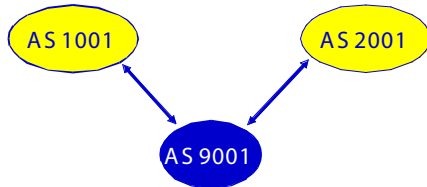


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Solutions

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Routing Registry Hands-on Course

Case 1 - Multihoming



Scenario A

- AS1001 is your upstream provider
- AS2001 is a private peer

Exercise:

- Create RPSL policy reflecting this scenario
- Put this policy in your aut-num object

Exercises

- Time: 15 mins

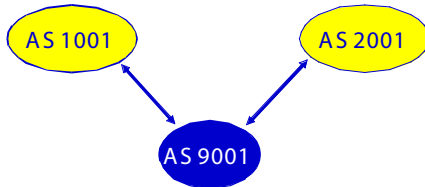
Solution:

```
aut-num: AS9001
as-name: RRTEST-AS9001
descr: Case 1 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario A
remarks: AS1001 is your upstream provider
import: from AS1001
        action pref=100
        accept ANY
export: to AS1001
        announce AS9001
remarks: AS2001 is a private peer
import: from AS2001
        action pref=20;
        accept AS2001
export: to AS2001
        announce AS9001
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

RIPE NCC Case 1 - Multihoming



RIPE NCC Scenario B

- AS1001 is your preferred upstream provider
- AS2001 is your backup upstream provider

Exercise:

- Create RPSL policy reflecting this scenario
- Put this policy in your aut-num object



- Time: 15 mins

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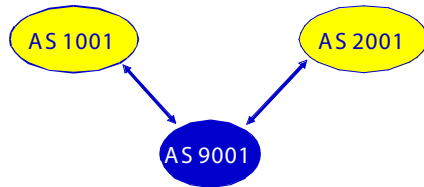
Solution:

```
aut-num: AS9001
as-name: RRTEST-AS9001
descr: Case 1 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario B
remarks: AS1001 is your preferred upstream provider
import: from AS1001
       action pref=100
       accept ANY
export: to AS1001
       announce AS9001
remarks: AS2001 is your backup upstream provider
import: from AS2001
       action pref=200;
       accept ANY
export: to AS2001
       action aspath.prepend (AS9001, AS9001);
       announce AS9001
remarks: Optional extra import line to prefer direct
remarks: connection to AS2001 for AS2001
import: from AS2001
       action pref=20;
       accept AS2001
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 1 - Multihoming



Scenario C

- AS1001 is your upstream provider
- AS2001 is your upstream provider

Exercise:

- Create RPSL policy reflecting this scenario
- Put this policy in your aut-num object

- Time: 15 mins

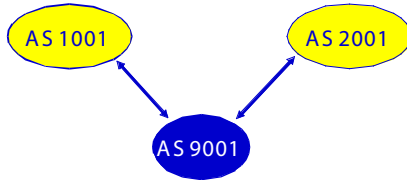
Solution:

```
aut-num: AS9001
as-name: RRTEST-AS9001
descr: Case 1 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario C
remarks: AS1001 is your upstream provider
import: from AS1001
       action pref=100
       accept ANY
export: to AS1001
       announce AS9001
remarks: AS2001 is your upstream provider
import: from AS2001
       action pref=100;
       accept ANY
export: to AS2001
       announce AS9001
remarks: the pref is optional
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

RIPE NCC Case 1 - Multihoming



RIPE NCC Scenario D

- AS1001 is your upstream provider
- AS2001 gives you transit
 - AND you give AS2001 transit

Exercise:

- Create RPSL policy reflecting this scenario
- Put this policy in your aut-num object



- Time: 15 mins

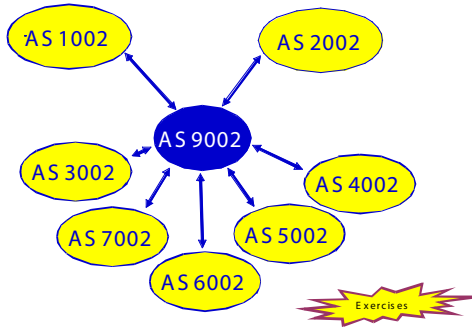
Solution:

```
aut-num: AS9001
as-name: RRTEST-AS9001
descr: Case 1 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario D
remarks: AS1001 is your upstream provider
import: from AS1001
        action pref=100
        accept ANY
export: to AS1001
        announce AS9001
remarks: AS2001 gives you transit AND you give AS2001 transit
import: from AS2001
        action pref=100;
        accept ANY
export: to AS2001
        announce ANY
remarks: the pref is optional
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 2 – Simplifying Policy



Scenario A

- You have private peerings with:
 - AS3002, AS4002, AS5002, AS6002, AS7002

Exercise:

- Create an AS -set for your peers
- Create RPSL policy for this AS -set
- Put this policy in your aut-num object

- Time: 15 mins

Solution:

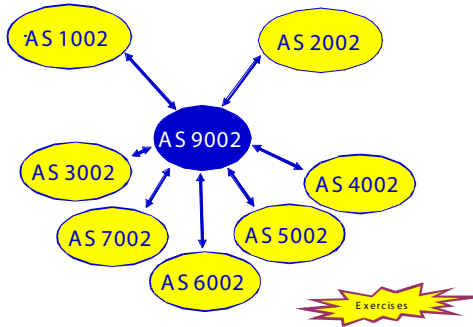
```
as-set: AS9002:AS-CASE2A
descr: Private peers
members: AS3002,AS4002,AS5002,AS6002,AS7002
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

```
aut-num: AS9002
as-name: RRTEST-AS9002
descr: Case 2 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remark: Scenario A
remark: as set for them is AS9002:AS-CASE2A
import: from AS9002:AS-CASE2A
export: accept PeerAS
to AS9002:AS-CASE2A
announce AS9002
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 2 – Simplifying Policy



Scenario B

- You have customers that prefer you as upstream provider:
 - AS3012, AS4012, AS5012, AS6012, AS7012

Exercise:

- Create an AS -set for your peers
- Create RPSL policy for this AS -set
- Put this policy in your aut-num object

- Time: 15 mins

Solution:

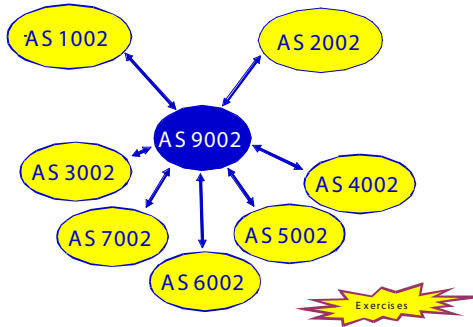
```
as-set: AS9002:AS-CASE2B
descr: Customers that prefer us
members: AS3012,AS4012,AS5012,AS6012,AS7012
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
notify: bert@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST

aut-num: AS9002
as-name: RRTEST-AS9002
descr: Case 2 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remark: Scenario B
remark: as set for them is AS9002:AS-CASE2B
import: from AS9002:AS-CASE2B
accept PeerAS
remark: a low pref is optional
export: to AS9002:AS-CASE2B
announce ANY
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 2 – Simplifying Policy



Scenario C

- You have multiple upstream providers:
 - AS1002, AS2002

Exercise:

- Create an AS -set for your peers
- Create RPSL policy for this AS -set
- Put this policy in your aut-num object

- Time: 15 mins

Solution:

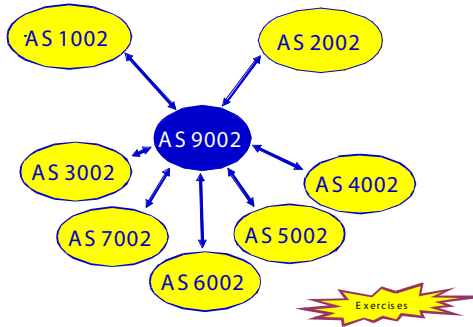
```
as-set: AS9002:AS-CASE2C
descr: Upstreams
members: AS1002,AS2002
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
notify: bert@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

```
aut-num: AS9002
as-name: RRTEST-AS9002
descr: Case 2 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remark: Scenario C
remark: You have multiple upstream providers: AS1002, AS2002
remark: as set for them is AS9002:AS-CASE2C
import: from AS9002:AS-CASE2C
accept ANY
export: to AS9002:AS-CASE2C
announce AS9002
remark: normally, you would announce yourself and your customers to your
upstreams
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 2 – Simplifying Policy



Scenario D

- You have customers that use you as backup provider :
 - AS3022, AS4022, AS5022, AS6022, AS7022

Exercise:

- Create an AS -set for your peers
- Create RPSL policy for this AS -set
- Put this policy in your aut-num object

- Time: 15 mins

Solution:

```
as-set: AS9002:AS-CASE2D
descr: Customers that use us as backup
members: AS3022,AS4022,AS5022,AS6022,AS7022
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
notify: bert@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

```
aut-num: AS9002
as-name: RRTEST-AS9002
descr: Case 2 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remark: Scenario D
remark: AS3022, AS4022, AS5022, AS6022, AS7022 use you as backup provider
remark: as set for them is AS9002:AS-CASE2D
import: from AS9002:AS-CASE2D
        action pref=500
        accept PeerAS

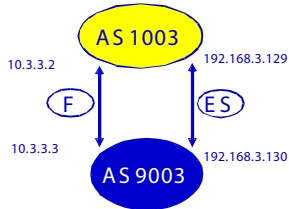
remarks: prefixes with prefs are more preferred than those without
remarks: this means other prefixes need a lower pref
export: to AS9002:AS-CASE2D
        action aspath.prepend (AS9002, AS9002);
        announce AS9002

notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 3 – Multiple Links, Same Peer



Scenario A

- You peer with AS1003 in Spain and France
- AS1003 has route -sets differentiated per country:
 - as1003:rs-france
 - as1003:rs-spain

Exercise:

- Create RPSL import policy for these peerings
 - Using the IP addresses of the routers (if needed)
 - Using your peer 's route -sets
 - Honouring your peer 's MEDs
- Put this policy in your aut-num object

- Time: 15 mins

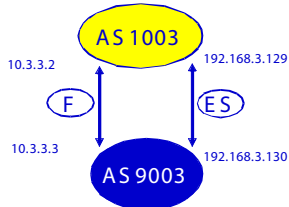
Solution:

```
aut-num: AS9003
as-name: RRTEST-AS9003
descr: Case 3 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario A
remarks: AS1003 is a peer that uses routesets
remarks: as1003:rs-france and as1003:rs-spain
remarks: this scenario honours their MEDs
import: from AS1003
accept AS1003 as1003:rs-france as1003:rs-spain
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Case 3 – Multiple Links, Same Peer



Scenario B

- You peer with AS1003 in Spain and France
- AS1003 has route -sets differentiated per country:
 - as1003:rs-france
 - as1003:rs-spain

Exercise:

- Create RPSL import policy for these peerings
 - Using the IP addresses of the routers
 - Using your peer's route-sets
 - Not honouring your peer's MEDs
- Put this policy in your aut-num object

- Time: 15 mins

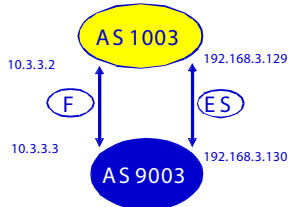
Solution:

```
aut-num: AS9003
as-name: RRTEST-AS9003
descr: Case 3 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario B
remarks: AS1003 is a peer that uses routesets
remarks: as1003:rs-france and as1003:rs-spain
remarks: this scenario does not honour their MEDs
remarks: there are many other possible scenarios
import: from AS1003
import: from AS1003 10.3.3.2 at 10.3.3.3
import: from AS1003 192.168.3.129 at 192.168.3.130
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 3 – Multiple Links, Same Peer



Scenario C

- You peer with AS1003 in Spain and France
- You have route -sets differentiated per country:
 - rs-course-france
 - rs-course-spain

Exercise:

- Create RPSL export policy for these peerings
 - Using the IP addresses of the routers
 - Using your route -sets
 - Setting different MEDs for local and global prefixes
- Put this policy in your aut-num object

- Time: 15 mins

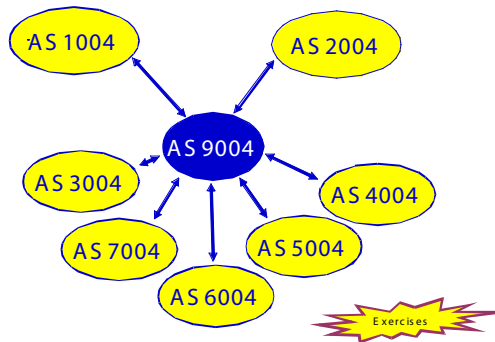
Solution:

```
aut-num: AS9003
as-name: RRTEST-AS9003
descr: Case 3 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario C
remarks: AS1003 is a peer that you announce different routesets to
remarks: rs-course-france for the French connection
remarks: rs-course-spain for the Spanish connection
export: to AS1003 10.3.3.2 at 10.3.3.3
        action med=2000;
        announce AS9003 rs-course-spain AND NOT rs-course-france
export: to AS1003 10.3.3.2 at 10.3.3.3
        action med=1000;
        announce rs-course-france
export: to AS1003 192.168.3.129 at 192.168.3.130
        action med=2000;
        announce AS9003 rs-course-france AND NOT rs-course-spain
export: to AS1003 192.168.3.129 at 192.168.3.130
        action med=1000;
        announce rs-course-spain
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 4 – Communities



Scenario A

- You want to give your customers the option to indicate to you that you are their preferred upstream
- You want to do this with communities

Exercise:

- Create RPSL import and export policy for these peerings
 - Using communities to filter
- Put this policy in your aut-num object

- Time: 15 mins

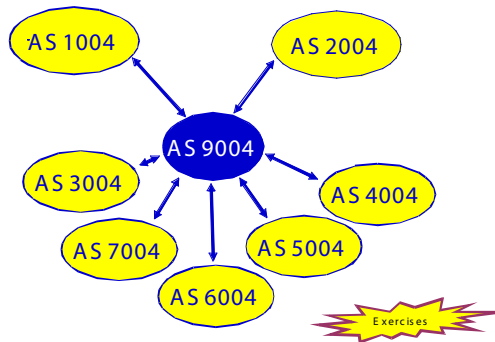
Solution:

```
aut-num: AS9004
as-name: RRTEST-AS9004
descr: Case 4 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario A
remarks: import and export lines for customers that prefer us
import: from AS-CUSTOMERS
import: action pref=100;
import: accept PeerAS AND community.contains (9004:100)
import: to AS-CUSTOMERS announce ANY
export: to AS-UPSTREAMS
export: announce AS-CUSTOMERS AND community.contains (9004:100)
remarks:
remarks: it is not possible to differentiate customers
remarks: based on communities, you can only differentiate
remarks: prefixes.
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20080401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 4 – Communities



Scenario B

- You want to give your customers the option to indicate to you that you are their backup upstream
- You want to do this with communities

Exercise:

- Create RPSL import and export policy for these peerings
 - Using communities to filter
- Put this policy in your aut-num object

- Time: 15 mins

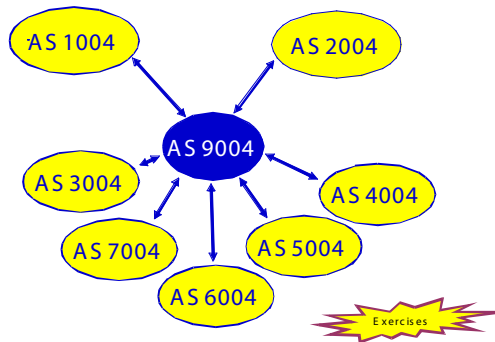
Solution:

```
aut-num: AS9004
as-name: RRTEST-AS9004
descr: Case 4 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario B
remarks: import and export lines for customers that use us as backup
import: from AS-CUSTOMERS
       action pref=500;
       accept PeerAS AND community.contains (9004:500)
export: to AS-CUSTOMERS
       announce ANY
export: to AS-UPSTREAMS
       action aspath.prepend (AS9004, AS9004);
       announce AS-CUSTOMERS AND community.contains (9004:500)
remarks:
remarks: it is not possible to differentiate customers
remarks: based on communities, you can only differentiate
remarks: prefixes.
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Case 4 – Communities



Scenario C

- Upstreams AS1004 tags their routes with a community so that you can distinguish between routes from their EU and US upstreams
- They also allow you to tag your routes with a community that they will use to prepend 2 times to either their EU or US upstreams

Exercise:

- Create RPSL import and export policy for peer AS1004
 - prefer EU traffic
- Put this policy in your aut-num object

- Time: 15 mins

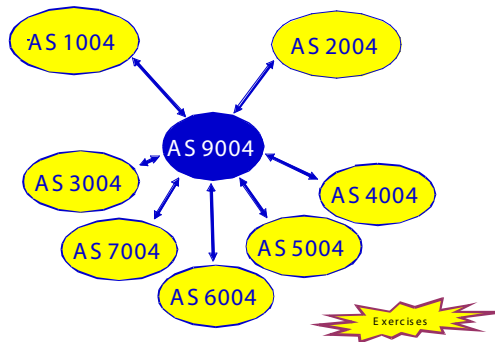
Solution:

```
aut-num: AS9004
as-name: RRTEST-AS9004
descr: Case 4 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario C
remarks: prefer EU traffic from and to AS1004
import: from AS1004
import: action pref=100;
import: accept ANY
import: from AS1004
import: action pref=50;
import: accept ANY AND community.contains (1004:555)
export: to AS1004
export: action community.append(1004:991);
export: announce AS9004 AS-CUSTOMERS
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

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Routing Registry Hands-on Course

Case 4 – Communities



Scenario D

- Upstreams AS2004 tags their routes with a community so that you can distinguish between routes from their EU and US upstreams
- They also allow you to tag your routes with a community that they will use to prepend 2 times to either their EU or US upstreams

Exercise:

- Create RPSL import and export policy for peer AS2004
 - prefer US traffic
- Put this policy in your aut-num object

- Time: 15 mins

Solution:

```
aut-num: AS9004
as-name: RRTEST-AS9004
descr: Case 4 exercises
admin-c: RT1-RRTEST
tech-c: RT1-RRTEST
remarks: Scenario D
remarks: prefer US traffic from and to AS2004
import: from AS2004
       action pref=100;
       accept ANY
import: from AS2004
       action pref=50;
       accept ANY AND community.contains (2004:1)
export: to AS2004
       action community.append(2004:995);
       announce AS9004 AS-CUSTOMERS
notify: trainer@example.net
mnt-by: RRTEST-COURSE-MNT
changed: trainer@example.net 20050401
source: RRTEST
```

