NAE Offshoring of Engineering Workshop: Network Systems

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Observations

- Dot-com fallout persists:
  - in US Corporations and R&D
  - in US college student enrollment

- National Initiatives in other countries
  - Korea FTTH
  - China Broadband buildout and IPV6
  - India - Engineering in general, tax code
  - EU – COST Initiatives in Telecom
Recent CSTB/NRC Study

Renewing US Telecommunications Research

- Chasm between US Industry and US academic programs
- DARPA not funding long term R&D
- NSF not funding major, relevant R&D
- US initiative needed to address Bell Lab demise and dot-com impact
Anecdotal Evidence -1

- US citizens enrolled in ECE Programs
  - Univ. of Texas (~ 65% UG; 12% Grad)
  - Purdue Univ. (~ 65% UG; 15% Grad)
  - Univ. of FL (~ 75% UG; 14% Grad)

- Foreign grads now seek jobs in home country

- Approx. 1M US telecom professionals lost their jobs in 2001-2003 - big turnoff for US youth considering telecom
In 1970, 70% of conference papers in IEEE Globecom were from industry.

In 2003, 7% of conference papers in IEEE Globecom were from industry.

Only 8 companies published more than 1 conference paper at 2005 IEEE Globecom.
Companies and R&D?

- Analyzed largest Telecom companies over past few years
- Scanned public R&D press releases
  - Type of R&D investments
  - Where investments occurring
  - R&D expenditures
Network Companies

- Alcatel
- Cisco
- Ericsson
- Huawei
- Intel
- LG
- Lucent
- Microsoft
- Motorola
- NEC
- Nokia
- Nortel
- Samsung
- Siemens
- UTStarcom
- ZTE
Annual Revenues (USD)

- Alcatel: 15B
- Cisco: 28B
- Ericsson: 19B
- Huawei: 6B
- Intel: 39B
- LG: 23B
- Lucent: 10B
- Microsoft: 44B
- Motorola: 37B
- NEC: 46B
- Nokia: 40B
- Nortel: 10B
- Samsung: 79B
- Siemens: 91B
- UTStarcom: 3B
- ZTE: 3B
Major Market Focus

- Subscriber devices/CPE
- Infrastructure Equipment & Services
- Switching and Routing
- Integrated Circuits
- Software and Applications
Key Corporate Research Themes

- Emergence of IP
- Convergence of wired/wireless
- Power to the “edge” of the network
- Multimedia from multiple providers
- Low cost for emerging economies
- Software, middleware, reusability
Alcatel

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2002: 1 in China; 1 in Canada
  - 2003: 1 in Australia; 1 in Taiwan
  - 2004: 1 in Australia; 1 in Italy
  - 2006: 1 in France; 1 in China
Cisco

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2004: 1 in Japan
  - 2005: 1 in India
  - 2006: 1 in Vietnam
Ericsson

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2005: 1 in China
Huawei

- **Number of publicly announced R&D Projects, Centers, Major Investments or Expansions**
  - 2002: 1 in China
  - 2005: 1 in Malaysia
  - 2006: 1 in India
Intel

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2002: 1 in Spain
  - 2003: 1 in England
  - 2005: 1 in China
LG

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions

  - 2002: 1 in China; 1 in Korea; 1 in Italy
  - 2003: 1 in France
  - 2004: 2 in Korea; 1 in France
  - 2005: 1 in Korea; 1 in US
Microsoft

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2004: 1 in England
  - 2005: 1 in India
  - 2006: 1 in US
Motorola

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2002: 1 in China
  - 2003: 1 in China
  - 2004: 1 in Singapore
  - 2005: 1 in Brazil; 1 in India; 1 in England; 1 in France, 1 in US
  - 2006: 1 in Denmark
NEC

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2003: 1 in China
Nokia

Number of publicly announced R&D Projects, Centers, Major Investments or Expansions

- 2002: 1 in China
- 2003: 1 in Brazil
- 2004: 1 in China; 1 in India
- 2005: 1 in China; 1 in US
- 2006: 1 In China
Nortel

Number of publicly announced R&D Projects, Centers, Major Investments or Expansions

- 2003: 1 in China
- 2004: 1 in France
- 2005: 1 in US
- 2006: 1 in India
Samsung

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2004: 1 in China
  - 2005: 1 in Korea
Siemens

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2004: 1 in Korea
Number of publicly announced R&D Projects, Centers, Major Investments or Expansions

- 2002: 1 in India
- 2003: 1 in India
ZTE

- Number of publicly announced R&D Projects, Centers, Major Investments or Expansions
  - 2003: 1 in China
Observations

Of 57 major global telecom R&D Announcements in past few years:

• 35 in Asia
• 12 in Europe
• 5 in US
• 2 in Australia
• 2 in South America
• 1 in Canada
Observations

- R&D Investments are going to high growth countries
- Investments are going to countries with national initiatives and incentives
- Foreign students from high growth areas are coming to US academic programs
- US companies are not investing in US research facilities, but instead are going offshore to expanding markets
Consider this……

- Could the US “invent” the internet or cellphone technology in today’s telecom R&D environment?
- How can/should US corporations engage with US universities in the aftermath of the dot-com era?
- How long will the US have technical talent to build and operate its own secure networks?
- Will the US be able to compete globally in telecom with Asia and EU in the coming decade if we continue our current public policy?
What should we do…?

- US industry must initiate “social contract”: encourage US students and faculty, K-12, with government support
- Public/Private “big-picture” projects to excite US youth and the public
- Public policy must pick technology futures and enlist private support - roadmapping
- US Telecommunications needs a focused national convener with public/private involvement - NSF and DARPA aren’t doing this adequately
Lori Lacy of the Wireless Networking and Communications Group (WNCG) at the University of Texas conducted extensive searches of corporate websites for this presentation. This data base, with links to each press release, are available on my home page.