

## Integration of Smart Cards into Automation Networks

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- Motivation and Scenarios
- Related Work
- State of the Art
- Proposed Architecture
- Conclusions and Future Work



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## Motivation

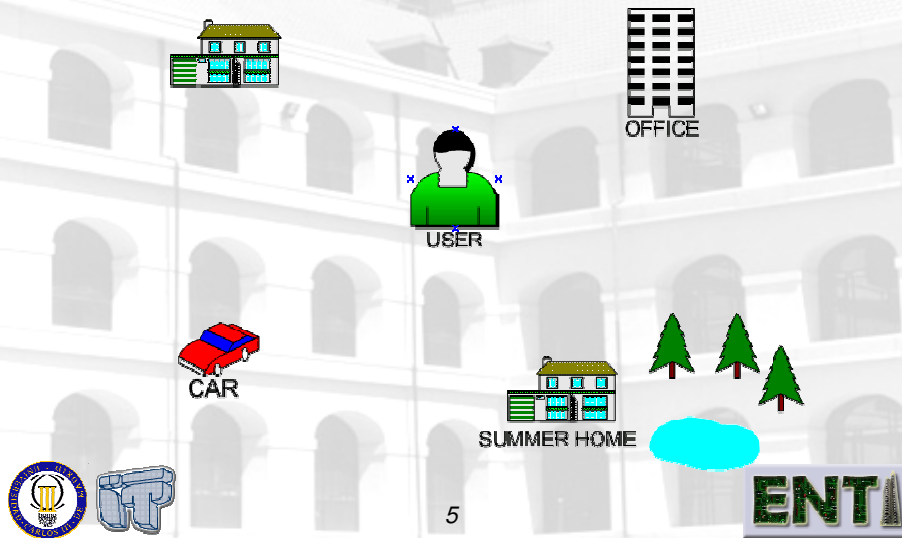
- Intelligent environments:
  - User aware.
  - Customisable.
- User configurations storage media :
  - Portable.
  - No energy consumption.
  - Programmable.
  - Configuration for different environments.



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## Scenario



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## Related Work

- Interactions between automation networks and smart cards → only user authentication  
Examples of current projects:
  - FUTURE HOME (IST IPv6 Cluster)
  - ePerSpace. IST 506775 (6<sup>th</sup> Fram. Programme)
- Similar concept in SUN white paper  
“*The Connected Home Powered by Java EmbeddedServer*”



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## Smart Cards

- Devices able to store, process and protect data from unauthorized access or tampering
- Traditionally → mean to authenticate users
- Lately more computational power:
  - Cryptography operations
  - On-card applications



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## Automation Networks (LonWorks)

- **Automation networks:** networks used to automate and control buildings, companies, houses etc.
- **LonWorks:** decentralized and distributed control network.
- **Architecture:** composed of a set of intelligent nodes (LonTalk).



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## More about LonWorks

- Network Variables (NVs)
  - LonWorks technology concept
  - Used to adapt environments to user's preferences
- Nodes share information via NVs
- Modifying NVs' values → change the nodes' behaviour (Environment)



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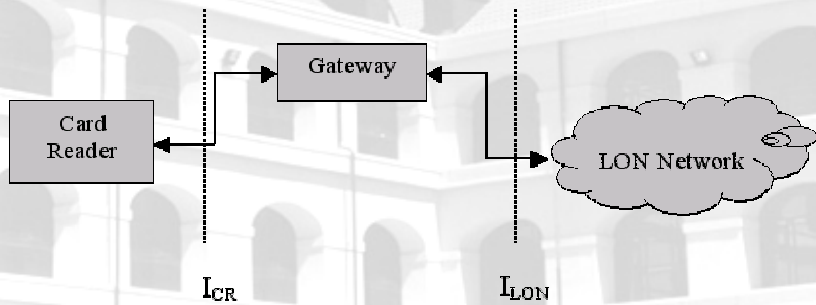
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# Proposed Architecture (I)



I<sub>CR</sub>: Card Reader interface, I<sub>LON</sub>: LonWorks network interface



# Proposed Architecture (II)

- Smart Card
  - Stores and manages the user configurations
- I<sub>CR</sub>
  - Interface between the card reader and the gateway
- Gateway
  - Translation of received information from the card to the network and vice versa:
    - Customising an environment / network
    - Storing network current status as user's configuration
- I<sub>LON</sub>
  - Network Interface
- LonWorks network
  - Its nodes behaviour depends on network variable values.



# Card operations / Interface

- Stores user configurations
- Valid in different LonWorks networks
- Configuration Management Application (CMA)
  - Application for controlling information stored in the card
- Card stores two different data structures for each network
  - User configurations
  - Network variables and its value
- Interaction with Gateway
  - Independent information storing
  - Smart Card and Gateway exchange APDUs via RS-232
  - Gateway communicates with CMA



# Configuration and network variable

- User Configuration

Env. ID	Conf. ID	Ref. To NV01	Ref. To NV02	Ref. To NV03	...	Ref. To NV0n
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- Network Variables

Network Variable	Value
1	Value_1
2	Value_2
...	...



# Gateway: Modes of operation

- Configuration mode:  
Programming the card with the information of the gateway
- Operation mode:  
Configuration of LonWorks network with information stored in the card

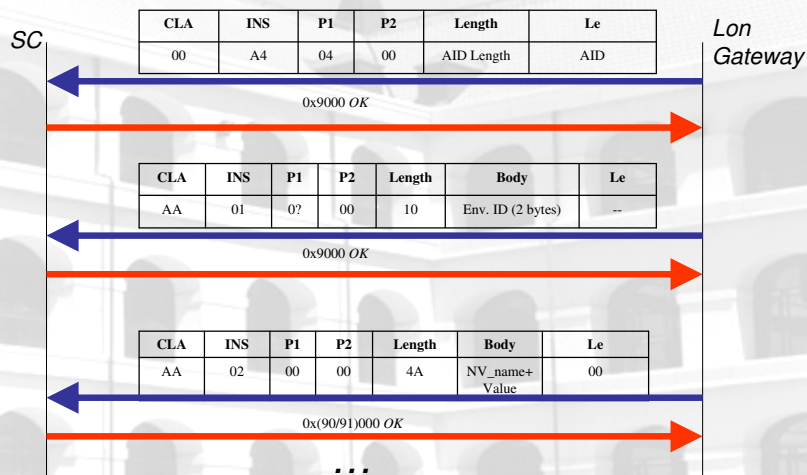


# Information stored in the Gateway

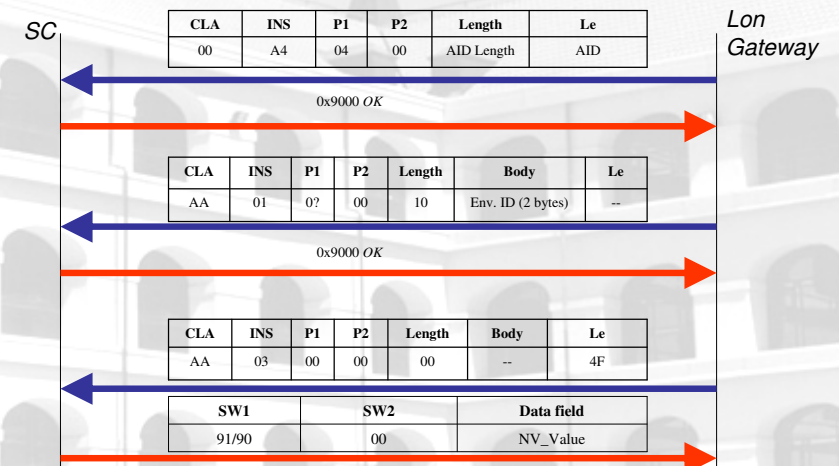
Network Variable Name	Current Value	Default Value	Network Variable Id
nviLampValue01	value_for_nviLampValue01	default_value_for_nviLampValue01	1
nviLampValue02	value_for_nviLampValue02	default_value_for_nviLampValue02	2
nviLampValue03	value_for_nviLampValue03	default_value_for_nviLampValue03	3
...	...	...	...
...	...	...	...
nviSetting0n	value_for_nviSetting0n	default_value_for_nviSetting0n	nn



# Configuration Mode



# Operation Mode



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## Conclusions

- Portability
- Secure storage
- No power supply
- Network customization
- Different LonWorks networks can be controlled through the same device



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## Future Work

- Integration into a Open Service Gateway Initiative (OSGi) compliant Home Gateway
- Adding user authentication
- Extension to another control networks (Konnex, X.10, ...)



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Thanks!!

Questions??



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