

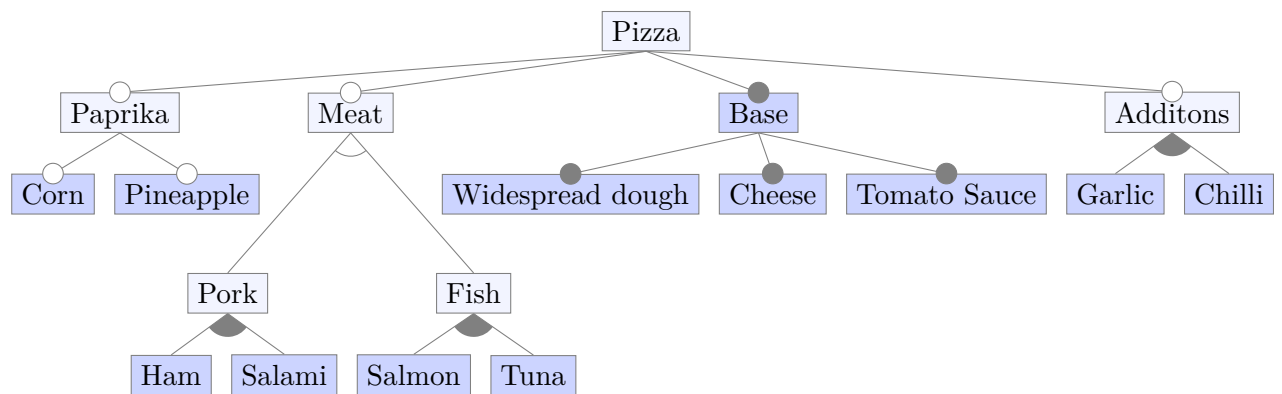
# Software Engineering

## Assignment 1

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### Task 1



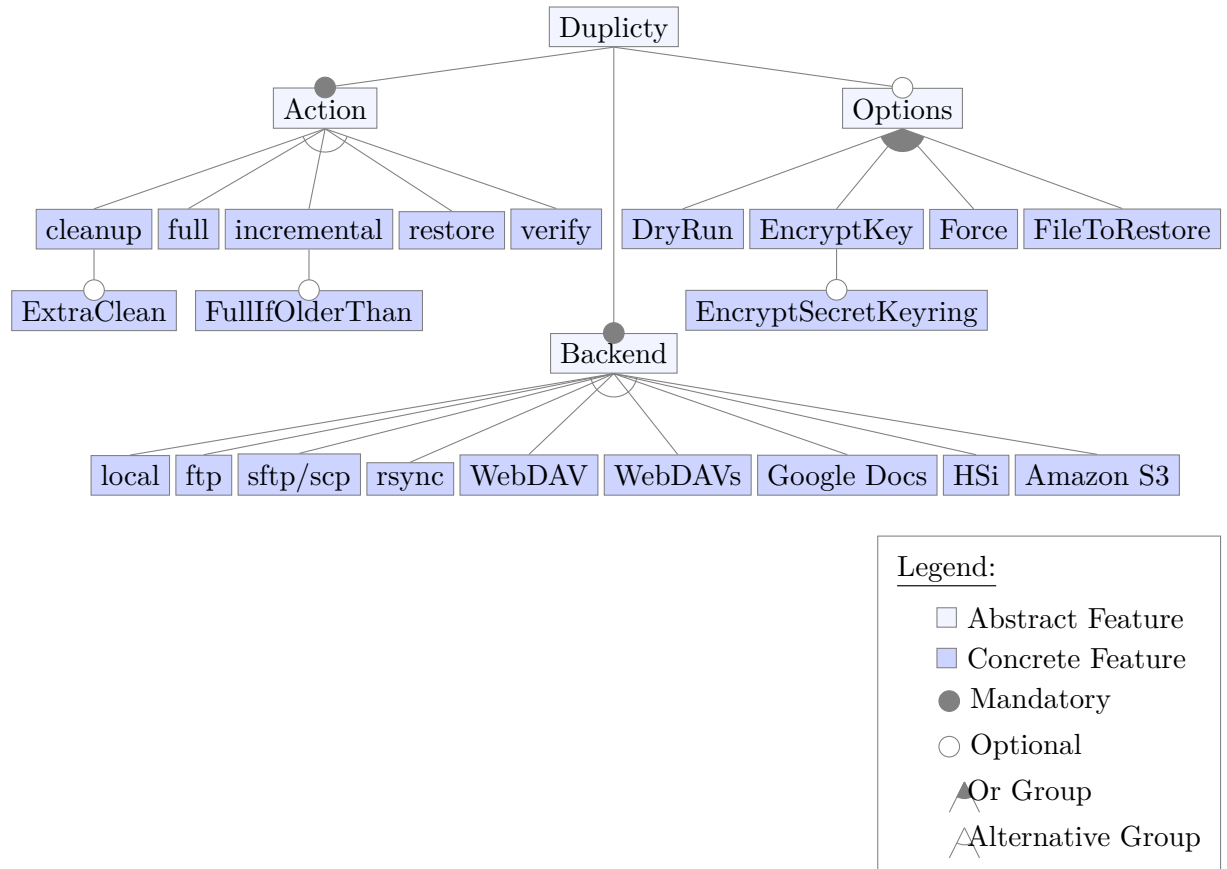
#### Legend:

- Abstract Feature
- Concrete Feature
- Mandatory
- Optional
- Or Group
- Alternative Group

### Cross-Tree Constraints

$$Pineapple \implies \neg(Fish \vee Salami)$$

## Task 2



## Cross-Tree Constraints

$$EncryptKey \implies incremental \vee full$$

$$FileToRestore \implies restore \vee verify$$

### Task 3

a)

$F = \{Grep,$   
     $ProgramInfo, Help, VersionInfo,$   
     $MatcherSelection, extRegex, string, basicRegex, perlRegex,$   
     $MatchingControl, ignoreCase, invertMatch, wordRegex, lineRegex,$   
     $OutputControl, count, filesWithoutMatch, filesWithMatch, onlyMatching, quiet, noMsg,$   
     $FileDirSelection, recursive\}$

$\llbracket fn \rrbracket = Grep$   
     $\wedge (Grep \Leftarrow ProgramInfo)$   
         $\wedge (ProgramInfo \Leftrightarrow (Help \vee VersionInfo))$   
         $\wedge \neg(Help \wedge VersionInfo)$   
     $\wedge (Grep \Leftarrow MatcherSelection)$   
         $\wedge (MatcherSelection \Leftrightarrow (extRegex \vee string \vee basicRegex \vee perlRegex))$   
         $\wedge \neg(extRegex \wedge string \wedge basicRegex \wedge perlRegex)$   
     $\wedge (Grep \Leftarrow MatchingControl)$   
         $\wedge (MatchingControl \Leftrightarrow (ignoreCase \vee invertMatch \vee wordRegex \vee lineRegex))$   
     $\wedge (Grep \Leftarrow OutputControl)$   
         $\wedge (OutputControl \Leftrightarrow$   
             $(count \vee filesWithoutMatch \vee filesWithMatch \vee onlyMatching \vee quiet \vee noMsg))$   
     $\wedge (Grep \Leftarrow FileDirSelection)$   
         $\wedge (FileDirSelection \Leftarrow recursive)$

b)

**Generalization:** Remove the following clause (i.e. replace it with **true**):

$$\neg(Help \wedge VersionInfo)$$

**Specialization:** Add the following clause:

$$\neg(filesWithoutMatch \wedge filesWithMatch \wedge onlyMatching)$$

**Refactoring:** Add the following clause:

$$Grep \Leftarrow recursive$$

## Task 4

a)

$$\begin{aligned}
 fn = & \star \langle \langle \wedge \langle \langle ShoeGenerator, \\
 & \bullet \langle \langle ShoeGenerator, Logo \rangle \rangle, \\
 & \bullet \langle \langle ShoeGenerator, \Delta \langle \langle Color, Blue, Red, White, Black \rangle \rangle \rangle \rangle, \\
 & \circ \langle \langle ShoeGenerator, FastToTieShoelaces \rangle \rangle, \\
 & \bullet \langle \langle ShoeGenerator, \Delta \langle \langle Material, Recycled, Leather, \\
 & \quad \wedge \langle \langle Canvas, \circ \langle \langle Canvas, BigLogo \rangle \rangle \rangle \rangle \rangle, \\
 & \quad \rangle \rangle \rangle, \\
 & \circ \langle \langle ShoeGenerator, Platform \rangle \rangle, \\
 & \bullet \langle \langle ShoeGenerator, \Delta \langle \langle Width, Standard, \\
 & \quad \wedge \langle \langle Wide, \circ \langle \langle Wide, ExtraWide \rangle \rangle \rangle \rangle \rangle \rangle \\
 & \quad \rangle \rangle \rangle \\
 & \rangle \rangle
 \end{aligned}$$

b)

$$\begin{aligned}
 v_1 = & \{ (ShoeGenerator, 1), (Logo, 1), (Color, 1), (Blue, 0), (Red, 0), (White, 1), (Black, 0), \\
 & (FastToTieShoelaces, 1), (Material, 1), (Recycled, 0), (Leather, 0), (Canvas, 1), \\
 & (BigLogo, 1), (Platform, 1), (Width, 1), (Standard, 0), (Wide, 1), (ExtraWide, 1) \} \\
 v_2 = & \{ (ShoeGenerator, 1), (Logo, 1), (Color, 1), (Blue, 1), (Red, 0), (White, 0), (Black, 0), \\
 & (FastToTieShoelaces, 0), (Material, 1), (Recycled, 0), (Leather, 0), (Canvas, 1), \\
 & (BigLogo, 0), (Platform, 0), (Width, 1), (Standard, 0), (Wide, 1), (ExtraWide, 1) \} \\
 v_3 = & \{ (ShoeGenerator, 1), (Logo, 1), (Color, 1), (Blue, 0), (Red, 0), (White, 0), (Black, 1), \\
 & (FastToTieShoelaces, 0), (Material, 1), (Recycled, 0), (Leather, 1), (Canvas, 0), \\
 & (BigLogo, 0), (Platform, 0), (Width, 1), (Standard, 1), (Wide, 0), (ExtraWide, 0) \} \\
 v_4 = & \{ (ShoeGenerator, 1), (Logo, 1), (Color, 1), (Blue, 0), (Red, 1), (White, 0), (Black, 0), \\
 & (FastToTieShoelaces, 1), (Material, 1), (Recycled, 1), (Leather, 0), (Canvas, 0), \\
 & (BigLogo, 0), (Platform, 1), (Width, 1), (Standard, 1), (Wide, 0), (ExtraWide, 0) \}
 \end{aligned}$$

c)

$$\begin{aligned}\eta_1 &= \text{ShoeGenerator} \\ &\quad \wedge \text{Logo} \\ &\quad \wedge \text{Color} \wedge \text{Blue} \wedge \text{Red} \wedge \text{White} \wedge \text{Black} \\ &\quad \wedge \neg \text{FastToTieShoelaces} \\ &\quad \wedge \text{Material} \wedge \text{Recycled} \wedge \neg \text{Leather} \wedge \neg \text{Canvas} \wedge \neg \text{BigLogo} \\ &\quad \wedge \text{Platform} \\ &\quad \wedge \text{Width} \wedge \text{Standard} \wedge \neg \text{Wide} \wedge \neg \text{ExtraWide} \\ \eta_2 &= \text{ShoeGenerator} \\ &\quad \wedge \text{Logo} \\ &\quad \wedge \text{Color} \wedge \text{Blue} \wedge \neg \text{Red} \wedge \neg \text{White} \wedge \neg \text{Black} \\ &\quad \wedge \text{FastToTieShoelaces} \\ &\quad \wedge \text{Material} \wedge \neg \text{Recycled} \wedge \neg \text{Leather} \wedge \neg \text{Canvas} \wedge \neg \text{BigLogo} \\ &\quad \wedge \text{Platform} \\ &\quad \wedge \text{Width} \wedge \text{Standard} \wedge \text{Wide} \wedge \text{ExtraWide} \\ \eta_3 &= \text{ShoeGenerator} \\ &\quad \wedge \text{Logo} \\ &\quad \wedge \text{Color} \wedge \text{Blue} \wedge \neg \text{Red} \wedge \neg \text{White} \wedge \neg \text{Black} \\ &\quad \wedge \neg \text{FastToTieShoelaces} \\ &\quad \wedge \text{Material} \wedge \text{Recycled} \wedge \neg \text{Leather} \wedge \neg \text{Canvas} \wedge \text{BigLogo} \\ &\quad \wedge \neg \text{Platform} \\ &\quad \wedge \text{Width} \wedge \text{Standard} \wedge \neg \text{Wide} \wedge \text{ExtraWide} \\ \eta_4 &= \text{ShoeGenerator} \\ &\quad \wedge \neg \text{Logo} \\ &\quad \wedge \text{Color} \wedge \text{Blue} \wedge \neg \text{Red} \wedge \neg \text{White} \wedge \neg \text{Black} \\ &\quad \wedge \neg \text{FastToTieShoelaces} \\ &\quad \wedge \text{Material} \wedge \text{Recycled} \wedge \neg \text{Leather} \wedge \neg \text{Canvas} \wedge \neg \text{BigLogo} \\ &\quad \wedge \neg \text{Platform} \\ &\quad \wedge \text{Width} \wedge \text{Standard} \wedge \neg \text{Wide} \wedge \neg \text{ExtraWide}\end{aligned}$$