A Multiplexer System for Measurement of Gaseous Emissions

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Objectives

- Develop a method to increase productivity when sampling during a field campaign
- Automate data collection

Overview

- Sampling Methodology
- System Design
- Benefits of using a multiplexer
- Concluding remarks

Sampling Methodology

- Flux chambers
  - 30 minute conditioning @ 7L/min input
  - 30 minute sample @ 7L/min input
  - 2L/min drawn from chamber
  - vented

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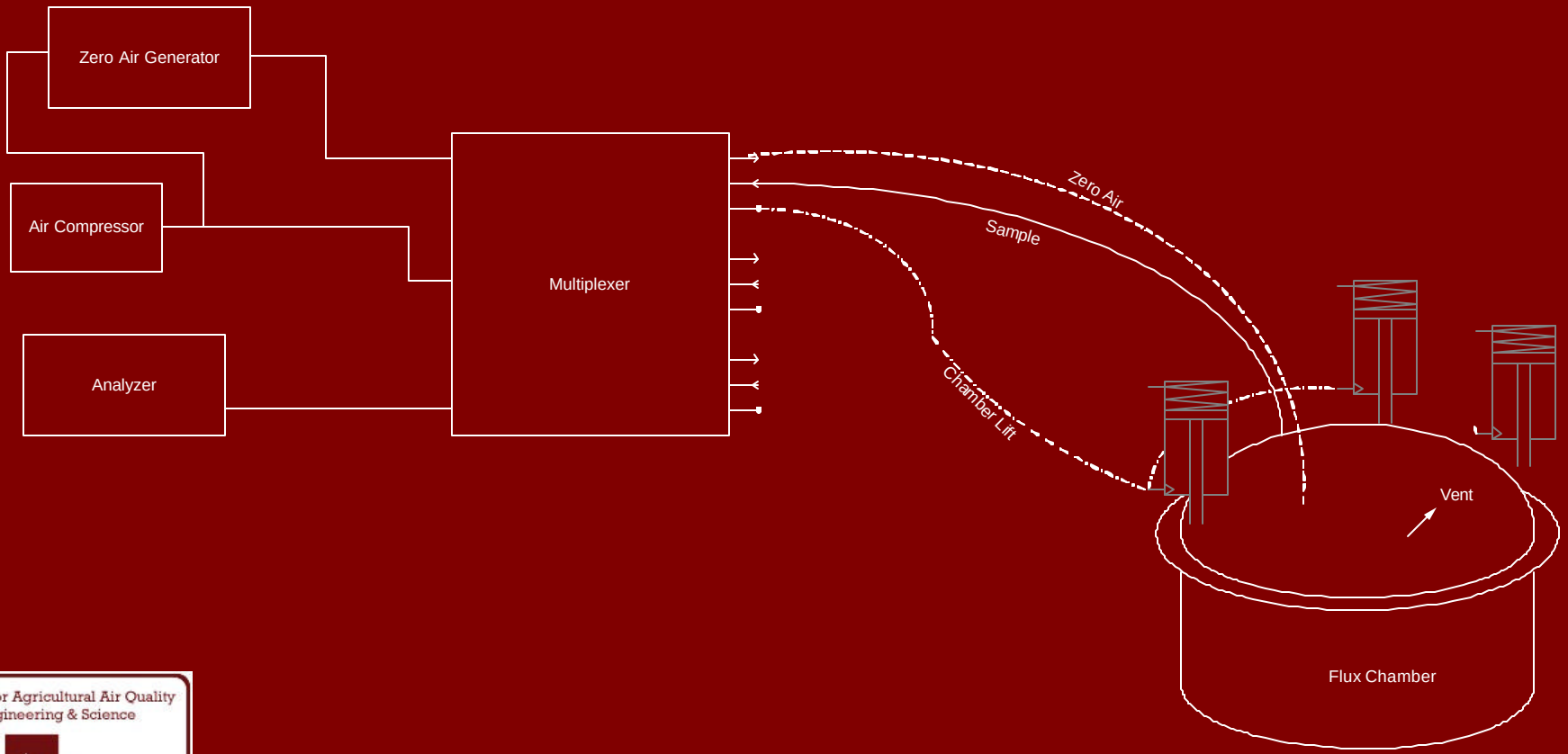
Sampling Setup



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Sampling Setup

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Sampling Setup

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Sampling Protocol

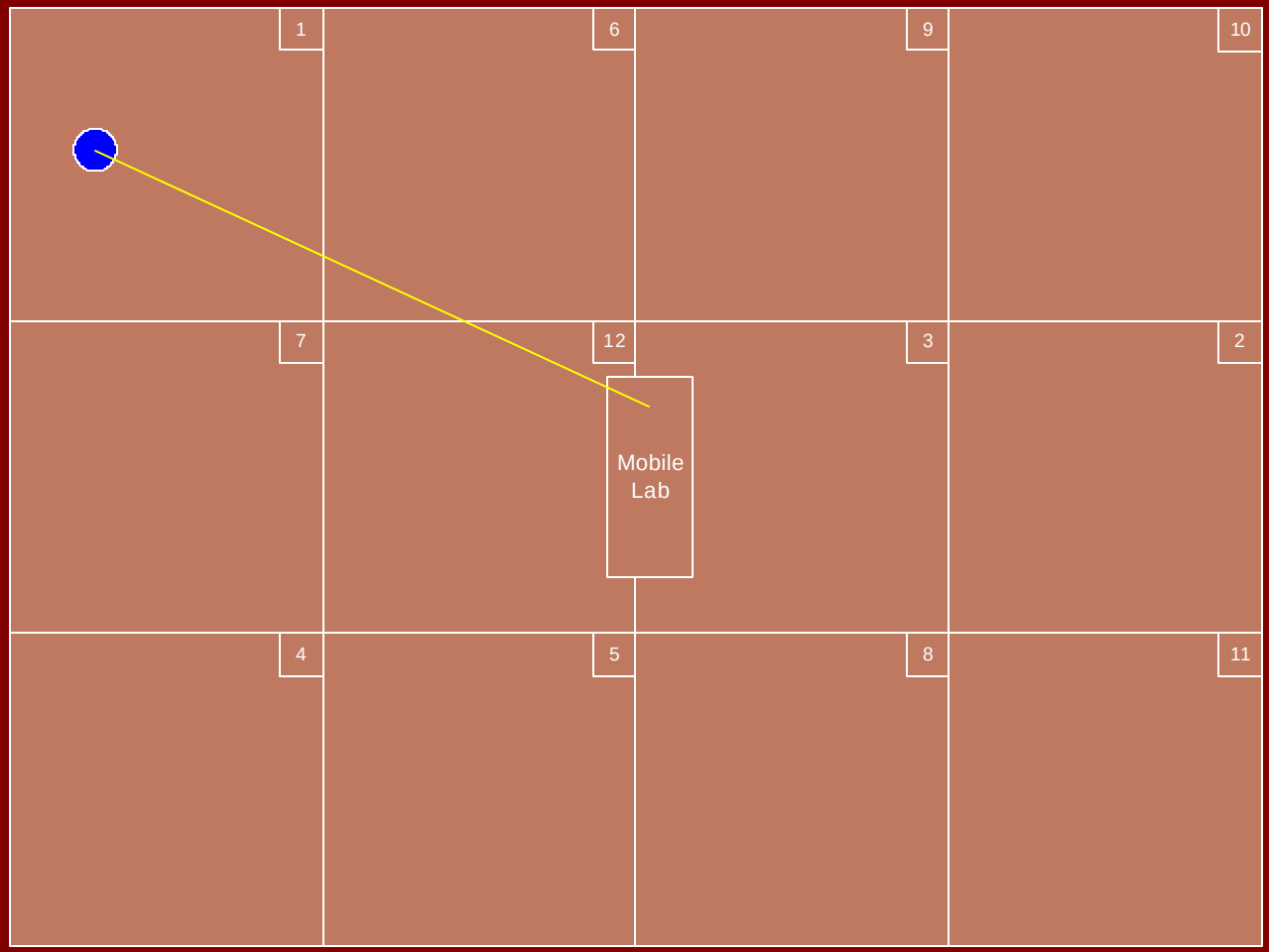
- Sample each management area within the facility
- Grids placed in management area with one sample point in each boxed grid point
- Sample order is random
- Sample point within the box is random

Multiplexer Sampling Protocol Example

- Small Open lot
- 12 Grid points
- Start time is 9:00 am
- 1 multiplexer setup
  - 3 chambers

Multiplexer Sampling Protocol

9:01 am



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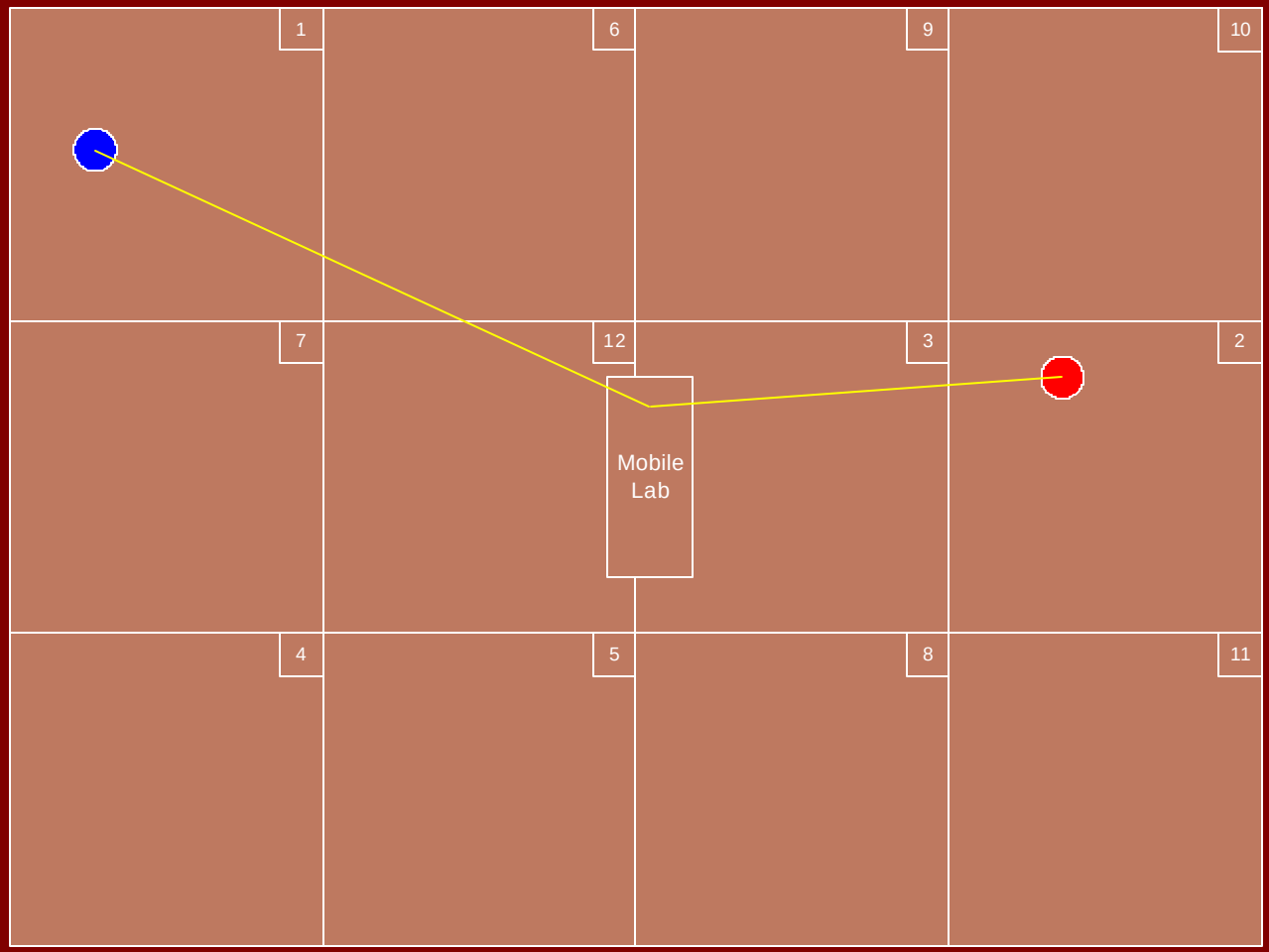
Multiplexer Sampling Protocol

9:05 am



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Multiplexer Sampling Protocol

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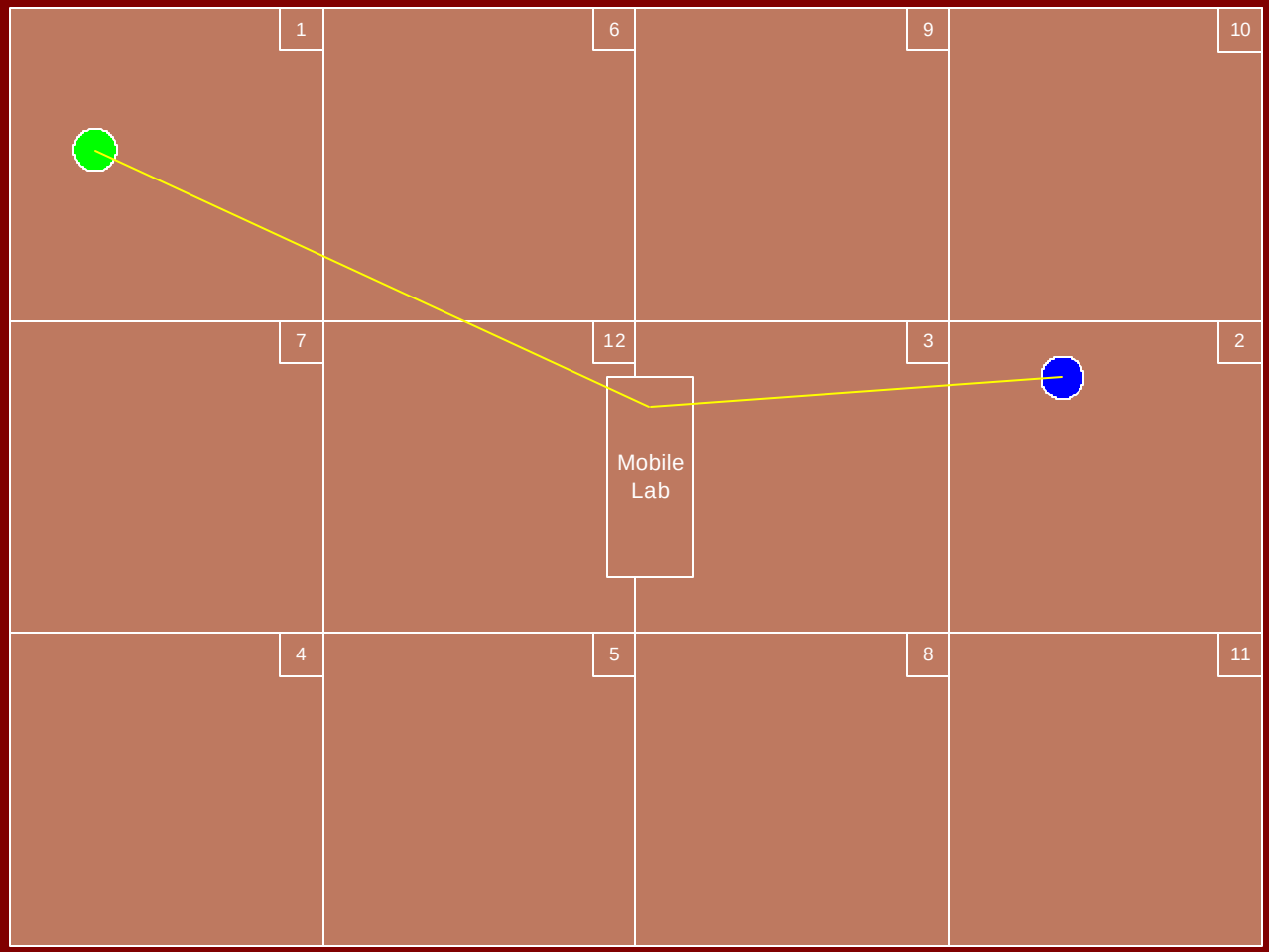

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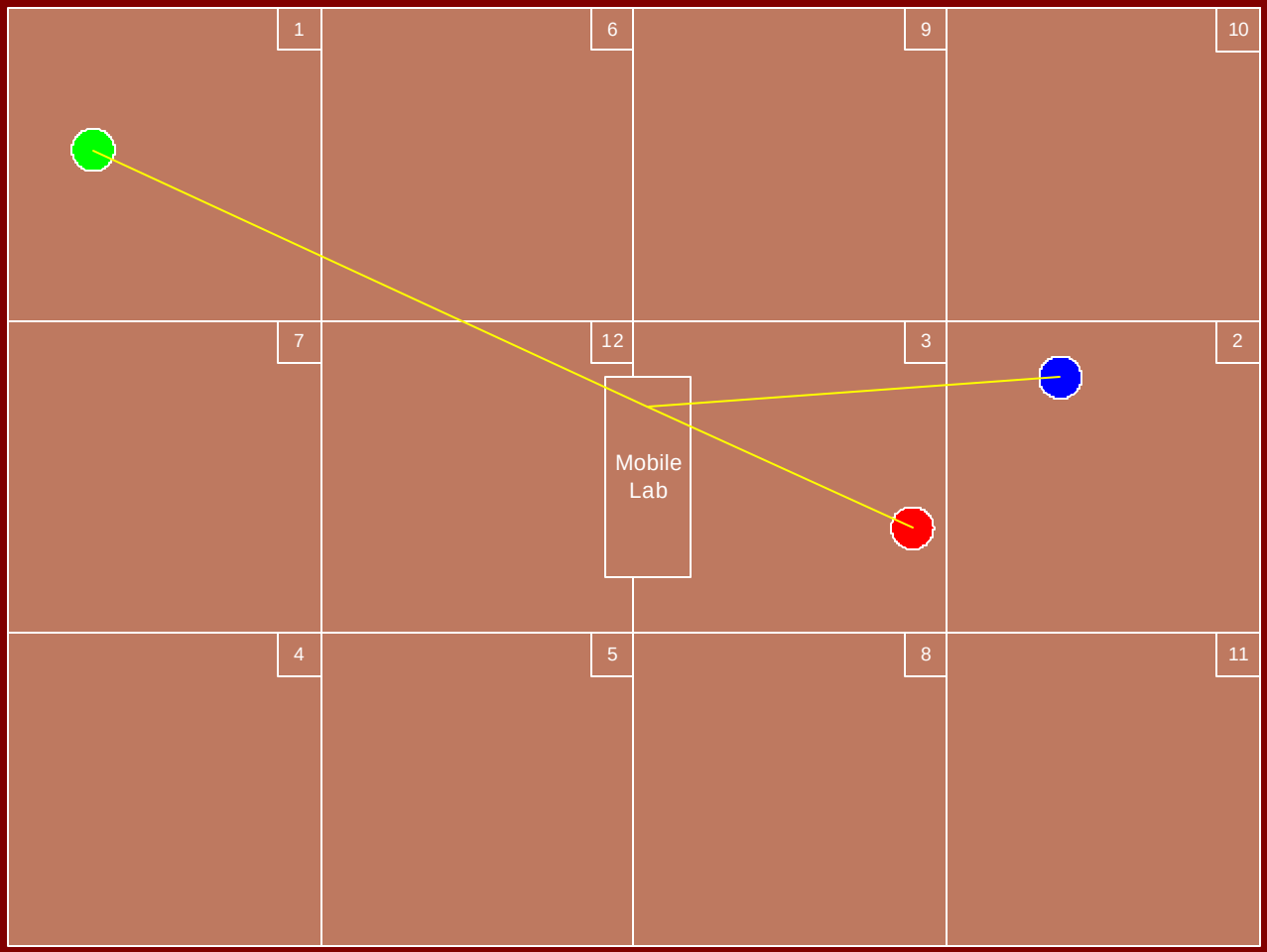

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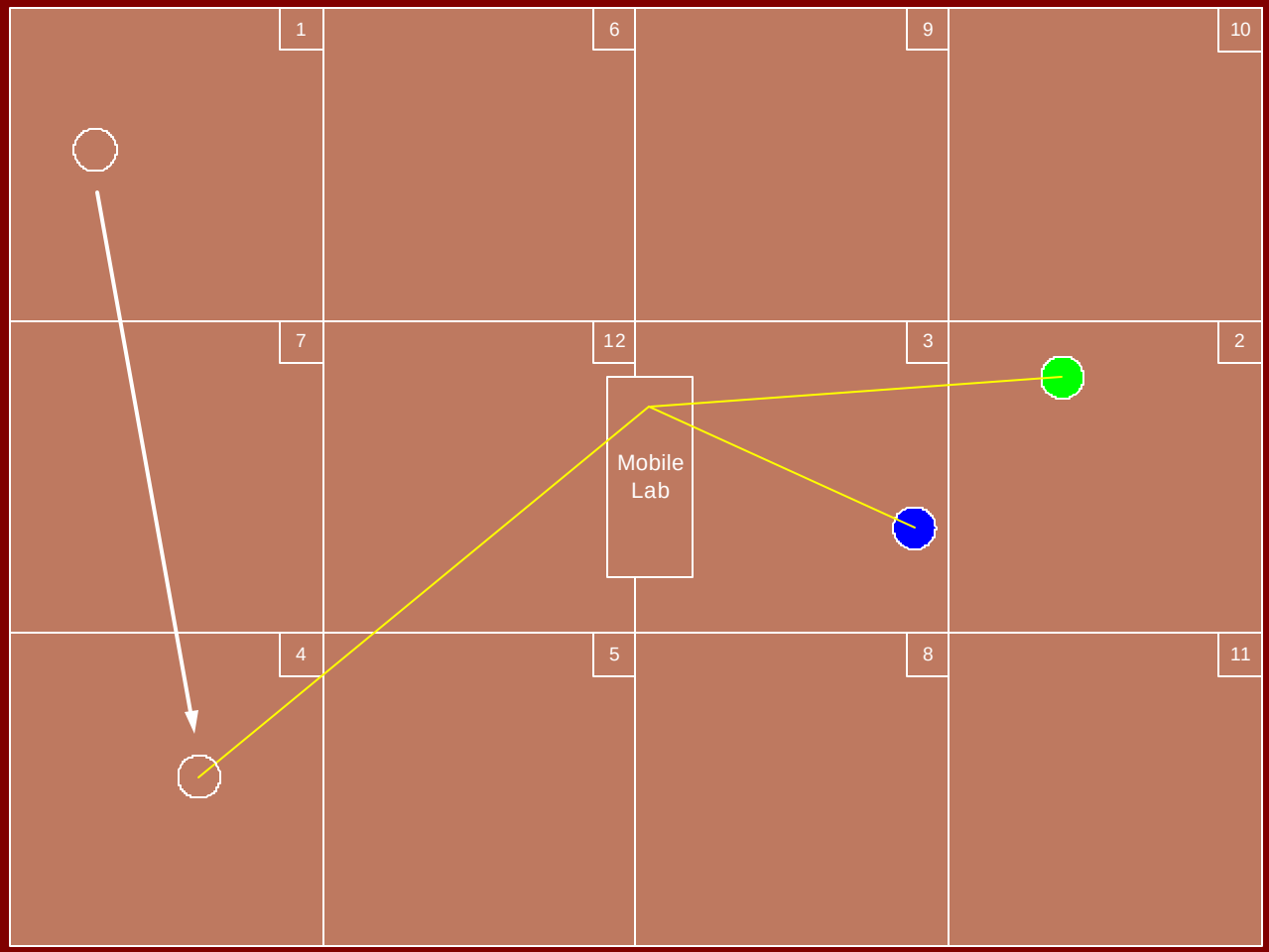

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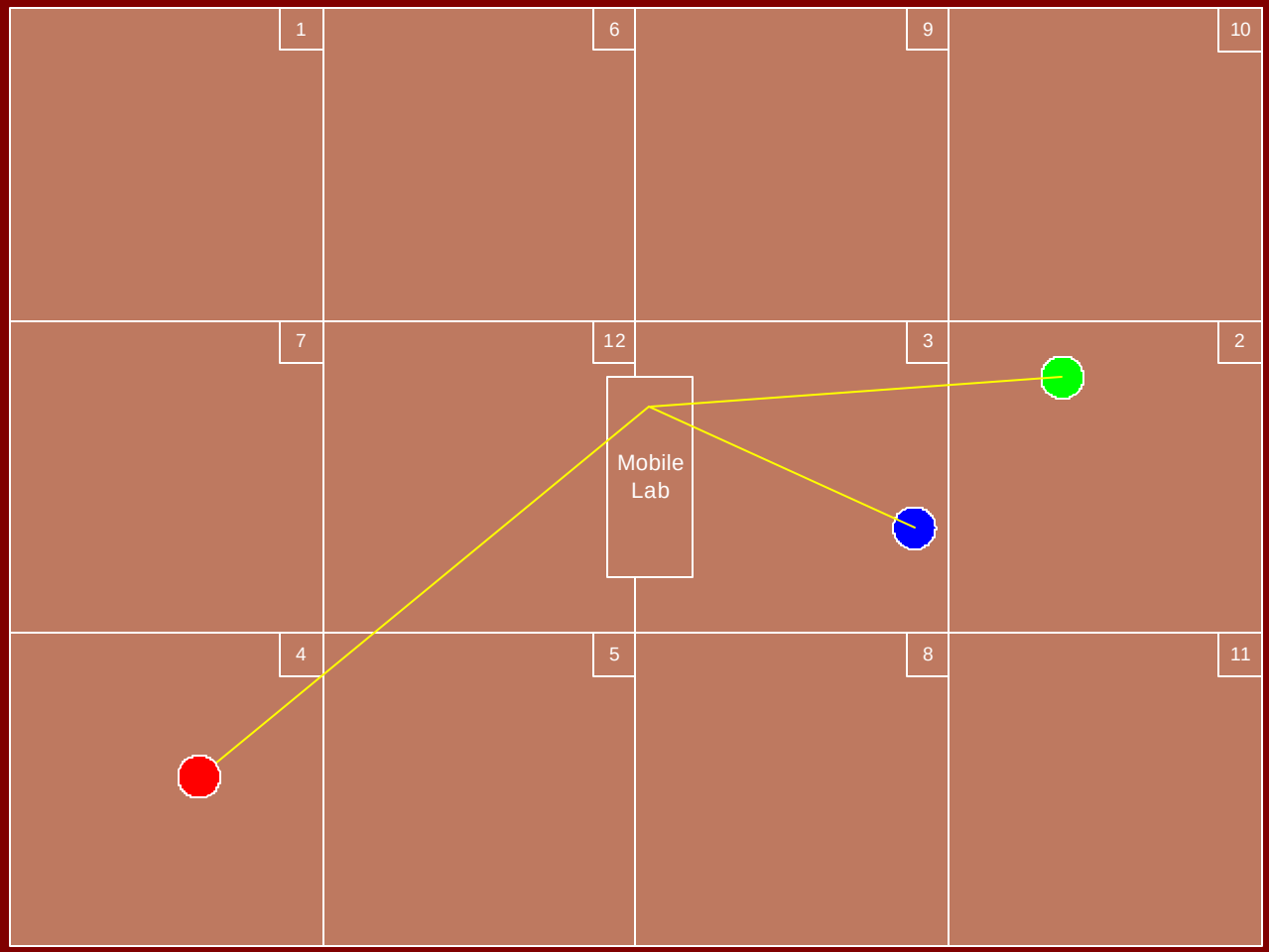

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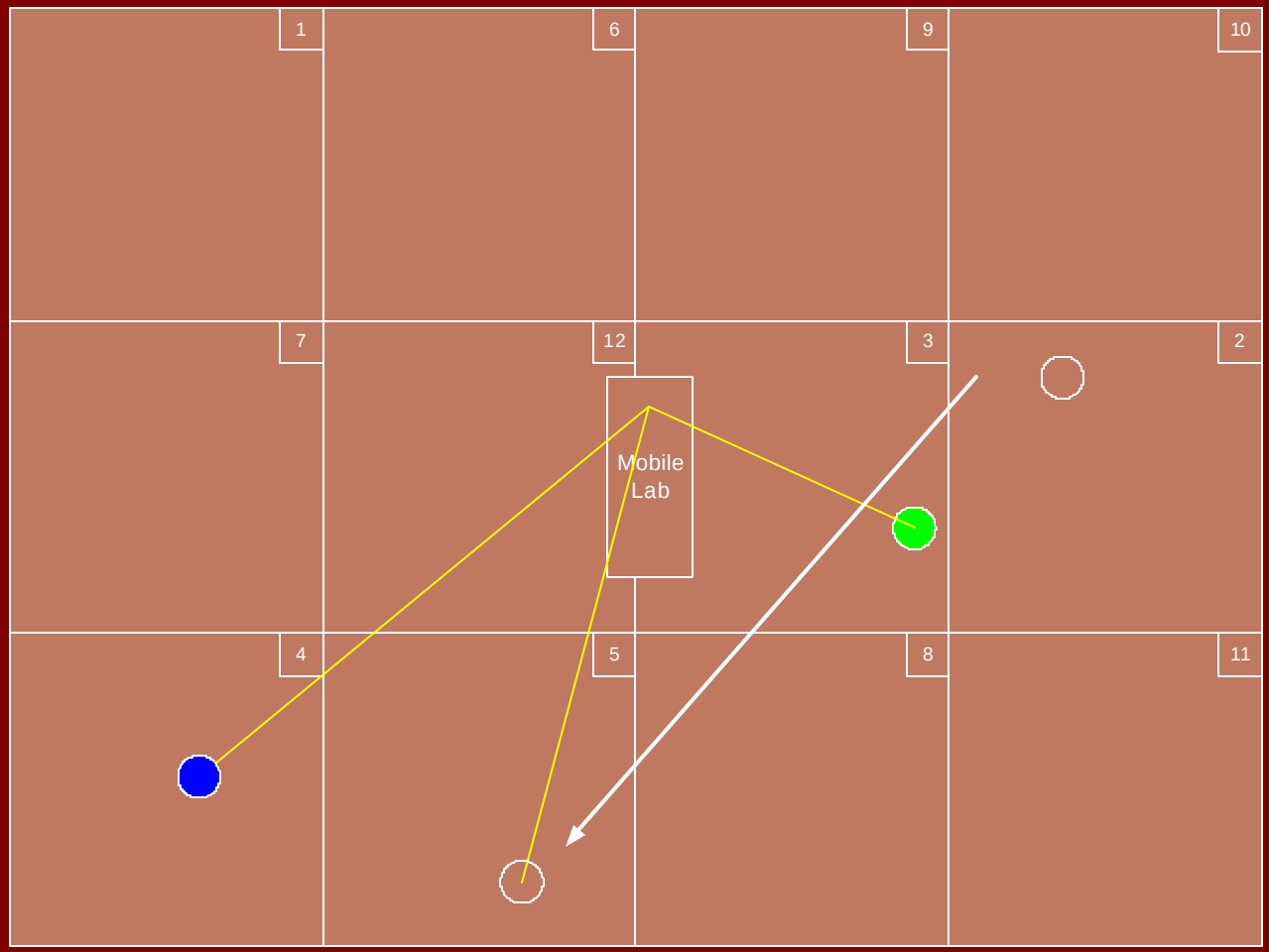

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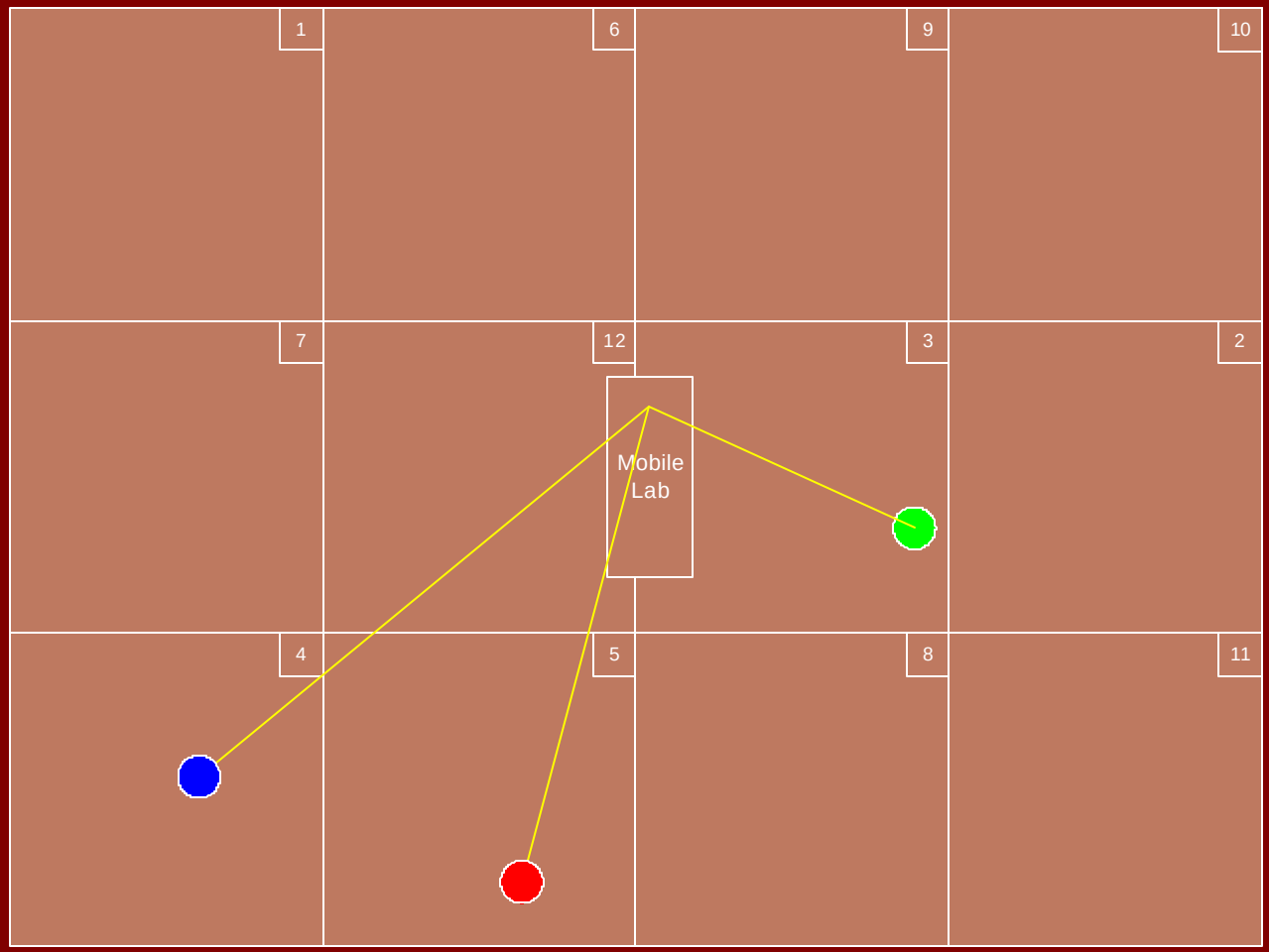

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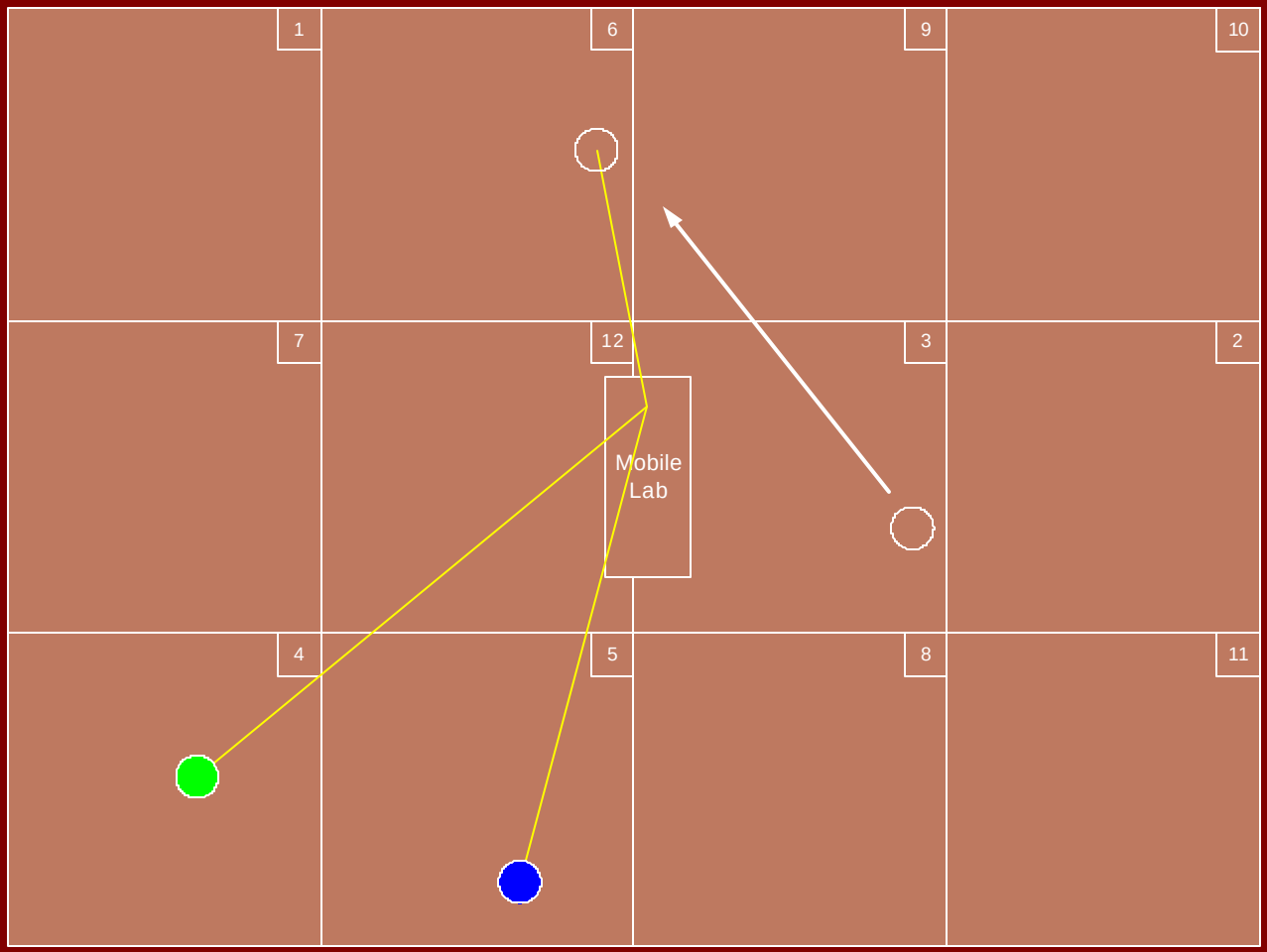

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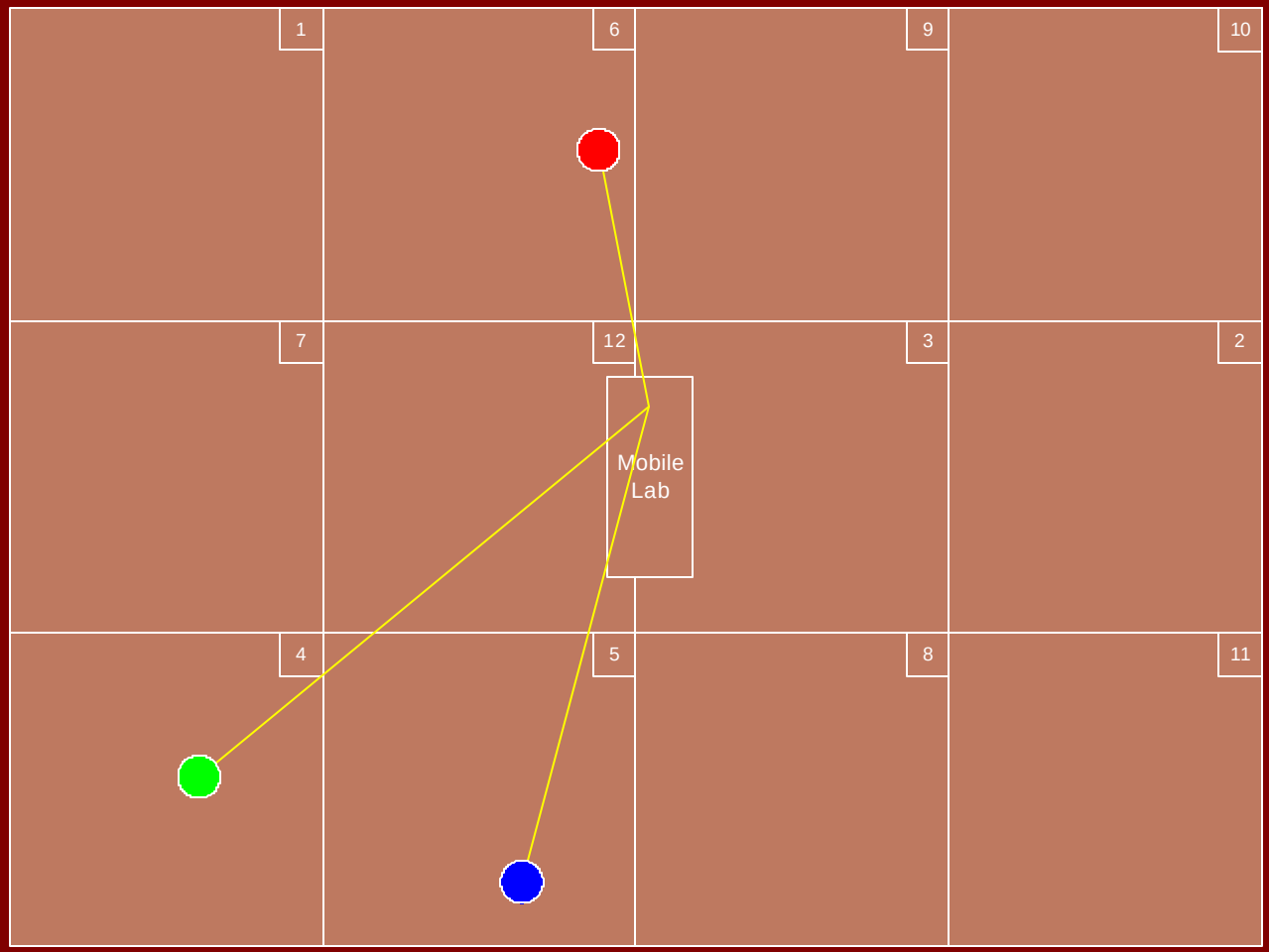

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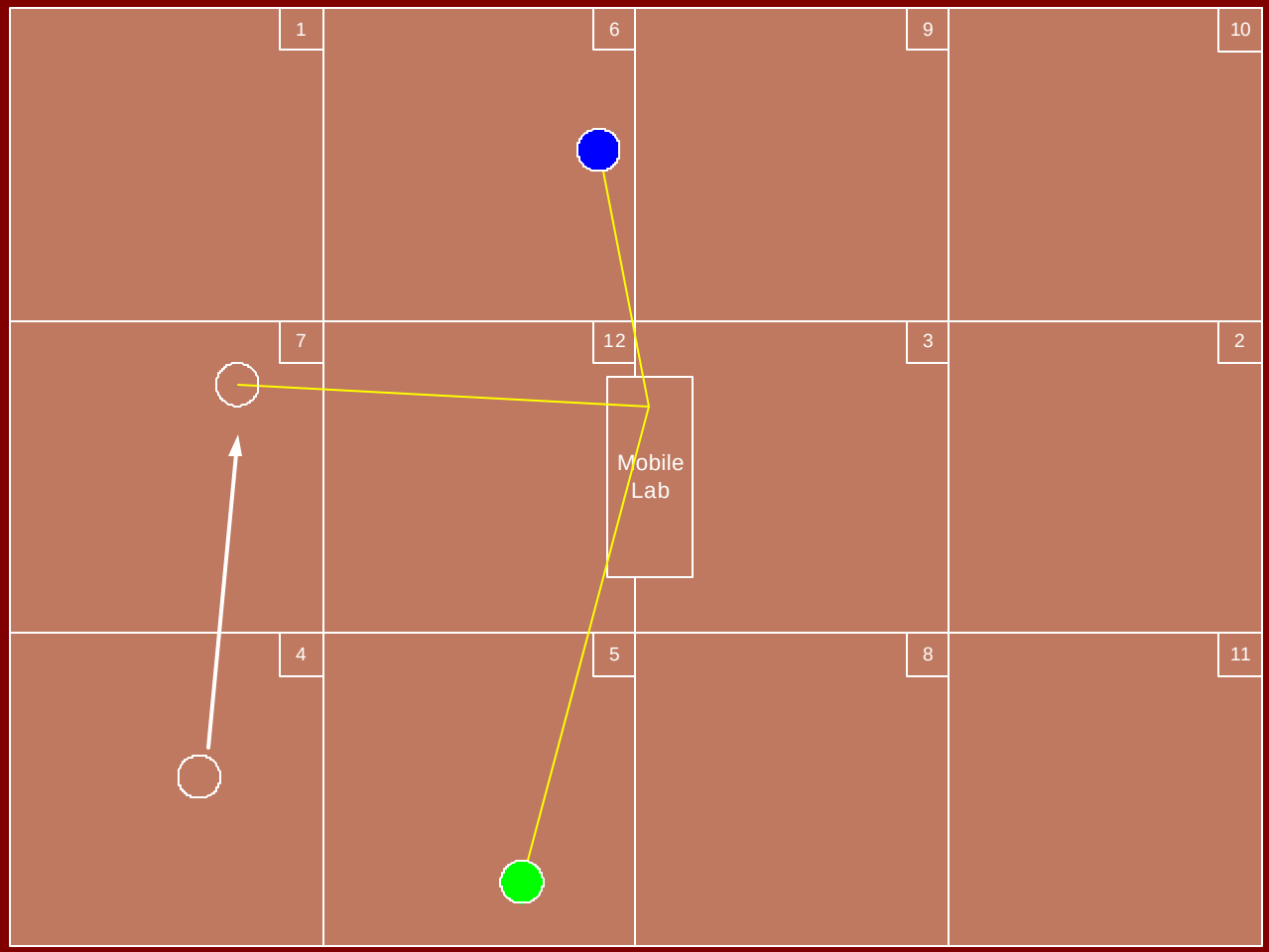

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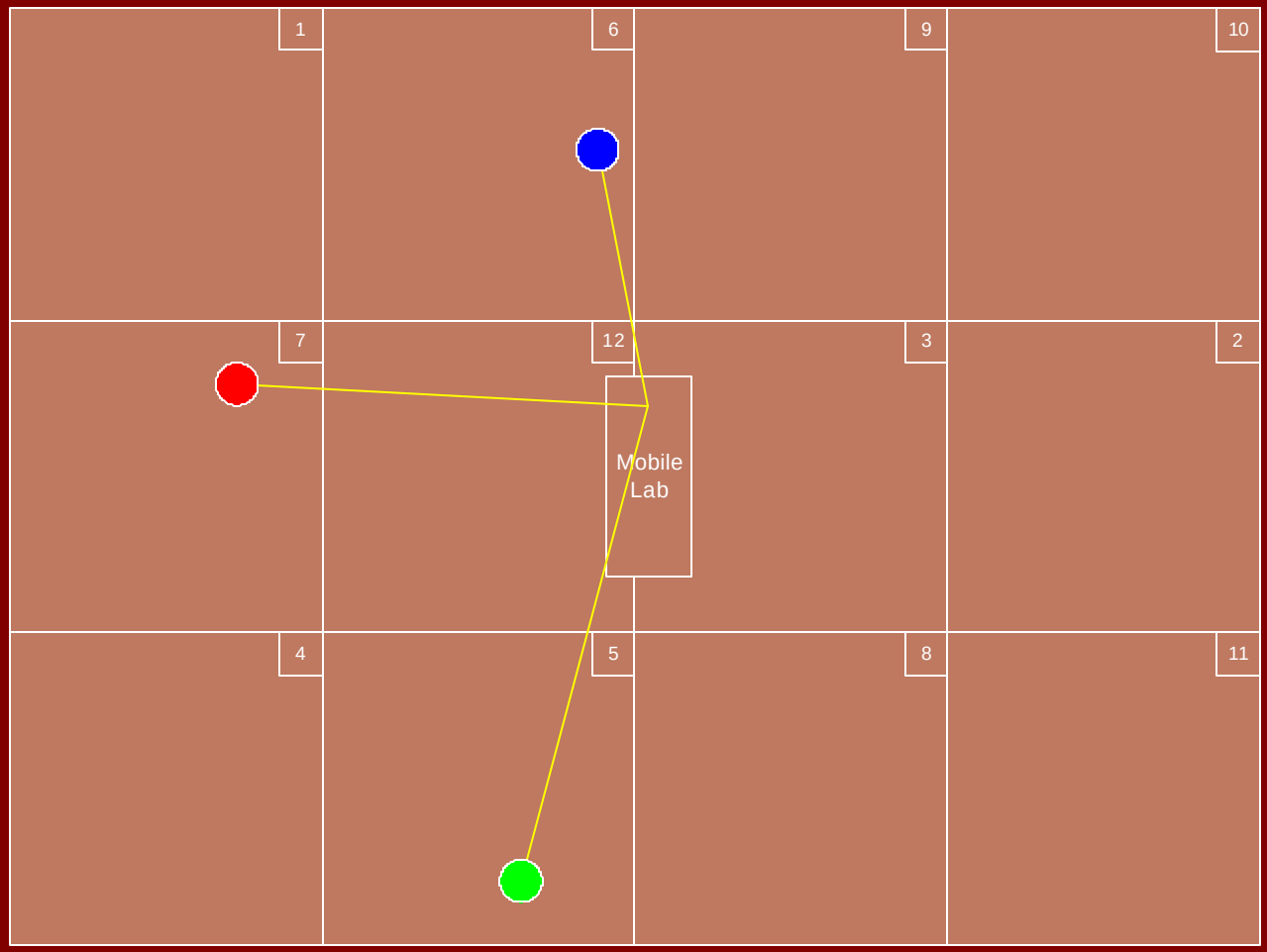

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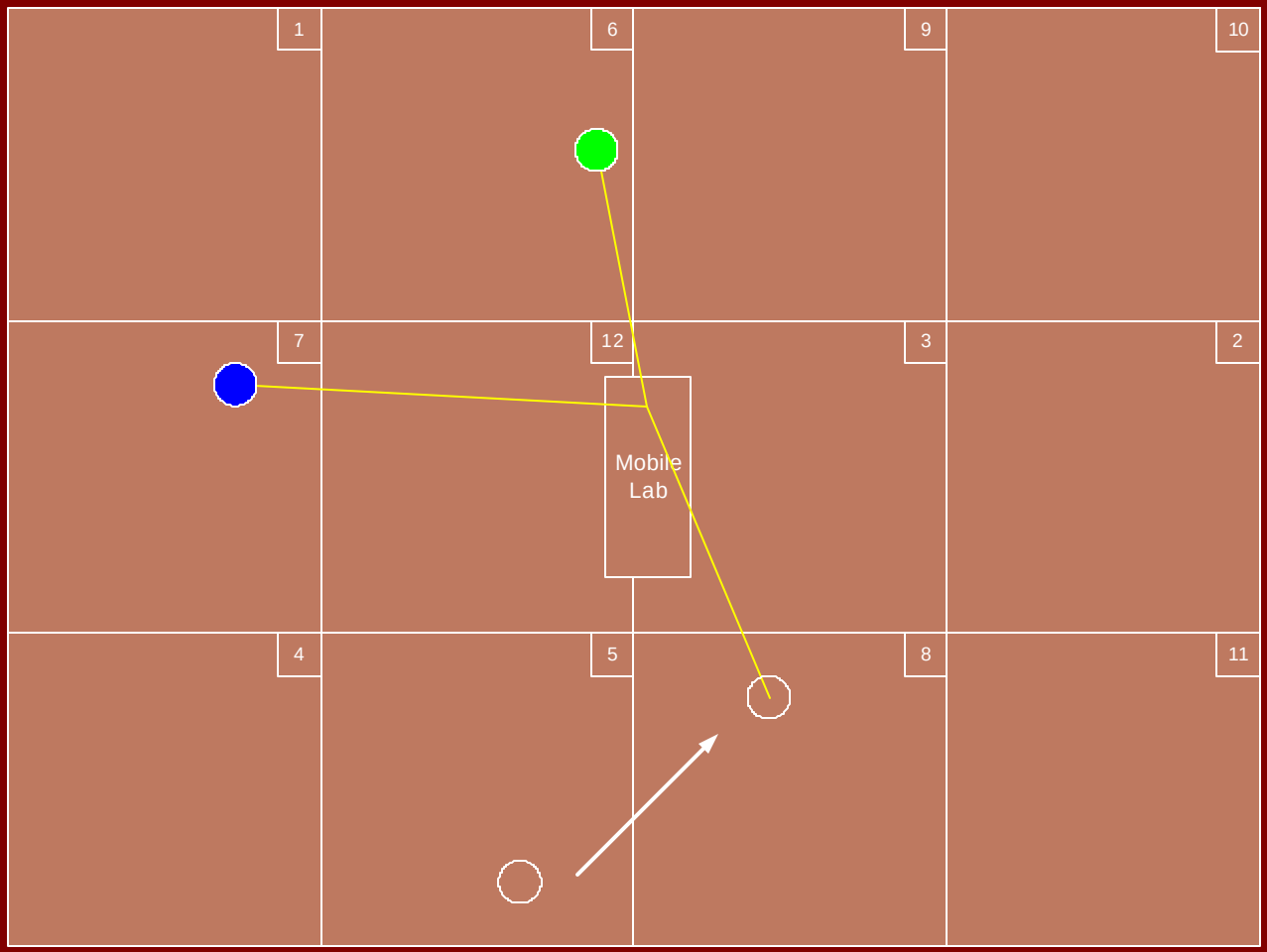

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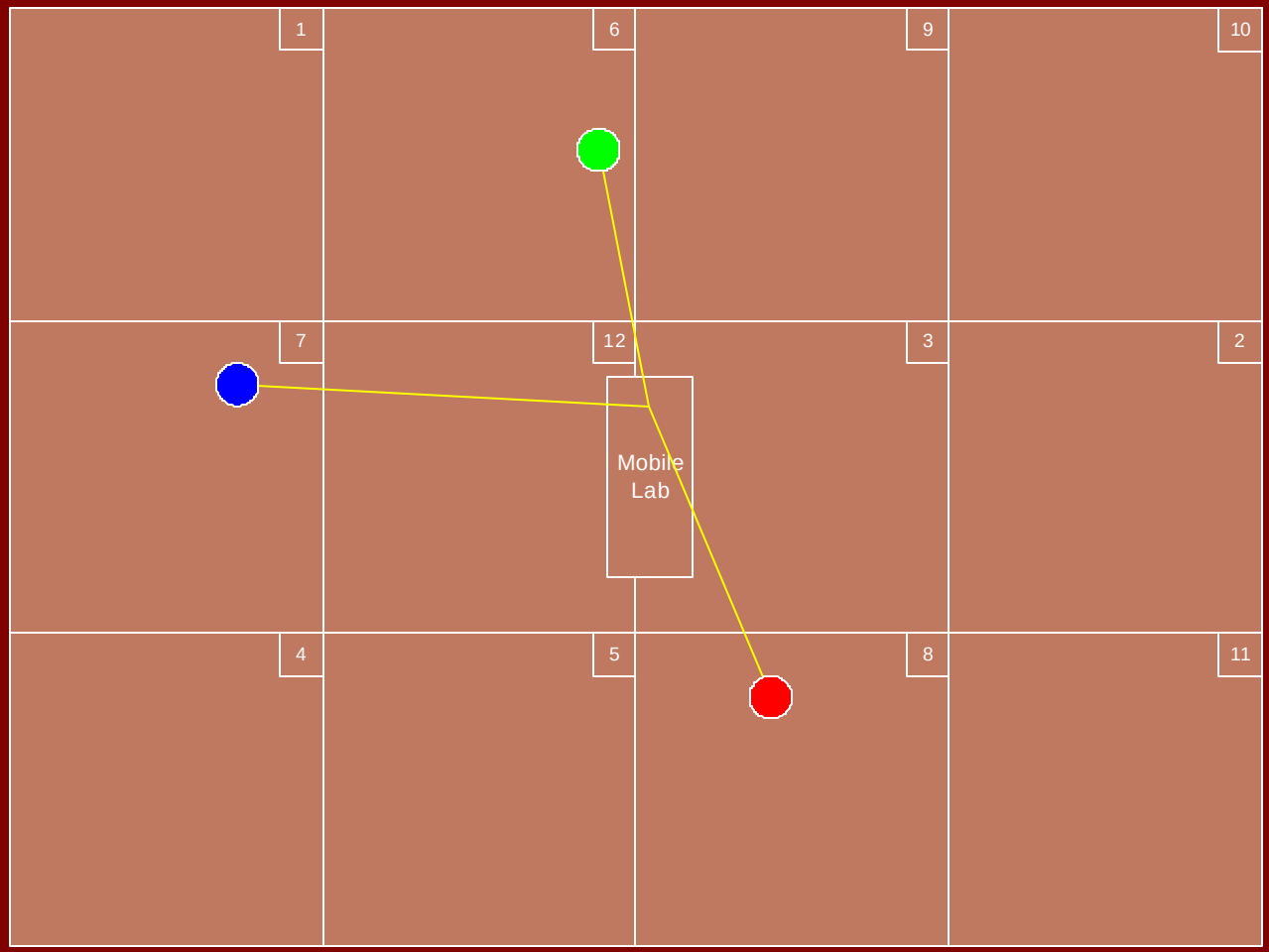

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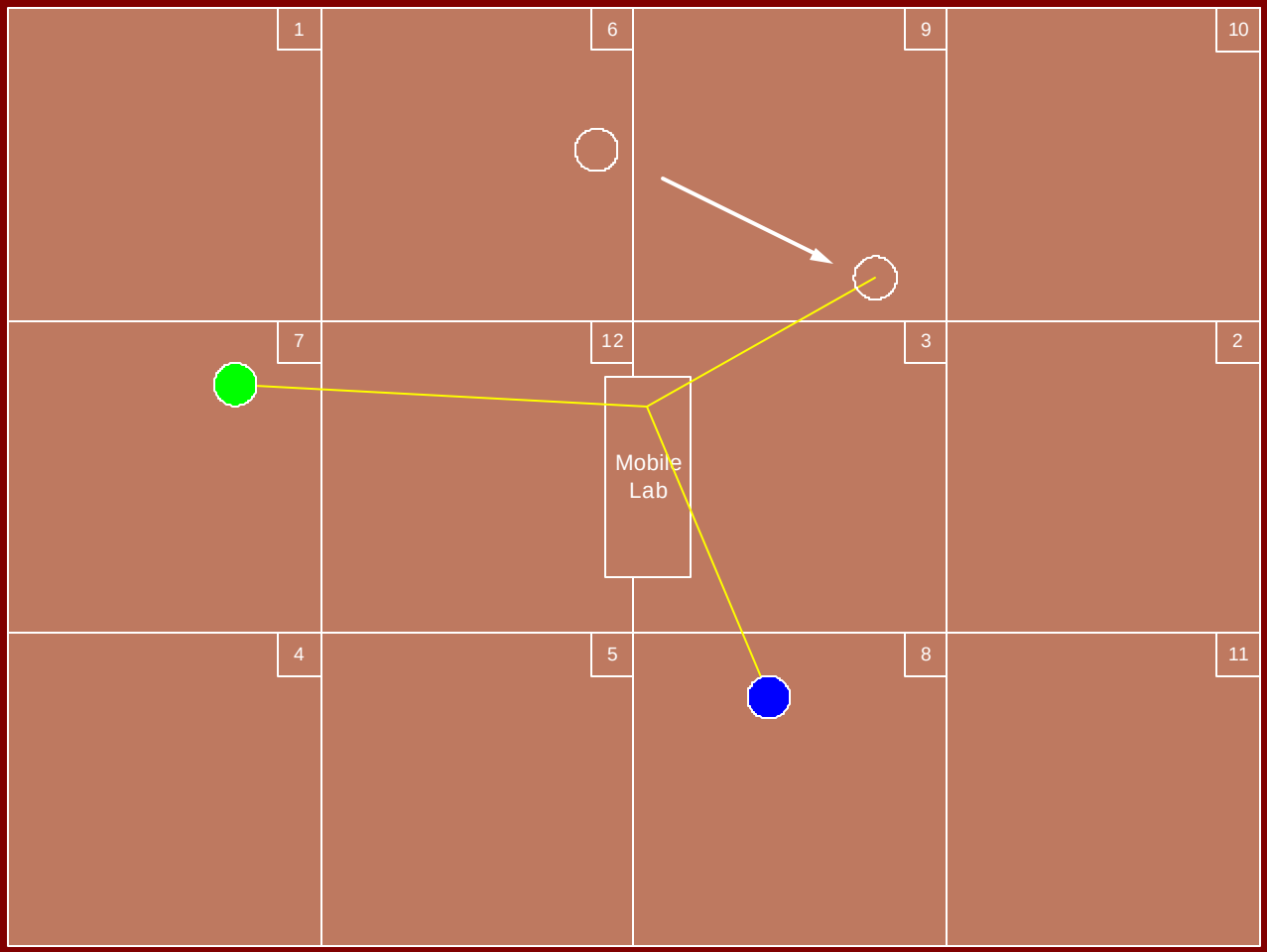

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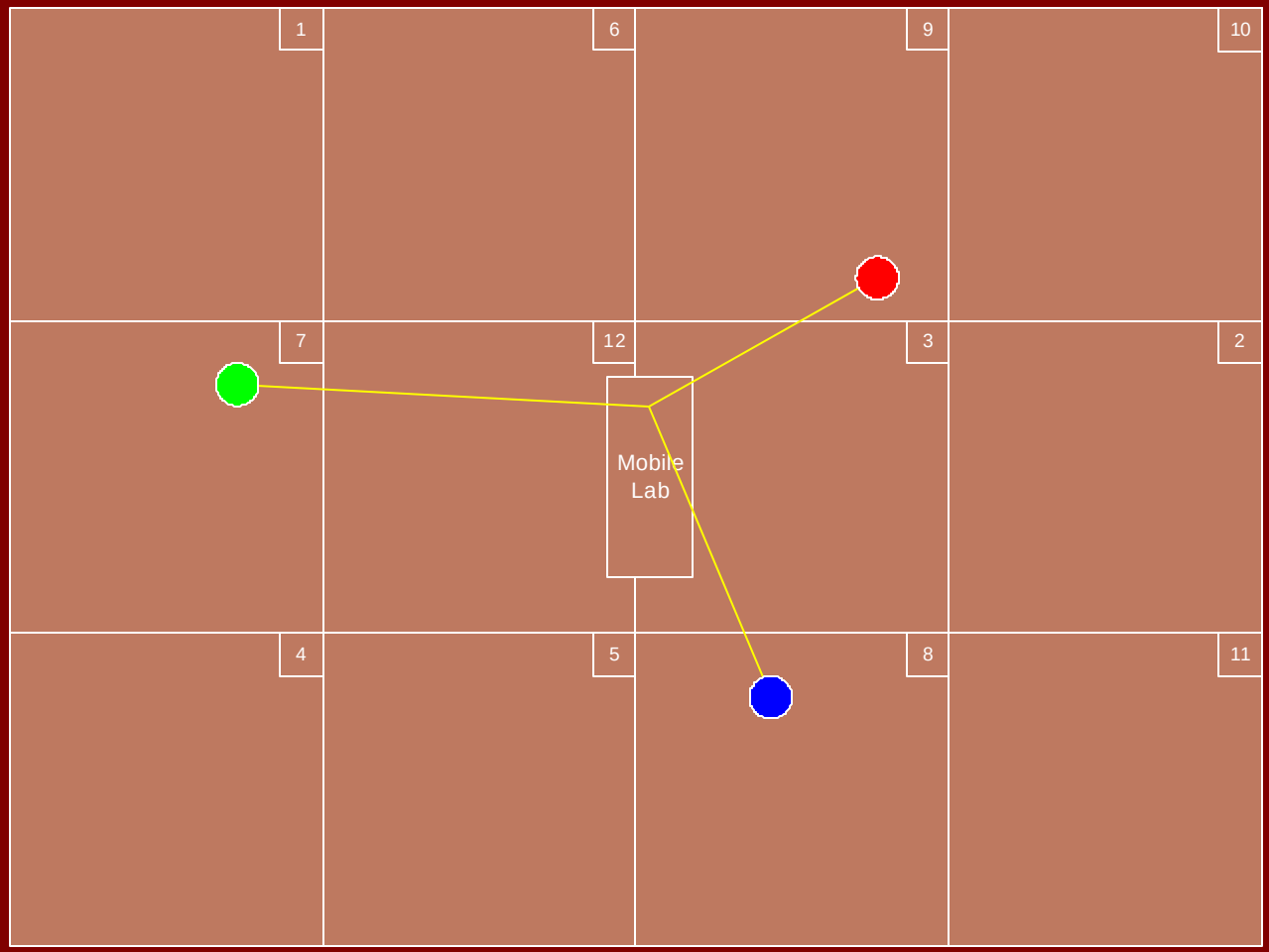

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Multiplexer Sampling Protocol

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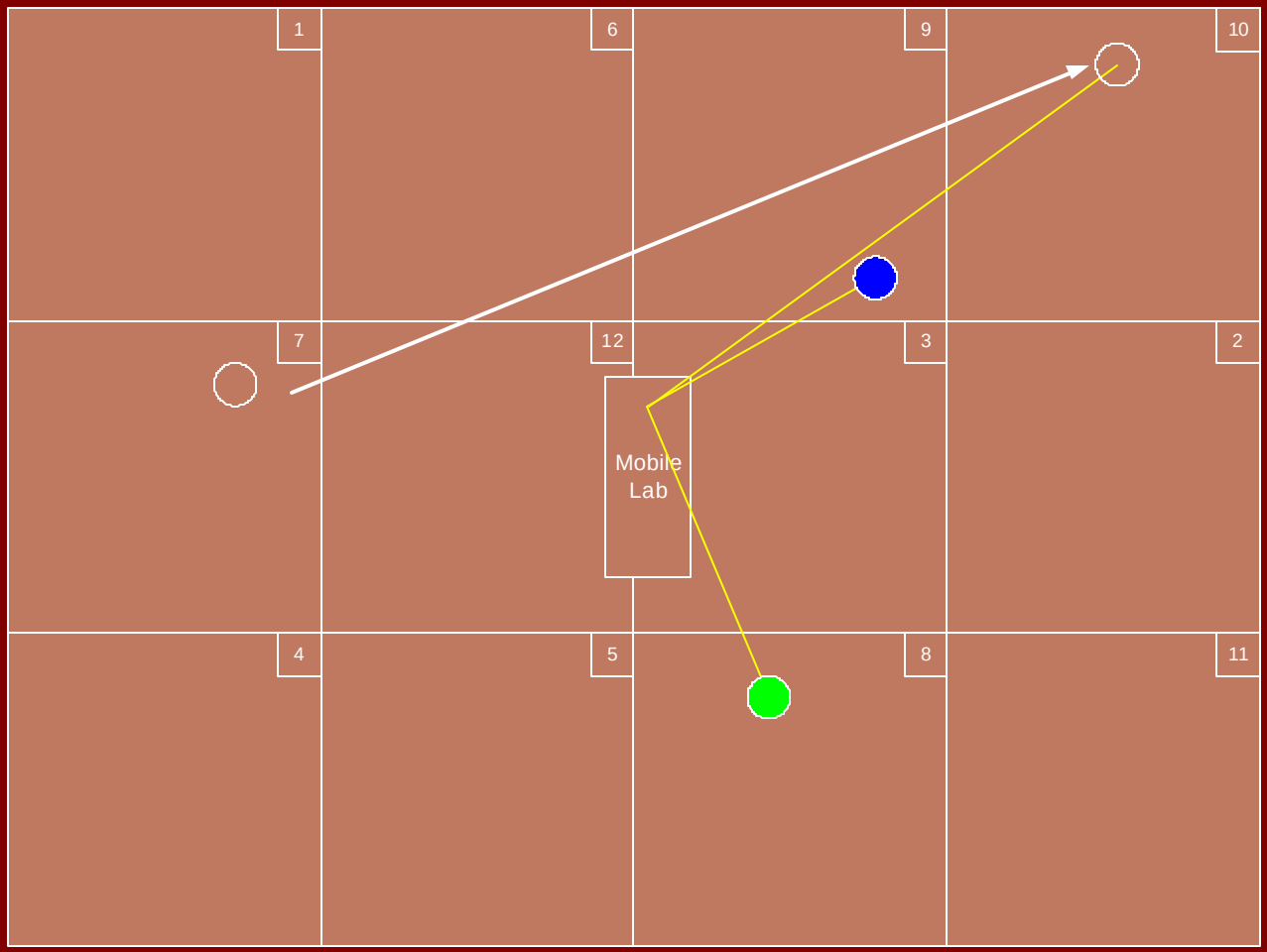

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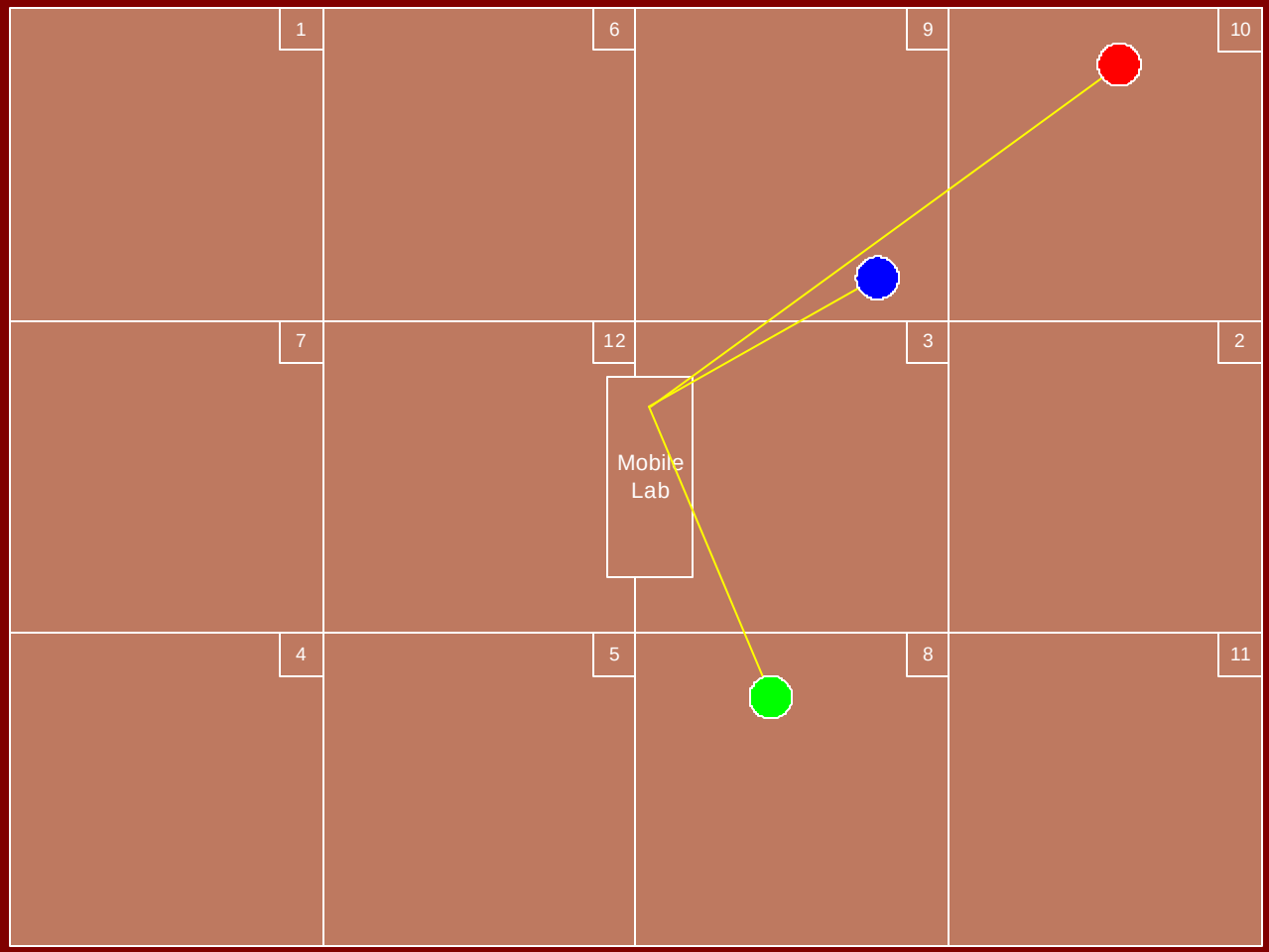

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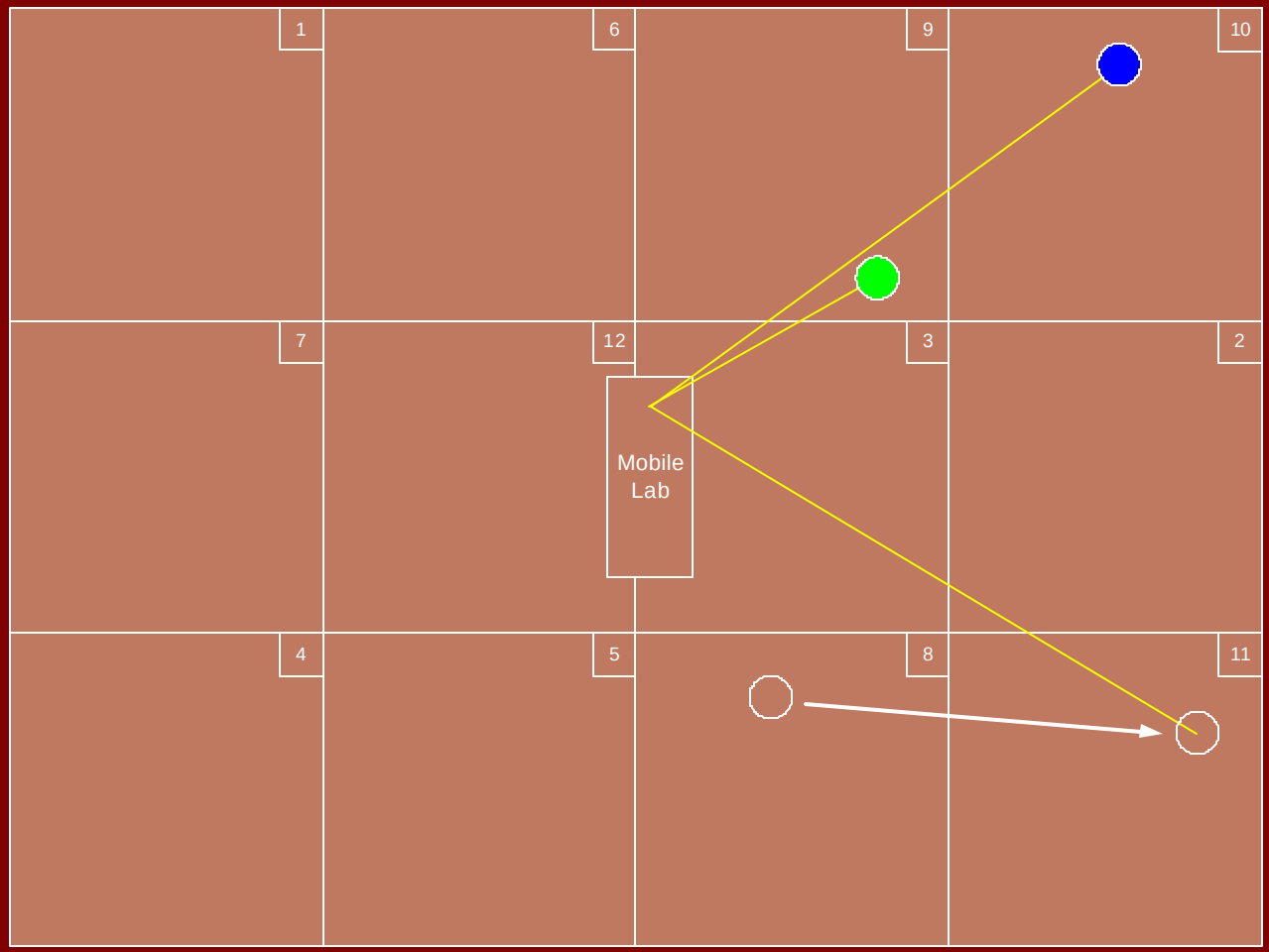

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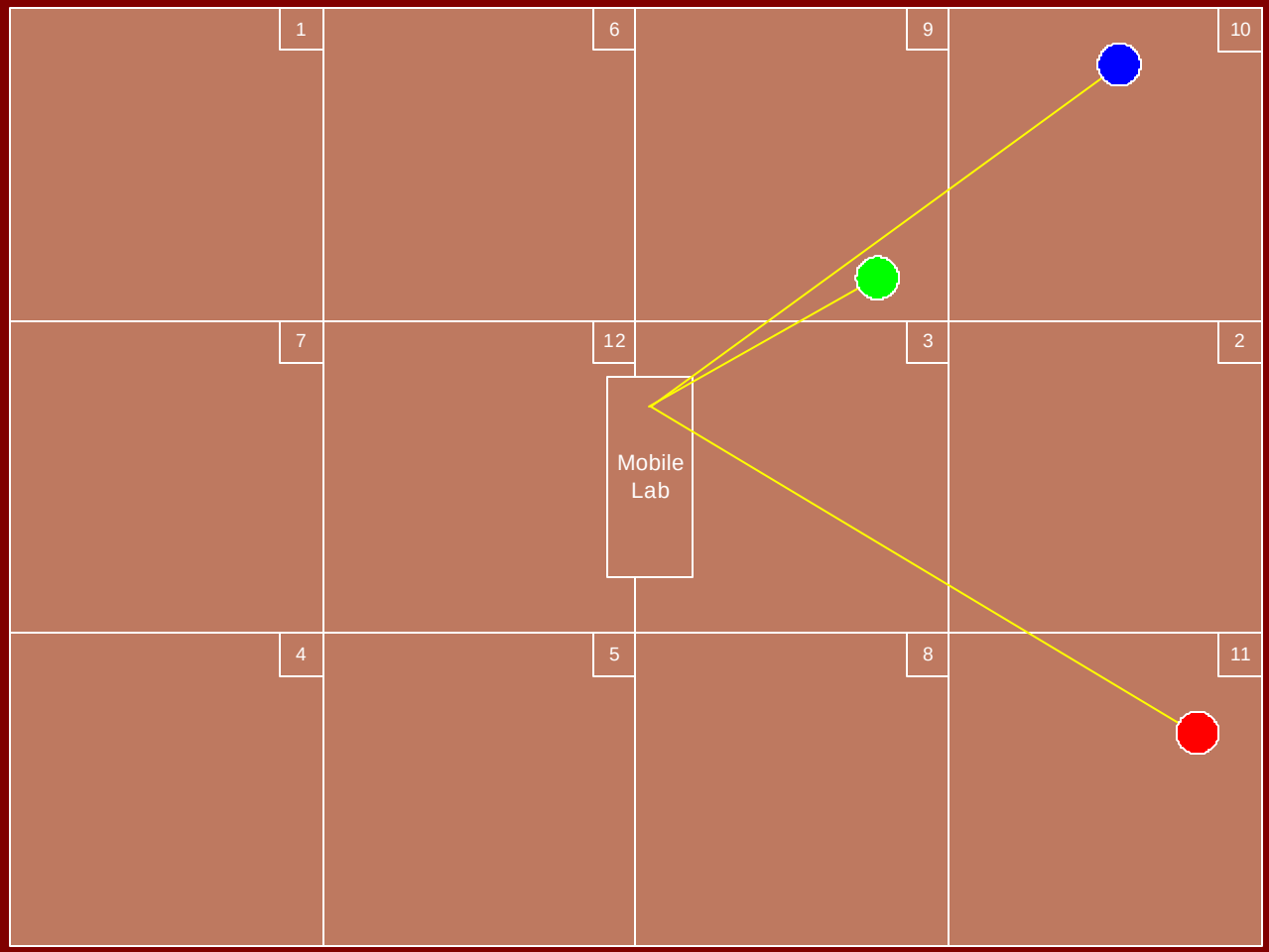

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Multiplexer Sampling Protocol

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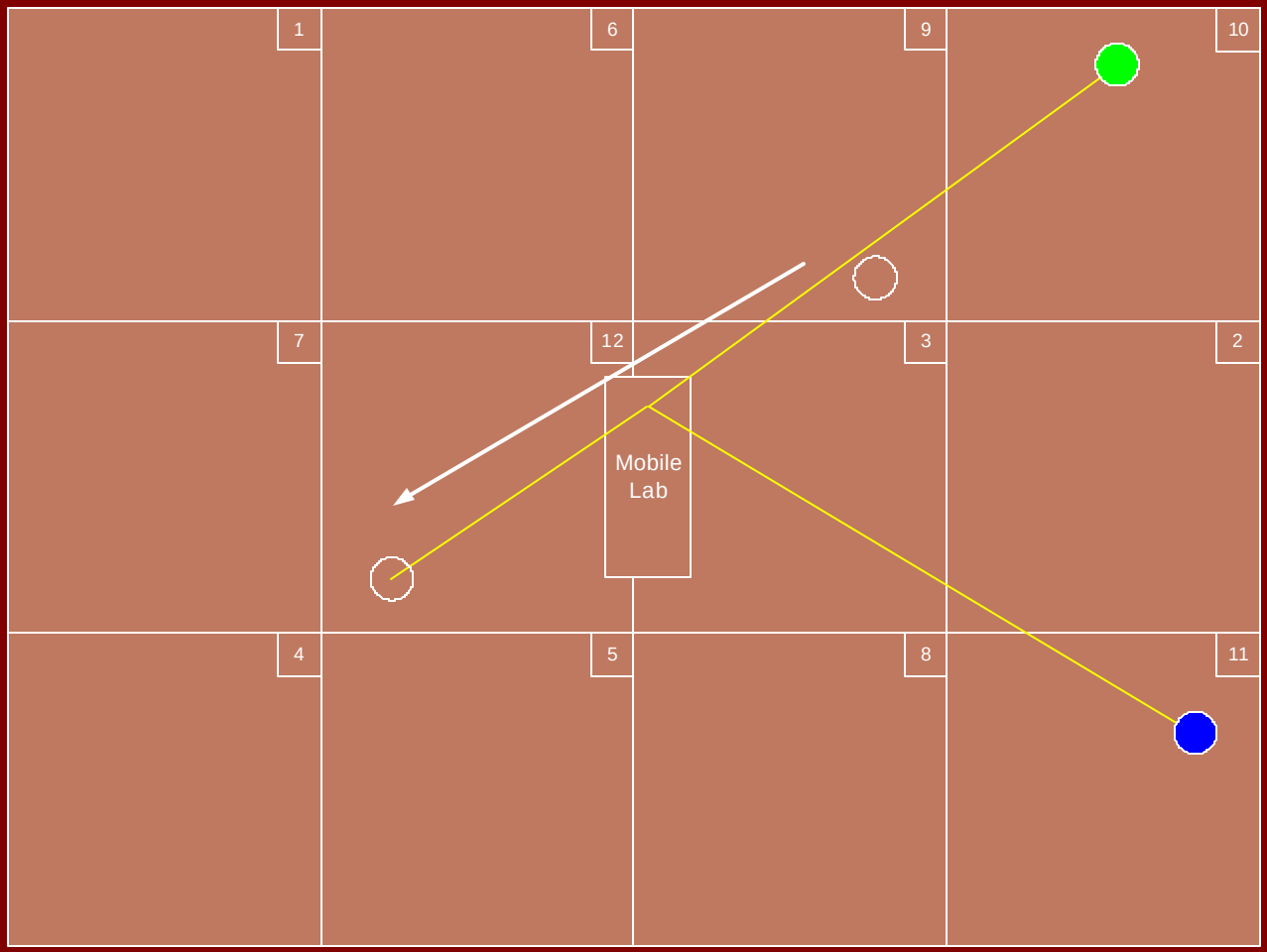

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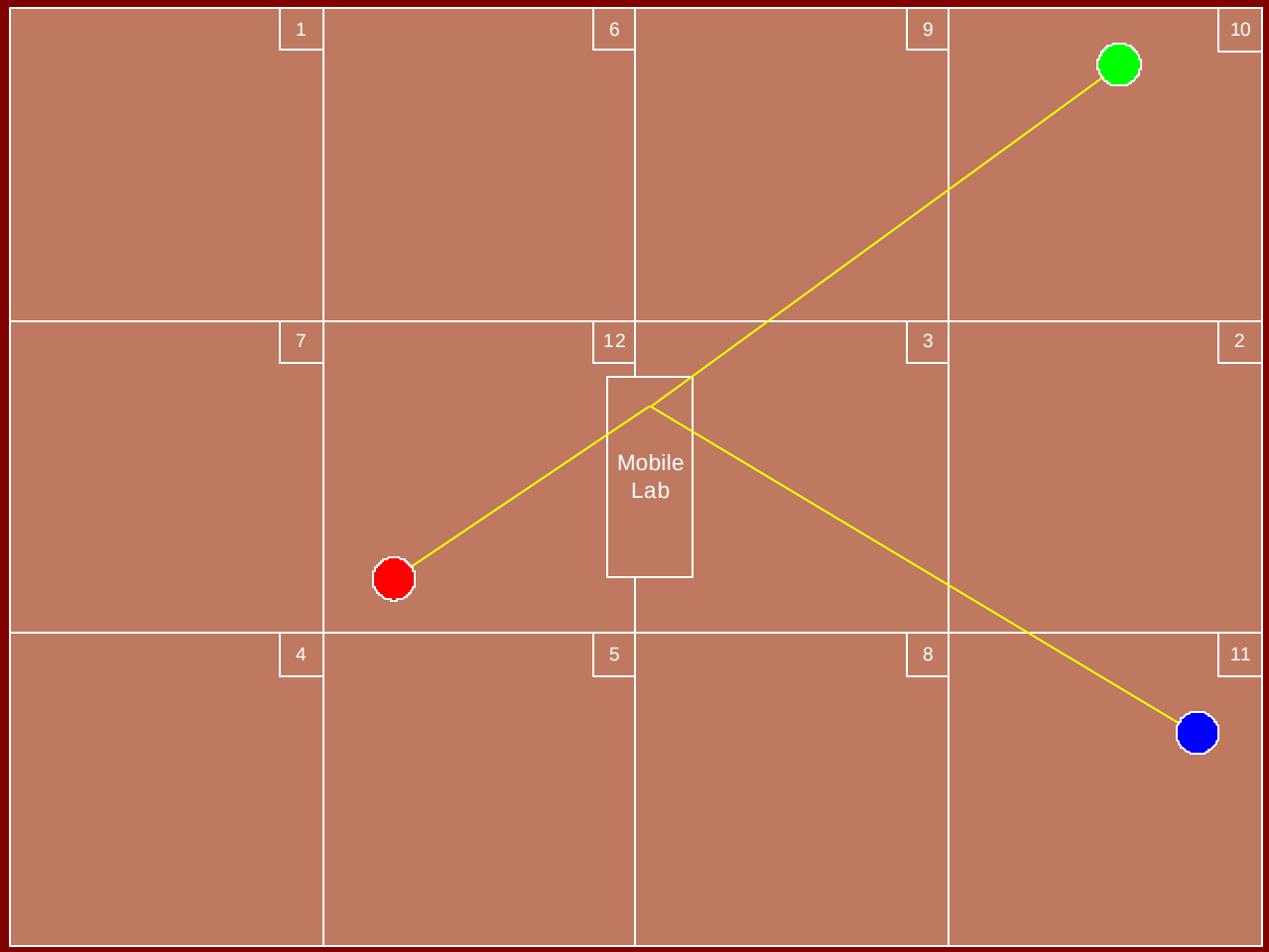

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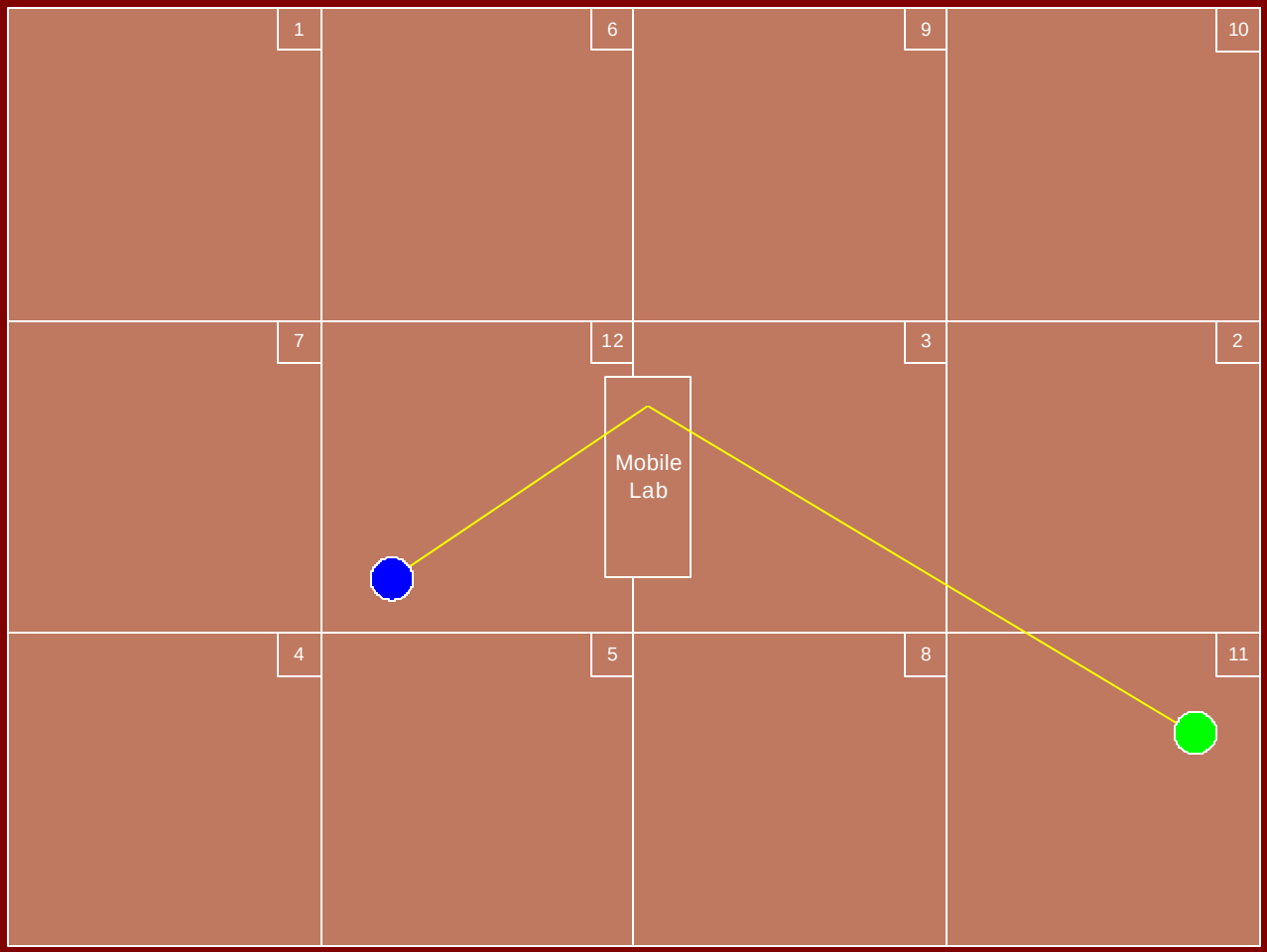

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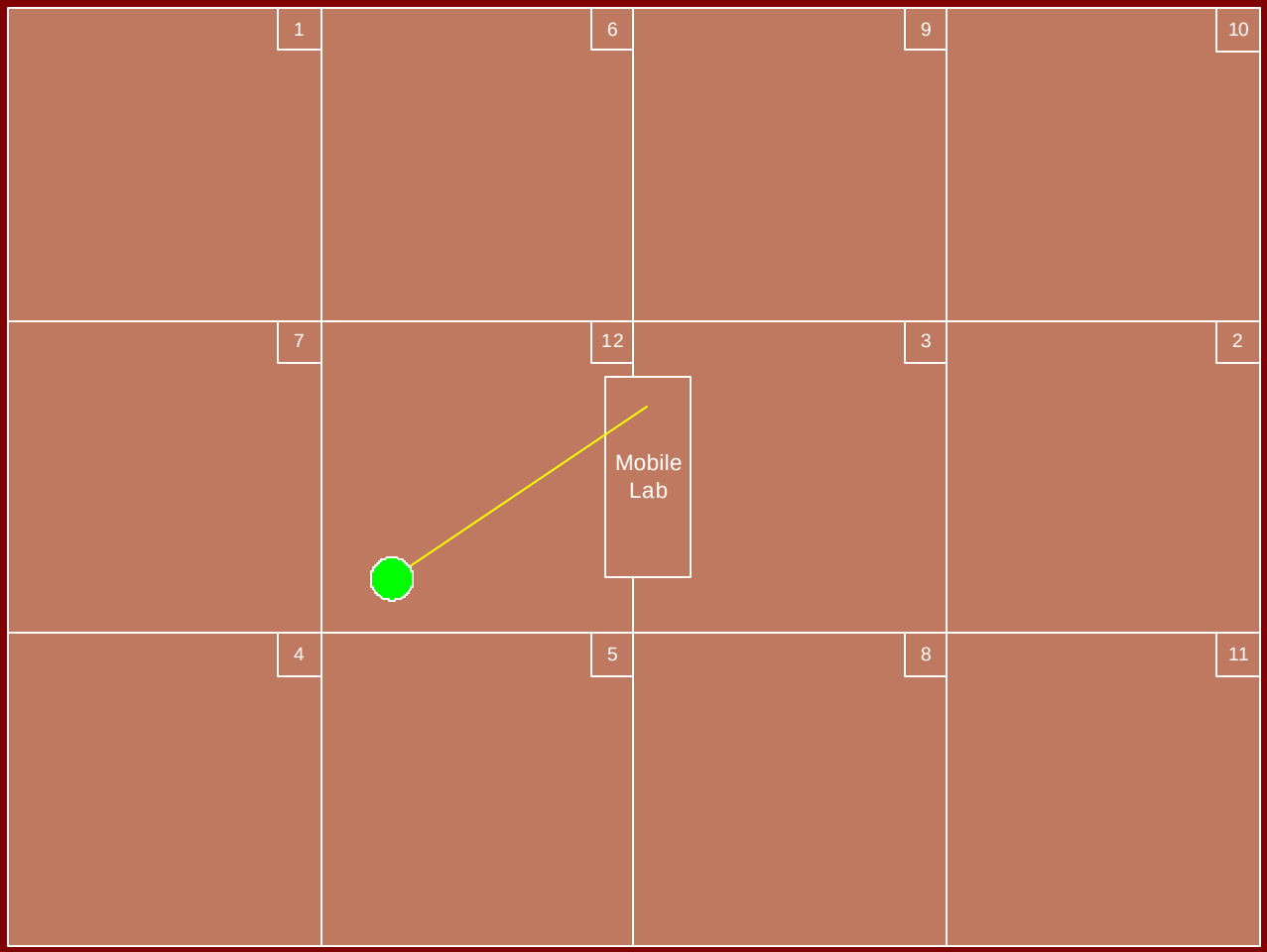
3:01 pm



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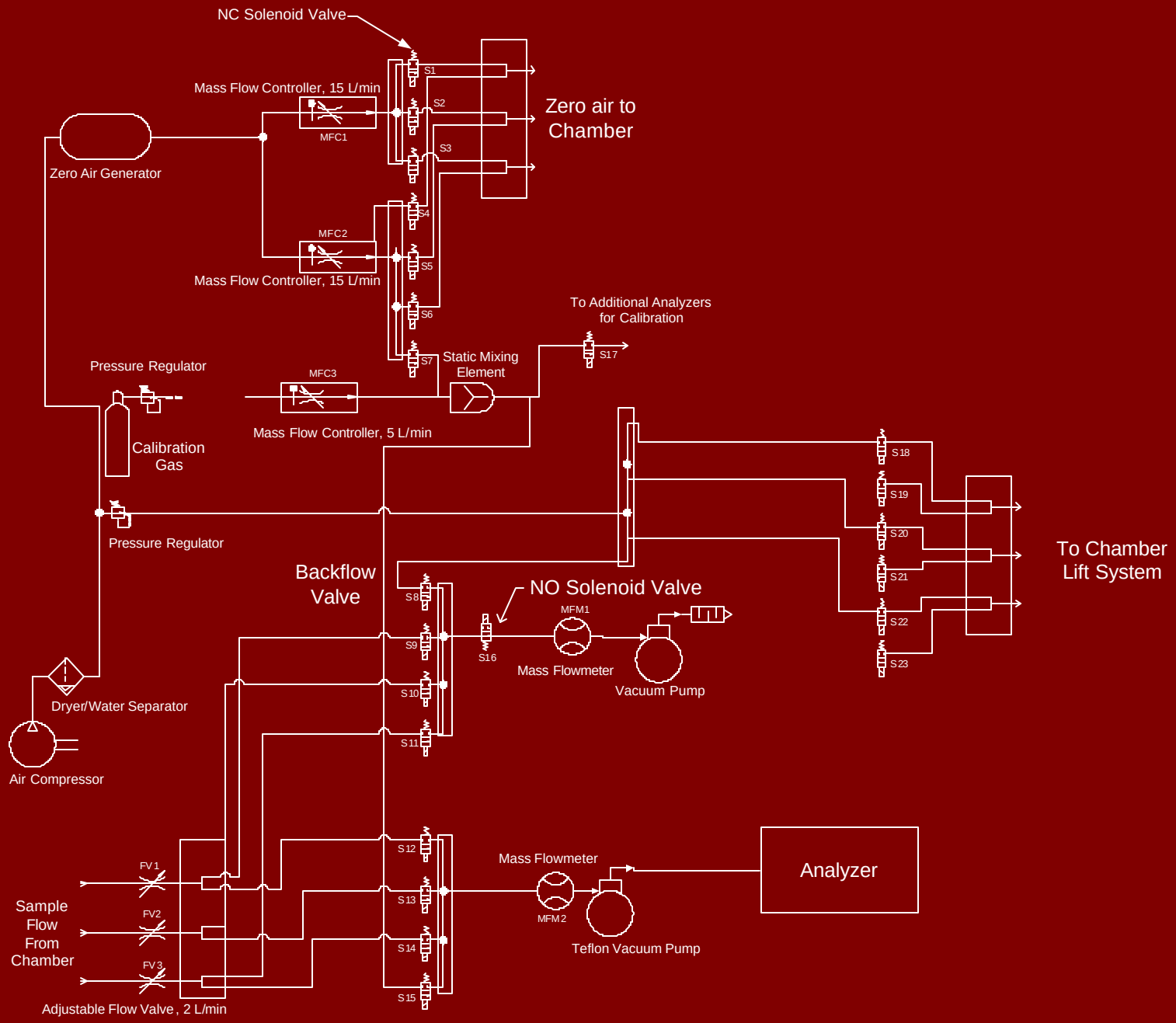
System Design

- 23 solenoid valves
- 3 mass flow controllers
- 1 Mass flow meter
- 3 Flow valves
- Control system
- Outdoor Enclosure

System Design



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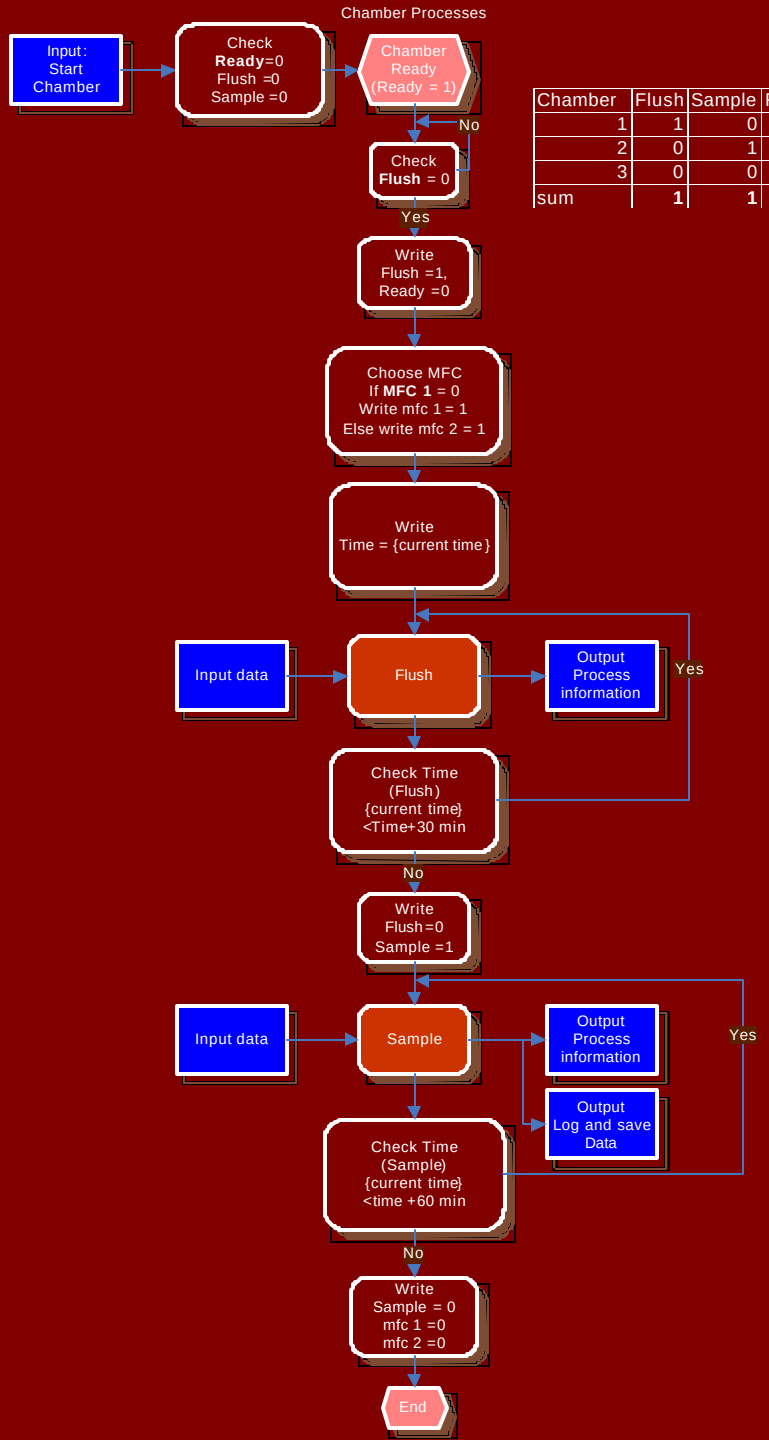
Chamber Process Controller



Chamber	Flush	Sample	Ready	mfc1	mfc2	T(chamber)
1	1	0	0	0	1	8:30
2	0	1	0	1	0	8:00
3	0	0	0	0	0	
sum	**1**	**1**	**0**	**1**	**1**	

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Benefits of Multiplexing

- Ability to use equipment at full capacity
- Increase data collection capacity
- Increase sampling rate

Results from 2002-2004

- No multiplexer (2002)
  - 16 hr/day, 4 days
  - 29 samples
- 1 multiplexer (2003)
  - 16 hr/day, 4 days
  - 55 samples
- 1 multiplexer (2004)
  - 24 hr/day, 4 days
  - 127 samples

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Additional requirements

- Computer control
- Error checking
- Data management
- Additional manpower

Concluding remarks

- Multiplexing allows more efficient use of resources
- Results in a lower cost to sample
- Multiplexer may be applicable to other gas sampling processes

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