

WORK LINKED LEARNING ENVIRONMENT

Chandan Mishra
4 April 2015

Work linked learning environment (WLLE)



Concept note

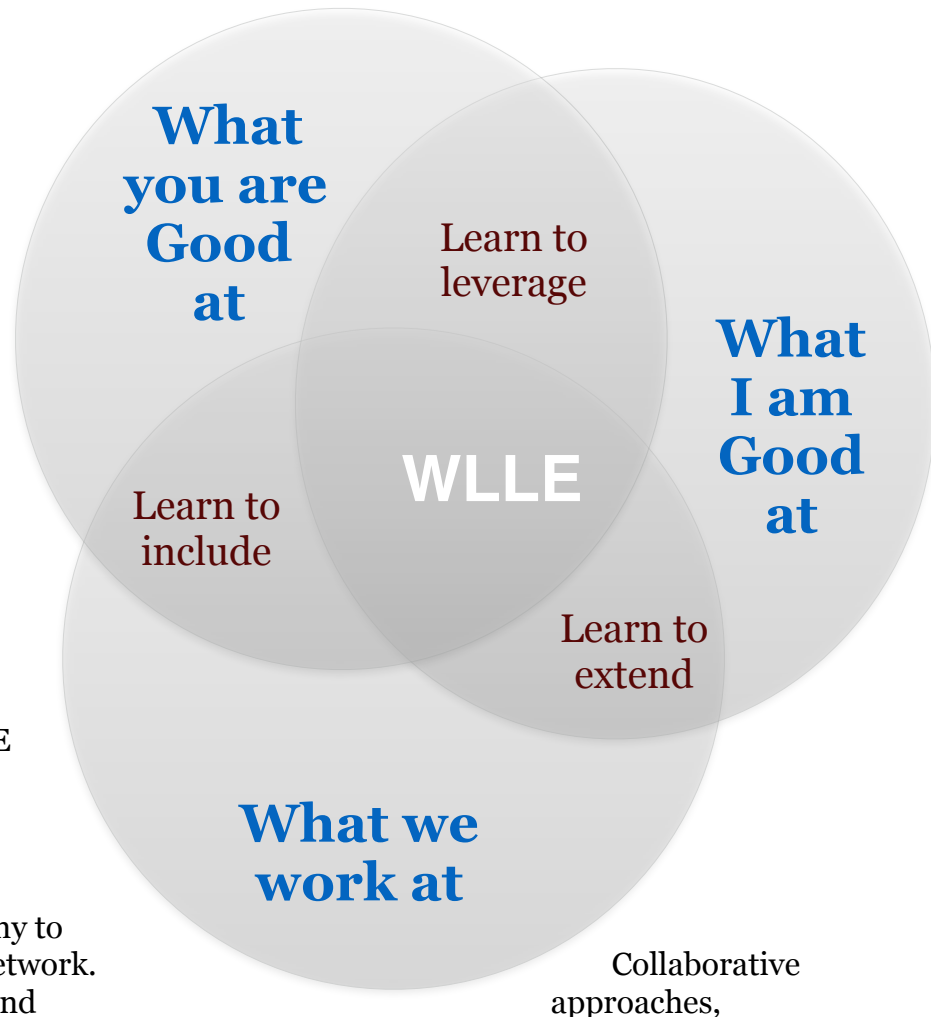
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What is WLLE (Work linked learning environment)

Work link learning environment is working on live projects. It could be both coding based projects and non coding projects where participants would work on the live projects and submit the project work at the end of the sessions. The projects could be taken up individually or in groups as a collaborative effort.

The projects will involve the platform based interactions with those who choose to work on the projects and the project managers.

WLLE will focus on building collaborative intelligence
Basis this CI WLLE will take the projects from the development to the go live status.



Collaborative intelligence in WLLE will characterise multi-agent, distributed systems where each student or participant, is uniquely positioned, with autonomy to contribute to a problem-solving network. autonomy will offer varied views and crowd-sourcing individual expertise, preferences, and unique contributions in a problem-solving process.

WLLE would essentially a platform which will have the following modules tightly integrated for a shared project and harnessing individual expertise.

1. Initiating a project
 1. Why this project
 2. Listing documentation
 3. Expertise wanted
 4. Problems and possible solutions
 5. Sought after approach
 6. Timelines

2. Opting a project

1. listing expertise
2. opting the work area
3. adhering the timelines
4. Possible questions

3. Work in progress

A complex project work may include multiple streams of engineering or only one stream. The projects from various organisations would of course cater to all kind of engineering streams listed below.

1. Mechanical
2. Civil
3. Electrical
4. GeoTechnical
5. Computers
6. Chemical
7. Environmental
8. Architectural
9. Bio
10. Electronics
11. Automobile
12. Textile
13. Marine
14. Instrumentation

The Document for now lists only approach of WLLE as a software collaboration project.

Problem solving approach

The approach of WLLE would be a problem solving approach. The group or the students with a leader would be asked to opt for a live problem and provide or build a solution of the problem.

The big projects would however include a collaborative approach to resolve an existing issue and example of the such crowd sourcing projects would be:

- SwarmSketch is a crowd-sourced art experiment.
- Galaxy Zoo is a citizen science project led by Chris Lintott at Oxford University to tap human pattern recognition capacities to catalog galaxies.
- DARPA Network Challenge explores how the Internet and social networking can support timely communication, wide-area team-building, and urgent mobilisation to solve broad-scope, time-critical problems.
- Climate CoLab, spun out of MIT and its Centre for Collective Intelligence.

- reCAPTCHA is a project to digitise books, one word at a time

The projects would list and tap the unique expertise of individual contributors toward increased functional effectiveness, co-evolving with systems to tag, credit, time-stamp, and sort content. The WLE projects will require capacity for effective search, discovery, integration, visualisation, and frameworks to support collaborative problem-solving.

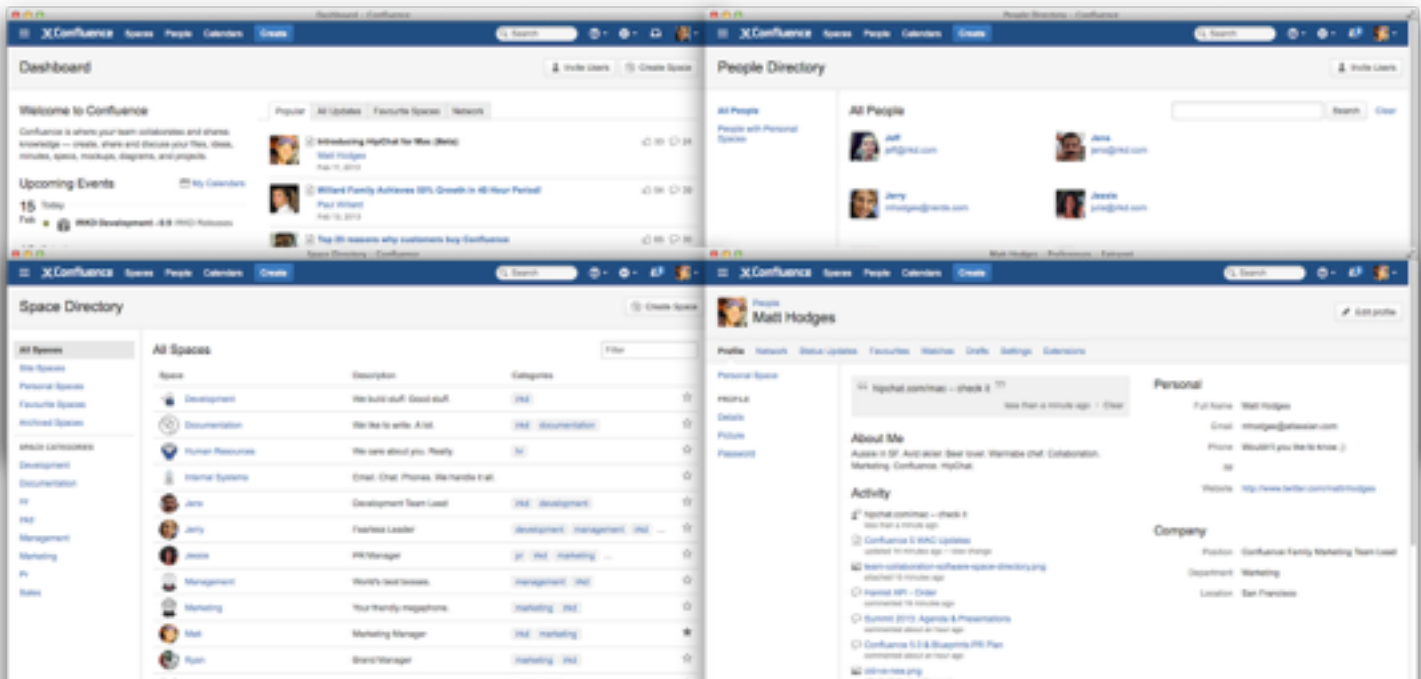
The WLE may include the following:

- Independent modules of the large project: Where submissions must be integrated to produce a synergistic outcome.
- Interaction forums for modules: Defined path or various modules and communication on changes, Rework and timelines.
- Effective project management: Planning, development, and sustainable project management for timely and effective results.

Existing tools to facilitate group problem-solving may include collaborative groupware, such as

- GitHub,
- Confluence,
- JIRA,
- WebEx,
- group Wikis.

An Example of the Confluence key screen for a shared activity tracking.



The project manager would also involve in the following aspects on the projects

- Quality control
- Peer review & performance controls
- A documented group memory
- creating a knowledge base
- Shared memory of the group
- Interest groups
- Future problem-solving.

The job of the Project manger would be to oversee how knowledge content interacts with its knowledge context in cross-disciplinary, multi-institutional, or global distributed collaboration.

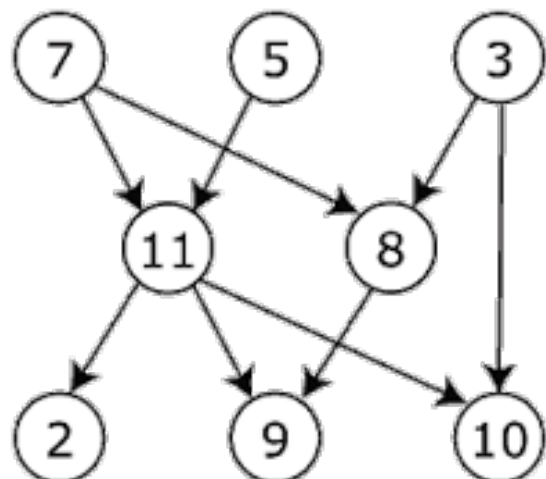
Live projects

A live project is a project distributed/listed to various stake holders in various modules for development.

All the modules are to be developed independently of each other however all the module groups/Individuals can download, read or have views on the main project documentations.

Modular programming will help separating the functionality of a program into independent, interchangeable modules, such that each contains everything necessary to execute only one aspect of the desired functionality.

In the live projects the modules can be arranged as a hierarchy, where the lowest-level modules are independent, depending on no other modules, and higher-level modules depend on lower-level ones.



Initiating a live project

A Project will go live post fulfilling the following requisites:

1. Proven Business cases for a large project
2. Requirements from clients
3. Social projects
4. Apps with proven GTM
5. Existing modules with live projects with ATMC
6. Great Ideas
7. Listed problems with
8. Existing funded Ideas
9. Internal Software projects

Getting a project live will be a decision of the the business lead of the WLLE and will go live post discussion with the matched skill set of the participants. The process would include

1. listing a project
2. listing the requirements, documentation, project timelines, clients etc.
3. Announcing the project
4. Gaining participants with required skill sets
5. Project acceptance and sign offs.

Listing projects (Modules and Apps)

Once the project is approved it will proceed to listing of the projects and will flow to the relevant project managers. This will be the responsibility of the Business manager of project to get the projects listed and announced. He may ask the project manager to over see the overall development and timelines.

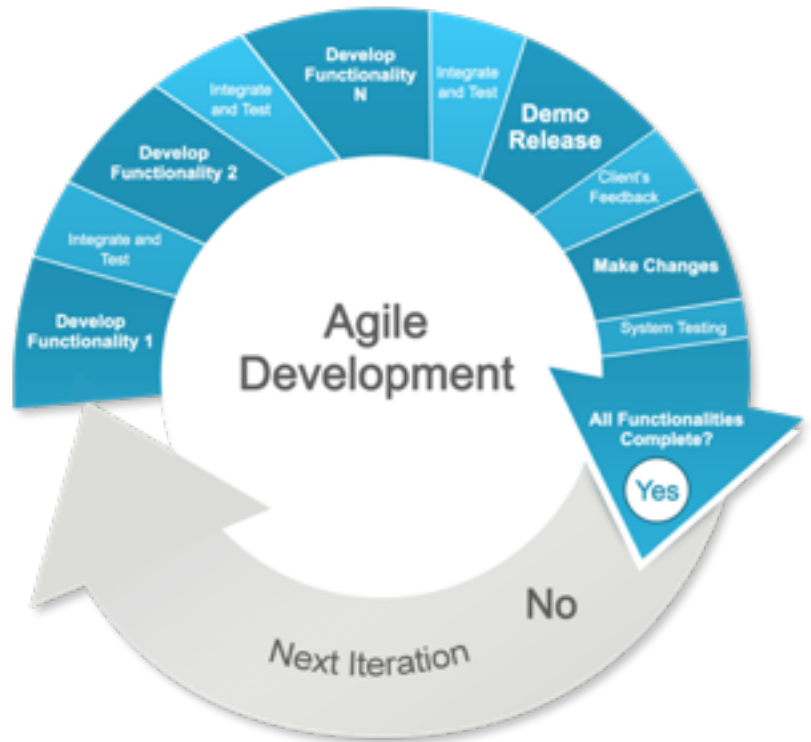
WLLE platform Which will list all the projects will expect the project managers to use the following for a better project management.

- Project details.
- Distributed revision control
- Source code management (SCM).
- A web-based graphical interface
- Access controls
- Project wikis
- Task management,
- Bug tracking
- Other Feature requests
- Documentation
- Nested task-lists
- Gantt charts

Any project will be based on Agile modelling, the Agile methodology is for cross functional team to work individually, sync and produce better codes.

Agile Modelling Principles

- Just barely good enough (JBGE) artefacts. A model or document needs to be sufficient for the situation at hand and no more.
- Architecture envisioning. At the beginning of an project, high-level architectural modelling is done to identify a viable technical strategy.
- Lookahead modelling is used to reduce overall risk.
- Multiple models can be used. Each type of model has its strengths and weaknesses. Effective developers have a range of models in their intellectual toolkit enabling them to apply the right model in the most appropriate manner for the situation at hand.
- Active stakeholder participation. Stakeholders are important for funding the process and accepting the results, that is why they are involved as soon as possible. Stakeholders provide information in a timely manner, make decisions in a timely manner, and are as actively involved in the development process as possible.
- Requirements envisioning. At the beginning of an agile project, time is invested to identify the scope of the project and to create the initial prioritised stack of requirements.
- Prioritised requirements. Requirements are implemented in priority order, as defined by their stakeholders, so as to provide the greatest return on investment possible. Collecting the low hanging fruit.
- Iteration modelling. At the beginning of each iteration, a bit of modelling is done as part of the iteration planning activities.
- Test-driven development (TDD). Requirements are written like a test. Tests are performed and then just enough code is made to fulfil that test. TDD is a JIT approach to detailed requirements specification and a confirmatory approach to testing.
- Model storming. Throughout an iteration a brainstorming session can be hold, called "model storm" on a just-in-time (JIT) basis for a few minutes to explore the details behind a requirement or to think through a design issue.



Opting a Project Module:

Skill set based

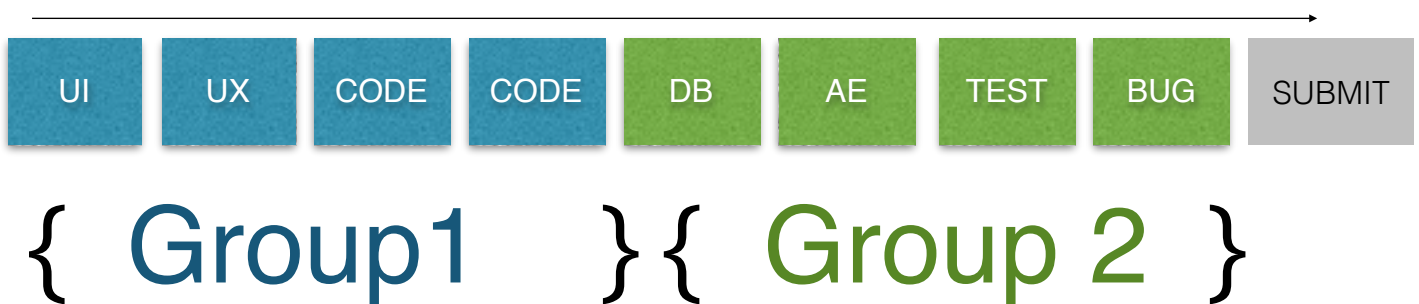
You can choose a project on your skill set. What you are best at or what do you want to do. However it is expected that when you opt for the project you should have a deeper level of understanding and should have worked on demo projects before.

Heads	Skill sets	Proficiency	Required	Demo
Framework	NET 1.x/2.0/3.5	Good/Excellent	Yes	YES
Programming Languages	Java, C#.NET, <u>ASP.NET</u>	Good/Excellent	Yes	YES
Programming Languages	ADO.NET, XML, LINQ	Beginner / Intermediate	Yes	No
Web Technologies	WCF, Web Services, HTML, Silverlight	Intermediate/ Good/	Yes	YES
Operating Systems	Windows2000/XP, Windows Server 2003	Excellent	Yes	YES
Databases	SQL Server 2000/2005/2008	Beginner	Yes	No
Testing Tools	Microsoft ACT, SOAPUI, SOAPSonar, VSTS 2008	Intermediate	Yes	YES
Hardware	FGPA design, Digital IO and processor design, Digital communications	Excellent	Yes	YES
Hardware	RF Design, Microwave circuits, Circuit design, Analog Applications	Excellent	Yes	YES

Group based

The objective of group based projects is coordinated learning and execution of the projects. Instead of the individual assignments of the project modules, a little complex modules are assigned to the group where teams are responsible for the delivery of the end to end project modules. An example would be part of App based project broken into following tasks still part of the module.

- UI Design and principles
- UX Design and implementations
- Coding for features
- Coding for functionalities
- Database integrations
- Analytics engine integrations
- Testing
- Bug fixing
- project submissions



While the project managers will list It's own requirements of the skills required to execute the projects, However there are some key skills which will be critical when opting for a project.

No. 1 Critical Thinking

Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.

No. 2 Complex Problem Solving

Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

No. 3 Judgment and Decision-Making

Considering the relative costs and benefits of potential actions to choose the most appropriate ones.

Listed down would be skill set for majority of projects

No. 1 Computers and Electronics

Knowledge of circuit boards, processors, electronic equipment and computer hardware including applications and programs.

No. 2 Mathematics

Knowledge of arithmetic, algebra, geometry, calculus, statistics and their application.

No. 3 Operations and Systems Analysis

Determining how a system or operation should work and how changes in conditions, operations and environments will affect outcomes. Understanding the needs and product requirements of a particular design.

No. 4 Monitoring

Monitoring and assessing performance of yourself, other individuals or project to make improvement or take corrective action.

No. 5 Programming

Writing computer programming for various purposes.

No. 6 Designing

UI and UX experts.

Submission of projects



Checks for Coding principles

The team will check the code post submission to be included in the main project. If the code doesn't follow the coding principles, the code will be rejected and coder will be asked to correct the code for others to understand. Listing some of the principles that should be followed.

- DRY - Don't repeat yourself - This is probably the single most fundamental tenet in programming is to avoid repetition. Many programming constructs exist solely for that purpose (e.g. loops, functions, classes, and more).
- Abstraction Principle - Related to DRY is the abstraction principle "Each significant piece of functionality in a program should be implemented in just one place in the source code.
- KISS (Keep it simple, stupid!) - Simplicity (and avoiding complexity) should always be a key goal. Simple code takes less time to write, has fewer bugs, and is easier to modify.
- Avoid Creating a YAGNI (You aren't going to need it) - You should try not to add functionality until you need it.
- Do the simplest thing that could possibly work - A good question to ask one's self when programming is "What is the simplest thing that could possibly work?" This helps keep us on the path towards simplicity in the design.

- Open/Closed Principle - Software entities (classes, modules, functions, etc.) should be open for extension, but closed for modification. In other words, don't write classes that people can modify, write classes that people can extend.

Another example of the principles of creating a neat HTML code would be :

- Strict Doctype
- Proper Indention
- Keep CSS and Scripts outside
- Keep Typography for CSS
- Class /give id to body and DIV

There are other principles of the coding, however the document doesn't cover all of them. The program however expects a neat code submission which can be worked by other people.

If the code get's accepted, it will proceed for the integration with the other modules and the main project.

Integration with the main project

Integration with the main project will follow the continuous integration with the project.

Each developer works on their own task. As they make changes, continuous integration is done against that team's branch. If it does not succeed, then that developer and the team fixes the branch. The team will commit to the main project and test and in case of failure will test recommit and rebuild to get the main code functional.

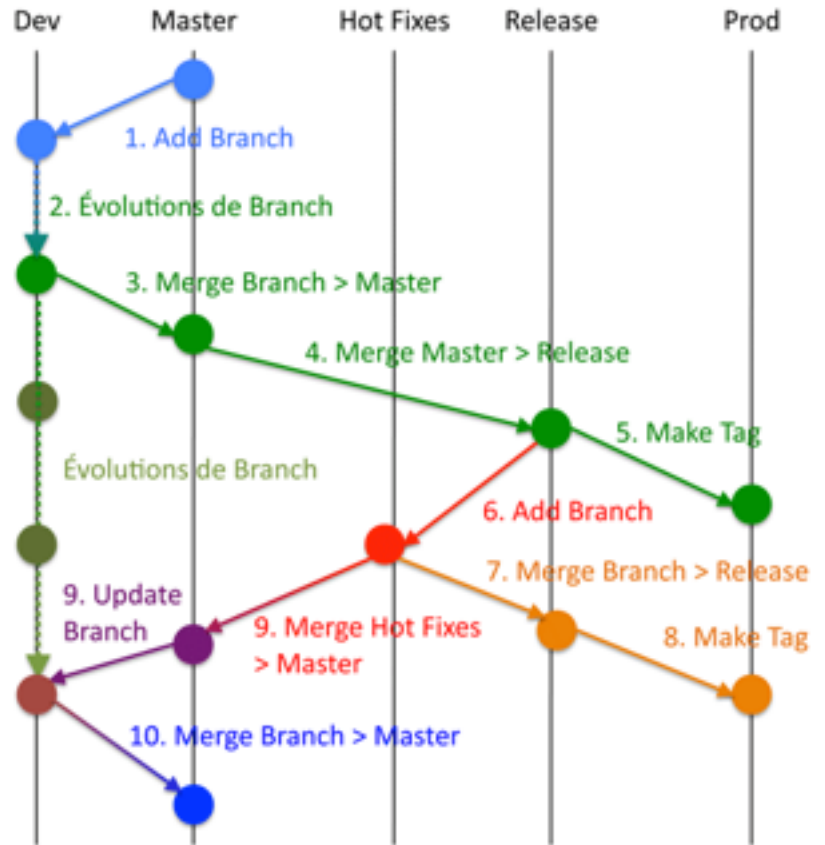
DEVELOPER WORKFLOW

- Developer clones repository
- Developer makes a new branch to work on feature with.
- Developer makes changes to team branch, signing off on every commit.
- Tests and build
- Fix issues, commit, test and rebuild
- Team commits to the Mainline code
- Tests and Build
- Fix issues, commit, test and rebuild the mainline.

INTEGRATION WORKFLOW

Whenever an integrator brings in a new commit, it should be rebased to the head of the master branch on the main repo. The Integrator will maintain linearity in the main repository (repo) while also not changing code out from under developers.

- Integrator receives pull request or patch
- If pull request, integrator makes sure it is rebased.
- If not rebased, and developer is in IRC channel, talk to developer there to have them properly rebase. If developer is not in IRC channel, integrator pulls to local repo and rebases. If conflicts arise, notify developer via pull request comment.
- If patch, integrate on top. If conflicted, contact developer with issue comments.
- Integrator merges patch into main branch. Should confirm to all if the rebase was successful.
- Integrator pushes to main repo



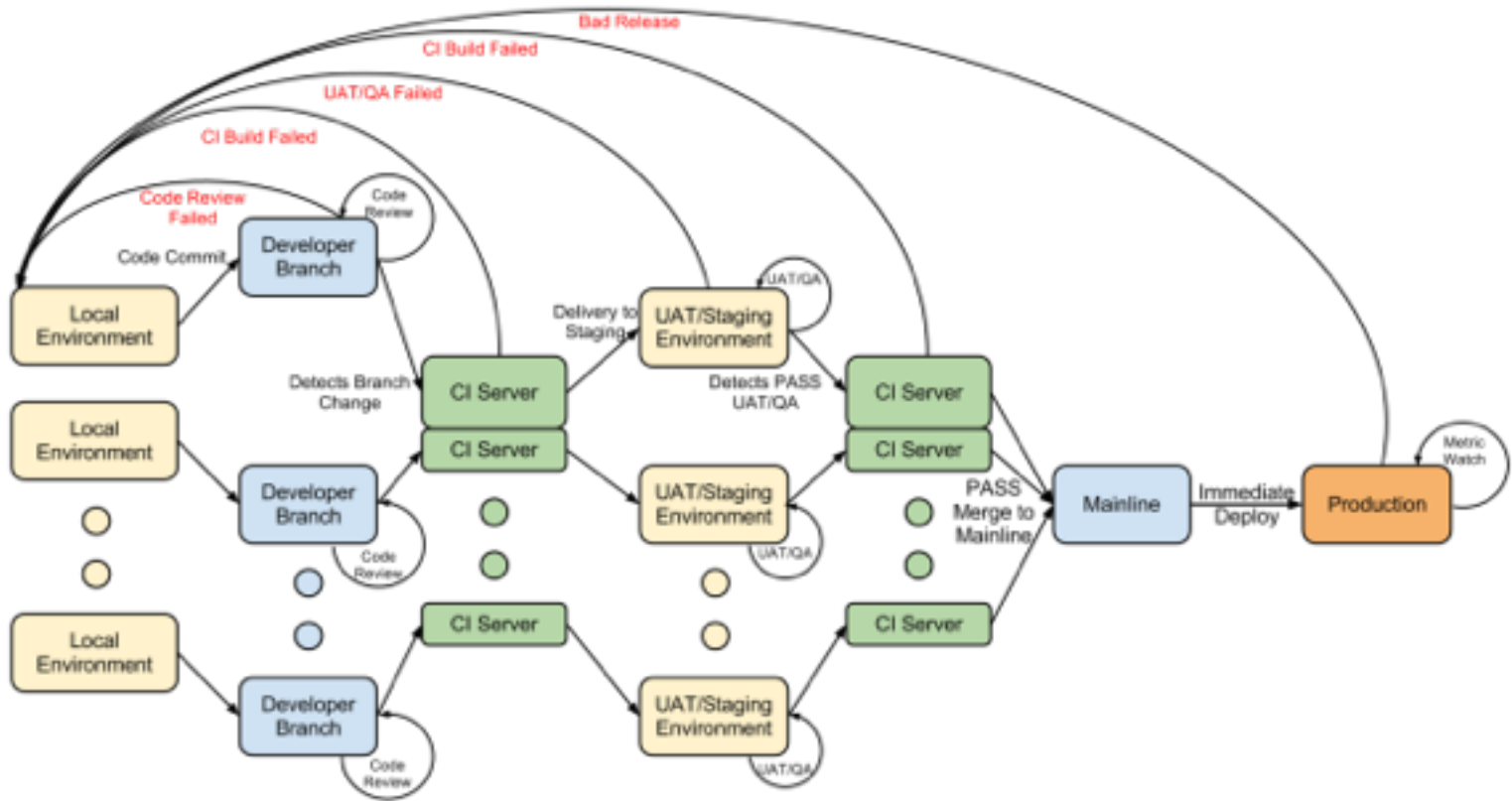
The developers/Integrators of the various module are expected to do the following with the project managers:

- Maintain a code repository
- Automate the build
- Make the build self-testing
- Everyone commits to the baseline on regular timelines.
- Every commit (to baseline) should be built
- Integrator will keep everyone updated about the rebase.
- Test in a clone of the production environment
- Announce the results of the latest build
- Automate deployment

This will help to test the multiple integration conflicts and failures at the regular stages, at the same time source code repository is build at the same time.

The longer a branch of code remains checked out, the greater the risk of multiple integration conflicts and failures when the developer branch is reintegrated into the main line.

When developers submit code to the repository they must first update their code to reflect the changes in the repository since they took their copy. The more changes the repository contains, the more work developers must do before submitting their own changes.



Continuous integration involves integrating early and often, so as to avoid the pitfalls of "integration hell". The practice aims to reduce rework and thus reduce cost and time.

Testing and Bug fixing (along with the final project)

Once the project is submitted now it will be subjected to the final testing, bug fixes and regression tests. Testing is a process rather than a single activity. This process starts from test planning then designing test cases, preparing for execution and evaluating status till the test closure. So, we can divide the activities within the fundamental test process into the following basic steps:

- 1) Requirement Analysis
- 2) Planning and Control
- 2) Analysis and Design
- 3) Implementation and Execution
- 4) Evaluating exit criteria and Reporting
- 5) Test Closure activities

REQUIREMENT ANALYSIS

During this phase, test team studies the requirements from a testing point of view to identify the testable requirements. The QA team may interact with various stakeholders (Client, Business Analyst, Technical Leads, System Architects etc) to understand the requirements in detail. Requirements could be either Functional (defining what the software must do) or Non Functional (defining system performance /security availability) .Automation feasibility for the given testing project is also done in this stage.

Activities-

- Identify types of tests to be performed.
- Gather details about testing priorities and focus.
- Prepare Requirement Traceability Matrix (RTM).
- Identify test environment details where testing is supposed to be carried out.
- Automation feasibility analysis (if required).
- Deliverables
- RTM
- Automation feasibility report. (if applicable)

TEST PLANNING

This phase is also called Test Strategy phase. Typically , in this stage, a Senior QA manager will determine effort and cost estimates for the project and would prepare and finalize the Test Plan.

Activities

- Preparation of test plan/strategy document for various types of testing
- Test tool selection
- Test effort estimation
- Resource planning and determining roles and responsibilities.
- Training requirement
- Deliverables
- Test plan /strategy document.
- Effort estimation document.

TEST CASE DEVELOPMENT

This phase involves creation, verification and rework of test cases & test scripts. Test data , is identified/created and is reviewed and then reworked as well.

Activities

- Create test cases, automation scripts (if applicable)
- Review and baseline test cases and scripts
- Create test data (If Test Environment is available)
- Deliverables
- Test cases/scripts
- Test data

TEST ENVIRONMENT SETUP

Test environment decides the software and hardware conditions under which a work product is tested. Test environment set-up is one of the critical aspects of testing process and can be done in parallel with Test Case Development Stage. Test team may not be involved in this activity if the customer/development team provides the test environment

in which case the test team is required to do a readiness check (smoke testing) of the given environment.

Activities

- Understand the required architecture, environment set-up and prepare hardware and software requirement list for the Test Environment.
- Setup test Environment and test data
- Perform smoke test on the build
- Deliverables
- Environment ready with test data set up
- Smoke Test Results.

TEST EXECUTION

During this phase test team will carry out the testing based on the test plans and the test cases prepared. Bugs will be reported back to the development team for correction and retesting will be performed.

Activities

- Execute tests as per plan
- Document test results, and log defects for failed cases
- Map defects to test cases in RTM
- Retest the defect fixes
- Track the defects to closure
- Deliverables
- Completed RTM with execution status
- Test cases updated with results
- Defect reports

TEST CYCLE CLOSURE

Testing team will meet , discuss and analyze testing artifacts to identify strategies that have to be implemented in future, taking lessons from the current test cycle. The idea is to remove the process bottlenecks for future test cycles and share best practices for any similar projects in future.

Activities

- Evaluate cycle completion criteria based on Time,Test coverage,Cost,Software,Critical Business Objectives , Quality
- Prepare test metrics based on the above parameters.
- Document the learning out of the project
- Prepare Test closure report
- Qualitative and quantitative reporting of quality of the work product to the customer.
- Test result analysis to find out the defect distribution by type and severity.
- Deliverables
- Test Closure report
- Test metrics

Going live with main project

Post the Software testing the site will go live with the best testing phase and will be open for the consumers feedback.

Go to market



Selections for GTM (Independent projects- Apps)

The Beta projects are now open for the investments and go to market.

The Business team shall come up with the business plans for the product basis the Beta test results and consumer adoption for the product. They will also embed a Go to market strategy for the product.

A Go-To-Market strategy usually involves answering below key questions:

- What are you selling?
- Who are you selling it to?
- How will you reach your target market?
- Where will you promote your product?

Basis a strong GTM strategy and roadmap for the product, the team will start investing on the product.