B2B Product Definition

TECHNICAL SPECIFICATION

MAY 2011

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Environment

NBN Co asks that you consider the environment before printing this Specification.

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1 About this document

Who is it for?	This document is intended to be used by: • Access Seeker Solution Architects and Development Teams • NBN Co vendors of the Integration and Core Flow (ICF) domain to aid the design and development of the B2B Gateway.
Purpose	This document details the schema, technical specifications and overall architecture proposed for Product definition by the NBN Co in support of the Industry Interface Concept.
In scope	The contents of this document represent NBN Co's current position on the subject matter.
Out of scope	
Important Note	This specification reflects input received from extensive industry consultation, including NBN Co sessions with the Communications Alliance, and a number of technical 'deep dives' with Access Seekers. The content of this document represents NBN Co's current position on the subject matter and should not be relied upon as representing NBN Co's final position on the subject matter of this document, except where stated otherwise. The views expressed by NBN Co in this document may change.

1.1 Related Documents

Document Number	Document Title	Owner/Link	Date of Issue	Version Number
1.	NBN Co B2B Gateway Architecture Technical Specification	NBN Co	2/05/2011	1.0
2.	NBN Co B2B Interaction Business Processes Technical Specification	NBN Co	2/05/2011	1.0

1.2 Role Descriptions

None

2 Overview

NBN Co will provide Access Seekers with a means of Product description that is machine-readable. NBN Co aims to converge on an Industry standard for Product description so that current and future NBN Co Products as well as subsequent Access Seekers Products can be consistently described. The wide adaptation of machine-readable Product definition will allow for more efficient and reusable business systems to be constructed. NBN Co aims to facilitate Access Seeker systems architecture where new Products or new versions of existing Products can be easily adopted by their systems with low integration costs.

This document describes the following:

- Challenges and requirements that need to be met by a Product definition standard:

    o Section 4 Product Definition Requirements provides an example of the detailed semantics required by such a standard.

- Product definition schema proposed by NBN Co:

    o How the schema will facilitate the semantic requirements outlined, and

    o How the Tele-Management (TM) Forum Shared Information Data (SID) information model has been adopted for the purpose.

    o How the Product definition can be used within NBN Co and by Access Seekers:

    o How resilient and adaptable systems architecture can be set up NBN Co and Access Seekers.

- Early thoughts on how the Product lifecycle and versioning control will be managed.

3 Product Definition

The NBN Co B2B systems will allow Access Seekers (AS) achieve a high level of automated interaction with NBN Co supporting Fulfilment, Assurance & Billing. NBN Co will also strive to develop the B2B Gateway so that it forms a standard for B2B implementations between Access Seekers and Access Providers in the Telco industry. Defined as the 'Industry Interface Model', NBN Co believes that adaptation of a common B2B interaction context between the Access Provider & Access Seekers will lead to more stable and reusable B2B systems across the Telco vertical.

Figure 1 – Industry Interface Model shows the components that make up the NBN Industry Interface Model. The 'Interaction Process Model' shown within the diagram forms the basis for interaction between NBN Co and Access Seekers and is described in the NBN B2B Interaction Business Processes Technical Specification.
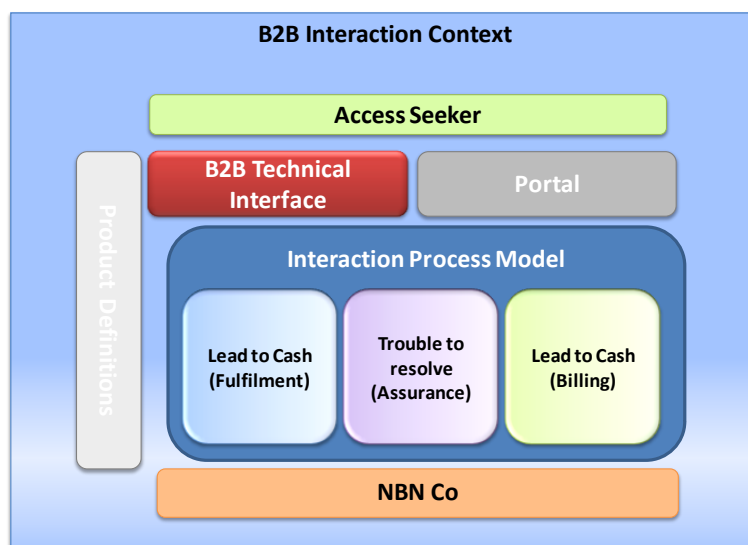
Figure 1 – Industry Interface Model

In addition to a process framework for interaction, the NBN Industry Interface Model highlights the need for a Product Definition standard. Interactions revolve around Products - with Fulfilment, Assurance and Billing processes all making reference to the information described in the Product Definition.

Products will evolve over time, through the evolution of individual Product that will respond to changing NBN capabilities, and through the expansion of the Product portfolio. Therefore a structured and stable Product definition standard that describes the various Product types and their mapping to interaction process is required. The NBN Co's approach for Product definition is detailed in the rest of this document.

All interactions between Access Seekers and NBN Co via B2B Gateway can be represented through a messaging model (request, responses and notification between parties). NBN Co's common information model (CIM) includes messaging data models used internally to NBN Co systems, as well as models for information exchange between parties. The Product definition is in effect a subset of the NBN Co CIM and forms a common CIM for communication between an Access Seeker and NBN Co for Product information supporting business processes.

 The following diagram depicts a subset of a Product order interactions between NBN Co and Access Seeker systems that utilise the Product definition.

Figure 2 - Product Order Interaction

As shown in the diagram above, the NBN Co B2B Gateway provides two services.

- "*queryProductCatalogue*" is the NBN Co service that will be responsible for providing Product definitions. The service response will be a XML file (Product definitio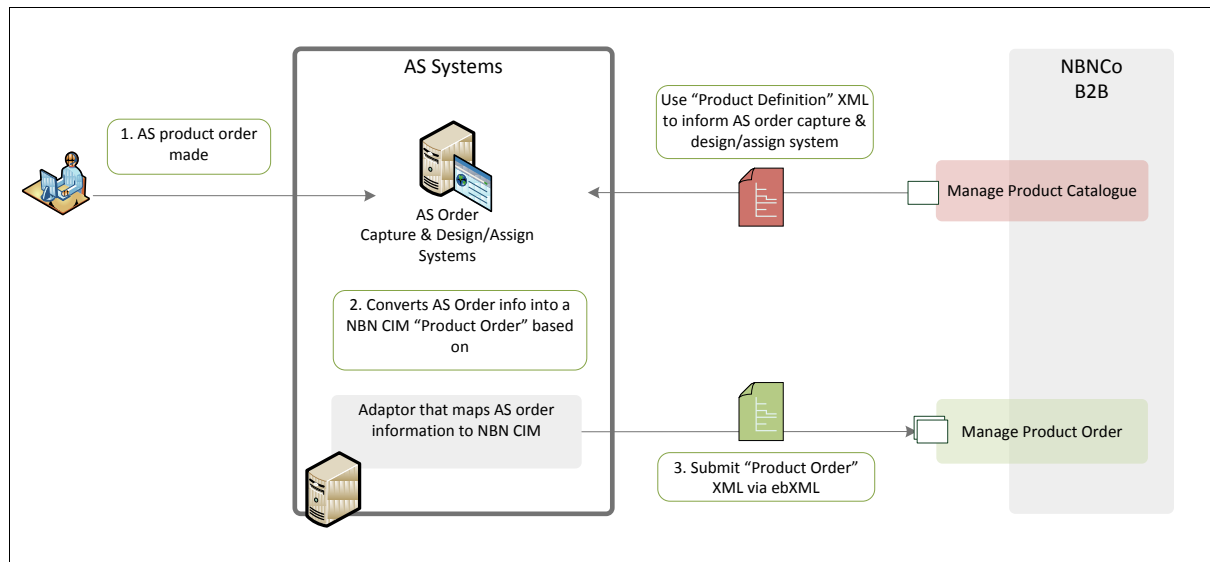n XML) that describes the Product makeup and rules. The service response adheres to an XSD (Product definition schema) that will be used to construct the Product definition XML.

- "*submitOrderConnect*" is the NBN Co service that will be responsible for accepting any Product order from the Access Seeker. This service is bound to a Product Order schema and accepts XML orders that fit the Product order schema.

Access Seeker Systems implementing the Product order interaction will be able to use the Product definition XML to create a valid Product order NBN-XML message for submission to the B2B Gateway message handler. The rules involved in mapping a Product definition to an order interaction will be consistent regardless of Product. This provides the Access Seeker with the ability to create reusable mapping components that are agnostic of Product. Essentially, all Products can be ordered through the same service and no extra B2B services integration is required for new Products. It should be noted that the retrieval of the Product definition from the catalogue and its use within the Access Seeker's BSS/OSS can be achieved at design time (i.e as a point integration). It is not necessary to retrieve the Product definition each time a Product order needs to be constructed.

Products vary based on their orderable options, and indeed, on the relationships between these options. However the variability in Products does not require a re-integration in the B2B systems. Instead, once retrieved, the Access Seeker need only source the ordering options from their internal systems. This could be a function of the AS design and assign systems.

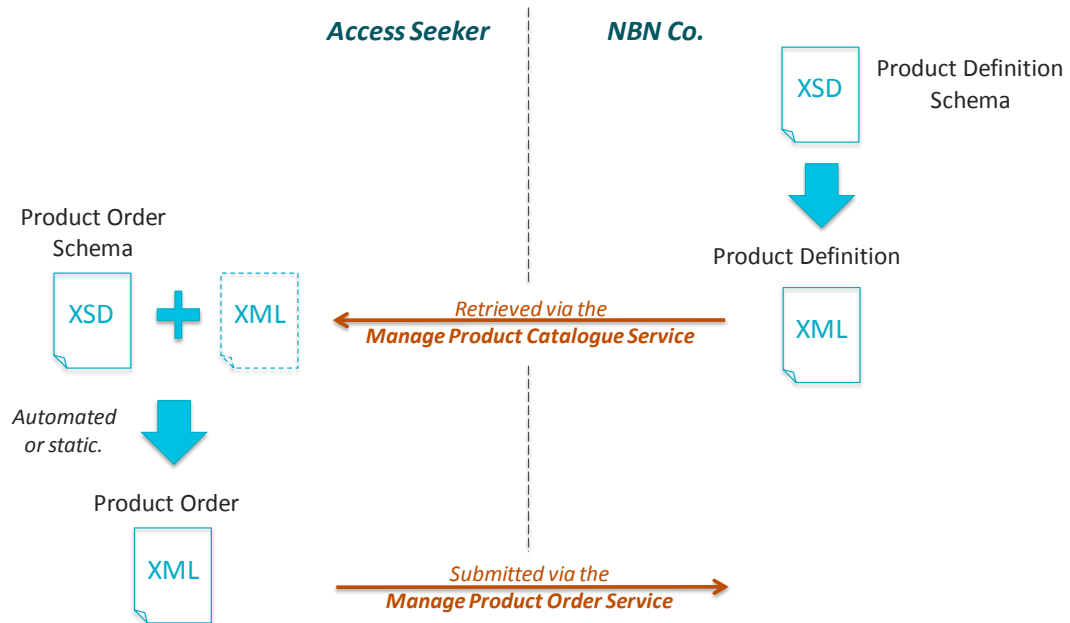**Figure 3 – Order construction combining Product Definition with Product Order Schema**

NBN Co requires the ability to describe a Product and its specifications to Access Seekers in a consistent manner. The method of defining a Product should be:

- *Flexible enough to meet present and future NBN Co Product and marketing strategies,*

- *Consistent and comprehensive to aid industry adoption,*

- *Machine and Human readable.*

4 Product Definition Requirements

In order to successfully describe a Product through an XML file, the attributes that make up a Product need to be individually identified. They are referred to as Product Characteristics. Product Characteristics can be seen as name/value pairs. A Product Characteristic has a name, and defines a type or predefined list of values that it could take. A Product definition is essentially a collection of such Product characteristics. However, Product characteristics are often subjected to conditions and relationships.

This section identifies some of the Product definition requirements by describing a sample NBN Co Product. By analysing a sample Product, the semantics required to explain the Product characteristic relationships can be better understood.

Note: The Product described is not complete and is not intended to represent a final Product offered by NBN Co. They serve as examples to understand the Product definition capability required.

4.1 Sample Product

This section uses an example NBN Co Fibre Access Service (NFAS) Product to illustrate the Product definition concepts. The NFAS Product Technical Speciation, available through the NBN Co web site, remains the definitive Product specification. For the avoidance of doubt, the NFAS Product definition available through the Product catalogue is an XML structured description of the Product aligning to the requirements as defined in the specification.

The NBN Co NFAS comprises four components: the User Network Interface, Access Virtual Circuit, Connectivity Virtual Circuit and Network-Network Interface. The UNI and AVC components are required for each end-user and are ordered together. For the purpose of this example, we assume that NBN Co offers a 'data' Product that provides Access Seekers with a data connection. The Product definition includes the information required to activate or configure a data AVC and UNI-D.

The Product characteristics that describe the Products are shown grouped by AVC and UNI-D on the tables below. Product characteristics are used as the building blocks to define a Product. A Product characteristic can be defined as a quality or distinctive feature of a Product. They can also be used to describe rules that govern the Product.

Data AVC Product Characteristic	Selectable Values	Description
AVC Type	1:1 (UNI-D Only)	Specification of the AVC type
	N:1 (UNI-V only)	
Access Loop Identification Active	TRUE/FALSE	AVC that enables an Access Seeker to identify it.
C-TAG Mapping	<Integer: (0-4000)>	Requested C-TAG at UNI-D, range (0-4000)
Traffic Class Availability	TC_1 Active	Traffic Class Availability
	TC_4_Active	
CVC Id	<Valid CVC Id>	Identification of the Connectivity VC that the Access VC is

Data AVC Product Characteristic	Selectable Values	Description
		to be delivered on.
UNI Reference	UNI ID (Existing)	Identification of the UNI that the Access VC is terminated on. An existing UNI or an Order Id for a UNI can be specified.
Bandwidth Profile	0 TC4 DS/ 0 TC4 US/ 150 TC1 US/DS	Select Upstream/Downstream & Traffic Class Speed combination. Traffic class allocations applicable to tagged/priority-tagged/DSCP-mapped UNI-D.
	12 TC4 DS/ 1 TC4 US/ 0 TC1 US/DS	
	12 TC4 DS/ 1 TC4 US/ 150 TC1 US/DS	
	25 TC4 DS/ 0 TC4 US/ 150 TC1 US/DS	
	0 TC4 DS/ 0 TC4 US/ 150 TC1 US/DS	
	0 TC4 DS/ 0 TC4 US/ 150 TC1 US/DS	

Table 1 Data AVC Product Characteristics

UNI-D Product Characteristic	Selectable Values	Description
UNI Type	UNI-D	The Access Seeker must select which type the requested UNI is.
	UNI-V	
Speed Duplex	Auto-negotiation	Configure the physical parameters of the Ethernet port.
VLAN Mode	Default-Mapped	The tagging and traffic identification options of the UNI
	DSCP Mapped	
	Tagged	
NTD Reference	NTU ID (Existing)	Identification of the NTU that houses the UNI. An existing NTD or an Order Id for a NTU can be specified.
NTD Port Id	Next Free	NTD Port Id to activate UNI
	Port 1	
	Port 2	
	Port 3	
	Port 4	

Table 2 UNI-D Product Characteristics

There are a number of requirements that must be facilitated when describing a Product through an electronic interface and format. The following table takes a look at those requirements using the data Product described above as an example.

Requirement	Scenario
Requirement 1 *Represent a Product characteristic that allows the predefined options of which one value is required to be picked.*	Most Product characteristics have a predefined set of values that can be selected. E.g. AVC Type has options of "1:1" or "1:N" of which one value can be selected. Similarly, VLAN mode has "Default-Mapped", "DSCP Mapped" & "Tagged" as options. Characteristics such as "Speed Duplex" in the sample Product above, will only have one selectable value "Auto- negotiation".
Requirement 2 *Represent a Product characteristic that allows the predefined options of which more than one value can be picked.*	It is also possible that Product characteristics allow multiple values to be selected.
Requirement 3 *Represent characteristics that are self-defining like "Auto-negotiation" for speed duplex.*	E.g. Traffic Class Availability characteristic allows "TC_4Active" that represents the traffic classes available on the sample Product. Although, only one traffic class is available in the sample Product above, NBN Products can include multiple traffic classes of which more than one traffic class can be activated based on customer selection.

Requirement	Scenario
Requirement 4 *Represent a complex characteristic that requires a collection of sub characteristics to be defined.* **Requirement 5** *Represent the hierarchical dependency from one characteristic to its dependent characteristics.*	Some characteristics are represented in a hierarchy of sub characteristics that collectively define its value. E.g. Bandwidth is Product characteristic that require to be defined in terms of multiple sub characteristics. I.E. Bandwidth should be specified per traffic class activated for the service. And for each traffic class, bandwidth should represent the upstream and downstream profiles. Therefore a holistic bandwidth characteristic requires multiple sub characteristics to describe it.
Requirement 6 *Represent characteristics that require a value to be provided conforming to type and range validation.*	Some characteristics require a value to be provided and optionally define a range and/or a format that is expected. E.g. C-Tag mapping is required to be an integer and has to fit between 0-4000. Other possible examples are IP addresses etc.
Requirement 7 *Represent default values for characteristics that are defined by optional characteristics or free-form fields.*	Defaults can be applied to characteristics. E.g. "Access Loop Identification Active" Product characteristic can be defaulted to "False" . Similarly, Duplex characteristic of a Data UNI identifies "Auto Negotiation" as the default selection. Similarly, characteristics that require a formatted value might be presented with a default, for example a C-TAG characteristic can be defaulted to 0 if no other valid integer is provided
Requirement 8 *Represent business rules around repeating characteristics within a Product definition.*	Although not included in the sample Product above, a Product may require defining characteristics that are allowed to be instantiated multiple times based on business rules. E.g. If the Product were to be extended to allow multiple VLANs, characteristics such as C-TAG will be required to be instantiated for each VLAN. Here, the C-TAG characteristics are required to be defined multiple times to match the number of VLAN's.
Requirement 9 *Represent interrelationships between Product characteristics and the underlying cause and effect.*	On occasions, Product definitions are required to communicate more complex business rules driven by the interrelationships of characteristics. E.g. AVC Type "1:1" is only available if UNI Type is "UNI-D". AVC Type "N:1" is only selectable if UNI Type is "UNI-V" **Note: Alternatively, such rules can be allowed to be validated as part of the NBN Co order processing systems.**
Requirement 10 *Represent Product definitions in terms of groups of Product specifications (components).*	Product characteristics can often be grouped into logical components where they intuitively belong. E.g. Characteristics are grouped into AVC, UNI in our example above. They represent the underlying service construct of the NBN, and each identifies information required to activate the corresponding service. The ability to group characteristics into components allows a more modular approach for Product definition where components can be reused in constructing a Product. E.g. The Data UNI component will be reused in other Products that require a

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Requirement	Scenario
Requirement 11 *Ability to link Product components together in specifying a Product.*	UNI-D as a physical interface. This also enables the ability to reuse existing resource as part of a new Product where applicable. E.g. The data Product above requires a UNI-D for the Data AVC to terminate on. Since a UNI-D can be shared across many Data AVC's, an existing UNI-D can be provided instead of having to place an order for a new UNI-D. In such a scenario, only the AVC component is required to be filled with a reference to an existing UNI-ID or order replacing the need to fill in a UNI-D component.
Requirement 12 *Represent versions for a given Product definition.*	Products can be introduced or changed based on market demand and customer requirements. Therefore the ongoing maintenance and lifecycle management of the Product definition strategy is vital. The Product definition versioning should be considered from the perspective of both Access Seekers and NBN Co. Access Seekers would require a complete Product definition to be versioned holistically for identification and integration purposes. Any change in Product characteristics within a definition would require the Product definition to be incremented. It will be possible to identify major and minor versions, where minor versions identify a backwards compatible change. From the NBN Co perspective, versioning requirements extend to components within a Product definition. The Product components will strongly align to underpinning service constructs such as UNI, an AVC, CVC and NNI. However, the components will be subsets of the capability that NBN Co systems will manage. E.g. The UNI capabilities exposed through the sample Product only represent a subset of the total set. The component is put to get with characteristics that are suitable and required for the given Product.
Requirement 13 *Represent Product characteristics in a manner that could be mapped to inform service specifications.*	Although Products will be described in terms of components and characteristics based on NBN service constructs, it is required to maintain Product definitions separate to service definitions – but still allowing them to be mapped. E.g. A NTD Port ID is a Product characteristic in a UNI-D Product component. From a Product perspective, the NTD Port ID specification should allow a 'next available' value as it is a valid way of describing a Product Offering. From a service perspective, the NTD Port ID characteristic is distinct from its Product characteristic counterpart. Here, The UNI-D service specification should be modelled as a characteristic that requires a specific integer value – the assigned NTD Port ID. This follows the SID relationship where a Product characteristic can be used to define or map one or more service specification characteristics. It is recommended that the service specification be constructed using similar semantics to the Product definition.

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The requirements above can be identified as capabilities that the Product Definition Schema and its various elements will provide. Each requirement will be fulfilled by part of the schema. They are summarised in terms of the roles that schema element will play.

Requirement	Roles	Description
1	Enumeration	A characteristic that is defined by a set of options of which one can be picked.
2	Multi-Select Enumeration	A characteristic that is defined by a set of options of which more than one can be picked.
3	Key	A basic characteristic that identifies a value. A key defines a known entity.
4	Complex Type	A characteristic that is defined by a set of child characteristics.
5	Characteristic Relationship	Ability to link a characteristic to another, where the characteristic type identifies use of the child characteristic.
6	Key Value	A characteristic representing an entity that requires a value
6	Validation	A validation rule described along with a key-value characteristic
7	Default Value	An attribute of an characteristic that defines a default value
8	Multiplicity	A characteristic that defines cardinality rules
9	Rule	Rules that restrict values available for a characteristic.
10	Product Component	Ability to group characteristics together
11	Component Relationship	Ability to link a Product component to another through a relationship type.
12	Version	Ability to version components and Product definitions.

Table 3 – Capabilities required for Product definition

NBN Co will use a standard schema that supports the capabilities above to describe Product data requirements. Section 5 Product Definition Schema provides detail on how the capabilities are realised using the schema.

Each NBN Co Product will be described in an XML file using this Product definition schema and will be shared with the Access Seeker through the Product catalogue.

5 Product Definition Schema

The Product Definition Schema is a set of XML schema elements that will be used to describe Products. This will be defined as an XML Schema Definition (XSD) document. It will contain elements and attributes used to satisfy the Product definition requirements identified in section 4 "Product Definition Requirements". The Product definition schema is designed to support the definition of all NBN Co Product data requirements. Therefore, this specification will seldom change, providing Access Seekers with a stable platform into which to tune their systems

The NBN Co Product Definition Schema has been derived from the TM Forum SID. The SID is a commonly used Information Model familiar to many telecommunication industry participants. NBN Co believes that adopting the SID would drive consistency in vocabulary and aid in the adaptation of the   Product Definition Schema.

Table 4 – Product Definition Schema - Element Description lists the key schema elements used, the relationship to the SID and how each maps to the Product definition schema. Figure 4 - Element Relationship shows the relationships between the elements.

| Element	Description	SID Mapping
Product Offering ("ProductOffering")	The top level element that represents an orderable Product. A Product Offering is described by one or more Product specifications.	As specified. (Bundled offering will be detailed in a future version of this document).
Product Specification ("ProductSpecification")	A grouping of characteristics that describe the Products and the options available.	As specified. (This will be detailed in a further version of this document).
Characteristic Specification ("Characteristic")	Specifies a characteristic used to form the overall Product definition.	Maps to EntitySpecCharUse SID entity.
Characteristic Specification Relationship ("CharacteristicRelationship")	Specify relationships between characteristic specs.	Maps to EntitySpecRelationship SID entity.
Characteristic Specification Value ("CharacteristicSpecValue")	Used to enumerate values that describe values that a Characteristic Specification can take.	Maps to the EntitySpecCharValueUse SID entity.
Characteristic Specification Relationship ("CharacteristicRelationship")	Used to specify relationships between Characteristic Specifications.	As specified.

Table 4 – Product Definition Schema - Element Description
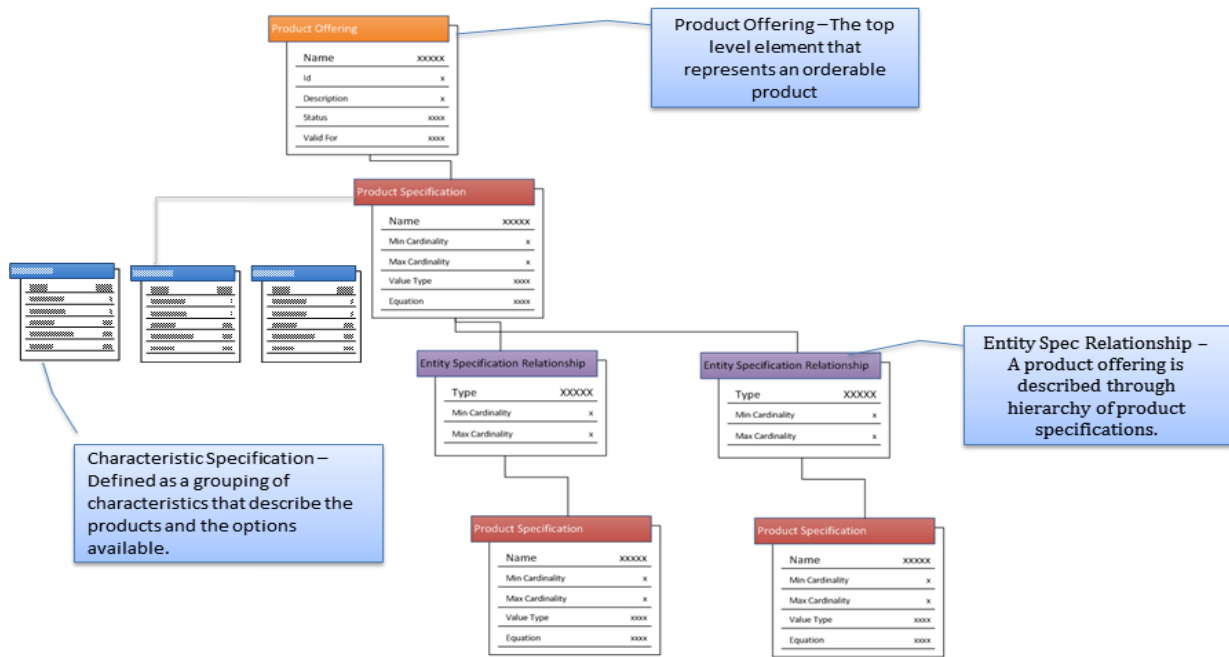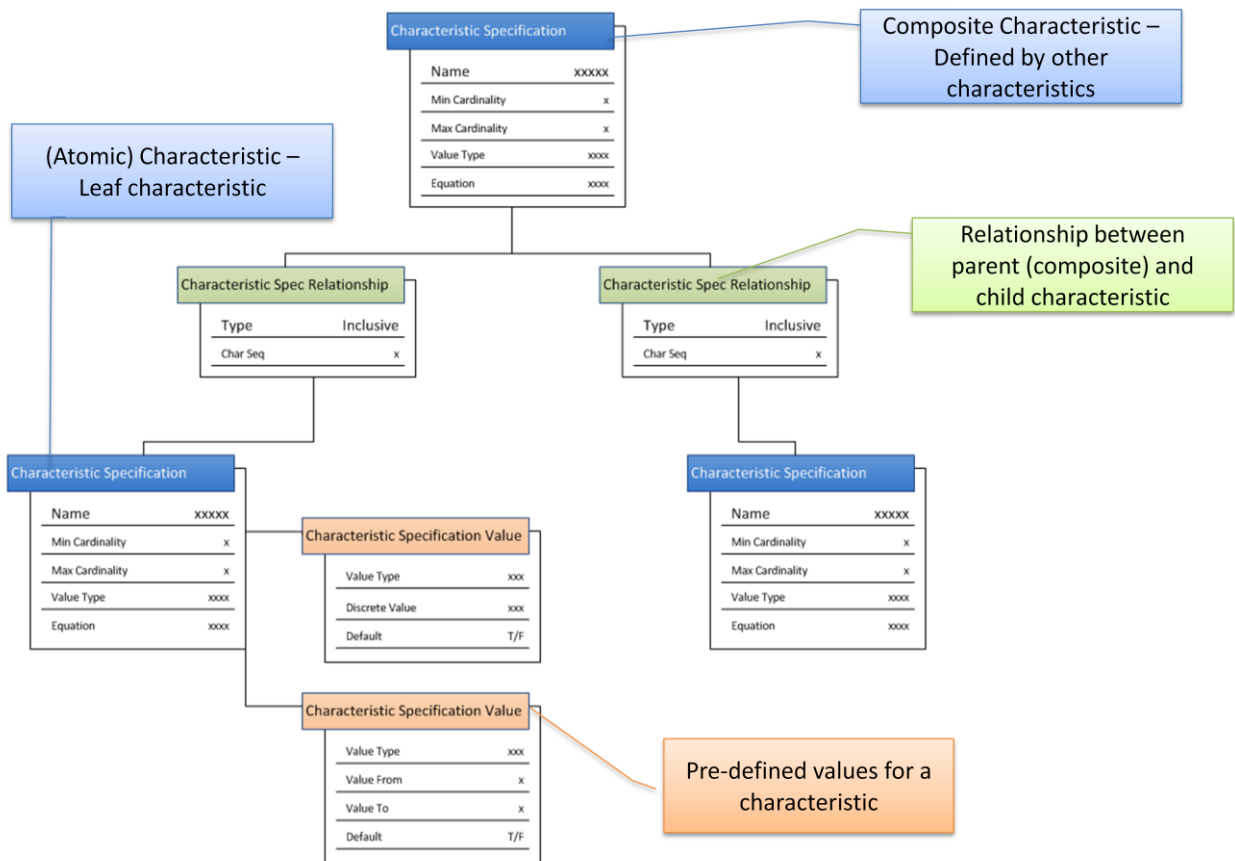
Figure 4 - Element Relationship Topology View (1)

Figure 5 - Element Relationship Topology View (2)

Figure 4 - Element Relationship Topology View (1) shows a Product Offering constructed using a Product Specification. It further shows the Product Specification being recursively defined. Each Product Specification contains a number of Characteristic Specifications. Figure 5 - Element Relationship Topology View (2) shows further hierarchies that can be established between characteristic specifications. It also shows the characteristic specification value element used to enumerate characteristic specifications.

The following sections will describe each of the sections in detail.

Note: The Product definition schema describes Products using the following reusable SID patterns.

1. Entity Specification / Entity (ES/E)

2. Characteristic Specification / Characteristic Value (CS/CV).

These patterns support the Industry Interface Concept by providing the extensibility required to model Access Seeker Products. The ES/E pattern allows a business entity to be described using an specification (template) and any variants specific to the entity. This pattern can be used to describe a Product specification (the Entity Spec) that can be instantiated as a Product (the Entity).

The CS/CV pattern allows characteristics that make up a specification to be described. This pattern will be used to describe the attributes, their values and any relationships. NBN Co plans to use these patterns and the underlying semantics to describe an increasing number of Products in the future.

5.1 Product Offering

A Product Offering represents an Access Seeker orderable Product. The Product Offering element will contain information required to uniquely identify a Product. It acts as a container of Product characteristics and specifications (described below) that describe a Product. NBN Co's Product catalogue will consist of Product Offerings. An Access Seeker may see the full catalogue, but can only order those Products to which the Access Seeker is certified by NBN Co to order.

The Product Offering will have terms, including SLA's and charges which will be defined under the Wholesale Broadband Agreement (WBA). For the avoidance of doubt, this information will not be described by the Product Definition XML.

The table below contains a summary of the Product Offering elements.

Element	Description	Required
Id	A unique identifier for the Product Offering.	Required
Name	A word, term, or phrase by which the Product Offering is known and distinguished from other Product Offerings.	Required
Description	A narrative that explains what the offering is.	Required
Status	The condition in which the offering exists, such as planned, obsolete, active.	Required
Valid For	A time period for which the Product is available.	Required
Version	The major and minor version of the Product	Required

Table 5 - Product Offering - Elements & Description

5.2 Product Specification

Product Specifications act as a grouping of Product Characteristics and are used to construct a Product Offering. They can be explained as a sub component of a Product.

Product Specifications generally relate to a tangible or intangible object that is provided to the Access Seeker as part of the Product. Common candidates are Product components that align to customer facing services or resources. Therefore, Product Specifications can be structured around customer facing services and resources that make up a Product Offering.

Product Specification may also be cascaded with other Product specifications. Dependent Product Specifications are useful when constructing bundled or complex Products. This allows a Product Offering to be defined as a tree structure with dependent Product Specifications. Following this mode, each Product Offering will contain one Product Specification which in turn can be made up of dependent Product Specifications.

The table below contains a summary of the Product Specification elements.

Element	Description	Required
Name	The name of the Product specification.	Required
Description	A narrative that describes the Product specification.	Required
Product Number	An number assigned to uniquely identify the Product specification.	Required
Brand/Badge	The manufacturer or trademark owner of the Product specification.	Optional
Valid For	The period for which the Product specification is valid.	Required
Life Cycle Status	The condition of the Product specification, such as active, inactive, planned.	Required

Table 6 - Product Specification - Elements & Description

5.3 Characteristic Specification

A Characteristic Specification represents a Product attribute. It is integral to the communication and expression of a Product. Characteristic Specifications can be used both to describe aspects of Products and also to describe the associated choices and rules. The three central elements used to achieve this are:

1. Characteristic Specification
2. Characteristic Specification Value
3. Characteristic Specification Relationship.

Characteristic Specifications have a unique ID and an associated Name to identify it. Their primary role is to provide a template that defines a distinctive feature. Being a template, it defines the value that it could take. The schema supports 2 methods of value specification.

The Characteristic Specification element contains a ValueType item that can restrict the type of the value that the Characteristic could take. Eg. Integer, Date, String etc. Alternatively, a Derivation Formula used to derive a value can be provided as a restriction, beyond which no further restriction is posed. The second method is more specific, and involves enumerating the values that the characteristic could take (See 5.4 Characteristic Specification Value).

The Characteristic Specification can also specify if the characteristic in optional, mandatory or if more than one instance is required. This can be indicated by the Min/Max cardinality elements. The following table indicates some of the scenarios.

Min Cardinality	Max Cardinality	Required
0	0	Optional Characteristic
1	1	Mandatory Characteristic
0	m	Optional, however the characteristic could be specified up to 'm' times.
n	m	The characteristic should be specified between 'n' and 'm' times.

Table 7 - Cardinality Options

The Characteristic Specification construct therefore covers for the following requirements described in Table 3 – Capabilities required for Product definition:

- Key Value
- Multiplicity
- Validation.

The table below contains a summary of the Product Specification elements.

Element	Description	Required
ID	A unique identification for the characteristic	Required
Name	A word, term or phase by which the characteristic is identified and distinguished from.	Required
Description	A narrative that explains the characteristic in details.	Optional
Value Type	Kind of value that the characteristic could take.	Required, if the specification is not a composite.
Min Cardinality	The minimum number of instances of a characteristic value that can be assigned.	Optional
Max Cardinality	The maximum number of instances of a characteristic value that can be assigned.	Optional
Extensible	If new values are allowed to be added - NBN Co will confirm the use of this attribute in the future.	Optional.
Derivation Formula	An equation to define the value of a characteristic.	Optional

Table 8 – Characteristic Specification - Elements & Description (SID)

5.4 Characteristic Specification Value

Some Characteristic Specifications require the ability to define specific values that it could hold. Often, they are expressed as an enumeration in terms of the values by which the characteristic could be described. Characteristic Specification Value provides a mechanism to enumerate values that a Characteristic Specification can take. It can be used to specify different types of Characteristic Specification Value enumerations.

1. A single discrete value
2. A range of values allowed
3. A default value (if applicable in a group).

A discrete value can be specified using the "Value" element only. This provides a single value that can be used for the characteristic specification. The "Default" element can be used to indicate if the value is to be used as default among other characteristic specification values. As a rule, only one Characteristic Specification Value can be marked with Default. Optionally, a Unit of Measure could be specified with the value. When used in this manner, no other element will be populated.

The characteristic specification value can also represent a range of values. When specifying a range, the Value from/to elements represents lower and higher bounds of the range. The Value Type would indicate the value type E.g. Integer, Date etc. The Range Internal element specify if the values provided in the from/to range is inclusive. Optionally, a Unit of Measure could be specified with the value. When used in this manner, no other element will be populated. A range characteristic specification value is used by providing a value that fits the range and type. Note, it is not allowed to set a characteristic specification value a Default.

The following table summarizes the element combinations allowed under different modes:

Element	Discrete Value	Range Value
Value Type	N/A	Required
Default	Optional	N/A
Value	Required	N/A
Unit of Measure	Optional	Optional
Value from	N/A	Required
Value to	N/A	Required
Range internal	N/A	Required

<p align="center">Table 9 - Characteristic Specification Value, Element combinations</p>

The Characteristic Specification Value construct therefore covers for the following requirements described in Table 3 – Capabilities required for Product definition

- Enumeration
- Key
- Default Value.

Detailed description of the Characteristic Specification Value is provided below:

Element	Description	Required
Value Type	The type of the specification value.	Optional
Default	Indicate if the value is the default value for the specification.	Optional
Value	A discrete value that a characteristic could take.	Optional
Unit of Measure	Indicates the unit of measure of the value, if applicable.	Optional
Value from	The low range value that a characteristic can take on.	Optional
Value to	The upper range value that a characteristic can take on.	Optional
Range internal	Specifies inclusion or exclusion of the value range.	Optional

<p align="center">Table 10 – Characteristic Specification Value - Elements & Description (SID)</p>

5.5 Characteristic Specification Relationship

A Characteristic Specification Relationship allows a Characteristic Specification to be linked to one or more child specifications. They allow for composite Characteristic Specification to be defined that are required to manage characteristic specification dependency. Composite Characteristic Specifications can be defined as ones those have child Characteristic Specifications.

The following table summarizes the Characteristic Specification Relationship elements within the schema.

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Element	Description	Required
Relationship Type	The value specified or selected for the characteristic.	Required
Char Sequence	Specify the relative order of listing.	Optional

Figure 6 – Characteristic Specification Relationship - Elements & Description (SID)

The Relationship type element is used to specify how to interpret and interact with the Characteristic Specifications related to the head characteristic. NBN Co will use the following two types:

1. Inclusive – To indicate that all related characteristics are required to be honored.
2. Exclusive – To indicate that only one of the characteristics needs to be selected. This is used as an enumeration, where one characteristic enumerates other characteristics that in turn have their own definition.

Note that a composite characteristic has no characteristic specification value associated to it. It is derived from the child characteristics and their values. A composite characteristic that is defined by child characteristics is required to be instantiated differently based on the relationship type.

An Inclusive Characteristic requires the name/ID of the selected child characteristic to be specified as a value, because that characteristic is defined by the child characteristic selected.

An Exclusive Characteristic does not require any value as its characteristics will bear the value. This is because the characteristic is not being defined by any choice in terms of its immediate characteristics.

The Characteristic Specific Relationship construct therefore covers for the following roles described in Table 3 – Capabilities required for Product definition :

- Enumeration
- Characteristic Relationship
- Complex Type
- Validation

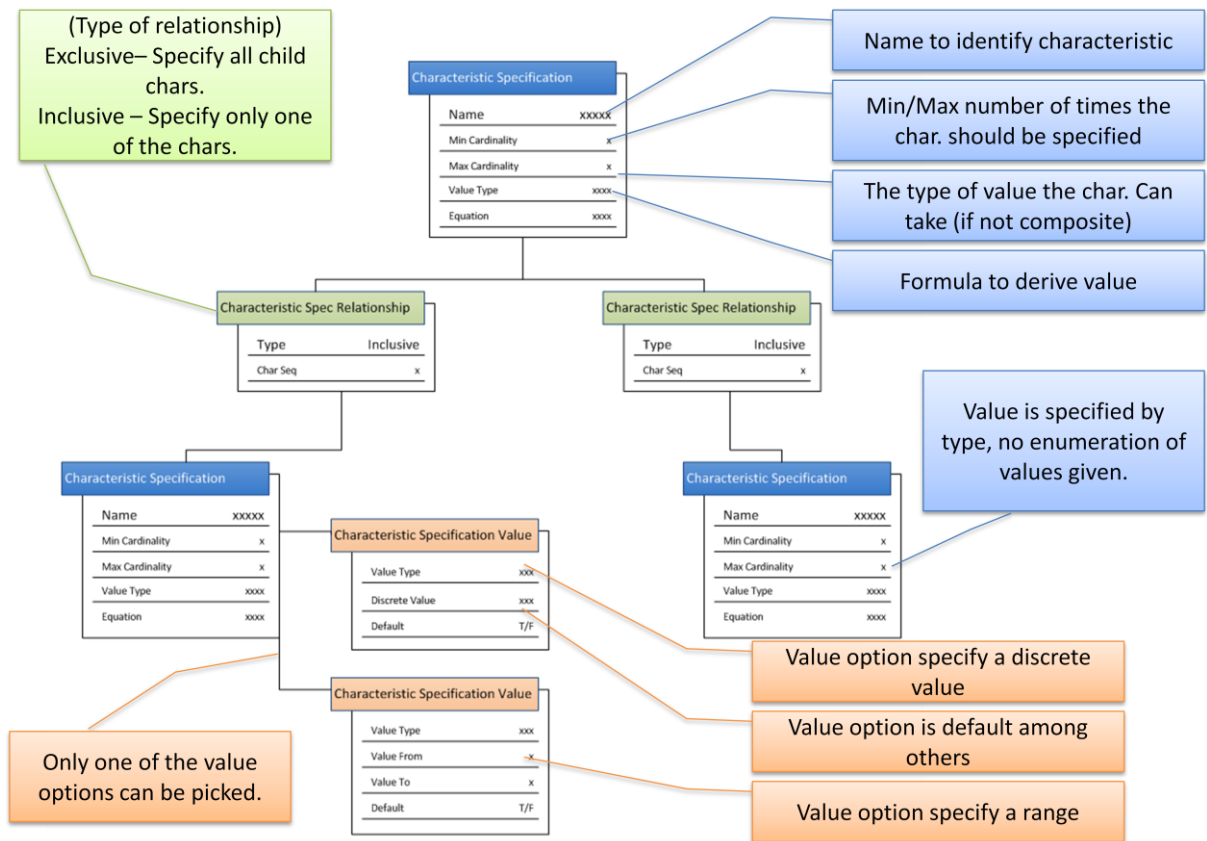The key concepts around characteristics specifications are summarised in the diagram below.

Figure 7 - Characteristic Specification Topology

Note: Details on how a Product Offering and a composite Product Offering are mapped back to the Main Order Line Item (MOLI) and Order Line Item (OLI) structure of a Product order will be described in subsequent versions of this document.

6 Product Order Interaction

The Product ordering interactions described in the B2B Interaction Business Processes Technical Specification are intertwined with the Product definition. The NBN Co "Manage Product Order" service will be designed so that a consistent approach can be used to map a Product definition into a Product order, regardless of the Product being described.

In order to achieve this, NBN Co will use a Product order schema. This will be derived from the NBN Co Information Model (CIM). CIM uses SID's business interaction entity to model a Product Order.   The manage Product order service will use this schema to structure all NBN Co Product order XML's via the B2B Gateway. The table below summarise the key elements included in Product order schema.
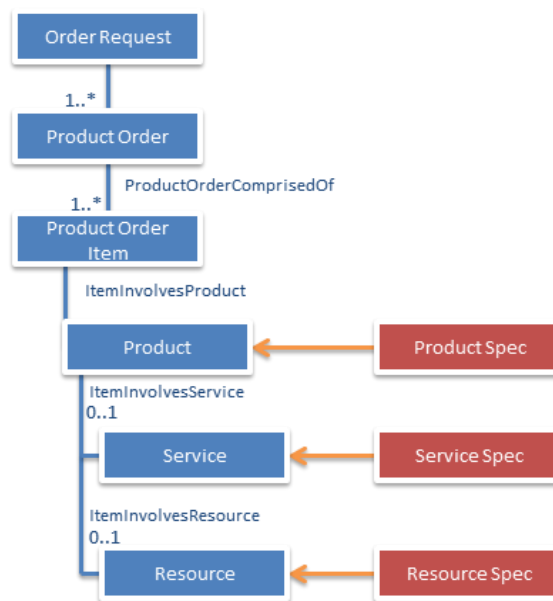
Figure 8 - Product Order Schema Topology View

Element	Description
Order Request	A message representing the Product order. May either be either a single or bulk request.
Product Order	The entity that contains each order item.
Product Order Item	A Product order has one or more Product order items. MOLI/OLI is supported.
Product	Each Product order item has one Product which is governed by a Product specification.
Service	A Product may comprise a service which represents logical connectivity and is governed by a service specification.
Resource	A Product may comprise a resource which represents a physical or logical component and is governed by a resource specification
Characteristic Value	Represents the "selected" value for a Characteristic Specification.

Table 11 - Product Order Schema - Key Elements

The Product element is an instance view of a Product specification within the Product Offering. Each Product element will contain Characteristic Values that define it. A Characteristic Value can be specified for each Characteristic Specification. The Characteristic Specification and Characteristic Specification Value acts as a guide for the Characteristic Values that can be selected.
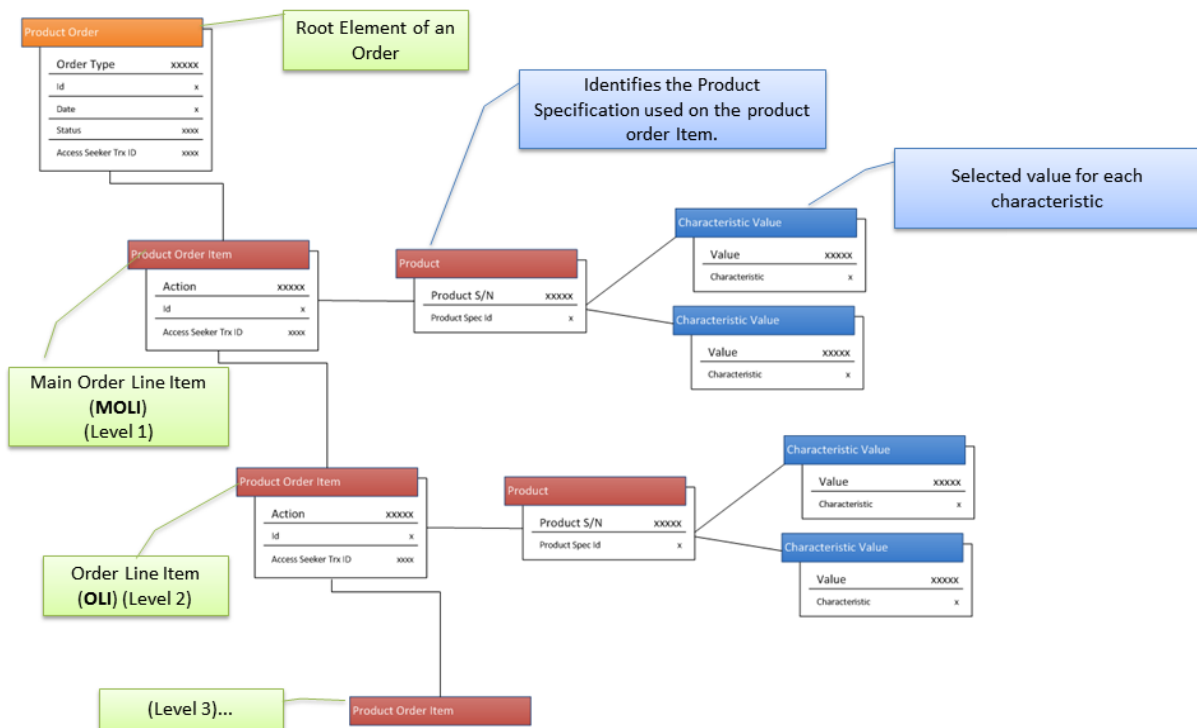

The following rules can be applied when mapping Product definition to a Product order.

1. The Product Offering element within the Product xml maps to the Product Order element of the Product order xml. There is a 1:1 relationship here.

2. Each Product Specification within a Product xml maps to a Product Order Item element within the Product order xml.

3. The Product Order Item's within the Product order xml can cascade, and is required to follow the Product Specification containment hierarchy in the Product xml.

4. The top most Product Specification will be defined in the first Product Order Item of the Product order xml. Referred to as Main Order Link Item (MOLI). (Subsequent Product Order Items used to instantiate remaining Product Specifications are called OLI's).

5. Each Characteristic Specification within a Product Specification (on the Product xml) is provided with a Characteristic Value within the Product Order Item element of the order. The Characteristic Value should be validated base on the Characteristic Specification rules (enumeration of allowed values, multiplicity of values required etc).

6. Each Characteristic Value element within the Product Order Item will contain the selected value as well as the ID/Name of the Characteristic Specification is refers to.

7. Characteristic Value elements within a Product Order Item will not be hierarchical. Even through Composite characteristic specifications are being used.

The diagram below summaries how the key elements between the two schemas can be mapped.
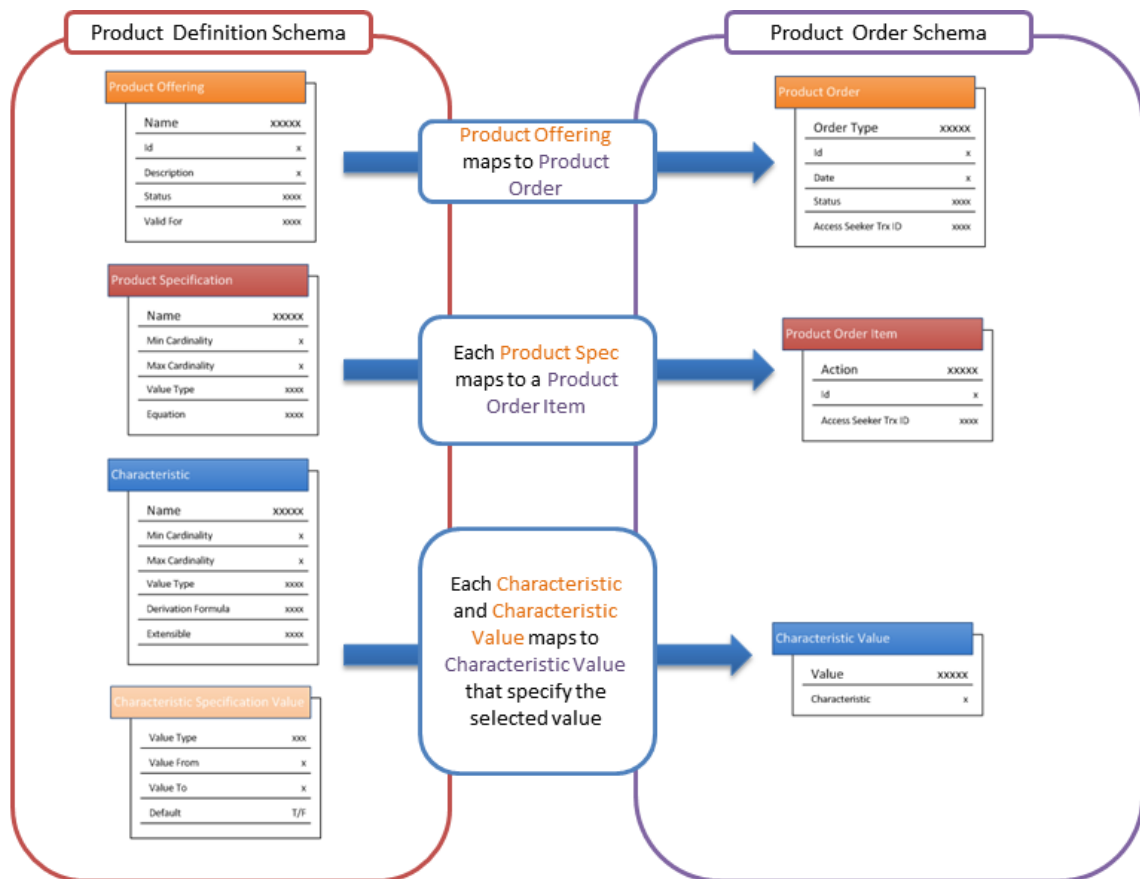
Figure 9 - Mapping between Product definition and Product order

Figure 8 (below) is a snippet from 8.3 Appendix C – Product Order Sample where an NBN Product Order is filled using characteristics defined in the Product definition. The NBNProductOrderItem (a type of Business Interaction Item) contains an NBNProduct element that contains the characteristic specification and values as shown below.

The NBNProductOrder element contains hierarchy of recursive ProductOrderItems. The top most ProductOrderItem (referred as a Main Order Line Item – MOLI) contains the Product reference that identifies the Product Offering being ordered as shown below.

▲ tns:NBNProductOrder				
	() tns:ID	NBN Product Order Instance ID		
	() tns:interactionDate	2010-11-22		
	() tns:description	NA		
	() tns:interactionDateComplete	2010-11-22		
	() tns:interactionStatus	New		
	▼ tns:AccessSeekerInteraction			
	() tns:orderType	Connect		
	() tns:dueDate	2010-11-22		
	Comment	Main Order Line Item (MOLI)		
	▲ tns:ProductOrderComprisedOf			
		() tns:ID	NBN Order Line Item ID (MOLI)	
		() tns:action	add	
		▼ tns:AccessSeekerInteractionItem		
		▲ tns:BusinessInteractionLocationSpecifiesThePlaceFor		
			▲ tns:Place	
				= xsi:type	tns:AustralianPropertyAddress
				() tns:id	NBN Address Instance ID
		▲ tns:BusinessInteractionItemInvolvesAppointment		
			= xsi:type	tns:NBNAppointment
			() tns:activityNr	APP-000111222
			▲ tns:ActivitySpec	
				() tns:name	Demand Type: Install Demand of Drop fibre and ONT
				() tns:specVersionNr	1.01
		▲ tns:BusinessInteractionItemInvolvesProduct		
			= xsi:type	tns:Product
			() tns:commonName	NFAS Mass Market Fibre Access Template 001
			() tns:description	NFAS Mass Market Fibre Access Template 001 - Voice and Data provided on different interfaces
			() tns:objectID	Product Instance ID: PRI012345678912
			▲ tns:EntitySpecification	
				= xsi:type	tns:EntitySpecification
				() tns:commonName	NFAS Mass Market Fibre Access Template 001 Product Specification
				() tns:description	NFAS Mass Market Fibre Access Template 001 - Voice and Data provided on different interfaces
				() tns:objectID	PRS000000000001
			() tns:productStatus	LIVE
			() tns:productSerialNumber	PRS000000000001

Figure 10 – NBN Product Instance – Structure

Each Product specification within the Product Offering is mapped into a sub ProductOrderItem following the hierarchy set out in the Product definition. The sub ProductOrderItems (referred to as Order Line Items – OLI's) each contain the values selected for the characteristics within the Product specification as show below:

Figure 11 Product Order - Value Assignment

The key elements involved are described below in detail.

6.1 Application of Product Definitions

This section summarises the benefits of using Product definitions, and outlines the possible modes that can be used.

Party	Benefits
Access Seeker	• Allows stable and reusable business applications to be built that are more resilient to change. • Reduces integration effort for new Products.
Access Provider	• Establishes a uniform way of describing a Product. • Allows the internal reuse of characteristics to define new Products.

It is intended that a machine that reads the schema is able to handle any Product description, as the same set of elements, attributes and rules will be used regardless of Product. The rich semantic support and consistent use opens up a raft of integration options to access that are more resilient to change and Product updates. For example:

1. Construction of web portals that can read the Product definitions and render screens on run time by interpreting the semantics.

Uncontrolled when printed.

2.   Integrate fulfilment operations into Access Seeker Product catalogues (where the NBN Co Services are modelled as resources and combined with other Access Seeker resources and configurations as value added services of the Access Seeker).

7 Product Definition - Versioning

Product definitions and their subparts have distinct versioning implications for Access Seekers and NBN Co. NBN Co will be in maintaining versioning of the granular subparts of a Product definition. However, for Access Seeker the most granular versioned element would be the Product definition itself. It is critical that the B2B Gateway and NBN Co systems implementation be able to decouple the above and be able to maintain them independently. (For example, version or systems changes within NBN Co should not necessitate changes to touch points exposed in the B2B Gateway).
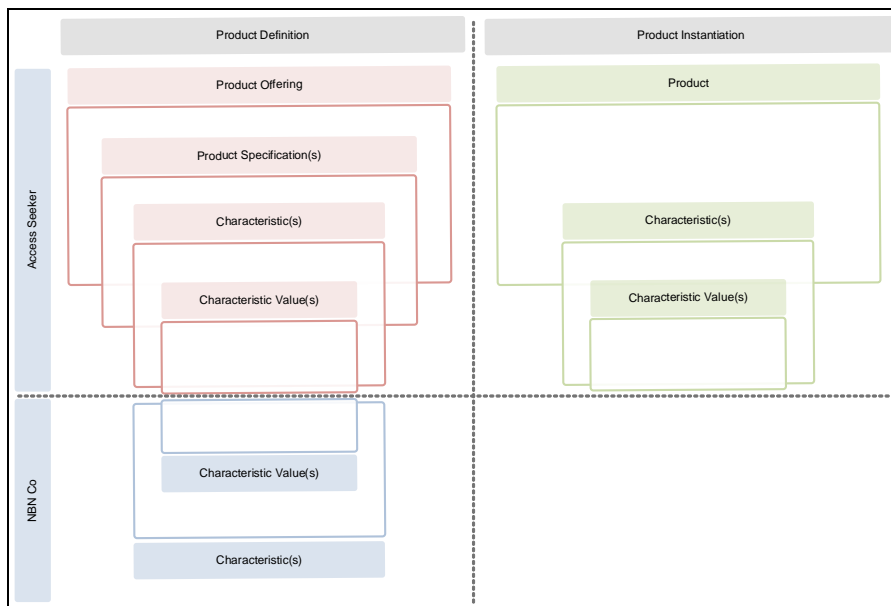

Figure 12 – Product Definition - Versioning Overview

For Access Seekers, the lowest possible versioning element will be a Product Offering. There will be no additional benefit in specifying Access Seekers with versions at a Product specification level or below. A major and minor version number will be used within a **Product definition** to manage changes in the following way:

1. All new **minor** versions will be backwards compatible.
   - A minor version change will mostly be used to indicate minor changes in a Product Offering. It does not necessitate changes to the access seeker systems that are already integrated with the older (minor) version – however some changes might be required if the new features exposed are to be used.

   - E.g. Addition of a new Product feature that is optional to use or underlying system change that is transparent to access seeker (however still notified as a minor version update).

2. All new **major** versions will not be backwards compatible.
   - A major version change will not guarantee that changes are not required by the access seeker. It would require attention or reconfiguration by the access seeker.

   - E.g. Addition of a mandatory Product feature, removal of a Product feature

Note: It is also conceivable that major updates will lead to a new Product being offered.

Conversely, *internal NBN Co systems* implementations require more granular versioning. This is to ensure that reusable sets of characteristics are available to specify Product Offerings, that is, different versions of a Product Offering should not lead to its own disconnected characteristics being maintained.

For example, bandwidth is a characteristic type that will be reused across Products. The bandwidth selected for a Product instance needs to be described internally using a single data type. However, the bandwidth options made available through Product Offerings and specifications can change from Product to Product. Therefore, the internal representation of the bandwidth characteristic should contain all possible values by the NBN Co systems implementation and NBN Co network. Characteristic specifications should be formed not directly with the internal characteristics, but as overrides of the internal characteristics.

8 Appendices

8.1 Appendix A – Product Definition Schema

The embedded document contains the current Product definition schema developed by NBN Co.

Important: This schema is provided as an illustration only and is subject to change by NBN Co.

ManageProductCatal
ogue.xsd

8.2 Appendix B – Product Definition Sample

The embedded document contains a sample UNI Type Product characteristic shown.

Important: This is not a complete or valid NBN Co Product. It is intended as a sample to demonstrate how Product characteristics can be described. A more complete example including Product specification of the sample Product will be made available following the completion of NBN Co's detailed interface design.

This Product definition sample is provided as an illustration only and is subject to change by NBN Co.
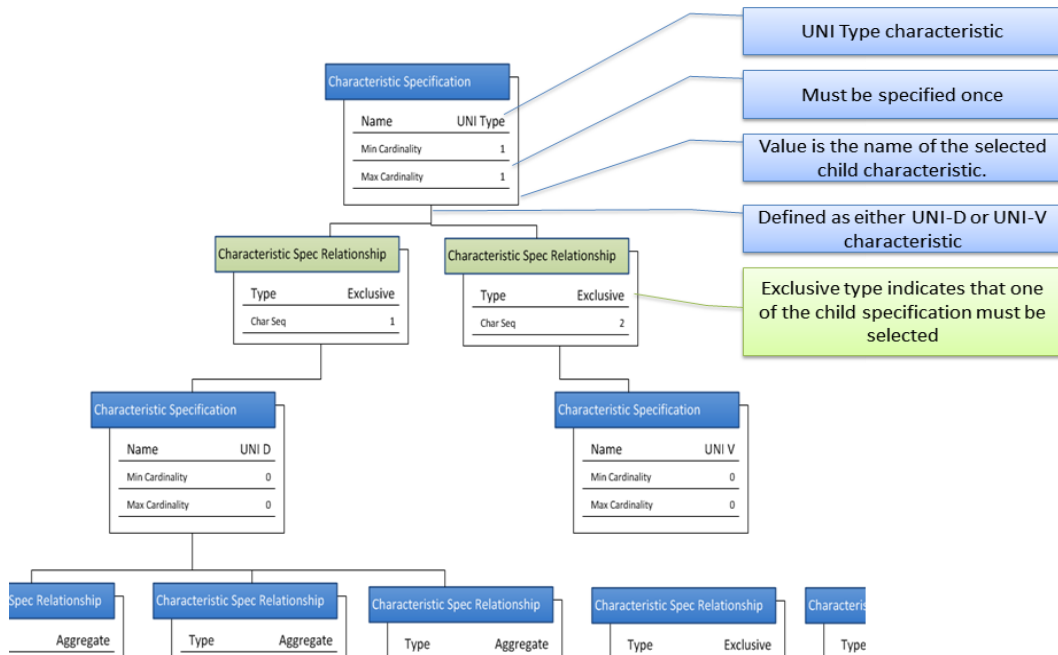
ManageProductCatal
ogue.Response.Temp

Figure 13 – Product Definition Sample - UNI Type Exclusive Relationship
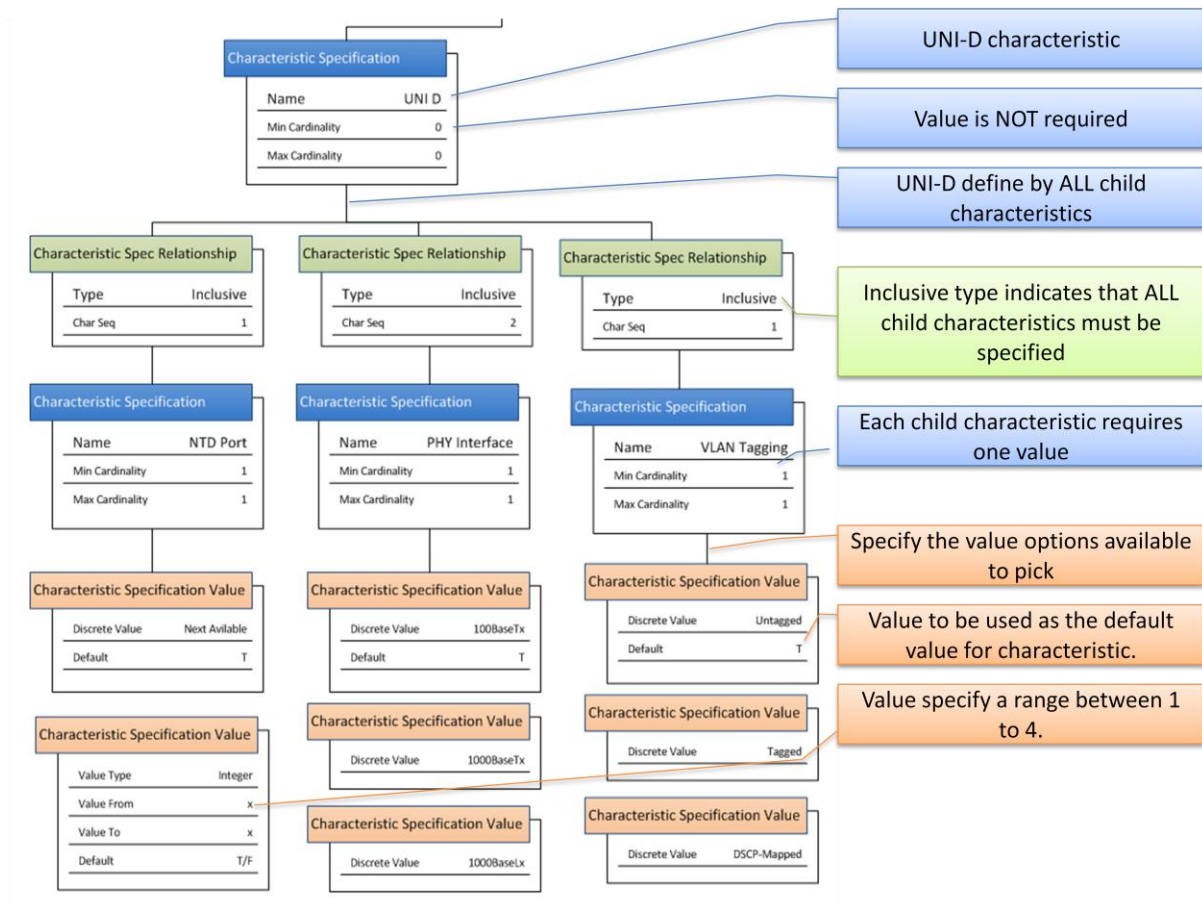
Figure 14 – Product Definition Sample - UNI-D Characteristic

8.3 Appendix C – Product Order Sample

The embedded document contains a sample Product order for the sample NBN Co Data Product described in section 4.

Important: This Product Order sample is provided as an illustration only and is subject to change by NBN Co.

submitOrderConnect
.v0.3.xml

8.4 Appendix D – Product Order Schema

The embedded document contains the current Product order schema developed by NBN Co.

Important: This Product Order schema is provided as an illustration only and is subject to change by NBN Co.

ManageProductOrde
r.xsd

8.5 Appendix E – Key Terms

Term	Description
Access Seeker/s	The term to refer jointly to Retail Service Providers (RSPs) and Wholesale Service Providers (WSPs). This document specifically relates to those Access Seekers that connect a Message Service Handler (MSH) to the NBN Co B2B Gateway in order to transact with NBN Co.
AS	Access Seekers
Assurance	The functional area that performs assurance for Services and Resources and covers performance management, incident management and alarming
AVC or Access VC	Access Virtual Circuit a logical Ethernet Virtual Circuit that connects the User Network Interface to an Aggregation Point.
B2B	Business-to-Business
B2B Gateway	The NBN Co ebXML gateway providing access to the NBN Co B2B system as further described in the NBN Co B2B Gateway Architecture Technical Specification.
Billing	Refers to activities related to charging access seekers for NBN Co Product use.
Cardinality	A business rule specifying how many times (minimum and maximum) and entity can be related to another entity in a given relationship.
CIM	NBN Co Common Information Model
CIR	Committed Information Rate Defines a level of data throughput for which service frames are delivered according to the performance objectives of their Traffic Class.
Communications Alliance	Communications Alliance is the peak body for the Australian communications industry - forging a unified voice for its members in public policy, facilitating industry solutions to industry issues and providing up-to-date information on industry issues.
Complex Type	A characteristic that is defined by a set of child characteristics.
CVC or Connectivity VC	Connectivity Virtual Circuit a logical Ethernet Virtual Circuit that connects Aggregation Points of Fibre Serving Areas to a Point Of Interconnect.
CS/CV	Characteristic Specification / Characteristic Value (CS/CV)
C-TAG	Tagging structure for Virtual Local Area Network (VLAN) addressing scheme as specified in IEEE802.1ad
CVC	Connectivity Virtual Circuits A shared Ethernet Virtual Circuit that aggregates one or more Access Virtual Circuits in a Connectivity Serving Area to a Network-Network Interface
DSCP	Differentiated Service Code Point
DHCP	Dynamic Host Control Protocol is a method for automating the assignment of IP addresses and other networking information
Enumeration	A characteristic that is defined by a set of options of which one can be picked. Each option is itself a characteristic.

Term	Description
ES/E	Entity Specification / Entity
Fulfillment	Refers to the activation operations followed in order to configure a service requested by an order.
ICF domain	Refers to the Integration and Core Flow domain within NBN Co systems.
Industry Interface Concept / Model	This model requires a Product to be defined by the data requirements as well as the exposed processes relating to the 'Fulfillment', 'Assurance' and 'Billing' of the Product.
Instantiation	Refers to creating an instance following a template.
IP	Internet Protocol
Key	A basic characteristic that identifies a value. A key defines a known entity.
Key Value	A characteristic represents an entity that requires a value.
L2C	Lead to Cash is a stage in the NBN Co End-to-End Business Model.
Link	Ability to link a characteristic to another, where the characteristic type identifies use of the child characteristic.
MOLI	Main Order Line Item
Multiplicity	A characteristic that defines cardinality rules.
NBN	The Australian national broadband network, or part thereof (including the optical, satellite, wireless and other communication technologies used therein).
Network	The NBN.
NNI	Network to Network Interface as described by the Metro Ethernet Forum.
NTD	Network Terminating Device. A generic term for NBN Co network equipment at the End-user premises which provides a point for network demarcation.
NFAS	NBN Co Fibre Access Service
OAM	Operations, administration and Maintenance
OLI	Order Line Item
PHY Duplex	Refers to the ability to communicate simultaneously in both directions of the physical layer.
PHY	PHY is an abbreviation for the physical layer of the OSI model.
Product	NBN Co Products sold to Access Seekers by customer facing systems. Multiple Services can be associated with a Product.
Product Catalogue	A repository (and single point of entry) of all current and historical Product Definitions that are available to NBN Co channels and customer sets.
Product Definition	Refers to XML that describes the Product in a machine interpretable manner.
Product Instance	Refers to an order for a Product being placed. It filled out using Product definition template and where specific values have been selected by the access seeker.
Product Specification	Refers to a component of an overall Product that is being described.
SID	Shared Information Data (SID) information model Product Definition

Term	Description
SLA	Service Level Agreement. A formal negotiated agreement between two parties, sometimes referred to as service level guarantee. It is a contract (or part of one) that exists between the Service Provider (NBN Co) and the Customer (Access Seeker), designed to create a common understanding about services, priorities, responsibilities, etc.
T2R	Trouble to Resolve is a stage in the NBN Co End-to-End Business Model.
TM Forum	Tele-Management Forum
Traffic Class	A traffic class is a system-wide collection of buffers, queues, and bandwidth that you can allocate to provide a defined level of service.
Tx	Refers to transmission speed.
UNI	User Network Interface: The physical End-user NFAS access point and NFAS point of network demarcation – either an Ethernet connector or analogue voice connection.
UNI-D	User Network Interface - Data
UNI-V	User Network Interface - Voice
Validation	A validation rule described along with a key-value characteristic
VLAN	Virtual LAN *A network architecture which allows geographically distributed users to communicate as if they were on a single physical LAN by sharing a single broadcast and multicast domain*
VLAN Tagging	*VLAN tagging* implementation enables partitioning of traffic in a network using multiple VLANS.
XML	Extensible Markup Language
XSD	XML Schema Definition

9 Document Control

Revision History

Major changes to this document are listed in the table below for each version of the document distributed.

Date	Version	Author	Description/Section Revised	Reviewed By
18/1/2011	V0.8	Guy Liyanage	Public draft for comment	Roger Venning
2/05/2011	V1.0	Guy Liyanage	Updated following industry consultation	Martin Pittard

Providing Feedback

Please direct any feedback regarding this Technical Specification to your Account Manager or feedback@nbnco.com.au