CONTINUOUS INTEGRATION, DELIVERY & DEPLOYMENT
ONE CLICK DELIVERY
QUICK POLL
SAFE?

Are you using version control?
Can you release new version of your software in one day?
QUICK AND SAFE?

Can you release new, well-tested version of your software in one day?
DEVELOPMENT NOW
DEVELOPMENT NOW

- Each developer has feature branches
  - *If* the version control is used at all
- Features are deployed when completed
- Integration issues

- Small test suite
PROBLEMS

- Bringing software into production is hard
- Takes a lot of time
- Error prone
SOLUTION – CONTINUOUS INTEGRATION
Continuous Integration is a software development practice where members of a team integrate their work frequently, usually each person integrates at least daily - leading to multiple integrations per day. Each integration is verified by an automated build (including test) to detect integration errors as quickly as possible.

- Martin Fowler
CHANGE THE WORKFLOW!

- Checkout/update
- Code
- Build & test locally
- Update (merge)
  - Retest if changed
- Commit
- Continuous Integration server takes over ...
CHANGE THE VERSIONING!

- No ‘feature’ branches
- Temporary ‘developer’ branches
  - Good to test crazy ideas
  - Branch and throw away
- **Trunk must always compile**
- Avoid big scary merges
HOW TO HANDLE FEATURES

- No ‘feature’ branches
- Features can be toggled on and off via deployment or compilation configuration
  - Also helps with Continuous Delivery/Deployment
- Keep features small
- Improve features interactively
  - Introduce early, then improve
SIDENOTE – VERSION CONTROL SYSTEMS

- History
  - Log
  - Blame
- Revert to version
  - Bug-finding tool
- Branches
  - Tag/mark every release

- Always use VCS – even for single-person projects!
<table>
<thead>
<tr>
<th>Revision</th>
<th>Actions</th>
<th>Author</th>
<th>Date</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>14695</td>
<td></td>
<td>istvan</td>
<td>29. september 2014 16:00:00</td>
<td>+ added support for AuthorizeAttribute to controllers and their invokable methods. A class should implement a method with the name <code>AuthorizeAttribute</code> in Java.</td>
</tr>
<tr>
<td>14693</td>
<td></td>
<td>primoz</td>
<td>29. september 2014 13:58:00</td>
<td>Page caption is updated when user interface language is changed.</td>
</tr>
<tr>
<td>14691</td>
<td></td>
<td>primoz</td>
<td>29. september 2014 13:01:00</td>
<td>* code cleanup &amp; doc</td>
</tr>
<tr>
<td>14690</td>
<td></td>
<td>primoz</td>
<td>29. september 2014 13:01:00</td>
<td>* fixed command line selection problems with Ettwin</td>
</tr>
<tr>
<td>14689</td>
<td></td>
<td>primoz</td>
<td>29. september 2014 11:38:00</td>
<td>* Background color can be set in Options, Editor.</td>
</tr>
<tr>
<td>14688</td>
<td></td>
<td>primoz</td>
<td>29. september 2014 10:51:00</td>
<td>Fixed problems with caret wrapping in Block mode.</td>
</tr>
<tr>
<td>14686</td>
<td></td>
<td>istvan</td>
<td>28. september 2014 23:29:00</td>
<td>+ added font-awesome icons * prompt to discard changes if a page's text is changed and trying to navigate to another item.</td>
</tr>
<tr>
<td>14685</td>
<td></td>
<td>istvan</td>
<td>27. september 2014 22:07:00</td>
<td>* TWorkstationInfoController Log returns only newer items than specified</td>
</tr>
<tr>
<td>14684</td>
<td></td>
<td>istvan</td>
<td>27. september 2014 21:56:00</td>
<td>* cleaned up web interface code</td>
</tr>
<tr>
<td>14683</td>
<td></td>
<td>istvan</td>
<td>26. september 2014 17:46:00</td>
<td>* updated Subtitler WEB interface</td>
</tr>
<tr>
<td>14682</td>
<td></td>
<td>istvan</td>
<td>26. september 2014 17:39:00</td>
<td>* updated NC web interface to use the new translator.js</td>
</tr>
<tr>
<td>14680</td>
<td></td>
<td>primoz</td>
<td>26. september 2014 15:32:00</td>
<td>+ different color display (number on background) + color background is transparent in Open mode</td>
</tr>
<tr>
<td>14679</td>
<td></td>
<td>istvan</td>
<td>26. september 2014 13:32:00</td>
<td>* Subtitler automation.js stores all strings in &quot;labels&quot; object for dynamic translations</td>
</tr>
<tr>
<td>14678</td>
<td></td>
<td>primoz</td>
<td>26. september 2014 12:47:00</td>
<td>+ editor colors on Home ribbon tab are correctly displayed</td>
</tr>
<tr>
<td>14676</td>
<td></td>
<td>primoz</td>
<td>26. september 2014 10:54:00</td>
<td>+ MUCH cleaner code</td>
</tr>
<tr>
<td>14675</td>
<td></td>
<td>istvan</td>
<td>25. september 2014 22:43:00</td>
<td>+ translator.js service can translate an object and update its properties * Subtitler automation web interface has all translations</td>
</tr>
<tr>
<td>14674</td>
<td></td>
<td>primoz</td>
<td>25. september 2014 22:38:00</td>
<td>+ bitmaps are displayed (stretched) + cleaner code</td>
</tr>
<tr>
<td>14673</td>
<td></td>
<td>primoz</td>
<td>25. september 2014 17:07:00</td>
<td>+ colors in Edit group are custom painted [currently colors are selected randomly]</td>
</tr>
<tr>
<td>14672</td>
<td></td>
<td>build</td>
<td>25. september 2014 16:48:00</td>
<td>FT-OFFICE 3.89</td>
</tr>
<tr>
<td>14671</td>
<td></td>
<td>mihay</td>
<td>25. september 2014 16:35:00</td>
<td>* password form is opened if logon does not work * office version 3.89</td>
</tr>
<tr>
<td>14670</td>
<td></td>
<td>istvan</td>
<td>25. september 2014 16:19:00</td>
<td>NC WEB interface displays app version in the footer and the computer name Subtitler WEB interface displays the log in Status dialog.</td>
</tr>
<tr>
<td>14667</td>
<td></td>
<td>primoz</td>
<td>25. september 2014 12:06:00</td>
<td>oldconfig.txconfig -&gt; previousconfig.txconfig</td>
</tr>
<tr>
<td>14666</td>
<td></td>
<td>primoz</td>
<td>25. september 2014 11:17:00</td>
<td>+ When configuration is restored to default, previous configuration is stored to oldconfig.txconfig, not ettwin.txconfig.</td>
</tr>
<tr>
<td>14665</td>
<td></td>
<td>primoz</td>
<td>25. september 2014 10:59:00</td>
<td>* controllers are rebased on TRestPublicController</td>
</tr>
<tr>
<td>14662</td>
<td></td>
<td>mihay</td>
<td>24. september 2014 17:54:00</td>
<td>* To install the same version hold Shift or Ctrl on clicking on OK (InstallerForm.pas) * Search filter in export corrected * Subtitler WEB interface has all translations</td>
</tr>
<tr>
<td>14661</td>
<td></td>
<td>istvan</td>
<td>24. september 2014 16:49:00</td>
<td>updated readme.txt</td>
</tr>
<tr>
<td>14660</td>
<td></td>
<td>istvan</td>
<td>24. september 2014 16:48:00</td>
<td>* updated manual to include REST /info/log API</td>
</tr>
<tr>
<td>14659</td>
<td></td>
<td>istvan</td>
<td>24. september 2014 16:08:00</td>
<td>* log status in rest returns the same string as the file log (OK, ER, ST, WA)</td>
</tr>
<tr>
<td>14658</td>
<td></td>
<td>istvan</td>
<td>24. september 2014 15:43:00</td>
<td>+ added get log api to subtitler REST server; call http://{server}/info/log to get the full log, or pass in parameters to specify</td>
</tr>
<tr>
<td>14657</td>
<td></td>
<td>primoz</td>
<td>24. september 2014 11:53:00</td>
<td>+ initialize ModalPopupMode</td>
</tr>
</tbody>
</table>
begin
  if TryStrToInt64(value, intValue) then
    Result := intValue
  else if TryStringToGUID(value, guidValue) then
    Result := TOmnivalue.FromRecord<TGUID>(guidValue)
  else
    Result := value;
end; { RestTypeMapper.MapStringToValue }

class function RestTypeMapper.MapValueToArgument(const paramType: TTypeKind;
  const value: TValue): TValue;
begin
  if paramType in [tkString, tkUString, tkWString, tkLString, tkChar, tkWChar] then
    Result := value.StrValue
  else if paramType = tkRecord then
    Result := TValue.From<TGUID>(value.Value.ToRecord<TGUID>)
  else
    Result := value.Value.AsTValue;
end; { RestTypeMapper.MapValueToArgument }

class function RestTypeMapper.TryStringToGuid(const value: string; var guidValue: TGUID): boolean;
var
  invalid: boolean;
function HexChar(c: char): byte;
begin
  case c of
    '0'..'9': Result := byte(c) - byte('0');
    'a'..'f': Result := (byte(c) - byte('a')) + 10;
    'A'..'F': Result := (byte(c) - byte('A')) + 10;
  else
    invalid := true;
    Result := 0;
  end;
end;

{ 6.4.2013 13:38:47
+ GUID parameters are supported.  }
TESTING

- Automate everything
  - If it hurts, do it more often. Continuously.
  - Fail fast.
- Integration testing
- Unit testing
- Functional testing
- Application testing
- Mobile testing

- Whatever you don’t test against, will happen
REQUIREMENTS
REQUIREMENTS

- Source code repository (version control)
  - Subversion, Git, Mercurial, ...
- Project build
  - MSBuild
  - FinalBuilder
  - ...
- Testing
  - TestComplete
- Continuous Integration server
while true do
begin
    if change_checked_into_vcs then begin
        if not build then
            report_error;
        if not test then
            report_error;
    end;
sleep;
end;
CI SERVERS

- Continua CI
  - VSoft (FinalBuilder)
- Jenkins
  - Hudson fork
  - Java
  - Commercial support - Cloudbees
- CruiseControl.Net
  - XML configuration :(
### Project Monitoring

<table>
<thead>
<tr>
<th>Project</th>
<th>Server</th>
<th>Category</th>
<th>Activity</th>
<th>Detail</th>
<th>Last...</th>
<th>Last Build Time</th>
<th>Project...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upload</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Next build check: 14.10.2014 6:00:00...</td>
<td>241</td>
<td>13.10.2014 6:00:00</td>
<td>Running</td>
</tr>
<tr>
<td>SVN cleanup</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>17</td>
<td>11.10.2014 8:41:39</td>
<td>Running</td>
</tr>
<tr>
<td>SVN revert</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1760</td>
<td>10.10.2014 15:09:07</td>
<td>Running</td>
</tr>
<tr>
<td>Release Build</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1739</td>
<td>10.10.2014 15:09:36</td>
<td>Running</td>
</tr>
<tr>
<td>Activity Manager</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1760</td>
<td>10.10.2014 15:09:40</td>
<td>Running</td>
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<tr>
<td>Archive Server</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1754</td>
<td>10.10.2014 15:09:56</td>
<td>Running</td>
</tr>
<tr>
<td>DVB Interface</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1744</td>
<td>10.10.2014 15:11:09</td>
<td>Running</td>
</tr>
<tr>
<td>UDP tools</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1746</td>
<td>10.10.2014 15:12:59</td>
<td>Running</td>
</tr>
<tr>
<td>EDL</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1739</td>
<td>10.10.2014 15:13:38</td>
<td>Running</td>
</tr>
<tr>
<td>Sports</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1743</td>
<td>10.10.2014 15:14:09</td>
<td>Running</td>
</tr>
<tr>
<td>DVB Interface</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1743</td>
<td>10.10.2014 15:14:09</td>
<td>Running</td>
</tr>
<tr>
<td>Switch</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1738</td>
<td>10.10.2014 15:14:39</td>
<td>Running</td>
</tr>
<tr>
<td>Switch</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1744</td>
<td>10.10.2014 15:15:39</td>
<td>Running</td>
</tr>
<tr>
<td>TVGuide Editor</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1736</td>
<td>10.10.2014 15:15:54</td>
<td>Running</td>
</tr>
<tr>
<td>otProc</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1751</td>
<td>10.10.2014 15:16:49</td>
<td>Running</td>
</tr>
<tr>
<td>MS Tools</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1539</td>
<td>10.10.2014 15:16:52</td>
<td>Running</td>
</tr>
<tr>
<td>HL SN</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1746</td>
<td>10.10.2014 15:17:50</td>
<td>Running</td>
</tr>
<tr>
<td>FAB ftp</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1742</td>
<td>10.10.2014 15:17:53</td>
<td>Running</td>
</tr>
<tr>
<td>SetFABHtml</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1748</td>
<td>10.10.2014 15:18:10</td>
<td>Running</td>
</tr>
<tr>
<td>Media Converter</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1729</td>
<td>10.10.2014 15:18:13</td>
<td>Running</td>
</tr>
<tr>
<td>Media Encoder</td>
<td>192.168.211.92</td>
<td>Sleeping</td>
<td>Sleeping</td>
<td>Project is not automatically triggered</td>
<td>1728</td>
<td>10.10.2014 15:19:10</td>
<td>Running</td>
</tr>
</tbody>
</table>
CI RECOMMENDATION

- Use a separate server (or VM)
  - For CI, or
  - For CI + build, or
  - For CI + build + test
CENTRAL DOGMA

- Build early, build often
  - On every checkin
  - Check in early, check in often
BENEFITS
Brings order into chaos

Everything could be achieved without the Continuous Integration, but ...

CI is the great enforcer
BENEFITS

- Code is always in the consistent state
- Code always compiles
- Automatic tests
- Automatic feedback on product readiness
CODE ALWAYS COMPILES

I PITY 'DA FOOL
WHO BREAKS THE BUILD
Code should **always** build and test.

→ Continuous Delivery
“The essence of my philosophy to software delivery is to build software so that it is always in a state where it could be put into production. We call this Continuous Delivery because we are continuously running a deployment pipeline that tests if this software is in a state to be delivered.”

– Jez Humble, Thoughtworks
CD = CI + fully automated test suite

Not every change is a release

- Manual trigger
- Trigger on a key file (version)
- Tag releases!

CD – It is all about testing!
CONSIDER THIS

“How long would it take your organization to deploy a change that involves just one single line of code?”

- Mary and Tom Poppendieck, *Implementing Lean Software Development*
CONT. DELIVERY VS. DEPLOYMENT

Continuous Delivery

build → unit tests → integration tests → validation tests → deploy to production

MANUAL

Continuous Deployment

build → unit tests → integration tests → validation tests → deploy to production

AUTO
CONTINUOUS DEPLOYMENT
Continuous integration is simple.
Continuous delivery is doable.
Continuous deployment is a hard problem.
DEPLOYMENT SCHEDULE

- Release when a feature is complete
- Release every day
DEPLOYMENT STRATEGIES

- **Zero-downtime deployment (and rollback)**

- **Blue-green**
  - Two environments
  - Install on one. Switch. Switch back on problems.

- **Canary release**
  - Deploy to subset of servers

- **Real-time application state monitor!**
PROBLEMS

- Technical
  - Databases
    - Schema migration
    - Revert!
    - Change management software
  - Configuration
- Human
  - Even more important
  - Automatic deployment = great fear
  - Customers don't want software to constantly change
TRANSITION
(Introduce VCS)

Gain expertise
  - First step accomplished – you are here

Automate the build

Introduce tests

Prove the concept
  - Introduce CI system
  - Run it in parallel to existing infrastructure
  - Give it time
  - Show the win-win
NOTES FROM THE FIELD
WHAT WE FOUND

- Continuous Integration is relatively easy
  - It is all about communication
- Continuous Delivery is harder (but we are getting there)
  - Some things are hard to test automatically
  - You need dedicated test-writers
- Continuous Deployment is not a requirement
  - Customers don’t want it
  - Only for mission critical systems
SIDENOTE - VCS RULES!

- Disks are large, store as much as possible in the VCS
- Continuous Integration server configuration should be stored in the VCS
- You should be able to restore complete build system from the VCS (after installing necessary software)
IMPLEMENTATION

- Run everything in VM
- Backup!
It is all about the people!
SOFTWARE

- Continua CI
  http://www.finalbuilder.com/continua-ci

- Jenkins
  http://jenkins-ci.org

- CruiseControl.NET
  http://www.cruisecontrolnet.org
B O O K S

- Continuous Delivery
  http://www.amazon.com/dp/0321601912

- Continuous Integration
  http://www.amazon.com/dp/0321336380

- Implementing Lean Software Development
  http://www.amazon.com/dp/0321437381

- Release It!
QUESTIONS?