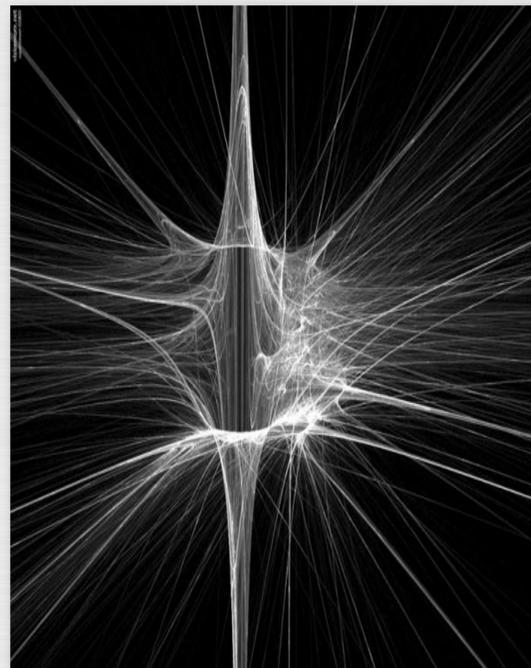


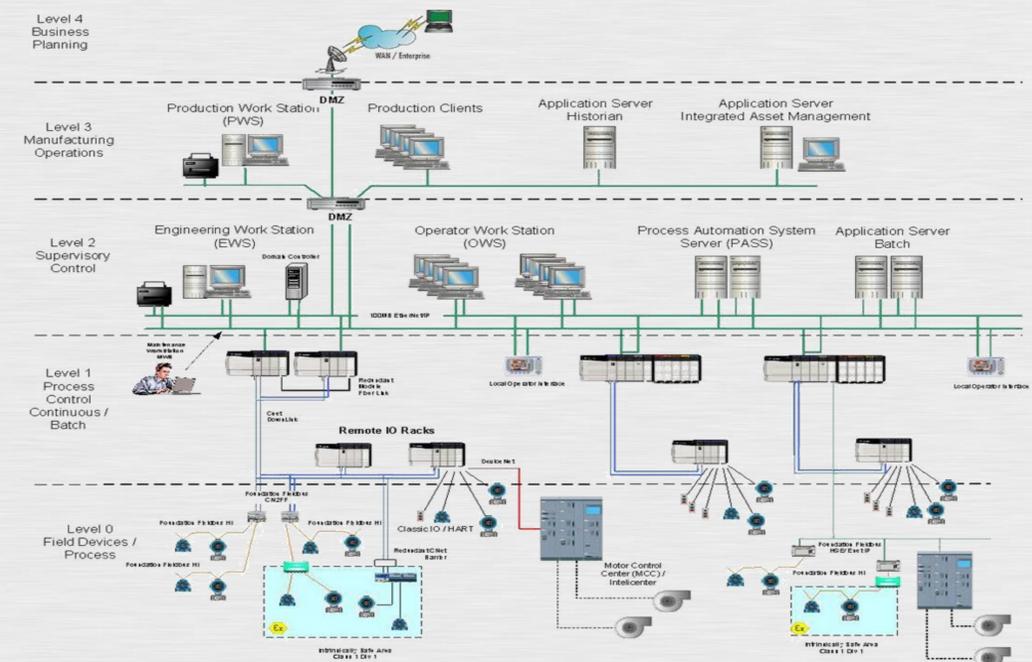


Stigmergy:
Communication via
environmental cues



Neuronal inspiration
for mesh networks

Communication Networks are a Key Enabling Technology for Advanced Process Control



Traditional Control Architecture for Distributed Control Systems (DCS) can be wired or use existing Wireless LAN technology

Mesh networks build on trends in wireless communication technology towards low power, high security, multi-hop. Network classification is wireless personal area network (WPAN) and typical protocol is IEEE 802.15.4

Complex Systems and the future of mesh networks

- **Increasing intelligence of network**
 - Biologically inspired tools for coordination of sensor data
 - Control is decentralized
 - Processors are embedded in each node
 - Extend communication range via multi-hop topology
- **Sensor nodes have increased functionality for intelligent behavior without extra features that increase complexity of interaction. Benefits are**
 - Low Power requirements permit power harvesting
 - Security via less unexpected behaviors
- **Stigmergy makes communication more robust for less cost (more efficient)**
 - Good data paths reinforced to produce optimal data lines
- **“Network is first priority” – Malfunctioning nodes power down for safety of network**

Power Harvesting Modes	
Technology	Vibration Mechanism
Piezoelectric	Mechanical vibration produces electric current
Magnetostrictive	Mechanical vibrations cause change in magnetization of material near pickup coil
Magnetic (induction)	Mechanical vibration of magnet in presence of pickup coil
Technology	Other Mechanism
Solar	Photovoltaic conversion of incoming radiation
RF scavenging	Radiation, antenna reception
Thermoelectric	Thermal motion of electrons, Seebeck Effect