



Consumer point of view of GENESYS Architecture

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Outline

1. WP2 in GENESYS
2. Trends and challenges
3. Approach and requirements
4. Results during project work
5. Next steps for WP2



WP2 in GENESYS

- Target: ensure cross-domain nature and wide applicability of reference architecture template
 1. Capture, analyze and provide to other WPs the high level architecture requirements of consumer applications
 2. Define the associated domain specific services
 3. Assess the preliminary architecture description and evaluate the solutions proposed by other WPs
- Partners
 - Nokia Research Center
 - Embedded Systems Institute
 - Fraunhofer-Gesellschaft
 - NXP Semiconductor

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3



WP2 and WP1

- GENESYS architecture is intended for both consumer (WP2) and industrial (WP1) domains
- Need to understand the commonalities and conflicts between these application domains
 - Avoid unintentional limitations in the applicability of the proposed architecture template
 - Must not omit necessary requirements
 - Must not force unnecessary requirements
 - What to do when something is necessary for WP1 but unnecessary for WP2 or vice versa ???

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4



Consumer domain trends

- Growth of SW intensive applications
 - Complexity of systems is in the SW
- Growth in features of wireless devices
 - Mobile and digital convergence: more features/functionality with less time/size/cost
- Architectures for application developers
 - Platforms for open innovation
 - Most developers see only the SW APIs
 - In one word: consumers drive the industry !

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5



Current challenges

Consumer electronics products must be

- Low cost (added value vs. added cost)
- Low power (but high performance !)
- Easy to operate (moving target...)
- Robust (have you ever repaired a phone?)

Additional challenges in product creation

- Short life-cycles (time-to-market, time-in-market)
- Complex combinations of diverse technologies

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6



Emerging challenges

- Inter-operability for device federations
 - While carried, at home, on the road
 - Self-organizing configurations to deliver high quality user experience with shared resources
- High level of security and privacy
 - Mobile payments, banking and work emails
 - Sensitive personal (e.g. health) information
 - Often user's own behavior does not help !

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Approach and requirements



Approach

- WP2 copes with its wide domain and accounts for different future products and solutions
 - Focus on open systems, smart spaces, and ambient intelligence
 - End-user centric approach in requirements analysis
 - Focus on critical high-level domain specific services to guide the definition of the GENESYS core services
- Acknowledge the limited resourcing
 - Analyze and utilize state-of-the-art when available
 - Identify research problems when no solutions exist

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9



Requirements from use cases

- Highlight desired product properties for end users by describing example usage scenarios
 - Rich Personal Communication
 - Distributed Business Negotiation
 - Do-It-Yourself use case
 - Health-related Sensor Networks for independent recovery or living at old age, emergency handling
1. Identify actor's and system's activities
 2. Identify system services and their interaction
 3. Derive requirements from system behavior

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10



Other requirements

- Only imagination limits consumer use cases
 - Take additional required product properties from the industry experience
- Product creation related requirements
 - Many consumer devices are produced in massive volumes for a versatile user base
 - Profitability sets demands on product creation
 - Sometimes these concerns override even product properties desired by end users
- Distill a limited set of key platform requirements

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11



WP2 requirements overview

Product Property Related

2.1: Usability

2.5: Robustness

2.2: High performance and scalable QoS

2.6: Adaptivity to changing system environment and different user preferences

2.3: Energy efficiency

2.7: Connectivity and interaction with web and other external systems

2.4: Support of Security

2.8: Systems-of-Systems Abilities

Product Creation Related

2.9: Low cost and good manufacturability

2.13: Predictability, verifiability, testability and certifiability

2.10: Modularity, composability and fast product integration

2.14: Manageability

2.11: Scalability, extensibility and evolvability

2.12: Technology agnosticism

2.15: Flexible design approach

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12



Requirement descriptions

- Each requirement has sub-requirements
- Rationale summarizes key motivations
- Architectural Significance
 - Template must guarantee by construction
 - Template must enable
- Application Significance
 - High / Medium / Not applicable
- Integration Level
 - Chip (L1) / Device (L2) / System (L3)

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13



Results during project work



Services for consumer apps

Categories of platform services used by applications

1. Component/Service Detection, Registration and Discovery
2. Mobility and Connectivity Management
 - Device/infra controlled mobility, connection/session mgmt
3. Security
 - Storage, key mgmt, authentication, service access ctrl
4. Storage
 - File system, DB mgmt system
5. Event Detection and Handling
6. Management of Distributed Applications
 - Network/application initialization, start/pause/stop application

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15



Services for consumer apps

Categories of platform services used by applications

7. Combined Quality-of-Service and Resource Awareness
 - Service & resource knowledge and information providers
 - Service & resource predictor and planner
 8. Multimedia and Graphics
 - Khronos OpenMAX IL (media component interface)
 9. Trust and Privacy
 - Identity and trust mgmt, privacy protection
 10. Open Systems and Ambient Intelligence
 - Situation reasoner, dialog manager, service orchestrator, user profiler, context archiver, Smart Space gateway
- May or may not be possible to build using lower level core services described by WP4 and WP5

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16



GENESYS promise

- Composability for fast and predictable product creation
 - Not just design-time composability
 - Run-time composability: easily form open system configurations
- Basic cross-industry device interoperability
 - Clearly specified interfaces
 - Uniform communication principles
- Facilitates low power consumption and energy efficiency
 - Support parallel execution architectures, alignment of logical and physical architecture, platform services for resource awareness
 - However, resource management mechanisms limited to static configurations and primarily targeted to chip and device level
- More advanced capabilities left open for future research
 - Mechanisms to convey service semantics for interoperability
 - System-level resource and QoS awareness and planning

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17



Learnings so far

- Shared insights on needs of future systems and systems-of-systems in the converging domains of mobile communication, consumer electronics, and ambient intelligence
 - Knowledge on how to use the GENESYS services and architectural style in this domain
 - Industry more likely to accept GENESYS results when they address the concerns and needs of the domain
- Understanding the possibilities and limitations of the GENESYS architecture
 - One step forward in improving reuse across industries

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18



Assessment approach

1. Select a set of significant requirements
 - WP2 consumer application & industry viewpoint
 - E.g. composability, energy efficiency, scalability/evolvability, technology agnosticism
2. Analyze and describe how well template addresses these key requirements
 - Brief description on other WP2 requirements
3. Summarize and propose improvements
 - Within remaining work by GENESYS WPs
 - In future research projects

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19



Next steps for WP2



Current status

- Architectural requirements collected, enriched with use cases, and analyzed
 - Together with state-of-the art or envisioned architectures
- Domain specific platform services defined
 - Linked to proposed core services in the architecture template if applicable
- Contributions to GENESYS book made
- Assessment of the template in progress

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21



GENESYS future

- What can be achieved
 - Will instantiations of the template deliver the promised advantages cost efficiently?
 - Competition with in-production architectures that already satisfy key industry requirements
 - Cross-industry awareness (GENESYS book)
- Future research needed to address more advanced capabilities identified in WP2
 - e.g. Smart Objects for Intelligent Applications

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22



Thank you !
