

MySQL Connectors 8.0.19 & DNS SRV

with examples using `docker` & `consul`

Kenny Gryp
MySQL Product Manager

ORACLE®

Safe Harbor Statement

The following is intended to outline our general product direction. It is intended for information purpose only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

DNS-SRV

- DNS Service record - [RFC 2782](#)
- "defining the location, i.e., the hostname and port number, of servers for specified services"

Example

```
_service._proto.name.    TTL  class SRV priority weight port target.  
_mysql._tcp.domain.     0    IN   SRV   0      5      3306 mysql_server_1.domain.  
_mysql._tcp.domain.     0    IN   SRV   0      5      3306 mysql_server_2.domain.  
_mysql._tcp.domain.     0    IN   SRV   0      5      3306 mysql_server_3.domain.  
...  
...
```

What is DNS-SRV

```
# dig database-router-ro.service.consul SRV
; <>> DiG 9.11.5-P4-5.1-Debian <>> database-router-ro.service.consul SRV
...
;; QUESTION SECTION:
;database-router-ro.service.consul. IN      SRV

;; ANSWER SECTION:
database-router-ro.service.consul. 0 IN      SRV      1 1 6447 ac14000a.addr.dc1.consul.
database-router-ro.service.consul. 0 IN      SRV      1 1 6447 ac140007.addr.dc1.consul.
database-router-ro.service.consul. 0 IN      SRV      1 1 6447 ac14000b.addr.dc1.consul.

;; ADDITIONAL SECTION:
ac14000a.addr.dc1.consul. 0      IN      A      172.20.0.10
ac140007.addr.dc1.consul. 0      IN      A      172.20.0.7
ac14000b.addr.dc1.consul. 0      IN      A      172.20.0.11

;; Query time: 6 msec
;; SERVER: 172.20.0.2#53(172.20.0.2)
;; WHEN: Mon Jan 27 19:43:07 UTC 2020
;; MSG SIZE  rcvd: 560
```

How do I configure DNS-SRV?

Do I need to configure BIND and list the Database Servers manually?

How do I configure DNS-SRV?

Do I need to configure BIND and list the Database Servers manually? **NO!**

Use Service Discovery Tools!

How do I configure DNS-SRV?

Do I need to configure BIND and list the Database Servers manually? **NO!**

Use Service Discovery Tools!

Service Discovery Tools



How do I configure DNS-SRV?

Do I need to configure BIND and list the Database Servers manually? **NO!**

Use Service Discovery Tools!

Service Discovery Tools



Container Orchestration



MySQL 8.0.19 Supports DNS-SRV

Released for native protocol connectors

- Connector/.NET
- Connector/ODBC
- Connector/J
- Connector/Node.js
- Connector/Python
- Connector/C++

Both X & Classic Protocol



MySQL 8.0.19 Supports DNS-SRV

Released for native protocol connectors

- Connector/.NET
- Connector/ODBC
- Connector/J
- Connector/Node.js
- Connector/Python
- Connector/C++

Both X & Classic Protocol

In progress for...

- Connector/C / libmysqlclient
 - & dependent community connectors:
 - Perl
 - MySQL/Ruby
 - mysql-python
- PHP Plugin
 - Awaiting PHP release

Not started...

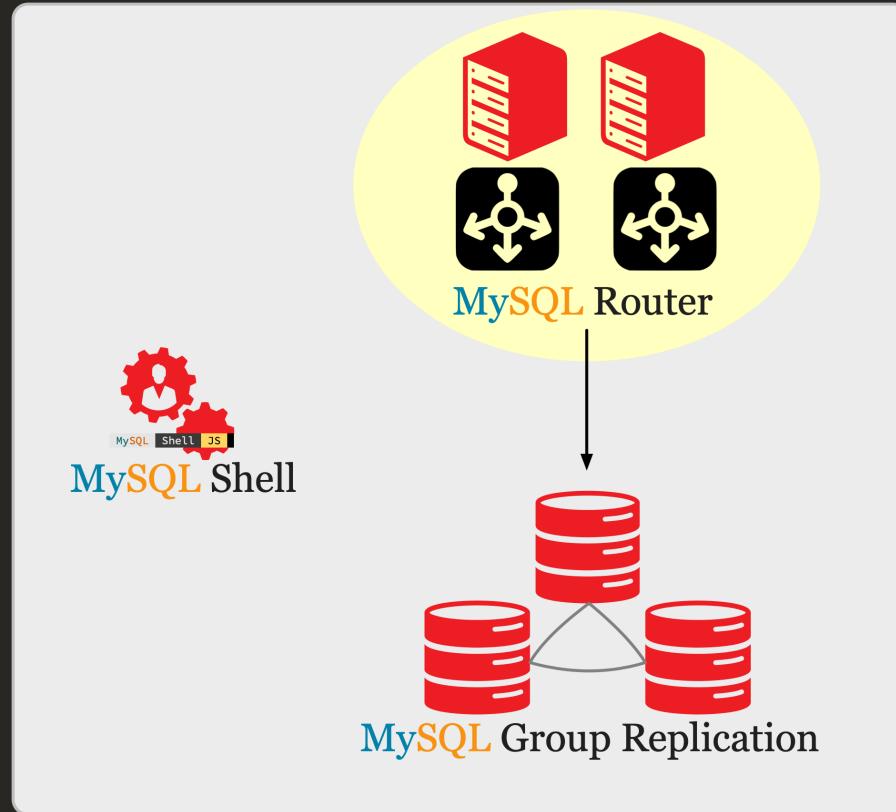
native community drivers:

- go-sql-driver

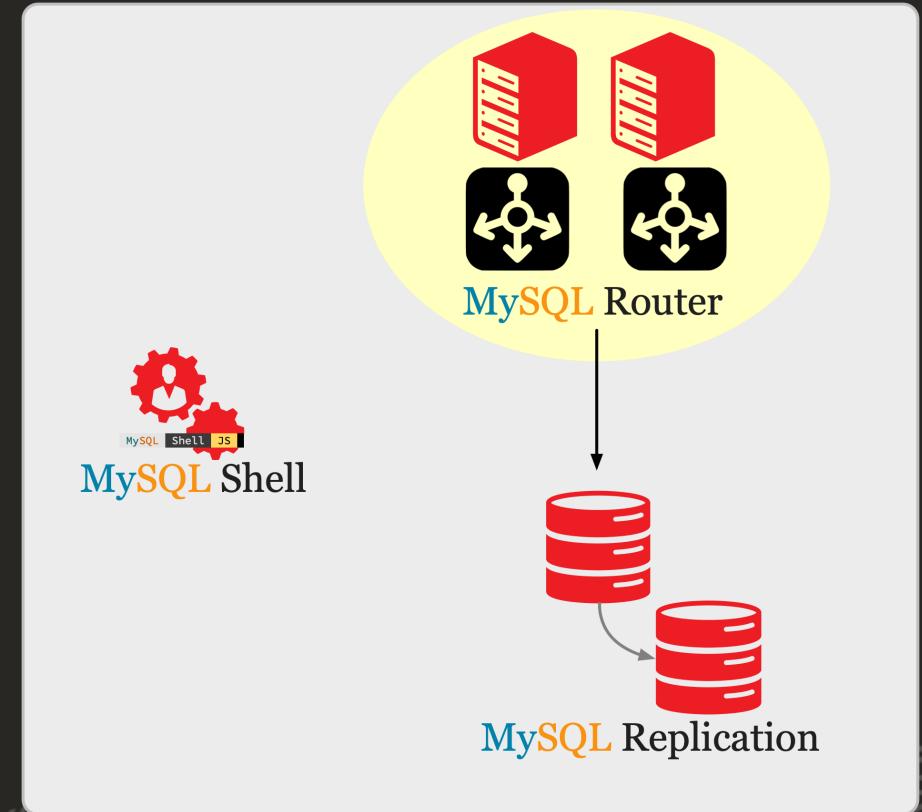


Use Cases - MySQL InnoDB Cluster / ReplicaSet

MySQL InnoDB Cluster



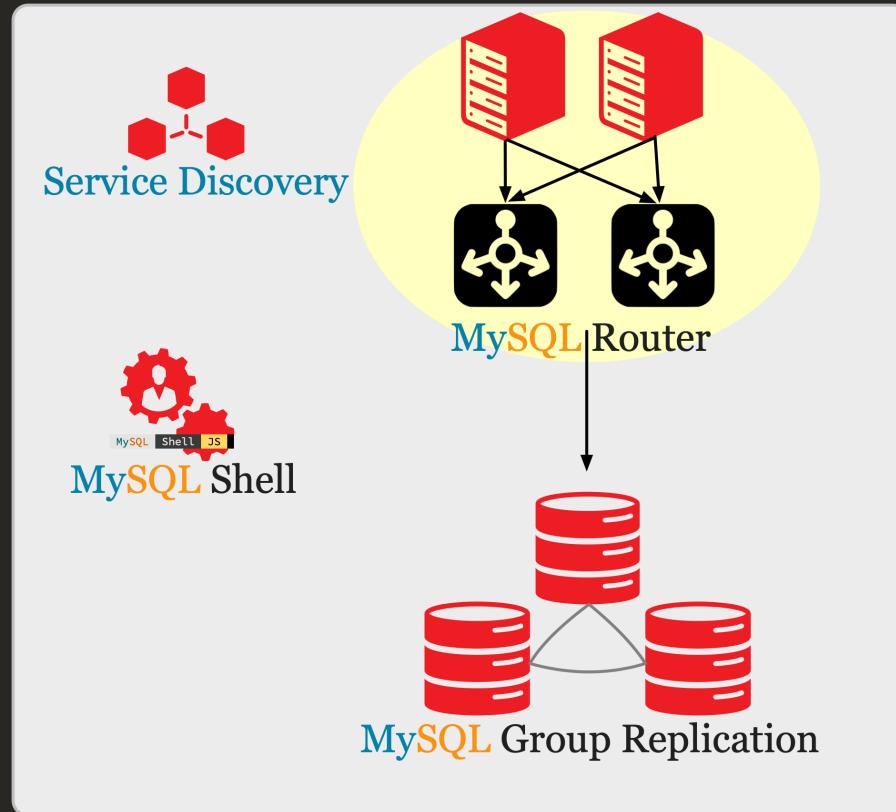
MySQL InnoDB ReplicaSet



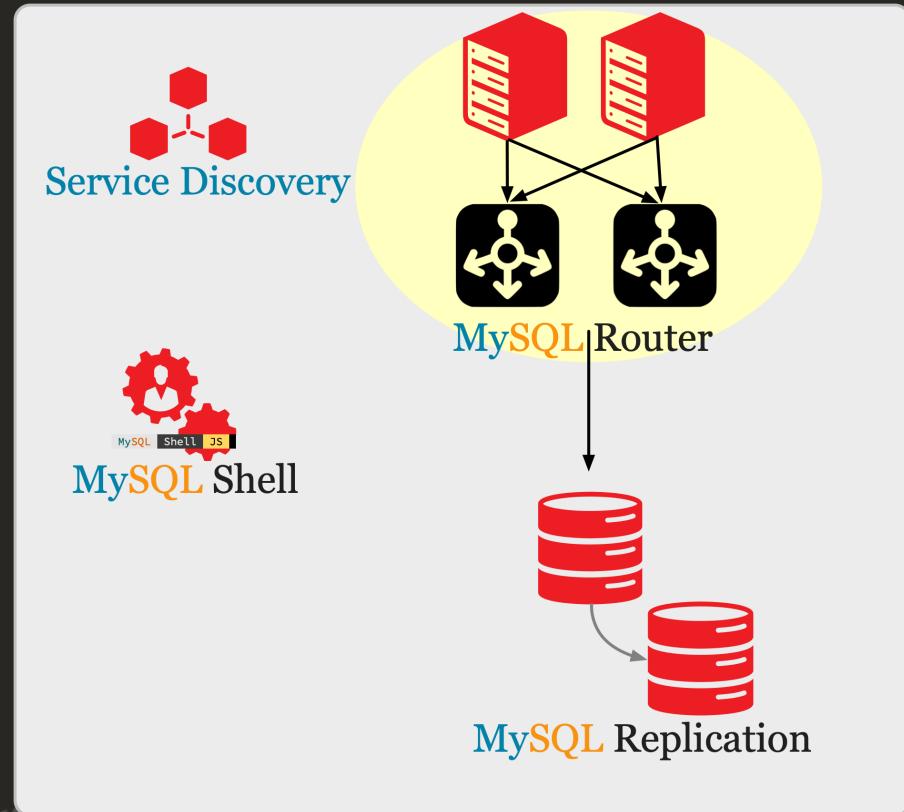
When MySQL Router cannot be installed on Application servers!

Use Cases - MySQL InnoDB Cluster / ReplicaSet

MySQL InnoDB Cluster



MySQL InnoDB ReplicaSet



When MySQL Router cannot be installed on Application servers!



Use Cases

Ease of Use

Changes in database architecture does not require handling/changing:

- virtual IPs
- Load Balancers
- change connector configuration
- `consul-template`

Elasticity

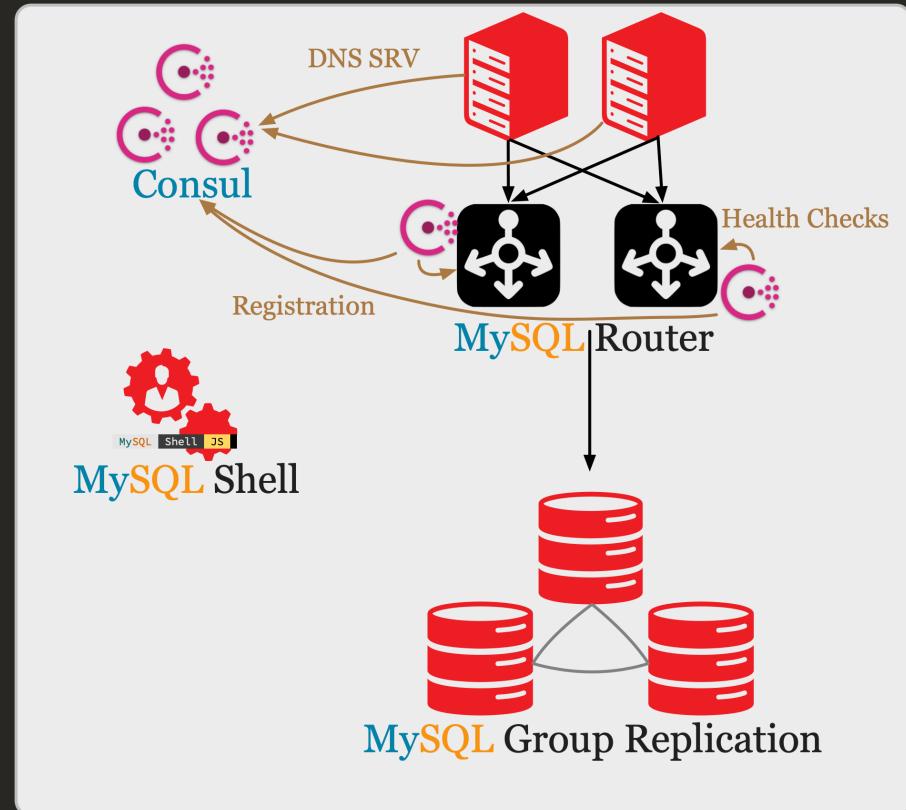
New endpoints can register/deregister, adding/removing them from service discovery

Customization

Ability to customize & automate integration from application to data

How to Use -- 1. Registration & Health Checking

MySQL InnoDB Cluster



Steps

1. Router Starts
2. `consul-agent` register with `consul` cluster
3. `consul-agent` performs health checks
4. connectors do DNS SRV request to find MySQL Router servers

How to Use -- 2. DNS Forwarding

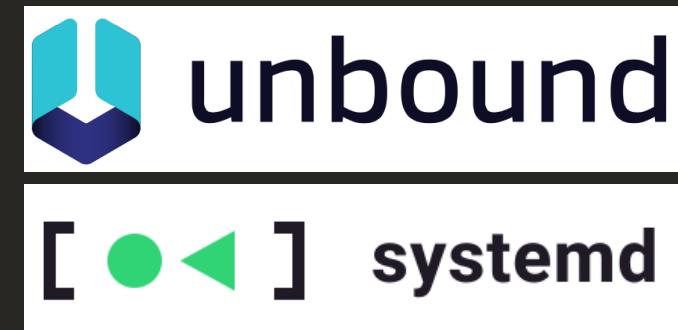
1. Connectors do not do any form of caching or forwarding.
 - Every new connection does a new DNS SRV request.
2. Service Discovery is usually different from other DNS infrastructure, which then requires DNS Forwarding

DNS Server Level:



Excellent implementation guide:
[HashiCorp - Consul - Forward DNS](#)

Local Forwarders



dnsmasq



How to Use -- 3. Example Connector/Python Configuration

Example:

```
cnx = mysql.connector.connect(  
    user='root', password='mysql',  
    host='database-router-rw.service',  
    dns_srv=True)
```

How to Use -- 3. Example Connector/Python Configuration

Example:

```
cnx = mysql.connector.connect(  
    user='root', password='mysql',  
    host='database-router-rw.service',  
    dns_srv=True)
```

Wait... not according to RFC 2782? (expecting `_mysql._tcp.service`)

How to Use -- 3. Example Connector/Python Configuration

Example:

```
cnx = mysql.connector.connect(  
    user='root', password='mysql',  
    host='database-router-rw.service',  
    dns_srv=True)
```

Wait... not according to RFC 2782? (expecting `_mysql._tcp.service`)

Nope

How to Use -- 3. Example Connector/Python Configuration

Example:

```
cnx = mysql.connector.connect(  
    user='root', password='mysql',  
    host='database-router-rw.service',  
    dns_srv=True)
```

Wait... not according to RFC 2782? (expecting `_mysql._tcp.service`)

Nope

- Consul does not fully adhere to RFC, allowing:

```
# all  
database-router-rw.service  
_database-router-rw._tcp.service  
# tag ghent  
ghent.database-router-rw.service  
_database-router-rw._ghent.service
```

DNS SRV Priority & Weights -- According to RFC 2782

Connectors implement RFC:

Priority

Servers with lower priority MUST be attempted
(Not supported by Consul)

Weight

Larger weights SHOULD be given a proportionately higher probability of being selected.
(Supported by Consul)

Calculation

- For each Priority (lowest first)
 - calculated **SUM(weights)**, assign each number to a Server
 - choose random number **BETWEEN 0 AND SUM(weights)**
 - find server that is greater than or equal the random number

TTL

TTL can be configured to allow caching on DNS Level, but be wary of impact:

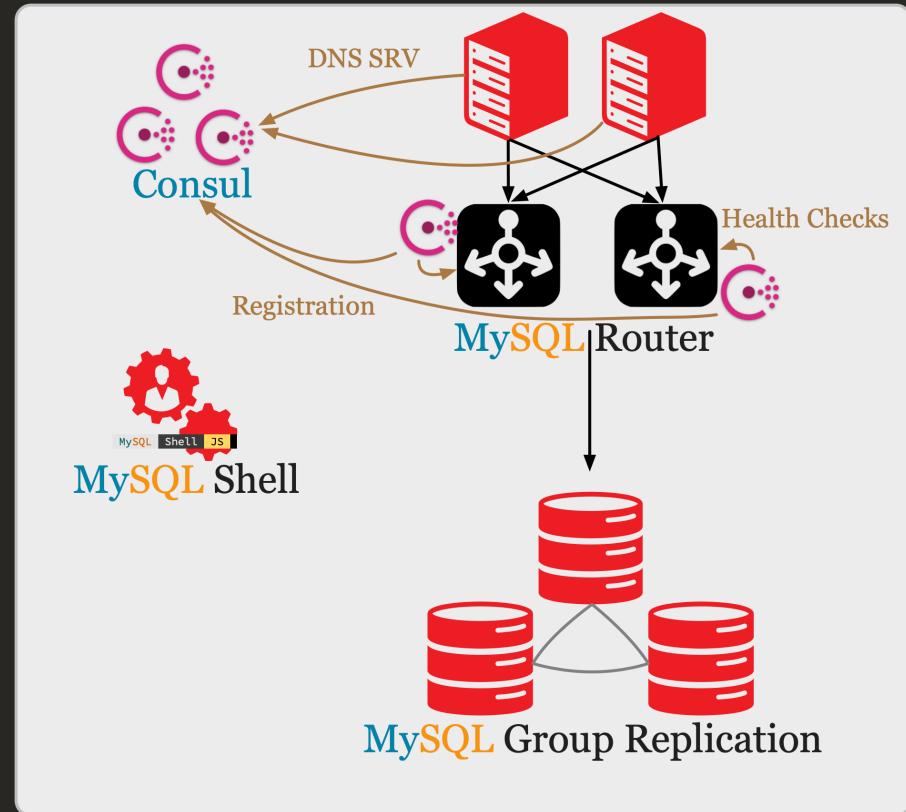
- TTL of 0 means no caching:
 - service discovery that is down will result in database connection issues
- TTL that is too high reduces flexibility:
 - takes time before a broken server is taken out of the pool, causing connection issues

(Supported by Consul)

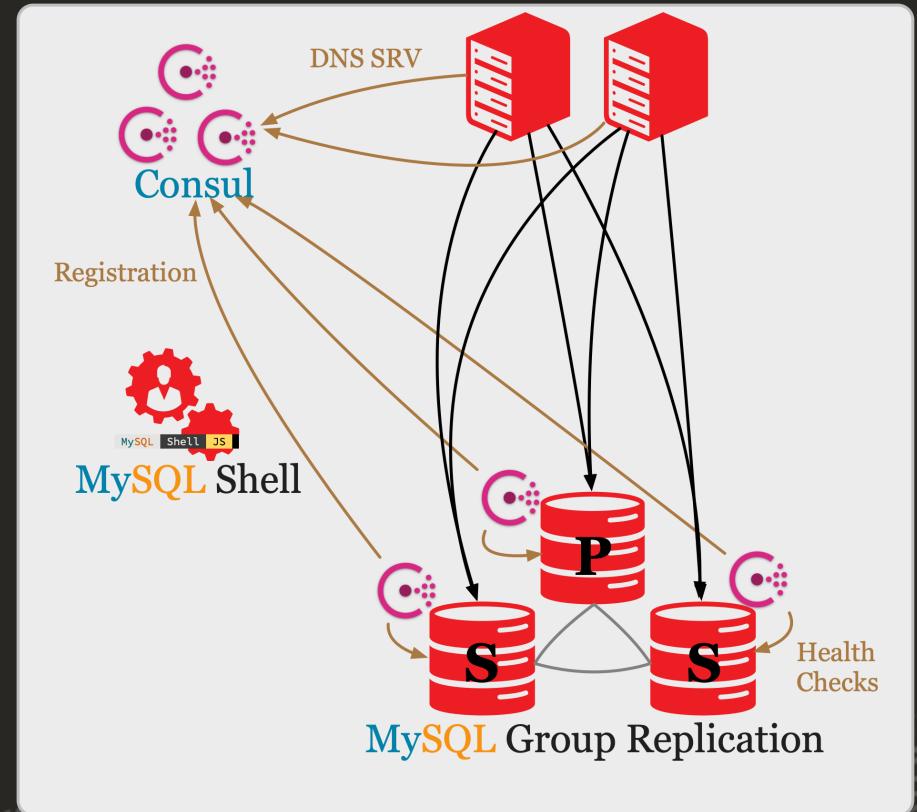
DNS Servers/Caching/Forwarders configuration might not respect TTL, doublecheck!

Endless Possibilities

MySQL InnoDB Cluster

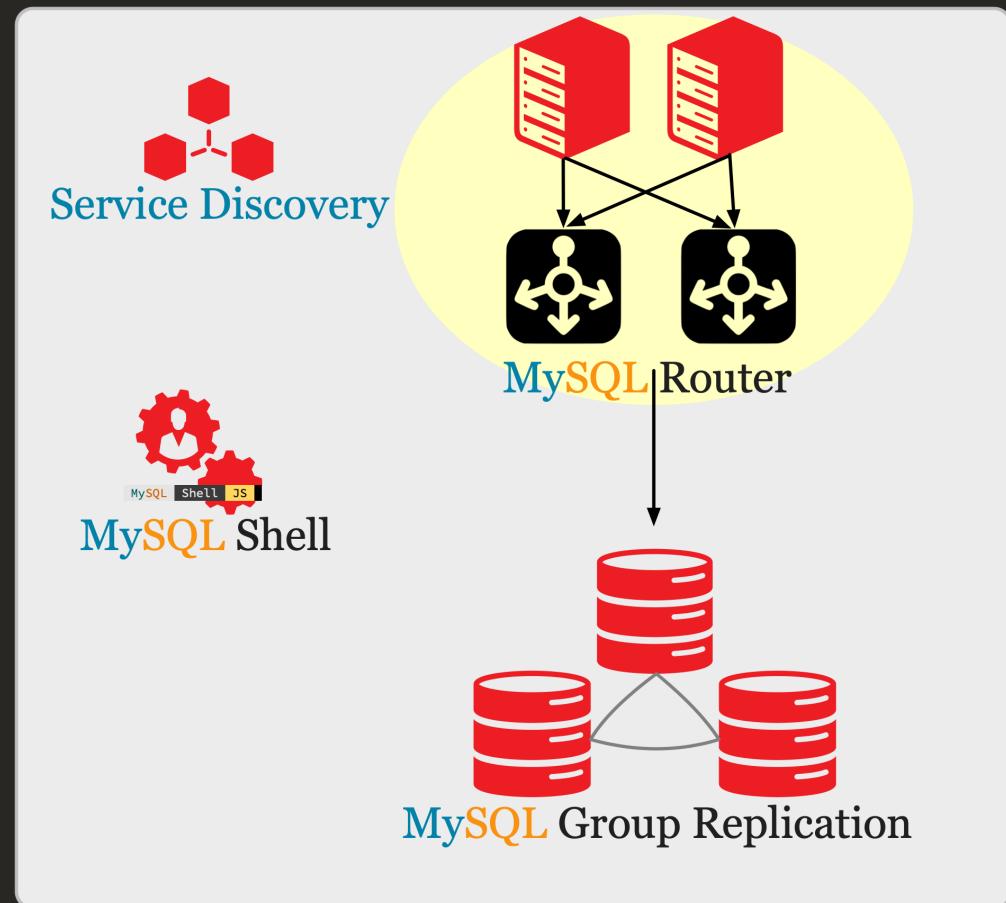


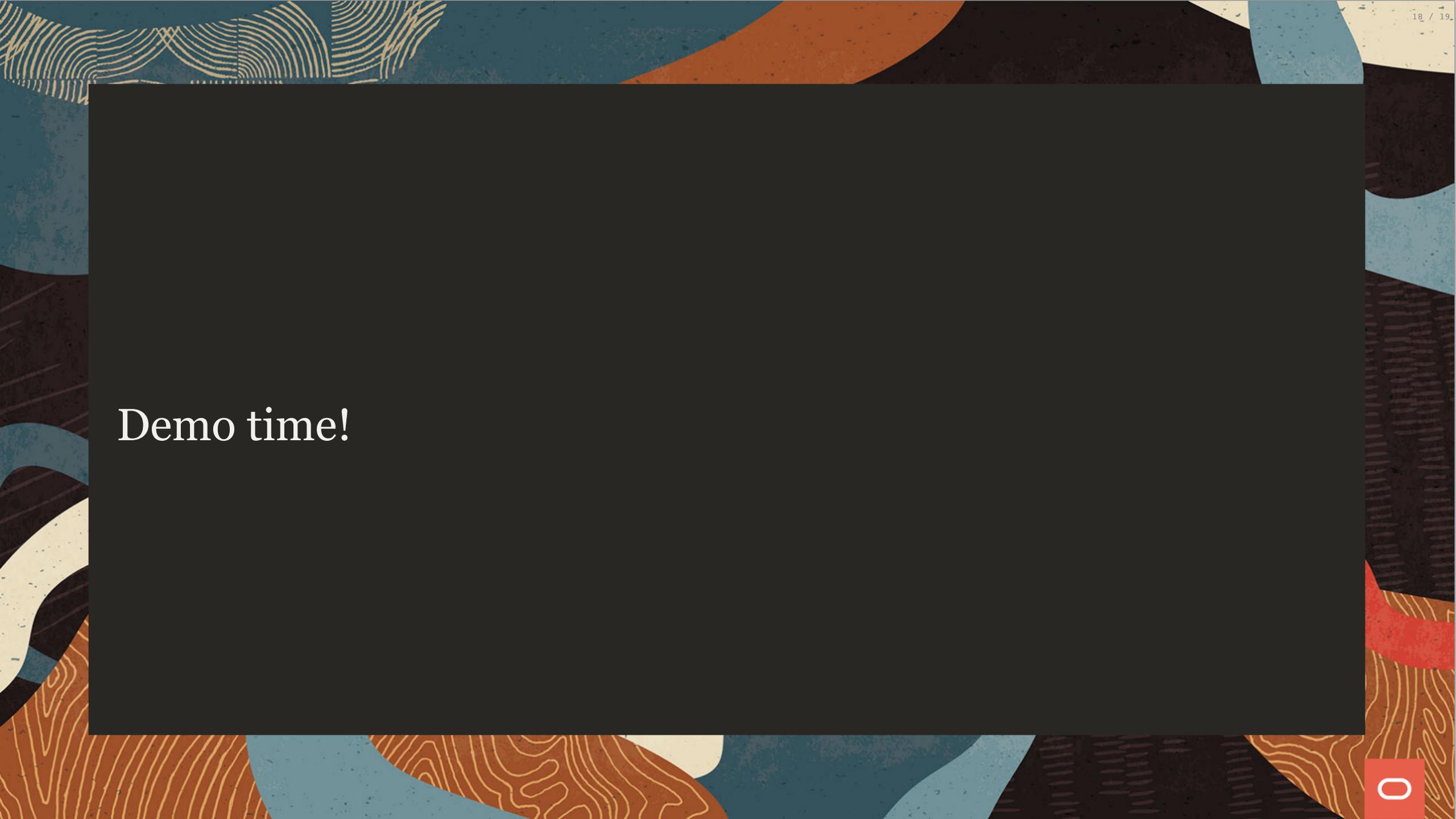
MySQL InnoDB Cluster



Demo

- Docker as Environment
- Consul as Service Discovery
- Registrator as Service Registry
- MySQL InnoDB Cluster as Database Backend
- MySQL Router as Proxy
- Python Application to demonstrate





Demo time!

MySQL Connectors 8.0.19 & DNS SRV

with examples using `docker` & `consul`

Kenny Gryp
MySQL Product Manager