### CODING

- Coding- The objective of the coding phase is to transform the design of a system into code in a high level language and then to unit test this code.
- The programmers adhere to standard and well defined style of coding which they call their coding standard.
- The main advantages of adhering to a standard style of coding are as follows:
  - A coding standard gives uniform appearances to the code written by different engineers
  - It facilitates code of understanding.
  - Promotes good programming practices. For implementing our design into a code, we require a good high level language.

## Challenges of Large Code Base

- How to ensure...
  - Maintainable code?
  - DRY code?
  - Readable code?
  - Bug-free code?
- Average defect detection rate for various testing
  - Unit testing: 25%
  - Function testing: 35%
  - Integration testing:45%

How can this be improved?

### **Code Reviews**

 code review: A constructive review of a fellow developer's code. A required sign-off from another team member before a developer is permitted to check in changes or new code.

- Analogy: writing articles for a newspaper
  What is the effectiveness of...
  - Spell-check/grammar check
  - Author editing own article
  - Others editing others' articles

#### Mechanics of code reviews

- **who**: Original developer and reviewer, sometimes together in person, sometimes offline.
- what: Reviewer gives suggestions for improvement on a logical and/or structural level, to conform to previously agreed upon set of quality standards.
  - Feedback leads to refactoring, followed by a 2nd code review.
  - Eventually reviewer approves code.
- when: When code author has finished a coherent system change that is otherwise ready for checkin
  - change shouldn't be too large or too small
  - before committing the code to the repository or incorporating it into the new build

# Why Bother?

- > 1 person has seen every piece of code
  - Prospect of someone reviewing your code raises quality threshold.
- Forces code authors to articulate their decisions
- Hands-on learning experience for rookies without hurting code quality
  - Pairing them up with experienced developers
- Team members involved in different parts of the system
  - Reduces redundancy, enhances overall understanding
- Author and reviewer both accountable for committing code

## Code reviews in industry

- Code reviews are a very common industry practice.
- Made easier by advanced tools that:
  - integrate with configuration management systems
  - highlight changes (i.e., diff function)
  - allow traversing back into history
  - E.g.: Eclipse, SVN tools

```
c alsplay.c 1.155
       unsigned char *data:
                                                                                            unsigned long num, rest:
                                                                                            unsigned char *data:
       meta_error_trap_push_with_return (display);
       if (XGetWindowProperty (display->xdisplay,
                                                                                            meta_error_trap_push (display):
                               event->xselectionrequest.requestor,
                                                                                            XGetWindowProperty (display->xdisplay,
                               event->xselectionrequest.property, 0, 256, Fa
                                                                                                                event->xselectionrequest.requestor,
                               display->atom_atom_pair,
                                                                                                                event->xselectionrequest.property, 0, 256, F
                               &type, &format, &num, &rest, &data) != Succes
                                                                                                                display->atom_atom_pair,
                                                                                                                &type, &format, &num, &rest, &data);
           meta_error_trap_pop_with_return (display, TRUE);
                                                                                            if (meta_error_trap_pop (display) == Success)
           return:
                                                                                                /* FIXME: to be 100% correct, should deal with rest > 0,
                                                                                                 * but since we have 4 possible targets, we will hardly ever
       if (meta_error_trap_pop_with_return (display, TRUE) == Success)
                                                                                                 * meet multiple requests with a length > 8
           /* FIXME: to be 100% correct, should deal with rest > 0.
                                                                                                adata = (Atom*)data:
           * but since we have 4 possible targets, we will hardly ever
                                                                                                i = 0:
           * meet multiple requests with a length > 8
                                                                                                while (i < (int) num)
           adata = (Atom*)data;
                                                                                                    if (!convert_property (display, screen,
           i = 0:
                                                                                                                           event->xselectionrequest.requestd
           while (i < (int) num)
                                                                                                                            adata[i], adata[i+1]))
                                                                                                      adata[i+1] = None:
               if (!convert_property (display, screen,
                                                                                                    i += 2:
                                      event->xselectionrequest.requestor,
                                                                                  1
```

#### Code review variations

- inspection: A more formalized code review with:
  - roles (moderator, author, reviewer, scribe, etc.)
  - several reviewers looking at the same piece of code
  - a specific checklist of kinds of flaws to look for
    - possibly focusing on flaws that have been seen previously
    - possibly focusing on high-risk areas such as security
  - specific expected outcomes (e.g. report, list of defects)
- walkthrough: informal discussion of code between author and a single reviewer
- code reading: Reviewers look at code by themselves (possibly with no actual meeting)