

Distributed Cyberphysical Systems Topics for literature research & training in technical writing

Presentation for course DAT147
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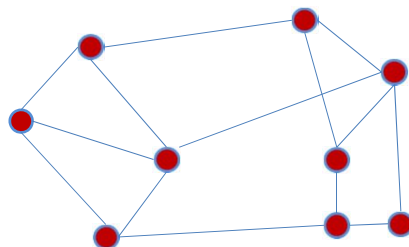


Distributed Computing and Systems
Computer Science and Engineering Department

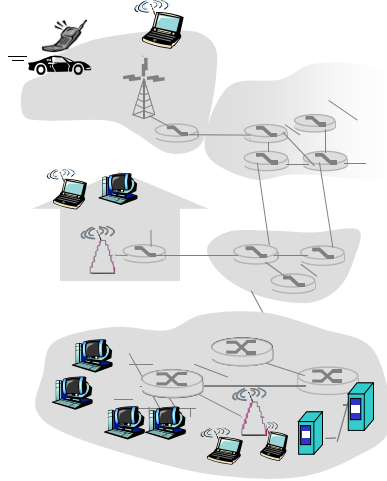
CHALMERS

A Distributed System

A set of computing & communicating processes,
collaborating for achieving local and/or global goals



A Distributed System



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Figure: Computer Networking: A Top Down Approach , Jim Kurose, Keith Ross, Addison-Wesley.

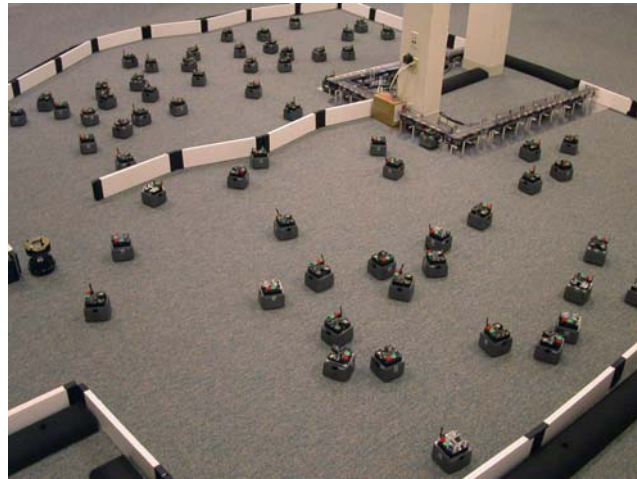
A Distributed System



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Picture source:Wikipedia

A Distributed System

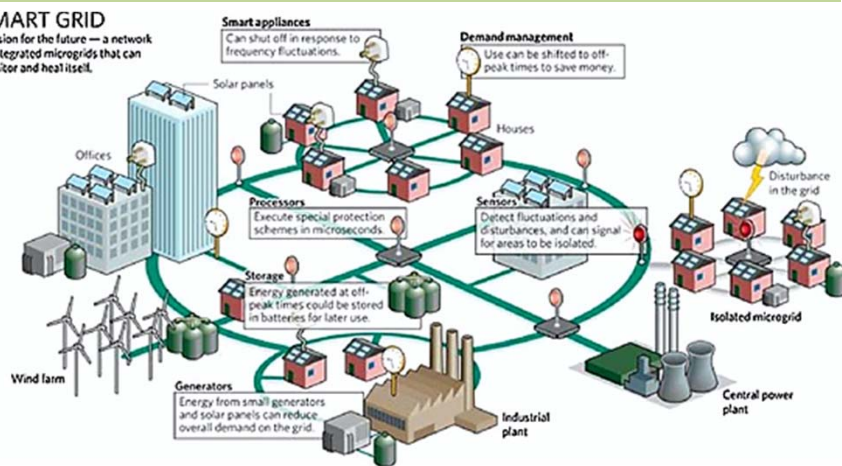


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Pic. <http://www.hatswitch.org/~sn275/courses/DSS/info.shtml>

A Distributed (Cyberphysical) System

SMART GRID
A vision for the future — a network of integrated microgrids that can monitor and heal itself.



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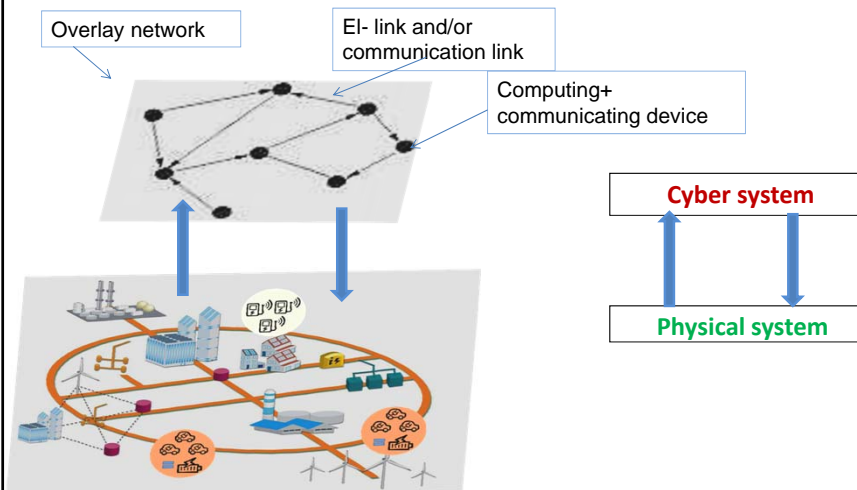
Picture source <http://www.energy-daily.com/images/smart-grid-electricity-schematic-bg.jpg>

Another distributed cyberphysical system



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EI-networks as example of distributed cyber-physical systems



(abstraction also relevant in vehicular-networks)

What can be there in the EI-network cyber-layer ?

Enabling "tools": Communication, Data, information

- **Adaptiveness: Distributed resource management: utilize renewables when possible**
- For that we need to:
 - know state (local/global, summaries),
 - Form prosumer overlays
 -

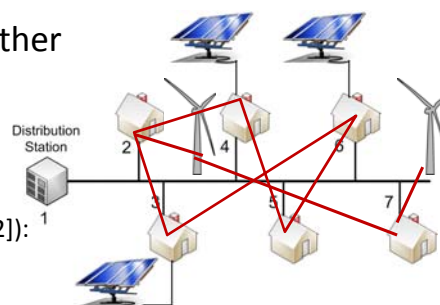
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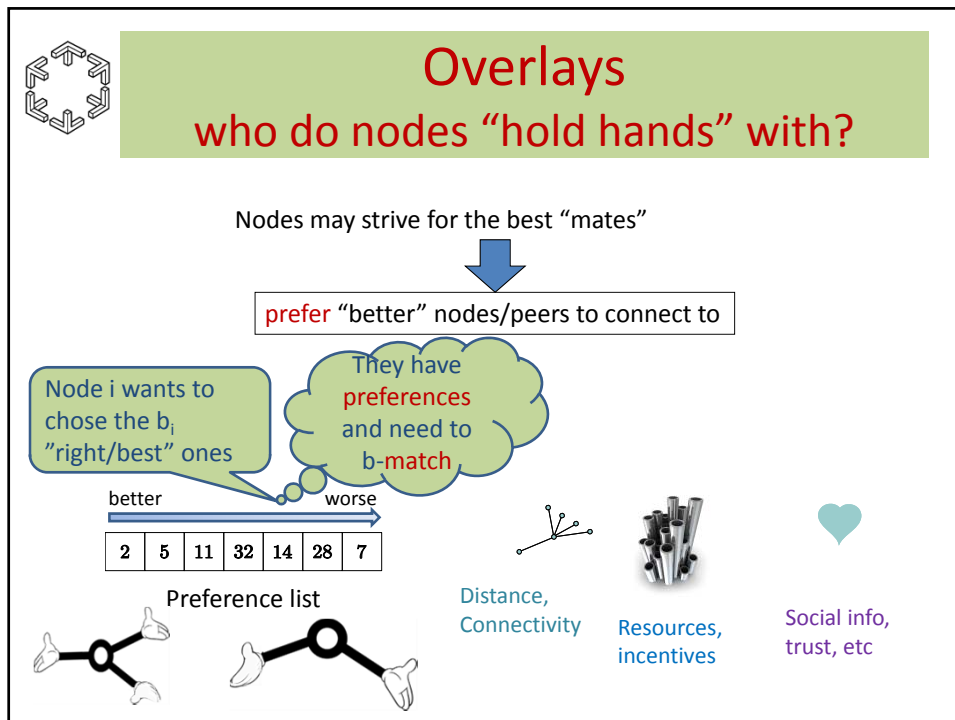
Virtual Private Grids/microgrids

- exchanging supplies and loads
& cooperating for 0-energy or mixed use of renewable and other sources

- connect "prosumers"
 - network overlays ([GP10, GP12]):
- To exchange power



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Topic 1 in Distributed cyberphysical systems:
generalized matchings with preferences for overlays

- Main articles:
 - R. W. Irving and S. Scott, "The stable fixtures problem - a many-to-many extension of stable roommates," Discrete Appl. Math., vol. 155, no. 16, pp. 2118–2129, 2007.
 - F. Mathieu, "Self-stabilization in preference-based systems," Peer-to-Peer Networking and Applications, vol. 1, no. 2, pp. 104–121, sept 2008.
 - Georgiadis, Giorgos, and Marina Papatriantafidou. "Overlays with Preferences: Distributed, Adaptive Approximation Algorithms for Matching with Preference Lists." Algorithms 6.4 (2013): 824-856.

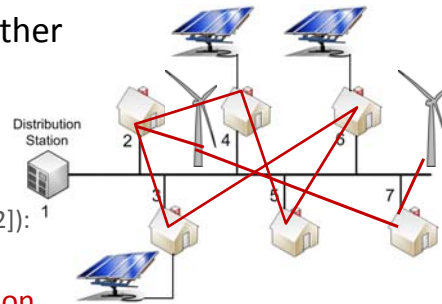
The diagram features a green header box with the title 'Topic 1 in Distributed cyberphysical systems: generalized matchings with preferences for overlays'. Below the header is a list of three main articles related to the topic. A small network icon is visible in the top left corner of the slide.



Virtual Private Grids/microgrids: what else?

- exchanging supplies and loads
& cooperating for 0-energy or mixed use of renewable and other sources

- connect “prosumers”
 - network overlays ([GP10, GP12]):
- Need consistent snapshot/summary information



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Topic 2 in Distributed cyberphysical systems: Snapshots/overview of distributed and shared state

- Main articles:
 - Chandy, K. Mani, and Leslie Lamport. "Distributed snapshots: determining global states of distributed systems." ACM Transactions on Computer Systems (TOCS) 3.1 (1985): 63-75.
 - Suman Nath, Phillip B. Gibbons, Srinivasan Seshan, and Zachary R. Anderson. 2004. Synopsis diffusion for robust aggregation in sensor networks. In Proceedings of the 2nd international conference on Embedded networked sensor systems (SenSys '04).
 - Afek, Y., Attiya, H., Dolev, D., Gafni, E., Merritt, M., & Shavit, N. (1993). Atomic snapshots of shared memory. Journal of the ACM (JACM), 40(4), 873-890.



Some papers for context/background on cyberphysical systems

- Randy H. Katz, David E. Culler, et-al , *An information-centric energy infrastructure: The Berkeley view*, Sustainable Computing: Informatics and Systems, Volume 1, Issue 1, March 2011, Pages 7-22, ISSN 2210-5379.
- Rajkumar, Ragnathan Raj, et al. "*Cyber-physical systems: the next computing revolution.*" Proceedings of the 47th Design Automation Conference. ACM, 2010.



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