IMPLEMENTATION STATUS

❍ Distr is freely available from ftp://ftp.eecs.tufts.edu/pub/distr

❍ revision: 2.0.0Alpha (not satisfied with specifications)

❍ handles UNIX files and links (directories easy given time)

❍ considering supporting NT

SCALABLE DISTRIBUTION ALLOWS

- scalable **mistakes** that disable networks very efficiently
  - network **storms**
  - rapid propogation of human **errors**
- scalable **vulnerability** to attack
  - cracking master cracks slaves
  - can be used for denial-of-service

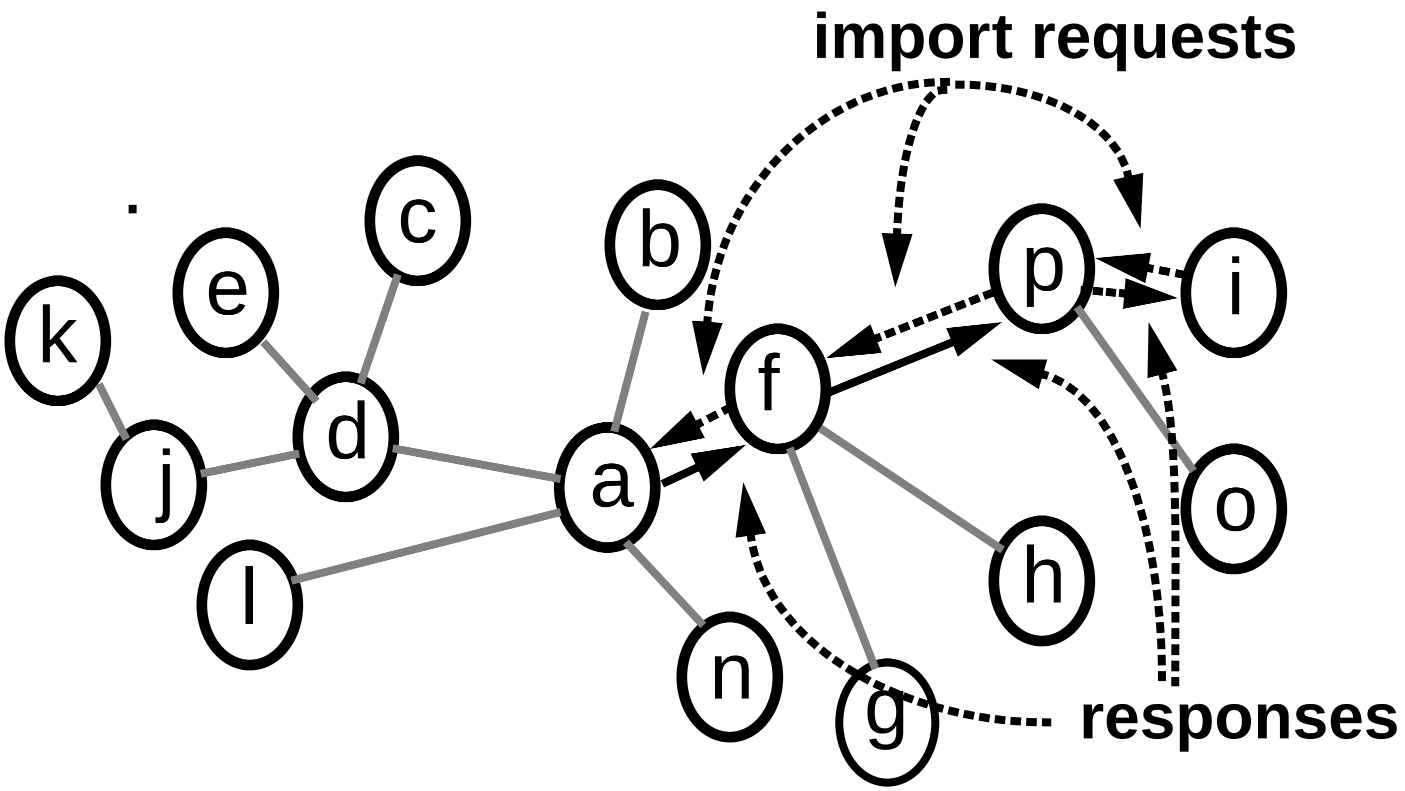
AT WHAT COST?

- must **create** configurations for each kind of host and domain
- must **manually configure** a distribution topology for scalable use
- must **bootstrap** by distributing configuration files and Perl-5, perhaps with RDIST:)

ILLUSION AND REALITY

- ✗ illusion: PGP signing provides security
- ✔ reality: susceptible to replay attacks.
- ✗ illusion: difficult to write configurations
- ✔ reality: one basic file per host type
- ✗ illusion: it'd be easy to auto-configure
- ✔ reality: very hard problem

UNDERSTANDING IMPORT SCALABILITY



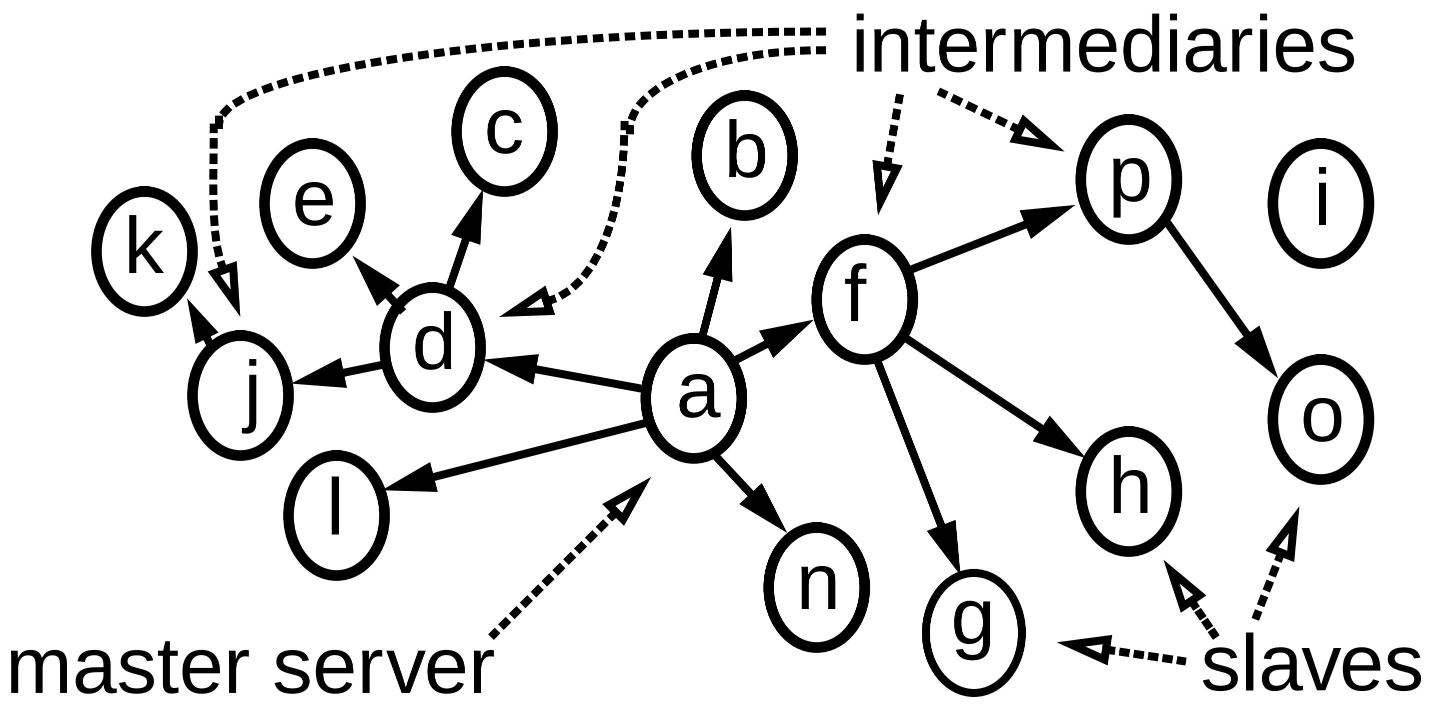
IMPLEMENTING SCALABILITY

-
  ```
  import.afterSuccess = sub {
   &some('export.initiate');
  };
  clients = ['foo','bar'];
  ```
  follows each successful import with an export!

-
  ```
  export.before = sub {
    &some('import.initiate');
  };
  servers = ['foo','bar'];
  ```
  queries servers for the correct versions before exporting to others!

SCALABILITY

if you told two friends,
and they told two friends...



SIMPLE HACKS

-
  ```
  import.authentic = \&PGPauthentic;
  signers = ['Alva L. Couch'];
  ```
  authenticates each **`file`** against detached PGP signature **`file.sig`**

-
  ```
  import.before = sub {
   my $file = &some('import.file');
   system("/usr/bin/ci -m 'distr' \
    $file >/dev/null 2>&1")/256==0;
  };
  ```
  implements local pre-distribution archiving.
- can be limited to **specific cases** by naming!

LOCAL CUSTOMIZATION

```
import = sub { # oversimplified to fit!
 if (&some('import.authentic')) {
  if (&some('import.before')) {
   if (&some('import.method')) {
    &some('import.afterSuccess');
   } else {
    &some('import.afterFailure');
   }}
 } else {
  &some('import.afterDenial');
 }
};
```

actually does the import

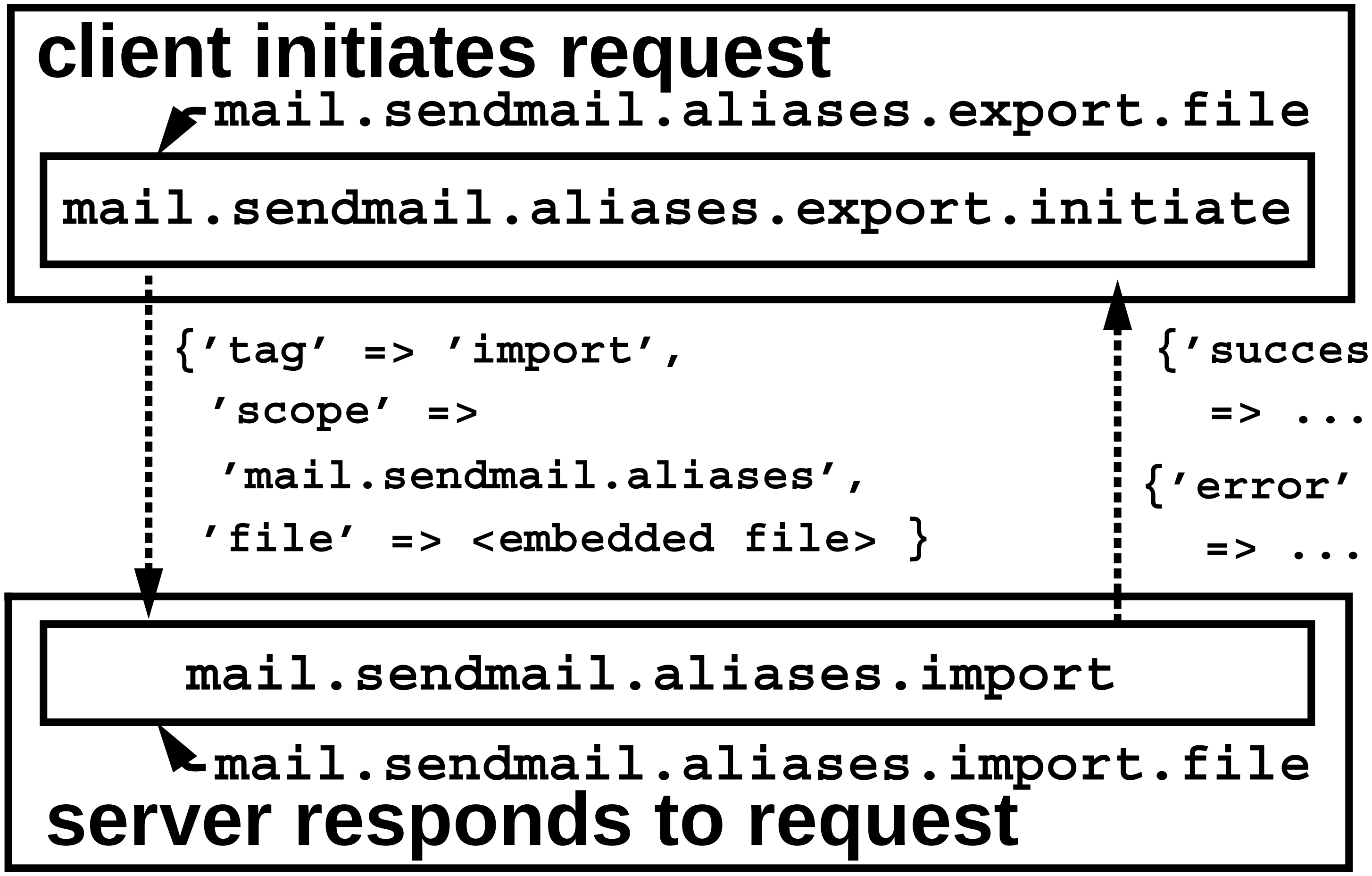
user 'hooks'

USING DISTR

-
  ```
  distr -scopes mail.sendmail \
        -tags export
  ```
  calls distr on a **master** host to **distribute** files to a slave host

-
  ```
  distr -scopes mail.sendmail \
        -tags import
  ```
  calls distr on a **slave** host to **request** a file from a master host.

DISTR'S PROTOCOL


client initiates request
mail.sendmail.aliases.export.file
mail.sendmail.aliases.export.initiate
{'tag' => 'import',
'scope' =>
'mail.sendmail.aliases',
'file' => <embedded file> }
{'success'
=> ...}
{'error'
=> ...}
mail.sendmail.aliases.import
mail.sendmail.aliases.import.file
server responds to request

PARAMETER-PASSING

- `foo.import.file = '/foo';` is used by method `foo.import`
- `bar.import.file = '/bar';` is used by method `bar.import`
- both these methods are aliases for plain `import` (through inheritance)!

INHERITANCE

- **scope**: 'where' you are, e.g.,
  - `mail.sendmail.aliases`
- **tag**: 'what' you want, e.g., `import`
- use the first definition you find in the list:
  - `mail.sendmail.aliases.import`
  - `mail.sendmail.import`
  - `mail.import`
  - `import`
- Perl syntax: `&some('import')`

DISTR CONFIGURATION

```
mail.sendmail.aliases {
   import.file = '/usr/lib/aliases';
   import.afterSuccess = sub {
       system("/usr/lib/newaliases \
          >/dev/null 2>&1")/256==0;
   };
}
```

- attributes can be arbitrary Perl-5 **scalars**, including **function references**
- missing details 'filled in' with **inheritance**

WHAT'S IN A NAME?

- **`mail.sendmail.aliases`**
  is the name of a (distributed) **object**
- **`mail.sendmail.aliases.import.file`**
  `= '/usr/lib/aliases';`
  specifies the target file.
- **`mail.sendmail.aliases.import`**
  is the **method** for importing that file

DISTR

- hosts are both **servers** and **clients**
  - server **`distrd`**: reacts to requests
  - client **`distr`**: makes requests
- hosts can be both **masters** and **slaves**
  - **master**: provider of information
  - **slave**: consumer of information
- **bidirectional**: master or slave initiates.
- slave machines must **agree** to updates! Masters **can't force** slaves to comply!

TYPICAL APPROACH (RDIST)

```
mail:/usr/lib/aliases->(slave)
    install /etc/mail/aliases
    special "/usr/sbin/newaliases"
```

- requires a **master server**
- **unidirectional**: master-to-slave
- **platform-specific**
- master needs **root privileges** on slave
- this doesn't exactly **encourage** cooperation between admins!

FILE DISTRIBUTION AND HETEROGENEITY

~~server~~:
master:

provides file `/usr/lib/aliases`

distribute:

- ✔transmit
- ✔transform
- ✔authenticate
- ✔archive
- ✔journal
- ✔rollback

may have:

- ✔different name
- ✔different format
- ✔different actions

~~client~~:
slave:

receives file: `/etc/mail/aliases`
executes: `/usr/sbin/newaliases`

AN 'ANARCHIST' VIEW

- **replace** a venerable and very mature tool (with a very young and strange one)!
- **violate** (almost all) software engineering and programming language principles!
- develop configuration maintenance architecture from the **bottom up**!
- **redefine** what is meant by 'distribution' (and perhaps even 'scalable')

TO GET ALONG, WE NEED:

- a **common language** for referring to things and actions
- the ability to **interpret** that language to make changes for the common good
- the ability to **limit changes** to those agreed upon by both parties

CHAOS OUT OF ORDER:

A SIMPLE, SCALABLE FILE DISTRIBUTION FACILITY FOR "INTENTIONALLY HETEROGENEOUS" NETWORKS

-OR-

AN ANARCHISTS' GUIDE

TO HETEROGENEOUS NETWORK CONFIGURATION MANAGEMENT

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