Network Configuration

Automation

Consistency
Flexibility
Reliability
Scale at Lower Cost

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Today’s Problems

• Costs scale linearly (or worse) with the number of customers
• Hard to make changes in response to events (e.g., security)
• Hard to ensure consistency in routing and customer options
• Hard to upgrade, add new equipment, etc.
• I.e., provisioning is a serious opportunity for Competitive Advantage
The Ideal

Central Data
Customers
Devices, Circuits,
IP Addrs, DNS

Management Reporting
NOC & Monitoring
Ticketing
Customer Service
Billing
Provision
Configure
Cust Self-Provision

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What Can we Do Today?

IRR

Cust & Peers

Conf Gen

Conf Gen

local RR

IRR

the net

the net

GUIs

Rtrs & Circuits

Cust & Peers

Conf Gen

local RR

the net
Configuration Generation

- IRR
- Back Office
- Convert
- Cust & Peers
- Conf Gen
- Conf
- Templates
- local RR
- GUIs
- Vendor
  - SW Version
  - BGP Skeleton
  - Interface Skel
  - ...

the net
Example (BGP Peer) Template

```c
#define $AS
#define $IP
#define $MD5

printf (POLICY "    policy-statement peer-%d {
", $AS);
printf (POLICY "        term ok {
");
printf (POLICY "            from {
");
foreach $PREFIX (@PFX) {
    printf (POLICY "                route-filter $PREFIX exact;\n");
}
printf (POLICY "        }
");
printf (POLICY "    }
");
printf (POLICY "    term final {
");
printf (POLICY "        then reject\n");
printf (POLICY "    }
");
printf (POLICY "    }
");
printf (PEERS "            neighbor %s {\n", $IP);
printf (PEERS "                peer-as $AS;\n");
if ( $MD5 ne "NONE" ) {
    printf (PEERS "                authentication-key "%s";\n", $MD5);
}
printf (PEERS "            import [ no-bogons dampening peer-%d ];\n", $AS);
printf (PEERS "            }
");
```
My Home Rack Hack
for Seattle IX Peerings

<table>
<thead>
<tr>
<th>ASN</th>
<th>IP Address</th>
<th>IRR</th>
<th>AS-MACRO</th>
<th>MD5 Auth</th>
</tr>
</thead>
<tbody>
<tr>
<td>6456</td>
<td>198.32.180.10</td>
<td>CW</td>
<td>AS6456</td>
<td>NONE</td>
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<tr>
<td>7610</td>
<td>198.32.180.12</td>
<td>VERIO</td>
<td>AS-SINGAREN</td>
<td>p33-r-4ng</td>
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<tr>
<td>3491</td>
<td>198.32.180.13</td>
<td>RADB</td>
<td>AS-CAIS</td>
<td>sn00[kl3]</td>
</tr>
<tr>
<td>4565</td>
<td>198.32.180.22</td>
<td>EPOCH</td>
<td>AS-EPOCH</td>
<td>00ps-i3</td>
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<td>sd1-sux</td>
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<td>vu1r-ab13</td>
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<td>AS-PNW-GIGAPOPP</td>
<td>4t1-t00d</td>
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<tr>
<td>11726</td>
<td>198.32.180.89</td>
<td>RADB</td>
<td>AS-ACUMEN</td>
<td>w33-n33</td>
</tr>
</tbody>
</table>
Generates BGP Configs

```plaintext
eighbor 198.32.180.10 {
    peer-as 6456;
    import [ no-bogons dampening peer-6456 ];
}
neighbor 198.32.180.12 {
    peer-as 7610;
    authentication-key "p33-r-4ng";
    import [ no-bogons dampening peer-7610 ];
}
neighbor 198.32.180.13 {
    peer-as 3491;
    authentication-key "sn00[kl3]";
    import [ no-bogons dampening peer-3491 ];
}
neighbor 198.32.180.22 {
    peer-as 4565;
    authentication-key "00ps-i3";
    import [ no-bogons dampening peer-4565 ];
}
```
And Route ACLs

policy-statement peer-7610 {
  term ok {
    from {
      route-filter 202.21.158.0/23 exact;
      route-filter 202.8.94.0/23 exact;
      route-filter 202.3.135.0/24 exact;
      route-filter 202.0.149.0/24 exact;
      route-filter 192.122.140.0/24 exact;
      route-filter 192.122.136.0/22 exact;
      route-filter 192.122.132.0/22 exact;
      route-filter 192.122.131.0/24 exact;
      route-filter 164.78.0.0/16 exact;
      route-filter 137.132.0.0/16 exact;
    }
    then accept;
  }
  term final {
    then reject
  }
}

policy-statement peer-3491 {
  term ok {
    from {
      route-filter 221.124.0.0/14 exact;
    }
  }
}

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Configuration Distribution

- **Conf Gen**
- **Confs**
- **Distribute**
- **SNMP**
- **CVS of Confs**
- **Rancid**
- **NOC**

- eMail
- Cron & Forced
- Forced Diff

Diffs flow to the net.