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
The Digital Business Marketplace Catalyst

- **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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Digital Business Marketplace Catalyst - Contents

- High level Vision
- Context & Multi-Party Challenges
- Hurdles & Repeatable Multi Partner Solution Framework
- Ecosystem solution
  - Ecosystem Business Architecture
- Demo – Minimum Viable Demo
  - Ecosystem to Business to IT Architecture
  - Service Catalogue and Product Catalogue architecture
  - Sequence diagram
  - TM Forum API Calls Used
  - Multi Party Ecosystem Screenshots – Digiglu and Infonova
- Champion & Participant – Catalyst Feedback
- Champion / Participant approach capabilities
  - Intel SDO
  - BT Zero Touch Suite Patents
  - Ecosystem Design Thinking
  - Digiglu
  - BearingPoint//Beyond’s Infonova Digital Business Platform
Example anatomy of a Digital Business Marketplace ecosystem

- **Health**
- **Energy**
- **Automotive**
- **Manufacturing**
- End Customer Digital Self-Service
- CSP & Devices
- Logistics
- Cloud

**Frictionless Trading Relationships**

- Trading Entity Tenant
- Trading Entity Tenant
- Trading Entity Tenant
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The global Digital Business Marketplace

… enabling companies to be a part of a frictionless trading global ecosystem
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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
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”
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- ... to provide milli-second decision making capabilities at the edge
• Managing a massive number of IoT devices is a labour-intensive and slow process when carried out manually. BT wants to manage its relationships with IoT devices in a fully trusted, secure and remotely automated “zero-touch” fashion. BT wants to establish these relationships as soon as is convenient, i.e. either at device purchase time through a BT portal, or ‘out-of-band’ after a device has been acquired through other means

• BT wants to achieve these relationships in a fully commercialised manner, permitting BT’s customers to order single and bundled IoT offers consisting of, for example, devices, gateways and network access. Where possible, BT wants to configure and make best use of available resource (e.g. gateways and network access) according to BT customer IoT ongoing requirements (e.g. applications and devices)

• BT acknowledges that many partners may be required to deliver IoT services. BT wants to manage these relationships in a frictionless way, both commercially and technically

• This slideset contains the user stories, offer hierarchies, user interfaces and workflows needed to implement the Digital Business Marketplace for smart car parking ZTO scenarios at BT’s Adastral Park
Priority 1: User stories for Intel SDO-Ready devices

• As Sarah, a Smart Adastral channel customer, I want to order a smart car parking bundle of Intel SDO-ready devices and BT and Intel ZTO services via the “smartadastral” channel, so that I can make my car park smart
  - Sarah orders 20 SDO-ready NUCs, 5 for Smart lighting and 15 for Smart parking
  - Intel, the manufacturer, provisions the NUCs with the smartadastral channel’s public key, and generates an Ownership Proxy (OP)
  - Intel ships the NUCs to Sarah
  - Intel digitally sends the OP to the smartadastral channel’s business entity

• As Sarah, a Smart Adastral channel customer, I want to create a bootstrap for my Intel SDO-ready devices via the “smartadastral” channel, so that when they are switched on they may ready themselves by downloading any necessary code and configuration
  - This step can be done either at order-time or after the order is placed
  - Sarah lists her ordered SDO-ready devices. Each device has a “ServiceID : MAC address” UUID – should this be presented when available?
  - Sarah can create a bootstrap for each SDO-ready device. A bootstrap will indicate code and configuration to load on the device (which may be achieved locally or remotely) at boot time, e.g., specific operating systems, apps, settings, protocols, authentication mechanisms and device management agents. Bootstrap directives may be received via Infonova service characteristics
  - Sarah may change her SDO-ready device’s bootstrap configuration at any time, and changes will be effected on next boot up

• As Sarah, a Smart Adastral channel customer, I want to attestate and on-board my Intel SDO-ready devices
  - Sarah turns on the SDO-ready devices that have been delivered to her. The devices securely connect to their network access points (ZTC), trust is established between the devices and the IoT attestation service, via Intel’s SDO Rendezvous service, (ZTA), the devices get their bootstrap code and configuration, and boot up using the bootstrap sequence (ZTB), and, finally, the devices are ready for use according to their task and are also being managed in-life (ZTD) – others use device, change of ownership (demos and slides)

Assumptions:
A relationship exists between the smartadastral channel’s business entity and Intel (the manufacturer)
The smartadastral channel’s business entity has obtained Intel’s IoT platform SDO-ready agent?
Priority 2: User stories for BT-Ready Devices

• As Ben, a BT Enterprise IoT device designer, I want to configure BT-ready IoT device templates via the “bosch” channel, so that BT Enterprise or BT Enterprise customers may order BT-ready Bosch devices based on these templates

• As Edward, a BT Enterprise IoT device procurer, I want to order BT-ready Bosch IoT devices via the “bosch” channel, so that I may stockpile a number of devices ready to ship to BT Enterprise customers

• As Sarah, a Smart Adastral channel customer, want to order a smart car parking bundle of BT-ready Bosch IoT devices and BT ZTO services via the “smartadastral” channel, so that I can make my car park smart
  - Sarah orders 40 BT-ready Bosch connected devices, 5 for Smart lighting/environment and 35 for Smart parking
  - These devices may come from the BT Enterprise warehouse if a stockpile is available or direct from Bosch

• As Sarah, a Smart Adastral channel customer, I want to create a bootstrap for my BT-ready Bosch devices via the “smartadastral” channel, so that when they are switched on they may ready themselves by downloading any necessary code and configuration

• As Sarah, a Smart Adastral channel customer, I want to attestate and on-board my BT-ready Bosch devices
  - Sarah turns on the BT-ready Bosch devices that have been delivered to her. The devices securely connect to their network access points (ZTC), trust is established between the devices and the IoT attestation service, (ZTA), the devices get their bootstrap code and configuration, and boot up using the bootstrap sequence (ZTB), and, finally, the devices are ready for use according to their task and are also being managed in-life (ZTD)
Priority 3: User stories for Generic Devices

• As Ben, a BT Enterprise IoT device designer, I want to create Generic device agents via the “btenterprise” channel, so that BT Enterprise customers may order Generic devices with these agents

• As Sarah, a Smart Adastral channel customer, want to order a smart car parking bundle of Generic devices and BT ZTO services via the “smartadastral” channel, so that I can make my car park smart

• As Sarah, a Smart Adastral channel customer, I want to create a bootstrap for my Generic devices via the “smartadastral” channel, so that when they are switched on they may ready themselves by downloading any necessary code and configuration

• As Sarah, a Smart Adastral channel customer, I want to attestate and on-board my Generic devices
  – Sarah turns on the Generic devices that have been delivered to her. The devices securely connect to their network access points (ZTC), trust is established between the devices and the IoT attestation service, (ZTA), the devices get their bootstrap agents, code and configuration, and boot up using the bootstrap sequence (ZTB), and, finally, the devices are ready for use according to their task and are also being managed in-life (ZTD)
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.
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

- SDO enable device & create Ownership Voucher
- Register Ownership Voucher with SDO service
- Provision device
- Onboard device
- SDO Rendezvous Service
- Data flows
- Target Platform
- SDO SDK
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
Frictionless Trading between different organisations is complicated...

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

... additionally 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’s offerings are overlayed and abstracted, articulating the technical dependency rules and commercial pricing rules into a common language.

Each company has its own data models, technical dependencies and different articulation for handling pricing.

Source: TM Forum, New Business Model Compendium
Digitally Transform or face extinction!

- Consumers expect to be able to buy and configure any/everything on their Smartphone, “self-service”
  - Increasingly a similar buy and configure experience is expected in B2B scenarios, for SmartOffice, SmartGrid, SmartEnergy, SmartFactory, SmartCity, etc. as well as SmartHome and SmartVehicle

- As traditional industries move 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”

But there are a number of barriers and hurdles hindering the Digital Business Marketplace

- Frictionless Trading between different organisations where the parties can be certain that their technical dependency rules are being respected and maintained, and can be sure of being properly compensated for their contribution according to their pricing – whether internal sister companies and / or 3rd parties

- The need to define industry agnostic repeatable patterns to make it easy to plug & play so that all industries can rapidly scale and accelerate their digital Smart offerings

- The need to remove manual processes and achieve Zero Touch Onboarding (ZTO) and in life Management of end-to-end solution components, i.e. IoT devices, products, applications, services

- Ensure secure / non-hackable devices and systems leveraging encrypted keys with unique passwords (VPN tunneling etc), with a fully trace-able and secure automated supply chain

- The need to provide milli-second decision making capabilities at the edge leveraging 5G connectivity, with massive Machine-Type Communication (mMTC) and Ultra-Reliable Low-Latency Communication (URLLC) – together with high performance compute at the edge

The Digital Business Marketplace Catalyst delivers...
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Initial ecosystem entities and roles for the Smart Adastral car parking ZTO scenario

**Devices** | **Capabilities** | **Chargeable**
--- | --- | ---
NUC | Smart Gateway / Edge Device Wi-Fi, LoRa, (5G?) | NUC - one-off ZTO – MRC Network – Usage based
Cameras | SD, HD (to cloud) Wi-Fi, LoRa, (5G?) (to cloud) NPR, Queueing, Speed detection, Free parking spaces | Camera - one-off ZTO – MRC Apps
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].
BT GS (USA) Marketplace – leveraging Infonova DBP

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]
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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.
Zero-Touch-Onboarding high level deployment architecture

Cloud-native and event-oriented micro-services architecture based on the digiglu digital experience framework
The Ecosystem 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.
Integration Architecture enabled through Open APIs, Microservices and Cloud native architecture
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
Demo Architecture – Digital Experience Layer

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Device Service

- SKU*: String (*pre-filled as part of the offer, read-only*)
- Supporting Connectivity*: Select
  - WiFi
  - 4G/5G
  - LoRa
  - USB
- Supporting ZTA*: Select
  - Intel (SDO)
  - MS (Azure SPhere)
  - BT (MoZo)
- Supporting OS*: Select
  - Windows IoT
  - Windows 10
  - Axis Linux
  - Any Linux
- MAC: String (*allocates on the order*)
- Owner Cert <address>: String (*allocates on the order*)

*visible on order capture ... CSV list

Intel NUC Device Offer (nuc6cay, nuc7i7bnh)
Intel NUC Device Service
- Processor: Select i5; i7
- RAM: Select 2GB, 4GB, 8GB

Intel NUC Device Offer (nuc6cay, nuc7i7bnh)
Intel NUC Device Service
- Processor: Select i5; i7
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  - Any Linux
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*visible on order capture ... CSV list
Connectivity offers:
Connectivity Service
• 4G/5G
• WiFi
• LoRa

When USB is selected as part of the device then: All three connectivity offers are possible for selection. Then show the dongles

Offer: 4G/5G Dongle  Offer: WiFi Dongle  Offer: LoRa Dongle

*visible on order capture ... CSV list
ZTO Offers (A, B, C, D)

• ZTC
  • WiFi (Offer)
    • BT-WiFi Pinhole
    • Encrypted SSID
  • LoRa
    • OTA (Offer)
  • 4G/5G (no Offer necessary)
• ZTA (Offer)
  • Intel SDO
  • BT MoZo
• ZTD (Offer)
  • Arm
  • Nokia
  • BT
• ZTB (Offer) ... always there
  • BT

*visible on order capture ... CSV list

ZTA Offer (example Intel SDO)
Offers available to enable Zero Touch Onboarding

- 4G/5G Connectivity
  - Intel NUC6cay
  - Intel NUC7ibnh
- LoRa Connectivity
  - LoRa Dongle
- USB Dongle
- WiFi Connectivity
- ZTA - Zero Touch Attestation
  - ZTA - Zero Touch Attestation
- ZTB - Zero Touch Bootstrap
  - ZTB - Zero Touch Bootstrap
- ZTC 4G/5G

£ 34.30 / mo
No Tax

Offer key: RTO_4G_5G_CONNECTIVITY
Activation: 29/04/2019
Example Offer – NUC devices
ZTO (ZTA, ZTB, ZTC, ZTD) Offerings
XML service and offer configuration example

- More details to be accessed directly from the system

Intel SDO Service

BT ZTA Offer using the SDO Service from Intel
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As the City of London Council, I want to “self-service order” a Zero-Touch bundle (order fulfilment phase – 1 of 2).

Device

- NUC order in progress
  - device order progress notification
  - device order progress notification

- NUC order delivered
  - device order progress notification

Network

- Network order complete
  - Connectivity order progress notification

ZTC

- ZTC order complete
  - Configuration order progress notification

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

**ZTB**

- ZTB orderService (serviceName, deviceProfile, ...)
  - 201 Created (externalId, state, serviceIdentifier, ...)
- requestBootstrap (deviceProfile, ...)  
  - 200 Ok ...
- Bootstrap order progress notification
  - Bootstrap order progress notification (serviceId, ...)
- ZTB order complete

**ZTD**

- ZTD orderService (serviceIdentifier, deviceProfile, ...)
  - 201 Created (externalId, state, serviceIdentifier, ...)
- configureDms (deviceProfile, ...)
  - 200 Ok ...
- ProvisionDeviceInDms (protocols, credentials, ...)
  - 200 Ok ...
- requestDmAgent (deviceProfile, Dms endpoint & credentials, ...)
  - 200 Ok ...
- DM order progress notification
  - DM order progress notification (serviceId, ...)
- ZTD order complete

**ZTA**

- SDO orderService (serviceIdentifier, ...)
  - 201 Created (externalId, state, serviceIdentifier, ...)
- orderCertificates (serialNumbers, digitalOwnerPublicKey, ownerEndpoint, endpointCredentials)
  - 200 Ok (serviceId, serialNumbers, extendedOwnershipVoucherIds)
- SDO order progress notification
  - SDO order progress notification
- SDO order progress notification
  - SDO order progress notification
- devicesClaimed (serialNumbers, state, ...)
  - 200 Ok ...

© serviceIdentifier’s are correlated with serialNumbers

**Triggers:**
This ★ triggers ★
As the City of London Council, I want to “securely zero-touch” set up and use my devices (establishment and operational phases)

Device operation

Switch on devices
- ZTC
  - Secure connection with access point/gateway

Attestation handshake
- ZTA
  - Who is my owner?
  - Your owner is BT DMS (DMS Extension)
- ZTB
  - Secure Bootstrapping (protocols, ...)

Secure connection with BT DMS (e.g. updates, reboots, status)
- ZTD
  - ZTD usages {serviceIdentifier, mediationKeys, ...}

- ZTD usages {serialNumbers, spPrices, quantity, parameters, ...}

- ZTB usages {serialNumbers, spPrices, quantity, parameters, ...}

- AWS usages and billing is out-of-scope for the demo but can be folded into the ecosystem later
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TM Forum Open API calls used

- Product Catalogue API
- Service Catalogue API
- Product Inventory API
- Service Inventory API
- Product Ordering API
- Service Ordering API
- Usage API
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Infonova Ecosystem Screenshots
ZTO portal landing page

Press “Login” to get started.
ZTO portal login page

Enter your Infonova R6 login credentials
Click “My Shopping Cart” to start an ordering journey
Select Device

Click “Select & Configure” to choose your device
Enter number of Devices

Enter number of devices and click “continue” (only 1 is supported yet)
Select connectivity

Click “continue”
(Order connectivity is not supported yet)
Select ZTA

Open the ZTA drawer
Configure ZTA

Select ZTA provider – only “Intel (SDO)” is supported

Select ZTA configuration
Select ZTB

Open ZTB drawer
Configure ZTB

Select ZTB configuration

<table>
<thead>
<tr>
<th>ZT Configuration</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZTA - Zero Touch Attestation</td>
<td>£599.00</td>
</tr>
<tr>
<td>ZTB - Zero Touch Bootstrap</td>
<td></td>
</tr>
<tr>
<td>ZTB - Zero Touch Bootstrap</td>
<td></td>
</tr>
<tr>
<td>ZTC 4G/5G</td>
<td>£45.00</td>
</tr>
<tr>
<td>ZTC LoRa</td>
<td>£40.00</td>
</tr>
<tr>
<td>ZTC Wi-Fi</td>
<td>£42.00</td>
</tr>
<tr>
<td>ZTD - Zero Touch Device</td>
<td>£74.00</td>
</tr>
</tbody>
</table>

Select the desired ZTB configuration.
Select ZTD

Open ZTD drawer
Configure ZTD

- Select ZTD provider – only “BT” is supported
- Select ZTA configuration
- Press continue
Shopping cart overview

Click “Submit” to send the order
Order submitted successfully

Click “My Devices”

Find your order Id here
My Devices - overview

Change to InfonovaR6
InfonovaR6 login – BT Enterprise tenant

Login to BT Enterprise Tenant with your InfonovaR6 credentials
Search for your order id
Click on “Overview”
InfonovaR6 customer overview page

<table>
<thead>
<tr>
<th>UNBILLED USAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZTD - Zero Touch Device</td>
</tr>
<tr>
<td>ZTA - Zero Touch Attachment</td>
</tr>
<tr>
<td>ZTB - Zero Touch Bootstrap</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALLOWANCES &amp; LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No allowances or limits to display</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order 15555: New (Completed)</td>
</tr>
</tbody>
</table>

See “unbilled usage” coming in
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Champions objectives from the catalyst and the outcomes

Gary Bruce, Smart Infrastructure Research Manager

• The catalyst provided the opportunity to test outcome....

Sigrid Braun, IT Architecture & Transformation

• The catalyst provided an implementation for digital platform business that bundles IOT devices and corresponding services in a fully automated and secure way. The business benefit is based on cost savings due to very short onboarding time and enabling new revenue streams which are demonstrated for the complete process from order to billing.

• The catalyst provided
Participants objectives from the catalyst and the outcomes

John Reynolds
• The catalyst provided the initial step in the lean development process of producing a real production ecosystem for the secure supply chain that will be used to roll out the Agile Fractal Grid. Additional technologies and techniques will be added each cycle beyond the Catalyst to optimize trust and cybersecurity in what is basically the untrusted environment of our transitioning power distribution system around the world.

Andrew Thomson, SVP Digital Enablement BearingPoint//Beyond & Distinguished Fellow TM Forum
• The catalyst provided a great opportunity to partner with experts from different companies with markedly different expertise to test out how, with the right tools, it is possible to overlay, abstract, simplify, deliver and orchestrate complex partner business ecosystems

{d|g}
• The catalyst provided

xx
• The catalyst provided
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Intel® Secure Device Onboard
Making the IoT Plug & Play - Any Device to Any Cloud
Making Device Provisioning “Plug & Play”

**LEGACY MANUAL ONBOARDING APPROACH**

- Manual configuration = >20 minutes per device
- Slow, insecure, expensive

**IOT NEEDS “PLUG AND PLAY” MODEL**

- Similar to USB
- Add a printer with USB = ~1 minute per device
- Fast, downloaded appropriate drivers, works with different hardware
Enable Fast, Scalable Device Onboarding
Intel® Secure Device Onboard (SDO)

**BENEFITS***
- **Zero touch onboarding** – integrates readily with existing zero touch solutions
- **Fast & more secure** – ~1 minute
- **Hardware flexibility** – any hardware (from ARM* MCU to Intel® Xeon®)
- **Any cloud** – internet & on-premise
- **Late binding** -of device to cloud greatly reduces number of SKUs vs. other zero touch offerings
- **Open** - industry standard with open source (planned – 2019)

* No product or component can be absolutely secure
Late Binding – Unique to SDO

✓ Most “Zero touch” automated onboarding solutions require the target platform to be decided at manufacturer.
  ▪ Forces Custom Build-to-Order Model - ODMs must manufacture unique device SKUs for each customer/cloud combination.

✓ SDO “Late Binding” - allows the device’s target platform to be selected “late” in the supply chain, at first power-on.
  ▪ Enables Build-to-Plan Model - ODMs can build identical IOT devices in high volume using a standardized manufacturing process. Reduces inventories, supply cycle times, and costs.
  ▪ Open – service & cloud independent. Devices are bound to target ecosystem at install. Works with existing cloud services, it does not replace them.

There are other “zero touch” automated onboarding solutions - but only SDO offers “Late Binding”
Device Onboarding with SDO

1. **Device Manufacturer**
   - Build and Ship SDO Enabled Devices

2. **Register Ownership to Target Platform**
   - Load Ownership Voucher into Target Platform

3. **Register Devices with SDO Server**
   - SDO redirects Device to its target Platform

4. **Onboard Device**
   - Provision device

5. **Target Platform**
   - Device Authenticated and Provisioned

6. **Device Installation & Provisioning**
   - Device sends data to IoT Platform

**Additional Steps:**
- **SDO enable device & create Ownership Voucher**
- **Register Ownership Voucher with SDO service**
- **Onboard device**
- **Data flows** from SDO Rendezvous Service to Target Platform
Unified Provisioning, that Scales Across Ecosystems

Working together to establish SDO as an industry standard

**Intel** and **Arm**

Silicon

- **Oems/ODMs**
  - Ex: Advantech, Congatec, Siemens

- **Cloud & IoT Platforms**
  - Ex: Arm, Hitachi, Infosim, Siemens, Mocana, etc.

- **Standards & Open Source**
  - Est: Announce 2nd half 2019

“This is an ROI win for the customer, who will be able to deploy both Intel and Arm based devices at a lower cost and retaining flexibility over their data and cloud partner choice until the deployment phase.”

- Michela Menting, Director ABI Research
Value Added CoSP Models that Layer on Provisioning

**Edge Services & Solutions**

- **Packaged IoT Connectivity Solutions**: wireless access base-stations & plans
- **Multi-Access Edge Computing**: servers and app deployment services
- **Security Services**: partner with security ecosystem to provision: SD-WAN edge devices & firewall SW

**Device Management Platform Services**

- **Operator Platform Service**: onboard devices to central service management platform that brokers identity, multi-network connectivity services, and device software updates
- **Service Assurance & Data Insights**: extend into visibility, monitoring, and support for devices with data analytics, advanced telemetry & alerts, and developer app API enablement
- **Vertical Bundle**: partner with industry to package vertical solutions for smart city, industrial, building management and other applications.
Benefits of “Late Bind” Provisioning to Scale IoT

Device Manufacturers
- Reduce cost of development, deployment, and support with a single SKU manufacturing flow
- Increased ROI with “Build-to-plan” manufacturing process

End Customers
- Reduce cost of device deployment and management
- Improved HW-security model to help pass IT audits

IoT Platform Providers
- Reduce costs through standardized model that provides unified developer and customer experience
- Increased data volume drives revenues for value-add IoT services
Fast, Open Ecosystem Enablement

SDO Manufacturer Toolkit
- Configures Device & Generates Ownership Voucher
  - SDO Client-Intel Signed for ME
  - SDO Client-SDK ex. Arm Cortex A & M, TZ, TPM

SDO Reseller Toolkit
- Sign Voucher to Transfer Ownership
  - Intel Processors
  - Arm Processors

SDO Installer Tools
- Enables Network Access & Troubleshooting
  - System Integrators
  - Customer Installers
  - VARs
  - Distributer

SDO SDK - IoT Platform Integration
- Redirect to Target Platform & Device Registration
  - SDO 'Rendezvous' Service
  - SDO SDK "Components"

Device Manufacturers

Supply Chain

Implementatio

IoT Platforms

*Planned 2019
Learn More

1. See solution in action:
   - Arm Demo Video
   - Overview Collateral

2. Inquire about Partner Program or Pilot Offer
   - iotonboarding@intel.com

3. Developer docs and access to software:
   - Register an IDZ account
   - Request software & docs
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Enterprise or Ecosystem?

Enterprise architecture & costs

- CSP’s customers and markets
- Costs passed onto customers and markets!
- Most onboard costs incurred by all digital platform operators
- Duplicate onboard costs
- CSP’s B2B or B2C digital platform
- Supplier A’s products and services
- Supplier B’s products and services
- CSP’s products and services
- Partner Y’s products and services
- Supplier C’s products and services
- CSP and partner relationships are somewhat siloed

Ecosystem architecture & costs

- Your customers and markets
- Lower costs passed onto customers and markets!
- Onboard costs distributed between all digital tenants
- Onboard costs done once
- CSP’s B2B2X digital platform – frictionless tenant trading
- CSP’s B2B2X digital tenant
- Partner Z’s B2B2X digital tenant
- Partner Y’s B2B2X digital tenant
- Partner Y’s customers and markets
- Partner Y’s B2B or B2C digital platform
- Partner Y’s products and services
- Supplier C’s products and services
- Your mindset may be fixated with enterprise architectures but ecosystem platform costs are holistically lower than enterprise platform costs!

CSP’s customers and markets

- CSP’s B2B or B2C digital platform
- CSP’s products and services
- CSP’s customers and markets
- Costs passed onto customers and markets!
- Most onboard costs incurred by all digital platform operators
- Duplicate onboard costs

Partner Y’s customers and markets

- Partner Y’s B2B or B2C digital platform
- Partner Y’s products and services
- Partner Y’s customers and markets
- Lower costs passed onto customers and markets!
- Onboard costs distributed between all digital tenants
- Onboard costs done once
- CSP’s B2B2X digital platform – frictionless tenant trading
- CSP’s B2B2X digital tenant
- Partner Z’s B2B2X digital tenant
- Partner Y’s B2B2X digital tenant
- Partner Y’s customers and markets
Enterprise or Ecosystem?

Enterprise architecture & channel partners

CSP’s B2B or B2C digital platform

Channel partner’s customers and markets

CSP’s products and services

If the channel partner doesn’t have a digital platform, there is no low-cost way to bundle or assemble its products and services with the CSP’s products and services.

Channel partner’s products and services

Ecosystem architecture & channel partners

CSP’s B2B2X digital platform

Channel partner’s customers and markets

CSP’s B2B2X digital tenant

Channel partner’s products and services bundled or assembled with the CSP’s products and services

Your mindset may be fixated with enterprise architectures but ecosystem platforms can enable a richer product and service customer experience than enterprise platforms!

Channel partner’s products and services

Channel partner’s customers and markets

CSP’s products and services

If the channel partner doesn’t have a digital platform, there is no low-cost way to bundle or assemble its products and services with the CSP’s products and services.

Channel partner’s products and services
Enterprise or Ecosystem?

Enterprise architecture & billing/settlement

CSP’s B2B or B2C digital platform

Bills always come from the digital platform owner

Settlement done across digital platform owner and suppliers

Partner Y’s B2B or B2C digital platform

Partner Y’s customers and markets

Your mindset may be fixated with enterprise architectures but ecosystem platforms can enable flexible bill presentment options and bill settlement across all partners - enterprise platforms cannot!

CSP’s B2B2X digital platform – frictionless tenant trading

Bills may come from single or multiple digital tenant owners

Settlement done across digital platform and tenant owners, and suppliers

Your customers and markets

Partner Y’s customers and markets

Partner Z’s B2B2X digital tenant

Partner Y’s B2B2X digital tenant

Supplier A’s products and services

Supplier B’s products and services

CSP’s products and services

Partner Y’s products and services

Supplier C’s products and services

CSP’s customers and markets

Partner Y’s customers and markets

CSP’s customers and markets

Partner Y’s customers and markets

Your customers and markets

Partner Y’s customers and markets

CSP’s customers and markets

Partner Y’s customers and markets

CSP’s customers and markets

Partner Y’s customers and markets

Your customers and markets

Partner Y’s customers and markets

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We help organizations to reinvent their business models and grow their revenue by utilizing digital platforms. Our Infonova digital platform solutions give companies the start-up advantage to move rapidly from ideas to concept to revenue, with minimum risk and cost. It brings them closer to their customers, enables connections between systems and partners, and helps them to become more agile in the face of digital disruption.

**A BearingPoint solution**
BearingPoint//Beyond is part of BearingPoint, an independent management and technology consultancy with European roots and a global reach.

**Partner Options**
Infonova digital platform solutions are available on premise, or as SaaS from BearingPoint cloud, from BT’s Cloud of Clouds and also from AWS.

**Sample customers**
- Analysys Mason
- PAY BOX
- Liberty Global
- Telia
- Orange
- Optus
- TRG
- iinet
- Dimension Data
- HD Plus

**Sample use cases**
- **BT**: Digital platform supporting the BT’s Cloud of Cloud compute services (concept-to-bill) and Business Platform as a Service “PCMS” offering (concept-to-cash) for B2B2x new business models
- **Telia**: Digital platform (concept-to-bill) for partnering, ordering and billing for IoT services
- **Dimension Data**: Enabling consumption-based service charging and automatic service activation for the global ITaaS offerings as well as automatic cost recovery for the multi-layered global business and partner channels through the Infonova platform

**Industry recognition**
- **Analysts API Award**
The most prominent vendor within the TM Forum community to adopt and promote the Open API Standard, exposing Open APIs globally, active in 30+ countries spanning 5 continents

**Award Winners**
Our digital platform solutions support our customers’ business priorities

Our Infonova digital platform gives companies the start-up advantage to move rapidly from ideas to concept to revenue, with minimum risk and cost

Highlights

- Cultivates collaboration and innovation by connecting and facilitating business interactions between different ecosystems
- Enables the partners in the ecosystem to quickly abstract, onboard and launch digitised services, package and monetize them
- Allows sale and support of any product or any service with any business rules and pricing model (XaaS, outcome based, bundles, etc.)
- Orchestrates streamlined and automated digital business processes across diverse IT systems
- Designed to start small and scale fast
- Utilizes cloud flexibility and open APIs
Infonova Digital Business Platform
Global E2E automation for sales, fulfillment, monetization and partner settlement for ANY digital offering
The Infonova Digital Business Platform

Each tenant gets their own use of the Infonova Digital Business Platform process capabilities

Each one is a Digital Business Platform
From a single platform it’s possible to manage diverse customers, partners, products and services and participate in the business success of the platform partners.

Each tenant can sell offers to end customers directly – Direct channel offers can be based on the tenant’s own services or partner services from other tenants.

Each tenant can directly onboard and manage its own services.

Each tenant gets the processes to execute business.

Each tenant can purchase services from other partner tenants.

Each tenant can sell offers through other tenants in the ecosystem – These offers can be based on the tenant’s own services or services from other tenants.
Multi-tenant business architecture

A powerful enabler for a multi-partner ecosystem

**BUSINESS BENEFITS**

- Enables multiple parties to cross-sell each other’s products and services in combinations and bundles.
- Infonova enables frictionless business process orchestration for B2B2X business activities
- Leveraging TM Forum’s SID Common Data Model ensures end-to-end consistency for all partner trading interactions
- Managed Ecosystem: All tenants can control who they do business with on the platform

*Ecosystem Dynamics - Illustration*
Vertical Solutions

- Devices, Sensors & Things
- Connectivity
- Edge Compute & Access VNF
- Core VNF
- Content, Apps & Cloud Services

Agriculture
Media & Entertainment
Energy & Utilities
Transportation & Logistics
Finance
Public Sector
Automotive
Industrial Manufacturing
Healthcare

New opportunities in the enterprise segment
5G, SDN, NFV, cloud & edge compute enable new types of services

Devices, Sensors & Things

Connectivity

Edge Compute & Access VNF

Core VNF

Content, Apps & Cloud Services

Local Comms
WiFi, BLE, ...

Fixed Access
Fibre, Copper, ...

Long-range Comms
3G, 4G, 5G, LoRA, WiMAX, ...

Fixed Access Network

Aggregation & Core Network

Core Data Centers & Clouds
The market demands agility and flexibility

Verticals need to innovate and rapidly develop new services based on customer demands
Infonova Digital Business Platform

A system for innovation: rapidly develop and monetize any type of new digital services

- Provide each product group and vertical with a tenant on the platform to rapidly develop and sell new offers based on combinations of onboarded services.
Open API & Functional Capabilities

Open APIs are a key enabler for interoperability and building digital platform solutions

Infonova Open APIs

- Customer Interaction
  - Customer Accounts
  - Related Parties
  - Addresses
  - Trouble Ticketing
  - Notifications

- Ordering
  - Product Orders
  - Service Orders
  - Resource Orders
  - Order Details and History

- Instance Information
  - Products
  - Services
  - Resources
  - Charges

- Billing and Finance
  - Billing Accounts
  - Billing Cycles
  - Customer Bills
  - Billing Tasks
  - Disputes
  - Payments
  - Debt Collection
  - Usages
  - Allowances

- Product Configuration
  - Product Offerings
  - Service Specifications
  - Resource Specifications
  - Charge Specifications
  - Sales Channels

- Authentication Authorization
  - Users
  - Customer Account Users
  - Account Management Groups
  - User Groups
  - Permissions

- Infrastructure Operations
  - Tasks
  - Events
  - System Configuration
  - Bulk Operations
  - Documents
  - Tenants
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

Questions