

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

Anecdotal Evidence -2

- ◆ 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, middlewear, 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

UTStarcom

- ◆ 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

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