GateDaemon (Gated)

Information T echnologies/
Network Resources
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gated-people@gated.cornell.edu
gated-people ***-request*** *@gated.cornell.edu*

What is Gated?

- Routing daemon for **BSD** based systems
- Initially as **glue** for the 56kB NSFnet
- Originally based on BSD **routed** and Kirton's **egpup**
- Partially funded by NSF
- Model implementation of routing protocols
- Routing protocol development platform

Design Goals

- Modularity
  - Protocols are independent
  - Selective compilation
- Capability
  - More configurable than routers
- Simplicity
  - Minimal configuration for simple case
  - Easy to configure advanced features

Version 2.1

- BGP version 1 (RFC-1105)
- EGP version 2 (RFC-904)
- RIP version 1 (RFC-1058)
- HELLO (Fuzzballs)
- Configuration parser
- Multi-way policy

BGP

- Version 1 (RFC-1   105)
- Route selection on AS path (RFC-1   106) not yet implemented

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EGP

- Version 2 (RFC-904)
- **Complete** implementation
- Allows grouping of peers for maxup
- Maximum packet size configurable
- HELLO and POLL timers configurable

HELLO

- Supports subnetwork and hosts
- Does incremental updates correctly

RIP

- Version 1 (RFC-1058)
  - Does not reject packets based on zero fields
- Does flash updates correctly

Redirects

- Configuration option to disable
  - Deletes and reinstalls old route
  - Default when supplying RIP/HELLO

Facilities

- Tracing
- Parser
- Family common
- Timers
- Tasks
- Routing table

Tracing

- Uniform trace file and syslog support
  - %m format for system errors
  - %A format for addresses (IP , ISO)
  - %T format for time

    tracef()
    trace()
- Many levels

    internal, external, route, kernel
    parse, lex, config
    task, timer , mark, nostamp
    update, protocol

Parser

- Expandable Lex/Y   acc (Flex/Bison)
- Improved diagnostics
- Facilities for common types
  - IP addresses/masks
  - Time (ss, mm:ss, hh:mm:ss)
  - metrics (w/limit checking)
  - interface references
  - gateways (host on local network)
- Structured grammar (C-like syntax)
- Nested configuration files

  %include

Family common

- Checksum

  inet_cksum()

- Masking

  inet_netmask()
  inet_wholenetof()

- Classes (Internet)

  inet_class()

Timers

- One second resolution
- One-shot or repeating
- Corrected for drift **(anti-boxcar)**
- Separate queues for
  - Inactive
  - Active (in order)

timer_create()
timer_delete()
timer_set()
timer_interval()
timer_reset()

Tasks

- One or more per protocol

  task_alloc()
  task_create()
  task_delete()

- Routing table changes

  task_flash

- Interface changes

  task_ifchange

  - Up/Down
  - Add/Delete

Tasks ...

- Access to sockets

    task_get_socket()
    task_set_socket()
    task_reset_socket()
    task_close()

    - Establishing connections

        task_addr_local()
        task_addr_remote()

    - Packet ready/Data ready

        task_recv
        task_receive_packet()

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Tasks ...

- Access to sockets ...
  - Ready for write

    task_write
    task_send_packet()

  - Exception

    task_except

  - Connection complete

    task_connect

  - Incoming connection

    task_accept

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Tasks ...

- Access to sockets ...
  - Common socket options and ioctls

    task_set_option()

    - Receive/Send buffer size

      TASKOPTION_RECVBUF
      TASKOPTION_SENDBUF

    - Broadcast

      TASKOPTION_BROADCAST

    - Bypass routing table

      TASKOPTION_DONTROUTE

    - Linger after close

      TASKOPTION_LINGER

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Tasks ...

- Reconfiguration
  - Preconfig cleanup

    task_cleanup

  - After config setup

    task_reinit

  - After config policy re-evaluation

    task_newpolicy

- Limited subprocess support

  task_fork()
  task_kill()

  - Used by status dump

    /var/tmp/gated_dump

Routing Table

- Multiple **routes** (RIP, EGP, ...) per **destination** (network/mask)
- Static Interface routes
  - Multiple logical networks
  - Only allows access to gateways

Routing T able ...

- Route selection
  - Degree of Preference
    - **0** most - **255** least prefered

0	***Interface***
10	***Default***
20	***Redirect***
50	***Static***
90	***HELLO***
100	***RIP***
150	***BGP***
200	***EGP***

  - Metric
    - **Same** protocol and AS
  - Gateway with lowest IP address

Version 3.0

- BGP version 2/3 (RFC-1 163/RFC-????)
- EGP version 2 (RFC-904)
- OSPF version 2 (RFC-1247)
- RIP version 1 (RFC-1058)
- HELLO (Fuzzballs)
- SNMP via ISODE and SMUX
- Routing socket (some systems)
- Variable subnet masks (some systems)
- Integrated stack IS-IS
- IDRP (ISO Inter -Domain Routeing Protocol)

BGP

- BGP version 2 (RFC-1   163)
- BGP version 3 (RFC-????)
- AS path pattern matching (RFC-1   164)
- Dennis Ferguson (CA*NET)
    - Entering production

OSPF

- Version 2 (RFC-1247)
- Multicast support (some systems)
- MIB support
- Not reconfigurable

RIP

- RIP version 1 (RFC-1058)
- Proper subsuming of host routes
- **Split horizon** w/o **poison reverse**
  - Reduces routing overhead
- Graceful shutdown
  - Avoids **black holes**

HELLO

- Proper subsuming of host routes
- **Split horizon** w/o **poison reverse**
  - Reduces routing overhead

Routing T able

- Event driven
  - Policy evaluated by protocols when changes occur
  - Steady state processing minimal (just packet stuffing)
- Kernel routing table
  - Implemented as a protocol
  - Always called first

Routing T able ...

- Route Locking
  - Protocols flag **routes** they announce
  - **Routes** not released until flag reset
  - Holddowns implemented by protocols that require them (RIP , HELLO)
  - Non-holddown protocols not restricted by holddowns (BGP , EGP , OSPF)
- Policy independence
  - All routes are retained (except RIP , HELLO and redirects)
  - Reconfiguration results in minimal impact

Routing T able ...

- Preferences

0	***unterface***
10	***OSPF (intra/inter area)***
20	***default (EGP/BGP)***
30	***redirects***
40	***‘route‘ (routing socket)***
50	***SNMP***
60	***static***
90	***HELLO***
100	***RIP***
110	***OSPF (ASE)***
150	***BGP***
200	***EGP***

SNMP

- Via SMUX protocol
  - ISODE 7.0 w/SNMP UPGRADE 1
  - Freely available
  - Robust
  - Compiled in MIB
  - Traps
  - Writable variables

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Tasks

- Memory management
  - System memory management

    task_mem_malloc()
    task_mem_calloc()
    task_mem_realloc()
    task_mem_free()

  - Optimized for control blocks

    task_block_init()
    task_block_alloc()
    task_block_free()

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Tasks ...

- Access to sockets
  - Common socket options and ioctls

    task_set_option()

    - Multicast parameters

    TASKOPTION_MUL TI_ADD
    TASKOPTION_MUL TI_DROP
    TASKOPTION_MUL TI_IF
    TASKOPTION_MUL TI_LOOP
    TASKOPTION_MUL TI_TTL

    - Receive dest address (Reno)

    TASKOPTION_RCVDST ADDR

    - Use loopback (routing socket)

    TASKOPTION_USELOOPBACK

Parser

- Interface reference with wildcard

  le → le0, le1, le2

- Trace options per task

Work in Progress

- BSD 4.3 Reno radix tree
  - Variable length masks
  - Variable length addresses (ISO)
  - Ordered retrieve (SNMP)

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Work in Progress ...

- Integrated stack IS-IS
  - University of W   isconson WISIS
- Dynamic Interfaces
  - *Pop-up* Interfaces
    - SunOS, Ultrix SLIP
  - Unavailable Interfaces
- IDRP
  - Dave Katz (Merit)
- Router Discovery
  - Erik Nordmark (SunSoft)

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Obtaining Gated

- Anonymous FTP

gated.cornell.edu

pub/gated/gated-2.0.1.14.tar .Z
pub/gated/gated-alpha.tar .Z
pub/lists/gated-people

- Electronic mail

gated-people-archive@gated.cornell.edu

  - Subject:
    - send gated/gated-2.0.1.14.tar .Zus*
    - send gated/gated-alpha.tar .Zus*
    - help
    - send Contents