

plexmath

proposal # 317614

Consortium Hearing session

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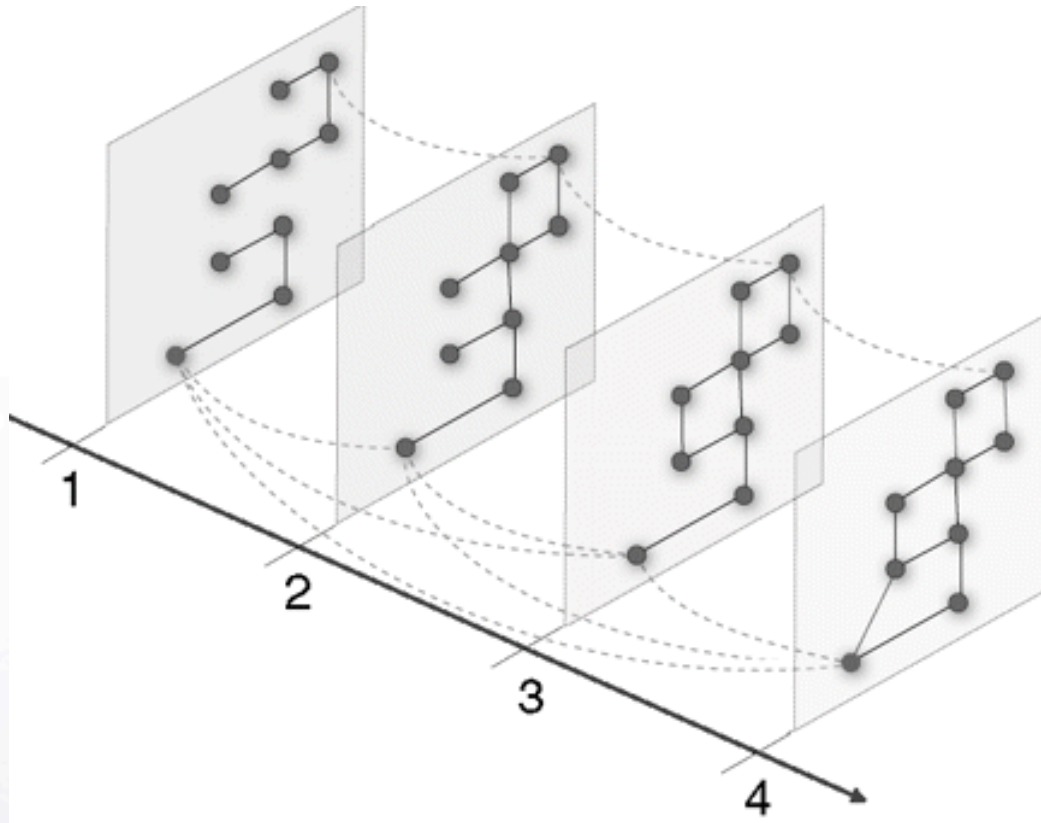
# Consortium



| Institution                    | Representative |
|--------------------------------|----------------|
| Universitat Rovira i Virgili * | A. Arenas      |
| Universidad de Zaragoza        | Y. Moreno      |
| University of Limerick         | J. Gleeson     |
| CNRS-URA                       | M. Barthelemy  |
| University of Oxford           | M.A. Porter    |



# Object of study



Time-dependent, multi-layered  
network structures



Mathematical object  
rank-4th order tensor

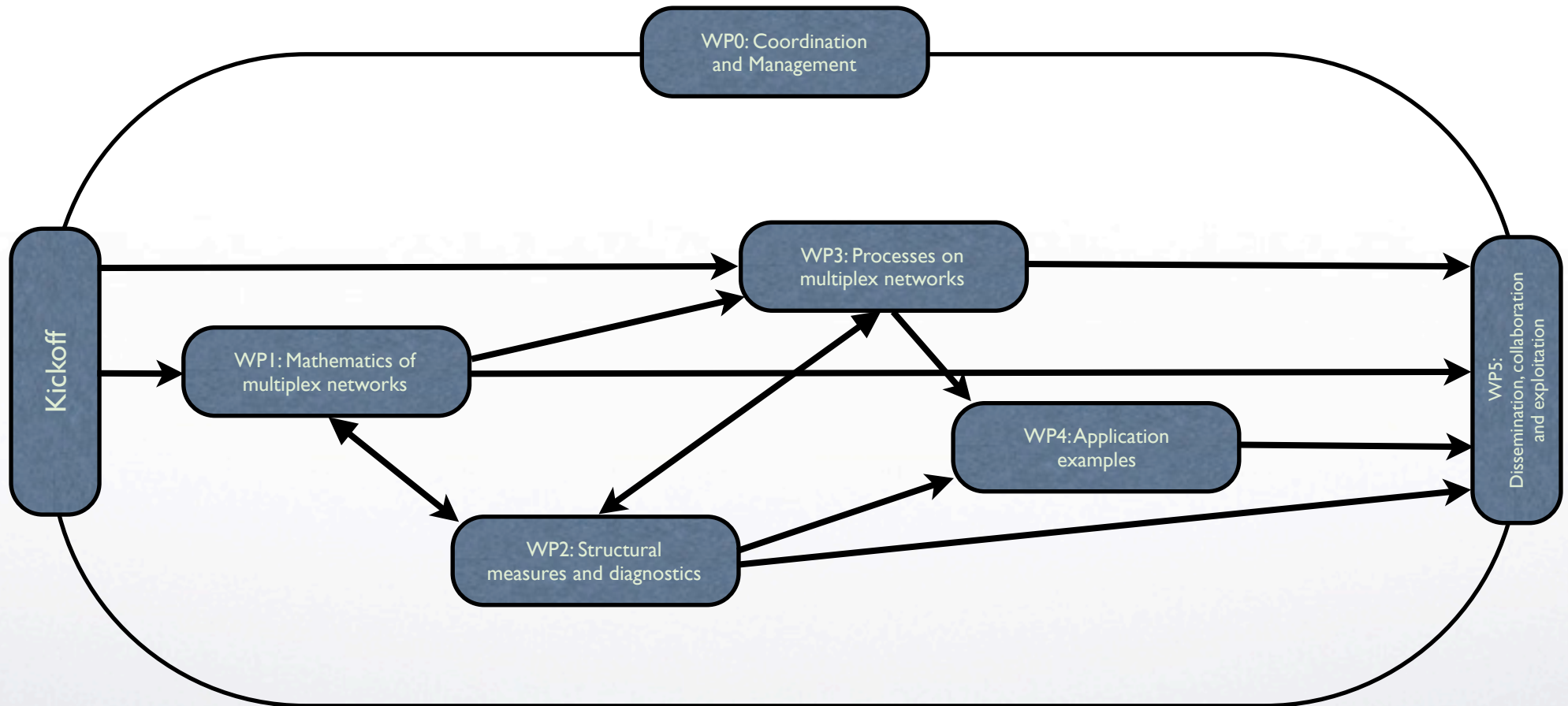


- To create a comprehensive mathematical formalism for describing the general class of multiplex network structures, including time-varying networks.
- To extend the understanding of standard network structure diagnostics and descriptors, e.g. strength distributions, correlations, clustering coefficients, betweenness, mesoscopic structure etc., to the general multiplex framework.
- To determine how particular dynamical processes (random walks and complex contagions) act on multiplex networks.
- To validate our theoretical approaches on real-world multiplex data sets.





# Plexmath structure





- WP2 will address the problem of both formulation and scalable/efficient computation of time dependent and multiplex networks
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- WP3 will address the generalization of network diagnostics such as clustering coefficient and methods such as community detection to this new framework.
- WP4 will address dynamical systems on multiplex and time-dependent networks, which will allow us to consider interactions between dynamics on networks, and dynamics of networks as well as network-control problems in such situations.
- WP5 will then apply the tools, concepts, diagnostics, and algorithms from WP2—WP4 to large data sets to demonstrate the practical use of the theory and algorithms that we will develop.



# Expected progress



|             | SCIENCE   | TECHNOLOGY  |
|-------------|---|---|
| NOVELTY     | A general theoretical foundation for the study of multi-level complex systems | Identification of previously unnoticed correlations between the structural properties and the relevant dynamics of large socio-technical networks |
| INTEGRATION | Common mathematical framework for general complex network structures          | Unified set of data structures to implement computational codes representing multiplex structures and dynamical processes on them                 |