

How Much is Too Much

On the Explosion in Sensor Network Research & Applications

A Panel Session at PerCom'07

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(*) Opinions expressed in this discussion are strictly mine and do not reflect in any way, shape or form any stated or implied position of my employer.

Some historical notes

- The Weckquaeskeck tribe, members of the Mohican nation who lived in the area called it “Quarropas”
 - ▶ The name was descriptive of the fogs that hung above the swamplands and remained suspended for days on end like a white opaque blanket
 - ▶ Translated, Quarropas means the white marshes or the white plains
- White Plains has been a focal point in the history of New York State and the nation
 - ▶ New England colonists bought it from the Mohican Indians in 1683
 - ▶ On July 11, 1776, in the Armory building (5min from here), the Declaration of Independence was read publicly in New York State for the first time
 - Thus, White Plains claims to be the birthplace of the State of New York
 - ▶ George Washington later established headquarters here, and the Battle of White Plains (October 28, 1776) marked a turning point in the struggle for independence

Source: The official site of the City of White Plains

Some historical perspective

- Successful technologies are built around a visionary theme that makes sense
 - ▶ Fill real “user” needs rather than fill technology gaps
- Success does not come overnight, and it takes time for a new technology to reach its sweet spot balancing between:
 - Technology stability (maturity, standards)
 - Cost
 - To both the manufacturer and the consumer
 - Proven utility
 - Critical penetration
 - User comfort
- With every successful technology introduction, examples abound of substantial amounts of research conducted on (eventually) unsuccessful technologies
 - ▶ That does not mean that research effort is necessarily wasted
 - as long as there are (at least some) lessons learned

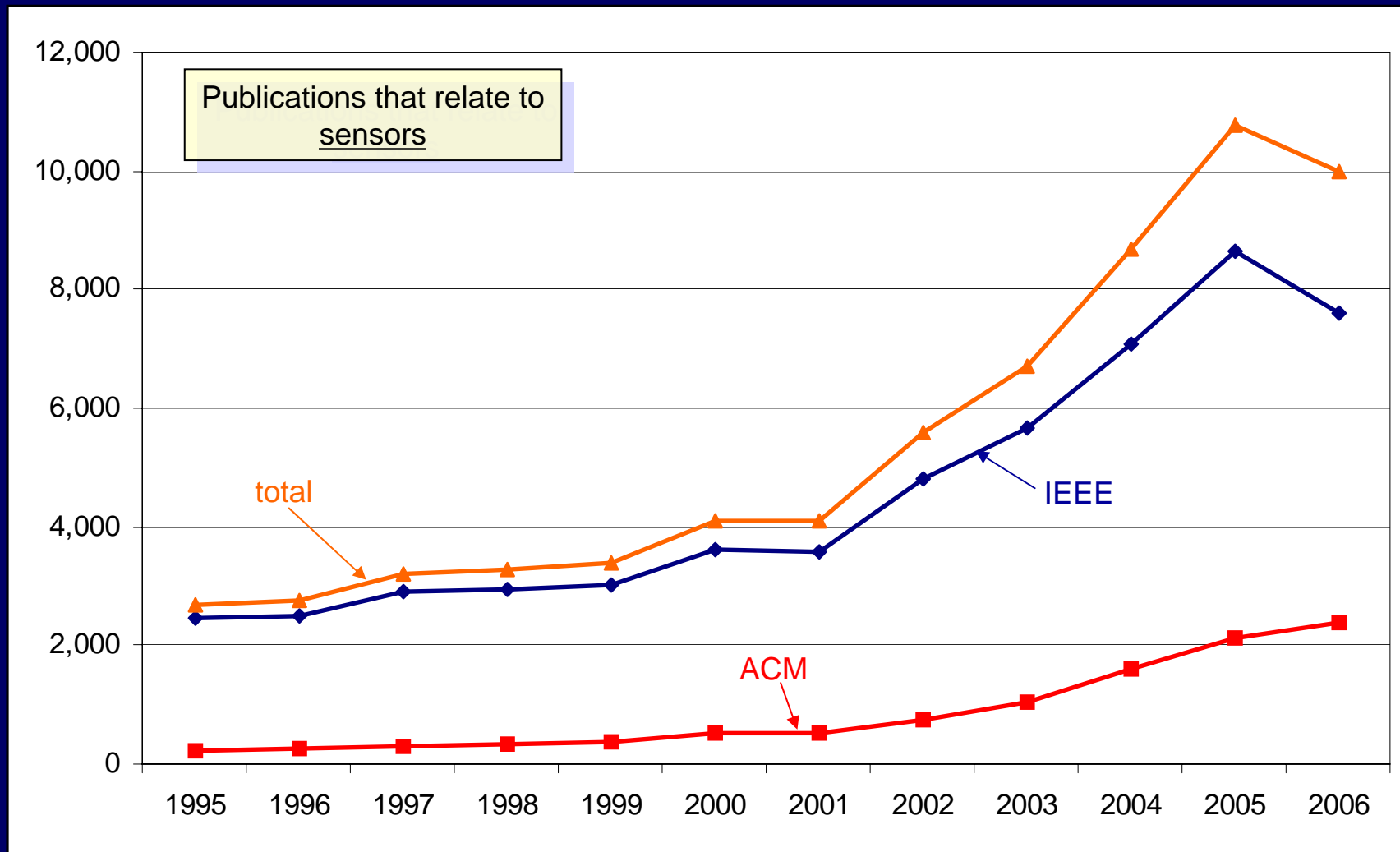
Some historical perspective: examples

- After 10 years and over billion Bluetooth-enabled devices shipped, Bluetooth can eventually be considered a successful technology
 - It cuts down on the wire clutter (to the headset and other personal devices)
- However, despite the many, many years researchers researched Bluetooth scatternets, there is still no promise of any success in the area
 - The Bluetooth protocols were never really designed to accommodate scatternets
 - Bluetooth focuses on connectivity of one's personal devices
 - *Proposals were to add unnecessary cost to the base technology*
- Research in Service Discovery for pervasive environments was a very big thing
 - Lots of papers were written for basically finding the “closest printer”
 - *Proposals were to add unnecessary complexity (hence cost) to a simple process*
 - Ask!

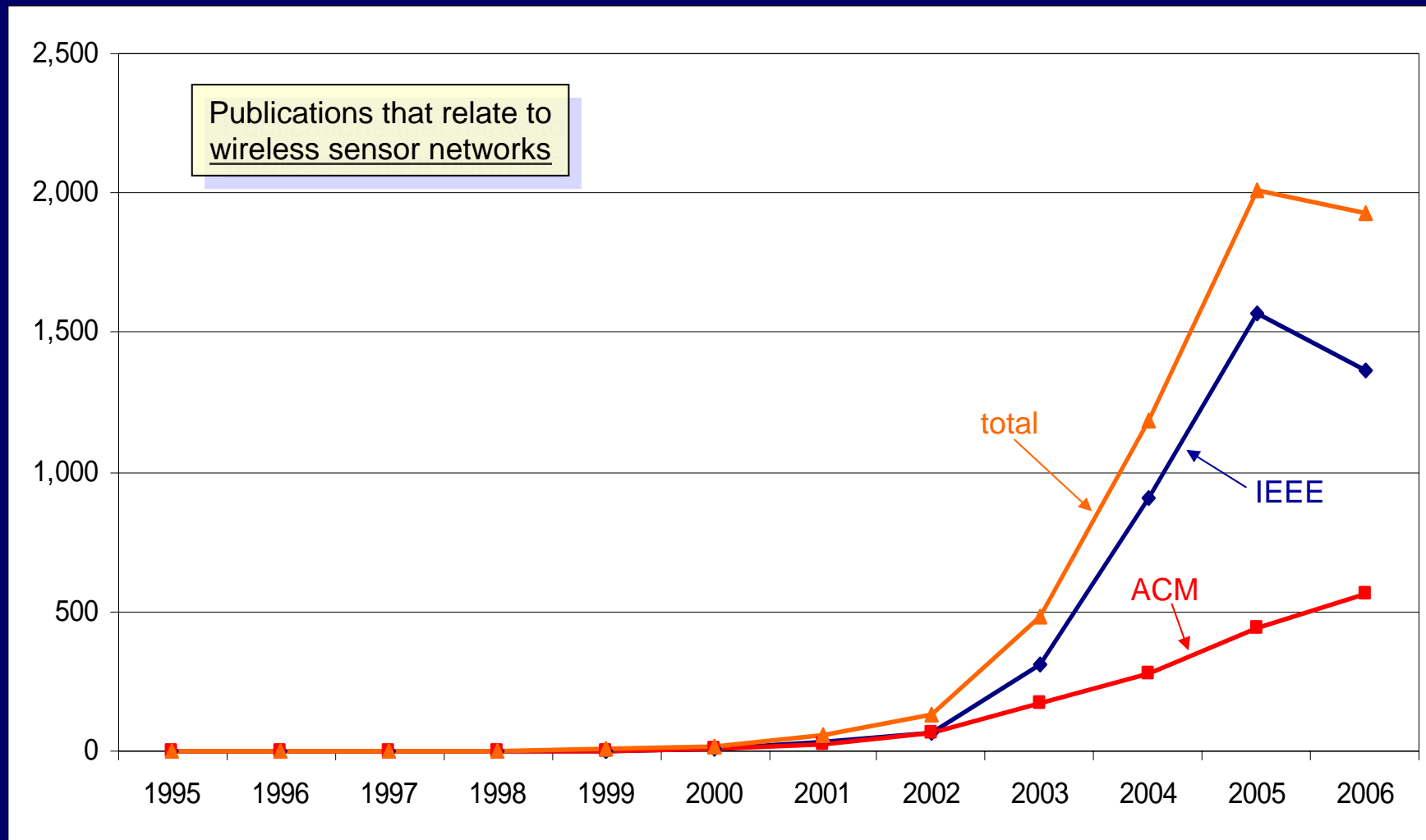
Wireless sensor networks

- Due to recent advances in
- Wireless sensor networks (WSNs) ~~appear to be~~ have become the next biggest, coolest research “thing”
 - ▶ A panacea to practically everything!!!!
- No surprising that research on WSNs abounds
 - ▶ Will it become the scatternets and service discovery of the next few years?

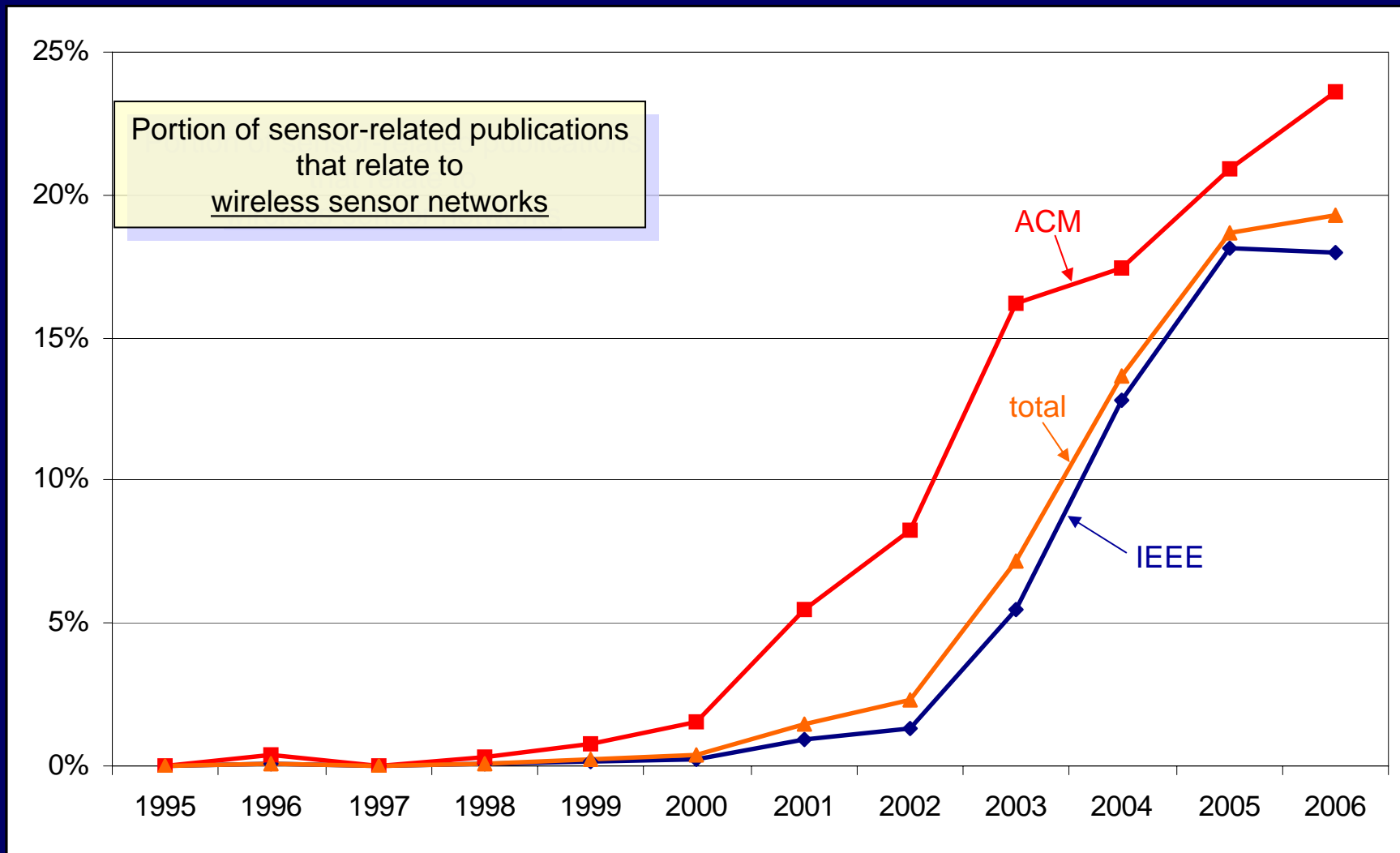
1995-2006: ACM and IEEE publications on sensors (1)



1995-2006: ACM and IEEE publications on sensors (2)



1995-2006: ACM and IEEE publications on sensors (3)



WSNs – what's so special about them

- WSNs are different “beasts” than previous technology ventures. Aside from their known resource constraints...
 - ▶ They represent not only data processing and transport facilities but also “glorified” data collection opportunities
 - The addition of actuators can create a complete end-to-end solution
 - ▶ They are intimately tied to an application space
 - WSNs are not deployed as general purpose utilities but for specific purpose
- As a result, WSNs need to be studied within the context of the applications they support
 - ▶ Or, don't they?
- This introduces a new twist which is inherent to WSNs
 - ▶ What are the trade-offs between developing a custom solution to a specific problem vs. a customizable (and replicable) solution?
 - Such questions are common when considering high-level, end-to-end services-oriented solutions
 - But WSNs already cover a wide portion of the application “stack,” and hence, the above question is very relevant to them

Some food for thought

- What is the killer application for WSNs?
 - ♦ Does this question even make any sense?
 - Reading the WSN research literature, one may think that the killer applications will be controlling thermostats and tracking animals
- Is there a mix of applications (or application classes) that can serve as a “benchmark” to evaluate the trade-offs between custom and customizable solutions?
 - ♦ After all, in how many different ways can we program thermostats for a temperature-dependent application
 - ♦ Or how many thermostats should we have to program and how often to make the development of a “unifying” infrastructure worth while
- Are there applications classes that are not sufficient covered?
 - ♦ Observing rapid vs. slow changing phenomena
 - ...The drawback is that it doesn't [sic] seem to be practical. typical monitoring applications deal with slow decaying signals (temperature, humidity variations), so this analysis might be an overkill... (from a review of a paper of mine on detecting transient phenomena)
- Are certain issues unnecessarily overemphasized
 - ♦ How really constrained are resource (bandwidth&processing) constrained nodes?
 - ♦ How many applications need data from 100s, 1,000s, 1,000,000s (mobile) sensors?

Distinguished panel

- Prof. Deborah Estrin
 - ▶ Center for Embedded Networked Sensing (CENS), UCLA, USA
- Prof. Silvia Giordano
 - ▶ Professional University School of Italian Switzerland (SUPSI)
- Prof. Amy Murphy
 - ▶ Center for Scientific and Technological Research (ITC-IRST), Italy
- Dr. Tien Pham
 - ▶ US Army Research Lab, Sensors & Electron Devices Directorate (SEDD)
- Dr. Vicraj Thomas
 - ▶ Network Centric Systems, Honeywell Laboratories, USA

Enjoy!

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