

WP4: Relation with industry

Report

Second AIDA annual meeting

LNF, 10-12 April 2013

- Academia-Industry matching event
- Analysis of the 3 AIME events
- National-level events
- Plans for 2013-2014
- Collaboration Spotting

- *AIDA 2012 - Academia meets Industry: Solid-State Position Sensitive Detectors from Monday, March 26, 2012 at 09:00 to Tuesday, March 27, 2012 at 14:00 (Europe/Zurich) at DESY*
 - State of the art in Position Sensitive Solid-State Detectors
 - The ALICE Inner Tracking System Upgrade
 - ATLAS pixel detector
 - CMS strip tracker
 - LHCb
 - High Energy Physics community needs
 - Detector Challenges at the Free-Electron Lasers
 - Silicon Tracking and Vertexing at a Linear Collider
 - Some applications of pixel sensors in life sciences
 - imaging Functional computed tomography using energy resolved photon counting detectors
 - Position Sensitive Silicon Detectors for particle beam diagnostics
 - Monitoring of Mixed Radiation Fields and Dosimetry with Pixel Detectors
 - DECTRIS Solid State Position Sensitive Detectors in Synchrotron Applications

13 Industrial companies involved

Academia meets Industry

On

Advanced interconnections for chip packaging in future detectors

Organizing Committee:

Marie-Laure BOURGEOIS-SCHUTZ
Catherine BRANDT
Maria-Rita FERRAZZA
Sotiris FRAGKISKOS
Jean-Marie LE GOFF
Lucia LILLI
Abdenour LOUNIS
Giovanni MAZZITELLI
Hans-Gunther MOSER
Valerio RE
Laurent SERIN
Svetlomid STAVREV
Agnes SZEBERENYI

8th-9th April 2013
LNF

With the assistance of:



AIDA is co-funded by the European Commission within the Framework Programme 7 Capacities Specific Programme, Grant Agreement 262025



- **Advanced interconnections for chip packaging in future detectors**
 - Meet WP3 needs and foster collaborations among the 3D-IC community worldwide
 - Needs of communities
 - Particle Physics
 - 3D needs and opportunities in X-ray detection
 - Medical Imaging
 - Astroparticle Physics

Integration of sensor with 3D electronics



77 attendees from 28 institutions

- Academy of Sciences Czech Republic
- Austrian Acad Sci
- CEA
- CERN
- CMP
- CNRS/IN2P3
- DESY
- FNAL
- Fraunhofer IZM
- GSI
- HEPTech
- IFJ PAN
- CSIC
- INFN
- Institute of Physics, Prague
- IMEC
- KTH Royal Institute of Technology
- MPI
- NTUA
- STFC
- Universite de Geneve
- Universite de Paris-Sud 11 - LAL
- University of Bergen
- University of Heidelberg
- University of Liverpool
- University of Manchester
- Universität Bonn

14 attendees from 13 companies

- Advacam
- BelleTech
- Dectris
- EMFT
- IBM
- IPDiA
- KETEK GmbH
- micron semicond
- Philips Corp
- Printech Circuit Laboratories Ltd
- Tezzaron Semiconductor
- Tohoku-MicroTec Co., Ltd
- TTA Techtra

91 participants

High Energy Physics & Astroparticle Physics

- HL-LHC Trackers: upgrades (ATLAS, CMS, LHCb)(thin silicon, fine granularity)
- X-ray and γ -ray for particle detection (Medipix)
- Linear Collider vertex, CLIC, Muon collider
- Soft γ -ray astronomy

Other Scientific Interests

- SIPM in 3D
- X-ray Detection, (HELMHOLTZ Cube)
- X-ray Detectors
- Medical applications
- Active Real Time Space dosimetry (Medipix)

3D and Interconnection Projects needs

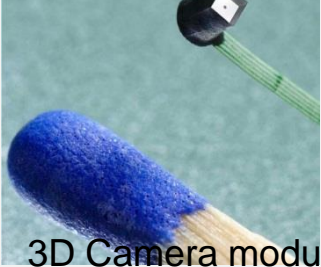
- High space resolution tracking
- Thin sensors, miniaturization
- Granularity, reduce occupancy
- Low noise, low consumption
- readout electronics (<65nm CMOS)
- High speed electronics (40 MHz clock)
- Radiation tolerant issue ~100 MRad
- Cooling issue, operate < -20 °C
- 4-side buttable (Edgeless)
- To couple Edgeless sensors with submicronic readout electronics
- Heterogeneous layers
- Affordable costs

Industry and R&D Institutes offerings

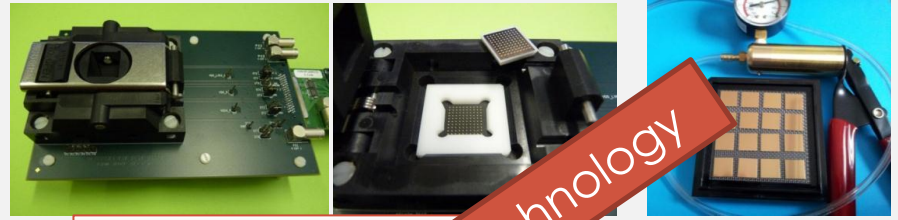
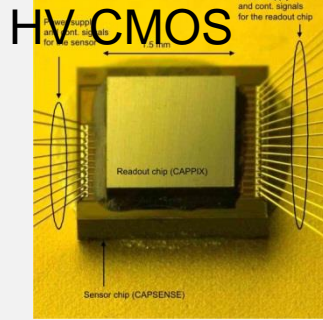
- TSV process flow
- Via First, Via Last, Via Middle process
- Micro-bumps
- SLID
- Interposers
- Advanced packaging integration and density
- Oxide Bond Process

- Various processes for TSV fabrication available
- There are 3 TSV families with various properties, applications and maturity levels :
 - TSV pre-process : R&D level
 - TSV Middle : consumer / High end - pre-industrialization level
 - TSV last : CIS / Imaging – Mass production
- Lot of companies & R&D centres are working on TSV developments and industrialization (See the List Before and more)
- The 3D & TSV supply chain is starting to be available
- Some industrial products have been already achieved with TSV
- **Prospects**
 - For TSV community : to find the “killer application” for TSV adoption in the consumer market
 - To disseminate the TSV technologies on other markets :
 - High energy Physics
 - Astrophysics
 - Synchrotrons
 - Medical Application
 - Portable applications
 - Spatial / aerospace
 - Dosimetry
 - ...

Fraunhofer IZM



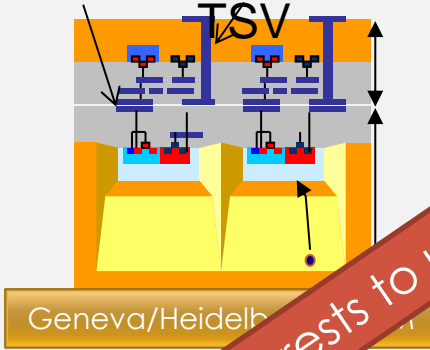
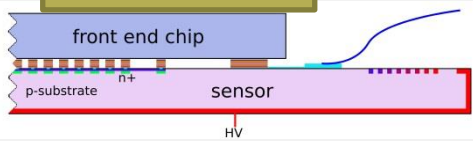
3D Camera module with Flex



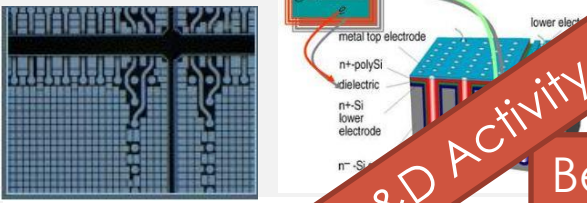
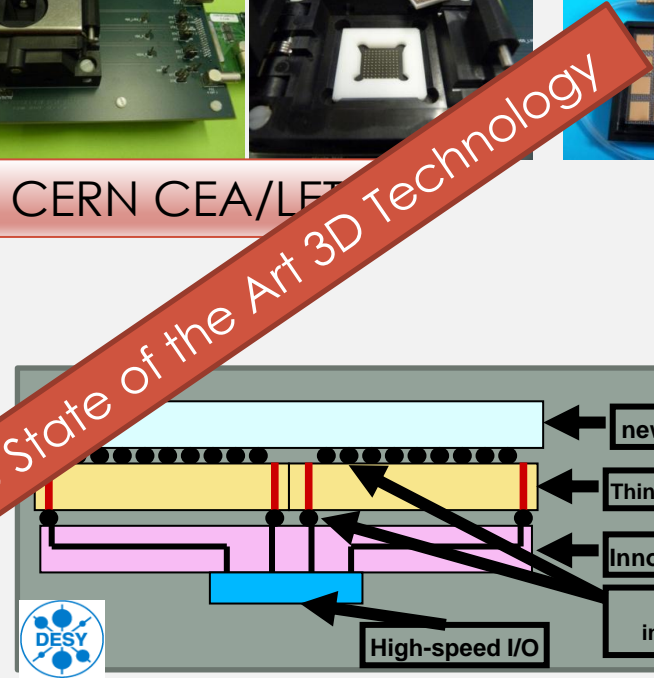
CERN CEA/LET

MEDIPIX

EMFT/ MPI



Geneva/Heidelberg



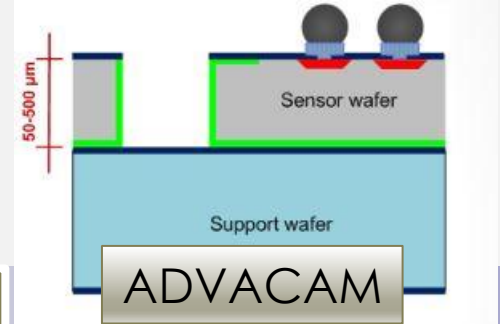
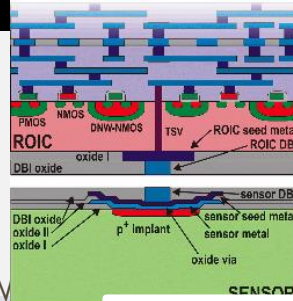
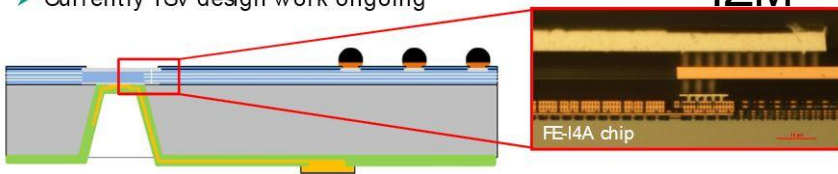
BelleTech/IPIDIA



Si PM Based PET/MRI

- FE-14A wafers available
- Currently TSV design work ongoing

IZM



Ziptronix

- → **Meet WP3 needs and foster collaborations among the 3D-IC community worldwide** ←
- **Impressive amount of progress shown during this workshop**
- **How can our community achieve (afford) the 3rd Dimension?**
 - To improve the physics performance for our future challenging HEP projects (innovative vertex detectors, Intelligent Trackers)
 - To answer fundamental questions related to the story of the Universe raised by astronomy (origin of cosmic rays, gravity..)
 - To increase the performance of diagnostics tools in medicine and miniaturized medical sensors (Scanners, 3D ultra thin pacemakers, X-ray DNA imaging)

Very Important to intensify the worldwide and EU collaborations inside-projects (LHC, HEP groups), inter-academia and Industries and also encourage international consortiums (3D IC...)

(i.e. to share developments efforts, costs (MPW), design licenses, Software and simulation Tools)

Analysis

Academia-industry matching event

- SiPM
- PSSSD
- 3D-IC

- **SiPM**
 - Very technology-specific → Photosensor
 - High Technology Readiness Level (TRL)
- **PSSSD**
 - Wider focus → Medipix, Pilatus, Bumpbonding, etc.
 - High TRL
- **3D Interconnections**
 - Very technology-specific
 - TSV
 - SLID
 - Interposers
 - Low TRL

101 attendees from 40 institutions

- Austrian Acad Sci
- CERN
- CIEMAT
- CNRS-IN2P3
- CPAN
- CSIC
- DESY
- EPFL
- ETHZ
- FBK
- FNAL
- Forschungszentrum Julich GmbH
- GSI
- IFAE
- INAF
- INFN
- Kernfys Versneller Inst
- MPI
- PSI
- Rhein Westfal TH Aachen
- UERJ
- Univ AGH Sci & Technol
- Univ Bari
- Univ Gent
- Univ Glasgow
- Univ Heidelberg
- Univ Insubria
- Univ Leicester
- Univ Louvain KU
- Univ Michigan
- Univ Napoli Federico 2
- Univ Oxford
- Univ Pisa
- Univ Politecn Bari
- Univ Roma 1
- Univ Siena
- Univ Surrey
- Univ Tech Delft
- NTUA
- Univ Udine

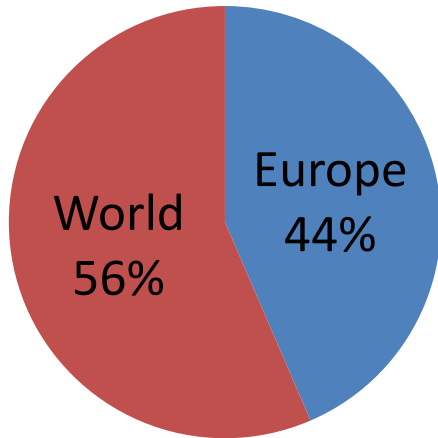
29 attendees from 23 companies

- AdvanSiD
- Atostek_Ltd
- AXINT
- Bruker_AXS
- CAEN_SpA
- CPTA_Moscow
- CSEM
- djh consult
- e2v_technol
- Excelitas_Tech_Inc
- Gamma_Medica_Ideas_Inc
- Hamamatsu_Photonics
- ID_Quantique_SA
- INOV_INESC_Inovacao
- KETEK_GmbH
- kromek?
- Philips_Corp
- Photek_Ltd
- Pulsar_Enterprise
- Raytest
- SensL
- STMicroelectronics
- Zecotek_Photonics_Inc

130 participants

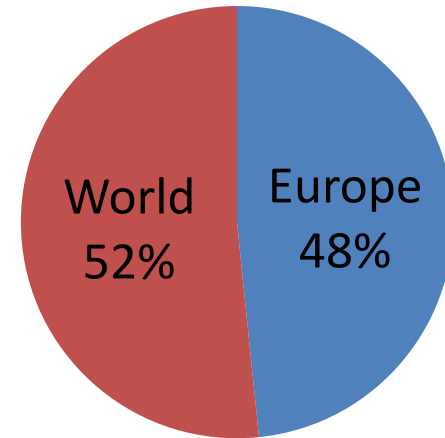
Companies

(Total: 108)



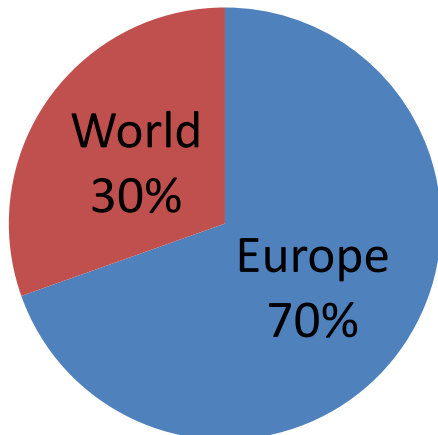
Institutions

(Total: 339)



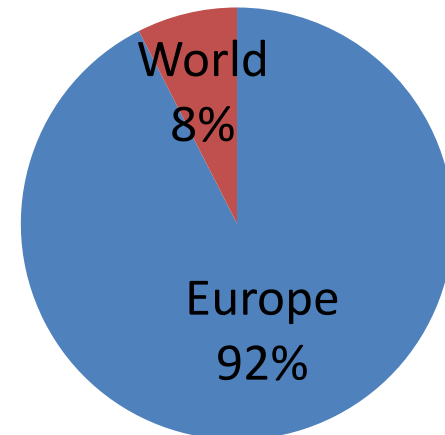
Attending companies

(Total: 23)



Attending institutions

(Total: 40)



68 attendees from 25 institutions

- Academy of Sciences of the Czech Republic
- Bulgarian Academy of Sciences
- Catholic University of Louvain
- CEA/Irfu Saclay
- CERN
- CNM-Barcelona
- CNRS - IN2P3 – LAL
- CPAN
- DESY
- IFCA (CSIC)
- INFN
- Institute of High Energy Physics, Wien
- Institute of Nuclear Physics of Poland
- KIT - Karlsruhe Institute of Technology
- Max-Planck-Institut für Physik Munich
- MRC Laboratory of Molecular Biology United Kingdom
- NIKHEF
- Oxford University
- Tomsk Polytechnic University
- University of Barcelona
- University of Bonn
- University of Cantabria
- University of Hamburg
- University of Otago
- VTT

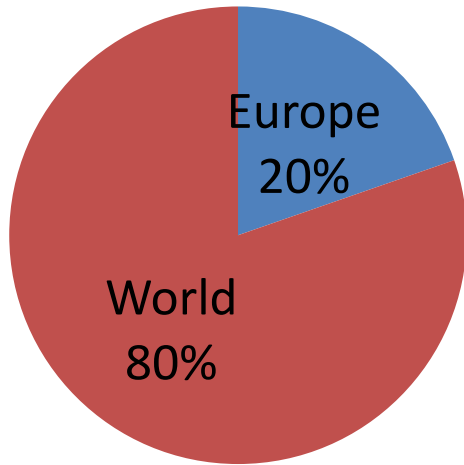
18 attendees from 15 companies

- ALIBAVA Systems
- Amsterdam Scientific Instruments BV
- Baltic Scientific Instruments
- CAEN SpA
- Canberra
- Dectris Ltd.
- Infineon Technologies
- iseg Spezialelektronik GmbH
- KETEK GmbH
- Kromek Ltd
- Philips Digital Photon Counting
- Photek LTD
- SEMIKON Detector GmbH
- Struck Innovative Systeme GmbH
- Technology Transfer Agency Techtra Sp. z o.o.

86 participants

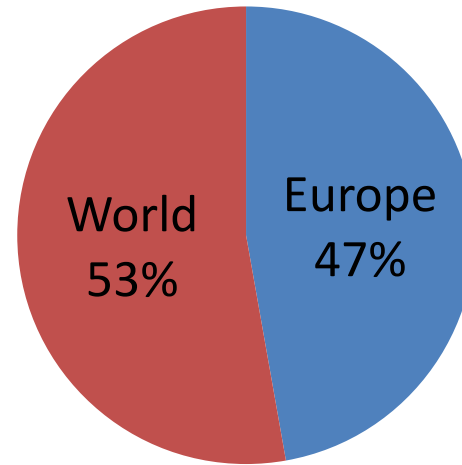
Companies

(Total: 436)



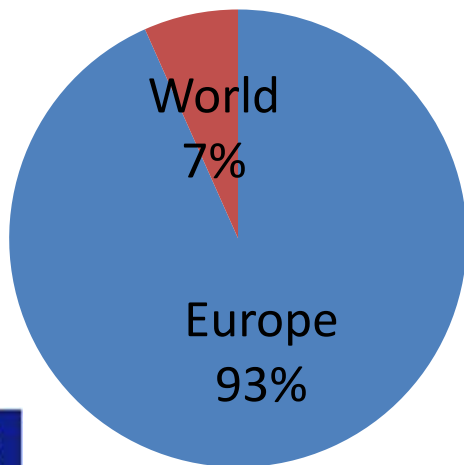
Institutions

(Total: 735)



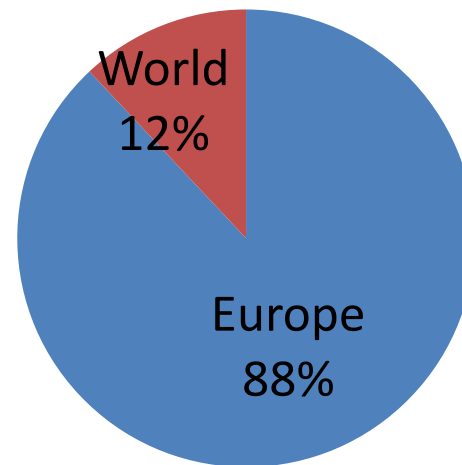
Attending companies

(Total: 15)



Attending institutions

(Total: 25)



77 attendees from 28 institutions

- Academy of Sciences Czech Republic
- Austrian Acad Sci
- CEA
- CERN
- CMP
- CNRS/IN2P3
- DESY
- FNAL
- Fraunhofer IZM
- GSI
- HEPTech
- IFJ PAN
- CSIC
- INFN
- Institute of Physics, Prague
- IMEC
- KTH Royal Institute of Technology
- MPI
- NTUA
- STFC
- Universite de Geneve
- Universite de Paris-Sud 11 - LAL
- University of Bergen
- University of Heidelberg
- University of Liverpool
- University of Manchester
- Universität Bonn

14 attendees from 13 companies

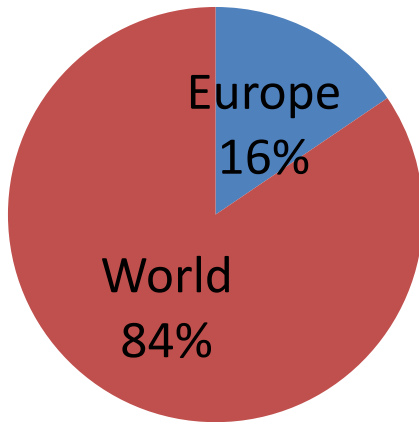
- Advacam
- BelleTech
- Dectris
- EMFT
- IBM
- IPDiA
- KETEK GmbH
- micron semicond
- Philips Corp
- Printech Circuit Laboratories Ltd
- Tezzaron Semiconductor
- Tohoku-MicroTec Co., Ltd
- TTA Techtra

91 participants

- Search for industrial (290) and academic (181) organisations active in
 - TSV
 - SLID
 - Interposers
- Contacted all key-players worldwide
 - (IBM, Tezzaron, Intel, EMC-members, TI, etc.)
- Invited all European companies (46) and institutions (65)

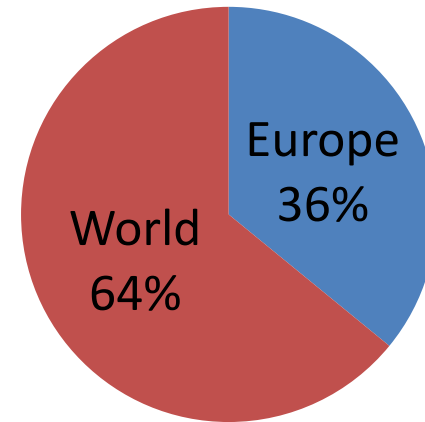
Companies

(Total: 290)



Institutions

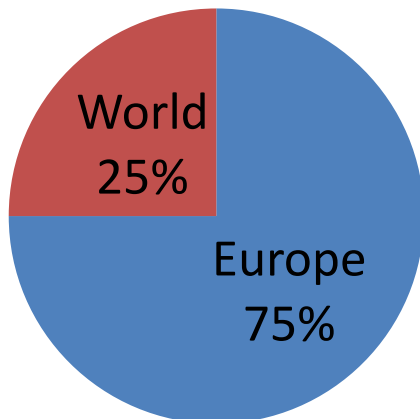
(Total: 181)



Attending companies

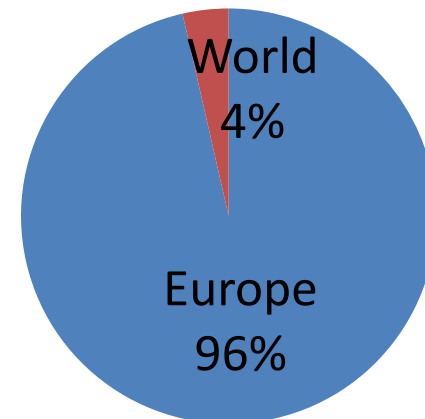
(Total: 12)

(Contacted all european companies)



Attending institutions

(Total: 28)

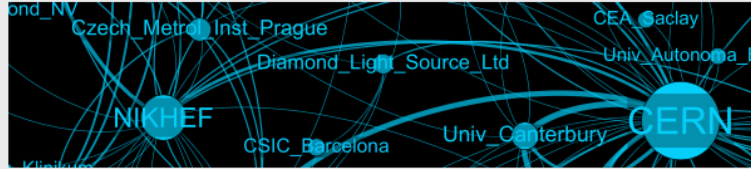




- Common technological projects between CERN and Israel
 - Sponsored by ATLAB and AIDA
 - 19 High-tech companies represented
- Topics
 - Silicon detectors
 - Materials and techniques for semiconductor detectors
 - PCB-related issues
 - Optical transmission
- Opportunity for companies to promote their technology to other experiments in other labs

- **Event:** Implementation of advanced electronics and precise mechanical components for HEP research (Alexandroupolis, 26-27 September 2011)
- **Results**
 - Cooperation with two Greek firms and the ATLAS Collaboration for the development of ATLAS Wireless Personal Safety & Supervision system (ATWPSS)
 - ATWPSS improvement using the Augmented Reality (AR) concept in collaboration with other European companies

- Academia-Industry matching event before AIDA 3rd Annual meeting
 - Focusing on WPs urgent needs
 - WP9?
 - WP3?
 - Involving communities active in the technology
 - Organised with experts of corresponding WPs
- National events organised by AIDA members



Collaboration Spotting

Spotting Collaborations in Particle Physics

- About us
- Home
- Our Approach**
- Samples

Authentication

[CERN SSO Login](#)

Samples

Micropattern Gaseous Detectors

Technologies	Publications	Patents	Publications + Patents
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Micropattern Gaseous Detectors General (MPGDs)



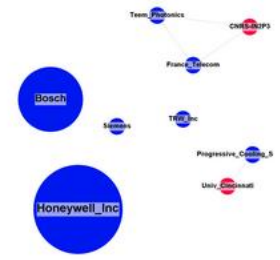
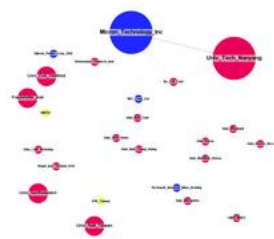
- [Preparatory Workshop](#) on using collaborative network analysis tools to monitor high tech R&D for scientific research and trace its impact (Nov 12 2012)
- Needs from
 - HEP
 - Technology Transfer
 - Industry
 - Governmental Organisations
- Software topics
 - Semantics & Analytics
 - Graphics
- Panel session and requirements collection

Identified organisations for the 3D-IC matching event

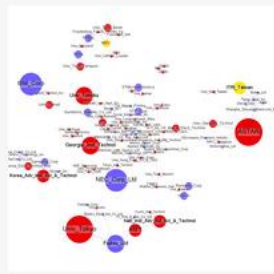


Technologies	Publications	Patents	Publications + Patents
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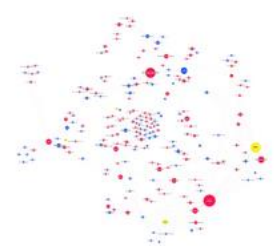
Solid-liquid interdiffusion (SLID)



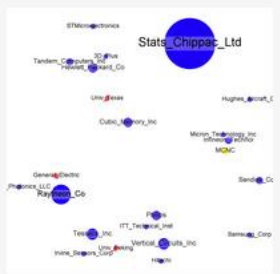
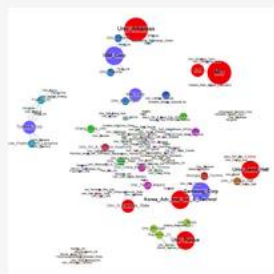
Interposers
Organizations information



Through-Si Vias (TSV)
Organizations information

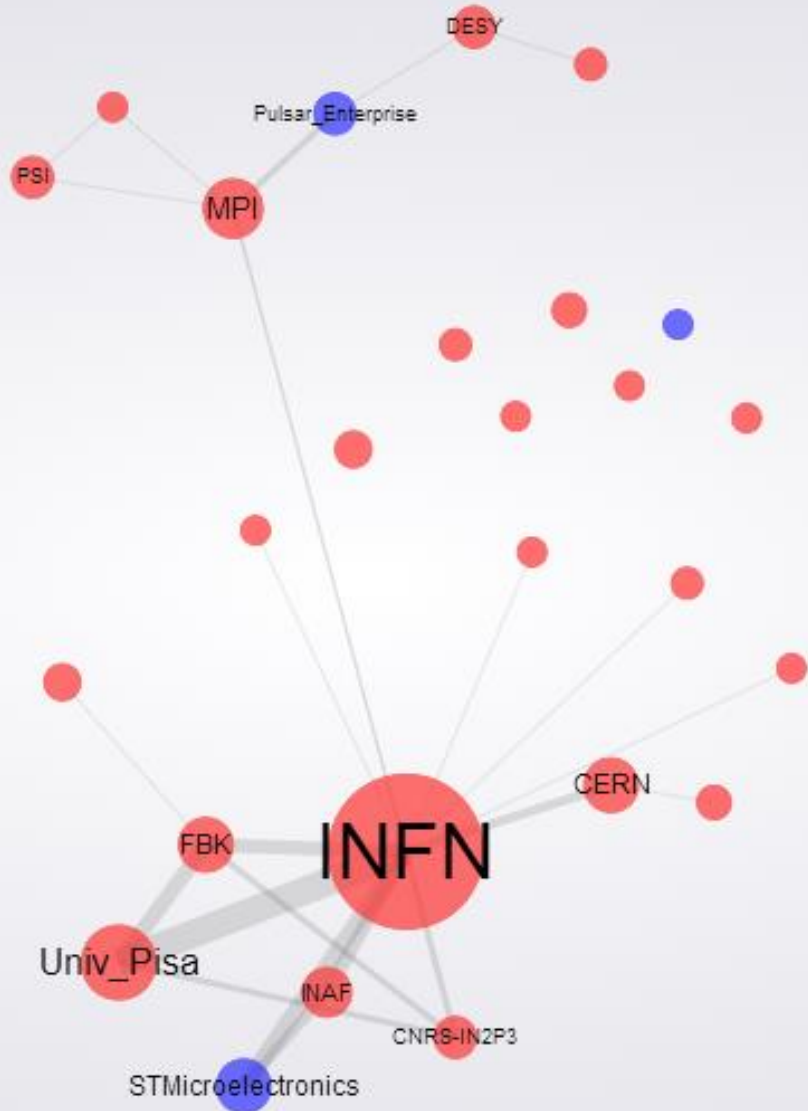


Vertical Connectors

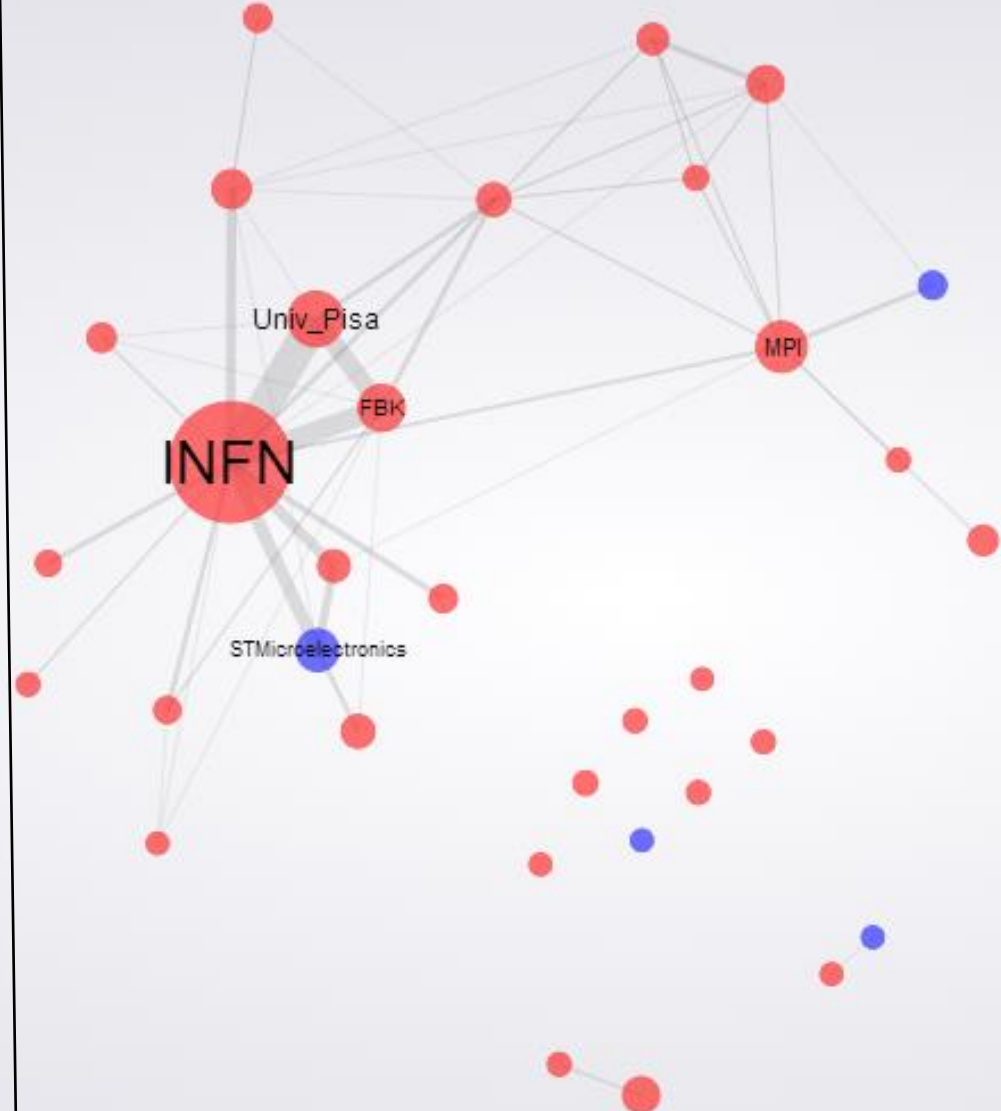


- Impact of Academia-Industry matching events in terms of collaborations
- Case: SiPM Event (February 2011)
 - First Data Set (pubs): before the event
 - Second Data Set (pubs): two years after the event
- Tracing:
 - All organisations attending the event
- Results:
 - Increase in publications
 - Collaboration development

graph from timeline – 2010



graph from timeline – 2013



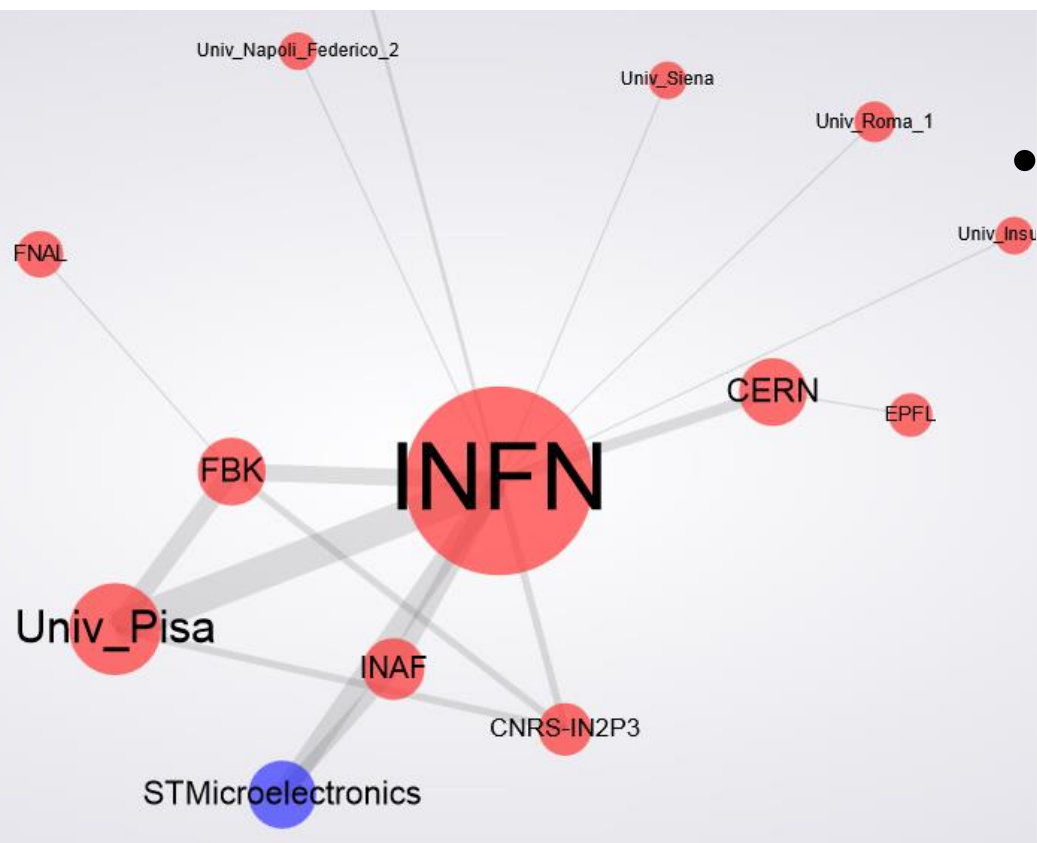
Organisation name	Pubs 2010	Pubs 2013	ΔP
CERN	11	16	5
CIEMAT	0	3	3
CNRS-IN2P3	6	11	5
CPTA_Moscow	2	2	0
CSIC	3	7	4
DESY	6	14	8
EPFL	3	6	3
ETHZ	1	2	1
FBK	11	23	12
FNAL	4	11	7
GSI	0	3	3
INAF	9	10	1
INFN	51	91	40
KETEK_GmbH	1	1	0
Kernfys_Versneller_Inst	0	2	2

Organisation name	Pubs 2010	Pubs 2013	ΔP
MPI	13	27	14
PSI	6	8	2
Photek_Ltd	0	1	1
Pulsar_Enterprise	6	6	0
STMicroelectronics	11	19	8
Univ_AGH_Sci_&_Technol	1	1	0
Univ_Glasgow	0	1	1
Univ_Heidelberg	2	9	7
Univ_Insubria	1	5	4
Univ_Leicester	0	1	1
Univ_Napoli_Federico_2	1	4	3
Univ_Oxford	1	2	1
Univ_Pisa	19	31	12
Univ_Roma_1	2	6	4
Univ_Siena	1	2	1
Univ_Surrey	1	2	1
Univ_Tech_Delft	4	14	10
Univ_Udine	0	1	1

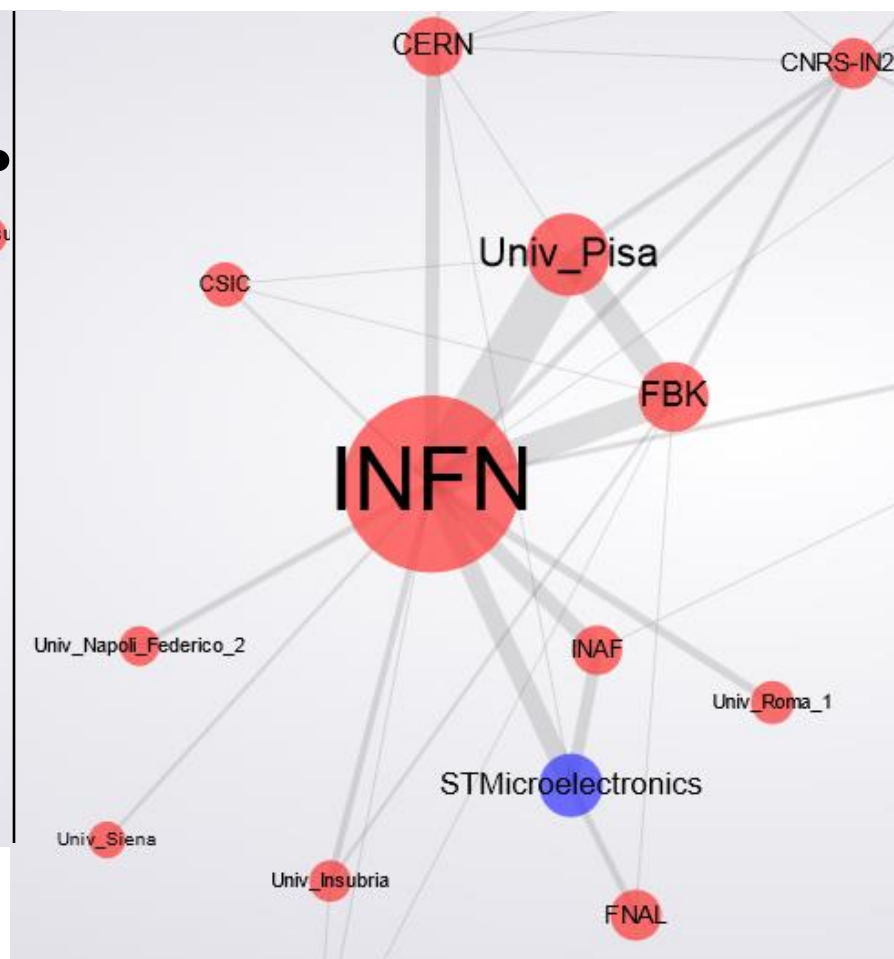
No increase

Increase

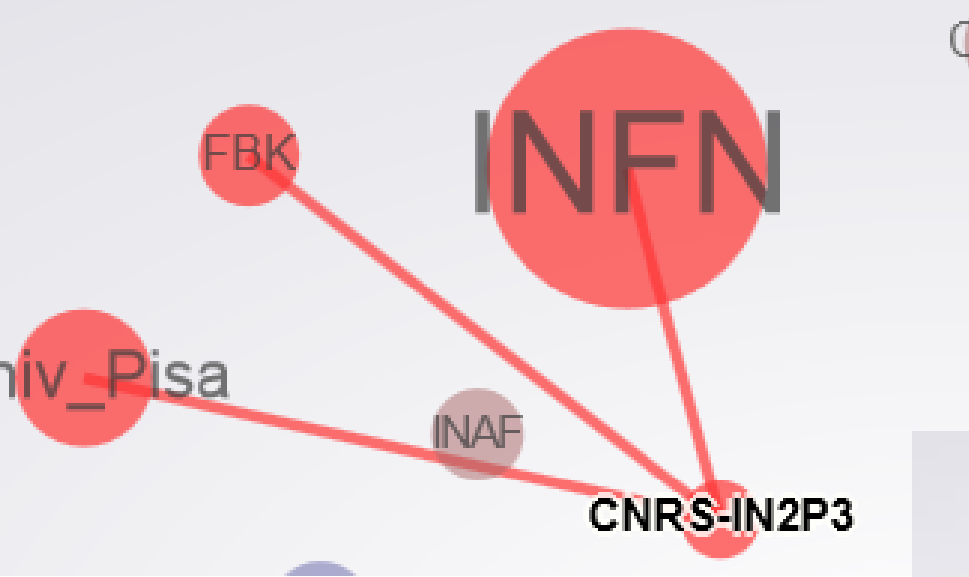
- Existing collaborations
 - INFN
 - CNRS-IN2P3
 - MPI
- New collaborations
 - Photek Ltd – Uni Leicester
 - Tech Uni Delft – Kern Versneller Institute



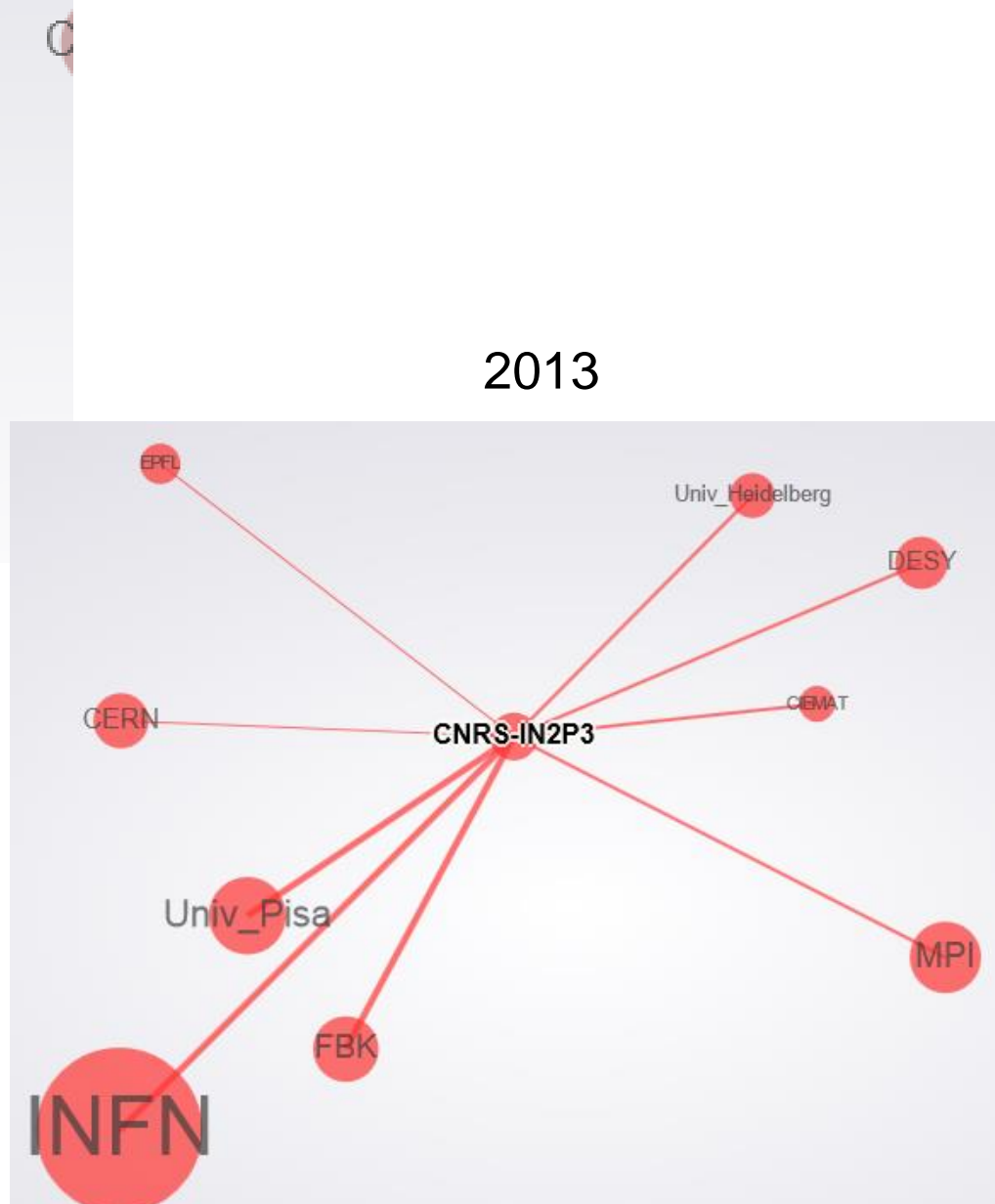
2010



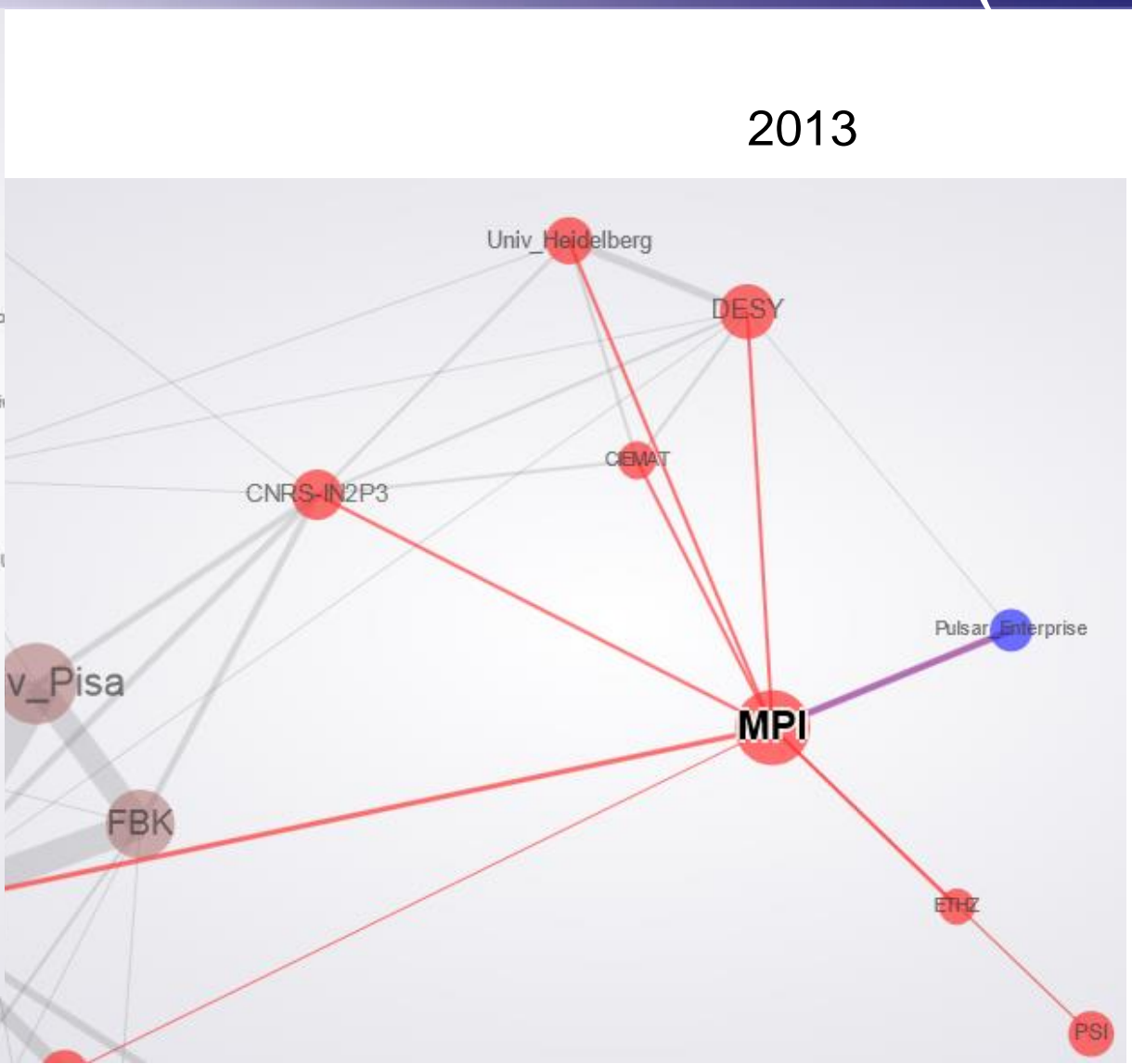
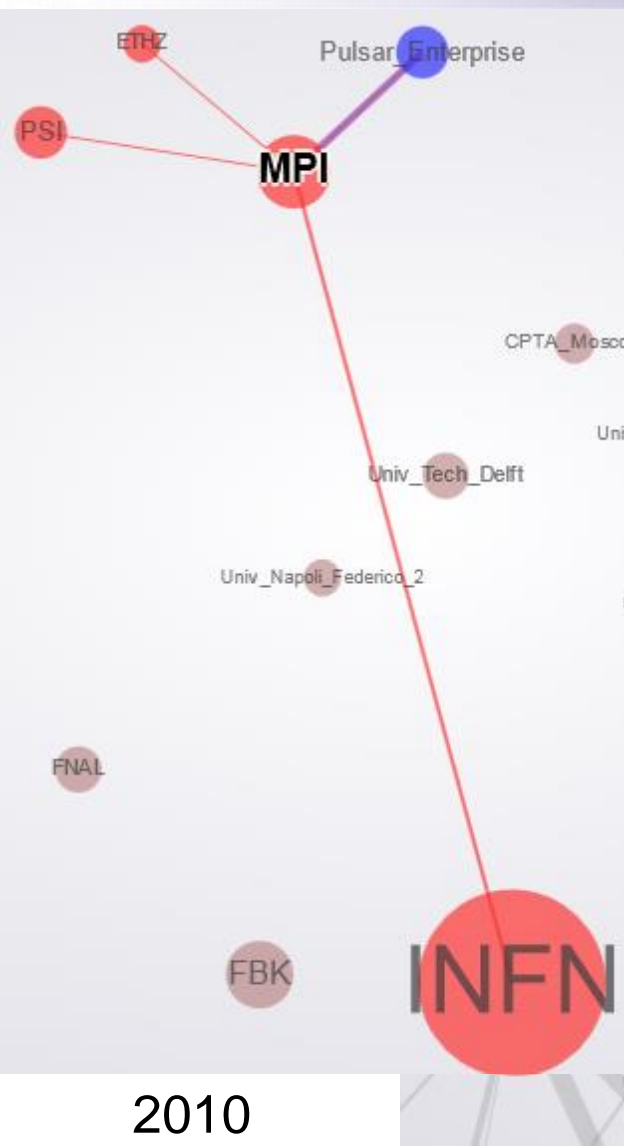
2013

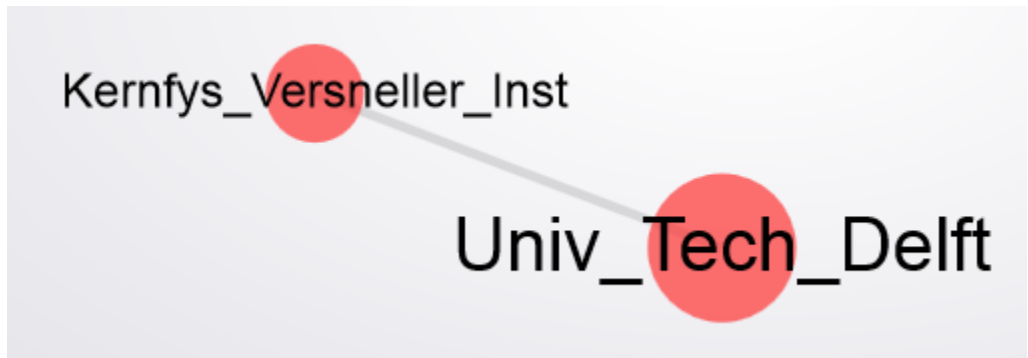
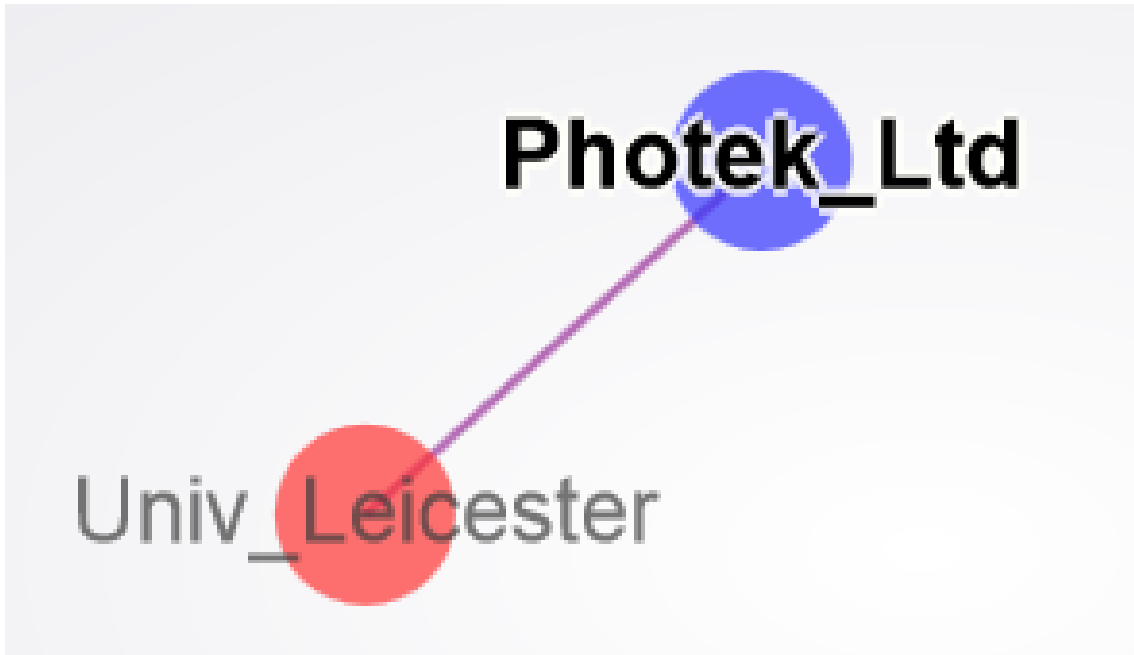


2010



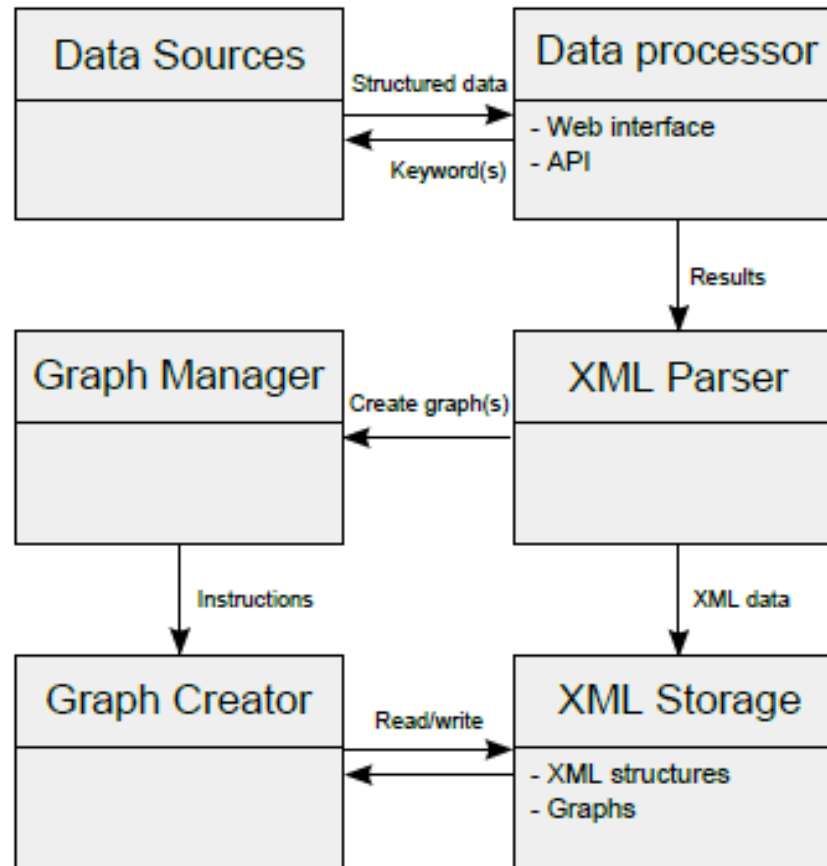
2013





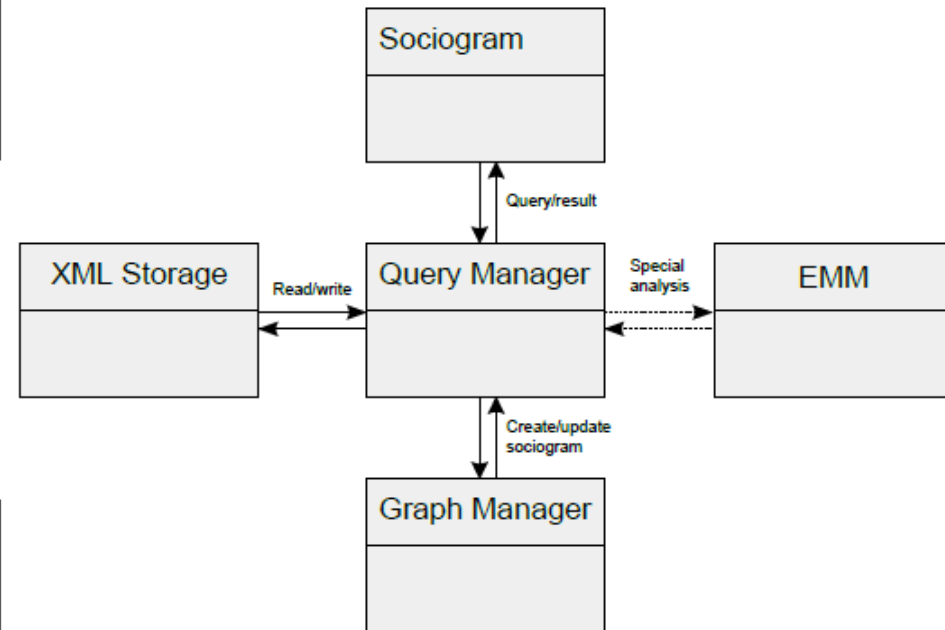
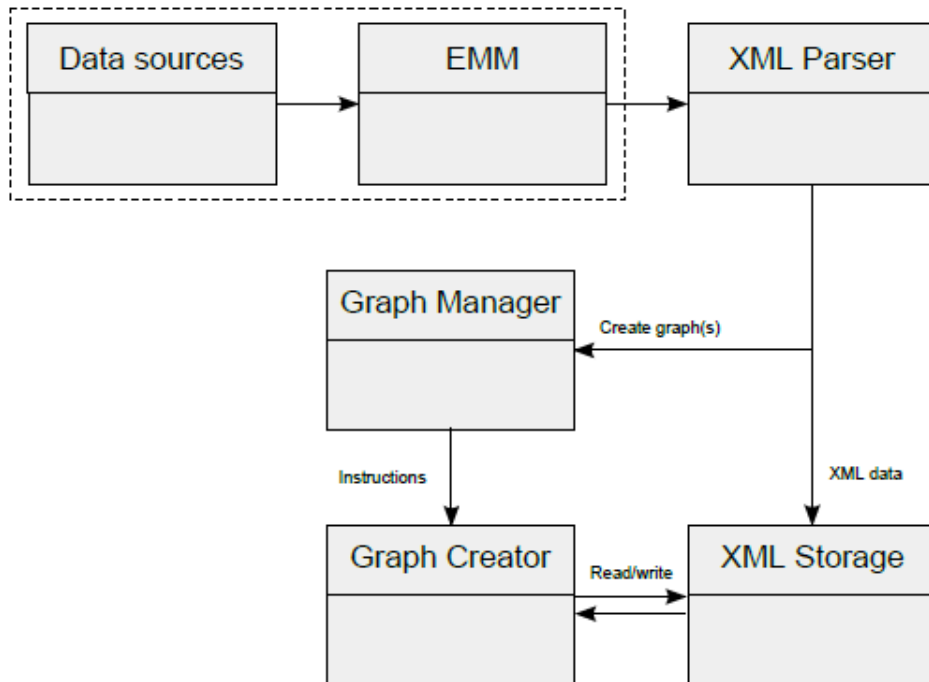
- Collaboration with JRC (Ispra) to incorporate their semantic analysis tools
 - European Media Monitor (see [EMM](#))
- Open service to the PP community
 - XML queries
- Enhanced graphics facilities
 - Timeline
 - Event follow-up

Initialisation: populating new technology info



TechnoWatch: monitoring and updating technology info

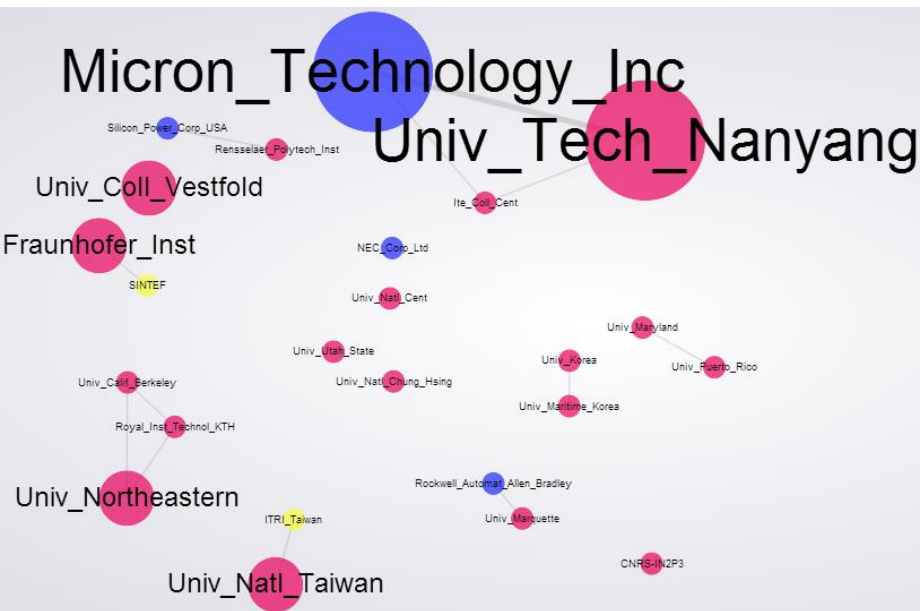
User services: XML queries



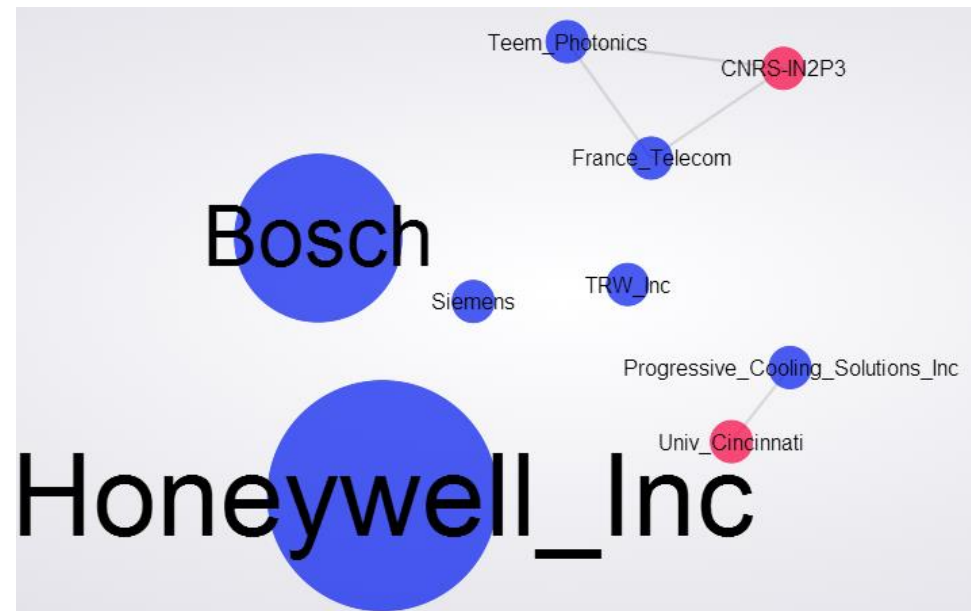
- WP4

Thank you for your attention!

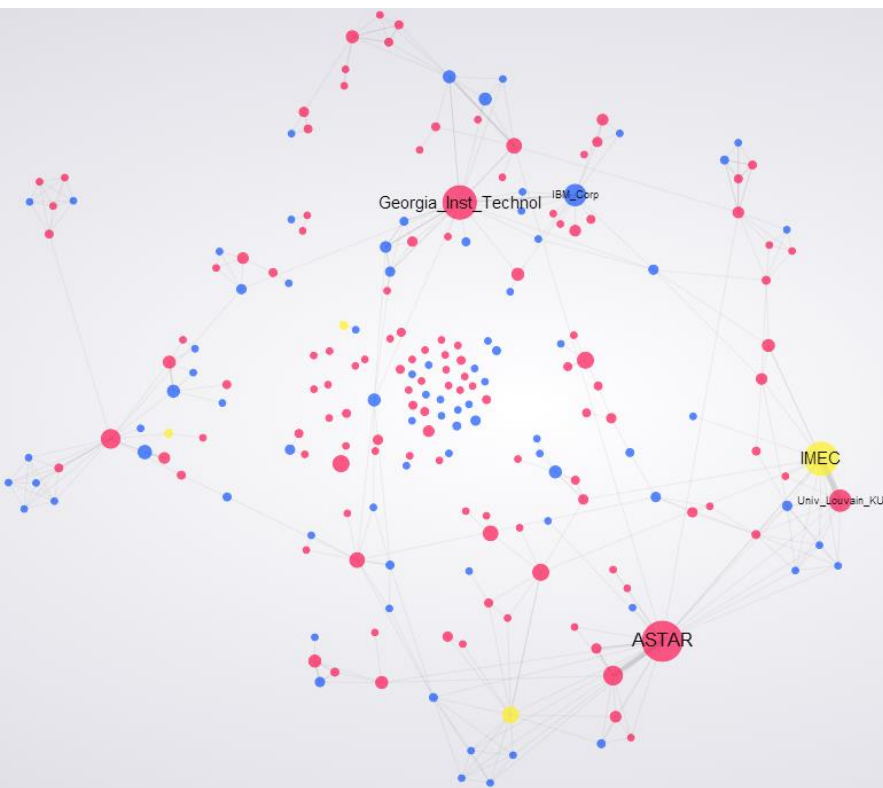
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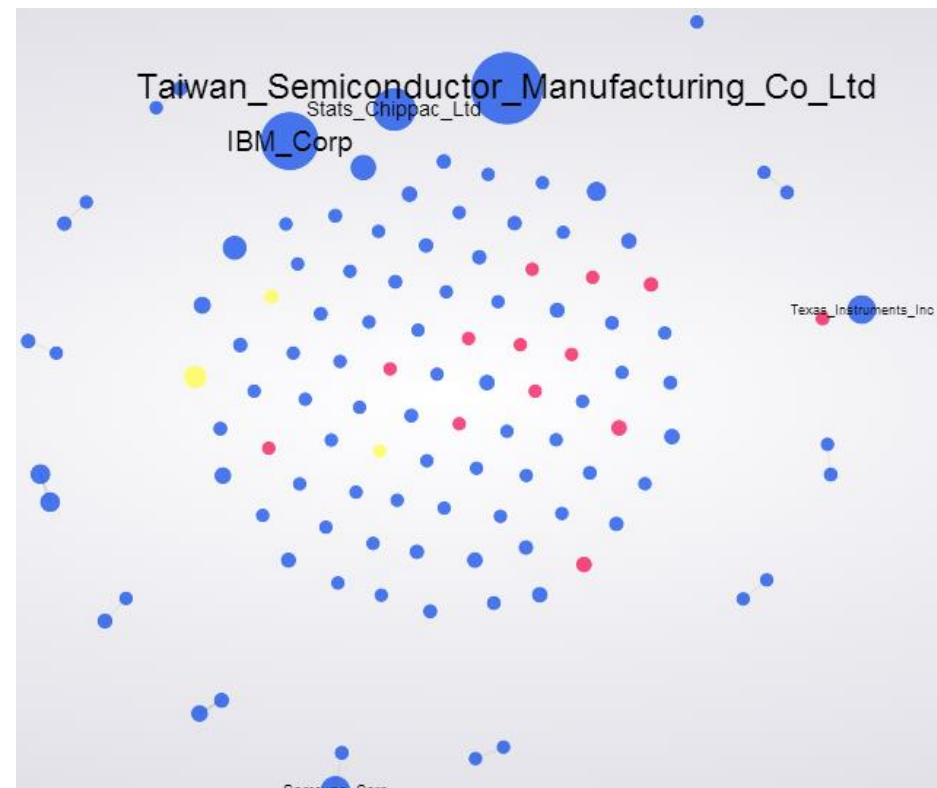
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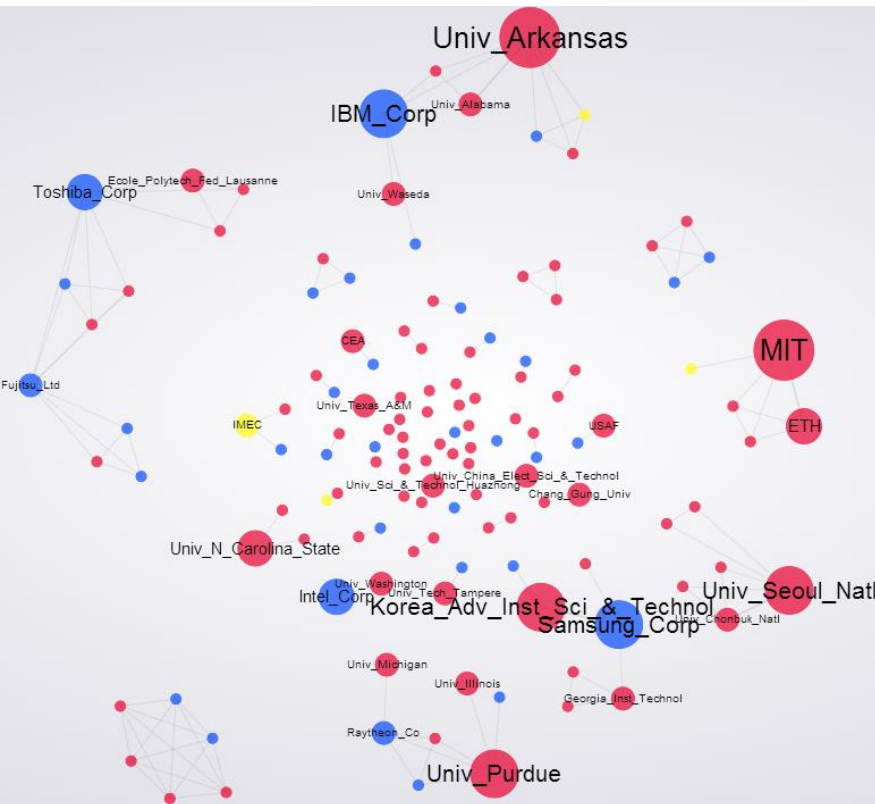
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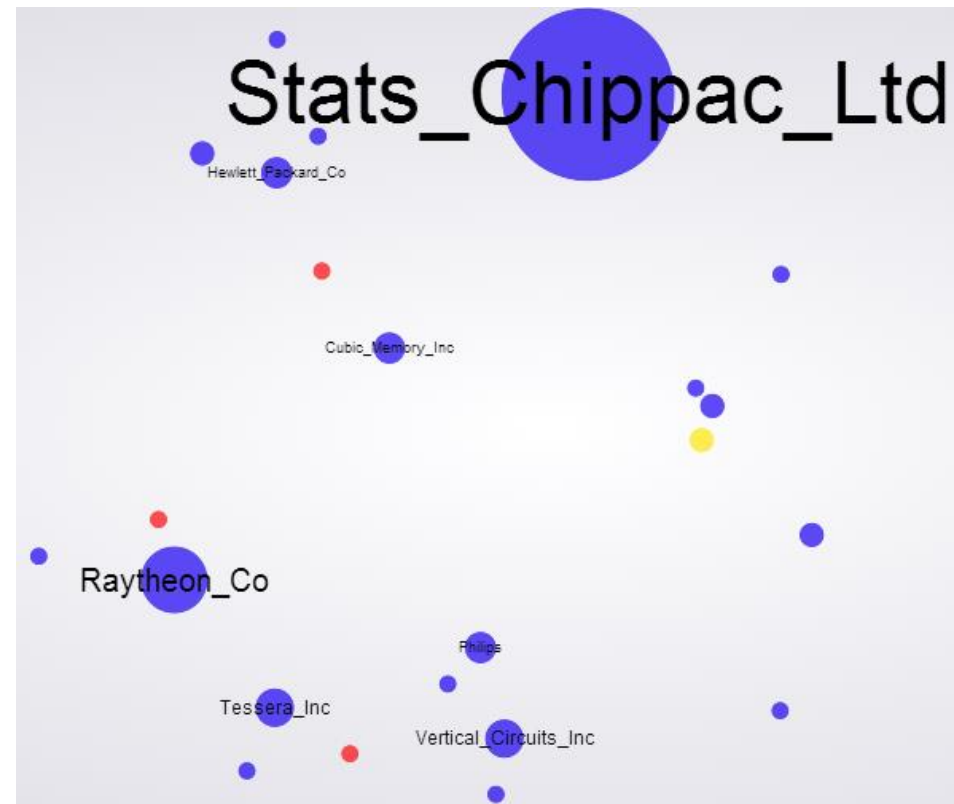
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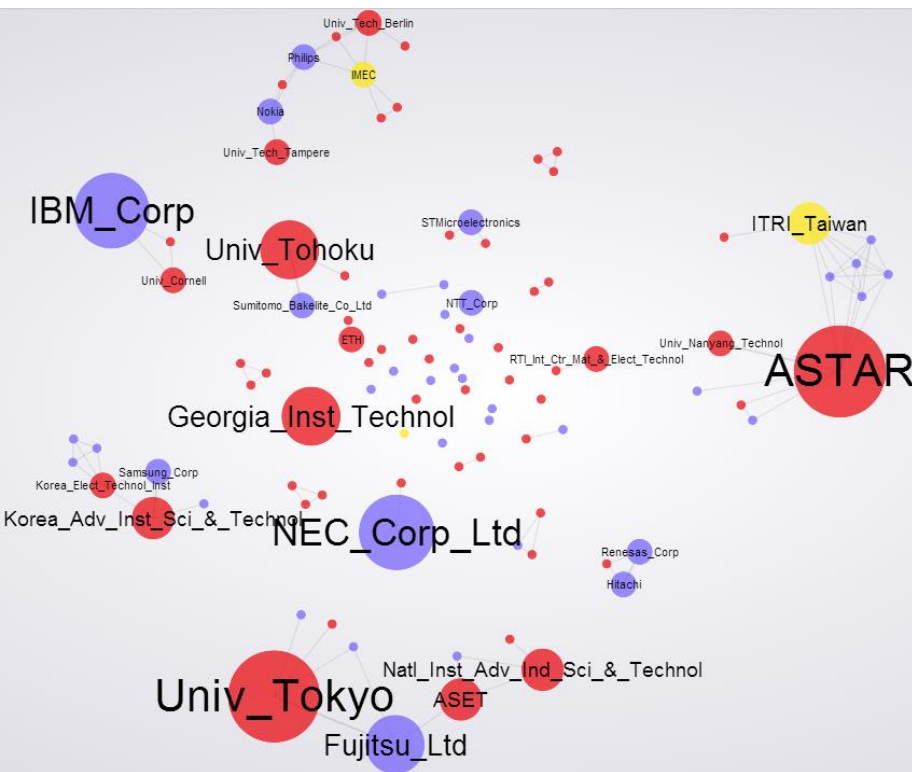
- publications



- patents



- publications



- patents

