CentMesh : Modular and Extensible Wireless Mesh Network Testbed

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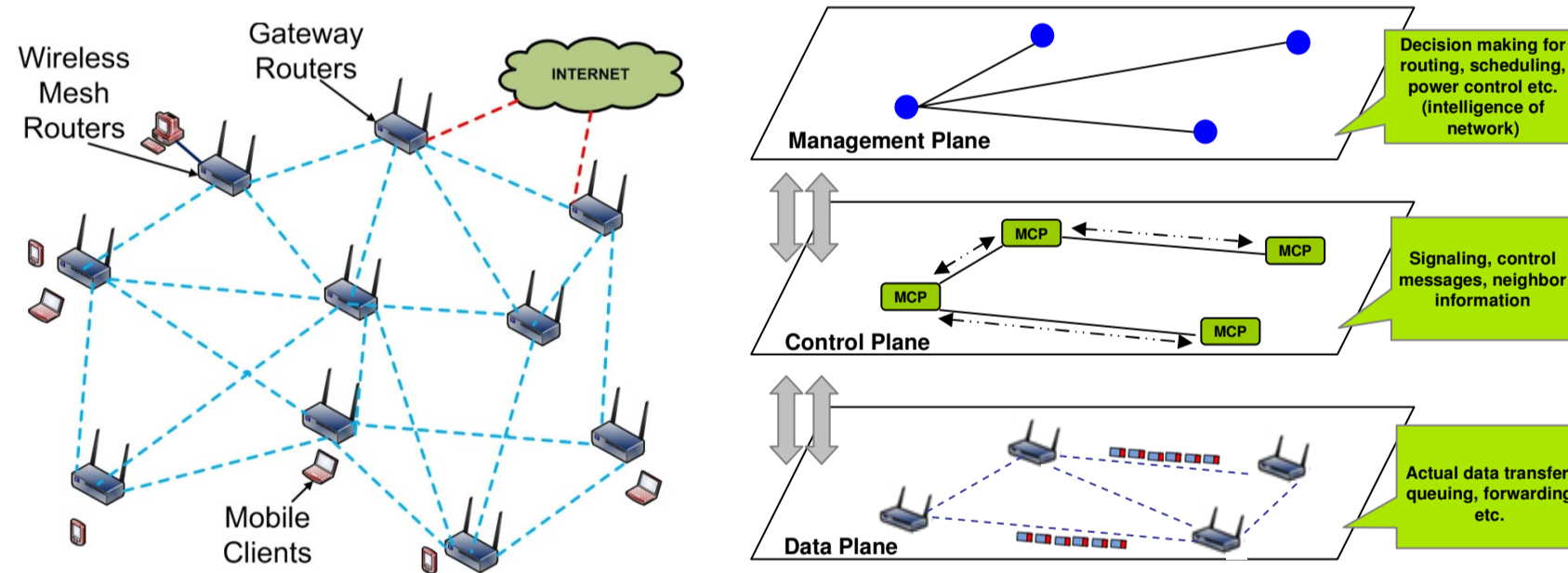North Carolina State University, Raleigh, NC, USA

Motivation

✓ Developing software, controlling testbed resources, and running experiment in a wireless mesh testbed is a challenging task because of:
- Dependencies between software
- Distributed operations in a multihop topology
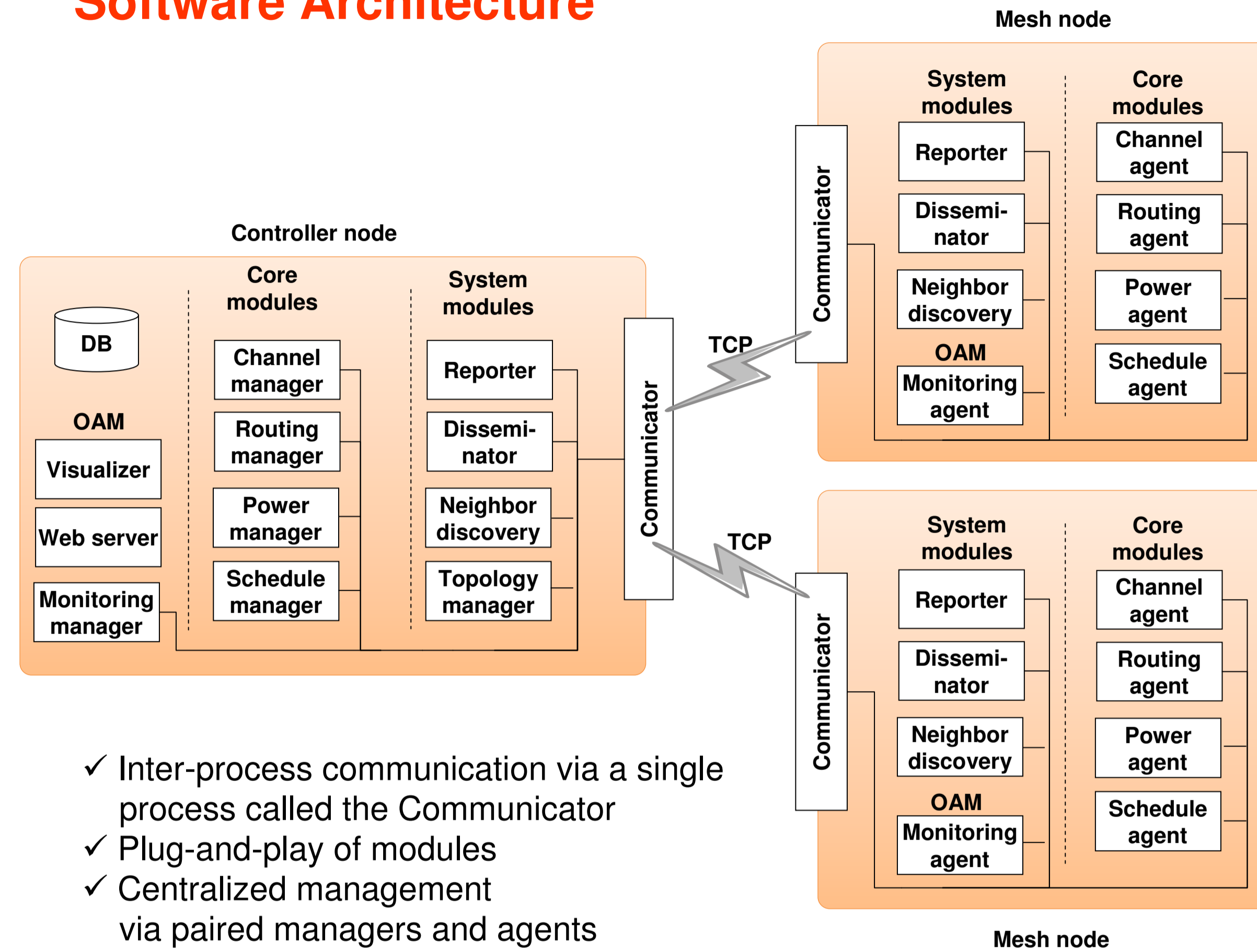- Limited abstraction of the testbed environment

Requirements

✓ Loosely coupled system
✓ Modular programming library
✓ Separation of common operations from core modules
✓ No dedicated backhaul network

Introduction

✓ Modular and extensible testbed
✓ Clear separation between data, control, and management planes

Inter-process Communication

✓ Publish and receive messages based on the topic
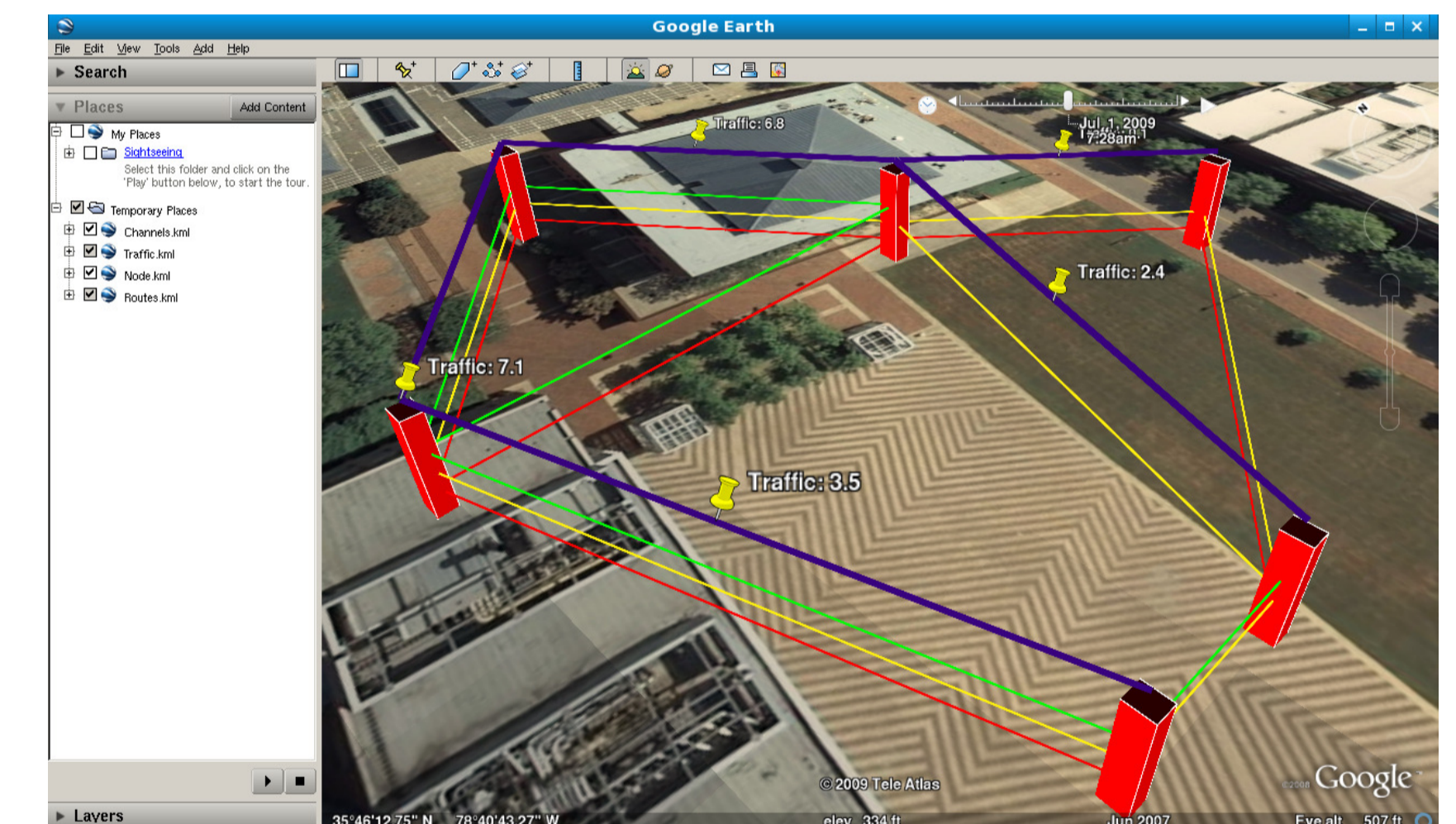✓ Enable a loosely coupled system

Software Architecture

✓ Inter-process communication via a single process called the Communicator
✓ Plug-and-play of modules
✓ Centralized management via paired managers and agents

Programming Structure

✓ Event-driven programming structure
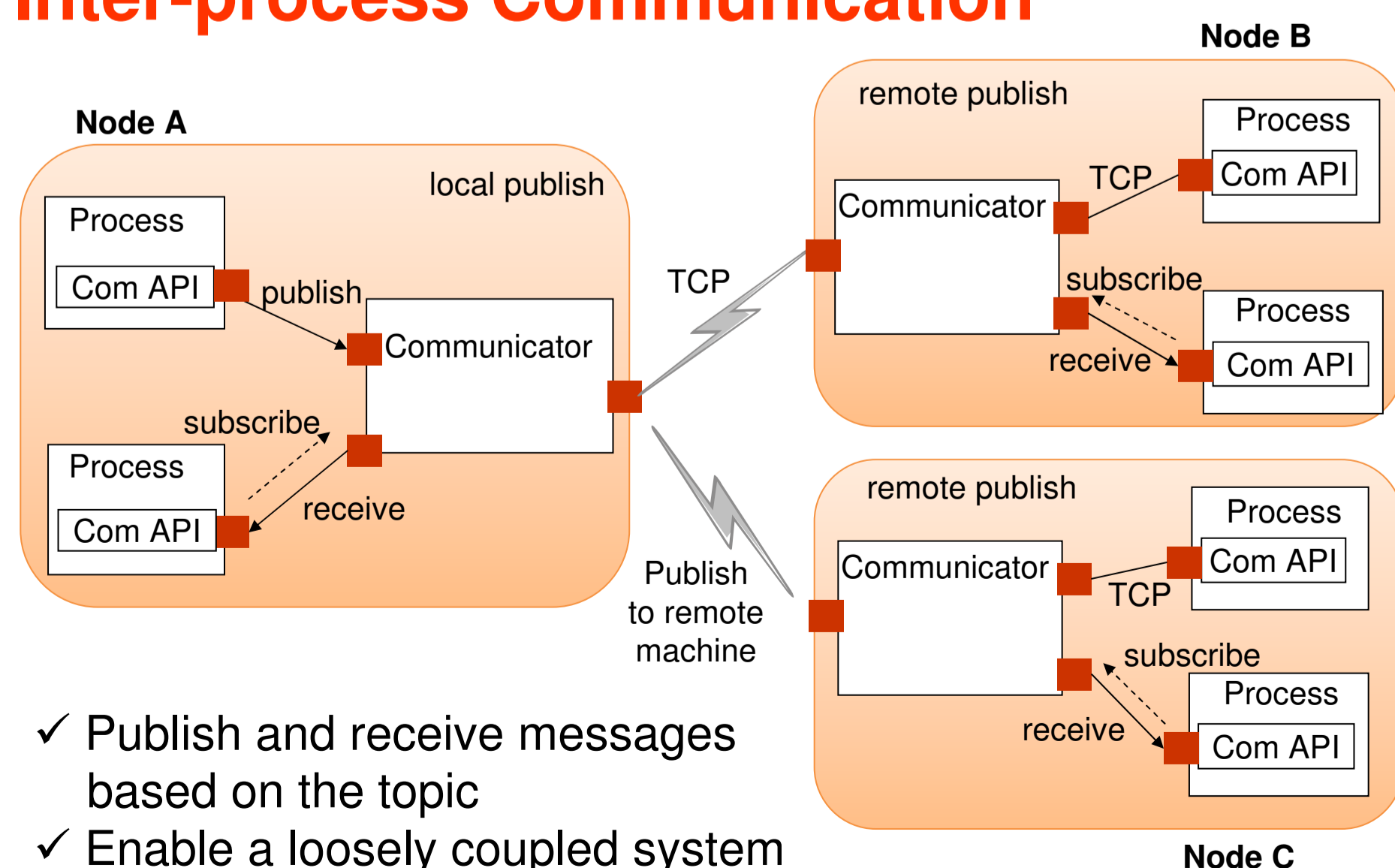✓ Asynchronous handling of messages by inheriting from a class called Subscriber

Hardware Components

✓ No customized devices
✓ Off-the-shelf desktop computers
✓ Up to 4 Atheros wireless cards
✓ Autocraft marine batteries
✓ GPS (Garmin 18x)
✓ Indoor deployment with 10-12 mesh nodes
✓ PVC pipe for separation between antennas
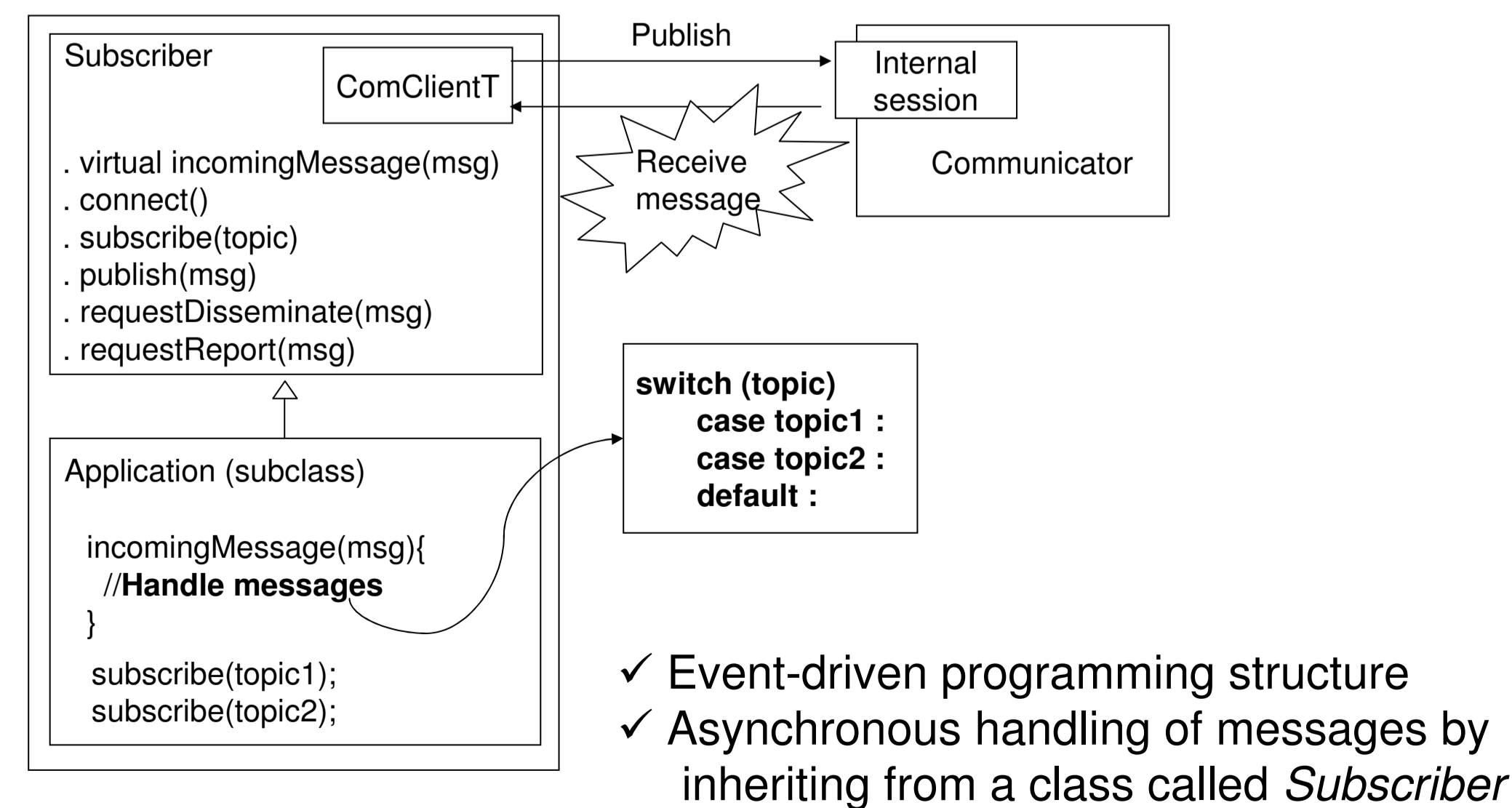

Network Monitoring and Visualization

Future Work

✓ Research studies
- Coarse-grain TDM scheduling
- Back-pressure medium access control
- Diverse routing
- Joint channel assignment and routing
✓ Ongoing extensions
- Outdoor deployment
- Release the software suite under open source license