Python & amqp

Why messaging is a good thing
When and how to use it
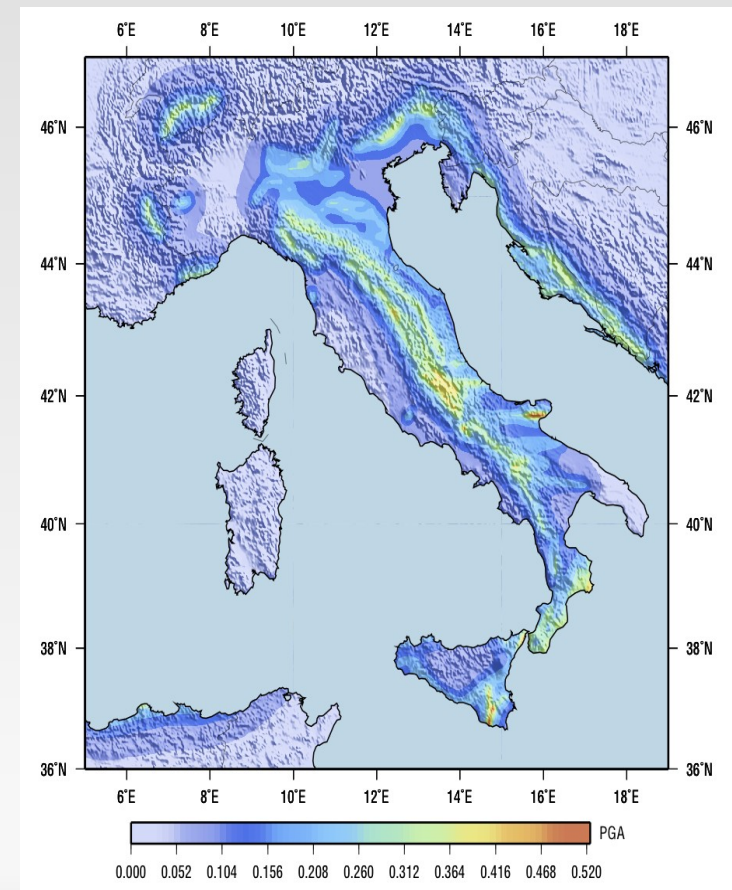
Muharem Hrnjadovic <muharem@openquake.org>
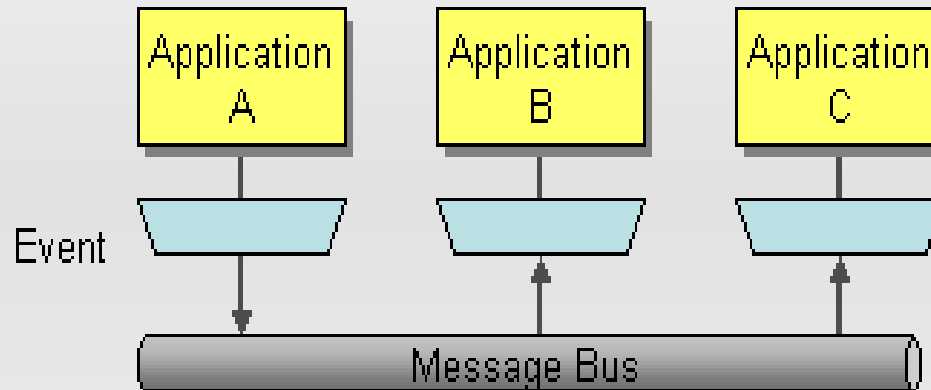
OpenQuake

Seismic hazard/risk, socio-economic impact

- Scaling seismic calculations

- Teams based in Zürich/CH and Pavia/Italy

- We are hiring:

  jobs@openquake.org

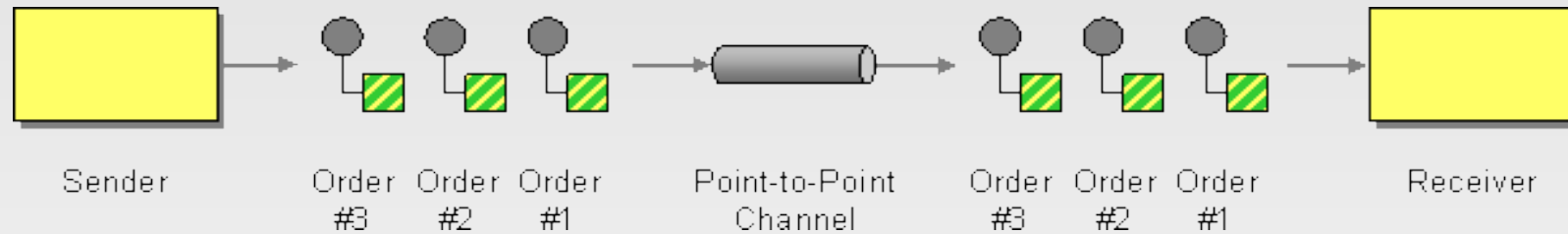# Main ideas

http://www.eaipatterns.com/Messaging.html

- Information bus for dynamic systems
  - Point-to-point (Queues)
  - Publish-subscribe (Topics)

Info bus for dynamic systems

Point to point
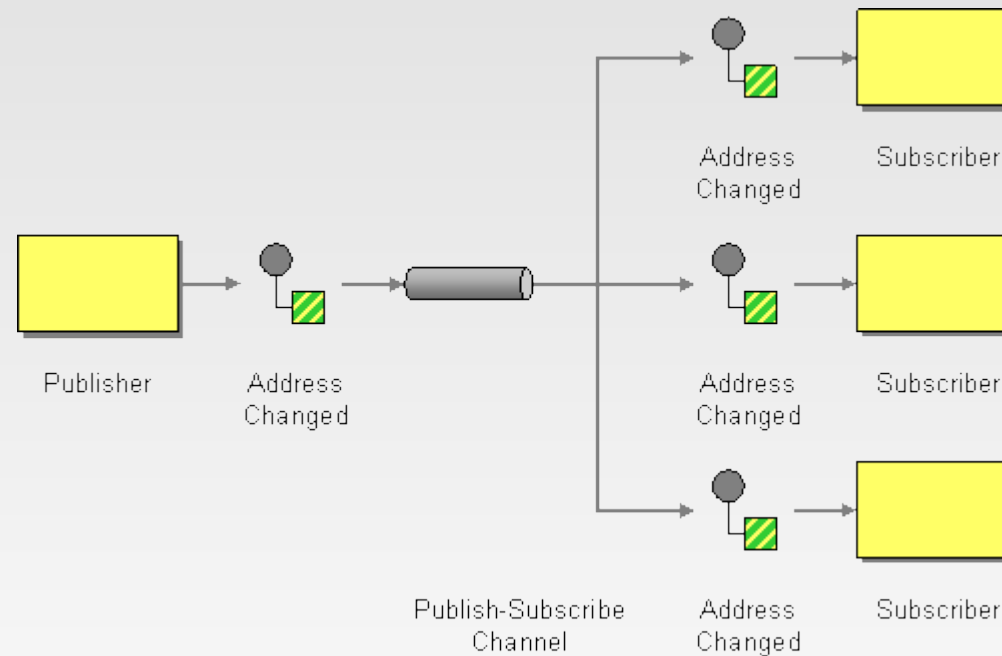

http://www.eaipatterns.com/PointToPointChannel.html

Info bus for dynamic systems

Publish/subscribe

http://www.eaipatterns.com/PublishSubscribeChannel.html

Messaging History

- Work started in the late 80s

- Popular in the financial industry

- But

  - Many proprietary systems (TIBCO, IBM MQseries, MSMQ)

  - Vendor lock-in

- JMS (API definitions)

Today

- AMQP
  - Open standard (like SMTP)
  - Pretty mature at this time
- Free and open source amqp brokers
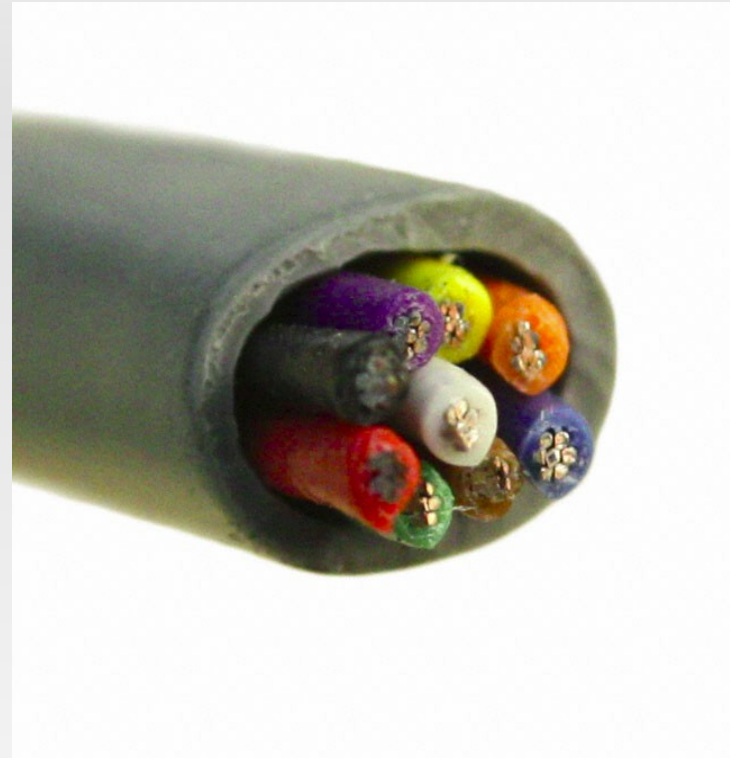 - RabbitMQ
  - ZeroMQ
  - qpid

decoupling   scaling

- time/space

- languages

- concerns

- performance

- availability

- deployment
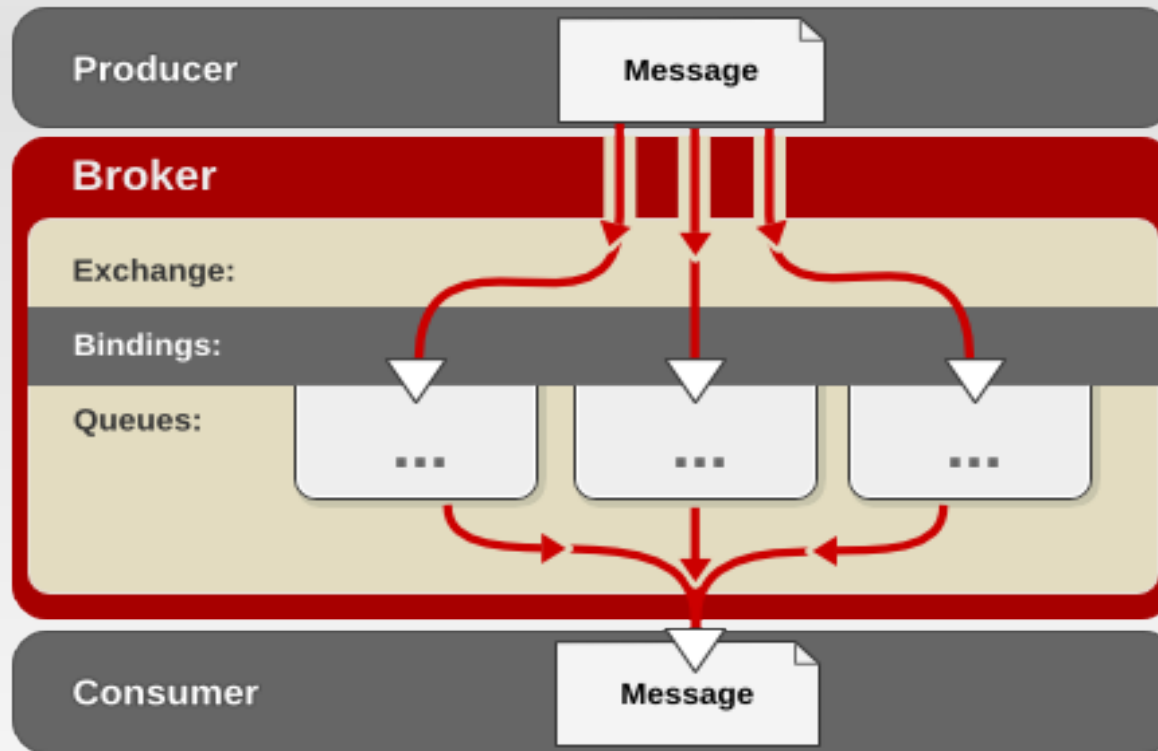
- development

- agility

Connections and channels

- Single connection to broker

- Multiple channels

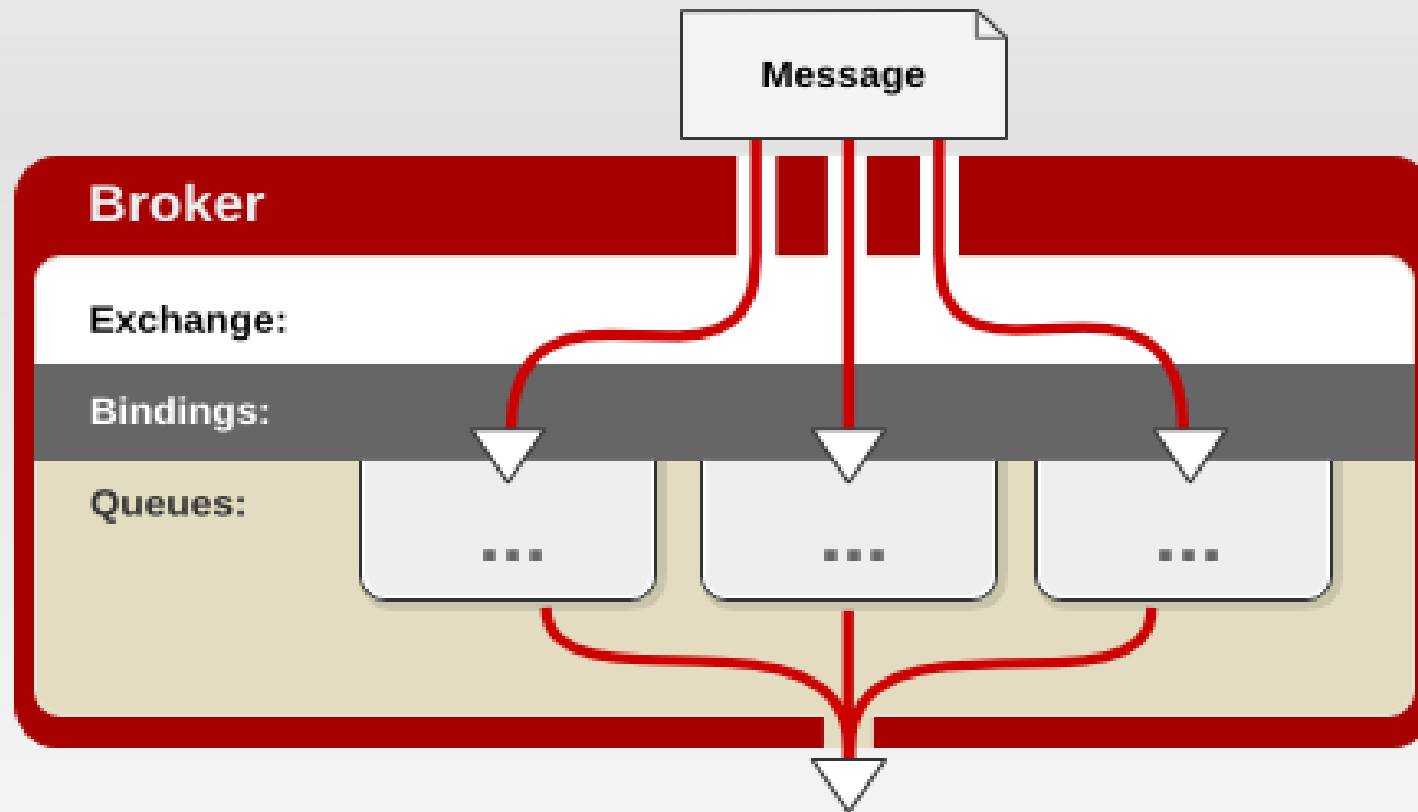http://media.digikey.com/photos/General%20Cable%20Photos/C4070.41.10.jpg

Producers and consumers

http://docs.redhat.com/docs/en-US/Red_Hat_Enterprise_MRG/1.1/html/Messaging_Tutorial/chap-Messaging_Tutorial-Initial_Concepts.html

Fanout exchange

Fanout Exchange

http://docs.redhat.com/docs/en-US/Red_Hat_Enterprise_MRG/1.1/html/Messaging_Tutorial/chap-Messaging_Tutorial-Initial_Concepts.html

Direct exchange
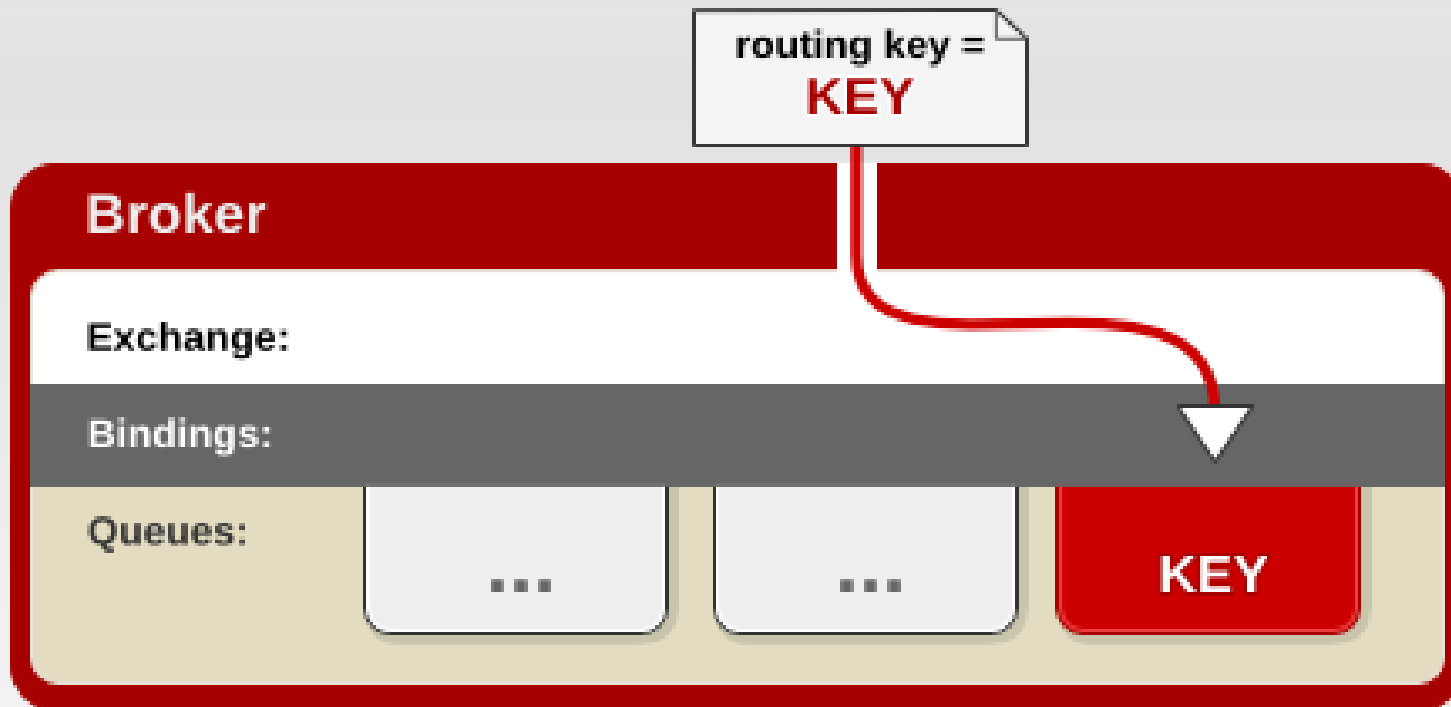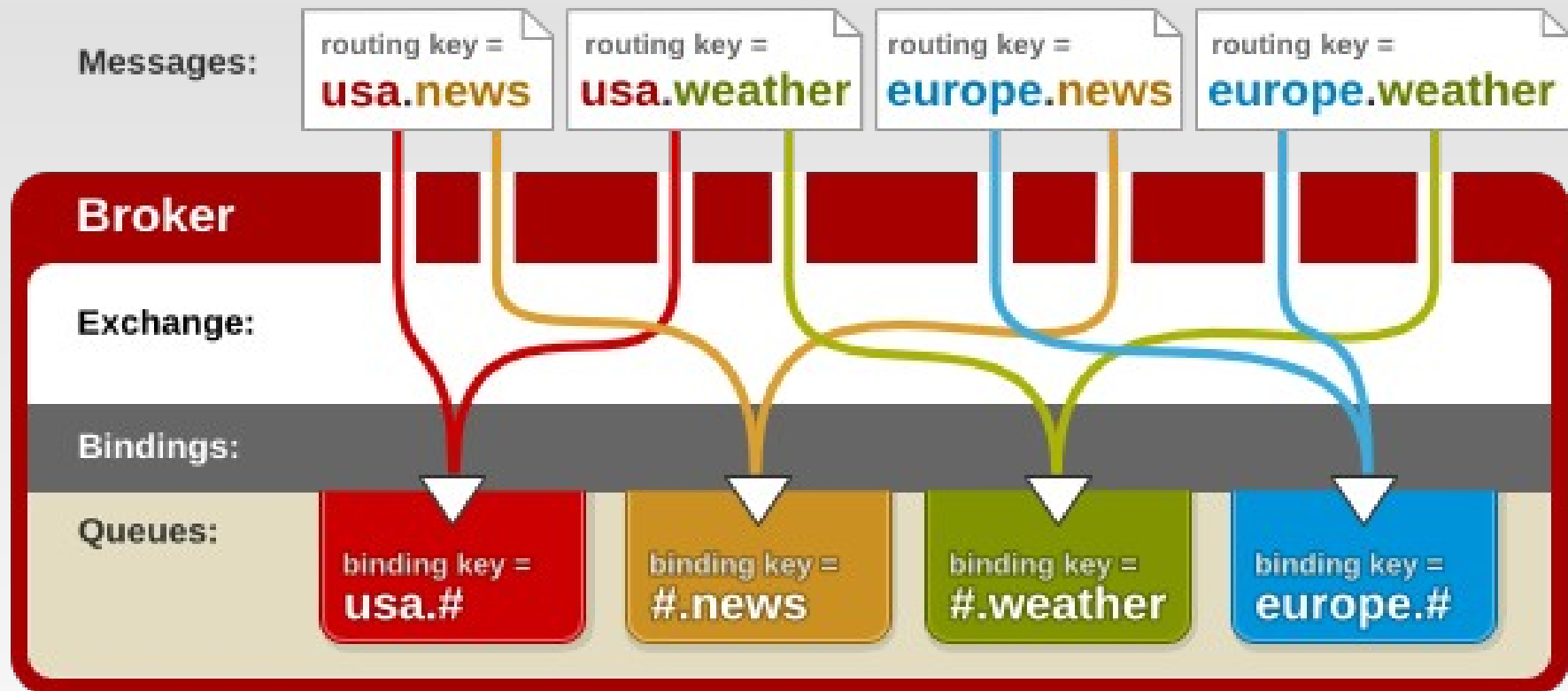

Direct Exchange

routing key = KEY

Broker

Exchange:

Bindings:

Queues: ... ... KEY

Topic exchange

Virtual host (vhost)

- A vhost contains
  - exchanges, queues and bindings
  - authentication & permissions
- Users may be registered with multiple vhosts

http://matcmadison.edu/files/users/kfoster3/seattle-mail-boxes.jpg

Are we there yet..?

http://www.pauldoolan.com/2011/05/running-from-boredom.html

Surviving a crash/reboot

- Surviving a reboot
  - Exchanges, queues: durable
  - Message delivery mode: persistent

  - There is a cost to persisting messages
  - Use in moderation

```
*** STOP: 0x0000001E (0x80000003,0x80106fc0,0x8025ea21,0xfd6829e8)
Unhandled Kernel exception c0000047 from fa8418b4 (8025ea21,fd6829e8)

Dll Base Date Stamp - Name          Dll Base Date Stamp - Name
80100000 2be154c9 - ntoskrnl.exe    80400000 2bc153b0 - hal.dll
80258000 2bd49628 - ncrc710.sys     8025c000 2bd49688 - SCSIPORT.SYS
80267000 2bd49683 - scsidisk.sys    802a6000 2bd496b9 - Fastfat.sys
fa800000 2bd49666 - Floppy.SYS      fa810000 2bd496db - Hpfs_Rec.SYS
fa820000 2bd49676 - Null.SYS        fa830000 2bd4965a - Beep.SYS
fa840000 2bdaab00 - i8042prt.SYS    fa850000 2bd5a020 - SERMOUSE.SYS
fa860000 2bd4966f - kbdclass.SYS    fa870000 2bd49671 - MOUCLASS.SYS
fa880000 2bd9c0be - Videoprt.SYS    fa890000 2bd49638 - NCC1701E.SYS
fa8a0000 2bd4a4ce - Vga.SYS         fa8b0000 2bd496d0 - Msfs.SYS
fa8c0000 2bd496c3 - Npfs.SYS        fa8e0000 2bd496c9 - Ntfs.SYS
fa940000 2bd496df - NDIS.SYS        fa930000 2bd49707 - wdlan.sys
fa970000 2bd49712 - TDI.SYS         fa950000 2bd5a7fb - nbf.sys
fa980000 2bd72406 - streams.sys     fa9b0000 2bd4975f - ubnb.sys
fa9c0000 2bd5bfd7 - usbser.sys      fa9d0000 2bd4971d - netbios.sys
fa9e0000 2bd49678 - Parallel.sys    fa9f0000 2bd4969f - serial.SYS
faa00000 2bd49739 - mup.sys         faa40000 2bd4971f - SMBTRSUP.SYS
faa10000 2bd6f2a2 - srv.sys         faa50000 2bd4971a - afd.sys
faa60000 2bd6fd80 - rdr.sys         faaa0000 2bd49735 - bowser.sys


Address dword dump Dll Base                              - Name
801afc20 80106fc0 80106fc0 00000000 00000000 80149905 : fa840000 - i8042prt.SYS
801afc24 80149905 80149905 ff8e6b8c 80129c2c ff8e6b94 : 8025c000 - SCSIPORT.SYS
801afc2c 80129c2c 80129c2c ff8e6b94 00000000 ff8e6b94 : 80100000 - ntoskrnl.exe
801afc34 80124f02 80124f02 ff8e6df4 ff8e6f60 ff8e6c58 : 80100000 - ntoskrnl.exe
801afc54 80124f16 80124f16 ff8e6f60 ff8e6c3c 8015ac7e : 80100000 - ntoskrnl.exe
801afc64 8015ac7e 8015ac7e ff8e6df4 ff8e6f60 ff8e6c58 : 80100000 - ntoskrnl.exe
801afc70 80129bda 80129bda 00000000 80088000 80106fc0 : 80100000 - ntoskrnl.exe

Kernel Debugger Using: COM2 (Port 0x2f8, Baud Rate 19200)
Restart and set the recovery options in the system control panel
or the /CRASHDEBUG system start option. If this message reappears,
contact your system administrator or technical support group.
```
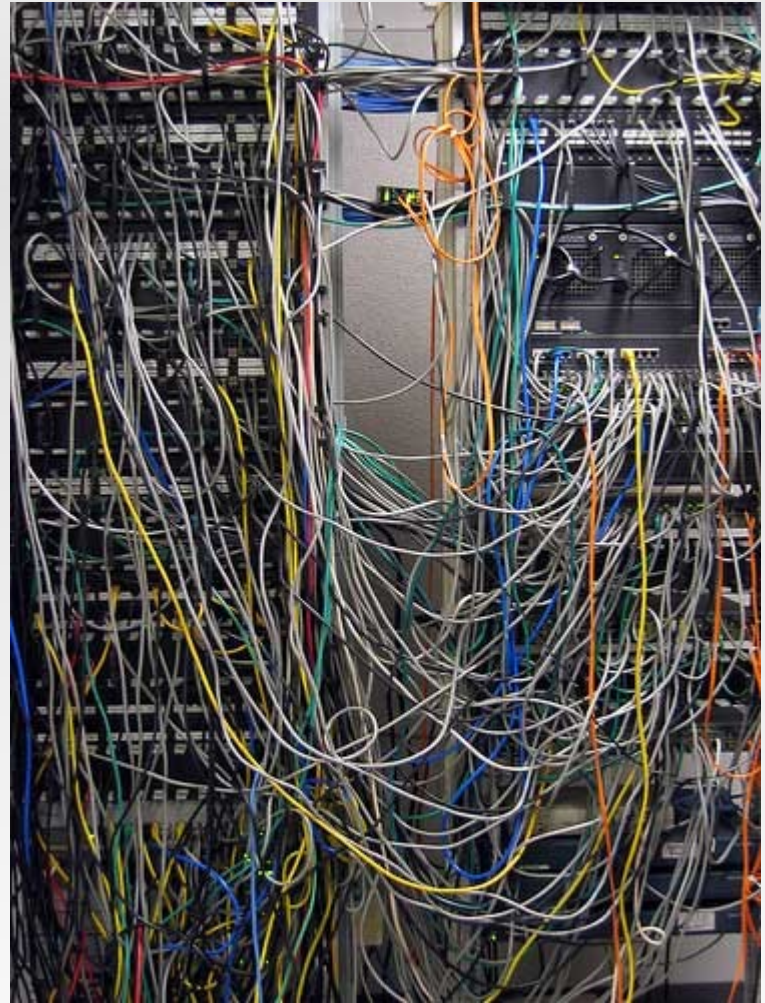
http://picz.jikan.fr/2010/07/Bsod_nt.jpg

Resource management

- dynamic configuration of exchanges, queues & bindings

- declaring queues 2x is fine

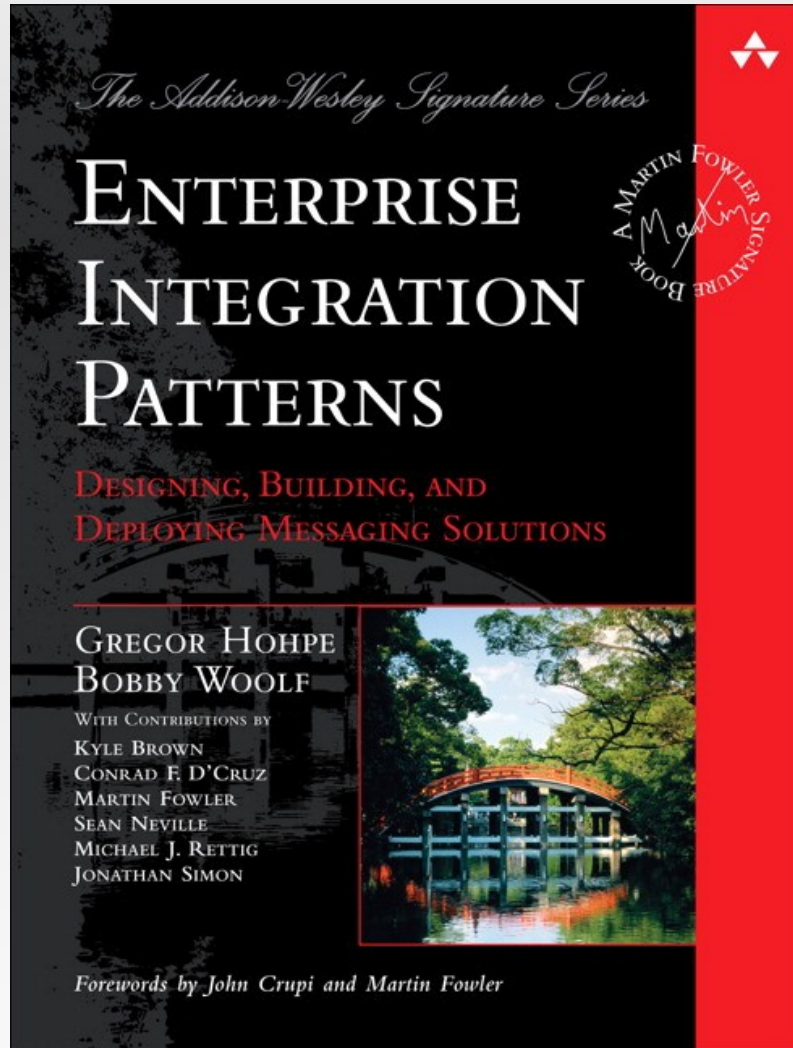- check existence by declaring with "passive" flag

http://www.vibrant.com/images/cables/gameplay-dm-nyc.jpg

Temporary resources

- temporary exchanges

- temporary queues
  e.g. for RPC:
  - Private, auto-delete queues with unique names
  - Queue name in "reply_to" header

http://www.flickr.com/photos/clearwater88/with/4675557567/
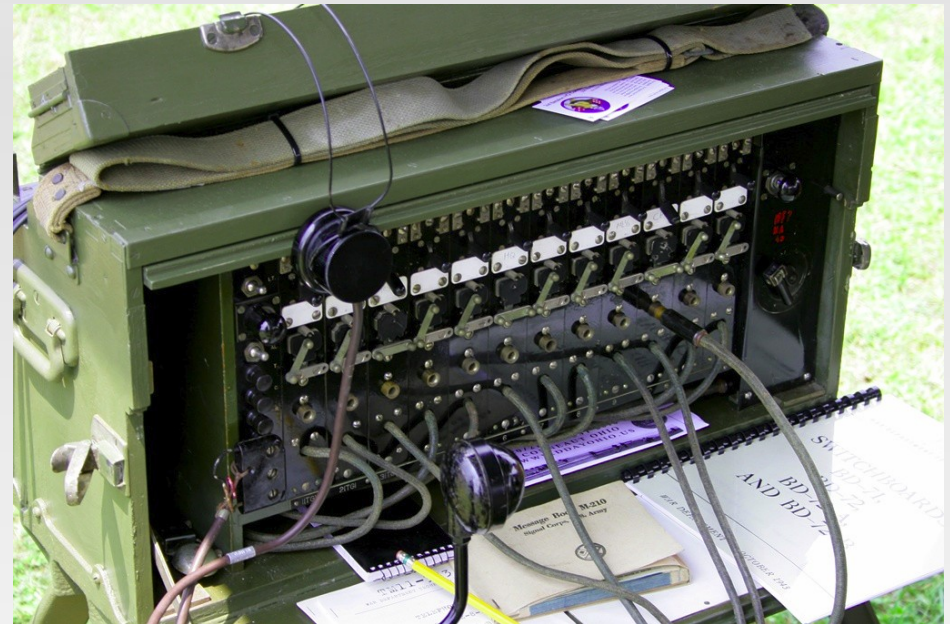
Patterns!

- Enterprise Integration Patterns
- By Gregor Hohpe, Bobby Woolf
- 736 pages

Wake up! It's code time!!

https://github.com/al-maisan/ep11

http://www.toptenz.net/wp-content/uploads/2010/07/wake-up-early.jpg

1: RPC

http://www.eaipatterns.com/RequestReply.html
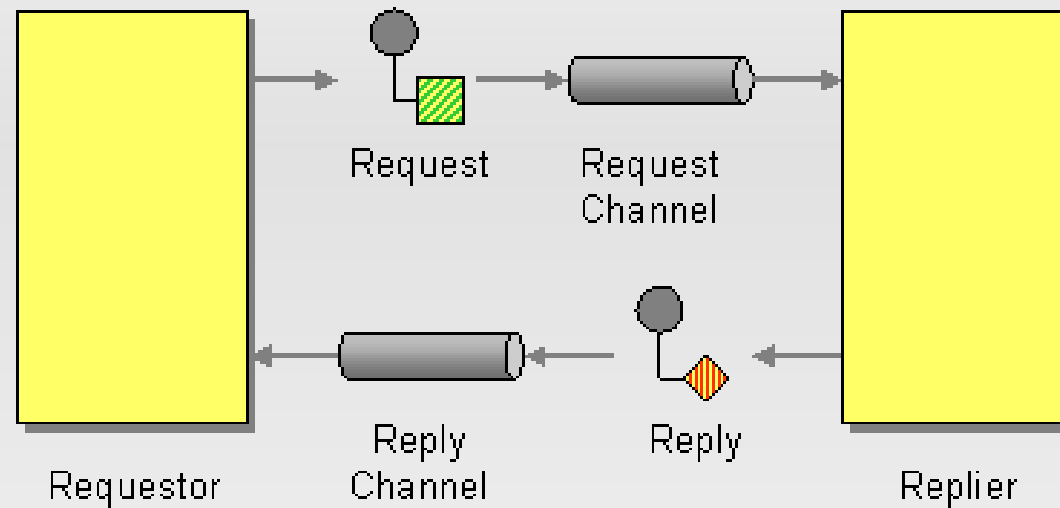
- Private, temporary queue with unique name

- "reply_to" header to enable responses

- round robin of incoming messages

- Correlation ID

Show the $%*&*^$ code !!

http://www.ncpc.org/resources/enhancement-assets/clipart-and-stock-art/iStock-000003290557XSmall.jpg/image_preview

2: Pipes and filters

http://www.eaipatterns.com/PipesAndFilters.html
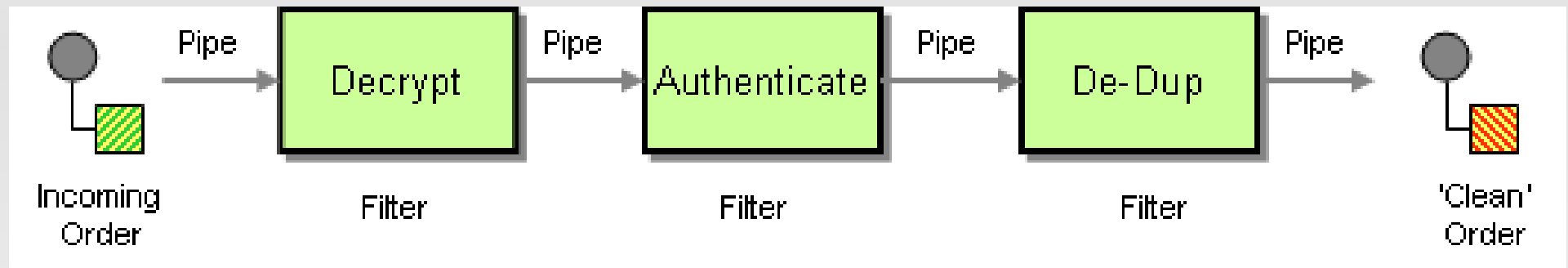
- Series of queues

- One queue for failure reports

The code !!

http://www.ncpc.org/resources/enhancement-assets/clipart-and-stock-art/iStock-000003290557XSmall.jpg/image_preview
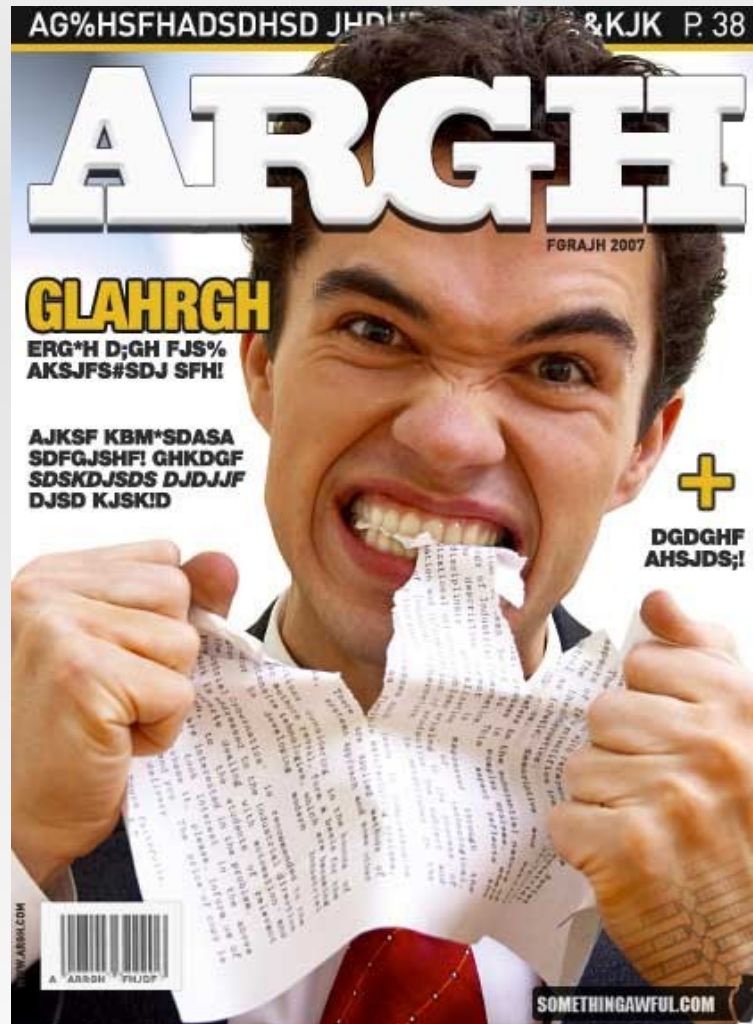
3: Topic exchange
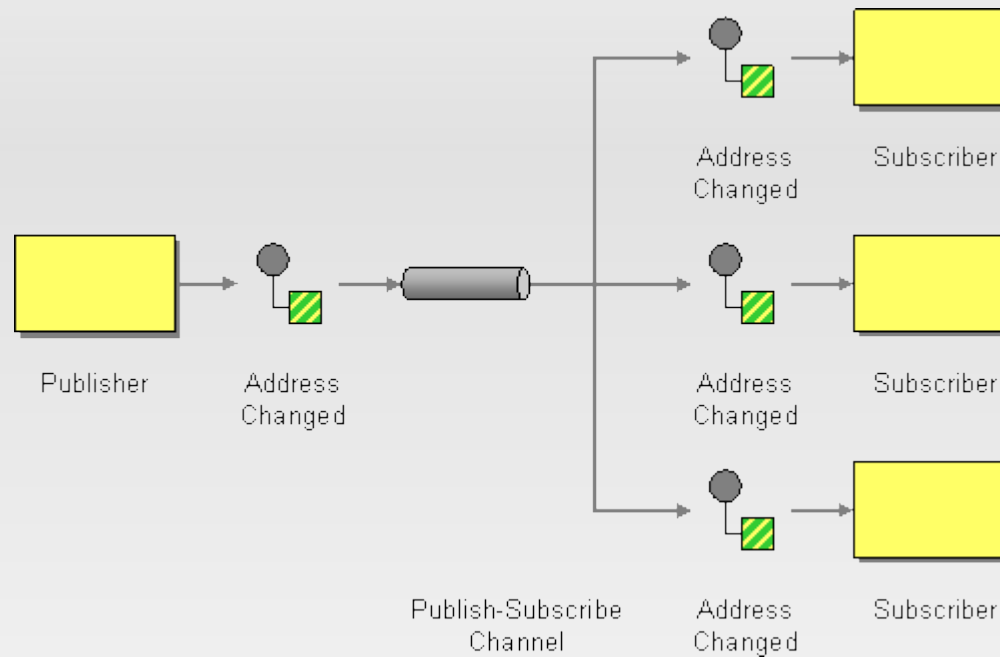
- pattern matching on routing keys
  - *.en.#
  - twitter.#

Show time !!

http://www.ncpc.org/resources/enhancement-assets/clipart-and-stock-art/iStock-000003290557XSmall.jpg/image_preview

Questions?

http://www.roflmachine.com/fun/argh.jpg