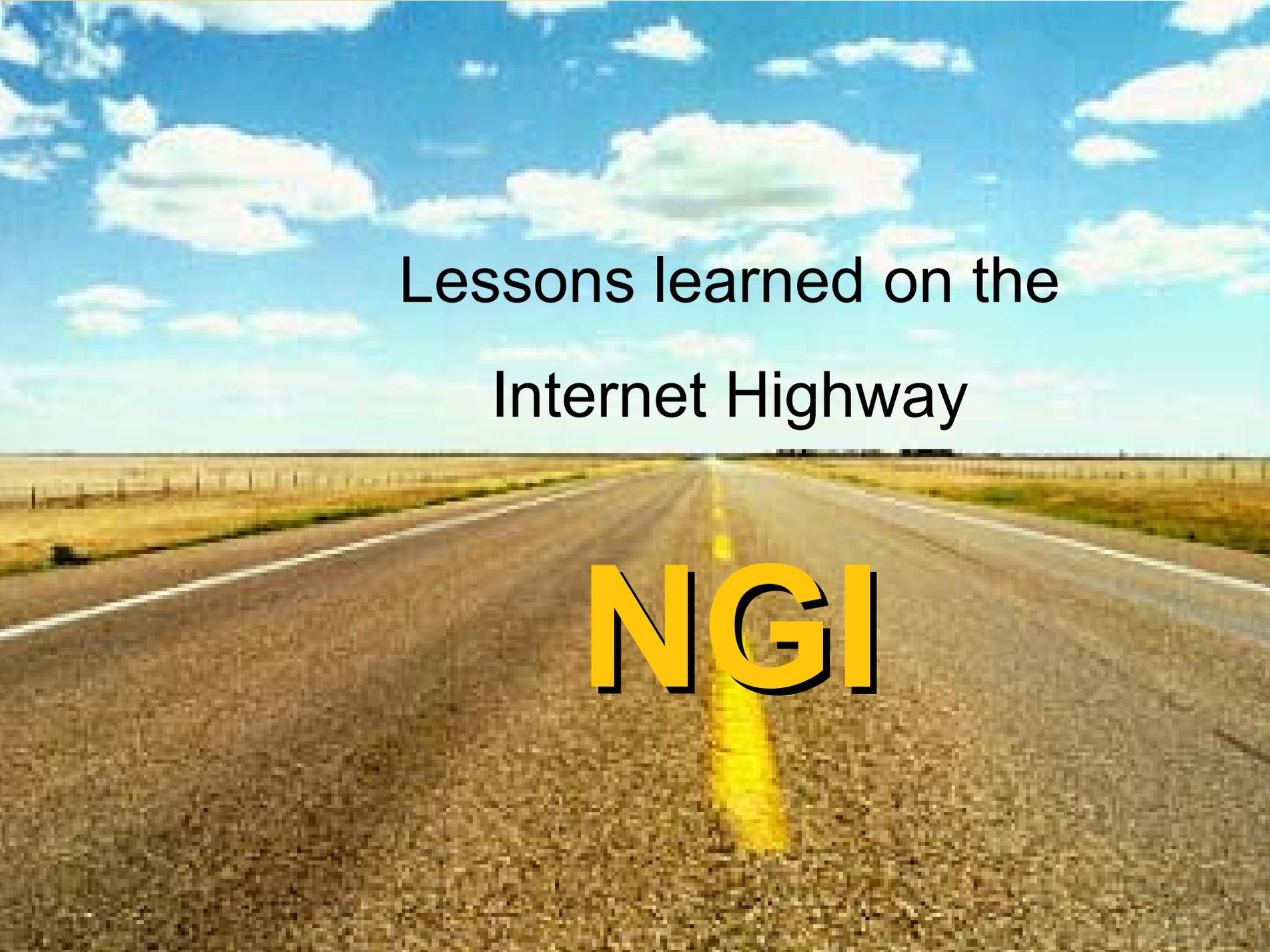


# Remote Real Time Simulation for Anatomy and Surgery Education

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Lessons learned on the  
Internet Highway

**NGI**

# Overview

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- Objectives of our research program.
- Features of net-aware applications.
- Measurement of end-to-end performance.
- Lessons learned.

# Our objectives

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- Applications that utilize power of Internet/NGI
  - We did not repurpose existing applications
  - We created a set of applications that exploited different aspects of Internet2/NGI but were pedagogically useful
  - We integrated networked **haptics** as a novel modality for sensing and learning that challenged the performance of the network

# Our objectives

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- Applications that utilize power of Internet/NGI
- Focus on medical education
  - Universities are able to set up large server-based resources
  - Students usually use medium or low end computers to access learning resources
  - This challenges us to create a scalable solution where a range of client capabilities can be used to reach numerous and varied learning resources

# Our objectives

- Applications that utilize power of Internet/NGI
- Focus on medical education
- Use Internet to link developers and evaluators
  - The Stanford SUMMIT lab
    - project definition and management
    - lab and field testing and evaluation
  - Development at
    - Stanford-NASA Biocomputation lab
    - University of Wisconsin
    - Texas Tech University
  - Design and manufacture of laparoscopic surgical manipulators
    - Immersion Corp (San Jose/ Montreal)
  - End-to-end performance assessment of networked applications
    - The Stanford Electrical Engineering Department
  - Evaluations of the educational use of simulators
    - Education evaluation experts at Stanford and Pittsburgh



**Haptics and stereovision**

# Achievements: networked applications

- We designed and implemented networked applications for
  - Anatomical Education
  - Surgical Simulation
- “Real Time Remote Simulations for Anatomy and Surgery Education”
- *(These applications will be presented by Dr. Senger)*

# Achievements: Evaluation

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- We tested the applications for performance over simulated and real networks
  - Developed a generalizable method for end-to-end performance testing
- We evaluated the efficacy of some applications for learning

# Achievements: Curricular integration

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- Human Anatomy curriculum for medical students
- Surgical simulations in process of curricular integration
- Real-time event-based learning environment
  - integrate numerous applications
  - lead to a new generation of pedagogic methods

# Achievements: Distributed team

- We were successful in
  - Creating a distributed team that worked well together.
  - Operated over 12.
  - Achieved the goals of the project.

