

# Modes, Features, and State-Based Modeling for Clarity and Flexibility

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Mats P.E. Heimdahl



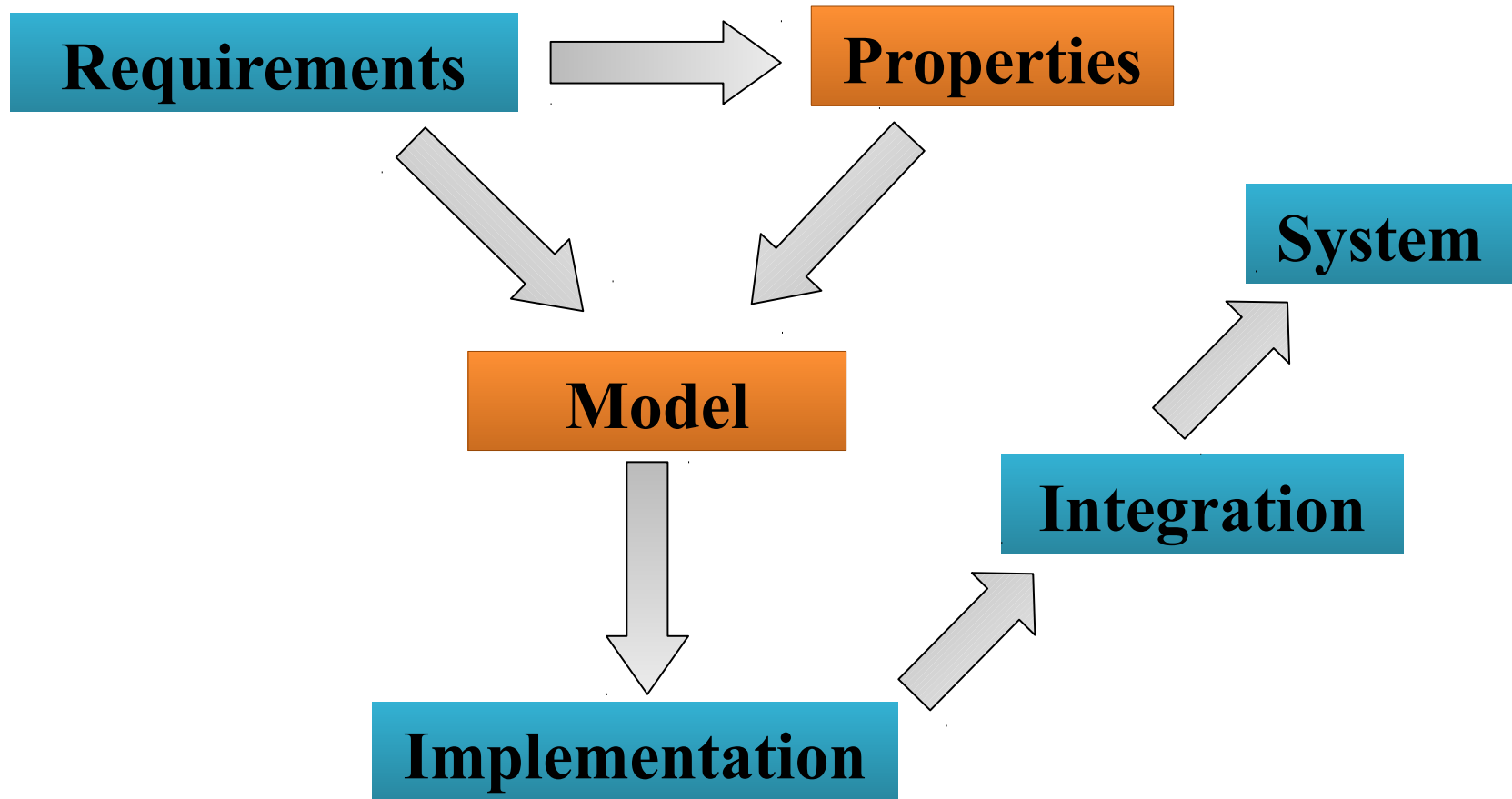
UNIVERSITY OF MINNESOTA

Department of Computer Science and Engineering

# Critical Systems



# Model Based Development



# Modal System Behavior



# Modal? System Behavior



**Modes**



**Features**



**Therapies**

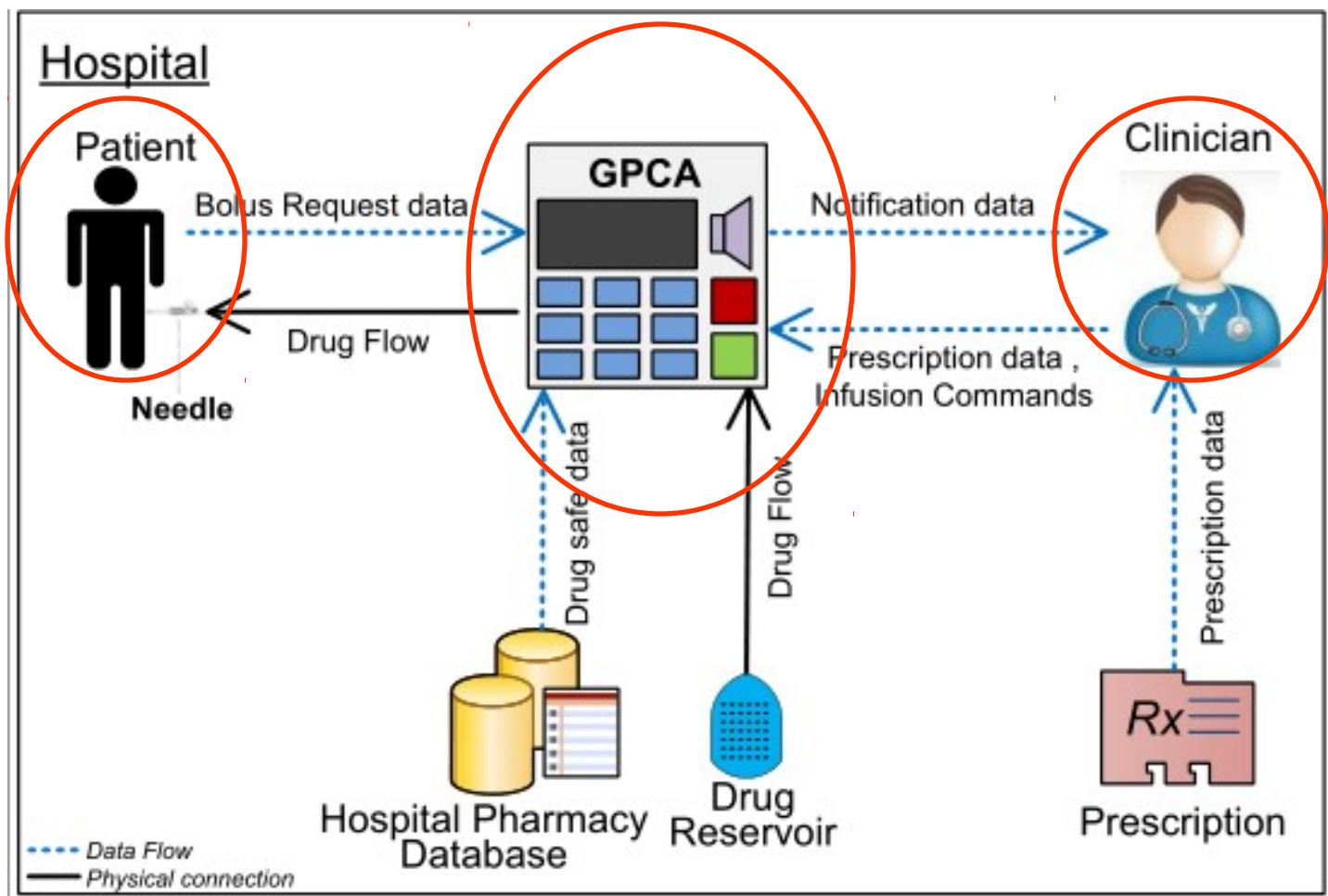


**States**

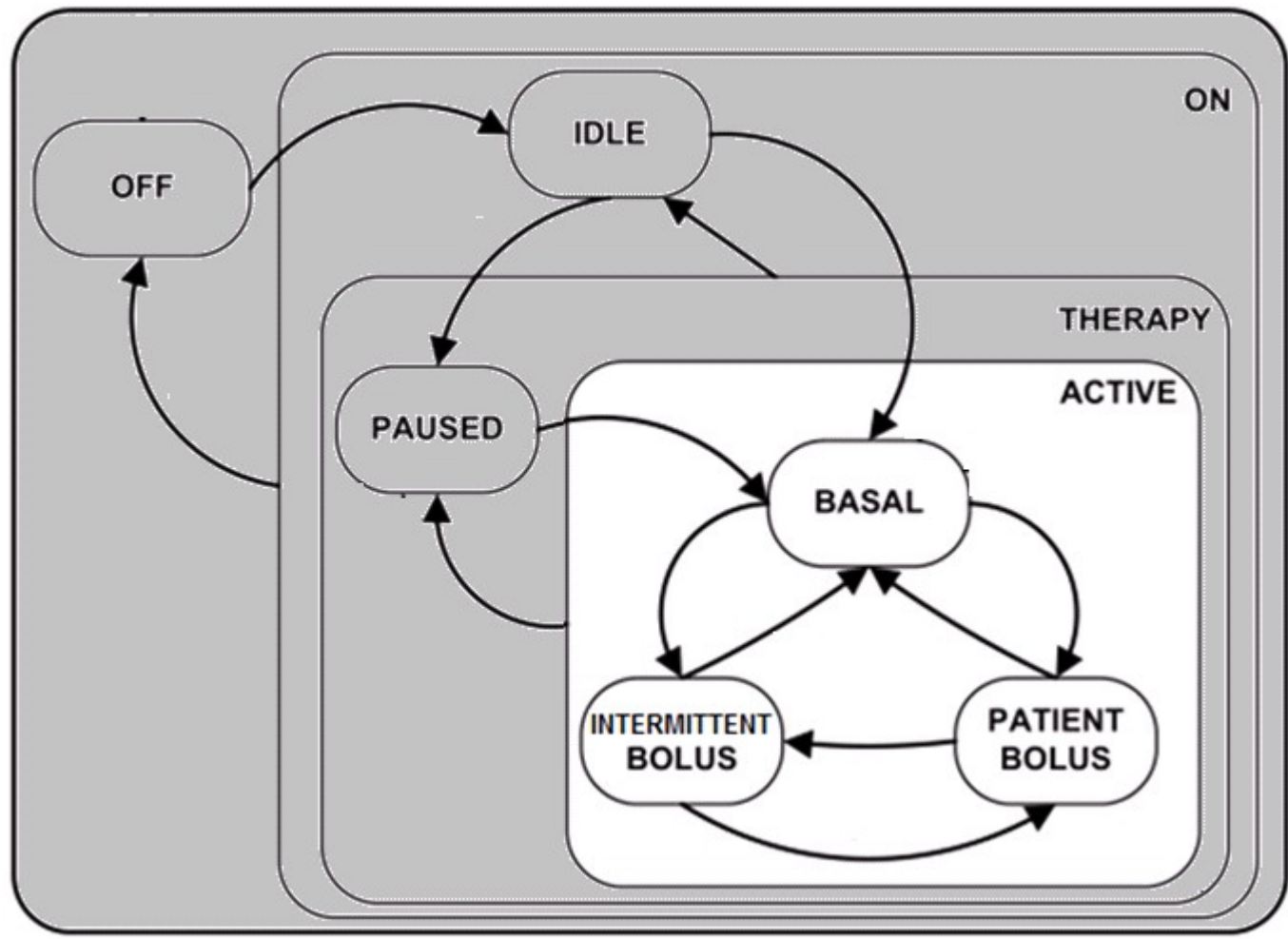


# Infusion Pump

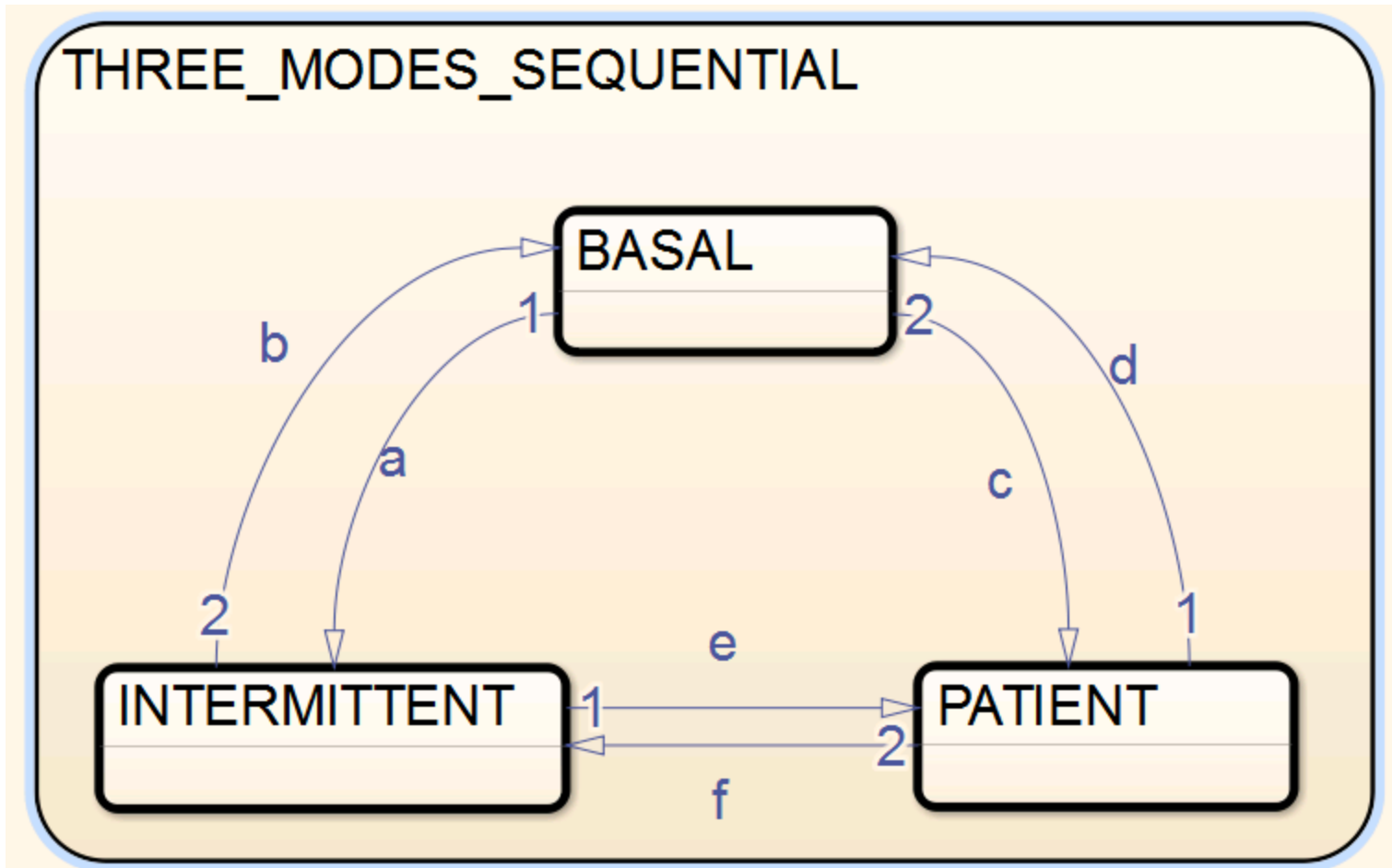
## Generic Patient Controlled Analgesia (GPCA)



# GPCA Behaviors

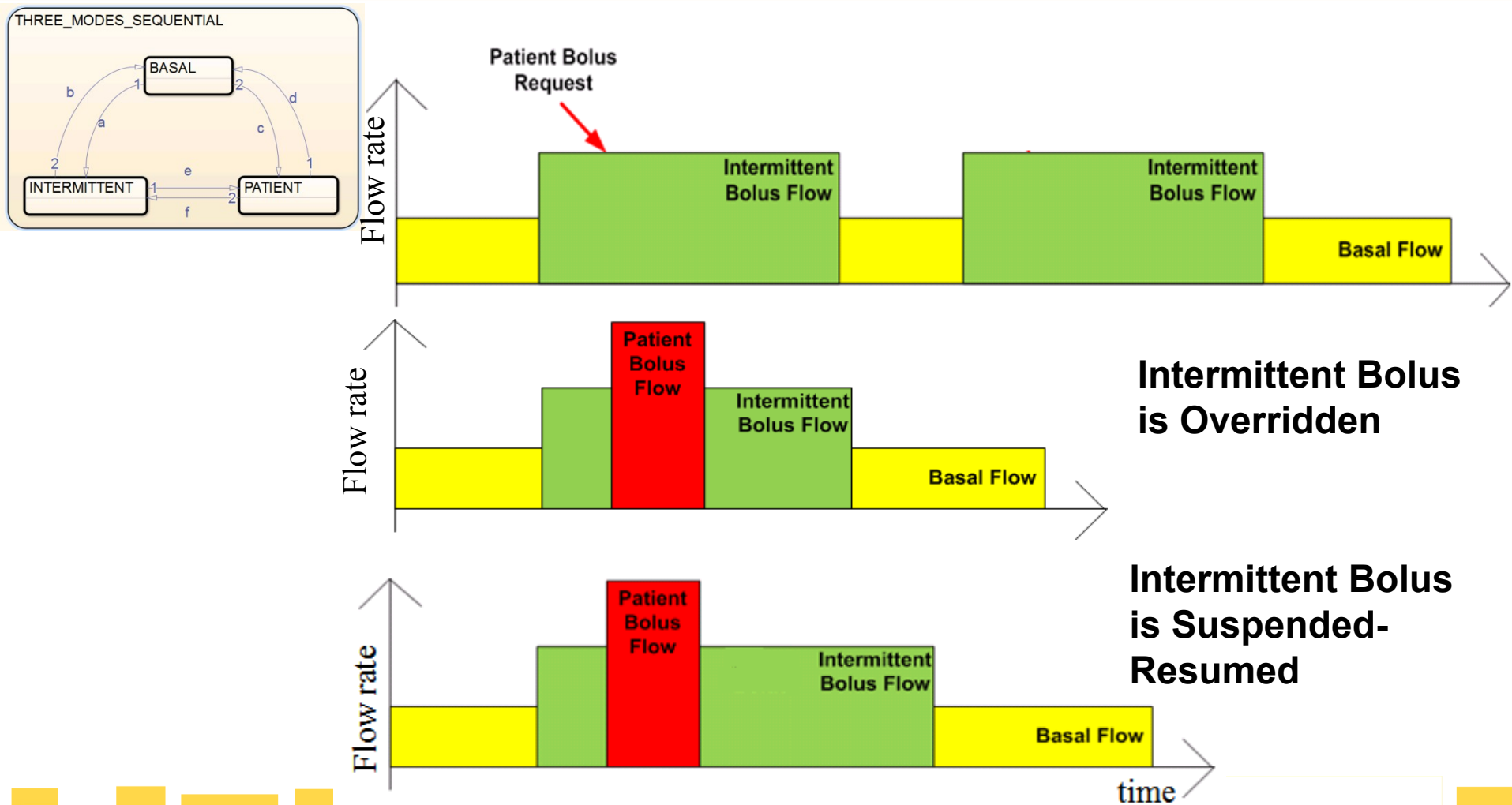


# Sequential Organization

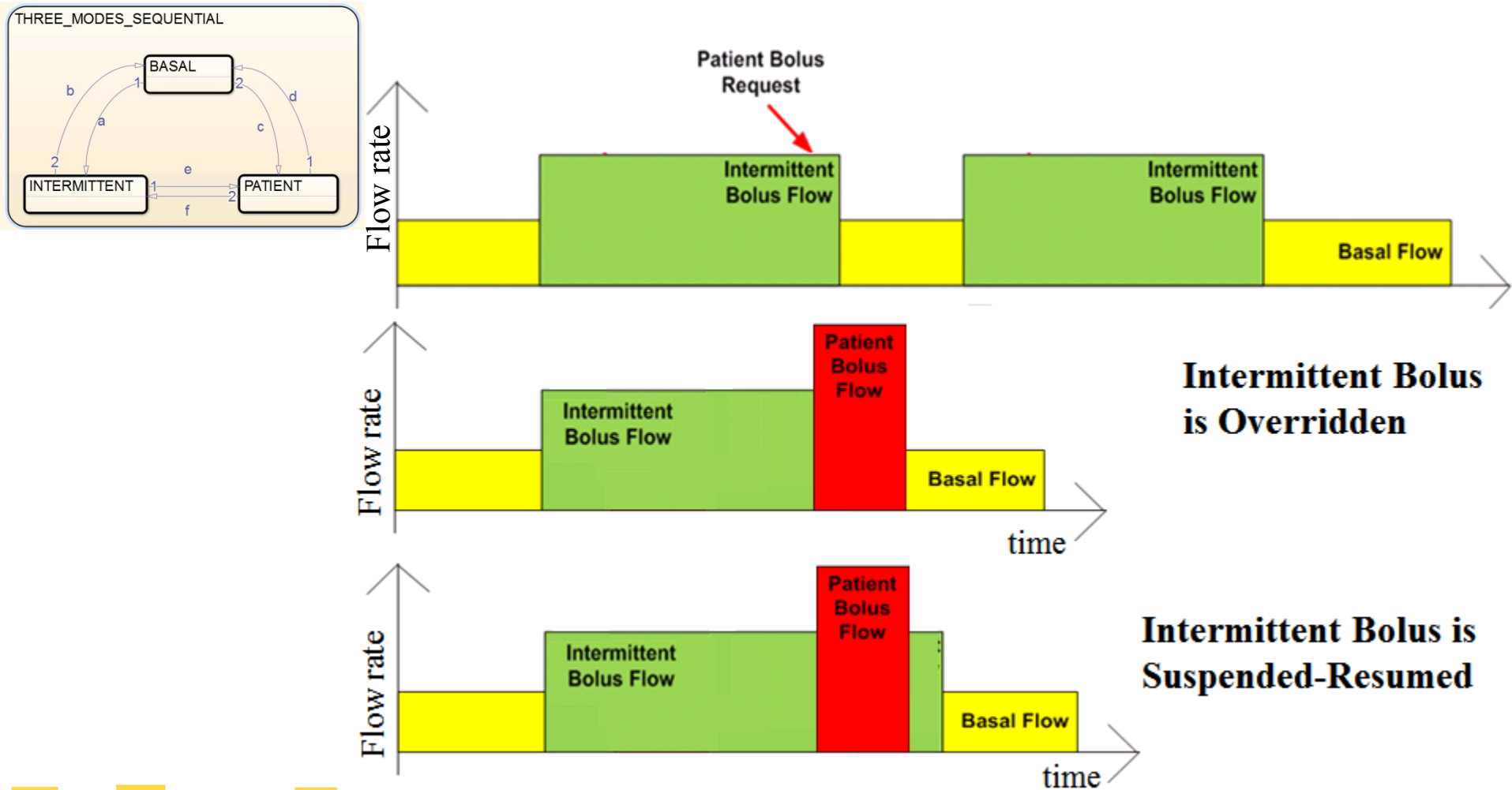




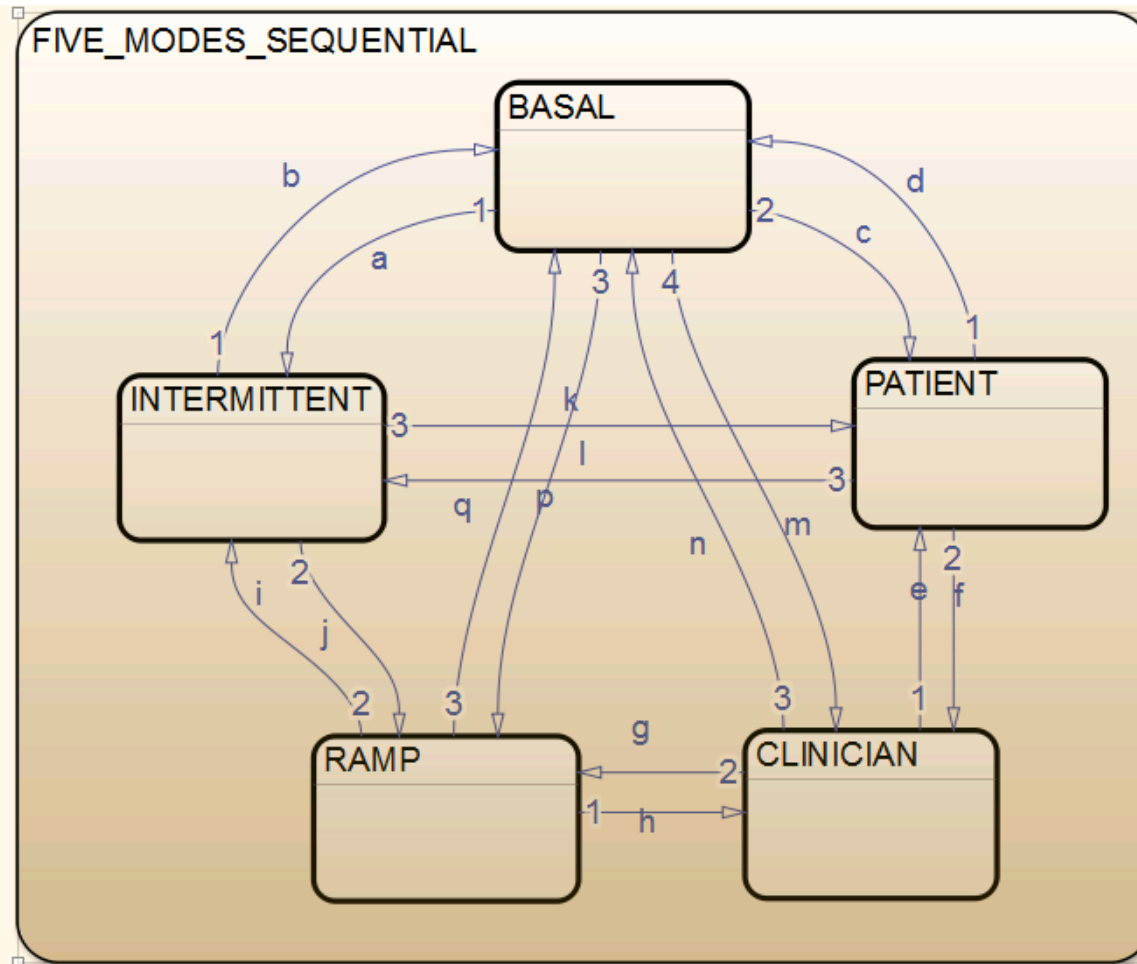
# Sequential Organization – Behaviors (1)



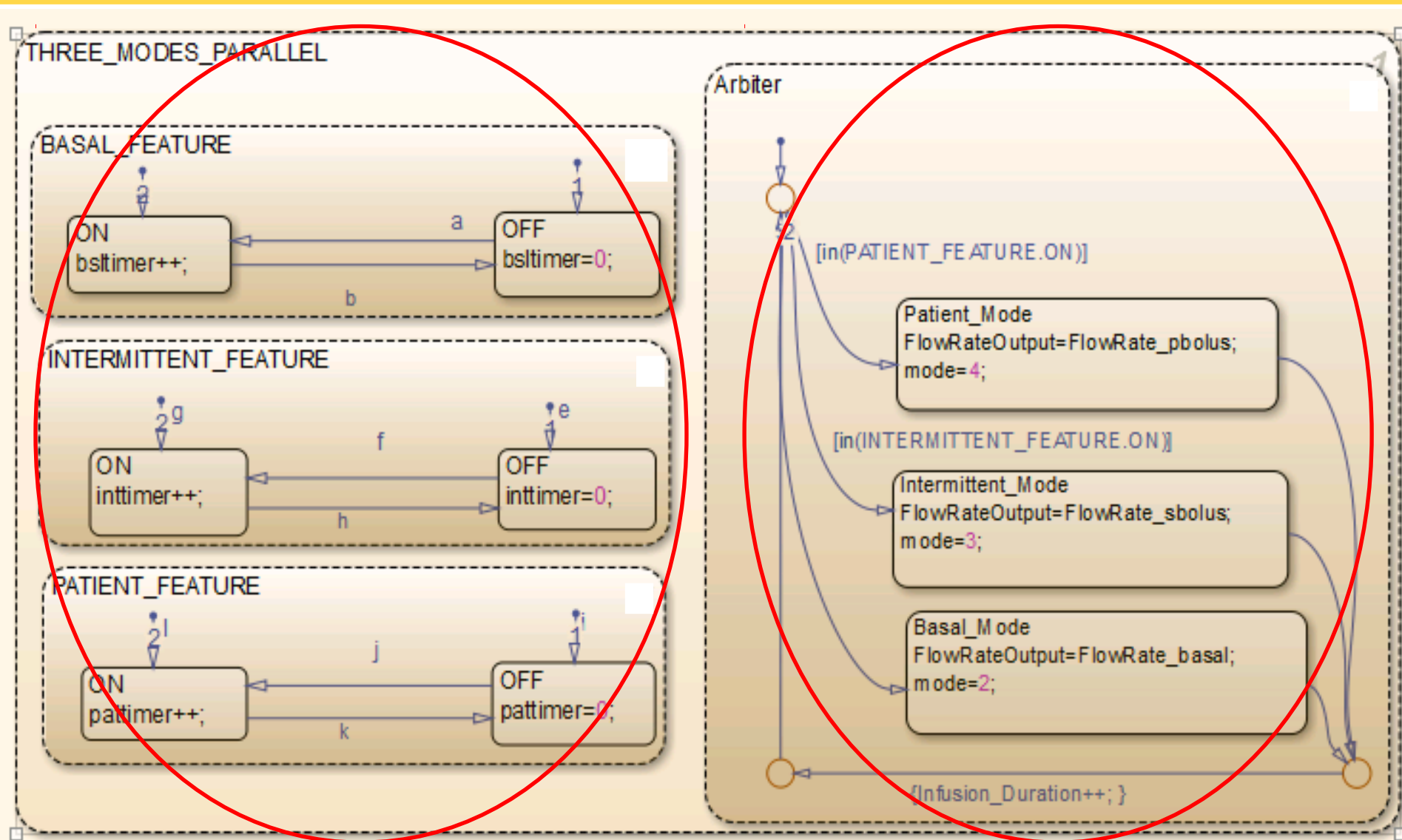
# Sequential Organization – Behaviors (2)



# Sequential Organization: New Modes

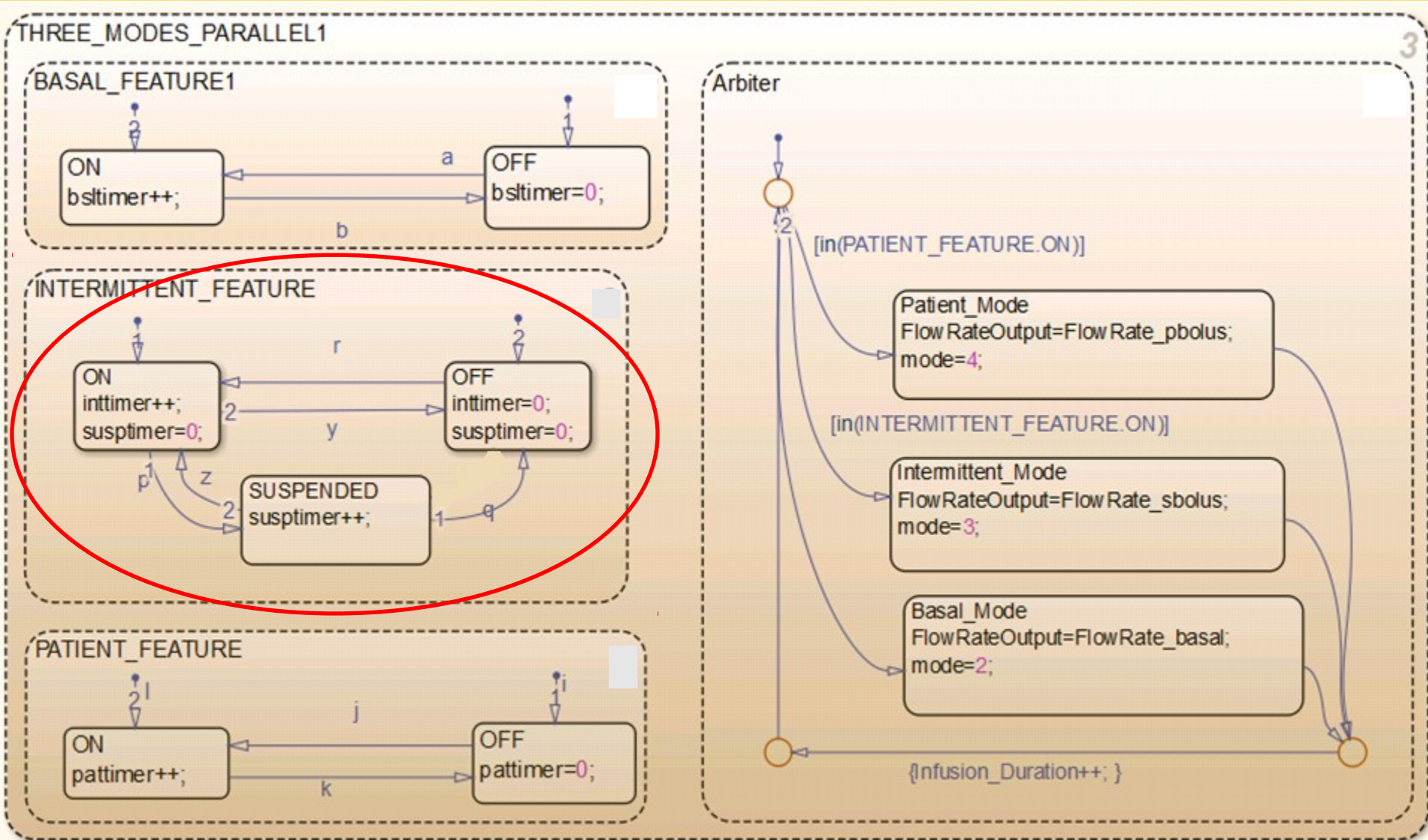


# Parallel Organization



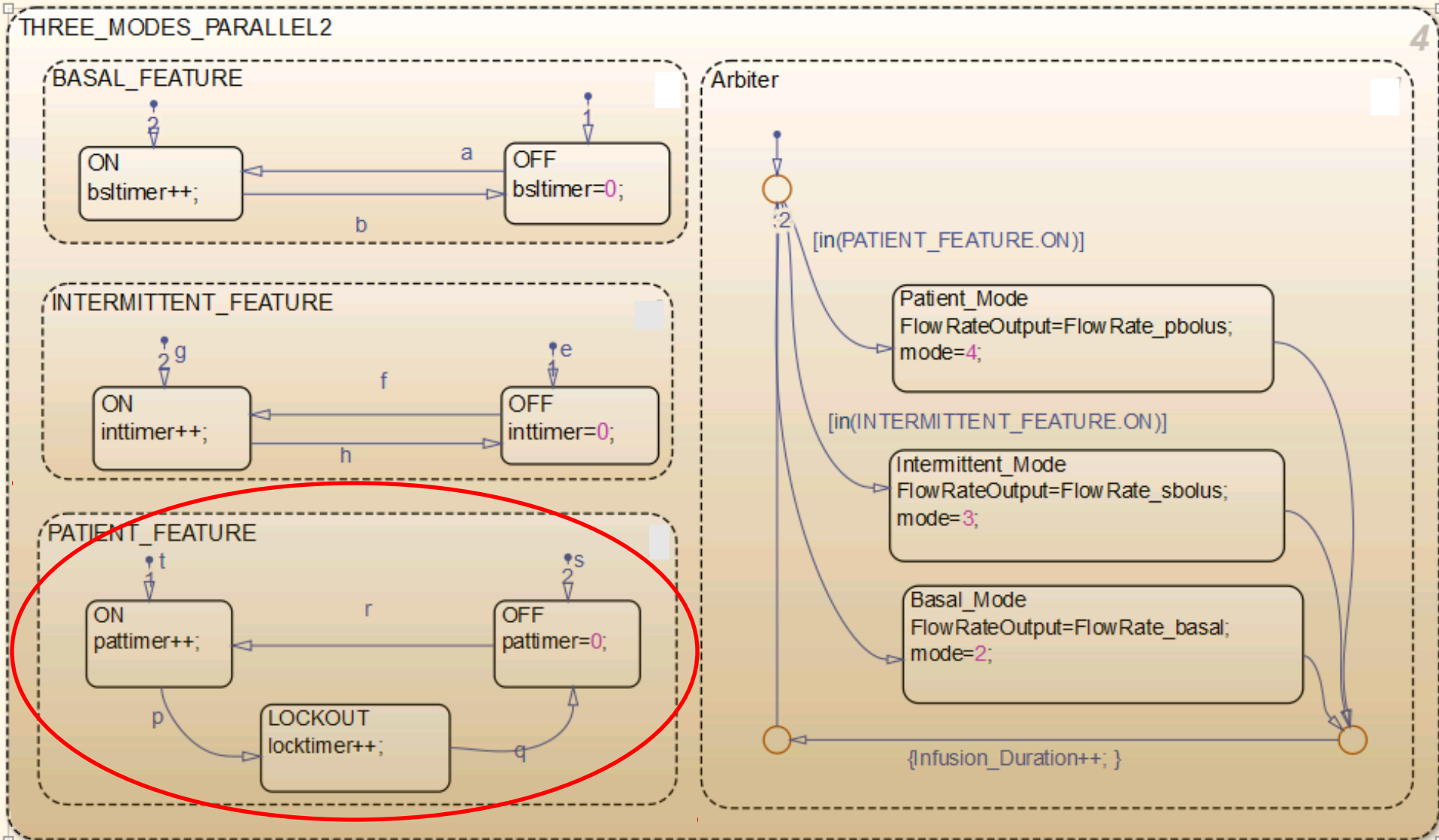
# Additional Feature Behaviors

## Intermittent Bolus Feature



# Additional Feature Behaviors

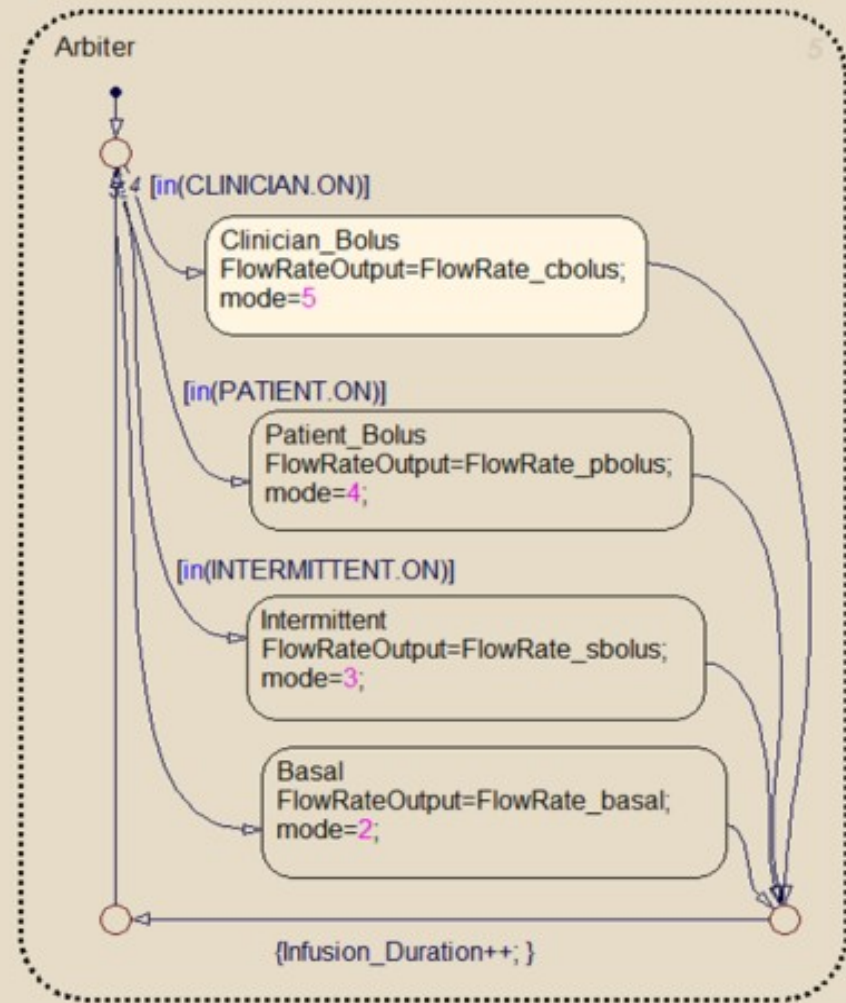
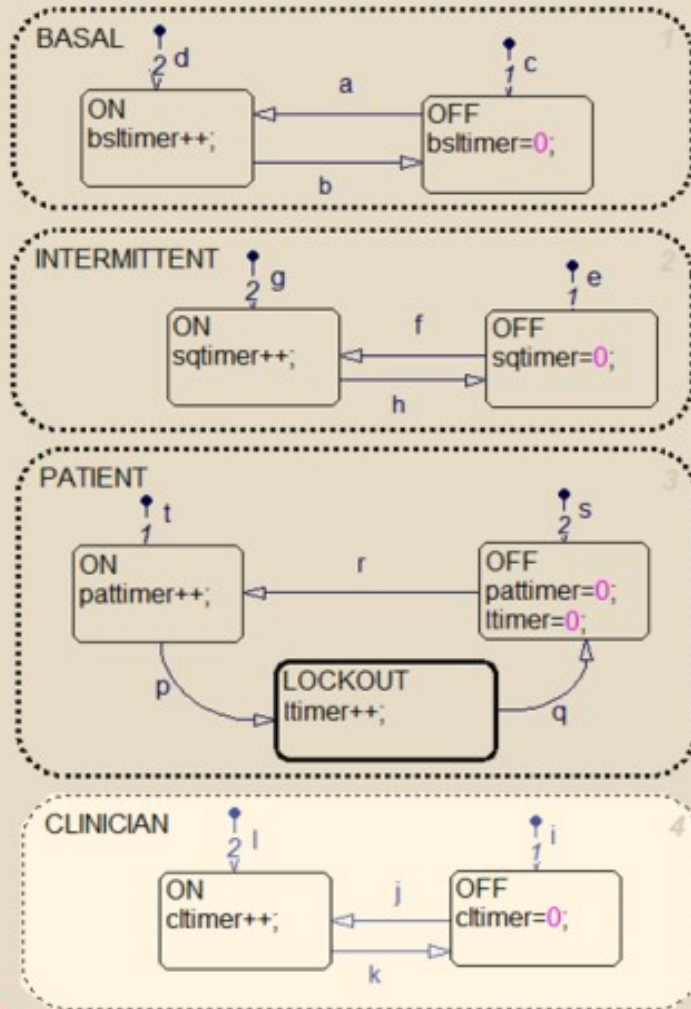
## Patient Bolus Feature



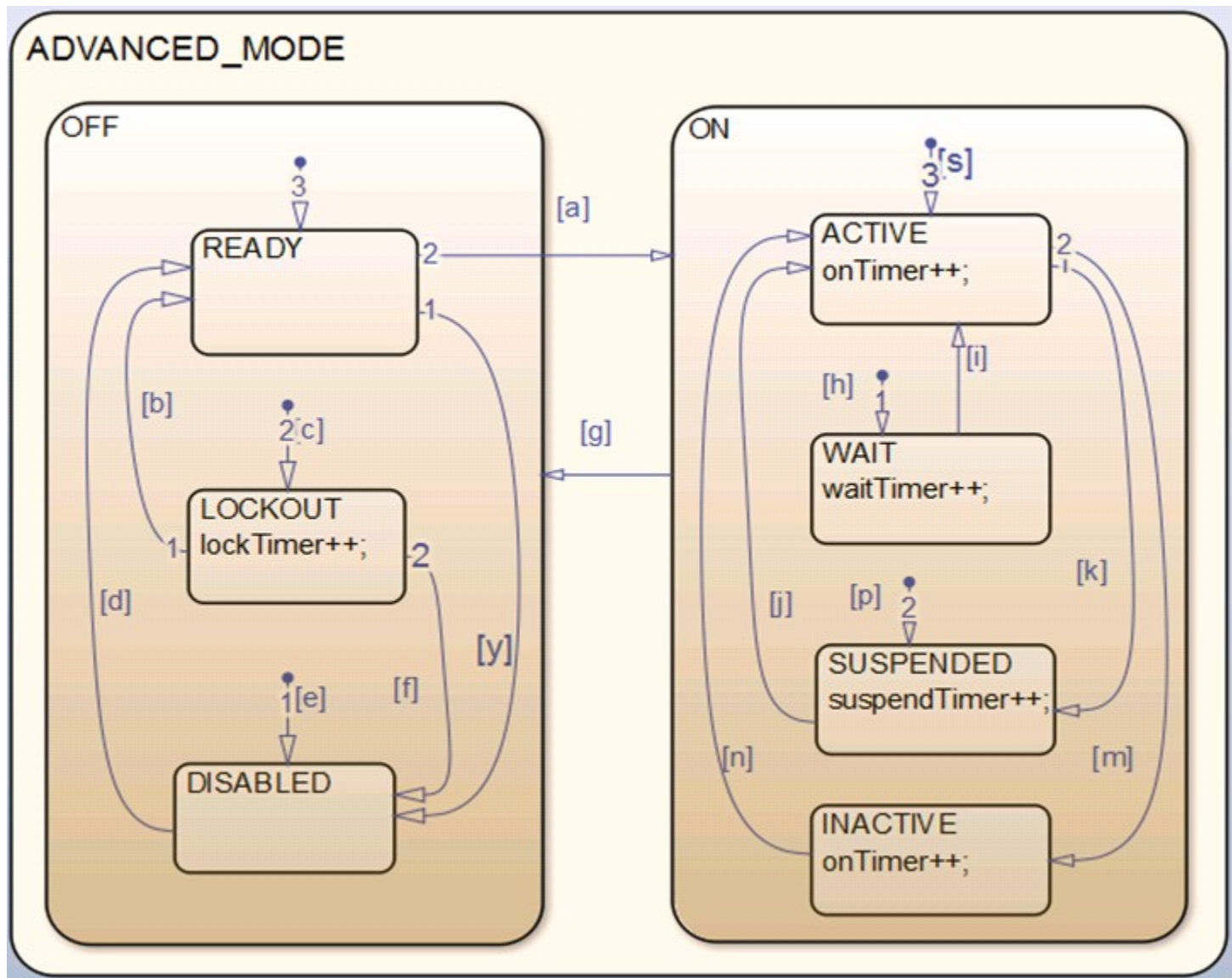
# New Features

## FOUR\_PARALLEL

3

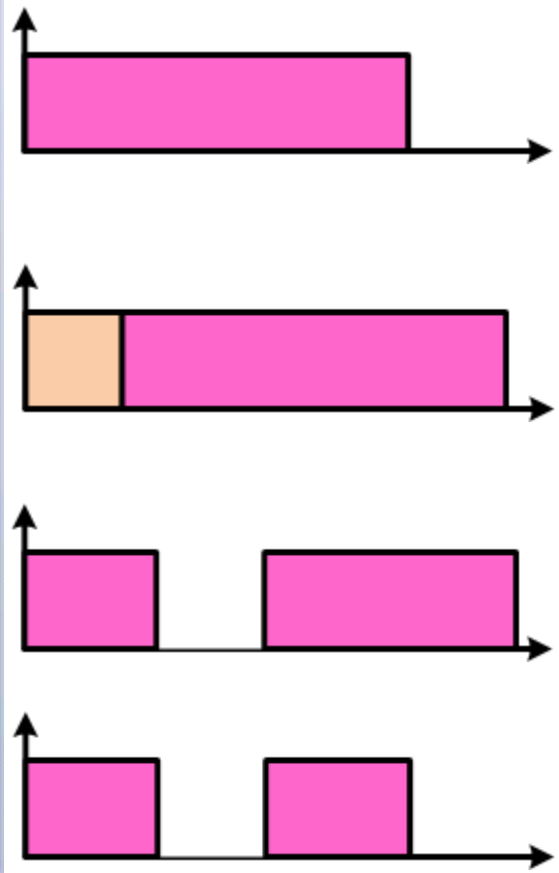
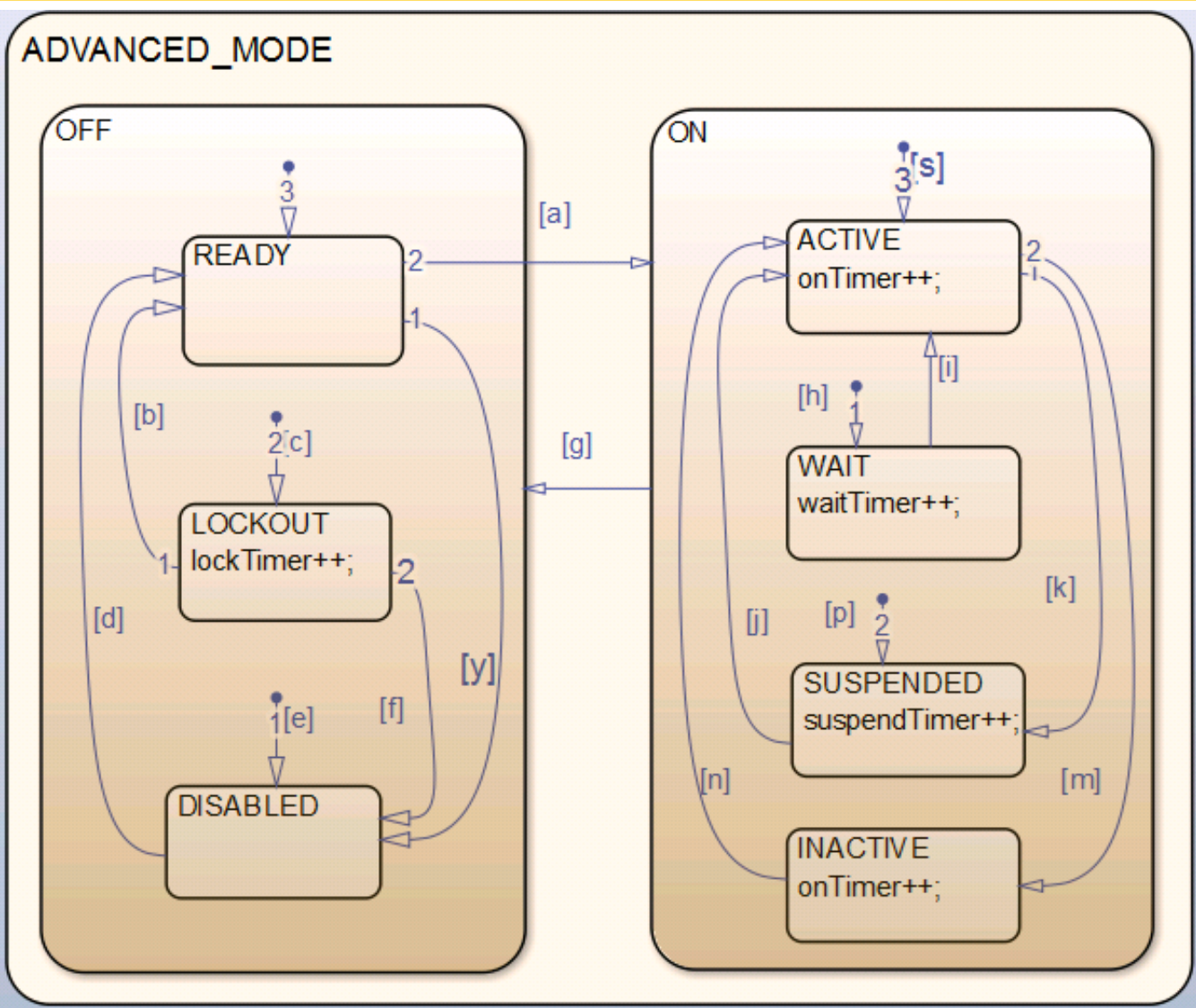


# Complex Feature Behaviors





# Complex Feature Behaviors



# Conclusion

- Modeling modes and feature interaction :
  - Parallel organization
  - Feature behaviors patterns

# Next Steps

- Comprehensive catalog solutions for behavioral modeling problems
- Repertoire of modeling patterns

# Thank you



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and CNS-1035715**

# Visualization of the FGS Modes

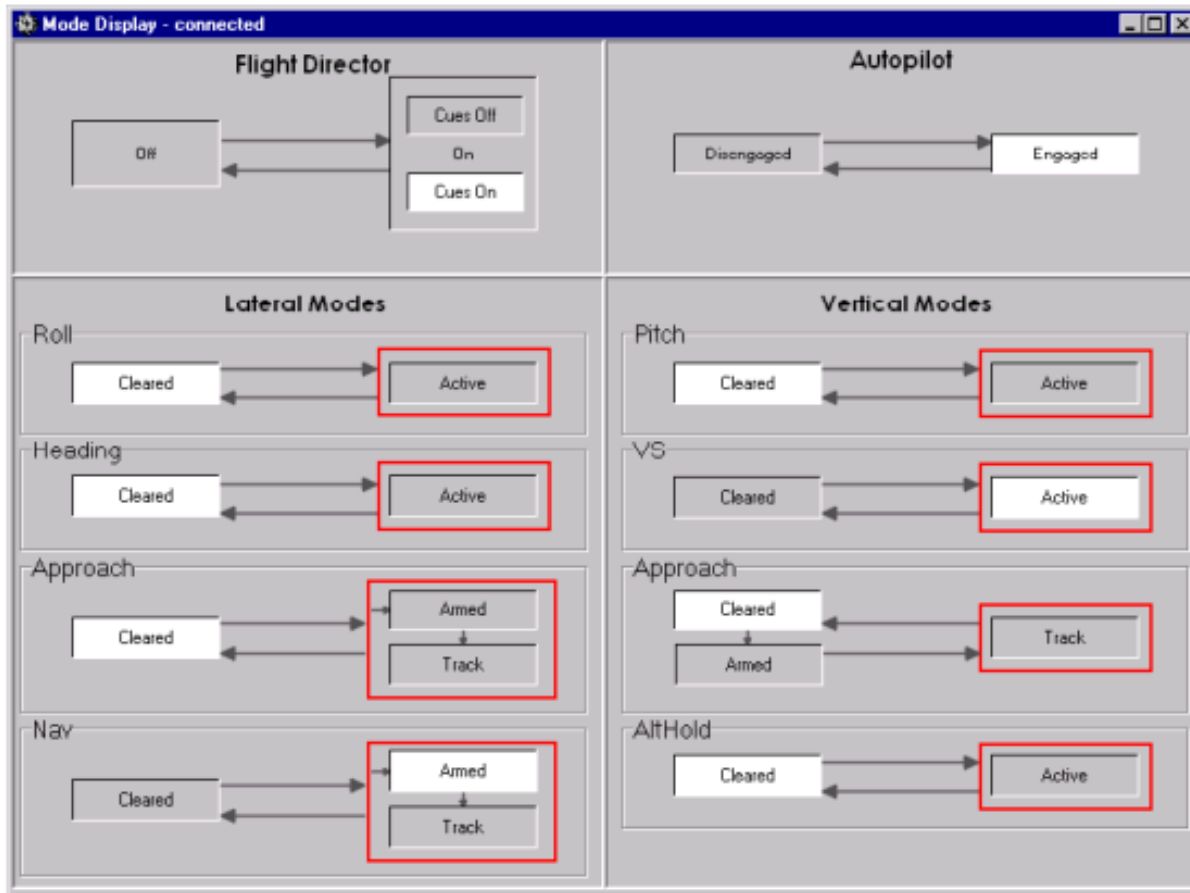


Figure 3 - Visualization of the FGS Modes

# FGS Mode Structure

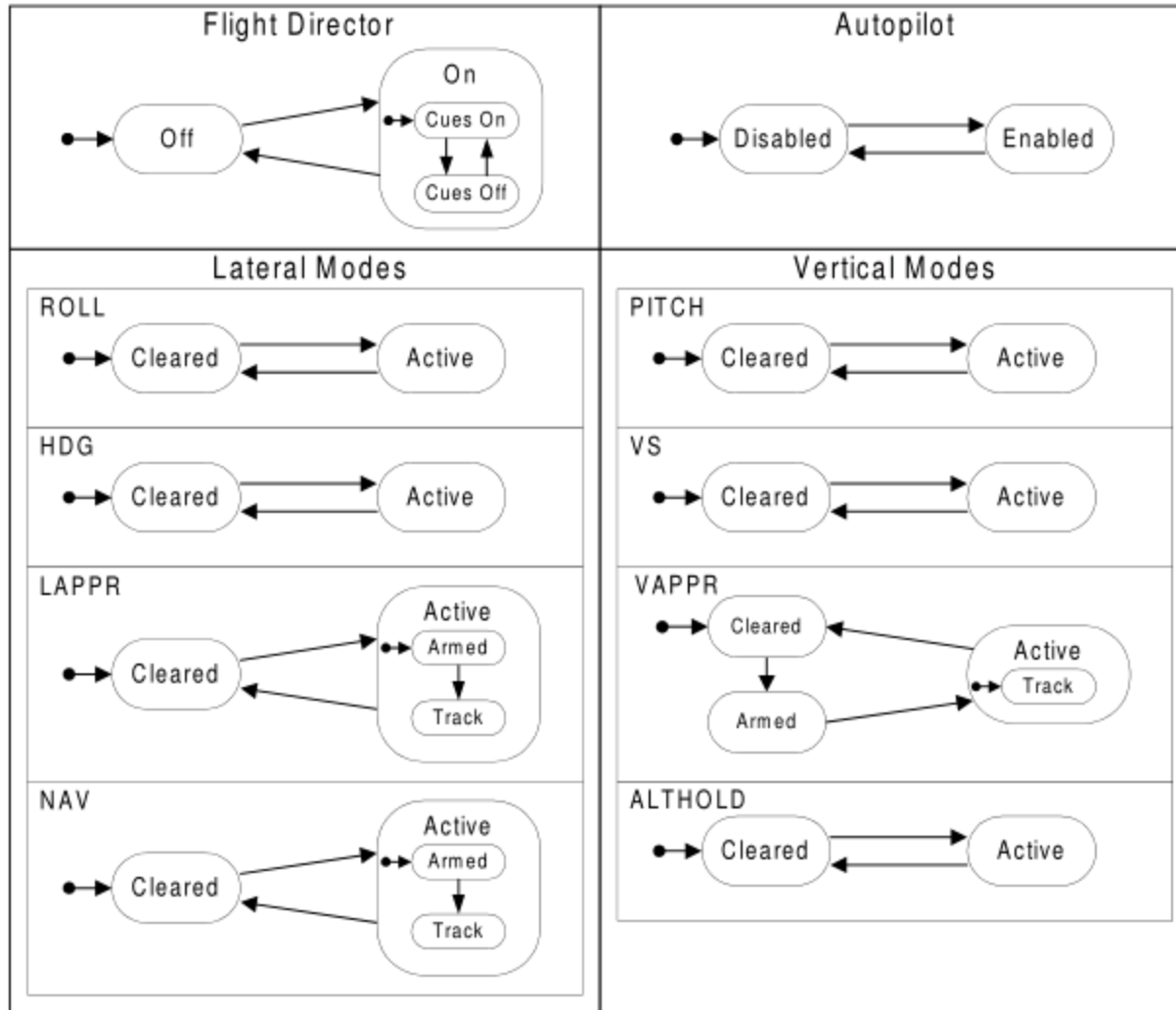


Figure 7 - FGS Mode Structure

Detecting Mode Confusion  
Through Formal Modeling  
and Analysis

Steven P. Miller and James N.  
Potts, Rockwell Collins, Inc.