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Yocto Meta-Virtualization Project

Linux System and User Space Virtualization for Next-Gen Embedded Applications

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Enea

Agenda

- Intro to the Yocto Meta-Virtualization Project
- Market Drivers for Embedded Virtualization
- Summary, and Call to Action

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Intro to the Yocto Meta-Virtualization Project

The Yocto Meta-Virtualization Project

In a nutshell:

Enea has initiated and is co-maintaining a “Linux meta virtualization layer” within the Yocto environment.

http://git.yoctoproject.org/cgit/cgit.cgi/meta-virtualization/tree/README.

The goal is to create a long/medium-term production ready layer for embedded virtualization. Specifically the program is

a. To collaboratively research and benchmark system level virtualization LxC/KVM/Xen combined with advanced core isolation techniques and then bring this into Yocto

b. To integrate and contribute into Yocto user space/networking related virtualization initiatives like OpenFlow (Flowvisor), OpenvSwitch, CRIU, dmtcp along with incremental contributions of OpenStack components.

But the BIG QUESTION, is why is this important for traditional embedded systems?

These technologies are usually associated with traditional Enterprise computing applications

meta-virtualization

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Project Summary

No description has been added for this project. Add description

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Quick Reference

Project Links: Homepage
Code Locations: http://git.yoctoproject.org/
Licenses: MIT
Similar Projects: None
Managers: David Nyström

Browse Code

In a Nutshell, meta-virtualization...

... has had 62 commits made by 5 contributors

Languages

shell script 100%

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Market Drivers for Embedded Linux Virtualization Solutions

Why is this Important for traditional embedded ?

A Mobile Communications Example

1990s… a long time ago in a galaxy far, far away

Digital Mobile phones

The Nokia 1011 was the first mass-produced GSM phone. The typenumber refers to the launch date, 10 November, in 1992

Digital Services

2000s

Data savvy Mobile Devices

Server Virtualization and cloud

vmware

amazon.com

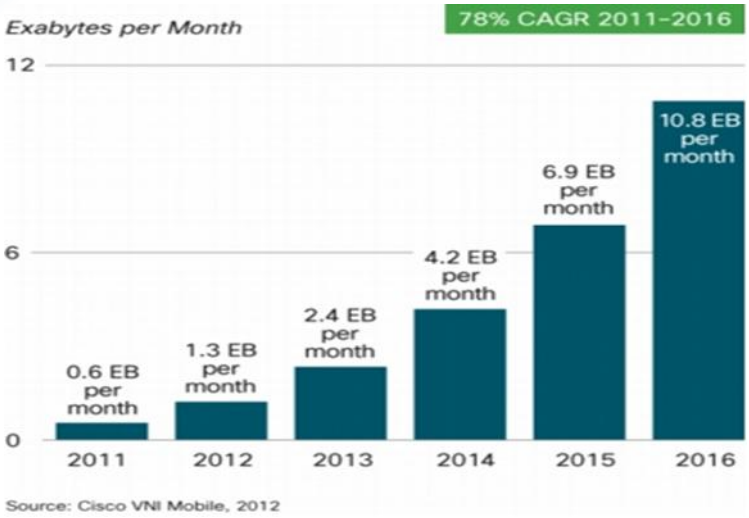
Google

Amazon announced EC2 on August 25, 2006 based on more than a decade of infrastructure work for the evolution of the Amazon E-Commerce Platform

2010-2012..

Exploding Bandwidth need

Cloud Based Services

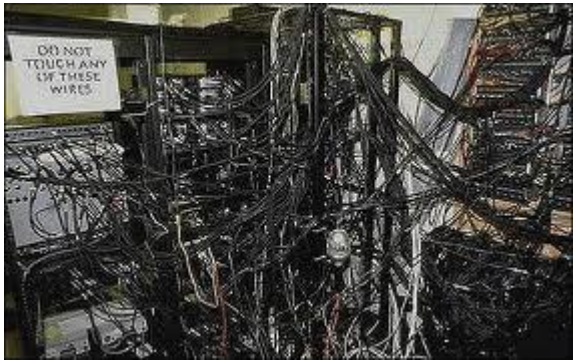


As Paul Cobos, Sales Director at ZTE Corporation commented: “The emergence of the completely connected business and home, coupled with demand for feature rich services such as P2P, HDTV, 3DTV, Interactive 3D and cloud computing, has created an urgent need for significantly higher capacity bandwidth

2013-

DAS* , Small Cell and Wifi off load

Complex data flow management



DAS == Distributed Antenna Systems
“Small Cell is the Buzz but DAS* is the Biz”
- Say Operators in Latest Infonetics Survey

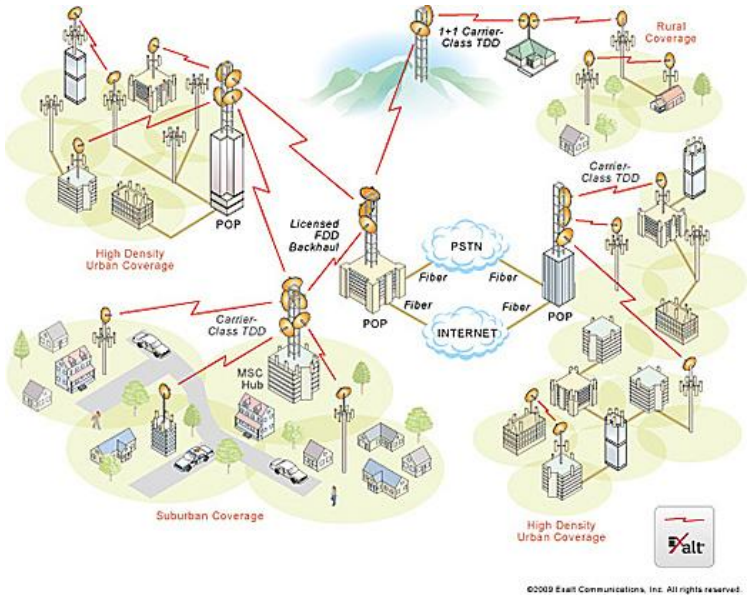
Key difference from yesterday: Capacity is more important than coverage meaning interference must be minimized

In many virtualized data center deployments, most of the traffic flows from VM to VM (“east-west” traffic)

It becomes very complex to set up networking flows that align well with various services

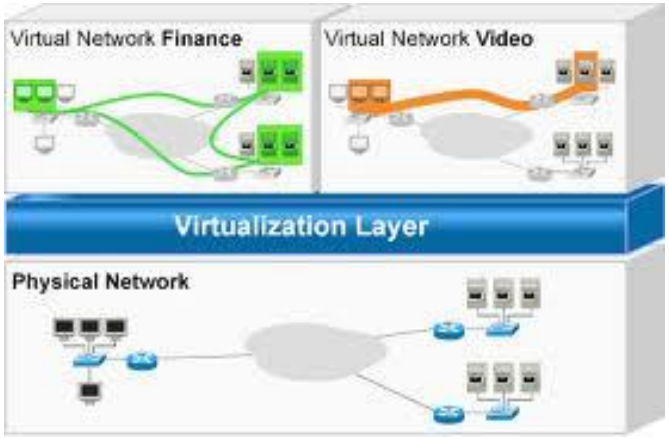
Near future…

Back haul explosion



Spending on mobile backhaul is growing solidly and will continue to do so, surpassing $9.7bn by 2016 – Infonetics Research

Network Virtualization

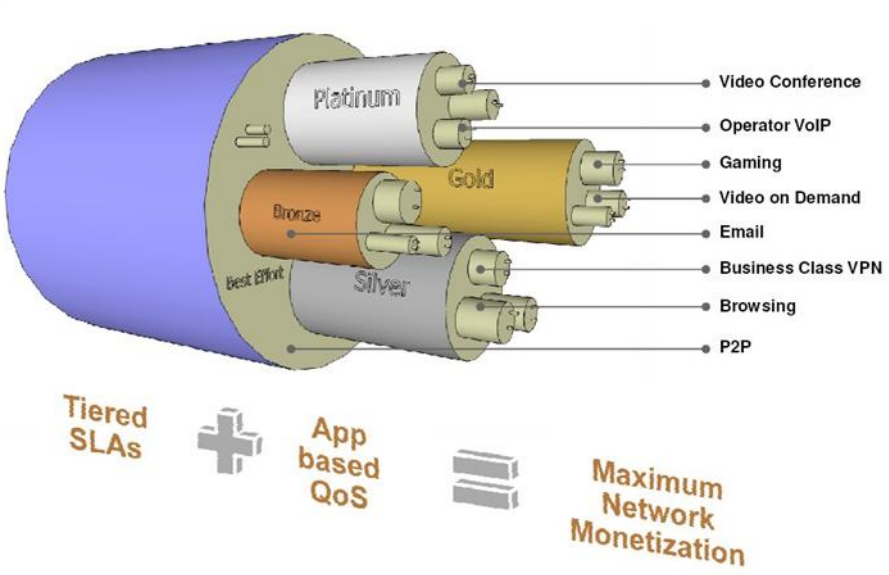


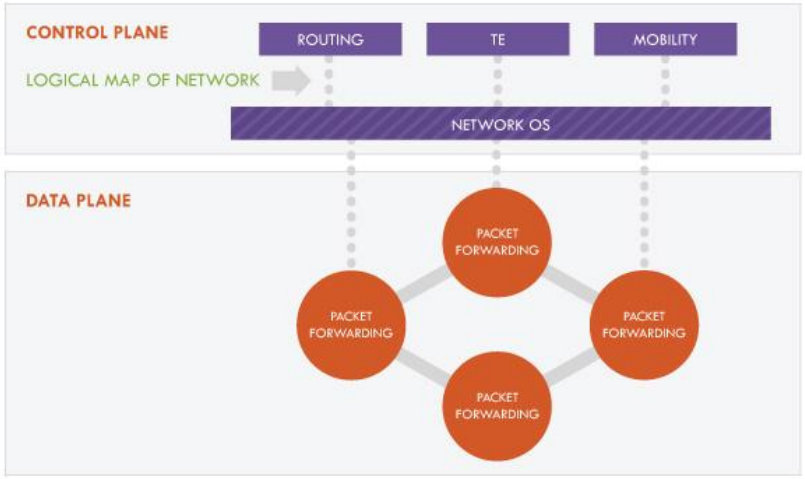
There are a number of emerging and proposed standard protocols focused on optimizing the support Ethernet LANs provide for server virtualization.

Around the Corner…

Intelligent Network Management

Software Defined Networking



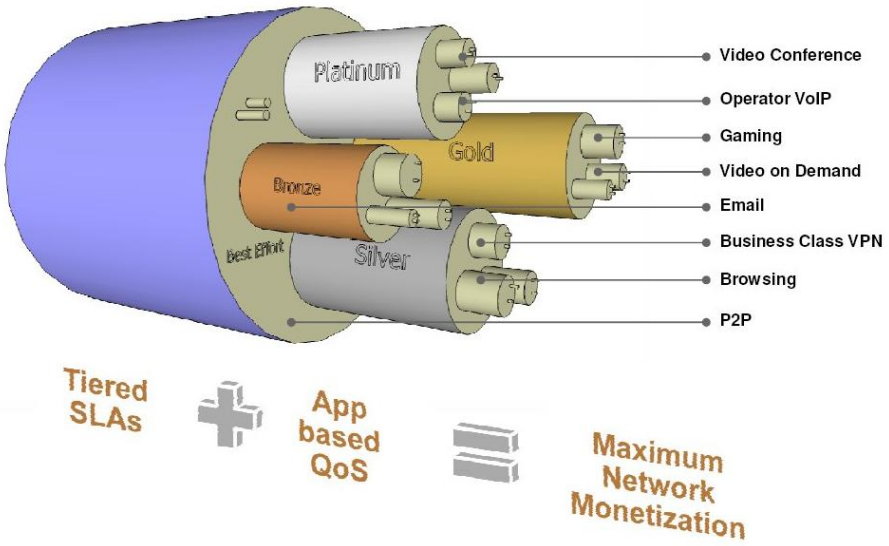


In order to align network impact with subscriber demand, mobile operators will have to adopt methods of measuring the data subscribers' user experience and then sell that value to their subscribers.

Cloud computing and mobile Internet will place greater demands on the network infrastructure and SDN will go a long way in providing the agile service delivery that people will expect from the networks

“Intelligent” Networks

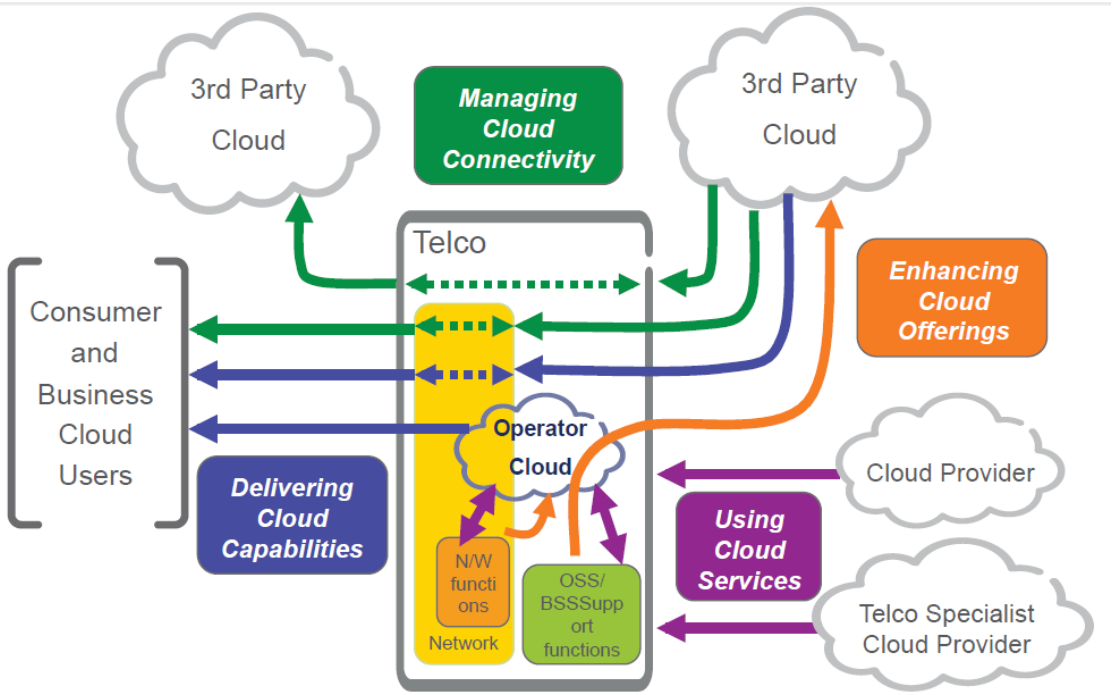
- The move to IP as main bearer for back haul and core networks will require intelligent solutions to a range of problems.
- New innovation in packet management and deep packet inspection will enable
  - policy based routing
  - load balancing/ load sharing,
  - active flow management etc.



There is a need to provide scalable Packet management solutions

In a couple of years…

Telecom / Cloud blurring



Cloud Opportunities as provider:

- Connectivity Management
- Content Delivery
- Enhancements through network integration
- Commercialization of operator functions such as billing
- M2M platforms

And as user as User:

- OSS/BSS
- Support functions

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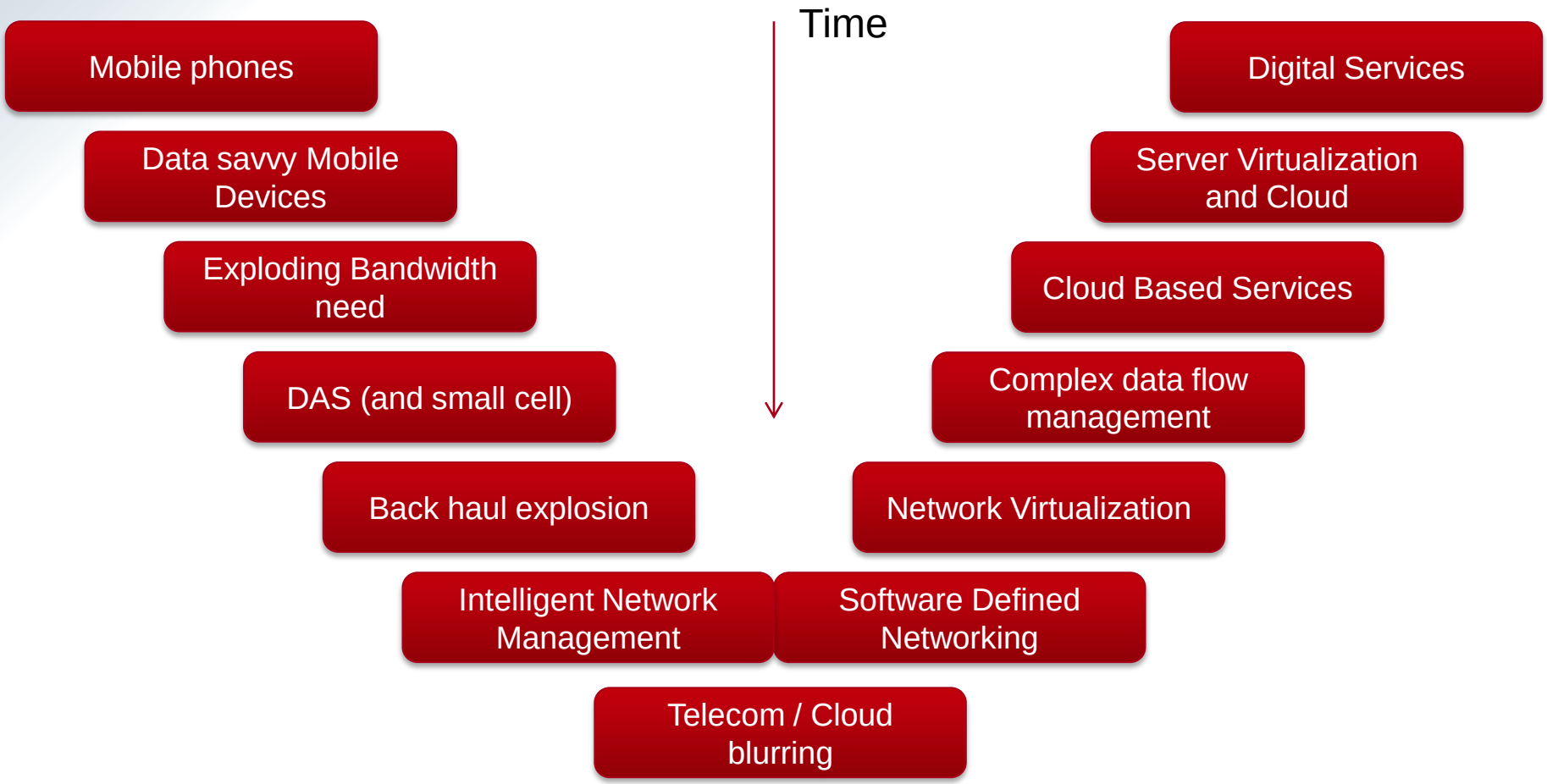
Trends… Embedded Mobile Infrastructure vs Enterprise Computing



Again, Market Drivers…

- Physical deployment of processing nodes *does not scale* in terms of cost (CAPEX, OPEX) and bandwidth / capacity in terms of optimization of totally available computing power.
- Cloud based centralized computing that can offload high capacity functions from the physical embedded device network does scale with its *elasticity* in terms of optimization of computing resources with system virtualization techniques
  - ***More bandwidth at less cost***
- Cloud based centralized computing with user space / networking virtualization delivers easy configuration or re-configuration of resources to meet demands of constantly expanding networks of managed devices
  - ***Reduce costs by eliminating need for costly remotely fielded network devices***

The Punch Line…

- Linux in multicore is the dominant solution
- Virtualization solutions like KVM, Xen, and LxC offer
  - Consolidation of legacy
  - Isolation for security
  - Optimization of computing resources
- But *SYSTEM and USER SPACE VIRTUALIZATION* is the biggest issue for the expansion of bandwidth and agility in the brave new world of networking/communications operations, i.e. **the *Internet of Everything***
  - *Operators have dynamic flexibility in adapting their service availability to subsystems that are ever expanding*
  - *Or need to have completely isolated or separated sub-networks for commercial reasons*

Enter the Yocto Meta-Virtualization Project

Summary and Call to Action

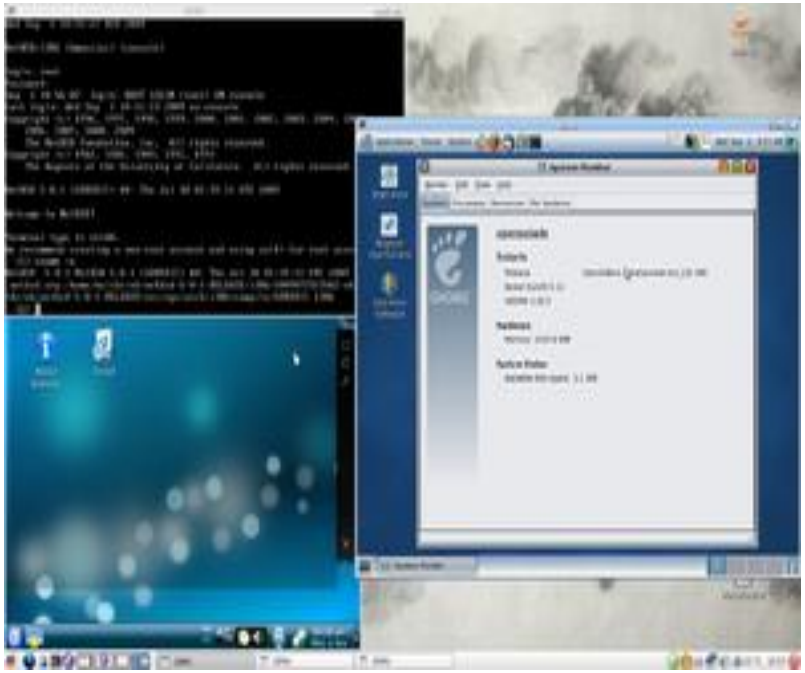
Again, the Objects … Enterprise or Embedded?

System Level Virtualization

- KVM – Linux Kernel based virtual machine
- Xen Hypervisor
- LxC – OS Level Virtualization

User Space / Networking Virtualization

- OpenFlow – “Virtual Network”, sophisticated traffic management
  - See also FlowVisor
- Open vSwitch – Virtual switch for virtualized environments
- CRIU – Checkpoint-Restore in User Space
- OpenStack – multiple projects for management of cloud based data center processing, storage, and networking resources
  - TBD projects



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Name	Kudos	12 Month Commits	All Time Commits	5 Year Trend	Primary Language	First Commit
Lei Yang	6	2	2	5 year commit count		about 1 month ag
Mihai Prica	7	20	20	5 year commit count	shell script	3 months ago
David Nyström (Principal Engineer - ENEA Software)	4	21	21	5 year commit count	shell script	3 months ago
Bruce Ashfield	6	1	1	5 year commit count		2 months ago
Raymond Danks					shell	

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Enea is helping to spearhead the movement towards next generation embedded real-time based Linux applications

Join Us in the Project!!

And don't *take it on the chin!!*