Information Model of NSFs Capabilities

draft-xibassnez-i2nsf-capability-00

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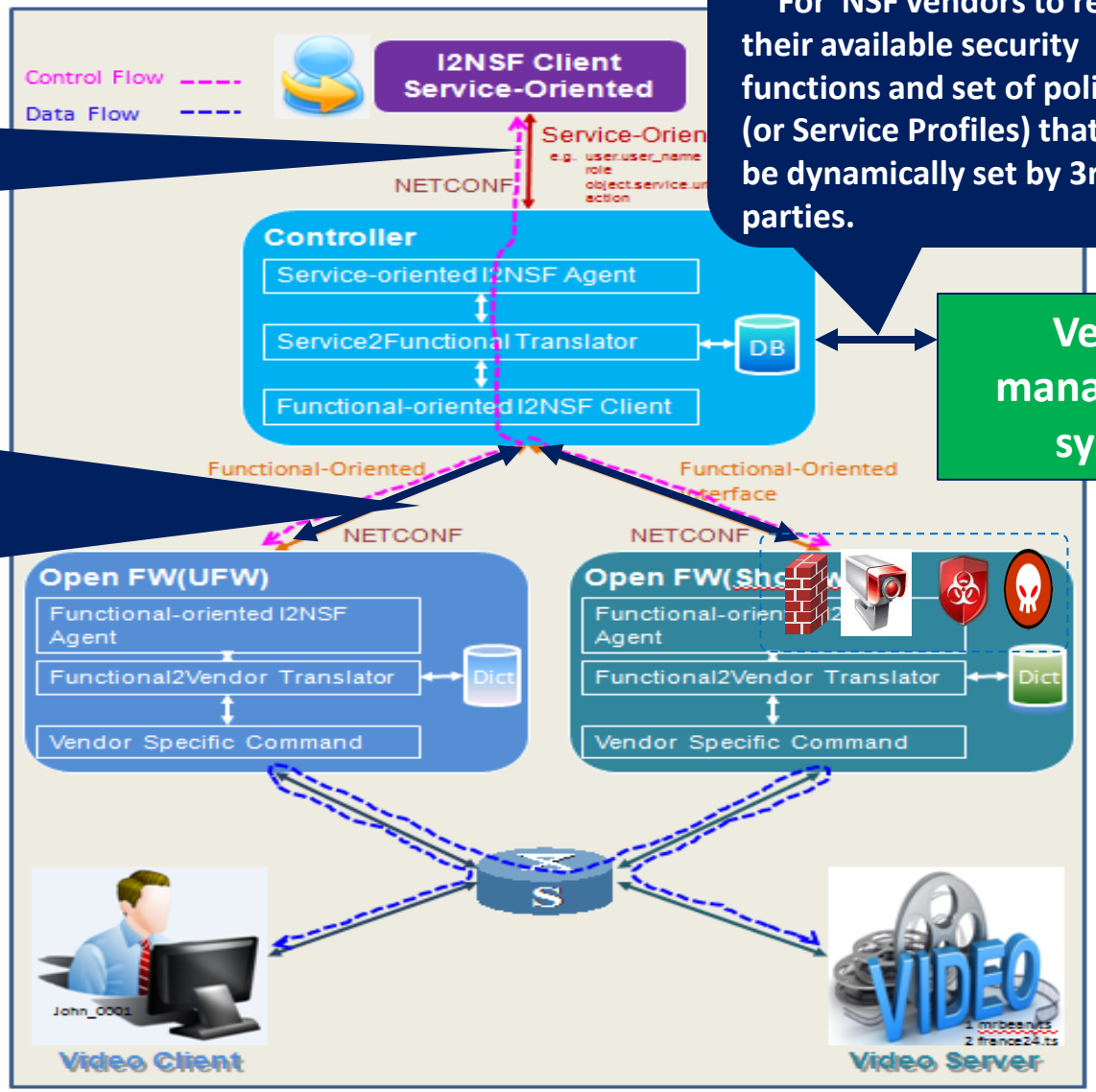
Monitoring Part of I2NSF Architecture

Service Interface
For clients or App Gateway to express and monitor security policies for their specific flows

NSF Registration
For NSF vendors to register their available security functions and set of policies (or Service Profiles) that can be dynamically set by 3rd parties.

Capability Interface
For controller to define explicit rules for individual NSFs to treat packets, as well as methods to monitor the execution status of those functions



Vendor management system

What Happened

- A big step forward: 2 complementary drafts are converged:
  - *Draft-xia-i2nsf-capability-interface-IM-06:* "ECA" model, basic framework and detailed class design of capability information model, ...;
  - *draft-baspez-i2nsf-capabilities-00:* accurate definition of I2NSF capability, geometric model complementing "ECA" with resolution strategies, external data, default action, more specific condition types, ...
- Many thanks to Aldo and Diego (joining as draft co-authors) who brought good inputs for this work based their experiences gained from EU FP7 SECURED project, which really helps a lot!

What is I2NSF Capability?

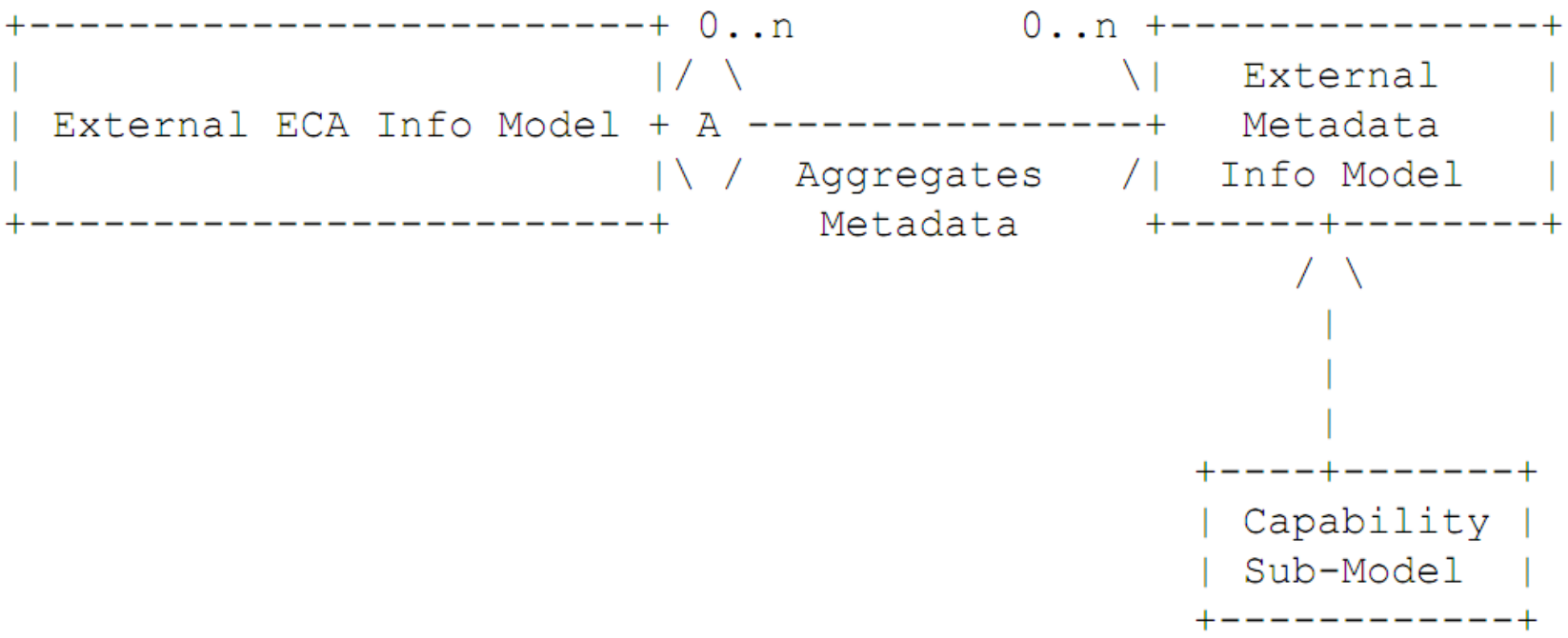
- Terminology update:
  - ~~capability interface~~ -> NSF-facing interface;
  - Capability: "Defines a set of features that are available from a managed entity". There should be NSF Capabilities and Controller Capabilities, which are announced through the Registration Interface;
- Capability Model:
  - based on actions and traffic classification features, used to define
    - generic security functions (GNSF) = known classes of security functions (like: packet filter, URL filter, HTTP filter, VPN, gateway, anti-virus, ...)
    - and extensions: modules, extensions, additional features
    - composed with an Algebra of Capabilities. Example:
      - iptables = generic packet filter + set of stateful TCP conditions
      - iptables with time module installed = iptables + conditions of the time module
  - 3 NSFs Categories already analyzed:
    - network security
    - content security
    - attack mitigation

A_{pf} = {Allow, Deny, some GNSFs}
C_{pf} = {IPsrc,IPdst,Psrc,Pdst,protType}
C_{time} ={timestart,days,datestart,datestop}
$C_{CPstate}$ ={}
cap_{pf}=(Apf; Cpf; {FMR}; F)
iptables=cap_{pf}+ $C_{CPstate}$
$iptable_{time}$=iptables + C_{time}

More Fine-grained I2NSF NSF-facing Interface Policy Information Model

- Geometric Model:
  - (R, RS, E, d): the rule set R {r = (condition, action)}, the resolution function RS, the set E of mappings to the external attributes, and the default action d
  - Resolution function (RS): FMR (First Matching Rule), LMR, Priority-based, ad hoc RS, ...;
  - External attributes (E): priority, identity of the creator, and creation time;
  - Condition types: exact-match, range-based, regex-based, and custom-match

The Overall I2NSF IM Design



Network Security Info Sub-Model ECAPolicyRule Extensions

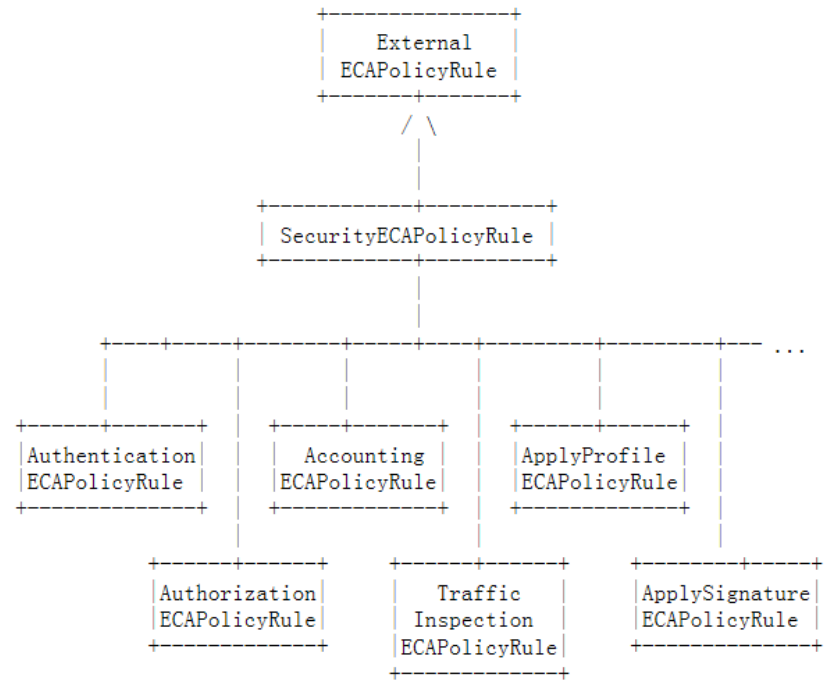


Figure 3. Network Security Info Sub-Model ECAPolicyRule Extensions

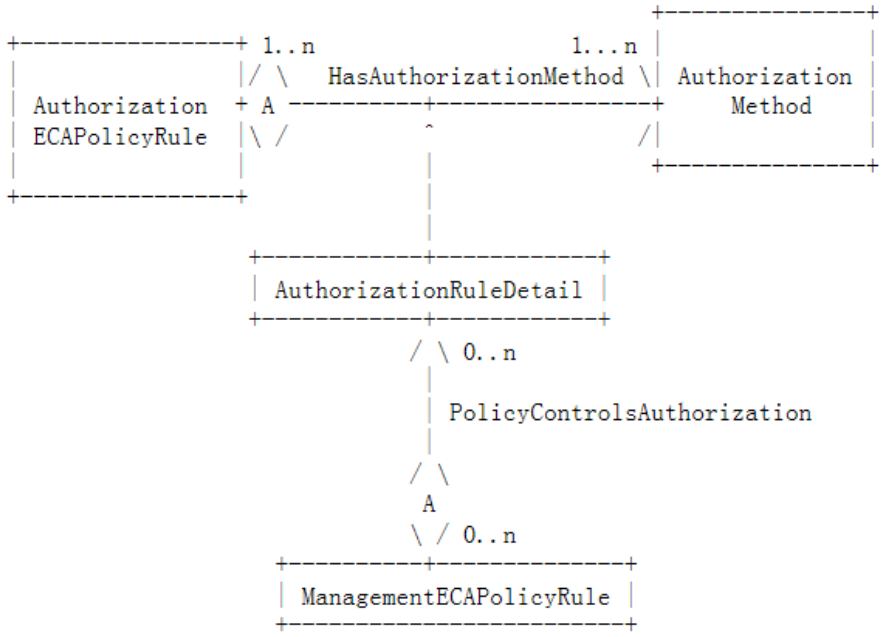


Figure 5. Modeling Authorization Mechanisms

Event sub-class for Network Security

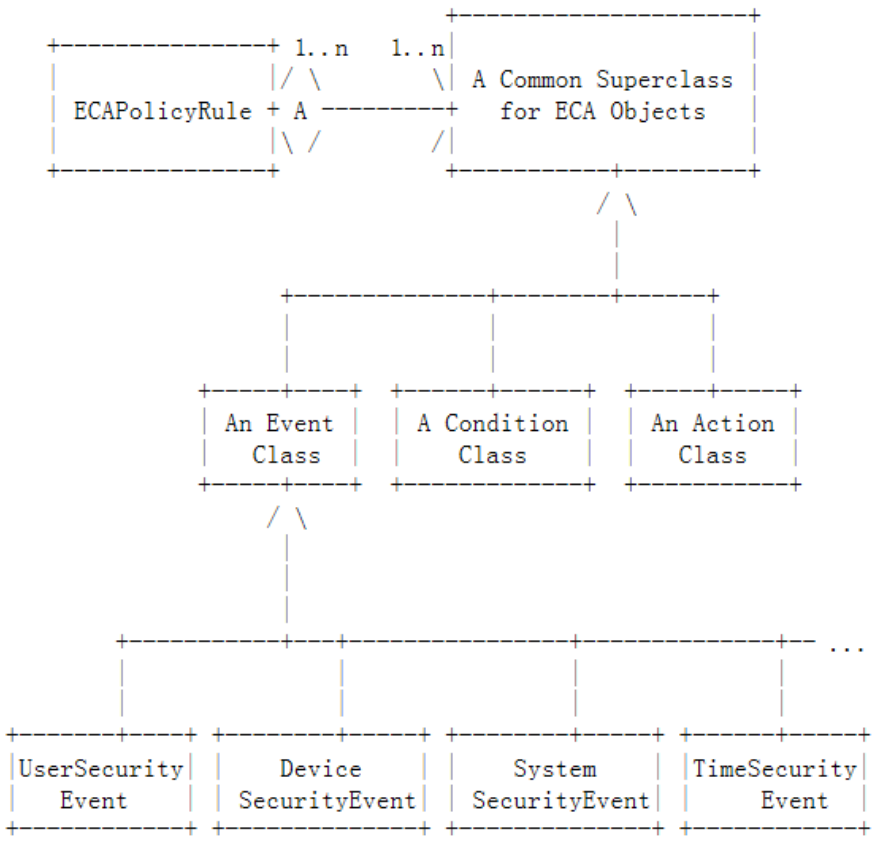


Figure 10. Network Security Info Sub-Model Event Class Extensions

Example:

UserSecurityEvent has the attributes as below:

- **usrSecEventContent**: string;
- **usrSecEventFormat**
  - 0: unknown
  - 1: GUID (Generic Unique IDentifier)
  - 2: UUID (Universal Unique IDentifier)
  - 3: URI (Uniform Resource Identifier)
  - 4: FQDN (Fully Qualified Domain Name)
  - 5: FQPN (Fully Qualified Path Name)
- **usrSecEventType**
  - 0: unknown
  - 1: new user created
  - 2: new user group created
  - 3: user deleted
  - 4: user group deleted
  - 5: user logon
  - 6: user logoff
  - 7: user access request
  - 8: user access granted
  - 9: user access violation

Condition sub-class for Network Security

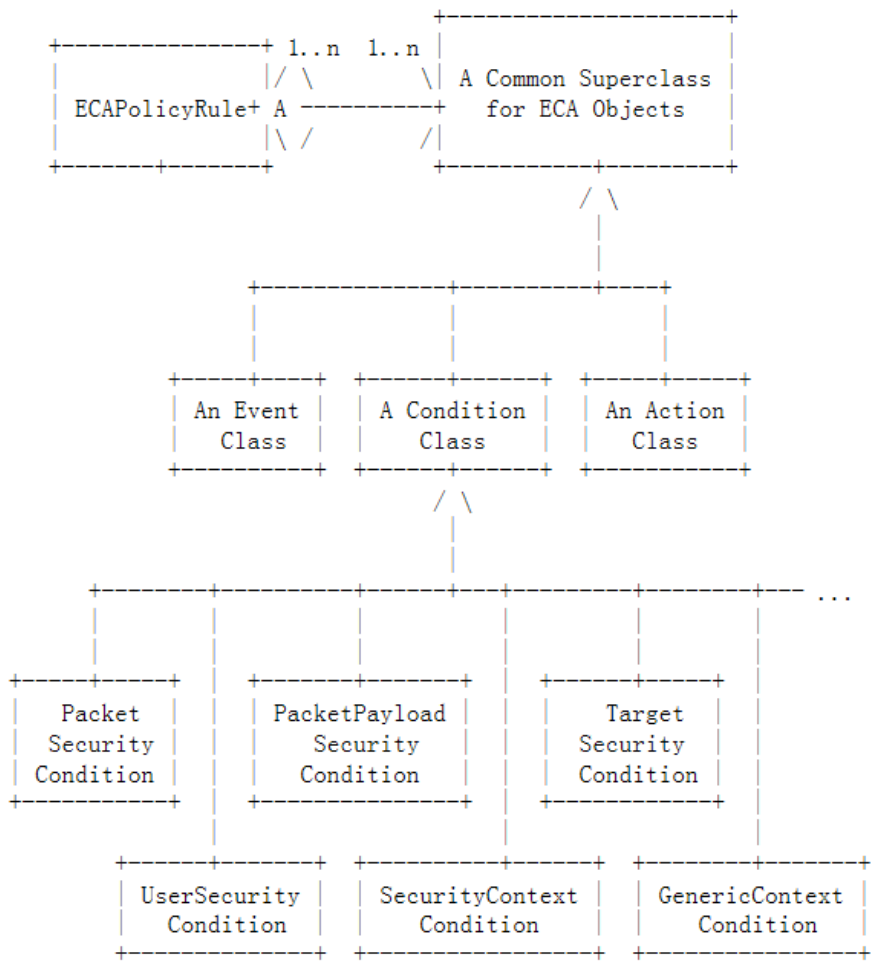


Figure 11. Network Security Info Sub-Model Condition Class Extensions

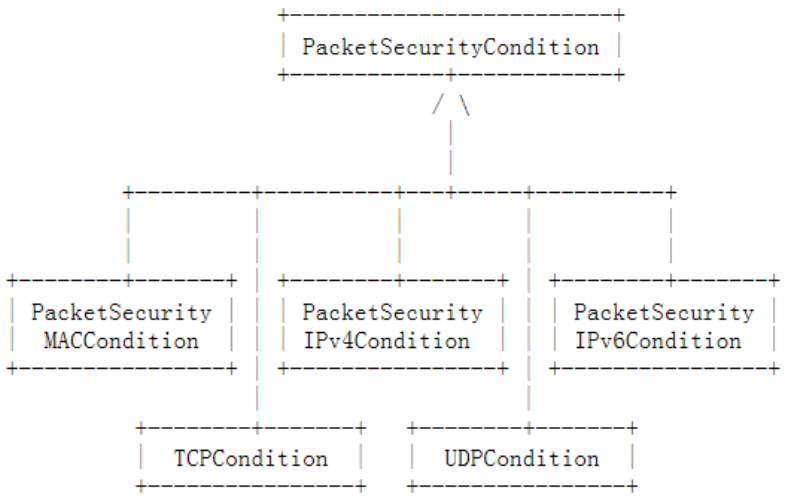


Figure 12. Network Security Info Sub-Model PacketSecurityCondition Class Extensions

Action sub-class for Network Security

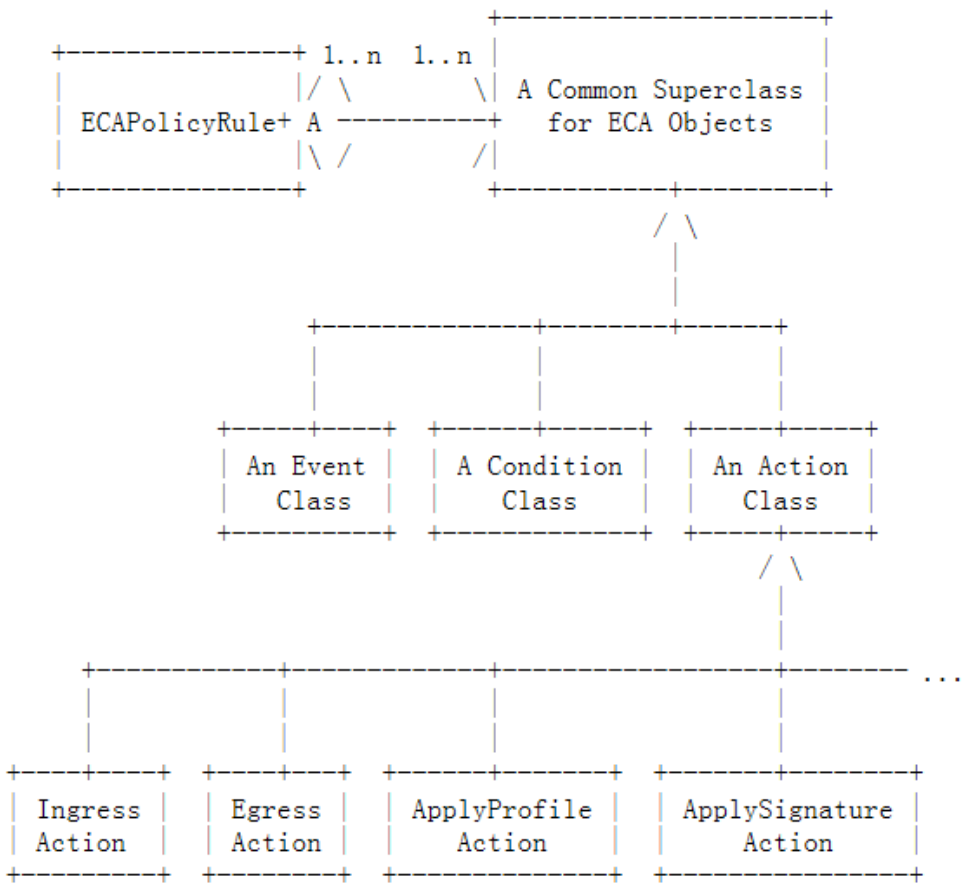


Figure 13. Network Security Info Sub-Model Action Extensions

- **IngressAction**: The purpose of this Class is to represent actions performed on packets that enter an NSF. Examples include pass, drop, mirror traffic.
- **EgressAction**: The purpose of this Class is to represent actions performed on packets that exit an NSF. Examples include pass, drop, mirror traffic, signal, encapsulate.
- **ApplyProfileAction**: The purpose of this Class is to represent applying a profile to packets to perform content security and/or attack mitigation control.
- **ApplySignatureAction**: The purpose of this Class is to represent applying a signature file to packets to perform content security and/or attack mitigation control.

Next Step

- Comments are welcome!
- Keep on being aligned with I2NSF framework and terminology drafts
- 3 information models
  - General I2NSF capability information model for Register interface: be included or another individual draft?
  - NSF-facing interface policy information model: be complemented with resolution strategies, external data, default action in next version
  - Customer-facing interface policy information model: this draft will not cover
- More polishing work

- Call for WG adoption

Thanks!

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