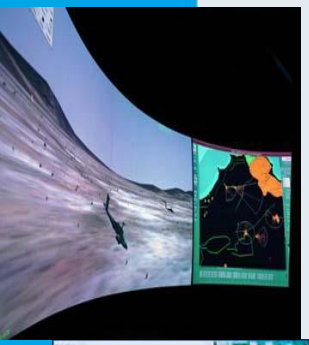
The transformation relationship between defense enterprise architecture and C4ISR system architecture

Dr. Meng-chyi Harn



報告人：韓孟麒 博士
德明財經科技大學
資訊科技系 C4ISR研究中心

Introducing Takming C4ISR Research Center

個人資訊區塊

觀看帳號
編輯帳號
提醒通知
登出
私人傳訊
系統管理員選單

主選單區塊

回首頁
新聞區
C4ISR研究中心介紹
關於召集人
運作方式

C4ISR研究中心介紹

德明技術學院資訊科技系「C4ISR研究中心」於2007年1月1日成立，由本系韓孟麒博士擔任召集人，結合國內外產、官、學、研界有興趣之人士，投入政府用、軍事用、企業用與家電用之「指揮與管制系統」(Command and Control Systems, C2 Systems)相關科技之研究。

所謂的C4ISR系統係指「指揮、管制、通訊、資訊、情報、監視與偵察」系統(Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Systems)，簡稱C4ISR系統(C4ISR Systems)，依資訊科技的進步，其演進過程分別爲：C2、C3、C3I、C4I及目前大家所慣稱的C4ISR系統，許多北約國家將之與目標需求(Target Acquisition)功能相結合，稱它爲C4ISTAR(Command, Control, Communications, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance)，不管如何稱呼，我們都統稱它們爲「指揮與管制系統」(Command

誰在線上區塊

線上目前共2人
(2人在瀏覽C4ISR研究中心

會員: 1
訪客: 1

harn, 尚有...

最新新聞區塊

- 二月份各研究專案之研究及時程已擬定　請各位專業研及資深研究員撥冗至研究主題區瀏覽 (2007-02-02)
- 採智科技加入本中心之「夥伴及合作廠商」(2007-0 12)
- MISOO物件教室加入本中「研究夥伴及合作廠商」(2

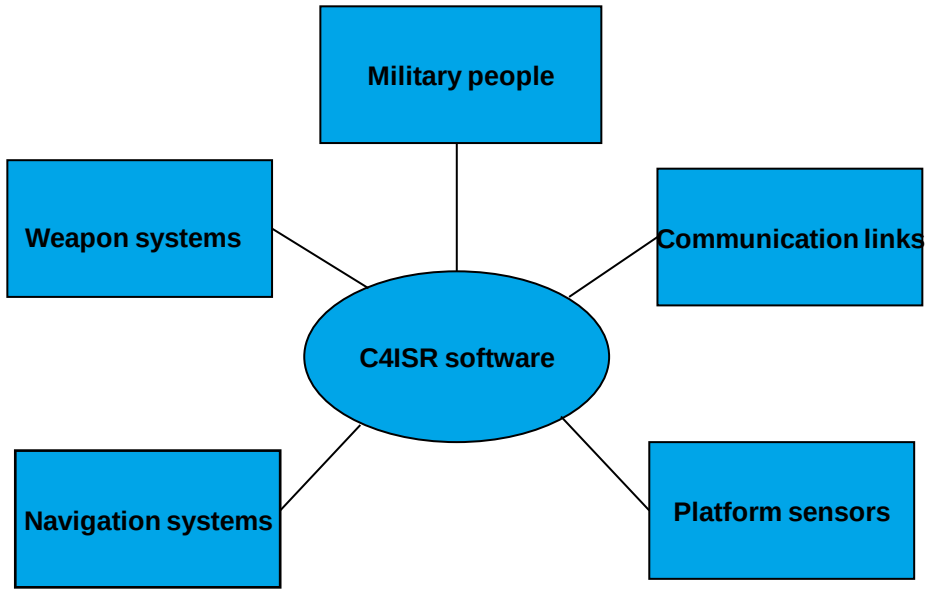
Outline

- Introduction
- Fundamental structure of architecture
- Defense business architecture
- C4ISR system architecture
- Conclusion

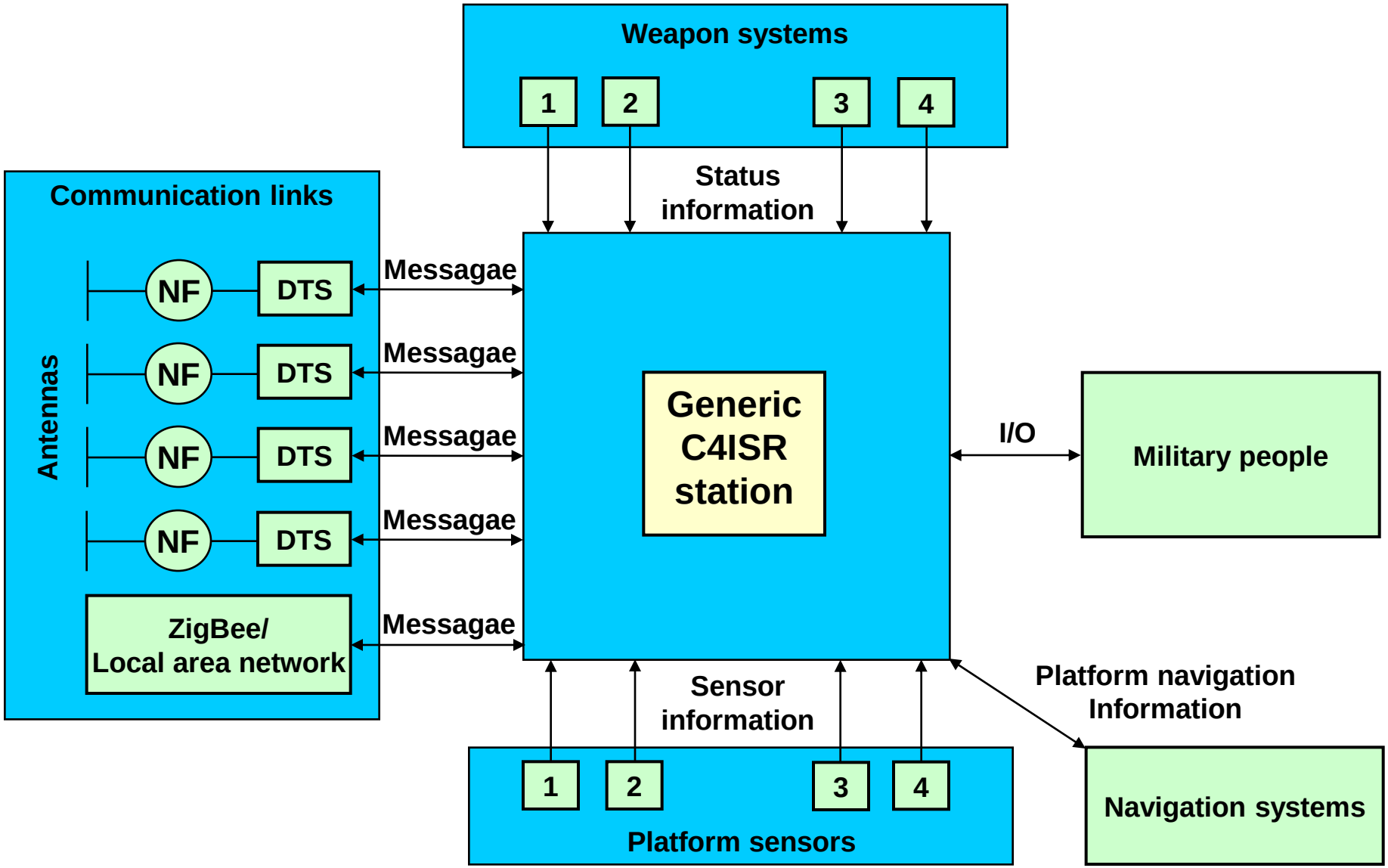
What is a C4ISR system?

C4ISR

- Most of the C4ISR systems (the commands, control, communications, computers, intelligence, surveillance and reconnaissance systems) are huge-grain systems.
- Five types of a battlefield object are
  - military people,
  - weapon systems,
  - navigation systems,
  - platform sensors, and
  - communication links.
- C4ISR system architecture
  - Description
  - Validation



C4ISR system architecture



Formalization

- Informal architecture
  - Defense business architecture
- Formal architecture
  - C4ISR system architecture

Architecture definition

- Architecture (IEEE STD 1472)
  - is the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment and principles guiding its design and evolution.
- Architecture configuration
- Architecture evolution
  - Version control and configuration management (VCCM)

Architecture life cycle

- System development life cycle (SDLC)
  - System analysis (SA)
  - System design (SD)
  - Coding
  - Testing
  - Maintenance
- Information technology (IT)
  - Hardware
  - Software
  - Database
  - Network

Architecture evolution model

- Richard Nolan's four-stage model/theory/hypothesis of information system management (Hardware and software)
  - Initiation, expansion, formalization or control, and maturity
- Richard Nolan's six-stage model/theory/hypothesis of information system management (Database)
  - Initiation, contagion, control, integration, data administration, and maturity
- Nolan's 3 S model model/theory/hypothesis of information system management (Network)
  - 1960-1980: Data processing era, DP era
  - 1980-1995: Micro era
  - 1990- :Network era

Outline

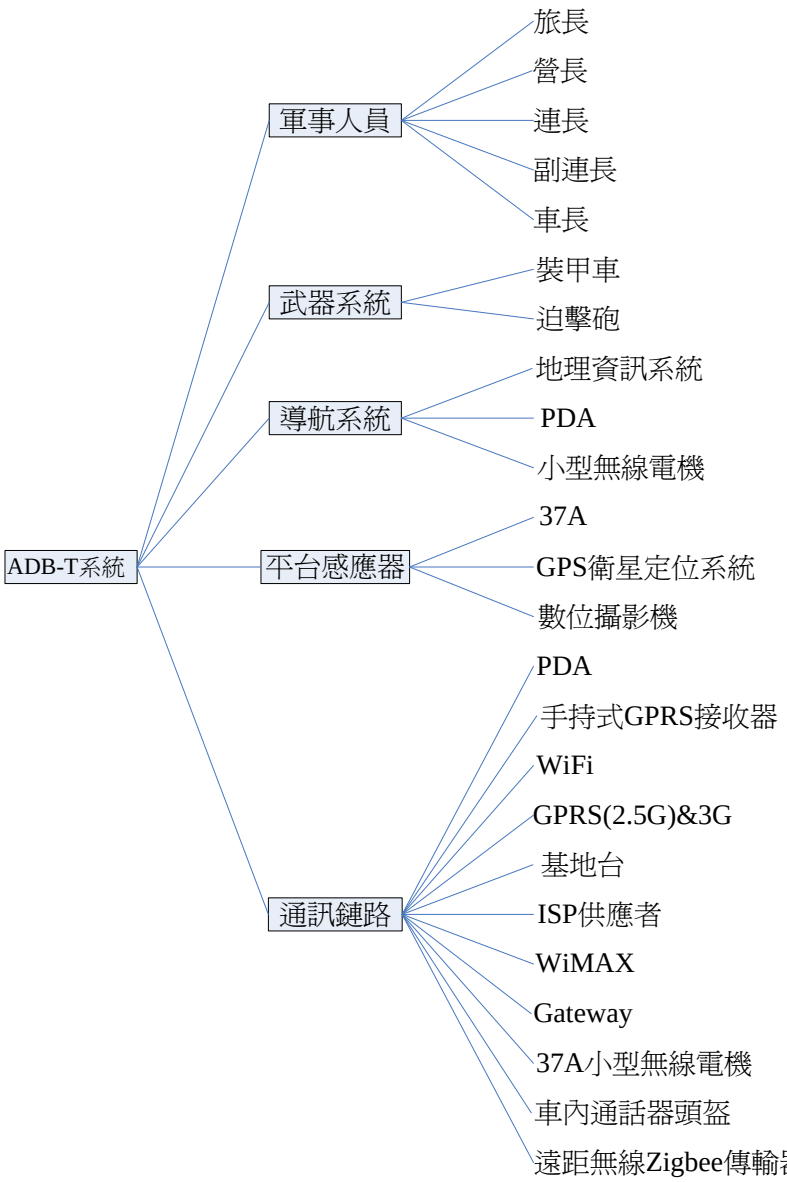
- Introduction
- Fundamental structure of architecture
- Defense business architecture
- C4ISR system architecture
- Conclusion

Fundamental structure of architecture

- Tree structure
- Stack structure
- Disk structure
- Set structure
- List structure
- Rule structure

Tree structure

- A tree structure build by the C4ISR system of the army digital brigade for tanks

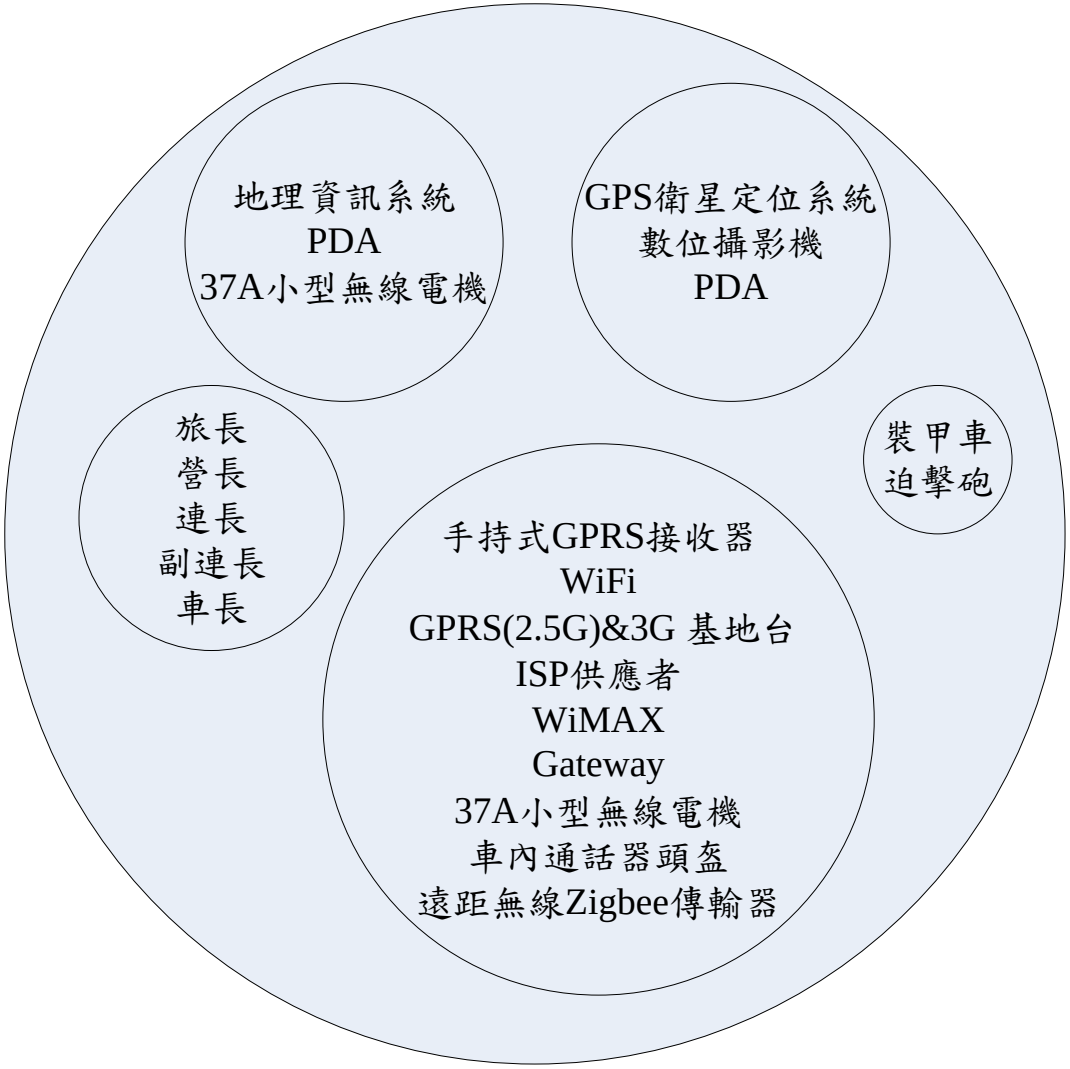


Stack structure

- A stack structure build by C4ISR system battlefield objects of the army digital brigade for tanks

Disk structure

- A disk structure build by C4ISR system battlefield objects of the army digital brigade for tanks



Set structure

- A set structure build by C4ISR system battlefield objects of the army digital brigade for tanks

- 軍事人員
  - 使用ADB-T系統的軍事人員爲P = {旅長, 營長, 連長, 副連長, 車長}。
- 武器系統
  - ADB-T系統所使用到的終端武器系統爲W = {裝甲車, 迫擊砲}。
- 導航系統
  - ADB-T系統所使用到的導航系統爲N = {地理資訊系統, PDA, 37A, 小型無線電機}。
- 平台感應器
  - ADB-T系統所使用到的平台感應器爲S = {GPS衛星定位系統, 數位攝影機, PDA}。
- 通訊鏈路
  - ADB-T系統所使用到的通訊鏈路爲C = {手持式GPRS接收器, WiFi, GPRS(2.5G)&3G, 基地台, ISP供應者, WiMAX, Gateway, 37A, 小型無線電機, 車內通話器頭盔, 遠距無線Zigbee傳輸器}。

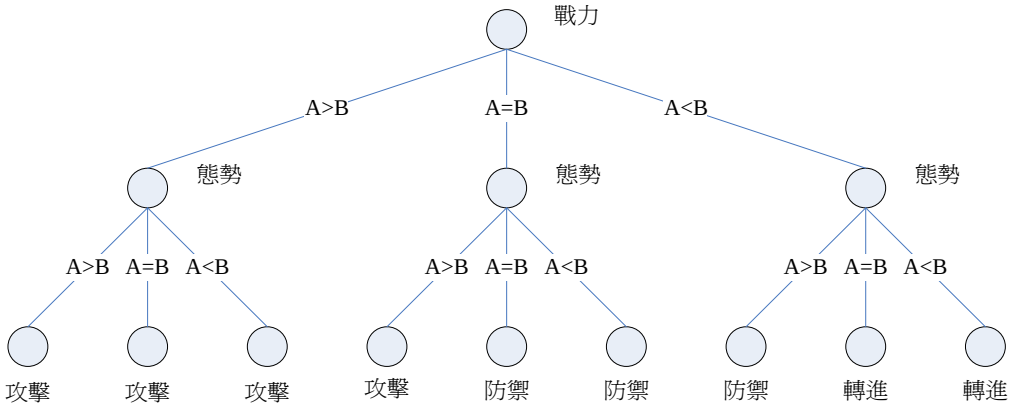
List structure

- A list structure build by C4ISR system battlefield objects of the army digital brigade for tanks

- ((旅長 營長 連長 副連長 車長)
  (裝甲車 迫擊砲)
  (地理資訊系統 PDA 37A 小型無線電機)
  (GPS衛星定位系統 數位攝影機 PDA)
  (手持式GPRS接收器 WiFi GPRS(2.5G)&3G 基地台 ISP供應者 WiMAX Gateway 37A 小型無線電機 車內通話器頭盔 遠距無線Zigbee傳輸器))

Ruls structure

- A rule structure build by C4ISR system battlefield objects of the army digital brigade for tanks



- Rule 1：(if (and (戰力 (> A B)) (態勢 (> A B))) (then (攻擊 A B))
- Rule 2：(if (and (戰力 (> A B)) (態勢 (= A B))) (then (攻擊 A B))
- Rule 3：(if (and (戰力 (> A B)) (態勢 (<A B))) (then (攻擊 A B))
- Rule 4：(if (and (戰力 (= A B)) (態勢 (> A B))) (then (攻擊 A B))
- Rule 5：(if (and (戰力 (= A B)) (態勢 (= A B))) (then (防禦 A B))
- Rule 6：(if (and (戰力 (= A B)) (態勢 (<A B))) (then (防禦 A B))
- Rule 7：(if (and (戰力 (< A B)) (態勢 (>A B))) (then (防禦 A B))
- Rule 8：(if (and (戰力 (< A B)) (態勢 (=A B))) (then (轉進A B))
- Rule 9：(if (and (戰力 (< A B)) (態勢 (<A B))) (then (轉進A B))

Outline

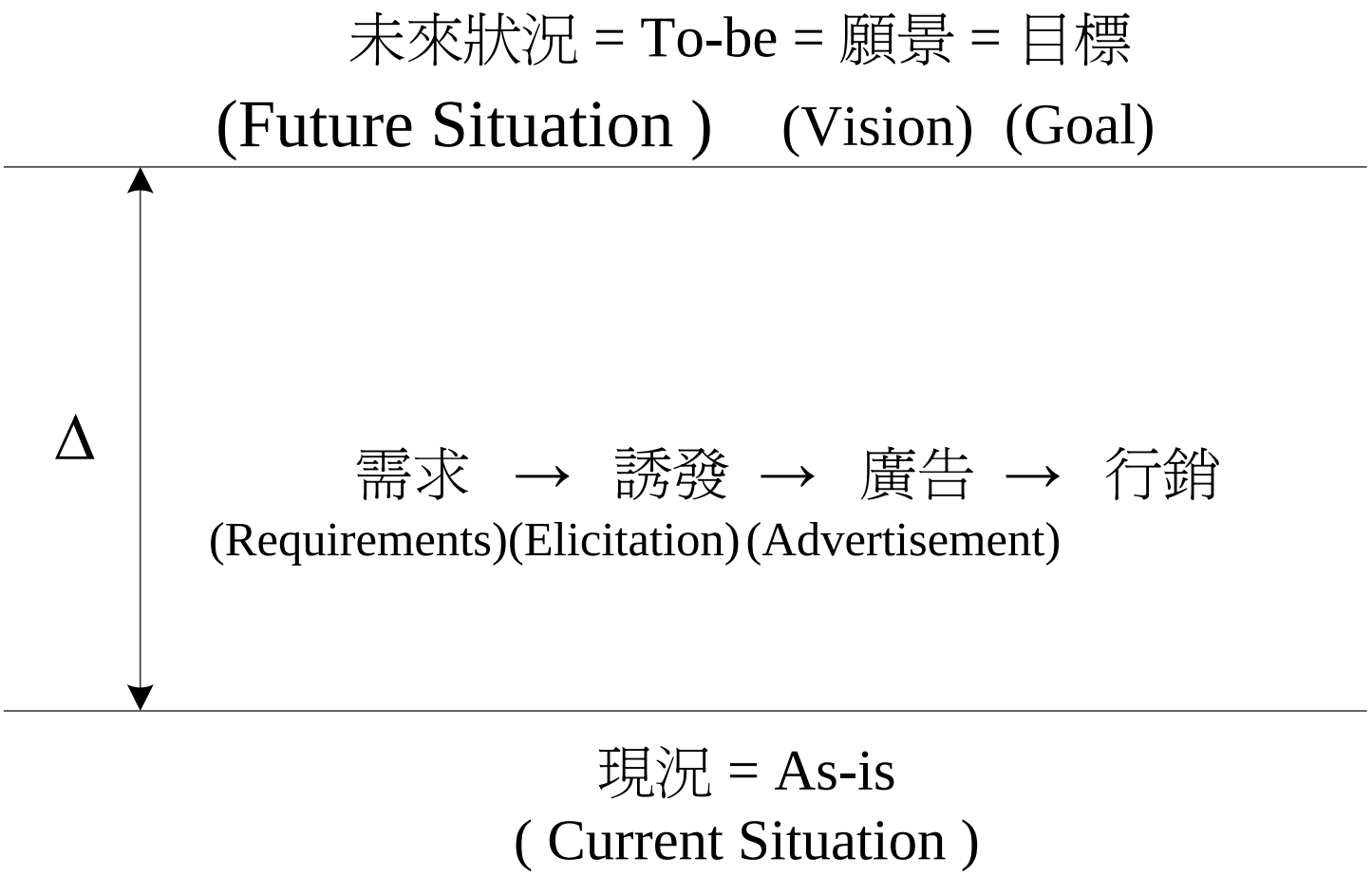
- Introduction
- Fundamental structure of architecture
- Defense business architecture
- C4ISR system architecture
- Conclusion

Defense business architecture

- Requirement theory
- Organizational theory
- Systematic theory

Requirement theory

- Requirements Definition

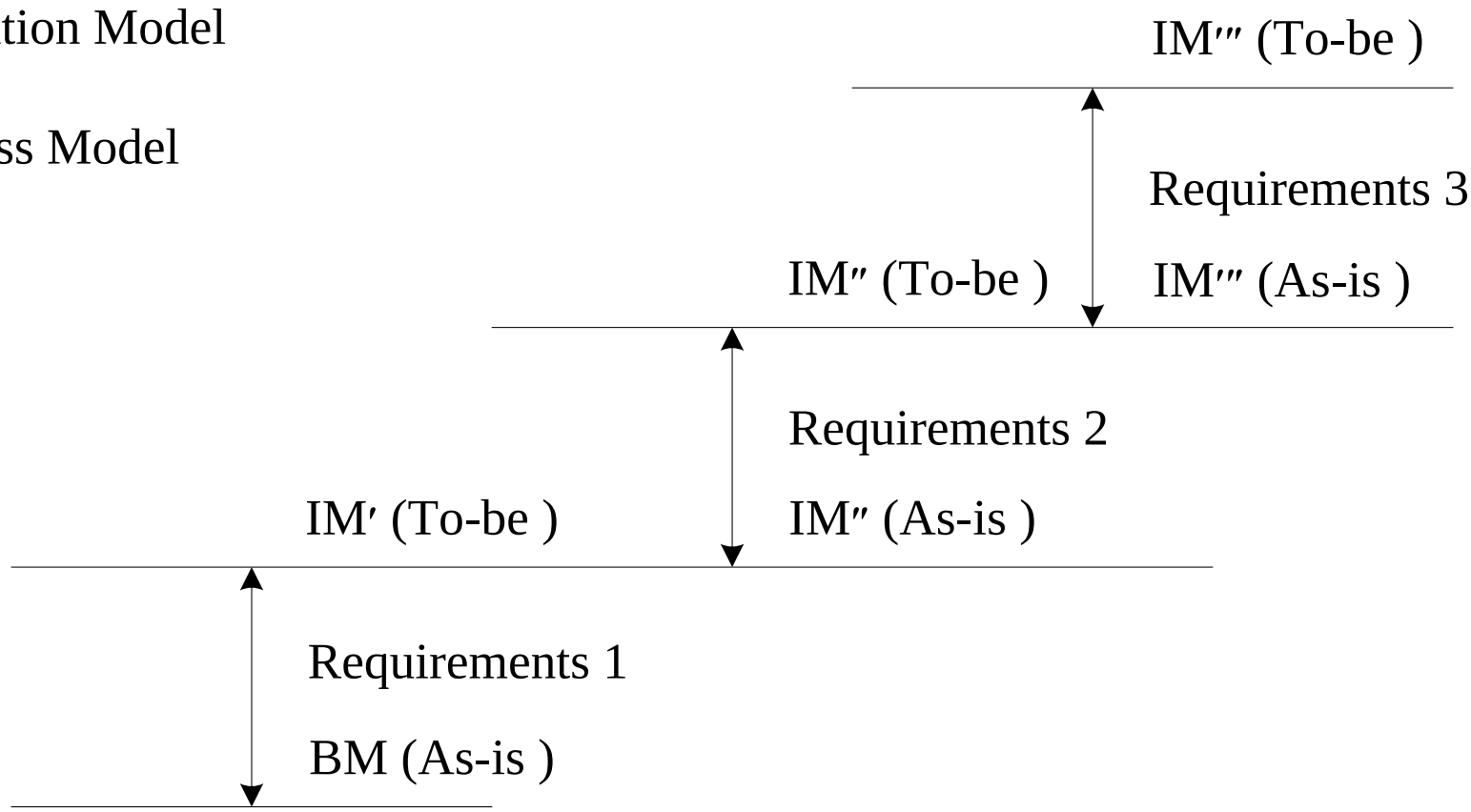


Requirement theory

- Requirements evolution from 1 to 3

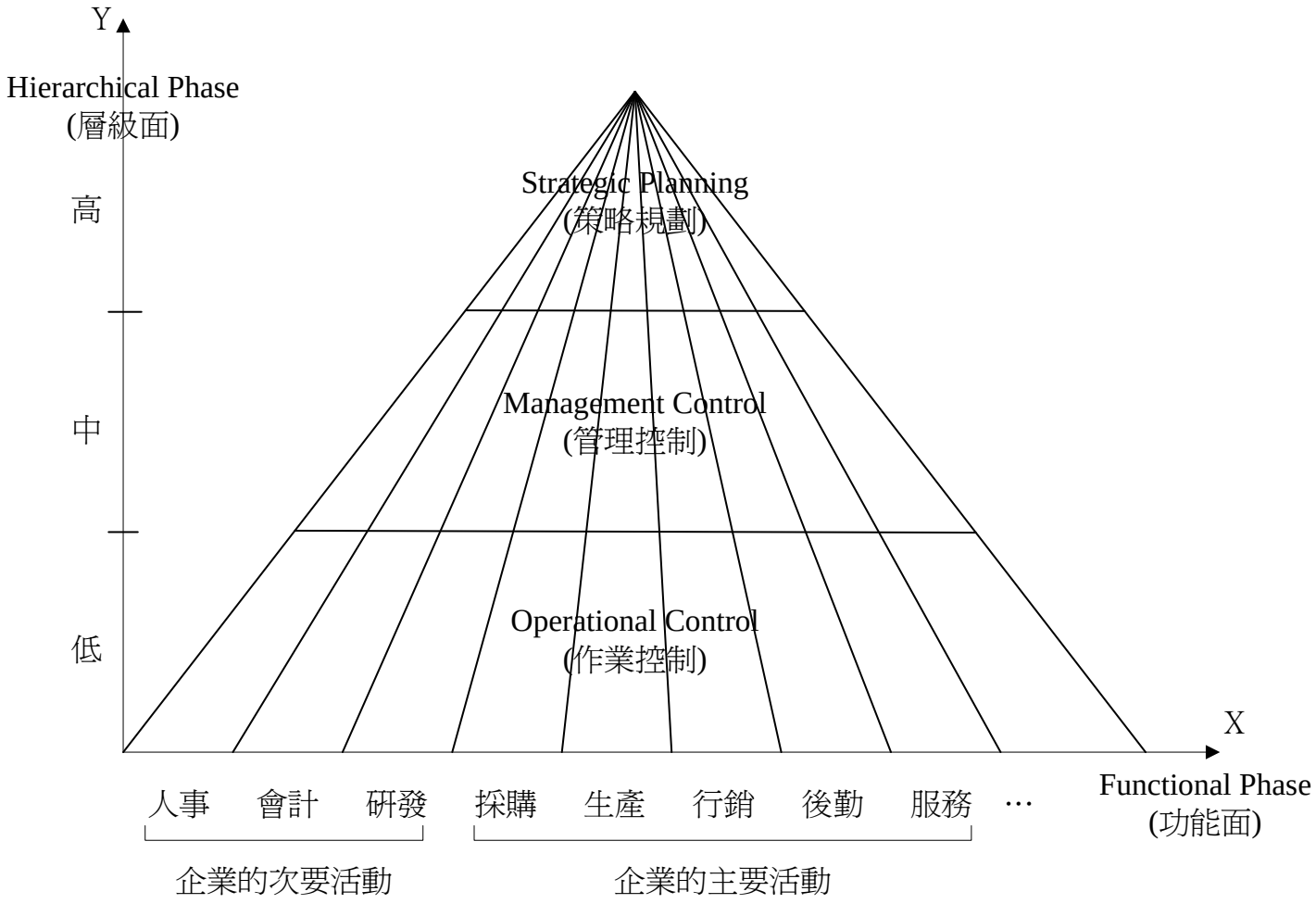
IM – Information Model

BM – Business Model



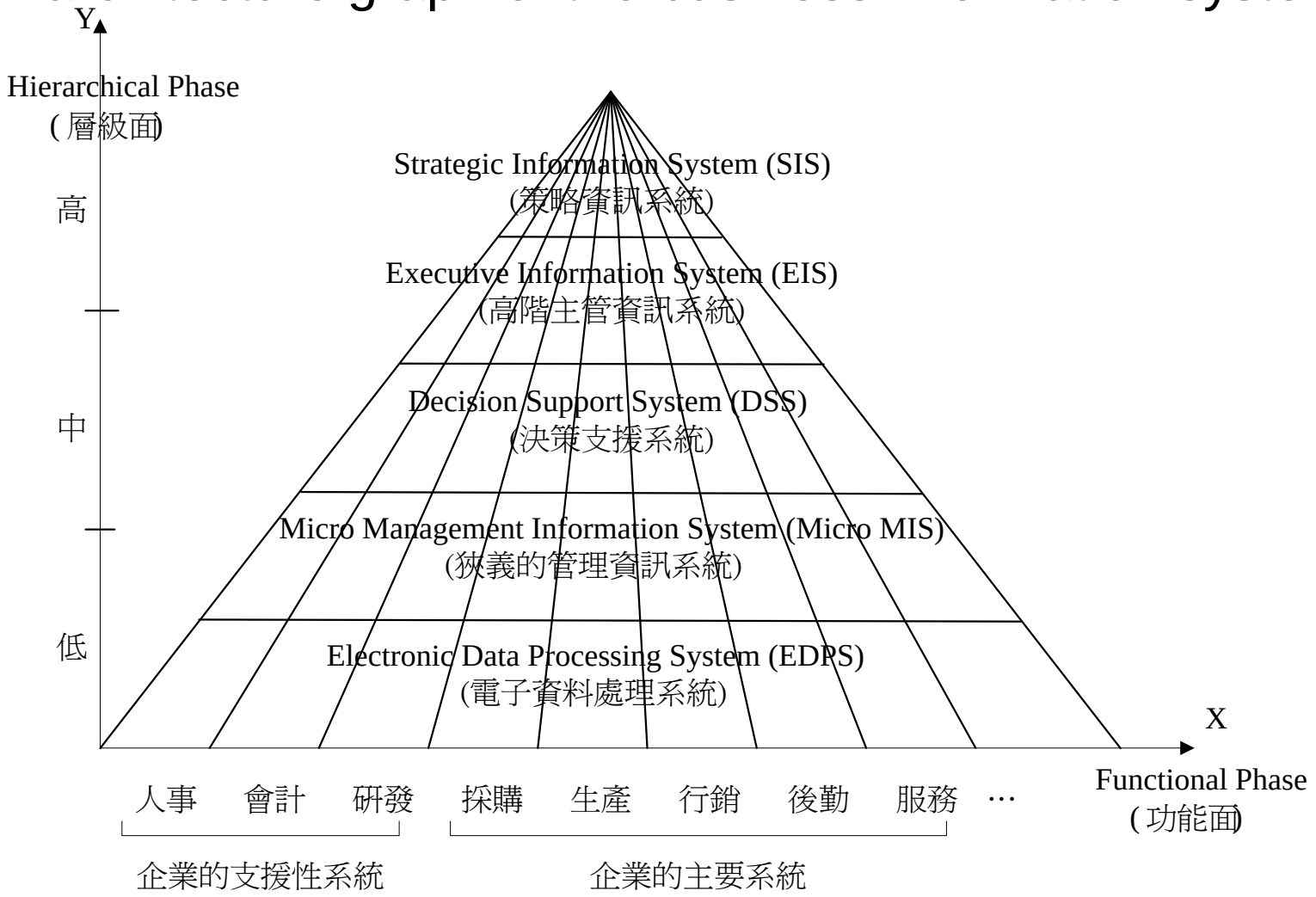
Organizational theory

- The Anthony's business organization hierarchical graph



Systematic theory

- An architecture graph of the business information system



Outline

- Introduction
- Fundamental structure of architecture
- Defense business architecture
- C4ISR system architecture
- Conclusion

Formalization of C4ISR system architecture

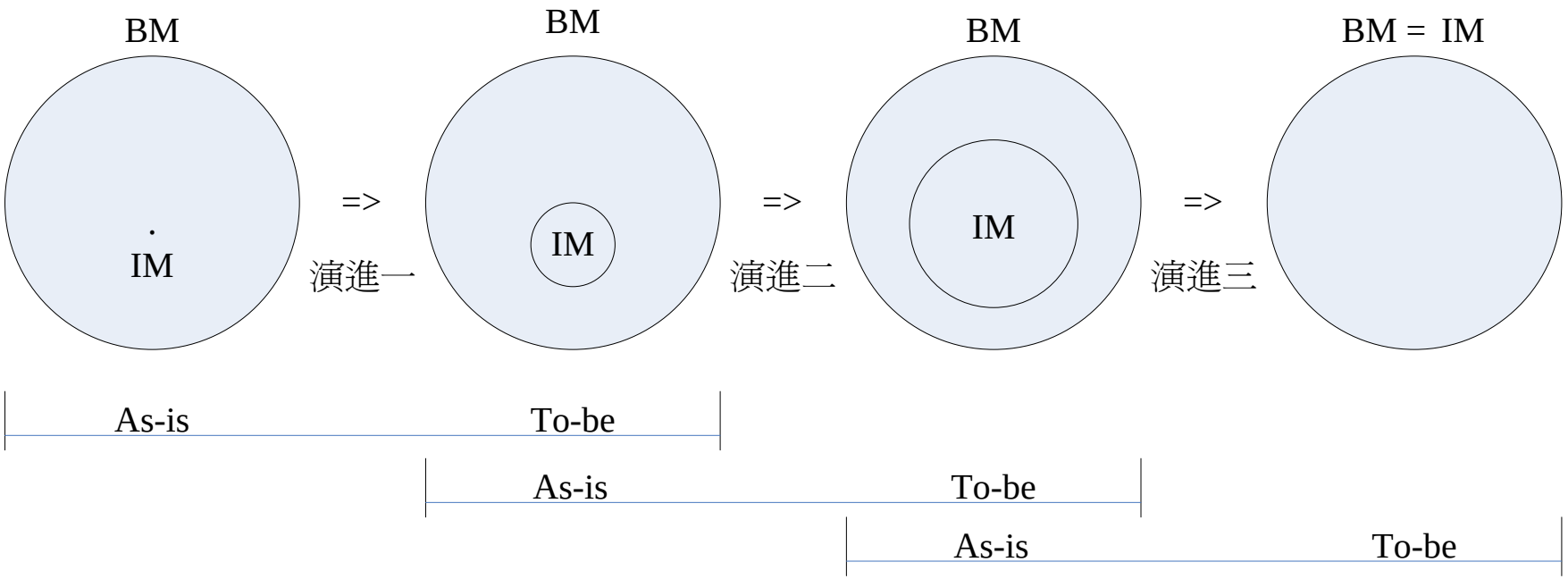
- Business system planning (BSP): IBM
  - Job Planning
  - Requirements Evaluation
  - Environment Evaluation
  - System Architecture
  - Implementation Strategy and Plan
- Structured Method and Object-oriented
- DoDAF V1.5 (2007, 4)
  - 綜合觀點、作戰觀點、系統觀點與技術標準觀點，共二十六項產品
- DoDAF V2.0 (2009, 5)
  - 綜合模組、戰力模組、資料資訊模組、作戰模組、計畫模組、服務模組、標準模組、系統模組等八模組，共五十二種模組產品

C4ISR system architecture

- Organization architecture
  - Business process reengineering (BPR)
- Mission objective architecture
  - Critical success factor (CSF)
  - Priority of CSFs
- Technology architecture
  - Hardware, software, database, and network
- System architecture
  - C4ISR system

C4ISR system evolution graph

- Evolution process



Outline

- Introduction
- Fundamental structure of architecture
- Defense business architecture
- C4ISR system architecture
- Conclusion

Conclusion

- DoDAF
  - Structured Tools
  - Object-oriented Tool
  - Integrated Computer-Aided Manufacturing DEFinition Tools, ICAM DEFinition Tools
  - Entity Relationship Diagrams, ER Diagrams
  - Hierarchical Trees
  - Tables
  - Matrixes
  - Texts
  - Graphics
- Sparx Systems Enterprise Architect (EA)
- IBM Telelogic System Architect (SA)
- IBM Telelogic Rhapsody

More information and articles on C4ISR at:
http://c4isr.takming.edu.tw

Thank You

harn@takming.edu.tw

0919-297-147

韓孟麒 副教授

德明財經科技大學 資訊學院 院長

資訊科技系**C4ISR**研究中心 召集人

美國海軍研究院 電腦科學博士