

4. Requirements Analysis

4. 1. What is Requirements Analysis

- Goal: understand the problem as perceived by the user

Focus on "what" not "how"

- Done by system analyst/system ...engineer/chief system designer

- Tasks:

1. problem recognition

work from system spec guided by sw project plan
understand sw context and scope
communicate with managers, users, technical staff, ...

2. evaluation and synthesis

identify the flow and content of information
define and elaborate sw functions
establish system interface characteristics
uncover design constraints

3. modeling

data flow, control flow, information content, formal methods,...
e.g., as in Structured Analysis

4. specification

a detailed and precise description of a set of requirements

5. review

completeness and consistency, traceability to requirements documents

4. Requirements Analysis

4. 2. How To Carry Out Requirements Analysis

Calibration and tracking questions

Are you the right person to answer these questions?

Are your answers "official"? If not, who can give official answers?

Are the questions relevant to the problem you have?

Are there too many questions?

Is there anyone else I should talk to?

Is there anything else I should be asking you?

Unaskable questions (ask indirectly)

Are you opposed to the new system?

Are you trying to obstruct/delay the new system?

Do you feel threatened by the proposed system?

Are you trying to create a more important role for yourself?

FAST Approach to Requirements Analysis

Facilitated Application Specification Technique

Use joint team of developers and customers

Needs to be staged so that customer representatives feel free to contribute and criticize

JAD (Joint Application Development)

developed by IBM in 1977

increased productivity (20-60%), enhanced design quality, lower cost

**4 tenets: group dynamics + visual aids +
organized, rational process + WYSIWYG documentation approach**

4. Requirements Analysis / Sw Specification

Requirements Analysis Techniques

Structured Analysis

Object Oriented Analysis and Data Modeling

JSD - Jackson System Design

SADT - Structured Analysis and Design Technique

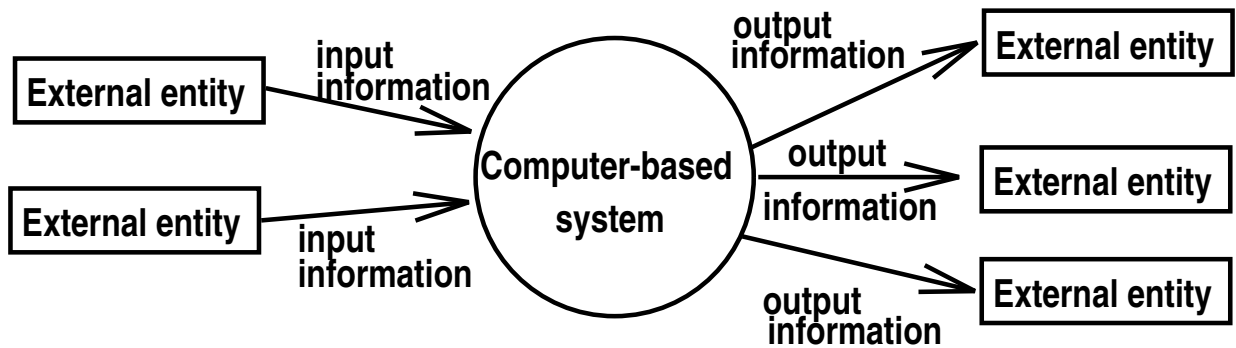
Formal Methods - Z, Larch

Structured Analysis

- graphical approach to describing requirements (Why?)
- model system based on information flow through the system
 - Data Flow Diagram (DFD)* models transformations
 - Control Flow Diagram (CFD)* models system behavior
 - Requirements/Data Dictionary* defines all terms
- hierarchical approach - increasing level reveals more detail (Why?)
- originally a manual technique, now widely automated by CASE tools

Data Flow Diagrams (DFD)

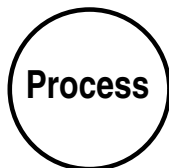
❑ The Basic Form:



❑ Terminology

External entity

A producer or consumer of information that resides outside the bounds of the system.



Process

A transformer of information that resides within the bounds of the system.



Data item

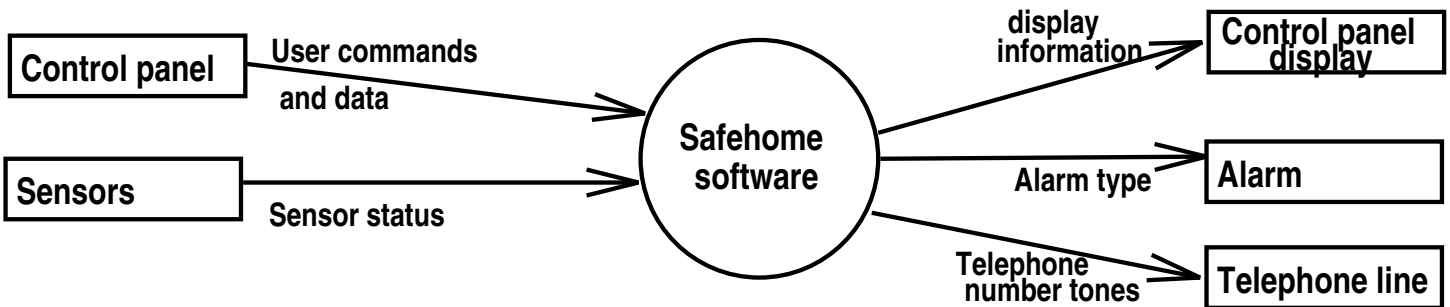
A data item or collection of data items; the arrowhead indicates the direction of data flow

Data store

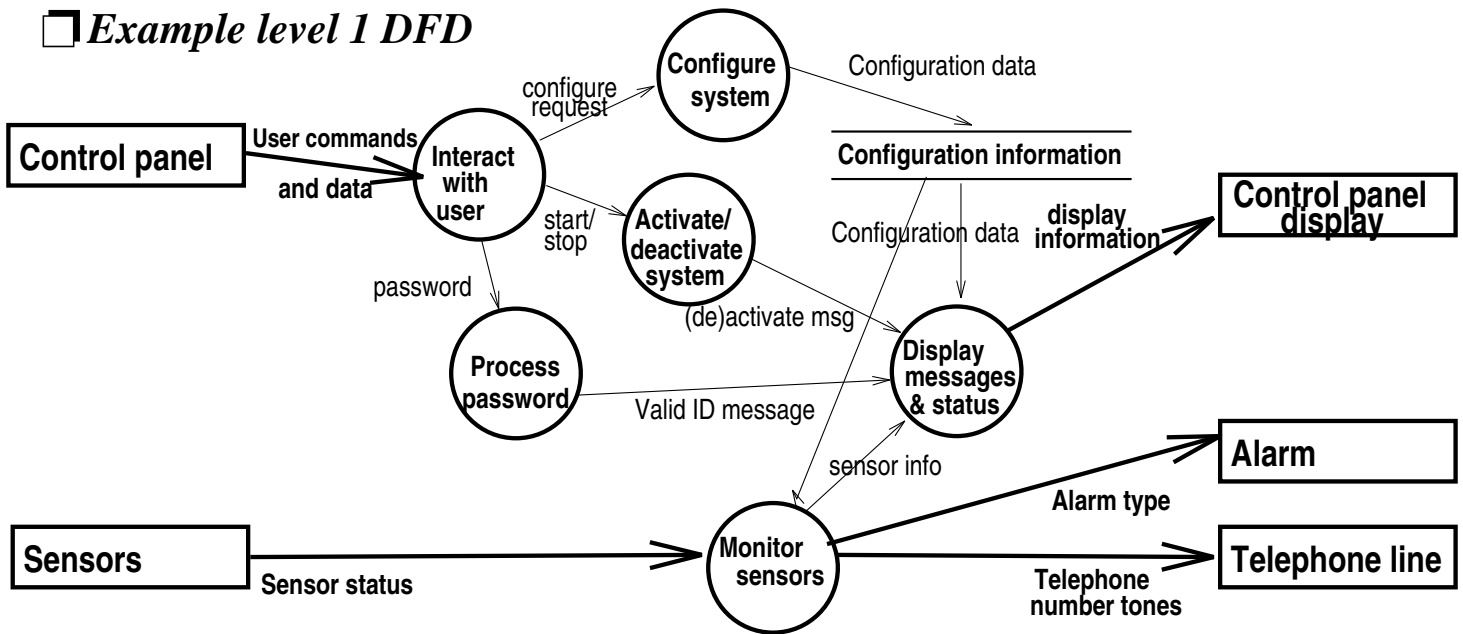
A repository of data to be stored for use by one or more processes

Data Flow Diagrams (DFD)

□ *Top level (0) DFD gives context of system in its operating environment*



□ *Example level 1 DFD*

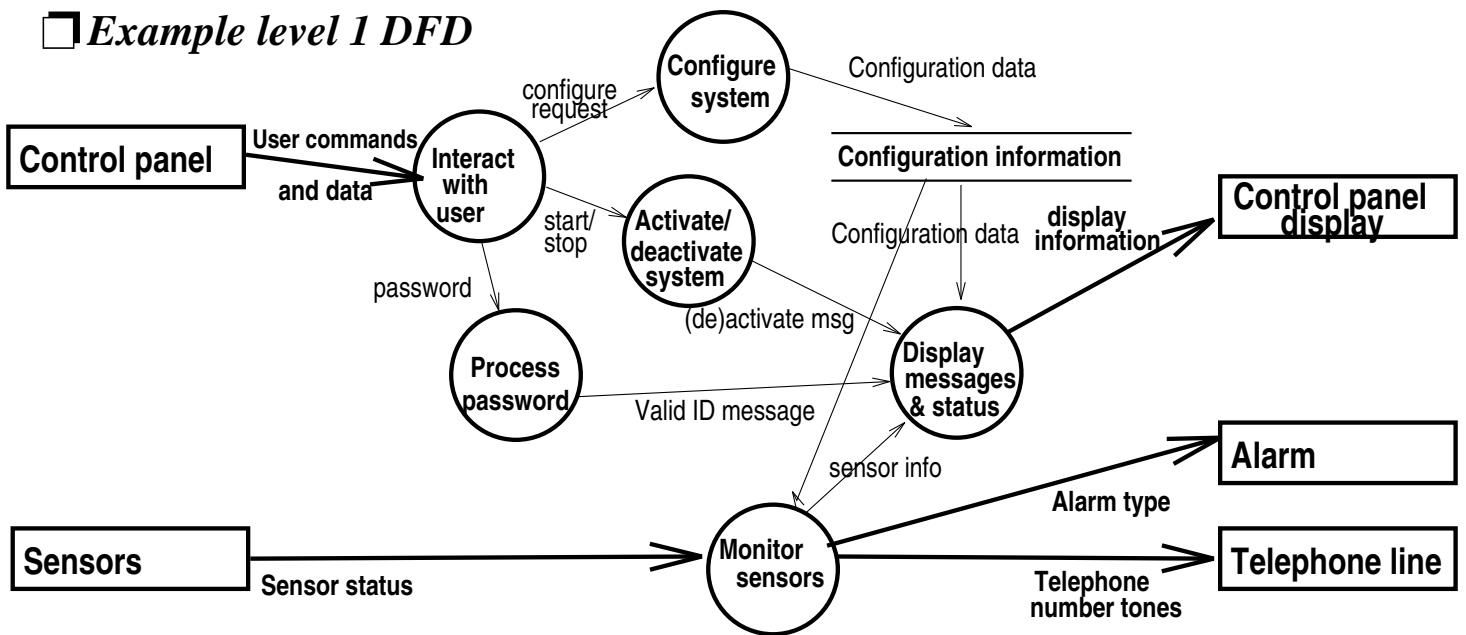


□ *Data Flow Modeling Constraints*

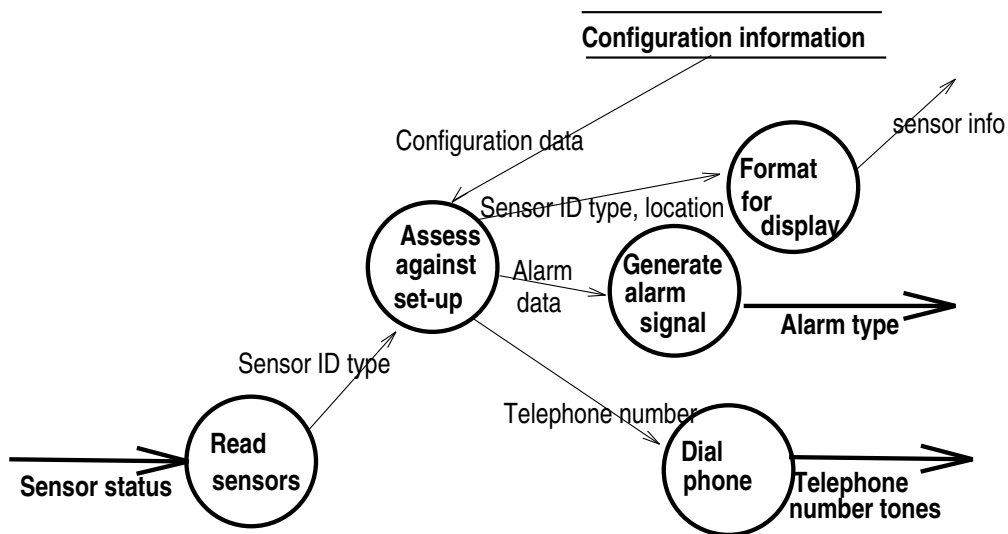
- ▲ Refine from level N to level N+1 by selecting a process, data items & stores at level N. *(Expand one process/bubble at a time)*
- ▲ Information Flow Contiguity must be maintained between levels *(All level N inputs & outputs must appear at level N+1)*
- ▲ Create Data Dictionary entries for level N+1 data items
- ▲ Narrative (text) description defines each processor, I/O, design constraints, etc.
- ▲ *Do diagrams show processing order?*

Data Flow Diagrams (DFD)

Example level 1 DFD



Example Level 2 DFD refining the monitor sensors process



Requirements/Data Dictionary

☐ *Complete description for all objects (data elements) defined during SA*

☐ *Example*

name: telephone number

aliases: none

where/how used: **assess against set-up** (output)
dial phone (input)

description: **telephone number = [local extension| outside number]**

☐ *Content description notation*

<i>Data construct</i>	<i>Notation</i>	<i>Meaning</i>
Sequence	=	<i>is composed of</i>
Selection	+	<i>and</i>
Repetition	[]	<i>either-or</i>
	{ } ⁿ	<i>n repetitions of</i>
	()	<i>optional data</i>
	* *	<i>delimits comments</i>

☐ *Example: cont'd*

local extension = [2001 | 2002 | ... | 2999]

outside number = 9 + [local number | long distance number]

local number = prefix + access number

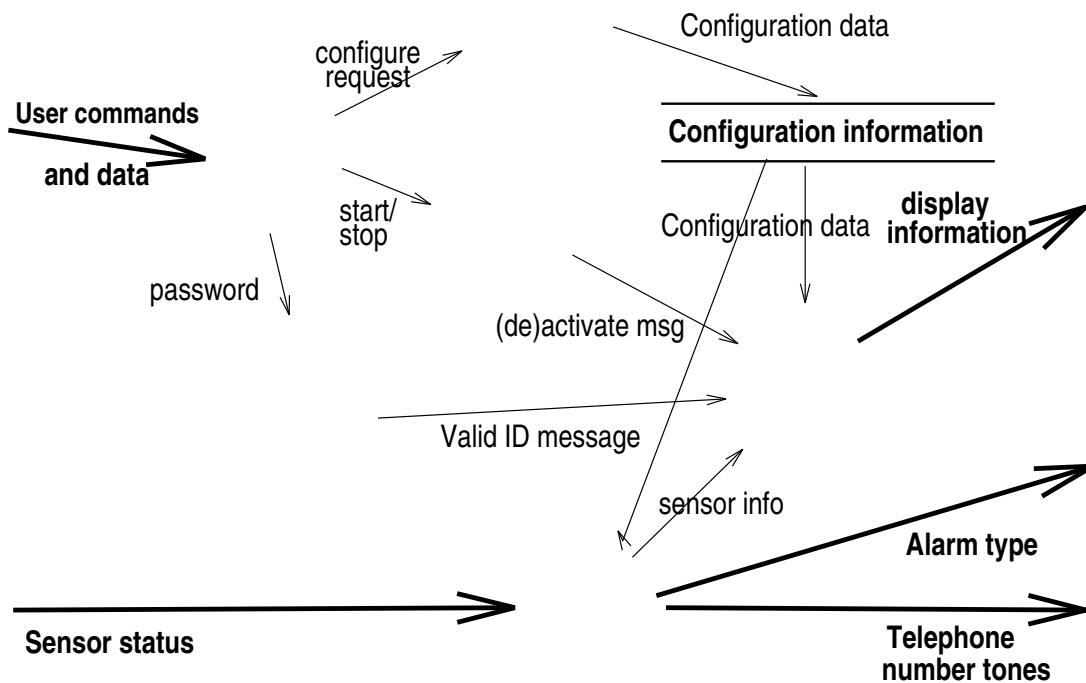
long distance number = (1) + area code + local number

prefix = [690 | 883 | 235]

access number = *any four number string*

Data Flow Diagrams (DFD)

Example level 1 DFD



Control panel

**Interact
with
user**

**Configure
system**

**Activate/
deactivate
system**

**Control panel
display**

**Process
password**

**Display
messages
& status**

Alarm

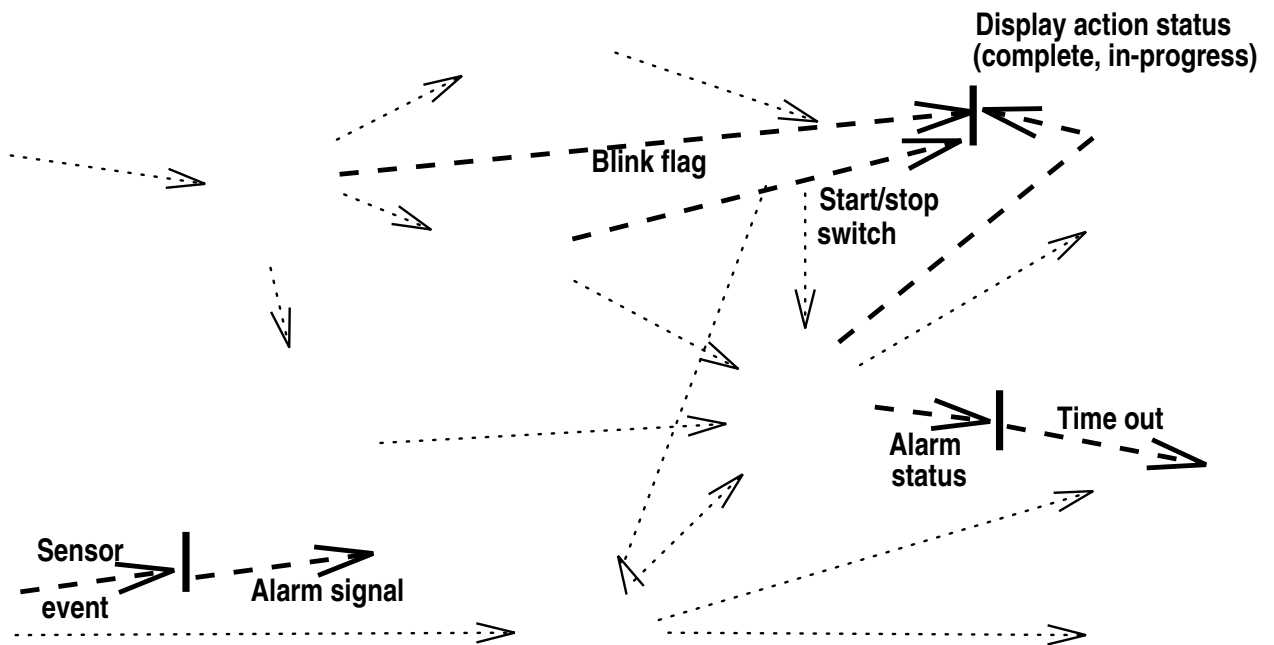
Sensors

**Monitor
sensors**

Telephone line

Control Flow Diagrams (CFD)

□ Example level 1 CFD



Control item A control item or event; takes on a boolean or discrete value; the arrowhead indicates the direction of control flow



Control store A repository of control items that are to be stored for use by one or more processes

State Transition Diagrams (STDs)

