

Simulation  
Assisted  
Certification



Merging **test** and **simulation** knowledge in engineering troubleshooting

WE ARE  
**MEGALAB**  
Group Inc

A new all-inclusive testing laboratory, aiming to bring all the must-have services of product certification testing under one roof. MegaLab is one of the largest ISO 17025 accredited testing labs of its kind in Canada. Our group now offers a comprehensive suite of consulting solutions tailored to meet the evolving needs of our clients. From physical tests to physics based computer simulation, we are poised to deliver unparalleled value and insights.



#### EMC/EMI Testing

Test your device's against Conducted/  
Radiated Immunity and RF Emissions  
(FCC/CE marking)



#### Product Safety & Certification Marking

We work with a number of certifiers  
including: UL, CSA, TUV, ITS, CE &  
File Reviews



#### Environmental Mechanical Testing

Mechanical stress testing via: Vibration/  
Shock, Temperature, IPXX, Corrosion,  
Dust, Durability (NEMA, MIL, IEC)



#### Global Market Access

Achieve global market compliance in  
China, EU (CE), Russia, Mexico, Korea  
and other countries.



#### Package Design & Testing

Prove package integrity through every  
phase of distribution with: ISTA, ASTM,  
Package Design, Amazon FFP/SIOC



#### Product Design & Fabrication

Prototyping, small run fabrication,  
jig construction, retrofitting, analysis.

# About MegaSim:

A distinguished division of the Megalab Group. At MEGASIM, we specialize in the fusion of test and simulation to deliver innovative solutions for complex engineering challenges.

**[MEGASIM Engineering Simulation Consulting Services - Megalab Group Inc. \(megalabinc.com\)](http://megalabinc.com)**

## Key Services Offered

- Shock, Vibration, and NVH
- Drop simulation
- Crush and Impact simulation
- Durability Analysis
- Design Optimization
- Fluid Dynamics and Thermal Analysis
- Fire, Explosion and Smoke Propagation Modelling - Pollutant Dispersion

## Advanced Simulation Expertise

Our dedicated and knowledgeable team at MEGASIM harnesses cutting-edge computer simulation technologies to provide comprehensive solutions tailored to your needs. Leveraging state-of-the-art software, we offer a range of analyses including structural (linear and non-linear, static, fatigue), fluid mechanics, and thermal/thermo-mechanical analysis. With years of experience and access to high-capacity computing resources, our skilled staff delivers precise results efficiently.

## Trusted Partners in Decision-Making

Establishing the credibility of simulation models is crucial for making informed decisions in design and certification processes. MEGASIM serves as your trusted partner, enabling faster and safer innovation for our clients.



# Benefit of working with Megasim

## Merging **test** and **simulation** knowledge in troubleshooting

Simulation (virtual test) before physical testing of an mechatronics product for vibration, shock, stress, thermal, and fluid dynamics assessment offers several key benefits:

1. **Risk Mitigation:** Early identification of potential failure modes through simulation helps in mitigating risks. This proactive approach can enhance product reliability and customer satisfaction.
2. **Cost Efficiency:** Identifying potential issues early through simulation leads to significant savings in both time and resources.
3. **Time Savings:** Simulation allows for rapid analysis and iteration, enabling quicker design modifications. This accelerates the overall development timeline, helping products reach the market faster.
4. **Comprehensive Analysis:** Simulations can model a variety of conditions and load cases that might be impractical or impossible to replicate physically. This includes extreme environmental conditions, natural frequencies, complex vibrations, and varying operational scenarios.
5. **Enhanced Design Optimization:** Simulation tools provide insights into how designs respond to stresses and vibrations, allowing engineers to optimize materials, shapes, and component placements for improved durability and performance.
6. **Informed Decision-Making:** Data from simulations provides a solid basis for design decisions, allowing teams to understand the impact of changes before physical testing, ultimately leading to more informed and confident decisions.
7. **Improved Collaboration:** Simulation results can be easily shared and discussed among teams, facilitating collaboration and alignment on design choices and project goals.
8. **Environmentally Friendly:** Simulation contributes to more sustainable practices in product development.

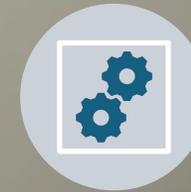
## Simulation capabilities outline



Thermal analysis;  
electronics cooling



Modal and vibration  
analysis



Mechanical shock  
and drop analysis



Opto-Mechanical  
analysis



Design of  
Experiment (DoE)



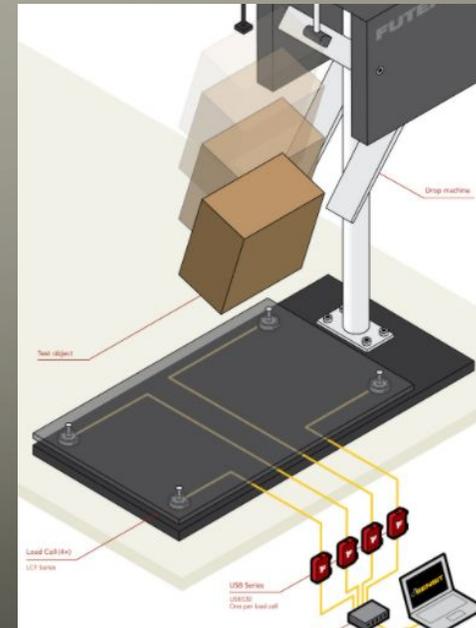
Design exploration  
(what-if analysis)  
and optimisation



# Mechanical shock and drop

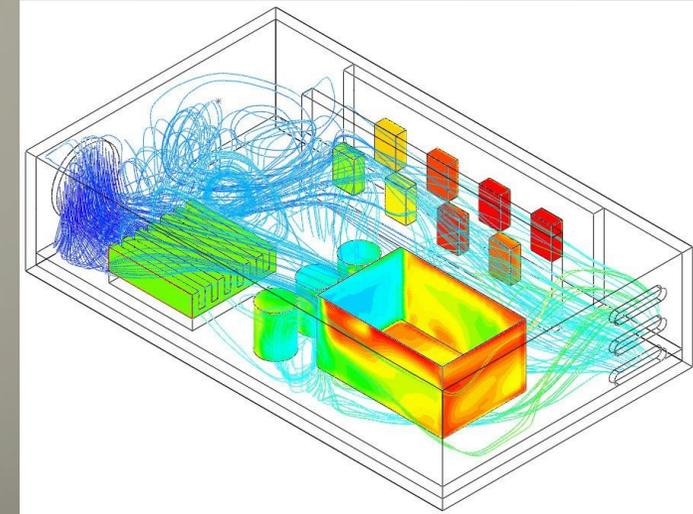
- Mechanical shock and drop impact reliability is one of the major concerns that needs to be addressed in products mechanical design
- Drop impact energy transmitted into internal component of an electronic module or system may cause:
  - Intensive functional damage of component
  - Interconnection breakage
  - Failure of mating components interphase (TIM)
  - System malfunctioning / failure . . .

Structural integrity of product under dynamic loading has to be evaluated through simulations prior to design fab-out in order to **avoid traditional design-failure-redesign process**



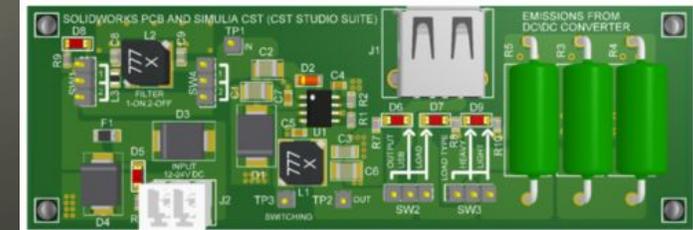
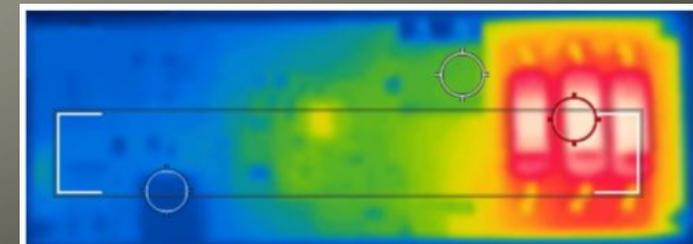
# Thermal simulation, electronics cooling

- Steady-state and transient thermal analysis
- Forced air cooling simulation
- Optoelectronics modules and systems thermal simulation
- Heatsink design
- Liquid cooling and cold plate design
- Thermo-electric cooler (TEC) design
- Heat exchanger design



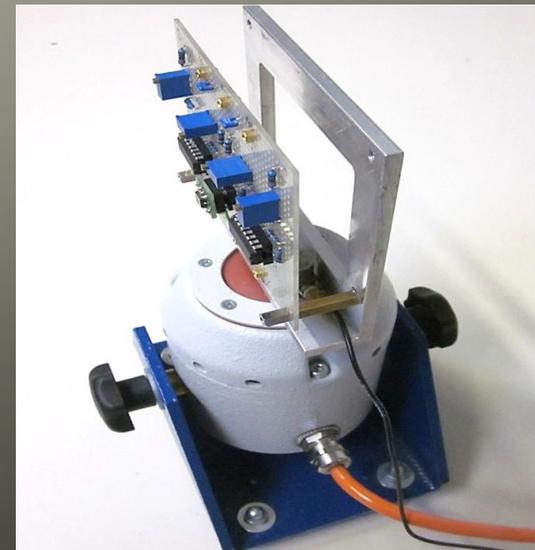
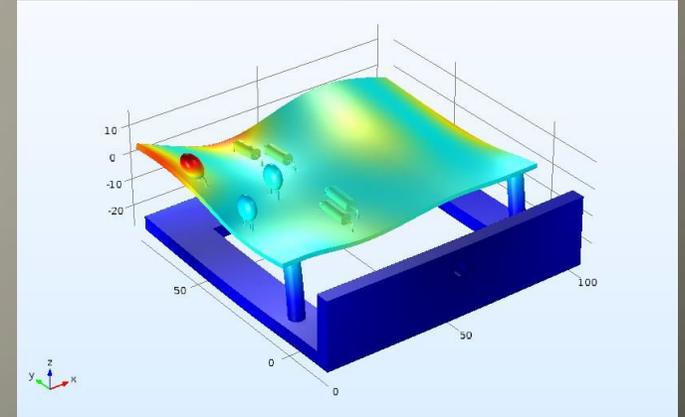
## Thermal stress analysis

- Temperature cycling stress analysis
- Solder joint reliability analysis
- Semiconductor chip warpage analysis
- Adhesive bond line stress analysis



# Modal and vibration analysis

- Simulations based on MIL spec and Telcordia Network Equipment Building System (NEBS) requirements
- Determining the inherent dynamic characteristics of a structure in forms of ***natural frequencies*** and ***mode shapes***
- Harmonic and random vibration analysis based on MIL standard
- Stress analysis at resonance frequencies
- Mechanical design optimization based on simulation model to avoid resonance frequencies



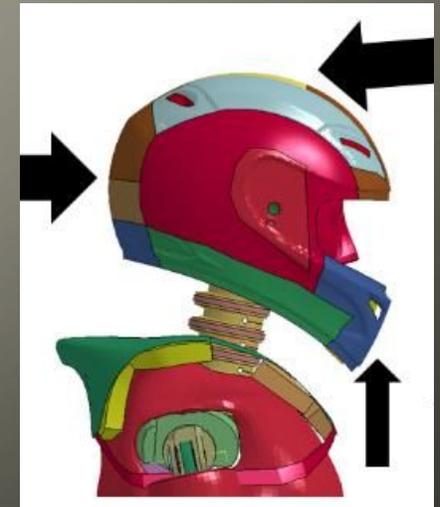
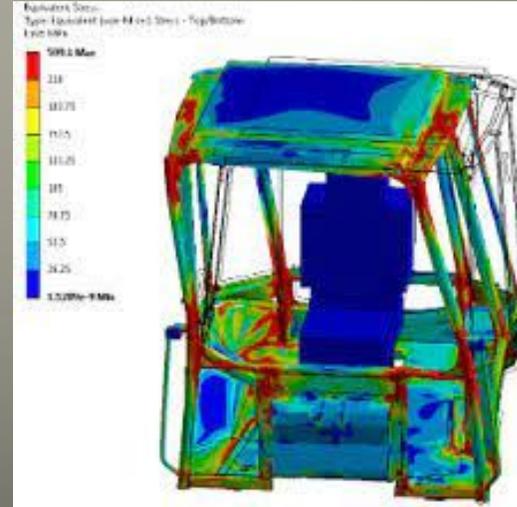
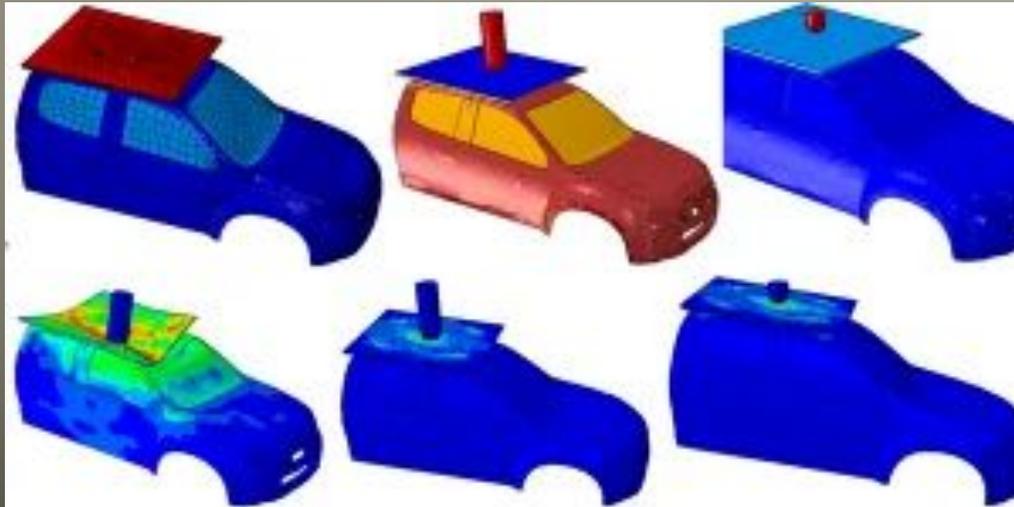
# Drop & Impact analysis

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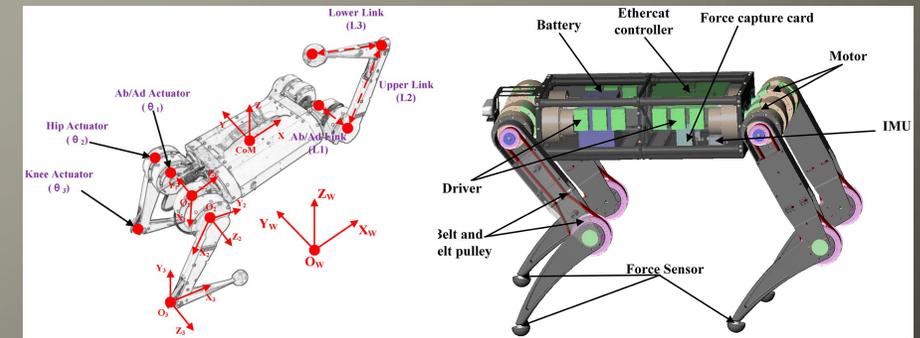
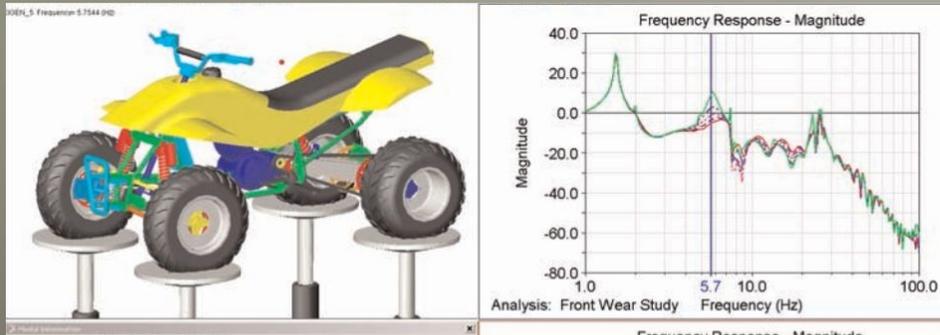
- Simulations based on Telcordia Network Equipment Building System (NEBS) requirements
- Module and system level transient dynamic effect analysis
- Structural integrity improvement based on simulation model to avoid system failure



# Safety Analysis



# Multibody Dynamics



***MBD simulations permitted us to get different loading conditions to be studied through an FE analysis, putting to evidence the most critical loading combinations***

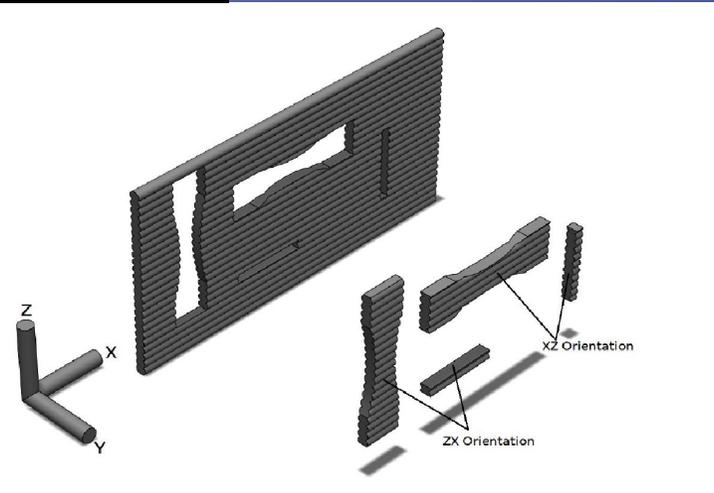
# Megasim's Digital Manufacturing capabilities outline

## Metrology, Inspection & Reverse Engineering



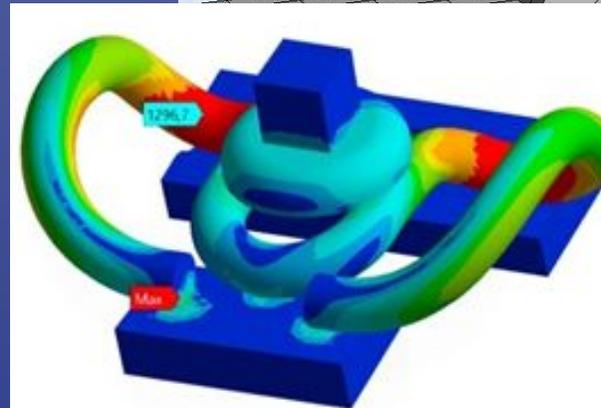
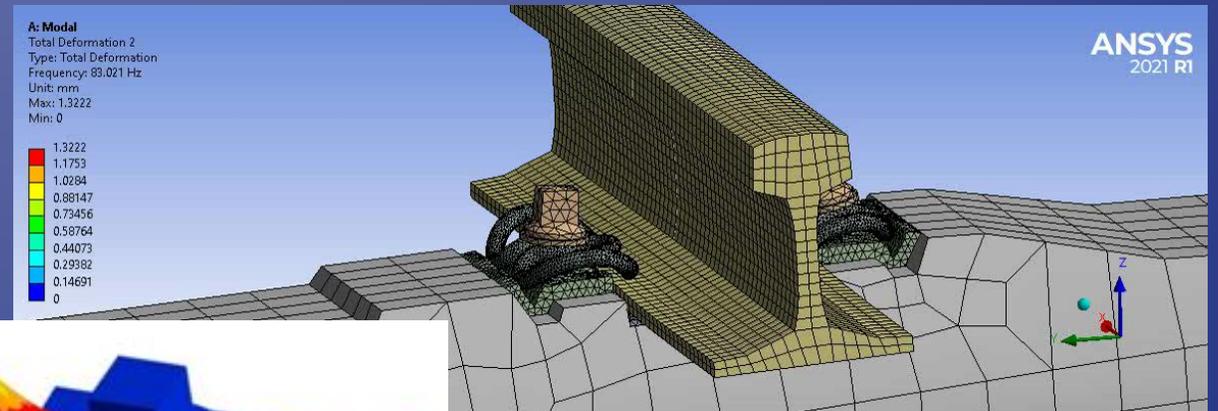
# Megasim's Digital Manufacturing capabilities outline

Material Characterization for FEA Analysis  
3D Printing - Steel, Titanium and polymers



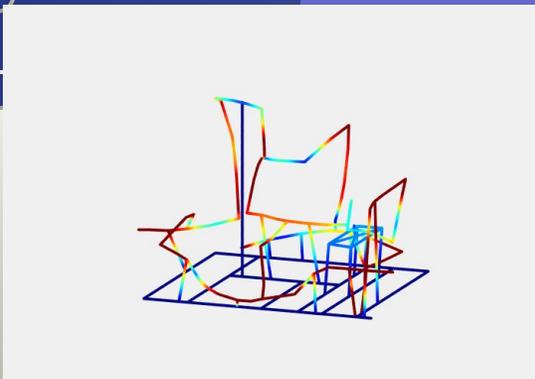
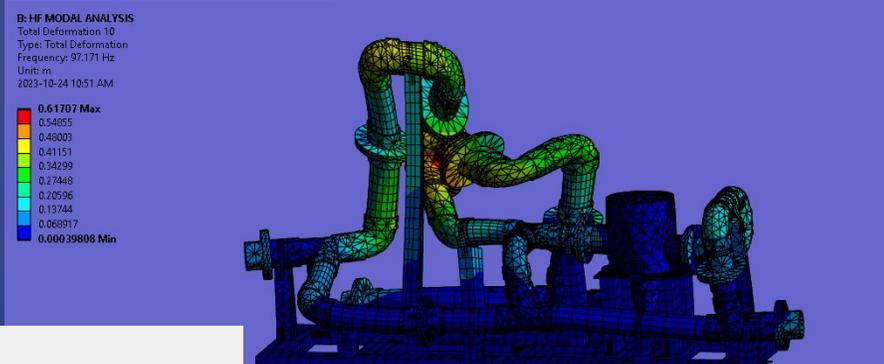
# Virtual test of stationary and large equipments

Collaboration with Stantec  
and transportation industry



# Digital model of large and stationary equipments

- ▮ A Digital Model is calibrated with a physical model using an Experimental Modal Analysis (EMA)
- ▮ Optimization of location of sensors for actual test

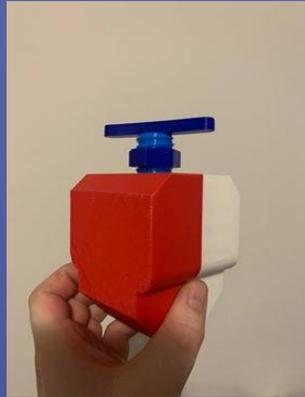


## Employing LIVE Digital Twin in Prognostic and Health Management: Identifying Location of the Sensors

Andrew E. Bondoc ✉, Mohsen Tayefeh ✉, Ahmad Barari ✉

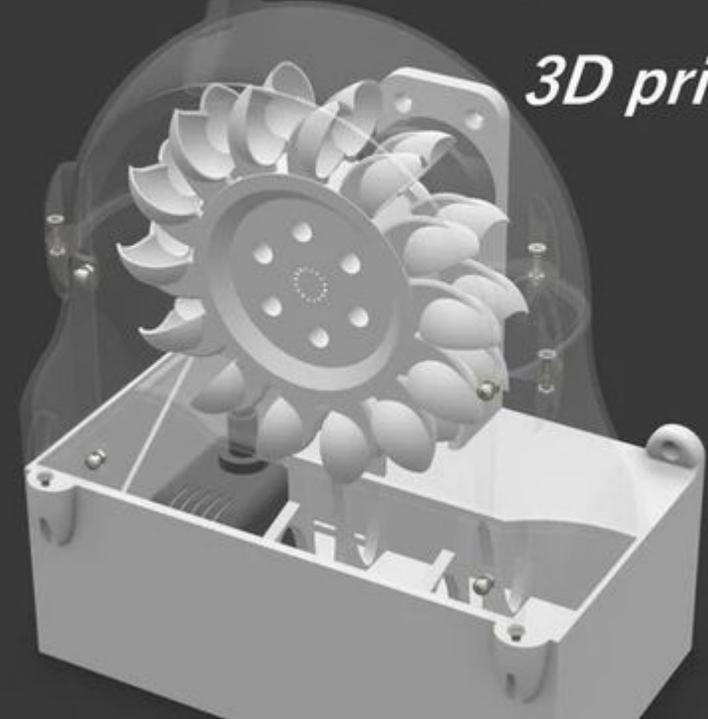


✓  
✓  
Prototyping of scale models to build a scaled model of actual equipments for test (rotational dynamics)  
Collaboration with hydro power companies



*Hydroelectric power plant model*

*3D printable*



THANK YOU!

Please feel free to ask questions.

