

EECS3342 Fall 2024  
Notes on Discharging PO of Deadlock Freedom (DLF)  
Bridge Controller: Initial Model

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**1 Discharging the PO of Deadlock Freedom: First Attempt**

$$\boxed{\begin{array}{l} d \in \mathbb{N} \\ n \in \mathbb{N} \\ n \leq d \\ \vdash \\ n < d \vee n > 0 \end{array}}$$

$\equiv$

$$\boxed{\begin{array}{l} d \in \mathbb{N} \\ n \in \mathbb{N} \\ n < d \vee n = d \\ \vdash \\ n < d \vee n > 0 \end{array}}$$

**MON**

$$\boxed{\begin{array}{l} n < d \vee n = d \\ \vdash \\ n < d \vee n > 0 \end{array}} \text{ OR\_L } \left\{ \begin{array}{l} \boxed{\begin{array}{l} n < d \\ \vdash \\ n < d \vee n > 0 \end{array}} \text{ OR\_R1 } \boxed{\begin{array}{l} n < d \\ \vdash \\ n < d \end{array}} \text{ HYP} \\ \boxed{\begin{array}{l} n = d \\ \vdash \\ n < d \vee n > 0 \end{array}} \text{ EQ\_LR } \boxed{\begin{array}{l} n = d \\ \vdash \\ d < d \vee d > 0 \end{array}} \text{ MON } \boxed{\begin{array}{l} \vdash \\ d < d \vee d > 0 \end{array}} \text{ OR\_R2 } \boxed{\begin{array}{l} \vdash \\ d > 0 \end{array}} ? \end{array} \right.$$

## 2 Discharging the PO of Deadlock Freedom: Second Attempt (after adding axm0.2)

$$\boxed{\begin{array}{l} d \in \mathbb{N} \\ d > 0 \\ n \in \mathbb{N} \\ n \leq d \\ \vdash \\ n < d \vee n > 0 \end{array}}$$

$\equiv$

$$\boxed{\begin{array}{l} d \in \mathbb{N} \\ d > 0 \\ n \in \mathbb{N} \\ n < d \vee n = d \\ \vdash \\ n < d \vee n > 0 \end{array}}$$

**MON**

$$\boxed{\begin{array}{l} d > 0 \\ n < d \vee n = d \\ \vdash \\ n < d \vee n > 0 \end{array}} \quad \text{OR\_L} \quad \left\{ \begin{array}{l} \boxed{\begin{array}{l} d > 0 \\ n < d \\ \vdash \\ n < d \vee n > 0 \end{array}} \quad \text{OR\_R1} \quad \boxed{\begin{array}{l} d > 0 \\ n < d \\ \vdash \\ n < d \end{array}} \quad \text{HYP} \\ \boxed{\begin{array}{l} d > 0 \\ n = d \\ \vdash \\ n < d \vee n > 0 \end{array}} \quad \text{EQ\_LR} \quad \boxed{\begin{array}{l} d > 0 \\ n = d \\ \vdash \\ d < d \vee d > 0 \end{array}} \quad \text{MON} \quad \boxed{\begin{array}{l} d > 0 \\ \vdash \\ d < d \vee d > 0 \end{array}} \quad \text{OR\_R2} \quad \boxed{\begin{array}{l} d > 0 \\ \vdash \\ d > 0 \end{array}} \quad \text{HYP} \end{array}$$