CODING STANDARDS AND SECURITY CONCERNS

- WHAT A CODING STANDARD IS AND ITS BENEFITS WHEN WRITING CODE.
- OUTLINE THE CODING STANDARD YOU HAVE USED IN YOUR CODE.

WHAT IS A CODING STANDARD? WHY USE THEM?

- A SET OF GUIDELINES, BEST PRACTICES, PROGRAMMING STYLES, AND CONVENTIONS THAT DEVELOPERS ADHERE TO WHEN WRITING SOURCE CODE FOR A PROJECT. ALL BIG SOFTWARE COMPANIES HAVE THEM. CODING STANDARDS ARE ALL ABOUT CREATING:
- ROBUST - ERROR-FREE AND EFFICIENT.
- READABLE - EASILY READ AND UNDERSTOOD.
- RECTIFIABLE - PROPERLY DOCUMENTED
- REUSABLE CAPABLE OF BEING USED AGAIN.

ALSO KNOWN AS CODING CONVENTIONS OR SYNTAX CONVENTIONS

CODING STANDARDS ARE NOT ENFORCED BY THE COMPILER

THE CODING STANDARD.

- CODING STANDARDS: THE WELL-DEFINED AND STANDARD STYLE OF CODING. USUALLY, ORGANIZATIONS WANTS TO WANT THEIR PROGRAMMERS TO MAINTAIN SOME CODING STANDARDS.
- SOME BENEFITS :
  - A coding standard gives a uniform appearance to the codes written by different engineers.
  - It improves readability, and maintainability of the code and it reduces complexity also.
  - It helps in code reuse and helps to detect error easily.
  - It promotes sound programming practices and increases efficiency of the programmers

CONT..

- SO IT IS SIMPLY A SET OF RULES AND GUIDELINES FOR THE FORMATTING OF SOURCE CODE. THIS INCLUDES:
- NAMING CONVENTIONS
- FILE NAMING AND ORGANIZATION
- FORMATTING AND INDENTATION
- COMMENTS AND DOCUMENTATION
- CLASSES, FUNCTIONS AND INTERFACES
- POINTER AND REFERENCE USAGE
- TESTING

An example would be the use of two different styles of CamelCase:

- UpperCamelCase
- lowerCamel Case

This standard could be different between teams needing to be refactored.

REFACTORING

- THE METHOD OF CHANGING SOURCE CODE TO MEET A TEAMS CODING STANDARD
- USED TO IMPROVE READABILITY OR IMPROVE ITS STRUCTURE.
- ANY CHANGE THAT DOES NOT ALTER THE BEHAVIOUR OF THE SOFTWARE CAN BE CONSIDERED REFACTORING.

  COMMON REFACTORING INVOLVES:
  - CHANGING VARIABLE NAMES, METHODS NAMES,
  - MOVING METHODS OR CLASSES
  - SPLITTING LARGE METHODS INTO SMALLER ONES.

BENEFITS OF CODING STANDARDS

- THESE INCLUDE:
  - READABILITY, MAINTAINABILITY AND COMPATIBILITY
- ANY MEMBER OF THE ORGANIZATION WILL UNDERSTAND THE CODING STANDARD.
- THEREFORE CODERS CAN INTERCHANGE WITHOUT TO MUCH TROUBLE UNDERSTANDING OTHERS CODE.
- IMPROVES:
  - TEAM CODER INTEGRATION
  - MAINTENANCE
  - EASIER PROBLEM SOLVING
  - MINIMISES THE NEED FOR EXCESSIVE COMMUNICATION
  - LOWERS MAN HOURS FOR THE ORGANISATION

SOME EXAMPLES OF CODING STANDARDS:

- LIMITED USE OF GLOBALS VARIABLES
- STANDARD HEADERS FOR DIFFERENT MODULES
- NAMING CONVENTIONS FOR VARIABLES, FUNCTIONS
- INDENTATION

I THINK THERE IS A BUG IN MY CODE…

```
FUNC GREENEGGSNHAM(NOT SAMIAM, GREEN EGGSNHAM)
  FOREACH GREEN TRYTHEM IN SAMIAM
      DO EATTHEM(TRYTHEM) = FALSE
  NOTINACARNOTONABUS(EGGSNHAM)
FUNC NOTINACARNOTONABUS(GREEN EGGSNHAM)
  EATTHEM(EGGSNHAM) = TRUE
  NOTONAPLANE(EGGSNHAM)
  FOREACH NOTLIKETHEM SAMIAM OF EGGSNHAM DO
      IF NOT EATTHEM(SAMIAM) THEN
            NOTINACARNOTONABUS(SAMIAM)
  IDONOTLIKETHEM(EGGSNHAM)
```

AFTER APPLYING A CODING STANDARD…

```
FUNC DEPTHFIRSTSEARCH(GRAPH G, VERTEX V)
   FOREACH VERTEX W IN G
      DO ENCOUNTERED(W) = FALSE
   RECURSIVEDFS(V)

FUNC RECURSIVEDFS(VERTEX V)
   ENCOUNTERED(V) = TRUE
   PREVISIT(V)
   FOREACH NEIGHBOUR W OF V DO
      IF NOT ENCOUNTERED(W) THEN
         RECURSIVEDFS(W)
   POSTVISIT(V)
```

CODING STANDARDS

- CODING STANDARDS ARE GUIDELINES FOR CODE STYLE AND DOCUMENTATION.
- THEY MAY BE FORMAL (IEEE) STANDARDS, OR COMPANY SPECIFIC STANDARDS.
- THE AIM IS THAT EVERYONE IN THE ORGANIZATION WILL BE ABLE TO READ AND WORK ON THE CODE.
- CODING STANDARDS COVER A WIDE VARIETY OF AREAS:
  - PROGRAM DESIGN
  - NAMING CONVENTIONS
  - FORMATTING CONVENTIONS
  - DOCUMENTATION
  - USE (OR NOT) OF LANGUAGE SPECIFIC FEATURES

CODING STANDARDS

- WHY BOTHER WITH A CODING STANDARD?
  - CONSISTENCY BETWEEN DEVELOPERS
  - EASE OF MAINTENANCE AND DEVELOPMENT
  - READABILITY, USABILITY
- EXAMPLE SHOULD MAKE THIS OBVIOUS!
- NO STANDARD IS PERFECT FOR EVERY APPLICATION.
  - IF YOU DEVIATE FROM THE STANDARD FOR ANY REASON, DOCUMENT IT!

CODING STYLE

- THERE ARE SEVERAL EXAMPLES OF CODING STYLES. OFTEN THEY DIFFER FROM COMPANY TO COMPLANY.
- THEY TYPICALLY HAVE THE FOLLOWING IN COMMON:
  - NAMES
    - USE FULL ENGLISH DESCRIPTORS
    - USE MIXED CASE TO MAKE NAMES READABLE
    - USE ABBREVIATIONS SPARINGLY AND CONSISTENTLY
    - AVOID LONG NAMES
    - AVID LEADING/TRAILING UNDERSCORES
  - DOCUMENTATION
    - DOCUMENT THE PURPOSE OF EVERY VARIABLE
    - DOCUMENT WHY SOMETHING IS DONE, NOT JUST WHAT

CODING STYLE

- ACCESSORS
  - USE GETX(), SETX() FUNCTIONS ON ALL CLASS VARIABLES.
- MEMBER FUNCTION DOCUMENTATION
  - WHAT & WHY MEMBER FUNCTION DOES WHAT IT DOES
  - PARAMETERS/RETURN VALUE
  - HOW FUNCTION MODIFIES OBJECT
  - PRECONDITIONS/POSTCONDITIONS
  - CONCURRENCY ISSUES
  - RESTRICTIONS
- DOCUMENT WHY THE CODE DOES THINGS AS WELL AS WHAT IT DOES.

RULES

- CODING STANDARDS NEED NOT BE ONEROUS – FIND OUT WHAT WORKS FOR YOUR ORGANIZATION/TEAM AND STICK TO IT.
- STANDARDIZE EARLY – THE COST OF RETROFITTING A STANDARD IS PROHIBITIVE.
- ENCOURAGE A CULTURE WHERE A STANDARD IS FOLLOWED.
- ***INDUSTRY STANDARDS > ORGANIZATIONAL STANDARDS > PROJECT STANDARDS > NO STANDARDS***
- THE MORE COMMONLY ACCEPTED THE STANDARD IS, THE EASIER IT IS FOR THE TEAM MEMBERS TO COMMUNICATE.
- INVENT STANDARDS WHERE NECESSARY, BUT DO NOT WASTE TIME CREATING A STANDARD YOU WON'T EVER USE AGAIN!
- ALL LANGUAGES HAVE RECOMMENDED CODING STANDARDS AVAILABLE. IT IS WORTHWHILE FINDING OUT ABOUT THESE INDUSTRY STANDARDS.
- PUSH FOR ORGANIZATIONAL STANDARDS WHEREVER POSSIBLE.

STANDARDS

- STANDARDS RARE DOCUMENTED AGREEMENTS CONTAINING TECHNICAL SPECIFICATIONS OR OTHER PRECISE CRITERIA TO BE USED CONSISTENTLY AS GUIDELINES, RULES, OR DEFINITIONS OF CHARACTERISTICS, TO ENSURE THAT MATERIALS, PRODUCTS, PROCESSES AND SERVICES ARE FOR FOR THEIR PURPOSE.
- INTERNATIONAL STANDARDS ARE SUPPOSED TO CONTRIBUTE TO MAKING LIFE SIMPLER, AND TO INCREASING RELIABILITY AND EFFECTIVENESS OF THE GOODS AND SERVICES WE USE.
- STANDARDS REPRESENT BEST, OR MOST APPROPRIATE, PRACTICE:
  - THEY ENCAPSULATE HISTORICAL KNOWLEDGE OFTEN GAINED THROUGH TRAIL AND ERROR.
  - THEY PRESERVE AND CODIFY ORGANIZATIONAL KNOWLEDGE AND MEMORY
  - THEY PROVIDE A FRAMEWORK FOR QUALITY ASSURANCE.
  - ENSURE CONTINUITY OVER A PROJECT'S LIFECYCLE.

STANDARDS

- THERE ARE MANY INDUSTRY STANDARDS GOVERNING ALL ASPECTS OF SOFTWARE DEVELOPMENT:
  - TERMINOLOGY
  - NOTATION
  - REQUIREMENTS GATHERING
  - DESIGN
  - CODING
  - DOCUMENTATION
  - HUMAN COMPUTER INTERACTION
  - VERIFICATION AND VALIDATION
  - QUALITY ASSURANCE
  - EVEN ETHICS!
- MANY JOBS WILL REQUIRE YOU TO FOLLOW APPROPRIATE STANDARDS.
- SOFTWARE THAT FOLLOWS PUBLISHED STANDARDS IS MORE LIKELY EO BE MAINTAINABLE AND MARKETABLE.
- THERE ARE MANY GOOD IDEAS IN THE STANDARDS AND YOU CAN LEARN FROM THEM. EVEN THE BAD IDEAS ARE GOOD TO KNOW SINCE YOU HAVE TO DEAL WITH THEM ;-)

PROFESSIONALISM

- PART OF BEING A PROFESSIONAL SOFTWARE DEVELOPER IS KNOWING ABOUT, AND USING, THE APPROPRIATE STANDARDS.
    - THIS MEANS HAVING THE ABILITY TO READ, COMPREHEND AND FOLLOW SPECIFICATIONS.
- YOU DO NOT DEVELOP SOFTWARE SYSTEMS IN A VACUUM. OTHER PEOPLE WILL:
    - READ YOUR CODE (AND YOU WILL WORK WITH THEIRS).
    - MAINTAIN YOUR CODE (AND YOU WILL MOST LIKELY MAINTAIN SOMEONE'S CODE).

WHO WRITES STANDARDS?

- STANDARDS ARE COMPLEX DOCUMENTS ENCAPSULATION A LARGE BODY OF COLLECTIVE WISDOM.
- THEY ARE DIFFICULT AND TIME CONSUMING TO WRITE.
- THERE ARE NATIONAL AND INTERNATIONAL STANDARDS BODIES TO CREATE AND ADMINISTER STANDARDS.

ISO	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
SAA	STANDARDS AUSTRALIA
BSI	BRITISH STANDARDS INSTITUTE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
IEEE	INSTITUTE FOR ELECTRONIC AND ELECTRICAL ENGINEERS

- AND ABOUT 80 OR SO OTHERS!

ISO

- ISO WAS ESTABLISHED IN GENEVA IN 1947. IT IS THE HEAD ORGANIZATION FOR ALL OF THESE NATIONAL STANDARDIZATION ORGANIZATIONS.
- ISO'S WORK RESULTS IN INTERNATIONAL AGREEMENTS WHICH ARE PUBLISHED AS INTERNATIONAL STANDARDS.
  - NOT ALWAYS AS SUCCESSFUL AS YOU WOULD LIKE. LOOK AT THE DIFFERENCES GLOBALLY IN TELEVISION ENCODING (NTSC/PAL) AND MOBILE PHONE COMMUNICATIONS (GSM/CDMA)
  - THERE ARE ALSO SOME SUCCESSES – METRIC SYSTEM OF UNITS (WELL ALMOST EVERYWHERE!), INTERNATIONAL STATIONERY SIZES, PROGRAMMING LANGUAGES, COMPUTER PROTOCOLS, FILE FORMATS, INTERNATIONAL STANDARD BOOK NUMBERS (ISBN).
- OVER 10,000 ISO STANDARDS HAVE BEEN PUBLISHED SO FAR.
- WITHIN ISO, ISO/IEC JOINT TECHNICAL COMMITTEE 1 (JTC1) DEALS WITH INFORMATION TECHNOLOGY. (IEC = INTERNATIONAL ELECTROTECHNICAL COMMISSION)

ISO STANDARDS RELEVANT TO COMPUTING

- ISO 646 – 7-BIT ASCII WITH NATIONAL VARIANTS
- ISO 8859 – SEVERAL 8-BIT ASCII EXTENSIONS:
  - ISO 8859-1: WEST EUROPEAN LANGUAGES (LATIN-1)
  - ISO 8859-2: EAST EUROPEAN LANGUAGES (LATIN-2)
  - ISO 8859-5: LATIN/CYRILLIC
- ISO 6429 – ASCII CONTROL CODES
- ISO 2382 – INFORMATION TECHNOLOGY VOCABULARY
- ISO 8652 – THE ADA PROGRAMMING LANGUAGE
- ISO 9899 – THE C PROGRAMMING LANGUAGE
- ISO 9660 – CD-ROM VOLUME AND FIE STRUCTURE
- ISO 3166 – CODES FOR THE REPRESENTATION OF NAMES OF COUNTIES:
  - DEFINES A 2-LETTER, 3-LETTER AND NUMERIC CODE FOR EVERY COUNTRY.
  - US/USA/840 = UNITED STATES
  - GB/GBR/826 = UNITED KINGDOM
    - THE 2-LETTER CODES ARE WELL KNOWN AS THE INTERNET TOP-LEVEL DOMAIN NAMES.