Identity Management Basics

Part 1 of Identity Management with OpenEdge

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What is Identity Management?

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

This is Nothing New

Forces aligned against you are more prevalent, and they have more, and more sophisticated weapons

And you’ve given people a door and invitation via the internet

So now the things you used to do are no longer adequate

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

Authentication

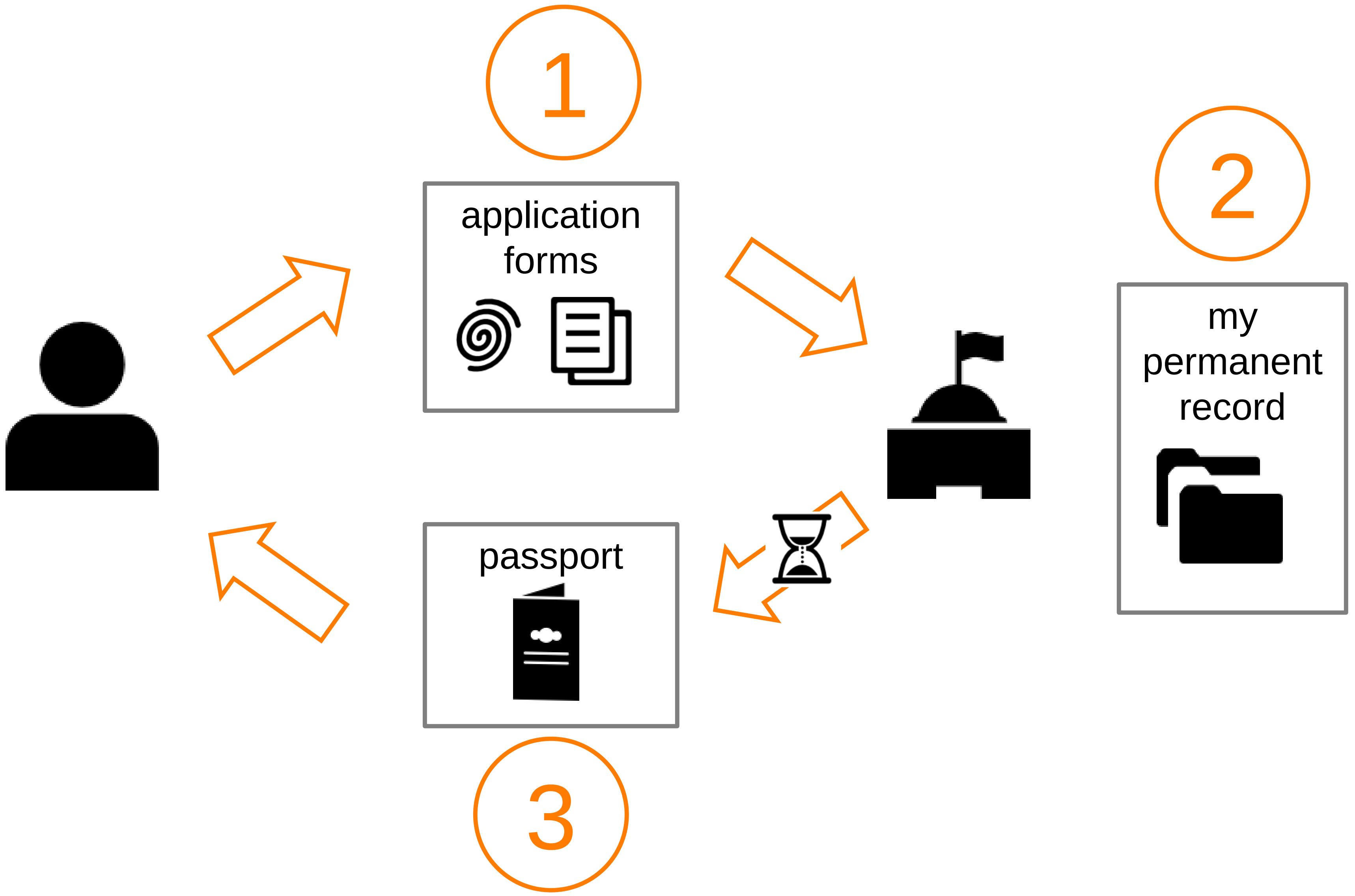
- Identifies a user, using factors
  - Something the user knows (e.g. password)
  - Something the user has (e.g. security token)
  - Something of the user (e.g. biometric)
- Verify that users are who they say they are
  - We need to be able to trust this fact, as do others

Authorisation & Auditing

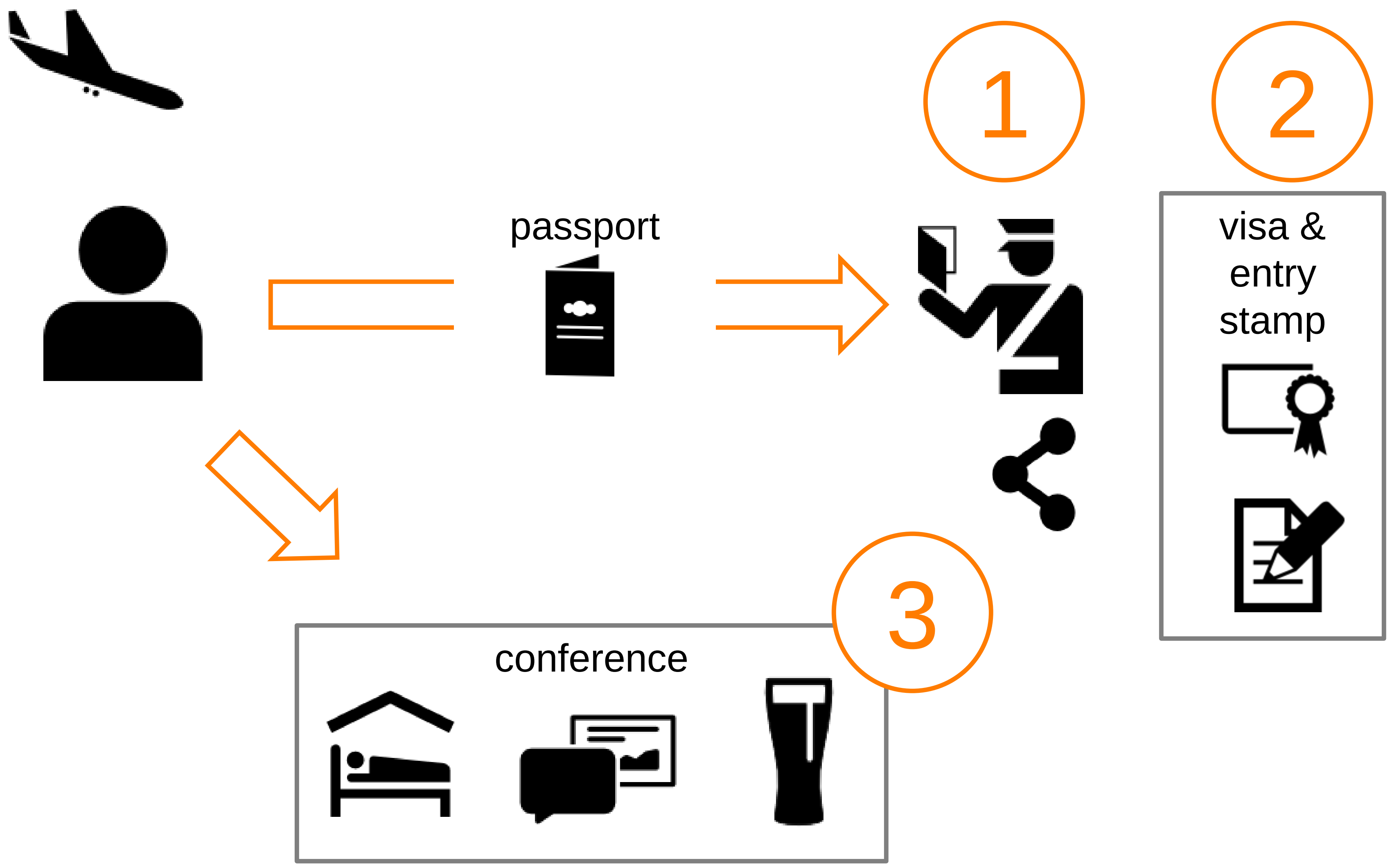
- Authorisation
  - What services can the user access?
  - What data can the user see and/or modify?
    - Multi-tenancy
    - Record-level, field-level

- Auditing
  - Verifiable trace of a user’s actions

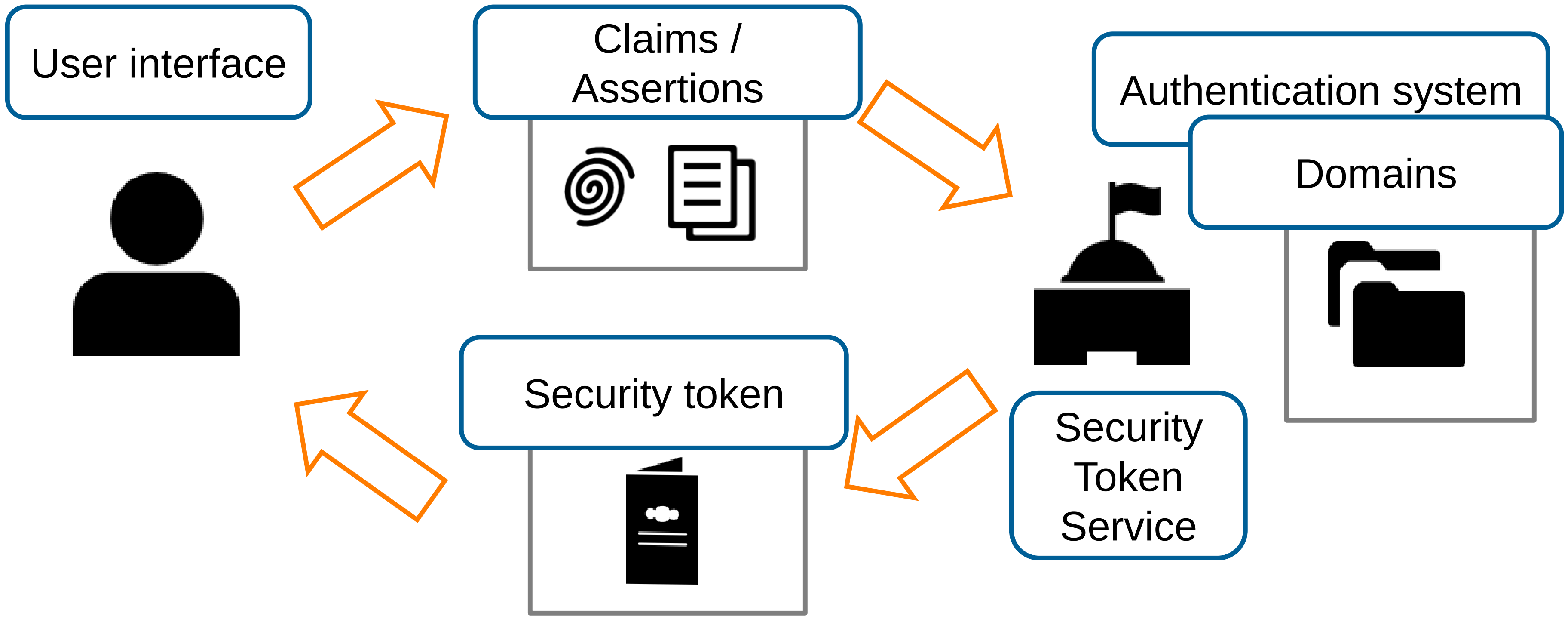
Getting a Passport



Using a Passport



Application Architecture



What is a Security Token?

- A transportable block of data that can be used as proof of user identity by any systems or applications that have a trust relationship with the originator of the security token
  - Exists for same reason passports do: so that a gatekeeper doesn’t have to ask you for everything every time you want to pass
- Enables Single Sign On (SSO)
  - Authenticate once and allow access many times across (ABL) processes
- Secure, time sensitive and data-integrity protected

The ABL CLIENT-PRINCIPAL

- CLIENT-PRINCIPAL = ABL security token

```
CREATE CLIENT-PRINCIPAL hCP.
hCP:INITIALIZE(<args>)
```

- Sets current identity in any connected db or AVM session

```
SECURITY-POLICY:SET-CLIENT(hCP).
SET-DB-CLIENT(<dbname>, hCP).
```

- AVM creates if not created explicitly

```
SETUSERID(<userid>, <pass>, <dbname>).
cmd> $PROEXE –U <userid> -P <pass>
```

- Manage a user's login session

```
hCP = SECURITY-POLICY:GET-CLIENT().
rCP = hCP:EXPORT-PRINCIPAL.
hCP:LOGOUT().
```

OE 10.1A+

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

```
_sec-authentication-domain

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

Authentication Systems (aka Plug-ins)

- Validates requesting entity’s claims
  - Full user login (i.e. user authentication), or
  - Single Sign-On (SSO)
- Specifies actual means of performing authentication
  - ABL callbacks available for user-defined systems

OE 11.1+

```
_sec-authentication-system

  _Domain-type
  _Domain-type-description
  _PAM-plug-in
  _PAM-callback-procedure
```

- Single authentication system can support multiple domains
  - One domain has one authentication system

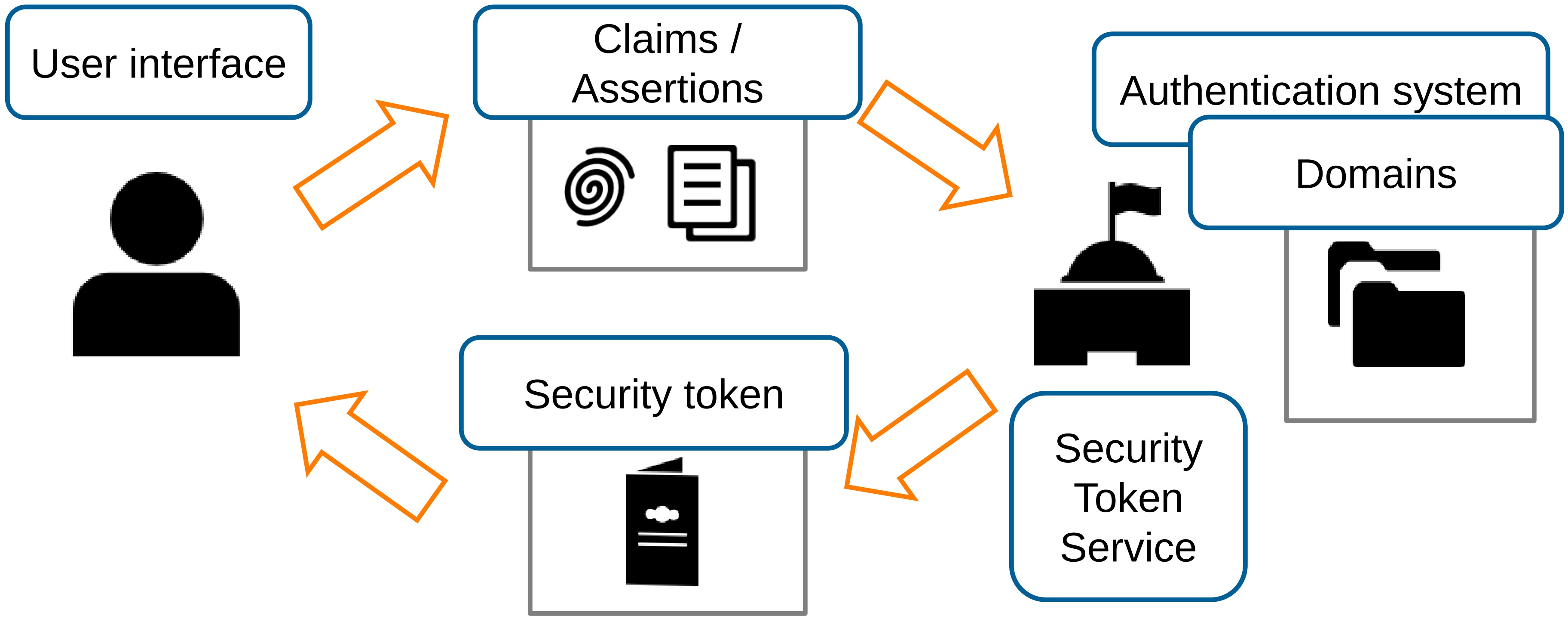
User Credentials Example Schema

```
ADD TABLE "ApplicationUser"
  AREA "Data"
  DESCRIPTION "The application's user table. Contains login names,
passwords and mappings to login domains."
  DUMP-NAME "applicationuser"


ADD FIELD "LoginName" AS character
/* Domain necessary for re-use */
ADD FIELD "LoginDomain" AS character
ADD FIELD "Password" AS character
ADD FIELD "LastLoginDate" AS datetime-tz
/* Last login IP address / host  */
ADD FIELD "LastLoginLocation" AS character

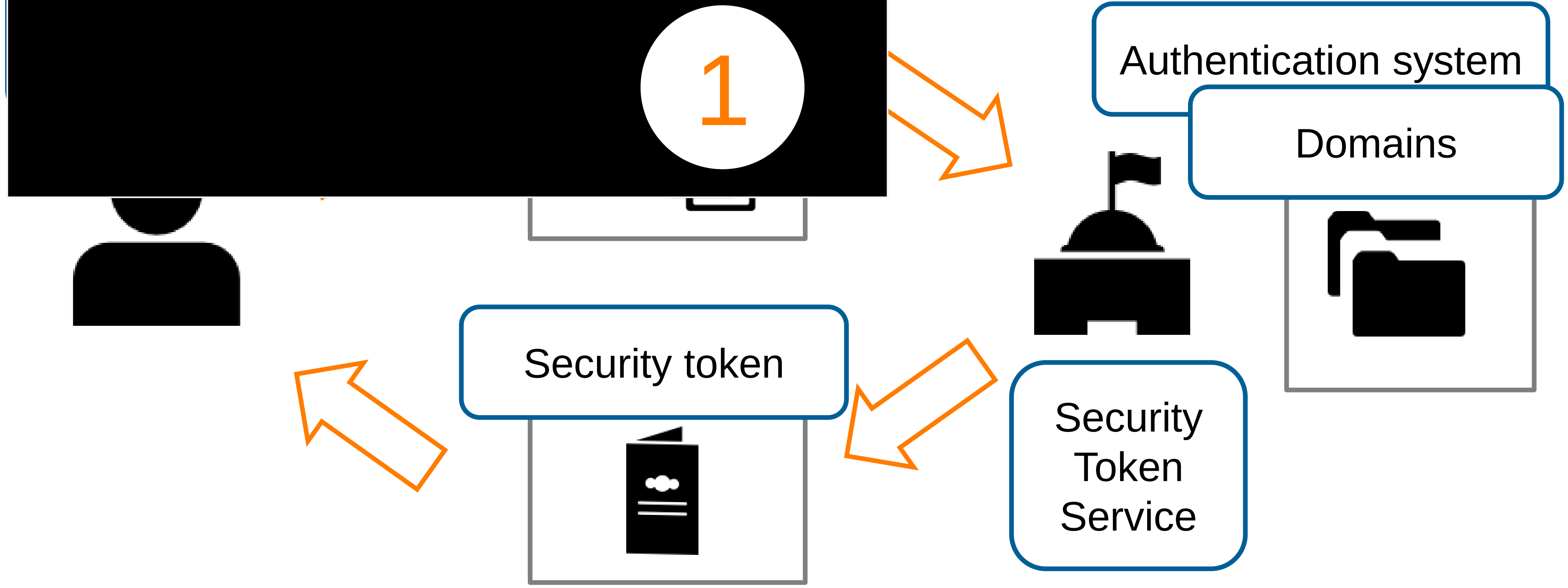
ADD INDEX "Login" ON "ApplicationUser"
  AREA "Indexes"
  UNIQUE
  INDEX-FIELD "LoginName" ASCENDING
  INDEX-FIELD "LoginDomain" ASCENDING
```

Application Architecture: Login

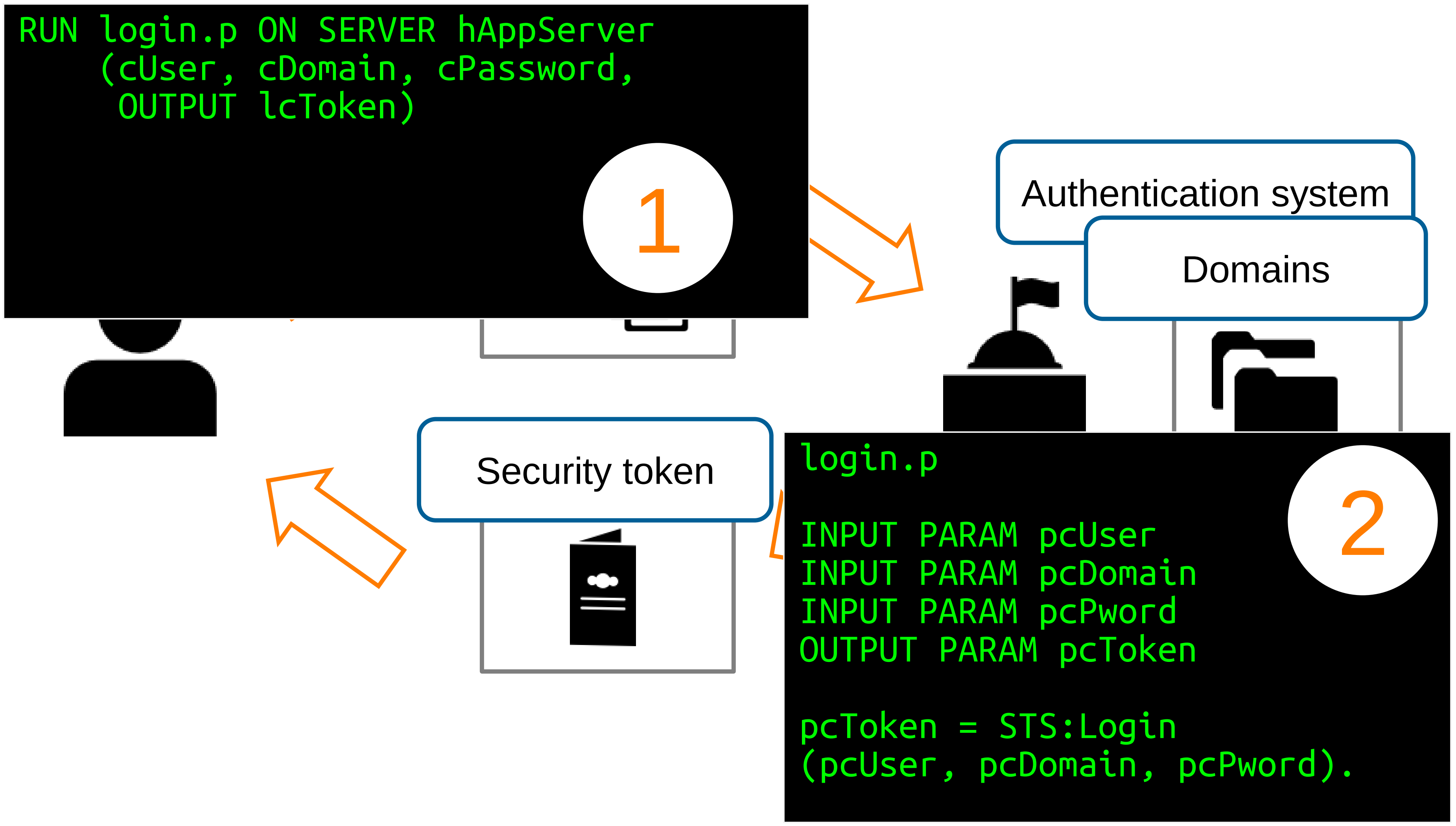


Application Architecture: Login

```
RUN login.p ON SERVER hAppServer
    (cUser, cDomain, cPassword,
     OUTPUT lcToken)
```



Application Architecture: Login



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RUN login.p ON SERVER hAppServer
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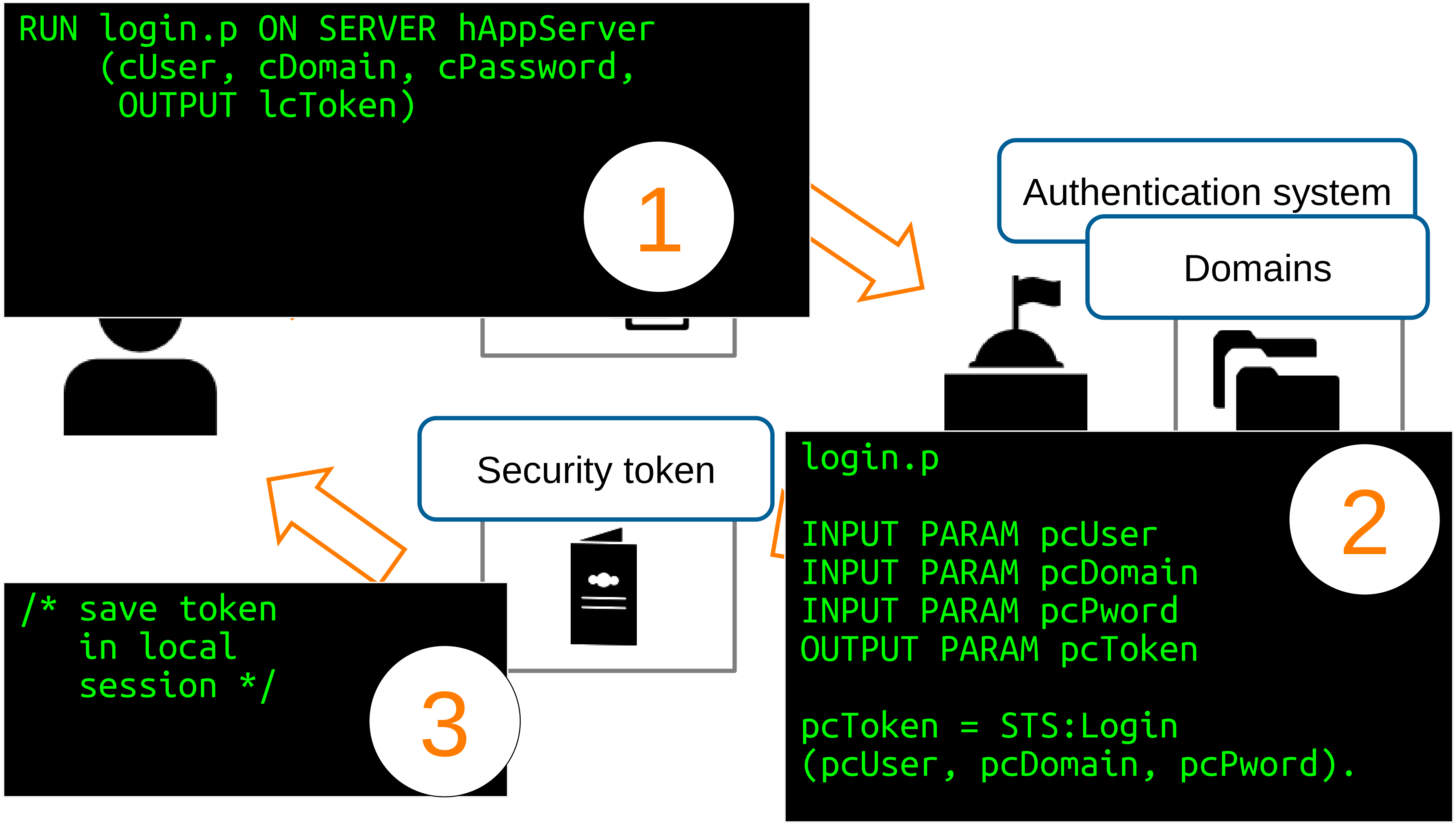
```

```
login.p

INPUT  PARAM pcUser
INPUT  PARAM pcDomain
INPUT  PARAM pcPword
OUTPUT PARAM pcToken

pcToken = STS:Login
(pcUser, pcDomain, pcPword).
```

Application Architecture: Login



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```
/* save token
   in local
   session */
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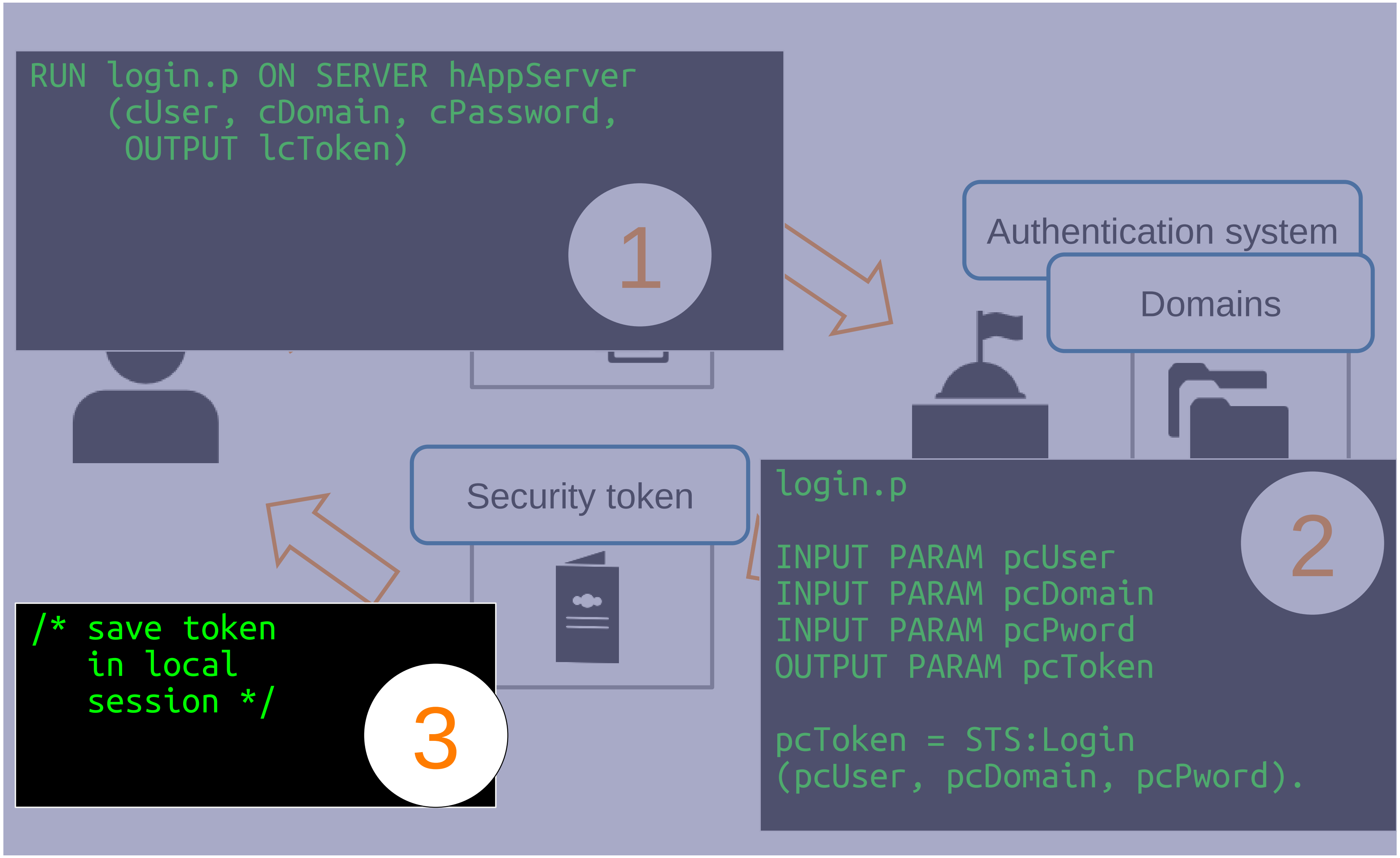
Application Architecture: Login



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/* save token
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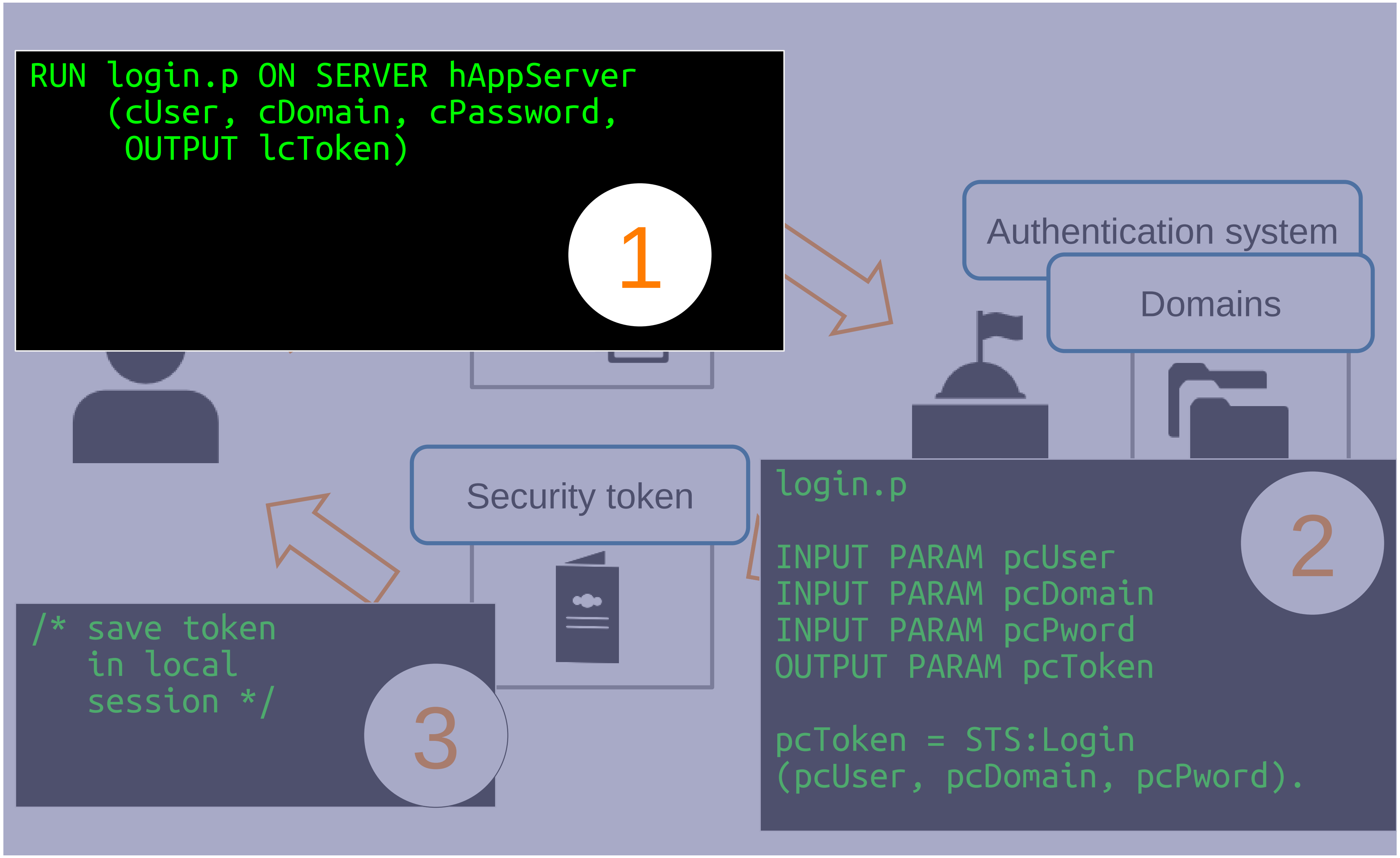
Managing Security Context

Client Context (OE 11.2+)	Server Context (OE 11.0+)
Entire security context for session in sealed C-P	Entire security context for session stored on server, using C-P's SESSION-ID as key ("CCID")
Sealed C-P moves between server and client	CCID moves between server and client. CCID used to find context in cache & rehydrate C-P
Server validates C-P & uses it to establish security context	Server validates C-P & uses it to establish security context
Used in stateful apps that run in stateless server environments	Used in stateful applications
More data transmitted per call = more overhead	Less data transmitted = lower overhead
Less secure, unless C-P encrypted or in SSL session	More secure, since C-P not at risk of exposure

```
rawToken = hCP:EXPORT-PRINCIPAL
```

```
charToken = hCP:SESSION-ID
```

Application Architecture: Login



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pcToken = STS:Login
(pcUser, pcDomain, pcPword).
```

```
/* save token
   in local
   session */
```

Desktop.MainForm.cls

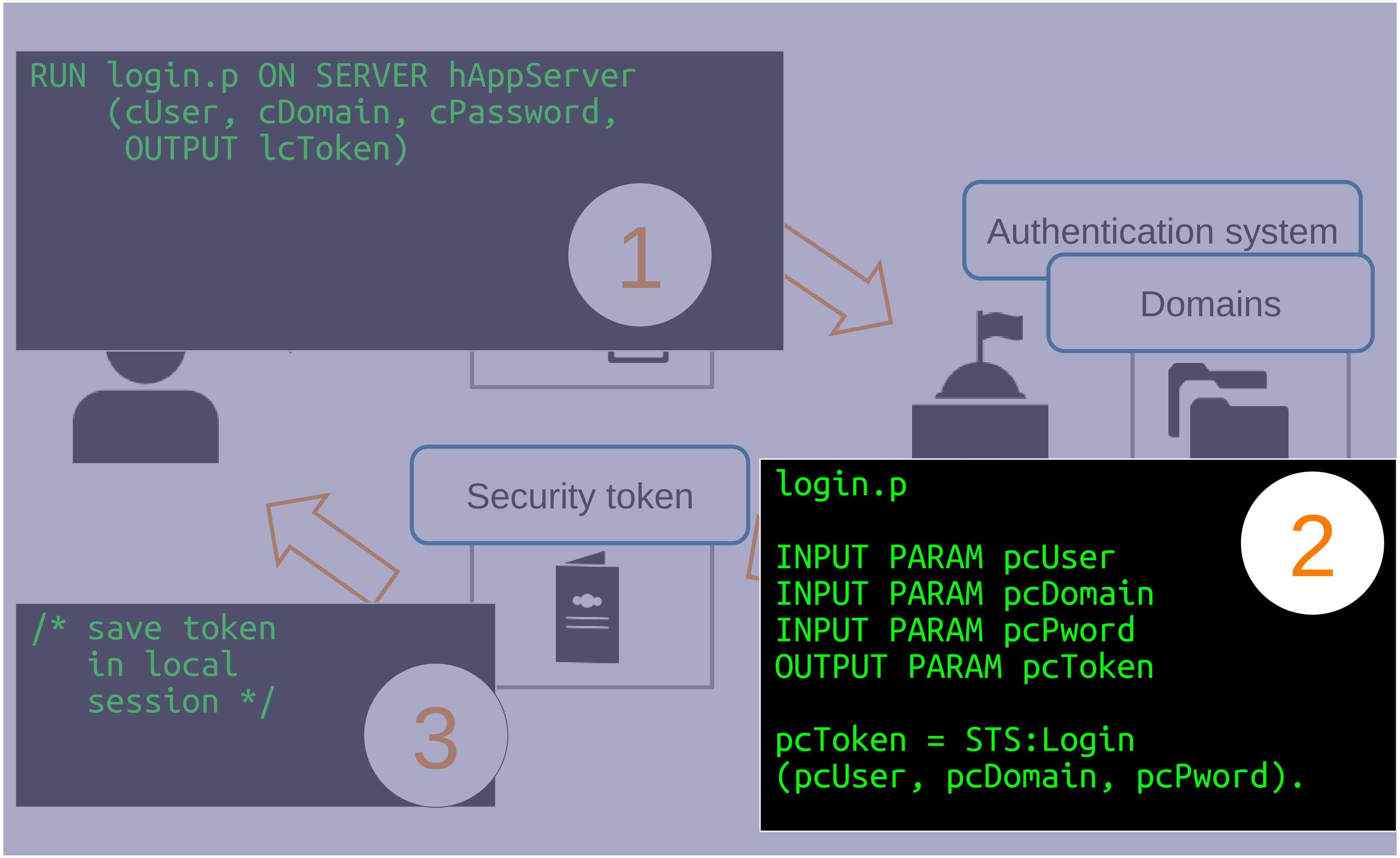
```
method public logical LoginUser(
              input pcUserName as char,
              input pcDomain as char,
              input pcPassword as char):

  run Security/Login.p on hAppServer (
          pcUserName, pcDomain, pcPassword,
          output cUserContextId).
  if cUserContextId eq '' then return false.

  /* set the CCID on the business logic server so that it's
     transported with every request. */
  hAppServer:request-info:ClientContextId = cUserContextId.

  return true.
end method.
```

Application Architecture: Login



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login.p

INPUT PARAM pcUser
INPUT PARAM pcDomain
INPUT PARAM pcPword
OUTPUT PARAM pcToken

pcToken = STS:Login
(pcUser, pcDomain, pcPword).
```

```
/* save token
   in local
   session */
```

Security/Login.p

```
define input  parameter pcUser as character no-undo.
define input  parameter pcDomain as character no-undo.
define input  parameter pcPassword as character no-undo.
define output parameter pcToken as character no-undo.

pcToken = Security.SecurityTokenService:Instance
            :LoginUser(pcUser, pcDomain, pcPassword).
```

Security.SecurityTokenService.cls

```
method public char LoginUser(input pcUserName as char,
                             input pcUserDomain as char,
                             input pcPassword as char):
  define variable hClientPrincipal as handle no-undo.

  create client-principal hClientPrincipal.
  hClientPrincipal:initialize(
     substitute('&1@&2', pcUserName, pcUserDomain),
     ?,   /* unique session id */
     add-interval(now, 8, 'hours'),  /* login expiration */
     pcPassword).

  /* passes authentication work off to
     authentication system */
  security-policy:set-client(hClientPrincipal).

  /* writes security context into DB */
  WriteClientPrincipalToStore(hClientPrincipal).

  /* return character value */
  return hClientPrincipal:session-id.
end method.
```

Security.SecurityTokenService.cls

```
method public char LoginUser(input pcUserName as char,
                             input pcUserDomain as char,
                             input pcPassword as char):
  define variable hClientPrincipal as handle no-undo.

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     authentication system */
  security-policy:set-client(hClientPrincipal).

  /* writes security context into DB */
  WriteClientPrincipalToStore(hClientPrincipal).

  /* return character value */
  return hClientPrincipal:session-id.
end method.
```

_sec-authentication-system

```
create _sec-authentication-system.
_Domain-type                 = 'TABLE-ApplicationUser'.
_Domain-type-description =
         'The ApplicationUser table serves as
          the authentication domain'.
_PAM-plug-in                 = true.

_PAM-callback-procedure   =
         'Security/AppUserAuthenticate.p'.
```

Security/AppUserAuthenticate.p

```
procedure AuthenticateUser:
  def input  param phClientPrincipal  as handle no-undo.
  def input  param pcSystemOptions as character extent no-undo.
  def output param piPAMStatus as integer init ? no-undo.
  def output param pcErrorMsg as character no-undo.

  find ApplicationUser where
       ApplicationUser.LoginName eq phCP:user-id and
       ApplicationUser.LoginDomain eq phCP:domain-name
       no-lock no-error.

  if not available ApplicationUser then
    piPAMStatus = Progress.Lang.PAMStatus:UnknownUser.
  else
  if ApplicationUser.Password ne
     encode(phCP:primary-passphrase) then
    piPAMStatus = Progress.Lang.PAMStatus:AuthenticationFailed.
  else
    /* we're good to go */
    piPAMStatus = Progress.Lang.PAMStatus:Success.

  return.
end procedure.
```

Security.SecurityTokenService.cls

```
method public char LoginUser(input pcUserName as char,
                             input pcUserDomain as char,
                             input pcPassword as char):
  define variable hClientPrincipal as handle no-undo.

  create client-principal hClientPrincipal.
  hClientPrincipal:initialize(
     substitute('&1@&2', pcUserName, pcUserDomain),
     ?,   /* unique session id */
     add-interval(now, 8, 'hours'),  /* login expiration */
     pcPassword).

  /* passes authentication work off to
     authentication system */
  security-policy:set-client(hClientPrincipal).

  /* writes security context into DB */
  WriteClientPrincipalToStore(hClientPrincipal).

  /* return character value */
  return hClientPrincipal:session-id.
end method.
```

Security.SecurityTokenService.cls

```
method protected void WriteClientPrincipalToStore(
                                   input phClientPrincipal as handle):
  define buffer lbSecurityContext for SecurityContext.

  /* scope this transaction as small as possible */
  do for lbSecurityContext transaction:
    find lbSecurityContext where
         lbSecurityContext.SessionId eq phClientPrincipal:session-id
         exclusive-lock no-wait no-error.
    if not available lbSecurityContext then
    do:
      create lbSecurityContext.
      lbSecurityContext.SessionId = phClientPrincipal:session-id.
    end.
    lbSecurityContext.ClientPrincipal =
                        phClientPrincipal:export-principal().
    lbSecurityContext.LastAccess = now.
  end.
end method.
```

Security.SecurityTokenService.cls

```
method public char LoginUser(input pcUserName as char,
                             input pcUserDomain as char,
                             input pcPassword as char):
  define variable hClientPrincipal as handle no-undo.

  create client-principal hClientPrincipal.
  hClientPrincipal:initialize(
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     ?,   /* unique session id */
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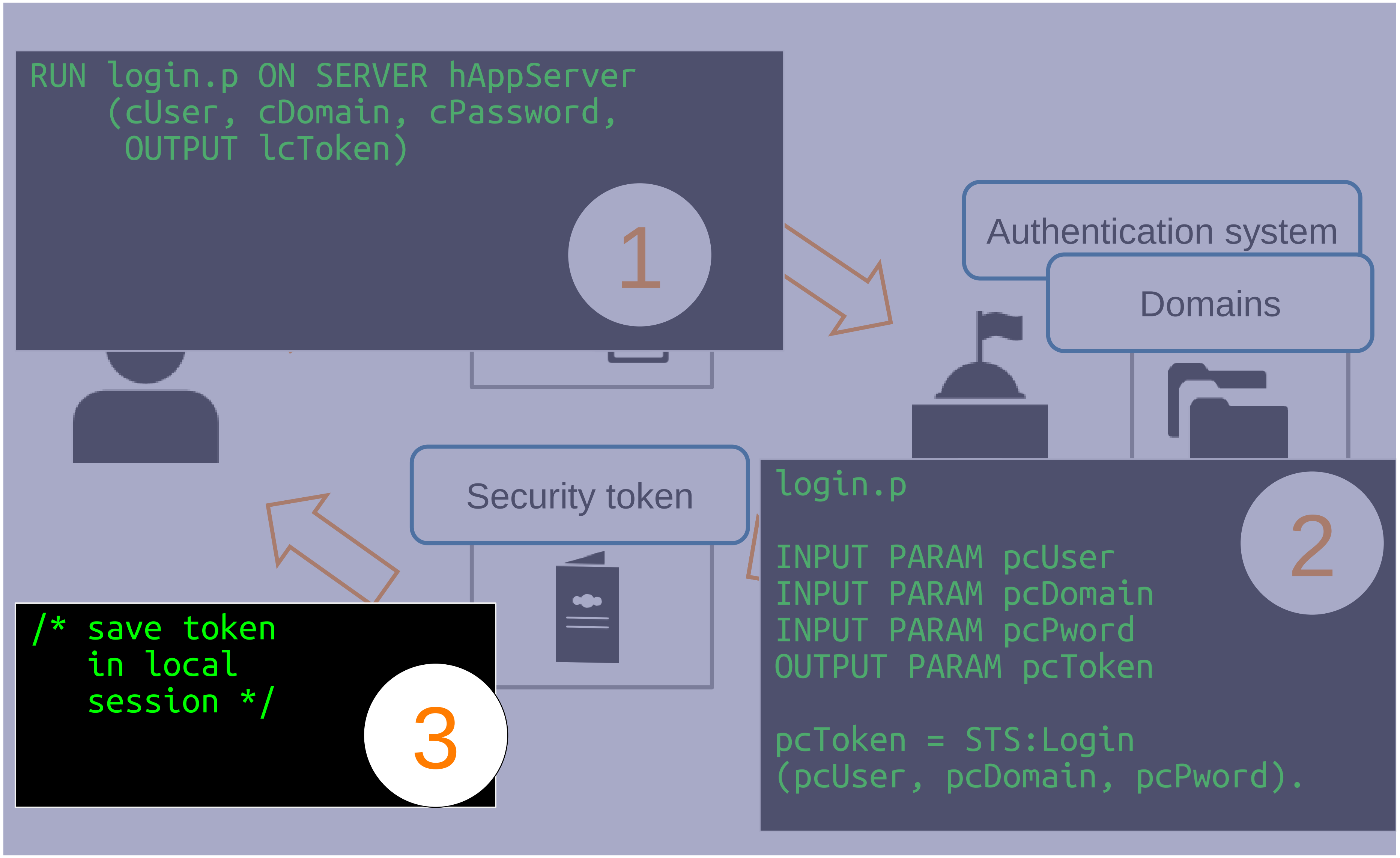
  /* return character value */
  return hClientPrincipal:session-id.
end method.
```

Application Architecture: Login



```
RUN login.p ON SERVER hAppServer
    (cUser, cDomain, cPassword,
     OUTPUT lcToken)
```

```
login.p

INPUT PARAM pcUser
INPUT PARAM pcDomain
INPUT PARAM pcPword
OUTPUT PARAM pcToken

pcToken = STS:Login
(pcUser, pcDomain, pcPword).
```

```
/* save token
   in local
   session */
```

Desktop.MainForm.cls

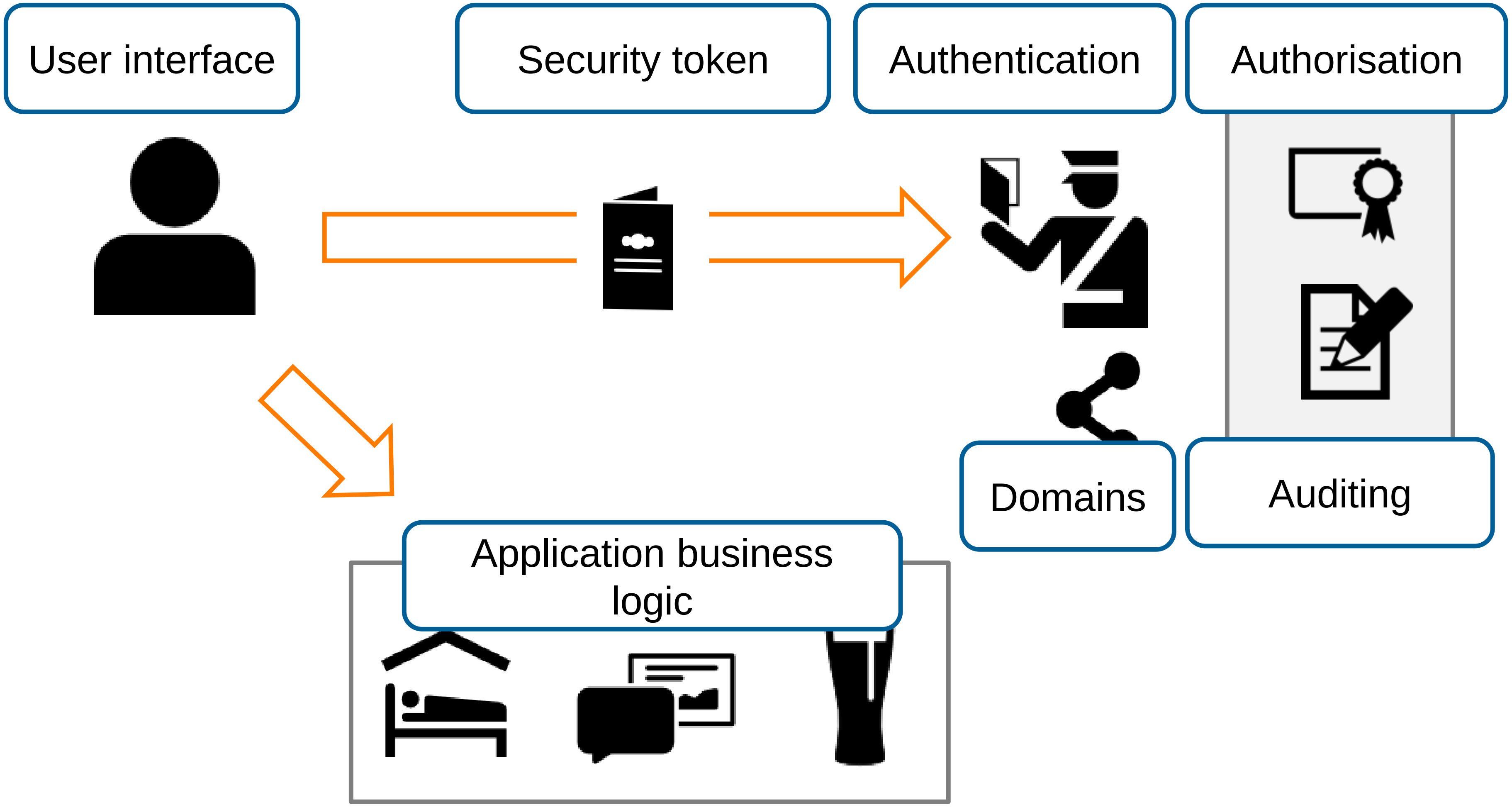
```
method public logical LoginUser(
              input pcUserName as char,
              input pcDomain as char,
              input pcPassword as char):

  run Security/Login.p on hAppServer (
          pcUserName, pcDomain, pcPassword,
          output cUserContextId).
  if cUserContextId eq '' then return false.

  /* set the CCID on the business logic server so that it's
     transported with every request. */
  hAppServer:request-info:ClientContextId = cUserContextId.

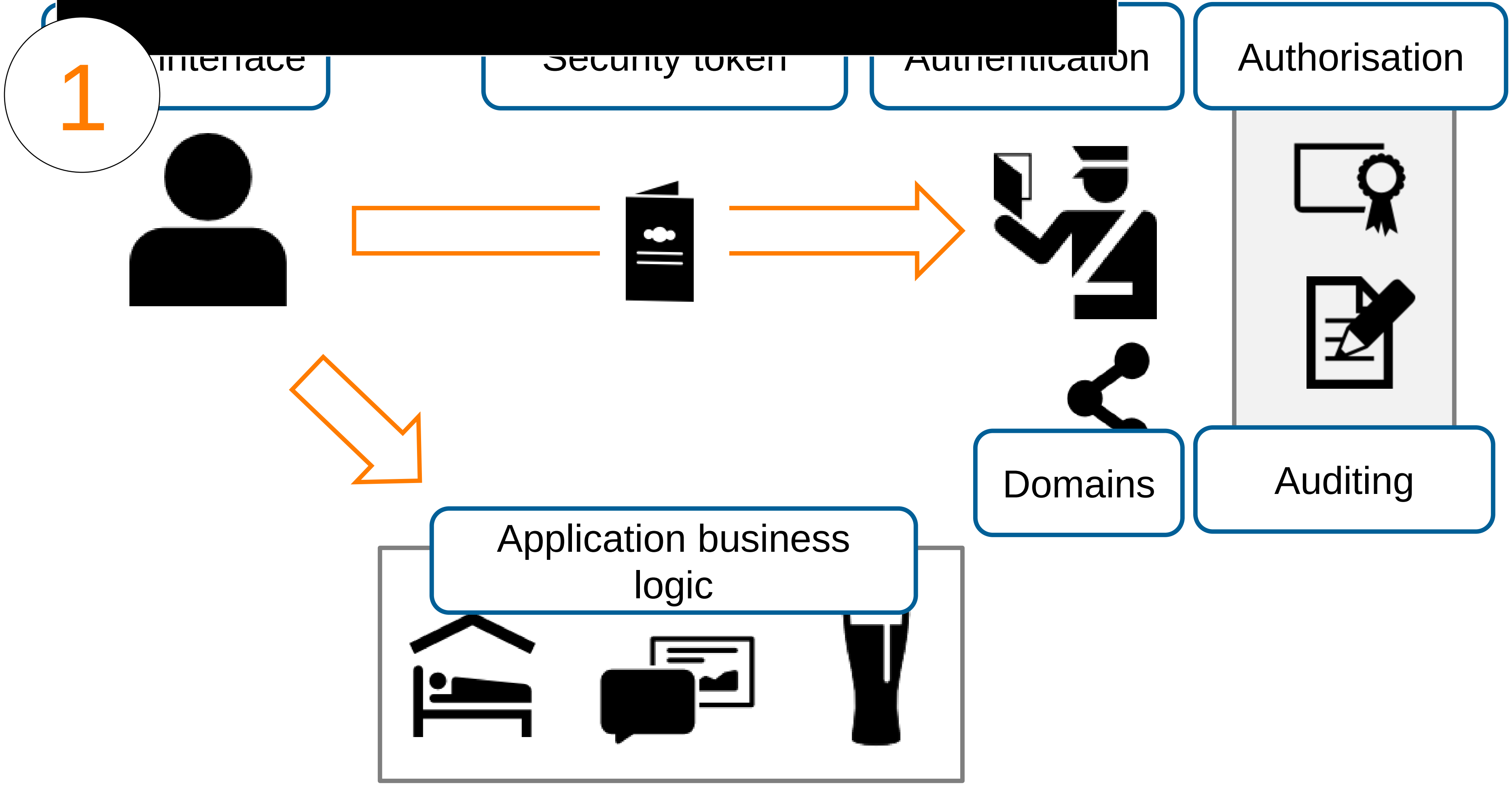
  return true.
end method.
```

Application Architecture: Business Logic

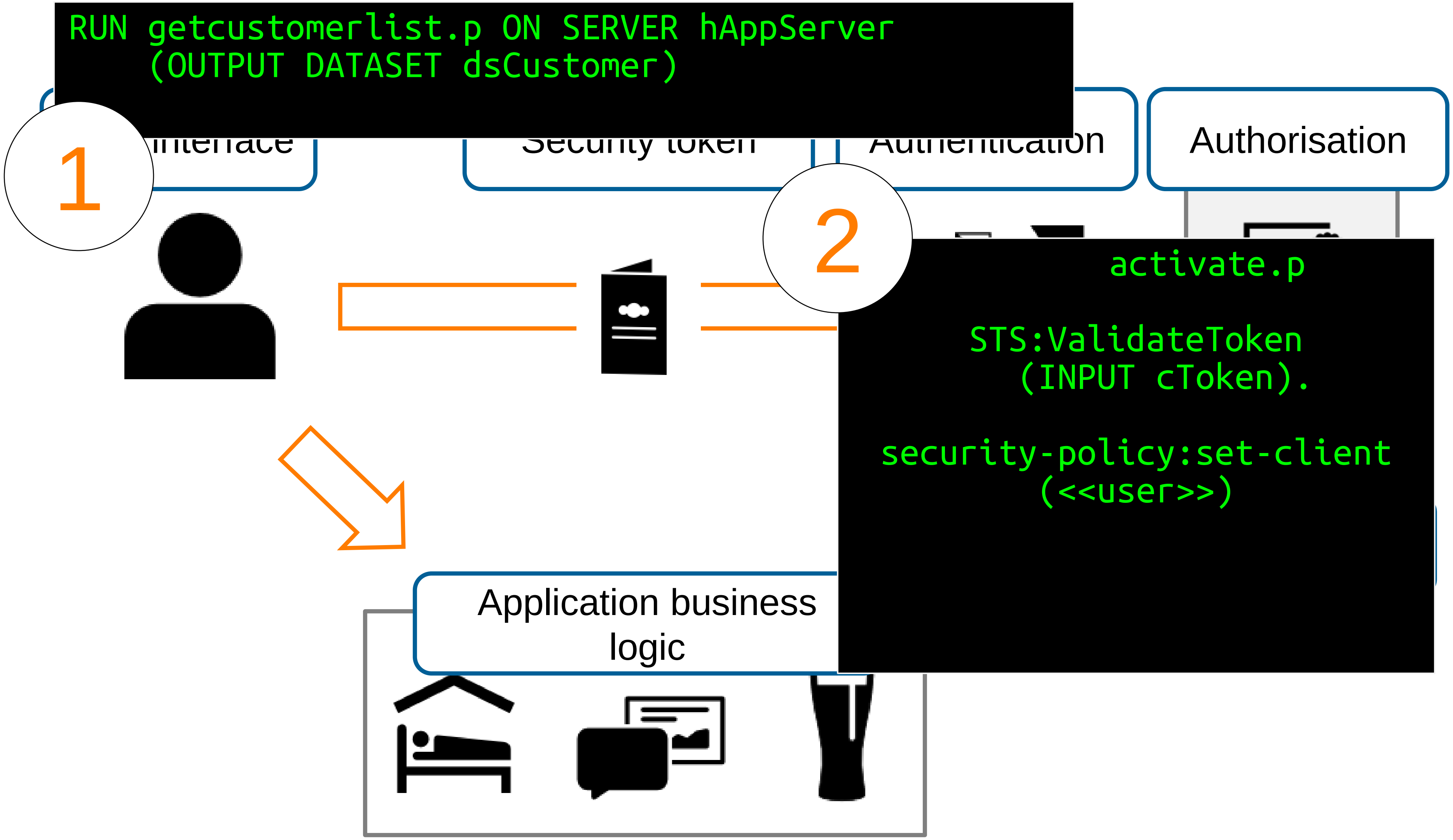


Application Architecture: Business Logic

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



Application Architecture: Business Logic



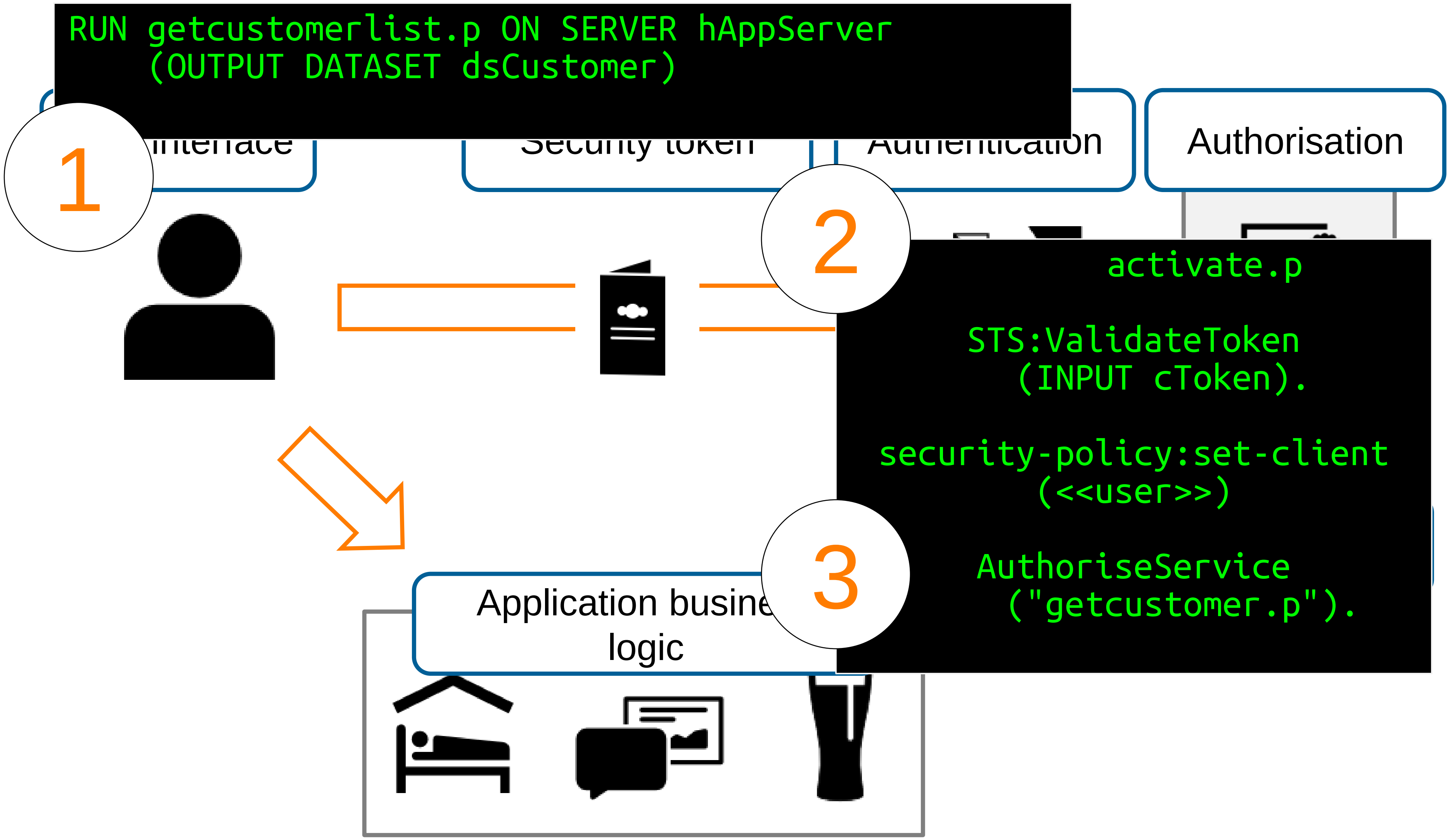
```
RUN getcustomerlist.p ON SERVER hAppServer
    (OUTPUT DATASET dsCustomer)
```

```
activate.p

STS:ValidateToken
    (INPUT cToken).

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

Application Architecture: Business Logic



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```

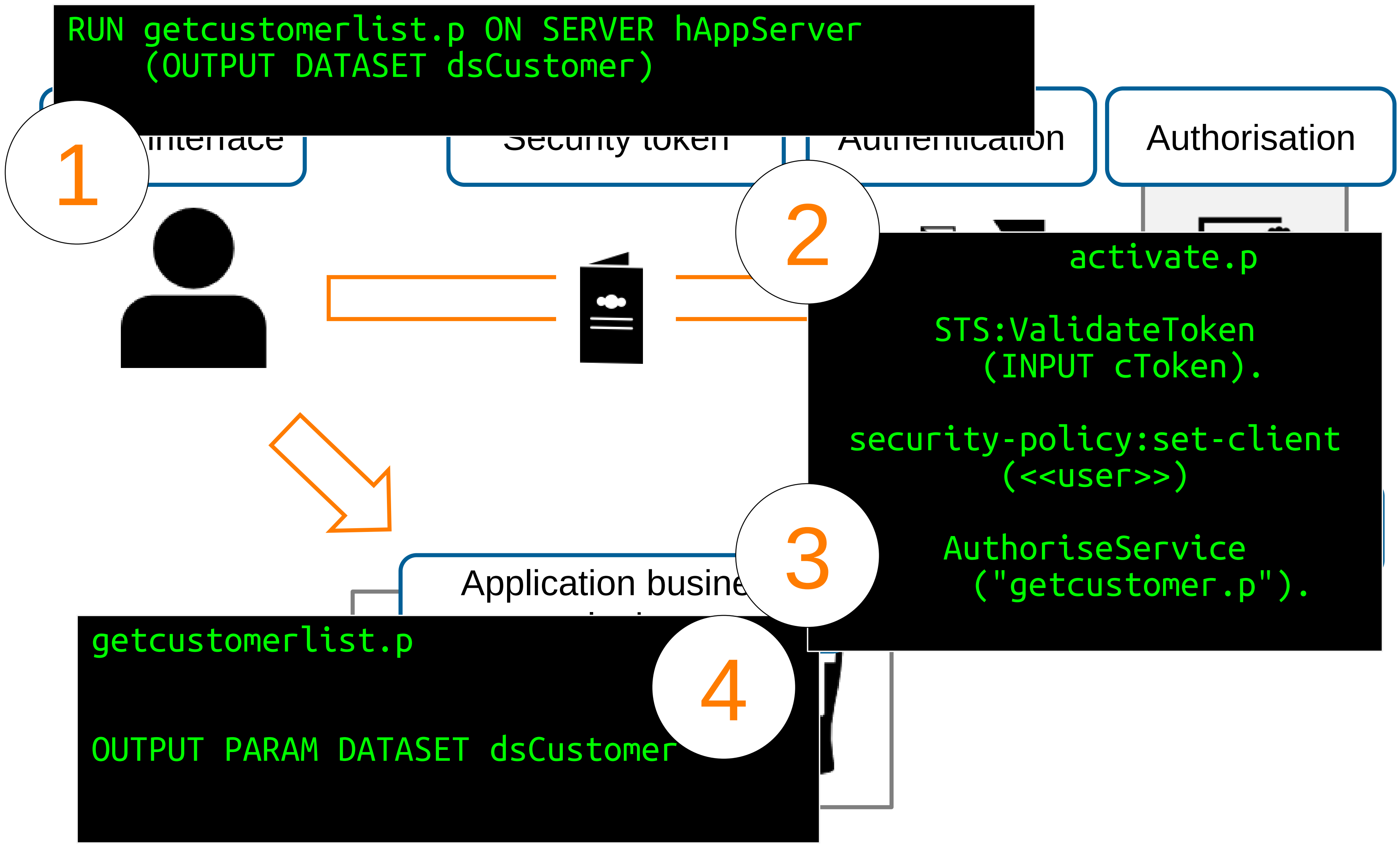
```
           activate.p

       STS:ValidateToken
         (INPUT cToken).

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

      AuthoriseService
        ("getcustomer.p").
```

Application Architecture: Business Logic



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activate.p

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security-policy:set-client
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AuthoriseService
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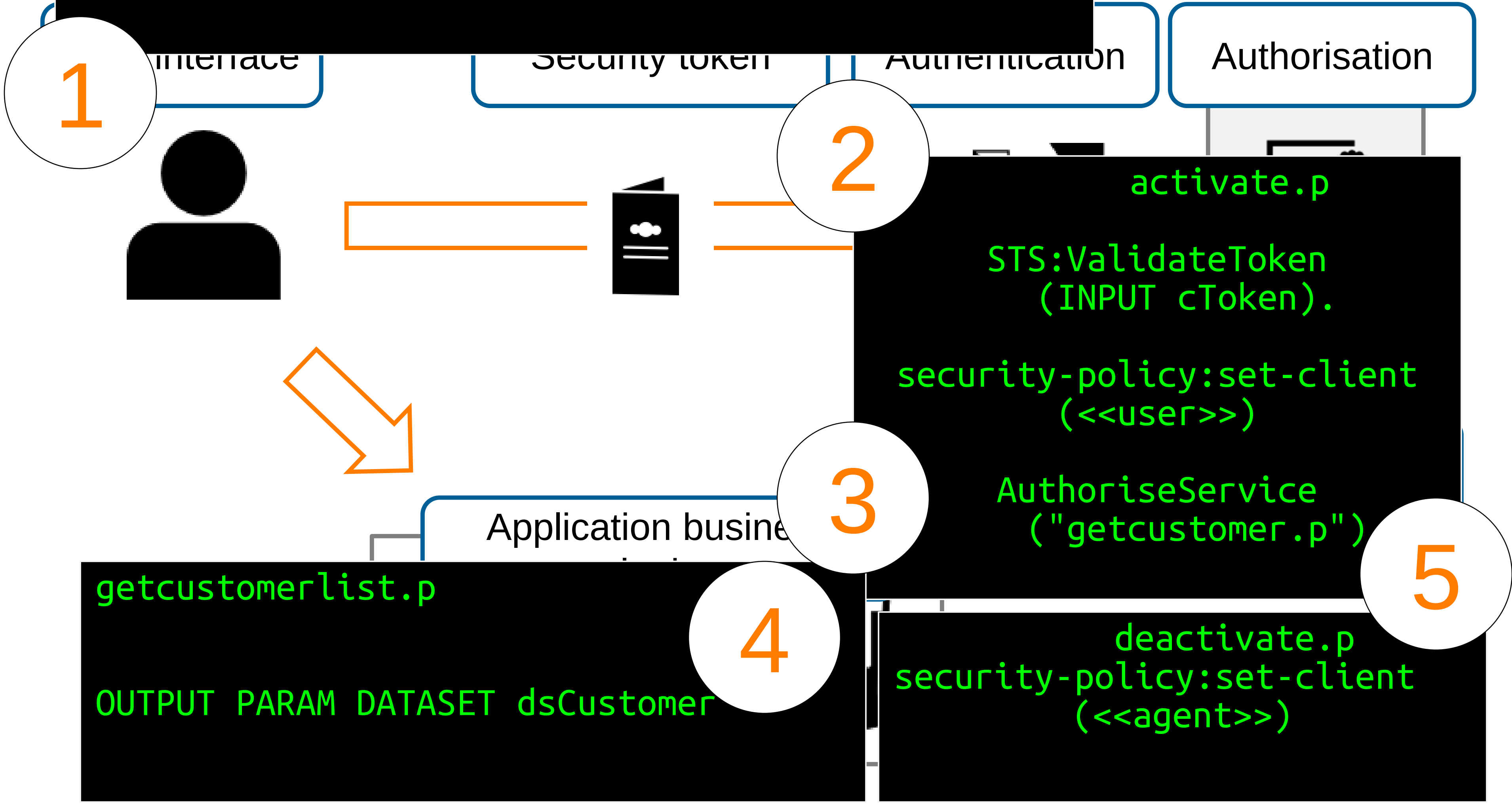
```
getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
```

Application Architecture: Business Logic



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```
activate.p

STS:ValidateToken
  (INPUT cToken).

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

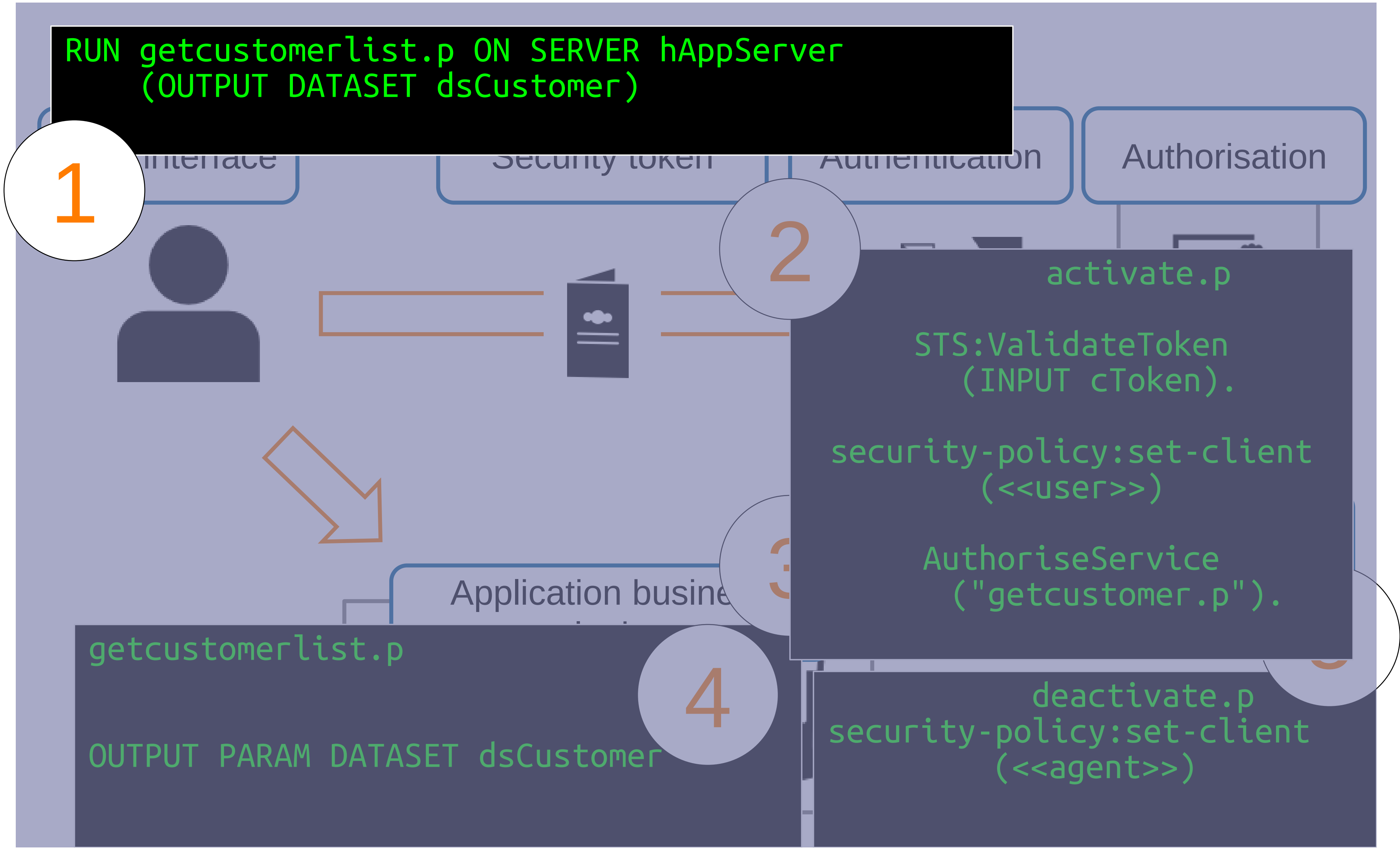
AuthoriseService
  ("getcustomer.p")
```

```
getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
```

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

Application Architecture: Business Logic



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```
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STS:ValidateToken
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  (<<user>>)

AuthoriseService
  ("getcustomer.p").
```

```
getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
```

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

Desktop.MainForm.cls

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

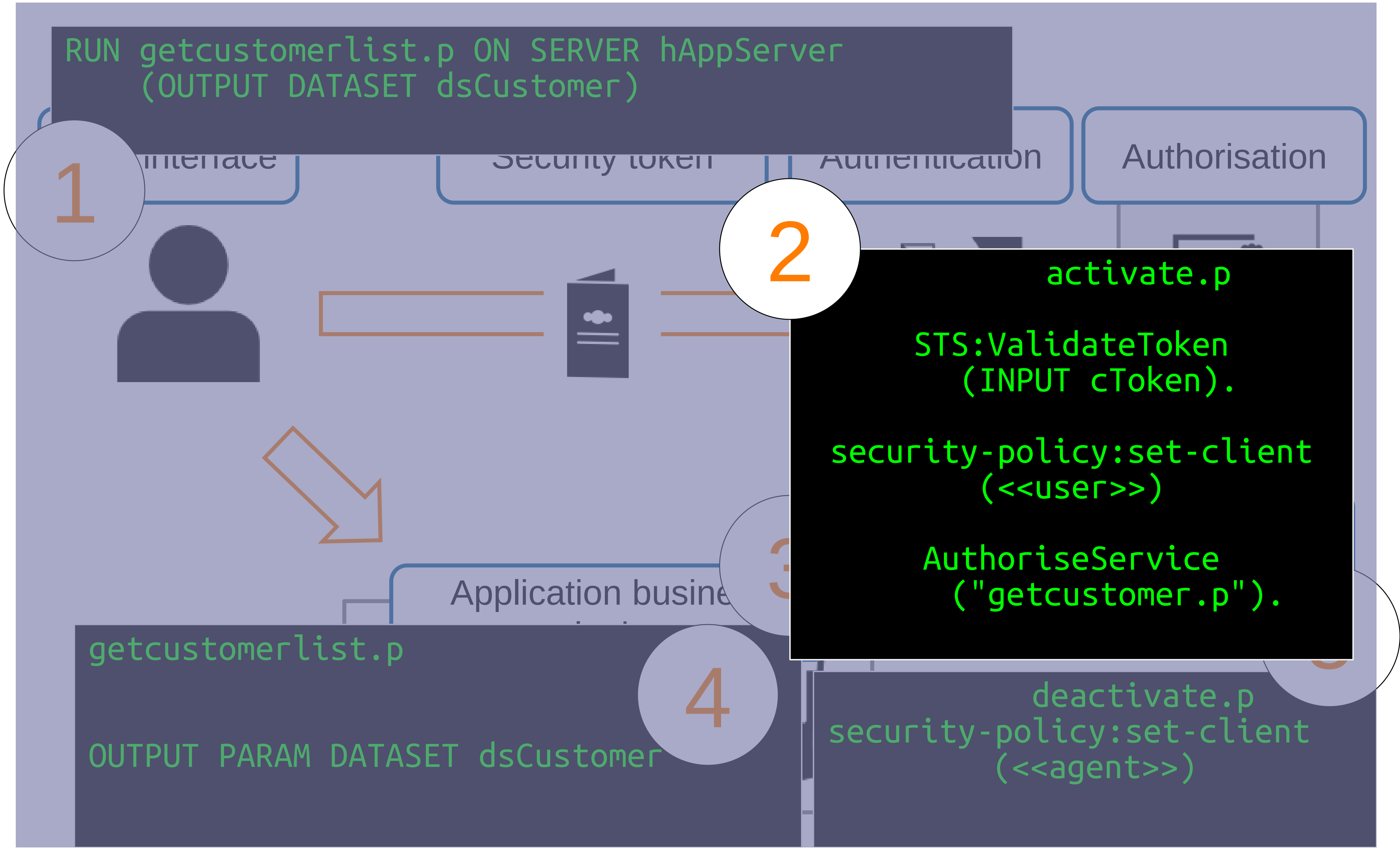
  run BusinessLogic/GetCustomerList.p on hAppServer
                          (output dataset dsCustomerOrder).

  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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STS:ValidateToken
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  (<<user>>)

AuthoriseService
  ("getcustomer.p").
```

```
getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
```

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

Security/Activate.p

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

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

Security.SecurityTokenService.cls

```
method public handle GetClientPrincipal(input pcContextId as char):
  define variable hClientPrincipal as handle no-undo.
  define variable rClientPrincipal as raw no-undo.

  define buffer lbSecurityContext for SecurityContext.

  /* scope this transaction as small as possible */
  do for lbSecurityContext transaction:
    find lbSecurityContext where
         lbSecurityContext.SessionId eq pcContextId
         exclusive-lock no-wait no-error.
    if not available lbSecurityContext then
      undo, throw new AppError('Context does not exist').
    assign rClientPrincipal = lbSecurityContext.ClientPrincipal
           lbSecurityContext.LastAccess = now.
  end.

  create client-principal hClientPrincipal.
  hClientPrincipal:import-principal(rClientPrincipal).

  return hClientPrincipal.
end method.
```

Security/Activate.p

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

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

_sec-authentication-system

```
create _sec-authentication-system.
_Domain-type                 = 'TABLE-ApplicationUser'.
_Domain-type-description =
         'The ApplicationUser table serves as
          the authentication domain'.
_PAM-plug-in                 = true.

_PAM-callback-procedure  =
         'Security/AppUserAuthenticate.p'.
```

Security/AppUserAuthenticate.p

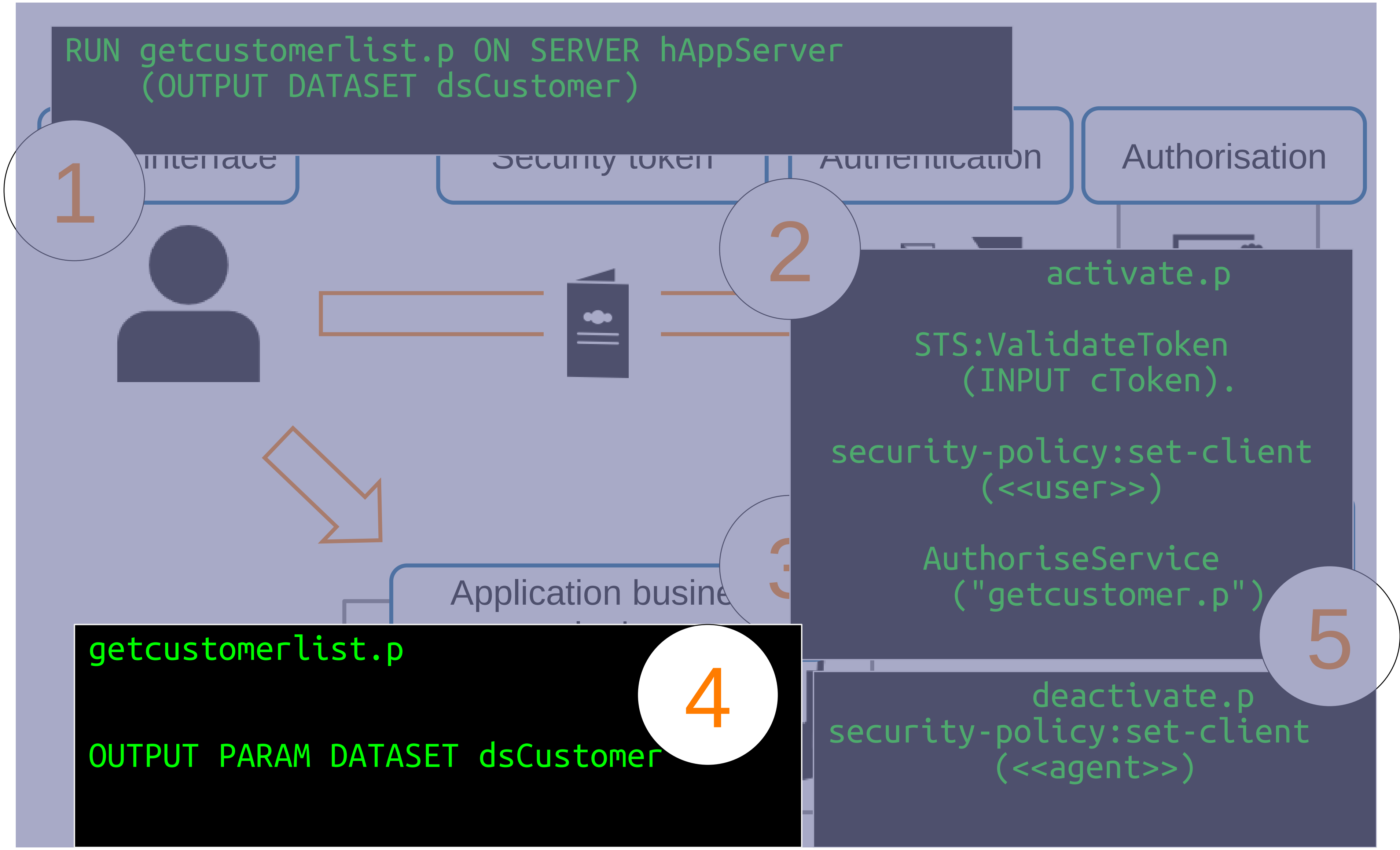
```
procedure AfterSetIdentity:
  def input param phClientPrincipal  as handle no-undo.
  def input param pcSystemOptions as character extent no-undo.

  /* At this point the CLIENT-PRINCIPAL is sealed and the
     user authenticated */

  /* Load user/application (as opposed to security)
     context here */

  return.
end procedure.
```

Application Architecture: Business Logic



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    (OUTPUT DATASET dsCustomer)
```

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activate.p

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

AuthoriseService
  ("getcustomer.p")
```

```
getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
```

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

BusinessLogic/GetCustomerList.p

```
{BusinessLogic/dsCustomerOrder.i}

define output parameter dataset for dsCustomerOrder.

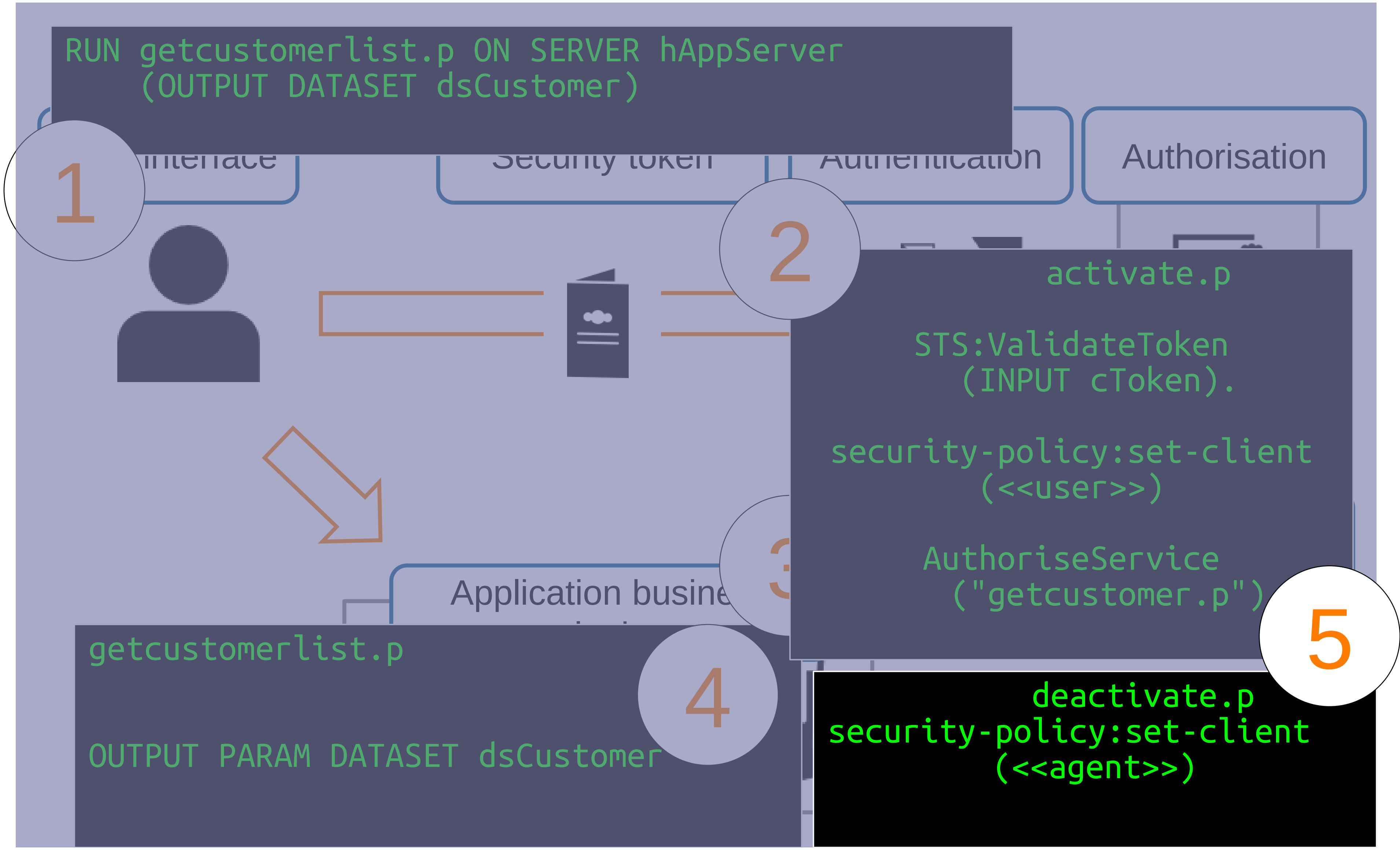
define variable oBusinessEntity as CustomerOrderBE no-undo.

oBusinessEntity  = new CustomerOrderBE().

oBusinessEntity:GetCustomers(output dataset dsCustomerOrder).

/* eof */
```

Application Architecture: Business Logic



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getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
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security-policy:set-client
  (<<agent>>)
```

Security/Deactivate.p

```
define variable hClientPrincipal as handle no-undo.

hClientPrincipal = dynamic-function(
                      'GetAgentClientPrincipal' in hStartupProc)

security-policy:set-client(hClientPrincipal).

/* eof */
```

Desktop.MainForm.cls

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

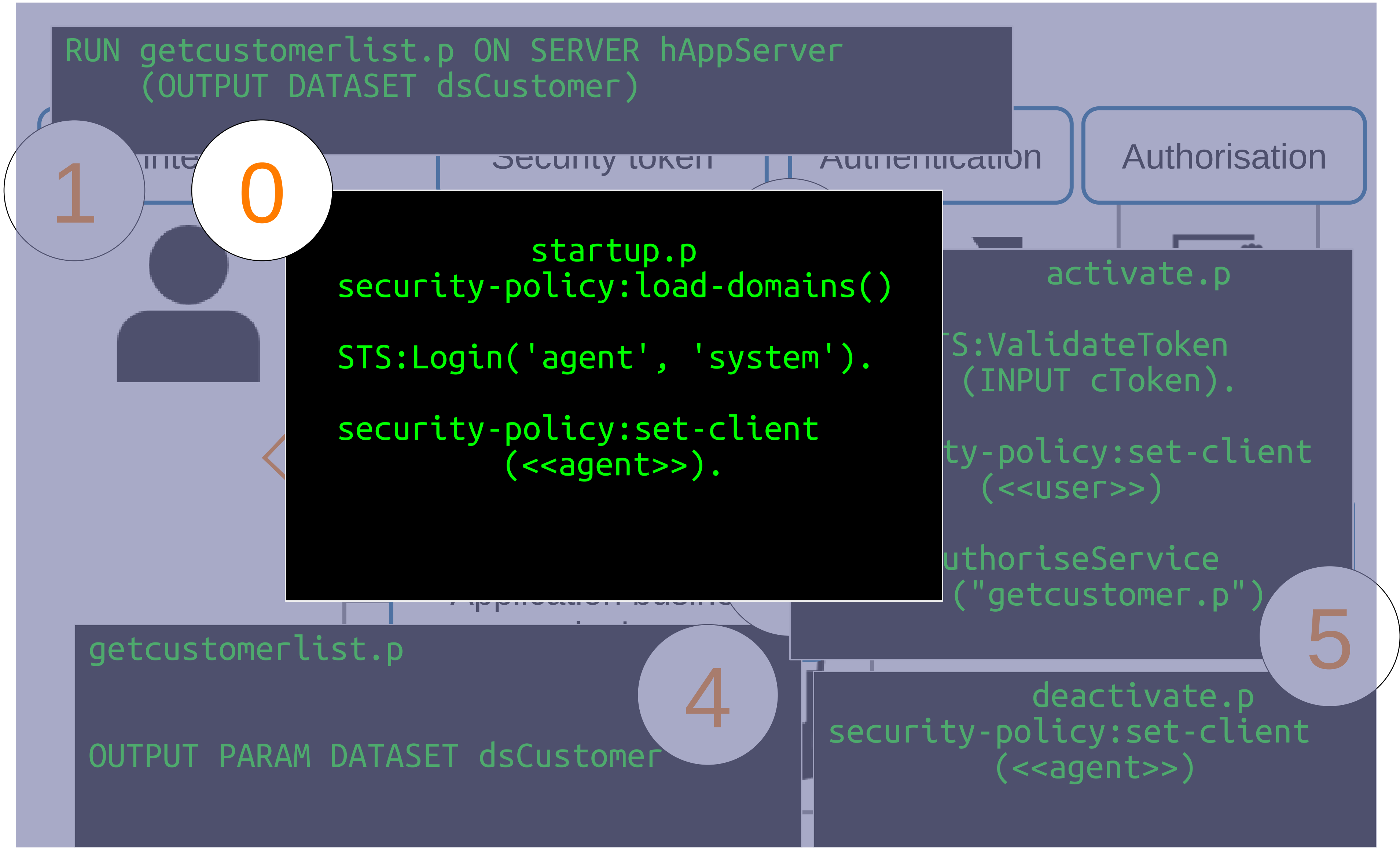
  run BusinessLogic/GetCustomerList.p on hAppServer
                          (output dataset dsCustomerOrder).

  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



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

```
startup.p
security-policy:load-domains()

STS:Login('agent', 'system').

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

```
activate.p

TS:ValidateToken
  (INPUT cToken).

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

uthoriseService
 ("getcustomer.p")
```

```
getcustomerlist.p


OUTPUT PARAM DATASET dsCustomer
```

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

Security/Startup.p

```
define input parameter pcStartupData as character no-undo.

define variable cAgentSessionId as character no-undo.
define variable hClientPrincipal as handle no-undo.

/* load domains */
security-policy:load-domains('sports2000').

/* immediately  set session user to a low-privilege agent user */
cAgentSessionId = Security.SecurityTokenService:Instance

             :LoginUser('agent', 'system','oech1::3c373b2a372c3d').

hClientPrincipal = Security.SecurityTokenService:Instance
                      :GetClientPrincipal(cAgentSessionId).

security-policy:set-client (hClientPrincipal).

function GetAgentSessionId returns character ():
    return cAgentSessionId.
end function.

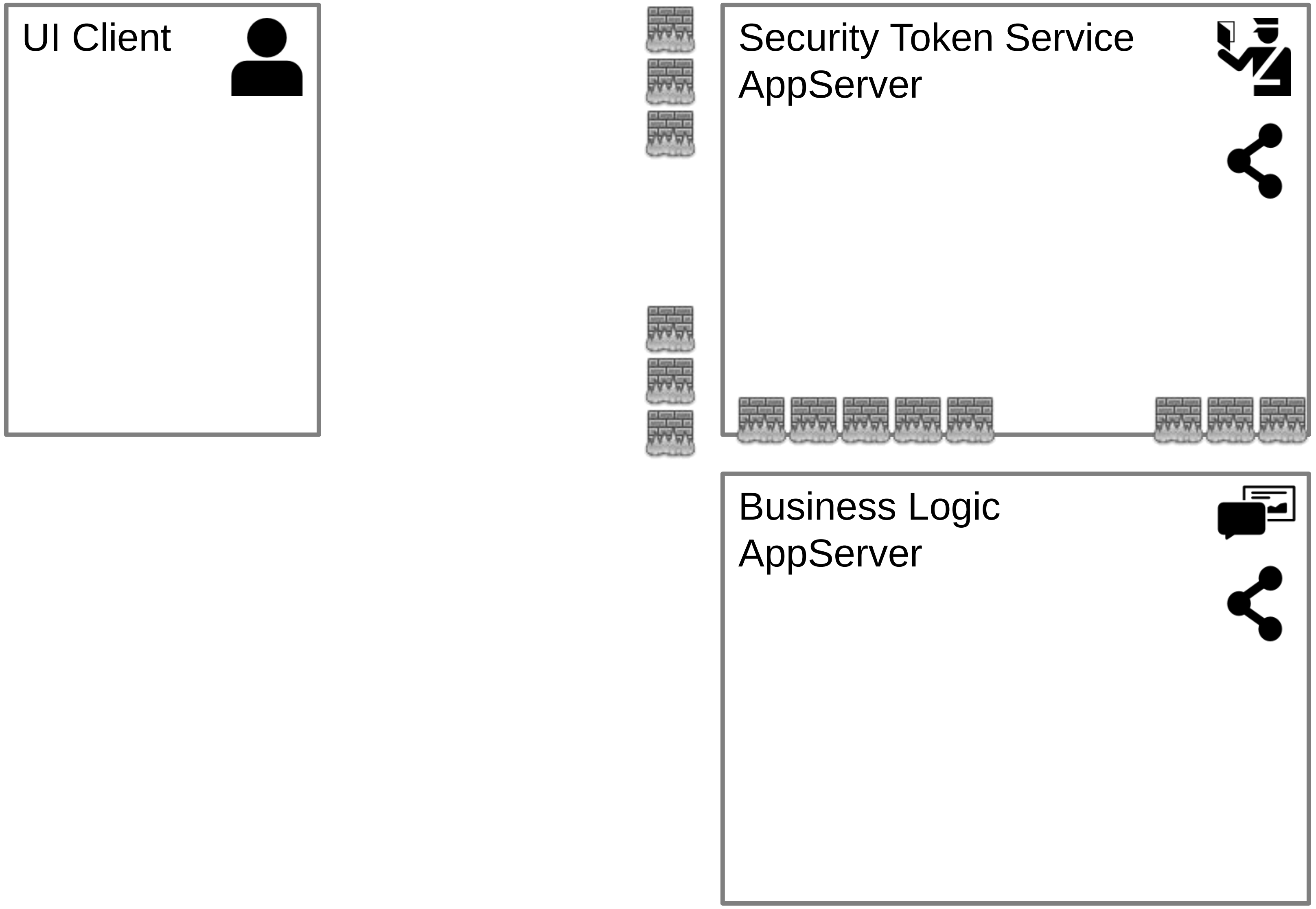
function GetAgentClientPrincipal returns handle():
    return hClientPrincipal.
end function.
/* eof */
```

Security/Shutdown.p

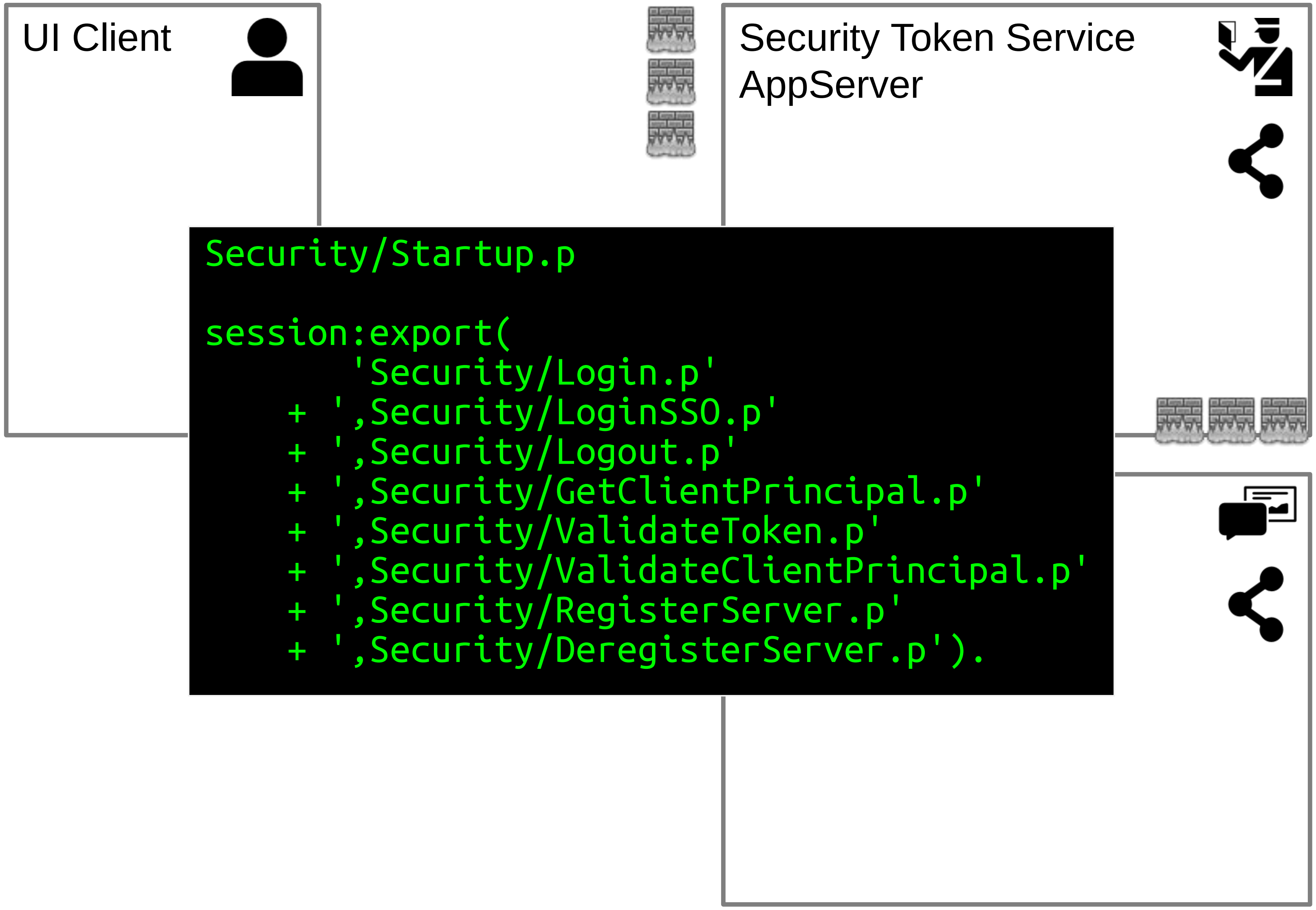
```
Security.SecurityTokenService:Instance
    :LogoutUser(
        dynamic-function('GetAgentSessionId' in hStartupProc)).

/* eof */
```

Separate AppServers for STS & Business Logic



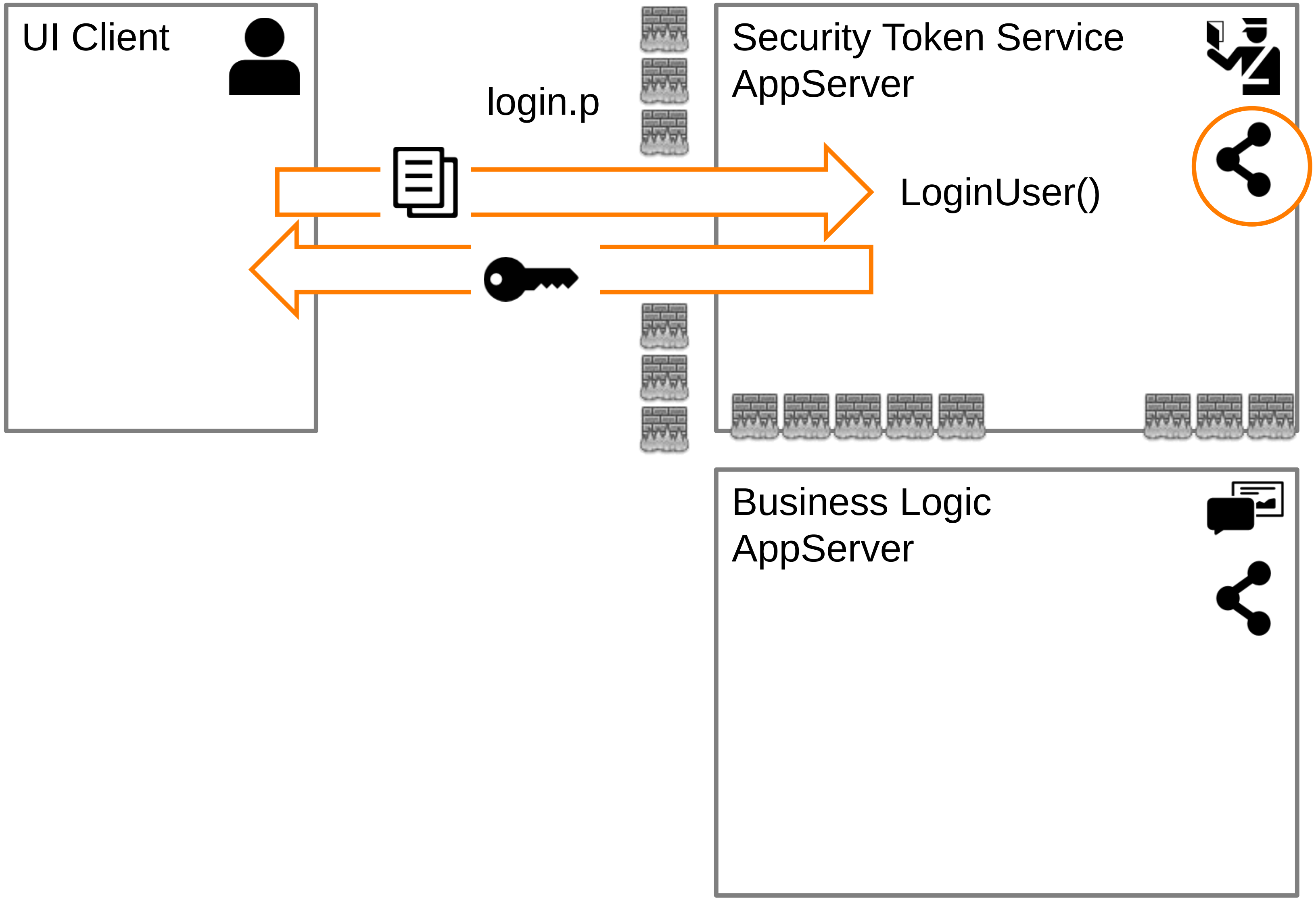
Separate AppServers for STS & Business Logic



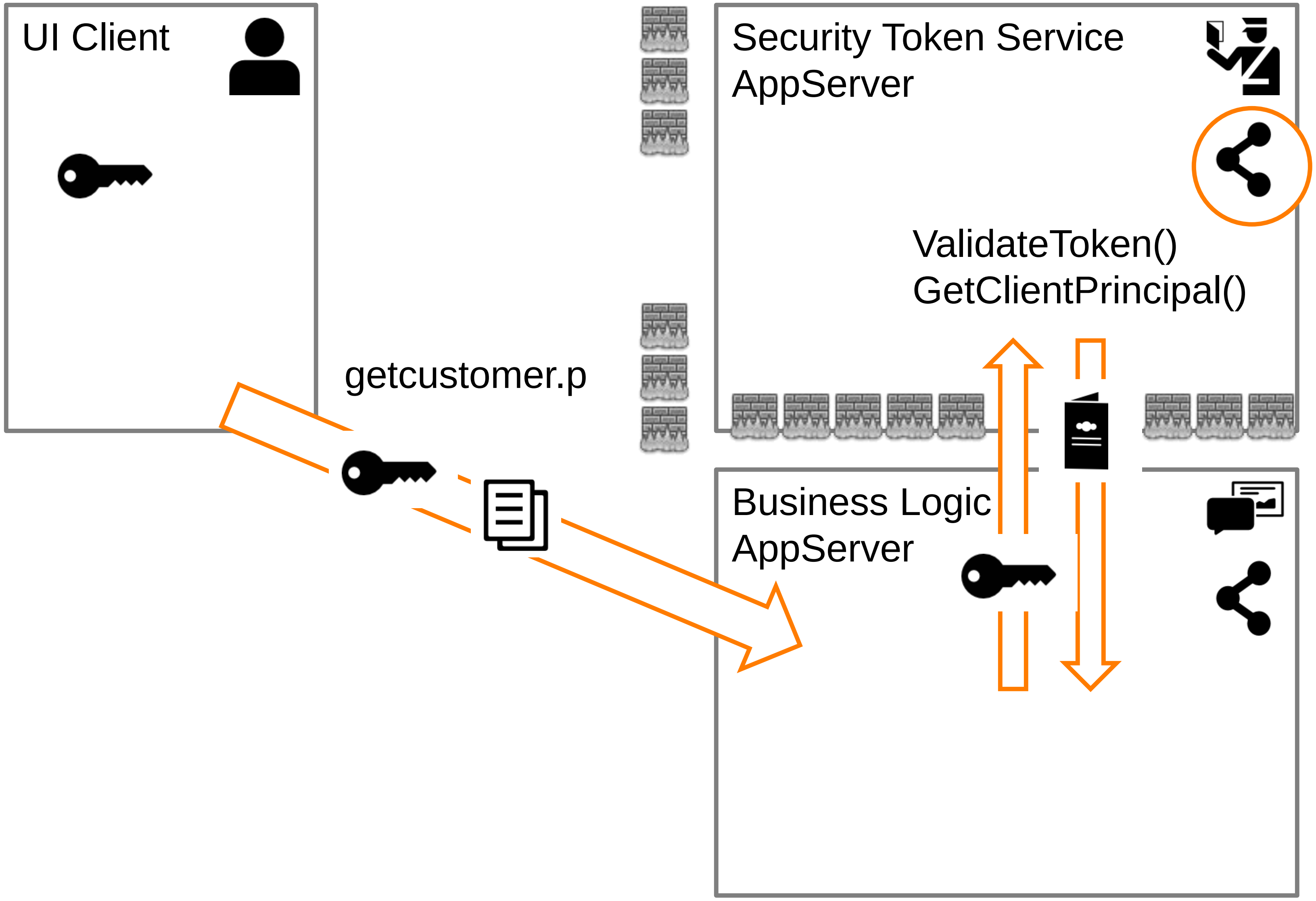
```
Security/Startup.p

session:export(
        'Security/Login.p'
    + ',Security/LoginSSO.p'
    + ',Security/Logout.p'
    + ',Security/GetClientPrincipal.p'
    + ',Security/ValidateToken.p'
    + ',Security/ValidateClientPrincipal.p'
    + ',Security/RegisterServer.p'
    + ',Security/DeregisterServer.p').
```

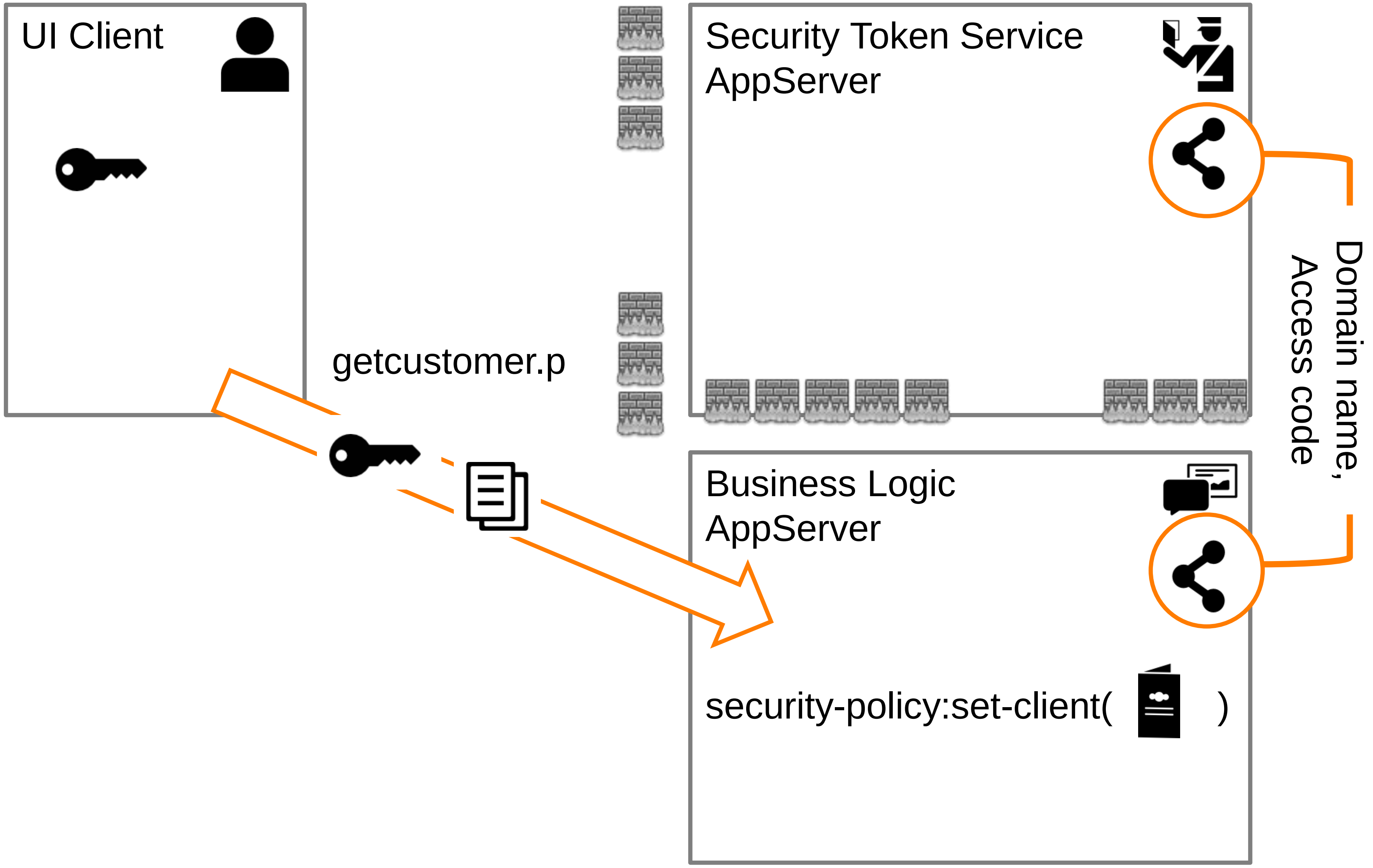
Separate AppServers for STS & Business Logic



Separate AppServers for STS & Business Logic



Separate AppServers for STS & Business Logic



_sec-authentication-system & -domain

Security Token Service

```
create _sec-authentication-system.
_Domain-type                  = 'TABLE-ApplicationUser'.
_PAM-plug-in                  = true.
_PAM-callback-procedure  =
         'Security/AppUserAuthenticate.p'.
```

Business Logic Service

```
create _sec-authentication-system.
_Domain-type                  = 'TABLE-ApplicationUser'.
_PAM-plug-in                  = true.
_PAM-callback-procedure  =
         'Security/NoLoginAuthenticate.p'.
```

Common

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

_PAM-callback-procedure

Security Token Service

```
procedure AuthenticateUser:
   /* snipped parameters*/
   find ApplicationUser where
          ApplicationUser.LoginName eq phCP:user-id and
          ApplicationUser.LoginDomain eq phCP:domain-name
          no-lock no-error.

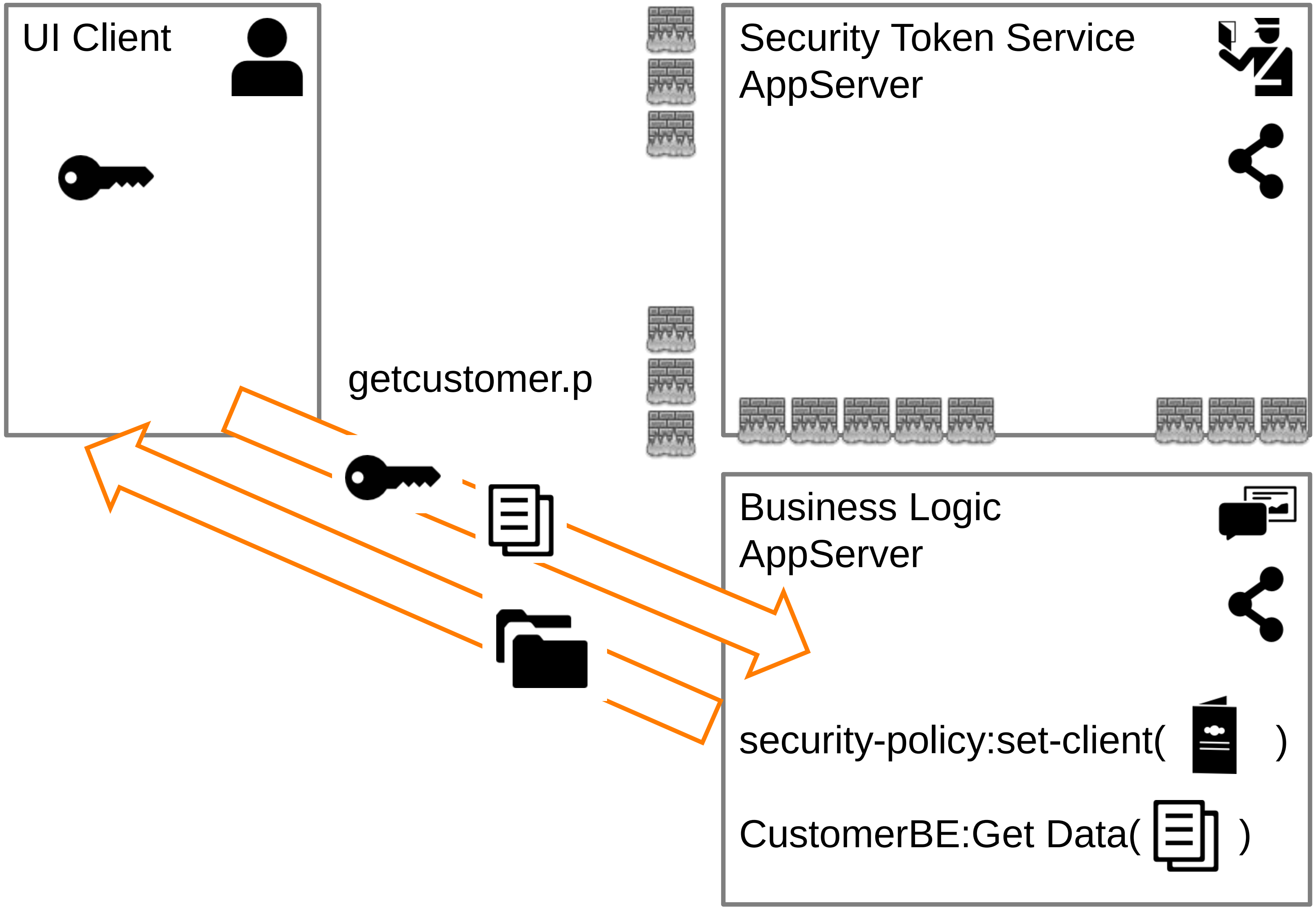
   if not available ApplicationUser then
     piPAMStatus = Progress.Lang.PAMStatus:UnknownUser.
   else
   if ApplicationUser.Password ne
      encode(phCP:primary-passphrase) then
     piPAMStatus = Progress.Lang.PAMStatus:AuthenticationFailed.
   else
     /* we're good to go */
     piPAMStatus = Progress.Lang.PAMStatus:Success.

   return.
end procedure.
```

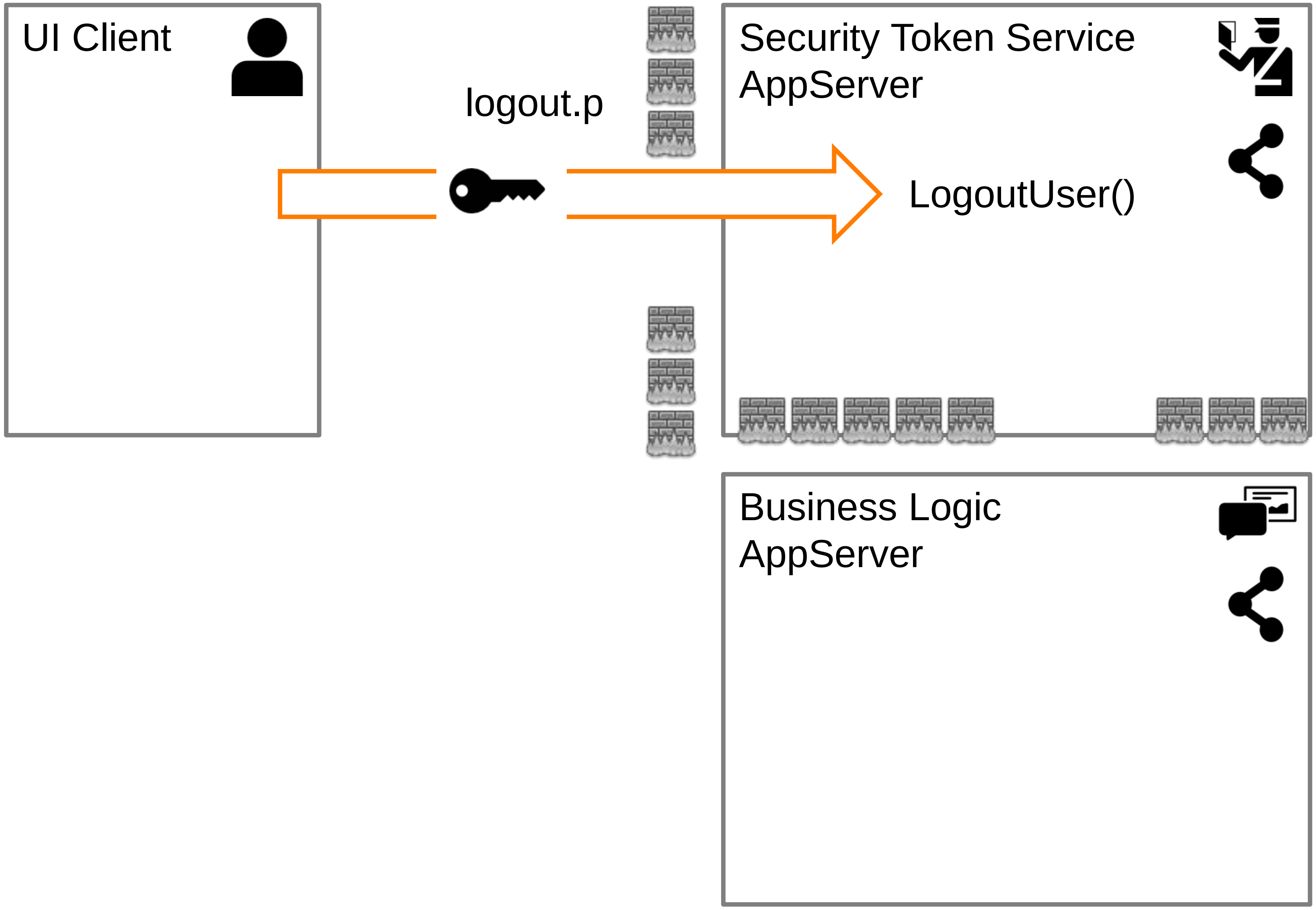
Business Logic Service

```
procedure AuthenticateUser:
  /* snipped parameters*/
  /* we're not allowed to do any logins here */
  piPAMStatus = PAMStatus:InvalidConfiguration.
  return.
end.
```

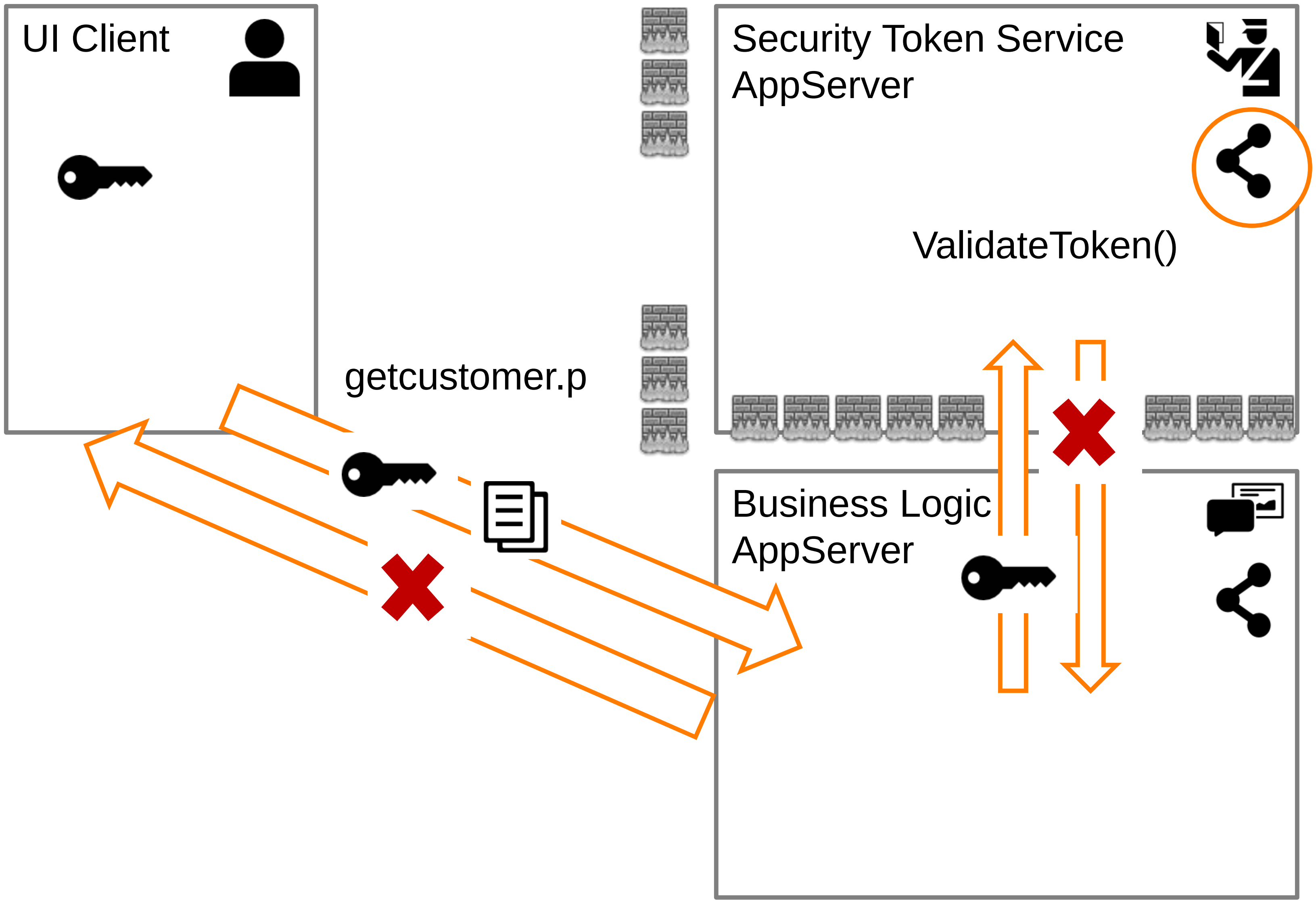
Separate AppServers for STS & Business Logic



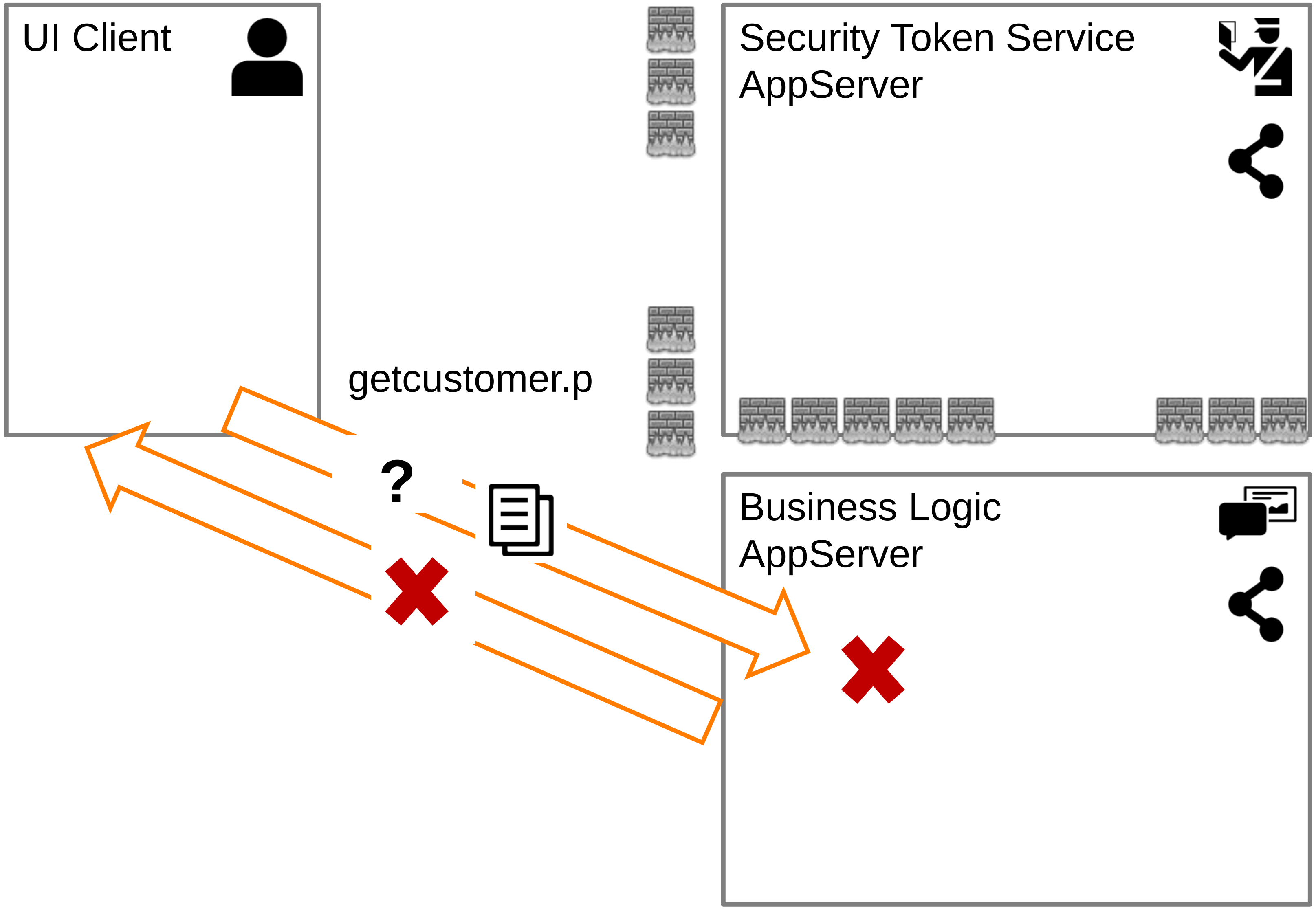
Separate AppServers for STS & Business Logic



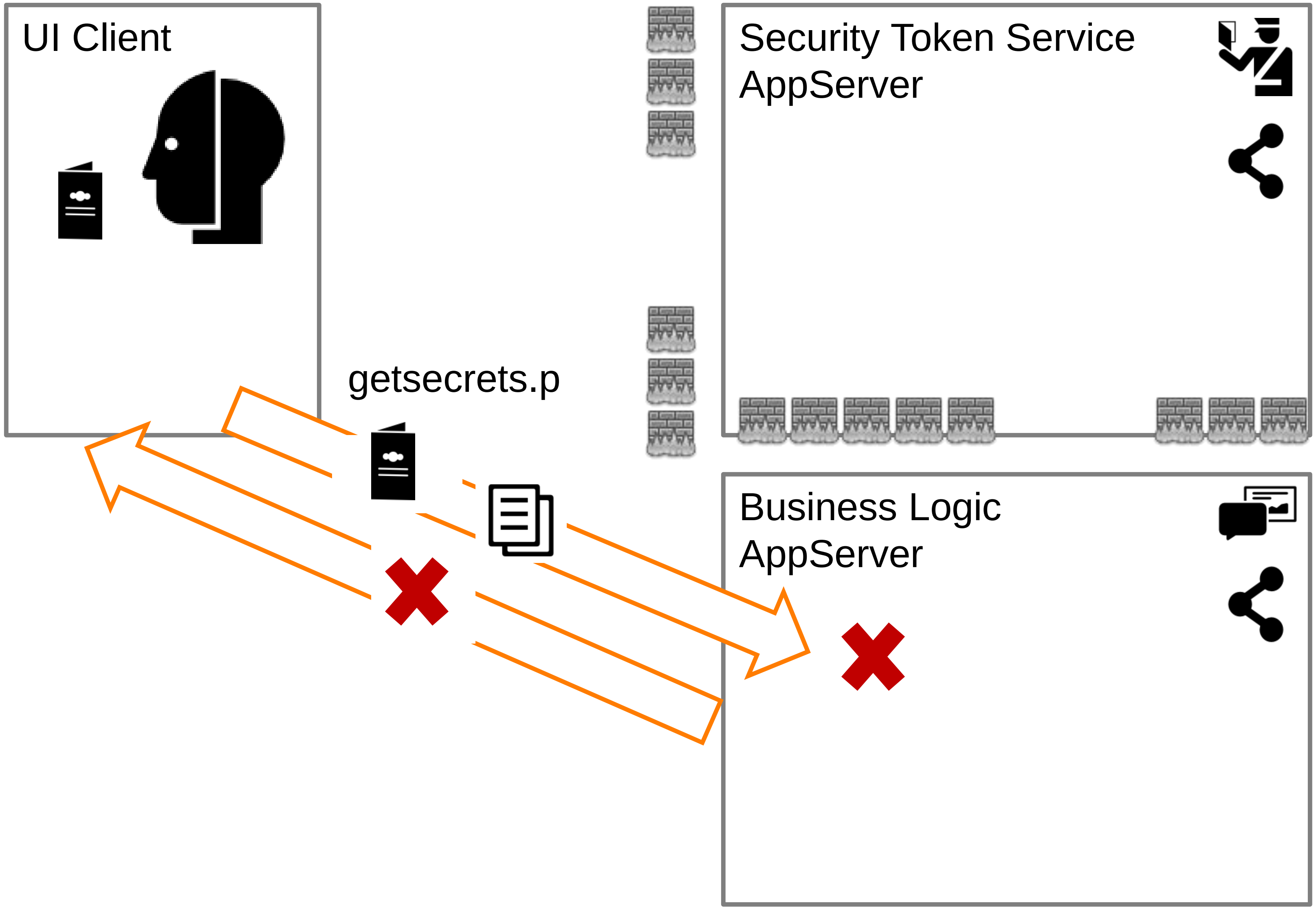
Separate AppServers for STS & Business Logic



Separate AppServers for STS & Business Logic



Separate AppServers for STS & Business Logic



OpenEdge Provides …

- A security token
  - CLIENT-PRINCIPAL available in multiple clients
  - Automatic creation in some cases
- Token available in activate procedure
- PAM modules
  - Configurable, plug-in architecture
  - Guaranteed, consistent, trusted code-paths

OpenEdge Does Not …

- Have a prescriptive model
- Manage security context for an entire application
- Automatic import of external systems’ tokens
  - For example, SAML for federated authentication

Coming Soon … {std/disclaimer.i}

- More authentication systems / PAM modules
  - Better SSO support (Windows workstation)
  - LDAP
  - ActiveDirectory
- Upgraded security for _User
- OpenEdge realm for BPM & REST

```
Progress.Security.Realm.IHybridRealm
```

Summary

- Identity management is a process that helps protect your business data

- Applications must have security designed in
  - Delegation of responsibility
  - Multiple layers

- OpenEdge provides components of identity management
  - CLIENT-PRINCIPAL
  - Authentication Systems
  - Transportation of security token

Extra materials

- This session
  - Slides to be posted on PUG Challenge site
  - Supporting code at https://github.com/nwahmaet/IdM_Sample
- Other PUG Challenge sessions
  - Coding with Identity Management & Security (Part 2)
    Peter Judge, PSC
  - Advanced OpenEdge REST/Mobile Security
    Mike Jacobs, PSC
  - Programming with the Client-Principal Object
    Chris Longo, BravePoint

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