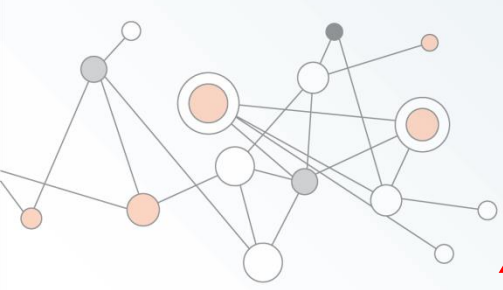# Modelling Automotive Control Systems
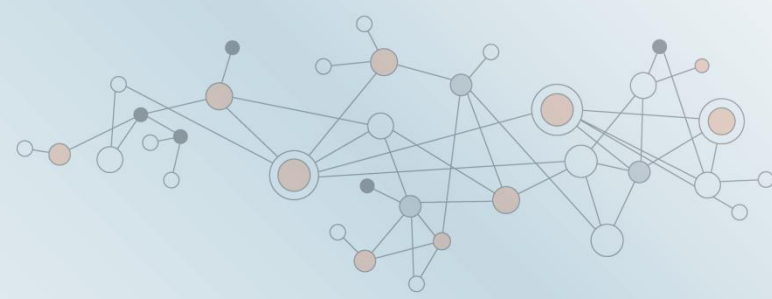
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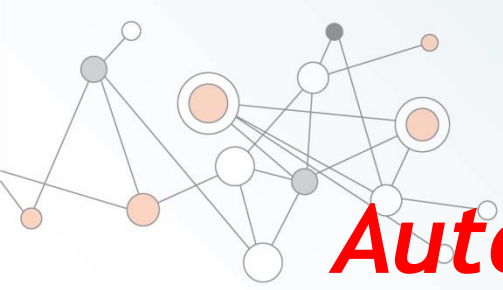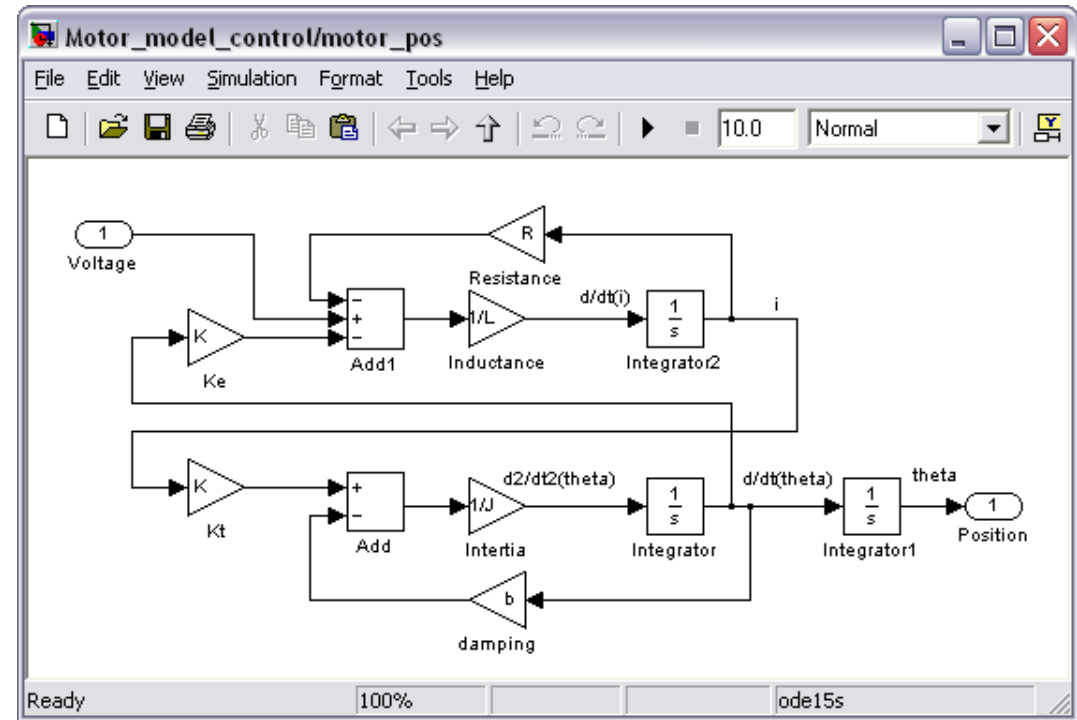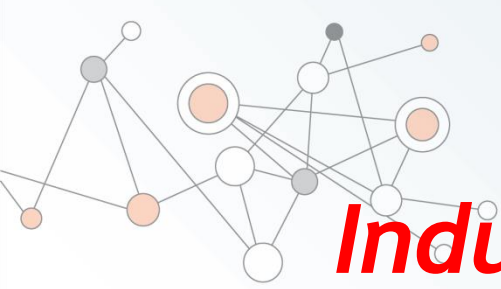
Agenda

- Intro to Control Systems
- Industry Trends
- Industry Challenge
- Modelling in Eclipse
- From C AST to Simulink
- C as Data Flow
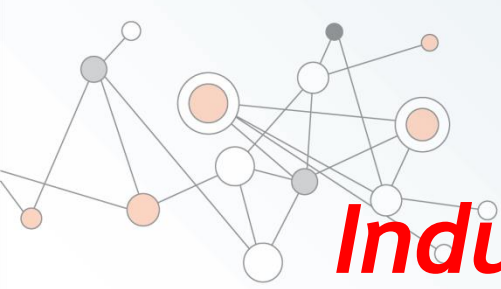- Demo

Automotive Control Systems

Industry Trends

- Industry has embraced model based development
- Migration from C to Simulink models
- Simulink models allow better simulation and verification

Industry Challenge

- Ford Motor Co. converted 20% of code base[1]
- Manually converting is not acceptable
- Migrating other models as needed

Can we build a tool to automate the conversion?

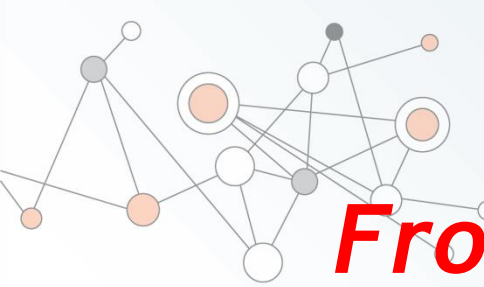1: Talk given by Ford Motor Co. at the dSPACE 2013 North American Automotive User Conference.

Modelling in Eclipse

- Eclipse has a number of great modelling tools
- Code is still stuck in C
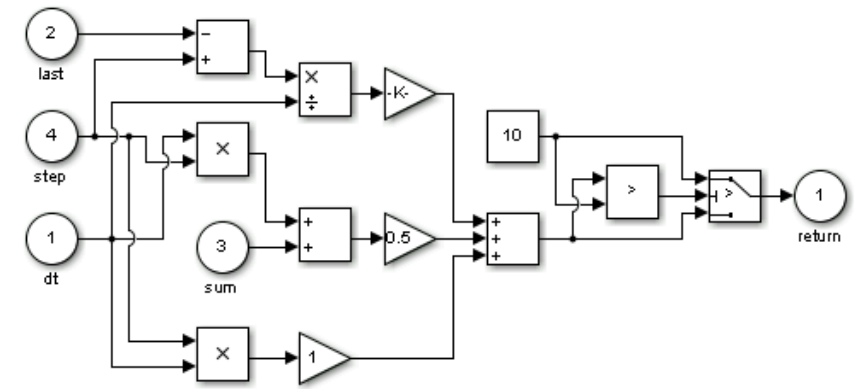- Can parse C to AST using Eclipse C Development Tools (CDT)
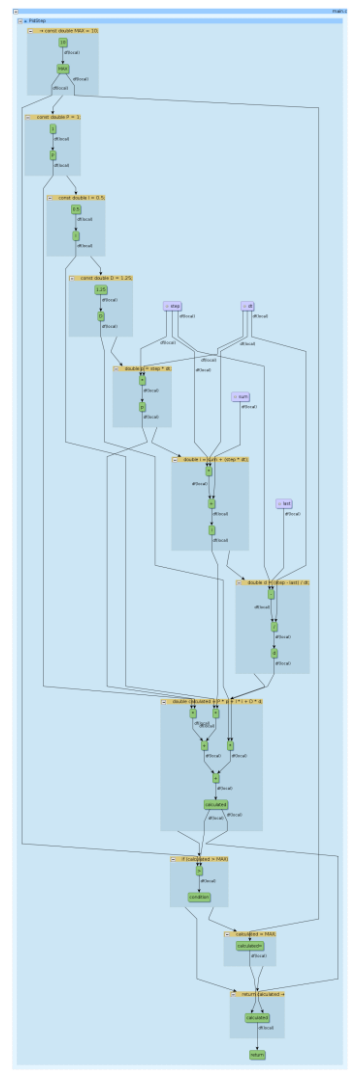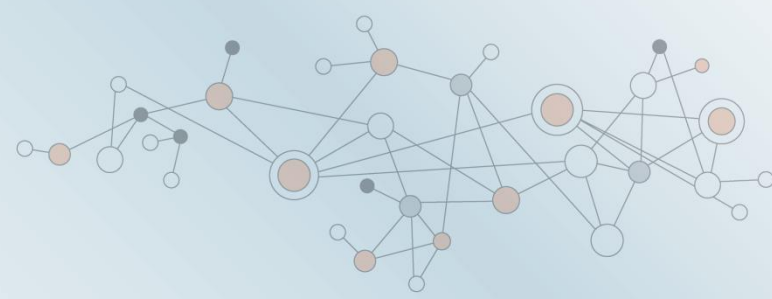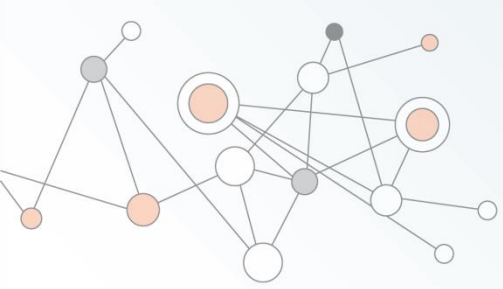
From C AST to Simulink

- Atlas indexes the AST
- Stores relations in a graph
- Common relations
  - Declaration, definition
  - Invoke
  - Data flow
  - Control flow
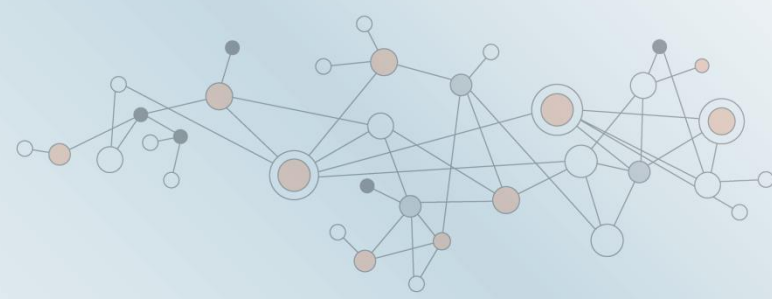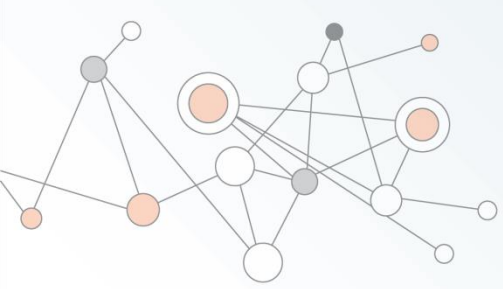- Data flow graph is similar to Simulink model

```c
double PidStep(double dt, double sum,
        double last, double step)
{
    const double MAX = 10;

    const double P = 1;
    const double I = 0.5;
    const double D = 1.25;

    double p = step * dt;
    double i = sum + (step * dt);
    double d = (step - last) / dt;

    double calculated = P * p + I * i + D * d;

    if(calculated > MAX)
        calculated = MAX;

    return calculated;
}
```
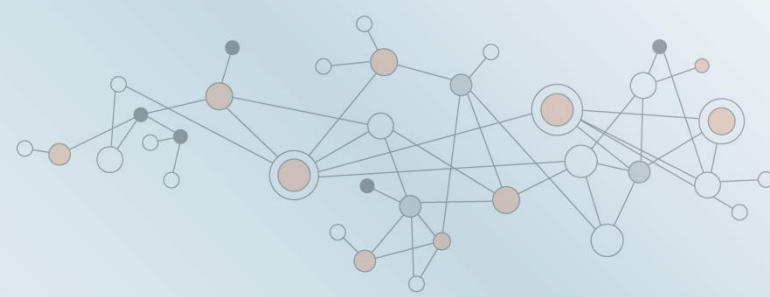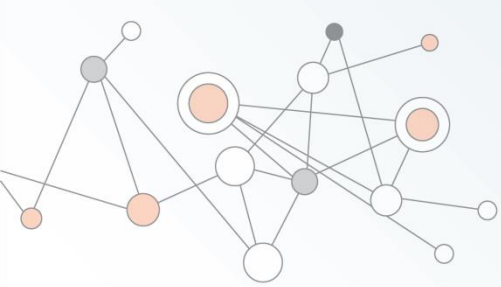
Demo!

Questions?

Thanks
for coming

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