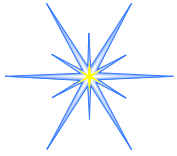


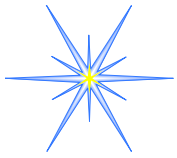
Raising Programming Abstractions In Wireless Sensor Networks

Professor Jack Stankovic
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August 8, 2006

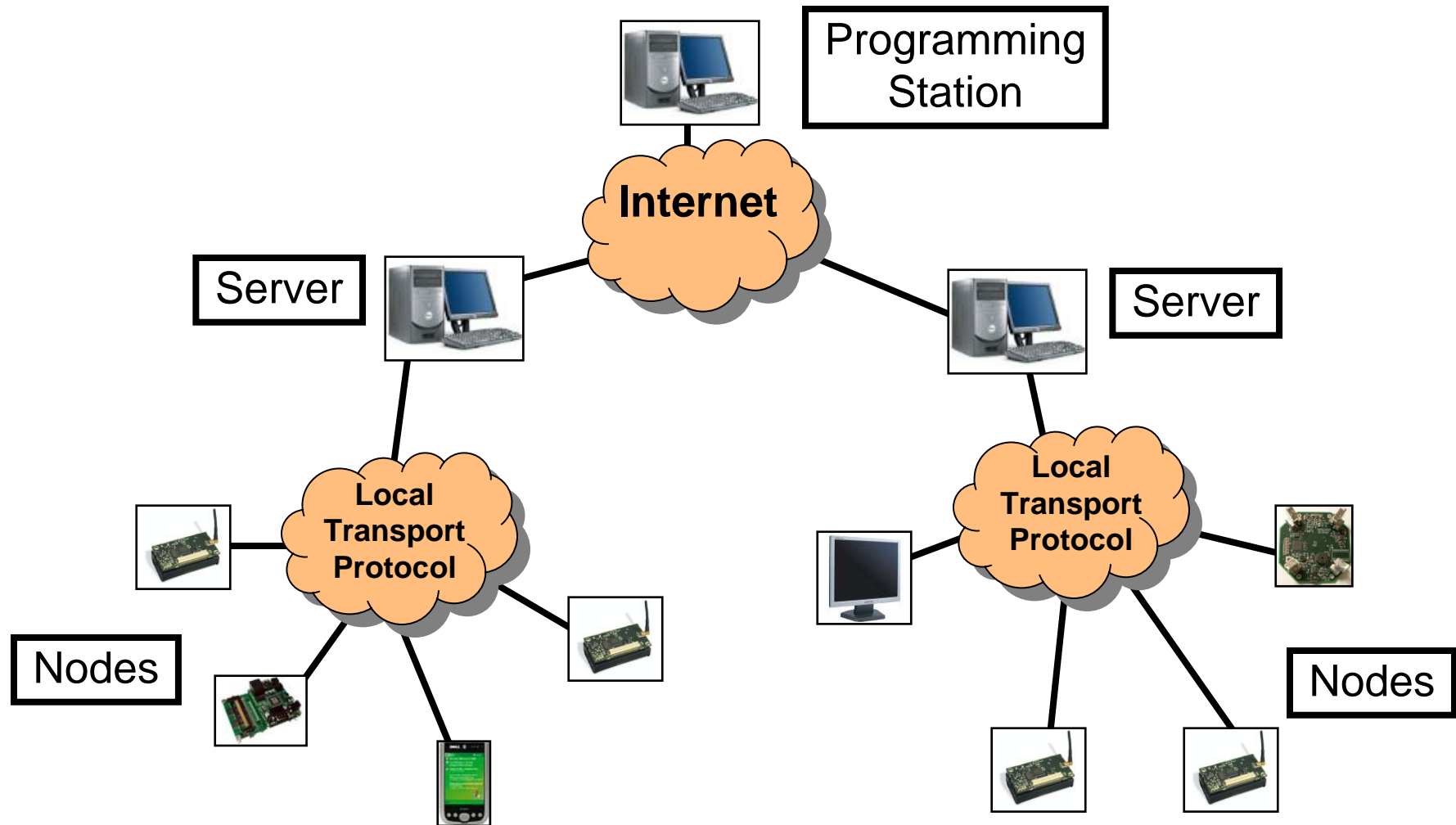


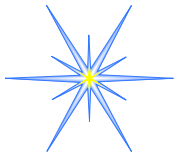
The PhysicalNet

- Networks of networks via the Internet
 - WSN
 - Home appliances (networks)
- } *SN and Ubicomp*
- Sensors and Actuators (*going physical*)
 - Mobile Devices
 - Each WSN may be multi-user, multi-application

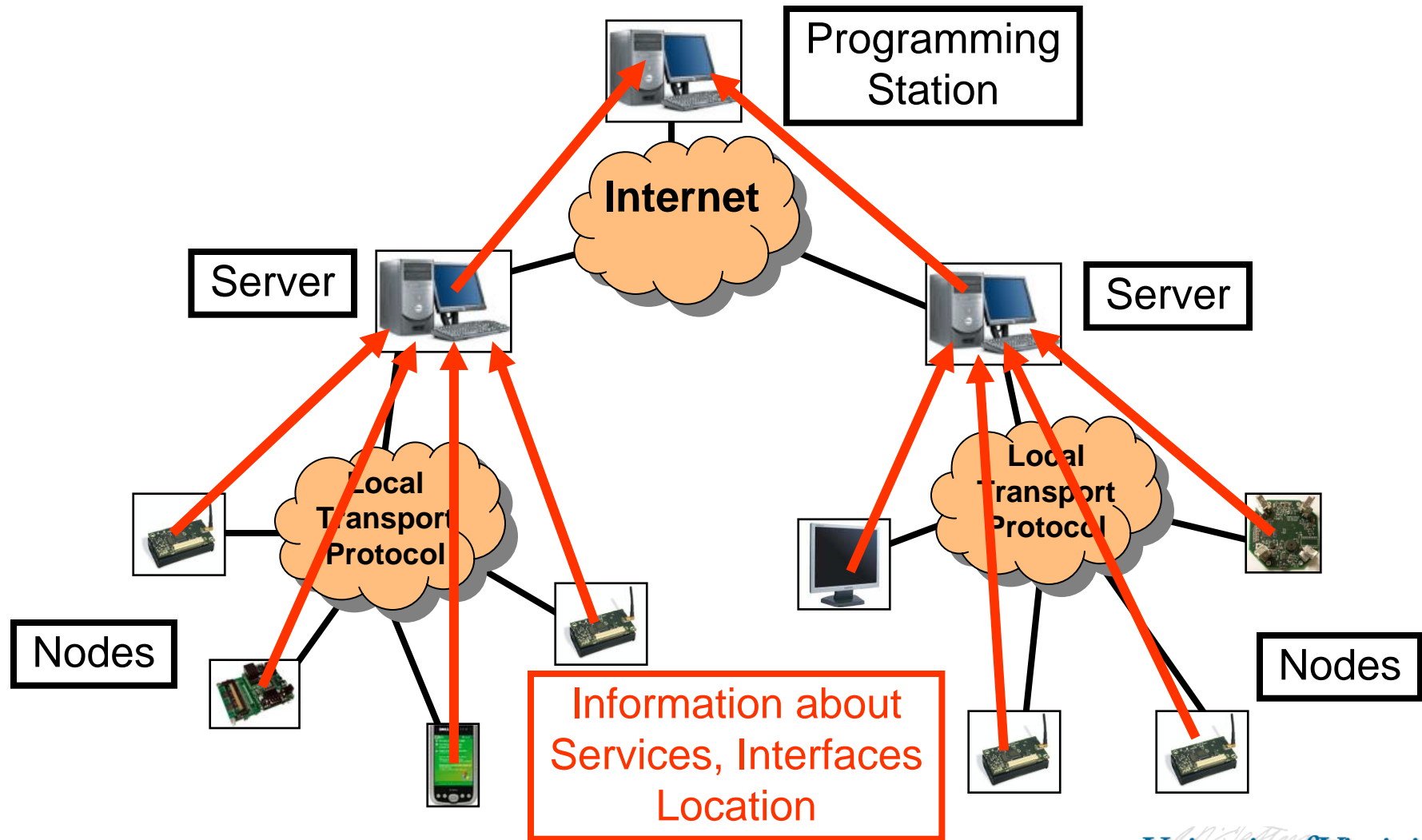


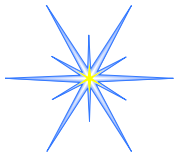
System Architecture



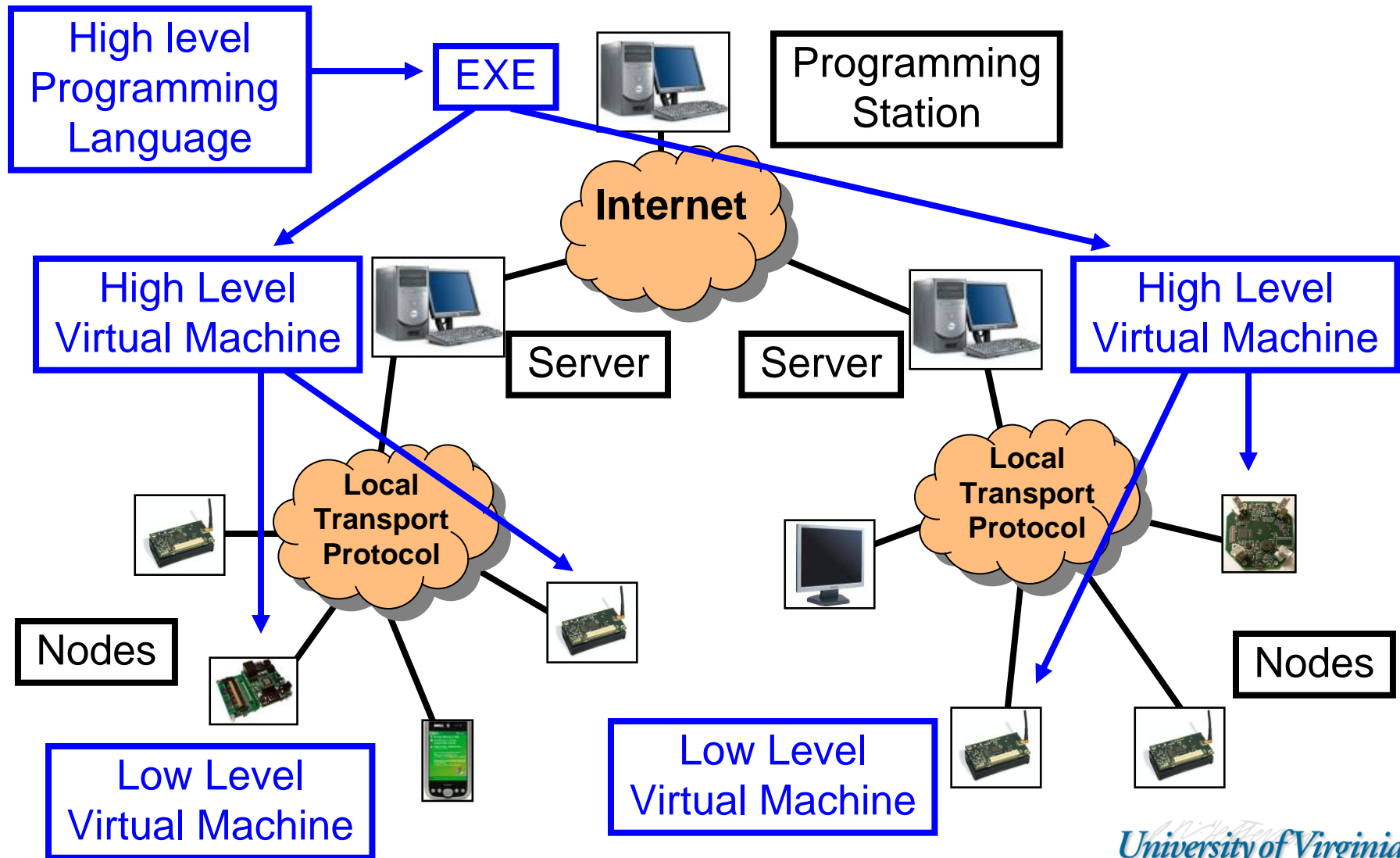


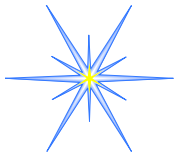
System Architecture



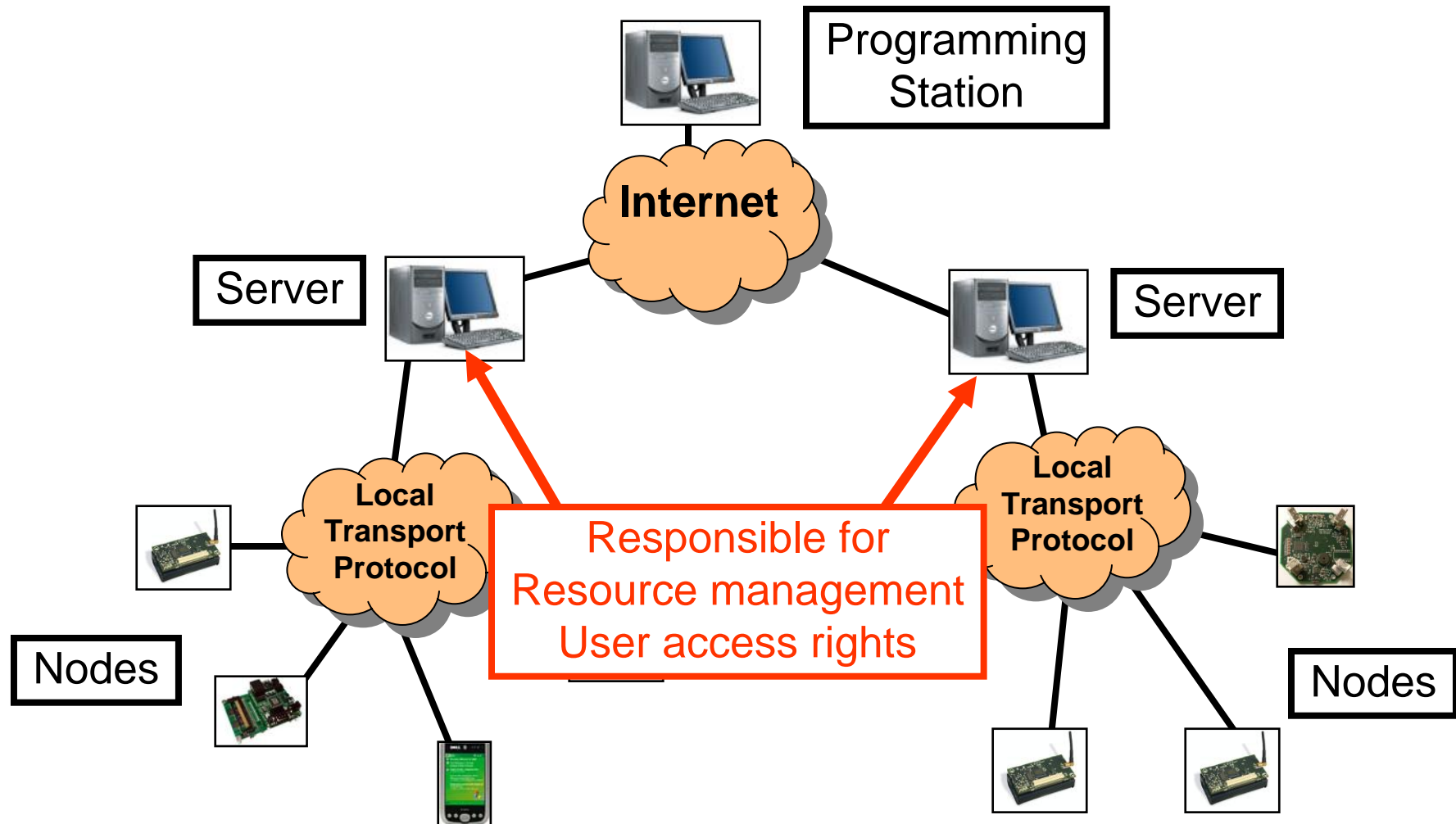


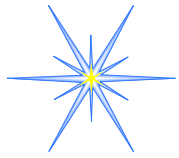
System Architecture



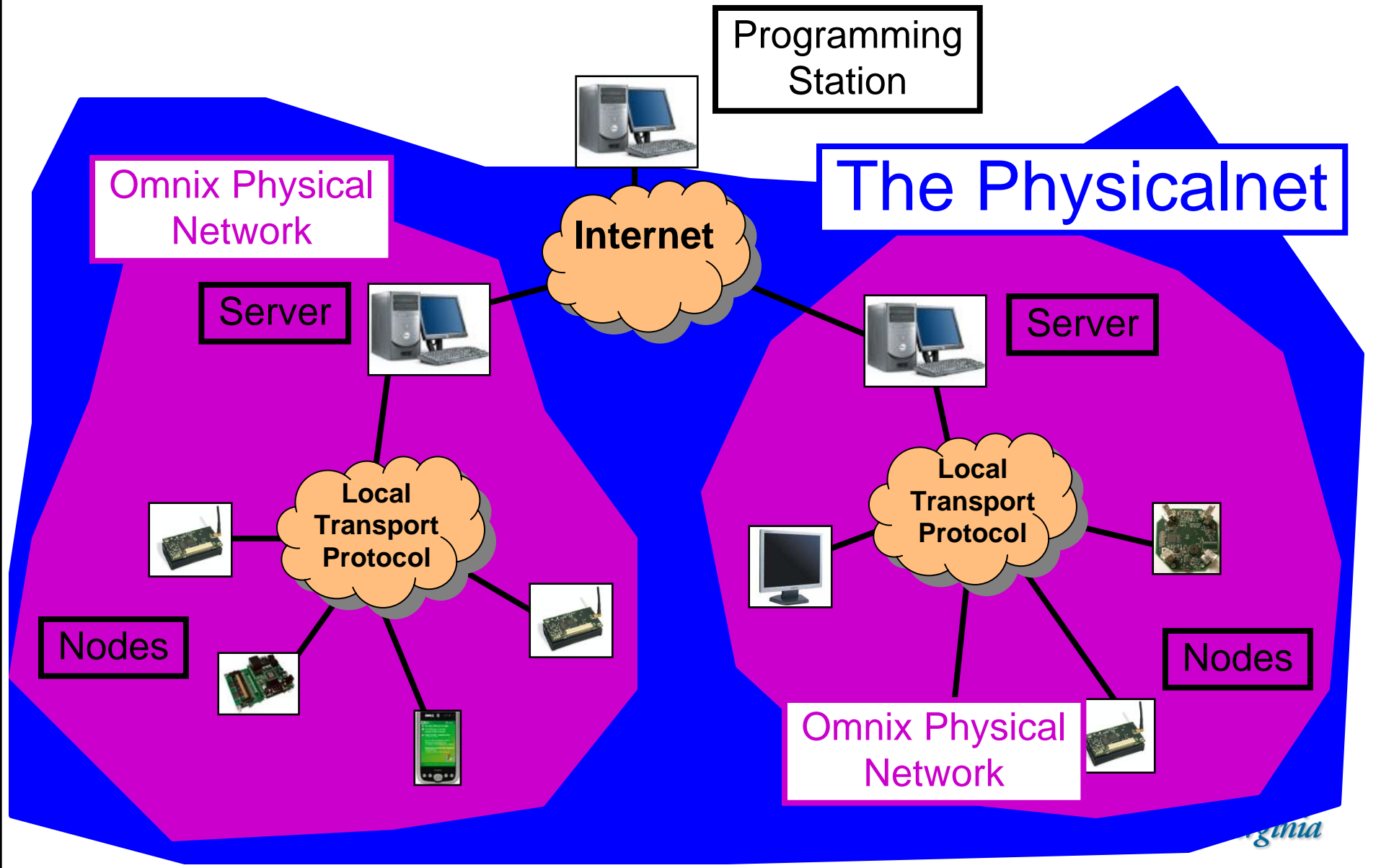


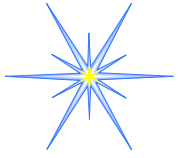
System Architecture





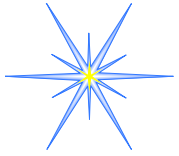
System Architecture





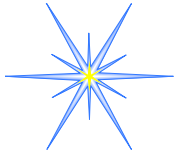
Programming Abstractions

- Object based (home, car, office, bear, ...)
- Node class
 - Constructors
 - Closest to location
 - Closest to another node
 - Random node in region
 - Exact node
- Spatial-Temporal Abstractions
 - Variables (with history)



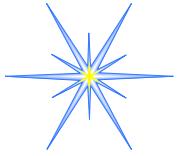
Programming Abstractions

- Services (API)
 - Discovery tool
 - Compose
- Bundles (must handle mobility)
 - Collections of nodes
 - All nodes in area (current)
 - Subset of another bundle
 - Merge, split etc. bundles
 - At least 5 motes for sensor fusion



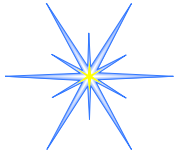
Programming Abstractions

- Event-Action Chains
 - *One system*: When Jack is home start the music and turn on lights near him
 - *Across Systems*: If system A detects an intruder tell system B to turn on lights and alert Jack (wherever he is) by the closest appropriate device



GUI

- Distribute Applications
- Monitor Applications
- Run simulator (debugging)
- Resource and service discovery
- ...



Lesson

- Globally Virtual, Locally Physical
- New, special purpose language not likely to succeed
- Build upon Java
 - Libraries
 - Middleware
 - Virtual machines
 - Monitoring and Debugging