



Образование для инженеров
и технических лидеров

RabbitMQ - High Availability, High Load

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Цель урока

Узнать о HL/HA возможностях сервиса и уметь их настраивать на практике

План урока

- **Shovel, federation** - полезные плагины
- **High Load** - высокая нагрузка
- **High Availability** - отказоустойчивость
- **Практика** (демонстрация)
- **Практическое задание**

Shovel

- По сути просто **интегрированный в RabbitMQ consumer+publisher**
- Можно запустить **на любой стороне**
- Бывает **динамический** и **статический**
- Работает **довольно быстро**
- **Сложноват** в траблшутинге
- **Не умеет** ни в какую, даже самую базовую **логику**
- **Работает в кластере**

Shovel

▼ Add a new shovel

Name: *

Source: ⌵

URI: ?

Exchange: ⌵ ?

*

Routing key:

Prefetch count: ?

Auto-delete ?

⌵

Destination: ⌵

URI ?

Queue: ⌵ ?

*

Add forwarding headers: ?

⌵

Reconnect delay: ? s

Acknowledgement mode: ? ⌵

Federation

- Есть отдельные понятия **federation exchange** и **federation queue**
- Настройка происходит с downstream серверов в сторону upstream
- Все минусы shovel

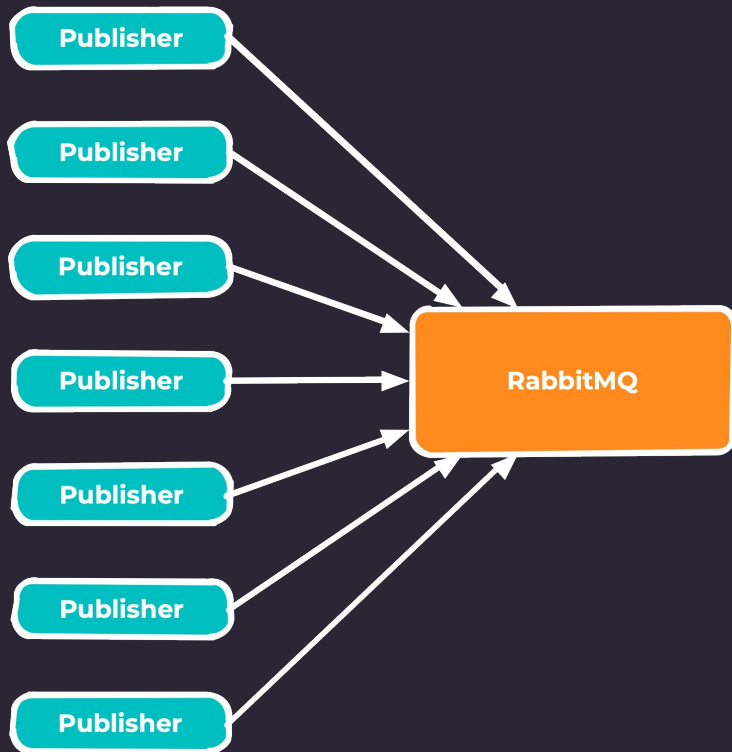
High Load

- Большое количество **соединений** от паблишеров
- Большой поток **сообщений**
- Большое количество **открытий/закрывтий коннектов/каналов**
- Сообщения **не успевают обрабатываться**

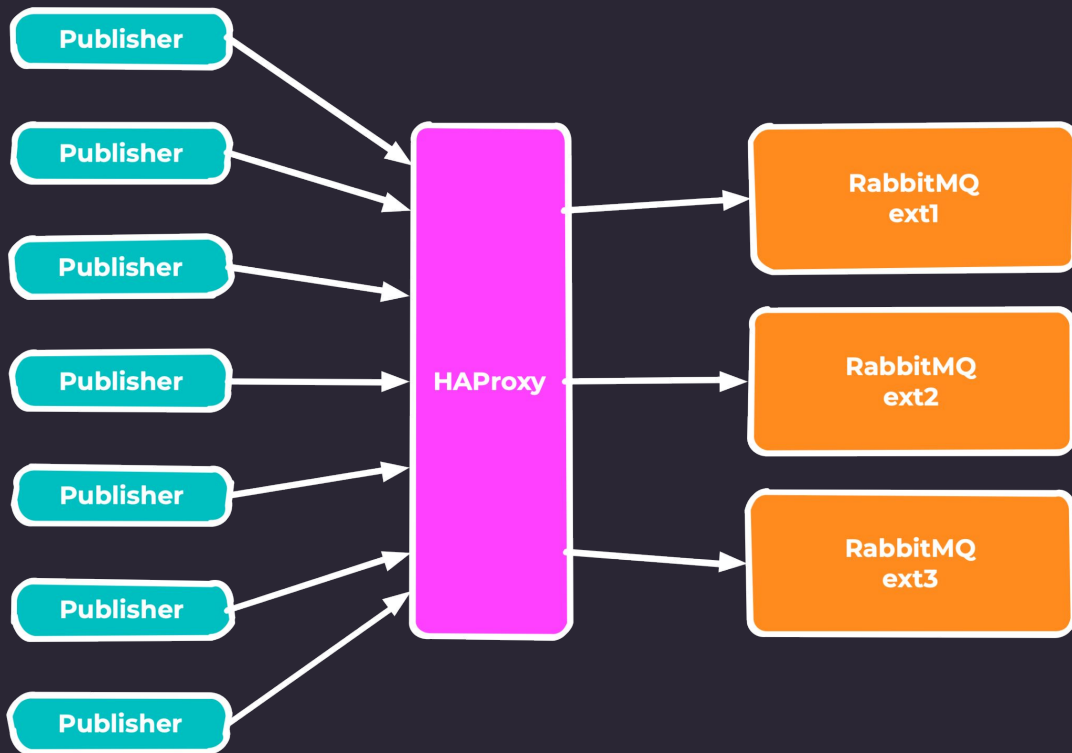
Большое количество соединений от публичеров



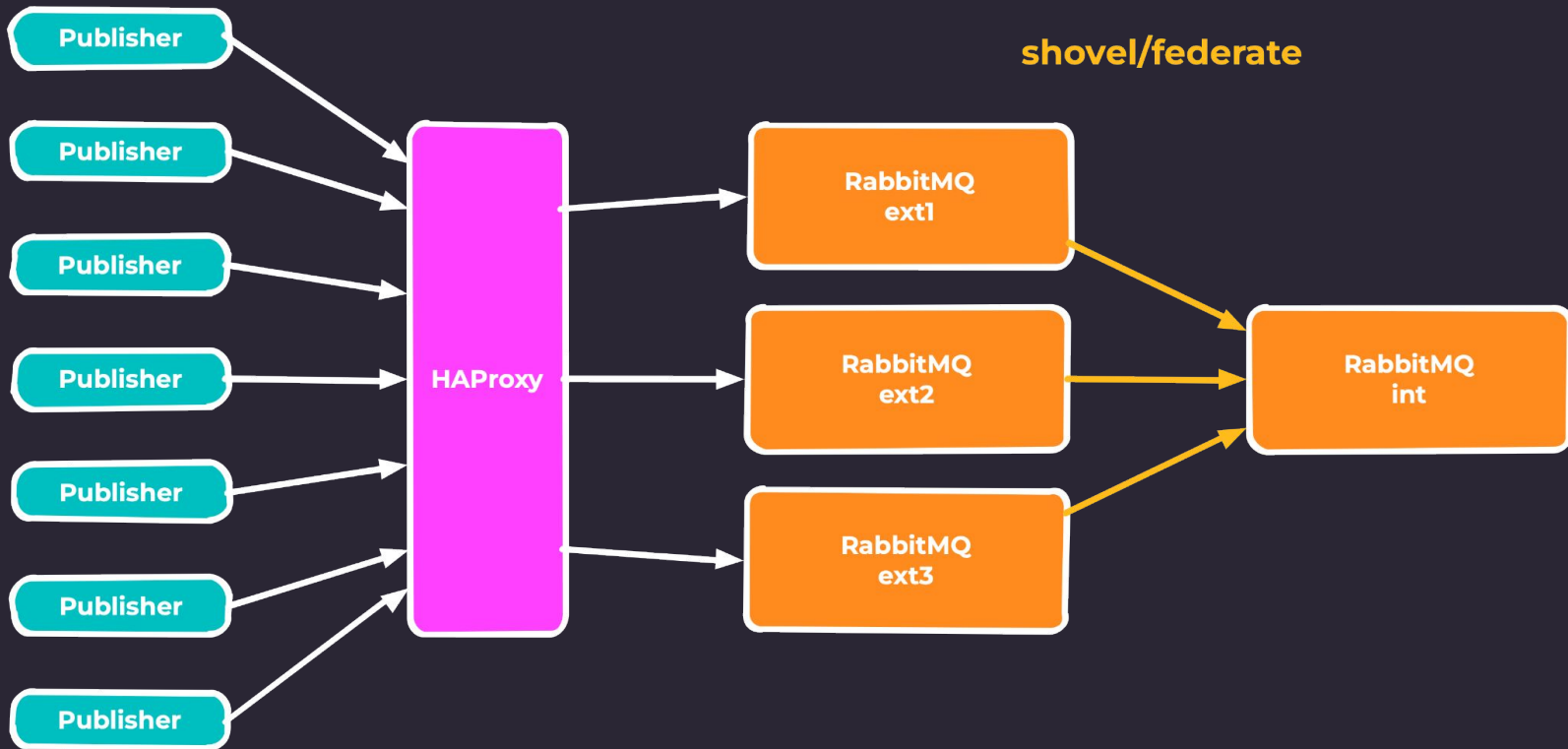
Большое количество соединений от публишеров



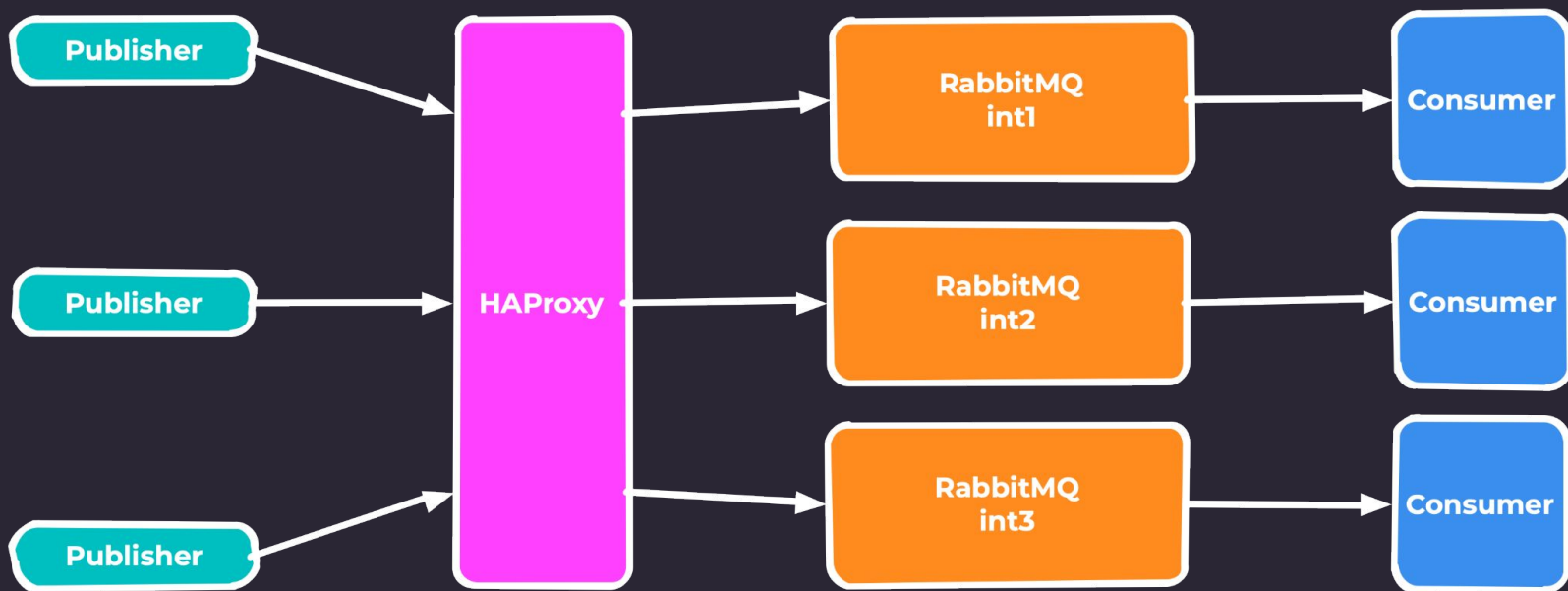
Большое количество соединений от публишеров



Большое количество соединений от публишеров

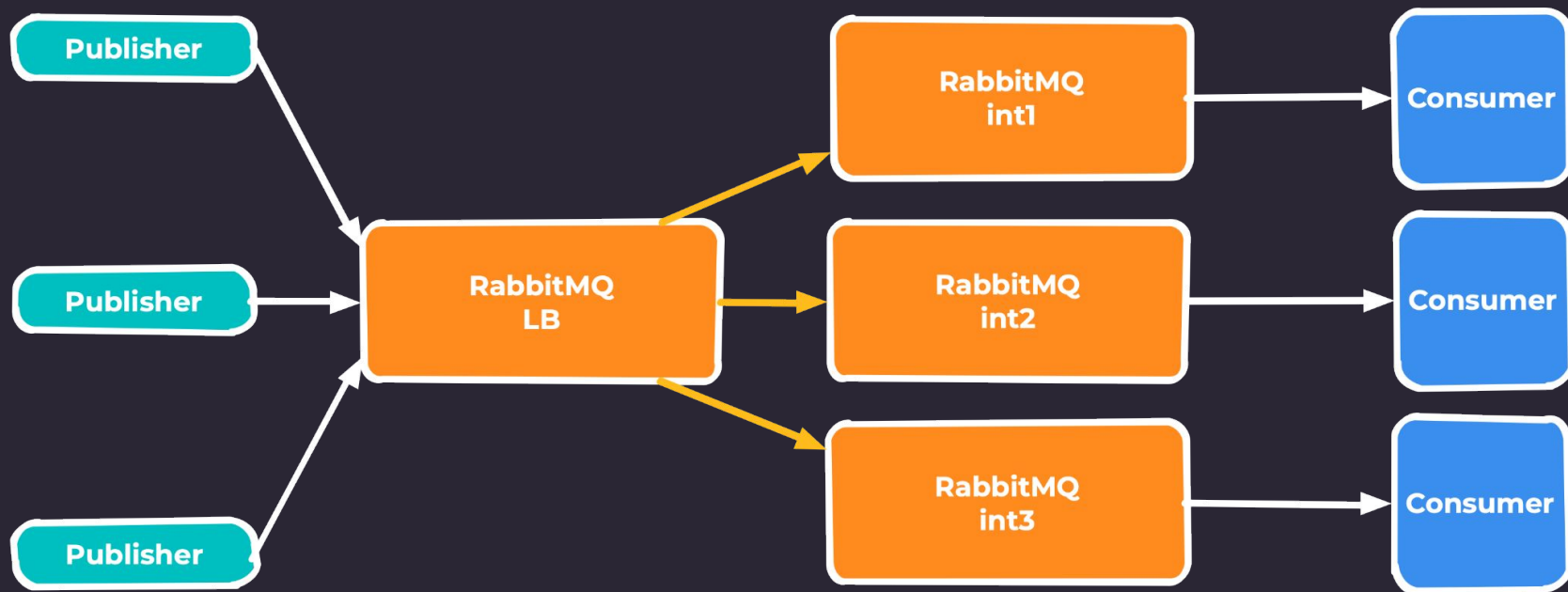


Большой поток сообщений

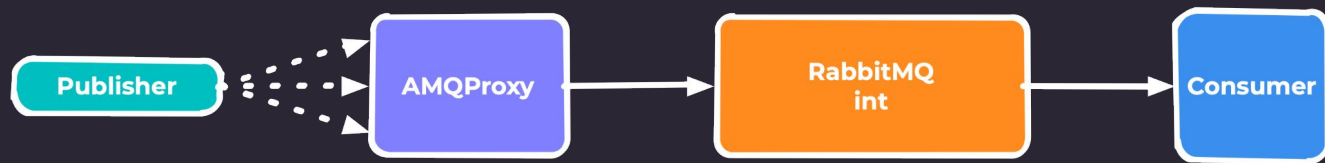


Большой поток сообщений

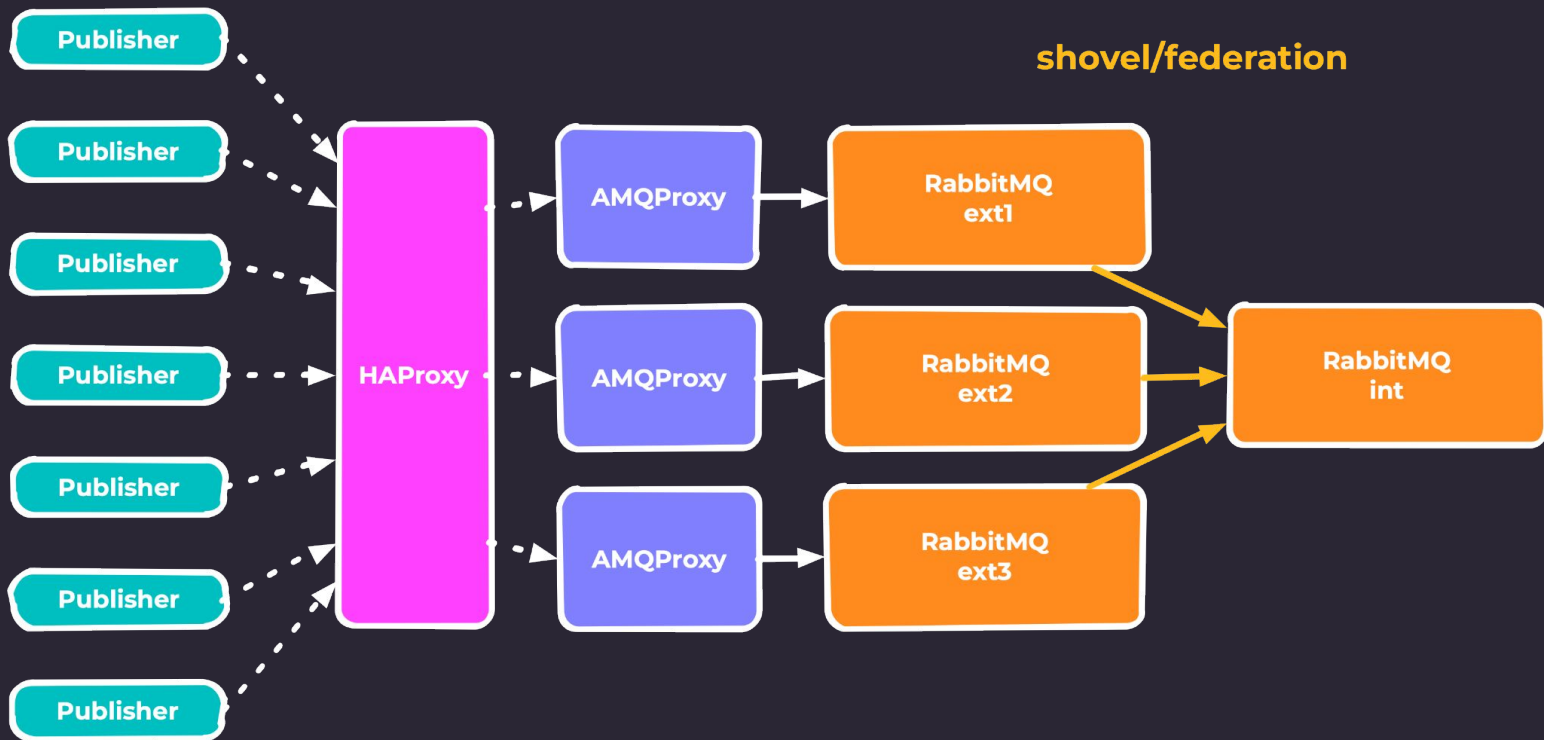
shovel/federation



Большое количество открытий/закрываний коннектов/каналов



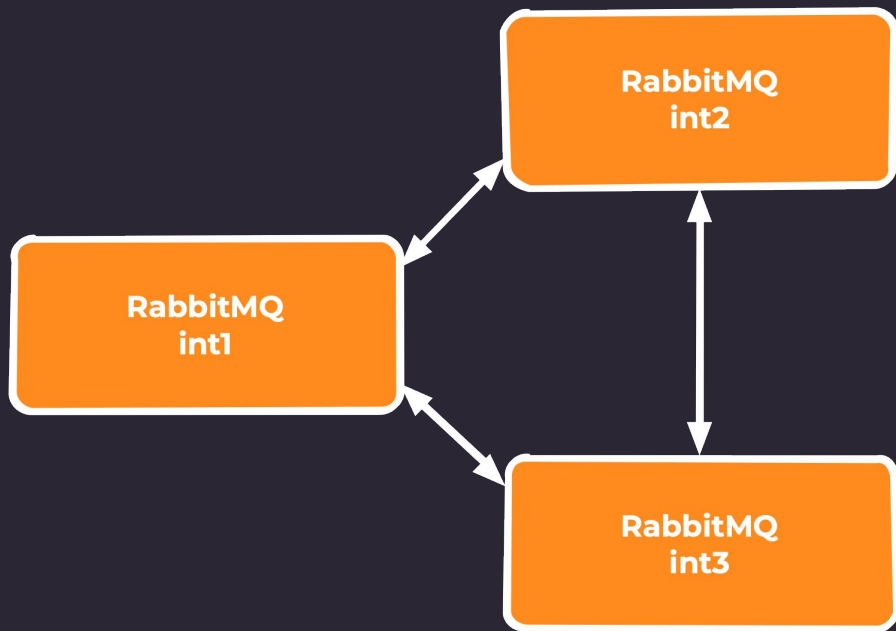
Большое количество открытий/закрываний коннектов/каналов



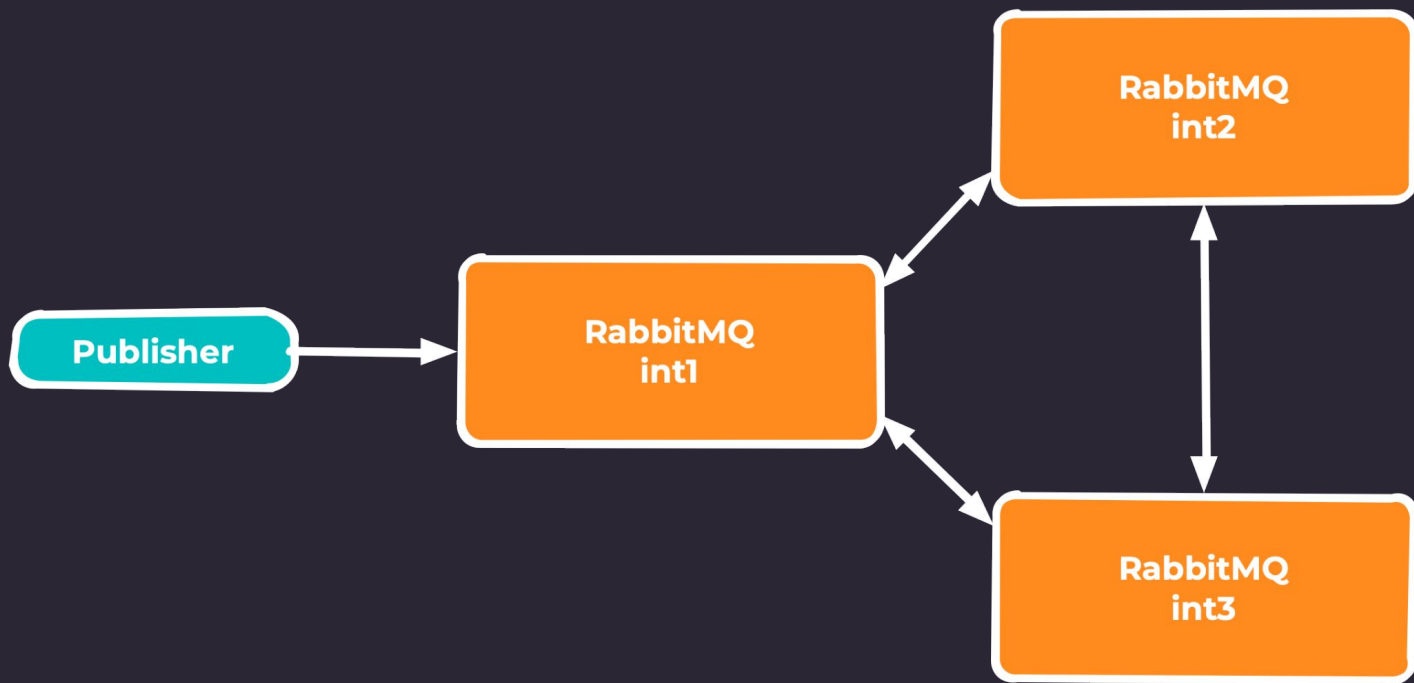
High Availability

- **Кластеризация** - репликация очередей
- **Мастер** для каждой очереди может быть **только один**
- **Автоматическое проксирование** запросов на мастер
- **Quorum queue** - тип очереди
- **Shovel/federation** - механизмы зеркалирования между ДЦ
- **HAProxy** - балансировщик

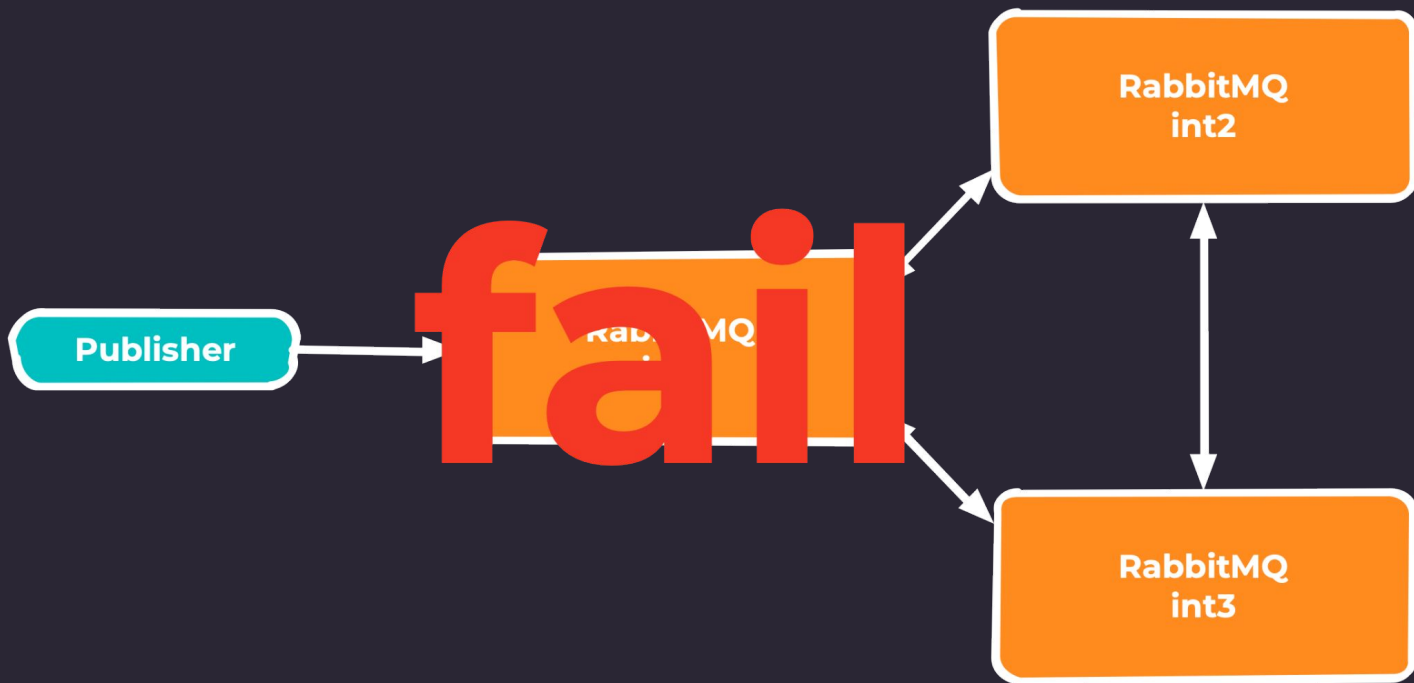
Кластер



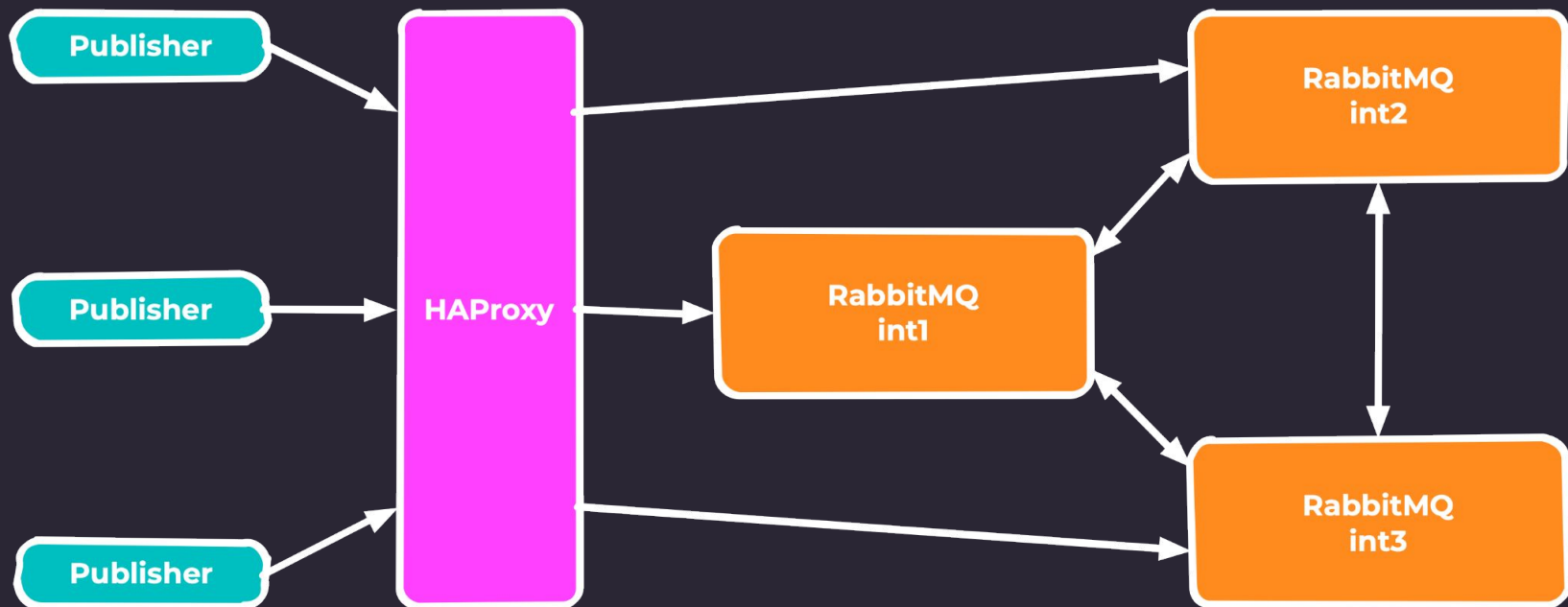
Кластер



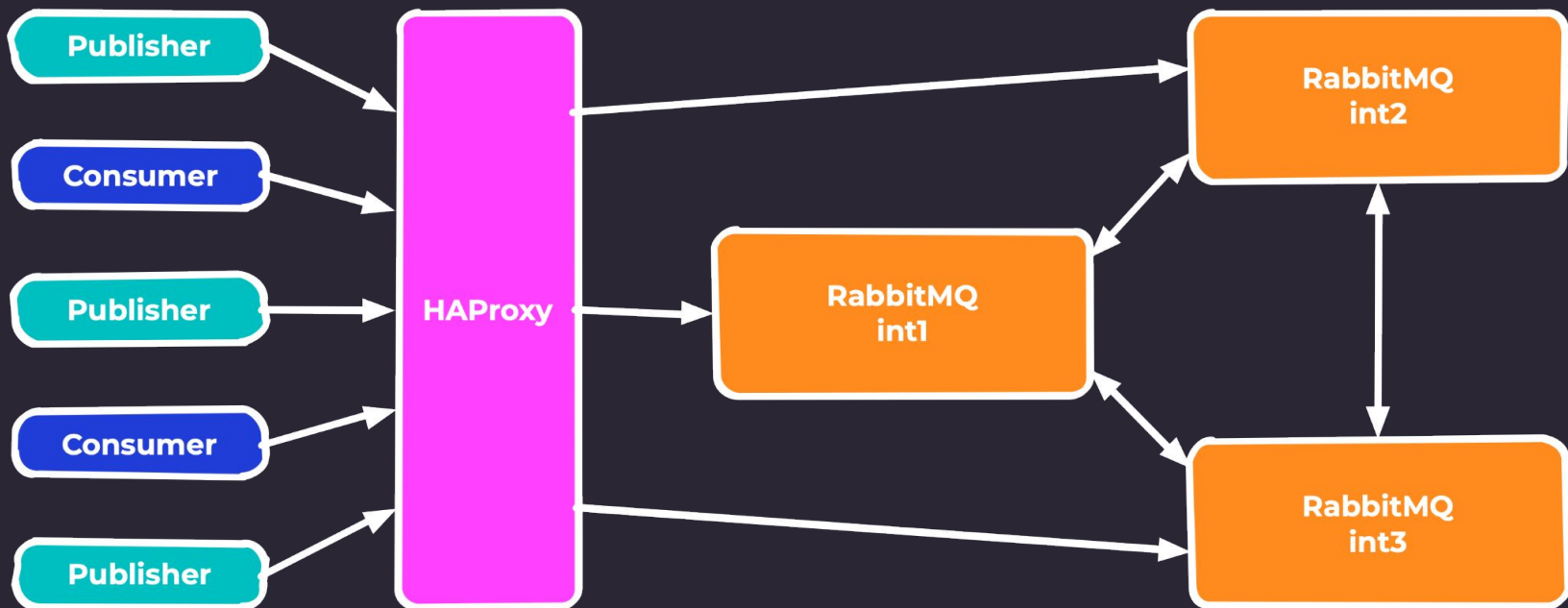
Кластер



Кластер



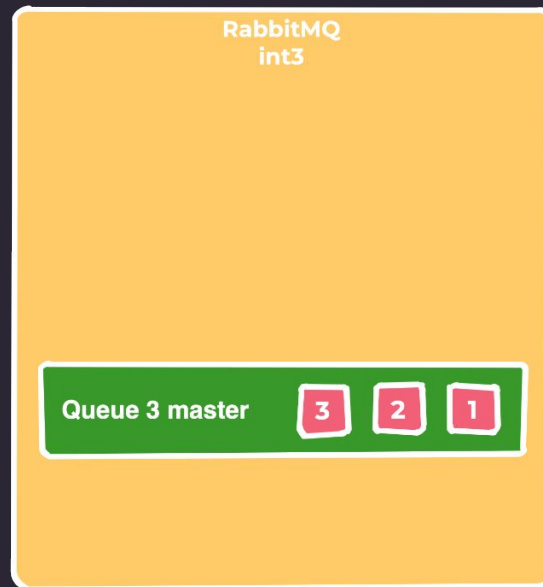
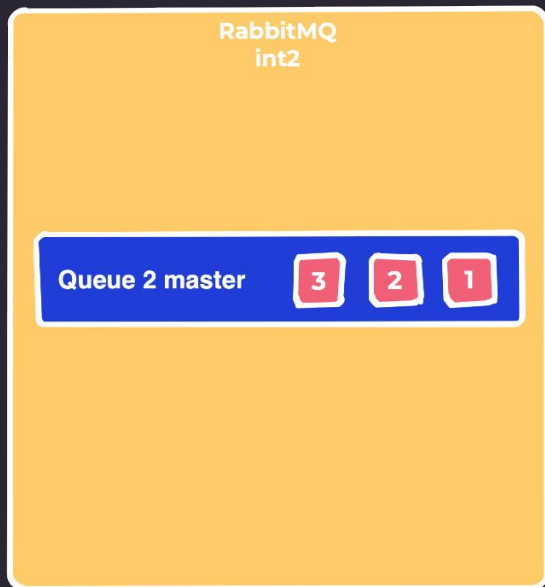
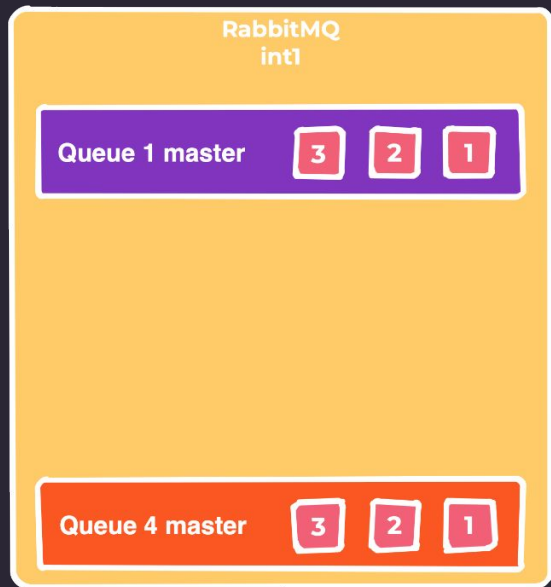
Кластер



Policy HA

- **ha-mode: exactly** - по количеству реплик (ha-params=2)
- **ha-mode: all** - на все ноды кластера
- **ha-mode: nodes** - на определенные ноды (ha-params={nodenames})
- **ha-sync-mode: manual** - default, полуручное управление
- **ha-sync-mode: automatic** - автоматическая синхронизация

HA queues



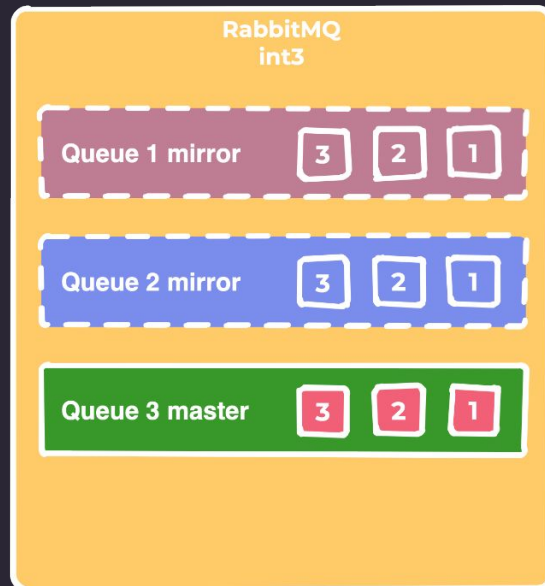
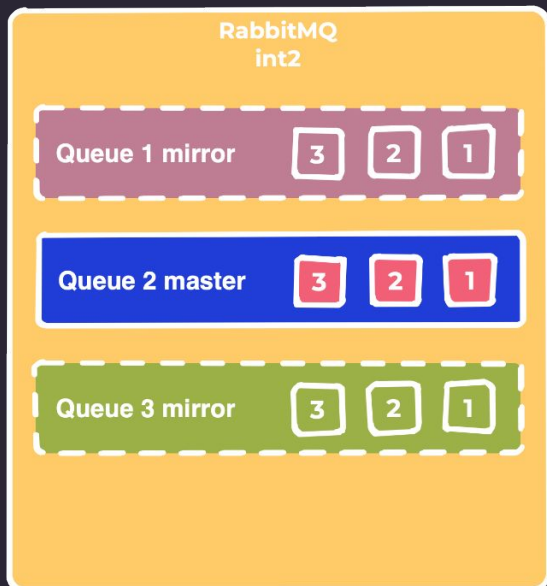
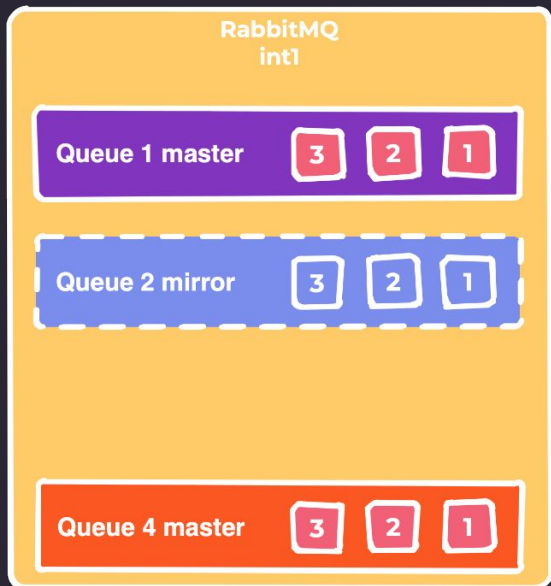
HA queues

ha-mode: exactly

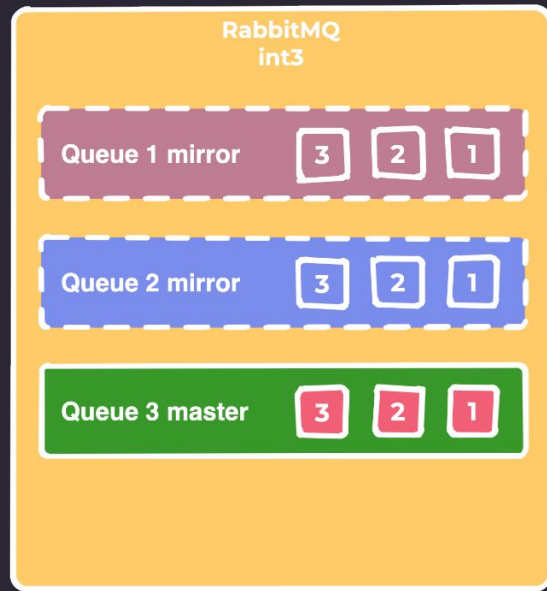
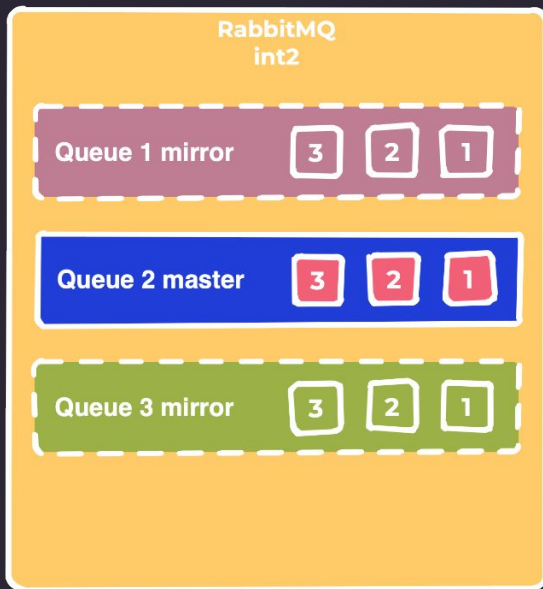
ha-sync-mode: automatic

ha-params:

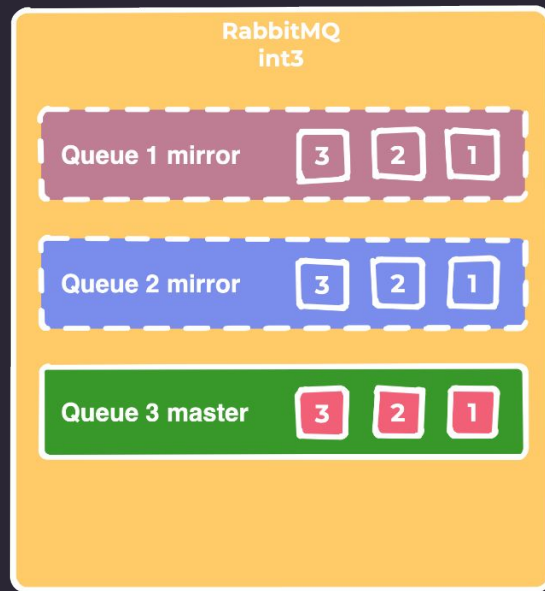
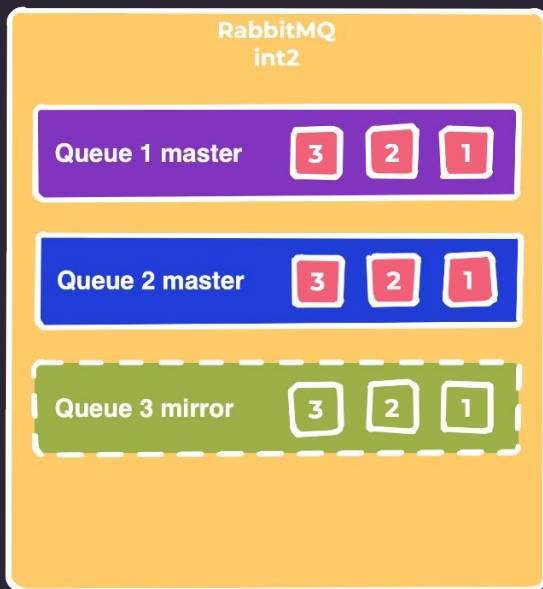
Queue 1: 3 Queue 2: 3 Queue 3: 2 Queue 4: 1



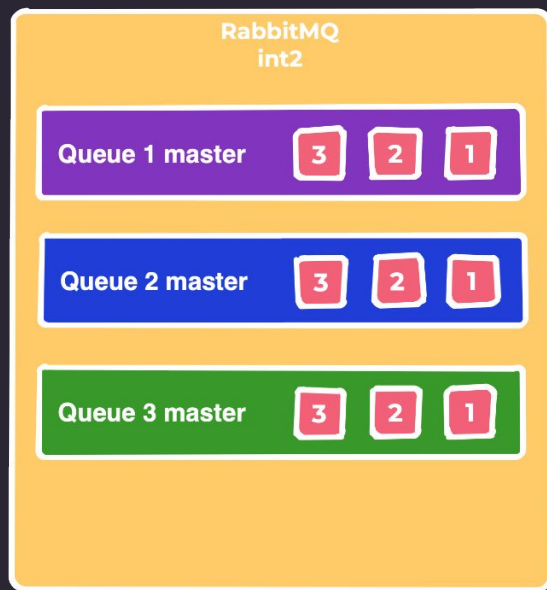
HA queues



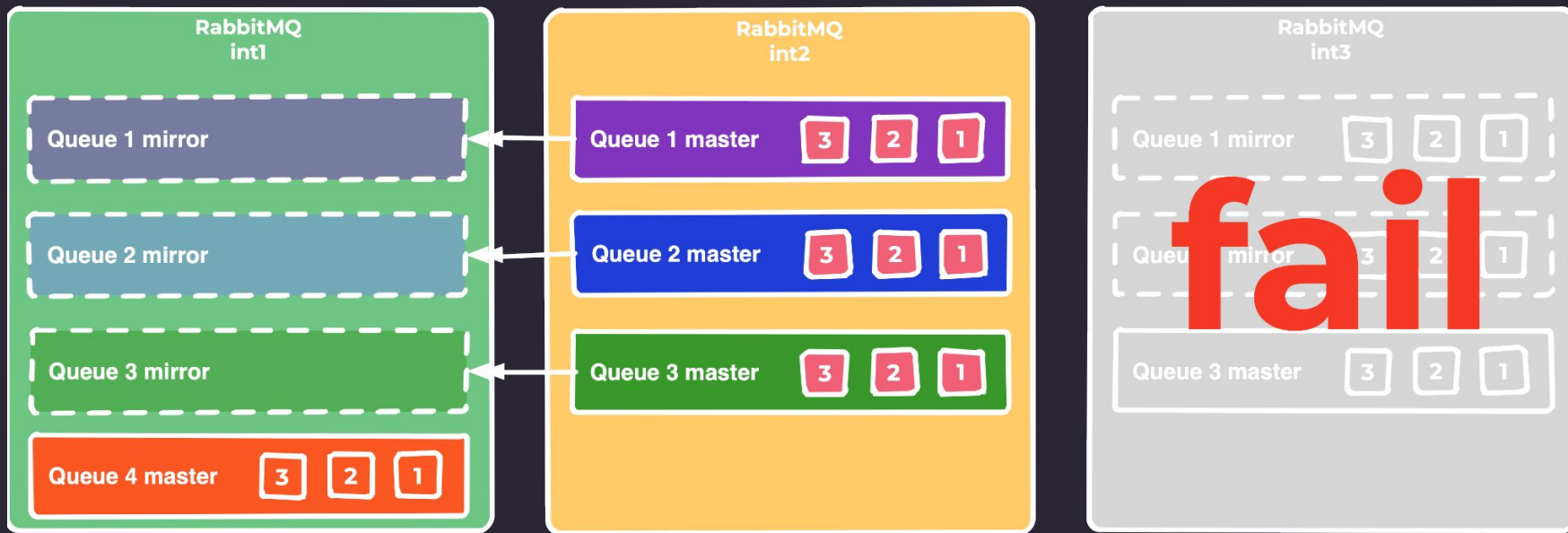
HA queues



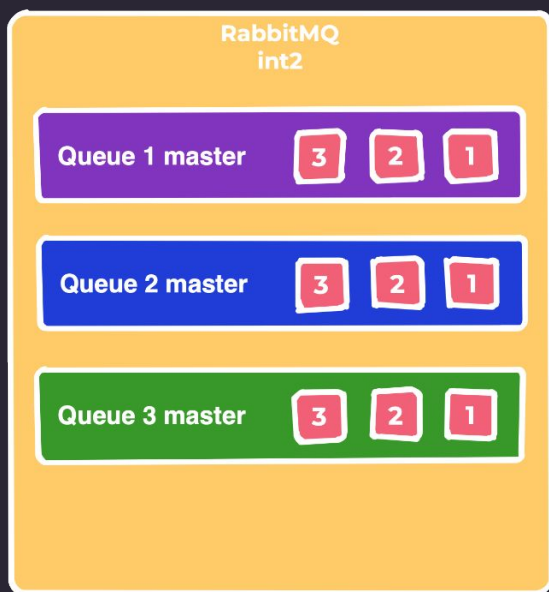
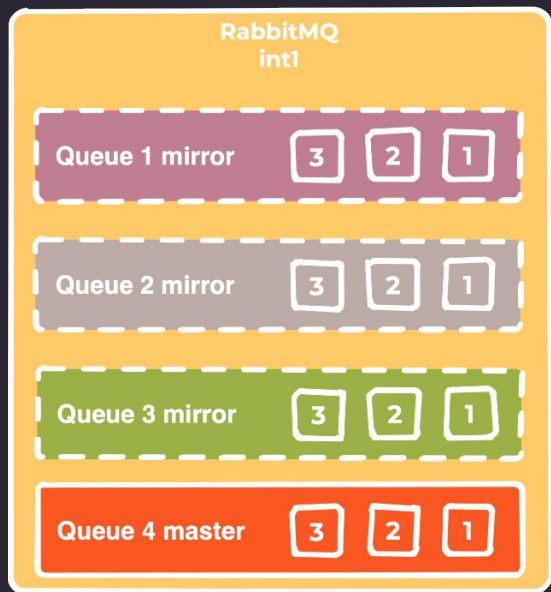
HA queues



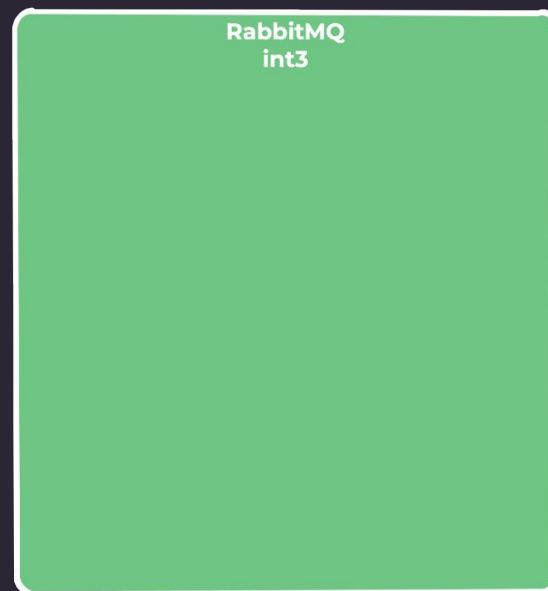
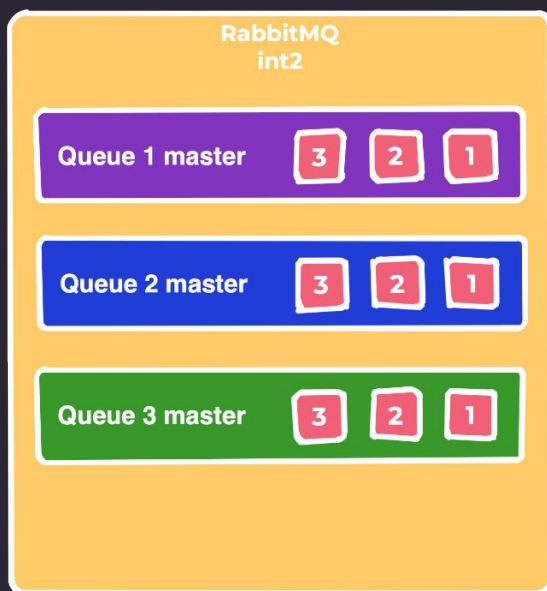
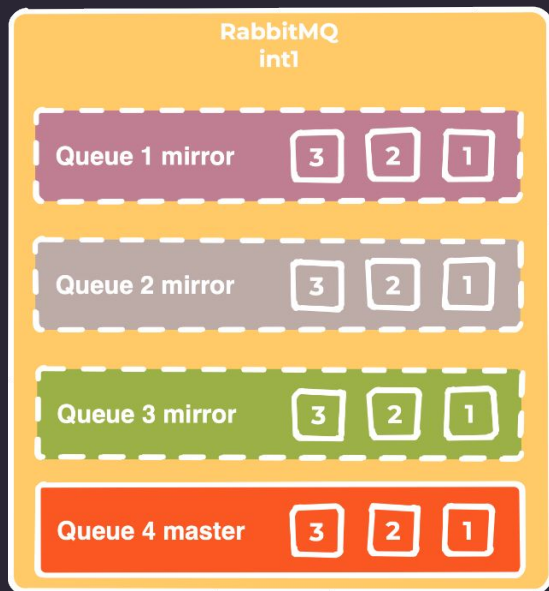
HA queues



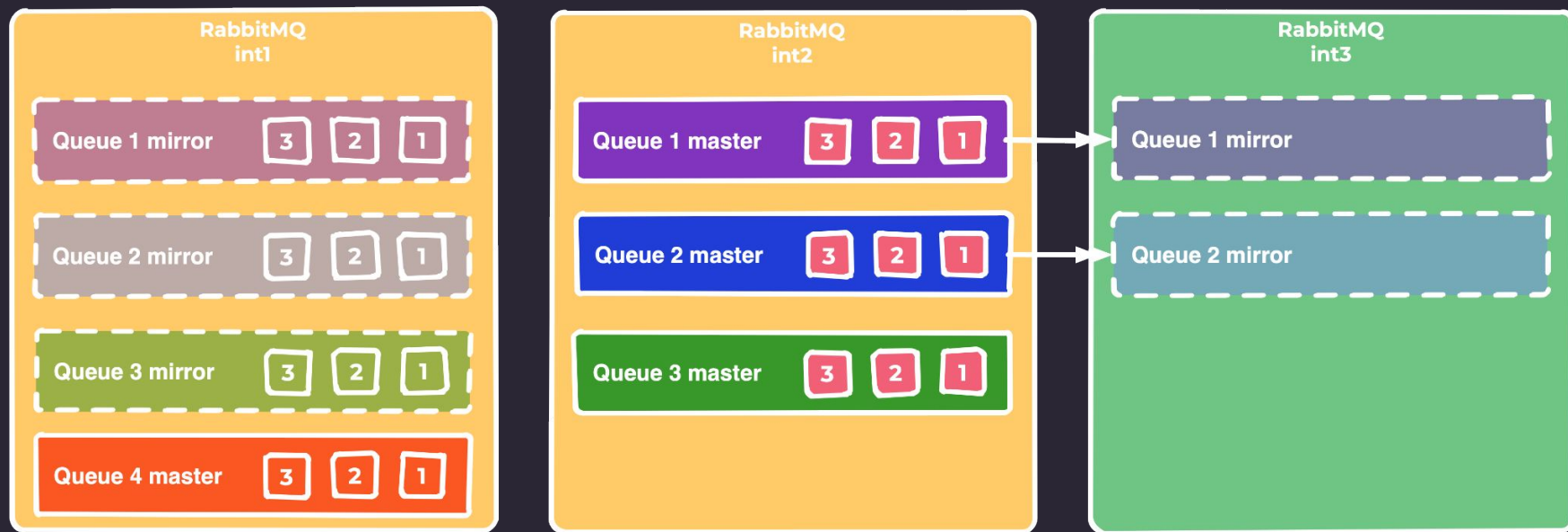
HA queues



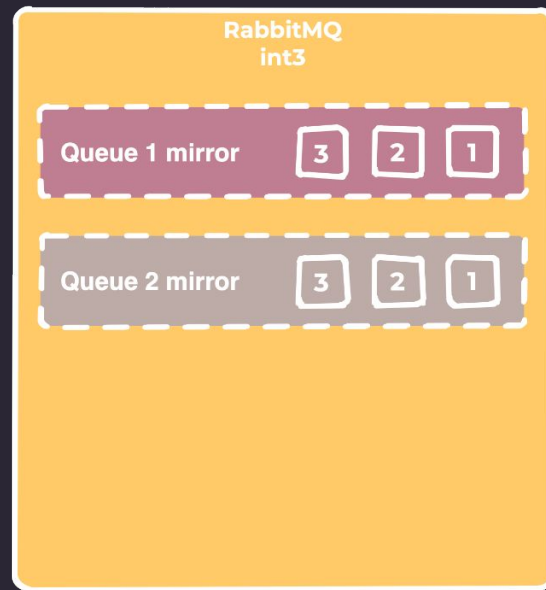
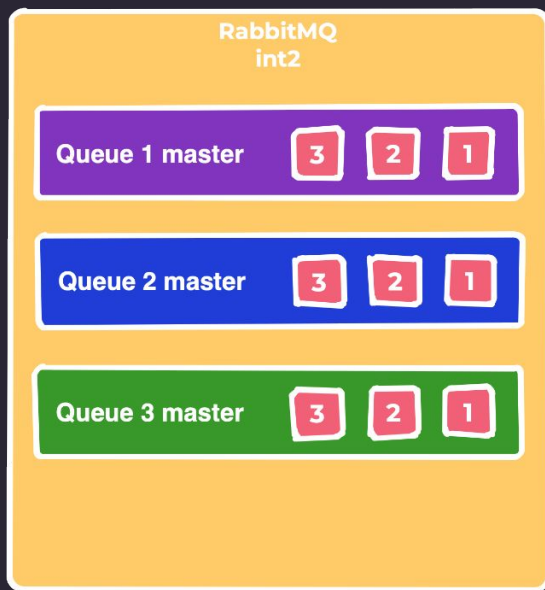
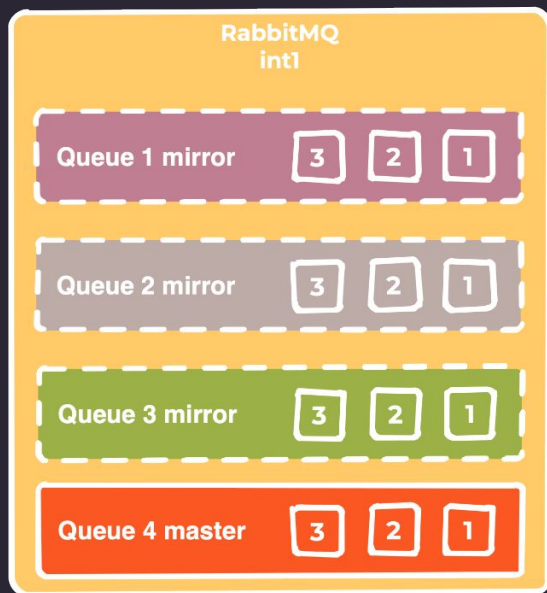
HA queues



HA queues



HA queues



Настройка кластера

```
rabbitmq1:
  image: rabbitmq:3.10.7-management
  hostname: rabbitmq1
  restart: always
  environment:
    RABBITMQ_DEFAULT_USER: rmuser
    RABBITMQ_DEFAULT_PASS: rmpassword
    RABBITMQ_ERLANG_COOKIE: SUPER1SECRET1COOKIE
    RABBITMQ_SERVER_ADDITIONAL_ERL_ARGS: -rabbit log_levels
  [{connection,error},{default,error}] disk_free_limit 2147483648
  volumes:
    - ./rabbitmq-1:/var/lib/rabbitmq
  ports: ["15672:15672"]
```

Настройка кластера

**Cluster Formation and
Peer Discovery**



Clustering Guide



Настройка кластера

rabbitmq2:

image: rabbitmq:3.10.7-management

hostname: rabbitmq2

restart: always

environment:

RABBITMQ_DEFAULT_USER: rmuser

RABBITMQ_DEFAULT_PASS: rmpassword

RABBITMQ_ERLANG_COOKIE: SUPER1SECRET1COOKIE

RABBITMQ_SERVER_ADDITIONAL_ERL_ARGS: -rabbit log_levels

[{connection,error},{default,error}] **disk_free_limit** 2147483648

volumes:

- **./rabbitmq-2:/var/lib/rabbitmq**

ports: ["15673:15672"]

Настройка кластера

rabbitmq3:

image: rabbitmq:3.10.7-management

hostname: rabbitmq3

restart: always

environment:

RABBITMQ_DEFAULT_USER: rmuser

RABBITMQ_DEFAULT_PASS: rmpassword

RABBITMQ_ERLANG_COOKIE: SUPER1SECRET1COOKIE

RABBITMQ_SERVER_ADDITIONAL_ERL_ARGS: -rabbit log_levels

[{connection,error},{default,error}] **disk_free_limit** 2147483648

volumes:

- **./rabbitmq-3:/var/lib/rabbitmq**

ports: ["15674:15672"]

Настройка кластера

```
docker-compose up -d
```

Настройка кластера

The screenshot displays the RabbitMQ management interface. At the top, the RabbitMQ logo is visible along with version information: RabbitMQ 3.10.7 and Erlang 25.0.4. The page is titled 'Overview' and shows various system metrics. A navigation bar includes tabs for Overview, Connections, Channels, Exchanges, Queues, and Admin. The user is identified as 'rmuser' with a 'Log out' button. The 'Totals' section shows: Queued messages (last minute), Currently idle, Message rates (last minute), and Global counts. A summary bar indicates: Connections: 0, Channels: 0, Exchanges: 7, Queues: 0, Consumers: 0. The 'Nodes' section contains a table with the following data:

Name	File descriptors ?	Socket descriptors ?	Erlang processes	Memory ?	Disk space	Uptime	Info	Reset stats	+/-
rabbit@rabbitmq1	36 <small>1048576 available</small>	0 <small>943629 available</small>	433 <small>1048576 available</small>	143 MiB <small>5.5 GiB high watermark</small>	281 GiB <small>2.0 GiB low watermark</small>	2m 43s	basic disc 6 rss	This node All nodes	

Below the table, there are expandable sections for Churn statistics, Ports and contexts, Export definitions, and Import definitions. At the bottom, a footer contains links for HTTP API, Server Docs, Tutorials, Community Support, Community Slack, Commercial Support, Plugins, GitHub, and Changelog.

Настройка кластера

```
HOST=rabbitmq2
```

```
docker-compose exec $HOST rabbitmqctl stop_app
```

```
docker-compose exec $HOST rabbitmqctl reset
```

```
docker-compose exec $HOST rabbitmqctl join_cluster rabbit@rabbitmq1
```

```
docker-compose exec $HOST rabbitmqctl start_app
```

Настройка кластера

```
MacBookPro:rabbit-ha kilex$ HOST=rabbitmq2
MacBookPro:rabbit-ha kilex$ docker-compose exec $HOST rabbitmqctl stop_app && docker-compose exec $HOST rabbitmqctl reset && docker-compose exec $HOST
rabbitmqctl join_cluster rabbit@rabbitmq1 && docker-compose exec $HOST rabbitmqctl start_app
RABBITMQ_ERLANG_COOKIE env variable support is deprecated and will be REMOVED in a future version. Use the $HOME/.erlang.cookie file or the --erlang-c
ookie switch instead.
Stopping rabbit application on node rabbit@rabbitmq2 ...
RABBITMQ_ERLANG_COOKIE env variable support is deprecated and will be REMOVED in a future version. Use the $HOME/.erlang.cookie file or the --erlang-c
ookie switch instead.
Resetting node rabbit@rabbitmq2 ...

09:55:57.417 [warning] Feature flags: the previous instance of this node must have failed to write the `feature_flags` file at `/var/lib/rabbitmq/mnes
ia/rabbit@rabbitmq2-feature_flags`:

09:55:57.417 [warning] Feature flags: - list of previously enabled feature flags now marked as such: [:maintenance_mode_status]
RABBITMQ_ERLANG_COOKIE env variable support is deprecated and will be REMOVED in a future version. Use the $HOME/.erlang.cookie file or the --erlang-c
ookie switch instead.
Clustering node rabbit@rabbitmq2 with rabbit@rabbitmq1

09:55:58.793 [warning] Feature flags: the previous instance of this node must have failed to write the `feature_flags` file at `/var/lib/rabbitmq/mnes
ia/rabbit@rabbitmq2-feature_flags`:

09:55:58.793 [warning] Feature flags: - list of previously disabled feature flags now marked as such: [:maintenance_mode_status]

09:55:59.851 [warning] Feature flags: the previous instance of this node must have failed to write the `feature_flags` file at `/var/lib/rabbitmq/mnes
ia/rabbit@rabbitmq2-feature_flags`:

09:55:59.851 [warning] Feature flags: - list of previously enabled feature flags now marked as such: [:maintenance_mode_status]

09:55:59.903 [error] Failed to create a tracked connection table for node :rabbit@rabbitmq2: {:node_not_running, :rabbit@rabbitmq2}

09:55:59.904 [error] Failed to create a per-vhost tracked connection table for node :rabbit@rabbitmq2: {:node_not_running, :rabbit@rabbitmq2}

09:55:59.904 [error] Failed to create a per-user tracked connection table for node :rabbit@rabbitmq2: {:node_not_running, :rabbit@rabbitmq2}
RABBITMQ_ERLANG_COOKIE env variable support is deprecated and will be REMOVED in a future version. Use the $HOME/.erlang.cookie file or the --erlang-c
ookie switch instead.
Starting node rabbit@rabbitmq2 ...
MacBookPro:rabbit-ha kilex$
```

Настройка кластера

The screenshot displays the RabbitMQ management interface. At the top, the RabbitMQ logo is visible along with version information: RabbitMQ 3.10.7 and Erlang 25.0.4. The page is titled 'Overview' and shows various system metrics. A navigation bar includes 'Overview', 'Connections', 'Channels', 'Exchanges', 'Queues', and 'Admin'. The 'Overview' section includes a 'Totals' dropdown, 'Queued messages last minute', 'Currently idle', 'Message rates last minute', and 'Global counts'. A summary bar shows: Connections: 0, Channels: 0, Exchanges: 7, Queues: 0, Consumers: 0. Below this is a 'Nodes' section with a table listing two nodes: 'rabbit@rabbitmq1' and 'rabbit@rabbitmq2'. Each node row includes columns for Name, File descriptors, Socket descriptors, Erlang processes, Memory, Disk space, Uptime, Info, and Reset stats. The 'Info' column for each node shows 'basic', 'disc', '6', and 'rss'. The 'Reset stats' column has buttons for 'This node' and 'All nodes'. At the bottom, there are links for 'Churn statistics', 'Ports and contexts', 'Export definitions', and 'Import definitions'. The footer contains links for 'HTTP API', 'Server Docs', 'Tutorials', 'Community Support', 'Community Slack', 'Commercial Support', 'Plugins', 'GitHub', and 'Changelog'.

Refreshed 2022-10-18 13:57:18 Refresh every 5 seconds

Virtual host All
Cluster **rabbit@rabbitmq1**
User **rmuser** [Log out](#)

Overview

▼ Totals

Queued messages [last minute](#) ?

Currently idle

Message rates [last minute](#) ?

Currently idle

Global counts ?

Connections: 0 Channels: 0 Exchanges: 7 Queues: 0 Consumers: 0

▼ Nodes

Name	File descriptors ?	Socket descriptors ?	Erlang processes	Memory ?	Disk space	Uptime	Info	Reset stats	+/-
rabbit@rabbitmq1	37 1048576 available	0 943629 available	434 1048576 available	145 MiB 5.5 GiB high watermark	281 GiB 2.0 GiB low watermark	8m 25s	basic disc 6 rss	This node All nodes	
rabbit@rabbitmq2	36 1048576 available	0 943629 available	418 1048576 available	147 MiB 5.5 GiB high watermark	281 GiB 2.0 GiB low watermark	22m 32s	basic disc 6 rss	This node All nodes	

▶ Churn statistics

▶ Ports and contexts

▶ Export definitions

▶ Import definitions

[HTTP API](#) [Server Docs](#) [Tutorials](#) [Community Support](#) [Community Slack](#) [Commercial Support](#) [Plugins](#) [GitHub](#) [Changelog](#)

Настройка кластера

The screenshot displays the RabbitMQ management interface for a cluster. The browser address bar shows the URL `127.0.0.1:15671/#/`. The page title is "RabbitMQ" with sub-headers for "RabbitMQ 3.10.7" and "Erlang 25.0.4". The interface is refreshed every 5 seconds. The cluster name is "rabbit@rabbitmq1" and the user is "rmuser".

The navigation menu includes: Overview (selected), Connections, Channels, Exchanges, Queues, and Admin.

Overview

Totals

Queued messages: last minute ?

Currently idle

Message rates: last minute ?

Currently idle

Global counts ?

Connections: 0 Channels: 0 Exchanges: 7 Queues: 0 Consumers: 0

Nodes

Name	File descriptors ?	Socket descriptors ?	Erlang processes	Memory ?	Disk space	Uptime	Info	Reset stats	+/-
rabbit@rabbitmq1	39 1048576 available	0 943629 available	436 1048576 available	147 MiB 5.5 GiB high watermark	281 GiB 2.0 GiB low watermark	9m 55s	basic disc 6 rss	This node All nodes	
rabbit@rabbitmq2	37 1048576 available	0 943629 available	419 1048576 available	147 MiB 5.5 GiB high watermark	281 GiB 2.0 GiB low watermark	24m 2s	basic disc 6 rss	This node All nodes	
rabbit@rabbitmq3	37 1048576 available	0 943629 available	419 1048576 available	150 MiB 5.5 GiB high watermark	281 GiB 2.0 GiB low watermark	11m 22s	basic disc 6 rss	This node All nodes	

- Churn statistics
- Ports and contexts
- Export definitions
- Import definitions

Настройка кластера

```
HOST=rabbitmq4
```

```
docker-compose exec $HOST rabbitmqctl stop_app
```

```
docker-compose exec $HOST rabbitmqctl reset
```

```
docker-compose exec $HOST rabbitmqctl start_app
```

Quorum queue

▼ Add a new queue

Type:

Name: *

Node:

Arguments: =

Add **Auto expire** ? | **Message TTL** ? | **Overflow behaviour** ?
Single active consumer ? | **Dead letter exchange** ? | **Dead letter routing key** ?
Max length ? | **Max length bytes** ?
Delivery limit ? | **Initial cluster size** ?
Dead letter strategy ? | **Leader locator** ?

Add queue

Quorum queue

Queues

▼ All queues (1)

Pagination

Page 1 of 1 - Filter: Regex ?

Overview						Me
Name	Node	Type	Features	Consumers	State	Re
quorum1	rabbit@rabbitmq1 +2	quorum	D Args	0	running	

▼ Add a new queue

Type: Quorum

Name: *

Node: rabbit@rabbitmq1

Arguments: = Str

Quorum queue

Details

Features arguments: x-queue-type: quorum

 durable: true

Policy

Operator policy

Effective policy definition

Leader rabbit@rabbitmq1

Online rabbit@rabbitmq1
rabbit@rabbitmq3
rabbit@rabbitmq2

Members rabbit@rabbitmq1
rabbit@rabbitmq3
rabbit@rabbitmq2

Classic queue

▼ Add a new queue

Type: Classic

Name: classic1 *

Durability: Durable

Node: rabbit@rabbitmq1

Auto delete: ? No

Arguments: = String

Add **Auto expire** ? | **Message TTL** ? | **Overflow behaviour** ?

Single active consumer ? | **Dead letter exchange** ? | **Dead letter routing key** ?

Max length ? | **Max length bytes** ?

Maximum priority ? | **Lazy mode** ? | **Version** ? | **Master locator** ?

Add queue

Classic queue

Queues

▼ All queues (2)

Pagination

Page 1 of 1 - Filter: Regex ?

Overview

Name	Node	Type	Features	Consumers	State
classic1	rabbit@rabbitmq1	classic	D Args	1	idle
quorum1	rabbit@rabbitmq1 +2	quorum	D Args	0	running

▼ Add a new queue

Type: Classic

Name: *

Durable

Classic queue

Queues

▼ All queues (2)

Pagination

Page of 1 - Filter: Regex ?

Overview						Messages		
Name	Node	Type	Features	Consumers	State	Ready	Unacked	Total
classic1	rabbit@rabbitmq1	classic	D Args	?	■ down	NaN	NaN	NaN
quorum1	rabbit@rabbitmq2 +1	quorum	D Args	0	■ running	0	0	0

Classic queue

Name	Pattern	Apply to	Definition	Priority
classic	^classic.*	queues	ha-mode: exactly ha-params: 3 ha-sync-mode: automatic	5

Classic queue

Queues

▼ All queues (2)

Pagination

Page of 1 - Filter: Regex ?

Overview						
Name	Node	Type	Features	Consumers	State	Re
classic1	rabbit@rabbitmq1 +2	classic	D Args classic	1	idle	
quorum1	rabbit@rabbitmq2 +2	quorum	D Args	0	running	

▶ Add a new queue

Classic queue

Queues

▼ All queues (2)

Pagination

Page of 1 - Filter: Regex ?

Overview

Name	Node	Type	Features	Consumers	State
classic1	rabbit@rabbitmq2 +1	classic	D Args classic	0	idle
quorum1	rabbit@rabbitmq2 +1	quorum	D Args	0	running

Classic queue

Queues

▼ All queues (2)

Pagination

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Overview						Messages
Name	Node	Type	Features	Consumers	State	Ready
classic1	rabbit@rabbitmq3	classic	D Args classic	0	idle	10
quorum1	? +0	quorum	D Args	?		NaN

HAProxy

```
lb:  
  image: haproxy:2.6.6-alpine  
  restart: always  
  volumes:  
    - ./haproxy.cfg:/usr/local/etc/haproxy/haproxy.cfg  
  ports:  
    - 15671:15672  
  links:  
    - rabbitmq1  
    - rabbitmq2  
    - rabbitmq3
```

HAProxy

```
global
  daemon
  maxconn 10000

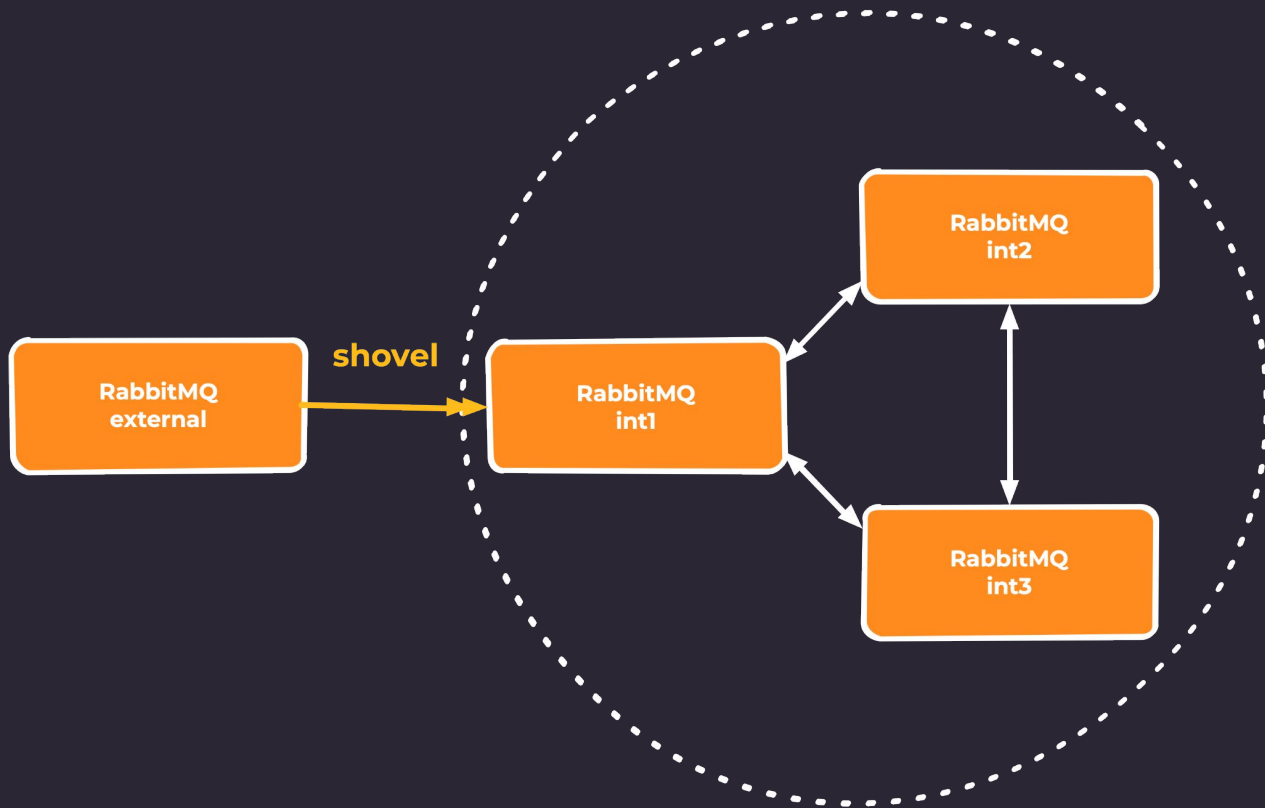
defaults
  mode    tcp
  timeout connect 5000
  timeout client 50000
  timeout server 50000

listen rabbitmq-web
  bind *:15672
  balance roundrobin
  server r1 rabbitmq1:15672 check inter 1s rise 2 fall 2
  server r2 rabbitmq2:15672 check inter 2s rise 2 fall 2 backup
  server r3 rabbitmq3:15672 check inter 2s rise 2 fall 2 backup
```

HAProxy

```
listen amqp
  bind :5672
  mode tcp
  option tcplog
  option clitcpka
  balance roundrobin
  server amqp1 rabbitmq1:5672 check inter 5s rise 2 fall 3
  server amqp2 rabbitmq2:5672 check inter 5s rise 2 fall 3
  server amqp3 rabbitmq3:5672 check inter 5s rise 2 fall 3
```

Shovel




Shovel

```
rabbitmq1:
  image: rabbitmq:3.10.7-management
  hostname: rabbitmq1
  restart: always
  environment:
    RABBITMQ_DEFAULT_USER: ruser
    RABBITMQ_DEFAULT_PASS: rpassword
    RABBITMQ_ERLANG_COOKIE: SUPER1SECRET1COOKIE
    RABBITMQ_SERVER_ADDITIONAL_ERL_ARGS: -rabbit log_levels
    [{connection,error},{default,error}] disk_free_limit 2147483648
  volumes:
    - ./rabbitmq-1:/var/lib/rabbitmq
    - ./enabled_plugins:/etc/rabbitmq/enabled_plugins
  ports: ["15672:15672"]
```

Shovel

```
[rabbitmq_federation,rabbitmq_federation_management,rabbitmq_management,rabbitmq_shovel,rabbitmq_shovel_management].
```

Shovel

 RabbitMQ RabbitMQ 3.10.7 Erlang 25.0.4Refreshed 2022-10-18 15:15:35 Refresh every 5 secondsVirtual host AllCluster rabbit@rabbitmq1User rmuser Log out

[Overview](#) [Connections](#) [Channels](#) [Exchanges](#) [Queues](#) **Admin**

Dynamic Shovels

▼ Shovels

... no shovels ...

▼ Add a new shovel

Name: *

Source: AMQP 0.9.1

URI: Queue: ?

*

Prefetch count:

Auto-delete: Never

Destination: AMQP 0.9.1

URI: Queue: ?

*

Add forwarding headers: No

Reconnect delay: s

Acknowledgement mode: On confirm

[Add shovel](#)

Users
Virtual Hosts
Feature Flags
Policies
Limits
Cluster
Federation Status
Federation Upstreams
Shovel Status
Shovel Management

Shovel

▼ Add a new shovel

Name: *

Source:

URI: ?

Queue: ?

*

Prefetch count: ?

Auto-delete ?

Destination:

URI ?

Exchange: ?

*

Routing key:

Add forwarding headers: ?

Reconnect delay: ? s

Acknowledgement mode: ?

Shovel



RabbitMQ 3.10.7

Erlang 25.0.4

Refreshed 2022-10-18 15:26:33

Refresh every 5 seconds

Virtual host All

Cluster rabbit@rabbitmq1

User rmuser Log out

Overview

Connections

Channels

Exchanges

Queues

Admin

Shovel Status

Name	Node	State	Source	Destination	Last changed	Operations
from_ext dynamic	rabbit@rabbitmq1	running	amqp091 amqp://rabbitmq- ext	external queue amqp091 amqp:// from_external : from_external exchange	2022-10-18 11:20:14	Restart

Users

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Shovel Status

Shovel Management

Shovel

Pagination

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Overview					Messages	
Name	Type	Features	Consumers	State	Ready	U
external	classic	D Args	1	<input type="checkbox"/> idle	0	

Shovel итоги

- **Работает в кластере** - дополнительная отказоустойчивость
- **Add forwarding headers** - медленно добавляет заголовки в сообщение
- **URI** - для vhost / - ставить слеш в конце не надо!
- **URI** - для локального кластера можно оставить amqp://

Демонстрация

Практическое задание

- Запустить **три инстанса RabbitMQ** с отдельными стейтами
- Настроить **балансировку на management** при помощи haproxy
- **Собрать кластер** из 3 инстансов RabbitMQ
- Создать классическую очередь
- **Настроить HA- полиси** для этой очереди
- Записать пачку сообщений в очередь
- Проверить **отказоустойчивость кластера**
- Настроить **shovel**

Конец

А кто слушал - молодец

