The aim of the activities under this heading is to enable the creation of a world-class High Performance Computing (HPC)/Big Data (BD) ecosystem based on European leadership in HPC, Cloud and Big Data technologies....
HPC-BD Collaboration - Timeline

BDVA participation in ETP4HPC’s Steering Board Meeting in Barcelona (22-23 September 2016), ~25 attendees

ETP4HPC participation in BDVA’s mini Summit in Valencia (29 Nov-1 Dec 2016), ~300 attendees

BDV-PPP – Technical Committee: ETP4HPC representative present, Brussels

BDVA attended European Extreme Data & Computing Initiative) 2nd workshop in Bologna

ETP4HPC SRA Kick-off Meeting 20 March 2017, Munich – presentation by BDVA

BDVA attended European HPC Summit in Barcelona 15-19 May 2017; presenting and contributing to workshops/round tables

HPC attend EBDVF & workshops (x2), Versailles
…..from the H2020 ICT 11 and ICT 12 call:

* Horizon 2020 - Work Programme 2018-2020

“The Internet of Things and the convergence of HPC, Big Data and Cloud computing technologies”*

“…..resulting in an increased prevalence of data value chains and related technologies (HPC/BD/Cloud/IoT).” *

“…..a coordinated action with all related areas (e.g. analytics, software engineering, HPC, Cloud technologies, IoT) is necessary.”*
HPC-BD Collaboration – Bologna Workshop, July ‘17

Agenda
1. HPC - Big Data - a common glossary
2. Cross-Pollination of HPC and BD technologies
3. Extreme BD workloads
4. Collaboration between HPC CoEs and BD CoEs
   - Centres of Excellence for High Performance Computing
   - Centres of Excellence for Big Data
5. User engagement
6. Exploring options for possible collaborations

Common understanding of technical challenges for joint future research priorities
HPC-BD Collaboration – Versailles Workshop, Nov ‘17

13:00  Welcome and agenda review (J.Kenneally, M. Malms)
13:10  Introduction of AIOTI as organisation, technical agenda (T. Hahn)
13:25  Review of remaining use cases (moderator M. Malms)
14:25  ISO use case template walk-through (J.K. and N. Stojanovic)
15:00  Coffee - Break
15:45  HPC template walkthrough (D. Pleiter)
16:15  Research projects: critical implementation aspects (political, economical, social and technical challenges) (JK, MM)
17:00  Joint look at ICT 11 and 12: how to interpret the call text? (JK, MM)
17:45  Next events and steps

Structured description of use cases => common understanding
From BDEC report: HPC and Big Data stacks side by side

Reed et al, COMMUNICATIONS OF THE ACM | JULY 2015 | VOL. 58 | NO. 7
ETP4HPCs extension to HPC, Big Data and Deep Learning

This is the structural foundation of the technical roadmap work ahead

**HPC**
- Compiled in-house, commercial & OSS applications
- IDEs & Frameworks (PETSc, ...)
- Conventional compiled languages (C, C++, FORTRAN)
- Domain-specific libraries
- PFS (Lustre etc.)
- MPI
- Cluster management (OpenHPC)
- User-space fabric access
- Infiniband & OPA fabrics
- Storage & I/O nodes, NAS
- GP* CPU nodes, GPUs, FPGAs

**Big Data**
- Workflows combining many application elements
- Compiled languages (C++)
- Scripting & WF languages (R, Python, Java, Scala, ...)
- Distributed coordination (Zookeeper, ...)
- Map-Reduce Processing (Hadoop, Spark)
- Cloud service I/F
- VMM and container management
- Virtualization: hypervisor or containers (Dockers, Kubernetes, ...)
- Linux OS Variant (some Windows)

**Deep Learning**
- Defined and instantiated/trained neural networks
- Scripting languages (Python, ...)
- Load distribution layer
- Orchestration and RMS
- Neural network frameworks (Caffe, Torch, Theano, ...)
- Inference engines (low precision)
- Virtualization: hypervisor or containers (Dockers, Kubernetes, ...)
- Linux OS Variant (Windows?)

**System SW**
- Conventional compiled languages (C, C++, FORTRAN)
- I/O libraries (HDFS, ...)
- Numerical libraries
- OpenMP, threading
- Accelerator APIs
- Batch scheduling (SLURM, ...)
- Performance & debugging
- Accelerator APIs
- Virtualization: hypervisor or containers (Dockers, Kubernetes, ...)
- VMM and container management
- Orchestration and RMS

**Hardware**
- Linux OS Variant
- Local storage
- GP* CPU hyper-convergent nodes

**Applications**
- Compiled in-house, commercial & OSS applications
- IDEs & Frameworks (PETSc, ...)

**Middleware & Mgmt.**
- Conventional compiled languages (C, C++, FORTRAN)
- Domain-specific libraries
- PFS (Lustre etc.)
- MPI
- Cluster management (OpenHPC)
- User-space fabric access
- Infiniband & OPA fabrics
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**System SW**
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* GP: general purpose  
Red boxes: data components  
‡ need for faster fabrics for training scale-out
Enabling *new forms* of transforming 

\[\text{Data} \rightarrow \text{Information} \rightarrow \text{Action} \rightarrow \text{Value}\]

Taxonomy of Use Cases
Spectrum of high-impact use cases
BD-HPC-IOT high-impact use cases – summary pitch

**ICT-11-2018-2019:** HPC and Big Data enabled Large-scale Test-beds and Applications

1. Cases in Manufacturing Line / Factory Digital twin, - [Anibal Reñones, Cartif, ]
2. Smart grid and customer pattern analysis - [Anibal Reñones, Cartif, ]
3. Hybrid-Twin: Wind Turbine Farm of Composite Rotor Blade – [Fouad El-Khadi, ESI Group],
4. Near Real Time Electricity Network Smarter Optimized Operation, [Davide Dalle Carbonare, Engineering, ]

**ICT-12-2018-2020:** Big Data technologies and extreme-scale analytics

5. Real-time Simulation For Man-in-the-loop Aircraft Testing [[Davide Dalle Carbonare, Engineering, ]
6. Combating Fake News with AI, Big Data and HPC solutions, [Davide Dalle Carbonare, Engineering, ]
7. Noninvasive Load Monitoring – [Davide Dalle Carbonare, Engineering],
8. Automatic cartography of extensive territories – [Tonny Velin, Answare]
10. Ship behaviour simulation/modelling. [Konstantinos Chatzikokolakis, Marine Traffic]
12. FEM-based optimisation & digital twin of electromechanical devices [Janne Keränen, VTT]
13. Individualized healthcare diagnosis - [DANIEL ALONSO ROMÁN, ITI ]
14. Weather and climate forecasts – [Claudio Arlandini, CINECA]
15. Weather and Climate Modelling – [Philipp Neumann , Deutsches Klimarechenzentrum, : Peter Bauer, European Centre for Medium-Range Weather Forecasts]
16. Data-Check: distinguish truth from lies, [Antonis Ramflos, Athens Technology Center S.A.]
Panel Discussion + Q&A

BDV
BIG DATA VALUE ASSOCIATION

ETP 4 HPC
EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

AIOTI
ALLIANCE FOR INTERNET OF THINGS INNOVATION

HiPEAC
ARCHITECTURE

European Commission
BDVA focuses its activities on updating the multi-annual roadmap and on providing regular advice to enable the European Commission to prepare, draft and adopt the periodic Work Programmes, as well as on delivering Data Innovation Recommendations, developing Big Data Value Ecosystem, guiding Standards, and, facilitating Know-how exchange.

BDVA (~200) members include large industries, SMEs, research organisations and data users and providers to support the development and deployment of the EU Big Data Value Public-Private Partnership with the European Commission.
ETP4HPC Association
Industry-led think tank founded in 2012 – Private partner of the HPC cPPP with the EC
“Building a globally competitive European world-class HPC technology value chain”

86 Members
44 Private / 29 SMEs
38 Research organisations

Main remit:
Provide input to define H2020 HPC R&D programmes funded and operated by the EC
Tool = “Strategic Research Agenda “ – SRA

Other activities
HPC global ecosystem development (actions with other stakeholders, mainly in the context of EXDCI, a H2020-funded support action)

http://www.etp4hpc.eu/  office@etp4hpc.eu
The Alliance for Internet of Things Innovation (AIOTI) was initiated by the European Commission in 2015, with the aim to strengthen the dialogue and interaction among Internet of Things (IoT) players in Europe, and to contribute to the creation of a dynamic European IoT ecosystem to speed up the take up of IoT.
HiPEAC was a European Network of Excellence (now a CSA) on High Performance and Embedded Architecture and Compilation

Created in 2004, HiPEAC gathers over 500 leading European academic and industrial computing system researchers from nearly 350 institutions in one virtual centre of excellence of 1800 researchers.

January 2017 version is available at:
http://hipeac.net/vision
The workshops on **Big Data and Extreme-scale Computing (BDEC)** have been premised on the idea that we must begin to systematically map out and account for the ways in which the major issues associated with Big Data intersect with, impinge upon, and potentially change, the national (and international) plans that are now being laid for achieving exascale computing.
HPC, Big Data & IoT: Panel Discussion + Q&A

European Commission
Thank You

To participate....

office@etp4hpc.eu
secretarygeneral@core.bdva.eu