Abstract

The competitive forces and increase in adoption of innovative & multifaceted business models are enforcing the Service providers to create and launch new products more rapidly and reduce product design & development cost. In order to achieve this ubiquitous business objective, many of the service providers are adopting a centralized dynamic catalog strategy. The product designs need to be reusable, componentized, modular and flexible such that they provide a single agreed view between Business, IT and Network Engineering spread across different systems and dispensing them efficiently across multiple layers of networks.

This white paper attempts to provide a solution framework on how to design a reusable, componentized, modular and flexible product Catalog and also provides a pragmatic methodology to design enterprise products and services across multiple IT systems. It focuses on the need to decouple Product’s commercial view from that of its technical view and provides guidance on how to achieve this architectural objective. It also defines 12 key Product Catalog Effectiveness Metrics that can be used to measure the reusability, componentization, modularity and flexibility of a product model.
From the above we can correctly infer that the main drivers for adoption of Centralized Catalog solution and the need to create effective Product Models in a Service provider’s environment are Competitive pressure, Reduced time to market, Cost reduction & revenue enhancements, Launch of new services and last but not the least, Effective and Improved Managed Product Lifecycle and Fulfilment.

On the supply side the product catalog solution vendors are coercively offering Centralized or Integrated Enterprise Product Catalog solutions to the Service Providers suited to their needs. The EPC serves as a means to provide a single point of truth / master reference database for multiple IT systems. The adoption of Enterprise Product Catalog solution is also gaining momentum amongst multiple service providers because of increasing demand pull. TM Forum Information Modeling Framework (SID) in most cases is often considered as a de facto standard for achieving common product and service definitions across different systems.

However the adoption of a unified or master catalog solution is merely a first step in this transformational journey as it just provides a robust platform to be able to standardize and define products in a consistent manner. The next leap and bigger challenge lies in simplification of product designs that would be stored over the enterprise catalog. The TM Forum Information Model framework can be leveraged and used as a reference to simplify product structures.

Challenges

Simplification of Enterprise architectures and Product Designs is a critical factor and enabler in realizing the above objectives. From a product modeling and design perspective, especially in case of Enterprise & Complex products, there are multiple challenges that require immediate attention and resolution, these challenges typically are:

1. The existing product Information, product definitions and service definitions are scattered across different groups, systems, documents
2. The commercial view of the product is often mixed up with its technical view
3. Services are product based or are tightly coupled with their respective products and as a result product & services cannot be managed independently.

4. Provisioning flows are often product based for Complex and Enterprise products adding to solution complexity.

5. Absence of a single agreed view of Products, standardization and consistencies in product definitions amongst Product Managers, Network Engineers and IT solution designers.

6. Unable to leverage existing capabilities to create Product Bundles and Individual Customer solutions within a short period of time to maximize revenue opportunities.

**Section I: Strategic Product Model (Design)**

It is often said that Design is a choice. However we can still strive to create strategic product designs, adequately balanced with pros and cons and take informed design decisions to simplify our enterprise architecture. Strategic Product Modeling and Simplification would mean:

1. Decoupling a Product's commercial view from that of the Product's technical view

2. Establishing a single agreed view of Products between Business, IT and Network Engineering and

3. Creating reusable, componentized, modular and flexible product models. The product designs should be such that:
   - Product models enable easy and simplified Opportunity, Quotation, and Sales Order Management in CRM system
   - Product Structures are loosely coupled with their Pricing structures such that customer oriented pricing models can be dynamically changed without significantly disrupting their associated Product Structures
   - Products are easily and fully decomposable into respective services which when implemented help to realize the products
   - Products can be correctly committed to Billing system for managing Rating, Discounts, Campaigns, negotiated Prices and Pricing logic algorithms
   - The definition/specification of the product can be standardized across multiple systems

The simplification and effectiveness of Product Designs in turn would greatly assist the Product Managers to create multiple product offerings, plug & play simple product offerings to create Product Bundles and Composite Product offerings by reusing the existing Product Specifications. Doing so, would in turn reduce the cost and would greatly reduce the time to market products.

Simplified consistent product designs across multiple IT systems would also reduce the fulfillment errors and would enhance customer experience thereby reducing the customer churn.
Product View: Technical & Commercial

Product

Definition: Products are things (tangible or intangible) which enterprises, such as service providers, market, sell or lease to customers to create profit. A product is an externally facing representation of a Service and/or Resource procured by the market.

Product Offering

Definition: Represents tangible and intangible goods and services made available in the market for selling at a certain price in the form of product catalogs. It is worth noting that a Product Offering may contain other Product Offerings. In telecoms a PSTN special offer (or Triple Play) may ‘bundle’ other Product Offerings – for example, Internet Access. Product offering with its prices, discounts, campaigns related information represents the Marketing & Commercial view of the product. It is usually the Product offering names which are used to communicate to the customer in Quotation, Invoicing / Billing processes.

Root Product Offering/Saleable Products

Definition: These represent the saleable view of the product as defined in the enterprise product catalog. A root product offering or a saleable product is generally a composite product, made up of multiple simple product offerings. These can be sold as a Bundled or multiple Un-bundled products. Bundling of product offerings can be done either from a pricing or product structure perspective, to launch pre-defined or tightly coupled bundled offers at a single price point.

Product Specification

Definition: Product Specification defines the functionality and characteristics of product offerings made available to the market. Product offerings are made available to customers via Product Specifications. Product Specification sometimes also referred as Product definition can be considered as the building/engineering view of the product. Product specifications are the building blocks and are the reusable components of the Products.

Service

Definition: Service is an intangible realization of a product or something provided in support of a product. Service represents the technical or engineering and implementation view of the product.

Product Offering is sold / offered to customers, but service is implemented to help realize the product.

Two types of services exist:

1. Customer Facing Service: part of a product that is bought by a customer
2. Resource Facing Service: indirectly part of a product but is invisible to a customer. It exists to support one or more Customer Facing Services

Resource

A resource is a part of an enterprise’s infrastructure utilized by a Service or a good procured by the market in the form of Product. Services are generally hosted on resources.

Segregating Product’s commercial view from its technical view enables decoupling the volatility of market offerings from life-cycle management of services (design, provisioning, assurance, upgrades, SLA performance tracking and remediation etc.)

An example is cited below:

Let us consider the Bundled IP Ethernet product. It is a simplified pricing bundle and a Layer 3 VPN based product. The product provides High bandwidth at low cost – an overall reduction when compared with purchasing stand-alone or unbundled services. The product consists of 1 IP Port and 1 Access service provided to the customer as a single line item on their bill. Two access types are available – Ethernet and Frame Relay. Speed options range from 128kbps to 10Mbps.

How to go about modelling this product?

As a thumb rule, any information which helps to describe the product, determines the price of the product, impacts the quotation, bill descriptions, customer agreements, terms & conditions etc. can be safely regarded as commercial information. Information which is required to realize the product by implementing services can be considered as technical information.
Rule No. 1: Restrict commercial information to product models and technical information to service models. As illustrated in the Venn diagram, there would be no overlap of product model with technical information and service model with commercial information. So this model is too ideal to be true in most practical scenarios.

Rule No. 2: Any technical information which has commercial impact (i.e. either affects price, quotation, product manager prefer to convey the information as a value addition, or is dependent on user selection), needs to be present in product model. For instance, user-selectable “Multicast bandwidth”, or price-affecting “Class of Service” should be absorbed in the product model either an attribute or as an offering.

Additionally since the information is originally technical in nature, it needs to be accordingly modeled in the service layer as an appropriate Customer Facing or resource facing service.

Although from a theoretical perspective, it looks easy to understand the difference between an attribute and an offering, however in practical situations, especially in case of modeling Enterprise Products and services, it can become confusing whether to model an entity as a product offering or as an attribute in the product model.

Note: A product offering is a ‘thing’ and has validity (lifetime) however an attribute is the characteristic of that thing. The relevance of an attribute is only meaningful if the offering is valid.

On the other hand, commercial information may have to be sent to the network layer for the offerings to be realized through services. In such cases, such information has to be included in service models. One example could be SLA being dependent on class of service viz. E2E COS, Data Transfer etc.

Note: Not all information in the product model necessarily has to have a mapping in the service model. For example, an installation charge or set up fee for a product is just an amount which is to be enforced on to the customer and may not require any corresponding service. From the above diagram, we can infer that ‘VPN Set Up fee’ is such a product offering which doesn’t have a corresponding service.

In most practical cases, as illustrated in the examples above, commercial and technical information are not entirely disparate so it may not be possible to segregate them totally and there could be an overlap. So effectively we have the adjoining Venn diagram as illustrated below. However we should the modeling should strive to attain a minimum overlap.

The below table shows the sample fields contained in a typical order entry form, other than Customer and Site details:

<table>
<thead>
<tr>
<th>Fields</th>
<th>Possible Values</th>
<th>Information Type</th>
<th>Information Capturing Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Identifier</td>
<td>Generally a 10 digit unique identifier for Network identification</td>
<td>Commercial Product &amp; Technical Information</td>
<td>Customer Product Layer</td>
</tr>
<tr>
<td>Port Identifier</td>
<td>Generally a 10 digit unique identifier for Port identification</td>
<td>Commercial Product &amp; Technical Information</td>
<td>Customer Product Layer</td>
</tr>
<tr>
<td>Rate Limiting Type</td>
<td>Port Based Rate Limiting (PBRL), VLAN Based Rate Limiting (VBRL)</td>
<td>Commercial Product &amp; Technical Information</td>
<td>Customer Product Layer</td>
</tr>
<tr>
<td>Existing Trunk Port</td>
<td>Yes, No</td>
<td>Commercial Product &amp; Technical Information</td>
<td>Customer Product Layer</td>
</tr>
<tr>
<td>Port Speed</td>
<td>256kbps, 512kbps, 1Mbps, 2Mbps</td>
<td>Commercial Product &amp; Technical Information</td>
<td>Customer Product Layer</td>
</tr>
<tr>
<td>Access Identifier</td>
<td>Generally a 10 digit unique identifier for Access identification</td>
<td>Commercial Product &amp; Technical Information</td>
<td>Customer Product Layer</td>
</tr>
<tr>
<td>Access Type</td>
<td>Ethernet, ATM, Frame Relay, ADSL, ISDN, PSTN</td>
<td>Commercial Product &amp; Technical Information</td>
<td>Customer Product Layer</td>
</tr>
</tbody>
</table>
Some of the above fields occur in the product model, some in the service model and others in both.

From the product description and the above table, we can distinctly identify the main product offering or the saleable offering as ‘Bundled IP Ethernet Product’. This bundled product would comprise of product offerings as “Port” and “Access”. The offerings will have their respective definitions or specifications. The generic specifications for access and port offerings could be:

In this case, both the generic Access and Port specifications can be reused across different products like ATM, Frame Relay, and ADSL also, by varying the value of Access Type and Port Type accordingly.

However the above design approach would require conditional pricing and product to service decomposition based on the value of the attribute access type and port type (assume that pricing and service configuration of Ethernet, Frame Relay, ATM etc. are different). This approach can at-times increase the complexity of the solution.

To avoid the complexity of the solution, a solution designer can take an informed decision and can create specialized specifications as Ethernet Access and Ethernet Port to make the solution implementation simplified.

Also, since Ethernet technology is a different type of access from that of Frame Relay from example, it would be wise to have a specialized specification.

We can now optimally and efficiently reuse the Ethernet Port and Ethernet Access specification across all the Ethernet-based products in an enterprise like Unbundled IP Ethernet, Bundled IP Ethernet etc.

Solution design decisions are taken based on the product road map, number of products, size of product family, product line or category, common characteristics etc.

Note: there needs to be optimal balance between the level of reusability and ease of solution implementation.
To define the product offerings: One offering can have only one specification, but the reverse is not true. We have to define a corresponding Port offering and an Access offering.

The below diagram provides an outline for the ‘Bundled IP Ethernet’ product model. Different access offerings having their own price points (for instance Bundled IP Single Uplink Access, Bundled IP Fully Redundant Access, Bundled IP Dual Access) can be mapped to the same ‘Ethernet Access’ specification by varying the values of Access Configuration in Ethernet Access Product Specification.

A container specification ‘Bundled IP Ethernet’ for the main product offering can be made in such a way that the user can configure the product at the main product level rather than having a need to configure each of its components individually. This way, we can increase the customer and sales user experience and significantly reduce errors during Sales order configuration and fulfillment.

Ideally, Product manager should decide the exact name of the offering and a solution designer should define the specifications for the offering.

A good and effective design avoids 1-1 mapping of Product Offering to Specification. An effective product design should define the optimal number of building blocks (product specifications) using which a Product Manager has the flexibility to create multiple saleable product offerings, can do mix and match, and can potentially reduce the time to market new products to its customers as per market needs. The
model should also be complete in information such that all sources of revenue are tightly modeled. This will avoid any revenue leakage associated to the product.

The complete product-service-resource model would look like:

Strategic Product & Service Modeling View in OSS BSS Landscape

The below diagram illustrates the Strategic Product & Service Modeling view across multiple IT systems in OSS BSS landscape. It identifies the relationship of the Catalog Specifications with multiple IT systems, being created through decoupling product's commercial view with that of its technical view. The product and service definitions are realized as instances of product, services, and resources.

The strategic modeling ensures that only the pertinent information is dispensed efficiently across Product/Customer, Service and Network layers.
Product Design Guidelines & Best Practices

Below are list of guidelines & best practices which should be followed in order to achieve Reusable, Modular, Componentized and Flexible Product Catalog Solution Design:

• The core capability of Product Catalog and Solution Implementation of Products are expected to make use of TM Forum Information Framework (SID) so that the product models can make use of the ABEs, BEs, attributes as defined in the Product Domain.

• While designing a product model it is encouraged to understand the order behavior and end to end fulfillment process so that the design considers all the perspectives of Product data right from Ordering, Billing & Provisioning and is not designed as a model just for CRM system.

• It is highly recommended to have design patterns defined so that we have a reusable solution for a set of products which are common in nature. This certainly helps in avoiding reinventing the wheel & by embracing tested design patterns one can speed up the product design & build process.

• Services should be defined in such a way that they are product agnostic. Attribute driven conditional decomposition of Product Specification to Customer facing specification is recommended. This will enable strategic product models and would simplify the overall end to end solution design without having to make any changes to the existing service models.

• Following litmus test can be adopted to segregate and find out the product’s commercial information. A product model should ideally have the following kind of information in the product layer:
  a. Information that inherently helps to describes the product & its characteristics
  b. Information that determines the price of the product
  c. Information that impacts the quotation or bill descriptions of the product
  d. Information that impacts the Customer’s Terms & Conditions or agreements etc.

• It is recommended not to have 1-1 mapping of Product specification to Product offering. Where ever possible it is encouraged to re-use an existing specification to define Product offerings sharing the same product & price describing characteristics. However a fine balance is to be achieved so that catalogue maintenance and solution complexity does not become a hindrance at the cost of reuse.

• Ideally one product should have a single consistent and uniform definition which can then be reused to create multiple product offerings

• The product model should support Inter product, Intra product, Inter characteristic & other business rules so that the models are tightly coupled.

From a product modeling methodology and governance perspective:

• It is encouraged that Product Managers, Modelling team, IT system SMEs, Network designers work in a centralized committed and collaborative manner. A centralized design team can reduce the number of touch points amongst the stakeholders and thus can lead to faster delivery and launch of new products & services at a reduced cost.

• After drafting a high level product model design, brain storming should be carried out to check if the design can be further optimized by re-use of existing appropriate product specifications / offerings / attributes.

• A Design Authority team is recommended to oversee all designs decisions, provide architectural guidance and establish good governance amongst multiple parties.

Adherence to the above stated guidelines / best practices will assist in building an Optimized Product Catalog solution as depicted below:
Section II: Product Catalog Solution Metrics*

How to measure the Effectiveness of Product Models

The reusability, componentization, modularity and flexibility index helps to define the core dimensional framework for measuring the effectiveness of design solutions in a product catalog. There should be Product Catalog Solution specific metrics to be able to assess the effectiveness of product designs. These metrics needs to be simple to understand, easy to calculate and report and relevant to Product Management needs.

Metric 1: Product Offerings Reusability %
Definition: Product Offerings Reusability % describes the ratio of Reusable Product Offerings to the total number of Product Offerings modeled in all packages/root products

Metric 2: Effort Savings % from Offerings Optimization
Definition: Effort Savings % from Offerings Optimization describes the percentage effort saved as a result of reusable product offerings; savings cascade to effort involved in modeling, data maintenance and product configuration

Metric 3: Product Specifications Reusability %
Definition: Product Specifications Reusability % describes the ratio of Reusable Product Specifications to the total number of Product Specifications modeled in all packages. Product Specifications are reused to map to multiple Product Offerings

Metric 4: Effort Savings % from Specifications Optimization
Definition: Effort Savings % from Specifications Optimization describes the effort saved as a result of product specifications reused in Product Offering mapping; savings cascade to effort involved in modeling, data maintenance and product configuration

Metric 5: Prod Offs and Prod Specs Reuse % in Packages/Root Products/Bundled Product
Definition: Prod Offs and Prod Specs Reuse % in Packages/Root Products/Bundled Product - percentage reduction in Product Offerings and Product Specifications as a result of reuse across various packages/root products

Metric 6: Frequency (Mileage) of a Design Pattern
Definition: Frequency or Mileage of a Design Pattern describes the maximum frequency of Reuse of a Design Pattern. Design pattern usage amongst multiple products is also a key criterion that can provide accelerated design and development of products thus enabling faster time to market.

Metric 7: Design Pattern Reusability %
Definition: Design Pattern Reusability % - number of Design patterns reused to create packages as a fraction of the total Design Patterns

Metric 8: Frequency (Mileage) of Specification Reuse in Product Offerings
Definition: Frequency or Mileage of Specification Reuse in Product Offerings - maximum frequency of Reuse of a Product Specification to map to different Product Offerings

Metric 9: Frequency (Mileage) of Specification Reuse in Solution Packages/Root Product/Main Product
Definition: Frequency or Mileage of Specification Reuse in Solution Packages/Root Product/Main Product - maximum frequency of Reuse of a Product Specification in different solution packages (Root Products)

Metric 10: Frequency (Mileage) of Offering Reuse in Solution Packages/Root Products/Main Product
Definition: Frequency or Mileage of Offering Reuse in Solution Packages/Root Products/Main Product - maximum frequency of Reuse of a Product Offering in different solution packages (Root Products)

Metric 11: Number of fully Modular Solution Packages/Root Products/Main Product
Definition: Number of fully Modular Solution Packages/Root Products/Main Product - number of modular solution packages (Root Products) created and reused in entirety in other solution packages

Metric 12: Frequency (Mileage) of a Solution Package/Root Product/Main Product
Definition: Frequency or Mileage of a Solution Package/Root Product/Main Product - maximum frequency of use of a modular solution package (Root Product) in other solution packages

*Source - the above metrics is an Infosys proprietary and have been defined by Manish Juneja & Neha Bhatia
Significance of Product Catalog Solution Effectiveness Metrics

From a utility perspective, any Service Provider can make use of these metrics to measure the effectiveness of their product designs in the catalog and can also track improvements against a set benchmark. The use of this solution metric framework will help to reduce Design Cost by improving the Reusability, Flexibility and Modularity of the product designs. This will ultimately benefit the service provider to reduce the cost to design products and also facilitate in faster time to market its products.

These metrics also serve as a solution to the following key questions that are relevant to the solution designer in the product domain:

- What to measure in an enterprise product catalog from a solution perspective?
- How to measure the reusability, modularity and flexibility index of a product catalog?
- How to demonstrate the benefits of reduced product design timelines achieved by the implementation of componentized, reusable, modular and flexible product catalog?
- How to quantify the effort and cost savings as a result of reusability?
- How to maintain the performance growth charts to checkpoint progress and analyze?

Du Pont View: Product Catalog Solution Metrics contribution in realizing Business Benefits

The above 12 key Product Catalog Effectiveness metrics thus enables:

- Suggestive guidance and provides a dimensional framework for analysis of product design in a catalog
- Quantified analysis of the product models / designs in a Product Catalog
- Metrics results and outcome can help us to define Benchmarks as per the Service provider’s context. For example a solution designer can set an optimal target of Product Specification Reusability % based on the cost, complexity and number of products in a given product family.
- It is an indication of alignment of IT with Business needs
- It aids in measuring the effectiveness of product rationalization, product bundling, controlling product proliferation, product catalog data management & maintenance by gauging product design effectiveness on the metric parameters which emphasize on reusable and modular design solutions
- The metrics are handy to track the improvement in design solutions within/ across a program bucket to reach an optimum level for componentized and modular approach
- The metrics are directly linked to the business benefits and thus can provide meaningful information to Product Managers
Conclusion

From a business perspective the solution design approach exhibited in this white paper has tried to provide the answer to the following question:

How a Service Provider can reduce product design and development cost, and can create a reusable, modular, componentized and flexible product design framework to assist reduction in time to market its product and services.

From a technical and IT perspective, it provides a solution as to how a Service provider can strategically decouple Product’s commercial and technical view and thus contribute to realize the business objectives.

The white paper emphasizes on the need of a centralized catalog solution as a first critical step and all the more accentuates the need to create effective design solutions to be able to realize the business benefits and address business pain points.

The unique set of Product Catalog Solution Metrics would enable a Service Provider to independently evaluate and quantitatively measure the reusability, modularity and componentization index of product designs thereby measuring the effectiveness of product catalog solution implementation.

These unique metrics if accepted by TM Forum Information Modeling Product Addendum group can then also be used as a standard guideline for Product Design Optimization as an extension to existing TM Forum SID standards. These product catalog solution metrics can also be used to set benchmarks or optimal reference marks for Strategic Product Modeling.

Hopefully this white paper has done justice to the problems it endeavored to solve.

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