



S^X QUICK START GUIDE

CHAPTER 1

INTRODUCTION

Welcome to Skylable S^X, a complete framework for building distributed data clusters. This Quick Start Guide gives you the basics to install, configure and start using our software. While S^X was designed to be user friendly and easy to set up, we encourage you to read the User Guide (sorry, it may not exist yet :-)) for complete information on all the features.

USEFUL LINKS

- <http://lists.skylable.com>
- <https://bugzilla.skylable.com>
- <http://wiki.skylable.com>

CHAPTER 2

INSTALLATION

REQUIREMENTS

Skylable S^X is tested on all popular UNIX platforms, including Linux, FreeBSD, and Mac OS X. We try to support as many platforms as possible, if you have troubles compiling or running our software on your platform please open a bug report.

In order to compile S^X from source, you will need the following packages to be installed together with their development versions:

- OpenSSL
- libcurl

For example, on Debian run:

```
# apt-get install libssl-dev libcurl4-openssl-dev
```

COMPILATION

The software is based on autoconf, so just follow the standard installation procedure. In this guide we will install S^X into /opt/sx.

```
$ ./configure --prefix=/opt/sx && make  
# make install
```

CHAPTER 3

CONFIGURATION

REQUIREMENTS

S^X operates on ports 80 and 443, which need to be available on a given IP address. You can build even a single-node S^X cluster, however for data safety reasons it is recommended to create at least a two-node cluster and use replica higher than 1.

THE FIRST NODE

Setting up the first node initializes the cluster and makes S^X ready to use. The `sxsetup` tool presented below performs an automated configuration of the S^X server, which includes creating a local data storage, SSL certificate, and default admin account. You will only need to answer a few basic questions!

In the example we assume the IP address of the first node is 192.168.1.101, the name of the cluster is "mycluster", and S^X was installed into `/opt/sx`. Also in some cases (eg. the path to S^X storage) we assume default values, however your mileage may vary.

```
# /opt/sx/sbin/sxsetup
```

--- SKYLABE SX CONFIGURATION SCRIPT ---

The script will help you to create or extend a Skylable SX data cluster.

--- CLUSTER NAME ---

Clients will access your cluster using a `sx://clustername/volume/path` URI. It is recommended to use a FQDN for clustername, but not required. Refer to the documentation for more info.

Enter the cluster name (use the same across all nodes) []: **mycluster**

--- DATA STORAGE ---

Please provide the location where all incoming data will be stored.

Path to SX storage [default=/opt/sx/var/lib/sxserver]: **<confirm default>**

Please specify the maximum size of the storage for this node. You can use M, G and T suffixes, eg. 100T for 100 terabytes.

Maximum size [default=1T]: **500G**

--- NODE ADDRESS ---

Enter the IP address of this node [default=192.168.1.101]:

<confirm default>

Checking port 80 on 192.168.1.101 ... OK

Checking port 443 on 192.168.1.101 ... OK

--- CLUSTER CONFIGURATION ---

Is this (192.168.1.101) the first node of a new cluster?

(Y/n)[default=y] **<confirm default>**

--- SSL CONFIGURATION ---

Generating default SSL certificate and keys in

/opt/sx/etc/ssl/private/sxkey.pem /opt/sx/etc/ssl/certs/sxcert.pem

Generating a 2048 bit RSA private key

.....+++

.....+++

writing new private key to '/opt/sx/etc/ssl/private/sxkey.pem'

--- YOUR CHOICES ---

Cluster: `sx://mycluster`

Node: `192.168.1.101`

Storage: `/opt/sx/var/lib/sxserver`

Run as user: `nobody`

Is this correct? (Y/n)[default=Y] **<confirm default>**

--- CLUSTER INITIALIZATION ---

```
Initializing storage (hashfs):
+ /opt/sx/sbin/sxadm node --new --batch-mode --run-as=nobody:nogroup /
  opt/sx/var/lib/sxserver/data
[runas]: Switched to nobody:nogroup (65534:65534)
+ /opt/sx/sbin/sxadm cluster --new --batch-mode --node-dir=/opt/sx/var/
  lib/sxserver/data --ssl-ca-file=/opt/sx/etc/ssl/certs/sxcert.pem
  500G/192.168.1.101 sx://mycluster
Starting SX.fcgi
[runas]: Switched to nobody:nogroup (65534:65534)
Starting sxhttpd
SX node started successfully
[runas]: Switched to nobody:nogroup (65534:65534)
HashFS Version: WiPfs 2.0
Cluster UUID: 01dca714-8cc9-4e26-960e-daf04892b1e2
Cluster authentication: CLUSTER/ALLNODE/ROOT/
  USERwBdjfz3tKcnTF2ouWIKTipreYuYjAAA
Admin key: 0DPiKuNlrrVmD8IUCuw1hQxNqZflkCY+oKwxi5zHSPn5y0SOi3IMawAA
Internal cluster protocol: SECURE
Used disk space: 17568768
Actual data size: 463872
List of nodes:
    * ec4d9d63-9fa3-4d45-838d-3e521f124ed3 192.168.1.101
      (192.168.1.101) 536870912000
```

--- CONFIGURATION SUMMARY ---

```
SSL private key (/opt/sx/etc/ssl/private/sxkey.pem):
-----BEGIN PRIVATE KEY-----
MIIEvAIBADANBgkqhkiG9w0BAQEFAASCBywggSiAgEAAoIBAQCYNdtHyNgIHZQ8
vaO1HJWtZ/ eerB2H80XyQTZpDFRS87qGUNcrRudDN09EypcueXaW1UN/3L8KKn7t
tGhLe6quG8QuKw//UiJDDGTDEICOnDtYfBh07zNR9zgaQRi9loqQB6Iqfe4K/T9F
EONMjVji1OF5JI/3SgxEDwoQ4+1eghDuMGMEIzJ4VJCojXhiEtvwo1ZruFX+Xogd
rq4Ys6Pch7n9FowdOc2n+IRxPXB6CqnHC1t9AKEBmbaoP+0zhM8ZFCl3WFRChvb
JF8T9ZZ5q3nol668NILNN1f4RRRe07+pb9ubfWqNABhul5hQUnG81wKjclzWK4HZ
+3bMwg6PAgMBAAECggEAQ+fTGmV6OKTHm4mnXYeRjzm4+SskSaC41elOEvoTMybV
UIMCi6YoSo6EaNZROESsKYKfi129FRX8ZqQT24kijmaI0WgYzPmh3QOCBB2qim2
z/UdHB4TMUAv4ValaP+edb9SE872wiRVc8SjA2YT/66loNw09kgszLhA72QgZAbG
xmxVwCnTRFd7dg4Wmy1OQz3YVOnLC3Qs8C8LoGoO0Mci85quhBUw9s7J12skXGbu
ZGDtpJylgtwfc1q7nojaFkWenGCA9D1HB8zCqKPKhMh+HtA26g8VdFaHPVBzw/pz
avv5r9gLnBETwHfM3XuIYv7h3wowE5uAKVhgvL8w0QKBgQDJs2avbYOWgcEEO7L
nPRqmb5XjJE329KsYlzo4YwOrZDjQXSyrBjifoBIJzURedDB7ww5lt0Xy3MExeS4
ngL0/oWotjd7jGU+EdABozKwW3bZuyUTSqTeQJwo+aIhjNtiyMrnpFy3vjYrJKGy
W/9cnv1WjxqpqnQgDjE/yJt36wKBgQDBL7p7iCWJlf+LH1/caFgPchJENd4YZZrB
bhGA/tuo6VtJcarc/Etx3DGBKhJq13LxRRLjyHlPhw/k7oZBdaVK271+vNfw5Lj
c2KZCYbFnF3kbP5ryuMW0QqGbkZZ/FEzxwgFyAOuUcTW9L2VmKtPgbP9ywDTJc0Z
Jq/pdzOe7QKBGFOPxn4dvvIH4DgQlk9+2yMcgoduFw5EcC6bQVeXtrCf7elVzTdG
q0vHjQ5gtPJ6GD9ZGIlKusqT6TGhpC2v3SoiKO7CJmFo6tXELbOALhZY2gOWTNqj
```

```
q59EzYFxin7AHn/rKb7Lvmm4zF844pII77NLf2nX5EwwF9r0CBmc7F/hAoGAUctH
ha4rYVqu9PY3pU/U6rUmRTFqEa8s1FLD/bYQjgrcnkyAsa/msHELxIwQPbRi8kx
wpwjmdAmXbTKgnW6WQY+rdGy4cUImEzuXiVubpS6HFEZl8IbTDnN3wUpvEfciN5D
Y09AVONyoKK+8mvlfJBKCRa+jqfeotuCd7MEpDECgYAhWcDt6aXSsUOtq+jgVNtC
oi9Cnm4FNW7Z/VVgCCRFlwHxpqqAau63/naSGxkLUlK+U0StReiLC2D4FPrqs9Jh
scUH9hTIp3hxwznZBRFkuvUOm3h6CwQ0t3km7AffLRsGQZ9EMlvNb4T5mR/Izgxxy
smcEPJfJgX6lfx7c//bU6Q==
-----END PRIVATE KEY-----
```

SSL certificate (/opt/sx/etc/ssl/certs/sxcert.pem):

```
-----BEGIN CERTIFICATE-----
MIIDpzCCAo+gAwIBAgIJAAODcwKZHi35MA0GCSqGSIb3DQEBCwUAMDsxCAJBgNV
BAYTAkdCMQswCQYDVQQIEWJSzELMAkGA1UEChMCU1gxEjAQBgNVBAMTCW15Y2x1
c3RlcjAeFw0xNDAzMjExNDU2NTdaFw0xOTAzMjAxNDU2NTdaMDsxCAJBgNVBAYT
AkdCMQswCQYDVQQIEWJSzELMAkGA1UEChMCU1gxEjAQBgNVBAMTCW15Y2x1c3Rl
cjCCASlwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJg120f12CUdlDy9o7Uc
la1n956sHYfzRfjBNmkMVFLzuoZQ1ytG50M3T0TKly55dpbVQ3/cvwoqfu20aEt7
qq4bxC4rD/9SlkMMZMMQgl6d21h8GHTvM1H3OBpBGL2WipAHoip97gr9P0UQ40yN
WOLU4Xkkj/dKDEQPChDj7V6CEO4wYwSXMnhUkKiNeGIS2/CjVmu4Vf5eiB2urhiz
o9yHuf0WjB05zaf4hHE9cpvoKqccLW30AoQGZtqg/7TOEzXkUKXdYVEKG9skXxP1
lnmreeiXrrw0gs03V/hFF7Tv6lv25t9ao0AGG4jmFBScbzXAqNwjONYrgdn7dszC
Do8CAwEAAaOBrTCBqjAdBgNVHQ4EFgQUs7Zs8qeEtPdNQ7l3zs3f2v+MTTrswawYD
VR0jBGQwYoAUs7Zs8qeEtPdNQ7l3zs3f2v+MTTruhP6Q9MDsxCAJBgNVBAYTAkdC
MQswCQYDVQQIEWJSzELMAkGA1UEChMCU1gxEjAQBgNVBAMTCW15Y2x1c3RlcjAe
AODcwKZHi35MA8GA1UdEwEB/wQFMAMBAf8wCwYDVROPAQDAgEGMA0GCSqGSIb3D
QEBCwUAA4IBAQBQBGwoULuHM5svPvV7c0tdsBmxovrhCYkMg4MwtPJ8eJQckyrCP3
fiU1VMXXeHKegaZ4q3QzIV9DDO1XB9TzifZ8yKm7a2/NIUnvgLQCGu82H/226YLE
abqoipcJsAANo5+2qGYEmYDODmLOnToaCX5bcmbLc1tcG4uf/x88O+PGLgh/h5+9
MUMlffyJWAE5eJN1rk9T5k0Onm5PElQLP/ZQecodHGL9Xxzgj09kLfwBmUruGu/
ft4Ru0oOrQDIDWxQuiBitawQKX/tyaGkpX+g38gyFwDiPINo2q/IHeckX5EHgF3
YGgPNaWwBnH3jfsJ/kMXcJS52q/zPOlvUCz0
-----END CERTIFICATE-----
```

```
Cluster: sx://mycluster
This node: 192.168.1.101
HashFS Version: WiPfs 2.0
Cluster UUID: 01dca714-8cc9-4e26-960e-daf04892b1e2
Cluster authentication:
CLUSTER/ALLNODE/ROOT/USERwBdjfz3tKcnTF2ouWIKtipreYuYjAAA
Admin key: 0DPiKuNIrrVmD8IUCuw1hQxNqZflkCY+oKwxi5zHSPn5y0SOi3IMawAA
Internal cluster protocol: SECURE
Used disk space: 17568768
Actual data size: 463872
List of nodes:
    * ec4d9d63-9fa3-4d45-838d-3e521f124ed3 192.168.1.101
      (192.168.1.101) 536870912000
Storage location: /opt/sx/var/lib/sxserver
Run as user: nobody
Sockets and pidfiles in: /opt/sx/var/run/sxserver
Logs in: /opt/sx/var/log/sxserver/sxfcgi.log
```

--- END OF SUMMARY ---

Congratulations, the new node is up and running!
You can control it with `'/opt/sx/sbin/sxserver'`

You can add a new node to the cluster by running `'sxsetup'` on another server. When prompted, enter the `'admin key'`, `'SSL private key'` and `'SSL certificate'` printed above.

When the script finishes successfully, the node is already functional. Please notice the admin key listed at the end of the summary: it will be needed for both adding more nodes and accessing the cluster. You can always retrieve the admin key with the following command:

```
# /opt/sx/sbin/sxserver status
--- SX STATUS ---
sx.fcgi is running (PID 14394)
sxhttpd is running (PID 14407)

--- SX INFO ---
Cluster name: mycluster
HashFS Version: WiPfs 2.0
Cluster UUID: 01dca714-8cc9-4e26-960e-daf04892b1e2
Cluster authentication: CLUSTER/ALLNODE/ROOT/
USERwBdjfz3tKcnTF2ouWIKTipreYuYjAAA
Admin key: 0DPiKuNIrrVmD8IUCuw1hQxNqZflkCY+oKwxi5zHSPn5y0SOi3IMawAA
Internal cluster protocol: SECURE
Used disk space: 17568768
Actual data size: 463872
List of nodes:
    * ec4d9d63-9fa3-4d45-838d-3e521f124ed3 192.168.1.101
      (192.168.1.101) 536870912000
Storage location: /opt/sx/var/lib/sxserver/data
SSL private key: /opt/sx/etc/ssl/private/sxkey.pem
SX Logfile: /opt/sx/var/log/sxserver/sxfcgi.log
```

That's it - your SX storage is already up and running! You can now go to the next step and add more nodes or go to the next chapter and learn how to perform basic client operations.

ADDING MORE NODES

Follow these steps to add a new node to the cluster:

- Run 'sxserver status' on one of the nodes of the cluster
- Collect the following information:
 - Cluster name
 - Admin key
 - One of the IP addresses from the list of nodes
 - The content of the SSL private key file (not the path itself!)
- Compile and install S^X with `./configure --prefix=/opt/sx && make install`
- Run `/opt/sx/sbin/sxsetup` and provide the collected information. Below we assume the new node is 192.168.1.102 and it's size is 250 GBs.

```
# /opt/sx/sbin/sxsetup
--- SKYLABLE SX CONFIGURATION SCRIPT ---

The script will help you to create or extend a Skylable SX data
cluster.

--- CLUSTER NAME ---

Clients will access your cluster using a sx://clustername/volume/path
URI. It is recommended to use a FQDN for clustername, but not
required. Refer to the documentation for more info.
Enter the cluster name (use the same across all nodes) []: mycluster

--- DATA STORAGE ---

Please provide the location where all incoming data will be stored.
Path to SX storage [default=/opt/sx/var/lib/sxserver]: <confirm default>

Please specify the maximum size of the storage for this node. You can
use M, G and T suffixes, eg. 100T for 100 terabytes.
Maximum size [default=1T]: 250G

--- NODE ADDRESS ---

Enter the IP address of this node [default=192.168.1.102]:
<confirm default>
Checking port 80 on 192.168.1.102 ... OK
```

Checking port 443 on 192.168.1.102 ... OK

--- CLUSTER CONFIGURATION ---

Is this (192.168.1.102) the first node of a new cluster?

(Y/n)[default=y] **n**

Please provide the IP address of a working node in 'mycluster'.

IP address: **192.168.1.101**

The admin key is required to join the existing cluster.

If you don't have it, run 'sxserver status' on 192.168.1.101.

Below you can provide the key itself or path to the file containing the key.

Admin key or path to key-file:

0DPiKuNIrrVmD8IUCuw1hQxNqZflkCY+oKwxi5zHSPn5y0SOi3IMawAA

--- SSL CONFIGURATION ---

Please paste the SSL private key below (and press CTRL+D when done) or provide a path to it.

SSL private key:

<paste private key from 192.168.1.101 and press CTRL+D>

-----BEGIN PRIVATE KEY-----

MIIEvAIBADANBgkqhkiG9w0BAQEFAASCBywggSiAgEAAoIBAQCYNdtHyNglHZQ8
vaO1HJWtZ/eerB2H80XyQTZpDFRS87qGUNcrRudDN09EypcueXaW1UN/3L8KKn7t
tGhLe6quG8QuKw//UijDDGTDEICOntYfBh07zNR9zgaQRi9loqQB6lqfe4K/T9F
EONMjVji1OF5JI/3SgxEDwoQ4+1eghDuMGMElZJ4VJCojXhiEtvwo1ZruFX+Xogd
rq4Ys6Pch7n9FowdOc2n+IRxPXKb6CqnHC1t9AKEBmbaoP+0zhM8ZFCI3WFRChvb
JF8T9ZZ5q3nol668NILNN1f4RRRe07+pb9ubfWqNABhul5hQUnG81wKjclzjWK4HZ
+3bMwgg6PAgMBAECCgGAQ+fTGmV6OKTHm4mnXYeRjzm4+SskSaC41elOEOTMybV
UIMCi6YoSo6EaNZROESsKYKfiL29FRX8ZqQT24kijmaI0WgYzPmhm3QOCBB2qim2
z/UdHB4TMUAv4ValaP+edb9SE872wiRVc8SjA2YT/66loNw09kgszLhA72QgZAbG
xmxVwCnTRFd7dg4Wmy1OQz3YVOnlC3Qs8C8LoGoO0Mci85quhBUw9s7J12skXGbu
ZGDtpJylgtwfc1q7nojaFkWenGCA9D1HB8zCqKPKhMh+HtA26g8VdFaHPVBzw/pz
avv5r9gLnBETwHfM3XuIYv7h3wowE5uAKVhgvL8w0QKBgQDJs2avbYOWgcEEOf7L
nPRqmb5XjJE329KsyIzo4YwOrZDjQXSYrBjifoBIJzUREDDb7ww5lt0Xy3MExeS4
ngL0/oWotjd7jGU+EdABozKwW3bZuyUTSqTeQJwo+alhJNtiyMrnpFy3vjYrJKGy
W/9cnv1WjxqpqnQgDjE/yJt36wKBgQDBL7p7iCWJlf+LH1/caFgPchJENd4YZZrB
bhGA/tuo6VtJcarc/Etx3DGBKhNjQ13LxRRLjyHlPhw/k7oZBdaVK27I+vNfw5Lj
c2KZCYbFnF3kbP5ryuMW0QqGbkZZ/FEExzwgFyAOuUcTw9L2VmKtPgbP9ywdTJc0Z
Jq/pdzOe7QKBgFOPxn4dvIH4DgQlk9+2yMcgoduFw5EcC6bQVeXtrCf7elVzTdG
q0vHjQ5gtPJ6GD9ZGikKusqT6TGhpC2v3SoiKO7CJmFo6tXELbOALhZY2gOWTNqj
q59EzYFxin7AHn/rKb7Lvmm4zf844plI77NLf2nX5EwwF9r0CBmc7F/hAoGAUctH
ha4rYVqv9PY3pU/U6rUmRTFqEa8s1FLD/bYQjgrcnkyAsa/msHELxIwQPbRi8kx
wpwjmndAmXbIKgnW6WQY+rdGy4cUImEzuXiVubpS6HFEZl8IbTDnN3wUpvEfciN5D
Y09AVONyoKK+8mvlfJBKCRa+jqfeotuCd7MEpDECgYAhWcDt6aXsSUotq+jgVNtC
oi9Cnm4FNW7Z/VVgCCRFIwHxpqqAAu63/naSGxkLUiK+U0StReiLC2D4FPrqs9Jh
scUH9hTIp3hwxznZBRFkuvUOm3h6CwQ0t3km7AffLRsGQZ9EMlvNb4T5mR/Izgyx
smcEPJfjgX61fx7c//bU6Q==

-----END PRIVATE KEY-----

Successfully obtained SSL certificate from 192.168.1.101

--- YOUR CHOICES ---

Cluster: sx://mycluster

Node: 192.168.1.102

Storage: /opt/sx/var/lib/sxserver

Run as user: nobody

Is this correct? (Y/n) [default=Y] <confirm default>

--- CLUSTER INITIALIZATION ---

Initializing storage (hashfs):

```
+ /opt/sx/sbin/sxadm node --new --batch-mode --run-as=nobody:nogroup --
  cluster-uuid=01dca714-8cc9-4e26-960e-daf04892b1e2 --key=/opt/sx/var
  /lib/sxserver/cluster.key /opt/sx/var/lib/sxserver/data
```

[runas]: Switched to nobody:nogroup (65534:65534)

Starting SX.fcgi

[runas]: Switched to nobody:nogroup (65534:65534)

Starting sxhttpd

SX node started successfully

```
+ /opt/sx/sbin/sxadm cluster --mod 536870912000/192.168.1.101/ec4d9d63
  -9fa3-4d45-838d-3e521f124ed3 250G/192.168.1.102 sx://mycluster
```

[runas]: Switched to nobody:nogroup (65534:65534)

HashFS Version: WiPfs 2.0

Cluster UUID: 01dca714-8cc9-4e26-960e-daf04892b1e2

Cluster authentication:

CLUSTER/ALLNODE/ROOT/USERwBdjfz3tKcnTF2ouWikTipreYuYjAAA

Admin key: 0DPiKuNirrVmD8IUCuw1hQxNqZflkCY+oKwxi5zHSPn5y0SOi3IMawAA

Internal cluster protocol: SECURE

Used disk space: 17568768

Actual data size: 463872

List of nodes:

```
- ec4d9d63-9fa3-4d45-838d-3e521f124ed3 192.168.1.101
  (192.168.1.101) 536870912000
* 02e01f5d-80d8-4a01-b1f7-a56eecb8aef5 192.168.1.102
  (192.168.1.102) 268435456000
```

--- CONFIGURATION SUMMARY ---

SSL private key (/opt/sx/etc/ssl/private/sxkey.pem):

-----BEGIN PRIVATE KEY-----

```
MIIIEvAIBADANBgkqhkiG9w0BAQEFAASCBywggSiAgEAAoIBAQCYNdtHyNglHZQ8
vaO1HJWtZ/ eerB2H80XyQTZpDFRS87qGUNcrRudDN09EypcueXaW1UN/3L8KKn7t
tGhLe6quG8QuKw// UijDDGTDEICondtYfBh07zNR9zgaQRi9loqQB6lqfe4K/T9F
EONMjVji1OF5JI/3SgxEDwoQ4+1eghDuMGMEIzJ4VJCojXhiEtvwo1ZruFX+Xogd
rq4Ys6Pch7n9FowdOc2n+IRxPXKb6CqnHC1t9AKEBmbaoP+0zhM8ZFCl3WFRChvb
```

JF8T9ZZ5q3nol668NILNN1f4RRe07+pb9ubfWqNABhul5hQUnG81wKjclzjWK4HZ
+3bMwg6PAgMBAACgEAQ+fTGmV6OKTHm4mnXYeRjzm4+SskSaC41eIOEvOTMybV
UIMCi6YoSo6EaNZROESsKYKfiL29FRX8ZqQT24kijmaIOWgYzPmhm3QOCBB2qim2
z/UdHB4TMUAv4ValaP+edb9SE872wiRVc8SjA2YT/66loNw09kgszLhA72QgZAbG
xmxVwCNTRFd7dg4Wmy1OQz3YVOnlC3Qs8C8LoGoO0Mci85quhBUw9s7J12skXGbu
ZGDtpJylgwtfc1q7nojaFkWenGCA9D1HB8zCqKPKhMh+HtA26g8VdFaHPVBzw/pz
avv5r9gLnBETwHfM3XuIYv7h3wowE5uAKVhgvL8w0QKBgQDJs2avbYOWgcEEOf7L
nPRqmb5XjJE329KsYLzo4YwOrZDjQXSYrBjifoBIJzUReDDb7ww5lt0Xy3MExeS4
ngL0/oWotjd7jGU+EdABozKwW3bZuyUTSqTeQJwo+aIhjNtiyMrnpFy3vjYrJKGy
W/9cnv1WjxqpqnQgDJE/yJt36wKBgQDBL7p7iCWjIf+LH1/caFgPchJENd4YZZrB
bhGA/tuo6VtJcarc/Etx3DGbKhnJq13LxRRLjyHlPhw/k7oZBdaVK271+vNfw5Lj
c2KZCYbFnF3kbP5ryuMW0QqGbkZZ/FEzswgFyAOuUcTw9L2VmKtPgbP9ywDTJc0Z
Jq/pdzOe7QKBgFOpxn4dvIH4DgQlk9+2yMcgoduFw5EcC6bQVeXtrCf7eIVzTdG
q0vHjQ5gtPJ6GD9ZGikKusqT6TGhpC2v3SoiKO7CJmFo6tXELbOALhZY2gOWTNqj
q59EzYFxin7AHn/rKb7Lvmm4zf844plI77NLf2nX5EwwF9r0CBmc7F/hAoGAUctH
ha4rYVquv9PY3pU/U6rUmRTfQeA8s1FLD/bYQjgrcnkyAsa/msHELxIwQPbRi8kx
wpwjmndAmXbIKgnW6WQY+rdGy4cUImEzuXiVubpS6HFEZl8IbTDnN3wUpvEfciN5D
Y09AVONyoKK+8mvlfJBKCRa+jqfeotuCd7MEpDECgYAhWcDt6aXsUOtq+jgVNtC
oi9Cnm4FNW7Z/VVgCCRFIwHxpqqAau63/naSGxkLUiK+U0StReiLC2D4FPrqs9Jh
scUUh9hTIp3hxwznZBRFkuvUOm3h6CwQ0t3km7AffLRsGQZ9EMlvNb4T5mR/Izgyx
smcEPJfJgX61fx7c//bU6Q==
-----END PRIVATE KEY-----

SSL certificate (/opt/sx/etc/ssl/certs/sxcert.pem):

-----BEGIN CERTIFICATE-----

MIIDPzCCAo+gAwIBAgIJAAODcwXKZHi35MA0GCSqGSIb3DQEBCwUAMDsx CzAJBgNV
BAYTAkdCMQswCQYDVQQIEwJV SzELMAkGA1UEChMCU1gx EjaQBGNVBAMTCW15Y2x1
c3RlcjAeFw0xND AzMjExNDU2NTdaFw0xOTAzMjAxNDU2NTdaMDsx CzAJBgNVBAYT
AkdCMQswCQYDVQQIEwJV SzELMAkGA1UEChMCU1gx EjaQBGNVBAMTCW15Y2x1c3Rl
cjCCASIWdQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBAJg120f12CUdlDy9o7Uc
la1n956sHYfzRfjBNmkMVFLzuoZQ1ytG50M3T0TKly55dphVQ3/cvwoqfu20aEt7
qq4bx C4rD/9SikMMZMMQgJ6d21h8GHTvM1H3OBpBGL2WipAHoip97gr9P0UQ40yN
WOLU4Xkkj/dKDEQPChDj7V6CEO4wYwSXMnhUkKiNeGIS2/CjVmu4Vf5eiB2urhiz
o9yHuf0WjB05zaf4hHE9cpvoKqccLW30AoQGZtqg/7TOEzXkUKXdYVEKG9skXxP1
lnmreeiXrrw0gs03V/hFF7Tv6lv25t9ao0AGG4jmFBScbzXAqNwjONYrgdn7dszC
Do8CAwEA AaOBrTCBqjAdBgNVHQ4EFgQU s7Zs8qeEtPdNQ7l3zs3f2v+MTrswawYD
VR0jBGQwYoAUs7Zs8qeEtPdNQ7l3zs3f2v+MTruhP6Q9MDsx CzAJBgNVBAYTAkdC
MQswCQYDVQQIEwJV SzELMAkGA1UEChMCU1gx EjaQBGNVBAMTCW15Y2x1c3RlcjA
AODcwXKZHi35MA8GA1UdEwEB/wQFMAMBAf8wCwYDVRO PBAQDAgEGMA0GCSqGSIb3
DQEBCwUAA4IBAQB GwoULuHM5svPvV7c0tdsBmxovrhCYkMg4MwtPJ8eJQckyrCP3
fIU1VMXXeH KegaZ4q3QzIV9DDO1XB9TzifZ8yKm7a2/NIUnvgLQCGu82H/226YLE
abqoipcJsAANo5+2qGYEmYDODmLOnToaCX5bcmbLc1tcG4uf/x88O+PGLgh/h5+9
MUUMlfyJWAE5eJN1rk9T5k0Onm5PElQLP/ZQecodHGL9Xxzgj09kLfwBmRmUruGu/
ft4Ru0oOrQDIDWxQuiBitawQKX/tyaGkpX+g38gyFwDiPINo2q/IHeckX5EHgF3
YGgPNaWwBnH3jfsj/kMXcJS52q/zPOIvUCz0

-----END CERTIFICATE-----

Cluster: sx://mycluster

```
This node: 192.168.1.102
HashFS Version: WiPfs 2.0
Cluster UUID: 01dca714-8cc9-4e26-960e-daf04892b1e2
Cluster authentication: CLUSTER/ALLNODE/ROOT/
                        USERwBdjfz3tKcnTF2ouWIKTipreYuYjAAA
Admin key: 0DPiKuNIrrVmD8IUCuw1hQxNqZfIkCY+oKwxi5zHSPn5y0SOi3IMawAA
Internal cluster protocol: SECURE
Used disk space: 17568768
Actual data size: 463872
List of nodes:
  - ec4d9d63-9fa3-4d45-838d-3e521f124ed3 192.168.1.101
    (192.168.1.101) 536870912000
  * 02e01f5d-80d8-4a01-b1f7-a56eecb8aef5 192.168.1.102
    (192.168.1.102) 268435456000
Storage location: /opt/sx/var/lib/sxserver
Run as user: nobody
Sockets and pidfiles in: /opt/sx/var/run/sxserver
Logs in: /opt/sx/var/log/sxserver/sxfcgi.log

--- END OF SUMMARY ---
Congratulations, the new node is up and running!
You can control it with '/opt/sx/sbin/sxserver'

You can add a new node to the cluster by running 'sxsetup' on another
server. When prompted, enter the 'admin key', 'SSL private key' and
'SSL certificate' printed above.
```

The node successfully joined the cluster - at the end of the summary you can see the current list of nodes in the cluster. Repeat the same steps to add more nodes to the cluster.

CLIENT OPERATIONS

ACCESSING THE CLUSTER

To access the cluster you need to have credentials for an existing account. In this example we will use the default admin account created during cluster setup. The following command sets up the admin access to the S^X cluster "mycluster" for the client tools. Because "mycluster" is not a DNS name, we need to point `sxinit` to one of the nodes of the cluster. It will automatically discover the IP addresses of the other nodes. After the initialization you can access the cluster just as "mycluster", without specifying any IP address.

```
$ ./sxinit -l 192.168.1.101 sx://admin@mycluster
Warning: self-signed certificate:

    Subject: C=GB, ST=UK, O=SX, CN=mycluster
    Issuer: C=GB, ST=UK, O=SX, CN=mycluster
    SHA1 Fingerprint: 84:EF:39:80:1E:28:9C:4A:C8:80:E6:56:57:A4:CD
                      :64:2E:23:99:7A

Do you trust this SSL certificate? [y/N] y
Trusting self-signed certificate
Please enter the user key:
ODPiKuNIrrVmD8IUCuw1hQxNqZflkCY+oKwxi5zHSPn5y0SOi3IMawAA
```

S^X allows creating additional users of your choice and assigning them appropriate privileges. In this Quick Start Guide we will only use the default admin account, though.

Please refer to `sxACL useradd --help` on how to add new users to the cluster.

CREATING NEW VOLUMES

Volumes are logical partitions of the S^X storage assigned to particular groups of users. What you need to know about volumes at this point is that their names need to be unique across the entire cluster, and you can create special volumes by enabling data processing filters. For example, the filters allow you to create volumes, which can be transparently encrypted, compressed, or preserve file attributes. The tool to manage volumes is named "sxvol". Here we show how to list available filters and create a client-side encrypted volume "mydata" owned by the admin user.

```
$ /opt/sx/bin/sxvol filter --list
Name          Ver    Type          Full name
-----
null          1.1    generic       Null Filter
zcomp         0.2    compress      Zlib Compression Filter
aes256        1.0    crypt         Encrypt data using AES-256
attribs       1.1    generic       File Attributes
$ /opt/sx/bin/sxvol create --filter=aes256 --owner=admin --replica=2
sx://admin@mycluster/mydata
aes256: Enter encryption password:
aes256: Re-enter encryption password:
```

WORKING WITH FILES

S^X provides easy to use file tools, which resemble typical UNIX commands. Below we show how to upload a file to the 'mydata' volume, display it, and list files in the volume.

```
$ echo Hello World! > /tmp/hello.txt
$ sxcp /tmp/hello.txt sx://admin@mycluster/mydata/
Overall: 0.000MB transferred @0.00MB/s
Uploaded blocks: total 1, unique 1, requested 1, transferred 1
- speed 0.34MB/s
Downloaded blocks: total 0, unique 0, requested 0, transferred 0
- speed 0.00MB/s
$ sxcat sx://admin@mycluster/mydata/hello.txt
Hello World!
$ sxls sx://admin@mycluster/mydata/
```

```
sx://admin@mycluster/mydata/hello.txt  
$ srm sx://admin@mycluster/mydata/hello.txt  
Deleted 1 file(s)
```

Use `sxcp -r` to recursively upload directories to S^X. Every tool comes with a help page, which is invoked with `--help`.