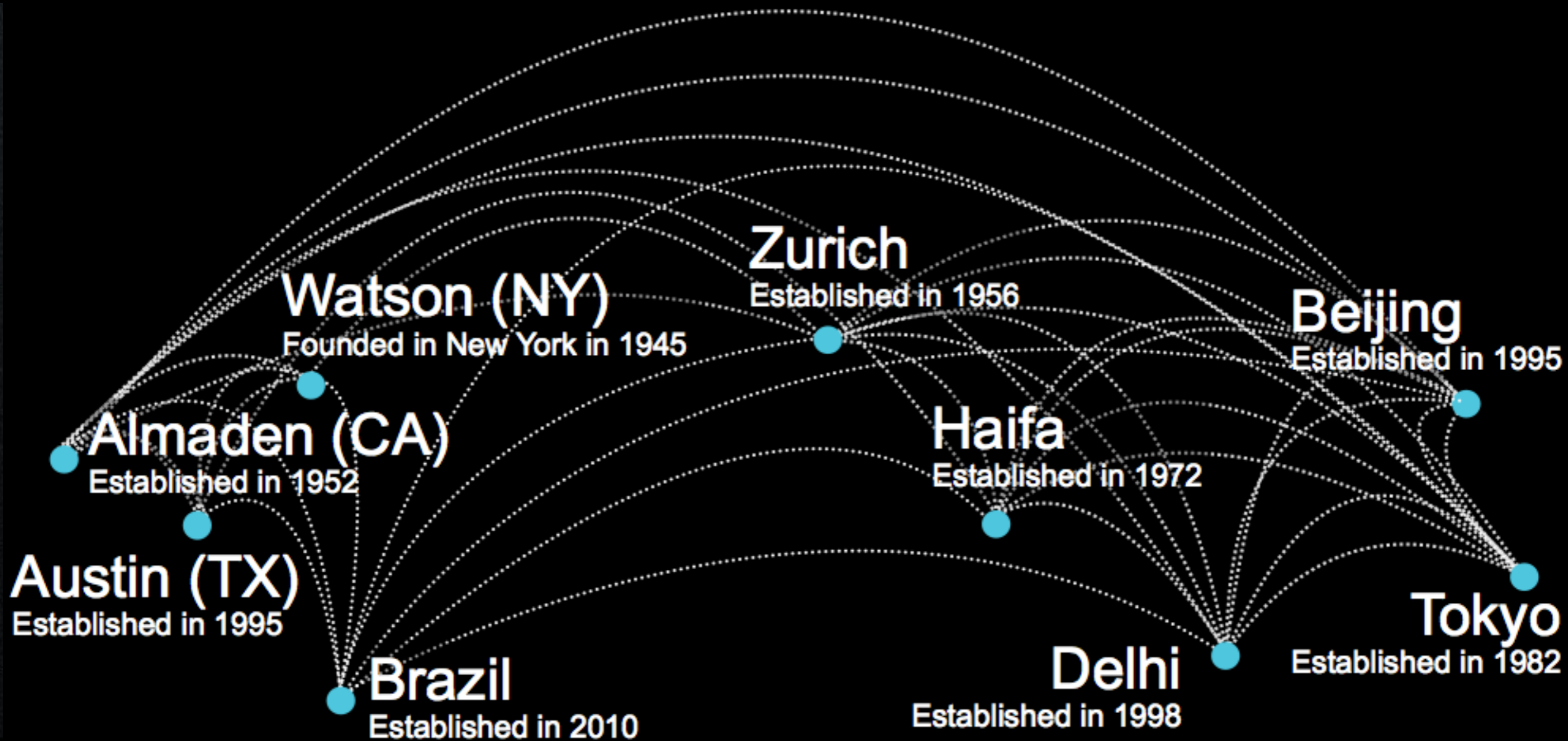


IBM Mote Runner

Thorsten Kramp
IBM Zurich Research Laboratory



IBM Research: Globally Integrated



IBM Research Fact Sheet

- Largest IT Research Organization Worldwide
- More Than 3'000 Scientists and Engineers in 9 Labs
- \$6B on R&D in 2011



IBM Research Zurich

- Since 1956
- 45 Different Nationalities
- 90 Collaborative Projects with Universities, Industrial Partners and Governments
- Two Nobel Prizes (1986 and 1987)
- New Nanotech Center opened in 2011



Wireless Sensor Networks

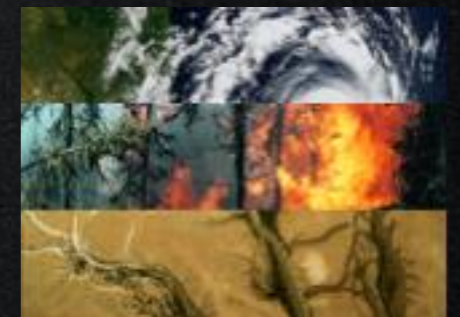
A wireless sensor network (WSN) is a wireless network of spatially distributed autonomous devices using sensors and actuators to cooperatively monitor and react to physical or environmental conditions.

- Heterogeneous set of autonomic devices
 - processor, radio, sensors/actuators
- Potentially very limited resources
 - computing power, memory, energy
- Application development is difficult
 - even for computer scientists



WSN Application Scenarios

- Agronomy management
 - Measure various soil parameters
e.g., moisture, salinity, temperature
 - Optimize the ability to grow, flourish, proliferate
control parameter to stay in “the zone”
 - Avoid diseases, inconsistency, waste of water / fertilizer
identify problems early, not when the plant declines
 - Examples: green houses, vineyards, agriculture, golf courses
- Environmental monitoring
 - Environmental research
e.g., long-term biocomplexity mapping and
habitat sensing
 - Early warning systems
e.g., pollution, floods, fires, landslides, earthquakes



WSN Application Scenarios

- Building and facility management
 - Convenience, safety, and security
e.g., lighting, air handlers, fire warning, surveillance
 - Smart metering and energy monitoring
e.g., min-energy buildings, remote access for utility companies
- Industrial applications
 - Safety and regulatory compliance
e.g., emission control, collateral effects monitoring
 - Logistics
e.g., goods tracking, traffic data / road conditions
- Health care and sports medicine
 - Examples: elderly people at home, training optimization



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.

- Operating System
 - optimized for 8/16 bit CPUs, scales up
 - minimum requirements: 8 KB RAM, 64 KB Flash
 - power management, device access / scheduling
- Virtual Machine
- Edge Server
- Development Environment



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.

- Operating System
- Virtual Machine
 - optimized for embedded systems
 - portable binary applications, dynamic load / delete
 - managed memory, controlled access to all objects
- Edge Server
- Development Environment



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.

- Operating System
- Virtual Machine
- Edge Server
 - connects WSNs to backend infrastructure
 - provides various interaction protocols (e.g., HTTP)
 - programmable in Javascript
- Development Environment



IBM Mote Runner

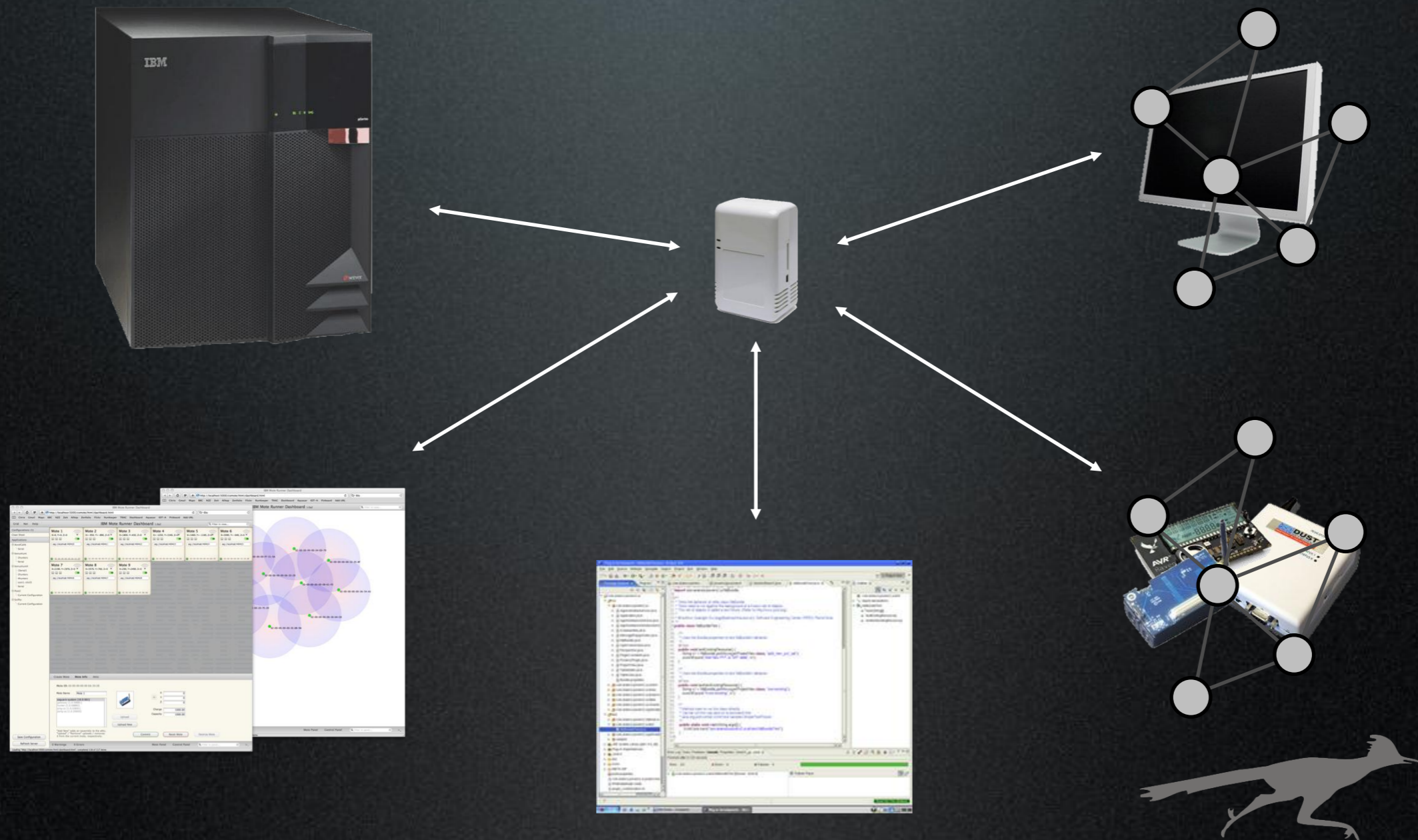
An open, dynamic run-time platform and development environment for WSNs.

- Operating System
- Virtual Machine
- Edge Server
- Development Environment
 - high-level object-oriented development in Java / C#
 - simulation environment for networks
 - source-level debugging in Eclipse
 - network management (web and command line)
 - web-application framework



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.

- **Hardware**
 - hardware-agnostic
 - occasionally application-specific sensor boards
- Network Protocols
- Application Development



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.

- Hardware
- Network Protocols
 - protocol-agnostic
 - occasionally application-specific protocols
- Application Development



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.

- Hardware
- Network Protocols
- Application Development
 - application-agnostic
 - occasionally to demo the platform



IBM Mote Runner

An open, dynamic run-time platform and development environment for WSNs.

- Available now: <http://www.zurich.ibm.com/moterunner>
- Free for academic use, 90 days commercial evaluation
- Ready for customer projects

