Practical Programmer

The methodology of the professional and scientific work,
Belgrade, Mathematical Faculty, May 2011

Dejan Vesić, http://www.vesic.org

or
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Disclaimer

- Real life
- Happened many times (experience)
- This is about **Software Development** and **NOT** about **Computer Science**
- Honestly, I do not lie ☺
- I am old, probably outdated, but this is mandatory lecture ;-)

About me

- Dejan Vesić

- More than 19 years in commercial software development
- Started as Clipper and FoxPro, then Oracle programmer, moved to Web (Asp & Asp.Net), ended on C# side (all rounder)
- Target systems: e-commerce sites of high risk and high traffic (bookmaking sites) backed by Oracle database
- Head of GTECH Belgrade company – more than 160 employees, of which 80+% are programmers and 10 in UK
- Member of IEEE Computer Society, ACM and Mensa
- More details on http://www.vesic.org (Serbian) and http://www.vesic.org/english/

Agenda

- Why this?
- You - Start of:
  - Identity
  - Communication
  - Work
- First rule of Programming
- You – Best Programmer Ever
- Usual Problems
- Dangerous Programming Errors
- Commercial Programming
- Team Work
- Documentation / Comments
- CV / Resume
- CV: General Rules
- CV: Bad Examples
- CV: References
- Selection of Candidates
- Interview - Preparation
- Interview
- Interview – About Money
- Final Decision
- Where Not to Look for Work
- References

Start of You: Identity

- Mail address
  - Professional format (name.surname; no nicknames, or misleading terms)
  - Respect this medium as phone
  - Think twice – change is complicated
  - Private / Business one
  - Protect from spam (http://www.sneakemail.com or similar service)
- Presentation / Web page (online CV)
- Twitter / Facebook / LinkedIn
- Blog
- Discussion groups / forums
- **Build your personal brand – create something!** *

* http://www.squidoo.com/distinguishyourself

Start of You: Communication

- **Learn to communicate** with:
  - Customers
  - Clients
  - Users
  - Co-workers
  - Bosses
- Learn how to speak in public
- Learn how to persuade someone without shouting (guilty as charged ☺)
- Learn how to explain w/o jargon ☺
- **Learn to communicate**

Start of Work

- You only or in small team
- Even pro bono one (no money, but practice and references)
- Open Source projects (community, communication, team work, team tools, remote work; http://sourceforge.net)
- RentACoder, Elance, Guru
  - Real Work – from requirements ’till support
  - Real Money – can be decent addition to income
  - Real Possibilities – can be start of very useful relations

Start of Work: Guidelines

- Keep learning (to avoid Coders syndrome)
- Learn a language (new one each 6 – 12 months)
- Read code of others – REGULARLY
- Use Design Patterns (but understand them!)
- DRY (Don’t Repeat Yourself)
- Automate (Scripting languages / build systems)
- KISS (Keep It Simple Stupid ☺)

Bugs - First rule of Programming: You made bug!

- OS
- Compiler
- Third party Library

7%

- Programmer

93%

You - Best Programmer Ever

- No one can't control (really) on what you are working
- Your boss can't make you to be good programmer
- **Only person** who can make you **great programmer is you**
- Be **Humble**:
  "The competent programmer is fully aware of the strictly limited size of his own skull; therefore he approaches the programming task in full humility, and among other things he avoids clever tricks like the plague."*
- Be **Vain**: make something that looks as good as it works

* http://c2.com/cgi/wiki?TheHumbleProgrammer
Edsger Dijkstra, 1972 Turing Award lecture

Daily Work

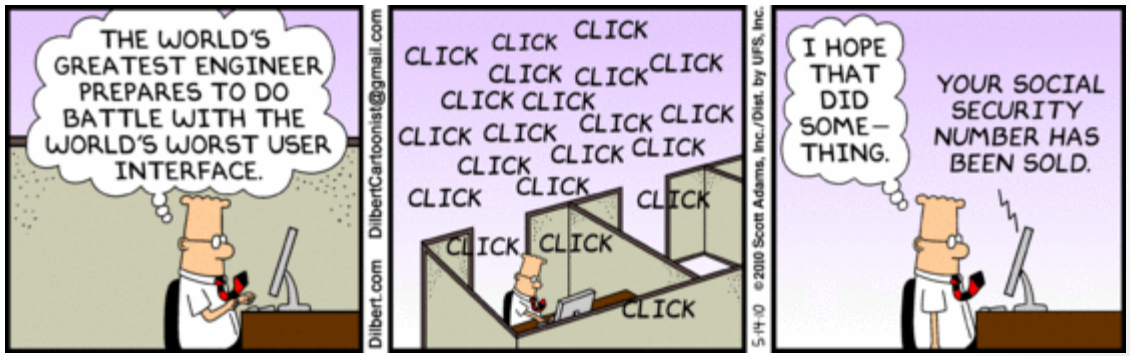
- Problems
  - Not Critical but important
- Errors
  - Critical
  - Can cause loss of money (for client) or private data
- Mistakes
  - Wrong ways to solve problems
  - Some out of your hands (team / process), some not

Usual problems (algorithms /techniques)

- Exceptions
- Object lifecycle (Disposable)
- Locking
- Multithreading
- Messaging
- Internationalization / localization (I18N)
- DB: Transactions, Locking, Triggers, Data reconciliation

Usual Problems (desktop)

- User Interface
  - Usability
    - All with keyboard as well
    - Distribution and order of controls on form
    - Adapt to environment (resolution / DPI / font size)
    - No confirmation for positive actions
    - Very careful selection of defaults
  - Standardization
    - As much as similar to existing applications on given platform (Office)
- Ease of Use
- Zero Tester (your mother? ☺)



http://www.dilbert.com/

Usual Problems (Serbian ones)

- No responsibility (all excuses)
- Very bad code:
  - IPP (Serbian: APP)
  - Only positive branch
  - No standard way of error handling
  - Non-existent documentation
- Overdue delivery
- Over self-confidence w/o results behind that

2010 CWE/SANS Top 25 Most Dangerous Programming Errors (1/3)

- Insecure Interaction Between Components
  - Failure to Preserve Web Page Structure ('**Cross-site Scripting**')
  - Improper Sanitization of Special Elements used in an SQL Command ('**SQL Injection**')
  - Cross-Site Request Forgery (**CSRF**)
  - Unrestricted **Upload** of File with **Dangerous Type**
  - Improper Sanitization of Special Elements used in an OS Command ('**OS Command Injection**')
  - Information Exposure Through an Error Message
  - URL Redirection to Untrusted Site ('**Open Redirect**')
  - Race Condition

Reference: http://cwe.mitre.org/top25/#Brief

2010 CWE/SANS Top 25 Most Dangerous Programming Errors (2/3)

- Risky Resource Management
  - Buffer Copy without Checking Size of Input ('**Classic Buffer Overflow**')
  - Improper Limitation of a Pathname to a Restricted Directory ('**Path Traversal**')
  - Buffer Access with Incorrect Length Value
  - Improper Check for Unusual or Exceptional Conditions
  - Improper Control of Filename for Include/Require Statement in PHP Program ('**PHP File Inclusion**')
  - Improper Validation of Array Index
  - Integer Overflow or Wraparound
  - Incorrect Calculation of Buffer Size
  - Download of Code Without Integrity Check
  - Allocation of Resources Without Limits or Throttling

Reference: http://cwe.mitre.org/top25/#Brief

2010 CWE/SANS Top 25 Most Dangerous Programming Errors (3/3)

- Porous Defenses
  - Improper Access Control (Authorization)
  - Reliance on Untrusted Inputs in a Security Decision
  - Missing Encryption of Sensitive Data
  - Use of Hard-coded Credentials
  - Missing Authentication for Critical Function
  - Incorrect Permission Assignment for Critical Resource
  - Use of a Broken or Risky Cryptographic Algorithm

Reference: http://cwe.mitre.org/top25/#Brief

35 Classic Mistakes*

People-Related Mistakes	Process-Related Mistakes	Product-Related Mistakes	Technology-Related Mistakes
1. Undermined motivation 2. Weak personnel 3. Uncontrolled problem employees 4. Heroics 5. Adding people to a late project 6. Noisy, crowded offices 7. Friction between developers and customers 8. Unrealistic expectations 9. Lack of effective project sponsorship 10. Lack of stakeholder buy-in 11. Lack of user input 12. Politics placed over substance 13. Wishful thinking	14. Overly optimistic schedules 15. Insufficient risk management 16. Contractor failure 17. Insufficient planning 18. Abandonment of planning under pressure 19. Wasted time during the fuzzy front end 20. Shortchanged upstream activities 21. Inadequate design 22. Shortchanged quality assurance 23. Insufficient management controls 24. Premature or too frequent convergence 25. Omitting necessary tasks from estimates 26. Planning to catch up later 27. Code-like-hell programming	28. Requirements gold-plating 29. Feature creep 30. Developer gold-plating 31. Push me, pull me negotiation	32. Silver-bullet syndrome 33. Overestimated savings from new tools or methods 34. Switching tools in the middle of a project 35. Lack of automated source-code control

Advices *

- Never stop **learning**.
- Do Programming ... a LOT!
- **Communication** is critical
- Learn how to WRITE in English (words, not code) – COMMUNICATION:
  - Blog
  - Active in community (any community)
  - Speak to real people
- Under promise, over **deliver**.
- Make stuff (working ones, for real people)
- "I was wrong."
- If it is not **tested** it doesn't work. If tested, it does not guarantee that it works what it should do
- Learn Microeconomics* (soon or later, it goes on money side)
  - And it helps to understand business

* http://www.removingalldoubt.com/PermaLink.aspx/a32977e2-cb7d-42ea-9d25-5e539423affd „Fatherly Advice to New Programmers“, Chuck Jazdzewski

** http://www.joelonsoftware.com/articles/StrategyLetterV.html

Recommended Literature

- **Code Complete 2nd Edition**
  Steve McConnel
- **The Pragmatic Programmer: From Journeyman to Master**,
  Andrew Hunt, David Thomas
- **The Mythical Man-Month: Essays on Software Engineering, Anniversary Edition**,
  Frederick P. Brooks
- 24 Deadly Sins of Software Security,
  Michael Howard, David LeBlanc, John Viega
- Refactoring: Improving the Design of Existing Code
  Martin Fowler, John Brant, William Opdyke, Don Roberts
- Rapid Development: Taming Wild Software Schedules
  Steve McConnel
- Design Patterns: Elements of Reusable Object-Oriented Software
  Erich Gamma, Richard Helm, Ralph Johnson, John M. Vlissides

Desktop Application (example)

- Prerequisite check (and install)
  - OS version + service pack (check for minimal)
  - Mandatory OS components
  - Java runtime
  - .Net Framework
- Installation
  - As well under limited (non-admin) account
- Registration (machine signature)
- Desktop Application for something
- Error Logging
  - Remote Error Reporting
- Update
  - Backward compatibility (keep user data)
- Customer Support

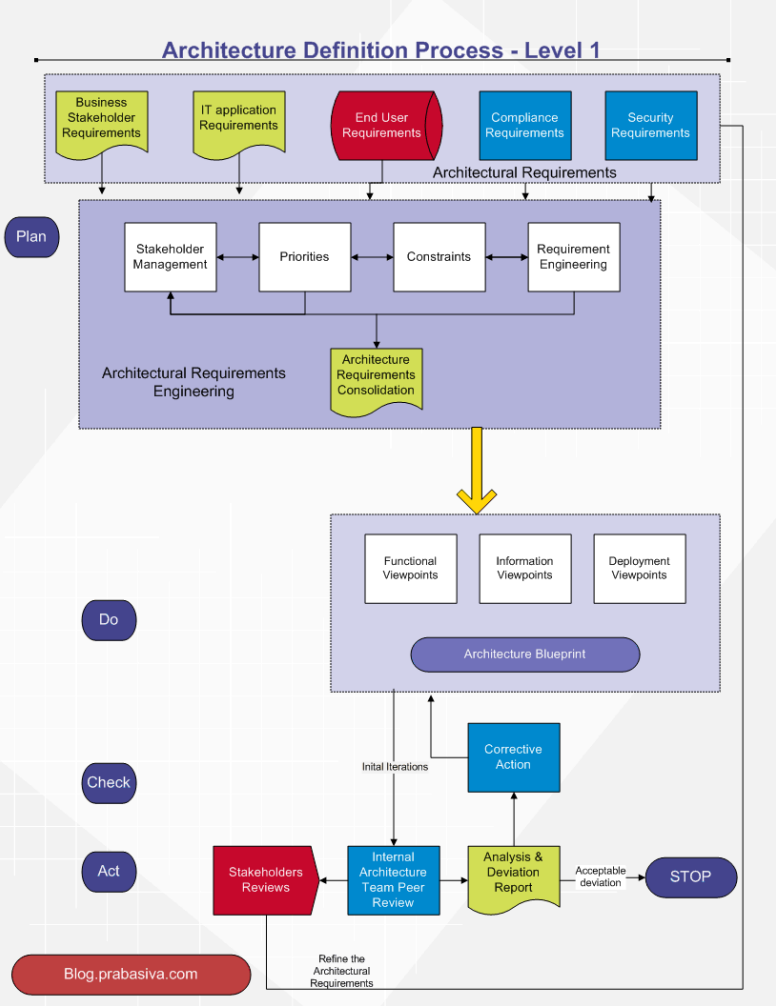
Commercial programming

- You **don't get paid to program**, you **get paid to ship**. Be good at your job*
- Write software which will be used by someone (or that people will actually want to use)**
- It's all about **what your code will do for the end user** and **not about how you did it**
- All Programming is Maintenance Programming

* http://www.removingalldoubt.com/PermaLink.aspx/a32977e2-cb7d-42ea-9d25-5e539423affd - Fatherly Advice to New Programmers, Chuck Jazdzewski

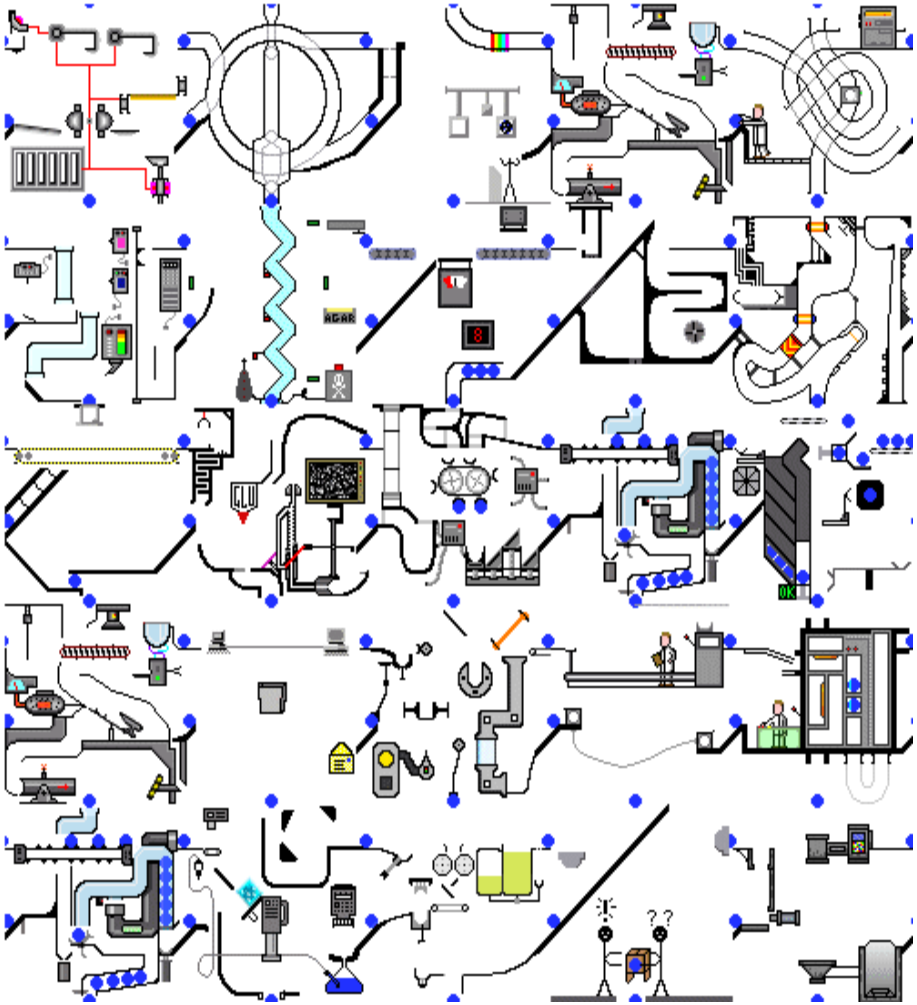
** http://www.skrenta.com/2007/01/market_engineering.html - How to Ship Code and Influence People, Rich Skrenta

Software System

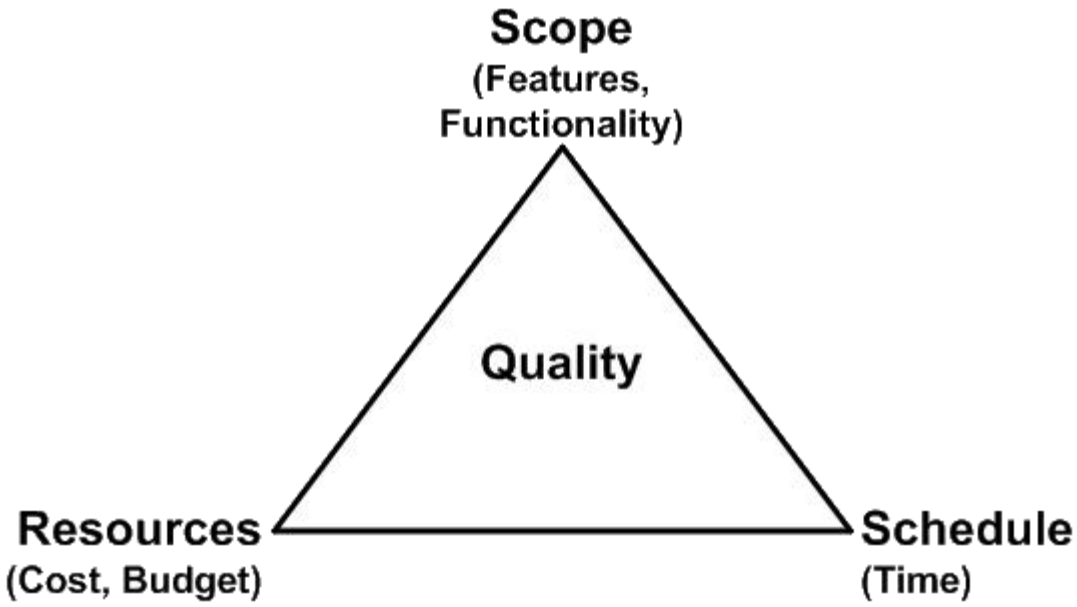


Picture taken from http://blog.prabasiva.com/2008/08/11/software-system-architecture-definition-process/

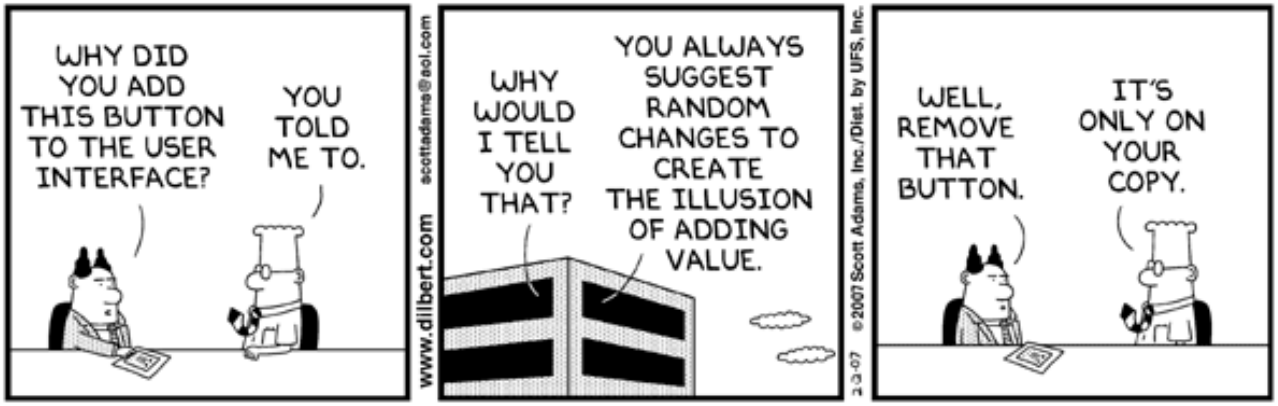
Real System



Iron Triangle



Real Problems ☺



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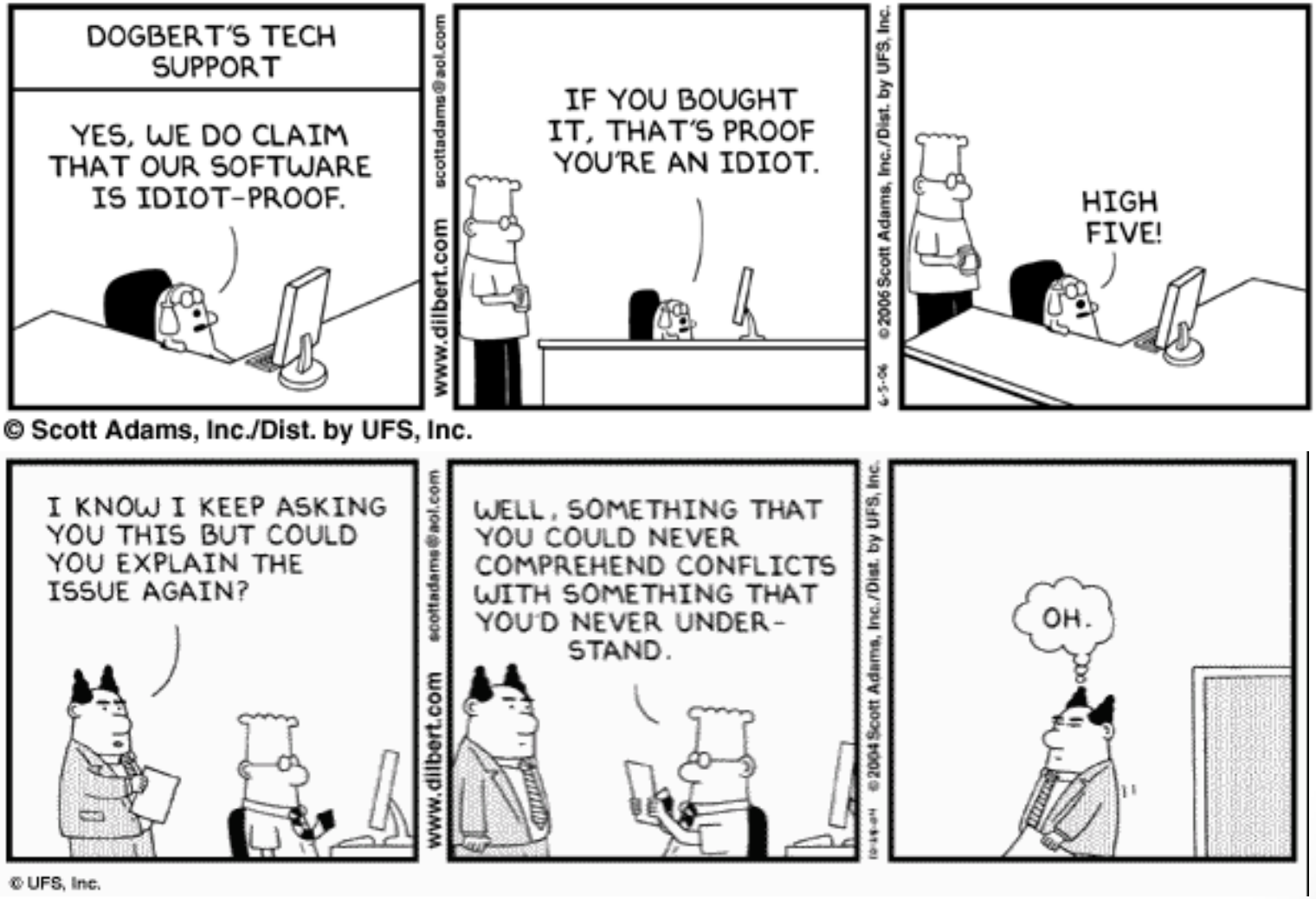
http://www.dilbert.com/

More Real Problems ☺



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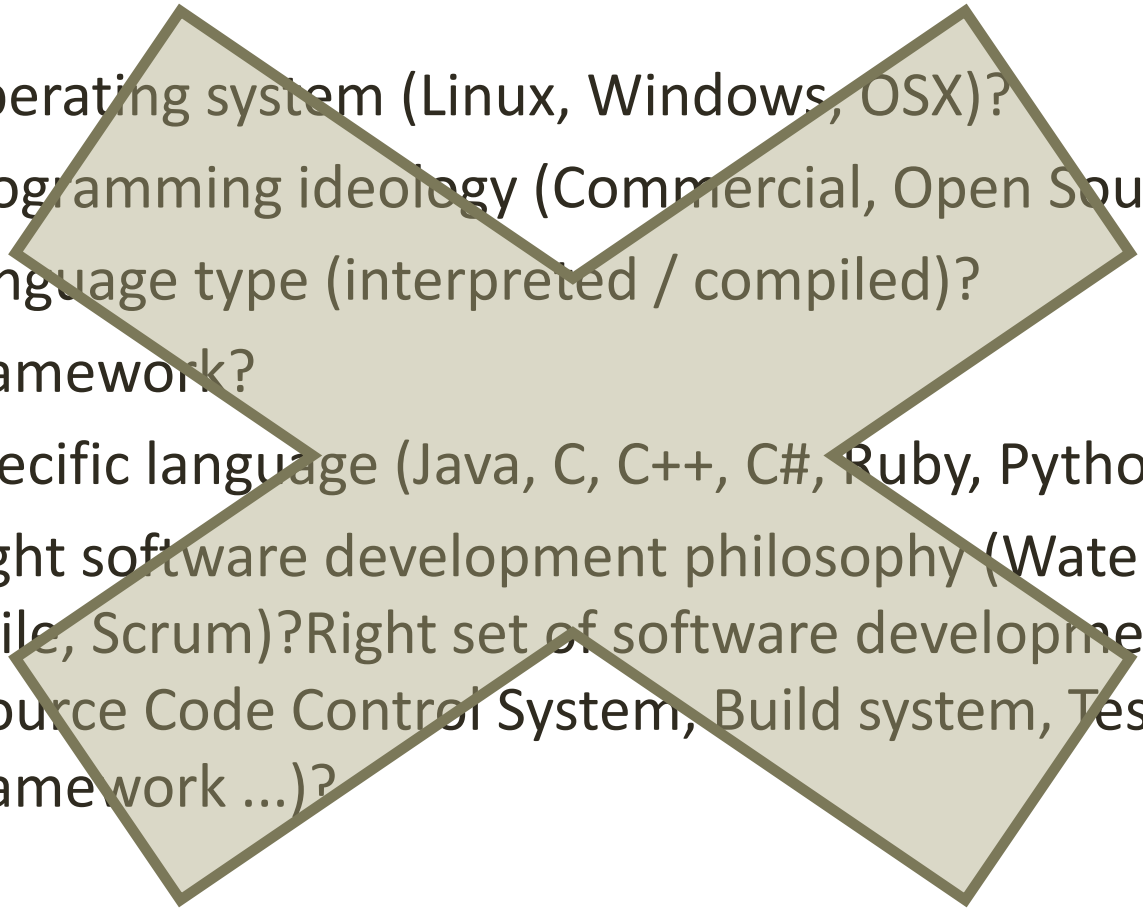
[Poll] Most important thing to deliver:

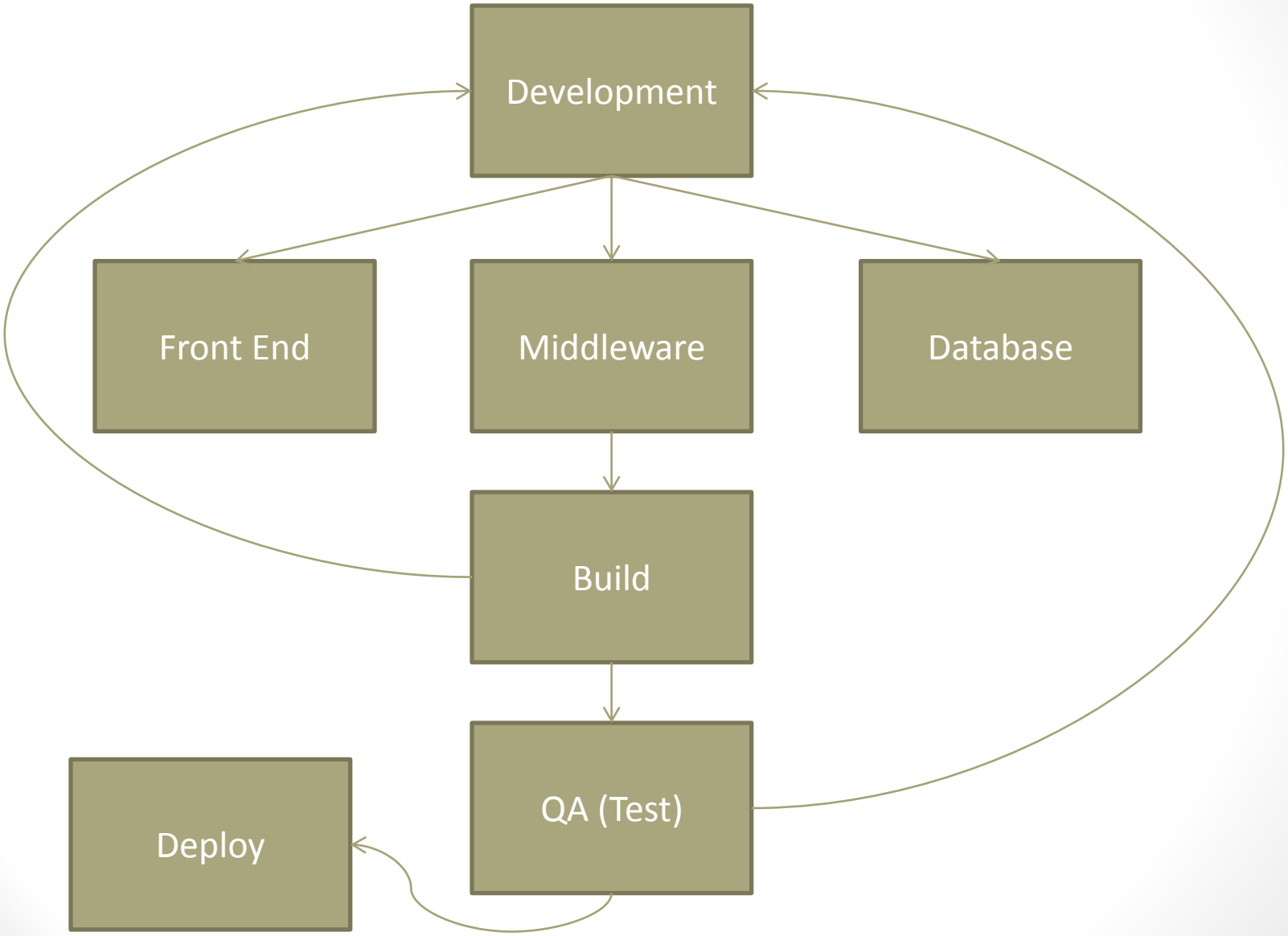
1. Operating system (Linux, Windows, OSX)?
2. Programming ideology (Commercial, Open Source)?
3. Language type (interpreted / compiled)?
4. Framework?
5. Specific language (Java, C, C++, C#, Ruby, Python ...)?
6. Right software development philosophy (Waterfall, XP, Agile, Scrum)?Right set of software development tools (Source Code Control System, Build system, Testing Framework ...)?



Most important thing to deliver:

TEAM!

Software Factory



How Good Your Team Is? (technology)

- Do you use source code control system?
- Can you make a build in one step?
- Do you make daily builds?
- Do you have a bug database?
- Do you fix bugs before writing new code?
- Do you have an up-to-date schedule?
- Do you have a spec?

How Good Your Team Is For You?

- Do you respect your coworkers?
- Do you like your coworkers?

Teams – Real Life Problems

- Personality Problems
- Distributed Team (communication issues)
- Split Responsibility (unknown owner)
- Duplication of code / functionality (missing design)
- Knowledge Sharing (Wiki / Stack Overflow / Bug Tracking tools)
- Clear lines of Reporting
- Noise

Documentation

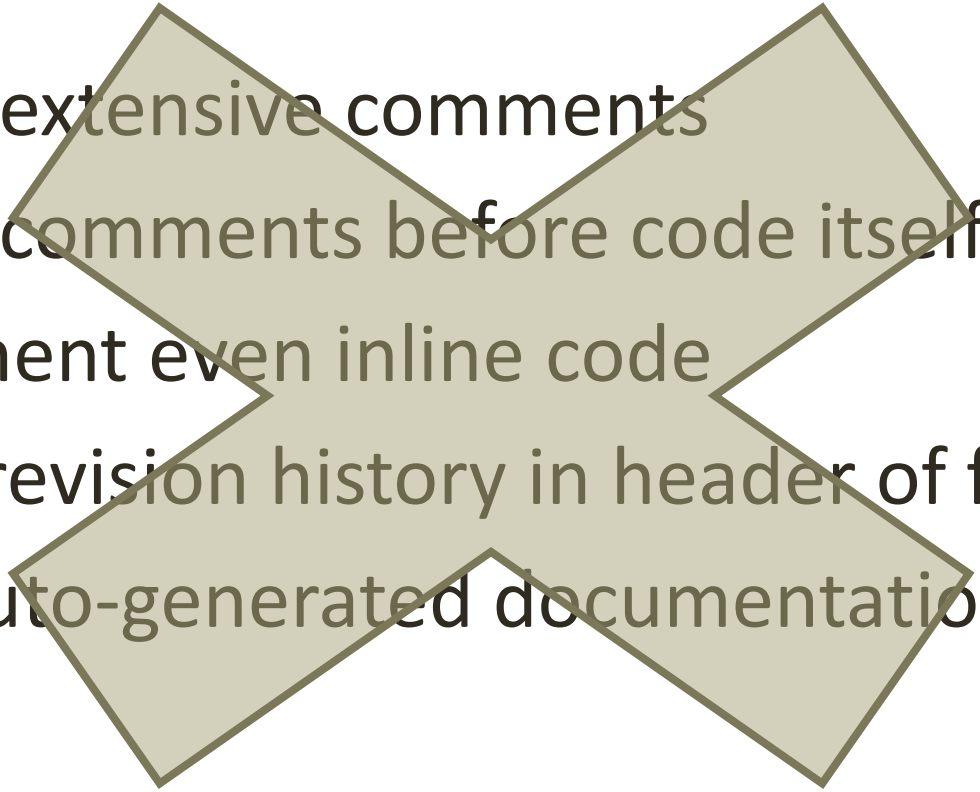
- High Level
- Structured
- Explains details which are higher than code
- Targeted toward human, not toward compiler
- Types:
  - Requirements
  - Design
  - Technical (algorithms, interfaces, APIs) - default
  - End User (tutorial, thematic, list or reference doc)
  - Marketing
- „Prior, clear, and extensive documentation is a key element in creating software that can survive and adapt“*
- Documentation is COMMUNICATION

* http://queue.acm.org/detail.cfm?id=1053354 - Comments are More Important than Code

Documentation (example)

- What is it?
  - Why is written?
  - How it works?
  - Limitations
- Basic Context (where to use it)
- Installation
  - Upgrade
- Configuration
- Examples
- Troubleshooting
- Licensing / Copyright issues
- Good example of documentation: http://www.urlrewriting.net/160/en/documentation.html

Comments



- Write extensive comments
- Write comments before code itself
- Comment even inline code
- Keep revision history in header of file
- Use auto-generated documentation

Writing comments:

- Is boring in a first place
- Takes time out of coding time
- Easy to forget to update when signature changes
- „When I wrote this, only God and I understood what I was doing.
  Now, God only knows“ *

* **Karl Weierstrass, mathematician**

Examples of Comments ☺

- `// Magic. Do not touch.`
- `/* You are not meant to understand this */`
- `// drunk, fix later`
- `return 1; # returns 1`
- `// I'm sorry.`
- `// I am not sure if we need this, but too scared to delete.`
- ```
  // I am not responsible of this code.
  // They made me write it, against my will.
  ```
- ```
  /*
   * You may think you know what the following code does.
   * But you don't. Trust me.
   * Fiddle with it, and you'll spend many a sleepless
   * night cursing the moment you thought you'd be clever
   * enough to "optimize" the code below.
   * Now close this file and go play with something else.
   */
  ```
- http://code.google.com/p/xee/source/browse/trunk/XeePhotoshopLoader.m?spec=svn28&r=11#107

Comments: HOWTO

- MAKE CODE SELF EXPLANATORY (so that you do not need to write comments) by using:
  - Same coding standard across team
  - Good variable names
  - Write / re-write / refactor code so that speaks for itself
- Use comments to **communicate ideas** to other **HUMAN BEINGS***
- Good comments -> you have to be good writer
- Good comment **answer on "Why"** (... is this algorithm / idea used) **and not on "What"** (... is going on in code) or "How" (.. is done)

* http://www-cs-faculty.stanford.edu/~knuth/lp.html - Literate Programming, Donald E. Knuth

Comments: Example

Initial:

```
r = n / 2;
while ( abs( r - (n/r) ) > t ) {
    r = 0.5 * ( r + (n/r) );
}
System.out.println( "r = " + r );
```

First:

```
// square root of n with Newton-Raphson
approximation
r = n / 2;
while ( abs( r - (n/r) ) > t ) {
  r = 0.5 * ( r + (n/r) );
}
System.out.println( "r = " + r );
```

Final:

```
private double SquareRootApproximation(n) {
  r = n / 2;
  while ( abs( r - (n/r) ) > t ) {
    r = 0.5 * ( r + (n/r) );
  }
  return r;
}
System.out.println( "r = " + SquareRootApproximation(r) );
```

http://www.codinghorror.com/blog/2008/07/coding-without-comments.html

CV, Hiring, Interview – Disclaimer!

- Strictly personal view
- Based on previous personal experience
- Take this “as is” – without any warranty that it will work with other employer
- I **don’t** want to say “this is right approach” but this is **my** current approach!

How to present yourself

- How to write CV / Resume
- Cover letter (application letter)
- Examples ☺
- Recommendation letters
- References

CV != Resume

- There are several differences between a curriculum vitae and a resume.
- A Curriculum Vitae is usually longer (two or more pages) than resume
- When asking for a job in Europe, the Middle East, Africa, or Asia, expect to submit a CV rather than a resume.
- Some of personal information on a curriculum vitae that would never be included on an American resume, such as date of birth, nationality and place of birth.
- United States law on what information job applicants can be asked to provide does not apply outside the country.

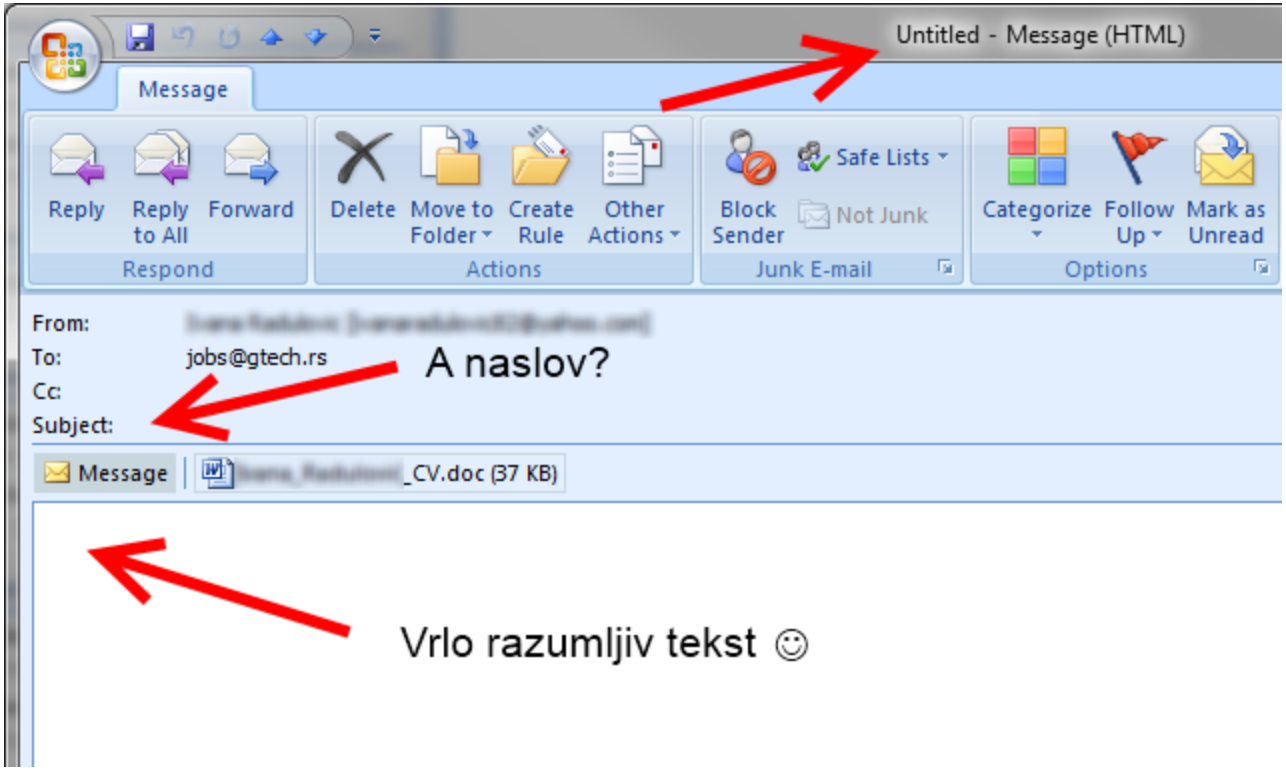
CV (1)

- Curriculum vitae should include:
  - your name
  - contact information
  - education
  - skills
  - experience.
- In addition to the basics, a CV includes:
  - research and teaching experience
  - publications
  - grants and fellowships
  - professional associations and licenses
  - awards
  - and other information relevant to the position you are applying for.
- Start by making a list of all your background information, then organize it into categories. Make sure you include dates on all the publications you include.

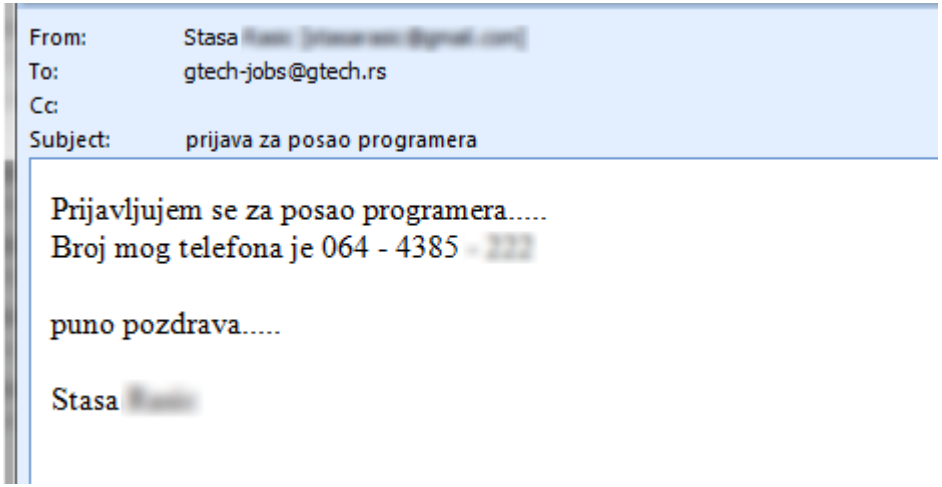
CV (2) (practicalities)

- CV
  - Universal format (PDF)
  - If not PDF, make it as an archive (7-zip, Zip)
  - CV according to job you are applying (emphasize elements important for that position)
  - Content:
    - No more than two page
    - No grammar or spelling errors
    - Live references (work – sites and/or proper mail of your contacts)
  - **UP TO DATE!**
  - **UP TO DATE!**

CV – Bad (1)


Untitled - Message (HTML)
Message
Reply
Reply to All
Forward
Respond
Delete
Move to Folder
Create Rule
Other Actions
Actions
Block Sender
Safe Lists
Not Junk
Junk E-mail
Categorize
Follow Up
Mark as Unread
Options
From:
To:
jobs@gtech.rs
Cc:
Subject:
A naslov?
Message
_CV.doc (37 KB)
Vrlo razumljiv tekst ☺

CV – Bad (2)



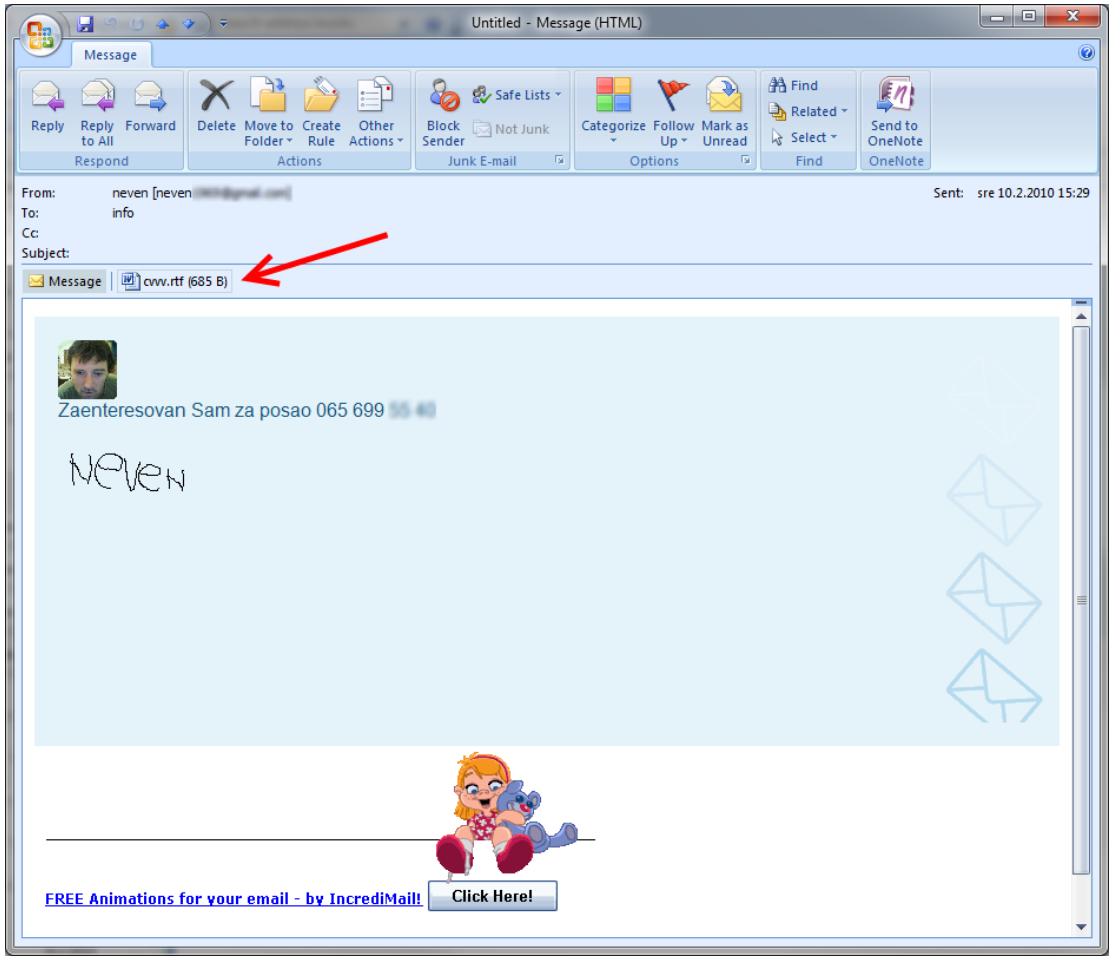
From: Stasa
To: gtech-jobs@gtech.rs
Cc:
Subject: prijava za posao programera

Prijavljujem se za posao programera.....
Broj mog telefona je 064 - 4385

puno pozdrava.....

Stasa

CV – Bad (3: Mail)


Untitled - Message (HTML)
Message
Reply
Reply to All
Forward
Delete
Move to Folder
Create Rule
Other Actions
Block Sender
Safe Lists
Not Junk
Categorize
Follow Up
Mark as Unread
Find
Related
Select
Send to OneNote
Respond
Actions
Junk E-mail
Options
Find
OneNote
From: neven [neven
To: info
Cc:
Subject:
Sent: sre 10.2.2010 15:29
Message
cvvv.rtf (685 B)
Zaenteresovan Sam za posao 065 699
neven
FREE Animations for your email - by IncrediMail!
Click Here!

CV – Bad (3: Attachment)

12/14/2009

cv [redacted] Neven

[redacted] NEVEN IZ KIKINDE

ZANIMANJE - IT TEHNISON
SERVISER RACUNARA
I MREZA I PROGRAMER

A+ SERTIFIKAT o65699[redacted]

Checking references and recommendations

- References and recommendations are very important
  - Professors / Teachers
  - Former Bosses
  - Former Colleagues
  - Users of your previous products / services
- Those gets checked and people get contacted
- Programming community (in Serbia) is small – make note of that

How to apply for work?

- Preparation
  - Get informed about potential employer: web site, products, structure and public image
  - Be sure to know for what you are applying to – if there is not enough info in advertisement, dare to ask for more
- Application (Cover) Letter
  - From your mail address
  - On intended address
  - Make sure that note position you are targeting for
- Recommendations
- References

Selection of candidates based on CV

- How it really works (in practice)?
- Sometimes just quick overview of CV (few seconds), sometimes very detailed
- Criteria
  - Internal (from company) recommendations and information
  - Skills
  - Ability to Learn (stuff already done)
  - Personal (team working, communication, languages…)
  - Experience
  - Education
  - External info

Interview - Preparation

- Get informed (good!) about potential employer
  - Official sources (web sites, materials, search, financial records)
  - Unofficial sources (current or ex-employees etc.)
- Get your (minimal) terms under you would accept position with that company
- Clear idea for which position you are applying to and under which conditions
- Prepare list of not-so-comfortable list of questions (for potential employer) as well list of your answers on similar questions

Interview

- Usually: Two parts + two circles
  - Personality and team member roles
  - Expert (for area of expertise required for specific role)
- Sometimes very informal
- Interview is bidirectional – be prepared to ask, not just to be asked
- Expect pressure and be prepared to it
- Be ready to say „No“

Interview – About Money

- Money is very important factor (but not only one!)
- Know price of your work
- Do not be ashamed to ask that price
- Prepare list of minimal conditions which you expect employer to fulfill
- Be sure that both sides are fully aware about agreed conditions! (repeat and verify before leaving final discussion and making decision)

Final decision

- Huh… this is hard to explain
- We consider all previously noted elements:
  - CV
  - All conversations
  - View of other colleagues involved in your interview
- If we can’t decide… sometimes we follow our intuition

Where not to look for work

- The leading association in the systems for payment online is looking for:
  The senior programmer with at least 5 years of experience. The candidate has to have a **complete and total knowledge** of the **programs languages** which have been **indicated**, and has to prove that he can handle these projects alone. The candidate has to deal with European and American reality for that reasons he should speak and write fluently english. Experience in the sector of mobile telephones is the most important advantage.

  The program languages (5 years experience)

  • HTML, XHTML, DHTML / • XML, XSL, XSLT, DOM.
  • CSS1 & 2, Javascript. / • Microsoft ASP (ADO2 & ADO3), ASP.NET
  • PHP 3, 4 & 5. / • Sun Java Server Pages (JSP & Servlet).
  • MySQL, Microsoft Access & Microsoft SQL Server 2000

  The candidate should also have the good knowledge of the things such as -web server, ftp and mail server, nntp

  • Microsoft IIS4 & 5. / • Linux
  • Apache v1.XX & v2.XX. / • Apache Tomcat 4.XX

(real job offer, December 2008)

References

- Steve McConnell, http://www.stevemcconnell.com/
- Joel Spolsky, http://www.joelonsoftware.com/
- Scott Guthrie, http://weblogs.asp.net/scottgu/
- Jeff Atwood, http://www.codinghorror.com

- Dejan Vesić,
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Q & A

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