# Coding with Identity Management & Security

## Part 2 of Identity Management with OpenEdge

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PROGRESS software

# What is Identity Management?

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It's about protecting your business data by

- Controlling and verifying who accesses your data
- Controlling what they can do with your data
- Reviewing what they did with your data
- Maintaining information about your users

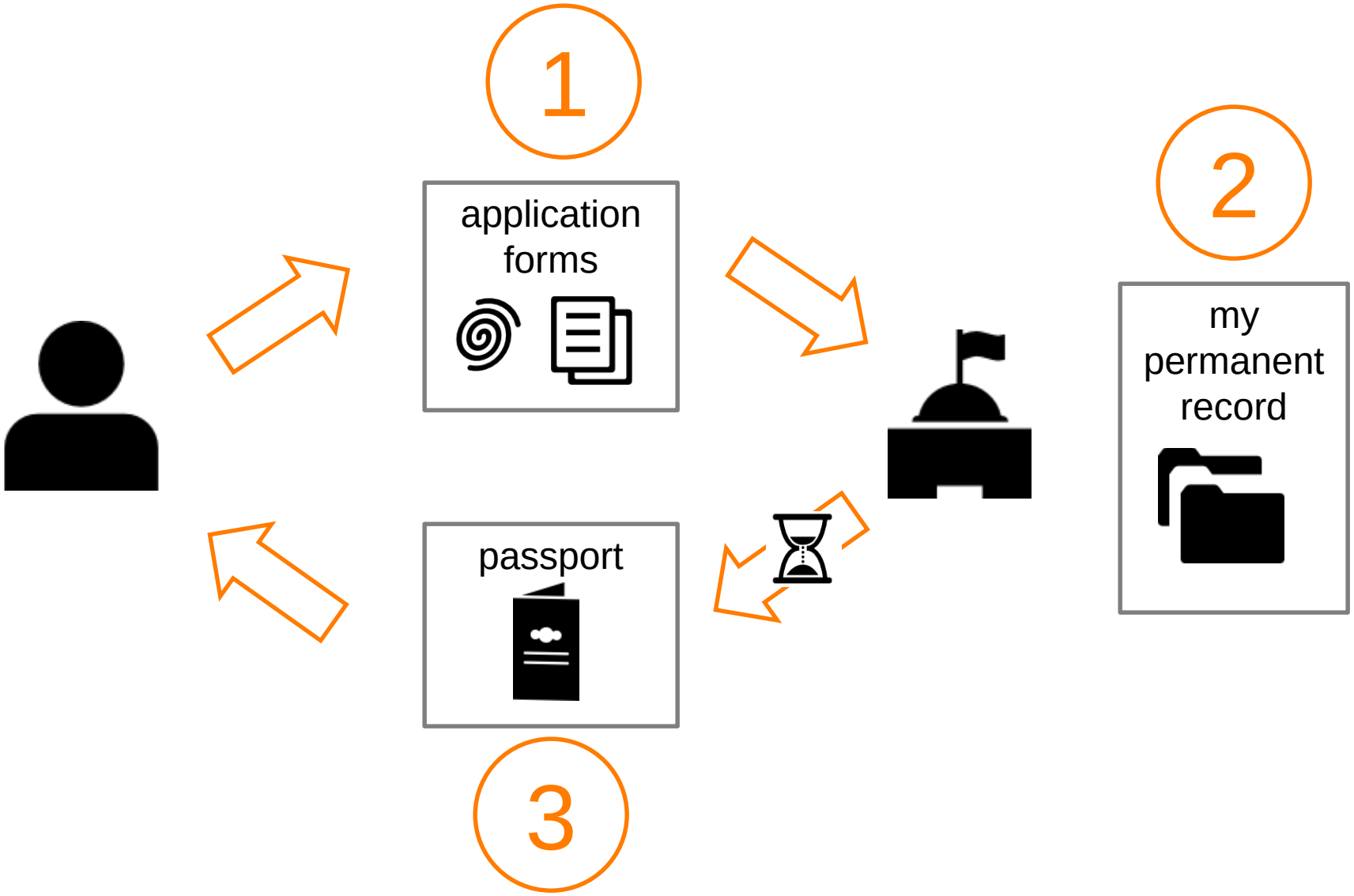
**You** make security decisions on behalf of your customers … understand the maximum loss **they** might suffer

# What is Identity Management?

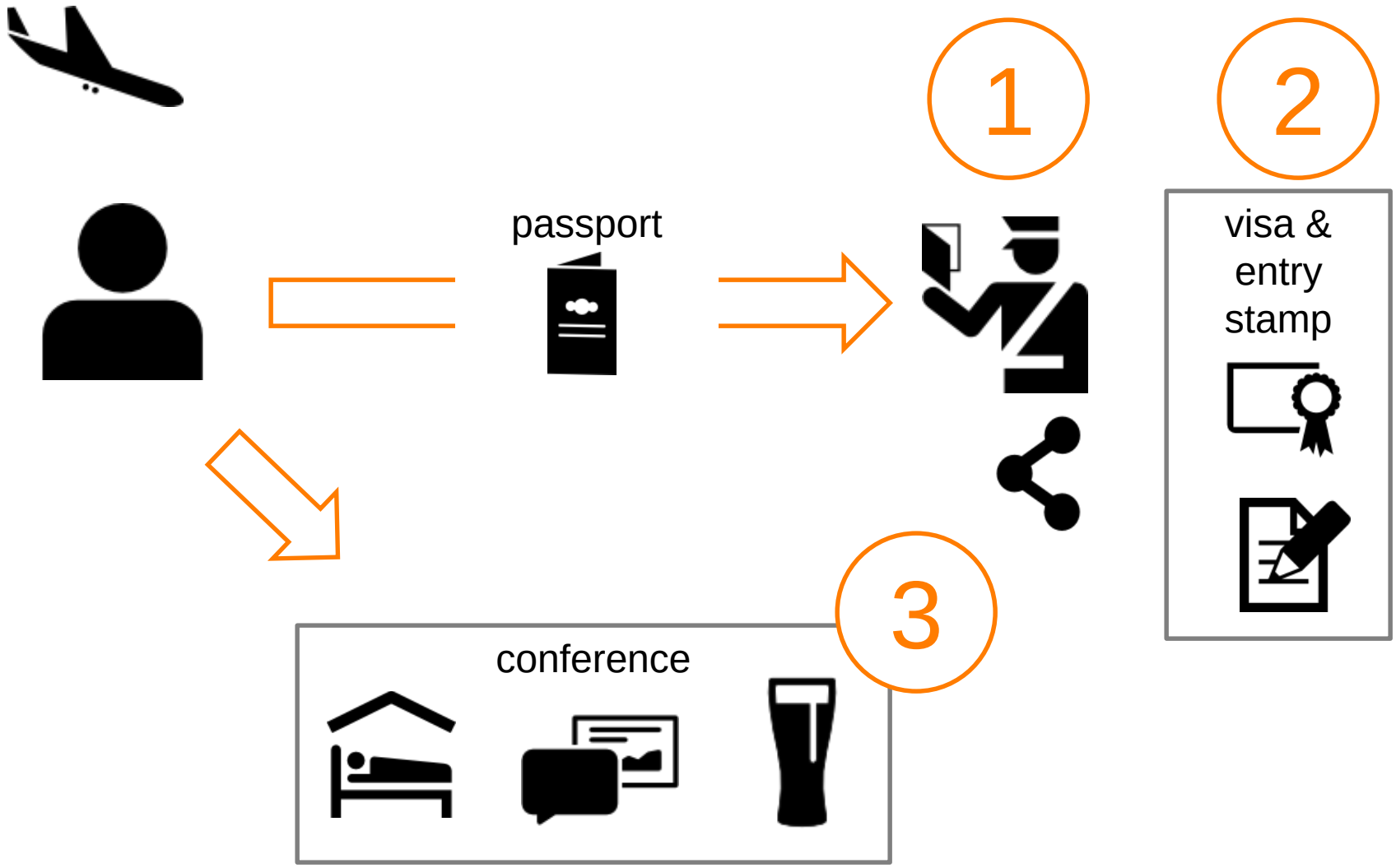
It's about protecting your business data by

- Controlling and verifying who accesses your data — Authentication
- Controlling what they can do with your data — Authorisation
- Reviewing what they did with your data — Auditing
- Maintaining information about your users — Administration

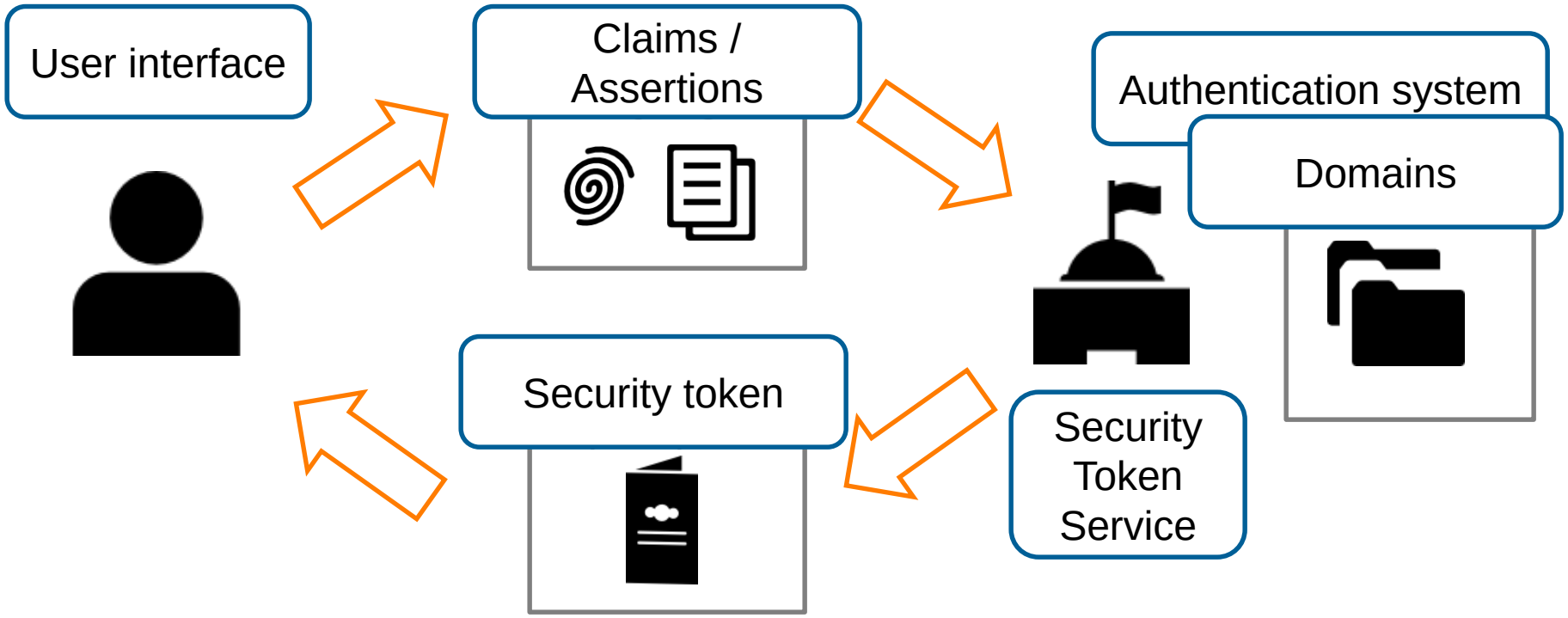
# Getting a Passport



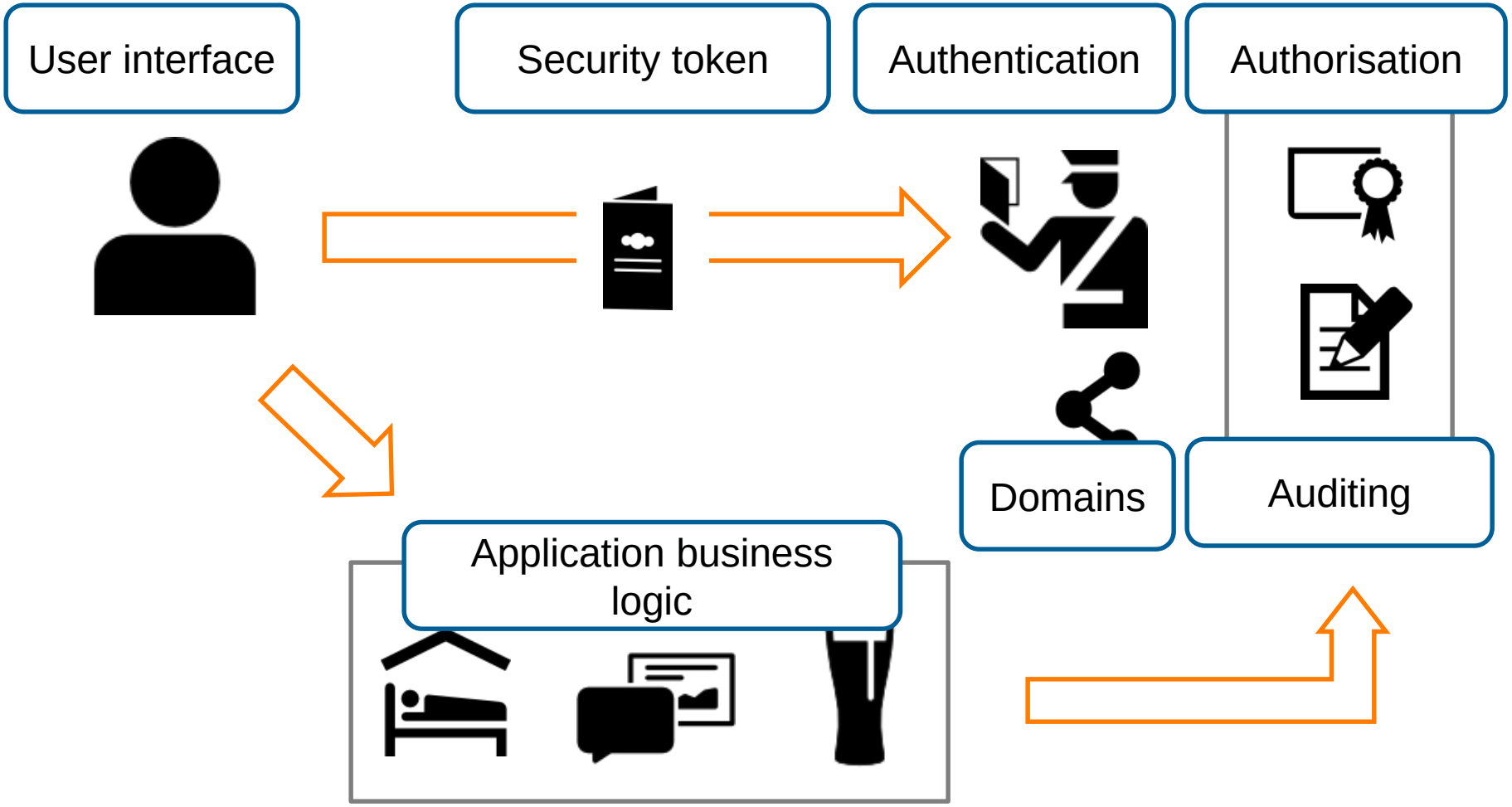
# Using a Passport



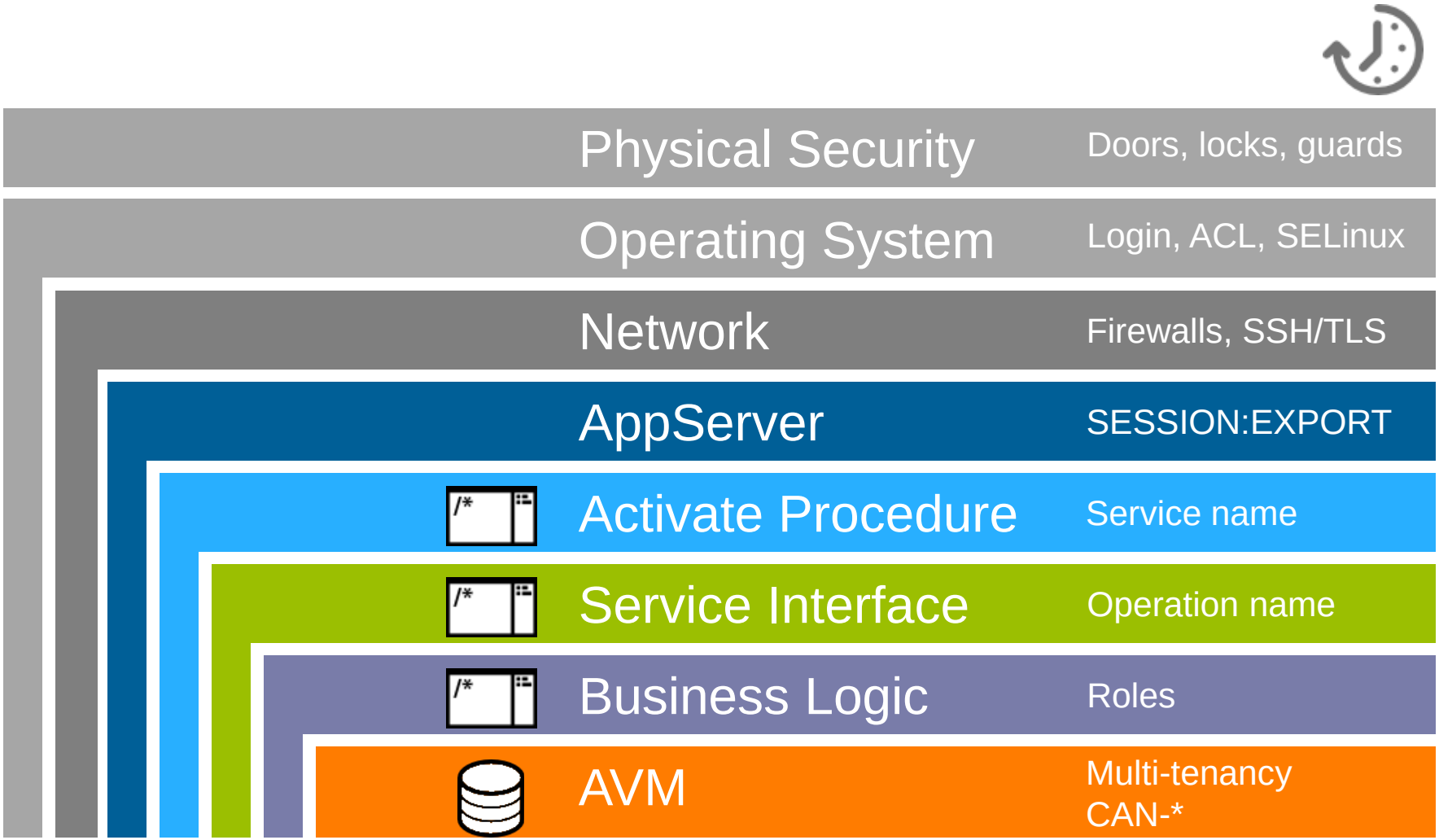
# Application Architecture



# Application Architecture



# Authorisation: Defence in Depth



# ~~If~~ When Authorisation Fails

- Record
- Rewind
  - Deeper you are in the stack, the harder it is to unwind
  - Deeper you are in the stack, the less info you have
- Return
  - Nondescript error messages

```
~~undo, throw new AppError(~~
~~  substitute("User &1 not authorised for service &2",~~
~~              phCP:qualified-user-id, pcServiceName)).~~

undo, throw new AppError(
  "User not authorised for service").
```

# Roles & Responsibilities

| | Anonymous | Customer | Employee | System |
|---|---|---|---|---|
| See catalogue | X | X | X | |
| Modify catalogue | | | X | |
| Update shopping cart | | X | X | |
| Add users | | | X | |
| Dump & load data | | | | X |
| Provision services | | | | X |
| Level of trust | | | | |

# _File Operations

```
find _File where _File-Name eq "Customer"
_Desc       : "Customer master data"
_Can-Create : "*,!*@customer"
_Can-Write  : "*,!*@customer"
_Can-Delete : "*,!*@customer"
_Can-Read   : "*"

find _File where _File-Name eq "Order"
_Desc       : "Order header data"
_Can-Create : "*"
_Can-Write  : "*"
_Can-Delete : "*"
_Can-Read   : "*"

find _File where _File-Name eq "ApplicationUser"
_Desc       : "Application login data"
_Can-Create : "!batch@system,*@system"
_Can-Write  : "!batch@system,*"
_Can-Delete : "!batch@system,*@system"
_Can-Read   : "!batch@system,*"
```

OE 3.0+ | OE 11.0+

# What Are Domains?

- A group of users with a common set of
  - Roles and responsibilities
  - Level of security
  - Data access privileges
- Configured in db meta-schema
  - Authentication systems
  - Tenants

```
_sec-authentication-domain

  _Domain-name
  _Domain-type
  _Domain-description
  _Domain-access-code
  _Domain-runtime-options
  _Tenant-name

  _Domain-enabled
```

OE 10.1A+ | OE 11.0+ | OE 11.1+

# Per-role Domains

Customer

```
create _sec-authentication-domain.
_Domain-name        = 'customer'.
_Domain-type        = 'TABLE-ApplicationUser'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4CUSTOMER').
_Domain-enabled     = true.
```

Anonymous

```
create _sec-authentication-domain.
_Domain-name        = 'anonymous'.
_Domain-type        = 'FTP'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4ANONYMOUS').
_Domain-enabled     = true.
```

Employee

```
create _sec-authentication-domain.
_Domain-name        = 'employee'.
_Domain-type        = 'TABLE-ApplicationUser'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4EMPLOYEE').
_Domain-enabled     = true.
```

# Per-role Domains, Ctd.

System

```
create _sec-authentication-domain.
_Domain-name        = 'system'.
_Domain-type        = '_extsso'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4SYSTEM').
_Domain-enabled     = true.
```

# Per-role Domains, Ctd.

System

```
create _sec-authentication-domain.
_Domain-name        = 'system'.
_Domain-type        = '_extsso'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4DBSYSTEM').
_Domain-enabled     = false.
```

DB Admin

```
create _sec-authentication-domain.
_Domain-name        = 'db-admin'.
_Domain-type        = '_oslocal'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4DBADMIN').
_Domain-enabled     = true.
```

App Admin

```
create _sec-authentication-domain.
_Domain-name        = 'app-admin'.
_Domain-type        = '_extsso'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4APPADMIN').
_Domain-enabled     = true.
```

# Per-role Domains with Multi-tenancy

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Customer Tenant 1

```
create _sec-authentication-domain.
_Domain-name        = 'customer.tenant1'.
_Domain-type        = 'TABLE-ApplicationUser'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4CUSTOMER.T1').
_Domain-enabled     = true.
_Tenant-name        = 'tenant-ONE'.
```

Customer Tenant 2

```
create _sec-authentication-domain.
_Domain-name        = 'customer.tenant2'.
_Domain-type        = 'TABLE-ApplicationUser'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4CUSTOMER.T2').
_Domain-enabled     = true.
_Tenant-name        = 'tenant-TWO'.
```

Customer Tenant 3

```
create _sec-authentication-domain.
_Domain-name        = 'customer.tenant3'.
_Domain-type        = 'TABLE-ApplicationUser'.
_Domain-access-code = audit-policy:encrypt-audit-mac-key(
                    's00perSecr1tK3y4CUSTOMER.T3').
_Domain-enabled     = true.
_Tenant-name        = 'tenant-THREE'.
```

# Multiple Domains per Tenant

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Tenant 1
Customer

```
create _sec-authentication-domain.
_Domain-name        = 'customer.tenant1'.
_Domain-type        = 'TABLE-ApplicationUser'.
_Tenant-name        = 'tenant-ONE'.
```

Tenant 1
Employee

```
create _sec-authentication-domain.
_Domain-name        = 'employee.tenant1'.
_Domain-type        = 'LDAP'.
_Tenant-name        = 'tenant-ONE'.
```

Tenant 1
System

```
create _sec-authentication-domain.
_Domain-name        = 'system.tenant1'.
_Domain-type        = '_oslocal'.
_Tenant-name        = 'tenant-ONE'.
```

# Roles & Responsibilities

| | Anonymous | Customer | Employee | System |
|---|---|---|---|---|
| See catalogue | X | X | X | |
| Modify catalogue | | | X | |
| Update shopping cart | | X | X | |
| Add users | | | X | |
| Dump & load data | | | | X |
| Provision services | | | | X |
| Level of trust | ■□□ | ■■□ | ■■□ | ■■■ |

# Roles

- Roles a way of mapping sets of capabilities to classes of users
- May not serve the principle of least privilege

  (which states that one should have the minimal privileges necessary, and no more)
- On the other end of the spectrum, one can define one role for every set of resource capabilities one might want to allow
- Map roles to static sets of capabilities

Role definition from OWASP https://www.owasp.org/index

# Configuration: Roles

```
create _Sec-role.
_Role-name = 'ShoppingCart.Data.Write'.
_Role-creator = 'app-admin@system'.
_Role-description = 'Allows users to mod the shopping cart table'.

create _Sec-granted-role.
_Role-name = 'ShoppingCart.Data.Write'.
_Grantee = 'amy@customer'    /* one record per user */
_Grantor = 'app-admin@system'.

create _Sec-role.
_Role-name = 'Customer.Data.Read'.
_Role-creator = 'app-admin@system'.
_Role-description = 'Allows users to read the customer table'.

create _Sec-granted-role.
_Role-name = 'Customer.Data.Read'.
_Grantee = 'amy@customer'.   /* one record per user */
_Grantor = 'app-admin@system'.
```

OE 10.1A+

# Using Roles

```
/* when the user has been successfully authenticated */
/* hCP:qualified-user-id = amy@customer */

for each _Sec-granted-role where
   _Grantee = hCP:qualified-user-id:

  hCP:roles = hCP:roles + ','
            + _Sec-granted-role._Role-name .
end.

/* Roles: ShoppingCart.Data.Write, Customer.Data.Read ... */
```

```
/* later, when the user attempts access */
pcOperation = 'ShoppingCart.Data.Read'.
if not can-do(hCP:roles, pcOperation) then
    undo, throw new AppError(
              'User not authorised for operation').
```

# Configuration: Operation Access

```
create _Sec-role.
_Role-name = 'Customer.Service.GetCustomers'.
_Role-creator = 'app-admin@system'.
_Role-description =
    'Allows users to access the Get Customer operation'.

create _Sec-role.
_Role-name = 'Customer.Service.GetCustomerOrders'.
_Role-creator = 'app-admin@system'.
_Role-description =
    'Allows users to access the Customer Order operation'.

create _Sec-role.
_Role-name = 'ShoppingCart.Service.UpdateCart'.
_Role-creator = 'app-admin@system'.
_Role-description =
    'Allows users to access the update a shopping cart'.
```

# Using Operation Access

```
/* BusinessLogic/si_ShoppingCartService.p */
routine-level on error undo, throw.

{dsShoppingCart.i}

procedure UpdateShoppingCartService:
  define input-output parameter dataset for dsShoppingCart.

  Security.AuthorisationService:AuthoriseOperation(
       'ShoppingCart.Service.UpdateCart').

  ShoppingCartService:Instance:UpdateShoppingCartService(
      input-output dataset dsShoppingCart by-reference).
end procedure.
```

# Roles & Responsibilities

| | Anonymous | Customer | Employee | System |
|---|---|---|---|---|
| See catalogue | X | X | X | |
| Modify catalogue | | | X | |
| Update shopping cart | | X | X | |
| Add users | | | X | |
| Dump & load data | | | | X |
| Provision services | | | | X |
| Level of trust | | | | |

# Configuration: Service Names

```
create _Sec-role.
_Role-name = 'Customer.Service.Access'.
_Role-description = 'Allows access to the Customer service'.

_Role-name = 'ShoppingCart.Service.Access'.
_Role-description = 'Allows access to the ShoppingCart service'.
```

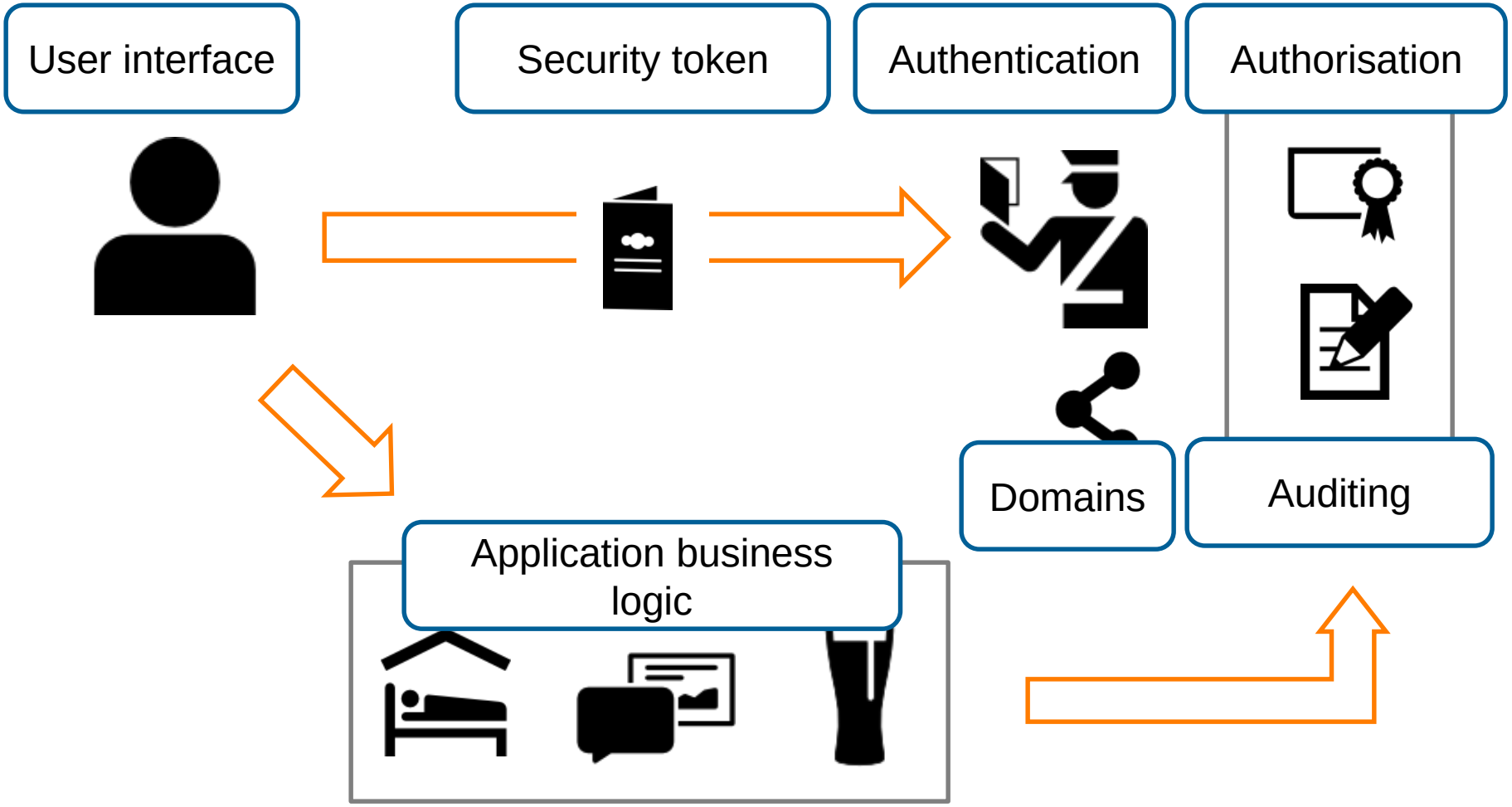
```
define private temp-table ttService no-undo
  field service as character
  field role    as character

create ttService.
 service = "BusinessLogic/si_ShoppingCartService.p".
 role    = "ShoppingCartService.Service.Access".

create ttService.
 service = "BusinessLogic/GetCustomers.p"
 role    = "Customer.Service.Access"

create ttService.
 service = "BusinessLogic/si_GenericFetchData.p".
 role    = "ShoppingCartService.Service.Access".
```

# AppServer Access

```
/* ttService populated from database or config files */
define private temp-table ttService no-undo
  field service as character
  field role    as character

define variable cDelim as character no-undo.
define variable cExportList as character no-undo.

cDelim = ''.

for each ttService break by service:
    if first-of(ttService.service) then
        assign cExportList = cExportList
                           + cDelim
                           + ttService.service
               cDelim = ','.
end.

session:export(cExportList).
```

OE ~9.0+

# Application Architecture: Business Logic



# Application Architecture: Business Logic

PROGRESS software

```
RUN getcustomerlist.p ON SERVER hAppServer
    (OUTPUT DATASET dsCustomer)
```

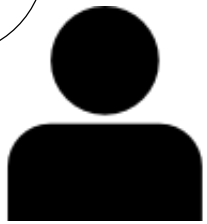
1

Security token

Authentication

Authorisation

2



```
activate.p

STS:ValidateToken
  (INPUT cToken).

security-policy:set-client
  (<<user>>)

AuthoriseService
  ("getcustomer.p")
```

Application business

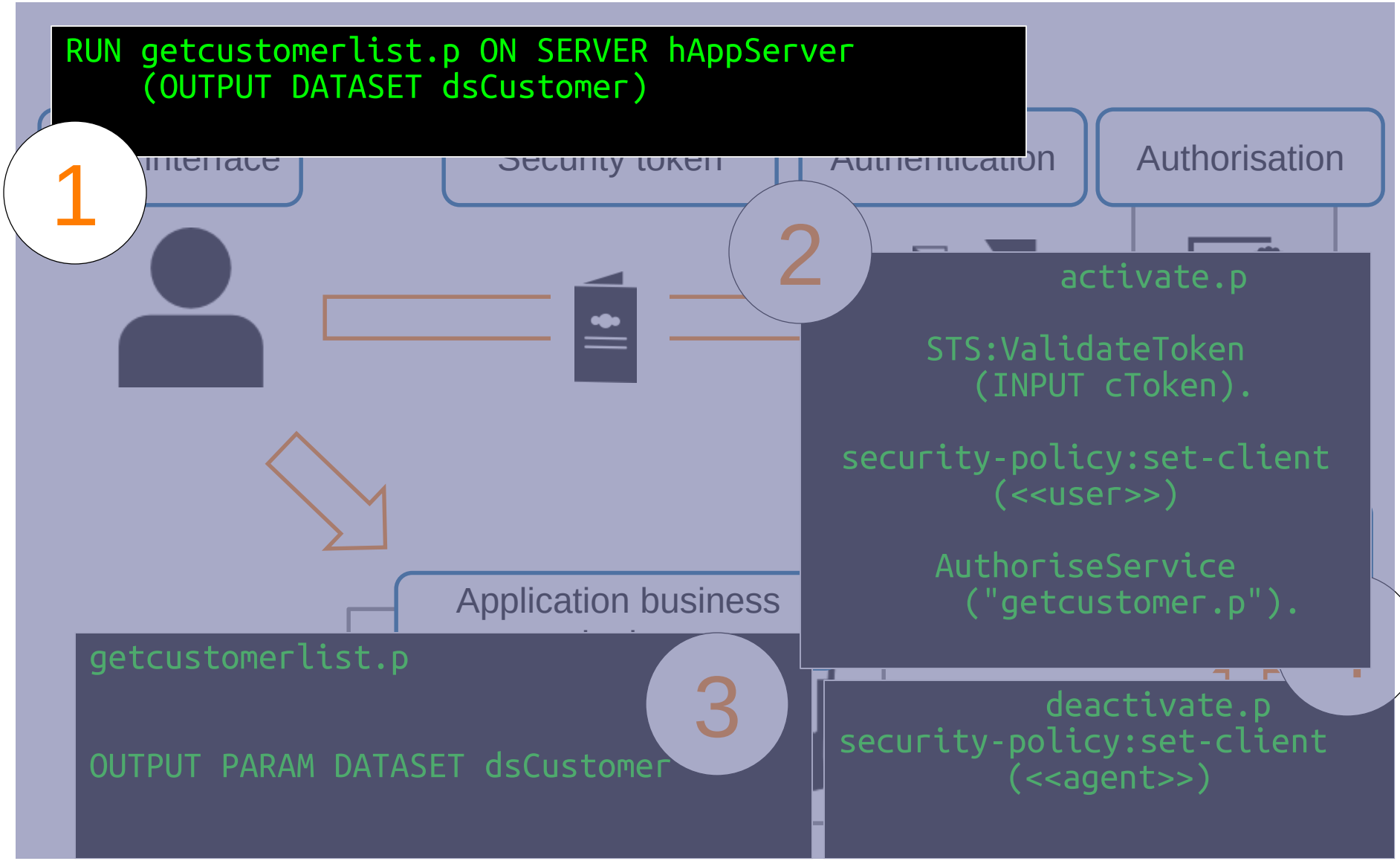
```
getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
```

3

4

```
deactivate.p
security-policy:set-client
  (<<agent>>)
```

# Application Architecture: Business Logic



# Desktop.MainForm.cls

```
method protected void RefreshCustomerList():
  define variable hAppServer as handle no-undo.

  run BusinessLogic/GetCustomerList.p on hAppServer
                          (output dataset dsCustomerOrder).

  open query qryCustomer preselect
     each ttCustomer by ttCustomer.CustNum.

  bsCustomer:Handle = query qryCustomer:handle.

  query qryCustomer:reposition-to-row(1).
end method.
```

# Application Architecture: Business Logic

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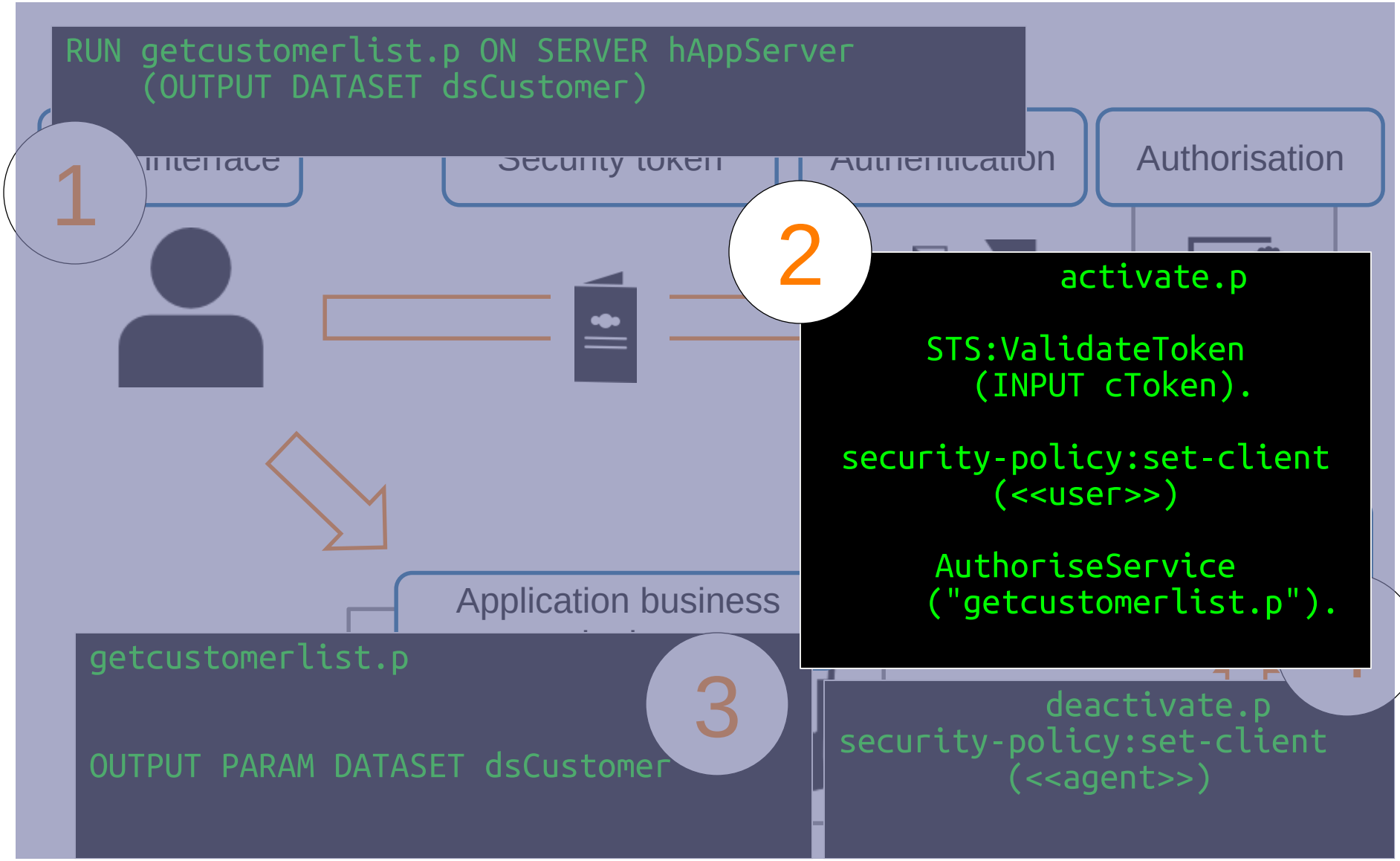


# Security/Activate.p

```
hClientPrincipal = Security.SecurityTokenService:Instance:
    GetClientPrincipal(
        session:current-request-info:ClientContextId).

/* authenticate client-principal */
security-policy:set-client(hClientPrincipal).

/* authorise service access */
Security.AuthorisationService:Instance
    :AuthoriseService(
        hClientPrincipal,
        session:current-request-info:ProcedureName).
```

# Security/Activate.p

```
hClientPrincipal = Security.SecurityTokenService:Instance:
    GetClientPrincipal(
        session:current-request-info:ClientContextId).

/* authenticate client-principal */
security-policy:set-client(hClientPrincipal).

/* authorise service access */
Security.AuthorisationService:Instance
    :AuthoriseService(
        hClientPrincipal,
        session:current-request-info:ProcedureName).
```

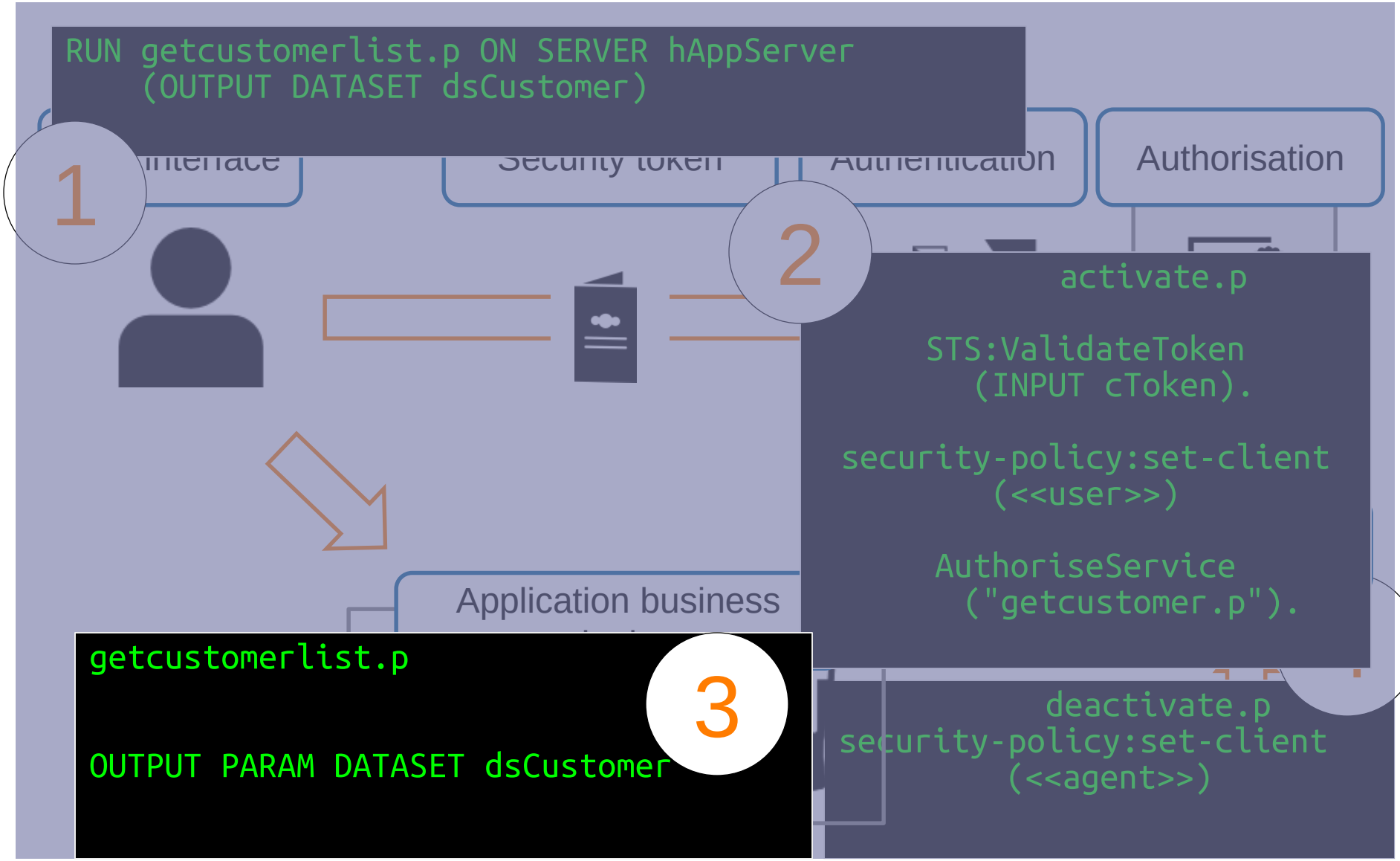
# Security/Activate.p

```
hClientPrincipal = Security.SecurityTokenService:Instance:
    GetClientPrincipal(
        session:current-request-info:ClientContextId).

/* authenticate client-principal */
security-policy:set-client(hClientPrincipal).

/* authorise service access */
Security.AuthorisationService:Instance
    :AuthoriseService(
        hClientPrincipal,
        session:current-request-info:ProcedureName).
```

# Security.AuthorisationService

```
define private temp-table ttService no-undo
  field service as character
  field role    as character
  index idx1 as primary service.

/* pcServiceName: BusinessLogic/GetCustomerList.p */
method public void AuthoriseService(
                      input phCP as handle,
                      input pcServiceName as character):
  define variable lIsAuthorised as logical no-undo.

  lIsAuthorised = can-find(
      first ttService where ttService.service eq pcServiceName).

  for each ttService where ttService.service eq pcServiceName
      while lIsAuthorised:
     lIsAuthorised = not can-do(phCP:roles, ttService.role).
  end.

  if not lIsAuthorised then
    undo, throw new AppError("User not authorised for service").
end method.
```

# Application Architecture: Business Logic



# BusinessLogic/GetCustomerList.p

```
{BusinessLogic/dsCustomerOrder.i}

define output parameter dataset for dsCustomerOrder.

define variable oBusinessEntity as CustomerOrderBE no-undo.

Security.AuthorisationService:Instance
    :AuthoriseOperation("Customer.Service.GetCustomers").

oBusinessEntity  = new CustomerOrderBE().

oBusinessEntity:GetCustomers(
    output dataset dsCustomerOrder).

/* eof */
```

# Security.AuthorisationService

```
method public void AuthoriseOperation(
                        input pcOperation as character):
  define variable hCP as handle no-undo.

  hCP = security-policy:get-client().

  if not can-do(hCP:roles, pcOperation) then
    undo, throw new AppError("User not authorised for service").
end method.
```

# BusinessLogic/GetCustomerList.p

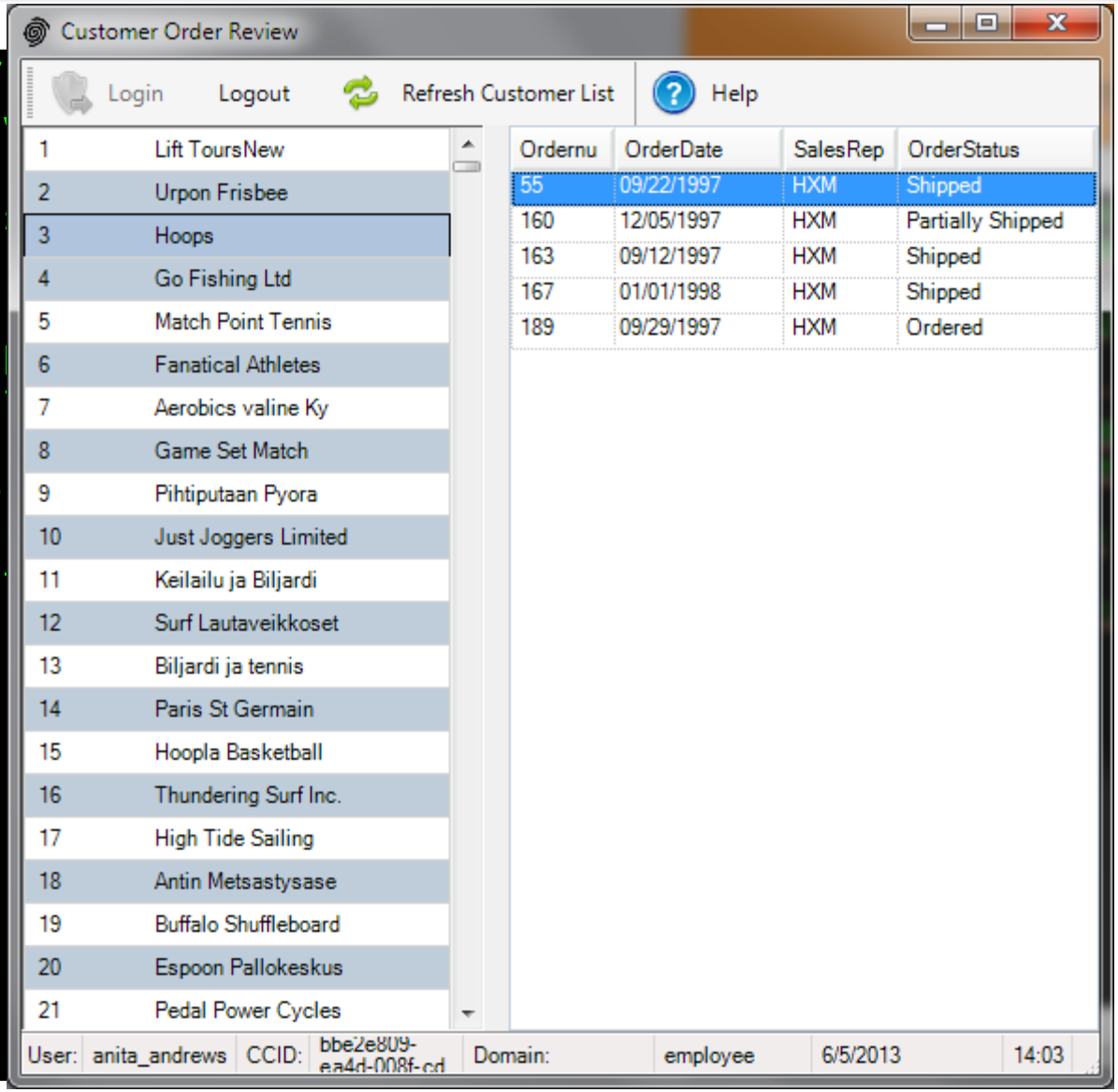
```
{BusinessLogic/dsCustomerOrder.i}

define output parameter dataset for dsCustomerOrder.

define variable oBusinessEntity as CustomerOrderBE no-undo.

Security.AuthorisationService:Instance
    :AuthoriseOperation("GetCustomers").

oBusinessEntity  = new CustomerOrderBE().

oBusinessEntity:GetCustomers(
    output dataset dsCustomerOrder).

/* eof */
```

# CustomerOrderBE.cls

```
{BusinessLogic/dsCustomerOrder.i}

method public void GetCustomers(
             output parameter dataset dsCustomerOrder):
  define data-source srcCustomer for Customer.
  define data-source srcOrder for Order.

  buffer ttCustomer:attach-data-source(
              data-source srcCustomer:handle).
  buffer ttOrder:attach-data-source(
              data-source srcOrder:handle).

  /* multi-tenancy magic happens here.
     CAN-READ too.
     based on the asserted user via SECURITY-POLICY
     GET-CLIENT */
  dataset dsCustomerOrder:fill().

  buffer ttCustomer:detach-data-source().
  buffer ttOrder:detach-data-source().

end method.
/* eof */
```

# Desktop.MainForm.cls

```
method protected void Ref
  define variable hAppSer

  run BusinessLogic/GetCu


  open query qryCustomer
     each ttCustomer by t

  bsCustomer:Handle = que

  query qryCustomer:repos
end method.
```



# Application security principles

Applications must have security designed in. Some proven application security principles

1. **Identify and secure the weakest link**
2. **Practice defense in depth**
3. Be reluctant to trust
4. Remember that hiding secrets is hard
5. **Follow the principle of least privilege**
6. **Fail and recover securely**
7. Compartmentalize
8. Keep it simple, stupid
9. Keep trust to yourself
10. **Assume nothing**

http://news.cnet.com/2008-1082-276319.html

# Summary

PROGRESS software

- Identity management is a process that helps protect your business data
  - Strength in depth
- OpenEdge provides components of identity management
  - CLIENT-PRINCIPAL
  - Multi-tenancy, Domains & Authentication Systems
- Run with least privilege
  - Use Domains and Roles to keep privileges ‘tight’
  - Reset to lower privileges when done
- Configuration > Code
  - Code is the weakest link

# Extra materials

PROGRESS software

- This session
  - Slides to be posted on PUG Challenge site
  - Supporting code at https://github.com/nwahmaet/IdM_Sample
- Other PUG Challenge sessions
  - Identity Management Basics (Part 1)
    Peter Judge, PSC
  - Advanced OpenEdge REST/Mobile Security
    Mike Jacobs, PSC
  - Programming with the Client-Principal Object
    Chris Longo, BravePoint

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