

# Adaptive Applications for Wireless Clients

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# Applications & Data Services for the Communication Era

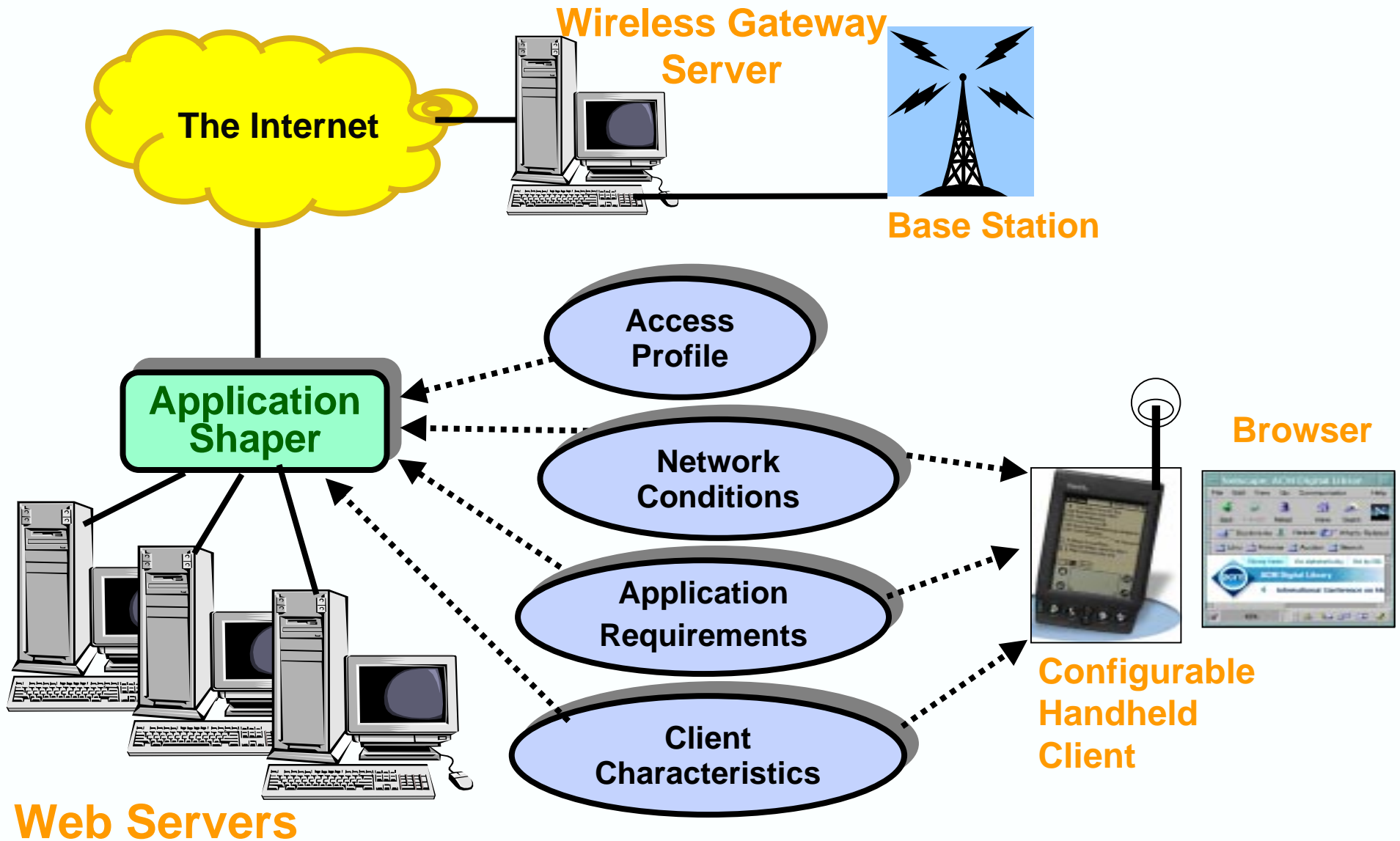
- **Computing Era**

- Primary Resource : *Computing*
- Paradox : Computing resources increased over years, but so did problem complexity
- Solution: **Efficient computing algorithms**: minimize computation ops
- Metrics: Runtime, space complexity

- **Communication Era**

- Primary Resource : *Bandwidth*
- Paradox : As bandwidth capabilities increase, so will new data-intense wireless services and number of users
- Solution: **Adaptive Applications**: minimize data traffic
- Metrics: Quality of data; Quality of service; Latency; Energy

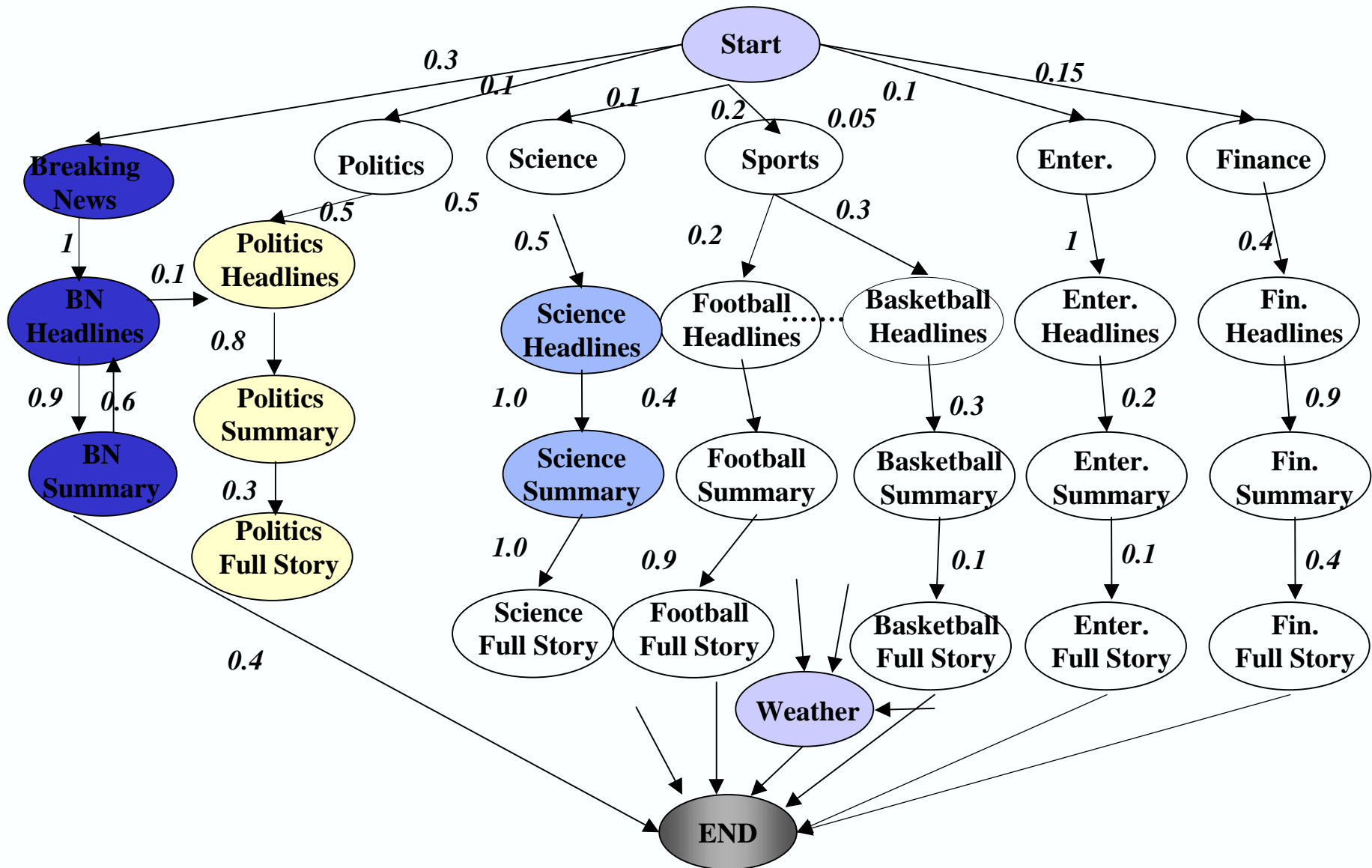
# Our Approach: Adaptive Wireless Data



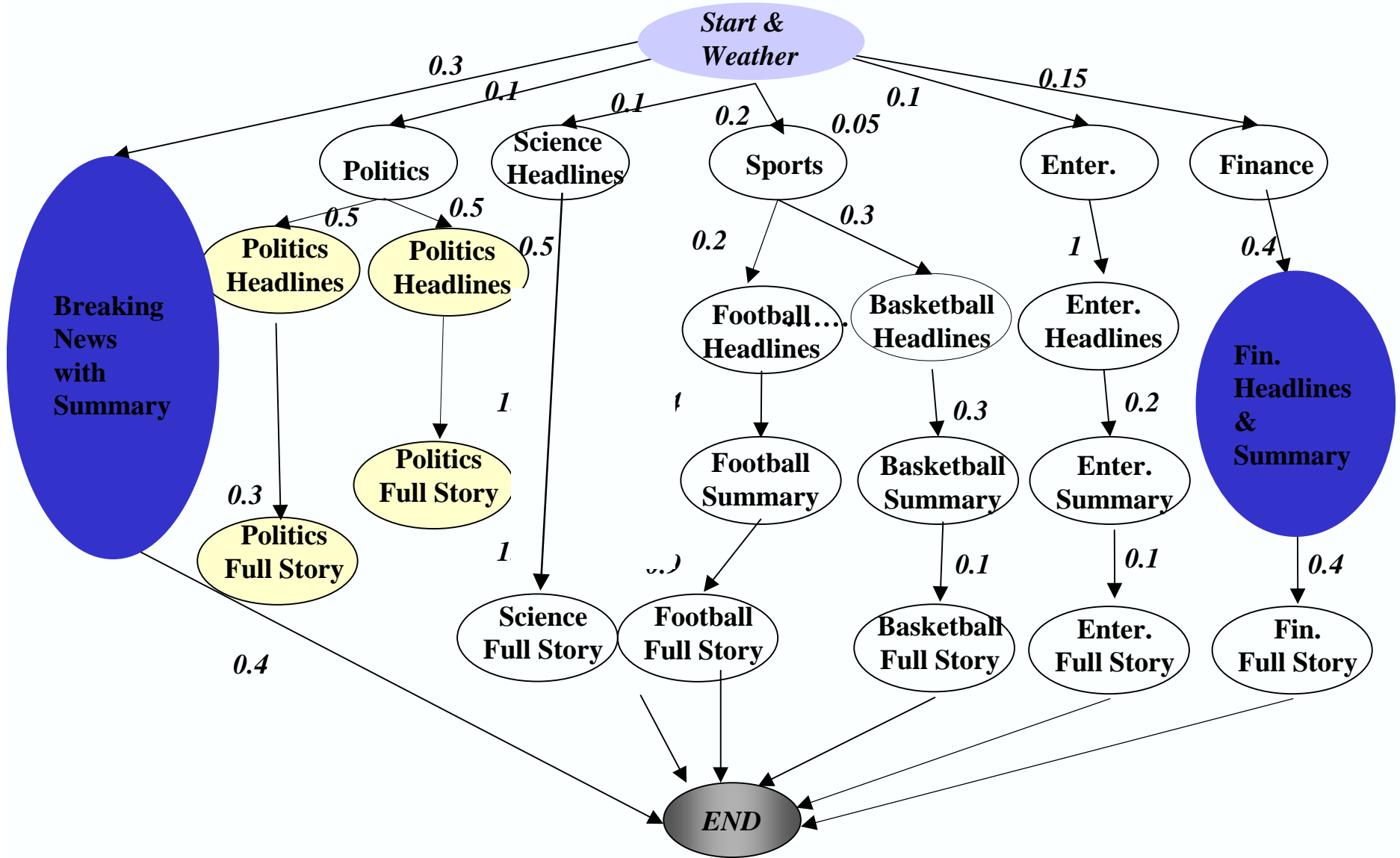
**Web Servers**

*Sujit Dey*

# Energy-Constrained Wireless Application Design : Motivation



# Wireless Application Design : Energy Optimization



# Wireless Applications : Energy Modeling

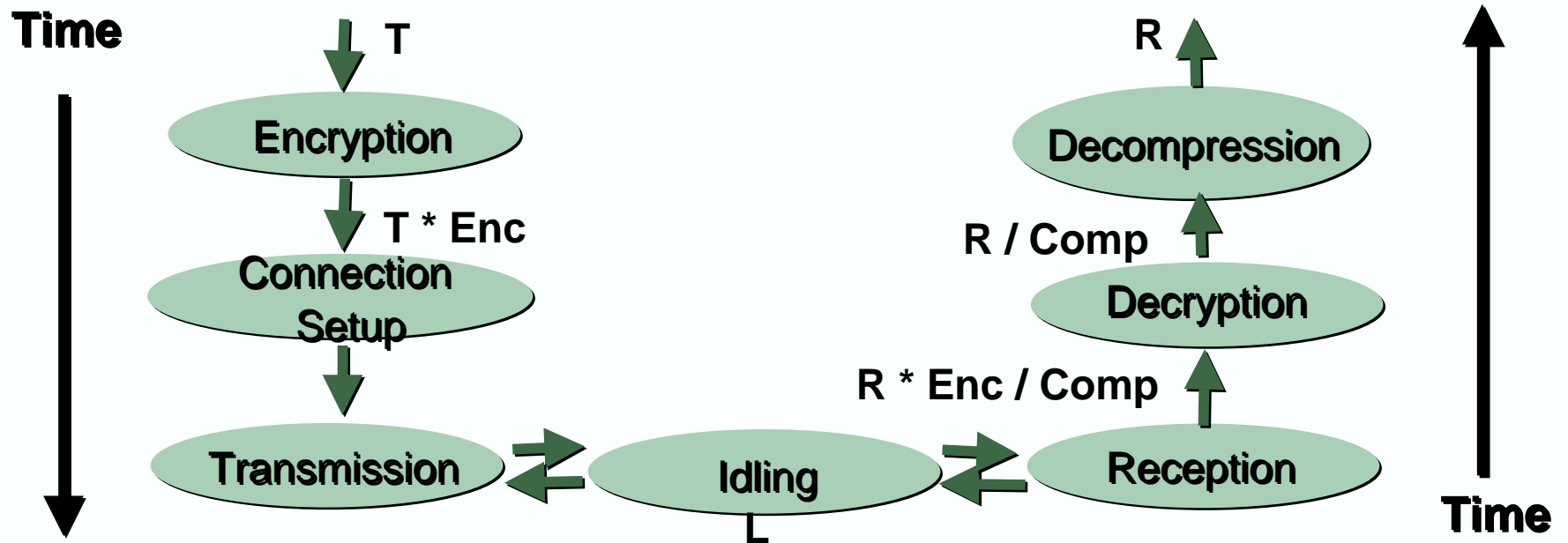
## Goal :

Develop energy modeling methodology for wireless application design exploration

## Steps :

- Develop energy model for a handheld client (PalmVII) using measurement based methodology
- Develop a generic energy estimation methodology for wireless applications

# Energy Model



$$\begin{aligned}
 E(R, T, C, L, \text{Enc}, \text{Comp}) = & C_0 \\
 & + C_{\text{idle}} * L \\
 & + C_t * (T * \text{Enc}) \\
 & + C_r * (C * R * \text{Enc} / \text{Comp}) + \\
 & + C_{\text{enc}} * T + C_{\text{comp}} * R
 \end{aligned}$$

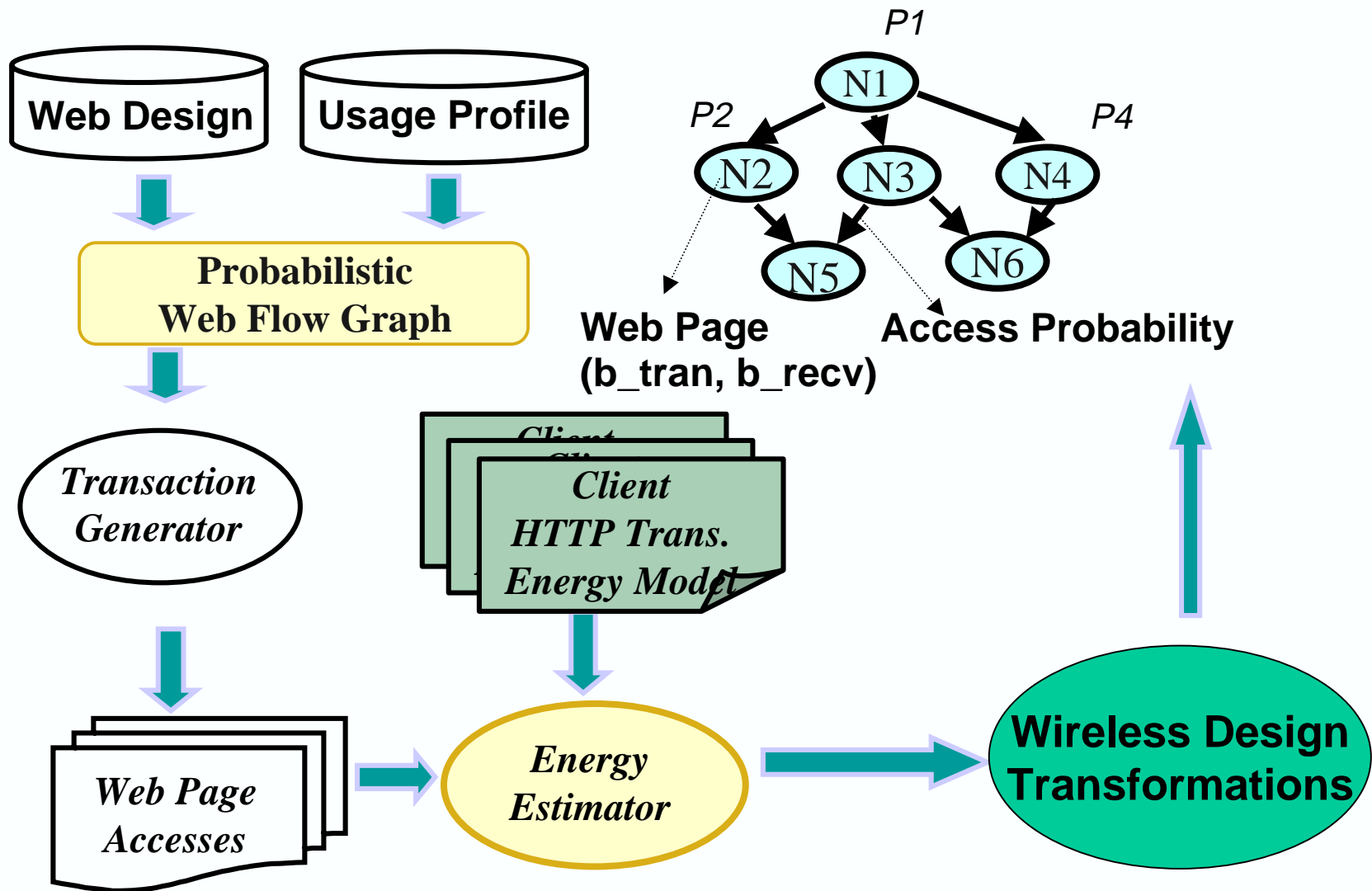
## Validation of Energy Model

- Comparison of measured energy consumption with energy estimation using the proposed model
  - Based on average energy consumption over 10 accesses

Application	Measured Energy (J)	Estimated Energy (J)	% Error
News	2.983	2.800	6.0
Travel	2.219	2.200	5.0
Personal	0.735	0.730	0.5

**Energy Model : Sufficiently Accurate to drive application level energy optimization**

# Wireless Application Design Exploration Environment



# Energy Aware Application Optimizations

