draft-ietf-i2nsf-capability-04
Development Plans

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Introduction: the Context

- **NSFs are defined by Capabilities**
  - The set of features to be exposed to other I2NSF components and NSFs, *independent* of the customer and provider interfaces
  - NSFs can be combined to provide security services
  - Every NSF SHOULD be described with the set of capabilities it offers.
  - Capabilities MAY have their access control restricted by policy (this is out of scope for this draft)
- **This draft defines**
  - The concept of NSF Capabilities and their use using an info model and a Capability Algebra
    - Ensures that the different actions of the Policy Rule do not conflict with each other

Conceptually, a Template of Templates

- **Events, Conditions, and Actions are each Templates**
  - Define a structure and organization of MTI attributes (and optionally, methods) that define behavior
  - Each may have metadata to further describe properties and operation and/or prescribe behavior
- **Policy Rule is a Template of Templates**
  - Defines a structure and organization of MTI components of a policy rule
  - Each may have metadata to further describe properties and operation and/or prescribe behavior
- **Information Model used to describe the structure and semantics of these templates in a technology-neutral way**

Key Abstractions

- **Security is independent of physical vs. virtual packaging**
- **Security is described by one or more Capabilities**
- **Policies define how to manage Capabilities**
- **Policies are defined in an object-oriented info model**

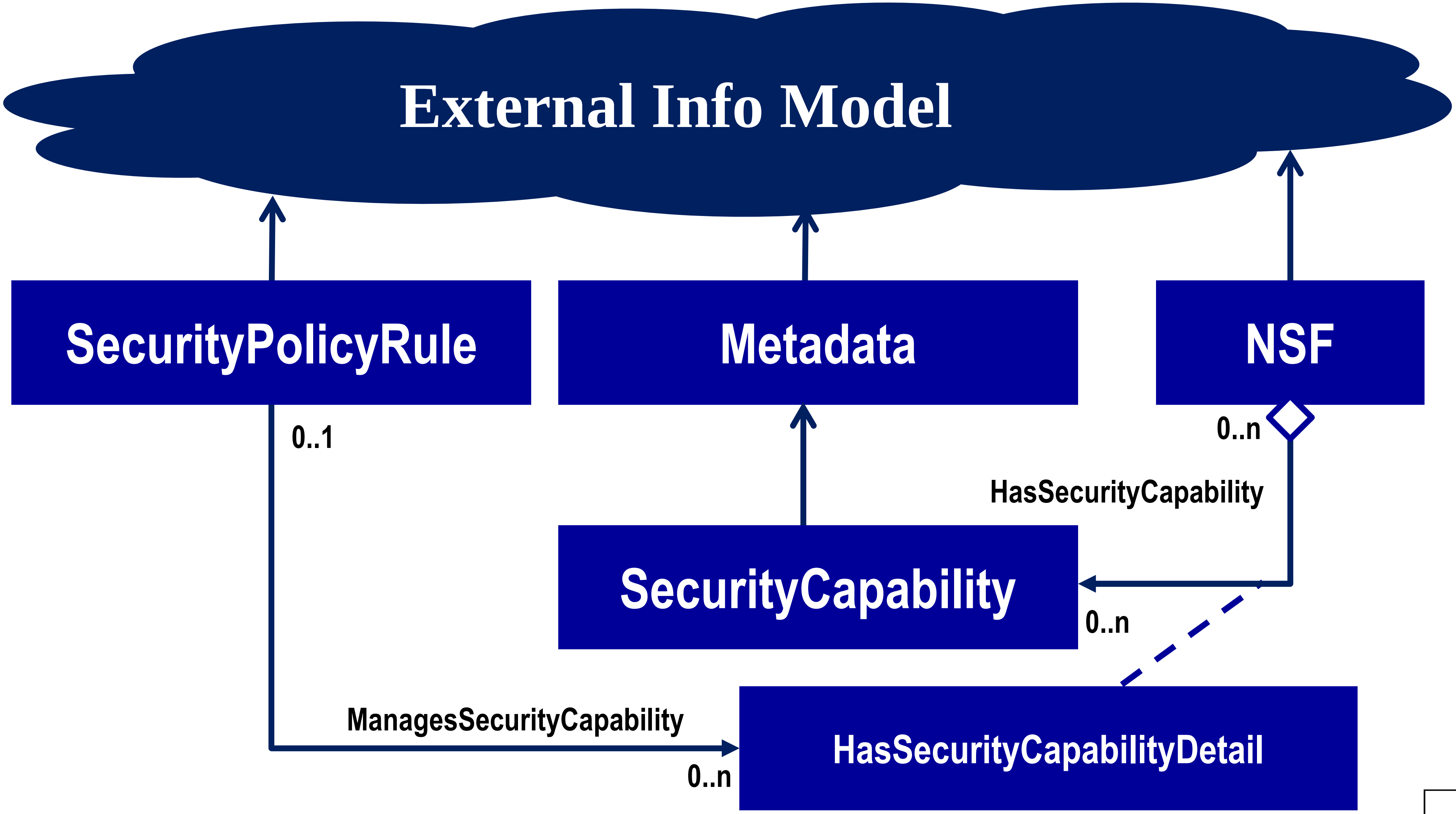
- **This enables**
  - *NSF behavior to be defined using Capabilities*
  - *Policy Rules to be defined to manage NSF behavior*
  - *Capabilities and Policy Rules can be reused as is, or extended*

The ECA Policy Rule Model

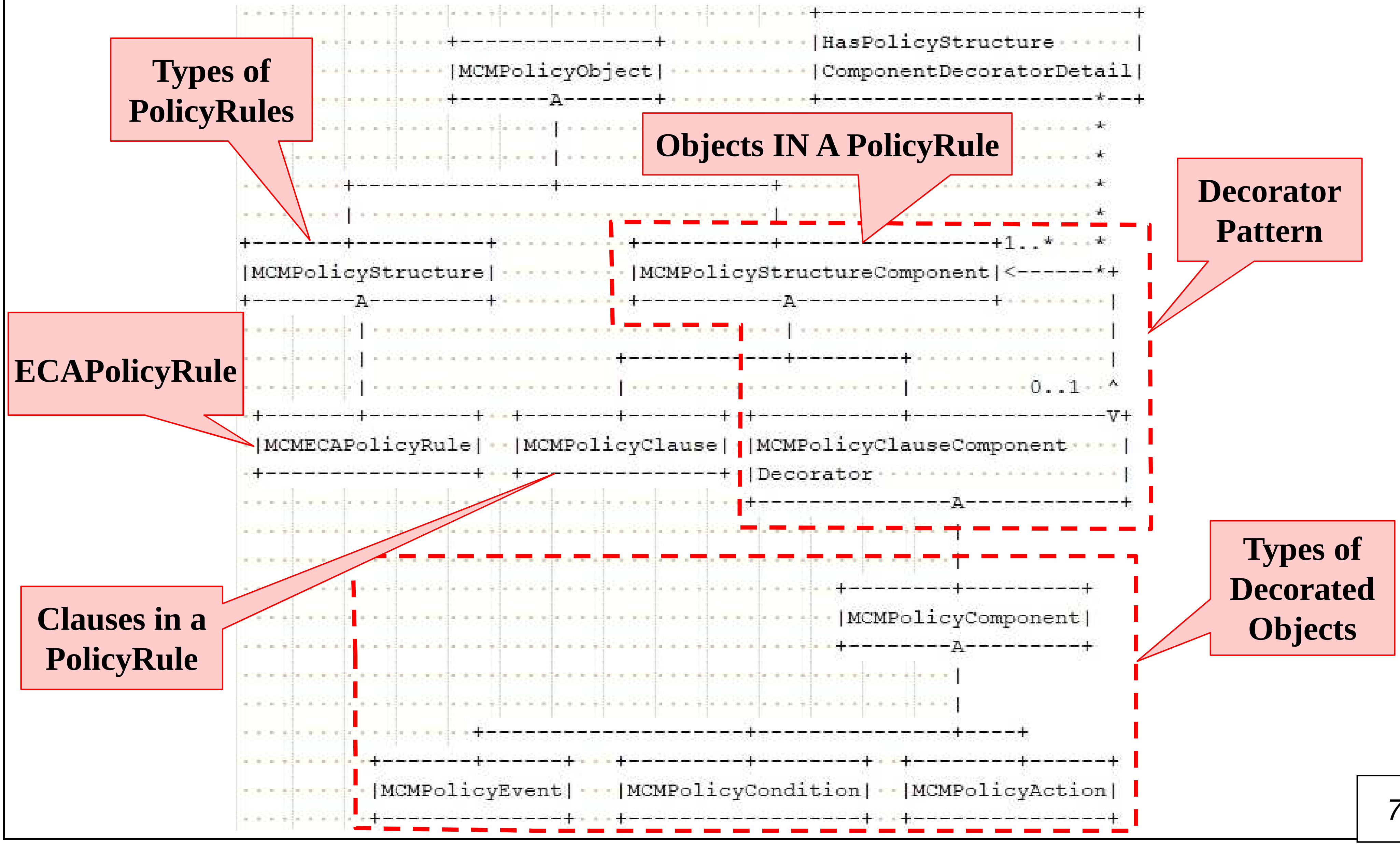
- **The Current Model Uses ECA Policy Rules**
  - *Events:* significant occurrences the NSF is able to react to
  - *Conditions:* how the NSF decides which actions to apply
  - *Actions:* what operations to execute
  - *PolicyRule: a container that aggregates an Event, a Condition, and an Action (Boolean) clause*

- **Behavior**
  - Actions MAY execute if Event and Condition (Boolean) clauses BOTH evaluate to TRUE; this is controlled by *resolution strategy* and *metadata*
    - Capability Algebra used to make resolution strategy decidable
  - Default actions MAY be specified

Conceptual Operation



Exemplary External Info Model (MCM)



```
                                           +------------------------+
                +---------------+          |HasPolicyStructure      |
                |MCMPolicyObject|          |ComponentDecoratorDetail|
                +-------A-------+          +---------------------*--+
                        |                                        *
                        |                                        *
        +---------------+---------------+                        *
        |                               |                        *
+-------+----------+         +----------+----------------+1..*   *
|MCMPolicyStructure|         |MCMPolicyStructureComponent|<------*+
+--------A---------+         +-----------A---------------+        |
         |                               |                        |
         |                   +-----------+--------+               |
         |                   |                    |         0..1  ^
 +-------+--------+  +-------+-------+ +----------+---------------V+
 |MCMECAPolicyRule|  |MCMPolicyClause| |MCMPolicyClauseComponent   |
 +----------------+  +---------------+ |Decorator                  |
                                       +--------------A------------+
                                                      |
                                                      |
                                             +--------+---------+
                                             |MCMPolicyComponent|
                                             +--------A---------+
                                                      |
                                                      |
                  +--------------------+--------------+----+
          +-------+------+   +---------+--------+ +--------+------+
          |MCMPolicyEvent|   |MCMPolicyCondition| |MCMPolicyAction|
          +--------------+   +------------------+ +---------------+
```

Types of PolicyRules

Objects IN A PolicyRule

Decorator Pattern

ECAPolicyRule

Clauses in a PolicyRule

Types of Decorated Objects

YANG Generation (1)

- **Let’s review YANG construction guidelines**
  - Three key information modeling concepts that a data model SHOULD consistently represent: classes, class inheritance, and associations.
  - Each class in the model is represented by a YANG identity and by a YANG grouping. The grouping enables us to define classes abstractly. Each grouping begins with two leaves (either defined in the grouping or inherited via a uses clause), which provide common functionality.
    - One leaf is used for the system-wide unique identifier for this instance
    - The second leaf is an identityref which is set to the identity of the instance. It is read-write in the YANG formalism due to restrictions on the use of MUST clauses.
  - Subclassing is done by defining an identity and a grouping for the new class. The identity is based on the parent identity, and is given a new name to represent this class. The new grouping uses the parent grouping. It refines the entity-class of the parent (the second leaf), replacing the default value of the entity-class with the correct value for this class.

YANG Generation (2)

- Associations are represented by the use of instance-identifiers and association classes. Association classes are classes, using the above construction, which contain leaves representing the set of instance-identifiers for each end of the association, along with any other properties the information model assigns to the association.
- The two associated classes each have a leaf with an instance-identifier that points to the association class instance.
- Each instance-identifier leaf is defined with a must clause. That must clause references the entity-class of the target of the instance-identifier, and specifies that the entity class type must be the same as, or subclassed from, a specific named class. Thus, associations can point to any instance of a selected class, or any instance of any subclass of that target.
- Note: It is impossible in YANG to retain the difference between associations, aggregations, and compositions. This is mitigated by the use of association classes.

YANG Generation (3)

- The concrete class tree is constructed as follows. The YANG model defines a container for each class that is defined as concrete by the information model. That container contains a single list, keyed by an appropriate instance-identifier. The content of the list is defined by a uses clause referencing the grouping that defines the class.
- Example on next slide:

Example YANG

```
module: ietf-supa-policy
    +--rw supa-encoding-clause-container
    |  +--rw supa-encoding-clause-list*                               [supa-policy-ID]
    |     +--rw entity-class?                                         identityref
    |     +--rw supa-policy-ID                                        string
    |     +--rw supa-policy-name?                                     string
    |     +--rw supa-policy-object-description?                       string
    |     +--rw supa-has-policy-metadata-agg-ptr*                     instance-identifier
    |     +--rw supa-policy-clause-deploy-status                      identityref
    |     +--rw supa-has-policy-clause-part-ptr*                      instance-identifier
    |     +--rw supa-policy-clause-has-decorator-agg-ptr*             instance-identifier
    |     +--rw supa-encoded-clause-content                           string
    |     +--rw supa-encoded-clause-language                          enumeration
    +--rw supa-policy-variable-container
    |  +--rw supa-policy-variable-list*                               [supa-policy-ID]
    |     +--rw entity-class?                                         identityref
    |     +--rw supa-policy-ID                                        string
    |     +--rw supa-policy-name?                                     string
    |     +--rw supa-policy-object-description?                       string
    |     +--rw supa-has-policy-metadata-agg-ptr*                     instance-identifier
    |     +--rw supa-policy-clause-has-decorator-part-ptr*            instance-identifier
    |     +--rw supa-has-decorated-policy-component-part-ptr?         instance-identifier
    |     +--rw supa-pol-clause-constraint*                           string
    |     +--rw supa-pol-clause-constraint-encoding?                  identityref
    |     +--rw supa-has-decorated-policy-component-agg-ptr*          instance-identifier
    |     +--rw supa-pol-comp-constraint*                             string
    |     +--rw supa-pol-comp-constraint-encoding?                    identityref
    |     +--rw supa-policy-term-is-negated?                          boolean
    |     +--rw supa-policy-variable-name?                            string
```

Main Updates in -04

- Re-organize the document structure (no more new contents): create a new section 3.4 (Modelling NSF Features as Security Capabilities), and move the existing sections into it, in which;
  - 3.4.1 - Matched Policy Rule, 3.4.2 Conflict, Resolution Strategy and Default Action and 3.4.3 I2NSF Condition Clause Operator Types are logically closely related, to clarify how to construct a Policy Rule and all of the key components
  - 3.4.4 - Uses of the capability information model: clarify the “GNSF” concept
  - 3.4.5 - A Syntax to Describe the Capability of an NSF and 3.4.6 - Capability Algebra are together to describe the representation of NSF Capability and how to manipulate them with a formal way (Capability Algebra)
- Add Section 4 (Considerations on the Practical Use of the CapIM) to describe how our IM serves the purposes of I2NSF WG and allows solving issues that WG wanted to solve: <u>maybe better as an Appendix</u>

Next Step

- Further content improvement of section 4 (considering moving it to Appendix), one more round of document text polishing
- Provide examples of the YANG generation rules in Appendix
- Next version (-05) for WGLC?
- Analyze existing DMs in the light of the Capability Model and contribute it as a supporting Internet Draft
  - Not as part of this document to avoid unmanageable forward references

Questions?

"Create like a god. Command like a king. Work like a slave"
- Constantin Brancusi