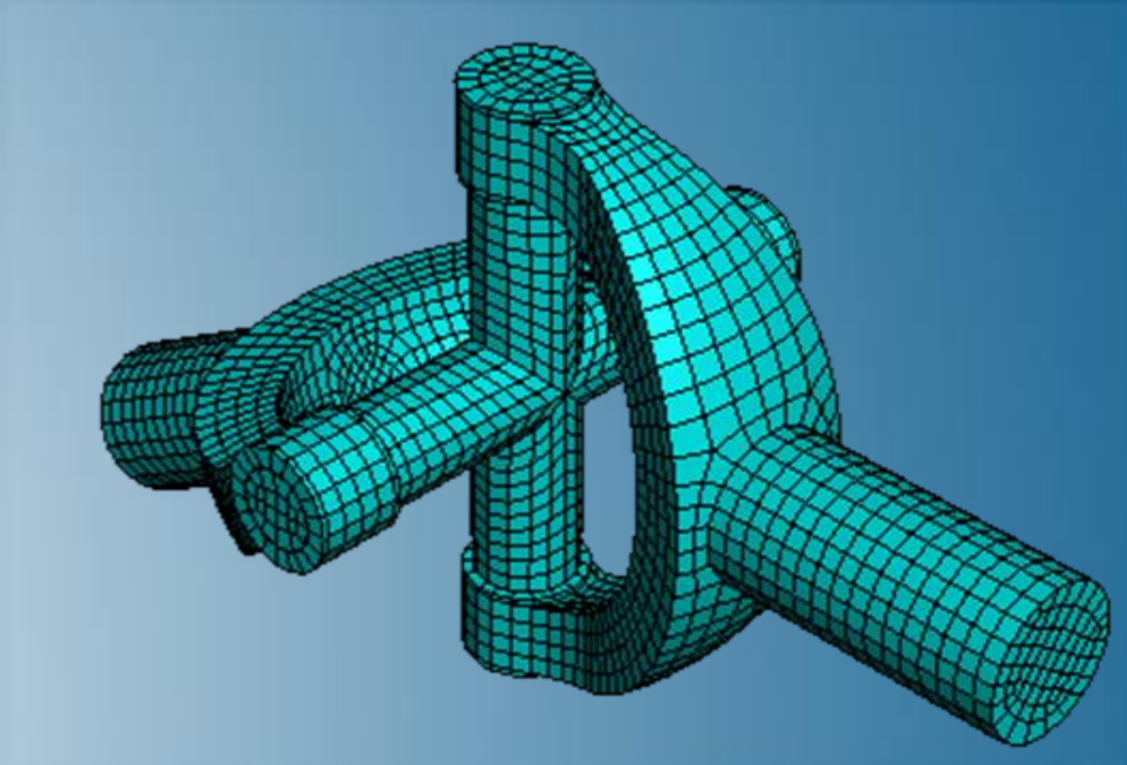


Abaqus/CAE: Geometry Import and Meshing

Abaqus 2019



3DEXPERIENCE[®]



About this Course

Course objectives

Upon completion of this course you will be able to:

- ▶ Import, edit, and repair CAD geometry.
- ▶ Import and edit orphan meshes.
- ▶ Use virtual topology to ease the meshing of complicated geometry.
- ▶ Partition geometry to enable different meshing techniques.

Targeted audience

Simulation Analysts

Prerequisites

None



2 days

Day 1

- ▶ Lecture 1 Geometry Import and Repair
 - Demonstration 1 Geometry Import and Repair: Lens Model
 - Demonstration 2 Geometry Import, Diagnostics, and Defeaturing
 - Workshop 1 Geometry Import and Repair: Machine Part
 - Workshop 2 Geometry Repair: Piston Model
 - Workshop 3 Creating a Shell From a Thin Solid

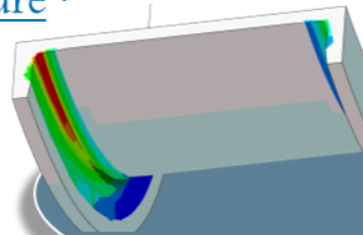
- ▶ Lecture 2 Orphan and Native Meshes
 - Demonstration 3 Importing and Editing an Orphan Mesh
 - Demonstration 4 Virtual Topology: Piston Model
 - Demonstration 5 Virtual Topology: U-Joint Model
 - Workshop 4 Importing, Editing, and Extracting Geometry from a Mesh
 - Workshop 5 Virtual Topology: Bracket Model

SIMULIA

- ▶ SIMULIA is the Dassault Systèmes brand for Realistic Simulation solutions
- ▶ Portfolio of established, best-in-class products
 - Abaqus, Isight, Tosca, fe-safe, Simpack

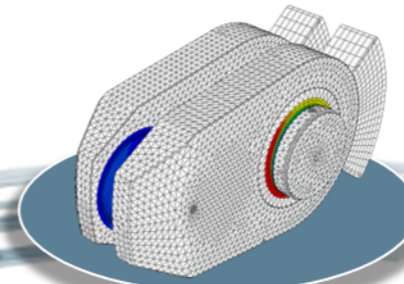
Design Optimization: Tosca Structure *

Simulation-driven design refinement to improve performance



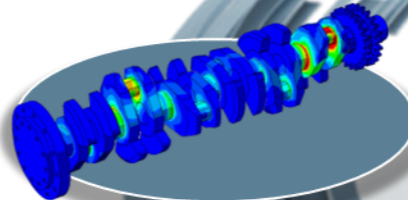
Durability Assessment: fe-safe *

Accurate life estimation to achieve certification



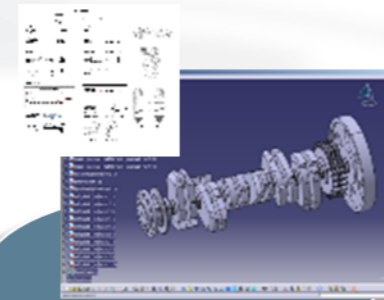
FEA Stress Analysis: Abaqus *

Detailed stress analysis using extracted load history from MBS



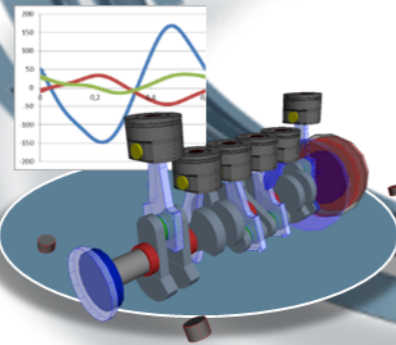
CAD Geometry: CATIA

Fully parameterized 3D geometry; FEA model generation via associative interface



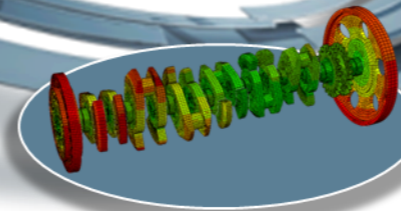
Multibody Simulation: Simpack

System analysis to extract virtual load history of complete working cycle



Mesh Calibration: Isight *

Automated mesh calibration; sufficient mesh quality for accurate results

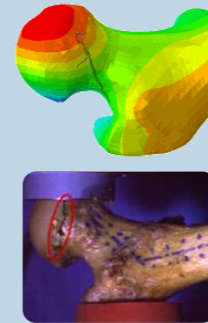


* Included in extended licensing pool

SIMULIA's Power of the Portfolio

Abaqus

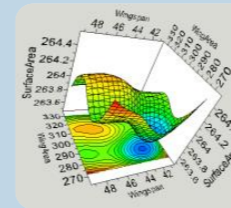
- Routine and Advanced Simulation
- Linear and Nonlinear, Static and Dynamic
- Thermal, Electrical, Acoustics
- Extended Physics through Co-simulation
- Model Preparation and Visualization



**Realistic Human Simulation
High Speed Crash & Impact
Noise & Vibration**

Isight

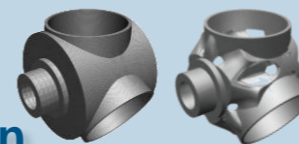
- Process Integration
- Design Optimization
- Parametric Optimization
- Six Sigma and Design of Experiments



**Material Calibration
Workflow Automation
Design Exploration**

Tosca

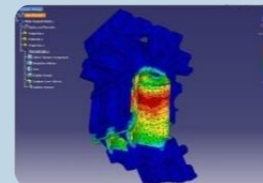
- Non-Parametric Optimization
- Structural and Fluid Flow Optimization
- Topology, Sizing, Shape, Bead Optimization



**Conceptual/Detailed Design
Weight, Stiffness, Stress
Pressure Loss Reduction**

fe-safe

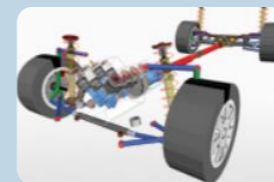
- Durability Simulation
- Low Cycle and High Cycle Fatigue
- Weld, High Temperature, Non-metallics



**Safety Factors
Creep-Fatigue Interaction
Weld Fatigue**

Simpack

- 3D Multibody Dynamics Simulation
- Mechanical or Mechatronic Systems
- Detailed Transient Simulation (Offline and Realtime)



**Complete System Analyses
(Quasi-)Static, Dynamics, NVH
Flex Bodies, Advanced
Contact**

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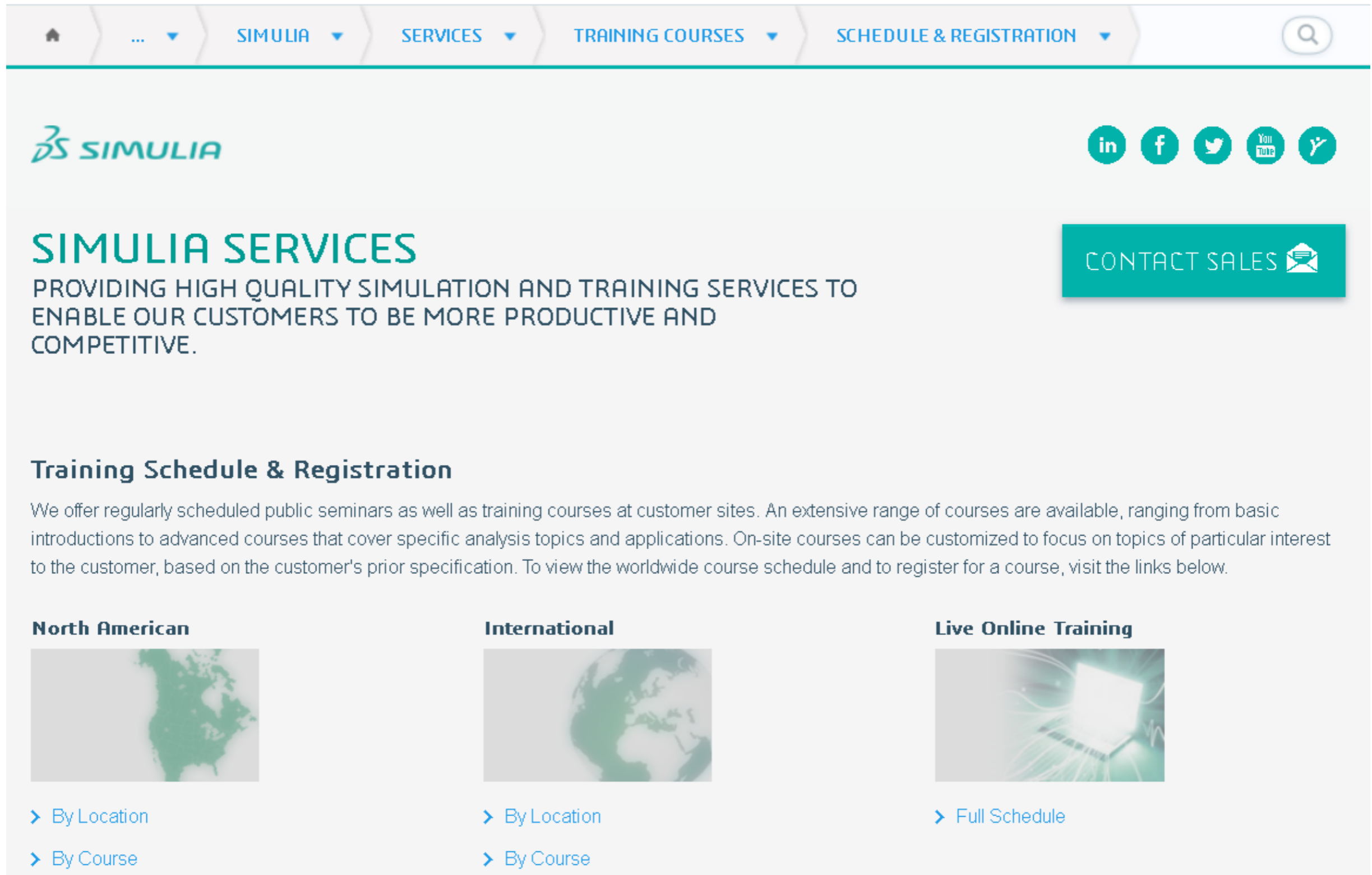
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Revision Status

Lecture 1	11/18	Updated for Abaqus 2019
Lecture 2	11/18	Updated for Abaqus 2019
Lecture 3	11/18	Updated for Abaqus 2019
Lecture 4	11/18	Updated for Abaqus 2019
Demonstration 1	11/18	Updated for Abaqus 2019
Demonstration 2	11/18	Updated for Abaqus 2019
Demonstration 3	11/18	Updated for Abaqus 2019
Demonstration 4	11/18	Updated for Abaqus 2019
Demonstration 5	11/18	Updated for Abaqus 2019
Demonstration 6	11/18	Updated for Abaqus 2019
Demonstration 7	11/18	Updated for Abaqus 2019
Demonstration 8	11/18	Updated for Abaqus 2019
Workshop 1	11/18	Updated for Abaqus 2019
Workshop 2	11/18	Updated for Abaqus 2019
Workshop 3	11/18	Updated for Abaqus 2019
Workshop 4	11/18	Updated for Abaqus 2019
Workshop 5	11/18	Updated for Abaqus 2019
Workshop 6	11/18	Updated for Abaqus 2019
Workshop 7	11/18	Updated for Abaqus 2019
Workshop 8	11/18	Updated for Abaqus 2019
Workshop 9	11/18	Updated for Abaqus 2019

Lesson 1: Geometry Import and Repair

Lesson content:

- ▶ Introduction
- ▶ Geometry Import
- ▶ CAD Associative Import
- ▶ CAD Standalone Import
- ▶ Neutral Geometry Formats
- ▶ Geometry Repair
- ▶ Query and Diagnostics Tools
- ▶ Geometry Import Flowchart
- ▶ Example
- ▶ Shell Midsurface Creation
- ▶ Workshop Preliminaries
- ▶ Demonstration 1 Geometry Import and Repair: Lens Model
- ▶ Demonstration 2 Geometry Import, Diagnostics, and Defeaturing
- ▶ Workshop 1 Geometry Import and Repair: Machine Part
- ▶ Workshop 2 Geometry Repair: Piston Model
- ▶ Workshop 3 Creating a Shell From a Thin Solid



4 hours

Lesson 2: Orphan and Native Meshes

Lesson content:

- ▶ Introduction
- ▶ Dependent and Independent Part Instances
- ▶ Orphan Meshes
- ▶ Mesh Editing
- ▶ Creating Geometry from an Orphan Mesh
- ▶ Combined Orphan and Native Meshes
- ▶ Mesh Generation Techniques
 - Free meshing
 - Swept meshing
 - Structured meshing
- ▶ Virtual Topology
- ▶ Demonstration 3: Importing and Editing an Orphan Mesh
- ▶ Demonstration 4: Virtual Topology: Piston Model
- ▶ Demonstration 5: Virtual Topology: U-Joint Model
- ▶ Workshop 4: Importing, Editing, and Extracting Geometry from a Mesh
- ▶ Workshop 5: Virtual Topology: Bracket Model



3.5 hours

Lesson 3: Meshing and Partitioning

Lesson content:

- ▶ Enabling Various Meshing Techniques
- ▶ Controlling Mesh Density and Gradation
- ▶ Methods of Gaining More Control over the Mesh
- ▶ Creating and Merging Meshable Regions
- ▶ Hex Meshing Revolved Regions
- ▶ Mesh Stack Direction
- ▶ Parametric Modeling
- ▶ Assigning Element Types
- ▶ Verifying Mesh Quality
- ▶ Mass and Mesh Queries
- ▶ Midside Nodes
- ▶ Demonstration 6: Partitioning and Mixed Meshing
- ▶ Demonstration 7: Sweep Meshing Techniques
- ▶ Workshop 6: Hex Meshing Intersecting Pipes
- ▶ Workshop 7: Hex Meshing a Cardan Joint
- ▶ Workshop 8: Additional Geometry Repair and Meshing Exercises



4 hours

Lesson 4: Bottom-Up Meshing

Lesson content:

- ▶ Introduction
- ▶ Basic Features
- ▶ Example
- ▶ Summary
- ▶ Demonstration 8: Bottom-Up Meshing
- ▶ Workshop 9: Bottom-Up Meshing



75 minutes