

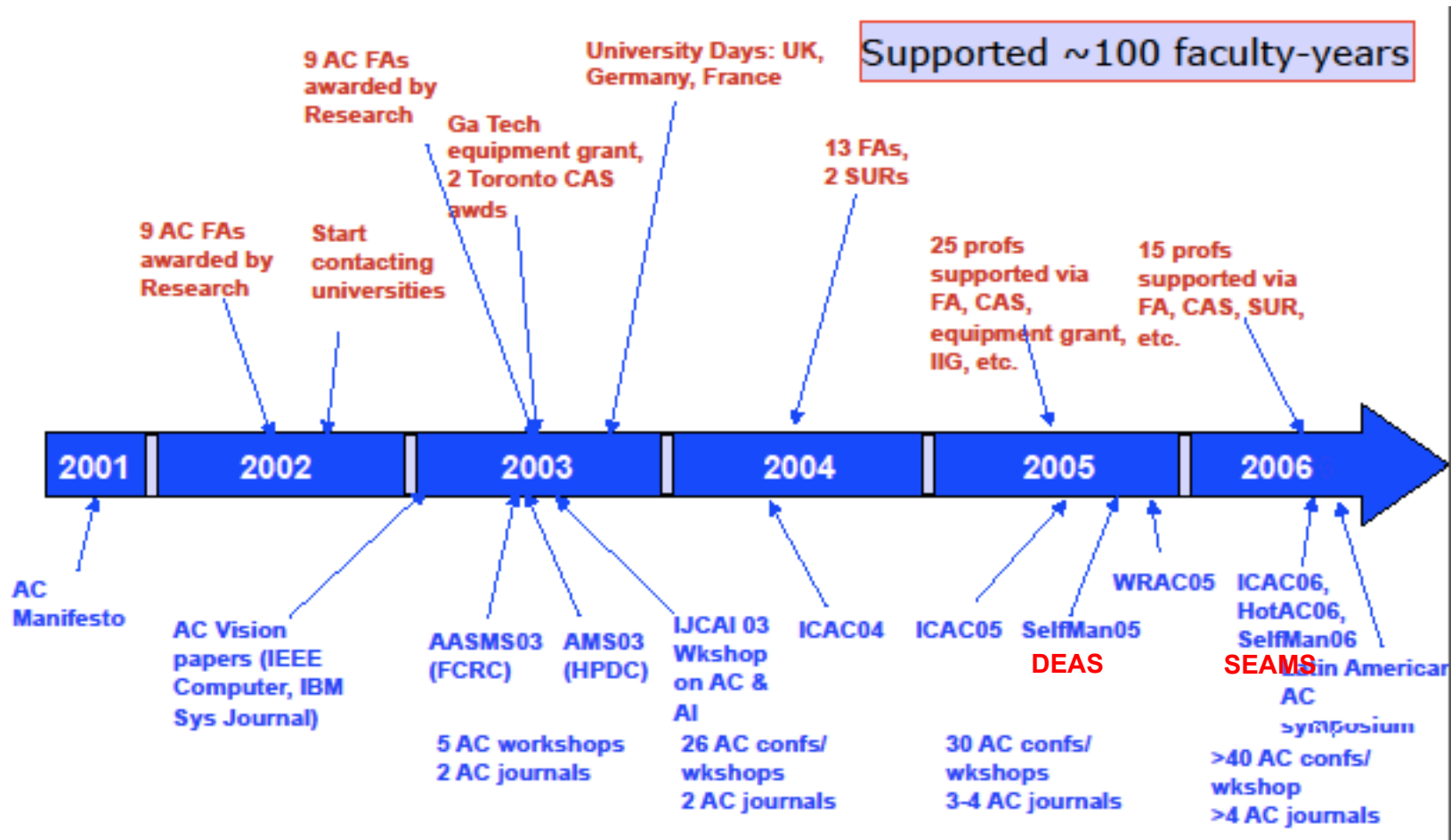
Is the Goal of Self-adaptive Systems Full Automation?

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AC Formative Years: IBM Perspective*



We Lost the Human in the Loop!!

- In the early phase of AC, Human Interaction Studies topic was present
- At DEAS 2005, we had a session on “Interactions”
- In ICAC community, “ human interaction studies, never prevalent, became extinct in 2006”*
- At SEAMS, after 2006, human interactions studies became (almost) extinct
- **What is the risk?**

Model Predictive Optimization: Simplified View**

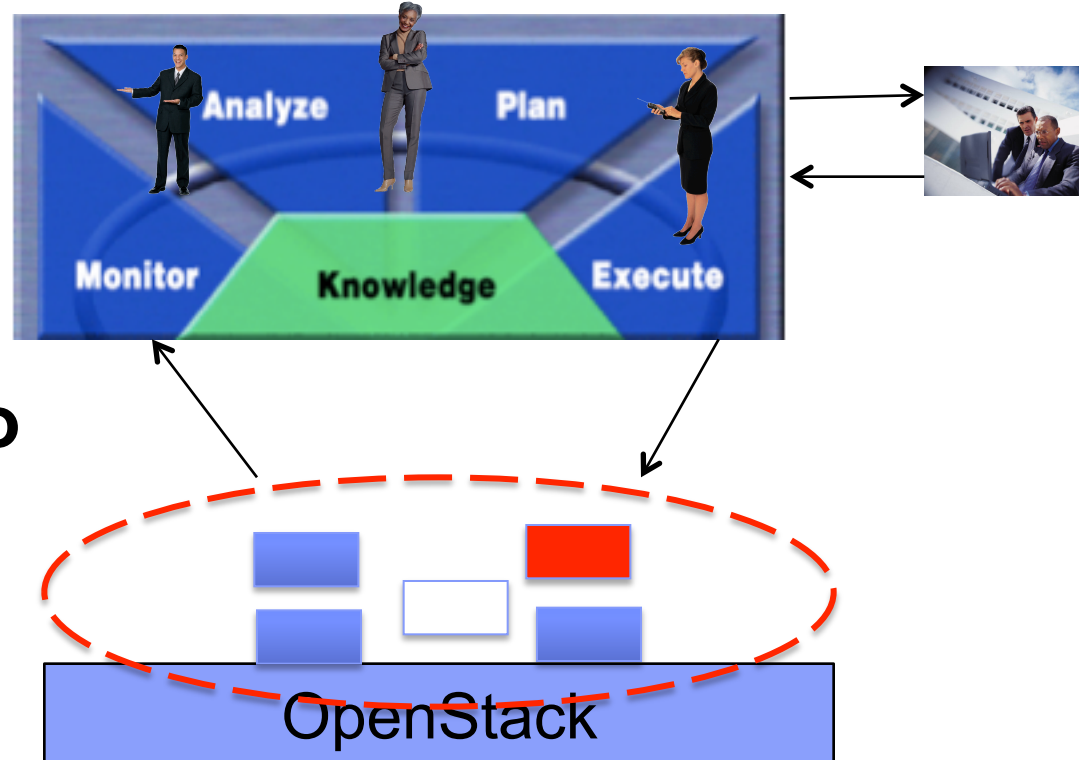
$$\begin{aligned}
 & \text{minimize}_{\theta_0, \dots, \theta_{T-1}} E \left[r_{\text{SLA}} \sum_{t=1}^T \sum_{c=1}^C \lambda_{\text{SLA}} (R_{c,t} - R_c^{\text{SLA}}) \right. && \text{SLA Breaches Penalties} \\
 & + r_{\text{resource}} \sum_{t=1}^T \sum_{h=1}^H \lambda_{\text{resource},h} (U_{h,t}) && \text{Hardware Cost} \\
 & \left. + r_{\text{dep}} \sum_{t=1}^T \sum_{h=1}^H \sum_{s=1}^S \lambda_{\text{dep}} (\theta_{s,h,t}, \theta_{s,h,t-1}) \right] && \text{Trashing Cost} \\
 & \text{subject to:} \\
 & R_t = \text{LQM}_{\Omega, \sigma}(d_t, \theta_t, W_t) && \forall t && \text{Model (Layered Queuing Model)} \\
 & \sum_{h=1}^H \theta_{s,h,t} = 1 && \forall s, t && \text{Allocation}
 \end{aligned}$$

- I delegate the financial/investment decisions, procurement, trade-off analysis, forecasting, etc.. to an unsupervised program
- This breaches most companies policies

Towards a Human Centric MAPE-K Loop

- **Consider the users**
 - Operations teams
 - Developers

- **Add the “K” back to the MAPE loop**



Industry Trends: DevOps

- **DevOps: promotes the idea of strong collaboration among Development and Operations teams**
- **NoOps means developers can code, deploy, manage and maintain the application**
 - automated systems (PaaS like Cloud Foundry, BlueMix) manage app lifecycles; no Operations teams
- **Adaptation is one of the main aspects of DevOps/Noops**

