

PHILIPPINES DREAMIN' 2026

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Constraint Modeling Language (CML): The New Programming Language Powering Revenue Cloud

Speaker: **Kyle Tan**



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2019

LWC

**Lightning Web
Components**
(Spring '19 GA)



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Agenda

- Revenue Cloud
- Constraints
- Past Solutions for Constraints
- Constraint Rules Engine
- Visual Builder
- Constraint Modelling Language
 - Types, Variables, Relationship, and Constraints
- CML Demo





Revenue Cloud

Catalog



Product Catalog
Price Management

CPQ



Configure Deal
Price & Approve
Quote & Propose

Contracts



Execute Contract

Orders



Order Management
Order Decomposition & Orchestration

Assets



Asset Lifecycle Management

Billing



Invoice Calculation
Bill Presentation
Payment Processing

Subscriptions & Consumption

Direct Sales

Channel Sales

In-Product

E-Commerce

Agentforce

Salesforce Platform



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Revenue Lifecycle Manage...

Quotes

AWS Quote | Quote

Quote

AWS Quote

Browse Catalogs

New Contact

New Opportunity

Quote Number

Expiration Date

Syncing

Opportunity Name

Account Name

Grand Total

00000021

☐

₱1,056.99

✓

✓

✓

✓

✓

✓

Accepted

Denied

✓ Mark Status as Complete

Lines

Details

Related

Approvals

Quote Line Items (2)

Instant Pricing ☐ Inactive

Manage Header Adjustment

Add Assets

Bulk Delete

Add Group

Reprice All

Q Add Product

#	Product ID	Sales Price	Quantity	Subtotal	Discount	Partner Discount Percent	Partner Unit Price	Total Price	Selling Model Type	Pricing Term	Pricing Term Unit	Billing Frequency	List Price	Net Unit Price	Net Total Price
1	Mouse	₱7.99	1.00	₱7.99				₱7.99	OneTime				₱7.99	₱7.99	₱7.99
2	Laptop	₱1,049.00	1.00	₱1,049.00				₱1,049.00	OneTime				₱1,049.00	₱1,049.00	₱1,049.00

Quote Summary

Subtotal

PHP 1,056.99

Discount

0%

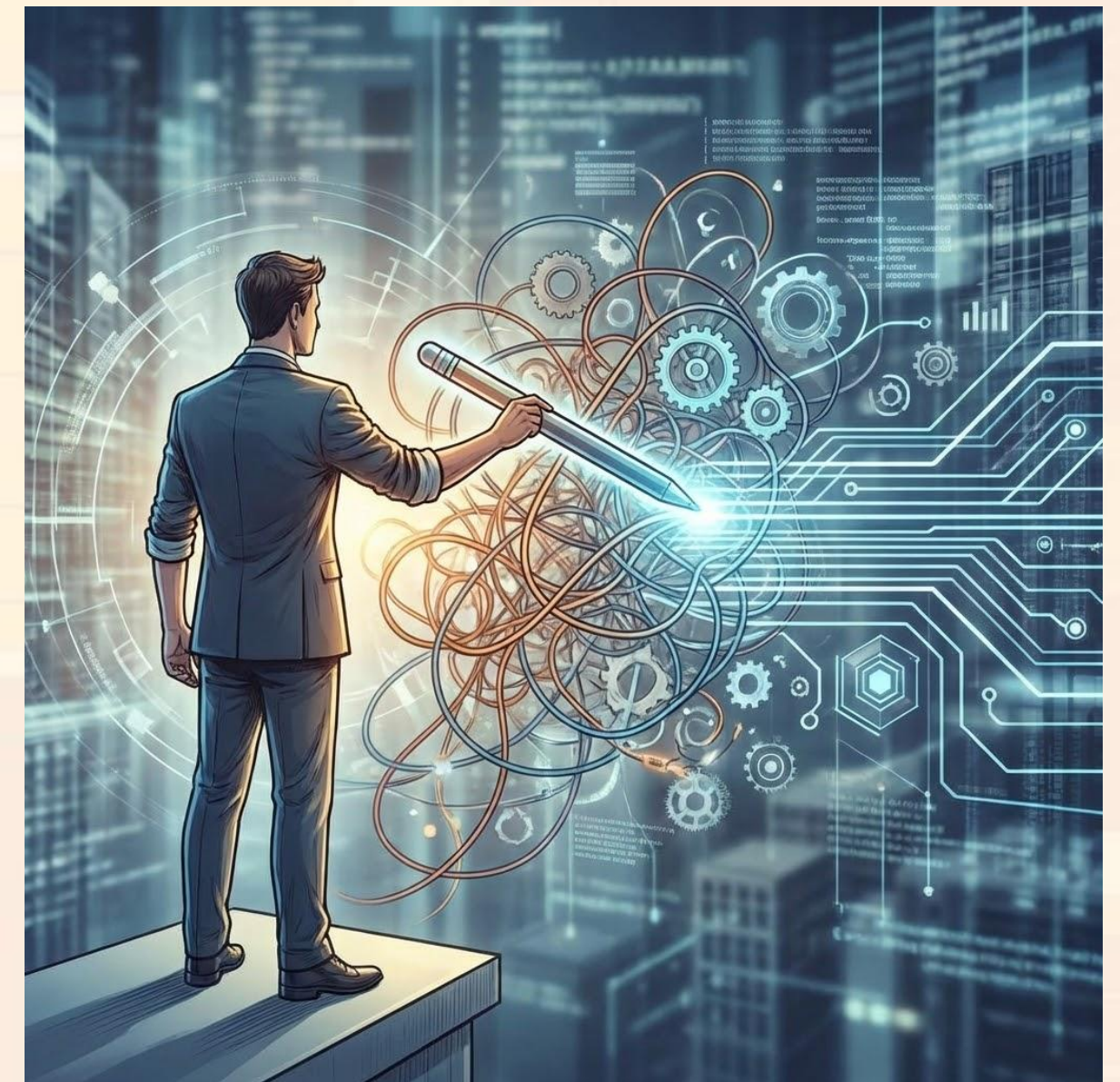
Grand Total

PHP 1,056.99



The Challenge: Taming Configuration Complexity

- **Enforce Business Rules:** Products have interdependencies that must be respected (e.g., compatibility, prerequisites).
- **Guide User Choices:** Sales reps need clear guardrails and messages to prevent errors during quoting.
- **Maintain Scalability:** The logic must be manageable and adaptable as product catalogs grow and change.





Example of Constraints

- **Business Rule #1:** If an Iphone 17 is selected and the customer's service location is in the US, the system must exclude the physical sim option
- **Business Rule #2:** If a high-end graphics card (RTX 4090) is selected, the system must also include a 1000W PSU and Liquid Cooling.





Salesforce CPQ

- Option Constraints
 - Dependency
 - Exclusion
- Product Rules
 - Validation Rules
 - Alert Rules
 - Selection Rules

Industries CPQ

- Context Rules
 - Qualification
 - Penalty
- Advanced Rules
 - Availability
 - Eligibility
 - Compatibility



Rule-Based vs Constraint-Based

Rules

If-Then Rules

Sequential, Condition-Based

Grows Exponentially with Options

Uni-Directional

Slower with Large Models

Hard to Manage at Scale

Easy to Learn, Hard to Scale



Constraints

Declarative Constraints Between Options

Relational, Dependency-Based

Scales Efficiently

Bi-Directional

Optimized for Large Transactions

Fewer, Abstract Rules

Steeper Learning, More Scalable

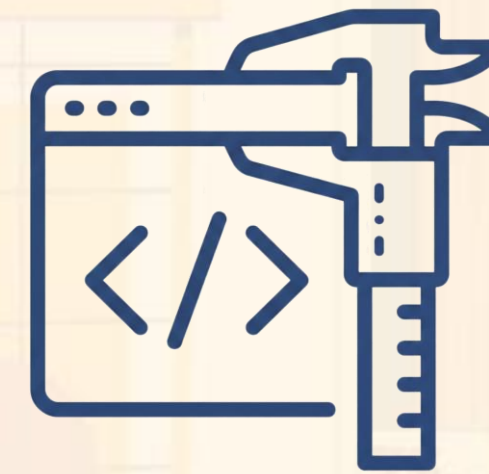


The Right Tool for the Right Job



Visual Builder (Point-and-Click Ease)

Primary Use: Standard configuration rules for 80% of business use cases



CML Editor (Advanced Coding Control)

Primary Use: High-complexity logic and specialized behaviors



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Constraint Builder LaptopBundle V1

Visual Builder

Activate Save

Product Index

Search this list...

Add Item

Products

- LaptopProBundle
- Laptop
- Software
- Mouse
- PrinterBundle
- PrinterPaper
- Printer
- Keyboard

Mouse Products

+

Basic Logic Constraint
Enforces a constraint that is always true.

*Item	*Variable Type	*Variable	*Operator	*Value
Mouse	Attribute	Wireless	== Equals	True

Add Expression

Run-time Message
mouse must be wireless

Enforce Constraints on Product Attributes

Attribute must always have a certain value. E.g. mouse connectivity must be wireless.

point and click visual constraint builder



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Constraint Builder

DemoModel V1

Visual Builder

Activate

Save

Product Index

Search this list...

Add Item

Products

- LaptopProBundle
- Laptop
- PrinterBundle
 - Printer
 - PrinterPaper
 - Mouse
 - Warranty
 - Software

Laptop Products

+

Conditional Logic Constraint

Enforces a constraint when certain conditions are true.

Item

Laptop

Variable Type

Attribute

Variable

Windows_Processor

Operator

== Equals

Value

Intel Core i9 5.2 GHz

Add Expression

IMPLIES

Item

Laptop

Variable Type

Attribute

Variable

Memory

Operator

== Equals

Value

RAM 64GB

Add Expression

Run-time Message

i9 Processor must have 64 GB memory

Enforce Constraints on Product Attributes



Constraint Builder

LaptopBundle V1

Visual Builder

Activate

Save

Product Index

Search this list...

Add Item

Products

- LaptopProBundle
- Laptop
- Software
- Mouse
- PrinterBundle
 - PrinterPaper
 - Printer
 - Keyboard
 - Monitor

Laptop Products

+

Dynamic Message Rule

Display informational, warning, or error messages when certain conditions are true.

WHEN

- Item
 - Laptop
- Variable Type
 - Attribute
- Variable
 - Display_Size
- Operator
 - == Equals
- Value
 - 27 Inch

Add Expression

DISPLAY

- Message Type
 - Informational
- Run-time Message
 - for the best experience, please select a 4K display

Display messages with three levels of severity viz. informational, warning or error.

Set up message rules



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Constraint Builder

LaptopBundle V1

Visual Builder

Activate

Save

Product Index

Search this list...

Add Item

Products

- LaptopProBundle
 - Laptop
 - Software
 - Mouse
- PrinterBundle
 - PrinterPaper
 - Printer
 - Keyboard
 - Warranty

LaptopProBundle Products

Require Rule

Automatically add an item based on conditions.

*Item

Laptop

*Variable Type

Field

*Variable

LineItemQuantity

*Operator

> Greater...

*Value

0.00

Add Expression

REQUIRES

*Item

Mouse

Quantity

1

WITH

Attribute

Wireless

*Value

True

+ Add Attribute

Run-time Message

Auto Add Wireless Mouse for Laptop

Auto-Add Products

Set up require rules.



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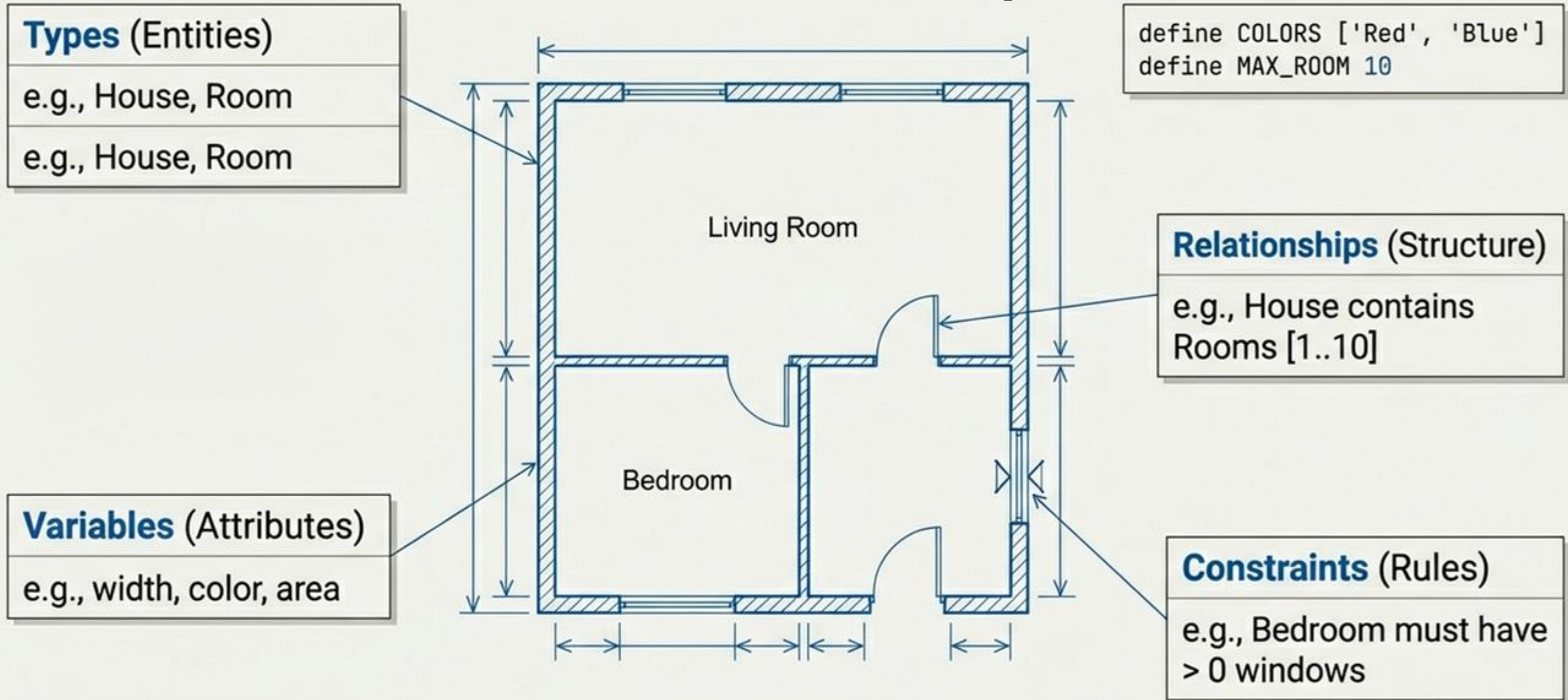
The Constraint Modeling Language (CML)

- **Domain-Specific Language:** CML is a specialized language used by the Constraint Rules Engine to define models for complex systems
- **Type-Based Structure:** CML uses "types"—similar to classes in object-oriented programming—as foundational building blocks to represent entities, properties, relationships, and rules

CML Constraint Snippet

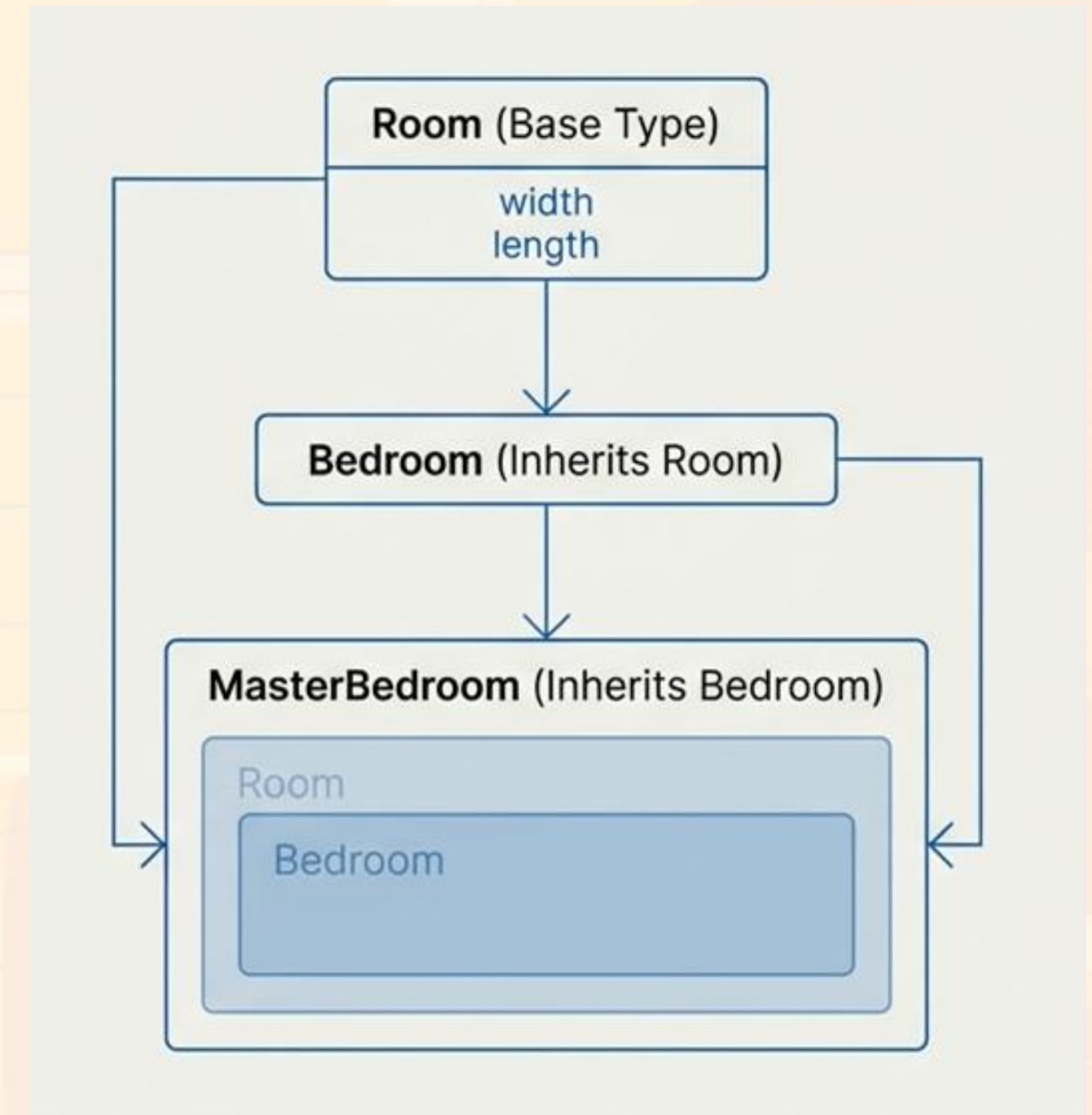
```
type Room {  
    string color = ["Red", "Blue", "White"];  
    string windowShape = ["Oval", "Square"];  
  
    constraint(color == "Red" ?  
        windowShape == "Oval" :  
        windowShape == "Square"  
    );  
}
```


The Foundations: Core Concepts



Types

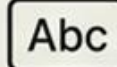
- Typically represents a real-world entity.
- Similar to a class in object oriented programming languages.
- For Configurator - a product or product classification would be defined as a type.
- Product details can be imported into CML from the Product Catalog.

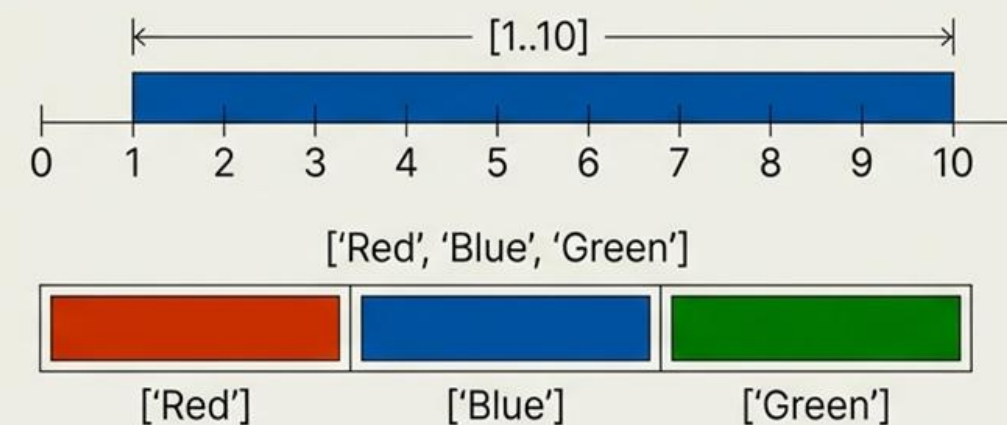


Attributes

- Attributes are the properties or characteristics within a type.
- Attributes support multiple data types.
- Eg: Product attributes or context tags can be mapped to CML attributes.

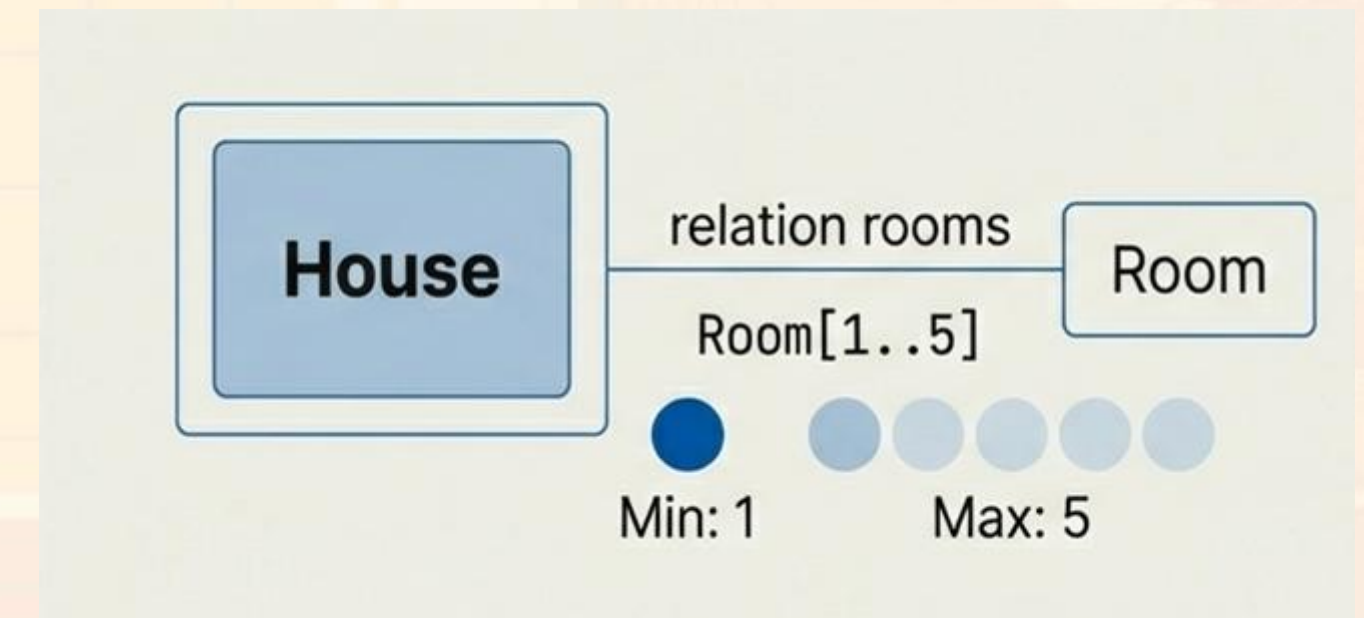
Data Types

-  Boolean (T/F)
-  Date (YYYY-MM-DD)
-  Integer (32-bit)
-  Decimal(n) (Fixed point)
-  String ('Text')



Relations

- Relations define how different types are associated with each other.
- Typically represents the has a relationship.
- Eg: A House has multiple rooms & bathrooms.
- Eg: A Bundle has multiple product components.
- From a configurator standpoint, relation is used to represent the relationship between a bundle and its child component.



Constraint

- Defines condition that must be satisfied.
- Configurator changes values of all attributes & relations to satisfy the constraints.
- The constraint condition is a logic expression and the result must be true or false.
- Usage: Enforce conditions that always need to be true.

```
type Mouse {  
    boolean wireless;  
    constraint(wireless == true, "Mouse must be wireless");  
}
```



```
constraint((inkColor == "Blue" ||  
            inkColor == "Black"),  
           "This pen comes with blue/black ink");
```



Message Rule

📘 INFO: Total price is \$500.00

⚠️ WARNING: Quantity mismatch.

❌ ERROR: Cannot add Discover Channel.

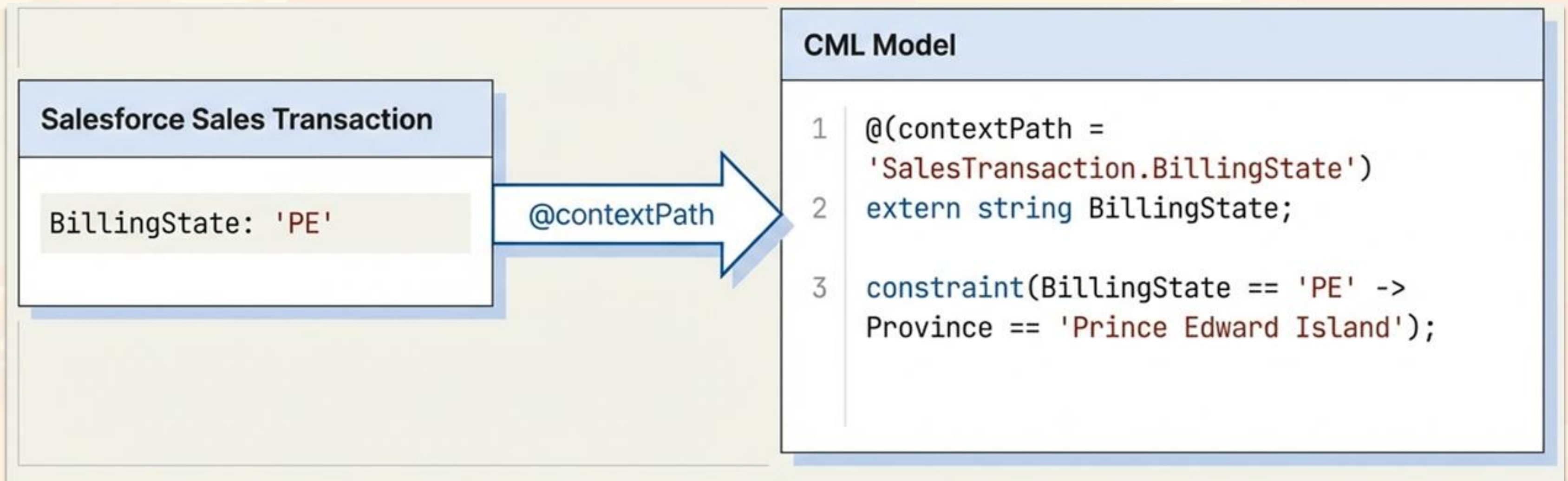
```
message(true, 'Total price is {}', Price, 'Info')
```

```
message(Qty != 5, 'Check Qty', 'Warning')
```

```
message(Discover > 0, 'Blocked', 'Error')
```



Context Inputs: External Variables



Architect's Reference: Syntax & Annotations

Annotations

- `@contextPath` Salesforce Fields
- `@configurable` User Input
- `@sequence` Order of execution
- `@virtual` Header Type
- `@split` Quantity Behavior

Constraint Syntax

- `constraint(A -> B) //`
Implication
- `table(var1, var2, {val1, val2})`
- `require(Condition, Relation)`
- `exclude(Condition, Relation)`

Rule Syntax

- `rule(Condition, 'hide'/'disable', Scope, Target)`
- `message(Condition, 'Text', Severity)`



CML Demo



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Kyle Tan

Technical Architect

14x Certified (5x Architect, 4x Developer)

8 years in Salesforce

Revenue Cloud Architect

CTA Aspirant (2026)



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**QUESTION
& ANSWER**



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**THANK
YOU!**



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