Unit-4: Regular properties

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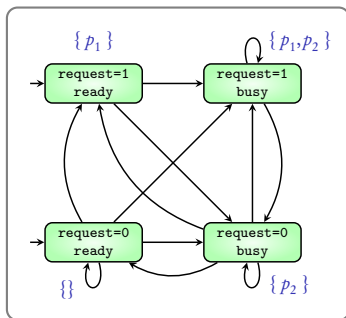
Chennai Mathematical Institute

NPTEL-course
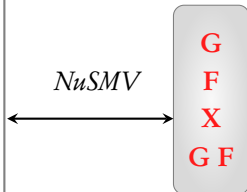
July - November 2015

Module 1:

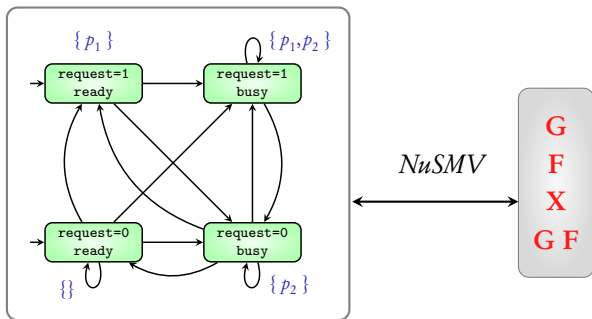# Road Map

Model

Requirements

NuSMV

G
F
X
G F

Model

$\{p_1\}$ — request=1 ready

$\{p_1, p_2\}$ — request=1 busy

$\{\}$ — request=0 ready

$\{p_2\}$ — request=0 busy

NuSMV

Requirements

G
F
X
G F

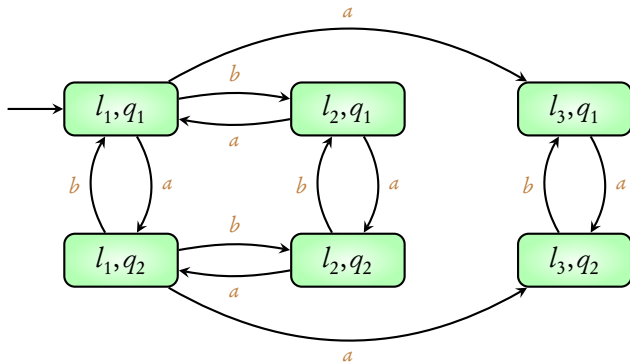**Question 1:** What are the **algorithms** used for checking requirements on transition systems?

Coming next: A **major** challenge in designing model-checking algorithms
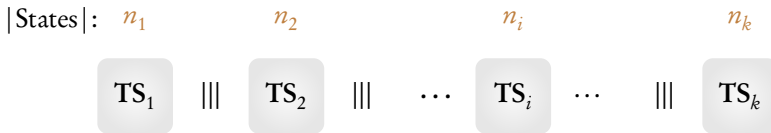
Recall...

$|\text{States}|:$ n_1 n_2

$$\textbf{TS}_1 \quad ||| \quad \textbf{TS}_2$$

Number of states in the interleaving

$n_1 \ \cdot \ n_2$

$|\text{States}|$: $\quad n_1 \qquad\qquad n_2 \qquad\qquad\qquad n_i \qquad\qquad\qquad n_k$

$$\boxed{\textbf{TS}_1} \quad ||| \quad \boxed{\textbf{TS}_2} \quad ||| \quad \cdots \quad \boxed{\textbf{TS}_i} \quad \cdots \quad ||| \quad \boxed{\textbf{TS}_k}$$

Number of states in the interleaving

$$n_1 \;\cdot\; n_2 \;\cdot\; \cdots \qquad n_i \;\cdot\; \cdots \;\cdot\; n_k$$

If there are 10 TS each with 10 states, interleaving would have 10^{10} **states!**

|States|: n_1 n_2 n_i n_k

$$\mathbf{TS}_1 \quad ||| \quad \mathbf{TS}_2 \quad ||| \quad \cdots \quad \mathbf{TS}_i \quad \cdots \quad ||| \quad \mathbf{TS}_k$$

Number of states in the interleaving

$$n_1 \ \cdot \ n_2 \ \cdot \ \dots \quad n_i \ \cdot \ \dots \ \cdot \ n_k$$

If there are 10 TS each with 10 states, interleaving would have 10^{10} **states!**

State-space explosion

NuSMV can handle more than 10^{120} states

NuSMV can handle more than 10^{120} states

Question 2: How does NuSMV tackle state-space explosion?

Questions

Question 1: What are the **algorithms** used for checking requirements on transition systems?

Question 2: How does NuSMV tackle state-space explosion?

Course plan