Module 13: Modelling, simulation and using models in building a simulation over the SDP
Session 1 of 7

Rev 2.1.0

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Objectives

1. To provide a case study of developing a model (system) through the states of the SDP
2. To show the iterative nature of the problem-solving process in the SDC
3. To illustrate the decision-making process in system development
4. To show how the implementation domain can affect the realized system

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CQSS Case Study Objectives

1. To demonstrate the systems engineering approach to building a simulation
2. To illustrate necessity of the multi-disciplinary domain knowledge in the
   1. Problem domain
   2. Application domain
   3. Implementation domain
3. To demonstrate how applying holistic thinking when problem-solving is fundamental to systems engineering
4. To show how models can be combined into a simulation
5. To introduce you to amateur radio
   - The application domain

Topics

1. The CQSS Case Study
2. The Needs Identification State (HKM^{2}F columns A1 and A2)
3. The Needs Identification State (HKM^{2}F column A3)
4. The requirements State
5. The Subsystem Design State
6. The Subsystem Construction And Testing States
7. The Operations and Maintenance State

Knowledge component

- Lecture
  - Sets the context
- Reading
  - 1302 Systems Engineering Chapter 22
    - It explains one reason for selecting the domain

Synergy

- Provide some answers to the following questions
  - How do models relate to simulations?
  - When and how to use systems engineering tools?
  - What comes first; requirements or functions?
  - Do we really need requirements?
  - Does the systems approach produce different results to the engineering approach?
  - How does technology affect the system?

Why use this example

- Example is available (history of technology)
  - ~1980 – Reuse after 40 years
- Example can be freely discussed
- Illustrates importance of knowledge
  - Systems engineering
  - Domain
    - Application
    - Implementation
- Illustrates pertinent aspects of the SDP
- Students should have some knowledge of radio communications
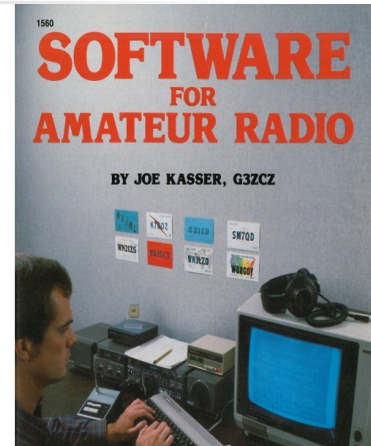
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Understanding the domain

- Amateur radio
  - https://www.youtube.com/watch?v=8x6x_6mDVlQ&t=11s
  - https://www.youtube.com/watch?v=wDn-6SDxyD4
- Other YouTube videos and sources if necessary

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Big Picture: Amateur radio - context

- World-wide hobby
- Licensed by governments
- National societies
  - American Radio Relay League (ARRL)
  - Radio Society of Great Britain (RSGB)
  - Singapore Amateur Radio Transmitting Society (SARTS)
  - Wireless Institute of Australia (WIS)
  - Your countries society
- Experimenting and applying
  - Emergency communications, terrestrial, satellite, hardware, software, business, etc.
- Platform for developing systems engineers (Reading 1302)

Big Picture HTP - context

- Go back in time to 1978
- Simulated emergency message traffic handling
- Contest format
- Exchange messages simulating traffic into and out of simulated disaster zone
  - World-wide contests
    - Everybody contacts everybody
  - Local and regional contests
    - US Sweepstakes, Australia, BERU, etc.
  - Target area contests
    - Everybody tries to contact stations in a given area
      - US State QSO parties, ARRL DX, WAE, etc.

ARRL Sweepstakes contest [1977]

- Contact (work) as many other stations as possible within 48 hour period
  - Two weekends in November
- Exchange simulated emergency message
- Use different frequency bands with different propagation characteristics
- Score = number of contacts * multipliers
  - Multiplier is number of ARRL Sections contacted
    - Section only counts once irrespective of frequency band

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Exercise 13-11 Creating scenarios

1. Visualze at least 10 scenarios that can take place in a contest
   1. Use HTPs and Active Brainstorming
2. Identify the mission, support and risk prevention/mitigation functions (if any, as appropriate)
3. Prepare a <5 minute presentation containing
   1. This slide and the version number of the Module
   2. The scenarios at top level
   3. A higher level drawing (or N^2 chart) showing the links (interfaces) between the scenarios
   4. The exercise problem formulated per COPS problem formulation template
   5. A compliance matrix for the exercise
   6. Lessons learned from exercise
4. Save as a PowerPoint file in format Exercise13.11-abcd.pptx
5. Post/email presentation as and where instructed

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Knowledge reading exercise 13-12

1. Prepare a brief on two main points in reading 1302 (< 5min)
2. Presentation to contain
   1. Formulated problem per COPS problem formulation template
   2. A summary of the content of the reading (<1 minute)
   3. The compliance matrix
   4. This slide and the version number of the lesson
   5. The two main points (<1 minute)
   6. The two briefings
   7. Reflections and comments on reading (<2 minute)
   8. Comparisons of content with other readings and external knowledge
   9. Why you think the reading was assigned to the module
   10. Lessons learned from module and source of learning e.g. readings, exercise, experience, etc. (<2 minutes)
3. Save as a PowerPoint file as Exercise13-12-abcd.pptx
4. Post/email presentation as and where instructed

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Any questions ?

1. Best

2. Worst

3. Missing

Email: beyondsystemsthinking@yahoo.com
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