

# Functional Model Representation of the Identity Ecosystem

Version 1.1

A structured representation of the functions within identity ecosystems

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## Revision History

Version 1.0	September 19, 2014	Adam Madlin
Version 1.1	July 28, 2016	IDEF Functional Model Committee

## 1 Introduction

### 2 Structure

3 The Identity Ecosystem Functional Model deliverable was developed by the IDESG Security Committee  
4 to provide context to discussions of identity ecosystems and a consistent model upon which to center  
5 descriptions of identity solutions. This is not a model of the IDESG as an organization but a  
6 representation of online identity interactions and the various components needed to execute those  
7 interactions.

8 The Security Committee first identified a preliminary set of Functional Elements (defined as the core set  
9 of functions that occur within the Identity Ecosystem) to serve as the foundation for functional model  
10 work and relevant evaluation methodologies. The efforts resulting in two complementary products that  
11 lay the ground work for future development of the Identity Ecosystem Functional Model:

- 12 • The Identity Ecosystem Functional Element Diagram, showing each of the functional elements,  
13 and
- 14 • The Identity Ecosystem Functional Element Description Matrix, providing a brief description of  
15 each of the core operations and elements.

16 In short, the functional elements are the “verbs” of identity-related activities online; they represent the  
17 possible activities that service providers<sup>1</sup> conduct in identity-related transactions. They do not, however  
18 encompass the whole of the identity ecosystem. In order to complete the model, three additional layers  
19 to the functional elements represent major components in the identity ecosystem:

- 20 • A governance layer involving activities such as policy and rule development, certification,  
21 accreditation, and assessment and
- 22 • An interoperability layer involving activities such standards and specification development and  
23 exchange technologies, and
- 24 • An administration and operations layer involving activities such as performing redress and  
25 internal auditing within the functional elements.

### 26 Purpose and Use

27 The purpose of the functional model deliverable is to identify and describe common operations,  
28 functions, roles, and activities applicable to the broadest set of Identity Ecosystem use cases possible.  
29 The model’s primary purpose is to provide a consistent model upon which to center descriptions of  
30 identity solutions. The functional model deliverable can facilitate and support several other work  
31 streams of the IDESG, including:

- 32 • Support the development of IDESG requirements and best practices,
- 33 • Highlight common technical and policy considerations for interoperability,
- 34 • Set conditions for mutual recognition of existing trust frameworks/federations,
- 35 • Facilitate consistency for service provider descriptions of the activities they conduct in online  
36 interactions,
- 37 • A broad way to organize a certification and accreditation program for the IDESG.

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<sup>1</sup> The term service provider covers the roles identified in the Functional Model except for the User role.

38 As the functional model deliverable is primarily a descriptive tool, the model provides only high-level  
39 descriptions to ensure maximum coverage without being dependent upon existing or pre-determined  
40 ecosystem roles. The goal is to establish common operations, functions, and roles that are applicable  
41 across environments, technologies, and interaction types. The operations and actions could be executed  
42 at different times, in different orders, and by different actors, depending on the use case, and each is  
43 intended to be considered independent of the others.

44 The primary purpose of this document is to provide a consistent model for describing identity ecosystem  
45 services, however, the security committee intends for it to be extensible and flexible so that it can be  
46 used to facilitate other IDESG work as well.

#### 47 [Maintenance](#)

48 The security committee will maintain and update the document but other IDESG committees may  
49 request changes as necessary. For more information about this document and the maintenance of it see  
50 the IDESG wiki under Functional Model

51 **Functional Model**

52 The functional model consists of four layers: functional elements, administration and operations,  
53 interoperability, and governance and accountability. This section details each of these layers.  
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55 **Functional Model Diagram**

56 The functional model diagram provides the activities that occur in the governance, interoperability, and  
57 administration and operations layers, the core operations in the functional elements layer and the roles  
58 in which entities engage at each of the four layers. The order of appearance of the layers does not  
59 indicate a priority or preference.  
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Figure 1. The Identity Ecosystem Functional Model

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64 **Functional Elements Layer**

65 The functional elements layer consists of functional elements—the basic operations that may occur in  
66 online identity-related interactions—grouped into core operations. Not all elements will be invoked in  
67 every identity interaction, and some may be invoked multiple times. While logically some functions are  
68 likely to occur before or after others, there is no explicit order specified in the model.

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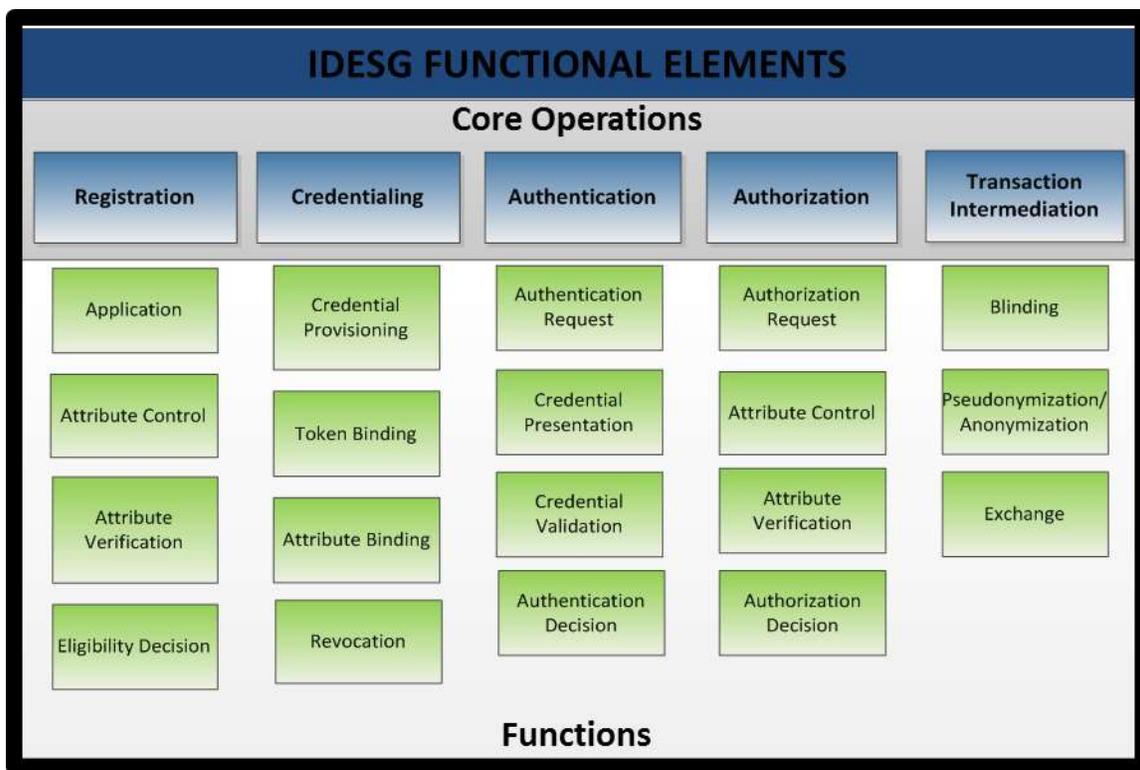
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Figure 2. Functional Elements Layer

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### 73 Functional Elements Diagram

74 To improve readability, the functional elements layer is presented in a single diagram including all  
75 functional elements and core operations.  
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Figure 3. Identity Ecosystem Functional Elements

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### 80 Functional Elements Description Matrix

81 The functional elements description matrix provides brief descriptions of each core operation and  
82 functional element.  
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Core Operation	Function	Description
<a href="#">Registration</a>		Process that establishes a <a href="#">digital identity</a> for the purpose of issuing or associating a <a href="#">credential</a> .
	Application	Process by which a <a href="#">user</a> or <a href="#">agent</a> requests initiation of registration.
	<a href="#">Attribute</a> Control	Process of managing and releasing attributes for the purposes of registration or <a href="#">authorization</a> .
	<a href="#">Attribute</a> Verification	Process of confirming or denying that claimed identity attributes are correct and meet the pre-determined requirements for accuracy, assurance, etc.
	Eligibility Decision	Decision that a user or agent does or does not meet the pre-determined eligibility requirements for a digital identity or credential.
<a href="#">Credentialing</a>		Process to bind an established <a href="#">digital identity</a> with a <a href="#">credential</a> .
	Credential Provisioning	Process by which ownership of a credential is conferred, confirmed, or associated with a digital identity.
	Token Binding	Process of binding a physical or electronic <a href="#">token</a> to a credential.
	<a href="#">Attribute</a> Binding	Process of binding attributes to a credential.
	Revocation	Process by which an issuing authority renders a digital identity, issued credential, token, or verified attribute invalid for <a href="#">authentication</a> or <a href="#">authorization</a> .
<a href="#">Authentication</a>		Process of determining the validity of one or more <a href="#">credentials</a> used to claim a <a href="#">digital identity</a> .
	Authentication Request	Process by which authentication is initiated by an <a href="#">entity</a> .
	<a href="#">Credential</a> Presentation	Process by which a user or agent submits a credential for the purposes of authentication.
	Credential Validation	Process of establishing the validity of the presented credential.
	Authentication Decision	Decision to accept or not accept the results of the credential validation process.
<a href="#">Authorization</a>		Process of granting or denying specific requests for access to resources.
	Authorization Request	Process by which authorization is initiated by a <a href="#">relying party</a> .
	<a href="#">Attribute</a> Control	Process of managing and releasing attributes for the purposes of <a href="#">registration</a> or authorization.

Core Operation	Function	Description
	Attribute Verification	Process of confirming or denying that claimed attributes are correct and meet the pre-determined requirements for authorization; typically, these attributes for authorization have not been bound to the <a href="#">credential</a> or previously available to the organization making the authorization decision.
	Authorization Decision	Decision to grant or deny access to a resource based on the results of the authorization processes and policies.
<a href="#">Transaction Intermediation</a>		Processes and procedures that limit linkages between <a href="#">transactions</a> and facilitate <a href="#">credential</a> portability.
	Blinding	Process by which service providers involved in a transaction are prevented from observing each other (i.e., a <a href="#">relying party</a> does not know which <a href="#">credential</a> service provider a <a href="#">user</a> or <a href="#">agent</a> is utilizing in a transaction or vice versa). Based upon the transaction type and the number of service providers involved, blinding may be done to prevent a single, multiple, or all service providers from viewing the other participating services.
	<a href="#">Pseudonymization/Anonymization</a>	Process by which an intermediary prevents service providers from linking a <a href="#">digital identity</a> with a particular <a href="#">user</a> .
	Exchange	Process by which one protocol is translated to another for consumption by different <a href="#">entities</a> involved in a transaction.

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Table 1. Functional Elements Description Matrix

85 Table 2 provides descriptions of the roles in the functional elements layer. These are intended to  
 86 provide ecosystem participants with a common understanding of the functions typically executed by the  
 87 identified roles. Note that an ecosystem participant may serve more than one role and serving a role  
 88 does not require the participant to execute all of the functions in that role. Additionally, this list is not  
 89 intended to restrict organizations from executing any of the ecosystem functions.

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Category	Description
Role	Functions Executed
<a href="#">User</a>	Person attempting to establish a <a href="#">digital identity</a> and/or use a <a href="#">credential</a> to access a protected resource.
Credential Service Provider (CSP)	<a href="#">Entity</a> that manages the <a href="#">credentialing</a> and <a href="#">authentication</a> core operations.
	<i>Application, Attribute Control, Credential Presentation, Authorization Request</i>
	<i>Credential Provisioning, Token Binding, Attribute Binding, Revocation, Credential Presentation, Credential Validation, Authentication Decision</i>

<a href="#">Authentication Service Provider</a>	Entity that manages authentication core operations.	<i>Credential Validation, Authentication Decision</i>
<a href="#">Registration Authority (RA)</a>	Entity that manages the registration core operation.	<i>Attribute Control, Attribute Verification, Eligibility Decision, Updates (Periodic &amp; Event Based)</i>
<a href="#">Identity Provider (IDP)</a>	Entity that manages the <a href="#">registration</a> , <a href="#">credentialing</a> , and <a href="#">authentication</a> core operation.	<i>Attribute Control, Attribute Verification, Eligibility Decision, Updates (Periodic &amp; Event Based), Credential Provisioning, Credential Provisioning, Token Binding, Attribute Binding, Revocation, Credential Presentation, Credential Validation, Authentication Decision</i>
<a href="#">Attribute Provider (AP)</a>	Entity that executes the attribute verification and attribute <a href="#">control</a> functions in support of the core operations.	<i>Attribute Verification, Attribute Control, Updates, Revocation</i>
<a href="#">Relying Party (RP)</a>	Entity that relies upon other entities to execute the core operations and functions in order to authorize access to protected resources.	<i>Eligibility Decision, Authorization Decision, Attribute Binding<sup>2</sup></i>
Intermediary <sup>3</sup>	Entity that executes the transaction intermediary core operation. <sup>4</sup>	<i>Blinding, Pseudonymization/Anonymization, Exchange</i>

91 *Table 2. Functional Element Layer Roles*

92 **Administration and Operations Layer**

93 The layer at which entities execute activities intended to administer and support the IDESG core  
 94 operations and functions. All members of the ecosystem that execute functional layer roles will also  
 95 execute the activities in the administration and operations layer.



96 *Figure 4. Administration and Operations Layer*

98 Table 3 provides descriptions of the activities in the administration and operations layer

<sup>2</sup> The inclusion of this function serves as an acknowledgement that some RPs conduct attribute binding to user accounts for managing user preferences, conducting identity resolution, or other transactional purposes.

<sup>3</sup> This role may be filled by any service provider (e.g., organization, device, application) that executes the identified core operation and functions. As with all the core operations, this is a set of operations that do or can exist in identity systems and, in turn, could have associated standards and requirements that apply to them.

Category	Description
Activity	
Redress	Process by which <a href="#">users</a> and organizations reconcile errors that occur during the operations and processes of an identity system. All ecosystem service providers must execute redress activities.
Recovery	Process and procedures by which an organization ensures availability and continuity of <a href="#">credentials</a> , <a href="#">attributes</a> , and other identity services following a security or privacy event (e.g., data breach, disruption of services, etc.) All ecosystem participants are responsible for executing recovery activities.
Enterprise Governance	Process by which <a href="#">entities</a> develop and implement necessary policies and rules to support proper execution of core operations and functions (e.g., legal agreements/policies, data protection policies, security policies, privacy policies, etc.)
Internal Audit	Process of reviewing and collecting evidence of an entity's conformance with enterprise rules, policies, and requirements.
Service Optimization	Process by which organizations take internal and external inputs (e.g., <a href="#">standards</a> , customer surveys, or external governance/regulation) and integrate them in order to improve execution of the service.
Updates (Periodic & Event Based)	Process by which a <a href="#">user</a> or organization updates accounts, <a href="#">attributes</a> , <a href="#">credentials</a> , and other identity information to determine eligibility for an entitlement; may be periodic in nature or event based (e.g., marriage, end of subscription, etc.)

99 *Table 3. Administration and Operations Layer*

100 **Interoperability Layer**

101 The interoperability layer is that at which entities in the ecosystem establish and maintain the ability to  
 102 communicate and exchange identity data

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*Figure 5. Interoperability Layer*

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Table 44 provides descriptions of the activities and descriptions in the interoperability layer.

Category	Description
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Activity	
<a href="#">Standards</a> Development	Process of creating standards for identity technologies and procedures to be used within communities or across the ecosystem.
Specification Development	Process of creating the specifications and profiles that define how participants in a community assert and exchange identity data.
Exchange	The process of facilitating technical (including semantic) interoperability to support credential portability between participants within a specific community or across the ecosystem.
Role	
<a href="#">Standards</a> Development Body	Entity responsible for creating identity standards for a specific community or the ecosystem.
Specification Development Body	Entity responsible for creating identity specifications.
Interoperability Providers	<a href="#">Entities</a> responsible for facilitating technical interoperability between participants across entities and communities of the ecosystem, such as <a href="#">federation</a> operators and exchanges (e.g., <a href="#">attribute</a> , <a href="#">credential</a> ).

Table 4. Interoperability Layer Activities and Roles

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### Governance & Accountability Layer

The layer at which entities create, monitor, and enforce rules, guidelines, and requirements for executing the IDESG functional elements across communities or actors. Unlike the administration and operations layer, the governance and accountability layer is specifically intended to address cross entity efforts rather than enterprise or internal governance.



Figure 6. Governance Layer

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Table 55 provides descriptions of the activities and descriptions in the interoperability layer.

Category	Description
Activity	

Policy / Rule/ Requirements Development	Process of creating a trust framework including identifying or adopting rules, requirements, and policy for governing the use of identities and identity technology within a specific community.
Accreditation	Processes for the evaluation, approval and formal recognition that an entity is capable of carrying out certification or assessment activities for a trust framework.
Certification	Processes of assessing, validating, and determining that a product or service provider meets the defined requirements of a trust framework.
Assessment/Audit	Process of reviewing and collecting evidence of an entity's conformance with the rules, policies, and requirements for a trust framework or community.
<b>Roles</b>	
Community of Interest	A group of entities that establish a trust framework.
Accreditation Body	Entity responsible for conducting accreditation activities for a trust framework.
Certification Body	Entity responsible for conducting certification activities for a trust framework.
Assessor/Auditor	Entity that conducts assessments of participants in a trust framework or community; these can support accreditation or certification.

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*Table 5. Governance Layer Activities and Roles*