The Digital Business Marketplace Catalyst

Tackling the worldwide digital ecosystem with frictionless partnering and secure, zero-touch establishment and in-life management of IoT devices at scale

Champions: BT, DT, NTT, T-Mobile
Participants: Agile Fractal Grid, BearingPoint, Digiglu, Intel
Example anatomy of a Digital Business Marketplace ecosystem

Frictionless Trading Relationships

End Customer Digital Self-Service

Energy

Health

Manufacturing

Automotive

CSP & Devices

Logistics

Cloud
Problem Statement:
Digitally Transform or face extinction!

- Consumers expect to be able to buy & configure any/everything on their Smartphone, “self-service”
  - Increasingly a similar configure & buy experience is expected in B2B scenarios, e.g. SmartOffice, SmartGrid, SmartEnergy, SmartFactory, SmartCity, etc… as well as SmartHome and SmartVehicle
- As traditional industries move their products and/or services to be Smart “end-to-end solutions”, by applying eSIM’s or IoT devices to physical goods, this implies a need for organisations to combine different components to deliver end-to-end solutions, anticipating a “Digital Business Marketplace”

But there are complex barriers and hurdles hindering the Digital Business Marketplace getting established and being able to scale. The need is:

- … for “Frictionless Trading” between different traditional organisations
- … to define and adopt industry agnostic repeatable patterns
- … to remove manual processes and achieve Zero Touch Onboarding (ZTO) & in-life Management
- … to ensure secure / non-hackable devices and systems
- … to provide milli-second decision making capabilities at the edge
The need to remove manual processes...

...and achieve Zero Touch Onboarding (ZTO) and Management of end-to-end solution components, i.e. IoT devices, products, applications, services – and simultaneously secure devices’ supply chain...

Saving 20 mins per device…. for 3m devices = a saving of **500 man years** of onboarding work!

The aim is to offer cost-effective, secure & scalable solutions for the IoT market, dealing with onboarding of millions of devices automatically as assured and fully trusted endpoints.

Delivering secure / non-hackable IoT devices and systems leveraging encrypted keys with unique passwords (VPN tunnelling etc), with a fully trace-able and secure automated supply chain and granular monetization for all the partners.
The need to provide milli-second decision making at the edge

... using 5G connectivity, massive Machine-Type Communication (mMTC) & Ultra-Reliable Low-Latency Communication (URLLC) – together with secure IoT and high performance compute at the edge

Electric Power
- To enable a power substation to protect itself from a spike from the electrical grid backbone, it has less than 4 milliseconds

Manufacturing
- To enable a metal lathe to stop in time to avoid replacement when its bearings fail, there is only 1 millisecond

Surveillance - Security
- To enable a drone to have its HDTV camera feed instantaneously analysed by BI to determine the threat and next action

Repeatable Secure Solution
- The capabilities of URLLC and secure IoT together with compute at the edge are effective to solve the scenarios above and the needs of the 4th Industrial Revolution
Flexible ZTA/B/C/D options to enrich the enterprise experience

Other manufacturer tenants are AD-Link (Camera & Applications), Future Robot (Camera & Applications), Bosch (Connected Devices & Applications) and Dell (Smart Gateway & Operating Systems) [Not shown for the sake of clarity]
Zero-Touch-Onboarding high level deployment architecture

Cloud-native and event-oriented micro-services architecture based on the digiglu digital experience framework
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Questions
The **Vision** is to create a worldwide ecosystem, where businesses can bundle, assemble and trade each other’s products & services and sell & support these new offerings to customers in a frictionless **self-service** digital way.

The **Mission** is to leverage the TM Forum catalyst programme, to shape and test key “partnering and customer” use cases in a prototype that will illustrate the business case for traditional companies to participate in the digital worldwide ecosystem – enabling the 4th industrial revolution.

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Device Onboarding with SDO

1. **Build and Ship SDO Enabled Devices**
2. **Register Ownership to Target Platform**
3. **Register Devices with SDO Server**
4. **SDO redirects Device to its target Platform**
5. **Device Authenticated and Provisioned**
6. **Device sends data to IoT Platform**

- **Device Manufacturer**
- **Target Platform**
- **SDO SDK**
- **SDO Rendezvous Service**
- **Data flows**
- **Onboard device**

**Steps:**
1. SDO enable device & create Ownership Voucher
2. Load Ownership Voucher into Target Platform
3. Register Ownership Voucher with SDO service
4. Onboard device
5. Provision device
6. Load Ownership Voucher into Target Platform
The global Digital Business Marketplace

... enabling companies to be a part of a frictionless trading global ecosystem

Digital Business Marketplace

BearingPoint // Beyond
Traditional industries are moving their products and services to be Smart “end-to-end solutions”

... by applying eSIM’s or IoT devices to physical goods, this implies a need for organisations to combine different components to deliver end-to-end solutions, anticipating a “Digital Business Marketplace”
Frictionless Trading between different organisations is complicated...

... because each industry, each company (& even LOB) has it’s own data models, technical dependencies and different articulation for handling pricing

... additionally each each company (& LOB) has its own Legacy IT ERP or BSS... all of which have been customised! and each industry has its own “language”...

Most traditional company’s find it difficult to offer customers self-service for their own products and services ...

...so to add in another company’s product and services into the mix in a self-service context is very difficult due to different data models, different technical dependencies for MACD and different articulation for handling pricing
Successful Frictionless Trading between different organisations ...

... requires an overlay, abstraction & agnostic approach to enable companies to plug & play AND trade so that they can rapidly scale and accelerate their digital Smart offerings using a common language.

The system maintains each company’s technical dependency rules and business pricing rules, enabling combinations of products and services to be exposed as self-service for customers—and providing billing and settlements.

Each company has its own data models, technical dependencies and different articulation for handling pricing.
Initial ecosystem entities and roles for the Smart Adastral car parking ZTO scenario

- **Smart Adastral Customers**
  - Admins
  - Users

- **Intel SDO Customers, Admins and Users**
  - Intel SDO rendezvous service
  - Intel SDO-ready NUC, Bosch Camera (with Arm), Raspberry Pi Camera

- **BT Enterprise Tenant Operators**
  - BT Enterprise’s onboarded services / service providers: ZTC, ZTA, ZTB, ZTD, Wi-Fi, LoRa, (5G?)

- **BT Enterprise Tenant**
  - BT Enterprise’s onboarded resources / resource providers: None?

- **Intel Tenant**
  - Intel’s onboarded services / service providers: Intel SDO rendezvous service
  - Intel’s onboarded resources / resource providers: Intel SDO-ready NUC, Bosch Camera (with Arm), Raspberry Pi Camera

**Devices**

<table>
<thead>
<tr>
<th>Devices</th>
<th>Capabilities</th>
<th>Chargeable</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUC</td>
<td>Smart Gateway / Edge Device Wi-Fi, LoRa, (5G?)</td>
<td>NUC - one-off ZTO – MRC Network – Usage based</td>
</tr>
<tr>
<td>Cameras</td>
<td>SD, HD (to cloud) Wi-Fi, LoRa, (5G?) (to cloud) NPR, Queueing, Speed detection, Free parking spaces</td>
<td>Camera - one-off ZTO – MRC Apps</td>
</tr>
</tbody>
</table>
B2B2X in an IoT ZTO context

- B2B2X will allow businesses to aggregate a complex mix of IoT products and services (e.g. data hub services, edge computing, devices, connectivity, apps) from large numbers of partners
- TMF catalyst initial partners/prospects – AFG, Arm, AWS, BearingPoint, Digiglu, DT, Intel, Nokia, NTT, Salesforce, T-Mobile
Minimise the ZTA/B/C/D options to simplify the consumer experience

Other manufacturer tenants are AD-Link (Camera & Applications), Future Robot (Camera & Applications), Bosch (Connected Devices & Applications) and Dell (Smart Gateway & Operating Systems) [Not shown for the sake of clarity]
In this demo, the digital owner’s public key that is used in the order is the one that corresponds to BT’s DMS. In other demos, it will correspond to the DMS that is selected by the Enterprise customer.

Note: Keep all ZTO options in the UI and product configuration but default to the MVD choices (and only allow these choices) for now.

Note: ZTA has a dependency on ZTD.

- In the consumer scenario, the customer settles the bill with BT, while BT shares revenue with other partners.
- In the enterprise scenario, the customer may need to settle the bill with BT and partners (e.g. arm for DMS), while BT and, in this case, arm share revenue with other partners.
Demo Architecture – Digital Orchestration Layer

To prove out the workflows and partnering repeatability, a lightweight approach was taken to deliver the demo in 5 weeks.

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Demo Architecture – Digital Experience Layer

To prove out the workflows and partnering repeatability, a lightweight approach was taken to deliver the demo in 5 weeks.
As the City of London Council, I want to "self-service order" a Zero-Touch bundle (order fulfilment phase – 1 of 2)

Subsequent customer page refreshes at any time cause the portal to issue GET requests on the BT Tenant.

**Device**
- NUC order in progress
  - device order progress notification
  - device order progress notification
  - NUC order in progress
  - NUC orderService
  - 201 Created (externalId, state, serviceIdentifier, ...)
  - orderDevices (Skus, shippingAddress)
  - 200 Ok (serviceName, serialNumbers)

**Network**
- Network order in progress
  - Connectivity order progress notification
  - Connectivity order progress notification
  - 201 Created (externalId, state, serviceIdentifier, ...)
  - orderConnectivity (connectivity, ...)
  - 200 Ok (serviceName)

**ZTC**
- ZTC order in progress
  - Configuration order progress notification
  - 201 Created (externalId, state, serviceIdentifier, ...)
  - configureConnectivity (deviceProfile, connectivity, ...)
  - 200 Ok (serviceName, ...)

Device installation already done at the manufacturing stage.

Device order in progress.

Further device order notifications (not shown for clarity).

Device order delivered.
As the City of London Council, I want to “self-service order” a Zero-Touch bundle (order fulfilment phase – 2 of 2)

Triggers:
This ⭐ triggers ⭐

© serviceIdentifier’s are correlated with serialNumbers

ZTA

Transfer requested, ZTA order in progress

SDO orderService (serviceIdentifier, …)

- 201 Created (externalId, state, serviceIdentifier, …)

SDO order progress notification

orderCertificates (serialNumbers, digitalOwnerPublicKey, ownerEndpoint, endpointCredentials)

SDO order in progress

Ownership transferred, ZTA order in progress

SDO order progress notification

SDO order progress notification

200 Ok (serviceId, serialNumbers, extendedOwnershipVoucherIds)

Certificates delivered notification

Ownership claimed, ZTA order complete

SDO order progress notification

SDO order progress notification

200 Ok (…)

200 Ok (…)

SDO order in progress

ZTD

ZTD order complete

SDO orderService (serviceIdentifier, deviceProfile, …)

- 201 Created (externalId, state, serviceIdentifier, …)

configureDms (deviceProfile, …)

200 Ok (…)

200 Ok (…)

Assumes templates are already uploaded

ZTB

ZTB order complete

SDO orderService (serviceIdentifier, deviceProfile, …)

- 201 Created (externalId, state, serviceIdentifier, …)

requestBootstrap (deviceProfile, …)

200 Ok (…)

200 Ok (…)

Deliver bootstrap (file with instructions, apps and DMS agent)
As the City of London Council, I want to “securely zero-touch” set up and use my devices (establishment and operational phases)

Switch on devices

Secure connection with access point/gateway

ZTC

Who is my owner?

Your owner is BT DMS (DMS Extension)

Attestation handshake

SDO actions

SDO actions

SDO usages {serviceIdentifier, mediationKeys, …}

SDO usages {serialNumbers, spPrices, quantity, parameters, …}

ZTA

Attestation outcome

Secure Bootstrapping (protocols, …)

ZTD

Secure connection with IoT platform (sensing and actuating)

ZTB

Secure connection with BT DMS (e.g. updates, reboots, status)

Device operation

Secure connection with IoT platform (sensing and actuating)

AWS IoT Platform

AWS usages and billing is out-of-scope for the demo but can be folded into the ecosystem later
Integration Architecture enabled through Open APIs, Microservices and Cloud native architecture

Infonova SaaS

Digital Experience

Open APIs

Inforona Digital Platform

Microservice Layer

Service Providers

AWS IoT

AWS Adapter

AEP Adapter

Intel Adapter

{d|g} Adapter

Attestation Server

AEP

Infonova SaaS

AWS

Config

UI

Digital Experience

AEP

Adapter

Intel

Adapter

AWS

Adapter
The business architecture enables a multi-party environment for service and solution providers, enterprises and resellers.

Once onboarded, these services are available on the platform to other tenants and enterprise customers for their use.

Services are onboarded once onto the business platform for each participating tenant.
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