ECMAScript 4th Edition Grammar

ID	SURFACE SYNTAX

TEXT STRUCTURE

Line terminator normalization

1 The character sequence CRLF, and the single characters CR, LS, and PS, are all converted to a single LF character, in all source contexts, before tokenization takes place.

Cf stripping (Compatibility Note)

2 Format Control characters (category Cf in the Unicode database) will no longer be stripped from the source text of a program [see Ecma-262 section 7.1]

Byte order mark (BOM) handling

3 The character sequences for BOM shall be replaced with a single white space character before tokenization takes place.

Unicode escapes

4 The escape sequence of the form **\u{n..n}** will be replace by the unicode character whose code point is the value of the hexidecimal number between **{** and **}**

LEXICAL STRUCTURE

ReservedIdentifier [one of]

1 **break case cast catch class const continue debugger default delete do dynamic else false final finally for function if in instanceof interface is let like namespace native new null override return static super switch this throw true try type typeof use var void while with yield __proto__**

ContextuallyReservedIdentifier [one of]

2 **each extends generator get implements set standard strict undefined**

Punctuator [one of]

3 **. .< … ! != !== % %= & &= && &&= * *= + += ++ - -= -- / /= < <= << <<= = == === > >= >== >> >>= >>> >>>= ^ ^= | |= || ||= : :: ( ) [ ] { } ~ , ; ?**

VirtualSemicolon

4 [If the first through the *n*th tokens of an ECMAScript program form are grammatically valid but the first through the n+1st tokens are not and there is a line break between the nth tokens and the n+1st tokens, then the parser tries to parse the program again after inserting a VirtualSemicolon token between the nth and the n+1st tokens]

Identifier

5 [see Ecma-262 section 7.6]

StringLiteral

6 [see Ecma-262 section 7.8.4]

7 [see Line continuations spec: http://wiki.ecmascript.org/doku.php?id=features_specs:line_continuation_in_strings]

DoubleLiteral

8 [see Ecma-262 section 7.8.3]

DecimalLiteral

9 [Literals that denote decimal objects can be expressed as numeric literals (see E262 sec 7.8.3) with a suffix “m”: 10m; 12.48m; 1.5e-7m. When these literals are evaluated they yield new instances of decimal objects]

RegExpInitialiser

[see Ecma-262 section 7.8.5]

[see Extend RegExp: http://developer.mozilla.org/es4/proposals/extend_regexps.html]

[see Line continuations spec: http://wiki.ecmascript.org/doku.php?id=features_specs:line_continuation_in_strings]

PROGRAM STRUCTURE

EXPRESSIONS

α = { allowColon, noColon }

β = { allowIn, noIn }

Identifier

1 3 **Identifier**

2 3 **ContextuallyReservedIdentifier**

PropertyIdentifier

3 3 Identifier

4 4 **ReservedIdentifier**

NameExpression

5 3 Identifier

6 4 NamespaceExpression **::** PropertyIdentifier

NamespaceExpression

7 4 NameExpression

8 4 ***StringLiteral***

ParenExpression

9 3 **(** CommaExpression$^{allowColon, allowIn}$ **)**

FunctionExpression$^{\alpha, \beta}$

10 3 **function** PropertyIdentifier FunctionSignature FunctionExpressionBody$^{\alpha, \beta}$

11 3 **function** FunctionSignature FunctionExpressionBody$^{\alpha, \beta}$

FunctionExpressionBody$^{\alpha, \beta}$

12 3 { Directives^{local} }

13 4 CommaExpression$^{\alpha, \beta}$

ObjectInitialiser^{noColon}

14 3 InitialiserAttribute **{** FieldList **}**

ObjectInitialiser^{allowColon}

15 3 InitialiserAttribute **{** FieldList **}**

16 4 InitialiserAttribute **{** FieldList **}** **:** TypeExpression

FieldList

17 3 «empty»

18 3 Field

19 3 Field **,** FieldList

Field

20 3 InitialiserAttribute FieldName **:** AssignmentExpression$^{allowColon, allowIn}$

21 4 InitialiserAttribute **get** FieldName GetterSignature FunctionExpressionBody$^{allowColon, allowIn}$
22 4 InitialiserAttribute **set** FieldName SetterSignature FunctionExpressionBody$^{allowColon, allowIn}$
23 3 **__proto__** **:** AssignmentExpression$^{allowColon, allowIn}$

InitialiserAttribute
24 3 «empty»
25 4 **const**
26 4 **var**

FieldName
27 3 NameExpression
28 3 **StringLiteral**
29 3 **NumberLiteral**
30 4 [lookahead !{**__proto__**}] **ReservedIdentifier**

ArrayInitialiser^{noColon}
31 3 InitialiserAttribute **[** ArrayElements **]**

ArrayInitialiser^{allowColon}
32 3 InitialiserAttribute **[** ArrayElements **]**
33 4 InitialiserAttribute **[** ArrayElements **]** **:** TypeExpression

ArrayElements
34 3 ArrayElementList
35 4 ArrayComprehension

ArrayElementList
36 3 «empty»
37 3 AssignmentExpression$^{allowColon, allowIn}$
38 3 SpreadExpression
39 3 **,** ArrayElementList
40 3 AssignmentExpression$^{allowColon, allowIn}$ **,** ArrayElementList

SpreadExpression
41 4 **...** AssignmentExpression$^{allowColon, allowIn}$

ArrayComprehension
42 4 AssignmentExpression$^{allowColon, allowIn}$ ComprehensionExpression

ComprehensionExpression
43 4 **for** **(** TypedPattern^{noIn} **in** CommaExpression$^{allowColon, allowIn}$ **)** ComprehensionClause
44 4 **for each** **(** TypedPattern^{noIn} **in** CommaExpression$^{allowColon, allowIn}$ **)** ComprehensionClause
45 4 **let** **(** LetBindingList **)** ComprehensionClause
46 4 **if** ParenExpression ComprehensionClause

ComprehensionClause
47 4 «empty»
48 4 ComprehensionExpression

PrimaryExpression$^{\alpha, \beta}$
49 3 **null**
50 3 **true**
51 3 **false**

52 3 **DoubleLiteral**
53 4 **DecimalLiteral**
54 3 **StringLiteral**
55 3 **RegExpInitialiser**
56 3 ArrayInitialiser$^{\alpha}$
57 3 ObjectInitialiser$^{\alpha}$
58 3 FunctionExpression$^{\alpha, \beta}$
59 3 ThisExpression
60 4 LetExpression$^{\alpha, \beta}$
61 3 ParenExpression
62 3 NameExpression

ThisExpression
63 3 **this**
64 4 **this** [no line break] **function**
65 4 **this** [no line break] **generator**

LetExpression$^{\alpha, \beta}$
66 4 **let** **(** LetBindingList **)** CommaExpression$^{\alpha, \beta}$

LetBindingList
67 4 «empty»
68 4 VariableBindingList$^{\text{allowIn}}$

Arguments
69 3 **( )**
70 3 **(** SpreadExpression **)**
71 3 **(** ArgumentList **)**
72 3 **(** ArgumentList **,** SpreadExpression **)**

ArgumentList
73 3 AssignmentExpression$^{\text{allowColon, allowIn}}$
74 3 ArgumentList **,** AssignmentExpression$^{\text{allowColon, allowIn}}$

PropertyOperator
75 4 **.** **ReservedIdentifier**
76 3 **.** NameExpression
77 3 Brackets
78 4 TypeApplication

Brackets
79 3 **[** CommaExpression$^{\text{noColon, allowIn}}$ **]**
80 4 **[** SliceExpression **]**

SliceExpression
81 4 OptionalExpression$^{\text{noColon}}$ **:** OptionalExpression$^{\text{noColon}}$
82 4 OptionalExpression$^{\text{noColon}}$ **:** OptionalExpression$^{\text{noColon}}$ **:** OptionalExpression$^{\text{allowColon}}$
83 4 **::** OptionalExpression$^{\text{allowColon}}$
84 4 OptionalExpression$^{\text{noColon}}$ **::**

OptionalExpression$^{\alpha}$
85 4 «empty»
86 4 CommaExpression$^{\alpha, \text{allowIn}}$

TypeApplication
87 4 **.<** TypeExpressionList **>**

MemberExpression$^{\alpha,\beta}$
88 3 PrimaryExpression$^{\alpha,\beta}$
89 3 **new** MemberExpression$^{\alpha,\beta}$ Arguments
90 4 SuperExpression PropertyOperator
91 3 MemberExpression$^{\alpha,\beta}$ PropertyOperator

SuperExpression
92 4 **super**
93 4 **super** ParenExpression

CallExpression$^{\alpha,\beta}$
94 3 MemberExpression$^{\alpha,\beta}$ Arguments
95 3 CallExpression$^{\alpha,\beta}$ Arguments
96 3 CallExpression$^{\alpha,\beta}$ PropertyOperator

NewExpression$^{\alpha,\beta}$
97 3 MemberExpression$^{\alpha,\beta}$
98 3 **new** NewExpression$^{\alpha,\beta}$

LeftHandSideExpression$^{\alpha,\beta}$
99 3 NewExpression$^{\alpha,\beta}$
100 3 CallExpression$^{\alpha,\beta}$

PostfixExpression$^{\alpha,\beta}$
101 3 LeftHandSideExpression$^{\alpha,\beta}$
102 3 LeftHandSideExpression$^{\alpha,\beta}$ [no line break] **++**
103 3 LeftHandSideExpression$^{\alpha,\beta}$ [no line break] **--**

UnaryExpression$^{\alpha,\beta}$
104 3 PostfixExpression$^{\alpha,\beta}$
105 3 **delete** PostfixExpression$^{\alpha,\beta}$
106 3 **void** UnaryExpression$^{\alpha,\beta}$
107 3 **typeof** UnaryExpression$^{\alpha,\beta}$
108 3 **++** PostfixExpression$^{\alpha,\beta}$
109 3 **--** PostfixExpression$^{\alpha,\beta}$
110 3 **+** UnaryExpression$^{\alpha,\beta}$
111 3 **-** UnaryExpression$^{\alpha,\beta}$
112 3 **~** UnaryExpression$^{\alpha,\beta}$
113 3 **!** UnaryExpression$^{\alpha,\beta}$

MultiplicativeExpression$^{\alpha,\beta}$
114 3 UnaryExpression$^{\alpha,\beta}$
115 3 MultiplicativeExpression$^{\alpha,\beta}$ ***** UnaryExpression$^{\alpha,\beta}$
116 3 MultiplicativeExpression$^{\alpha,\beta}$ **/** UnaryExpression$^{\alpha,\beta}$
117 3 MultiplicativeExpression$^{\alpha,\beta}$ **%** UnaryExpression$^{\alpha,\beta}$

AdditiveExpression$^{\alpha,\beta}$
118 3 MultiplicativeExpression$^{\alpha,\beta}$
119 3 AdditiveExpression$^{\alpha,\beta}$ **+** MultiplicativeExpression$^{\alpha,\beta}$

120 3 AdditiveExpression$^{\alpha,\beta}$ **-** MultiplicativeExpression$^{\alpha,\beta}$

ShiftExpression$^{\alpha,\beta}$
121 3 AdditiveExpression$^{\alpha,\beta}$
122 3 ShiftExpression$^{\alpha,\beta}$ **<<** AdditiveExpression$^{\alpha,\beta}$
123 3 ShiftExpression$^{\alpha,\beta}$ **>>** AdditiveExpression$^{\alpha,\beta}$
124 3 ShiftExpression$^{\alpha,\beta}$ **>>>** AdditiveExpression$^{\alpha,\beta}$

RelationalExpression$^{\alpha,\beta}$
125 3 ShiftExpression$^{\alpha,\beta}$
126 3 RelationalExpression$^{\alpha,\beta}$ **<** ShiftExpression$^{\alpha,\beta}$
127 3 RelationalExpression$^{\alpha,\beta}$ **>** ShiftExpression$^{\alpha,\beta}$
128 3 RelationalExpression$^{\alpha,\beta}$ **<=** ShiftExpression$^{\alpha,\beta}$
129 3 RelationalExpression$^{\alpha,\beta}$ **>=** ShiftExpression$^{\alpha,\beta}$
130 3 RelationalExpression$^{\alpha,\beta}$ [β == allowIn] **in** ShiftExpression$^{\alpha,\beta}$
131 3 RelationalExpression$^{\alpha,\beta}$ **instanceof** ShiftExpression$^{\alpha,\beta}$
132 4 RelationalExpression$^{\alpha,\beta}$ **cast** TypeExpression
133 4 RelationalExpression$^{\alpha,\beta}$ **is** TypeExpression
134 4 RelationalExpression$^{\alpha,\beta}$ **like** TypeExpression

EqualityExpression$^{\alpha,\beta}$
135 3 RelationalExpression$^{\alpha,\beta}$
136 3 EqualityExpression$^{\alpha,\beta}$ **==** RelationalExpression$^{\alpha,\beta}$
137 3 EqualityExpression$^{\alpha,\beta}$ **!=** RelationalExpression$^{\alpha,\beta}$
138 3 EqualityExpression$^{\alpha,\beta}$ **===** RelationalExpression$^{\alpha,\beta}$
139 3 EqualityExpression$^{\alpha,\beta}$ **!==** RelationalExpression$^{\alpha,\beta}$

BitwiseAndExpression$^{\alpha,\beta}$
140 3 EqualityExpression$^{\alpha,\beta}$
141 3 BitwiseAndExpression$^{\alpha,\beta}$ & EqualityExpression$^{\alpha,\beta}$

BitwiseXorExpression$^{\alpha,\beta}$
142 3 BitwiseAndExpression$^{\alpha,\beta}$
143 3 BitwiseXorExpression$^{\alpha,\beta}$ **^** BitwiseAndExpression$^{\alpha,\beta}$

BitwiseOrExpression$^{\alpha,\beta}$
144 3 BitwiseXorExpression$^{\alpha,\beta}$
145 3 BitwiseOrExpression$^{\alpha,\beta}$ **|** BitwiseXorExpression$^{\alpha,\beta}$

LogicalAndExpression$^{\alpha,\beta}$
146 3 BitwiseOrExpression$^{\alpha,\beta}$
147 3 LogicalAndExpression$^{\alpha,\beta}$ **&&** BitwiseOrExpression$^{\alpha,\beta}$

LogicalOrExpression$^{\alpha,\beta}$
148 3 LogicalAndExpression$^{\alpha,\beta}$
149 3 LogicalOrExpression$^{\alpha,\beta}$ **||** LogicalAndExpression$^{\alpha,\beta}$

ConditionalExpression$^{\alpha,\beta}$
150 4 UnaryTypeExpression
151 4 YieldExpression$^{\alpha,\beta}$
152 3 LogicalOrExpression$^{\alpha,\beta}$
153 3 LogicalOrExpression$^{\alpha,\beta}$ **?** AssignmentExpression$^{noColon,\beta}$
154 **:** AssignmentExpression$^{\alpha,\beta}$

NonAssignmentExpression$^{\alpha, \beta}$

155 4 UnaryTypeExpression

156 4 YieldExpression$^{\alpha, \beta}$

157 3 LogicalOrExpression$^{\alpha, \beta}$

158 3 LogicalOrExpression$^{\alpha, \beta}$ **?** NonAssignmentExpression$^{noColon, \beta}$

159 3 **:** NonAssignmentExpression$^{\alpha, \beta}$

UnaryTypeExpression

160 4 **type** TypeExpression

YieldExpression$^{\alpha, \beta}$

161 4 **yield**

162 4 **yield** [no line break] AssignmentExpression$^{\alpha, \beta}$

AssignmentExpression$^{\alpha, \beta}$

163 3 ConditionalExpression$^{\alpha, \beta}$

164 3 Pattern$^{\alpha, \beta, allowExpr}$ **=** AssignmentExpression$^{\alpha, \beta}$

165 3 SimplePattern$^{\alpha, \beta, allowExpr}$ CompoundAssignmentOperator AssignmentExpression$^{\alpha, \beta}$

CompoundAssignmentOperator

166 3 ***=**

167 3 **/=**

168 3 **%=**

169 3 **+=**

170 3 **-=**

171 3 **<<=**

172 3 **>>=**

173 3 **>>>=**

174 3 **&=**

175 3 **^=**

176 3 **|=**

177 3 **&&=**

178 3 **||=**

CommaExpression$^{\alpha, \beta}$

179 3 AssignmentExpression$^{\alpha, \beta}$

180 3 CommaExpression$^{\alpha, \beta}$ **,** AssignmentExpression$^{\alpha, \beta}$

PATTERNS

γ = { allowExpr, noExpr }

Pattern$^{\alpha, \beta, \gamma}$

181 3 SimplePattern$^{\alpha, \beta, \gamma}$

182 4 ObjectPattern$^{\alpha, \beta, \gamma}$

183 4 ArrayPattern$^{\gamma}$

SimplePattern$^{\alpha, \beta, noExpr}$

184 3 Identifier

SimplePattern$^{\alpha, \beta, allowExpr}$

185 3 LeftHandSideExpression$^{\alpha, \beta}$

ObjectPattern$^{\gamma}$

186 4 **{** FieldListPattern$^{\gamma}$ **}**

FieldListPattern$^{\gamma}$

187 4 «empty»

188 4 FieldPattern$^{\gamma}$

189 4 FieldListPattern$^{\gamma}$ **,**

190 4 FieldListPattern$^{\gamma}$ **,** FieldPattern$^{\gamma}$

FieldPattern$^{\gamma}$

191 4 FieldName

192 4 FieldName **:** Pattern$^{allowColon,\ allowIn,\ \gamma}$

ArrayPattern$^{\gamma}$

193 4 **[** ElementListPattern$^{\gamma}$ **]**

ElementListPattern$^{\gamma}$

194 4 «empty»

195 4 ElementPattern$^{\gamma}$

196 4 **...** SimplePattern$^{allowColon,\ allowIn,\ \gamma}$

197 4 **,** ElementListPattern$^{\gamma}$

198 4 ElementPattern$^{\gamma}$ **,** ElementListPattern$^{\gamma}$

ElementPattern$^{\gamma}$

199 4 Pattern$^{allowColon,\ allowIn,\ \gamma}$

TypedIdentifier

200 3 Identifier

201 4 Identifier **:** TypeExpression

TypedPattern$^{\beta}$

202 3 Pattern$^{noColon,\ \beta,\ noExpr}$

203 4 Pattern$^{noColon,\ \beta,\ noExpr}$ **:** TypeExpression

LikenedPattern$^{\beta}$

204 4 Pattern$^{noColon,\ \beta,\ noExpr}$ **like** TypeExpression

TYPE EXPRESSIONS

TypeExpression

205 4 BasicTypeExpression

206 4 **?** BasicTypeExpression

207 4 **!** BasicTypeExpression

BasicTypeExpression

208 4 *****

209 4 **null**

210 4 **undefined**

211 4 TypeName

212 4 FunctionType

213 4 UnionType

214 4 RecordType

215 4 ArrayType

TypeName
216 4 NameExpression
217 4 NameExpression TypeApplication

FunctionType
218 4 **function** FunctionSignatureType

FunctionSignatureType
219 4 TypeParameters **( )** ResultType
220 4 TypeParameters **(** ParametersType **)** ResultType
221 4 TypeParameters **(this :** TypeName **)** ResultType
222 4 TypeParameters **(this :** TypeName **,** ParametersType **)** ResultType

ParametersType
223 4 RestParameterType
224 4 NonRestParametersType
225 4 NonRestParametersType **,** RestParameterType

NonRestParametersType
226 4 ParameterType **,** NonRestParametersType
227 4 ParameterType
228 4 OptionalParametersType

OptionalParametersType
229 4 OptionalParameterType
230 4 OptionalParameterType **,** OptionalParametersType

OptionalParameterType
231 4 ParameterType **=**

ParameterType
232 4 TypeExpression
233 4 Identifier **:** TypeExpression

RestParameterType
234 4 **...**
235 4 **...** Identifier

UnionType
236 4 **(** TypeUnionList **)**

TypeUnionList
237 4 «empty»
238 4 NonemptyTypeUnionList

NonemptyTypeUnionList
239 4 TypeExpression
240 4 TypeExpression **|** NonemptyTypeUnionList

RecordType
241 4 **{** FieldTypeList **}**

FieldTypeList

242 4 «empty»

243 4 FieldType

244 4 FieldType , FieldTypeList

FieldType

245 4 FieldName

246 4 FieldName : TypeExpression

ArrayType

247 4 [ElementTypeList]

ElementTypeList

248 4 «empty»

249 4 TypeExpression

250 4 ... TypeExpression

251 4 , ElementTypeList

252 4 TypeExpression , ElementTypeList

TypeExpressionList

253 4 TypeExpression

254 4 TypeExpressionList , TypeExpression

STATEMENTS

τ = { constructor, class, global, interface, local, statement }

ω = { abbrev, noShortIf, full }

Statement$^{\tau, \omega}$

255 3 BlockStatement

256 3 BreakStatement Semicolon$^{\omega}$

257 3 ContinueStatement Semicolon$^{\omega}$

258 3 DoWhileStatement Semicolon$^{\omega}$

259 3 ExpressionStatement Semicolon$^{\omega}$

260 3 ForStatement$^{\omega}$

261 3 IfStatement$^{\omega}$

262 3 LabeledStatement$^{\omega}$

263 4 LetBlockStatement

264 3 ReturnStatement Semicolon$^{\omega}$

265 3 SwitchStatement

266 4 SwitchTypeStatement

267 3 ThrowStatement Semicolon$^{\omega}$

268 3 TryStatement

269 3 WhileStatement$^{\omega}$

270 3 WithStatement$^{\omega}$

Substatement$^{\omega}$

271 3 EmptyStatement

272 3 Statement$^{\text{local}, \omega}$

273 3 VariableDefinition$^{\text{noIn, statement}}$

Semicolon$^{\text{abbrev}}$

274 3 **;**
275 3 **VirtualSemicolon**
276 3 «empty»

Semicolon[noShortIf]
277 3 **;**
278 3 **VirtualSemicolon**
279 3 «empty»

Semicolon[full]
280 3 **;**
281 3 **VirtualSemicolon**

EmptyStatement
282 3 **;**

ExpressionStatement
283 3 [lookahead ∉{ **{**, **const**, **function**, **let**, **var** }] CommaExpression[allowColon, allowIn]

BlockStatement
284 3 **{** Directives[local] **}**

LabeledStatement[ω]
285 3 Identifier **:** Substatement[ω]

LetBlockStatement
286 4 **let (** LetBindingList **) {** Directives[local] **}**

IfStatement[abbrev]
287 3 **if** ParenExpression Substatement[abbrev]
288 3 **if** ParenExpression Substatement[noShortIf] **else** Substatement[abbrev]

IfStatement[full]
289 3 **if** ParenExpression Substatement[full]
290 3 **if** ParenExpression Substatement[noShortIf] **else** Substatement[full]

IfStatement[noShortIf]
291 3 **if** ParenExpression Substatement[noShortIf] **else** Substatement[noShortIf]

WithStatement[ω]
292 3 **with** ParenExpression Substatement[ω]

SwitchStatement
293 3 **switch** ParenExpression **{** CaseElements **}**

3 CaseElements
294 3 CaseClauses[full] DefaultClause[full] CaseClauses[abbrev]
295 3 CaseClauses[full] DefaultClause[abbrev]
296 3 CaseClauses[abbrev]

3 CaseClauses[ω]
297 3 «empty»
298 3 CaseClauses[full] CaseClause[ω]

3 CaseClause$^{\omega}$

299 3 **case** CommaExpression$^{\text{allowColon, allowIn}}$ **:** Directives$^{\text{local, }\omega}$

3 DefaultClause$^{\omega}$

300 3 **default :** Directives$^{\text{local, }\omega}$

SwitchTypeStatement

301 4 **switch type** ParenExpression **{** TypeCaseElements **}**

TypeCaseElements

302 4 TypeCaseElement

303 4 TypeCaseElements TypeCaseElement

TypeCaseElement

304 4 **case (** TypedPattern$^{\text{allowColon, allowIn}}$ **) {** Directives$^{\text{local}}$ **}**

DoWhileStatement

305 3 **do** Substatement$^{\text{abbrev}}$ **while** ParenExpression

WhileStatement$^{\omega}$

306 3 **while** ParenExpression Substatement$^{\omega}$

ForStatement$^{\omega}$

307 3 **for (** ForInitialiser **;** OptionalExpression$^{\text{allowColon}}$ **;** OptionalExpression$^{\text{allowColon}}$ **)** Substatement$^{\omega}$

308 3 **for (** ForInBinding **in** CommaExpression$^{\text{allowColon, allowIn}}$ **)** Substatement$^{\omega}$

309 4 **for each (** ForInBinding **in** CommaExpression$^{\text{allowColon, allowIn}}$ **)** Substatement$^{\omega}$

ForInitialiser

310 3 «empty»

311 3 CommaExpression$^{\text{allowColon, noIn}}$

312 3 VariableDefinition$^{\text{noIn, }\tau}$

ForInBinding

313 3 Pattern$^{\text{allowColon, noIn, allowExpr}}$

314 3 VariableDefinitionKind$^{\text{local}}$ VariableBinding$^{\text{noIn}}$

ContinueStatement

315 3 **continue**

316 3 **continue** [no line break] Identifier

BreakStatement

317 3 **break**

318 3 **break** [no line break] Identifier

ReturnStatement

319 3 **return**

320 3 **return** [no line break] CommaExpression$^{\text{allowColon, allowIn}}$

ThrowStatement

321 3 **throw** CommaExpression$^{\text{allowColon, allowIn}}$

TryStatement

322 3 **try** **{** Directives[local] **}** CatchClauses
323 3 **try** **{** Directives[local] **}** CatchClauses **finally** **{** Directives[local] **}**
324 3 **try** **{** Directives[local] **}** **finally** **{** Directives[local] **}**

CatchClauses
325 3 CatchClause
326 3 CatchClauses CatchClause

CatchClause
327 3 **catch** **(** Parameter **)** **{** Directives[local] **}**

SuperStatement
328 4 **super** **(** Arguments **)**

DIRECTIVES

Directives[τ]
329 3 «empty»
330 3 DirectivesPrefix[τ] Directive[τ, abbrev]

DirectivesPrefix[τ]
331 3 «empty»
332 3 DirectivesPrefix[τ] Directive[τ, full]

Directive[class, ω]
333 4 Pragma[class]
334 4 **static** [no line break] **{** Directives[local] **}**
335 4 AnnotatableDirective[class, ω]

Directive[interface, ω]
336 4 Pragma[interface]
337 4 AnnotatableDirective[interface, ω]

Directive[constructor, ω]
338 4 Pragma[local]
339 4 EmptyStatement
340 4 SuperStatement Semicolon[ω]
341 4 Statement[local, ω]
342 4 AnnotatableDirective[local, ω]

Directive[τ, ω]
343 4 Pragma[τ]
344 3 EmptyStatement
345 3 Statement[τ, ω]
346 3 AnnotatableDirective[τ, ω]

AnnotatableDirective[global, ω]
347 4 Attribute [no line break] AnnotatableDirective[global, ω]
348 3 VariableDefinition[allowIn, global] Semicolon[ω]
349 3 FunctionDefinition[global, ω]
350 4 NamespaceDefinition Semicolon[ω]
351 4 ClassDeclaration Semicolon[ω]
352 4 ClassDefinition

353 4 InterfaceDeclaration Semicolon$^{\omega}$
354 4 InterfaceDefinition
355 4 TypeDeclaration Semicolon$^{\omega}$
356 4 TypeDefinition Semicolon$^{\omega}$

AnnotatableDirective$^{class,\ \omega}$
357 4 Attribute [no line break] AnnotatableDirective$^{class,\ \omega}$
358 3 VariableDefinition$^{allowIn,\ class}$ Semicolon$^{\omega}$
359 3 FunctionDefinition$^{class,\ \omega}$
360 4 NamespaceDefinition Semicolon$^{\omega}$
361 4 TypeDefinition Semicolon$^{\omega}$

AnnotatableDirective$^{interface,\ \omega}$
362 4 Attribute [no line break] AnnotatableDirective$^{interface,\ \omega}$
363 4 FunctionDeclaration Semicolon$^{\omega}$

AnnotatableDirective$^{local,\ \omega}$
364 3 VariableDefinition$^{allowIn,\ local}$ Semicolon$^{\omega}$
365 3 FunctionDefinition$^{local,\ \omega}$

Attribute
366 4 NamespaceExpression
367 **dynamic**
368 4 **final**
369 4 **override**
370 4 **__proto__**
371 4 **static**

DEFINITIONS

VariableDefinition$^{\beta,\ \tau}$
372 3 VariableDefinitionKind$^{\tau}$ VariableBindingList$^{\beta}$

VariableDefinitionKind^{statement}
373 3 **var**

VariableDefinitionKind$^{\tau}$
374 4 **const**
375 4 **let**
376 3 **var**

VariableBindingList$^{\beta}$
377 3 VariableBinding$^{\beta}$
378 3 VariableBindingList$^{\beta}$ **,** VariableBinding$^{\beta}$

VariableBinding$^{\beta}$
379 3 TypedIdentifier
380 3 TypedPattern$^{\beta}$ VariableInitialisation$^{\beta}$

VariableInitialisation$^{\beta}$
381 3 **=** AssignmentExpression$^{allowColon,\ \beta}$

FunctionDeclaration

382 4 **function** PropertyIdentifier FunctionSignatureType
383 4 **function get** PropertyIdentifier GetterSignature
384 4 **function set** PropertyIdentifier SetterSignature

FunctionDefinition$^{class,\ \omega}$
385 4 **function** Identifier [Identifier == outer classname] ConstructorSignature **{** Directives^{constructor} **}**
386 4 **function** PropertyIdentifier FunctionSignature FunctionBody$^{allowIn,\ \omega}$
387 4 **function get** PropertyIdentifier GetterSignature FunctionBody$^{allowIn,\ \omega}$
388 4 **function set** PropertyIdentifier SetterSignature FunctionBody$^{allowIn,\ \omega}$
389 4 **native** FunctionDeclaration

FunctionDefinition$^{local,\ \omega}$
390 4 **const function** PropertyIdentifier FunctionSignature FunctionBody$^{allowIn,\ \omega}$
391 4 **function** PropertyIdentifier FunctionSignature FunctionBody$^{allowIn,\ \omega}$

FunctionDefinition$^{\tau,\ \omega}$
392 4 **const function** PropertyIdentifier FunctionSignature FunctionBody$^{allowIn,\ \omega}$
393 4 **function** PropertyIdentifier FunctionSignature FunctionBody$^{allowIn,\ \omega}$
394 4 **function get** PropertyIdentifier GetterSignature FunctionBody$^{allowIn,\ \omega}$
395 4 **function set** PropertyIdentifier SetterSignature FunctionBody$^{allowIn,\ \omega}$
396 4 **native** FunctionDeclaration

FunctionSignature
397 3 TypeParameters **( )** ResultTypeOrLike
398 3 TypeParameters **(** Parameters **)** ResultTypeOrLike
399 4 TypeParameters **(this :** TypeName **)** ResultTypeOrLike
400 4 TypeParameters **(this :** TypeName **,** Parameters **)** ResultTypeOrLike

GetterSignature
401 4 **( )** ResultTypeOrLike

SetterSignature
402 4 **(** Parameter **)** ResultTypeVoid

FunctionBody$^{\alpha,\ \beta,\ \omega}$
403 3 **{** Directives^{local} **}**
404 4 CommaExpression$^{\alpha,\ \beta}$ Semicolon$^{\omega}$

TypeParameters
405 3 «empty»
406 4 **.<** TypeParameterList **>**

TypeParameterList
407 4 Identifier
408 4 Identifier **,** TypeParameterList

Parameters
409 4 RestParameter
410 3 NonRestParameters
411 4 NonRestParameters **,** RestParameter

NonRestParameters
412 3 Parameter **,** NonRestParameters

413 3 Parameter
414 3 OptionalParameters

OptionalParameters
415 4 OptionalParameter
416 4 OptionalParameter , OptionalParameters

OptionalParameter
417 4 Parameter **=** NonAssignmentExpression^{allowIn}

Parameter
418 3 ParameterAttribute TypedPattern^{allowIn}
419 3 ParameterAttribute LikenedPattern^{allowIn}

ParameterAttribute
420 3 «empty»
421 4 **const**

RestParameter
422 4 **...**
423 4 **...** Identifier

ResultTypeOrLike
424 4 ResultType
425 4 **like** TypeExpression

ResultType
426 4 «empty»
427 4 **: void**
428 4 **:** TypeExpression

ResultTypeVoid
429 4 «empty»
430 4 **: void**

ConstructorSignature
431 4 **(** Parameters **)**
432 4 **(** Parameters **) :** ConstructorInitialiser

ConstructorInitialiser
433 4 SettingList
434 4 SettingList **,** SuperInitialiser
435 4 SuperInitialiser

SettingList
436 4 Setting
437 4 SettingList **,** Setting

Setting
438 4 Pattern$^{allowIn,\ allowExpr}$ VariableInitialisation^{allowIn}

SuperInitialiser
439 4 **super** Arguments

ClassDeclaration
440 **class** Identifier TypeSignature

ClassDefinition
441 4 **class** Identifier TypeSignature ClassInheritance ClassBody

TypeSignature
442 4 TypeParameters
443 4 TypeParameters **!**

ClassInheritance
444 4 «empty»
445 4 **extends** TypeName
446 4 **implements** TypeNameList
447 4 **extends** TypeName **implements** TypeNameList

TypeNameList
448 4 TypeName
449 4 TypeNameList , TypeName

ClassBody
450 4 **{** Directives[class] **}**

InterfaceDeclaration
451 4 **interface** Identifier TypeSignature

InterfaceDefinition
452 4 **interface** Identifier TypeSignature InterfaceInheritance InterfaceBody

InterfaceInheritance
453 4 «empty»
454 4 **extends** TypeNameList

InterfaceBody
455 4 **{** Directives[interface] **}**

TypeDeclaration
456 4 **type** Identifier TypeSignature

TypeDefinition
457 4 **type** Identifier TypeSignature TypeInitialisation

TypeInitialisation
458 4 **=** TypeExpression

NamespaceDefinition
459 4 **namespace** Identifier NamespaceInitialisation

NamespaceInitialisation
460 4 «empty»
461 4 **=** NamespaceExpression

PRAGMAS

Pragma$^{\tau}$

462 4 UsePragma$^{\tau}$ Semicolon^{full}

UsePragma$^{\tau}$

463 4 **use** PragmaItems$^{\tau}$

PragmaItems$^{\tau}$

464 4 PragmaItem$^{\tau}$

465 4 PragmaItems$^{\tau}$ **,** PragmaItem$^{\tau}$

PragmaItem^{local}

466 4 **namespace** NamespaceExpression

467 4 **standard**

468 4 **strict**

PragmaItem^{global}

469 4 **default namespace** NamespaceExpression

470 4 **namespace** NamespaceExpression

471 4 **standard**

472 4 **strict**

PragmaItem$^{\tau}$

473 4 **default namespace** NamespaceExpression

474 4 **namespace** NamespaceExpression

475 4 **strict**

PROGRAMS

Program

476 3 Directives^{global}

Revision History:

07-May-2008: Add alpha to OptionalExpression (79-82, 83-84, 307); Replace inadvertently erased definition of LetBindingList; Replace ParenExpression with LetBindingList in ComprehensionExpression (45); Proper handling of >>= and >== after .< (85-87, 125-134); Remove hack to handle >> and >>> in .< expressions (86, 87); Move lookahead restriction on __proto__ from NameExpression to ReservedIdentifier in FieldName (27, 30); Change allowColon to allowIn in TypedPattern and LikenedPattern (202-205); Add explicit syntax for native functions to FunctionDefinition (386-389, 392-395); Remove TypeParameter from GetterSignature and SetterSignature (400, 401); Change FunctionSignature to GetterSignature and SetterSignature in FunctionDefinition (388, 389, 394, 395); Insert comma in ConstructorInitialiser (433); Restrict use of 'use standard' to global code (470)

05-May-2008: Remove paren expression qualifier from PrimaryName (7); Rename NamespaceName to NamespaceExpression (6, 8, 9, 366, 370, 376, 466, 471, 474, 475); Remove Brackets (); Rename BracketsOrSlice to Brackets (); Rename PrimaryName to NameExpression (); Replace TypeName with TypeExpression in initialiser annotations (17, 35); Remove structual type annotation on array and object initialisers (18, 36); Add InitialiserAttribute to getter and setter syntax in object initialisers (24, 25); Inline ArrayElement (40, 43, 46); Replace use of NonemptyLetBindingList with VariableBindingList (72); Erase definition of NonemptyLetBindingList (73, 74); Refactor FunctionTypeSignature and FunctionSignature to allow rest after this parameter (230-233, 400-402, 411-415); Replace occurances of Block with { Directives } (292, 294, 312, 330, 331, 332, 335, 455, 460); Remove definition of Block (478); Erase errant ':' (404); Remove unused ResultTypeBoolean (434-435); Add SuperStatement and Directive for constructor contexts; Allow Pragma wherever Directive is allowed (339, 341-346); Consolidate Attribute non-terminals (347, 357, 362, 366-376)

29-Apr-2008: Define NamespaceName; Use NamespaceName from 'use namespace', 'use default namespace', NamespaceInitialisation, qualifier expressions and Attribute (6, 359, 363, 369, 456, 462, 465, 466); Define ClassDeclaration, InterfaceDeclaration and TypeDeclaration and allow them in global code (343-349); Moved 'const', 'dynamic', 'final', 'interface', 'let', 'namespace', 'native', 'override', 'prototoype', 'static', 'use', and 'yield' from ContextuallyReservedIdentifier to ReservedIdentifier (lexical 1, 2); Rename TypeReference to TypeName and TypeReferenceList to TypeNameList (223, 224, 445, 446); Replace all uses of TypeReference, TypeReferenceList, and PrimaryName that are type names with TypeName (16, 34, 218, 227, 228, 394, 395, 442-446, 450); Rename 'prototype' to '__proto__' in Attribute (367); Move '__proto__' from ContextuallyReservedIdentifier to ReservedIdentifier (lexical: 1, 2); Remove [look ahead...] conditions in Attribute (359, 363); Add LetBlockStatement to Statement (261-275)

26-Apr-2008: Remove ambiguous production '. ParenExpression :: QualifiedNameIdentifer' in PropertyOperator (82); Remove stale use of PackageDefinition in AnnotatableDirective (349); Remove ParameterType without trailing '=' from OptionalParameterType (237); Refactored Parameters and ParametersType to allow a rest parameter as the only parameter (340, 407); Remove namespace and type definitions from local blocks (359, 360); Add Directive for class and interface blocks; Add DecimalLiteral to PrimaryExpression (55); Add lookahead condition to disambiguate PrimaryName from explicit identifiers in Attributes (361, 365); Replace FunctionName with Identifier in FunctionDeclaration (384); Add productions for getters and setters in FunctionDeclaration (384); Remove 'import' from ContextuallyReservedIdentifiers (2, lexical); Remove restriction disallowing 'let' in classes (374, 375); Allow ReservedIdentifiers as function identifiers (11, 384-394); Disallow 'use default namespace' in local blocks (336, 459-466); Remove the use of StringLiteral and NumberLiteral in QualifiedNameIdentifier and rename to PropertyIdentifier (5, 6); Move ! in TypeSignature from prefix to postfix position (441)

19-Apr-2008: Remove Qualifier non-terminal (3, 4); Remove PrimaryName that begins with Qualifier (4); Remove definition of ReservedNamespace (5-8); Replace uses of NamspaceAttribute with PrimaryName (378, 382, 388,); Remove definition of NamespaceAttribute (389-396); Add [no line break] to ReturnStatement (342); Move definition of gamma parameters to Patterns section; Add 'meta', 'reflect', 'intrinsic', 'iterator' and __proto__ to ContextuallyReservedIdentifiers (3, 4: lexical); Remove duplicate productions in RelationalExpression by adding an inline condition for beta == allowIn (150-158, 145); Allow Pragma anywhere in DirectivesPrefix (353); Remove definition of Pragmas (484, 485); Remove lingering use of ImportPragma in Pragma (487)

18-Apr-2008: Remove TypeParameter from ConstructorSignature (452, 453); Remove Brackets in QualifiedNameIdentifier (13); Change argument to Block in BlockStatement to 'local' (304); Removed lingering uses of 'external' from NamespaceAttributes (388, 394); Remove lingering E4X punctuators **</** and **/>** from (6, lexical); Change let and function expression forms to use CommaExpression instead of AssignmentExpression (22, 76, 423); Add productions for handling **>>** and **>>>** in TypeApplication (101); Add productions for handling **::** in SliceExpression (98); Disallow 'let' in class bodies (398)

17-Apr-2008: Rename ElementComprehension to ArrayComprehension; Allow empty body of 'let' clause in ArrayComprehension; Add 'standard' as a pragma; Fix obligatory ',' bug in ArrayType; Allow only SimplePattern in RestParameter; Remove PackageDefinition; Remove ImportPragma; Remove 'external' from ReservedIdentifier and ReservedNamespace; Add 'Identifier : TypeExpression' to ParameterType; Replace TypeExpression with Identifier in RestParameterType; Removed 'meta::' productions from ObjectInitialiser; Remove ContextuallyReservedIdentifiers 'package', and 'xml'; (Re)-add ContextuallyReservedIdentifier 'standard'; Replace uses of QualifiedName with PrimaryName; Remove QualifiedName;

10-Apr-2008: Removed reserved E4X syntax; Rename and update object and array initialisers to match latest proposals; Rename SplatExpression to SpreadExpression; Add signatures for getters and setters; Add void and boolean result types; Move 'internal', 'private', 'protected', 'public' from ReservedIdentifier to ContextuallyReservedIdentifier; Rename various "Literal" non-terminal to "Initialiser" with corresponding changes to their constituents; Change argument to CommaExpression in BracketOrSlice from allowColon to noColon; Allow FieldType with ': TypeExpression' elided; Remove getters and setters from local blocks; Change signature of FunctionDeclaration to FunctionSignatureType; Include nested let, if and for-in expressions in ElementComprehension; Allow 'const' attribute on parameters; Require optional parameters to follow obigatory ones; Replace SimplePattern in TypedIdentifier with Identifier; Refactor CaseElements; Add 'const' and 'var' to the lookahead set of ExpressionStatement

09-Apr-2008: Remove description of triple quoted strings; Rename LikedPattern to LikenedPattern; Allow trailing comma in RecordType and ObjectPattern; Add [no line break] to ThisExpression; Add reference to "line continuations" spec in lexical section; Limit syntax of annotations on object and array literals; Replace PrimaryName... in TypeExpression with TypeReference; Refactor class Block to only allow a static block statements; Added description of source text handling; Allow VariableDefinition in Substatement

03-Apr-2008: Remove reserved identifiers 'wrap' and 'has'; Replace use of PropertyName with PrimaryName in PropertyOperator; Remove definition of PropertyName; Remove 'enum' from ReservedIdentifiers; Move 'extends' from ReservedIdentifiers to ContextuallyReservedIdentifiers; Add FieldKind to getters and setter in LiteralField; Remove omega from VariableDefinition in AnnotatableDirective (Global...); Add Semicolon the other occurances of VariableDefinition in AnnotatableDirective; Add Semicolon to occurances of TypeDefinition and NamespaceDefinition in AnnotatableDirectives; Remove TypeDefinition from InterfaceDefinition; Fix various arguments in RelationalExpression; Fix argument in AnnotatableDirective (class); Add Semicolon to FunctionDeclaration production in AnnotatableDirective (interface); Add interface argument to NamespaceAttribute in Attribute (interface); Add NamespaceAttribute (interface); Replace 'intrinsic' with 'external' in NamespaceAttribute rules; Remove Attribute (local); Remove definition and use of OverloadedOperator; Rename InitialiserList to SettingList and Initialiser to Setting; Make TypeReferenceList left recursive; Rename PackageAttributes to PackageAttribute

30-Mar-2008: Rename ListExpression to CommaExpression; Make CommaExpression a binary expression in the AST; Change ParenExpression to ParenListExpression in SuperExpression; Rename ParenListExpression to ParenExpression; Remove Path qualified PropertyNames; Mark reserved/deferred features with 'x'; Remove 'wrap'; Remove 'like' as a type; Add 'like' as a binary type operator; Remove LetStatement; Remove UnitDefinition; Fold NullableTypeExpression into TypeExpression; Remove OverloadedOperator from QualifiedNameIdentifier; Add distinguishing syntax for tuples and array types in ArrayType; Add SplatExpression to arguments and array literals; Add RestPattern to array patterns; Add to ReservedIdentifiers 'type'; Add to ContextuallyReservedIdentifiers 'external'; Removed from ContextuallyReservedIdentifiers 'decimal', 'double', 'generic', 'int', 'Number', 'precision', 'rounding', 'standard', 'to', 'uint', 'unit'; Add LikedPattern to Parameter; Add LikePredicate to ResultType; Remove ParameterKind and use in Parameter

20-Mar-2008: Use noColon parameter before : in ConditionalExpression and NonAssignmentExpression; Swapped [PropertyName, QualifiedName] => [QualifiedName, PropertyName]; Removed . AttributeName from PropertyOperator; Add AttributeName to PrimaryName; Rename Brackets to BracketsOrSlice; Add Brackets, without slice; Change Brackets in PropertyOperator to BracketsOrSlice; Add TypeUnionList etc to allow for | list separators and empty unions; Move LetExpression from ConditionalExpression to PrimaryExpression; Move the UnaryTypeExpression from PostfixExpression to ConditionalExpression and NonAssignmentExpression; Replace TypedExpression with ParenListExpression; Remove TypedExpression; Remove import aliasing; Add ReservedNamespace to PrimaryExpression; Add ".*" syntax to PropertyOperator for E4X compatibility; Remove "intrinsic" from ReservedNamesapce and ContextuallyReservedIdentifiers; Add TypeApplication syntax to BasicTypeExpression (got dropped by ealier refactoring); Refactored CaseElementsPrefix; Change PrimaryNameList to TypeReferenceList in InterfaceInheritance (typo)

04-Dec-2007: Add productins for AnnotattableDirective(class,...)

31-Oct-2007: Add 'wrap' to ReservedIdenifiers; Move 'is' and 'cast' from ContextuallyReservedIdentifiers to ReservedIdentifiers; Add version number for which each production applies

23-Oct-2007: Add 'wrap' operation to RelationalExpression; Add 'like' type expression; Rename root type expression from NullableType to TypeExpression

17-Oct-2007: Change 'this callee' to 'this function'; Remove 'callee' from ContextuallyReservedIdentifiers; Add TypeReference and TypeReferenceList; Replace use of PrimaryName and PrimaryNameList in ClassInheritance and InterfaceInheritance with TypeReference and TypeReferenceList; Remove [No newline] contraint in ReturnStatement; Add Semicolon after DoStatement; Minor reordering of productions in PrimaryExpression; Rename ObjectType to RecordType; Initial definition of mapping from concrete to abstract syntax

14-Oct-2007: Remove 'type' TypeExpression from UnaryExpr; Add UnaryTypeExpression; Change uses of TypeExpression to NullableTypeExpression for symmetry with TypeDefinitions; Restore use of 'undefined' in TypeExpression (although ambiguous, provides clarity); update 'use decimal' pragma; Rename DestructuringField* to Field*Pattern and DestructuringElement* to Element*Pattern; Change "Path . Identifier" in NamespaceAttribute to PrimaryName; Remove Identifier from NamespaceAttribute

04-Oct-2007: Replace Identifier with NonAttributeQualifiedIdentifier in FieldName; Add ReservedNamespace to Qualifier; Change arguments to Pattern in Initialiser to allowIn, allowExpr; Remove Semicolon after DoStatement; Add TypeApplication to PropertyIdentifier; Remove PropertyName; Rename NonAttributeIdentifier to PropertyName; Remove default from TypeCaseElement; Remove duplicate production for XMLElementContent

22-Aug-2007: Fix several cases of missing rule arguments; Move use of Semicolon out of VariableDefinition

21-Aug-2007: Remove '*' from QualifiedNameIdentifier; Rename use of AttributeIdentifier to AttributeName in PrimaryExpression; Add SwitchTypeStatement to Statement; Replace ClassName with Identifier TypeSignature in InterfaceDefinition and FunctionDefinition; Replace ParameterisedTypeName with Identifier TypeSignature in TypeDefinition; Fix various other typos found by E. Suen

20-Aug-2007: Remove LiteralField without value; Add FieldName without pattern to DestructuringField; Move null and undefined from NullableTypeExpression to TypeExpression; Erase ToSignature; Distinguish FunctionExpressionBody from FunctionBody; Move Semicolon into specific definition rules that use them; Add UnitDefinition; Fix use unit pragma; Factor out ClassSignature from ClassName (now just Identifier); Replace use of SimpleQualifiedName with PrimaryName in NamespaceInitialiser; Rename RecordType to ObjectType; Change String to StringLiteral; Number to NumberLiteral in QualifiedNameIdentifier; Remove ambiguous ReservedNamespace in Qualifier; Remove 'undefined' from TypeExpression; Add 'callee' and 'generator' to ContextuallyReservedIdentifiers

23-Jul-2007: Require Block body in LetStatement; Fixed missed renames of *Identifier to *Name; Allow trailing common in ObjectLiteral; Make 'debugger' a reserved identifier; Add 'this callee' and 'this generator' as a primary expressions; Simplified TypedPattern; Change prefix of type application from TypeExpression to ParenListExpression; Remove 'null' and 'undefined' from TypeExpression; Require semicolon after braceless function body; Various fixes to the beta argument; Add alpha parameter to indicate contexts which allow annotations on object and array literals; Fix missed replacement of PrimaryIdentifier with PrimaryName; Add Unit pragmas; Relax rules that packages must come before any other directive (make PackageDefinition a Directive)

29-May-2007: Add types 'null' and 'undefined' to TypeExpression; Rename Identifier to Name; add non-terminal QualifiedNameIdentifier to hold various kinds of identifiers; Add TypedExpression and use in head of WithStatement and SwitchTypeStatement; Change name of get and set fields to FieldName; Eliminate distinction between NullableTypeExpression and TypeExpression;

23-May-2007: Fix list comprehensions; Remove 'debugger' and 'include' from ContextuallyReservedIdentifier; Change body of yield, let and function expressions from ListExpression to AssignmentExpression; Remove use of the alpha parameter to distinguish allowList from noList uses of yield, let and function expressions; Add optional Qualifier to FieldName

10-Apr-2007: Fix several typos; Add to SimpleQualifiedIdentifier syntax for calling global intrinsic overloadable operators

06-Apr-2007: Replace errant references to TypeIdentifier with PropertyIdentifier; Move from ReservedIdentifiers to ContextuallyReservedIdentifiers: cast const implements import interface internal intrinsic is let package private protected public to use; Remove ReservedIdentifier: as; Add missing allowIn argument to uses of FunctionBody; Remove lexical non-terminal PackageIdentifiers

30-Mar-2007: Replace TypeIdentifier in PrimaryExpression with PrimaryIdentifier; Inline PropertyIdentifier production; Rename TypeIdentifier to PropertyIdentifier; Remove function names with embedded *

29-Mar-2007: Revert previous restriction that 'use default namespace' argument must be a particular reserved namespace; Add tau parameter to BlockStatement and Block to allow top-level blocks with hoisted definitions; Rename ParameterisedClassName to ParameterisedTypeName; Change Identifier in TypeDefinition to ParameterisedTypeName; Replace the lexeme PackageIdentifier with the nonterminal Path, which gets resolved to a PackageName or an object referece by the definer; Move the ListExpression form of function body into FunctionBody; Add PrimaryIdentifier production and move Path qualified references out of TypeIdentifier to PrimaryIdentifier; Change right side of PropertyOperator from QualifiedIdentifier to TypeIdentifier; Add 'has' to the ContextuallyReservedIdentifiers; Update FunctionName to include 'call' and 'has' functions; Remove 'invoke' from ContextuallyReservedIdentifiers

13-Mar-2007: Add SuperInitialiser to as optional final constituent of ConstructorInitialiser; Erase SuperStatement; Erase "const function" from the class context (all methods are const); Restrict use default namespace argument to public, internal and intrinsic; Remove 'in' from ContextuallyReservedIdentifiers; Define 'function to' so that no return type is allowed; Remove 'construct' from ContextuallyReservedIdentifiers; Add 'invoke' to ContextuallyReservedIdentifiers

02-Mar-2007: Erase gamma parameter from TypedPattern (always noExpr), Add syntax for array comprehension; Rename ElementList to Elements; Rename FieldList to Fields; Rename NonemptyFieldList to FieldList; Add "const function" definition syntax; Change PropertyIdentifier to * in function call definitions; Rename call to invoke in non-catchall definitions; Remove 'construct' function; Update PackageIdentifier; Remove '^^' and '^^=' punctuators; Fork FunctionSignatureType from FunctionSignature; Fix bug which allowed "this : T ," in FunctionSignature; Make 'null' and 'undefined' NullableTypeExpressions; Add 'undefined' to ContextuallyReservedIdentifiers

18-Jan-2007: Add syntactic parameter τ to distinguish between contexts that allow / exclude certain kinds of definitions; Add syntax for constructor definitions, including ConstructorInitialiser; Add syntax to FunctionSignature to constrain type of 'this'; Dinstinguish between nullable/nonnullable and orther type expression; Allow any TypeExpression in TypedPattern

08-Dec-2006: Add FieldKind to LiteralField; Change NonAttributeQualifiedIdentifier to PropertyIdentifier in FieldName; Remove [no line break] constraint from FunctionName; Add to FunctionName productions for 'construct' and for 'call' and 'to' without a name; Add 'construct' to ContextuallyReservedIdentifiers

06-Dec-2006: Add BlockStatement non-terminal, minor refactoring of the Program productions; Rename PackageDefinition as Package; Change NonAttributeQualifiedIdentifier to FieldName in DestructuringField; Change SwitchTypeStatement to take a ListExpression and TypeExpression in its head rather than a binding form; Merge LogicalAssignmnetOperator into CompoundAssignmentOperator; Rename Inheritance to ClassInheritance; Rename ExtendsList to InterfaceInheritance; Refactor InterfaceDefinition to have a more specific syntax;

29-Nov-2006: Update AST nodes for VariableDefinition; Update AST nodes for Pragmas; Change rhs of SimplePattern from PostfixExpression to LeftHandSideExpression; Tighten the syntax of definition attributes that are reference to namespaces; Add AST nodes for SwitchStatement and SwitchTypeStatement

21-Nov-2006: Make the 'cast' operator a peer of the infx 'to' operator; Propagate the α parameter to FunctionExpression; Unify TypedIdentifier and TypedPattern, and lhs postfix expressions and Pattern; Remove logical xor operator; Add 'precision' to PragmaIdentifier and ContextuallyReservedIdentifier; Add AST node types for expressions; Refactor slice syntax; Remove empty bracket syntax

14-Nov-2006: Move 'yield' from Reserved to contextually reserved; Add ReservedIdentifier after '::' in ExpressionQualifiedIdentifier; Refactor RestParameter; Remove abstract function declaration from FunctionCommon; Add accessors to ObjectLiteral; Move TypedIdentifier and TypedPattern to the Expressions section; Remove FieldName : ParenExpression; Remove ExpressionClosure; Add expression closure syntax to FunctionExpression; Propagate the β parameter down to FunctionExpression; Distinguish between RecordType and ArrayType in TypedPattern; Rename noLet and allowLet to noList and allowList, respectively; Add «empty» to DestructuringFieldList; Added links to 'triple quotes' and 'extend regexp' proposals

26-Sep-2006: Add ReservedIdentifier after '::'; Parameterise productions to restrict the context where LetExpression and YieldExpression can be used; Change the body of LetExpression and YieldExpression from AssignmentExpression to ListExpression

21-Sep-2006: Rename lexical non-terminals 'String' to 'StringLiteral' and 'Number' to 'NumberLiteral'; Remove infix 'cast' expressions; Remove prefix 'to' expressions; Change the rhs of 'to' to be a TypeExpression; Move 'yield' to 'AssignmentExpression' (again); Replace Arguments with ParenExpression in SuperExpression

15-Sep-2006: Add rules for tagging an object or array literal with a structural type; Add “decimal”, “double”, “int”, “uint”, “Number”, “rounding”, “strict”, and “standard” to the list of ContextuallyReservedIdentifiers; Fix capitalisation of PackageIdentifier (409); Add definition of lexical Identifier; Remove redundant productions referring to ContextuallyReservedIdentifier; Add "Number" as a PragmaArgument; Refactor YieldExpression to be used by MultiplicativeExpression and use UnaryExpression

30-Aug-2006: Remove 'native' from ReservedIdentifier; Add lexical non-terminals for missing literal forms and VirtualSemicolon; Replace productions for Identifier with one that uses lexical symbol ContextuallyReservedIdentifiers; Replace RestParameters with RestParameter (57); Replace Expression with ListExpression (94,99,101,106); Replace NonAssignmentExpression with LogicalOrExpression (219); Remove unused production for DestructuringAssignmentExpression (250); Remove Statement production for SwitchTypeStatement (291); Sort Statement productions; Remove unused productions for Substatements and SubstatementsPrefix; Replace use of VariableInitialiser with AssignmetExpression (441); Replace uses of TypeName with TypeIdentifier (462,463); Rename TypeNameList as TypeIdentifierList

15-Jun-2006: Add 'yield' expression without subexpression; Remove Semicolon after PragmaItems in UsePragma; Remove parens around PragmaARgument in PragmaItem; Change SimpleQualifiedIdentifier to SimpleTypeIdentifier in PragmaArgument; Add SimpleTypeIdentifier to NamespaceInitialisation

07-Jun-2006: Remove AttributeCombination from Attributes; Remove true and false from Attributes (they are a carryover from the NS proposal and have never been proposed here); Added comment on the creation of a lexical PackageIdentifier from a syntactic PackageName; Allow 'let' on VariableDefinition and FunctionDefinition; Merge SwitchType into SwitchStatement; Add 'call' to context keywords and syntactic identifier; Replace ListExpression in Arguments with ArgumentList; Reuse VariableBinding for LetBinding; Add ParameterAttributes to Pattern in Parameter; Add TypedParameter to RestParameter; Change Identifier to TypedIdentifier in RestParameter; Add TypedPattern to TypeCaseElement; Rename 'private' to 'internal' in PackageAttributes

01-Jun-2006: Add '!' to ClassName; Remove 'as'; Replace TypeExpression on the rhs of 'is' and 'to' with ShiftExpression; Rename AttributeQualifiedIdentifier to AttributeIdentifier; Add 'type' operator to UnaryExpression; Change yield construct from YieldStatement to YieldExpression; Add 'yield' to the list of reserved identifiers; Add TypedPattern everywhere that TypedIdentifier is used to defined a variable, except in switch-type; Define the meaning of the lexical symbol PackageIdentifier; Add primary expression for "to" and binary expression for "cast"

23-May-2006: Add 'super' to reserved words; Refactor TypeIdentifier; Use simpler E3 syntax for PostfixExpression; Rename LPattern and children to Pattern etc.; Move DestructuringAssignmentExpression out of AssignmentExpresion; Move LetExpression to AssignmentExpression; Remove attribute blocks; Remove variable initialiser with multiple attributes on the rhs; Add parens around pragma arguments; Add prama identifiers 'default namespace' and 'default package'; Add PackageAttribute to PackageDefinition; Sort rules for readability

16-May-2006: Added '.' before '<…>' in type definitions; removed ReservedNamespace from PrimaryExpression since it is already include via QualifiedIdentifier; simplified PostfixExpression; changed qualifier on ExpressionQualifiedIdentifier from ParenExpression to ParentListExpression; Refactored TypeIdentifier; replaced QualifiedIdentifier with TypeIdentifier and added AttributeQualifiedIdentifier in PrimaryExpression; made .< a token rather than two; Redefined TypeParameters to include the .< and > delimiters

15-May-2006: Moved 'PackageIdentifier . Identifier' from PrimaryExpression to QualifiedIdenfier; Added dot to left angle brace for parameterized type expressions in TypeExpression

12-May-2006: Initial draft. First attempt to capture the whole grammar of ES4. Current with the latest proposals