Next Generation Train Control Systems Design by GE Transportation Italy:

A Universal Vital Platform Approach to meet Current and Future Rail Transportation Signaling Challenges

Giovanni Zanelli

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GE imagination at work

COLLEGIO INGEGNERI FERROVIARI ITALIANI

Mapping Requirements to Design Objectives

LCC Optimization	• Lower Capex • Reduced maintenance costs • Better obsolescence management • Higher reliability and availability
Execution Excellence	• Consistency with specific requirements • On-time delivery • Effective migration strategies • Effective Handholding
Operating Process Efficiency	• Improved operational efficiency
Scalability	• Flexible to changing needs over life cycle • Upgradability/downgradability
Flexibility	• Adaptive architecture
Energy Saving	• Contribution to sustainable growth
Security	• Avoid signalling system intrusion
Enhanced Customer Experience	• Smooth on/off boarding • Real time schedule adherence • Information on journey planning • Personalized experience

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- Shorter development cycles, less development cycle re-run
- Lower development cost, less modules to sustain
- Flexible – HW & SW modular solution
- Less inventory & training – products built with same modules
- Embedded energy optimization functions
- Embedded maintenance and asset management functions

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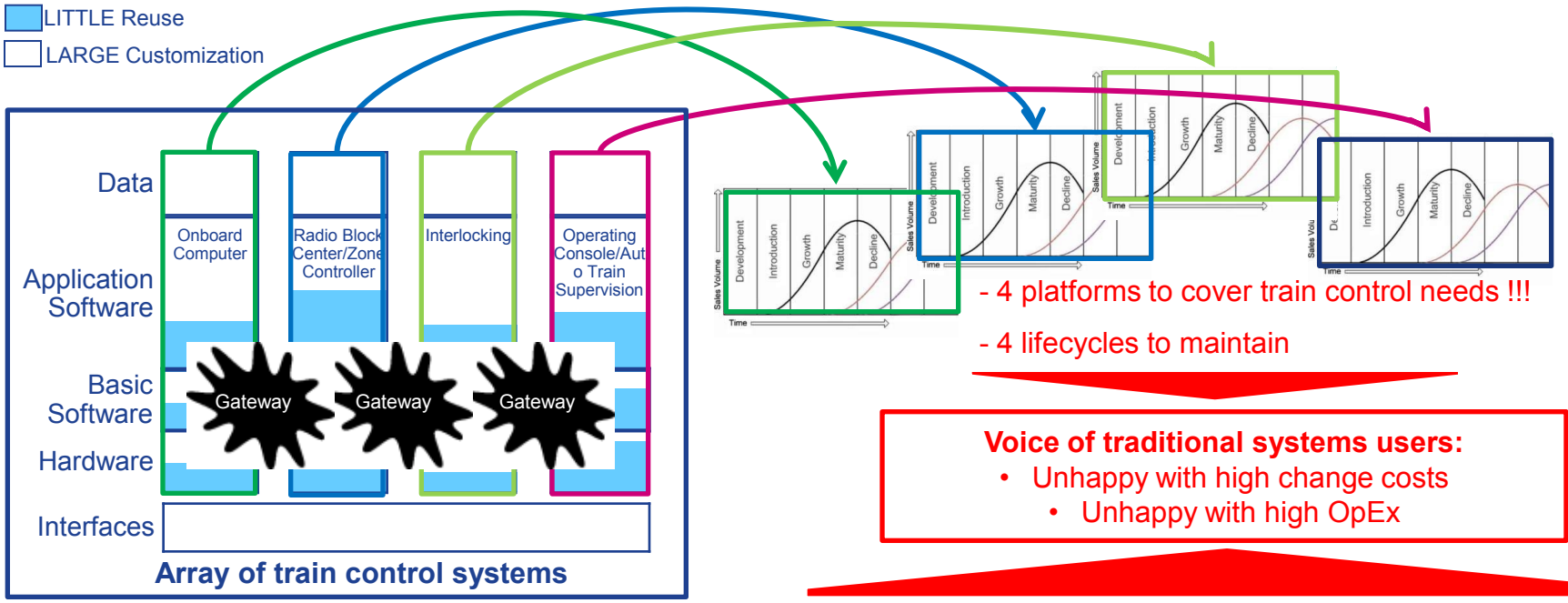
Universal Vital Platform?

Current Cumbersome Rail Signalling Situation



Voice of traditional systems users:
- Unhappy with high change costs
- Unhappy with high OpEx

Current Situation	Drawbacks
Non optimized “Silo” based implementation	Non modular products (monolithic): little room for customization, impact of changes difficult to predict
Non integrated set of engineering tools and processes	System level, product level, dedicated project execution– not usable at tendering stage
“Bottom up” step by step approach	Using and adapting legacy modules…requiring additional equipment – “glue ware” or “gateways” between sub systems
Asynchronous Multi Platform R&D investments in multiple “vintages”/branches	Great inertia and cost to make portfolio evolve Little cross platform development re-use
Multiple product SW developments , product specific SW	New generation development increases sustaining cost of large installed base

Project Delta: A Team on a Mission

High Growth Train Control Market Segments and Geographies

Passenger Rail

- Conventional
- High Speed

Solutions: ETCS/IXL…

GE Tempo™

Mass Transit

- Metro
- Light Rail

Solutions: CBTC…

GE Transportation

Intelligent Control Systems

Differentiated and Integrated Solutions

Open System and Sub-System Architectures

Delta

Imagine
a new generation
of train control solutions
designed around:

- optimized project execution
- long term LCC effectiveness
- environmental friendliness in mind.

An Imagination Breakthrough Initiative

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Intelligent Control Systems

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Differentiated and Integrated Solutions

Open System and Sub-System Architectures

60 M $US Investment

100 + people strong team of experts

Two Centres of Excellence:
- Paris La Défense (France)
- **Sesto Fiorentino (Italy)**

An Imagination Breakthrough Initiative

Sesto Fiorentino Office Opening

REGIONE TOSCANA

EUROPEAN COMMISSION

Promotion of industrial research, transfer of technologies, pre-competition development; valorization of research and innovation

- Creation of a Center of Excellence
- Recruitment of new skilled resources
- Develop the know-how in the region
- Tuscany as a worldwide player in the Railway sector
- Set up laboratories and a showroom

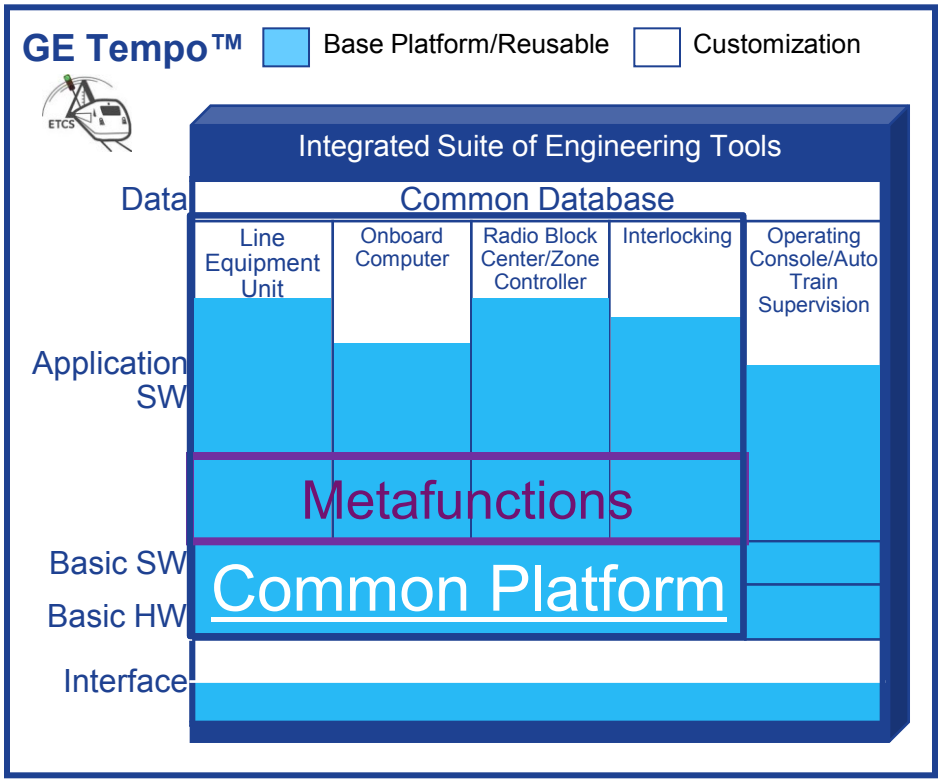
Activities: Research & Development

Maximum funding €6.589.496,64

Steps	**Date**
Submission	26th July 2010
Contract Signature	7th Oct 2011
Office Opening	9th June 2011

"Ribbon-Cutting" ceremony

Tempo™ System Architecture
A Universal Vital Platform Approach…



One system platform enables:

- standardized and a minimum set of HW/SW bricks
- APIs to application SW
- Flexible application SW using set of SW functional modules
- cross-functional features: Metafunctions
- Integrated end to end tools to manage entire project lifecycle milestones

"Top down" integrated system design capable of supporting all rail transportation control functions without complexity

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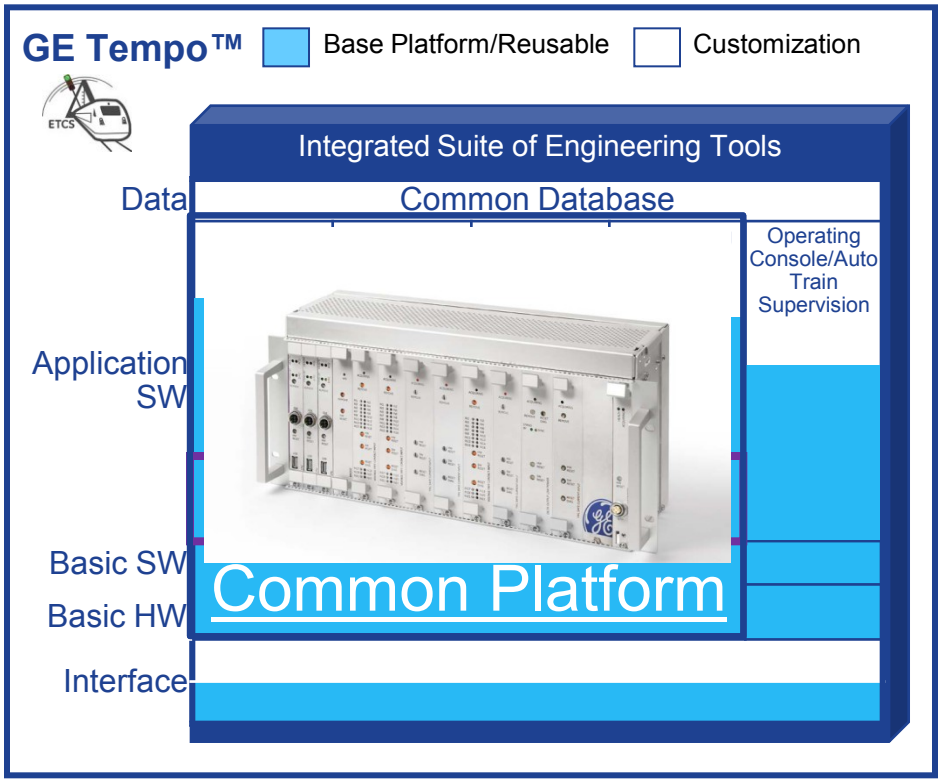

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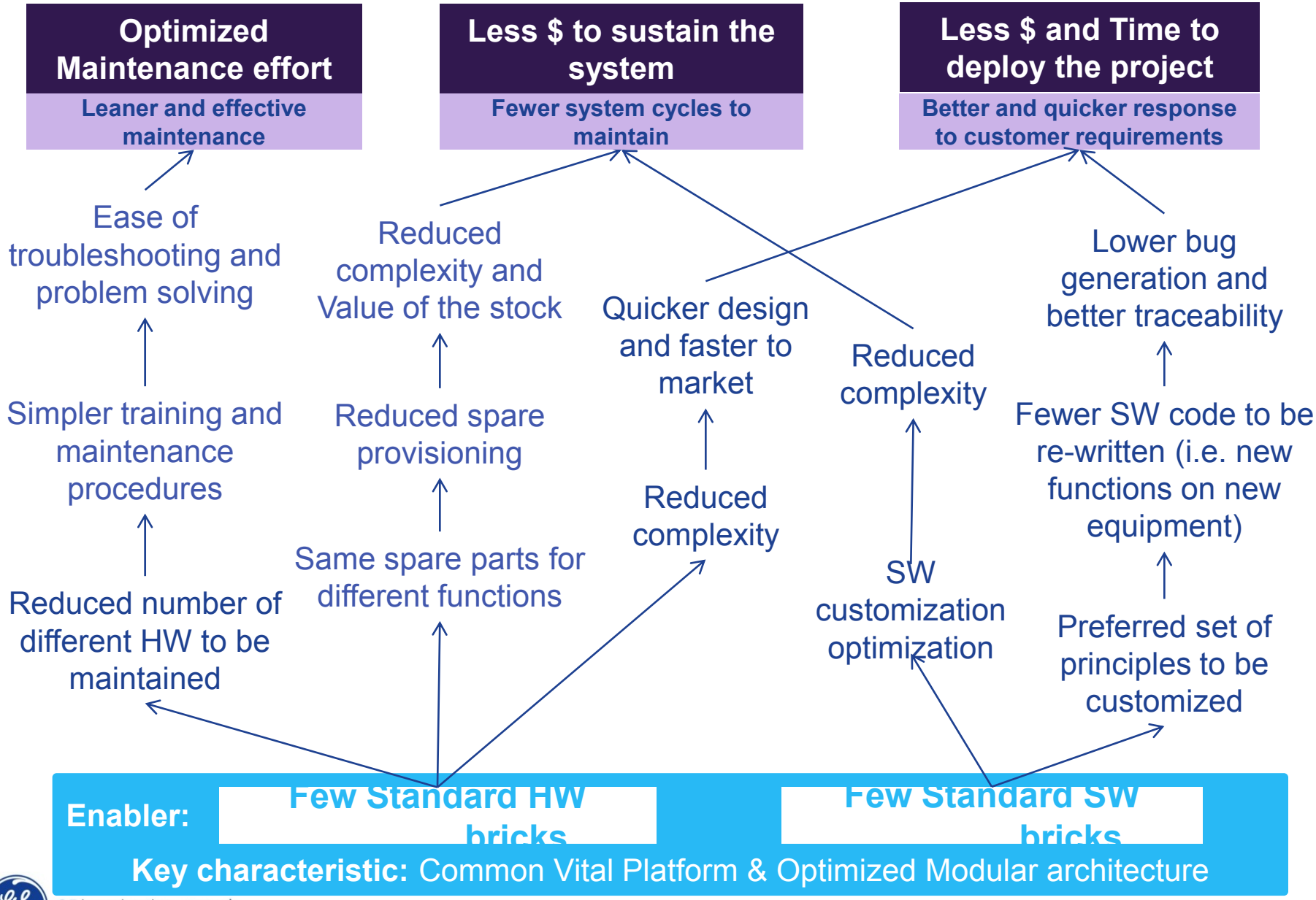
The value chains



Conclusions

- Long term LCC effectiveness → Reduced Total Cost of Ownership
- Common platform- Commonality of Hardware: racks, PCBs, I/O cards,
  - Using set of SW Functional Modules
  → minimum set of common bricks
- Modular Architecture: flexibility in reuse, ease of interface, ease of standardization
- Taking advantage of State-of-the art integrated tool set through entire project lifecycle
- Environmental friendliness in mind

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