The Telemedicine Reference Architecture Project

Exploring Interoperability Standards for the Next Generation of Telemedicine System Designs

For The

American Telemedicine Association Annual Meeting

May 22, 2000

Sandia National Laboratories

Los Alamos National Laboratories

http://www.sandia.gov/CIS/6200/Telemedicine

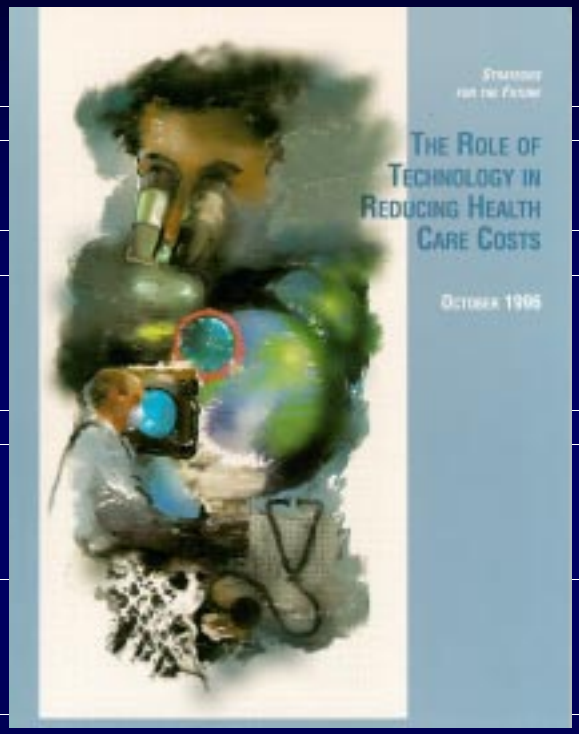
TATRC

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin company, for the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Biomedical Prosperity Game®

Goal: Identify technologies and technology-related policies with the potential for reducing United States health care costs while maintaining or improving quality of care.



Technology and policy roadmap areas:

- Advanced Telemedicine
- Health and Health Care Informatics
- Information and Network Security
- Integrated Predictive Diagnostics
- Minimally Invasive Therapy, Imaging, and Energy Delivery Systems
- Performance Measurement and Outcomes Research
- Preventive Medicine and Incentive Programs
- Rehabilitative Science and Incentive Programs

Telemedicine Project Charter

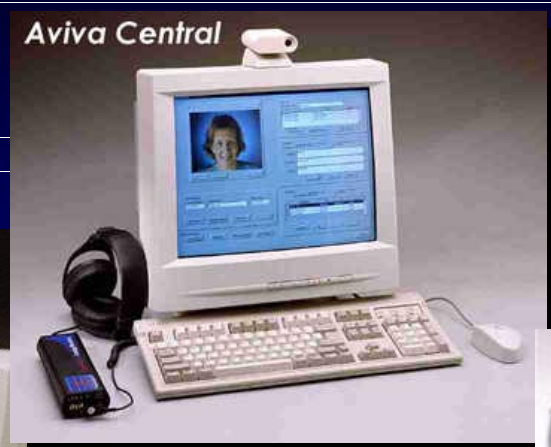
- Conduct an actual demonstration project to illustrate how telemedicine, advanced information systems, and remote patient monitoring can benefit the Department of Defense
- Focus
  - health care cost reduction
  - medical information surety
  - medical technology represented in the broader context of U.S. infrastructure protection

Original Approach to Project

- Partner with Ochsner Clinic to study cost effectiveness of telemedicine-based care for CAD
- Work with the developer of Ochsner's telemedicine system to include features that secure interactions between the nodes
- Evaluate the degree to which these features affect the clinical effectiveness and cost of telemedicine-based care delivery

Examples of Current Technology

American Telecare's Aviva Home Care System



U.S. Army Medicam

Wyle Life Sciences Telemedicine Instrumentation Pack (NASA)

TelAssist 2000 Home Care System

The Platform We Selected

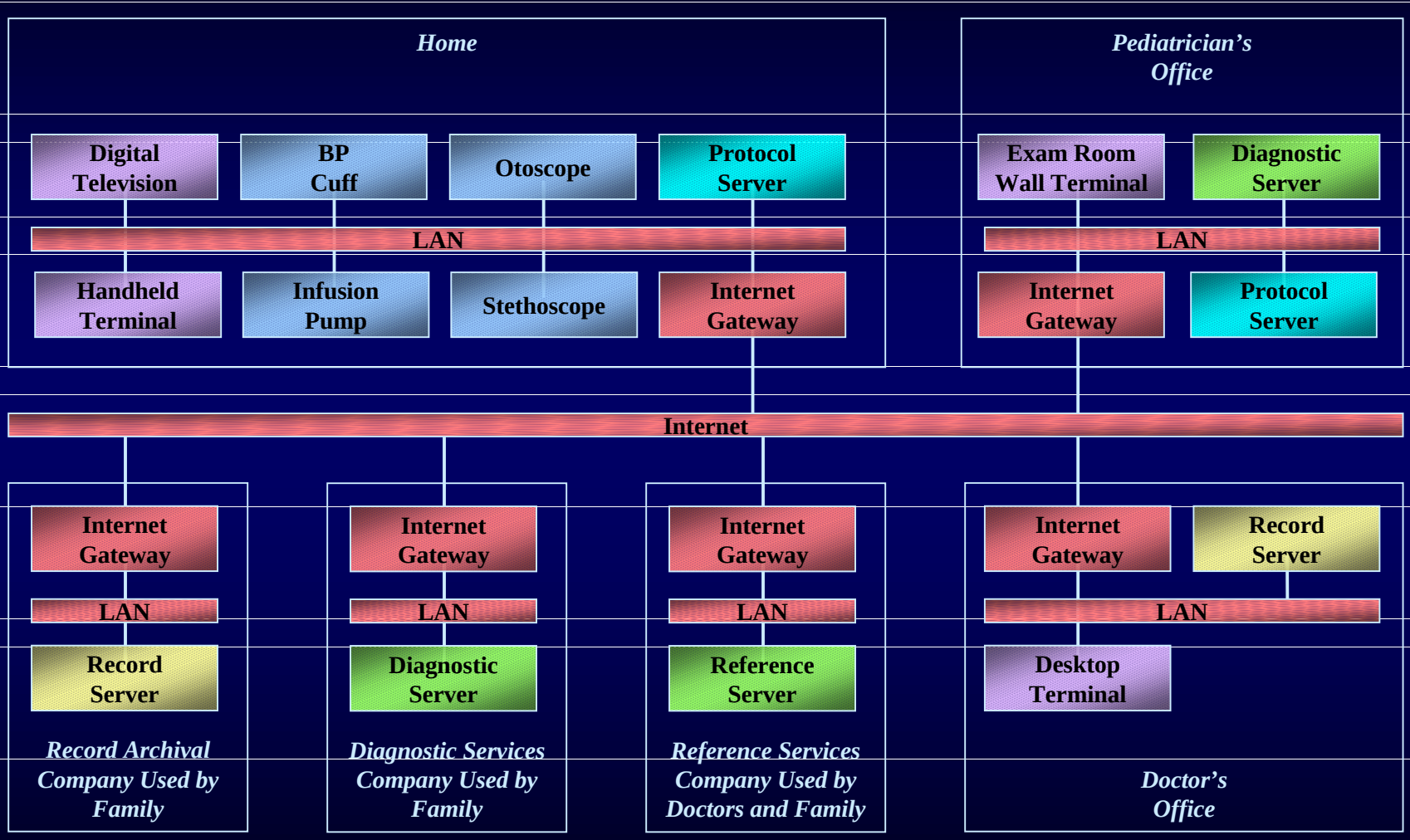
Physician Station

Patient Station

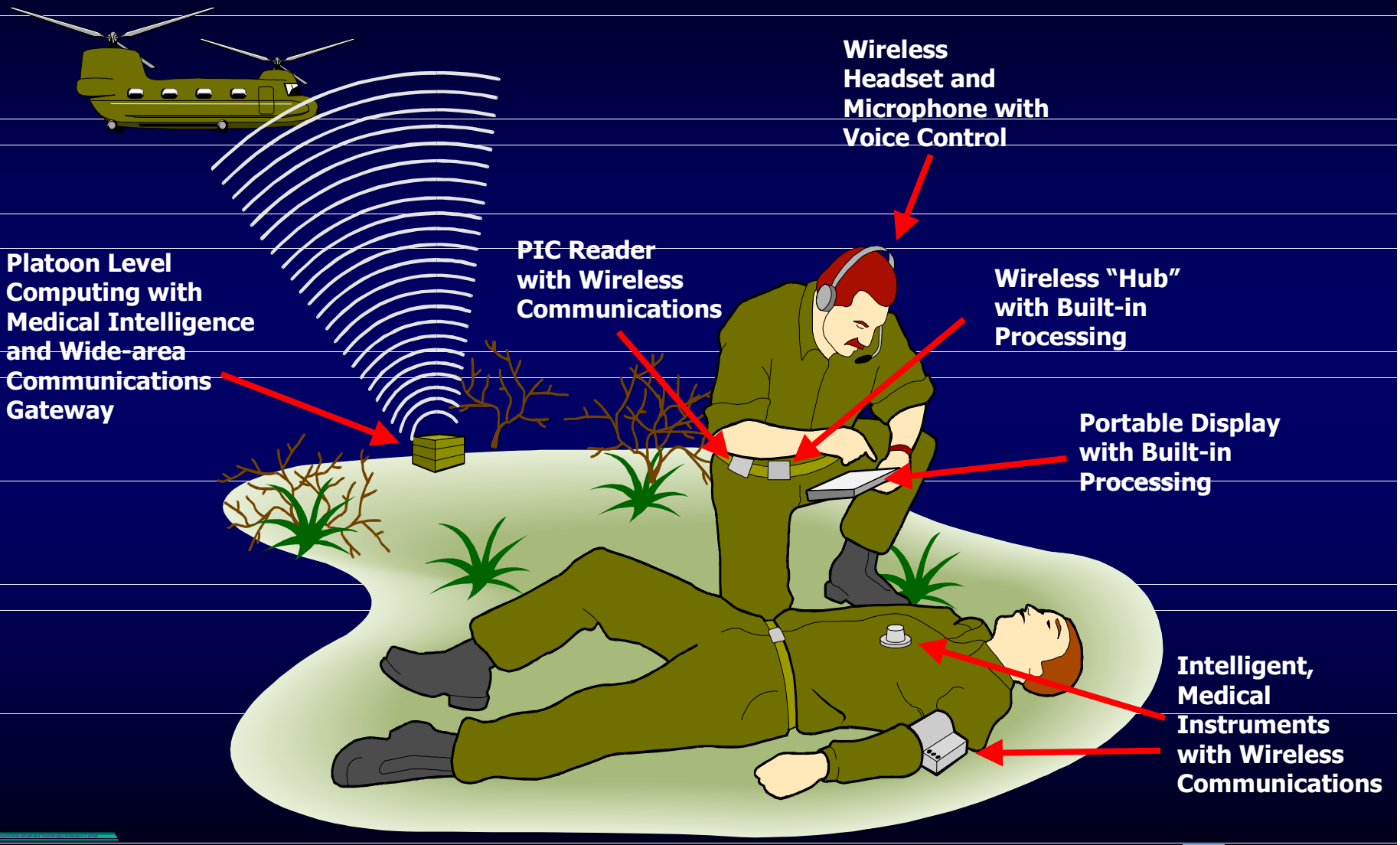
Key Technology Trends

- Future systems will be composed of:
  - plug-and-play component technologies
  - that are increasingly capable and intelligent
  - which may be widely distributed
  - that are interconnected by capable communications
  - that dynamically confederate in order to achieve some purpose

A Distributed Telemedicine System



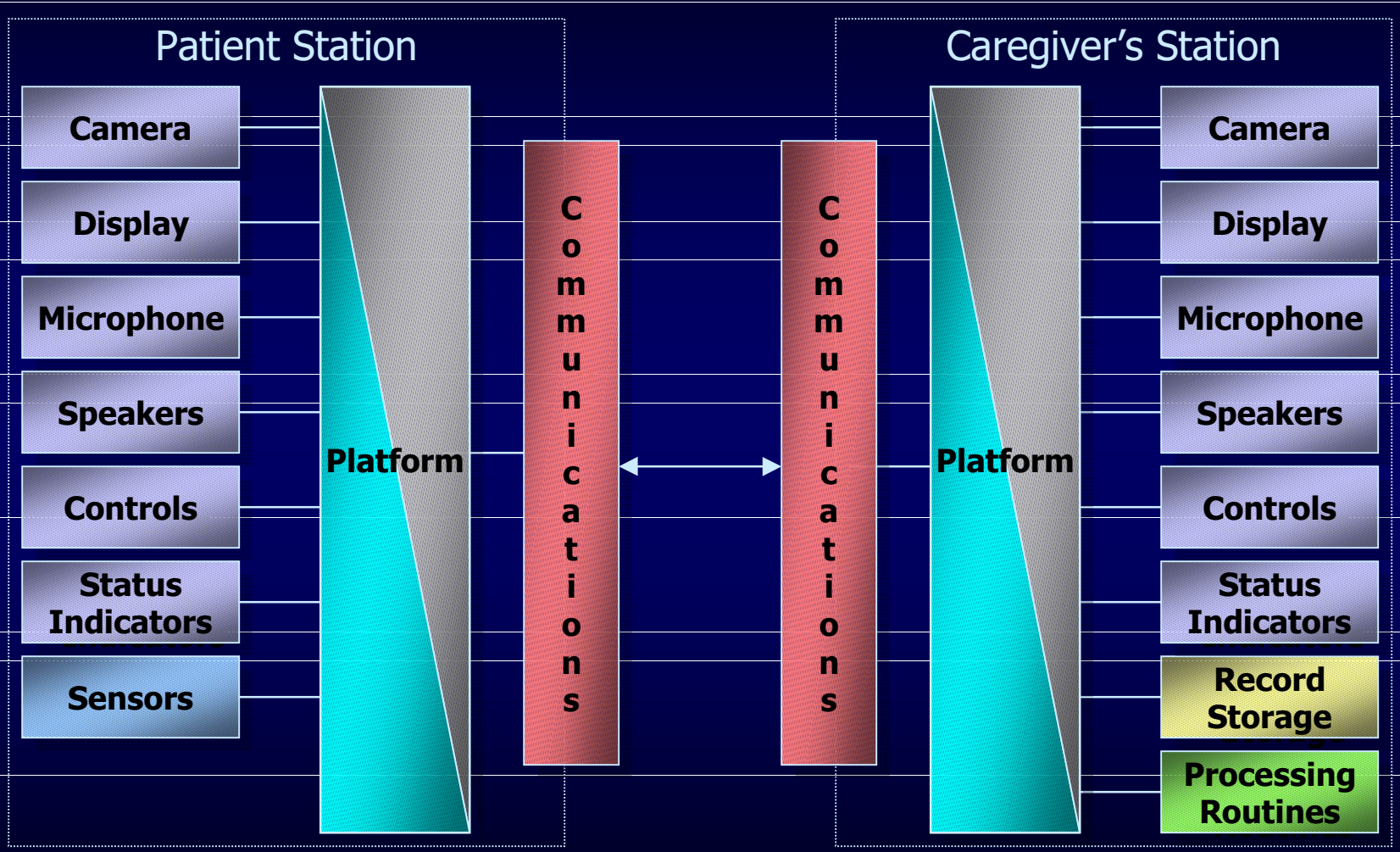
A Target Architecture



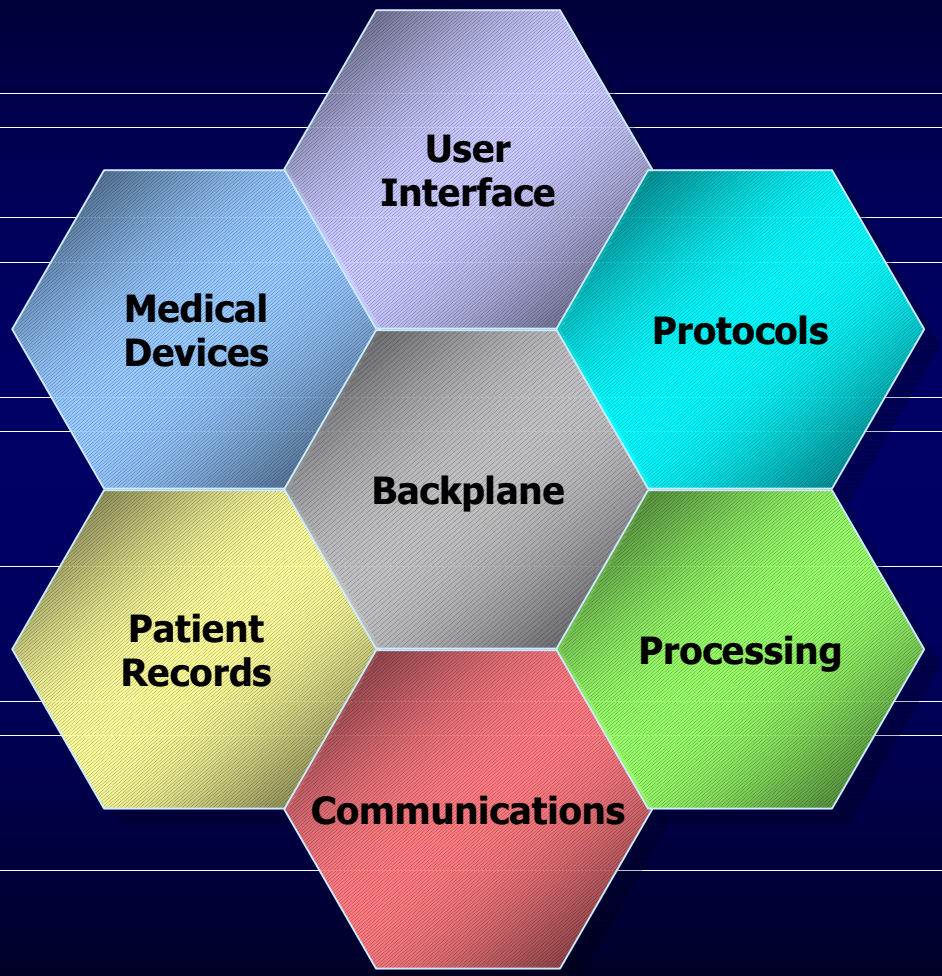
The Revised Goal

- Identify a telemedicine system architecture consistent with technology trends that:
  - enables the production of low cost equipment
  - supports interoperability across vendors
  - ensures the security and reliability of federated systems
  - expands the clinical capabilities available to users
  - increases accessibility for non-clinicians

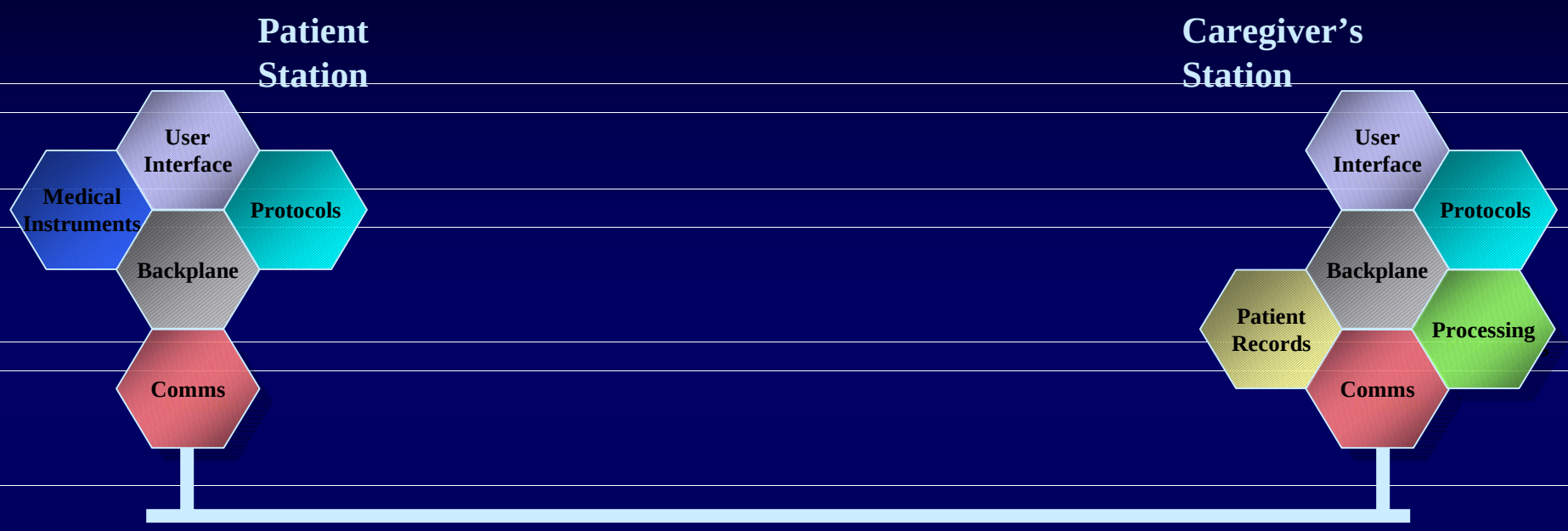
Typical Telemedicine System Architecture



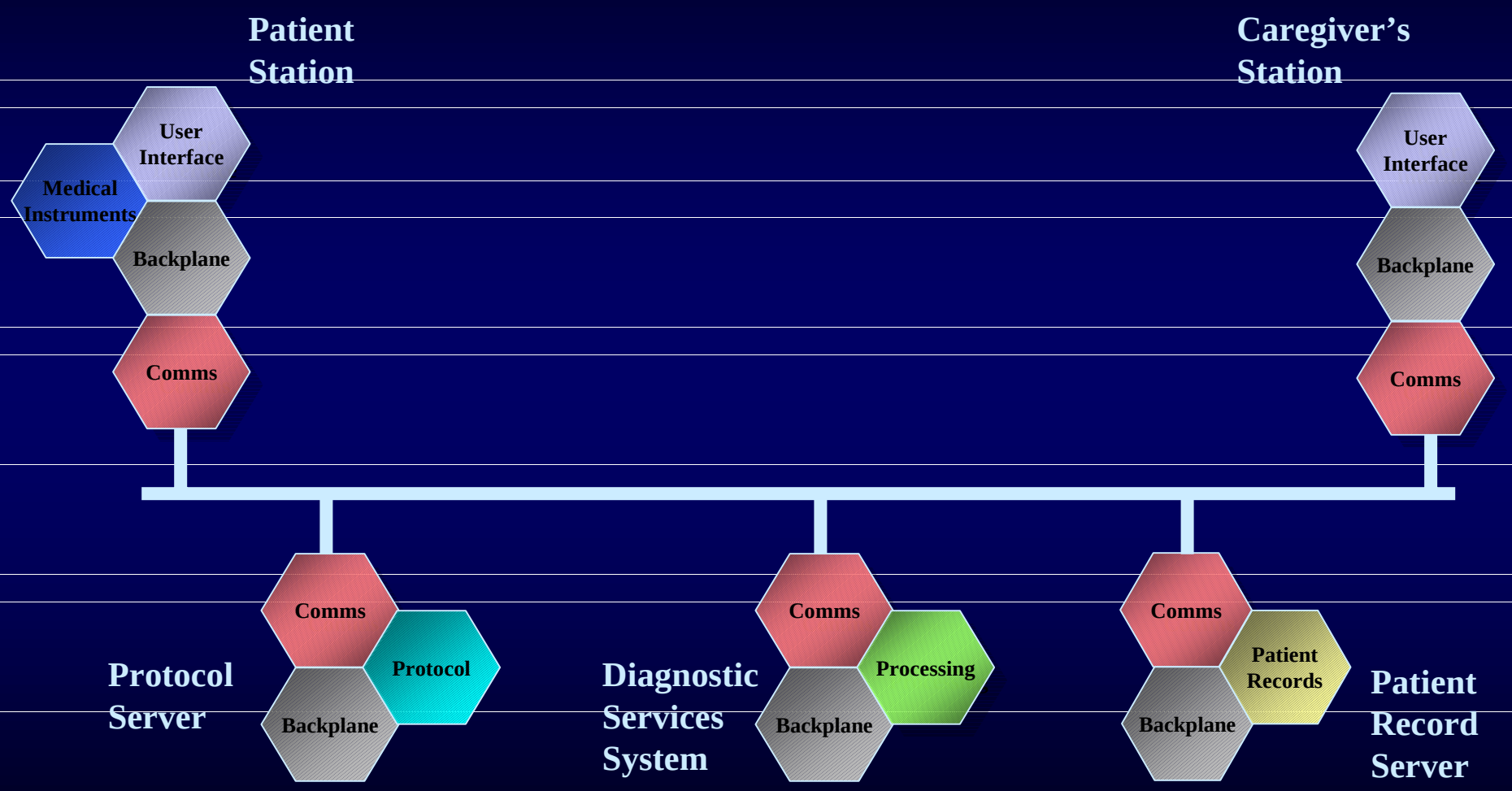
Partitioning of Services in the Architecture



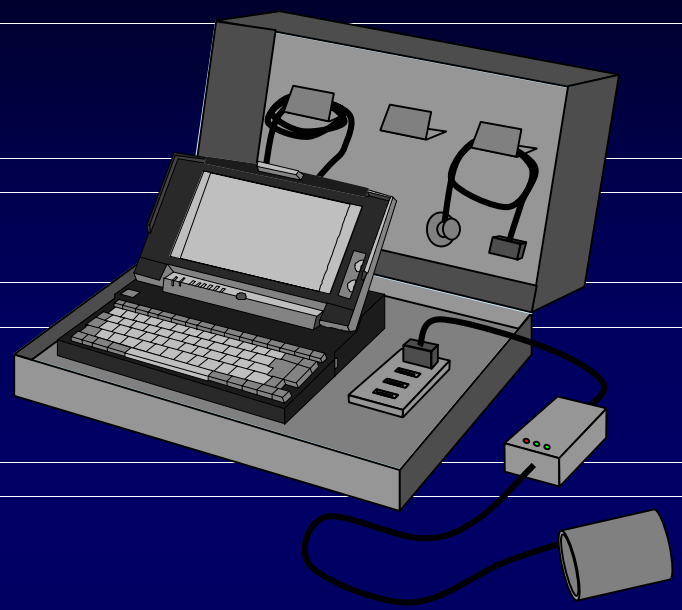
Building Block View of a Typical System



A Distributed Version of The Same System



Build 1: The Traveling Medic's Unit



Implementation Goal

Development of the infrastructure on which a telemedicine node is based

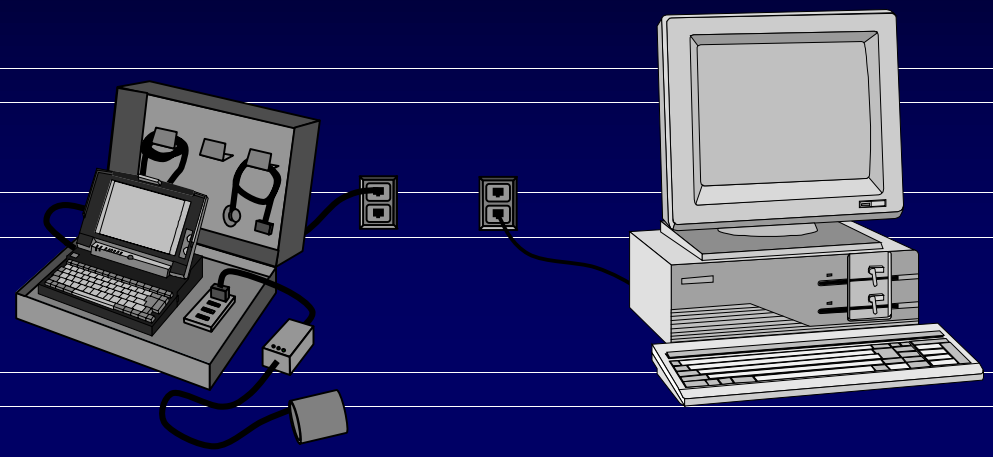
Clinical Capabilities

- On laptop, maintain simple EPRs for multiple patients with primary focus on objective data
- Synchronize laptop with clinic's patient record server
- Monitor weight, SpO2, BP, temperature, lung and heart sounds

Security Focus

- Method-level access control of objects
- User identification and authentication

Build 2: The Remote Care System



Implementation Goal

Development of the communications infrastructure and distribution of processing across multiple fixed nodes

Security Focus

- Sophisticated access control policies
- Communications security

New Clinical Capabilities

- Videoconferencing
- Remote control of instruments
- ECG and still and video cameras
- "Smart" instruments

Build 3: Advanced Medic Instrumentation Suite

Implementation Goal

Demonstration of the "virtual" telemedicine device

- **focus is on the "backplane"**

Security Focus

- Negotiation of policy amongst confederated nodes
- Certification of non-monolithic medical devices

New Clinical Capabilities

- True "smart" instruments
- Volumetric Sensors
- Environmental monitors

Presentations

- Technologies That Will Reshape Telemedicine -- Rudy Garcia
- Progress Toward a Telemedicine Reference Architecture -- Don Funkhouser
- A Distributed Object-Oriented Patient Record for Telemedicine -- Dave Forslund
- Security & Safety Issues in Next Generation Telemedicine Design -- Rick Craft
- An Example of a Next Generation Telemedicine Device -- Garcia and Funkhouser