Accelerating deployment **in the Internet of Things**

gemalto
security to be free

Foreword

If 2016 was the year that the Internet of Things broke into mainstream consciousness, 2017 will be the one where it starts to prove its worth. While consumers are being wowed by virtual assistants that turn on the lights, those in enterprise are discovering how to demonstrate real value to their business.

The initial hype has been overcome, the technology and connectivity is here and sensors are bringing in data that is robust. Now this foundation stage is complete, attention can turn to the more exciting task of rapid experimentation and eventual widespread adoption.

Many companies have completed proof of concept ideas and tinkered with small scale tests. But to be truly useful, these projects must mature quickly. It is this challenge that organizations must address as the need to scale rises in prominence.

This paper has been developed to assist those thinking about how the Internet of Things can aid their organizations. It outlines the opportunity that the new levels of connectivity bring, and helps demystify what it takes to deploy an enterprise IoT solution.

As part of the process we sought the assistance of two experts in the Internet of Things. Rob van Kranenburg and Robert van der Veur have many years' experience in building and managing IoT projects around the world. We thank them for their contributions.

We hope you find the insights contained within helpful in accelerating your own IoT project.

Neil Bosworth
UK manager, Gemalto M2M

Starting off

The fascinating aspect of this new world of digitalization combined with connectivity is its limitless possibilities. Each company has its own objectives and its own advantages. The reason for bringing previously disconnected devices and machines onto a network will differ in every case. But the goal will invariably be the same—drive the company to new heights.

It can be daunting at first. Those on the front-lines of operations and those at the very top of management understand the transformational potential of the IoT. But achieving company-wide buy-in can be a challenge both in terms of internal investment and overcoming the risk of doing something new for the first time.

If building and deploying IoT solutions in the enterprise is to be a success, there must be recognition that each use-case is not the same. A large-scale project that aims to connect tens of thousands of endpoints is markedly different to one in the low hundreds. While those looking to connect large, complex infrastructures together may have to create a bespoke solution, there are alternative options for those with smaller scale objectives. This is where opting for a partially pre- designed and pre-certified endpoint solution can result in significant savings, both in terms of costs and time.

Common application scenarios

There are industries and sectors that lend themselves more readily to the Internet of Things in the near-term. These are:

1. **Predictive maintenance**
2. **Remote monitoring**
3. **Building management**
4. **Agriculture**
5. **Fleet management**

Adding predictive maintenance and remote monitoring to a company's toolset can have a dramatic effect on its productivity. There are countless machines that the digital revolution has hitherto passed by—everything from manufacturing and farming equipment, to vending machines, digital signage and even plumbing.

What many industries have in common is that non-connected devices are often deployed remotely and manned (if at all) by employees who generally have limited technical skills. Thus, when something malfunctions, there can be high associative costs for problem identification and resolution. The obvious solution is to install something that can monitor performance in real-time and send alerts and diagnostic information as soon as a fault is detected or, ideally, before it happens - and potentially provide a route for remote troubleshooting as well.

Introducing Gemalto Cinterion EHS6T M2M terminals

Gemalto has developed a range of simple and reliable plug-and-play M2M terminals. They ship with embedded Java™ allowing for easy and fast application development.

With the footprint of a credit card and encased in robust plastic housing, the miniaturized terminals work in virtually any scenario providing secure connectivity.

They also have on-device debugging, multi-threading programming and program execution.

Read on for a look at one potential use-case:

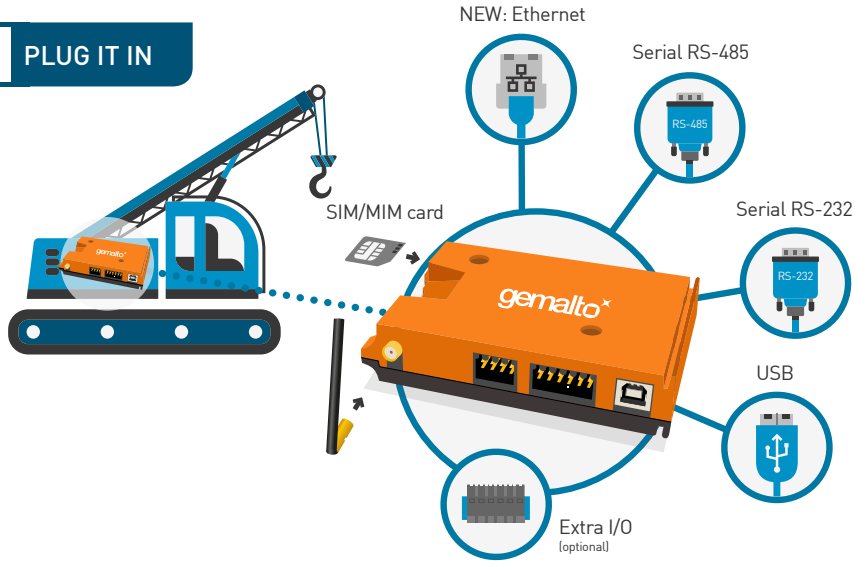
A TYPICAL FIELD SERVICE ENGINEERING CHALLENGE

- When something goes wrong...
- You rely on your service contract to get it fixed
- But this means calling out the maintenance team
- Which means wasted time and money...

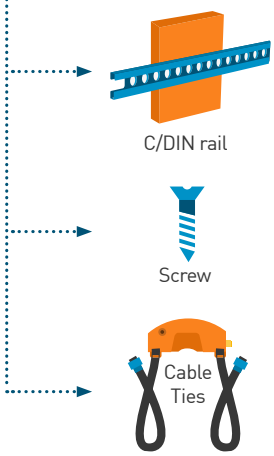
THE BENEFITS OF WORKING WITH GEMALTO

Quickly connect your industrial applications with virtually zero design time, no hardware skills, minimal integration effort and no costly approvals using Gemalto Cinterion® Cellular Terminals.

1 PLUG IT IN



2 FIX IT IN



3 ADD EXTRA EMBEDDED FEATURES (OPTIONAL)

4 24/7 ONLINE MAINTENANCE TEAM

For many the IoT remains something of a revelation and an enigma.
Each project will have its own pain points but for the majority the path to success can be fast tracked.

The workflow of IoT deployment

Assessment is the bedrock of any IoT project. The goal and the constraints must be known, including costs, deliverables and timescales. Once a company has confirmed these parameters, there are a further five stages before deployment. These are concepting, prototyping, pre-production, approvals and certification, and production.

When approaching design of an IoT device, the temptation will naturally exist to craft something bespoke. This has its advantages in that it will cater specifically to its purpose. However, there are hidden drawbacks that mean a purpose-built solution like a Gemalto terminal is ideally suited for the majority of IoT enterprise projects.

This is a breakdown comparing what it takes to complete an IoT deployment using a pre-built solution and a wholly bespoke design. The key benefit of a Gemalto terminal is that everything required is limited to the software level. For bespoke design, things are a little different...

GEMALTO TERMINAL

Concept

GEMALTO TERMINAL REQUIREMENTS:

- Development of AT Commands on lab equipment
  - Network connection management
  - Data formatting
- Demonstration of back end display

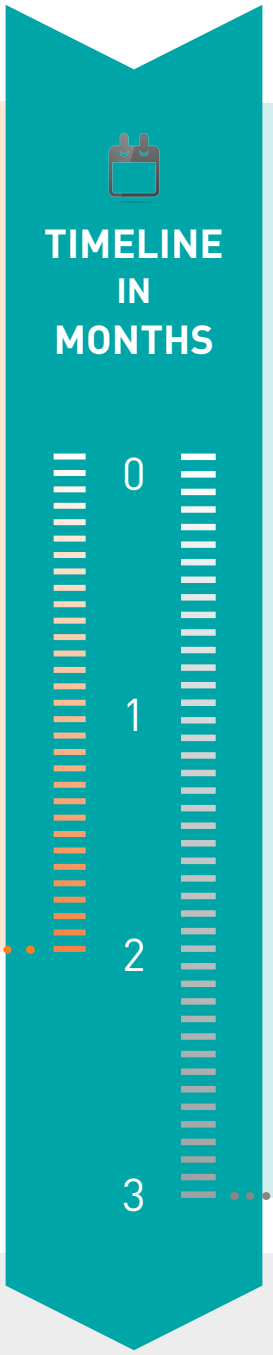
SKILLS REQUIRED:

- Software and firmware
- Systems engineering

TIMESCALE

1.5 – 2 MONTHS

The cost savings are immediately apparent with no need for creation of a concept or development board. Using the terminal companies can jump to demoing embedded software quickly.



BESPOKE

Concept

FULL BESPOKE DESIGN REQUIREMENTS:

- Creation of development board
- Connection to the connected object
- Development of AT Commands on lab equipment
  - Network connection management
  - Data formatting
- Demonstration of back end display

SKILLS REQUIRED:

- Software and firmware
- Systems engineering

TIMESCALE

2 – 3 MONTHS

GEMALTO TERMINAL

Prototype

GEMALTO TERMINAL REQUIREMENTS:

- Firmware development
  - In host device/Embedded in Terminal
- Back end data capture and display development

SKILLS REQUIRED:

- Software and firmware design

TIMESCALE

1–2 MONTHS

TIMELINE IN MONTHS

2

3

4

5

6

7

8

BESPOKE

Prototype

FULL BESPOKE DESIGN REQUIREMENTS:

- Schematic Capture
- Layout
- Component Selection
  - Migration Strategy
- Component Procurement
- RF Concept
- Enclosure Design
- Embedded firmware
  - AT Commands
- Back end data capture and display development

SKILLS REQUIRED:

- Hardware design
- Mechanical design
- Software and firmware design
- RF design
- PCB layout
- Purchasing

TIMESCALE

4–5 MONTHS

It is this second stage where the time savings start to show more dramatically. The skills needed to prototype a product are also extensive which can drive up development costs.

GEMALTO TERMINAL

Pre-production

GEMALTO TERMINAL REQUIREMENTS:

- Firmware development
  - In host device/Embedded in Terminal
- Back end data capture and display development
- Testing

SKILLS REQUIRED:

- Software and firmware design

TIMESCALE

1–2 MONTHS

Products require significant approvals – especially for connectivity. This process often leads to multiple design iterations, component and layout changes, as well as scheduling time with an authorised test facility. The costs of tests, retests, and reports are significant, running from Đ10,000–Đ50,000.

Meanwhile with a Gemalto terminal, this has all been completed, and only software testing is required.

TIMELINE IN MONTHS

4

5

6

8

13

BESPOKE

Pre-production

FULL BESPOKE DESIGN REQUIREMENTS:

- Schematic Capture - rework
- Layout – rework
- Component Selection – optimise
- Component Procurement – negotiation
- RF approvals in test house
- General EMC – approvals
- Test equipment design
- Testing
- Design for manufacturing
- Manufacture selection
- Embedded firmware
  - Back end data capture and display development
  - Manufacturing Test firmware
  - Configuration firmware

SKILLS REQUIRED:

- Hardware design
- Software and firmware design
- RF design
- PCB layout
- Purchasing

TIMESCALE

4–5 MONTHS

GEMALTO TERMINAL

Production

TIMESCALE

COMPLETE
AT 6 MONTHS

A Gemalto terminal is already made. This negates the costs needed for bespoke production runs, but also ancillary concerns such as documentation, warranty, and export restrictions.

Time to deployment: up to 6 months

TIMELINE IN MONTHS

6

13

18

BESPOKE

Production

FULL BESPOKE DESIGN REQUIREMENTS:

- Schematic Capture - rework
- Layout – rework
- Component Selection – optimise
- Component Procurement
- Manufacturing
- Documentation
- Warrantees
- Export restrictions

SKILLS REQUIRED:

- Hardware design
- Software and firmware design
- RF design
- PCB layout
- Purchasing
- Legal

TIMESCALE

4–5
MONTHS

Time to deployment: up to 18 months

Deployment

Both products are now ready to be deployed into the field.

A Gemalto terminal would have made it there a minimum of **three times faster**, and with considerable cost savings. If you started at the beginning of the year, a good idea could be rolled out before summer, while a bespoke design could take another year to be ready.

Nine best practices for accelerating IoT projects within your organization

01.

Depend on the generic functions of IoT service modules

At this stage in the IoT, off-the-shelf solutions allow companies to deploy quickly and start iterating faster.

02.

Work within your skills base

If your company lacks expertise in connectivity, for example, hiring a team to develop a bespoke solution is more complex than selecting a trusted partner.

03.

Get good at building the business case for IoT

Many parts of an organization will not be able to visualize the benefits of investing in the IoT. You must bring many hierarchical layers together so arming yourself with proposed results that work for different facets of your business will be essential.

04.

Retrain your service engineers

Responding to and supporting remote diagnostic flaws picked up by IoT solutions will be very different to previous diagnostics work.

05.

Consider how you secure your endpoints

A growing area of concern in cyber security is that of data integrity attacks. If an endpoint is compromised it could result in multiple service calls to an otherwise functioning machine. This could end up driving up costs. Security is vital to maintaining a high degree of trust in the IoT.

06.

Be aware of the landscape

There is no one size fits all when it comes to the IoT. For example, connectivity standards differ around the world, so what works in Europe may not necessarily work in the Americas.

07.

Decide early on the types of data collection and transmission

Modern sensors can detect anything you like, and transmit it back in various forms. sound, images, video, text, raw data etc.

08.

Think about where you want data processing to happen

There is a wide range of IoT endpoints on the market (and any you develop bespoke), ranging from the 'simplistic' which may just transmit very simple data, through to the quite sophisticated. The presence of a JavaME™ core in the terminal makes it possible for developers to carry out data transformations as well as performing communication control and applying a particular industry communication protocol at end points which may simplify data aggregation and analysis.

09.

Build external partnerships

Telecoms providers, for example, are negotiating new deals to allow companies to operate their own virtual networks. Could this be a game-change for your company's IoT ambitions?

A guide to successful enterprise IoT deployment

Robert van der Veur
Project Manager, Business Intelligence & Analytics

Rob van Kranenburg
Founder of the IoT Council

The rewards of a successful IoT solution for an enterprise are potentially huge: cost savings, new income streams, efficient business processes and happier customers. When it comes to developing enterprise Internet of Things (IoT) solutions, there is a lot to consider. Here are some guidelines:

The idea of IoT is not to connect everything to everything else, it is to gain the right information at the right time and place, for decisions to be made. IoT is not about the things, networks or platforms, but all about the data collected. Business value will be only realized through data analytics and the decisions based on the information extracted.

Planning is key. When starting with IoT **think big, but start small.** Using IoT and data analytics often requires changes to the enterprise culture. That can be achieved by proving the value of IoT through small, fast wins that demonstrate business value, by showing how the new way is better than the old way and communicating that to the whole enterprise.

Achieving enterprise wide buy in can also be a challenge in terms of internal investment and departments closely working together for the first time. This requires breaking down barriers and realizing that the problem is about culture and people, not technology. Although integration of technology will take on average 30% of the budget.

Keep it simple. Watch out for the hype and don't get carried away with all the possibilities IoT, data science, artificial intelligence or robotics can offer. If starting out with just an idea with nothing built yet, the first goal should be to prove the solution to build adds business value. This first version is often referred to as a Minimum Viable Product, or in other words, a solution that has just the core features that make it work. Every following version adds functionality and must increase the business value.

High cohesion and loose coupling. The current lack of uniform standards for the Internet of Things is a problem. The chance that parts of the enterprise IoT solutions will have to be redesigned after a few years is high. A design with high cohesion and loose coupling reduces the effects a change on one part of the system has on the rest of the solution.

And stop reinventing the wheel. Use COTS (commercial of the shelf), SAAS (software as a service) and plug & play hardware, like the Gemalto LAN terminal.

Conclusion

The future is clearly a connected world. Waiting for a product or machine to fail and then attending to it is inefficient. Instead we can monitor its status and diagnose issues before they become severe. This alone could have far-reaching ramifications for dozens of industries, reducing downtime for customers, lowering support costs, and optimising productivity. And by adding connectivity, you open up possibilities for innovation that cannot exist when devices and machines are offline.

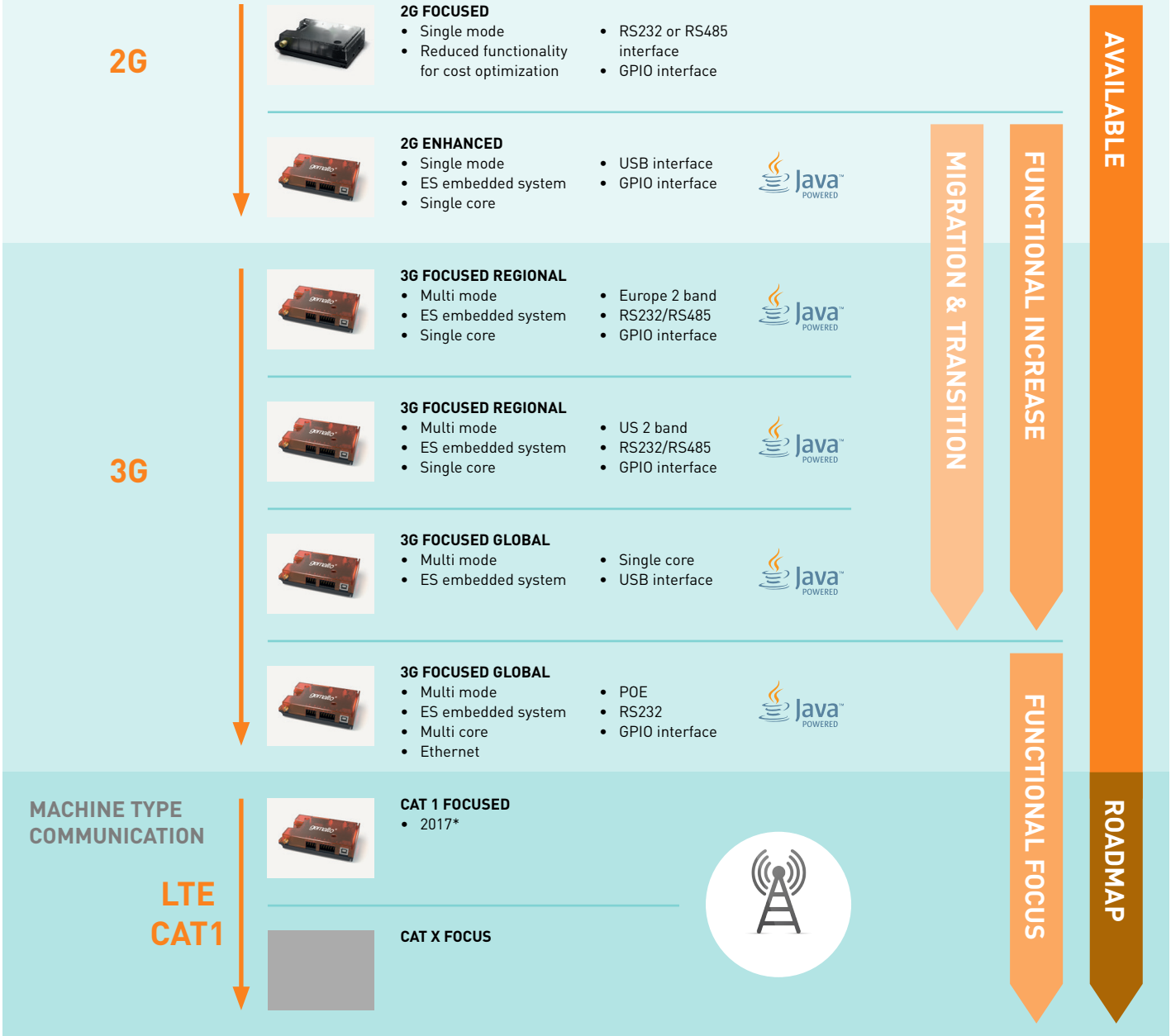
We are approaching a point where the barriers to entry are rapidly diminishing, allowing companies to take accelerate their progress in the Internet of Things. Critical to this acceleration is understanding the nuances of the ways in which IoT projects evolve from prototype to production, and the ways in which you could accelerate that process. For example, using a Gemalto terminal could allow your project to be deployed up to a year faster than it could be with bespoke development.

We hope this paper has been helpful and would gladly receive comments and additions from the community, and must once again give our thanks to Rob van Kranenburg and Robert van der Veur for their contributions.

Gemalto Cinterion M2M Terminals ("Small Terminals for Big Ideas")

Cinterion M2M Terminals work out of the box to quickly and easily add M2M connectivity to smart enterprise applications. With very little integration effort, Terminals can be connected to applications via standard industrial interfaces such as RS232, RS485, USB and the newly introduced Ethernet LAN terminal offers Power Over Ethernet (PoE). With a focus on Industrial connected applications the Terminals facilitate various mounting options (e.g. DIN rail, Crail) to further ease integration into industrial machines.

GEMALTO MIGRATION PATH FROM 2G TO MTC MADE SIMPLE



More information can be found at: **www.gemalto.com/m2m/solutions/modules-terminals/terminals**

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