ZMailer — A Different Kind of MTA

Matti Aarnio <*matti.aarnio@sonera.fi*>

ZMailer — A Different Kind of MTA

A presentation of ZMailer for FUUG at SEA 2000 conference

FUUG = Finnish Unix User Group

SEA = The baltic sea; cruising from Helsinki to Stockholm, and back

Matti Aarnio, 15-Sep-2000

The overlays and notes are supplementary material, which supports the mainline slides. (Page numbers at low right corner have a hyphen in them.)

Note: When viewing this with XPDF (0.90 or 0.91), few TEX fonts will be invisible. Adobe AcroReader 4.0 is able to show those fonts. (Mainly these are less-than and greater-than glyphs around email addresses in baseline text.)

A bit of History

$ZMailer$ was created at *University of Toronto* around 1986 by Mr. *Rayan Zachariassen* (hence the “Z” in the name.)

Back then the king of the hillock was (and still is) *sendmail(8)*, but it was troubled with lots and lots of security problems.

The *sendmail(8)* is also a resource consumption pig – having same process do message collection, and its final delivery may make sense in low-load environments, but with high volumes use of queues is a must.

A bit more of History

Rayan went to private sector around 1992, and ZMailer development was essentially abandoned by him.

Since then, yours truly has been hacking at it developing all kinds of extensions for modern Internet email.

Introduction to the Terminology

In the 1970'es the *Institute for Federal Information Processing* defined terminology for then a new thing: email. The terminology was made more popular by X.400 standard from 1984.

MTA: Mail Transfer Agent – program to move mail from one system to other.

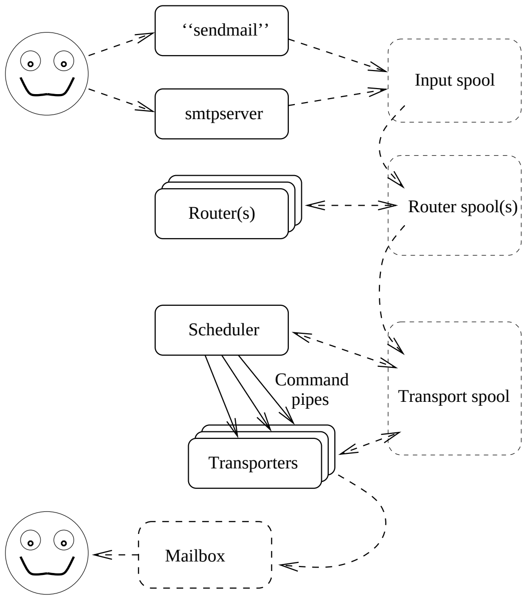
MDA/LDA: A latter addition; Message/Local Delivery Agent – program (subsystem) doing delivery to local message store/driving program agents/whatnot.

MS: Message Store – Standard UNIX mailbox, or something way more complicated like a database.

MUA: Mail User Agent – program which user uses to pick their email from the MS, read them, compose email, and submit to the care of the MTA.

UA: A generic X.400 term for the User Agent – basically software entity acting on message content, usually driven directly by the MTA without the message ever going via MS. (E.g. quite unlike MTA, compare with *vacation(1)*)

ZMailer structure

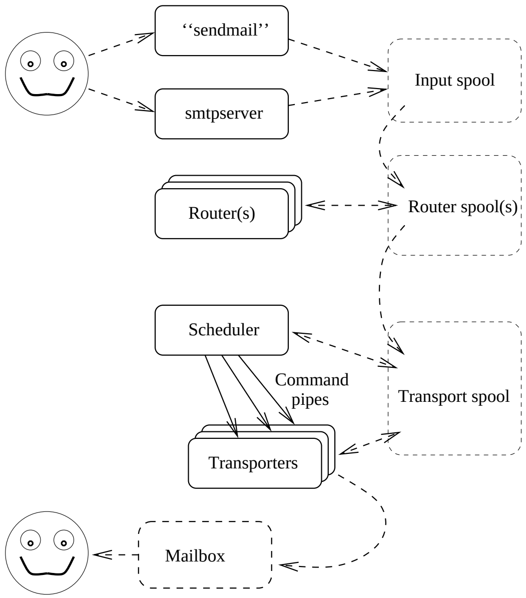


ZMailer consists of several main subsystems running in coordinated, although separate existence. This means also that any of the subsystems can be shut down for a while without harming other subsystem functionality.

The task-transfer in between the subsystems is done via the filesystem – "*spool*". Performance of this filesystem is usually the ultimate system throughput limit.

There are no suid-anything programs in this system!

ZMailer structure



Input subsystems: *sendmail, smtpserver, rmail, mail(3)* library

Routing subsystem: *router*

Delivery subsystem: *scheduler,* and *transport agents*

Plus a set of administrative tools.

The goal has been that each subsystem uses minimal possible amount of resources (memory, CPU, syscalls), and privileges to achieve its task.

There are also resource usage limitation features built in.

ZMailer subsystems: "`$POSTOFFICE/`"

The `$POSTOFFICE/` is ZMailer's way of referring to filesystem where a few basic things are guaranteed to happen:

1. moving files around with *rename(2)* and/or *link(2),* and *unlink(2)* works just fine in between different directories

2. i-node numbers are preserved over *rename(2)*, and *link(2)* system calls

There are filesystems where these two things don't happen, e.g. possibly *link(2)* can't be done in between directories. Such ones are not suitable for ZMailer's `$POSTOFFICE/` partition use.

ZMailer subsystems: *“sendmail”*

For normal local system use there needs to be a well-known submission interface for email. The de-facto one is *sendmail.*

ZMailer’s *sendmail* implements most of message submission options of the real *sendmail(8).*

Many of *sendmail(8)* options are meaningless in ZMailer, and thus they are ignored, or in case of several administrative functions, start subsystems in interactive test mode and/or just plain complain loudly.

For message submission, ZMailer’s *sendmail* is extremely *lightweight* one. Just writing the message envelope and message to the file, and moving it to *router* subsystem’s care.

ZMailer subsystems: *“sendmail”*

In normal message submission the *sendmail* will just spool the message into `$POSTOFFICE/router/`, however if option *“-v”* is used, process is left behind to poll a message specific “verbose trace” log file, and its content is copied to STDERR of the process.

The verbose trace copy process ends when the *scheduler* process writes a line:

```
scheduler done ....
```

to the log file.

ZMailer’s *sendmail* is just message submission interface, like also the *smtpserver*, and *libzmailer.a* contained *mail(3).*

ZMailer subsystems: *“smtpserver”*

- about features

- about hooks to external subsystems

- about protocol quirks

ZMailer subsystems: *"smtpserver"* (2)

ESMTP RFC's	
1425/1651/2045	EHLO framework
1426/1652	8BITMIME
1427/1653/1870	SIZE
1830	CHUNKING
1854/2197	PIPELINING
1891	Delivery Status Notification
1985	ETRN
2034	ENHANCEDSTATUSCODES
2476	Message Submission Agent
2487	STARTTLS
2554+MS	AUTH LOGIN
2554+Netscape	AUTH=LOGIN
2852	DELIVERBY

ZMailer's *smtpserver* subsystem implements a rich set of enhanced SMTP features defined over the last 10 or so years.

At the same time it aims to be lightweight, fast protocol receiver with ability to quickly verify incoming protocol stream syntax conformance, but it can also be configured to behave sloppily in this regard.

ZMailer subsystems: *“smtpserver”* (3)

The *smtpserver* can do interactive routing analysis of *MAIL FROM:* and *RCPT TO:* phase envelope addresses by running a router process synchronously underneath itself, however that is seriously heavy-weight thing, and really taxes system performance for no practically useful thing.

A more useful approach is simply to do SMTP MX/A routing rules analysis of source and destination envelope addresses, with some control rules from a few local database files giving the system an idea of which domains are local, and which are rules for finding which domains are our customers.

ZMailer subsystems: *“smtpserver”* (4)

There are also some experimental hooks to run external message content analysis program for each received message synchronous for the message reception.

A non-experimental thing is STARTTLS encrypted application mode implemented with OpenSSL library. ZMailer has been used as one of comparison benchmarks for *sendmail(8)*’s new STARTTLS functionality.

Session encryption was mainly implemented for giving some peace of mind when using plaintext password authentication for email sending.

ZMailer subsystems: *“smtpserver”* (5)

As much as I would like to run things with strict protocol adherence also at message reception, the world seems to be full of crappy systems whose coders have done several basic mistakes:

- SMTP protocol replies can be multiline all the time (RFC 821 Annex E), many softwares groak when receiving such replies.

- SMTP protocol replies can arrive in multiple TCP segments (some MS platform software does not do proper line segment collection into lines, and instead expects the receive return entire line(s) at one go.)

ZMailer’s smtpserver defaults to one-line replies sent out in one block. (Except with PIPELINING optimization.)

ZMailer subsystems: *“smtpserver”* (6)

- “*The theory of SMTP reply codes*” (RFC 821 Annex E) tells that if exact code is not known (e.g. new non-821-listed ones are invented), the first digit should guide its interpretation. Many systems barf completely when they encounter unexpected reply code.

  ZMailer’s smtpserver tries to use only “*valid at the place*” reply codes.

ZMailer subsystems: *“smtpserver”* (7)

- RFC 821 has quite clear BNF production rules for the protocol syntax, and still lots of clients are sending “MAIL FROM: user@domain” without the mandatory $<$ and $>$ angle brackets.

  ZMailer’s smtpserver **can** be configured to accept such **Sloppy** input protocol. (The *sendmail(8)* is the archetype of “sloppy by default” SMTP receive protocol implementation, and also the reason for these utterly sloppy client implementations.)

ZMailer subsystems: *“smtpserver”* (8)

- Many SMTP client systems can’t report accurately what protocol command they sent out when reporting to user an error they encountered while talking to the server.

  ZMailer’s smtpserver attempts to copy the MAIL FROM/RCPT TO address in the diagnostic report.

ZMailer subsystems: *“smtpserver”* (9)

- Many SMTP client systems give up the entire message when in a multi-recipient mail even one of the RCPT TO addresses is yielding 400 or 500 series reply.

  ZMailer does not yet have a solution for this kind of SMTP client stupidity. Many, if not all, user agents have this problem, as seem to have “MTA” class things like “ccMail”.

"smtpserver.conf"

```
#
# smtpserver.conf - autogenerated edition
#
#PARAM maxsize               10000000    # Same as -M -option
#PARAM min-availspace            5000    # Minimum free in POSTOFFICE after
#                                        # message has arrived; in KILOBYTES.
#PARAM max-error-recipients         3    # More than this is probably SPAM!
#PARAM MaxSameIpSource             10    # Max simultaneous connections
#                                        # from any IP source address
#PARAM MaxParallelConnections     800    # Max simultaneous connections
#                                        # in total to the server
#PARAM TcpRcvBufferSize         32000    # Should not need to set!
#PARAM TcpXmitBufferSize        32000    # Should not need to set!
#
#PARAM ListenQueueSize             10    # listen(2) parameter
#
#PARAM RcptLimitCount           10000    # Max number of recipients for one
#                                        # MAIL FROM session. Minimum: 100
```

"smtpserver.conf"

```
#PARAM BindPort                   25    # Binding port
#PARAM BindAddress         [0.0.0.0]    # Binding address - for multihomers..
#PARAM BindAddress       [IPv6.0::0]    # and here is for IPv6 - NO SPACES!
#
# Enables of some commands:
PARAM   DEBUGcmd
PARAM   EXPNcmd
PARAM   VRFYcmd
PARAM   enable-router   # This is a security decision for you.
#                       # This is needed for EXPN/VRFY and interactive
#                       # processing of MAIL FROM and RCPT TO addresses.
#                       # However it also may allow external user entrance
#                       # to ZMailer router shell environment with suitably
#                       # pervert input, if quotation rules are broken in
#                       # the scripts.
```

“smtpserver.conf”

```
PARAM   smtp-auth       # enable if you want to allow SMTP to authenticate
#                       # with the default code against system  /etc/passwd
#                       # (or whatever source  getpwnam() uses for it..)
#
PARAM  AUTH-LOGIN-also-without-TLS
#                       # Enable, if the "AUTH LOGIN" is to be allowed to
#                       # be used without running under SSL/TLS security
#                       # envelope.
#
#PARAM  MSA-mode        # Message Submission Agent mode. Require
#                       # successful user authentication during SMTP
#                       # sessions initiated from outside of the trusted
#                       # networks or the networks with relaying enabled
#                       # (see "fulltrustnet" and "relaycustnet" in
#                       # smtp-policy.src file).
#
PARAM   deliverby 60
#                       # RFC 2852 defined deliverby machinery.
```

"smtpserver.conf"

```
#PARAM  SMTP-auth-pipe /path/to/program
#                       # External authentication program. The
#                       # authenticator should read a username from
#                       # command line and a password from standard input.
#                       # Exit status 0 means successful authentication.
#
# Disablers of some facility advertisements
#PARAM  NoEHLO
#PARAM  NoPIPELINING
#PARAM  No8BITMIME
PARAM   NoCHUNKING
#PARAM  NoDSN
#PARAM  NoETRN
PARAM  no-multiline-replies # except to EHLO (Bloody M$ RFC821/AppE violators)
```

“smtpserver.conf”

```
# HDR220 metatags:
#  %% -- '%' character
#  %H -- SS->myhostname
#  %I -- '+IDENT' if 'identflg' is set
#  %V -- VersionNumb
#  %T -- curtime string
#  %X -- xlatelang parameter
#
#PARAM hdr220 %H ZMailer ESMTP-server %V running at Yoyodyne Propulsion Inc
#PARAM hdr220 %H ESMTP (NO UCE)(NO UBE) our local time is now %T
#
# Note above the "ESMTP" words are present because *some* MTA systems won't
# do EHLO greeting, unless they see "ESMTP" - against RFC 1869 part 4.
# "EHLO is to be done blindly, server responses are not to be studied for
#  any possible 'ESMTP' keyword!"
```

“smtpserver.conf”

```
PARAM help -------------------------------------------------------------
PARAM help  This mail-server is at Yoyodyne Propulsion Inc.
PARAM help  Our telephone number is: +1-234-567-8900, and
PARAM help  telefax number is: +1-234-567-8999
PARAM help  Our business-hours are Mon-Fri: 0800-1700 (Timezone: -0700)
PARAM help
PARAM help  Questions regarding our email service should be sent via
PARAM help  email to address  <postmaster@OURDOMAIN>
PARAM help  Reports about abuse are to be sent to: <abuse@OURDOMAIN>
PARAM help -------------------------------------------------------------
#
# Uncomment following for not to strip incoming addresses of format:
# <@aa,@bb:cc@dd> into non-source-routed base form: <cc@dd>
#
#PARAM  allowsourceroute # DON'T ENABLE UNLESS YOU USE ROUTER BASED
#                        # POLICY ANALYSIS!
#
# The policy database:  (NOTE: See  'makedb'  for its default suffixes!)
#
PARAM  policydb   btree  /opt/mail/db/smtp-policy
```

“smtpserver.conf”

```
#PARAM  tarpit 0 0   # No "tarpit" for 4XX/5XX reply codes
#PARAM  tarpit 20 2  # Initial delay: 20 secs, next = prev + (prev * 2)

#
# TLSv1/SSLv[23] parameters; all must be used for the system to work!
#
# See  http://www.aet.tu-cottbus.de/personen/jaenicke/pfixtls/doc/setup.html
#
PARAM   use-tls
PARAM   tls-CAfile      /opt/mail/db/smtpserver-CAcert.pem
PARAM   tls-cert-file   /opt/mail/db/smtpserver-cert.pem
PARAM   tls-key-file    /opt/mail/db/smtpserver-key.pem
#  # If system default SSL-session-cache is to be used ?
PARAM   tls-use-scache
PARAM   tls-scache-timeout 3600 # (cache timeout in seconds)
#  # Then some futher thoughs that may materialize some time..
#PARAM tls-loglevel     0
#PARAM tls-ccert-vd     0
#PARAM tls-ask-cert     0
#PARAM tls-require-cert 0
##PARAM tls-CApath ... (somewhen: ways to verify client's certificates)
##PARAM tls-enforce-tls 1
```

“smtpserver.conf”

```
#
# Elements to be added into "Received:" header’s initial comment part:
#
PARAM rcvd-ident        # The ident lookup result (or even admitting it)
PARAM rcvd-whoson       # Likewise for "whoson"
PARAM rcvd-auth-user    # Authenticated Username
PARAM rcvd-tls-mode     # Cipher, or not
PARAM rcvd-tls-ccert    # Client Certificate reference

PARAM etrn-cluster  localhost        etrn zzETRNzz
PARAM etrn-cluster  ipv6-localhost   etrn zzETRNzz
```

“smtpserver.conf”

```
#
#
# HELO/EHLO-pattern     style-flags (Remember: 'ftve' set needs enable-router!)
#               [max loadavg]
#
localhost           999 ftveR
some.host.domain    999 !NO EMAIL ACCEPTED FROM YOUR MACHINE
# If the host presents itself as:  HELO [1.2.3.4], be lenient to it..
# The syntax below is due to these patterns being SH-GLOB style patterns
# where the brackets are special characters.
\[*\]               999 ve
# Per default demant strict syntactic adherence, including fully
# qualified addresses for  MAIL FROM, and RCPT TO.  To be lenient
# on that detail, remove the "R" from "veR" string below:
*                   999 veR
```

smtpserver policy-db construction rules

At the end of this is actually the default boiler-plate file from the distribution pretty much as is.

In addition to that, policy-builder.sh script adds a set of other things before policy filter is ready for use:

```
DB/smtp-policy.src                  The boilerplate
DB/localnames                 ('= _local_names')
DB/smtp-policy.relay          ('= _full_rights')
DB/smtp-policy.mx             ('= _relaytarget')
DB/smtp-policy.spam           ('= _bulk_mail')
DB/smtp-policy.spam.manual ('= _bulk_mail')
```

If you want, you can modify your boiler plate as well as your installed policy-builder.sh script.
(Doing 'make install' will overwrite policy-builder.sh, but not smtp-policy.src)

See file “doc/guides/smtp-policy” for more info.

ZMailer subsystems: *“router”*

- about the router program tasks

- about router configuration mechanisms

- about resource consumption, and its control

- about the router script language

ZMailer subsystems: *"router"* (2)

Tasks of the *router* subsystem are:

- Picking tasks for processing from multiple input queues.
- Producing analysis on what to do with given input addresses (i.e. "routing").
- Producing *scheduler + transport agent* control information regarding the message

ZMailer subsystems: *“router”* (3)

Resource spenditure is limited at the router by having long-living processes handling lots and lots of email over long periods of time.

The *router* processes are running as one taskmaster (“scheduler”), and a farm of workers. The main input queue area can get more than one processing process, others get only one.

Each process aims to have as small memory footprint as possible, which is achieved with LISP-like memory management strategies inside the *router.*

ZMailer subsystems: *“router”* (4)

The *router* is configured with a script language which greatly resembles that of the `/bin/sh` a.k.a. The Shell.

The *router* picks file “router.cf” from a well-known location, and continues then picking more configuration scripts in given order. Once all are loaded, the task sequencer starts to call “process” entrypoint with taskfile name as a parameter.

ZMailer subsystems: *"router"* (5)

The *router* script language looks very much like the `/bin/sh` script language added with a few odd quirks that mainly are due to having a desire to run everything within one single process – apparent pipes are run stage at the time storing the intermediate results into memory resident buffers.

System has a number of builtin functions including various database access mechanisms.

The system has two extensions to `/bin/sh`: "ssift" and "tshift", which are like "case", but matched labels are regular expressions. The meaning of dot (.) in "ssift" is just any single character, while at "tshift" it is RFC-822 token.

ZMailer subsystems: *"router"* (6)

As the *router* scripts are quite complicated, average user will not like to poke things inside them.

ZMailer has two (third on TODO list) configuration entries for facility selections, plus a set of files for local system identity setup.

File "`$MAILSHARE/`router.cf" points by default to file "`/etc/mail.conf`" from which the local system identity should be found – if it does not exist, default values are attempted to be supplied.

Same file contains also a list of transport protocols for external routing, and on TODO list there is similar variable for internal address analysis functions, that is, various "aliases".

ZMailer subsystems: *"router"* (7)

For making usage of various mapping databases somewhat simpler, a new facility exists. It is called "dbases.conf", and is located into "`$MAILVAR/db/`" directory. ZMailer management command "zmailer newdb" uses it to (re)generate the databases.

```
#|Fields:
#|     relation-name
#|         dbtype(,subtype)
#|              dbpriv_yield_varname
#|                  newdb_compile_options (-a for aliases!)
#|                   dbfile (or "-")
#|                         dbflags (or "-") ...
#|

aliases          $DBTYPE priv -la $MAILVAR/db/aliases           -lm
#aliases         $DBTYPE priv -la $MAILVAR/db/aliases-2         -lm
fqdnaliases      $DBTYPE priv -la $MAILVAR/db/fqdnaliases       -lm
routesdb         $DBTYPE -    -l  $MAILVAR/db/routes            -lm
thishost         $DBTYPE -    -   $MAILVAR/db/localnames        -lm
#thishost        bind,mxlocal - - -                     -l -s 200 -e 2000
userdb           $DBTYPE -    -la $MAILVAR/db/userdb            -lm
```

ZMailer subsystems: *“scheduler”*

- about scheduler role

- about its communication with transport agents

- about scheduler configuration

- about resource controls

- about “mailq” communication channel

ZMailer subsystems: *“scheduler”* (2)

The role of the *scheduler* in ZMailer is to be seriously parallelizing taskmaster to make sure all recipients are getting evenhanded handling, while still making sure that nobody gets to be a resource hog.

The *scheduler* reads all message processing task descriptors from their spoolfiles, and places them into appropriate slots in the work-profile data-structures.

Depending on the situation the *scheduler* will likely immediately upon new recipient destination reception to try to start delivery into there. Various resource usage limitation controls may postpone such activities, though. (More of that latter.)

The *scheduler* also collects diagnostics issued by the actual message delivery subprograms – the *Transport Agents* – and issues delivery report messages per RFC 1891-1984 specifications.

ZMailer subsystems: *"scheduler"* (3)

The *scheduler* communicates with the *transport agents* via bi-directional channel, which towards the TAs sends commands regarding which taskfile to pick, and what addresses to process.

From the TAs to the *scheduler* there come status diagnostics. Usually *permanent* kind of diagnostics are stored into the transport-agent taskfile, and the *scheduler* is merely informed of what has been done.

For temporary/transient kind of diagnostics, the entire diagnostic is sent from the TA to the *scheduler*, and stored into the *scheduler* memory (**not** into the taskfile!).

ZMailer subsystems: *“scheduler”* (4+)

- about resource controls

- about scheduler configuration

The *scheduler* has two configuration files:

- scheduler.conf

- scheduler.auth

First of which guides task pickup and resource allocations. Path for the second one is parametrized inside the first one.

The second file contains “mailq” service port access autentication data.

ZMailer subsystems: *“scheduler.conf”*

```
#
# Scheduler configuration file
#
# The scheduler reads this file on startup or when it receives a SIGUSR1 signal
#
# Every channel/host combination in recipient addresses will be sifted through
# the clauses matched in this file, picking up parameters until a clause that
# specifies a command.  Everything is free-form with three requirements:
# Clauses (i.e. the channel/host pattern) start at the beginning of a line.
# Clause contents (i.e. the parameters) don't.
# Components are separated by whitespace.
#
# Within command=" ... " strings, following "variables" are known:
#  $host message's host
#  $channel message's channel
#  ${LOGDIR} ZENV variable LOGDIR (all ZENV variables supported)
#
# NB! For command paths, the "current directory" is MAILBIN/ta
#
```

"scheduler.conf"

```
#
# Note, there are three kinds of resource-pool limitation parameters
# which control when a given channel+host pair (thread) is NOT taken
# into processing:
#
#  maxta:  (Set in "*/*" clause)
#       GLOBAL parameter limiting the number of transport-agent processes
#       that the scheduler can have running at the same time.
#
#  maxchannel:
#       Selector clause specific value limiting how many transport-agent
#       processes can be running on which the ``channel'' part is the same.
#       You may specify dis-similar values for these as well.  For example
#       you may use value '50' for all your 'smtp' channel entries, except
#       that you want always to guarantee at least five more for your own
#       domain deliveries, and thus have:
#               smtp/*your.domain
#                       maxchannel=55
#       If the sum of all ``maxchannel'' values in different channels exceeds
#       that of ``maxta'', then ``maxta'' value will limit the amount of work
#       done in extreme load situations.
```

"scheduler.conf"

```
#
#  maxring:
#       This limits the number of parallel transport agents within each
#       selector definition.    This defined the size of the POOL of
#       transport agent processes available to processing the selector
#       clause matching the selector.
#

#
# -------- Some external parameters - name starts from column 0, and -----
# -------- always begins with "PARAM" ------------------------------------

# MAILQv2 authentication database file reference:
# If you define this (like the default is), and the file exists,
# scheduler mailq interface goes to v2 mode.

PARAMauthfile = "/opt/mail/scheduler.auth"


#PARAMmailqsock = "UNIX:/path/to/mailq.sock"
#PARAMmailqsock = "TCP:174"
```

"scheduler.conf"

```
#
# Default parameter boilerplate, following values are in use in
# all operational channel/host clauses, unless overridden in them..
#
*/*     interval=1m
        idlemax=4m # Max idle for SMTP connections is 5 minutes, don't exceed that!
        #          # (Unless smtp channel becomes a bit smarter on handling it..)
        #
        # expire messages after 3 days without full delivery
        expiry=3d
        # when the scheduler gets to the end of the retry sequence,
        # it starts over at some random point in the middle.  The
        # numbers are factors of the scheduling interval.
        retries="1 1 2 3 5 8 13 21 34"
        # no default limits on simultaneous transport agents or
        # connections to a particular host
        maxchannel=0
        maxring=20
        #
        maxta=0 # Let the scheduler to autodetermine the limit

#(continues below)
```

"scheduler.conf"

```
# ``*/*'' continues
        #
        # skew is maximum number of tries before the retry time is
        # aligned to a standard boundary (seconds modulo interval).
        skew=1
        # default uid/gid of transport agents
        user=root
        group=daemon
        #
        # A flag telling about queue-order..
        #
        ageorder
        overfeed=150

#(continues below)
```

“scheduler.conf”

```
# ‘‘*/*’’ continues
        #
        # Possible nice/setpriority values in case one wants to run
        # the scheduler at higher scheduling priority, than TA programs:
        #
        # "priority" sets ABSOLUTE value, and requires setpriority(2)
        # system call.  "nice" is -- well: nice(2)
        #
        # nice=2
        ##priority=0
        #
        # "syspriority"/"sysnice" set the value for the scheduler process
        # itself, and are not inherited from the default boilerplate to
        # other parameter blocks.
        #
        # sysnice=-2
        # syspriority=-2
```

“scheduler.conf”

```
# Deferred delivery is handled by this transport agent.  Deferrals are low
# priority, but they tend to bunch up.  The 1 channel slot means there will
# be lots of contention, and typical checking intervals will be a bit higher
# than what is specified (due to waiting for a free slot).
hold/*
        interval=5m
        maxchannel=1
        command=hold
```

“scheduler.conf”

```
#
# Local delivery: files, processes, user mail
#
# Parameterless "local/file*" will get same values, as
# "local/pipe*" immediately following it has !
#
local/file*
local/pipe*
        interval=5m
        idlemax=9m
        # Originally we had 3 hour expiry, but if your local system goes to
        # a fizz (freezes, that is), your local mail may start to bounce
        # before anybody notices anything...
        expiry=3d
        # want 20 channel slots, but only one HOST
        maxchannel=15
        maxring=5
        #
        # Do MIME text/plain; Quoted-Printable -> text/plain; 8BIT
        # conversion on flight!  (Can’t use CYRUS, nor PROCMAIL here!)
        command="mailbox -8"
```

“scheduler.conf”

```
#
# This fallback "local/*" can be used to yield different local
# delivery mechanism -- mailbox / CMU cyrus IMAP server / procmail
#
# The latter two can not do deliveries to explicit files / pipes,
# thus you need the  "local/file*" and "local/pipe*" above.
#

local/*
        interval=5m
        idlemax=9m
        # Originally we had 3 hour expiry, but if your local system goes to
        # a fizz (freezes, that is), your local mail may start to bounce
        # before anybody notices anything...
        expiry=3d
        # want 20 channel slots, but only one HOST
        maxchannel=15
        maxring=5

#(continues below)
```

“scheduler.conf”

```
# ‘‘local/*’’ continues

        #
        # Do MIME text/plain; Quoted-Printable -> text/plain; 8BIT
        # conversion on flight!
        command="mailbox -8"
        # Or with CYRUS server the following might do:
        #command="sm -8c $channel cyrus"
        # Or with PROCMAIL as the local delivery agent:
        #command="sm -8c $channel procm"
```

“scheduler.conf”

```
# smtpx is a channel where the delivery is done without checking at MXes;
# rather only on A/AAAA (address) entries:
smtpx/*
        maxchannel=90
        maxring=10
        command="smtp -S /opt/mail/smtp-tls.conf -c smtpx -x -s"


# Sometimes we may want to PUNT all out to somewhere without regarding
# on what the routing said:
#
# smtp/*
#       maxchannel=199
#       maxring=5
#       command="smtp -S /opt/mail/smtp-tls.conf -F [192.89.123.25] -l ${LOGDIR}/smtp.punt"
```

“scheduler.conf”

```
# This is a FAST EXPIRY test case.. Will always cause bounce, btw.
# (those machines are cisco routers, which don't have smtp-servers..)
smtp/*-gw.funet.fi
        maxchannel=0
        maxring=5
        expiry=1m
        interval=15s
        retries="1"
        skew=1
        command="smtp -s" # -l ${LOGDIR}/smtp"

smtp/*.rutgers.edu
        maxchannel=199
        maxring=10
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
smtp/*.edu
        maxchannel=199
        maxring=20
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
```

“scheduler.conf”

```
smtp/*.com
        maxchannel=199
        maxring=30
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
smtp/*.uk
        maxchannel=199
        maxring=8
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
smtp/*.ca
        maxchannel=199
        maxring=10
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
smtp/*.{se,dk,is,no}
        maxchannel=199
        maxring=20
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
smtp/*.de
        maxchannel=199
        maxring=10
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
```

"scheduler.conf"

```
smtp/*.gov
        maxchannel=199
        maxring=5
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
smtp/*.mil
        maxchannel=199
        maxring=5
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
smtp/*.net
        maxchannel=199
        maxring=10
        command="smtp -S /opt/mail/smtp-tls.conf -s -l ${LOGDIR}/smtp.net"
smtp/*.org
        maxchannel=199
        maxring=10
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
```

“scheduler.conf”

```
# Within FUNET we have a bit longer expiry..
smtp/*funet.fi
        maxchannel=199
        maxring=9
        # maxta=2
        interval=10m
        retries="1 1 2 3 5 8 13 21 34"
        skew=1
        # Do FORCED MIME-decoding into C-T-E: 8BIT
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"

# Within our organization we care more about speed and capacity than connections
# The maxchannel value should be larger than the value used by smtp/*, to avoid
# some potential state and phase problems in the queues.
smtp/*.fi
        maxchannel=199
        maxring=20
        interval=10m
        retries="1 1 2 3 5 8 13 21 34"
        skew=1
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
```

"scheduler.conf"

```
#
# These messages will go only into the queue, and need explicit
# SMTP mediated ETRN request, before they become flushed out.
#

smtp-etrn/*
        maxchannel=199
        maxring=20
        interval=1h
        retries="12"
        queueonly
        command="smtp -S /opt/mail/smtp-tls.conf -s -c $channel -l ${LOGDIR}/smtp-etrn"

# Connections to the outside shouldn't duplicate effort so we only allow one
# per destination.
smtp/*
        maxchannel=199
        maxring=50
        command="smtp -S /opt/mail/smtp-tls.conf -s" # -l ${LOGDIR}/smtp"
```

“scheduler.conf”

```
# Error messages.  Delivery can be retried at leisure.
error/*
        interval=5m
        idlemax=2m
        maxchannel=5
        command=errormail

# UUCP delivery.  The "sm" transport agent picks the first host it sees and
# will select further recipient addresses with that host only.  We tell
# the scheduler this with the "byhost" boolean, to avoid a staggered delivery
# effect if the scheduler has to discover this on its own.
uucp/*          maxchannel=5
                command="sm -8c $channel uucp"

# News delivery.  Hostname is always the same here.
usenet/*        maxchannel=2
                command="sm -8c $channel usenet"

# UBC EAN X.400 gateway.  See comment at UUCP.
ean/*           maxchannel=1
                command="sm -c $channel ean"
```

"scheduler.conf"

```
# BitBucket channel
bitbucket/*
                maxchannel=1
                command="sm -c $channel bitbucket"

smtpgw-*/*
                maxchannel=30
                maxring=30
                command="sm -8c $channel $channel"
```

"scheduler.conf"

```
# BITNET delivery methods

defrt1/*
        maxchannel=3
        command="sm -c $channel defrt1"

bsmtp3/*
        maxchannel=3
        command="sm -c $channel bsmtp3"

bsmtp3nd/*
        maxchannel=3
        command="sm -c $channel bsmtp3nd"
bsmtp3rfc/*
        maxchannel=3
        command="sm -c $channel bsmtp3"

bsmtp3ndrfc/*
        maxchannel=3
        command="sm -c $channel bsmtp3nd"
```

ZMailer subsystems: *“scheduler/mailq”*

The *scheduler* has so called “mailq” service port listening for administrative interface connections.

Earlier days it was just listing several in-core tables whoever wanted to know.

These days the “mailq-v2” is fully capable to execute various administrative functions, least of which are “mailq” queue displays.

Due to the inherent security problems in this kind of interfaces, an APOP-like user authentication has been added to the protocol, and each contacting address can be matched against IP-address/mask address mask (IPv4 and IPv6).

ZMailer subsystems: *"mailq -Q"*

The *mailq* is ZMailer's tool for asking *scheduler's* queue status.

Asking queue overview:

```
nic-2.03# mailq -Q
smtp/*.com/0
    smtp/golferslist.com/0      R=1   A=64 QA=1d20h
    smtp/thegamblingreport.com/0 R=1   A=65 QA=1d20h
        Threads: 2 Msgs: 2 Procs: 0 Idle: 0 Plim: 19 Flim: 15 Tlim: 1
smtp/*funet.fi/0
    smtp/videolab-e.funet.fi/0  R=1   A=57 W=10909s QA=2d21m34s
        Threads: 1 Msgs: 1 Procs: 0 Idle: 0 Plim:  9 Flim: 15 Tlim: 3
Kids: 1  Idle:  1 Msgs:  6  Thrds: 4  Rcpnts:  6  Uptime: 14d10m8s
Msgs in 15063 out 15057 stored 6 Rcpnts in 29139 out 29133 stored 6
```

ZMailer subsystems: *“mailq (no -Q)”*

The *mailq* is ZMailer’s tool for asking *scheduler’s* queue status.

Asking the individual messages:

```
nic-2.03# mailq
smtp/golferslist.com:
    Q/28694-17127: (64 tries, expires in 1d3h) \
         smtp; 500 (connect to spammit.com [24.28.100.125|25|193.166.0.145|63811]: \
                    Connection timed out)
smtp/thegamblingreport.com:
    K/12438-17128: (65 tries, expires in 1d3h) \
        smtp; 500 (connect to futuresite.register.com [209.67.50.203|25|193.166.0.145|45834]: \
                    Connection timed out)
smtp/videolab-e.funet.fi:
    K/28714-17127: (19 tries, expires in 23h28m21s) \
          smtp; 500 (connect to videolab-e.funet.fi [193.166.0.50|25|193.166.0.145|63802]: \
                     Connection refused)
```

ZMailer subsystems: *"scheduler.auth"*

```
#
# APOP-like authentication control file for the ZMailer scheduler.
#
# Fields are double-colon (':') separated, and are:
#   - Username
#   - PLAINTEXT PASSWORD (which must not have double-colon in it!)
#   - Enabled attributes (tokens, space separated)
#   - IP address ACL masks
#
# Default-account for 'mailq' is 'nobody' with password 'nobody'.
# Third field is at the moment a WORK IN PROGRESS!
#
# SECURITY NOTE:
#   OWNER:      root
#   PROTECTION: 0600
#
# Attribute tokens:
#       ALL     well, a wild-card enabling everything
#       SNMP    "SHOW SNMP"
#       QQ      "SHOW QUEUE SHORT"
#       TT      "SHOW QUEUE THREADS", "SHOW THREAD channel/host"
#       ETRN    "ETRN etrn_string"
#       KILL    "KILL THREAD channel host", "KILL MSG spoolid"
```

“scheduler.auth

```
nobody:nobody:SNMP QQ TT ETRN:[ipv6:::1]/128,[127.0.0.1]/32,[194.252.70.162]/32
#watcher:zzzzz:SNMP QQ TT ETRN:[127.0.0.1]/32
#root:zzzzzzz:ALL:[127.0.0.1]/32
etrn:zzETRNzz:ETRN:[0.0.0.0]/0,[ipv6:0::0]/0
```

ZMailer subsystems: Transport Agents

The *Transport Agents* are a collection of programs intended to be driven by the *scheduler* to perform processing for the routed result addresses.

These programs will produce diagnostics according to system internal protocols for each processed recipient address.

ZMailer TA subsystems: *“mailbox”*

The *mailbox* is ZMailer’s local delivery subsystem used in normal cases for driving deliveries to pipes and files (like to normal UNIX mailbox).

Under some circumstances delivery to user’s mailbox can be done via different system-wide setup, like via “procmail”, or “cyrus”. See “local/*” clause at the “scheduler.conf” file for examples, and below for *sm* program.

This program has no configuration file for itself.

ZMailer TA subsystems: *“sm”*

The *sm* program is transport agent for driving various programs which are assuming that they are driven under the *sendmail(8)’s* “`M`” (mailer) specifications.

In the default “scheduler.conf” file there are several examples of such usages.

This program has its own configuration file: “sm.conf”.

ZMailer TA subsystems: *“smtp”*

The *smtp* program is transport agent for moving the email out of the system via the SMTP protocol.

All features which are supported at the *smtpserver* are also supported here for outbound email.

This program can also use SSL/TLS protocol to communicate with remote node, and thus to encrypt the transfer session hiding message content and receivers from weak eavesdroppers. When using SSL/TLS mode, the program needs a configuration file telling parameters for the used crypto subsystem. (Mainly info about the keys, and certificates.)

ZMailer TA subsystems: *"error, hold"*

The *error* transport agent constructs error messages from canned data material — to be used in unusual cases needing canned error reports.

The *hold* transport agent will recycle the message back to the *router* after condition likely causing the problem during messages previous round via *router* has become solved.

ZMailer used to do a lot of e.g. DNS lookups at the *router* before, and *hold* was the way to handle timeouts in the lookups. Nowadays it is needed very rarely.

ZMailer Administrative tools

For system managers use the ZMailer suite has couple of tools:

- “zmailer.sh” (a.k.a. “zmailer”) command which is all together the SystemV Init script for the system, and command interface for various submodules
- “newdb” is script wrapper for “makedb”
- “newdbprocessor” is what “zmailer newdb” runs when it sees configuration file: “$MAILVAR/db/dbases.conf”, otherwise that same program does a set of classical pre-determined db setups.

ZMailer Administrative tools (2)

- "manual-expirer" is tool for managers having hundreds, or thousands of emails to some destination, and wanting to get rid of them all in one go.

- "newaliases" and "newfqdnaliases" are scripts calling "newdb" with suitable parameters to regenerate "aliases" and "fqdnaliases" alias databases. Semi-obsoleted by "newdbprocessor".

- "mboxpath" is system helper in case admin wants to scatter classical UNIX mailspool directory ("/var/spool/mail/") located mailboxes into subdirectories. See "mailbox" documentation.

ZMailer Administrative tools (3)

- “vacation” – well, an obvious thing, isn’t it ?

- “policy-builder.sh” rebuilds smtpserver input policy filter control database from its components.

- “smtpserver-log-parser.pl” – can assist picking entire incoming SMTP sessions from the logfile (if its collection is active) with regular expression matching.