TOP DOWN PARSING
SAMPLE PROBLEMS

Example

S → A | B C
A → a A | ε
B → b B | ε
C → c C | d C | ε

	FIRST	FOLLOW
S	a,b,c,d,ε	$
A	a,ε	$
B	b,ε	c,d,$
C	c,d,ε	$

	a	b	c	d	$
S	S → A	S → B C	S → B C	S → B C	S → A S → B C
A	A → a A				A → ε
B		B → b B	B → ε	B → ε	B → ε
C			C → c C	C → d C	C → ε

Example

LEXP → ATOM | LIST
ATOM → num | id
LIST → (LSEQ)
LSEQ → LSEQ LEXP | LEXP

LEXP → ATOM | LIST
ATOM → num | id
LIST → (LSEQ)
LSEQ → LEXP LSEQ'
LSEQ' → LEXP LSEQ' | ε

	FIRST	FOLLOW
LEXP	num, id, (	$, num, id, (,)
ATOM	num, id	$, num, id, (,)
LIST	(	$, num, id, (,)
LSEQ	num, id, (	)
LSEQ'	num, id, (, ε	)

Example

LEXP → ATOM | LIST
ATOM → num | id
LIST → (LSEQ)
LSEQ → LEXP LSEQ'
LSEQ' → LEXP LSEQ' | ε

	FIRST	FOLLOW
LEXP	num, id, (	$, num, id, (,)
ATOM	num, id	$, num, id, (,)
LIST	(	$, num, id, (,)
LSEQ	num, id, (	)
LSEQ'	num, id, (, ε	)

LEXP → ATOM | LIST FIRST(ATOM) ∩ FIRST(LIST) = ∅

ATOM → num | id FIRST(num) ∩ FIRST(id) = ∅

LSEQ' → LEXP LSEQ' | ε FIRST(LEXP) ∩ FOLLOW(LSEQ') = ∅

⇒ Grammar is LL(1)

Example

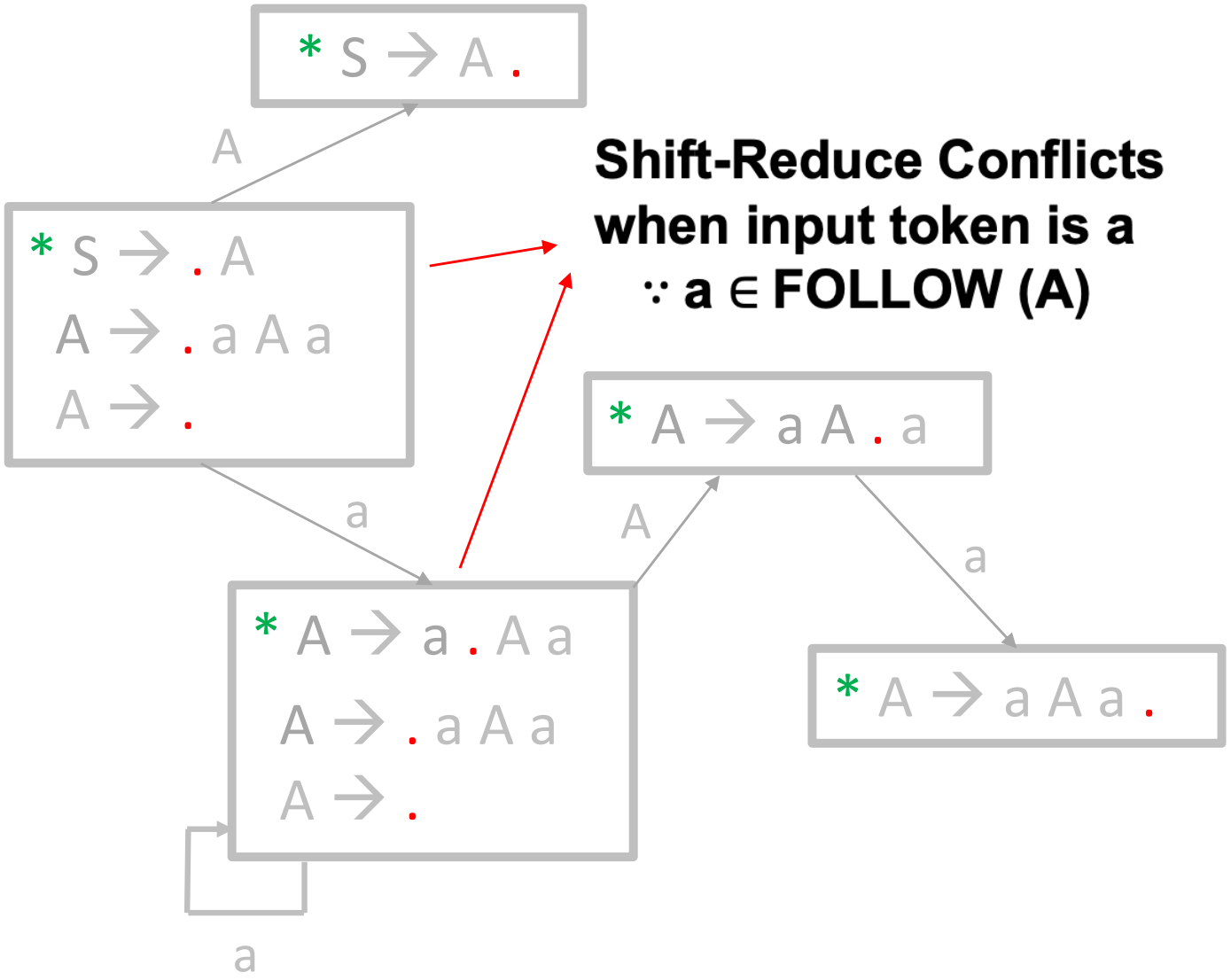
LEXP → ATOM | LIST
ATOM → num | id
LIST → (LSEQ)
LSEQ → LEXP LSEQ'
LSEQ' → LEXP LSEQ' | ε

	FIRST	FOLLOW
LEXP	num, id, (	$, num, id, (,)
ATOM	num, id	$, num, id, (,)
LIST	(	$, num, id, (,)
LSEQ	num, id, (	)
LSEQ'	num, id, (, ε	)

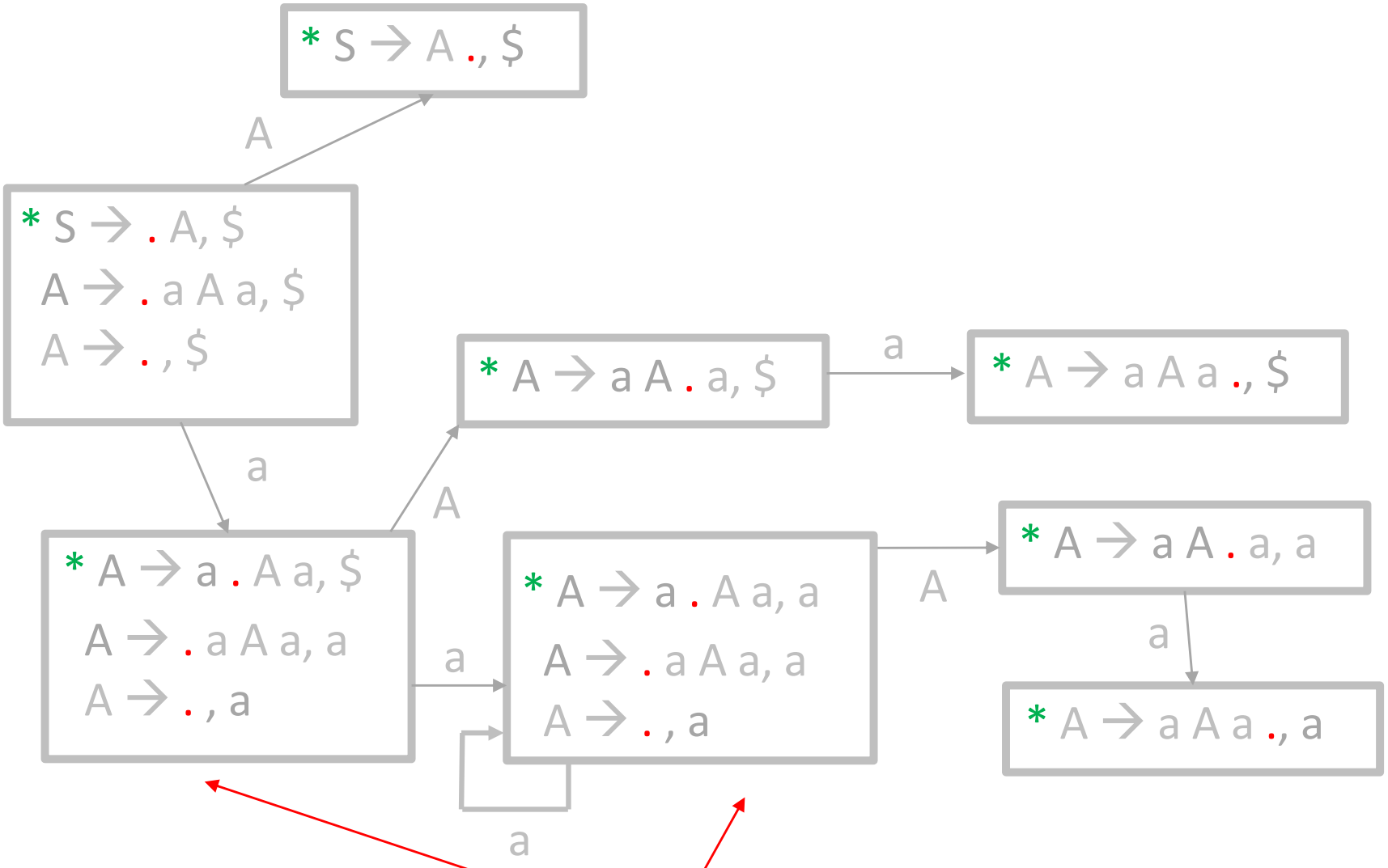
	num	id	(	)	$
LEXP	LEXP → ATOM	LEXP → ATOM	LEXP → LIST		
ATOM	ATOM → num	ATOM → id			
LIST			LIST → (LSEQ)		
LSEQ	LSEQ→LEXP LSEQ'	LSEQ→LEXP LSEQ'	LSEQ→LEXP LSEQ'		
LSEQ'	LSEQ'→LEXP LSEQ'	LSEQ'→LEXP LSEQ'	LSEQ'→LEXP LSEQ'	LSEQ'→ε	

BOTTOM UP PARSING
SAMPLE PROBLEMS

S → A
A → a A a | ϵ

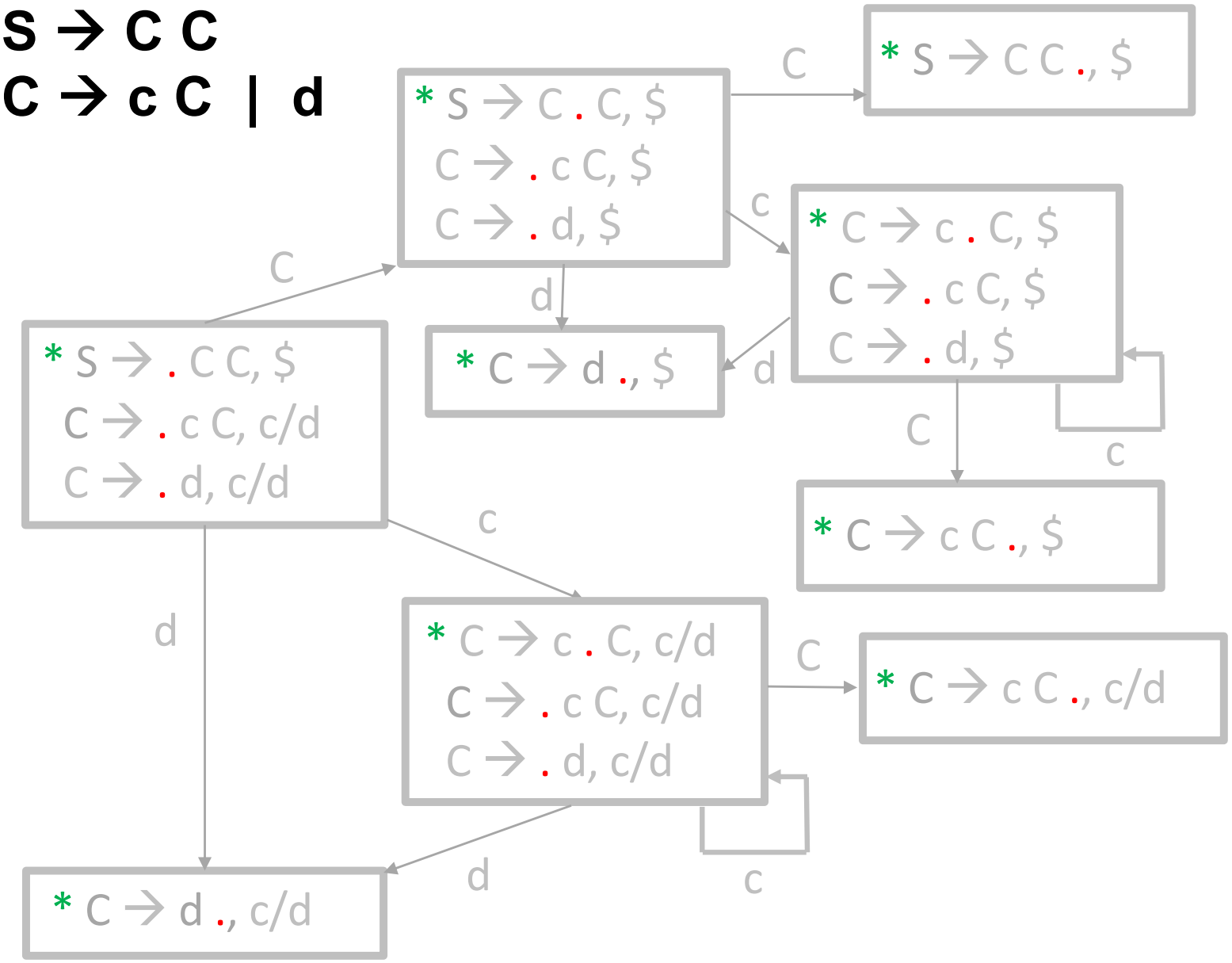

* S → A .
A
* S → . A
A → . a A a
A → .
a
* A → a . A a
A → . a A a
A → .
a
A
* A → a A . a
a
* A → a A a .
Shift-Reduce Conflicts
when input token is a
∵ a ∈ FOLLOW (A)

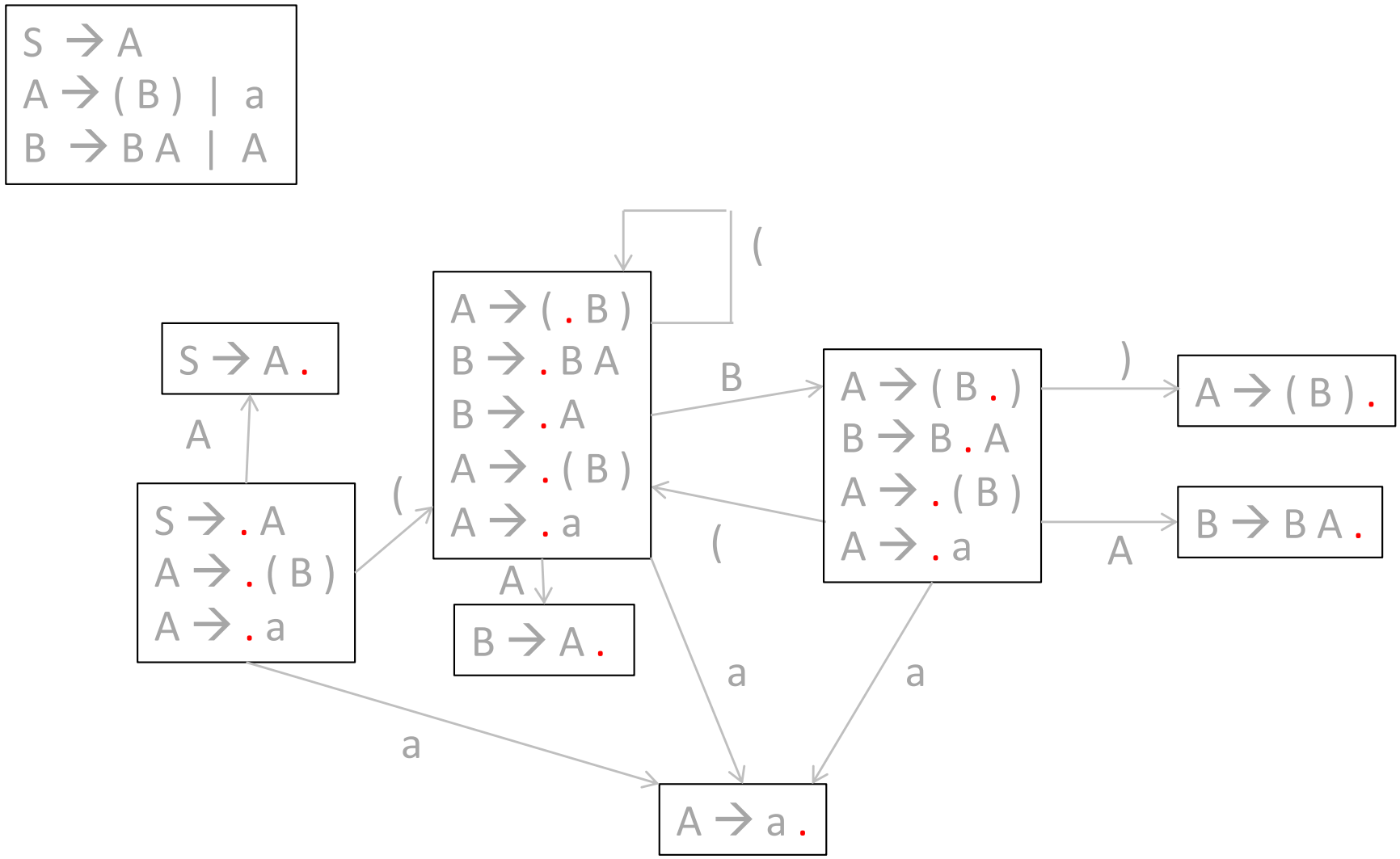
S → A
A → a A a | ϵ



Shift-Reduce Conflicts when input token is a

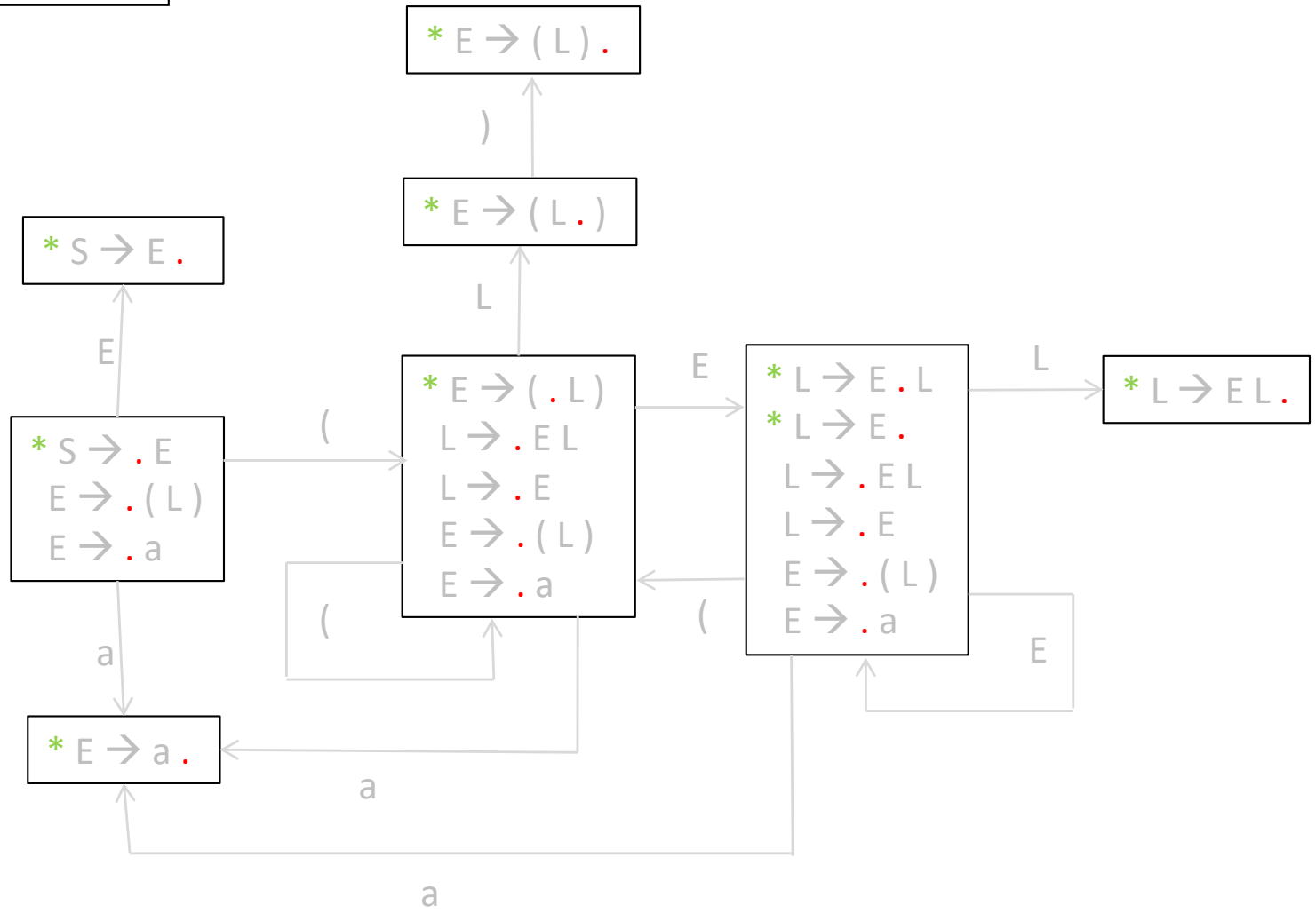
S → C C
C → c C | d

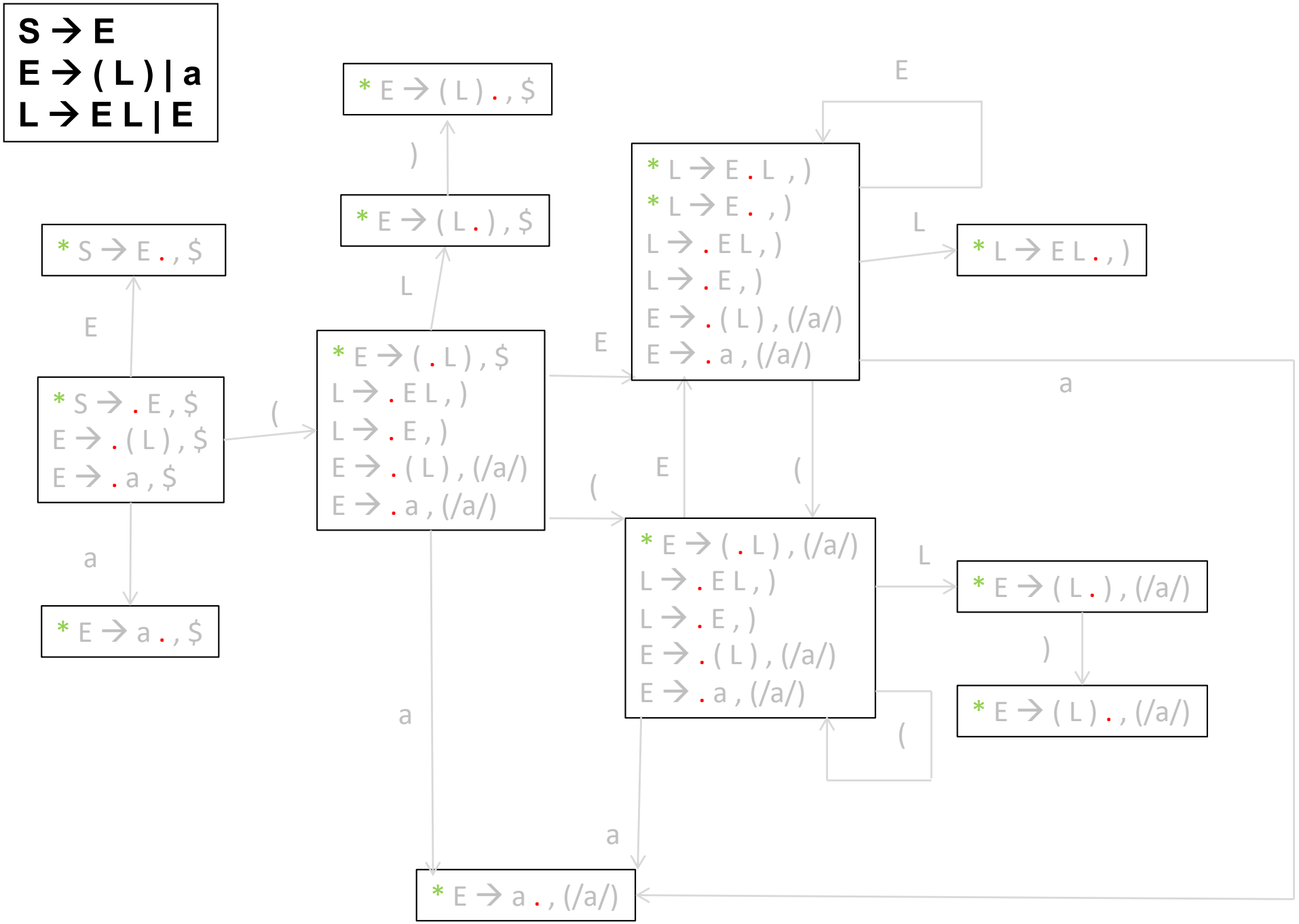

* S → C . C, $
C → . c C, $
C → . d, $
C
* S → C C ., $
c
* C → c . C, $
C → . c C, $
C → . d, $
d
* C → d ., $
d
C
c
* S → . C C, $
C → . c C, c/d
C → . d, c/d
C
* C → c C ., $
c
d
* C → c . C, c/d
C → . c C, c/d
C → . d, c/d
C
* C → c C ., c/d
c
d
* C → d ., c/d



No Conflicts!

S → E
E → (L) | a
L → E L | E




S → E
E → (L) | a
L → E L | E
* S → E . , $
* S → . E , $
E → . (L) , $
E → . a , $
* E → a . , $
* E → (L) . , $
* E → (L .) , $
* E → (. L) , $
L → . E L ,)
L → . E ,)
E → . (L) , (/a/)
E → . a , (/a/)
* L → E . L ,)
* L → E . ,)
L → . E L ,)
L → . E ,)
E → . (L) , (/a/)
E → . a , (/a/)
* L → E L . ,)
* E → (. L) , (/a/)
L → . E L ,)
L → . E ,)
E → . (L) , (/a/)
E → . a , (/a/)
* E → (L .) , (/a/)
* E → (L) . , (/a/)
* E → a . , (/a/)
E
L
a
(
)