Flex4Apps

WP5 D5.1: Platform Architecture & Integration
Flex4Apps – Introduction

- **Situation**: Many sensors produce large data amounts

- **Challenges for future systems**:  
  - Extract the important information fast  
  - React quickly to anomalies  
  - Reveal hidden correlations  
  - Keep data secure

- **Solution**: Flex4Apps - Smart system connecting multiple sensors to the cloud  
  - The Flex4Apps platform architecture shall monitor, analyze and hence utilize Big Data (technologies).

- **NXP target**:  
  - The project requires an efficient and flexible end-to-end security concept.  
  - For instance, common Plug & Play concepts could be upgraded to industrial Plug & Trust systems by introducing automatic authentication and secure data transmission methods.
## Application Scenarios for Flex4Apps

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Domain</th>
<th>Sensors</th>
<th>Real-time adapted sensor usage</th>
<th>Security consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly house</td>
<td>healthcare</td>
<td>Heart rate, glucose monitoring, breath rate, oxygen level, ...</td>
<td>Priority sensor reading for sensors on critical persons</td>
<td>Personal privacy</td>
</tr>
<tr>
<td>Building Automation</td>
<td>Personal, enterprise</td>
<td>Temperature, humidity, gas composition, noise, ...</td>
<td>Priority transmission on suspect sensor data allows for targeted setting of building controls</td>
<td>External interference on Sensor network must not be the ‘open window’ to vital networks in the building</td>
</tr>
<tr>
<td>Factory Monitoring</td>
<td>Industry</td>
<td>Temperature, pressure, chemical composition...</td>
<td>Early warning for shift in machinery settings.</td>
<td>Competition insight in factory status Machinery data must be guaranteed to be correct for proper feedback.</td>
</tr>
<tr>
<td>Network Monitoring</td>
<td>Industry</td>
<td>Network elements providing log data, status info</td>
<td>Use network optimally by knowledge of status on network elements</td>
<td>Information on functioning of network elements must not be open.</td>
</tr>
</tbody>
</table>
Architecture Considerations

Observations:
– Solutions nowadays are heterogeneous
– With different deployment of applied security
– With variety of sensors/actors used (basic On/Off up to smart with identification, en/decryption, etc.)
– Neither simple nor standalone - turning one gear may trigger unexpected behavior in one or many unexpected areas and unexpected locations.
– Companies want quick return on invest → security follows functionality.

System topologies:
– Generally follow the architecture shown on the right site

Next generation solutions need to be architecture conscious
– key hole surgery is envisaged. A minimal invasive change shall lead to a maximum result.
Flex4Apps Use Cases

NXP challenge in the Flex4apps project: To add security to a Flex4Apps framework:

- With minimum invasive changes in existing systems?
- With user determined protection mechanisms to prevent data loss / theft?
- To adjust security levels of data transfers with respect to priority and content
Architectures
Architecture overview

Cyber physical system

Device (sensor, actor) → Aggregator → Communicator

- Device (sensor, actor): Collects data or acts upon commands, data to be delivered or intelligence.
- Aggregator: Performs aggregations, manages information, or acts upon data.
- Communicator: Communicates, sends information, receives information, manages data integrity, or ensures confidentiality.

Cloud

- Staging: Receives information for further processing.
- Storage: Build final data storage.
- Processing: Extracts information from data logs, performs complex computations, and checks events for priority.
- Presentation: Visualizes information to become knowledge.

- Evermind FlatGateway: Manages devices, gathers information, aggregates data, sets priorities on communication, and ensures confidentiality/integrity.
- Nokia NE: Collects data or acts upon commands, little to no dedicated intelligence, manages devices, gathers information, can aggregate data, sets priorities on communication, and must ensure confidentiality/integrity.
- NXP: Receives data in any form or shape and holds it for further processing.
Structure of the architecture document

2. Architecture
   – Overview
   – Cloud
     • Staging
     • Storage
     • Processing
     • Presentation
   – Cyber Physical devices
     • Devices
     • Aggregator
     • Communicator
     • Customer business logic
   – Security
   – Software COTS

1. Introduction
   – Short description of FLex4Apps
   – Overview of the document
   – Glossary and abbreviations
   – References
   – Conventions

3. Dynamic behavior of the architecture
   – Workflows
   – Sequences

4. Reasons for the architecture
   – System architecture capabilities
   – Network architecture capabilities
   – Risk analysis

5. Requirements traceability