ConnectivityWeek

Open Automated Demand Response Communication Standards

Ed Koch

CTO Akuacom

Definitions

- Utility/ISO – entity supplying electricity and offering DR programs
- Participant – Entity with business agreement with Utility/ISO to participate in DR programs
- DRAS – Demand Response Automation Server, automates delivery of messages between the Utility/ISO and the Participant.
- DRAS Client – entity owned by the Participant that communicates with the DRAS to receives DR Event information (MM communications).

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Technical Advisory Group Affiliations

- NIST
- CA ISO
- CEC/PIER
- CIEE
- Enernex
- EPRI
- Gridnet
- Gridwise
- LBNL
- OpenAMI
- OpenHAN
- PG&E
- SCE
- SDG&E
- UCB - PCT

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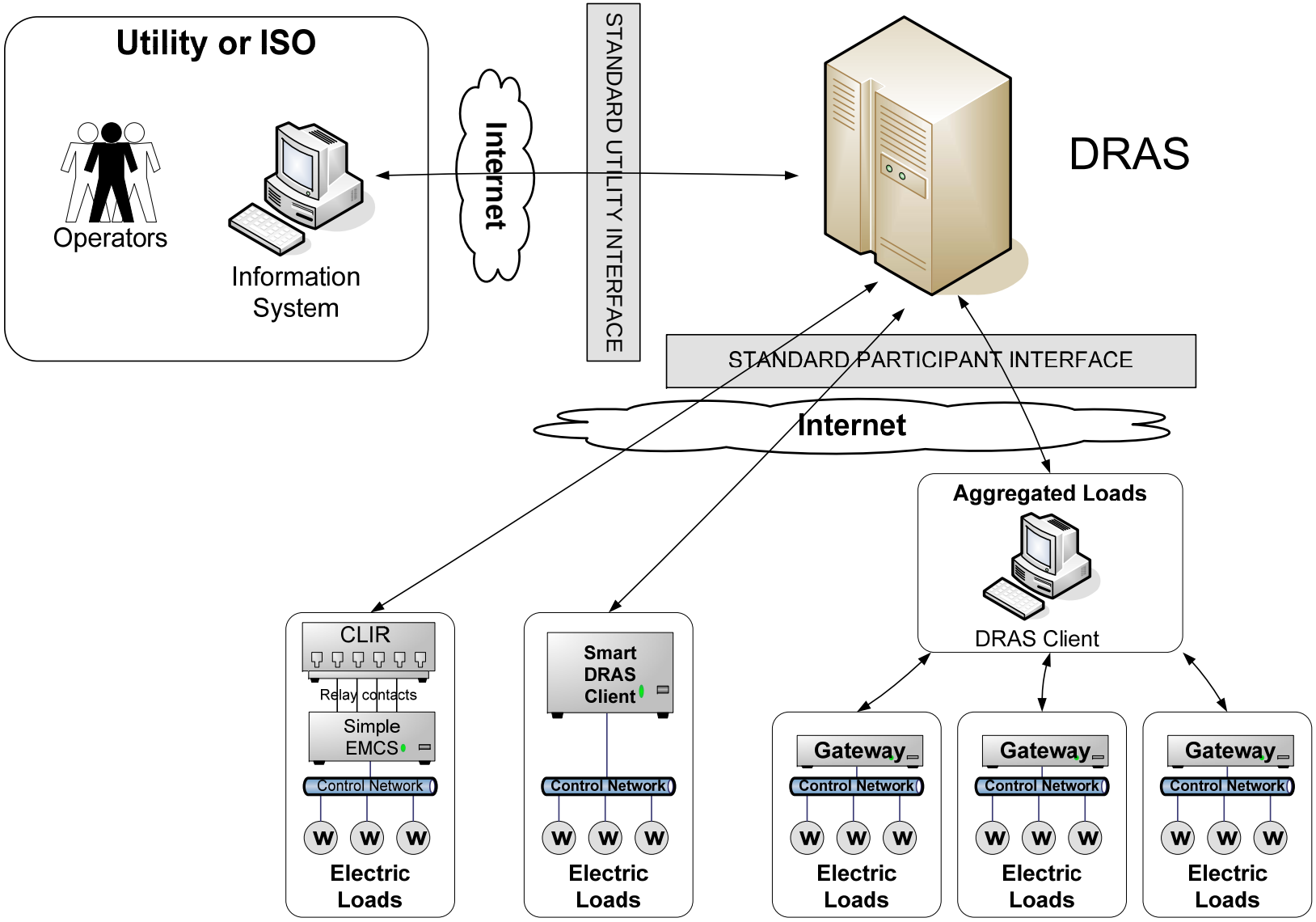
DRAS Concept



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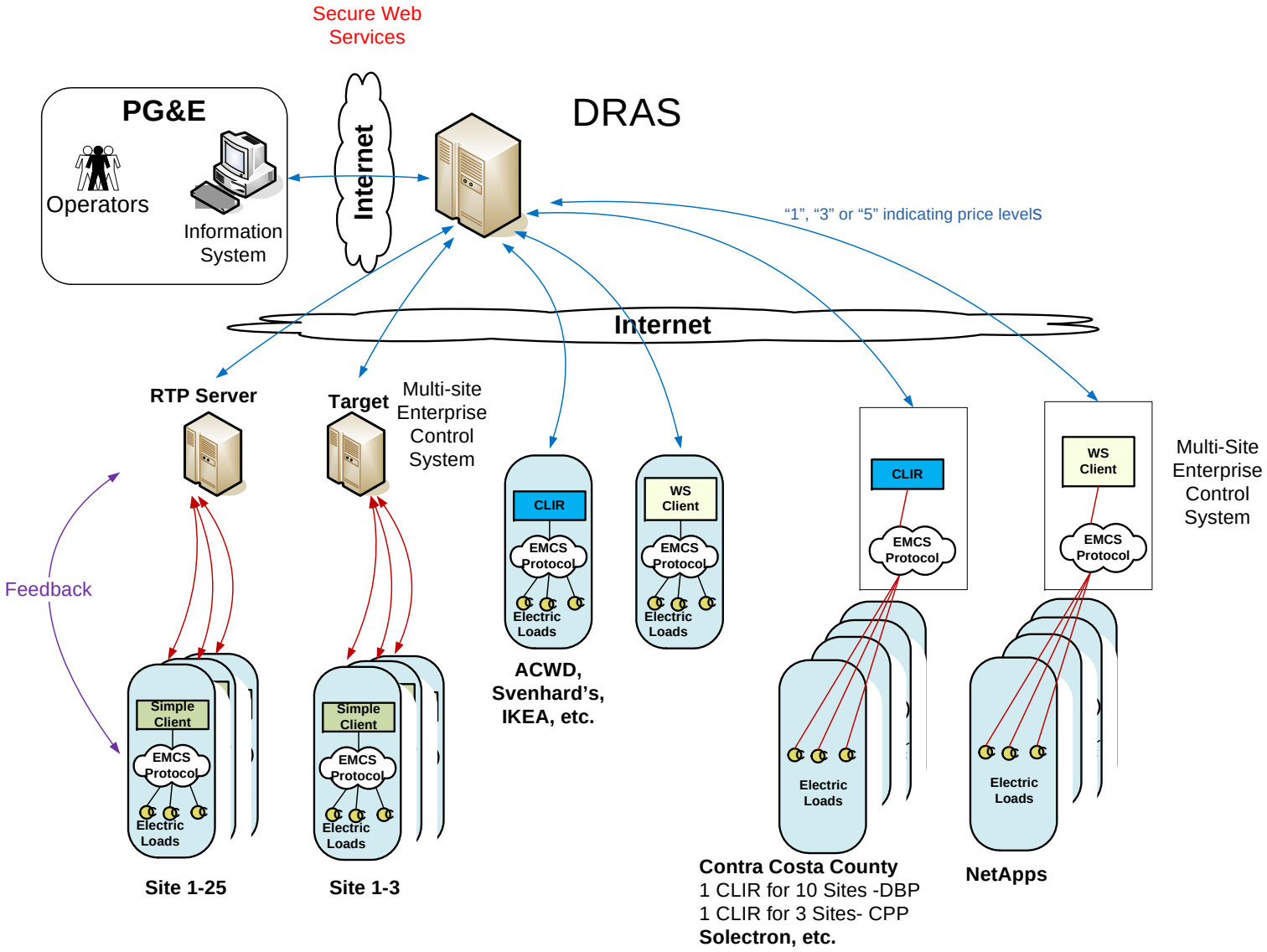
Sample Deployment Scenarios



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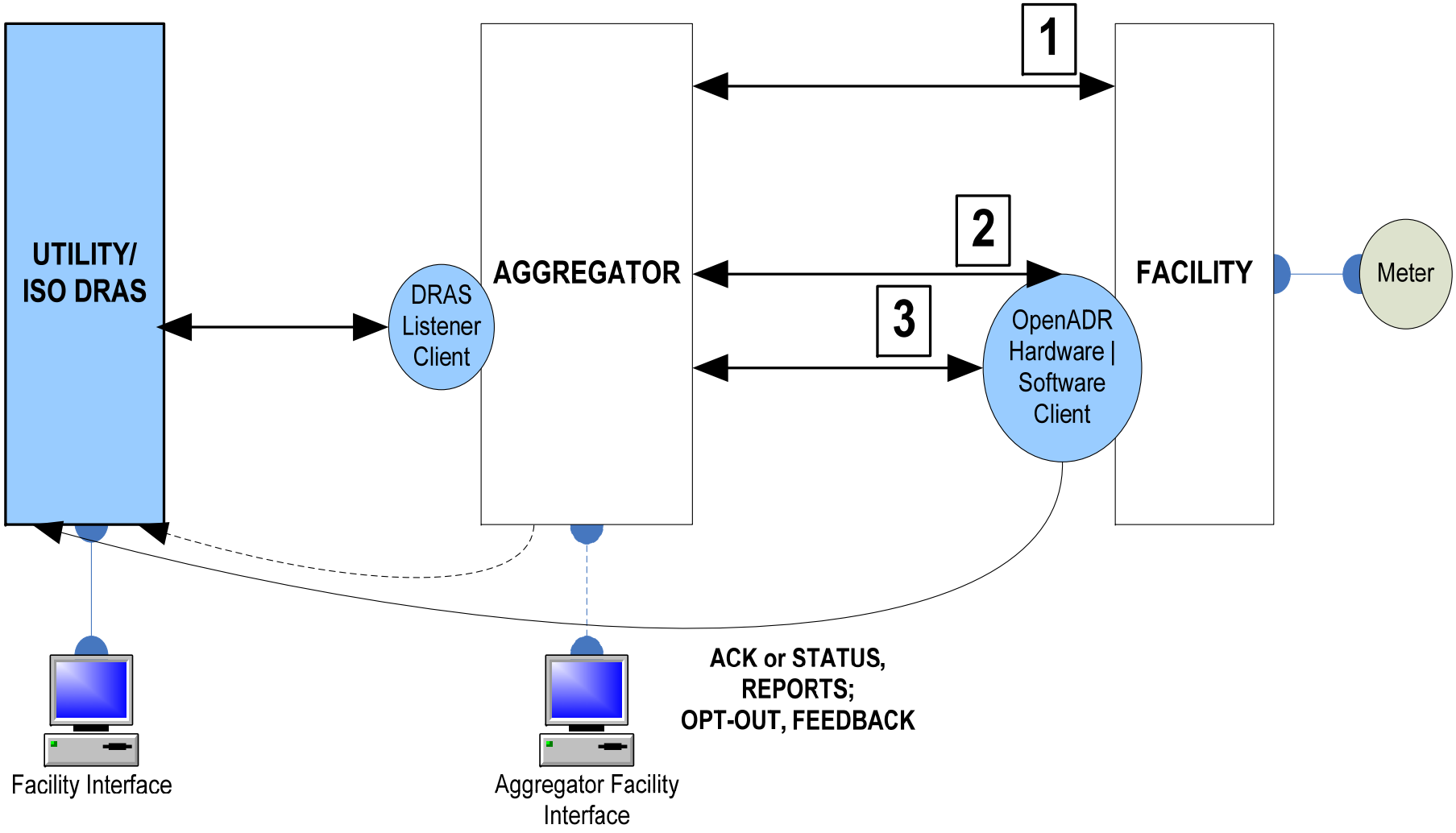
Example Aggregator Scenarios



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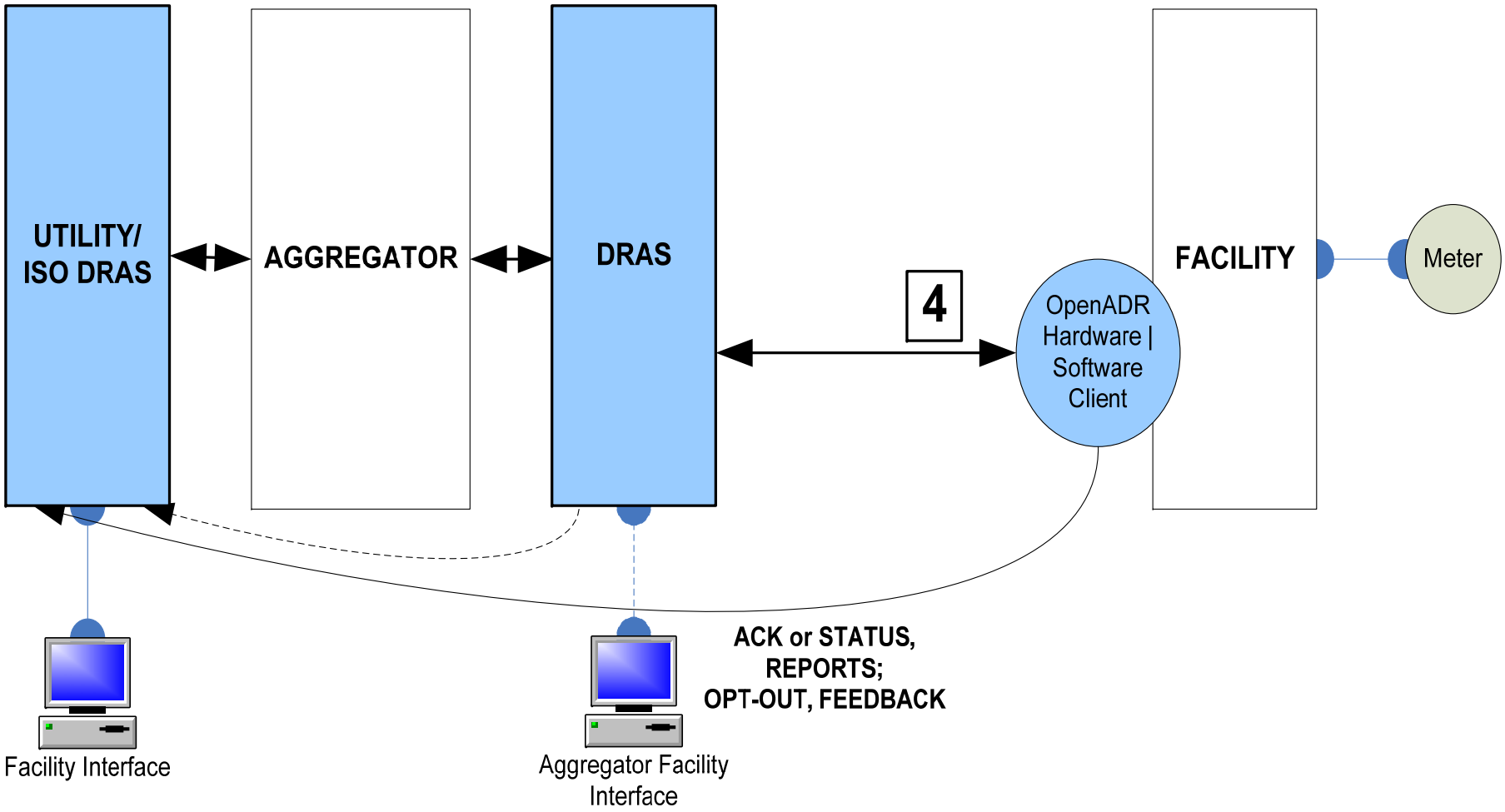
Example Aggregator Scenario



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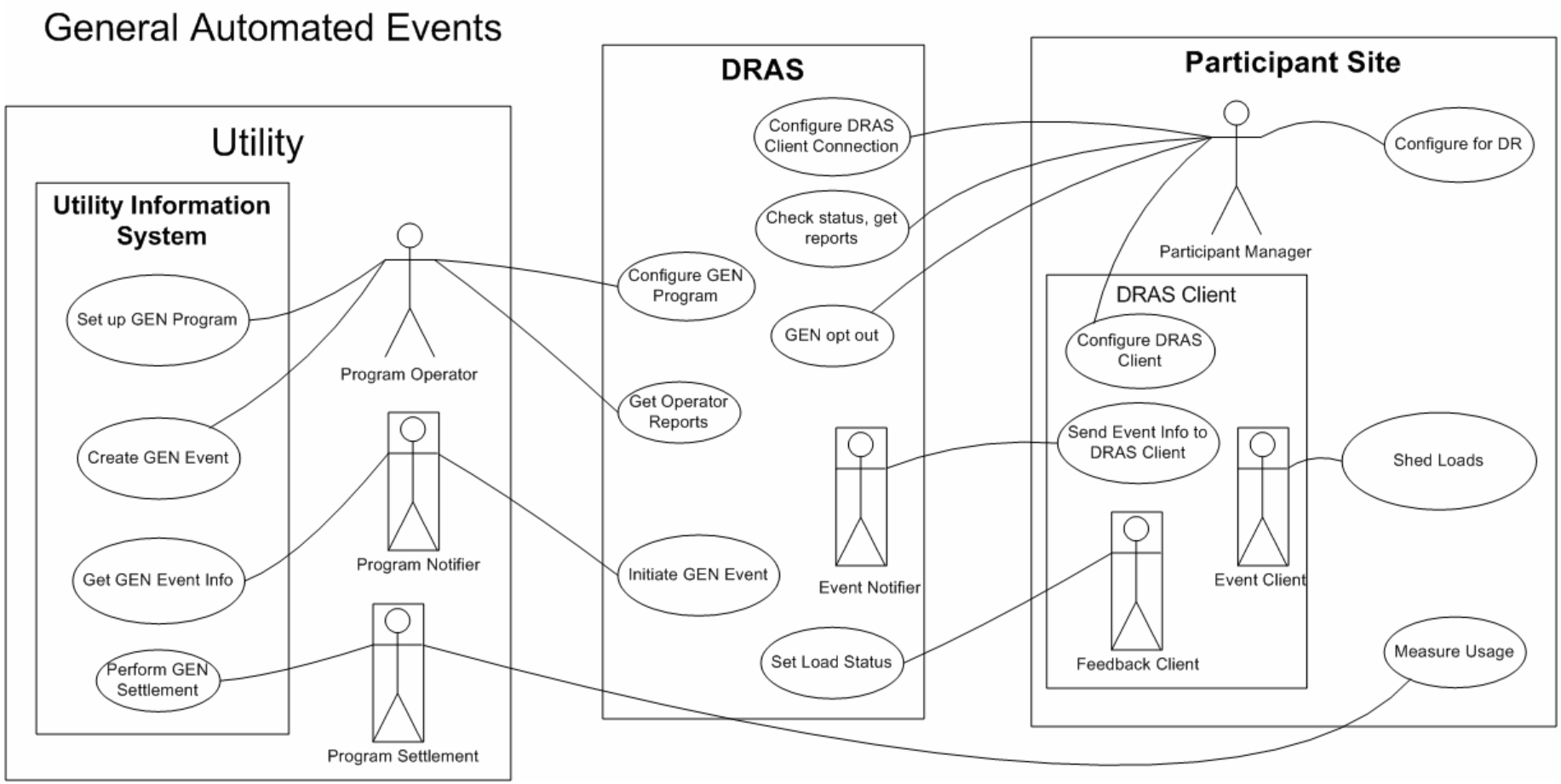
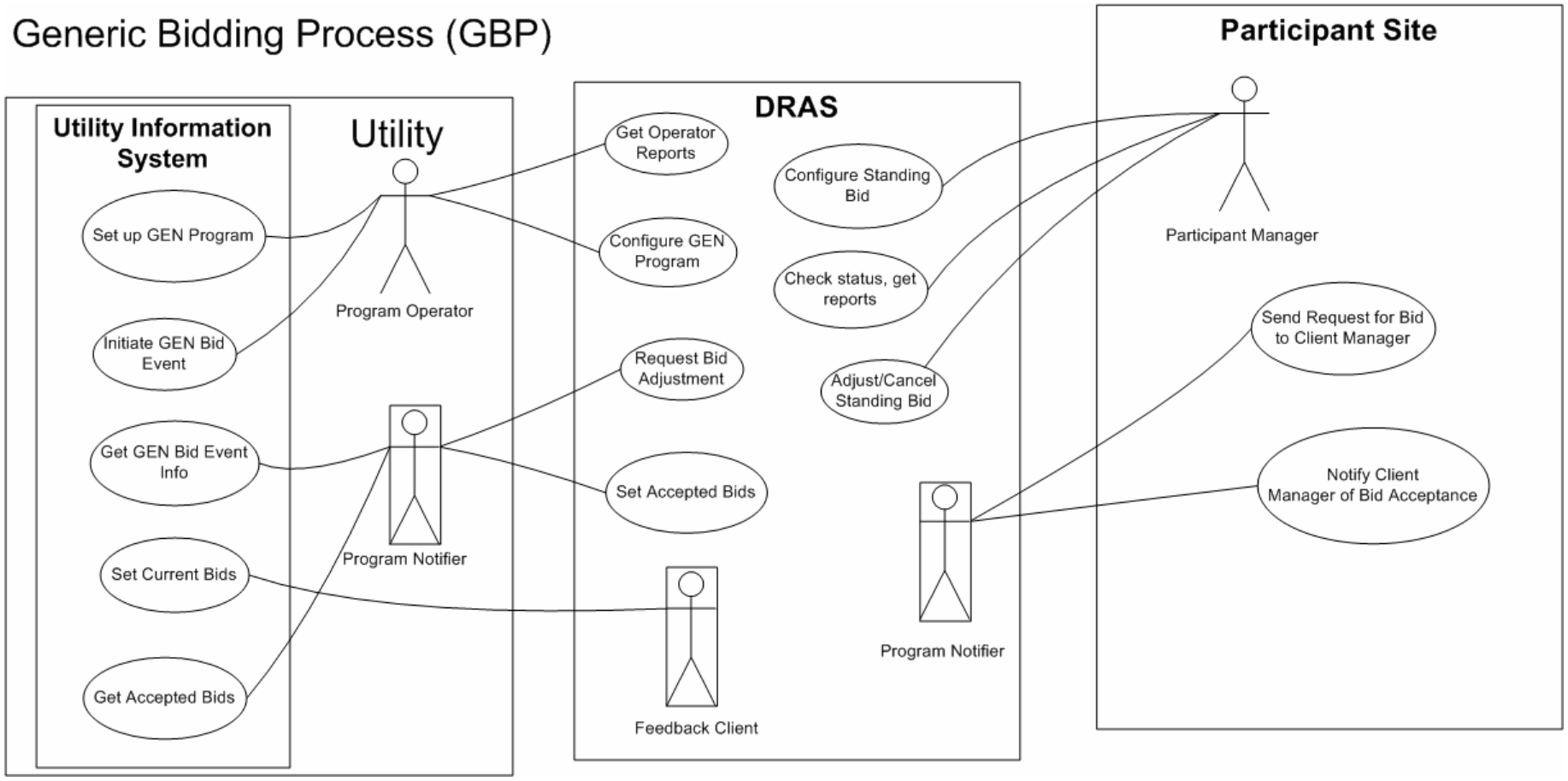
Automated DR Events Uses Case



Automated Bidding Use Case



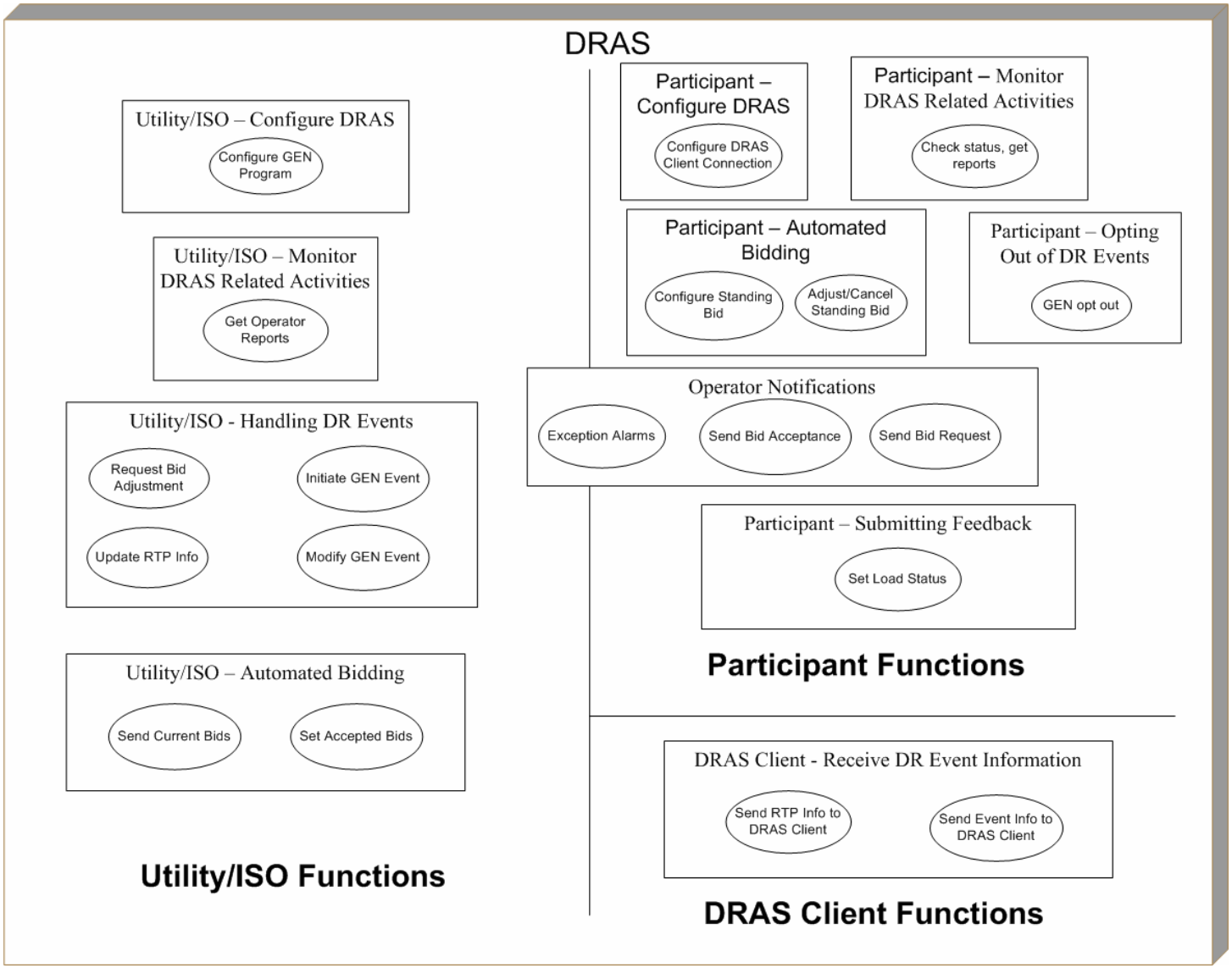
DRAS Requirements

- Communications with the DRAS should use readily available and existing networks such as the internet.
- The DRAS interfaces should be platform independent and leverage existing standards such as XML and Web Services.
- The DRAS communications should use a security policy that enables non-repudiation and encryption of the communications with the DRAS.
- The DRAS should support communications with a variety of control systems that may range from a very simple EMCS (Simple DRAS client) to those with sophisticated data processing and programming capabilities (Smart DRAS client).

DRAS Requirements (cont)

- The DRAS should not be dependent on specific control systems within the facilities.
- DRAS Clients that communicate with the DRAS should easily integrate with existing facility networks and IT infrastructures.
- The DRAS should support aggregated loads that may be managed by third party aggregators.
- Reconciliation of DR Event participation is outside the scope of the DRAS. There are a number of methods such as aggregators, AMI, etc. that can and will handle the measurement of sheds for the purposes of the reconciliation of DR programs.

DRAS Interfaces



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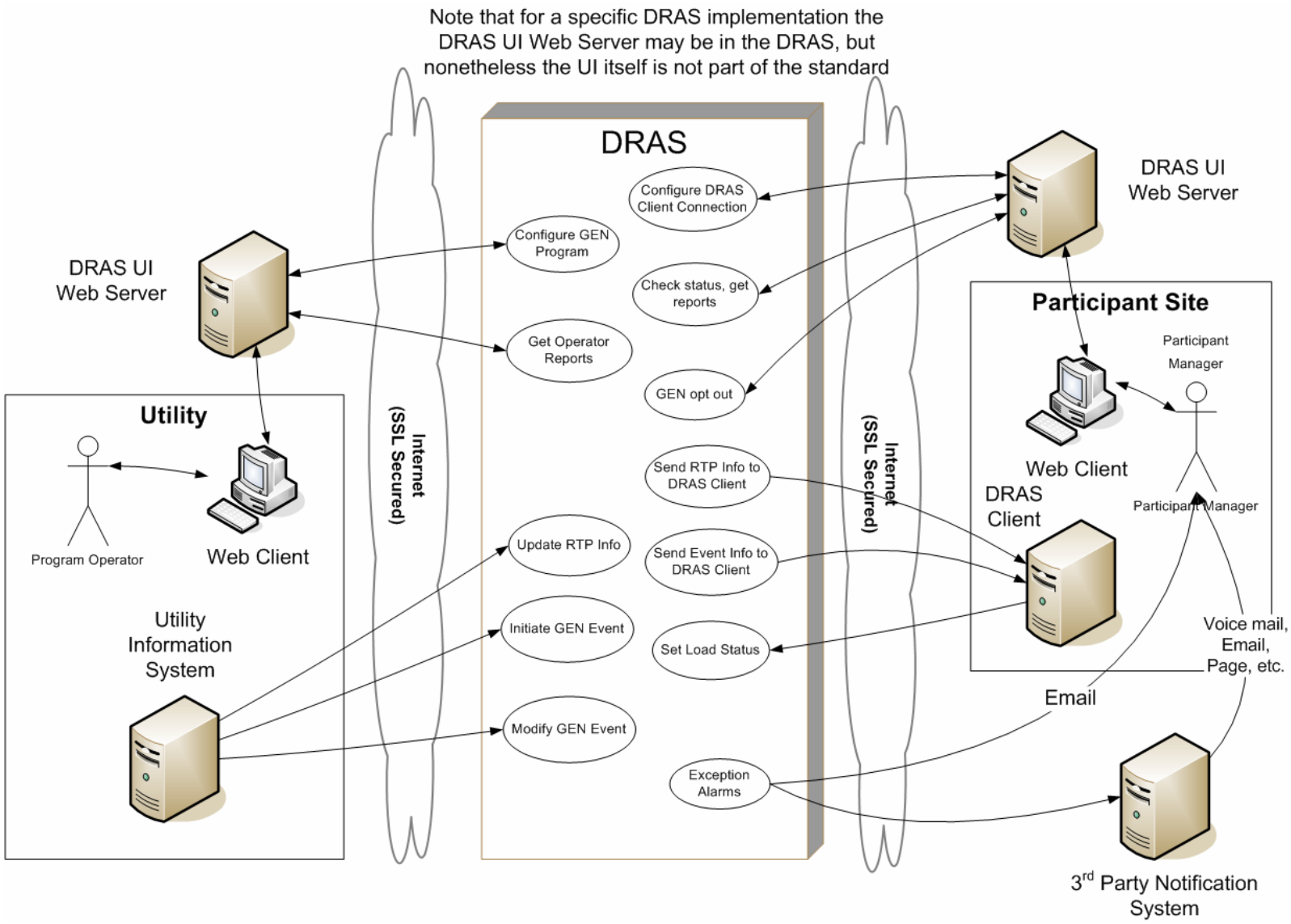
DRAS Event Architecture



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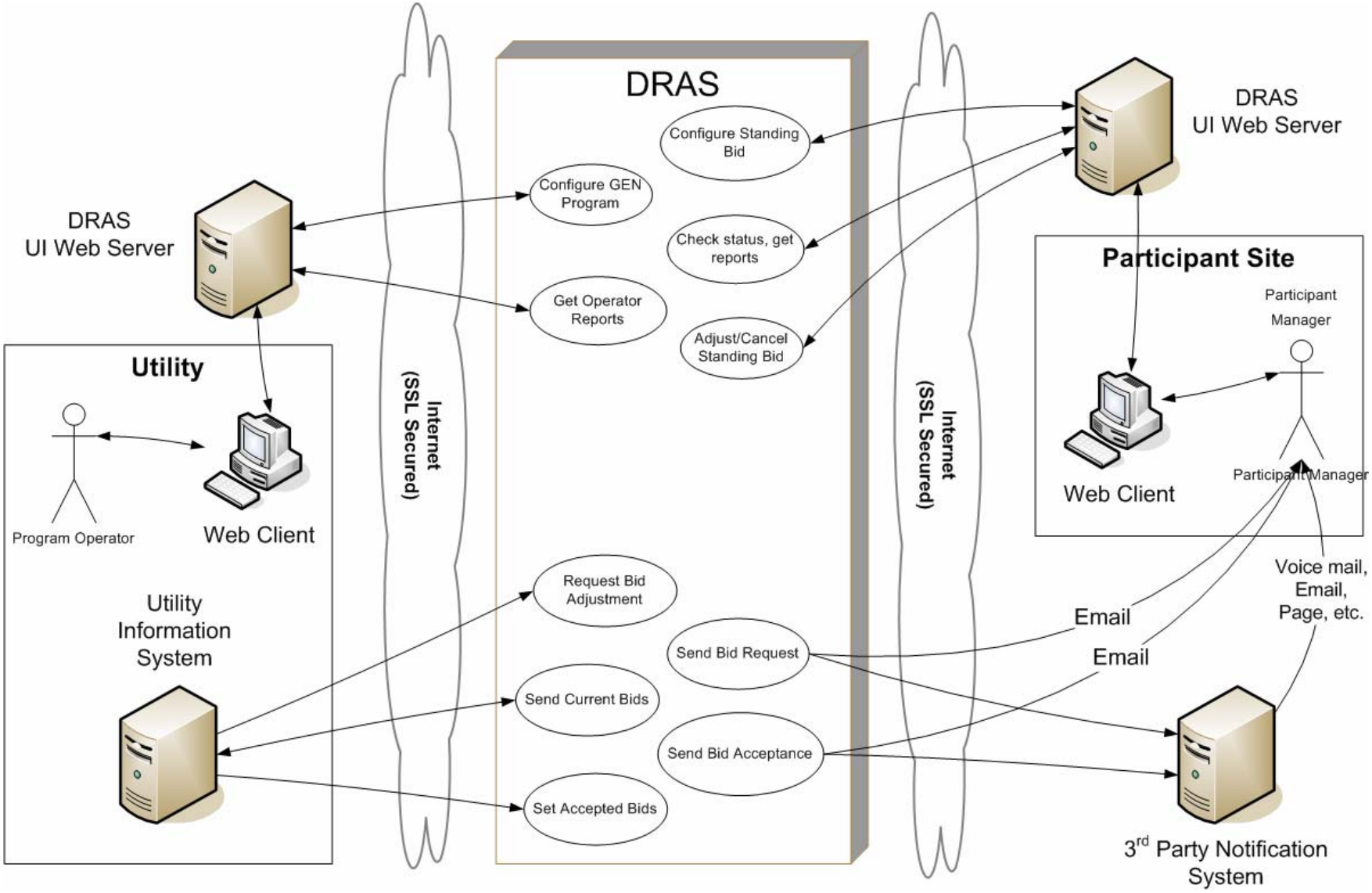
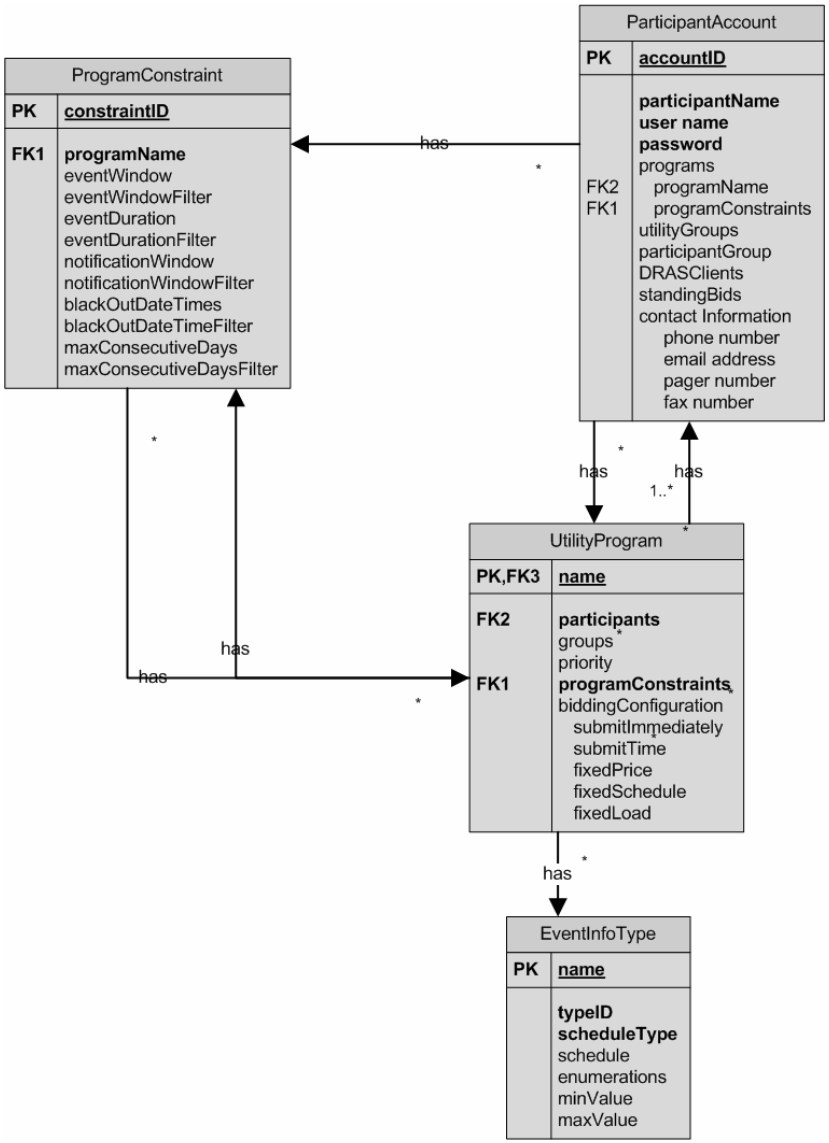
DRAS Bidding Architecture



Utility Configuration Entities



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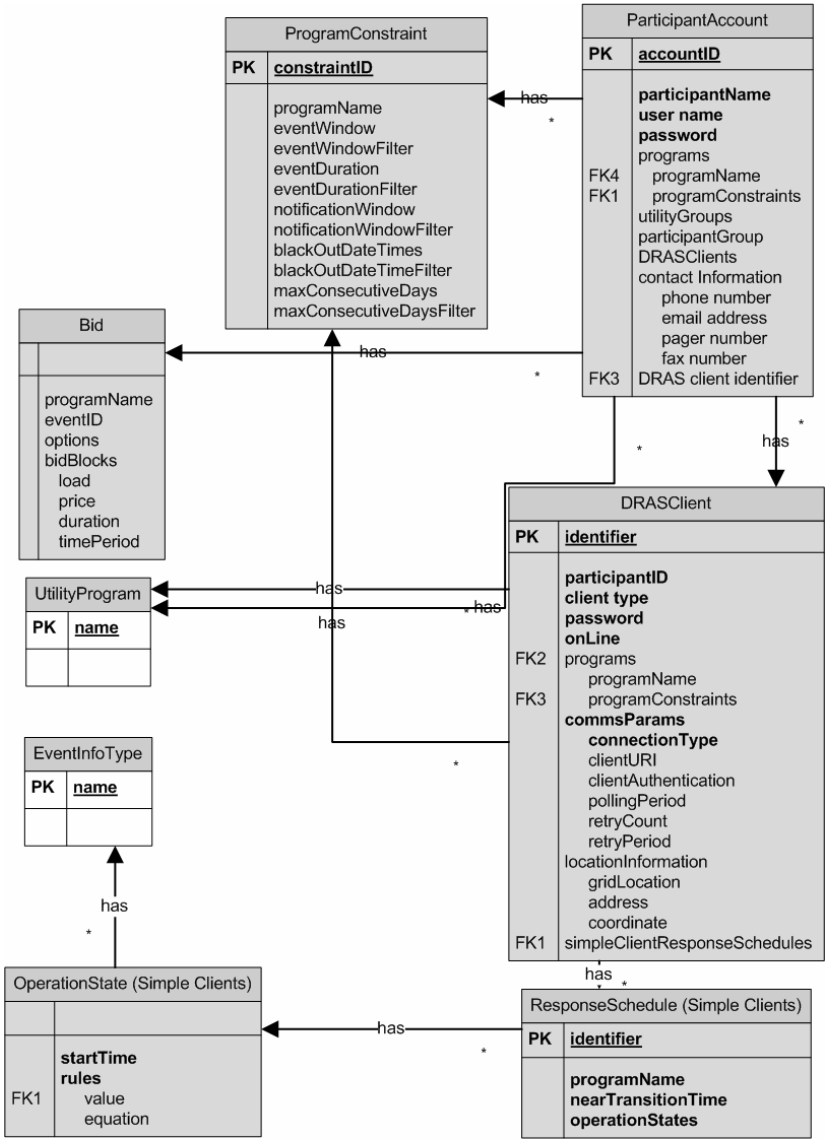
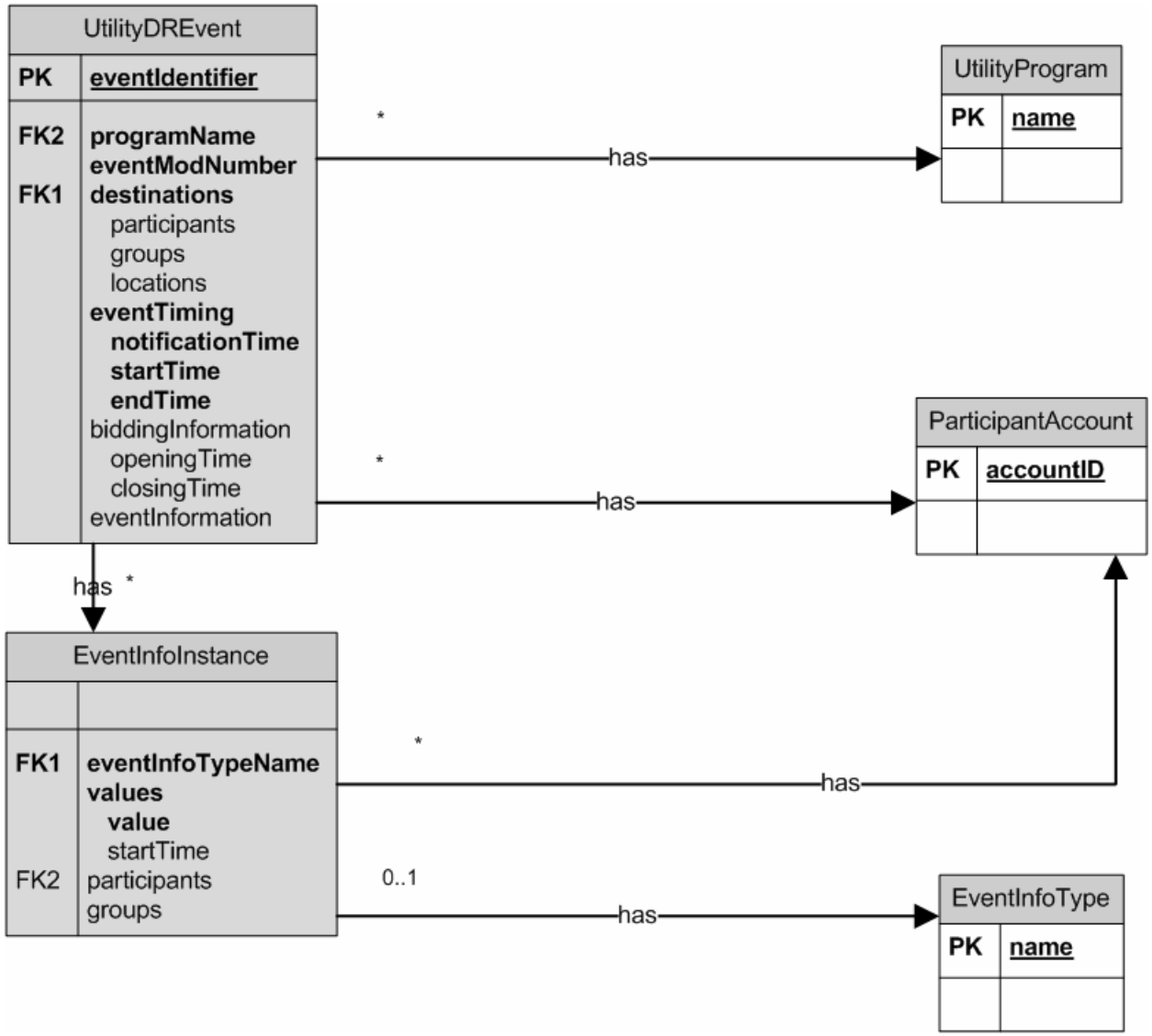
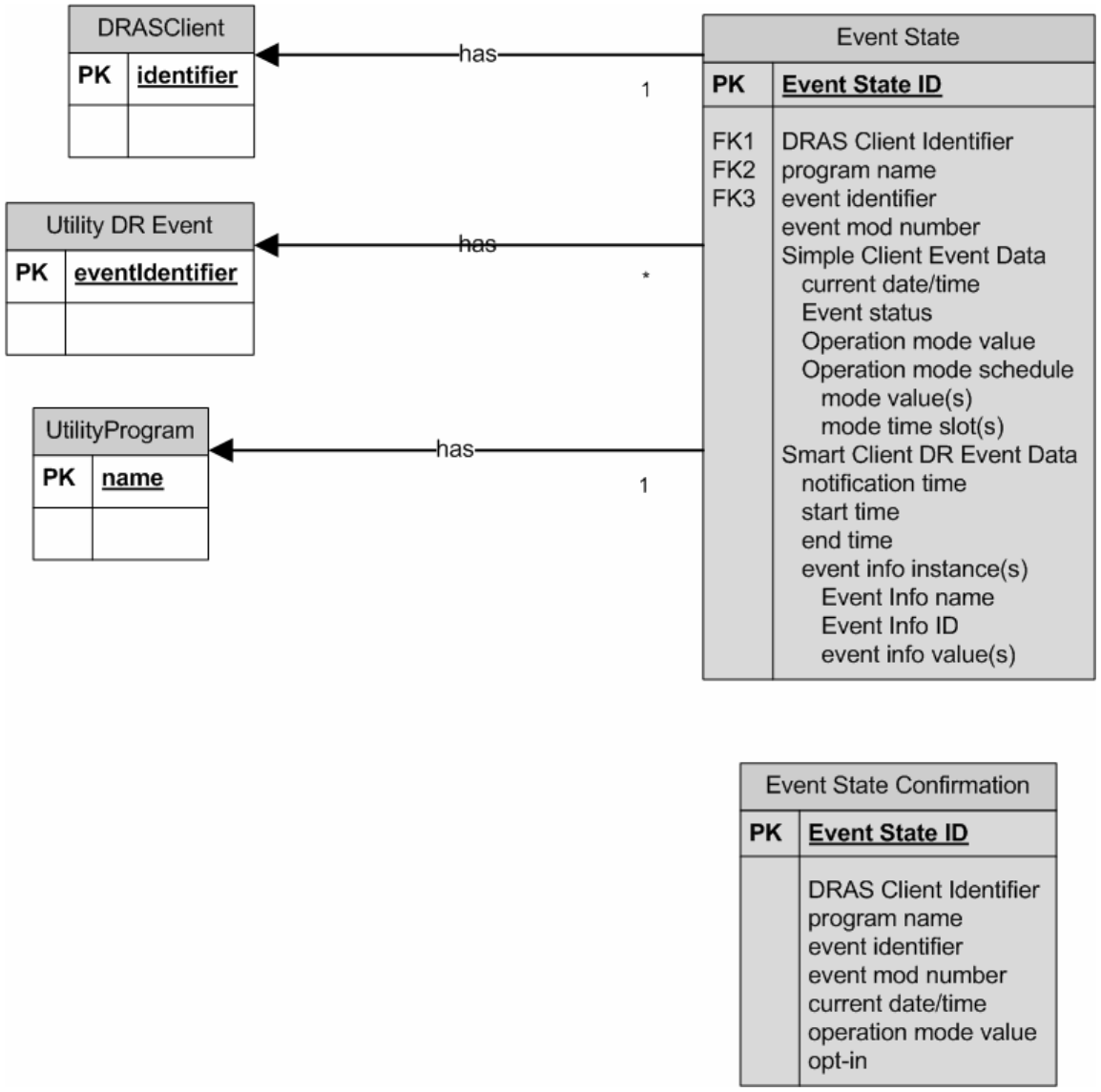
Participant Configuration Entities



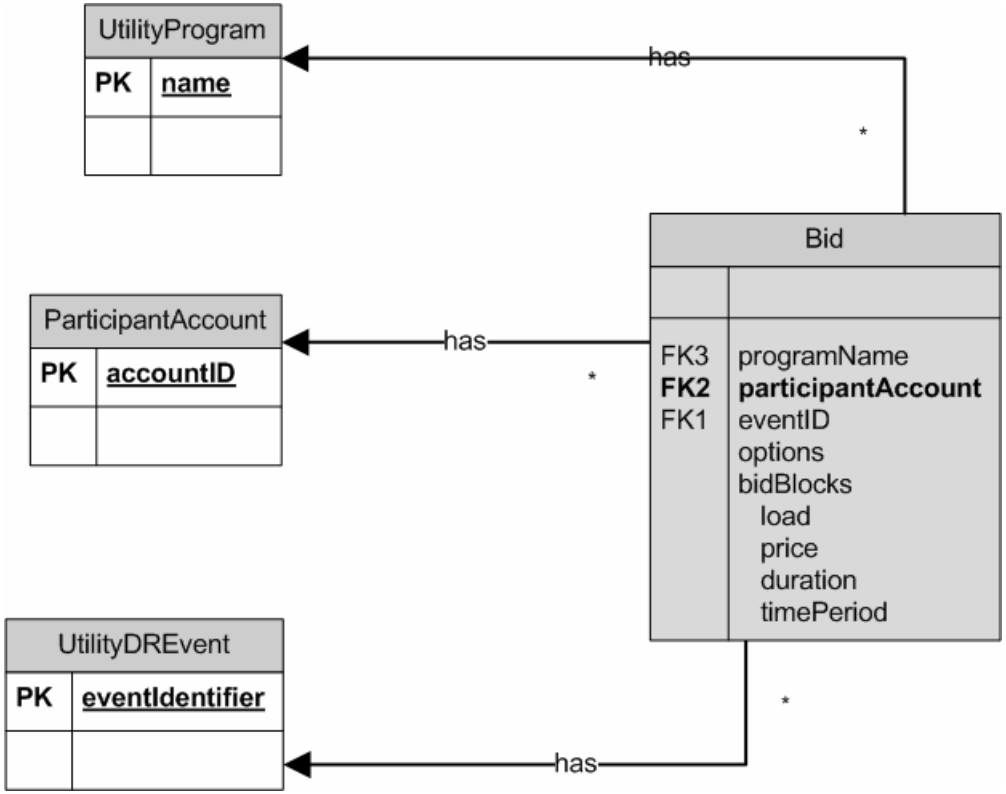
Utility Issues DR Event



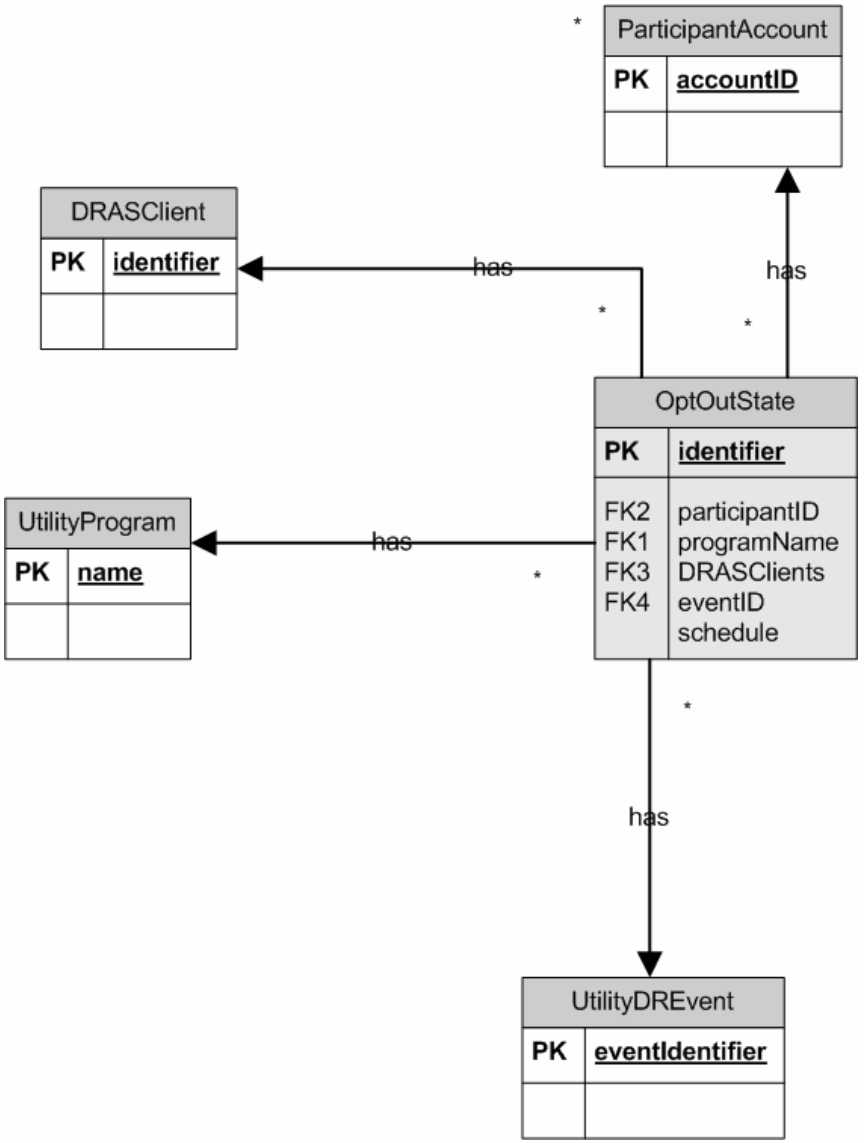
DRAS Client DR Event State



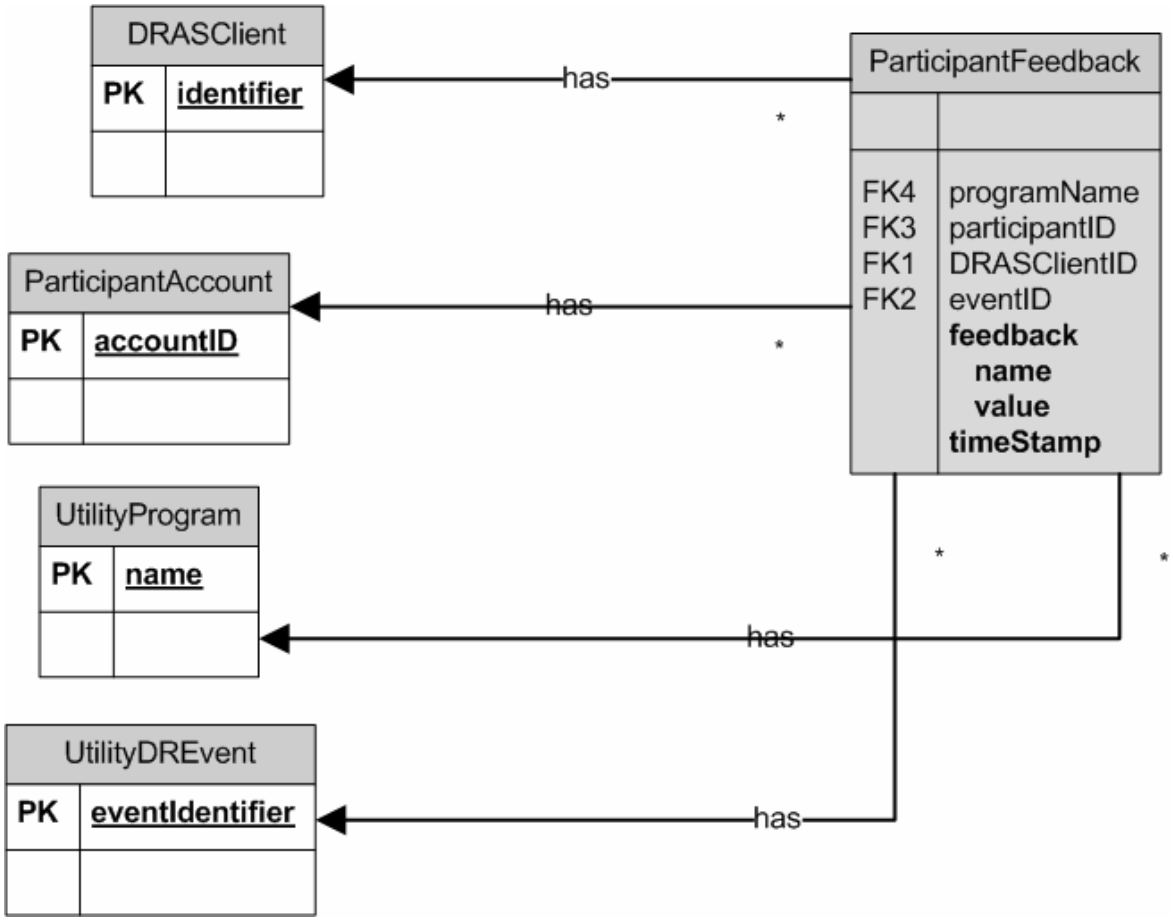
Participant Submits Bid



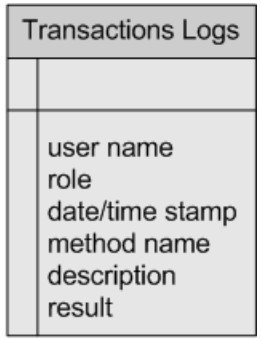
Participant Opt-Out

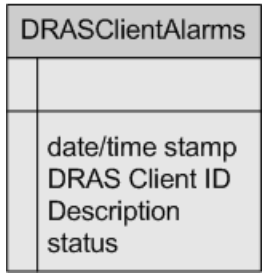


Participant Feedback



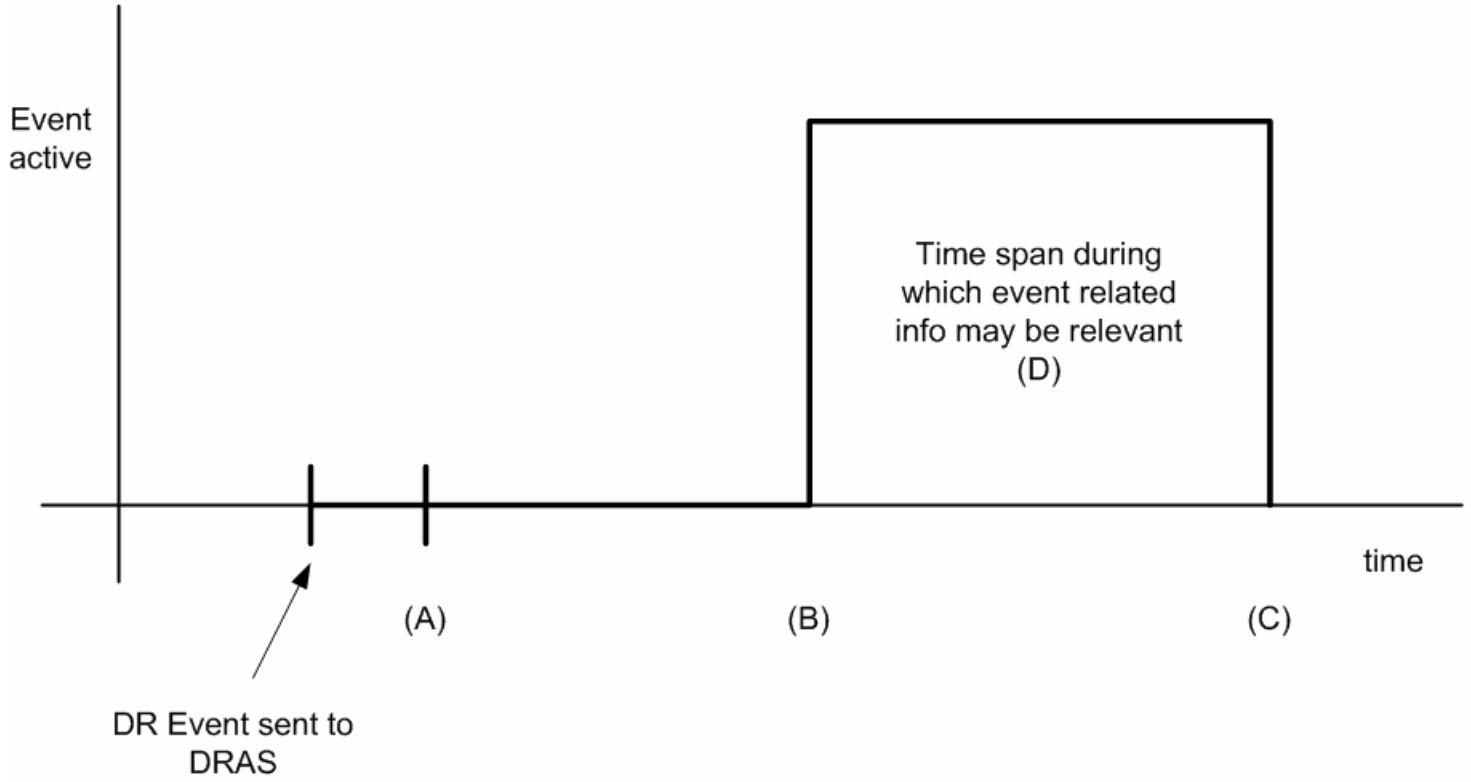
Logs and Alarms



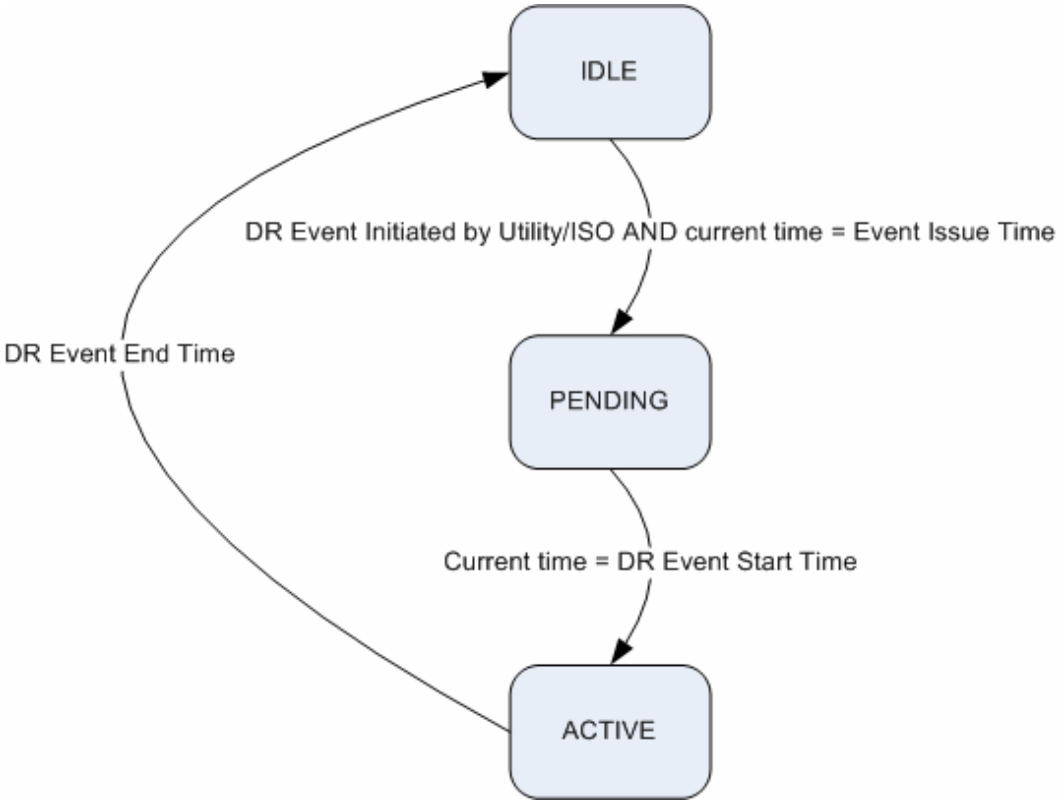


DR Event Model

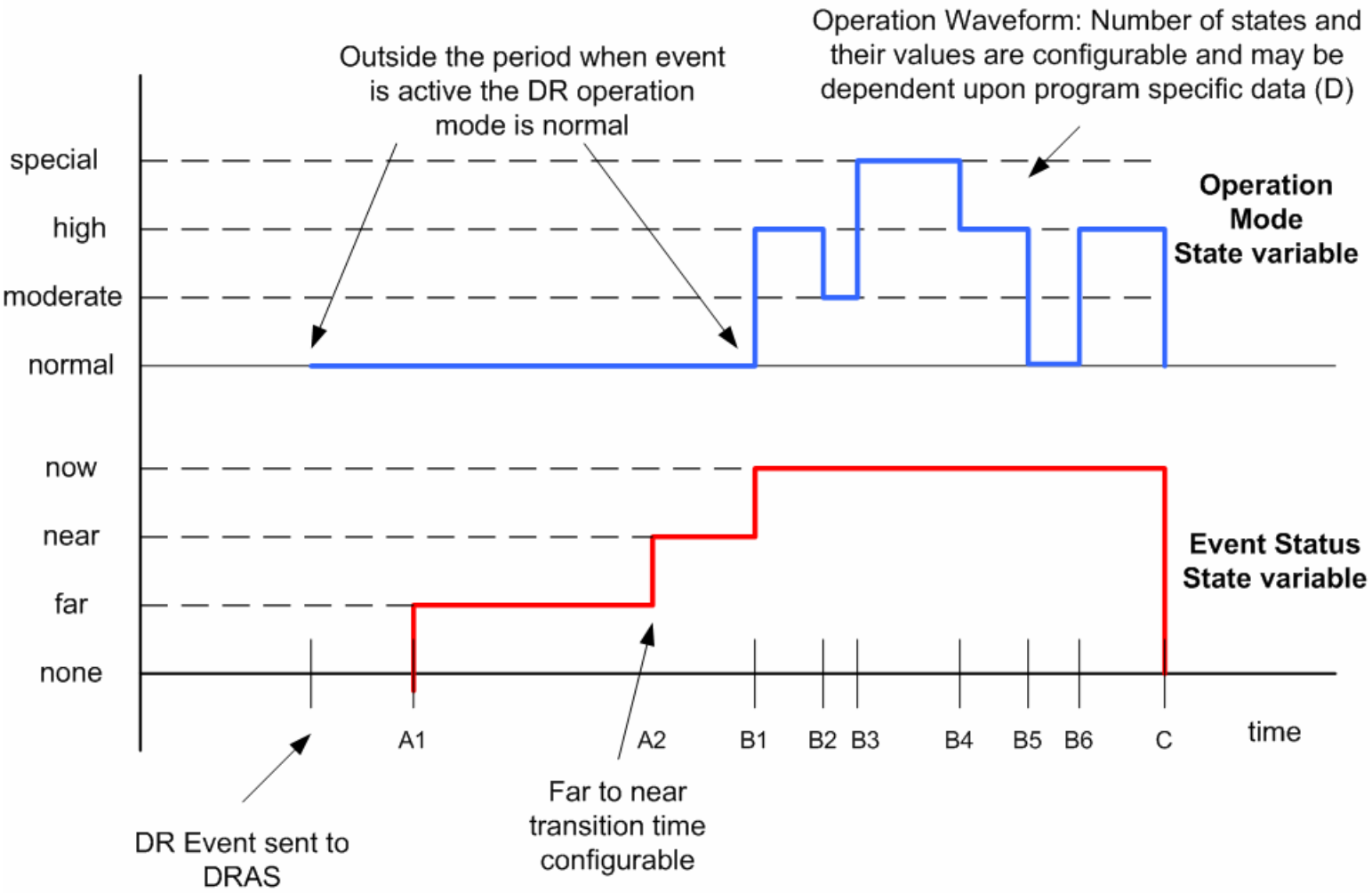
(A) Issue Time – Time at which participants should be notified of an upcoming event.
(B) Start Time – Time at which the event starts.
(C) End Time – Time at which the event ends.
(D) Event Info – Program specific information that is related to the event, e.g. RTPor level. name value pair, start/end time, (constrained within event period). Note that the Event Info may also be used to set up conditional events.



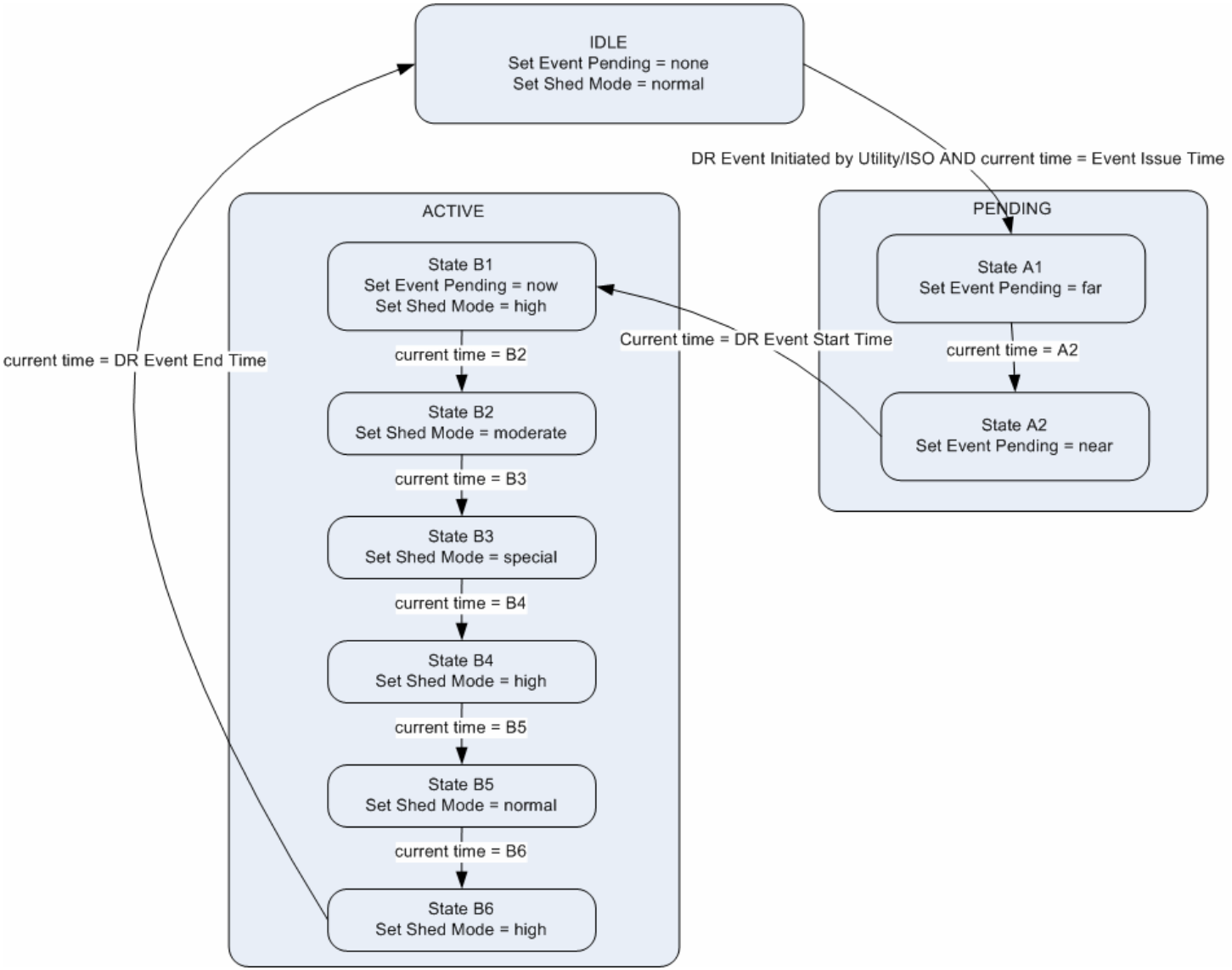
Event States



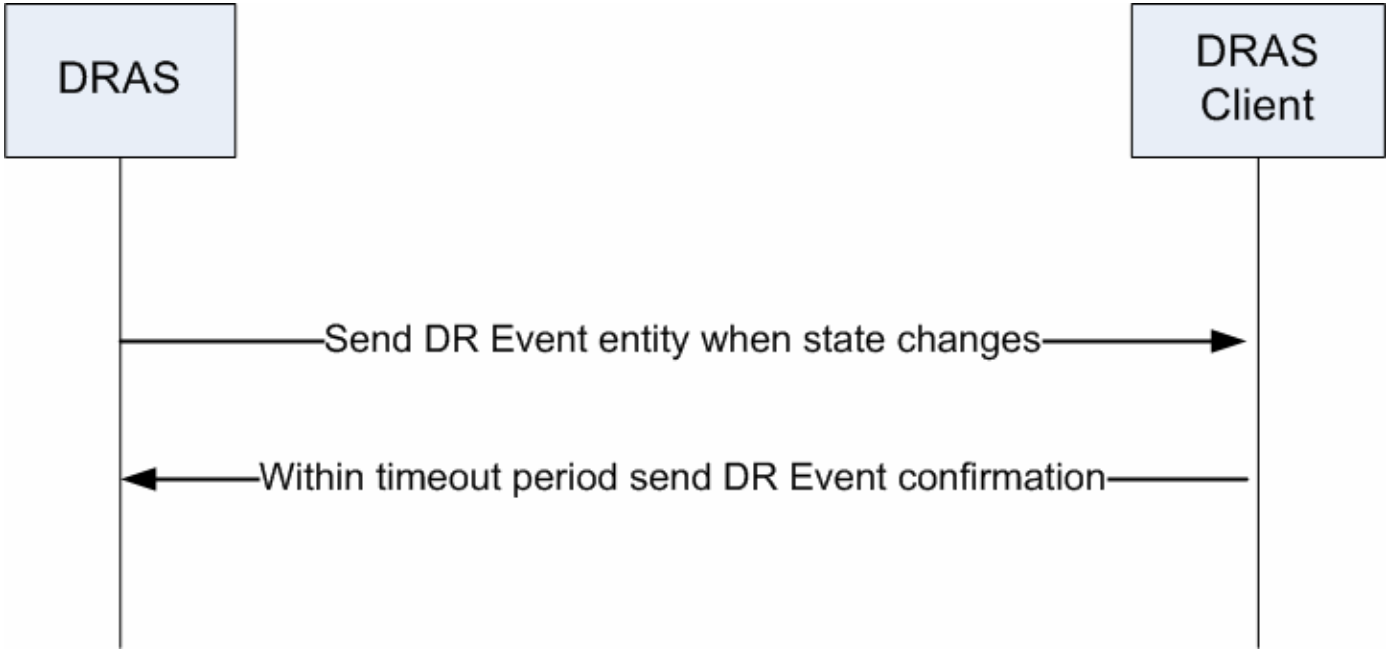
Simple DRAS Client Model



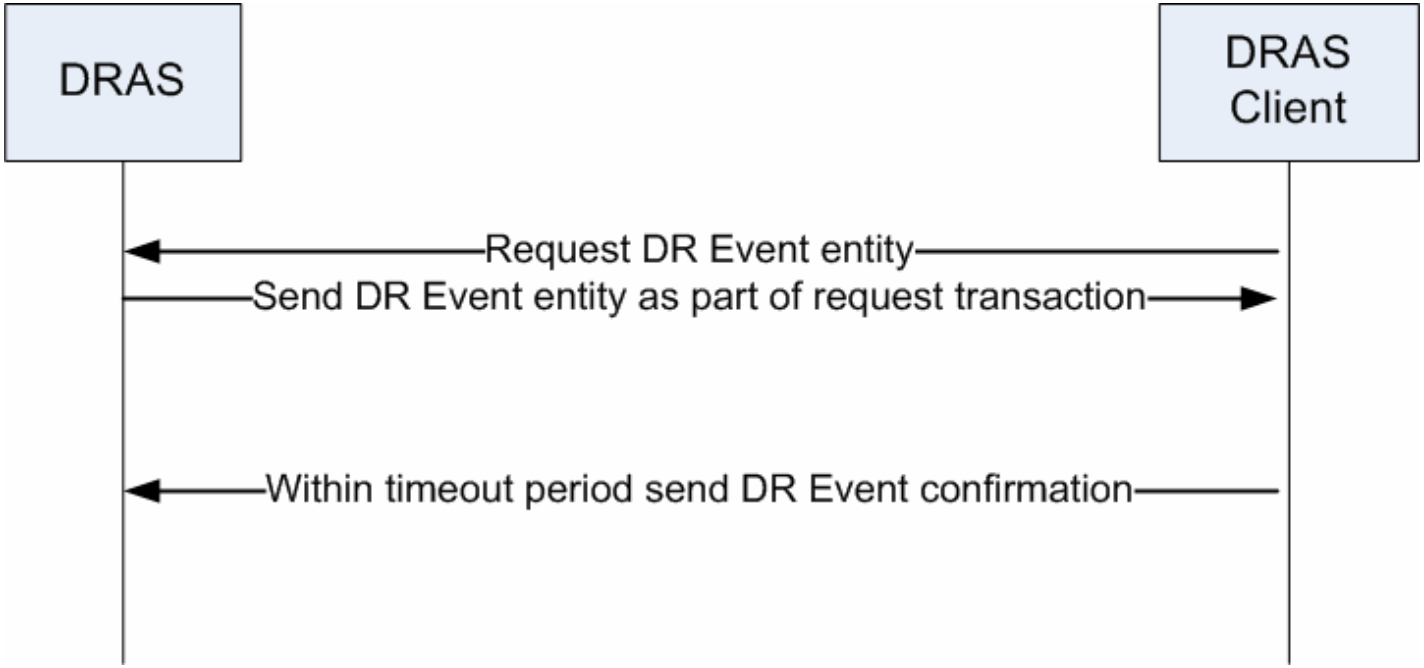
Simple DRAS Client States



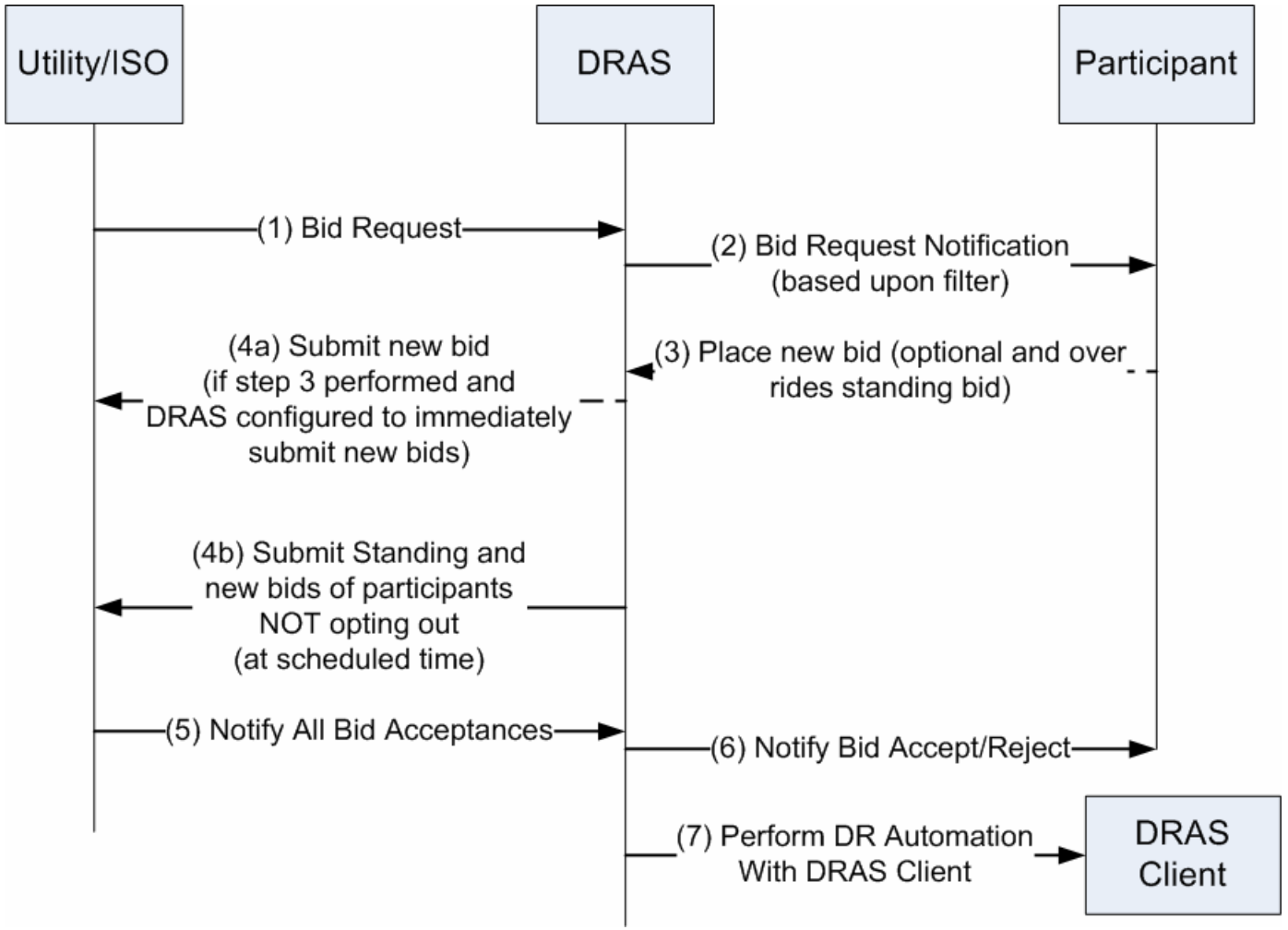
DRAS Client Interaction (PUSH)



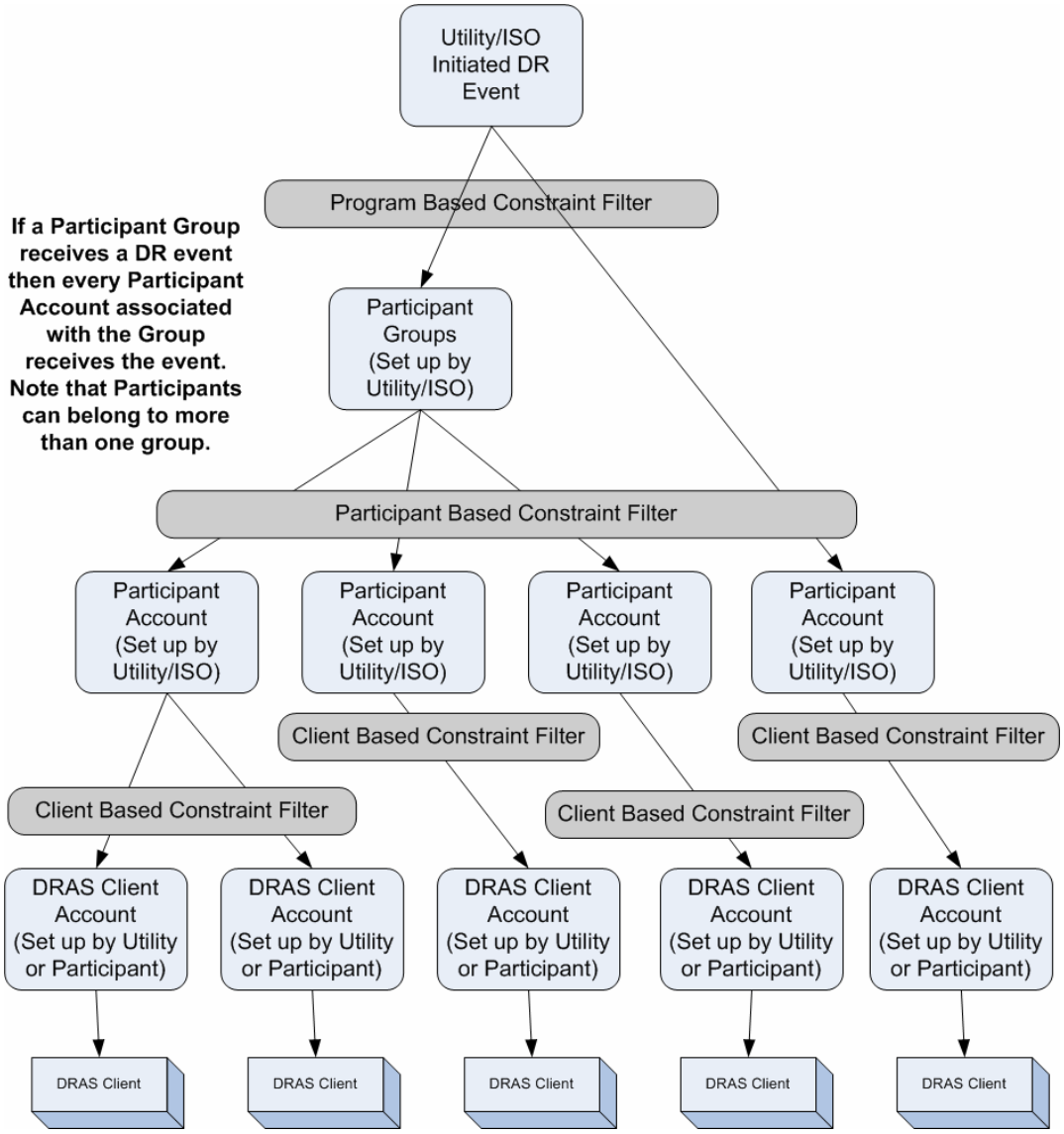
DRAS Client Interaction (PULL)



Bidding Sequence Diagram



Event Propagation Model



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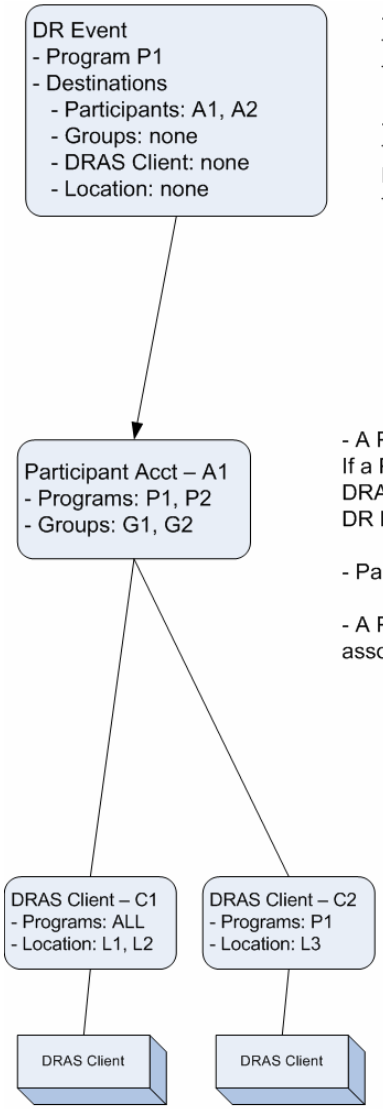
Event Propagation



- DR Events are associated with a particular Program. Only those DRAS Clients that belong to that Program will receive that event.

- DR Events have a "destination" specification that is used by the DRAS to determine which DRAS Clients receive the DR Event. The destination specification may have one or more of the following attributes:
  - List of participants.
  - List of Utility groups.
  - List of DRAS Clients.
  - List of locations.

- A Participant Account may belong to one or more DR Programs. If a Participant Account does not belong to a DR Program then the DRAS Clients associated with it will not receive DR Events for that DR Program.

- Participant Accounts may belong to one or more Groups.

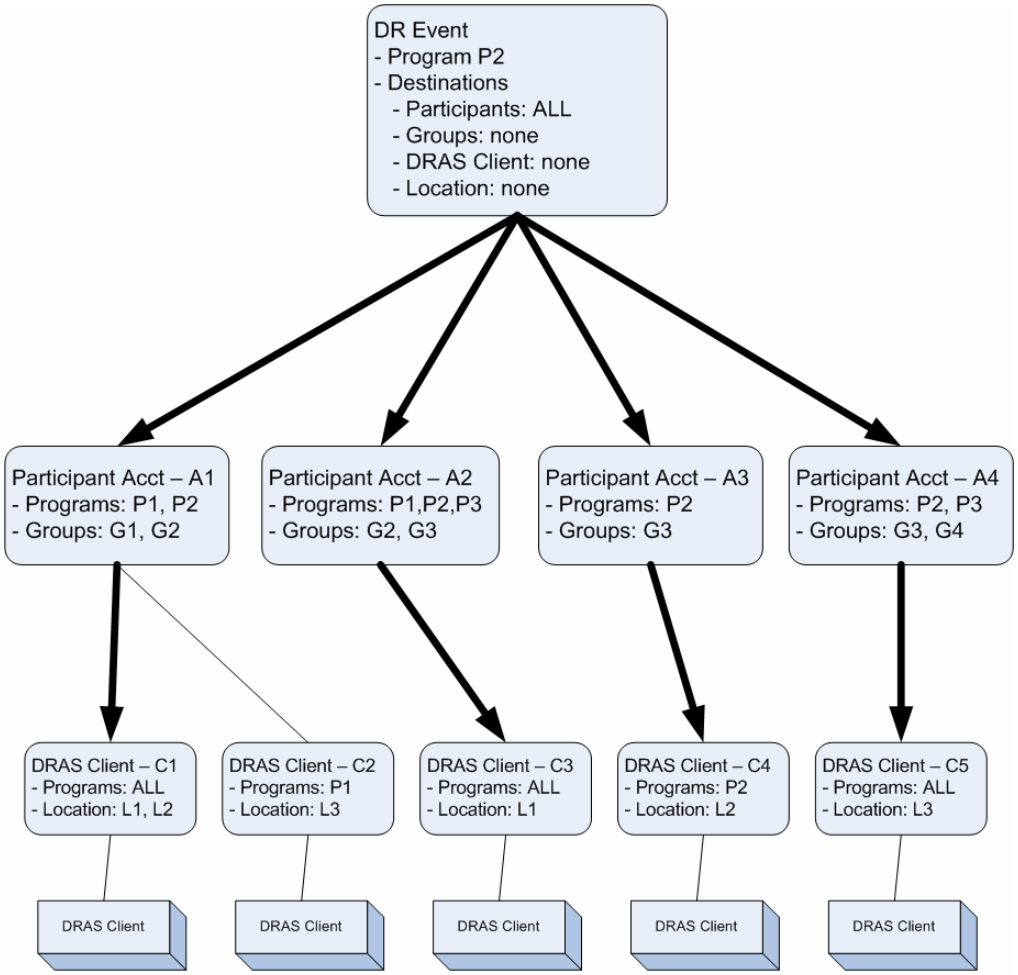
- A Participant Account may have one or more than DRAS Clients associated with it.

- DRAS Clients are associated with one and only one Participant.

- By default a DRAS Client belongs to all the same Programs that the Participant Account that it is associated with belongs to, but it may also belong to a subset of such Programs. If a DRAS Client does not belong to a DR Program then it will not receive DR Events for that DR Program.

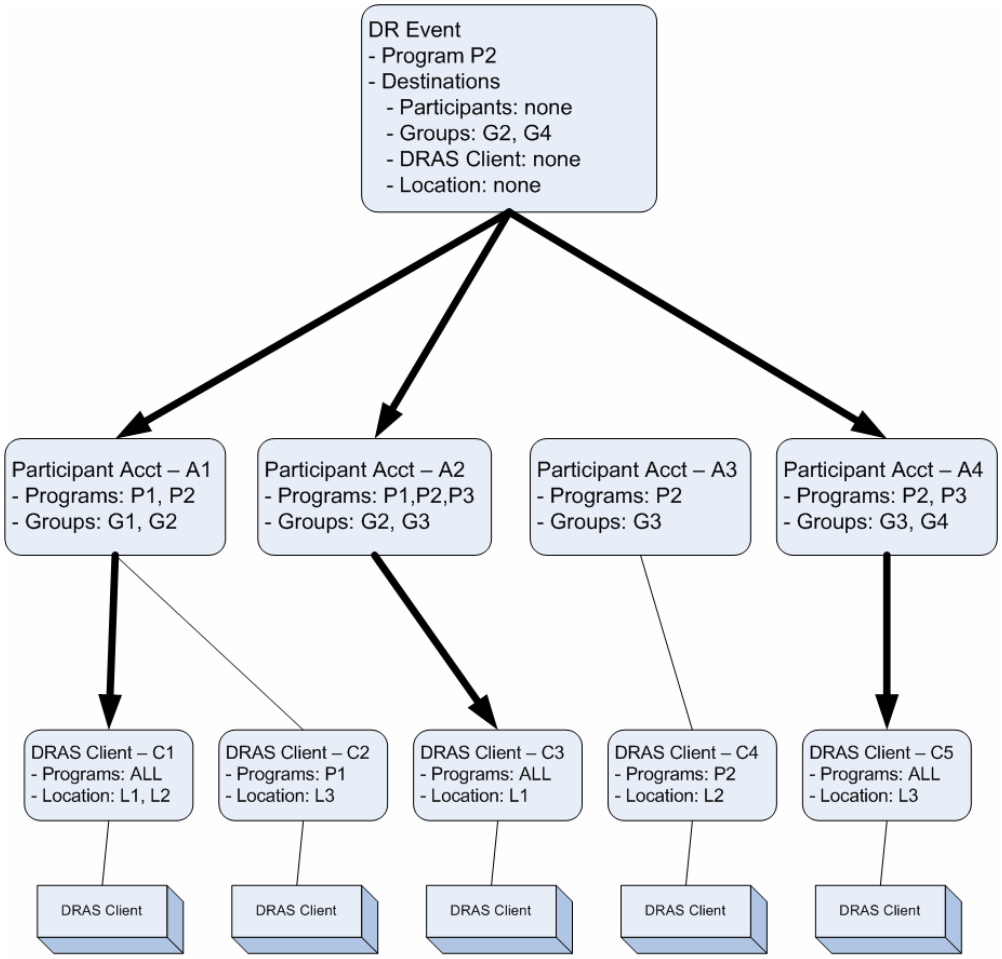
- A DRAS Client may have a location specification consisting of one or more of the following attributes:
  - grid location
  - address
  - lat/lon coordinates

Event Propagation Example



Example: DR Event for Program P2 - All Participant Accounts

Example Event Propagation



Example: DR Event for Program P2 –
Groups G2, G4

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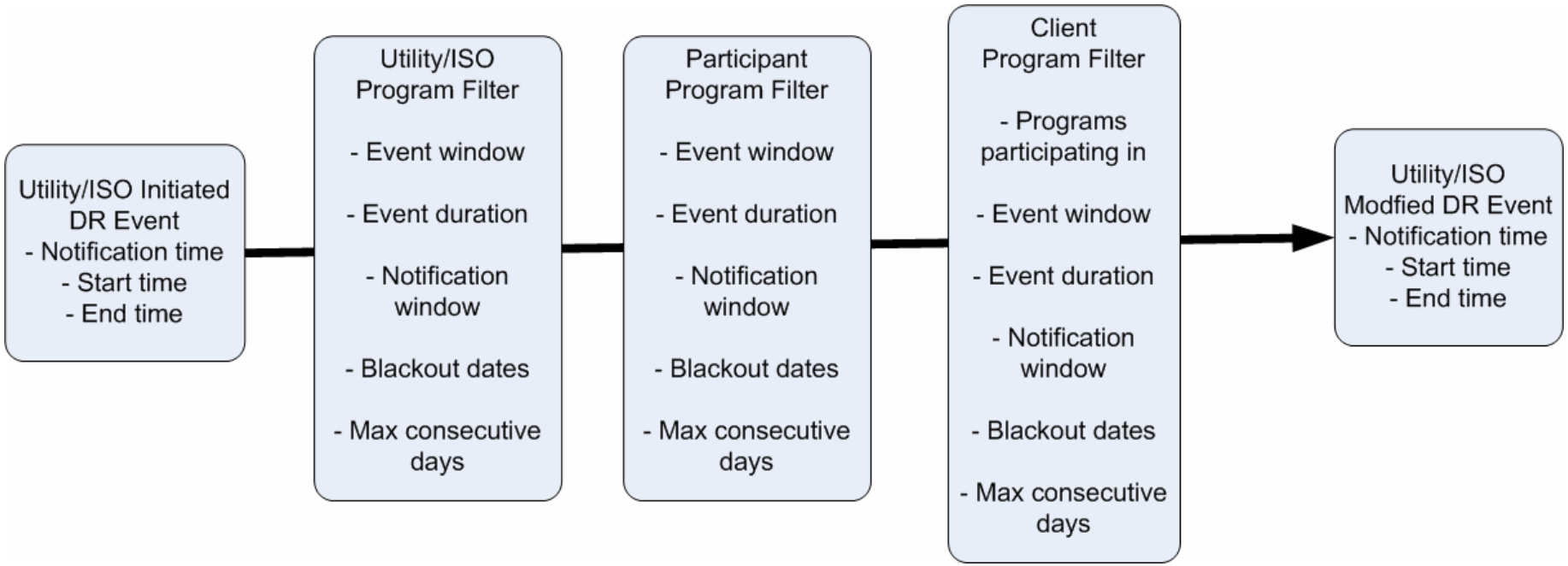
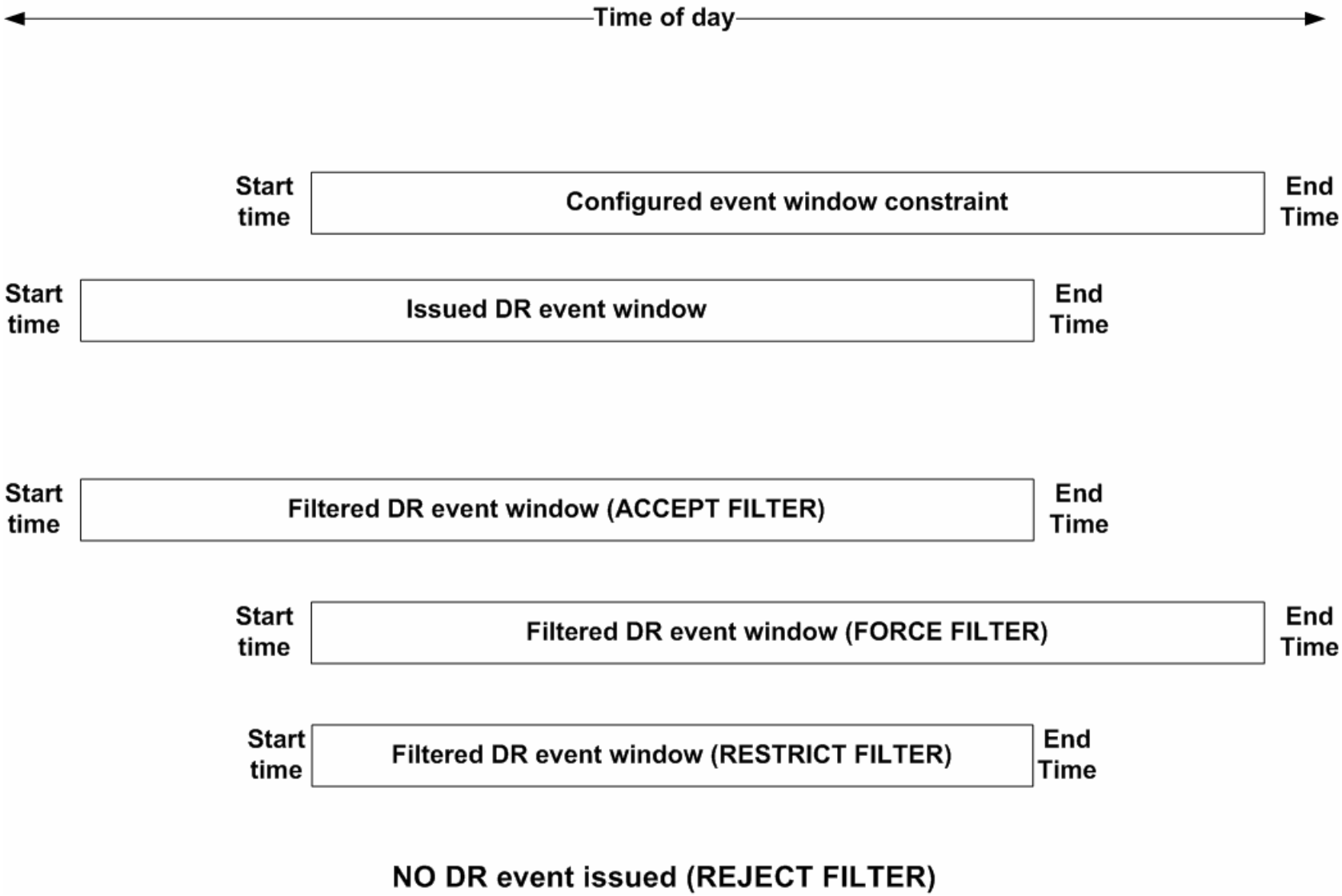
Program Constraints



Event Window Constraint



API Interfaces

- Utility/ISO Interface
- Participant Interface
- DRAS Client Interface

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Utility/ISO Methods for Handling DR Events

- InitiateDREvent
- ModifyDREvent
- AdjustDREventParticipants
- GetDREventInformation
- SetEventConstraint
- GetEventConstraint

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Utility/ISO Methods to Support Automated Bidding

- GetCurrentBids (PULL MODEL)
- SetCurrentBids (PUSH MODEL)
- CloseBidding
- SetBidStatus

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Utility/ISO Methods to Configure DRAS

- Manage Programs
  - CreateProgram
  - ModifyProgram
  - DeleteProgram
  - GetPrograms
  - AdjustProgramParticipants
- Manage Participant Accounts
  - CreateParticipantAccounts
  - ModifyParticipantAccounts
  - DeleteParticipantAccounts
  - GetParticipantAccounts
  - GetGroups

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Utility/ISO Monitoring of DRAS Related Activities

- GetDRASClientCommsStatus
- GetDRASTransactions
- GetDRASClientAlarms
- GetParticipantFeedback