Re-Use of Integrated Dictionary Components for C4ISR Architectures

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Outline

- C4ISR Architecture Framework Products Version 2.0
- Problem Illustration
- Research Objective
- Methodology Adopted
- Comparison of Integrated Dictionaries
- Conclusion

C4ISR Architecture Framework (CAF) Products Version 2.0

- CAF Version 2.0 provides architecture specifications.

- Objectives of CAF are to provide,

  - Rules, guidance and product description for developing architectures.

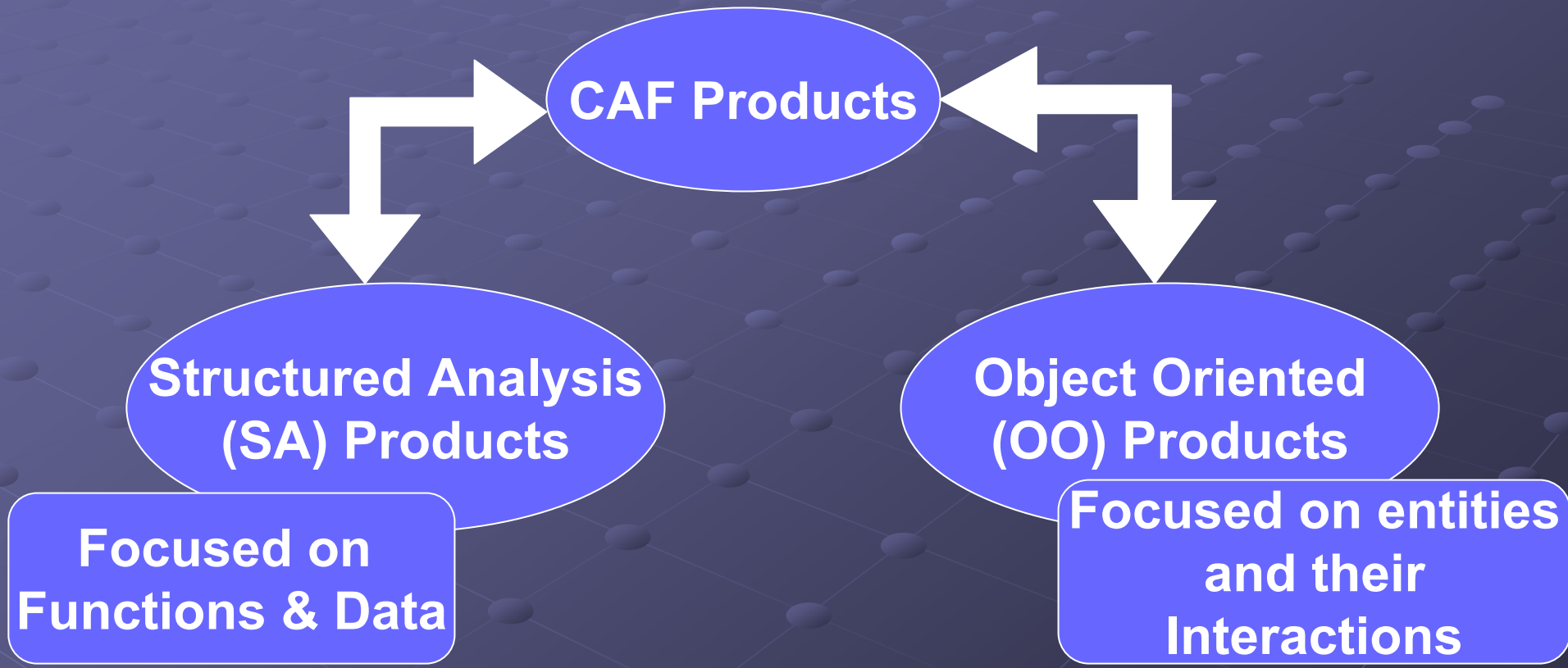
  - Common unifying approach for different agencies for architecture development.

Views of Architecture Products

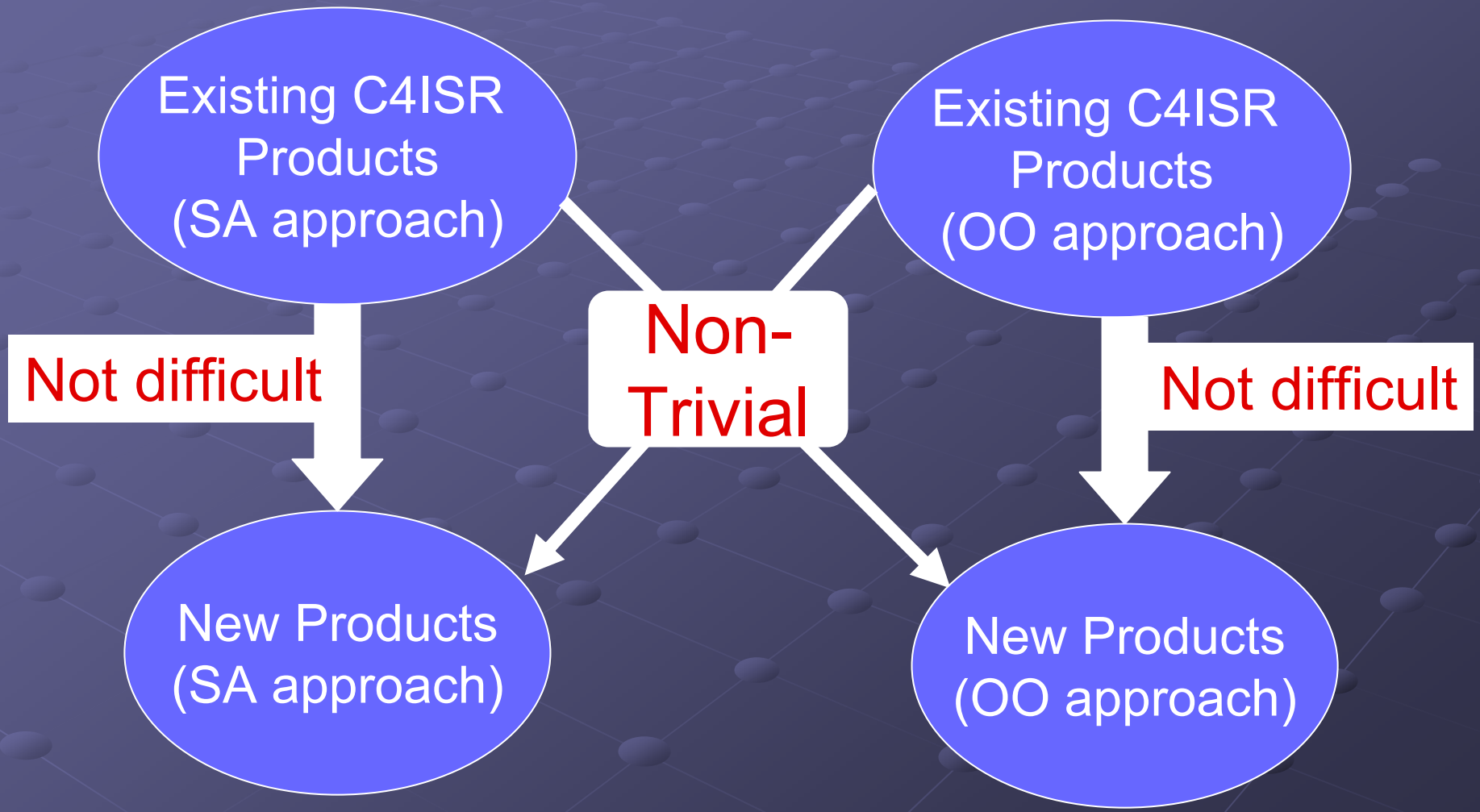
- CAF describes a set of products to represent three views of architecture
  - Operational Architecture View
  - System Architecture View
  - Technical Architecture View

- However, no well defined or widely accepted approach to produce these products is provided.

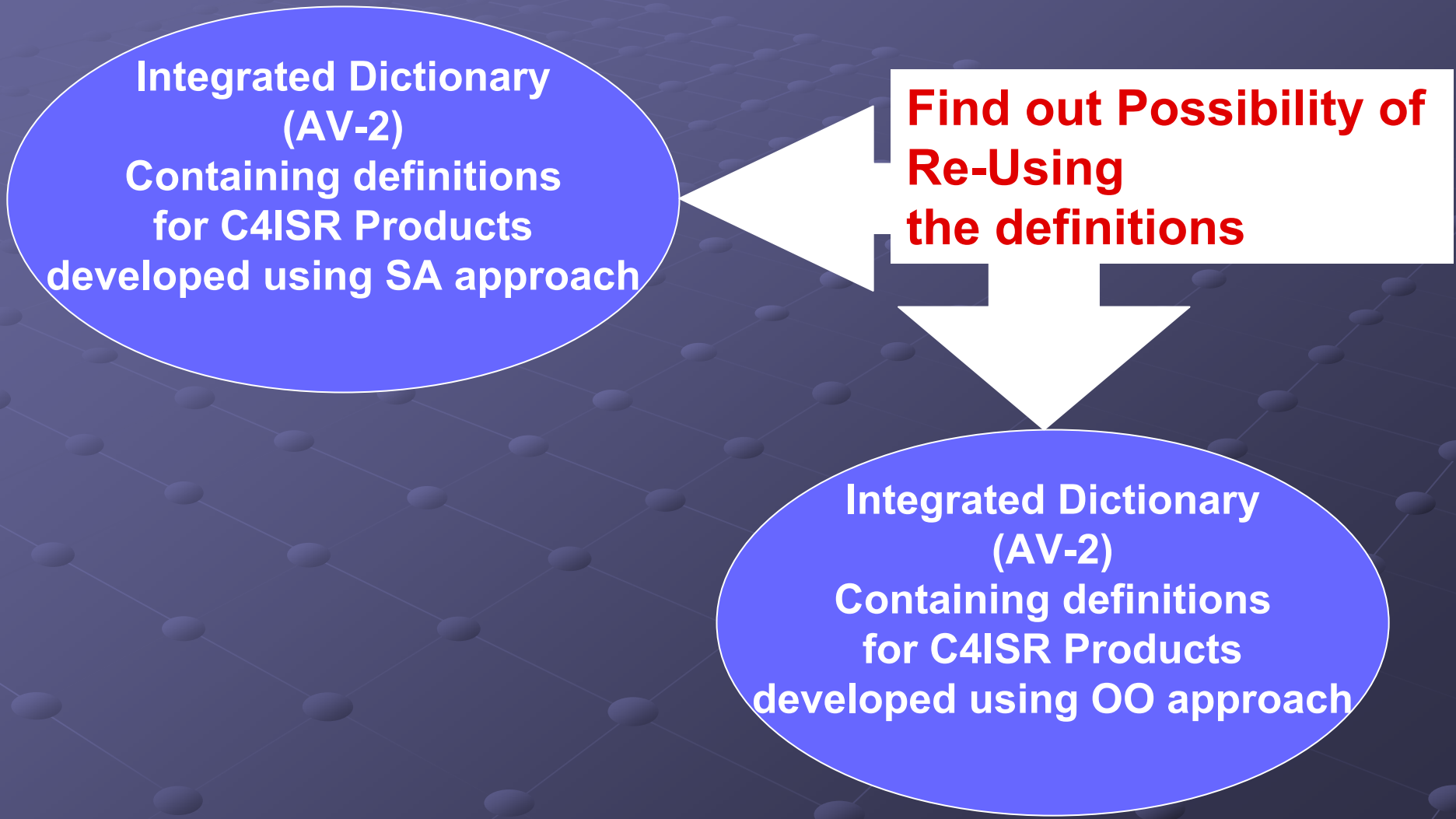
Approaches for Developing CAF Products



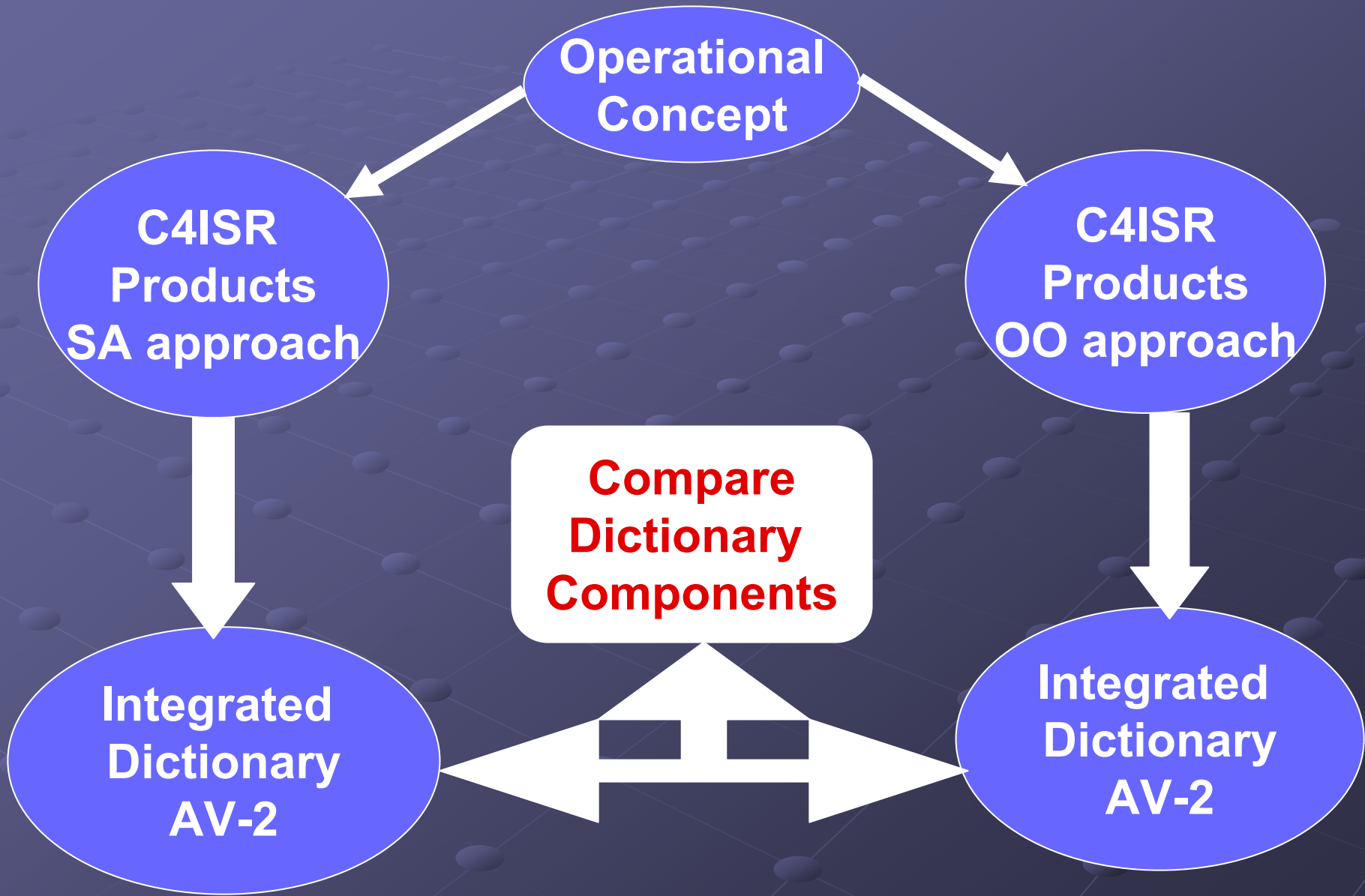
Problem Illustration



Research Objective

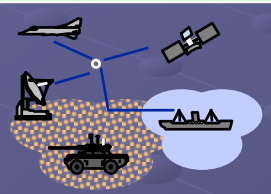


Methodology Adopted for Research



Mapping Between CAF/SA/OO Products

Operational Concept Diagram (OV-1)



SA

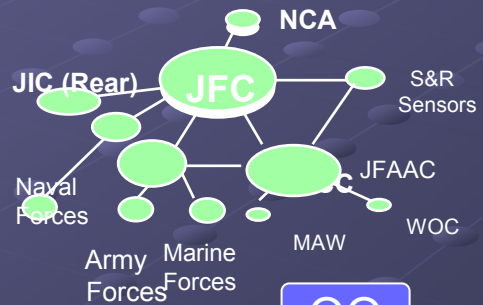
OO

Derived From Domain Knowledge

Node Connectivity Description

SA

Derived from OV-1 & Functional decomposition



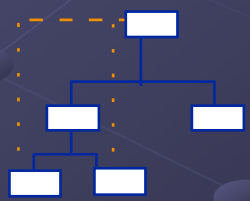
OO

Derived from the UML Class diagram

Command Relationship Chart

SA

Derived from OV-1



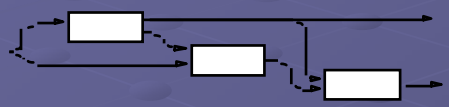
OO

Derived from Class/Object diagram

Mapping Between CAF/SA/OO Products (Contd..)

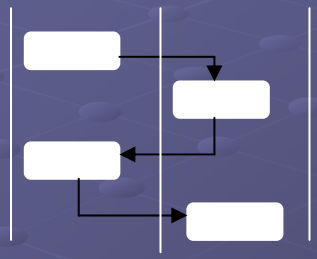
Activity Model

SA



IDEF0

OO



Activity diagram

State Transition Diagram OV-6b

SA

State Transition Diagram

OO

State Transition Diagram for each object

SA

Derived directly from Data Model

Logical Data Model OV-7

OO

May be derived from Class diagram

Operational Event/Trace Description OV-6C

SA

To be consistent OV-2 and OV-5

OO

UML Sequence diagram Can be used directly

Mapping Between CAF/SA/OO Products (Contd..)

System Interface diagram (SV-1)

SA

System nodes and links Derived from operational concept

OO

Derivable from the System class diagram

SA

Derived from Operational concept

System communication Diagram (SV-2)

OO

Logically similar to SV-1

System Functionality Description (SV-4)

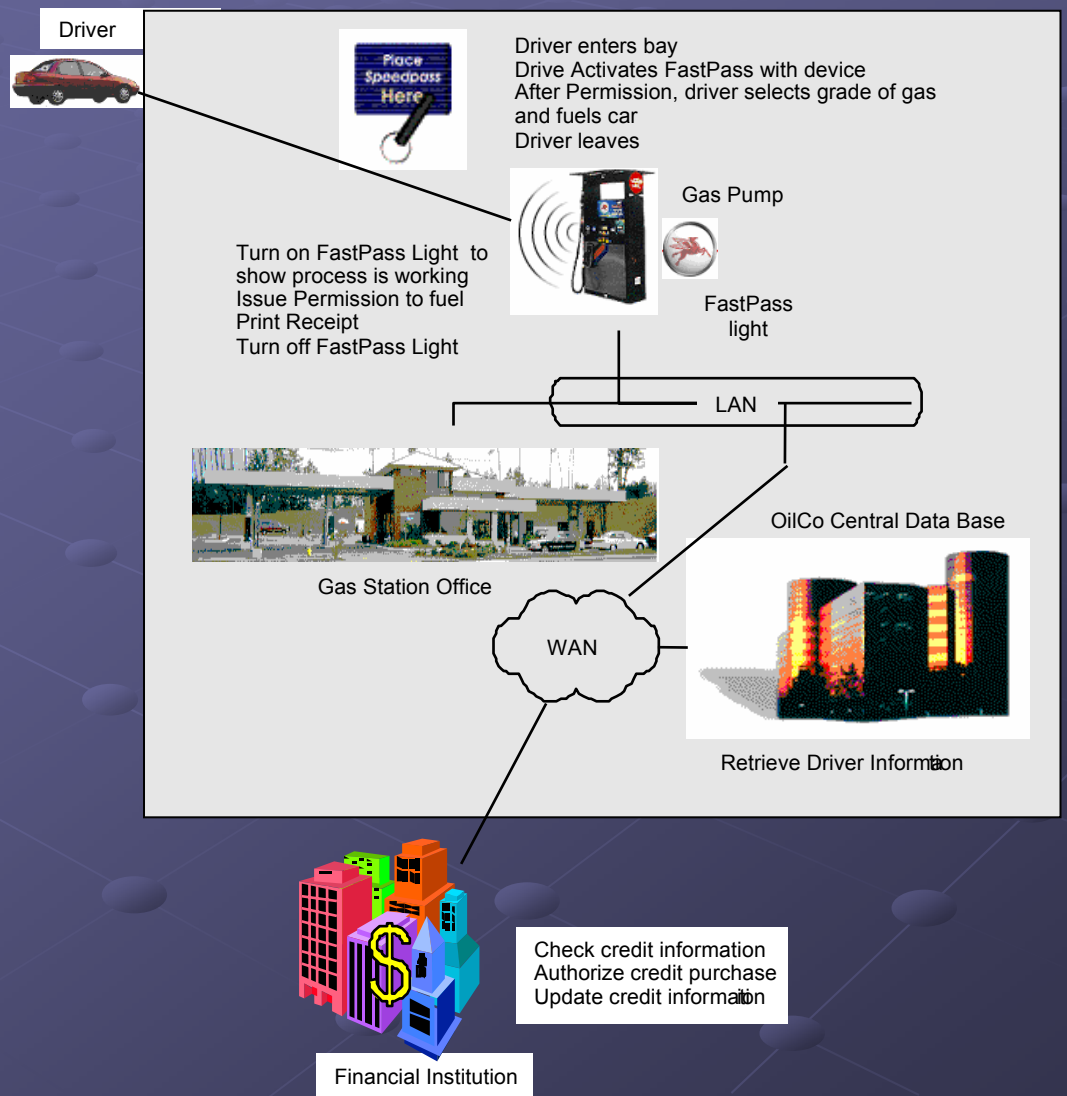
SA

Graphically can be represented as activity Model as DFD

OO

UML activity diagram for System classes can be used directly

FastPass System Operational Concept (OV-1)

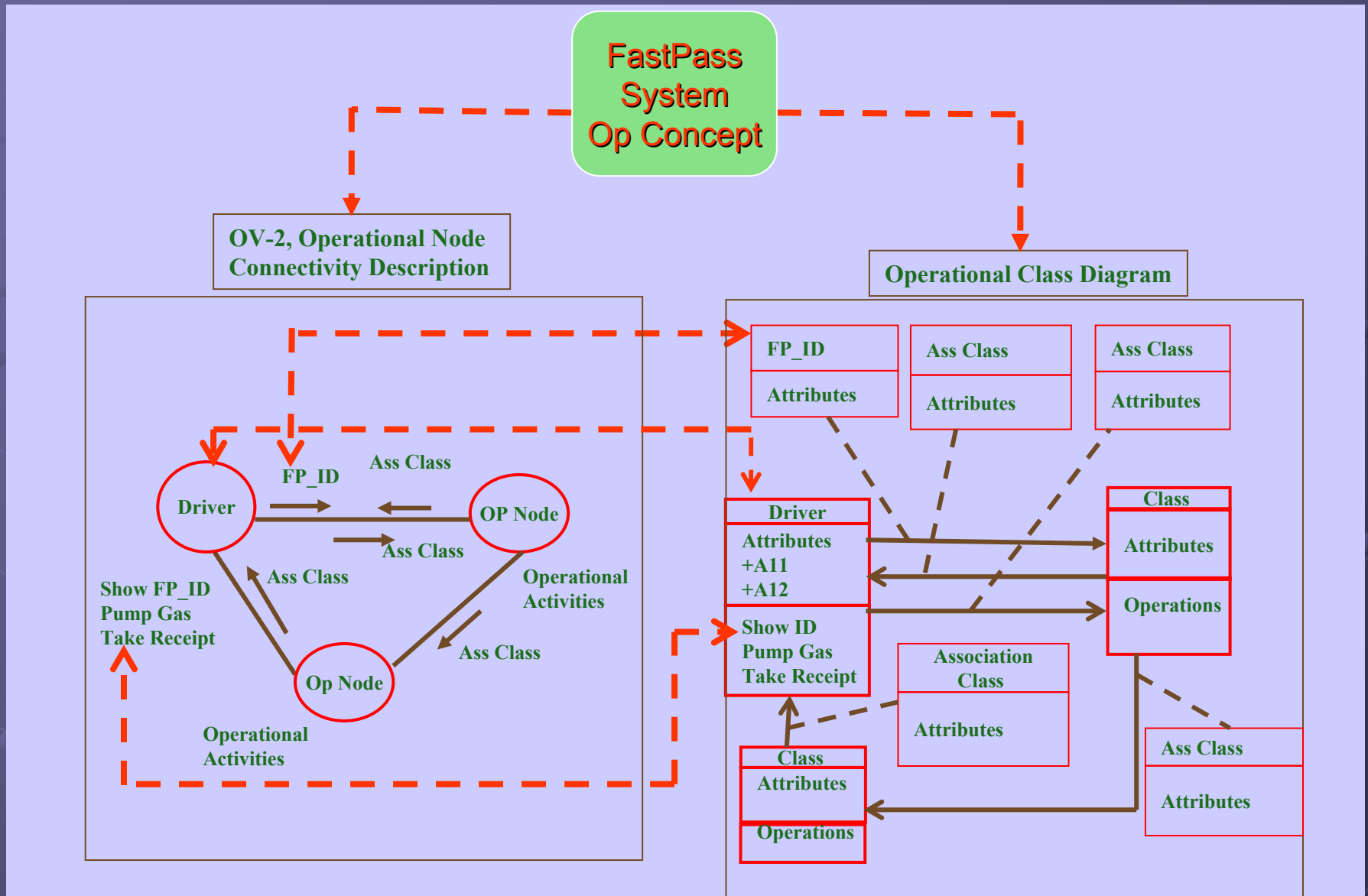


Comparison of Data Dictionaries Components

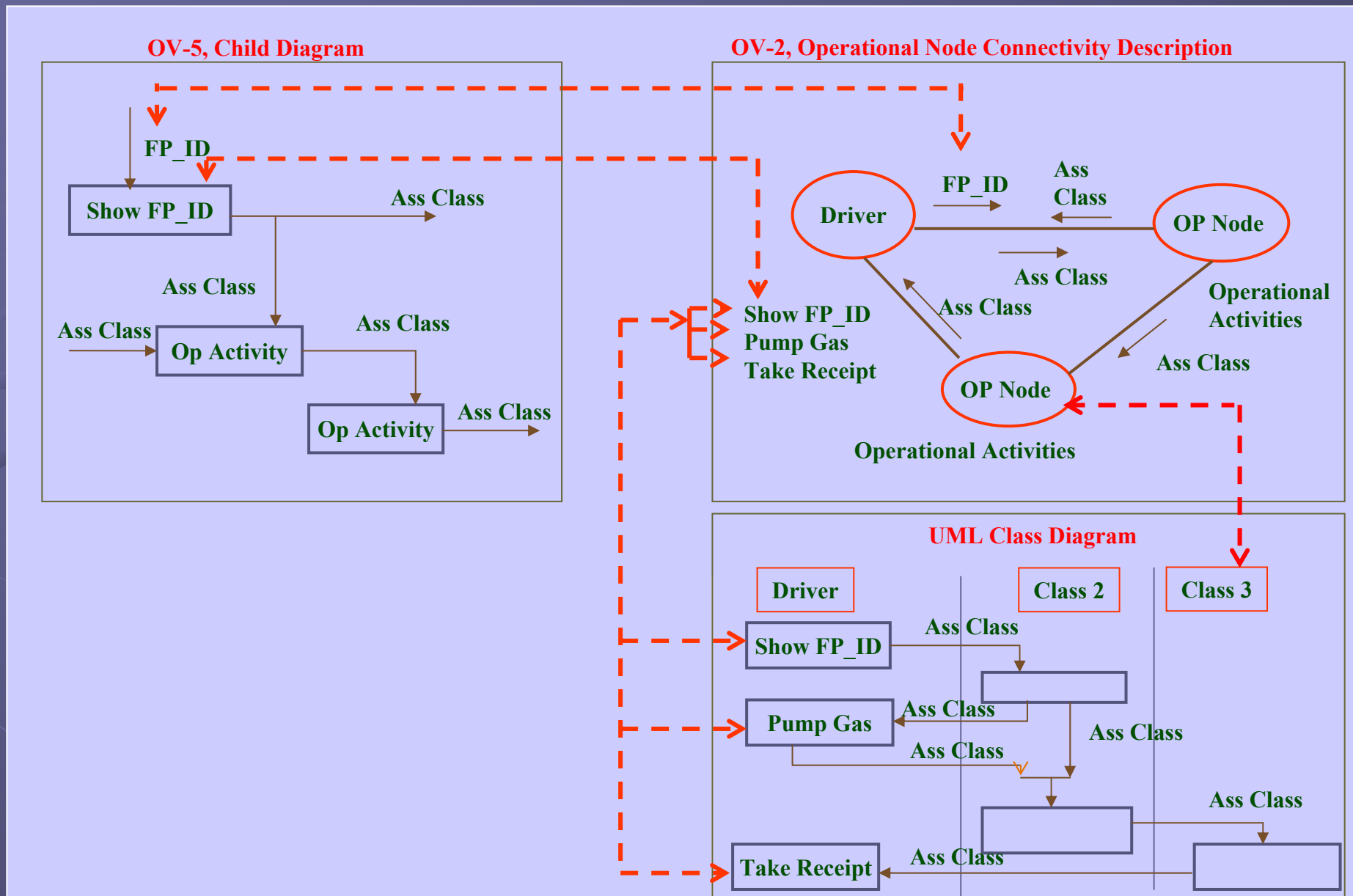
- Many definitions for two set of products match with other. For example,
  - Operational Nodes/Classes
  - Information Exchange
  - Organizational Units
  - Operational Activities
  - Object State
  - ICOM/Message Flow

- Reason being, products for both sets were produced using same operational concept.

Mapping between Operational Concept, Operational Node Connectivity Description and UML Class Diagram



Mapping Between Activity Model, Operational Node Connectivity and UML Activity Diagram



Comparison of Data Dictionaries Components (Contd..)

- However, certain definitions did not match.

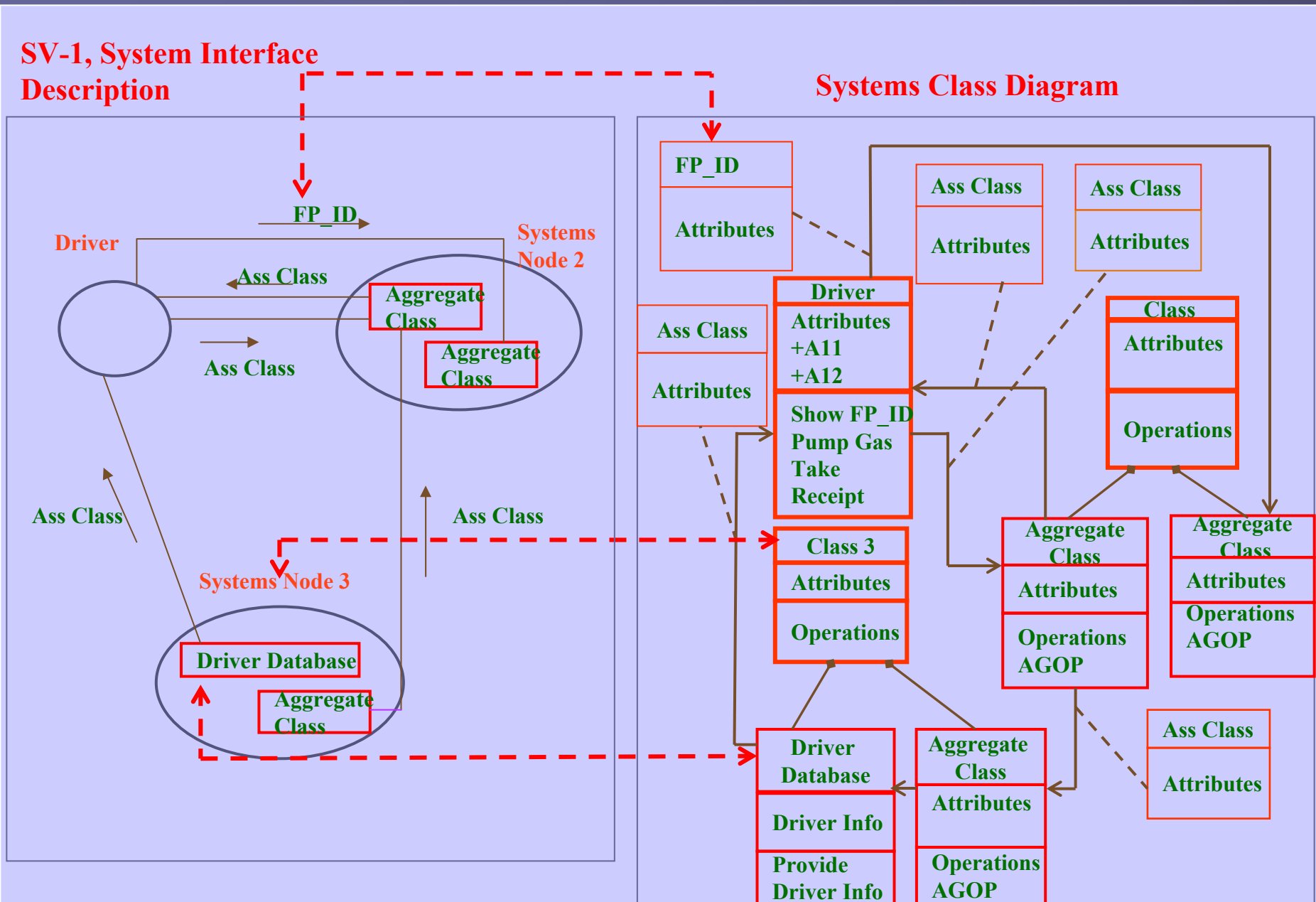
Definitions in SA dictionary	Definitions in OO dictionary
Op activities for A_0, A1, A_2, and A_3	None
None	ICOM/Message Flow at Decision point in UML Activity diagram
Relationships between entities in the Logical data model	None

Comparison of Data Dictionaries Components (Contd..)

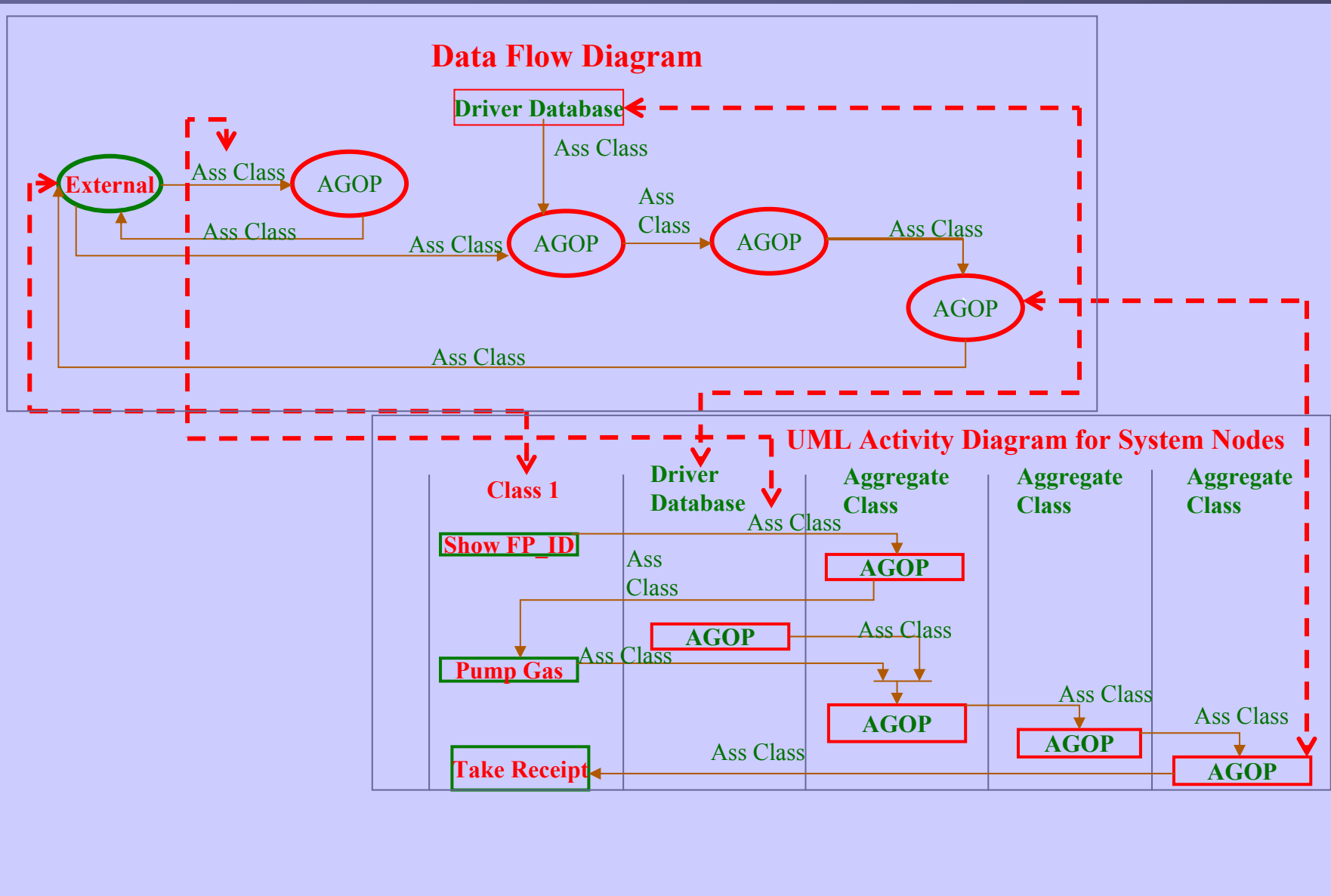
- For System Architecture view products many definitions match with each other. For example,

- System Nodes
- System Data Exchange
- System Elements
- Communication Nodes
- System Functions/Operations of the classes
- Data Stores/Aggregate Classes

Mapping Between System Interface Description (SV-2) and UML Class Diagram for Systems Classes



Mapping Between UML Activity Diagram and the Data Flow Diagram



Comparison of Data Dictionaries Components (Contd..)

- However, no definitions of systems functions for external entities in DFD diagram, like,
  - Functions for Driver
  - Functions for Financial Institution

- In SA approach Information provided by “Data stores” in DFD match with information contained by the aggregate classes in OO approach.

Summary & Conclusion

- Re-Use of definitions contained by Integrated dictionary was discussed.
- CAF products were developed using SA and OO approach.
- Components of the two dictionaries were compared.
- Results showed that most of the terms were identical and can be reused.
- Certain differences in definitions were due to the difference of product development techniques.
- Hence, use experience and domain knowledge to “fill in the blanks” for reusing definitions from one architecture into another.

Questions