Modelagem e Avaliação de Dependabilidade de Infraestruturas de *Mobile Cloud Computing* para sistemas mHealth

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Agenda

- Objetivos
- *Mobile cloud computing*
- Modelos propostos
  - Disponibilidade e Confiabilidade
  - Performabilidade
- Ferramenta DR Monitor
- Próximas etapas

Objetivos

1 – Proposição de modelos de Confiabilidade e Disponibilidade;

2 – Proposição de modelos de Performabilidade;

3 – Proposição de estratégias de monitoramento e tomada de decisão para ambientes distribuídos.

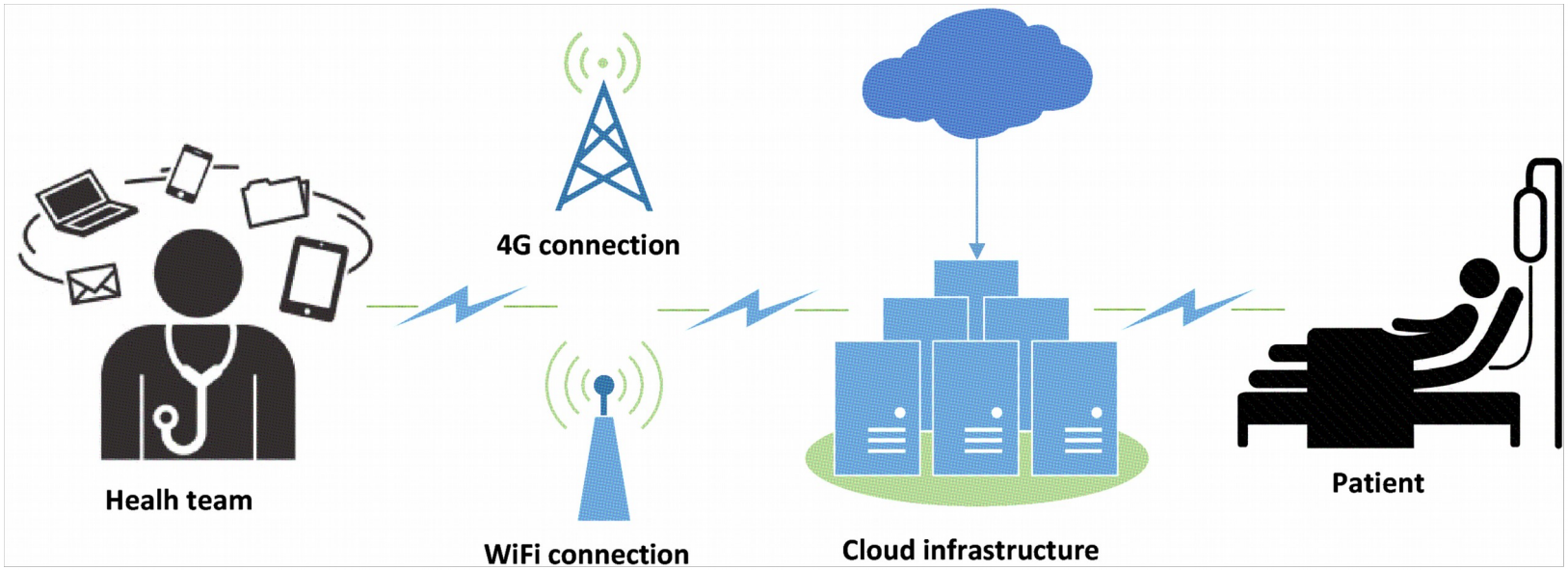
Mobile Cloud Computing

O que é?

- É a combinação da computação em nuvem e redes móveis para trazer benefícios para usuários móveis, operadores de rede, bem como provedores de nuvem;

- Transfere a computação intensiva, armazenamento de dados e processamento massivo de informação para a nuvem.

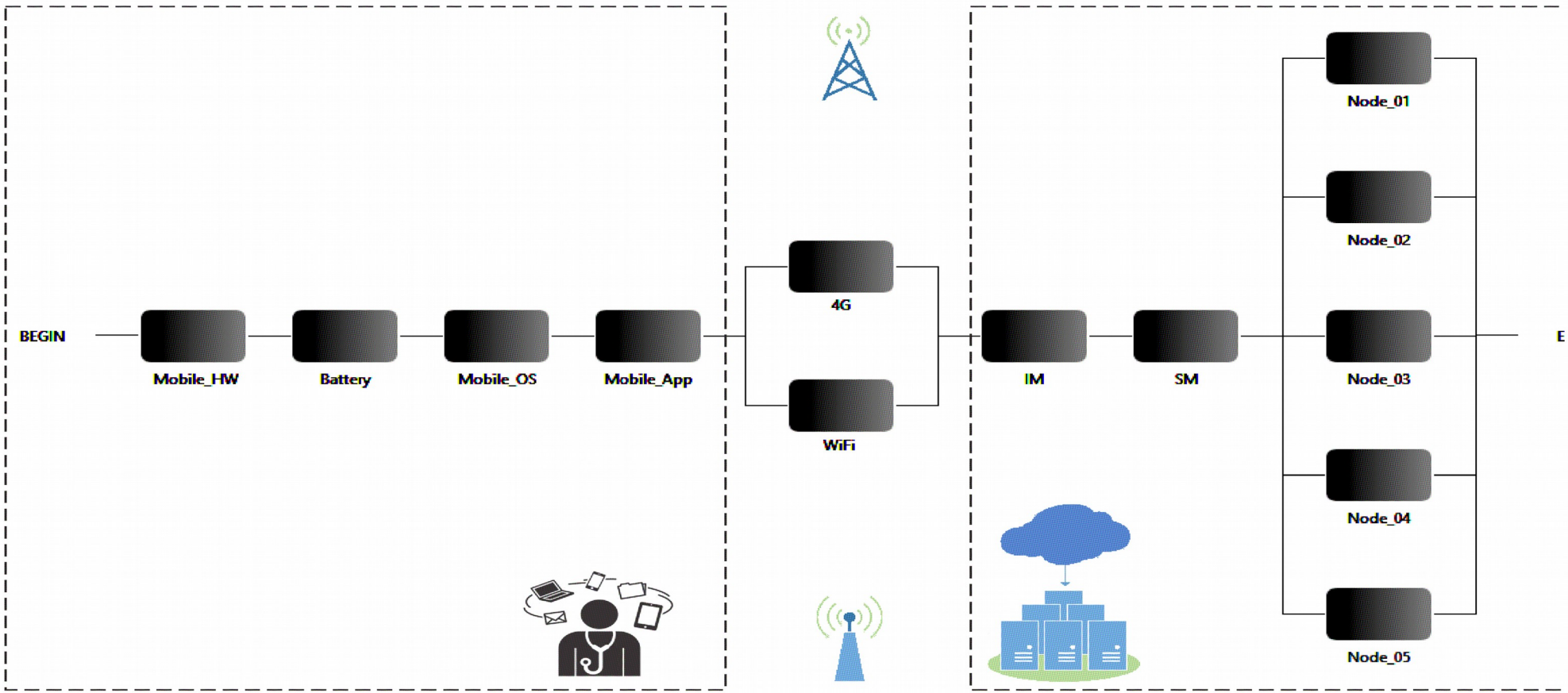
Arquitetura



Arquitetura da *mobile cloud*

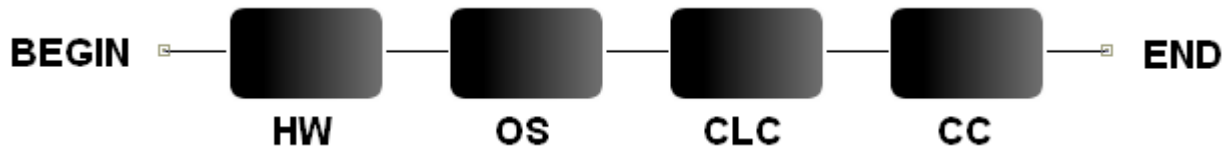
Modelos de confiabilidade e disponibilidade

Modelos propostos - Disponibilidade



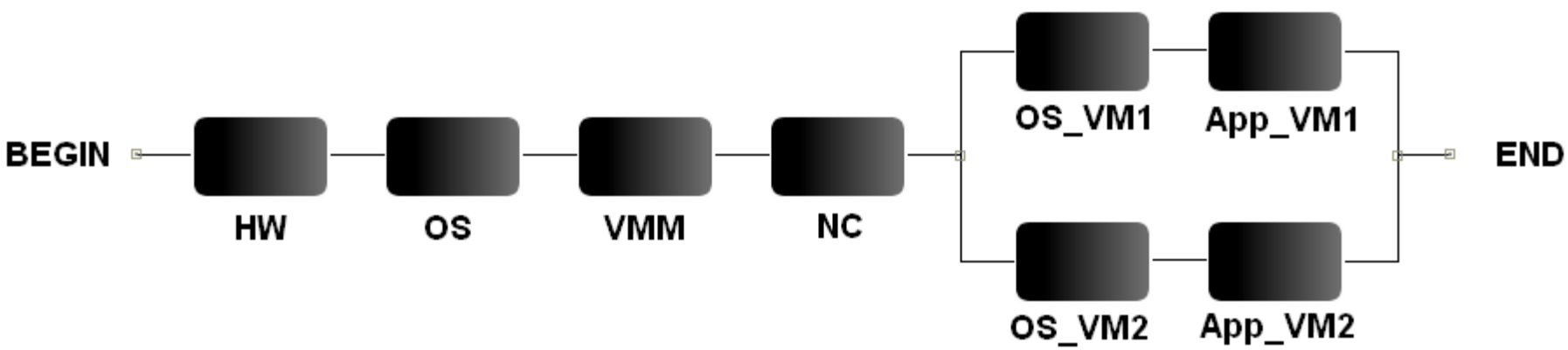
Modelo RBD para a *mobile cloud*

Modelos propostos - Disponibilidade



Modelo RBD para o subsistema *Infrastructure Manager (IM)*

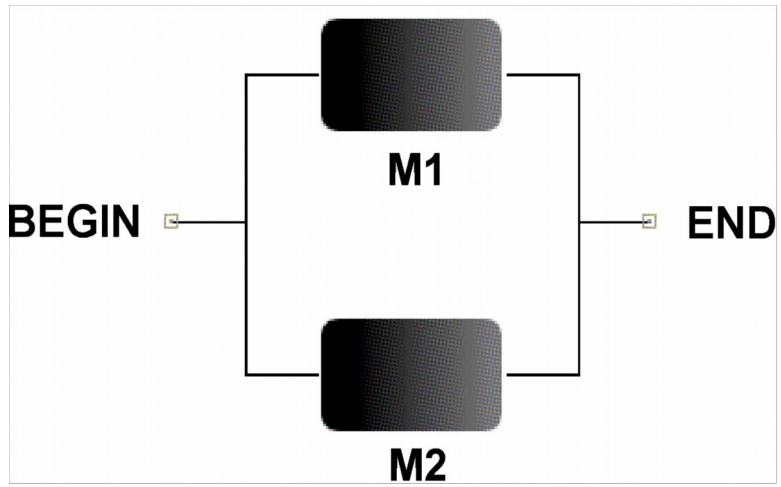
Modelo RBD para o subsistema *Storage Manager (SM)*



Modelo RBD para o subsistema dos Nós

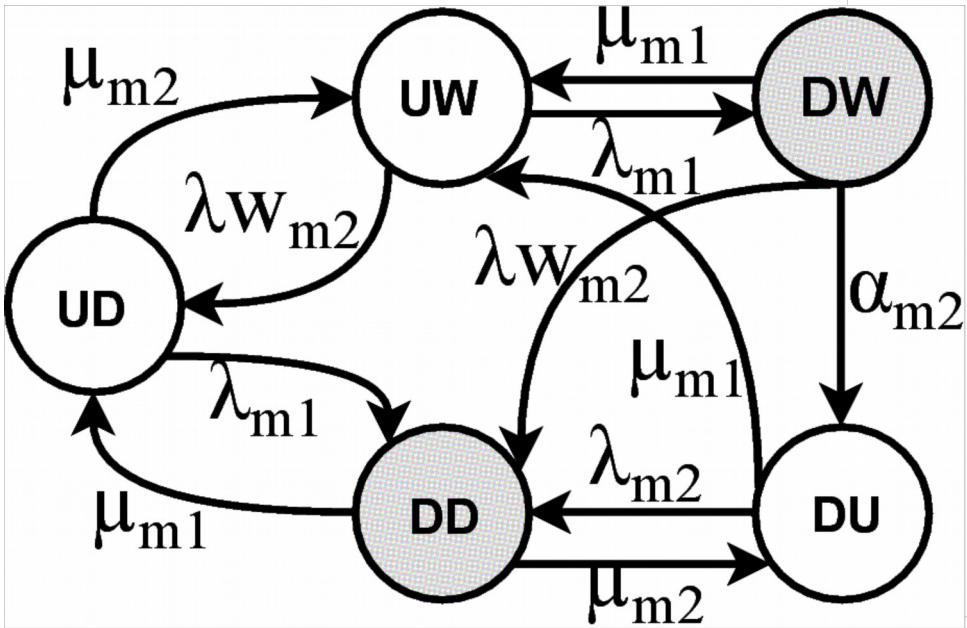
Modelos propostos - Redundância

Modelo de redundância TMR (*Triple Modular Redundancy*)

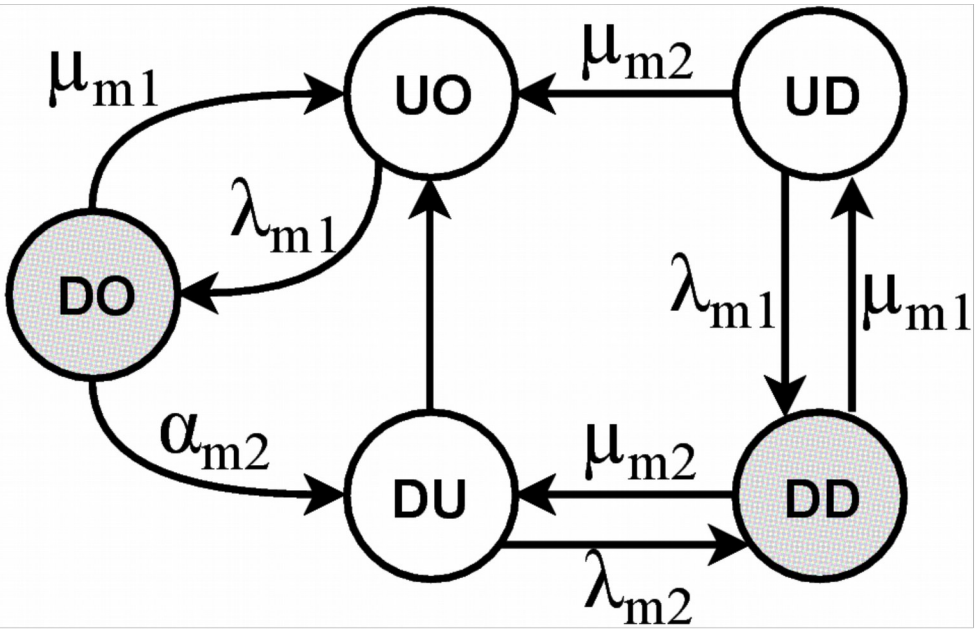


Modelo de redundância *Hot standby*

Modelos propostos - Redundância

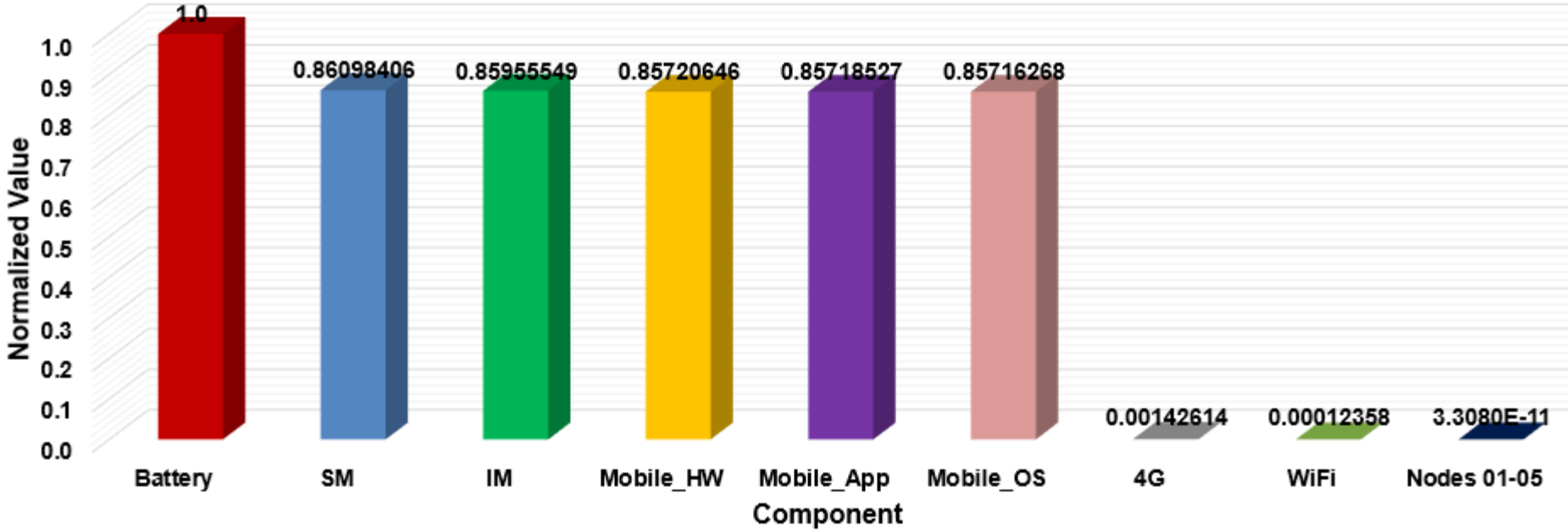


Modelo de redundância w*arm-standby*

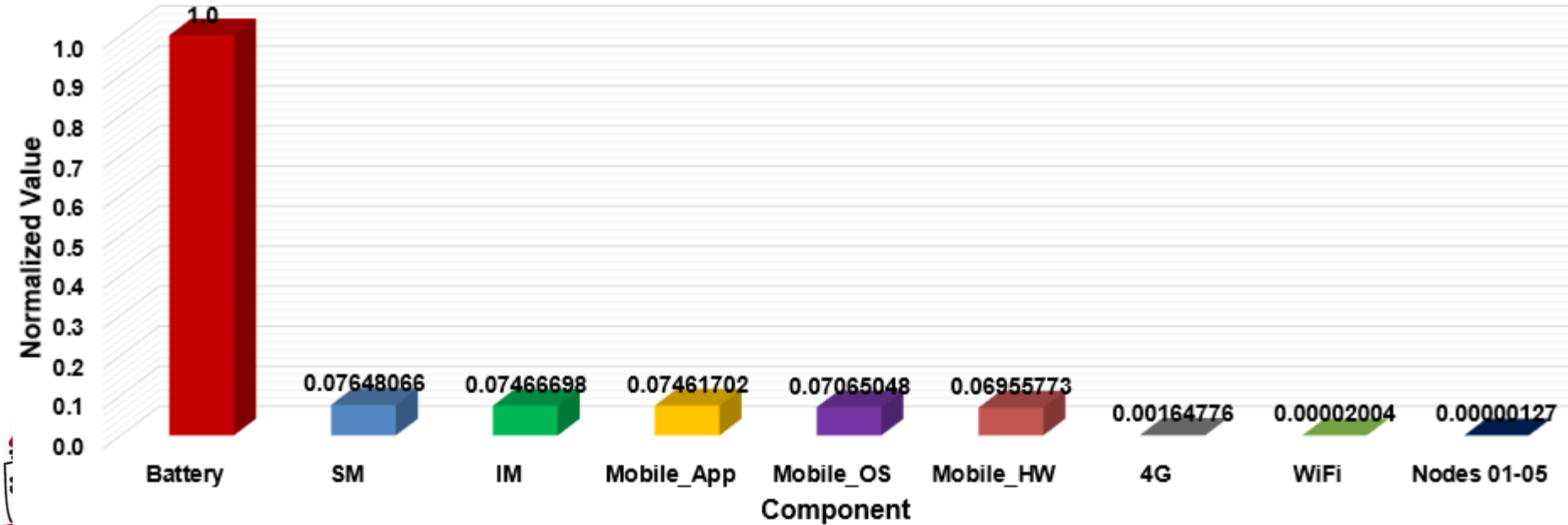


Modelo de redundância *cold-standby*

Resultados

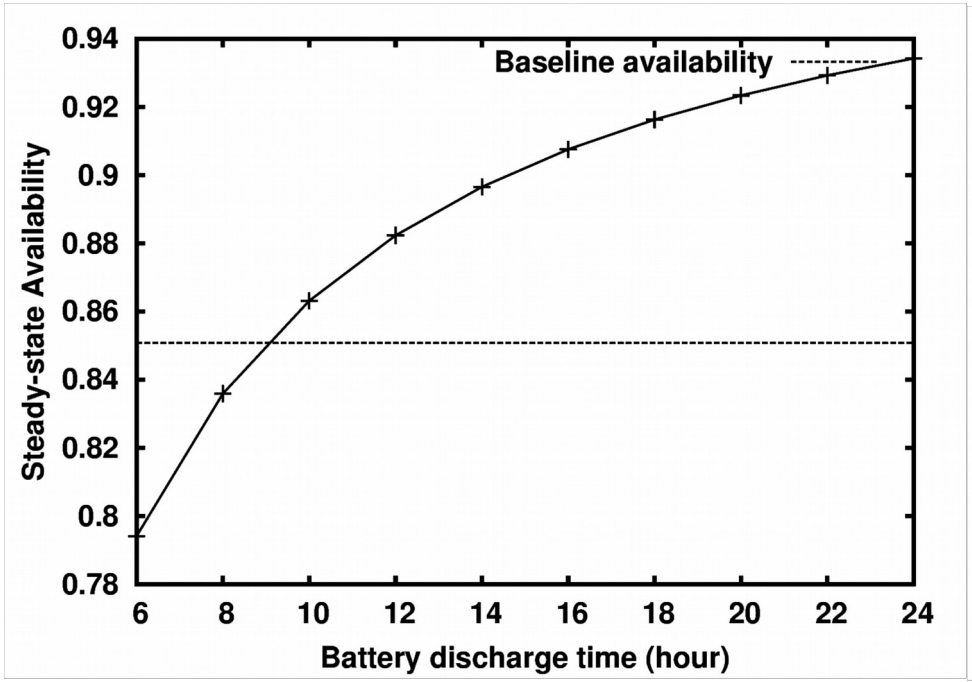


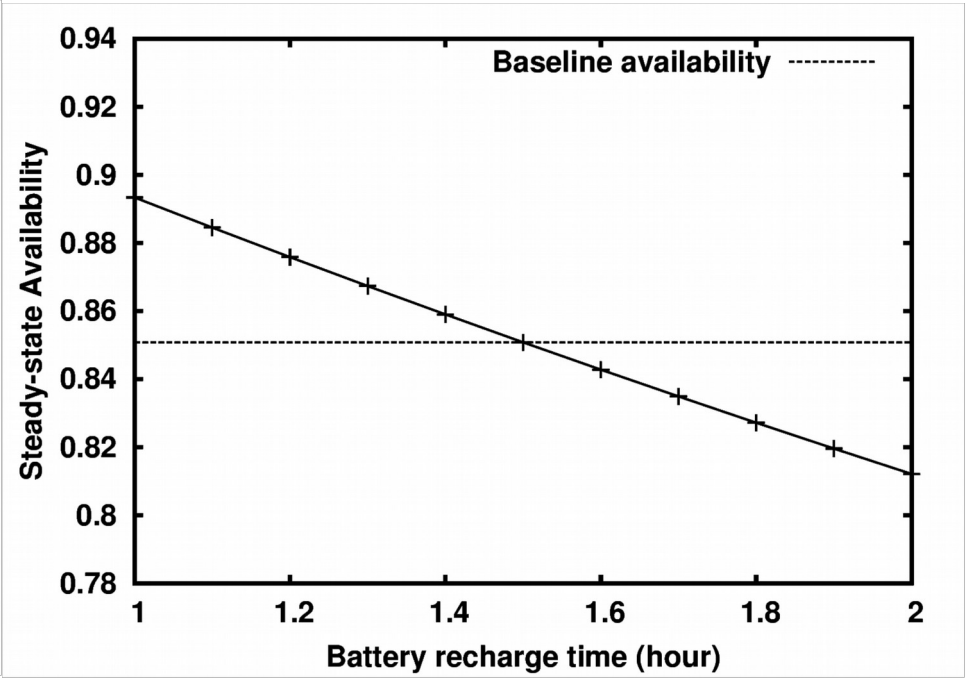
Availability importance of the mobile cloud



Reliability importance of the mobile cloud

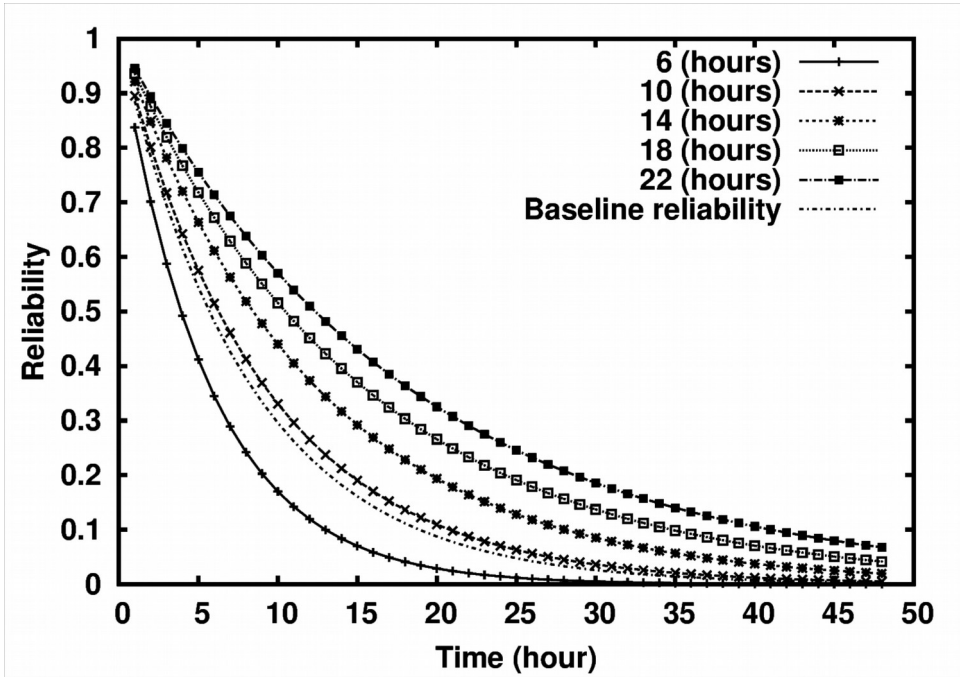
Resultados



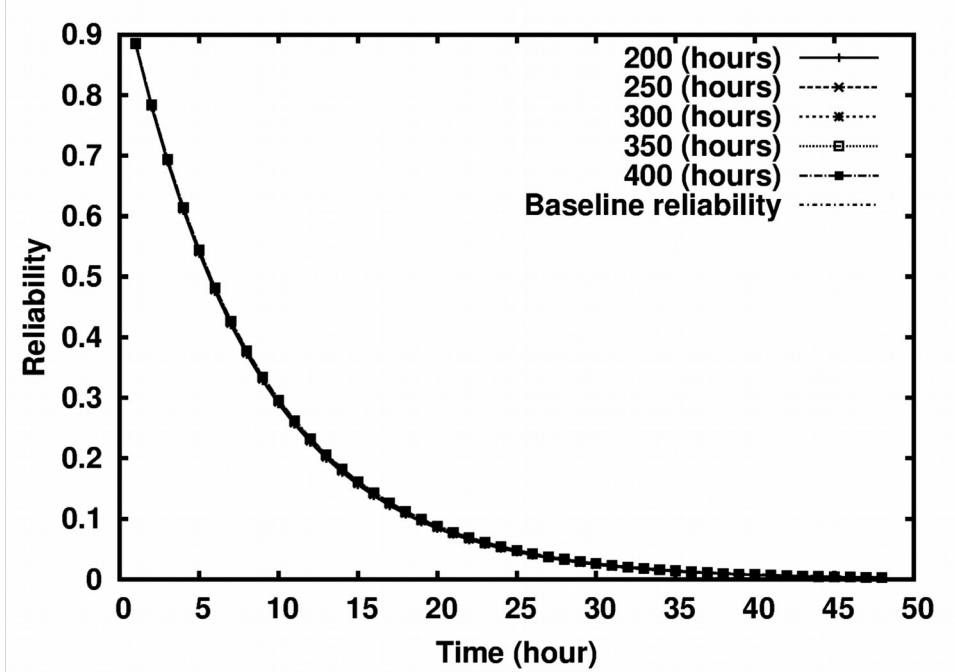


Disponibilidade da *mobile cloud*

Resultados



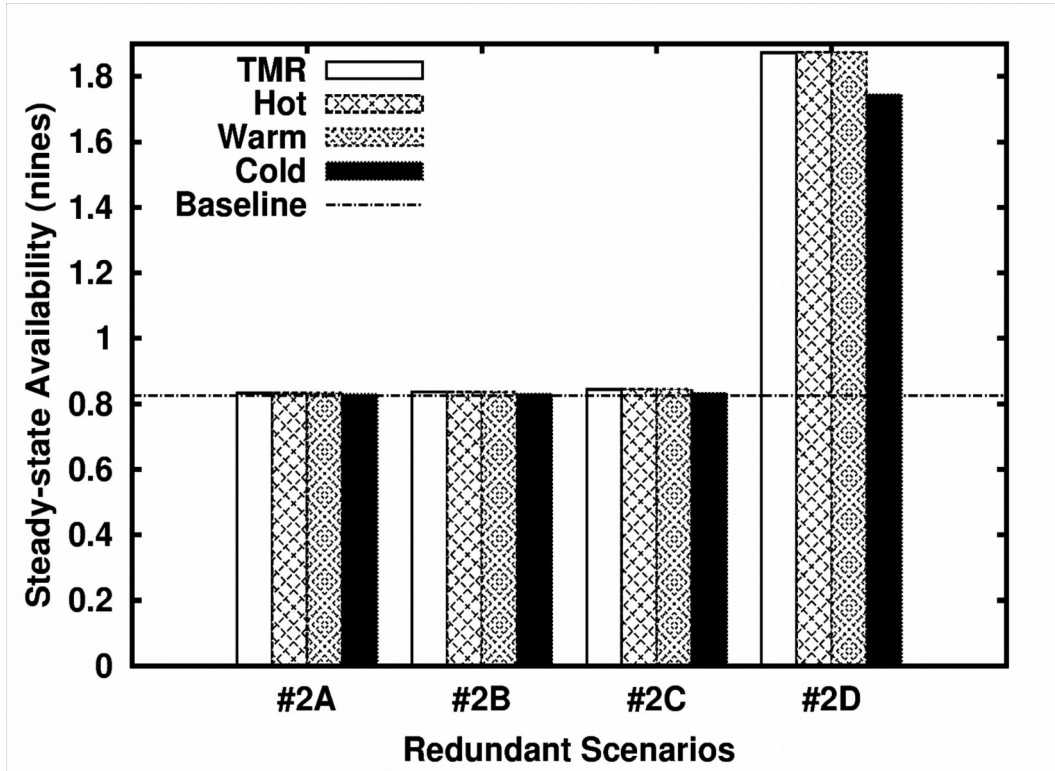
Bateria



Infrastructure Manager

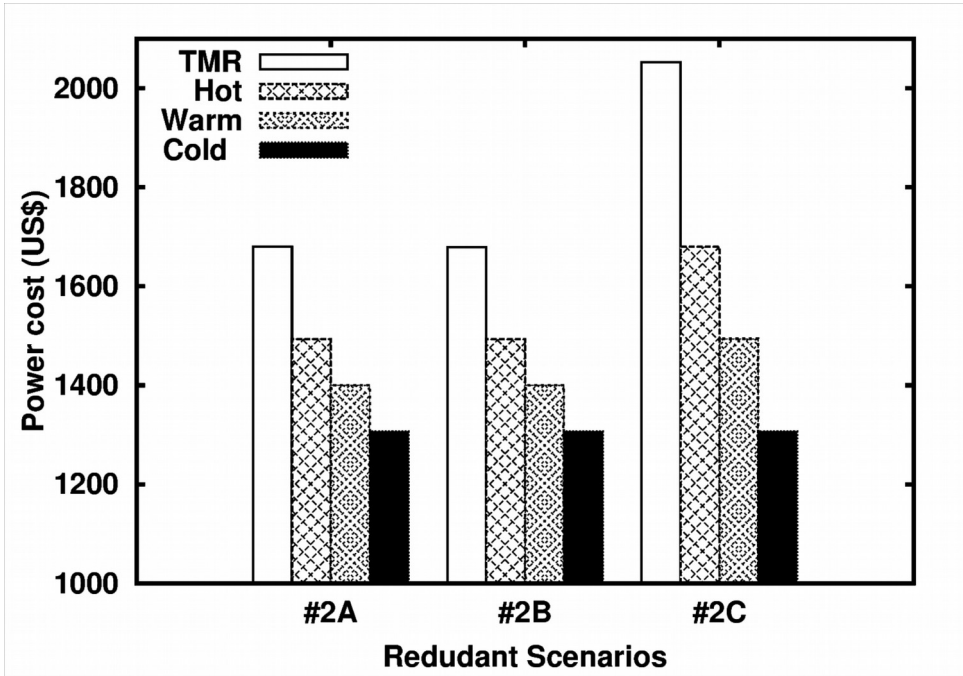
Confiabilidade da *mobile cloud*

Resultados

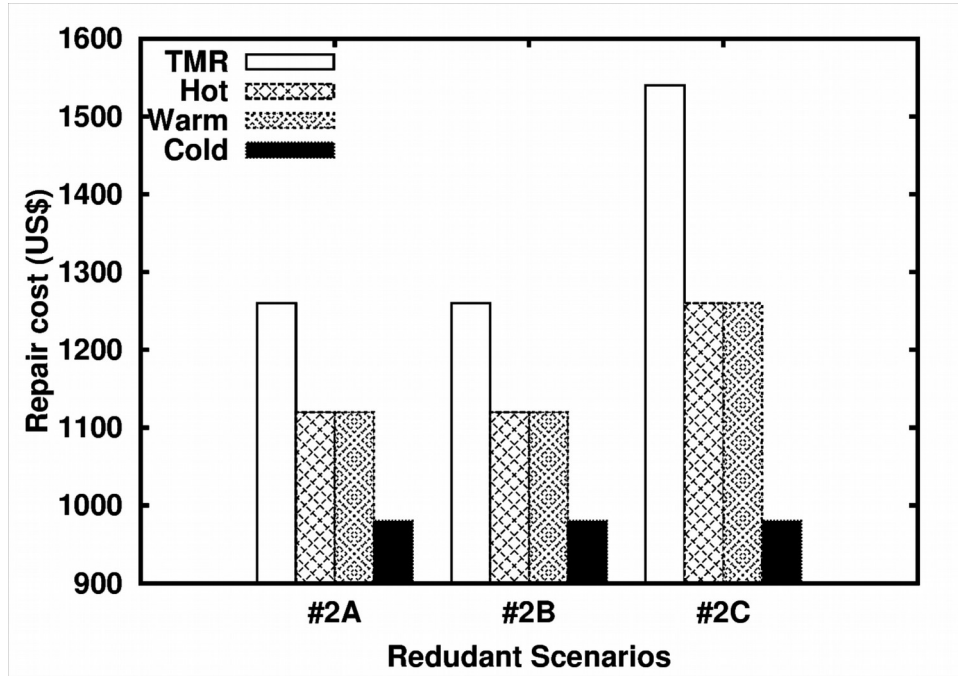


Disponibilidade da *mobile cloud* com diferentes tipos de redundância

Resultados



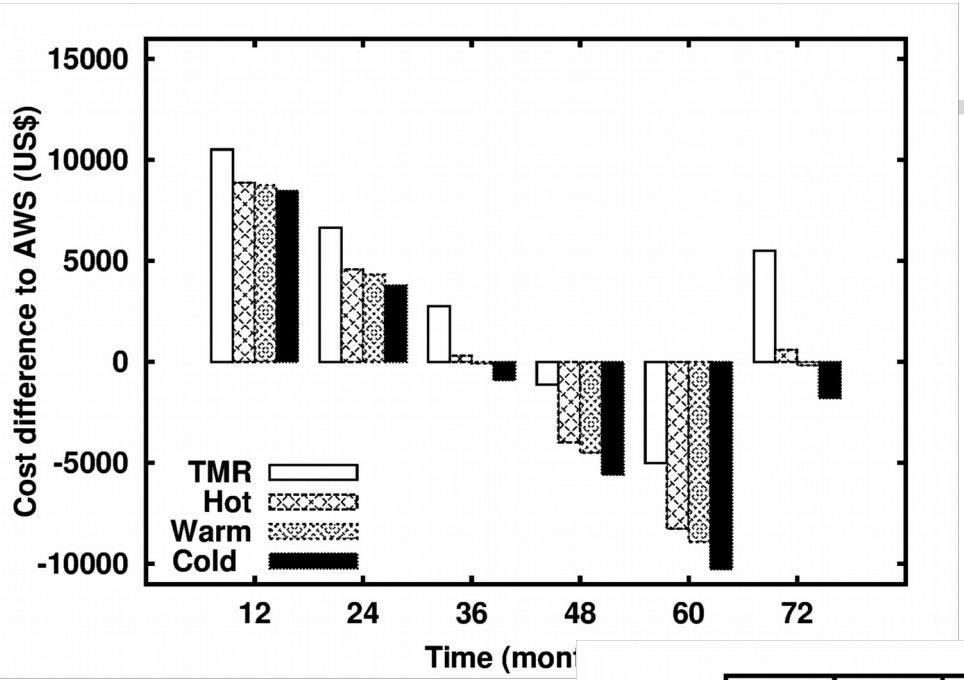
Custo com energia



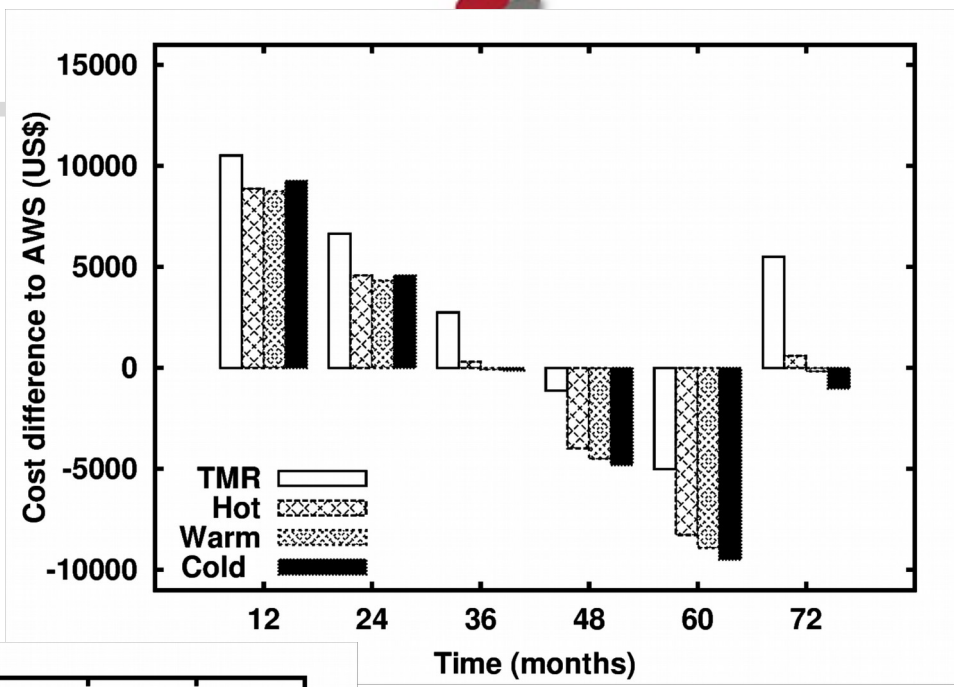
Custo com reparos

Custos com diferentes tipos de redundância

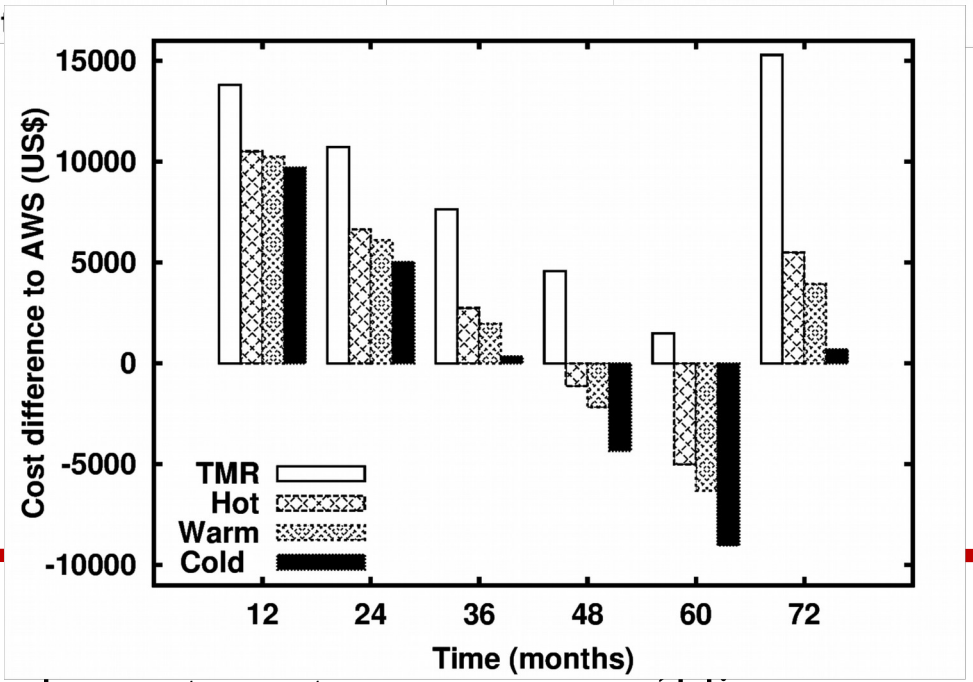
Resultados



Cenário 2A



Cenário 2B

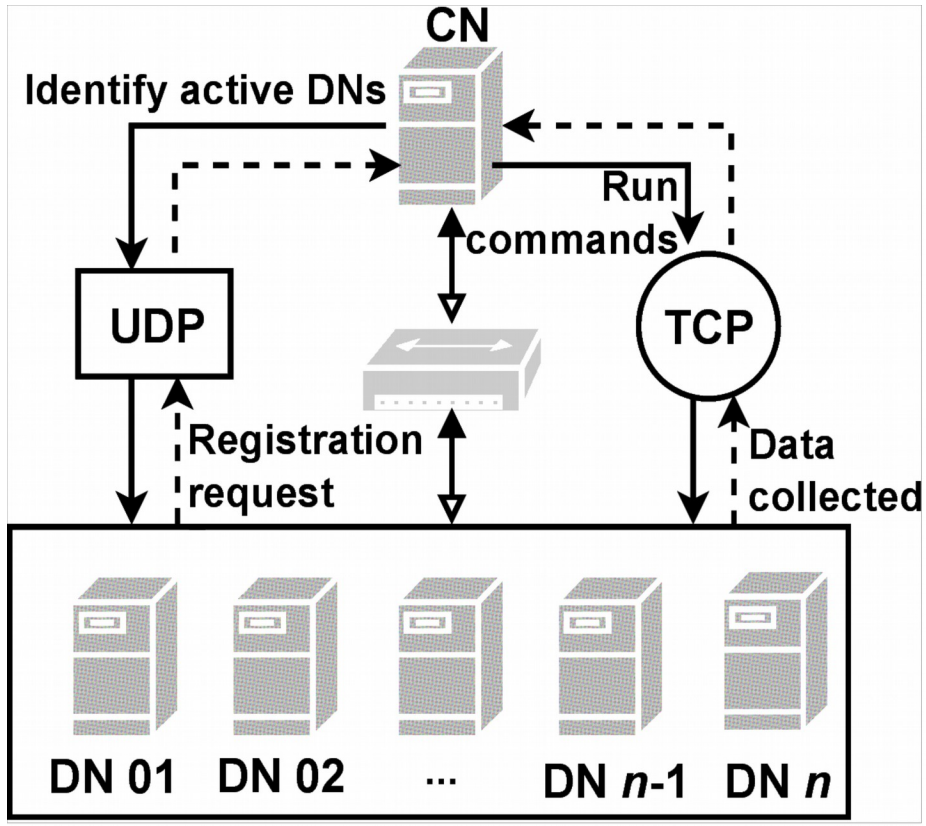


Diferença dos custos entre um nuvem pública e uma nuvem privada

Distributed Resources Monitor

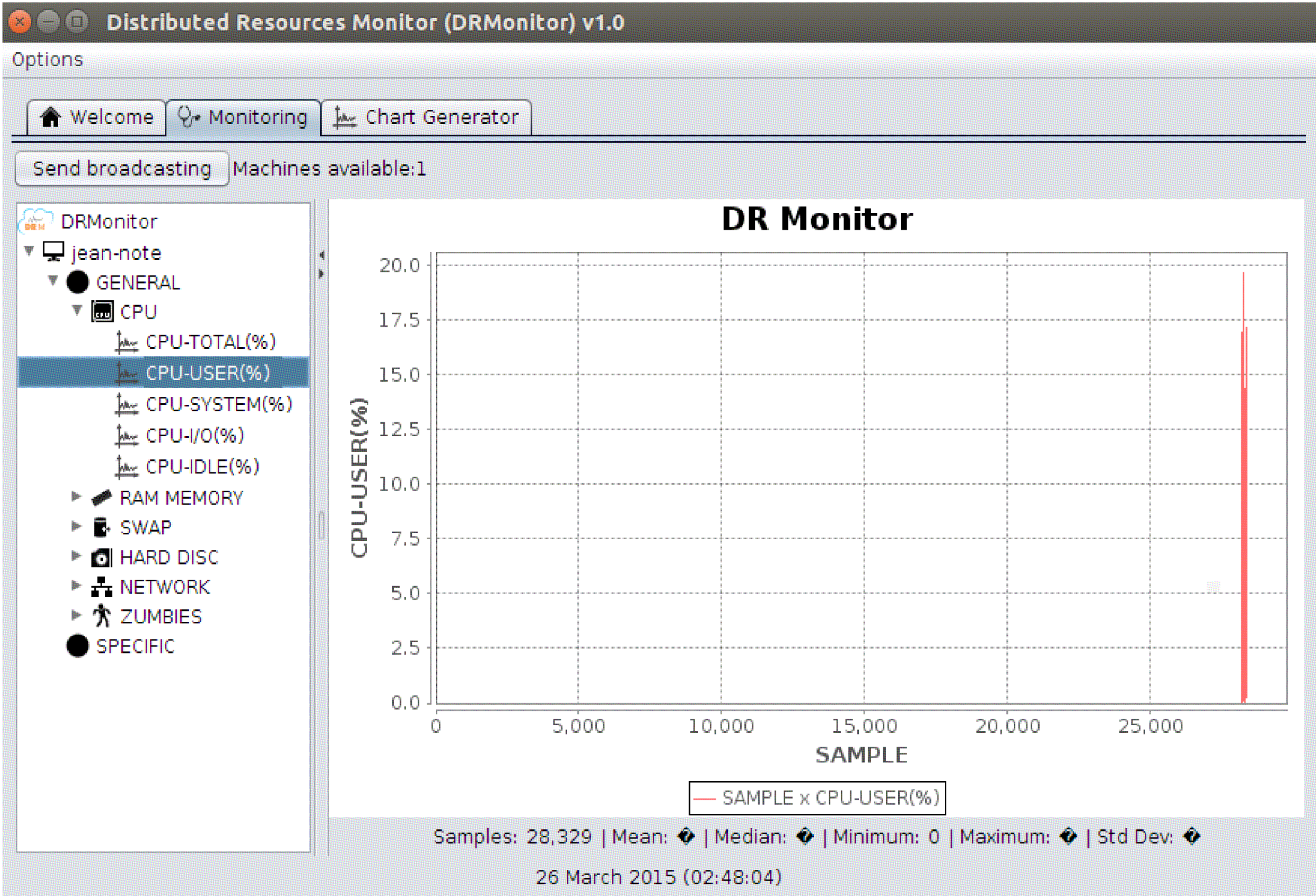
(DR Monitor)

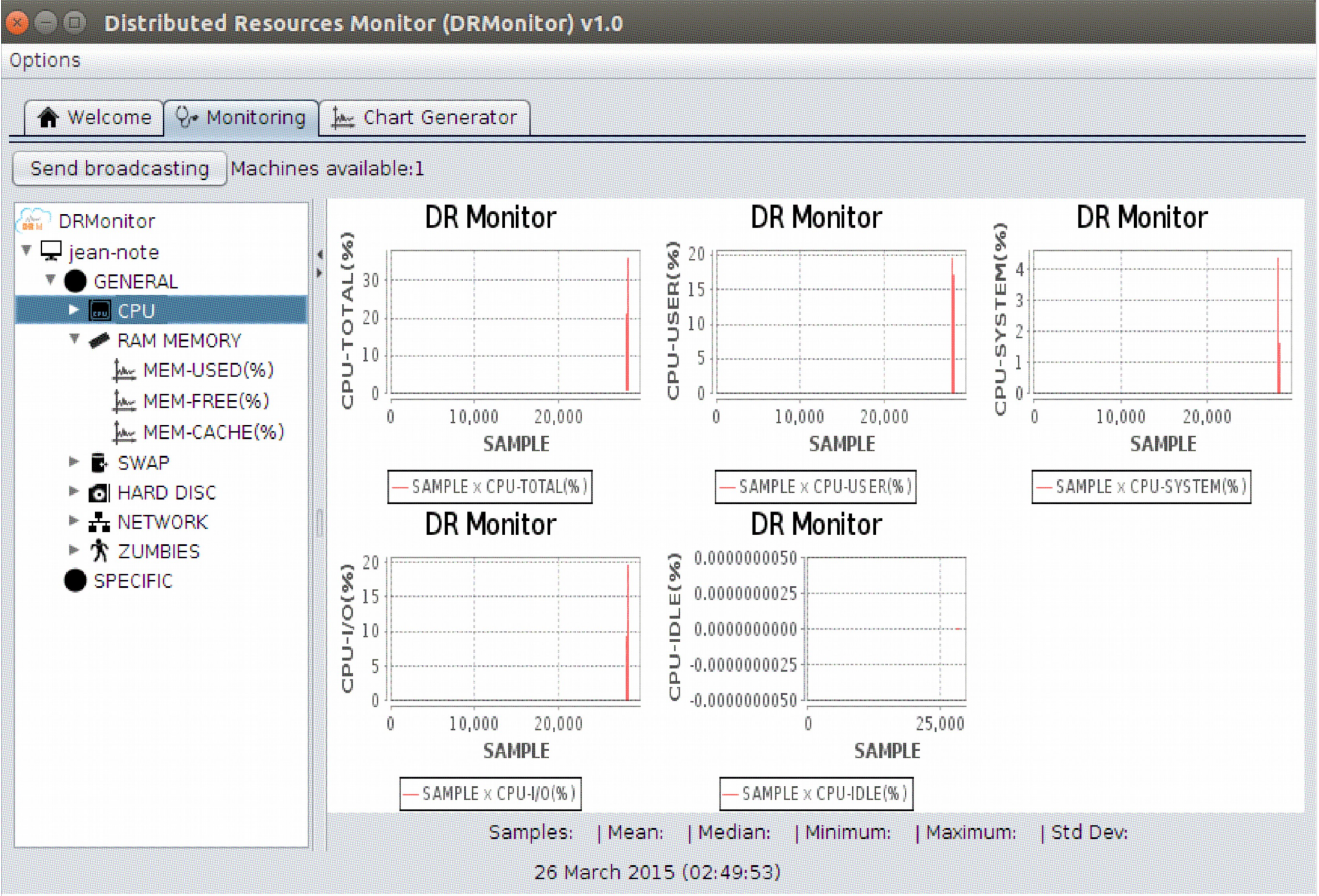
DR Monitor



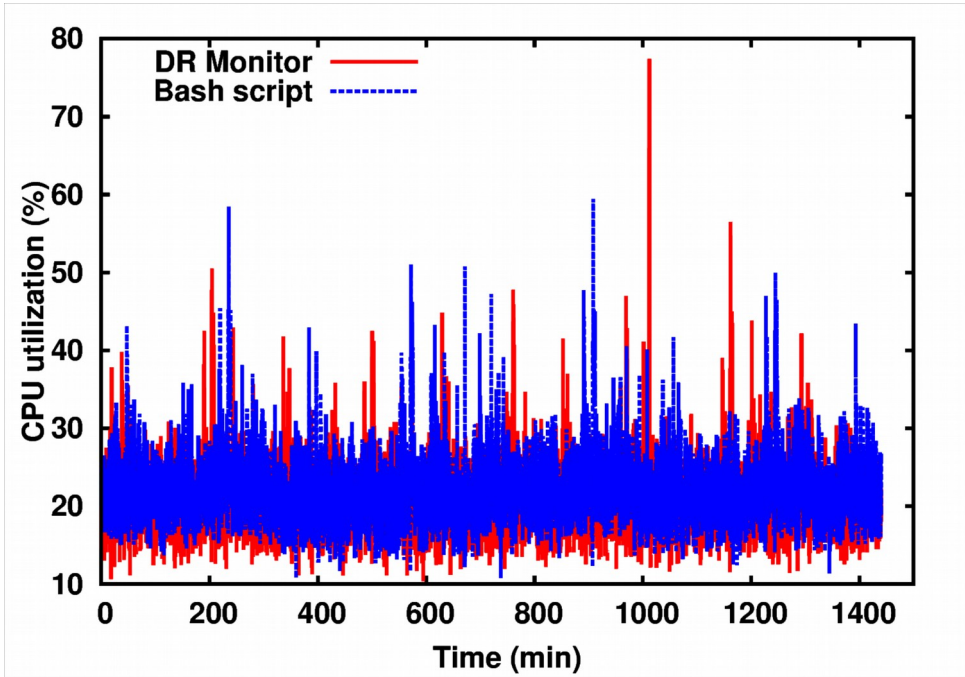
Arquitetura do DR Monitor


Distributed Resources Monitor (DRMonitor) v1.0
Options
Welcome
Monitoring
Chart Generator
Monitoring
Chart Generator
Manual
DR Monitor
Distributed Resources Monitor
26 March 2015 (04:19:53)

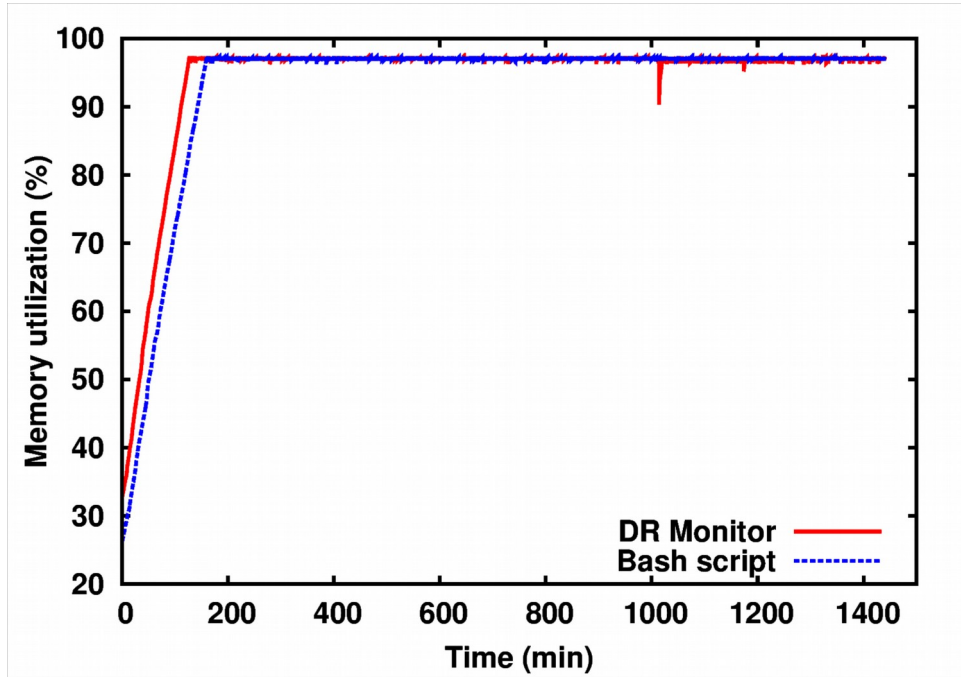

Distributed Resources Monitor (DRMonitor) v1.0
Options
Welcome
Monitoring
Chart Generator
Send broadcasting
Machines available:1
DRMonitor
jean-note
GENERAL
CPU
CPU-TOTAL(%)
CPU-USER(%)
CPU-SYSTEM(%)
CPU-I/O(%)
CPU-IDLE(%)
RAM MEMORY
SWAP
HARD DISC
NETWORK
ZUMBIES
SPECIFIC
DR Monitor
CPU-USER(%)
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0
5,000
10,000
15,000
20,000
25,000
SAMPLE
SAMPLE x CPU-USER(%)
Samples: 28,329 | Mean: | Median: | Minimum: 0 | Maximum: | Std Dev:
26 March 2015 (02:48:04)


Distributed Resources Monitor (DRMonitor) v1.0
Options
Welcome
Monitoring
Chart Generator
Send broadcasting
Machines available:1
DRMonitor
jean-note
GENERAL
CPU
RAM MEMORY
MEM-USED(%)
MEM-FREE(%)
MEM-CACHE(%)
SWAP
HARD DISC
NETWORK
ZUMBIES
SPECIFIC
DR Monitor
CPU-TOTAL(%)
SAMPLE
SAMPLE x CPU-TOTAL(%)
DR Monitor
CPU-USER(%)
SAMPLE
SAMPLE x CPU-USER(%)
DR Monitor
CPU-SYSTEM(%)
SAMPLE
SAMPLE x CPU-SYSTEM(%)
DR Monitor
CPU-I/O(%)
SAMPLE
SAMPLE x CPU-I/O(%)
DR Monitor
CPU-IDLE(%)
SAMPLE
SAMPLE x CPU-IDLE(%)
Samples: | Mean: | Median: | Minimum: | Maximum: | Std Dev:
26 March 2015 (02:49:53)

DR Monitor



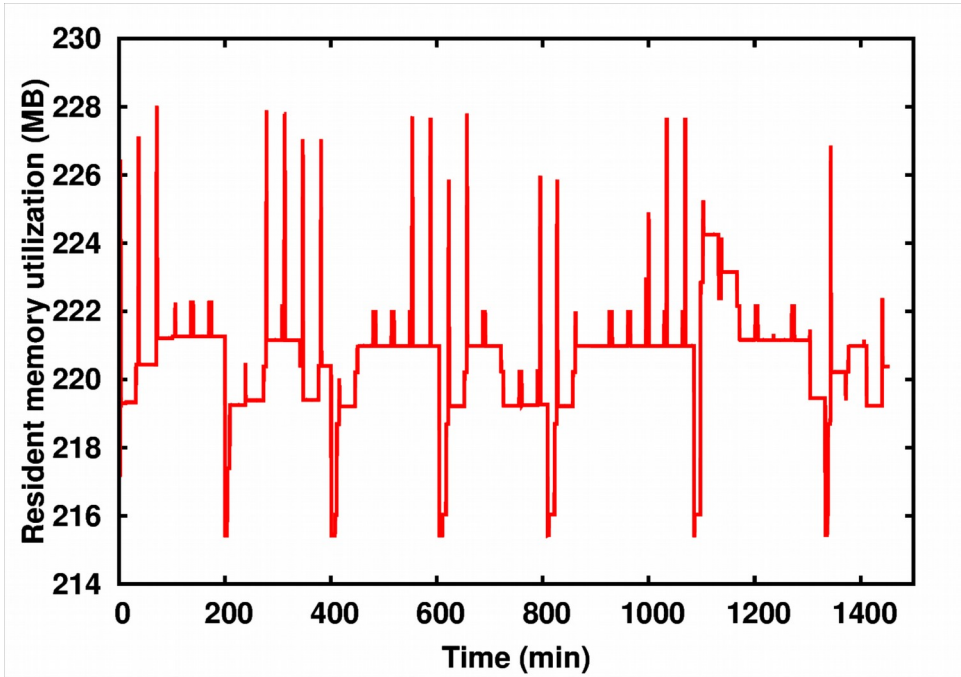
Utilização de CPU



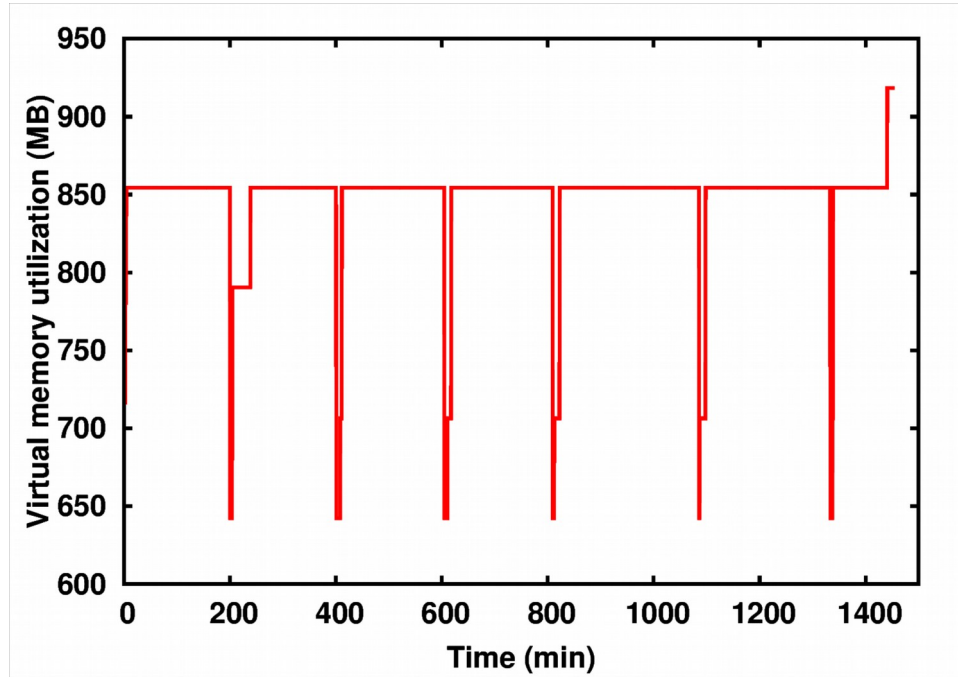
Utilização de memória

Comparação utilização de recursos: DR Monitor vs script Bash

DR Monitor



Memória residente

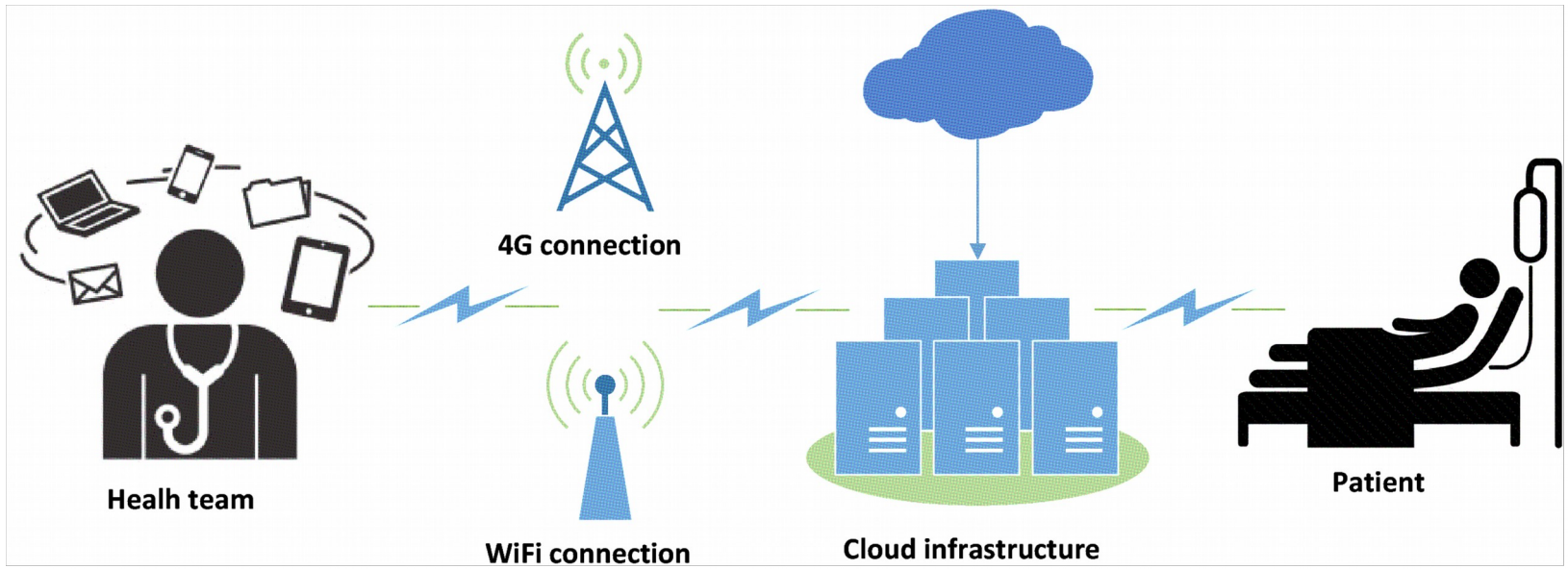


Memória virtual

Comparação utilização de recursos: DR Monitor vs script Bash

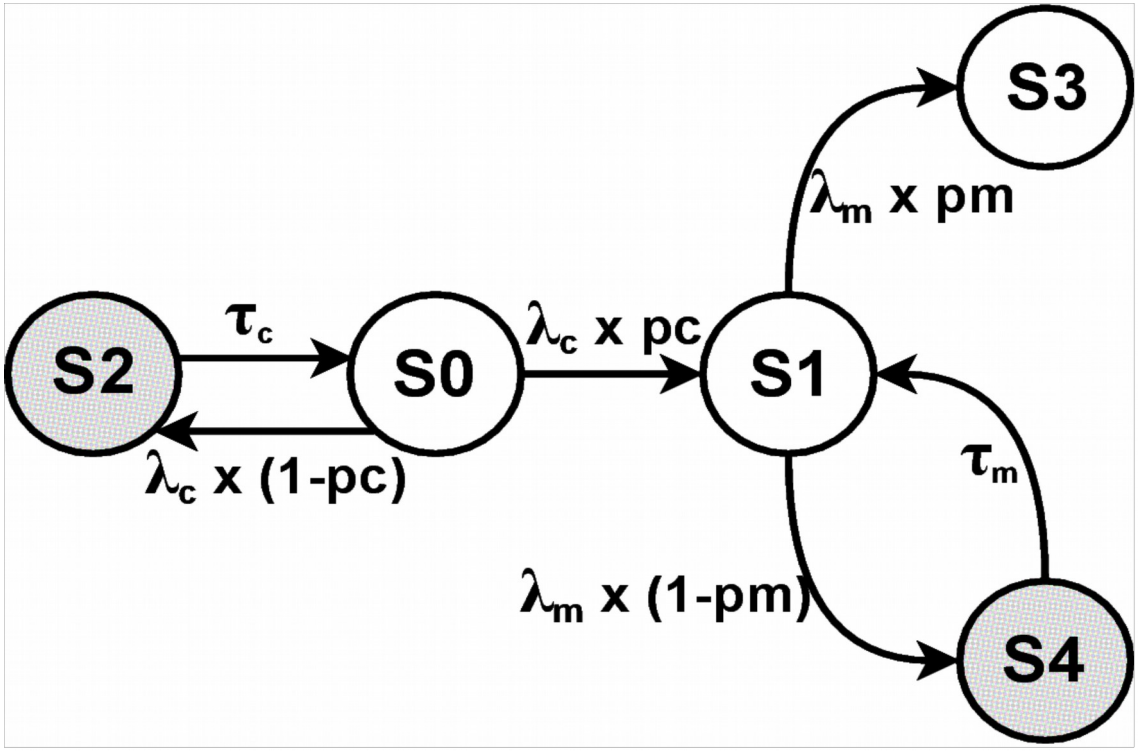
Modelos de performabilidade

Arquitetura de um sistema mHealth



Arquitetura do sistema

Modelo de estado absorvente



Modelo de entrega de mensagens

Resultados – Modelo de estado absorvente

$$\frac{1}{pc\ \lambda c} + \frac{1}{pm\ \lambda m} - \frac{-pc\ \lambda c\ \lambda m\ \tau c + pc\ pm\ \lambda c\ \lambda m\ \tau c}{pc\ pm\ \lambda c\ \lambda m\ \tau c\ \tau m} - \frac{-pm\ \lambda c\ \lambda m\ \tau m + pc\ pm\ \lambda c\ \lambda m\ \tau m}{pc\ pm\ \lambda c\ \lambda m\ \tau c\ \tau m}$$

$$\frac{\frac{1}{\lambda c} + \frac{1}{\tau c}}{pc} + \frac{\frac{1}{\lambda m} + \frac{1}{\tau m}}{pm} - \frac{\tau c + \tau m}{\tau c\ \tau m}$$

Fórmulas fechadas

Próximas etapas...

- Análise de sensibilidade do modelo de estado absorvente;
- Execução de experimento de desempenho da *mobile cloud* usando diferentes tipos de protocolos de comunicação;
- Otimização do tempo de vida de sensores mHealth;
- Implementação da *PocketStack Cloud Platform*.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