Scalable Edge Nodes (SEN) & Other Key Enablers for The Embedded Cloud

Potential Implications for Military and Intelligence Programs

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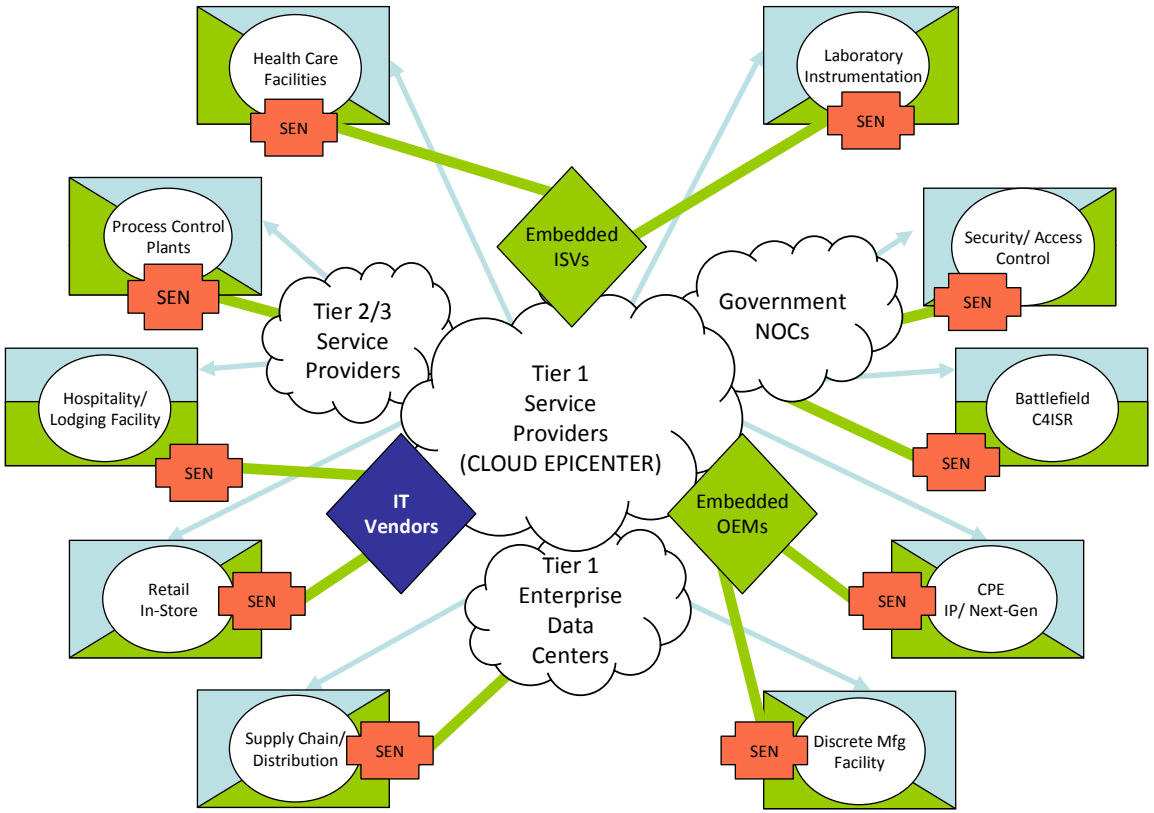
Embedded Cloud, SEN & Other Enablers

- **There is clear evidence that industrial and commercial operators are investing in migration to an *'Embedded Cloud'* … one that supports applications that are deep in core process, mission critical, high availability**
- **In order to do this, most deployers are specifying a local point-of-presence platform to support a wide range of local functions … primary, backup and redundant**
- **The products that look most like the solution to the requirement, we are calling Scalable Edge Nodes (SEN)**
- **There are few SEN solutions available on the market today, however, feverish development is taking place among a number of stakeholder communities … from services providers to embedded OS suppliers, hardware vendors from multiple segments**
- **In parallel, many embedded equipment suppliers are exploring SoC designs and alternative processing platforms and configurations**

Defining the Embedded Cloud

SEN are the local points-of-presence enabling embedded application migration to cloud-based models



- **Scalable Edge Node (SEN) = dense, flexible hardware platforms that reside on the edges of networks – enterprise, factory, laboratory, retail floor.**
- **SEN represent a new class of hardware platform that incorporates the density of an appliance, with the flexibility of an embedded industrial computer to enable mission critical applications, including control application, migration to cloud services.**

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Defining the Scalable Edge Node (SEN)

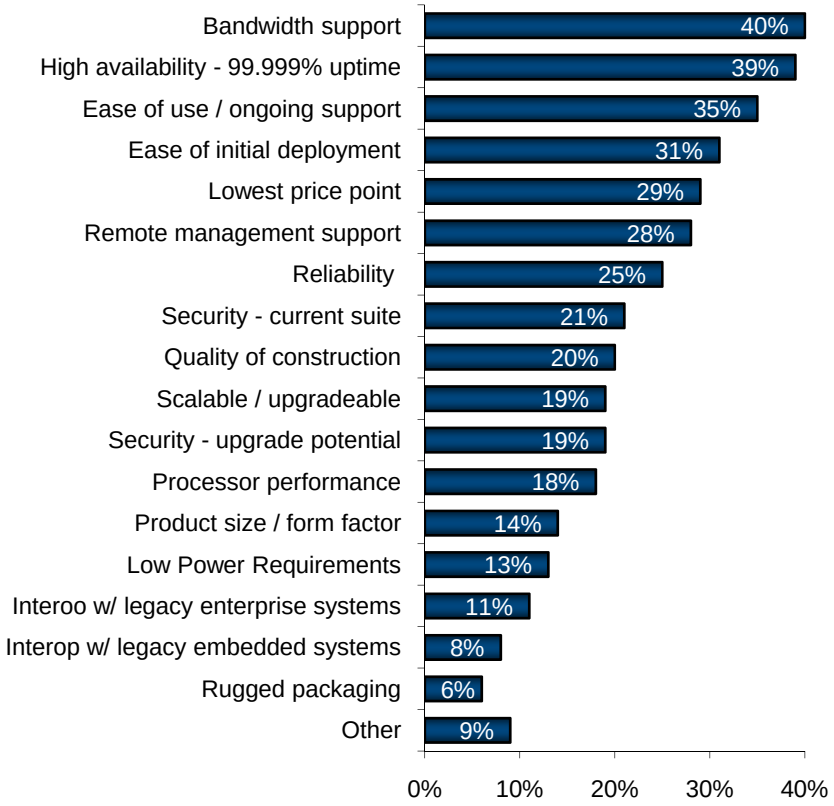
Technical definition / position of Scalable Edge Nodes with traditional hardware platforms

	Enterprise Servers	Industrial / Embedded Computers	Appliances	Scalable Edge Nodes
Form Factor	Rack	Multiple	Rack Set-top	Multiple
Baseline Cost	High	High Highest for COTs	Moderate	Low
Scalable – Capacity – Expandable with new apps	 High High	 Moderate High	 High Low	 Moderate Moderate
Power Requirement	High	High	Moderate	Low
Connectivity – Capacity – Protocol support	 High Limited	 Moderate High	 Moderate Moderate	 Moderate High
Management Requirement	High	High	Moderate	Low

Technical Requirements for SEN Deployment

Three major technical requirements: performance, reliability, and ease of use; Then the price point

Did You Define Any Specific Technical or Commercial Requirements for SEN Platforms?
(% of IT end user respondents identifying)



- **Bandwidth / scalability – the platform is no good if it can't keep up or operate in real-time – performance is absolutely vital; remember: embedded often means real time … and real time definitions vary widely**
- **Reliability – provide typical embedded high availability or five 9s for SEN**
- **Ease of use – both in initial deployment and in ongoing support.**
  - Remote management / support is likely the easiest way for suppliers to address ongoing support.
  - Addressing security issues are also a major part of ongoing support.
- **These must be addressed while keeping the SEN price point within customers' price boundary.**

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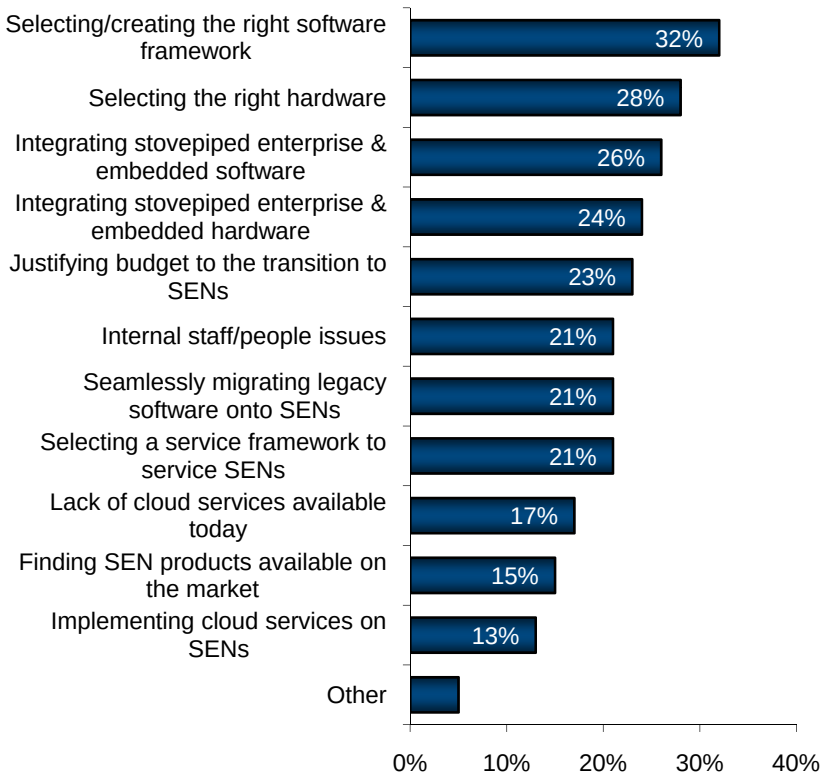
Implementation Challenges for SEN Deployment

A complex installed base and vast array of investment options are presenting challenges

Biggest Challenges to Migrating Traditional Enterprise & Embedded Class Infrastructure to SEN Platforms

(% of IT end user respondents identifying)



- **Migrating to SEN and cloud-based platforms requires adopters to choose a software framework for their specific implementation and picking the right one is the greatest challenge cited by our respondents.**
  - Not a lot of proven choices
  - This is a 10-20 year commitment in some cases
- **There are simply not a lot of proven products offered today.**
- **Integrating stove piped legacy enterprise and embedded software and hardware systems are the next greatest challenges.**

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SoC Platforms Are A Key Enabler for SEN

CPU – MultiCore SoC

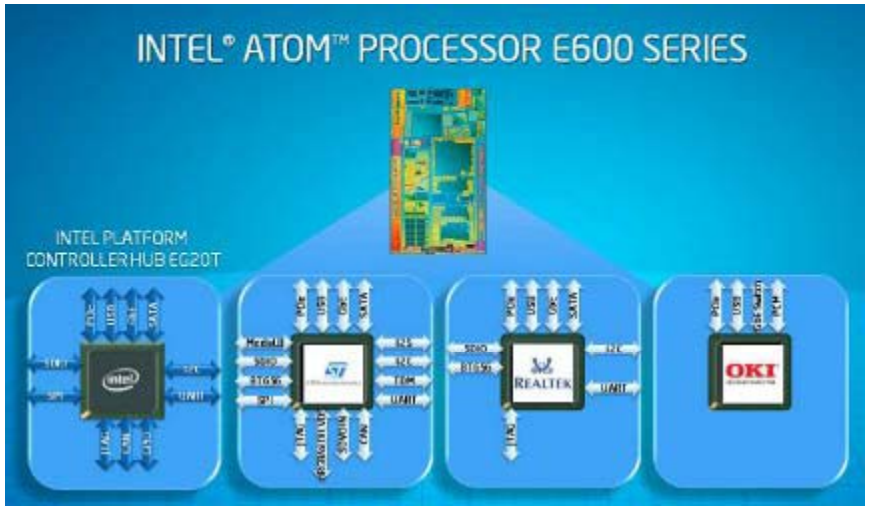

Image from www.hexus.com

GPU – FPGA SoC

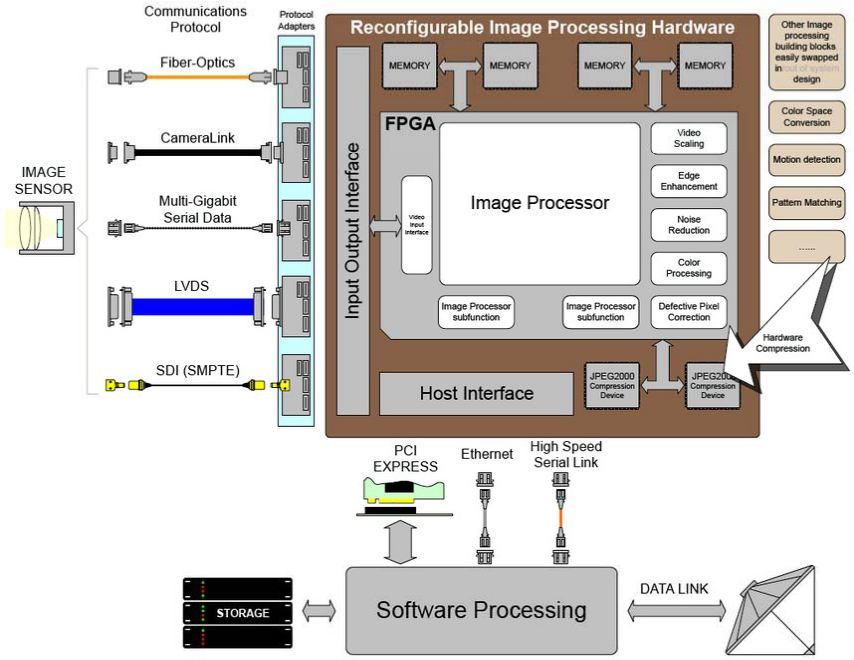

Image from www.military embeddedsystems.com

System on Chip (SoC) Driving SEN Alternatives

Vertical Market OEM Expected Change in Processing Platform Design Commit

	CPU	FPGA w/ CPU Core	FPGA	NPU	GPU
Communications, Edge	-15%	250%	40%	15%	10%
Communications, Core	-15%	flat	flat	40%	15%
Industrial Automation	-25%	220%	60%	15%	flat
Medical	-20%	325%	flat	95%	flat
Transportation	-15%	flat	10%	flat	25%

Source: VDC Research

Number of OEMs citing each processing today and in 2014

Summary … Reality is Ahead of Hype

- **The reality is not as clean as the statement, but it appears that market changes are forcing industrial enterprises to …**
  - Become more agile
  - Gain better real time visibility into operations
  - Secure APPROPRIATE access to EXISTING data in at the RIGHT TIME
  - Migrate to the embedded cloud to meet technical, operational and financial requirements
  - Explore SoC designs and alternatives to CPUs to meet same
  - The reality of these migrations is stronger than the hype