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Operational Use of CP in Industry

The CHIP Case

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CP and Industry

- ◆ **CP : a powerful paradigm for combinatorial problems**
 - ▼ **Problems with multiple types of constraints, hard to find a feasible solution**
 - ▼ **Modeling of problems in terms of “constraints” (numerical/symbolic)**
 - ▼ **Efficiency by mixing “constraint reasoning” and “search procedures”**
 - ▼ **Combination of different techniques : AI, OR, Discrete Maths**

- ◆ **Industrial organizations have combinatorial problems**
 - ▼ **Organization of Activities (e.g. production, transport, logistics)**
 - ▼ **Allocation of Resources (e.g. equipments, personnel)**
 - **→ Business Process & Resources Optimization**

CP and Industry

◆ Target of Entreprises : increase the competitiveness

- ▼ Maximize business activities
- ▼ Minimize operating costs
- ▼ Maintain quality (products & services)
- ▼ → Fast reactivity to the market
- ▼ → Quick ROI

◆ What can CP bring

- ▼ Complementary to standard business packages : ERP, WMS, SCE/M, HRMS
- ▼ Computing an “optimal” planning of Activities
- ▼ Computing an “optimal” distribution of Resources
- ▼ → Optimisation of Activities & Resources (with ROI ?)

Industrial reality vs. Academic & Research

◆ Important issues in an industrial contexte :

- ▼ No formal description of the problem !
- ▼ Understand the “business need” (-> “business process”)
- ▼ Find the “right” modeling (-> can be solved “reasonably”)
- ▼ Solve the “right” problem ! (-> improve the business process)
- ▼ Look for a “reasonable” solution : cost, resp. time, comp. resources, quality
- ▼ Look for a “flexible” solution : any time / any case, scalable, parametrizable
- ▼ Look for a “user-friendly” solution : easy to use, ergonomic, understandable

◆ Important issues for an industrial software :

- ▼ Robustness, scalability, adaptability, parametrization,...
- ▼ Compatibility, portability, usability, easy integration,...

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◆ Origine :

- ▼ **CHIP team of ECRC / Munich (Germany)**
- ▼ **Founded in 1990 at Orsay (South Paris)**
- ▼ **Private company (SA)**

◆ Mission:

- ▼ **Provide complex Planning & Scheduling Software**
- ▼ **based on Constraint Programming technology (CHIP)**
- ▼ **for Resources Management & Optimization**

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◆ **Products & Services :**

- ▼ **Constraint Programming Tool : CHIP V5**
- ▼ **Vertical solution/package : OPTI-CHANNEL (based on CHIP)**
- ▼ **Customer-specific application development**

◆ **Main features of CHIP :**

- ▼ **Global Constraints (“cumulative”, “diffn”, “cycle”, “prod-cons”,...)**
- ▼ **Search methods : Exact /Partial search, user-defined search, semantic labeling,...**
- ▼ **Utilities : GUI, DB interface, process communication, debugging,...**

◆ **Main Application areas :**

- ▼ **Production Scheduling, Logistics / Supply Chain Management**
- ▼ **Personnel/Manpower Planning & Scheduling (Human Resources)**

Ex. Planning and Scheduling of Human Resources

- ◆ **Covering a demand for services :**
 - ▼ **Continuous (24h/7d), fluctuating (seasonality), frequently disturbed,...**
 - ▼ **Sectors : Emergency Services, Transports, Retail, Broadcasting,...**

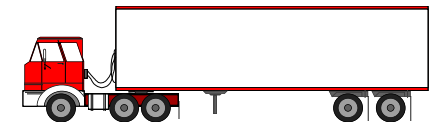
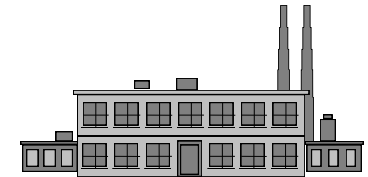
- ◆ **Constraints :**
 - ▼ **Operational and Regulatory**
 - ▼ **HR : fairness, preferences**

- ◆ **Planning & Scheduling process :**
 - ▼ **Combination of human & physical resources (equipment)**
 - ▼ **Different time horizons (yearly, monthly, weekly, daily)**
 - ▼ **Automatic, semi-automatic and/or interactive uses**

Some (operational) References of CHIP ...

◆ Production Scheduling, Logistics & Supply Chain

- ▼ e.g. Airbus/EADS, Dassault Aviation, Falcon Jet, Essilor, SCI*
- ▼ e.g. ArcelorMittal, ExxonMobil, Mitsubishi, Monsanto, Isab/Erg Petroli
- ▼ e.g. Electricity of France, Fujifilm, Toyota, Alcatel-Lucent



◆ Personnel/Manpower Planning & Scheduling

- ▼ e.g. Arte, Canal+, I-Tele, France24, RFI, RTL, RTS, Technicolor
- ▼ e.g. Cremonini, Wagons-Lits, SNCM(MediterraneanCarFerries)
- ▼ e.g. SDIS(Fire&RescueServices/Rhone), French Ministry of Justice



CHIP in Action ...

