

Converging Technologies in Biosecurity

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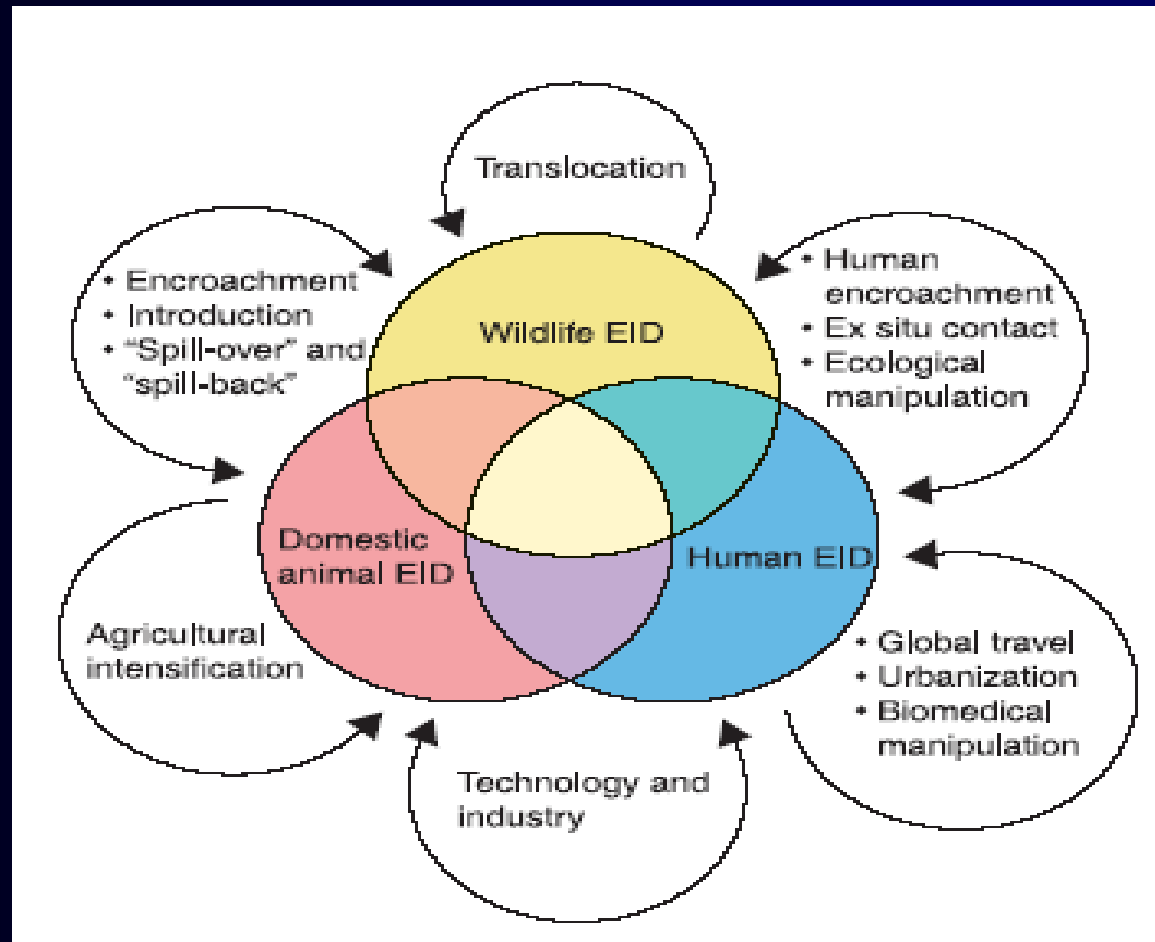
ANU Conference

February 11/12, 2008

Background

- Particular relevance to Asia-Pacific region in view of recent outbreaks of SARS and avian influenza
- H5N1 virus now endemic in much of Asia
- Old virus diseases have re-emerged-dengue and foot-and-mouth disease
- More new diseases in last 20 years than in previous 50-75% originated in wildlife
- Diseases know no national boundaries!
- Emergence arises from a complex set of factors

Background



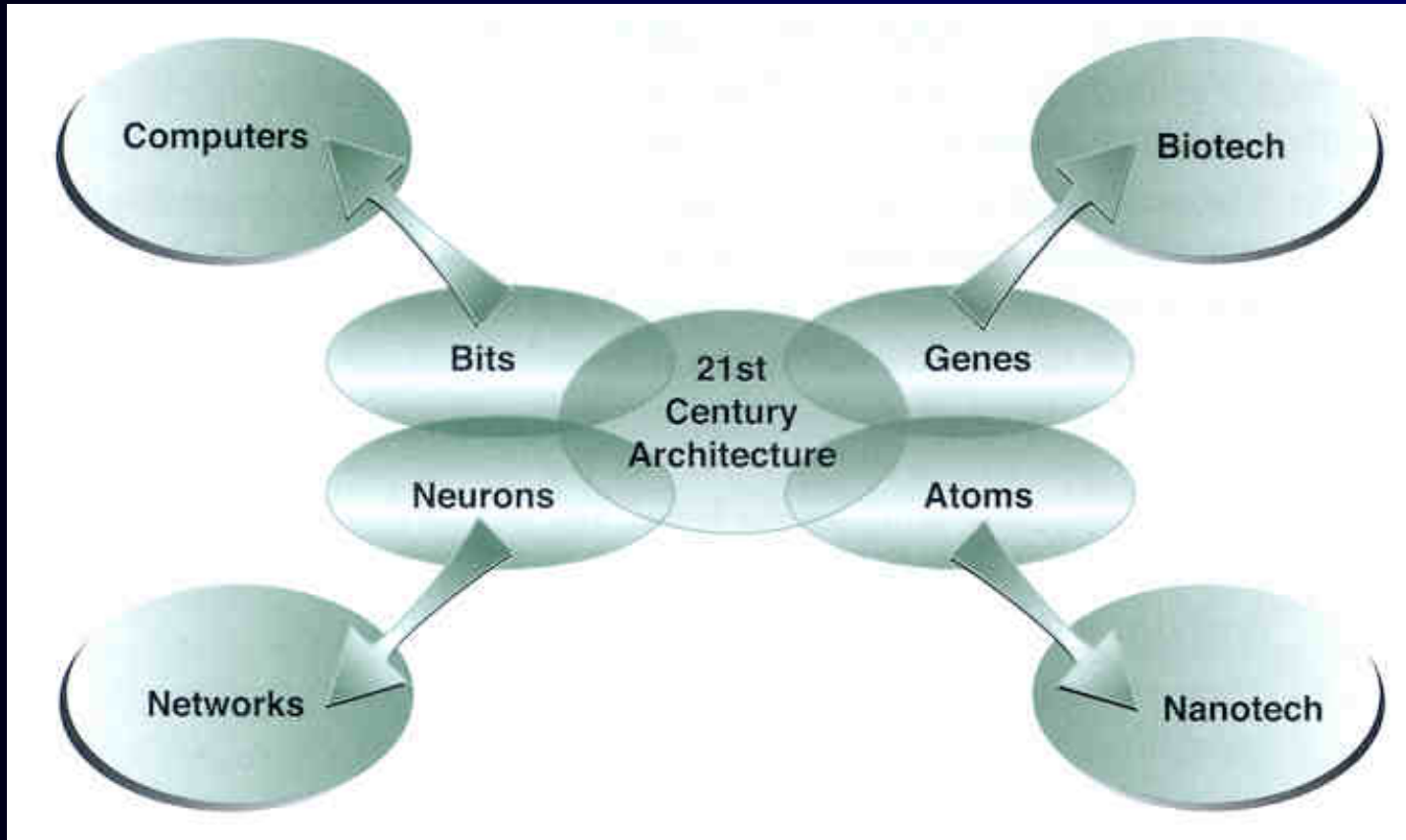
Need for New Approach

- Have to respond rapidly to reduce risk to public and animal health and to limit damage to environment and trade
- Complex set of factors to be considered-social, economic and technological
- Need to systematically draw on wide variety of inputs
- Concept of converging technologies has emerged in recent years

Converging Technologies-characteristics

- CTs are enabling technologies and knowledge systems that enable each other in pursuit of common goals
- Diversity of applications
- Knowledge base growing exponentially as entirely new areas form at interfaces
- Role of cognitive science increasingly important
- NBIC (fusion of nano-bio-info-cogno) – seen as driver of developments in future

The convergence of IT, biotechnology, nanotechnology and cognitive sciences in 21st century architecture for S&T



Source: NSF Report on Converging Technologies for Improving Human Performance, Washington DC, June 2002.

Examples of areas emerging at interfaces of converging technologies

- Info-bio – bioinformatics
- Bio-nano – DNA micro arrays
- Nano-info – molecular electronics
- Info-cogno – neural computation
- Nano-cogno – neural networks for nano-devices

CTs are leading to new approaches to technologies and management applicable to biosecurity and emerging infectious diseases.

ATSE Workshop on Converging Technologies for Biosecurity

- As one example an innovative ATSE workshop in Melbourne in June examined effective handling of information as a focus for dealing with biosecurity issues involving EIDs.
- The 40 participants from Australia, PRC, Indonesia, Taiwan, Thailand and Korea had a variety of backgrounds in nanotechnology, genomics, human health, veterinary science, bioinformatics, communication technology, modeling, risk analysis and policy development.
- Normally never meet as a group to exchange information and look to synergies between their areas of interest.
- The workshop was structured around a horizontal slice through the biosecurity sector from information collection to information management to information analysis to use of analysis.

Areas Identified for Urgent Attention

- Improved generation, collection and management of data
- Better integration of diagnostic technologies with information management
- Greater sharing of information across boundaries given maintenance of data integrity and security
- Enhanced access to, and better analysis of, large amounts of data
- Better communication to policy makers

Current Issues in Research (R) and Practice (P)

Diagnostic testing

R- dramatic progress test technology

P- translate into cheap, rapid and reliable (field) tests

Genomics & Bioinformatics

R- rapid advances with high speed computing

P- collection and management of (field) data

Modelling

R-sophisticated models developed

P-how do these influence policy? Value in outbreak response? Valuable in training

Current Issues in Research (R) and Practice (P)

Policy

R- improved processes for supporting development of evidence- based policy

P- difficult in practice - decisions made rapidly in context of incomplete data

Issues in practice are particularly relevant to developing countries in the region!

APEC CTF Project on Roadmapping Converging Technologies to Combat EID

- APEC CTF has a major project in Thailand, Taiwan and Japan
 - create a set of scenarios for the future of EIDs in the APEC region
 - develop roadmaps for research domains of ubiquitous computing, treatments and diagnosis.
- Specialists would normally never meet together to exchange different views on the same problems.
- The technologies in three domains covered in the context of realisation in the short (5 years), medium (10 years) and long-term (15 years).
- Final report later this year, progress reports on www.apecforesight.org

Converging Technologies to Combat EID

- Major advances in technology.
- Greatest potential impacts in converging technologies.
- Facilitate cross discipline and cross sectoral interactions
- Application of outcomes to enhance national and regional biosecurity.