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RPC and Rendezvous

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RPC introduction & Rendezvous (1/3)

- (A)synch msg passing are powerful enough for all four kinds of processes (clients, servers, filters, peers)

- But …
  - Two-way information flow between client ←→ server requires explicitly a **two-message exchange** using two different message channels
  - Each client requires a different message channel

RPC introduction & Rendezvous (2/3)

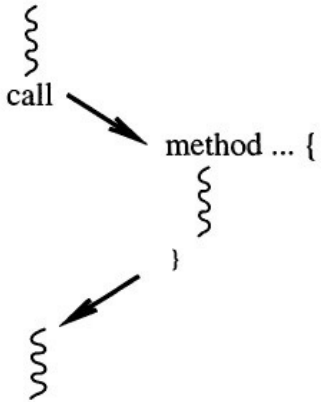
- Client/server interactions via **remote-procedure call (RPC)** or **rendezvous**
  - They both combine aspects of sync msg passing and monitors
    - Server exports operations that are to be invoked
    - Invocation is synchronous → Caller (client) delays until operation completes
  - An operation is a two-way communication channel
    - Caller (client) → Server …. Server → Caller (client)

RPC introduction & Rendezvous (3/3)

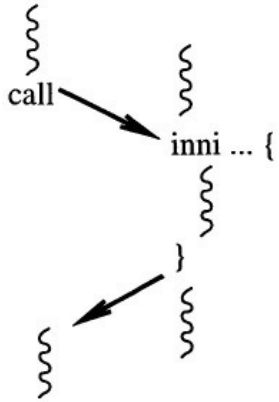
- Involves 2 processes
  - Invoking process (client)
  - Handling process (server)

- The handling process is a process that exists already
  - **No new** process is created!
- It's a synchronous protocol (from the invoking process' perspective)
- Both process can be on different machines

Difference between RPC and Rendezvous



remote procedure call

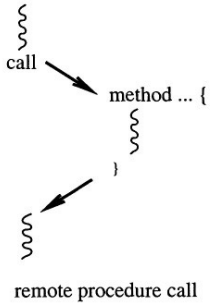


rendezvous

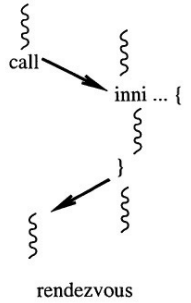
Serviced by:	**method (`op`)**	**input statement (`inni`)**

Key take away messages

- Rendezvous and RPC are sync. mechanisms
- Using a two-way channel for communication
- No new process created for server
- Service by operation (RPC)…
- … or by input statement (Rendezvous)



remote procedure call



rendezvous

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RPC in Python

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RPC recap

- RPC = Remote procedure call
- Synchronous message passing
- 2-way communication
  - RPC in Java is called RMI (Remote Method Invocation)
- Invoker and Server can be on different machines → distributed computing

RPC recap

- RPC = Remote procedure call
- Synchronous message passing
- 2-way communication
- ~~Like rendezvous, but a new process will be created on the server side~~
  - RPC in Java is called RMI (Remote Method Invocation)
- Invoker and Server can be on different machines → distributed computing

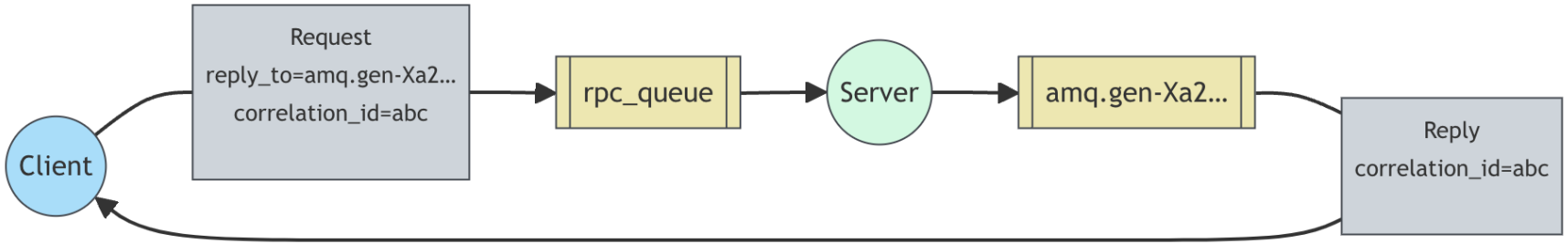
Remote process call - Python

- RPC in Python are not available *out of the box*.
- Additional libraries (e.g. xmlrpc, tinyrpc, …) provides the functionality
- RabbitMQ gives also the needed tools for doing RPC

- Read the RabbitMQ's tutorial:

  https://www.rabbitmq.com/tutorials/tutorial-six-python.html

RPC in Python with RabbitMQ



RPC Python - Server

```
ch.basic_publish(exchange='',
                 routing_key=props.reply_to,
                 properties=pika.BasicProperties(
                     correlation_id = props.correlation_id),
                 body=str(response))

ch.basic_ack(delivery_tag=method.delivery_tag)



channel.basic_qos(prefetch_count=1)
channel.basic_consume(queue=EXCHANGE_NAME,
                      on_message_callback=on_request,
                      auto_ack=False)
```

RPC Python - Client

Creation of a class for the RPC stub

```
def __init__(self):
  [self.connection, self.channel] =
     connect_rabbit_noqueue()

  result = self.channel.queue_declare(queue='',
                       exclusive=True)
  self.callback_queue = result.method.queue

  self.channel.basic_consume(
    queue=self.callback_queue,
    on_message_callback=self.on_response,
    auto_ack=True)

def on_response(self, ch, method, props, body):
  if self.corr_id == props.correlation_id:
    self.response = body
```

```
def call(self, n):  # method exposed for RPC
   self.response = None
   self.corr_id = str(uuid.uuid4())
   self.channel.basic_publish(
      exchange='',
      routing_key=EXCHANGE_NAME,
      properties=pika.BasicProperties(
         reply_to=self.callback_queue,
         correlation_id=self.corr_id,
      ),
      body=str(n))
   while self.response is None:
      self.connection.process_data_events()
   return int(self.response)
```