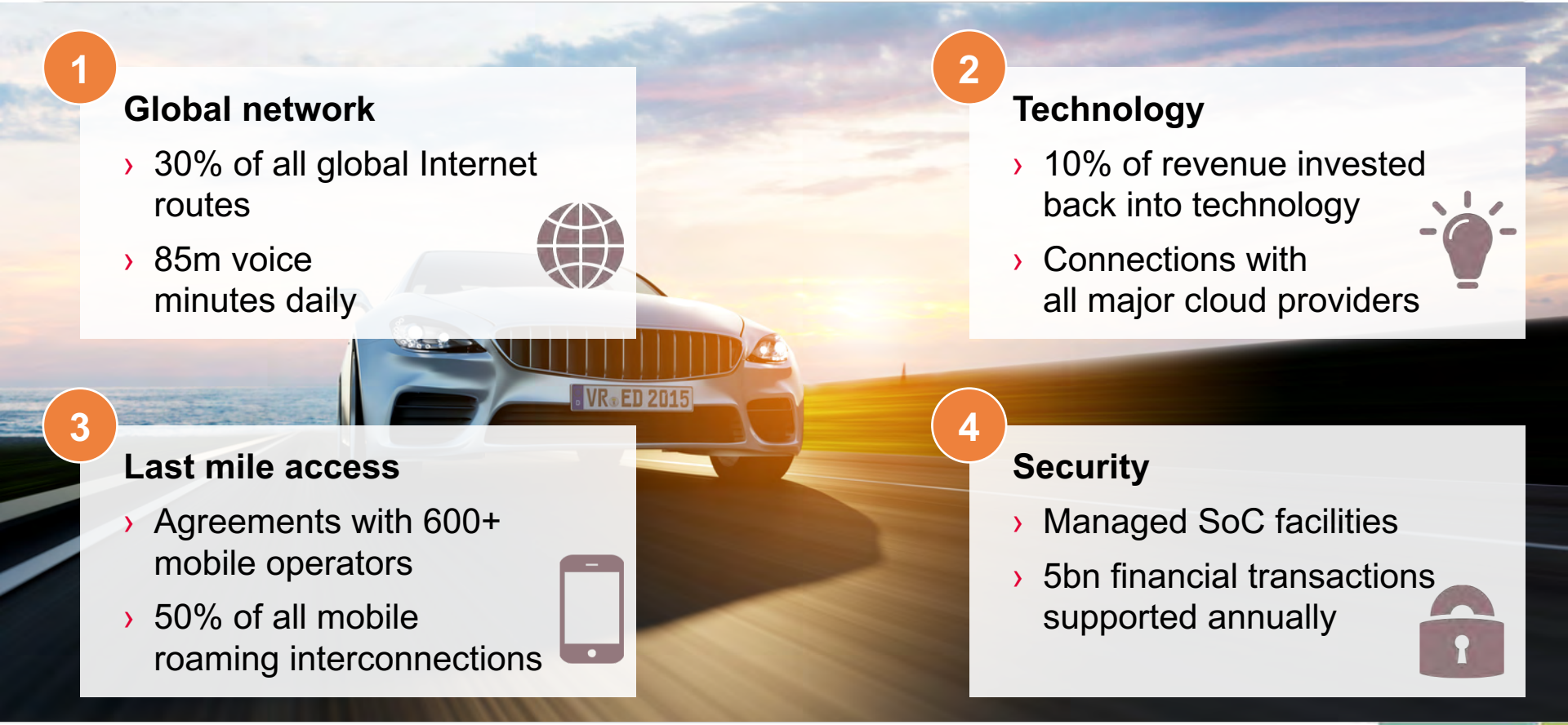
Tata Communications
Cloud application connectivity service



Tata Communications
End to end connectivity reference design



Tata Communications
Key assets



1

Global network

- 30% of all global Internet routes
- 85m voice minutes daily

2

Technology

- 10% of revenue invested back into technology
- Connections with all major cloud providers

3

Last mile access

- Agreements with 600+ mobile operators
- 50% of all mobile roaming interconnections

4

Security

- Managed SoC facilities
- 5bn financial transactions supported annually

You can count on us

Solutions proven in the industry

200 million

eSIM's delivered

Best partner network

50 Partners

for Security

Most trustworthy and innovative network of partners in the security space

Extensive track record and reliable logistics

36 billion

units shipped

In FY 17/18 ≈ 4 pieces for every person in the world

Long-term commitment

10 years

product lifetime commitment

Shaping tomorrow's standards

> 100

standardization bodies

Driving standardisation bodies like GSMA, ETSI, Global Platform, 3GPP and NFC Forum

Strong innovation power

> 25,000

patents

7,161 R&D employees; 11% of Infineon's revenue goes into R&D

Which IoT security challenges do you face?

Part of your life. Part of tomorrow.