SOEN331: Introduction to Formal Methods for Software Engineering
Assignment 4: Z Specifications

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$[Product, OrderId]$

$Order == \{order : \text{bag } Product \mid order \neq \varnothing\}$

$OrderState ::= pending \mid invoiced$

$Report ::= oder\_not\_pending \mid not\_enough\_stock \mid no\_more\_ids$

Stock

$stock : \text{bag } Product$

OrderInvoices

$orders : OrderId \pfun OrderState$
$orderStatus : OrderId \pfun OrderState$

$\text{dom } orders = \text{dom } orderStatus$

State

$Stock$
$OrderInvoices$
$newids : \mathbb{P}\, OrderId$

$\text{dom } orders \cap newids = \varnothing$

$\Delta State$

$State$
$State'$

$newids' = newids \setminus \operatorname{dom} orders'$

$InitState$

$State'$

$stock' = \varnothing$
$orders' = \varnothing$
$newids' = OrderId$

$NewOrder$

$\Delta State$
$order? : Order$
$id! : OrderId$

$id! \in newids$
$orders' = orders \cup \{id! \mapsto order?\}$
$orderStatus(id!) = pending$
$stock = stock'$

$InvoiceOrder$

$\Delta\, State$
$id? : OrderId$

$id? \in \operatorname{dom} orders$
$orders(id?) \sqsubseteq\ stock$
$orderStatus(id?) = pending$
$stock' = stock \uplus\ orders(id?)$
$orderStatus' = orderStatus \oplus \{id? \mapsto invoiced\}$
$orders = orders'$

InvoiceError

$\Xi State$
$id? : OrderId$
$error! : Report$

$orderStatus(id?) \neq pending$
$error! = order\_not\_pending$

StockError

$\Xi State$
$id? : OrderId$
$error! : report$

$\neg\ (orders(id?) \sqsubseteq\ stock)$
$error! = not\_enough\_stock$

InvoiceOrderOp

$InvoiceOrder \lor InvoiceError \lor StockError$