

Remote Debugging

with PyCharm



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Integrated Development Environment



IDE interface showing a Java project structure, source code, and debug console.

Project Structure:

- resources
 - test
 - target
 - third_party
 - observing-domain.iml
 - pom.xml
- persistence [observing-persistence]
- piapi
 - proto [piapi-proto]
 - src
 - assembly
 - main
 - java
 - edu.hawaii.cfht.observing.piapi
 - action
 - HealthCheckService
 - ObservingGroupService
 - ObservingTemplateService
 - TargetService
 - dagger
 - repositories
 - util
 - DatabaseConfigLoader
 - ProgramWhitelist
 - resources
 - test
 - java
 - edu.hawaii.cfht.observing.piapi
 - action
 - ObservingGroupServiceTest
 - ObservingTemplateServiceTest
 - TargetServiceTest
 - migration
 - repositories
 - roundtrip

Source Code (ObservingTemplateService.java):

```
70     return;  
71 }  
72  
73 builder.setSuccess(observingTemplateRepository.persist(request.getRunid(), observingTemplate));  
74  
75 responseObserver.onNext(builder.build());  
76 responseObserver.onCompleted();  
77  
78 @Override  
79 public void listObservingTemplates(  
80     ObservingTemplateListRequest request, request: "runid: \"17AE91\"\\n"  
81     StreamObserver<ObservingTemplateListResponse> responseObserver) { responseObserver: GrpcResponseUtil$1@2376  
82     ObservingTemplateRepository observingTemplateRepository = observingTemplateRepository: MariaDbObservingTemplateRepository@2377  
83     observingTemplateEntityRepositoryProvider.get(); observingTemplateEntityRepositoryProvider: ObservingTemplateServiceTest$lambda$23@0  
84     if (request.getRunid().isEmpty()) {  
85         edu.hawaii.cfht.aspect.grpc_rest.impl.Errors errors = edu.hawaii.cfht.aspect.grpc_rest.impl.Errors  
86         .collectErrors();  
87         errors.enter( scopeName: "runid", (runIdErrors) -> {  
88             runIdErrors.recordError("must be specified");  
89         });  
90         responseObserver.onError(new StatusRuntimeException(Status.INVALID_ARGUMENT, errors.toMetadata())); responseObserver: GrpcResponseUtil$1@2376  
91         return;  
92     }  
93  
94     List<ObservingTemplateEntity> observingTemplateEntities = observingTemplateEntities: size = 0  
95     observingTemplateRepository.getEntityByRunid(request.getRunid()); observingTemplateRepository: MariaDbObservingTemplateRepository@2377 request: "runid: \"17AE91\"\\n"  
96     ObservingTemplateListResponse.Builder responseBuilder = ObservingTemplateListResponse.newBuilder();  
97     observingTemplateEntities.forEach((observingTemplate) -> responseBuilder.addObservingTemplate  
98         (observingTemplate.toObservingTemplateData()));  
99  
100     responseObserver.onNext(responseBuilder.setSuccess(true).build());  
101     responseObserver.onCompleted();  
102 }  
103  
104 }  
105  
106 }  
107 }
```

Debug Console:

Debug ObservingTemplateServiceTest

Frames

- "main"@1 in group "main": RUNNING
- listObservingTemplates:99, ObservingTemplateService (edu.hawaii.cfht.observing.piapi.action)
- listObservingTemplate_listsObservingTemplates:73, ObservingTemplateServiceTest (edu.hawaii.cfht.observing.piapi.action)
- invoke:0-1, NativeMethodAccessorImpl (sun.reflect)
- invoke:62, NativeMethodAccessorImpl (sun.reflect)
- invoke:43, DelegatingMethodAccessorImpl (sun.reflect)
- invoke:498, Method (java.lang.reflect)
- runReflectiveCall:50, FrameworkMethod\$1 (org.junit.runners.model)
- run:12, ReflectiveCallable (org.junit.internal.runners.model)
- invokeExplosively:47, FrameworkMethod (org.junit.runners.model)
- evaluate:17, InvokeMethod (org.junit.internal.runners.statements)
- evaluate:26, RunBefore (org.junit.internal.runners.statements)
- lambda\$evaluate\$0:22, TransactionTestRule\$1 (edu.cfht.common.persistence.testhelpers)
- run:-1, 2119992687 (edu.cfht.common.persistence.testhelpers.TransactionTestRule\$1\$Lambda\$19)
- run:514, DefaultDSLContext\$2 (org.jooq.impl)
- run:511, DefaultDSLContext\$2 (org.jooq.impl)
- lambda\$TransactionResult\$0:23, SingleTransactionDSL (edu.cfht.common.persistence.testhelpers)
- run:-1, 967576586 (edu.cfht.common.persistence.testhelpers.SingleTransactionDSL\$Lambda\$20)
- lambda\$TransactionResult\$0:468, DefaultDSLContext (org.jooq.impl)

Variables

- this = {ObservingTemplateService@2363}
- request = {ObservingTemplateListRequest@2375} "runid: \"17AE91\"\\n"
- responseObserver = {GrpcResponseUtil\$1@2376}
- observingTemplateRepository = {MariaDbObservingTemplateRepository@2377}
- observingTemplateEntities = {ArrayList@2378} size = 0

All files are up-to-date (moments ago)

99:1 LF+ UTF-8+ Git: master +





Debugging is the act of determining why an output of a process does not match the expected result.



Science

Verbalize a hypothesis

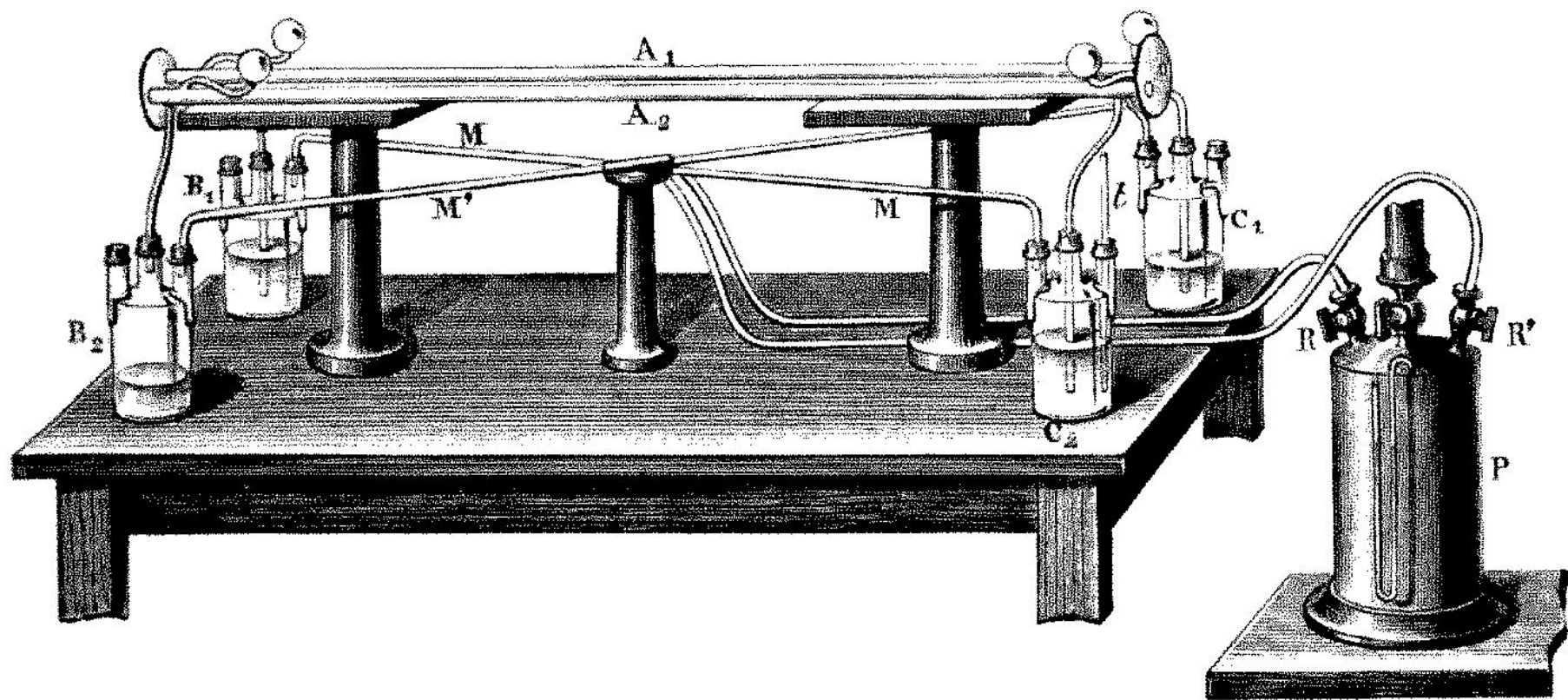
Verbalize a hypothesis

Verbalize a statement that must be true because of this hypothesis.

Verbalize a hypothesis

Verbalize a statement that must be true because of this hypothesis.

Verbalize a statement that must be false because of this hypothesis.







Nik Szymanek

Local Workstation

Local Workstation



Display

Local Workstation



Display



IDE

Local Workstation



Display



IDE

Production Server

Local Workstation



Display



IDE

Production Server



Headless Program

Local Workstation



Display



IDE

Production Server



Headless Program



Bug

Local Workstation



Display



IDE

SSH

Production Server



Headless Program



Bug

Local Workstation



Production Server



Local Workstation



Production Code Files
(sshfs)

Production Server



Local Workstation



Production Code Files
(sshfs)

Debugging Data
(reverse ssh tunnel)

Production Server



Local Workstation

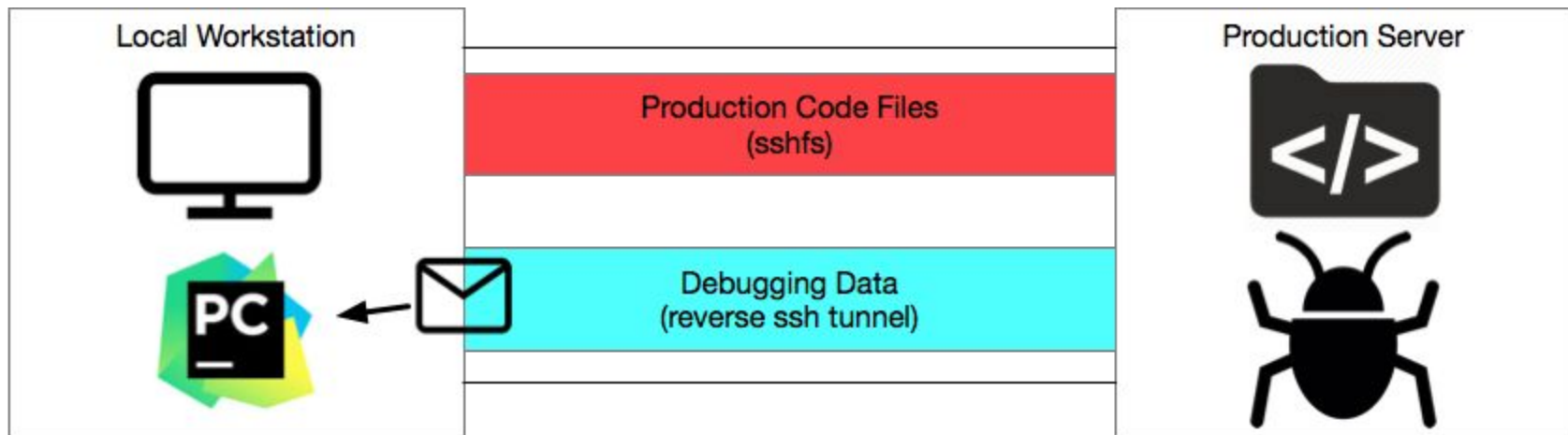


Production Code Files
(sshfs)

Debugging Data
(reverse ssh tunnel)

Production Server





Local Workstation



Docker VM

Production Code Files
(sshfs)

SSH (:2222)

Debugging Data
(reverse ssh tunnel)

Production Server



Setup Remote File System

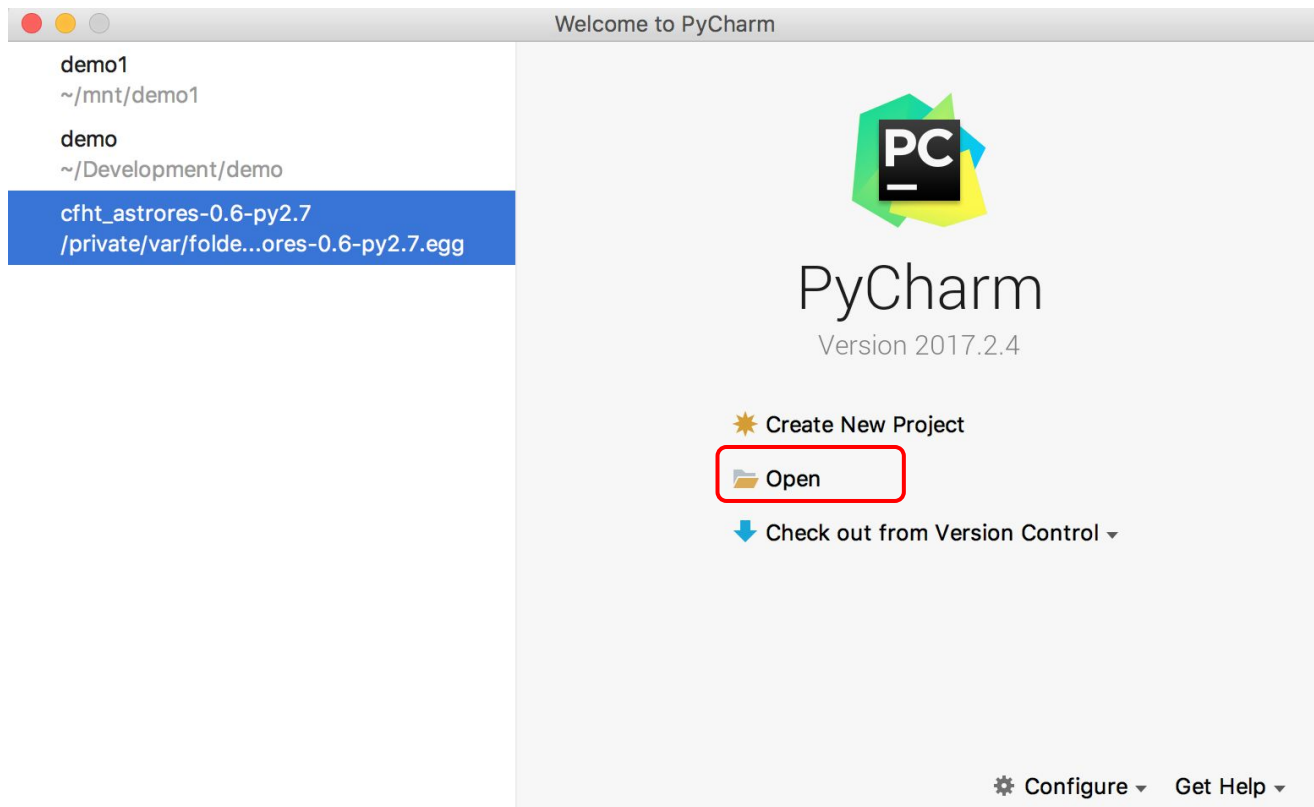
```
> mkdir ~/mnt
```

```
> sshfs <user>@<remote-host>:<path-to-source> ~/mnt
```

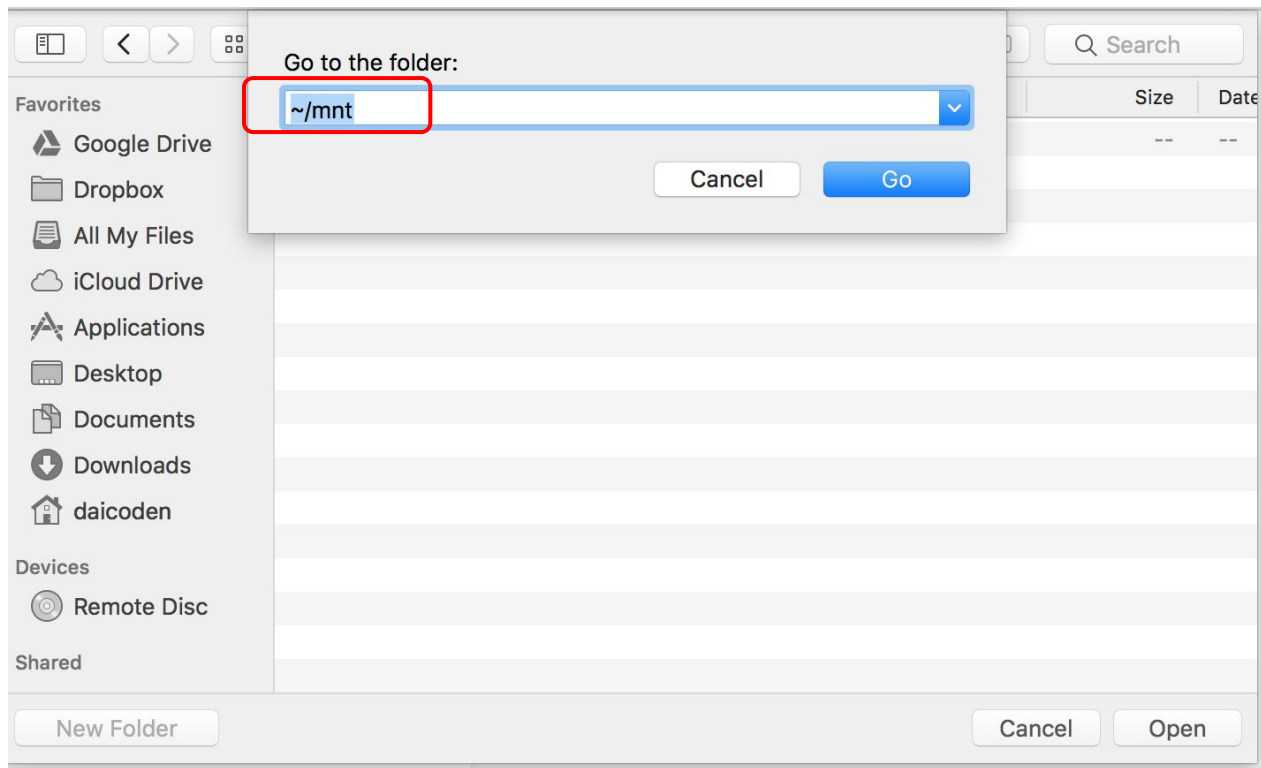
Setup Reverse Tunnel for Debug Information

```
> ssh -R 1234:localhost:1234 <user>@<remote-host>
```

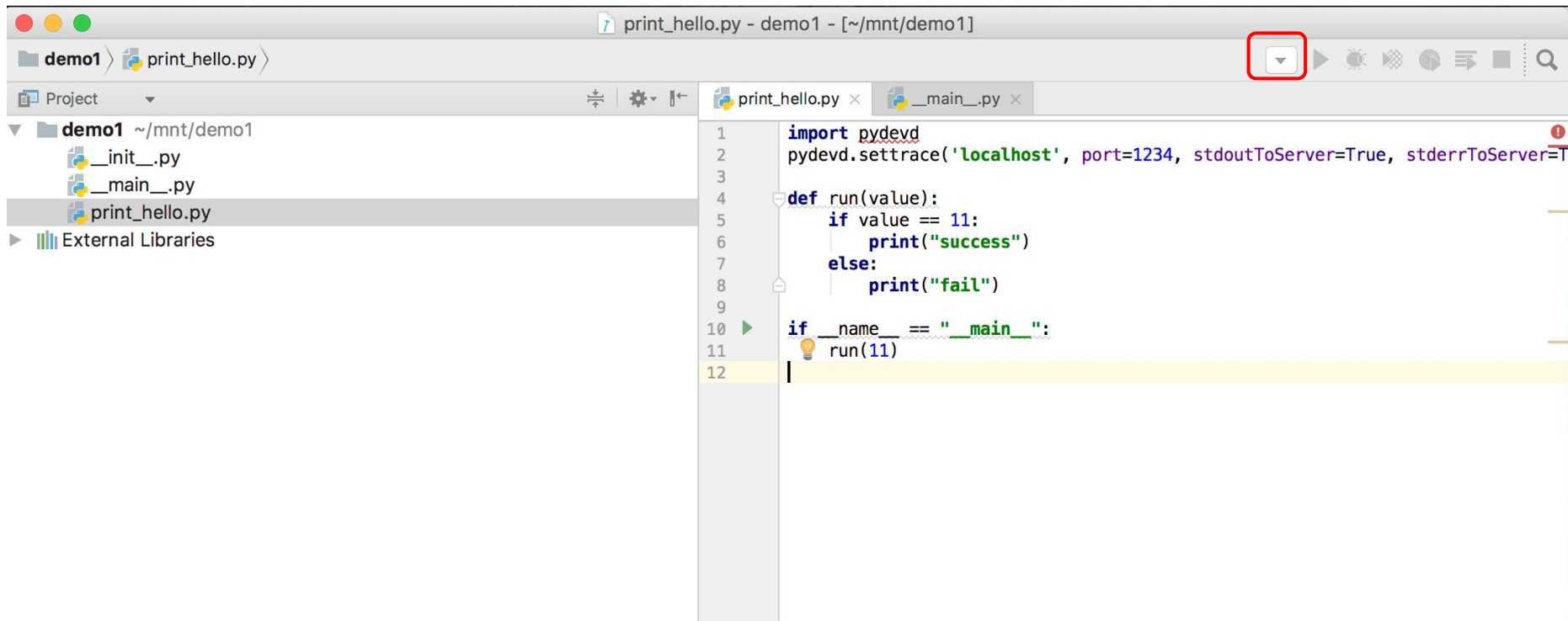

Configure PyCharm for Remote Debugging



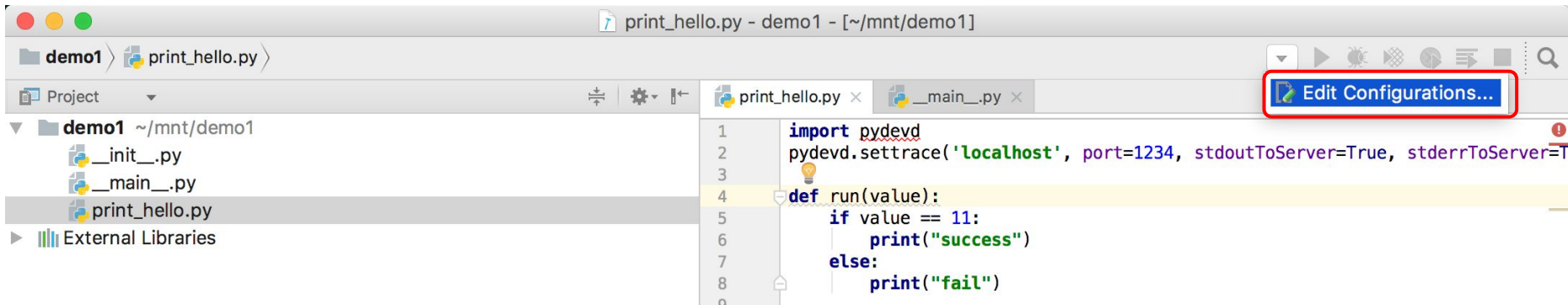
Configure PyCharm for Remote Debugging



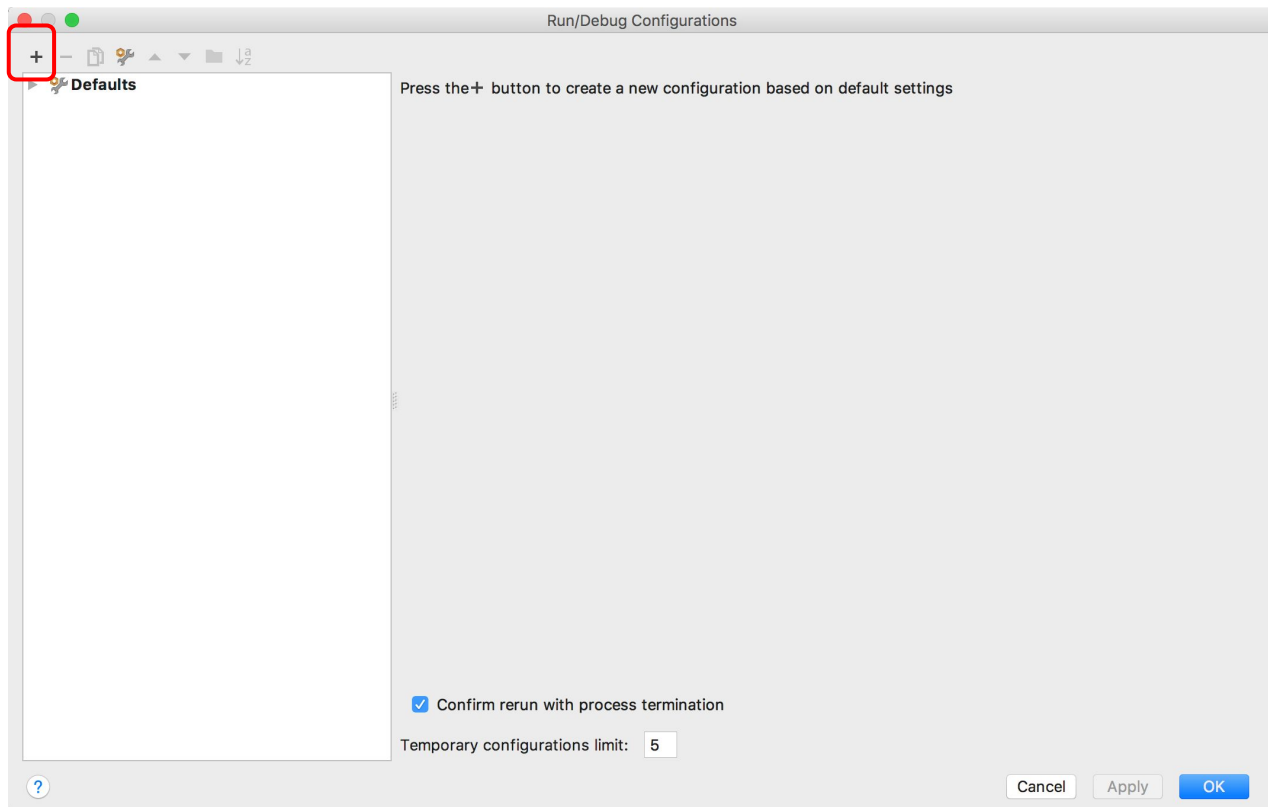
Configure PyCharm for Remote Debugging



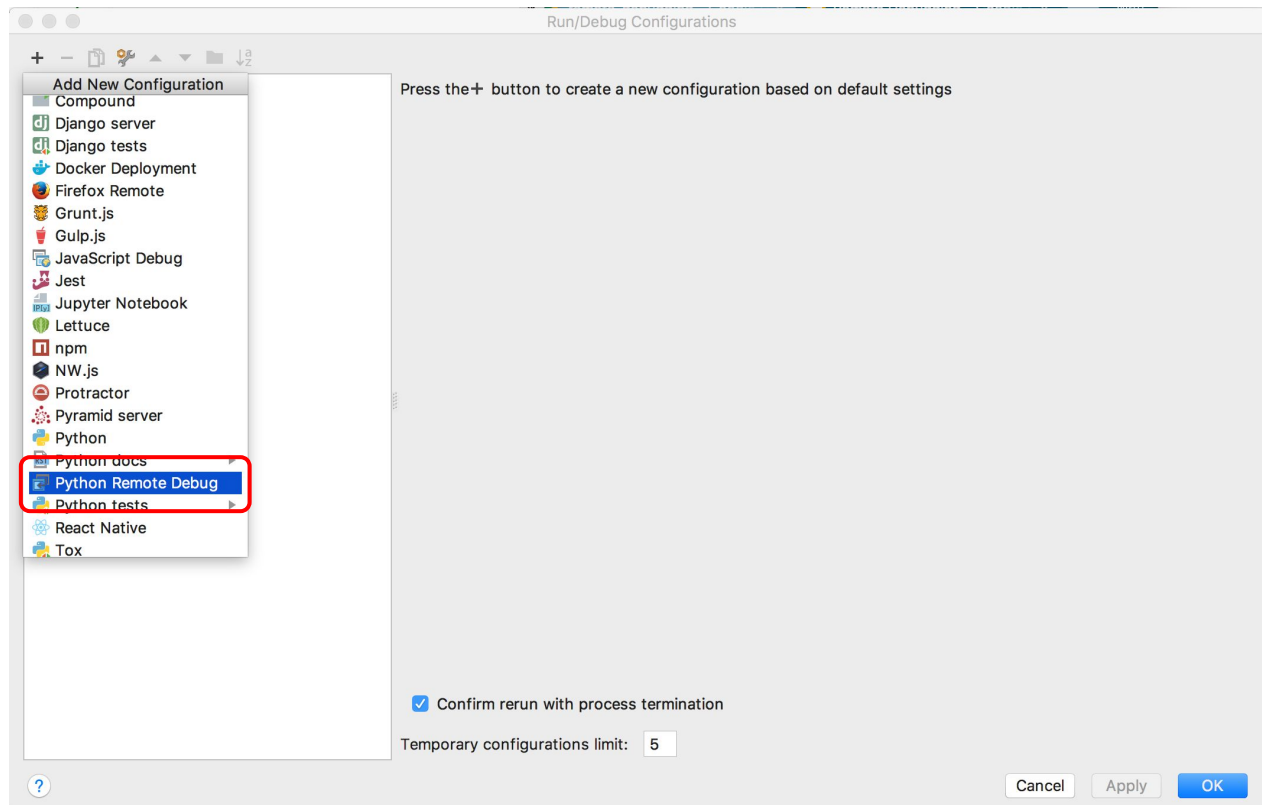
Configure PyCharm for Remote Debugging



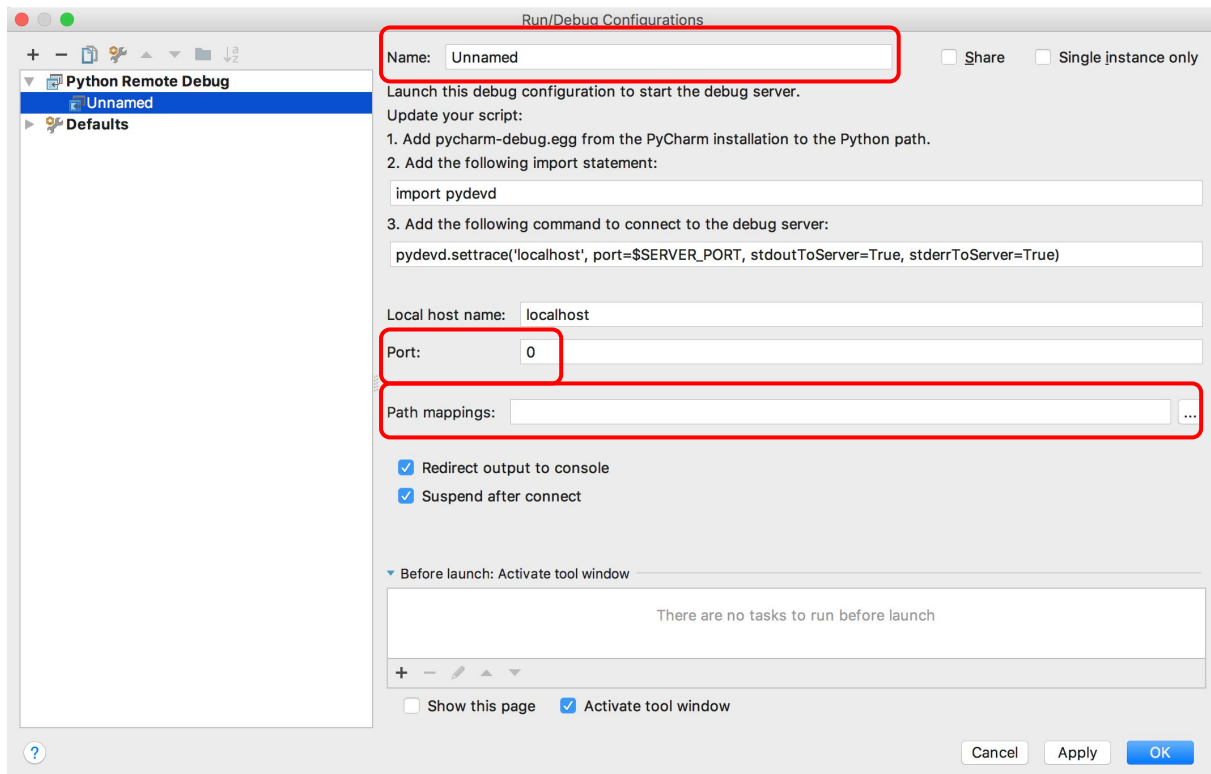
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Configure PyCharm for Remote Debugging



Configure PyCharm for Remote Debugging

name: For your to reference later. E.g. Remote Debug

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port: Reverse tunnel port, i.e. 1234 from previous step

Configure PyCharm for Remote Debugging

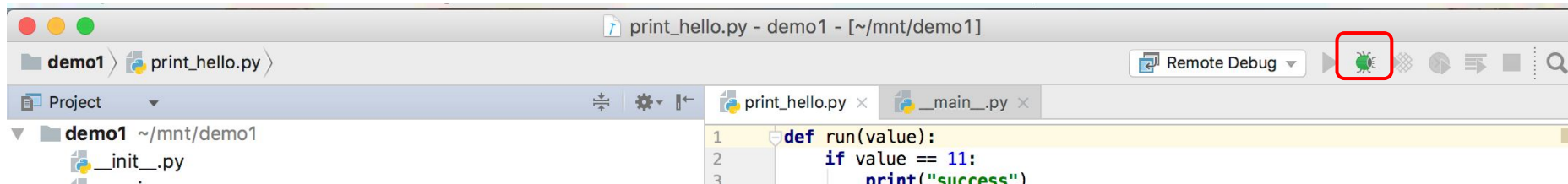
name: For your to reference later. E.g. Remote Debug

port: Reverse tunnel port, i.e. 1234 from previous step

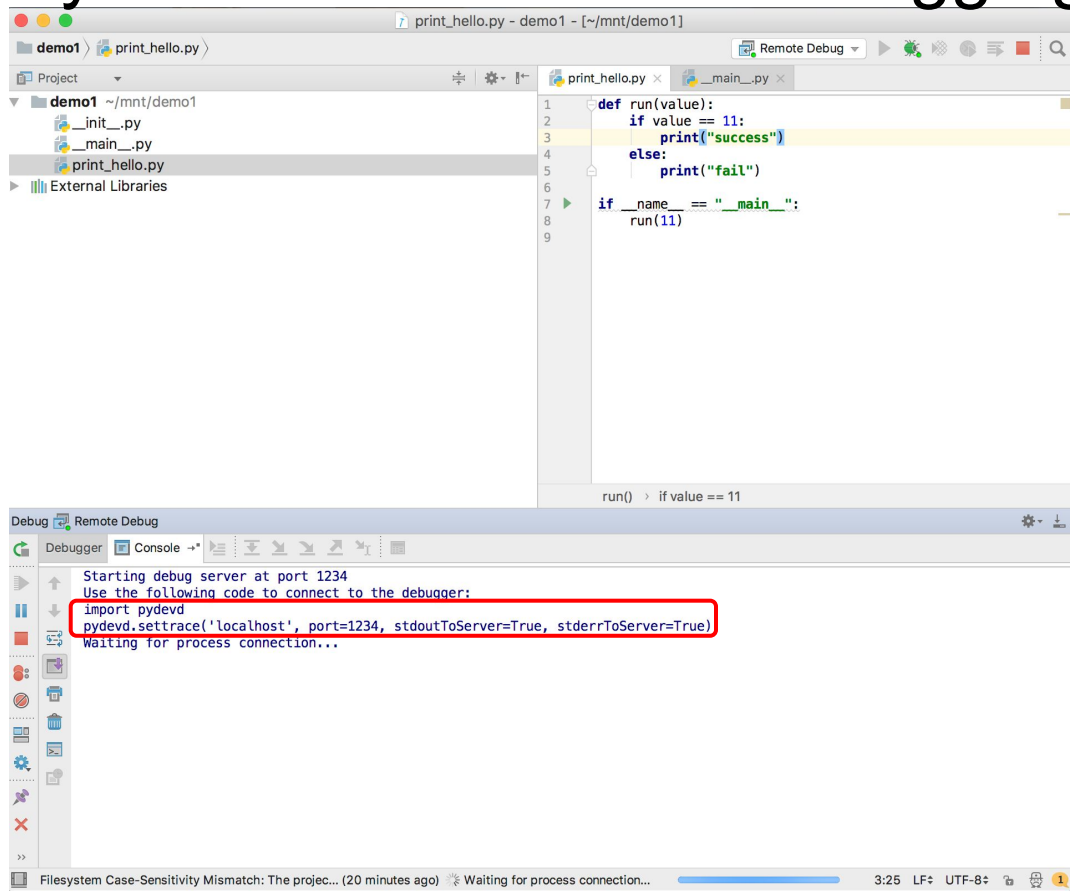
path mappings: Absolute paths to map the local directory to the remote directory. E.g.

/Users/<username>/mnt/ => /app/

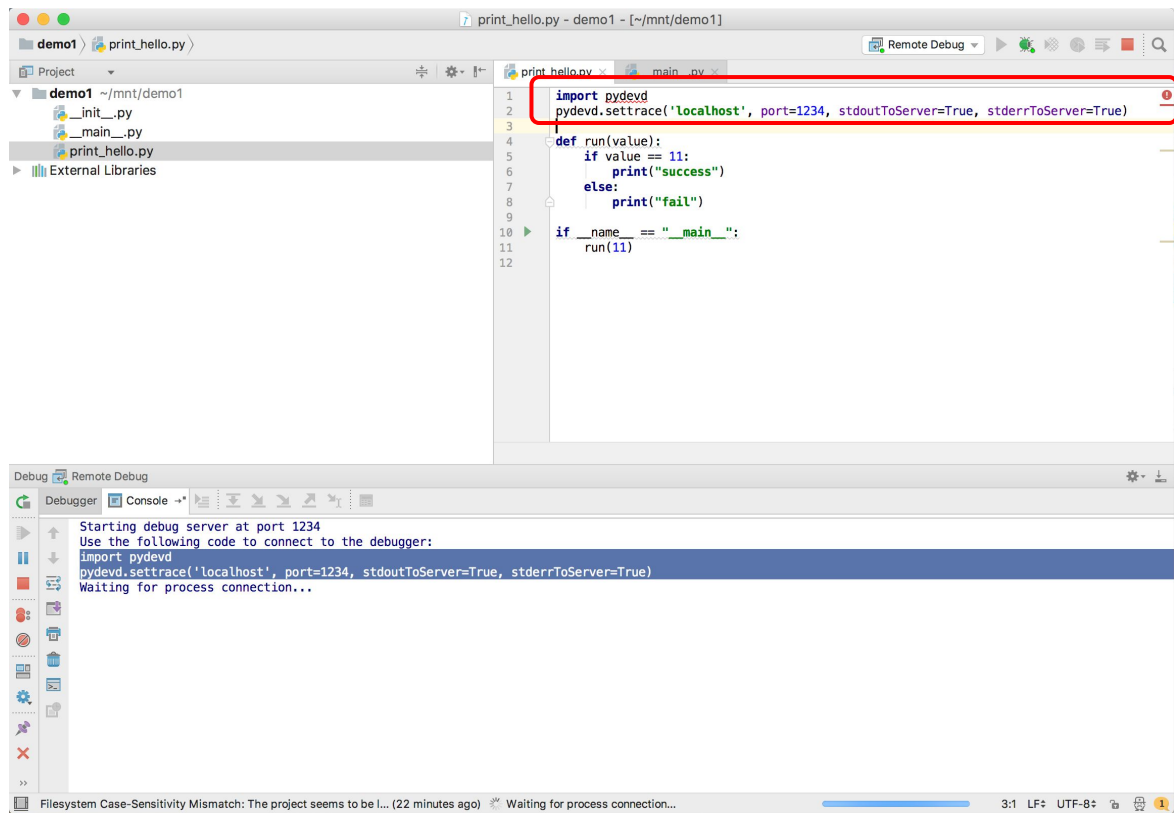
Configure PyCharm for Remote Debugging



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Configure PyCharm for Remote Debugging



Demo!

Limitation

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Parallel Debugging with PP is not supported.

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Python projects which modify system load path confuse PyCharm.

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Python projects which modify system load path confuse PyCharm.

Projects with lots of similar method names and no type information are still painful to browse.



Thank you!



<https://github.com/cfht/remote-debugging>