

LEGO[®]

Simulation

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Learning Objective

***Enhance your
understanding of Lean
Manufacturing through a
hands-on simulation***

Lean System Concepts

- **5 S** - Sort, Store, Shine, Standardize, Sustain
- **Waste Elimination** — Transportation, Inventory, Motion, Waiting, Over-processing, Overproduction, Defects
- **Make to Use** - Pull System
- **Visual Factory**

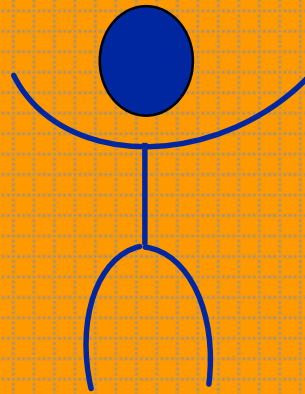
The Toyota Production System

GOALS: Best Quality ● Lowest Cost ● Shortest Lead Time

KEY IS: *Elimination of Waste*

JUST-IN-TIME

- Continuous Flow
- Pull System
- Takt Time



AUTONOMATION (Jidoka)

- “Automation with a Human Touch”
- Machines Stop for Abnormalities
- Separate Man & Machine
- Error Proofing (Poka Yoke)

Leveling
(Heijunka)

Standardized
Work

Continuous Improvement
(Kaizen)

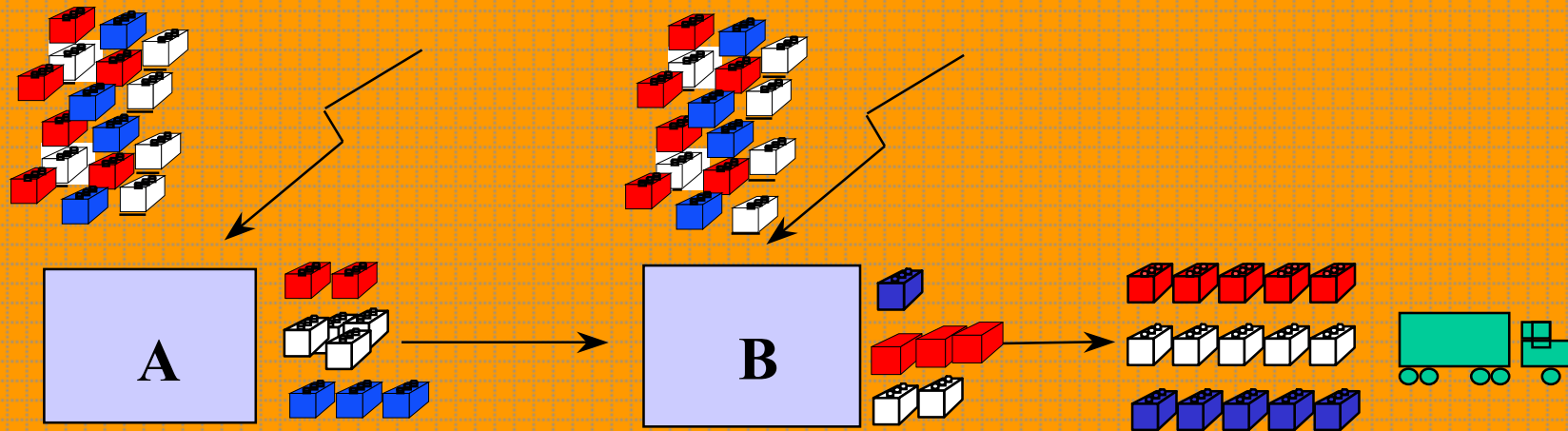
Stability

(e.g.: Equipment Reliability; Stable Processes, Quality, Suppliers)

PEOPLE

Run1: Traditional Manufacturing, Push

MULTIPLE PRODUCTION INSTRUCTIONS



Subassemblies

Final
Assemblies

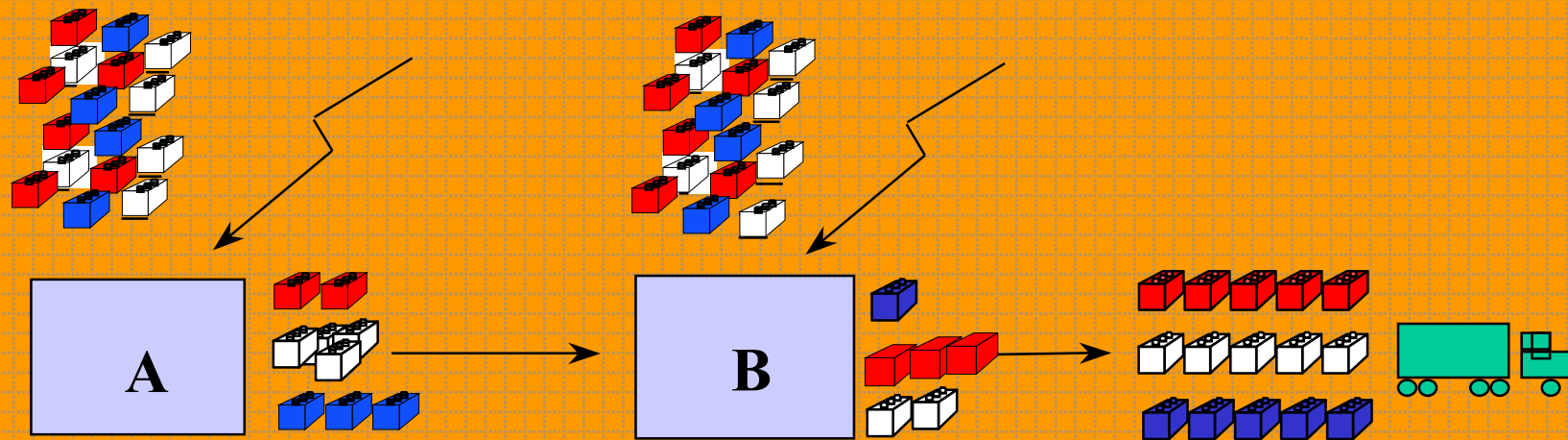
Shipping

Batch Flow

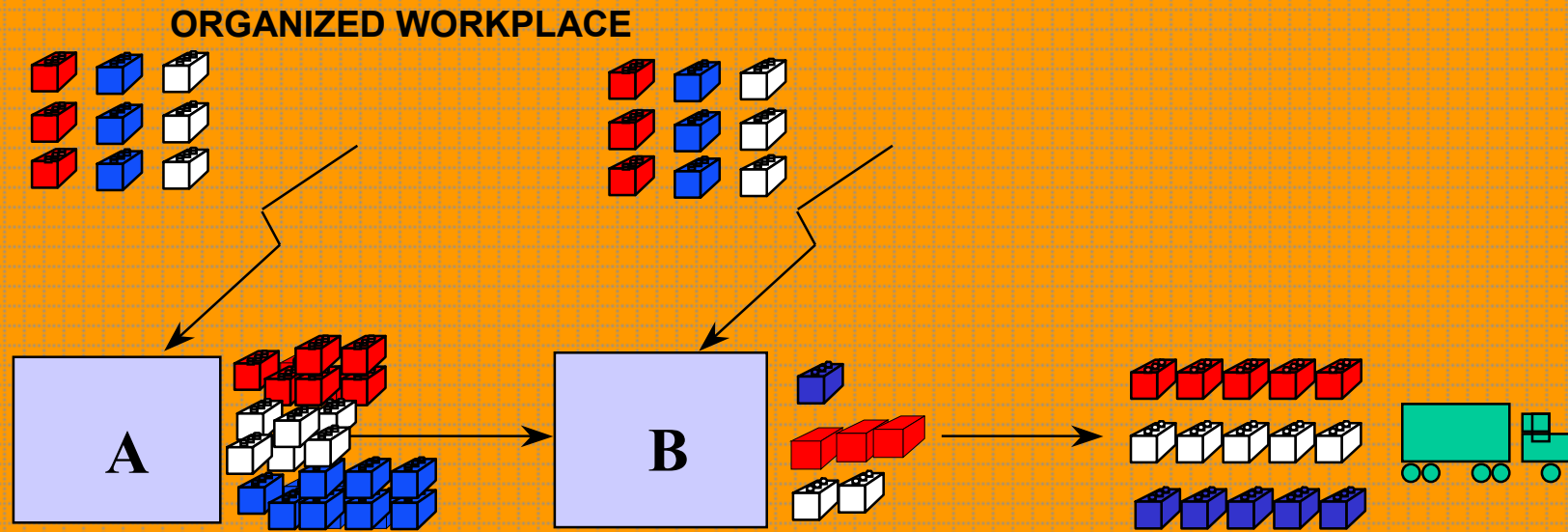
Batch Flow

Batch
Shipments

Run1: Traditional Manufacturing, Push



Run 2: Traditional Manufacturing with 5S

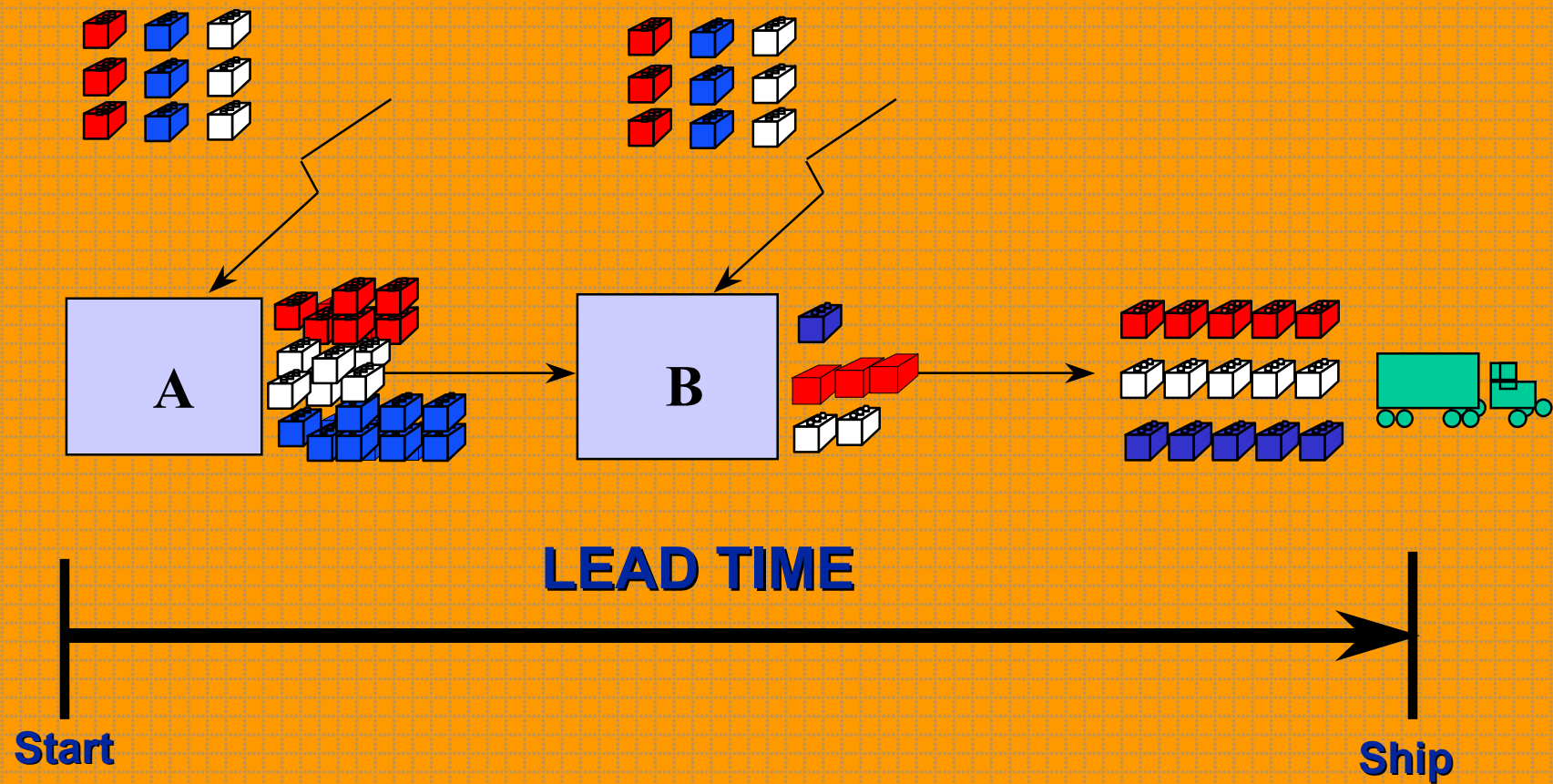


Batch Flow

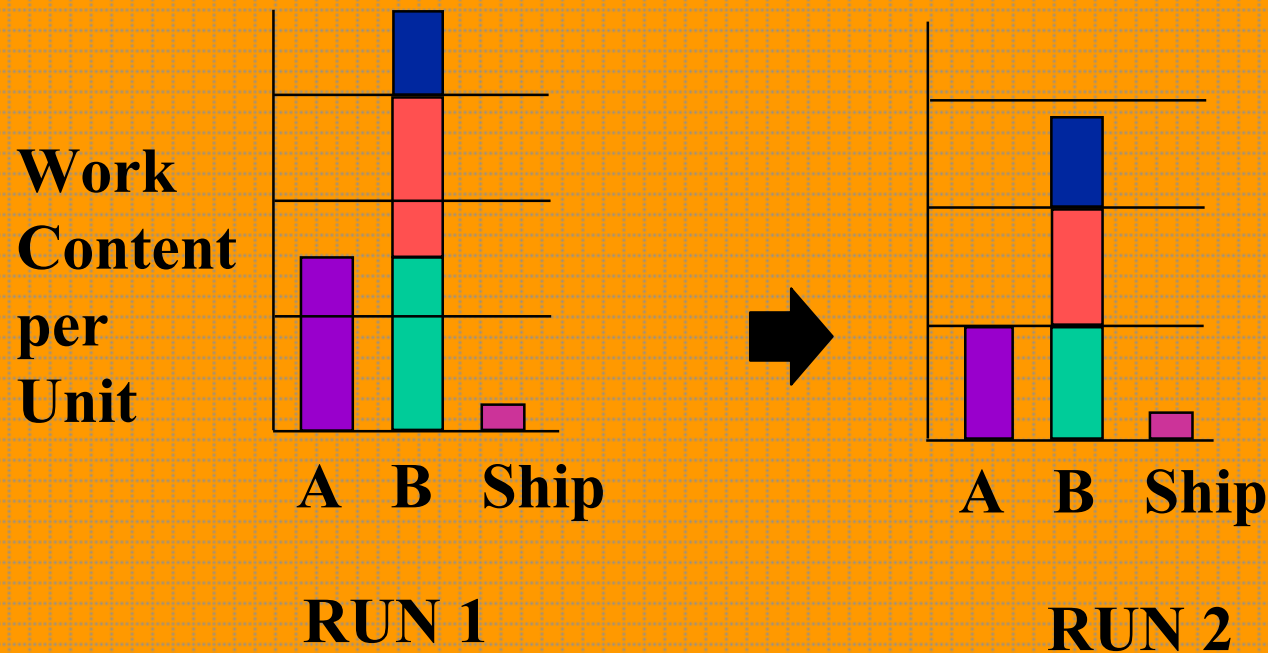
Batch Flow

Batch Shipments

Run 2: Traditional Manufacturing with 5S

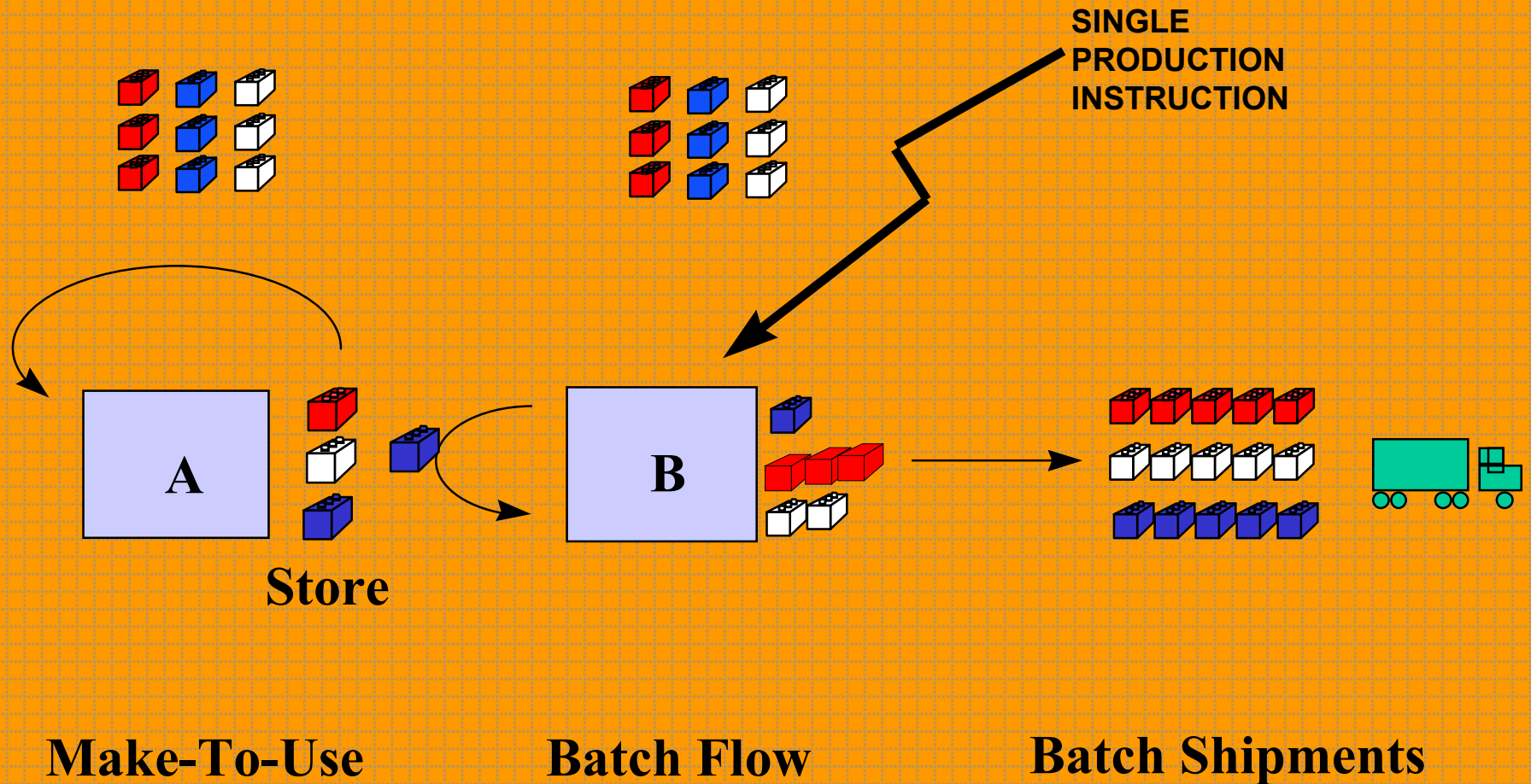


Workload Distribution

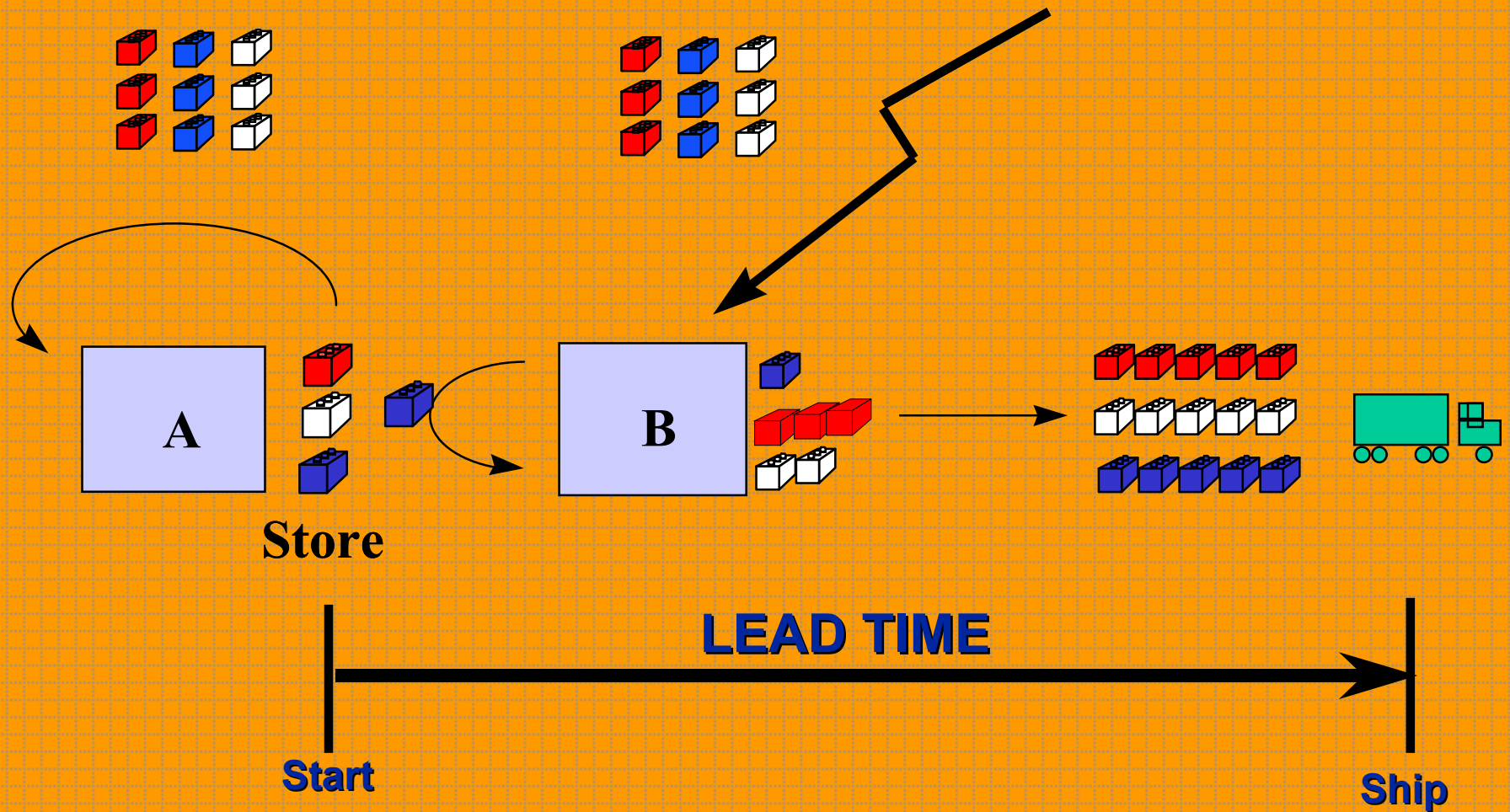


- **5s Reduces A & B Work Content**

Run 3: Pull & Improved Work Balance

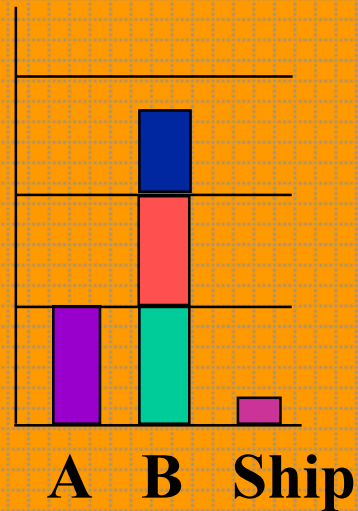


Run 3: Pull & Improved Work Balance

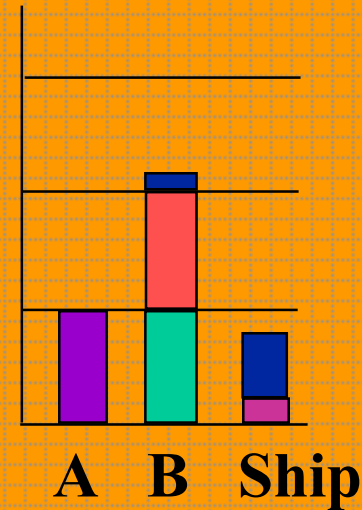


Workload Distribution

Work
Content
per
Unit



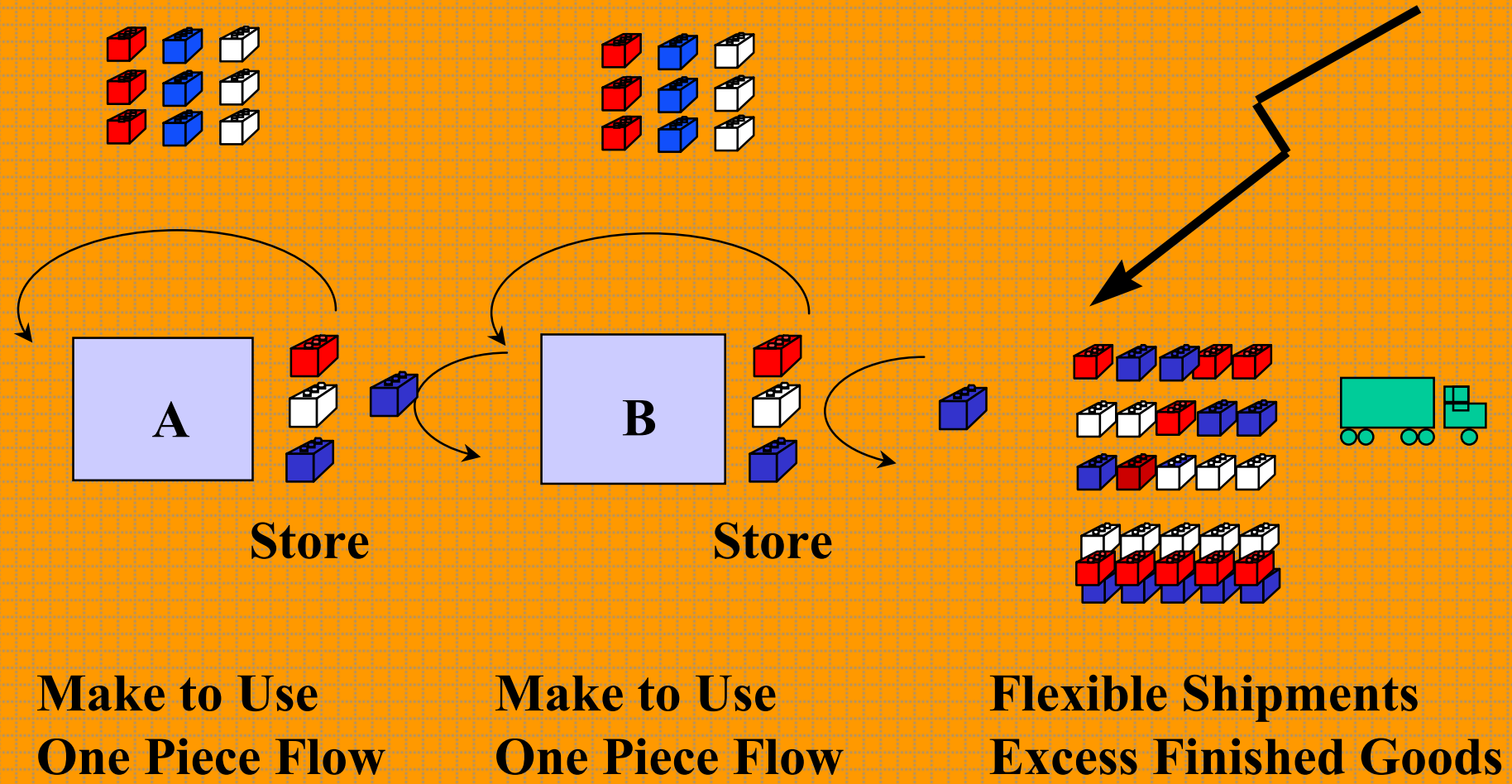
RUN 2



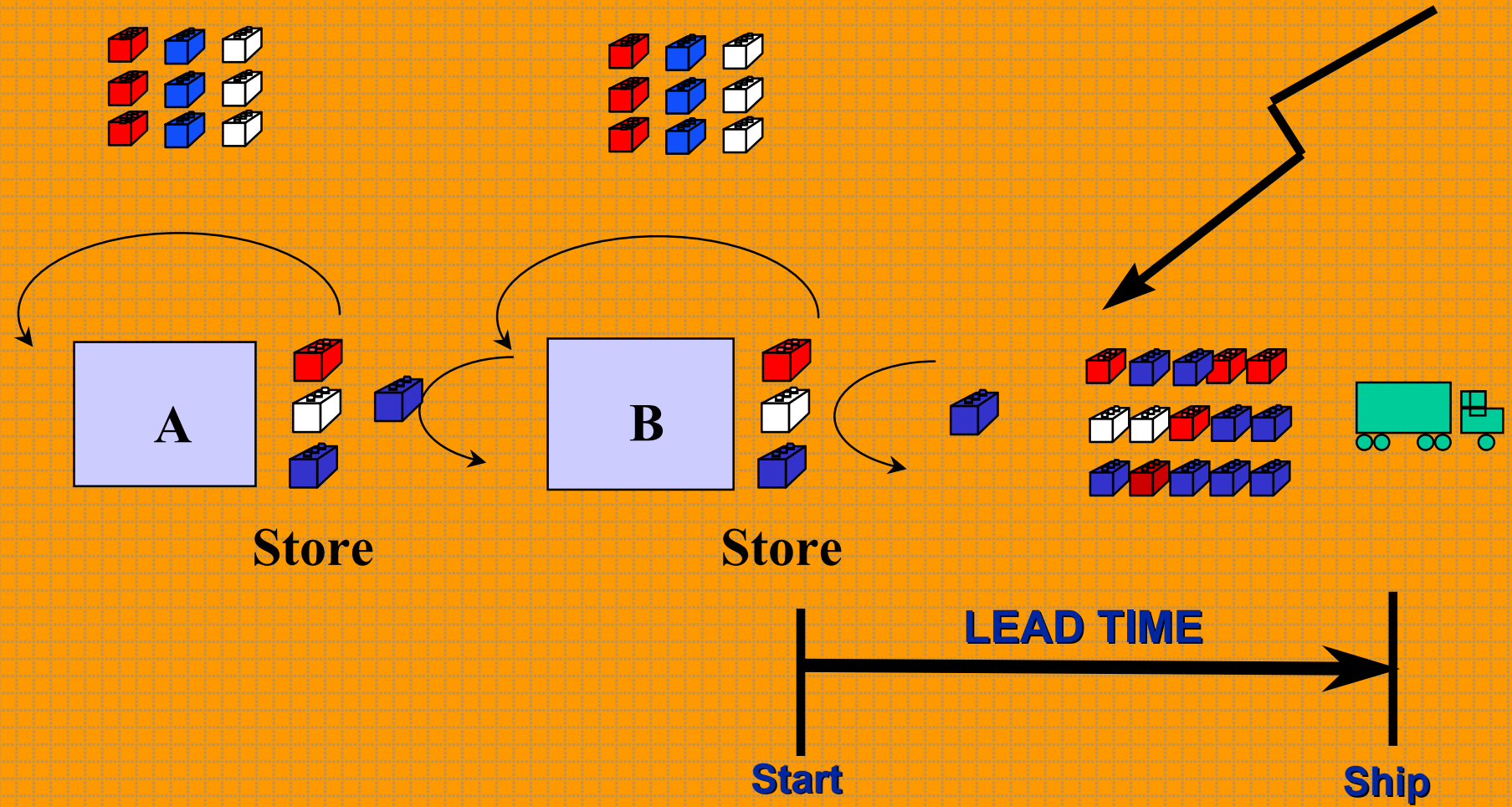
RUN 3

- Work Balance of Changeover

Run 4: One Piece Flow, Further Balance

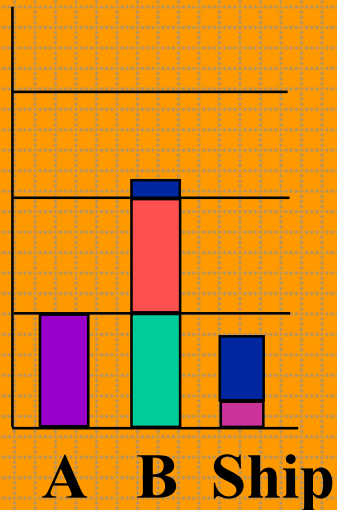


Run 4: One Piece Flow, Further Balance

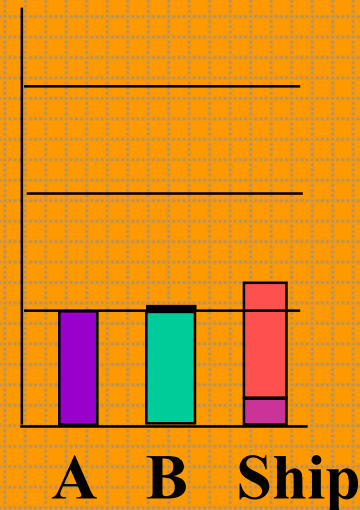


Workload Distribution

Work
Content
per
Unit



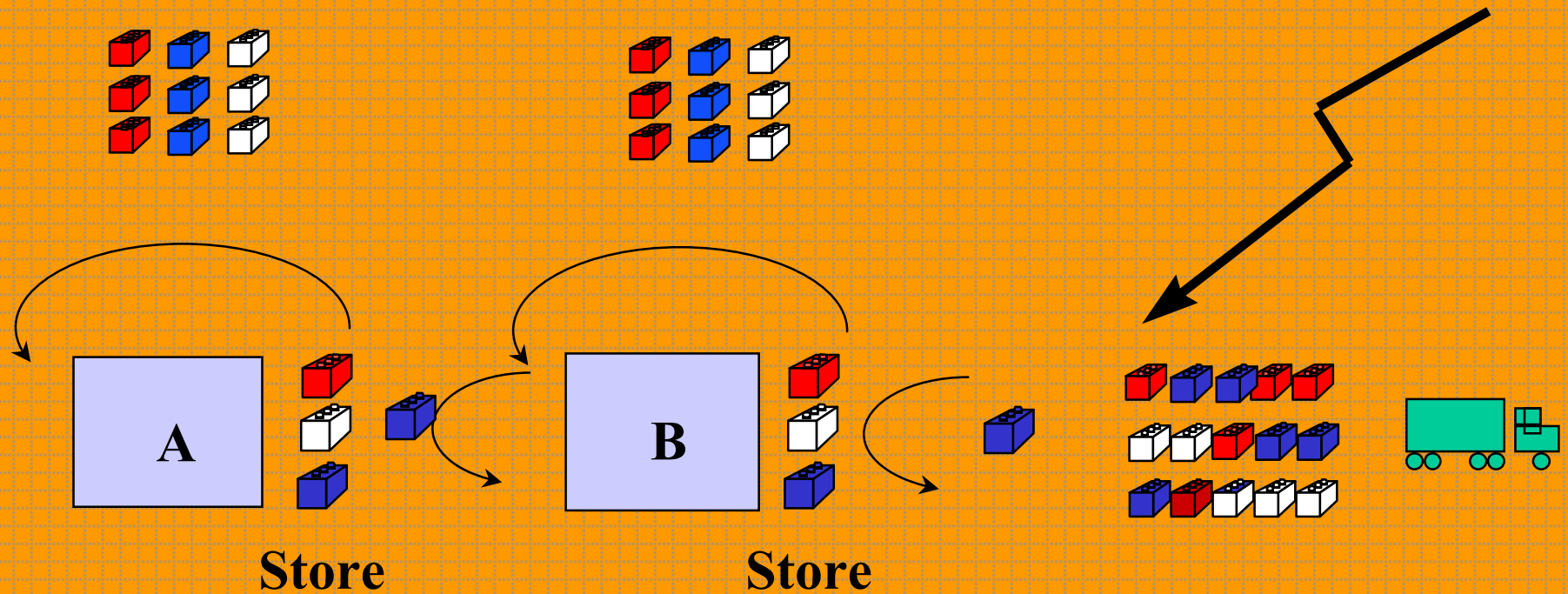
RUN 3



RUN 4

- **Rapid Changeover**
- **Work Balance**

Run 5: Pull system based on TAKT



**Make to Use
One Piece Flow**

**Make to Use
One Piece Flow**

**Flexible Shipments
Relaxed Pace**

Run 4 & 5: The Hidden Factory

RESULTS

- 50% + HIGHER THROUGHPUT VS. RUN 3
- SHORTENED LEAD TIME (time from closest Store)
- VERY FLEXIBLE to Customer Demand Changes

HOW

- Very Rapid Changeovers
- Small Batches
- Improved Work Balance
- by *Continually Eliminating Waste and Producing to TAKT*