

a)

Input Log:

Figure 1

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Regular Expressions:

Line parsing:

(?<ip>) .+ /(?(<TYPE>.+).php"

Execution mapping:

\k<ip>

b)

Mined Invariants:

check-out AP get-credit-card

check-out AP invalid-coupon

check-out AP reduce-price

check-out AP valid-coupon

check-out AFby get-credit-card

invalid-coupon AFby check-out

invalid-coupon AFby get-credit-card

invalid-coupon AFby reduce-price

reduce-price AFby check-out

reduce-price AFby get-credit-card

valid-coupon AFby check-out

valid-coupon AFby get-credit-card

valid-coupon AFby reduce-price

get-credit-card NFby check-out

get-credit-card NFby get-credit-card

get-credit-card NFby invalid-coupon

get-credit-card NFby reduce-price

get-credit-card NFby valid-coupon

invalid-coupon NFby invalid-coupon

invalid-coupon NFby valid-coupon

reduce-price NFby invalid-coupon

reduce-price NFby reduce-price

reduce-price NFby valid-coupon

valid-coupon NFby invalid-coupon

valid-coupon NFby valid-coupon

+

Initial Model:

INITIAL

check-out

valid-coupon

get-credit-card

invalid-coupon

reduce-price

TERMINAL

INITIAL

check-out

valid-coupon

get-credit-card

invalid-coupon

reduce-price

TERMINAL

c)

Final Model:

INITIAL

check-out

valid-coupon

invalid-coupon

reduce-price

get-credit-card

check-out

TERMINAL

INITIAL

check-out

valid-coupon

invalid-coupon

reduce-price

get-credit-card

check-out

TERMINAL