IdP Attribute Release

How to Test Attribute Release?

The best way to see if your IdP is releasing attributes properly to eduGAIN services is testing it with the eduGAIN Attribute Release Check, which is an easy way to find out if an IdP is configured properly.

Attribute Release Training

To get a better understanding of attribute release in general, how it affects services in eduGAIN and what to consider to properly implement it, we strongly recommend to have a look at the GÉANT online course on "Successful Attribute Release".

Which are the most requested attributes?

According to best common practices Service Providers should publish the attributes they require or desired in metadata, either explicitly using a `<Request edAttribute>` element or implicitly, via the R&S entity category. Based on these numbers an IdP ideally should be able to release the following attributes:

- eduPersonPrincipalName (urn:oid:1.3.6.1.4.1.5923.1.1.1.6)
- mail (urn:oid:0.9.2342.19200300.100.1.3)
- eduPersonTargetedID (urn:oid:1.3.6.1.4.1.5923.1.1.1.10)
- givenName (urn:oid:2.5.4.42)
- sn (urn:oid:2.5.4.4)
- displayName (urn:oid:2.16.840.1.113730.3.1.241)
- cn (urn:oid:2.5.4.3)
- eduPersonScopedAffiliation (urn:oid:1.3.6.1.4.1.5923.1.1.1.9)
- eduPersonAffiliation (urn:oid:1.3.6.1.4.1.5923.1.1.1.1)
- eduPersonEntitlement (urn:oid:1.3.6.1.4.1.5923.1.1.1.7)
- schacHomeOrganization (urn:oid:1.3.6.1.4.1.25178.1.2.9)

It is easily possible to create a list of the most requested attributes of eduGAIN Service Providers. Using a script to generate these attribute statistics, the complete results are as follows (data from August 21st 2018):

**Total SPs: 2135**
With requested attributes/R&S: 5326
Without requested attributes/R&S: -3191

**Total Requested Attributes: 4735**
- Attributes with isRequired=true: 1606 (33.9%)
- Attributes with implicit isRequired=false: 2371 (50.1%)
- Attributes with explicit isRequired=false: 0 (0%)
182 SAML attributes with their most used friendly name sorted by popularity:

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Requested</th>
<th>Required</th>
<th>Desired</th>
</tr>
</thead>
<tbody>
<tr>
<td>eduPersonPrincipalName (urn:oid:1.3.6.1.4.1.5923.1.1.1.6)</td>
<td>24.37%</td>
<td>3.8%</td>
<td>8.09%</td>
</tr>
<tr>
<td>mail (urn:oid:0.9.2342.19200300.100.1.3)</td>
<td>24.05%</td>
<td>4.41%</td>
<td>7.16%</td>
</tr>
<tr>
<td>eduPersonTargetedID (urn:oid:1.3.6.1.4.1.5923.1.1.1.10)</td>
<td>19.96%</td>
<td>2.28%</td>
<td>5.2%</td>
</tr>
<tr>
<td>givenName (urn:oid:2.5.4.42)</td>
<td>19.18%</td>
<td>1.63%</td>
<td>5.07%</td>
</tr>
<tr>
<td>sn (urn:oid:2.5.4.4)</td>
<td>18.75%</td>
<td>1.67%</td>
<td>4.6%</td>
</tr>
<tr>
<td>displayName (urn:oid:2.16.840.1.113730.3.1.241)</td>
<td>17.04%</td>
<td>1.8%</td>
<td>2.77%</td>
</tr>
<tr>
<td>eduPersonAffiliation (urn:oid:1.3.6.1.4.1.5923.1.1.1.1)</td>
<td>17.99%</td>
<td>1.82%</td>
<td>3.7%</td>
</tr>
<tr>
<td>displayName (urn:oid:2.16.840.1.113730.3.1.241)</td>
<td>17.04%</td>
<td>1.8%</td>
<td>2.77%</td>
</tr>
<tr>
<td>eduPersonEntitlement (urn:oid:1.3.6.1.4.1.5923.1.1.1.7)</td>
<td>17.99%</td>
<td>1.82%</td>
<td>3.7%</td>
</tr>
<tr>
<td>schacHomeOrganization (urn:oid:1.3.6.1.4.1.25178.1.2.9)</td>
<td>17.04%</td>
<td>1.8%</td>
<td>2.77%</td>
</tr>
</tbody>
</table>

Also an IdP should support the following name ID formats:

<table>
<thead>
<tr>
<th>NameID Format</th>
<th>Requested</th>
<th>Required</th>
<th>Desired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transient NameIDFormat (urn:oasis:names:tc:SAML:2.0:nameid-format:transient)</td>
<td>4.18%</td>
<td>42.34%</td>
<td>7.05%</td>
</tr>
<tr>
<td>Persistent NameIDFormat (urn:oasis:names:tc:SAML:2.0:nameid-format:persistent)</td>
<td>2.28%</td>
<td>20.04%</td>
<td>3.34%</td>
</tr>
</tbody>
</table>

If your IdP supports the above attributes, it should be more capable of addressing most attribute request. Some less frequently attributes and NameID formats, which probably are either using non-standard names (i.e. urn:mace:dir:... names instead of urn:oid:... names) or are mostly used in a local context are:

<table>
<thead>
<tr>
<th>Name Identifier</th>
<th>Requested</th>
<th>Required</th>
<th>Desired</th>
</tr>
</thead>
<tbody>
<tr>
<td>o (urn:oid:2.5.4.10)</td>
<td>1.25%</td>
<td>0.32%</td>
<td>0.93%</td>
</tr>
<tr>
<td>NameIdentifier NameIDFormat (urn:mace:shibboleth:1.0:nameidentifier)</td>
<td>1.1%</td>
<td>12.19%</td>
<td>2.03%</td>
</tr>
<tr>
<td>uid (urn:oid:0.9.2342.19200300.100.1.1)</td>
<td>0.95%</td>
<td>0.38%</td>
<td></td>
</tr>
<tr>
<td>Attribute</td>
<td>Desired</td>
<td>Requested</td>
<td>Required</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>eduPersonTargetedID</td>
<td>0.57%</td>
<td>0.87%</td>
<td>0.06%</td>
</tr>
<tr>
<td>eduPersonScopedAffiliation</td>
<td>0.8%</td>
<td>0.82%</td>
<td>0%</td>
</tr>
<tr>
<td>eduPersonPrincipalName</td>
<td>0.7%</td>
<td>0%</td>
<td>0.04%</td>
</tr>
<tr>
<td>eduPersonPrimaryAffiliation</td>
<td>0.06%</td>
<td>0.61%</td>
<td>0.36%</td>
</tr>
<tr>
<td>eduPersonUniqueID</td>
<td>0.25%</td>
<td>0.53%</td>
<td>0.23%</td>
</tr>
<tr>
<td>preferredLanguage</td>
<td>0.3%</td>
<td>0.49%</td>
<td>0.32%</td>
</tr>
<tr>
<td>mail</td>
<td>0.42%</td>
<td>0.38%</td>
<td>0.04%</td>
</tr>
<tr>
<td>transientId</td>
<td>0.38%</td>
<td>0.38%</td>
<td>0.04%</td>
</tr>
<tr>
<td>schacHomeOrganizationType</td>
<td>0.15%</td>
<td>0.38%</td>
<td>0.27%</td>
</tr>
<tr>
<td>EmailAddress NameIDFormat</td>
<td>0.27%</td>
<td>0.38%</td>
<td>0.08%</td>
</tr>
<tr>
<td>telephoneNumber</td>
<td>0.19%</td>
<td>0.27%</td>
<td>0.08%</td>
</tr>
<tr>
<td>ou</td>
<td>0.19%</td>
<td>0.27%</td>
<td>0.08%</td>
</tr>
<tr>
<td>eduPersonNickname</td>
<td>0.19%</td>
<td>0.27%</td>
<td>0.08%</td>
</tr>
<tr>
<td>eduPersonOrgUnitDN</td>
<td>0.19%</td>
<td>0.27%</td>
<td>0.08%</td>
</tr>
<tr>
<td>Unspecified NameIDFormat</td>
<td>0.19%</td>
<td>0.25%</td>
<td>0.02%</td>
</tr>
<tr>
<td>eduPersonOrcid</td>
<td>0%</td>
<td>0.23%</td>
<td>0.06%</td>
</tr>
<tr>
<td>eduPersonOrgDN</td>
<td>0.17%</td>
<td>0.23%</td>
<td>0.08%</td>
</tr>
<tr>
<td>displayName</td>
<td>0.21%</td>
<td>0.21%</td>
<td>0%</td>
</tr>
<tr>
<td>eduPersonPrimaryOrgUnitDN</td>
<td>0.18%</td>
<td>0.23%</td>
<td>0.08%</td>
</tr>
</tbody>
</table>
Required: 0.08%
Desired: 0.11%
* eduPersonAffiliation (urn:mace:dir:attribute-def:eduPersonAffiliation)
  Requested: 0.17%
  Required: 0%
  Desired: 0.17%
* title (urn:oid:2.5.4.12)
  Requested: 0.17%
  Required: 0.04%
  Desired: 0.13%
* schacPersonalUniqueID (urn:oid:1.3.6.1.4.1.25178.1.2.15)
  Requested: 0.17%
  Required: 0.17%
  Desired: 0%
* givenName (urn:mace:dir:attribute-def:givenName)
  Requested: 0.15%
  Required: 0.02%
  Desired: 0.13%
* supannEtablissement (urn:oid:1.3.6.1.4.1.7135.1.2.1.14)
  Requested: 0.15%
  Required: 0.13%
  Desired: 0%
* cn (urn:mace:dir:attribute-def:cn)
  Requested: 0.15%
  Required: 0.02%
  Desired: 0.13%
* mobile (urn:oid:0.9.2342.19200300.100.1.41)
  Requested: 0.15%
  Required: 0.08%
  Desired: 0.06%
* sn (urn:mace:dir:attribute-def:sn)
  Requested: 0.15%
  Required: 0.02%
  Desired: 0.13%
* employeeNumber (urn:oid:2.16.840.1.113730.3.1.3)
  Requested: 0.13%
  Required: 0.06%
  Desired: 0.06%
* supannEtudId (urn:oid:1.3.6.1.4.1.7135.1.2.1.10)
  Requested: 0.11%
  Required: 0.02%
  Desired: 0.08%
* eduOrgLegalName (urn:oid:1.3.6.1.4.1.5923.1.2.1.4)
  Requested: 0.11%
  Required: 0.02%
  Desired: 0.08%
* norEduPersonLIN (urn:oid:1.3.6.1.4.1.2428.90.1.4)
  Requested: 0.11%
  Required: 0.11%
  Desired: 0%
* postalAddress (urn:oid:2.5.4.16)
  Requested: 0.11%
  Required: 0.08%
  Desired: 0.02%
* l (urn:oid:2.5.4.7)
  Requested: 0.11%
  Required: 0.04%
  Desired: 0.06%
* employeeID (urn:oid:1.2.840.113556.1.4.35)
  Requested: 0.08%
  Required: 0%
  Desired: 0.08%
* schacPersonalUniqueCode (urn:oid:1.3.6.1.4.1.25178.1.2.14)
  Requested: 0.08%
  Required: 0.04%
  Desired: 0.04%
* schacCountryOfCitizenship (urn:oid:1.3.6.1.4.1.25178.1.2.5)
  Requested: 0.08%
  Required: 0.08%
  Desired: 0%
* postalCode (urn:oid:2.5.4.17)
  Requested: 0.08%
  Required: 0.02%
  Desired: 0.06%
* X509SubjectName NameIDFormat (urn:oasis:names:tc:SAML:1.1:nameid-format:X509SubjectName)
  Requested: 0.08%
  Required: 0.15%
  Desired: 0.02%
* supannEntiteAffectation (urn:oid:1.3.6.1.4.1.7135.1.2.1.8)
Requested: 0.08%
Required: 0.06%
 Desired: 0.02%
* eduPersonEntitlement (urn:mace:dir:attribute-def:eduPersonEntitlement)
  Requested: 0.08%
  Required: 0%
  Desired: 0.08%
* eduPersonAssurance (urn:mace:dir:attribute-def:eduPersonAssurance)
  Requested: 0.08%
  Required: 0%
  Desired: 0.08%
* homePostalAddress (urn:oid:0.9.2342.19200300.100.1.39)
  Requested: 0.08%
  Required: 0.08%
  Desired: 0%
* employeeNumber (urn:oid:1.2.840.113556.1.2.610)
  Requested: 0.08%
  Required: 0%
  Desired: 0.08%
* facsimileTelephoneNumber (urn:oid:2.5.4.23)
  Requested: 0.08%
  Required: 0.04%
  Desired: 0.04%
* eduPersonPrimaryAffiliation (urn:mace:dir:attribute-def:eduPersonPrimaryAffiliation)
  Requested: 0.06%
  Required: 0%
  Desired: 0.06%
* street (urn:oid:2.5.4.9)
  Requested: 0.06%
  Required: 0.02%
  Desired: 0.04%
* seeAlso (urn:oid:2.5.4.34)
  Requested: 0.06%
  Required: 0.02%
  Desired: 0.04%
* ou (urn:mace:dir:attribute-def:ou)
  Requested: 0.06%
  Required: 0%
  Desired: 0.06%
* employeeType (urn:oid:1.2.840.113556.1.2.613)
  Requested: 0.06%
  Required: 0%
  Desired: 0.06%
* initials (urn:oid:2.5.4.43)
  Requested: 0.06%
  Required: 0.02%
  Desired: 0.04%
* postOfficeBox (urn:oid:2.5.4.18)
  Requested: 0.06%
  Required: 0.02%
  Desired: 0.04%
* businessCategory (urn:oid:2.5.4.15)
  Requested: 0.06%
  Required: 0.02%
  Desired: 0.04%
* o (urn:mace:dir:attribute-def:o)
  Requested: 0.06%
  Required: 0%
  Desired: 0.06%
* isMemberOf (urn:oid:1.3.6.1.4.1.5923.1.5.1.1)
  Requested: 0.06%
  Required: 0.04%
  Desired: 0.02%
* description (urn:oid:2.5.4.13)
  Requested: 0.06%
  Required: 0.02%
  Desired: 0.04%
* homePhone (urn:oid:0.9.2342.19200300.100.1.20)
  Requested: 0.06%
  Required: 0.06%
  Desired: 0%
* manager (urn:mace:dir:attribute-def:manager)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* st (urn:oid:2.5.4.8)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
Desired: 0%
* userCertificate (urn:oid:2.5.4.36)
  Requested: 0.04%
  Required: 0.04%
  Desired: 0%
* employeeNumber (urn:mace:dir:attribute-def:employeeNumber)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* departmentNumber (urn:oid:2.16.840.1.113730.3.1.2)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* schacDateOfBirth (urn:oid:1.3.6.1.4.1.25178.1.2.3)
  Requested: 0.04%
  Required: 0.04%
  Desired: 0%
* eduPersonPrincipalName (eduPersonPrincipalName)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* mail (mail)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* givenName (givenName)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* sn (sn)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* auEduPersonSharedToken (urn:oid:1.3.6.1.4.1.27856.1.2.5)
  Requested: 0.04%
  Required: 0.02%
  Desired: 0.02%
* eduPersonNickname (urn:mace:dir:attribute-def:eduPersonNickname)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* eduPersonOrgDN (urn:mace:dir:attribute-def:eduPersonOrgDN)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* Kerberos NameIDFormat (urn:oasis:names:tc:SAML:2.0:nameid-format:kerberos)
  Requested: 0.04%
  Required: 0.02%
  Desired: 0%
* WindowsDomainQualifiedName NameIDFormat (urn:oasis:names:tc:SAML:1.1:nameid-format:WindowsDomainQualifiedName)
  Requested: 0.04%
  Required: 0.02%
  Desired: 0%
* eduPersonOrgUnitDN (urn:mace:dir:attribute-def:eduPersonOrgUnitDN)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* physicalDeliveryOfficeName (urn:oid:2.5.4.19)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* physicalDeliveryOfficeName (urn:mace:dir:attribute-def:physicalDeliveryOfficeName)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* eduCourseOffering (urn:oid:1.3.6.1.4.1.5923.1.6.1.1)
  Requested: 0.04%
  Required: 0.02%
  Desired: 0.02%
* businessCategory (urn:mace:dir:attribute-def:businessCategory)
  Requested: 0.04%
  Required: 0%
  Desired: 0.04%
* eduCourseMember (urn:oid:1.3.6.1.4.1.5923.1.6.1.2)
  Requested: 0.04%
  Required: 0.02%
  Desired: 0.02%
* labeledURI (urn:oid:1.3.6.1.4.1.250.1.57)
  Requested: 0.04%
* funetEduPersonECTS (urn:oid:1.3.6.1.4.1.16161.1.1.11.19)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* userPresenceID (urn:oid:1.3.6.1.4.1.25178.1.2.12)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* eduroamUID (http://eduroam.cz/attributes/eduroamUID)
  Requested: 0.02%
  Required: 0%
  Desired: 0%

* supannAutreMail (urn:oid:1.3.6.1.4.1.7135.1.2.1.134)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleGenerique (urn:oid:1.3.6.1.4.1.7135.1.2.1.23)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuTypeDiplome (urn:oid:1.3.6.1.4.1.7135.1.2.1.33)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuSecteurDisciplinaire (urn:oid:1.3.6.1.4.1.7135.1.2.1.32)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuRegimeInscription (urn:oid:1.3.6.1.4.1.7135.1.2.1.31)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* funetEduPersonCreditUnits (urn:oid:1.3.6.1.4.1.16161.1.1.11.18)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuEtape (urn:oid:1.3.6.1.4.1.7135.1.2.1.29)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuElementPedagogique (urn:oid:1.3.6.1.4.1.7135.1.2.1.28)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuDiplome (urn:oid:1.3.6.1.4.1.7135.1.2.1.27)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuCursusAnnee (urn:oid:1.3.6.1.4.1.7135.1.2.1.26)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannEtuAnneeInscription (urn:oid:1.3.6.1.4.1.7135.1.2.1.25)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRoleEntite (urn:oid:1.3.6.1.4.1.7135.1.2.1.24)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%

* supannRole (urn:oid:1.3.6.1.4.1.7135.1.2.1.21)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%
Desired: 0%
* supannEmpid (urn:oid:1.3.6.1.4.1.7135.1.2.1.11)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%
* supannListeRouge (urn:oid:1.3.6.1.4.1.7135.1.2.1.1)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%
* swissEduPersonHomeOrganizationType (urn:oid:2.16.756.1.2.5.1.1.5)
  Requested: 0.02%
  Required: 0%
  Desired: 0.02%
* swissEduPersonUniqueID (urn:oid:2.16.756.1.2.5.1.1.1)
  Requested: 0.02%
  Required: 0%
  Desired: 0.02%
* schacPersonalTitle (urn:oid:1.3.6.1.4.1.25178.1.2.8)
  Requested: 0.02%
  Required: 0%
  Desired: 0.02%
* schacYearOfBirth (urn:oid:1.3.6.1.4.1.25178.1.0.2.3)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%
* norEduPersonNIN (urn:oid:1.3.6.1.4.1.2428.90.1.5)
  Requested: 0.02%
  Required: 0.02%
  Desired: 0%
* urn:oid:1.3.6.1.4.1.23735.100.0 (urn:oid:1.3.6.1.4.1.23735.100.0)
  Requested: 0.02%
  Required: 0%
  Desired: 0.02%