

CS4125

SYSTEMS ANALYSIS

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Modelling Dynamics

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- Which objects should be responsible for each part of the overall behaviour?
- What interaction between objects are required?
- CRC technique, while not part of UML, is useful.
- UML: interaction sequence and communication diagrams.
- Where responsibilities are evenly distributed, each class tends not to be unduly complex.
- Result is easier to develop, to test and maintain. Facilitates reuse.

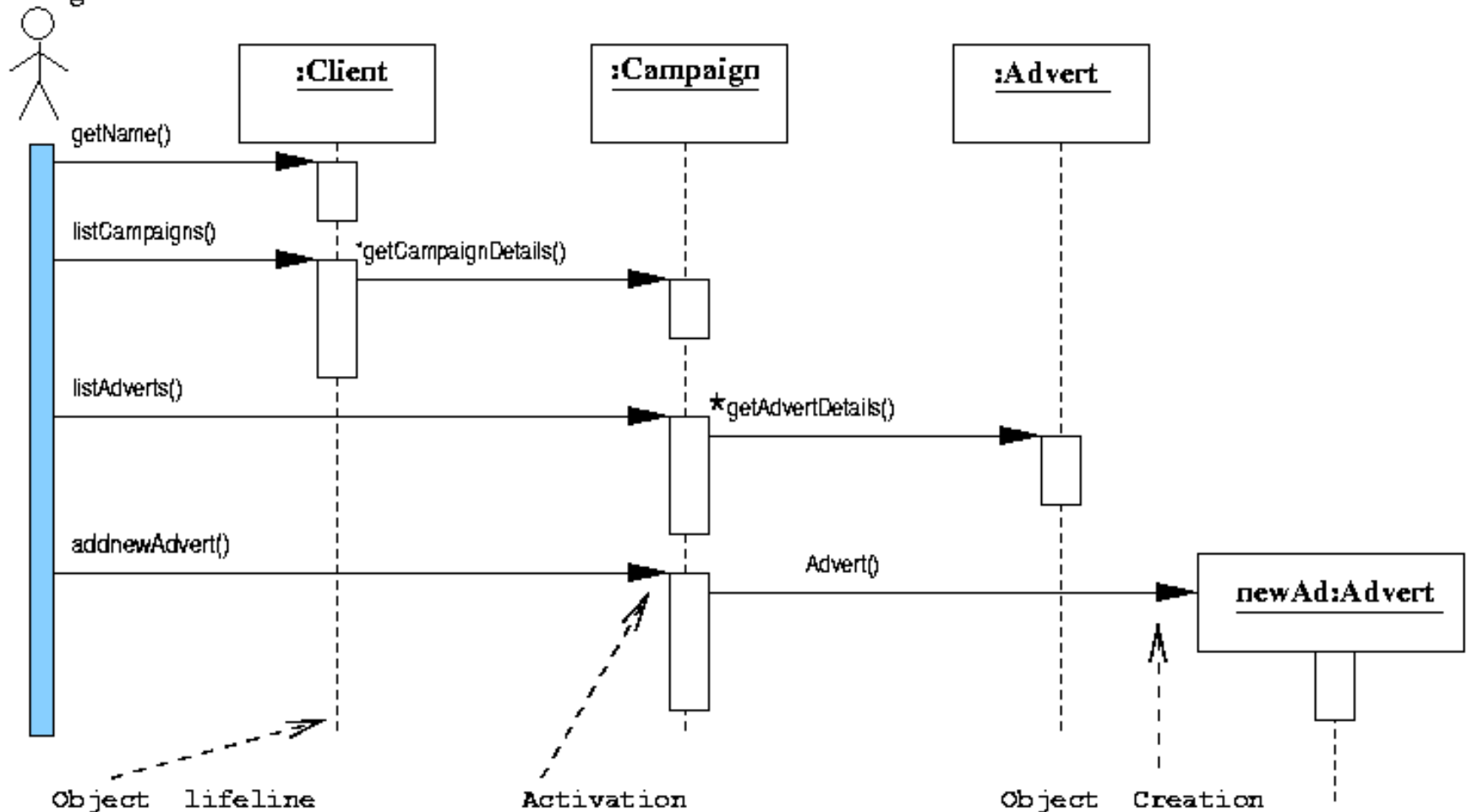
- What about the identification and specification of dialogue objects:
 - ▣ Is in part an analysis activity and in part a design activity.
 - ▣ Use case is a dialog between an actor and the system.
 - ▣ Analysis: identify the nature of a dialogue in terms of the users need for information and his/her access to the system's functionality.
 - ▣ The detailed specification of user interface objects is primarily a design activity.

UML 1.x : Sequence Diagrams

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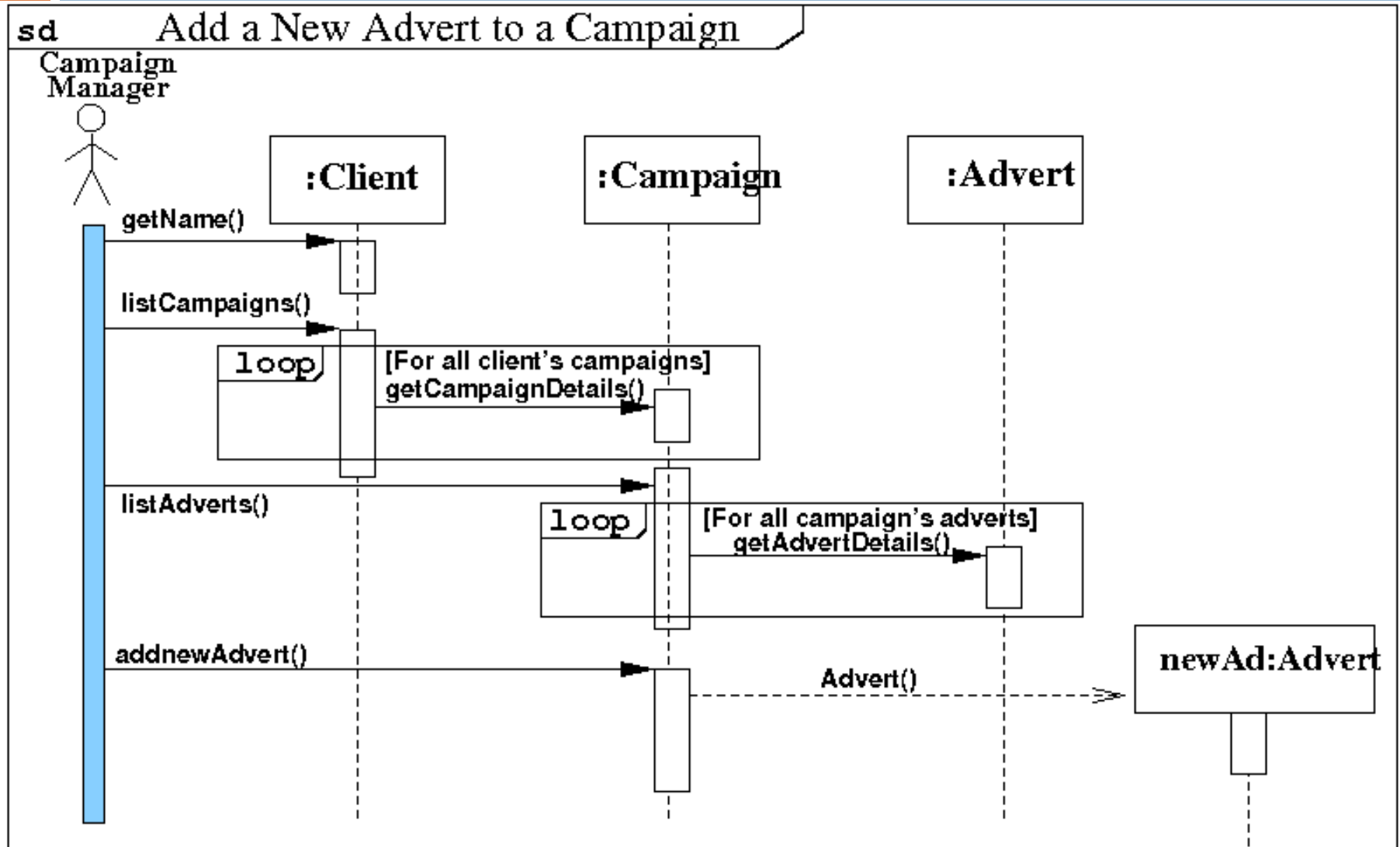
Campaign
Manager

Sequence diagram for the use case Add a New Advert to a Campaign



UML 2.0 : Sequence Diagram

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UML 2.0 Frames and Combined Fragments

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- ❑ Interaction frame: sequence diagram drawn within a rectangular boundary
- ❑ Combined Fragment:
 - ▣ Used to show iteration and branching (and others).
 - ▣ Shown by enclosing the message in a rectangular boundary (frame) with the keyword loop or alt etc.
 - ▣ Keyword is known as an interaction operator.
 - ▣ Guard conditions specified in square brackets and optional. i.e.
 - ▣ [For all client's campaigns]
 - ▣ Example of an interaction constraint

UML 2.0: Interaction Operators

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1. loop
2. alt
3. opt: optional, the fragment executes only if the supplied condition is true. Equivalent to alt with only one trace.
4. par: each fragment is executed in parallel
5. region: critical region, the fragment can only have one thread executing at any point in time
6. neg: fragment shows an invalid interaction
7. ref: refers to an interaction defined in another diagram
8. sd: sequence diagram

Sequence Diagram: a Note on Iteration

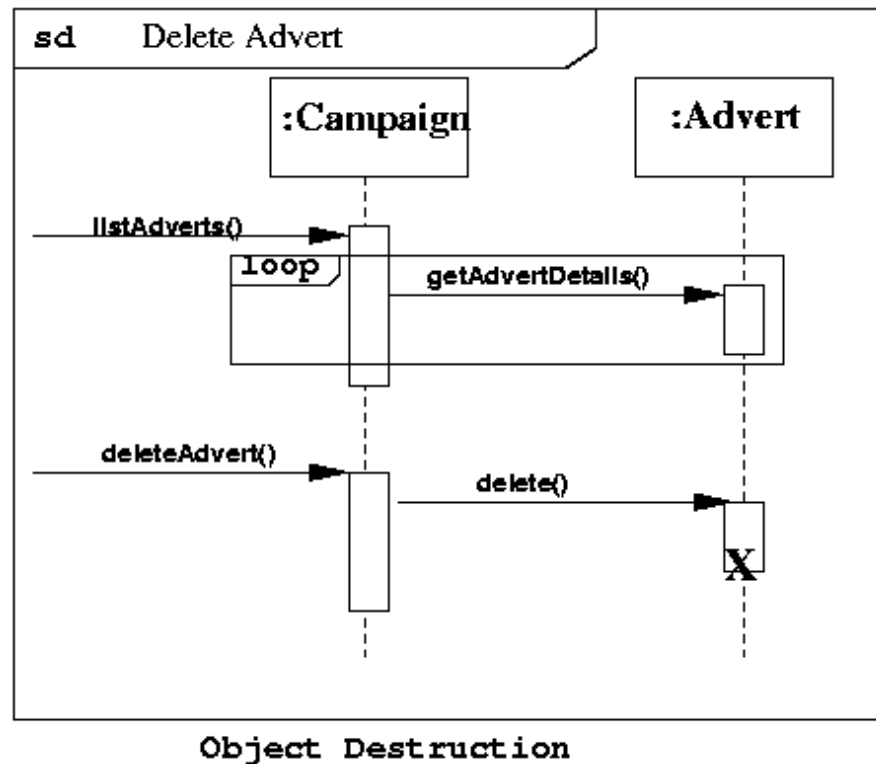
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- UML 1.x: The conditions for continuing or ceasing an iteration may be shown beside a message name
[For all client's campaigns] *getCampaignDetails()
- UML 2.0: shown inside an interaction frame
[For all client's campaigns] getCampaignDetails()

Sequence Diagrams: Constructors and Destructors

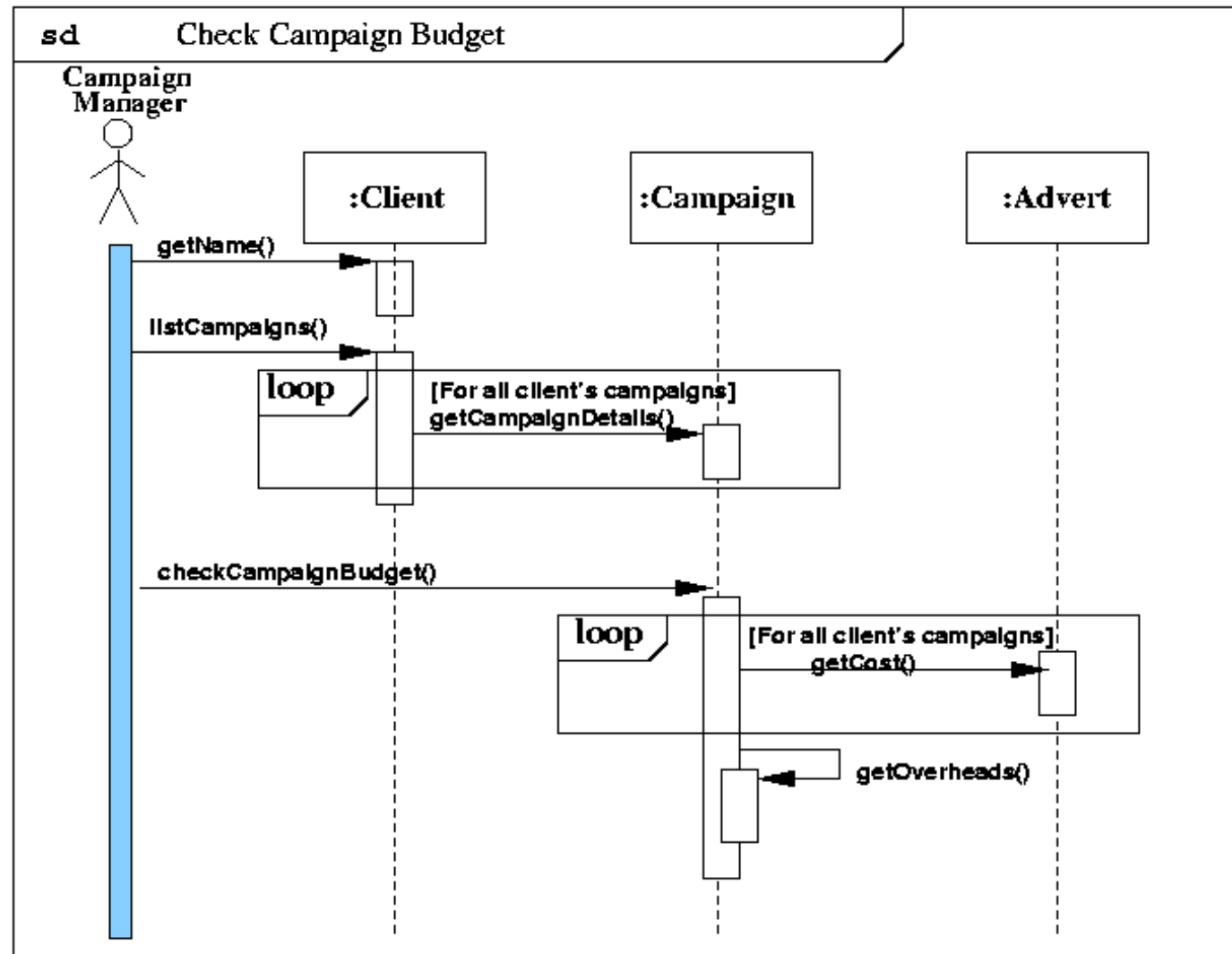
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- Constructors drawn with arrowhead pointing directly to the object symbol at the top of its lifeline.
- The destruction of an object is indicated by a large X on the lifeline.



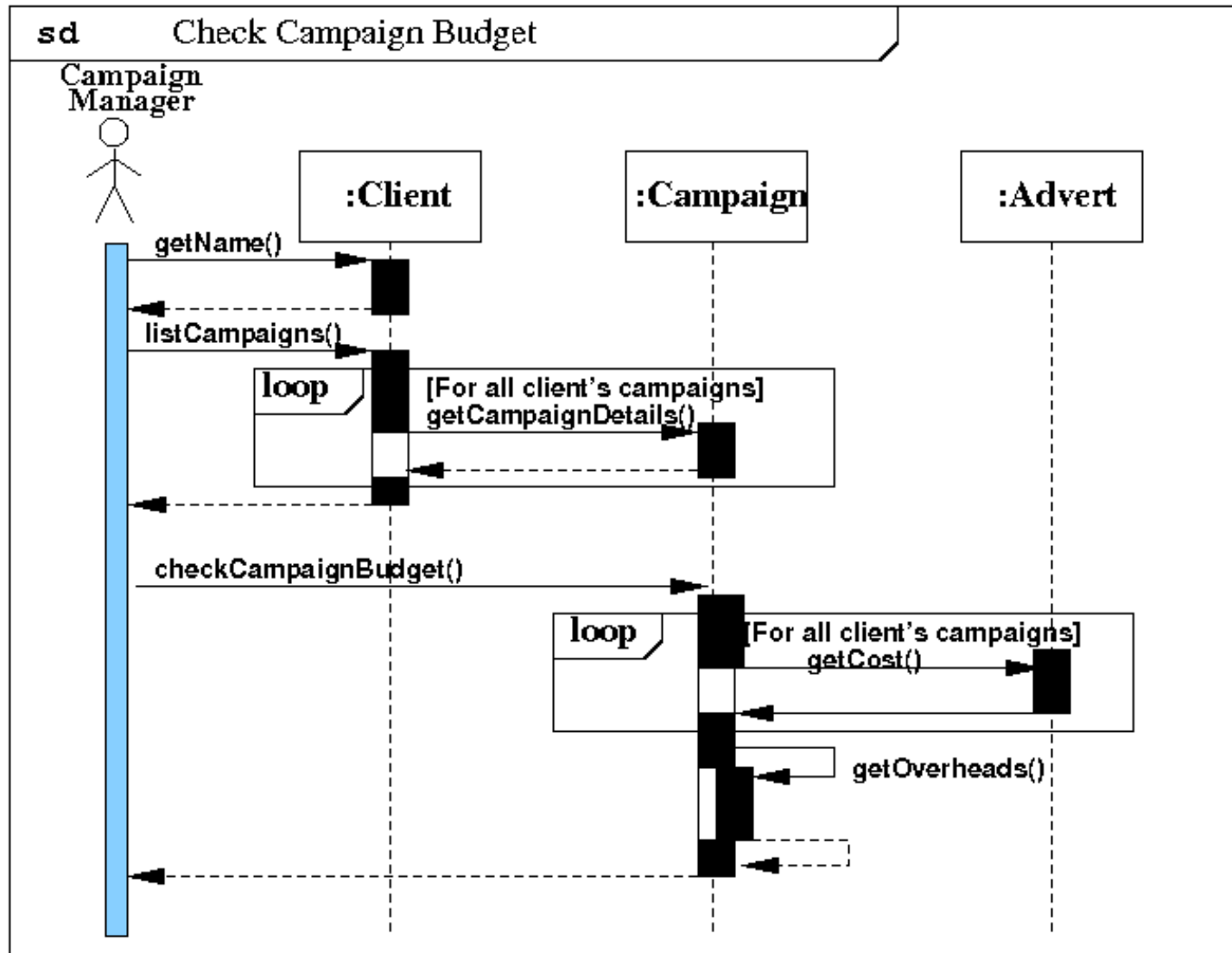
Sequence Diagrams: Reflexive Messages

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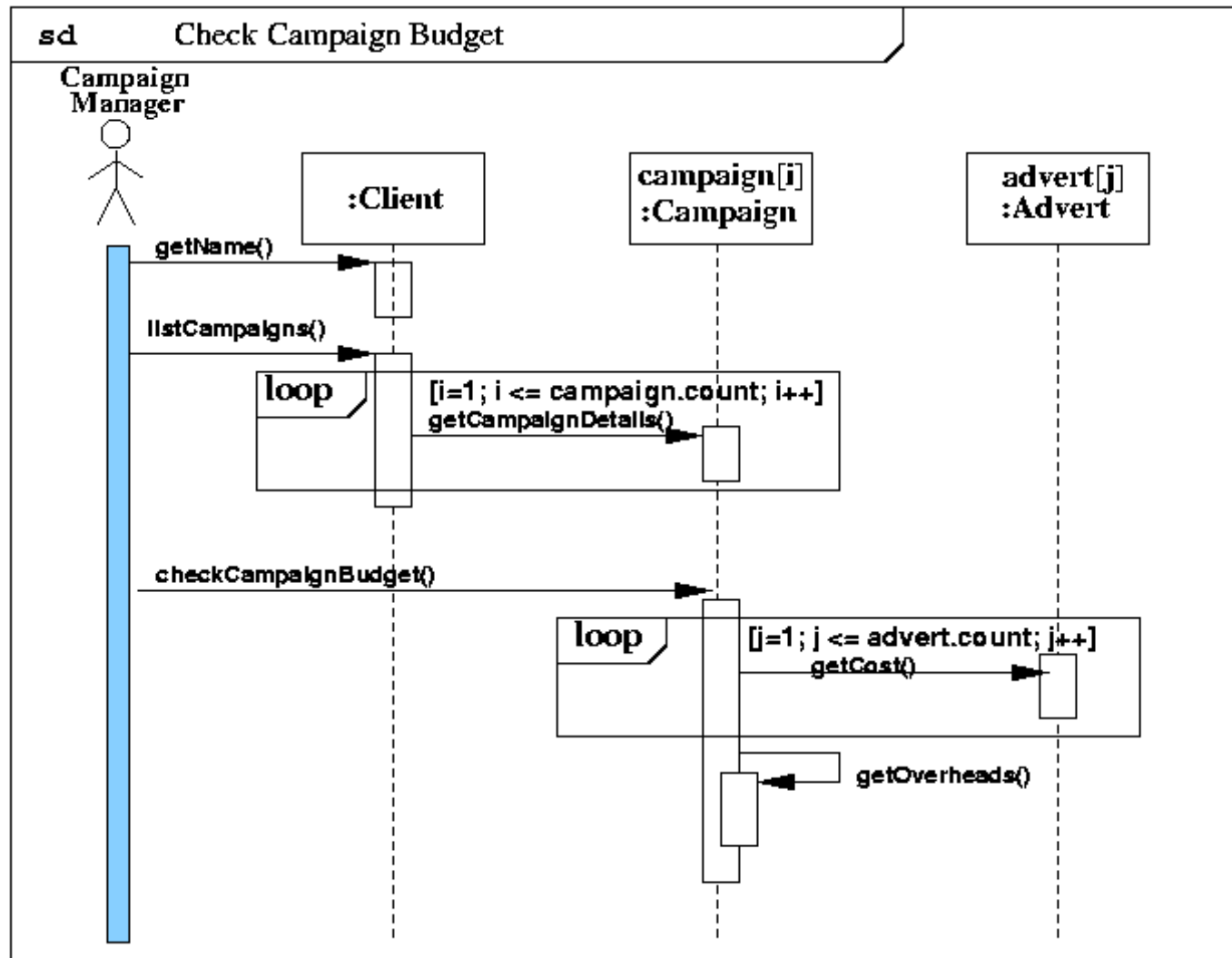
Sequence Diagrams: Focus of Control

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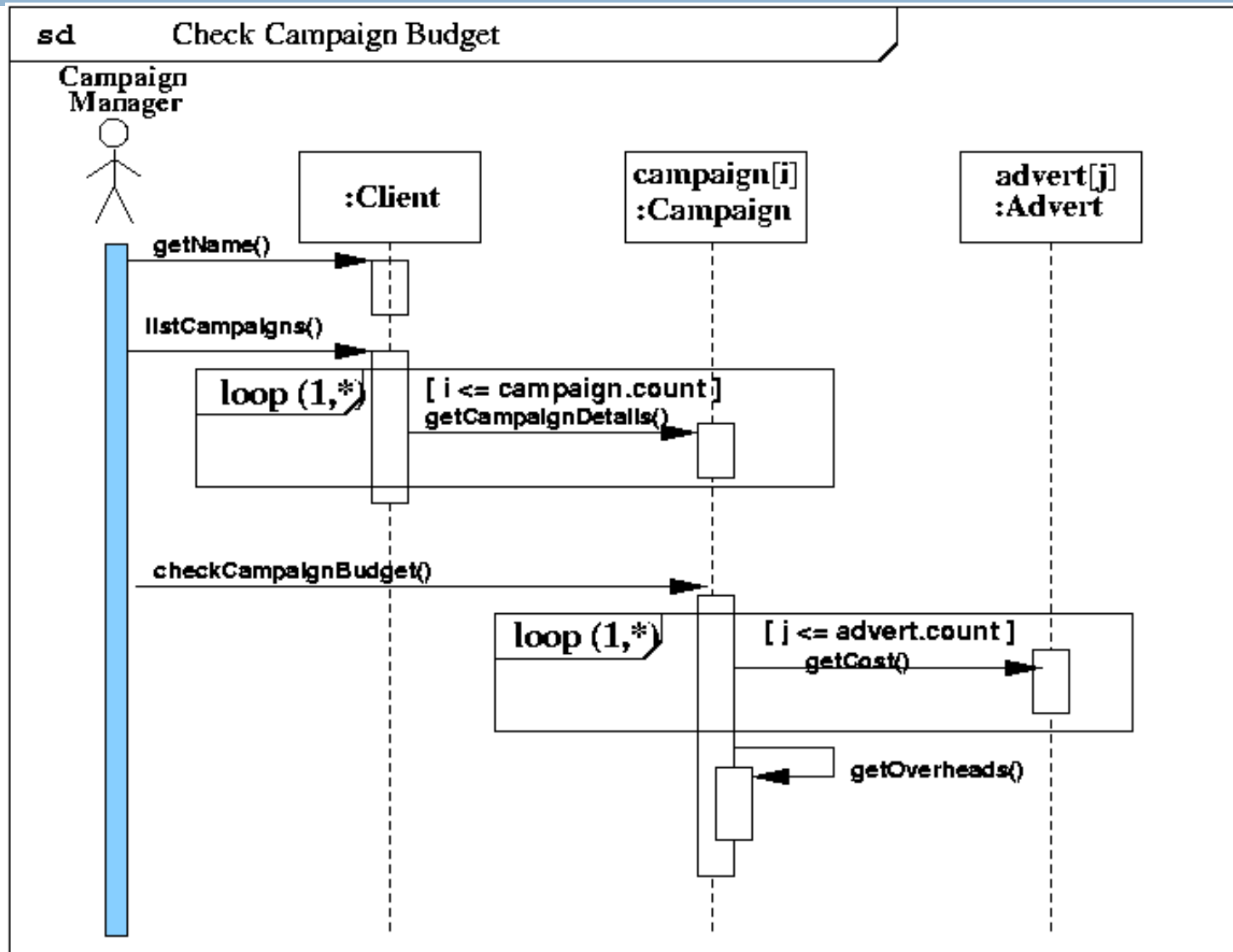
UML 2.0 : Sequence Diagrams – Object Selector Notation

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UML 2.0 : Sequence Diagrams – Interaction Operators with Parameters

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Use Case Scenario

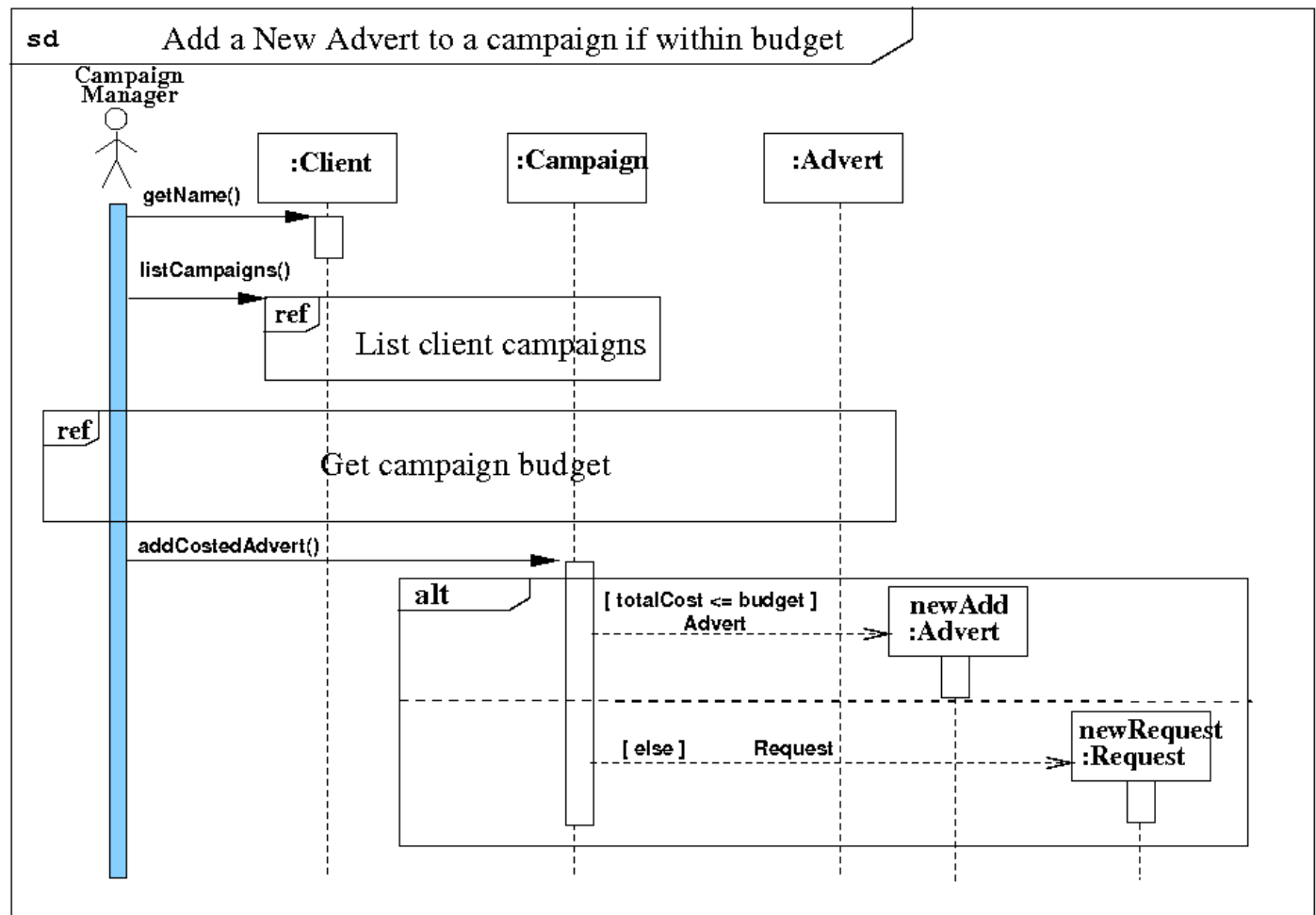
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- A new advertisement is added to a campaign by a campaign manager only if the campaign budget is not exceeded by adding a new advert. If adding a new advert would cause the budget to be exceeded, then a campaign budget extension request is generated.....

UML 2.0 : Sequence Diagrams - Branching

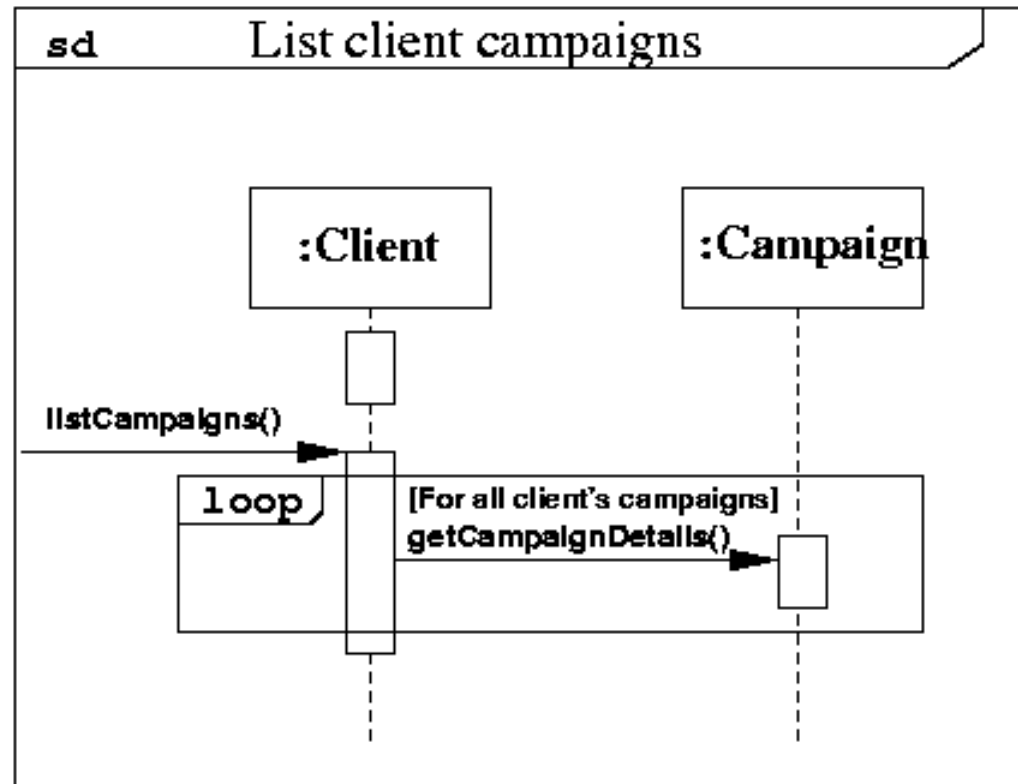
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- Gate showing the message *ListCampaigns* enter the interaction occurrence
- An example of a continuation



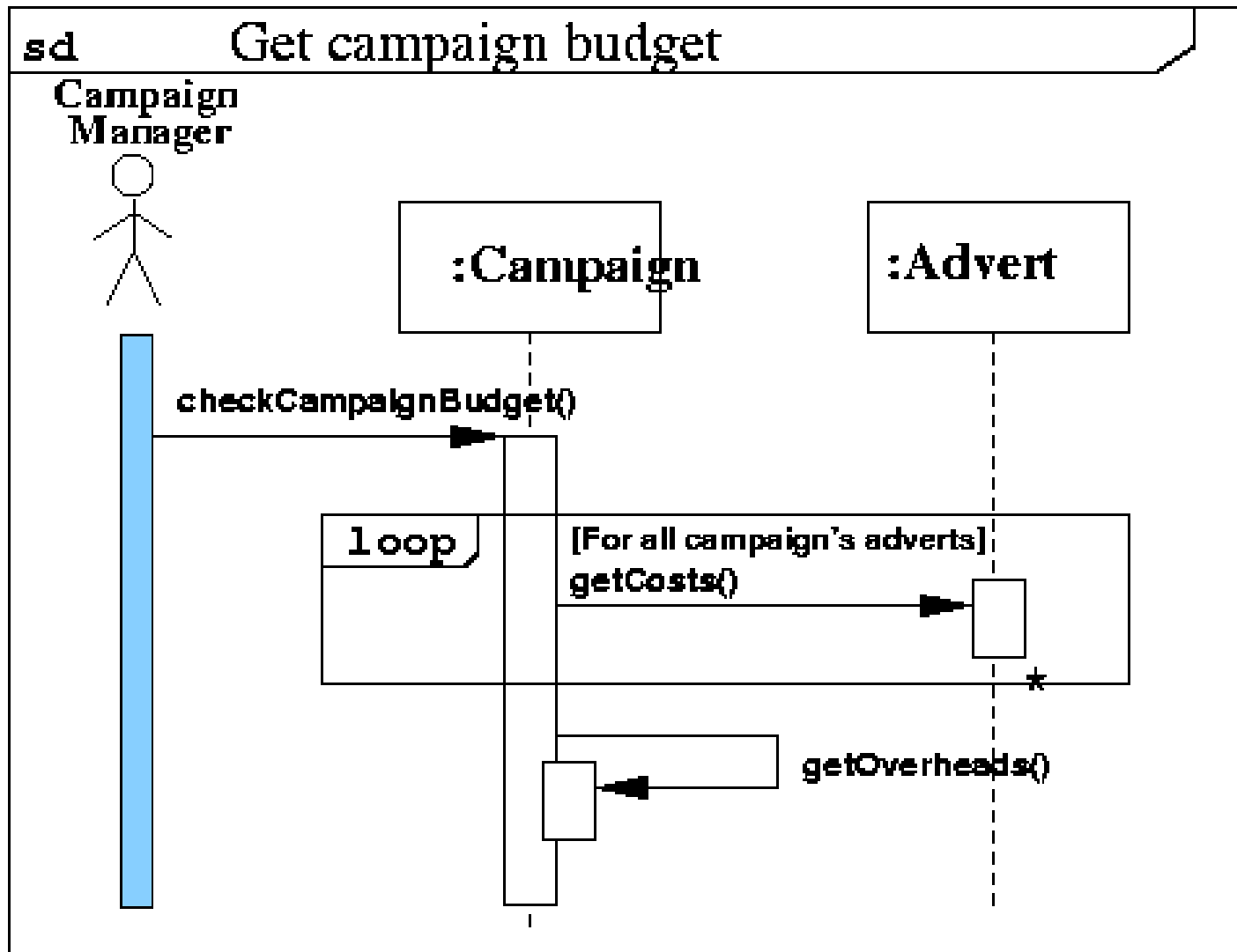
Sequence Diagram: Interaction Fragment

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Sequence Diagram: Interaction Fragment

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Sequence Diagrams: Invocations

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Sender

Receiver



Synchronous Procedure Call



Object Constructor



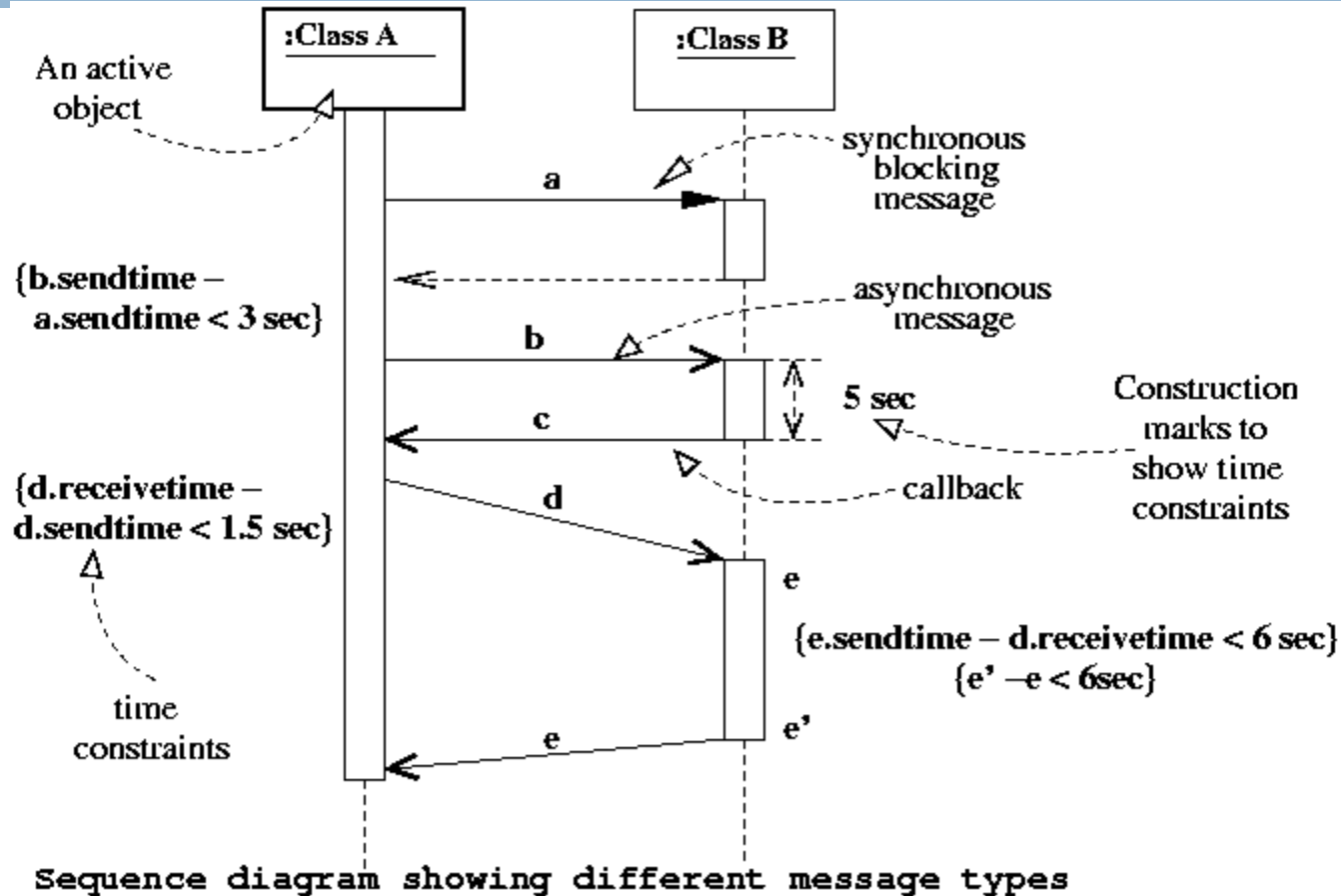
Asynchronous



Return

Sequence Diagrams: Time Constraints

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- Active object specified using UML 1.x notation
- Active objects shown with double line at each side of the class icon in UML 2.x

Modelling Several Threads of Control

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- A new thread of execution can start up if:
 - ▣ A single existing thread is split into several threads i.e. an object sends two or more messages concurrently.
 - ▣ An actor, or an active object can start a new thread of execution i.e. it can send a message on its own initiative, without having been triggered to do so by receipt of a message.
 - ▣ An object can send an asynchronous message to another object.

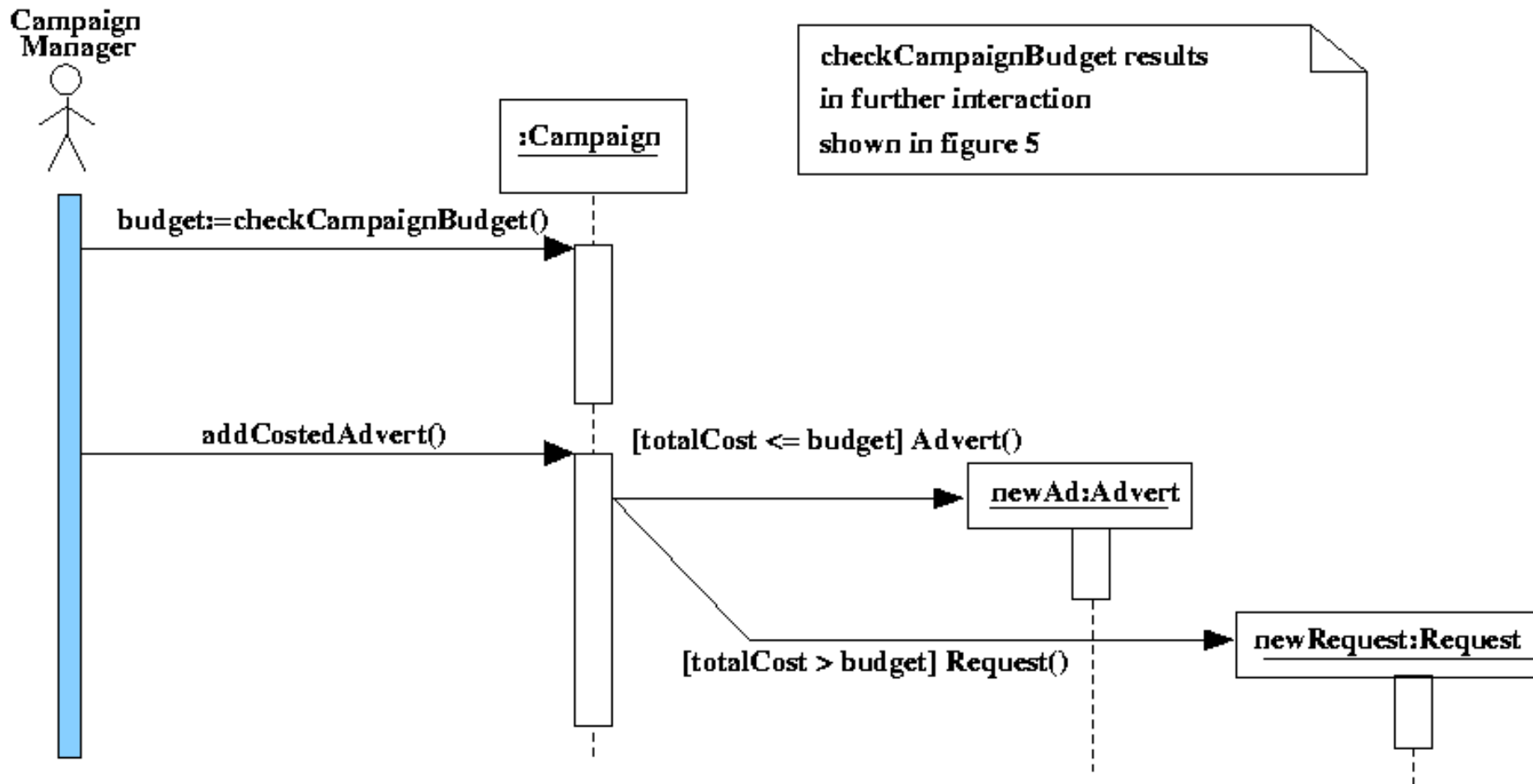
Guidelines for Preparing Sequence Diagrams

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- See section 9.3.8
- Additional notes:
 1. UML 2.0: introduces combined fragments
 2. Normally one or more sequence diagrams per use case – depends on number of scenarios
 3. Most CASE workbenches support UML 1.X
 4. Some differences across texts with respect to use of The UML notation for modelling interaction
 5. The UML provides a notation, at discretion of individual as to how they are used, or not used!
 6. Should one depict boundary and control objects?
 1. See figure 9.5 on page 257 in Bennett et al.
 2. Yes for project

UML 1.X : Sequence Diagrams - Branching

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Sequence diagram for the use case Add a New Advert to a Campaign

UML 1.X : Sequence Diagram - Branching

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Branching Lifeline in receiver i.e

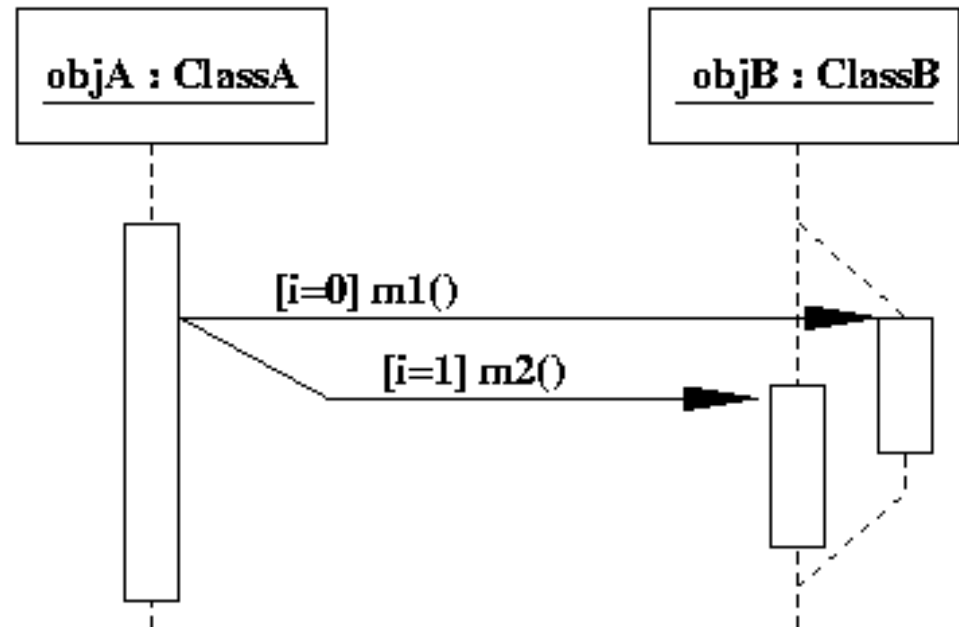
START-IF

IF(i=0) objB.messageA(...)

ELSEIF (i=2) objB.message2(...)

// ELSE exception handling

END-IF



Reading

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- Chapter 9 in Bennett et al. or
- Chapters 9 and 10 in Stevens and Pooley
- Will not cover interaction overview and timing diagrams.
- Does not imply that import is lessened!