Jenkins: Humble servant of the Quality Assurance department

Using Jenkins as the backbone of a testing infrastructure

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AVAST Software a.s.

http://www.avast.com

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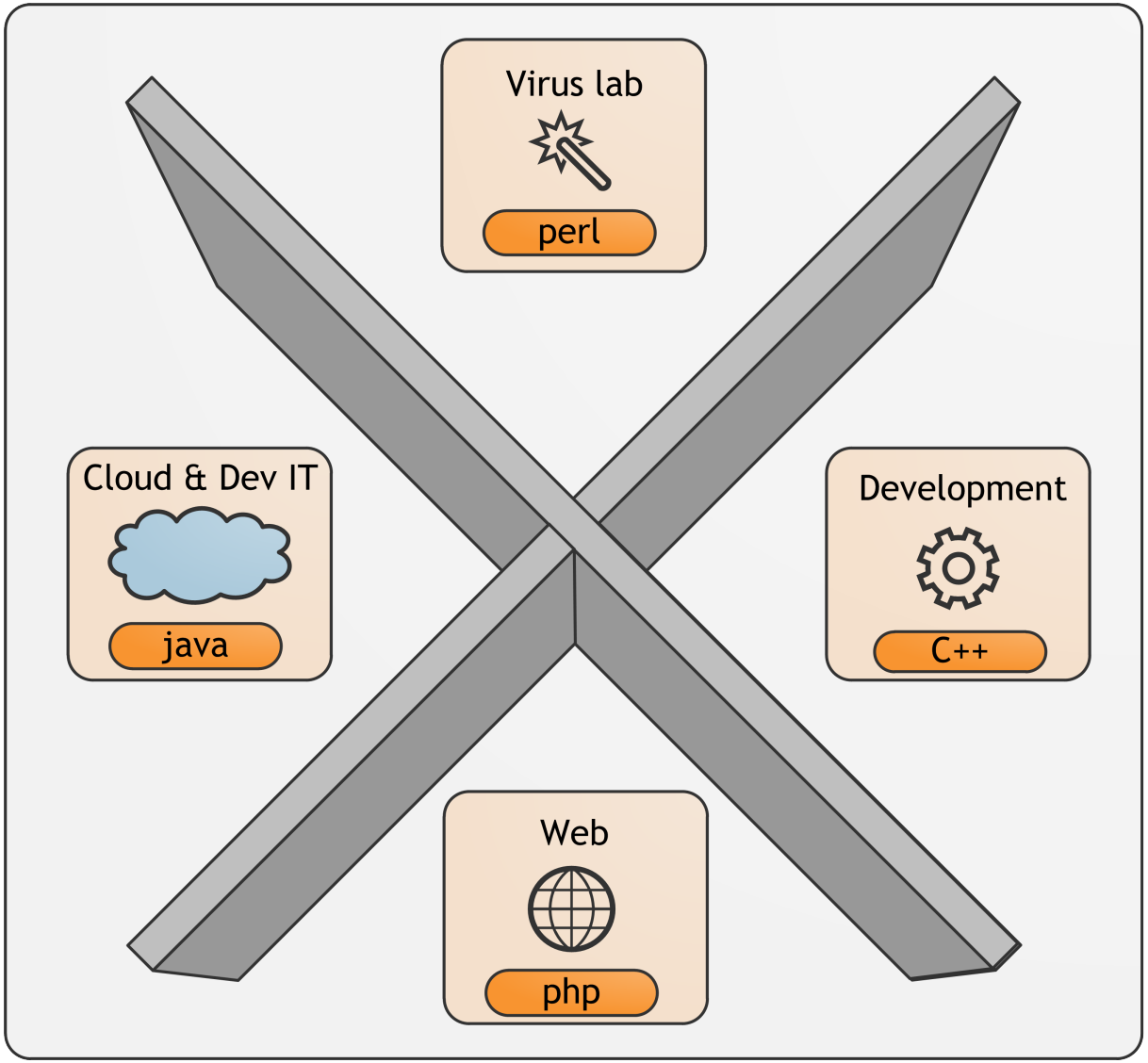
Case Study - Agenda

- What do we test at avast!
- How do we test it
  - Local execution
  - Remote execution
  - The Cloud
- Conclusion

Department map



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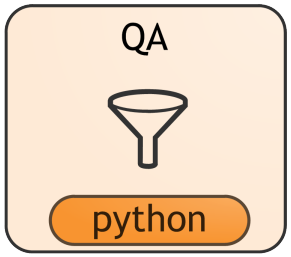
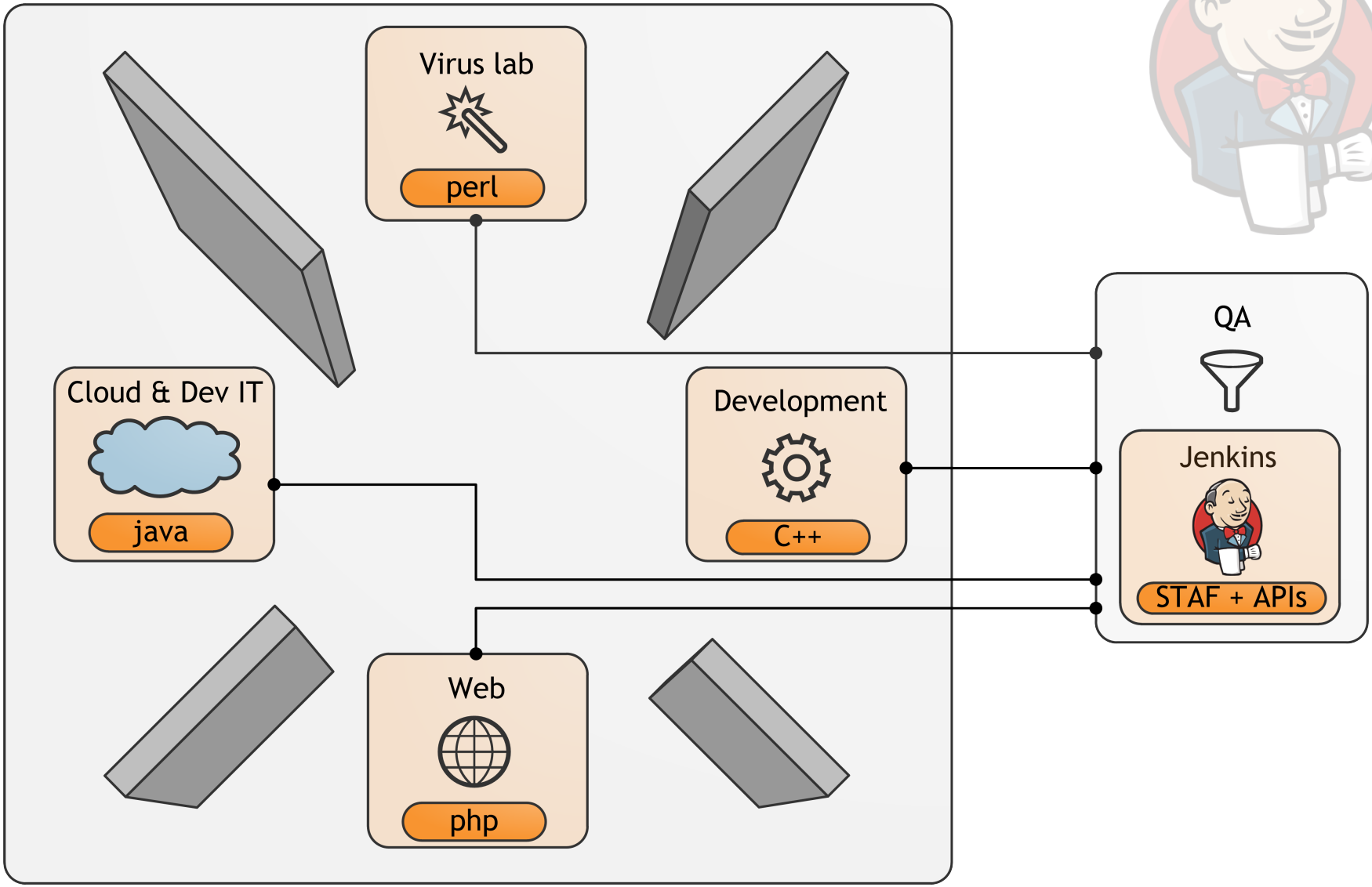


Department map with our friend, Jenkins



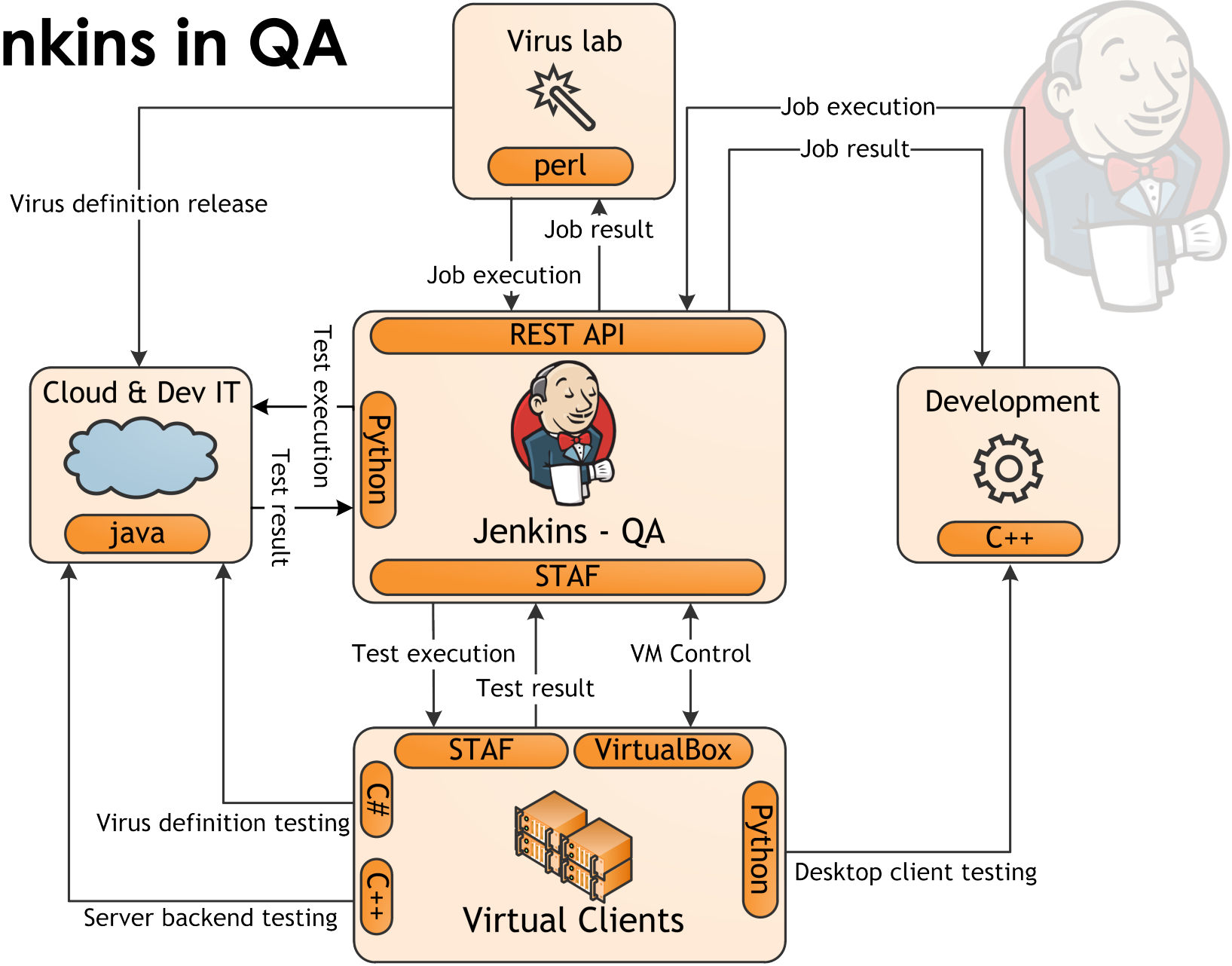
Test automation tasks

- Testing web services with REST API
- Server backend testing
- Functional testing of avast! antivirus desktop applications on multiple OS versions
  - Sanity suite
  - Smoke suite
  - Regression suite
  - Upgrade suite
- Virus definition validation
- Cloud features tests

Three different approaches

- Local execution
  - Web services and REST API
- Remote execution
  - Functional testing of antivirus desktop application
  - Virus definition validation
- Local cloud
  - Cloud features testing

Jenkins in QA



Local execution

- Web services and REST API
- Server infrastructure backend round tests
- Everything can be done out of the Jenkins build step
- Tests implemented in
  - Python
  - Robot
  - C++/C#

Local execution – example

- Job configuration
  - Add build parameters
    - `SERVERS=192.168.1.3 192.168.1.4`
  - Set build trigger
    - `@hourly`
  - Configure build step
    - `add execute shell`
    - `trigger child job execution`
  - Publish test results
    - `jUnit`
    - `Robot Framework plugin`

Local execution – example

- Test script example

testRating.py:

```
class  Test_getRatingTestCase(unittest.TestCase):

    def test_getRating(self):
        ratingData = 'www.avast.com'
        rating = int(getRating(ratingData, WebRepServer))
        expectedRating = 100
        assert rating == expectedRating
if __name__ == '__main__':
    unittest.main()
```

- Jenkins Execute shell

```
for server in ${SERVERS}; do
  ./testRating.py -s ${server} -l ${WORKSPACE}/
WebRepRating_${server}_log.xml
```

Local execution – test results evaluation

- jUnit – pyUnit

☑ Publish JUnit test result report

Test report XMLs

Fileset 'includes' setting that specifies the generated raw XML report files, such as 'myproject/target/test-reports/*.xml'. Basedir of the fileset is the workspace root.

☑ Retain long standard output/error

- Robot framework Jenkins plugin

☑ Publish Robot Framework test results

Directory of Robot output: results

Path to directory containing robot xml and html files (relative to build workspace)

Log/Report link

Name of log or report file to be linked on jobs front page

Thresholds for build result

% 90.0

% 100.0

☑ Use thresholds for critical tests only

Remote execution

- Goals of remote execution
  - Multi environment testing
    - Same tests, different OS versions
    - Need for virtualization
    - One machine cannot host enough virtual machines
  - Remote process execution
    - Virtual machine control
    - Test execution
    - Test result gathering

Remote execution – solution

- Executor:
  - Jenkins
- Virtualization technology:
  - VirtualBox
- Remote execution technology:
  - STAF framework
    - Used for remote VirtualBox machine control
    - Allows remote test execution and results gathering

(STAF)

Remote execution – STAF and VirtualBox configuration

- Install STAF framework on both host and guest machines
  - `All in one installer`
- Configure staf.cfg on guest machine, set trust machine option
  - `trust machine tcp://10.0.2.2 level 5`
- Set port forwarding on VirtualBox machine for STAF ports
  - `From VirtualBox settings`
  - `Forward STAF port 6500 to other port on a host machine`

Remote execution – example

- Start remote virtual machine

```
$> staf $IP process start command  "VBoxManage
startvm $MACHINE_NAME -  type headless"
```

  – Alternative: Jenkins VirtualBox plugin?

- Run remote tests

```
$> staf $IP process start command  "nosetests /
tests/*.py " WAIT  RETURNSTDOUT STDERRTOSTDOUT
```

Remote execution – example

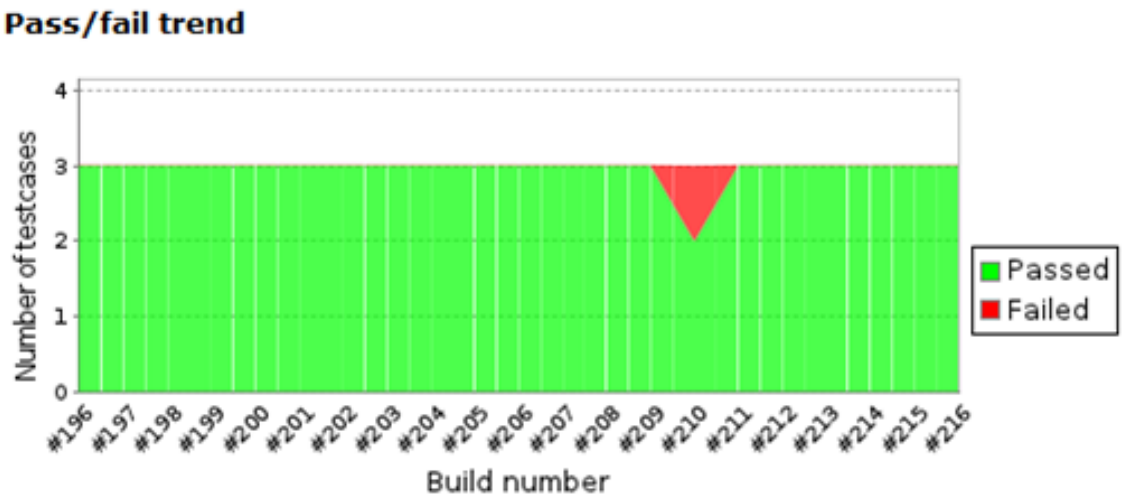
- 1) revert to a clean snapshot and start the virtual machine on a remote computer
  - `staf $IP process start command "VBoxManage startvm $MACHINE_NAME -type headless"`
- 2) wait
  - `wait_for_machine_start.py $IP 300`
- 3) execute tests directly on the remote virtual machine
  - `staf $IP process start command "/tests/runTests.cmd " WAIT RETURNSTDOUT STDERRTOSTDOUT`
- 4) test result evaluation
  - `staf $IP FS copy directory '\test_results' todirectory $WORKSPACE`

Remote execution - evaluation

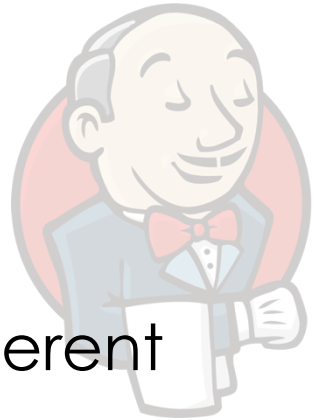
- Evaluate the jUnit, pyUnit or Robot framework test results in the Jenkins job

All Testcases

Name
Registration
Free Express Install with Chrome
Verify Avast Installation



Remote execution – job hierarchy



- Requirement of multiple products and on different OSes
- Solution: One Master job and multiple Child jobs

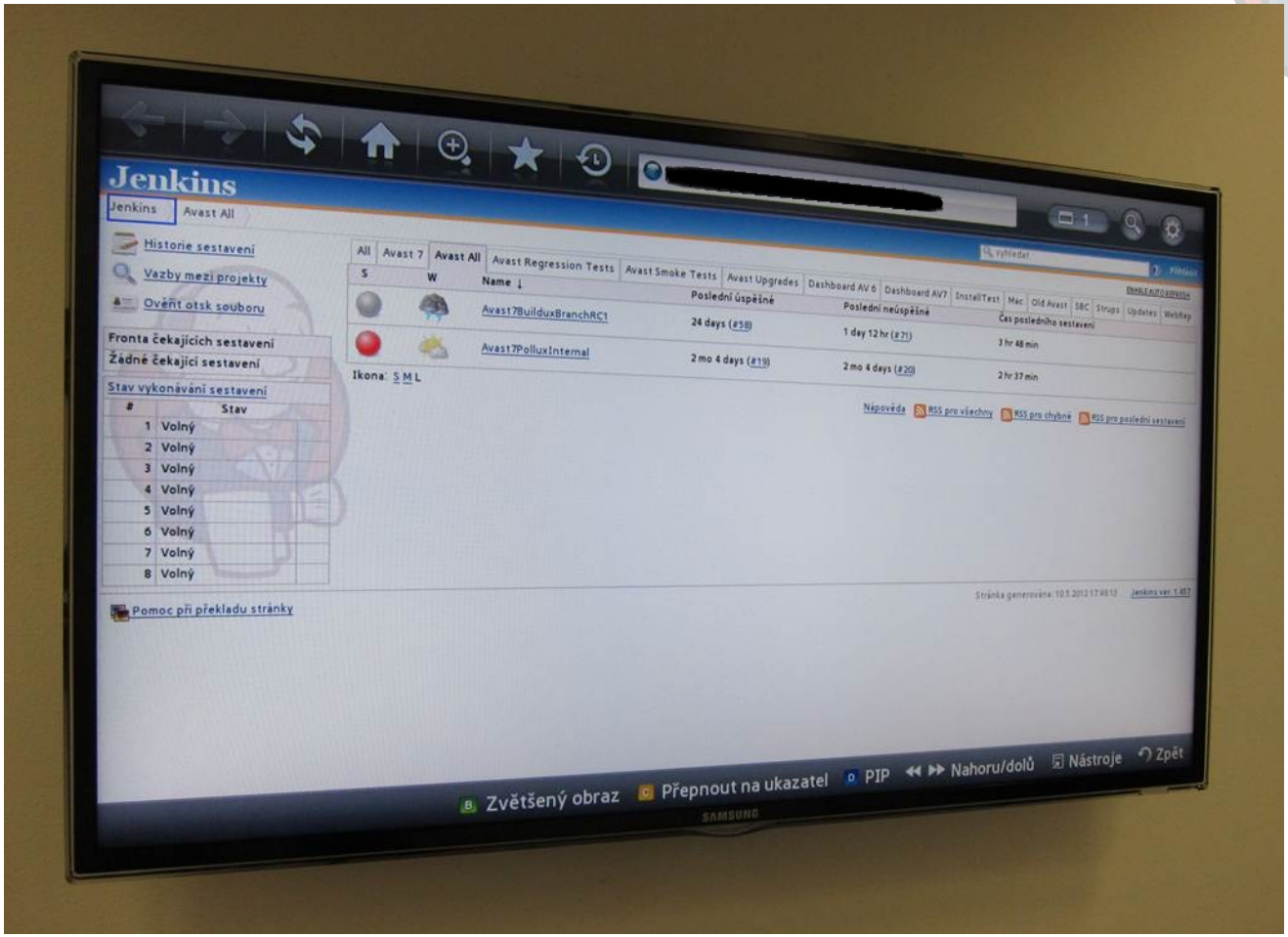
- Master job
  - Application of Parameterized Trigger Plugin
  - Trigger child job as a build step
- Child jobs with parameters
- Re-using child jobs in various master jobs
  - One common child job for desktop app installation
  - Different set of tests executed from different master jobs
  - Testing of staging/production builds

Remote execution – jobs hierarchy, test results evaluation

- Request to be able to see all failed tests in all jobs of the hierarchy
- Dashboard view
  - Unable to display job hierarchy
- Downstream build view
  - Incompatible with Parameterized Trigger plugin

What's your solution?

Remote execution – test result presentation



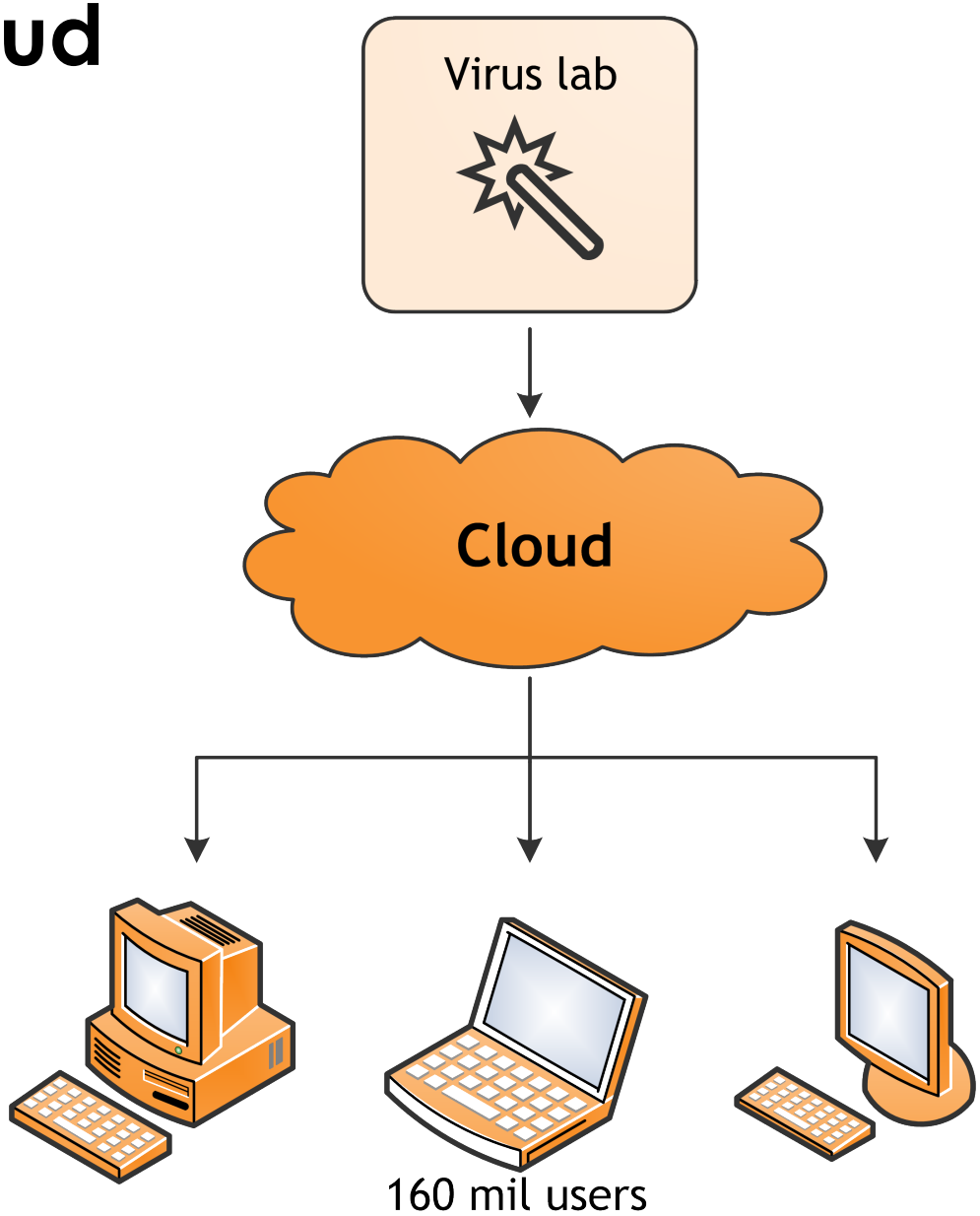
Remote execution – Jenkins slave as an alternative solution

- Jenkins slave node instead of STAF framework
- More complicated Jobs execution on snapshot reverted virtual machines
- Cannot reboot slave machine during job run
- Higher system performance requirements than STAF in Desktop environment

The Cloud

- Goal
  - Integrate smoke tests into existing viruslab infrastructure
  - Build infrastructure implemented in perl
  - Every 30 minutes, small package of virus definitions is distributed to 160 milion users
    - But, do not break their computers

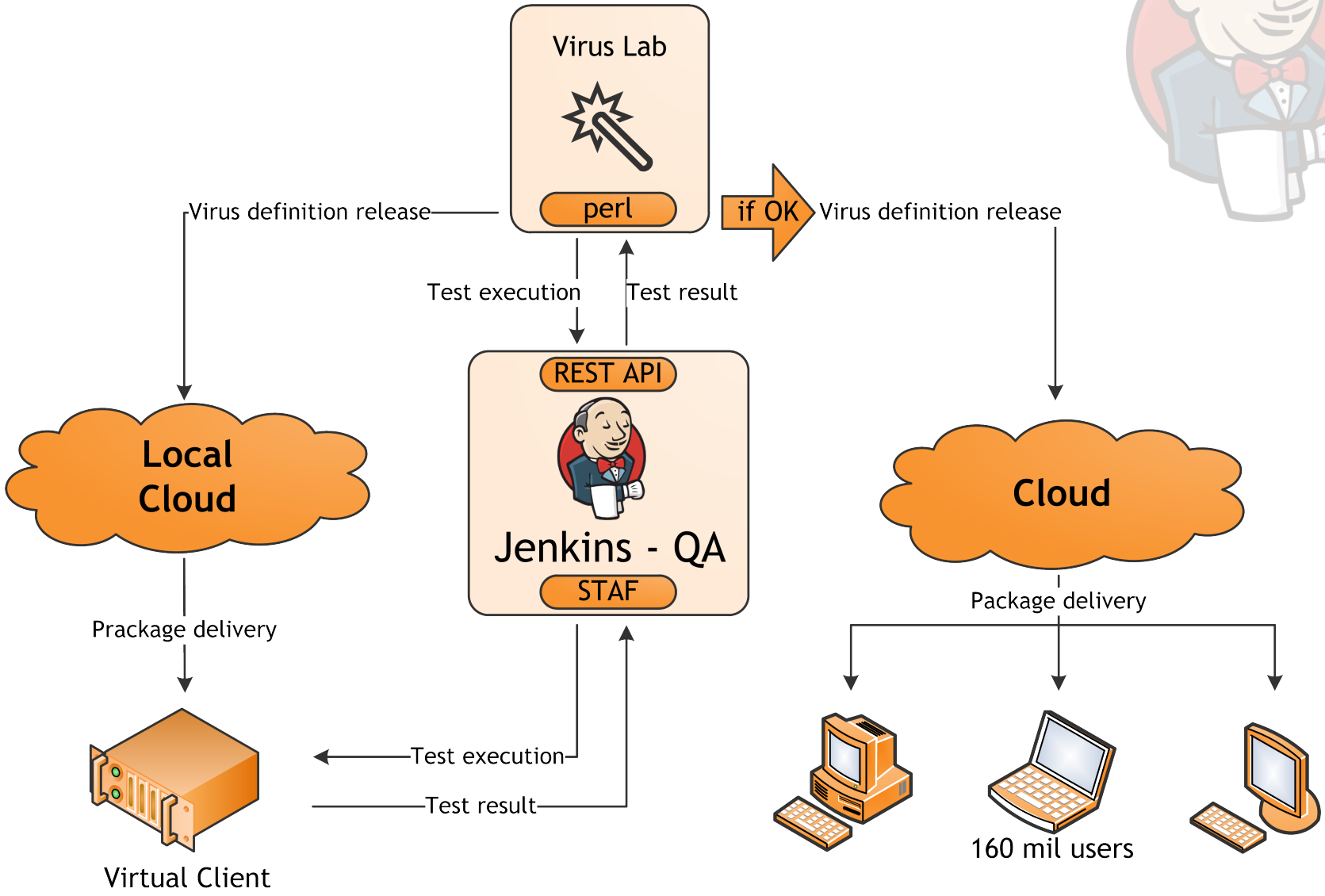
The Cloud



The Cloud - solution

- Combination of everything that we have learned
- Remote test execution
- Integration of Jenkins job into the perl build script using Jenkins REST API

The Cloud - solution



The Cloud – REST API in perl example

```
my $srvurl = 'http://our.jenkins.server:8080', $job = 'OurJobName';
my $security_token = 'SomeSecretStuff', $uagent = new LWP::UserAgent;
my $req = HTTP::Request->new(GET => "$srvurl/job/$job/build?token=$security_token");

# Get next build number
my $job_req = HTTP::Request->new(GET => "$srvurl/job/$job/api/json");
my $job_res = $uagent->request($job_req);
my $job_info = from_json( $job_res->content );
my $next_build_number=$job_info->{"nextBuildNumber"};

# Run the job on Jenkins
my $res = $uagent->request($req);
if (not $res->is_success) { die "Failed to run the jenkins job: ".$res->status_line."\n"; }
sleep(10); # Wait for the job to start (job execution in jenkins takes a while)

# Get the status of the job in a loop until result is found
my $status_req = HTTP::Request->new(GET => "$srvurl/job/$job/$next_build_number/api/json");
my $build_result, $finished = 0;
while ( $finished != 1 ) {
  my $status_res = $uagent->request($status_req);
  my $build_info = from_json( $status_res->content );
  if ( defined($build_info->{"result"}) ){
    $build_result = $build_info->{"result"};
    $finished = 1;
  }
  sleep(6);
}
```

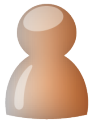
The Cloud – Job Hierarchy

- Every 30 minutes, Jenkins master job is executed by the perl script, package gets validated and is released to users
- The master job runs set of child jobs on various OS versions
- Child jobs evaluate test results by parsing their jUnit results
- Perl build script continues only if the master job status is SUCCESS

Conclusion

- Jenkins allows even functional testing of desktop applications or distant cloud systems
- It is worth executing even simple tests by Jenkins
- All this you get for free
  - Test result view
  - Scheduled job triggering
  - Integration using Jenkins API
- Easy integration with other development departments without infrastructure changes

Jenkins is your humble servant!



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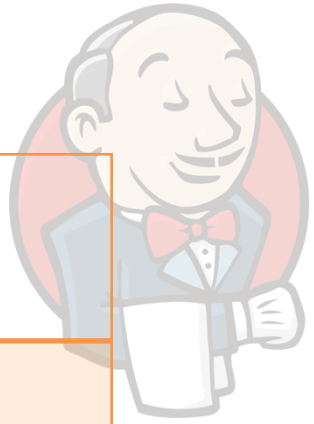

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