



Linkage

Development Kickoff

10/28/20

Agenda

1. Introductions

- LBL, Building Intelligence Group, Modelon, Devetry

2. Context

3. Requirement Overview

4. Scheduling

5. Discussion and Next Steps

Context - Designing and Modeling HVAC Systems and Controls

OpenBuildingControl

Digitizing the control delivery

- from specification
- through building energy modeling (BEM)
- to implementation, and
- formal verification

Spawn-of-EnergyPlus

- Next-generation whole-building simulation engine
- Enable integrated BEM-control workflows

ASHRAE SGPC 36P & SPC 231P

obc.lbl.gov

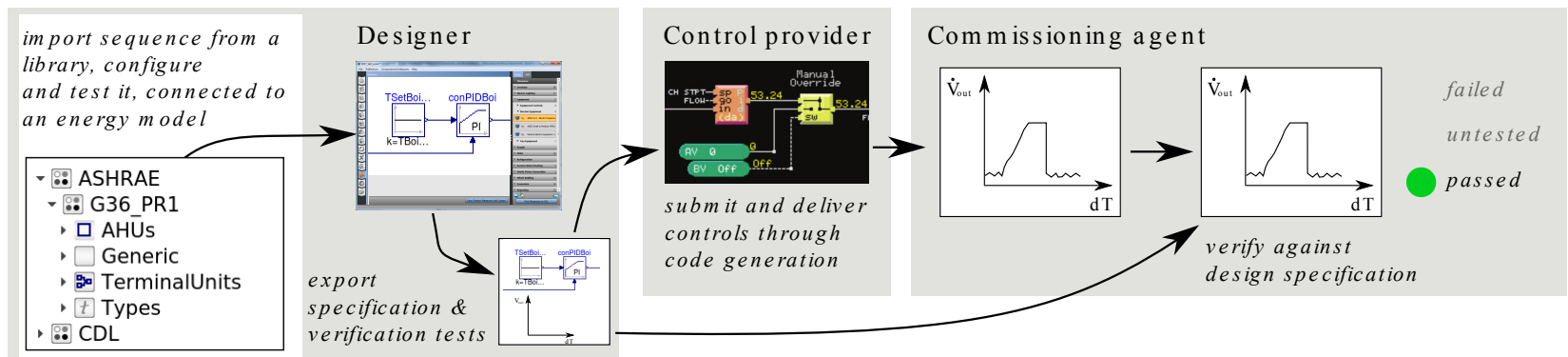
Performers

- Lawrence Berkeley National Lab
- Pacific Northwest National Lab

Partners

- kW Engineering – Oakland, CA
- Taylor Engineering – Alameda, CA
- Building Intelligence Group – Portland, OR

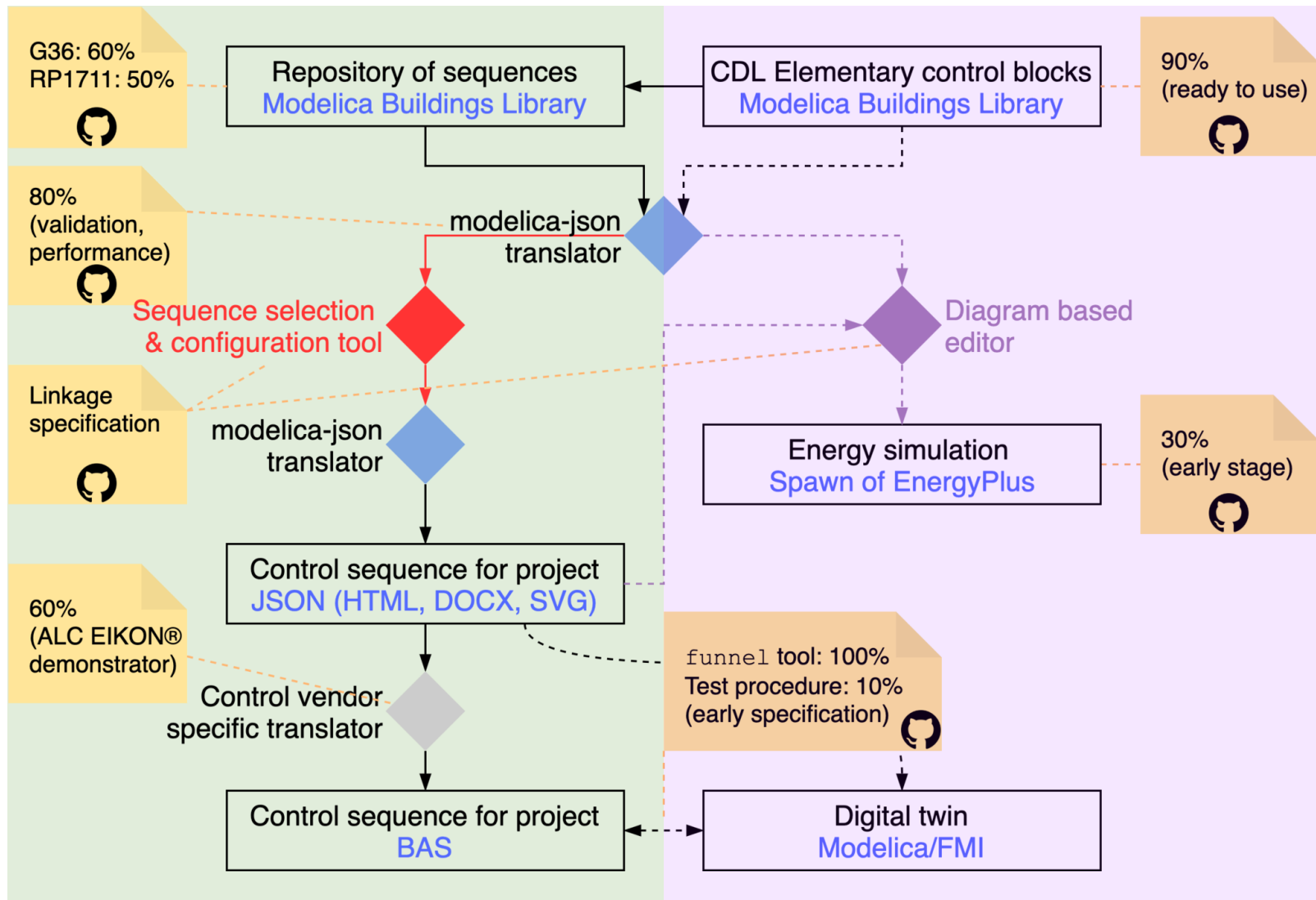
Performance Period: Oct. 1, 2019 – Sep. 30, 2021



Context - Practical Workflows

Design-Bid-Build

Modeling & Simulation



Context - Existing Solutions for Design & Specification

tranedesignassist.com

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TRANE TEST

DESIGN PUBLISH

Hi, mangeclou@gmail.com

?

Facility Type

Systems

Equipment Controls

Auxiliary Controls

COOLING PLANT SYSTEM

HEATING PLANT SYSTEM

VARIABLE AIR VOLUME SYSTEM

VRF SYSTEM

WATER SOURCE HEAT PUMP LOOP

PROJECT HIERARCHY

Collapse All Expand All

✓

■

VARIABLE AIR VOLUME SYSTEM

VAV BOX

VAV BOX

VAV BOX

AHU

AHU

VAV BOX

✓

■

HEATING PLANT SYSTEM

HW BOILER

HW BOILER

✓

■

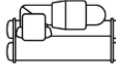
COOLING PLANT SYSTEM


OPEN TOWER

WATER CHILLER

COOLING PLANT SYSTEM

REQUIRED UNITS

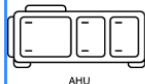
WATER CHILLER


OPEN TOWER


NON SYSTEM UNITS


VARIABLE AIR VOLUME SYSTEM

REQUIRED UNITS


AHU


VAV BOX

VAV BOX

VAV BOX


NON SYSTEM UNITS

AHU


VAV BOX

HEATING PLANT SYSTEM

REQUIRED UNITS

HW BOILER

NON SYSTEM UNITS

HW BOILER

PROJECT DESIGN

FLOW DIAGRAM

SEQUENCE

GUIDE SPEC

POINT LIST

CONFIGURATION OPTIONS

Outside Air Configuration

RA/OA Mixing Damper

Building Pressure (Relief Air)

Separate Variable Volume Relief Fan

Outdoor Air Flow

Yes

Preheat

Hot Water

Cooling

Chilled Water

Reheat

Hot Water

Dehumidification

No

Economizer

Comparative Enthalpy (Local)

Demand Control Ventilation

Space CO2 (Local)

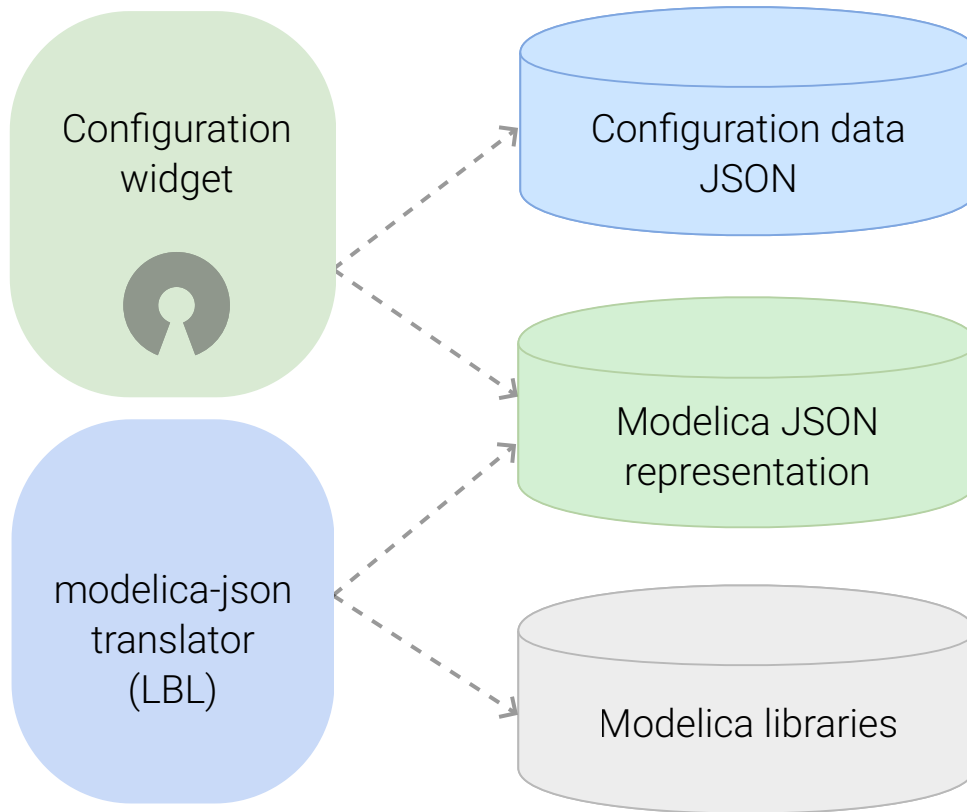
Fan Air Flow Monitoring

Yes

Mixed Air Temperature Sensor

Yes

Requirement Overview



- Based on template-oriented schema specified by LBL
- Allow for 100+ configurations, automatic generation of `connect` clauses for advanced controls
- Based on Modelica JSON schema and parser developed by LBL
- JS libraries can be leveraged
- Based on Modelica specification
- Conditional instances typically allow for 10+ configurations

- Client-side JS code with minimal dependencies
- Open source (3 or 4-clause BSD)
- Available as a free software

Full specification available at github.com/lbl-srg/linkage.js



Scheduling

Linkage Phase I Scheduling (Draft)

#	TASK TITLE	TASK OWNER	DUE DATE	2020			2021												2022	
				O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
-	Start Date	All	11/1/20																	
1	Review of the software requirements specification																			
	Review, submit comments and questions	D+M	12/1/20																	
	Address questions, update specification	LBL	1/15/21																	
2	Specification of the configuration data model																			
	Develop, release specification	D+M	2/1/21																	
	Review spec, submit comments and questions	LBL	2/15/21																	
3	UI/UX design																			
3.1	Discovery phase	D+M	2/15/21																	
3.2	Design/Test/Iterate	D+M	5/1/21																	
	Develop example of HVAC template	LBL	3/15/21																	
	Validate mockups and wireframes	LBL	6/1/21																	
4	Software implementation (web app)																			
	Implement, test, document	D+M	12/15/21																	
4.1	Alpha release	D+M	8/1/21																	
4.2	Beta release	D+M	10/1/21																	
4.{3,4,5}	Stable release (w/ user and developer documentation)	D+M	12/15/21																	
	Develop module to connect block connectors	LBL	5/1/21																	
	Develop modelica-json	LBL	7/1/21																	
	Develop library of HVAC templates	LBL	8/1/21																	
	Review alpha release	LBL	9/1/21																	
	Review beta release	LBL	11/15/21																	
5	Integration into a third-party Modelica editor																			
5.{1,2}	Demonstrator with developer documentation	D+M	2/1/22																	

Discussion and Next Steps

Validate planning

- https://docs.google.com/spreadsheets/d/1R6HB4_-zItPC-74J3IYnMwFfw2tEtSvo4sckCoIMYI/edit?usp=sharing

Collaboration

- github.com/lbl-srg/linkage.js
 - Use Github for iterating on the requirements?
- Iteration meetings
- Devetry & Modelon suggestions

Include partners?

- Include HVAC/Controls designers for UI/UX discovery phase
- Group of beta testers
- ...